

## **APPENDIX A**

# **ADULT SPRING CHINOOK SALMON RETURNS TO DWORSHAK AND KOOSKIA NATIONAL FISH HATCHERIES IN 2002 AND PROGNOSIS FOR 2003**

Prepared by:

Howard L. Burge  
Project Leader

Mike Faler  
Assistant Project Leader

Ralph B. Roseberg  
Ray N. Jones  
Fishery Biologists

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

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## Introduction

Dworshak National Fish Hatchery (NFH) is located at the confluence of the North Fork and the main stem 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 and has been administered and operated by the U.S. Fish and Wildlife Service since the first phase of construction was completed in 1969. In 1982 thirty 8-ft by 80-ft raceways were constructed under the Lower Snake River Compensation Plan (LSRCP) to provide rearing facilities for spring Chinook salmon (*O. tshawytscha*). In 1986, an additional twelve 8-ft by 75-ft raceways were temporarily converted from rainbow trout rearing to spring Chinook salmon rearing. In 1993, two of these raceways were converted to an adult holding pond. Presently spring Chinook salmon are only reared in the 30 raceways built specifically for LSRCP.

Kooskia NFH is located about 1.5 miles southeast of Kooskia, Idaho, near the confluence of Clear Creek and the Middle Fork Clearwater River. Because of production constraints, temperature considerations, and other factors, Kooskia NFH broodstock are held and spawned at Dworshak NFH. Kooskia spring Chinook eggs and juveniles were often held at Dworshak NFH as well. In 1998, we began using Kooskia NFH for incubation and early rearing of Dworshak NFH Chinook, to take advantage of the colder water temperature. In 1978, Kooskia NFH was included as part of the Dworshak Fishery Complex.

This report includes a summary of the adult returns of spring Chinook salmon to Dworshak and Kooskia NFHs in 2002. Our predictions for the returns in 2002 are reviewed and revised predictions for the adult returns in 2003 are presented.

## Stock description

The Dworshak NFH spring Chinook salmon program was initially started using spring Chinook salmon stock from the Leavenworth and Little White Salmon NFH programs. Eggs were transferred from these facilities and made up the smolt releases from 1983 to 1986 (**Table 1**). Since these stocks were very strongly influenced by transfers to their programs from Carson NFH, the early Dworshak Chinook stock was considered a Lower Columbia River Carson derivative. The spring Chinook programs for brood years 1985 and 1986 consisted entirely of eggs that had been transferred from Rapid River State Fish Hatchery (SFH), which used spring Chinook trapped at Hells Canyon Dam to start that stock. Thus, smolts released from Dworshak NFH in 1987 and 1988 were entirely Rapid River stock, shifting the program away from using the Lower Columbia River Carson spring Chinook type stock. In the 14 years since 1988, Dworshak NFH has maintained its program from returns to its own rack, with the exception of two years when the program was below full production. In 1995, the Dworshak release was one third Kooskia stock spring Chinook. Then in 2001 about one third of the Dworshak release was

Rapid River stock (Lookingglass returnees collected at Lower Granite Dam). 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 direct products of transfers of Rapid River stock.

**Table 1.** Genetic background of Dworshak NFH spring Chinook salmon smolts directly released from the hatchery, 1983-2002. (RR = Rapid River, KK = Kooskia, DW = Dworshak, LE = Leavenworth, LW = Little White Salmon).

Release Year	Genetic Background
1983	75% LW, 12% RR, 13% LE
1984	100% LE
1985	68% LW, 32% LE
1986	100% LE
1987 - 1988	100% RR
1989 - 1994	100% DW
1995	66% DW, 34% KK
1996 - 2000	100% DW
2001	64% DW, 36% RR
2002	100% DW

The Kooskia NFH spring Chinook salmon program was started using a wide variety of stocks from the Lower Columbia River and Rapid River SFH. However, from 1973 through 1980, smolt releases had a very strong Carson stock influence. Egg transfers of Carson type stock from Dworshak NFH in 1985 and 1986 resulted in smolt releases in 1987 and 1988 that were a mixed stock, referred to as Clearwater stock (**Table 2**). Since the Kooskia NFH program already had stock made up primarily of Carson derivatives, the resultant program (1989 and later) is still considered a Carson type stock, and is referred to as Kooskia 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.

### 2002 Run Size

The exact numbers of Dworshak and Kooskia NFH origin adult spring Chinook salmon that returned to the Clearwater River in 2002 are difficult to determine because of the mixed stock fisheries and harvests that occurred in the basin. The adults that entered the Clearwater River in 2002 originated from programs at Dworshak and Kooskia NFHs, as well as the Idaho Department of Fish and Game (IDFG) facilities at Powell, Red River, and Crooked River. The IDFG (Barrett 2001) provided estimates of sport harvest in 2001. They were able to estimate hatchery contribution by the use of coded-wire tag (CWT) recovery data. We corrected our

tables in this report using this information which was not yet parsed to hatchery origin at the time of the 2001 report. The Nez Perce Tribe (NPT) (Oatman, personnel communication) provided tribal harvest estimates for 2001 after the 2001 report was completed. We included these 2001 numbers in our update of the tables as well. The IDFG provided us with an estimate of total sport harvest for the Clearwater for 2002 but CWT data remains unprocessed. In our attempt to reconstruct the 2002 run we used the contribution percentages from the 2001 report on the 2002 data. The NPT provided tribal harvest estimates for 2002 (Oatman 2002). We attempted to reconstruct the the DNFH and KNFH runs from this data. We estimated the total number of Dworshak and Kooskia NFH adult spring Chinook salmon that returned to the Clearwater River in 2002 to be about 9,162 (**Table 3**). Of that total, we calculated the number of Dworshak NFH origin spring Chinook salmon to be 5,618 ( 2,157 in the Dworshak NFH rack, 2,667 sport harvest, and 794 tribal harvest in North Fork). We calculated that the total number of Kooskia NFH origin spring Chinook salmon adults that returned to the Clearwater River was 3,544 (1,037 in the Kooskia NFH rack, 2,042 sport harvest, and 465 tribal harvest in Clear Creek).

**Table 2.** Genetic background of Kooskia NFH spring Chinook salmon smolts directly released from the hatchery, 1971-2002. (RR = Rapid River, KK = Kooskia, LE = Leavenworth, SS = South Santiam, CL = Clearwater, LW = Little White Salmon, CA = Carson, WR = Wind River).

Release Year	Genetic Background
1971	86% RR,14% WR
1972	100% RR
1973 - 1974	100% CA
1975	58% RR, 42% CA
1976	100% SS
1977	84% CA, 11% KK, 5% LW
1978	75% RR, 25% CA
1979	69% KK, 31% CA
1980	31% KK, 69% CA
1981	64% CA, 19% KK, 17% RR
1982	100% CA
1983	65% KK, 35% LE
1984	89% KK, 11% RR
1985 - 1986	100% KK
1987 - 1988	100% CL
1989 -2002	100% KK

## Age Composition

Age composition of the run is presently based on fork length categories derived from known age/length data from a cumulative coded-wire tag (CWT) recovery database. I-salts are 56 cm or less, II-salts are 57 through 81 cm, and III-salts are larger than 81 cm.. Age composition for spring Chinook salmon returning to Dworshak NFH is listed in **Table 4**. Usually, the majority of spring Chinook salmon returning to both Dworshak and Kooskia NFHs are II-salts and this year certainly fit that pattern. (**Table 5**).

**Table 3.** Total number of Dworshak and Kooskia NFH spring Chinook salmon returning to the Clearwater River annually from 1987 to 2002.

Year	Dworshak NFH Rack Return	Kooskia NFH Rack Return	Sport Harvest <sup>1</sup>	Tribal Harvest <sup>1</sup>	Total Return
1987	2,017	687	0	210	2,914
1988	1,972	595	0	312	2,879
1989	1,700	973	0	404	3,077
1990	2,042	1,141	369	644	4,196
1991	165	467	0	0	632
1992	370	312	54	160	896
1993	823	1,180	0	43	2,046
1994	74	232	0	0	306
1995	125	40	0	0	165
1996	963	202	0	24	1,189
1997	3,150	1,657	741	847	6,395
1998	915	408	99	202	1,624
1999	800	157	0	37	994
2000	3,202	1,581	3,908	1,183	9,874
2001	4,018	2,261	14,752	3,144	24,175
2002	2,157	1,037	4,709	1,259	9,162

<sup>1</sup> Total estimated sport harvest of Dworshak and Kooskia NFH origin spring Chinook salmon in the Clearwater River Basin.

Table 4. Hatchery rack returns and age composition of spring Chinook salmon for Dworshak NFH, 1984-2002.

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	1,604	376	12	2,017
1988	163	569	1,240	0	1,972
1989	156	1,322	221	1	1,700
1990	7	1,892	135	8	2,042
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
1996	275	663	25	0	963
1997	12	2,380	740	18	3,150
1998	11	176	728	0	915
1999	670	78	52	0	800
2000	221	2,827	104	0	3,202
2001	36	3,235	747	0	4,018
2002	62	1,480	615	0	2,157

**Table 5.** Hatchery rack returns and age composition of spring Chinook salmon for Kooskia NFH, 1972-2002.

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	2,539	154	0	3,026
1978	23	1,676	336	0	2,035
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	1,141
1991	10	98	350	9	467
1992	14	239	38	21	312
1993	11	749	409	11	1,180
1994	1	96	135	0	232

**Table 5.** Continued.

Year	I-Salt	II-Salt	III-Salt	Unmeasured	Total Return
1995 <sup>1</sup>	21	7	12	0	40
1996	86	113	3	0	202
1997	7	1,523	127	0	1,657
1998	1	200	207	0	408
1999	72	28	57	0	157
2000	966	604	11	0	1,581
2001	28	2,137	96	0	2,261
2002	14	852	171	0	1,037

<sup>1</sup> These numbers were incorrectly reported in the 1996, 1997, and 1998 annual reports.

### Survival

The III-salt returns in 2002 complete the adult returns from the 1999 releases of 1,044,511 smolts at Dworshak NFH (**Table 6**) and the 684,165 smolts released at Kooskia NFH (**Table 7**). Total returns to the Dworshak NFH rack from the 1999 release were 496 I-salts, 10,622 II-salts, and 1,602 III-salts for a total return rate of 1.2171 percent (**Table 6**). Total returns to Kooskia NFH from the 1999 release were 972 I-salts, 10,347 II-salts, and 584 III-salts for a return rate of 1.7398 percent (**Table 7**). Returns to both facilities from the 1999 releases were our highest ever recorded for both % return and actual numbers.

**Table 6.** Return vs. release numbers for adult spring Chinook salmon returns to Dworshak NFH, 1988-2002. Includes sport and tribal harvest or other estimates for 1990, 1997, 1998, 2000, 2001, and 2002 .

Release Year	Smolts Released <sup>1</sup>	I-Salt (% Return)	II-Salt (% Return)	III-Salt (% Return)	Total (% Return)
1988	1,547,219	156 (0.0101%)	2,709 (0.1751%)	72 (0.0047%)	2,937 (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%)

**Table 6. Continued.**

Release Year	Smolts Released <sup>1</sup>	I-Salt (% Return)	II-Salt (% Return)	III-Salt (% Return)	Total (% Return)
1993	467,222	3 (0.0006%)	36 (0.0077%)	25 (0.0054%)	64 (0.0137%)
1994	1,278,273	83 (0.0065%)	663 (0.0517%)	1,110 (0.0868%)	1,856 (0.1452%)
1995	1,311,445	275 (0.0210%)	3,571 (0.2723)	952 (.0726%)	4,798 (0.3659%)
1996	102,903	18 (0.0175%)	230 (0.2235%)	52 (0.0505%)	300 (0.2915%)
1997	53,078	14 (0.0264%)	78 (0.1470%)	344 (0.6481%)	436 (0.8214%)
1998	973,400	670 (0.0688%)	7,443 (0.7646%)	2,452 (0.2519%)	10,565 (1.0854%)
1999	1,044,511	496 (0.0475%)	10,622 (1.0169%)	1602 (0.1533%)	12,720 (1.2711%)
2000	1,017,873	128 (0.0126%)	3,855 (0.3787%)		
2001	333,120	161 (0.0483%)			

<sup>1</sup> Releases at hatchery only and does not include off-site releases or fry/fingerling

**Table 7.** Return vs. release numbers for adult spring Chinook salmon returns to Kooskia NFH, 1988-2002. Includes sport and tribal harvest estimates for 1990, 1999, 2000, 2001, and 2002.

Release Year	Smolts Released <sup>1</sup>	I-Salt (% Return)	II-Salt (% Return)	III-Salt (% Return)	Total (% Return)
1988	778,407	107 (0.0137%)	921 (0.1183%)	350 (0.0450%)	1,378 (0.1770%)
1989	384,235	11 (0.0029%)	98 (0.0225%)	38 (0.0096%)	147 (0.0077%)
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%)	119 (0.0164%)
1993	343,437	13 (0.0003%)	7 (0.0020%)	3 (0.0009%)	11 (0.0032%)
1994	305,813	21 (0.0069%)	113 (0.0360%)	127 (0.0415%)	261 (0.0853%)
1995	722,906	86 (0.0119%)	1,523 (0.2107%)	207 (0.0285%)	1,816 (0.2512%)
1996	333,794	7 (.0021%)	200 (.0599%)	57 (0.0189%)	264 (0.0790%)
1997	16,598	1 (0.0060%)	28 (0.1687%)	11 (0.0663%)	40 (0.2410%)
1998	76,846	72 (0.0937%)	608 (0.7912%)	465 (0.6050%)	1,145 (1.4900%)
1999	684,165	972 (0.1421%)	10,347 (1.5124%)	584 (.0854%)	11,903 (1.7398%)
2000	449,454	160 (0.0356%)	2,912 (.6479%)		
2001	80,430	48 (.0597%)			

<sup>1</sup> Releases at hatchery only and does not include off-site releases or fry/fingerling releases.

## Coded-Wire Tag Recoveries

We substantially increased spring Chinook salmon marking from the contribution-only level (one tag group released from Dworshak NFH in 1987) to multiple tag groups for complex evaluation studies having several treatment groups and controls with replication (9 to 24 tag groups/year from 1988 to 1994). Since that time, we have returned to marking only for contribution. At Kooskia NFH, we released CWT groups less often (1984, 1990, 1992-2001). Since 1993 all hatchery spring Chinook have been fin clipped to allow discrimination 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 has also dramatically increased the workload for CWT sampling, recovery, and data processing.

Rack recoveries in previous years have included strays from several other hatcheries and also National Marine Fisheries Service transportation studies, which were probably not strays (**Table 8**). We have extracted and read the tags from the 1997-2001 racks. Data will be verified and formatted for submission to PSMFC. We recovered 395 coded-wire tagged spring Chinook salmon in the 2002 rack (**Table 8**).

**Table 8.** Summary of CWT recoveries for adult spring Chinook salmon in the Dworshak NFH rack, 1987-2002.

Rack Year	Hatchery Tags Recovered <sup>1</sup>	Other Tags Recovered <sup>2</sup>	Total Tags Recovered
1987	19	6	25
1988	49	6	55
1989	47	30	77
1990	302	4	306
1991	10	20	30
1992	177	6	183
1994	449	0	449
1995	95	0	95
1996	508	7	515
1997	1,820	5	1,825
1998	739	4	743
1999	288	Not Completed	Not Completed
2000	1040	Not Completed	Not Completed
2001	320	Not Completed	Not Completed
2002	395	Not Completed	Not Completed

<sup>1</sup> Includes both Dworshak and Kooskia NFHs.

<sup>2</sup> Includes all spring Chinook that were not tagged at Dworshak and Kooskia NFHs

## 2002 Run Predictions

Over the years, we have been able to develop a very strong regression between the number of jack (I-Salt) returns and the number of II-Salt returns the following year. Although this method works well for II-Salt returns, we have not been able to develop good regressions that will provide predictions for the I-Salt and III-Salt returns. Therefore, the predictions for these two age groups are generated from average return rates. Below is a review of our predictions, made in 2001 and the actual returns for both Dworshak and Kooskia NFHs in 2002.

### Dworshak NFH-2002

The total number of spring Chinook salmon that we predicted would return to Dworshak NFH in 2002 was 4,684 less than the actual return. **Table 9** lists the predicted return, made in 2001, and the calculated return of all three age classes of adults to Dworshak NFH in 2002. Our prediction for the I-Salt return was less than the actual return, 46 vs.161. The regression used for making our prediction gave a low estimate for II-Salt returns, 921 predicted vs. 3,855 actual. Our prediction for the III-Salt returns was lower than the actual return, 853 vs.1,602. Although our total prediction was lower than the actual return, it was still useful for preliminary management purposes such as potential harvest opportunity, broodstock collection adequacy, and planning for adult outplanting. We coordinated ladder operation to maximize the fishing opportunities and to minimize broodstock handling and holding.

**Table 9.** Predicted and calculated returns of spring Chinook salmon to Dworshak NFH by ocean age class, 2002. Includes sport and tribal harvest estimates.

Ocean Age Class	Prediction	Total Return
I-Salt	46	161
II-Salt	921	3,855
III-Salt	853	1,602
Total	1,820	5,618

### Kooskia NFH-2002

The total number of spring Chinook salmon that returned to Kooskia NFH was slightly less than our prediction, 3,544 vs. 3,615. **Table 10** lists the predicted return, made in 2001, and the actual return of all three age classes of adults to Kooskia NFH in 2002. The extremely high return of I-Salt (972 Jacks) in 2000, was more than double the previous record of 409 set in 1976. Therefore we had a data point that was an outlier to use for the 2001 prediction. Both the I-Salt and II-Salt predicted returns were more than the actual returns, while the III-Salt return exceeded our expectations. Our Kooskia NFH predictions were much closer than our Dworshak NFH predictions. These predictions were useful for preliminary management purposes such as potential harvest, broodstock collection adequacy, and planning for adult outplanting. Ladder

operations was coordinated to maximize fishing opportunities and also allow adequate ISS broodstock collection.

**Table 10.** Predicted and calculated returns of spring Chinook salmon to Kooskia NFH by ocean age class, 2002. Includes sport and tribal harvest estimates.

Ocean Age Class	Prediction	Total Return
I-Salt	67	48
II-Salt	3,296	2,912
III-Salt	252	584
Total	3,615	3,544

### 2003 Run Predictions

Our forecast for the 2003 spring Chinook salmon returns to Dworshak and Kooskia NFHs is given in **Table 11**. The combined forecast is for nearly 5,000 spring Chinook salmon to return to the Dworshak Fishery Complex. We are very confident that we will more than meet our brood stock requirements of 1,800 adults. Idaho Department of Fish and Game and the Nez Perce Tribe may open sport and tribal fisheries in the Clearwater River in the spring of 2002 after dam counts confirm the validity of our estimates.

**Table 11.** Predicted returns of spring Chinook salmon to the Dworshak Fishery Complex by ocean age class, 2003. Including sport and tribal harvest.

Ocean Age Class	Dworshak NFH	Kooskia NFH
I-Salt	150	133
II-Salt	2,895	634
III-Salt	837	323
Total	3,882	1,090

### Supplementation

The 2002 rack returns to both Dworshak and Kooskia NFHs were greater than was needed to meet broodstock needs. Arrangements were made with the Nez Perce Tribal Fisheries Department to transport excess adults to various tributaries throughout the Clearwater River basin for supplementation purposes. A total of 1,191 adults from Dworshak NFH (**Table 12**) and 81 adults from Kooskia NFH (**Table 13**) were outplanted. In addition, 163 adults from Kooskia NFH were transported down river and released to recycle through the sport and tribal fisheries (**Table 14**).

**Table 12.** Numbers of adult spring Chinook salmon transported from Dworshak NFH to various locations in the Clearwater River to supplement natural production, 2002.

Date	Location	Adults	Jacks	Total	Comments
July 25	Selway-McGruder	347	3	350	114 males; 233 females; 3 jacks
August 8	Selway-McGruder	392	8	400	171 males; 221 females; 8 jacks
Sept. 8	Selway-McGruder.	300	11	311	145 males; 155 females; 11 jacks
Sept. 18	Lower Selway R.	121	9	130	78 males; 43 females; 9 jacks
<b>Totals</b>		<b>1,160</b>	<b>31</b>	<b>1,191</b>	

**Table 13.** Numbers of adult spring Chinook salmon transported from Kooskia NFH to various locations in the Clearwater River to supplement natural production, 2002.

Date	Location	Adults	Jacks	Total	Gender
July 17	Meadow Cr.-Selway R.	79	2	81	males =32 females =47
<b>Totals</b>		<b>79</b>	<b>2</b>	<b>81</b>	jacks = 2

**Table 14.** Numbers of adult spring Chinook salmon transported from Kooskia NFH and released into the lower Clearwater River for recycle through the sport and tribal fisheries, 2002. Gender could not be determined because it was early in the season.

Date	Location	Adults	Jacks	Total
May 8	Kamiah	10	0	10
May 13	Kamiah	20	0	20
June 18	Kamiah	132	1	133
<b>Totals</b>		<b>162</b>	<b>1</b>	<b>163</b>

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