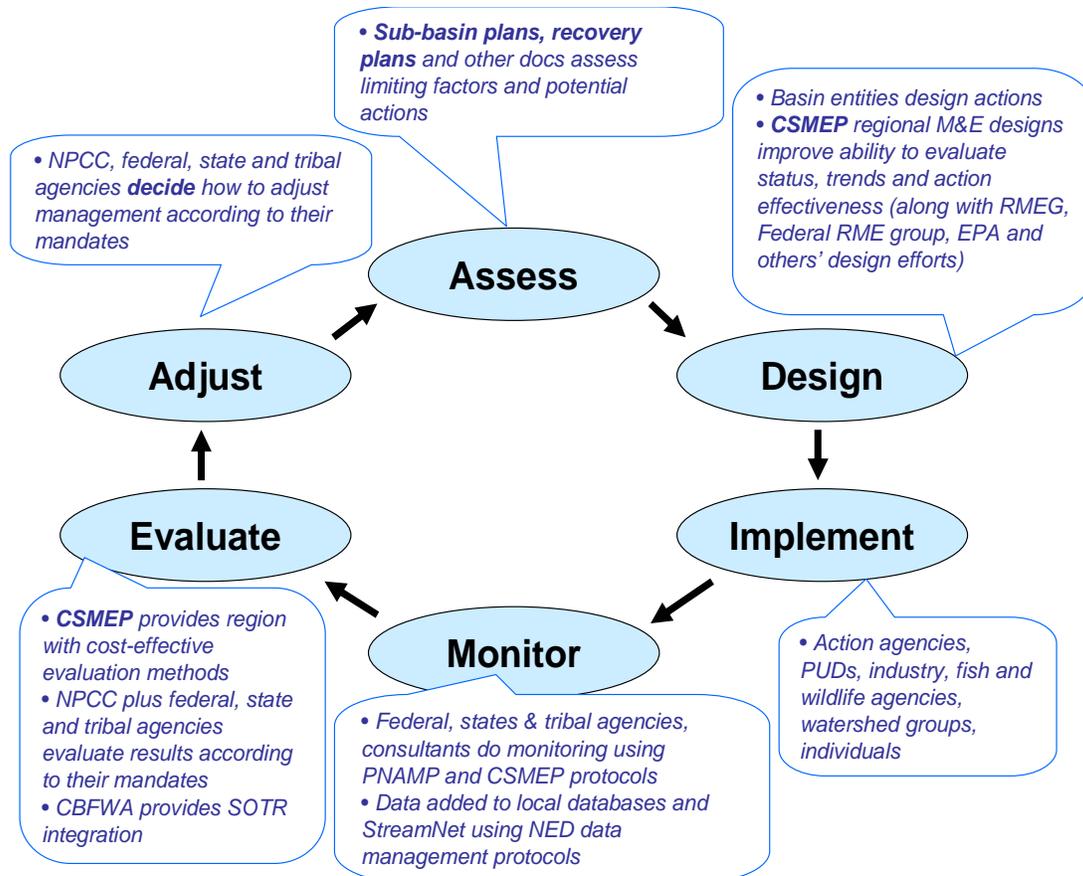


**CSMEP Background Paper**  
**Prepared for the Member's Advisory Group**  
**April 19, 2007**

The Collaborative Systemwide Monitoring and Evaluation Project (CSMEP) is a cooperative process to improve the quality, consistency, and focus of fish population and habitat data to answer key monitoring and evaluation (M&E) questions relevant to major decisions in the Columbia Basin. CSMEP is sponsored and administered by the Columbia Basin Fish and Wildlife Authority (CBFWA), with the participation of federal (NOAA, USFWS, BPA, EPA), state (IDFG, WDFW, ODFW), tribal (CRITFC, Nez Perce, Colville, Yakama, Umatilla, Coeur d'Alene), fish and wildlife projects (StreamNet), regional entities (PNAMP), and consultants in facilitation and monitoring design (ESSA, Paulsen Environmental Research, Eco Logical Research, WEST Inc.). CSMEP does not have the regulatory authority to change how fish population M&E is conducted throughout the Basin. Rather, it is a bottom-up effort to build consensus across multiple agencies to ensure technically and consistently sound programmatic M&E decisions. CSMEP provides a forum for collaboration and coordination in the design and implementation of fish monitoring programs in the Columbia Basin. The results of the CSMEP can be adopted by individual managers to strengthen their monitoring programs and be brought before the Members of CBFWA for regional consideration. The collaborative forum provided by CSMEP is vital to implementing a regional adaptive management process (Figure 1).



**Figure 1.** The adaptive management cycle, with example Basin entities included. The rigorous M&E designs being developed by CSMEP are essential for adaptive management. Modified from Murray and Marmorek (2003), and NPCC (2006-4).

CSMEP was initiated in 2003 to inventory and evaluate existing M&E for fish populations, and develop improved, integrated M&E designs, so as to meet the needs of the Northwest Power and Conservation Council’s (NPCC) Program, and those of federal, state and tribal fish and wildlife agencies. CSMEP received strong endorsement by the Independent Scientific Review Panel (ISRP), CBFWA, NPCC and Bonneville Power Administration (BPA) in the Mainstem Systemwide Review cycle completed in the fall 2002. The NPCC Draft Research Monitoring and Evaluation Guidance (pg. 16, NPCC 2006-4) notes that development of a regionally consistent, cost-effective M&E program “will likely require two funding cycles to be fully implemented”, beginning with the FY07-09 funding cycle. The FY2007-09 CSMEP proposal received a very strong endorsement by the ISRP, which noted:

“This project has made much progress in a relatively short time. It probably represents the most significant collaborative multi-species fish population monitoring effort in the Columbia River Basin, if not the entire US.” (ISRP 2006-4b, pg. 188)

The Mainstem Systemwide Review Team recommended CSMEP as a Core Project, noting that:

“CSMEP is accomplishing the Columbia River fish elements of the PNAMP work plan. This project has demonstrated high production and good coordination. It is likely the best program to coordinate and standardize RME and its partnership with PNAMP will assist in “marketing” standardization and agency acceptance.”

Despite these positive reviews, the NPCC decided on November 15, 2006 to fund CSMEP for only 2 years (FY07 and FY08). The NPCC made the funding for FY09 contingent upon receiving a report for Council and science review. On February 12, 2007, BPA cut CSMEP’s FY08 funding in half and terminated the project at the end of FY08. BPA’s only rationale for cutting FY08 funding is that it “reflects a transition to project closure in FY08”. The proposed funding cut is particularly unfortunate as many CSMEP products are just now coming to fruition.

CSMEP has completed many work products since its inception including:

- a systematic inventory and evaluation of the strengths and weaknesses of current monitoring data for assessing status and trends for salmon and steelhead populations,
- the development of standardized sampling designs for status and trend monitoring including an EMAP sampling approach that will facilitate data summarization and aggregation;
- novel multi-year evaluation methods that permit assessments of smolt to adult return rates on provincial or sub-basin scales; and
- provincial scale analyses of the aggregate benefits of hundreds of habitat restoration projects on parr to smolt, as well as smolt to adult salmon survival.

CSMEP has had tangible results improving the monitoring programs of various CBFWA Members. The following are examples of how CSMEP efforts to date have improved Member monitoring programs.

- The Washington Department of Fish and Wildlife has used the strengths and weaknesses analysis to improve their monitoring programs including: the use of GPS to locate all winter steelhead redds and Chinook redds in selected basins to obtain spatial structure information; the development of study designs that include variance estimates for selected Chinook salmon and summer steelhead populations using mark-recapture methods; and the sample size in wild Tule Fall Chinook salmon population monitoring has been increased to better detect coded-wire tag strays from hatchery programs.

- The Idaho Department of Fish and Game has used CSMEP results to retool their natural production monitoring programs, integrate M&E across fish species, develop probabilistic sampling approaches for their juvenile sampling program, and develop a plan for effectiveness monitoring in the Lemhi watershed as part of the ISEMP program.
- Oregon Department of Fish and Wildlife (ODFW) along with the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Confederated Tribes of the Umatilla Indian Reservation have used the CSMEP data inventories and strengths and weakness assessments to develop viability assessments in Oregon’s Mid-Columbia Steelhead Recovery planning efforts. ODFW staff within CSMEP is now working with regional biologists to use the strengths and weakness assessments to develop a monitoring program for Mid-Columbia steelhead in Oregon. This hybrid design will incorporate existing routine surveys and the principles of EMAP-type survey designs to create a cost effective and statistically sound monitoring program.
- ODFW’s StreamNet and CSMEP staff has assembled metadata for bull trout M&E. These will be useful in reporting status and trend data, documenting regional methodologies, and identifying strengths and weaknesses of ongoing monitoring efforts.
- The CSMEP strengths and weaknesses assessments have been one of the most widely accessible and comprehensive overviews to characterize ongoing monitoring and identify monitoring gaps to assess the effectiveness of recovery actions addressed in the collaborative “BiOp remand” group. This group examines research, monitoring and evaluation needed to assess the effectiveness of recovery actions within an overall status and trends context. Participants in the remand collaboration workgroups have used the work by the CSMEP hydro group to develop Columbia Basin RME alternatives that can evaluate life cycle survival components integrated across tributary habitat, hatchery, and harvest actions; mainstem hydro actions; and overall hydro effects into complete life cycle (spawner to spawner) survival estimates.
- Collaborative review of harvest monitoring designs with the Technical Advisory Committee of *US v. Oregon* has provided fisheries managers a forum to discuss and address potential biases of steelhead mortality estimates and identify potential improvements to existing fisheries monitoring actions.
- The US Army Corps of Engineers used the CSMEP Data Quality Objectives process in multi-agency discussions to help scope information needs for monitoring fall Chinook survival through the hydrosystem.

CSMEP’s ongoing work products include:

- development of integrated designs to use PIT tagged fish multiple times to address status & trend, habitat, hydro, hatchery and harvest questions;
- expanding and integrating designs to include steelhead, bull trout and other resident fish species,
- systematic evaluation of the costs and benefits of current M&E for each of these functions (as well as lower, similar, and higher cost alternatives).
- CSMEP is working with CBFWA to develop a Data Quality Guide and simple rating system for the data presented in the Status of the Resource Report (SOTR).

A Data Quality Guide will help to synthesize the results of CSMEP's inventory and assessment work into an accessible format for readers of the SOTR. It would also help the NPCC and fish managers prioritize areas for improving data and ensuring consistency across subbasins and at regional scales by identifying the areas with poor data quality or insufficient data. The Data Quality Guide can be updated annually to assess progress towards filling data gaps and improving data quality.

The CBFWA members should work with the NPCC and BPA to restore full funding for this project through at least FY2008 as recommended by the NPCC. CSMEP will have products ready for science, Members and NPCC review in early FY2008 and if fully funded additional products by the end of FY2008. These products can then be used to inform recommendations for future work in FY09 and beyond. CSMEP is a vital project that will be increasingly important in the future as recovery plans are implemented. The role CSMEP plays to coordinate M&E among federal, state, and tribal agencies is necessary to develop a logical, cost effective M&E program that can answer key management questions at various spatial and temporal scales. Although PNAMP also provides a forum for dialogue and discussion, without CSMEP there is no collaborative group providing the rigorous, technical analyses needed for design of a coherent, consistent regional M&E program. This is especially important for ESA listed Chinook salmon, steelhead and bull trout populations whose ESU'S (DPS units for bull trout) cross state and tribal boundaries.

CSMEP provides the foundation for cost effective, coordinated, regional Status/Trend monitoring and Action/Effectiveness monitoring within and among all the "Hs". The attached appendix displays CSMEP's proposed work elements through 2009. The work elements are outlined by placing them into "principles" that describe how we will achieve our objectives and "recommendations" that describe the future products that will result from implementing the principles. As these products are completed they will be subject to scientific review and brought to the Members as specific recommendations to consider for adoption. The principles and recommendations will be presented to the CBFWA Anadromous and Resident Fish Committees for consideration in the development of Fish and Wildlife Program

Amendment monitoring measures. CSMEP also will be identifying information gaps to help define research needs.

## APPENDIX

### **Principles for developing consistent, cost-effective M&E for fish populations in the Columbia River Basin**

**Principle 1.** A regionally consistent, cost-effective M&E for fish populations can be developed through a long term, systematic process that has the following attributes:

- a. it involves dialogue with Columbia River Basin fish managers and decision makers to identify the key management decisions, spatial and temporal scales of decisions, information needs, time frame for actions, and the level of acceptable risks when making the decisions;
- b. it conducts an inventory of existing M&E methods and evaluates their strengths and weaknesses for meeting information needs;
- c. it involves the long term participation of Columbia River Basin scientists with both field and statistical expertise, to ensure that M&E approaches meet information needs, are cost-effective, practical, statistically reliable, and have the support of state and tribal agencies;
- d. it recognizes that information needs, available funding, and scales of interest vary across agencies and it addresses the tradeoffs among design objectives and evaluation criteria; and
- e. it recognizes that M&E is an essential element of an adaptive management loop to iteratively improve habitat, hydrosystem, and fisheries management actions, and that M&E approaches themselves need to be iteratively improved through the evaluation of projects.

Decisions on regional M&E designs need to be based on a quantitative evaluation of the costs and benefits of the status quo and alternative designs to answer management questions. The alternative designs should build on the strengths of each sub-basin's existing monitoring infrastructure and data, remedy some of the major weaknesses, and adapt to regional variations that affect monitoring protocols (e.g. steelhead redds are visible in many coastal streams, but are not visible in turbid interior streams). Without a formal quantitative evaluation of costs and benefits (e.g. statistical reliability, cost, ability to answer key questions, practicality), there is a risk that *ad hoc* M&E decisions will be made that are not cost-effective and preclude data aggregation for decisions and evaluations at greater spatial or temporal

scales. Each region in the Columbia River Basin has invested a lot of resources to develop a monitoring infrastructure that is primarily adapted to address local needs. It is much more cost-effective to build on the strengths of the existing monitoring infrastructure, rather than applying a uniform “cookie-cutter” approach throughout the Columbia River Basin. These improved designs can be developed to overcome weakness in the existing M&E programs to allow assessments at larger spatial and longer temporal scales. CSMEP is developing a cost-integration database to allow a quick assessment of the approximate costs of alternative monitoring designs.

**Principle 2.** The development and implementation of sound M&E designs must be accompanied by strong data management systems which facilitate the sharing, analysis and synthesis of data across agencies, spatial and temporal scales, and disciplines. Without a strong investment in data management, even the best monitoring designs will falter. This is not a primary focus of CSMEP, but CSMEP can coordinate with other entities with this responsibility (e.g. federal, state and tribal fish management agencies; NED; StreamNet; CBFWA Status of the Resource Report).

**Principle 3.** Status and Trend monitoring of fish populations is of fundamental importance to adaptive management as it provides a general assessment of whether program objectives are being met. Action effectiveness monitoring (Harvest, Hydrosystem, Habitat, and Hatcheries) must be integrated with Status and Trends monitoring to understand the mechanistic causes that regulate fish populations. The CSMEP Snake Basin Pilot study is pioneering methods of performing this integration.

## **Recommendations on future M&E for fish populations in the Columbia River Basin**

**Recommendation 1.** CSMEP recommends that member agencies should evaluate hybrid sampling designs for improving fish population monitoring. A hybrid sampling design would supplement the existing non-random, index monitoring sites with randomly chosen sites. While index sites are not representative, sampling random sites throughout the range of a fish population is not efficient (a lot more time can be spent getting to each site). The hybrid approach takes advantage of the fact that index sites often efficiently sample a large fraction of the population and uses the supplementary random sampling to accurately determine just how big that fraction is. This approach would allow agencies to assess the bias in index sites, get reliable estimates of population abundance for viability assessments, permit aggregation to a variety of larger spatial scales (e.g. MPG, sub-basin), support the sharing of data collected by different agencies with different interests, and facilitate data analyses.

**Recommendation 2.** Status and trend monitoring of fish populations must satisfy the needs of population and ESU level assessments (for both listed and unlisted species) of viability, as well as assessments of overall trends in population abundance at larger spatial and longer temporal scales. It must also meet the needs of multiple agencies with different objectives, questions, and scales of interest. There are challenging tradeoffs to meet all M&E objectives but using the collaborative process CSMEP has adapted should result in cost effective designs to adequately address all information needs.

**Recommendation 3.** Status and Trends monitoring provides the foundation of a regional M&E program but it must be integrated with action effectiveness monitoring. An integrated M&E program provides economy of scale, prevents duplicative efforts, and is cost effective. Action effectiveness monitoring is more focused on specific questions that influence fish populations hence, it is typically of fixed duration and usually provides more precision. It can respond to adaptive management needs by focusing its efforts to address the mechanistic causes of uncertainty in the relationship between management actions and fish population responses. Action effectiveness monitoring designs must respond to highly varied M&E needs. CSMEP has focused on a few current habitat, hydrosystem, harvest, and hatchery management issues to illustrate integration of M&E designs for action effectiveness and status and trends monitoring. The Habitat Action Effectiveness Monitoring group is developing a database of habitat restoration projects and a retrospective analysis of PIT data to evaluate restoration effectiveness. The Hydrosystem Action Effectiveness Group is developing improved designs to evaluate the relative effectiveness of transportation and other management actions on survival of migrating fish. The Harvest Effectiveness Monitoring Group is developing designs to improve harvest stock composition estimates, in-season run strength assessments, and harvest monitoring. The Hatchery Effectiveness Monitoring Group is developing designs to quantify hatchery straying and to estimate the reproductive success of hatchery fish that spawn in streams.

**Recommendation 4.** M&E designs under development must also be integrated across species. CSMEP is currently working to incorporate steelhead and bull trout into the Chinook salmon designs that have been developed for the Snake and mid-Columbia basins. CSMEP is working to integrate the use of PIT-tags and other techniques to answer multiple questions, improving the cost-effectiveness of Status & Trends, Habitat, Hydrosystem, Harvest, and Hatchery M&E designs.