

# SMOLT MONITORING BY NON-FEDERAL ENTITIES

8712700

## SHORT DESCRIPTION:

Monitor smolt migration in the Lower Snake and Columbia Rivers as they leave the tributaries and pass through the dams, including collection of data required for BiOp measure implementation and development of information required for decision path determinations.

## SPONSOR/CONTRACTOR: PSMFC

Pacific States Marine Fisheries Commission  
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## SUB-CONTRACTORS:

PSMFC-administered Non-Federal SMP Sub-contractors  
(Contract #8712700):

1. Chelan Public Utility District (PUD): Rock Island Dam  
(#8712700)

Idaho Dept. of Fish & Game (IDFG):

(A) McCall & Rapid R. Hatcheries (#8712700)

Gas & Spill at Clearwater R. (#8712700)

Washington Dept. of Fish & Wildlife (WDFW):

(A) Lower Granite Dam (#8712700)

(B) McNary/Lower Monumental/Hanford (#8712700)

(C) Supplement: Ice Harbor GBT (#8712700)

Oregon Dept. of Fish & Wildlife (ODFW):

(A) Grand Ronde/Imnaha parr/analysis (#8712700)

(B) Little Goose Dam (#8712700)

(C) Lower Grande Ronde R. Trap (#8712700)

(D) Construction at Grand Ronde Trap (#8712700)

BPA-administered Federal SMP Sub-contractors (see  
individual contract numbers below):

U.S. Geological Survey (formerly National Biological  
Service (NBS)):

(A) GBT Training & QA, QC (#9602100)

(B) Physiological final report (#8740100)

U.S. Fish & Wildlife Service (USFWS): PIT marking in  
Snake R. & mid-Columbia R. (#8906500)

National Marine Fisheries Service (NMFS): John Day &  
Bonneville dams (#8401400)

PSMFC & BPA-administered: 1997 Hatchery PIT Tag  
Study (see individual contract numbers below. Note:

these contracts do not include cost of PIT tags)

USFWS: Snake & Lower Columbia R. hatcheries  
(#8906500)

IDFG: McCall, Rapid R., Pahsimeroi hatcheries (#9602000)

ODFW: Lookingglass, Imnaha hatcheries (#8712700)

WDFW: Cowlitz Hatchery (#8712700)

Cost of PIT Tags only (#9008000):

PSMFC-administered Non-federal SMP: PIT Tags only

Nez Perce Tribes: Imnaha River (#9008000)

BPA-administered Federal SMP : PIT Tags only

IDFG: Salmon, Snake R. (#9008000)

USFWS: Snake R. & mid-Col. Drainages (#9008000)

PSMFC & BPA-administered Hatchery PIT Tag Study: PIT  
Tags only (#9008000)

## GOALS

### GENERAL:

Supports a healthy Columbia basin, Maintains biological diversity, Maintains genetic integrity, Increases run sizes or populations, Adaptive management (research or M&E), Basis for management decisions

### ANADROMOUS FISH:

Hydro ops, mainstem passage, construction, Research, M&E

### NPPC PROGRAM MEASURE:

5.9A.1

### RELATION TO MEASURE:

Implementation of the collection and distribution of migration characteristics data as a basis for passage management decisions and implementation of ESA Biological Opinion measures, as well as monitoring and evaluation objectives.

### BIOLOGICAL OPINION ID:

NMFS BO RPA Sec. 13a

### OTHER PLANNING DOCUMENTS:

2.1.d.5.

<u>TARGET STOCK</u>	<u>LIFE STAGE</u>	<u>MGMT CODE (see below)</u>
Coho	Juvenile and adult	S
Sockeye	Juvenile and adult	L,P,S
Steelhead	Juvenile and adult	L,P,S
Chinook	Juvenile and adult	L,P,S

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## BACKGROUND

### STREAM AREA AFFECTED

**Stream name:**

Columbia and Snake rivers

**Subbasin:**

Columbia and Snake rivers

**Stream miles affected:**

702 miles

**Hydro project mitigated:**

All of the federal hydrosystem

**Habitat types:**

mainstem migration corridors

### HISTORY:

Component of basin-wide Smolt Monitoring Program, which is the basis of flows and passage management data submitted to the Fish Passage Center. Agencies and tribes funded under this contract are Idaho Department of Fish and Game (IDFG), Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), Nez Perce Tribe and Chelan County PUD. (Prior to 1994 this contract also included the funding of the Fish Passage Center budget.) IDFG has conducted smolt trapping activities for the SMP since 1985 on the Snake and Clearwater rivers near Lewiston, Idaho. Since 1993 IDFG has also operated a scoop trap on the lower Salmon River near Whitebird Idaho for the SMP. In 1996 the Snake and Salmon River trap operations will continue, while the Clearwater River trap operation will be replaced with an electroshocking and beach seining operation for the purpose of monitoring Gas Bubble Trauma in resident and migratory fish in the Clearwater River as a result of spill at Dworshak Dam. The Snake and Salmon River trap operations provides data on outmigration timing and serves as a site for PIT tagging smolts for subsequent analysis of travel time and survival indices. The Grande Ronde component was initiated by ODFW in 1994 to provide baseline data on the overall outmigration of smolts from the Grande Ronde River drainage. Smolt monitoring has been conducted by the Nez Perce tribe since 1991 under the Lower Snake River Compensation Plan (LSRCP) hatchery evaluations program, and in 1993 a joint effort was initiated with the Fish Passage Center (FPC) to better coordinate the ongoing outmigrant trapping operation with FPC project needs. Since 1996, SMP program funds have covered about two-thirds of the cost of the Imnaha River smolt monitoring activities. Each of the trap sites provides data on

outmigration timing and biological characteristics of outmigrating smolts, as well as data on migration rates and survival indices to downstream dams from the component of the run that is PIT tagged and released from each trap. An additional smolt monitoring site that is used to PIT tag outmigrating smolts is Rock Island Dam. A bypass trap has been operated at Powerhouse 2 by Chelan County PUD for the SMP since 1995. Migration timing past the dam, and gas trauma monitoring are also conducted at this site. SMP activities occur at each of the dams on the Snake and Columbia River conducting Corps Fish Transportation. Funds at these sites are split between the SMP and the Corps Fish Transportation and Oversight Program. The Corps funds transportation related activities, fish ladder hydraulic inspections and part of the daily fish sampling activities. The SMP funds part of the daily fish sampling activities and all of the activities related to gas bubble trauma monitoring, plus SMP funds cover data summarization and daily electronic data transmission. SMP responsibilities at these Corps fish transportation sites is split among state agencies. ODFW conducts the monitoring at Little Goose Dam, WDFW conducts the monitoring at Lower Granite, Lower Monumental and McNary dams. Monitoring at Lower Monumental and McNary dams was originally conducted by NMFS, but WDFW assumed responsibility for this activity in 1988 at Lower Granite Dam and in 1990 at McNary Dam. This resulted in an overall cost reduction due primarily to lower state administration overhead rates and partial time sharing of positions funded through other contracts. At Lower Monumental Dam, WDFW conducted gateway sampling from 1985 through 1991, and beginning in 1993 conducted smolt monitoring activities in the newly constructed collection/bypass system. Beginning in 1997, the Smolt Monitoring Program will incorporate the "Comparative Survival Rate Study of Hatchery PIT Tagged Chinook". This study will develop smolt-to-adult survival index, compare these rates among transported and non-transported fish, and upstream and downstream stocks.

**BIOLOGICAL RESULTS ACHIEVED:**

The quality of passage conditions at the Snake River dams directly affects survival to the estuary and eventually to adult. Whatever can be done operationally to insure a higher quantity of smolt leaving the system is a priority for this project (i.e. reduce descaling, lingering in areas where H2O temps increase occasionally, etc.) The travel time and flow relationship of smolts is quantified along with the documentation of the actual migration timing for each species for a particular year. Ball park estimates of survival from tag observations as fish move downstream through the system and at their return as adults. Assessment of GBT related to the spill program has also been realized. Collection of basic biological and hydroelectric operation data has also been achieved along with providing sample fish for research activities. Results have included the outmigration timing of smolts biological characteristics of smolts, and relative effect of water temperature and water discharge on smolt outmigration of wild and hatchery chinook salmon and steelhead trout smolts. PIT tagging studies have allowed distinction of chinook salmon and steelhead trout smolts migrating through the Snake River and Columbia River hydroelectric projects. Results from chinook salmon and steelhead trout smolt outmigration timing data and from PIT tag interrogation information at the dams have allowed managers increased information to make informed decisions concerning flow augmentation and spill planning. Documenting dam arrival timing of wild chinook smolts will assist managers to implement spill to benefit smolt survival at hydroelectric facilities.

**PROJECT REPORTS AND PAPERS:**

Annual reports are prepared by all agencies and tribes participating in the Smolt Monitoring program.

**ADAPTIVE MANAGEMENT IMPLICATIONS:**

The data provides an essential component for making decisions regarding flow augmentation and spill as they affect wild and hatchery salmonid stocks in terms of survival and rate of migration. Gas Bubble trauma data is particularly relevant to strategies for spill management and flow augmentation. At the same time the fish condition data relevant to any water management strategy allows for policy decision makers to reflect on fish passage quality with specific river operations. Decision makers use information on the spring and summer outmigration timing of wild and hatchery chinook salmon and steelhead trout smolts. They also use the data on PIT tagged fish arrival timing at dams, travel time to the dams and relative survival to the dams. This provides managers in-season information on which to base flow augmentation and spill decisions relative to management of endangered chinook salmon juveniles. In addition, smolt-to-adult survival indices will contribute to the decision path regarding long term mitigation measures.

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**PURPOSE AND METHODS**

**SPECIFIC MEASUREABLE OBJECTIVES:**

Ability to evaluate and implement operational modifications to reduce injury to fish passing via the collection facility. Each monitoring site has the following specific objectives 1) determine the spring and summer outmigration timing of salmonid

smolts, 2) determine for PIT tagged smolts the outmigration timing and travel time from release site to downstream dams, and 3) provide final report summarizing results of smolt monitoring activities, 4) provide smolt -to-adult survival indices, 5) comparative survival of hatchery PIT tag chinook and an evaluation of the smolt transportation program.

**CRITICAL UNCERTAINTIES:**

Whether or not PIT tags affect smolt behavior and survival. The high river discharge during smolt outmigration irrevocably implies increased survival for a particular cohort.

**BIOLOGICAL NEED:**

The SMP is mandated in the Northwest Power Planning Council's (NPPC) Program for flow augmentation and spill management and to evaluate any future reservoir drawdowns. This information will be useful for evaluation of the effects of flow, smolt condition and other environmental factors on outmigration timing, travel time and relative survival of wild and hatchery chinook salmon steelhead trout smolts. The NPPC's Program includes measures for flow, spill, and drawdown to provide for partial mitigation for losses due to operation of mainstem dams on the Snake and Columbia Rivers. The Program establishes and directs the Fish Passage Center to manage fish mitigation measures on behalf of the fishery agencies and tribes represented on the Columbia Basin Fish and Wildlife Authority. Specifically, the Program directs the Fish Passage Center to: 1) plan and implement the annual Smolt Monitoring Program; 2) develop and implement flow and spill requests; and 3) monitor and analyze smolt monitoring results to assist in flow augmentation and spill planning and reporting. The project ensures that avenues to reduce fish injury or stress are a primary concern to the facility operators. The collected data provides for in season water management of flow, spill effects on successful fish passage. The baseline for each drainage shifts independently and unpredictably. It is for this reason that overall outmigration needs to be assessed annually and accumulated to allow examination for trends/or lack of trends relevant to the manageable downstream water parameters.

**HYPOTHESIS TO BE TESTED:**

Salmonids that outmigrate at higher river discharges migrate faster and survive to Lower Granite Dam interrogation site in higher numbers. Higher river discharge and lower water temperatures during summer months increase fall chinook smolt survival.

**ALTERNATIVE APPROACHES:**

N/A

**JUSTIFICATION FOR PLANNING:**

N/A

**METHODS:**

Fish are sorted by size at the wet separator and funneled accordingly through a pit tag detector which either bypasses them to the river or sends them to a sample tank. Fish are subsampled from this group at an interval relative to the number of fish passing. The 24 hour subsample is anesthetized and species, fork length, GBT, fish injury data are collected. The data are summarized entered into appropriate software and downloaded. Smolts pit tagged and released are used in travel time analyses. Analysis involves summarization and subsequently a regression between travel time and the reciprocal of flow. The salmonids intercepted will be wild and hatchery spring chinook, wild and hatchery steelhead and subyearling fall chinook. Incidental capture of other non target species is also roughly assessed. The Fish Passage Center plans the annual Smolt Monitoring Program which the fishery agencies and tribes implement at smolt monitoring sites. Fish Passage Center staff provides technical assistance, computer assistance, and biometrician consultation to the SMP sites as needed.

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**PLANNED ACTIVITIES**

**SCHEDULE:**

**Planning Phase**                      **Start** 3/4/96                      **End** 1/8/97                      **Subcontractor** yes(see 13)

**Task** Major tasks include a new lower river monitoring site to be developed for the Grande Ronde River, and major modifications to the fish sampling facilities at John Day and Bonneville dams. Project activities are generally the same each year but the number of fish to be PIT tagged by species can vary. The SMP sites will collect data from a subsample of the total daily collection on species abundance, mark recaptures, fork length, gas bubble trauma, fish condition (descaling body fungus).

project operations, flow data, and water temperature. The SMP sites will transfer these data electronically on a daily basis to the Fish Passage Center. Major project tasks for 1997 and beyond will continue to focus on the SMP objectives outlined in the 1997 statement of work, including development of smolt-to-adult survival indices.

**PROJECT COMPLETION DATE:**

12/31/97

**CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:**

We believe the benefits of the knowledge gained through the SMP with the many project safeguards put in place to protect migrating smolts far outweigh any risk involved. See Underlying Assumptions or Critical Constraints section.

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## **OUTCOMES, MONITORING AND EVALUATION**

### **SUMMARY OF EXPECTED OUTCOMES**

**Expected performance of target population or quality change in land area affected:**

Data to support water strategies that improve fish survival. Annual data that monitors throughout the downstream migration season the quality via external examination of juvenile passing the hydroelectric facility through the collection system. SMP project will provide in-season information on relative number and outmigration timing of wild and hatchery chinook salmon and steelhead trout smolts. It will also provide data relative to outmigration timing, travel time and relative survival of PIT tagged smolts from release site to Snake River and Columbia River Dams. This information is needed by managers to make flow augmentation and water spill recommendations and decisions to enhance survival of smolts through the hydroelectric projects. In addition, the SMP will provide long-term smolt-to-adult survival indices.

**Present utilization and conservation potential of target population or area:**

N/A

**Assumed historic status of utilization and conservation potential:**

N/A

**Long term expected utilization and conservation potential for target population or habitat:**

N/A

**Contribution toward long-term goal:**

Rebuilding the wild, natural and hatchery populations of anadromous fish.

**Indirect biological or environmental changes:**

Modifications of hydrosystem operation regimes and fish mitigation measures.

**Physical products:**

Approximately 268,321 PIT tagged fish, daily passage data provided to the region.

**Environmental attributes affected by the project:**

Flow, spill, timing of hydrograph, project operations.

**Changes assumed or expected for affected environmental attributes:**

Changes in hydrosystem operations for fish passage mitigation.

**Measure of attribute changes:**

N/A

**Assessment of effects on project outcomes of critical uncertainty:**

Annual analysis, real time implementation.

**Information products:**

Monitoring data, migration characteristics, passage indices, gas bubble trauma symptoms, historical data, and survival indices required for decision analysis.

**Coordination outcomes:**

System operation requests, fish passage data and analysis, data distribution to the region.

**MONITORING APPROACH**

Fish are sorted by size at the wet separator and funneled accordingly through a pit tag detector which either bypasses them to the river or sends them to a sample tank. Fish are subsampled from this group at an interval relative to the number of fish passing. The 24 hour subsample is anesthetized and species, fork length, GBT, fish injury data are collected. The data are summarized entered into appropriate software and downloaded. Smolts pit tagged and released are used in travel time analyses. Analysis involves summarization and subsequently a regression between travel time and the reciprocal of flow. The salmonids intercepted will be wild and hatchery spring chinook, wild and hatchery steelhead and subyearling fall chinook. Incidental capture of other non target species is also roughly assessed. The Fish Passage Center plans the annual Smolt Monitoring Program which the fishery agencies and tribes implement at smolt monitoring sites. Fish Passage Center staff provides technical assistance, computer assistance, and biometrician consultation to the SMP sites as needed. The project provides data to the region for real time management decisions.

**Provisions to monitor population status or habitat quality:**

FPC data system collects, archives, and maintains data on passage and hydraulic conditions provided for fish passage.

**Data analysis and evaluation:**

Various analysis: smolt-to-adult return, travel time, passage distribution, etc.

**Information feed back to management decisions:**

Data is provided daily to the region through the Fish Passage Center home page, weekly reports and annual reports.

**Critical uncertainties affecting project's outcomes:**

N/A

**EVALUATION**

Data and analysis produced and utilized on a daily, weekly, monthly, and annual basis for mitigation management decisions, and for long-term decision path determinations on the basis of smolt-to-adult survival indices.

**Incorporating new information regarding uncertainties:**

The project is reviewed and modified annually by the regions fish and wildlife managers.

**Increasing public awareness of F&W activities:**

By provision of passage and migration characteristics data regionally and nationally.

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**RELATIONSHIPS**

**RELATED BPA PROJECT**

9602000 Hatchery PIT Tag Study

9008000 PSMFC: Col. Basin PIT Tag Info. System

**RELATIONSHIP**

key component

key component

8401400 National Marine Fisheries Service	key component
8906500 US Fish & Wildlife Service	key component
8740100 US Geological Survey(formerly NBS)	key component
9602100 US Geological Survey(formerly NBS)	key component
8332300 Idaho Fish & Game	key component
9403300 Fish Passage Center	key component

**RELATED NON-BPA PROJECT**

NMFS Survival Study: #9302900

**RELATIONSHIP**

NMFS cooperation

Smolt Transportation Study: #9204101 COE cooperation

**OPPORTUNITIES FOR COOPERATION:**

As part of the smolt monitoring program by non-federal entities, the activities of participating entities are coordinated with the fisheries managers through the Fish Passage Center. All mark groups and data utilized by other projects are reviewed and utilized to avoid duplication, including lower Snake Compensation Plan activities and research from other programs.

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**COSTS AND FTE**

**1997 Planned:** \$1,300,000

**FUTURE FUNDING NEEDS:**

<u>FY</u>	<u>\$ NEED</u>	<u>% PLAN</u>	<u>% IMPLEMENT</u>	<u>% O AND M</u>
1998	\$2,779,881			
1999	\$2,631,897			
2000	\$2,793,338			
2001	\$2,964,788			
2002	\$3,146,868			

**PAST OBLIGATIONS (incl. 1997 if done):**

<u>FY</u>	<u>OBLIGATED</u>
1987	\$800,332
1988	\$921,430
1989	\$1,022,337
1990	\$989,545
1991	\$1,221,103
1992	\$1,278,046
1993	\$1,396,393
1994	\$682,927
1995	\$1,139,870
1996	\$1,340,012
1997	\$1,212,704

TOTAL: \$12,004,699

Note: Data are past obligations, or amounts committed by year, not amounts billed. Does not include data for related projects.

**OTHER NON-FINANCIAL SUPPORTERS:**

Chelan County PUD; Idaho Department of Fish and Game; Washington Department of Fish and Wildlife; Oregon Department of Fish and Wildlife; Nez Perce Tribes; U.S. Geological Survey (formerly known as National Biological Service); U.S. Fish and Wildlife Service; National Marine Fisheries Service; and; Pacific States Marine Fisheries Commission.

**LONGER TERM COSTS:** 2003 Estimated total costs \$3,340,237

Continued implementation and for operation and maintenance.

**1997 OVERHEAD PERCENT:**

Each agency charges a different overhead rate. (Chelan 10%; IDFG 26.4%; WDFW 19.5%; ODFW 20.5%; and Nez Perce 29.5%). For the portion where PSMFC employs seasonal help for the state agencies, PSMFC charges 15%. PSMFC charges approximately 2% on funds passed-through to the subcontractors.

**HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:**

Applies to all direct costs except capital outlay.

**CONTRACTOR FTE:**       None

**SUBCONTRACTOR FTE:**   Chelan 1.86; IDFG .80; WDFW 8.8; ODFW 4; Nez Perce 2.4.

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