

Upstream Migration Timing

Table 1. Proposal Metadata

Project Number	2008-518-00
Proposer	Columbia River Inter-Tribal Fish Commission
Short Description	Run timing and upstream migration mortality of adult Chinook and sockeye salmon and steelhead through PIT tagging at Bonneville Dam (Upstream Migration Timing)
Province(s)	Mainstem
Subbasin(s)	n/a
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A. Abstract

This project seeks to use Passive Integrated Transponder (PIT) tags and, through another MOA project (Bonneville GSI), Genetic Stock Identification (GSI) to better assess Chinook, steelhead, and sockeye salmon adult migratory timing and survival through the Columbia River hydrosystem. Adults will be sampled at the Bonneville Dam Adult Fish Facility for scales, length, and tag and biological information in conjunction with existing Columbia River Inter-Tribal Fish Commission monitoring programs. Adults will also be PIT tagged and non-lethally sampled for genetic material. Upstream PIT tag detections will be used to track tagged and sampled fish through the hydrosystem and, in some cases, into the tributaries. GSI will identify the stock of many of these PIT tagged fish, allowing stock-specific upstream migration timing and mortality to be calculated. We also plan to use the PIT tag data to estimate stray rates and fall back, where possible on a stock-specific basis.

B. Technical and/or scientific background

Since 1985, the Columbia River Inter-Tribal Fish Commission (CRITFC) has, using Pacific Salmon Commission (PSC) funding, sampled Chinook and sockeye salmon at Bonneville Dam to determine age, length-at-age, and, in the case of sockeye salmon, stock identification (Whiteaker and Fryer 2007). In 2004, we took over a similar long-running steelhead sampling program at Bonneville Dam from Oregon Department of Fish and Wildlife (Whiteaker and Fryer 2007) The development and maturation of two new technologies, Passive Integrated Transponder (PIT) tags and genetic stock identification, have provided an opportunity to greatly expand the information obtained from our Bonneville monitoring program. PIT tag readers are now installed at fish ladders at most mainstem Columbia and Snake River dams, as well as at dams and weirs on many

tributaries. By PIT tagging fish that we sample at Bonneville Dam, we can track those fish upstream giving valuable information on migration timing and survival rates. PIT tags can provide much of the same information as radio tags at minimal expense, with greater sample sizes and reduced impact on the tagged fish. Unlike radio tags, this information is readily available to all managers and researchers on a real-time basis through the [PTAGIS system](#). The information obtained by PIT tags can be further expanded by identifying the origin of the fish using GSI. It then becomes possible, for many stocks of Chinook and sockeye salmon and steelhead, to determine migration timing, stray rates and upstream survival on a stock-specific basis without using radio tags.

Almost all PIT tagging presently done in the Columbia Basin is conducted on juveniles, either at hatcheries or at smolt traps located in some tributaries. These efforts predominantly study the effects of the downstream juvenile migration, but rarely tag enough fish to assess the adult return. There are also many salmon stocks for which no PIT tagging is done, thus it is difficult to answer questions on upstream migration timing, straying, and survival. This study will likely tag salmonid stocks that have not previously been tagged. Unlike juvenile tagging efforts, by tagging returning adults at Bonneville Dam we can obtain a reasonably representative sample of the run that could be useful other researchers and managers. Subsequent detections at upstream dams can be quickly downloaded from the PTAGIS website.

C. Rationale and significance to regional programs

Upstream migration of adult salmon is considered of critical importance to regional programs. PIT tagging adults allows these fish to be tracked through the hydrosystem, and their reaction to changing conditions to be monitored. For example, the ISRP and ISAB Example Summary Research Plan list as critical uncertainties the following:

1. What is the relationship between levels of flow and survival of juvenile and adult salmon and steelhead (including kelts) through the Columbia hydrosystem? Do changes in spill and other flow manipulations significantly affect water quality, smolt travel rate, and survival during migration? How do effects vary among species, life-history stages, and migration timings? What is the role of hydrodynamic features other than mid-channel velocity in fish migration?
2. What are the effects of multiple dam passages, transportation, and spill operations on adult salmon migration behavior, straying, and pre-spawn mortality, and SARs?
3. What is the effect of hydrosystem flow stabilization, flow characteristics, and channel features on anadromous and resident fish species and stocks?
4. What are the optimal temperature and water quality regimes for salmonid survival in tributary and mainstem reaches affected by dams, and are there options for hydrosystem operations that would enable these optimal water quality

characteristics to be achieved? What would be the effects of such changes in operations and environment on anadromous and resident fishes, shoreline and riparian habitat, and wildlife?

An ISAB report on harvest management of Columbia Basin salmon and steelhead (ISAB 2005) recommended that quantitative data on individual production units be collected and used to better manage fisheries. Implementation of PIT tag and GSI technology could make monitoring individual production units in mixed stock areas possible. This could lead to reduced uncertainty in harvest expectations and limits

The 2008 BiOp, Hydrosystem substrategy 1.2, mainstem adult fish passage improvement calls for the following:

- The Corps and BPA will provide spill to improve juvenile fish passage while avoiding high TDG supersaturation levels or adult fallback problems (RPA 29).
- The action agency will...monitor and evaluate adult salmonid survival upstream through the FCRPS. Adult migration studies—continue adult passage telemetry to evaluate adult survival through the hydrosystem including assessment of straying and unaccounted loss. Analysis will provide information necessary to assess the adult PIT-tag passage indices. (RPA 52)
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The long term tracking of fish with PIT tags could offer valuable information on delay, straying, and unaccounted loss through the hydrosystem. Fallback is another area of importance where PIT tags can be valuable. PIT tagged adults that fallback through juvenile bypass systems will be detected in those bypass systems. PIT tagged adults that pass over the spillway or through the turbines (and survive) will be detected if they choose to reascend the fish ladders.

This project will provide valuable information that will assist in sockeye restoration efforts in the Wenatchee and Okanogan basin, especially if we can use this project as justification for proposing PIT tag detection capability in the Okanogan Basin. Upstream migration survival appears to be a major problem for Okanogan sockeye (Okanogan subbasin plan page 273), although the impact likely varies by year (Fryer 1995). A Wenatchee basin sockeye salmon supplementation program has produced disappointing returns and this may be partly due to low survival on the upstream migration.

D. Relationships to other projects

This project will run simultaneously with our other Bonneville sampling projects (Age and length-at-age composition of Columbia Basin Chinook and sockeye salmon and steelhead and Stock composition of Columbia Basin sockeye stocks) (PSC, NOAA BiOp funded).

It is expected that other projects monitoring PIT tagged returns to subbasins will find the record provided by fish we PIT tag useful.