

UMATILLA HATCHERY MONITORING AND EVALUATION PROJECT 9000500

SHORT DESCRIPTION:

Monitor and evaluate juvenile rearing, marking and tagging, juvenile and adult survival, stock life history, fish health, mass marking, straying, sport fishing, and catch contribution for salmon and steelhead reared in oxygen supplemented and standard raceways at Umatilla Hatchery.

SPONSOR/CONTRACTOR: ODFW

Oregon Department of Fish and Wildlife
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SUB-CONTRACTORS:

Some marking and tagging is contracted through a temporary employment service.

GOALS

GENERAL:

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

NPPC PROGRAM MEASURE:

7.4I.1

BIOLOGICAL OPINION ID:

This project relates to the following requirements of the Hatchery Operations - Biological Opinion for 1995-1998, hatchery operations in the Columbia River basin, section 7 consultation, Endangered Species Act: 1) Wire tag 100% and coded-wire tagging a representative sample of upriver bright fall chinook salmon released into the Umatilla River2) Provide information on Umatilla River fall chinook salmon straying3) Implement preventative fish health inspections

OTHER PLANNING DOCUMENTS:

Extensive monitoring and evaluation plans are called for in the: Umatilla Hatchery Master Plan (ODFW and CTUIR and 1989)In depth evaluation needs are detailed in: A comprehensive plan for rehabilitation of anadromous fish stocks in the Umatilla River Basin (Boyce 1986)Umatilla River sub-basin plan (NPPC)The Wy Kan Ush Me Wa Kish Wit plan calls for continuation of current monitoring of all artificial production actions in the Umatilla basin (volume II, page 45)

TARGET STOCK

LIFE STAGE

MGMT CODE (see below)

Coho salmon	Adult	SAE
Umatilla/summer steelhead	All	SAWP
Carson/spring chinook salmon	All	SAE
Upriver bright/fall chinook salmon	All	SAE

AFFECTED STOCK

BENEFIT OR DETRIMENT

Snake river fall chinook salmon	Detrimental
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BACKGROUND

STREAM AREA AFFECTED

LAND AREA INFORMATION

Stream name:

Subbasin:

Umatilla River

Umatilla River

Stream miles affected:

Land ownership:

100

38% public, 11% tribal, 51% private

Hydro project mitigated:

Acres affected:

Bonneville, The Dalles, John Day

1,465,600

HISTORY:

The Umatilla Hatchery Monitoring and Evaluation study was initiated in 1991 to assess the success of meeting restoration and management objectives for the Umatilla Basin and to evaluate new rearing methods at Umatilla Hatchery. We have completed five years of monitoring and evaluation; however, critical information on smolt-to-adult survival is incomplete. Termination of project funding would result in a significant loss of investment. Current studies include evaluating: rearing methods at design densities in standard and oxygen supplemented raceways, fish health, fisheries restoration, recreational fishing, survival, catch contribution, straying, and the effects of marking. In the future we will examine the effects of different rearing densities, acclimation, and size and time at release. Results achieved at this hatchery will have implications for production throughout the Columbia basin.

BIOLOGICAL RESULTS ACHIEVED:

We have monitored the production of more than 4 million chinook salmon and steelhead produced at Umatilla and Bonneville Hatcheries each year. Results indicate that water quality, smolt quality, and smolt survival indices are similar for fish produced in high-density oxygen supplemented Michigan raceways compared to standard raceways. Subyearling and yearling spring chinook salmon successfully migrate to the John Day dam. Preliminary analyses suggests slightly greater disease levels for fish reared at higher densities and in water reuse raceways. Adult return data is incomplete, but we have found similar smolt-to-adult survival rates for fish reared in Michigan and standard raceways and for fish reared in single use and reuse raceways. Restoration and supplementation goals have been partially achieved. Hatchery reared salmon and steelhead have returned to the Umatilla River, spawned, and produced naturally reared smolts. Monitoring has shown that adult fall chinook salmon from releases made into the Umatilla River stray into the Snake River system. The tagging program annually wire-tags more than 3 million fish and early results show that significant numbers of fish can be removed before straying past Lower Granite Dam. Marking studies are incomplete, but have provided valuable information on the use of body-tags as a mass mark. Tag return data shows that fish reared at Umatilla Hatchery are making a substantial contribution to commercial and recreational fishing in the Columbia basin.

PROJECT REPORTS AND PAPERS:

Umatilla Hatchery Monitoring and Evaluation Annual Report, 1992, 1993, 1994, 1995, 1996.

Straying of Umatilla Origin Fall Chinook Salmon into the Snake River (Carmichael, in press).

Accuracy of fork length estimates for chinook salmon and steelhead in compartmented and standard hatchery raceways (Hayes, Carmichael, Keefe, Whitesel, in press).

ADAPTIVE MANAGEMENT IMPLICATIONS:

Knowledge gained from past activities has been used to alter rearing profiles at Umatilla Hatchery to produce better quality smolts to improve adult survival. Evaluation of juvenile and adult survival has enabled us to reevaluate rearing strategies, size at release goals, and time of release. Monitoring of fish health and disease profiles will allow us to analyze adult returns and determine which release strategies are most successful. Evaluation of catch contribution for groups reared at Umatilla Hatchery through creel surveys and other tag recovery programs is important for assessing the success of different rearing methods and provides valuable information on restoration efforts. Monitoring of steelhead allows us to maintain the genetic character of naturally producing populations. Mass marking and assessment of stray fall chinook salmon into the Snake River system is required under Section 7 consultation. The inability to show improvements in stray rates could lead to major reductions in the fall chinook program.

Successful production of chinook salmon and steelhead at Umatilla Hatchery is critical to the restoration of salmon and supplementation of steelhead in the Umatilla Basin. Production from Umatilla Hatchery is expected to contribute significantly to the Northwest Power Planning Council's goal of doubling salmonid production in the Columbia basin. Restoration will provide sustainable Indian and non-Indian harvest. Evaluation of rearing in Michigan and standard raceways can be applied to hatcheries throughout the Columbia basin. Rearing fish in high-density raceways with supplemental oxygen, if successful, will allow managers to produce more adults with less water, possibly at a lower cost. With current water and funding shortages in the basin, the results of studies at Umatilla Hatchery may be critical to salmonid restoration.

PURPOSE AND METHODS

SPECIFIC MEASUREABLE OBJECTIVES:

Objective 1-2 Determine and compare rearing performance, smolt condition, juvenile migration performance, and smolt-to-adult survival of fall chinook salmon subyearling smolts reared in Michigan and Oregon systems at standard densities and at three densities in the "Michigan System". Recommend changes in hatchery practices to improve adult survival.

Objective 3. Determine and compare stray rates of fall chinook salmon into the Snake and upper Columbia rivers for all groups of marked fall chinook salmon.

Objective 4 . Determine and compare smolt-to-adult survival of spring chinook salmon smolts reared in the "Michigan system" and the standard "Oregon system" and released in the fall. Recommend changes in hatchery practices to improve adult survival.

Objective 5 . Determine and compare smolt-to-adult survival of spring chinook salmon subyearling smolts reared in the Michigan system and the standard Oregon system. Recommend changes in hatchery practices to improve adult survival.

Objective 6 . Monitor rearing performance, determine smolt condition, monitor juvenile migration performance and smolt-to-adult survival of Umatilla stock summer steelhead produced in the Michigan system. Recommend changes in hatchery practices to improve adult survival.

Objective 7-8 . Determine and compare smolt-to-adult survival between spring chinook salmon yearling smolts produced in Michigan and Oregon raceways and between yearlings produced at Bonneville Hatchery and Umatilla Hatchery and subyearling smolts produced at Umatilla Hatchery and compare return rates to expected survival rates. Recommend changes in hatchery practices to improve adult survival.

Objective 9. Determine smolt-to-adult survival of fall chinook salmon yearling smolts reared at Umatilla and Bonneville Hatcheries and spring chinook salmon released in the fall that were reared at Bonneville Hatchery. Recommend changes in hatchery practices to improve adult survival.

Objective 10. Identify and compare the effects of tagging and marking on smolt-to-returning-adult survival of subyearling fall chinook smolts.

Objective 11. Monitor water quality parameters in an index series of Michigan and Oregon raceways in which fall and spring chinook salmon and summer steelhead are reared.

Objective 12 . Coordinate in the development of a water quality sampling and monitoring program in the Umatilla basin.

Objective 13. Determine annual recreational fishery harvest of chinook salmon and summer steelhead in the Umatilla River including estimates of catch by marked group. Ensure adequate escapement of stocks for natural reproduction.

Objective 14. Participate in planning and coordination activities associated with anadromous fish production and monitoring and evaluation in the Umatilla basin.

Objective 15. Monitor and evaluate health of spring and fall chinook salmon and summer steelhead juveniles and adult broodstocks. Make recommendations on broodstock management and juvenile rearing to improve adult survival of target stocks

Objective 16. Complete a report of progress that summarizes results of annual work.

CRITICAL UNCERTAINTIES:

Uncertainties about water supplies at Umatilla Fish Hatchery could affect the schedule for implementation of experiments.

Uncertainties about the numbers of spring chinook salmon broodstock may cause schedule changes.

Risks to Snake River fall chinook salmon from fish released in the Umatilla River and risks to natural Umatilla steelhead stocks are unknown.

BIOLOGICAL NEED:

Specific biological problems have been described as biological critical uncertainties in the Umatilla Hatchery Master Plan as follows:

Primary

1. Can fish return goals to Threemile Falls Dam be achieved using hatchery production and supplementation?
2. To what extent can we use O2 supplementation during rearing to increase the efficiency of producing summer steelhead and fall chinook for hatchery and natural production?
3. Will releases of subyearling and yearling spring chinook smolts produced at Umatilla Hatchery achieve the desire level of adult production?
4. To what extent can we use O2 supplementation during rearing to increase the efficiency of producing spring chinook adults for hatchery and natural production.
5. Will returning adult fall chinook salmon from releases made in the Umatilla River stray beyond acceptable limits into the Snake River system?
6. To what extent are harvest objectives being achieved?

Secondary:

1. To what extent will acclimation of summer steelhead, fall chinook, and spring chinook smolts enhance smolt-to-adult survival and homing.
2. To what extent will rearing density influence efficiency of producing summer steelhead, fall chinook, and spring chinook adults in the standard and O2 supplementation systems.

Biological need and priorities were established based on their effect on achievement of program goals and the systemwide application of results. At present there is limited natural reproduction of fall or spring chinook salmon in the basin, however the success of restoration efforts, to a large extent will be determined by the success of the hatchery program. A substantial proportion of the production at Umatilla Hatchery is produced in the "Michigan Type" oxygen supplementation system. This rearing system has not been thoroughly evaluated to determine the effects on smolt-to-adult survival. Disease monitoring and evaluation is a also critical component of the evaluation. Long-range plans include evaluation of the benefits of acclimation and effects of different sizes at release.

Monitoring and evaluation of the hatchery provides critical information on all life stages of anadromous salmonids in the Umatilla basin. Broodstock developments and egg-to-fry survival is evaluated to improve hatchery techniques. Fish reared at the hatchery are monitored for performance measures including health, ability to respond to stress, migration success, and achievement of size-at-release goals. Adult returns are monitored to determine success of different rearing methods and profiles, adult survival, appropriateness of stocks, numbers of fish straying to other basins, and contribution of hatchery releases to commercial, tribal, and sport fisheries throughout the Columbia basin.

HYPOTHESIS TO BE TESTED:

1. Null: Smolt-to-adult survival rates are not significantly different between groups reared in Michigan or standard raceways, between groups reared in first, second, or third pass Michigan or Oregon raceways, or between groups reared at different densities in Michigan raceways.

Alternative: There is a significant difference in the smolt-to-adult survival rates.

2. Null: Smolt to returning adult survival of spring chinook salmon is not significantly different for yearlings produced at Bonneville Hatchery and yearlings produced at Umatilla Hatchery.

Alternative: There is a significant difference in smolt-to-adult survival rates.

3. Null: Smolt to returning adult survival is not significantly different for differentially marked or tagged fall chinook salmon subyearlings.

Alternative: There is a significant difference in smolt-to-adult survival rates.

4. Null: Adult stray rates are not significantly different for subyearling and yearling fall chinook salmon.

Alternative: There is a significant difference stray rates.

5. Null: Water quality parameters are not significantly different for groups of fish reared in Michigan and standard raceways, between groups reared in first, second, or third pass Michigan or Oregon raceways, or between groups reared at different densities in Michigan raceways.

Alternative: There is a significant difference in water quality parameters.

6. Null: Mean length, weight, growth, condition, and food conversion rates, and hatchery mortality rates are not significantly different for groups reared in Michigan and standard raceways, between groups reared in first, second, or third pass Michigan or Oregon raceways, or between groups reared at different densities in Michigan raceways.

Alternative: There is a significant difference in rearing parameters between groups.

7. Null: Stress indices are not significantly different between groups reared in at different densities in first, second, or third pass Michigan raceways.

Alternative: There is a significant difference in the stress indices between groups reared in first, second, or third pass Michigan raceways.

8. Null: Migration success and migration rate are not significantly different between groups reared in Michigan and standard raceways, between groups reared in first, second, or third pass Michigan or Oregon raceways, or between groups reared at different densities in Michigan raceways.

Alternative: There is a significant difference in the migration success and migration rate.

ALTERNATIVE APPROACHES:

Changes in accomplishing this projects biological objectives are described in BPA annual reports (1992-1995).

METHODS:

Experimental design:

1. Uncertainties should be evaluated in priority order.
2. Each treatment should be replicated twice within a year, preferably, three or four times.
3. Each treatment should be replicated for four years to ensure that performances are observed under a variety of environmental conditions. This should allow us to distinguish a minimum of 50% difference among treatments with 95% certainty.
4. At least one treatment (rearing and release strategy) for each species must be used as the standard control and maintained through time.
5. To minimize variation we require 35 observed mark recoveries per test group. This should give a coefficient of variation for smolt-to-adult survival rate of 0.25.
6. The same species must be reared in a raceway series where water is reused and each pass must be considered a separate treatment because of potential differences in water quality as water is modified by the degree of reuse.
7. To estimate the recreational fishery, all weekend and holiday dates are sampled. Weekday samples are randomly selected. Pressure counts are made three times each day. Anglers are interviewed in-between pressure counts.
8. To evaluate straying rates, coded-wire tag recoveries from completed brood years are used. Recovery information for marked Umatilla fish from all locations in the Columbia basin will be summarized to evaluate straying.

Statistical Analysis: ANOVA tests are used to compare testable hypotheses at the 95% confidence level. Non-parametric tests are substituted when necessary. Non-testable data is summarized or compared graphically. Creel survey information is analyzed with an ODFW creel survey program. All tests are reviewed by an ODFW statistician.

PLANNED ACTIVITIES

SCHEDULE:

Planning Phase **Start** 11/1988 **End** 10/1989 **Subcontractor**

Task Historic planning to evaluate Umatilla Hatchery rearing and production

Implementation Phase **Start** 11/1991 **End** 10/2003 **Subcontractor**

Task Evaluation of: juvenile rearing in Michigan and Oregon raceways, juvenile rearing within Michigan raceways, juvenile rearing and migration performance, adult survival, rearing density, acclimation, body tags, straying of fall chinook salmon, contribution of commercial and sport fisheries, juvenile and adult health.

O&M Phase **Start** 11/1991 **End** 10/2003 **Subcontractor**

Task Tagging and marking of fish, fish health examinations for juvenile and adult fish.

PROJECT COMPLETION DATE:

2005 (for analysis of experiments)

CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:

1. Straying of Umatilla fall chinook salmon may threaten endangered Snake River salmon.
2. Supplementation with hatchery steelhead may threaten native Umatilla River stocks.
3. Inadequate supply of spring chinook salmon broodstock may cause schedule changes.
4. Inadequate water supplies at Umatilla Hatchery may cause schedule changes.

OUTCOMES, MONITORING AND EVALUATION

SUMMARY OF EXPECTED OUTCOMES

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

Subyearling fall chinook salmon reared in Michigan and Oregon raceways - measurement and analyses of juvenile rearing performance, adult survival, juvenile and adult health, estimates of the contribution of marked or tagged groups to commercial, tribal, and sport fisheries, the effects of mass marking, and numbers of fall chinook salmon that stray into the Snake River (1999)
 Subyearling fall chinook salmon reared at three densities in Michigan raceways - measurement and analyses of juvenile rearing performance, adult survival, juvenile and adult health, estimates of the contribution of marked or tagged groups to commercial,

tribal, and sport fisheries (2005)

Subyearling spring Chinook salmon reared in Michigan and Oregon raceways - measurement and analyses of juvenile rearing performance, adult survival, juvenile and adult health, estimates of the contribution of marked or tagged groups to commercial, tribal, and sport fisheries (2005)

Yearling spring Chinook salmon reared in Oregon raceways at Umatilla and Bonneville Hatcheries -- measurement and analyses of juvenile rearing performance, adult survival, juvenile and adult health, estimates of the contribution of marked or tagged groups to commercial, tribal, and sport fisheries (2000)

Steelhead reared in Michigan - measurement and analyses of juvenile rearing performance, adult survival, juvenile and adult health, estimates of the contribution of marked or tagged groups to commercial, tribal, and sport fisheries (1999)

Results of experiments will be used under the adaptive management guidelines to improve the efficiency and success of rearing systems. Improvements made to hatchery programs by using information gained from monitoring and evaluation studies will assist in reaching restoration goals for the Umatilla River and doubling goals in the Columbia basin. The expected performance of the target populations is: 21,000 fall chinook salmon, 11,000 spring chinook salmon, and 9,670 steelhead. Objectives may be adjusted based on current natural production and habitat evaluations. A minimum of 15 years is expected to be required to meet goals for fall chinook salmon (2006).

Present utilization and conservation potential of target population or area:

Outcomes produced from this study include estimates of commercial and sport fishing utilization and estimates of numbers of adults produced for fall and spring chinook salmon, coho salmon, and steelhead. Present use of chinook salmon and steelhead populations are for commercial, sport, and tribal fisheries in the Columbia and Umatilla river basins. Present use contributes more than 6,000 hours of sport fishing recreation annually in the Umatilla basin. The conservation potential for all salmon and steelhead stocks is being evaluated but is estimated at more than 80,000 fish in the Columbia basin.

Assumed historic status of utilization and conservation potential:

The historic use was major fisheries which supported Indian and non-Indian fisheries (Boyce 1985). Historic numbers of fish are unknown, but are believed to be major contributors to Columbia River fisheries.

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

The target populations are expected to significantly contribute to Columbia River doubling goals and the establishment or supplementation of naturally reproducing populations in the Umatilla River. Uses include commercial, sport, and tribal fisheries in the Columbia and Umatilla river basins. Long term goals for adult returns to the mouth of the Umatilla River are: 11,000 natural and 10,000 fall chinook salmon, 1,000 natural and 10,000 hatchery spring chinook salmon, 4,000 natural and 5,670 hatchery steelhead, and an undetermined number of natural and 6,000 hatchery coho salmon.

Contribution toward long-term goal:

Products of the project will contribute to: restoring and supplementing salmon and steelhead populations in the Umatilla River; evaluating critical uncertainties about reestablishing anadromous fisheries in the Umatilla River; the Columbia River doubling goal; and evaluation of new rearing methods that will have implications for production throughout the Columbia basin.

Indirect biological or environmental changes:

Supplementation of hatchery steelhead may adversely affect wild stocks; straying of hatchery stocks outside the Umatilla basin may adversely affect wild stocks other basins.

Physical products:

Annual tagging: 3 million fall chinook salmon, 350,000 spring chinook salmon, 150,000 steelhead, more than 2,000 fish examined for fish health.

Assessment of effects on project outcomes of critical uncertainty:

Outcomes will be assessed by statistical analyses of juvenile rearing and migration data and adult survival data (see METHODS)

Information products:

Analyses of hatchery rearing success, including monthly length, weight, and condition data; smolt condition data; smolt performance

nce indicators including fish health examinations, response to stress, migration performance, outmigration survival; counts of returning adults, analyses of adult survival data, monitoring of sport fisheries for chinook salmon and steelhead; annual evaluations of past performance that is used for hatchery operation plans.

Coordination outcomes:

Outcomes of the project are annually used to coordinate: hatchery planning and rearing schedules, scheduling acclimation and release schedules, marking and tagging schedules, plan future experiments, evaluate and plan sport fishery goals, and plan regional research and monitoring activities.

MONITORING APPROACH

Provisions to monitor population status or habitat quality:

Extensive marking and tagging has been completed to monitor the population status of all target stocks. Numbers tagged were selected to provide a minimum of 35 mark recoveries per test group. Returning adults are enumerated at several locations to ensure the target populations are adequately monitored including, coordination of tag recoveries with PSMFC, counts of adults at Three Mile Falls Dam (Umatilla River), creel surveys, and spawning ground surveys.

Data analysis and evaluation:

ANOVA tests are used to compare testable hypotheses at the 95% confidence level. Non-parametric tests are substituted when necessary. Non-testable data is summarized or compared graphically. Creel survey information is analyzed with an ODFW creel survey program. All tests are reviewed by an ODFW statistician. Using these results and the adaptive management process we will change programs as determined by the outcome of juvenile and adult survival analyses.

Information feed back to management decisions:

Information is fed back to management personnel through monthly and quarterly reports, annual reports, monthly research coordination meetings for the Umatilla basin, and a regional research process.

Critical uncertainties affecting project's outcomes:

We have attempted to resolve the affect of critical uncertainties on the projects outcome by planning studies for a minimum of four years to provide adequate replication and to ensure we are monitoring the fisheries during periods of different environmental conditions. Using the adaptive management process we attempt to adjust to unforeseen conditions by altering experimental schedules.

EVALUATION

The project's overall performance can be assessed through completion of the specific measurable objectives. Other measures include annual reports, completion of tasks identified in annual work statements, numbers of fish tagged or marked and released, numbers of returning adults salmon and steelhead, commercial and sport fishery benefits provided and the achievement of harvest objectives.

Incorporating new information regarding uncertainties:

We will use the adaptive management process to reevaluate current and planned programs. Changes may include adding or eliminating planned experiments or releases, expanding or eliminating use of oxygen supplemented raceways at Umatilla Hatchery, increasing or decreasing numbers of fish tagged or released. In addition, we participate in regional research and monitoring meetings to incorporate all parties in the decision process.

Increasing public awareness of F&W activities:

We are increasing the public awareness though the ODFW outreach program and environmental education efforts. Outreach efforts have included presentations to the public, creation of fishing information guides, listing the results of numbers of fish released and returning, individual contact with anglers, poster displays at schools and symposiums, radio information shows, regional recreation reports, and newspaper articles.

RELATIONSHIPS

RELATED BPA PROJECT

8710002 Umatilla Fish Habitat Improvement

8710001 Umatilla River Basin Anad Fish Habitat Enhancement

8343600

8710000

8802200 Umatilla River Basin Trap and Haul Program

8343500 Umatilla Hatchery Satellite Facilities O&M

9000501 Umatilla Basin Natural Production Monitoring and Evaluation

8902401 Evaluation of Juvenile Salmonid Outmigration and Survival in the Lower Umatilla River Basin

8403300

RELATIONSHIP

Instream and riparian habitat improvement on national forest, tribal, and private lands.

Instream and riparian habitat improvement on national forest, tribal, and private lands.

Design, construct, operate and maintain five passage facilities at Three Mile Dam and WEID Canal screens.

Instream and riparian habitat improvement on national forest, tribal, and private lands.

Provides low water passage of fish in the Umatilla River by trapping fish and hauling to sections of river with adequate water

Operation and monitoring of smolts that are acclimated prior to being release in the Umatilla River. Acclimation is being used to reduce straying of Umatilla fall chinook salmon into the Snake River.

This study evaluates the amount and extent of salmonid natural production in the Umatilla Basin. Identification is critical to the determining the success of hatchery programs aimed at restoring and supplementing naturally producing populations.

This study evaluates the outmigration success of hatchery and naturally produced juvenile salmonids. Completion of tasks includes identifying the amount and location of juvenile mortality in the Umatilla River, success of outmigration for different rearing and release strategies, and description of their outmigration

Umatilla Hatchery provides the majority of the production for restoring salmon and supplementing steelhead populations in the Umatilla River

OPPORTUNITIES FOR COOPERATION:

We coordinate with: CTUIR evaluating adult returns; NMFS and the Fish Passage Center collecting data on migrating smolts and adults; with WDFW determining numbers of stray chinook salmon escaping into the Snake River basin, Bureau of Reclamation and Corps of Engineers on Umatilla basin activities, and Umatilla basin irrigation districts. Coordination between all projects in the basin allows for all projects to share equipment and personnel.

COSTS AND FTE

1997 Planned: \$633,485

FUTURE FUNDING NEEDS:

PAST OBLIGATIONS (incl. 1997 if done):

<u>FY</u>	<u>\$ NEED</u>	<u>% PLAN</u>	<u>% IMPLEMENT</u>	<u>% O AND M</u>	<u>FY</u>	<u>OBLIGATED</u>
1998	\$68,800		67%	33%	1991	\$517,073
1999	\$701,760		67%	33%	1993	\$563,416
2000	\$715,795		67%	33%	1994	\$602,555
2001	\$730,111		67%	33%	1995	\$582,260
2002	\$744,713		67%	33%	1996	\$545,003
					1997	\$649,914

TOTAL: \$3,460,221

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

<u>FY</u>	<u>OTHER FUNDING SOURCE</u>	<u>AMOUNT</u>	<u>IN-KIND VALUE</u>
1998	ODFW (Tagging supervision)	\$20,000	

OTHER NON-FINANCIAL SUPPORTERS:

Oregon Department of Fish & Wildlife, Confederated Tribes of the Umatilla Indian Reservation, Washington Department of Fish and Wildlife, National Marine Fisheries Service, Fish Passage Center, Pacific States Marine Fisheries Commission, U.S. Fish & Wildlife Service, Bureau of Reclamation, Umatilla Basin Irrigation districts.

LONGER TERM COSTS:

\$255,000 annual cost for operation and maintenance (marking and tagging and fish health examinations).

1997 OVERHEAD PERCENT: Present indirect costs are 20.5%.

HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:

116 Overhead applies to all items except capital and contract services.

CONTRACTOR FTE: 4.6

SUBCONTRACTOR FTE: 4.9