

**ADULT SPRING CHINOOK SALMON RETURNS TO
DWORSHAK AND KOOSKIA NATIONAL FISH HATCHERIES
IN 2007 AND PREDICTIONS FOR 2008**

Prepared by:

Howard L. Burge
Project Leader

Mike Faler
Assistant Project Leader

Ray N. Jones
Fish Biologist

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

February, 2008

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 east of Kooskia, Idaho, near the confluence of Clear Creek and the Middle Fork Clearwater River. In 1978, Kooskia NFH was included as part of the Dworshak Fishery Complex. Because of production constraints, temperature considerations, and other factors, Kooskia NFH brood stock are held and spawned at Dworshak NFH. Kooskia spring Chinook salmon eggs and juveniles are occasionally held at Dworshak NFH as well. In 1998, we began using Kooskia NFH for incubation and early rearing of Dworshak NFH spring Chinook salmon, to take advantage of the colder water temperature. Then in 2005 we were able to use the upgraded chilling capacity at Dworshak NFH for incubation of the Dworshak stock. Kooskia stock eggs are still incubated at Kooskia NFH.

This report includes accounting of the adult returns of Dworshak and Kooskia NFH origin spring Chinook salmon to Dworshak and Kooskia NFHs and the Clearwater River in 2007. A summary of the age composition of the rack returns, and estimates of smolt to adult survival and return is included. The predictions made for the 2007 return are reviewed and pre-season predictions for the adult returns in 2008 are presented.

Stock Origin and Genetic History

Dworshak NFH

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 to Dworshak NFH and made up the smolt releases from 1983 to 1986 (**Table 1**). Since these stocks were very strongly influenced by transfers from Carson NFH to Leavenworth and Little White Salmon NFHs, the early Dworshak spring Chinook salmon stock was considered a Lower Columbia River derivative. The spring Chinook salmon program for brood years 1985 and 1986 consisted entirely of eggs that had been transferred from Rapid River State Fish Hatchery (SFH). Rapid River State Fish Hatchery used spring Chinook salmon trapped at Hells Canyon Dam (considered an upper Snake River stock) as an original parent 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 Chinook stock. In the 16 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, releases from Dworshak NFH were one third Kooskia stock spring Chinook salmon. Then in 2001 about one third of the Dworshak release was Rapid River stock (Lookingglass Fish Hatchery adults 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, 1983-2007. (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
2002-2007	100% DW

Kooskia NFH

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 Lower Columbia River stock influence. Egg transfers of Lower Columbia River 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 Lower Columbia River derivatives, the resultant program (1989 and later) retained that lineage, but is now referred to as Kooskia stock. Length frequency data, ocean age class at return, and allele frequencies (Elliot and Pascho 1994) all support a distinction between Dworshak and Kooskia stocks. In April 2007, about 60,000 smolts from Dworshak NFH were released at Kooskia NFH to supplement the smolt releases at that hatchery. All the Dworshak NFH stock were marked with coded-wire tags in order to identify the adults as Dworshak origin stock upon their return. The I-Ocean adults will begin to return to Kooskia NFH this spring.

Table 2. Genetic background of Kooskia NFH spring Chinook salmon smolts directly released from the hatchery, 1971-2007. (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 - 2007	100% KK

Dworshak and Kooskia Adult Returns to the Clearwater River in 2007

The numbers of Dworshak and Kooskia NFH origin adult spring Chinook salmon that returned to the Clearwater River in 2007 are challenging to determine because of the mixed stock fisheries and harvests that occur in the basin. The adults that entered the Clearwater River in 2007 originated from smolt release programs at Dworshak NFH, Kooskia NFH, and Idaho Department of Fish and Game (IDFG) facilities at Powell, Red River, and Crooked River in 2004, 2005, and 2006. Run reconstruction is based on the numbers of adults that return to the racks at Dworshak and Kooskia NFHs and estimates of the sport and Tribal harvests.

The IDFG provided estimates of harvest for the 2007 spring Chinook sport season (Barrett 2006) and coded-wire tag recovery data from harvested adults. Expansion factors were developed based on the percentages of coded-wire tags released from each hatchery and used to estimate hatchery contribution in the sport harvest. The Nez Perce Tribe provided tribal harvest estimates for 2007. Most of the harvest by Tribal fisherman occurred at the ladder at Dworshak NFH and below the adult trap at Kooskia NFH.

Currently, our office has not developed a satisfactory method for estimating the numbers of Dworshak and Kooskia NFH spring Chinook salmon that do not enter the hatchery or contribute to harvest, so our estimate is actually an under-estimate of the total numbers of adults that cross over Lower Granite Dam. Attempts have been made using PIT-tag information to reconcile the numbers of spring Chinook salmon crossing Lower Granite Dam with numbers entering hatchery racks and harvest but the results so far has been unsatisfactory. Methods to reconcile the data are still being developed.

Table 3 lists the total numbers of adults that entered Dworshak and Kooskia NFHs, the contribution of each hatchery to the sport and Tribal harvests, and the total estimated return to the Clearwater River for the last five years. The historical numbers, from 1987 through 2007, are listed in **Appendix Table 1**.

Table 3. Number of Dworshak and Kooskia NFH spring Chinook salmon returning to the hatcheries and estimates of hatchery fish harvested in the Clearwater River annually from 2003 to 2007.

Year	Dworshak NFH				Kooskia NFH			
	Rack Return	Sport Harvest	Tribal Harvest	Total Hatchery Return	Rack Return	Sport Harvest	Tribal Harvest	Total Hatchery Return
2003	3,422	1,788	1,445	6,655	965	280	164	1,409
2004	2,356	1,595	419	4,370	718	230	389	1,337
2005	882	942	102	1,926	270	0	173	443
2006	1,354	431	392	2,177	670	64	65	799
2007	2,110	215	198	2,523	589	131	166	886
Mean	2,025	994	511	3,530	642	141	191	975

Age Composition of the Hatchery Rack Return

Adult spring Chinook salmon return from the ocean after spending 1, 2, or 3 years in the ocean. A very small number of individuals return as 0's, having returned to the hatchery the same year as they were released as smolts. The nomenclature used to describe the age at return is I-, II-, or III-Ocean, fish. Scales are commonly used to determine age, but with spring Chinook salmon at Dworshak and Kooskia NFHs, we have observed that scales are often re-absorbed and are severely degenerated by the time the adults enter the hatchery. Therefore, scale interpretation is very difficult if not impossible. In lieu of scales, our office has developed an alternative method based on the lengths of individuals of known age using coded-wire tag information accumulated over the past 20 years. Fork length categories for each class is as follows: I-Oceans are 56 cm or less, II-Oceans are 57 through 81 cm, and III-Oceans are larger than 81 cm, fork length.

Dworshak NFH

Age composition for spring Chinook salmon returning to Dworshak NFH is listed in **Table 4**. The 2007 return year is atypical of most years in that I and III- Ocean age classes were high and II-Ocean age class was low. So when 2007 is included in the 5-year average along with 2003, which was also atypical, it tends to skew the mean upward. The historical numbers, from 1984 to 2007, are listed in **Appendix Table 2**.

Table 4. Age composition of spring Chinook salmon adults returning to Dworshak NFH, 2003-2007.

Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Total Return
2003	580	17	478	14	2,364	69	0	3,422
2004	142	6	2,077	88	137	6	0	2,356
2005	74	8	686	78	122	14	0	882
2006	62	5	1,136	84	156	11	0	1,354
2007	702	33	809	39	599	28	0	2,110
Mean¹	312	16	1,037	51	676	33	0	2,025

¹This is a 5-yr mean, however, the returns for 2003 and 2007 are not what we would consider typical because of the number of I and III-Ocean returns.

Kooskia NFH

Age composition for spring Chinook salmon returning to Kooskia NFH is listed in **Table 5**. The age composition for the 2007 return is atypical of most years in that the I- and III-Ocean age class returns were higher than usual. The historical numbers, from 1972 to 2007, are listed in **Appendix Table 3**.

Table 5. Age composition of spring Chinook salmon adults returning to Kooskia NFH, 2003-2007.

Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Total Return
2003	97	10	71	7	797	83	0	965
2004	15	2	682	95	21	3	0	718
2005	29	11	202	75	39	14	0	270
2006	7	1	617	92	46	7	0	670
2007	257	44	148	25	184	31	0	589
Mean¹	81	12	344	54	217	34	0	642

¹ This is a 5-yr mean, however, note the atypical return numbers in 2003 and 2007.

Smolt to Adult Survival

The success of an anadromous fish hatchery program is measured not only in the ability of the program to meet established production goals, but also in the quality of the fish produced. One of the most important and useful measures of smolt quality is the ability of smolts to successfully emigrate to the ocean and return as adults to perpetuate the program. Typically referred to as SAR (Smolt-to-Adult-Return), adults return over a three year period to the hatchery after being released as smolts. Thus, in 2007, the III-Ocean individuals in the Dworshak and Kooskia NFH racks were the last adults to return from the smolts that were released in 2004, closing out Brood Year 2002. The I- and II-Ocean individuals returned in 2005 and 2006, respectively.

Dworshak NFH

Table 6 lists the numbers of smolts released and estimated survival of each returning age class from 2002 to 2006. The data have been expanded to include estimates from the sport and Tribal harvests. The historical numbers, from 1988 to 2007 are listed in **Appendix Table 4**. Estimated smolt-to-adult-return, or survival, for Brood Year 2002, released as smolts in 2004, had the second lowest rate of return since Brood Year 1994 smolts released in 1996.

Table 6. Release year, number of smolts released, and the numbers and percent survival of adult returns to Dworshak NFH by age class from 2002 to 2006.

Release Year	Smolts Released ¹	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2002	1,000,561	847 (0.0847%)	3,936 (0.3934%)	279 (0.0279%)	5,062 (0.5059%)
2003	1,033,982	184 (0.0178%)	1,567 (0.1516%)	238 (0.0230%)	1,989 (0.1924%)
2004	1,078,923	80 (0.0074%)	1,875 (0.1738%)	599 (0.0555%)	2,554 (0.2367%)
2005	1,072,359	64 (0.0060%)	809 (0.0754%)		
2006	1,007,738	702 (0.0687%)			

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

Kooskia NFH

Table 7 lists the numbers of smolts released and the estimated survival of each returning age class from 2002 to 2006. The data have been expanded to include harvest estimates from the sport and Tribal fisheries. The historical numbers, from 1988 to 2007, are listed in **Appendix Table 5**. Estimated smolt-to-adult-return, or survival, for Brood Year 2002, released as smolts in 2004, had the second lowest rate of return since Brood Year 1994 smolts, released in 1996.

Table 7. Release year, number of smolts released, and the numbers and percent survival of adult returns to Kooskia NFH by age class from 2002 to 2006.

Release Year	Smolts Released ¹	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2002	549,861	113 (0.0206%)	1,275 (0.2319%)	67 (0.0122%)	1,465 (0.2646%)
2003	597,063	15 (0.0025%)	347 (0.0631%)	50 (0.0084%)	412 (0.0690%)
2004	643,503	29 (0.0045%)	741 (0.1348%)	184 (0.0286%)	954 (0.1483%)
2005	624,967	8 (0.0013%)	148 (0.0237%)		
2006	637,334	257 (0.0403%)			

¹ 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, 1992-2003). 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 also dramatically increased the workload for CWT sampling, recovery, and data processing.

Rack recoveries in previous years have included strays from other hatcheries. Recoveries have also been made from National Marine Fisheries Service transportation studies, which were probably not strays (**Table 8**). The tags from the 1997-2006 racks have been extracted and read. Data will be verified and formatted for submission to PSMFC. To date, CWT recovered from the 2007 rack have not been read.

Table 8. CWT recoveries for adult spring Chinook salmon in the Dworshak NFH rack, 1987-2007.

Rack Year	Hatchery Tags Recovered ¹	Other Tags Recovered ²	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	329	1	330
2000	1,030	22	1,152
2001	332	21	353
2002	289	35	324
2003	531	166	697
2004	399	62	461
2005	124	24	148
2006	220	5	225
2007 ³			

¹ Includes both Dworshak and Kooskia NFHs.

² Includes all spring Chinook that were not tagged at Dworshak and Kooskia NFHs

³ 2007 recoveries not read at time of report

2007 Run Predictions

Over the years, we have been able to develop a very strong regression between the number of jack (I-Ocean) returns and the number of II-Ocean returns the following year. Although this method works well for II-Ocean returns, we have not been able to develop reliable regressions that will provide predictions for the I-Ocean and III-Ocean returns. Therefore, the predictions for those two age groups were generated from average return rates. Below is a review of our predictions, made in 2006 and the actual returns for both Dworshak and Kooskia NFHs in 2007.

Dworshak NFH-2007

The total number of spring Chinook salmon that we predicted would return to Dworshak NFH and associated fisheries in 2007 was 1,641. This number was about 500 fish lower than the actual return. **Table 9** lists the predicted return, made in 2006, and the expanded actual returns of all three age classes of adults in 2007. Our predictions for both the I-Ocean and III-Ocean returns were lower than the actual returns. The I-Ocean prediction was substantially lower,

which accounted for most of the differences between the predicted and actual returns. The regression used for making our prediction gave a high estimate for II-Ocean returns.

Table 9. Predicted and calculated returns of Dworshak NFH spring Chinook salmon by ocean age class, 2007. Includes sport and tribal harvest estimates.

Ocean Age Class	Prediction	Total Return
I-Ocean	194	702
II-Ocean	1,107	809
III-Ocean	340	599
Total	1,641	2,110

Kooskia NFH-2007

The total number of spring Chinook salmon that was predicted to return to Kooskia NFH and associated fisheries in 2007 was 400. This number is about 200 fish lower than the actual return of 589. **Table 10** lists the predicted return made in 2006 and the expanded actual returns of all three age classes of adults in 2007. While we were low for all age classes most of the difference between the predicted and actual return is accounted for by the low estimate for the I-Ocean age class. Predictions for Kooskia NFH tend to be more accurate than that for Dworshak NFH. The predictions were useful for preliminary management purposes such as potential harvest, brood stock collection adequacy, and planning for adult outplanting. Trap operations were coordinated to maximize fishing opportunities and also allow ISS brood stock management.

Table 10. Predicted and calculated returns of Kooskia NFH spring Chinook salmon for 2007 by ocean age class, includes sport and tribal harvest estimates.

Ocean Age Class	Prediction	Total Return
I-Ocean	127	257
II-Ocean	134	148
III-Ocean	139	184
Total	400	589

Our predictions for both hatcheries were useful for preliminary management purposes such as developing potential harvest seasons and brood stock collection plans. PIT tag adult return information from Lower Granite Dam allowed in season verification of return estimates. We coordinated ladder operations at Dworshak and trap operations at Kooskia to maximize the fishing opportunities and minimize brood stock handling and holding.

2008 Run Predictions

Our forecast for the 2008 spring Chinook salmon return to the Clearwater River from Dworshak and Kooskia NFHs is given in **Table 11**. The combined forecast is for almost 9,300 spring Chinook salmon to return to the Dworshak Fishery Complex and adjacent fisheries. We are

confident that we will meet our brood stock requirements of 1,200 adults at Dworshak NFH and 800 at Kooskia NFH. The Idaho Department of Fish and Game and the Nez Perce Tribe will likely open sport and tribal fisheries in the Clearwater River in the spring of 2008 after dam counts of PIT tagged adults verify our estimates.

Table 11. Predicted returns of spring Chinook salmon to the Clearwater River from the Dworshak Fishery Complex by ocean age class, 2007. Including sport and tribal harvest as well as rack return.

Ocean Age Class	Dworshak NFH	Kooskia NFH
I-Ocean	174	114
II-Ocean	6,172	2,285
III-Ocean	423	116
Total	6,769	2,515

Appendix Table 1. Number of Dworshak and Kooskia NFH spring Chinook salmon returning to the hatcheries and estimates of hatchery fish harvested in the Clearwater River annually from 1987 to 2007.

Year	Dworshak NFH Rack Return	Kooskia NFH Rack Return	Sport Harvest ¹	Tribal Harvest ¹	Estimated 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	5,087	1,259	9,540
2003	3,422	965	2,068	1,609	8,064
2004	2,356	718	1,825	808	5,707
2005	882	270	942	275	2,369
2006	1,354	670	495	457	2,976
2007	2,110	589	346	364	3,409

¹ Harvest estimates provided by IDFG and NPT.

Appendix Table 2. Age composition of spring Chinook salmon returning to Dworshak NFH, 1984-2007. Percentages do not include unmeasured adults.

Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Total Return
1984	14	(17)	52	(63)	16	(20)	0	82
1985	13	(4)	281	(85)	35	(11)	5	334
1986	78	(15)	346	(67)	91	(18)	0	516
1987	25	(1)	1,604	(80)	376	(19)	12	2,017
1988	163	(8)	569	(29)	1,240	(63)	0	1,972
1989	156	(9)	1,322	(78)	221	(13)	1	1,700
1990	7	(0.3)	1,892	(93)	135	(6.7)	8	2,042
1991	16	(10)	77	(47)	72	(43)	0	165
1992	23	(6)	286	(82)	40	(12)	21	370
1993	9	(1)	452	(55)	359	(44)	3	823
1994	3	(4)	30	(41)	41	(55)	0	74
1995	83	(66)	36	(29)	6	(5)	0	125
1996	275	(28)	663	(69)	25	(3)	0	963
1997	12	(0.4)	2,380	(76)	740	(23.6)	18	3,150
1998	11	(1)	176	(19)	728	(80)	0	915
1999	670	(84)	78	(10)	52	(6)	0	800
2000	221	(7)	2,827	(90)	104	(3)	0	3,202
2001	36	(1)	3,235	(80)	747	(19)	0	4,018
2002	62	(3)	1,480	(69)	615	(28)	0	2,157
2003	580	(17)	478	(14)	2,364	(69)	0	3,422
2004	142	(6)	2,077	(88)	137	(6)	0	2,356
2005	74	(8)	686	(78)	122	(14)	0	882
2006	62	(5)	1,136	(84)	156	(11)	0	1,354
2007	702	33	809	39	599	28	0	2,110

Appendix Table 3. Age composition and total annual return of spring Chinook salmon returning to Kooskia NFH, 1972-2007. Percentages do not include unmeasured adults.

Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Total Return
1972	5	(100)	0	(0)	0	(0)	0	5
1973	5	(10)	45	(90)	0	(0)	0	50
1974	16	(30)	35	(66)	2	(4)	0	53
1975	15	(5)	284	(87)	27	(8)	0	326
1976	409	(51)	286	(36)	106	(13)	0	801
1977	333	(11)	2,539	(84)	154	(5)	0	3,026
1978	23	(1)	1,676	(82)	336	(17)	0	2,035
1979	11	(3)	100	(27)	264	(70)	0	375
1980	9	(13)	55	(82)	3	(5)	0	67
1981	1	(0.4)	168	(68)	78	(31.6)	0	247
1982	3	(1)	116	(45)	139	(54)	0	258
1983	1	(0.3)	231	(61.7)	141	(38)	0	373
1984	55	(16)	80	(23)	206	(61)	0	341
1985	26	(5)	449	(85)	54	(10)	0	529
1986	21	(7)	159	(56)	103	(37)	0	283
1987	16	(2)	607	(88)	64	(10)	0	687
1988	39	(7)	363	(61)	193	(32)	0	595
1989	107	(11)	717	(74)	142	(15)	7	973
1990	11	(1)	921	(81)	209	(18)	0	1,141
1991	10	(2)	98	(21)	350	(77)	9	467
1992	14	(5)	239	(82)	38	(13)	21	312
1993	11	(1)	749	(64)	409	(35)	11	1,180
1994	1	(0.4)	96	(41.6)	135	(58)	0	232

Appendix Table 3. Continued.

Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Total Return
1995 ¹	21	(52)	7	(18)	12	(30)	0	40
1996	86	(43)	113	(56)	3	(1)	0	202
1997	7	(0.4)	1,523	(92)	127	(7.6)	0	1,657
1998	1	(0.3)	200	(49)	207	(50.7)	0	408
1999	72	(46)	28	(18)	57	(36)	0	157
2000	966	(61)	604	(38)	11	(1)	0	1,581
2001	28	(1)	2,137	(95)	96	(4)	0	2,261
2002	14	(1)	852	(82)	171	(17)	0	1,037
2003	97	(10)	71	(7)	797	(83)	0	965
2004	15	(2)	682	(95)	21	(3)	0	718
2005	29	(11)	202	(75)	39	(14)	0	270
2006	7	(1)	617	(92)	46	(7)	0	670
2007	257	44	148	25	184	31	0	589

Appendix Table 4. Release year, number of smolts released, and the numbers and percent survival of adult returns to Dworshak NFH by age class from 1988 to 2006. Estimates include sport and Tribal harvest or other estimates for 1990, 1997, 1998, 2000-2007.

Release Year	Smolts Released ¹	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% 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%)
1993	7,222	3 (0.000646%)	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%)	1,851 (0.1722%)	12,969 (1.2416%)
2000	1,017,873	128 (0.0126%)	4,455 (0.4377%)	4,930 (0.4843%)	9,513 (0.9346%)
2001	333,120	187 (0.0561%)	878 (0.2636%)	250 (0.0750%)	1,315 (0.3948%)
2002	1,000,561	847 (0.0847%)	3,936 (0.3934%)	279 (0.0279%)	5,062 (0.5059%)
2003	1,033,982	184 (0.0178%)	1,567 (0.1516%)	238 (0.0230%)	1,989 (0.1924%)
2004	1,078,923	80 (0.0074%)	1,875 (0.1738%)	599 (0.0555%)	2,554 (0.2367%)
2005	1,072,359	64 (0.0060%)	809 (0.0754%)		
2006	1,007,738	702 (0.0687%)			
2007	963,211				

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

Appendix Table 5. Return vs. release numbers for adult Kooskia NFH spring Chinook salmon returns, 1988-2006. Including sport and tribal harvest estimates for 1990, 1999, 2000-2007.

Release Year	Smolts Released ¹	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% 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%)	502 (0.0734%)	11,821 (1.7278%)
2000	449,454	160 (0.0356%)	2,503 (0.5569%)	1,212 (0.2697%)	3,875 (0.8622%)
2001	80,430	41 (0.0510%)	83 (0.1032%)	39 (0.0485%)	163 (0.2027%)
2002	549,861	113 (0.0206%)	1,275 (0.2319%)	67 (0.0122%)	1,465 (0.2646%)
2003	597,063	15 (0.0025%)	347 (0.0631%)	50 (0.0084%)	412 (0.0690%)
2004	643,503	29 (0.0045%)	741 (0.1348%)	184 (0.0286%)	954 (0.1483%)
2005	624,967	8 (0.0013%)	148 (0.0237%)		
2006	637,334	257 (0.0403%)			
2007	569,565				

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