

## **Part Four: Adaptive Management**

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

### **Rationale**

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

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

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

### **Monitoring Principles**

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

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

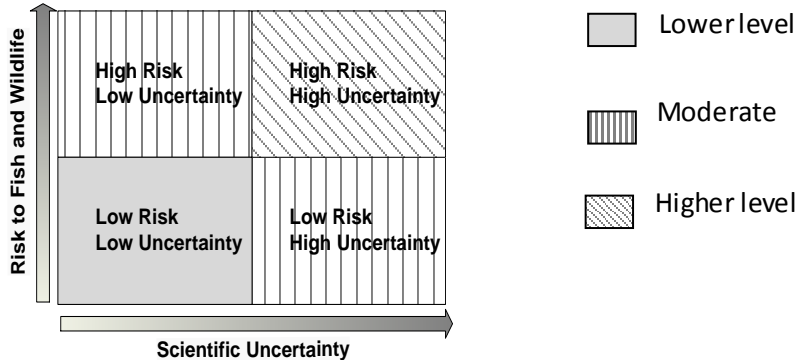



Figure 5. Risk-uncertainty matrix guiding level of monitoring efforts for a given action (hatchery, hydrosystem, habitat), and biological status. This guidance also applies to effectiveness assessments and research.

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

### General measures

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

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

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

## **Effectiveness**

### **Principles**

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

### **General measure**

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

## **Research**

### **Principles**

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

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

### **General measures**

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

### **Data management**

#### **Principles**

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

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

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

### **General measures**

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

### **Reporting Principles**

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

### **General measures**

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

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

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

## **Evaluation**

### **Principles**

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

### **General measures**

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



## Background

### The Risk-Uncertainty Matrix

The risk uncertainty matrix should be used to assess whether the level of effort is appropriate for the proposed project and measures. This assessment should be completed by both the project sponsor when submitting a proposal for review and by the Independent Scientific Review Panel and the Council when reviewing a project for its consistency with the program. This assessment should be guided by the risk uncertainty matrix, which states that the level of effort used to gather data should be commensurate with the risk and uncertainty associated with a given species, habitat, and action (Figure 6). In this approach the intensity of monitoring associated with an action, environmental condition, or population characteristic align with the perceived risk<sup>7</sup> of the activity to fish, wildlife and habitat and the level of certainty<sup>8</sup> associated with the impact of the actions, environmental conditions, and population characteristics. This can also serve to guide the level of effort for effectiveness assessments and research. The risk-uncertainty matrix does not apply to baseline status and trend monitoring.

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

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