Lyons Ferry Hatchery Evaluation:

Fall Chinook Salmon Annual Report 2000

by

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Abstract

This report summarizes activities by the Washington Department of Fish and Wildlife's (WDFW) Lower Snake River Hatchery Evaluation Program from April 16, 2000 to April 15, 2001. Fall chinook salmon broodstock were obtained from two sources: voluntary returns to the Lyons Ferry Hatchery (LFH) ladder and fish trapped and transported to LFH from Lower Granite (LGR) Dam. Only coded-wire tagged (CWT), blank wire tagged (BWT), or ventral fin clipped salmon were collected at LGR Dam and transported to the hatchery. Prior to spawning, fall chinook which volunteered into LFH were sorted to determine sex. At that time, 12 fish with visible implant elastomer (VIE) tags (indicating returns from upstream acclimated releases) were transported above LGR Dam and released in accordance with the Nez Perce Tribe's (NPT) request. The total number of fall chinook processed at spawning in 2000 was 4,831, including 2,379 adults and jacks that had voluntarily returned to the hatchery, and 2,452 salmon transported from trapping operations at LGR Dam. There were an additional 272 fish that were sacrificed at LGR Dam for CWT recovery that will also be included in this report.

As in previous years, we were able to evaluate straying to the Snake River by using CWTs, BWTs, and ventral fin clips recovered from fish trapped at LFH, fish trapped and hauled to LFH from LGR Dam, and fish sacrificed at LGR Dam. In 2000, there were 249 strays processed at LFH. The majority of strays (240 fish) were from hatchery releases in the Umatilla River. There were an additional two hatchery recoveries from fish released in the Klickitat River. The remaining seven were strays from other locations.

In 2000, 21 coho (17 males and 4 females) were trapped incidentally at LFH. One fish was returned to the Snake River at LFH and two fish were transported above LGR Dam and released. Ten fish were transferred to the NPT and the remaining eight coho died before they could be transferred.

Fall chinook were spawned at LFH from October 24 to December 5, 2000. Peak of spawning was November 7 and 8. Coded-wire tags were removed from marked hatchery fish and read to determine the fish's origin prior to mixing of gametes. We read 53% of the CWTs associated with red VIE tagged (known LFH) fish and 100% of the wire detected from other fish which were slated for spawning. Matings consisted of single female/single male lots with a backup male. Only salmon verified to be of LFH/Snake River origin were used for broodstock. All hatchery strays and unmarked fish were spawned together as "strays." In addition, CWTs were read from unspawned fish to determine their origin.

In 2000, egg take from all fish was 4,190,338. The final egg take from LFH/Snake River origin broodstock was 3,576,956 green eggs. As a precautionary measure, 53,176 green eggs from LFH/Snake River origin females which tested ELISA positive for Bacterial Kidney Disease were destroyed prior to eye-up. This left 3,523,780 green eggs available for production. At eye-up,

3,365,268 eggs were picked and loss was estimated at 4.5%. On December 7, we transferred 115,891 eyed eggs to Idaho Fish and Game as part of the Idaho Power Company mitigation agreement. The estimated number of LFH/Snake River origin fry ponded was 3,158,689 fish. Stray or unmarked fall chinook from the 2000 brood produced 613,382 green eggs, 213,785 of which were destroyed. Loss to the eyed stage of the remaining 399,597 eggs was 2.9% leaving 388,157 stray origin eggs that were shipped to Klickitat Hatchery.

Sex, age, and mean length information was compiled for LFH/Snake River origin fall chinook salmon adults and jacks. These returns continued to be dominated by younger age classes. Females dominated the older age class of returning LFH/Snake River origin salmon because few males return at age 5 or older.

LFH released 196,643 subyearling (1999 brood) fall chinook salmon from the hatchery on May 26, 2000. Subyearling releases from LFH were 100% adipose clipped (marked) and coded-wire tagged. In addition, the NPT released 2,183,477 subyearling (1999 brood) fall chinook; two releases from Big Canyon and Captain John acclimation facilities, and a single release from Pittsburg Landing acclimation facility May 20 through June 26. Fish released from Big Canyon and Pittsburg Landing acclimation sites were not tagged or marked by the NPT. The early release at Captain John was 40% marked with CWT, but without an associated fin clip. The late release was 50% marked in the same fashion.

In 2001, all yearling fall chinook salmon released from LFH and the acclimation sites were adipose clipped (marked), coded-wire tagged, and elastomer tagged. During April 1-20, LFH volitionally released 338,757 yearling (1999 brood) fall chinook salmon from the hatchery. The LFH yearling release was tagged with a red VIE tag in the clear tissue behind the left eye (LR). Releases were delayed to synchronize with increasing flows in a drought year. The NPT released a total of 318,932 fall chinook yearlings (1999 brood) April 4-13, 2001 from acclimation facilities upstream of LGR Dam. Fish from Pittsburg Landing had right green (RG) elastomers, fish from Big Canyon had left green (LG) elastomers, and fish from Captain John had left blue (LB) elastomers. Also in 2001, subyearlings were barged from LFH to below Bonneville Dam, released from three acclimation sites above LGR Dam, and directly released into the Snake River below Hells Canyon Dam.

Surveys were conducted to count fall chinook redds in the Tucannon River. In 2000, we observed 19 redds (2.1 redds/km below Rk 9.6) and 18 carcasses. Five of the carcasses originated from Umatilla Hatchery, nine originated from Lyons Ferry Hatchery, and one was of unknown origin (skeletal remains). The Umatilla component was 27.8%, nearly a two-fold increase from what we have observed in the last two years. The remaining three fish were unmarked and of natural origin based on scale samples.

We are unable to account for 19.4 percent (3,196 salmon) of fall chinook escapement past Ice Harbor (IHR) Dam in 2000. These estimates are calculated as the difference between the number of fish crossing IHR Dam and the numbers of fish entering LFH, spawning in the Tucannon River, and counted at LGR Dam.

Recommendations for the future: 1) pursue more aggressive hazing to deter/decrease the avian predation before tagging occurs in September; 2) pursue additional funding to build additional raceways or rearing ponds at LFH to address fish density and fish health concerns; 3) propose outlets for additional fish produced at LFH like a direct stream release of subyearlings paired with the release of subyearlings out of Captain John acclimation facility to compare survival between release strategies, or encourage IDFG and Idaho Power Company to aggressively develop Oxbow Hatchery for future chinook releases; 4) look at ways to reduce the incidence of BKD at LFH; 5) summarize adult returns for LFH origin fall chinook beginning with the 1990 brood released at LFH and include in a future (2001) report; 6) complete a cooperative report with fall chinook co-managers in the Snake River basin to determine the effectiveness of programs to meet LSRCP goals and assess the success of each release site by looking at smolt-to-adult survivals; 7) discontinue ATPase and Cortisol sampling until the existing data has been summarized in an upcoming (2002) report; 8) examine the size, time, and type of release that may be causing excess jacks; and 9) summarize adult and jack return data by release type to evaluate age and sex composition.

Table of Contents

List of Tables

List of Figures

List of Appendices

Introduction

Program Objectives

This report summarizes activities by the Washington Department of Fish and Wildlife's (WDFW) Lower Snake River Hatchery Fall Chinook Evaluation Program from April 16, 2000 to April 15, 2001. This work was completed with Fiscal Year 2000 funds provided by the U.S. Fish and Wildlife Service (USFWS) under the Lower Snake River Compensation Plan (LSRCP). The fall chinook salmon program at Lyons Ferry Hatchery (LFH) and some related natural production in tributaries of the Snake River are described in this report. We have also incorporated information about salmon trapping at Lower Granite (LGR) Dam.

Congress authorized the LSRCP in 1976. As a result of that plan, LFH was constructed and has been in operation since 1984. One objective of the hatchery was to compensate for the loss of 18,300 adult, Snake River stock, fall chinook salmon (U.S. Army Corps of Engineers 1975). To meet mitigation, 18,300 adult hatchery produced fall chinook (Snake River Stock) are needed to return to the Snake River yearly. An evaluation program was initiated in 1984 to monitor the success of LFH in meeting the LSRCP compensation goals and to identify any production adjustments required to accomplish those goals.

The WDFW has two general goals in its evaluation program: (1) monitor hatchery practices at LFH to ensure quality smolt releases, high downstream migrant survival, and sufficient contribution to fisheries with escapement to meet the LSRCP compensation goals; and (2) gather genetic information to help maintain the integrity of Snake River Basin fall chinook salmon stocks (WDF 1994). Specific program objectives were outlined previously in Mendel et al. (1995).

Description of Facilities

LFH is located at the confluence of the Palouse and Snake Rivers at river kilometer (Rk) 95.1 (Lower Monumental Pool, Figure 1). Design capacity for the fall chinook salmon program was 9,160,000 subyearling smolts at 90 fish per pound (fpp). This was based upon the smolt to adult return (SAR) rate of 0.2% and the goal to return 18,300 fall chinook adults. Fall chinook are spawned, hatched, and reared at LFH and then released as yearlings and subyearlings. Release locations have included the hatchery (on-station), downstream of Ice Harbor Dam (barged), upstream of LGR Dam (acclimated releases), and downstream of Bonneville Dam (barged in 2001). Broodstock are obtained from various locations (see: Broodstock Collection and Management).

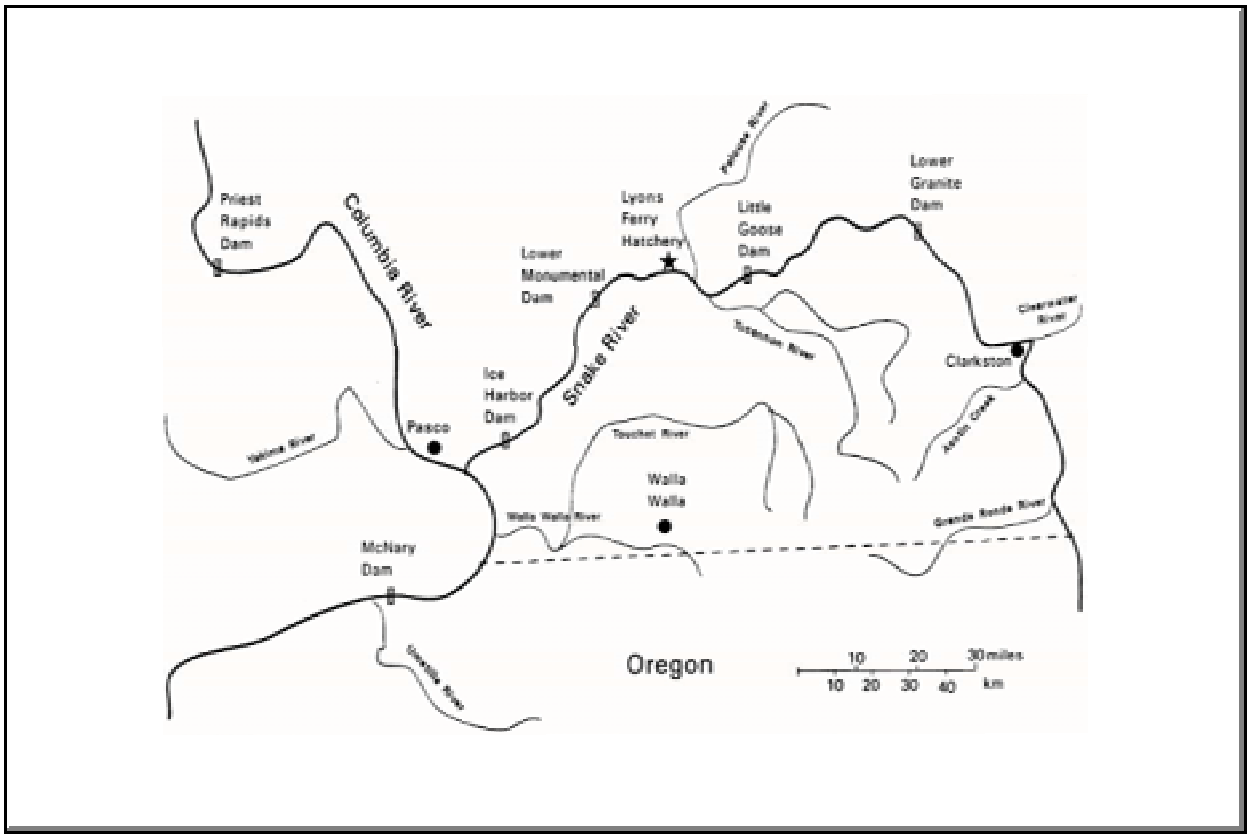

Figure 1. Lower Snake River Basin, showing the location of LFH and major tributaries in the area.

Broodstock Collection And Management

LFH has been developing its broodstock since the facility began operating in 1984. Broodstock collection, from 1984-1990 and during the egg bank program (1977-1984), has been summarized previously (Bugert and Hopley 1989, Bugert et al. 1991, Bugert et al. 1995). Until 1990, salmon were obtained from two primary locations: 1) returns to the LFH ladder; and 2) adults trapped at Ice Harbor (IHR) Dam (Bugert and Hopley 1991). LFH broodstock collection from these two sources averaged 37% of total escapement to the Snake River above IHR Dam (Bugert et al. 1991). Beginning in 1990, salmon were collected at LGR Dam, providing a third source for broodstock. Collection of salmon from IHR Dam ceased in 1994 because of the high incidence of stray salmon, concerns about salmon passage delay caused by trapping, and personnel safety issues.

National Marine Fisheries Service (NMFS) and WDFW personnel have cooperatively trapped and transported adult salmon since 1990 and jack salmon[1] since 1992 at LGR Dam for the following reasons: (1) to obtain information about run composition; (2) to reduce the number of stray hatchery salmon spawning naturally upstream of LGR Dam; and (3) to collect broodstock for LFH. Broodstock collected from the LFH trap and the trap at LGR Dam have averaged 38 % of total escapement to the Snake River above IHR Dam over the last five years. A detailed account of LFH broodstock collection and spawning protocol is provided in Appendix A.

The number of fish counted at LFH at the time of collection is considered a preliminary estimate of return (Table 1). The final estimate of total return to LFH is determined using the number of fish actually processed. Despite continuing efforts to improve accounting procedures, discrepancies occur between the number of salmon estimated at collection and the number actually processed. This is due, in part, to the partially automated sorting system at LFH. The counter tallies a fish every time the diverter gate is opened and closed to sort the fish. If multiple fish are diverted simultaneously, only one fish will be counted. In 2000, this resulted in a 7% under-estimate of fish on hand.

Discrepancies also occur between the number of salmon trapped at LGR Dam and the number actually processed at LFH. In 2000 we used operculum punches to mark LGR collected and transported fish. Occasionally data were not recorded for this mark, making tracking of those fish inaccurate.

[1] Throughout this report, jacks were distinguished only by size at the time of collection. The length criterion for jacks collected at the dams was < 56 cm total length (53 cm fork length), whereas the criterion at LFH was < 49 cm fork length. Jack counts at the dams exclude mini-jacks (#30 cm fork length) while this report includes them in the jack numbers. There were two mini-jacks processed at LFH in 2000.

Table 1. Fall chinook returns estimated at collection from IHR Dam, LFH ladder, and LGR Dam, 1990-2000. (Dam counts in November have been updated from past reports.)

				Daytime Dam Counts[b]			
		Number Collected		(through Oct.)		(Nov. & Dec.)	
Year	Collection Location	Adults	Jacks[a]	Adults	Jacks	Adults	Jacks
1990	LFH	521	602				
	Ice Harbor Dam	1,092	0	3,470	1,847	-	-
	Lower Granite Dam	49	0	354	181	31	9
1991	LFH	863	675				
	Ice Harbor Dam	361	71	4,500	1,526	-	-
	Lower Granite Dam	37	0	613	379	17	18
1992	LFH	898	176				
	Ice Harbor Dam	256	71	4,636	894	-	-
	Lower Granite Dam	178	26	797	97	58	5
1993	LFH	714	157				
	Ice Harbor Dam	127	-	2,805	332	-	-
	Lower Granite Dam	218	4	1,129	39	41	0
1994	LFH	656	-				
	Ice Harbor Dam[c]	-	-	2,069	1,033	-	-
	Lower Granite Dam	328	-	764	237	27	18
1995	LFH	2,231	-				
	Ice Harbor Dam	-	-	2,750	2,452	-	-
	Lower Granite Dam	693	-	1,047	301	20	7
1996	LFH	1,359	-				
	Ice Harbor Dam	-	-	3,810	808	41[d]	3
	Lower Granite Dam	396	-	1,272	415	36	9
1997	LFH	1,221	-				
	Ice Harbor Dam	-	-	2,752	1,726	15	128
	Lower Granite Dam	653	-	1,434	469	17	35
1998	LFH	2,023	-				
	Ice Harbor Dam	-	-	4,220	3,491	32	33
	Lower Granite Dam	1,578	-	1,852	1,920	57	82
1999	LFH	1,989	-				
	Ice Harbor Dam	-	-	6,532	3,489	54	32
	Lower Granite Dam	1,983	-	3,302	1,790	79	66
2000	LFH	2,105	-				
	Ice Harbor Dam	-	-	6,485	9,864	48	59
	Lower Granite Dam	2,833[e]	-	3,635	6,947	59	183

[a] Salmon were not classified by size at time of collection from 1993-2000 (1994, Lower Granite Dam).
[b] Classification of adults and jacks is based upon size at the counting window at each dam.
[c] Trapping at Ice Harbor Dam ceased in 1994.
[d] Prior to 1996, Ice Harbor Dam did not conduct daytime dam counts in November.
[e] Includes 272 fish collected at LGR Dam and sacrificed by the Nez Perce Tribe for collection of additional coded wire tag data. The number hauled to LFH was 2,561 fish.

LGR Dam Trapping Operations

Trapping operations at LGR Dam began mid-August. Salmon with coded-wire tag (CWT), bland wire tag (BWT), or other metal objects activated the door to the trap in the south shore fish ladder at LGR Dam. Also, fin clipped (right or left ventral; RV or LV) salmon without wire were captured and retained during periods when the trap door was kept open to sample steelhead passing the dam.

Stray salmon were collected at the trap for transport to LFH[2]. Lyons Ferry origin fish were also collected to supplement broodstock at LFH. Prior to transport, NMFS staff anesthetized the stray and LFH salmon, gathered length and sex data, and marked the fish by putting a hole in the operculum with a paper punch. The fish were then hauled to the hatchery by WDFW personnel in a 5,678 L aerated, unrefrigerated tank truck.

This was the first year of returns from the subyearlings released by the Nez Perce Tribe (NPT) which were not fin clipped but had CWTs. This mark has confounded the collection protocol. Externally these Lyons Ferry origin fish could not be differentiated from stray Umatilla or Klickitat fish, although internally the Klickitat and Umatilla fish had BWTs. Thus, all fish with no clips and wire were removed from the Snake River system. Since these fish were primarily jacks and not needed for spawning, it was agreed to by WDFW and the NPT that a portion of these fish would be processed by the NPT to determine release location and confirm identification.

The number of fall chinook trapped at LGR Dam was 2,833 (Table 1). LFH staff hauled 2,561 fish to LFH for spawning. The number of fish processed at LFH was 2,452 salmon, leaving 109 jacks unaccounted for. These fish were most likely processed as volunteers. The remaining 272 trapped fish were sacrificed by the NPT to recover CWTs.

LFH Trapping Operations

The trap was opened in September to permit salmon to voluntarily enter the hatchery. Several times a week, salmon that had entered the trap were directed into a holding pond.

The final count of adults and jacks handled at LFH was 2,391 fish, including 2,379 fish processed, 12 fish hauled upstream before spawning, and 109 LGR jacks that were unaccounted for as transported. The number of voluntary returns initially estimated at collection was 2,105 fish. Duration of trapping was 83 days (Table 2).

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[2] NMFS requires that stray salmon trapped at LGR Dam be removed from the Snake River system. These fish are taken to LFH for spawning. Progeny of these strays are reared and released at Klickitat Hatchery if needed.

Table 2. Voluntary returns of fall chinook to LFH estimated at collection, 1986-2000.

	Number of Return				Peak Return Day	
Year	Adults	Jacks [a]	Total	Trapping Dates	Date	Adults
1986	245	1,125	1,370	Sep 5 - Nov 15	Sep 18	24
1987	1,654	543	2,197	Sep 13 - Dec 12	Sep 26	202
1988	327	1,053	1,380	Sep 9 - Dec 5	Sep 16	95
1989	704	670	1,374	Sep 6 - Dec 4	Oct 1	56
1990	521	602	1,123	Sep 5 - Nov 14	Nov 7	57
1991	863	675	1,538	Sep 13 - Dec 4	Oct 1	54
1992	898	176	1,074	Sep 14 - Dec 7	Oct 19	181
1993	714	157	871	Sep 8 - Dec 7	Nov 11	42
1994	1,310	-	1,310	Sep 11 - Nov 29	Nov 13	80
1995	2,231	-	2,231	Sep 8 - Dec 3	Oct 17	42
1996	1,354	-	1,354	Sep 1 - Dec 1	Oct 11	109
1997	1,224	-	1,224	Aug 18 - Nov 25	Oct 31	77
1998	2,023	-	2,023	Sep 1 - Dec 4	Oct 29	93
1999	1,989	-	1,989	Sep 1 - Nov 23	Sep 29 & Oct 5	90
2000	2,105	-	2,105	Sep 1 -Nov 22	Oct 3	86

[a] Jacks were classified by size ($\leq$ 61 cm fork length) at the time of collection prior to 1994. After 1994, adults and jacks were not classified at time of collection.

In 2000, 21 coho (17 males and 4 females) were trapped incidentally at LFH. One fish was returned to the Snake River at LFH and two fish were transported above LGR Dam and released. Ten fish were transferred to the NPT and the remaining eight coho died before they could be transferred.

Hatchery Operations

Spawning Operations

Spawning and Egg Take

Fall chinook collected at LGR Dam were held separately from those that voluntarily entered the hatchery (Appendix A). At spawning, ripe fish were killed and their gametes collected and set aside unmixed. Wire tags were removed from marked fish and read to determine origin prior to fertilization of the eggs. Fish were spawned in two groups: 1) Lyons Ferry origin fish, identified through examination of CWTs or the presence of elastomer tags; and 2) all others. This latter category included unmarked fish, and strays identified by BWT, CWT, or ventral fin clips. Lyons Ferry origin fish were mated together and retained for subsequent Snake River releases. All fish were mated as single male/single female pairs (with a back-up male 15-30 seconds later). Fertilized eggs from Lyons Ferry fish were incubated separately from unknown origin or stray fish.

Fish were spawned from October 24 through December 5, 2000 (Tables 3 and 4). Snake River origin salmon produced 3,576,956 total eggs ("green" or unfertilized eggs), 53,176 of which were destroyed because of positive enzyme linked immunosorbent assay (ELISA) values when tested for Bacterial Kidney Disease(BKD). For more information regarding ELISA results see the Disease Incidence and Prophylaxis section of this report. Initial mortality of Lyons Ferry origin eggs was 4.5%, which does not include loss due to destruction of eggs with high ELISA values. A total of 613,382 green eggs came from stray fish.

Table 3. Duration and peak of spawning, egg take, and percent egg mortality at LFH, 1984-2000.

Year	Spawning Duration	Peak of Spawning	Total Egg Take	Initial Egg Loss (%)	
				Total[a]	Known LFH
1984	Nov 8 - Dec 5	Nov 21	1,567,823	21.58	
1985	Nov 2 - Dec 14	Nov 7	1,414,342	3.99	
1986	Oct 22 - Dec 17	Nov 19	592,061	3.98	
1987	Oct 20 - Dec 14	Nov 17	5,957,976	3.82	
1988	Oct 18 - Dec 6	Nov 12	2,926,748	3.41	
1989	Oct 21 - Dec 16	Nov 11	3,518,107	5.75	
1990	Oct 20 - Dec 8	Nov 6	3,512,571	8.28	
1991	Oct 15 - Dec 10	Nov 12	3,003,676[b]	8.30	
1992	Oct 20 - Dec 8	Nov 21	2,274,557[b]	5.96	5.06
1993	Oct 19 - Dec 7	Nov 2	2,181,879	6.69	9.60
1994	Oct 18 - Dec 6	Nov 8	1,532,404	5.09	5.40
1995	Oct 25 - Dec 5	Nov 14	1,461,500	5.64[c]	3.22
1996	Oct 22 - Dec 3	Nov 5	1,698,309	4.56	3.95
1997[d]	Oct 21 - Dec 2	Nov 4	1,451,823	5.22	4.18
1998	Oct 20 - Dec 8	Nov 3	2,521,135	5.08	5.11
1999	Oct 19 - Dec 14	Nov 9 &10	4,668,267		9.42[e]
2000	Oct 24 - Dec 5	Nov 7 & 8	4,190,338		5.92[e]

[a] From 1984-1991 loss was calculated on all fish because of hatchery records. Beginning in 1999, strays were transferred before picking occurred so egg loss cannot be calculated.
[b] Includes 9,000 eggs from stray females given to Washington State University.
[c] Doesn't include loss from 10,000 stray eggs given to University of Idaho. The egg loss from strays was 8.63% excluding eggs used in fertilization experiments.
[d] Total eggtake includes eggs from one coho female crossed with a fall chinook.
[e] Initial loss includes eggs destroyed due to positive ELISA values: 156,352 eggs in 1999 and 53,176 eggs in 2000 .

Table 4. Weekly spawning summary for fall chinook broodstock processed at LFH, 2000. (Volunteer and transported fish are included and jacks are included with males.)

Week Ending	Mortality[a]		Spawned			Surplussed		Eggtake
	M	F	M	F	NV[b]	M	F	
Sep 9	1	1						
Sep 16	1	2						
Sep 23	1	2						
Sep 30	4	3						
Oct 7	14	5						
Oct 14	2	0						
Oct 21	8	2						
Oct 28	43	21	62	62	0	450	0	235,195
Nov 4	48	15	179	188	0	55	0	670,510
Nov 11	92	14	438	456	1	27	1	1,650,080
Nov 18	236	5	273	269	1	52	1	940,176
Nov 25	325	3	125	125	2	186	0	418,200
Dec 2	243	0	75	58	0	195	1	201,277
Dec 9	146	3	28	25	0	250	6	74,900
Total	**1164**	**76**	**1180**	**1183**	**4**	**1215**	**9**	**4,190,338**

[a] Mortality includes prespawning mortality of one male and four females crushed during processing.
[b] Non-viable females(NV)--not ripe when killed.

Incubation, Rearing, Marking, and Transfer

1999 Brood Year

The final estimate of the 1999 eggtake from Lyons Ferry origin broodstock is provided in Table 5. Loss to the eyed stage was 9.4%. Of this loss, 41% occurred when 156,352 green eggs from LFH origin ELISA positive (low-high values) females were destroyed prior to eye-up. Loss from eye-up to ponding was estimated at 2%. The estimated number of LFH origin fry ponded was 3,533,372 fish. Stray or unmarked fall chinook from the 1999 brood produced 687,812 unfertilized eggs. All stray eggs were fertilized then shipped to Klickitat Hatchery.

Table 5. Estimated salmon progeny from known LFH/Snake River origin adults, 1990-2000 brood years. (These fish were released at various locations in the Snake and Clearwater rivers by WDFW, NPT, NMFS, and USFW.)

Brood Year	Total Green Eggs	Eyed Eggs	Fry Ponded	Subyearlings Released	Yearlings	
					Marked	Released
1990	1,103,745	1,011,998	958,241	224,439	694,388	689,601
1991	906,411	828,514	807,685	0	765,207	760,018
1992	901,232	855,577	835,171	206,775	611,107	603,050
1993	400,490	363,129	352,574	0	349,805	349,024
1994	583,871	553,189	542,461	25,858	536,867	521,822
1995[a]	1,056,700	1,022,700	959,773	28,855	817,290	803,491
1996	1,433,862	1,377,202	1,361,577	336,482	904,332	755,183
1997[b]	1,184,141	1,134,641	1,101,070	60,125	1,039,448	961,669
1998	2,085,155	1,978,704	1,926,605	918,015	926,581	868,179
1999	3,980,455	3,605,482	3,533,372	2,419,183	865,208	657,689
2000[c]	3,576,956	3,365,268	3,158,689			

[a] Includes 83,183 fry up to ponding that were accidentally released.
[b] Includes eggs from a coho female mated to a known LFH chinook. These eggs were mixed with other known LFH eggs at picking.
[c] Between green and eyed stages, 53,176 eggs were destroyed to reduce potential BKD in production (based on ELISA results). Between eyed and ponding stages, 115,891 eyed eggs were transferred to IDFG for release as subyearlings below Hells Canyon Dam.

Subyearlings

Subyearling salmon to be released at LFH were 100% adipose fin clipped and coded-wire tagged in April, 2000. These fish were reared in raceways until release from LFH.

Salmon to be released by the NPT at Big Canyon acclimation site as subyearlings were not fin clipped or coded-wire tagged. Big Canyon acclimation site is located on the Clearwater River (Rk 57) in Idaho. These fish were reared in raceways at LFH until transfer. WDFW transported 500,229 subyearlings (76.2 fpp) to Big Canyon during May 10-12 for acclimation. A second

transfer of 398,368 subyearlings (49.8 fpp) occurred June 5-14 for a later release. After transfer to Big Canyon, the fish were held in 6.1 m diameter aluminum tanks until release.

Salmon to be released by the NPT at Pittsburg Landing acclimation site as subyearlings were neither fin clipped nor coded-wire tagged. Pittsburg Landing acclimation site is located on the Idaho shore in the Hells Canyon portion (Rk 346) of the Snake River. These fish were reared in raceways at LFH until transfer. From May 8-10, WDFW transported 403,697 subyearlings (73.2 fpp) to Pittsburg Landing for acclimation. After transfer to Pittsburg Landing, the fish were held in 6.1 m diameter aluminum tanks until release.

Subyearling salmon destined for early release at Captain John acclimation site were 40% coded-wire tagged with no associated fin clip. The fish slated for late release at Captain John were 50% coded-wire tagged with no associated fin clip. Captain John acclimation site is located downstream of the Grande Ronde River on the Washington shore of the Snake River, near Captain John Rapids (Rk 263). These fish were reared in raceways at LFH until transfer. After transfer, the fish were held in an earthen pond at Captain John until release. The transfer of 495,736 subyearlings (73.9 fpp) to Captain John for acclimation occurred May 8-10, 2000. A second transfer of 404,044 subyearlings (45.1 fpp) occurred June 5-14 for a later release. A portion of these fish were also coded-wire tagged but not fin clipped.

In June and July an additional 24,040 fish were transferred to the NPT and 15,023 fish were transferred to NMFS for research studies. These fish will not be mentioned further in this report.

Yearlings

Yearling salmon for on-station and off-station releases were marked with clipped adipose fins, CWTs, and visible implant elastomer (VIE) tags during September and October 2000. By accident, 7,500 of the fish to be released on-station were tagged with 1.5 length tags instead of standard length tags.

A red VIE tag was placed behind the left eye of fish that were to be released into the Snake River at LFH. The 1999 brood fish were reared in raceways until marking in September and October 2000. As the fish were marked they were placed into Lake 2, an 18,900 cubic meter earthen pond.

A green VIE tag was placed behind the right eye of fish for acclimation and release at Pittsburg Landing. WDFW reared these fish in raceways at LFH until transfer. On March 5-7, 2001, WDFW transferred 105,991 yearlings (11.3 fpp) to the NPT. After transfer, the fish were acclimated in 6.1 meter diameter aluminum tanks at Pittsburg Landing until release.

A green VIE tag was placed behind the left eye of fish for acclimation and release at Big Canyon. WDFW reared these fish in raceways at LFH until transfer. On March 5-7, 2001, WDFW

transferred 116,267 yearlings (12.4 fpp) to the NPT. After transfer, the fish were acclimated in 6.1 meter diameter aluminum tanks at Big Canyon until release.

A blue VIE tag was placed behind the left eye of fish for acclimation and release at Captain John. WDFW reared these fish in raceways at LFH until transfer. On February 12, 2001, WDFW transferred 70,819 yearlings (13.5 fpp) to the NPT. The transfer of fish began earlier than in previous years because of space limitations at LFH. On March 16 an additional 33,773 yearlings (10.8 fpp) were transferred to the NPT. After transfer, both groups were acclimated in an earthen pond at Captain John until release.

2000 Brood Year

The final egg take from LFH/Snake River origin broodstock was 3,576,956 green eggs (Table 5). As a precautionary measure, 53,176 green eggs from LFH/Snake River origin females which tested ELISA positive for Bacterial Kidney Disease were destroyed prior to eye-up. This left 3,523,780 green eggs available for production. At eye-up, 3,365,268 eggs were picked and loss was estimated at 4.5%. On December 7, we transferred 115,891 eyed eggs to Idaho Fish and Game as part of the Idaho Power Company mitigation agreement. The estimated number of Lyons Ferry origin fry ponded was 3,158,689 fish. Stray or unmarked fall chinook from the 2000 brood produced 613,382 green eggs, 213,785 of which were destroyed. Loss to the eyed stage of the remaining 399,597 eggs was 2.9% leaving 388,157 stray origin eggs available for shipment to Klickitat Hatchery.

Subyearlings

Subyearling salmon (200,716 fish) to be released at LFH were adipose fin clipped and coded-wire tagged in March and April 2001. These fish were reared in raceways at LFH.

Salmon to be released by the NPT at upstream acclimation sites were not adipose clipped. Tagging occurred in April 2001. Only 53% of fish slated for release at the Pittsburg Landing acclimation site were coded wire tagged. Likewise, the early release of subyearlings at the Big Canyon acclimation site were only 39% coded-wire tagged, and fish destined for the second release were not tagged. Fish slated for the Captain John acclimation facility were not marked or tagged. The transfer of subyearling fall chinook to Pittsburg Landing, Big Canyon, and Captain John acclimation facilities occurred in early May, 2001. This data will be presented in an upcoming report.

Disease Incidence and Prophylaxis

Broodstock

The 2000 broodstock were injected at capture at LGR Dam with erythromycin (20 mg/kg of fish) to reduce infection levels of *Renibacterium salmonarum* (causative agent of Bacterial Kidney Disease [BKD]). For fish captured at LFH, injections were performed October 3 when fish were counted for sex identification. The salmon broodstock were treated with a 2-hour formalin drip (167 ppm) every other day as prophylaxis for *Saprolegnia sp.* (External Fungus).

All females were examined for BKD using the enzyme linked immunosorbent assay [ELISA] test. In 2000, only 16 females (0.7%) had high ELISA values (>0.45 optical density, [OD]) and 17 females (0.3%) had moderate ELISA values (0.2-0.45 OD). Results from most females were low (0.11-0.199 OD) or below low levels (< 0.11 OD).

Sixty female broodstock were sampled to detect viral pathogens on November 14, 2000. No viral pathogens were detected from the samples.

Eggs

Eggs from the 2000 broodstock were initially disinfected and water hardened for one hour in iodophor (1:100 or 100 ppm). During incubation, eggs were treated daily with formalin at 1,667 ppm (1:600) in a flow through treatment for external fungus control.

In December 2000, eggs from 16 LFH origin females with high ELISA values were destroyed to prevent the spread of BKD.

Juveniles

1999 Brood Year

Bacterial gill disease was observed in the 1999 brood year fall chinook in March and April, 2000. Fish were treated with potassium permanganate in a one hour flow through treatment on three consecutive days. The treatment regimen was 0.5 ppm on day one, 1.0 ppm on day two, and 1.5 ppm on day three.

Staff from Idaho Fish Health Center (IFHC) collected 60 pre-liberation samples on April 12, 2001, from yearling fish slated for release at LFH. The staff were looking at three variables: fat levels in the body cavity; hematocrits; and BKD levels using ELISA testing. The fat levels were good (2+) in all fish sampled. Hematocrits were collected to evaluate the general health of the fish by looking at the percent of red blood cells present in the blood. A hematocrit value above 32% is considered normal. Fish with hematocrits below 32% are considered anemic.

Hematocrits averaged 42.3% (standard deviation [SD] 3.7), indicating the fish were in the normal range. The 1999 brood year showed fewer fish with anemia than the 1998 brood year yearling release (average 37.7%, SD 12.4). ELISA samples showed fish having moderate or high ELISA values comprised 23.3% of the total sample.

Pre-release samples were collected April 9-11 by IFHC staff from yearlings scheduled for release by the NPT at upstream acclimation sites. The samples from Big Canyon and Captain John release groups had hematocrit percentages within the normal range, however 10% of the fish in the Pittsburg Landing sample were below normal, indicating anemic fish. The Pittsburg Landing sample also had the highest ELISA values among the three release groups.

BKD was diagnosed near the end of April 2000 in fall chinook slated for yearling production. Erythromycin was prescribed and administered in feed at a rate of 100 mg/kg of fish per day for 28 days in April and May. Mortality declined following treatment but again increased in late summer. A second erythromycin treatment was administered following marking in October and November. Mortality declined following the second treatment, however, chronic BKD was noted throughout the remaining rearing period.

2000 Brood Year

Bacterial gill disease was observed in several raceways of fall chinook in March and April, 2001. The fish were treated with potassium permanganate in a one hour flow through treatment on three consecutive days. The treatment regimen was 0.5 ppm on day one, 1.0 ppm on day two, and 1.5 ppm on day three.

Juvenile Releases and Migration

The current fall chinook production goal for LFH, which began with the 1995 brood, is 900,000 fish for release as yearlings. Half of the yearlings are to be released on-station; the other half are to be released from acclimation sites upstream of LGR Dam. If the number of eggs available is insufficient to meet the goal, the first priority is to produce 450,000 yearlings for release at LFH.

Any production beyond the full yearling program is to be reared for release as subyearlings or transferred as eggs to IDFG for rearing and release for Idaho Power Company mitigation. Subyearlings may be released either above LGR Dam, or at LFH. WDFW continues, however, to emphasize yearling releases as a means to increase the number of adult salmon returning to the Snake River. Nonetheless, we wish to evaluate subyearling releases and compare them with yearling releases in an attempt to improve subyearling survival and maintain natural age and sex composition of adult returns.

Releases of LFH/Snake River origin fall chinook, during 1994-2001, are presented in Appendix B. Releases of fall chinook in the Snake River which occurred prior to 1994 are presented in Wargo et al. 1999.

1998 Brood Year

Yearling Release

Information for the yearlings which were released from LFH and three NPT acclimation facilities above LGR Dam (Big Canyon, Pittsburg Landing, and Captain John) was presented in Milks et al. (2000). Passage and travel times of fish released at LFH are presented below. Similar migration information for fish released from the acclimation sites will be presented in an upcoming NPT report (Steve Rocklage, personal communication).

Sampling of yearlings released from LFH (with left red VIE tag) occurred at juvenile bypass collection facilities at Lower Monumental and McNary dams, and PIT tag interrogation units at downstream Snake and Columbia River dams provided passage data (Table 6).

Table 6. Passage data for on-station release (March 24-April 14) of LFH/Snake River origin yearling (1998 BY) fall chinook at Snake and Columbia River dams, 2000. (Data includes all detections for each dam.)

Tag Type - Group[a]	No. Sampled / Detected	Mean Travel Days	Peak Passage Date[b]	Passage Date Range 2000	Passage Dates 10%	Passage Dates 90%
Lower Monumental Dam						
Left red VIE tag	5,228	-	April 16	April 2-May 30	April 4	April 25
PIT - 1	123	10	April 7	April 2-May 4	April 3	April 21
PIT - 2	125	7	April 16	April 2 - May 10	April 14	April 27
McNary Dam						
Left red VIE tag	3,811	-	April 23	April 1-June 21	April 8	May 9
PIT - 1	80	20	April 14	April 8-May 26	April 10	May 4
PIT - 2	67	18	April 26	April 18 - May 17	April 21	May 9
John Day Dam						
PIT - 1	62	25	April 16	April 13-May 23	April 15	May 8
PIT - 2	64	20	May 3	April 21-May 20	April 24	May 12
Bonneville Dam						
PIT - 1	32	27	April 22	April 16-May 22	April 18	May 11
PIT - 2	39	23	May 8	April 24-May 25	April 26	May 16

[a] Release date for PIT-1 was March 31 and the release date for PIT-2 was April 12.
[b] Peak passage date refers to the first peak documented.

An estimated 90,307 left red VIE tagged fish (based on sample rate) were collected at Lower Monumental Dam, which represented 19.8% of the fish released from LFH. By comparison, 248 unique PIT tags were detected at Lower Monumental, which represented 25.3% of the 980

tagged fish released from LFH. PIT tag interrogation units at all dams combined detected 553 (56.4%) different PIT tagged fish of the 980 tags released from LFH. The passage data derived from sampling VIE tagged fish at Lower Monumental and McNary dams were similar to PIT tag passage data at those dams[3].

1999 Brood Year

Subyearling Release

Subyearlings were released from LFH and three acclimation sites above LGR Dam in 2000. Prior to release, some groups of fish were sampled to collect size and condition data as well as to evaluate tag loss. A portion of these fish were PIT tagged to allow collection of migration data through the Snake and Columbia Rivers.

The 1999 brood subyearlings (196,643 fish) were released from LFH on May 26, 2000. Mean fork length was 96.8 mm (SD 8.9) and mean weight was 10.0 g (2.9 SD) or 45.5 fpp. The CV for length was 9.2 %. Condition factor (K) was 1.1. Included in the release were 1,487 fish that were PIT tagged May 24. PIT tag retention was estimated at 100% at time of release on May 26.

In 2000, Lower Monumental Dam detected 260 unique PIT tags (Table 7), or 17.5% of the 1,487 tagged fish released from LFH. PIT tag interrogation units at all dams combined detected 503 (33.8%) different PIT tagged fish of the 1,487 tags released from LFH.

In 2001, an additional three PIT tagged fish were detected, which indicates they reared in the reservoir an additional year before they migrated. One of these fish was detected at McNary and John Day Dams. Travel time to Lower Monumental Dam was 347 days. The average travel time to John Day Dam was 347 days.

The NPT released 2,183,477 fall chinook subyearlings in May and June 2000 from acclimation facilities upstream of LGR Dam (Appendix B). Information regarding migration will be presented by the NPT in an upcoming report (Bill Arnsberg, NPT, personal communication).

At the Captain John site, 491,033 subyearling fall chinook were released from May 20-31. Mean fork length was 97.9 mm (SD 7.7) and mean weight was 10.0 g (SD 2.5) or 45.4 fpp. The CV for length was 7.9 % and the K was 1.1. Included in the release were 1,001 fish that were PIT tagged in May, 2000. A second release of 401,814 fish occurred from June 15-23. These fish were released at 52 fpp (based on pound counts). To reduce stress, these fish were not PIT tagged or individually measured or weighed prior to release. River water temperatures were

[3] Peak passage dates for VIE tagged salmon were based on passage indices for each dam. A passage index is calculated by assuming a 100 percent collection efficiency at the turbine intake diversions screens, and by adjusting based on the proportion of river flow that is spilled at a dam.

higher than normal so the fish were released earlier than planned. At the time of release the water level of the Snake River was low and the outlet flume did not reach the waters edge. Therefore, the subyearlings were released into dirt and rocks for approximately 30 feet before they reached the river.

Table 7. Passage data for on-station release (May 26) of LFH/Snake River origin subyearling (1999 BY) fall chinook at Snake and Columbia River dams, 2000. (Data includes all detections for each dam.)

Tag Type - Group	No. Sampled/ Detected	Mean Travel Days	Peak Passage Date[a]	Passage Date Range 2000	Passage Dates	
					10%	90%
Lower Monumental Dam						
PIT - 1	260	28	June 26	May 27 - Sept 22	May 30	July 3
McNary Dam						
PIT - 1	327	33	June 16	June 9 - Nov 22	June 19	July 9
John Day Dam						
PIT - 1	45	33	June 20	June 12 - Sept 4	June 19	July 13
Bonneville Dam						
PIT - 1	13	33	June 26	June 18 - July 21	June 18	July 21

[a] Peak passage date refers to the first peak documented.

At the Big Canyon site, 497,790 subyearling fall chinook were released from May 30 through June 1. Mean fork length was 98.2 mm (SD 8.3) and mean weight was 11.3 g (SD 2.6) or 40.2 fpp. The CV for length was 8.4% and the K was 1.2. Included in the release were 1,014 fish that were PIT tagged in May, 2000. A second release of 392,684 fish occurred from June 20-26. These fish were released at 45 fpp (based on pound counts). To reduce stress, these fish were not PIT tagged or individually measured or weighed prior to release. Water temperatures were higher than normal so the fish were released earlier than planned.

At the Pittsburg Canyon site, 400,156 subyearling fall chinook were released from May 24-26. Mean fork length was 89.6 mm (SD 7.9) and mean weight was 8.2 g (SD 2.2) or 55.6 fpp. The CV for length was 8.8% and the K was 1.1. Included in the release were 1,001 fish that were PIT tagged in May, 2000.

Yearling Release

Release dates for Lyons Ferry on-station releases were delayed compared to the past due to lower flows and no spill in the Snake River in 2001. The 1999 brood yearlings were released from LFH and three NPT acclimation facilities above LGR Dam: Big Canyon, Pittsburg Landing, and Captain John. Prior to release, the yearlings were sampled to collect size and condition data as well as to evaluate tag loss. In 2000, all co-managers agreed to abandon

organosomatic and ATPase sampling. The IFHC performed blood work and documented fat indices on fish prior to release. A portion of the fish were tagged with PIT tags to allow collection of migration data through the Snake and Columbia rivers. WDFW assisted NPT in PIT tagging fish at Pittsburg Landing and Captain John acclimation facilities in 2001.

Estimated release numbers for fall chinook at LFH have been imprecise ever since 1996 when the rearing area was shifted from raceways to the earthen pond. In 2001, yearling fall chinook experienced an estimated 25% loss from tagging to release primarily due to avian predation. Loss was calculated based upon similar losses of steelhead in an earthen pond located next to the fall chinook pond. Because of predation, only 338,757 yearling fall chinook were estimated released at LFH April 1-20, 2001. Mean fork length was 171.6 mm (SD 14.9) and mean weight was 52.2 g (SD 15.2) or 8.7 fpp. The CV for length was 8.7%, and the K was 1.0. These fish were marked with a red VIE tag behind the left eye. Elastomer loss was estimated at 7.2%. PIT tagging occurred April 11 and April 17 when 499 and 492 fish, respectively, were tagged. PIT tag retention was estimated at 100% at time of release on April 12 and April 18. Passage and travel times of 1999 brood yearlings released on-station will be included in the next evaluation report.

The NPT released a total of 318,932 fall chinook yearlings in April 2001 from acclimation facilities upstream of LGR Dam (Appendix B). Information regarding migration will be presented by the NPT in an upcoming report (Steve Rocklage, personal communication).

At Captain John, 101,976 yearling fall chinook were released from April 4-13, 2001. Mean fork length was 155.4 mm (SD 14.8) and mean weight was 44.8 g (SD 12.5) or 10.1 fpp. The CV for length was 9.5% and the K was 1.19. These fish were marked with a blue VIE tag behind the left eye. Elastomer loss was estimated at 11.1%. Included in the release were 2,518 fish that were PIT tagged on April 6, 2001. WDFW assisted NPT with PIT tagging at Captain John in 2001.

At Big Canyon, 113,215 yearling fall chinook were released from April 9-11, 2001. Mean fork length was 157.0 mm (SD 14.9) and mean weight was 44.5 g (SD 12.6) or 10.2 fpp. The CV for length was 9.5% and the K was 1.15. These fish were marked with a green VIE tag behind the left eye. Elastomer loss was estimated to be 5.4%. Included in the release were 7,499 fish that were PIT tagged April 2-3 and 5, 2001.

At Pittsburg Landing, 103,741 yearling fall chinook were released from April 10-12, 2001. Mean fork length was 156.2 mm (SD 14.9) and mean weight was 43.5 g (SD 12.5) or 10.4 fpp. The CV for length was 9.5% and K was 1.14. These fish were marked with a green VIE tag behind the right eye. Elastomer loss was estimated at 13.3%. Included in the release were 7,503 fish that were PIT tagged April 2-4, 2001. WDFW staff assisted NPT with PIT tagging at Pittsburg Landing in 2001.

2000 Brood Year

Subyearling Release

Subyearlings originally slated for on-station release were barged from LFH and released below Bonneville Dam on May 30, 2001. Transportation was decided upon to try and increase survival of the LFH subyearlings during a drought year. In addition, subyearlings were also released from three acclimation sites above LGR Dam by the NPT and directly released into the Snake River below Hells Canyon Dam in 2001 as part of Idaho Power Company mitigation. Prior to release, some groups of fish were sampled to collect size and condition data as well as to evaluate tag loss. A portion of the upriver acclimated fish were PIT tagged to allow collection of migration data through the Snake and Columbia Rivers. Subyearling releases will be described in more detail in next years report. For now, refer to Appendix B for release information.

Survival Rates to Release

We used the estimated number of eggs and fish present at life stages in the hatchery for 1990-1999 broods (Table 5) to estimate survival rates within the hatchery environment (Table 8).

Table 8. Estimated survivals (%) between various life stages at LFH for fall chinook of LFH/Snake River origin, 1990-1999 brood years.

Brood Year	Release Stage		Green Egg – Ponded Fry	Ponded Fry – Release	Green Egg – Release
1990	yearling		86.8[a]	94.5	82.1
	subyearling		86.8[a]	98.0	85.1
1991	yearling		89.1[a]	94.1	83.8
1992	yearling		92.7	96.5	89.5
	subyearling		92.7	98.4	91.2
1993	yearling		88.0[a]	99.0	87.1
1994	yearling		92.7	99.3	92.1
1995[b]	yearling		90.8	94.8	86.1
	subyearling		90.8	99.0	89.9
1996	yearling		95.0	76.6	72.8
	subyearling		95.0	89.5	85.0
1997	yearling		93.0	92.5	86.0
	subyearling		93.0	97.6	90.8
1998	yearling		92.4	94.8	87.6
	subyearling		92.4	95.1	87.9
1999	yearling		92.4	66.3[c]	61.3[c]
	subyearling		92.4	95.2	87.9
yearling mean:		%	91.3	90.8	82.8
		SD	2.6	10.7	9.2
subyearling mean:		%	91.9	96.1	88.3
		SD	2.6	3.3	2.5

[a] Based on back calculation to estimate green eggs taken.

[b] Estimated after partitioning loss in that raceway for subyearlings (33,459 eggs), yearlings, and escaped fry (83,183). Survivals for accidentally released fry are not included.

[c] Avian predation of yearlings released at LFH was estimated at 25%. This loss occurred between tagging and release, while the fish were in the lake.

Stock Profile Evaluation

Age and Sex Ratio

LFH/Snake River origin fall chinook returns continue to be dominated by younger age classes. Since 1991, age 2 and age 3 fish together have made up 50% or more of a year's return (Table 9). Females dominate the older age classes of returning LFH/Snake River origin salmon. Few males return at age 5 or older. Age 3 and 4 males tend to be smaller than females of the same age, and adults returning from subyearling releases tend to be larger than adults from yearling releases (Appendix C). The sex ratio of adult LFH/Snake River origin fish processed at LFH over the last seven years averaged 1.6 males/female (Table 10). Including jacks with males, the sex ratio averages 3.3 males/female.

Table 9. Mean percentages of LFH/Snake River origin salmon returning from 1991-2000 by age and sex. (Included are transported and volunteer fish processed at LFH. Based on data in Wargo et al. 1999 and Milks et al. 2000.)

	Age					
Sex	**2**	**3**	**4**	**5**	**6**	**Total**
			Means of percentages			
Male	**27.3**	**25.8**	**12.6**	**4.0**	**0.2**	69.9
(SD)	(16.5)	(12.0)	(6.9)	(2.6)	(0.3)	
Female	**0.0**	**2.7**	**19.2**	**7.8**	**0.4**	30.1
(SD)	(0.0)	(2.2)	(9.8)	(4.4)	(0.5)	
Sum%	27.3	28.5	31.8	11.8	0.6	100.0

The 2000 return was comprised primarily of males (76.3%). Age 2 salmon accounted for 32.7%, age 3 males were 33.3%, and age 4 males were 7.1% of returning fish (Table 11). Males of other ages, mainly age 5, accounted for 3.1% of the return. As a single age/sex class, age 2 and 3 males were most numerous, representing 33.3% of the return in 2000. Females were composed primarily of age 4 fish (12.3% of the run) and age 5 fish (7.8% of the run). Females of other ages, mainly age 3, accounted for 3.4% of the return. LFH/Snake River origin fish tended to be smaller than stray salmon (Figures 2 and 3). These differences may be due to size and age at release. LFH releases mostly yearlings and Umatilla Hatchery releases mostly subyearlings. Overall, strays were older with fewer jacks. The sex ratio of adult LFH/Snake River origin males at processing was 1.8 males per female, similar to the seven year average (Table 10). The sex ratio including jacks with males was 2.8, also similar to the 7-year average.

Table 10. Sex ratios for LFH/Snake River origin salmon processed at LFH in 1994-2000. (Fish from acclimation sites are included.)

	LFH Ladder		LGR Trucked [a]		Total Processed	
Return Year	**M / F**	**J+M / F**	**M / F**	**J+M / F**	**M / F**	**J+M / F**
1994	2.3	4.6	1.1	4.1	2.1	4.5
1995	1.6	9.2	1.6	3.2	1.6	6.8
1996	1.4	2.8	0.8	1.0	1.2	2.2
1997	1.3	3.1	0.7	1.5	1.1	2.4
1998	2.2	2.8	2.3	3.3	2.3	3.0
1999	1.2	1.8	0.9	1.3	1.1	1.6
2000	2.7	3.4	1.1	2.3	1.8	2.8
mean	1.8	4.0	1.2	2.4	1.6	3.3
(std)	(0.58)	(2.46)	(0.56)	(1.18)	(0.49)	(1.78)
range	1.2 - 2.7	1.8 - 9.2	0.7 - 2.3	1.0 - 4.1	1.1 - 2.3	1.6 - 6.8

[a] Sex ratio only applies to those fish hauled to LFH. The sex ratio of fish returning to LGR Dam is different because a portion of LFH/Snake River origin fish are passed upstream, and others are not marked or trackable.

Table 11. Age and sex of LFH/Snake River origin salmon processed (and CWT analyzed) at LFH, 1998-2000. (Jacks are included with males.**)**

	Age					
Year / Sex	**2**	**3**	**4**	**5**	**6**	**Total**
1998						
Male	207	1,775	290	136	2	2,410
Female	1	143	300	351	3	798
Percent	**6.5**	**59.8**	**18.4**	**15.2**	**0.1**	3,208
1999						
Male	383	542	571	43	11	1,550
Female	0	59	745	96	27	927
Percent	**15.5**	**24.3**	**53.1**	**5.6**	**1.5**	2,477
2000						
Male	1047	1066	228	99	1	2,441
Female	0	110	394	249	4	757
Percent	**32.7**	**36.8**	**19.4**	**10.9**	**0.2**	3,198

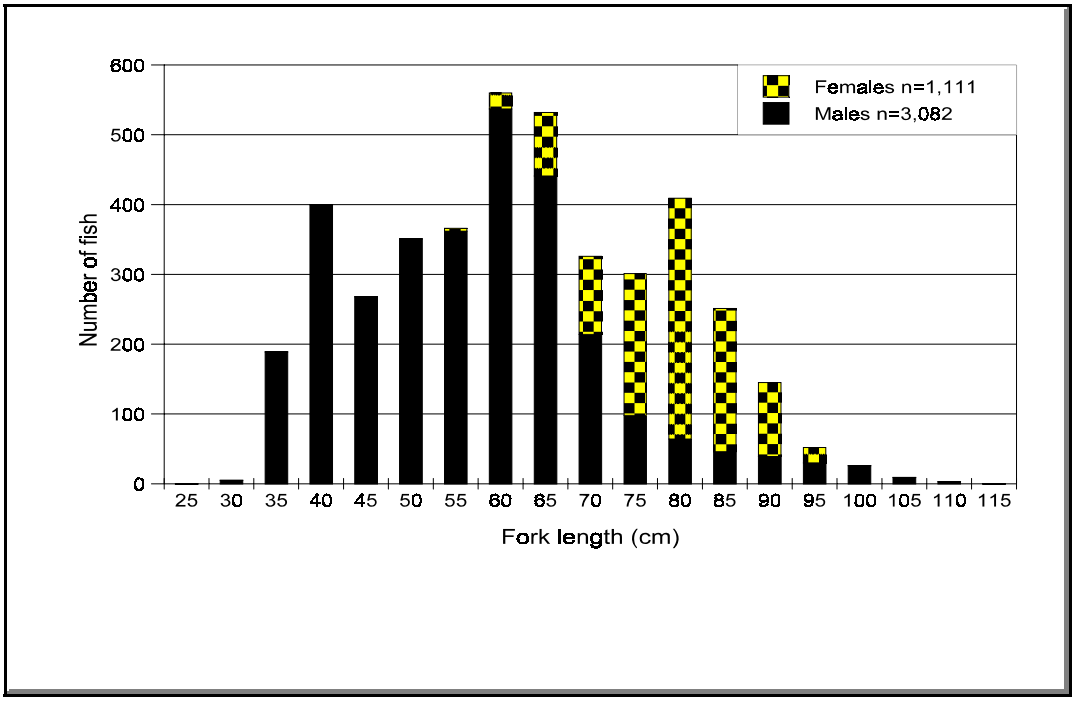

Figure 2. Length frequency of LFH/Snake River origin fall chinook processed at LFH, 2000.

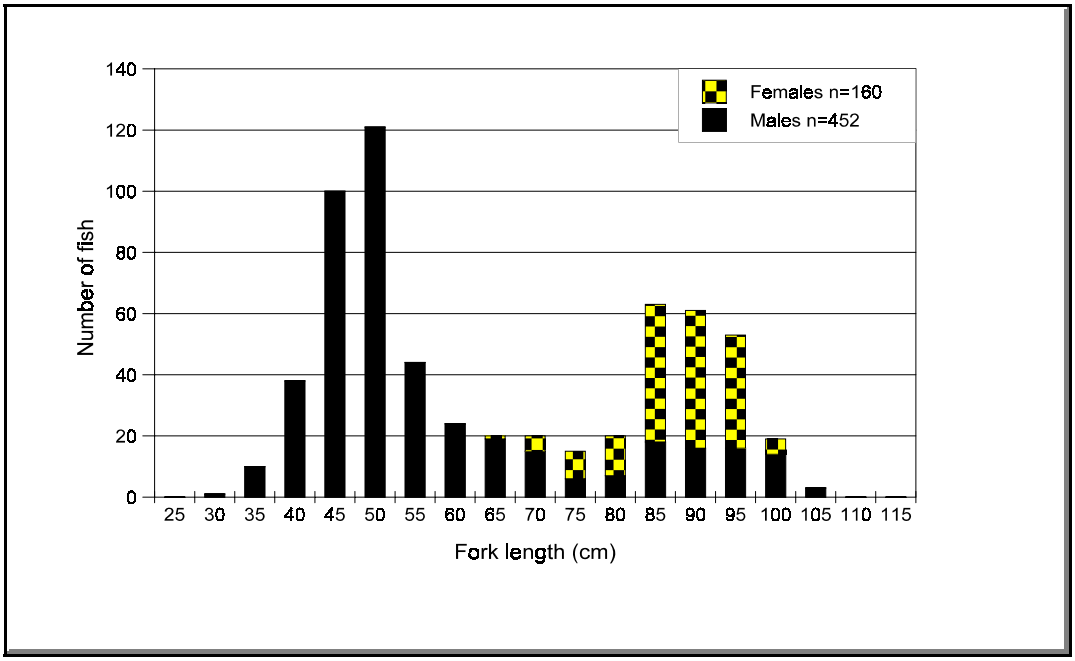

Figure 3. Length frequency of stray fall chinook processed at LFH, 2000.

Fecundity

Fecundity was evaluated for 176 LFH/Snake River origin females by age class. Each age class had seven fish evaluated per spawn day, plus an additional seven fish from subyearling releases. Lengths were proportioned for each age class by week then selected according to category (i.e., 50-60 cm). We enumerated loss, then counted and weighed 100 live eggs. The total lot of live eggs was also weighed and the average weight per egg applied to yield total number of live eggs. This estimate was decreased by 4% to compensate for excess water. The number of live and dead eggs were combined to estimate total fecundity for that fish.

Average fecundity was highly variable for each age class (Table 12). The smallest overall fecundity was 1,326 eggs from a 60 cm, age 4 fish released as a subyearling. The largest fecundity was 8,754 eggs from a 90 cm, age 5 fish released as a yearling. After regression [yearling eggs = -3804.19+(97.659 x yearling length)] and ANOVA analysis, it was determined that fecundity was directly related to fork length. For age 4 yearlings, the P-value was <0.01 indicating there was a statistically significant relationship between fecundity and length at the 99% confidence level (Figure 4). The R-squared statistic indicated that the model as fitted explains 51% of the variability in yearling fecundities. For age 4 subyearlings [subyearling eggs = -4241.13 + (98.4141 x subyearling length)], the P-value was also <0.01 indicating a statistically significant relationship between fecundity and fork length at the 99% confidence level (Figure 5). The R-squared statistic indicated that the model as fitted explains 71% of the variability in subyearling fecundities. A similar relationship between fecundity and length was seen when the population (all ages) of females was examined, but the relationship was not as strong. Fecundity data for previous years will be presented in an upcoming topic specific report.

Table 12. Average fecundity by age class of LFH/Snake River origin fall chinook spawned at Lyons Ferry Hatchery, as determined by weight samples and egg counts in 2000.

Age [a]	# Females Sampled	Average # Eggs	SD	Median # Eggs	Average Fork ln (cm)	SD
3	41	3,045	656.9	3,090	65	5.2
4 (0)	40	3,561	811.6	3,459	79	6.9
4	43	3,486	816.8	3,495	75	6.0
5	48	3,705	1,072.4	3,655	81	7.5
6	4	4,333	833.0	4,154	92	0.6

[a] Age refers to total age including fresh water rearing. All ages are yearling releases unless noted in parenthesis as being a subyearling release (0).

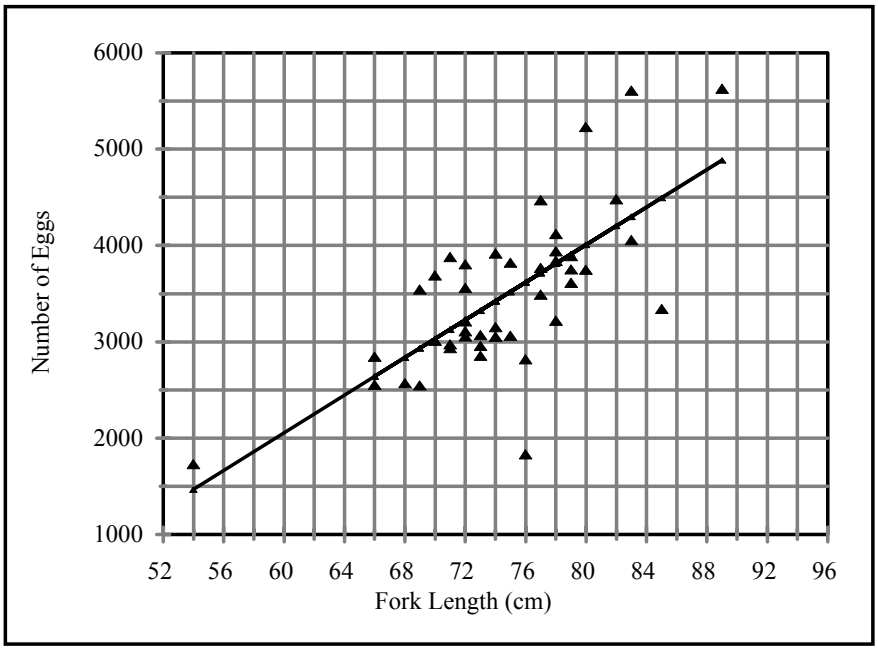

Figure 4. Fecundity by length relationship of LFH/Snake River origin fish released as yearlings and processed at LFH in 2000 as 4 year olds.

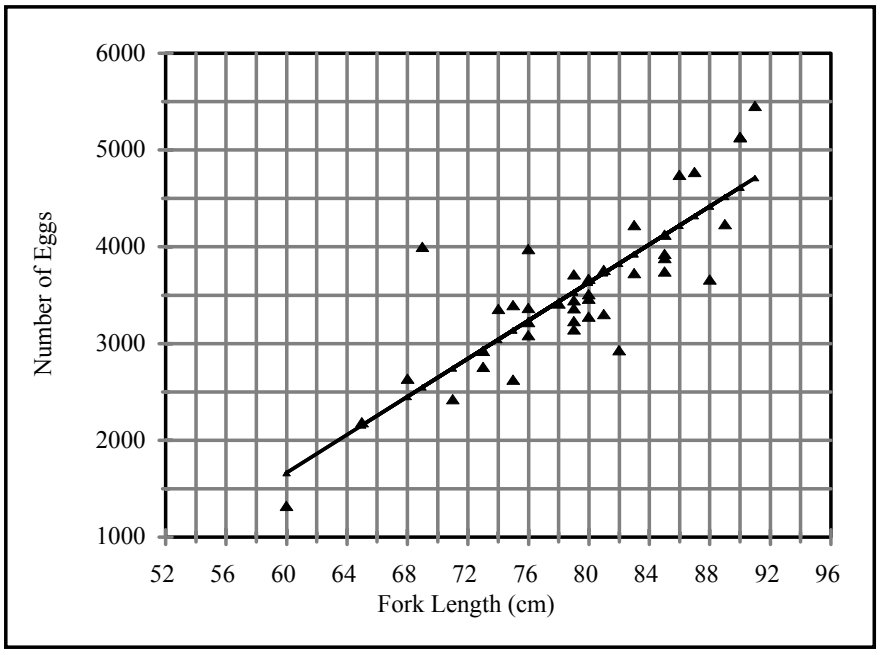

Figure 5. Fecundity by length relationship of LFH/Snake River origin fish released as subyearlings and processed at LFH in 2000 as 4 year olds.

Adult Salmon Surveys

The Tucannon River was surveyed by WDFW personnel weekly from October 30 through December 11, 2000. Surveys generally covered the river from Rk 1.3 to Rk 28.0. The first 1.3 kilometers of the Tucannon River are deep slack water from the Snake River's reservoir between Lower Monumental and Little Goose Dams. Spawning habitat is poor in this area, and we assume no spawning occurs there. Also, due to restricted access, we were unable to survey 1.1 kilometers of river below Fletcher's Dam (Rk 9.6). Survey conditions were good throughout the spawning season.

The total estimated escapement to the Tucannon River in 2000 was 57 fall chinook (Table 13). Nineteen redds, 19 live salmon, and 18 carcasses were observed during spawning surveys (Table 14). Spawning density was 2.1 redds/km (3.3 redds/mile) downstream of Fletcher's Dam. Four of the nineteen redds observed were located upstream of Fletchers's Dam.

Table 13. Number of redds and estimated escapement to the Tucannon River, and redd densities below Fletcher's Dam, 1985-2000.

	Tucannon River		Redds below Fletcher's Dam			
Year	Total Redds	Estimated Escapement[a]	Total	(%)	Redds/km	Redds/Mile
1985	0	0	0	(100)	0	0
1986	0	0	0	(100)	0	0
1987	16	48	16	(100)	1.9	3.1
1988	26	78	26	(100)	3.1	5.0
1989	48	144	48	(100)	5.8	9.3
1990	61	183	61	(100)	7.3	11.8
1991	50	150	50[b]	(100)	6.0	9.7
1992[c]	23	69	21	(91)	2.5	4.1
1993	28	84	21	(75)	2.5	4.1
1994	25	75	25	(100)	3.0	4.8
1995	29	87	28[d]	(97)	3.4	5.4
1996	43	129	31	(72)	4.3	6.9
1997	27	81	24	(89)	3.3	5.4
1998	40	120	38	(95)	5.3	8.5
1999	21	63	18[d]	(86)	2.5	4.0
2000	19	57	15	(79)	2.1	3.3

[a] Estimate derived using three fish per redd.
[b] We observed several other redds during the last survey that were not counted because of high turbidity and uncertainty whether they had been counted before. Thus, this should be considered a minimum estimate.
[c] Fletcher's Dam, identified as a passage barrier, underwent modification to improve fish passage in 1992 (Mendel et al. 1994).
[d] We were unable to survey after the peak of spawning because of high water and turbidity. This should be considered an incomplete estimate.

Table 14. Date, number of redds, live fish, and carcasses found during fall chinook spawning surveys on the Tucannon River in 2000. (Jacks are included with males.)

			Carcasses	
Week Beginning	**Redds**	**Live Fish**	**Females**	**Males**
10-30	2	0	0	3
11-06	4	8	0	1
11-13	7	8	2	2
11-20	1	0	1	2
11-27	3	1	0	0
12-04	2	2	2	1[a]
12-11	0	0	4	0
Totals	**19**	**19**	**9**	**9**

[a] Only the backbone and tail from an adult were recovered.

The eighteen carcasses recovered in 2000 included three unmarked, fourteen hatchery origin fish, and one adult with only skeletal remains. All of the carcasses were found below Fletcher's Dam. Results from scale samples indicate that two of the unmarked fish were 4-year old wild fish and the third was a 3-year old wild fish. Snouts were collected on all adipose fin-clipped fish to recover the CWTs. LFH/Snake River origin fish accounted for nine of the hatchery origin carcasses recovered. Eight of those hatchery fish were from yearling releases (seven from LFH on-station and one from the Captain John site). The ninth LFH/Snake River origin fish was from an on-station subyearling release at LFH. The five remaining hatchery fish were all determined to have originated from the Umatilla Hatchery based on fin clips and CWTs. Of the sampled eighteen carcasses, 27.8% of the fish were of Umatilla origin. This is nearly a two-fold increase from what we have observed in the last two years; 14.2% Umatilla component in 1999 and 12.5% in 1998.

The WDFW no longer participates in cooperative spawning surveys upstream of LGR Dam. Personnel from Idaho Power and the USFWS jointly survey spawning grounds in the upper Snake, Grande Ronde, and Imnaha Rivers (Garcia et al. 2001). Personnel from the NPT conduct spawning surveys in the Clearwater and Salmon Rivers (Bill Arnsberg, personal communication). Spawning surveys in the tail races below the four dams on the Snake River have not occurred since 1997 (Bob Mueller, personal communication). For more information regarding previous spawning in tail races, refer to Dauble et al. 1999.

Juvenile Salmon Emigration

In 2000, WDFW used PIT tags to study the emigration timing and success of wild fall chinook from the Tucannon River. The tags allowed us to identify the characteristics of successful

smolts. Approximately 100 fish were desired for each week's tagging. No fish were killed during PIT tagging. For 2000, we tagged 557 wild origin fall chinook over a 6-week period (Table 15). PIT tag retention was estimated at 100% at time of release.

All fish tagged were 57 mm in length or larger. Larger fish appeared to be more successful migrants since they were detected more frequently (or at a higher rate) than smaller fish. Fish that were tagged later appeared to migrate faster downstream. Fish tagged earlier in the migration may have reared in the mainstem Snake River before completing their migration.

Table 15. Cumulative detection (one unique detection per tag code) and mean travel day summaries of PIT tagged wild fall chinook salmon released from the Tucannon River smolt trap at downstream Snake and Columbia River dams in 2000.

Release Data				Recapture Data									
		Mean		Mean	LMJ		MCJ		JDJ		BONN		Total
Date	N	Length	SD	Length	N	TD	N	TD	N	TD	N	TD	N (%)
5/11-5/13	79	76.2	8.5	80.0	14	33.1	8	42.8	2	34.8	1	46.0	25 (31.6)
5/18-5/19	91	77.7	9.8	79.5	24	17.8	15	25.3	4	31.2	1	19.1	44 (48.4)
5/25	102	83.5	10.8	86.1	23	17.3	17	30.0	2	33.0	2	21.8	44 (43.1)
5/31	107	79.2	9.6	81.7	19	33.5	15	36.1	3	36.0	0	---	37 (34.6)
6/07-6/08	100	85.3	10.5	87.7	16	31.3	21	35.1	1	42.0	1	17.9	39 (39.0)
6/15-6/16	78	93.2	10.6	99.2	19	21.2	5	25.6	0	---	0	---	24 (30.8)
Totals/Mean	**557**	**82.4**	**11.3**	**85.0**	**115**	**24.6**	**81**	**32.5**	**12**	**34.0**	**5**	**23.6**	**213 (38.2)**

Note: mean travel times listed are from total number of fish detected at each dam, not unique recoveries for a tag code. Abbreviations are as follows: LMJ-Lower Monumental Dam, MCJ- McNary Dam, JDJ-John Day Dam, Bonn-Bonneville Dam, SD- standard deviation, TD- Mean Travel Days.

Summary of Fall Chinook Run Size and Composition

Return to IHR Dam

Again, in 2000, the counts at IHR Dam did not accurately estimate the run size of Snake River upriver bright fall chinook. An estimated 16,456 fall chinook passed IHR Dam in 2000 (US Army Corps of Engineers, 2000). Of those, 2,391 (14.5%) fish voluntarily returned to LFH; 10,824 (65.8%) escaped to LGR Dam and an estimated 57 (0.3%) spawned naturally in the Tucannon River. The remaining 3,184 fall chinook were not accounted for. This is less than the 27-56% estimated losses (missing fish) above IHR in 1992-1999. Possible disposition of missing fish includes fall back at IHR Dam (Mendel et al. 1993), mortality, or spawning in tributaries or tailraces of the lower Snake River dams. Mendel documented that dip-in chinook from the Columbia River have been inflating the IHR Dam counts, and likewise the estimate of Snake River fall chinook. Counts at IHR Dam should not be used in estimating the number of Snake River fall chinook. The fish count data reported here are for daytime counts only.

Return to LFH

In 2000, voluntary returns to LFH numbered 2,391 fish, representing 14.5% of the estimated escapement over IHR Dam. This was the smallest percentage estimated to have voluntarily entered LFH since 1993. We have only been able to estimate the percent escapement to LFH from IHR Dam since 1993 when broodstock trapping there ceased. The increasing numbers of fish swimming past LFH is not surprising. In 1996 we had the first acclimated release of LF origin fall chinook above Lower Granite Dam. Since that time, the numbers of fish released above LGR Dam have increased, thus changing the escapement percentage of fish to LFH.

Of the 2,391 fish volunteering into the LFH fish trap, 12 were handled, hauled, and released above LGR Dam at Chief Timothy Park on the Snake River (Rk 210.3). Based on VIE data, 4 of these fish came from the Big Canyon Acclimation site, another 4 from the Pittsburg Landing site, and the last 4 from the Captain John acclimation facility. The hauling of these fish was requested by the NPT. These fish were not reported to the Regional Mark Information System (RMIS) because they were returned to the stream. These fish will be included in the following stock composition.

Of the 2,391 fish handled as volunteers into LFH, 109 were probably hauled from LGR Dam but, we were unable to determine which fish they were. Therefore, return composition will be based on 2,391 fish processed (Appendix B). Of the 2,391 fish processed, 2,233 fish (93.4%) were LFH/Snake River origin. The majority (93.5%) of LFH/Snake River origin returns came from on-station releases at LFH.

Only 50 of the fish (2.1%) processed were strays from other hatcheries. The majority (90%) of strays processed were from hatchery releases in the Umatilla River (15 fish with CWTs and 30 fish with ventral fin clips or BWTs). There were an additional 3 fish with BWTs and no fin clips. Both Umatilla and Klickitat hatcheries released fish with this mark. Since there were no recoveries of CWTs from Klickitat Hatchery releases which had associated BWT groups, we assumed all BWT recoveries in 2000 were from Umatilla Hatchery. Therefore, Umatilla Hatchery strays actually made up 96% of the stray fish processed. Strays also included 1 fish from Trinity River (California) and one spring chinook from the Imnaha River.

There were 65 fish processed that were of unknown hatchery origin. Also, there were 43 unmarked fish processed. Scale samples were collected from 11 of these fish. Results indicated 10 were of natural origin, and 1 had unreadable scales. We were unable to determine origin for the remaining 32 unmarked fish.

Return to LGR Dam and Composition of Fish Hauled to LFH from LGR Dam

In recent years, WDFW has estimated the Snake River fall chinook run composition, in part, using CWTs and BWTs from marked hatchery salmon collected at LGR Dam and spawned at LFH. In 2000, NMFS was assigned the task of generating the run reconstruction for LGR Dam. At the time this report was printed, the run reconstruction report was not finalized. Details regarding run composition of the total run to and above LGR Dam will be presented in a subsequent report. The following section of this report will present a brief account of escapement to LGR Dam and the final composition of fall chinook processed at LFH that were hauled from Lower Granite Dam.

The 2000 daytime count of fall chinook at LGR Dam (August 18 to December 15) was 3,694 adults, 7,130 jacks, and an undetermined number of mini jacks (< 30 cm; U.S. Army Corps of Engineers 2000). During night counts an additional 133 adults and 396 jacks were observed, resulting in a total of 3,827 adults and 7,529 jacks reaching LGR Dam. The adult count was higher than for all other years since 1976 (Figure 6).

Based solely on expansions of CWT recoveries from fish hauled from LGR Dam, we have attempted to estimate a minimum number of strays to LGR Dam. Please refer to Appendix B, Table 2 for the expanded recoveries. We estimated 258 stray fish arrived at LGR Dam, resulting in a minimum stray rate of 2.3% (258/11,356). The strays were primarily from releases in the Umatilla (64.3%) and Klickitat (16.7%) Rivers. Please use this data cautiously because it will change when the run reconstruction is finalized.

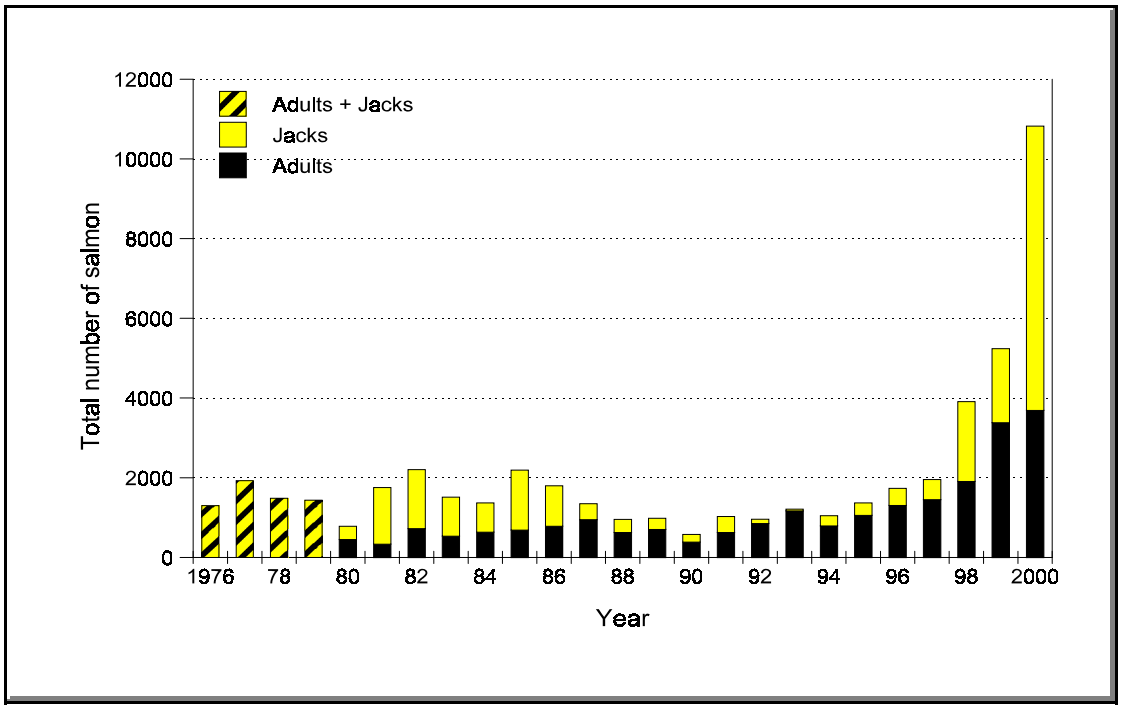

Figure 6. Fall chinook counts at LGR Dam, 1976-2000.

WDFW personnel hauled 2,561 fish from LGR Dam to LFH. There were 109 fish which were not recognized as being hauled from LGR Dam at processing. These fish were probably included and processed as volunteers. Thus, at processing, 2,452 fish were recognized as being hauled from LGR Dam. There were an additional 272 fish collected at LGR Dam which were sacrificed for CWT analysis. These fish had no external marks but had wire in the snout. It was expected that the majority of these would be upstream acclimated fish from the NPT. The no-clip plus wire fish were collected as a unique group from which we read 51% of the CWTs to determine origin. These fish were included with the hauled fish to determine composition.

Of the 2,724 fish analyzed (2,452 hauled + 272 sacrificed), 2,462 fish (90.4%) were LF origin (Appendix B). The majority of LFH/Snake River origin fish processed, 1,253 fish (50.9%), came from on-station releases at LFH.

Only 199 of the fish (7.3%) processed were strays from other hatcheries. The majority of strays processed came from Umatilla Hatchery (83.4%, 41 fish with CWTs and 125 with ventral clips or clips plus BWTs). Included in the strays are 26 fish which were BWT only fish. As was explained for volunteers, all BWTs were assumed to be Umatilla origin. Thus, fish released in the Umatilla River actually represent 96.5% of the strays processed. Identified strays also included 1 fish from NMFS research/Pittsburg, 2 from Klickitat Hatchery, 1 from Ringold Hatchery, 1 from the Klamath River (California), 1 late chinook from the Little White Salmon River, and 1 spring chinook from the Imnaha River.

There were 53 fish processed that were of unknown hatchery origin. There were also 3 unmarked fish processed that were accidently hauled from LGR. One of the unmarked fish was of natural origin based on scale analysis. The other two were of unknown origin. There were also 7 fish which were disposed of before any data could be collected.

Status of Mitigation Requirements

We estimate that 4,498 fall chinook adults and 3,681 jacks of Lyons Ferry origin returned to the Snake River in 2000; well below the 18,300 adults which are required by mitigation. Included in the return are fish released at LFH and acclimation facilities above LGR Dam. These estimates are based upon CWT recoveries at LFH and the preliminary run reconstruction for 2000 (Sands 2001). This is a preliminary estimate which will change when the final run reconstruction is completed.

Conclusions and Recommendations

The fall chinook program at LFH is unique in that there are multiple co-managers involved. The program is currently being managed to meet the requests of Tribal, state, and federal agencies. Conclusions and recommendations listed below are not in order of importance.

1. Bird predation is of utmost concern at LFH. In 2000, approximately 128,000 fish from Lake 2 were consumed by an assortment of gulls, terns, herons, and kingfishers. This estimated 25% loss due to avian predation occurred between tagging and release. In 2001, yearling fall chinook at LFH experienced an estimated 25% loss from tagging to release due to avian predation. Loss was calculated based upon similar losses of steelhead in an earthen pond located next to the fall chinook pond.

   Recommendation: pursue more aggressive hazing to deter/decrease the avian predation before tagging occurs in September.

2. LFH is currently raceway-limited due to the raising of subyearling and yearling salmon for production and research purposes. The small groups of fish requested for transfer need to be kept separate, which increases the number of raceways needed. In the spring of 2001, three raceways of yearling fall chinook were transferred ahead of schedule to Captain John because of the need for more raceway space at LFH. While waiting for Captain John to come on line, the density index in several raceways at LFH exceeded the maximum of 0.18 for fall chinook. The formula for the calculation of density index is described in Piper et al. 1986. As it is, LFH has a very strict ponding schedule and any delays associated with transferring fish off-station can compromise the health of the remaining on-station fish.

   Recommendation: pursue additional funding to build additional raceways or rearing ponds at LFH. This would allow LFH more flexibility when ponding/splitting and thus benefit the health and welfare of the fish reared on-station. Also, LFH staff may need to reconsider using the adult fall chinook holding pond for temporary juvenile rearing to reduce crowding. Reduction in production levels may be another option.

3. Big Canyon, Pittsburg Landing, and Captain John facilities, and Oxbow Hatchery, all located above LGR Dam, are currently acclimating fish near maximum capacity. There needs to be an additional outlet for the abundance of fish (yearlings and subyearlings) we could produce at LFH in the future. Currently, nothing is known about the effectiveness of a direct stream release of subyearling salmon into the Snake River.

   Recommendation: continue to propose a direct stream release of subyearlings paired with the release of subyearlings out of Captain John acclimation facility to compare survival between release strategies.

Recommendation: Encourage IDFG and Idaho Power Company to aggressively develop Oxbow Hatchery for future chinook releases.

4. Bacterial Kidney Disease continues to be a problem. In 2000 as a preventative measure, eggs from 16 females with low to high ELISA results were destroyed. The remaining brood of production fish continue to have BKD problems.

   Recommendation: look at ways to reduce the incidence of BKD at LFH. For example: changing ponding schemes, density indexes, transfer times, treatment types, etc.

5. Smolt-to-adult returns using CWT recovery data have not been summarized since 1989 for comparison between release years.

   Recommendation: summarize the adult returns for LFH origin fall chinook beginning with the 1990 brood released at LFH and include in a future (2001) report.

6. A comprehensive look at the effectiveness of the release sites to return fish to the Snake River has not been completed.

   Recommendation: complete a cooperative report with fall chinook co-managers in the Snake River basin to determine the effectiveness of programs to meet LSRCP goals and assess the success of each release site by looking at smolt-to-adult survivals.

7. ATPase and Cortisol samples have been collected at LFH since 1995. This data needs to be compiled and summarized to fully understand its value in release strategies.

   Recommendation: Discontinue ATPase and Cortisol sampling until the existing data has been summarized in an upcoming (2002) report.

8. A comprehensive comparison of sex and age composition of returning fish from subyearling vs. yearling releases has not been done because most of our production between 1990 and 1996 consisted of yearling releases.

   Recommendation: Summarize adult and jack return data by release type to evaluate age and sex composition.

9. Some broodyears are dominated by large returns of jacks.

   Recommendation: Examine the size, time, and type of release that may be causing excess jacks.

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Appendix A: LFH Fall Chinook Broodstock Collection and Spawning Protocol, 2000

2000

LGR Trap Operations

The fall chinook salmon passage period at Lower Granite (LGR) Dam is August 18 to December 15. The National Marine Fisheries Service (NMFS) operates the adult trap at the dam, and from August 18 to November 30, collects hatchery fall chinook for transport by WDFW to Lyons Ferry Hatchery (LFH). Trapping may continue after November 30 if marked salmon continue to arrive at the dam.

Trapped fall chinook will be anesthetized and examined to detect marks present. Adults and jacks with left red visible implant elastomer (VIE) tags will be collected and returned to LFH because production there is broodstock limited (mini-jacks, # 30 cm, will be passed upstream). Fish that are not marked with VIE, but that are wire tagged (CWT or BWT), fin clipped (adipose or ventral), or wire tagged and fin clipped, are considered to be of unknown origin and will be collected and taken to LFH. Fish to be transported to LFH will be given one right-side opercle punch, and hauled in a 5,229 L aerated non-refrigerated tank truck at least three times a week, or more frequently if necessary.

In the event that the fish on hand, and the number anticipated, exceed the trap's holding capacity, NMFS personnel will pass left red VIE marked fish (adults and jacks) to reserve space to accommodate strays. Left red VIE marked fall chinook passed upstream will be given two right-side opercle punches to help track recapture/fallback events. Fall chinook with green or blue elastomers originated from acclimation pond releases above LGR and will be passed upstream.

LFH Trapping

Salmon that volunteer to LFH will be transferred to the holding pond every day to reduce stress to fish. Voluntary and LGR Dam captured salmon will be held separately at LFH to document broodstock composition from each capture location. The hatchery will trap salmon from September 1 until early to mid-December.

Spawning Groups

Salmon at LFH will be checked for the presence of wire tags and external marks. All salmon will be electronically sampled. Salmon will be accounted for and mated in two distinct groups:

Strays

Salmon of unknown origin will be spawned together as "strays." Unless a fish has a VIE tag (red, blue, green) behind the eye, we will initially assume that it is a stray. Salmon with ventral fin clips, whether wire tagged or not, will be assumed to be of Umatilla origin. These fish will

be automatically mated as strays. Likewise, untagged salmon with no external marks or fin clips will be categorized and mated as strays. But, to recover eggs from LFH/Snake River origin fish missing a VIE tag, all salmon with adipose clips and wire tags in the snout will have the CWT read before mating. Fertilized eggs or fry from strays will be transferred to Klickitat Hatchery for release outside the Snake River basin.

LFH/Snake River Origin

Salmon that have red, green, or blue VIE tags behind the eye will be assumed to be of LFH/Snake River origin and their gametes will be mated before reading the CWT. Later, CWTs will be read from a subsample (50%) of left red VIE fish (adults and jacks) and all blue or green VIE tagged fish to verify origin and determine age.

This is the first year of returns for LFH/Snake River origin fish released by the NPT with a CWT in the snout and no associated fin clips. These fish will primarily be jacks and thus a small portion of them may be included in the spawning population. If, by random sample, we decide to use one of these fish in spawning, the wire will be read to confirm origin prior to mating. The remaining fish with this mark/tag will be subsampled at 50% for CWT analysis.

Spawning

At processing, salmon will be numbered to allow fish to be identified and accounted for individually. All fish will be sampled for length, fin clips and tags. Weights will be collected from 20 males and 20 females per spawn day.

Salmon of LFH/Snake River origin will be spawned together and kept separate from other groups. We will use single pair matings, with semen from a back-up male whenever possible for all salmon spawned. Our goal is to ensure that semen from many different males (including jacks) are used for matings of known LFH/Snake River origin salmon. Accordingly, no male should be used more than twice as the primary male. We do not anticipate live spawning males in 2000.

Semen from jacks (<49 cm fork length) will be used for fertilizing eggs to take advantage of genetic diversity and increase genetic contribution across all age classes. Our primary interest in the use of jacks is for matings of known LFH/Snake River origin salmon. However, we will ensure jacks are used to some extent in other mating groups as well. The goal each week, depending on jack abundance, is to have jacks contribute to 10-25% of the LFH/Snake River origin matings. Jacks will be selected without regard to fish size, and mated at random.

Procedures for sub-sampling left red (LR) VIE tagged fish and fish with no fin clips which have wire.

Pond Mortalities

Hatchery staff will sample all pond mortalities for external marks, wire tags, sex, and length. This data will be recorded on head labels provided by Snake River Lab (SRL). Pond mortalities will need to be separated and bagged into the following groups:

1. LR or no clip plus wire-Volunteers
2. all other Volunteers
3. LR or no clip plus wire-Lower Granite
4. all other Lower Granite

SRL staff will pick up and process all snouts from pond mortalities. In addition, SRL staff will randomly select 50% of the LR snouts, and 50% of the no-clip plus wire snouts for CWT recovery. Head labels will be handled in one of the following two ways:

1. Head labels from snouts that are not slated to have the CWT/BWT read will have their data transferred to a form titled "LR or no-clips plus wire - Snout Not Taken". Database entry will occur from the form.

2. Head labels from snouts that will have the CWT/BWT read will be kept with the snout and data will be recorded on blue Hatchery Mark Recovery forms (labeled "LR VIE or no-clips plus wire - 50% wire read"). The BWT data will be kept on a separate form.

Snouts from all other big bags will have the CWT/BWT recovered and read. Data from these will be recorded on blue hatchery mark recovery forms (labeled non-LR VIE, 100% wire read). The BWT data will be kept on a separate form.

Spawning

SRL staff will sample all fish for external marks, wire tags, length, and sex. Data for all fish will be recorded on a head label. Samplers will remove the snout from every other (50%) LR fish and every other no clip plus wire. Fish with left or right ventral fin clips and wire will be assumed to be of Umatilla origin with a BWT. These fish will not have their wire dissected or read. Fish with other marks which have wire will have their snouts removed and 100% of their CWT/BWT read. All fish will be processed without regard to sex, size, or disposition (spawned and used or not used; or killed outright).

Weights will be collected from: 10 Lower Granite males (including a percentage of jacks), 10 Lower Granite females, 10 volunteer males (including a percentage of jacks) and 10 volunteer females. Scales will be collected from all fish that are unmarked without wire.

Incubation

Fertilized eggs from each female of LFH/Snake River origin will be incubated in individual trays. Each tray of eggs will be labeled with the female identification number. Eggs from unknown origin females may be pooled (eggs from several females in one incubation tray) within their respective mating groups.

SRL personnel will assist hatchery personnel with egg picking and counting at eye-up. Fecundity will be documented for a portion of the known Lyons Ferry origin females spawned. Each age class will have 7 fish evaluated per spawn day, plus an additional 7 fish from subyearling releases. Lengths will be proportioned for each age class by week then selected according to category (i.e., 50-60 mm). We will enumerate loss, then count and weigh 100 live eggs. The total lot of live eggs will also be weighed and the average weight per egg applied to yield total number of live eggs. This estimate will be decreased by 4% to compensate for excess water. The number of live and dead eggs will be combined to estimate total fecundity for that fish. Eggs from several females will then be grouped into one tray, usually in batches of 5,000. Eggs or fry from females with moderate or high bacterial kidney disease (BKD) ELISA levels will not be mixed with eggs of low or below low levels. Progeny from high and moderate BKD ELISA females will be ponded together to prevent the spread of BKD or destroyed. Progeny with high and moderate BKD ELISA may be incorporated into subyearling releases to prevent holding these fish at the hatchery for an extended period.

Appendix B: LFH/Snake River Origin Fall Chinook Releases Table

(Numbers presented do not match hatchery records for fish per pound because of reporting constraints put on the hatchery. Included are releases from 1994-2001.)

Appendix B; Table 1. LFH/Snake River origin fall chinook releases with number marked (adipose clipped), tagged (coded wire tag [CWT]), and unmarked by release year and type, April 1994-April 2001.

Release Year / Age (Brood Year)	Release		Number CWT	CWT Code[b]	Adipose Only Marked	Number Unmarked	Lbs	Fish /Lb	Other Marks			
	Type[a]	Date							Type	Location	Color	% Loss
1994												
yearling (92)	direct	4/18	53,276	52/24	53	168	4,863	11.0	VIE	behind left eye	red	2.5
			49,248	49/20	49	155	4,496	11.0	"	"	"	2.5
			51,702	49/18	312		4,709	11.0	"	"	"	4.0
			51,702	49/17	312		4,709	11.0	"	"	"	4.0
			51,258	49/15	273		4,685	11.0	"	"	"	3.2
			51,168	49/12	273		4,676	11.0	"	"	"	3.2
			308,354		1,272	323	28,138					
		4/19	50,481	47/63	1,831	104	4,765	11.0	VIE	behind left eye	yellow	7.0
			51,160	47/60	726		4,717	11.0	"	"	"	3.8
			51,091	52/29	1,149		4,733	11.0	"	"	"	4.8
			51,260	52/27	413		4,707	11.0	"	"	"	5.6
			51,316	47/58		104	4,684	11.0	"	"	"	5.6
			33,736	52/63	135	206	3,074	11.0	"	"	"	3.9
			289,044		4,254	414	26,680					

Appendix B; Table 1 (continued).

Release Year Age (Brood Year)	Release		Number CWT	CWT Code[b]	Adipose Only Marked	Number Unmarked	Lbs	Fish /Lb	Other Marks			
	Type[a]	Date							Type	Location	Color	% Loss
1995												
yearling (93)	direct	4/17	73,986	56/40	484	346	9,237	8.0	VIE	behind left eye	red	8.1
			101,165	51/63	300		13,529	7.5	"	"	"	4.1
			82,624	56/39	39	195	10,761	8.0	"	"	"	4.5
			89,900	51/62	85		11,378	8.0	"	"	"	7.2
			347,675		908	541	44,905					
1996												
fry (95)	direct	3/1-31				83,183	186	500				
yearling (94)	Lake 2[c]	4/9-12	196,604	58/44	196	197	18,762	10.5	VIE	behind left eye	red	10.2
			206,860	58/45	206	207	19,740	10.5	"	"	"	"
	Ice Harbor[d]	4/8	3,230	58/44 &	3		308	11.0	"	"	"	"
			406,694	58/45	405	404	38,996					
	Pittsburg	4/12-15	113,977	57/12	64	258	11,108	10.3	VIE	behind right eye	blue	17.9

Appendix B; Table 1 (continued).

Release Year Age (Brood Year)	Release		Number CWT	CWT Code[b]	Adipose Only Marked	Number Unmarked	Lbs	Fish /Lb	Other Marks			
	Type[a]	Date							Type	Location	Color	% Loss
1997												
yearling (95)	Lake2	4/4-26	217,794	63/20	872	9,714	24,583	9.3	VIE	behind left eye	red	12.8
			217,810	63/21	872	9,714	24,585	9.3	"	"	"	"
			435,700		1,744	19,428	49,168					
	Pittsburg	4/14-17	67,252	59/57	1,335	4,968	6,876	10.7	VIE	behind right eye	green	27.1
			67,441	59/58	1,338	4,982	6,895	10.7	"	"	"	"
			134,693		2,673	9,950	13,771					
	Big Canyon	4/14-17	71,692	59/59	992	902	7,138	10.3	VIE	behind left eye	green	11.7
			73,110	59/60	1,012	920	7,279	10.3	"	"	"	"
		5/14-15	29,341	59/53	698	3,529	2,894	11.6	"	"	blue	10.4
			610	60/24	14	73	60	11.6	"	"	"	"
			14,428	60/25	343	1,735	1,423	11.6	"	"	"	"
			189,181		3,059	7,159	18,794					
subyearling (96)	Big Canyon	6/10-13	119,824	51/20	1,816	7,897	2,028	63.9	BWT	left cheek		
			113,932	53/16	1,727	7,509	1,928	63.9	"	"		
			233,756		3,543	15,406	3,956					
1998												
yearling (96)	Lake2	4/3-16	208,388	63/18	3,444	1,854	21,157	10.1	VIE	behind left eye	red	15.7
			200,215	01/63	3,309	1,782	20,327	10.1	"	"	"	"
			408,603		6,753	3,636	41,484					
	Pittsburg	4/13-16	67,671	04/46	848	2,119	7,164	9.9	VIE	behind right eye	green	6.7
			68,187	04/48	854	2,135	7,218	9.9	"	"	"	"
			135,858		1,702	4,254	14,382					

Appendix B; Table 1 (continued).

Release Year Age (Brood Year)	Release Type[a]	Release Date	Number CWT	CWT Code[b]	Adipose Only Marked	Number Unmarked	Lbs	Fish /Lb	Other Marks Type	Location	Color	% Loss
1998 continued												
yearling (96)	Big Canyon	4/13-16	15,367	61/26	264	56	1,646	9.5	VIE	behind left eye	green	9.4
			7,980	63/43	137	29	855	9.5	"	"	"	"
			23,738	63/47	407	87	2,543	9.5	"	"	"	"
			11,901	01/10	984	222	436	30.0	"	"	"	3.2
			58,986		1,792	394	5,480			"		
	Captain John	4/9-15	6,798	03/63	82	47	637	10.9	VIE	behind left eye	blue	19.2
			1,438	04/01	17	10	135	10.9	"	"	"	"
			60,527	63/45	728	419	5,670	10.9	"	"	"	"
			61,965	63/46	745	429	5,804	10.9	"	"	"	"
			130,728		1,572	905	12,246			"		
1999												
yearling (97)	Lake2	3/25-4/13	423,772	08/60	2,026	6,368	51,881	8.3	VIE	behind left eye	red	14.9
	Pittsburg	4/12-15	134,983	04/51	3,401	4,501	14,238	10.0	VIE	behind right eye	green	17.2
	Big Canyon	4/12-15	150,648	04/54	1,241	1,333	14,761	10.4	VIE	behind left eye	green	11.2
		4/26-28	75,332	09/38	603	451	6,854	11.1	"	"	"	2.4
			225,980		1,844	1,784	21,615			"		
	Captain John	3/25-4/15	154,750	04/53	816	1,444	13,292	11.8	VIE	behind left eye	blue	18.9

Appendix B; Table 1 (continued).

Release Year Age (Brood Year)	Release Type[a]	Release Date	Number CWT	CWT Code[b]	Adipose Only Marked	Number Unmarked	Lbs	Fish /Lb	Other Marks Type	Location	Color	% Loss
1999 continued												
subyearling (98)	direct	6/15	198,594	10/26	1,301	4,299	4,171	50.1				
	Big Canyon	6/2-3	n/a	10/25	n/a	198,496	2,370	83.8	CWT-only was intended mark (1.6% CWTloss)			
			n/a	n/a	n/a	148,609	1,775	83.8	No fish marked or tagged			
						347,105	4,145					
	Captain John	5/26-6/5	n/a	n/a	n/a	322,928	3,930	82.2	No fish marked or tagged			
2000												
yearling (98)	Lake2	3/24-4/14	442,113	12/13	2,971	11,317	48,699	9.2	VIE	behind left eye	red	10.6
	Pittsburg	4/11-13	133,411	12/12	1,298	0	14,017	9.6	VIE	behind right eye	green	16.8
	Big Canyon	4/11-13	130,032	10/12	743	531	12,476	10.5	VIE	behind left eye	green	12.4
	Captain John	4/1-12	131,048	10/13	138	138	16,010	8.0	VIE	behind left eye	blue	13.1

Appendix B; Table 1 (continued).

Release Year Age (Brood Year)	Release Type[a]	Release Date	Number CWT	CWT Code[b]	Adipose Only Marked	Number Unmarked	Lbs	Fish /Lb	Other Marks Type	Location	Color	% Loss
2000 continued												
subyearling (99)	direct	5/26	188,047	01/67	2,513	6,083	4,326	45.5				
	Pittsburg	5/24-26	n/a	n/a	n/a	400,156	7,197	55.6	No fish marked or tagged			
	Big Canyon	5/30-6/1	n/a	n/a	n/a	497,790	12,368	40.2	No fish marked or tagged			
		6/20-26	n/a	n/a	n/a	392,684	8,726	45.0	"	"	"	
						890,474	21,094					
	Captain John	5/20-31	n/a	01/68	n/a	198,083	4,363	45.4	CWT-only was intended mark (2.4% CWT loss			
			n/a	n/a	n/a	292,950	6,453	45.4	No fish marked or tagged			
		6/15-23	n/a	01/69	n/a	199,420	3,835	52.0	CWT-only was intended mark (2.4% CWT loss			
			n/a	n/a	n/a	202,394	3,892	52.0	No fish marked or tagged			
						892,847	18,543					
2001												
yearling (99)	Lake2	4/1-20	326,669	04/76	1,648	10,440	38,938	8.7	VIE	behind left eye	red	7.2
	Pittsburg	4/10-12	102,980	04/79	0	761	9,949	10.4	VIE	behind right eye	green	13.2
	Big Canyon	4/9-11	112,933	04/77	188	94	11,107	10.2	VIE	behind left eye	green	5.4
	Captain John	4/4-13	100,461	04/78	505	1,010	10,072	10.1	VIE	behind left eye	blue	11.1

Appendix B; Table 1 (continued).

Release Year Age (Brood Year)	Release Type[a]	Release Date	Number CWT	CWT Code[b]	Adipose Only Marked	Number Unmarked	Release Lbs	Release Fish/Lb	Other Marks Type	Other Marks Location	Other Marks Color	Other Marks %Loss
2001 continued												
subyearling (00)	barged[e]	6/1	188,085	02/70	1,534	10,357	4,376	45.7				
	direct[f]	7/03	n/a	n/a	n/a	3,994	77	52.2	No fish marked or tagged			
	Pittsburg	5/28	n/a	02/72	n/a	197,182	2,344	84.1	CWT only was intended mark (1.4% CWT loss)			
			n/a	n/a	n/a	176,888	2,104	84.1	No fish marked or tagged			
						374,070	4,446					
	Big Canyon	5/29	n/a	02/71	n/a	196,507	3,687	53.3	CWT only was intended mark (1.5% CWT loss)			
			n/a	n/a	n/a	303,099	5,688	53.3	No fish marked or tagged			
		6/13	n/a	n/a	n/a	357,362	4,569	78.2	No fish marked or tagged			
						856,968	13,944					
	Captain John	5/26	n/a	n/a	n/a	501,129	10,129	49.5	No fish marked or tagged			
Below Hells Canyon Dam[g]		5/16	n/a	n/a	113,801	n/a	2,709	42.0	Adipose clip only was intended mark			
		6/19	n/a	n/a	1,450	n/a	63	23.0	Adipose clip only was intended mark			
					115,251							

Appendix C: Mean Fork Length, Standard Deviation, Sample Size, and Range for Returning LFH/Snake River Origin Fall Chinook Salmon Released as Subyearlings and Yearlings

Appendix C; Table 1. Mean (cm) fork length, (SD), sample size, and range for returning LFH/Snake River origin fall chinook salmon released as subyearlings. (All release locations are included.)

Recovery Year	Sex	Brood Year[a] 1998	1997	1996	1995	1994
1996	male					
	female					
1997	male					
	female					
1998	male			**46.0** (4.7) 69 35-58		
	female			- (-) 0 -		
1999	male			**60.7** (8.1) 146 44-89		
	female			**68.9** (3.9) 45 60-76		
2000	male	**46.0** (4.4) 635 34-64		**79.1** (11.4) 37 57-94		
	female	**-** (-) 0 -		**79.4** (6.4) 101 59-91		

[a] There were no subyearling groups released for brood years 1993, 1994, 1995 or 1997.

Appendix C; Table 2. Mean (cm) fork length, (SD), sample size and range for returning LFH/Snake River origin fall chinook salmon released as yearlings. (All release locations are included.)

Recovery Year	Sex	Brood Year 1998	1997	1996	1995	1994
1996	male					**33.7** (2.2) 380 24-47
	female					- (-) 0 -
1997	male				**33.6** (2.1) 434 27.5-40	**49.6** (4.6) 402 28-68
	female				- (-) 1 70	- (-) 0 -
1998	male			**35.1** (4.8) 138 22-72	**52.3** (5.3) 1775 33-73	**69.7** (9.6) 289 45-97
	female			- (-) 1 34	**57.8** (4.7) 143 48.5-77.5	**72.9** (6.0) 300 49-90.5
1999	male		**52.0** (4.8) 368 30-49	**52.8** (5.5) 394 37-70	**69.5** (8.8) 571 35-95	**85.5** (11.9) 43 50-104
	female		- (-) 0 -	**60.1** (5.0) 14 49-70	**72.3** (5.3) 741 53-86	**84.1** (6.0) 96 64-96
2000	male	**36.4** (2.6) 412 28-44	**58.5** (5.2) 1066 34-72	**70.9** (7.3) 191 55-95	**86.8** (11.0) 99 59-110	- (-) 1 86.0
	female	- (-) 0 -	**64.4** (3.7) 110 54-74	**76.4** (4.9) 293 54-89	**81.4** (6.0) 249 58-94	**91.3** (0.6) 4 91-92

Appendix D: Coded-Wire Tag Recoveries at LFH in 2000

*(*VOL=voluntary return to Lyons Ferry Hatchery including data from fish hauled above Lower Granite Dam, LGR=hauled from Lower Granite Dam or sacrificed fish collected at Lower Granite Dam. Release site LFH=Lyons Ferry Hatchery, CJ=Captain John Rapids acclimation site on the Snake River, PL=Pittsburg Landing acclimation site on the Snake River, and BC=Big Canyon acclimation site on the Clearwater River. Age Y=yearling release and S=subyearling release.)

Appendix D; Table 1. Expanded recoveries of CWTs from adipose clipped LFH/Snake River origin fall chinook processed at Lyons Ferry Hatchery in 2000. (Yearling fall chinook with red VIE tag released at LFH had 53% of their CWTs read. Estimated (est) compositions of wire "not read" and lost wire were based upon composition of AD+CWT+left red VIE recoveries).

Volunteers			Lower Granite																
Not Read	Lost Est		Not Read	Lost Est							Number AD+CWT	Number CWT Only	Number AD Only	Number [b] Unmarked	Expansion Rate	Expanded Recoveries		
Read	Est	Est	Read	Est	Est	Total	CWT Code	Release Site	Age [a]	Brood Year	T	C	A	U	(T+C+A+U)/T	Vol	LG	Total
113	54	1	115	57	2	342	630163	LFH	Y	96	200,215	1,782	3,309	0	1.03	172	178	350
1			0			1	630363	CJ	Y	96	6,798	47	82	0	1.02	1	0	1
0			17			17	630446	PL	Y	96	67,671	2,119	848	0	1.04	0	18	18
1			17			18	630448	PL	Y	96	68,187	2,135	854	0	1.04	1	18	19
1			31			32	630451	PL	Y	97	134,983	4,501	3,401	0	1.06	1	33	34
9			72			81	630453	CJ	Y	97	154,750	1,444	816	0	1.01	9	73	82
5			14			19	630454	BC	Y	97	150,648	1,333	1,241	0	1.02	5	14	19
856	408	10	177	87	3	1541	630860	LFH	Y	97	423,772	6,368	2,026	0	1.02	1299	272	1571
3			3			6	630938	BC	Y	97	75,332	451	603	0	1.01	3	3	6
9			22			31	631012	BC	Y	98	130,032	531	743	0	1.01	9	22	31
18			99			117	631013	CJ	Y	98	131,048	138	138	0	1.00	18	99	117
1			5			6	631025	BC	S	98	0	195,231	0	151,874	0.0	1	5	6
112			278			390	631026	LFH	S	98	198,594	4,299	1,301	0	1.03	115	286	401
7			35			42	631212	PL	Y	98	133,411	0	1,298	0	1.01	7	35	42
123	59	2	97	48	2	331	631213	LFH	Y	98	442,113	11,317	2,971	0	1.03	190	152	342
1			75			76	635120	BC	S	96	119,824	7,897	1,816	0	1.08	1	81	82
1			61			62	635316	BC	S	96	113,932	7,509	1,727	0	1.08	1	66	67
2	1	0	0	0	0	3	635844	LFH	Y	94	196,604	197	196	0	1.00	3	0	3
1	1	0	2	1	0	5	635845	LFH	Y	94	206,860	207	206	0	1.00	2	3	5
0			2			2	635953	BC	Y	95	29,341	3,529	698	0	1.14	0	2	2
2			12			14	635957	PL	Y	95	67,252	4,968	1,335	0	1.09	2	13	15

[a] Number AD-only applies to fish which were meant to be adipose clipped plus CWT tagged at tagging, which had lost their CWT before release.

[b] Number unmarked refers to fish which were not clipped or tagged. Unmarked for CWT 631025 includes 3,265 fish with lost CWT.

Appendix D; Table 1 (continued).

Volunteers			Lower Granite															
Not Read	Lost Est	Lost Est	Not Read	Lost Est	Lost Est	Total	CWT Code	Release Site	Age	Brood Year	Number AD+CWT T	Number CWT Only C	Number[a] AD Only A	Number[b] Unmarked U	Expansion Rate (T+C+A+U)/T	Expanded Recoveries Vol	LGR	Total
0			13			13	635958	PL	Y	95	67,441	4,982	1,338	0	1.09	0	14	14
0			12			12	635959	BC	Y	95	71,692	902	992	0	1.03	0	12	12
1			7			8	635960	BC	Y	95	73,110	920	1,012	0	1.03	1	7	8
0			2			2	636025	BC	Y	95	14,428	1,735	343	0	1.14	0	2	2
96	46	1	88	43	1	275	636318	LFH	Y	96	208,388	1,854	3,444	0	1.03	147	135	282
68	32	1	80	39	1	221	636320	LFH	Y	95	217,794	9,714	872	0	1.05	106	126	232
68	32	1	81	40	1	223	636321	LFH	Y	95	217,810	9,714	872	0	1.05	106	127	233
0			1			1	636343	BC	Y	96	7,492	138	516	0	1.09	0	1	1
0			18			18	636345	CJ	Y	96	60,527	419	728	0	1.02	0	18	18
2			10			12	636346	CJ	Y	96	61,965	429	745	0	1.02	2	10	12
1			2			3	636347	BC	Y	96	23,738	87	407	0	1.02	1	2	3
1502	**633**	**16**	**1448**	**315**	**10**	**3924**										**2203**	**1827**	**4030**

[a] Number AD-only applies to fish which were meant to be adipose clipped plus CWT tagged at tagging, which had lost their CWT before release.
[b] Number unmarked refers to fish which were not clipped or tagged. Unmarked for CWT 631025 includes 3,265 fish with lost CWT.

Appendix D; Table 2. Expanded recoveries of CWTs from adipose clipped stray origin hatchery salmon processed at Lyons Ferry Hatchery in 2000. (Recoveries are of fall chinook unless otherwise noted).

Vol	LGR	Total	CWT Code	Release Location	Brood Year	Number AD+CWT T	Number[a] AD-Only A	Number[b] Unmarked U	Expansion Rate (T+A+U)/T	Expanded Recoveries Vol	LGR	Total
1	0	1	065241	Trinity River, CA	97	313,080	5,157	589,363	2.90	3	0	3
1	1	2	071320	Umatilla River	95	30,015	250	273,538	10.12	10	10	20
0	1	1	071322	Umatilla River	95	29,646	796	236,471	9.00	0	9	9
0	1	1	071323	Umatilla River	95	29,914	285	270,178	10.04	0	10	10
3	0	3	071358	Umatilla River	95	25,983	87	25,042	1.97	6	0	6
2	6	8	071359	Umatilla River	95	25,232	80	25,553	2.02	4	12	16
1	1	2	076127	Umatilla River	96	22,783	91	67,120	3.95	4	4	8
2	10	12	091729	Umatilla River	95	25,250	0	28,743	2.14	4	20	24
4	5	9	091748	Umatilla River	95	25,260	0	26,657	2.06	8	10	18
2	2	4	091807	Umatilla River	95	25,258	78	25,730	2.02	4	4	8
0	2	2	092126	Umatilla River	96	33,555	502	162,971	5.87	0	12	12
0	2	2	092130	Umatilla River	96	32,464	1,203	260,349	9.06	0	18	18
0	1	1	092132	Umatilla River	96	31,382	2,218	271,393	9.72	0	10	10
0	1	1	092402	Umatilla River	97	30,654	544	369,416	13.07	0	13	13
0	1	1	092406	Umatilla River	97	30,558	451	286,287	10.38	0	10	10
0	1	1	092559	Imnaha R. spring chin.	97	12,992	111	1,769	1.14	0	1	1
0	2	2	092663	Umatilla River	98	66,220	0	137,731	3.08	0	6	6
0	1	1	092701	Umatilla River	98	64,856	1,388	103,699	2.62	0	3	3
0	3	3	092703	Umatilla River	98	65,834	490	276,369	5.21	0	15	15
1	0	1	092829	Imnaha R. spring chin.	98	17,660	0	0	1.00	1	0	1
0	1	1	232925	Umatilla River	98	26,956	0	208,290	8.73	0	9	9
0	1	1	232712	NMFS Pittsburg	94	14,566	591	0	1.04	0	1	1
0	1	1	636006	Klickitat River	95	101,123	127	1,948,750	20.27	0	20	20
0	1	1	636007	Klickitat River	95	100,574	388	2,229,038	23.17	0	23	23
0	1	1	0501011211	L.White Salmon R.-late chin.	95	196,920	3,207	1,897,079	10.65	0	11	11
0	1	1	0501020406	Ringold Springs pond	96	664,852	12,201	0	1.02	0	1	1
0	1	1	0601020212	Klamath River, CA	97	57,375	1,913	1,456,654	26.42	0	26	26
17	**48**	**65**								**44**	**258**	**302**

[a] Number AD-only applies to fish which were meant to be adipose clipped plus CWT tagged at tagging, which had lost their CWT before release.
[b] Number unmarked refers to fish which were not clipped or CWT tagged. Included under unmarked are BWT only tagged fish released in the Umatilla River. Umatilla fall chinook releases have been 100% wire tagged (CWT or BWT) since 1992.

Appendix D; Table 3. Fall chinook salmon with no fin clips but wire (wire only) which were processed in 2000. (Heads were dissected and wire was read for 51% of these fish collected).

VOL	Not read Est	LGR	Not read Est	Total	CWT Code	Release Location	Brood Year	Expansion[a] Rate	Expanded Recovery[b] VOL	LGR	Total
Fish with CWT only.											
1	1			2	630163	LFH	96	n/a			
5	4	1	1	11	630860	LFH	97	n/a			
		1	1	2	631013	CJ	98	n/a			
16	12	341	341	710	631025	BC (subyearling)	98	1.78	50	1,212	1,262
2	1	3	3	9	631026	LFH (subyearling)	98	n/a			
		1	1	2	636318	LFH	96	n/a			
Fish with "lost" wire.											
2		6		8							
Fish without wire ("no tag").											
4	3	1	1	9	(no clips + beeped when scanned, greatest chance they were CWT)						
Fish with BWTs, Umatilla											
2	1	13	13	29							
32	**22**	**367**	**361**	**782**	**Totals**						

[a] Refer to Appendix B; Table 1 for release information associated with CWT 631025.

[b] Expansions were only done for tag code 631025 because the other fish in this table are included in the expanded recoveries estimated in Tables D1 and D2.

Appendix D; Table 4. Other fall chinook salmon handled or processed at LFH in 2000. These fish are already included in expansions in Tables D1-D3.

Vol	LGR	Total	CWT	Release Location	Brood Year
Fish with CWT and VIE tag that were not adipose clipped but left green VIE tagged.					
	1	1	631025	BC (subyearling)	98
Fish with "lost" CWTs.					
1		1	(Ad clipped + left blue VIE tag from BC)		
20	27	47	(Ad clipped)		
Fish without CWTs, but adipose clipped ("no tag").					
2		2	(Ad clipped + left red VIE tag from LFH)		
4	4	8	(Ad clipped)		
Fish with BWTs, all Umatilla origin.					
21	120	141	(RV clipped)		
1	1	2	(Ad + RV clips)		
2	3	5	(Ad clipped)		
Fish that were not adipose clipped or CWT/BWT.					
43	3	46	(no clips)		
4	1	5	(RV only clipped)		
2		2	(LV only clipped)		
Fish were only adipose clipped					
31	8	39	(Ad clipped)		
Fish unknown - no data collected					
	7	7	(unknown)		
Fish with CWT + left red VIE tag which were "not read", all LFH/Snake River Origin					
3		3	(CWT + left red VIE tag)		
Fish which were adipose clipped with a VIE tag which should have had a CWT, all LFH/Snake River Origin					
1		1	(Ad clipped + left blue VIE tag)		
22		22	(Ad clipped + left red VIE tag)		
Fish with VIE tags which were sorted before spawning and hauled and released above LGR Dam.					
4		4	(left green VIE tag - only data collected)		
4		4	(right green VIE tag - only data collected)		
4		4	(left blue VIE tag - only data collected)		
169	**175**	**344**	**Totals**