Lyons Ferry Hatchery Evaluation
Fall Chinook Salmon
Annual Report: 2009

by

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Abstract

This report summarizes activities by the Washington Department of Fish and Wildlife's (WDFW) Lower Snake River Hatchery Evaluation Program for the period 16 April 2009 through 15 April 2010.

During 2009, WDFW collected 5,466 fish at Lyons Ferry Hatchery (LFH) and Lower Granite Dam (LGR Dam) for broodstock, monitoring and evaluation of our hatchery releases, and to estimate the run composition at LGR. Because of higher than expected run size and high pre-spawning survival, 838 fish were eventually caudal clipped and returned to the river to spawn naturally. Accuracy of identification of origins occurred at three levels: highly accurate, moderately accurate, and relatively unknown. Fish with CWT, VIE or PIT tags contributed to a highly accurate count of hatchery or natural fish in broodstock. Fish with Adipose clips were highly accurate at determining hatchery origin but not accurate about the release location. Fish PIT tagged as juveniles during outmigration past LGR Dam were accurate at determining basin of origin but not hatchery/wild designation. Unmarked/untagged fish were the least accurate group because their origins were based on scale analysis (hatchery or natural). Accurate assignments occurred with 75.4% of the broodstock being identified as Snake River hatchery fish based on CWT, VIE, and PIT tags, 0.5% of the broodstock were Snake River natural origin based on PIT tags from seined juvenile in the Snake River, and 0.04% of the broodstock were Strays based on CWTs. Moderate accuracy was determined for 17.7% of the broodstock that were AD clipped hatchery fish without wire, 1.5% of the broodstock that were PIT tagged as Snake River outmigrants (hatchery or natural). And low level accuracy was determined for 2.7% of the broodstock identified as natural origin fish through scale analysis, and 2.2% of the broodstock were unmarked and untagged which could be hatchery or wild.

This was the first year true age was used to identify jacks in season. In years prior to 2009, jacks were designated based on an estimated fork length. Due to fish returning at larger than expected sizes, it was determined that the criteria was significantly underestimating the numbers of jacks used in broodstocks throughout the basin. Co-managers agreed that immediate action would occur to minimize the effects of jacks already included in broodstocks, maximize the use of adults, and assure that jack would only be used if there were not enough adult males available to cover spawned females. Mating protocol changes in season were effective in reducing the use of jacks and minijacks in broodstock from 70% to 41.3%. Of the 833 males spawned, 218 fish were used multiple times to minimize the use of jacks. Overall, minijacks (zero salt) contributed to 0.1% of the matings, one salt jacks contributed to 41.2% of the matings, and jills contributed to 38.5% of the matings. A reduction in the numbers of jills used in broodstock was not possible because culling of jills was not allowed.

PIT tagged fish (males and females) trapped at LGR Dam were evaluated to determine if there was a relationship between trapping date and spawning date. Run timing was not a predictor of spawn timing. Fecundity and size relationships were evaluated and fork length was the best predictor of fecundity when subyearling and yearling data were combined. We did not find a correlation between egg size and mortality at eye-up. Egg size was variable and salmon with greater fecundities tended to have larger eggs. Based on hatchery records, overall average fecundity of LGR and LFH trapped females combined was 3,538 eggs/female.

A total of 4,574,182 green eggs were taken at Lyons Ferry Hatchery in 2009; sufficient to meet the full production goals listed in the *United States v. Oregon Management Agreement*. Egg survival from green to eye-up was 95.3%.

Hatchery staff released BY08 yearlings into the Snake River on site from 12-15 April 2010 (478,852 fish) with peak emigration occurring 13 April. An estimated 0.25% of the yearlings released were precocious based on visual examination. Approximately 53 % of the release was AD+CWT tagged and 47% were CWT tagged at release. PIT tags in 26,975 of the yearlings (BY08) released on station will be used to monitor returns in-season and to compare two methods of estimating SARs (using CWTs and PIT tags). Migration timing of PIT tagged fish was calculated from release site to detection facility and juvenile salmon averaged 2.3 km/day to LMO Dam, 5.7 km/day to IHR dam, 7.7 km/day to MCN Dam, 11.1 km/day to John Day Dam, and 15.2 km/day to Bonneville Dam. BY08 subyearlings were released in 2009 and have been reported in an earlier report (Milks et al 2011).

Upon return, fish from yearling production were consistently larger than subyearlings at the same salt water age. Yearling females returned at larger sizes than yearling males of the same salt water age until three salt age when males were larger than the females. Subyearling females consistently returned at larger sizes than subyearling males of the same salt water age. Minijacks (zero salt) returned from yearling releases but not from subyearling releases. Yearlings returned one salt jacks and jills, whereas subyearlings returned no jills. Fork lengths were highly variable and there was overlap between each of the salt water ages.

The Tucannon River was surveyed by foot, covering 91% of the historical spawning area of fall Chinook. After expanding for areas not surveyed, we estimate 252 fall Chinook redds were constructed in the river during fall 2009, resulting in a estimated spawning escapement of 756 Chinook. Fall Chinook spawning in the Tucannon River have only replaced themselves one year since 1992 and that occurred with the 1993 spawners. The most current four year average adult progeny to parent ratio was 0.04 returns/spawner and 0.01 returns/female. Coho produced an estimated 59 redds on the Tucannon, resulting in an estimated escapement of 177 fish.

Juvenile production in the Tucannon River was estimated at 5,030 naturally produced fall Chinook from the 2008 spawners. Juvenile fall Chinook were observed at the Tucannon smolt trap from 09 March through 10 July 2009. Median passage date for fall Chinook passing the trap was 18 June. We calculate 20 smolts/redd were produced from the 2008 spawn. Juvenile coho salmon were trapped from 2 February through 7 June with a median passage date of 3 May. Approximately 24% of the coho observed were subyearlings based on fork length. No estimate of emigration was made.

Characteristics of fall Chinook reaching LGR Dam showed that females tended to arrive earlier than males. The return consisted of 84.3% males, including jacks. The sex ratio of the return was calculated at 5.4 males/female. After removal of broodstock, the fish calculated passing LGR Dam was 84.8% males resulting in a sex ratio of 5.8 males/female. These estimates were not adjusted for fish trapped at NPTH that were removed from the river and killed for broodstock

purposes. The majority of the run consisted of small males 51 cm or less. The median fork length of males was 50 cm and the median fork length of females was 74cm.

A total of 44,138 LSRCP adult fall Chinook were estimated in returns to the Snake River (WDFW and FCAP) and harvest recoveries (WDFW releases) outside of the Snake River. Returns to the Snake include 165 fish harvested in sport fisheries, and an unreported number of fish harvested in tribal fisheries. We calculate a minimum of 48.2% of the total LSRCP mitigation goal (91,500 fish) was met in 2009. Harvest estimates were not tallied for the FCAP sites so the actual level of mitigation met will be greater than is reported here. The escapement goal (18,300 hatchery fish) to the Snake River Basin was exceeded in 2009 (WDFW and FCAP). At a minimum, 30,551 true jacks and jills (1-salts) and 5,804 adults (2-5 salts) contributed to this estimate. An additional 526 minijacks (0-salt) were also estimated to return to the Snake although are not counted toward the mitigation goal. Harvest of 2,711 WDFW released fall Chinook occurred in sport fisheries and 5,020 occurred in commercial fisheries, representing 9 and 15 % of the below project area harvest goals in 2009. WDFW released fish had a 0.3% stray rate to hatcheries (four salmon) and spawning grounds (18 salmon) outside of the Snake River basin.

We compared adipose fin clipped yearling and subyearling fall Chinook recoveries of salmon released by WDFW to determine if there were differences in interception rates by location of fishery. Yearling fall Chinook were harvested mostly in the Ocean (60%) while subyearling fall Chinook were harvested primarily in freshwater fisheries (58.4%). The main fishery in freshwater that contributed to harvest was the zone 6 Tribal gillnet fishery. In the ocean, yearlings were primarily caught off the coast of Washington and British Columbia, while the subyearlings were caught off the coast of British Columbia then Washington. Including freshwater and ocean harvest, yearlings were harvested mainly in the Columbia River followed by WA and BC ocean fisheries, although combined ocean fisheries had the greatest harvest impact. Subyearlings were also harvested mainly in the Columbia River followed by BC and WA fisheries; but to a much lesser extent than the yearlings. The majority of yearlings were harvested as 1-salts while the subyearlings were primarily harvested as 3-salts.
We compared two methods of estimating smolt to adult returns (SARs) to the Snake River and smolt to adult survivals (SASs) including all recoveries: 1) PIT tag detections at return and 2) standard CWT recovery methods. By using PIT tagged returns of yearling fall Chinook released at LFH, we were able to detect 4.4 times the SAR of 0-salt fish on average compared to estimates using conventional CWT estimates based on trapping rates and detections. As fish returned at older ages the differences between estimation methods decreased and CWT estimates resulted in 1.8 and 1.3 times greater SARs for 1-salt and 2-salts than occurred by using PIT tag estimates.

When estimations included detections inside and outside of the Snake River and harvest estimates (smolt to adult survival), PIT tags continued to result in 5.2 times the SAS than occurred by using CWT estimation methods. Again, as fish returned at older ages the differences between methods decreased and the CWT estimation method resulted in 1.9 and 1.4 times the SASs of 1-salt and 2-salt fish estimated using PIT tags. Although returns are not completed for the brood years evaluated, it appears that CWT estimation methods result in accounting for more jack and adults than PIT tag detections.

Preliminary literature reviews have resulted in the Deschutes River fall Chinook being a potentially viable reference population to compare with Snake River fall Chinook. Both stocks of fish exhibit subyearling and reservoir rearing lifestyles. Efforts will continue to find additional reference populations of fall Chinook and those comparisons are anticipated to be included in an upcoming annual report.

Acknowledgments

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Table of Contents

List of Tables

List of Figures

List of Appendices

Introduction

Program Objectives

This report summarizes activities by the Washington Department of Fish and Wildlife's (WDFW) Lower Snake River Hatchery Fall Chinook Evaluation Program from 16 April 2009 to 15 April 2010. WDFW's Snake River Lab (SRL) staff completed this work with Federal fiscal year 2009/2010 funds provided through the U.S. Fish and Wildlife Service (USFWS), under the Lower Snake River Compensation Plan (LSRCP).

This hatchery program began in 1984 (Figure 1) and is part of the Lower Snake River Compensation Plan (LSRCP) authorized by Congress in 1976. The purpose of the LSRCP is to replace adult salmon, steelhead and rainbow trout lost by construction and operation of four hydroelectric dams on the Lower Snake River in Washington. Specifically, the stated purpose of the plan was:

> *"…[to]….. provide the number of salmon and steelhead trout needed in the Snake River system to help maintain commercial and sport fisheries for anadromous species on a sustaining basis in the Columbia River system and Pacific Ocean" (NMFS & USFWS 1972 pg 14.)*

Subsequently in 1994, additional authorization was provided to construct juvenile acclimation facilities for fall Chinook salmon that would

> " … protect, maintain or enhance biological diversity of existing wild stocks."

Numeric mitigation goals for the LSRCP were established in a three step process (COE 1974). First, the adult escapement that occurred prior to construction of the four dams was estimated. Second, an estimate was made of the reduction in adult escapement (loss) caused by construction and operation of the dams (e.g. direct mortality of smolt). Last, a catch to escapement ratio was used to estimate the future production that was forgone in commercial and recreational fisheries as result of the reduced spawning escapement. Assuming that the fisheries below the project area would continue to be prosecuted into the future as they had in the past, LSRCP adult return goals were expressed in terms of the adult escapement back to, or above the project area.

For fall Chinook salmon, the escapement above Lower Granite Dam prior to construction of these dams was estimated to be 34,400. Construction and operation of the dams were expected to cause a reduction in the spawning escapement in two ways. First, the slack water reservoirs created behind the dams was expected to eliminate spawning grounds for 5,000 adults. Second, 15% of the smolts migrating past each dam were expected to die (48% cumulative mortality). These factors were expected to reduce the adult spawning escapement by 18,300[1]. This number

[1] The LSRCP Special Report has language referring to adult recoveries. That language was intended to differentiate adults from juveniles in the document (Dan Herrig, USFW, personal communication). The LSCRP mitigation goal was based upon 97,500 fall Chinook counted at McNary Dam in 1958 and expected 14,363 fall Chinook to persist in the Snake River through natural production. At that time adult and jack counts were combined to give a total count.

established the LSRCP escapement mitigation goal back to the project area. This reduction in natural spawning escapement was estimated to result in a reduction in the coast-wide commercial/tribal harvest of 54,900 adults, and a reduction in the recreational fishery harvest of 18,300 adults below the project area. In summary the expected total number of adults that would be produced as part of the LSRCP mitigation program was 91,500 (Table 1).

Table 1. Fall Chinook goals as stated in the LSRCP Mitigation document.

Component	Number of Adults
Escapement to Project Area	18,300
Commercial Harvest	54,900
Recreational Harvest	18,300
Total	91,500

Since 1976 when the LSRCP was authorized, many of the parameters and assumptions used to size the hatchery program and estimate the magnitude of benefits have changed.

- The survival rate required to deliver a 4:1 catch to escapement ratio has been less than expected and this has resulted in fewer adults being produced.

- The listing of Snake River fall Chinook and Snake River Steelhead under the Endangered Species Act has resulted in significant curtailment of commercial, recreational and tribal fisheries throughout the ocean and mainstem Columbia River. This has resulted in a higher percentage of the annual run returning to the project area than was expected.

The LFH fall Chinook program was designed to escape 18,300 adults back to the project area after a harvest of 73,200. While recognizing the overarching purpose and goals established for the LSRCP, and realities' regarding changes since the program was authorized, the following objectives for the beneficial uses of adult returns have been established for the period through 2017:

1. To contribute to the coast-wide ocean fisheries in accordance with Pacific Salmon Treaty.

2. To contribute to the recreational, commercial and/or tribal fisheries in the mainstem Columbia River consistent with agreed abundance-based harvest rate schedules established in the 2008 – 2017 *US vs. Oregon* Management Agreement.

3. To spawn enough fish to retain 4.75 million eggs (Lyons Ferry AOP 2009-2010) to assure that production goals as stated in *US vs. Oregon* are met. Fecundities vary depending upon return age classes and run composition, but generally 1,400-2,000 females would need to be spawned to make production goals. In order to produce enough fish to meet harvest goals, many more fish would need to be trapped, spawned, and

Therefore the mitigation goal consists of jacks and adults, not just adults. Since minijacks (fish < 30 cm total length) are not counted at the dams, they were excluded from the calculations that determined the mitigation goal.

reared. Major construction additions would need to occur at LFH and changes to the production tables would need to occur in order to meet harvest mitigation goals.

4. To estimate the numbers of returns of LSRCP, FCAP, and IPC fish to the basin, the run composition must be estimated. For this task, an additional 1,300-2,000 fish must be recovered so coded wire tag information can be decoded.

5. To provide tribal and non-tribal fisheries in the Snake River consistent with co-manager goals.

6. To contribute to hatchery and natural-origin return goals identified in the Snake River Fall Chinook Management Plan.

Hatchery-Origin Return Goals

- Interim total return target based on current production levels and survival is 15,484 hatchery-origin fish above Lower Monumental Dam, which is comprised of 9,988 from LSRCP, 3,206 from Nez Perce Tribal Hatchery (NPTH), and 2,290 from IPC.

- The long-term goal is for a total return 24,750 hatchery-origin fish above Lower Monumental Dam, which is comprised of 18,300 from LSRCP, 3,750 from NPTH, and 2,700 for IPC.

Natural-Origin Return Goals

- Achieve ESA delisting by attaining interim population abundance in the Snake River ESU of at least 3,000 natural-origin spawners, with no fewer than 2,500 distributed in the mainstem Snake River (as recommended by the Interior Columbia Technical Recovery Team).

- Interim goal is to achieve a population of 7,500 natural-origin fall Chinook (adults and jacks) above Lower Monumental Dam.

- Long term goal is to achieve a population of 14,360 natural-origin fall Chinook (adults and jacks) above Lower Monumental Dam.

Three hatchery programs artificially propagate endemic Snake River fall Chinook. Two ((LSRCP (includes LFH and FCAP), and Nez Perce Tribal Hatchery)) of the programs are integrated programs aimed to increase harvest and natural-origin abundance via supplementation. The third (Idaho Power Company) is primarily mitigation for lost production. Fish are released at two different life stages (sub-yearling and yearling smolts). Releases occur at 10 release locations. The three programs are highly coordinated in their operations, including broodstock collection at Lower Granite Dam and fish transfers between facilities. Several out of basin hatchery facilities are utilized (Irrigon and Umatilla) in addition to the in basin facilities and acclimation sites. Marking of hatchery-origin fish is guided by a Snake River Basin Fall Chinook Salmon Production

Program Marking Justification white paper. Mark types and quantities have been adopted under the 2008 - 2017 *US vs. Oregon* Management Agreement. At full production levels, 76% of the hatchery-produced fish are marked in some manner, 47% are marked with an adipose fin clip.

1. The goal of the LSRCP program is to mitigate for decreased numbers of fall Chinook harvested and returning to the Snake River due to the construction of the lower Snake River Dams. Production goals are consistent with *US vs. Oregon* Agreements.

2. The goal of the IPC program is to replace adult fall Chinook salmon lost to the construction and ongoing operation of the HCC by releasing 1,000,000 smolts annually.

3. The immediate goal of the FCAP is a concerted effort to ensure that the Snake River fall Chinook salmon above Lower Granite Dam are not extirpated. Long-term goals of the project are

3.1 Increase the natural population of Snake River fall Chinook spawning above Lower Granite Dam.

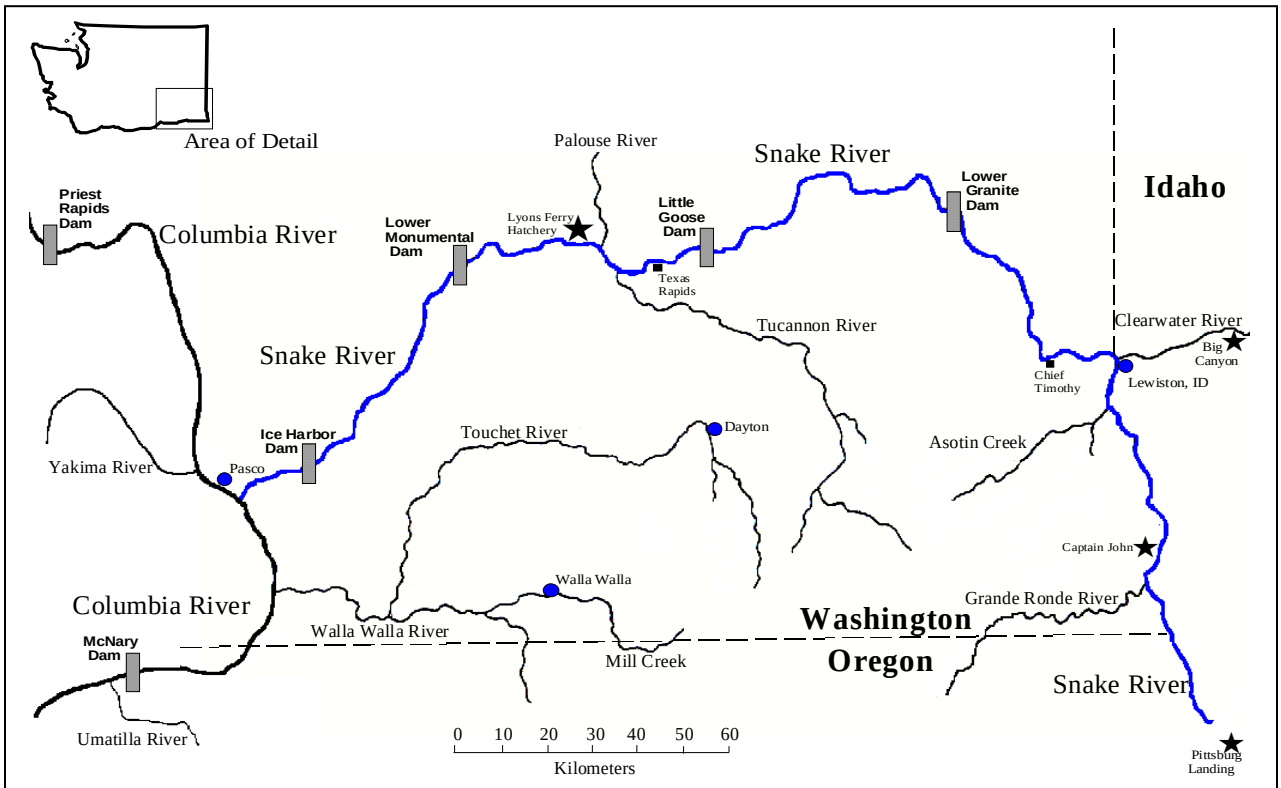
3.2 Sustain long-term preservation and genetic integrity of this population.

3.3 Keep the ecological and genetic impacts of non-target fish populations within acceptable limits.

3.4 Assist with the recovery of Snake River fall Chinook for removal from ESA listing.

3.5 Provide harvest opportunities for both tribal and non-tribal anglers.

The LSRCP program in Washington has been guided by the following objectives: 1) Establish broodstock(s) capable of meeting egg needs, 2) Maintain and enhance natural populations of native salmonids, 3) Return adults to the LSRCP area which meet designated goals, and 4) Improve or re-establish sport and tribal fisheries. The production program is consistent with *US vs. Oregon* Agreements.



Rkm	Location
0.0	Snake River mouth
16.1	Ice Harbor Dam
66.9	Lower Monumental Dam
95.1	Lyons Ferry Hatchery
95.7	Lyons Ferry Park
105.2	Texas Rapids Boat Launch
113.1	Little Goose Dam
115.0	Bryan's Landing Boat Launch
132.3	Central Ferry Park
173.0	Lower Granite Dam
210.3	Chief Timothy Park
253.7	Couse Creek Boat Launch
263.0	Captain John Acclimation Site
346.0	Pittsburg Landing Acclimation Site
397.4	Hells Canyon Dam (not shown)
0.0	Clearwater River mouth
57.0	Big Canyon Acclimation Site
0.0	Grande Ronde River mouth
49.4	Cougar Creek

Figure 1. The Lower Snake River Basin showing location of Lyons Ferry Hatchery and major tributaries in the area.

Broodstock Collection and Management 2009

Fall Chinook are collected at LFH and LGR Dam for broodstock (Appendix A). Each year there is a discrepancy between estimated numbers of fish collected and the numbers of fish processed/killed (Table 2). The in-season estimate of numbers of fish diverted into the hatchery at LFH is a minimum estimate of the run to LFH. Some of the fish that are trapped at LFH are shunted back to the river and never used for broodstock. The trap is closed much of the fall and opened for limited periods during which times fish recycle through the trap if they are not diverted into the brood ponds (see LFH Trapping Operations below). The discrepancies between the numbers of fish recorded as collected at LGR trap and the number of fish processed were likely data errors in the numbers of fish trapped at LGR trap.

Table 2. Number of Chinook initially collected for broodstock from LFH and LGR trapping efforts and how they were accounted for in 2009.

Year	Trap Location	Number Collected/Hauled for Broodstock	Processed (killed)	Returned to Snake River	Difference from Number Collected/Hauled
2009	LFH	1,885	1,286[a]	599	0
	LGR	3,581	3,320	239	22

[a] Includes coho and summer Chinook that were trapped and killed during processing.

Lower Granite Dam Trapping Operations

A systematic automated trapping of 12 % of the run at LGR Dam was conducted 18 August through 8 September and 9% of the run from 9 September through 21 November. Historical trapping rates and operation dates of systematic sampling at LGR are presented in Appendix C. Trapping protocols are presented in Appendix B. In general, prior to transport, NOAA Fisheries staff anesthetized the salmon, gathered length and sex data, and indicated if the fish had a fin clip, wire tag or a PIT tag. The fish were then marked with a hole in the operculum prior to release upstream or transport. Approximately 70% of the salmon collected for broodstock were shipped to LFH and 30% were hauled to NPTH. Fish slated for LFH were hauled in a 5,678 L aerated tank truck by WDFW personnel.

LFH Trapping Operations

Broodstock are collected at LFH to fulfill needs not met by trapping at LGR Dam. The trap at LFH was operated periodically from 1 September through 17 November as noted in trapping and sorting protocols provided in Appendix D. Estimates were made each day the trap was operated for fish retained and fish returned to the river.

To estimate the numbers of fish to trap at LFH, we used sex ratio data from prior years and calculated that 30% of the adults trapped would be females. The estimated number to trap was divided by week according to historical arrival timing to LFH. Once the number of fish scheduled to trap was met for the week, any additional fish trapped would be diverted to the river.

On 9 September, the trapping target at LFH was increased to offset the anticipated decrease in the numbers of fish hauled from LGR (12 % trapping rate reduced to 9 %).

On 6 October, fish collected at LGR were sorted at LFH and a count was made to determine the actual number of females on hand. Staff at LFH determined that the sex composition estimated at the LGR Trap overestimated the numbers of females they had shipped. The LFH trapped fish (hereafter volunteers) were sorted on 7 October and staff determined that the adults were primarily males (51 %). The majority of the females (60%) trapped at LFH were small so estimated fecundity was decreased to 3,000 for those fish when estimating total eggtake. After a full tally of numbers of females on hand, it was determined that only 64 more females were needed to reach the goal.

On 9 October, the trapping protocol at LFH changed and adult salmon were shunted back to the river. The trap at LFH remained open to enumerate returning PIT tagged fish and to subsample jacks as dictated by the trapping protocol.

Hatchery Operations 2009

Spawning Operations

Spawning and Egg Take

On 2 October, an excessive amount of fungus was observed on the fish in the holding ponds at LFH. It was determined that the flow in the newly divided adult ponds was higher than anticipated, resulting in only 30% of the intended efficacy of formalin treatments. As a result, the potency and frequency of treatment increased. Above normal mortality was not expected, although it was closely monitored in order to determine whether the trap at LFH would need to reopen.

Sorting of broodstock prior to spawning is an essential task for determining the sex composition and lengths of fish on hand. Both of these enumerations are used to modify trapping protocols as well as spawning protocols in-season. After sorting, it was determined that the LGR pond had approximately a 1.5:1 male/female sex ratio in the adults (57 cm or greater) and approximately 300 extra males if we used one male per female. The sex ratio in the pond with fish trapped at LFH had a 1:1 sex ratio in fish 57 cm or greater.

The duration, peak of spawning, eggtake, and percent egg mortality are shown in Table 3 and numbers of fish spawned, killed outright, and that died in the pond (mortalities) are shown in Tables 4 and 5. During each week of spawning, salmon trapped at LGR were spawned before salmon trapped at LFH. Some gametes from the males were held overnight for use on the LFH trapped fish. Semen from untagged males held overnight was used in matings first thing the following morning. The goal is to maximize the use of untagged fish during spawning as a way to maximize the proportion of natural origin fish in matings. If there were extra fish to return to the river, the desire was to return fish trapped at LFH. Returning LGR trapped fish to the river complicates the run reconstruction and is avoided if possible.

After the first two weeks, data were summarized to determine the true age for all males and females spawned. At that time, 79% of the males and 30% of the females spawned were determined to be true jacks and jills, all coming from yearling releases. Jacks and jills measured up to 75 cm in fork length.

On 3 November, the mating protocol was changed. To reduce the numbers of jacks in matings, only larger males would be spawned. Another change to the protocol was to mate jills with older aged fish, and if there was a shortage of males to use, subyearling jacks would be preferred over yearling jacks. Males 75 cm fork length and larger were suggested to be used on as many as three females. During the spawn day it became obvious that there were not enough males in that size criteria to cover all of the ripe females. The protocol changed again. Unmarked/untagged males from 70-74 cm fork length were used on three females, while the larger fish would be split four times to be used on more females, and if needed, AD-only clipped fish 70-74 cm would be spawned (since they were likely from Idaho Power rearing and release program). These changes were intended to increase the number of adults from subyearlings used in broodstock. To

determine if there were enough larger sized fish to spawn for the following week, LFH staff re-measured all of the males they returned to the pond and tallied males greater than 74 cm.

On 4 November, fish trapped at LFH were spawned. The composition of the return to LFH is much different than fish trapped at LGR. The majority of fish returning to LFH are yearlings, which reflects what is primarily released from that location. Knowing that there were not enough males in the 75 cm and larger category, the protocol was changed again. Males 60-74 cm were not used until the CWTs were decoded in order to verify true age and to assure that if jacks had to be spawned, only jacks from subyearling releases would be used if possible.

Table 3. Duration and peak of spawning, egg take, and percent egg mortality at LFH, 1984-2009.

Year	Spawn Duration Begin	End	Peak of Spawning	Total Egg Take	Egg take fully covered through *US v. Oregon* priority number [a]	Egg take partially covered *US v. Oregon* priority number	Egg mortality to eye-up (%)[b]
1984	Nov 8	Dec 5	Nov 21	1,567,823	-	-	21.6
1985	Nov 2	Dec 14	Nov 7	1,414,342	-	-	4.0
1986	Oct 22	Dec 17	Nov 19	592,061	-	-	4.0
1987	Oct 20	Dec 14	Nov 17	5,957,976	-	-	3.8
1988	Oct 18	Dec 6	Nov 12	2,926,748	-	-	3.4
1989	Oct 21	Dec 16	Nov 11	3,518,107	-	-	5.8
1990	Oct 20	Dec 8	Nov 6	3,512,571	-	-	8.3
1991	Oct 15	Dec 10	Nov 12	2,994,676[c]	-	-	8.3
1992	Oct 20	Dec 8	Nov 21	2,265,557[c]	-	-	6.0
1993	Oct 19	Dec 7	Nov 2	2,181,879	-	-	6.7
1994	Oct 18	Dec 6	Nov 8	1,532,404	-	-	5.1
1995	Oct 25	Dec 5	Nov 14	1,461,500	-	-	5.6[d]
1996	Oct 22	Dec 3	Nov 5	1,698,309	-	-	4.6
1997	Oct 21	Dec 2	Nov 4	1,451,823[e]	-	-	5.2
1998	Oct 20	Dec 8	Nov 3	2,521,135	-	-	5.1
1999	Oct 19	Dec 14	Nov 9 & 10	4,668,267	-	-	9.4
2000	Oct 24	Dec 5	Nov 7 & 8	4,190,338	-	-	5.9
2001	Oct 23	Nov 27	Nov 13 & 14	4,734,234	-	-	6.4
2002	Oct 22	Nov 25	Nov 12 & 13	4,910,467	-	-	3.6
2003	Oct 21	Dec 2	Nov 10 & 12	2,812,751	8	9	3.1
2004	Oct 19	Nov 22	Nov 9 & 10	4,625,638	16	17	3.3
2005	Oct 18	Nov 29	Nov 15 & 16	4,929,630	16	17	3.5
2006	Oct 24	Dec 5	Nov 7 & 8	2,819,004	8	9	3.2
2007	Oct 23	Dec 3	Nov 13 & 14	5,143,459	17	-	3.3
2008	Oct 21	Nov 25	Nov 4 & 5	5,010,224	17	-	3.7
2009	Oct 20	Nov 18	Nov 9 & 10	4,574,182	17	-	4.7

[a] Priority levels as listed in the *US v. Oregon fall agreement* production tables.
[b] Egg mortality includes eggs destroyed due to positive ELISA values.
[c] An additional 9,000 eggs from stray females were given to Washington State University.
[d] Does not 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.
[e] Total egg take includes eggs from one coho female crossed with a fall Chinook.

Table 4. Spawn dates, numbers of fall Chinook, and weekly egg take of fish spawned at LFH in 2009. (LFH and LGR trapped fish are combined and jacks are included with males).

Spawn Dates	Male [a]	Female [a]	Non-Viable [b]	Eggtake
Oct 20 and 21	43	43	0	164,486
Oct 27 and 28	191	192	2	670,998
Nov 3 and 4	146	407	3	1,426,120
Nov 09 and 10	295	476	2	1,671,674
Nov 17	158	175	1	640,904
Totals	**833**	**1,293**	**8**	**4,574,182**

[a] Numbers of fish presented include spawned fish whose progeny were later destroyed.
[b] Non-viable females—not ripe when killed.

Table 5. Weekly summary and origins of mortality and surplus fall Chinook processed at LFH in 2009. (LFH and LGR trapped fish are combined; jacks are included with males).

	Mortality						Killed Outright					
Week	LF/Snake R. [a]		Natural		Other/Unk [b]		LF/Snake R.		Natural		Other/Unk	
Ending	M	F	M	F	M	F	M	F	M	F	M	F
30-Aug	0	0	0	0	1	2	0	0	0	0	0	0
06-Sep	0	0	0	0	0	0	0	0	0	0	0	0
13-Sep	3	0	0	0	0	2	0	0	0	0	0	0
20-Sep	6	1	0	0	1	1	0	0	0	0	0	0
27-Sep	4	1	1	2	0	2	0	0	0	0	0	0
04-Oct	4	4	0	0	1	6	0	0	0	0	0	0
11-Oct	5	5	1	1	4	3	1,184	0	1	0	35	0
18-Oct	6	5	1	0	0	0	27	0	0	0	1	0
25-Oct	3	8	0	1	0	3	101	1	1	0	15	0
01-Nov	5	4	0	0	2	1	13	0	0	0	3	0
08-Nov	12	10	1	0	2	3	116	2	0	0	1	2
15-Nov	102	13	1	1	5	2	63	2	0	0	7	3
22-Nov	115	15	1	0	14	1	394	55	7	0	30	6
Totals	**265**	**66**	**6**	**5**	**30**	**26**	**1,898**	**60**	**9**	**0**	**92**	**11**

[a] Includes known LFH or NPTH origin (from CWT and/or VIE), and PIT tagged or scale sampled fish of Snake River hatchery origin.
[b] Includes undetermined hatchery yearlings by scales, hatchery strays by scales or wire, regenerated scales, and Lost and No tags.

Fish Returned to River

More fish were trapped at LFH than were needed for run composition estimates. Fish not needed for broodstock or run composition analysis were returned to the Snake River (Table 6).

Fish trapped at LFH were released downstream of Little Goose (LGO) Dam at Lyons Ferry Park (Rkm 95.7). Fish released were given a top caudal clip but they were not scanned for wire or scale sampled. The composition of these fish was estimated from the composition of fish trapped and killed at LFH. It was determined that 101 of these fish ended up in the estimated run to the Tucannon River, and the remaining fish were estimated to have remained in the reservoirs between LMO and LGR Dams. Window counts of fish at LGR Dam confirm that they did not pass the dam because numbers of fish did not increase after 18 November as expected. The composition of the 498 fish not accounted for at other locales is presented in Appendix E.

Excess fish from LGR Dam trapping were transported from LFH and released above LGR Dam at Chief Timothy Park (Rkm 210.3). These fish were caudal clipped so tribal fishers would be able to identify that these fish had been treated with MS-222 without a 21 day holding period and therefore should not be consumed. Fish released were not wire tagged but some of them were PIT tagged. Scales were taken on fish that were not PIT tagged, and the age composition of those fish is provided in Appendix E. Since these fish were returned to the river above LGR Dam and it was early in the season, they were presumed to have continued upstream to spawn.

Table 6. Fall Chinook hauled to the Snake River and released in 2009.

Release location	Trap site	Release date	Female	Male	Jack	Total
Lyons Ferry	LFH	11/18/2009	175	424	0	599
Chief Timothy	LGR	11/18/2009	33	106	35	174
		11/19/2009	9	31	25	65
Grand Total			**217**	**561**	**60**	**838**

Broodstock Profile

Fin tissue samples are taken yearly and archived for future DNA profiling of broodstock. Scales are also taken from these fish to determine age and rearing type. Fin tissue was taken from 150 fish (09JW001-09JW150): tagged and untagged fish trapped at both locations. Additional fin tissue samples were taken from 100 unmarked/untagged spawned fish (09JX001-09JX100) that had been trapped at LGR. Scales were taken on all untagged fish including fish with left red visually implanted elastomer (LRVIE), ADLR, AD clip only, unmarked/untagged fish, and unmarked radio tagged fish to determine age and rearing type. Scales were not taken on PIT tagged fish unless they were radio tagged because scales had already been taken on PIT tagged fish at LGR Dam. Otoliths were taken from all unmarked/untagged fish (spawned as well as unspawned), from LGR by staff from the University of Idaho. The otoliths were used in a microchemistry study to determine where fall Chinook rear in the Snake River basin based on strontium levels found in the otoliths (Hegg 2011). These otoliths are archived at the University of Idaho.

The composition and length frequencies of broodstock at Lyons Ferry Hatchery are presented in Figure 2 and Figure 3, respectively. Males used multiple times are counted multiple times in both figures. Unknown origin fish could be either hatchery or natural origin. An estimated 57.2% of the males and 67.7% of the females that contributed gametes for production were returns from yearling releases. Forty-four percent of the broodstock contributing to production were collected at the LFH trap. The majority of the unmarked/untagged fish included in our broodstock were trapped at LGR Dam.

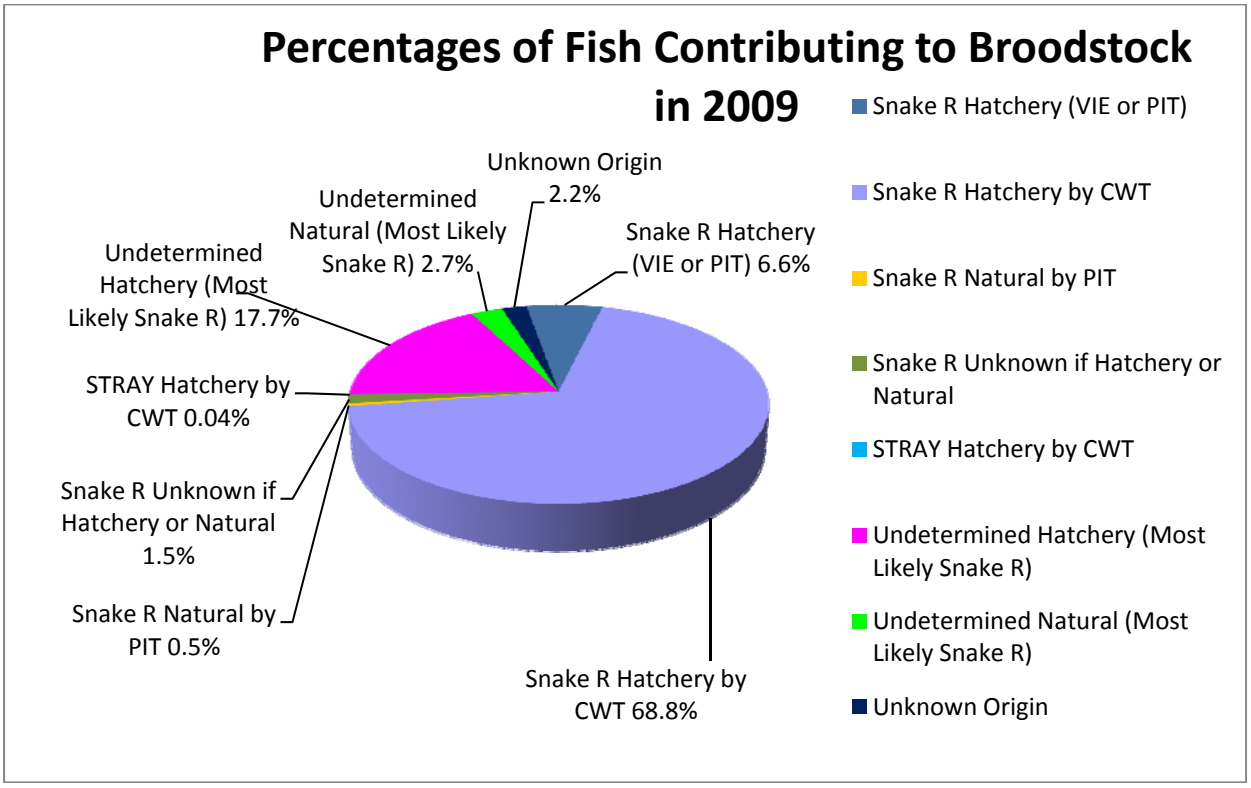


Figure 2. Percentages of fish contributing to broodstock at LFH during 2009.

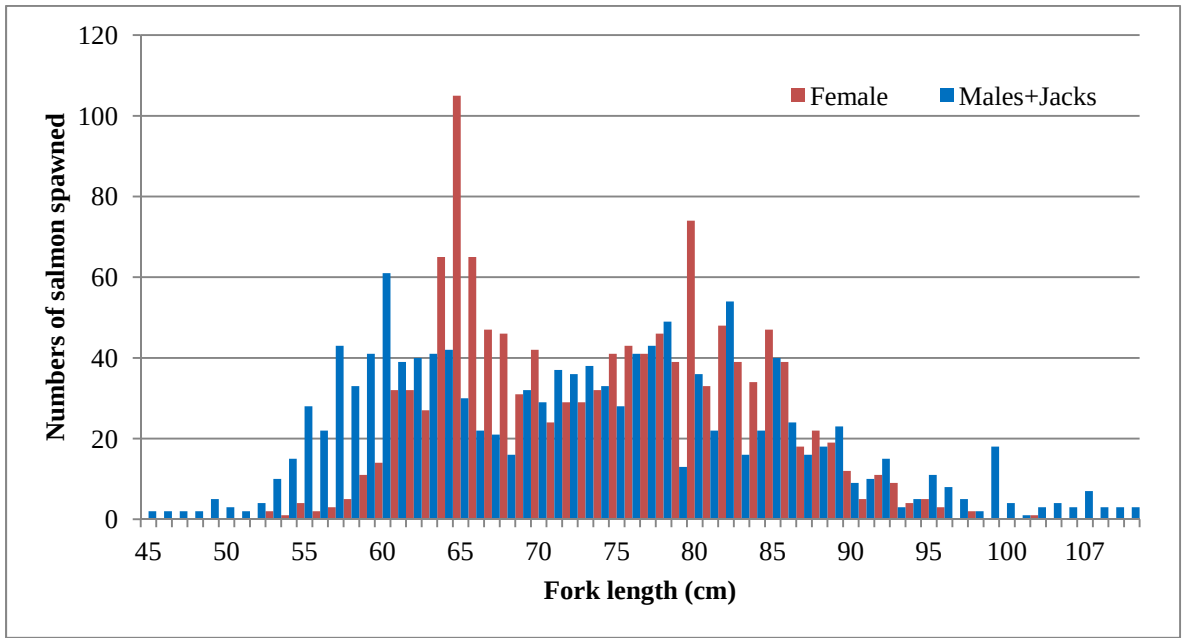


Figure 3. Fork lengths of salmon used as broodstock at LFH in 2009.

Spawn timing

PIT tagged fish (males and females) trapped at LGR Dam were evaluated to determine if there was a relationship between trapping date and spawning date (Figure 4). Run timing was not a predictor of spawn timing

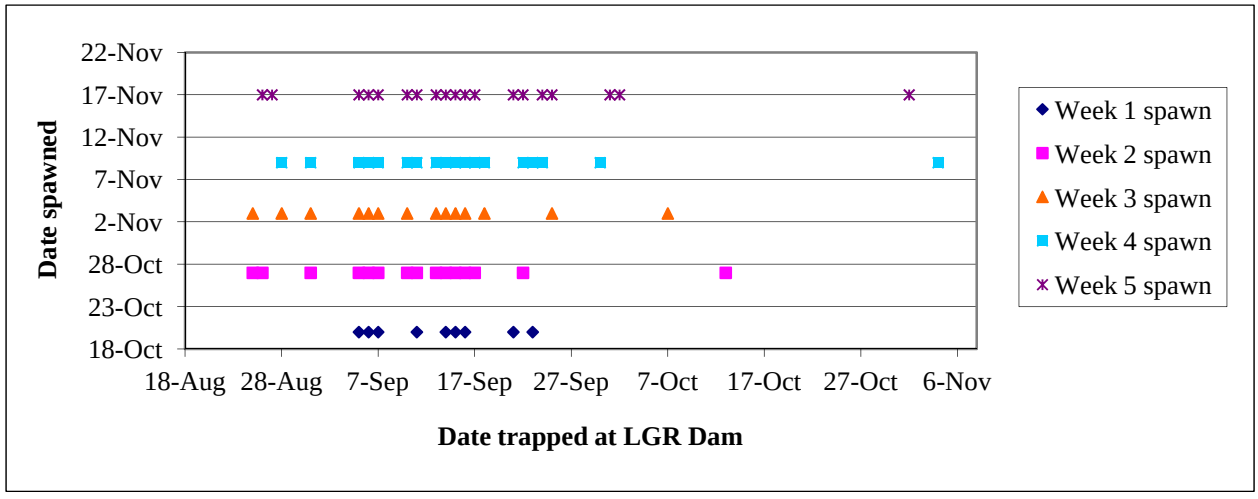


Figure 4. Spawn timing of PIT tagged fish trapped at LGR in 2009.

Males used in broodstock

Fish collected at LGR for broodstock, run reconstruction, and monitoring and evaluation purposes were hauled to LFH and NPTH with the goal of a 70:30 split. Males hauled to LFH were trapped across the run at LGR Dam (Figure 5). Older aged males were used on multiple females, mimicking nature (Hankin 2009). Of the 833 males spawned, 218 were used multiple times (Table 7) to reduce the usage of jacks in the broodstock and to maximize the numbers of adults from subyearlings used. The calculated effective number of male breeders was 593 (N_b) using procedures described in Busack (2006). The effective male breeders is 71.2% of the census number of males, or 45.9% of the male N_b that would have been achieved if enough males had been available to avoid reuse of males.

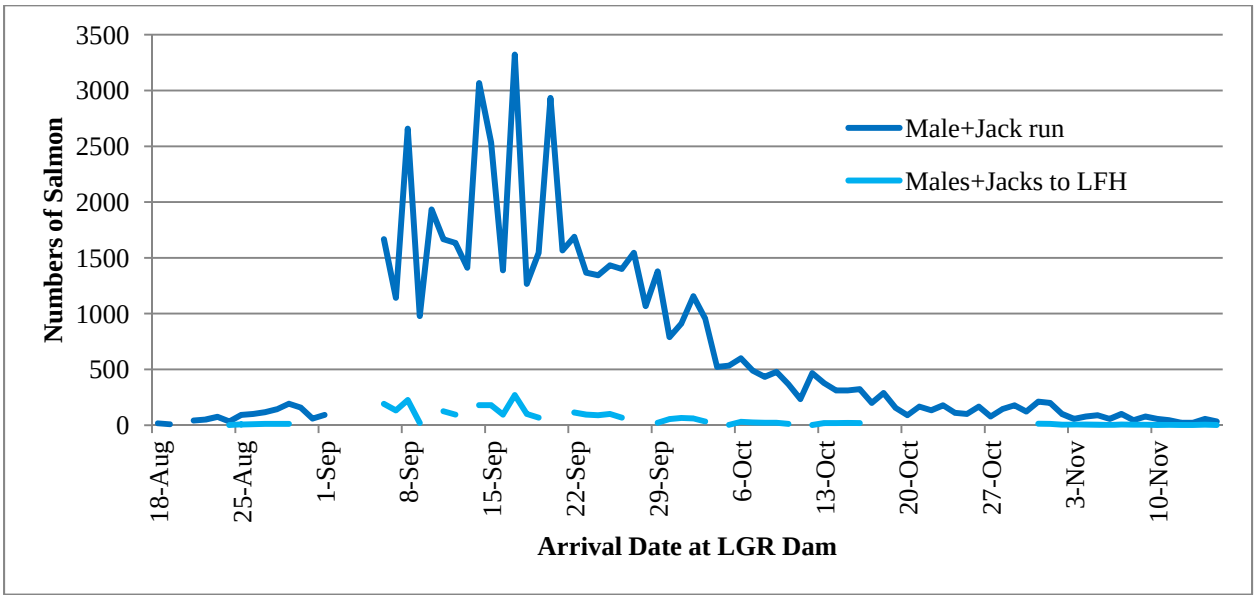


Figure 5. Arrival timing of the run of male fall Chinook at LGR Dam and the proportion hauled to LFH during 2009.

Table 7. Origin and age of males used multiple times during spawning at LFH, 2009.

Origin/Age	Number of times each male was used				Total Unique
	2	3	4	5	
Snake R Hatchery subyearling age 2	1	3	0	0	4
Snake R Hatchery subyearling age 3	1	3	1	0	5
Snake R Hatchery subyearling age 4	4	25	7	1	37
Snake R Hatchery yearling age 3	3	1	0	0	4
Snake R Hatchery yearling age 4	8	43	20	0	71
Snake R Hatchery yearling age 5	0	3	3	0	6
Snake R Hatchery yearling unknown age	0	1	2	0	3
Snake R Unknown reservoir reared age 3	1	3	0	0	4
Snake R Unknown reservoir reared age 5	0	2	0	0	2
Unknown Hatchery subyearling age 3	2	4	0	0	6
Unknown Hatchery subyearling age 4	3	30	3	2	38
Unknown Hatchery subyearling age 5	0	1	0	0	1
Unknown Hatchery yearling age 3	0	1	0	0	1
Unknown Hatchery yearling age 4	0	4	7	0	11
Unknown Hatchery reservoir reared age 4	1	4	0	0	5
Unknown Hatchery reservoir reared age 5	0	2	0	0	2
Unknown Hatchery unknown age	0	0	1	0	1
Unknown Natural reservoir reared age 4	1	2	1	0	4
Unknown Natural reservoir reared age 5	1	2	0	0	3
Unknown Natural subyearling age 5	0	2	0	0	2
Unknown Origin unknown age	1	7	0	0	8
Total Unique Males	**27**	**143**	**45**	**3**	**218**

Origin including release site information was determined for 70.2 % of the males spawned based on CWT or PIT tag data. An additional 2.1 % of the males were identified as hatchery origin based only on an AD clip. Males that were neither tagged nor clipped (hatchery and natural origin) represent 27.7 % of the males spawned.

Females used in broodstock

Females hauled to the LFH from LGR Dam were trapped throughout the run (Figure 6). Origin including release site information was determined for 81.6% of the females spawned based on CWT or PIT tag data. An additional 1.5% of the females were identified as hatchery origin based only on an AD clip. Females that were not tagged or clipped represent 16.9% of the females spawned. The estimated age composition and origins of females contributing to broodstock at LFH are listed in Table 8. Overall, the average fecundity for LGR trapped fish was 3,760 eggs/female and LFH trapped was 3,315 eggs/female.

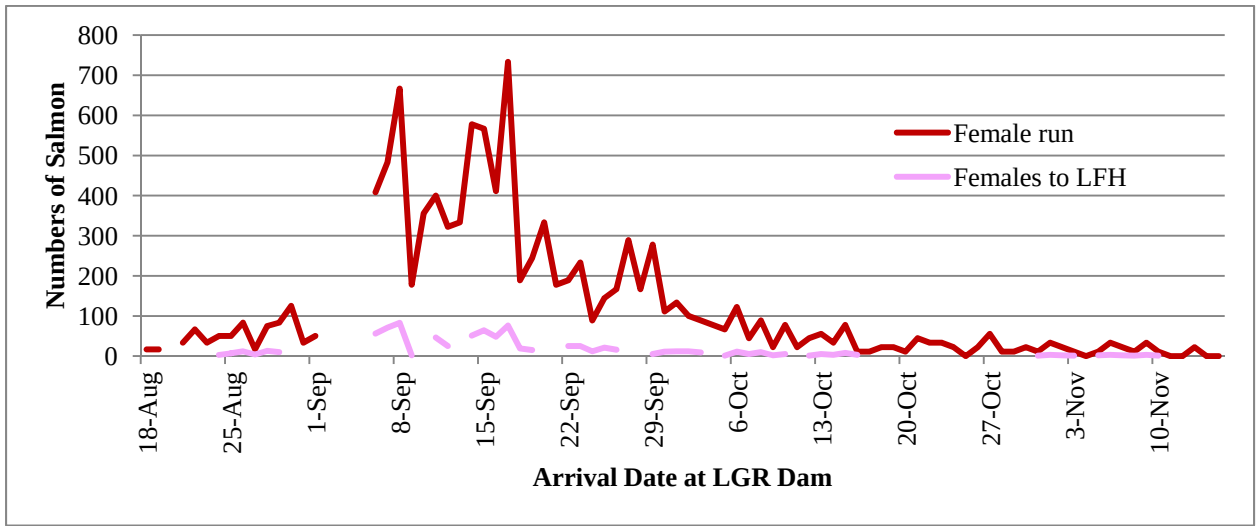


Figure 6. Arrival timing of the run of female fall Chinook at LGR Dam and the proportion of females hauled to LFH during 2009.

Table 8. Origins of females contributing to LFH broodstock during 2009.

Origin Determination Method	Age	Number of Females
Snake R Hatchery		
Snake R Hatchery by CWT or VIE	subyearling 2-salt (age3)	24
	subyearling 3-salt (age4)	124
	yearling 1-salt (age3)	486
	yearling 2-salt (age4)	347
	yearling 3-salt (age5)	11
	yearling 4-salt (age6)	1
	yearling unknown age	3
Snake R Hatchery by PIT	reservoir reared 2-salt (age4)	10
	subyearling 3-salt (age4)	30
	subyearling 4-salt (age5)	2
	subyearling 5 salt (age6)	1
Snake R Hatchery by Scales	reservoir reared 2-salt (age4)	2
	reservoir reared 3-salt (age5)	1
Natural Origin		
Snake R Natural by PIT	reservoir reared 3-salt (age5)	2
Snake R Natural by Scales	reservoir reared 1-salt (age3)	5
	reservoir reared 2-salt (age4)	13
	reservoir reared 3-salt (age5)	10
	subyearling 2-salt (age3)	2
	subyearling 3-salt (age4)	2
	subyearling 4-salt (age5)	2
Unknown Origin		
Snake R Unknown by PIT	reservoir reared 2-salt (age4)	2
STRAY Hatchery by CWT	yearling 3-salt (age5)	1
Undetermined Hatchery by Clip	Unknown age	10
Undetermined Hatchery by Scales	reservoir reared 1-salt (age3)	4
	reservoir reared 2-salt (age4)	5
	subyearling 1-salt (age2)	1
	subyearling 2-salt (age3)	10
	subyearling 3-salt (age4)	120
	subyearling 4-salt (age5)	7
	yearling 1-salt (age3)	2
	yearling 2-salt (age4)	25
Unknown Origin	Unknown age	28
Total		**1,293**

Fecundity

Fecundities were estimated on a subsample of broodstock, but only CWT hatchery fish are presented due to the small sample size of natural origin fish. Fecundity was estimated by counting and weighing100 live eggs, applying the weight/egg calculation to the total weight of the live eggs, adding in counted dead eggs, and applying a 4% correction factor for water retention. Reproductive effort (ratio of gamete biomass to total body mass) was calculated for each female and used to determine which females might have lost some eggs prior to spawning (Knudsen et al 2008). Females whose eggs weighed less than 10 % of the total body weight were removed from the analysis. Females generally contributed 16 % of their body weight toward egg production but not more than 25 % (Figure 7).

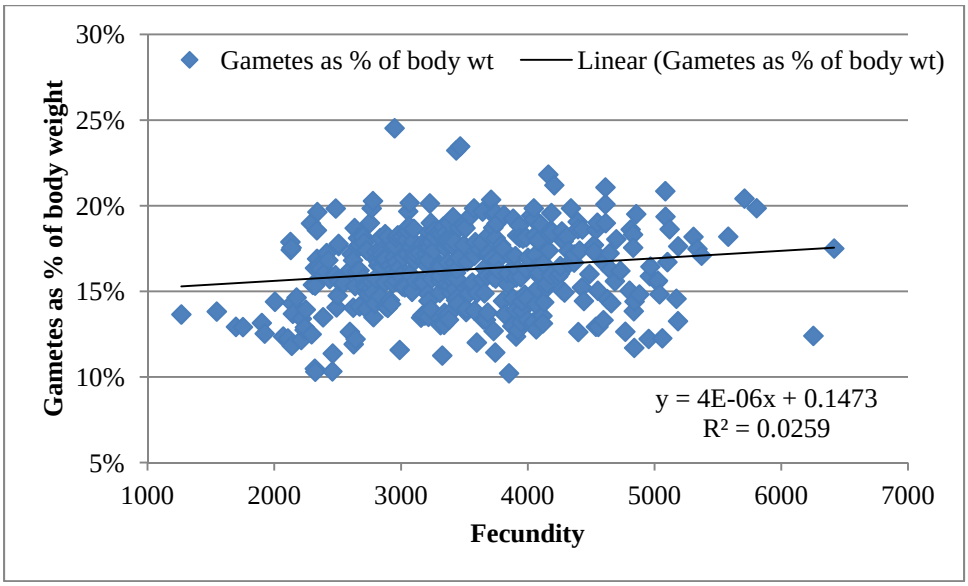


Figure 7. Gametes as percent of body weight for CWT hatchery broodstock at LFH in 2009.

Fecundity relationships were evaluated for yearling (Figure 8) and subyearling (Figure 9) fall Chinook with CWTs. Fork length more reliably predicted fecundities for yearling than for subyearling salmon. When data were combined for yearling and subyearling (Figure 10) salmon the precision of the fecundity estimates improved. Fecundities were highly variable (1,266-6,417 eggs/fish) and were best predicted using fork lengths. Based on hatchery records, overall average fecundity of LGR and LFH trapped females combined was 3,538 eggs/female. This estimate was derived after egg picking when the estimated number of green eggs taken (prior to egg picking) was corrected based on actual counts and weights of eggs collected.

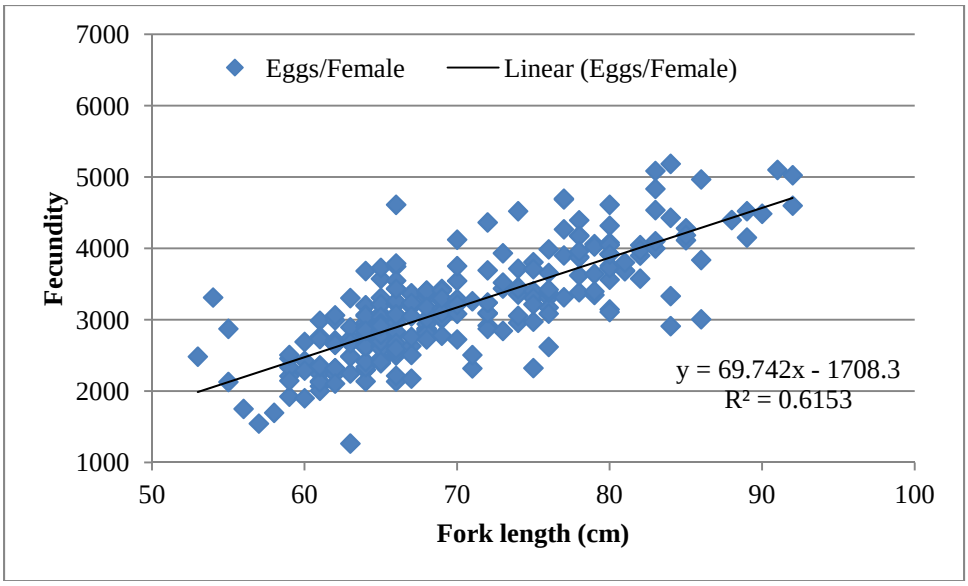


Figure 8. Yearling salmon fork length to fecundity relationships in 2009.

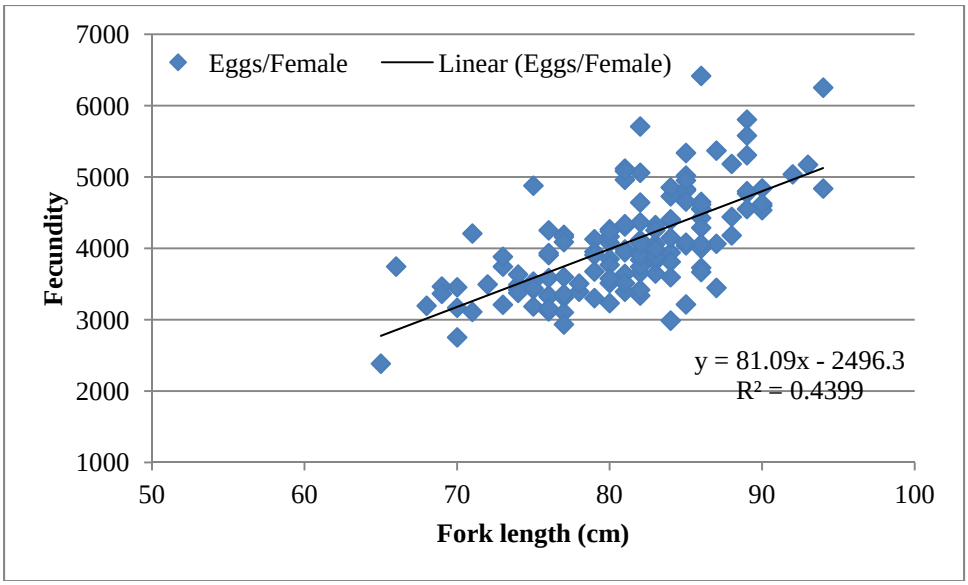


Figure 9. Subyearling salmon fork length to fecundity relationships in 2009.

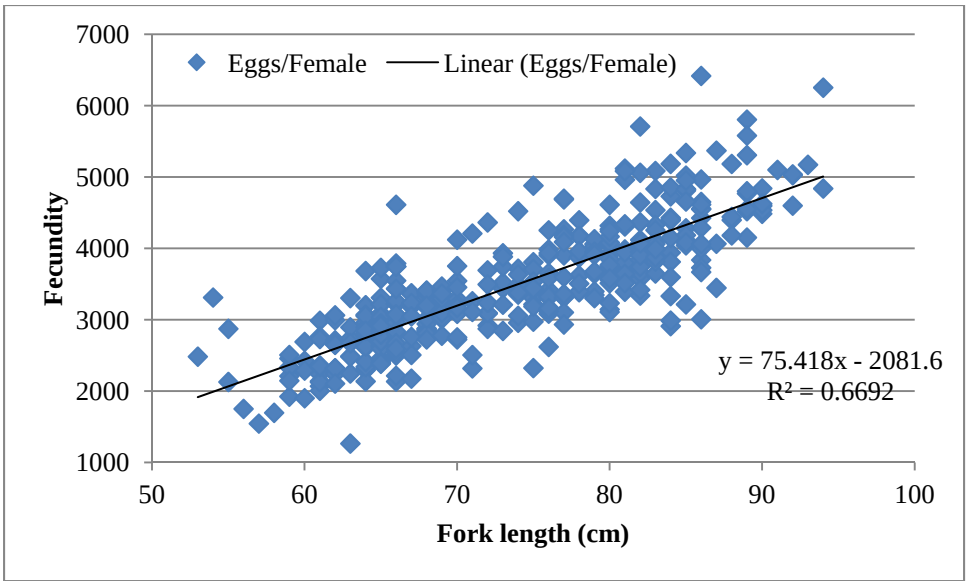


Figure 10. Combined yearling and subyearling salmon fork length to fecundity relationships in 2009.

In Heath et al. (1999) egg size was positively correlated with early survival, but negatively correlated with fecundity. Our data did not show a correlation between egg size and mortality at eye-up. Egg size was variable (0.13 – 0.41 g/egg with a median of 0.24 g/egg) and salmon with greater fecundities tended to have larger eggs (Figure 11), although variability is high.

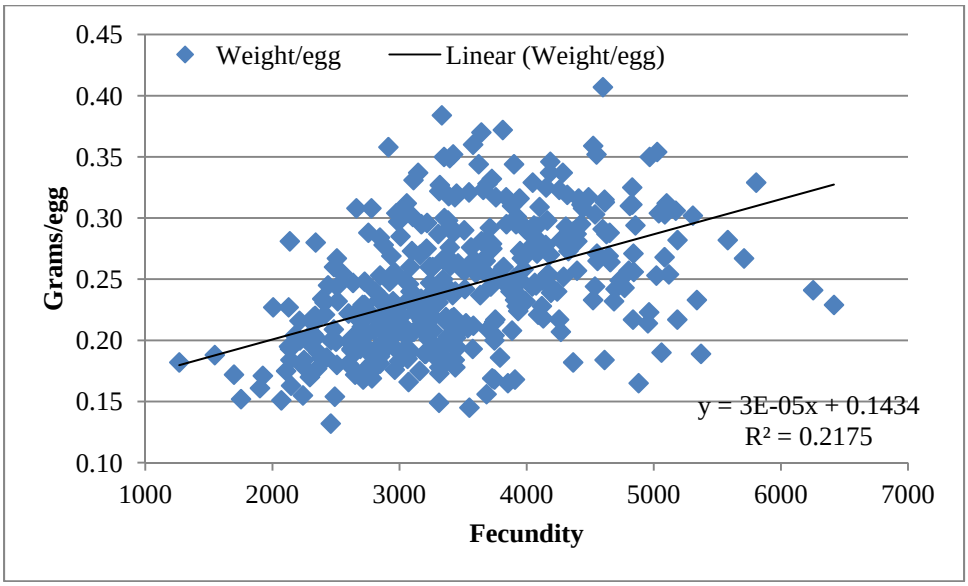


Figure 11. Relationship between egg weight and fecundity for CWT tagged broodstock at LFH in 2009.

Inclusion of natural origin fish

This was the seventh year that Snake River natural origin fish (based on scale analysis) were included in broodstock (Table 9). Males used multiple times are only counted once in the table below to describe take for ESA reporting purposes. The goal is to have 30% of the fish used as broodstock come from Snake River natural origin stock.

Table 9. Unique numbers of Snake River natural origin fall Chinook included in broodstock, 2003-2009.

Return Year	Trapping location	Natural Females	Natural Males	Natural Jacks < 53cm	Total % of Naturals in Broodstock	Total number of fish spawned	Mating protocol
2003	LGR LFH	0 2	0 0	0 0	0.1	1560	Unknown x LF
2004	LGR LFH	118 9[a]	2 0	1 0	4.9	2645	Unknown x LF
2005	LGR LFH	110 1	122 2	6 0	9.1	2634	Unknown x LF
2006	LGR LFH	115 2	71 3	0 0	12.2	1567	Unknown x unknown and Unknown x LF
2007	LGR LFH	43 1	49 3	0 0	3.3	2915	Unknown x unknown
2008	LGR	110	54	0	6.4	2575	Unknown x unknown
2009	LGR	36	30	0	3.1	2126	Unknown x unknown

[a] Includes one female that was a true jill (1-salt).

Jacks and jills in broodstock

To document the extent that jacks and jills were used in broodstock, jacks used multiple times were included multiple times in the estimates in Table 10. Mating protocol changes in season were effective in reducing the use of jacks and minijacks in broodstock from 70% to 41.3%. Reduction in the numbers of jills used in broodstock was not possible because culling of jills was not allowed. Fork length data of jacks and jills used in broodstock are presented in Table 11.

Table 10. Numbers and percentages of matings with 1-salt jacks and jills and 0-salt minijacks that contributed to production at LFH during 2009.

			Mini-jacks and Jacks		Jills	
Age/rearing	**Brood year**	**Saltwater age**	**Number of matings**	**% of matings**	**Number of matings**	**% of matings**
H-yearling	2006	1	401	31.0%	488	37.7%
H reservoir reared	2006	1	9	0.7%	4	0.3%
Natural res rear	2006	1	11	0.9%	5	0.4%
Unk reservoir reared	2006	1	29	2.2%		
H subyearling	2007	1	82	6.3%	1	0.1%
Natural subyearling	2007	1	1	0.1%		
H reservoir reared	2007	0	1	0.1%		
Totals			**534**	**41.3%**	**498**	**38.5%**

Table 11. Fork lengths of 1- salt jacks and jills and 0-salt minijacks used in broodstock at LFH during 2009.

	Number of matings	**Average fork length (cm)**	**Median fork length (cm)**	**SD of fork length (cm)**	**Min fork length (cm)**	**Max fork length (cm)**
Jacks 1-salt						
H yearling	401	62	61	4.0	51	75
H reservoir reared	9	64	64	4.5	57	70
Natural reservoir reared	11	65	64	4.8	58	73
Unk reservoir reared	29	68	69	6.2	57	77
H subyearling	82	54	55	3.5	45	60
Natural subyearling	1	53	-	-	-	-
Jills 1-salt-						
H yearling	485[a]	65	65	3.3	53	76
H reservoir reared	4	73	71	4.7	69	78
Natural reservoir reared	5	73	73	2.1	71	76
H sub	1	72	-	-	-	-
Mini-jack 0-salt						
H reservoir reared	1	45	-	-	-	-

[a] Three jills did not have fork lengths associated with them.

Rearing and Marking

Tag and clip precision from quality control checks (Table 12) and historical information regarding egg take, early life stage survival (Table 13), are provided. Marking was consistent with *United States v. Oregon* recommendations as listed in Appendix F. Rearing followed standard hatchery procedures in the Snake River fall Chinook HGMP available at http://www.fws.gov/lsnakecomplan/Reports/HGMPreports.htm. Detailed information regarding type and size of vessels used for rearing can be found in LFH Annual Reports.

PIT tags were inserted into 27,000 onstation yearlings (BY08) for the purpose of monitoring returns in-season and to compare two methods of estimating SARs (using CWTs and PIT tags). The tag list was submitted to PTAGIS and fish were assigned to monitor mode to allow them to be treated like non-PIT tagged fish when intercepted at dams. Initial tag loss was < 1 % and the recovered PIT tags were reused on fish at release to increase the sample size. After release, the rearing pond and outlet structures were scanned for PIT tags and 25 tags were recovered (0.09%), leaving an estimated 26,975 PIT tags to represent the yearling release. A PIT tag array consisting of three antennas was installed in the outlet structure. Only 48.4 % of the PIT tags were detected at the array due to system malfunctions and fish leaving the structure in masses that overwhelmed the antennas.

The BY09 subyearlings were not PIT tagged in 2010 due to a priority change shifting the use of those PIT tags to another need. PIT tagging will resume at expanded levels in 2011.

Table 12. Numbers of yearling fall Chinook sampled at LFH for marking and tagging quality control checks.

Brood Year	Intended Marks	CWT	Number sampled	AD+CWT	AD ONLY	CWT ONLY	Unmarked/Untagged
2008	AD+CWT	635166	1,500	1,480	15	1	4
	(Percent of sample)			(98.7)	(1.0)	(0.0)	(0.3)
	CWT ONLY	635165	1,510	0	0	1488	22
	(Percent of sample)			(0.0)	(0.0)	(98.5)	(1.5)

Table 13. Egg take and survival numbers by life stage of Lyons Ferry origin fall Chinook spawned at LFH, brood years 1997-2009.

Brood Year	Eggs Taken	ELISA Loss [a]	Eggs Shipped [b]	Eyed Eggs Retained	Fry Ponded	Intended Program
1997	1,184,141	0	0	1,134,641	1,037,221 63,849	Yearling Subyearling
1998	2,085,155	0	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
2003	2,812,751	0	250,400	2,476,825	985,956 1,455,815 0	Yearling Subyearling Research
2004	4,625,638	0	1,053,278	3,421,751	914,594 2,191,102 184,682	Yearling Subyearling Research
2005	4,929,630	0	1,180,000	3,562,700[c]	980,940 2,078,206 216,417	Yearling Subyearling Research
2006	2,819,004	0	127,564	2,601,679	961,105 1,640,574 2,000	Yearling Subyearling Research
2007	5,143,459	0	1,761,500	3,212,900[d]	960,900 1,894,933 0	Yearling Subyearling Research [e]
2008	5,010,224	0	1,810,800	2,969,200	1,000,000 1,969,200 0	Yearling Subyearling Research [e]
2009	4,574,182	0	1,507,300	2,853,020	977,667 1,875,353 0	Yearling Subyearling Research

[a] Eggs from ELISA positive females were incorporated into the rest of the brood stock in 1997-1998 and 2003-2004.
[b] The destination of shipped eggs prior to 2009 can be found in previous Annual Reports.
[c] This number includes 154,100 eyed-eggs that were destroyed as ponded fry and 30,000 eyed-eggs that were shipped as fry to NPTH in February 2006.
[d] This number includes 364,983 eyed-eggs that were destroyed as ponded fry in January and February 2007.
[e] 336,500 of the shipped eyed-eggs (included in the shipped egg numbers) were dedicated to research.

Juvenile Releases

Brood year 2008

Yearling fall Chinook at LFH were released from 12 April to 15 April, with peak emigration occurring on 13 April. Fish were measured and weighed (Table 14) and visually appeared in good condition, with no external signs of BKD, pop-eye, or descaling from bird beaks. At release, fish were visually examined for sexual precocity [precocious fish expelled semen when handled and were dark colored (non-smolted)]. An estimated 0.25% of the yearlings released were precocious based on that visual examination, which is likely a large underestimate. An estimated 254,203 fish were released from the AD+CWT+VIE group, and 224,649 were released from the CWT+VIE group. Hatchery staff counted 512 pounds of fish and calculated the size at release (9.8 fpp). Fish used in the pound counts were set aside for SRL staff to subsample for individual lengths and weights. The majority of emigration occurred prior to 14 April therefore data collected on 13 April best represents the release. Snake River flows at LMO Dam were 24.2 kcfs with 12.1 kcfs spill on 12 April and Columbia River flows at MCN Dam were 93.9 kcfs with 37.6 kcfs spill on 15 April. The release occurred during an increasing hydrograph in each basin. Subyearlings released by WDFW from BY08 were previously reported (Milks et al 2011). Historical releases by WDFW, NPT, IDFG, and NOAA are provided in Appendix G.

Table 14. Length and weight data from yearling fall Chinook (BY08) released at LFH in 2010.

	Sample dates	
Length/weight data	**13 April**	**14 April**
Number sampled	200	204
Avg. length (mm)	165	165
Median length (mm)	165	165
Range of lengths (mm)	121-206	121-189
SD of lengths (mm)	13.1	11.2
CV of lengths	7.9	6.8
Avg. weight (g)	47	47
SD of weights (g)	10.8	8.7
CV of weights (g)	23.0	18.3
Avg. K:factor	1.03	1.05
FPP	9.7	9.6

Survival Rates to Release

Survival rates were estimated at different life stages to document survival in the hatchery environment (Table 15).

Table 15. Estimated survivals (%) between various life stages at LFH for fall Chinook of LFH/Snake River hatchery origin, 2004-2008 brood years.

Brood year	Release stage	Green egg-ponded fry	Ponded fry-release [a]	Green egg-release
2004	Yearling	93.3	96.8	90.1
	Subyearling	93.3	97.6	90.8
2005	Yearling	92.2	99.3	91.5
	Subyearling	92.2	104.9	96.7
2006	Yearling	95.7	95.4	91.3
	Subyearling	95.7	100.2	95.5
2007	Yearling	95.8	95.4	91.4
	Subyearling	95.8	100.3	95.5
2008	Yearling	95.8	95.3	91.3
	Subyearling	95.8	105.9	90.4
Yearling mean:	**%**	**94.6**	**96.2**	**90.9**
	SD	**1.7**	**2.0**	**0.7**
Subyearling mean:	**%**	**94.6**	**101.8**	**93.8**
	SD	**1.7**	**3.5**	**3.0**

[a] Survival estimates exceed 100% due to inventory tracking methodologies used at LFC.

Migration timing and survival

Interrogation summaries from the PTAGIS website (www.ptagis.org) were used to populate Table 16. Migration timing of PIT tagged yearlings released onstation represent the non-PIT tagged release because they were designated as monitor mode fish at the dams. From release site to detection facility, juvenile salmon averaged 2.3 km/day to LMO Dam, 5.7 km/day to IHR dam, 7.7 km/day to MCN Dam, 11.1 km/day to John Day Dam, and 15.2 km/day to Bonneville Dam. Minimum survival was estimated at 12.6 % based on 1,643 PIT tag detections at Bonneville Dam from fish also detected at the PIT tag array at LFH. We cannot estimate total downstream survival using the SURPH model because the salmon were put in monitor mode and not returned to the river at each dam to estimate survival through the hydro system. Overall, 33.2% of the fish detected at the array at LFH were also detected at downstream detection sites.

Table 16. Migration timing of BY08 PIT tagged yearlings released at LFH in 2010.

Detection Facility	Number Detected [a]	Median Travel Days [b]	Median Passage Date	Passage Date Range	Passage Dates	
					10%	90%
LMO Dam	809	12.4	April 24	April 14 - 5 June	April 20	April 29
IHR Dam	535	16.5	April 28	April 19 - 1 June	April 23	May 5
McNary Dam	3371	18.9	May 1	April 17 - 10 June	April 24	May 11
John Day Dam	1845	24.2	May 6	April 24 - 11 June	April 29	May 17
Bonneville Dam	3526	25.1	May 7	April 25 - 15 June	April 30	May 16

[a] Number of unique PIT tags detected at each detection facility.
[b] Travel days to detection facility from release date.

Adult progeny to parent ratio

We are unable to estimate the adult progeny to parent ratio because we are unable to identify untagged hatchery returns. Parental based tagging (PBT) of broodstock at LFH will begin in 2011. Combining data from PBT of broodstock at NPTH and LFH will result in the ability to identify all inbasin hatchery releases at return. In 2016, the whole return of inbasin hatchery fish will be identifiable through PBT analysis which will enable the estimation of adult progeny to parent ratios for both hatchery and natural origin fish.

Hatchery Stock Profile Evaluation

Average size at age of return was estimated for yearling (Table 17) and subyearling (Table 18) wire tagged fish processed by WDFW. All CWT recoveries from fish released inbasin (LSRCP, NPTH, and IPC) are included in the tables below. Fish trapped at LFH and LGR are combined in the tables below. These data provide the reader a general idea of the size at return, not the extent of the return by age because of selective trapping protocols skewing the data. In general, fish trapped at LFH are primarily yearlings while fish trapped at LGR contain more subyearlings. Again, these tables do not include fish processed at NPTH.

Table 17. Average size at age of return by sex for fish processed by WDFW that were part of yearling production.

			Age at Return				
Sex	**Origin**		0-salt	1-salt	2-salt	3-salt	4-salt
Male	LFH	N=	43	1,293	130	5	-
		Median	**34**	**59**	**74**	**89**	**-**
		Range	29-42	39-75	56-92	76-96	-
	Stray	N=	-	6	1	1	-
		Median	**-**	**67**	**93**	**88**	**-**
		Range	-	64-72	93	88	-
Female	LFH	N=	-	545	389	11	1
		Median	**-**	**65**	**77**	**85**	**80**
		Range	-	53-88	61-90	80-92	80
	Stray	N=	-	-	3	1	-
		Median	**-**	**-**	**85**	**88**	**-**
		Range	-	-	73-94	88	-

Table 18. Average size at age of return by sex for fish processed by WDFW that were part of subyearling production.

			Age at Return				
Sex	**Origin**		0-salt	1-salt	2-salt	3-salt	4-salt
Male	LFH	N=	-	1,154	25	36	-
		Median	**-**	**48**	**66**	**79**	**-**
		Range	-	35-61	50-80	63-107	-
	Stray	N=	-	15	-	3	-
		Median	**-**	**49**	**-**	**66**	**-**
		Range	-	43-54	-	44-74	-
Female	LFH	N=	-	-	26	136	-
		Median	**-**	**-**	**73**	**82**	**-**
		Range	-	-	65-80	61-94	-
	Stray	N=	-	-	-	3	-
		Median	**-**	**-**	**-**	**84**	**-**
		Range	-	-	-	84-86	-

Tucannon River Natural Production 2009

Adult Salmon Surveys

Fall Chinook Redd Surveys

WDFW personnel have conducted adult salmon surveys on the lower Tucannon River since 1985 (Appendix H). Survey sections generally covered the river from Rkm 1.1 to Rkm 29.0. The first 1.1 kilometers of the Tucannon River are deep slack water from the Snake River's LMO Dam reservoir and no surveys or estimates are made for that area; the habitat is poor in this area and it is presumed no spawning occurs there. During 2009, landowner access restrictions prevented the surveying of 1.5 kilometers of river above the Starbuck Bridge within survey sections 5 and 6 (Appendix H). River conditions for viewing were good throughout the spawning season.

An estimated 252 fall Chinook, 59 coho, and 1 summer Chinook redds were constructed in the Tucannon during 2009. A total of 266 redds (from all species) were counted in the Tucannon River and we estimate an additional 46 redds occurred in sections of river not accessed due to landowner restrictions. We estimated the numbers of redds built in inaccessible sections by calculating redds/Rkm in an adjacent surveyed section and applying it to the non-surveyed area. It was not possible to determine the origin of each redd due to the overlap in spawning area, spawn timing, and the confounding effect of the large numbers of coho seen in the stream (Table 19).

Table 19. Date and number of redds and carcasses counted on the Tucannon River in 2009.

	Total Redds [a]		Carcasses Sampled	
Week beginning	Chinook & Coho [b]	Summer Chinook	Chinook	Coho
18 Oct	9	1[c]	0	0
25 Oct	35	0	1	2
1 Nov	57	0	14	22
8Nov	56	0	29	11
15 Nov [d]	37	0	54	7
22 Nov	47	0	54	3
29 Nov	24	0	43	1
Totals	**265**	**1**	**195**	**46**

[a] Observed redds not expanded for sections with access restrictions.
[b] Chinook & coho redds estimated through visual counts were combined.
[c] Summer redd was estimated to be four weeks old.
[d] On 18 Nov, 599 fish were hauled back to the Snake River at Lyons Ferry which may have added an influx of fish to the Tucannon at that time.

The methodology used to estimate numbers of fall Chinook and coho redds was changed in 2009 because the proportion of redds identified as fall Chinook were different than the proportion of fall Chinook carcasses recovered. The total number of fall Chinook and coho redds counted and expanded for sections not walked were combined for a total redd count. The proportion of coho found during carcass surveys was applied to the total redd count to estimate the total number of redds built by coho. The number of coho redds initially identified in each section walked was adjusted to match the revised number of coho redds. The remainder of redds were assigned to fall Chinook.

Escapement and Composition of Run

Using the revised number of fall Chinook and coho redds as described in the prior section, we applied a 3 fish/redd calculation and estimated that 756 fall Chinook and 177 coho escaped to the Tucannon River (Table 20). We recovered 195 fall Chinook carcasses equating to 25.8 % of the estimated total escapement to the Tucannon River. No summer Chinook carcasses were collected, although one summer Chinook redd was identified. Using 3 fish/redd estimate, it is estimated that 3 summer Chinook also escaped to the Tucannon. Since the summer Chinook redd was located below the smolt trap, it was excluded from the table below.

Table 20. Estimated escapement, redd construction, and resulting estimates of smolts/redd and total number of migrants from fall Chinook spawning in the Tucannon River, 2002-2009.

			Redd Construction [a]			Success of Spawning		
Brood Year	Estimated escapement [a]	% Strays in carcasses sampled	# Redds observed	# Redds in no access areas (est.)	Total # of Redds (est.)	Estimated smolts/redd [b]	Total # Estimated Emigrants [c]	Adult progeny to Parent ratio
2002	630	35.1	183	27	210	81	17,030	0.051
2003	474	65.8	143	15	158	460	72,656	0.044
2004	345	29.4	111	4	115	631	72,655	0.029
2005	198[d]	60.0	61	5 [d]	66	320	21,170	0.020
2006 [e]	460	9.7	127 [f]	26	153	289	44,296	Pending
2007	326	7.0	93	16	109	Unknown [g]	Unknown [g]	unknown
2008	763	16.5	209	45	254	20	5,030	Pending
2009 [h]	756	10.7	217	35	252	147	36,991	Pending

[a] This estimate was derived using three fish per redd and no adjustments were made for super imposition of redds.
[b] This estimate was derived using redds counted above the smolt trap and estimates of emigration the following spring.
[c] This estimate was derived using the smolt per redd estimate above the trap and applying it to the total number of redds in the Tucannon River.
[d] Corrected estimated area walked in section 6 and adjusted escapement and numbers of redds in area not walked.
[e] Includes approximately 2.3% summer Chinook in escapement that contributed to production estimate.
[f] Corrected estimate by removing four coho redds.
[g] No estimate was made because the smolt trap sampling box had a hole in it and fish escaped.
[h] First year of using new methodology to estimate proportion of fall Chinook redds based on proportion of fall Chinook in carcass recoveries. Excludes one summer Chinook redd located below the smolt trap.

Heads and scales were collected from each carcass. DNA was collected from 99 salmon (09JY001 - 09JY026 and 09JY028 - 09JY100) for archiving. CWT and scale analysis were used to determine the age and origin of each carcass (Table 21). The composition of fall Chinook carcasses in Table 22 consists primarily of 1-salt jacks and jills (63.5%). Fish with out-of-basin hatchery scale patterns were assigned to the Snake R. hatchery group because CWT recoveries shed doubt on the magnitude of the estimated out-of-basin return using scale determinations. Based on recoveries of fish with a caudal fin clip, an estimate of 101 (16.9%) of the 599 fish trapped at LFH and released into the Snake River from the hatchery ended up in the run to the Tucannon River. Fish released back into the river at LFH elevated the number of fish spawning fish in the Tucannon by 13.4%.

Table 21. Composition of carcasses recovered and estimated run composition of fall Chinook on the Tucannon River, 2009.

		Raw recoveries			Expanded to Run			
Origin	CWT	F	M	M <53cm	F	M	M <53cm	Total
Snake River Hatchery (wire)								
LF05SO	633582	4	0	0	15	0	0	15
LF05SCCD1	633583	1	0	0	4	0	0	4
LF05SIPCPLA	109577	1	0	0	4	0	0	4
LF05YO	633597	11	4	0	43	15	0	58
	633598	12	1	0	47	4	0	51
LF06YO	633987	17	24	3	66	93	12	171
	634092	23	29	4	89	112	15	216
LF07SO	634672	1	0	1	4	0	4	8
LF07YO	634680	0	0	3	0	0	11	11
	634681	0	0	4	0	0	15	15
Snake River Hatchery (VIE)								
Yearling age 4		1	0	0	4	0	0	4
Yearling age 3		2	1	0	8	4	0	12
Presumed Snake River Hatchery (no wire)[a]								
Unknown subyearling age 2		0	0	1	0	0	4	4
Unknown subyearling age 3		1	0	0	4	0	0	4
Unknown subyearling age 4		8	3	0	31	12	0	43
Unknown hatchery yearling age 2		0	0	1	0	0	4	4
Unknown hatchery yearling age 3		4	0	3	16	0	11	27
Unknown hatchery yearling age 4		2	0	0	8	0	0	8
Unknown hatchery yearling age 5		1	0	0	4	0	0	4
Hatchery Adclip subyearling age 4		1	1	0	4	4	0	8
Out-of-basin hatchery (wire-CWT or BLANK)								
BLANK	BLANK	6	0	0	23	0	0	23
Agency wire tag	09BLANK	2	5	1	8	19	4	31
UMA05YUMA	094450	0	1	0	0	4	0	4
UMA06YUMA	094505	0	1	0	0	4	0	4
BONN07SUMA	094506	0	1	0	0	4	0	4
	090134	0	1	0	0	4	0	4
	090135	0	0	3	0	0	11	11
Snake River Natural								
Subyearling age 4		1	0	0	4	0	0	4
Total		**99**	**72**	**24**	**382**	**279**	**95**	**756**

[a] Ages estimated using scale data and fork lengths of fish sampled.

Table 22. Estimated composition of fall Chinook run to Tucannon River by salt water age and origin, 2009.

Origin	0-salt minijack	1-salt True jack	1-salt True jill	2-5 salt Adult F	2-5 salt Adult M	Total	% of Return
Snake River Hatchery (wire or VIE)	26	240	167	117	19	569	75.3%
Presumed Snake River Hatchery (no wire)	4	15	16	51	16	102	13.5%
Out-of-basin hatchery (wire-CWT or BLANK)	0	38	4	31	8	81	10.7%
Snake River Natural (Scales)	0	0	0	4	0	4	0.5%
Total	**30**	**293**	**187**	**203**	**43**	**756**	
% of return	**4.0**	**38.8**	**24.7**	**26.8**	**5.7**		**100%**

Adult progeny to parent ratios

Fall Chinook spawning in the Tucannon River have only replaced themselves one year since 1992 (Appendix H) and that occurred with the 1993 spawners. The most current four year average adult progeny to parent ratio was 0.04 returns/spawner and 0.01 returns/female (Table 19).

Coho

DNA was collected from 32 coho (09KC001-09KC032) for archiving. Coho produced an estimated 59 redds when expanded for areas not surveyed. Forty-six coho carcasses were recovered resulting in a 26.0 % sample of the total coho escapement estimate. The majority of coho were untagged hatchery fish (Table 23).

Table 23. Composition of coho carcasses recovered on the Tucannon River in 2009.

Origin	CWT	Females AD clip	Females No clip	Females Unknown	Males No clip	Males Unknown	Unknown No clip	Totals
No Wire								
Hatchery (Scales)			16		11	2		29
Natural			1		1			2
Unknown origin			2		1	1		4
Wire tagged coho								
Clearwater (CWTs)	612706	1	1		2		1	5
	612720		2	1	2			5
Hatchery (Scales)	LOST TAG		1					1
Total		**1**	**23**	**1**	**17**	**3**	**1**	**46**

Juvenile Salmon Emigration

Fall Chinook

Juvenile fall Chinook (BY08) were observed at the smolt trap (Rkm 3.0) from 9 March through 10 July 2009 when the trap was pulled for the season (Gallinat and Ross, 2009). Median passage date for fall Chinook passing the trap was 18 June. Staff captured 1,227 fall Chinook, and estimate that 4,258 (95% C.I. = 3,626-5,023) naturally produced fall Chinook smolts passed the Tucannon River smolt trap during 2009. Based on 215 redds estimated above the smolt trap during 2008, a calculated 20 smolts/redd were produced. After including juvenile production from below the smolt trap, an estimated 5,030 naturally produced fall Chinook smolts left the Tucannon during 2009.

Staff measured 815 fall Chinook which ranged from 34-108 mm fork length and averaged 79 mm with a median of 80 mm. Lengths and weights were taken on 378 fish. For this group, fork lengths ranged from 37-108 mm, with an average of 82 mm and a median of 81 mm. Weights ranged from 0.6 g to 15.9 g, with an average of 7.1 g and median of 6.6 g. K-factors ranged from 0.99-1.8, with an average and median of 1.21. Scales were not collected on fall Chinook. PIT tags identified for use on fall Chinook on the Tucannon were directed to another study this year.

Coho

Juvenile coho salmon were incidentally captured at the smolt trap. This is the third year mark-recapture trap efficiencies were done for coho to determine if their recapture rates are similar to fall Chinook (Table 24). Staff trapped 97 coho, but only two were recaptured so estimates were not made regarding the magnitude of outmigrants.

Juvenile coho were observed at the smolt trap from 2 February through 7 June. Median passage date of coho past the smolt trap was 3 May. Overall, coho ranged from 31-180 mm in length. Coho are generally considered yearling migrants but we estimate that up to 24% of the coho in the Tucannon emigrate as subyearlings.

Small fish measuring 31-91 mm in length (n=23) averaged 63 mm with a median fork length of 65 mm. It is suspected these fish were subyearlings from the 2008 spawn, although scales were not taken to verify age. Weights from 6 subyearling coho ranged from 4.9-10.4 g, and averaged 7.9 g with a median of 8.2 g. K-factors ranged from 1.19-1.37, with a mean of 1.28, and a median of 1.27.

Large fish (n=74) ranged from 95-180 mm, and averaged 130 mm with a median fork length of 129 mm. It is estimated those fish were yearlings from the 2007 spawn. The weights of the 56 yearling coho ranged from 10.5-60.9 g with an average of 27.0 g and a median of 25.3 g. K-factors ranged from 0.96-1.36 with a mean of 1.11 and median of 1.10.

Table 24. Trapping efficiency estimates for fall Chinook and coho at a smolt trap on the Tucannon River in 2009.

Week Ending	Fall Chinook Recapture efficiency	Coho Recapture efficiency
26 April	unknown	0.0%
03 May	unknown	7.7%
10 May	unknown	0.0%
17 May	unknown	50.0%
24 May	unknown	unknown
31 May	0.0%	unknown
07 June	30.3%	unknown
14 June	21.5%	unknown
21 June	19.8%	0.0%
28 June	48.6%	unknown
06 July	35.6%	unknown

Fall Chinook Run Size and Composition 2009

Return to LFH

Fish trapped at LFH are not systematically trapped or marked; therefore, neither the full run size nor the true composition of the run to LFH can be estimated. The estimated composition of fall Chinook trapped at LFH that were killed during spawning is listed in Table 25. Fish that were not needed for broodstock or monitoring and evaluation were caudal clipped and released into the Snake River (see Hatchery Operations section). Some of the released fish were detected during spawning surveys in the Tucannon or at the LGR Adult trap, or were re-trapped and killed at LFH. The remaining fish are listed in Table 26 and are presumed to have remained in the Snake River; likely between LMO and LGR Dams.

Table 25. Estimated composition of fall Chinook trapped at LFH and killed in 2009 by program and saltwater age.

	0-salt	1-salt		2+ salt			
Program	**Minijack**	**True jack**	**True jill**	**Adult F**	**Adult M**	**Total**	**% of total**
Umatilla/BONN	0	3	1	0	0	4	0.3
Bonneville	0	1	1	0	0	2	0.2
Umatilla	0	1	0	0	0	1	0.1
NPTH	0	0	0	0	0	0	0.0
LSRCP	2	409	344	367	152	1,274	99.4
Natural	0	0	0	1	0	1	0.1
Total	2	414	346	368	152	1,282	

Table 26. Estimated composition of caudal clipped fall Chinook released at LFH that remained in the reservoirs between LMO and LGR dams by program and saltwater age in 2009.

	0-salt	1-salt		2+ salt			
Program	**Minijack**	**True jack**	**True jill**	**Adult F**	**Adult M**	**Total**	**% of total**
Umatilla/BONN	0	2	0	0	0	2	0.4%
LSRCP	0	323	45	56	72	496	99.6%
Total	0	325	45	56	72	498	

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

Fish hauled from LGR to LFH that were processed (killed) are listed in Appendix I. A finalized run reconstruction was not completed for 2009 although preliminary estimates for mitigation are presented in a later section.

Chinook were counted 24 hours per day during August, 16 hours per day September through October, and 10 hours per day from November through 15 December at the counting window at LGR Dam (U.S. Army Corps of Engineers, 2009). Window counts estimated 15,167 adults and 41,285 jacks (30 cm-52 cm) reached LGR Dam in 2009 (Figure 12). The Chinook passing LGR Dam after 17 August are designated as falls based on arrival date, which may be inaccurate because of the overlap between the fall and summer Chinook runs. In addition, fish counts do not count fish less than 30 cm long nor do they adjust for fish that crossed the dam and fell back through the juvenile bypass system (fallback event) nor fish that re-crossed the dam after a fallback event (double counting).

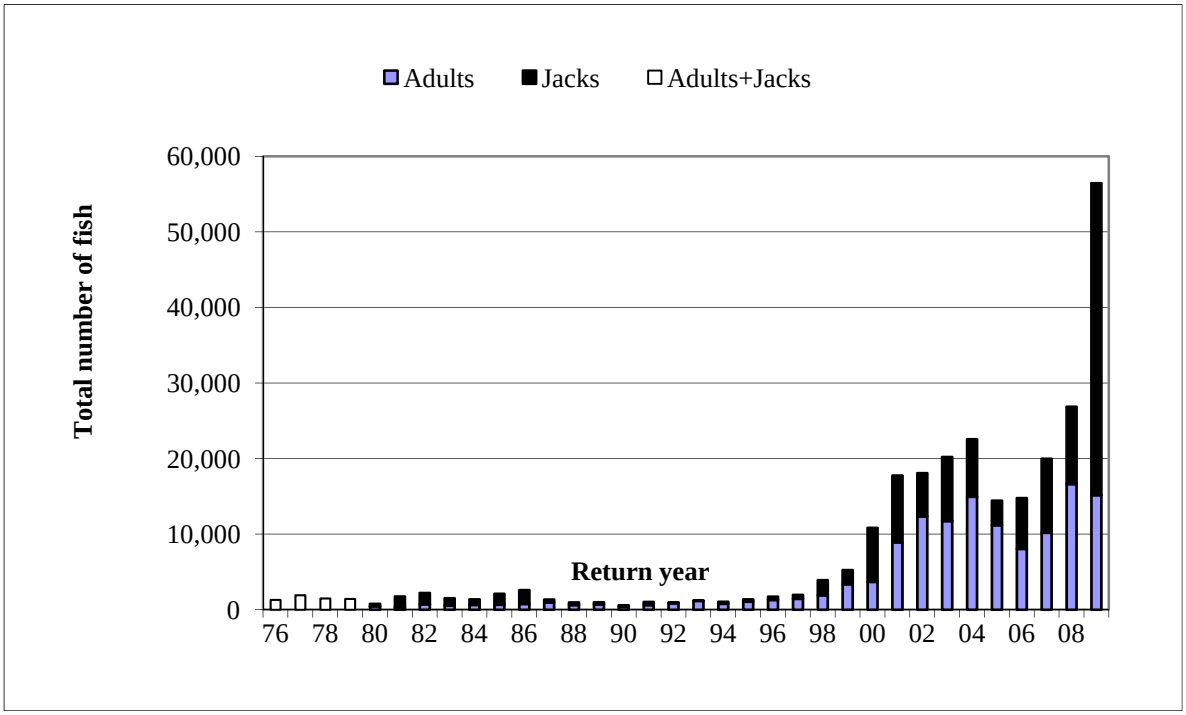


Figure 12. Fall Chinook window counts at LGR Dam, 1976-2009

Fallbacks

A combined total of 5,877 fallback events were counted at the juvenile collection facility (Table 27) and the separator (Table 28) located below LGR Dam. These fallback events occur when fish encounter the traveling screens that bypass fish from the turbines and shunt them to the juvenile collection facility. Fish can also fallback over the spillway, go through the turbines, or the navigation lock, but we did not estimate fallback for those routes.

Table 27. Documented fallbacks of Chinook at the LGR juvenile collection facility during 2009 by clip, wire, and VIE.

Run	Fin clip	Wire	VIE	<30cm	30-50cm [a]	Grand Total
Chinook [b]	AD clip	No wire	LR		1	1
			No VIE		2	2
		Wire	LR	11	60	71
			NoVIE	3	6	9
			LR	7	16	23
			No VIE		4	4
		No Data	No data		1	1
	No clip	No wire	LR		1	1
			NoVIE		5	5
		Wire	LR	10	39	49
			NoVIE	2	7	9
			No data		2	2
		No data	LR	3	4	7
			NoVIE	1	2	3
Fall Chinook Total				**37**	**150**	**187**
% Hatchery Origin				**97.3**	**95.3**	
% yearling releases from LFH				**83.8**	**80.7**	

[a] Category does not differentiate males from females , although they are likely males.
[b] The run of Chinook is not identified during sampling and may include summers.

Fish encountered at the juvenile collection facility and separator were examined for size, fin clips, VIE tags, and operculum punches. Fish less than 50 cm were primarily hatchery fish (> 95 %). An estimate of at least 68.3% of the fish ≥53 cm sampled at the separator were of hatchery origin based solely on adipose clips and VIEs, but we expect the rate is actually much greater.

Table 28. Composition of fall Chinook fallbacks at the LGR Dam separator in 2009 by clip, VIE, and length.

Clip	VIE	<53cm[a]	≥53 cm [a]	No data	Grand Total
AD clip	LR	237	476		713
	No VIE	474	807	3	1,284
	No data	500	772	2	1,274
No Clip	LR	200	499	1	700
	No VIE	253	595	4	852
	No data	241	581	1	823
No data	LR		7	1	8
	No VIE	6	7	1	14
	No data	16	5	1	22
Grand Total		**1,927**	**3,749**	**14**	**5,690**

[a] Category includes males and females.

Characteristics of fall Chinook reaching LGR Dam

The following figures were built using data collected at the LGR adult trap. These analyses include hatchery and natural origin fall Chinook.

Arrival timing

The actual numbers of fish trapped were expanded to estimate the magnitude of the run arriving at LGR each day (Figure 13) the trap was operated. No estimates were made for days the trap was closed due to high water temperatures.

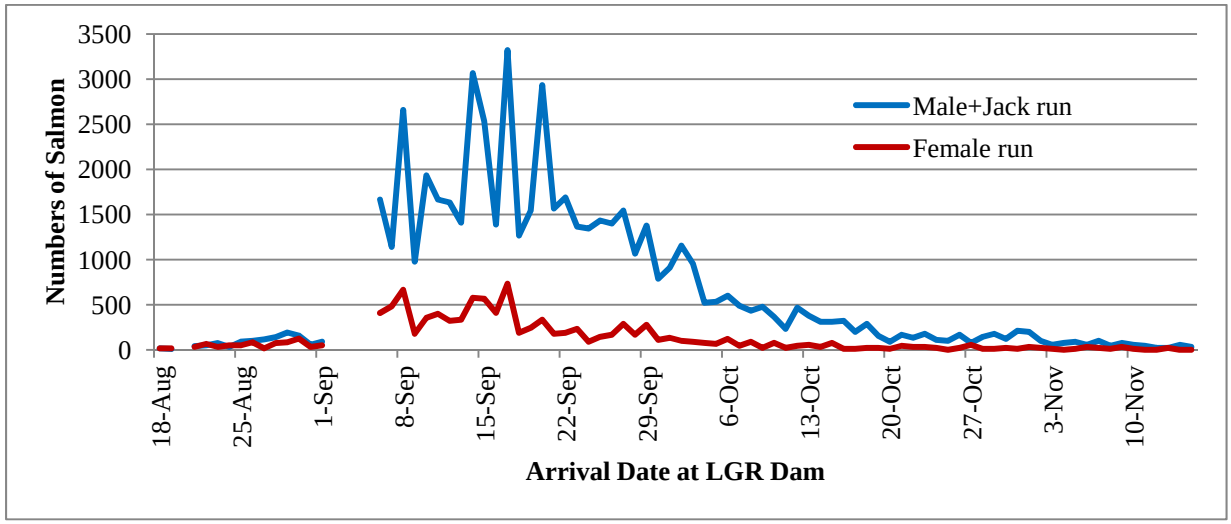


Figure 13. Run timing of fall Chinook to LGR Dam by sex in 2009.

Sex Ratio

The 2009 return consisted of 84.3% males, including jacks. The sex ratio of the return was calculated at 5.4 males/female. After removal of fish for broodstock, the fish calculated passing LGR Dam were 84.8% males resulting in 5.8 males/female.

Length frequencies

Fish trapped at LGR were measured and numbers of fish at each length were expanded based on trap rate (Figure 14). The majority of the run consisted of small males 51 cm or less. Males ranged from 27 cm to 108 cm with a median fork length of 50 cm while females ranged from 51 cm to 101 cm with a median fork length of 74 cm. Figure 15 shows the length frequencies of fish passing LGR Dam after broodstock was removed.

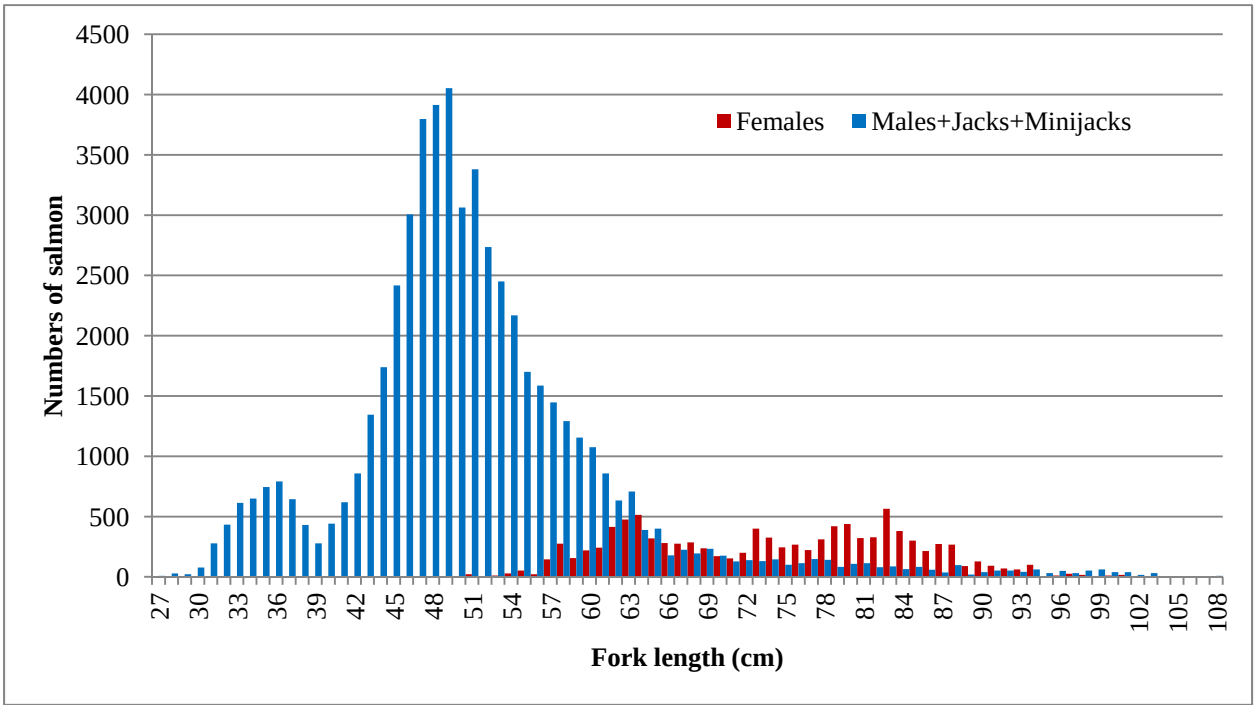


Figure 14. Length frequencies of the fall Chinook run to LGR Dam by sex in 2009.

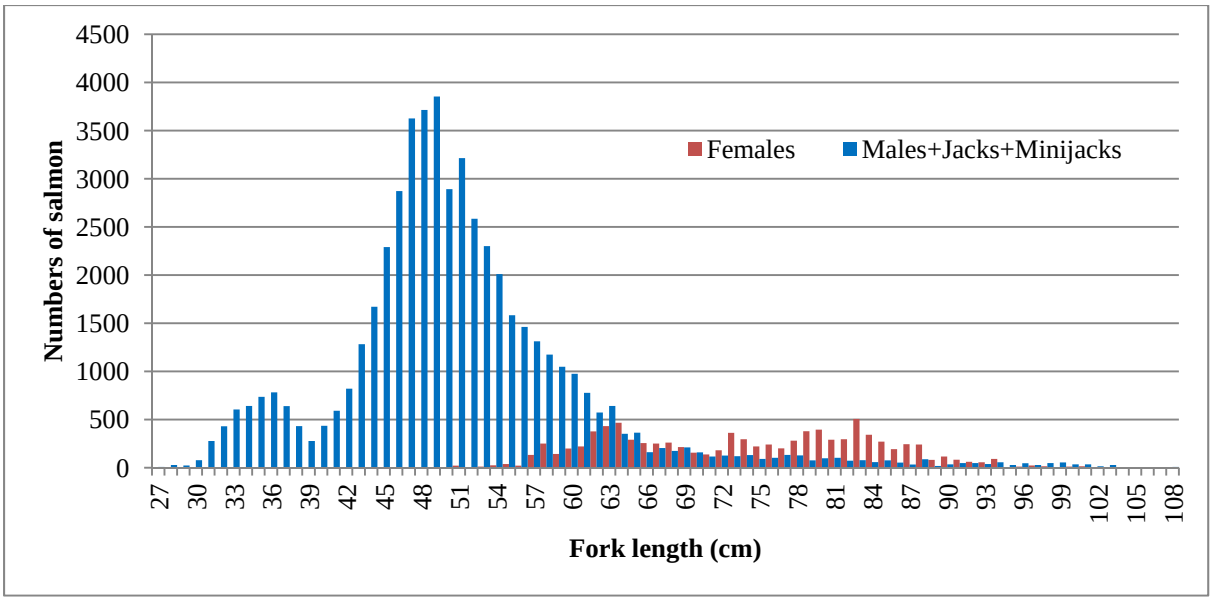


Figure 15. Length frequencies of fall Chinook passing LGR Dam by sex in 2009.

Status of Mitigation Requirements

Overall Mitigation Level

In 2009 an estimated a minimum of 44,138 adults returned from WDFW and FCAP releases. The total number of LSRCP fish returning to the Snake River was 36,385 (WDFW and FCAP) with an additional 7,753 fish (WDFW releases only) recovered outside of the Snake River basin. At a minimum, 48.2% of the total LSRCP mitigation goal of 91,500 fish was met in 2009. Additional fish harvested from the FCAP releases will increase the total mitigation number, although they are not presented here.

Returns to the Project Area

The LSRCP mitigation goal of 18,300 fish returning to the Snake River project area was exceeded in 2009 (Table 29). Combining recoveries at LFH, the estimates of fish remaining in the reservoir, the run to the Tucannon River and LGR Dam provides the best estimate of mitigation returns (tagged and untagged fish). These estimates do not include in-basin hatchery returns from the IPC nor the NPTH programs.

This was the second year jack fisheries occurred in the Snake River basin since 1988 and the first year of an adult Chinook fishery since LFH was constructed. In 2009 fishers were allowed to harvest two adipose clipped adults and four jacks. RMIS reported 84 fish (LSRCP production) observed in sport fisheries and WDFW estimated an additional 81 fish were harvested based on expansion estimates from sampling. IDFG submitted observed recoveries but not estimated catch and Tribal catch was not reported.

At the time this report was completed, the 2009 run reconstruction was not finalized. In order to estimate the level of mitigation attained, a conservative estimate was used to determine the run of LSRCP fish to LGR Dam consisting of CWT recoveries, estimates of untagged fish associated with the CWTs, estimates of untagged hatchery fish not associated with a CWT, and estimated numbers of PIT tagged fish tagged at Dworshak hatchery that were part of the ACOE transportation study. After all these calculations were completed, there were approximately 4,500 hatchery subyearlings based on scale analysis that could not be assigned to a hatchery, 54% which were jacks. It is possible that some proportion of these fish may actually be natural origin. At this time there is no agreement on how to deal with these fish. If we keep them designated as hatchery origin, the greatest proportion would be counted towards LSRCP mitigation.

In 2009, the original estimated run composition based on the trapping rates expanded to a full run yielded a 68,961 estimate to LGR, while window counts expanded to a run size of 56,452. To remain conservative in our estimates, we reduced our preliminary run estimates by 8.2% to match the magnitude of the run as counted at the window at LGR Dam. The LSRCP run to LGR listed in Table 29 has been adjusted to account for the discrepancies between methods.

Table 29. Preliminary estimated returns of LSRCP fall Chinook to the Snake River and levels of mitigation goals met in 2009.

	Saltwater age						
	0-salt	1-salt		2-5 salt			
Location	Mini Jack [a]	Jack [b]	Jill [c]	Adult F	Adult M	Total (A+J)	% of LSRCP goal [d]
LFH trapped and killed during processing	2	406	341	367	149	1,263	6.9
Snake R between LMO and LGR dams [e]	0	323	45	56	72	496	2.7
Run to Tucannon R[f].	31	260	182	163	35	640	3.5
Run to LGR dam (prelim LSRCP est)[g]	493	26,233	2,791	3,147	1,815	33,986	185.7%
Total	**526**	**27,222**	**3,359**	**3,733**	**2,071**	**36,385**	**198.8%**

[a] Minijacks are males that did not spend a year in salt water.
[b] Jacks are males that spent 1 year in salt water.
[c] Jills are females that spent 1 year in salt water.
[d] LSRCP returns include WDFW and FCAP releases.
[e] Fall Chinook returned to the Snake River that were not accounted for in other estimates.
[f] Estimated run to the Tucannon River.
[g] Estimated run to LGR Dam (includes fish hauled to LFH and NPTH for processing as well as fish released from the dam).

Recoveries outside of the Snake River Basin

To document where recoveries of LFH/Snake River hatchery fish occurred in 2009, the RMIS database was queried on 5 April 2011 for all tag recoveries (all tag statuses) of LSRCP released fish. Estimates of harvest for fish released by WDFW are listed in Table 30 and do not include recoveries of fish released by the NPT (LSRCP or NPTH programs) or ODFW or IDFG (IPC program).

An estimated 10.6 % of the harvest goal (73,200 fish) was met by WDFW releases in 2009. The sport harvest estimate is a minimum and does not include harvest in the Snake River since those fish were included in the run to the Snake estimates. Estimates of harvest of NPT fish (FCAP) that were part of the LSRCP mitigation are not presented in this report and will be documented in a NPT future report. These estimates include fish that were tagged as well as untagged fish estimated in the following sections.

The majority (55%) of harvest occurred in the ocean off the coasts of Washington and British Columbia, but the single largest fishery contributor to harvest was the Zone 6 Gillnet fishery which consisted of 31.6% of all the fish harvested in 2009. Commercial fisheries (Tribal and non-Tribal) contributed to 65% of the fish captured in fisheries. Fish recovered at hatcheries outside of the Snake River basin contributed 0.04 % of the fish reported to RMIS and another 0.24% were located during carcass surveys.

Table 30. Estimated recoveries of tagged and untagged fall Chinook outside of the Snake River basin in 2009 for WDFW releases.

Water body	Area	Fishery	RMIS ESTD	Revised ESTD
Freshwater	COL	Columbia River Gillnet Zone 1 - 5	522	912
		Columbia River Gillnet Zone 6	1,364	2,446
		Above Bonneville test	1	1
		Estuary Sport	40	76
		Mid-Columbia Sport (Bonneville pool)	1	1
		Freshwater Sport (Drano LK)	15	15
		Oregon Hatchery (Bonneville)	1	2
		Spawning Ground (Hanford reach/vernita bar)	10	16
	OR	Estuary Sport (Coos Bay)	1	1
		Hatchery (Bonneville)	1	2
	WA	Spawning Ground (Lewis R)	2	2
		Treaty Drift Gillnet (Skagit R)	2	2
Ocean	AK	Experimental Area Troll	4	4
		Marine Sport	7	7
		Terminal Area Drift Gillnet	2	4
		Traditional Drift Gillnet	1	2
		Traditional Troll	75	97
	BC	Marine Sport	12	21
		Sport	653	1,090
		Troll-Freezer Boat	48	56
		Troll-Ice Boat	362	413
	COL	Marine Sport	120	125
	HS	At Sea Hake Midwater Trawl Bycatch	154	160
	OR	Ocean Sport	79	143
		Ocean Troll	18	28
		OSU Experimental Ocean Purse Seine	9	9
	WA	Marine Sport	1,198	1,232
		Non-treaty Drift Gillnet	10	10
		OSU Experimental Ocean Purse Seine	29	30
		Set Gillnet	7	8
		Treaty Troll	353	379
		Troll (Non-treaty)	355	459
		Total	**5,486**	**7,753**

Harvest Adjustments for Non-Selective Fisheries

Non-selective fisheries retain any fall Chinook captured. Non-selective fisheries include all the commercial and tribal net fisheries. The WA and OR sport fisheries in the Columbia River and Canadian and Alaskan sport fisheries are also non-selective. The RMIS database was used to generate estimated (ESTD) harvest data of CWT tagged fish. Fish without CWTs are not reported to RMIS and therefore the harvest estimates must be expanded to reflect total take for

mitigation purposes. Adjustments to RMIS harvest data were calculated differently based upon CWT detection methods listed below.

Visual Detection Method

Visual detection means only adipose fin clipped fish were scanned for wire. Since Oregon, Canada, and Alaska only sample adipose clipped fish but allow take of all fish, we expanded the RMIS estimated recoveries (ESTD) by determining an expansion factor based on release data for each tag code recovered. For example, if the tagcode recovered was from a release of fish that had ADCWT, CWT only, AD only, and unmarked/untagged fish in the release, we used the following formula to expand harvest data of CWT fish to represent the total take:

ESTD CWTs harvested by fisheries from RMIS x (total # released from that were associated with a tagcode/
ADCWT in the release) = Revised ESTD total take

Electronic Detection Method

Electronic detection method scans all fish for wire regardless of fin clip. For this detection type we used the following formula to expand the harvest data of CWT fish to estimate the total take:

ESTD CWTs harvested by fisheries from RMIS x (total # released represented by that tagcode/ (# ADCWT in the release + # CWT in the release) = Revised ESTD total take

Contribution of yearling and subyearlings intercepted in fisheries

To determine if yearling released fish were recovered in different locations at different ages than subyearling released fish we populated Tables 31 and 32 using only fish that were released with adipose clips. Only adipose clipped releases were compared so that recoveries in British Columbia, Alaska, Washington, and Oregon would be included in the analysis. Harvest of yearlings occurred mostly in the Columbia River followed by WA and BC ocean fisheries, although all ocean fisheries combined had the greatest take impact. Subyearlings were also harvested mainly in the Columbia River then in BC and WA fisheries; but to a much lesser extent than the yearlings. The majority of yearlings were harvested as one salts while the subyearlings were primarily harvested as 3-salts.

Table 31. Final locations of ADCWT yearling fall Chinook released by WDFW to Freshwater and Ocean areas in 2009 by saltwater age

Area	0-salt	1-salt	2-salt	3-salt	4-salt	Total	% of Total
Freshwater	23	760	534	21	7	1,345	39.9
COL	23	757	534	21	7	1,342	39.8
OR	0	1	0	0	0	1	0.0
WA	0	2	0	0	0	2	0.1
Ocean	9	1,489	510	17	0	2,025	60.1
AK	0	1	12	3	0	16	0.5
BC	0	414	235	9	0	658	19.5
COL	0	43	19	0	0	62	1.8
HS	0	85	0	0	0	85	2.5
OR	3	75	4	0	0	82	2.4
WA	6	871	240	5	0	1,122	33.3
Total	**32**	**2,248**	**1,044**	**38**	**7**	**3,370**	**100.0**

Table 32. Final locations of ADCWT subyearling fall Chinook released by WDFW to freshwater and ocean areas in 2009 by saltwater age.

Area	0-salt	1-salt	2-salt	3-salt	Total	% of Total
Freshwater	0	149	42	631	822	58.4
COL	0	148	40	631	818	58.2
OR	0	1	0	0	1	0.1
WA	0	0	2	0	2	0.1
Ocean	15	77	45	449	585	41.6
AK	0	0	0	82	82	5.8
BC	0	17	16	228	260	18.5
COL	0	13	4	12	29	2.1
HS	0	33	0	0	33	2.3
OR	4	3	0	8	15	1.1
WA	11	11	25	119	167	11.8
Total	**15**	**226**	**86**	**1,080**	**1,407**	**100.0**

Smolt to Adult Returns estimated using PIT tags and CWTs

The trap at LGR Dam is not designed to hold small (zero-salt) fish. Small fish can slip between the bars of the graile and are thought to be able to fit between the bars in the ladder, thus allowing small fish to avoid being diverted into the trap. The trap at LFH can hold small fish but a similar problem occurs when the fish are shunted into the fallback channel and crowded. The bars on the crowder are not designed to keep small fish from escaping so although they may be trapped, they are not accounted for at spawning because they never made it into the spawning building for processing. This will under account for returning fish.

To address this issue, we compared two methods of estimating smolt-to-adult returns to the Snake River (SARs): 1) PIT tag detections at return and 2) estimated returns of CWT fish. Data presented is preliminary since return information by brood year is incomplete. PIT tag detections were downloaded 9 June 2011and resulted in detections through 2010. PIT tags used for SARs to the Snake River consisted of fish detected at arrays in the Snake River (Table 33). Data presented in Table 34 include returns of CWT fish in 2010.

By using PIT tagged returns of yearling fall Chinook released at LFH, we were able to detect an average 4.4 times greater SAR of 0-salt fish on average compared to estimates using conventional CWT estimates based on trapping rates and detections. As fish returned at older ages the differences between estimation methods decreased and CWT estimates resulted in 1.8 and 1.3 times greater SARs for 1-salt and 2-salt fish than when using PIT tag estimates.

Table 33. SARs to the Snake River for yearling fall Chinook released at LFH estimated using PIT tag detections in the Snake River through 2010.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total Return to Date	Total PIT tagged at Release
2006	4.0% 1,183	1.7% 500	0.8% 233	-	-	6.4% 1,916	29,806
2007	0.4% 106	0.7% 195	-	-	-	1.1% 301	26,757
2008	0.6% 157	-	-	-	-	0.6% 157	26,975

Table 34. SARs to the Snake River for yearling fall Chinook released at LFH estimated using CWT recoveries and return estimates of live fish through 2010.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total Return to Date	Total Tagged at Release	Tag codes
2006	1.3% 5,737	3.3% 14,856	1.0% 4,541	-	-	2.6% 25,134	452,340	634092 633987
2007	0.1% 522	1.1% 4,987	-	-	-	1.2% 5,509	442,640	634680 634681
2008	0.1% 324	-	-	-	-	0.1% 324	472,359	635165 635166

Smolt to Adult Survival estimated using CWT and PIT tags

Smolt to adult survival (SAS) estimates include recoveries or detections in the Snake River as well as harvest recoveries and detections at downstream locations (Table 35 and Table 36). PIT tag detections result in an average 5.2 times greater 0-salt survival (SAS) than occurred by using CWT estimation methods. However, as fish returned at older ages the differences between methods reversed and the CWT estimation method resulted in 1.9 and 1.4 times greater SASs of 1-salt and 2-salt fish than estimated by using PIT tags. Although returns are not complete for the brood years evaluated, it appears that CWT estimation methods result in accounting for more jack and adults than PIT tag detections, but PIT tags are useful for estimating the abundance of minijacks. We do not presently know the cause of the difference in estimated returns between PIT and CWT older fish.

Table 35. SASs of yearling fall Chinook released at LFH estimated using PIT tag detections in the Snake and Columbia rivers during 2010.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total Return to Date	Total PIT tagged at Release
2006	4.8% 1.418	2.1% 635	1.4% 405	-	-	8.3% 2.458	29,806
2007	0.5% 142	0.8% 225	-	-	-	1.4% 367	26,757
2008	0.7% 198	-	-	-	-	0.7% 198	26,975

Table 36. SASs of yearling fall Chinook released at LFH estimated using CWT recoveries and return estimates of live fish through 2010.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total Return to Date	Total Tagged at Release	Tag codes
2006	1.3% 5,800	3.9% 17,749	2.0% 9,000	-	-	7.2% 32,549	452340	634092 633987
2007	0.1% 572	1.4% 6,034	-	-	-	1.5% 6,606	442640	634680 634681
2008	0.1% 324-	-	-	-	-	0.1% 324	472359	635165 635166

Reference Population

Deschutes River fall Chinook

Preliminary literature reviews suggest that Deschutes River fall Chinook may be a viable reference population to compare with Snake River fall Chinook. Both populations of fish exhibit subyearling and reservoir rearing lifestyles. Efforts will continue to find additional reference populations of fall Chinook and results will be presented in an upcoming report.

Conclusions and Recommendations

The fall Chinook program at LFH requires substantial coordination. The program is currently being managed to meet the requests of Tribal, state, and federal co-managers. Conclusions and recommendations listed below are not prioritized.

One-salt jacks and jills were abundant during 2009. Was this a onetime occurrence or has it occurred in the past? How far back were true jacks and jills used in broodstock at LFH? Should LFH be moving towards an increased subyearling program and a reduced yearling program to potentially increase age at return?

Recommendation: Perform a literature search regarding the occurrence of jills in fall Chinook returns in other river basins.

Recommendation: Calculate the proportions of true jacks and jills used in broodstocks since the program began.

Recommendation: Continue to minimize the use of jacks in broodstock and cull progeny from jills if not needed to meet production needs.

Recommendation: Evaluate the size at age for true jacks and jills since the program began.

Recommendation: Discuss with co-managers in the basin what the direction should be for the LFH program.

To fully estimate the numbers of fish remaining above LGR Dam to spawn, we must have an accurate estimate of the numbers of fish that fallback over LGR Dam. In addition, we need to know how many of those fish have fallen back and remain below LGR. Each year fallback events are tallied at the juvenile collection facility and the separator located below LGR Dam. Fish intercepted at the separator that are too large to fit through the separator bars are shunted back to the Snake River. Since these fish are not marked before they are released we cannot determine how many of those fish re-ascend the ladder and fallback via the juvenile bypass to be counted again at the separator.

Recommendation: Query the PTAGIS database to determine the fallback rate of PIT tagged salmon.

Recommendation: Estimate the number of recapture events, and the final tally of fish that fell back through the separator that remained below the dam.

Recommendation: Use the final fallback data to estimate the number of fish remaining above LGR to spawn.

Recommendation: PIT tag LFH onstation released fall Chinook subyearlings so they are represented, allowing estimation of fall back from this group of salmon.

Recommendation: Perform a radio tag study. Radio tag PIT tagged onstation released fish once they return to LGR to document fallback.

Concerns have been raised about onstation released fall Chinook passing LGR Dam, which could be considered straying away from the release site. At what rate is this occurring and how many of those fish are remaining above the dam?

Recommendation: PIT tag onstation subyearlings so this analysis can be performed.

Recommendation: Calculate the percent of the onstation releases that are crossing LGR Dam and the estimated final location of these fish.

Recommendation: Perform a radio tag study. Radio tag PIT tagged onstation released fish once they return to LGR to document fallback as well as behavior of onstation releases through the reservoir.

To fully estimate the numbers of returns from fish released onstation we need to either subsample fish trapped at LFH or be able to identify them in river. We are unable to trap at LFH throughout the return because we are unable to handle those fish and mark them to estimate recaptures. In addition, we are not permitted to trap the large numbers of fish that we would intercept if we trapped during the full season at LFH.

Recommendation: PIT tag onstation released subyearlings to allow full enumeration.

Fecundity counts have been performed for several years and have been used to develop trapping protocols and estimate numbers of females to spawn to make production goals. Unfortunately, when fork lengths are used as an estimator of fecundity there is still approximately a 40% error rate. Comparisons of fecundities of natural fish and hatchery fish are an important metric that needs to be completed but unfortunately since there are many untagged hatchery fish in the basin we are unable to identify them with 100% surety using scales.

Recommendation: Collect genetic samples from broodstocks in the basin to profile parentage of fish used in production so when they return we will be able to determine which untagged (nowire) fish are hatchery.

Recommendation: Cease doing fecundity counts on LFH broodstock for five years until all inbasin hatchery returns are identifiable and the natural component can be identified.

Recommendation: In 5 years begin taking fecundity counts to compare hatchery and natural origin stock profiles.

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Appendix A: Fall Chinook Run to LFH, IHR, LMO, and LGR Dams: 2004-2009

(Numbers of fall Chinook observed at Snake River Dams and numbers of fall Chinook trapped and processed at LFH. LGR trapped fish that were processed at LFH are listed under LGR Dam data with COE window counts).

Appendix A Table 1. Numbers of fall Chinook processed at LFH, estimated escapement to the Tucannon River and window counts at Ice Harbor, Lower Monumental, and Lower Granite dams, 2004-2009.

		Daytime Counts				Night Video [a]				Totals [b]	
		Through October		Nov and Dec		Through Oct		Nov and Dec			
Year	Location	Adults	Jacks	Adults	Jacks	Adults	Jacks	Adults	Jacks	Adults	Jacks
	IHR Dam	21,109	11,167	Nc [c]	nc	nc	nc	nc	nc	21,109	11,167
	LOMO Dam	19,812	5,921	114	30	nc	nc	nc	nc	19,926	5,951
2004	LFH									2,863	506
	Tucannon R.									345	0
	LGR Dam	14,560	7,478	400	122	nc	nc	nc	nc	14,960	7,600
	IHR Dam	14,677	4,561	nc	nc	nc	nc	nc	nc	14,677	4,561
	LOMO Dam	13,137	3,051	nc	nc	nc	nc	nc	nc	13,137	3,051
2005	LFH									2,240	473
	Tucannon R.									181	20
	LGR Dam	11,137	3,183	57	53	nc	nc	nc	nc	11,194	3,236
	IHR Dam	10,272	6,835	nc	nc	nc	nc	nc	nc	10,272	6,835
	LOMO Dam	11,127	8,769	nc	nc	nc	nc	nc	nc	11,127	8,769
2006	LFH									1,534	427
	Tucannon R.									386	88
	LGR Dam	7,974	6,551	74	170	nc	nc	nc	nc	8,048	6,721
	IHR Dam	13,408	9,743	nc	nc	nc	nc	nc	nc	13,408	9,743
	LOMO Dam	16,073	8,834	nc	nc	nc	nc	nc	nc	16,073	8,834
2007	LFH									2,697	347
	Tucannon R.									263	63
	LGR Dam	10,050	9,710	147	72	4[c]	2[c]	nc	nc	10,201	9,784
	IHR Dam	21,907	11,544	nc	nc	nc	nc	nc	nc	21,907	11,544
	LOMO Dam	20,923	10,465	nc	nc	nc	nc	nc	nc	20,923	10,465
2008	LFH									1208	792
	Tucannon R.									486	277
	LGR Dam	16,443	10,076	185	152	nc	nc	nc	nc	16,628	10,228
	IHR Dam	24,824	38,611	nc	nc	nc	nc	nc	nc	24,824	38,611
	LOMO Dam	22,184	39,241	nc	nc	nc	nc	nc	nc	22,184	39,241
2009	LFH									540	742
	Tucannon R.									653	103
	LGR Dam	15,058	40,973	109	312	nc	nc	nc	nc	15,167	41,285

[a] Night counts occurred during 18-31 August.

[b] Total from LFH consist of killed fish that were identified at processing as LFH trapped.

[c] No counts (nc) were completed at the dam during that time of year.

Appendix B: Trapping and Sampling Protocols at LGR Adult Trap for 2009

2009 Fall Chinook Trapping/Sampling Protocol

13 Aug 2009

Executive summary:

The tagging/sampling protocol for broodstock shipped to LFH and NPTH will be the same.

The trapping rate will be set at 12%. The gates will open for 1.8 minutes, 4 times/hour.

Basics: Scan all FCH for wire and PIT tags. Any fish hauled to LFH or NPTH must be given 1-ROP punch. If you release a fish give it 1-LOP.

Take scales on every other untagged fish (50%) that is NOT PIT tagged, regardless if it is released or hauled to LFH or NPTH.

Note: ALL WIRE TAGGED FISH > 40 cm SHOULD BE HAULED TO LFH or NPTH. Every 9th WIRE TAGGED fish <41cm should be euthanized, frozen, and retained for LFH or NPTH.

Scales sampled at the LGR Trap for LFH and NPTH broodstock will be mounted by staff from the NPT. Please give scales to NPT driver when they pick up their broodstock.

WDFW is providing 2 staff for helping with the broodstock collection activities at LGR.

Data collected from spring/summer Chinook should be put on the same form that is used for FCH. Please note Spring or Summer under comments. If you are getting jacks suspected of being summers we will need to subsample those fish for wires as well. Please call before you sample those fish.

Protocol:

Minijack criteria: Minijacks are fish 40 cm or less.

Jack and Male criteria: JACKS ARE 56-41 cm, MALES are AT LEAST 57 cm fork length
Females: We have verified females as small as 49 cm during processing.
ALL FEMALES ARE TO BE HAULED REGARDLESS OF SIZE!

COLLECT & HAUL: All wire tagged FCH adults and jacks. Please give 1-ROP punch.

COLLECT & EUTHANIZE & HAUL: 1 out of 9 WIRE TAGGED minijacks (40 cm or less). Please bag and freeze these fish and give to LFH/NPT driver when they come for broodstock.

PASS: 8 out of 9 WIRE TAGGED mini-jacks (40cm or less), give 1-LOP punch.

COLLECT & HAUL: ALL untagged FEMALES and MALES >56 cm. Please give 1-ROP punch. Take scales on every other untagged fish that does not have a PIT tag until September 28 then increase the sampling to 100%.

COLLECT & HAUL: 1 out of 10 unmarked/untagged (NO PIT tag present) FCH jacks: give 1-ROP punch. Here we are targeting wild jacks.

PASS: 9 out of 10 untagged FCH jacks (NO PIT tag present), give 1-LOP punch, and take scales on every other untagged fish that does not have a PIT tag.

PASS: ALL untagged FCH jacks WITH PIT tags, give 1-LOP punch.

PASS: All UNTAGGED mini-jacks (40cm or less), give 1-LOP. Take scales on every other fish that does not have a PIT tag

COLLECT & HAUL: All AD Only (no wire) adult FCH, give 1-ROP punch, and take scales on every other fish that does not have a PIT tag.

PASS: All AD Only (no wire) jack FCH, give 1-LOP punch, and take scales on every other fish that does not have a PIT tag.

PASS: All AD Only (nowire) minijack FCH, give 1-LOP punch and take scales on every other fish that does not have a PIT tag

More detailed information regarding trapping/sampling:

1. Trapping at LGR Dam
    a. Trapping/Sampling Protocol based upon water temperature in the ladder at the beginning of the day.
        i. Begin trapping August 18 if temperatures allow
        ii. Water temps at or below 70^{o} F
            1. Set automatic trapping gates to sample 12% of the entire run, 24 hours a day.
                a. Any fish that are retained for broodstock must receive 1-ROP. If a fish to be retained is accidentally punched on the left side, give 1-ROP also and make a note in the comments column.
                b. Any fish released must receive 1-LOP and be scale sampled. Place scales in an envelope for age and origin determinations. If these fish are caught again DO NOT scale sample, but enter in data as recapture.

    b. Data and Verification
        i. Please note the times you check the trap and when the trap is empty (you are caught up).
        ii. Please write hauling destination (LFH or NPTH) on top of each data form.

iii. Circle sampling or data recording errors and briefly note in comments column (examples: released with 1-ROP, forgot to scale sample, both sides punched, forgot to record or missing digit in PIT Tag, sample envelope numbers either out of numerical order or skipped for some reason).
iv. Briefly check over data forms prior to faxing, sometimes erasures and cross-outs are not transmitted clearly through the fax machine.

c. Hauling of broodstock
    i. Injections at LGR Adult Trap
        1. All fish collected for broodstock (both LFH and NPTH) will be injected as directed by hatchery staff.
    ii. WDFW and NPT will haul fish from LGR Dam (70% go to LFH and 30% go to NPTH).
        1. Fish will be divided weekly unless otherwise agreed to.
        2. It was agreed that trucks would be at LGR at 10am when the 70 degree protocol was in effect.
d. Research
        1. No U of I radio tagging this year.
        2. NOAA sort-by-code fish.
            a. These fish will be used as broodstock at LFH and NPTH.
            b. Doug Marsh will run a program to indicate which fish were trapped during the 12% and which fish were outside of the trapping period (sort-by-code).
            c. Doug will provide a sampling protocol for his fish. These fish may be used for broodstock.
            d. NOAA staff will be in charge of mounting scales collected for NOAA studies
e. Coordination of trapping data and CWT decoding of hauled fish
    i. Fax paper copy of data to LFH, NPT, and SRL daily or whenever fish are hauled.
    ii. Data entry, verification, and finalization by January 14.
        1. WDFW will enter, verify, and finalize the LGR Adult Trap trapping data.
    iii. All database files at season's end must be sent to NPT (Bill Arnsberg), WDFW (Debbie Milks), and TAC (Stuart Ellis and Henry Yuen).
f. Video monitoring of sort-by-code fish
    i. No video monitoring in 2009
    ii. At season's end Doug Marsh will let us know what the realized trap rate was for the season (set at 12% then adjusted for time gates left open for sbyc fish)

2009 Fall Chinook Trapping/Sampling Protocol
20 Aug 2009

Through Sept 27:

Wire tagged fish: Keep all adults and jacks (regardless of PIT tag or clip)
-Keep/euthanize/bag/freeze 1 out of 9 minijacks (Pass the other 8)

No wires/no PIT tag (regardless of fin clip): scale sample 1 out of 2
Keep all Adults
No clip/no wire/no PIT tag: Keep 1 out of 10 Jacks (Pass the other 9), Pass all

Minijacks: AD clip/no wire/no PIT tag: PASS all jacks and minijacks

No wires/PIT tag (regardless of fin clip): scale sample according to Doug Marsh's action code
Keep all adults
PASS all jacks and minijacks

2009 Fall Chinook Trapping/Sampling Protocol
9 Sept 2009

Executive summary:

The tagging/sampling protocol for broodstock shipped to LFH and NPTH will be the same.

The trapping rate will be reduced from 12% to 9% as agreed to by the co-managers in the Snake River Basin. This change was done because of the large numbers of steelhead returning to the basin that will be trapped with the fall Chinook.

If the trap is swamped with fish: Shut down trap for an hour or so but clearly identify in the data when the trap was shut down and when it was started up again. Do not shut down and stay shut down for the rest of the day because we need to have a pre and post shut down sample so we can average them to estimate what passed during the shutdown.

Basics: Scan all FCH for wire and PIT tags. Any fish hauled to LFH or NPTH must be given 1-ROP punch. If you release a fish give it 1-LOP and take scales.

Take scales on every other untagged fish (50%) that is NOT PIT tagged, regardless if it is released or hauled to LFH or NPTH.

Untagged fish that are PIT tagged will be sampled for scales according to Doug Marsh's protocol which uses action codes at the trap.

Note: ALL WIRE TAGGED FISH ≥ 40 cm SHOULD BE HAULED TO LFH or NPTH.
Every 9th WIRE TAGGED fish <41cm should be euthanized, frozen, and retained for LFH or NPTH.

Scales sampled at the LGR Trap for LFH and NPTH broodstock will be mounted by staff from the NPT. Please give scales to NPT driver when they pick up their broodstock.

WDFW is providing 2 staff for helping with the broodstock collection activities at LGR.

Data collected from spring/summer Chinook should be put on the same form that is used for FCH. Please note Spring or Summer under comments. If you are getting jacks suspected of being summers we will need to subsample those fish for wires as well.

Protocol:
Minijack criteria: Minijacks are fish 40 cm or less.

Jack and Male criteria: JACKS ARE 56-41 cm, MALES are AT LEAST 57 cm fork length
Females: We have verified females as small as 49 cm during processing.
ALL FEMALES ARE TO BE HAULED REGARDLESS OF SIZE!

COLLECT & HAUL: All wire tagged FCH adults and jacks. Please give 1-ROP punch.

COLLECT & EUTHANIZE & HAUL: 1 out of 9 WIRE TAGGED minijacks (40 cm or less). Please bag and freeze these fish and give to LFH/NPT driver when they come for broodstock.

PASS: 8 out of 9 WIRE TAGGED mini-jacks (40cm or less), give 1-LOP punch.

COLLECT & HAUL: ALL untagged FEMALES and MALES >56 cm. Please give 1-ROP punch. Take scales on every other untagged fish that does not have a PIT tag until September 28 then increase the sampling to 100%.

COLLECT & HAUL: 1 out of 10 unmarked/untagged (NO PIT tag present) FCH jacks: give 1-ROP punch. Here we are targeting wild jacks. (Note when scale sampling these fish and fish in #6, take scales on every other untagged fish that does not have a PIT tag, regardless if it is collected or passed).

PASS: 9 out of 10 untagged FCH jacks (NO PIT tag present), give 1-LOP punch, and take scales on every other untagged fish that does not have a PIT tag.

PASS: ALL untagged FCH jacks WITH PIT tags, give 1-LOP punch.

PASS: All UNTAGGED mini-jacks (40cm or less), give 1-LOP. Take scales on every other fish that does not have a PIT tag.

COLLECT & HAUL: All AD Only (no wire) adult FCH, give 1-ROP punch, and take scales on every other fish that does not have a PIT tag.

PASS: All AD Only (no wire) jack FCH, give 1-LOP punch, and take scales on every other fish that does not have a PIT tag.

PASS: All AD Only (nowire) minijack FCH, give 1-LOP punch and take scales on every other fish that does not have a PIT tag.

More detailed information regarding trapping/sampling:

1. Trapping at LGR Dam
    a. Trapping/Sampling Protocol based upon water temperature in the ladder at the beginning of the day.
        i. Begin trapping August 18 if temperatures allow
        ii. Water temps at or below 70^{o} F
            1. Set automatic trapping gates to sample 20% of the entire run, 24 hours a day
                a. Any fish that are retained for broodstock must receive 1-ROP. If a fish to be retained is accidentally punched on the left side, give 1-ROP also and make a note in the comments column.

b. Any fish released must receive 1-LOP and be scale sampled. Place scales in an envelope for age and origin determinations. If these fish are caught again DO NOT scale sample, but enter in data as recapture.

b. Data and Verification
   i. Please note the times you check the trap and when the trap is empty (you are caught up).
   ii. Please write hauling destination (LFH or NPTH) on top of each data form.
   iii. Circle sampling or data recording errors and briefly note in comments column (examples: released with 1-ROP, forgot to scale sample, both sides punched, forgot to record or missing digit in PIT Tag, sample envelope numbers either out of numerical order or skipped for some reason).
   iv. Briefly check over data forms prior to faxing, sometimes erasures and cross-outs are not transmitted clearly through the fax machine.

c. Hauling of broodstock
   i. Injections at LGR Adult Trap
      1. All fish collected for broodstock (both LFH and NPTH) will be injected as directed by hatchery staff.
   ii. WDFW and NPT will haul fish from LGR Dam (70% go to LFH and 30% go to NPTH).
      1. Fish will be divided weekly unless otherwise agreed to.
      2. It was agreed that trucks would be at LGR at 10am when the 70 degree protocol was in effect.

d. Research
      1. No U of I radio tagging this year.
      2. NOAA sort-by-code fish.
         a. These fish will be used as broodstock at LFH and NPTH.
         b. Doug Marsh will run a program to indicate which fish were trapped during the 12% and which fish were outside of the trapping period (sort-by-code).
         c. Doug will provide a sampling protocol for his fish. These fish may be used for broodstock.
         d. NOAA staff will be in charge of mounting scales collected for NOAA studies.

e. Coordination of trapping data and CWT decoding of hauled fish
   i. Fax paper copy of data to LFH, NPT, and SRL daily or whenever fish are hauled.
   ii. Data entry, verification, and finalization by January 14.
      1. WDFW will enter, verify, and finalize the LGR Adult Trap trapping data.
   iii. All database files at season's end must be sent to NPT (Bill Arnsberg), WDFW (Debbie Milks), and TAC (Stuart Ellis and Henry Yuen).

f. Video monitoring of sort-by-code fish

i. No video monitoring in 2009

g. At season's end Doug Marsh will let us know what the realized trap rate was for the season (set at 12% then adjusted for time gates left open for sbyc fish).

2009 Fall Chinook Trapping/Sampling Protocol
15 Sept 2009

Executive summary:

The tagging/sampling protocol for broodstock shipped to LFH and NPTH will be the same.

The current change will be to release PIT tagged jacks, even if they have wire tags. This will be done to reduce the numbers of jacks that need to be killed at the hatcheries. This change will not affect the run recon because we will have the PIT tag data for those fish.

On 9 September, 2009 the trapping rate was reduced from 12% to 9% as agreed to by the co-managers in the Snake River Basin. This change was done because of the large numbers of steelhead returning to the basin that will be trapped with the fall Chinook.

If the trap is swamped with fish: Shut down trap for an hour or so but clearly identify in the data when the trap was shut down and when it was started up again. Do not shut down and stay shut down for the rest of the day because we need to have a pre and post shut down sample so we can average them to estimate what passed during the shutdown.

Basics: Scan all FCH for wire and PIT tags. Any fish hauled to LFH or NPTH must be given 1-ROP punch. If you release a fish give it 1-LOP.

Take scales on every other untagged fish (50%) that is NOT PIT tagged, regardless if it is released or hauled to LFH or NPTH.

Untagged fish that are PIT tagged will be sampled for scales according to Doug Marsh's protocol which uses action codes at the trap.

Note: ALL WIRE TAGGED FISH > 40 cm SHOULD BE HAULED TO LFH or NPTH. Every 9th WIRE TAGGED fish <41cm should be euthanized, frozen, and retained for LFH or NPTH.

Scales sampled at the LGR Trap for LFH and NPTH broodstock will be mounted by staff from the NPT. Please give scales to NPT driver when they pick up their broodstock.

WDFW is providing 2 staff for helping with the broodstock collection activities at LGR.

Data collected from spring/summer Chinook should be put on the same form that is used for FCH. Please note Spring or Summer under comments. If you are getting jacks suspected of being summers we will need to subsample those fish for wires as well.

Protocol:

Minijack criteria: Minijacks are fish 40 cm or less.

Jack and Male criteria: JACKS ARE 56-41 cm, MALES are AT LEAST 57 cm fork length
Females: We have verified females as small as 49 cm during processing.
ALL FEMALES ARE TO BE HAULED REGARDLESS OF SIZE!

COLLECT & HAUL: All wire tagged FCH adults. Please give 1-ROP punch.

COLLECT & HAUL: Wire tagged jacks WITHOUT PIT tags.

COLLECT & EUTHANIZE & HAUL: 1 out of 9 WIRE TAGGED minijacks (40 cm or less). Please bag and freeze these fish and give to LFH/NPT driver when they come for broodstock.

PASS: 8 out of 9 WIRE TAGGED mini-jacks (40cm or less), give 1-LOP punch.

COLLECT & HAUL: ALL untagged FEMALES and MALES >56 cm. Please give 1-ROP punch. Take scales on every other untagged fish that does not have a PIT tag until September 28 then increase the sampling to 100%.

COLLECT & HAUL: 1 out of 10 unmarked/untagged (NO PIT tag present) FCH jacks: give 1-ROP punch. Here we are targeting wild jacks. (Note when scale sampling these fish and fish in #6, take scales on every other untagged fish that does not have a PIT tag, regardless if it is collected or Passed).

PASS: 9 out of 10 untagged FCH jacks (NO PIT tag present), give 1-LOP punch, and take scales on every other untagged fish that does not have a PIT tag.

PASS: ALL untagged and tagged FCH jacks WITH PIT tags, give 1-LOP punch.

PASS: All UNTAGGED mini-jacks (40cm or less), give 1-LOP. Take scales on every other fish that does not have a PIT tag.

COLLECT & HAUL: All AD Only (no wire) adult FCH, give 1-ROP punch, and take scales on every other fish that does not have a PIT tag.

PASS: All AD Only (no wire) jack FCH, give 1-LOP punch, and take scales on every other fish that does not have a PIT tag.

PASS: All AD Only (nowire) minijack FCH, give 1-LOP punch and take scales on every other fish that does not have a PIT tag.

More detailed information regarding trapping/sampling:

1. Trapping at LGR Dam
    a. Trapping/Sampling Protocol based upon water temperature in the ladder at the beginning of the day.
        i. Begin trapping August 18 if temperatures allow
        ii. Water temps at or below 70^{o} F

1. Set automatic trapping gates to sample 12% of the entire run, 24 hours a day.
    a. Any fish that are retained for broodstock must receive 1-ROP. If a fish to be retained is accidentally punched on the left side, give 1-ROP also and make a note in the comments column.
    b. Any fish released must receive 1-LOP and be scale sampled. Place scales in an envelope for age and origin determinations. If these fish are caught again DO NOT scale sample, but enter in data as recapture.

b. Data and Verification
    i. Please note the times you check the trap and when the trap is empty (you are caught up).
    ii. Please write hauling destination (LFH or NPTH) on top of each data form.
    iii. Circle sampling or data recording errors and briefly note in comments column (examples: released with 1-ROP, forgot to scale sample, both sides punched, forgot to record or missing digit in PIT tag, sample envelope numbers either out of numerical order or skipped for some reason).
    iv. Briefly check over data forms prior to faxing, sometimes erasures and cross-outs are not transmitted clearly through the fax machine.

c. Hauling of broodstock
    i. Injections at LGR Adult Trap
        1. All fish collected for broodstock (both LFH and NPTH) will be injected as directed by hatchery staff.
    ii. WDFW and NPT will haul fish from LGR Dam (70% go to LFH and 30% go to NPTH).
        1. Fish will be divided weekly unless otherwise agreed to.
        2. It was agreed that trucks would be at LGR at 10am when the 70 degree protocol was in effect.

d. Research
        1. No U of I radio tagging this year.
        2. NOAA sort-by-code fish.
            a. These fish will be used as broodstock at LFH and NPTH.
            b. Doug Marsh will run a program to indicate which fish were trapped during the 12% and which fish were outside of the trapping period (sort-by-code).
            c. Doug will provide a sampling protocol for his fish. These fish may be used for broodstock.
            d. NOAA staff will be in charge of mounting scales collected for NOAA studies.

e. Coordination of trapping data and CWT decoding of hauled fish
    i. Fax paper copy of data to LFH, NPT, and SRL daily or whenever fish are hauled.

ii. Data entry, verification, and finalization by January 14.
    1. WDFW will enter, verify, and finalize the LGR Adult Trap trapping data.
iii. All database files at season's end must be sent to NPT (Bill Arnsberg), WDFW (Debbie Milks), and TAC (Stuart Ellis and Henry Yuen).

f. Video monitoring of sort-by-code fish
    i. No video monitoring in 2009.
    ii. At season's end Doug Marsh will let us know what the realized trap rate was for the season (set at 12% then adjusted for time gates left open for sbyc fish).

Appendix C: Systematic Sampling Rates at Lower Granite Dam 2003-2009

Appendix C.: Dates, times, and trapping rates of fall Chinook at Lower Granite Adult trap, 2003-2009.

Year	Date opened trap	Trapping rate (%)	Date trap closed	Date/time trapping rate changed	Modified trapping rate (%)	Date trapping rate changed	Modified trapping rate (%)	Date Trap Closed
2003	9 Sept	11	-		Nc[a]		nc	19 Nov
2004	2 Sept	15	3&5 Sept[b]	10 Sept	13		nc	22 Nov
2005	6 Sept	13			nc		nc	20 Nov
2006	1 Sept	13			nc		nc	21 Nov
2007	1 Sept	20			nc		nc	20 Nov
2008	24 Aug 8:00am[c]	20		12 Sept 2:52pm	12	26 Sept 3:00pm	10	21 Nov
2009	18 Aug 7:37am	12		9 Sept 7:25am	9		nc	15 Nov

[a] No change (nc) was made to the trapping rate.Trap was closed down for two hours each day.
[b] Trap was closed down for two hours each day.
[c] Trap was operated between 8am-8:30, then 12:30-12:55, then 2:20-3:02 on 24 Aug due to water temperature restrictions. Full operation began 25 August.

Appendix D: Trapping and Sorting Protocol at Lyons Ferry Hatchery 2009

2009 Trapping Protocol at LFH

Begin trapping the first week of September.

Adults:->56cm
-goal is 1027 fish (308 females)
-should have 48% of females by October 6 at sorting
Jacks: 56-41 cm
-(sample 100 fish)

2009 Trapping Schedule at LFH

Adults	Date	Jacks (41-56cm)
19	1	9/1-9/6
49	2	9/7-13
136	2	9/14-20
141	3	9/21-27
149	14	9/28-10/4
134	21	10/5-11
92	5	10/12-18
82	22	10/19-25
82	26	10/26-11/1
72	2	11/2-8
41	2	11/9-15
31	1	11/16-22
?	0	11/23-29

Mini-Jacks:
-Do not trap any.
We will use PIT tag detections to estimate yearling return of BY07 fish. Since the return is minijacks is primarily (99%) onstation yearlings this will cover or data needs.

2009 Sorting Plan

LGR pond: work the LGR Pond first

Count females, males (>56) cm, jacks (45-56cm), small jacks (<45)
Double check number and side of operculum punches
For fish that do not have 1-ROP:
Give 1-ROP punch and make note of sex, clips, wire of that fish, and what operculum punches they had.

LFH pond: Count females, males (> 56 cm), jacks (45-56cm), and small jacks (<45cm)
We are dividing jacks by fork length because spawning protocol says we will not use jacks less than 45 cm in matings. We are also trying to figure out the % of small jacks in the jack estimate of what was trapped.

2009 Trapping Protocol at LFH
Revised 9 Sept 2009

9 September 2009 Revised Trapping Schedule at LFH
Trapping target at LFH has increased due to changes in LGR Protocol (12% to 9% trap rate)

2009 Trapping Schedule at LFH 9 September, 2009

Adults	Jacks (56-41cm)	Date
19	1	9/1-9-6
132	2	9/7-13
304	2	9/14-20
314	3	9/21-27
332	14	9/28-10/4
298	21	10/5-11
206	5	10/12-18
183	22	10/19-25
183	26	10/26-11/1
161	2	11/2-8
92	2	11/9-15
69	1	11/16-22
?	0	11/23-29

2009 Trapping Protocol at LFH
Revised 9 Oct 2009

Discontinue retaining fish trapped at LFH.
Continue trapping to allow for PIT tag detection of fish returning to LFH, but shunt all trapped fall Chinook back to the river.

Appendix E: Key of Origin Codes and Estimated Composition of fall Chinook hauled and released into the Snake River for 2009

Appendix E 1. 2009 Key for Origin Codes

PARAMETERS EXAMPLE

11-DIGIT CODE TO SUMMARIZE RECOVERY DATA	Origin	Release Area or Source	Brood year	Release Strategy or Life History	Data Source(s) for interpretation decision	Total Age
Example: Known Lyons Ferry on-station subyearling by CWT	H	LF	06	SS	CWT	4

PARAMETERS DEFINITIONS

Origin		**Release Area or Source**		**Brood year**		**Release Strategy or Life History**		**Data Source(s) for interpretation decision**		**Total Age**	
H	Hatchery	SN	Snake River (FCAP, CJ, PB AND PITTAG)	04	2004	SS	subyearling	PIT	PIT tag	2	total age
W	Wild	CL	Clearwater River (FCAP, BC AND PITTAG)	05	2005	RR	reservoir-reared	SCA	Scales	3	total age
U	Unknown	LF	Lyons Ferry Hatchery on-station releases	06	2006	YL	yearling	CWT	CWT	4	total age
		HS	Hatchery Stray (out-of-Snake-basin)	07	2007	XX	unknown	WIR	Lost or Unreadable tag	5	total age
		XX	Unknown	08	2008			MIX	Mixture	6	total age
				09	2009			VIE	Visual Implant	X	unknown
				55	Unknown			CLP	Fin Clip		

Examples	Definitions
HCL05SSMIX5	Hatchery origin Clearwater River rearing history by scales and PIT tag
HHS04XXMIX6	Out-of-basin hatchery based on blank wire tag, age determined by scales
HLF06SSCWT4	Known Lyons Ferry on-station subyearling by CWT
HXX55XXCWTX	Lost CWT, know hatchery origin but no other data available
USN06RRPIT3	Unknown if hatchery or wild, PIT tagged in Snake, PIT history indicates Reservoir Reared
UXX55XXSCAX	Regenerated scales no other data
WXX04RRSCA6	Scales indicate Wild in-basin 5 year old that was Reservoir Reared, but unknown if Snake or Clearwater origin
HCL08SSCWT2	Hatchery origin Clearwater River rearing history by CWT origin LF08SBCA
HSN07SSCWT3	Hatchery origin Snake River rearing history by CWT origin LF07SCJA
Summers and coho	
COHOCL06	Coho, Clearwater origin
SUMMERSN06SSCWT3	Summer Chinook, Snake River origin
SUMMERWEN05SSCWT4	Summer Chinook, Wenatchee River origin

Appendix E 2. LFH trapped and released fish estimated to have remained in the reservoirs between LMO and LGR dams in 2009.

Program	NEW_AGE_ORIGIN	Origin	CWT	F	M
LSRCP	HCL06YRLCWT3	LF06YBCA	612513	0	1
LSRCP			612516	0	2
BONN	HHS06YLCWT3	09BLANK	09BLANK	0	1
BONN/UMA	HHS55XXCWTX	09BLANK	09BLANK	0	1
LSRCP	HLF04YLCWT5	LF04YO	633284	1	0
LSRCP	HLF04YLCWT5	LF04YO	633283	0	1
LSRCP	HLF05SSCWT4	LF05SO	633582	6	3
LSRCP	HLF05YLCWT4	LF05YO	633597	25	19
LSRCP			633598	20	30
LSRCP	HLF06SSCWT3	LF06SO	633986	2	5
LSRCP	HLF06YLCWT3	LF06YO	633987	24	160
LSRCP			634092	19	142
LSRCP	HSN06YLCWT3	LF06YCJA	612511	0	3
LSRCP			612514	1	4
LSRCP	HLF05YLMIX4			1	0
LSRCP	HLF06YLMIX3			1	7
LSRCP	HXX05SSSCA4			0	2
LSRCP	HXX05YLSCA4			0	9
LSRCP	HXX06SSSCA3			0	3
LSRCP	HXX06YLSCA3			0	4
LSRCP	HXX55XXCLPX			1	0
Total				**101**	**397**

Appendix E 3. 2009 Composition of fall Chinook hauled and released into the Snake River.

Release site	Trap site	Release date	NEW_AGE_ORIGIN	F	M	M <53 cm	Grand Total
HCT	LGR	11/18/2009	HCL05SSPIT4	1	1		2
			HCL06SSPIT3		1		1
			HCL07SSPIT2			1	1
			HLF05YLMIX4	2	3		5
			HLF06YLMIX3		5		5
			HLF07YLMIX2		1		1
			HSN05RRPIT4	1			1
			HSN05SSPIT4		1		1
			HSN07SSPIT2		3	5	8
			HXX04RRSCA5		1		1
			HXX05RRSCA4		1		1
			HXX05SSSCA4	18	8		26
			HXX05YLSCA4	1	2		3
			HXX06RRSCA3	1	12		13
			HXX06SSSCA3		15		15
			HXX06YLSCA3		7		7
			HXX07SSSCA2		13	25	38
			HXX55XXCLPX	1	1	1	3
			USN05RRPIT4		2		2
			USN06RRPIT3		4		4
			USN06XXPIT3	1			1
			UXX55XXSCAX	1	8	2	11
			WSN06XXPIT3		1		1
			WXX04RRSCA5	1			1
			WXX04SSSCA5	1			1
			WXX05RRSCA4	1	1		2
			WXX05SSSCA4	1	3		4
			WXX06RRSCA3	2	9		11
			WXX06SSSCA3		3		3
			WXX07SSSCA2			1	1
		11/19/2009	HCL05SSPIT4	2	2		4
			HCL06SSPIT3		2		2
			HCL06YLPIT3		1		1
			HCL07SSPIT2			6	6
			HSN05SSPIT4	4	3		7
			HSN06RRPIT3	1			1
			HSN06YLPIT3		1		1
			HSN07SSPIT2		3	18	21
			USN06RRPIT3	1	18		19
			USN07RRPIT2			1	1
			WSN05RRPIT4	1			1
			WSN06RRPIT3		1		1
HLF	LFH	11/18/2009	UXX55XXXXXX	175	424	0	599
Grand Total				**217**	**561**	**60**	**838**

Appendix F: United States v. Oregon Production and Marking Table

Appendix F Table B4B. Revised production table listing Snake River fall Chinook salmon production priorities for LFH per the *Us v. OR* Management Agreement, Table *B4B*, and agreed upon by members of the SRFMP for Brood Years 2008-2017.

Priority	Production Program				
	Rearing Facility	**Number**	**Age**	**Release Location(s)**	**Marking**
1	Lyons Ferry	450,000	1+	On station	225KAdCWT 225K CWT
2	Lyons Ferry	150,000	1+	Pittsburg Landing	70K AdCWT 80K CWT only
3	Lyons Ferry	150,000	1+	Big Canyon	70K AdCWT 80K CWT only
4	Lyons Ferry	150,000	1+	Captain John Rapids	70K AdCWT 80K CWT only
5	Lyons Ferry	200,000	0+	On station	200K AdCWT
6	Lyons Ferry	500,000	0+	Captain John Rapids	100K AdCWT 100K CWT only 300K Unmarked
7	Lyons Ferry	500,000	0+	Big Canyon	100K AdCWT 100K CWT only 300K Unmarked
8	Lyons Ferry	200,000	0+	Pittsburg Landing	100K AdCWT 100K CWT only
9	Oxbow	200,000	0+	Hells Canyon Dam	200K AdCWT
10	Lyons Ferry	200,000	0+	Pittsburg Landing	200K Unmarked
11	Lyons Ferry	200,000	0+	Direct stream evaluation Near Captain John Rapids	200K AdCWT
12	DNFH/Umatilla	250,000	0+	Transportation Study[a]	250K PIT Tag only
13	Irrigon[b]	200,000	0+	Grande Ronde River	200K AdCWT
14	DNFH/Umatilla	78,000	0+	Transportation Study[a]	78K PIT tag only
15	Umatilla	200,000	0+	Hells Canyon Dam	200K AdCWT
16	Irrigon[b]	200,000	0+	Grande Ronde River	200K Unmarked
17	Umatilla	600,000	0+	Hells Canyon Dam	600K Ad only
TOTAL	**Yearlings**	**900,000**			
	Subyearlings	**3,528,000 (of which 328,000 are for Transportation Study)**			

Footnotes for Table B4B:

a/ The Parties expect that fisheries conducted in accordance with the harvest provisions of this Agreement will not compromise broodstock acquisition. If broodstock acquisition is nevertheless compromised by the current mark strategy and as a result of implementation of mark selective fisheries for fall Chinook in the ocean or Columbia/Snake River mainstem, the Parties will revisit the marking strategy during the course of this Agreement.

b/ Production of transportation study surrogates is in effect for five brood years. After this group of fish has been provided for five years the transportation study group will be removed from the table and the groups of fish below will move up one step in priority. If eggs available for subyearling production are 1.2M or less, production of the transportation study surrogate group will be reduced to 250K or be deferred for that year. The PAC will review broodstock collected and projected egg take and make a recommendation to the policy group on whether to provide 250,000 fish or defer by November 1.

c/ USACOE Transportation Study natural-origin surrogate groups direct stream released into the Clearwater and mainstem Snake River.

d/ For logistical purposes, fish may be reared at Irrigon (LSRCP).

Appendix G: LFH/Snake River Origin Fall Chinook Releases Brood Years: 2004-2008

Appendix G. LFH/Snake River hatchery origin fall Chinook releases with number marked, tagged, and unmarked by release year and type.

Release Year	S/Y[b]	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released[a] AD Clip +CWT	CWT Only	AD Clip Only	No Clip or CWT	FPP	VIE Mark	% VIE	PIT Tagged[c]
2005	S	2004	BC1-direct	30-31 May	612504	96,630	98,657	1,377	313,562	55.3			unk
2005	S	2004	CJ1 Acclimated [vs. CC]-volitional	28-31 May	610154	94,164	87,888	9,015	314,020	46.8			unk
2005	S	2004	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	28 April	106676	53,548	-	4,726	-	61.5			3,098
2005	S	2004	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	28 April	109370	21,094	-	1,861	-	61.5			1,209
2005	S	2004	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	28 April	100471	20,578	-	1,816	-	61.5			1,180
2005	S	2004	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	28 April	106776	54,047	-	4,769	-	61.5			3,098
2005	S	2004	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	28 April	107176	24,709	-	2,180	-	61.5			1,416
2005	S	2004	PL1-Umatilla hatchery-IPC-direct	25-26 May	073336	211,302	-	186,402	-	50.4			2,492
2005	S	2004	Snake R. below HC Dam-Umatilla hatchery-IPC-direct	8-12 May	none	-	-	394,055	-	63.0			0
2005	S	2004	NPTH1-volitional	17 May	612669	-	106,079	-	74,575	120.8			Unk
					612672	140,171	-	365	98,176	120.8			Unk
2005	S	2004	NPTH1-volitional	17 May	610108	-	194,334	-	100,753	115.3			Unk
					612670	101,580	-	408	52,876	115.3			
2005	S	2004	NPTH1-volitional	17 May	none	-	-	-	57,764	110.0			
2005	S	2004	Research Transport Study (NOAA)-direct		unk	-	-	-	~180,000 -	unk			unk
2005	S	2004	Couse Creek Direct [vs. CJ1 Accl.]-direct	26 May	610155	183,401	1,937	14,853	-	49.2			3,465
2005	S	2004	Snake R. at Couse Creek boat launch-direct	23 May	none	-	-	-	234,030	59.0			0
2005	S	2004	Grande Ronde R. -direct	25 May	632782	191,868	610	8,050	241	56.0			0
2005	S	2004	Grande Ronde R. unmarked-direct	24 May	none	-	-	-	281,688	66.0			0
2005	S	2004	LFH-direct	27 May	632787	195,367	934	3,870	-	51.0			1,498
2006	Y	2004	LFH-direct	5-10 April	633283	223,151	1,489	213	-	9.8	LR	92.5	
2006	Y	2004	LFH-direct	5-10 April	633284	-	220,952	-	4,195	10.3	LR	89.6	

Appendix G. LFH/Snake River hatchery origin fall Chinook releases with number marked, tagged, and unmarked by release year and type.

Release Year	S/Y[b]	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released[a] AD Clip +CWT	CWT Only	AD Clip Only	No Clip or CWT	FPP	VIE Mark	% VIE	PIT Tagged[c]
2006	Y	2004	PL1-direct	05 April	610150	66,987	-	2,516	-	10.3			2,320
2006	Y	2004	PL1-direct	05 April	610153	-	77,644	-	2,410	10.3			2,673
2006	Y	2004	BC1-direct	12-13 April	610148	66,732	-	1,965	-	9.3			2,642
2006	Y	2004	BC1-direct	12-13 April	610144	-	59,465	-	1,636	9.3			2,394
2006	Y	2004	CJ1-volitional	11-14 April	610151	70,185	-	490	-	8.9			2,284
2006	Y	2004	CJ1-volitional	11-14 April	610152	-	78,156	-	2,291	8.9			2,600
2006	S	2005	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	02 May	109477	66,879	-	1,091	-	80.3			0
2006	S	2005	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	02 May	109577	68,040	-	1,110	-	80.3			0
2006	S	2005	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	02 May	108977	41,257	-	673	-	80.3			0
2006	S	2005	Snake R. below HC Dam-Umatilla hatchery-IPC-direct	09-10 May	none	-	-	330,172	1,993	80.3			23,969
2006	S	2005	PL1-Umatilla hatchery-IPC-direct	22-24 May	094419	185,413	-	211,654	-	52.5			24,162
2006	S	2005	CJ1-volitional	25-29 May	610177	-	99,366	-	306,594	45.6			2,792
2006	S	2005	CJ1-volitional	25-29 May	610176	98,699	-	2,313	-	45.6			695
2006	S	2005	BC1-direct	25-26 May	610175	-	98,994	-	304,613	56.7			46,698
2006	S	2005	BC1-direct	25-26 May	610174	97,763	-	3,336	-	56.7			11,697
2006	S	2005	Couse Creek Direct [vs. CJ1 Accl. Study]	30-31 May	633583	195,701	262	4,463	394	55.6			11,995
2006	S	2005	Couse Creek Direct (late release)	22 June	610178	207,606	1,076	2,153	673	50.0			10,872
2006	S	2005	LFH-direct (accidental release)	04 April	none	-	-	-	71,000	181.0			0
2006	S	2005	LFH-direct	01 June	633582	200,369	789	790	263	52.3			12,095
2006	S	2005	GRR Direct	19-21 June	633584	196,630	335	3,467	208,733	50.6			25,357
2006	S	2005	Research Transport Study (NOAA)-Snake River Release-direct	10 May-03 Jun	none	-	-	-	229,097	115.0			229,063
2006	S	2005	Research Transport Study (NOAA) BC1-direct	19 Jun-09 July	none	-	-	-	150,374	83.0			109,506
2006	S	2005	NPTH-North Lapwai Valley Accl.	17 May	612707	-	98,670	-	1,148	72.3			unk
2006	S	2005	NPTH-North Lapwai Valley Accl.	17 May	612671	99,438	-	490	-	72.3			unk
2006	S	2005	NPTH-Site 1705	6-15 June	612709	-	197,659	-	134,787	59.0			2,314
2006	S	2005	NPTH-Site 1705	6-15 June	612698	99,163	-	488	-	59.0			693
2006	S	2005	NPTH-Cedar Flats Accl.	13 June	612653	-	16,077	-	187	32.9			3,145

Appendix G. LFH/Snake River hatchery origin fall Chinook releases with number marked, tagged, and unmarked by release year and type.

Release Year	S/Y[b]	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released[a]				FPP	VIE Mark	% VIE	PIT Tagged[c]
						AD Clip +CWT	CWT Only	AD Clip Only	No Clip or CWT				
2006	S	2005	NPTH-Cedar Flats Accl.	13 June	612660	-	9,401	-	109	32.9			1,839
2006	S	2005	NPTH-Lukes Gulch Accl.	13 June	612655	-	25,099	-	292	36.6			4,971
2007	Y	2005	LFH-direct	2-6 April	633598	226,442	-	1,805	24,143	11.0	LR	87.8	
2007	Y	2005	LFH-direct	2-6 April	633597	-	220,825	5,489	24,457	10.1	LR	85.5	
2007	Y	2005	PL1-direct	16-17 April	612505	64,106	-	128	2,291	10.0			2,252
2007	Y	2005	PL1-direct	16-17 April	612510	-	72,805	-	476	10.0			2,481
2007	Y	2005	PL1-direct	16-17 April	612661	6,863	-	-	14	10.0			233
2007	Y	2005	BC1-direct	18-19 April	612507	67,891	-	-	-	10.0			2,128
2007	Y	2005	BC1-direct	18-19 April	612508	-	77,220	-	10,369	10.0			2,746
2007	Y	2005	CJ1-volitional	13 April	612506	69,180	-	112	9,911	10.0			1,996
2007	Y	2005	CJ1-volitional	13 April	612509	-	78,588	-	708	10.0			1,999
2007	S	2006	LFH-direct	23 May	633986	191,436	1,810	6,000	571	61.3			
2007	S	2006	LFH-Unassociated	23 May	none	-	-	-	875	103.0			
2007	S	2006	PL1-	26 May	612732	97,668	-	1,117	-	50.0			712
2007	S	2006	PL1-	26 May	612731	98,046	-	-	1,122	50.0			714
2007	S	2006	PL1-Unassociated	26 May	none	-	-	-	202,971	56.3			1,463
2007	S	2006	CJ1	29 May	612727	99,017	-	1,456	-	50.0			565
2007	S	2006	CJ1	29 May	612728	-	99,212	-	1,459	50.0			566
2007	S	2006	CJ1-Unassociated	29 May	none	-	-	-	313,339	50.0			1,761
2007	S	2006	BC1	28-29 May	612729	98,546	-	789	--	50.0			567
2007	S	2006	BC1	28-29 May	612730	-	100,103	-	2,013	50.0			583
2007	S	2006	BC1-Unassociated	28-29 May	none	-	-	-	305,255	50.0			1,741
2007	S	2006	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	08 May	101273	11,247	-	1,419	-	55.0			1,067
2007	S	2006	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	08 May	104480	48,621	-	6,135	-	55.0			4,613
2007	S	2006	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	08 May	103880	44,638	-	5,633	-	55.0			4,235
2007	S	2006	NPTH-Site 1705	11-15 June	612699	98,947	-	665	-	37.9			627
2007	S	2006	NPTH-Site 1705	11-15 June	612696	-	194,988	-	196,824	37.9			2,468
2007	S	2006	NPTH-North Lapwai Valley Accl.	22-23 May	612710	100,303	44,538	674	17,916	50.9			3,090
2007	S	2006	NPTH-Lukes Gulch Accl.	4 June	612733	-	24,906	-	49	37.2			3,093
2007	S	2006	NPTH-Cedar Flats Accl.	11 June	612734	-	24,890	-	98	47.3			3,100
2008	Y	2006	LFH	7-10 April	633987	231,534	456	1,673	-	10.3	LR	93.4	14,972

Appendix G. LFH/Snake River hatchery origin fall Chinook releases with number marked, tagged, and unmarked by release year and type.

Release Year	S/Y[b]	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released[a] AD Clip +CWT	CWT Only	AD Clip Only	No Clip or CWT	FPP	VIE Mark	% VIE	PIT Tagged[c]
2008	Y	2006	LFH	7-10 April	634092	-	220,350	-	5621	10.1	LR	89.5	14,972
2008	Y	2006	CJ1	14 April	612511	69,056	-	768	-	8.4			8,597
2008	Y	2006	CJ2	14 April	612514	-	82,934	-	922	8.4			10,324
2008	Y	2006	BC1	15 April	612513	68,199	-	880	-	9.3			8,794
2008	Y	2006	BC1	15 April	612516	-	77,749	-	1,004	9.3			10,324
2008	Y	2006	PL1	14 April	612512	68,129	-	343	-	9.8			8,426
2008	Y	2006	PL1	14 April	612515	-	81,476	-	409	9.8			10,076
2008	S	2007	LFH-Direct	2 June	634672	194,723	2,270	3,606	133	48.7			
2008	S	2007	Couse Creek Direct [vs. CJ1 Accl. Study]	28 May	634671	195,095	2,794	2,129	30,420	59.1			16,054 2,083
2008	S	2007	CJ1	28 May	612518	98,282	-	1,647	-	65.0			7,630
2008	S	2007	CJ1	28 May	612521	-	98,734	-	314,082	65.0			31,522
2008	S	2007	BC1	26 May	612517	98,903	-	676	-	55.0			7,517
2008	S	2007	BC1	26 May	612520	-	99,367	-	321,089	55.0			31,740
2008	S	2007	PL1	27 May	612519	99,371	-	395	-	60.0			7,896
2008	S	2007	PL1	27 May	612522	-	99,802	-	202,639	60.0			23,938
2008	S	2007	GRR Direct[b]	29 May	634670	-	190,424	-	112,846	46.2			25,745
2008	S	2007	NPTH-Cedar Flats Accl.	12 June	612736	-	99,641	-	653	59.3			8,275
2008	S	2007	NPTH-Lukes Gulch Accl.	12 June	612737	-	99,456	-	912	46.0			8,332
2008	S	2007	NPTH-North Lapwai Valley Accl.	15 May	612694	98,251	69,725	378	269	73.4			3,059
2008	S	2007	NPTH-Site 1705	10-15 June	612716	100,665	-	388	244,354	50.7			2,131
2008	S	2007	NPTH-Site 1705 - Irrigon	10-15 June	612695	-	149,162	-	1,368	50.7			
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	6 May	107171	22,795	-	2,369	-	51.4			2,022
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	6 May	103680	55,816	-	5,799	-	51.4			4,952
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	6 May	107502	55,004	-	5,714	-	51.4			4,880
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	6 May	107271	23,092	-	2,399	-	51.4			2,048
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	6 May	104381	17,650	-	1,833	-	51.4			1,566
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	20-22 May	090136	142,500	-	627,850	-	44.0			64,436

Appendix G. LFH/Snake River hatchery origin fall Chinook releases with number marked, tagged, and unmarked by release year and type.

Release Year	S/Y[b]	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released[a] AD Clip +CWT	CWT Only	AD Clip Only	No Clip or CWT	FPP	VIE Mark	% VIE	PIT Tagged[c]
2008	S	2007	Research Transport Study (NOAA) Couse Ck.	19 May- 5 June	none	-	-	-	522	Unk			201,846
2008	S	2007	Research Transport Study (NOAA) Kaylers Landing	19 May-11 July	none	-	-	-	7,108	unk			110,254
2009	Y	2007	LFH	6-10 April	634680	220,723	424	5,935	282	9.1	LR	92.2	13,390
2009	Y	2007	LFH	6-10 April	634681	-	221,493	-	6,295	8.7	LR	91.8	13,395
2009	Y	2007	CJ1	3 April	612752	70,325	-	854	-	9.1			9,467
2009	Y	2007	CJ2	3 April	612755	-	66,821	-	2,784	9.1			9,257
2009	Y	2007	BC1	4-6 Mar	612750	72,770	-	146	-	10.6			8,769
2009	Y	2007	BC1	4-6 Mar	612753	-	80,783	-	651	10.6			9,793
2009	Y	2007	PL1	2-3 Mar	612751	71,169	-	-	-	9.5			8,846
2009	Y	2007	PL1	2-3 Mar	612754	-	78,673	-	2,433	9.5			10,082
2009	S	2008	LFH	2 June	634995	191,407	823	8,230	235	51.7			1,509
2009	S	2008	Couse Creek Direct [vs. CJ1 Accl. Study]	26 May	634996	187,434	488	11,966	855	46.5			13,740
2009	S	2008	GRR-extras	2-3 June	612676	165,146	1,191	6,024	9,039	50.0			0
2009	S	2008	CJ1	26 May	610180	100,383	-	-	-	57.0			2,645
2009	S	2008	CJ1	26 May	610183	99,521	-	-	325,006	57.0			11,186
2009	S	2008	BC1	26 May	610179	100,093	-	-	-	62.5			2,901
2009	S	2008	BC1	26 May	610182	-	99,332	-	275,443	62.5			10,862
2009	S	2008	PL1	24 May	610181	95,227	-	5,012	-	59.3			3,320
2009	S	2008	PL1	24 May	610184	-	99,727	-	216,025	59.3			10,457
2009	S	2008	GRR-direct	28-29 May	634997	193,275	535	7,892	239,348	67.1			27,764
2009	S	2008	NPTH-Cedar Flats Accl.	9 June	612760	-	100,760	-	1,202	59.7			7,104
2009	S	2008	NPTH-Cedar Flats Accl.	9 June	612761	95,840	-	2,296	-	59.7			6,838
2009	S	2008	NPTH-Lukes Gulch Accl.	10 June	612762	-	98,025	-	11,008	51.6			7,276
2009	S	2008	NPTH-Lukes Gulch Accl.	10 June	612763	98,486	-	2,359	-	51.6			6,730
2009	S	2008	NPTH-North Lapwai Valley Accl.	15 May	612766	-	182,328	-	213,149	85.3			2,381
2009	S	2008	NPTH-North Lapwai Valley Accl.	15 May	612738	97,751	-	2,341	-	85.3			602
2009	S	2008	NPTH-Site 1705	8-12 June	612739	90,953	-	27,725	-	51.5			559
2009	S	2008	NPTH-Site 1705	8-12 June	612697	181,522	-	-	328,615	51.5			2,404
2009	S	2008	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	8 May	107582	64,892	-	7,289	-	54.7			5,090
2009	S	2008	Snake R. below HC Dam-Oxbow	8 May	107682	65,514	-	7,359	-	54.7			4,854

Appendix G. LFH/Snake River hatchery origin fall Chinook releases with number marked, tagged, and unmarked by release year and type.

Release Year	S/Y[b]	Brood Year	Release Location-Type	Release Date	CWT Code	Number of Fish Released[a] AD Clip +CWT	CWT Only	AD Clip Only	No Clip or CWT	FPP	VIE Mark	% VIE	PIT Tagged[c]
			hatchery-IPC-direct										
2009	S	2008	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	8 May	107482	51,950	-	5,836	-	54.7			4,900
2009	S	2008	Snake R. below HC Dam-Umatilla hatchery-IPC-direct	12-14 May	090228	233,692	-	569,793	-	60.2			55,488
2009	S	2008	Research Transport Study (NOAA) Couse Ck.	18 May-5 June	none	-	-	-	237,741	Unk			237,741
2009	S	2008	Research Transport Study (NOAA) Kaylers Landing	29 June-17 July	none	-	-	-	90,039	unk			90,039
2010	Y	2008	LFH	12-15 April	635166	250,814	169	2,517	678	9.8			13,488
2010	Y	2008	LFH	12-15 April	635165	-	221,376	-	3,273	9.8			13,487
2010	Y	2008	CJ1	5 April	220305	70,925	-	1,284	-	8.0			8,922
2010	Y	2008	CJ1	5 April	220300	-	81,467	-	961	8.0			10,184
2010	Y	2008	BC1	14 April	220303	70,043	-	1,993	-	9.0			8,925
2010	Y	2008	BC1	14 April	220302	-	79,756	-	1,907	9.0			10,117
2010	Y	2008	PL1	13 April	220304	70,834	-	984	-	9.3			8,902
2010	Y	2008	PL1	13 April	220301	-	80,417	-	1,244	9.3			10,123

[a] Numbers presented do not necessarily match hatchery records for fish per pound because of reporting constraints for the hatchery. Release information for some NPT release sites that had multiple CWT codes was estimated by WDFW based upon proportions of fish at tagging since those data were not available at the time this report was printed.

[b] S/Y indicates subyearling or yearling rearing strategy.

[c] Numbers of fish PIT tagged are included in the Number of Fish Released categories.

Appendix H: Tucannon River Survey Sections and Historical Escapement

Appendix H. Table 1. Description and length of sections, survey length, percent of reach surveyed, and estimated total number of fall Chinook redds in the Tucannon River, 2009.

Section	Description	Length of section (Rkm)[a]	Length surveyed (Rkm)	% of productive reach surveyed[b]	Estimated total # of Redds[c]
1	Mouth of Tucannon R to highway 261 Bridge	2.8	1.7	100	57
2	Highway 261 Bridge to Smolt trap	0.2	0.2	100	7
3	Smolt trap to Powers Bridge	0.5	0.5	100	29
4	Powers Bridge to upper hog barns	1.2	1.2	100	41
5	Hog barns to Starbuck Br.	2.5	2.4	96	11
6	Starbuck Br. To Fletchers Dam	2.7	1.3	48	66
7	Fletcher's Dam to Smith Hollow	2.9	2.9	100	17
8	Smith Hollow to Ducharme's Sheep Ranch Br.	4.4	4.4	100	16
9	Ducharme's Bridge to Highway 12	5.5	5.5	100	0
10	Highway 12 to Brines Bridge	6.2	6.2	100	7
11	Brines Bridge to Broughton's barn	1.6	1.6	100	1
	Total	30.5	27.9	95	252

[a] Section lengths measured using Maptech, Terrain Navigator Pro version 6.0 software.
[b] Percentage is based upon length of stream that is presumed to successfully produce fry.
[c] Counted redds were expanded based on percent of reach surveyed to estimate total number of redds.

Appendix H. Table 2. Estimated escapement, % stray component of the run, and number of redds, and resulting estimates of smolts/redd and total number of migrants from fall Chinook spawning in the Tucannon River, 1985-2001.

	Escapement		Redd Construction			Success of Spawning		
Year	Estimated escapement[a]	% Strays in escapement estimate	# Redds observed	# Redds in no access areas (estim)	Total # of Redds (estim)	Estimated smolts/redd[b]	Total Estimated # emigrants[c]	Adult progeny/ Parent ratio
1985[d]	0	unknown	0	No estim	0	unknown	unknown	Unknown
1986[e]	2[f]	unknown	0	No estim	0	unknown	unknown	Unknown
1987	48	0	16	0	16	unknown	unknown	Pending
1988	78	0	26	0	26	unknown	unknown	Pending
1989	150	27.9	48	2	50	unknown	unknown	pending
1990	186	30.8	62[g]	0	62	unknown	unknown	Pending
1991	150	20.0	50	0	50	unknown	unknown	pending
1992	69	0	23	0	23	unknown	unknown	0.22[h]
1993	84	6.3	28	0	28	unknown	unknown	1.17[h]
1994	75	28.0	25	0	25	unknown	unknown	0.56
1995	87	33.3	29	0	29	unknown	unknown	0.50
1996	144	95.5	43	5	48	0.6[i]	29	0.06
1997	93	5.3	27	4	31	712	22,076	0.71
1998	132	7.1	40	4	44	15	666	0.40
1999	87	9.1	21	8	29	441	12,799	0.67
2000	60	27.8	19	1	20	468	9,352	0.47
2001	219	14.9	65	8	73	336	24,545	0.63

[a] This estimate was derived using three fish per redd.
[b] This estimate was derived using redds counted above the smolt trap and estimates of emigration the following spring. Estimates began in 1997 when the smolt trap was moved to its current position at Rkm 3.0, at an area low enough in the system to trap fall Chinook.
[c] This estimate was derived using the smolt per redd estimate above the trap and applying it to the total number of redds in the Tucannon River.
[d] Based on one survey completed 12/17/85.
[e] Based on one survey completed 11/18/86.
[f] Two carcasses counted but not sampled.
[g] Correction of number of redds observed that was presented in the 1990 Annual Report.
[h] Data is incomplete for returns of progeny.
[i] Flood event occurred January of 1997, nearly eliminating all the progeny from the 1996 spawn.

Appendix I: Salmon Processed and killed at LFH in 2009

(LFH=voluntary return to Lyons Ferry Hatchery, LGR=fish trapped at Lower Granite Dam. Age/Rearing states origin, brood year, age at release, and release site (LF05SO is a LFH hatchery origin fish from the 2005 brood year, released as a subyearling, on-station at LFH).

Appendix I. Table 1. Estimated composition of non-wire tagged salmon trapped and killed at LFH during 2009.

Age/Origin Determinations by Method	<53cm Males	Males	Females	Grand Total
Presumed Snake R., Natural res rear age 4 by scales	0	0	1	1
Snake R. hatchery ADLR yearling age 3	0	3	2	5
Snake R. hatchery ADLR yearling age 4	0	1	0	1
Snake R. hatchery ADLR yearling unknown age	0	1	2	3
Snake R. hatchery LR only yearling age 3	0	3	2	5
Snake R. hatchery LR only yearling age 4	0	1	3	4
Snake R. hatchery LR only yearling unknown age	0	0	0	0
Snake R. hatchery sub age 2 by PIT tag	1	1	0	2
Snake R. hatchery sub age 4 by PIT tag	0	0	1	1
Unknown Snake R., res rear age 3 by PIT tag	0	1	0	1
Unknown hatchery AD sub age 3 by scales	0	0	2	2
Unknown hatchery AD sub age 4 by scales	0	2	0	2
Unknown hatchery AD yearling age 4 by scales	0	2	0	2
Unknown hatchery res rear age 4 by scales	0	0	1	1
Unknown hatchery sub age 2 by scales	1	0	0	1
Unknown hatchery sub age 3 by scales	0	2	0	2
Unknown hatchery sub age 4 by scales	0	3	4	7
Unknown hatchery yearling age 3 by scales	0	3	1	4
Unknown hatchery yearling age 4 by scales	0	16	22	38
Unknown hatchery age/origin by AD clip	0	0	3	3
Unknown hatchery age/origin	0	1	0	1
Unknown age/origin (Presume hatchery)	0	4	4	8
Summer Chinook Unknown hatchery yearling age 4 by scales	0	0	2	2
Total	**2**	**44**	**50**	**96**

Appendix I. Table 2. Estimated composition of wire tagged fall salmon trapped and killed at LFH during 2009.

Program	Origin-CWT	CWT	<53 cm Males	Males	Females	Grand Total
Bonneville	BLANK	BLANK	0	1	1	2
Bonneville/Umatilla	09BLANK	09BLANK	0	3	1	4
Umatilla	UMA06YUMA	094506	0	1	0	1
LSRCP	LF03YO	631769	0	0	1	1
LSRCP	LF04YO	633283	0	3	2	5
LSRCP		633284	0	1	3	4
LSRCP	LF05SBCA	610174	0	1	2	3
LSRCP		610175	0	1	1	2
LSRCP	LF05SCCD1	633583	0	1	0	1
LSRCP	LF05SGRRD	633584	0	0	1	1
LSRCP	LF05SO	633582	0	5	21	26
LSRCP	LF05YCJA	612506	0	0	1	1
LSRCP	LF05YO	633597	0	44	130	174
LSRCP		633598	0	58	158	216
LSRCP	LF05YPLA	612505	0	0	1	1
LSRCP	LF06SO	633986	0	7	9	16
LSRCP	LF06YBCA	612513	0	1	1	2
LSRCP		612516	0	2	0	2
LSRCP	LF06YCJA	612511	0	4	1	5
LSRCP		612514	0	4	5	9
LSRCP	LF06YO	633987	9	183	157	349
LSRCP		634092	7	171	170	348
LSRCP	LF07SBCA	612520	1	0	0	1
LSRCP	LF07SO	634672	3	0	0	3
LSRCP	LF07YO	634681	2	0	0	2
LSRCP	LOST TAG	unknown age	1	8	0	9
Summer Chinook	WDFW04SUMCH_WILD_WENATCHEE	633166	0	1	0	1
Coho	COHO_06YDNFHCLRWATER	612720	0	0	1	1
		Total	**23**	**500**	**667**	**1,190**

Appendix I. Table 3. Estimated composition of wire tagged salmon trapped at LGR Dam that were hauled to LFH and killed during 2009.

Origin/CWT	CWT	<53 cm Males	Males	Females	Grand Total
Stray yearling age 4	BLANK	0	0	2	2
Stray yearling age 5		0	1	1	2
Stray unknown age		0	0	1	1
Stray yearling age 3	09BLANK	0	2	0	2
Stray yearling age 4		0	1	1	2
Stray unknown age		1	6	1	8
ELWA05SELWARIVER	633370	1	0	0	1
KLICK05SO	633377	0	1	0	1
UMA05SUMA	094415	0	1	1	2
	094417	0	0	2	2
BONN05YUMA	094450	0	0	1	1
BONN06YUMA	094506	0	1	0	1
UMA07SUMA	090132	2	0	0	2
	090134	6	2	0	8
	090135	4	1	0	5
LF04YCJA	610151	0	0	2	2
	610152	0	0	1	1
LF04YO	633283	0	0	1	1
	633284	0	1	1	2
LF04YPA	610153	0	0	1	1
LF05SBCA	610174	0	1	15	16
	610175	0	0	10	10
LF05SCCD1	633583	0	7	12	19
LF05SCCD2	610178	0	1	4	5
LF05SCJA	610176	0	4	6	10
	610177	0	1	3	4
LF05SGRRD	633584	0	2	5	7
LF05SIPCPLA	108977	0	1	0	1
	109477	0	0	1	1
	109577	0	1	1	2
LF05SO	633582	0	4	24	28
LF05YBC	612507	0	2	4	6
	612508	0	1	3	4

Appendix I. Table 3 (continued).

Origin/CWT	CWT	<53 cm Males	Males	Females	Grand Total
LF05YCJA	612506	0	2	1	3
	612509	0	0	1	1
LF05YO	633597	0	11	45	56
	633598	0	10	36	46
LF05YPLA	612505	0	0	3	3
	612510	0	2	4	6
	612661	0	0	1	1
LF06SBCA	612729	0	3	0	3
	612730	1	0	0	1
LF06SCJA	612727	0	2	2	4
	612728	0	1	0	1
LF06SIPCHC	101273	0	0	1	1
	103880	0	1	2	3
	104480	0	1	1	2
LF06SO	633986	0	2	3	5
LF06SPLA	612731	0	0	2	2
	612732	0	1	0	1
LF06YBCA	612513	12	40	5	57
	612516	17	75	16	108
LF06YCJA	612511	10	46	14	70
	612514	13	69	27	109
LF06YO	633987	38	214	76	328
	634092	40	190	56	286
LF06YPLA	612512	16	45	5	66
	612515	10	78	15	103
LF07SBCA	612517	70	18	0	88
	612520	51	6	0	57
LF07SCCD	634671	80	11	0	91
LF07SCJA	612518	52	8	0	60
	612521	29	2	0	31
LF07SGRRD	634670	27	2	0	29
LF07SICPHC	090136	171	35	0	206
	103680	20	6	0	26

Appendix I. Table 3 (continued).

Origin/CWT	CWT	<53 cm Males	Males	Females	Grand Total
LF07SICPHC	104381	6	4	0	10
	107171	10	4	0	14
	107271	12	6	0	18
	107502	26	10	0	36
LF07SO	634672	116	14	0	130
LF07SPLA	612519	62	11	0	73
	612522	45	3	0	48
LF07YBCA	612750	1	0	0	1
	612753	2	0	0	2
LF07YCJA	612752	4	0	0	4
	612755	1	0	0	1
LF07YO	634680	13	0	0	13
	634681	22	0	0	22
NPTH05SCFA	612653	0	0	1	1
NPTH05SLGA	612655	0	0	2	2
NPTH05SNLVA	612671	0	1	6	7
	612707	0	0	3	3
NPTH05SO	612698	0	1	3	4
	612709	0	4	17	21
NPTH06SNLVA	612710	1	0	0	1
NPTH06SO	612696	0	2	3	5
	612699	0	3	3	6
NPTH07CFA	612736	43	3	0	46
NPTH07SLGA	612737	51	11	0	62
NPTH07SNLVA	612694	63	7	0	70
NPTH07SO	612695	9	2	0	11
	612716	40	4	0	44
LOST TAG	Lost Tag	30	10	6	46
TAG CUT SHORT	Tag Cut Short	0	1	0	1
MCCALL06SUMMERSALMONR	612726	1	0	0	1
Total		**1,229**	**1,024**	**464**	**2,717**

Appendix I. Table 4. Estimated composition of non-wire tagged salmon that were trapped at LGR, hauled to LFH, and killed during 2009.

Age/Origin Determinations by Method	<53cm Males	Males	Females	Grand Total
Snake R. Natural res rear age 3 by PIT tag	0	0	4	4
Snake R. Natural res rear age 4 by PIT tag	0	0	4	4
Snake R. Natural res rear age 5 by PIT tag	0	1	4	5
Presumed Snake R., Natural res rear age 2 by scales	1	0	0	1
Presumed Snake R., Natural res rear age 3 by scales	0	17	1	18
Presumed Snake R., Natural res rear age 4 by scales	0	6	12	18
Presumed Snake R., Natural res rear age 5 by scales	0	4	9	13
Presumed Snake R., Natural sub age 2 by scales	2	1	0	3
Presumed Snake R., Natural sub age 3 by scales	1	7	2	10
Presumed Snake R., Natural sub age 4 by scales	0	3	2	5
Presumed Snake R., Natural sub age 5 by scales	0	2	2	4
Snake R. hatchery ADLR yearling unknown age	1	0	0	1
Snake R. hatchery LR only yearling age 3	0	3	1	4
Snake R. hatchery LR only yearling age 4	0	1	2	3
Snake R. hatchery LR only yearling age 5	0	1	0	1
Snake R. hatchery LR only yearling unknown age	0	0	1	1
Snake R. hatchery res rear age 3 by PIT tag	0	4	0	4
Snake R. hatchery res rear age 4 by PIT tag	0	1	12	13
Snake R. hatchery res rear age 5 by PIT tag	0	0	1	1
Snake R. hatchery sub age 2 by PIT tag	15	7	0	22
Snake R. hatchery sub age 4 by PIT tag	0	32	30	62
Snake R. hatchery sub age 5 by PIT tag	0	0	2	2
Snake R. hatchery sub age 6 by PIT tag	0	0	1	1
Snake R. hatchery yearling age 3 by PIT tag	0	4	0	4
Unknown Snake R., res rear age 2 by PIT tag	1	0	0	1
Unknown Snake R., res rear age 3 by PIT tag	0	24	0	24
Unknown Snake R., res rear age 4 by PIT tag	0	1	2	3

Appendix I. Table 4 (continued)

Age/Origin Determinations by Method	<53cm Males	Males	Females	Grand Total
Unknown Snake R., res rear age 5 by PIT tag	0	2	0	2
Unknown Snake R., sub age 3 by PIT tag	0	1	0	1
Unknown hatchery AD sub age 2 by scales	6	6	0	12
Unknown hatchery AD sub age 3 by scales	1	2	3	6
Unknown hatchery AD sub age 4 by scales	0	3	8	11
Unknown hatchery AD yearling age 4 by scales	0	3	1	4
Unknown hatchery res rear age 2 by scales	1	0	0	1
Unknown hatchery res rear age 3 by scales	0	9	4	13
Unknown hatchery res rear age 4 by scales	0	5	5	10
Unknown hatchery res rear age 5 by scales	0	2	0	2
Unknown hatchery sub age 2 by scales	19	7	1	27
Unknown hatchery sub age 3 by scales	0	19	8	27
Unknown hatchery sub age 4 by scales	0	53	121	174
Unknown hatchery sub age 5 by scales	0	6	9	15
Unknown hatchery yearling age 3 by scales	0	1	1	2
Unknown hatchery yearling age 4 by scales	0	5	4	9
Unknown hatchery age/origin by AD clip	2	2	7	11
Unknown age/origin (Presume hatchery)	2	16	26	44
Total	**52**	**261**	**290**	**603**

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