CSMEP Accomplishments

I) Inventory and Assessment

- Inventoried metadata for anadromous fish studies for 20 subbasins. In FY 2006 inventory efforts focused more intensively on resident species (bulltrout and cutthroat).
- Assessed strengths and weakness of data from above studies for addressing a structured set of monitoring questions about fish population status and trends at different spatial and temporal scales.
- Developed a Web database to store inventory metadata in readily accessible format and location which now contains a growing body of metadata for the pilot watersheds.

II) M&E Designs

Status & Trends

- Identified monitoring design elements necessary to adequately address one of the most important management decisions in the Snake River Basin: has there been sufficient improvement in population status of a listed Snake River S/S Chinook ESU to justify delisting and allow removal of ESA restrictions?
- Developed a simulation model that can be used to determine how alternative designs for monitoring: abundance, productivity, spatial structure and diversity affect our ability to answer TRT status and trends questions. These design alternatives are intended to define: 1) the location and temporal pattern of measurements ("sampling design"); 2) the specific types of measurements that are to be made ("response design"); and 3) the analyses to be performed to make a decision ("evaluation design"). Alternative design templates will be compared in terms of cost (dollars/yr) and probability of error in decisions that are associated with individual templates
- Developed an analytical plan for examining the accuracy of Mid-Columbia index survey expansion estimation methods and comparing the efficacy of EMAP and index surveying protocols for TRT population viability assessments of mid-Columbia steelhead
- Began to assemble information/GIS themes on the distribution and habitat use of the three runs of Snake Basin Chinook salmon, sockeye salmon, steelhead trout, and bull trout to address the potential of alternative monitoring designs to provide information on additional anadromous species and resident fish species in the CSMEP pilot subbasin

Hydro

- Developed an initial set of Low (L), Medium (M) and High (H) designs that both builds on the LMH designs developed for Status and Trend monitoring, and integrates across the major hydrosystem questions discussed in the previous Data Quality Objectives document developed for the hydrosystem[1]
- Developed an estimate of the cost of PIT-tagging both hatchery and wild Chinook parr (or smolts) from the Snake Basin under each of the LMH scenarios
- Developed and iteratively revised statistical models to evaluate the statistical reliability of alternative M&E designs to answer four key assessment questions that are of high

[1] Petrosky, C., D. Marmorek, D., C. Paulsen, P. Wilson, E. Weber, T. Berggren, and F. Young. 2005. CSMEP Hydrosystem Subgroup. DRAFT Document for Steps 6 and 7 of the DQO Process. December 02, 2005. 91 pp.

priority for hydrosystem decisions: 1) Are SARs sufficient for NPCC[2] and BiOp / TRT recovery goals?; 2) Is transportation more effective than in-river passage?; 3) Has the hydrosystem complied with performance standards set out in the 2000 FCRPS BiOp?; 4) How does the effectiveness of transportation change over the course of the season?

- The alternative M&E designs evaluated by the Hydro Subgroup involve variations in the number of fish PIT-tagged, the location of that tagging (i.e. from spawning area tributaries at the population scale, to main rivers representing Major Population Groups, to Lower Granite Dam and other mainstem projects representing the Snake River aggregate), the sampling duration (number of years monitored), the proportion of transported and control fish in the tagged population, and the true condition (e.g. true SAR or T/C relative to the goal).
- The metrics of statistical reliability include statistical power to test various hypotheses, and the Coverage (the chances that estimated confidence intervals for SARs will include the true mean)
- These analyses have revealed a number of very useful insights concerning the ability to answer these questions with alternative M&E designs (see Executive Summary of draft FY06 report).
- Further work is planned for FY 2006 to fine tune the LMH designs in response to these analyses, and clarify cost-precision and other tradeoffs (i.e. between different questions), so as to converge on the most reasonable designs that balance a number of competing objectives.

Harvest

- Assessing the value of harvest monitoring alternatives (bias, precision, and cost) using the *US v Oregon* Technical Advisory Committee (TAC) fishery impact models as a tool to describe how precision and bias of impact estimates may be influenced by changes in harvest monitoring (Snake River Spring/Summer Chinook salmon recovery monitoring has been the focus of design efforts in FY2006)
- Described the problems encountered in conducting fisheries, namely ensuring that fisheries related mortalities do not exceed prescribed levels for conservation of weak or federal ESA-listed salmon populations or predetermined allocation rates among user groups (*US v Oregon*, Pacific Salmon Treaty, Columbia River Compact).
- Identified the thresholds (impact rates) at which decisions to close or reshape fisheries occur and the performance measures and metrics needed to monitor and evaluate the magnitude of the impact rates
- Described the major fisheries that affect wild Snake River spring/summer Chinook salmon and defined the spatial scale of interest
- Reviewed the decision rules for each fishery that determine whether and for how long a fishery will be conducted
- Working with members of TAC, began identifying opportunities and constraints to develop alternative monitoring and evaluation designs relative to current monitoring ("status quo" M&E)
- Assembled datasets that represent examples of the statistical properties of the actual harvest monitoring data that are typically collected to estimate harvest impact rates.
- Began to examine the sensitivity of the impact model results to present and alternative inputs (i.e., effects of varying rates of sampling effort both temporally and spatially on precision and bias)

[2] Pg. 13 of NPCC mainstem amendments of 2003-2004. www.nwcouncil.org/library/2003/2003-11.pdf ; interim goals of 2-6% SAR

- Began to characterize the associated costs of alternative designs (e.g., FTEs, number of vehicles, boats, aerial flights, etc.)

Habitat Actions

- Developed a "question clarification process" that can be applied to development of individual monitoring designs dependent on the particular situation in different subbasins. Piloted this approach within the Lemhi Subbasin
- Compared CSMEP's M&E design development process and their final design recommendations for the Lemhi Subbasin with a parallel design process being undertaken concurrently for the Lemhi HCP
- Finalized Lemhi Subbasin habitat design work and engaged regional managers to determine the management objectives for the subbasin (a "closing the loop" process)
- Explored the actual statistical analyses that should be undertaken within the proposed CSMEP designs for testing each of the Lemhi habitat hypotheses
- Incorporated M&E designs for bull trout in the Lemhi Subbasin and explored how these might be integrated with the proposed low, medium, high Lemhi designs originally developed for spring chinook

Hatchery

- Identified uncertainties associated with the operation of hatcheries as a "class" of actions
- Developed a design strategy that should allow us to employ an EMAP style approach to probabilistically select locations/hatcheries, such that the information produced is applicable to all locations/hatcheries rather than just those where sampling occurs
- Assessed the distribution of current sampling effort, evaluated data gaps, and identified appropriate design strata for overall Basin wide monitoring of a suite of broad hatchery effectiveness questions
- Undertook initial development of a specific stratified study design to estimate the proportion of hatchery origin strays in target and non-target populations across the Snake River subbasin
- Undertook initial development of a specific stratified design to representatively allocate research using genetic parentage analysis to address the relative reproductive success of hatchery origin adults

Design integration

- Began to apply the PrOACT approach (a simplified multi-objective decision analysis) for the generation and filtering of alternative M&E designs across the CSMEP subgroups based on a suite of criteria which includes: 1) high inferential ability, 2) strong statistical performance, 3) reasonable cost, 4) practical application, and 5) environmental impact
- Developed a preliminary matrix of shared performance measures and data interdependencies across the different CSMEP design subgroups (i.e., providing a starting foundation for identifying the priority performance measures for monitoring and the relevant spatial scale(s) of these data for varied subgroup monitoring needs)
- Developed a preliminary matrix of integrated monitoring costs for the shared performance measures (i.e., working to achieve greater cost/labour efficiencies across monitoring designs)
- Ensured that subgroup analyses and monitoring designs explored as part of the project are consistent with the overarching objectives of Columbia River Basin monitoring agencies through facilitating shared interagency workshops with PNAMP