

Response to ISRP Comments  
Monitoring and Evaluation Statistical Support  
University of Washington  
BPA Project No. 199105100

ISRP Preliminary Comments

- a. A response related to monitoring and evaluation is needed.
  - The annual proposals to the Bonneville Power Administration (BPA) have identified tasks and subtasks. Performance of the project is measured, in part, on the timely and on-budget completion of the work elements defined in support of the BPA mission. The performance of the project is also measured by the number of visitors to the in-season run-time predictions of the smolt outmigration. Visitors to the website average now 1100 hits per day. At the peak of the outmigration, visits exceed 1700 hits per day. These numbers have generally increased at a rate of 25% per year. The web site also includes a survey page for users to provide commentary on the web products. Comments are reviewed continuously to help improve services.
- b. How many clients are supported by the statistical consulting service and is the service duplicated in other projects (e.g., 198910700)?
  - One group of clients is the public at large. The average of 1100 hits per day on the web site mentioned above represents an average of 700 unique visitors a day.
  - The primary client of the project, however, is the BPA; the goal of the project is to provide the BPA with independent analysis capabilities. The analysis of historical tagging data is used to provide BPA with analytical capabilities for the following issues:
    1. Management of the hydrosystem during migration to optimize spill and flow strategies to best benefit fish survival.
    2. Evaluate the potential effects of alternative hydromanagement strategies on salmonid passage and survival.
    3. Understand the effect of the hydrosystem in relationship to the rest of the environment on salmon recovery strategies.
    4. Help prioritize funding initiatives and the cost benefits of expenditures in the hydrosystem.
    5. Independent evaluation of the effects of the hydrosystem on mitigation success.
  - A third group of clients are investigators designing mitigation studies at hydroprojects. These projects include evaluating surface bypass collectors, spillways, sluiceways, fish guidance structures and screens—all to enhance safe passage through the hydrosystem. Statistical guidance on fish passage studies have been provided at Lower Granite, Little Goose, Lower Monumental, McNary, John Day, The Dalles,

and Bonneville dams to insure precise and accurate estimates of fish passage efficiency and effectiveness.

- There is no overlap between the services provided by this project and Project 198910700. Project 198910700 focuses solely on the design of future tagging studies and the development of statistical theory and models for proper analysis. Data analysis is not a primary component of that project. On the other hand, Project 199105100 has a strong focus on data analysis to support management decisions by the BPA and the fisheries community. The statistical consulting in Project 199105100 focuses on non-tagging technologies such as hydroacoustics.
- c. What evidence is there of client satisfaction and cost effectiveness?
- The continued increase in web users for the run-timing predictions is a strong indicator of user satisfaction. The fact that members of the Technical Management Team (TMT) come to the UW rather than FPC for in-season information is another indicator of user satisfaction.
  - The DART project and this project provide database services at a fraction of the budget of any other database projects or proposals. If you prorate the costs by number of daily users, this project compares even more favorably from a cost/user basis.
- d. What evidence is there that the extra-value information extracted has benefited fish?
- The extra-value analyses have benefited fish through the information used in managing fish resources. Examples of information that have or should have effected decisions include the following:
    1. The report by Skalski et al. (1996) demonstrated using CWT data that upstream-downstream paired-designs do not work because different fish stocks migrate to different parts of the ocean. If this information would have been acted upon, many tens of thousands of dollars and years of time could have been saved in the CSS study. The paired-design aspect of the CSS study has subsequently been abandoned because of the failure of the pairing. This example illustrates the difference between providing information to decision makers and informed decision-making which is outside the scope and authority of this project.
      - Skalski, J. R., R. L. Townsend, R. F. Donnelly, R. W. Hilborn. 1996. Relationship between survival of Columbia River fall chinook salmon and inriver environmental factors: Analysis of historic data for juvenile and adult salmonid production, Phase II. DOE/BP-35885-10. Final report to BPA, Portland, OR.
    2. Analysis of the freeze-brand data found strong biases in the estimation of mean travel time. The bias and lack of precision were suspected of masking the relationship between travel time and river flows. This problem with freeze-brand data was one of the motivations for the BPA to move ahead with PIT-tag

technology. Current data show strong flow – travel time relationships are subsequently used for the benefit of fish.

3. Analysis of subyearling chinook salmon CWT data has found a strong positive relationship between smolt size at time of release and their ocean survival rate across coastal hatcheries in Washington and Oregon. Changes in hatchery practices to maximize quality rather than quantity of smolt would benefit fish returns.
4. Analysis of ocean effects on the returns of CWT-tagged salmonids found a strong relationship between oceanographic conditions and early ocean survival of coho and subyearling chinook salmon. Understanding the effects of the ocean environment is important in understanding the contributions of the hydrosystem to recovery. Otherwise, the historically large adult returns in 2001 could be falsely inferred as recovery to the detriment of the fish.
5. Currently, we are compiling historical data on the PIT-tag detection efficiency at the juvenile bypass system at Bonneville Dam. This information is being used to develop minimum operating performance of the PIT-tag detector at the new corner collector. Historical precision levels of reach survival estimates are also being examined to determine the benefits of greater detection efficiency at Bonneville Dam in measuring performance standards for the 2005 and 2008 recovery decisions. Results will provide guidance on the cost/benefits and engineering requirements of the new facilities.

These few examples demonstrate the correct management decisions depend on accurate interpretation of data. The historical data provide a valuable source of needed information for managers. The project attempts to provide that support to BPA management and the fisheries community.

- e. What is the basis for deciding which hypotheses to test, parameters to estimate, and interrelationships to investigate?
  - The annual tasks of the project are determined in consultation with the BPA Fish and Wildlife staff. The tasks define which analyses to perform based on critical uncertainties BPA have in assessing management alternatives. The BPA is charged, in part, to assess the contribution of the hydrosystem operations on salmonid recovery. That mission leads to critical uncertainties concerning system operational effects and proper management of the hydrosystem for the benefit of both the environment and power production. Questions addressed by the project are defined by the BPA mission and their critical uncertainties.
- f. What evidence exists that the in-season statistical support has been sufficiently accurate to be useful?
  - At the end of each season since 1994, a retrospective evaluation of predictive precision is performed and reported in annual technical reports. This is the only project that reports its predictive precision and accuracy for public scrutiny. There is no measure of either accuracy or precision for any other run-timing predictions made

in the Basin. In many cases, the mean absolute deviance (MAD) from the true passage percentage is 2-5% across the season for a stock. Robson and Regier (1964) suggest a precision of  $\pm 50\%$  for rough management,  $\pm 25\%$  for careful management, and  $\pm 10\%$  for accurate research. This project is well within that framework for performance. The TMT has not expressed concern over the current level of precision nor specified any desired level of precision.

- Robson, D. S., and H. A. Regier. 1964. Sample size in Petersen mark-recapture experiments. *Transactions of the American Fisheries Society* 93:215-216.
- g. The ISRP recommends that Task 3.2 “Statistical evaluation of performance standards” be redirected to Project #198910700, a proposal from the proponent that seems to be more consistent with this task.
- As mentioned in the response to (b), Project 198910700, entitled “Statistical support for salmonid survival studies,” involves developing statistical methods for fish tagging studies. Furthermore, it involves minimal analysis of historical data. On the other hand, Project 199105100 is entitled “Monitoring and evaluation statistical support,” and its stated goal is to analyze historical data and provide BPA with information on critical uncertainties associated with hydromanagement and salmonid recovery. The evaluation of proposed decision rules to assess recovery status seems more appropriate with the mission of this project.
- h. The FY00 ISRP review noted that plans for formal evaluation do not exist other than those provided by observing the continued use of the products from this on-going project and the success of the investigators in publishing results.
- The performance of the project is evaluated in several ways.
    1. Peer review of scientific publications, a standard historically used to measure the quality of scientific products.
    2. Continued and expanded use of electronic data and analyses posted on the internet for the public.
    3. Completion of tasks specified by BPA staff on time and on budget.
    4. Continuous online survey of users of the internet for the products produced by this project.
    5. Providing timely information to BPA staff and interagency working groups requesting historical analyses of monitoring and evaluation data.
    6. Success in increasing the quantitative rigor of M&E activities in the Basin. Past successes have included:
      - a. Designing Basin-wide juvenile PIT-tag system implemented by the fisheries community.
      - b. Recommending the design of the Basin-wide adult PIT-tag detection system.
      - c. Substituting formal mark-recapture analysis for the relative recovery methods of analyzing tagging data in the past.
      - d. Moving the community away from batch-marking techniques to unique PIT-tag methods for measuring travel time.

- e. Encouraging NMFS to reevaluate the decision rules for measuring salmonid recovery based on statistical performance.
  - f. Presenting run-timing predictions for public scrutiny and examination.
  - g. Providing public access to the outmigration data for scientific and independent evaluation.
  - h. Designing hydroacoustic M&E studies with prescribed levels of precision that meet peer-reviewed standards.
- i. The budget and personnel are not adequately justified.
- The details of the 2003 budget for the project, including personnel time, are presented below.

### Task-Based Estimated Budget

Objective	Task	Estimated FY03 Cost	Personnel Time
1. In-season statistical support	a. Run-timing predictions	\$71,857	9 months
	b. Annual review of run-timing predictions.	10,970	2 months
2. Statistical analysis of historical tagging data	a. Post-season outmigration estimation.	67,750	7.5 months
	b. Analysis of smolt-to-adult ratios (SARs).	75,938	9 months
	c. Sample size software.	82,875	7 months
3. Statistical support for region	a. Statistical consultation.	28,420	3 months
	b. Statistical evaluation of performance standards.	56,845	6 months
Total		\$394,655	

- Objective 1a: Requires monitoring outmigration timing for 41 stocks for 8 months plus preseason preparation.
- 1b: Report preparation on predictive successes for all fish stocks monitored.
  - 2a: The task is analyzing PIT-tag smolt travel times and survivals for 25 stocks from 18 hatcheries and traps for years 1995-present.
  - 2b: The task is analyzing CWT data from 96 hatcheries and 174 stocks for the years 1975-present.
  - 2c: Interactive sample size software being developed for a variety of study designs used in the Basin.
  - 3a: Provides real-time statistical consulting to BPA, etc., along with review of technical reports as needed.
  - 3b: Participating with NMFS to evaluate RPA recovery rules based on Monte Carlo studies and analytical computations.