Northwest Power and Conservation Council

May 28, 2009

MEMORANDUM

TO: Council members

FROM: Jim Ruff -- ISAB ex officio

SUBJECT: Management Recommendations from ISRP/ISAB's Tagging Report #2009-1

Background
An exhaustive, comparative independent science review of various fish tagging technologies used in the Columbia River basin was completed in March 2009 along with recommendations for making the tagging programs more productive and efficient. The review was conducted jointly by the Independent Scientific Review Panel (ISRP) and Independent Scientific Advisory Board (ISAB), culminating in a "Tagging Report--A Comprehensive Review of Columbia River Basin Fish Tagging Technologies and Programs" dated March 17, 2009 (ISRP/ISAB 2009-1). A link to the science report can be found at http://www.nwcouncil.org/library/isab/isabisrp2009-1.htm.

The ISRP had suggested such a review following its 2006 evaluation of over 100 tagging-related projects requesting program funding during the project review cycle for fiscal years 2007-2009. Over several project review cycles and in various other reports, the ISRP has raised issues about tagging technology.

Such a review was timely because data from tagged or marked fish are used in the basin to provide information useful for effective decision-making in the Columbia River Basin (CRB). Fish of various species, stocks and sizes are tagged annually to obtain data on their numbers, harvest rates, behavior, migration and mortality rates, habitat use, and the success of hatchery and other enhancement programs. Results from these tagging investigations influence decisions on hydrosystem management such as spill for fish passage at mainstem dams and smolt transportation; harvest regimes in the ocean and river; hatchery practices; and endangered species risk assessments.

Consequently the Council, in a July 2007 letter, requested an independent science review of tagging technologies used in the Fish and Wildlife Program and the Corps' Anadromous Fish Evaluation Program (AFEP). Specifically, the Council requested that the ISAB and ISRP jointly address six questions:

851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
www.nwcouncil.org

Steve Crow
Executive Director

503-222-5161
800-452-5161
Fax: 503-820-2370

1. Can the coordination of fish tagging projects and programs, both within and outside of the program, be improved?
2. Can the compatibility between the results of different tagging studies be increased?
3. Can the Council, through its Fish and Wildlife Program, best encourage the development and use of innovative tagging technologies relevant to program RM&E needs?
4. Do gaps exist in the basin's capacity to collect life history information at the project or program scale because of lack of relevant technology?
5. Can criteria be developed for determining the most cost-effective tagging technology during the project review process?
6. How can this element of the program be made more cost-effective?

The ISRP and ISAB's report begins with recommendations and responses to the Council's questions. This is followed by summaries of fish tagging programs for three management domains: hydrosystem passage and operations; hatchery and harvest management; and estuary and ocean conditions monitoring. The report concludes with a brief summary of statistical considerations in tag programs. The appendices provide descriptions of the primary tagging technologies used in the basin and tables identifying ongoing projects recently funded through the Council's Fish and Wildlife Program, the Corps' AFEP, and the Pacific Salmon Commission's (PSC) Northern and Southern Funds.

This memo will summarize the science panels' major recommendations related to the Council's questions in five areas, identify those recommendations already being implemented in the basin, and suggest some management implications for the next Fish and Wildlife Program project review cycle.

Recommendations to Improve Coordination of Tagging Projects and Programs

1. All of the Council's Fish and Wildlife Program (FWP) projects involving tagging or marking of fish should include a coordination plan in the proposal describing: a) protocols for coordinating with other similar studies; and b) plans for data archiving and data sharing.

2. A web-based information network should be developed to help coordinate all CRB fish tagging projects and programs, e.g., networked web sites maintained by each agency funding tagging/marking projects. Web-based information should include the type of study (tributary, hydrosystem, estuary or ocean); principal investigator's name and contact information; species studied; ESU; location of study; dates; tagging technology used; and links to reports or published research results.

3. Establish a tagging/marking standing committee (e.g., panel of experts) designed specifically to improve coordination of tagging/marking projects and programs of the FWP, the Corps' AFEP, and the Lower Snake River Compensation Plan. In addition, such a committee could coordinate the future development and review of criteria for cost-effectiveness of FWP tagging projects and programs.

Recommendations to Improve the Cost-Effectiveness of Tagging Projects and Programs

1. Develop an inclusive FWP monitoring/tagging framework for all salmon and steelhead ESUs, major population groups, and independent populations, including both listed and unlisted species, to evaluate population status and trends, hydrosystem passage and operations, hatchery and harvest management, and estuary and ocean condition domains.

2. For FWP proposals during the next project review cycle, project sponsors should provide a review of the applicability and costs of different tagging technologies appropriate for their research or management objectives. In addition, proposal budgets should include itemized costs per unit, e.g., cost per tag and cost per receiver, and number of units to be purchased. This information will aid in evaluation of the overall costs of tagging and marking programs in the Basin.

Recommendations to Encourage Development and Use of Innovative Tagging Technologies

1. At present, the most effective strategy is to continue to develop several tag technologies that, when used in combination, are highly effective at addressing all FWP management needs. An alternative would be to develop a single tag technology that addresses most of the needs well, but does a mediocre job at addressing the remainder of the needs.

2. Continue to develop innovative techniques or improve existing techniques for surgical insertion of internal tags or external attachment of acoustic, radio, or data storage tags that reduce handling times, fish injury and stress.

<u>Recommendations Related to Specific Tagging Technologies</u>

- For **genetic markers**: (1) continue to develop standardized single nucleotide polymorphism (SNP) markers for all CRB salmon and steelhead ESUs; (2) continue to develop fishery and management models that use genetic data for both ocean harvest and in-river fisheries; and (3) **s**upport pilot and proof-of-concept trials for Parental-Based Tagging of hatchery populations of salmon and steelhead.

- For **otolith thermal marking**, further development of the otolith thermal marking technique, using pilot or proof-of-concept trials, as an alternative to coded wire tags (CWTs) to mark 100 percent of CRB hatchery salmon and steelhead.

- For **PIT tags**, further development of prototype in-stream transceivers for detection in key tributaries to monitor smolt and adult movements in both large and small tributaries to better understand salmonid behavior and migration timing, fate of juvenile, smolt, and adult migrants before and after dam passage and to spawning grounds.

- For **acoustic tag technologies**: (1) continue to miniaturize acoustic tags to increase battery life while reducing battery and tag size (or use of variable pulse rate tags that can be switched on and off); (2) develop an acoustic receiver system that can track fish tagged with all types of acoustic tags used in the CRB through the river and near-shore ocean over the continental shelf; (3) continue to develop ocean receivers that can be remotely downloaded; (3) develop sensors to detect when an acoustically tagged fish dies; and (4) evaluate the long-term effects of acoustic tags on salmon survival.

- For **radio tag technologies**: (1) develop miniaturized radio tag transmitters with longer battery life and no trailing antennas; (2) develop and use underwater antennas in depths greater than 9 meters; (3) increase the number of unique tagging codes; (4) develop sensor technology (depth, motion, water temp., etc.) for juvenile salmon tags; and (5) use radio tag technology together with PIT tags to address management needs in freshwater.

Recommendations to Close Gaps in Basin's Capacity to Collect Life History Information

1. Since there is a large gap in the capacity to collect data on the status and trends of wild fish populations in the basin, it is recommended the region employ PIT-tag technology in tributaries where complete counts of adults-in and smolts-out using weirs are infeasible. At those sites where a complete count of adults-in and smolts-out using weirs is effective, maintain that data collection. In addition, because the risks of capturing and PIT-tagging wild fish are significant, great care must be taken, especially if the population is small. To reduce the risks in handling wild fish for tagging, develop and implement projects to determine whether hatchery fish can be used as surrogates for wild fish (raised to match size/weight). Tag/mark 100% of CRB hatchery fish to facilitate hatchery broodstock management and evaluations of the impacts of hatchery straying on natural populations.

2. In the next FWP project review cycle, all tagging projects should address and document the statistical validity of tagging and tag recovery rates. Sample size calculations should be based on statistically valid methods and documented. Develop statistically valid sampling designs to estimate: (1) straying of adult hatchery-origin and natural-origin salmon and steelhead; (2) mortality of juvenile lamprey migrating downriver through the hydrosystem projects; and (3) mortality of adult lamprey migrating upriver through the hydrosystem projects.

3. Implement the relative reproductive and long-term monitoring projects identified in the Ad Hoc Supplementation Monitoring and Evaluation Workgroup (AHSWG 2008).

4. Develop and implement projects to address the long-term effects of all tag types on both juvenile and adult fish, e.g., initiate a comprehensive study to determine why PIT-tagged Snake River wild spring/summer Chinook salmon may be producing lower SARs than unmarked wild Chinook salmon (ISAB /ISRP 2007-6) and the extent of PIT-tag losses (Knudsen et al., in press). Long-term data are especially needed on the effects of acoustic and radio tags on juvenile and adult salmonids. Continue tagging studies with objectives to better standardize surgical protocols, tag size/weight criteria, and battery performance. Conduct studies to determine the rate and extent of tag shedding or loss for all tag types.

5. Develop PIT-tag detectors that can be used in mainstem dam spillways, removable spillway weirs, turbines, and selected tributaries to collect PIT-tag data on migration timing, straying, and survival by routes of passage to spawning tributaries, which currently cannot be done. Flat plate PIT-tag detector units, similar to the one developed for the corner collector at Bonneville Dam's second powerhouse, need to be developed for these other routes of passage and for dams and key tributaries throughout the hydrosystem.

Recommendations to Improve the Compatibility of Results of Fish Tagging Studies

1. During the next FWP project review cycle, all projects involved in ocean port sampling and lower river sampling for CWT recovery should address the tagging and tag recovery issues (statistical validity of tagging rates, tag recovery rates, and fishery sampling rates) presented in the Pacific Salmon Commission's Action Plan to Address the CWT Expert Panel (PSC Tech. Rep. No. 25, March 2008).

2. FWP and AFEP projects should be developed and implemented to evaluate and monitor the effects of handling stress and tagging on salmon growth, survival, migratory behavior, and other

biological characteristics to determine whether estimates of vital rates using data from tagged hatchery fish are representative of wild fish.

Recommendations Already Being Implemented or Addressed in Basin

A number of the science panels' recommendations are already being implemented or acted on in the basin. Several examples are provided below.

- Development of an inclusive FWP monitoring/tagging framework for all salmon and steelhead ESUs, major population groups, and independent populations, including both listed and unlisted species, to evaluate population status and trends, hydrosystem passage and operations, hatchery and harvest management, and estuary and ocean condition domains has already begun as part of the interagency anadromous sub-basin research, monitoring and evaluation review effort.
- To evaluate and monitor the effects of handling stress and tagging on salmon growth, survival, migratory behavior, and other biological characteristics, the Corps' AFEP has been funding and implementing a study to evaluate the comparative performance of acoustic-tagged and PIT-tagged juvenile salmon in the basin.
- The science panels' recommendation to tag/mark all CRB hatchery fish to facilitate hatchery broodstock management and evaluations of the impacts of hatchery straying on natural populations is consistent with a Hatchery Scientific Review Group's recommendation.
- The major recommendations related to genetic markers are largely consistent with recommendations from the *Report of the Expert Panel on the Future of the Coded Wire Tag Recovery Program for Pacific* Salmon dated November 2005. Some of the science panels' recommendations related to genetic markers may be advanced in near future by a proposed CRITFC project entitled *Influence of Environment and Landscape on Salmonid Genetics* (project #2009-005-00). This project was developed under the Columbia River Fish Accords.

Proposed Management Implications for Next FWP Project Review Cycle

1. All of the Council's FWP projects involving tagging or marking of fish should include a coordination plan in the proposal describing: a) protocols for coordinating with other similar studies; and b) plans for data archiving and data sharing.

2. To facilitate coordination of tagging projects, a web-based information network should be developed for all Columbia River Basin (CRB) fish tagging projects and programs, e.g., networked web sites maintained by the agency funding tagging/marking projects. Web-based information should include the type of study (tributary, hydrosystem, estuary, ocean); principal investigator's name and contact information; species studied; ESU; location of study; dates; tagging technology used; and links to reports or published research results. Initially, this type of information could be readily incorporated as part of Bonneville's new Taurus web-based database system for all Bonneville-funded FWP projects.

3. During the next FWP project review cycle, all projects involved in ocean port sampling and lower river sampling for CWT recovery should address the tagging and tag recovery issues (statistical validity of tagging rates, tag recovery rates, and fishery sampling rates) presented in

the Pacific Salmon Commission's Action Plan to Address the CWT Expert Panel (PSC Tech. Rep. No. 25, March 2008).

4. During the next FWP project review cycle, all tagging projects should address and document the statistical validity of tagging and tag recovery rates. Sample size calculations should be based on statistically valid methods and documented.

5. For FWP proposals during the next project review cycle, project sponsors should provide a review of the applicability and costs of different tagging technologies that are appropriate for their research/management objectives. In addition, proposal budgets should include itemized costs per unit, e.g., cost per tag and cost per receiver, and number of units to be purchased.

6. The region should establish a tagging/marking standing committee (e.g., panel of experts) designed specifically to improve coordination of tagging/marking projects and programs of the FWP, the Corps' Anadromous Fish Evaluation Program (AFEP), and the Lower Snake River Compensation Plan. Such a committee could also coordinate the future development and review of criteria for cost-effectiveness of FWP tagging projects and programs. This committee could be co-chaired by NOAA Fisheries and Bonneville or Corps, with other participants to be determined.