# Draft Columbia River Basin Monitoring, Evaluation, Research and Reporting (MERR) Plan

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# Executive Summary

This Monitoring, Evaluation, Research and Reporting (MERR) Plan ensures the Council's Columbia River Basin Fish and Wildlife Program (Program) goals, objectives, and actions are monitored, evaluated, and reported in a manner that allows assessment and reporting of Program progress; it is intended to evolve with the Program. To facilitate Program assessment and reporting, the MERR Plan consists of a Strategic Plan, Implementation Framework, as well as implementation strategies for anadromous fish, resident fish, and wildlife.

The **Strategic Plan** focuses on the Council's research, monitoring, evaluation (RME) and reporting needs at the policy level. The Strategic Plan sets forth the purpose and expectations for RME and reporting implemented through the Program.

The **Implementation Framework** contains existing, modified and new processes for prioritizing and implementing RME and reporting at the programmatic level. The Implementation Framework describes how the various components of RME can be used to adaptively manage the Program and guides the development of standardized Implementation Strategies for anadromous fish, resident fish, and wildlife.

The three **Implementation Strategies**, Anadromous Fish Implementation Strategy, Resident Fish Implementation Strategy, and Wildlife Implementation Strategy, are attached as separate appendices providing additional guidance in prioritizing and implementing RME and reporting. The Implementation Strategies will be developed with regional partners, and will consider integration of regional products.

Upon approval by the Council, the MERR Plan will provide expectations for, and guidance on, how RME and reporting are conducted through the Program. This guidance will assist the Council and other partners in the Basin with:

- Increasing the efficiency and effectiveness of RME efforts by facilitating communication and coordination among project proponents and funding agencies within the Basin;
- Adaptively managing the Program;
- Reporting on Program progress for accountability purposes;
- Providing sufficient information to guide Council decisions;
- Enhancing timeliness, quality and quantity of information for a given level of effort by encouraging collaboration and more efficient coordination among entities in the Basin;
- Prioritizing implementation of the Program's RME and reporting;
- Identifying priority data gaps;
- Ensuring that all projects have the appropriate level of monitoring;
- Ensuring implemented projects comply with contractual agreements and meet implementation criteria;
- Supporting tracking of status and trends of priority species and habitat characteristics as well as factors affecting them;
- Supporting evaluation and reporting on project effectiveness and the effectiveness of actions in protecting, mitigating, and enhancing the Basin's fish and wildlife resources;

- Facilitating sharing and reporting of RME information with the public in an easily accessible and understandable manner; and,
- Ensuring that RME are integrated with relevant plans and guidance documents such as biological opinions and recovery plans.
- Providing further context for the Independent Scientific Review Panel's review of projects and of the Program.

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# 1) Monitoring, Evaluation, Research and Reporting Plan's Context, Development Approach, Implementation, and Relationship with Related Efforts

## 1.1) Context for the Monitoring, Evaluation, Research and Reporting Plan

In 1980, the Pacific Northwest Electric Power Planning and Conservation Act (Act) charged the Northwest Power and Conservation Council (Council) with developing a program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, affected by the development, operation, and management of hydroelectric projects on the Columbia River and its tributaries (Basin).

Today, the Council's *Columbia River Basin Fish and Wildlife Program* (Program) is one of the largest regional efforts to recover, rebuild, and mitigate effects of hydropower dams on fish and wildlife. As a planning, policy-making and reviewing body, the Council is responsible for developing and monitoring the Program. The Council's policy and management decisions are limited to the Program. The Council's decisions do not extend to decisions related to management of fish and wildlife populations and associated habitats which reside under the authority of the fish and wildlife managers. Bonneville Power Administration's (Bonneville) hydropower ratepayers fund the implementation of the Program; federal, state, and tribal fish and wildlife managers and others implement Program[1] actions.

The Council has a responsibility to the region to ensure that this ratepayer-funded Program is implemented in a cost-effective and efficient manner. The Council also has a responsibility to ensure the Program is implemented in a manner that achieves the desired protection, mitigation, and enhancement of the Basin's fish, wildlife, and habitat characteristics. Hence, the Program recommends implementation of research, monitoring, and evaluation (RME) that can enhance the Program's effectiveness and assess the Council's progress toward meeting its responsibilities.

The Council has developed this Monitoring, Evaluation, Research and Reporting (MERR) Plan to partially meet its responsibility under the Act as well as to address the 2009 Program's call to (1) conduct scientific review of new and ongoing actions; (2) establish reporting guidelines to increase project performance and accountability; (3) develop quantitative objectives for the Program; (4) engage in a periodic and systematic exchange of science and policy information; and (5) adaptively manage the Program to solve uncertainties and guide decision making.

While past Programs have included some guidance for RME and reporting, these have not been sufficient to guide limited resources to the Council's highest priorities. The MERR Plan seeks to address this need by:

1The Program is funded by Bonneville Power Administration's hydropower ratepayers. In addition to Bonneville the Program calls upon other federal agencies, such as the US Army Corps of Engineers and the US Bureau of Reclamation.

- Providing information for Council decisions;
- Assessing the Council's progress toward meeting Program objectives;
- Aiding in prioritizing RME projects;
- Ensuring that monitoring effort is conducted at the appropriate scale and effort; and,
- Assisting the Council in deciding which actions to implement in order to provide the greatest benefit to species and habitat.

As stated in the 2009 Fish and Wildlife Program, the Council's Fish and Wildlife Program, and hence its supporting MERR Plan, is not intended to address all fish and wildlife problems in the Basin from all sources while meeting its requirements under the Northwest Power Act. Throughout the Basin, NOAA's National Marine Fisheries Service (NOAA Fisheries) and the U.S. Fish and Wildlife Service are administering the Endangered Species Act, which requires information gathering, planning, and mitigation actions. Recovery plans approved by NOAA Fisheries or the U.S. Fish and Wildlife Service are currently being implemented for several listed species in the Columbia River Basin. In addition, the Environmental Protection Agency, in cooperation with the other federal agencies, states and tribes, is taking actions to achieve compliance with the Clean Water Act. The four Northwest states and all of the Columbia Basin's Indian tribes also have fish and wildlife initiatives under way. The Program is not intended to pre-empt the legal authorities of any of these parties. Rather, the Program and its MERR Plan provide an opportunity for each of these regional participants to coordinate information-gathering, planning, and implementation of recovery actions on a voluntary basis.

## 1.2) Development of the Monitoring, Evaluation, Research and Reporting Plan

The MERR Plan was developed over a one-year period by Council staff. The impetus for the MERR Plan came from the primary strategies for research, monitoring, evaluation and reporting adopted in the 2009 Program, which are:

- Identify priority fish, wildlife, and ecosystem elements of the Program that can be monitored in a cost-effective manner, evaluate the monitoring data and adaptively manage the Program based on results;
- Research and report on key uncertainties;
- Make information from this Program accessible to the public; and
- To the extent practicable, ensure consistency with other processes.

In addition to these strategies, the MERR Plan responds to policy direction provided throughout the 2009 Program. Furthermore, draft and final products produced by the Council's staff, the Independent Scientific Advisory Board, Independent Scientific Review Panel, and documents related to this endeavor from within and outside of the Basin were consulted in developing the draft MERR Plan (see Bibliography).

The MERR Plan is intended to evolve with the Program. The initial draft MERR Plan was released for public comments on March 15, 2010. The policy direction obtained from the 2009 Program will remain in the revised version of the MERR Plan in addition to the direction provided by the Fish and Wildlife committee. Some of the initial public comments have been

addressed in this July 2010 draft; other changes will be made over time. The Revision Approach and Status document that accompanies this July 2010 version of the draft MERR Plan describes in detail the process and time line by which comments and improvements will be incorporated. To ensure the MERR Plan reflects changes in the Program and its subbasin plans, there are numerous feedback connections within and between the MERR Plan, Columbia River Basin Research Plan (Research Plan), the Program and its subbasin plans, projects, and actions (Figure 1). These feedback loops allow the Council to adaptively manage both the program and the MERR Plan as information gathered and evaluated from implemented actions facilitates identifying aspects that could be improved or that would benefit from more RME efforts.

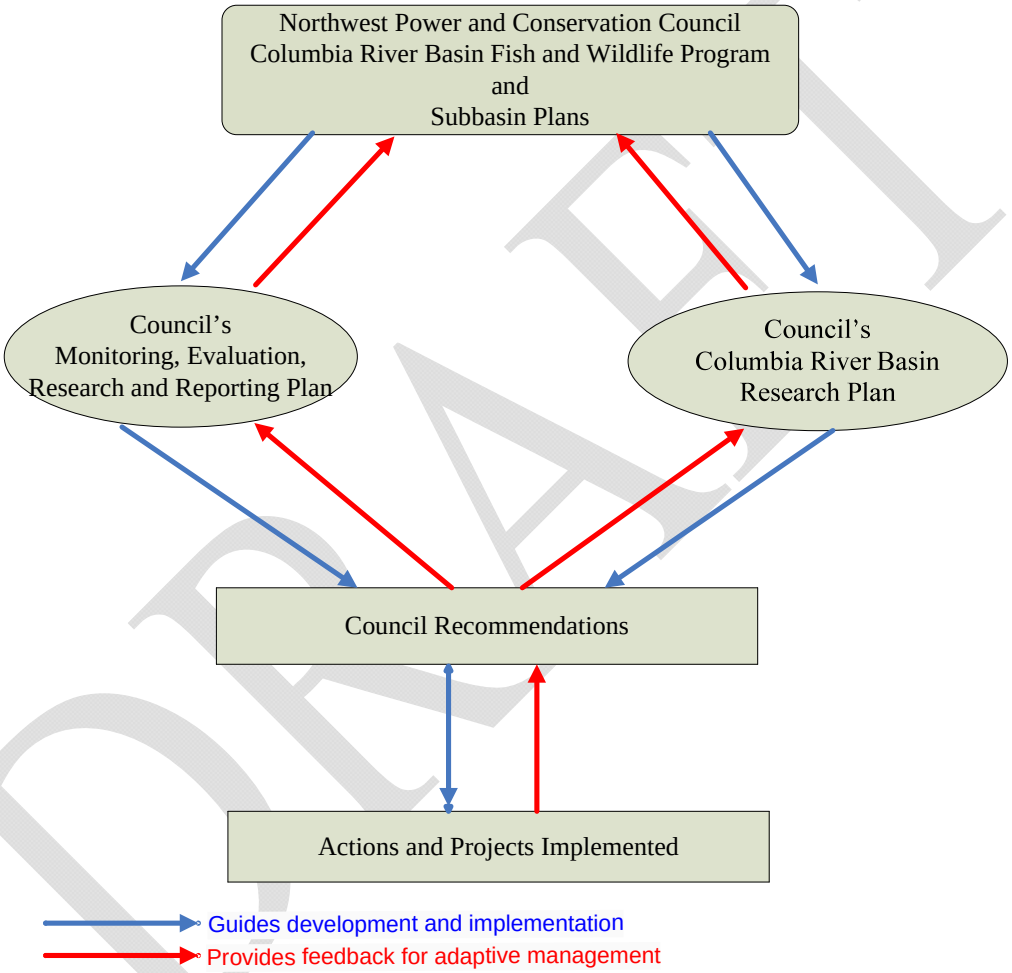


**Figure 1:** Relationship between the Columbia River Basin Fish and Wildlife Program and subbasin plans, the Council's Monitoring, Evaluation, Research and Reporting Plan, Council's Columbia River Basin Research Plan and Action and Project Implementation.

As Figure 1 illustrates, the connections among Program and its subbasin plan, the MERR Plan, the Research Plan, and Council recommendations for implementation of actions and projects are reciprocal. The Program guides the development of the MERR Plan and Council recommendations of actions and projects to implement, as well as the identification of critical research uncertainties in the Program. The MERR Plan in turn provides guidance on

prioritizing and conducting RME and reporting. The Research Plan guides research conducted through the Program and it is influenced by the MERR Plan with respect to prioritization of research uncertainties. Adaptive management of the Program, and of the implemented actions and projects, occurs through several paths including:

- Identifying aspects in the MERR Plan, Research Plan, and Program to be improved based on the evaluation and reporting of collected data from actions and projects;
- Feedback on changes to improve RME and reporting of Program actions and projects under the MERR Plan which in turn may result in changes in the Program; and
- On-going efforts to prioritize research uncertainties and project actions as new information becomes available.

As a living document, the MERR Plan will be updated on a regular basis as needed. The main two components of the MERR Plan, Strategic Plan and Implementation Framework, will be updated along with the Program on a 5-year time period. The Implementation Strategies, appended to the MERR Plan, will be available for updates on an annual basis to facilitate applying what is learned to improve Program implementation. Request for updates can originate from the Council or from the Basin's fish and wildlife managers and other stakeholders. The Council's Fish and Wildlife Division will be responsible for incorporating updates as provided by the region. Following substantial changes to components, the Council may request that the ISAB/ISRP review to ensure that the revisions do not negatively affect the MERR Plan's scientific integrity and alignment with the Program.

### 1.3) Implementation of the Monitoring, Evaluation, Research and Reporting Plan - Approach, Roles, and Responsibilities

The MERR Plan is an extension of the Program. The MERR Plan provides more detailed guidance and information as to how monitoring, evaluation, research and reporting should be conducted through the Program. The MERR Plan provides guidance on the general approaches supported by the Council for implementing and prioritizing monitoring, evaluation, research, and reporting through the Program. Through the MERR Plan's Anadromous Fish, Resident Fish, and Wildlife Implementation Strategies, the MERR Plan describes how state, tribal, and federal agencies implementing the Program are conducting their monitoring, evaluation, research, and reporting in a manner that aligns with the Program and guidance in the MERR Plan.

To accurately depict the RME and reporting implementation approach used in the Basin in the MERR Plan's implementation strategies, the Council relies on state, tribal, and federal agencies that are receiving Program funding to summarize their implementation approach in the MERR Plan's Implementation Strategies. This summary of the basinwide implementation approaches fills a gap in the documentation of how the Program is implemented. Specifically, they contribute to filling a crucial component lacking from the majority of subbasin plans, which consists of how the Basin's managers' monitor and evaluate progress in addressing these factors and the response by fish and wildlife species. Further, there lacks a basinwide, comprehensive summary of how critical research uncertainties are identified and prioritized through the Program. By providing a monitoring, evaluation, and research summary, this serves to transparently convey in a comprehensive manner how Program funding is applied to ensure that the Program is implemented in a coordinated and effective manner. These implementation

strategies will also serve to provide a basinwide context for ISRP review of projects and aid in the ISRP evaluation of the Program's implementation.

The approach utilized to develop the implementation strategies will vary depending on what works best for a given topic and species. For example, the Anadromous Fish Implementation Strategy component related to tributary viable salmonid population parameters, habitat effectiveness, and hatchery effectiveness for anadromous salmon and steelhead was developed through a series of subregional and regional workshops and is scheduled to undergo ISRP review. This later component is also referred to as the Anadromous Salmonid Monitoring Strategy. Components of the other implementation strategies are being initiated by the members of the Columbia Basin Fish and Wildlife Authority (CBFWA) through their advisory committees, with participation from non-members. This latter process will eventually evolve into a Council-CBFWA process to insure all pertinent fish and wildlife managers and stakeholders are involved in producing the draft components. Following the completion of a draft implementation strategy, or of substantial components, there will be a Council-lead public comment period and ISAB/ISRP review of the product.

As emphasized in the Program, the MERR Plan and its implementation strategies should embrace adaptive management to incorporate uncertainties and maximize learning about these uncertainties. The MERR Plan recognizes that adaptive management can be applied either in an active or passive manner, depending on which is most appropriate for the work conducted and feasible to implement. Active adaptive management refers to an experimental approach whereby, when faced with uncertainty, more than one alternative is implemented as concurrent experiments to see which will best meet objectives. The important aspect of active adaptive management is that there are alternatives that can be confidently compared. Passive adaptive management is an approach that when faced with uncertainty, the alternative that is believed to be the best is implemented, and then monitored to see if it was the best, with adjustments being made if the desired objectives are not in fact met.

The roles and responsibilities of the Council and its regional partners in relation to the MERR Plan are the same as those described in the Program. Specifically, as a planning, policy-making and reviewing body, the Council develops the MERR Plan and then monitors its implementation by the Bonneville Power Administration (Bonneville), the U.S. Army Corps of Engineers (the Corps), the Bureau of Reclamation (the Bureau) and the Federal Energy Regulatory Commission (FERC) and its licensees. The Council recognizes that the Indian tribes in the Columbia River Basin have vital interests directly affected by activities covered in the MERR Plan. These Indian tribes are sovereigns with governmental rights over their lands and people, and with rights over natural resources that are reserved by or protected in treaties, executive orders, and federal statutes. The United States has a trust obligation toward Indian tribes to preserve and protect these rights and authorities. Nothing in the MERR Plan is intended to affect or modify any trust or treaty right of an Indian tribe. The regional partners of the Council include state, tribal and federal agencies with management authority in the Basin as well as interested stakeholders which include regional forums and the public utility sector.

The ISAB and ISRP are called upon for several aspects of the MERR Plan. Their involvement aligns with the description of their role in the Program. The expertise of the ISAB and ISRP is

used in the MERR to assist in providing scientific advice on topics and questions, providing scientific advice on priorities for RME and reporting, the scientific soundness of proposed and funded projects, and evaluating the scientific merit of the Program as well as reviewing Program accomplishments.

### 1.4) Monitoring, Evaluation, Research and Reporting Plan's Relationship with the Program and other Related Monitoring, Evaluation, Research and Reporting Efforts

The approaches and guidance provided through the MERR Plan aim to align and complement existing efforts in the Basin. Thus, the direction provided by the Northwest Power Act for the Program also applies to the guidance and approaches described in the MERR Plan. Specifically, that the MERR Plan strives to "complement the existing and future activities of the Federal and the region's State fish and wildlife agencies and appropriate Indian tribes" and will "be consistent with the legal rights of appropriate Indian tribes in the region." Further, the MERR Plan aims to build onto current existing process and structures to minimize the burden of implementing the MERR Plan and developing implementation strategies.

To proactively ensure that the MERR Plan aligns as feasible with existing and future RME and reporting activities of state, tribal and federal agencies the development of the MERR Plan involved:

- Incorporation of concepts from Council and regional products related to RME and reporting.
- An initial public comment period to receive input from state, tribal, and federal fish and wildlife managers and stakeholders on the draft MERR Plan.
- An initial scientific review from the ISAB and ISRP on the draft MERR Plan.
- A transparent revision process consisting of: (1) Fish and Wildlife Committee discussion of the process to revise the MERR Plan which is posted on the Council website; (2) discussions during Fish and Wildlife Committee meetings concerning decisions on policy comments, and (3) revised versions of the MERR Plan posted on the Council website.
- Public workshops will be held to further develop the prioritization scheme for the MERR Plan.
- Involvement of state, tribal, and federal fish and wildlife managers and stakeholders in the development of the Anadromous Fish, Resident Fish, and Wildlife Implementation Strategies.
- Subsequent public comment periods and scientific review from the ISAB and ISRP will be held when substantial components are revised or completed, as well as when the draft MERR Plan is fully developed.
- Public comment period, as part of the Program amendment process, will be held for any component of the MERR Plan that may be considered for incorporation within the Program;
- Encouraging alignment and coordination among existing RME and reporting processes/activities by emphasizing the need to coordinate among entities conducting this work within the MERR Plan.

The draft MERR Plan, as stated above, is a direct response to the 2009 Program. The MERR Plan aligns with the Program and its supporting documents, such as the subbasin plans. The guidance and prioritization scheme developed for the MERR Plan applies only to RME and reporting. The MERR Plan does not directly influence the actions implemented to mitigate for effects of the hydrosystem on the Basin's fish and wildlife. The prioritization of mitigation actions identified in the Program and the subbasin plans is not supplanted by the prioritization scheme applied to RME and reporting in the MERR Plan. As actions implemented to mitigate hydrosystem effects are monitored and evaluated for their effectiveness in achieving desired outcomes, the information learned may, however, serve to modify or replace an action as needed to enhance the Program's progress in mitigating for hydrosystem effects.

# 2) Strategic Plan for Monitoring, Evaluation, Research and Reporting

The Strategic Plan for Monitoring, Evaluation, Research and Reporting (Strategic Plan), reflects the overall goal and expectations of the Fish and Wildlife Program and summarizes existing and new policy guidance to assist in the allocation of resources for conducting Program RME and reporting.

## 2.1) Council's Goal for the MERR Plan

To design and operate RME, and to report the results under the Program in an efficient, integrated, cost-effective manner by focusing on biological and ecosystem priorities, by addressing key Fish and Wildlife Program management questions, by identifying priority data gaps, and by eliminating any redundant RME efforts that may exist.

## 2.2) Purpose of the MERR Plan

The MERR Plan is intended to aid the Council achieve its congressionally declared purpose as stated under the Northwest Power Act

> " to protect, mitigate and enhance the fish and wildlife, including related spawning grounds and habitat, of the Columbia River and its tributaries, particularly anadromous fish which are of significant importance to the social and economic well-being of the Pacific Northwest and the Nation and which are dependent on suitable environmental conditions substantially obtainable from the management and operation of Federal Columbia River Power System and other power generating facilities on the Columbia River and its tributaries."

The MERR Plan aids the Council by providing the approaches and tools needed for the Council and the ISRP to evaluate progress in achieving the Program's purpose, which serves to inform needed modification of the Program and its implementation to ensure progress is being made. To facilitate evaluation of Program implementation and progress, the MERR Plan provides guidance to the agencies implementing the Program, and project proponents funded to conduct the implementation work, on how RME and reporting and data sharing should be conducted through the Program. This guidance aids in assuring that the appropriate information is collected in an

efficient manner and that the data collected are compatible and available for Program assessment as needed.

The Council expects that the MERR Plan will:

- Increase the efficiency and effectiveness of RME efforts by facilitating communication; and coordination among project proponents and funding agencies within the Basin;
- Facilitate adaptively managing the Program;
- Facilitate reporting on Program progress for accountability purposes;
- Provide sufficient information to guide Council decisions;
- Enhance timeliness, quality and quantity of information for a given level of effort by encouraging collaboration and more efficient coordination among entities in the Basin;
- Prioritize implementation of the Program's RME and reporting;
- Identify priority data gaps;
- Ensure that all projects have the appropriate level of monitoring;
- Ensure implemented projects comply with contractual agreements and meet implementation criteria;
- Support tracking of status and trends of priority species and habitat characteristics as well as factors affecting them;
- Support evaluation and reporting on project effectiveness and the effectiveness of actions in protecting, mitigating, and enhancing the Basin's fish and wildlife resources;
- Facilitate sharing and reporting of RME information with the public in an easily accessible and understandable manner;
- Ensure that RME are integrated with relevant plans and guidance documents such as biological opinions and recovery plans; and,
- Provide further context for the Independent Scientific Review Panel's review of projects and of the Program.

Meeting some of these expectations requires that the Council has a clear understanding of RME and reporting expectations of other policy-decision makers in the Basin such as NOAA-Fisheries. For this reason, having the other policy-decision makers in the Basin identify their RME priorities and desired level of certainty is important. By explicitly stating expectations, this will aid integration of the Council's RME with other plans and guidance documents and facilitate collaboration and coordination among entities.

## 2.3) Policy Guidance

Existing fish, wildlife, and habitat RME efforts in the Basin are highly complex and expansive in scope and detail. Given limited resources and competing needs of fish, wildlife, and habitats the Council has developed policy guidance for the MERR Plan based on existing and new policies. New policies are indicated with an asterisk with the Program page from which the new policy was based upon, if pertinent. Existing policies are referenced with the relevant 2009 Program page number. The following new (identified with an asterisk '*') and existing policies will ensure that appropriate RME and reporting are being conducted:

1. Apply information gathered from the Implementation Framework and its Implementation Strategies to adaptively manage the Program, Research Plan, and MERR Plan* (2009 Program page 24);
2. Evaluate RME and reporting approaches detailed in the MERR Plan on a regular basis, such as every 5 years, to assess whether the best approaches for informing Council decisions are being utilized*;
3. Vigilantly review on-going and proposed RME and projects to identify opportunities to increase efficiencies and reduce duplication (2009 Program page 24, 26, 61);
4. Consider the amount of certainty or confidence needed to inform Council policy decisions. Where appropriate, base Council decisions on a preponderance of evidence standard[2] versus the 95-percent confidence level (Program page 24). The application of preponderance of evidence is limited to guiding policy decisions as related to the Program and is not intended to guide scientific assessment;
5. Utilize a risk-uncertainty analysis approach to guide Council decisions on whether resolving a research uncertainty is a high or low priority to be addressed through the Program* (2009 Program page 54);
6. Adopt measurable and quantitative biological objectives and performance standards for the Program where feasible (2009 Program page 11);
7. Ensure that the Program's biological objectives and performance standards are being assessed by the Program's RME and projects (Program page 24);
8. Preferentially collect or identify data at population and reach spatial scales that contributes to basinwide evaluation and reporting of the Implementation Framework's priorities* (2009 Program page 24);
9. Require that actions implemented under the Program have a monitoring component that is appropriate in terms of scale and effort level (2009 Program page 24 and 25);
10. As required by the ISRP, all research and monitoring conducted must apply scientifically sound study design and analyses, be based on sound scientific principles, have measurable, quantitative biological objectives, and collect or identify data appropriate for measuring progress toward their biological objectives. Furthermore, projects should use protocols that are consistent with guidelines approved by or that are adopted by the Council,[3] as feasible (2009 Program page 7, 9, 25, 26 and 61).
11. All RME projects are required to have effective and efficient monitoring and evaluation tasks appropriate for the projects' objectives; identify who will do the monitoring and reporting and on what schedule; incorporate independent scientific review, provide a budget for the

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2 Preponderance of evidence standard does not require a 95 percent level of certainty. The standard is met if the proposition is more likely to be true than not true. Effectively, the standard is satisfied if there is greater than 50 percent chance that the proposition is true. The actual percentage may be higher if the risk of being wrong is great, e.g., may result in extirpation of a species.

3 As of the date of adoption of the 2009 Program amendment, the Council had adopted the following methods and protocols: Northwest Environmental Data Network's Best Practices for Reporting Location and Time Related Data; Pacific Northwest Aquatic Monitoring Partnership's (PNAMP) Methods for Collection and Analysis of Benthic Macroinvertebrate Assemblages in Wadeable Streams of the Pacific Northwest; and PNAMP's Salmonid Field Protocol Handbook.

monitoring and evaluation work, be measurable, and yield statistically reliable results that are biologically relevant within a reasonable timeframe* (2009 Program page 19, 21, 23, 25 and 65);

12. To the extent practicable, ensure that status and trend monitoring and action effectiveness monitoring are designed to assess at the appropriate scale, such as suites of projects, population scale, and subbasin-scale (2009 Program page 25);
13. All Program funded RME data need to be readily accessible and in an agreed-upon electronic format. RME data will consist of either the raw data, derived data, or summarized performance measure as agreed upon by the project proponent, the funding agency, and Council. RME data, its metadata and relevant reports should be available annually, as well as within six months of completing a significant phase of any research project or within six months of project completion (2009 Program page 25 and 26).

The Council will be responsible for ensuring that the 13 policy guidance items are implemented by Council and project proponents, as appropriate. The ISRP's review of project and of the Program will also serve to assess whether the 13 policy guidance items are being implemented. If the ISRP's review of a project determines that some of the 13 policy guidance items are not being applied, then the Council may recommend that project proponents addresses this omission.

The above 13 policy guidance items are discussed in more detail throughout the Implementation Framework.

# 3) Implementation Framework for Research, Monitoring, Evaluation, and Reporting

## 3.1) Purpose

The Implementation Framework for Research, Monitoring, Evaluation, and Reporting (Implementation Framework) is a basinwide approach to RME and reporting that is guided by the Strategic Plan and that is realized through Implementation Strategies. The Implementation Framework follows the Strategic Plan in focusing and providing effective and efficient approaches for Program RME and reporting. The Implementation Framework explains linkages among the RME and reporting components, provides details on how the Council will prioritize RME, and describes approaches for conducting RME and reporting through the Program. The Implementation Framework also describes how information will be made available and reported to facilitate adaptive management of the Program, Research Plan, and MERR Plan. To ensure compatibility of RME conducted for fish and wildlife, the Implementation Framework provides guidelines for developing standardized basinwide Implementation Strategies. These Implementation Strategies align with the Council's expectations for RME and reporting of anadromous fish, resident fish, and wildlife. The RME data collected through the Program then feeds back through the Implementation Strategies to provide the information needed to assess and improve Program progress towards meeting biological objectives. The RME data gathered can influence the evolution of all components of the MERR Plan. In the sections that follow, the guidance and processes used to focus and conduct RME and reporting are explained.

## 3.2) Focusing Program Research, Monitoring, Evaluation and Reporting

### 3.2.1) Council's Management Questions

RME conducted through the Program should assist the Council in answering one or more of the Council's working list of nine basinwide draft management questions.[4] The Council utilizes the term *management* in the sense of seeking to handle, direct, administer, conduct, and guide the Council's actions and not in the sense of managing fish and wildlife populations as this latter responsibility resides with the Basin's fish and wildlife managers. With this definition in mind, the Council's management questions are intended to assess how the Council's Fish and Wildlife Program is making progress towards achieving its congressionally declared purpose:

> *to protect, mitigate and enhance the fish and wildlife, including related spawning grounds and habitat, of the Columbia River and its tributaries, particularly anadromous fish which are of significant importance to the social and economic well-being of the Pacific Northwest and the Nation and which are dependent on suitable environmental conditions substantially obtainable from the management and operation of Federal Columbia River Power System and other power generating facilities on the Columbia River and its tributaries. [Northwest Power Act, §2(6), 94 Stat. 2698.] (94 Stat. 2698, 16 USC §839)*

All RME conducted through the Fish and Wildlife Program must contribute data toward answering one or more of these Council's management questions.

**Placeholder for Management Questions – Bucket 2**

The topics and format for the Council's management question will be discussed along with the issues placed in Bucket Two. The Bucket Two phase will include further discussion with the region's managers and stakeholder through focused meetings or online forums and will take place during the interim period between the RME categorical review and Program amendment.

### 3.2.2) Biological Objectives

The Program contains numerous quantitative and qualitative biological objectives requiring research to resolve uncertainties and monitoring to assess action implementation, action effectiveness and the status and trends of Basin fish, wildlife, and habitat characteristics. Achieving the Program's biological objectives is a shared responsibility among the Basin's federal, tribal, and state fish and wildlife managers. As the Program's biological objectives are developed further, they should aid in prioritizing RME and reporting conducted through the Program, because these efforts should provide data needed to assess progress toward the biological objectives.

4 The Council approved the nine draft management questions as a working list in October 2009. The list of questions are listed in Appendix 3 with their associated indicators as well as available online at http://www.nwcouncil.org/fw/program/hli/Default.htm (January 2010).

**Placeholder for Biological Objectives – Bucket 3**

As outlined in the 3-phase approach for revising the draft MERR that was approved by the Council's Fish and Wildlife Committee during its June 2010 meeting, the development and prioritization of the Program's biological objectives has been assigned to the Bucket Three (long-term) and will to be addressed prior to the onset of the next Program amendment process. The Bucket Three phase will include further discussion with the region's managers and stakeholder through focused meetings or online forums.

This section will include a description of the process and criteria used to develop biological objectives. The actual list of biological Objectives will be inserted in the appropriate appendix.

### 3.2.3) Performance Standards

**Placeholder for Performance Standards – Bucket 3**

Currently, the 2009 Program contains some quantified basinwide biological objectives for anadromous salmon and steelhead that can be used as performance standards. As the Council assesses the need for, and further develops, quantitative objectives for the Program, this process will also result in changing or further developing performance standards for assessing Program progress.

Performance standards will be assessed in conjunction with the process for developing and prioritizing the Program's biological objectives. As described in the previous section, this process will occur prior to the onset of the next Program amendment process at which time Bucket Three (long-term) items, including biological objectives, will be addressed.

### 3.2.4) Prioritization Criteria

**Placeholder for Prioritization Criteria – Bucket 3**

There are limited resources available for implementing RME. This limitation necessitates the Council prioritize RME and reduce duplication of effort in the Basin.

The Council, as outlined in the 3-phase approach for revising the draft MERR that was approved by the Council's Fish and Wildlife Committee during its June 2010 meeting, assigned this topic to be addressed as part of Bucket Three (long-term) prior to the next Program amendment. The Bucket Three phase will include further discussion with the region's managers and stakeholder through focused meetings or online forums.

### 3.2.5) Decision Making Process

**Placeholder for Decision Making Process – Bucket 3**

Once the prioritization scheme for the MERR Plan is addressed during the Bucket Three phase,

then the decision making process used by the Council will be depicted in this section.

The Bucket Three phase will to be addressed prior to the onset of the next Program amendment process and will include further discussion with the region's managers and stakeholder through focused meetings or online forums.

## 3.3) Approaches for Program Research, Monitoring, Evaluation and Reporting

There are three main approaches that apply to all research, monitoring and evaluation activities and projects implemented through the Program. These consist of applying adaptive management, using preponderance of evidence to guide Council decision as applicable, and basing Council prioritization on a combined technical and a policy evaluation process (risk-uncertainty approach).

**(i) Adaptive Management Approach**

As emphasized in the MERR Plan's section 1.3 *Implementation of the Monitoring, Evaluation, Research and Reporting Plan's - Approach, Roles and Responsibilities*, projects conducting research and should incorporate uncertainties by embracing adaptive management. Depending on the project type, either active or passive adaptive management may be appropriate. The active adaptive management approach consists of "actively probing" in order to distinguish between competing hypotheses. Passive adaptive management is an approach that involves implementing the best alternative and then monitoring to see if this is correct and making adjustments as needed. As the Council learns from the research, monitoring and evaluation conducted through the Program this may result in modification of priorities and monitoring conducted.

**(ii) Preponderance of Evidence Approach**

The Council in assessing whether there is sufficient information to guide a policy decision regarding a research uncertainty, change in a population, species and habitat, and the effectiveness of an action may rely on a preponderance of evidence standard. Preponderance of evidence standard does not require a 95 percent level of certainty. The standard is met if the proposition is more likely to be true than not true. Effectively, the standard is satisfied if there is greater than 50-percent chance that the proposition is true. The actual percentage used by the Council when making their assessment may be higher if the risk of being wrong is great, e.g., may result in extirpation of a species. The Council will based their assessment whether the there is a preponderance of evidence to guide a policy decision on information provided by the ISAB, ISRP, as well as information available from the peer-reviewed literature and non-peer reviewed literature such as reports and technical publications. The decision of whether or not existing information meets the preponderance of evidence standard for guiding a policy decision is based on these criteria:

Information Meets Preponderance of Evidence Standard

- Thoroughly established, generally accepted, good peer-reviewed empirical evidence in its favor;

- Strong weight of evidence in support, but not fully conclusive;
- Misleading or demonstrably wrong; based on good evidence to the contrary.

Does Not Meet Preponderance of Evidence Standard for Proving or Disproving Effectiveness of Actions

- Theoretical support with some evidence from experiments or observations for action effectiveness;
- Speculative; little empirical support for action effectiveness.

When the Council chooses to make a policy decision based on preponderance of evidence, the information used in the assessment will be made available on the Council website for public comment. This will provide the opportunity for the Council's regional partners to provide input on whether the information is complete, biased, being accurately or inaccurately interpreted and the rational for the regional partners' support or non-support of the Council's assessment of the information meeting or not meeting the preponderance of evidence standard.

The use of the preponderance of evidence standard to guide Council policy decision is not intended to reduce the scientific requirement for projects funded through the Program. Projects will still be accountable for applying scientifically sound study design and analyses, be based on sound scientific principles, have measurable, quantitative biological objectives, and collect or identify data appropriate for measuring progress towards their biological objectives, which may require, per ISRP guidance, the conventional 95% standard to demonstrate scientifically valid results. The use of the preponderance of evidence standard is to be applied in the policy arena to guide policy decisions, and not scientific decisions.

**(iii) Risk-Uncertainty Approach**

To make recommendations on RME actions implemented through the Program, the Council will use a two-step process in which a technical evaluation is followed by a policy evaluation. The technical evaluation weighs the risk posed by the mitigation action to fish and wildlife resources and scientific uncertainty using a risk matrix (Figure 2), whereby risk and uncertainty are interpreted as:

> **Risk -** How much risk is there to fish and wildlife in the Basin if the scientific foundation or assumptions related to a type of mitigation action are wrong?
>
> **Uncertainty -** How certain are we of the science underpinning the mitigation actions?

The risk-uncertainty matrix (Figure 2) provides a visual characterization of how mitigation actions may fit along the risk and uncertainty continuum. Some mitigation actions may fit clearly in one category whereas others may seem to fall between categories. Below are two examples illustrating how two types of mitigation actions may fit into the lower risk and lower uncertainty quadrant (lower left) and the higher risk and higher uncertainty quadrant (upper right) of the risk-uncertainty matrix. For each

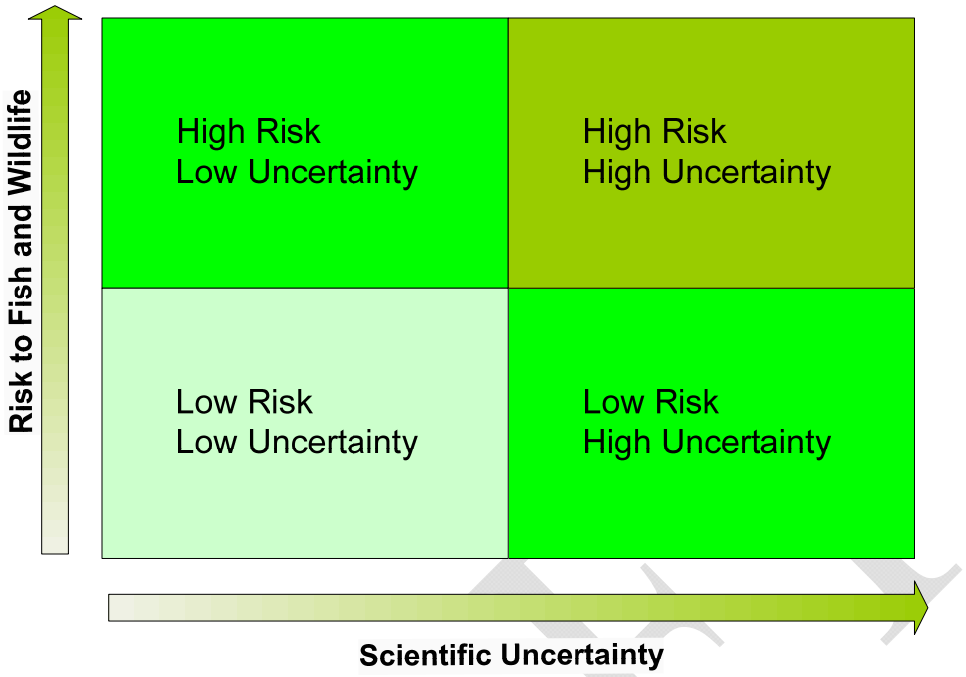
example, the potential Council recommendation for monitoring of these mitigation actions and for resolving critical uncertainties associated with these mitigation actions are also indicated.

**(1) Riparian Fencing Mitigation Action - Lower Left Quadrant of the Risk-Uncertainty Matrix**

- Low risk to fish and wildlife and their habitat
- Low uncertainty as these mitigation actions' outcomes are well understood. For example, the fence will exclude cattle from the riparian area and allow riparian vegetation to grow.
- The Council may recommend funding a lower level of monitoring and evaluation for these mitigation actions, and recommend a lower level of prioritization for funding research uncertainties associated with these mitigation actions.

**(2) Lamprey Passage Mitigation Action - Upper Right Quadrant of the Risk-Uncertainty Matrix**

- High risk to fish
- High uncertainty as these mitigation actions' outcomes are not well understood. For example, if the lamprey passage structures are ineffective for passage or result in harm.
- The Council may recommend funding a higher level of monitoring and evaluation for these mitigation actions, and recommend a higher level of prioritization for funding research uncertainties associated with these mitigation actions.




Mitigation action may require lower level of monitoring and have a lower priority associated with its research uncertainties

Mitigation action may require moderate level of monitoring and have a moderate priority associated with its research uncertainties

Mitigation action may require higher level of monitoring and have a higher priority associated with its research uncertainties

**Figure 2.** Risk-uncertainty matrix for use in the technical evaluation of RME projects.

The technical evaluation will be conducted by an independent scientific group. It is important to note that if an RME action is identified as low priority through the technical evaluation, this does not suggest that the mitigation action itself is of low priority. Conversely, a high priority RME action does not imply that the underlying mitigation action is of high priority. The priority level given to a RME action is simply a reflection of the relative degree of risk to fish and wildlife resources and the relative degree of scientific uncertainty associated with implementing the mitigation action.

The technical evaluation is followed by a policy evaluation conducted by the Council. In the policy evaluation, the Council might consider available funding, feasibility, likelihood of action success, urgency, and emerging policy. In determining what Council recommendation to provide for an RME action, the Council will consider the findings of both the technical and the policy evaluations.

This approach to guide Council recommendations of RME actions will evolve over time. The Council hopes that through a collaborative process of the Council, ISRP, fish and

wildlife managers and other vested parties, a quantitative prioritization tool could be developed. This would allow for a more objective process for rank ordering of RME actions.

**Placeholder for the Desired Effect Size – Bucket 2**

Develop policy guidance on 'what is the desired size of the effect [for monitoring projects to] detect and at what level of confidence.' For example, a 20% change with an 80% confidence level may be the target for monitoring some action types.

The Bucket Two phase will include further discussion with the region's managers and stakeholder through focused meetings or online forums, and will take place during the interim time period between the RME categorical review and Program amendment.

### 3.3.1) Research Approach

Research of critical uncertainties, such as factors limiting abundance and condition of fish and wildlife, increases the Council's and others' understanding of fish, wildlife and their habitats. Enhancing the Council's understanding should lead to better decisions about which actions to recommend for implementation through the Program.

There are numerous research uncertainties related to the Program's implementation resulting in a need for prioritization by the Council. This prioritization serves to guide the Council's research recommendations and to ensure that the research uncertainties that will provide the greatest benefit to the Council's Program are addressed first. As stated in the Program, the Council will focus on those areas where results can be generated or tools developed to better inform decisions and to more efficiently deploy Program resources. With this focus, the Council will periodically update, at least every 5-years, its Columbia River Basin Research Plan (Research Plan)[5] in collaboration with the Independent Scientific Advisory Board (ISAB),[6] Independent Scientific Review Panel (ISRP)[7] and regional partners.

The Council recognizes that prioritizing research uncertainties is a challenge, but one that is best undertaken by informed decision makers. The Council strives to meet this challenge by using science to frame the risk and uncertainty associated with different research topics. The Council can then compare the risks and uncertainties associated with the different research topics when prioritizing them. In determining whether a research

5 The Council's Columbia River Basin Research Plan consists of a nine-year strategy with implementation plans updated every three-years. The current version is available http://www.nwcouncil.org/library/2006/2006-3.htm (January 2010).

6 For more information on the ISAB see http://www.nwcouncil.org/fw/isab/Default.htm (January 2010).

7 For more information on the ISRP see http://www.nwcouncil.org/fw/isrp/Default.htm (January 2010).

project assessing a critical uncertainty requires lower, moderate, or a higher level of monitoring effort the Council will consider, and encourage the ISRP to similarly consider both the risk to fish and wildlife and the level of uncertainty associated with the research project (see figure 2).

**Placeholder for Prioritization Scheme – Bucket 3**

The prioritization approach for research will be developed as part of the prioritization scheme assigned to Bucket 3.

The Bucket Three phase will to be addressed prior to the onset of the next Program amendment process and will include further discussion with the region's managers and stakeholder through focused meetings or online forums.

All topics researched through the Program must be consistent with the Council's Research Plan and align with Council priorities. Further, all research recommended by the Council will be based on sound scientific principles, have measurable, quantitative biological objectives, and collect or identify data appropriate for measuring the biological outcomes identified in their objectives. Lastly, all research must apply scientifically sound study design and analyses,[8] and, as feasible, use protocols that are compatible with Council guidelines or that have been adopted by the Council.[9] Scientific assessment of the study design and analyses is conducted by the ISRP. Protocols approved by the Council are identified through regional processes and reviewed by the ISAB/ISRP for their scientific merit.

### 3.3.2) Monitoring Approach

Monitoring is necessary to track progress toward meeting Program objectives and to adaptively manage Program implementation. Monitoring is also necessary to provide the public, Congress and governors with an accurate assessment of what the Program has accomplished to date and what work remains to be done.

The Program requires all actions and projects to have an adequate level of monitoring. In certain situations, aspects of monitoring for a particular action implemented under the Program can be conducted separately from the implementation of the action, such as having another entity or project collect the required status and trend and action effectiveness monitoring data.

8 Examples of study design and analyses include: Roni, P., editor. 2005. Monitoring stream and watershed mitigation. American Fisheries Society, Bethesda, Maryland; Downes, B. J., L. A. Barmuta, P. G. Fairweather, D. P. Faith, M. J. Keough, P. S. Lake, B. D. Mapstone, and G. P. Quinn. 2002. Monitoring Ecological Impacts: Concepts and Practice in Flowing Water. Cambridge University Press, New York, New York.

*9 As of the date of adoption of the 2009 Program amendment, the Council had adopted the following methods and protocols: Northwest Environmental Data Network's Best Practices for Reporting Location and Time Related Data; Pacific Northwest Aquatic Monitoring Partnership's (PNAMP) Methods for Collection and Analysis of Benthic Macroinvertebrate Assemblages in Wadeable Streams of the Pacific Northwest; and PNAMP's Salmonid Field Protocol Handbook.*

In situations where different projects or entities are responsible for implementing an action and conducting the monitoring for that action, the relationship between these projects and the responsible entities must be clearly articulated to the Council and the ISRP. This may involve having coordination at a Programmatic level, among project proponents, or entail watershed-scale monitoring projects such as through intensively monitored watershed programs.

At a Programmatic level, the agencies funding the implementation of research, monitoring, and evaluation through the Program may decide to contract with an independent entities to conduct the monitoring for a given type of action. In this approach, the monitoring entity would be required to develop a monitoring proposal that documents, but is not limited to, how the monitoring is to be conducted, which projects will be included for data collection, and how the findings will be applicable to all projects implementing that action type. This proposal would be reviewed by ISRP.

Alternatively, project proponents may chose to coordinate amongst one another and decide on who collects and analyzes the monitoring data. Coordination among project proponents will require a clearly articulated monitoring strategy, which should document, but not be limited to how the monitoring is to be conducted, which projects will be included for data collection, and how the findings will be applicable to all projects implementing that action type. This monitoring strategy should be included in the appropriate MERR Plan implementation strategy and be reviewed by ISAB and ISRP.

Lastly, monitoring of a given action may be best suited for monitoring at the watershed scale such as through intensively monitored watershed programs. In the later situation, the project proposal submitted for ISRP review and Council consideration should document, but not be limited to how the monitoring is to be conducted, which projects will be included for data collection, and how the findings will be applicable to all projects implementing that action type. In all situations, project proponents implementing the action would refer to the entity responsible for conducting the monitoring within their project proposal.

For purposes of this Implementation Framework, monitoring is grouped into three types that are further described and defined in the subsections below:

1. Compliance and Implementation Monitoring;
2. Status and Trend Monitoring; and,
3. Effectiveness Monitoring.

The monitoring type(s) and the level of monitoring effort applied to any given action depends on the objectives and on the information required (Table 1). For example, compliance, implementation, and project effectiveness monitoring are applied to all actions and consist of a lower level of monitoring effort when compared to the other two monitoring types. Effort in this situation is equal to resources used such as time and labor. In contrast, action effectiveness monitoring requires a higher level of monitoring effort than the other two monitoring types and is applied to a subset of actions given the correspondingly greater effort required.

**Table 1.** Types of monitoring

| Monitoring Type | Purpose | Scale and Effort Level |
|---|---|---|
| Compliance and Implementation | Are contractual obligations fulfilled and set criteria met? | - Conducted at project scale.<br>- Lower level of monitoring effort in terms of data collection. |
| Status and Trend | How are species and habitats faring in the Basin? | - Conducted at population or other scale of relevance, e.g., ESU and watershed.<br>- Moderate level of monitoring effort in terms of data collection. |
| Project and Action Effectiveness | Project effectiveness: are projects performing as anticipated | Project effectiveness:<br>- Conducted at the project level.<br>- Lower level of monitoring effort in terms of data collection. |
| | Action effectiveness: Are Program actions having desired biological and environmental effects? | Action effectiveness:<br>- Conducted at population, watershed or reach scale.<br>- Higher level of monitoring effort in terms of data collection. |

In determining whether an action requires lower, moderate, or a higher level of monitoring effort the Council will consider, and encourage the ISRP to similarly consider both the risk to fish and wildlife and the level of uncertainty associated with the action producing its intended outcome (see Figure 2). For example, actions that have a high risk of negatively effecting fish and wildlife and/or have a high level of uncertainty in producing their intended outcome should require a higher level of monitoring effort. The determination of an action's risk level and outcome certainty is based on the project proponent's argument and the findings of an independent scientific review.[10]

**Placeholder for Prioritization Scheme – Bucket 3**

The prioritization approach for monitoring will be developed along with the prioritization scheme scheduled to be developed during the third phase.

The Bucket Three phase will to be addressed prior to the onset of the next Program amendment process and will include further discussion with the region's managers and stakeholder through focused meetings or online forums.

10 Independent scientific review can be conducted by ISRP, ISAB, or both depending on the topic.

As the case with Program recommended research, all monitoring will be based on sound scientific principles, have measurable, quantitative biological objectives, and collect or identify data appropriate for measuring progress toward these biological objectives. Additionally, all monitoring conducted through the Program will apply scientifically sound study design and analyses and, as feasible, will use protocols compatible with Council guidelines or that have been adopted by the Council.[11] Scientific assessment of monitoring efforts is conducted by the ISRP. Protocols approved by the Council are identified through regional processes and reviewed by the ISAB/ISRP for their scientific merit. Lastly, these efforts are required to have effective and efficient monitoring and evaluation tasks appropriate for assessing progress toward meeting the objectives of the project implementing the actions; identify who will do the monitoring and reporting and on what schedule; incorporate independent scientific review, and provide a budget for the monitoring and evaluation work.

### Compliance and Implementation Monitoring

All actions and projects implemented through the Program must conduct compliance and implementation monitoring. Compliance and implementation monitoring are essential to maintain Program accountability. Per the Pacific Northwest Aquatic Monitoring Partnership, compliance and implementation monitoring are defined as:

> **Implementation Monitoring -** monitoring of management actions to determine if they were implemented properly or comply with established standards. This is normally associated with a restoration project where an engineered solution has been constructed, or where a best management practice has been implemented. Implementation monitoring documents the type of action, the location, and whether the action was implemented successfully. It does not require environmental data and is usually a low-cost monitoring activity.
>
> **Compliance Monitoring -** tracking compliance with established laws, rules, or benchmarks. However, compliance monitoring has also been used in reference to post monitoring of implemented projects to see if they are still functioning as they were designed or intended.

The processes used to gather information necessary to conduct compliance and implementation monitoring consist of an existing process used by project proponents and new processes to be used by Bonneville. The following explains the processes used to gather the data for compliance and implementation monitoring under the Program:

11 As of the date of adoption of the 2009 Program amendment, the Council had adopted the following methods and protocols: Northwest Environmental Data Network's Best Practices for Reporting Location and Time Related Data; Pacific Northwest Aquatic Monitoring Partnership's (PNAMP) Methods for Collection and Analysis of Benthic Macroinvertebrate Assemblages in Wadeable Streams of the Pacific Northwest; and PNAMP's Salmonid Field Protocol Handbook.

1. Project proponents annually collect the data necessary to document compliance, implementation, and performance monitoring. The information is provided as stipulated in their contract with Bonneville, such as submitting data to the PISCES database. This process is currently being used.

2. Bonneville, on an annual basis, verifies that Program actions and projects are implemented as stipulated in the contracts. This evaluation will annually review a selected subset of projects to verify the information reported in PISCES database as well as to gather any additional information required. This process will be implemented starting in 2011.

The compliance and implementation data needed for the first two processes generally consist of information that project proponents already collect for reporting in Bonneville's PISCES database. The information gathered for these processes will be made available through the appropriate Bonneville database, and will be consulted as needed during the Council's project review process.

### Status and Trend Monitoring

Status monitoring characterizes existing conditions that can be used as a baseline for future comparisons. Trend monitoring measures specified parameters at predetermined time or space intervals in order to assess change in status over time. The regionally accepted definition for status and trend monitoring, per the Pacific Northwest Aquatic Monitoring Partnership is:

> **Status and Trend Monitoring -** to estimate the status of fish populations and watershed conditions, and to track over time indicators of habitat, water quality, water quantity and other factors that effect watershed health. The spatial scale is large and varies from watershed scale (HUC 6), to ESUs, to the entire Pacific Northwest.

The Council gives higher priority to status and trend monitoring contributing to:

- Assessment of the effectiveness of Program implemented actions.
- Basinwide, or other relevant high level such as population, status and trend data;
- Status and trend assessment for Program priorities.

The Council expects project proponents to collaborate on the collection of status and trend data to enable data sharing and to facilitate determination of status and trend(s) at the appropriate scale, e.g., population, evolutionarily significant unit (ESU) for salmon.

As with research uncertainties, the Council will take into consideration, and encourages the ISRP to similarly consider, the potential risk to fish and wildlife, and the action's outcome certainty level associated actions (Figure 2). Further, the Council will periodically request, at least every 10-years, that either the ISAB and/or the ISRP review available methods and tools, such as landscape level and remote sensing monitoring tools, to evaluate their applicability to the Program's status and trend monitoring. This periodical review should involve input from fish and wildlife managers and serve to ensure that the most effective and efficient monitoring methods and tools are employed under the Program.

## Effectiveness Monitoring

Effectiveness monitoring consists of both project scale effectiveness and action effectiveness monitoring. The regionally accepted definitions for these two types of effectiveness monitoring, per the Pacific Northwest Aquatic Monitoring Partnership are:

> **Project scale effectiveness monitoring -** is conducted by projects implemented at a small scale, with defined sets of actions intended to protect or enhance specific habitat features or habitat-forming processes. Project scale effectiveness monitoring measures environmental parameters to ascertain whether the actions implemented were effective in creating a desired change in habitat conditions.
>
> **Action effectiveness monitoring**[12] **-** attempts to establish "cause and effect" or inferential relationships between fish conditions, habitat conditions, and/or management actions. It pertains to evaluation of projects and programs meant to protect or enhance habitat conditions or fish production. These studies are complex and technically rigorous, and often require measuring many parameters under a very structured statistical design to detect the variable affecting change.

Project Effectiveness monitoring is critical for adaptively managing the Program at the project and action level. Assessment of project effectiveness will be conducted through the ISRP review of projects. To facilitate this assessment, project proponents should ensure that data is collected for the appropriate metrics, such as those approved by the ISRP during an earlier review of the project, those discussed in the ISRP review of metrics report,[13] and those suggested in the AHSWG report for hatchery supplementation standard by Beasley *et. al* (2008). If an action or project fails to perform as intended, the Council may recommend modifying or terminating the action or project as necessary.

Action Effectiveness monitoring is critical for assuring that actions implemented through the Program are having the intended biological effects and avoiding unintentional consequences. To achieve this, the Council can recommend implementation of actions with proven effectiveness, such as actions strongly supported by relevant peer reviewed studies, or the Council can support RME work necessary to determine the effectiveness of these actions. The effectiveness of an action type can be evaluated by assessing whether a single action, similar actions implemented

12 Action Effectiveness Monitoring as used in this document is synonymous with "validation or intensive monitoring" as used in the Washington Comprehensive Monitoring Strategy for Watershed Health and Salmon Recovery. Available at: http://www.rco.wa.gov/documents/srfb/Monitoring/Comprehensive_Strategy_Vol_2.pdf (January 2010).

13 See metrics suggested in ISRP 2006 Retrospective Report (ISRP 2007-1) and the ISRP 2008 Metrics review that provides guidance on project reporting metrics for the Columbia River Basin Fish and Wildlife Program (ISRP 2008-7), available at http://www.nwcouncil.org/library/ (January 2010).

across several locations, or a diversity of actions implemented in a specific location are achieving the desired biological result. As resources available for implementing the Program are limited, action effectiveness monitoring should concentrate on actions implemented through the Program and should focus on assessing the highest relevant level of response, such as at the population-level response. In addition, when detection of the effectiveness of an action requires a long-term commitment, implementation on a large scale, and/or a high level of sampling intensity, the effectiveness of the action should maximize the use of a coordinated reach-scale approach, coordinated basinwide or watershed-wide approach, or by using intensively monitored watersheds (Appendix 9). Intensively monitored watersheds may be the preferred approach if combining data from separate reach-scale level projects could result in consuming more resources or an inability to detect the effect. Alternately, if an action may have effects throughout the Basin a coordinated approach across the Basin or among watersheds to assess this effect may be warranted.

To reduce duplication of efforts in situations where adequate information is available to assess an action's effectiveness the Council will:

- Require project proponents to provide a convincing argument to the ISRP on whether or not the proposed action requires action effectiveness monitoring to demonstrate its effect. This requirement should aid in preventing duplication of existing work by having project proponents provide strong evidence that information supporting the effectiveness of an action is not available. The ISRP will comment on whether the argument is adequate to substantiate whether an action requires action effectiveness monitoring or not. This is an elaboration on existing ISRP review process;

- Project proponents will be expected to demonstrate evidence of effectiveness during project review process. This information will also contribute to the periodic review by ISAB and ISRP of available information to support for the effectiveness of an action or lack of effectiveness.

- Periodically request, at least every 10-years, that the ISAB and/or ISRP review peer-reviewed publications, technical publications, and, where feasible, compile information from compatible actions and/or projects implemented through the Program to summarize current support for the effectiveness of an action or lack of effectiveness. This is a new process developed for the MERR Plan; and,

- Submit to the ISAB and ISRP the findings from collaborative endeavors (discussed below) to comment on their contribution toward substantiating the effectiveness of an action. This also is a new process for the MERR Plan.

Collaboration among entities conducting action effectiveness monitoring at the reach or watershed scale will assist in managing the long-term and resource intensive investment necessary to accomplish this work. The Council encourages both project proponents and monitoring programs in the Basin who are interested in assessing the effectiveness of actions of common interest to collaborate (e.g., Washington Salmon Recovery Funding Board, NOAA Fisheries, and the Oregon Watershed Enhancement Board). In addition to the Council, existing

regional collaboration forums can facilitate the development and enhancement of this collaboration among monitoring entities.

Collaborative monitoring should build upon existing actions and projects, such as by combining data from multiple reach-scale actions and projects to assess the effectiveness of actions of common interest. Collaborative monitoring also may involve data collection from intensively monitored watersheds. To better aggregate data from multiple actions and/or projects, the Council strongly suggests using compatible or standardized monitoring protocols to gather effectiveness data, or otherwise ensure that data collected are compatible across actions and projects.

In the absence of collaborative monitoring occurring for an action, the Council may recommend that project proponents collaborate on this monitoring need or that the funding agency determine the best manner to conduct the necessary monitoring.

As information is gathered on the effectiveness an action, the Council may periodically assess, at least every 10-years, whether sufficient information is available to inform a Council decision as to whether an action has been proven effective. Proven effectiveness means that the action is well enough understood to have reasonably predictable outcomes. In making that assessment, the Council will use a preponderance of evidence standard, discussed above, to evaluate the existing information. The Council will rely on the information provided by the ISAB and/or ISRP for the second and third process listed above, specifically the review of publications and available data, review of findings from collaborative endeavors, and review of independent party's findings based on combined data from existing actions and projects. If the outcome of this assessment leads to a Council decision that an action has been proven effective, based on a preponderance of evidence as effective and that the Council will no longer recommend conducting action effectiveness monitoring, it will be listed in Appendix 10. Alternatively, if there are actions that appear to be ineffective in achieving a specific effect based on a preponderance of evidence the Council may recommend no longer implementing that action through the Program for that specific effect.

Actions for which effectiveness monitoring is not being conducted will require project proponents to provide support for the effectiveness of these actions from peer-reviewed studies or refer to other ongoing work that does provide an assessment of the effectiveness of these actions.

As with status and trend monitoring, the Council will take into consideration, and encourages the ISRP to similarly consider, the potential risk to fish and wildlife, and the action's outcome certainty level associated actions (Figure 2). The Council also will periodically request, at least every 10-years, that the ISAB and ISRP, as appropriate, evaluate new methods and tools that may enhance the action effectiveness monitoring conducted through the Program. This periodical review should involve input from fish and wildlife management and serve to ensure that the most effective and efficient monitoring methods and tools are employed under the Program.

### 3.3.3) Evaluation and Reporting Approach

Research and monitoring information collected through the Program must be evaluated and reported in order to adaptively manage the Program. This serves to inform the Council on the status of the Program's implementation which facilitates informed decision-making for improving the Program. For example, understanding what the Program has accomplished so far, what future work still needs to be done, and what lessons have been learned, allows for adaptive management of the Program by guiding action and project implementation, policy decisions, and future revisions of the Program. The purpose of this Evaluation and Reporting Approach Section is to improve the effectiveness of the overall Program and of specific program actions, as well as to promote Program accountability by providing information on the status of Program implementation and progress made toward meeting basinwide biological objectives.

**Placeholder for Reporting Forum – Bucket 2**

The Fish and Wildlife Committee has assigned the reporting section to be revised as part of Bucket Two.

The Bucket Two phase of the draft MERR revision approach is scheduled to occur between RME+ categorical review and the next Program amendment. The Bucket Two phase will include further discussion with the region's managers and stakeholder.

### High Level Indicators and Fish and Wildlife Program Indicators

To communicate the Program's progress to Congress, governors, and the public, the Council approved two lists of indicators,[14] a list of High Level Indicators (HLI) and a list of Fish and Wildlife Program Indicators (FWI), which are related to the Council's working list of management questions (Appendix 3). The indicators were selected as a means of conveying a complex message in a simple and useful manner. HLIs summarize the information believed to be of most interest to Congress and Pacific Northwest Governors. FWIs summarize a broader spectrum of information believed to be of interest to Columbia River Basin Fish and Wildlife managers and the public.

The lists of indicators are not static; rather these lists are intended to evolve over time. The data incorporated by the indicators are obtained from numerous sources throughout the Basin, not just Program-funded data, in order to provide the broadest and most accurate overview of the Basin's fish, wildlife, and habitat characteristics (i.e., Biological Indicators). Hence, the Biological Indicators also reflect the work and progress made by other fish and wildlife entities in the Basin. The remaining indicators, Implementation Indicators, report on specific actions implemented through the Program.

14 The Council adopted two lists of indicators, High Level Indicators and Fish and Wildlife Program Indicators, during October 2009. Available http://www.nwcouncil.org/fw/program/hli/Default.htm (January 2010).

To ensure that the Council's High Level Indicators (HLI) are appropriately reported, the Council will request the Independent Scientific Advisory Board assess the data used in reporting these HLI. This assessment will include verifying the caveats associated with the data to ensure that any constraints are properly conveyed.

The indicators provide the Council with information on issues that may require policy decisions and highlight aspects of the Program that should be modified to improve the Program's effectiveness. For example, if an indicator suggests that a specific RME is, or group of actions are, not contributing to progress made towards the relevant objectives and performance standard then the Council may decide to recommend a modification or termination of that action or group of actions.

The Council, starting in 2010, will report on the status of the Program's HLI. The FWI will be reported through the Columbia River Basin Fish and Wildlife Authority's Status of the Resource. Relevant Council performance standards used to track progress towards the Program's objectives will also be used to provide context for information reported through the HLI and FWI such as how close an indicator's value is to the desired performance standard.

### 3.3.4) Data Management and Sharing Requirements Approach

All Program RME data must be made readily accessible and provided in an agreed-upon electronic format. Per the 2009 Program, RME data and metadata must be compiled, analyzed, and reported annually as well as within six months of project completion.[15] To facilitate monitoring of the Program's progress towards achieving basinwide biological objectives, project proponents must make information that is necessary for evaluating and reporting accessible.

**Placeholder for Data Management – Bucket 2**

As data requirements are intricately linked to evaluation and reporting, this section will be revised at the same time as the section on Evaluation and Reporting Approach. The latter will be addressed during the Bucket Two phase of the draft MERR revision approach, which is scheduled to occur between RME+ categorical review and the next Program amendment. The Bucket Two phase will include further discussion with the region's managers and stakeholder.

## 3.4) Developing Implementation Strategies

The MERR Plan provides general guidance on conducting and prioritizing RME and reporting conducted through the Program. To be successful, the MERR Plan needs to be incorporated into the implementation process of the Program. To facilitate evaluating how the MERR Plan is being considered and incorporated in the implementation process, implementation strategies need to be developed.

15 2009 Columbia Basin Fish and Wildlife Program pages 25-26 available at http://www.nwcouncil.org/library/2009/2009-09/ (January 2010).

The implementation strategies provide a unique opportunity to summarize strategies used in conducting RME and reporting through the Program in a single location. These implementation strategies should be considered as a refinement of existing RME and reporting approaches in the Basin that will evolve over time. Therefore, similar to the process used in developing the Anadromous Salmonid Monitoring Strategy component of the Anadromous Fish Implementation Strategies, managers conducting RME and reporting should coalesce their RME and reporting strategies as feasible. This effort will provide a basinwide context for RME and reporting, which will facilitate communicating the Basin's strategy for implementing the Program as well as providing context for ISRP review of the Program and its projects.

Given the diversity of the Basin's ecosystem and fish and wildlife management approaches and needs, it is unrealistic to expect that one RME and reporting approach will work for all implementation strategies or for all components of an implementation strategy. These implementation strategies will therefore be flexible enough to address this diversity while ensuring that the ultimate goal of data sharing and aggregating at the desired level is met. For example, depending on the area of the Basin, a different subregional-strategy may be applied but ultimately data that are need to be aggregated for a basinwide assessment would be compatible across these sub-strategies.

Further, the decision to develop an implementation strategy on a species by species basis or on ecosystem basis may differ among the implementation strategies. For example, the Anadromous Salmonid Monitoring Strategy applied a species by species approach to meet a basinwide strategy for addressing viable salmonid population parameters, FCRPS Biological Opinion, and the Program.

Regardless of how the implementation strategies are structured, species or ecosystem or basinwide strategy or compatible subregional-strategies, it is important that actions taken to protect, mitigate, and enhance one species or its habitat be considered relative to the potential effects that the actions may have on other species and their habitats. Thus, implementation strategies will consider and recognize ecosystem linkages during their development.

Ultimately, these implementation strategies should provide sufficient guidance to ensure that the data sharing and aggregating necessary for evaluating and reporting on the Program occurs, as well as meeting the assessment needs of other processes recognized by the Program, such as assessments for recovery plans and biological opinions.

Through the MERR Plan, three implementation strategies are to be developed to address the three categories that form the focus of the Fish and Wildlife Program: anadromous fish, resident fish, and wildlife. Within each strategy, the effect of the hydrosystem as well as other factors discussed in the Program including mainstem, tributary, estuary and ocean habitat, predators, invasive species, climate change, and toxins, harvest, and artificial production should be considered. As a base, each implementation strategy should consist of these eight elements: (i) a description of the management questions and indicators that the strategy aims to address; (ii) the objectives and performance standards used to assess progress; (iii) discussion of the prioritization criteria and rational; (iv) identification of priorities; (v) standards for data quality, including precision and accuracy; (vi) preferred study designs and statistical analysis; (vii) preferred

performance measures and protocols; and, (viii) data management, data sharing and reporting approach.

When developing implementation strategies, these should be refined as needed to ensure alignment with the guidance provided in the Program and in this MERR Plan. This guidance includes, but is not limited to, the 9 draft Council management questions, Council indicators, the Program's biological objectives, Program's performance standards as they become available, the MERR Plan's prioritization scheme, and the MERR Plan's research and monitoring approaches. Further, implementation strategies should incorporate, as appropriate, information from ISRP and ISAB reports, RME products collaboratively developed by the region, and other sources of expertise, such as those listed in the 2009 Program measures and in the MERR Plan's Appendix 5. Implementation strategies should emphasize a rigorous application of the scientific method, as well as an active adaptive management versus a passive approach to learning when conducting research or monitoring. Lastly, the development of implementation strategies should include discussions and coordination with action implementation project proponents to ensure adequate levels of actions are implemented to enable effectiveness evaluation.

Through their development, implementation strategies may aid to identify areas where efficiencies may be gained, the presence of gaps, and any existing redundancies. If resources become available by this process then the Council may recommend that these resources be reallocated to address priority RME actions or to on the ground mitigation actions. For example, during the development of the basinwide Anadromous Salmonid Monitoring Strategy component of the Anadromous Fish Implementation Strategies, areas were efficiencies could be gained were identified, which made available resources to address monitoring gaps identified during the process.

Formal development of implementation strategies begins following approval of the July revised version of the MERR Plan, and will be accomplished through a collaborative process involving the Council and its regional partners. The Council anticipates completion of the Implementation Strategies by 2014. The resources available for developing these implementation strategies will vary and will be discussed as needed.

Implementation strategies are intended to be living documents that can be updated as new information becomes available. The Council anticipates, that at minimum, future reports from the ISAB, the ISRP, and others in the region will continue to play a prominent role in influencing the Implementation Strategies. For this reason, implementation strategies are set forth in appendices to facilitate revisions as necessary (Appendices 6-8). The implementation strategies will be available for updates on an annual basis to facilitate applying what is learned to improve Program implementation. Request for updates can originate from the Council or from the Basin's fish and wildlife managers and other stakeholders. The Council is aware, however, that as these implementation strategies evolve, that the Implementation Framework itself may also need revision to properly reflect commonalties across the three implementation strategies.

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## 5) Glossary

**Action(s)** - refers to actions implemented by project proponents through the Program. These actions include mitigation, research, monitoring and evaluation actions. Mitigation actions may serve to mitigate for an undesirable effect or to result in a specific desired effect. Research, actions may serve to resolve uncertainty associated with actions and monitoring and evaluation actions to assess the effect of actions.

**Action effectiveness monitoring** - This type of monitoring (or research) attempts to establish "cause and effect" or inferential relationships between fish conditions, habitat conditions, and/or management actions. It pertains to evaluation of projects and programs meant to protect or enhance habitat conditions or fish production. These studies are complex and technically rigorous, and often require measuring many parameters under a very structured statistical design to detect the variable affecting change.

**Active adaptive management -** is an experimental approach whereby, when faced with uncertainty, managers implement more than one alternative as concurrent experiments to see which will best meet management objectives. It is characterised by "actively probing" the system in order to distinguish between competing hypotheses (where the different hypotheses suggest different "optimal" actions). The key is that there are alternatives that can be more confidently compared (http://www.for.gov.bc.ca/hfp/amhome/Admin/index.htm).

**Adaptive management** - is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form– "active" adaptive management–employs management programs that are designed to experimentally compare selected policies or practices, by evaluating alternative hypotheses about the system being managed.

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

**Artificial production** - Any assistance provided by human technology to animal reproduction. In the context of Pacific salmon, this assistance may include, but is not limited to, spawning and rearing in hatcheries, stock transfers, creation of spawning habitat, egg bank programs, captive broodstock programs and cryopreservation of gametes.

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

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

**Biological objectives** - The initial assessments along with the vision will guide the focus of the biological objectives. Biological objectives should clearly describe physical and biological

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

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

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

**Compliance monitoring** - This type of monitoring typically tracks compliance with established laws, rules, or benchmarks. However, compliance monitoring has also been used in reference to post monitoring of implemented projects to see if they are still functioning as they were designed or intended.

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

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

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

**Effectiveness monitoring** - Monitoring set up to test cause-and-effect hypotheses about actions: Did the management actions achieve their direct effect or goal? For example, did fencing a riparian area to exclude livestock result in recovery of riparian vegetation?

**Effort** - in terms of the phrase 'level of effort', this refers to the amount of resources required to conduct the monitoring and evaluation. Resources include time, labor, and cost associated with the monitoring effort.

**Risk-uncertainty analysis** - A technical evaluation of risk and uncertainty that weighs relative risk to fish and wildlife resources and scientific uncertainty about the project and activities.

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

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

**FW program indicators -** indicators approved by the Council to communicate more in-depth detain on the biological and implementation progress accomplished by the Council's Fish and Wildlife Program. This consists of a moderate level summary of progress and is to be reported through the Columbia River Basin Fish and Wildlife Authority's Status of the Resource report.

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

**High Level Indicators -** indicators approved by the Council to communicate to Congress on the biological and implementation progress accomplished by the Council's Fish and Wildlife Program. This consists of a very high level summary of progress to be communicated through the Council's High Level Indicators report.

**Implementation monitoring** - is the monitoring of management actions to determine if they were implemented properly or comply with established standards. This is normally associated with a restoration project where an engineered solution has been constructed, or where a best management practice (BMP) has been implemented. Implementation monitoring documents the type of action, the location, and whether the action was implemented successfully. It does not require environmental data and is usually a low-cost monitoring activity. All actions under the Program must have implementation monitoring that must be reported to Bonneville. In some cases this may be as simple as a photo point and a brief description.

**Intensively monitored watershed** - a watershed in which actions are implemented in a sufficient amount to produce a large enough change that is detected at the watershed scale or population level.

**Level of Effort** - refers to the amount of resources required to conduct the monitoring and evaluation. Resources include time, labor, and cost associated with the monitoring effort.

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

**Mainstem** - The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it. In the Fish and Wildlife Program, mainstem refers to entirety of the main channels of the Columbia and Snake rivers.

**Management -** seeking to handle, direct, administer, conduct, and guide the Council's actions and not in the sense of managing fish and wildlife populations as this latter responsibility resides with the Basin's fish and wildlife managers.

**Metadata** - Data exist in two forms -- primary data and metadata. Primary data are numbers or counts – for example, the number of adult fish counted in a given time period, interval, and location. Metadata describe how those numbers were obtained, including the monitoring design (selection of times and locations), objectives, and methods.

**Metrics -** are typically associated with specific data collection and/or analysis protocols and define data in standard units of measurement. Metrics differ from indicators in the sense that they are directly measured and used in deriving the HLIs.

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

**Objectives -** identify the strategies or implementation steps to attain an identified goal. Objectives are specific and measureable. They include implementation, biological and environmental objectives.

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

**Performance standard -** consists of the target value or condition against which progress or achievements may be compared such as progress in meeting a particular objective. Performance standard may also be synonymous with the following terms: benchmark, reference point, targets and threshold.

**Passive adaptive management -** is an approach whereby, faced with uncertainty, managers implement the alternative they think is 'best' (with respect to meeting management objectives), and then monitor to see if they were right, making adjustments if desired objectives are not in fact met.

**Population** - A group of organisms belonging to the same species that occupy a well-defined locality and exhibit reproductive continuity from generation to generation.

**Project scale effectiveness monitoring** - This monitoring is generally conducted by projects implemented at a small scale, with defined sets of actions intended to protect or enhance specific habitat features or habitat-forming processes. Project scale effectiveness monitoring measures environmental parameters to ascertain whether the actions implemented were effective in creating a desired change in habitat conditions.

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

**Regional partners -** The regional partners of the Council include state, tribal and federal agencies with management authority in the Basin as well as interested stakeholders including regional forums and the public utility sector.

**Research, monitoring, and evaluation (RME) data -** consists of either the raw data, derived data, or summarized performance measure as agreed upon by the project proponent, the funding agency, and Council.

**Species** - A group of individuals of common ancestry that closely resemble each other structurally and physiologically and that can interbreed, producing fertile offspring. For purposes of the Endangered Species Act (ESA), a species is defined to include "any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." A population (or group of populations) will be considered "distinct" (and hence a "species") for purposes of the ESA if it represents an evolutionarily significant unit (ESU) of the biological species. A population must satisfy two criteria to be considered an ESU:

1. It must be reproductively isolated from other conspecific population units, and
2. It must represent an important component in the evolutionarylegacy of the species.

**Status and trend monitoring** - is to estimate the status of fish populations and watershed conditions, and to track over time indicators of habitat, water quality, water quantity and other factors that effect watershed health. The spatial scale is large and varies from watershed scale (HUC 6), to ESUs, to the entire Pacific Northwest.

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

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

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

# 6) Appendices

## 6.1) Appendix 1: 2009 Columbia River Basin Fish and Wildlife Program's Biological Objectives and Their Prioritization

**Placeholder for Biological Objectives – Bucket 3**

The development and prioritization of the Program's biological objectives has been assigned to the Bucket Three (long-term), as stated in the 3-phase approach for revising the draft MERR described on page 1, and will to be addressed prior to the onset of the next Program amendment process. The Bucket Three phase will include further discussion with the region's managers and stakeholder through focused meetings or online forums..

This section will contain the actual list of biological Objectives will be inserted in the appropriate appendix. The process and criteria used to develop biological objectives will be described under the appropriate MERR Plan section within the MERR Plan Framework.

## 6.2) Appendix 2: Council 2009 Program's Quantitative Performance Standards

The 2009 Program currently specifies 11 quantitative biological objectives that serves as performance standards. These 11 are subdivided into three main categories: Run Size and Return Rates; Dam Passage Survival; and Reach Survival and are:

**Run Size and Return Rates**

- Average total run size of adult salmon and steelhead, emphasizing populations originating above Bonneville Dam, of 5 million annually by 2025.

- Smolt-to-adult return rates in the 2-6 percent range (minimum 2 percent; average 4 percent) for listed Snake River and upper Columbia salmon and steelhead.

**Dam Passage Survival**[16]

- Average dam passage survival across Snake River and Lower Columbia River dams for juvenile spring Chinook and steelhead is 96%.

- Average dam passage survival across all dams for Snake River subyearling Chinook is 93%.

16 The Dam Passage Survival and Reach Survival performance standards were adopted as part of the Program's Mainstem Monitoring and Evaluation Section. See footnote 18 on page 53 of the Columbia River Basin Fish and Wildlife Program - 2009 Amendments (Council Document 2009-09). Available: http://www.nwcouncil.org/library/2009/2009-09.pdf

**Reach Survival**[17]

- Adult Snake River Fall Chinook survival performance standard for the reach between the Bonneville Dam and the Lower Granite Dam is 81.2%.

- Adult Snake River Spring-Summer Chinook survival performance standard for the reach between the Bonneville Dam and the Lower Granite Dam is 91.0%.

- Adult Snake River Sockeye survival performance standard for the reach between the Bonneville Dam and the Lower Granite Dam is, until standards are developed, assumed met if the adult Snake River spring/summer Chinook salmon and steelhead performance standards of 91.0% and 90.1%, respectively, are met for the same reach.

- Adult steelhead survival performance standard for the reach between the Bonneville Dam and the Lower Granite Dam is 90.1%.

- Adult Upper Columbia River Spring Chinook survival performance standard for the reach between the Bonneville Dam and the McNary Dam is 90.1%.

- Adult Upper Columbia River steelhead survival performance standard for the reach between the Bonneville Dam and the McNary Dam is 84.5%.

- Adult Middle Columbia River steelhead survival performance standard, specific reach variable, until standards are developed, assumed met if the adult Snake River steelhead performance standard of 90.1% is met for the reach between Bonneville Dam and Lower Granite Dam.

**Placeholder for Performance Standards – Bucket 3**

As the Council assesses the need for, and further develops, quantitative objectives for the Program, this process will also result in changing or further developing performance standards for assessing Program progress. Thus, performance standards will be assessed in conjunction with the process for developing and prioritizing the Program's biological objectives. As described in the previous section, this process will occur prior to the onset of the next Program amendment process at which time Bucket Three (long-term) items, including biological objectives, will be addressed.

17 See footnote above.

## 6.3) Appendix 3: Council's Programmatic Questions and Associated High Level Indicators and Fish and Wildlife Program Indicators

During the October 2009 Council meeting[18], the Council adopted a working list of programmatic questions and associated High Level Indicators and Fish and Wildlife Indicators to facilitate communicating Program progress to Congress, Pacific Northwest Governors, Fish and Wildlife managers, and the public. Below are the nine management questions in bolded text. Under each management question is listed the associated High Level Indicator and the Fish and Wildlife Indicators.

The management questions listed below are considered draft and may change in terms of topic and format pending their revision during the Bucket Two phase of the draft MERR revision.

**Placeholder for Management Questions – Bucket 2**

The topics and format for the Council's management question will be discussed along with the issues placed in Bucket Two. The Bucket Two phase will include further discussion with the region's managers and stakeholder through focused meetings or online forums, and will take place during the interim period between the RME categorical review and Program amendment.

**Biological Indicators**

**Are Columbia River Basin fish and wildlife abundant, diverse, productive, spatially distributed, and sustainable?**

High Level Indicator

- Abundance of Fish and Wildlife

Fish and Wildlife Program Indicators

- Abundance of salmon and steelhead in the Columbia River Basin.
- Abundance of pacific lamprey and sturgeon in the Columbia River Basin.
- Smolt-Adult return rates for ESA listed salmon and steelhead in the Columbia River Basin.
- Abundance of focal resident fish species in the Columbia River Basin.
- Wildlife species abundance and diversity in the Columbia River Basin.
- ESA listed or non-listed status and trend of fish and wildlife in the Columbia River Basin.

**Are Columbia River Basin ecosystems healthy?**

18 The Council adopted two lists of indicators, High Level Indicators and Fish and Wildlife Program Indicators, during October 2009. Available http://www.nwcouncil.org/fw/program/hli/Default.htm (January 2010).

High Level Indicator
- Ecosystem Health

Fish and Wildlife Program Indicators
- Watershed Health for fish and wildlife.
- Non-native species distribution.

**Are ocean conditions affecting Columbia River Basin anadromous fish?**

High Level Indicator
- Ecosystem Health

Fish and Wildlife Program Indicators
- Ocean Condition.

**Is climate change affecting fish and wildlife in the Columbia River Basin?**

High Level Indicator
- Ecosystem Health

Fish and Wildlife Program Indicators
- Climate Change (to be developed).

**Are the actions implemented by the Council Fish and Wildlife Program having the expected biological effect on fish and wildlife and their habitat?**

High Level Indicator
- Abundance of Fish and Wildlife

Fish and Wildlife Program Indicators
- Production of wild fish related to habitat improvement actions.
- Predation on fish in the Columbia River Basin.

**Implementation Indicators**

**Are Council program actions coordinated within the program and with other programs?**

High Level Indicator
- Council Action

Fish and Wildlife Program Indicators
- Wildlife habitat units acquired relative to loss by dam.
- Number of instream fish passage improvements.
- Potential maximum additional miles of fish habitat made accessible.
- Amount of water conserved by conservation activities and water transactions for instream use.
- Amount of land protected for fish and wildlife.
- Amount of land receiving actions aimed at improving habitat for fish and wildlife.
- Managing predation on adult and juvenile fish.

- Define indicator for successful occurrence of Resident fish substitution to replace anadromous fish species loss due to hydrosystem.
- Define an indicator for: Progress in implementing action to address subbasin plan objectives and needs (limiting factors, priority reaches, etc).
- Coordination of Council Fish and Wildlife Program with other fish and wildlife entities, activities, and programs in the Basin.

**Are mainstem hydro operations meeting the Council Fish and Wildlife Program's survival and passage objectives?**

High Level Indicator

- Hydrosystem Survival & Passage

Fish and Wildlife Program Indicators

- Salmon and steelhead juvenile survival through Federal Columbia River Power System's dams.
- Salmon and steelhead adult survival through Federal Columbia River Power System's dams.

**Is harvest consistent with the Council fish and wildlife program's vision?**

High Level Indicator

- Council Action

Fish and Wildlife Program Indicators

- Harvest numbers and rates per year for salmon, steelhead, sturgeon, and resident fisheries.
- Contribution of Council's Fish and Wildlife program funded hatcheries to Columbia River Basin and Ocean fisheries.

**Does artificial production complement resident and anadromous recovery and harvest goals within the Columbia River Basin?**

High Level Indicator

- Council Action

Fish and Wildlife Program Indicators

- Implementation of artificial production recommendations supported by the Council Fish and Wildlife Program's.
- Abundance of hatchery parr/smolts released complement abundance of wild parr/smolts in-stream.

## 6.4) Appendix 4: Priority Species and Habitat Characteristics

**Placeholder for Priority Species and Habitat – Bucket 3**

Prioritization approach to be applied through the draft MERR will be addressed during Bucket Three of the phased approach to revising the draft MERR

The Bucket Three phase will to be addressed prior to the onset of the next Program amendment process and will include further discussion with the region's managers and stakeholder through focused meetings or online forums.

## 6.5) Appendix 5: Suggested Documents to Consider during Development of Implementation Strategies

Below is a list of documents that should be considered during the development of the implementation strategies. This list is not all inclusive, therefore information from other relevant documents should be consulted as needed.

### Anadromous Fish, Resident Fish, and Wildlife


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## 6.6) Appendix 6: Anadromous Fish Implementation Strategy (to be developed)

This strategy is in development. The strategy will incorporate, as appropriate, the content of the Anadromous Salmonid Monitoring Strategy developed during the 2009 Collaborative Columbia River Basin Monitoring and Evaluation Workshops as well as information from relevant regional products (Appendix 5). The Anadromous Salmonid Monitoring Strategy includes tributary VSP, tributary habitat effectives and hatchery effectiveness for salmon and steelhead. The Anadromous Salmonid Monitoring Strategy was developed in consideration of FCRPS Biological Opinion and recommendation of the RME AA-NOAA-NPCC-BPA FCRPS Biological Opinion RPA workgroups' report. Components for other anadromous fish, as well as for the ocean, estuary, mainstem components of the Program need to be developed through a regional approach and may incorporate aspects of the RME AA-NOAA-NPCC-BPA FCRPS Biological Opinion RPA workgroups' report.

## 6.7) Appendix 7: Resident Fish Implementation Strategy (to be developed)

This strategy is in development. A regional approach will be used to assist Council development of this strategy. This strategy will incorporate information from relevant regional products as appropriate (Appendix 5).

## 6.8) Appendix 8: Wildlife Implementation Strategy (to be developed)

This strategy is in development. A regional approach will be used to assist Council development of this strategy. It will incorporate, as appropriate, the content regional products such as the FCRPS Wildlife Mitigation Monitoring and Evaluation Framework being developed by the Wildlife Advisory Committee of CBFWA, the Draft Monitoring and Evaluation Plan for the UCUT Wildlife Monitoring and Evaluation Program and other similar products (Appendix 5).

## 6.9) Appendix 9: List of Intensively Monitored Watersheds in the Pacific Northwest

Intensively monitored watersheds (IMW), or intensive watershed-scale research and monitoring efforts, are designed to address questions that are not suitable for being answered by effectiveness monitoring conducted at the project-scale. IMW is an efficient method of achieving the necessary sampling intensity to detect a biological response to a set of actions. An IMW can facilitate determining which factors affect biological response and how these factors respond to different actions. The information gathered from an IMW may not be directly applicable to another watershed, because watersheds are not all similar.

The Pacific Northwest Aquatic Monitoring Partnership has worked, and continues to work, with state and federal agencies to establish an appropriate mix of IMWs in Washington, Oregon and Idaho. As of 2008 there are 17 IMWs funded in Washington, Oregon, and Idaho (Figure 3).

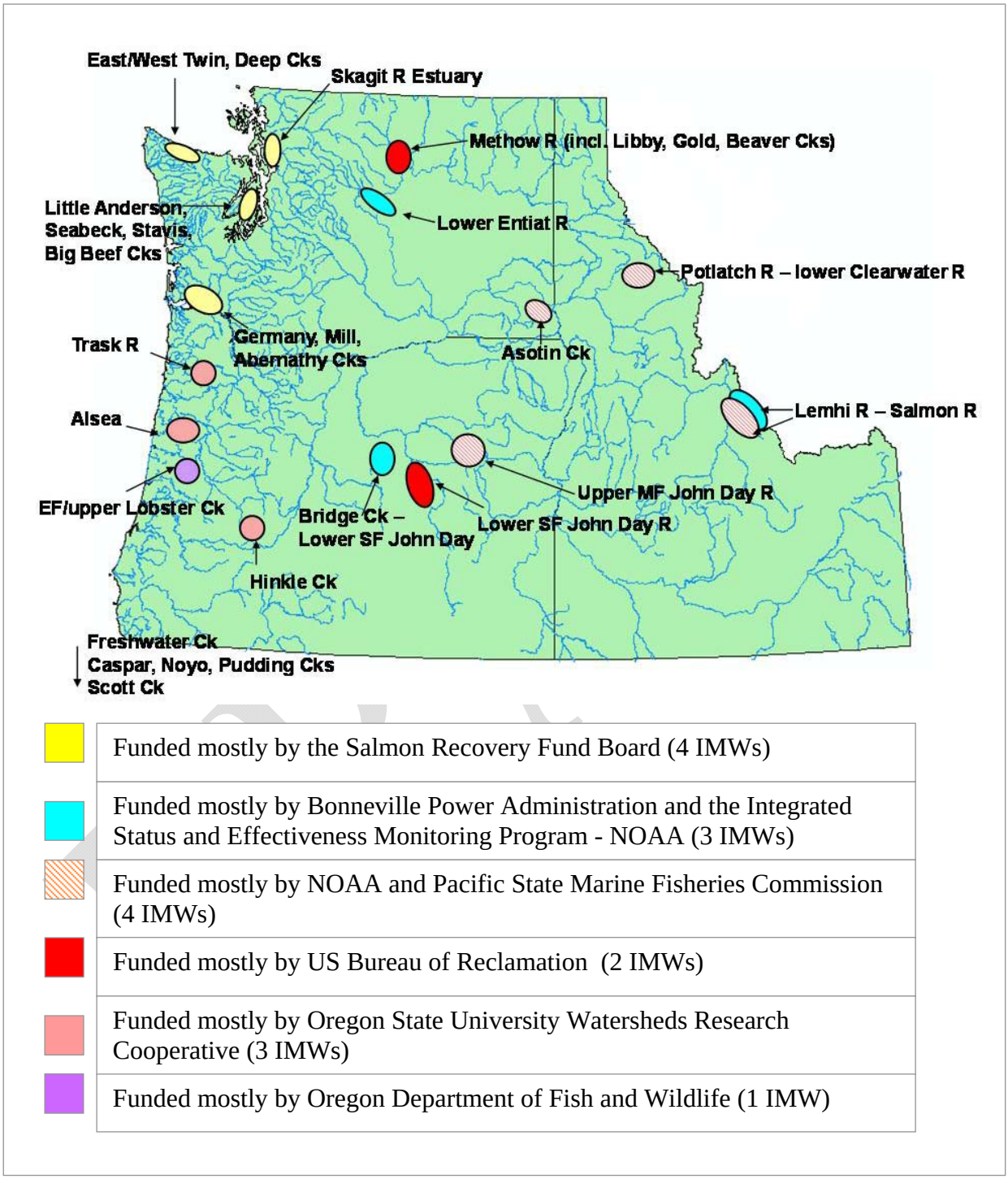


**Figure 3.** List of existing intensively monitored watershed in the states of Washington, Oregon, and Idaho as of 2008. http://www.pnamp.org/IMW

## 6.10) Appendix 10: Actions for which Council has rendered a Decision on Effectiveness

Council may periodically assess, at least every 10-years, whether sufficient information is available to inform a Council decision as to whether an action has been proven effective. In making that assessment, the Council will use a preponderance of evidence standard, discussed above, to evaluate the existing information. The Council will rely on the information provided by the ISAB and/or ISRP for the second and third process listed above, specifically the review of publications and available data, review of findings from collaborative endeavors, and review of independent party's findings based on combined data from existing actions and projects. If the outcome of this assessment leads to a Council decision that an action has been proven based on a preponderance of evidence as effective this action be listed here.

Currently, the Council has not rendered a decision on the effectiveness of any actions implemented through the Program.