ANNUAL REPORT

FISCAL YEAR 1995

IDAHO FISHERY RESOURCE OFFICE

AHSAHKA, IDAHO

Project Leader

12-18-95
Date

Table of Contents

Page

I. Narrative

Introduction 1

Station Operations 2

Station Cost Summary 11

Future Outlook 12

II. Forms

Management Activities - Form 3-112 . . . . . FORMS-1

Report of Station Personnel - Form 3-114 . . . . . FORMS-4

Operations/Maintenance Cost Data - Form 3-110. . . . . FORMS-6

Public Relations - Form 3-172. . . . . FORMS-10

III. Appendices

A. Spring Chinook Salmon Program Review A-1

B. Steelhead Program Review B-1

C. Fall Chinook Research Review C-1

I. NARRATIVE

Introduction

The Idaho Fishery Resource Office (FRO) was originally established as the Dworshak Fisheries Assistance Office in 1981 and became fully operational in FY82. The name was changed to the Idaho Fishery Resource Office in 1991 as part of a region-wide change to better reflect the office's responsibilities and functions. In 1995 the Idaho FRO along with Dworshak NFH, Dworshak FHC, and Kooskia NFH were combined to form the Dworshak Fisheries Complex. On a larger scale we are also within the Columbia Basin Ecoregion of the Service's Region 1. The Idaho FRO is located on the grounds of Dworshak National Fish Hatchery, Ahsahka, Idaho, approximately 40 miles east of Lewiston, Idaho, on the mainstem Clearwater River. The Idaho FRO is staffed by eleven full-time permanent employees and four full-time temporary employees. The primary purpose of the office is to assist in management and evaluation of fishery resources which relate to federal issues. Activities are primarily directed toward protection, restoration and enhancement of anadromous fish resources in the Lower Snake River Basin.

Functions and projects include: evaluation and fishery management planning for the three federally operated hatcheries in Idaho, (Dworshak, Hagerman, and Kooskia NFHs); compilation of the information required to assess how each of the three hatcheries are meeting their established mitigation goals; providing assistance in designing studies to evaluate hatchery effectiveness and various management scenarios; developing databases for fisheries of national significance; acquiring data on spawning, rearing, and migration of the threatened Snake River fall chinook salmon; acquiring data on the use of supplementation to increase natural/wild populations of spring chinook salmon in the Snake River Basin; and investigating the potential interactions of hatchery and wild steelhead in lower Clearwater River tributaries.

Besides the offices in the Dworshak Fisheries Complex, we work with a number of other Service offices including Hagerman NFH, Lower Snake River Compensation Plan Office, Columbia River Fisheries Program Office, other Columbia Basin Ecoregion offices, and the Regional Office (Fisheries) in Portland, Oregon.

In evaluating various fish management programs, we work closely with a number of cooperators including the National Biological Service, Idaho Department of Fish and Game, the Nez Perce Tribe, Washington Department of Fish and Wildlife, Idaho Power Company, Shoshone-Paiute Tribe, Oregon Department of Fish and Wildlife, National Marine Fisheries Service, U.S. Forest Service, U.S. Army Corps of Engineers, Bonneville Power Administration, Battelle Pacific Northwest Labs, and Pacific States Marine Fisheries Commission.

Station Operations

1. To produce the healthiest most viable smolts possible, our office worked together with Dworshak NFH and developed a project in 1990 to evaluate the effect of rearing density on smolt survival and adult returns. Spring chinook salmon from Brood Year 1989 (BY89) and BY90 were reared at three densities and were released on 4/04/91 and 4/15-16/92, respectively.

   Results of the hatchery rearing phase and post-release performance of smolts (migration time and survival) have already been summarized in a Progress Report.

   Adult returns are now complete for both brood years. For BY89, low density groups returned at a higher rate than either medium or high density groups, based on coded wire tag returns. Adult returns for BY90 were very disappointing, a total of 10. The medium density group had the highest return rate, but the low number of returns precludes making any conclusions.

   A final report is scheduled for completion this year. No recommendations for an optimum rearing density for spring chinook salmon at Dworshak NFH will be made at this time and our office is recommending that rearing density for spring chinook be re-evaluated as brood stock become available.

2. Spring chinook have generally been released near the last part of March or first part of April at Dworshak NFH. Preliminary smolt assessment data indicate that spring chinook salmon smolts at Dworshak NFH may not be fully developed at the time of release. For this reason, our office developed a pilot study in 1993, in coordination with Dworshak NFH and Dworshak FHC, to evaluate the effect of time of release on smolt survival to Lower Granite Dam and on the rate at which adults return from the ocean.

   Three groups of about 129,000 each were released on April 8, April 22, and May 6, 1993. Based on PIT-tag information, we observed that smolts released later migrated faster and survived at a higher rate than smolts released earlier. However, higher river flows during the later releases may have contributed more to the increased smolt survival than smolt development. Although not part of the original study, the experiment was repeated with the 1994 releases. Three groups of about 70,000 each were released on April 8, April 22, and May 6, 1994. Similar to releases in 1993, later releases migrated much faster than earlier releases. However, migration rate did not appear to affect survival. Cumulative interrogation rates for PIT-

tagged fish were not significantly different for the first or last release groups but were higher for the second group.

A progress report combining the two years of data at Dworshak NFH and one year of data at Kooskia NFH is being prepared. Adult returns for BY90 released at Kooskia NFH in 1993 are complete. The II-Ocean returns for BY91 released from Dworshak NFH in 1993 are complete and the I-Ocean returns for the release in 1994 are complete. However, these data have not been analyzed. Final evaluation results will not be completed until 1997.

3. Spring chinook salmon at Dworshak NFH have had a chronic problem with bacterial kidney disease (BKD) which undoubtedly contributes to various sources of mortality after release. Although BKD has recently not been as severe as in past years, the problem persists. Modifications in production protocols, such as lower rearing densities, have helped to reduce stress and improve survival. However, administration of erythromycin several times during the rearing period has been an important factor in providing spring chinook protection against BKD.

Since 1993, the Hatchery Evaluation Team (HET) for the Dworshak Fishery Complex has been actively engaged in conducting field trials under INAD 4333, designed to generate data on the efficacy of feeding erythromycin to spring chinook salmon at both Dworshak and Kooskia NFHs. Treatment groups were set up in 1993 to compare: (1) the efficacy and palatability of gallimycin 50-P to a proposed new formulation of 22 percent erythromycin in a wheat germ carrier; (2) administering the treatment for 21 days versus 28 days; and (3) the efficacy of two treatments versus three treatments. These groups were released in April 1994. In 1994, treatment groups were set up to compare: (1) administering the treatment for 21 days versus 28 days; and (2) whether, as a second treatment, a fall treatment would be more effective than a spring treatment prior to release. In addition, we included, for the first time, control groups that did not receive any erythromycin during rearing. All these groups were released in April 1995. In 1995, treatment groups were set up to determine: (1) if administration of erythromycin before fish handling during marking operations provides them some level of protection; and (2) administration of erythromycin just before fish are released provides protection during outmigration and seawater entrance. These groups will be released during April 1996.

All treatment groups were PIT tagged and coded-wire tagged to evaluate outmigration performance and adult returns. Preliminary data on outmigration performance for releases in

1994 and 1995 have been completed. Groups released in 1994 had similar outmigration performance in that no significant differences in survival rates to Lower Granite Dam were observed between treatments. The statistical analysis for outmigration performance of 1995 releases has not been completed but all groups had cumulative interrogation rates to Lower Granite Dam above 60%. The control groups that received no treatment had the second highest interrogation rate of 66%. Coded-wire tag information is available only for the I-Ocean returns for groups released in 1994 and is not sufficient for analysis. The Dworshak Fish Health Center is currently compiling on station results into a progress report and our station will included PIT-tag and coded-wire tag data in that report.

4. In April of 1995, the Hatchery Evaluation Team was given the assignment to investigate possible reasons for wide length frequency distributions for steelhead at Dworshak NFH. The Team recommended conducting three pilot studies: (1) an evaluation of feeding methods and rearing containers; (2) evaluation of the size at conversion to demand feeders; and (3) an evaluation of the growth potential of smaller fish after grading.

   Length frequency data have been collected from 12 experimental treatment groups on a monthly basis since June. Length frequency distributions were relatively narrow in the nursery during June and July. Once fish were moved to outside rearing containers in August, variation in length increased noticeably and continued to increase monthly with the development of bi-modality in some cases. Data analysis so far indicates no significant differences between treatment groups and that factors other than those being studied are responsible. Data collection will continue through April 1996 when smolts are released and recommendations will be developed for further study.

5. We are also evaluating several aspects of methods used during routine production sampling at Dworshak NFH. The first aspect involves crowding vs dipping to collect samples. At Dworshak NFH, fish in raceways and burrows ponds are crowded into a small area using portable screens before being sampled to help insure that samples are random and representative of the entire population in that rearing container. However, crowding takes additional time and places the fish under increased stress for the period of time required to collect the samples. An alternative crowding and sampling method involves using dip nets to crowd the fish to one end of the rearing container and quickly taking several dips of fish before they disperse. The advantage of this method is that crowding takes less time and the fish are not forced to endure extremely crowded conditions,

even for a short period of time. The potential drawback is that they are not crowded as tightly as with portable screens and can quickly disperse around the dipnets. Samples may not be as representative of the entire population. The objective of this aspect of our evaluation is to determine if there is any significant difference between samples collected using these two methods.

Each month since August 1995, three samples of about 150 juvenile steelhead each have been collected from one raceway and one burrows pond using the two methods described above. Fish are measured for total length and mean lengths for each method are tested for significant differences using a Two-Sample T-Test. Tests are conducted separately to evaluate if type of rearing container (raceway vs burrows pond) has an effect on the method being used. To date, no significant differences have been observed between methods or rearing containers.

The second aspect we are evaluating is the size of sample being collected. The third aspect, number of samples collected, is somewhat related. At Dworshak NFH, sample sizes usually range between 100 and 150 fish and from three to four samples are collected. Time and effort can be saved if sample sizes and number of samples collected can be reduced.

Each month since August 1995, we have collected about 1,000 juvenile steelhead from one raceway and one burrows pond and have measured each fish for total length. These data were entered into a computer spreadsheet and used to generate random samples for analysis. Sample size is evaluated by examining the effect that sample size has on the coefficient of variation in mean length. Likewise, the same fish length data and procedure is being used to evaluate numbers of samples collected. To date, data analysis indicates that sample sizes over 75 have very little effect on reducing the coefficient of variation in mean length. The number of samples collected appears to have no affect on the coefficient of variation in mean length.

6. We conducted work on our spring chinook supplementation project in cooperation with the Idaho Supplementation Studies (ISS) program. Participants in ISS include IDFG (lead agency), FWS, Nez Perce Tribe, and Shoshone-Bannock Tribe. We compared outmigration success of PIT-tagged natural spring chinook salmon smolts with PIT-tagged hatchery smolts (both outplants and direct releases). The overall ISS design will allow comparison with "natural" streams and test streams being supplemented. Our office is primarily looking at two tributaries in the Clearwater River drainage to evaluate impacts of hatchery produced smolts and/or parr releases. In 1995, 10 segments on Pete King Creek

(parr supplementation), a tributary of the Lochsa River, and 18 segments on Clear Creek (smolt supplementation), a tributary of the Middle Fork Clearwater River, were snorkeled and substrate typed according to established protocol. The 1995 juvenile spring chinook salmon counts and densities in Clear Creek and Pete King Creek were down dramatically from 1994. No parr were stocked in Pete King Creek in 1995. However, 49,317 marked smolts were stocked in Clear Creek and were monitored successfully via a smolt trap in the stream and at Lower Snake River dams.

Redd and adult spawner surveys were conducted two times in Clear Creek and once in Pete King Creek. No adults were trucked and released above the two low water barriers in Clear Creek for the first time in three years. No redds were located and no adults were observed during our surveys on Clear Creek. This will mean two poor years for natural production in Clear Creek. For the fourth consecutive year, no adults or redds were found in Pete King Creek.

We PIT tagged only a few spring chinook salmon parr captured in Clear Creek. In 1992 most of the parr were found in a relatively small section of stream immediately below the Nez Perce National Forest boundary. In 1993 however, the parr were dispersed more evenly throughout the drainage. In 1994 the parr were very difficult to find until they began moving in early fall. PIT-tagging and electrofishing mortality were each less than one percent. In 1995 the parr densities were very low and individual spring chinook salmon parr were widely scattered in the stream. Temperatures were very favorable, but flows were so high that we could not even install our low tech weir for capturing fall outmigrants. High flows also made electrofishing ineffective. Our screw trap was unavailable for much of the sampling season, although it was functional during the pulse of outmigration of planted hatchery supplementation fish.

7. During FY95, the funding was cancelled for our work on mountain whitefish in the Lochsa River drainage. The project was part of the nationwide National Fishery Resources Status and Trends. While this study was designed to be long-term the program only ran for four years. The goal of the project was to help predict and document the effects of climate change by monitoring mountain whitefish populations in the upper Lochsa drainage, Northern Idaho. Over the four year period, 1992-1995, the study focused on three components: 1) monitoring densities, distribution, migration timing, age structure and growth, and spawn timing patterns of mountain whitefish, 2) documenting changes in water temperature over time; and describing the relation between changes in whitefish population attributes and

changes in environmental variables, and 3) modeling water temperature scenarios for the drainage to predict the responses of mountain whitefish to potential shifts in water temperature regimes caused by climate change. Study sites in White Sand and Crooked Fork creeks (within the Lochsa drainage) were monitored. Shifts in mountain whitefish densities, distribution, and migration timing were seen during snorkel surveys and tagging efforts at these sites from July to November, 1992-1995. Age structure and growth was not fully investigated due to time and funding constraints. Water temperatures in both creeks were slightly warmer in 1994 than any other year. Homing to specific creeks was documented in 1993, 1994, and 1995. Observations of tagged whitefish provided information on mountain whitefish distribution patterns over time. Prespawning and postspawning migration were documented in White Sand and Crooked Fork Creeks. Thermographs at 6 locations recorded year-round water temperatures for calibration of the SNTEMP water temperature model and to determine correlations with timing of spawning and migration.

Mountain whitefish populations in White Sand and Crooked Fork Creeks were minimally monitored during FY95. A few snorkel surveys were conducted and water temperature data were taken, but no other components were investigated.

8. We continued to collect data for our second year of study on the "Interaction of hatchery and wild steelhead in the Clearwater River". Aspects of the study include monitoring Dworshak NFH steelhead releases, monitoring natural outmigration, monitoring adult returns to one of the major tributaries downstream of Dworshak NFH, sampling for hatchery and natural steelhead in Clearwater tributaries downstream of Dworshak NFH, and natural steelhead densities, genetics, and fish health sampling in the 5 study tributaries.

To assist in assessing optimum size-of-release for minimizing straying and maximizing survival, 3,637 Dworshak NFH steelhead were PIT tagged. The fish were stratified by 3 times of spawning, 3 size-at-release groups, and 3 release sites. As was true in 1994, small steelhead were detected at downriver dams significantly less than either medium or large steelhead. Steelhead less than or equal to 180 mm fork length were detected at the rate of 52%; 86% of the medium and large steelhead were detected. Travel time to downriver dams equipped with PIT-tag detectors will be correlated with in-river temperature and flow conditions over a three year period.

A rotary screwtrap was operated on Big Canyon Creek (March 9 through June 14) to monitor natural/wild outmigration. A total

of 2,440 natural/wild and 122 hatchery steelhead was captured. Of these, 799 natural/wild and 53 hatchery received PIT tags so that their outmigration could be monitored. An adult weir was operated during weekdays on Big Canyon Creek from early April through mid June. Nine hatchery and 2 natural steelhead were captured and released.

Bedrock, Big Canyon, and Cottonwood creeks were again sampled as study creeks in 1995; Jacks and Mission creeks were added. In order to analyze juvenile straying rates, effects of Dworshak NFH fish on wild/natural fish, and survival of strays and natural fish to Lower Granite Dam, sampling was conducted in lower portions of the five study tributaries biweekly from just prior to release of Dworshak NFH fish to the beginning of July. Five hundred forty seven fish collected in these creeks were PIT tagged and released. Seventy three percent (399 steelhead) were hatchery strays. Strays sampled in our study creeks were significantly smaller than PIT-tagged Dworshak NFH fish detected at downstream dams. However, they were not significantly different from those that were not detected.

Density estimates were completed and natural A-run steelhead were collected for genetic and disease analysis. No strays were found in upper sites of these creeks during density sampling. Natural steelhead are being assayed for 1) viral pathogens of regional concern (IHNV, VHSV, and IPNV), 2) bacterial infections, and 3) external parasites. These steelhead are also being examined for the presence of *Myxobolus cerebralis*, the causative agent of whirling disease. Larger fish collected for genetic work will be used to assess the prevalence of *R. salmoninarum*, the causative agent of bacterial kidney disease.

An annual report for this project will be completed early in 1996. Cooperators are Idaho Fishery Resource Office, Dworshak NFH, Dworshak Fish Health Center, and Nez Perce Tribe. Genetic analysis is again being completed by the National Marine Fisheries Service at no cost to the project.

9. We again sampled kokanee in three tributaries to Dworshak Reservoir for disease background. The Reservoir provides the water for both Dworshak NFH and the LSRCP Clearwater State Hatchery. Samples were collected and analyzed from Breakfast, Isabella, and Skull creeks on the North Fork Clearwater River above Dworshak Reservoir. This year we collected 368 kokanee salmon spawners with all testing negative for IHN virus. The positive IHN detection rate in past years has ranged from 0.0 to 1.5% with the average at 0.6%.

10. Spring chinook salmon and steelhead run summaries and prediction information were prepared for Dworshak and Kooskia NFH's (see Appendices A and B, respectively). These data, in conjunction with IDFG and Nez Perce Tribe information, is used to set fishing seasons and future hatchery production plans.

11. Idaho FRO continues to assist Ecological Services when needed or requested. We participated in the NMFS/FWS screening of Forest Service projects in regards to salmon and bull trout. We assisted on the Challis and Payette National Forest screens and the Cottonwood BLM screen.

    We also evaluated the Kootenai Tribes Kootenai white sturgeon hatchery in response to a request from Ecological Services. Recommendations for improvements were made.

12. The Idaho FRO was active in Outreach activities of many types. Target groups included senior citizens, community leaders, junior high advanced biology students, elementary school groups, and preschool children.

    Early in the year, biologists participated in conducting Earth Day activities for five local schools. It was an interagency effort, with 7 different agencies involved. The theme for this year was "Habitat". Over 400 fourth and fifth grade students were led through a series of stations, each focusing on one of five habitats: freshwater, ocean, forest, desert and prairie. The key elements stressed included water, shelter, food, and space (that each habitat provided for specific species). Feedback from the teachers indicated that this was a very useful tool in educating the children and addressing local issues. They were anxious to make it an annual program.

    Later in the spring, the Natural Resource Conservation Service, the Corps of Engineers and the Latah Conservation District all hosted separate events in which IFRO biologists assisted with different booths. A two day Environmental Awareness Day, a Water Safety Fair, and a "Forestry Tour" (which included a fisheries focus) were held, with 900 kids attending.

    During the summer, IFRO biologists developed a new event at the annual Dworshak Complex Open House. In addition to the normal free fishing for kids, a fish printing activity was designed, called Gyotaku. Approximately 300 kids learned about fish anatomy and behavior as they made fish prints to take home. Everyone enjoyed the activity as it added a popular new aspect to the annual festival.

The Idaho FRO along with the help of the Regional Office Public Affairs division produced a press releases on improved survival of fall chinook salmon juveniles from the Snake River. We attributed much of the improved survival to water releases from Dworshak and upper Snake River reservoirs. The releases was a tele-conference with approximately 15 reporters calling in to ask questions. Overall, we received a lot of good press on the release, but also generated a lot of questions from local opposition (Chamber of Commerce).

IFRO Biologists were also instrumental in designing and staffing The Clearwater County Fair booth. The goal was to educate the public about the Dworshak Fisheries Complex and the various projects that each section is involved in. IFRO was responsible for creating the presentation, and with participation from hatchery employees, we answered questions at the booth during the fair. It was well received by the public.

In addition to the above mentioned events, some of the IFRO biologists worked with teenagers from the Clearwater Youth Program (formerly the Youth Conservation Corps) on their field studies. Six students participated in an annual summer work program for kids, and among other things they helped IFRO in conducting Dworshak Hatchery evaluation studies, periodic salmon population surveys and habitat monitoring on Clear Creek.

Several other Outreach events were held during the year, including talks at the local elementary and junior high schools, Lewis and Clark State Junior College, and the Lewiston Chamber of Commerce's Steelhead Derby.

13. Idaho FRO has the responsibility for fishery data for all three federal hatcheries in Idaho. We archive distribution data and computerize return data as well as develop summary files.

Additionally, our office has developed a PIT-tag database that provides release and interrogation information for chinook and steelhead released from Dworshak and Kooskia NFHs. Currently, data is available back to 1988. We have pooled these data with other agencies, such as the Idaho Department of Fish and Game, and NMFS. This is part of an effort to build a large database and begin developing multi-variate regression models that will relate factors such as flow, time of release, size at release, migration time, and survival. This database can also be used to compare return rates of various tag groups (CWT, PIT, freeze brand) to determine effects of the various tags on adult return.

14. Idaho FRO personnel participated on the following committees and study teams in 1995:

a. Member of the Nez Perce Tribal Hatchery Team developing the Draft Environmental Impact Statement on the construction of an anadromous salmon hatchery and associated facilities.
b. Member of the outplanting subcommittee to establish priority, numbers, and places for outplanting steelhead fingerlings, smolts, adults, and spring chinook fingerlings from Dworshak and Kooskia NFHs.
c. We assist in planning tagging, branding, and clipping work at the various hatcheries, particularly Dworshak and Kooskia NFHs.
d. Member of Idaho Supplementation TAC. As a member of this committee, we review and provide technical guidance on developing Idaho supplementation projects. We also participate by sampling two study streams in the Idaho Supplementation Studies program.
f. Pacific States Marine Fishery Commission/Pacific Salmon Commission. We contribute to their regional coded-wire tag database for release and recovery data as well as advise the mark committee on sample design and policy.
g. Participated in the Earth Day Planning Committee with six other agencies.
h. Member of Endangered Species Technical Committee. This team reviews endangered species issues relating to anadromous salmon in the Columbia Basin.
i. Member of Columbia River PIT-tag Steering Committee.
j. Member of Clear Creek Coordinated Resource Management Planning Group.
k. Participated on the Pacific Salmon Biological Technical Committee regarding west coast steelhead.
l. Member of the Idaho Fisheries Habitat Enhancement Coordination committee.
m. Members on the Dworshak-Kooskia Hatchery Evaluation Team
n. Member of the Hagerman Hatchery Evaluation Team
o. Participated on the Watershed Enhancement Teams for Potlatch, Mission-Lapwai, and Bedrock Creeks.

Station Cost Summary

With the continued high level of our staff, projects, and other activities, expenditures for FY95 remained basically the same as FY94.

A major expenditure in FY95 continued to be the lease of a modular office building to accommodate our staff. We also leased a 4WD Bronco and purchased a new 4x4 pickup as well. We added a 486 laptop, docking station, and software, two 486 Pentium desktop computers and, (with e-mail) a number of modems to our ADP equipment.

Considerable minor equipment, supplies, and services were again purchased for the Snake River Fall Chinook Project in FY95. Major purchases included a contract with the USFS, helicopter flights, and an Electronic Distance Measure to speed data collection and accuracy.

With continuation of the Fishery Stewardship Project more, equipment was purchased and contracts were let. Major purchases included PIT tags, thermographs, and weir materials. Funds were provided to the Nez Perce Tribe and Dworshak NFH and FHC.

Major Purchase Cost Summary:

1. General office purchases

Building lease	15,000
Vehicle lease	4,359
Desktop computer and software	3,347
4X4 Pickup	19,500

2. Fall Chinook Project

Electronic Distance Measurer	13,776
Desktop computer	2,609
USFS contract	22,000
Helicopter flights	4,905

3. Fishery Stewardship Program

Temperature loggers	1,323
PIT tags	19,250
Desktop computer	2,386
Weir materials	2,781
Nez Perce Tribe contract	43,604
Dworshak NFH	15,884
Dworshak FHC	26,326

Future Outlook

Idaho FRO will continue to function as a key player in the complex problems stemming from anadromous salmonid production and management in the Snake River Basin. The outlook is for greater demand for fewer resources by more users and the requisite for agencies to do more with less.

The FRO became part of the Dworshak Fisheries Complex in January 1995. This will change the office somewhat. Greater sharing of personnel will provide us with help during critical times as well as provide staff the opportunity to receive some cross training with the hatchery and the Fish Health Center. Also with the direction of the Service changing to Eco-Regions, our office will certainly take on a different role assisting and cooperating with Ecological Services and Refuges when the need arises.

We will continue to evaluate chinook and steelhead production at Dworshak and Kooskia NFHs to determine how the Service can best meet their goals. We will also work with Hagerman NFH by providing technical assistance and coordination on their evaluation projects. Because of low returns of spring chinook salmon at Dworshak and Kooskia NFHs, new evaluation projects are on hold until runs rebound. However, there are a number of projects that need to be finalized.

We will continue to document Dworshak NFH steelhead production and contributions by providing information to states, tribes, and others concerning seasons and CWT, PIT-tag, and freeze brand data. We have begun steelhead evaluation studies to identify potential causes for the wide length frequency distribution we typically see at Dworshak NFH. We will continue a project looking at hatchery and wild steelhead interactions in lower Clearwater River tributaries. This project is a cooperative study with involvement of Dworshak NFH, Dworshak Fish Health Lab, and the Nez Perce Tribe. The study will expand field efforts by operating an adult weir and juvenile screw trap for a longer period than in the past.

Our initial study on Snake River fall chinook concludes this year, but research will continue in another direction as more questions have arisen. The cooperative research will still include NBS, WDFW, and Idaho Power Company. Other coordinated projects are with NMFS looking at survival and supplementation of sub-yearling fall chinook salmon released into the Snake River and with WDFW and the Nez Perce Tribe evaluating acclimated yearling releases into the Snake River. We will continue in our role as the experts on fall chinook in the Snake River Basin.

We will continue to evaluate hatchery supplementation and natural production of spring chinook salmon through the BPA funded Idaho Supplementation Studies. Our office will continue to be deeply involved in ESA salmon issues with the planned finalization and implementation of the Snake River Salmon Recovery Plan. We foresee more time being spent in this area with steelhead still undecided and potential impacts on listed salmon.

II - FORMS

SUMMARY OF FISH AND WILD LIFE MANAGEMENT AREAS SERVED

Station Idaho FRO

Fiscal Year 1995

Check one of the following:	Restoration Mitigation x	Management Assistance ___	Federal Leadership ___

Management Activities 1	Area Served 2	Number of Projects 3	Staff Years (FTE's) 4
Stock Evaluations	NFH	5	2.5
Fish and Wildlife Stockings	State	8	1.1

Form 3-112 (Rev. 7/88)

SUMMARY OF FISH AND WILD LIFE MANAGEMENT AREAS SERVED

Station Idaho FRO

Fiscal Year 1995

Check one of the following:	Restoration Mitigation ___	Management Assistance _x_	Federal Leadership ___

Management Activities 1	Area Served 2	Number of Projects 3	Staff Years (FTE's) 4
Management Plan Development	Federal	2	0.2
Coordination and Technical Assistance	Tribal	2	0.4
	Other Federal	6	1.4
	State	5	0.4
Fish and Wildlife Stocking	State	1	0.1

Form 3-112 (Rev. 7/88)

SUMMARY OF FISH AND WILD LIFE MANAGEMENT AREAS SERVED

Station Idaho FRO Fiscal Year 1995

Check one of the following:	Restoration Mitigation ___	Management Assistance ___	Federal Leadership x

Management Activities 1	Area Served 2	Number of Projects 3	Staff Years (FTE's) 4
Habitat Surveys	NBS	2	1.5
	State	2	0.5
Population Analysis and Monitoring	NBS	2	2.5
	State	2	0.5
Endangered Species	Other Federal	4	1.5
Coordination and Technical Assistance	NBS	2	0.5
	Other Federal	4	0.2
	State	6	0.3
Stock Evaluations	NFH	5	1.2
Fish/Wildlife Stocking	State	1	0.1
Interagency Cooperative Management	Other Federal	3	0.2

Form 3-112 (Rev. 7/88)

REPORT OF STATION PERSONNEL

Idaho Fisheries Resource Office **Fiscal Year 1995**

Part I - Permanent Personnel (FTE's: 6.9)				
Name of Employee	**Functional Title**	**Grade**	**Period Worked**	**Remarks**
William H. Miller	Project Leader	GM-13	10/01/94 to 08/20/95	Reassigned
Howard L. Burge	Assistant Project Leader	GS-12	10/01/94 to 09/30/95	Permanent
Ralph B. Roseberg	Fishery Biologist	GS-11	10/01/94 to 09/30/95	Permanent
William P. Connor	Fishery Biologist	GS-11	10/01/94 to 09/30/95	Permanent
Ray N. Jones	Fishery Biologist	GS-11	10/01/94 to 09/30/95	Permanent
Aaron P. Garcia	Fishery Biologist	GS-11	10/01/94 to 09/30/95	Permanent
Pat Bigelow	Fishery Biologist	GS-11	10/01/94 to 09/30/95	Permanent
Part II - Temporary Personnel (FTE's: 3.6)				
Name of Employee	**Functional Title**	**Grade**	**Period Worked**	**Remarks**
Rick A. King	Maintenance Worker	WG-5	10/01/94 to 09/30/95	Term
Jill M. Olson	Fishery Biologist	GS-07	10/01/94 to 09/30/95	Term
Douglas C. Burum	Biological Science Tech	GS-06	10/01/94 to 09/30/95	Term
Russ Waitt	Fishery Biologist	GS-05	4/03/95 to 09/30/95	Temporary

REPORT OF STATION PERSONNEL

Idaho Fisheries Resource Office **Fiscal Year 1995**

Part I - Permanent Personnel (FTE's: 4.0)				
Name of Employee	**Functional Title**	**Grade**	**Period Worked**	**Remarks**
Elizabeth A. Rockhold	Fishery Biologist	GS-07	10/01/94 to 09/30/95	Permanent
Diane E. Praest	Secretary	GS-06	10/01/94 to 09/30/95	Permanent
Amy C. Kishpaugh	Office Automation Clerk	GS-04	10/01/94 to 09/30/95	Permanent
Randall S. Bowen	Biological Science Tech	GS-05	10/01/94 to 09/30/95	Permanent
Paul Hayduk	Fishery Biologist	GS-07	03/05/95 to 09/30/95	Permanent (Trainee)

Part II - Temporary Personnel (FTE's: .5)				
Name of Employee	**Functional Title**	**Grade**	**Period Worked**	**Remarks**
Dan Steele	Fishery Biologist	GS-05	04/03/95 to 08/19/95	Temporary
John Branstetter	Biological Science Tech	GS-04	12/27/94 to 01/06/95	Student Trainee

OPERATIONS AND MAINTENANCE COST DATA

Idaho Fisheries Resource Office **Fiscal Year 1995**

	Funding Source			
	Operations (Fisheries) 1	Cyclical Maintenance (Fisheries) 2	Quarters Maintenance 3	Other Funding 4
1. Salaries, Permanent (Including Benefits):	484,414			
2. Salaries, Temporary (Including Benefits):	85,200			
3. Operating Costs:				
A. Utilities				
1. Telephone	2,475			
2. Electricity				
3. Heating Oil				
4. Natural Gas				
5. Other Building rental	14,770			
B. Vehicles Maintenance				
1. Distribution Vehicles				
Total Mileage:				

OPERATIONS AND MAINTENANCE COST DATA

Idaho Fisheries Resource Office **Fiscal Year 1995**

	Funding Source			
	Operations (Fisheries) 1	Cyclical Maintenance (Fisheries) 2	Quarters Maintenance 3	Other Funding 4
3. B. Vehicle Maintenance (continued) 2. Non-Distribution Vehicles Total Mileage: 47,204 miles	2,422			
C. Fuel for Vehicles/Boats Vehicle Fuel 4,123 gals. Boat Fuel 5,304 gals.	10,420			
D. Supplies 1. Tags and Tagging Supplies	51,446			
2. Office Supplies	10,079			
3. Custodial Maintenance Supplies	500			
4. Other Supplies	5,531			
5. Chemicals				
E. Travel	39,212			

OPERATIONS AND MAINTENANCE COST DATA

Idaho Fisheries Resource Office **Fiscal Year 1995**

	Funding Source			
	Operations (Fisheries) 1	Cyclical Maintenance (Fisheries) 2	Quarters Maintenance 3	Other Funding 4
3. F. Moving Expenses				
C. Miscellaneous 1. Wader, wetsuits, diving supplies, nets, batteries, cables, wood, film, etc.	15,219			
4. Operations (Total: Lines 1, 2, 3A-G)	721,688			
5. Vehicles Purchases (List) 4X4 Pickup	19,500			
6. Total Vehicles Purchased				
7. Equipment Purchased (over $500 - List)	See Attachment A (next page)			
8. Total Equipment (Total: Lines 5, 6, and 7)	174,330			
9. Column Totals (Total: Lines 4 and 8)	901,018			
10. Total Expenditures (Add Totals of Columns 1-4)	$901,018			

Attachment A

Item	Cost
Desktop computers (2)	4,495
Laptop computer	2,900
Software	845
4X4 Pickup truck	19,500
Slide Projector and lens	575
Lease of 1995 Bronco	4,359
Flight Gear	693
Camera equipment	1,403
Electronic Distance Measurer	13,776
Temperature loggers (10)	1,323
Copier	2,830
PIT tag scanner	565
Weir materials	2,781
Helicopter flights	6,055
Clear Creek Trap Contract	4,416
Dworshak NFH	15,884
Dworshak FHC	26,326
Nez Perce Tribe Contract	43,604
Forest Service Contract	22,000
TOTAL	174,330

PUBLIC RELATIONS

Idaho Fisheries Resource Office **Fiscal Year 1995**

1. Presentations:	Number of Groups	Number of People
On Site	2	500+
Off Site	12	1500+

2. Number of Visitors:	
Official	50
Public	10

3. Other Public Relation Activities:

Type of Activity	
1. Press Release	15 Reporters
2. Presentations to sportmens groups	50+
3. Clearwater County Fair - Display Booth	800+
4. Interactions with sportsmen	200+

III. APPENDICES

APPENDIX A

ADULT SPRING CHINOOK SALMON RETURNS TO DWORSHAK-KOOSKIA NFH COMPLEX IN 1995 AND PROGNOSIS FOR 1996

Prepared by:

Ray N. Jones
and
Ralph B. Roseberg
Fishery Biologists

U.S. Fish and Wildlife Service
Idaho Fishery Resource Office
Ahsahka, Idaho

December 1995

Introduction

Dworshak National Fish Hatchery (NFH) is part of the Dworshak Fishery Complex located at the confluence of the North Fork and the main-stem of the Clearwater River near Ahsahka, Idaho. Construction of the hatchery was included in the authorization for Dworshak Dam and Reservoir (Public Law 87-847, October 23, 1962) to mitigate for losses of steelhead (*Oncorhynchus mykiss*) caused by the dam and reservoir.

The hatchery was designed and constructed by the U.S. Army Corps of Engineers (COE) and has been administered and operated by the U.S. Fish and Wildlife Service since 1969. Additional construction was completed in 1982 under the Lower Snake River Compensation Plan (LSRCP) to provide rearing facilities for spring chinook salmon (*O. tshawytscha*). A total of 30 8-foot by 80-foot raceways were constructed. In 1986, 12 8-foot by 75-foot raceways were converted from rainbow trout rearing to chinook salmon rearing (In 1993, two of these raceways were converted to an adult holding pond).

Dworshak NFH formed a "Complex" with Kooskia NFH on April 9, 1978. All administrative responsibilities and operations for both hatcheries were assigned to the Manager at Dworshak NFH. In 1995, both hatcheries, the Dworshak Fish Health Center, and the Idaho Fishery Resource Office were combined to form the Dworshak Fishery Complex. Kooskia NFH is located about 1.5 miles southeast of Kooskia, Idaho, near the confluence of Clear Creek and Middle Fork of the Clearwater River. Because of production constraints, disease considerations, and other factors, Dworshak NFH has held and spawned spring chinook salmon adults returning to Kooskia NFH, as well as incubated eggs and reared juveniles. With the inception of the LSRCP program for spring chinook salmon at Dworshak NFH, transfers between hatcheries have occurred frequently and for several years, the programs were combined. Presently, the programs are separate and adults and offspring are being handled separately.

This report includes a summary of the 1995 adult returns of spring chinook salmon to Dworshak and Kooskia NFHs and predictions for the 1996 adult returns.

Since a low return was predicted in 1995 for Clearwater River spring chinook salmon, a sport fishery season was not opened and the Nez Perce Tribe did not open a subsistence season.

Stock Description

The initial Dworshak NFH spring chinook salmon program utilized a variety or mix of stocks for release years 1983-1986 (Table 1). Leavenworth and Little White Salmon stocks have both been strongly influenced by Carson stock transfers to their programs. The two release years of Rapid River stock (1987-1988) indicate a complete shift from Carson type stocks to rearing smolts from eggs transferred from Rapid River State Fish Hatchery (SFH). For those two release years, the eggs taken at Dworshak NFH and Kooskia NFH returns were transferred to Kooskia NFH. This mix was referred to as Clearwater stock (Table 2).

In fact, the Kooskia NFH program already had stock made up primarily of Carson derivatives. So the resultant Kooskia stock (1989 and later) is still considered a Carson type stock. The recent returns to Dworshak NFH (1989 and later) are referred to as Dworshak stock, since they are progeny of returns to Dworshak NFH, rather than products of Rapid River egg transfers. The Dworshak stock is referred to as a Rapid River type stock. Length frequency data, ocean age class at return time information, and allele frequencies (Elliot and Pascho 1994) all support a distinction between Dworshak and Kooskia stocks.

Table 1. Genetic make-up of Dworshak NFH spring chinook salmon smolts directly released from the hatchery.

Release Year	Genetic Make-up*	% Rack Return
1983	75.1% LW	0.0741
	12.3% RR	
	12.6% LE	
1984	100% LE	0.2831
1985	67.8% LW	0.2570
	32.2% LE	
1986	100% LE	0.1610
1987	100% RR	0.0981
1988	100% RR	0.1898
1989	100% DW	0.0077
1990	100% DW	0.0528
1991	100% DW	0.0471
1992	100% DW	0.0047

RR - Rapid River
LW - Little White Salmon
LE - Leavenworth
DW - Dworshak

Table 2. Genetic make-up of Kooskia NFH spring chinook salmon smolts directly released from the hatchery.

Release Year	Genetic Make-up*	% Rack Return
1971	85.6% RR - 14.4% WR	0.0343
1972	100% RR	0.0698
1973	100% CA	0.0798
1974	100% CA	0.1498
1975	58% RR - 42% CA	0.4094
1976	100% SS	0.2338
1977	84% CA - 11% KK - 5% LW	0.0088
1978	75% RR - 25% CA	0.0123
1979	69% KK - 31% CA	0.0327
1980	31% KK - 69% CA	0.0336
1981	64% CA - 19% KK - 17% RR	0.0390
1982	100% CA	0.0272
1983	65% KK - 35% LE	0.0970
1984	89% KK - 11% RR	0.0533
1985	100% KK	0.2721
1986	100% KK	0.1483
1987	100% CL	0.1263
1988	100% CL	0.1770
1989	100% KK	0.0300
1990	100% KK	0.1630
1991	100% KK	0.2430
1992	100% KK	0.0164

*RR - Rapid River
LE - Leavenworth
CL - Clearwater
LW - Little White Salmon
KK - Kooskia
CA - Carson
SS - South Santiam

1995 Run Size

Rack Returns

The spring chinook salmon adult return to Dworshak NFH for 1995 was 125, the third lowest return on record (Table 3). The adult spring chinook salmon return to Kooskia NFH was 40, the lowest return since 1982 (Table 4). The only positive note for this year's return is the number of I-Ocean returns. Although not exceedingly high, it is an indication of a better return for 1996.

Table 3. Hatchery rack returns and age composition of spring chinook salmon for Dworshak NFH, 1984-1995.

Year Return	I-salt	II-salt	III-salt	Unmeasured	Total
1984	14	52	16	0	82
1985	13	281	35	5	334
1986	78	346	91	0	516
1987	25	1604	376	12	2017
1988	163	569	1240	0	1972
1989	156	1322	221	1	1700
1990	7	1892	135	8	2042
1991	16	77	72	0	165
1992	23	286	40	21	370
1993	9	452	359	3	823
1994	3	30	41	0	74
1995	83	36	6	0	125

Table 4. Hatchery rack returns and age composition of spring chinook salmon for Kooskia NFH, 1972-1995.

Year Return	I-salt	II-salt	III-salt	Unmeasured	Total
1972	5	0	0	0	5
1973	5	45	0	0	50
1974	16	35	2	0	53
1975	15	284	27	0	326
1976	409	286	106	0	801
1977	333	2539	154	0	3026
1978	23	1676	336	0	2035
1979	11	100	264	0	375
1980	9	55	3	0	67
1981	1	168	78	0	247
1982	3	116	139	0	258
1983	1	231	141	0	373
1984	55	80	206	0	341
1985	26	449	54	0	529
1986	21	159	103	0	283
1987	16	607	64	0	687
1988	39	363	193	0	595
1989	107	717	142	7	973
1990	11	921	209	0	1141
1991	10	98	350	9	467
1992	14	239	38	21	312
1993	11	749	409	11	1180
1994	1	96	135	0	232
1995	21	7	12	0	40

Age Composition

Age composition of the run is presently based on fork length categories. The length categories were derived from known age/length/sex data from CWT recovery databases. I-salts are 56 cm or less, II-salts are 57 through 81 cm, and III-salts are larger than 81 cm. The age composition for the 1995 adult return is displayed in Table 5.

Survival

The III-salt returns in 1995 complete the returns from the 959,369 smolts released at Dworshak NFH and the 727,251 smolts released at Kooskia NFH in 1992. Total returns to the North Fork of the Clearwater from the 1992 release were 9 I-salts, 30 II-salts, and 6 III-salts for a hatchery return survival rate of 0.0047 percent (Table 6). Total returns to Clear Creek from the 1992 release were 11 I-salts, 96 II-salts, and 12 III-salts for a hatchery return survival rate of 0.0164 percent (Table 7).

Table 5. Age composition for 1995 spring chinook salmon returning to Dworshak Fishery Complex.

Dworshak NFH			Kooskia NFH		
Age	Number	Percent	Age	Number	Percent
I-salt	83	66.4	I-salt	21	52.5
II-salt	36	28.8	II-salt	7	17.5
III-salt	6	4.8	III-salt	12	30.0
TOTAL MEASURED	125	100	TOTAL MEASURED	40	100

Table 6. Return vs. release numbers for adult spring chinook salmon returns to Dworshak NFH.

Release Year	Smolts Released at Hatchery*	I-salts (% return)	II-salts (% return)	III-salts (% return)	Total (% return)
1988	1,547,219	156 (0.0101%)	2709 (0.1751%)	72 (0.0047%)	2937 (0.1898%)
1989	1,651,472	10 (0.0006%)	77 (0.0047%)	40 (0.0024%)	127 (0.0077%)
1990	1,251,247	16 (0.0013%)	286 (0.0229%)	359 (0.0287%)	661 (0.0528%)
1991	1,094,884	23 (0.0021%)	452 (0.0413%)	41 (0.0037%)	516 (0.0471%)
1992	959,369	9 (0.0009%)	30 (0.0031%)	6 (0.0007%)	45 (0.0047%)
1993	467,222	3 (0.0006%)	36 (0.0077%)		
1994	1,278,273	83 (0.0065%)			

*Includes smolt releases at hatchery only. Does not include off-site releases or fry/fingerling releases.

Table 7. Return vs. release numbers for adult spring chinook salmon returns to Kooskia NFH.

Release Year	Smolts Released at Hatchery*	I-salts (% return)	II-salts (% return)	III-salts (% return)	Total (% return)
1988	778,407	107 (0.0137%)	921 (0.1183%)	350 (0.0450%)	1378 (0.1770%)
1989	384,235	11 (0.0029%)	98 (0.0255%)	38 (0.0096%)	147 (0.0383%)
1990	403,701	10 (0.0025%)	239 (0.0590%)	409 (0.1013%)	658 (0.1630%)
1991	396,619	14 (0.0038%)	749 (0.2026%)	135 (0.0365%)	898 (0.2430%)
1992	727,251	11 (0.0015%)	96 (0.0132%)	12 (0.0017%)	
1993	343,437	1 (0.0003%)	7 (0.0020%)		
1994	305,813	21 (0.0069%)			

*Includes smolts released at hatchery only. Does not include off-site releases or fry/fingerling releases.

Coded-wire Tag (CWT) Recoveries

Our facilities have significantly increased spring chinook salmon marking. From one CWT group at Dworshak NFH for the 1987 release year (contribution only) to a range of from 9 to 24 CWT groups representing multiple evaluation studies for the 1988-1995 release years. At Kooskia NFH, we released CWT groups less often (1984, 1990, 1992, 1993, 1994, and 1995). In 1993, 1994, and 1995 all hatchery fish were marked with at least an adipose fin clip in order to discriminate between hatchery and natural or wild stocks. The increased marking in recent years has enlarged the spring chinook salmon CWT recovery database to a point where it is much more useful for hatchery evaluation. It also dramatically increased the workload for CWT sampling, recovery, and data processing.

A summary of adult spring chinook salmon recoveries in the Dworshak NFH rack is shown in Table 8. All recoveries at the Dworshak NFH rack were Dworshak NFH marks this year. Rack recoveries in previous years have included strays from other hatcheries and National Marine Fisheries Service transportation study marks.

Table 8. Summary of CWT recoveries for adult spring chinook salmon in the Dworshak NFH rack (1987-1995).

Rack Year	Total Recoveries	Recoveries of Dworshak Marks
1987	25	19
1988	55	49
1989	77	47
1990	306	302
1991	30	10
1992*	183	177
1993*	449	449
1994*	51	28
1995*	95	68

* recoveries include fish tagged at Kooskia NFH. Previous recoveries were only fish tagged at Dworshak NFH.

1995 Run Predictions

Dworshak NFH-1995

Even though the 1995 spring chinook salmon return to Dworshak NFH was disappointing, the total return was higher than we predicted. Both the II- and III-Salt predictions were high, but were not unreasonable. The I-Salt prediction was significantly underestimated.

1995 Run Prediction		1995 Rack Return	
I-salt =	19	I-salt =	83
II-salt =	40	II-salt =	36
III-salt =	15	III-salt =	6
Total n =	74	Total run =	125

Kooskia NFH-1995

The 1995 spring chinook salmon return to Kooskia NFH was even more disappointing. The only prediction that was close was for the I-Salt fish. Both the II- and III-salt predictions were vastly overestimated.

1995 Run Prediction		1995 Rack Return	
I-salt =	14	I-salt =	21
II-salt =	80	II-salt =	7
III-salt =	40	III-salt =	12
Total n =	134	Total Run =	40

1996 Run Predictions

The following is our prediction for the 1996 spring chinook salmon run to Dworshak and Kooskia NFHs.

Dworshak NFH		Kooskia NFH	
I-salts	50	I-salts	20
II-salts	900±200	II-salts	300±100
III-salts	5	III-salts	5
TOTAL	955±200	TOTAL	325±100

Total predicted to return both hatcheries in 1996 is 1280±300 . The total hatchery spring chinook salmon predicted to return to Dworshak and Kooskia NFH's in 1996 will not meet the complete broodstock requirements. The number of adults needed for supplying eggs to fill both hatcheries is estimated at 1,700. Actual number needed varies, depending on number of eggs per female (which varies with size and age of fish returning) and sex ratio of any particular run. The estimated return will also be far short of our LSRCP mitigation goal of 9,135 adults returning to Lower Granite Dam.

Literature Cited

Elliot, Diane G. and R. J. Pascho. 1994. Juvenile fish transportation: Impact of bacterial kidney disease on survival of spring/summer chinook salmon stocks. Annual Report. U.S. Army Corps of Engineers. Contract E86920048. 79p.

APPENDIX B

ADULT STEELHEAD RETURNS TO DWORSHAK NFH IN 1994-95 AND PROGNOSIS FOR 1995-96

Prepared By:

Ralph B. Roseberg

and

Ray N. Jones
Fishery Biologists

Douglas C. Burum
Biological Science Technician

U.S. Fish and Wildlife Service
Idaho Fishery Resource Office
Ahsahka, Idaho

December 1995

Introduction

Dworshak NFH is part of the Dworshak Fishery Complex located at the confluence of the North Fork and the main-stem of the Clearwater River near Ahsahka, Idaho. Construction of the hatchery was included in the authorization for Dworshak Dam and Reservoir (Public Law 87-847, October 23, 1962) to mitigate for losses of anadromous steelhead (*Oncorhynchus mykiss)* caused by the dam and reservoir.

The hatchery was designed and constructed by the U.S. Army Corps of Engineers (COE) and has been administered and operated by the U.S. Fish and Wildlife Service since the first phase of construction was completed in 1969. At that time, the hatchery had 25 ponds on a reuse system and 59 ponds on single-pass. In 1972, a second phase of construction placed all ponds on reuse systems with the option of operating some ponds on either reuse or single-pass.

Releases of steelhead smolts from Dworshak National Fish Hatchery (NFH) began in 1970 with the first hatchery produced adults returning in 1972. The 1994-95 return marked the 23rd year that North Fork Clearwater River hatchery steelhead have returned to Dworshak NFH. Table 1 summarizes the Dworshak NFH steelhead returns to the Clearwater from 1972-1995. This report reviews the statistics of the 1994-95 run and the prognosis for 1995-96.

Stock Description

The North Fork Clearwater River steelhead stock maintained by Dworshak NFH is unique in the Columbia River Basin. At maturity, males and females of this stock (also referred to as "B" run steelhead) average about 91 cm (36 inches) and 82 cm (33 inches) in length, respectively. Spawning stock is comprised of three age classes; I-, II-, and III-"salt" fish. This nomenclature refers to the number of complete years fish have spent in salt water. Fish are actually two years older than this system indicates, as they are reared for one year in the hatchery and spend another year emigrating to and returning from the ocean to the hatchery.

The "B" run steelhead enter the Columbia River in August, usually later than the smaller size "A" run fish. The "B" run steelhead reach the Snake and Clearwater Rivers in the fall, then over-winter until their final spawning run into the hatchery.

Dworshak NFH maintains the North Fork Clearwater River stock of B-run summer steelhead which was denied access to historical spawning area in 1968 by the completion of Dworshak Dam. B-run steelhead were native to the North and Middle Forks of the Clearwater River and the Middle and South Forks of the Salmon River. B-run steelhead grow larger than A-run steelhead; generally cross Bonneville Dam later; and tend to winter lower in the rivers. Dworshak NFH B-run steelhead are unique in that they grow larger than any other Columbia Basin steelhead.

1994-95 Adult Returns

The hatchery ladder was opened October 25, 1994 and remained open until December 1, 1994. A total of 180 early returning steelhead entered the trap during this period. The initiation of fish ladder operation in October was a continuing attempt to insure inclusion of early arriving steelhead in the hatchery gene pool. The fish ladder was reopened

January 23, 1995 and was closed on May 4, 1995. A total of 1,394 adult steelhead entered the ladder during the spring of 1994. The 1995 adult steelhead return to Dworshak NFH was the lowest return on record. The previous record low of 1,698 fish occurred in 1975 (Table 1).

A total of 421 hatchery steelhead returned to Kooskia NFH and 417 were transferred to Dworshak NFH for broodstock. This is the first time in a decade that steelhead returning to Kooskia NFH have been used at Dworshak NFH.

Age and Sex Composition of Rack Return

Age composition of the run is presently based on fork length criteria. The length categories were derived from known age/length/sex data from coded-wire-tag (CWT) recovery databases. The criteria for males is: I-Salt <73 cm; II-Salt 73-92 cm; III-Salt >92 cm. The criteria for females is: I-Salt <68 cm; II-Salt 68-90 cm; III-Salt >90 cm. The total returns by age and sex are listed in Table 2.

Table 1. Number of steelhead returning to Dworshak National Fish Hatchery, estimates of hatchery fish harvested, and total hatchery returns to the Clearwater River, Idaho.

Return[1]	Number Back To DNFH	Estimated Clearwater Sport Harvest[2]	Estimated Clearwater Tribal Harvest[3]	Unharvested Clearwater Hatchery Fish[4]	Total Hatchery Fish Returning to Clearwater R.
1972-73	9,938	2,068	-	0	12,006
1973-74	7,910	2,320	-	0	10,230
1974-75	1,698	N.S.[5]	290	0	1,988
1975-76	1,858	N.S.	430	0	2,288
1974-77	3,100	N.S.	410	0	3,510
1977-78	12,727	14,000	(1,000)[6]	0	27,727
1978-79	4,939	4,610	(500)	0	10,049
1979-80	2,519	N.S.	1,250	300	4,069
1980-81	1,968	4,510	(1,000)	500	7,978
1981-82	3,054	1,665	(1,000)	0	5,719
1982-83	7,672	13,967[7]	(1,500)	0	23,139
1983-84	3,284	6,500	(,500)	100	11,384
1984-85	14,018	19,410	(1,500)	2,700	37,628
1985-86	4,462	7,240	1,471	1,800	15,002
1986-87	5,286[8]	15,679	4,210	3,000	28,175
1987-88	3,764	8,766	1,478	2,000	16,008
1988-89	6,041	11,332	1,242	3,700	22,315
1989-90	10,630	27,952	1,710	3,650	43,942[9]
1990-91	7,876	12,973	1,211	2,250	24,310
1991-92	3,700	10,416	1,326	1,650	17,092
1992-93	7,900	19,351	1,184	3,368	31,803
1993-94	3,757	14,063	675	1,457	19,952
1994-95	1,394	5,953	730	500	8,577

(1972-73 to 1983-84 data based on Pettit, 1985, IDFG Federal Aid Report, Project F-73-6, January, 1985.)

[1]Return year is from October through May.
[2]Unless otherwise noted, estimates of sport harvest in the Clearwater River taken from Idaho Department of Fish and Game annual reports.
[3]Unless otherwise noted, estimates of tribal harvest in the Clearwater River were taken from Nez Perce Tribe Department of Fishery Resource Management annual reports.
[4]Based on return percentage back to hatchery to calculate returning II-salts from upstream releases.
[5]N.S., no sport fishing season.
[6]( ) guesstimate on tribal harvest by author.
[7]Pettit (IDFG, Lewiston, Idaho, personal communication) included an additional 2,000 fish in harvest from Snake River for a total of 15,967.
[8]Ladder was closed for several days due to high number of returns; not a total hatchery return figure.
[9]We believe the sport estimate of 27,953 is around 8,000 too high and the total number of Dworshak steelhead to the Clearwater River was in the range of 31,000 to 35,000.

Table 2. Age and sex composition of the 1995 adult return of summer steelhead to Dworshak NFH.

	I-salt	II-salt	III-salt	Total
Males	31	383	41	455
Females	17	887	35	939
Totals	48	1270	76	1394

Survival

The III-salt returns in 1995 complete the returns from the 1,192,503 smolts released at Dworshak NFH in 1991. Total returns to the North Fork of the Clearwater from the 1991 release were 389 I-salts, 3,543 II-salts, and 76 III-salts for a hatchery return survival rate of 0.3361 percent (Table 3). The mean hatchery rack return rate for the period of 1980-1991 is 0.4839 percent.

Coded-wire Tag (CWT) Recoveries

A summary of adult steelhead recoveries in the Dworshak NFH rack is shown in Table 4. There were no CWT recoveries from strays at the Dworshak NFH rack this year. Rack recoveries in most previous years have included strays from other hatcheries, usually Lyons Ferry Hatchery. National Marine Fisheries Service(NMFS) transportation study marks were included as Dworshak NFH marks as there was no reason to believe they were strays.

Table 3. Return vs. Release numbers for adult summer steelhead returns at Dworshak NFH, 1980-1995.

Release year	Smolts Released	I-Salt	II-Salt	III-Salt	Total	Percent Return
1980	2,666,085	400	6,613	652	7,665	0.2875
1981	1,930,047	124	1,538	1,219	2,881	0.1493
1982	2,108,319	1,094	12,679	403	14,176	0.6724
1983	1,259,110	120	3,359	239	3,718	0.2953
1984	1,208,319	700	8,318	119	9,137	0.7562
1985	1,035,573	431	3,487	317	4,235	0.4090
1986	1,239,541	168	5,296	215	5,679	0.4582
1987	1,206,580	428	9,896	314	1,0638	0.8817
1988	1,432,125	487	7,339	250	8,076	0.5639
1989	1,073,900	218	3,132	162	3,512	0.3270
1990	1,166,664	313	7,349	153	7,815	0.6699
1991	1,192,503	389	3,543	76	4,008	0.3361
1992	1,224,101	61	1,270			
1993	1,217,990	48				
1994	1,153,417					
1995	1,213,577					

Table 4. Summary of CWT recoveries for adult summer steelhead in the Dworshak NFH rack (1987-1995).

Rack Year	Total Recoveries	Recoveries of Dworshak Marks	Recoveries of Marks from Strays
1987	397	388[1]	9
1988	50	44	6
1989	284	279[1]	5
1990	587	571[1]	16
1991	738	738	0
1992	325	322[1]	3
1993	511	508	3
1994	238	234	4
1995	108	108[1]	0

[1]Includes NMFS transportation study marks.

Evaluation of Run Prediction for 1995 and Forecast for 1996

1995 Prediction - The 1995 run prediction and actual rack return is listed in Table 5 by age class. The 1995 steelhead returns to Dworshak NFH were an all time record low. Our prediction was for a low return. However, even that prediction was overly optimistic. Unfortunately, the jack return was also a new record low.

Table 5. Comparison of predicted adult return with actual adult return for summer steelhead at Dworshak NFH, 1995.

1995 Rack Prediction	1995 Rack Return
I-salt = 200	I-salt = 48
II-salt = 2,200	II-salt = 1,270
III-salt = 200	III-salt = 76
Total n = 2,600	**Total run = 1,394**

1996 Run Predictions. River flows, water temperatures, Zone 6 harvest, and sport harvest are all factors that influence the number of returning steelhead. The low flows and relatively warm water of 1993 and 1994 slowed the fall return of adults, which made them more susceptible to sport harvest in Washington and Oregon. Idaho sport effort on the Clearwater was very low in the fall of 1994. The 1995 fall Idaho sport season was modified to no harvest. Our estimates are based on data from years with a sport harvest so our estimate in Table 6 will be low.

Table 6. Predicted returns to the Dworshak NFH rack in 1995-96.

I-Salts	336
II-Salts	1,300 ± 100 (2,500 ± 500 if season remains closed)
III-salts	150
Totals	1,786 ± 100

The total hatchery summer steelhead predicted to return to Dworshak NFH in 1996 will meet the broodstock requirements of Dworshak NFH, especially since adult hatchery steelhead returning to Kooskia NFH may also be spawned, as they were in 1995. The combined broodstocks will meet our requirements but there will probably be a male/female ratio similar to 1995 (1:2.37) if the sex ratio is similar. Actual number needed varies, depending on number of eggs per female (which varies with size and age of fish returning), pre-spawning mortality, IHN incidence, and sex ratio of any particular run. The estimated return will be far short of our COE mitigation goal of 20,000 adults returning to the mouth of the Clearwater River.

Literature Cited

Roseberg, R.B., H.L. Burge, W.H. Miller and D. Diggs, 1991. A review of coded-wire tagged fish released from Dworshak, Kooskia, and Hagerman National Fish Hatcheries. 1976-1990. U.S. Fish and Wildlife Service Report. Ahsahka, ID.

APPENDIX C

FALL CHINOOK SALMON RESEARCH IN THE SNAKE AND CLEARWATER RIVERS FROM 1991-95

Prepared By:

William P. Connor

and

Aaron P. Garcia
Fishery Biologists

U.S. Fish and Wildlife Service
Idaho Fishery Resource Office
Ahsahka, Idaho

December 1995

INTRODUCTION

The number of fall chinook salmon spawning in the free-flowing Snake River from Hells Canyon Dam to the head of Lower Granite Reservoir declined dramatically after the completion of Hells Canyon Dam in 1967. Low escapement of fall chinook salmon adults to the free-flowing Snake River has persisted from 1967 to 1992. Accordingly, Snake River fall chinook salmon were added to the federal list of threatened species in 1992. This listing was downgraded to endangered status by emergency action in 1994. The endangered status of Snake River fall chinook salmon emphasizes the need for information on: spawning escapement, spawning habitat, natural juvenile life history, and supplementation with Lyons Ferry Hatchery fall chinook salmon as an interim recovery measure. We worked closely with the National Biological Service (NBS) in FY95 to:

1) Conduct aerial surveys to count fall chinook salmon redds;

2) Validate (ground truth) redd counts from aerial surveys to improve count accuracy;

3) Search underwater with video cameras to locate redds in water too deep to allow detection from the air;

4) Map spawning sites and collected data to classify spawning habitat types;

5) Participate in a graduate study of spawning gravel quality of the Snake River;

6) Develop a model to identify the race of subyearling chinook salmon seined in the Snake River;

7) Assist the National Marine Fisheries Service (NMFS) with tests of a prototype system for collecting fish by PIT-tag code at Lower Granite Dam;

8) Seine and PIT-tag subyearling chinook salmon to assist in inseason water management;

9) Work cooperatively with the NMFS and the NBS conducting a pilot supplementation/survival study with subyearling-hatchery fall chinook salmon released into the Snake River;

10) Coauthor a proposal to monitor and evaluate supplementation releases of Lyons Ferry Hatchery yearlings from acclimation facilities at Pittsburg Landing; and

11) Participate in a press release concerning the benefits of summer-flow augmentation from Dworshak Reservoir for fall chinook salmon emigration.

The study area in FY95 included the free-flowing Snake River between Hells Canyon Dam at river kilometer (RK) 398 and the head of Lower Granite Reservoir near Asotin, Washington (RK 235), the lower Snake River reservoirs to the mouth, and the Columbia River downstream from the mouth of the Snake River to McNary Dam (RK 470). We described specific locations within the area in terms of river kilometers based on U.S. Army Corps of Engineers (COE) navigation charts of the Snake River (COE 1990) and U.S. Geological Survey topographical maps.

SPAWNING SURVEYS

The objectives for spawning ground surveys conducted in FY95 were to describe spawning time, redd distribution, and extent of fall chinook salmon spawning in the Snake River using redd counts from helicopter surveys, underwater searches, and ground observations. Redd counts were made by two observers in a helicopter as it traveled from Asotin, Washington to Hells Canyon Dam at an altitude of <200 m. When a potential redd was observed, the helicopter was positioned for optimal viewing and one observer marked the location on COE navigation charts. In 1994, eight redd surveys were conducted at 6 to 8-d intervals from 24 October to 12 December. Potential fall chinook salmon redds observed from the air in 1994 were examined (ground truthed) by boat, wading, or using underwater cameras. The locations of most validated redds observed from the air in 1994 were recorded using survey instrumentation. Deep-water searches in 1994 were conducted in three parts. First, we performed low-intensity searches by passing a camera through each search area in 6-9 m zig-zag pattern. Second, if a redd was encountered, we then searched the site intensively, without limits on the search pattern. Third, we used a systematic high-intensity search method to cover each site where redds were located. A total of 53 redds was counted through weekly helicopter surveys and ground truthing in 1994. A total of 14 deep-water redds was located in 1994 using the underwater video camera. A total of 67 fall chinook salmon redds was located in 1994 by all survey methods.

SPAWNING HABITAT

The development of an empirical approach for classifying Snake River fall chinook salmon spawning habitat types was a continuation of research that began in 1991 to establish the relation between Hells Canyon Complex discharge and habitat availability at selected index sites. Video taped substrate, surveyed river channel elevations, and surveyed water surface elevations were collected at 16 spawning sites using a cross-sectional approach. Substrate was classified as spawning gravel if the dominant particle size was 2.5-15 cm. Data were collected under a range of flows and times to construct detailed site maps. Cross-sectional profiles were used to calculate median lateral slope of, and median depth over, the spawning substrate. Classifying fall chinook salmon spawning habitat types emphasized three components: 1) median lateral slope of spawning substrate, 2) water surface slope between hydraulic controls, and 3) median depth over the spawning substrate. The median lateral slopes of each spawning cross section were ranked in ascending order. Linear regression was used to calculate an r^2 and P-value between the four lowest ranks and the median lateral slope of the substrate of each cross section. Subsequent regressions were done by adding the next highest rank and its slope until the r^2 and P-values were maximized. The next data set selected for regression started where the first ended and proceeded until the r^2 and P-values were maximized. We analyzed the water surface slopes and depths for groups using the regression technique described for lateral slope of spawning substrate. Tentatively, it appears there are 12 types of Snake River fall chinook salmon spawning habitat in the free-flowing Snake River.

Underwater video and ground surveys can only estimate the quantity and quality of available spawning gravels by visual appearance of the substrate surface; an inadequate and often misleading indicator of gravel quality. Dr. David Bennett (major professor; University of Idaho) and Craig Eaton (student investigator) began a two-year study of spawning gravel quality of the Snake River. SCUBA divers randomly sampled spawning substrate at study sites using a modified, suction dome sampler at depths > 1.2 m deep. A modified, tri-tube freeze core

sampler, fueled by liquid CO_2, was used to sample substrate in water < 1.2 m deep. Dried substrate samples were shaken through U.S.G.S standard sieves with a range of mesh sizes. Dry weight from each sieve was used to calculate the mean particle size distribution of each sample. Three measures of gravel size/permeability were used to determine substrate composition including the proportion of gravel particles less than a given sieve size, geometric mean, and the fredle index. Fry survival was tested in the laboratory under the range of substrate sizes collected in the field using 48 troughs and hatchery fall chinook salmon eggs. Bennett and Eaton found that overall quality indices of spawning substrate from sites studied in FY95 were generally high. Incubation and emergence success from experimental troughs were similar to those of others who found an inverse relationship between survival to emergence and fine sediments. Indices for the quality of spawning gravel indicate incubation and emergence success of fall chinook salmon should generally exceed 75% at locations studied in FY95.

GENETIC ANALYSIS

An unknown stock of fall chinook salmon spawned in the Snake River in 1990 when the population was petitioned for listing under the Endangered Species Act. In FY95, we began a manuscript with Washington Department of Fish and Wildlife (WDFW) and the NBS to document the stock of fall chinook salmon in the Snake River and model the race of subyearling chinook salmon seined in the Snake River from 1991-1995. We used juvenile chinook salmon tissue to identify the Snake River's fall chinook salmon stock and develop a race model. Juvenile subyearling chinook salmon were PIT tagged in the Snake River from 1991-1995 and recaptured at Lower Granite Dam where a subsample was sacrificed for electrophoresis. Maximum Likelihood Estimation (MLE) was used to estimate the race of recaptured/PIT-tagged juvenile salmon as either fall or spring/summer chinook salmon. MLE-estimated fall chinook salmon dominated the recaptured/PIT-tagged sample three of four years including FY94 (80% of total). These 1991 data were used as a genetic baseline for natural Snake River Fall chinook salmon. Cluster analysis showed that the natural Snake River fall chinook salmon was genetically unique and closely related to Lyons Ferry Hatchery Stock. We calibrated the a race model using the FL and tagging dates of the recaptured\PIT-tagged salmon of estimated race since spring/summer chinook salmon were generally larger than fall chinook salmon. Accuracy of the calibrated model, measured in terms of correct race predictions for MLE estimated salmon, averaged 71% from 1991-1994. The model predicted that from 1991-1994 our beach seine catch was composed of 87%-92% fall race salmon.

SEPARATION-BY-CODE

The use of juvenile chinook salmon tissue to identify the Snake River's fall chinook salmon stock was initially difficult because of it was hard to recapture fish at Lower Granite Dam. We worked cooperatively with the National Marine Fisheries Service (NMFS) to test a prototype system at Lower Granite Dam which would allow the recapture of specific PIT-tagged fish. This system is called Separation-by-code or SBC. The work was led by Dr. Sandra Downing and Earl Prentice of NMFS's Manchester Marine Experimental Station. The test required PIT-tagging 500 Dworshak NFH steelhead, 500 Dworshak NFH spring chinook salmon, and 400 Lyons Ferry Hatchery fall chinook salmon. Different species/lifestage combinations were released into the bypass at Lower Granite Dam. Prior release, we programmed software, developed for SBC by Battelle Northwest, to either pass a specific PIT-tagged fish to the river or to a net pen. The net pen was made of three separate nets. We also

programmed the software to send a specific group PIT tagged to each of the three nets. The Dworshak NFH steelhead were strong swimmers and only about 70% ended up where we programmed SBC to direct them. Conversely, we had high success (>90%) directing spring and fall chinook salmon juveniles. The success of our tests with chinook salmon prompted us to request use of the SBC system on a prototype basis for collecting PIT-tagged natural and hatchery fall chinook salmon at Lower Granite Dam in FY95. This required intensive coordination with the U.S. Army Corps of Engineers (COE), Fish Passage Center (FPC), and WDFW. Good flow and temperature conditions in 1995 combined with SBC system operation by the FWS and WDFW, provided the best sample of fall chinook salmon at Lower Granite Dam since our work began in 1991.

JUVENILE SAMPLING

There was no information on the life history of natural Snake River fall chinook salmon juveniles in the free-flowing Snake River or the Clearwater River when the stock was petitioned for listing under the Endangered Species Act in 1990. Our objectives in FY95 were to collect the fifth year of data on natural fall chinook salmon juveniles and to provide in season run timing estimates to the Fish Passage Advisory Committee (FPAC) and the Technical Management Team (TMT). We seined: the Clearwater River from the confluence of the North Fork to the mouth; the upper Snake River from Two Corrals Creek (RK 222) to RK 319; and the lower Snake River from RK 290 to RK 226. Two technicians of the Nez Perce Tribe Department of Fisheries Resources Management provided field help on the Clearwater River. We seined totals of 827, 1,686, and 914 subyearling chinook salmon in the Clearwater, lower Snake, and upper Snake rivers, respectively. Totals of 463, 916, and 569 of the above fish were PIT tagged. Unique detections at Lower Granite, Little Goose, Lower Monumental, McNary, John Day, and Bonneville dams totaled 45, 436, and 326 for the Clearwater, lower Snake, and upper Snake rivers, respectively. Detection rates (unique detections/numbers tagged) of 9.7%, 47.6%, and 57.3% for the Clearwater, lower Snake, and upper Snake rivers were the highest for the 1991-1995 period. We provided real-time predictions to the FPAC and the TMT five times during FY95.

SUPPLEMENTATION RESEARCH

Through our research, and cooperation with numerous state and federal agencies and the Nez Perce Tribe, the understanding of the early life history of Snake River fall chinook salmon has increased greatly since 1991. However, more work is needed on subyearling fall chinook salmon supplementation and survival. Working with NMFS we conducted a pilot study in FY95 funded by BPA and COE. Our portion of the research focuses on supplementation with Lyons Ferry Hatchery subyearling fall chinook salmon parr and smolts and has five objectives including:

1) Describing the effects of rearing history on post-release behavior of fall chinook salmon released in the free-flowing Snake River;

2) Comparing the biology (i.e., health, physiology, and growth) over rearing and emigration of hatchery and natural fall chinook salmon release groups;

3) Comparing the environmental variability (i.e., discharge, temperature, turbidity) of the Snake River and Lower Granite Reservoir over the period of rearing and emigration of hatchery and natural fall chinook salmon release groups;

4) Determining the relative survival of hatchery and natural fall chinook salmon release groups from release to the tailrace of Lower Granite Dam; and

5) Defining the effects of post-release behavior, biology of fish release groups, and the environmental conditions during rearing and emigration on survival estimates to Lower Granite Dam for hatchery and natural fall chinook salmon release groups.

We released about 4,500 PIT-tagged and coded-wire-tagged hatchery parr at both Pittsburg Landing (RK 346) and Billy Creek (RK 265) in late May and early June of 1995. The above fish were detected passing Lower Granite, Little Goose, Lower Monumental, and McNary dams as they emigrated. Calculated capture probabilities, which are analogues to fish guidance efficiency, ranged from about 43% - 54% at the dams. This is higher than expected and probably attributable to high-cool emigration conditions and extended screens at Lower Granite Dam. Fish from all release groups grew well and their condition factors compared well to natural fall chinook salmon when both groups were recaptured at Lower Granite Dam using the SBC described earlier in this report. Median travel times for Pittsburg Landing and Billy Creek releases were not statistically different indicating that the salmon moved quickly through the free-flowing river then spent most of their time at large in the reservoir. Also, preliminary survival estimates calculated by NMFS indicate no difference in survival between the Pittsburg Landing and Billy Creek releases. This suggests that most of the mortality occurred in the reservoirs or at the dams.

ACCLIMATION EVALUATION

The Columbia River Intertribal Fish Commission in cooperation with Senator Hatfield of Oregon arranged funding for fall chinook salmon acclimation facilities above Lower Granite Dam in the Snake River Basin. Funding was transferred to the Lower Snake River Compensation Plan Program by the COE. The Production Advisory Committee (PAC) of U.S. versus Oregon agreed upon the release of up to 450,000 yearling Lyons Ferry Hatchery fall chinook salmon smolts annually from the proposed acclimation facilities. About 120,000 yearlings are scheduled for release in 1996 provided acclimation facilities are available. The Nez Perce Tribe assumed the lead in acclimation site selection and operation and maintenance. The Nez Perce Tribe, working closely with PAC, selected Pittsburg Landing in Hells Canyon National Recreation Area as the first of three acclimation sites. We authored a proposal jointly with WDFW and in cooperation with the Nez Perce Tribe to monitor and evaluate the yearling supplementation releases from Pittsburg Landing. The monitoring and evaluation program has three objectives:

1) Monitor release dates, release location, release physiology, post-release dispersal, emigration timing, migrant physiology, and adult escapement of outplanted and hatchery released salmon to the spawning grounds and hatchery;

2) Evaluate progress towards escapement goals including a limiting factor analysis based on objective 1 monitoring; and

3) Share these data and results of monitoring and evaluation with the agencies and tribes.

Work on the monitoring and evaluation of the yearling releases is scheduled to begin in FY96.

NEWS RELEASE

In conjunction with the Regional Office Public Affairs division we prepared a news release concerning the controversial water releases from Dworshak Reservoir. The objective of the news release was to tell the public why the Service felt that releasing water from Dworshak Reservoir increases Snake River fall chinook salmon survival. A number of misconceptions were partially responsible for the controversial nature of the releases. These misconceptions were: 1) no juvenile salmon are emigrating through the Snake River when the releases were made; 2) the water from Dworshak reservoir would not make any difference in flow or temperature of the lower Snake River; 3) there was no science behind the releases. The releases made from Dworshak Reservoir from 1991-1995 were timed, in part, according to updates we provided the FPAC and TMT. There is a great resistance to begin the releases until after the fourth of July weekend. Therefore, the Dworshak releases have been made as timely as possible for fall chinook salmon juveniles emigration. In 1995, over half of the PIT-tag detections occurred after the Dworshak releases took affect. Researchers have conclusively documented that Dworshak Dam releases cool Lower Granite Reservoir significantly and contribute markedly to flow volume in Lower Granite Reservoir. Even under the near normal (relatively high) Snake River flows of 1995 Dworshak Reservoir releases, averaging about 13.5 KCFS, made up 1/3 to 1/4 of flows at Lower Granite Reservoir. Furthermore, Dworshak Reservoir releases in 1995 made it possible to meet and exceed NMFS minimum target of 51.4 KCFS for fall chinook salmon recovery. Providing fisheries managers with sound scientific information has been an important goal of our research. Our research has led to a better understanding of Snake River fall chinook salmon early life history. We did not intend to study fall chinook salmon survival in the first five years of this project. However, within the five-years of PIT-tag data we have seen some evidence of increased survival of PIT-tagged fall chinook salmon related to high flow and cool temperatures. PIT-tagged subyearling chinook salmon which are detected at the dams are bypassed around turbines and trucked below Bonneville Dam. Fish which are not detected pass through the turbines and die at rates of about 10%-15%. Therefore, the percentage of fish which are detected throughout the Snake and Columbia River hydrosystem are relative measures of minimum survival. Obviously, these minimum survival estimates are affected by tagging mortality and changes in dam operations between years.

Minimum survival estimates for subyearling chinook salmon (i.e., unique-cumulative detections at dams with detection hardware) were 6.8, 11.1, 15.4, 23.6, and 47.5 in 1992, 1994, 1991, 1993, and 1995, respectively. Maximum mean daily water temperatures measured about 60 meters below the surface of Lower Granite Reservoir just upstream from Lower Granite Dam were 22.8, 23.9, 21.1, 23.3, and 19.9 in 1992, 1994, 1991, 1993, and 1995, respectively. We plotted these data and regressed minimum survival against water temperature and produced Figure 1. Simply, stated cooler conditions are significantly related to higher survival through the reservoir. In this report we have shown that: 1) survival estimates calculated in through pilot research with hatchery fish indicate that most of the survival benefits occurred in the reservoir during 1995, 2) Dworshak Reservoir releases cool Lower Granite Reservoir, and 3) cooler reservoir water is positively related to fall chinook salmon survival. Obviously, the high survival in 1995 was due to a combination of factors including extended travelling screens, better post-tagging survival, and high natural flows. However, the evidence given above supports the release of Dworshak Reservoir water to increase fall chinook salmon survival.

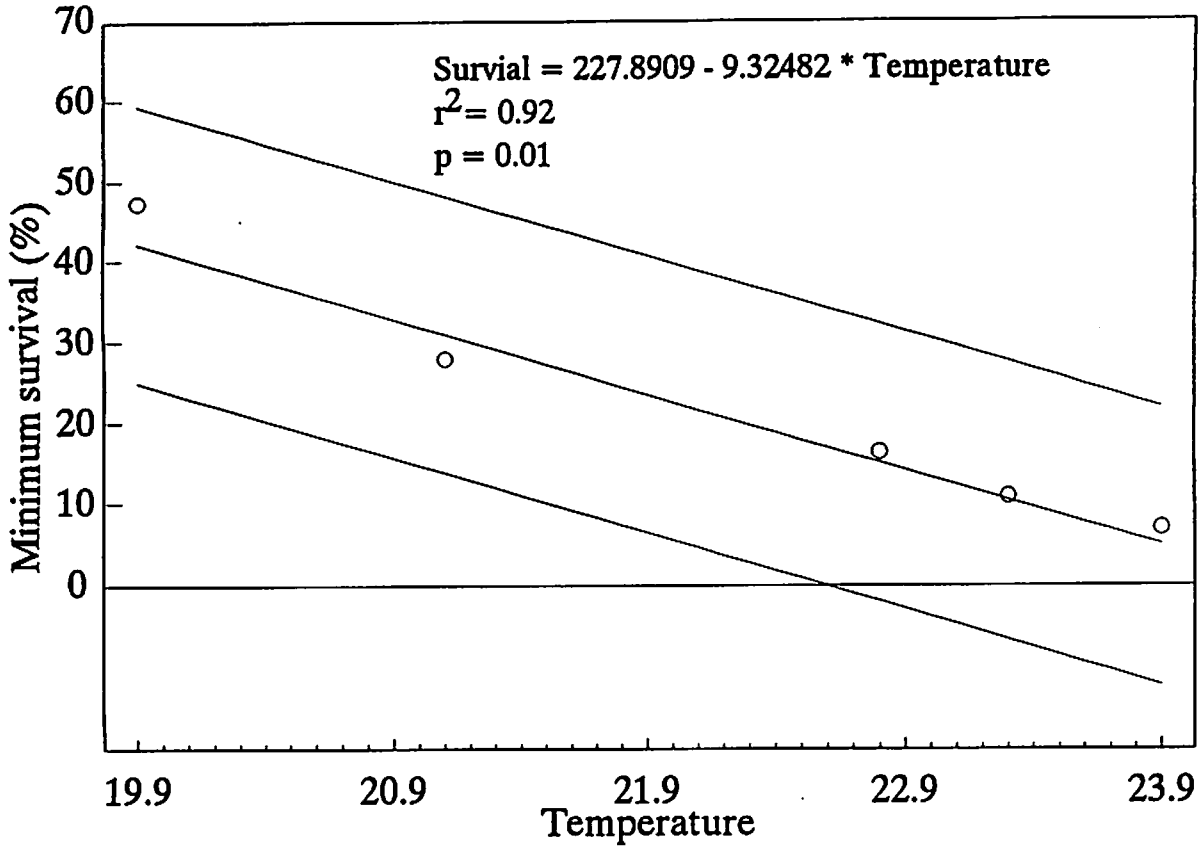

Figure 1.-Relation between minimum survival estimates for PIT-tagged Snake River subyearling chinook salmon and maximum-daily-average summer water temperature measured 180 feet below the surface of Lower Granite Reservoir, 1991-1995.