
PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Comparative Survival Rate Study (Css) Of Hatchery Pit Tagged Chinook

BPA project number: 8712702

Contract renewal date (mm/yyyy): 12/1998 **Multiple actions?**

Business name of agency, institution or organization requesting funding

Pacific States Marine Fisheries Commission

Business acronym (if appropriate) PSMFC

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses

3.6F.10, Sections 303, 403b, 1408.2.8

FWS/NMFS Biological Opinion Number(s) which this project addresses

RPA Section 13 A, C and RPA Section 17

Other planning document references

NMFS Biological Opinion RPA 13 (a) & RPA 17

Short description

Adult and juvenile PIT tag recovery data are analyzed to compare survival estimates for transported fish of known origin, downriver stocks, wild and hatchery transported fish and fish handled and not handled at dams.

Target species

Spring Chinook Salmon

Section 2. Sorting and evaluation

Subbasin

Mainstem Snake & Columbia Rivers

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
<input checked="" type="checkbox"/> Anadromous fish <input type="checkbox"/> Resident fish <input type="checkbox"/> Wildlife	<input type="checkbox"/> Multi-year (milestone-based evaluation) <input type="checkbox"/> Watershed project evaluation	<input type="checkbox"/> Watershed councils/model watersheds <input checked="" type="checkbox"/> Information dissemination <input type="checkbox"/> Operation & maintenance <input type="checkbox"/> New construction <input checked="" type="checkbox"/> Research & monitoring <input checked="" type="checkbox"/> Implementation & management <input type="checkbox"/> Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects**Umbrella / sub-proposal relationships.** List umbrella project first.

Project #	Project title/description
20552	Smolt Monitoring Program

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9008000	PITAGIS	Critical Component
8712700	Smolt Monitoring	Critical Component
94033	Fish Passage Center	Critical Component
960200	Marking Spring Chinook	Critical Component

Section 4. Objectives, tasks and schedules**Past accomplishments**

Year	Accomplishment	Met biological objectives?
1997	Completed all tasks planned for 1997	Yes
1998	Completed all tasks planned for 1998; provided data base for analysis of down stream migration	Yes

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Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Develop a long-term index of transport survival rate (smolt-to-adult) to inriver survival rate (smolt-to-adult for Snake River hatchery spring & summer chinook smolts.	a	Compute annual ratio of transport survival rate to inriver survival rate
		b	Test if the annual ratio of transport survival rate to inriver survival rate (measured at LGR w/associated confidence intervall
		c	Evaluate inriver controls obtained from fish PIT tagged at the hatcheries have higher smolt-to-adult survival rates to LGR than inriver controls from migrating fish that were collected, handled, and PIT tagged at LGR
2	For Snake River basin hatcheries, develop a long-term index of survival rates from release of smolts at hatcheries to return of adults to hatcheries.	a	Partition survival rates (i) from hatchery (smolts) to Lower Granite Dam (smolts), (ii) from Lower Granite Dam (smolts) back to Lower Granite Dam (adults), and (iii) from Lower Granite Dam (adults) to the hatchery (adults).
		b	For the combined Snake River hatcheries, compute the annual survival rate of smolts transported at Lower Granite Dam to adult returns to the hatcheries.
		c	For the combined Snake River hatcheries, compute the annual survival rate of smolts migrating inriver to adult returns to the hatcheries.
		d	Explore the feasibility of increasing mark sizes to improve precision in the annual ratio of transport survival rate to inriver survival rate [Task 1(a)] measured back to the hatchery.
3	Compute and compare overall	a	Compute annual hatchery survival

	smolt-to-adult survival rates for selected upriver and downriver spring and summer chinook hatcheries.		rates (adjusted for terminal harvest rates) using both CWT and PIT tags for selected upriver and downriver hatchery stocks. Compare survival rates of CWT and PIT tag estimates. Estimate survival rates (smolt-to-adult) fo
		b	Compute an annual ratio of downriver hatchery survival rate to upriver hatchery survival rate (all measured at the hatcheries and adjusted for terminal harvest) with associated confidence interval.
		c	Test if the annual ratio of downriver hatchery survival rate to upriver hatchery survival rate (all measured at the hatcheries) is greater than 2.0 with sufficient power to provide a high probability that the ratio is greater than 1.0.
		d	Test aggregately & individually the annual ratio of downriver hatchery survival rate to upriver hatcheries transported smolts survival rate is greater than 2.0 with sufficient power to provide a high probability that the ratio is greater than 1.0.
		e	Explore the feasibility of developing lower river wild index stocks (e.g., Warm Springs, John Day, and Klickitat rivers) to measure smolt-to-adult survival rates.
4	Begin a time series of smolt-to-adult survival rates for use in the PATH hypothesis testing process and in the regional long-term monitoring and evaluation program, which is under development.		
5	Begin a time series of smolt-to-adult survival rates for use in the PATH hypothesis testing process and in the regional long-term monitoring and evaluation program, which is under development.	a	Collect and catalog scales from PIT tagged adults detected at Lower Granite Dam adult trap or at the upriver hatcheries.

		b	Coordinate with the downriver hatcheries to collect and catalog scales from CWT groups that are representative of the production lots from which the PIT tagged fish were taken.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	1/2000	12/2000			20.00%
2	1/2000	12/2000			20.00%
3	1/2000	12/2000			20.00%
4	1/2000	12/2000			20.00%
5	1/2000	12/2000			20.00%
				Total	100.00%

Schedule constraints

None known at this time.

Completion date

Unknown

Section 5. Budget

FY99 project budget (BPA obligated): \$908,793

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel		%12	113,689
Fringe benefits		%4	34,990
Supplies, materials, non-expendable property	Included in Operations & Maint.	%0	
Operations & maintenance		%5	45,645
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	0
NEPA costs		%0	

Construction-related support		%0	
PIT tags	# of tags: 221,500	%69	642,350
Travel		%1	7,802
Indirect costs		%7	62,061
Subcontractor		%0	
Other	Oversight Committee	%3	29,664
TOTAL BPA FY2000 BUDGET REQUEST			\$936,201

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount (\$)
		%0	
		%0	
		%0	
		%0	
Total project cost (including BPA portion)			\$936,201

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	\$983,011	\$1,012,501	\$1,042,876	\$1,074,162

Section 6. References

Watershed?	Reference
<input type="checkbox"/>	Boregerson, L.A. 1991. A determination of the hatchery and wild ratios and selected life history characteristics from scales of transported and non-transported groups of spring chinook and steelhead in the Snake River. Oregon Department of Fish and Wildl
<input type="checkbox"/>	Boregerson, L.A. 1992. Life history studies of spring and summer chinook salmon and steelhead from the Snake River using scale analysis. Oregon Department of Fish and Wildlife, Annual Progress Report, Portland.
<input type="checkbox"/>	Burnham, K.P., D.R. Anderson, G.C. White, C. Brownie, and K.H. Pollock. 1987. Design and analysis methods for fish survival experiments based on release-recapture. American Fisheries Society Monograph 5. ISSN 0362-1715. Bethesda, Maryland. 437 p.
<input type="checkbox"/>	Snedecor, G.W. and W. G. Cochran. 1967. Statistical methods. Sixth edition. Iowa State University Press. Ames, Iowa. 593 p.

PART II - NARRATIVE

Section 7. Abstract

The Comparative Survival Study is the fourth year of a long term PIT tag study to develop smolt-to-adult survival indices for spring and summer stream type chinook originating above Lower Granite Dam to evaluate smolt migration mitigation measures and actions (such as flow augmentation, spill, and transportation) for the recovery of listed salmon stocks. The objective of developing smolt-to-adult survival indices is consistent with the recommendations of the PATH (Plan for Analyzing and Testing Hypotheses) process being carried out by the regional, state, federal and tribal salmon managers with the Northwest Power Planning Council (NPPC). The PATH recommendations address the question, “can transportation of fish to below Bonneville Dam compensate for the effect of the hydro system on juvenile survival rates of the Snake River spring and summer chinook salmon during their downstream migration?” The PATH recommended research includes the following; 1) Estimate smolt-to-adult survival rate (SAR) for transported wild and hatchery stream type chinook, 2) Determine if SAR rates are significantly different from the interim SAR hydro goal, 3) Compare SARs of transported and downriver indicator stocks, 4) Estimate transport/control ratio and in-river survival concurrently over a number of years in order to span a range of environmental conditions.

Section 8. Project description

a. Technical and/or scientific background

This project incorporates the long term PIT tag marking and recovery of large numbers of groups of hatchery spring chinook juveniles. Hatchery groups from Lookingglass, Imnaha, McCall, Rapid River, Dworshak, Round Butte, Warm Springs, and Carson facilities. These PIT tag groups will be an important component of the regional Smolt Monitoring Program. The interagency Comparative Survival Study Oversight Committee will analyze recovery of tag data in returning adults. These analyses will result in smolt-to-adult survival estimates, comparison of wild and hatchery chinook SARs, evaluation of the transportation program and comparison of upriver and downriver SARs.

The project was developed through the regional PATH process, and is intended to address the question, “ can transportation of fish to below Bonneville Dam compensate for the effect of the hydrosystem on juvenile survival rates of Snake River spring and summer chinook salmon during their downstream migration?” The study design was developed by the Comparative Survival Study Oversight Committee. The committee includes the PATH representatives of the Washington Department of Fish and Wildlife, the Oregon Department of Fish and Wildlife, the Idaho Department of Fish and Wildlife, the Columbia River Intertribal Fish Commission and a representative of the Fish Passage Center. The study design has been reviewed by the Northwest Power Planning Council

(NPPC) and Independent Scientific Advisory Board (ISAB) for 1997 and for 1998. The ISAB approved the study proposal and design in both reviews.

b. Rationale and significance to Regional Programs

This study is intended to begin to provide the basis for PATH analysis of long term alternatives for recovery of depressed listed and unlisted stocks of chinook and steelhead. The Region has committed to utilization of the PATH process in assessing alternative future recovery options. It will also provide downstream migration information for the regional Smolt Monitoring Program (see SMP Umbrella). This study will provide specific information, which will provide the basis for long-term mitigation decisions in the region, specifically the role of the smolt transportation program in recovery. Other PIT tag mark groups from other studies and projects will be included in this analysis where possible. The project reflects the reviews by the NPPC, Independent Scientific Advisory Board.

c. Relationships to other projects

This study is intended to begin to provide the basis for PATH analysis of long term alternatives for recovery of depressed listed and unlisted stocks of chinook and steelhead. The Region has committed to utilization of the PATH process in assessing alternative future recovery options. It will also provide downstream migration information for the regional Smolt Monitoring Program. This study will provide specific information, which will provide the basis for long-term mitigation decisions in the region, specifically the role of the smolt transportation program in recovery. Other PIT tag mark groups from other studies and projects will be included in this analysis where possible. The project reflects the reviews by the NPPC, Independent Scientific Advisory Board.

d. Project history (for ongoing projects)

Component of basin-wide Smolt Monitoring Program (see SMP umbrella), which is the basis of flows and passage management data submitted to the Fish Passage Center. Agencies and tribes conducting work 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.)

The project began in 1996 and has had extensive regional review. The study is a coordinated regional effort under the auspices of a regional oversight committee and is closely tied to the Regional PATH process. The study has been conducted under two separate Bonneville Power Administration (BPA) project numbers #8712700 and #9602000. Review by the ISAB in 1997 has suggested consolidating the study under one project number, which is being explored. Thus far, three years of juvenile marking have been completed. One year of jack returns and one year of adult return tags have been recovered. Preliminary analysis is being conducted.

The budget numbers for previous years for project #8712700 are as follows: 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 – 1,696,000; 1997 – 1,299,914; 1998 – 1,696,000; 1999 - 908,793.

e. Proposal objectives

1. Develop a long-term index of transport survival rate (smolt-to-adult) to inriver survival rate (smolt-to-adult) for Snake River hatchery spring and summer chinook smolts.
2. For Snake River Basin hatcheries, develop a long-term index of survival rates from release of smolts at hatcheries to return of adults to hatcheries.
3. Compute and compare overall smolt-to-adult survival rates for selected upriver and downriver spring and summer chinook hatcheries.
4. Begin a time series of smolt-to-adult survival rates for use in the PATH hypothesis testing process and in the regional long-term monitoring and evaluation program, which is under development.
5. Evaluate the growth patterns of transported and inriver migrating smolts and of upriver and downriver stocks.

f. Methods

There are three test groups defined for the upriver hatchery stocks: Transport (T), Inriver 1(I1), and Inriver (I2).

- Group I1 consists of known PIT tagged smolts migrating inriver below Lower Granite Dam, because it includes only those fish that were detected at one or more dams and returned to river. Group I1 is a subset of Group I2. Since it consists of known survivors to the downstream dams, it may have a higher adult return rate than Group I2. Similarity in adult return rates between Group I1 and I2 will be evaluated.
- Group I2 consists of the estimated number of PIT tagged smolts alive in the Lower Granite Dam tailrace that will then migrate inriver below Lower Granite Dam. The number of smolts in Group I2 is the sum of detected smolts re-released at Lower Granite Dam and the estimated number of undetected PIT tagged smolts alive in the Lower Granite Dam tailrace. This estimated number (defined as $R_{1?2}$) will be computed using the Jolly-Seber methodology (Burnham *et al.*, 1987) as follows (letting Cohort 1 represent the undetected fish at Lower Granite Dam and Cohort 2 the detected and re-released fish at Lower Granite Dam):

$$R_{1?2} = z_2 \cdot \{R_2 / r_2\} \quad \text{where } z_2 = \sum m_{1j} \text{ with } m \text{ fish at } j^{\text{th}} \text{ dam for Cohort 2}$$

R_2 = number of detected PIT tagged fish re-released to river at Lower Granite Dam.

In determining the size of Group I2, satisfaction of the assumptions of Jolly-Seber methodology is required. In particular, this requires that the subsequent survivability and collectability of PIT tagged fish are the same between the two cohorts through the reach of reservoirs and dams below Lower Granite Dam, which will be tested.

Returning adults are assigned to Group T and Group I1 based on the fact that the smolts were detected at the dams entering into one of those two groups, whereas returning adults are assigned to Group I2 based only on the fact that those fish are known not to have been transported. By the very nature of being observed as a returning adult, these PIT tagged fish are known to have been part of the group of fish alive in the tailrace of Lower Granite Dam.

In years when NMFS conducts their transportation studies, survival rates of Group I1 and Group I2 (aggregate of all upriver hatcheries) would be compared to the survival rates of the aggregate of inriver migrants collected, marked, and re-released as control groups by NMFS at Lower Granite Dam.

The partitioning of survival rates in Objective 2 will require estimating the following. The survival rate for smolts from hatchery to Lower Granite Dam will be computed for each hatchery group using the Jolly-Seber methodology. A composite average survival rate from hatchery to Lower Granite Dam will be computed by weighting by the hatchery production numbers. The survival rate from Lower Granite (smolts) to Lower Granite (adults) will be generated in the tasks of Objective 1, using the aforementioned groups T1, I1, and I2. These survival rates will be based on the aggregate of upriver hatcheries within each group. The survival rates from Lower Granite Dam back to the individual hatchery for adults will be computed as a ratio of detections at the hatchery to detections at Lower Granite Dam for the groups T1, I1, and I2. Adult returns to the hatcheries from T, I1 and I2 will be adjusted by estimated terminal harvest rates (if any). An anticipated benefit from this task is the ability to estimate confidence intervals and look at the feasibility of designing future experiments to achieve the desired significance and power in hypothesis testing.

For Objective 3 the selected upriver hatcheries will include Rapid River, McCall, Dworshak, and Lookingglass hatcheries for analysis with PIT tagged and CWT adult returns. The downriver hatcheries include Carson and Round Butte hatcheries for analysis with PIT tagged and CWT adult returns. Adult returns from Cowlitz Hatchery PIT tag releases in 1996 and 1997 will be compared with onsite CWT adult returns, and future SAR's for this hatchery will be based on CWT data (no future PIT tag releases for this study). Adult returns will be adjusted by estimated terminal harvest rates. Because jacks make up a lower proportion of the upriver total return compared to the downriver total return, the comparison between smolt-to-adult returns to the upriver and downriver hatcheries will be made both with and without jacks included. Mini-jack returns to any hatchery will be excluded from the total smolt-to-adult returns.

Sample Size Requirements:

Sample size requirements vary among objectives, desired levels of precision (significance), the difference one is trying to measure, the power of the tests to detect a true difference of that magnitude, and the expected smolt-to-adult return rates of the different groups.

Target number of returning adults:

Objective 1: The target number of adult recoveries for Transport (T) and Inriver (I1 and I2) groups is 86 adult fish. This number of adult recoveries from each group will be sufficient to determine if the annual ratio of transport survival rates to inriver survival rates is greater than 1.5 with approximately 90% power to show that the ratio is greater than 1.0 at a significance level of $\alpha = 0.05$ (Snedecor and Cochran 1967).

Objective 2: The target adult recovery levels are the same as those for Objective 1.

Objective 3: The target number is 26 adult recoveries from each upriver (U) and downriver (D) hatchery to determine if the ratio of D/U is greater than 2.0 with approximately 90% power to show that the ratio is greater than 1.0 at a significance level of $\alpha = 0.05$ (Snedecor and Cochran 1967).

Number of smolts to PIT tag to meet target number of returning adults:

The number of smolts required for Objective 1 is based on smolt-to-adult return rates estimated from NMFS transportation studies in past years. The minimum (1989) smolt-to-adult return rate (SAR) was 0.2% and the average across 7 years of study was approximately 0.4%. Under low flow and no spill conditions, we assume the lowest SAR and under high flow and moderate-to-high spill conditions we assume the average SAR. The number of smolts arriving at Lower Granite Dam that need to be assigned to the transport and inriver groups in order to arrive at the target goal of 86 adult returns is 43,000 transport and 64,500 inriver fish under the low flow, no spill scenario and 21,500 transport and 32,250 inriver fish under the high flow, moderate-to-high spill scenario.

The number of smolts required for Objective 3 is based on smolt-to-adult return rates to Rapid River, McCall, and Round Butte hatcheries for the 1979-1987 brood years. The average α 79-87 SAR measured back to McCall and Rapid River hatcheries was 0.82% (summer chinook stock) and 0.28% (spring chinook stock), respectively. The average α 79-86 SAR measured back to Round Butte Hatchery was about 1.1%. Past wild chinook SAR estimates for Warms Springs River have ranged between 2-6%. The smaller SAR of 0.28% would require approximately 9,300 PIT tagged fish in transport to achieve the target goal of 26 adult returns. Under these historic SAR levels, the downstream stocks would need at least 2,400 hatchery fish and 1,300 wild fish to achieve the minimum of 26 adult returns.

g. Facilities and equipment

PIT tag detection facilities and PIT tag separation by code facilities are required at major mainstem projects. The PITAGIS data system is required. Juvenile PIT tag detection facilities are required for Rapid River Hatchery for volitional release of juvenile salmon. Adult detection facilities are required at Round Butte Hatchery, Warm Springs Hatchery, Carson Hatchery, Imnaha Hatchery and completed as needed at other facilities. Provide support and assistance at Lower Granite Trapping facility as part of adult recapture evaluation for survival study.

h. Budget

The majority of the budget requirement for this project, 69%, can be accounted for by the cost of PIT tags at \$2.90 per tag. The study design is dependent on the use of PIT tags to facilitate multiple recapture of downstream migrants and capture (detections) of returning adults. The remaining portion of the budget, including 16% of the total for personnel, is the cost of actually implanting and recovering tags. In addition, 7% of the total budget is allotted to Oversight Committee time. Because this study is part of the Smolt Monitoring Program Umbrella project, marking coordination, logistics, communication with the Oversight Committee and other coordination activities are conducted as part of Fish Passage Center activities without additional budget requirements in this contract study.

Section 9. Key personnel

Oversight Committee:

Charlie Petrosky, Idaho Department of Fish and Game

Tom Berggren, Fish Passage Center

Howard Schaller, Oregon Department of Fish and Wildlife

Olaf Langness, Washington Department of Fish and Wildlife

Earl Weber, Columbia River Intertribal Fish Commission

Marking:

Rodney Duke, Idaho Department of Fish and Game

Walt Ambrogetti, Dave Wills, US Fish and Wildlife Service

Mary Louise Keefe, Oregon Department of Fish and Wildlife

Larry Basham, Fish Passage Center

Resumes, as available, follow:

Thomas J. Berggren
4921 SE 43 Ave
Portland, OR 97206
(503) 774-2016

Title: Biometrician

FTE: 1 (40 hrs/week)

Description of duties: Provide oversight on design/analysis aspects of Smolt Monitoring Program. Analyze the data collected from monitoring sites, as well as the PIT tagged data for groups released in the Smolt Monitoring Program to arrive at smolt travel times and survivals. As adult returns from the 1996 to 1998 PIT tag releases from key hatcheries in the Snake and lower Columbia River become complete for each brood year, I will estimate SAR's and analyze return rates with respect to whether fish migrated in-river or were transported. Responsible for completion of sections of Fish Passage Annual Report related to the Smolt Monitoring Program.

Experience:

- Fish Passage Center, Portland OR – February 1986 to present. Biometrician on Smolt Monitoring Program.
- Bonneville Power Administration, Portland OR – March 1982 to February 1986. Fishery Biologist within Fish and Wildlife Division (2 yrs) and Statistician within Forecasting Division (2 yrs).
- Beak Consultants, Portland OR – October 1979 to March 1982. Fishery Biologist/Analyst providing statistical support to staff of fish and wildlife biologists and botanists.
- Texas Instruments, Buchanan NY – March 1974 to January 1978. Fishery Biologist/Analyst providing operational and analytical oversight on study of Stripped Bass demographics in Atlantic fishery.

Education:

- Master of Science, May 1981 from Cornell University in Department of Plant Breeding and Biometry, Ithaca NY. Coursework in statistics and biometry completed between January 1978 and October 1979, with thesis completed May 1981.
- Master of Science, March 1974 from University of Washington in College of Fisheries, Seattle WA. Coursework emphasized fishery population dynamics and mathematics/statistics.
- Bachelor of Science, June 1971 from University of Washington in College of Fisheries, Seattle WA. Coursework emphasized quantitative science and mathematics.

Recent Publications:

- Berggren, TJ and MJ Filardo, 1993. An analysis of variables influencing the migration of juvenile salmonids in the Columbia River basin. North American Journal of Fisheries Management, Vol 13 (1): 48-63.
- Chapter on Smolt Monitoring Program in each Annual Report of the Fish Passage Center since 1986.

Larry R Basham
222 Davis Rd
Skamania, WA 98648
(509) 427-4177

Work Experience

Field Operations Coordinator – Fish Biologist 12/83 to present
Smolt Monitoring Program
Fish Passage Center, Portland, OR

- Responsible for coordination of hatchery release schedules in the Columbia River Basin; coordination of marking of juvenile fish for Smolt Monitoring Program, including dissemination of freeze brand tools, PIT tagging fish for SMP, and other methods of marking fish. Responsible for field coordination for the FPC SMP including in season and planning of mark groups to be used at the hatcheries or trapping sites. Responsible for reporting pertinent information to FPC manager and Fish agencies and tribes. Responsible for writing sections of the Fish Passage Center annual report.
- Allotted time – 2/3 FTE for SMP and CSS programs.

Fish Biologist, Chairman of Fish Transportation Oversight Team 12/80-12/83
National Marine Fisheries Service, Portland, OR

- Responsible for setting up an oversight team for the juvenile fish transportation program for the NMFS that would transition from a research program to a management program that included Federal and State agencies. Responsible for developing criteria for operating transport and sampling facilities on the Snake and Columbia River. Responsible for writing the initial Fish Transportation Oversight Team Annual Report. Responsible for coordination of all matters relating to fish transportation with the State and Federal fish agencies and tribes.

Fish Biologist, Fish Transportation Program (Research) 7/75-12/80
National Marine Fisheries Service, Pasco, WA

- Responsible for day-to-day operation of fish transportation program at Little Goose Dam from 1976-80.
- Responsible for operation of adult trapping facility at Bonneville Dam from 1978-80.
- Responsible for writing sections of research reports of transport operations at Little Goose Dam.
- Wrote or co-authored several publications.

Fish Technician, Snake River Transportation Program Research 3/72-6/75
National Marine Fisheries Service, Pasco, WA

- Assisted project leaders at Little Goose Dam with operation of the adult trapping facility, marking juvenile fish for the research program, and compilation of data at site.

Education

1969 - Bachelor of Arts in Biological Science, Northwest Nazarene College, Nampa, ID

1969-1971 – US Army Military Trng

1975 – Completed summer work at UofI in fisheries credits to qualify as biologist

Section 10. Information/technology transfer

Data from this project will be maintained in the PITAGIS data system in the same manner as all PIT tag information is maintained. Analysis by the Oversight Committee will be provided through the PATH process and presented as determined by the Oversight Committee. Juvenile passage data and analysis resulting from this project will be presented and distributed region-wide through the Fish Passage Center, Smolt Monitoring Program annual report.

Congratulations!