

**ANNUAL REPORT**  
**FISCAL YEAR 1991**  
**IDAHO FISHERY RESOURCE OFFICE**  
**AHSAHKA, IDAHO**

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**Table of Contents**

	<u>Page</u>
INTRODUCTION . . . . .	1
STATION OPERATIONS . . . . .	2
EQUIPMENT PURCHASED . . . . .	6
FUTURE OUTLOOK . . . . .	7
APPENDIX I - Forms Section	
Operations/Management Cost Data	
Report of Station Personnel	
Public Relations	
APPENDIX II - Adult Spring Chinook Salmon Returns to Dworshak NFH in 1991 and Prognosis for 1992	
APPENDIX III - Adult Steelhead Returns to Dworshak NFH in 1990-91 and Prognosis for 1991-92	

## INTRODUCTION

The Idaho Fishery Resource Office (IFRO) was originally established as Dworshak Fisheries Assistance Office in 1981 and became fully operational in FY 82. The name change to Idaho Fishery Resource Office occurred last year as part of a region-wide change to better reflect the office's responsibility and function. IFRO is located on the grounds of Dworshak National Fish Hatchery, Ahsahka, Idaho, approximately 40 miles upstream of the Snake-Clearwater River confluence at Lewiston, Idaho. The office is staffed by eight full-time employees.

The primary goal of IFRO is to assist in management and evaluation of fishery resources which relate to federal issues, i.e., fishery resources of national significance, fishery mitigation for federal projects, assistance to Indian tribes, fishery work on federal lands and other fishery projects as called for under federal law. Activities are primarily directed toward protection, restoration and enhancement of anadromous fish resources in the Lower Snake River Basin.

A primary area of work includes evaluation and fish management planning for the three federal hatcheries in Idaho; Dworshak National Fish Hatchery (DNFH), Hagerman National Fish Hatchery (HNFH), and Kooskia National Fish Hatchery (KNFH).

For hatchery evaluations, we compile the information to assess how each of the three hatchery facilities are meeting their established mitigation goals. Our office also helps set up and design studies to evaluate hatchery effectiveness and various management scenarios. We work closely with Idaho Department of Fish and Game (IDFG), Nez Perce Tribe, Shoshone-Bannock Tribe, and Shoshone-Paiute Tribe in evaluation of various fish management programs in Idaho.

## STATION OPERATIONS

During Fiscal Year 1991, we continued to participate on the Endangered Species Technical Committee. Various technical committee meetings were attended throughout the year to review the status of the Salmon River sockeye salmon, Snake River chinook salmon, and Lower Columbia River coho salmon. ESA status reviews were developed for each of the above species and our office drafted comments on the reviews for the U.S. Fish and Wildlife Service.

Our research on cryopreservation of male summer steelhead gametes was continued this year. Sperm from 33 males collected in 1991 were frozen and subsequently used for fertilization of females. However, eye-up success ranged from 7.5 to 0.7%. Frozen sperm from 1990 was used to fertilize females in 1991 with eye-up success averaging about 75%. Differences in success are attributed primarily to inconsistencies in technique. We may have also had a problem with the quality of dry ice used in the freezing process. We feel that this technique has excellent potential as a management tool, especially for preserving the genetic integrity of our endemic summer steelhead stock. Our short-term objectives for the next few years are to: (1) develop consistency in the cryopreservation technique to obtain at least 70-80% eye-up success, and (2) test for qualitative differences between local and out-of-town dry ice. Our long-range goals for the project are to: (1) compile an inventory of summer steelhead sperm for use when there are not enough males for one-to-one production needs, and (2) compile an inventory of wild summer steelhead sperm for purposes of genetic diversification and preservation.

In an effort to increase the efficacy of 0-age release of spring chinook salmon (SCS), we are exploring accelerated maturation of adults. We did this first in 1989 and advanced maturation 5-6 weeks over hatchery production. In 1990 we advanced maturation approximately 4 weeks. The progeny from the 1989 accelerated spawning were released with 1988 production smolts. The accelerated fish were PIT-tagged prior to release to evaluate their migration performance. We recorded a rapid migration rate for these fish, indicating that they were functional smolts. Progeny from the 1990 accelerated spawning were released April 16, 1991. Again, we recorded a rapid migration rate for these fish, indicating they were functional smolts. Survival rate of 0-age fish to lower Granite Dam was about 23%, slightly lower than the 32% for yearling fish. We plan to continue this project in 1992, contingent upon an adequate return of spring chinook salmon to Dworshak National Fish Hatchery in 1992.

We continue to sample feral fish for disease background. Samples were collected and analyzed from Clear Creek above Kooskia National Fish Hatchery on the Middle Fork Clearwater River. The primary diseases of interest are the IHN virus and whirling disease (Myxobolus cerebralis). No disease was detected in any fish collected. This year we collected 510 kokanee salmon spawners from tributaries to Dworshak Reservoir and one tested positive for IHN virus.

We are planting two strains of rainbow trout, Arlee and Shasta, from Hagerman National Fish Hatchery into Dworshak Reservoir. Studies by the Nez Perce Tribe and IDFG are documenting production and return to creel. In the past, (1987) we also planted kamloops rainbow trout strain into Dworshak Reservoir. Final results of the evaluation are not yet complete.

We determined the coded-wire tag (CWT) retention for steelhead and chinook salmon smolts tagged at Dworshak National Fish Hatchery. Retention rates averaged 98% and 99% for spring chinook salmon and summer steelhead smolts, respectively. Adipose clips (ad-clips) were also evaluated on steelhead adults for 1991. Adult hatchery returns in 1991 had 1.4 percent hatchery fish with non-clipped adipose fins.

Steelhead and spring chinook salmon (SCS) run summaries and run prediction information were prepared for Dworshak and Kooskia NFH's (see Appendix II, and III, respectively). This information, in conjunction with IDFG and Nez Perce Tribe information, is used to set fishing seasons and future hatchery production plans.

We initiated a new study in the spring of 1991 to, "Identify the spawning, rearing, and migratory requirements of fall chinook salmon in the Columbia River Basin." The project was originally funded by FWS under the Lower Snake River Compensation Plan (LSRCP). Project funding switched to Bonneville Power Administration on August 1, 1991. Responsibilities for the research is being shared between the Idaho Fishery Resource Office and the Columbia River Field Station at Cook, Washington with the lead project office at Cook. Our specific objectives are to: (1) identify and describe the characteristics of fall chinook salmon spawning habitat in the Snake River and estimate the extent of utilization and production of emergent fry, (2) identify and describe the characteristics of rearing habitats used by sub-yearling chinook salmon in the main stem reservoirs, (3) describe the factors influencing the migratory behavior of sub-yearling chinook salmon in the main stem reservoirs, (4) estimate the relationships among various low regimes and the timing, travel time, and survival of out-migrating sub-yearling chinook salmon in main stem reservoirs, and (5) synthesize the data and the final report for the project. Major activities accomplished for FY 91 include: (1) placement of 10 Ryan TempMentors in the Snake River to record water temperatures during the fall spawning season, (2) coordination with other State, Federal, tribal, and private agencies, (3) tagging 740 juvenile chinook salmon that were collected in the Snake River and PIT-tagged to assess travel time to lower Granite Dam. Sixty-six fish identified as fall chinook salmon were recaptured at lower Granite Dam.

Another new study was initiated in July 1991. Funding was provided by the U.S. Fish and Wildlife Service to monitor mountain whitefish populations in the Lochsa River drainage as part of a global change project and the National Fishery Resources Monitoring Program. The study objectives are to: (1) document the status and trends of mountain whitefish populations and habitat in the upper Lochsa River and tributaries, (2) use statistical analysis to assess the reasons for changes in mountain whitefish populations and habitat, and (3) develop predictive modeling abilities to assess the effects of climate

changes on mountain whitefish populations and their habitat. Major activities completed during FY 91 were: (1) placement of five Ryan TempMentors in the upper Lochsa River, White Sands Creek, and Crooked Fork Creek, (2) preliminary snorkeling and reconnaissance of whitefish populations to identify potential sampling locations, and (3) completion of the study plan.

IFRO personnel continued snorkeling surveys to estimate number of yearling and sub-yearlings steelhead and spring chinook salmon in selected subbasin streams where outplanting has occurred. This data is compiled along with IDFG and Forest Service data to provide a broad background of salmon and steelhead production for Idaho.

IFRO personnel participated on the Lower Snake River Compensation Plan (LSRCP) team. We evaluated LSRCP released fish (spring chinook salmon at DNFH and steelhead at HNFH) which included the following projects: a 0-age release, analysis of age at return, calculation of return percentage for spring chinook salmon to DNFH, and assisting in setting up and reviewing a spring chinook rearing density study.

The final Fishery Management Plan for the Shoshone-Paiute Tribe, Duck Valley Indian Reservation was submitted for review and approval. This Plan provided recommendations for rehabilitating their fishery, evaluated the prospects for additional fisheries, and investigated the potential for hatchery development. Other activities completed include: (1) gillnetting to assess overwinter survival of rainbow trout stocked in the spring of 1990 and in the spring of 1991, (2) with representatives from the Duck Valley Indian Reservation, conducted a walk-through and evaluation of the commercial hatchery supplying the Tribe with rainbow trout, and (3) in coordination with the Boise office of Fish and Wildlife Enhancement, we collected water samples from lakes being stocked with rainbow trout for contaminant analysis.

IFRO has the responsibility for the fishery database for all three federal hatcheries in Idaho and limited responsibility for Leavenworth NFH Complex in Washington. IFRO is gathering and computerizing distribution and return data as well as completing summary release files.

The major accomplishments for our fishery database for 1991 were:

1. 100% of desired data ascension for the Idaho federal hatcheries was completed.
2. 80% of the current data ascension for the Leavenworth Complex was completed, but there is still a diminishing backlog of early data.
3. Most of the bugs are worked out of our file structures. There has been a concerted effort to resolve these problems and data discrepancies between our databases and archive files. Our end products are now in high demand from other federal and state agencies, tribes, and others.
4. We now have the most comprehensive anadromous salmonid database in Idaho.

IFRO personnel have participated on the following Technical Advisory Committees (TAC) and study teams in 1991:

1. Member of the Nez Perce Tribal TAC on the development of a anadromous salmon hatchery.
2. Member of the Nez Perce Tribal TAC on the production potential for the main stem Clearwater River.
3. Outplanting subcommittee to establish priority, numbers, and places for outplanting steelhead fingerlings, smolts, adults, and spring chinook fingerlings from DNFH.
4. Idaho fish tagging coordination. We assist in planning for upcoming tagging work at the various hatcheries particularly at the three federal hatcheries, DNFH, HNFH, and KNFH.
5. Subbasin Planning Technical Work Group. We are members of the Salmon and Clearwater groups.
6. Idaho Supplementation Technical Advisory Committee. As a member on this committee, we review and provide technical guidance on developing the Idaho Supplementation project.
7. Supplementation Technical Work Group.
8. Anadromous fish production committee.
9. Pacific States Marine Fishery Commission/Pacific Salmon Commission. We contribute to their regional coded-wire tag database for release and recovery data.
10. Redband Trout Management Committee. A multi-state/federal group that develops management guidelines to protect native redband trout.
11. Idaho Stream Segment of Concern Working group. We provide technical fishery information to the group upon request.
12. Endangered Species Technical Committee. Member of a team reviewing endangered species issues relating to anadromous salmon in the Columbia Basin.
13. Member of Technical Review Committee regarding an environmental assessment of proposed sonar research by the U.S. Navy at the David Taylor Acoustic Research Center, Lake Pend Oreille, Idaho.
14. Clear Creek Coordinated Resource Management Planning Group.

## EQUIPMENT PURCHASED

With the addition of two new field projects and three new biologists, equipment purchases increased significantly over FY 90.

Four new CompuAdd 386/25 desktop computers and the software needed for use were added to our ADP equipment. Additional purchases included a laser printer, and typewriter.

Additional office furniture was purchased to equip our new biologists with workstations.

A new 4x4 crew cab pickup and a 22 foot aluminum jet boat were purchased to support the fall chinook study in the Snake River. Crew cab not delivered as of this report.

To accommodate snorkeling and diving on both the fall chinook salmon and Lochsa River mountain whitefish studies, a variety of diving equipment was purchased including four new wet suits, five new dry suits, five new buoyancy compensators, four new regulators, and various accessories and other equipment. Also, an underwater communication system was purchased.

A total of 19 Ryan TempMentors was purchased for use in the Snake River fall chinook and Lochsa River whitefish studies.

Coded-wire tags were purchased to continue a steelhead broodstock study. Tags were also purchased for spring chinook salmon bacterial kidney disease study and U.S. Canada marking agreement.

### Cost Summary:

1.	1 4x4 crew cab pickup - - - - -	\$ 18,000
2.	1 22 foot aluminum jet boat - - - - -	22,874
3.	ADP equipment and supplies - - - - -	16,101
4.	1 Typewriter - - - - -	577
5.	Office furniture (desks, chairs, filing cabinets, book shelves) - - - - -	4,579
6.	Dive gear (dry suits, wet suits, regulators, masks, fins, snorkels, B.C.'s, tanks) - - -	4,970
7.	TempMentors (19) - - - - -	12,320
8.	New phone system - - - - -	7,737
9.	Air conditioner - - - - -	300

## 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 headwaters of the Columbia Basin. The outlook on the horizon is greater demand by more user groups for fewer resources.

We will be analyzing CWT returns from the steelhead broodstock study in the future. We will also be analyzing freeze brand data to determine if run timing, i.e. early or late adult arrival, is a heritable trait.

We will continue to explore programs to produce spring chinook salmon smolts in one year. If we can produce large enough smolts, we believe we can increase return survival. This program may also have potential to lessen BKD exposure time and susceptibility.

We are excited about the possibilities of cryopreservation of "wild" fish sperm as a means of maintaining genetic integrity of a stock, as well as broodstock management. This is especially critical in years when we experience less than 25 percent males return to the hatcheries. We believe that technology is on the threshold of successful cryopreservation of fish sperm.

Our personnel will become more involved in determining fishery contribution and project area escapements of adults produced by FWS operated facilities in the Columbia River Basin, especially the lower river fisheries.

This office will continue to provide a lead role in providing interagency coordination on hatchery operations and evaluation. We believe this role will expand in value as new hatcheries come on line in the Clearwater drainage.

We will continue to be involved in fishery management on the Duck Valley Indian Reservation. Future work will mainly be implementation of recommendations made in the Management Plan.

Our office is also becoming more involved in endangered species issues relating to proposed listings of anadromous salmon stocks in the Columbia Basin.

We will also be involved in key management research related to rebuilding fish runs. We will be a lead player in fall chinook studies in the Snake River. We will also be a player in evaluating hatchery supplementation as a means to rebuild natural salmon runs.

## **APPENDIX I**

## **APPENDIX II**

**ADULT SPRING CHINOOK SALMON RETURNS TO  
DWORKSHAK-KOOSKIA NFH COMPLEX  
IN 1991 AND PROGNOSIS FOR 1992**

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## INTRODUCTION

Dworshak National Fish Hatchery (DNFH) began production scale rearing of spring chinook salmon (SCS) in 1982. In 1981 the Lower Snake River Compensation Plan authorized and funded the construction of 30 raceways for the production of 1.05 million SCS smolts. Construction was completed by June 1982 and the first direct release took place in 1983. The DNFH trap on the North Fork Clearwater River was operated for returning SCS adults for the first time in 1984.

Kooskia National Fish Hatchery (KNFH) has been producing SCS since 1972. KNFH is approximately 30 miles upstream from DNFH, on Clear Creek near its confluence with the Middle Fork Clearwater River. KNFH is responsible for rearing and releasing SCS into the Middle Fork Clearwater River. KNFH is directly funded by the U.S. Fish and Wildlife Service.

### Run Size

The 1991 adult SCS return to the Dworshak-Kooskia NFH Complex was the worst in recent years. DNFH had a near record low rack return of 149 adults replacing the 1985 return as our second lowest (Table 1). The adult SCS return to KNFH was the ninth highest ever for that facility (Table 2). The 1990 SCS run was a benchmark for plausible return levels from normal production releases from both hatcheries. The lower KNFH return is partially due to a dramatic decrease (from over 750,000 to less than 400,000) in on-site releases for the 1989 release year. The 1990 run supported a tribal fishery, a sport fishery, and provided enough eggs for both federal hatcheries, as well as three Idaho Department of Fish and Game satellite facilities. The 1991 run was so low that there was no sport season and the Nez Perce tribe closed their fishery.

In 1991, 433 adults were spawned at DNFH and an estimated 907,500 eggs were taken (Table 3). This is the combined take for the Dworshak-Kooskia NFH Complex, since all spawning operations occurred at DNFH.

Table 1. Hatchery returns and age composition of spring chinook salmon to Dworshak NFH.

Year	I-salt	II-salt	III-salt	Unmeasured	Total Return
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

**Table 2. Hatchery returns and age composition of spring chinook salmon to Kooskia NFH.**

Year	I-salt	II-salt	III-salt	Unmeasured	Total Return
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

**Table 3. Dworshak-Kooskia NFH Complex spring chinook salmon spawning data for 1991.**

	<u>Males</u>	<u>Females</u>	<u>Total</u>
Adults Sexed	303	326	632
Adults Spawned	191	242	433
% Mortality			
Green Eggs	--	--	995,842
Eyed Eggs	--	--	883,250
Percent Eye-up	--	--	89
% IHN Positive	--	--	3.6
% BKD Positive	--	--	15

Stock Description

We have complete rack returns for the 1988 release year at DNFH. We realized a 0.1898 percent return with a genetic makeup of 100 percent Rapid River stock. The 1989 release year (also 100 percent Rapid River stock ) returned only 77 II-salt fish to the DNFH rack (For a complete stock breakdown see Appendix A). The 1990 release returned only 16 I-salts. (For the genetic make-up of DNFH releases see Table 4).

We also have complete rack returns for 1988 release year at KNFH. We had a smolt-to-adult return of 0.1770 percent from Kooskia releases. The 1988 release year returned 350 III-salt fish. The 1989 release year returned 98 II-salt fish (only half the production was released on-site). The 1990 release returned only 10 I-salts. (For the genetic make-up of KNFH releases see Table 5).

Table 4. Genetic make-up of DNFH spring chinook salmon releases at the hatchery as smolts.

Release Year	Genetic Make-up*	% Rack Return
1983	75.1% LW 12.3% RR 12.6% LE	0.0741
1984	100% LE	0.2831
1985	67.8% LW 32.2% LE	0.2570
1986	100% LE	0.1610
1987	100% RR	0.0981
1988	100% RR	0.1898

- \*KK - Kooskia
- RR - Rapid River
- CA - Carson
- LW - Little White Salmon
- LE - Leavenworth

**Table 5. Genetic make-up of KNFH spring chinook salmon released in Clear Creek as smolts.**

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

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

Age Composition

Age composition of the run is presently based on fork length categories. These length categories were derived from known age/length/sex data from a CWT return database. 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 is displayed in Table 6.

Table 6. Age composition for 1991 spring chinook salmon returning to Dworshak-Kooskia NFH Complex.

Age	<u>Dworshak NFH</u>		Age	<u>Kooskia NFH</u>	
	Number	Percent		Number	Percent
I-salt	16	9.7	I-salt	10	2.0
II-salt	77	46.7	II-salt	98	21.0
III-salt	72	43.6	III-salt	350	75.0
<b>TOTAL MEASURED</b>	<b>165</b>	<b>100</b>	<b>TOTAL MEASURED</b>	<b>467</b>	<b>100</b>

Survival

The III-salt returns in 1991 complete the returns from the 1,547,219 smolts released at DNFH and the 778,407 smolts released at KNFH in 1988. Total returns to the North Fork of the Clearwater (DNFH rack plus harvest estimates) from the 1988 release were 156 I-salts, 2,709 II-salts, and 72 III-salts for a hatchery return survival rate of 0.1898 percent (Table 7). Total returns to Clear Creek (KNFH rack plus harvest estimate) from the 1988 release were 107 I-salts, 921 II-salts, and 350 III-salts for a hatchery return survival rate of 0.1770 percent (Table 8).

Table 7. Return vs. release numbers for the 1991 adult spring chinook salmon return to DNFH.

Release Year	Smolts Released at Hatchery*	Smolts Released			Total (% return)
		I-salts (% return)	II-salts (% return)	III-salts (% 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%)		
1990	1,251,247	16 (0.0013%)			

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

Table 8. Return vs. release numbers for the 1991 adult spring chinook salmon return to KNFH.

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%)		
1990	403,701	10 (0.0025%)			

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

#### Coded-wire Tag (CWT) Recoveries

Our facilities have increased the levels of fish marking because of the need to verify our contributions to various fisheries as well as test various rearing and/or release schemes. As a result, the formerly meager SCS CWT recovery database has expanded to the point where it is more useful for ongoing hatchery evaluation efforts. The 1987 rack yielded 25 total recoveries, 19 of which were DNFH releases. The 1988 rack contained 55 total recoveries, 49 of which were DNFH marks. The 1989 rack yielded 77 total recoveries, 47 of which were DNFH marks. The 1990 rack yielded a record 306 total adult CWT recoveries, 302 of which were DNFH marks. Almost all adult recoveries, that are not DNFH marks, were part of the National Marine Fisheries Service transportation study. Occasional adult strays from other hatcheries do appear. In 1990 CWT smolts and mini-jacks from Oregon and Washington hatcheries showed up in the DNFH rack. The 1991 racks yielded only 30 total snout recoveries and only 10 of those were actually jack or adult recoveries of DNFH releases. Many of the snouts taken were part of the University of Idaho radio tag study.

#### 1991 Preseason Predictions

The 1990 SCS returns to Dworshak-Kooskia NFH Complex was both gratifying and disappointing. The very successful II-salt return gave us cause to celebrate but the abysmal I-salt return (only 7) forecast a grim 1991. We also overestimated the return for III-salts at DNFH in 1990 and 1991. We believe that this may be because of the shift in recent years to Rapid River stock which yields higher proportion of II-salt returns. The grim forecast came true, as only 77 II-salts returned to DNFH, for the lowest II-salt return since 1984, which was the first year DNFH operated their rack. This was not a

big surprise for the II-salt portion of the 1991 run to be down, since the 1990 jack return was the lowest ever at DNFH. But the mammoth drop off in II-salts from 2720 to 77 was greater than expected.

KNFH began an off-site distribution program in 1989. This program dictated a direct release of only 400,000 smolts at KNFH rather than a full production on-site release of around 800,000 smolts like 1987 and 1988. Therefore we expected a decrease in the number of II-salts returning to the 1991 rack (1989 release year). This decrease was greater than expected since there was only one-tenth as many II-salts as the previous year from a release that was one-half as large. However, the III-salt return was the second largest ever (350). Because of the large decrease in on-site releases future KNFH rack returns are expected to be lower even though KNFH maintains a relatively good rack return percentage.

Dworshak NFH-1991

1991 Run Prediction

I-salt = 75  
 II-salt = 250  
 III-salt = 500  
 Total n = 825

1991 Rack Return

I-salt = 16  
 II-salt = 77  
 III-salt = 72  
 Total Run = 165

Our prediction was considerably over actual returns. We would like to blame this on the 1989 release having poorer downstream survival than usual. Runs of chinook were down throughout the basin which supports this hypothesis. Also, the 1990 I-salt returns which we use to regress the predicted II-salt component was completely out of the data range. However, we did miss the target no matter what our excuse.

Kooskia NFH-1991

1991 Run Prediction

I-salt = 35  
 II-salt = 350  
 III-salt = 300  
 Total n = 685

1991 Rack Return

I-salt = 10  
 II-salt = 98  
 III-salt = 350  
 Unmeasured = 9  
 Total Run = 467

Our prediction was closer on the Kooskia run prediction, but we still missed on the II-salt prediction.

1992 Run Predictions

The following is our prediction for the 1992 SCS run to the Dworshak-Kooskia Complex. Our estimate has wide confidence limits because the ultra low 1990 I-salt count and 1991 II-salt were out of the range of our previous regression data.

Dworshak NFH

I-salts	50
II-salts	300
III-salts	<u>25</u>
TOTAL	375

Kooskia NFH

I-salts	25
II-salts	200
III-salts	<u>100</u>
TOTAL	325

Prediction 375 ± 200

Prediction 325 ± 200

Total predicted to return both hatcheries in 1992 is 700 ± 400.

The total hatchery spring chinook salmon predicted to return to Dworshak and Kooskia NFH's in 1992 will not meet the hatchery needs for eggs in the Clearwater drainage. The number of adults needed for supplying eggs to fill both hatcheries is estimated at 2500. 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 Dworshak-Kooskia NFH Complex 1989 and 1990 spawning operations satisfied their needs as well as the egg requirements for Idaho Department of Fish and Game's Powell, Red River, and Crooked River satellite stations. Unfortunately, this was not the case in 1991 and looks like it will not be the case in 1992, which will be only a small improvement over 1991.

**APPENDIX III**

**ADULT STEELHEAD RETURNS TO  
DWORSHAK NPH IN 1990-91 AND  
PROGNOSIS FOR 1991-92**

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## INTRODUCTION

Releases of steelhead smolts from Dworshak National Fish Hatchery (DNFH) began in 1970 with the first hatchery produced adults returning in 1972. The 1991 return marked the 19th year that artificially spawned North Fork Clearwater River ("B" run) steelhead have returned to DNFH. This report reviews the statistics of the 1990-91 run and the prognosis for 1991-92.

### 1990-91 Adult Returns

The 1990-91 return year started off when we again opened our ladder in early October. Early ladder opening insured that we include a portion of the early returning spectrum in our broodstock. We held approximately 444 of these fish overwinter. The total return to the Dworshak NFH rack for 1991 was 7,870 (Table 1).

### 1991 Brood Year

The Infectious Hematopoietic Necrosis Virus (IHNV) problem has greatly improved over 1989. Loss of over 2.4 million fish (78%) was experienced at DNFH in 1989. Brood Year 1990 was almost an order of magnitude lower at 0.28 million fish (14%).

For Brood Year 1991, total mortality (from feeding fry to ponded fingerlings) was 1.39 million or 55.9%, higher than in 1990. However, other factors such as cold water disease contributed to mortality in addition to IHNV. Overall, the IHNV problem is still improved over 1989.

### Stock Description

Dworshak NFH maintains the North Fork Clearwater River steelhead stock which was cut off from its ancestral spawning grounds by Dworshak Dam in 1968. Size-wise, this stock ("B" run) of steelhead is unique. At maturity, males and females average about 91 cm (36 inches) and 82 cm (33 inches) in length, respectively. Spawning stock is comprised primarily 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. Chronologically, the fish are 2 years older than this system indicates as they are reared for 1 year in the fresh water hatchery environment and, also, spend another year emigrating and returning.

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

### Preseason Predictions

Predictions by the Idaho Fishery Resource Office (IFRO) are based primarily on the strength of returns of younger age classes for any given brood. For example, there is a strong linear correlation ( $r=0.95$ ) for predicting the number of II-salt steelhead returning in a year based upon the number of I-

salt fish that returned the previous year. A similar regression is used for predicting the III-salt return from the number of II-salt fish which returned the previous year. We do not have a consistent and accurate prediction method for I-salts. Instead, an average percentage return for I-salt fish is applied to the number of smolts released for the appropriate brood year. These three estimates are summed to predict the total hatchery return.

Table 1 summarizes Dworshak NFH steelhead runs to the Clearwater River. For the 1990-91 steelhead run, we predicted 7,200 fish back to the DNFH rack (see our 1989 annual report). We also predicted a total return to the Clearwater River of 22,700. We underestimated the return to DNFH rack which was 7,870 fish. Our estimate was off 9 percent. We also slightly underestimated the total return of DNFH steelhead to the Clearwater River. Using the survival rates to Lower Granite of our CWTed branded II-salt fish, 1.05 percent for hatchery released fish and 0.53 percent for off-site released fish. We calculated that 24,000 DNFH fish crossed Lower Granite Dam during the fall of 1990 and spring of 1991. Also, when we calculated the total harvest and escapement for the Clearwater, this figure comes out fairly close to the predicted return to the Clearwater. Using the estimated sport harvest figure from Idaho Department of Fish and Game, 6,653 fall harvest and 6,157 spring harvest (total 12,810), adding in the hatchery return of 7,870 fish, the estimated Nez Perce tribal harvest of 1,211 and outplanted non-harvested escapement of 2,250, we get an estimated minimum number of 24,141 DNFH fish to the Clearwater; very close to the CWT/branded predictor used. Thus, the total return of DNFH steelhead to the Clearwater River can be put at 24,000 fish.

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

Return <sup>1</sup>	Number Back To DNFH	Estimated Sport Fisherman Harvest Clearwater R.	Estimated Tribal Harvest Clearwater R.	Hatchery Fish Return Upriver of North Fork (unharvested) <sup>8</sup>	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. <sup>3</sup>	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) <sup>5</sup>	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 <sup>4</sup>	(1,500)	0	23,139
1983-84	3,284	6,500	(1,500)	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 <sup>2</sup>	15,679	4,210 <sup>6</sup>	3,000	28,175
1987-88	3,764	8,766 <sup>9</sup>	1,478 <sup>7</sup>	2,000	16,008
1988-89	6,041	11,332 <sup>9</sup>	1,242 <sup>10</sup>	3,700	22,315
1989-90	10,613	27,953 <sup>9</sup>	1,710 <sup>10</sup>	3,650	43,926 <sup>11</sup>
1990-91	7,870	12,810	1,211	2,250	24,141

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

<sup>1</sup>Return year is from October through May.

<sup>2</sup>Actual number returned, ladder closed, not a complete return figure.

<sup>3</sup>N.S., no sport fishing season.

<sup>4</sup>Pettit included an additional 2,000 fish in harvest from Snake River for a total of 15,967.

<sup>5</sup>( ) guesstimate on tribal harvest by author.

<sup>6</sup>Mauney, J.L. et al. 1988. A survey of the Nez Perce subsistence fishery for steelhead trout (*Oncorhynchus mykiss*) the Dworshak National Fish Hatchery ladder North Fork of the Clearwater River, Idaho, 1986-87.

<sup>7</sup>Mauney, J.L. et al. 1990. A survey of the Nez Perce subsistence fishery for steelhead trout (*Oncorhynchus mykiss*) North Fork of the Clearwater River, Idaho, 1987-88.

<sup>8</sup>Based on return percentage back to hatchery to calculate returning of II-salts from upstream releases.

<sup>9</sup>Kent Ball, IDFG, Salmon, Idaho, Personal Communication.

<sup>10</sup>Paul Kucera, Nez Perce Tribe, Lapwai, Idaho, Personal Communication.

<sup>11</sup>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. (See last paragraph on the previous page)

### Hatchery Operation

The hatchery ladder was opened October 23 and remained open until November 28 (444 steelhead entered the trap). The ladder was reopened February 6 and was closed on May 6. A total of 7,476 adult steelhead entered the ladder during the spring of 1991. The initiation of ladder operation in October was a continuing attempt to insure inclusion of early arriving SST in the hatchery gene pool. Over 11.2 million green eggs were collected over a twelve-week period (Table 2).

Table 2. Dworshak NFH steelhead spawning data for 1991.

	<u>Male</u>	<u>Female</u>	<u>Total</u>
Total rack return	2,482	5,388	7,870
Total SST spawned	1,034	1,549	2,583
Green eggs	11,000,296		
Eyed eggs	7,043,000		
Percent eye up	80.3%		

Excess fish and carcasses from spawned adults and health samplings were donated to the Idaho Department of Education food bank. The food bank received 5,479 steelhead.

### Adult Outplanting

On occasions when we have more adult steelhead than the hatcheries can accommodate, they are outplanted into streams. Usually the outplanting is to, hopefully, allow some natural spawning, but some 1991 outplanting was solely to provide for a specific sport fishery. In 1991, DNFH outplanted 2,607 adult steelhead. Table 3 summarizes numbers and release locations of the outplanted adults.

Table 3. Dworshak NFH Adult Steelhead Outplants, 1991.

<u>Date</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>	<u>Site</u>	<u>Purpose</u>
3/06/91	181 <sup>1</sup>	608 <sup>1</sup>	549	Main South Fork Clearwater River	Sport fishery
3/07/91	--	--	249	Snake River	Sport fishery
3/20/91	313	729	1042	Main South Fork Clearwater River	Natural spawning
4/15/91	60	123	183	Crooked River	Natural spawning
4/17/91	<u>200</u>	<u>393</u>	<u>593</u>	Crooked River	Natural spawning
TOTAL	754	1853	2607	Dworshak outplants	

<sup>1</sup>Total number outplanted on 3/06/91 and 3/07/91. The number of males and females outplanted in each river was not recorded.

### Coded-Wire Tag Returns (CWT)

The 1988 Dworshak NFH release contained 14 CWT groups from IFRO studies. There were no off-site releases.

To determine contribution of direct releases from Dworshak NFH, steelhead from each system were tagged. System I releases from Dworshak NFH were about the same as II and III. The data have not been completely analyzed to date, so details of rack returns are not available.

### Age Composition

The age composition entering DNFH was as follows:

I-salt =	218
II-salt =	7,333
III-salt =	314

The run was made up of 2.8 percent I-salts, 93.2 percent II-salts and 4.0 percent III-salts.

Adults were comprised of 68.5 percent females and 31.5 percent males.

### Survival

The return of DNFH fish to the rack was comprised of an estimated 93.2 percent II-salt fish. If this factor is applied to our estimated total of 24,000+ steelhead to the Clearwater River, then 22,368+ II-salt fish returned to the Clearwater. In 1988, DNFH released 2,669,615 steelhead smolts in the Clearwater River. Based on the estimated II-salt returns to the Clearwater of 22,368, this equals a 0.84 percent smolt to adult return.

### Prediction for the 1991-92 DNFH Steelhead Run

Based on correlation of I-salts to II-salts and standard percentage for I and III-salts, we are estimating the following for hatchery returns:

II-salts =	4000
III-salts =	250
I-salts =	<u>400</u>
<b>TOTAL</b>	<b>4650 back to hatchery</b>

With an estimated Idaho sport harvest of 50 percent of hatchery fish entering the Clearwater, a 25 percent straying rate of upriver outplanted fish back into Dworshak, a survival rate of outplanted fish one-third less than hatchery released fish, and an estimated Nez Perce Tribal harvest in the Clearwater of 2000 fish, we have estimated the following 1991-92 return for the Clearwater River.

4,650	DNFH rack return
4,650	Sport harvest of fish destined for DNFH
2,100	Return of upstream outplants - less sport harvest
2,100	Upstream outplants - sport harvested
<u>2,000</u>	Nez Perce Tribal harvest in Clearwater River
15,500	TOTAL DNFH fish entering Clearwater

Putting a range estimate on the above, we would feel comfortable in estimating between 13,000 and 18,000 DNFH steelhead will enter the Clearwater River during the 1991-1992 run year. A lot will depend on fall river flows, water temperature, and Zone 6 harvest rates. Right now flows are low and warm in the Snake River so less than optimum conditions exist but there may be cool water releases from Dworshak and Brownlee dams in August and September.

The 1989 (the year class returning as II-salts) direct or on-site hatchery release of only 1.07 million steelhead smolts followed three years of 1.2 to 1.4 million smolt releases. The total release to the Clearwater drainage was 1.8 million, considerably less than the 2.1 million or more of the three previous years.

All in all, the 1991-92 steelhead season for the Clearwater looks to be fair. The run is expected to compare closely with the run of 1985-86 where a total of 15,000 DNFH fish were estimated to have entered the Clearwater River. Our 1991-92 run will be much less than the 24,000+ fish we had last year.