Northwest Power and Conservation Council

June 7, 2005

MEMORANDUM

TO: Council Members

FROM: Steve Waste, Manager for Program Analysis and Evaluation

SUBJECT: Update on the Columbia Systemwide Monitoring and Evaluation Project

This is an informational briefing on the Columbia Systemwide Monitoring and Evaluation Project (CSMEP) presented by David Marmorek (ESSA Technologies, Inc.) and Frank Young, (Columbia Basin Fish and Wildlife Authority). The objective of the briefing is to report on the progress of the project to date.

Background

What is the Columbia Systemwide Monitoring and Evaluation Project (CSEMP)? - CSMEP is a coordinated effort to improve the quality, consistency, and focus of fish population and habitat data to answer key monitoring and evaluation questions relevant to major decisions in the Columbia Basin. The ISRP recommended, and the Council approved, funding the project under the Mainstem/Systemwide review, with the intention that it be a mechanism to link monitoring at a broader scales.

Problem Statement - In the Pacific Northwest government agencies and other organizations are conducting a variety of different monitoring efforts. Typically, these are independent efforts that address questions and management problems that are specific to each agency. Such monitoring efforts have often included little or no coordination with other agencies. Federal, state, tribal, local, and private monitoring programs independently have evolved in response to different organizational mandates, jurisdictional needs, issues, and questions. These programs often use different monitoring approaches and protocols and do not collect and present information in a manner that can be shared across different agencies. In some cases, the programs are measuring the same (or similar) things in the same streams with little coordination or awareness of each other's efforts. These independent, uncoordinated approaches do not realize their full potential for supporting policy and management objectives that could be achieved if the information could be combined and shared across the different agency efforts.

The Council has traditionally been a strong supporter of monitoring at the project scale, while calling in the Program for the design of monitoring at broader scales. The ISRP continued to

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recommend that the Fish and Wildlife Program move beyond project scale monitoring and develop a systemwide approach to monitoring as a basis for programmatic evaluation. Consequently, as we begin the FY 07 Funding Cycle, we expect greater emphasis on moving away from project scale monitoring, and towards more work on the building blocks for a regional monitoring program. The CSMEP project was funded to be a component of that effort.

Why is Monitoring Important? - If properly designed, monitoring can help identify limiting factors to salmon recovery and provide feedback to managers and to the public about how management plans and activities are affecting species and the environment. Monitoring also provides the basis for establishing program priorities, and for ensuring accountability for program expenditures.

Implementing Fish and Wildlife Program Requirements - In 2000, the Council recognized the importance of monitoring in the Basinwide Provisions of the 2000 Columbia River Basin Fish and Wildlife Program. Strategy number nine, which addresses Research, Monitoring, and Evaluation, stipulates that:

> Program implementation must also include as a systemwide project a program to evaluate whether the individual actions in the various subbasins are achieving the objectives of the program stated at the basin and province levels. The Council will work with other relevant parties in the basin to design this program–level monitoring and evaluation program, including describing the evaluation tasks, who will do the work, the possible budget, and the possible use of the independent science panels in assisting with this evaluation effort. The goal should be for the Council to produce an annual evaluation report of the success of the program in meeting its objectives.

The Council has supported the CSMEP project as a vehicle for developing these elements of the Fish and Wildlife Program. Although CSMEP does not in itself constitute a systemwide project to evaluate the program, it has undertaken steps towards developing a systemwide approach for fish monitoring, see Attachment 1. Furthermore, although the project is focused on fish monitoring, many of the technical and process issues are common to other monitoring topics. The Council's support for the CSMEP project constitutes a significant contribution to the development of a regional approach to monitoring.

Coordinating Monitoring at a Regional Scale - The Fish and Wildlife Program; the governors of Washington, Oregon, Idaho, and Montana; NOAA and USFWS; and, the Action Agencies have all recognized the need for a coordinated monitoring system for the Columbia River Basin. In response, the Council has been working to facilitate the development of a regional approach to monitoring. The Council has participated in, and provided strong support to, the formalization of the Pacific Northwest Aquatic Monitoring Partnership (PNAMP), the entity that is working to develop and implement a coordinated, regional approach to monitoring. The Council has supported PNAMP by providing direct staff participation on the PNAMP Steering Committee and by supporting the CSMEP project. The work of CSMEP has made a major contribution to PNAMP, as CSMEP has implemented many of the priority tasks identified by PNAMP's Fish Monitoring Workgroup.

What is the Relationship between CSMEP and PNAMP? - CSMEP is a three-year project funded under the Fish and Wildlife Program that is working on several of the tasks identified by

as priorities by the Fish Monitoring Workgroup of PNAMP, NOAA, USFWS, and the Action Agencies. For a detailed explanation of CSMEP products that address PNAMP objectives see Attachment 2.

New Challenges Ahead - A key focus for PNAMP has been to identify a shared perspective of monitoring tools and methods that, when used in common, allow current and new information to be viewed and used by decision-makers at various (different) scales across the landscape. This often means being able to "roll-up" local information to larger scales, or may involve relating information from larger scales across different jurisdictional boundaries. It involves both "what" is monitored, and "how" the information is collected in the field and made available through information systems.

Moving from Project to Programmatic Scale Monitoring: A Crucial Step for Program Evaluation - In their seminal work applying adaptive management in a hydropower context, Professor Kai Lee and Jody Lawrence noted the importance of developing a framework for evaluation in order to move beyond monitoring at the project scale, to monitoring at a programmatic scale.

> *As a strategy for implementation, adaptive management provides a framework within which measures can be evaluated systematically as they are carried out…Information from these evaluations should enable planners to estimate the effectiveness of protection and enhancement measures on a systemwide basis. Monitoring must be designed at the outset. Biological confirmation is the fundamental measure of effectiveness*. (Emphasis added.)
>
> (From *Adaptive Management: Learning from the Columbia River Basin Fish and Wildlife Program*, Environmental Law Vol.16:431-460, 1986.)

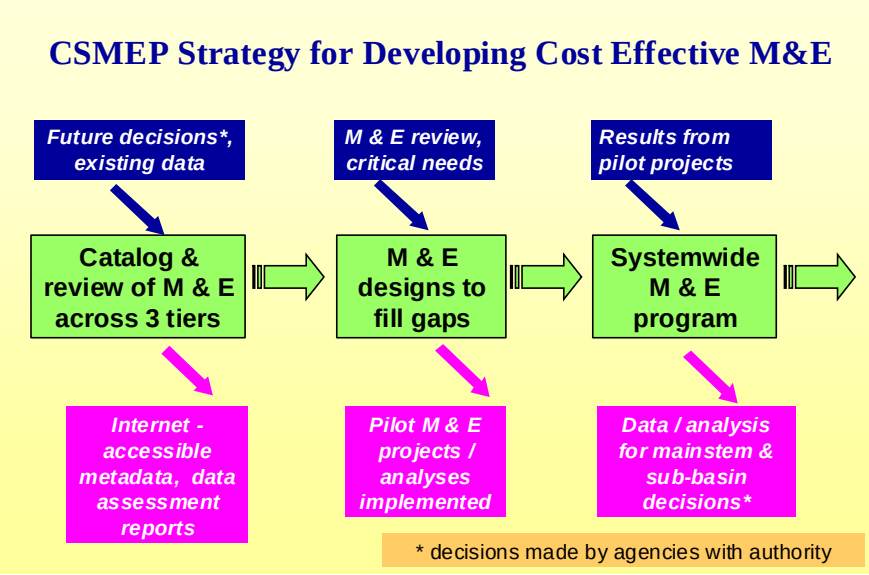
PNAMP's Strategic Plan sets forth priority tasks for each of its workgroups. Staff recommends supporting the implementation of some of these tasks as the most direct way to facilitate the development of a coordinated regional approach to monitoring.

(Attachments 1 and 2 are included in the packet. The Power Point presentation that will support the briefing cannot be attached because it contains video clips but can be accessed at: ftp://ftp.essa.com/pub/essa/NPCC/.)

Collaborative, Systemwide Monitoring and Evaluation Project (CSMEP)

Background

CSMEP is a co-ordinated effort 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 grew out of NOAA/USFWS/Action Agency articulated needs for M&E (Jordan 2002), and was given very strong endorsement by ISRP, CBFWA and NWPCC in the Mainstem/Systemwide Review (fall 2002). The 3-year project was initiated in October, 2003 with funding from BPA at the level of $968,802 per year. CSMEP is a major commitment of the Council towards regionally integrated M &E across the Columbia Basin, and is a critical element of PNAMP (Figure 2). CSMEP is administered by the Columbia Basin Fish and Wildlife Authority (CBFWA), with participation of over 30 scientists from federal, state and tribal fish and wildlife agencies, and outside experts[1]. Specific goals for CSMEP are to: 1) document, integrate, and make available existing monitoring data on listed salmon, steelhead, bull trout and other fish species of concern, 2) critically assess strengths and weaknesses of these data for answering key monitoring questions (Appendix A), and 3) collaboratively design and implement improved monitoring and evaluation methods, working with other programmatic entities, to provide better information for key decisions in the Columbia Basin. Figure 1 illustrates CSMEP's overall strategy for developing cost-effective, regionally integrated M&E; CSMEP is currently focused on the central column of this figure. Implementation of an effective, regionally integrated systemwide M&E program (for all fish and wildlife focal species) will require a long term commitments by the Council and all participating state, federal and tribal entities.



[1]**Agencies**: NOAA Fisheries, US Fish and Wildlife Service (USFWS), Columbia Fish and Wildlife Authority (CBFWA), Columbia River Intertribal Fish Council (CRITFC), Bonneville Power Administration (BPA), Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), Idaho Department of Fish and Game (IDGF), StreamNet, Environmental Protection Agency (EPA), Nez Perce Tribe, Colville Confederated Tribes, Yakama Nation; **Consultants**: ESSA Technologies Ltd. (Facilitators), Eco Logical Research, Quantitative Consultants, Paulsen Environmental Research, KWA Ecological Sciences

Figure 1. CSMEP strategy for developing cost effective monitoring and evaluation (M&E). Products developed by CSMEP co-evolve with the continuing work of PNAMP and other RME entities operating within the Columbia Basin.

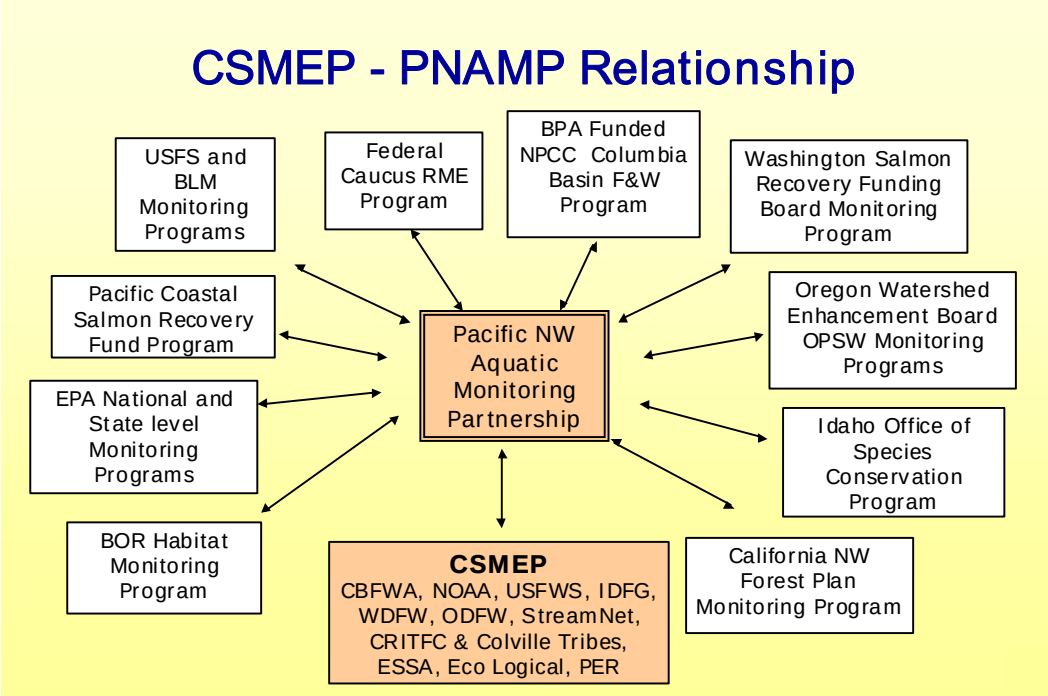


Figure 2. Relation of CSMEP to PNAMP and other RME efforts in the Columbia River Basin. CSMEP provides PNAMP with many work products of value for fish population M & E. Coordination occurs through overlapping membership, shared workplan development, and exchange of work products. Source: Steve Waste (NPCC) and Jennifer Bayer (USGS)

Progress and Work Products

Inventory and Data Evaluation. During FY2004, CSMEP conducted detailed inventories of fish data for six selected pilot subbasins in Washington, Oregon and Idaho, with the assistance of StreamNet staff. These subbasin inventories describe, in a sytematic manner, the kinds of information currently available on the abundance, productivity, spatial distribution and diversity of salmon, steelhead and bulltrout. CSMEP biologists then evaluated the strengths and weaknesses of these data for addressing a structured set of monitoring questions about population status and trends (an expansion of the questions listed in Appendix A of this handout). This inventory and assessment process is continuing in FY2005 for an additional nine subbasins in these three states. CSMEP has created a centralized web-based database (managed by ODFW StreamNet) to store inventory metadata and data assessments. [2]

Monitoring and Evaluation (M&E) Design. CSMEP has been using the 7-step EPA Data Quality Objectives (DQO) process to rigorously connect policy decisions and the M&E designs that provide the input for these decisions (Table 1). The DQO process forces rigour: clarification of the critical management decisions to be made in the Columbia Basin, the alternative evaluation approaches to those decisions, the performance measures required to feed those evaluation approaches, and the sampling options available to generate data for the key performance measures.

[2] **CSMEP Web Application Data Portal** https://nrimp.dfw.state.or.us/csmep/default.aspx?mod=15 (user name = csmep, password = csmep). Draft data inventories and assessments are available from the CSMEP website (http://www.cbfwa.org/committees/csmep/) under "Data Inventory".

Three multi-agency monitoring design workshops were undertaken in FY2004 to explore how best to integrate the strengths of existing monitoring, together with novel approaches that help to deal with their weaknesses. Reports from these workshops describe some of the alternatives available for improving regional integration of monitoring (e.g. EPA's EMAP approach to regional monitoring), explore the ability of these approaches to answer the questions in Appendix A, and lay out a structured approach to evaluating the costs, benefits and tradeoffs of different M&E strategies (Marmorek and Parnell 2004, Parnell 2004, Parnell et al. 2004).

In FY2005, CSMEP biologists have been applying the DQO process to develop a set of robust M&E designs for evaluating both the status and trends of fish populations and the effectiveness of habitat, harvest, hatchery and hydrosystem recovery actions. That is, what are the M&E alternatives for answering the questions laid out in Appendix A, how well can each option answer those questions, and at what cost? What are the risks of not answering certain questions well? The Snake River was chosen as a pilot location for this effort, and the draft results of steps 1-5 of the DQO process are now available on the CSMEP website (Marmorek et al. 2005).

Major advances in M&E design (steps 6 & 7 of the DQO process) were made at a recent workshop in April 2005, held in Nampa ID. The M&E alternatives developed for the Snake River Basin will be presented to fish and wildlife managers for feedback on July 20-21 2005, at a workshop attended by both CBFWA and PNAMP representatives. The M&E alternatives for the Snake River subbasin will subsequently be revised based on the feedback from fish and wildlife managers. In FY06, CSMEP intends to work with PNAMP partners to develop integrated M&E guidance applicable across the entire Columbia Basin.

CSMEP goals and achievements were presented at the NPIC American Fisheries Society general meeting (Skamania, WA) in November 2005. An update will be presented at the upcoming 135th American Fisheries Society meeting in Anchorage, AK September 2005.

Next Steps

Figure 3 shows the sequence of steps CSMEP is undertaking in FY05/06 to improve M&E designs across the Columbia Basin. This process involves two overlapping subgroups: Policy Interpretation Subgroups that clarify the existing policy issues, and Monitoring Design Subgroups that develop generalized monitoring designs. CSMEP subgroups are working closely with the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) throughout this process. Critical decisions will ultimately need to be made on how best to allocate limited funds to monitoring and evaluation programs across the Columbia Basin. CSMEP provides a systematic approach to these tough decisions, working through the key policy questions and the M & E methods required to answer them.

Table 1: EPA Data Quality Objectives process for developing monitoring and evaluation designs. (Source: **United States Environmental Protection Agency**. 2000. Guidance for the Data Quality Objectives Process. EPA QA/G-4. http://www.epa.gov/quality1/qs-docs/g4-final.pdf)

1. State the problem
2. Identify the decision
3. Identify inputs to the decision
4. Define the study boundaries
5. Develop an "if-then" decision rule
6. Specify limits on decision errors (both directions)
7. Optimize the design for obtaining data

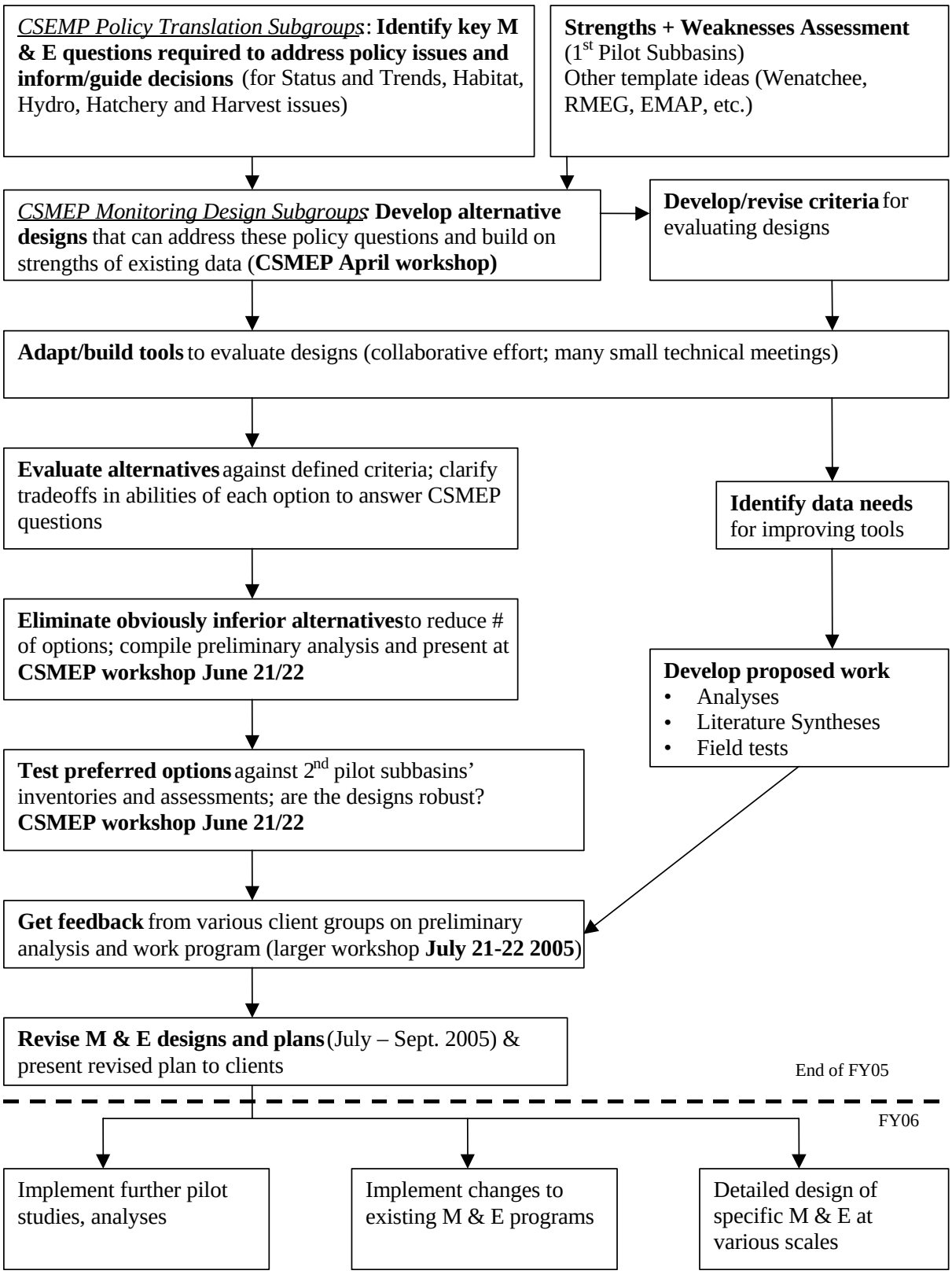


Figure 3. Process for development of basin-wide M & E designs - FY 2005/2006.

References Cited / Example Work Products

All CSMEP work products can be found on the publicly accessible CSMEP website (http://www.cbfwa.org/Committees/CSMEP).

Jordan, C. 2002 (ed). Mainstem/Systemwide Province Stock Status Program Summary. Guidelines for Conducting Population and Environmental Status Monitoring. February 22, 2002. Prepared for the Northwest Power Planning Council. 15 Contributors. http://www.cbfwa.org/files/province/systemwide/subsum/020515StockStatus.pdf

Marmorek, D. R. and I.J. Parnell. 2004. Summary of the CSMEP Design Meeting. July 21-22, 2004 Corvallis, OR. http://www.cbfwa.org/Committees/CSMEP/Meetings/2004_0721/2004_0721SummaryofWorkshop.doc

Marmorek, D. R., I.J. Parnell and M. Porter (eds) and 32 contributors. 2005. CSEMP DQO Status and Trends, Habitat, Harvest, Hatchery and Hydrosystem Assessments – Policy Interpretations (Snake River Pilot). Draft. Prepared by ESSA Technologies Ltd., Vancouver, BC for CSMEP Monitoring Design Workshop, Nampa, ID. 125 pp. http://www.cbfwa.org/Committees/CSMEP/meetings/2005_0412-14/CompositeDQOInterpretations0517051.pdf

Parnell, I.J., D.R. Marmorek and M. Porter. 2004. Collaborative Systemwide Monitoring and Evaluation Project, Definition and Evaluation of Design Templates. DRAFT. Prepared by ESSA Technologies Ltd., British Columbia, Canada. http://www.cbfwa.org/Committees/CSMEP/Meetings/2004_0928-29/DraftDesignTemplate.doc

Parnell, I.J. 2004. Collaborative Systemwide Monitoring and Evaluation Project (CSMEP): Summary of Design Workshop June 9-11th, 2004 Resort at the Mountain, Welches, OR. Prepared by ESSA Technologies Ltd., British Columbia, Canada. http://www.cbfwa.org/Committees/CSMEP/Meetings/2004_0609/2004_0818CSMEPDesignWorkshop2004_0609Summary.doc

Porter, M., I.J. Parnell and D.R. Marmorek. 2004. Guidance in Applying EPA's Data Quality Objectives Process to CSMEP's FY05 Design Task. http://www.cbfwa.org/Committees/CSMEP/Meetings/2004_1110/AnnotatedDQOtemplate_final111104.doc

Appendix A: Summary of CSMEP Questions

(used to guide both assessments of the strengths and weaknesses of existing data and the development of robust monitoring designs)

1. Broadscale Fish Distribution and Ecosystem Status
• What is the distribution of adult salmonid fishes across broad regions?
• What is the ecosystem status for Columbia River Basin (CRB) fish populations?
2. Fish Population and Habitat Status and Trends
• What is the size, annualized growth rate, freshwater productivity, age-structure of CRB fish populations?
• How frequently do resident fish spawn, and what life history types make up different populations?
• What is the fraction of potential natural spawners that are of hatchery origin?
• What are the physical habitat condition, biological condition and chemical water quality of CRB fish spawning and rearing habitat?
• Have listed CRB populations recovered sufficiently for delisting and removal of ESA restrictions?
3. Action Effectiveness of Specific Recovery Actions (habitat, hydro, hatchery, or harvest management)
HABITAT
• Have specific habitat projects affected habitat conditions and local fish population survival, abundance or condition?
• Did groups of habitat projects within a subpopulation or sub watershed on aggregate affect fish survival, abundance or condition in a larger demographic unit?
• Are particular classes of habitat projects effective?
• What are the mechanistic connections between habitat actions and fish population responses?
• Have habitat projects achieved the expected improvements in conditions?
HARVEST
• What are the inseason estimates of run size and escapement for each management group and how do they compare to preseason estimates?
• What is the target and nontarget harvest and when is it projected to reach allowable levels?
HATCHERIES
• To what extent can hatcheries be used to assist in meeting harvest management goals while keeping impacts to natural populations within acceptable limits?
• To what extent can hatcheries be used to enhance viability of natural populations while keeping impacts to non-target populations within acceptable limits?
• To what extent can hatcheries be used to conserve the genetic legacy of imperilled fish populations?
HYDROSYSTEM
• Are smolt-to-adult survival rates (SARs) sufficiently high to meet NPCC and recovery goals?
• Has hydrosystem complied with performance standards set out in 2000 FCRPS BiOp?
• What are the patterns in fish survival rates both within the mainstem and subsequent to it, for different species and groups of fish (e.g. transported vs. in-river, hatchery vs. wild, upstream vs lower river)?

• What's the effect of different within-season transportation management and flow/spill management actions on various measures of fish survival rates?
• To what extent would Removable Spillway Weirs improve fish survival rates, at both the project scale and over the overall life cycle?

Table 1. CSMEP activities and work products (either past, current or future) that will help to address selected PNAMP objectives/outcomes. The underlined work product titles are hyper-linked to the file on the CSMEP website, and the URLs are listed in endnotes.

PNAMP Outcome/Objectives	Related CSMEP Activities/Products (Past & Current) and Limitations
Objective 1. Develop and Maintain a Monitoring Coordination Framework for the Pacific Northwest	• Relationship of the CBFWA Collaborative System-wide Monitoring and Evaluation Project to other research, monitoring and evaluation and data management efforts in the Columbia River Basin (draft) Relationship of CSMEP to other Basin M&E activities[1]
Outcome E Coordinate and recommend standard sampling protocols and field data collection procedures between Status/Trend, Effectiveness, and Implementation Monitoring efforts	• PNAMP has been taking the lead on development of standardized field protocols. CSMEP has offered to assist where possible (although this has not been CSMEP's focus) and has provided a summary of the comparative statistical/cost performance of different sampling methods to assist PNAMP evaluations Comparative table of statistical and cost properties of different fish sampling methods[2] • Summary of initial meeting regarding standardization of sampling protocols for Basin genetics PMs Genetics PMS standardization approaches[3] • There will be a need for continuing interaction between CSMEP and PNAMP on this topic. The most appropriate sampling protocol depends on the question, the scale at which it needs to be answered, the precision required in the answer, and the proposed analytical approach. Thus there's an interplay between CSMEP's identification of the most appropriate PMs to monitor for answering specific questions at a given level of precision, and PNAMP's effort to ensure that these PMs are collected in a consistent, reliable manner.
Objective 2. Coordinate Pacific Northwest Watershed Status/Trend Monitoring Efforts	• To date CSMEP has not focused on M & E relating to broad scale fish habitat and water quality questions. CSMEP did some initial, brief review of the systems that are currently collecting/interpreting broad scale habitat status data for the Columbia Basin (e.g. IBIS summary[4], ICBEMP summary[5]). Subsequently, CSMEP has essentially deferred to PNAMP's lead in pursuing these habitat questions and it has not been a priority for CSMEP. This could change conceivably, based on further NPCC guidance and continued integration of PNAMP and CSMEP.

PNAMP Outcome/Objectives	Related CSMEP Activities/Products (Past & Current) and Limitations
Objective 3. Coordinate Pacific Northwest Fish Population Monitoring Efforts	• This Objective is where CSMEP has focused its activities to date and will continue to do so into the near future. CSMEP has been undertaking metadata inventories in a series of pilot subbasins, and using what has been learned from these subbasins to develop M & E 'design templates' as a pilot effort for the Snake River Basin. CSMEP intends to direct its efforts in the coming fiscal year to refining the M & E templates for the Snake Basin and then expand/modify them as necessary for use on a larger regional basis, building on what has been learned from the data inventories, and strengths and weaknesses assessments.
Outcome A Identify the key questions that could be addressed with coordinated fish population monitoring in support of management. Identify the current and proposed monitoring metrics, monitoring designs, and evaluation methods that could be used to answer these questions.	• Detailed assessments of the quality of each pilot subbasin's existing inventory data for addressing fish monitoring questions CSMEP Data Strengths & Weaknesses Assessments - B2 Tables[6] • Synoptic assessments of action effectiveness evaluations that have been undertaken within the pilot subbasins (not comprehensive) CSMEP Action Effectiveness Evaluations – C4 Tables[7] • Summary of the 1st CSMEP Monitoring Design Workshop held in Welches, OR on June 9-11, 2004 CSMEP Design Workshop June 9-11, 2004[8] • Summary of the 2nd CSMEP Workshop, held with EPA staff in Corvallis, OR on July 21-22.2004 to refine explorations of alternative monitoring designs and the applicability of EMAP to Tier 1 and 2 questions CSMEP Design Workshop July 21-22, 2004[9] • Proposed design and evaluation of preliminary design templates, describing the proposed CSMEP process for analyzing alternative M&E designs against various criteria Evaluation approaches for CSMEP design templates[10] • Guidance for employing the EPA's Data Quality Objectives Process (DQO) to CSMEP's monitoring design tasks. The DQO process has been used in fy05 by CSMEP's Policy Interpretation Groups. Guidance in applying EPA's DQO[11] • CSMEP subgroup interpretations of key policy questions (DQO steps 1-5) for Status & Trends, and Habitat, Hydro, Harvest and Hatcheries CSMEP DQO Status & Trends and 4Hs Policy Interpretations[12] • Draft Channel Reconnection Effectiveness Monitoring Design for the Lemhi River (CSMEP test case and federal RME pilot) Lemhi preliminary monitoring design[13] • Draft agenda for upcoming CBFWA/CSMEP Research Monitoring and Evaluation (RME) Workshop, Bonneville, July 20-21, 2005 Draft agenda for July RME Workshop[14]

PNAMP Outcome/Objectives	Related CSMEP Activities/Products (Past & Current) and Limitations
Outcome B Identify, develop and recommend a standardized set of metrics and compatible protocols for sampling designs and data collection.	• Data descriptors and performance measures (PMs) to guide development of the CSMEP Inventory Database and Data Input system CSMEP Inventory Performance Measures[15] • Comparisons of the statistical and cost properties of different sampling methods for estimating fish PMs Comparative table of statistical and cost properties of different fish sampling methods[16] • Summary of power analyses for CSMEP fish performance measures Power analyses summary[17] • CSMEP Table of Genetics PMs (currently being developed in conjunction with fish genetics labs for the Basin) • CSMEP Table of Fish Habitat PMs (current being developed in conjunction with PNAMP and CSMEP's inventory work being undertaken for the Okanagan pilot) • Status and Trends design alternatives – preliminary matrix Status and trends preliminary design matrix[18]
Outcome C Identify regional fish population monitoring efforts, including agency specific activities, that are key components of a monitoring network	• Pilot Subbasin Inventory Metadata (CSMEP C1 Tables)[19] • The CSMEP subbasin inventory metadata web application CSMEP Data Entry Application[20] (user name:CSMEP, password:csmep) • Identification of US agency data servers/custodians for fish habitat data in the Columbia Basin US Columbia Fish habitat data servers[21] • Summary of Federal (Canada) - Provincial (British Columbia) Fisheries Data and Data Portals Canadian Columbia Fish Data Portals[22] • CSMEP Snake River Basin design template effort (ongoing)

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[1] Relationship of the CBFWA Collaborative System-wide Monitoring and Evaluation Project to other research, monitoring and evaluation and data management efforts in the Columbia River Basin (draft):
http://www.cbfwa.org/Committees/CSMEP/Documents/Reports/031804CSMEProleVer4.doc

[2] Comparative summary of the statistical and cost properties of different methods for estimating CSMEP fish performance measures
:http://www.cbfwa.org/Committees/CSMEP/Documents/Project/ComparativesummaryofPMmethods032105.pdf

[3] Summary of initial meeting regarding standardization of sampling protocols for Basin genetics PMs:
http://www.cbfwa.org/Committees/CSMEP/Documents/Reports/GeneticsMtgSummary101504.doc

[4] IBIS Summary
http://www.cbfwa.org/Committees/CSMEP/Documents/Reports/IBIS_summary.doc

[5] ICBEMP summary
http://www.cbfwa.org/Committees/CSMEP/Documents/Reports/ICBEMP.doc

[6] CSMEP Data Strengths & Weaknesses Assessments - B2 Tables:
http://www.cbfwa.org/committees/Documents.cfm?Commshort=CSMEP&Pull=Data#10

[7] CSMEP Action Effectiveness Evaluations – C4 Tables:
http://www.cbfwa.org/committees/Documents.cfm?Commshort=CSMEP&Pull=Data #16

[8] Summary of1st CSMEP Design Workshop June 9-11, 2004 (Welches, OR):
http://www.cbfwa.org/Committees/CSMEP/Meetings/2004_0609/2004_0818CSMEPDesignWorkshop2004_0609Summary.doc

[9] Summary of 2nd CSMEP Design Workshop July 21-22, 2004 (Corvallis, OR):
http://www.cbfwa.org/Committees/CSMEP/Meetings/2004_0721/2004_0721SummaryofWorkshop.doc

[10] Proposed design and evaluation of preliminary CSMEP design templates:
http://www.cbfwa.org/Committees/CSMEP/meetings/2005_0412-14/EvaluationDesignTemplate.pdf

[11] Guidance in applying EPA's DQO process to CSMEP's design tasks:
http://www.cbfwa.org/Committees/CSMEP/Meetings/2004_1214/AnnotatedDQOtemplatefinal112904.doc

[12] CSMEP DQO Policy Interpretations of Monitoring Issues for Status & Trends and the 4Hs:
http://www.cbfwa.org/Committees/CSMEP/meetings/2005_0412-14/CompositeDQOInterpretations.pdf

[13] Draft Channel Reconnection Effectiveness Monitoring Design for the Lemhi River (CSMEP test case and federal RME pilot): http://www.cbfwa.org/Committees/CSMEP/meetings/2005_0428/LemhiEffectivenessMonApril25-05Draft.doc

[14] Draft agenda for upcoming CBFWA/CSMEP Research Monitoring and Evaluation (RME) Workshop, Bonneville, July 20-21, 2005: http://www.cbfwa.org/Committees/CSMEP/meetings/2005_0720-21/agenda.doc

[15] Data descriptors and performance measures (PMs) to guide development of the CSMEP Inventory Database and Data Input: system:http://www.cbfwa.org/Committees/CSMEP/Meetings/2004_0701/ESSArevisedTableC1June28.doc

[16] Comparative summary of the statistical and cost properties of different methods for estimating CSMEP fish performance measures (same as endnote #1): http://www.cbfwa.org/Committees/CSMEP/Documents/Project/ComparativesummaryofPMmethods032105.pdf

[17] Summary of power analyses for CSMEP fish performance measures: Power analyses summary

[18] Status and Trends preliminary design matrix (Excel spreadsheet): http://www.cbfwa.org/Committees/CSMEP/meetings/2005_0428/AltDesignWorksheetAbundanceOnly042805.xls

[19] CSMEP Pilot Subbasin Inventory Metadata - C1 Tables): http://www.cbfwa.org/committees/Documents.cfm?Commshort=CSMEP&Pull=Data

[20] CSMEP's subbasin inventory metadata web application (user name:CSMEP, password:csmep): https://nrimp.dfw.state.or.us/csmep/

[21] US Columbia Basin agencies fish habitat data servers: http://www.cbfwa.org/Committees/CSMEP/Meetings/2004_0831/HabitatDataServers.doc

[22] Summary of Federal (Canada) - Provincial (British Columbia) Fisheries Data and Data Portals: http://www.cbfwa.org/Committees/CSMEP/Documents/Reports/FederalCanada-Provincial-BritishColumbia-FisheriesDatabases.doc