2009 ANNUAL REPORT OF HATCHERY EVALUATION ACTIVITIES FOR SPRING CHINOOK SALMON AT DWORSHAK AND KOOSKIA NATIONAL FISH HATCHERIES

Brood Years 2007, 2008, and 2009

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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*). The production program is designed to return 9,135 adult spring Chinook salmon to Lower Granite Dam by rearing and releasing 1.05 million spring Chinook salmon smolts into the Clearwater River annually.

Kooskia NFH is located about 1.5 miles east of Kooskia, Idaho, 0.5 miles upstream of the confluence of Clear Creek and the Middle Fork Clearwater River. In 1978, Kooskia NFH was included as part of the Dworshak Fishery Complex. Kooskia NFH is a U.S. Fish and Wildlife Service hatchery constructed to mitigate for water development programs in the Columbia River basin. Currently, the program calls for the release of 600,000 spring Chinook salmon smolts annually to provide sport and Tribal harvest opportunities in the Clearwater River. Because of production constraints, temperature considerations, and other factors, Kooskia NFH brood stock are held and spawned at Dworshak NFH. Dworshak NFH provides initial incubation of eggs for Kooskia NFH until the eye-up stage at which point they are enumerated and transported to Kooskia NFH for final rearing.

This report includes the stock origin and genetic history of the programs, the smolts releases and emigration performances for Brood Year 2007, marking and tagging for Brood Year 2008, and the age composition of the rack returns, estimates of the sport and Tribal harvest, and estimates of smolt to adult survival for Brood Year 2009 at each hatchery. The predictions made for the 2009 adult return to each hatchery are reviewed and pre-season predictions for the adult returns to each hatchery in 2010 are presented.

Brood Stock Origin and 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 21 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. 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. Brood stock history of Dworshak NFH spring Chinook salmon smolts directly released from the hatchery, 1983-2009. (RR = Rapid River, KK = Kooskia, DW = Dworshak, LE = Leavenworth, LW = Little White Salmon).

Release Year	Brood Stock Composition
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
2002-2009	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 was referred to as Kooskia stock. Differences in length frequency, ocean age class at return, and allele frequencies all supported a distinction between Dworshak and Kooskia stocks (Elliot and Pascho 1994).

In April 2007, 178,678 Dworshak stock smolts (reared at Kooskia) were released from Kooskia NFH to fulfill the smolt release goal at that hatchery and to evaluate any differences in run timing between Kooskia and Dworshak stocks. All the Dworshak NFH stock were marked with either coded-wire or blank wire tags in order to identify them when they returned. The I-Ocean adults returned in the spring of 2008 and the II-Ocean adults returned in the spring of 2009. Data for I and II-Ocean adult returns suggested that there was essentially no difference in the run timing of the two stocks. A complementary analysis using PIT tag arrival data at Bonneville and Lower Granite dams for return years 2008 through 2009 supports this conclusion. We expect the III Ocean adults to return in the spring of 2010. However, the evaluation was terminated with the Co-Manager's agreement in 2009 to implement a change in brood stock management at Kooskia NFH. Rather than use only Kooskia stock for brood stock, the decision was made to not discriminate between different stocks that return to Kooskia NFH when selecting fish for brood stock. Thus, adults returning from releases made in 2007 and 2009 from Kooskia NFH, from Dworshak NFH stock, and the Idaho Department of Fish and Game program at Powell will be included into the brood stock for spawning in the future. Starting with the progeny of brood stock collected and spawned in 2010, the new stock will again be referred to as Clearwater stock (CL). Those adults identified as having been naturally spawned in Clear Creek, or as part of the Idaho Salmon Supplementation (ISS) program (Bowles *et. al* 1991), will be released above the weir to spawn naturally.

Table 2. Brood stock history of Kooskia NFH spring Chinook salmon smolts directly released from the hatchery, 1971-2009. (RR = Rapid River, KK = Kooskia, LE = Leavenworth, SS = South Santiam, CL = Clearwater, LW = Little White Salmon, CA = Carson, WR = Wind River).

Release Year	Brood Stock Composition
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 - 2006	100% KK
2007	69% KK, 31% DW
2008	100%KK
2009	62%KK, 15% DW, 23% Powell[1]

[1] Powell stock are progeny from the IDFG LSRCP Program located on Walton Creek in the Lochsa River.

Brood Year 2007

Brood Year 2007 was established with the adult returns to Dworshak and Kooskia NFHs in 2007 (Burge *et al*. 2008; Dworkshak National Fish Hatchery 2007). Incubation and early rearing was completed in late spring 2008. Juveniles were coded-wire tagged for evaluation of adult contributions to future fisheries and brood stock collections and were re-stocked into raceways at final rearing densities in August, 2008. Final rearing and smolt releases were completed in the early spring of 2009.

Smolt Releases

In March 2009, the Idaho FRO began monitoring flows and river conditions in the mainstem Clearwater River and at Lower Granite Dam to determine the optimum time for smolt releases. By March 23, the mean daily inflow of the Snake River into Lower Granite Reservoir and the mean daily flow of the mainstem Clearwater River at the Orofino bridge were very near the 10-year average (Idaho FRO data files). The forecast at that time was for conditions to remain stable for the next week.

Given the above forecast, Dworshak NFH released 1,014,748 spring Chinook salmon smolts during two separate early evening releases into the North Fork Clearwater River on March 25 and 26, 2009. Mean total length at release was 137 mm. Arrangements were made with the U.S. Army Corps of Engineers to increase flow in the North Fork Clearwater River from 1,200 cfs to 5,000 cfs on those days, to help move the fish into the mainstem Clearwater River. Releases were made in the early evening to help avoid predation.

Kooskia NFH released 442,030 Kooskia stock spring Chinook salmon smolts into Clear Creek at 6:00 pm on March 23, 2009. Mean total length at release was 125mm. Since the release was below the goal of 600,000, an additional 161,649 spring Chinook salmon smolts of Dworshak stock reared at Kooskia NFH were also released into Clear Creek. Mean size at release for that group was 133 mm TL.

As mentioned in the Brood Stock Origin and History section above, 234,151smolts from the Clearwater Hatchery program at Powell (progeny of adults collected at Powell) were transported and released into Clear Creek on March 30, 2009. All of these fish were marked with an adipose fin clip and oxytetracycline. In addition, 87,028 received a coded-wire tag and 11,556 were PIT-tagged. Adults that return from this release will be incorporated into Kooskia NFH brood stock.

Emigration Performance and Survival

Smolts outfitted with PIT-tags were used to evaluate the effectiveness of the production programs at both Dworshak and Kooskia NFH. Information is collected at the various dams throughout the lower Snake and Columbia rivers and is used to provide estimates on emigration time and survival. PIT-tag detection histories also provide real-time data on adult return timing and a means to assess total return as fish are detected at Columbia and Snake river dams.

Dworshak NFH - A total of 50,835 PIT-tagged smolts were at Dworshak NFH as part of the Comparative Survival Study conducted by the Fish Passage Center (FPC). The Comparative Survival Study (CSS) evaluates the effectiveness of using barges for transporting smolts past the

Snake and Columbia River dams as opposed to allowing them to emigrate in river through the Federal Columbia River Power System (FCRPS).

The migration time to Lower Granite Dam ranged from 5.5 days to 89.2 days with a mean travel time of 41.9 days (n= 8867). Ten percent arrived at Lower Granite Dam within 25.4 days; 50% and 90% arrived within 43.5 days and 54.4 days, respectively. Smolts that migrated through the hydropower system arrived at Bonneville Dam on average 56.7 days after release. Survival probabilities through the FCRPS were calculated using SURvival under Proportional Hazards 2.1 (SURPH) (Lady *et al.* 2001). The estimated survival for BY07 spring Chinook smolts to Lower Granite Dam was 69.1%, a decline from previous years. Comparatively, survival estimates for release years 2005 through 2008 ranged from 74% to 86%. The overall estimated survival to Bonneville Dam was 39.4%.

Kooskia NFH - A total of 9,900 smolts were PIT-tagged as part of the hatchery evaluation program at Kooskia NFH. The migration time to Lower Granite Dam ranged from 6.9 days to 78.1 days with a mean travel time of 36.5 days (n=1968) Ten percent arrived at Lower Granite Dam within 18.8 days; 50% and 90% arrived within 37.0 days and 51.7 days, respectively. Smolts that migrated through the FCRPS arrived at Bonneville Dam on average 60.6 days after release (n= 146). Survival probabilities through the FCRPS were calculated using SURvival under Proportional Hazards 2.1 (SURPH) (Lady *et al.* 2001).. The estimated survival for BY07 spring Chinook smolts to Lower Granite Dam was 62.4%. The overall estimated survival to Bonneville Dam was 47.3%.

Adult Contribution and Survival

Coded-wire tags (CWT) are used to estimate the contribution of adults to various commercial, sport and Tribal fisheries in the ocean, in the lower Columbia River, in the lower Snake River, and in the Clearwater River when BY 2007 Chinook salmon adults return in 2010, 2011, and 2012. CWT groups are also used to represent treatment and control groups for both on- and off-station research projects and provide information on the effectiveness of alternative production methods to increase the numbers of returning adults.

Two tag codes were used to represent the smolt releases at Dworshak NFH. At Kooskia NFH, CWT groups included one tag code and agency only wire, which was used to represent the Dworshak stock reared and released from Kooskia NFH (**Table 3**).

Just prior to release, 250 fish from each tag code group were checked for CWT to estimate retention rates. The retention rates for Dworshak NFH and Kooskia NFHs were 100% and 98%, respectively.

Table 3. CWT release information for Brood Year 2007 spring Chinook salmon released from Dworshak and Kooskia NFHs in 2009.

Hatchery	Tag Code	Number of Tags	Number of Unmarked Fish	Mark Rate	Purpose
DNFH	053572	67,690	437,350	0.13	Contribution, Raceways B23 and B24
	053573	65,226	444,482	0.13	Contribution, Raceways A8 and A9
KNFH	052987	113,406	442,030	0.20[2]	Contribution, Run Timing, BP05 and 06
	05[1]	47,277	442,030	0.10[2]	Contribution, Run Timing, BP 05

[1] Agency only wire.

[2] Mark rate is calculated using the total number of CWTs divided by the total release (tagged and ummarked fish combined).

Brood Year 2008

Brood Year 2008 was established with the adult returns to Dworshak and Kooskia NFHs in 2008 (Dworkshak National Fish Hatchery 2008). Incubation, early rearing and CWTing was completed in 2009. **Table 4** lists the tag codes, the number tagged, and the number of unmarked fish each tag code represents at each hatchery. Brood Year 2008 will be released in the spring of 2010.

Table 4. CWT release information for Brood Year 2008 spring Chinook salmon scheduled for release from Dworshak and Kooskia NFHs in 2010.

Hatchery	Tag Code	Number of Tags	Number of Unmarked Fish	Mark Rate	Purpose
DNFH	054686	59,331	498,399	0.11	Contribution, Raceways B20 and B21
	054685	59,652	491,813	0.11	Contribution, Raceway A5 and A6
KNFH	053486	29,602	523,822[1]	0.21	Contribution, BP 02
	053487	29,602			Contribution, BP 02
	053488	29,591			Contribution, BP 02
	050982	19,713			Contribution, BP 02

[1] The 523,822 unmarked fish are represented by all the tag codes listed.

Early Rearing Container Evaluation

In September, 2008, the production staff at Dworshak NFH submitted a proposal to the Dworshak Complex Hatchery Evaluation Team for the evaluation of several different styles of early rearing containers for spring Chinook salmon in lieu of using raceways. The study was designed to continue for two to three years with the intention of making recommendations on the optimum container to use for early rearing. Eventually, plans call for the construction of a separate nursery for the spring Chinook salmon program. The study was initiated in the spring with Brood Year 2008. Fry were stocked directly from the nursery into seven circular tanks, four stainless steel rectangular tanks, and into one raceway used as a control. Growth, mortality, and water quality were monitored from March through Junel, 2009. Preliminary data analysis indicated that there was very little difference between rearing containers, although the circular tanks appeared to provide a better environment and were easier to manage. A report of progress for the study is currently being drafted.

Brood Year 2009

Brood Year 2009 was established with the adult returns to Dworshak and Kooskia NFHs in 2009 (Dworkshak National Fish Hatchery 2009).

Adult Returns to the Clearwater River

Estimating the numbers of Dworshak and Kooskia NFH origin adult spring Chinook salmon that returned to the Clearwater River in 2009 is challenging because of the uncertainties associated with the mixed stock fisheries and harvests that occur in the Clearwater River basin. The adults that entered the Clearwater River in 2009 originated from smolt release programs at Dworshak NFH, Kooskia NFH, Idaho Department of Fish and Game (IDFG) facilities at Powell, Red River, and Crooked River, and Nez Perce Tribal Hatchery program releases in Lolo Creek, Newsome Creek, and the Selway River in 2006, 2007, and 2008. The estimated return of adults for Dworshak and Kooskia NFH stocks is based on the numbers of adults that enter the racks at Dworshak and Kooskia NFHs, estimates of the contribution of these two stocks to the sport and Tribal harvests, and estimates of the number of fish that escape to the river.

Estimates of the numbers of adults and jacks harvested in the sport fishery for Dworshak and Kooskia hatcheries are based on expanded numbers of coded-wire tags collected during sport fish harvest surveys by the IDFG. These tags are expanded by tagging and sample rates, across multiple creel survey river sections (Cassinelli, IDFG and Barrett, IDFG, personal communication). The Nez Perce Tribe provides estimates of tribal harvest, most of which occurs at the ladder at Dworshak NFH and in Clear Creek below the adult trap at Kooskia NFH. In 2009, the IDFG used expanded PIT-tag information from adults crossing Lower Granite Dam to estimate the total return of each spring Chinook salmon stock to the Clearwater River. Using the estimated total for each stock, the escapement of each stock (those fish not returning to a rack or harvested in a fishery) was calculated by subtracting the rack returns and harvest estimates. At this time, the methodology is still under development and evaluation, so any numbers reported are provisional and subject to change in future reports. It is understood that PIT tag expansions in adult returns are likely biased low due to possible tag loss and/or differential mortality from release to return. Currently, IDFG is analyzing the degree of any possible bias in hopes of being able to correct these expansions in the future (Personal Communication, John Cassinelli, Idaho Department of Fish and Game).

Dworshak NFH - The adult ladder at Dworshak NFH was opened on June 10 and was operated continuously through August 17. On a weekly basis starting June 18, adults were moved from the collection pond to the spawning room where they were checked for tags, measured for length, and transferred to the adult holding ponds to mature for spawning. Eleven inventories were conducted from June 18 through August 27. **Table 5** lists the numbers of adult spring Chinook inventoried on each date. **Table 6** lists the total number of adults that entered the rack at Dworshak NFH and the sport and Tribal harvests for the last five years. The estimated escapement and the total estimated return to the Clearwater River is listed for 2009. The historical numbers, from 1987 through 2009, are listed in **Appendix Table 1.**

Table 5. Ladder operation for BY09 SCS trapped at Dworshak NFH (Dworkshak National Fish Hatchery 2009).

Date of Inventory	Number of Fish
18 June	134
25 June	162
30 June	322
2 July	76
8 July	232
16 July	251
22 July	249
6 August	326
13 August	264
20 August[1]	58
27 August[1]	85
Trap Mortalities	12
Total	**2,171**

[1] Broodstock collection for the Nez Perce Tribal Hatchery program.

Table 6. Adult returns of Dworshak NFH adult spring Chinook salmon to the Clearwater River from 2005-2009.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement	Total Run[1]
2005	882	606	102	na	1,590
2006	1,354	589	392	na	2,335
2007	2,110	256	198	na	2,564
2008	1,857	1,109	159[2]	na	3,125
2009	**2,171**	**1,373**	**354**	**848**	**4,746**
Mean	1,675	787	528	na	2,872

[1] Does not include escapement from 2005 to 2008..
[2] Total number based on angler interview and is not an expanded estimate.

Kooskia NFH - The adult trap at Kooskia NFH was opened May 11 and was operated continuously until it was closed on July 22. On a weekly basis starting June 1, adults were removed from the holding pond, measured for length, checked for marks and tags, and then transported to Dworshak NFH for holding until mature for spawning. Adults identified as natural fish were passed above the weir to spawn naturally as part of the ISS project. In addition, excess I-Ocean fish (Jacks) were provided to the Nez Perce Tribe for subsistence purposes. Eleven inventories were conducted from June 1 through July 29. The total rack return was 590, including 10 fish passed above the weir to spawn naturally, 18 I-Ocean fish that were given to the Nez Perce Tribe, and there was one trap mortality. A total of 561 adults were transported to

Dworshak NFH. **Table 7** lists the numbers of fish inventoried on each date. **Table 8** lists the total number of adults that entered the trap at Kooskia NFH and the sport and Tribal harvests. The total estimated return to the Clearwater River for 2009 using expanded PIT-tag information for adults at Lower Granite Dam was very likely biased low. The estimated return was 607 adults, which was 294 fish less than the combined trap and harvest numbers of 901. The LGD estimate was likely further influenced by the fact that returning Kooskia PIT tags were not part of the Separation by Code process. Therefore, all returning PIT tags were used in expanding the adult returns, even though not all the tags were representative of the run at large (Personal Communication, John Cassinelli, Idaho Department of Fish and Game). The historical numbers, from 1987 through 2009, are listed in **Appendix Table 2.**

Table 7. Ladder operation for BY09 SCS trapped at Kooskia NFH (Kooskia National Fish Hatchery 2009).

Date of Inventory	Transported to Dworshak	Passed Upstream	Tribal Subsistence	Trap Mortalities
1 June	12			
15 June	99	1		
22 June	53			
29 June	104	2		
2 July	59		15	
6 July	103			
10 July	58	5		
15 July	54	2	1	
17 July	10		2	
23 July	2			
29 July	7			1
Total	**561**	**10**	**18**	**1**

Table 8. Adult returns of Kooskia NFH adult spring Chinook salmon to the Clearwater River from 2005-2009.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement	Total Run[1]
2005	270	53	173	na	496
2006	670	73	65	na	808
2007	589	128	166	na	883
2008	816	623	132[2]	na	1,571
2009	**590**	**188**	**123**	**na**	**901**
Mean	587	213	132	na	932

[1] Does not include escapement.

[2] Actual harvest estimate not reported. Idaho FRO estimate based on the average harvest reported for 2005, 2006, 2007, and 2009

Age Composition of the Hatchery Rack Return

Adult spring Chinook salmon return 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, and in some very exceptional years, some fish return after 4 years in the ocean. 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. Males are generally larger than females on average but attempts to break down the run into age classes by sex have been discontinued because of the difficulty in distinguishing males and females at the time of inventory. Sexually distinguishing characteristics do not usually begin to develop until the time of sexual maturity and spawning.

Dworshak NFH - Age composition for spring Chinook salmon returning to the Dworshak NFH rack is listed in **Table 9**. The 2009 return year is atypical of most years in that the percentage of I-Ocean age class was higher and the percentage of the II-Ocean age class was lower than historical averages, indicating a possible shift in the age composition of the run towards younger age at return. However, the five year average continues to be very close to the historical averages since 1984. The historical numbers, from 1984 to 2009, are listed in **Appendix Table 3.**

Table 9. Number and percent of I-, II-, and III-Ocean spring Chinook salmon adults returning to the Dworshak NFH rack, 2005-2009.

Return Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack Return
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
2008	319	17	1,201	65	337	18	0	1,857
2009	726	33	1,200	55	245	12	0	2,171
Mean	**377**	**19**	**1,006**	**64**	**292**	**17**	**0**	**1,675**

Kooskia NFH - Age composition for spring Chinook salmon returning to Kooskia NFH is listed in **Table 10.** The age composition for the 2009 return is atypical of most years in that the percentage of the I-Ocean age class was higher than the historical average. The percentages of the II- and III- Ocean components were very near the five year average and are typical of the long term historical averages listed in **Appendix Table 4**.

Table 10. Number and percent of I-, II-, and III-Ocean spring Chinook salmon adults returning to the Kooskia NFH rack, 2005-2009.

Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack Return
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
2008	107	13	647	79	62	8	0	816
2009	155	26	369	63	65	11	1	590
Mean	**111**	**19**	**397**	**67**	**79**	**14**	**0**	**586**

Smolt to Adult Survival

The ability of smolts to successfully migrate to the ocean and return as adults is an important and useful measure of smolt quality and program success. The measure is referred to as the Smolt-to-Adult-Return rate, or SAR. Spring Chinook salmon spend one, two, or three years in the ocean before returning as adults. Thus, estimating SAR for any given brood year requires determining the contribution of each age class within each respective adult return for the next three years. The adults that returned in 2009 were composed of I-Ocean adults that were released as smolts in 2008 (brood year 2006), II-Ocean adults that were released as smolts in 2007 (brood year 2005), and III-Ocean adults that were released as smolts in 2006 (brood year 2004). With the return of the III-Ocean adults in 2009, estimating the SAR for Brood Year 2004 can be completed. In addition we have the first I-Ocean returns for Brood Year 2006 and the II-Ocean adult returns for Brood Year 2007.

Estimating SAR is further complicated by having to account for the distribution of those age classes among various fishery programs that make up the total adult return; adults returning to the respective hatchery rack, the harvest in sport and Tribal fisheries, research, other programs where adults may be accounted for, and the escapement in the Clearwater River. Prior to 2009, the estimated numbers of Dworshak and Kooskia NFH spring Chinook in the sport and Tribal harvest were not reported by age class. In those years, the age classes were estimated by applying the age class percentages in the hatchery rack, making the assumption that harvest was in direct proportion to the rack return. In 2009, the IDFG and the Nez Perce Tribe began using PIT-tag and coded-wire tag expansion methods to estimate the age composition of the sport and Tribal harvests and calculated estimates for adults (II- and III-Ocean fish) and Jacks (I-Ocean fish).

Prior to 2009, the total return for a single brood year was estimated by combining the rack return and harvest estimates. The escapement (adults not returning to a rack, weir, or harvest) was not accounted for. This year the IDFG provided estimates of the total return of both Dworshak and Kooskia stocks to the Clearwater River and allowing a calculation of escapement. Beginning in 2009, the estimated escapement for each stock will be included in the total return for calculating the SAR.

Dworshak NFH - The IDFG reported 744 Jacks (I-Ocean), 629 II-Ocean, and 0 III-Ocean adults of Dworshak NFH stock harvested in the sport fishery. The Nez Perce Tribe reported a total of

97 Jacks, 257 adults (II- and III-Oceans adults combined) of Dworshak NFH stock harvested in the Tribal fishery in the North Fork Clearwater River. The percent of II and III-Ocean adults in the Dworshak NFH rack (I-Ocean adults excluded) was 83% and 17%, respectively. These percentages were applied to the Tribal harvest totals to estimate the II and III-Ocean ages classes in that fishery. To estimate the number of fish in each age class for the escapement, the age composition of the Dworshak rack was applied. **Table 11** lists the numbers of Dworshak NFH spring Chinook salmon of each age class in the hatchery rack, the sport fishery, the Tribal fishery, and the escapement during 2009. The historical age compositions of the sport and Tribal harvests for the Dworshak stock, by return year, are listed in **Appendix Tables 7** and **8**, respectively

Table 11. The estimated number of Dworshak NFH spring Chinook salmon adults of each ocean age class in the various fishery programs in the Clearwater River for the 2009 adult return.

Programs	**I-Ocean BY06**	**II-Ocean BY05**	**III-Ocean BY04**	**Total**
Hatchery Rack	726	1,200	245	2,171
Sport Harvest	744	629	0	1,373
Tribal Harvest	97	213	44	354
Escapement	280	466	102	848
Total	**1,847**	**2,508**	**391**	**4,746**

Table 12 lists the numbers of smolts released, and numbers and percent survival of adults returning by age class for Brood Years 2004 through 2007 (release years 2006 to 2009). The historical numbers, from Brood Years 1986 to 2007 (release years 1988 to 2009) are listed in **Appendix Table 5**. Estimated smolt-to-adult-return, or survival, for Brood Year 2004, released as smolts in 2006, was 0.3214%, just slightly lower than the 18 year average of 0.3440% for Brood Years 1984 to 2003.

Table 12. Brood Year, release year, number of smolts released, and the numbers and percent survival of adult returns to Dworshak NFH by age class for Brood Years 2004 to 2007.

Brood Year	Release Year	Smolts Released[1]	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2004	2006	1,007,738	832 (0.083%)	2,171 (0.215%)	391 (0.039%)	3,394 (0.337%)
2005	2007	963,211	506 (0.053%)	2,508 (0.260%)		
2006	2008	939,000	1,847 (0.197%)			
2007	2009	1,014,748				

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

Kooskia NFH - The Idaho Department of Fish and Game reported 188 fish of Kooskia NFH stock harvested, 109 that were adults (II and III-Ocean adults combined). The Nez Perce Tribe reported 2 jacks and 111 II and III-Ocean adults of Kooskia NFH stock harvested in the Tribal

fishery in Clear Creek. The percent of II and III-Ocean adults in the Kooskia NFH rack (I-Ocean adults excluded) was 85 and 15%, respectively. These percentages were applied to the Tribal harvest to estimate the II and III-Ocean ages classes in that harvest. **Table 13** lists the numbers of Kooskia NFH spring Chinook salmon of each age class in the hatchery rack, the sport fishery, and the Tribal fishery during 2009. The historical age compositions of the sport and Tribal harvests for the Kooskia stock, by return year, are listed in **Appendix Tables 9** and **10**, respectively. No estimate of the escapement is provided for reasons mentioned above.

Table 13. The estimated number of Kooskia NFH spring Chinook salmon adults of each ocean age class in the various fishery programs in the Clearwater River for the 2009 adult return.

Program	**I-Ocean BY06**	**II-Ocean BY05**	**III-Ocean BY04**	**Total**[1]
Hatchery Rack	155	369	65	589
Sport Harvest	79	109	0	188
Tribal Harvest	12	94	17	123
Escapement	na	na	na	na
Total	**246**	**556**	**98**	**900**

[1] Does not include one unmeasured trap mortality.

Table 14 lists the numbers of smolts released and the estimated survival of each returning age class for Brood Years 2004 to 2007 (Release Years 2006 to 2009). These data have been expanded to include harvest estimates from the sport and Tribal fisheries. The historical numbers, for Brood Years 1986 to 2001, are listed in **Appendix Table 7**. Estimated smolt-to-adult-return, or survival, for Brood Year 2004, released as smolts in 2006, was 0.26%, just a little lower than the 18 year average of 0.34% for Brood Years 1986 to 2003.

Table 14. Release year, number of smolts released, and the numbers and percent survival of adult returns to Kooskia NFH by age class for Brood Years 2000 to 2007.

Brood Year	Release Year	Smolts Released[1]	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2004	2006	637,334	415 (0.065%)	1,297 (0.204%)	82 (0.013%)	1,749 (0.274%)
2005	2007	569,565[2]	181 (0.032)	572 (0.100)		
2006	2008	649,601	246 (0.038)			
2007	2009	603,679[3]				

[1] Releases at hatchery only and does not include off-site releases or fry/fingerling releases.
[2] 178,687 were of Dworshak NFH stock, all marked with coded-wire tags.
[3] 161, 649 were of Dworshak NFH stock; 111,138 were marked with coded-wire tags.

Coded-Wire Tag Recoveries

Dworshak and Kooskia NFHs have been participating in the Pacific States Marine Fisheries Commission's (PSMFC) Regional Mark Processing Center (RMPC) since it went into operation

in 1977. The RMPC maintains the Regional Mark Information System (RMIS), the central database for all the coded-wire tagging programs in the Pacific Northwest, Canada, and Alaska. Data is taken from all the various research, commercial, sport, and Tribal fisheries activities in the Ocean and Columbia River basin.

All spring Chinook salmon returning to Dworshak and Kooskia NFHs are scanned for a coded-wire tag. Fish detected with coded-wire tags have the snouts removed after being spawned or before excess broodstock are removed from the hatchery for other management programs. Snouts are stored until the tags can be physically recovered and read. All the coded-wire tag information is assimilated into databases and reported to the Pacific States Marine Fisheries Commission (PSMFC) for inclusion into their Regional Mark Information System (RMIS) database. These data are used to estimate the contribution of Dworshak and Kooskia NFH stocks to various Ocean and Columbia River fishery programs. During 2009, a total of 295 tags were recovered from Dworshak NFH stock (74 for BY06, 215 for BY05, and 6 for BY04). Of the 215 recovered for BY05, 61 were Dworshak stock released in Clear Creek recovered at the Kooskia trap. A total of 52 were recovered from Kooskia NFH stock (16 for BY06, 34 for BY05, and 2 for BY04). Although the 2009 adult returns complete the life cycle for BY04, it will be at least two years before all the coded-wire tag information recovered from the various downriver commercial, sport, and Tribal fisheries has been submitted to RMIS. Therefore, the contribution of BY04 to those fisheries will not be reported until 2011.

PIT Tag Interrogations

During the 2009 migration, 230 spring Chinook adults of Dworshak origin were interrogated at Lower Granite Dam (4 from BY04 smolt releases, 139 from BY05 and 87 from BY06 smolt releases). Fifty two (22.6%) of those were collected in the Dworshak NFH adult ladder. These 52 PIT-tagged adults represent 0.03% of the 152,975 PIT-tagged smolts released from Dworshak NFH between 2006 and 2008. The first detection date for Dworshak origin spring Chinook at Lower Granite Dam was May 8, 2009. The last detection was on July 8, 2009.

Ten Kooskia origin spring Chinook adults were interrogated at Lower Granite Dam in 2009 (4 from BY06 and 6 from BY05). Only one (10%) was collected at Kooskia NFH weir. The first detection date for Kooskia origin spring Chinook at Lower Granite Dam was May 8, 2009. The last detection was on June 2, 2009.

2009 Run Predictions

Dworshak NFH - The total number of spring Chinook salmon that we predicted would return to Dworshak NFH and associated fisheries in 2009 using regression models was 5,465. Actual number of Dworshak NFH Chinook salmon estimated to have returned to the Clearwater River was 3,211, not including un-harvested SCS – use Cassinelli's estimate? an over-estimate of 2,254 fish. The greatest disparity was in the number of II-Ocean fish returning. Narrowing the dataset to the previous ten years reduced the predictor bias moderately (over-estimated total returns by ~1,100 fish). In contrast to previous years, the I-Ocean component of the run was the closest to the model prediction for 2009. **Table 15** lists the predicted returns and the expanded actual returns of all three age classes of adults in 2009.

Table 15. Predicted and calculated returns of Dworshak NFH spring Chinook salmon by ocean age class, 2009. Includes sport and tribal harvest estimates.

Ocean Age Class	Prediction	Total Return
I-Ocean	819	1,847
II-Ocean	4,604	2,401
III-Ocean	42	498
Total	5,465	4,746

Kooskia NFH - The total number of spring Chinook salmon that was predicted to return to Kooskia NFH and associated fisheries in 2009 was 3,357 using regression models. The actual number that returned to Kooskia NFH in 2009 was 1,589. Not including un-harvested SCS – use Cassinelli's estimate? As with DNFH estimates, the number of II-Ocean fish returning was significantly lower than the predicted value. **Table 16** lists the predicted and the expanded actual returns of all three age classes of adults in 2009. In recent years, predictions for Kooskia NFH have tended to be more accurate than those for Dworshak NFH. This was not the case for 2009 nor in 2008. Predictions were used for preliminary management purposes such as potential harvest, brood stock collection adequacy, and planning for adult outplanting so we will continue to work to improve prediction methods.

Table 16. Predicted and calculated returns of Kooskia NFH spring Chinook salmon for 2009 by ocean age class, includes sport and tribal harvest estimates.

Ocean Age Class	Prediction	Total Return
I-Ocean	424	246
II-Ocean	2,933	556
III-Ocean	0	98
Total	3,357	900

2010 Run Predictions

Our forecast for the 2010 spring Chinook salmon return to the Clearwater River from Dworshak and Kooskia NFHs is given in **Table 17**. Brood stock requirements are 1,000 adults at Dworshak NFH and 600 for 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 2010 after dam counts of PIT tagged adults provide actual estimates of returning adults.

Table 17. Predicted returns of spring Chinook salmon to the Clearwater River from the Dworshak Fishery Complex by ocean age class, 2010. Including sport and tribal harvest as well as rack return.

Ocean Age Class	Dworshak NFH	Kooskia NFH
I-Ocean	758	95
II-Ocean	4,647	1,298
III-Ocean	0	0
Total	5,405	1,393

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Appendix Table 1. Adult returns of Dworshak NFH adult spring Chinook salmon to the Clearwater River from 1987-2009.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement[1]	Total Run
1987	2,017	na	160	na	2,177
1988	1,972	na	240	na	2,212
1989	1,700	na	346	na	2,046
1990	2,042	na	514	na	2,556
1991	165	na	0	na	165
1992	370	na	160	na	530
1993	823	na	43	na	866
1994	74	na	0	na	74
1995	125	na	0	na	125
1996	963	na	24	na	987
1997	3,150	693	835	na	4,678
1998	915	99	182	na	1,196
1999	800	na	36	na	836
2000	3,202	4,095	1,173	na	8,470
2001	4,018	8,355	531	na	12,904
2002	2,157	3,542	794	na	6,493
2003	3,422	2,228	1,445	na	7,095
2004	2,356	3,608	419	na	6,383
2005	882	606	102	na	1,590
2006	1,354	589	392	na	2,335
2007	2,110	256	198	na	2,564
2008	1,857	1,109	159[1]	na	3,125
2009	2,171	1,373	354	848	4,746

[1] Estimates of escapment are not available for years 1987 to 2008
[2] Total number based on angler interview and is not an expanded estimate..

Appendix Table 2. Adult returns of Kooskia NFH adult spring Chinook salmon to the Clearwater River from 1987-2009.

Return Year	Rack Return	Sport Harvest	Tribal Harvest	Escapement[1]	Total Run
1987	687	na	50	na	737
1988	595	na	72	na	667
1989	973	na	58	na	1,031
1990	1,141	na	130	na	1,271
1991	467	na	na	na	467
1992	312	na	na	na	312
1993	1,180	na	na	na	1,180
1994	232	na	na	na	232
1995	40	na	na	na	40
1996	202	na	na	na	202
1997	1,657	45	12	na	1,714
1998	408	0	20	na	428
1999	157	na	1	na	158
2000	1,581	21	10	na	1,612
2001	2,261	6,397	834	na	9,492
2002	1,037	1,544	683	na	3,264
2003	965	426	164	na	1,555
2004	718	2,195	389	na	3,302
2005	270	53	173	na	496
2006	670	73	65	na	808
2007	589	128	166	na	883
2008	816	623	132[2]	na	1,571
2009	**590**	**188**	**123**	na	901

[1] Estimates of escapement are not available for years 1987 to 2009.
[2] Actual harvest estimate not reported. Idaho FRO estimate based on the average harvest reported for 2005, 2006, 2007, and 2009.

Appendix Table 3. Number and percent of I-, II-, and III-Ocean spring Chinook salmon adults returning to the Dworshak NFH rack from1987 to 2009. Percentages do not include unmeasured adults.

Return Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack 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
2008	319	(17)	1,201	(65)	337	(18)	0	1,857
2009	726	(33)	1,200	(55)	245	(12)	0	2,171

Appendix Table 4. Number and percent of I-, II-, and III-Ocean spring Chinook salmon adults returning to the Kooskia NFH rack from1972 to 2009. Percentages do not include unmeasured adults.

Return Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack 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 4. Continued.

Return Year	I-Ocean	%	II-Ocean	%	III-Ocean	%	Unmeasured	Rack 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	(51)	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
2008	107	(13)	647	(79)	62	(8)	0	816
2009	155	(26)	369	(63)	65	(11)	1	590

Appendix Table 5. Brood Year, release year, number of smolts released, and the numbers and percent survival of adult returns to Dworshak NFH by age class for Brood Years 1986 to 2004. Estimates include sport and Tribal harvest numbers for years when those fisheries occurred., and estimates of escapement, starting with returns in 2009.

Brood Year	Release Year	Smolts Released[1]	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
1986	1988	1,547,219	187 (0.012%)	2,370 (0.153%)	72 (0.005%)	2,629 (0.170%)
1987	1989	1,651,472	9 (0.001%)	77 (0.005%)	59 (0.004%)	145 (0.009%)
1988	1990	1,251,247	16 (0.001%)	417 (0.033%)	378 (0.030%)	811 (0.065%)
1989	1991	1,094,884	33 (0.003%)	476 (0.043%)	41 (0.004%)	591 (0.054%)
1990	1992	959,369	9 (0.001%)	30 (0.003%)	7 (0.001%)	46 (0.005%)
1991	1993	7,222	3 (0.042%)	36 (0.498%)	26 (0.360%)	65 (0.900%)
1992	1994	1,278,273	83 (0.006%)	679 (0.053%)	937 (0.073%)	1,699 (0.133%)
1993	1995	1,311,445	282 (0.022%)	3,708 (0.283%)	909 (.069%)	4,899 (0.374%)
1994	1996	102,903	15 (0.015%)	274 (0.266%)	56 (0.054%)	345 (0.335%)
1995	1997	53,078	13 (0.024%)	.82 (0.154%)	246 (0.463%)	341 (0.642%)
1996	1998	973,400	700 (0.072%)	7,649 (0.786%)	2,463 (0.253%)	10,812 (1.111%)
1997	1999	1,044,511	525 (0.050%)	10,372 (0.993%)	1397 (0.134%)	12,294 (1.177%)
1998	2000	1,017,873	69 (0.007%)	4,991 (0.490%)	5,299 (0.521%)	10,359 (1.018%)
1999	2001	333,120	105 (0.032%)	892 (0.268%)	269 (0.081%)	1,266 (0.380%)
2000	2002	1,000,561	904 (0.090%)	5,891 (0.589%)	1,545 (0.154%)	8,340 (0.834%)
2001	2003	1,033,982	223 (0.022%)	1,260 (0.122%)	199 (0.019%)	1,682 (0.163%)
2002	2004	1,078,923	85 (0.008%)	2,050 (0.190%)	762 (0.071%)	2,897 (0.269%)
2003	2005	1,072,359	86 (0.008%)	1,035 (0.097%)	477 (0.044%)	1,568 (0.146%)
2004	2006	1,007,738	832 (0.083%)	2,171 (0.215%)	391 (0.039%)	3,394 (0.337%)

Appendix Table 5 (Cont.).

Brood Year	Release Year	Smolts Released[1]	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2005	2007	963,211	506 (0.053%)	2,508 (0.260%)		
2006	2008	939,000	1,847 (0.197%)			
2007	2009	1,014,748				

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

Appendix Table 6. Brood Year, release year, number of smolts released, and the numbers and percent survival of adult returns for Kooskia NFH by age class for Brood Years 1986 to 2004. Estimates include sport and Tribal harvest numbers for years when those fisheries occurred.

Brood Year	Release Year	Smolts Released[1]	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
1986	1988	778,407	113 (0.015%)	1,026 (0.132%)	350 (0.045%)	1,489 (0.191%)
1987	1989	384,235	12 (0.003%)	98 (0.026%)	38 (0.010%)	148 (0.039%)
1988	1990	403,701	10 (0.002%)	239 (0.059%)	409 (0.101%)	658 (0.163%)
1989	1991	396,619	14 (0.004%)	749 (0.189%)	135 (0.034%)	898 (0.226%)
1990	1992	727,251	11 (0.002%)	96 (0.013%)	12 (0.002%)	119 (0.016%)
1991	1993	343,437	1 (0.0003%)	7 (0.002%)	3 (0.001%)	11 (0.003%)
1992	1994	305,813	21 (0.007%)	113 (0.037%)	128 (0.042%)	262 (0.086%)
1993	1995	722,906	86 (0.012%)	1,579 (0.218%)	217 (0.030%)	1,882 (0.260%)
1994	1996	333,794	7 (0.002%)	209 (0.063%)	57 (0.017%)	273 (0.082%)
1995	1997	16,598	2 (0.012%)	28 (0.169%)	11 (0.066%)	41 (0.247%)
1996	1998	76,846	73 (0.095%)	629 (0.819%)	1,366 (1.778%)	2,068 (2.691%)
1997	1999	684,165	978 (0.143%)	8,069 (1.179%)	531 (0.078%)	9,578 (1.400%)
1998	2000	449,454	57 (0.013%)	2,704 (0.602%)	1,304 (0.290%)	4,065 (0.904%)
1999	2001	80,430	29 (0.036%)	123 (0.153%)	97 (0.121%)	277 (0.344%)
2000	2002	549,861	128 (0.023%)	3,148 (0.573%)	73 (0.013%)	3,349 (0.609%)
2001	2003	597,063	57 (0.001%)	375 (0.063%)	70 (0.012%)	502 (0.084%)
2002	2004	643,503	67 (0.010%)	730 (0.113%)	235 (0.037%)	1,032 (0.160%)
2003	2005	624,967	9 (0.001%)	233 (0.037%)	93 (0.015%)	335 (0.054%)
2004	2006	637,334	415 (0.065%)	1,297 (0.204%)	82 (0.013%)	1,749 (0.274%)

Appendix Table 6 (Cont.)

Brood Year	Release Year	Smolts Released[1]	I-Ocean (% Return)	II-Ocean (% Return)	III-Ocean (% Return)	Total (% Return)
2005	2007	569,565[2]	181 (0.032)	572 (0.100)		
2006	2008	649,601	246 (0.038)			
2007	2009	603,679[3]				

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

Appendix Table 7. Historical age composition of the sport harvest of Dworshak NFH spring Chinook salmon by return year, 1997 to 2009.

Year	I-Ocean (BY)	II-Ocean (BY)	III-Ocean (BY)	Total Harvest
1997	0 (BY94)	693 (BY93)	0 (BY92)	693
1998	0 (BY95)	63 (BY94)	36 (BY93)	99
1999	0	0	0	0
2000	222 (BY97)	3,766 (BY96)	107 (BY95)	4,095
2001	28 (BY98)	6,712 (BY97)	1,615 (BY96)	8,355
2002	19 (BY99)	2,963 (BY98)	560 (BY97)	3,542
2003	78 (BY00)	212 (BY99)	1,938 (BY98)	2,228
2004	56 (BY01)	3,445 (BY00)	107 (BY99)	3,608
2005	3 (BY02)	494 (BY01)	1409(BY00)	606
2006	4 (BY03)	585 (BY02)	0 (BY01)	589
2007	0 (BY04)	148 (BY03)	108 (BY02)	256
2008	166 (BY05)	846 (BY04)	97 (BY03)	1,109
2009	744(BY06)	629 (BY05)	0 (BY04)	1,373

Appendix Table 8. Historical age composition of the Tribal harvest of Dworshak NFH spring Chinook salmon by return year, 1997 to 2009.

Year	I-Ocean (BY)	II-Ocean (BY)	III-Ocean (BY)	Total Harvest
1987	2 (BY84)	128 (BY83)	30 (BY82)	160
1988	19 (BY85)	70 (BY84)	151 (BY83)	240
1989	31 (BY86)	270 (BY85)	45 (BY84)	346
1990	2 (BY87)	478 (BY86)	34 (BY85)	514
1991	0	0	0	0
1992	10 (BY89)	131 (BY88)	19 (BY87)	160
1993	0	24 (BY89)	19 (BY88)	43
1994	0	0	0	0
1995	0	0	0	0
1996	7 (BY93)	16 (BY92)	1 (BY91)	24
1997	3 (BY94)	635 (BY93)	197 (BY92)	835
1998	2 (BY95)	35 (BY94)	145 (BY93)	182
1999	30 (BY96)	4 (BY95)	2 (BY94)	36
2000	82 (BY97)	1,056 (BY96)	35 (BY95)	1,173
2001	5 (BY98)	425 (BY97)	101 (BY96)	531
2002	24 (BY99)	548 (BY98)	222 (BY97)	794
2003	246 (BY00)	202 (BY99)	997 (BY98)	1,445
2004	25 (BY01)	369 (BY00)	25 (BY99)	419
2005	8 (BY02)	80 (BY01)	14 (BY00)	102
2006	20 (BY03)	329 (BY02)	43 (BY01)	392
2007	65 (BY04)	78 (BY03)	55 (BY02)	198
2008	21 (BY05)	125 (BY04)	13 (BY03)	159
2009	97 (BY06)	221 (BY05)	36 (BY04)	354

Appendix Table 9. Historical age composition of the Sport harvest of Kooskia NFH spring Chinook salmon by return year, 1997 to 2009.

Year	I-Ocean (BY)	II-Ocean (BY)	III-Ocean (BY)	Total Harvest
1997	0 (BY94)	45 (BY93)	0 (BY92)	45
1998	0 (BY95)	0 (BY94)	0 (BY93)	0
1999	0	0	0	0
2000	0 (BY97)	21 (BY96)	0 (BY95)	21
2001	21 (BY98)	5,139 (BY97)	1,237 (BY96)	6397
2002	8 (BY99)	1,292 (BY98)	244 (BY97)	1544
2003	15 (BY00)	40 (BY99)	371 (BY98)	426
2004	34 (BY01)	2,096 (BY00)	65 (BY99)	2195
2005	0 (BY02)	43 (BY01)	10 (BY00)	53
2006	0 (BY03)	53 (BY02)	20 (BY01)	73
2007	85 (BY04)	43 (BY03)	0 (BY02)	128
2008	57 (BY05)	546 (BY04)	20 (BY03)	623
2009	79 (BY06)	109 (BY05)	0 (BY04)	188

Appendix Table 10. Historical age composition of the Tribal harvest of Kooskia NFH spring Chinook salmon by return year, 1997 to 2009.

Year	I-Ocean (BY)	II-Ocean (BY)	III-Ocean (BY)	Total Harvest
1987	1 (BY84)	44 (BY83)	5 (BY82)	50
1988	5 (BY85)	44 (BY84)	23 (BY83)	72
1989	6 (BY86)	43 (BY85)	9 (BY84)	58
1990	1 (BY87)	105 (BY86)	24 (BY85)	130
1991	na	na	na	na
1992	na	na	na	na
1993	na	na	na	na
1994	na	na	na	na
1995	na	na	na	na
1996	na	na	na	na
1997	0 (BY94)	11 (BY93)	1 (BY92)	12
1998	1 (BY95)	9 (BY94)	10 (BY93)	20
1999	1 (BY96)	0 (BY95)	0 (BY94)	1
2000	6 (BY97)	4 (BY96)	0 (BY95)	10
2001	8 (BY98)	793 (BY97)	33 (BY96)	834
2002	7 (BY99)	560 (BY98)	116 (BY97)	683
2003	16 (BY00)	12 (BY99)	136 (BY98)	164
2004	8 (BY01)	370 (BY00)	11 (BY99)	389
2005	19 (BY02)	130 (BY01)	24 (BY00)	173
2006	1 (BY03)	60 (BY02)	4 (BY01)	65
2007	73 (BY04)	42 (BY03)	51 (BY02)	166
2008	17 (BY05)	104 (BY04)	11 (BY03)	132
2009	12 (BY06)	94 (BY05)	17 (BY04)	123