APPENDIX A

ADULT SPRING CHINOOK SALMON RETURNS TO DWORSHAK-KOOSKIA NFH COMPLEX IN 1996 AND PROGNOSIS FOR 1997

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Introduction

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

The hatchery was designed and constructed by the U.S. Army Corps of Engineers and has been administered and operated by the U.S. Fish and Wildlife Service since the first phase of construction was completed in 1969. At that time, the hatchery had 25 Burrows ponds on a reuse system and 59 ponds on single-pass for rearing steelhead. In 1972, a second phase of construction placed all ponds on the reuse system with the option of operating some ponds on either reuse or single pass. Additional construction was completed in 1982 under the Lower Snake River Compensation Plan to provide rearing facilities for spring chinook salmon *(0. tsha@scha)* A total of 30 8-ft by 80-ft raceways were constructed. (In 1993, two of these raceways were converted to adult holding ponds). In 1986, 12 8-ft by 75-ft raceways were converted from rainbow trout rearing to chinook salmon rearing.

In 1995 Kooskia NFH was included when the Dworshak Fishery Complex was formed. Kooskia NFH is located about 1.5 miles southeast of Kooskia, Idaho, near the confluence of Clear Creek and Middle Fork of the Clearwater River. Because of production constraints, disease considerations, and other factors, Dworshak NFH holds and spawns spring chinook salmon adults returning to Kooskia NFH. Kooskia NFH eggs and juveniles are often held at Dworshak NFH as well. This report includes a summary of the 1996 adult returns of spring chinook salmon to Dworshak and Kooskia NFHs and also includes predictions for the 1997 adult returns.

A low return prediction in 1996 for Clearwater River spring chinook salmon, led to the sport fishery not opening.

Stock description

The initial Dworshak NFH spring chinook salmon program utilized a variety or mix of stocks for release years 1983-86 (Table 1) . Leavenworth and Little White Salmon stocks have both been strongly influenced by Carson stock transfers to their programs. The two release years of Rapid River stock (1987-1988) indicate a complete shift from Carson type stocks to rearing smolts from eggs transferred from Rapid River State Fish Hatchery. For those two release years, the eggs taken at Dworshak NFH and Kooskia NFH returns were transferred to Kooskia NFH.

This mix was referred to as Clearwater stock **(Table 2).** In fact, the Kooskia NFH program already had stock made up primarily of Carson derivatives. So the resultant Kooskia stock (1989 and later) is still considered a Carson type stock. The recent returns to Dworshak NFH (1989 and later) are referred to as Dworshak stock, since they are progeny of returns to Dworshak NFH, rather than products of Rapid River stock. Length frequency data, ocean age class at return time information, and allele frequencies (Elliot and Pascho 1994) all support a distinction between Dworshak and Kooskia stocks.

Table 1. Genetic make-up of Dworshak NFH spring chinook salmon smolts directly released from the hatchery, 1983-1996.

Release Year	Genetic Make-up*
1983	75.1% LW-12.3% RR-12.6% LE
1984	100% LE
1985	67.8% LW-32.2% LE
1986	100% LE
1987	100% RR
1988	100% RR
1989	100% DW
1990	100% DW
1991	100% DW
1992	100% DW
1993	100% DW
1994	100% DW
1995	65.6% DW-34.4% KK
1996	100% DW

*RR - Rapid River
LW - Little White
LE - Leavenworth
DW - Dworshak
KK - Kooskia

Table 2. Genetic make-up of Kooskia NFH spring chinook salmon smolts directly released from the hatchery, 1971-1996.

Release Year	Genetic Make-up*
1971	85.6% RR - 14.4% WR
1972	100% RR
1973	100% CA
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	100% KK
1986	100% KK
1987	100% CL
1988	100% CL
1989	100% KK
1990	100% KK
1991	100% KK
1992	100% KK
1993	100% KK
1994	100% KK
1995	100% KK
1996	100% KK

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

1996 Run Size

Rack Returns

The 1996 adult spring chinook salmon return to Dworshak NFH was 963, the best since 1990 although still well short of the runs of the late 1980's and 1990 **(Table 3).** The adult spring chinook salmon return to Kooskia

NFH was 202. Although better than last years run of 125, it is still the third lowest run recorded **(Table 4).**

Table 3. Hatchery rack returns and age composition of spring chinook salmon for Dworshak NFH, 1984-1996.

Year	I-salt	II-salt	III-salt	Unmeasured	Total Return
1984	14	52	16	0	82
1985	13	281	35	5	334
1986	78	346	91	0	516
1987	25	1604	376	12	2017
1988	163	569	1240	0	1972
1989	156	1322	221	1	1700
1990	7	1892	135	8	2042
1991	16	77	72	0	165
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

Table 4. Hatchery rack returns and age composition of spring chinook salmon for Kooskia NFH, 1972-1996.

Year	I-salt	II-salt	III-salt	Unmeasured	Total Return
1972	5	0	0	0	5
1973	5	45	0	0	50
1974	16	35	2	0	53
1975	15	284	27	0	326
1976	409	286	106	0	801
1977	333	2539	154	0	3026
1978	23	1676	336	0	2035
1979	11	100	264	0	375
1980	9	55	3	0	67
1981	1	168	78	0	247
1982	3	116	139	0	258
1983	1	231	141	0	373
1984	55	80	206	0	341
1985	26	449	54	0	529
1986	21	159	103	0	283
1987	16	607	64	0	687

Table 4. cont.

Year	I-salt	II-salt	IIT-salt	Unmeasured	Total Return
1988	39	363	193	0	595
1989	107	717	142	7	973
1990	11	921	209	0	1141
1991	10	98	350	9	467
1992	14	239	38	21	312
1993	11	749	409	11	1180
1994	1	96	135	0	232
1995	83	36	6	0	125
1996	86	113	3	0	202

Age Composition

Age composition of the run is presently based on fork length categories. The length categories were derived from known age/length/sex data from CWT recovery databases. I-salts are 56 cm or less, II-salts are 57 through 81 cm, and III-salts are larger than 81 cm. The majority of spring chinook salmon returning to both Dworshak and Kooskia NFHs are II-salts with very few III-salts **(Table 5).**

Table 5. Age composition of spring chinook salmon returning to Dworshak Fishery Complex, 1996.

Ocean Age	Dworshak NFH		Kooskia NFH	
	Number	Percent	Number	Percent
I-Salt	275	28.6	86	42.6
II-Salt	663	68.8	113	55.9
III-Salt	25	2.6	3	1.5
Total Measured	963	100.0	202	100.0

Survival

The III-salt returns in 1996 complete the returns from the 467,222 smolts released at Dworshak NFH and the 343,437 smolts released at Kooskia NFH in 1993. Total returns to the North Fork of the Clearwater from the 1993 release were 3 I-salts, 36 II-salts, and 25 III-salts for a hatchery return survival rate of 0.0137 percent **(Table 6).** Total returns to Clear Creek from the 1993 release were 1 I-salt, 7 II-salts, and 3 III-salts for a hatchery return survival rate of 0.0032 percent **(Table 7).**

Table 6. Return vs. Release numbers for adult spring chinook salmon returns to Dworshak NFH, 1988-1995.

Release Year	Smolts Released at Hatchery*	I-salts (% return)	II-salts (% return)	III-salts (% return)	Total (% return)
1988	1,547,219	156 (0.0101%)	2,709 (0.1751%)	72 (0.00476)	2,937 (0.1898%)
1989	1,651,472	10 (0.0006%)	77 (0.00476%)	40 (0.0024%)	127 (0.0077%)
1990	1,251,247	16 (0.0013%)	286 (0.0229%)	359 (0.0287%)	661 (0.0528%)
1991	1,094,884	23 (0.0021%)	452 (0.0413%)	41 (0.0037%)	516 (0.0471%)
1992	959,369	9 (0.0009%)	30 (0.0031%)	6 (0.0007%)	45 (0.0047%)
1993	467,222	3 (0.0006%)	36 (0.0077%)	25 (0.00549%)	64 (0.0137%)
1994	1,278,273	83 (0.0065%)	663 (0.0517%)		
1995	1,311,445	275 (0.0210%)			

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

Table 7. Return vs. Release numbers for adult spring chinook salmon returns to Kooskia NFH, 1988-1995.

Release Year	Smolts Released at Hatchery*	I-salts (% return)	II-salts (% return)	III-salts (% return)	Total (% return)
1988	778,407	107 (0.0137%)	921 (0.1183%)	350 (0.0450%)	1,378 (0.1770%)
1989	384,235	11 (0.0029%)	98 (0.0255%)	38 (0.0096%)	147 (0.0383%)
1990	403,701	10 (0.0025%)	239 (0.0590%)	409 (0.1013%)	658 (0.1630%)
1991	396,619	14 (0.0038%)	7451 (0.2026%)	135 (0.0365%)	898 (0.2430%)
1992	727,251	11 (0.0015%)	96 (0.0132%)	12 (0.0017%)	(0.0164%)
1993	343,437	1 (0.0003%)	7 (0.0020%)	3 (0.0009%)	11 (0.0032%)
1994	305,813	21 (0.0069%)	113 (0.0360%)		
1995	722,906	86 (0.0119%)			

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

Coded-Wire Tag (CWT) Recoveries

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

CWT recoveries from spring chinook salmon in the Dworshak NFH rack shows seven 1996 recoveries were from salmon released from facilities other than Dworshak NFH or Kooskia NFH **(Table 8).** Rack recoveries in

previous years have included strays from several other hatcheries and also National Marine Fisheries Service transportation study marks.

Table 8. Summary of CWT recoveries for adult spring chinook salmon in the Dworshak NFH rack, 1987-1996.

Rack Year	Total Recoveries	Recoveries of Dworshak/Kooskia Marks
1987	25	19
1988	55	49
1989	77	47
1990	306	302
1991	30	10
1992*	183	177
1993*	449	449
1994*	51	28
1995*	95	95
1996*	515	508

*1992, 1993, 1994, 1995, and 1996 recoveries include fish tagged at Kooskia NFH.

1996 Run Predictions

Dworshak NFH-1996

The 1996 spring chinook salmon return to Dworshak NFH was 963 salmon, very close to our prediction total. Our II-salt estimate was a little high, while our I-salt estimate was very low **(Table 9).** The I-salt return was nearly double the previous record high. The following numbers include only Dworshak NFH rack returns. The Nez Perce Tribal estimated harvest was 24 adults and 5 jacks. A number of Dworshak NFH and Kooskia NFH CWT's were taken in a number of other racks.

Table 9. Predicted and actual rack returns of spring chinook salmon to Dworshak NFH by ocean age class, 1996.

Ocean Age Class	Prediction	Rack Return
I-salt	50	275
II-salt	900 ± 200	663
III-salt	5	25
Total	955 ± 200	963

Kooskia NFH-1996

The 1996 spring chinook salmon return to Kooskia NFH was disappointing. The total return was only 202 salmon. Our II-salt estimate was **very** high **(Table 10).**

Table 10. Predicted and actual rack returns of spring chinook salmon to Kooskia NFH by ocean age class, 1996.

Ocean Age Class	Prediction	Rack Return
I-salt	20	86
II-salt	300 ± 100	113
III-salt	5	3
Total	325 ± 100	202

1997 Run Predictions

Our forecast for the 1997 spring chinook salmon returns to Dworshak and Kooskia NFHs is given in **Table 11.** These estimates are for total return including whatever sport and tribal harvest occurs.

Table 11. Predicted returns of spring chinook salmon to the Dworshak Fishery Complex by ocean age class, 1997.

Ocean Age Class	Dworshak NFI4	Kooskia NFH
I-salt	6	20
II-salt	2,725 ± 300	720 ± 100
III-salt	100	20
TOTAL	2,831 ± 300	760 ± 100

The combined forecast for 1997 is for 3,591 ± 400 spring chinook salmon to return to the Dworshak Fishery Complex. We predict broodstock requirements **(1,700)** will be met for the first time in several years. There should be a substantial harvestable surplus! However, the estimated return will still be short of the our mitigation goal of 9,135 adults to Lower Granite Dam.

Literature Cited

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