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December 3, 2013

## MEMORANDUM

**TO:** Fish and Wildlife Committee members

**FROM:** Council Staff

**SUBJECT:** Fish and Wildlife Program Amendment discussion

- Climate change recommendations summary
- Overview of comments on the recommendations
- Discussion of issues

At the December Committee meeting, staff will review with the Committee members the current program amendment schedule along with tasks to be accomplished in the next several months. Staff will then present the following three main topics:

- *Attachment 1:* A summary of the recommendations pertaining to climate change. At the November Committee meetings, the recommendations were summarized and presented by 32 different topics. Our last topic, climate change, will be presented at the December Committee meeting.
- *Attachment 2:* A high-level overview of the comments received on the recommendations, specifically pertaining to new concepts. A more detailed draft summary of the comments received on the recommendations is attached for your review but will not be presented in detail at the meeting.
- *Attachment 3:* Some key issues that have emerged throughout the recommendations and comments. Some of the summaries on the key issues are still being developed. As those become available, they will be emailed to the Committee members in preparation for the December Committee meetings.

Below is an outline for the Program amendment process from today through February 2014. As the Committee and staff begin drafting Program language, staff is seeking guidance from the Committee on direction for emerging issues (*attachment 3*). Staff will lay out a few alternatives for each of the issue topics. The majority of the meeting times are set up for discussion amongst the Committee members on

these topics and their alternatives. Additional meeting times have been reserved for December 11, 12, 13, 16, 17, and 18, if needed, to continue this dialogue and draft Program language.

Draft Program amendment work schedule excerpt (December 3, 2013)

<b>Committee/Council meeting dates</b>	<b>Work session dates, Est. duration</b>	<b>Program amendment topics/activities for work sessions</b>	<b>Important related dates</b>
Committee meeting  (Council meeting is Dec 10, 11, Portland)	Dec 10, 11 Full day+  Reserved 11 <sup>th</sup> pm 12 <sup>th</sup> pm 13 <sup>th</sup> am 16 <sup>th</sup> pm 17 <sup>th</sup> am 18 <sup>th</sup> pm	<ul style="list-style-type: none"> <li>• Review comments</li> <li>• Review issue summaries</li> <li>• Reach agreement on issues &amp; revised program language</li> </ul>	
Committee meeting  (Council meeting is Jan 14, 15)	Jan 13 & 14 1-2 days	<ul style="list-style-type: none"> <li>• Review topic issue papers,</li> <li>• Reach agreement on issues &amp; revised program language</li> <li>• Discuss scheduling and procedures for public hearings and consultations (following release of draft amended program)</li> <li>• Agree to move to full Council for release</li> </ul>	
TBD Special Committee/Council meeting	Late January 1-2 days	<ul style="list-style-type: none"> <li>• Review the Committee recommendations, discuss draft program language</li> <li>• Review draft plan for public hearings and consultations</li> </ul>	
Feb 11, 12 Council meeting	Feb 11 Full day +	<ul style="list-style-type: none"> <li>• Discuss draft amended program language</li> <li>• <b>Decision to release draft program</b> (tentative)</li> </ul>	
TBD Late February	Half – full day	<ul style="list-style-type: none"> <li>• Hold in case need additional time for developing draft amended program</li> </ul>	

## **Attachment 1: Summary on climate change recommendations**

### **Staff Summary of Issues & Recommendations Climate Change**

\*Preliminary draft, please refer to full recommendations for complete review

12/3/2013 12:34 PM

#### **2009 Fish and Wildlife Program Sections**

Section II-Emerging Habitat Issues (page 16); the Resident Fish Mitigation section of Basinwide Strategies on pp. 22-23; and the Climate Change Planning Considerations section (pp. 51-52) in Section VI-Mainstem Plan.

#### **I. Overview**

The Council received many recommendations concerning climate change. A number of agencies and tribes recommended the Program should include the ISAB's recommendations addressing climate change and to assess the effects of climate change on both lampreys, sturgeon and forage fish. Generally, the recommendations fall into several major topic areas. Overwhelmingly, many agencies and tribes call for integrating climate change planning actions and assessments into the Program, as well as implementation of long-term habitat protections to combat expected climate change impacts on the basin's fish and wildlife resources. Implementation of various projects and actions, or assessments, to mitigate for climate change in the mainstem, the estuary, plume and nearshore ocean is widely recommended. System operational flexibility and assessment of flood risk management is also called for by several entities.

A number of entities recommend using adaptive management and operational tools to mitigate for the expected effects of climate change. One agency recommended identifying interactions between chemical and non-chemical stressors, and reducing pollution threats, which will be important under future climate change conditions. There was support for integrating future water use into climate change impacts, as well as establishing a framework for prioritizing flow restoration actions in light of expected flow changes due to climate change. One entity called for maintaining at-risk hydrologic monitoring stations in the basin, as well as strengthening the Protected Areas designations to ensure protections are in place in light of hydrologic changes expected under a changing climate. Finally, the Council is asked to expand its leadership role in identifying salmon recovery and mitigation actions to address the effects of climate change.

#### **II. ISAB Review of 2009 Program**

In its review of the 2009 Fish and Wildlife Program, the ISAB has identified climate change as one of the major threats to the sustainability of the Columbia River ecosystem and the success of the Fish and Wildlife Program. The ISAB stated that "climate change predictions point toward changes in the timing and distribution of water flow, including extreme events such as floods and droughts. The concept of return periods of floods and droughts based on historical data may no longer be adequate for designing and planning for extreme events. Fisheries impacts due to warmer water temperatures include physiological effects such as lower growth rates that can result in higher predation, increased

susceptibility to invasive and non-native species, and reduced cold water refuges. Ocean habitat suitable for salmonids in the Gulf of Alaska is projected to be substantially reduced in extent by the 2080s, due to changes in temperature, salinity, and acidification. Given the importance of climate change to the success of the Program, the ISAB recommends that the amended Program promote development of a comprehensive strategic plan to explore strategies to cope with potential impacts of climate change throughout the Basin. Modeling and analyses are needed to provide guidance for flood control and hydropower operations to enhance ecosystem resilience and adaptability under climate change.”

**ISAB recommendations for addressing climate change:**

- 1. Develop a comprehensive strategic plan on the potential impacts of climate change on the entire system, including the estuary and ocean, and develop a suite of strategies within the amended Program.**
  
- 2. Provide guidance for potential revisions to flood control and hydropower operations to enhance ecosystem resilience and adaptability under climate change.** Management options considered in experiments and modeling should not be limited to current operating constraints.
  
- 3. Examine management options under climate change scenarios by using monitoring data and modeling tools where possible**
  
- 4. Assess and appropriately revise ongoing monitoring to optimize collection of data regarding species responses, interactions and production under climate change**
  
- 5. Require project proposals and management plans to consider the potential impact on project outcomes of climate change and its associated variability and uncertainty.** Create a resource of references to the current science that can be shared with project designers and managers.

### **III. Summary**

**Specific Language Changes**

ODFW, WDFW, COWLITZ, USRTs and NOAA Fisheries all stated that recovery plans are a source for actions to address climate change. Under Habitat Strategies-Emerging Habitat Issues (p. 16), include the following modified language [with changes shown in **bold**]: “...*Specific measures to deal with these emerging issues are included in the mainstem plan, **recovery plans**, and many of the subbasin plans.*”

ODFW, WDFW, the WA Governor’s SRO, NPT, NOAA Fisheries and SOWS recommend amending the Program to include the ISAB’s recommendations for addressing climate change (ISAB 2013-1).

NOAA Fisheries recommends the existing Climate Change Planning section in Mainstem Plan on pp. 51-52 should be updated and moved to the Basinwide Strategies section.

ODFW, WDFW, CRITFC, COWLITZ, NPT, USRT and USGS recommendation adding new language under the Lamprey section on p. 47: *BPA and the Corps, in coordination with federal, state and tribal fish managers and the Council, should: a) determine the potential effects of climate change on*

*lampreys, including the effects of increasing water temperatures and changing runoff regimes on lamprey energetic and performance; and b) develop adaptation strategies to address these effects.*

ODFW, WDFW, COWLITZ and USRT recommend adding new language in White Sturgeon strategies in Section VI-Mainstem Plan on p. 47: *Assess the effects of climate change on basin sturgeon populations and develop adaptation strategies to address these impacts.*

## Major Topic Areas

### ***Focus of the Fish and Wildlife Program***

CRITFC recommends, over the next decade, the Council should: *a) develop a flexible framework for adjusting the Program to incorporate actions to deal with the **impacts of climate change** on restoration efforts; and b) develop and provide at the basin-wide level knowledge bases, tools and expertise (including regional **climate change analyses**) that may not be available locally and that subbasin stakeholders can draw upon as needed.*

### ***Program Vision***

USGS

Recommendation: *The federal Action Agencies, resource management agencies, tribes and the Council should manage natural resources in the basin under future conditions that will intensify current landscape-scale stressors such as **climate change**, water shortages, contaminants, invasive species, changes in water temperature, hypoxia and acidification in the estuary, and wildfire.*

### ***Role of Fish and Wildlife Program and the Council***

NOAA FISHERIES

Recommendation: *Develop a basinwide framework that assesses and addresses threats to sustainable ecosystem including **climate change**, loss of diversity, toxics and carrying capacity (food webs).*

PFMC

Recommendation: *The Council should expand its leadership role in identifying salmon recovery and mitigation actions to address [the effects of] climate change. The Council should convene a working group to begin addressing how predicted [climate] change could be addressed in decision-making at all levels of the Program.*

### ***Integrate Climate Change into Program***

MT DFW&P, ODFW, WDFW, WA Governor's SRO, LCREP, SALISH & KOOTENAI, COWLITZ, USRT and NOAA Fisheries (KOOTENAI TRIBE of IDAHO on recommendation #2 only):

To be added to "Climate change planning considerations" on pp. 51-52 of Fish and Wildlife Program:

Recommendation: *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: *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: *Require project proposals and management plans to consider the potential impact on project outcomes of climate change and its associated variability and uncertainty.*

#### NOAA Fisheries

Recommendation: *Provide guidance for potential revisions to flood control and hydropower operations to enhance ecosystem resilience and adaptability under climate change. Management options considered in experiments and modeling should not be limited to current operating constraints.*

Recommendation: *Examine management options under climate change scenarios by using monitoring data and modeling tools where possible.*

Recommendation: *Assess and appropriately revise ongoing monitoring to optimize collection of data regarding species responses, interactions and production under climate change.*

#### UCUT

Include in the amended Program a goal of a restored, resilient and healthy CRB that includes ecosystem-based function including an adaptive and flexible suite of river operations responsive to a great variety of changing environmental conditions, such as **climate change**.

#### BPA

Recommendation: *Implement numerous on-going actions that address FCRPS impacts to fish and wildlife in response to a **changing climate** including hydrosystem modeling; dry year strategy; flow variation and refill; temperature control; predator management; research; and habitat protection and improvement. The Accords include projects that support water transactions, land acquisitions, and development of riparian buffers along streams to help create cold-water refugia for salmon, minimize temperature increases, and ameliorate the effects of climate change.*

#### USGS

Recommendation: *Assess the potential **effects of climate change** on river hydraulics, temperature, and sediment movement in tributaries and mainstem reaches of the Columbia River Basin and the collateral effects on aquatic biota. Critical uncertainties in understanding future impacts of climate change on target aquatic species include:*

- *Changes in the magnitude, timing, and persistence of stream flows throughout the year.*
- *Changes in stream temperatures.*
- *Changes in sediment transport and habitat formation.*
- *Effects of flow changes on salmonids, sturgeon, and lamprey.*
- *Impacts of climate change on habitat restoration success.*
- *Shifts in the food web and resultant impacts on bioenergetics.*

#### **Revisit Flood Risk Management under Climate Change**

##### UCUT

Add a flood risk management section to Mainstem Strategies-Water Management section on pp.47-51:

Recommendation: *Provide operational flexibility to adapt to climate change and changing objectives in the U.S. and Canada to avoid additional risks to authorized project purposes.*

#### CRITFC

Recommendation: *Maintain funding emphasis on habitat projects which enhance floodplain function and 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.*

### ***Incorporate Other Climate Change Planning Efforts***

UCUT

Recommendation: *Develop a system for tracking the activities of, and similarities and differences between, various agency plans and actions in individual subbasins.*

### ***Implement Long-term Habitat Protections***

SALISH & KOOTENAI, COWLITZ, KOOTENAI TRIBES of IDAHO, NPT and USRT:

Proposed new language for Resident Fish Mitigation section of Basinwide Strategies on pp. 22-23:

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

MT DFW&P

Recommendation: *Habitat protection efforts should be implemented to help maintain habitat corridors allowing species to adapt to changing climatic conditions. BPA should fund perpetual land protection through conservation easements, land purchases, or other long-term measures such as water right acquisitions, to combat climate change impacts on resident fish and wildlife populations.*

### ***Implement Various Mainstem-related Projects and Actions to Mitigate for Climate Change***

ODFW, LCREP (for general recommendation only), COWLITZ and USRT:

Recommendation: *BPA, the Corps of Engineers and the Bureau of Reclamation, in coordination with federal, state and tribal fish managers and the Council, should fund and implement the following climate change-related projects and/or actions to mitigate for the effects of climate change on aquatic resources:*

- *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 meteorological and hydrological data,*
  - *Use appropriate downscaled GCMs for regional use,*
  - *Collect appropriate hydrological data and conduct hydrologic modeling using multiple models,*
  - *Generate stream flow 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 hydrogeneration) to protect ecosystem functions, and
- Reassess impacts to ecosystem function from modification of flood risk management and hydrogeneration 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); and
- 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.

American Rivers and 19 individuals:

**Recommendation:** *There is a need for additional research and implementation of actions to adapt to climate-forced changes to the hydrographs and water temperatures of the Columbia River and its tributaries.*

SOWS Coalition (includes ANWS, ID Rivers United, Institute for Fisheries Resources, PCFFA, SOWS)

**Recommendation:** *The Program should acknowledge that climate change is likely to significantly alter the basin's hydrology and habitats, recognize the additional impacts these changes will have on fish and wildlife – particularly anadromous fish – and provide actions and measures specifically designed to address and mitigate the additive impacts attributable to climate change. The Program should include adaptive management and operational tools to meet this eventuality.*

***Incorporate Estuary, Plume and Nearshore Ocean Actions in Program***

COWLITZ, USRT and NOAA Fisheries:

**Recommendation:** *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.*

COWLITZ, USRT, NOAA Fisheries and USGS:

Recommendation: *Fund research on forage fish in the lower estuary and nearshore area. Promote projects on forage fish in the lower estuary and near-shore area, including the following measure:*

- *Determine how **climate change**, ocean acidification, salinity, estuary turbidity maximum (ETM), and localized hypoxia are likely to affect forage fish in the coming decades.*

### ***Regional Assessments of Sea Level Rise and Cold Water Refugia***

LCREP

Recommendation: *Conduct regional assessments of sea level rise and cold water refugia.*

### ***Identify interactions between chemicals, and between chemicals and non-chemical factors:***

NOAA-NWFSC

To be added to the Water Quality section in Mainstem Plan on pp. 43-44.

Recommendation: *Investigate interactions between chemical and non-chemical habitat stressors.*

### ***Identify and minimize future pollution threats***

NOAA-NWFSC

To be added to the Water Quality section in Mainstem Plan on pp. 43-44.

Recommendation: *Develop new tools to predict the cumulative and interrelated impacts of regional human population growth, land use change, toxic terrestrial runoff, and **climate change** on salmon population viability.*

### ***Use Adaptive Management to Address Climate Change***

BPA

Recommendation: *Use adaptive management to address the uncertainty associated with the complexity, natural variability and **climate change** in the CRB.*

USGS

Recommendation: *The Program should include an ecological monitoring component as the basis for measuring changes in physical, chemical, and biological attributes of the Columbia River Basin in a way that can detect trends. Evaluate the effects of landscape scale stressors such as **climate change**, invasive species, and contaminants on the CRB ecosystem that the Fish and Wildlife Program strives to restore.*

### ***Habitat responses to changes in future flow conditions***

CRITFC, SALISH & KOOTENAI, COWLITZ, USRT and NOAA Fisheries:

Recommendation: *Integrate the human dimensions of climate change, i.e., future water use, into consideration of climate change impacts and adaptation on basinwide ecosystem function.*

CBWTP

Recommendation: *Bonneville should provide technical and financial support to establish a framework for prioritizing flow restoration activities with respect to the anticipated **effects of climate change** on tributary stream flows.*

USGS

Recommendation: *The Action Agencies should support adaptation of the DELFT3d model to a hierarchical habitat classification tool to identify key-recoverable habitats in the lower Columbia River.*

***Support for Maintaining Hydrologic Monitoring Stations***

WA Governor's SRO

Recommendation: *Provide support for at-risk hydrologic monitoring gages in the basin, as prioritized by salmon recovery regions.*

***Protected Areas Program***

WaterWatch of Oregon

Recommendation: *Among other recommendations, ensure adequate protections are in place in the Protected Areas program in light of changes to Pacific Northwest rivers and headwater streams due to a changing climate.*

## State Fish and Wildlife Agencies and Other State and State-Supported Agencies

ODFW(3) and WDFW(4)

Under Habitat Strategies-Emerging Habitat Issues (p. 16), include the following modified language [with changes shown in **bold**]: “...*Specific measures to deal with these emerging issues are included in the mainstem plan, **recovery plans**, and many of the subbasin plans.*”

Rationale: Recovery plans are also a source for actions addressing climate change, toxics, etc.

ODFW(3), WDFW(4) and the WA Governor’s SRO(5) recommend amending the Program to include the ISAB’s recommendations for addressing climate change (ISAB 2013-1).

ODFW(3) and WDFW(4) recommend adding new language under the Lamprey section on p. 47: *BPA and the Corps, in coordination with federal, state and tribal fish managers and the Council, should: a) determine the potential effects of climate change on lampreys, including the effects of increasing water temperatures and changing runoff regimes on lamprey energetic and performance; and b) develop adaptation strategies to address these effects.*

ODFW(3) and WDFW(4) both recommend adding new language in White Sturgeon strategies in Section VI-Mainstem Plan on p. 47: *Assess the effects of climate change on basin sturgeon populations and develop adaptation strategies to address these impacts.*

### ***Integrate Climate Change into Program***

MT DFW&P(2), ODFW(3), WDFW(4), WA Governor’s SRO(5) and LCREP(11):

To be added to “Climate change planning considerations” on pp. 51-52 of Fish and Wildlife Program:

Recommendation: *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: *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: *Require project proposals and management plans to consider the potential impact on project outcomes of climate change and its associated variability and uncertainty.*

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.

MT DFW&P (2)

***Implement Long-term Habitat Protections***

***Recommendation:*** *Habitat protection efforts should be implemented to help maintain habitat corridors allowing species to adapt to changing climatic conditions. BPA should fund perpetual land protection through conservation easements, land purchases, or other long-term measures such as water right acquisitions, to combat climate change impacts on resident fish and wildlife populations.*

***Rationale:*** Targeting protection of key habitats across the Columbia River Basin and linking them across the landscape is one of the most effective ways to help preserve species given the variability and uncertainty associated with future climatic conditions.

ODFW(3) and LCREP(11) [general recommendation only]

***Implement Various Mainstem-related Projects and Actions to Mitigate for Climate Change:***

***Recommendation:*** *BPA, the Corps of Engineers and the Bureau of Reclamation, in coordination with federal, state and tribal fish managers and the Council, should fund and implement the following climate change-related projects and/or actions to mitigate for the effects of climate change on aquatic resources:*

- *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 meteorological and hydrological data,*
  - *Use appropriate downscaled GCMs for regional use,*
  - *Collect appropriate hydrological data and conduct hydrologic 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 hydrogeneration) to protect ecosystem functions, and*
  - *Reassess impacts to ecosystem function from modification of flood risk management and hydrogeneration 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); and*
- *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.*

**Rationale:** The region should plan to help mitigate for the predicted impacts and effects of climate change. In the future, particularly in the summer months, other human water uses will create intense competition for limited water supplies and will thus tax fish and wildlife 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). The Program should acknowledge that climate change is likely to significantly alter the basin's hydrology and it should provide adaptive management and operational tools to meet this eventuality. Various climate models predict increased volatility, and increased uncertainty in temperatures, flows, and recharge. The climate 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 runoff) could increase the risk of drought during normally dry summers.
- Higher annual temperatures, which 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.
- Altered streamflows which 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 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.

Climate changes within the lower Columbia River are predicted to include warming water temperatures, rising sea levels, increasing hypoxia (low dissolved oxygen levels) and decreasing pH (acidification), amongst others. The ISAB (2007) lists impacts to water temperatures and reductions in habitat for cold water species, whereas several recent studies predict rising sea levels within the lowest downstream

areas of the river, inundating present floodplain wetland habitats and causing coastal migration inland (NWF 2007; Mark Petrie, *Personal Communication*, Ducks Unlimited). Additionally, hypoxia (Roegner et al. 2011) and ocean acidification (Feely et al. 2008) associated with coastal upwelling are getting worse and have the potential to extend further upstream into the lower Columbia with tidal exchange and the future increases in sea levels. Implications of the hypoxia are significant, as these episodes may lead to displacement or death of marine organisms such as salmonids and Dungeness crabs (Roegner et al. 2011), whereas acidification may damage the estuarine food web (Feely et al. 2008). One of several concerns is that these conditions have the potential to worsen with predicted climate change impacts, including a change in timing of the spring freshet to earlier in the year, and lower summer river flows.

WA Governor's SRO (5)

***Support for Maintaining Hydrologic Monitoring Stations***

Recommendation: *Provide support for at-risk hydrologic monitoring gages in the basin, as prioritized by salmon recovery regions, is recommended.*

Rationale: An additional element of monitoring that appears to be challenged due to limited resources is the continuation of operation and maintenance support for stream gages and SNOTEL sites that have provided a wealth of hydrologic data, some for decades. Certain gages installed for water quality and quantity purposes basin-wide (and state-wide) are being considered for de-commissioning in the near-term. While fiscal constraints do put certain pressures on the costs of infrastructure in this particular medium, in the wake of climate change and subsequent lessening of snowpack and increased rain-on-snow events, this hydrologic information is too valuable to be put at risk.

LCREP (11)

***Conduct Regional Assessments of Sea Level Rise and Cold Water Refugia:***

Recommendation: *Conduct regional assessments of sea level rise and cold water refugia.*

Rationale: To date, there has been no assessment of predicted sea level rise inundation for the entire lower Columbia River. Without this information, the multi-million dollar Council and BPA investments in ecosystem restoration are at risk. Current efforts are focused on protecting and restoring current floodplain wetlands, frequently in areas that might be inundated by rising Columbia River water levels. Because the region is not focused on protecting areas *behind* these wetlands to allow wetlands to migrate inland, we risk further decimation of key habitat essential for the recovery of endangered salmon and steelhead. A paradigm shift towards protecting future wetlands needs to occur. The Estuary Partnership is working to provide managers with specific inundation scenarios to understand where and how bad the impacts from sea level rise will be, but funding is an issue. Assessing sea level rise inundation scenarios and providing maps of these scenarios to regional resource managers will jump start discussions and crucial changes in thinking. This assessment also needs to include an evaluation of potential increase in the extent of tidal exchange, to better understand the potential risk from increasing hypoxia and acidification within the estuary reaches. In addition, identification, mapping and protection of cold water refugia within the lower Columbia River, is also key to protecting the capacity of the lower Columbia for juvenile salmon rearing and returning salmon adults.

## Indian Tribes and Tribal Organizations

COWLITZ (22) and USRT (28)

Under Habitat Strategies-Emerging Habitat Issues (p. 16), include the following modified language [with changes shown in **bold**]: “...*Specific measures to deal with these emerging issues are included in the mainstem plan, **recovery plans**, and many of the subbasin plans.*”

Rationale: Recovery plans are also a source for actions addressing climate change, toxics, etc.

The NPT (25) recommends amending the Program to include the ISAB’s recommendations for addressing climate change (ISAB 2013-1).

CRITFC (14), COWLITZ (22), NPT (25) and USRT (28) recommend adding new language under the Lamprey section on p. 47:

*BPA and the Corps, in coordination with federal, state and tribal fish managers and the Council, should: a) determine the potential effects of climate change on lampreys, including the effects of increasing water temperatures and changing runoff regimes on lamprey energetic and performance; and b) develop adaptation strategies to address these effects.*

COWLITZ (22) and USRT (28) recommend adding new language in White Sturgeon strategies in Section VI-Mainstem Plan on p. 47:

*Bonneville should fund sturgeon recovery and recommendations from the draft 2013 White Sturgeon Framework Plan, including assessing the **effects of climate change** on basin sturgeon populations and develop adaptation strategies to address these impacts.*

### ***Focus of the Fish and Wildlife Program***

CRITFC recommends, over the next decade, the Council should: *a) develop a flexible framework for adjusting the Program to incorporate actions to deal with the **impacts of climate change** on restoration efforts; and b) develop and provide at the basin-wide level knowledge bases, tools and expertise (including regional **climate change analyses**) that may not be available locally and that subbasin stakeholders can draw upon as needed.*

### ***Integrate Climate Change into Program***

CRITFC (14)

To be added to “Climate change planning considerations” on pp. 51-52 of Fish and Wildlife Program:

Recommendation: *Maintain funding emphasis on habitat projects which enhance floodplain function and 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.*

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.

CRITFC (14), SALISH & KOOTENAI (16), COWLITZ (22) and USRT (28)

Recommendation: *Integrate the human dimensions of climate change, i.e., future water use, into consideration of climate change impacts and adaptation on basinwide ecosystem function.*

Rationale: Particularly in the summer, other human water uses will create intense competition for limited water supplies and will thus tax fish populations that are already in a precarious status.

SALISH & KOOTENAI (16), COWLITZ (22), USRT (28)

To be added to “Climate change planning considerations” on pp. 51-52 of Fish and Wildlife Program:

Recommendation: *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: *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: *Require project proposals and management plans to consider the potential impact on project outcomes of climate change and its associated variability and uncertainty. (ISAB 2013-1)*

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.

KOOTENAI TRIBE of IDAHO (24)

To be added to “Climate change planning considerations” on pp. 51-52 of Fish and Wildlife Program:

Recommendation: *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.*

UCUT (27)

Include in the amended Program a goal of a restored, resilient and healthy CRB that includes ecosystem-based function including an adaptive and flexible suite of river operations responsive to a great variety of changing environmental conditions, such as **climate change**.

### ***Revisit Flood Risk Management under Climate Change***

UCUT (27)

Add a flood risk management section to Mainstem Strategies-Water Management section on pp.47-51:

Recommendation: *Provide operational flexibility to adapt to climate change and changing objectives in the U.S. and Canada to avoid additional risks to authorized project purposes.*

### ***Incorporate Other Climate Change Planning Efforts***

UCUT (27)

Recommendation: *Develop a system for tracking the activities of, and similarities and differences between, various agency plans and actions in individual subbasins.*

Rationale: The Fish and Wildlife program is only one of many programs that affect the condition of anadromous populations and their habitats. The programs, plans and actions by the Bureau of Reclamation, Bureau of Land Management, the U.S. Forest Service, the Department of Agriculture, the Corps of Engineers, individual state and county zoning and land use decisions, and **local climate change adaptation plans**, individually or together, have the ability to thwart or overwhelm any efforts or progress of Fish and Wildlife program projects. This coordination is needed to coordinate the Council's projects with multidisciplinary **climate change adaptation plans**.

### ***Implement Long-term Habitat Protections***

SALISH & KOOTENAI (16), COWLITZ (22), KOOTENAI TRIBES of ID (24), NPT (25), USRT (28)  
Proposed new language for Resident Fish Mitigation section of Basinwide Strategies on pp. 22-23:

Recommendation: *Bonneville 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: 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.

COWLITZ (22) and USRT (28)

### ***Incorporate Estuary, Plume and Nearshore Ocean Actions in Program***

Recommendation: *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 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 Basin anadromous fish. This is consistent with the principle mentioned above; i.e., that the Council views the Columbia River ecosystem to include the estuary, plume, and nearshore ocean environments.

**Recommendation:** *Fund research on forage fish in the lower estuary and nearshore area. Promote projects on forage fish in the lower estuary and near-shore area, including the following measure:*

- *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:** 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. 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.

COWLITZ (22) and USRT (28)

**Implement Various Mainstem-related Projects and Actions to Mitigate for Climate Change:**

**Recommendation:** *BPA, the Corps of Engineers and the Bureau of Reclamation, in coordination with federal, state and tribal fish managers and the Council, should fund and implement the following climate change-related projects and/or actions to mitigate for the effects of climate change on aquatic resources:*

- *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 meteorological and hydrological data,*
  - *Use appropriate downscaled GCMs for regional use,*
  - *Collect appropriate hydrological data and conduct hydrologic 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 hydrogeneration) to protect ecosystem functions, and*
- *Reassess impacts to ecosystem function from modification of flood risk management and hydrogeneration 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); and*
- *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.*

**Rationale:** The region should plan to help mitigate for the predicted impacts and effects of climate change. In the future, particularly in the summer months, other human water uses will create intense competition for limited water supplies and will thus tax fish and wildlife 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). The Program should acknowledge that climate change is likely to significantly alter the basin's hydrology and it should provide adaptive management and operational tools to meet this eventuality. Various climate models predict increased volatility, and increased uncertainty in temperatures, flows, and recharge.

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.

## Federal Agencies

### NOAA FISHERIES (30)

Amend the Emerging Habitat Issues section (p. 16) of the Habitat Strategies area. The Program should explicitly address the ISAB recommendations related to habitat threats to sustainability including: a) loss of biological diversity; b) **climate change**; c) proliferation of chemicals and contaminants; d) novel hybrid communities; e) non-native species and predation; and f) uncertainty about carrying capacity (food webs).

Under Habitat Strategies-Emerging Habitat Issues (p. 16), include the following modified language [with changes shown in **bold**]: “...*Specific measures to deal with these emerging issues are included in the mainstem plan, **recovery plans**, and many of the subbasin plans.*”

Rationale: Recovery plans are also a source for actions addressing climate change, toxics, etc.

### USGS (38)

Add new language under the Lamprey section on p. 47:

Recommendation: *Research is needed on lampreys in the Program to determine the potential **effects of climate change** on lampreys, including the effects of increasing water temperatures and changing runoff regimes on lamprey energetic and performance.*

Rationale: The current Fish and Wildlife Program discusses two primary strategies for the conservation and restoration of Pacific lamprey populations in the CRB, including addressing passage issues and determining the extent of predation on lampreys. While these two strategies address important issues for lampreys, and should be continued, they do not go far enough for developing a complete understanding of the limiting factors lampreys face today. To truly make lamprey conservation and restoration a significant part of the Program, the above-listed recommended strategy needs to be addressed.

### NOAA FISHERIES (30)

Recommendation: The existing Climate Change Planning section in Mainstem Plan on pp. 51-52 should be updated and moved to the Basinwide Strategies section beginning on p. 14.

Rationale: Climate change is a basin-wide issue that is not limited just to the mainstem Columbia and Snake Rivers.

### ***Program Vision***

#### USGS (38)

Recommendation: *The federal Action Agencies, resource management agencies, tribes and the Council should manage natural resources in the basin under future conditions that will intensify current landscape-scale stressors such as **climate change**, water shortages, contaminants, invasive species, changes in water temperature, hypoxia and acidification in the estuary, and wildfire.*

Rationale: It is becoming evident it will be increasingly difficult in the future to achieve a more natural, or normative state in CRB. The idea that "on the ground projects" can generate sufficient benefits to recover listed species held merit historically, but a more holistic approach is now needed because of impacts from various landscape-scale stressors originating both within and

outside of the Columbia River Basin. In light of the challenges that lie ahead, steps should be taken now to shift the emphasis of the Fish and Wildlife Program from an approach that is curative to one that is preventative.

### ***Role of Fish and Wildlife Program and the Council***

NOAA FISHERIES (30)

Recommendation: *Develop a basinwide framework that assesses and addresses threats to sustainable ecosystem including **climate change**, loss of diversity, toxics and carrying capacity (food webs).*

PFMC (34)

Recommendation: *The Council should expand its leadership role in identifying salmon recovery and mitigation actions to address [the effects of] climate change. The Council should convene a working group to begin addressing how predicted [climate] change could be addressed in decision-making at all levels of the Program.*

Rationale: The current Fish and Wildlife Program identifies adaptive water management as the primary response to climate change impacts on fish and wildlife resources in the basin. However, providing access to refugia habitats in tributaries may become vital as predicted climate change narrows the availability of existing habitats. For example, increased consideration of salmon reintroduction above currently non-passable obstructions into cool water habitat may become necessary.

### ***Integrate Climate Change into Program***

NOAA FISHERIES (30)

To be added to the new “Climate change planning” section of Fish and Wildlife Program:

Recommendation: *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. (ISAB 2013-1)*

Recommendation: *Provide guidance for potential revisions to flood control and hydropower operations to enhance ecosystem resilience and adaptability under climate change. Management options considered in experiments and modeling should not be limited to current operating constraints.*

Recommendation: *Examine management options under climate change scenarios by using monitoring data and modeling tools where possible.*

Recommendation: *Assess and appropriately revise ongoing monitoring to optimize collection of data regarding species responses, interactions and production under climate change.*

Recommendation: *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: *Require project proposals and management plans to consider the potential impact on project outcomes of climate change and its associated variability and uncertainty.* (ISAB 2013-1)

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.

Recommendation: *Integrate the human dimensions of climate change, i.e., future water use, into consideration of climate change impacts and adaptation on basinwide ecosystem function.*

Rationale: Particularly in the summer, other human water uses will create intense competition for limited water supplies and will thus tax fish populations that are already in a precarious status.

BPA (35)

Language to be added to the “Climate change planning considerations” section of Mainstem Plan on pp. 51-52:

Recommendation: *Implement numerous on-going actions that address FCRPS impacts to fish and wildlife in response to a **changing climate** including hydrosystem modeling; dry year strategy; flow variation and refill; temperature control; predator management; research; and habitat protection and improvement. The Accords include projects that support water transactions, land acquisitions, and development of riparian buffers along streams to help create cold-water refugia for salmon, minimize temperature increases, and ameliorate the effects of climate change.*

Rationale: These approaches and actions are included in the 2008 NMFS FCRPS BiOp and are also supported in the ISAB’s Climate Change Report (ISAB 2007-2).

USGS (38)

To be added to the “Climate change planning considerations” section of Mainstem Plan on pp. 51-52:

Recommendation: *Assess the potential **effects of climate change** on river hydraulics, temperature, and sediment movement in tributaries and mainstem reaches of the Columbia*



*River Basin and the collateral effects on aquatic biota. Critical uncertainties in understanding future impacts of climate change on target aquatic species include:*

- *Changes in the magnitude, timing, and persistence of stream flows throughout the year.*
- *Changes in stream temperatures.*
- *Changes in sediment transport and habitat formation.*
- *Effects of flow changes on salmonids, sturgeon, and lamprey.*
- *Impacts of climate change on habitat restoration success.*
- *Shifts in the food web and resultant impacts on bioenergetics.*

**Rationale:** Changes in the timing and magnitude of stream flows impact aquatic species in the Columbia River Basin. Up to 15 percent of the Columbia River's annual flow has been lost in the last century due to climate change and anthropogenic consumptive use (e.g., agriculture and municipal diversions). Furthermore, 14 mainstem hydroelectric dams and dozens of tributary dams modify the amount of water, thermal energy, and sediment moving through fish and aquatic habitats. Flow magnitude and timing have been severely disrupted, affecting spawning and rearing habitats of sturgeon, lamprey and salmon. Such changes have resulted in drastic declines in the populations of most salmonid and sturgeon stocks, with only a small percent of salmonids being of wild (non-hatchery) origin.

Currently, there are dozens of threatened and endangered fish stocks in the Columbia Basin and it is vital that the eminent threats posed by climate change be understood in order to protect, restore, and enhance their habitats and populations. Much work needs to be done to quantify the ecological flows necessary to maintain the various life stages of aquatic species, with particular emphasis on the magnitude, persistence, and timing of flows. Changes in stream temperatures have the potential to change trophic structures and food webs, with unforeseen consequences to aquatic biota that rely on them. The better we understand the potential consequences of climate change on aquatic biota the more we can do to prevent and mitigate the damages that will likely result from it. Stream reaches and fish stocks that are the most sensitive to streamflow and temperature alterations need to be identified so mitigation, restoration, and enhancement plans can be developed or modified to minimize risks posed by climate change. Changes in the Columbia River Treaty that recognize and address the potential effects of climate change are vital to maintaining and restoring the ecological health of the Columbia River. Lastly, strategic plans that focus on proactive activities such as assisted relocation, flow augmentation, and stream cooling techniques need to be developed so managers have the ability to minimize the risks posed by climate change to aquatic species in the Columbia Basin. Currently there is no established way to track changes in key components of the Columbia and Snake River ecosystems through time. Establishing a long-term integrated monitoring program will provide a way to track changes in the ecosystem through time and will help validate predictive models that predict climate effects.

### ***Incorporate Estuary, Plume and Nearshore Ocean Actions in Program***

NOAA FISHERIES (30)

**Recommendation:** *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 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 Basin anadromous fish. This is consistent with the principle mentioned above; i.e., that the Council views the Columbia River ecosystem to include the estuary, plume, and nearshore ocean environments.

NOAA FISHERIES (30) and USGS (38)

Recommendation: *Fund research on forage fish in the lower estuary and nearshore area. Promote projects on forage fish in the lower estuary and near-shore area, including the following measure:*

- *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: 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. 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.

*Identify interactions between chemicals, and between chemicals and non-chemical factors:*

NOAA-NWFSC (31)

To be added to the Water Quality section in Mainstem Plan on pp. 43-44.

Recommendation: *Investigate interactions between chemical and non-chemical habitat stressors.*

Rationale: For fish throughout the Columbia River Basin, exposures to contaminants usually take place against a backdrop of many other habitat stressors. Environmental factors such as elevated water temperature and low dissolved oxygen are known to increase the relative impacts of many toxics. Conversely, contaminants can exacerbate the adverse effects of non-chemical factors that determine fish survival. In salmon, for example, the dietary accumulation of POPs can compromise the immune system, thereby increasing mortality rates in subsequent encounters of environmental pathogens. Due to these types of interactions, actual losses from wild fish populations in the Basin are likely higher than would be predicted from the results of chemical toxicity testing under ideal (i.e., non-stressful) laboratory conditions. The future **role of climate change** deserves particular attention, in the context of reduced flows (less dilution for pollution) and summer thermal extremes enhancing chemical toxicity. Warming water temperatures and changing precipitation patterns resulting from **climate change** are expected to have a deleterious impact on Pacific salmonid populations throughout the Columbia Basin, including approximately 40% salmon habitat loss in Oregon and Idaho, and a 22% loss in Washington by the year 2090. (ISAB 2007).

***Identify and minimize future pollution threats***

NOAA-NWFSC (31)

To be added to the Water Quality section in Mainstem Plan on pp. 43-44.

Recommendation: *Develop new tools to predict the cumulative and interrelated impacts of regional human population growth, land use change, toxic terrestrial runoff, and **climate change** on salmon population viability.*

Rationale: As noted recently by both the U.S. Commission on Ocean Policy and the Pew Oceans Commission, non-point source pollution is one of the most significant emerging threats to aquatic species worldwide. This is particularly true of the Pacific Northwest, where large increases in population growth and development are expected to dramatically increase the loading of toxic chemicals to salmon habitats in the years ahead. Non-point source pollution is driven largely by weather patterns, and thus **future changes in climate** will have important implications for the chemical quality of salmon habitats.

***Use Adaptive Management to Address Climate Change***

BPA (35)

Recommendation: *Use adaptive management to address the uncertainty associated with the complexity, natural variability and **climate change** in the CRB.*

Rationale: Adaptive management remains central to the implementation of the Fish and Wildlife Program. Adaptive management is the means to reflect new and emerging information, and to adjust our strategies to make them more effective.

USGS (38)

Recommendation: *The Program should include an ecological monitoring component as the basis for measuring changes in physical, chemical, and biological attributes of the Columbia River Basin in a way that can detect trends. Evaluate the effects of landscape scale stressors such as **climate change**, invasive species, and contaminants on the CRB ecosystem that the Fish and Wildlife Program strives to restore.*

Rationale: The Fish and Wildlife Program could become more effective and efficient by implementing a dedicated research, monitoring, and evaluation component that can provide the basis for learning and support adaptive management. Although often ignored, monitoring comprises the missing ingredient for a practical approach to adaptive management in the CRB. Evaluation provides the basis for re-directing Program emphases or charting a new course; ensuring Program accountability; and detecting unanticipated events that could impact the Program.

***Habitat responses to changes in future flow conditions***

Recommendation: *The Action Agencies should support adaptation of the DELFT3d model to a hierarchical habitat classification tool to identify key-recoverable habitats in the lower Columbia River.*

**Rationale:** The USGS, University of Washington and Pacific Northwest National Laboratory, through the Lower Columbia River Estuary Partnership and with support from BPA, developed a hierarchical habitat classification scheme for the Columbia River Estuary. This tool works extremely well to create ecosystem snapshots for many resource management purposes. Presently, however, this tool has no connectivity to stream flow or river level and thus cannot be used to predict the frequency and duration of inundation of habitat complexes given differing stream flow regimes. A modernized Columbia River Treaty would likely reshape the hydrograph to confer benefits to fish habitats and fish population, including more frequent spring-peaking flows and reconnection with floodplain habitats. Additionally, future flows shaped by **climate change and sea-level rise** will produce more winter peak flows and lower summer flows, and habitats and aquatic life in downstream reaches will experience increases in acidification and hypoxia. The ability to adapt a hydrodynamic model to the classification tool will help identify where and what habitats to restore (e.g., through land acquisitions and levee breaching) that will best serve aquatic life and sensitive life histories into the future, and which will be the most cost effective. Such a tool would be valuable to the management of salmon, lamprey, eulachon, and mussels as well as other first foods.

CBWTP (40)

**Recommendation:** *Bonneville should provide technical and financial support to establish a framework for prioritizing flow restoration activities with respect to the anticipated **effects of climate change** on tributary streamflows.*

**Rationale:** Based on the existing body of climate change science, it is generally understood that future flow conditions will deviate from historical flow patterns. Flow restoration transactions can help mitigate the impacts of climate change on target species, but more work is needed to prioritize where these investments should be made relative to the Council's priorities. The CBWTP would like to explore partnering with Bonneville to develop an assessment of climate change impacts specifically on streamflows and coordinate the development of a strategy for prioritizing actions to mitigate those impacts through flow restoration transactions.

## **Environmental and fishing groups -- and individuals in support (either by explicit connection or by similar recommendations)**

American Rivers (49) and 19 individuals:

Recommendation: *There is a need for additional research and implementation of actions to adapt to climate-forced changes to the hydrographs and water temperatures of the Columbia River and its tributaries.*

Rationale: Climate changes will likely provide another reason for many other recommendations, such as improved dam operations (more spill), construction of fish passage to higher elevation habitats above currently impassable barriers, protection of currently intact habitat, floodplain restoration and flood management changes to improve natural water storage and control water temperature, and maintaining and increasing the magnitude of the otherwise diminishing spring freshet with releases from upriver reservoirs.

SOWS Coalition (64) [includes ANWS, ID Rivers United, Institute for Fisheries Resources, PCFFA, SOWS]

Recommendation: *The Program should include the ISAB recommendations for addressing climate change.*

Recommendation: *The Program should acknowledge that climate change is likely to significantly alter the basin's hydrology and habitats, recognize the additional impacts these changes will have on fish and wildlife – particularly anadromous fish – and provide actions and measures specifically designed to address and mitigate the additive impacts attributable to climate change. The Program should include adaptive management and operational tools to meet this eventuality.*

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 and beyond. 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. Any of these factors could, if left 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.

WaterWatch of Oregon (68)

***Protected Areas Program***

Recommendation: *Among other recommendations, ensure adequate protections are in place in the Protected Areas program in light of changes to Pacific Northwest rivers and headwater streams due to a **changing climate**.*

Rationale: The Protected Areas program is a critical piece of maintaining existing salmon and steelhead strongholds and rebuilding populations of fish and wildlife impacted by hydroelectric construction.

## Individuals

Recommendation from 19 individuals:

Recommendation: *There is a need for additional research and implementation of actions to adapt to climate-forced changes to the hydrographs and water temperatures of the Columbia River and its tributaries.*

Rationale: Climate changes will likely provide another reason for many other recommendations, such as improved dam operations (more spill), construction of fish passage to higher elevation habitats above currently impassable barriers, protection of currently intact habitat, floodplain restoration and flood management changes to improve natural water storage and control water temperature, and maintaining and increasing the magnitude of the otherwise diminishing spring freshet with releases from upriver reservoirs.

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## Attachment 2: Overview and summary of comments on the Recommendations to amend the Council's Fish and Wildlife Program

**Bill Bradbury**  
Chair  
Oregon

**Henry Lorenzen**  
Oregon

**W. Bill Booth**  
Idaho

**James A. Yost**  
Idaho



**Jennifer Anders**  
Vice Chair  
Montana

**Pat Smith**  
Montana

**Tom Karier**  
Washington

**Phil Rockefeller**  
Washington

December 3, 2013

### MEMORANDUM

**TO:** Council Members

**FROM:** Patty O'Toole  
John Shurts

**SUBJECT:** Overview of written comments submitted on the recommendations

On November 20 the Council completed a 60-day comment period required by Section 4(h) of the Northwest Power Act during which the public could submit written comments on the Fish and Wildlife Program amendment recommendations directly to the Council via a web-based comment form. These comments are now posted on the [Council's webpage](#). The Council members should visit the webpage and read all the comments.

As discussed earlier, the Council can still receive public comment and have active interaction with the public on the program amendment recommendations and other aspects of the program amendment process. The closure of the on-line comment period provides a clear window after which the Council can begin considering the recommendations and comments and preparing a draft of an amended program. It does end the opportunity for public input. The Council has also received oral comments on the recommendations, especially at the last two Council meetings, and will receive more in future meetings.

The Council received 197 written comments on the program recommendations during this 60 day window. About 85% of these comments were focused on Protected Area recommendations or recommendations addressing Protected Areas plus some additional topics. The other 15% of the comments focused on other topics found in the recommendations. Commenters included state agencies, tribes and tribal entities, federal agencies, Bonneville customer groups, industry groups, environmental groups and individuals.



Attached to this overview is the beginning of the staff effort to summarize the comments on the recommendations so that these comments can be integrated into the documents already summarizing the recommendations. The comment summary is focused especially on extracting any new or additional perspectives or information on the recommendations. This summary is necessarily incomplete -- and no substitute for reading the comments themselves -- but it will give you a sense of what came in the written comments on the recommendations.

The great majority of the comments either supported something the commenter or some other entity had recommended without providing significant new information, or objected to something that had been recommended by others but again without significant new information or perspectives or detail. Topics that received the most attention in this regard include the protected areas and the possibility of adding an exemption process back into the program; the proposed spill experiment; artificial production, native fish conservation and the HSRG; ecosystem function in general and as related to mainstem operations; the role of the Program in addressing toxic contaminants; and the scope and priorities of the Council's Program.

Note that the Council did receive some comments that provided significant new supporting information or detail about a recommendation, raised new topics or perspectives of significance, or provided a significant level of detailed explanation in opposition to a recommendation. A few examples follow, in what is again an incomplete list:

- **Spill experiment.** The Oregon Department of Fish and Wildlife provided additional detailed information on the spill experiment, including more specific information on spill volumes and timing in a way that would make it possible to analyze the system effects of the experiment. The Council also received other comments that further support the spill experiment along with detailed critiques and criticisms of the proposed spill experiment. This includes comments from Northwest RiverPartners with an attached critique of the benefits and detriments of increased spill from John Skalski and others at the University of Washington.
- **Ecosystem function and mainstem flows and system operations.** The USGS and CRITFC provided additional detail on what it means, to them, to incorporate to a greater degree ecosystem function protection and improvement as a primary purpose of system operations. The USGS in particular provided specific additional detail, based on its experiences in the Columbia River Treaty review technical analysis, as to what the Council could do in the Fish and Wildlife Program and push for in near-term implementation to advance these concepts. The USGS focus is on developing a specific framework for Columbia River ecosystem function that identifies elements and critical processes that resource managers, policy makers, sovereigns, and Entitles (on both sides of the border) could use in collective management to achieve ecosystem improvements more comprehensively and holistically. The elements and processes would include identifying the types of data and models necessary to characterize ecosystem function needs after 2024 (the date the Treaty operations change); assessing how current fish protection, mitigation and recovery programs can be drawn from and integrated into a system-wide effort at improving ecosystem function into a full system-wide effort; identifying how data on ecosystem based function should be further developed and integrated into hydropower optimization models and analyses; and more.

- **Habitat -- “strongholds.”** In commenting on recommendations from others to designate or identify and protect strongholds or, in one case, hatchery-free wild fish zones, the Wild Salmon Center provided a significant amount of information on their Stronghold Partnership approach and on progress to date.
- **Artificial production.** The Columbia River Inter-Tribal Fish Commission provided a voluminous “bibliography in support of supplementation science” and other information in response to the recommendations from the Native Fish Society, Trout Unlimited, the Bonneville customers and others calling for changes in the program’s approach to artificial production.
- **Program scope.** Northwest RiverPartners and the Bonneville customer groups included in their recommendations what is essentially a legal analysis about the requirements of the Northwest Power Act and the scope of the Council’s Program. Bonneville provide its own legal perspective on program scope in the comments. And the Save Our Wild Salmon coalition submitted its own lengthy legal analysis in direct response to what came to the Council in the customers’ recommendations.
- **New energy resource development.** The Council received a comment from Northwest RiverPartners that added some detail to the base recommendation that the Council should review the criteria behind the Protected Areas designations to determine whether the current list of areas makes sense in light of new state and federal policies promoting renewable energy and specifically hydropower development. RiverPartners suggests that the Council would then need to reassess the impact of Protected Area designation on the supply curve of new hydropower available for meeting future power needs for the Council's next Power Plan. And to supplement a number of the recommendations regarding both mainstem operations and renewable energy development, the Columbia River Inter-Tribal Fish Commission submitted the draft of its revised Energy Vision for the Columbia River basin. This is the Commission’s set of principles and recommendations aimed at assuring an adequate, reliable, least-cost and environmentally benign energy system for the Pacific Northwest while reducing the adverse impacts of hydrosystem operations on fish and wildlife.

Draft Summary of Comments on Recommendations to amend the  
Council's 2009 Fish and Wildlife Program

December 3, 2014

Staff draft; please refer to full [comments](#) for complete review

## Framework elements comments

### Program framework

- Those that commented on this topic supported recommendations related to the basic outline of the Council's exiting Program.
- One commenter proposed that the Council, in its 2014 plan, may want to develop a framework for Columbia River Eco-Based Function (EbF). This framework could identify EbF elements and critical processes that resource managers, policy makers, sovereigns, and entities (on both sides of the border) can collectively manage to achieve ecosystem improvements more holistically. The elements of EbF are not new; they have been carefully defined in the CRT review process and include reservoir levels, larger spring-peaking hydrographs, fish reintroduction, floodplain re-connection, summer-flow augmentation, water temperature, among others. What remains to be defined is how these elements will be considered and advanced in the context of a modernized post-2024 Treaty that includes EbF as a 'primary purpose' along with hydro power and FRM (Flood Risk Management).

### Vision/assumptions

- No comments received on recommendations related to these topics

### Science foundation/principles

- Nothing new is presented in the comments received.
- Those that commented on these topics mainly provide support for a recommendation to adopt the ISAB's suggestions related to this topic.

### Program biological objectives

- Nothing new is presented in the comments received.
- Entities either support or do not support recommendations about current (e.g., keep or remove SAR) and proposed biological objectives (e.g. add escapement objectives).

### Resident fish

- Nothing new is presented in the comments received.
- Entities either support or do not support recommendation about resident fish
- Some provided clarification of language they submitted in their recommendations, such as the BPT (12) who provided clarifying for their recommendation related to "Address threat of Non-natives as Resident Fish Mitigation,"

### Research/monitoring/evaluation/data management/reporting

- Nothing new is presented in the comments received.

- Entities either support or do not support research uncertainties presented in the recommendations, such as the spill experiment and the assessment of hydropower projects may exacerbate toxic contamination
- Entities either support, such as the Coordinated Assessment project, or do not support recommendation about data management and monitoring approaches under the Program, such as one entity did not support the suggestion of having a distant third party conducting monitoring of mitigation lands and habitat
- Entities that commented on reporting recommendations mainly supported those recommendations such as supported separating out hatchery from wild fish and focusing on synthesis of data to inform decisions.

## **Habitat strategies comments**

### **Protected Areas**

The vast majority of the comments submitted to the Council concern the protected areas. Of those comments, the substantial majority supported recommendations to maintain the current version (no exemption process) of protected areas language and opposing recommendations that would include an exemption. Others supported the no-exemption aspect, but would increase protections for or expand protected areas through amendments to protected areas designations. Two specific areas, continued protection for the Sunset Falls on the Skykomish River and reversing the current exempt status of the Bear River in Idaho received substantial comment. Numerous commenters supported expansion or re-evaluation of protected areas for bull trout and passage re-establishment in places like the White Salmon. Wild Washington Rivers wished to “include into the Protected Areas Program all additional rivers and streams that are in areas where mineral compositions pose a threat to salmon and human health.”

Additional commenters supporting an exemption process included the National Hydropower Association, the Northwest Hydropower Association, River Partners and the Tulalip Tribes. River Partners noted new legislation streamlining small hydro relicensing had passed Congress and felt the “Council should review the criteria behind the Protected Areas designation to determine whether the current list of areas makes sense in light of new state and federal policies promoting renewable energy and specifically hydropower development. The Council would then need to reassess the impact of Protected Area designation on the supply curve of new hydropower available for meeting future power needs for the Council’s next Power Plan.” American Whitewater commented on the River Partner comments noting that the legislation River partners cited is “intentionally limited in scope to encouraging the development of new hydropower that can reuse existing water infrastructure, including pipes, canals, existing non-powered dams, and closed loop pumped storage projects” and that “neither the text or the legislative history of HR 267 or HR 678 imply Congressional support for the construction of new hydropower dams or for the removal of stream reaches from the Council’s Protected Areas Program.

**Northwest River Partners:** In fact, Congress recently passed bi-partisan legislation promoting the development of hydropower as well as streamlining the licensing of smaller hydro projects. The Council should review the criteria behind the Protected Areas designation to determine

whether the current list of areas makes sense in light of new state and federal policies promoting renewable energy and specifically hydropower development. The Council would then need to reassess the impact of Protected Area designation on the supply curve of new hydropower available for meeting future power needs for the Council's next Power Plan.

American Whitewater: We would like to clarify for the Council that the legislation that was recently passed is intentionally limited in scope to encouraging the development of new hydropower that can reuse existing water infrastructure, including pipes, canals, existing non-powered dams, and closed-loop pumped storage projects.<sup>22</sup> HR 267 expedites the permitting process for conduit hydropower and directs FERC to study the feasibility of a streamlined two-year permitting process for adding power to existing non-powered dams and for closed-loop pumped storage projects. HR 678 will streamline small conduit hydropower development at dams owned by the Bureau of Reclamation. The term conduit means any Bureau of Reclamation tunnel, canal, pipeline, aqueduct, flume, ditch, or similar manmade water conveyance that is operated for the distribution of water for agricultural, municipal, or industrial consumption and not primarily for the generation of electricity.<sup>23</sup> Congress' intent to limit the scope of these bills to such projects was explicit, and was critical to HR 267's unanimous vote in the House and support from environmental groups. This intent is also clearly captured in a statement in the Congressional Record made by one of HR 267's authors, Rep. Cathy McMorris Rodgers (R-WA): "There was a recent study by the National Hydropower Association that showed we could double hydropower production in this country without building a new dam, simply by investing in new technologies, new turbines. Actually, only 3 percent of the dams in the country produce electricity."<sup>24</sup>

There is no reason for the Council to consider the language of either one of these bills in relationship to the future of the Fish and Wildlife Program, as neither the text or the legislative history of HR 267 or HR 678 imply Congressional support for the construction of new hydropower dams or for the removal of stream reaches from the Council's Protected Areas Program.

Tulalip Tribes: Reinstate the exemption process that provide "exceptional benefits to fish and wildlife" as long as the affected Tribes with treaty fishing and hunting rights and the Resource agencies concur on the benefits.

Save Our Wild Salmon: We specifically oppose the recommendation to allow exemptions for project development within Protected Areas where a proposed facility is permitted by a county, city or state; or if the project has received a water right or 401 Water Quality Certification from the state. The Protected Areas Program provides a unique and valuable opportunity to help steer power planning at the regional, basin-scale. Allowing individual states or localities to carve out local exemptions would detract from the Council's value as a regional, multi-state planning entity and would also undercut the Program's directive for widespread public involvement.

Trout Unlimited (TU): While TU recognizes that there may be value in a process to evaluate potential changes to the Protected Areas mapping (both for including new areas as protected and evaluating whether certain designated areas may be suitable for development), we recommend – similar to our comment related to exemptions above – that the Council develop a review process based on clear criteria and strict resources protections standards with reliance on principles of sound science and public participation.

As outlined above, should the Council decide to pursue a process to allow amendments, exceptions or exclusions to the existing Protected Areas program, we recommend the Council develop strict criteria and standards to discourage abuse of any exemption process and to minimize erosion. In evaluating any recommendation to remove or add to the protected areas, the Council should consider changes in climate projections, designations of state or federal protections including critical habitat, wild and scenic river corridors, and state protection designations should be considered in evaluating changes to the existing protected areas maps.

### **Strongholds**

CRITFC, Umatilla Tribes: Any change of allocated funds by geography (e.g. strongholds) or subject matter area (ESA-only) requires broader discussion among co-managers.

Native Fish Society: (reiteration of recommendations)

The Wild Salmon Center (WSC) commented on several recommendations and provided information for the Council to consider. The WSC described its framework; the Salmon Stronghold Approach and also provided a summary of implementation progress towards the goals of the framework.

The WSC supports recommendations by the Oregon Department of Fish and Wildlife and suggests that opportunities are emerging that can help the Council better leverage funds and more effectively deliver conservation outcomes in strongholds. The WSC supports recommendations by NOAA Fisheries that call for developing criteria for identification of stronghold areas and identifying a system of Columbia River Basin strongholds. The WSC encourages the Council to review the stronghold identification methodology and population assessment criteria and consider adopting them within the Columbia Stronghold Strategy. The WSC also supports the recommendations by The Native Fish Society to establish “hatchery free zone” watersheds and concur that these zones can provide excellent reference sties to evaluate ongoing hatchery programs implementation.

### **Toxics Contamination**

The majority of commenters support the position that the Fish and Wildlife Program should include direct actions to monitor and reduce toxic contaminants that adversely affect anadromous or resident fish and food webs. Comments also support efforts to evaluate how toxic contamination impacts ongoing efforts to restore and improve fish and wildlife habitat. However, another group of commenters argue not to expand the Program with actions to monitor and address toxic contaminants because toxic contamination is not due to the existence and operation of the hydropower system.

Comments listed below are broken down into two categories. The first category includes those comments which are supportive of including more actions addressing toxic contaminants in the Program, while the second category includes comments which are not supportive of including actions addressing toxic contaminants in the Program.

The Columbia River Inter-tribal Fish Commission comments that the Fish and Wildlife program should include direct actions to monitor and reduce toxic contaminants that adversely affect anadromous or resident fish and food webs and to support efforts to evaluate how toxic contamination impacts ongoing efforts to restore and improve habitats. CRITFC disputes recommendations by BPA and its customers (PPC, NWRP, PNGC, and NRU) that resist expanding the Program to address toxic contamination.

CRITFC comments that the FCRPS and FERC-licensed dam reservoirs and their operations strongly control the chemical conditions such as anoxia and methylation of mercury, which impacts the bioavailability of toxics in the watershed which in turn impacts recovery efforts. Other toxic chemicals are directly released into the river through spills of PCB laden oils and lubricants from FCRPS dam operations and legacy sites such as Bradford Island continue to be a source of PCB in fish. In addition, flushing of contaminants regardless of their source out of the watershed from both non-point and point sources is inhibited in a river system that is heavily altered by the federal hydropower system.

The Confederated Tribes of the Umatilla support a leadership role for the Council in convening a forum to address toxic contamination in the Columbia River

The Upper Columbia United Tribes comments that they are concerned about the Bonneville recommendation that toxics mitigation and research is not an FCRPS obligation. The UCUT reiterates its recommendation that the Council coordinate a leadership forum where governmental entities can discuss and develop a regional toxics-reduction strategy. The UCUT comment that the Council should support investigation of any system operations changes that help mitigate any toxic contamination problems caused or exacerbated by the hydropower system.

The Bonneville Power Administration comments that the Council struck the right note with its 2009 language regarding toxics and that the studies recommended in the amendment recommendations arise outside the existence or operation of the FCRPS.

The US Geological Survey provided information regarding costs for evaluation of monitoring the distribution, level, and spatial patterns of contaminants of emerging concern (CECs) in the Columbia River Basin. The USGS acknowledges that costs for related research components cannot easily be estimated.

Customer groups such as Northwest RiverPartners and the Public Power Council comment that the hydropower system is not responsible for the majority of the toxics issues in the Columbia River and that mitigation and research regarding toxics falls outside the responsibility of the FCRPS. They state that Bonneville is not responsible for funding measure intended to address water pollution from sources other than the hydrosystem such as toxics resulting from industrial, agricultural or municipal discharges or storm water runoff.

Save our Wild Salmon (SOWS) comment that although the Bonneville customers and other urge the Council to resist expanding the Program to address toxics reductions they suggest that toxics are closely associated with or exacerbated by the hydropower system. They comment that the Council is in a position to provide leadership on this issue. SOWS supports the recommendations of CRITFC and others concerning a specific role for the Council in addressing toxics.

American Rivers comments that fish and wildlife are negatively affected by toxic contaminants in the Columbia River system, and some of that contamination is due to the existence and operation of the federal hydrosystem. The Fish and Wildlife Program should call for and conduct an assessment of how hydropower projects may exacerbate toxic contamination issues affecting human health, fish and wildlife populations, and the wider ecosystem, and create a program to reduce and mitigate for those effects.

Wild Washington Rivers – commented relative to the role of toxics and water quality standards as they relate to Protected Areas.

These individuals support the American Rivers recommendation which includes a call for an assessment of how hydropower projects may exacerbate toxics contamination issues: David Wick, **River Steenson**, **Zig Serafin**, Rebecca Post, Nina Phillips, James McRoberts, Andrea Matzke, Chris Lockerman, Sage Linn, Richard LaRivere, Lynne Kelly, Julia Hussey, Fred Fall, Harry and Jill Brownfield, Erin Berendes; Ellen Barnette;

### **Climate Change**

The Columbia River Inter-tribal Fish Commission supports reducing climate change impacts through habitat protection and restoration actions. CRITFC supports continued research on the effects of climate change on the hydro-system as a whole and to incorporate flexibility in the Program and Energy Plan to deal with impacts on restoration efforts and regional energy services and planning. CRITFC also comments that one of the goals of the *Energy Vision for the Columbia River* is to reduce the need for fossil-fuel generation that adds greenhouse gases to the atmosphere. Studies have shown that climate change in the Northwest will result in less snow pack; this will cause further changes in the amount and timing of river flows that move away from the natural conditions that previously supported abundant, health salmon populations; these climate changes will further reduce salmon survival.

American Rivers comments that the Fish and Wildlife Program is an appropriate venue for further research, recommendations, and implementation of actions to adapt to climate-forced changes to the hydrographs and water temperatures of the Columbia River and its tributaries. These changes will likely provide another reason for many of the above recommendations, such as improved dam operations (more spill), construction of fish passage to higher elevation habitat above currently impassable barriers, protection of currently intact habitat, floodplain restoration and flood management changes to improve natural water storage and control water temperature, and maintain and increase the magnitude of the otherwise diminishing spring freshet with releases from upriver reservoirs. American Rivers agrees with section 5-2 of CRITFC's comments on this topic at p. 26 of their recommendations.

### **Non natives**

The Columbia River Inter-tribal Fish Commission submits “Attachment A to present publications or studies that support the theory that supplementation (as defined by RASP 1992) techniques can be used to maintain or increase natural production, while maintaining the long-term fitness of the wild and native salmonid populations and keeping adverse genetic and ecological impacts within acceptable limits.”



The Native Fish Society comments that since hatchery origin fish behavior, reproductive success and disease infection makes them different from wild origin salmonids even when derived from wild brood stock, hatchery fish can be considered non-native fish.

Montana Fish, Wildlife & Parks comments that they support recommendations to prevent the introduction and spread of aquatic invasive species in the Basin as a Program priority where such efforts can be appropriately approved and funded. Savings achieved by prevention benefit everyone, a point of special awareness for those of us located in the most upstream locations of the Basin.

Wild Salmon Center acknowledges widespread recognition among partners of the value of salmon strongholds in maintaining the genetic integrity of healthy wild populations, providing key refugia, halting the proliferation of invasive species, and so on.

### **Predation**

The Columbia River Intertribal Fish Commission comments that included in their comments are statements regarding the operations and structural improvements made under the 2008 Biological Opinion that were designed to achieve dam passage performance standards of 96% per dam passage juvenile survival for spring migrants and 93% per dam passage survival for summer migrants. One improvement related to predation is:

John Day Dam

- Much improved avian wires to reduce tailrace avian predation

The Bonneville Power Administration acknowledges the predation programs being funded by the system managers. BPA comments on recommendation to expand the pikeminnow angling program to include Bonneville and McNary dams. BPA asserts that expansion is unnecessary at this time because dam angling programs at John Day and The Dalles Dams are meeting program objectives and providing survival benefits to salmon.

Bonneville also provides a bit more details on current efforts to:

- significantly reduce avian predation at the dams with line array;
- reducing the Caspian turn habitat in the estuary, reducing the numbers of nesting pairs;
- developing a management plan to address double-crested cormorant predation (COE & USFWS); and
- reduce pinniped predation, led by a number of fish and wildlife managers

Grant PUD urges the Council to adopt the avian predation management plans and also urges the Corps and the other federal action agencies to consider the magnitude of the threat that Caspian terns pose to the overall health of salmon and steelhead populations in the mid-Columbia River and implement measures that provide rapid and enduring relief.

### **Fish Habitat protection/Improvement**

The CRITFC, CTUIR, Yakama, and Warm Springs tribes reiterated that the protocol adopted to identify and implement priority habitat improvement projects is effective, transparent and

supported by regional expert consensus. CRITFC believes this approach is providing verification that habitat benefits are yielding survival benefits as anticipated in the BiOp.

The Confederated Tribes of the Colville Reservation believes the Program should support tributary efforts embodied in their Accord.

## **Other strategies comments**

### **Artificial Production**

American Rivers focuses on primarily on habitat protection and restoration, but it is important that fish and river managers take advantage of progress made toward improving habitat by reducing our dependence on hatcheries. To that end, we endorse Trout Unlimited's comments on hatchery policy in their recommendations at pp. 1-3.

The Bonneville Power Administration continues to support hatchery programs funded by BPA and others in the Basin provide benefits to ESA-listed fish and for regional harvests. Since the last Program amendments, the FCRPS Action Agencies have proposed Hatchery Genetic Management Plans (HGMPs) to NOAA Fisheries for all of the FCRPS facilities, more than 40 programs, incorporating appropriate reform actions. Through ESA consultation on individual hatchery programs, reforms are taking place across the region. New or renewed hatchery permits and biological opinions now reflect HGMP recommendations and recovery plans as appropriate.

The Confederated Tribes of Warm Springs continue to support the use of artificial production as a strategy to avoid jeopardy of listed species and to meet Treaty obligations and urge the Council to reject recommendations that would constrain its use.

Columbia River Inter-tribal Fish Commission, Confederated Tribes of Umatilla, and Yakama Nation continue to support the use of artificial production as a strategy for recovery. They provided an extensive bibliography in support of supplementation.

Confederated Tribes of the Colville Reservation encourages the Council to acknowledge the contribution of hatcheries and argues that the Program should continue to support the FCRPS BiOp and their Fish Accord.

A number of conservation organizations suggested that the Program should focus on improving mainstem dam operations and tributary habitat with less emphasis on hatcheries.

Trout Unlimited emphasized that the Council should give considerable weight to the ISAB recommendations on Artificial Production. At the same time, they support the use of artificial production as a tool for dealing with extirpated populations or those that are nearly extinct.

The Yakama Nation concludes that it is inappropriate for NPCC to seek to establish standards or criteria for operating hatcheries that are legally required to provide mitigation for FCRPS operations. The management of such hatchery programs is properly the jurisdiction of resource agencies and tribes identified as the relevant co-managers by applicable state statute, federal Treaty rights case law, and the ESA. In practice, the appropriate resource co-managers are jointly

developing hatchery management policies and plans that may incorporate HSRG guidance on a case-by-case basis. Adopting HSRG recommendations into the Program as a "one size fits all" measure would be inappropriate, needlessly contentious, and inefficient of resources.

Northwest River Partners supports the incorporation of the HSRG recommendations, indicating their belief that they reflect the best available science on the issue.

### **Wildlife**

The Kalispel Tribe does not support the recommendations of the Northwest Habitat Institute or the establishment of a regional coordination body. They see no need for third party assistance or centralized coordination of efforts.

Montana Fish, Wildlife & Parks supports each recommendation that places substantial importance on the welfare of resident fish and wildlife as well as anadromous species.

The Northwest Habitat Institute opposes BPA's recommendation that the Council consider retiring the use of habitat units and switch to using acres. NHI states that this approach is not based upon the best available science nor is it consistent with ISAB reviews. Additionally they continue to support the concept of independent compliance monitoring and methods to determine baseline habitat conditions in subbasins.

The Upper Columbia United Tribes supports flexible negotiated resolutions for wildlife mitigation that can rely on any agreed upon metric or base, including tracking Program accomplishments after construction and inundation mitigation is completed; and efforts to explore other innovative approaches to ensure long-term funding for operations and maintenance. The UCUT only supports the monitoring and evaluation of habitat changes and management using ISRP-endorsed methods and protocols, specifically the UCUT Wildlife Monitoring and Evaluation Program (UWMEP) methods and protocols. In addition, the UCUT supports the need for consistent nomenclature regarding any new program amendment language (i.e., Construction and Inundation Losses and Operational and Secondary Impacts).

### **Substitution/Blocked Area Mitigation**

The Bonneville Power Administration suggests that it is important to recall the Program's overhaul in 2000, which firmed up the scientific foundation and embraced an ecosystem based approach to mitigation planning. Bonneville states that the 2000 Program retained the legacy distinctions between anadromous fish, resident fish, and wildlife, a decision resource managers originally championed as a way to avoid conflicts over priorities within their own organizations. Bonneville suggests that recent analysis show BPA's annual spending continues to closely track the 70-15-15 guidelines.

### **Reintroduction of Anadromous Fish into Blocked Areas**

Bonneville acknowledged that many co-managers encouraged elaboration in the Program supporting efforts to reintroduce anadromous fish into areas blocked by hydroelectric dams. Bonneville states that as a practical matter, technological challenges exist for getting both adult and juvenile fish past high dams and that reintroduction efforts at Federal dams could require the

agency owning the dam to secure authorization and appropriations from Congress in order to proceed with studies.

American Rivers notes that the reintroduction of salmon and steelhead above Chief Joseph and Grand Coulee dams is under discussion in Columbia River Treaty conversations, and other processes are working toward reintroduction above impassable dams on the Snake River, Yakima River, and elsewhere. American Rivers comments that the Fish and Wildlife Program should endorse these efforts and offer expertise and funding to help speed them along and ensure their success.

These individuals support the American Rivers recommendation for reintroduction of native species above blocked areas: David Wick, **River Steenson**, **Zig Serafin**, Rebecca Post, Nina Phillips, James McRoberts, Andrea Matzke, Chris Lockerman, Sage Linn, Richard LaRivere, Lynne Kelly, Julia Hussey, Fred Fall, Harry and Jill Brownfield, Erin Berendes; Ellen Barnette.

### **Species Specific comments**

Columbia River Inter-tribal Fish Commission comments that for lamprey, the intent of their recommendation is to be consistent with accords.

Confederated Tribes of Umatilla comments that for lamprey, they support CRITFC's recommendations and appreciate the recognition of the importance of eels (lamprey). Regarding sturgeon, the Council needs to remember that establishing rebuilding goals of naturally spawning stocks above Bonneville needs to include sturgeon.

### **Renewable Energy Development**

The Columbia River Inter-tribal Fish Commission and The Confederated Tribes of Umatilla reiterated that the USFWS, Confederated Tribes of the Umatilla Reservation, Washington Department of Fish and Wildlife, Upper Snake River Tribes Foundation, recommended including in the program, guidance and recommendations for reducing the impacts of renewable energy development on aquatic and terrestrial resources.

To underscore the importance of the need for forward thinking regarding the effects of the region's energy development on operation of the FCRPS, CRFITC attached their 2013 Energy Vision for the CR. The document generally highlights the need to consider the limitation of the CR's ecosystem and hydrosystem when developing the regions energy services.

Bonneville commented on the agencies and tribes' comments summarized above. Bonneville asserts that mitigation for integrating new renewable resources in to the regional electric grid is beyond the scope of the fish and wildlife program, since the protected areas policy makes it unlikely that a new energy sources would be hydro facility in the CR system. BPA also asserts that they already comply with many environmental protection laws when working with developers on assessing a new resource onto the system, and, that other authorities such as FERC has considerable say over citing of renewables.

The Northwest RiverPartners commented that the Council should review the criteria behind the Protected Areas designation to determine whether the current list of areas makes sense in light of

new state and federal policies promoting renewable energy and specifically hydropower development. The Council would then need to reassess the impact of Protected Area designation on the supply curve of new hydropower available for meeting future power needs for the Council's next Power Plan.

## **Geographic area comments**

### **Estuary, Plume, near-shore Ocean**

The Bonneville Power Administration supports current estuary mitigation activities and embellishing current Program Language on estuary. BPA supports a continued role of the Ocean Plume Mgmt Forum but doesn't think they are responsible for funding research in the plume and near shore ocean.

*“Many recommendations called for additions to Program language covering the estuary. They cover the gamut, seeking to revise the Program to support additional coordination, research, and on the ground mitigation. For the most part the recommended additions embellish concepts already well established in the Program. In the last decade, BPA and the Corps have studied, protected and improved estuary habitat. With regard to ocean and plume research, BPA and the Corps already support and participate in the Ocean Management Forum. Here again, BPA anticipates being supportive, but not a leader, in these areas where hydroelectric effects are not predominant and others have clearer authority and responsibility to act. Some estuary recommendations continue to ignore the preponderance of scientific evidence that habitat improvements do indeed translate into healthier fish runs. Most recently, an assessment of the evidence surrounding estuarine habitat improvement concluded that “all lines of evidence from the [Lower Columbia River Estuary] indicate positive habitat-based and salmonid-based responses” to habitat actions prioritized by the Action Agencies. The same assessment “concluded that the habitat restorations activities... are likely having a cumulative beneficial effect on juvenile salmonids...” The Council should rely on the best available science and support ongoing estuary habitat improvement efforts.”*

The US Geological Survey comments that contaminants of emerging concern should be mapped throughout the CRB, including in the estuary and coastal ocean.

*“To evaluate distributions, levels, and spatial patterns of contaminants of emerging concern (CECs) in the Columbia River Basin, including the estuary and coastal ocean - Sites would need to be selected throughout the study area to answer the specific question. These sites could be distributed throughout the entire basin, a specific subbasin, the estuary, or a combination. They can be located to target known point sources (for instance, NPDES permittees or tributaries) or distributed throughout the study area. I have listed the costs for different suites of analyses per sample. You could then multiply these costs by the number of sites and the number of times you would sample (both dependent on the specific question you are trying to evaluate).  
Anthropogenic-indicator compounds (Compounds typically found in wastewater, including surfactants, food additives, fragrances, anti-oxidants, plasticizers, solvents, disinfectants, and fecal sterols) - \$760 water, \$920 solids (cost is for sediments, but tissues would be similar)  
Pharmaceuticals - \$600 water, \$750 solids (cost is for sediments, but tissues would be similar)  
Hydrophobic compounds (Compounds that like to be associated with sediments or tissues -*

*legacy contaminants like DDT and other organochlorine compounds, PBDEs, PCBs, fungicides) - \$560 water, \$600 solids (cost is for sediments, but tissues would be similar) Currently used pesticides and degradates (250+ compounds) - \$1,000 water PAHs - \$750 water Trace elements - \$530 (both filtered and unfiltered water) Transfer, accumulation, and persistence of CEC in estuaries, coastal ocean, and riverine foodwebs - This type of study would be best performed by collecting data for a few years and then spending a year interpreting and integrating the data. I used the USGS Columbia River ConHab (Contaminants and Habitat Characterization) study to estimate these costs. For that study we study contaminants levels in osprey, large-scale suckers, the water, and streambed sediment. We also performed an extensive suite of biomarkers to assess the effects these specific contaminants were having on the large-scale suckers and related the results to effects at the genetic level as well (a microarray was built and evaluated). These components (1. osprey, 2. large-scale suckers, 3. water, 4. sediment, 5. biomarkers, 6. microarray) could be estimated at \$40,000 - \$50,000 per site per year. After a few years of data collection, another year would be needed for data analysis, interpretation, and integration. This could be \$100,000+, depending on how many sites (i.e. how large a dataset) were involved. To address many of the other issues addressed in the Amendment comments related to the impacts and roles of contaminants, you can use the costs listed above to give you an idea of what it takes to perform analyses but those issues will most likely involve research components that cannot easily be estimated.”*

The Upper Columbia United Tribes comments that the NPCC should prioritize mitigation in the Upper Columbia as opposed to new projects in other geographic areas, including the estuary/plume/near-shore ocean.

*“To the best of our knowledge, the UCUT are the only entity to recommend a specific funding allocation based on geographic area commensurate to the amount of natural resource loss and electricity produced where those losses have occurred (i.e. the upper Columbia River). We are concerned that some recommendations have the potential to conflict with our recommended funding allocation, e.g. toxics, data management, M&E recommendations that are not supported by fish and wildlife managers, regional coordination forum and full integration of estuary/plume/near-shore ocean, and we encourage the Council to re-calibrate Program funding in a way that ensures more equitable funding throughout the Basin.”*

Grant PUD supports numerous recommendations related to monitoring in the lower Columbia River, estuary, plume, and near-shore ocean. Increasingly, evidence is indicating conditions during and surrounding the time of ocean entry are critically important for salmonids. Of the environmental continuum that salmonids experience throughout their lifecycle, the interface of fresh- and saltwater is the most dynamic. The physical and ecological processes are extremely complex and technological advancements are revealing tremendous insights. Continued, and perhaps increased, focus and studies in this area are critical and will likely realize ecological benefits as well as operational, management, and/or monitoring efficiencies. This area is particularly important, given the considerable scientific debate surrounding delayed mortality associated with the hydrosystem.

## **Mainstem**

The Oregon Department of Fish and Wildlife provided additional detailed information on the spill experiment, including more specific information on spill volumes and timing in a way that

would make it possible to analyze the system effects of the experiment. The Council also received other comments that further support the spill experiment along with detailed critiques and criticisms of the proposed spill experiment. This includes comments from Northwest RiverPartners with an attached critique of the benefits and detriments of increased spill from John Skalski and others at the University of Washington.

The US Geological Survey and Columbia River Inter-tribal Fish Commission provided additional detail on what it means, to them, to incorporate to a greater degree ecosystem function protection and improvement as a primary purpose of system operations. The USGS in particular provided specific additional detail, based on its experiences in the Columbia River Treaty review technical analysis, as to what the Council could do in the Fish and Wildlife Program and push for in near-term implementation to advance these concepts. The USGS focus is on developing a specific framework for Columbia River ecosystem function that identifies elements and critical processes that resource managers, policy makers, sovereigns, and Entitles (on both sides of the border) could use in collective management to achieve ecosystem improvements more comprehensively and holistically. The elements and processes would include identifying the types of data and models necessary to characterize ecosystem function needs after 2024 (the date the Treaty operations change); assessing how current fish protection, mitigation and recovery programs can be drawn from and integrated into a system-wide effort at improving ecosystem function into a full system-wide effort; identifying how data on ecosystem based function should be further developed and integrated into hydropower optimization models and analyses; and more.

CRITFC supports the performance standards for dam survival included in the 2008 BiOp and the related performance metrics for delay, spill passage efficiency, and in-river survival. CRITFC also comments that their Accord is the starting point for spill/transport operations based on available adult return data and tied future spill/ transport operation to new data and analysis developed over the years. They also comment that the Council should lend its support to regional efforts to address temperature issues at Lower Granite Dam.

### **Willamette**

The Council received one comment pertinent to the Willamette. Bonneville Power Administration commented on the ODFW amendment submission that numerous plans cover the Willamette, including the Wildlife Memorandum of Agreement and “[l]ittle if any additional planning for NPA compliance remains to address the Willamette.” They also note that if ODFW has requested additional habitat acquisition or operations and maintenance funding, presumably for habitat acquisition, those recommendations are inconsistent with the MOA.

## **Implementation comments**

### **Funding Priorities and allocation**

The Upper Columbia United Tribes comment about their recommendation for a specific funding allocation based on geographic area commensurate to the amount of electricity produced where those losses have occurred (i.e. the upper Columbia River). They are concerned that some recommendations have the potential to conflict with the recommended funding allocation, e.g.

toxics, data management, M&E recommendations that are not supported by fish and wildlife managers, regional coordination forum and full integration of estuary/plume/near-shore ocean, and encourage the Council to re-calibrate Program funding in a way that ensures more equitable funding throughout the basin.

The Columbia River Inter-tribal Fish Commission and Confederated Tribes of Umatilla support the current relationship in funding allocations. Any change of allocated funds by geography (e.g. strongholds) or subject matter area (ESA-only) requires broader discussion among co-managers.

The Columbia River Inter-tribal Fish Commission comments that the Stoel Rives legal analysis over-reaches the plain language of the Act as well as the well-established practices of the Council, BPA and others in the Basin.

The Bonneville Power Administration suggests that it is important to recall the Program's overhaul in 2000, which firmed up the scientific foundation and embraced an ecosystem based approach to mitigation planning. Bonneville states that the 2000 Program retained the legacy distinctions between anadromous fish, resident fish, and wildlife, a decision resource managers originally championed as a way to avoid conflicts over priorities within their own organizations. Bonneville suggests that recent analysis show BPA's annual spending continues to closely track the 70-15-15 guidelines.

Northwest RiverPartners comments that the Program is already well defined for the next five years given the advent of the Fish Accords (Accords), and the Council's prime challenge is to "refine" it and establish clear priorities to make it as efficient and effective as possible within existing funding constraints. They comment that it is the Council's role to establish priorities rather than just assembling or "stapling" together recommendations into the Program that no matter how individually valid, would be difficult to manage and potentially contradictory.

Northwest RiverPartners also asks that the Council engage in a priority setting process and notes that if the Council fails to develop a Program that can be reasonably implemented within current budget constraints the difficult decisions will fall to Bonneville to make the hard choices required but may make different tradeoffs than the Council.

Public Power Council comments that further expansion of a direct fish and wildlife program that has grown approximately 75 percent in the last five years creates very real economic difficulties for regional rate payers. In light of this fact, for funding purposes the Council should prioritize measures within its program. A strong foundational principle in this regard would be for the Council to incorporate the Biological Opinion and Accords into its program. The BiOp and Accords have provided a decade of funding certainty and have also ensured sound scientific principles that should be applied across the entirety of the direct program. Prioritization with consideration of greatest need and benefit while also being based on the best available science should be made a proud hallmark of the Council's program.

The Northwest Requirements Utilities comments that the Council has a difficult but necessary job scaling back the size of the funding requests to fit into projected financial planning parameters and to accommodate regional fish and wildlife commitments that are pre-established.



## ESA/BiOps

CTUIR: The protocol adopted by CTUIR and others, contained in the 2008 BiOp and its successor documents and the 2008 fish accord to identify and implement priority habitat improvement projects is effective, transparent and supported by regional consensus.

### CRITFC:

- No comment on the 2013 Supplemental BiOp
- Support the Program's adoption of both the 2008 BiOp and Fish Accords
- Support the performance standards for dam survival included in the 2008 BiOp and the related performance metrics for delay, spill passage efficiency, and in-river survival.

The protocol adopted to identify and implement priority habitat improvement projects is effective, transparent, and supported by regional expert consensus. CRITFC believes this approach is providing verification that habitat benefits are yielding survival benefits as anticipated in the BiOp.

CTSWR, Yakama Nation and Colville Tribe: The Program should continue to incorporate the strategies and measures in the FCRPS BiOp.

BPA: The Program should continue to support the existing hydrosystem operations, spill, and dam passage strategies, performance standards for juvenile and adult dam passage, and inriver survival targets in the NOAA Fisheries FCRPS Biological Opinion and reasonable and prudent alternative.

Continuing the current adaptively managed experiment in the operation and configuration of FCRPS projects under the Biological Opinion will continue to improve fish survival and ultimately help discern whether further alterations in spill patterns and passage routes would be beneficial.

To the extent recovery plans provide guidance for mitigating hydroelectric dams in the region, Federal regulators and action agencies currently incorporate appropriate elements from the plans into ESA compliance documents. Within this context, the plans are appropriate for the Council to consider in developing the Program so long as they're recognized to apply to the region as a whole, not just the hydroelectric dams covered by the Northwest Power Act.

PPC: Further expansion of a direct fish and wildlife program that has grown approximately 75 percent in the last five years creates very real economic difficulties for regional rate payers. In light of this fact, for funding purposes the Council should prioritize measures within its program. A strong foundational principle in this regard would be for the Council to incorporate the Biological Opinion and Accords into its program. The BiOp and Accords have provided a decade of funding certainty and have also ensured sound scientific principles that should be applied across the entirety of the direct program.

River Partners: Because the Draft BiOp reflects the best available science on spill and Accord party recommendations support inclusion of BiOp hydrosystem operations, the Council should include those operations in its Program.

Save Our Wild Salmon Coalition: The Council’s duty to ensure that the Program includes the measures necessary to achieve the fish restoration purposes of the Power Act is not constrained or guided by the FCRPS BiOp or any other associated contractual agreements between BPA and other entities.

Simply adopting the BiOp measures does not satisfy the Power Act’s separate substantive requirement that the Council to “protect, mitigate, and enhance” anadromous fish. Any argument that the Council must merely adopt measures from the FCRPS BiOp misunderstands the relationship of the ESA and the Power Act. To the extent that the BiOp is relevant at all to the Program, it at most sets a floor for measures that the Council may include. The BiOp is not a ceiling that could hamper adoption of measures necessary to achieve the Power Act’s distinct, but complementary, mandate to “protect, mitigate, and enhance ... anadromous fish.” 16 U.S.C. § 839(6). Nor does it provide a sufficient place for the Council to rest its compliance with the Power Act. NRIC, 35 F.3d at 1395 (finding that Council cannot comply with the Power Act’s fish restoration goals by adopting “lowest common denominator” measures).

It should be abundantly clear by now that relying on the measures developed for the BiOp will not satisfy the Council’s separate obligations to “enhance” anadromous fish populations.

The Council must recognize that its responsibilities under the Power Act are complementary, but ultimately different than those required of BPA and the other action agencies under the ESA. It must adopt recommendations that it independently finds will achieve what the Act requires – the restoration of anadromous fish runs.

NRU: Comment on the recommendation from Oregon to increase spill to 125% of total dissolved gas (TDG) from April 3<sup>rd</sup> to June 20<sup>th</sup> for a period of 10 years at the Lower Snake River and Lower Columbia River federal dams. We strongly urge the Council to not include this proposal for further consideration. This is a subject matter that falls within the FCRPS Biological Opinion, which is the responsibility of NOAA Fisheries and the Federal Action Agencies (BPA, Corps of Engineers and Bureau of Reclamation.)

## **Other comments**

### **Role of the Council**

The Public Power Council comments that if the NWPCC includes these (toxics, invasive species, and ocean and estuary research ) issues in its program, it should be to encourage better coordination between, states, tribes, and federal entities so that each fund their appropriate share of measures involving each. Where the Council finds amendments have no direct nexus to the hydrosystem, it should reject these amendments.

Northwest RiverPartners suggests that the Program is already well defined for the next five years given the advent of the Fish Accords (Accords), and the Council’s prime challenge is to “refine” it and establish clear priorities to make it as efficient and effective as possible within existing funding constraints.

They also remind the Council that the Act gives the Council the responsibility to craft a Program that achieves the Acts’ objectives to “protect, mitigate and enhance” fish and wildlife impacted by the

development and operation of the region's hydroelectric facilities while also assuring a "adequate, efficient, economical and reliable supply".

They state that it is the Council's role to establish priorities rather than just assembling or "stapling" together recommendations into the Program that no matter how individually valid, would be difficult to manage and potentially contradictory.

They comment that they believe the Council, in developing the 2014 Program, can provide the leadership that helps all parties to see the benefits in working together under the stability of a long term agreement. The Program could help to frame expectations as to what can be done within the Accords and budgets and what will have to be considered a possible future action for future time periods.

RiverPartners comment that they know that this is asking the Council to engage in a priority setting process that has been difficult for the Council in the past. They suggest if the Council fails to develop a Program that can be reasonably implemented within current budget constraints the difficult decisions will fall to Bonneville who we expect will make the hard choices required but may make different tradeoffs than the Council. They urge the Council to accept this responsibility as envisioned by Congress and the Governors "because we believe through your leadership a more effective and balance programmatic effort will be found."

Wild Salmon Center supports the ODFW recommendation: *The Fish and Wildlife Program and Council should create a liaison position to assist project sponsors in identifying complimentary (cost-share) grants.* They also support the NOAA recommendation: *The Council should continue to work with regional entities to establish criteria for identification of stronghold areas within the Columbia River Basin. These strongholds should emphasize the preservation and restoration of habitat for wild fish. Measure: Develop criteria for identification of stronghold areas and identify a system of Columbia River Basin strongholds.*

Save Our Wild Salmon Coalition comments that: "In response to recommendations to incorporate BiOp and Accord components into the program: The Council has an independent duty to adopt measures that will protect, mitigate, and enhance salmon and steelhead populations. The Council must reject recommendations that attempt to constrain or limit Program measures under the guise of arguments about 'consistency' with other laws or actions. Consistency does not require management to the lowest common denominator."

The Council must recognize that its responsibilities under the Power Act are complementary, but ultimately different than those required of BPA and the other action agencies under the ESA. It must adopt recommendations that it independently finds will achieve what the Act requires – the restoration of anadromous fish runs.

In response to recommendations that expenditures under the fish and wildlife program are "at capacity": The Council must reject recommendations premised on the mistaken belief that the current Program is sufficient, somehow funded at maximum capacity, or that any additional salmon and steelhead protection would in any way impact a reliable, economic power supply.

As the Ninth Circuit recently cautioned, there is a very real chilling effect associated with the use of "cost" figures that include foregone power estimates. NRIC, 730 F.3d at 1021 ("Whether those measures cost \$750 million annually rather than \$300 million annually will quite likely affect where

that balance is struck when the Council and the region's stakeholders develop future fish and wildlife programs and power plans.”). The Council must ensure that these inflated estimates – and any recommendations or arguments based on them – play no role in the development of the Program.

In response to recommendations that: the Council’s Program cannot consider recommendations regarding breaching the four Snake River dams. There is no validity to the argument that the Power Act prohibits the Council from considering changes to the configuration of the FCRPS, including Snake River dam removal. Contrary to these arguments, the Power Act authorized the Council to consider and adopt all recommendations necessary to protect salmon and steelhead in developing the Program.

In response to recommendations on toxics: Toxic contamination is a complex issue, and a coordinated, common approach by all comanagers is needed to mitigate the threat to fishery resources. The Council is in a unique position to provide leadership on this issue and to collaborate with ongoing efforts to reduce toxics in the Columbia River Basin. Save Our Wild Salmon supports the recommendations of the Columbia River Inter-Tribal Fish Commission and others concerning a specific role for the Council in addressing toxics in the Columbia Basin.

The Confederated Tribes of Umatilla support as leadership role for the Council in convening a forum to address toxic contamination in the Columbia River.

The Columbia River Inter-tribal Fish Commission comment that the Council should lend its support to regional efforts to address temperature issues at Lower Granite Dam.

Bonneville comments that: “We recommend that the Council facilitate regional discussions about these broader issues in relation to our shared objective of successful fish and wildlife rebuilding, with emphasis on awareness and need for cost-sharing partnerships among those with responsibility. The region can engage appropriate parties as directed by the Act in section 4(h)(8)(C) to address these broader mitigation measures. The Council is well situated to facilitate these broader regional discussions and agreements—and see that they are successfully implemented.”

The Northwest Requirements Utilities states that a preferred course of action is for the Council to keep control of the process [of cost control] by demonstrating financial prudence. The Council should support forums to facilitate a broader regional dialogue of these topics. (Invasive species, toxic chemicals, ocean and estuary research, protected areas and other items)

### **Fish and Wildlife related comments in the CRITFC Energy Vision for the Columbia River**

The Columbia River Inter-tribal Fish Commission offered comments regarding peak demand:

- Serving peak loads with hydropower kills millions of juvenile salmon every year. During certain times of the year, so much water is drawn down to generate electricity that salmon redds (gravel nests where salmon lay eggs) are uncovered or dewatered and their eggs die. Daily fluctuations change river water levels and juvenile fish that feed and live near the shore can be stranded and die when water levels are reduced. Migration of fish is interrupted when flows decrease at night because there is less demand for electricity and therefore less water moving through the reservoirs behind the dams. Fluctuations in reservoirs hurt resident fish by dewatering habitat and food supplies and reducing nutrients in the reservoirs.

- Water held behind storage dams for future power generation would, under natural conditions, be in the river aiding the swift and timely downstream migration of young salmon. Saving this water for summer energy production alters the natural (or normative) river conditions that aid juvenile salmon migration and would help in the restoration of fish to harvestable levels.
- Importantly, lower peak demands also help fish in the river. The river is ramped up and down to follow peak loads, and in so doing, smolts (juvenile fish) have been stranded on banks along the river, and redds (where salmon lay their eggs) have been dried out. Reducing peak loads will limit the number of hours in a year when the rivers have to be ramped up to meet peak demand, thereby, saving fish.

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## Attachment 3: Topic issues for discussion

### Format and structure of the Council's Fish and Wildlife Program December 3, 2013

The language of the 2009 Program is generally structured using the *elements* of the *framework* adopted during the 2000 Program amendment. These elements consist of the vision, objectives, science principles, strategies, actions, monitoring, evaluating and reporting. The framework also incorporates the Program's geographic structure consisting of Basinwide, ecoprovince, subbasins, mainstem, estuary and ocean.

During the 2009 Program amendment process the 2003 Mainstem Amendments, originally a separate document, were physically inserted into the 2009 Program document as a distinct Mainstem chapter. Forty-nine subbasin management plans were adopted into the Program in 2004, 2005 and 2011. These subbasin management plans remain distinct physical documents available on the Council's Program website and are incorporated in the 2009 Program by reference. These changes and additions have increased the complexity of the Program and can make it challenging for a reader to grasp what all is included in the Program.

Recommendations from around the region continue to support the basic *framework* and its *elements*. Many, however, recognize and recommend to the Council that the organization of the text in the Program can be improved for the reader. These recommendations support a clearer representation of the adaptive management process, considering restructuring around the life cycle of salmon, restructuring to clarify or streamlining particular topics by not dispersing language for that topic in multiple areas of the Program, improving linkages, and restructuring to better reflect ecosystem function.

As the Council considers re-organizing the Program based on the recommendations received, the Council may want to take into consideration other factors to ensure the re-organization is a success:

- The Council, along with society, is trending to a more digital environment which requires structuring information to be amenable to this media (Council's Power Plan is an example).
- Council's Fish and Wildlife Program has several audiences. Some such as the general public appreciate a high level, streamlined view of the Program with interest primarily in the main themes, objectives and results of the Program. Whereas, others, such as the state and federal agencies and tribes tend to appreciate more detail, technical information and guidance.

Potential approaches to be considered by the Council for re-organizing the Program's content include:

- **Succinct and explicit:** Focus on clarifying, reducing repetition, and more explicitly showing linkages.
- **Broad Policy versus Detailed Guidance:** Consider organizing the text so that a broad overview of the Program's history and intent, and other topics of interest to the general reader, is presented at the front of the Program. Thus, reorganizing the more detailed aspects of the program to be presented in a subsequent section. This would result in splitting up these two levels of details instead of intermingled them as in the 2009 Program.

- **Explore Cross Media Publishing:** Consider using different media to convey various aspects of the 2014 Program. Perhaps the broad overview is suited for a paper document versus the more detailed information would benefit from a web media that facilitates handling complex information. This approach may allow having more innovative tools and organization that easily allows the reader to follow linkages between the on-the-ground projects to the broad policy program guidance. This is similar to the Power Plan approach. This would apply to the finished 2014 Program, but would need to be taken into consideration as we revise the Program, so that it is easier to move the components of the finished product to the appropriate media.
- **Focus on Program Assessment Steps:** The Program content could be reorganized to more explicitly convey the 8 adaptive management steps<sup>1</sup>. This would support a transparent, accountable, and effective planning, implementation and evaluation process by clearly conveying and illustrating the linkages between each step. Thereby more explicitly indicating how the Program assesses whether the actions are addressing the intended strategy and whether the strategy is making progress towards meeting program objectives.
- **Biological Life Cycle:** The Program content could be reorganized to focus on the entire life cycle of its focal species (all fish, wildlife). This would place an emphasis on taking a holistic view of how a species is affected by the various habitats it utilizes and the different limiting factors it encounters during each of its life-stages. This may encourage Program implementers to rely on broader evaluation tools and more strategically inform where to focus mitigation efforts to improve the status and trend of a focal species. Although the recommendation focused on anadromous salmonids, to apply to the program, this would need to consider the variety of lifecycles of the Program's terrestrial and aquatic focal species. Caution would be needed to ensure that the Program is not perceived as species focused instead of ecosystem/habitat-based when reorganizing the program.
- **Ecosystem Focus:** Although the Program intends to have an ecosystem focus, it could be reorganized the program to more strongly demonstrate that it is focused to address ecosystem functions that are needed to support sustainable, productive, and diverse focal species. Although the recommendation seemed focused on ecosystem functions benefiting anadromous salmonids this would need to be expanded to all focal species to properly fit the Program.

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<sup>1</sup> The 8 steps of the adaptive management recommended are summarized as: (1) Update fish and wildlife status and trends of the fish and wildlife, (2) Adopt biological objectives and document progress ; (3) Quantify the limiting factors and threats, linked to the biological objectives, and document assumptions, hypotheses and unknowns; (4) Adopt strategies and measures linked to limiting factors and threats with expected outcomes; (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,; (6) Share the accumulated monitoring and research data and information which will inform steps 7 and 8; (7) Develop an evaluation process that contemplates the information from steps 1-6; and, (8) Establish a process for adjusting the implementation of the Program based on step 7.

## **Artificial Production: Topic/key issue summary December 2013**

The Council's 2009 Fish and Wildlife Program recognizes and supports the use of artificial production for certain purposes as necessary loss mitigation. And it does while also calling for artificial production to be implemented consistent with a set of principles intended to protect and even benefit the recovery of naturally spawning native fish in improved habitats.

A number of the recommending entities (tribes and state and federal agencies and others) believe the Council's program, both as written and as implemented, is on essentially the right path through these difficult waters, in scientific, policy and management terms. They recommend few changes to Program language; continuation of specific production programs, and that the Council let the ongoing implementation processes take their course. This includes the completion of the HGMPs, case-by-case consideration and implementation of HSRG principles; implementation of recovery plans; and adaptive management of programs as more is learned along the way.

Other recommending entities, including some state agencies and conservation groups along with the ISAB, are less comfortable that the Program and the region are on the right path, some significantly less comfortable. Sweeping a set of disparate views into one summary, in their view the science indicates that the benefits of the region's and the Program's extensive artificial production and supplementation efforts are not sustainable, are inconsistent at the current extent with an avowed habitat-based effort at rebuilding natural production, pose less than acceptable risks to natural spawning recovery over the long-term, contribute to carrying capacity and density dependence problems, and at best need to be better combined with and yield to other strategies for long-term recovery. These entities recommend a number of significant changes to the Program's strategies and the Program's implementation. These recommended changes include the development of quantitative objectives for each artificial production program based on HSRG recommendations; revised production plans that directly address carrying capacity issues and food supply demands that might limit natural production; quantifying cumulative impacts of artificial production on natural production and ecosystem functions and adapting production operations to ameliorate these impacts; changes to the way different types of programs operate to remove hatchery fish from spawning grounds and reduce straying; developing conservation requirements for naturally spawning fish in every locale and closely evaluating artificial production programs by those objectives; better address the impacts to weak natural stocks of harvest based on hatchery fish; and more. No recommendation seeks the closure of specific production efforts implemented under the Program. But surely these latter recommendations, if incorporated into the Program in some specifically different way and then implemented, would eventually affect on-going operations. Note that some recommending entities, such as NOAA and Idaho, span this divide in interesting ways.

Thus a key issue for the Council in this process will be to navigate through these competing recommendations, competing recommendations based in contrary conclusions drawn from the same set of current information and uncertainties. In that light also note there is one repeated recommendation that cuts across this divide and has the support of most of the recommending entities -- that the Council's Program ensure the development and funding of a



comprehensive basinwide effort at evaluating and reporting on hatchery effectiveness and hatchery impacts.

## **Protected Areas Topic Summary**

### **2009 Fish and Wildlife Program Section**

Section D. 1. Habitat Strategies, d. Protected Areas (page 15)

Appendix B. Hydroelectric Development Conditions, 2. Protected Areas (page 80)

### **Overview**

Since 1987, protected areas have been an aspect of the Fish and Wildlife Program. Protected areas focused on future hydroelectric development as a way to prevent degradation to existing fish and wildlife habitat. The Federal Energy Regulatory Commission has recognized the protected areas designations in its licensing procedures. Some state licensing processes also take protected designations into account in small hydro licensing proceedings.

The Council officially amended some protected area designations in 1992. From 1988 and through the 1994 Program, the Council had included a description of a protected areas amendment process and an exceptions process that included a party filing a petition with the Council to change a protected area designation. The process contained a description of information that petitions must include for the Council to consider the petition. During the development of the 2000 Program, the protected areas amendment process was not included in Appendix B, the protected areas section of the 2000 Program. The 2009 Program mirrored the protected area language of the 2000 Program.

Two hydroelectric projects have applied for preliminary permits in areas designated “protected” for fish species. The sponsors sought an exemption to the protected areas designation, but have found that no exemption process exists within the current program.

### **Issues**

The Council received several hundred recommendations for amendments to the protected areas section of the program. The vast majority of them came from individuals supporting the existing protections and opposing reinstating the process for exemptions that was dropped from the program in 2000. The Council received a few recommendations and comments supporting reinstating some type of protected areas amendment process.

Comments received from fish and wildlife agencies, tribes and conservation organizations raised issues about the addition of bull trout critical habitat, expansion of protection to areas where barriers have been removed, and adding climate change and toxics as considerations for enhancing protected areas.

Two major issues emerge from the recommendations and comments for the Council to consider. First, does the Council wish to restore the exemptions process? The record contains no intentional and informed decision by the Council to alter the exemptions process. The placement of protected areas amendments in the 1994 Program could account for it getting dropped from the 2000 Program. Does the Council wish to restore the exemptions process? If so, what conditions would it apply to that process?

Second, numerous recommendations favored expansion of protected area designations for a variety of factors. A few recommendations also cited legislative developments to contract designations. Does the Council wish to restore a protected areas amendment process or to open a protected areas amendment process and revisit designations last reviewed in 1992?

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c:\users\weist\desktop\protected areas topic summary.docx (Karl Weist)

## Alternative Approaches to Address Toxic Contaminant Recommendations

The Council's 2009 Fish and Wildlife Program already states that identifying and reducing toxic contaminants may be important for the success of the program and calls on the federal action agencies to work collaboratively with state, regional and tribal agencies to identify toxic contaminant sources; monitor contaminants in the river and evaluate whether these adversely affect anadromous or resident fish; and if so, identify actions to reduce toxic contaminants or their effects to improve survival. The issues posed by the current set of recommendations are: (1) whether the Council should add specific measures and steps to the Program to implement these general principles; and (2) whether and to what extent the Program should call on Bonneville and the other federal action agencies to take responsibility for implementation of certain actions (as opposed to the current general reference to federal and state agencies) as either directly addressing problems arising out of the development and operation of the hydrosystem or as a form of offsite enhancement to mitigate or compensate for adverse survival effects of the hydrosystem.

On the basis of these recommendations, there are a number of alternative approaches the Council could take on this issue, which generally fall into four categories:

The **first** approach would essentially leave the language of the Program as it is, with relatively few changes, and then support implementation of that language. This would largely defer to other regional entities to sort out what actions concerning toxics should take place in the next few years and who would take responsibility. Currently, regional toxics planning and coordination efforts are occurring in the EPA's Toxics Reduction Work Group. The Council staff plays a role in that effort, but outside any additional language in the Program. Prior to the next Program amendment process, the Council could review and consider the status of the regionally developed toxics reduction work plan, as well as results of regionally cooperative contaminant source identification and toxic contaminant monitoring information and then decide whether to make significant Program changes, seek scientific review, or take other steps. Some recommending entities would be more than comfortable with this approach; others would view it as unresponsive to the many recommendations received regarding toxics.

A **second** approach would also support implementation of the current program language and use the recommendations to add specific detail to the Program as to what actions should take place in the next few years to identify and address toxic contaminant issues in the mainstem that are or may be related to the development and operation of the hydrosystem. This could include actions such as: (a) call for an in-depth report characterizing the state of the science related to toxic chemicals in the Columbia/Snake mainstem; (b) call for an assessment and mapping of the most significant toxic contaminant sources and threats in the mainstem and their relationship, if any, to the development and operation of the hydrosystem; (c) call on the agencies (particularly the Corps) to monitor toxics levels in the mainstem, assess the effects of existing toxic contaminants, and mitigate for any impacts to fish in mainstem federal project reservoirs; and d) call on the Corps of Engineers to monitor and develop best practices for reducing spills and leakages of oils and lubricating fluids at federal dams.

A **third** approach would not confine the addition of specific actions to the mainstem, but instead would incorporate the broader range of measures and objectives to address toxic contaminant issues for anadromous and native resident fish across the basin that come out of the

recommendations of the state, tribal and federal resource agencies and environmental groups and from the ISAB. Added to the list of actions above (in the second approach) could be measures and objectives such as: (a) identify and assess the effects of particular toxic contaminants on native fish and wildlife and food webs across the CRB; (b) support for a basinwide monitoring and characterization of toxic contaminants; (c) incorporate toxics monitoring into ongoing efforts to assess, restore and improve habitats; and (d) implement actions to remediate, reduce and prevent toxic contamination to improve the survival and health of anadromous and resident fish. But in the third alternative the Council could stay silent as to ultimate responsibility for implementing these actions -- that is, become much more specific as to what actions need to take place to address toxics problems in the basin, but recognize that there are still issues of who takes responsibility for these actions to be sorted out by the implementing agencies and not assume any of the actions are necessarily the responsibility of a program intended to protect and mitigate for hydrosystem effects.

The **fourth** approach is a variant of the third, in which the Council includes from the recommendations a broad array of priority actions to assess and address toxic contaminant issues that affect fish survival *and* the Council explicitly identifies that *Bonneville* is to take some level of responsibility for implementing these actions and why. Note that this approach would be consistent with many of the recommendations, while completely inconsistent with the recommendations and comments of others, who would argue that this approach would be inconsistent with the Northwest Power Act.

#### **Existing 2009 Fish and Wildlife Program Language Concerning Toxic Contaminants:**

Section II-Emerging Habitat Issues on p. 16 of the Fish and Wildlife Program states:

Toxic contaminants in the rivers and streams of the Northwest may be having adverse effects on Columbia River Basin fish and wildlife mitigation and recovery. If so, **identifying and reducing these toxic contaminants may be important for the success of the Program.** The Council **encourages federal action agencies to collaborate on investigation of contaminant source identification and long-term monitoring of priority toxic contaminants** with federal, regional, and state agencies to better understand how contaminants are taken up by different fish and wildlife species. The Council specifically **encourages the long-term monitoring of known toxic contaminants** including DDT, PCBs, mercury, PBDEs, PAHs, arsenic, dioxins/furans, lead, organophosphate insecticides and herbicides, copper, and estrogen compounds to establish trends in contaminant levels and locations. The results of these investigations and monitoring will assist in fish recovery efforts and will inform the Council's subbasin planning and habitat restoration efforts. [Emphasis added.]

In addition, the Water Quality section on page 44 of the Mainstem Plan calls on the federal action agencies to continue to implement:

...actions to reduce toxic contaminants in the water to meet state and federal water quality standards. The **federal action agencies should** partner with and **support federal, 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 more susceptible to disease and result in increased mortality or reduced productivity**. [Emphasis added.]

## **ISAB Review of 2009 Program and Recommendations Concerning Toxic Contaminants**

In its review of the 2009 Fish and Wildlife Program, the ISAB stated that “artificial chemical proliferation in the Basin is a priority for resolution. In addition to contaminants of the past, there is a growing concern about emerging contaminants. The estuary and the coastal ocean communities are particularly vulnerable to the accumulation of contaminants because of their spatial position in the watershed. There is an urgent need to quantify and map the spatial patterns of these chemicals; assess their transfer, accumulation, and persistence; and document their impact on native organisms and on the carrying capacity of the Columbia River ecosystem for juvenile salmonids. The Council has an opportunity to take an active role – through cooperation with regional partners – to ensure that monitoring of toxic contaminants and evaluation of their effects on fish and wildlife are addressed.”

### **Specific ISAB recommendations for addressing chemicals and contaminants:**

**1. Actively investigate the impact of chemicals on restoration activities by fully implementing a water quality program.** This initiative will require working partnerships between the federal Action Agencies and other federal resource agencies (e.g., EPA, Bureau of Land Management, U.S. Forest Service and others), as well as initiating modeling of climate-temperature effects for all parts of the Basin.

**2. Work diligently with other regional agencies to implement the interagency Columbia River Basin Toxics Reduction Action Plan.** Update the plan regularly, so that current and future chemical insults to the system can be addressed in timely fashion, before they become even more serious problems. The nature of the issue dictates that this will be a large, ongoing, and collective regional effort.

## Summary of Major Comments

The majority of commenters support the position that the Fish and Wildlife Program should include direct actions to monitor and reduce toxic contaminants that adversely affect anadromous or resident fish and food webs. Comments also support efforts to evaluate how toxic contamination impacts ongoing efforts to restore and improve fish and wildlife habitat. However, another group of commenters argue not to expand the Program with actions to monitor and address toxic contaminants because toxic contamination is not due to the existence and operation of the hydropower system.

Comments listed below are broken down into two categories. The first category includes those comments which are supportive of including more actions addressing toxic contaminants in the Program, while the second category includes comments which are not supportive of including actions addressing toxic contaminants in the Program.

### Comments Supportive of Including Actions Addressing Toxic Contaminants in Program

**CRITFC and Save Our Wild Salmon coalition (SOWS)** comment that “toxics are closely associated with or exacerbated by the hydropower system. The presence of dams is associated with the accumulation of contaminated sediment, while the presence of reservoirs and their operations are a controlling factor on chemical conditions such as anoxia, which [can] impact the distribution and bioavailability of toxics in the river system. [For example,] FCRPS and FERC-licensed dam reservoirs strongly control the chemical conditions, such as anoxia and methylation of mercury, which impacts the bioavailability of toxics in the watershed, which in turn impacts recovery efforts.”

**CRITFC and SOWS** also state “other toxic chemicals are directly released into the river through spills of PCB-laden oils and lubricants from FCRPS dam operations, and legacy sites such as Bradford Island [near Bonneville Dam] continue to be a source of PCBs in fish. In addition, flushing of contaminants, regardless of their source, out of the watershed from both non-point and point sources is inhibited in a river system that is heavily altered by the federal hydropower system. An example of a specific impact caused by the [federal] dams is to sturgeon; once anadromous, sturgeon are now blocked in reservoirs and subjected to contaminants year-round at levels exacerbated by the reservoirs.”

**SOWS, the Umatilla Tribes and BPA** state that “toxic contamination is a complex issue... a coordinated, common approach by all co-managers is needed to mitigate the threat to fishery resources. The Council is in a unique role to provide leadership on this issue and collaborate with ongoing efforts to reduce toxics in the Columbia River Basin.”

Finally, both **CRITFC and SOWS** state that “considerable effort and funding have already been invested in programs to restore fish populations. Ignoring the impact of toxic chemicals on key species makes little sense in a rational, science-based pathway to recovery of these key species.”

### Comments Not Supportive of Including Actions Addressing Toxic Contaminants in Program

**BPA**'s comments state:

The Council struck the right note with its encouragement in the 2008 Program of “federal action agencies to collaborate on investigation of contaminant source identification and

long-term monitoring of priority toxic contaminants with federal, regional, and state agencies to better understand how contaminants are taken up by different fish and wildlife species.”<sup>2</sup> BPA appreciates the importance of the toxics studies recommended by many entities, but all of the proposals seek to address fundamental scientific questions that arise outside the existence or operation of the FCRPS. For example, studies on the environmental fate and persistence of contaminants, contaminant mixture interactions, or effective pollution control measures and mitigation strategies<sup>3</sup> are wholly unrelated to the FCRPS.

Some commenters [e.g., EPA and a number of fish agencies and tribes] opine that dam and reservoir presence contribute to the accumulation and distribution of toxic substances in the environment.<sup>4</sup> Still, FCRPS dams have not created the Northwest’s legacy of toxic contamination. Any additional provisions added to the Program to address this contamination should focus on identifying the responsible parties who are the presumptive original sources for mainstem toxics contamination.

**BPA staff** also submitted the following points via an email comment:

- As the dam operator, the Corps of Engineers is responsible for any spill or leakage at the dams. The Corps is required to follow the same federal environmental regulations as any other federal agency. The mineral oil [the Corps uses] as a lubricant contains low levels of PCBs, but the levels fall below the allowable standard of under 50 ppm.
- As a federal agency, BPA is subject to stronger environmental review requirements than a private entity. Under the National Environmental Policy Act (NEPA), BPA must evaluate the potential environmental consequences of all its prospective decisions and provide opportunities for the public to influence decisions that could have significant impacts. Prospective decisions are evaluated for effects on ESA-listed species, water quality, cultural resources and other factors. Accordingly, BPA considers the potential environmental effects of [potential] project actions prior to implementation of a project. BPA Environmental Compliance leads the review of each contract statement of work, before the contract is let, to assess and potentially investigate the impact of [the proposed] actions, identify any potential environmental concerns and validate that the contract/sponsor will meet environmental regulations prior to implementation.
- A Phase 1 contamination assessment is required of all BPA land acquisitions prior to purchase as part of the extensive acquisition process. Clean up is the responsibility of the land owner, and escrow funds are not typically released until BPA has verified that any identified contamination has been cleaned up.

Although **BPA customers (NW RiverPartners, NRU and PPC)** acknowledge the importance of addressing toxic contamination, they believe incorporating actions addressing toxics into the Program will distract from the goals of the Northwest Power Act.”

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<sup>2</sup> 2009 Fish and Wildlife Program at page 16.

<sup>3</sup> NOAA Science Center at pages 2-5.

<sup>4</sup> EPA at page 3; ODFW Attachment 2, Co-managers draft at page 41.



The **UCUTs** comment that “some recommendations [addressing toxics] have the potential to conflict with our recommended funding allocation.”

In addition, **NW RiverPartners and other BPA customers** assert that “the hydropower system is not responsible for the majority of this problem and mitigation and research regarding toxics falls outside the responsibility of the FCRPS. BPA is not responsible for funding measures intended to address water pollution from sources other than the hydrosystem, such as toxics resulting from industrial, agricultural, or municipal discharges or storm water runoff. Not only are such measures not related to the power system, they are otherwise addressed by obligations imposed by other federal statutes including the Comprehensive Emergency Response Compensation and Liability Act, the Resources Conservation and Recovery Act, and the Clean Water Act among others. Recommending funding for toxics would create an *in lieu* situation for BPA because the Act prohibits funds or expenditures authorized by other state or federal requirements. Therefore, we find this recommendation inconsistent with the purposes of the Act. The only exception would be those toxic chemicals directly released by dam operations, and in this case, BPA should accept full responsibility for preventing these types of releases.”

#### Other Comments Received About Toxic Contaminants

The **PPC** stated it “is supportive of cross-agency management and consideration of [the toxic contamination] issue, and that, “if the Council includes [the toxics issue] in its program, it should be to encourage better coordination between, states, tribes, and federal entities so that each fund their appropriate share of [toxics] measures.”

**American Rivers** comments that fish and wildlife are negatively affected by toxic contaminants in the Columbia River system, and some of that contamination is due to the existence and operation of the federal hydrosystem. The Fish and Wildlife Program should call for and conduct an assessment of how hydropower projects may exacerbate toxic contamination issues affecting human health, fish and wildlife populations, and the wider ecosystem, and create a program to reduce and mitigate for those effects.

In addition, **17 individuals** support the American Rivers comments and recommendation calling for an assessment of how hydropower projects may exacerbate toxics contamination issues.

**Wild Washington Rivers** comments about the role of toxic contaminants, particularly copper, lead, arsenic, etc. and a new fish consumption rate being considered presently under Washington’s water quality standards process as it relates to the Protected Areas exemption provision. The group also provides links to some studies about the adverse effects of copper on salmonids. The group states that “many studies reveal that the presence of copper interferes with a salmon’s ability to smell. It is [the fishes’] sense of smell that warns them when a predator is nearby and it’s their sense of smell that leads them back to their original spawning grounds. Even the smallest amounts of copper have deadly consequences on the survivability of salmonids.”

A senior scientist from the **USGS-Oregon Water Science Center** comments about ways to evaluate distributions, contaminant levels and spatial patterns of contaminants of emerging concern (CECs) in the Columbia River Basin. **USGS** provides some analytical cost estimates for evaluations based on monitoring CECs, pharmaceuticals, current use pesticides, PAHs, legacy contaminants such as DDT and other organochlorine compounds, PCBs, PBDES, trace elements,

and anthropogenic-indicator compounds found in personal care products. The **USGS** also comments about studying the transfer, distribution, accumulation and persistence of CECs in estuaries, coastal ocean and riverine food webs. Specifically, “this type of study would be best performed by collecting data for a few years and then spending a year interpreting and integrating the [contaminant] data.” As a reference, the **USGS** provides the cost of their internally-funded Columbia River ConHab (Contaminants and Habitat Characterization) study, which was about \$1 million over four years. That study was designed to address how CECs, such as PBDEs and endocrine-disrupting compounds (EDCs), impact fish, osprey and other wildlife at three sites in the lower Columbia River.

Finally, **Steven Kolmes-University of Portland** states the “FCRPS should share the responsibility for toxic response efforts. Dams and their equipment are sometimes direct sources of toxic pollution, and the flow modifications produced by the FCRPS dramatically change the way toxics move through the river system. The FCRPS ought not [to] get a ‘pass’ on toxics but should be asked to bring its resources to bear to help mitigate the current [toxics] problems. Even something as simple as FCRPS helping to collect more data to supplement the shockingly thin information available could be invaluable.”

## MEMORANDUM

**TO:** Fish and Wildlife Committee members

**FROM:** Tony Grover

**SUBJECT:** Staff recommendation for next steps in evaluating the Experimental Spill Management Recommendation

### **Summary of Alternatives related to the Experimental Spill recommendation**

Please see the following memorandum from Jim Ruff which describes the spill proposal and associated comments in detail.

#### **Alternative 1:**

Refer the Experimental Spill recommendation (spill proposal) and all relevant comments, assessments and critiques to the Independent Scientific Advisory Board (ISAB) for a full review of the scientific and statistical aspects of the spill proposal. Questions the Council may consider asking the ISAB are:

1. Is the spill proposal adequately described by the proponents?
  - a. Is there sufficient information to fully understand the within-year hydro-operations (water spill volumes, timing and duration at each hydro-facility under various run-off conditions)?
  - b. Are the proposed number of years duration of the spill proposal long enough to be likely to determine whether the spill proposal does or does not create the postulated survival benefits to salmon and steelhead?
2. Is adequate monitoring and evaluation included to understand the effects on juvenile salmon, steelhead, lamprey and other resident fish and aquatic life resulting from increased spill up to 125% total dissolved gas super saturation?
3. Is adequate monitoring included to understand the potential delay and reduced ability to find fishway entrances that may result from the spill proposal on adult salmon, steelhead, lamprey, eulachon and other fish migrating upstream during the times the spill proposal is in effect?
4. Is adequate monitoring included to detect and react to increased erosion that may result from the spill proposal in a timely manner?
5. Are the data and methods used by the spill proposal proponents to support the hypotheses of projected increased survival and adult returns (e.g., SARs) of salmon and steelhead resulting from the spill proposal sufficient and appropriate? If not, what additional data and methods should be used to adequately explore the hypotheses of the spill proposal?

When the ISAB completes the review of the spill proposal, the Council could review the ISAB report and recommendations at the fish and wildlife committee and the full Council, taking any additional comments and information from the region that are appropriate, before making a decision about what to do next with the spill proposal recommendation.

**Alternative 2:**

Proceed as recommended by NOAA Fisheries in the 2013 draft supplemental FCRPS BiOp and continue to operate the FCRPS hydro system spill and flow operations under the terms of the draft 2013 FCRPS Biological Opinion while gathering appropriate data to further evaluate the spill proposal when natural run-off events create spill and flow conditions similar to those recommended in the spill proposal. The Council may occasionally review the resulting information to determine if the spill proposal appears to be supported by the new information, seek further scientific review or take other steps.

**Alternative 3:**

Proceed with a staff economic and hydro-system reliability analyses of the recommended spill proposal in a manner approved by the Council. The Council would then consider the results of the staff analysis and then decide whether to support the proposal, seek further scientific review or take other steps.

**Alternative 4:**

Defer consideration of the spill proposal until the states of Oregon, Washington and the U. S. Environmental Protection Agency have in place water quality standards that would permit volitional spill up to 125% gas super saturation in the tailraces of each mainstem federal dam. When those regulatory changes are in place, then decide whether to support the proposal, seek further scientific review or take other steps.

**Alternative 5:**

Support the recommended spill proposal for inclusion in the draft amended 2014 Columbia Basin Fish and Wildlife Program. Recommend the region implement the experimental spill proposal as soon as is practical.

The staff recommendation is for the committee and Council to proceed with Alternative 1. An ISAB review, with recommendations, would clarify the conflicting claims regarding the spill proposal raised by fishery managers. An ISAB review may also help the Council address concerns about the spill proposal raised by several commenters.

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## MEMORANDUM

**TO:** Fish and Wildlife Committee members

**FROM:** Jim Ruff – Manager, Mainstem Passage and River Operations

**SUBJECT:** Experimental Spill Management Recommendations and Comments

### Summary of Recommendations

As part of the Fish and Wildlife Program amendment process, the Council received recommendations from Oregon Department of Fish and Wildlife (ODFW), the Nez Perce Tribe (NPT), the Pacific Fishery Management Council (PFMC), environmental and fishing groups, and individuals calling for implementation of an experimental spill management (based on CSS studies) regime. This proposal would increase spring spill levels at each mainstem federal Snake and Columbia River hydropower project up to 125% of total dissolved gas level in the tailrace of each dam<sup>5</sup> or biological constraints, and then monitor survival effects over ten years compared to the current court-ordered spill program. Since 125% total dissolved gas exceeds the Clean Water Act water quality standard, modifications to the standard through regulatory processes by the states of Washington and Oregon would be required.

As proposed, the key elements of the experimental spill management would include:

1. Implementing voluntary spill levels greater than historical levels, particularly in lower flow years. Implementation is proposed to 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 federal 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 (CSS) 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.

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<sup>5</sup> Current spill levels under the NOAA Fisheries FCRPS BiOp and the Program are to spill at each mainstem Snake and Columbia river dam up to 120% TDG in the tailrace of each dam or up to 115% TDG in the forebay of each dam, whichever is controlling.

## Scientific Biological Rationale and Background Information Provided for Recommendation

The following information was provided by ODFW as the scientific and biological rationale for the experimental spill management recommendation:

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 mainstem 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 powerhouses) 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.

In addition, several CSS 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 SAR objectives for listed Snake River and upper Columbia River salmon and steelhead. The second CSS workshop reviewed a draft study 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 study design included a detailed assessment of the spill levels that could be implemented at each dam, the expected changes in SARs across different 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: 1) the Biological Opinion spill levels currently in place; 2) spill levels defined by total dissolved gas levels of 115% in the forebay and 120% in the tailrace; 3) spill levels defined by total dissolved gas levels of 120% in the tailrace, and 4) spill levels defined by total dissolved gas levels of 125% in the tailrace. These scenarios evaluate spill levels that progressively increase from the Biological Opinion being the lowest up to the 125% TDG in the tailrace being the highest. Smolt Monitoring Program data collected over the past fifteen years have indicated that total 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, and poor, medium and good ocean conditions), the evaluation found that higher spill levels are expected to increase the probability of meeting the regional SAR goals set by the NPCC for Chinook salmon and steelhead, 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 anadromous stocks that encounter the FCRPS from 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 of spill at the 125% tailrace dissolved gas level would be the most likely spill level to achieve the Council's SAR objectives for ESA-listed Snake River Chinook salmon and steelhead, as well as the few remaining unlisted populations.

### Supporting Biological Reference Materials:

For additional background information, links are provided 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, on 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.

### Modifications Required to Clean Water Act Water Quality Criteria for Total Dissolved Gas

The federal Clean Water Act water quality criteria for total dissolved gas (TDG) is 110 percent. However, the states of Oregon and Washington have provided waivers for the TDG standard in recent years during the April through August juvenile fish migration period to facilitate implementation of the FCRPS Biological Opinion spill levels. The Oregon Department of Environmental Quality (ODEQ) waiver allows spill for fish passage up to the 120% TDG level in the tailrace of each mainstem Columbia River dam. Washington Department of Ecology (WDOE) waiver allows spill up to 115% in the forebay and 120% in the tailrace of each mainstem Snake and Columbia river dam.

The proponents of the experimental spill management proposal acknowledge the target 125% TDG level in the tailrace would exceed both Oregon and Washington water quality criteria. Thus the spill experiment is subject to both states changing the Clean Water Act TDG requirements. It will be necessary to obtain approvals for TDG criteria modification from both the Oregon Environmental Quality Commission and the Washington Department of Ecology through their regulatory processes to conduct this spill experiment.



## Power System Impacts and Economic Cost Estimate

No estimates of regional power system impacts or cost estimates were provided with this recommendation. However, the experimental spill proponents did provide the following language concerning power system impacts:

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 this standard is not violated.

In its comments, BPA says it is in the process of analyzing the implications of this spill proposal on power generation transmission system operations. BPA stated "the proposal for substantially different FCRPS operations would be expected to significantly reduce power generation and increase power rates while reducing the flexibility necessary to integrate renewable energy and achieve other regional objectives."

## Other Entities' Comments on Experimental Spill Management Proposal

The Save Our Wild Salmon (SOWS) coalition commented that:

any test of expanded spill would need to be conducted in cooperation with state water quality agencies, and would likely require that ODEQ and WDOE develop temporary modifications of existing water quality standards under state law in order to allow for Total Dissolved Gas (TDG) to the 125% level. Any modifications issued by either Oregon or Washington would be specifically tied to the proposed test of expanded spill, and would only apply for the duration of the test itself. They would also ensure that the spill test is in compliance with state water quality standards and the federal Clean Water Act. Further, the experimental spill proposal that's supported by our coalition, the State of Oregon, the Nez Perce Tribe, and many others would include robust, real-time biological monitoring and contingencies in the event that salmonids or other aquatic organisms are negatively impacted by moderately higher levels of dissolved gas; should those biological constraints be triggered, the spill experiment could be modified or suspended at any time.

In addition, SOWS also stated "there is strong, region-wide scientific support for a test of expanded spill" and that "CSS has documented a clear link between greater spill (i.e., spill provided under court order since 2006) and higher rates of juvenile salmon survival."

Moreover, the SOWS coalition states the:

CSS data also indicate that young fish that migrate in-river with the help of spill tend to fare better in the ocean and return successfully as adults, when compared with transported fish or those that travel through turbines or bypass systems. Based on these data, and the

strong correlation between inriver migration and overall survival of salmon, CSS modeled higher levels of spill over the past year to determine if there would be a corresponding increase in survival as measured by SARs. CSS focused their modeling of spill scenarios on what is technically feasible within the current configuration of the Federal Columbia River Power System. Those projections suggest that higher spill levels, when compared with BiOp-level spill, would reduce the risk of very low SARs (those SARs that leave salmon populations at a higher risk of extinction), and increase the likelihood of SARs above 2% (those SARs that allow populations to stabilize and rebuild – and in some cases recover). CSS’s analysis concluded that spilling to 125% TDG spill would yield the greatest likelihood and frequency of SARs above 2%.

Finally, the SOWS coalition took issue with the NOAA Fisheries criticism (see below) of the experimental spill management proposal in its 2013 draft FCRPS Biological Opinion, saying that NOAA’s dismissal of this expanded spill proposal is “based on a thin 3-page critique that rests on a very small set of severely flawed papers and interpretations. . . . This may indeed be an initial rejection by NOAA of the idea of expanded spill, but it is not one based on best available science, nor does it stack up against CSS’ 16-year, independent, regionally-supported, and heavily reviewed study.”

The NOAA Fisheries draft 2013 FCRPS supplemental BiOp included the following comments about the CSS experimental spill management proposal:

In considering this information, NOAA Fisheries finds that several substantial weaknesses in the analysis exist that would need to be resolved prior to further consideration of any operational study of this magnitude. The data used to construct the models in Haeseker et al. (2012) span a 9-year period (1998–2006). Since 2006, spill levels have increased at several of the mainstem projects and the efficiency of spill has increased as well with the addition of spillway weirs. (The last spillway weir was installed in 2009).

There is evidence that conventional and surface spill pass a greater proportion of fish for a fixed spill percentage at lower flows than at higher flows (NOAA Fisheries unpublished analyses). Thus, high spill percentages may not be needed to pass the same proportion of fish in lower flow years. The increased spill recommendation by the CSS also addresses the hypothesis that juvenile fish bypass systems are a significant source of delayed mortality based on adult returns of inriver juvenile migrants (Haeseker et al. 2012). However, an analysis of the Haeseker et al. (2012) data by Skalski et al. (2013) found that spill percentage also correlated with increased adult returns of transported fish, which conflicted with the Haeseker et al (2012) conclusions.

The analyses in Haeseker et al. (2012) provide correlative associations only, and should not be interpreted as demonstrating causation. Spill levels are also correlated with many other inriver conditions or mortality factors, some of which are not discussed in Haeseker et al.(2012). These authors investigated only four covariates in their inriver survival models and seven covariates in their ocean survival models, and the correlations among those covariates were not provided. The Skalski et al. (2013) analysis suggests that spill levels must have correlated with other mortality factors, such as ocean conditions, that were also experienced by transported fish. If the CSS modelers had replaced spill with

other correlated factors, it is likely that those factors would have also been associated with similarly increased survival. Mortality effects of this array of factors are confounded and not separately estimable with correlation studies alone. Randomized experiments would be necessary to adequately assess direct and indirect effects of spill. In the absence of randomized experiments, we suggest that a more thorough analysis that includes more potentially influential covariates, an assessment of correlation among variables, and an analysis of influential data points.

For example, an obvious variable that is missing from the CSS survival models is total dissolved gas. A model that predicts survival using a monotonic association with spill, and does not include mortality at higher levels of spill and thus total dissolved gas, will make the unrealistic prediction of increasing survival regardless of the level of total dissolved gas. Additional years of data under the current operations and configuration of the system (completed in 2010) will shed light on whether or not the CSS hypothesis is supported by the empirical data. Adult returns from the 2011 and 2012 outmigrations (high flow, high spill years) and 2010 (a lower flow, high spill year) should be especially instructive. NOAA Fisheries supports the CSS researchers' recent work to assess the proportion of spillway passed fish as an explanatory variable, which takes into account the passage efficiency of spill at each project, not just spill as a surrogate.

NOAA Fisheries is not dismissing the results of these modeling efforts and appreciates the progress made in the CSS modeling. NOAA will continue to closely monitor the effects of project operations on juvenile survival, and adult returns as reported by CSS and the Northwest Fisheries Science Center. We note the adult returns from the year 2011, a year which had high levels of spill and flow, has produced below average adult return rates. Results such as this reinforce our current management approach to hydrosystem operations.

Bonneville's comments on the proposed experimental spill management proposal are as follows:

Recommendations were proposed to significantly alter dam operations and increase spill, in some cases to twice current levels and above the Clean Water Act water quality standards. The proposed changes in hydro operations would disrupt the improvements currently underway, undermine the careful testing and adjustment of spill to meet the performance standards, and could in some instances cause harm by reducing fish survival.

The proposed [higher] spill levels are hypothesized to increase smolt-to-adult return rates for salmon. However, the underlying assumptions oversimplify the relationship between spill volume and spill effectiveness, understate the documented effect of ocean conditions, extrapolate outside the range of available data and past experience, and ignore dam-specific biological and structural constraints identified over the last five years. For example, analyses assume that the percentage of fish that pass over spillways is controlled by the volume of water spilled, when documented study results show much higher percentages when surface passage spill is involved. And similar correlations are observed with transported fish, which are not spilled. As a result, we believe implementation of the proposed spill test would actually impair fish survival and

diminish the benefit of years of work and millions of dollars worth of investments in structural improvements and survival testing at dams.

For example, altering spill patterns arrived at through extensive and careful testing could produce unexpected currents or eddies that delay juvenile fish or expose them to predators, undermine the effectiveness of surface passage systems that have boosted survival, and interfere with adult fish by delaying the upstream migration or increasing adult fall back through the spillway. Further, the higher spill levels recommended would elevate total dissolved gas levels (TDG) above applicable water quality standards, posing harm to aquatic organisms.

According to the Northwest Power Act, Program amendments should “complement the existing and future activities of the Federal and the region’s state fish and wildlife agencies and the appropriate Indian tribes.” The Biological Opinion for the FCRPS, the Columbia Basin Fish Accords, and the Implementation Plan (now in draft form) that describes actions planned under the Biological Opinion outline the existing and future activities related to the FCRPS. Beginning an extensive experiment involving much different dam operations halfway through the Biological Opinion’s term--when current operations have been finely adjusted based on sophisticated research and monitoring results, and are yielding benefits--would not complement, and could instead disrupt, the existing and future activities identified.

[Thus, BPA has] significant questions regarding recent proposals for increased levels of spill and new spill performance metrics which are not based on the best available science. Now is not the time to make a change. Instead, continuing the current adaptively managed experiment in the operation and configuration of FCRPS projects under the [NOAA 2013] Biological Opinion will continue to improve fish survival and ultimately help discern whether further alterations in spill patterns and passage routes would be beneficial.

A number of entities, including Northwest RiverPartners, NRU, PPC and Grant County PUD, urge the Council to not include the experimental spill management proposal in the amended Program for the following various reasons:

- It is inconsistent with the purposed of the Northwest Power Act to recommend an action which is contrary to state and federal laws, i.e., the federal Clean Water Act and current Washington and Oregon water quality standards for TDG.
- It is not based on the best available science, citing a Skalski et al. (2013) paper entitled “Limitations of Correlative Investigations in Identifying Causal Factors in Freshwater and Marine Survival of Columbia River Salmonids,” as well as the fact the draft 2013 FCRPS supplemental BiOp contains the best available science concerning spill.
- Current evidence based on correlative associations does not justify such as large-scale operational [spill] study, as additional analyses have identified several covariates suggesting broader mechanisms for survival relationships in freshwater and marine environments.
- Additional analyses are needed to better understand whether the relationships between freshwater indices (i.e., percent spill and water transit time) and subsequent salmonid survival are simply a function of the selected indices and their relationships with broader climactic conditions.

- Additional studies based on PIT-tags will have inherent limitations (e.g., detection range and efficiency) and will not address uncertainties associated with broader mechanisms for survival or lack of independence between freshwater and marine conditions and survival. Data from acoustic telemetry studies are available and can help account for environmental variation and provide additional insight for relationships between FCRPS operations and subsequent fish survival.
- It is not supported by NOAA Fisheries in its draft 2013 FCRPS supplemental BiOp.
- It is inconsistent with many of the other state and tribal Accord parties' recommendations to incorporate the FCRPS BiOp mainstem operations and Accords into the Program, which include the current court-ordered spill program.
- The biological benefits of the experimental spill program are speculative and would be costly to the region.

A number of tribal entities, including CRITFC, the Yakimas, Umatillas, Warm Springs and the Colvilles each commented the amended Program should continue to support and incorporate the NOAA Fisheries FCRPS Biological Opinion and the Fish Accords, and that the actions provided by these plans are adequate for ESA and Clean Water Act compliance while also meeting the Northwest Power Act mitigation mandates for anadromous fish mitigation through 2018.

Thus, a key issue for the Council in this amendment process will be to navigate through these competing recommendations and comments that are based on contrary conclusions, in some cases using the same or similar information and uncertainties. Also, while the experimental spill proposal includes “off-ramps” in the event harm is demonstrated to either salmonids or resident fish and aquatic life due to implementation of higher levels of spill and TDG, a detailed, real-time monitoring program was not included in the proposal or in comments to determine if aquatic organisms would be negatively impacted.

## **Key Mainstem/Operations Issues December 2013**

A separate document discusses the recommendations for an experiment in increased spill. The recommendations as whole raise a set of other key issues for the mainstem and for system operations. These group together into three categories, in summary fashion:

- (1) **Biological Opinion hydrosystem actions and performance standards as baseline Program measures and objectives.** The 2009 Fish and Wildlife Program recognizes the hydrosystem actions and performance standards in the FCRPS Biological Opinions as also baseline measures and objectives for the Program (Note: this is not the same as saying the Council adopts the BiOps.). Many of the federal and state agencies and tribes recommend that the Council continue this approach in the revised Program. A number of the conservation groups in particular recommend that the Council delink its Program completely from the Biological Opinion actions and objectives. This is one threshold issue for the Council to consider.
  
- (2) **Operations in addition to or as a revision of the baseline measures and objectives derived from the Biological Opinions.** While the Council's F&W Program has recognized the BiOp measures and standards as the Program's baseline measures and objectives, the Council has also included measures not in the BiOps (or not yet in the BiOps) to add to that baseline, based on recommendations from agencies and tribes for improved protection and mitigation for both unlisted and listed species, anadromous and resident fish. And in those cases the Council has called on the action agencies to work to adapt the ESA-required operations, if possible, to accommodate these new or additional measures. One good example from the past was the inclusion in 2003 of revised operations at Hungry Horse and Libby based on the recommendations of the Montana Department of Fish Wildlife and Parks, the Confederated Salish-Kootenai Tribes and the Kootenai Tribe of Idaho to provide improved conditions for listed and non-listed fish in the upper part of the system without unduly compromising protections for anadromous fish in the lower river. Another good example has been the Council Program's insistence on priority implementation of the Vernita Bar protections for Columbia River fall Chinook, an abundant non-listed population.

In the current process, some recommending entities would have the Council simply stop at the BiOp measures and objectives. Other recommending entities would have the Council call for additions or revisions to the baseline measures, either because of a desire to add on to the operations directly focused on migrating salmon and steelhead or because of a desire to see improved protection for other fish. The Committee and the Council need to ponder and decide on these recommendations, which include:

- Washington recommends continued adherence to the Vernita Bar operations that benefit fall Chinook in the Hanford Reach.
- Recommended adjustments in operations at Libby and Hungry Horse from Montana and the Kootenai Tribe of Idaho (at Libby), to improve conditions for listed sturgeon and other listed and unlisted fish in and below the reservoirs, adjustments they recommend again as consistent with the flexibility in the bull trout, Libby Dam and salmon and steelhead BiOps.

- The Spokane Tribe recommends that the Council continue to include in the Program the altered reservoir operations at Grand Coulee that the Tribe considers important to improve conditions for fish in Lake Roosevelt. The operations preferred by the Spokane Tribe are already in the Program, but only under the condition that they be implemented only if the NOAA and others conclude they can absorb the operations into an FCRPS BiOp without undue compromise to listed salmon and steelhead survival. That has not yet happened.
- The spill experiment recommendation from Oregon, the Nez Perce, conservation groups and others. Focused on both listed and unlisted salmon and steelhead. Discussed in a separate paper.
- The conservation groups in particular recommended additional flow and passage measures beyond the spill experiment to benefit listed and unlisted salmon and steelhead, including especially the John Day to MOP operation.
- The Nez Perce Tribe and a set of the conservation groups recommend another evaluation of the removal of the four dams in the lower Snake River.

(3) **Ecosystem function concepts/mainstem flows and operations/mainstem**

**habitat/floodplain connections/flood control.** A number of the state and federal agencies, tribes, environmental and fishing groups, and individuals recommend that the Council's mainstem plan incorporate an explicit ecosystem function focus and assist in restoring more natural floodplain functions, hydrograph and habitat all along the mainstem through the estuary and plume, in part taking advantage of any potential for improved fish habitat that may come from a modernized Columbia River Treaty. The 2009 Program's basinwide provisions and mainstem plan already incorporate a host of ecosystem and ecosystem function principles and concepts, and current operations are based in large part on partial implementation of these concepts. The issue for the Council is what more, if anything, can and should be incorporated into the Program and implemented in the near future to help improve the river's systemwide ecosystem functions and mainstem habitats while preserving other benefits society wants out of the river and the system as well. A number of the recommendations, especially from the Columbia River Inter-Tribal Fish Commission, the USGS (and the comments from the USGS), and the UCUT Tribes have provided specific details as to the progress that could be made on this front, most of which have to do with (a) gaining a better understanding of the ecosystem function/mainstem floodplain habitat/improved plume flow opportunities and benefits that might exist and (b) evaluating opportunities to shift operations for hydropower production and, especially, flood control as well as investigating other ways either to relax or strengthen local flood control to optimize for ecosystem functions while also protecting vital property. A key issue for the Committee and the Council will be to decide how much further down this path to lead the Program.

## **Monitoring, Research, Data Management, Evaluation, and Reporting (aka Program Assessment)**

The 2009 Program addresses the five topics of monitoring, research, data management, evaluation, and reporting (referred to as Program Assessment) under a basinwide section and in the mainstem section. Some past programs have been organized similarly, whereas other programs have addressed these topics per focal species (e.g. 1994). The amount of detail provided in these programs has also varied from very specific to more general guidance as in the recent programs. The recommendations received for the 2014 Program amendment, which are mirrored in the comments submitted, address all five of these topics. Below we briefly summarize the information received and provide some suggestions as to how these may be address in the 2014 Program

**Program Assessment recommendations:** Many are supportive of delineating the five topics used for Program Assessment into their own sections, providing more definition and more specificity by identifying priorities and gaps. There is support to clarify the linkages between objectives, monitoring, data, and indicators, as this may help guide related activities. Many suggest using a new or existing forum (forums), to better communicate Program information needs to ensure the Program is gathering the needed information. Many suggest considering cost reductions and limiting fish marking for priority needs.

### *Staff Suggested Potential Modifications to Address Recommendations:*

- *The Council could chose to dedicate five separate sections of the 2014 program for each of these five topics instead of lumping together. This may be most appropriate if the Council provides general guidance applicable all topics, topics and complement the actions made by the Council in 2011 and 2013.*
- *If the Council chooses to provide more specific guidance such as in the 1994 Program it may be appropriate to consider addressing the Program Assessment related to individual topics/focal species within the sections addressing each topic/species.*
- *Consider using the Program's indicators, numerical targets, and objectives as guidance for the Program Assessment efforts.*
- *Provide guidance within each of these five topics about how the region can engage the Council to modify or add specificity to the priorities identified, such as through an annual forum discussion with topic specific workgroups, a discussion held the year prior to the program amendment, or limited to the program amendment process.*

**Monitoring recommendations:** Many recommend incorporating as appropriate the draft council guidance for monitoring, such as the matrix balancing risk and effort, and ISAB recommendations. Many support better integrating monitoring projects, prioritizing projects that address multiple questions and produce scalable results, inventory existing projects and to build off of existing monitoring efforts. There is support to increase funding of IMWs, fund monitoring to inform models such as the lifecycle model, improve hatchery effectiveness monitoring and the minimum indicators to monitor, establishing non-hatchery watersheds, and implementing a basinwide hatchery effectiveness monitoring approach. Suggest using an independent approach for compliance monitoring, implementing Combined Habitat Assessment Protocols (CHAP), continuing Columbia Habitat Monitoring Program (CHaMP) for 3-years, and continuing to track status and trend of terrestrial vegetation / land use / land cover as



recommended by the ISAB. Others suggest the Council should monitor and report on economic benefits of fish activities including hatchery fish for harvest. Some recommend discontinuing monitoring methods.org.

*Staff Suggested Potential Modifications to Address Recommendations:*

- *Incorporate draft council guidance and ISAB guidance as appropriate.*
- *Incorporate the Council's draft risk-effort matrix and application guidance.*
- *Support tool development that facilitates integration of projects (e.g. PNAMP's monitoring explorer)*
- *Support implementation approaches that produce scalable results by having compatible methods (e.g. Bonneville's AEM) and derived indicators (e.g. Coordinated Assessment). This also aligns with ISRP and Council project recommendations related to habitat status and trends and habitat action effectiveness.*
- *Emphasize it is better to build from existing effort, by modifying and leveraging these to obtain the information needed instead of 'reinventing the wheel'.*
- *When needed, allow for third-party contractual compliance monitoring.*
- *State that Program monitoring priorities include data that inform objectives, indicators, and tools used to assess Program progress, such as models and large scale evaluations.*
- *Decide if the Program should support economic impact assessment of Program actions.*
- *Decide if the Program should include guidance for specific projects (e.g. CHaMP) and methods used (CHAP) or whether the Program should provide more generic guidance for these types of activities (e.g., programmatic hatchery effectiveness monitoring, aquatic habitat monitoring, wildlife habitat assessment)*

**Research recommendations:** many suggest incorporating as appropriate the draft council guidance for research, such as the matrix balancing risk-effort, and ISAB recommendations. Several entities provide critical research uncertainties to be included as part of the Program (e.g., acidification, invasive species, toxics, foodweb, lamprey, white sturgeon, eulachon, estuary action effectiveness, effects energy sources, and effects of the hydrosystem on marine attributes. There is a request to have research projects be better defined with specific end dates. Also there is support to have a regular solicitation of research projects to replace those that sunset and to facilitate addressing critical uncertainties.

*Staff Suggested Potential Modifications to Address Recommendations:*

- *Incorporate draft council guidance and ISAB guidance as appropriate*
- *Incorporate the risk-effort matrix and necessary guidance for its application*
- *Provide more specific guidance for research projects regarding their implementation, sunset, and sequencing of topics for the solicitation process (e.g., research database)*
- *Consider incorporating guidance from the revised draft Council Research Plan so as to integrate the guidance from the Research Plan into the Program. This would eliminate the need to have a separate document providing research guidance.*
- *Support short, fixed term duration research projects*
- *Dedicate a portion of the program funding to support a regular research solicitation*
- *To convey the Program's critical research uncertainties, consider producing a web accessible research uncertainty database comprising of uncertainties recommended by ISAB, ISRP, and the region. This database will link uncertainties to the Program, identify those that don't link to the Program, identify related projects, provide information on*

*current knowledge, and assign a sequence for addressing the uncertainties. This database would provide the specifics that cannot be included in the Program due to the length and dynamic nature of research uncertainties (e.g., updating the database as research uncertainties are resolved versus constrained to the 5-years program amendment cycle).*

- *Consider implementing a workgroup process that includes ISAB members, knowledgeable experts, and managers to identify and assign a sequence to Program critical uncertainties. This workgroup could revisit this information at least once every four-years and inform the research solicitation process.*

**Data Management recommendations:** many suggest incorporating as appropriate the draft council guidance for information management, the ISAB recommendations, and BPA data management framework. Some suggest a more streamlined approach to sharing data needed for program reporting. Most support fully funding the Coordinated Assessment for data sharing of salmon and steelhead indicators (and data), and support expanding this effort to include resident fish and wildlife. Recommendations also specify the need to fund state and tribal data management needs for information required by Program and regional reporting. Some supported having data sharing agreements to insure the information is properly used.

*Staff Suggested Potential Modifications to Address Recommendations:*

- *Incorporate draft council guidance and ISAB guidance as appropriate*
- *Consider being more explicit as to how information needed to assess Program progress (objectives, indicators) is to be made available to the Council for reporting purpose.*
- *Determine whether to (1) refer to the BPA data management framework as the implementation guidance being used by implementers, (2) extract relevant portions to include in the program (3) leave out of the Program as this is implementation guidance developed and used by BPA for program and FCRPS BiOp implementation and is not the policy guidance provided by the Program.*
- *Consider supporting the Coordinated Assessment effort at all levels to achieve a functional data sharing process that informs Program information needs (all focal fish species, to address the Program needs).*
- *Consider what guidance is needed to facilitate other data sharing needed for program reporting.*
- *Consider whether the Program should support data sharing agreements. Discuss whether the Program should provide guidance regarding penalties project sponsors that intentionally violate data sharing agreements.*

**Evaluation recommendations:** some suggest incorporating as appropriate the draft council guidance for evaluation and the ISAB recommendations. Some support models such as the lifecycle model that can explain population level response

*Staff Suggested Potential Modifications to Address Recommendations:*

- *Incorporate draft council guidance and ISAB guidance as appropriate.*
- *Consider providing support for broad-scale evaluation tools and approaches that can inform program progress such as models and watershed/population scale assessments.*
- *Consider supporting incorporation of basinwide evaluation using existing databases (e.g., landuse, water temperature) to provide a big picture context for the Program's*

*mitigation, protection, and enhancement activities which may facilitate understanding variation in action effectiveness. This could be used as an indicator or to guide program actions at the project scale.*

- *Specify what evaluation is required to produce derived information needed for reporting on the Council's objectives and indicators. This should include how this evaluation will be supported (e.g. process, financial and labor support).*

**Reporting:** incorporate as appropriate the draft council guidance for reporting and the ISAB recommendations. improving the Council's reporting about Program progress and effectiveness to inform adaptive management of the Program. This includes support for Bonneville funding of Council level reporting. The Council received recommendations to incorporate HLIs into the Program, develop HLIs that represent all Program objectives, develop HLIs for resident fish, pacific lamprey, eulachon, wildlife and the lower Columbia River; using CA indicators to report, and to align indicators with existing HLIs used by BPA and other agencies in the Basin such as by using performance metrics from the FCRPS BiOp and Accords. Some suggested including data from the Willamette (e.g. Minto Adult Collection facility) and to develop province level HLIs to link to Province level objectives. Some examples of what could be reported are provided, such as what data to graph. There is support for Bonneville to fund Council level reporting (or reporting by the Council) annually on Basinwide objectives, and annually/periodically on program actions and effectiveness to inform adaptive management.

*Staff Suggested Potential Modifications to Address Recommendations:*

- *Incorporate draft council guidance and ISAB guidance as appropriate*
- *Explicitly include the Council's indicators (developed and in-development) and their numerical targets (e.g., SAR, 5 million, hydrosystem performance standards, recovery targets) in the Program instead of referring to another document. These include the status and trend of focal species that some recommend is needed.*
- *For topics that can be addressed at a Provincial scale, e.g. ESU indicators, incorporate this level of indicators when available.*
- *Describe how the Council will continue the development of indicator graphics, with FW managers' engagement, for which data are available. Indicators with data should be developed whether the data is available from static sources (e.g. PDFs) or a web-accessible database.*
- *Explicitly state what process will be used (who will do what) and what frequency (annually) of updates is needed for reporting on the Program's objectives and indicators (e.g., HLIs, supporting dashboard).*
- *Describe how, when the Council reports on similar indicator topics as other entities in the Basin, the Council will work with these other entities to adjust these indicators so that they convey the same message.*

## Objectives

The desire to have useful biological objectives for the Program is not a new one. As one looks at past Programs various attempts have been made to identify and include objectives. These have sometimes been referred to as goals, objectives and performance standards, but regardless of the term used they were intended to provide a target towards which progress could be assessed. For instance, between the 1982 and the 2009 Program we have seen various objectives being included in the Program, including the doubling goal for salmon and steelhead; using the 2.5million to 5 million salmon and steelhead as an interim goal; population rebuilding targets; biological and operational objectives for the mainstem such as quantitative performance standards for flow and velocity; the 2-6% SAR; qualitative population performance environmental characteristics objectives; and, mainstem related performance standards.

The guidance that led to the adoption for the 2000 and 2009 Program objectives also included the intention to have these objectives be replicated at three levels of scale: Basinwide/Program level; Province/ESU level; and Mainstem/subbasin level. Currently objectives exist at the top and bottom levels but not at the Province/ESU level. Furthermore, the 2000 and the 2009 Program recognized the need to develop and assess the adequacy of existing objectives, coverage of topics, which scale is appropriate for qualitative versus quantitative, etc. In general the recommendations submitted for the 2014 Program amendment reiterate these needs; and the comments mirror the recommendations.

**Recommendations for Developing and Refining Objectives:** Many of the tribal and state fish and wildlife management agencies and tribes and NOAA-F are in favor of initiating a scientifically rigorous process to update and develop quantitative objectives. There is general support by these agencies to modify the biological objectives to provide explicit measurable objectives to support the more general Program goals in a manner consistent with the ISAB recommendation. Until a process is successfully concluded for updating the objectives, these agencies, have provided revisions to existing biological objective language. Some entities caution the Council about having goals that lack scientific credibility and that go beyond the scope of the NPA (e.g. SARs goals). Many suggested addition of objectives that address the reintroduction of extirpated populations in non-blocked areas; clarifying and updating objectives for blocked areas; expanding anadromous goals to the Subbasin and Province levels; adding specific and measurable objectives for resident fish and wildlife; and including recovery criteria as minimum milestones for ESA listed populations.

### *Staff Suggested Potential Modifications to Address Recommendations:*

- The Council could chose to start improving the Program objectives/numerical targets by building from what was provided in the recommendations. This information could be used to refine existing objectives (incorporate language edits). The Council could incorporate the numerical targets submitted (e.g. ESA targets, lamprey dam passage) as milestones that can be used to track indicators and inform progress towards overarching objectives. The Council may want to incorporate recommendations in the 2014 Program instead of deferring to a future process as done in past programs. All modifications included could be vetted as part of any future process or workshop the Council includes in the 2014 Program.

- Given the almost unanimous support for a scientifically rigorous process to update and develop objectives the Council should consider including in the 2014 Program language for this to occur. The process could consist of a Council led workshop with subgroups that focused on different objective topics, or the Council could request the ISAB lead this effort with input from the region.
- The Council could be more assertive in their guidance about the needs for the Program's assessment and reporting. This would aid in focusing efforts to improve future objectives and other numerical tracking used during objective workshop(s) or future program amendment. This could include which scale does the Council want to have qualitative or quantitative targets (e.g., program objectives, ESA/Province objectives, milestones or another scale); what topics should be covered perhaps using topics suggested in the recommendations; what topics are missing to represent the program equally; a need to treat topics equally at each scale so we avoid having quantitative objectives for a subset, etc.
- Given past guidance from the ISAB about considering having qualitative objectives at the basinwide scale and quantitative objectives at the lower scales (province, ESU, subbasin), the Council may want to strive for qualitative program objectives that are informed by quantitative milestones and quantitative objectives at the province/ESU and subbasin scale in the 2014 Program. This would entail moving the existing 5million and the SAR to a milestone, or reformatting to fit a province/ESU scale that can be used with the Council's indicators and for tracking progress towards the overarching qualitative objectives. Other quantitative targets provided in the recommendations could be treated similarly.

**Recommendation for Linking Objectives to Indicator Tracking Tools:**

Many of the agencies support linking objectives to the tools used to track and report them such as HLIs.

*Staff Suggested Potential Modifications to Address Recommendations:*

- The Council could provide explicit language about the linkages between the objectives and the tools we use for tracking progress, including the high level indicators. Perhaps specifying that these numerical targets are to be used as targets, whether ultimate goals or milestones, for the indicators we use to report on program progress. This may be best addressed as we wrestle with the recommendation to improve the organization of the program. This could include considering whether we want to better integrate some of the mainstem's objectives and performance standards with the rest of the Program including the indicators tracking these targets.
- The Council should also consider including in the 2014 Program, perhaps under the reporting section, what process is to be implemented to ensure that the Program progress is tracked on a regular basis against numerical targets (e.g., objectives, milestones).

## Maintenance of Program Investment

The majority of recommendations received by the Council regarding long-term O&M/contingency plans addressed the need to protect the extensive investments made to benefit fish and wildlife through the Fish and Wildlife Program (Program) over the past three decades. The recommendations focused on operation and maintenance funds associated with land acquisitions (wildlife and fish), fish screens and fishways, and hatcheries. Recommendations received expressed that the lack of adequate and dependable funding puts at risk the longevity and integrity of the existing Program funded infrastructure that requires ongoing maintenance to ensure that these are properly functioning. This in turn threatens their continued benefit to the fish and wildlife in the basin.

Maintaining these investments is critical to ensure benefits to fish and wildlife accrued under the Council and Bonneville legal obligations to achieve fish and wildlife protection, mitigation, and enhancement. Thus to ensure the continuation of these benefits over time, the fish and wildlife program must plan for the financial requirements associated with long-term operations and maintenance.

There are five types of Program funded projects that require a long-term financial maintenance plan to ensure their longevity and integrity. A small handful of these maintenance needs were addressed during past project review categories although a Programmatic approach would be a more permanent solution for all of them. Below we summarize these five project types and indicate if their long-term maintenance was addressed during a project review category:

1. Fish Screens – maintenance needs were partially addressed in the Geographic Category Review (five projects<sup>6</sup>), but there is a need for a long-term solution. In addition, there are other projects that have obligations to large fish screen (capital type) investments (e.g., Project #1009-019-00, *Evaluate Life History of Native Salmonids in Malheur River Subbasin*) that would benefit from a long-term financial maintenance plan.
2. Hatcheries – there remains the need to address the ongoing maintenance associated with artificial production facilities. This would seem to be an easily defined type of project, but it can be a little confusing, due to the variety of facilities used by the Program. That is, the Program has funded construction of permanent facilities (e.g., Chief Joseph Hatchery and Nez Perce Tribal Hatchery), temporary facilities, or modifying existing facilities (e.g., Mid Columbia Coho and Johnson Creek (McCall FH)). Thus, the Council may want to treat financial needs of ongoing maintenance for each of these types of facilities differently.
3. Fish ways and traps – this is a project type that is usually associated with hatchery type projects, but some are associated with mainstem dams or large non-program irrigation diversions (e.g., Project #2005-002-00, *Lower Granite Dam Adult Trap Operations*).

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<sup>6</sup> Project #1983-436-00, Umatilla Passage Operations and Maintenance  
Project #1992-009-00, Yakima Phase II Fish Screens Operations and Maintenance with  
Washington Department of Fish and Wildlife  
Project #1993-066-00, Oregon Fish Screens Project  
Project #1994-015-00, Idaho Fish Screening Improvement  
Project #2007-399-00, Upper Salmon Screen Tributary Passage

These facilities are important to many aspects of the Program associated with passage, brood collection, monitoring and passage<sup>7</sup>.

4. **Land** - land acquisitions also require ongoing maintenance to maintain their benefits to fish and wildlife. Maintenance needs for this type of project include things like weed control, fence maintenance, prescribed burns and public access issues. This need was initially identified during the Wildlife Category Review.
5. **Habitat** - This type of project needs the most definition because only a subset of habitat actions would warrant on-going maintenance. For instances, a log weir would probably not warrant long term support, whereas large (capital type) culverts would.

**Alternatives** – the following alternatives were outlined to generate discussion. Based on the input received further work on project type, definitions, criteria, content of plans and etc. would need to be developed. In addition, these alternatives are not mutually-exclusive; the Council could choose to implement more than one approach for a particular set of circumstances or project types.

1. **Manage through BOG.** Revise the BOG process so that maintenance issues may be planned, prioritized and managed and funded through expanded duties of the BOG process. This approach would require establishment of a placeholder to provide funds annually so that a long-term management plan could be established and implemented.
2. **Stewardship Group.** Establish a group similar to BOG, but with the authority to disperse funds from an annual BPA budget placeholder to support and maintain the integrity of the project types listed above. The approach would also require the development and implementation of Council would need to develop and implementation of a long-term management.
3. **Project Specific Support** - Identify all projects and /or project elements that need long-term support. Provide a carry forward budget capability and an amount that is to be used solely for that project element as part of contracting. The management of these funds would be the responsibility of the sponsor and Bonneville's COTR.
4. **Start-Of-Year (SOY) Support** - A process that incorporates long-term maintenance needs in the SOY budget process and accounts for it on an annual basis. For this approach to work - continuity and certainty is required. This would also require the development of a management plan for out year needs associated with the project types and elements outlined above. Based on a-yet-to-be-defined process the needs for this action would be amended into contracting for the particular project and or action with a degree of certainty.
5. **Province Based** - Establish a small percentage of the existing investment in each Province or Project Type (e.g. 1 to 5% annually) to be managed locally or regionally (i.e. watershed councils, region, tribe, state – depending on the infrastructure) for long-term

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<sup>7</sup> This project type could also be linked to reimbursable activities associated with the Columbia River Fish Mitigation (CRFM) program implementing juvenile and adult fish passage improvements at mainstem Snake and Columbia River hydropower projects, as well as similar fish passage improvements more recently at its Willamette Basin projects.

maintenance needs. Establish or encourage local infrastructure that is in place to develop a mechanism for overseeing the allocation of maintenance funds.

### **Options and thoughts**

- All operation and maintenance transition towards a basin-wide settlement. The Program conducts compliance monitoring and support on the ground actions in remainder of project actions and projects.
- The Program could support an effort to explore innovative approaches, such as endowing stewardship funds to ensure long-term funding for operations and maintenance (BPA, wildlife recommendation).



## The Willamette Subbasin

### Program Sections:

The Willamette has its own subbasin plan adopted by the Council in 2004. The 2009 Fish and Wildlife Program acknowledged the Willamette Biological Opinion chiefly in Section D. Mainstem Strategies Subsection 2 Strategies in Specific Areas and in particular for those areas pertaining to Juvenile Fish Passage and Adult Fish Passage.

### Issue summary and recommendation synthesis:

1. **Does the Council wish to incorporate various plans and agreements for the Willamette, including tables of measures, into the Council Program? If so, how and where should these recommendations be located?**
  - a. Bonneville recommended the Program include the Willamette River Basin Memorandum of Agreement Regarding Wildlife Protection and Enhancement
  - b. Bonneville and the Confederated Tribes of Grand Ronde (Recommendation 47) recommended adopting The NOAA Fisheries and US Fish and Wildlife Service BiOps on the Willamette into the Program.
  - c. The Confederated Tribes of Grand Ronde (Recommendation 47), Oregon Department of Fish and Wildlife (9.2) and NOAA Fisheries (Subbasin Measure 3) recommended incorporating the Upper Willamette Recovery Plan into the Program, through either updates to the Willamette Subbasin Plan or through the inclusion of specific measures articulated in the Recovery Plan. ODFW and Confederated Tribes of Grand Ronde also recommended adopting the ESA delisting goals and the broader goals of the Upper Willamette Recovery Plan. (ODFW 9.2, Confederated Tribes of Grand Ronde Recommendation 47).
  - d. Both the Confederated Tribes of Grand Ronde and ODFW called for the inclusion of a detailed table of measures derived from the Upper Willamette Recovery Plan be included as an update to the Willamette Subbasin Plan. (Confederated Tribes of Grand Ronde Recommendation 49 tables C-H; ODFW 9.2.2-9.2.6)
  - e. The Confederated Tribes of Grand Ronde also recommended including Tribal specific measures within the Implementation Provisions of the current Program for 2008-2018.
  
2. **Should the Council change the language on Page 44 of the current program to incorporate the recommendations of ODFW and the Confederated Tribes of Grand Ronde regarding funding priorities?**
  - a. Both Confederated Tribes of Grand Ronde and ODFW recommended revising the language under the Strategies in Specific Areas on page 44 of the current Program that they believed placed a lower priority on the funding of capital improvements necessary to implement the Willamette Biological Opinion. (ODFW 9.2; Confederated Tribes of Grand Ronde Recommendation 32):

*Current language revised: 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 Council encourages urges the Corps Action Agencies to seek alternative fully funding for their Willamette Biological Opinion implementation and mitigation obligations.~~

3. **Does the Council wish to include language to fund long-term O&M of passage facilities, collection facilities, hatcheries and other structures in the Willamette?**
  - a. Recommendations from ODFW and the Confederated Tribes of Grand Ronde stressed including long-term O&M, and short-term O&M for ODFW, for facilities in the Willamette that address fish collection and transport. (ODFW 9.2; Confederated Tribes of Grand Ronde Recommendation 33)