Lyons Ferry Hatchery Evaluation
Fall Chinook Salmon
Annual Report: 2001 and 2002

by

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Executive Summary

This report summarizes activities by the Washington Department of Fish and Wildlife's (WDFW) Lower Snake River Hatchery Evaluation Program from April 16, 2001 to April 15, 2003. Fall chinook salmon broodstock were obtained from 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.

The total number of fall chinook processed at spawning in 2001 was 5,977 fish (2,281 adults and jacks trapped at LFH and 3,696 adults and jacks trapped at LGR). Realizing there were more fish trapped than needed for broodstock, 727 of the fish on hand (52 fish trapped at LFH and 675 fish trapped at LGR Dam) were returned to the Snake River. Similar to 2002, the total number of fish processed during the season was 4,517 fish (2,728 adults and jacks trapped at LFH and 2,789 adults and jacks trapped at LGR Dam). Anticipating a large run it was decided to reduce the numbers of fish on hand to allow for sampling throughout the run. Because of this, 992 fish (501 trapped at LFH and 491 trapped at LGR Dam) were hauled back to the Snake River in 2002.

Fall chinook were spawned at LFH from October 23 to November 27, 2001 and from October 23 to November 25, 2002. Peak of spawning was November 13 and 14 in 2001 and November 12 and 13 in 2002. Coded-wire tags were removed from hatchery fish and read to determine the fish's origin prior to mixing of gametes, unless they were Visible Implant Elastomer (VIE) tagged fish. Left red VIE fish that were used in broodstock were sub-sampled for CWT composition. Matings consisted of single female/single male lots with a backup male in 2001 while in 2002 backup males were not used. Only salmon verified to be of LFH/Snake River origin were used for broodstock.

To determine the composition of the run at LGR Dam as well as the run to LFH we read 59%-100% of the VIE-CWT, CWT only, and AD-CWT groups. In 2001, any hatchery strays or unmarked fish were considered strays and removed from the population. This changed in 2002 when unmarked/untagged fish were released back into the Snake River. NOAA Fisheries allowed the return of these fish to the Snake River to continue their upward migration, based upon the assumption that these fish were primarily from upstream releases of unmarked LFH/Snake River hatchery origin fish. As in 2001, any stray fish were removed from the population since they were not needed elsewhere.

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 class males. Females dominated the older age class of returning LFH/Snake River origin salmon because few males return at age-5 or older.

In 2001 and 2002, egg take from LFH/Snake River origin broodstock, prior to any transfers, was 4,734,234 and 4,910,467 green eggs, respectively. As a precaution, 144,530 and 44,900 green eggs from LFH/Snake River origin females which tested ELISA positive for Bacterial Kidney Disease were destroyed prior to eye-up in 2001 and 2002. This left 4,589,704 and 4,865,567 green eggs available for production in 2001 and 2002. Green egg to eye-up loss was estimated at 3.5% and 3.1% for the two years, excluding the eggs that were destroyed because of high ELISA titers.

In 2001 we transferred 200,064 eyed eggs (2001 brood) to Idaho Fish and Game (IDFG) for the Idaho Power Company mitigation agreement. The estimated number of LFH/Snake River origin fry ponded was 4,103,521 fish (2001 brood). In 2002 we shipped 616,000 green eggs (2002 brood) to Nez Perce Tribal Hatchery (NPTH) to help supplement their new hatchery. In addition, we transferred 7,000 green eggs to USFWS for research. After eye-up we transferred 230,000 eggs to IDFG, and another 336,967 fish to ODFW as part of the Idaho Power Company mitigation agreement. Also in 2002 5,100-eyed eggs (2002 brood) were transferred to Battelle Northwest Laboratories for research purposes. An estimated 3,481,685 fish (2002 brood) LFH/Snake River origin fry were ponded.

In 2001, to maximize survival of subyearlings released during a low flow/no spill year, LFH production subyearlings originally slated for onstation releases were barged to below Bonneville Dam. On June 1, 2001, we released 199,976 subyearling (2000 brood) fall chinook salmon from the barge. These fish were 100% adipose clipped (marked) and coded-wire tagged. We released another 3,994 fish on July 3 directly into the Snake River at LFH. These fish were refused for NPT research because of size. An additional 1,732,167 subyearlings (2000 brood) were released by the NPT in 2001; one group at Captain John, two from Big Canyon, and one from Pittsburg Landing acclimation facilities. As part of Idaho Power Company's mitigation for fish loss associated with the construction of Hells Canyon Dam, another 115,220 subyearling (2000 brood) fall chinook were released below Hells Canyon Dam.

In 2002, all of the yearling fall chinook salmon (2000 brood) released from LFH and the acclimation sites were adipose clipped (marked), coded-wire tagged, and elastomer tagged. During April 1-11, LFH volitionally released 432,511 yearling (2000 brood) fall chinook salmon from the hatchery. The NPT released 479,360 fall chinook yearlings (2001 brood) on April 10, 2002 from acclimation facilities upstream of LGR Dam.

On June 24, 2002, LFH released 194,582 subyearling (2001 brood) fall chinook salmon from the hatchery. These fish were 100% adipose clipped and coded-wire tagged. There were two additional groups of late subyearlings released by WDFW, both of which were unmarked/untagged at release. The first group (29,059 fish) was released into the Snake River above LGR Dam at Chief Timothy Park on October 16, 2002. These fish were originally slated for NOAA research, but they were too small to PIT tag. The second group (24,573 fish) was released December 2, 2002 into the Snake River at Roosters Landing, also above LGR Dam. These were excess fish on hand at LFH after all the yearling groups were tagged. An additional 2,398,079 subyearlings (2001 brood) were released by the NPT; two groups at Captain John, two from Big Canyon, and one from Pittsburg acclimation facilities. As part of Idaho Power

Company's Hells Canyon mitigation agreement, another 171,120 subyearling (2001 brood) fall chinook were released below Hells Canyon Dam.
In 2003, from April 1-9, LFH volitionally released 518,436 yearling (2001 brood) fall chinook salmon from the hatchery. The NPT released a total of 437,633 fall chinook yearlings (2001 brood) March 30, 2003 from acclimation facilities upstream of LGR Dam.

Surveys were conducted to count fall chinook redds in the Tucannon River. In 2001 and 2002, we observed 65 and 183 redds and sampled 35 and 74 carcasses, respectively. The estimated escapement to the Tucannon River was 195 and 549 fall chinook in 2001 and 2002.

In 2001, we estimate 47.3% of the adults were LFH/Snake River hatchery origin, 35.3% were natural origin, and 17.4% were out-of-basin strays. Jacks in 2001 were composed of 60.7% LFH/Snake River hatchery origin fish, with 39.3% unassigned origin due to small sample size. In 2002, we estimate 38.0% of the adults were out-of basin strays, 31.2% were LFH/Snake River hatchery origin, 11.4% were natural origin, and 19.4% were of unknown hatchery origin. Jacks were composed of 26.7% LFH/Snake River hatchery origin fish, 23.3% out-of-basin strays, 23.3% unassigned hatchery origin fish, and 26.7% unassigned wild or hatchery origin fish.

We were unable to account for 19.2% (4,822 fish) and 6.0% (1,335 fish) of fall chinook escapement past Ice Harbor (IHR) Dam in 2001 and 2002, respectively. 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.

Since 1990 WDFW adopted a broodstock collection protocol that allowed removal of strays from broodstock to maintain similarity to the Snake River natural origin fall chinook. In 1993 National Marine Fisheries Service (NMFS) began requiring the removal of strays at LGR Dam. The goal was to keep strays below 5% of the total run above LGR Dam. During 2001 and 2002 the stray rate above LGR was 1.9% and 1.2%, well under the level suggested by NOAA. Out-of-basin strays were mainly (84.5%) from releases in the Umatilla River. Also included in the stray estimate were fish released from Klickitat Hatchery as well as Priest Rapids Hatchery.

The final location of wire tagged LFH/Snake River hatchery origin fish was summarized for the 2001 and 2002 return years. In 2001 yearling releases had approximately 43% of their adult detections in the Snake River, 20% in the Columbia River, and 37% in ocean fisheries. Adult detections in 2001 from subyearling releases indicated 75% were located on the Snake River, 10% were in the Columbia River, and the remaining 15% in ocean fisheries. Adults from yearlings returning in 2002 had approximately 46% of their detections in the Snake River, 15% in the Columbia River, and 39% in ocean fisheries, while subyearling returned adults were located strongly to the Snake River (67%), 9% to the Columbia River, and the balance of 24% to ocean fisheries.

We estimate that 9,361 fall chinook adults and 4,756 jacks of LFH/Snake River hatchery origin returned to the Snake River in 2001; 77% of the 18,300 which are required for mitigation. In 2002 we estimate that 11,355 fall chinook adults and 5,157 jacks of Lyons Ferry origin returned to the Snake River, 90% of the 18,300 fish required for mitigation. Jacks comprised 33.7% of the return of LFH/Snake River hatchery origin fish in 2001, compared to 9.1% wild origin jacks.

In 2002, jacks comprised 31.2% of the return of LFH/Snake River hatchery origin fish while jacks were 41.6% of the return of wild origin fish. These estimates are based on a preliminary Lower Granite Dam run reconstruction and will change when the final run reconstruction is completed.

Recommendations for the future include:

1) focus on reducing jack return rate by examining the size, time, and type of release that may be causing excess jacks;
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) summarize adult returns for LFH origin fall chinook beginning with the 1990 brood released at LFH and include in a future report;
5) complete a cooperative report with fall chinook co-managers in the Snake River basin to determine the effectiveness of programs at meeting LSRCP goals and assess the success of each release site by looking at smolt-to-adult survivals and age/sex of returns; and
6) summarize ATPase and cortisol data that has been collected over the years and include it in an upcoming report.

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, 2001 to April 15, 2003. This work was completed with fiscal year 2001 and 2002 funds provided through 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) is described in this report. We have also incorporated information about salmon trapping at Lower Granite (LGR) Dam, and some information about natural production in tributaries of the Snake River.

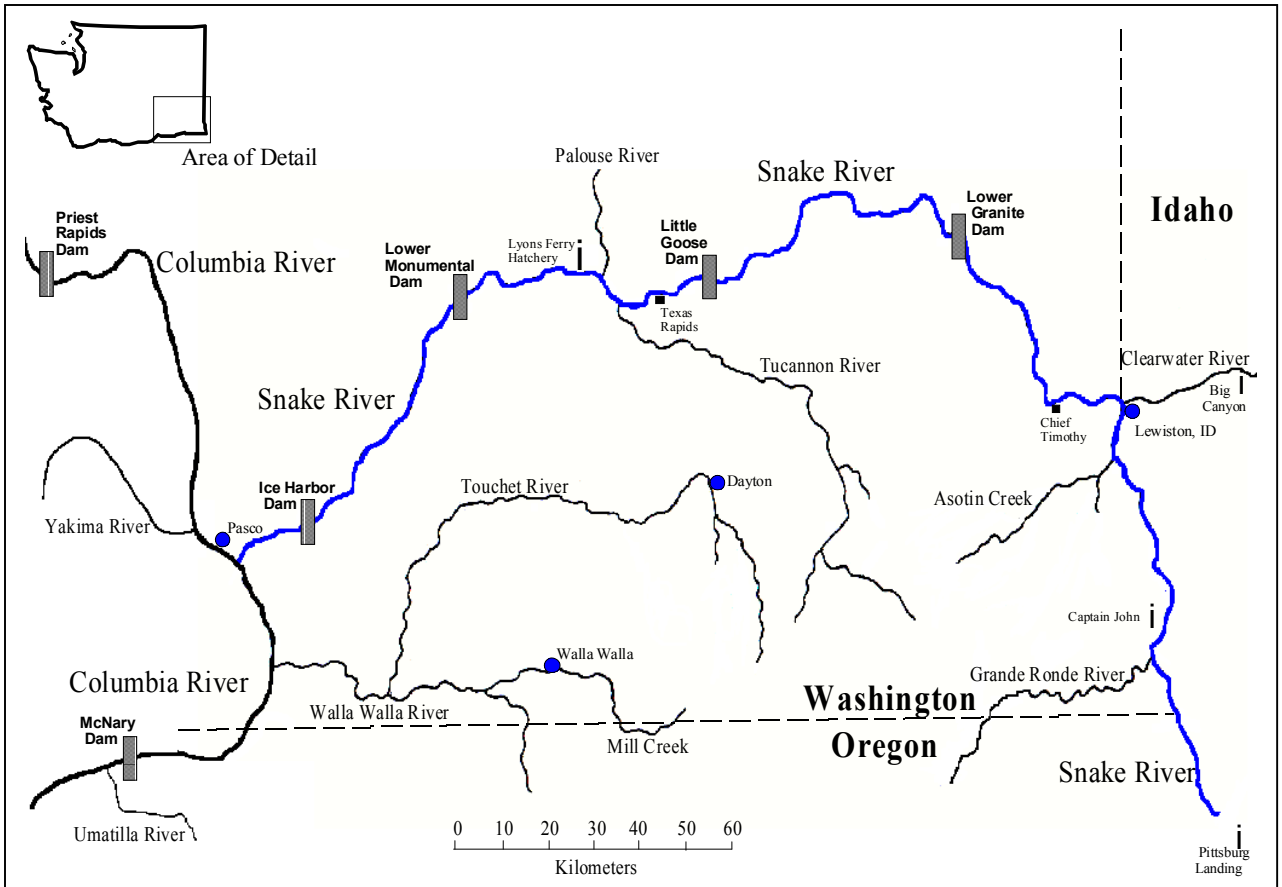
Congress authorized the LSRCP in 1976. As a result of that plan, LFH was constructed and has been in operation since 1984. One objective of the hatchery was to compensate for an annual loss of 18,300 adult, Snake River stock, fall chinook salmon (U.S. Army Corps of Engineers 1975). An evaluation program 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. This mitigation program was modified in the early 1990s under US v OR to provide supplementation of natural production above LGR and to assist with ESA recovery.

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). WDF and WDFW have been involved in operating a conservation hatchery program and assisting with recovery of naturally spawning fall chinook salmon in the Snake River (14,360 fall chinook were expected to persist through natural production) since the early 1990s (as part of ESA and Washington's Wild Salmonid Policy). We have contributed to evaluation of the status of the Snake River fall chinook, and monitoring population abundance, distribution, genetics, and life history (sex and age information of returns) as well as removing strays at LGR to minimize the effects of out-of-basin strays. Specific annual program objectives can be obtained from the Snake River Lab Project office.

Description of Facilities

LFH is located at the confluence of the Palouse and Snake Rivers at river kilometer (Rkm) 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 hatchery fall chinook adults. The current working capacity of LFH is 1.1 million yearlings and 2.1 million subyearlings. This change occurred to reduce rearing densities and the occurrence of bacterial gill disease. 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 and direct stream releases), and downstream of Bonneville Dam (barged in 2001). Broodstock is obtained from various locations (see: Broodstock Collection and Management).



Rkm	Location
Snake River	
16.1	Ice Harbor Dam
66.9	Lower Monumental Dam
95.1	Lyons Ferry Hatchery
105.2	Texas Rapids Boat Launch
113.1	Little Goose Dam
173.0	Lower Granite Dam
210.3	Chief Timothy Park
263.0	Captain John Acclimation Site
346.0	Pittsburg Landing Acclimation Site
397.4	Hells Canyon Dam (not shown)
Clearwater River	
57.0	Big Canyon Acclimation Site

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

Broodstock Collection and Management

WDFW began developing its broodstock before the LFH facility began operating in 1984. Broodstock collection, from 1984-1990 and during the egg bank program (1977-1984), was 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.

NOAA Fisheries (formerly 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 2.1% of total escapement to the Snake River above IHR Dam over the last five years. In the future we will use Lower Monumental Dam (LMO) as the trigger point to estimate Snake River origin fish, since we have documented IHR counts including out-of-basin fish, which dip in to the Snake River and return to the Columbia River. This change is reflected in the proposed Fall Chinook Management Plan for the Snake River. A detailed account of LFH broodstock collection and spawning protocols is provided in Appendices A and B.

The number of fish counted at LFH at the time of collection is considered a preliminary estimate of return. The final estimate of total return to LFH is determined using the number of fish actually processed (Table 1). This table has been modified from past reports to reflect jacks measuring <53cm to correspond with the length of jacks counted at the dams. Fish that were collected but hauled back to the river are not counted in this table. In addition, there is a discrepancy each year with the number of fish trapped at LGR Dam when compared to the number of fish processed. These LGR Dam trapped fish that are unaccounted for at processing are included in the number of LFH fish processed since we are unable to tell exactly which fish they are. Refer to Appendix C for similar data from years prior to 1996. Despite continuing efforts to improve accounting procedures, discrepancies occur between the number of salmon estimated at collection and the number actually processed (Table 2). This is due, in part, to the sorting system at LFH. An observer tallies a fish every time the diverter gate is opened and closed to sort the fish. If multiple fish are diverted simultaneously, the observer may incorrectly

[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.

estimate the number passed. This resulted in a 12% and 14% under-estimate of fish on hand during 2001 and 2002, respectively.

Table 1. Numbers of fall chinook processed at LFH and window counts at Ice Harbor and Lower Granite Dams, 1996-2002.

		Number Processed[a]		Daytime Dam Counts[b]			
				(through Oct.)		(Nov. & Dec.)	
Year	Collection Location	Adults	Jacks[c]	Adults	Jacks	Adults	Jacks
1996	LFH	838	593	-	-	-	-
	Ice Harbor Dam	-	-	3,810	808	41	3
	Lower Granite Dam	323	58	1,272	415	36	9
1997	LFH	595	603	-	-	-	-
	Ice Harbor Dam	-	-	2,752	1,726	15	128
	Lower Granite Dam	447	205	1,434	469	17	35
1998	LFH	1,432	615	-	-	-	-
	Ice Harbor Dam	-	-	4,220	3,491	32	33
	Lower Granite Dam	955	617	1,852	1,920	57	82
1999	LFH	1,701	549	-	-	-	-
	Ice Harbor Dam	-	-	6,532	3,489	54	32
	Lower Granite Dam	1,525	409	3,302	1,790	79	66
2000	LFH	1,821	558	-	-	-	-
	Ice Harbor Dam	-	-	6,485	9,864	48	59
	Lower Granite Dam[d]	1,375	1,077	3,635	6,947	59	183
2001	LFH	2,012	268	-	-	-	-
	Ice Harbor Dam	-	-	13,516	10,170	0	0
	Lower Granite Dam	2,295	675	8,621	8,707	294	127
2002	LFH	1,783	482	-	-	-	-
	Ice Harbor Dam	-	-	15,248	6,079	0	0
	Lower Granite Dam	1,931	329	12,215	5,630	136	97

[a] Fish as identified during processing at LFH. The LFH number processed may include some fish that were LGR trapped but were unidentified as such during processing. The number processed does not include fish that were trapped and then later returned to the river.
[b] Classification of adults and jacks is based upon size at the counting window at each dam.
[c] In this table, processed jacks have fork length of <53 cm to correspond with dam counts.
[d] Includes 272 fish collected at LGR and sacrificed by the NPT for collection of additional CWT data.

Table 2. Number of fall chinook collected at or hauled to LFH and how they were accounted for in 2001 and 2002.

Year	Trap Location	Number Collected/Hauled	Processed	Returned to River	Difference From Number Collected/Hauled [a]
2001	LFH	2,080	2,280	52	+252
	LGR	3,696	2,970	675	-51
2002	LFH	2,380	2,265	501	+386
	LGR	2,789	2,260	491	-38

[a] Inflated counts at LFH were due to trapping procedures. Number of fish unaccounted for from LGR were probably mixed in with the LFH trapped fish during processing.

Discrepancies also occur between the number of salmon trapped at LGR Dam and the number actually processed at LFH. During both years, we used operculum punches to mark LGR collected and transported fish. Occasionally data were not recorded for this mark, causing errors in tracking of these fish. In addition, coho are occasionally misidentified as fall chinook and shipped to LFH. Often there is mixing of LGR hauled fish and LFH trapped fish during the spawning process, again confounding the accounting results. In 2001 and 2002 we suspect 51 and 38 fish, respectively, are included in Table 2 as LFH processed fish that were unaccounted for during processing of the LGR fish.

LGR Dam Trapping Operations

Salmon with a coded-wire tag (CWT), blank 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.

Any fall chinook without a VIE tag (only LFH/Snake River hatchery origin fish are VIE tagged) was suspected as a stray and was collected at the trap for transport to LFH[2]. Lyons Ferry origin fish were also collected to supplement broodstock at LFH when needed. Prior to transport, NOAA 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.

Returns from subyearlings released by the Nez Perce Tribe (NPT) which were not fin clipped but had CWTs, continued to confound the collection protocol. Externally these Lyons Ferry origin

[2] NOAA requires that stray salmon trapped at LGR Dam be removed from the Snake River system. These fish are taken to LFH for processing.

fish could not be differentiated from stray Umatilla or Klickitat fish that are BWT only. Thus, all trapped fish with no clips and wire were hauled to LFH.

2001

High water temperatures at the LGR Trap delayed start of trapping from the standard protocol (Appendix A). Trapping began August 20 and continued until November 21. We initially believed LFH would be broodstock limited, therefore we began supplementing our broodstock by hauling left red VIE fish to LFH. On September 17, the Technical Advisory Committee (TAC) revised their projection of the fall chinook run to the Snake River. The run forecast was nearly doubled. Coupled with the increased numbers of steelhead, it was impossible for the NOAA staff to process all the fish during a normal workday.

On September 19, the staff at LGR Trap could not handle all the fish being trapped so they turned off the wire detectors. A sub-sampling scheme was devised to decrease the percentage of the run handled and thus minimizing stress on the fish. On September 20, sub-sampling began during day shift. The wire detectors were turned on every other hour to decrease the number of fish trapped. On September 22 it was determined that the sub-sampling design did not give staff at LGR adult trap enough time to get caught up between loads of fish. At that time it was decided to return left red VIE tagged to the ladder and allow them to pass upstream over the weekend. After performing an inventory of fish on hand at LFH on September 25, it was agreed that all left red VIE fish captured at LGR Dam would be allowed to pass the dam. This modification improved working conditions for the NOAA Fisheries staff as well as the LFH staff by decreasing the number of fish hauled to LFH. Toward the end of the season, trapping 100% of the time was resumed until the end of collections.

2002

Trapping at LGR Dam began August 18 and continued until November 22. Anticipating a larger return of fall chinook than encountered in 2001, we adopted a sub-sampling scheme at LGR Dam (Appendix B). We did not target collection of left red VIE tagged fish, only collection of stray/unknown origin fish. The season began by turning the detectors on all day. Occasionally, the trucks were not available for transporting fish. The wire detectors had to be shut off, allowing fish to pass, until the holding tanks were emptied. The trapping schedule was similar to 2001, but was modified October 7 to accommodate the large numbers of fish in the ladder. Sampling during the dayshift was changed to every third hour. The detectors were allowed to be on all day from November 6 through season's end.

LFH Trapping Operations

2001

The trap was opened August 31 to permit salmon to voluntarily enter the hatchery. Several times a week, salmon that had entered the trap were directed into a holding pond. We trapped continuously until October 2. At this time we were catching over 100 fish a day. The trap was

shut down for one day and reopened October 4 to determine if an every-other day protocol would actually decrease the numbers of fish trapped, or simply delay their entry into the trap. The trapping scheme appeared to decrease the number of fish trapped, but still more than 100 fish were trapped. At that time, a twice-weekly trapping protocol was adopted at LFH.

By October 11 it was very apparent we had far too many fish on hand. The adult run to LFH was later than the run to LGR adult trap. It was decided to reduce on-hand broodstock by hauling LGR trapped fish back to the river since they were the majority of fish at LFH, and their origin could easily be identified based on VIEs. This allowed LFH to trap on November 1 and 5, target 50 fish per day, and sample/spawn fish toward the end of the run. November 5 was the last trapping day at LFH.

2002

The trap at LFH was opened September 3 permitting salmon to voluntarily enter the hatchery unrestricted. We changed our trapping protocol to sample a full day periodically each week. Beginning October 8 we began trapping twice a week to sample fish across the run, then switched to trapping one day a week on October 21. The last day of trapping at LFH was November 18.

Hatchery Operations

Spawning Operations

Spawning and Egg Take

Fall chinook collected at LGR Dam were held separately from those that voluntarily entered the hatchery. 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. Lyons Ferry origin fish, identified through examination of CWTs or the presence of elastomer tags were spawned, mated, and retained for subsequent Snake River releases. The US v OR fall season agreement states that stray fall chinook will be used if needed to make program needs at other Columbia basin hatcheries. Since all Columbia River fall chinook programs were able to meet program objectives in 2001 and 2002, eggs from those fish were not needed. For disposition of strays, refer to the yearly sections below. For detailed composition of processed and hauled fish, see the stock composition section presented later in this report.

2001

Fish were spawned weekly from October 23 through November 27 (Tables 3 and 4). On October 31, we selected 214 pairs of adult fall chinook (trapped at LGR and hauled to LFH) and returned them to the Snake River above LGR Dam (Table 5). These fish were all LFH/Snake River origin based on VIEs. Prior to hauling, we marked each fish with three opercle punches to allow documentation of recaptures at LGR. Although ninety-nine, 3-opercle punched fish were captured in the LGR trap (fell back through LGR and re-ascended the ladder), only one continued downstream and re-entered the trap at LFH. Unfortunately, by hauling only adults, we were short on adult males for spawning and used a greater percentage of jacks (14%) in the brood stock than was targeted (10%).

Lyons Ferry origin fish were mated as single male/single female pairs (with a back-up male 15-30 seconds later). Snake River origin salmon produced 4,734,234 total eggs ("green" or unfertilized eggs), 144,530 of which were destroyed because of elevated enzyme linked immunosorbent assay (ELISA) values 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 3.5%, which does not include loss due to destruction of eggs with high ELISA values. All eggs from stray/unknown origin fish were destroyed.

On December 4, after eggtake needs were met, 105 of the remaining fish were sampled for run composition and 299 fish, including 27 females, were returned to the Snake River to spawn.

Table 3. Duration and peak of spawning, egg take, and percent egg mortality at LFH, 1984-2002.

Year	Spawning Duration	Peak of Spawning	Total Eggtake	Initial Egg loss (%) All fish[a]	Initial Egg loss (%) 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	2,994,676[b]	8.30	
1992	Oct 20 - Dec 8	Nov 21	2,265,557[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	Oct 21 - Dec 2	Nov 4	1,451,823[d]	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]
2001	Oct 23 - Nov 27	Nov 13 & 14	4,734,234		3.47[f]
2002	Oct 22 - Nov 25	Nov 12 & 13	4,910,467		3.08[f]

[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] An additional 9,000 eggs from stray females were 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.
[f] Loss percentage *does not* include eggs destroyed due to positive ELISA values: 144,530 in 2001 and 44,900 in 2002.

Table 4. Weekly spawning summary for fall chinook broodstock processed at LFH, 2001. Fish trapped at LFH and LGR are combined and jacks are included with males.

Week Ending	Mortality[a] M	Mortality[a] F	Spawned M	Spawned F	Spawned NV[b]	Surplused M	Surplused F	Eggtake
Sep 16	1	0						
Sep 23	1	8						
Sep 30	4	7						
Oct 7	7	0						
Oct 14	10	2						
Oct 21	11	4						
Oct 28	53	21	62	63	1	7	0	240,383
Nov 4	24	18	203	202	7	22	1	733,201
Nov 11	47	15	363	364	3	15	5	1,362,923
Nov 18	95	12	435	435	5	21	2	1,493,953
Nov 25	318	48	219	218	4	22	2	718,619
Dec 2	349	10	56	56	0	80	0	185,155
Dec 9	157	1	0	0	0	73	4	0
Totals	**1077**	**146**	**1338**	**1338**	**20**	**240**	**14**	**4,734,234**

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

Table 5. Original trapping location and numbers of excess LFH fall chinook broodstock returned to the Snake River above LGR Dam in 2001. Totals include recaptures.

Haul Date	Trapping Location	Sex			Total
		Male	Female	Jack <49cm	
October 31	LGR	214	214	0	428
December 4	LGR	207	22	18	247
	LFH	46	5	1	52
Grand Total		**467**	**241**	**19**	**727**

2002

We trapped more fish than needed for run composition needs so to assure representative sampling throughout the run, we continued trapping and returned the excess to the river nearly weekly (Table 6). Excess fish from LFH trapping were marked with a bottom caudal clip to monitor any recaptures. Those fish were hauled to and released below LGO Dam at Texas Rapids boat launch (Rk 105.2). Fish from LGR trapping were marked with a top caudal clip to monitor recaptures. Those fish were transported to and released above LGR Dam at Chief Timothy State Park on the Snake River (Rkm 210.3).

Table 6. Release locations and numbers of excess fall chinook broodstock hauled from LFH in 2002. (Totals include recaptures)

Release Location	Trap Site	Sex	Date hauled back to Snake River: October 23	October 29	October 30	November 13	November 19	November 20	November 25	Grand Total
Chief Timothy	LGR	male		20				140	97	257
		female		97				81	44	222
		jack <53		3				8	1	12
	VOL	male						1		1
		Total		**120**				**230**	**142**	**492**
Texas Rapids	VOL	male	91		46	37	9		148	331
		female	23		80	11	25		6	145
		jack <53	12			6	5		1	24
		Total	**126**		**126**	**54**	**39**		**155**	**500**
Grand Total			**126**	**120**	**126**	**54**	**39**	**230**	**297**	**992**

Of the 492 fish hauled to Chief Timothy Park, two were captured at LFH. One of these fish was again hauled above LGR Dam and the other was hauled and released at Texas Rapids. Interestingly, of the 500 total fish hauled to Texas Rapids (10.1 Rkm upstream of LFH), only 38 were recaptured at LFH. These fish were again hauled upstream and released at Texas Rapids.

Fish were spawned from October 23 through November 25, 2002 resulting in 4,910,467 green eggs (Table 7), 44,900 of which were destroyed because of high ELISA values for BKD. This was the first year green eggs (616,000) were transferred to the Nez Perce Tribal Hatchery (NPTH) as part of a good faith effort by WDFW to help them launch their new program. These eggs, along with another 7,000 that were transferred to the USFWS for research, are included in the eggtake total listed above. Green eggs for transfer were based on an estimated fecundity of 3,500 eggs/female. Initial mortality of LFH origin eggs was 3.08%, which does not include eggs destroyed due to high ELISA values. Jacks were incorporated into broodstock at a 6% level. Unmarked/untagged fish were returned to the Snake River to spawn and all known strays were destroyed.

Table 7. Weekly spawning summary for fall chinook broodstock processed at LFH, 2002. (Volunteer and transported fish are combined and jacks are included with males).

Week Ending	Mortality[a]		Spawned			Surplused		Eggtake
	M	F	M	F	NV[b]	M	F	
Sep 15	1	0						
Sep 22	2	0						
Sep 29	4	3						
Oct 6	2	1						
Oct 13	13	13						
Oct 20	14	21						
Oct 27	24	17	62	62	0	66	0	247,100
Nov 3	22	19	275	265	2	37	2	959,600
Nov 10	50	7	348	373	5	203	1	1,376,767
Nov 17	98	20	363	412	3	9	7	1,580,000
Nov 24	105	8	137	137	1	97	4	488,200
Dec 1	53	2	74	73	1	126	4	258,800
Totals	**388**	**111**	**1259**	**1322**	**12**	**538**	**18**	**4,910,467**

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

Procedural Changes

Each year, spawning becomes more complex with increased data being collected to track hauling of fish back to the river, transfer of adults to other agencies, sampling for DNA analysis, scale removal for origin (hatchery/wild) determinations, and CWT decoding for selecting broodstock. All these items occur during one day, along with enumerating the numbers of coho and steelhead handled. A typical spawn day consists of 20 people working to collect information, spawn, and haul fish. Listed below are changes that occurred in 2002 that streamlined spawning.

This was the first year we used a 1:1 matrix for matings. Historically, a backup male was used to decrease fall chinook egg loss from non-fertile males, as well as to increase genetic diversity. After discussions with WDFW geneticists it was agreed that diversity of our broodstock was not an issue when using greater than 1,000 females annually for spawning. Also, the effect of a non-fertile male on a large spawning population would be minimal. We adopted a 1:1 mating regime and documented the occurrence of non-fertile males. Fertilized eggs from each mating were kept separate during incubation. All matings showed some survival of gametes during picking of mortality at eye-up. This protocol speeded up the spawning process by eliminating the need to split bags of semen between two females and decreased data entry and proofing associated with the secondary male. We will continue to use this protocol in the future.

A trough was built to keep the eggs cool and increase the area where the eggs could be held prior to fertilization. At the beginning of each spawning day, a layer of ice was spread across the bottom of the trough. The ice was covered with burlap bags to prevent direct contact with the

eggs. Females were spawned into buckets lined with individually marked plastic bags. The bags were then placed in the burlap-lined trough. Because of the need to decode CWTs to determine which females and males could be mated together, spawning was often delayed to await decoding results. Prior to 2002, only 20 females could be collected at one time because that was all that the could be held on the bleeding rack. After the construction of the trough, 18 additional females could be held, thus speeding up spawning.

A final change in 2002 involved rinsing the fertilized eggs prior to water hardening. A hose was used to spray a gentle stream of water over the eggs to remove excess semen. Excess semen degrades the effective concentration of iodine in the water used for hardening. By removing the semen prior to water hardening, fish health specialists believe the prophylactic effects of the iodine (disease prevention) are maximized.

Cryopreservation Experiments

Testing of Semen in Tank 1 to Determine the Affect of Low Liquid Nitrogen Levels

In 2002 we assessed the impact of low liquid nitrogen levels on a subset of our archived cryogenically preserved semen samples. Our liquid nitrogen tanks (32 liter) must be refilled with liquid nitrogen every three months in order for internal temperatures of the tanks to remain within the parameters necessary for semen survival. In our tanks a liquid nitrogen depth of less than 10 cm can compromise semen viability (personal communication, Gerald Halsey, American Breeders Service). On several occasions the liquid nitrogen in one of our tanks was in the critical range. Tank 1 experienced a low liquid nitrogen level of 8 cm in 1999, but the samples were never tested for viability at that time. On March 6, 2001 the liquid nitrogen level in Tank 1 had fallen to 2 cm. Further investigation determined it had been five months since Tank 1 had been refilled due to an oversight by the Nitrogen vendor. Since semen from various males had been placed in multiple tanks, and some were moved from Tank 1 after 1999, we could evaluate semen viability both prior to and after the 2001 low nitrogen level event.

On November 20, 2002, we conducted an experiment to test the viability of cryopreserved fall chinook and spring chinook salmon semen exposed to low liquid nitrogen levels in 1991, 1999, and 2001. Past evaluations had determined that the low liquid nitrogen level experienced in 1991 did not affect the fertilization effectiveness of archived semen (Mendel et al. 1992). Straws from each tank, as well as straws frozen during multiple years, were evaluated. Further, we tested straws of semen from males that had previously been evaluated to determine their present status.

Fresh eggs from two stray fall chinook females were pooled and used for the experiment. Semen for the fresh control was taken from two fall chinook males, and applied at the same rate as the frozen semen (1ml per 400 eggs). The eggs were fertilized in individual lots, placed in divided incubation trays to be water hardened, and incubated alongside other fall chinook eggs taken on that day as part of normal LFH spawning. On December 12, after being shocked, the eggs were counted and destroyed. The results are presented in Table 8.

Results indicate the low liquid nitrogen event in 1999 did not measurably affect semen viability. However, it appears the 2001 low liquid nitrogen level in Tank 1 was severe enough to allow all semen stored in the tank to completely degrade.

Also, thawing techniques have changed since 1991. Instead of thawing for 90 seconds and adding the semen to the eggs when it was slushy, a 60-second thaw was utilized in 2002. The still-frozen semen actually had to be squeezed from the straws. Results indicated an increase in the fertilization rate when compared to experiments performed in previous years using the same fish and a longer thawing period. It is possible that the 90-second thaw (slushy semen) may have activated the sperm while still in the straw, whereas adding the semen in a frozen state delayed activation and may have increased the amount of time motile (and viable) sperm are in contact with the eggs.

Table 8. Results of fertilization experiments to determine the status of cryopreserved fall chinook (FCH) and spring chinook (SCH) salmon semen exposed to low liquid nitrogen levels in 1991, 1999, and 2001.

ID #	Race	Date	Amount used	Fert %	Evaluation/Comments
Control 1	FCH	11/20/02	1/4ml/100 eggs	100.0%	Control, fresh fall chinook semen
		11/20/02	1ml/400 eggs	97.8%	Control, fresh fall chinook semen
Y9	**SCH**	**9/18/91**	**Frozen archive**		
		12/09/92		2.7%	no backup male, done at WSU
		12/09/92		4.6%	no backup male, done at WSU
		10/01/96	1ml/400 eggs	7.9%	
		11/20/02	1ml/400 eggs	7.8%	straws in low tank in 1999 but moved before 2001
5BRN	**FCH**	**11/06/91**	**Frozen archive**		semen in refrigerator 1 day before frozen
		11/12/91	1ml/400 eggs	2.2%	frozen 7 days then used
		11/17/92	1ml/400 eggs	24.2%	frozen 1 yr then used, also had a backup male
		12/09/92		2.5%	no backup male, done at WSU
		12/09/92		3.7%	no backup male, done at WSU
		11/20/02	1ml/400 eggs	46.5%	Tank low in 1999, but moved to tank 3 before '01
97M453PUR	**FCH**	**11/01/97**	**Frozen archive**		
		11/20/02	1/4ml/100eggs	81.9%	Tank never low, tank 5, shows status of tank 5
95M446ORG	**FCH**	**11/01/95**	**Frozen archive**		
		11/20/02	1ml/400 eggs	0.0%	Tank 1, low in 2001
		11/20/02	1ml/400 eggs	29.4%	Tank never low, tank 2, shows status of tank 2
97W164-165	**SCH**	**9/18/91**	**Frozen archive**		
		11/20/02	1/4ml/100 eggs	66.7%	Tank never low, tank 4, shows status of tank 4
		11/20/02	1ml/400 eggs	0.0%	Tank 1, low in 2001

Comparison of Viability of Semen in Tank 1 with Semen Archived in Other Tanks

We conducted a similar experiment on February 04, 2003 to re-evaluate and compare the viability of semen in Tank 1 to the other semen storage tanks. For the experiment we used steelhead eggs fertilized with archived frozen semen from both fall and spring chinook. We

discussed the use of steelhead eggs with fall chinook and spring chinook semen with Dr. Gary Thorgaard at WSU. His studies indicate fertilization rates of steelhead eggs with chinook semen are only slightly less than using solely chinook gametes. Since there were no chinook eggs available at the time of this experiment, steelhead eggs were used. Eggs from two females were pooled (1/8 Cup = ~100 eggs). Semen for the fresh control was collected from two steelhead males, pooled, and applied at same rate as the frozen semen (1ml per 400 eggs).

Some of the cryogenically preserved semen used in the experiment had been exposed to all three occurrences of low liquid nitrogen, and some were exposed only to the last two occurrences. The controls were taken from the same archived males but preserved in tanks other than Tank 1. We fertilized the eggs in individual lots. Iodine solution was added to fill the individual containers for disinfection and water hardening. Each lot was then rinsed, and incubated alongside other steelhead eggs from that spawn day. Hatchery personnel shocked the eggs on February 19, 2003. The eggs were re-shocked on February 20 because the first shocking was not intensive enough to enumerate the non-fertile eggs. The eggs were examined and counted on February 21 and the results are presented in Table 9.

Table 9. Percent of steelhead eggs fertilized using cryogenically preserved fall chinook and spring chinook semen exposed to low liquid nitrogen levels in 1991, 1999, and 2001.

ID #	Race	Date	Amount used	Fert %	Evaluation/Comments
Control 1	SH	02/04/03	fresh, 1ml/400 eggs	76.7%	fresh control (2 pooled males)
		02/04/03	fresh, 1/4ml/400 eggs	85.4%	fresh control (2 pooled males)
465BLU	FCH	11/20/91	Frozen		semen kept in refrig 1 day before freezing
		10/29/96	1ml/400eggs	57.9%	quality of straw in dry tank, move from tank 1 to tank 3
		02/04/03	1ml/400eggs	0%	Tank dry in 91, 99, and 01
95M492RED	FCH	11/28/95	Frozen		
		02/04/03	1ml/400 eggs	58.0%	tank never dry, first use, status of tank 2
		02/04/03	1ml/400 eggs	0%	tank dry in 99 and 01
Y21	SCH	9/18/91	Frozen		
		02/04/03	1ml/400 eggs	0.2%	tank dry in 91 then moved to tank 3
		02/04/03	1ml/400 eggs	0%	tank dry in 91, 99, and 01
97W118-119GRN	SCH	9/16/97	Frozen		
		02/04/03	1/4ml/100 eggs	34.4%	tank never dry, first use, status tank 4
		02/04/03	1ml/400 eggs	0%	tank dry in 99 and 01
		02/04/03	1ml/400 eggs	0%	tank dry in 99 and 01, rep 2
		02/04/03	1/4ml/100 eggs	0%	tank dry in 99 and 01, cut full straw to get 1/4ml
98CLEAR132	SCH	9/15/98	Frozen		
		02/04/03	1/4ml/100 eggs	48.8%	tank never dry, first use, status tank 4
		02/04/03	1/4ml/100 eggs	0%	tank dry in 99 and 01
GRNM330	FCH	11/30/94	frozen		
		02/04/03	1ml/400 eggs	32.7%	tank never dry, first use, status tank 2
		02/04/03	1ml/400 eggs	0%	tank dry in 99 and 01

The purpose of this experiment was to test the viability of semen stored in Tank 1. Fertilization was 0% for all tests on straws that had been in tank 1 in 2001. We are currently looking for research uses for these samples, possibly as a source of DNA from an ESA listed population. The semen in tanks 2, 3 and 4 is still viable. The difference in fertilization percentages for the tests in control 1 (fresh semen, fresh eggs) was most likely due to the additional handling of one of the groups of eggs. Following the first shock, the eggs were hand counted and exhibited 83.61% fertilization. This same group was re-counted after the second shock and the percentage of live fertilized eggs decreased to 76.7%. This was the only group that was handled twice.

Incubation, Rearing, Marking, and Transfer

A detailed account of incubation methods is provided in Appendices A and B for return years 2000 and 2001, respectively. Historical information regarding eggtake, and early life stage survival (Table 10) and marking and transfer numbers (Table 11) are provided below.

Table 10. Egg take and survival numbers by life stage of Lyons Ferry origin fall Chinook spawned at LFH, brood years 1996-2002.

Brood Year	Eggs Taken	ELISA Loss	Eggs Shipped	Eyed Eggs Retained	Fry Ponded	Intended Program
1996	1,433,862	0[a]	0	1,377,202	941,900 419,677	Yearling Subyearling
1997	1,184,141	0[a]	0	1,134,641	1,037,221 63,849	Yearling Subyearling
1998	2,085,155	0[a]	0	1,978,704	916,261 1,010,344	Yearling Subyearling
1999	3,980,455	156,352	0	3,605,482	991,613 2,541,759	Yearling Subyearling
2000	3,576,956	53,176	115,891	3,249,377	998,768 2,159,921	Yearling Subyearling
2001	4,734,234	144,530	200,064	4,230,432	1,280,515 2,697,406 125,600	Yearling Subyearling Research
2002	4,910,467	44,900	1,195,067	3,540,000	1,032,205 2,376,251 73,229	Yearling Subyearling Research

[a] Eggs from ELISA positive females were incorporated into the rest of the brood stock in 1996-1998.

2000 Brood Year

Subyearlings

Fall chinook slated for LFH onstation release, NPT releases upstream of LGR Dam, NPT research, and NOAA research were reared in raceways at LFH until marking and transfer. Onstation release fish were marked back into a raceway for the remainder of their rearing. The NPT upstream release groups were also marked back into raceways at LFH to complete their rearing prior to transfer to NPT acclimation sites above LGR Dam. For a more detailed description of NPT acclimation sites please refer to NPT Annual reports.

Table 11. Snake River fall chinook marked by WDFW and/or transferred from LFH, 2000-2002 brood years.

Brood Year Age	Release Site	Marking				Transfer		
		Date	Type[b]	Number	Fpp	Date	Number	Fpp
2000	LFH-B [a]	3/28/01	AD+CWT	200,716	180.0	-	-	-
Subyearling	CJ	-	-	-	-	5/10/01	501,440	59.0
	BC1	4/05/01	CWT	200,595	150.0	5/08/01	501,260	67.5
	BC2	-	-	-	-	5/31/01	361,221	86.6
	PL	4/12/01	CWT	201,474	180.0	5/07/01	400,795	105.0
	NPT-Research	-		-	-	5/23/01	8,013	69.0
	NOAA-Research					5/18/01	79,414	70.9
	NOAA- Research	-		-	-	6/06/01	9,999	57.5
	NPT-Research	-		-	-	6/06/01	16,099	57.7
Yearling	LFH	09/20/01	AD+CWT+ LR	438,859	30.0	-	-	-
	BC	10/09/01	AD+CWT+ LG	177,456	25.0	3/07/02	166,516	12.9
	CJ	10/09/01	AD+CWT+ LB	165,888	30.0	3/06/02	162,969	16.6
	PL	10/17/01	AD+CWT+ RG	165,580	30.0	3/06/02	162,193	13.4
2001								
Subyearling	LFH	4/02/02	AD+CWT	202,224	190.0	-	-	-
	BC1	4/11/02	CWT	204,824	190.0	5/08/02	500,524	193.0
	BC2	-	-	-	-	5/31/02	506,865	178.0
	CJ1	4/12/02	CWT	200,488	180.0	5/08/02	499,876	215.0
	CJ2	4/09/02	CWT	200,375	180.0	6/04/02	500,026	152.1
	PL	4/18/02	CWT	203,368	180.0	5/07/02	401,289	196.7
	NOAA-Research	-	-	-	-	3/29/02	600	183.0
	NOAA-Research	-	-	-	-	6/28/02	113,213	148.0
Yearling	LFH	10/02/02	AD+CWT+ LR	453,010	35.0	-	-	-
	LFH	10/02/02	AD+CWT	200,881	35.0	-	-	-
	BC	10/10/02	AD+CWT+ LG	155,465	30.0	3/05/03	150,016	11.9
	CJ	10/22/02	AD+CWT+ LB	154,437	30.0	2/03/03	152,604	13.5
	PL	9/30//02	AD+CWT+ RG	155,342	30.0	3/03/03	143,492	11.9
2002								
Subyearling	LFH	3/31/03	AD+CWT	201,939	160.0	-	-	-
	Couse Cr.	4/22/03	AD+CWT	100,625	80.0	-	-	-
	Cherry Lane	-	-	-	-	4/02/03	100,000	272.0
	Cherry Lane	-	-	-	-	5/22/03	131,334	125.0
	BC1	4/08/03	CWT	201,035	170.0	5/07/03	513,626	100.8
	CJ1	3/31/03	CWT	201,432	170.0	4/22/03	201,120	118.0
	CJ2	4/24/03	CWT	189,294	140.0	6/05/03	603,836	84.0
	PL	4/14/03	CWT	201,396	160.0	5/06/03	401,564	139.0
	NOAA-Research	-		-	-	6/02/03	69,387	45.0

[a] On May 30, 2001, 199,967 fall chinook were barged from Lyons Ferry Hatchery and released downstream of Bonneville Dam on the Columbia River (Rkm 224.5).

[b] In the mark type column, visible implant elastomers (VIEs) are designated by side and then color, i.e., LR denotes left red, LB denotes left blue and RG denotes right green.

Off station research fish were transferred to the NPT and NOAA. Both groups of fish were PIT tagged at LFH by the receiving agency. The fish transferred to NOAA were part of a study to compare survival at return of transported and in-river migrating fish (personal communication,

Doug Marsh, NOAA). These fish were PIT tagged into a transport truck and released at Rkm 254 on the Snake River the same day they were tagged. These fish would then move down the Snake River and be collected at LGR Dam. Of those collected, 80% were transported to below Bonneville Dam and 20% were released. Survival would be estimated upon return to analyze any benefits associated with transporting. This was the first group of subyearlings used in this study by NOAA.

Yearlings

Prior to marking, yearling salmon for LFH on-station and acclimated upstream releases were reared in raceways. Marking and transfer numbers, and fish sizes are presented in Table 11. Following marking, yearlings to be released on-station were placed into Lake 2, a 2.1-surface acre earthen rearing pond with a concrete bottom. Yearlings awaiting transfer to acclimation sites were placed into raceways.

2001 Brood Year

Eyed eggs

This was the second year eyed eggs were transferred to Oxbow Hatchery (200,064) for Idaho Power Company as part of mitigation associated with the construction of Hells Canyon Dam. This group of fish was slated for release below Hells Canyon Dam as subyearlings.

Subyearlings

Fall chinook slated for LFH onstation release, NPT releases upstream of LGR Dam, NPT research, and NOAA research were reared in raceways at LFH until marking and/or transfer. Onstation release fish were marked back into a raceway for the remainder of their rearing. The NPT upstream release groups were also marked back into raceways at LFH prior to transfer to NPT acclimation sites above LGR Dam. For a more detailed description of NPT acclimation sites please refer to NPT Annual reports.

Off station research fish were transferred to the NPT and NOAA. Both groups of fish were PIT tagged at LFH by the receiving agency. This was the second group of subyearlings used for the transportation study by NOAA Fisheries.

Yearlings

Prior to marking, yearling salmon for LFH on-station and acclimated upstream releases were reared in raceways. Marking and transfer numbers, and fish sizes are presented in Table 11. Following marking, yearlings to be released on-station were placed into Lake 2. Yearlings awaiting transfer to acclimation sites were placed into raceways. After tagging fish for yearling production, an overage of 53,632 fish was apparent. These fish were released as late subyearlings.

2002 Brood Year

Eyed eggs

This was the third year eyed eggs (230,000) were transferred to Oxbow Hatchery and the first year eyed eggs (336,967) were transferred to Umatilla Hatchery (ODFW) for Idaho Power Company as part of mitigation associated with the construction of Hells Canyon Dam. Both groups of fish were slated for release below Hells Canyon Dam as subyearlings. In addition, Battelle Northwest Laboratories received 5,100 eyed eggs for research purposes.

Subyearlings

Fall chinook slated for LFH onstation release, NPT releases upstream of LGR Dam, NPT research, and NOAA research were reared, marked, and handled as described for 2001 brood year fish.

Disease Incidence and Prophylaxis

Broodstock

The 2001 and 2002 broodstocks were injected at capture at LGR Dam with erythromycin (20 mg/kg of fish) to reduce infection levels of *Renibacterium salmonarum* (causative agent of BKD). For fish captured at LFH, injections were performed during late September for brood years 2001 and 2002. While being held at LFH the salmon broodstock were treated with a 2hour flow through treatment of formalin (167 ppm) every other day as prophylaxis for *Saprolegnia sp.* (External Fungus).

2001 Spawning

At spawning, samples are collected for viral and BKD-ELISA testing. Only female fall chinook from the third, fourth and fifth spawning week were sampled for BKD-ELISA testing. A total of 660 female fall chinook were tested. BKD prevalence was moderate with 84.8% Below-Low females (Table 12). Progeny of Below-Low (<0.11 optical density, OD) females were selected for the yearling programs. Progeny of all other females were utilized in the subyearling programs.

No viral pathogens were detected in the broodstock in 2001.

Table 12. BKD-ELISA testing of female chinook broodstocks at Lyons Ferry Hatchery, 2001-2002.

Species-Stock-Year	No. Tested	% Below –Low[a]	% Low[b]	% Mod.[c]	% High[d]
CHF-Snake R. - 2001	660	84.8	8.9	3.9	2.3
CHF-Snake R. - 2002	668	83.5	10.0	3.0	3.4

[a] Below-low has an optical density of <0.11
[b] Low result has an optical density of 0.11 to 0.199
[c] Mod result have optical density of 0.20 to 0.44
[d] High result has optical density of >0.45

2002 Spawning

At spawning, samples are collected for viral and BKD-ELISA testing. We sampled females for BKD from the second, third, fourth, fifth, and sixth spawning weeks. A total of 668 female fall chinook were tested. BKD prevalence (as measured by ELISA methodology) was moderate with 83.5% of females measuring Below-Low (O.D. <0.11) as seen in Table 12. Progeny of Below-Low females were selected for the yearling programs. Progeny of all other females were utilized in the subyearling programs.

IHN virus was detected in BY 2002, but no management actions were recommended because of the positive virus finding.

Eggs

Eggs from the 2001 and 2002 broodstocks were initially disinfected and water hardened for 1-hour in an iodophor (buffered iodine) well water solution (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.

Juveniles

2000 Brood Year

Bacterial gill disease was observed in one raceway of subyearling fall chinook in March 2001. The fish were treated with potassium permanganate in a 1-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.

A pre-release exam for subyearlings was performed May 21-23 by USFWS staff at LFH and NPT Fall Chinook Acclimation Program (FCAP) facilities. LFH, Big Canyon, Captain Johns and Pittsburg pre-release samples looked very healthy with 2+ to 3+ fat reserves (Gates Index). Fish at all release sites were evaluated for presence of BKD and results indicated low incidence or not detected.

Bacterial kidney disease was diagnosed in the yearling fall chinook on September 2001. The fish were treated with erythromycin-medicated feed (28 day regimen) in fall, 2001. Chronic BKD mortality continued in the 2000 brood year fall chinook during the rearing cycle.

USFWS fish health staff performed a pre-release health exam of yearlings at LFH and FCAP facilities.

2001 Brood Year

Bacterial gill disease was observed in a number of raceways of subyearling fall chinook in April and May 2002. The fish were successfully treated with potassium permanganate. Seventeen of 26 raceways required treatment. Three raceways of fish required two treatment courses. Fish were under size (120-130 fpp on May 15) due to being off feed during the bacterial gill outbreak. Targeted subyearling size is 50 fpp at release (first week in June).

Bacterial kidney disease was first diagnosed in October 2002 and fish were treated with erythromycin-medicated feed. Chronic BKD mortality continued during the rearing cycle.

2002 Brood Year

Drop out syndrome was noted in one raceway of newly ponded fall chinook in February 2003. The dropout syndrome was noted in the only raceway receiving Ewos® micro starter feed. The problem was also noted at other WDFW hatcheries using the same feed. The feed was changed to Bio-diet starter and the mortality declined.

Bacterial gill disease was observed April 2003 in a number of raceways of subyearling fall chinook. The fish were successfully treated with potassium permanganate. Eight of 26 raceways required treatment. No multiple treatment courses were required.

The yearling fish received two erythromycin-medicated feed treatments; one in the spring and one in the fall. However, BKD was noted in the yearling fish in December 2003 and chronic BKD continued throughout the rearing cycle.

Juvenile Releases and Migration

The current fall chinook production goal for LFH, which began with the 1995 brood, is 900,000 yearling fish. Half of the yearlings are to be released on-station; the other half are to be released from Nez Perce FCAP 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 because of higher survival rates (Bugert et al. 1996). Nonetheless, we wish to evaluate subyearling releases and compare them with yearling releases in an attempt to improve subyearling survival and maintain the natural age and sex composition of adult returns. Additionally, more fish can be raised at LFH by including subyearlings instead of using only yearlings.

Numbers of WDFW releases, along with lengths and weights of fall chinook produced at LFH are listed in Table 13. Historical releases by WDFW, NPT, IDFG, and NOAA are presented in Appendix D for release years 1996-2003.

Table 13. WDFW juvenile fall chinook releases from brood years 1999-2002, released in 2002 and 2003.

Release site	Brood Year	1999		2000		2001		2002
		Subyearling	Yearling	Subyearling	Yearling	Subyearling	Yearling	Subyearling
LFH	# Released	**196,643**	**338,757**	**3,994**	**432,511**	**194,582**	**518,436**	**200,092**
	Release Date	May 26, 2000	April, 1 2001	July 3, 2001	April 1, 2002	June 24, 2002	April 1, 2003	June 6, 2003
	Mean Length (mm)	96.79	171.60	90.10	164.80	92.63	162.83	92.79
	CV of Length	9.20	8.70	15.25	8.04	6.95	8.91	9.82
	Mean Weight (gm)	9.97	52.20	8.70	48.70	8.69	46.70	9.07
	Fish per pound	45.50	8.70	52.20	9.30	52.00	9.70	50.01
Columbia River below Bonneville Dam (barged to release site)	# Released			**199,976**				
	Release Date			June 1, 2001				
	Mean Length (mm)			95.40				
	CV of Length			5.76				
	Mean Weight (gm)			9.93				
	Fish per pound			45.70				
Snake River at Roosters Landing	# Released					**24,573**		**33,500**
	Release Date					Dec. 2, 2002		March 4, 2003
	Mean Length (mm)					--		--
	CV of Length					--		--
	Mean Weight (gm)					17.50		--
	Fish per pound					26.00		1200.00
Snake River at Chief Timothy Park	# Released					**29,059**		
	Release Date					Oct. 16, 2002		
	Mean Length (mm)					--		
	CV of Length					--		
	Mean Weight (gm)					18.40		
	Fish per pound					24.60		
Snake River at Couse Creek boat launch	# Released							**100,019**
	Release Date							June 9, 2003
	Mean Length (mm)							98.83
	CV of Length							10.09
	Mean Weight (gm)							11.24
	Fish per pound							40.36
Totals		**196,643**	**338,757**	**203,970**	**432,511**	**248,214**	**518,436**	**33,611**

1999 Brood Year

Yearling Release

Information for the yearlings released from LFH and three NPT acclimation facilities above LGR Dam (Big Canyon, Pittsburg Landing, and Captain John) was presented in Milks et al. (2003). Passage and travel times of fish released at LFH are presented below (Table 14). Similar migration information for fish released from the acclimation sites will be presented in an upcoming NPT report (personal communication, Steve Rocklage, NPT).

At LFH, 338,757 yearlings were volitionally released April 1-24, 2001. Two groups were PIT tagged during the release; the PIT-1 group (499 fish) was tagged on April 11, and the PIT-2 group (492 fish) was tagged on April 17. PIT tag interrogation units at downstream Snake and Columbia River dams provided passage data. Although elastomer sampling occurred at both Lower Monumental and McNary Dam juvenile bypass collection facilities, only data from Lower Monumental Dam is included. This was because a group of spring chinook released on the Yakima River was also marked with left red VIEs and were therefore indistinguishable at McNary Dam from the LFH released yearling fall chinook.

Table 14. Passage data for on-station release (April 1-20, 2001) of LFH/Snake River origin yearling (1999 BY) fall chinook at Snake and Columbia River dams, 2001 (Data includes all detections for each dam).

Tag Type-Group	No. Sampled/ Detected	Median Travel Days	Median Passage Date	Passage Date Range 2001	Passage Dates	
					10%	90%
Lower Monumental Dam						
Left red VIE tag	12,713	-	April 25	April 4-Aug 7	April 10	May 6
PIT–1	241	17.2	April 29	April 17-June 24	April 23	May 10
PIT–2	264	12.7	April 30	April 21-June 5	April 27	May 10
McNary Dam						
PIT–1	183	30.4	May 12	April 29-June 27	May 4	May 24
PIT–2	194	27.6	May 15	April 30-June 12	May 5	May 22
John Day Dam						
PIT–1	87	37.6	May 19	May 7-June 8	May 13	May 30
PIT–2	109	32.3	May 20	May 6-June 7	May 12	May 31
Bonneville Dam						
PIT–1	30	43.9	May 25	May 5-June 17	May 16	June 7
PIT–2	28	34.9	May 22	May 17-June 13	May 18	June 7

2000 Brood Year

Subyearling Release

Because of low flows (Figure 2) and no anticipated spill at the Snake River Dams during the migration period, it was decided to transport these fish downstream via barge to try to increase their survival during a drought year. Fall chinook have been barged from LFH in the past, but never to below Bonneville Dam. By lengthening the journey and passing more dams we hoped to avoid loss that would occur at dams on the Columbia River.

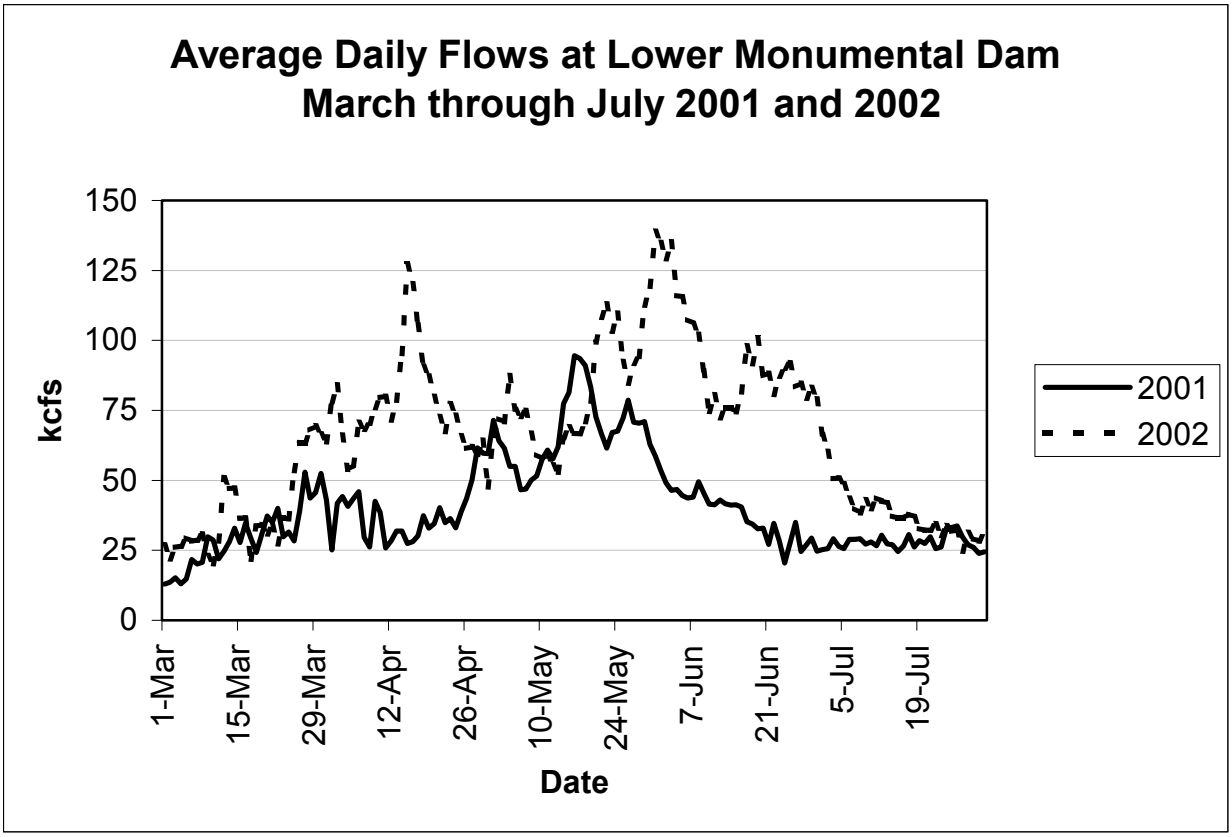


Figure 2. Average Daily Flows at Lower Monumental Dam, 2001 and 2002, as downloaded from the Fish Passage website: http://www.fpc.org/flowspill/.

The barge was loaded on May 30, 2001. Unfortunately, new staff at LFH had no experience in loading barges. The first fish were pumped at a rate that caused head injuries. Slowing the rate of the fish pump eliminated the problem. No accurate estimate of potential injuries was possible, however, on-site observers believed that probably no more than 25% of the fish were loaded before the problem was noticed and the error was corrected. It was believed at the time, that the on-board barge observer would document any short-term loss during the barge trip to below Bonneville Dam.

The barge left LFH at 6:00 p.m. on May 30, 2001 but did not release the fish below Bonneville at river mile 139.5 (Rkm 224.5) until 9:40 a.m. May 31. The fish were originally slated for a night release on May 30, but the tug pushing the barge had engine problems upstream of Bonneville Dam, causing a delay. In addition, the barge rider quit, and no record of fish mortality during the trip was made.

Subyearlings were released from the three FCAP sites above LGR Dam by the NPT and directly released into the Snake River below Hells Canyon Dam in 2001 for Idaho Power Company mitigation. Portions of the upriver acclimated fish were PIT tagged to allow collection of migration data through the Snake and Columbia Rivers.

Late Subyearlings

WDFW released 3,994 unmarked/untagged subyearlings onstation at LFH on July 3, 2001. These fish were slated for NPT research but were not needed. These progeny were from females that tested at moderate ELISA titer levels.

Yearling Release

The 2000 brood yearlings were released from LFH and three NPT acclimation sites upstream of LGR Dam. At LFH, the gates were open April 1-11 to allow for a volitional release. By day three, more than 95% of the fish had left the lake and were either in the outlet structure or headed down river. Quality control data from samples taken April 1 and 3 indicated a 6.9% VIE loss. Also, 5% of the fish had visible marks/injuries caused by birds. Out-migration data from upstream releases were recorded as fish were sampled in juvenile bypass collection facilities. Elastomer recovery data from Lower Monumental (LMO) Dam is presented below (Table 15). In 2002, LMO Dam detected 14.7% of our release, as estimated by Passage Index. No yearlings were PIT tagged at LFH in 2002.

Table 15. Lower Monumental Dam passage data for releases of LFH/Snake River origin yearling fall chinook (2000 BY), 2002.

Release Site/VIE	Release Dates	No. Sampled	Passage Index	Passage Dates	
				10%	90%
LFH L. Red	April 1-11	7,670	63,445	April 5	May 2
Big Canyon L. Green	April 8-16	3,053	22,247	May 2	May 20
Captain John L. Blue	April 9-17	3,166	16,737	May 2	May 13
Pittsburg L. R. Green	April 9-17	3,599	25,507	May 1	May 14

2001 Brood Year

Subyearling Release

LFH staff released 194,582 subyearlings at 52 fpp on June 24, 2002. Bacterial gill disease had been identified in the subyearlings on May 15. Because fish were not eating, they were much smaller (120-130 fpp) than usual. Therefore, the early June release was delayed until fish were closer to the target size of 50 fpp.

Tag detectors at LMO Dam identified 420 unique PIT tags (Table 16) or 28.0% of the 1,499 tagged fish released from LFH in 2002. Median travel times to LMO and Columbia River Dams are also provided.

Table 16. Passage data for PIT tagged on-station release of LFH/Snake River origin subyearling (2001 BY) fall chinook at Snake and Columbia River dams, 2002 (Data includes all detections for each dam).

Detection Facility	No. Sampled/ Detected	Median Travel Days[a]	Median Passage Date	Passage Date Range 2001	Passage Dates	
					10%	90%
L. Monumental Dam	420	18.8	July 13	June 25-5 September	June 27	July 28
McNary Dam	294	24.6	July 18	June 30-8 December	July 11	July 31
John Day Dam	68	28.2	July 22	6 July-1 September	July 13	August 12
Bonneville Dam	55	25.1	July 19	July 7-5 August	July 13	July 26

[a] Fish were PIT-tagged June 21, 2002 but released on June 24, 2002. Travel days are from tagging date.

Late Subyearlings

Two groups of excess fish were released as late subyearlings. LFH staff transported and released 29,059 unmarked fall chinook at Chief Timothy State Park (above LGR Dam at Rk 210.3) on October 16, 2002. These fish were originally slated to be included in a NOAA research transport study, but were too small to tag during the early summer out-migration and thus considered as "extras." An additional 24,573 unmarked fish were released on December 2 into the Snake River at Roosters Landing (Rk 221.3). These fish were originally slated for yearling production but were excess to what was needed for tagging.

Survival Rates to Release

We used the estimated number of eggs and fish present at life stages in the hatchery for 1990-2001 broods presented in Table 10 to calculate survival rates within the hatchery environment (Table 17).

Table 17. Estimated survivals (%) between various life stages at LFH for fall chinook of LFH/Snake River origin, 1990-2001 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
2000	Yearling	92.8	91.3	84.8
	Subyearling	92.8	94.9	88.1
2001	Yearling	93.6	79.5	74.5
	Subyearling	93.6	97.7	95.8
Yearling mean:	**%**	**91.6**	**89.9**	**82.3**
	SD	2.4	10.2	8.7
Subyearling mean:	**%**	**92.2**	**96.2**	**89.1**
	SD	2.3	2.9	3.3

[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 fish were in the rearing 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 18). 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 E). The sex ratio of adult LFH/Snake River origin fish processed at LFH over the last nine years averaged 1.5 males/female (Table 19). Including jacks with males, the sex ratio averages 2.9 males/female.

Table 18. Mean percentages of Lyons Ferry origin salmon returning from 1998-2002 by age and sex. Included are transported and volunteer fish processed at Lyons Ferry Hatchery[a].

	Age						
Sex	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
			Means of Percentages				
Male	**16.7**	**36.6**	**11.7**	**2.3**	**0.1**	**0.0**	67.4
(SD)	(9.7)	(12.7)	(6.8)	(1.4)	(0.2)	(0.0)	
Female	**0.0**	**5.5**	**20.7**	**6.0**	**0.4**	**0.0**	32.6
(SD)	(0.0)	(4.1)	(10.8)	(3.3)	(0.4)	(0.0)	
Sum%	16.7	42.1	32.5	8.2	0.5	0.0	100.0

[a] For numbers of fish returning per year, see Wargo et al. 1999 and Milks et al. 2000.

2001

The 2001 return was comprised primarily of males (64.8%). Age-2 males accounted for 15.5%, age-3 males 41.8%, and age-4 males 6.5%of the returning fish (Table 20). Females were composed primarily of age-3 (12.8% of the run) and age-4 fish (18.0% of the run). LFH/Snake River origin fish tended to be smaller than stray salmon (Figures 3 and 4). These differences may be due to size and age at release, but may also be from genetic stock differences. Over the years, LFH has released mostly yearlings and Umatilla Hatchery has released mostly subyearlings. In 2001, releases of subyearling fall chinook into the Umatilla River were reduced to 600,000 fish (down from approximately 2.6 million) because fish survivals had failed to meet program goals, and in an effort to reduce straying. This management change will most likely affect the age composition and size of strays recovered on the Snake River in upcoming years. Overall, strays processed at LFH were older with fewer jacks than for the LFH origin population. The sex ratio of adult LFH/Snake River origin males at processing was 1.4 males per female, similar to the 9-year average (Table 19). The sex ratio including jacks with males was 1.7, lower than the 9-year average.

Table 19. Sex ratios for Lyons Ferry origin salmon processed at LFH in 1994-2002. Fish from acclimation sites are included.

Return year	LFH Ladder		LGR Trucked [a]		Total Processed	
	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
2001	1.8	1.9	1.2	1.7	1.4	1.7
2002	1.4	1.9	0.9	1.1	1.1	1.5
mean	1.8	3.5	1.2	2.2	1.5	2.9
(std)	(0.52)	(2.31)	(0.50)	(1.12)	(0.46)	(1.71)
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 Lyons Ferry origin fish are passed upstream, and others are not marked or trackable.

Table 20. Age and sex of Lyons Ferry origin salmon with CWTs processed at LFH, 1998-2002. Fish from acclimation sites are included. Jacks are included with males.

	Age by Brood Year						
Year/Sex	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
1998							
Male	207	1775	290	136	2	0	2,410
Female	1	143	300	351	3	0	798
Percent	6.5	59.8	18.4	15.2	0.1	0.0	3,208
1999							
Male	383	542	571	43	11	0	1,550
Female	0	59	745	96	27	0	927
Percent	15.5	24.3	53.1	5.6	1.5	0.0	2,477
2000							
Male	1047	1067	227	99	1	0	2,441
Female	0	109	395	249	4	0	757
Percent	32.7	36.8	19.4	10.9	0.2	0.0	3,198
2001							
Male	530	1427	221	33	3	1	2,215
Female	0	436	615	137	13	0	1,201
Percent	15.5	54.5	24.5	5.0	0.5	0.0	3,416
2002							
Male	401	905	385	37	2	0	1,730
Female	0	136	1004	94	3	0	1,237
Percent	13.5	35.1	46.8	4.4	0.2	0.0	2,967

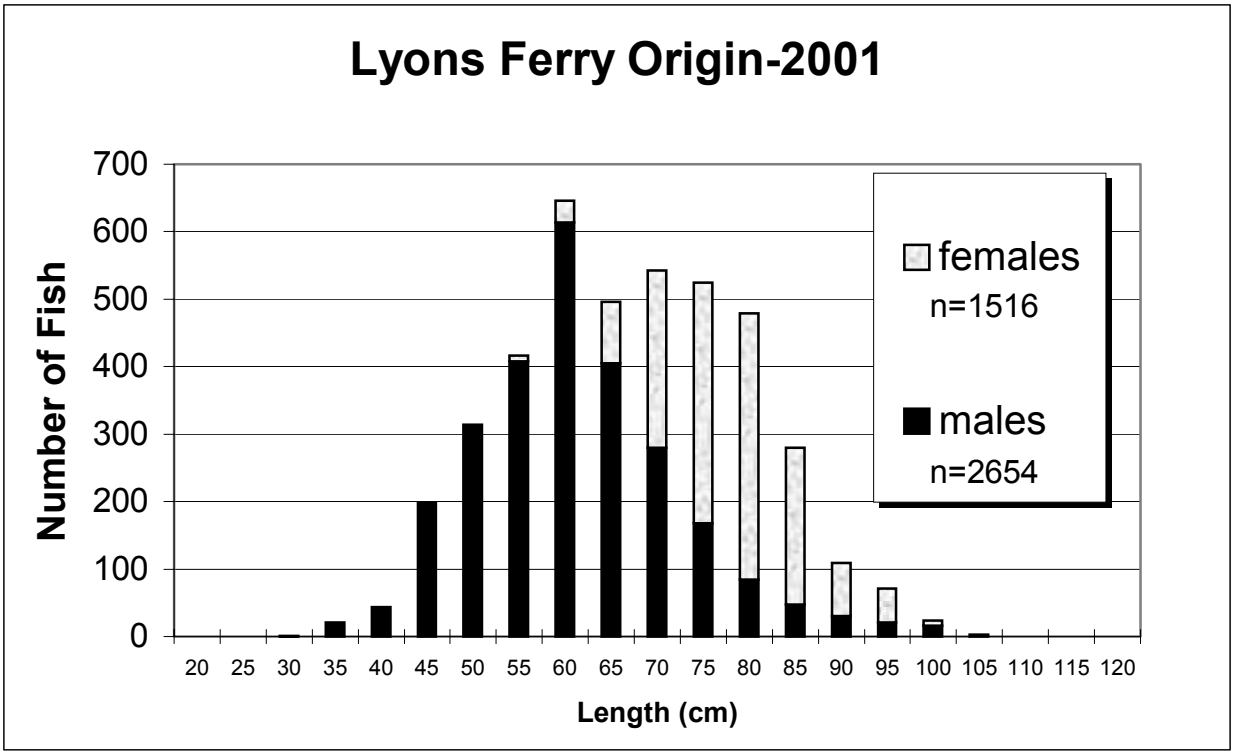


Figure 3. Length frequency of LFH/Snake River origin fall chinook processed at LFH, 2001.

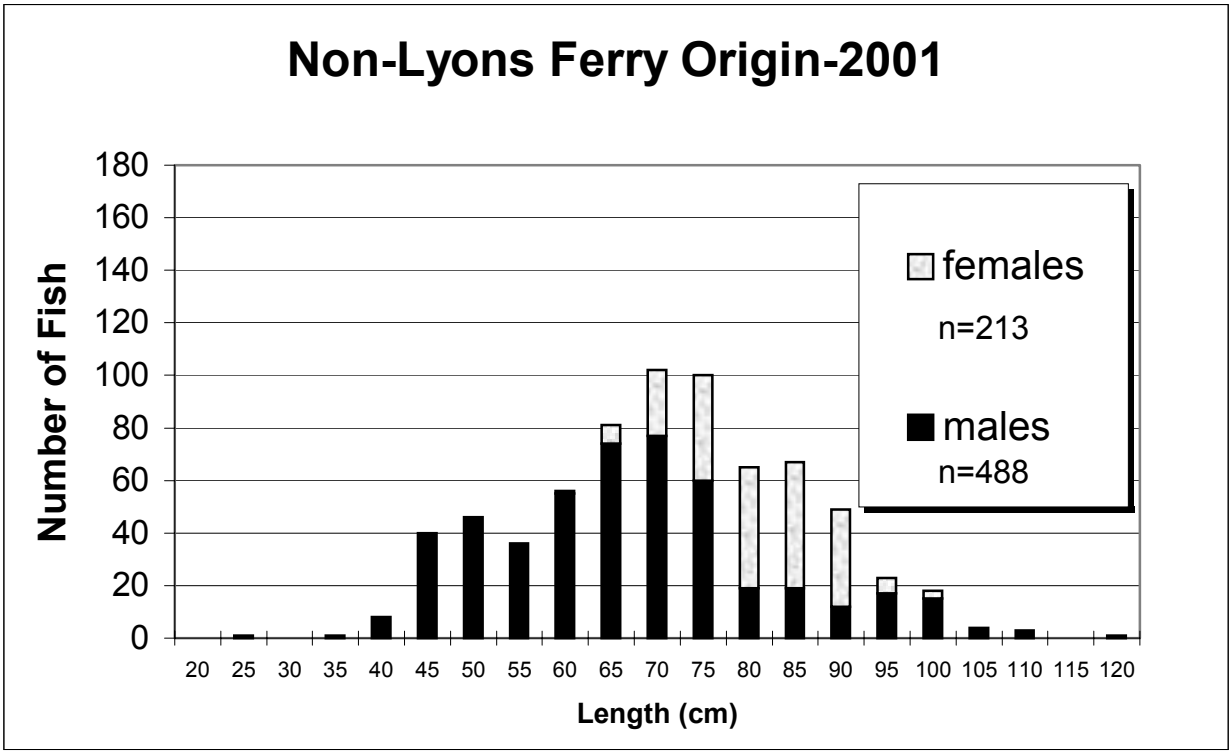


Figure 4. Length frequency of stray fall chinook processed at LFH, 2001.

2002

The 2002 return was comprised primarily of males (58.3%). Age-2 males accounted for 13.5%, age-3 males were 30.5%, and age-4 males were 13.0% of the returning fish (Table 20). As a single age/sex class, age-4 females were most numerous, representing 33.8% of the return in 2002. Females were composed primarily of age-4 (33.8% of the run) fish. Females of age-3 and age-5 returned at similar rates (4.6% and 3.2% of the return, respectively), with only 0.1% of the return being age-6 females. LFH/Snake River origin males tended to be smaller than stray salmon, although female sizes were similar (Figures 5 and 6). Overall, strays were older with fewer jacks. The sex ratio of adult LFH/Snake River origin males at processing was 1.1 males per female, similar to the 9-year average (Table 18). The sex ratio (including jacks with males) was 1.5, significantly less than the 9-year average, and the lowest for the years presented

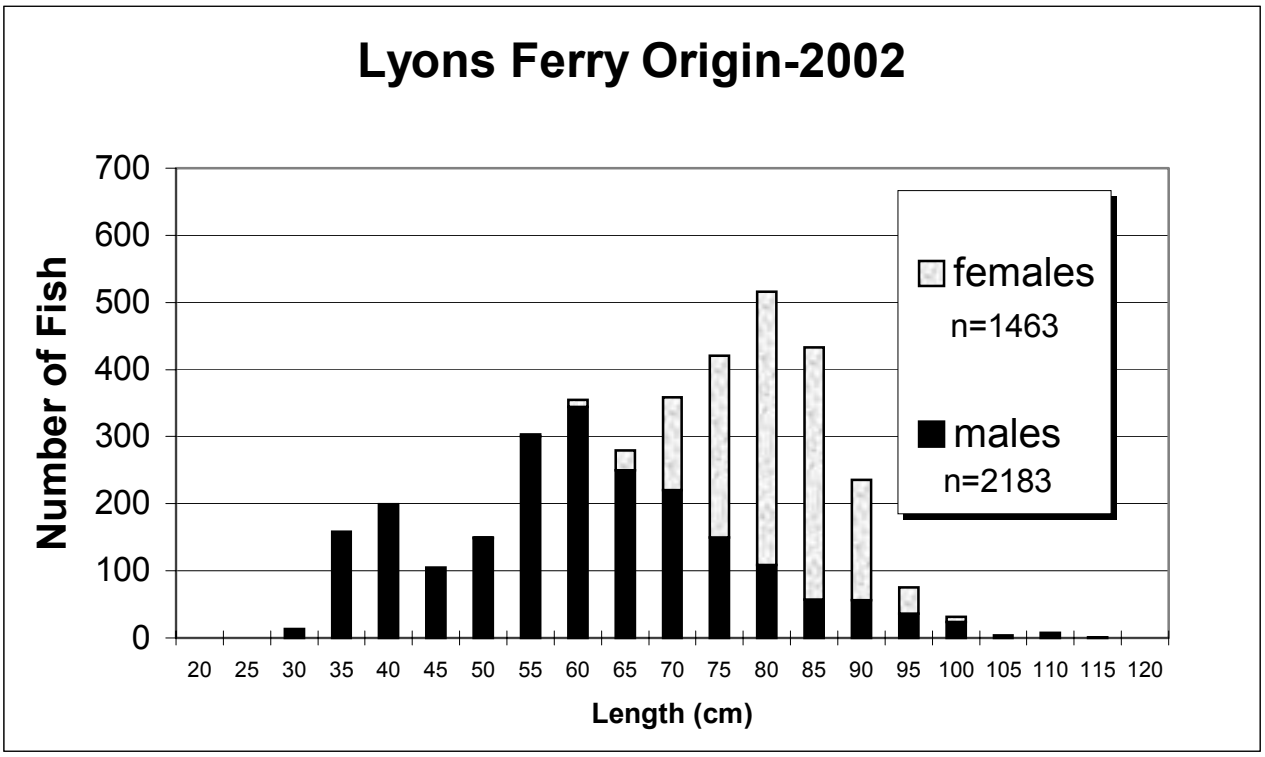


Figure 5. Length frequency of LFH/Snake River origin fall chinook processed at LFH, 2002.

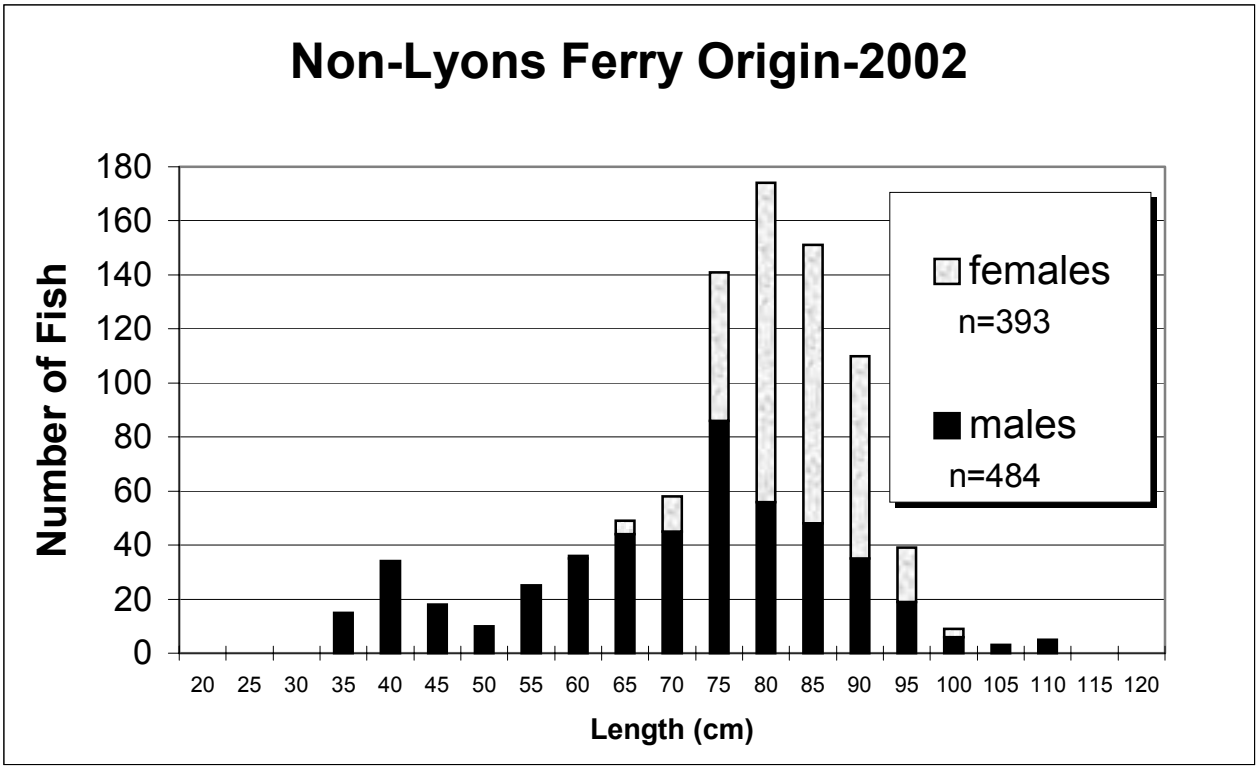


Figure 6. Length frequency of stray fall chinook processed at LFH, 2002.

VIE Detection in Adults

Since the 1990 brood year we have VIE tagged some portion of our yearling production. The intent was 3-fold: 1) identify the out-migration of our yearling fall chinook through the Snake and Columbia basins; 2) identify the yearlings upon their return at the LGR Adult Trap as a management tool for broodstock collection; and 3) identify our yearlings during spawning to facilitate the spawning process. While VIE tagging is expensive, it has proven a useful tool for us. Since the tag was developed for juveniles, little has been documented about its usefulness as a tag in returning adult fish. Listed in Table 21 are the observed detections of the various colors of VIE tags in fall chinook at LFH during processing, which indicate the variability in detection of this mark type. A more in depth analysis will be presented in an upcoming brief.

Table 21. Detection and percent retention of VIE tags in returning adult or jack fall chinook salmon processed at Lyons Ferry in 2001 and 2002.

CWT Code	% VIE Retention at Release	2001			2002			VIE locale and color
		Number of CWTs Decoded[a]	VIEs Observed	% VIEs Identifiable at Recovery	Number of CWTs Decoded	VIEs Observed	% VIEs identifiable at Recovery	
630163	84.3	65	22	33.8	2	2	100.0	LR
630183	80.3	-	-	-	13	3	23.1	LB
630363	80.8	1	0	0.0	-	-	-	LB
630446	93.3	5	0	0.0	-	-	-	RG
630448	93.3	16	1	6.3	1	0	0.0	RG
630451	82.8	32	3	9.4	9	2	22.2	RG
630453	81.1	62	7	11.3	15	2	13.3	LB
630454	88.8	26	3	11.5	4	2	50.0	LG
630476	92.8	10	7	70.0	405	305	75.3	LR
630477	94.6	2	1	50.0	15	5	33.3	LG
630478	88.9	1	0	0.0	31	9	29.0	LB
630479	86.7	1	0	0.0	25	11	44.0	RG
630677	86.2	-	-	-	16	10	62.5	LG
630678	83.0	-	-	-	28	2	7.1	RG
630860	85.1	708	349	49.3	102	46	45.1	LR
630938	97.6	7	3	42.9	1	1	100.0	LG
631012	87.6	43	21	48.8	33	12	36.4	LG
631013	86.9	66	10	15.2	93	5	5.4	LB
631212	83.2	38	10	26.3	39	6	15.4	RG
631213	89.4	772	398	51.6	581	331	57.0	LR
631273	93.1	-	-	-	163	129	79.1	LR
635845	89.8	1	1	100.0	-	-	-	LR
635957	72.9	2	0	0.0	-	-	-	RG
635958	72.9	1	0	0.0	-	-	-	RG
635959	88.3	1	0	0.0	-	-	-	LG
636025	89.6	1	0	0.0	-	-	-	LB
636126	90.6	1	0	0.0	-	-	-	LG
636318	84.3	41	20	48.8	2	0	0.0	LR
636320	87.2	7	2	28.6	-	-	-	LR
636321	87.2	4	0	0.0	-	-	-	LR
636345	80.8	4	1	25.0	-	-	-	LB
636346	80.8	7	0	0.0	-	-	-	LB

Fecundity

2001

Fecundity was evaluated for 176 LFH/Snake River origin females by age class (Table 22). Seven fish from each age class per spawn day, plus an additional seven fish from subyearling releases were measured. Lengths were proportioned by age class each week, then fish were selected for fecundity analysis 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 (Snake River Lab unpublished data, 1994). The numbers of live and dead eggs were combined to estimate total fecundity for each fish.

Table 22. 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 2001.

Brood Year	Age at Release	Total Age	Years in Salt Water	# Females Sampled	Average # Eggs	SD	Median # Eggs	Average Egg Size (gm)	Average Fork Ln (cm)	SD
1995	Y	6	4	8	3,905	736.5	3,910	0.37	90	5.8
1996	S	5	4	23	3,976	811.3	3,994	0.34	85	6.1
	Y	5	3	36	3,911	738.5	3,932	0.36	86	5.8
1997	Y	4	2	42	3,534	889.9	3,459	0.31	77	7.0
1998	S	3	2	41	3,102	706.3	3,182	0.24	70	5.8
	Y	3	1	26	2,731	565.8	2,726	0.24	62	4.9

Average fecundity was highly variable for each age class (Table 22). Generally, fecundities falling outside of two standard deviations for each age class were excluded from the analysis. However, we exempted fish on either end (50-59cm or 90-100cm) of the fork length spectrum from this rule. We believe the sample sizes of those groups were not adequate to fully represent the smallest and largest fish in each age class. The least overall fecundity was 1,508 eggs from a 55 cm, age-3 fish released at LFH as a yearling. The greatest fecundity was 6,392 eggs from a 91 cm, age-5 fish released as a subyearling at Big Canyon Acclimation facility.

2002

Fecundity was evaluated for 215 LFH/Snake River origin females by age class (Table 23), using the same method used in 2001. Again, average fecundity was highly variable for the females evaluated. The smallest overall fecundity was 1,225 eggs from a 52 cm age-4 fish that was released onstation at LFH as a subyearling. The largest fecundity was 6,248 eggs from a 96 cm, age-5 fish that was released at Big Canyon acclimation facility as a yearling.

Table 23. 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 2002.

Brood Year	Age at Release	Total Age	Years in Salt Water	# Females Sampled	Average # Eggs	SD	Median # Eggs	Average Egg Size (gm)	Average Fork Ln (cm)	SD
1996	Y	6	4	2	3,929	432.7	3,929	0.36	87	0.7
1997	Y	5	3	50	3,955	730.0	3,898	0.35	86	4.9
1998	S	4	3	59	3,862	855.1	3,965	0.32	82	7.5
	Y	4	2	57	3,407	818.7	3,393	0.31	76	7.5
1999	S	3	2	41	3,210	558.2	3,230	0.25	71	4.6
	Y	3	1	6	2,900	476.7	2,794	0.24	66	7.4

Tucannon River Natural Production

Adult Salmon Surveys

Fall Chinook Redd Surveys

2001

WDFW personnel located 65 redds during adult salmon surveys on the lower Tucannon River between November 5 and December 6, 2001. This was the largest number or redds detected on the Tucannon River since WDFW began surveys in 1985 (Table 24). The majority of redds (83%) detected were located below Fletcher's Dam (Rk 9.6, Figure 7).

Table 24. Number of redds, estimated escapement to the Tucannon River, and redd densities below Fletcher's Dam, 1985-2002.

	Tucannon River		Redds below Fletcher's Dam			
Year	Total redds	Estimated escapement[a]	Total	(%)	Redds/Rk	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[d]	21	63	18[d]	(86)	2.5	4.0
2000	19	57	15	(79)	2.1	3.3
2001[e]	65	195	54	(83)	6.3	10.2
2002	183	549	156	(85)	18.2	29.4

[a] This estimate was 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.
[e] Beginning in 2001, river kilometers for Tucannon River sections were revised.

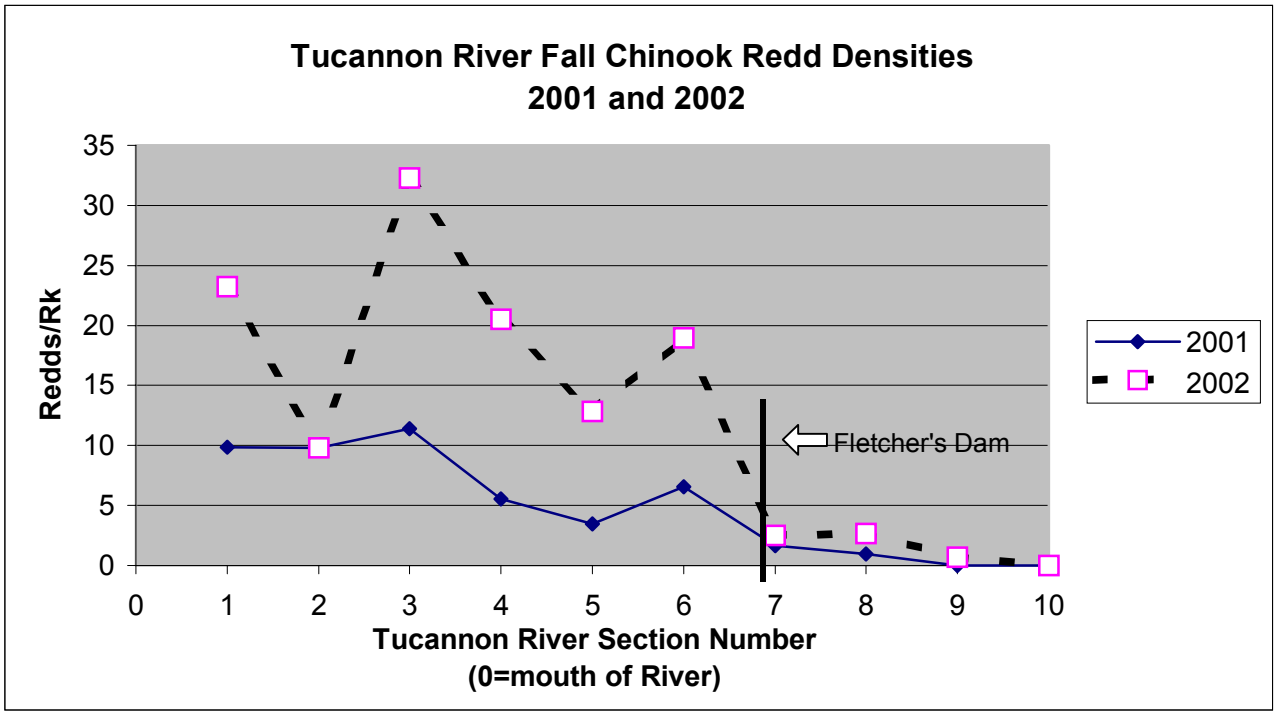


Figure 7. Tucannon River fall chinook redd densities, 2001 and 2002.

Surveys generally covered the river from Rk 1.3 to Rk 18.0 (Table 25). The first 1.3 kilometers of the Tucannon River are deep slack water from the Snake River's Lower Monumental Dam reservoir. The habitat is poor in this area and we assume no spawning occurs there. Landowner access restrictions prevented the surveying of 1.1 kilometers of river below Fletcher's Dam near Starbuck. Although the total area surveyed was 10.0 kilometers less than last year, the area surveyed did cover all spawning areas in the river. Surveys were not conducted above the adult steelhead fish trap (Rk 17.8) since no fish were passed upstream. River conditions for viewing were good throughout the spawning season.

Table 25. Tucannon River survey section descriptions and numbers of redds by location.

River Section Number and Description	Rk Surveyed	Number of redds		Redds/Rk	
		2001	2002	2001	2002
1. Mouth of Tucannon R. to highway 261 Bridge	1.7	17	40	9.9	23.2
2. Highway 261 Bridge to smolt trap	0.3	3	3	9.8	9.8
3. Smolt trap to Powers Bridge	0.5	6	17	11.4	32.3
4. Powers Bridge to upper hog barns	1.3	7	26	5.5	20.5
5. Hog barns to boundary fence above Starbuck	3.2	11	41	3.4	12.8
6. Upper boundary fence to Fletcher's Dam	1.5	10	29	6.5	18.9
7. Fletcher's Dam to Smith Hollow	3.6	6	9	1.7	2.5
8. Smith Hollow to Sheep Ranch Bridge	5.3	5	14	1.0	2.7
9. Sheep Ranch Bridge to Highway 12[a]	5.7	-	4	-	0.7
10. Highway 12 to Enrich Bridge[a]	6.7	-	0	-	0.0
Totals	**29.8**	**65**	**183**		
[a] Section not surveyed in 2001					

2002

Between November 7 and December 12, WDFW personnel located 183 redds during six adult salmon surveys of the lower Tucannon River. This is the greatest number of redds observed on the Tucannon River since WDFW began surveys in 1985 (Table 24). As in previous years, the majority (85%) of redds were located below Fletcher's Dam. Surveys covered the same river sections below the adult trap as surveyed in 2001. In addition, the survey reach was extended to above the adult trap. Throughout the spawning season, river viewing conditions were excellent.

Escapement and Composition

2001

The total estimated escapement to the Tucannon River in 2001 was 195 fall chinook (based on three fish per redd). The majority of live salmon were observed during the week of November 12. Seventy-three live salmon and 35 carcasses were observed during surveys (Table 26).

Table 26. Date, number of fall chinook redds counted, live fish seen, and carcasses on the Tucannon River in 2001 and 2002.

Week beginning	Redds Counted		Live Fish Seen		Carcasses Sampled	
	2001	2002	2001	2002	2001	2002
November 5	7	31	9	32	2	1
November 12	23	65	50	81	10	6
November 19	0	49	0	50	0	26
November 26	9	26	8	37	5	22
December 3	26	12	6	18	18	8
December 10	--	0	--	13	--	11
Totals	**65**	**183**	**73**	**231**	**35**	**74**

We collected scales and/or snouts from 35 carcasses (Appendix F). We were able to determine ages from19 of these samples (Table 27). The majority of the carcasses were from yearling onstation releases at LFH. Scales taken from a 1998 brood year female indicated she spent two years rearing in the reservoir before immigrating to the ocean. This behavior has been documented for subyearling LFH/Snake River hatchery origin fish released above LGR Dam, as well as in wild Snake River fish, but this is the first year we have documented it with onstation releases from LFH.

Strays from out of basin releases were often blank wire tagged or ventral clipped on the right side. The BWTs could have originated from either Klickitat Hatchery or Umatilla River releases. However, since there were no recoveries of CWTs from Klickitat Hatchery during our surveys, and the RV clip was a mark associated with Umatilla releases, we suspect all BWTs recovered were from releases into the Umatilla River.

Table 27. Age structure (total age) of fall chinook carcasses sampled on the Tucannon River. 2001.

Origin	Subyearling			Yearling			Reservoir Reared		
	Age 3	Age 4	Age 5	Age 3	Age 4	Age 5	Age 3	Age 4	Age 5
Lyons Ferry Hatchery				4	7		1		
Natural (wild)	1	3							
Blank Wire Tag	1								
Umatilla Hatchery									
Undetermined Hatchery					2				
Totals	**2**	**3**	**0**	**4**	**9**	**0**	**1**	**0**	**0**

We estimated run composition using CWT recoveries and scale pattern analysis. **The composition estimates below should be used cautiously because of the small sample size of recovered carcasses.** The run to the Tucannon was composed primarily of LFH origin fish and wild fish (Table 28). The wild fish are believed to be of Snake River origin, although no DNA testing has been done to compare wild fish from the Tucannon with wild fish upstream of LGR Dam. We were unable to assign origins to 11 jacks due to the small sample size. For more information regarding the assignment of fish to specific origins please refer to Appendix F.

Table 28. Estimated run composition of fall chinook in the Tucannon River, 2001.

Origin	Estimated Number of Adults in Run	Composition of Adult Run (%)	Estimated Number of Jacks in Run	Composition of Jack Run (%)
Lyons Ferry Hatchery	79	47.3	17	60.7
Strays	29	17.4	0	0.0
Unassigned (wild or hatchery)	0	0.0	11	39.3
Natural (wild)	59	35.3	0	0.0
Total	**167**	**100**	**28**	**100**

2002

The estimated escapement to the Tucannon River was 549 fall chinook (Table 24). The majority of salmon were observed during the week of November 12, similar to 2001. We observed 231 live salmon and 74 carcasses during surveys (Table 26). We collected scales and/or snouts from 74 carcasses (Appendix G) and were able to determine ages for 70 of the fish (Table 29).

The majority of Lyons Ferry origin fish were yearling releases from LFH. Also, the majority of subyearling recoveries of LFH origin fish were from onstation releases at LFH. In 2002, we expected returns from upstream releases of unmarked/untagged /unassociated subyearling salmon. We only had one recovery of an upstream released fish (LF98SBCA). Assuming the LF98SCJ (subyearling Captain John) group had a return rate similar to LF98SBCA, we expect one of the undetermined hatchery carcasses in Table 29 was from the Captain John release.

Stray fish were coded-wire tagged or blank-wire tagged. As in the past, the BWTs could have originated from either Klickitat Hatchery or Umatilla River releases. However, since there were no recoveries of CWTs from Klickitat Hatchery, we suspect all BWTs recovered were from Umatilla River releases. Any yearling recoveries from that are unmarked/untagged/no VIE fish are assumed to be strays, since LF/Snake River hatchery origin fish are AD/CWT/VIE tagged. We also recovered one CWT from a subyearling Yakima River (1999BY) release.

Table 29. Age structure of fall chinook carcasses sampled on the Tucannon River, 2002.

Origin	Subyearling			Yearling			Reservoir Reared		
	Age 3	Age 4	Age 5	Age 3	Age 4	Age 5	Age 3	Age 4	Age 5
Lyons Ferry Hatchery	1	3		3	11	2			
Natural (wild)	2	3						1	
Blank wire tagged	2	2		1	12				
Umatilla Hatchery					4				
Yakima River	1								
Undetermined Hatchery	9	5	1	1	2	2	2		
Totals	**15**	**13**	**1**	**5**	**29**	**4**	**2**	**1**	**0**

The run composition (Table 30) was estimated using CWT and BWT recoveries as well as scale pattern analysis. Returns to the Tucannon River were composed primarily of stray, out-of-basin salmon. We attempted to estimate run size of strays based solely on CWT data, then estimate the number of BWTs we should have seen, but the number of BWTs recovered was significantly less than was estimated by this method. Therefore strays were estimated by expanding CWTs as well as BWTs to estimate run size. Sampling occurred at random so we believe that expanding each carcass to estimate the run was the more accurate method. The Lyons Ferry component was the next greatest contributor to the run. We were unable to assign origins to 16.6% of the adult run. The natural (wild) component was significantly less than what was estimated for 2001. **The number of jacks recovered was small so their composition estimate must be used cautiously.** For more information regarding the assignment of fish to specific origins please refer to Appendix G.

Table 30. Estimated run composition of fall chinook in the Tucannon River, 2002.

Origin	Estimated Number of Adults in Run	Composition of Adult Run (%)	Estimated Number of Jacks in Run	Composition of Jack Run (%)
Lyons Ferry	172	31.2	8	26.7
Strays	212	40.8	7	23.3
Unassigned hatchery	86	16.6	7	23.3
Unassigned (wild or hatchery)	0	0	8	26.7
Natural (wild)	59	11.4	0	0
Total	**519**	**100**	**30**	**100**

Recovery of fish returned to Snake River

As a management tool to assure sampling of fish across the run, fall chinook were returned to the Snake River at different times during the season. Documentation of recoveries of these fish will help managers determine the effectiveness of returning fish to the river and the effect the releases potentially have on the spawning populations in the Tucannon River and upstream of Lower Granite. Please refer to Tables 5 and 6 for the number of fish hauled to the Snake River and the dates of hauling. Below are the fish that have been detected from these releases of adults back to the Snake River. These fish are included in the composition section above. A summary brief of this information will be written in the future after more years of data are collected.

2001

We did not recover any fish that were hauled back to the Snake River above LGR Dam on October 31. These excess fish were Snake River Hatchery origin fish that were given three hole punches on the right operculum prior to release to monitor recaptures.

2002

We recovered one female that was originally trapped at LGR, hauled to LFH, top-caudal-clipped, fell back through LGR and LGO Dams, and was recovered in the Tucannon River. This fish expands to seven fish and results in an estimated 1.2% increase in the run size to the Tucannon River.

We also recovered three carcasses from fall chinook trapped at LFH that were hauled back to the Snake River and released at Texas Rapids Boat Launch (Rk 105.2). These fish were bottom-caudal (BC) clipped prior to transport. The recoveries were non-ad-clipped males: one fish had a BWT, one was verified as being of hatchery origin through scale analysis, and data was insufficient to determine origin on the third recovery. When expanded for sample rate, the estimated escapement of BC-clipped fish was 22 fall chinook resulting in an estimated 4.0% increase in the run size to the Tucannon River because of this management action.

Coho

2001

Five coho redds were observed and seven coho carcasses recovered during 2001 surveys. All were located below Fletchers Dam. Scale results and one CWT indicated six of the carcasses were of hatchery origin. The coded-wire-tagged coho was from a 1998 brood year Clearwater River release by the NPT. With an associated expansion factor of 4.7, the majority of the coho recoveries were most likely from this release. The remaining carcass was not sampled for scales or wire.

2002

In 2002, one coho redd and two coho carcasses were observed below Fletcher's Dam. Although no coho redds were observed above the dam, five coho (2 males and 3 females) were passed upstream at the steelhead adult trap. One of these females was recovered at the trap after having spawned.

Juvenile Salmon Emigration

Prior to 2001, estimates of fall chinook smolts produced in the Tucannon River excluded any production below the smolt trap. Estimates of emigration to the smolt trap are essentially a point estimate. Relating smolt trapping to redd counts may give us a better estimate of productivity for the Tucannon River.

2001 Smolt Trapping

WDFW staff operated a 5-ft rotary screw trap continuously at Rk 3.0 on the Tucannon River to estimate numbers of migrating juveniles. Each week during the main out-migration, we attempted to determine trap efficiency by clipping a portion of the caudal fin on captured migrants and releasing them about one Rkm upstream of the trap. The percent of marked fish recaptured was used as an estimate of weekly trapping efficiency. When insufficient fish were captured for tap efficiency estimates stream flow data (provided from United States Geological Survey gauge station) were used in a correlation analysis that related out migration to stream flow. To estimate potential juvenile migrants passing when the tap was not operated, we calculated the average number of fish trapped for three days before and three days after non-trapping periods. The mean number of fish trapped daily was then divided by the estimated trap efficiency to calculate fish passage. Total daily estimated fall chinook out migrating form the Tucannon River was calculated by expanding the daily catch by the corresponding weekly trap efficiency.

On March 25, 2001, the first wild fall chinook juveniles were captured in the smolt trap. Passage numbers peaked May 12-June 15 and an estimated 6,012 juveniles passed the trap in 2001. Using smolt trap estimates, and redd counts above the smolt trap (12 redds) in 2000, the estimated number of smolts produced per redd was 501. Applying the smolt per redd estimate to

the total number of redds observed in 2000 (19 redds), yields an estimate of 9,519 fall chinook emigrating from the Tucannon in 2001. The river below the smolt trap is slow flowing with a high sediment load. The survival of eggs/fish below the smolt trap may be less than eggs/fish incubated/reared above the smolt trap, but to what level we don't know. Unfortunately, the velocity of the river in that section is not adequate for smolt trapping. Because of these concerns, we suggest the estimated production be used cautiously.

WDFW staff used PIT tags to study the emigration timing and success of wild fall chinook from the Tucannon River. The implanted tags allowed us to identify the characteristics of successful smolts. A portion of the wild fall chinook captured in the smolt trap were PIT-tagged and then released back into the Tucannon River downstream of the trap. In 2001, we tagged 419 wild origin fall chinook over a 4-week period during the peak of the migration (Table 31). Tagged fish ranged from 59-96mm in length and no fish were killed during PIT tagging. PIT tag retention was estimated to be 100% at time of release.

Table 31. 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 to downstream Snake and Columbia River dams in 2001.

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 (%)
5/23-5/24	102	72.4	7.2	73.6	9	45.6	6	59.1	4	64.0	0	40.5	19 (18.6)
5/30-6/02	119	74.8	7.5	75.2	21	35.6	8	54.3	2	67.2	0	25.2	31 (26.1)
6/07-6/09	97	77.6	7.1	78.3	15	47.4	4	75.3	2	77.9	0	75.4	21 (21.6)
6/12	101	79.4	6.8	82.2	12	41.4	9	78.3	4	72.4	1	56.9	26 (25.7)
Totals/Mean	**419**	**75.9**	**7.6**	**77.4**	**57**	**41.5**	**27**	**65.8**	**12**	**70.0**	**1**	**55.1**	**97 (23.1)**

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.

Larger fish appeared to be more successful migrants since they were detected at a higher rate than smaller fish. In 2001, a drought year, fish had large variations in travel days to each detection location as well as higher average travel days to each detection location than in the past.

2002 Smolt Trapping

In 2002, an estimated 16,082 fall chinook passed the trap. The first wild fall chinook was seen at the trap on April 7; with peak arrival occurring May 20-June 16. Using smolt trap estimates for out-migration and redd counts above the smolt trap (45 redds) in 2001, the estimated number of smolts produced per redd was 357. Applying the smolt per redd estimate to the total number of

redds observed in 2001, yields an estimate of 23,205 fall chinook emigrating from the Tucannon in 2002. As described before, this estimate should be used with caution.

In 2002, we tagged 630 wild origin fall chinook over a 3-week period at the smolt trap. Tagged fish ranged from 57-106mm with an average length of 79.9 mm (Table 32). PIT tag retention was estimated to be 100% at time of release.

Larger fish appeared to be more successful migrants since they were detected at a higher rate than smaller fish. Fish tagged and released in 2002 had fewer variations in travel days to each detection location than those tagged in 2001. Also, average travel days to each detection location were consistently less for the 2002 migration. This was likely due to greater flows in the Snake River in 2002 than in 2001 (Fig. 2).

Table 32. 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 to downstream Snake and Columbia River dams in 2002.

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 (%)
5/27-5/30	201	80.4	8.6	82.4	53	25.6	35	29.8	11	29.9	4	32.9	103 (51.2)
6/03-6/05	229	78.2	9.8	80.2	47	25.5	40	34.9	12	32.8	4	32.8	103 (45.0)
6/10-6/11	138	81.9	7.3	83.1	48	24.7	8	33.9	3	32.2	2	35.8	61 (44.2)
6/14	62	80.6	7.3	82.9	21	23.9	10	33.4	1	34.4	1	34.5	33 (53.2)
Totals/Mean	**630**	**79.9**	**8.8**	**81.8**	**169**	**24.6**	**93**	**32.9**	**27**	**33.6**	**11**	**33.6**	**300 (48.4)**

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

2001

Counts at IHR Dam do not accurately estimate the run size of Snake River upriver bright fall chinook. An estimated 25,064 fall chinook passed IHR Dam (day and night counts) in 2001 (US Army Corps of Engineers 2001). Of those, 8.9% voluntarily returned to LFH and were retained for broodstock; an estimated 0.8% spawned naturally in the Tucannon River (Table 33), and 71.1% escaped to LGR Dam (Norma Sands 2004 memo). The remaining 19.2% of the fall chinook that were counted at IHR were not accounted for upstream of the dam. This is less than the 27-56% estimated losses (missing fish) above IHR in 1992-1999, but very similar to 2000 (19.3%). Possible disposition of missing fish includes fall back at IHR Dam (Mendel et al. 1993), mortality, or spawning in the tailraces of the lower Snake River dams. Mendel documented that dip-in chinook (non-Snake River fall chinook) from the Columbia River inflated 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.

Table 33. Accountability for fall chinook in the Snake River after being counted at Ice Harbor Dam in 2001.

Fall Chinook Estimates	Adults	Jacks (<53cm)	Total	% of IHR Run
Run to IHR (day + night counts)	14,235	10,829	25,064	100.0
Fish trapped at LFH, processed, retained for broodstock[a]	2,010	219	2,229	8.9
Fish estimated as spawned in the Tucannon River [b]			195	0.8
Unique fish to LGR Dam	12,793	5,025	7,818	71.1
Fish unaccounted for in the Snake River			**4,822**	**19.2**

[a] Data excludes 2 adults and 49 jacks trapped at LGR Dam that were mixed in with the LFH trapped fish at processing.

[b] Adults and jack determinations are excluded from this table because of the difficulty in recovering jacks in the Tucannon River.

2002

An estimated 22,388 fall chinook passed IHR Dam (day and night counts) in 2002 (US Army Corps of Engineers 2002). Of those, 9.9% voluntarily returned to LFH and were retained for broodstock; an estimated 2.5% spawned naturally in the Tucannon River (Table 34), and 81.6% escaped to LGR Dam (Norma Sands 2004 memo). The remaining 6.0% of the fall chinook that were counted at IHR were not accounted for upstream of the dam. This is far less than the 19-56% estimated losses (missing fish) above IHR from 1992-2001. Although there were significantly fewer unaccounted for fall chinook in 2002 from IHR Dam counts, there remains the possibility for significantly inflated counts. We continue to believe that counts at IHR Dam should not be used in estimating the number of Snake River fall chinook.

Table 34. Accountability for fall chinook in the Snake River after being counted at Ice Harbor Dam in 2002.

Fall Chinook Estimates	Adults	Jacks (<53cm)	Total	% of IHR Run
Run to IHR (day + night counts)	15,904	6,484	22,388	100.0
Fish trapped at LFH, processed, retained for broodstock [a]	1,783	444	2,227	9.9
Fish estimated as spawned in the Tucannon River [b]			549	2.5
Unique fish to LGR Dam (pending adult/jack correction)	12,297	5,980	18,277	81.6
Fish unaccounted for in the Snake River			**1,335**	**6.0**

[a] Data excludes 38 jacks trapped at LGR Dam that were mixed in with the LFH trapped fish at processing.
[b] Adults and jack determinations are excluded from this table because of the difficulty in recovering jacks in the Tucannon River.

Return to LFH

2001

In 2001, LFH retained 2,229 fish trapped on station, released another 52 of the trapped fish to the Snake River, and processed another 51 fish as volunteers to LFH (in error) when they were actually LGR trapped fish. Therefore the actual number of fish trapped at LFH was 2,281 or 9.1% of the escapement over IHR Dam. This was the smallest percentage of the run 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 LFH origin fall chinook above Lower Granite Dam. Since that time, the numbers of fish released above LGR Dam have increased, thus decreasing the probability of fish entering LFH.

Since we were unable to identify the specific 51 fish (2 adults and 49 jacks) trapped at LGR that were misidentified as volunteers at LFH, we were unable to exclude them from the run composition at LFH. Also, since 52 of the LFH trapped fish were returned to the Snake River, we also excluded them from the LFH run composition, since they may be included in Tucannon River recoveries or the LGR run composition. These fish were not reported to the Regional Mark Information System (RMIS) as recoveries because they were returned to the stream.

The run composition was based on data from the 2,280 fish processed as volunteers (Appendix H). Of the 2,280 fish processed, 1,887 fish (82.8%) were verified as LFH/Snake River origin. In addition, it is estimated that an additional 197 unmarked/untagged fish (8.6% of the fish processed) are from upstream releases of LFH/Snake River hatchery origin fish. Unfortunately at the time the scales were analyzed, John Sneva was not able to determine if the fish were hatchery or wild origin, only that they were subyearlings. It is likely that these fish were hatchery origin since they volunteered into the hatchery, well below LGR Dam. Also, there were 96 fish (4.2%) with lost tags or no tags, the majority of which are also LFH origin. The majority (84.5%) of LFH/Snake River origin returns came from on-station yearling releases at LFH, another 8.0% came from on-station subyearling releases at LFH.

Fall chinook from other hatcheries contributed 89 fish (3.9% of the total processed). The majority (98.9%) of strays processed were from hatchery releases in the Umatilla River (15 fish with CWTs and 73 fish with ventral fin clips or BWTs). Both Umatilla and Klickitat Hatcheries released fish with this mark. Since there was only one recovered CWT from Klickitat Hatchery, we assume the majority of BWT recoveries in 2001 were from Umatilla Hatchery. Also incidentally caught while trapping were 11 spring/summer chinook, representing 0.5% of volunteers processed at LFH.

Minijacks

In 2001 only one volunteer minijack (<30 cm) was processed. This was a fish that had been released from LFH as a subyearling. At processing, the fish measured 23 cm long (fork length). It is not surprising that we had just one minijack recovery. The facility at LFH is not designed to hold such small fish. Since staff at LFH did not keep track of jacks and minijacks while trapping, we are unsure of the actual number of minijacks that were trapped.

2002

In 2002, LFH retained 2,227 fish trapped on station, released another 501 trapped fish back to the Snake River, and probably processed another 38 fish as volunteers to LFH (in error) when they were actually LGR trapped fish. Therefore the actual number of fish trapped at LFH was 2,766 or 12.3% of the escapement over IHR Dam.

Since we were unable to determine the specific 38 fish (jacks) trapped at LGR that were misidentified as volunteers at LFH, we were unable to exclude them from the run composition at LFH. In addition, the 501 LFH trapped fish that were returned to the Snake River were excluded from the LFH run composition, since they may be included in Tucannon River recoveries or the LGR run composition.

The run composition was based on data from the 2,265 fish processed as volunteers (Appendix I). Of the 2,265 fish processed, 1,956 fish (86.4%) were verified as LFH/Snake River origin. We estimated that an additional 65 unmarked/untagged fish (2.9% of the fish processed) were from upstream releases of LFH/Snake River hatchery origin fish. WDFW staff was not able to determine if the fish were hatchery or wild origin, only that they were subyearlings. It is likely that these fish were hatchery origin since they volunteered into the hatchery. Also, of the 30 fish (1.3%) with lost tags or no tags, it is anticipated the majority were also LFH origin. The majority (89.5%) of LFH/Snake River origin returns came from on-station yearling releases at LFH, another 5.1% came from on-station subyearling releases at LFH, and 0.3% were from fish barged from LFH to below Bonneville Dam.

There were 213 (9.4%) stray hatchery fall chinook processed. The majority (98.6%) of these strays were from the Umatilla River (23 fish with CWTs, 1 BWT ventral clipped fish, and 186 non-clipped fish with BWTs). Both Umatilla and Klickitat Hatcheries released fish with a BWT and no clips. Since only 1 CWT was from Klickitat Hatchery, we assume the majority of BWT

recoveries in 2002 were from Umatilla Hatchery. Also incidentally caught while trapping was 1 spring chinook.

Minijacks

We processed six minijacks (<30 cm) at LFH from fish trapped at the hatchery in 2002. These fish were from the 2000 brood year, five were from onstation releases and one was from the Big Canyon Acclimation facility release. Staff at LFH did not keep track of jacks and minijacks while trapping; therefore we are unsure of the actual number of minijacks that may have been present.

Returns 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 at LGR Dam, in part using CWTs and BWTs from marked hatchery salmon collected at LGR Dam and spawned at LFH. In 2000, NOAA Fisheries accepted the task of generating the run reconstruction for LGR Dam from CWT recoveries and data presented in Appendices H and I. At the time our annual report was printed, the run reconstruction report was not finalized. Rather, we provide here a summary of the Draft NOAA run reconstruction memo. Necessary corrections to the run reconstruction, not yet made in the memo or in this report, are listed under the appropriate run year. This is an abbreviated account of escapement to LGR Dam and the final composition of fall chinook processed at LFH that were hauled from Lower Granite Dam as estimated by NOAA Fisheries personnel (personal communication, Norma Sands, NOAA). **Please note that the NOAA Run Reconstruction should be the number one document used when doing any analysis of the fall chinook run to Lower Granite Dam.** The numbers of fish observed in the window at LGR Dam (annual US Army Corps of Engineers (COE) counts) include more fish than actually reached the dam, due to counting fish multiple times when they re-cross the dam (after a fallback event).

Another limitation of the COE counts of fall chinook, is that they do not include minijacks (fish <30cm long). Therefore, the total number of fall chinook in the Snake River is underestimated. As a result, the estimated number of fish available for upcoming fisheries will be under estimated as well since run predictors rely heavily on jack ratios in the population. Fish management has shown interest in the number of minijacks in the Snake River since it will give fish managers better data on which to base future fishery recommendations.

2001

The 2001 count of unique (fish not counted twice) fall chinook at LGR Dam (August 18 to December 15) was 12,793 adults, 5,025 jacks, and an undetermined number of mini jacks (<30 cm; Sands Memo 2004). The NOAA estimate yields 811 less fish than were observed at the counting window (Table 35). The result is a decrease in the estimated number of fish above LGR Dam by 4.3% when using the NOAA estimate versus the COE window estimate. The adult window count was higher than for all other years since 1976 (Figure 8).

Table 35. Comparison of fall chinook run to LGR Dam using NOAA estimate to the number of fish observed at the ladder window (COE) in 2001.

Data Origin	Adults	Jacks (<53 cm)	Total
Sands unique count (actual run)	12,793	5025	17,818
COE window count	9,376	9,253	18,629
Difference	**+3417**	**-4428**	**-811**

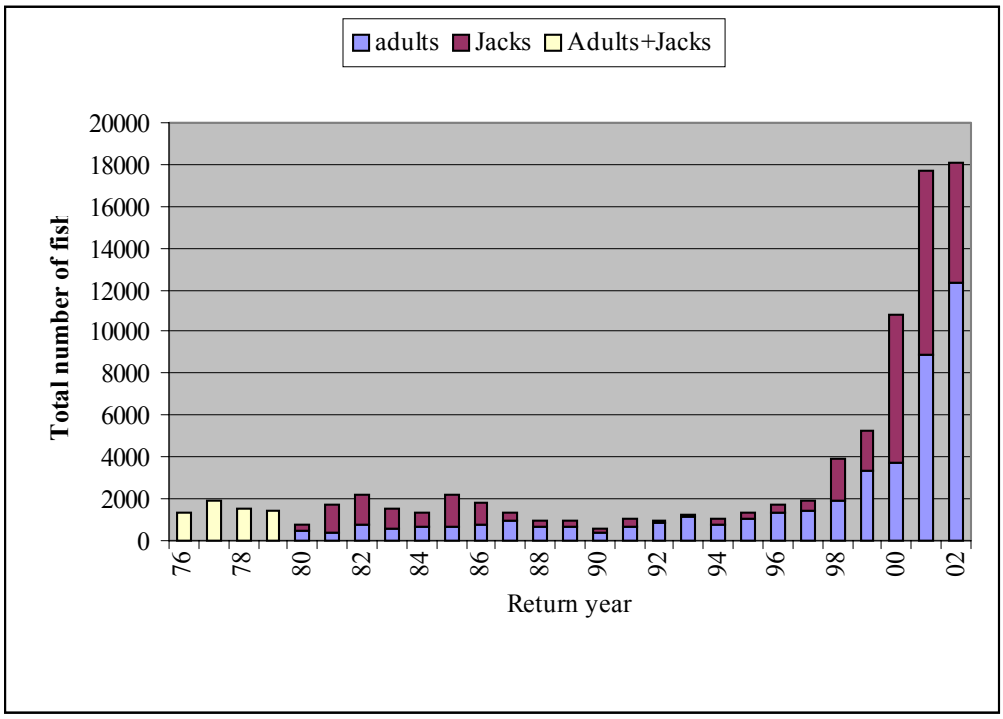


Figure 8. Fall chinook counts at LGR Dam, 1976-2002.

We removed and hauled 2,918 adults and 778 jacks from the LGR Dam in 2001. Of those 3,696 hauled fish, we processed 2,970 for CWTs (Appendix H), hauled 675 back to the Snake River above LGR Dam, and assumed the remaining 51 unaccounted for fish at processing were included in the LFH trapped composition. Based on the composition of the 2,970 fish processed at LFH the composition of the 3,696 fish hauled was estimated as 87.1% LFH/Snake River hatchery origin. Non-Snake River origin hatchery fish included 442 Umatilla fish, 18 Klickitat River fish, 15 Mid-Columbia fish, 1 Salmon River fish, and 1 fish from Youngs Bay (Lower Columbia River), totaling 12.9% of what was hauled to LFH.

The adult composition of fall chinook allowed to pass upstream of LGR Dam in 2001 was estimated by NOAA to include 48.3% LFH/Snake River hatchery origin, 49.1% wild fall chinook, and 2.6% non-Snake River origin hatchery fish. The jack composition was 87.7% LFH/Snake River hatchery origin fish, 11.9% wild Snake River fish, and 0.3% non-Snake River origin hatchery fish. The total resulting composition of fall chinook above LGR Dam was 59.8%

LFH/Snake River hatchery origin, 38.3% wild origin, and 1.9% non-Snake River origin hatchery fish. The number of minijacks counted at the LGR trap was not split from the jack estimate for the run reconstruction in Table 36. Minijacks listed in Table 37 have not been expanded for the run, these were fish identified at the LGR trap and released upstream.

Table 36. Stock Composition of fish passing LGR Dam in 2001 (Sands, NOAA memo 2004).

Origin/Release Area	Adults	Jacks (<53 cm)	Total
LFH	2,565	492	3,057
Big Canyon AF	1,232	1,994	3,226
Captain John AF	902	1,129	2,031
Pittsburg AF	371	195	566
Umatilla River	200	14	214
Klickitat River	26	0	26
Mid-Columbia	4	0	4
Salmon River	44	0	44
Wild/Natural Snake R.	5,163	518	5,681
Total	**10,507**	**4,342**	**14,849**

Table 37. Minijacks (<30cm) observed at the LGR Adult trap in 2001.

Criteria	Status of Fish	VI	Fork Length Range (cm)	No. Observed
Jacks <30cm	Released	LR	29	4
		RG	28-29	3
		LB	28	1
		LG	28	1
	Hauled to LFH	None	28	1

2002

One correction not reflected in the NOAA Run Reconstruction Memo regarding the 2002 return of fall chinook to LGR Dam concerns 256 fish. These fish, in error, were assumed to be jacks. At this time these fish have neither been removed from the number of jacks to LGR Dam nor added to the number of adults to LGR Dam. **The total fish to LGR Dam is correct in the NOAA memo.** Please note, since the run composition for adults is different than the composition of jacks, the moving of 256 jacks to adults will result in a change in run composition. When NOAA staff finalizes the run composition and the corrections mentioned above are made, we will report them in an upcoming report.

The 2002 count of unique (fish not counted twice) fall chinook at LGR Dam (August 18 to December 15) was 12,297 adults, 5,980 jacks, and an undetermined number of mini jacks (< 30 cm; Sands Memo 2004). The adult count was slightly less than 2001 but higher than for all other years since 1976 (Figure 8). The NOAA estimate yields 529 less fish than were observed at the

window (Table 38). The result is a decrease in the estimated number of fish above LGR Dam by 2.8% when using the NOAA estimate versus the COE window estimate. One reason is, minijacks are not documented by the COE. Observed minijacks are listed in Table 39. Another reason for the difference between the NOAA estimate and the COE estimate is fallback events, as documented in Table 40.

Table 38. Comparison of actual number of fish to LGR Dam and the COE counts as observed at the fish ladder in 2002.

Data Origin	Adults	Jacks (<53 cm)	Total
Sands unique count (actual run)	12,297	5,980	18,277
COE window count	12,639	6,167	18,806
Difference	**-342**	**-187**	**-529**

Table 39. Minijacks counted at the LGR trap during 2002.

Criteria	Status of Fish	VI	Fork Length Range (cm)	No. Observed
Minijacks <30cm	Released	LR	29	1
		RG	27-29	4
		LB	29	1
		LG	29	3
	Hauled to LFH	None	29	3

Table 40. Confirmed fallbacks of fall chinook as observed at the juvenile fish facility located below the LGR Dam, 2002.

Criteria	VI	Fork Length Range	No. Observed
Males	LR		1
Jacks <53 cm	LB	33	1
	LG	30-35	4
	LR	30-42	54
	None	31-45	41
Minijack <30 cm	LG	28	1
	LR	29	1
Total			**167**

We removed and hauled 2,406 adults and 383 jacks from the LGR Dam trap to LFH in 2002. Of the 2,789 hauled from LGR Dam to LFH, we processed 2,260 for CWTs (Appendix I), hauled 491 back to the Snake River above LGR Dam, and assume the remaining 38 unaccounted for fish at processing are included in the LFH trapped composition. Based on the composition of the 2,260 fish processed at LFH, 79.0% were LFH/Snake River hatchery origin. Non-Snake River origin hatchery fish included 545 Umatilla River fish, 22 Klickitat River fish, 11 Imnaha River fish, 4 Wells Hatchery fish, 3 Bonneville Hatchery fish released into the Umatilla River, and 1 fish from the Rogue River; totaling 21.0% of what was hauled to LFH.

The adult composition of fall chinook allowed to pass upstream of LGR Dam in 2002 was estimated by NOAA to include 77.4% LFH/Snake River hatchery origin, 20.9% wild fall chinook, and 1.7 % non-Snake River origin hatchery fish (Table 41). The jack composition consisted of 73.9% LFH/Snake River hatchery origin fish, 25.7% wild Snake River fish, and 0.4% non-Snake River origin hatchery fish.

Table 41. Run composition of fish passing LGR Dam in 2002 (Sands NOAA Memo 2004).

Origin/Release Area	Adults	Jacks (<53cm)	Total
LFH	1,035	849	1,884
Big Canyon	5,002	1,975	6,977
Captain John	1,331	817	2,148
Pittsburg	463	693	1,156
Umatilla	156	17	173
Klickitat	5	5	10
Imnaha	1	0	1
Rogue, OR	6	0	6
Wells	0	3	3
Wild/Natural Snake R.	2,116	1,506	3,622
Total	**10,115**	**5,865**	**15,980**

Status of Strays in the Snake River Basin

In 1990 WDFW adopted a broodstock collection protocol that allowed removal of strays from broodstock to maintain similarity to the Snake River natural origin fall chinook. This action was taken as a result of excessively high numbers of strays detected in the LFH broodstock in 1989 (Bugert et. al. 1990). This concern was further captured in the 1991 Status Review for Snake River Fall Chinook (Waples et. al. 1991). In 1993 NMFS began requiring the removal of strays at LGR Dam (NMFS 1993). The goal was to keep strays below 5% of the total run above LGR Dam. Since 1990 NOAA has requested that strays be removed from the Snake River to reduce the chances of strays spawning with naturally produced Snake River fall chinook. The goal was to keep strays below 5% of the total run above LGR Dam. Tables 42 and 43 show the number of strays that were detected in the Snake River Basin during 2001 and 2002. The numbers of LFH and LGR processed fish are the total number removed from the population.

2001

The majority of strays estimated in the Snake River were removed at LFH (10.1%) or LGR Dam (54.0%). The overall percent strays in the population above LGR Dam was estimated from run reconstruction as 1.9% in 2001.

Table 42. Summary of stray fall chinook to the Snake River Basin in 2001. Adults and jacks are included.

Origin/Release Area [a]	LFH Processed	Tucannon River [b]	LGR Processed [c]	Past LGR [c]	Total to Snake
Umatilla	88	18	442	214	746
Klickitat	1		18	26	45
Mid Columbia			15	4	19
Salmon ID			1	44	45
Youngs Bay			1		1
Unknown, age 4 yrl		11			
Total	89	29	477	288	883

[a] Unknown origin age 4 yrl are assumed to be strays because LF/Snake River hatchery origin yearlings are AD/CWT/VIE tagged, resulting in nearly 0 unmarked/untagged returns.
[b] Expanded for run to Tucannon River, assigning RV and BWT fish to Umatilla.
[c] Run reconstruction estimate

2002

The majority of strays estimated in the Snake River were removed at LFH (17.7%) or LGR Dam (48.7%). The overall percent strays in the population above LGR Dam was estimated from the run reconstruction as 1.2% in 2002.

Table 43. Summary of stray fall chinook to the Snake River Basin in 2002. Adults and jacks are included.

Origin/Release Area	LFH Processed	Tucannon River [a]	LGR Processed [b]	Past LGR [b]	Total to Snake
Umatilla	210	129	545	173	951
Klickitat	1		22	10	33
Imnaha			11	1	12
Bonneville	1		3		4
Ringold	1		1 [c]		1
Rogue, OR			1	6	7
Wells			4	3	7
Unknown (Blank wire tagged)		67			
Unknown (Unm/untag yrl)		14			
Total	213	210	587	193	1,203

[a] Actual recoveries, not expanded for run to Tucannon River.
[b] Run reconstruction estimate
c This fish was not in the run reconstruction (by error) although it was in the fish processed from LGR at LFH.

Final Location of Wire Tagged LFH/Snake River Hatchery Fall Chinook

The final locations of wire tagged LFH/Snake River hatchery origin fish were summarized for the 2001 and 2002 return years. Fishery recoveries, spawning ground recoveries from the Tucannon and Palouse Rivers, broodstock collected at LFH, as well as the run reconstruction estimates of wire tagged fish processed from LGR Dam and fish passed upstream of LGR Dam have been totaled (Appendix J). No expansions were made for untagged fish associated with the

wire recoveries. Comparing yearling data with subyearling data is tricky since the two groups of fish were marked differentially. Yearlings are 100% AD/CWT, while subyearlings included unmarked/untagged, wire tagged without a fin clip, as well as AD/CWT groups. Some ocean fisheries visually sample fish for fin clips while others sample electronically for wire presence. Because of this, the effect of ocean fisheries on subyearlings is probably underestimated.

2001

Yearlings had approximately 43% of their detections in the Snake River, 20% in the Columbia River, and 37% in ocean fisheries. Detections of subyearlings in 2001 indicated 75% were located on the Snake River, 10% were in the Columbia River, and 15% in ocean fisheries.

2002

Yearlings returning in 2002 had approximately 46% of their detections in the Snake River, 15% in the Columbia River, and 39% in ocean fisheries. Detections of subyearlings indicated 67% were located in the Snake River, 9% were in the Columbia River, and the balance of 24% were in ocean fisheries.

Status of Mitigation Requirements

Although we are approaching the hatchery mitigation target of 18,300 adults per year in the Snake River, the unmitigated portion of the population (14,360) that was expected to persist has not been maintained, which prompted the ESA designation for Snake River fall chinook. However, the naturally produced component of the population above LGR is increasing as the hatchery component increases.

2001

We estimate that 9,361 fall chinook adults and 4,756 jacks of LFH/Snake River hatchery origin returned to the Snake River in 2001 (Table 44); 77% of the 18,300 fish which are required for mitigation. Included in the LFH/Snake River hatchery return are fish released at LFH and NPT operated acclimation facilities above LGR Dam. This is a preliminary estimate, which will likely change when the run reconstruction is finalized. (Note: the natural (wild) component of the run consisted of 5,222 adults and 518 jacks to the Snake River (Table 45), merely 40% of the expected population. Although the natural component is low, the infusion of LFH/Snake River hatchery origin fish to the spawning grounds above LGR should supplement production.)

Jacks comprised 33.7% of the return of LFH/Snake River hatchery origin fish, while jacks comprised 9.1% of the return of wild origin fish. The jack rate of our mitigation fish is nearly four times that observed in the Snake River wild fish. Reducing our jack rate will help us meet the intent (in-place and in-kind mitigation) of our mitigation goals

Table 44. LFH/Snake River hatchery origin fish to the Snake River in 2001.

Sex	LFH Processed	Tucannon River [a]	LGR Processed [b]	Past LGR [b]	Total to Snake
Adults	1,743	79	2,469	5,070	9,361
Jacks (<53cm)	179	17	750	3,810	4,756
Total	1,922	96	3,219	8,880	14,117

[a] Estimated run to Tucannon River.
[b] Run reconstruction estimate.

Table 45. Snake River origin naturally produced salmon to the Snake River in 2001.

Sex	LFH Processed	Tucannon River [a]	LGR Processed	Past LGR [b]	Total to Snake
Adults	0	59	0	5,163	5,222
Jacks (<53cm)	0	0	0	518	518
Total	0	59	0	5,681	5,740

[a] Estimated run to Tucannon River.
[b] Run reconstruction estimate.

2002

We estimate that 11,355 fall chinook adults and 5,157 jacks of Lyons Ferry origin returned to the Snake River in 2002 (Table 46); 90% of the 18,300 fish which are required for mitigation. Included in the return are fish released at LFH and acclimation facilities above LGR Dam. This is a preliminary estimate. (Note: the natural (wild) component of the run consisted of 2,175 adults and 1,506 jacks to the Snake River (Table 47); merely 26% of the expected population.)

Jacks comprised 31.2% of the return of LFH/Snake River hatchery origin fish while jacks comprised 41.6% of the return of wild origin fish. The jack rate of our mitigation fish this year was three-quarters that observed in the Snake River wild fish, a significant change from 2001. There appears to be significant variation in jack abundance from year to year. While the proportion of jacks this year was more similar to the wild fish, our desire is to reduce the average jack rate in our long-term program to more closely match the natural jack rate.

Table 46. LFH/Snake River hatchery origin fish to the Snake River in 2002.

Origin/Release area	LFH Processed	Tucannon River [a]	LGR Processed [b]	Past LGR [b]	Total to Snake
Adults	1,511	172	1,841	7,831	11,355
Jacks (<53 cm)	453	8	362	4,334	5,157
Total	1,964	180	2,203	12,165	16,512

[a] Estimated run to Tucannon River.
[b] Run reconstruction estimate.

Table 47. Natural origin fall chinook to the Snake River in 2002.

Origin/Release area	LFH Processed	Tucannon River [a]	LGR Processed [b]	Past LGR [b]	Total to Snake
Adults	0	59	0	2,116	2,175
Jacks (<53 cm)	0	0	0	1,506	1,506
Total	0	59	0	3,622	3,681

[a] Expanded for run to Tucannon River, assigning RV and BWT fish to Umatilla.
[b] Run reconstruction estimate

Conclusions and Recommendations

The fall chinook program at LFH requires substantial coordination because 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. Focus on reducing jack rate to increase adult returns to meet mitigation earlier.

   Recommendation: reduce the size of yearlings released to decrease the jack rate and make it more similar to the jack rate of our subyearling releases.

2. The number of raceways at LFH currently limits production flexibility 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

   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. Reduction in production levels may be another option as is moving some of production to Umatilla Hatchery or another out-of-basin hatchery for rearing to provide more space at LFH.

3. Current acclimation sites (Big Canyon, Pittsburg Landing, and Captain John Acclimation facilities, and Oxbow Hatchery) are near maximum rearing capacity. If additional fish are to be released off-station, additional acclimation sites must be developed or direct releases must occur. Currently, nothing is known about the effectiveness of a direct stream release of subyearling salmon into the Snake River.

   Recommendation: continue to propose and implement a direct stream release of subyearlings paired with the release of subyearlings out of Captain John acclimation facility to compare survival between release strategies. Possibly include a direct release group paired with Pittsburg Landing or as a separate release in the Grand Ronde River.

   Recommendation: Encourage IDFG and Idaho Power Company to aggressively develop Oxbow Hatchery for future chinook releases to reach full production for IPC mitigation.

4. 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 report.

5. 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 federal, state, and tribal agencies involved in the fall chinook program 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 and age/sex of returns.

6. 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: summarize existing historical ATPase and Cortisol data in an upcoming report.

Literature Cited

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Appendix A: LFH Fall Chinook Broodstock Collection and Spawning Protocol 2001

2001

LGR Trap Operations

The fall chinook salmon passage period at Lower Granite (LGR) Dam is August 18 to December 15. The National Oceanic Atmospheric Administration (NOAA) 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. If water temperatures reach 72 degrees Fahrenheit, trapping and transport will cease. If any fall chinook arrive before August 18 we will be notified and the fish will be allowed to pass upstream until August 18 when fall chinook trapping officially begins. LFH staff will send a truck on August 20 to receive the first load of fish. After that date, hauling will occur every M, W, and F. The LFH will monitor the numbers of fall chinook trapped at LGR by reviewing the data faxed to them daily to get an idea when hauling efforts will need to be increased.

Trapped fall chinook will be anesthetized and examined to detect marks present. Adults and jacks released with left red visible implant elastomer (VIE) tags will be given two opercle punches. This will be done to document any fallback occurrences of LFH released fall chinook. Any other VIE fish detected will also be returned to the river as well as unmarked/untagged fish incidentally captured in the trap. Likewise, non-VIE tagged fish with adipose clip and a cheek tag will be released into the ladder and pass upstream. These fish are 5-year old returns from subyearling releases from Big Canyon Acclimation facility. Fish that are not marked with VIE, but 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. Fish hauled to LFH will be held separately from fish trapped at LFH to document broodstock composition for each capture location.

In the event that the fish on hand, and the number anticipated, exceed the trap's holding capacity, NOAA personnel will pass left red VIE marked fish (adults and jacks) to reserve space to accommodate strays.

Trapping Schedule

During the work day (7:00 a.m.-5:00 p.m.) the wire detectors will be turned on for one hour then turned off for one hour to trap wire tagged fish. The detectors will be turned on all evening from 5:00 p.m. to 7:00 a.m. To equally sample fish during the 10-hour day, on even numbered days the trap will be opened at 8:00 a.m., 10:00 a.m., 12:00 p.m., 2:00 p.m., and 4:00 p.m. On odd numbered days the detectors will be turned on at 7:00 a.m., 9:00 a.m., 11:00 a.m., 1:00 p.m., and 3:00 p.m. When the run becomes manageable then the wire detectors will be turned on full time.

LFH Trap Operations

The LFH will trap salmon from September 1 until early to mid-December, 2001. Salmon that volunteer to LFH will be transferred to the holding pond every day to reduce stress to fish. Fish captured at LFH will be held separately at LFH, from fish captured at LGR Dam to document broodstock composition from each capture location.

Sampling and Processing

All salmon sampled at LFH will be checked for the presence of wire tags and external marks, measured for fork length, and have their sex documented. In addition, all unmarked/untagged fish will be scale sampled for later determination of origin. Any sub-sampling will occur without regard to sex or size.

Non-spawn Days

Hatchery staff will sample all pond mortalities. These data will be recorded on head labels as well as a mortality form, both 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 LR fish and no-clip plus wire fish (slated for <100% of wire to be read)
    a. Not selected for wire decoding will have their data transferred to a form titled "WIRE NOT READ: LR elastomer or Wire only fish".
    b. Selected for wire decoding will be entered on the blue Mark Recovery form titled "<100% wire read" for the appropriate group (Volunteers or Lower Granite).
2. Head labels from all other fish (slated for 100% of wire to be decoded or fish without wire)
    a. No wire or RV/LV fish will be entered on the "OTHERS: No wire fish and RV/LV fish" form for the appropriate group (Volunteers or Lower Granite)
    b. All other fish with wire will be recorded on the blue Hatchery Mark Recovery form labeled "100% wire read". These forms will be attached to the back of the blue Mark Recovery form titled "100% wire read" for the appropriate group (Volunteers or Lower Granite).

Spawning Days

All salmon will be numbered to allow fish to be identified and accounted for individually. SRL staff will sample all fish and record the data on a head label or an appropriate form. Samplers will remove the snout from every other (50%) LR fish processed, regardless if it is spawned or not. Left red VIE fish are LFH origin. Any other VIE fish will have 100% of the wire decoded to determine age and origin. Fish with no clip plus wire, which do not have a VIE, will be 100% sampled and have the wire decoded prior to spawning to determine origin. All other wire decoding of the no clip plus wire fish (not spawned) will occur at 50%, by random sampling. 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 decoding of the wire will occur at 100%.

Spawning

Broodstock will consist of LFH/Snake River origin salmon. Unmarked/untagged fish will be considered strays and will not be used as broodstock at LFH. To be consistent with the US v OR fall season agreement, stray fall chinook will be used if needed to make program needs at other Columbia basin. Any progeny from strays will be shipped off-station to Klickitat or another Columbia basin hatchery. If not needed, strays will be destroyed.

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. 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 2001.

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.

If additional production is needed the Columbia River basin, it may be necessary to spawn strays. Strays will be spawned together and their resulting gametes will be shipped off-station.

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. If it is necessary

to keep stray eggs, they 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 seven fish evaluated per spawn day from yearling releases and an additional seven fish from subyearling releases. The fish will be picked at random regardless of release site. 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 Fall Chinook Broodstock Collection and Spawning Protocol 2002

2002

LGR Trap Operations

The fall chinook salmon passage period at Lower Granite (LGR) Dam is August 18 to December 15. The National Oceanic Atmospheric Administration (NOAA) 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. If water temperatures reach 72 degrees Fahrenheit, trapping and transport will cease. If any fall chinook arrive before August 18 we will be notified and the fish will be allowed to pass upstream until August 18 when fall chinook trapping officially begins. LFH staff will send a truck on August 20 to receive the first load of fish. After that date, hauling will occur every M, W, and F. The LFH will monitor the numbers of fall chinook trapped at LGR by reviewing the data faxed to them daily to get an idea when hauling efforts will need to be increased.

Trapped fall chinook will be anesthetized and examined to detect marks present. Adults and jacks with left red visible implant elastomer (VIE) tags, which are released, will be given two opercle punches. This will be done to document any fallback occurrences of LFH released fall chinook. Any other VIE fish detected will also be returned to the river as well as unmarked/untagged fish incidentally captured in the trap. Likewise, non-VIE tagged fish with adipose clip and a cheek tag will be released into the ladder and pass upstream. These fish are 6-year old returns from subyearling releases from Big Canyon Acclimation facility. Fish that are not marked with VIE, but 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. Fish hauled to LFH will be held separately from fish trapped at LFH to document broodstock composition for each capture location.

In the event that the fish on hand, and the number anticipated, exceed the trap's holding capacity, NOAA personnel will pass left red VIE marked fish (adults and jacks) to reserve space to accommodate strays.

Trapping Schedule

During the work day (7:00 a.m.-5:00 p.m.) the wire detectors will be turned on for one hour then turned off for one hour to trap wire tagged fish. The detectors will be turned on all evening from 5:00 p.m. to 7:00 a.m. To equally sample fish during the 10-hour day, on even numbered days the trap will be opened at 8:00 a.m., 10:00 a.m., 12:00 p.m., 2:00 p.m., and 4:00 p.m. On odd numbered days the detectors will be turned on at 7:00 a.m., 9:00 a.m., 11:00 a.m., 1:00 p.m., and 3:00 p.m. When the run becomes manageable then the wire detectors will be turned on full time.

If there are still too many fish to handle, modify the protocol used during they daytime to allow for sampling of fish every third hour. Additional modifications should be made as necessary. When the run becomes manageable, turn the wire detectors on full time.

LFH Trap Operations

The LFH will trap salmon from September 1 until early to mid-December, 2001. Salmon that volunteer to LFH will be transferred to the holding pond every day to reduce stress to fish. Fish captured at LFH will be held separately from fish captured at LGR Dam to document broodstock composition from each capture location.

Sampling and Processing

All salmon sampled at LFH will be checked for the presence of wire tags and external marks, measured for fork length, and have their sex documented. Any sub-sampling will occur without regard to sex or size. DNA (opercle punch or fin clip) and scale samples will be collected from 100 known LFH/Snake River origin hatchery fall chinook, all unmarked/untagged fall chinook, 30 LFH/Snake River origin hatchery fall chinook from subyearling releases, and 100 Umatilla origin fall chinook.

Non-Spawn Days

Hatchery staff will sample all pond mortalities. This data will be recorded on head labels as well as a mortality form, both provided by Snake River Lab (SRL). Pond mortalities will be bagged individually with the label inside the bag. Each head will be placed in the appropriate garbage can noting which group of fish it came from (LFH or LGR Dam). These heads will be gathered for one week and bagged on Monday as either:

1. Lyons Ferry
2. 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 33% of the no-clip plus wire snouts for CWT recovery. Head labels will be handled in one of the following three 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 "Wire not read". These forms will be stapled to the back of the blue Hatchery Mark Recovery forms since these fish did have wire;
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; or
3) Fish sampled which were unmarked/untagged with no VIE will be recorded on a form titled "No wire" and duplicated onto scale cards.

Spawning Days

All salmon will be numbered to allow fish to be identified and accounted for individually. SRL staff will sample all fish and record the data on a head label or an appropriate form. Samplers will remove the snout from every other (50%) LR fish processed, regardless if it is spawned or not. Left red VIE fish are LFH origin. Any other VIE fish will have 100% of the wire decoded to determine age and origin. Fish with no clip plus wire, which do not have a VIE, will be 100%

sampled and have the wire decoded prior to spawning to determine origin. All other wire decoding of the no clip plus wire fish, which are not spawned, will occur at 33%, by random sampling. All fish with left or right ventral fin clips and wire will have their wire decoded to verify they are BWT and Umatilla origin. Fish with other marks, which have wire, will have their snouts removed and decoding of the wire will occur at 100%.

Spawning

Broodstock will consist of LFH/Snake River origin salmon. Unmarked/untagged fish will be considered strays and will not be used as broodstock at LFH. This year we will haul all unmarked/untagged salmon back to the Snake River. To be consistent with the US v OR fall season agreement, stray fall chinook will be used if needed to make program needs at other Columbia basin. Any progeny from strays will be shipped off-station to Klickitat or another Columbia basin hatchery. If not needed, strays will be destroyed.

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. Salmon of LFH/Snake River origin will be spawned together and kept separate from other groups. We will use single pair matings for all salmon spawned. Not using a back-up (second) male is a change in our protocol. 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. We do not anticipate live spawning males in 2002.

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.

If additional production is needed the Columbia River basin, it may be necessary to spawn strays. Strays will be spawned together and their resulting gametes will be shipped off-station.

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. If it is necessary to keep stray eggs, they 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 ten fish evaluated per spawn day from yearling releases and an additional ten fish from subyearling releases. The fish will be picked at random regardless of

release site. 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 C: Corrected Version of Table 1 Presented in Lyons Ferry Hatchery Evaluation Fall Chinook Salmon Annual Report 2000

Table A1. Corrected version of Table 1 from 2000 report. Numbers of fall chinook processed at LFH and window counts at Ice Harbor and Lower Granite Dams, 1990-1995

		Number Processed		Daytime Dam Counts[a] (through Oct.)		(Nov. & Dec.)[c]	
Year	Collection Location	Adults	Jacks[b]	Adults	Jacks	Adults	Jacks
1990	LFH	521	602	-	-	-	-
	Ice Harbor Dam	1092	-	3,470	1,847	-	-
	Lower Granite Dam	49	-	385	190	31	9
1991	LFH	310	146	-	-	-	-
	Ice Harbor Dam	409	14	4,500	1,526	-	-
	Lower Granite Dam	41	17	630	397	17	18
1992	LFH	281	124	-	-	-	-
	Ice Harbor Dam	307	34	4,636	894	-	-
	Lower Granite Dam	64	14	855	102	58	5
1993	LFH	667	123	-	-	-	-
	Ice Harbor Dam	126	21	2,805	332	-	-
	Lower Granite Dam	218	3	1,170	39	41	0
1994	LFH	563	393	-	-	-	-
	Ice Harbor Dam	-	-	2,069	1,033	-	-
	Lower Granite Dam	184	141	791	255	27	18
1995	LFH	598	1658	-	-	-	-
	Ice Harbor Dam	-	-	2,750	2,452	-	-
	Lower Granite Dam	433	270	1,067	308	20	7

[a] Classification of adults and jacks is based upon size at the counting window at each dam.
[b] In this table, processed jacks have fork length of <53 cm to correspond with dam counts.
[c] Daily window counts were not conducted at Ice Harbor Dam during November and December 1990-1995.

Appendix D: LFH/Snake River Origin Fall Chinook Releases Table Brood Years: 1994-2002

(Numbers presented do not match hatchery records for fish per pound because of reporting constraints put on the hatchery.)

Appendix D; Table 1. LFH/Snake River hatchery origin fall chinook releases with number marked, tagged, and unmarked by release year and type, April 8,1996-June 19, 2003.

						Number of Fish Released						
Release Year	Age	Brood Year	Release Location-Type	Release Date	CWT Code	AD+CWT	CWT Only	Ad Clip Only	Unmarked Untagged	FPP	VIE Mark	% VIE
1996	yearling	1994	IHR Dam-direct	08 Apr	635844	1,615	-	2	-	11.0	LR	89.8
1996	yearling	1994	IHR Dam-direct	08 Apr	635845	1,615	-	1	-	11.0	LR	89.8
1996	yearling	1994	LFH-volitional	09-12 Apr	635844	196,604		196	197	10.5	LR	89.8
1996	yearling	1994	LFH-volitional	09-12 Apr	635845	206,860		206	207	10.5	LR	89.8
1996	yearling	1994	Pittsburg-direct	12-15 Apr	635712	113,977	-	64	258	10.3	RB	82.1
1996	fry	1995	LFH-direct	01-31 Mar	no CWT			-	83,183	500		
1997	yearling	1995	Big Canyon-direct	14-17 Apr	635959	71,692	-	992	902	10.3	LG	88.3
1997	yearling	1995	Big Canyon-direct	14-17 Apr	635960	73,110	-	1,012	920	10.3	LG	88.3
1997	yearling	1995	Big Canyon-direct	14-15 May	635953	29,341	-	698	3,529	11.6	LB	89.6
1997	yearling	1995	Big Canyon-direct	14-15 May	636024	610	-	14	73	11.6	LB	89.6
1997	yearling	1995	Big Canyon-direct	14-15 May	636025	14,428	-	343	1,735	11.6	LB	89.6
1997	yearling	1995	LFH-volitional	04-26 Apr	636320	217,794		872	9,714	9.3	LR	87.2
1997	yearling	1995	LFH-volitional	04-26 Apr	636321	217,810		872	9,714	9.3	LR	87.2
1997	yearling	1995	Pittsburg-direct	14-17 Apr	635957	67,252	-	1,335	4,968	10.7	RG	72.9
1997	yearling	1995	Pittsburg-direct	14-17 Apr	635958	67,441	-	1,338	4,982	10.7	RG	72.9
1997	subyearling	1996	Big Canyon-direct	10-13 Jun	635120	119,824	-	1,816	7,897	63.9	(BWT left cheek)	
1997	subyearling	1996	Big Canyon-direct	10-13 Jun	635316	113,932	-	1,727	7,509	63.9	(BWT left cheek)	
1998	yearling	1996	Big Canyon-direct	13-16 Apr	636347	23,738	-	407	87	9.5	LG	90.6

Appendix D; Table 1(continued).

Release Year	Age	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released				FPP	VIE Mark	% VIE
						AD+CWT	CWT Only	Ad Clip Only	Unmarked Untagged			
1998	yearling	1996	Big Canyon-direct	13-16 Apr	636126	15,367	-	264	56	9.5	LG	90.6
1998	yearling	1996	Big Canyon-direct	13-16 Apr	636343	7,980	-	137	29	9.5	LG	90.6
1998	yearling	1996	Big Canyon-direct	13-16 Apr	630110	11,901	-	984	222	30.0	LG	96.8
1998	yearling	1996	Captain John-volitional	13-15 Apr	630401	1,438	-	17	10	10.9	LB	80.8
1998	yearling	1996	Captain John-volitional	13-15 Apr	630363	6,798	-	82	47	10.9	LB	80.8
1998	yearling	1996	Captain John-volitional	13-15 Apr	636345	60,527	-	728	419	10.9	LB	80.8
1998	yearling	1996	Captain John-volitional	13-15 Apr	636346	61,965	-	745	429	10.9	LB	80.8
1998	yearling	1996	LFH-volitional	03-16 Apr	636318	208,388		3,444	1,854	10.1	LR	84.3
1998	yearling	1996	LFH-volitional	03-16 Apr	630163	200,215		3,309	1,782	10.1	LR	84.3
1998	yearling	1996	Pittsburg-direct	13-16 Apr	630446	67,671	-	848	2,119	9.9	RG	93.3
1998	yearling	1996	Pittsburg-direct	13-16 Apr	630448	68,187	-	854	2,135	9.9	RG	93.3
1999	yearling	1997	Big Canyon-direct	12-15 Apr	630454	150,648	1,333	1,241	-	10.4	LG	88.8
1999	yearling	1997	Big Canyon-direct	26-28 Apr	630938	75,332	451	603	-	11.1	LG	97.6
1999	yearling	1997	Captain John-volitional	25 Mar-15 Apr	630453	154,750	1,444	816	-	11.8	LB	81.1
1999	yearling	1997	LFH-volitional	25 Mar-13 Apr	630860	423,772	6,368	2,026	-	8.3	LR	85.1
1999	yearling	1997	Pittsburg-direct	12-15 Apr	630451	134,983	4,501	3,401	-	10.0	RG	82.8
1999	subyearling	1998	Big Canyon-direct	02-03 Jun	631025	-	195,231	-	151,874	83.8		
1999	subyearling	1998	Captain John-volitional	30 May-05 June	no CWT	-	-	-	322,928	82.2		

Appendix D; Table 1 (continued).

Release Year	Age	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released				FPP	VIE Mark	% VIE
						AD+CWT	CWT Only	Ad Clip Only	Unmarked Untagged			
1999	subyearling	1998	LFH-direct	15 Jun	631026	198,594	4,299	1,301	-	50.1		
2000	yearling	1998	Big Canyon-direct	11-13 Apr	631012	130,032	531	743	-	10.5	LG	87.6
2000	yearling	1998	Captain John-volitional	01-12 Apr	631013	131,048	138	138	-	8.2	LB	86.9
2000	yearling	1998	LFH-volitional	24 Mar-14 Apr	631213	442,113	11,317	2,971	-	9.4	LR	89.4
2000	yearling	1998	Pittsburg-direct	11-13 Apr	631212	133,411	-	1,298	-	9.6	RG	83.2
2000	subyearling	1999	Big Canyon-direct	30 May-01 June	no CWT	-	-	-	497,790	40.2		
2000	subyearling	1999	Big Canyon-direct	20-26 Jun	no CWT	-	-	-	392,684	45.0		
2000	subyearling	1999	Captain John-volitional	20-31 May	630168	-	193,476	-	297,557	45.4		
2000	subyearling	1999	Captain John-volitional	15-23 Jun	630169	-	194,717	-	207,097	52.0		
2000	subyearling	1999	LFH-direct	26-26 May	630167	188,125	6,083	2,435	-	45.5		
2000	subyearling	1999	Pittsburg-direct	24-26 May	no CWT	-	-	-	400,156	55.6		
2001	yearling	1999	Big Canyon-direct	09-11 Apr	630477	112,933	94	188	-	10.2	LG	94.6
2001	yearling	1999	Captain John-volitional	04-13 Apr	630478	100,461	1,010	505	-	10.1	LB	88.9
2001	yearling	1999	LFH-volitional	01-20 Apr	630476	326,669	10,440	1,648	-	8.7	LR	92.8
2001	yearling	1999	Pittsburg-direct	10-12 Apr	630479	102,980	761	-	-	10.4	RG	86.7
2001	subyearling	2000	Big Canyon-direct	29 May	630271	-	196,507	-	303,099	53.3		
2001	subyearling	2000	Big Canyon-direct	13 Jun	no CWT	-	-	-	357,362	78.2		
2001	subyearling	2000	Captain John-volitional	26 May	no CWT	-	-	-	501,129	49.5		

Appendix D; Table 1 (continued).

Release Year	Age	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released						
						AD+CWT	CWT Only	Ad Clip Only	Unmarked Untagged	FPP	VIE Mark	% VIE
2001	subyearling	2000	Col. R.-below BONN Dam-barged	01-Jun	630270	188,085	10,357	1,534		45.7		
2001	subyearling	2000	LFH-direct	03-Jul	no CWT			-	3,994	52.2		
2001	subyearling	2000	Pittsburg-direct	28 May	630272	-	197,182	-	176,888	84.1		
2001	subyearling	2000	Snake R. below HC Dam-direct	16 May	no CWT	-	-	113,770	-	42.0		
2001	subyearling	2000	Snake R. below HC Dam-direct	19 Jun	no CWT	-	-	1,450	-	23.0		
2001	suyearling	2000	Research – Snake near Couse Cr – direct	18-26 May	no CWT				74,245	(PIT tag only)		
2002	yearling	2000	Big Canyon-direct	10-12 Apr	630677	155,827	523	1,440	-	12.9	LG	86.2
2002	yearling	2000	Big Canyon-direct	10-12 Apr	630625	1,661	6	15	-	12.9	LG	86.2
2002	yearling	2000	Captain John-volitional	16 Apr	630183	155,692	4,463	-	-	16.6	LB	80.3
2002	yearling	2000	LFH-volitional	01-11 Apr	631273	421,390	6,612	4,509	-	9.3	LR	93.1
2002	yearling	2000	Pittsburg-direct	15-17 Apr	630678	156,372	2,687	672	-	13.4	RG	83
2002	subyearling	2001	Snake R. below HC Dam-direct	21 May	no CWT	-	-	171,120	343	42.3		
2002	subyearling	2001	Big Canyon-direct	27-28 May	612639	-	197,763	-	297,452	193.0		
2002	subyearling	2001	Big Canyon-direct	18-19 Jun	no CWT	-	-	-	505,674	178.0		
2002	subyearling	2001	Captain John-volitional	28 May	610106	-	185,010	-	313,917	215		
2002	subyearling	2001	Captain John-volitional	20-28 Jun	610105	-	182,429	-	316,519	152		
2002	subyearling	2001	LFH-direct	24 Jun	630890	188,874	3,373	2,335	-	52.0		
2002	subyearling	2001	Pittsburg-direct	27-29 May	612501	-	199,965	-	199,350	166		
2002	subyearling	2001	Snake R at Roosters Landing-direct	02 Dec	no CWT	-	-	-	24,573	26.0		

Appendix D; Table 1 (continued).

Release Year	Age	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released				FPP	VIE Mark	% VIE
						AD+CWT	CWT Only	Ad Clip Only	Unmarked Untagged			
2002	subyearling	2001	Snake R. at Chief Timothy-direct	16 Oct	no CWT	-	-	-	29,059	24.6		
2002	subyearling	2001	Research–near Couse Creek–direct	29 May-14 Jun	no CWT	-	-	-	97,916	(PIT tag onlyl)		
2003	yearling	2001	Big Canyon-direct	14-15 Apr	610119	140,217	3,449	1,665	0	10.6	LG	91.0
2003	yearling	2001	Captain John-volitional	30 Mar-07 Apr	610118	147,987	2,502	1,430	0	10.0	LB	88.9
2003	yearling	2001	LFH-volitional	01-19 Apr	631585	499,387	14,503	4,546	-	9.7	LR	58.7
2003	yearling	2001	Pittsburg-direct	13-14 Apr	610120	136,455	2,195	1,733	0	9.1	RG	84.3
2003	subyearling	2002	Big Canyon-direct	03 Jun	610122	-	193,255	-	313,233	94.5		
2003	subyearling	2002	Captain John-volitional	28 May	610121	-	196,068	-	316,617	81.3		
2003	subyearling	2002	Captain John-volitional	12 Jun	612654	-	186,937	-	104,465	74.4		
2003	subyearling	2002	LFH-direct	06 Jun	631545	193,848	4,517	1,727	-	50.0		
2003	subyearling	2002	NLV1-volitional	28-31 May	610109	-	77,855	-	9,862	61.3		
2003	subyearling	2002	NLV1-volitional	28-31 May	612657	-	72,009	-	9,146	61.3		
2003	subyearling	2002	NLV1-volitional	28-31 May	612648	-	9,303	-	1,178	61.3		
2003	subyearling	2002	NLV1-volitional	28-31 May	612649	-	9,259	-	1,172	61.3		
2003	subyearling	2002	NPTH1-volitional	02-04 Jun	610107	-	193,643	-	5,989	38.2		
2003	subyearling	2002	NPTH2-volitional	19-20 Jun	610110	-	97,932	-	17,032	81.4		
2003	subyearling	2002	Pittsburg-direct	04 Jun	610123	-	189,782	-	200,401	129.6		
2003	subyearling	2002	Snake R. at Roosters Landing-direct	04 Mar	no CWT	-	-	-	33,500	1200.0		

Appendix D; Table 1 (continued).

Release Year	Age	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released				FPP	VIE Mark	% VIE
						AD+CWT	CWT Only	Ad Clip Only	Unmarked Untagged			
2003	subyearling	2002	Snake R. at Couse Crk boat launch-direct	09 Jun	631391	96,073	2,631	1,315	-	40.4		
2003	subyearling	2002	Snake R. below HC Dam-direct	22 May	no CWT	-	-	199,246		46.6		
2003	subyearling	2002	Snake R. below HC Dam-direct	01-16 May	no CWT	-	-	332,226	-	41.4		
2003	subyearling	2002	Research – near Couse Creek - direct	28 Mar-05 Jun	no CWT			53,583		(PIT tag only)		

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

Appendix E; Table 1. Mean (cm) fork length, (standard deviation), sample size, and range for returning Lyons Ferry origin fall chinook salmon released as **subyearlings**. All release locations are included.

Recovery		Brood Year[a]					
Year	**Sex**	**2000**	**1999**	**1998**	**1997**	**1996**	**1995**
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	
2001	male		**46.1** (4.3) 516 32-70	**65.2** (6.6) 568 29-89		**97.8** (3.3) 4 93-100	
	female		**-** (-) 0 -	**69.7** (4.1) 375 57-87		**86.5** (5.3) 26 75-93	
2002	male	**43.5** (4.5) 181 35-55	**63.9** (6.8) 434 40-91	**82.7** (9.2) 144 60-101			
	female	**-** (-) 0 -	**70.9** (4.6) 130 55-81	**82.2** (5.4) 499 50-99			

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

Appendix E; Table 2. Mean (cm) fork length, (standard deviation), sample size and range for returning Lyons Ferry origin fall chinook salmon released as **yearlings**. All release locations are included.

Recovery		Brood Year						
Year	**Sex**	**2000**	**1999**	**1998**	**1997**	**1996**	**1995**	**1994**
1997	male						**33.6**	**49.6**
							(2.1)	(4.6)
							434	402
							27.5-40	28-68
	female						-	-
							(-)	(-)
							1	0
							70	-
1998	male					**35.1**	**52.3**	**69.7**
						(4.8)	(5.3)	(9.6)
						138	1775	289
						22-72	33-73	45-97
	female					**-**	**57.8**	**72.9**
						(-)	(4.7)	(6.0)
						1	143	300
						34	48.5-77.5	49-90.5
1999	male				**52.0**	**52.8**	**69.5**	**85.5**
					(4.8)	(5.5)	(8.8)	(11.9)
					368	394	571	43
					30-49	37-70	35-95	50-104
	female				**-**	**60.1**	**72.3**	**84.1**
					(-)	(5.0)	(5.3)	(6.0)
					0	14	741	96
					-	49-70	53-86	64-96
2000	male			**36.4**	**58.5**	**70.9**	**86.8**	-
				(2.6)	(5.2)	(7.3)	(11.0)	(-)
				412	1066	191	99	1
				28-44	34-72	55-95	59-110	86.0
	female			**-**	**64.4**	**76.4**	**81.4**	**91.3**
				(-)	(3.7)	(4.9)	(6.0)	(0.6)
				0	110	293	249	4
				-	54-74	54-89	58-94	91-92
2001	male		**34.4**	**57.2**	**76.0**	**88.2**	**94.7**	-
			(2.0)	(4.9)	(8.3)	(10.3)	(9.7)	(-)
			14	858	221	29	3	1
			32-40	39-74	57-98	69-103	84-103	78.0
	female		**-**	**62.2**	**77.3**	**85.1**	**89.2**	-
			(-)	(4.8)	(5.1)	(6.2)	(6.5)	(-)
			0	60	614	111	13	0
			-	52-76	55-95	65-98	79-100	-
2002	male	**35.4**	**55.0**	**74.3**	**94.5**	**85**		
		(4.3)	(4.7)	(8.7)	(13.8)	(17.0)		
		220	471	241	37	2		
		27-83	40-67	51-96	55-112	73-97		
	female	**-**	**65.8**	**76.8**	**85.5**	**85.7**		
		(-)	(7.4)	(5.6)	(5.2)	(1.5)		
		0	6	505	94	3		
		-	60-80	51-93	73-97	84-87		

Appendix F: Fall Chinook Processed from, and Estimated Run Composition for, the Tucannon River 2001

(Origin states origin, brood year, age at release, and release site (LF97YO is a LFH hatchery origin fish from the 1997 brood year, released as a yearling, onstation at LFH.)

Appendix F; Table 1. Composition and age of carcasses collected in the Tucannon River, 2001.

Origin	CWT or Marks	Adults	Jacks <53	Total Carcasses
LF97YO	630860	7		7
LF98YO	631213	2	2	4
LF98SO	631026	1		1
LFH	ADLR, unk age	1		1
Stray	Unassigned RV, unk age	1		1
	Unassigned BWT, sub age 3	1		1
	Unassigned BWT, unk age	1		1
	Unm/untag, yrl age 4	2		2
WILD	Wild, age 3	1		1
	Wild, age 4	4	1	5
Hatchery	AD/unk wire, unk age	3		3
Unassigned (Wild or hatchery)	no clip/no wire, unk age	5	1	6
	no clip/unk wire, unk age	1	1	2
Grand Total		30	5	35

Appendix F; Table 2. Estimated run composition to the Tucannon River, 2001.

Origin CWT or Marks	Adult Carcasses Sampled	Jack Carcasses Sampled	Estimated Number of Adults in Run	Composition of Adult Run (%)	Estimated Number of Jacks in Run	Composition of Jack Run (%)
LF origin	11	2	79	47.3	17	60.7
Strays:				17.4		0.0
unassigned RV, unk age	1		6			
unassigned BWT, sub age 3	1		6			
unassigned BWT, unk age	1		6			
unm/untag, yrl age 4	2		11			
Hatchery AD/unk wire, unk age	3	1		0.0		0.0
Unassigned (wild or hatchery)				0.0		39.3
no clip/no wire, unk age	5	1			6	
no clip/unk wire, unk age	1	1			5	
Natural (wild)	5		59	35.3		0.0
Grand Total	30	5	167	100.0	28	100.0

Appendix G: Fall Chinook Processed from, and Estimated Run Composition for, the Tucannon River 2002

(Origin states origin, brood year, age at release, and release site (LF99YO is a LFH hatchery origin fish from the 1999 brood year, released as a yearling, onstation at LFH.)

Appendix G; Table 1. Composition and age of carcasses collected in the Tucannon River, 2002.

Origin	CWT or Marks	Adults	Jacks <53	Total Carcasses
LF99YO	630476	2	1	3
LF98YO	631213	11		11
LF97YO	630860	2		2
LF99SO	630167	1		1
LF98SO	631026	2		2
LF98SBCA	631025	1		1
Umatilla	092925	4		4
	BLANK wire, yrl age 4	12		12
Strays (BWT)	BLANK wire, yrl age 3	0	1	1
	BLANK wire, sub age 4	2		2
	BLANK wire, sub age 3	2		2
	BLANK wire, unk age	2		2
Strays (unm/untag yrl) [a]	unm/untag, yrl age 4	1		1
	unm/untag, yrl age 5	1		1
Yakima River release age 3	0501021004	1		1
Natural (wild)	Wild, age 4	3		3
	Wild, res rear age 4	1		1
	Wild, age 3	2		2
Unassigned hatchery	unm/wire, sub age 3	1		1
	unm/unk wire, sub age 3	2		2
	unm/untag, sub age 3	5 [b]		5
	unm/untag, sub res rear age 3	2		2
	unm/untag, sub age 4	5		5
	unm/unk wire/no VI, sub age 5	1		1
	unm/unk wire, yrl age 5	1		1
	unm/unk wire/unk VI, yrl age 4	1		1
	unm/unk wire, yrl age 3		1	1
	AD/wire/no VI -Lost Tag, unk age	1		1
Unassigned (hatchery or wild)	unm/untag unk age	1	1	2
Grand Total		70	4	74

[a] Any unmarked/untagged/no VI fish are assumed to be strays, since LF/Snake River hatchery origin yearlings are AD/CWT/VI tagged.

[b] Estimated one of these carcasses was from LF98SCJ, an unassociated release group.

Appendix G Table 2. Estimated run composition to the Tucannon River, 2002.

Origin	CWT or Marks	Adult Carcasses Sampled	Jack Carcasses Sampled	Estimated Number of Adults in Run	Composition of Adult Run (%)	Estimated Number of Jacks in Run	Composition of Jack Run (%)
LF origin		19	1	172	31.2	8	26.7
Strays:					40.8		23.3
Umatilla (CWT or BLANK wire)							
	CWT yrl age 4	4		32			
	BLANK wire, yrl age 4	12		97			
Strays (BLANK wire)							
	yrl age 3	2	1			7	
	sub age 4	2		15			
	sub age 3			30			
	unk age	2		15			
Strays (unm/untag yrl) [a]							
	yrl age 4	1		7			
	yrl age 5	1		8			
Yakima R	CWT sub age 3	1		8			
Unassigned hatchery					16.6		23.3
	subs age 3	10		52			
	subs age 4	5[b]		20			
	subs age 5	1		7			
	yrl age 3		1			7	
	yrl age 4	1					
	yrl age 5	1		7			
	unk age	1					
Unassigned (wild or hatchery)		1	1		0.0	8	26.7
Natural (wild)		6		59	11.4		
Grand Total		70	4	519	100.0	30	100.0

[a] Any unmarked/untagged/no VI fish are assumed to be strays, since LF/Snake River hatchery origin yearlings are AD/CWT/VI tagged.

[b] Estimated one of these carcasses was from LF98SCJ, an unassociated release group. That fish expanded to 12 for the run and is included under LF origin for the adult run estimate.

Appendix H: Salmon Processed at LFH in 2001

(LFH=voluntary return to Lyons Ferry Hatchery, LGR=fish trapped at Lower Granite Dam. Origin states origin, brood year, age at release, and release site (LF99SO is a LFH hatchery origin fish from the 1999 brood year, released as a subyearling, Onstation at LFH.)

Appendix H; Table 1. Origin, CWT, and number of fish removed from the Snake River and retained at LFH for spawning/run composition purposes in 2001.

Origin	CWT	Adults	Jacks <53	LGR Total	Adults	Jacks<53cm	LFH Total	Grand Total
LF94YO	635845				1		**1**	1
LF95YO	636320	5		**5**	2		**2**	7
	636321	2		**2**	2		**2**	4
LF95YBCA	635959	1		**1**				1
	636025				1		**1**	1
LF95YPA	635957	2		**2**				2
	635958	1		**1**				1
LF96SBCA	635120	17		**17**				17
	635316	13		**13**				13
LF96YO	630163	46		**46**	19		**19**	65
	636318	28		**28**	13		**13**	41
LF96YBCA	636126	1		**1**				1
LF96YCJA	630363	1		**1**				1
	636345	3		**3**	1		**1**	4
	636346	5		**5**	2		**2**	7
LF96YPA	630446	4		**4**	1		**1**	5
	630448	13		**13**	3		**3**	16
LF97YO	630860	259		**259**	450		**450**	709
LF97YBCA	630454	18		**18**	8		**8**	26
	630938	4		**4**	3		**3**	7
LF97YCJA	630453	49		**49**	13		**13**	62
LF97YPA	630451	29		**29**	3		**3**	32
LF98SO	631026	331	6	**337**	127	1	**128**	465
LF98SBCA	631025	436	9	**445**	34		**34**	479
LF98YO	631213	201	43	**244**	452	76	**528**	772
LF98YBCA	631012	16	3	**19**	23	1	**24**	43
LF98YCJA	631013	37	7	**44**	20	2	**22**	66
LF98YPA	631212	22	6	**28**	9	1	**10**	38
LF99SO	630167	12	105	**117**	2	21	**23**	140
LF99SCJA	630168	10	97	**107**	1		**1**	108
	630169	5	250	**255**		13	**13**	268
LF99YO	630476		2	**2**		8	**8**	10
LF99YBCA	630477		1	**1**		1	**1**	2
LF99YCJA	630478		1	**1**				1
LF99YPA	630479		1	**1**				1
LFH	ADLB				1		**1**	1
	ADLR	3		**3**				3
	LOST TAG (ADLR)	6	1	**7**	16	4	**20**	27
	LR ONLY				1		**1**	1
	NOT READ (LR)					1	**1**	1
	NOT READ (ADLR)	160	14	**174**	507	43	**550**	724
Umatilla	071358	2		**2**	1		**1**	3
	071359	1		**1**				1
	091729	3		**3**	1		**1**	4

Appendix H; Table 1 (continued).

Origin	CWT	Adults	Jacks <53	LGR Total	Adults	Jacks <53	LFH Total	Grand Total
Umatilla	091748	1		**1**				1
	092037	1		**1**	1		**1**	2
	092402	1		**1**				1
	092404	3		**3**	1		**1**	4
	092405	2	1	**3**	1		**1**	4
	092406	1		**1**				1
	092407	1		**1**				1
	092409	1		**1**	1		**1**	2
	092410	1		**1**				1
	092652	1		**1**				1
	092663	7		**7**	1		**1**	8
	092701	5		**5**	1		**1**	6
	092702				2		**2**	2
	092703	3		**3**	1		**1**	4
	092704	1		**1**	1		**1**	2
	092705	5		**5**				5
	092925	7	1	**8**	2		**2**	10
	092926	3		**3**				3
	093003	1		**1**				1
	093004	1		**1**	1		**1**	2
	093034		1	**1**				1
	093037		1	**1**				1
	093206		1	**1**				1
	RV/BWT	12		**12**	3		**3**	15
	LV ONLY	1		**1**	1		**1**	2
	LV WIRE	1		**1**				1
	RV ONLY	13		**13**				13
	RV WIRE	94	1	**95**	11		**11**	106
Klickitat	054521	1		**1**				1
	630310	1		**1**				1
	631027	1		**1**	1		**1**	2
	631045	1		**1**				1
BWT	BLANK wire tag (No clip)	161	15	**176**	55	3	**58**	234
Priest Rapids	631030	1		**1**				1
Other hatchery	LOST TAG (RV)	2		**2**				2
	LOST HEAD (RV+wire)	2		**2**				2
Unknown hatchery (could be LFH)	Unm/untag (origin by scales)		1	**1**	6		**6**	7
	AD ONLY	11	1	**12**	22	2	**24**	36
	LOST TAG (AD)	34	3	**37**	17	3	**20**	57
	LOST TAG (No clip)	15	8	**23**	7	1	**8**	31
	LOST HEAD (AD only)	4		**4**	3		**3**	7

Appendix H; Table 1 (continued).

Origin	CWT	Adults	Jacks <53	LGR Total	Adults	Jacks <53	LFH Total	Grand Total
Unknown hatchery (could be LFH)	NO TAG (No clip)	1		**1**	2		**2**	3
	NO TAG (AD)	4		**4**	6		**6**	10
	NOT READ (No clip)	111	92	**203**	19	7	**26**	229
NO DATA	NO DATA				1		**1**	1
Unmarked/untagged (unk if H or W)	Subyearling scales	18	3	**21**	116	81	**197**	218
Spring/Summer Chinook incidentally caught	WILD by scales				4		**4**	4
	054210				1		**1**	1
	091860				1		**1**	1
	092414				1		**1**	1
	092755	1		**1**				1
	092853				1		**1**	1
	105128	1		**1**				1
	105422				1		**1**	1
	105507				1		**1**	1
	630606	1		**1**				1
	630611	6		**6**				6
	631032				1		**1**	1
	631148	1		**1**				1
	631151	1		**1**				1
	634129	1		**1**				1
	636049	1		**1**				1
	631061		1	**1**				1
Grand Total		**2294**	**676**	**2970**	**2011**	**269**	**2280**	**5250**

Appendix I: Salmon Processed at LFH in 2002

(LFH=voluntary return to Lyons Ferry Hatchery, LGR=fish trapped at Lower Granite Dam. Origin states origin, brood year, age at release, and release site (LF00SO is a LFH hatchery origin fish from the 2000 brood year, released as a subyearling, Onstation at LFH)

Appendix I; Table 1. Origin, CWT, and number of fish removed from the Snake River and retained at LFH for spawning/run composition purposes in 2002.

ORIGIN	CWT	Adults	Jacks <53	LGR Total	Adults	Jacks <53	LFH Total	Grand Total
LF00SB	630270		4	**4**		6	**6**	10
LF00SBCA	630271	3	121	**124**		4	**4**	128
LF00SPA	630272		43	**43**				43
LF00YBCA	630677		5	**5**		11	**11**	16
LF00YCJA	630183		8	**8**		5	**5**	13
LF00YO	631273	1	20	**21**		142	**142**	163
LF00YPA	630678		26	**26**		2	**2**	28
LF96YO	630163	1		**1**	1		**1**	2
	636318	1		**1**	1		**1**	2
LF96YPA	630448	1		**1**				1
LF97YBCA	630454	4		**4**				4
	630938	1		**1**				1
LF97YCJA	630453	14		**14**	1		**1**	15
LF97YO	630860	32		**32**	70		**70**	102
LF97YPA	630451	9		**9**				9
LF98SBCA	631025	372		**372**	11		**11**	383
LF98SO	631026	188		**188**	72		**72**	260
LF98YBCA	631012	22		**22**	11		**11**	33
LF98YCJA	631013	77		**77**	16		**16**	93
LF98YO	631213	102		**102**	478	1	**479**	581
LF98YPA	631212	36		**36**	3		**3**	39
LF99SCJA	630168	145	5	**150**	2		**2**	152
	630169	265	17	**282**	9	1	**10**	292
LF99SO	630167	89	3	**92**	28		**28**	120
LF99YBCA	630477	7	3	**10**	4	1	**5**	15
LF99YCJA	630478	14	6	**20**	8	3	**11**	31
LF99YO	630476	13	8	**21**	271	113	**384**	405
LF99YPA	630479	16	3	**19**	6	1	**7**	26
LFH	ADLR				10	1	**11**	11
	LOST TAG (ADLR)	1		**1**	4	4	**8**	9
	LOST TAG (ADRG)					1	**1**	1
	NO TAG (ADLR)					1	**1**	1
	NOT READ (ADLR)	3	3	**6**	497	156	**653**	659
Umatilla	092402	1		**1**				1
	092404	1		**1**				1
	092663	3		**3**	1		**1**	4
	092701	4		**4**				4
	092702	6		**6**	1		**1**	7
	092703	3		**3**	1		**1**	4
	092704	2		**2**				2
	092705	2		**2**	1		**1**	3
	092925	21		**21**	10		**10**	31
	092926	6		**6**	6		**6**	12
	093037	1		**1**				1
	093206	1		**1**	2		**2**	3
	093207	4		**4**	1		**1**	5

Appendix I; Table 1 (continued).

ORIGIN	CWT	Adults	Jacks <53	LGR Total	Adults	Jacks <53	LFH Total	Grand Total
BWT	BLANK wire tag (RV)	18		**18**	1		**1**	19
	BLANK wire tag (No clip)	375	13	**388**	180	6	**186**	574
Klickitat	054521	2		**2**				2
	092750	1		**1**				1
	631027				1		**1**	1
	631045	1		**1**				1
Bonneville	092740				1		**1**	1
	093030	2		**2**				2
Ringold	631011				1		**1**	1
	631047	1		**1**				1
Unknown Hatchery (could be LFH)	AD ONLY (no wire)	2	6	**8**	14	1	**15**	23
	LOST TAG (AD)	8	1	**9**	8		**8**	17
	LOST TAG (No clip)	15	6	**21**	3		**3**	24
	LOST HEAD (AD with wire)	1		**1**		1	**1**	2
	NO TAG (AD)	1		**1**				1
	NO TAG (No clip)	4	2	**6**				6
	NOT READ (No clip)	8	21	**29**	2	1	**3**	32
Unmarked/untagged	No wire	18	3	**21**	45	20	**65**	86
Spring/Summer Chinook								
Incidentally caught	092762	1		**1**				1
	092827	1		**1**				1
	104770				1		**1**	1
	630468		2	**2**				2
Grand Total		**1931**	**329**	**2260**	**1783**	**482**	**2265**	**4525**

Appendix J: Final Location of Wire Tagged LFH/Snake River Hatchery Origin Fall Chinook in Return Years 2001 and 2002

(SN=Snake River, COL=Columbia River, AK=Alaska, BC=British Columbia, CA=California, OR=Oregon, WA=Washington, HS=High Seas. Data for untagged fish associated with the wire tagged fish are not included. **This summary is solely for wire tagged fish.**)

Appendix J; Table 1. Estimated final locations of wire tagged LFH/Snake River hatchery origin fish in return years 2001 and 2002. Data is based upon RMIS downloads as well as run reconstruction estimates of fish returning above LGR Dam to spawn. A list of CWTs used to generate this table is available upon request. All release locations are included.

Return Year	Area	Locale	Subyearling Brood Year					Yearling Brood Year								Grand Total
			1996	1998	1999	2000	Total	1994	1995	1996	1997	1998	1999	2000	VIE[a] (no BY)	Total	
2001	freshwater	SN	36	1188	640		1864	4	26	370	1984	2131	21		938	5474	7338
		COL	37	187	15		239		41	279	1537	607	66			2530	2769
	freshwater Total		73	1375	655		2103	4	67	649	3521	2738	87		938	8004	10107
	ocean	AK	8	8			16		4	26	72	1				103	119
		BC	3	48			51			70	743	177				990	1041
		CA									106					106	106
		OR		108			108		5	52	1817	204	1			2079	2187
		WA		188	3		191		2	82	815	393				1292	1483
		HS			3		3				8	31				39	42
	ocean Total		11	352	6		369		11	230	3561	806	1			4609	4978
2001 Total			84	1727	661		2472	4	78	879	7082	3544	88		938	12613	15085
2002	freshwater	SN		846	739	215	1800			8	256	1712	1256	530	1077	4838	6638
		COL		170	53	14	237			5	173	1111	272	49		1610	1847
	freshwater Total			1016	792	229	2037			13	429	2823	1528	579	1077	6448	8485
	ocean	AK	3	69			72				32	103	12			147	219
		BC		128	121		249		7	11	54	831	117			1020	1269
		CA		3			3				7	74				81	84
		OR		38	10		48			9	70	1039	63	1		1182	1230
		WA		189	99		288				110	1452	80			1642	1930
		HS			1		1					1	5			6	7
	ocean Total		3	427	231		661		7	20	273	3500	277	1		4078	4739
2002 Total			3	1443	1023	229	2698		7	33	702	6323	1805	580	1077	10526	13224

[a] Estimates were based upon VIEs observed on fish released at LGR Dam.