Lyons Ferry Hatchery Evaluation
Fall Chinook Salmon
Annual Report: 2010

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 2010 through 15 April 2011.

During 2010, WDFW collected 3,291 fish at Lyons Ferry Hatchery (LFH) and Lower Granite Dam (LGR) for broodstock, monitoring and evaluation of our hatchery releases, and to estimate the run composition at LGR. At the end of the season 14 fish not needed for evaluations were returned to the river to spawn naturally. Accuracy of identification of origins (hatchery/wild) 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 for determination that they were of 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 scale analysis is unable to determine origins. Highly accurate assignments occurred with 61.7% of the broodstock being identified as Snake River hatchery fish based on CWT, VIE, and PIT tags, 0.1% of the broodstock were identified as Snake River natural origin based on PIT tags from seined juvenile in the Snake River, and 0.5% of the broodstock were identified as strays based on CWTs or PIT tags. Moderate accuracy was determined for 8.7% of the broodstock that were AD clipped, lost/unreadable CWT hatchery fish, or yearlings (hatchery fish released as yearlings) and 2.3% of the broodstock that were PIT tagged as Snake River outmigrants (hatchery or natural). Low level accuracy was determined for 26.7% of the broodstock that were unmarked and untagged which could be hatchery or wild. This high rate of uncertainty is not considered acceptable for run reconstruction, stock status monitoring, or for ESA recovery purposes.

Of the 996 males spawned, 150 fish were used multiple times to minimize the use of jacks. Overall, minijacks (zero salt) contributed to 0% of the matings, one salt jacks contributed to 3.1% of the matings, and jills contributed to 0.1% of the matings.

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 3,731 eggs.

A total of 4,619,533 green eggs were taken at Lyons Ferry Hatchery in 2010; numerically less than full production goals listed in the *United States v. Oregon Management Agreement,* but well within precision levels expected from large production hatcheries. Egg survival from green to eye-up was 97.3%.

Hatchery staff released BY09 subyearlings into the Snake River on site on 25 May 2010 (202,328 fish at 52.4 fpp). Two additional groups were released: one group into the Snake River

near Couse Creek (203,162 fish at 58.0 fpp), and a second group into the Grande Ronde River near Cougar Creek (386,840 fish at 42.0 fpp).

Hatchery staff released BY09 yearlings into the Snake River on site from 12-15 April 2011 (463,729 fish) with peak emigration occurring prior to 9am on 13 April. All release groups were represented by a unique coded wire tag (CWT) group and additionally may have received a passive integrated transponder (PIT) tag as identified in the US *v.* OR production tables. Approximately 49 % of the release was AD+CWT tagged and 51% were CWT tagged at release. Visual examinations showed slender bodies and was verified by low condition-factors of 1.04. There were no signs of precocity during visual examinations of the salmon at release. PIT tags in 29,890 of the released onstation yearlings (BY09) will be used to monitor returns in-season. Migration timing of PIT tagged fish was calculated from release site to detection facility and juvenile salmon averaged 3.4 km/day to LMO Dam, 6.2 km/day to IHR dam, 9.2 km/day to MCN Dam, 13.7 km/day to John Day Dam, and 17.1 km/day to Bonneville Dam.

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 age 3-salt when males were larger than the females. Subyearling females consistently returned at larger sizes than subyearling males of the same salt water age. Minijacks (0-salt) returned from yearling releases but not from subyearling releases. Yearlings returned 1-salt jacks and 1-salt 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 92.3% of the historical spawning area of fall Chinook. After expanding for areas not surveyed, an estimated 324 fall Chinook redds were constructed in the river during fall 2010, resulting in an estimated spawning escapement of 972 Chinook. The return to the Tucannon River consisted of 49.1% in-basin hatchery fish based on wire (CWT and Agency wire tags) or VIE tags and 26.8% stray salmon based on wire recoveries. Presumed to be from inbasin releases, non-tagged AD clipped hatchery fish represented 8.0% and adult returns from hatchery yearling releases by scale pattern analysis represented 6.2%. The remaining 9.9% of the run was unclipped and untagged therefore are of unknown origin.

Fall Chinook spawning in the Tucannon River have replaced themselves only one year since 1992, which occurred with the 1993 spawners. The most current four year average adult progeny to parent ratio was 0.19 recruits/potential spawner and 0.56 returns/redd. Coho produced an estimated 12 redds on the Tucannon.

Juvenile production in the Tucannon River was estimated at 36,991 naturally produced fall Chinook from the 2009 spawners. Juvenile fall Chinook were observed at the Tucannon smolt trap from 01 February through 09 July 2010. Median passage date for fall Chinook passing the trap was 09 June 2010. We calculated 147 fall Chinook smolts/redd were produced from the 2009 spawn. Juvenile coho salmon were trapped from 22 February through 6 July with a median passage date of 2 June. Scales were not collected on coho so we were unable to determine brood year of the emigrants, therefore no estimate of total coho emigrants was made.

Characteristics of fall Chinook reaching LGR Dam showed that females tended to arrive earlier than males. The return consisted of 65.8% males, including jacks. The sex ratio of the return was calculated at 1.9 males/female. After removal of broodstock, the fish estimated passing LGR Dam were 74.2% males resulting in a sex ratio of 2.9 males/female. No adjustments were made for fish passing the dam that fell back over the dam and remained below the dam. The majority of the run passing LGR Dam consisted of small males 60 cm or less. The median fork length of males was 60 cm and the median fork length of females was 73cm.

We calculated that a minimum of 68.7% of the total LSRCP mitigation goal (91,500 fish) was met in 2010. Mitigation numbers presented in this report should be considered minimum estimates. A total of 62,849 LSRCP adult fall Chinook were estimated to have returned to the Columbia basin, including; returns to the Snake River (WDFW and FCAP), fully expanded (CWT tagged and untagged) harvest recoveries of WDFW releases outside of the Snake River, and unexpanded harvest recoveries of FCAP releases with CWTs outside of the Snake River. Returns to the Snake include 215 fish harvested in sport fisheries, and an unreported number of fish harvested in tribal fisheries.

The escapement goal (18,300 hatchery fish) to the Snake River Basin was exceeded in 2010 (WDFW and FCAP). An estimated 8,375 true jacks and jills (1-salt) and 18,858 adults (2-5 salt) contributed. An additional 4,560 minijacks (0-salt) were also estimated to have returned to the Snake River, but do not count toward the mitigation goal. Mitigation fisheries may not be maintained if the naturally produced portion of the population is not maintained at a yet to be determined minimum abundance threshold (critical threshold under ESA permitting) that would be able to sustain the incidental catch and release mortality from tribal and non-tribal fisheries. It is possible that the hatchery return component could be exceeded and fisheries may not be granted because natural origin Chinook abundance is insufficient to sustain incidental fishery impacts.

The preliminary run size of natural origin fish estimated to reach LGR Dam was 10,113 fish $\geq$ 53 cm fork length and 1,063 fish <53 cm fork length. The remaining run consisted of 32,508 fish $\geq$ 53 cm fork length and 11,812 fish < 53 cm fork length, all likely hatchery origin. The stray rate was estimated at 2.2% for fish $\geq$ 53 cm fork length and 0.1% for fish <53 cm fork length. Due to changes in the methodology used in 2010, natural origin fish abundance seemed to increase dramatically, however this was likely a result of the change in methodology. We anticipate that when past run reconstructions are reworked the estimated numbers of natural origin fish will increase for those years as well. Run reconstruction methods are currently being revised and will have more refinements to improve accuracy and precision of estimates. Finalized run reconstruction estimates back to 2003 will be compiled once the revised methodology is agreed to by co-managers in the basin and the Technical Advisory Committee..

Fall Chinook WDFW released into the Snake River at LFH, the Snake River near Couse Creek, and into the Grande Ronde River, resulted in harvest of 7,463 fish in sport fisheries and 16,611 in commercial fisheries, representing 30.9 and 68.8 % of the below project area recoveries in 2010. WDFW released fish were also recovered at hatcheries (12 salmon, < 0.1% of all out of basin recoveries) and on spawning grounds (50 salmon, 0.2% of all out of basin recoveries) outside of the Snake River basin.

The main fishery that contributed to harvest was the zone 6 Tribal gillnet fishery (commercial fishery) which accounted for 31% of the total number of fish harvested in 2010. 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 2-salts while the subyearlings were primarily harvested as 2 and 4-salts.

We have continued our search to identify reference populations for comparisons with Snake River fall Chinook. After reviewing reports on Sacramento Winter Chinook, Trinity River Basin salmon, and the fall Chinook in the upper Willamette River we have determined those stocks are not appropriate candidates as reference populations. The Deschutes River fall Chinook continue to be a potentially viable reference population. We will continue this work jointly with NOAA and the co-managers as part of expanded RM&E to address BiOp concerns.

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We appreciate the efforts of Darren Ogden (NOAA Fisheries) and crew at Lower Granite Dam for trapping, tagging, and documenting fall Chinook salmon for transport to Lyons Ferry Hatchery. We also thank Fred Mensik (WDFW) for providing summarized fallback data from the juvenile collection facility at Lower Granite Dam. We also thank Bill Young (NPT), Stuart Ellis (CRITFC), and Stuart Rosenberger (Idaho Power) for their assistance in estimating a preliminary run composition estimate at Lower Granite Dam for 2010.

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(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).

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 2010 to 15 April 2011. WDFW's Snake River Lab (SRL) staff completed this work with Federal fiscal year 2010/2011 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 after construction of Lyons Ferry Hatchery (LFH, Figure 1) and is part of the LSRCP program 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 smolts resulting in reduced adult abundance and loss to mainstem spawning habitat). 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 and natural production. 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 to the Snake River below Hells Canyon Dam prior to construction of four lower Snake River dams was estimated to be 34,400. Construction and operation of the dams was expected to cause a reduction in the spawning escapement in two ways: 1) the slack water reservoirs created behind the dams was expected to eliminate spawning grounds for 5,000 adults, and 2) 15% of the smolts migrating past each dam were expected to die (48% cumulative mortality).

These factors were expected to reduce the adult escapement by 18,300[1]. This number established the LSRCP escapement mitigation goal back to the project area (Snake River). 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 (excludes minijacks but includes jacks) 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 hatchery fish	91,500
Maintain Natural origin population	14,363

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 hatchery run returning to the project area than was expected.

  Three hatchery programs artificially propagate endemic Snake River fall Chinook. Two of the programs (LSRCP [includes LFH and Fall Chinook Acclimation Project – FCAP)]), and Nez Perce Tribal Hatchery [NPTH]) are integrated programs aimed at increasing harvest and natural-origin abundance via supplementation and harvest mitigation releases. Information about the NPTH is presented in NPT annual reports and is not presented here. The third program (Idaho Power Company [IPC]) is primarily mitigation for lost production due to construction of the Hells Canyon Complex (HCC). Fish are released at two different life stages (sub-yearling and yearling smolts) throughout the basin. 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 among facilities. Several out of basin hatchery facilities are

[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. 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.

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 (Rocklage 2004). Mark types and quantities have been adopted under the 2008 - 2017 *United States v. Oregon* Management Agreement (*United States v. Oregon* 2008). At full production levels, 76% of the hatchery-produced fish are marked in some manner, 47% are marked with an adipose fin clip.

In summary, the LSRCP (LFH and FCAP) and IPC overall program purposes are as follows:

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 with the presumption that the natural population will remain at 14,363. The first order of business for the LSRCP fall Chinook mitigation program was the egg bank effort to keep this population from becoming extirpated. The conservation of this stock including both demographics and genetic integrity is paramount under the LSRCP. The Snake River fall Chinook program has been a conservation effort from the beginning. Production goals of LSRCP are consistent with *United States v. 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. FCAP is part of the LSRCP mentioned in item 1 above, but accounting for adults is done separately by NPT. 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.
- 3.5 Provide harvest opportunities for both tribal and non-tribal anglers.

4. There has been substantial effort made to maintain the population's genetic structure and diversity as well as rebuild adult returns of both hatchery and natural origin salmon through supplementation efforts by WDFW. The LSRCP program at LFH has been guided by the following objectives:

- 4.1 Maintain and enhance natural populations of native salmonids
- 4.2 Establish broodstock(s) capable of meeting eggtake needs,
- 4.3 Return adults to the LSRCP area which meet designated goals
- 4.4 Improve or re-establish sport and tribal fisheries.

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 (United States v. Oregon 2008):

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

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

3. 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 the original LSRCP harvest goals, many more fish would need to be trapped, spawned, and reared, or smolt to adult survivals would need to be increased dramatically. Major infrastructure additions would need to occur at LFH for additional production and changes to the *United States v. Oregon* production tables would need to occur in order to meet the original LSRCP harvest mitigation goals.

4. Estimate the numbers of returns of LSRCP, FCAP, NPTH and IPC program hatchery fish to the Snake River basin (below and above LGR Dam), and estimate the numbers of natural origin fish escaping to spawn above Lower Granite Dam. For these tasks, 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, ESA constraints and permits, and the Columbia River Management Plan.

6. To contribute to hatchery and natural-origin return goals identified in the draft 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. Returns are estimated in-season to Lower Monumental Dam and not to Ice Harbor Dam (located closer to the mouth of the Snake River) because Columbia River salmon dip into the Snake River, cross the dam, then fall back below the dam causing an overestimate of fall Chinook to the Snake River.

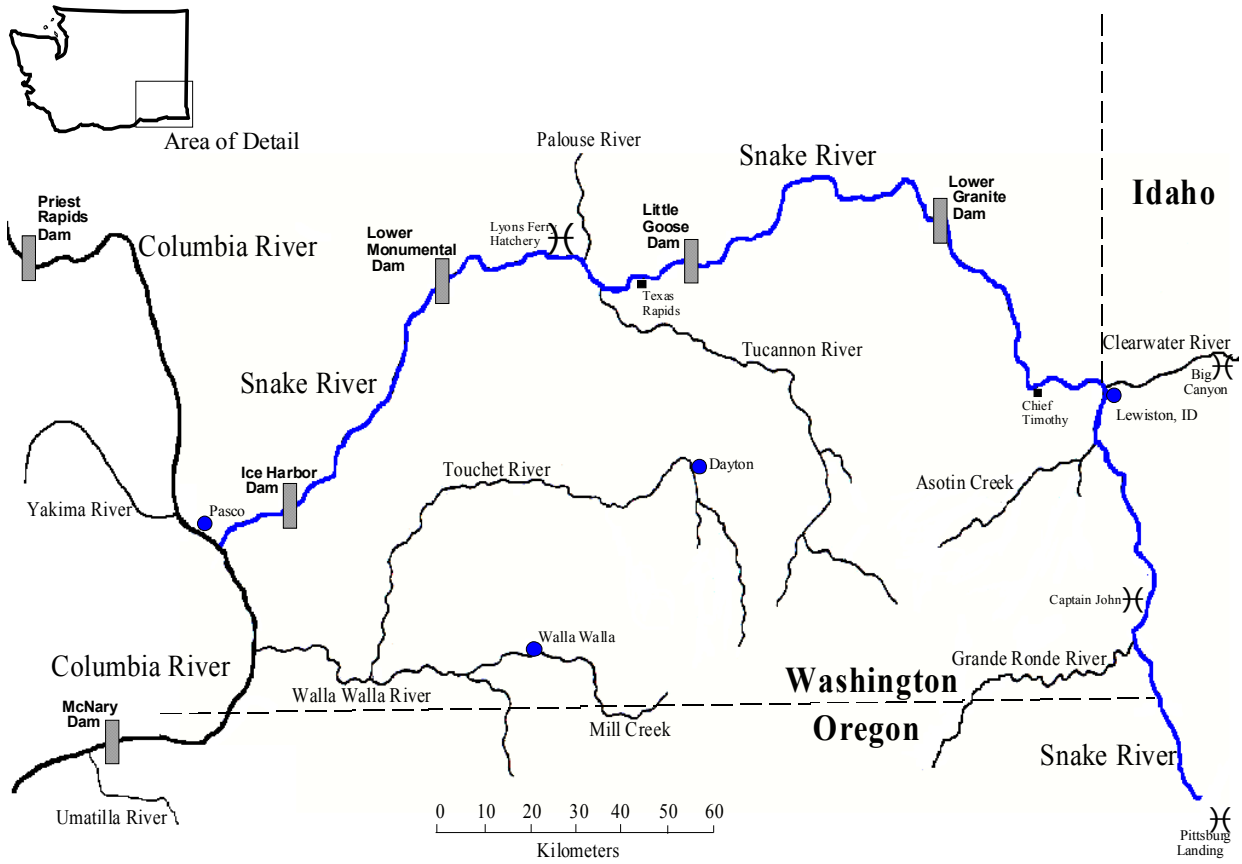
- The long-term goal is for a total return 24,750 hatchery-origin fish above Lower Monumental Dam, which is comprised of 18,300 from LSRCP, 3,750 from NPTH, and 2,700 for IPC.

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 14,363 natural-origin fall Chinook (adults and jacks) above Lower Monumental Dam.



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 locations of Lyons Ferry Hatchery and major tributaries in the area.

Broodstock Collection and Management 2010

Fall Chinook may be 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 discrepancy between the number of fish recorded as collected at LGR trap and the number of fish processed is likely data errors in the numbers of fish trapped at the LGR trap.

Table 2. Numbers of Chinook initially collected at LFH and LGR for broodstock, evaluation, and run construction needs in 2010.

Year	Trap Location	Number Collected/Hauled for Broodstock	Processed (killed)	Returned to Snake River	Difference from Number Collected/Hauled
2010	LFH	414	414	0	0
	LGR	2,877	2,840[a]	14	23

[a] Does not include one Coho trapped at LGR and processed at LFH

Lower Granite Dam Trapping Operations

Fall Chinook were trapped by systematically opening the trap during 12% of each hour from 22 August through 18 September and 10 % of each hour from 19 September through 18 November. Fish were trapped and hauled to LFH across the run (Figure 2). Trapping protocols are presented in Appendix B. Historical trapping rates and operation dates of systematic sampling at LGR are presented in Appendix C. In general, NOAA Fisheries staff anesthetized the salmon, gathered length and sex data, and indicated if the fish had a fin clip, wire tag or 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.

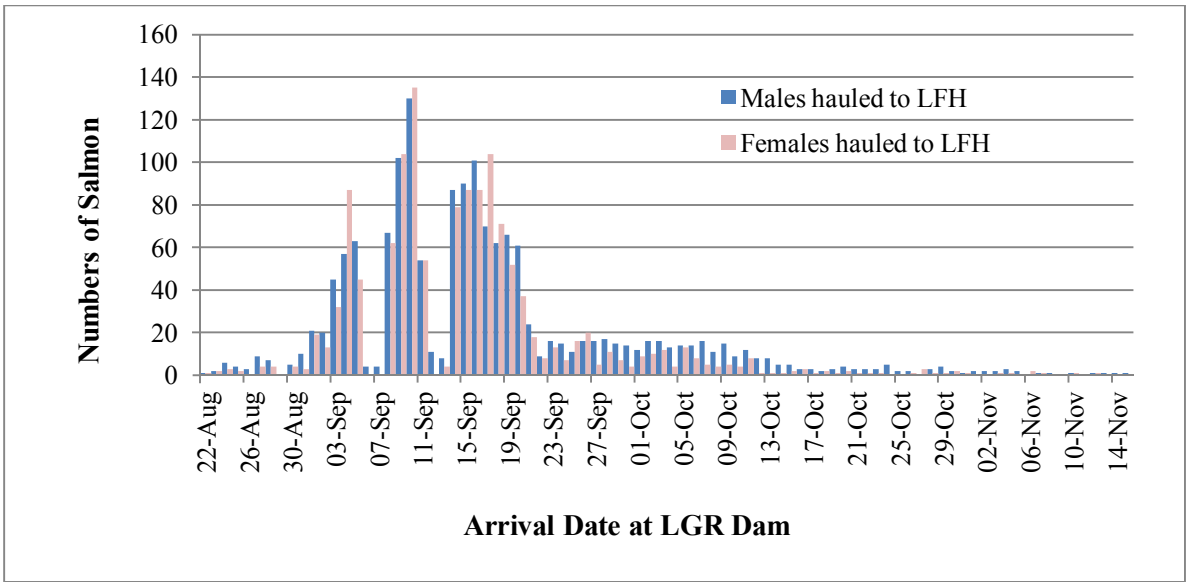


Figure 2. Arrival timing of fall Chinook at LGR Dam that were hauled to LFH in 2010.

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 20 September through 16 November as noted in trapping and sorting protocols provided in Appendix D.

Hatchery Operations 2010

Spawning Operations

Spawning and Egg Take

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 and spawning protocols in-season. The LGR pond had approximately 0.5:1 sex ratio (males/females) in the adults (75 cm or greater), and 2.0:1 sex ratio (males/females) for fish less than 75 cm. A random sample of males <75 cm was taken to determine the age composition of males from LGR for spawning protocol development. Mate selection and spawning protocols changed weekly to allow for maximum use of unmarked/untagged fish from LGR, older aged males (≥ 2-salt), and subyearlings.

The duration, peak of spawning, eggtake, and percent egg mortality (Table 3), numbers of fish spawned (Table 4), and the number killed outright and that died in the pond (Table 5) are provided. Natural origin fish were identified based on PIT tags recovered from fish seined and tagged as juveniles and likely underestimate the numbers of natural origin fish processed. Semen from some males was 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. In 2010 eggtake was within 4% of the 4.75 million goal and therefore was considered attained.

Table 3. Duration and peak of spawning, egg take, and percent egg mortality at LFH, 1984-2010.

Year	Spawn Duration Begin	Spawn Duration 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	8 Nov	5 Dec	21 Nov	1,567,823	-	-	21.6
1985	2 Nov	14 Dec	7 Nov	1,414,342	-	-	4.0
1986	22 Oct	17 Dec	19 Nov	592,061	-	-	4.0
1987	20 Oct	14 Dec	17 Nov	5,957,976	-	-	3.8
1988	18 Oct	6 Dec	12 Nov	2,926,748	-	-	3.4
1989	21 Oct	16 Dec	11 Nov	3,518,107	-	-	5.8
1990	20 Oct	8 Dec	6 Nov	3,512,571	-	-	8.3
1991	15 Oct	10 Dec	12 Nov	2,994,676[c]	-	-	8.3
1992	20 Oct	8 Dec	21 Nov	2,265,557[c]	-	-	6.0
1993	19 Oct	7 Dec	2 Nov	2,181,879	-	-	6.7
1994	18 Oct	6 Dec	8 Nov	1,532,404	-	-	5.1
1995	25 Oct	5 Dec	14 Nov	1,461,500	-	-	5.6[d]
1996	22 Oct	3 Dec	5 Nov	1,698,309	-	-	4.6
1997	21 Oct	2 Dec	4 Nov	1,451,823[e]	-	-	5.2
1998	20 Oct	8 Dec	3 Nov	2,521,135	-	-	5.1
1999	19 Oct	14 Dec	9 & 10 Nov	4,668,267	-	-	9.4
2000	24 Oct	5 Dec	7 & 8 Nov	4,190,338	-	-	5.9
2001	23 Oct	27 Nov	13 & 14 Nov	4,734,234	-	-	6.4
2002	22 Oct	25 Nov	12 & 13 Nov	4,910,467	-	-	3.6
2003	21 Oct	2 Dec	10 & 12 Nov	2,812,751	8	9	3.1
2004	19 Oct	22 Nov	9 & 10 Nov	4,625,638	16	17	3.3
2005	18 Oct	29 Nov	15 & 16 Nov	4,929,630	16	17	3.5
2006	24 Oct	5 Dec	7 & 8 Nov	2,819,004	8	9	3.2
2007	23 Oct	3 Dec	13 & 14 Nov	5,143,459	17	-	3.3
2008	21 Oct	25 Nov	4 & 5 Nov	5,010,224	17	-	3.7
2009	20 Oct	18 Nov	9 & 10 Nov	4,574,182	17	12,14 [f]	4.7
2010	19 Oct	30 Nov	16 Nov	4,619,533	16	17	2.7

[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.
[f] Priority levels 12 and 14 did not meet production goal. However, overall production in the subyearling group was more than required.

Table 4. Spawn dates, numbers of fall Chinook, and weekly egg take of fish spawned at LFH in 2010. (LFH and LGR trapped fish are combined and jacks are included with males).

Spawn Dates	Hatchery and Unk Origin Males [a]	Natural Origin Males	Hatchery and Unk Origin Females [a]	Natural Origin Females	Non-Viable [b]	Egg take
19 & 20 Oct	24	0	29	0	1	112,992
26 Oct	100	1	135	0	0	491,188
2 & 3 Nov	240	0	303	0	6	1,141,010
8 & 9 Nov	251	0	277	0	2	1,032,503
16 Nov	234	1	324	1	1	1,201,454
22 Nov	84	0	107	0	1	399,388
30 Nov	61	0	62	0	2	240,998
Totals	**994**	**2**	**1,237**	**1**	**15**	**4,619,533**

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

Table 5. Weekly summary and origins of mortality and surplus fall Chinook processed at LFH in 2010. (LFH and LGR trapped fish are combined; jacks are included with males).

Week Ending	Mortality						Killed Outright					
	LF/Snake R [a]		Natural		Other/Unk [b]		LF/Snake R.		Natural		Other/Unk	
	M	F	M	F	M	F	M	F	M	F	M	F
05 Sep	1	2	0	0	0	1	0	0	0	0	0	0
12 Sep	0	0	0	0	2	1	0	0	0	0	0	0
19 Sep	0	0	0	0	0	0	29	0	0	0	1	0
26 Sep	0	0	0	0	0	0	0	0	0	0	0	0
03 Oct	4	1	0	0	0	1	0	0	0	0	0	0
10 Oct	2	0	0	0	3	0	254	1	0	0	9	0
17 Oct	4	0	0	0	2	2	0	0	0	0	0	0
24 Oct	7	25	0	0	2	5	124	0	0	0	6	1
31 Oct	12	74	0	0	5	3	8	3	0	0	4	2
07 Nov	28	43	0	0	2	6	25	1	1	0	19	9
14 Nov	15	3	0	0	6	0	20	3	0	0	3	9
21 Nov	11	5	0	0	5	4	18	4	0	0	17	23
28 Nov	4	1	0	0	1	0	7	1	0	0	3	0
05 Dec	6	1	0	0	6	0	65	6	0	0	21	2
Totals	**94**	**155**	**0**	**0**	**34**	**23**	**550**	**19**	**1**	**0**	**83**	**46**

[a] Includes known LFH or NPTH origin (from CWT and/or VIE), and PIT tagged 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

Untagged fish from LGR Dam that were not needed for broodstock were returned to the Snake River near LFH on 30 November: 13 males (AD only or AD+PIT tag) and one female (unmarked/untagged) were released (Table 6). Co-managers agreed in-season that these fish could be returned to the Snake near LFH instead of above LGR because; 1) only one female was in the haul, 2) it was late in the season and the female could spawn in the Tucannon River, and 3) road conditions were hazardous. We estimate that all of these fish remained in the reservoir below LMO and LGR Dams since none were detected in the Tucannon River.

Table 6. Fall Chinook hauled to the Snake River and released in 2010.

Release site	Trap site	Release date	NEW_AGE_ORIGIN[a]	F	M	Grand Total
HLF	LGR	30 Nov	HSN07SSPIT3		2	2
			HIP07SSPIT3		4	4
			HXX07SSCLP3		7	7
			UXX06RRSCA4	1		1
Grand Total				**1**	**13**	**14**

[a] The key to new age origin codes are presented in Appendix E.

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 tissues were taken from 200 fish (ID #s10JP001-10JP200): tagged and untagged fish trapped at both locations. Additional fin tissue samples were taken from 100 unmarked/untagged spawned fish (ID #s10JQ001-10JQ100) that had been trapped at LGR. Descriptive data from a representative 50 male and 50 female subsample of fish used in broodstock is presented in Appendix F. Scales were taken on all untagged fish including fish with left red (LR) visual implant elastomer tags, ADLR, AD clip only and unmarked/untagged fish to determine age and rearing type. 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 are rearing within the Snake River basin based on strontium isotope levels found in the otoliths (Hegg 2011). These otoliths will be archived at the University of Idaho.

The composition and length frequencies of broodstock at Lyons Ferry Hatchery are presented in Figure 3 and Figure 4, respectively. Males used multiple times are counted multiple times in both figures. Unknown origin fish could be either hatchery or natural origin. An estimated 14.1% of the males and 32.0% of the females that contributed gametes for production were returns from yearling releases. Of the broodstock contributing to production, 6.6% were collected at the LFH trap.

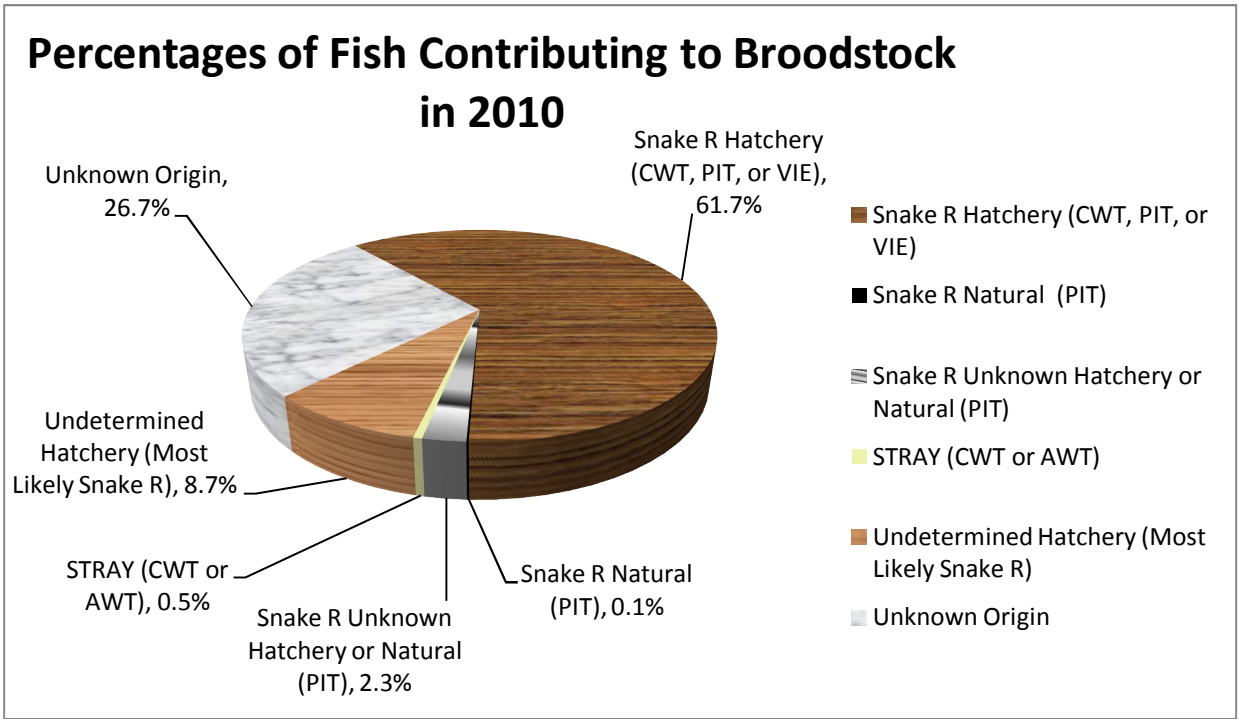


Figure 3. Percentages of fish contributing to broodstock at LFH during 2010.

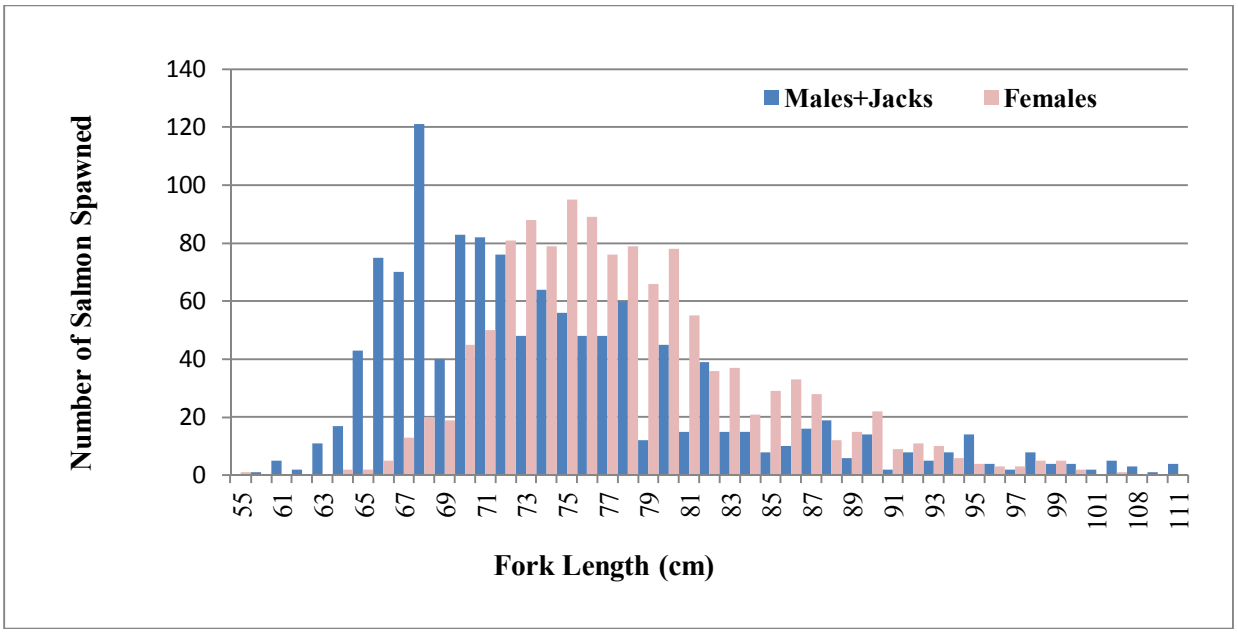


Figure 4. Fork lengths of salmon used as broodstock at LFH in 2010.

Spawn timing

PIT tagged fish (males and females) trapped at LGR Dam prior to 21 September were evaluated to determine if there was a relationship between trapping date and spawning date (Figure 5). Run timing was not a predictor of spawn timing for fish trapped during that time. We were unable to analyze data from PIT tagged fish trapped after 20 September because none were hauled to LFH to determine spawning date.

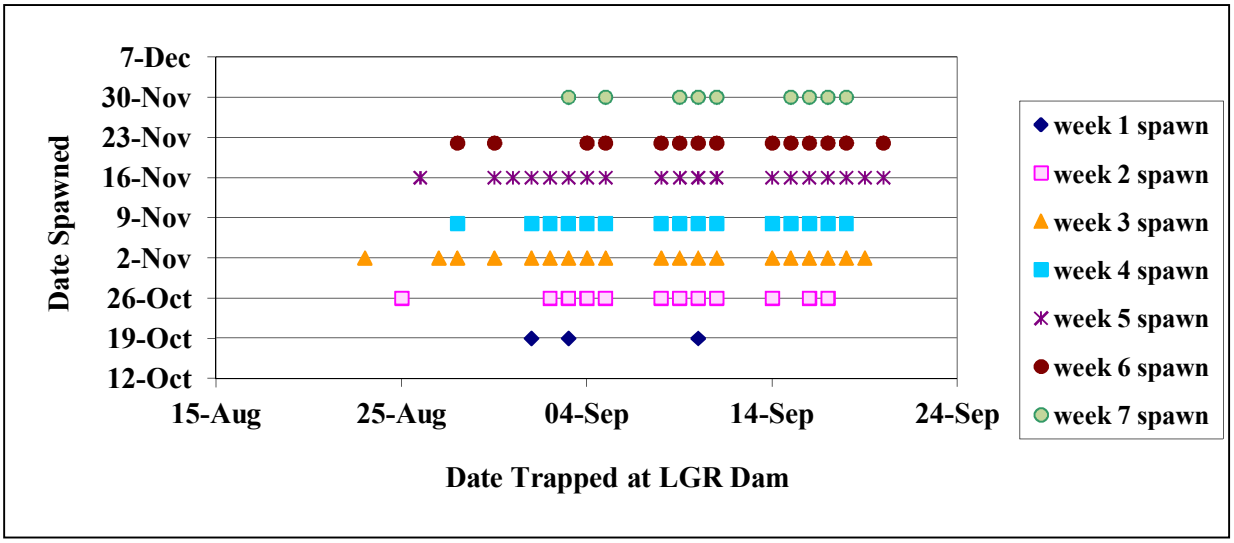


Figure 5. Spawn timing of PIT tagged fish trapped at LGR in 2010.

Males used in broodstock

Fish collected at LGR for broodstock, run reconstruction, and monitoring and evaluation purposes were hauled to LFH and NPTH with a goal of a 70:30 split. Males hauled to LFH were trapped across the run at LGR Dam (Figure 6). Older aged males were used on multiple females, mimicking nature (Hankin 2009). Of the 996 males spawned, 150 fish 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 785 (N_b) using procedures described by Busack (2006). The effective male breeders are 78.8% of the census number of males, or 63.4% of the male N_b that would have been achieved if enough males had been available to avoid reuse of males.

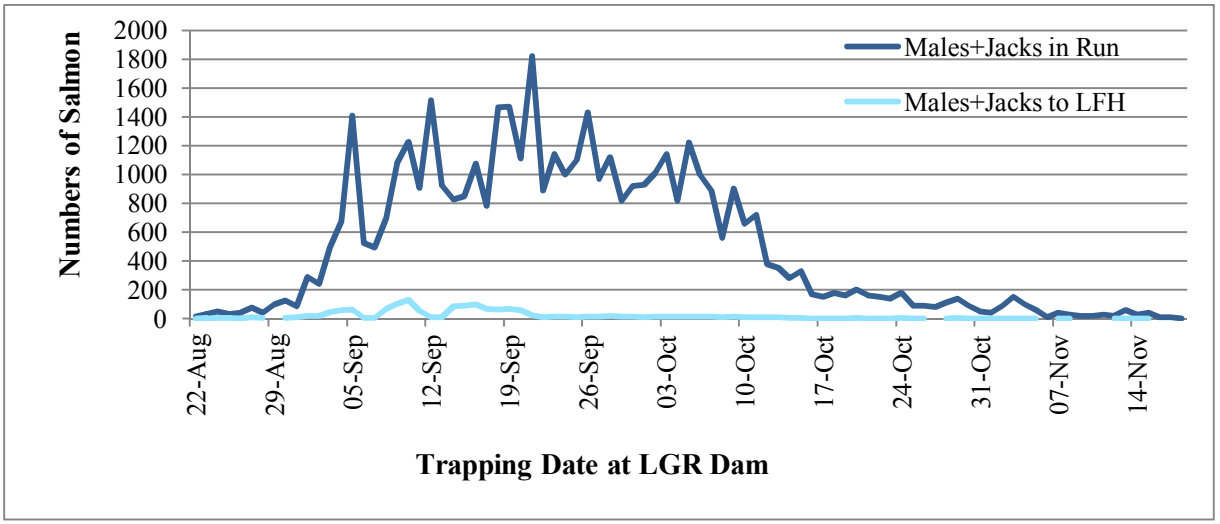


Figure 6. Arrival timing of the run of male fall Chinook at LGR Dam and the proportion hauled to LFH during 2010.

Origin including release site information was determined for 60.2 % of the males spawned based on CWT, VI, or PIT tag data. An additional 8.7 % of the males were identified as hatchery origin based either on an AD clip or lost/unreadable tags. Males that were neither tagged nor clipped (hatchery and natural origin) represented 31.1% of the males spawned.

Table 7. Origin and age of males used multiple times during spawning at LFH, 2010.

	Times Each Male was Used for Mating						
Origin Determination Method / Age[a]	**1**	**2**	**3**	**4**	**5**	**6**	**Total Unique**
Snake R Hatchery by CWT or VIE							
subyearling 1 salt (age2)	1	0	0	0	0	0	**1**
subyearling 2 salt (age3)	222	21	12	2		1	**258**
subyearling 4 salt (age5)	0	0	1	0	1	0	**2**
yearling 1 salt (age3)	13	1	1	0	0	0	**15**
yearling 2 salt (age4)	86	13	9	2	0	0	**110**
yearling 3 salt (age5)	4	0	0	0	0	0	**4**
yearling 4 salt (age6)	1	0	0	0	0	0	**1**
Snake R Hatchery by PIT							
reservoir reared 1 salt (age3)	7	0	1	0	0	0	**8**
subyearling 2 salt (age3)	169	3	3	0	0	0	**175**
Snake R Natural by PIT							
subyearling 2 salt (age3)	2	0	0	0	0	0	**2**
Snake R Unknown by PIT							
reservoir reared 1 salt (age3)	3	0	0	0	0	0	**3**
reservoir reared 2 salt (age4)	7	0	3	0	0	0	**10**
reservoir reared unknown age	0	0	0	1	0	0	**1**
subyearling 2 salt (age3)	1	0	0	0	0	0	**1**
subyearling 3 salt (age4)	2	1	1	1	0	0	**5**
Hatchery STRAY by CWT							
subyearling 2 salt (age3)	3	0	0	0	0	0	**3**
Unknown Hatchery by Clip or WIR							
subyearling 2 salt (age3)	71	7	4	0	0	0	**81**
yearling 2 salt (age4)	1	0	0	0	0	0	**1**
unknown age	3	0	1	0	0	0	**4**
Unknown Hatchery by Scales							
yearling 2 salt (age4)	1	0	1	0	0	0	**2**
Unknown Origin							
reservoir reared 1 salt (age3)	5	0	0	0	0	0	**5**
reservoir reared 2 salt (age4)	19	5	6	1	0	0	**31**
reservoir reared 3 salt (age5)	0	1	1	2	0	0	**4**
subyearling 1 salt (age2)	1	0	0	0	0	0	**1**
subyearling 2 salt (age3)	194	17	9	2	0	0	**222**
subyearling 3 salt (age4)	14	2	3	1	0	0	**20**
subyearling 4 salt (age5)	4	2	0	1	0	0	**7**
unknown age	12	3	3	0	0	0	**18**
Total Unique Males	**846**	**76**	**59**	**13**	**1**	**1**	**996**

[a] Saltwater age for wire tagged fish was estimated by subtracting 1 from the total age of subyearlings and 2 from the total age of yearlings. This method overestimates saltwater ages for subyearlings since reservoir rearing is not taken into consideration.

Females used in broodstock

Females hauled to LFH from LGR Dam were trapped throughout the run (Figure 7). Origin including release site information was determined for 70.5 % the females spawned based on CWT, VIE, or PIT tag data. An additional 8.4 % of the females were identified as hatchery origin based either on an AD clip or lost/unreadable tags. Females that were not tagged or clipped represent 21.1 % of the females spawned. The estimated age composition and origins of females contributing to broodstock at LFH are listed in Table 8. The average fecundity for LGR trapped fish was 3,747 eggs/female while LFH trapped fish had an average fecundity of 3,450 eggs/female.

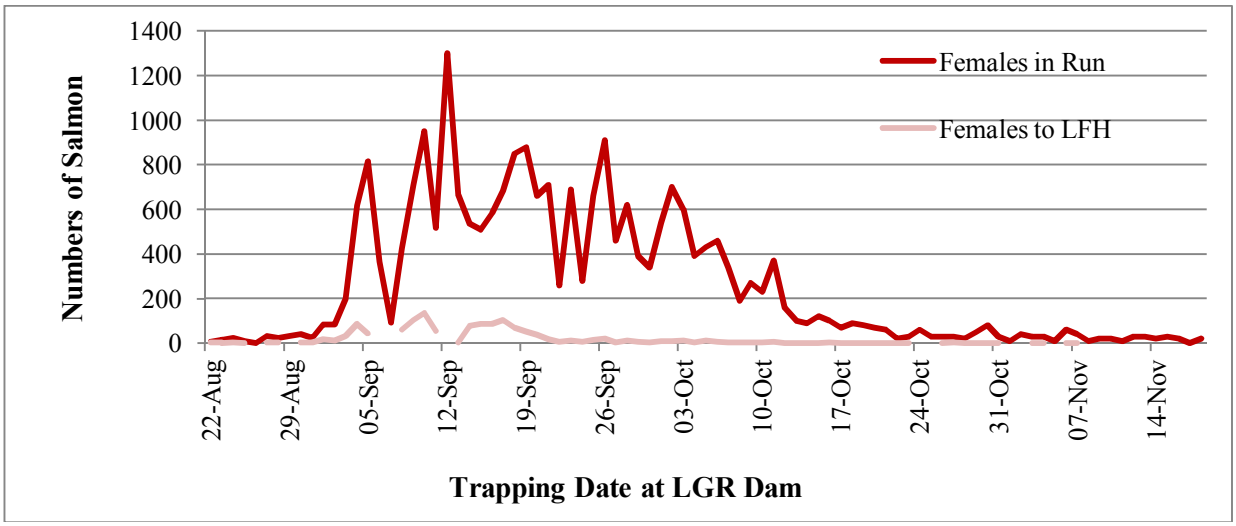


Figure 7. Arrival timing of the run of female fall Chinook at LGR Dam and the proportion of females hauled to LFH during 2010.

Table 8. Origins of females contributing to LFH broodstock during 2010.

Origin Determination Method	Age[a]	Number of Females
Snake R Hatchery		
Snake R Hatchery by CWT or VIE	subyearling 2 salt (age3)	**333**
	subyearling 3 salt (age4)	**13**
	subyearling 4 salt (age5)	**12**
	yearling 2 salt (age4)	**373**
	yearling 3 salt (age5)	**15**
Snake R Hatchery by PIT	reservoir reared 3 salt (age5)	**2**
	subyearling 2 salt (age3)	**88**
	subyearling 4 salt (age5)	**2**
	yearling 2 salt (age4)	**2**
Out of Basin Hatchery		
STRAY Hatchery by CWT or AWT	subyearling 2 salt (age3)	**3**
	subyearling 4 salt (age5)	**1**
	yearling 2 salt (age4)	**1**
	unknown age	**4**
Natural Origin		
Snake R Natural by PIT	reservoir reared 2 salt (age4)	**1**
Unknown Origin		
Snake R Unknown by PIT	reservoir reared 1 salt (age3)	**1**
	reservoir reared 2 salt (age4)	**18**
	subyearling 3 salt (age4)	**3**
	subyearling 4 salt (age5)	**1**
Undetermined Hatchery by Clip or WIR	subyearling 2 salt (age3)	**80**
	subyearling 3 salt (age4)	**2**
	subyearling 4 salt (age5)	**5**
	yearling 2 salt (age4)	**1**
	unknown age	**16**
Undetermined Hatchery by Scales	yearling 2 salt (age4)	**3**
	yearling 3 salt (age5)	**1**
Unknown Origin	reservoir reared 1 salt (age3)	**1**
	reservoir reared 2 salt (age4)	**39**
	reservoir reared 3 salt (age5)	**7**
	subyearling 2 salt (age3)	**120**
	subyearling 3 salt (age4)	**34**
	subyearling 4 salt (age5)	**21**
	unknown age	**35**
Total		**1,238**

[a] Saltwater age for wire tagged fish was estimated by subtracting 1 from the total age of subyearlings and 2 from the total age of yearlings. This method overestimates saltwater ages for subyearlings since reservoir rearing is not taken into consideration.

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 surface water retention. Reproductive effort (ratio of gamete biomass to total body mass) was calculated for each female to determine which females might have lost some eggs prior to spawning (Knudsen et al. 2008). Females whose eggs weighed less than 10 % or more than 25% of the total body weight were removed from the analysis. Females generally contributed 17 % of their body weight toward egg production (Figure 8).

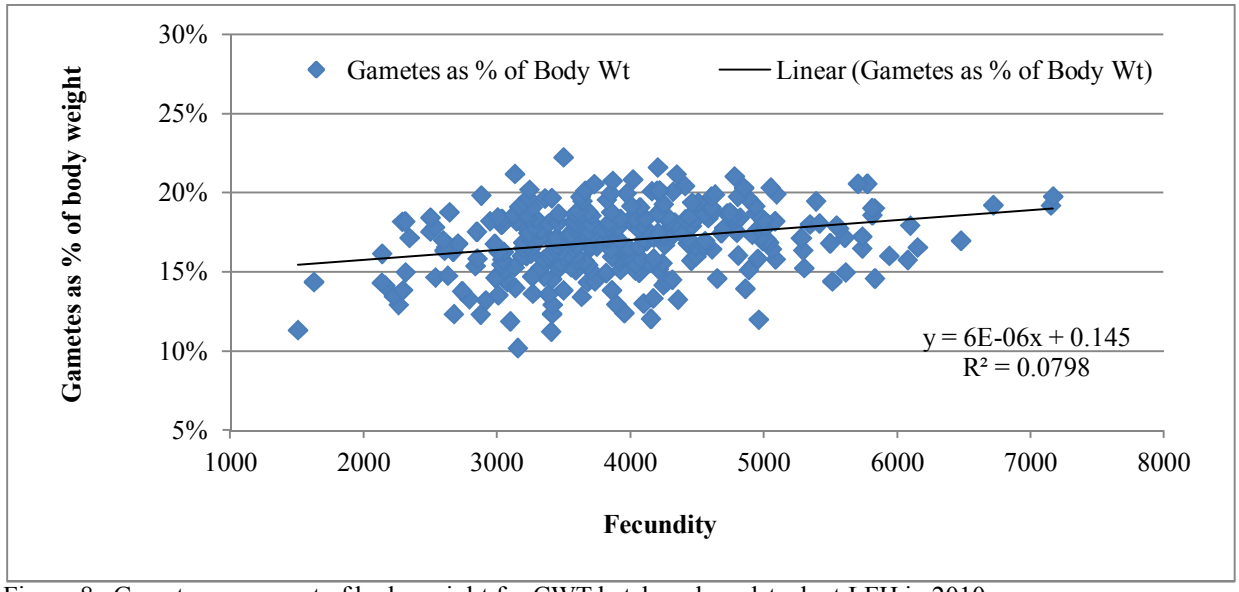


Figure 8. Gametes as percent of body weight for CWT hatchery broodstock at LFH in 2010.

Fecundity relationships were evaluated for yearling (Figure 9) and subyearling (Figure 10) fall Chinook with CWTs. Fork length more reliably predicted fecundity for subyearling than for yearling released salmon. When data were combined for yearling and subyearling salmon (Figure 11) the precision of the fecundity estimates was not improved. Fecundities were highly variable (1,504-6,077 eggs/fish) and were best predicted using fork lengths.

Based on hatchery records, overall average fecundity of LGR and LFH trapped females combined was 3,731 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.

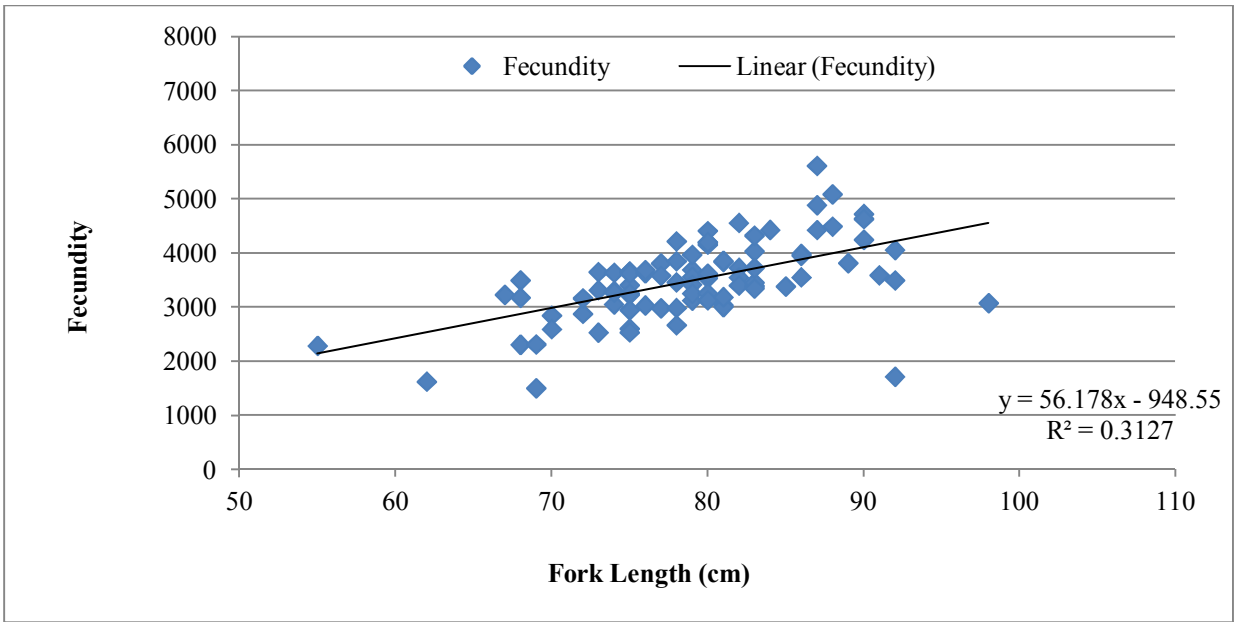


Figure 9. Yearling salmon fork length to fecundity relationships in 2010.

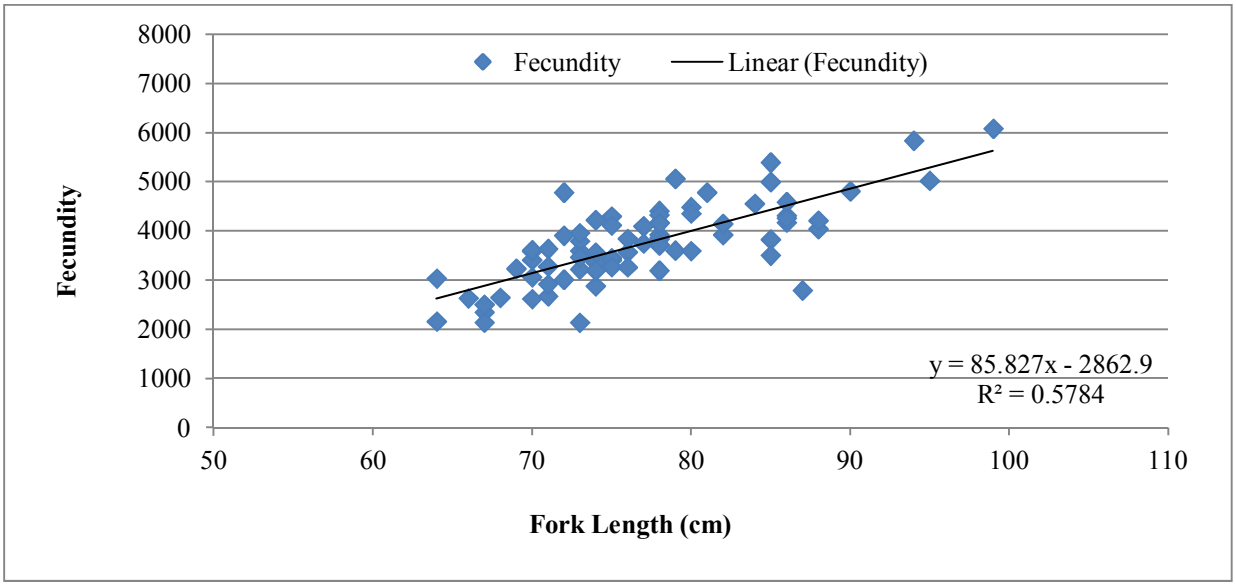


Figure 10. Subyearling salmon fork length to fecundity relationships in 2010.

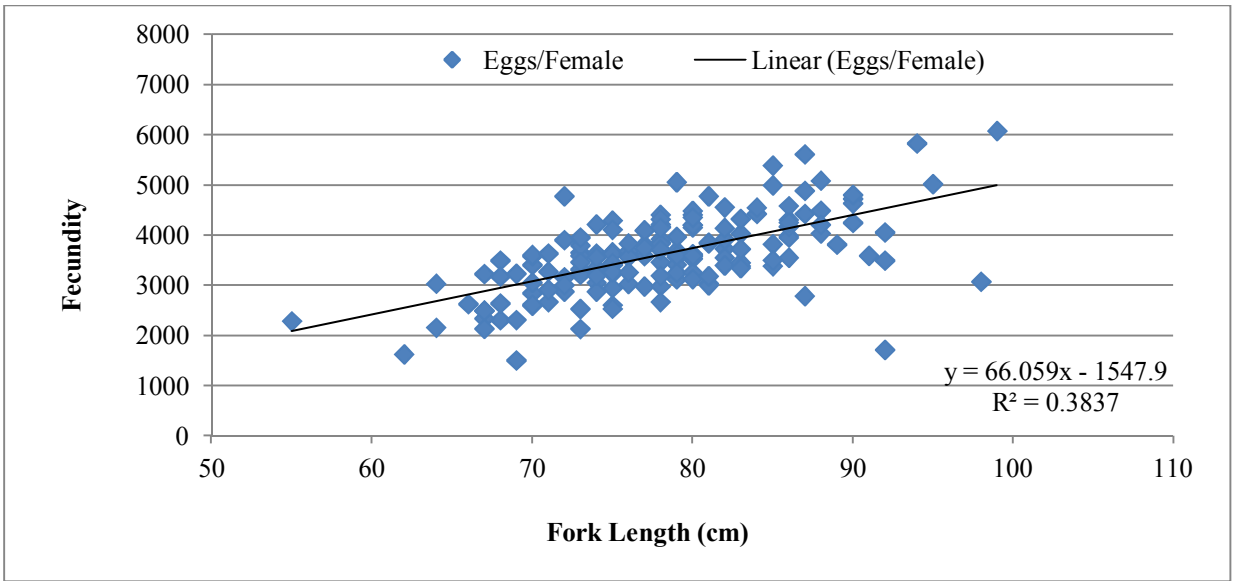


Figure 11. Combined yearling and subyearling salmon fork length to fecundity relationships in 2010.

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 (0.14 – 0.44 g/egg with a median of 0.28 g/egg) and salmon with greater fecundities tended to have larger eggs (Figure 12), but the relationship was weak and variability was high.

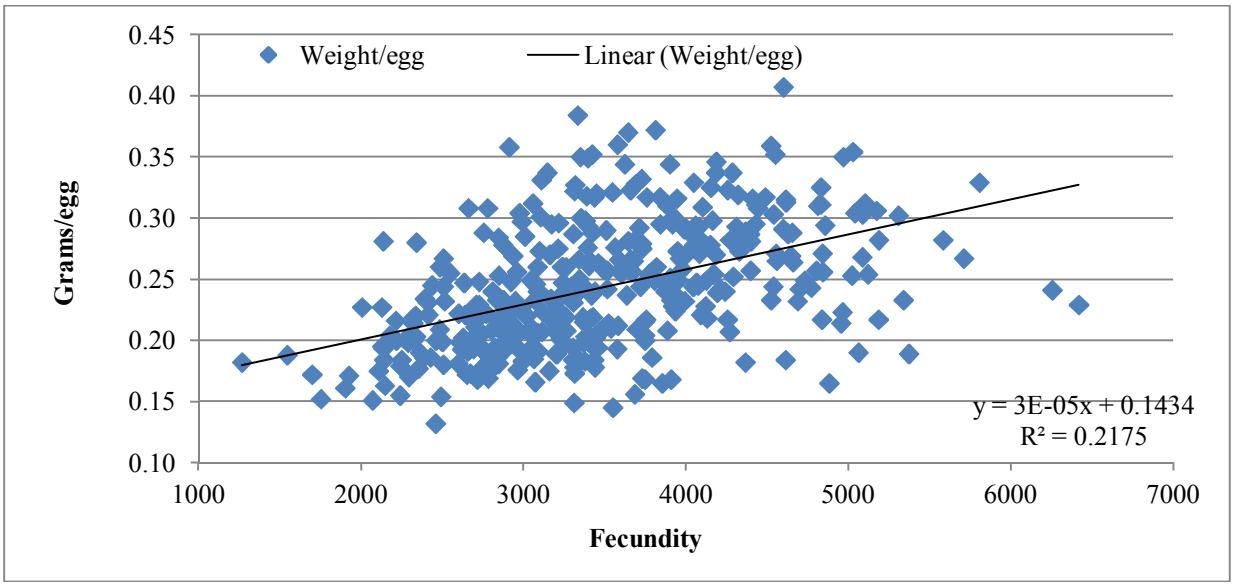


Figure 12. Relationship between egg weight and fecundity for CWT tagged broodstock at LFH in 2010.

Inclusion of natural origin fish

This was the eighth year that Snake River natural origin fish 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 broodstock come from Snake River natural origin stock. In previous years, scales were analyzed to determine natural versus hatchery origin on unmarked, untagged fish. Recent information has shown that scale results are not as reliable in that determination as once thought and are not included in this year's natural origin totals.

Table 9. Unique numbers of Snake River natural origin fall Chinook included in broodstock, 2003-2010.

Return Year	Trapping location	Estimated number Natural Females	Estimated number Natural Males	Estimated number 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
2010[b]	LGR	1	2	0	0.1	2234	Unknown x unknown

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

[b] Natural origin fish were no longer identified using scale analysis. Fish PIT tagged during juvenile seining efforts were identified as naturals

Jacks and jills in broodstock

To document the extent that jacks and jills were used as broodstock, jacks used multiple times were included multiple times in the estimates in Table 10. Minijack is defined as 0-salt fish and jacks/jills are defined as 1-salt fish. Saltwater age for wire tagged fish was estimated by subtracting 1 from the total age of subyearlings and 2 from the total age of yearlings. This method overestimates saltwater ages for subyearlings since reservoir rearing is not taken into consideration. Untagged fish are scale sampled and reservoir rearing is used to estimate salt water age. Fork length data of jacks and jills used in broodstock are presented in Table 11. Historical uses of jacks and jills in broodstock are presented in Table 12 and should be considered minimum estimates.

Table 10. Numbers and percentages of matings with 1-salt jacks and jills that contributed to production at LFH during 2010.

			Jacks	Jills
Age/rearing	**Brood year**	**Saltwater age**	**Number of matings**	**Number of matings**
H yearling	2007	1	18	0
H res rear	2007	1	10	0
Unk sub res rear	2007	1	0	1
Unk res rear	2007	1	8	1
H sub	2008	1	1	0
Unk sub	2008	1	1	0
Totals			**38**	**2**
% of Matings			**3.1**	**0.1**

Table 11. Fork lengths of 1- salt jacks and jills used in broodstock at LFH during 2010.

	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	18	68	68	4.7	61	77
H reservoir reared	10	71	69	4.8	66	77
Unk reservoir reared	8	71	70	3.0	67	75
H subyearling	1	59	-	-	-	-
Unk subyearling	1	66	-	-	-	-
Jills 1-salt-						
Unk subyearling reservoir reared	1	70	-	-	-	-
Unk reservoir reared	1	81	-	-	-	-

Table 12. Number of matings of minijacks, jacks, and jills contributing to broodstock at LFH, 2000-2010

Year	**0-salt**	**1-salt jack**	**1-salt jill**	**Number of matings containing jack x jill mating**	**% of total matings with 0 and/or 1-salt parentage**
2000	195	609	157	127	80.4
2001	9	875	67	47	67.6
2002	5	348	6	4	31.8
2003	3	527	78	63	74.5
2004	34	941	254	204	77.6
2005	13	610	58	26	45.3
2006	1	525	123	94	70.6
2007	0	1136	477	405	82.9
2008	0	348	78	31	30.2
2009	1	547	513	152	70.3
2010	0	38	2	0	3.2
Average	**24**	**591**	**165**	**105**	**57.7**

Rearing and Marking

Tag and clip quality control checks (Table 13) and historical information regarding egg take, and early life stage survival (Table 14) are provided. Marking was consistent with *United States v. Oregon* recommendations as listed in Appendix G. Rearing followed standard hatchery procedures identified 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 Lyons Ferry Hatchery Annual Reports.

This was the first year that yearlings were put into three different types of vessels after tagging. The majority of the fish were flushed to the rearing lake (29 July-13 Aug), approximately 1,500 fish from each CWT group were transferred into intermediate troughs, and approximately 30,000 fish (15,000 from each CWT group) were split into two raceways. Fish in the intermediate troughs were held for three weeks until QC sampling then they were added to the rearing lake. Staff PIT tagged 30,000 onstation yearlings from 15 Aug – 18 Aug for the purpose of monitoring returns in-season and to compare two methods of estimating SARs (using CWTs and PIT tags). After PIT tagging, the fish were returned to the raceways to allow healing of the incisions before initial tag loss was estimated. Initial tag loss was < 1 % and the recovered PIT tags were reused on fish at release to fully utilize available tags. After release, the rearing pond and outlet structures were scanned for PIT tags and 110 tags were recovered (0.4%), leaving an estimated 29,890 PIT tags to represent the yearling release. This was the second year a PIT tag array consisting of three antennas was used in the outlet structure. Only 68.5% 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 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.

The BY10 subyearlings were not PIT tagged in 2011 due to a priority change shifting the use of those PIT tags to another need. PIT tagging will resume at expanded levels in 2012.

Table 13. Numbers of fall Chinook sampled by WDFW for marking and tagging quality control checks.

Brood Year	Release site	Mark Type	CWT	Number sampled	AD+CWT	AD ONLY	CWT ONLY	Unmarked/ Untagged
2009 Yearling	LFH	AD+CWT	635564	1476	1471 (99.7%)	2 (0.1%)	3 (0.2%)	0 -
	LFH	CWT ONLY	635510	1454	0 -	0 -	1453 (99.9%)	1 (0.1%)
2009 Subyearling	LFH	AD+CWT	635180	1516	1487 (98.1%)	21 (1.4%)	8 (0.5%)	0 -
	CCD	AD+CWT	635181	1536	1507 (98.1%)	18 (1.2%)	7 (0.5%)	4 (0.2%)
	GRR	AD+CWT	635182	1536	1513 (98.5%)	21 (1.4%)	0 -	1 (0.1%)

Table 14. Egg take and survival numbers by life stage of Lyons Ferry origin fall Chinook spawned at LFH, brood years 2006-2010.

Brood Year	Eggs Taken	ELISA Loss	Eggs Shipped[a]	Eyed Eggs Retained	Fry Ponded	Intended Program
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[b]	960,900 1,894,933 0	Yearling Subyearling Research
2008	5,010,224	0	1,810,800	2,969,200	1,000,000 1,969,200 0	Yearling Subyearling Research
2009	4,574,182	0	1,507,300	2,853,020	977,667 1,875,353 0	Yearling Subyearling Research
2010	4,619,533	0	1,630,000	2,865,100	980,000 1,885,100 0	Yearling Subyearling Research

[a] Includes eyed eggs shipped for research.
[b] This number includes 364,983 eyed-eggs that were destroyed as ponded fry in January and February 2007.

Juvenile Releases

Brood year 2009

Subyearling

Subyearling fall Chinook at LFH were released 25 May 2010. A subsample of fish was measured and weighed and visually appeared in good condition, with no external signs of BKD, pop-eye, or descaling from bird beaks. Fish were also visually examined for sexual precocity; none were noted. An estimated 202,328 fish were released as an AD+CWT group. Hatchery staff counted 18.7 pounds of fish and calculated the size at release to be 52.4 fpp. Fish used in the pound counts were set aside for SRL staff to subsample for individual lengths and weights (Table 15). Snake River flows on 25 May at LMO Dam were 72.1 kcfs with 26.0 kcfs spill and total dissolved gases at the LMO tailrace was 118.7%. Columbia River flows at MCN Dam were 219.5 kcfs with 88.7 kcfs spill on 25 May.

Subyearling fall Chinook slated for Couse Creek were released 24 May 2010. Fish were measured and weighed and visually appeared in good condition, with no external signs of BKD, pop-eye, descaling or sexual precocity. An estimated 203,162 fish were released as an AD+CWT group. LFH staff counted 21.9 pounds of fish and calculated the size at release to be 58.0 fpp.

Subyearling fall Chinook reared at Irrigon FH were released into the Grande Ronde River on 24 May. An estimated 200,120 fish were released as an AD+CWT group and 186,720 were

released as unmarked/untagged. Fish were measured and weighed and visually appeared in good condition, with no external signs of BKD, pop-eye, descaling or sexual precocity. ODFW staff provided pound counts and the release was calculated at 42.0 fpp.

Table 15. Length and weight data from subyearling fall Chinook (BY09) sampled by Snake River Lab staff and released into the Snake and Grande Ronde Rivers during 2010.

Length/weight data	Snake R at LFH Sample Date	Snake R at Couse Creek Sample date	Grande Ronde R at Cougar Creek Sample date
	24 May 2010	21 May 2010	21 May 2010
Number sampled	255	231	400
Avg. length (mm)	90	88	96
Median	90	88	97
Range	58-111	61-109	59-120
STDS	8.3	7.1	7.3
CV	9.2	8.0	7.6
Avg. weight (g)	8.9	8.5	11.4
STDS	2.5	2.1	2.8
CV	9.2	24.7	24.0
Avg. K:factor	1.20	1.21	1.27
FPP	50.9	53.5	42.0

Yearling

Yearling fall Chinook at LFH were released from 12 April to 15 April 2011, with peak emigration occurring on 13 April. Fish were measured and weighed and visually appeared in good condition, with no external signs of BKD, pop-eye, or descaling from bird beaks. None of the yearlings observed were precocious {precocious fish expel semen when handled and are dark colored (non-smolted)} based on that visual examination. Fish were well smolted, slender and uniform in size. An estimated 227,391 fish were released from the AD+CWT group, and 236,338 were released from the CWT ONLY group. Hatchery staff counted 200 pounds of fish and calculated the size at release to be 9.9 fpp. Fish used in the pound counts were set aside for SRL staff to subsample for individual lengths and weights (Table 16). Most of emigration occurred prior to 9am on 13 April. The release occurred during a decreasing hydrograph. Historical releases by WDFW, NPT, IDFG, and NOAA are provided in Appendix H.

Table 16. Length and weight data from yearling fall Chinook (BY09) released at LFH in 2011.

	ADCWT	CWT ONLY
CWT code	635564	635510
Number sampled	422	483
Avg. length (mm)	165	163
Median	165	163
Range	120-208	120-208
STDS	12.9	12.5
CV of length	7.8	7.7
Avg. weight (g)	47.6	46.5
STDS	11.2	10.1
Avg. K:factor	1.04	1.03
FPP	9.5	9.7

Survival Rates to Release

The estimated number of eggs and fish present at life stages in the hatchery were used for brood years 2005-2009 to calculate survival rates within the hatchery environment (Table 17).

Table 17. Estimated survivals (%) between various life stages at LFH for fall Chinook of LFH/Snake River hatchery origin, 2005-2009 brood years.

Brood year	Release stage	Green egg-ponded fry	Ponded fry-release[a]	Green egg-release
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	107.1	89.4
2009	Yearling	94.1	98.3	92.5
	Subyearling	94.1	100.2	94.0
Yearling mean:	**%**	**94.7**	**96.7**	**91.5**
	SD	**1.6**	**1.8**	**0.3**
Subyearling mean:	**%**	**94.8**	**102.3**	**94.4**
	SD	**1.6**	**2.8**	**2.5**

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

Migration timing and survival

An interrogation summary from the PTAGIS website (www.ptagis.org) downloaded on 25 July was used to populate Table 18 and Table 19. PIT tagged subyearlings released into the Snake River near Couse Creek and into the Grande Ronde River are only to represent migration timing in this report. From the Couse Creek release site to detection facility, juvenile salmon averaged 5.1 km/day to LGR Dam, 7.8 km/day to LGO Dam, 10.7 km/day to LMO Dam, 12.7 km/day to IHR Dam, 11.1 km/day to MCN Dam, 16.2 km/day to John Day Dam, and 17.9 km/day to Bonneville Dam.

From the Grande Ronde release site near Cougar Creek to detection facility, juvenile salmon averaged 9.8 km/day to LGR Dam, 11.8 km/day to LGO Dam, 14.1 km/day to LMO Dam, 16.3 km/day to IHR Dam, 14.7 km/day to MCN Dam, 19.7 km/day to John Day Dam, and 20.7 km/day to Bonneville Dam.

Migration timing of PIT tagged yearlings released onstation from LFH (Table 20) are presumed to 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 3.4 km/day to LMO Dam, 6.2 km/day to IHR Dam, 9.2 km/day to MCN Dam, 13.7 km/day to John Day Dam, and 17.1 km/day to Bonneville Dam. Minimum detection to Bonneville dam was estimated at 6.2%

based on 1,269 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. Overall, 63.1% of the fish detected at the array at LFH were also detected at downstream detection sites.

Table 18. Migration timing of BY09 PIT tagged subyearlings released into the Snake River near Couse Creek in 2010.

	Detection Facilities						
	LGR	**LGO**	**LMO**	**ICH**	**MCN**	**JDD**	**BONN [a]**
Number Detected	**1,457**	**3,556**	**2,537**	**1,073**	**1,366**	**1,021**	**609**
Median Travel Days from CCD[b]	16	18	18	19	28	27	31
Median Passage Date	9 Jun	11 Jun	11 Jun	12 Jun	21 Jun	20 Jun	24 Jun
First Detection Date	28 May	31 May	4 Jun	5 Jun	6 Jun	9 Jun	12 Jun
Last Detection Date	25 Jul	8 Aug	9 Jul	10 Jul	25 Aug	2 Aug	4 Aug
10% of Run Passage Date	5 Jun	8 Jun	9 Jun	9 Jun	13 Jun	15 Jun	18 Jun
90% of Run Passage Date	27 Jun	25 Jun	22 Jun	22 Jun	4 Jul	4 Jul	8 Jul
TDG on Median Date (%)[c]	129	119	120	120	121	117	119
Flow on Median Date (kcfs)[c]	182	162	168	156	319	291	335
Spill on Median Date (kcfs)[c]	91	51	54	78	143	116	155

[a] TDG, outflow and spill for BONN are detected six miles downstream at Warrendale.
[b] Travel days are from the date of release.
[c] Detections are from the tailrace of each dam.

Table 19. Migration timing of BY09 PIT tagged subyearlings released into the Grande Ronde River near Cougar Creek in 2010.

	Detection Facilities						
	LGR	**LGO**	**LMO**	**ICH**	**MCN**	**JDD**	**BONN [a]**
Number Detected	**2,743**	**6,749**	**4,779**	**1,852**	**2,199**	**1,892**	**1,191**
Median Travel Days from GRR [b]	15	18	18	19	25	25	29
Median Passage Date	8 Jun	11 Jun	11 Jun	12 Jun	18 Jun	18 Jun	22 Jun
First Detection Date	28 May	2 Jun	4 Jun	6 Jun	7 Jun	9 Jun	12 Jun
Last Detection Date	14 Jul	15 Aug	15 Jul	10 Jul	3 Sep	29 Jul	5 Aug
10% of Run Passage Date	4 Jun	7 Jun	9 Jun	9 Jun	12 Jun	14 Jun	16 Jun
90% of Run Passage Date	24 Jun	22 Jun	18 Jun	21 Jun	3 Jul	2 Jul	7 Jul
TDG on Median Date (%)[c]	132	119	120	120	124	118	116
Flow on Median Date (kcfs)[c]	204	162	168	156	339	359	346
Spill on Median Date (kcfs)[c]	112	51	54	78	162	108	151

[a] TDG, outflow and spill for BONN are detected six miles downstream at Warrendale.
[b] Travel days are from the date of release.
[c] Detections are from the tailrace of each dam.

Table 20. Migration timing of BY09 PIT tagged yearlings released at LFH in 2011.

	Detection Facilities				
	LMO	**ICH**	**MCN**	**JDD**	**BONN [a]**
Number Detected	**9305**	**3656**	**7311**	**5104**	**1797**
Median Travel Days from LFH [b]	8	13	16	20	22
Median Passage Date	20 Apr	25 Apr	28 Apr	2 May	4 May
First Detection Date	13 Apr	14 Apr	16 Apr	18 Apr	20 Apr
Last Detection Date	22 May	23 May	2 Jun	12 Jun	24 May
10% of Run Passage Date	14 Apr	17 Apr	19 Apr	21 Apr	27 Apr
90% of Run Passage Date	29 Apr	4 May	4 May	27 Apr	12 May
TDG on Median Date (%)[c]	119	117	116	120	115
Flow on Median Date (kcfs)[c]	99	100	276	411	284
Spill on Median Date (kcfs)[c]	30	64	127	136	100

[a] TDG, outflow and spill for BONN are detected six miles downstream at Warrendale.
[b] Travel days are from the date of release.
[c] Detections are from the tailrace of each dam.

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. Parentage 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 2017, 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 possibly natural origin fish.

Size at age of return was calculated for wire tagged yearling (

Table **21**) and subyearling (Table 22) LSRCP releases (including FCAP) and out-of-basin strays processed by WDFW. Recoveries of fish that are part of IPC and NPTH programs are not included below. These data provide the reader a general idea of the size of the fish at return, not the extent of the return by age because of selective (non-random) trapping protocols. In addition, the reader must be aware that age 3 subyearlings include some jacks that reservoir reared.

In general, fish trapped at LFH are primarily yearlings while fish trapped at LGR consist of a higher proportion of subyearlings. The sizes at age of return of LSRCP fish were not different than the sizes of out-of-basin strays processed. Historical sizes at age of returning LSRCP program fish are provided in Appendix I.

Table 21. Comparisons of size at age of return by sex for CWT tagged fish from LSRCP and out of basin yearling releases processed by WDFW in 2010.

			Total Age at Return to Snake River[a]				
Sex	**Program**	**Fork length**	2 (minijack)	3 (Jack)	4	5	6
Male	LSRCP	N=	137	201	161	4	1
		Median (cm)	**35**	**59**	**77**	**93**	**-**
		Range (cm)	30-56	48-77	50-105	84-100	89
	Stray	N=	-	-	1	-	-
		Median (cm)	**-**	**-**	**-**	**-**	**-**
		Range (cm)	-	-	65	-	-
Female	LSRCP	N=	-	20	504	20	-
		Median (cm)	**-**	**67**	**79**	**86**	**-**
		Range (cm)	-	53-74	55-98	72-92	-
	Stray	N=	-	-	7	-	-
		Median (cm)	**-**	**-**	**81**	**-**	**-**
		Range (cm)	-	-	79-91	-	-

[a] Returns include fish trapped at LFH and LGR Dam.

Table 22. Comparisons of size at age of return by sex for CWT tagged fish from LSRCP and out-of-basin subyearling releases that were processed by WDFW in 2010.

			Total Age at Return to Snake River[a]				
Sex	**Program**	**Fork Length**	1	2 (Jack)	3[b]	4	5
Male	LSRCP	N=	-	51	216	-	2
		Median (cm)	**-**	**51**	**68**	**-**	**89**
		Range (cm)	-	42-64	52-88	-	88-90
	Stray	N=	-	4	26	-	-
		Median (cm)	**-**	**52**	**70**	**-**	**-**
		Range (cm)	-	49-57	61-75	-	-
Female	LSRCP	N=	-	-	185	4	6
		Median (cm)	**-**	**-**	**74**	**85**	**89**
		Range (cm)	-	-	65-84	78-86	79-99
	Stray	N=	-	-	16	-	1
		Median (cm)	**-**	**-**	**74**	**-**	**-**
		Range (cm)	-	-	70-79	-	93

[a] Returns include fish trapped at LFH and LGR Dam.
[b] Age 3 subyearling returns include reservoir reared fish (jacks).

Tucannon River Natural Production 2010

Adult Salmon Surveys

Fall Chinook Redd Surveys

WDFW personnel have conducted adult salmon surveys on the lower Tucannon River since 1985 (Appendix J). During 2010, survey sections generally covered the river from Rkm 1.1 to Rkm 33.6; a 3.6 Rkm increase in surveyed area. 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 2010, landowner access restrictions prevented the surveying of 1.5 kilometers of river above the Starbuck Bridge within survey sections 5 and 6 (Appendix J). River conditions for viewing were good for most sections throughout the spawning season.

An estimated 324 fall Chinook and 12 Coho redds were constructed in the Tucannon during 2010. A total of 296 redds (from all species) were counted in the Tucannon River (Table 23) and we estimate an additional 43 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 un-surveyed area. It was not possible to determine the origin of each redd due to the overlap in spawning area and spawn timing.

Table 23. Date and number of redds and carcasses counted on the Tucannon River in 2010.

	Total Redds [a]	Carcasses Sampled	
Week beginning	Chinook & Coho [b]	Chinook	Coho
24 Oct	24	5	0
31 Oct	105	31	3
7 Nov	54	30	0
14 Nov	35	36	0
21 Nov[c]	no data	no data	no data
28 Nov	67	26	2
5 Dec	11	21	1
12 Dec	0	9	0
19 Dec	0	5	0
Totals	**296**	**163**	**6**

[a] Observed redds not expanded for sections with access restrictions.
[b] Chinook & Coho redd data estimated through visual counts were combined.
[c] Extreme temperatures and icy conditions prevented surveys from being completed this week.

The methodology used to estimate the numbers of fall Chinook and coho redds was the same as was used in 2009 (Milks et al 2011). 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 972 fall Chinook and 36 Coho escaped to the Tucannon River (Table 24). We recovered 163 fall Chinook carcasses equating to 16.8% of the estimated total escapement to the Tucannon River.

Table 24. Estimated escapement, redd construction, and resulting estimates of smolts/redd and total number of migrants from fall Chinook spawning in the Tucannon River, 2001-2010.[a]

			Redd Construction[a]			Success of Spawning		
Brood Year	Estimated escapement [b]	% Strays in carcasses sampled	# Redds observed	# Redds in no access areas (est.)	Total # of Redds (est.)	Estimated smolts/redd [c]	Total # Estimated emigrants [d]	Adult progeny to Escapement ratio
2001	219	14.9	65	8	73	336	24,545	0.63
2002	630	35.1	183	27	210	81	17,030	0.05
2003	474	65.8	143	15	158	460	72,656	0.04
2004	345	29.4	111	4	115	631	72,655	0.03
2005	198	60.0	61	5	66	320	21,170	0.17
2006 [e]	460	9.7	127	26	153	289	44,296	0.04[f]
2007	326	7.0	93	16	109	unknown[g]	unknown[g]	0.15[h]
2008	763	16.5	209	45	254	20	5,030	Pending
2009[i]	756	10.7	217	35	252	147	36,991	Pending
2010	972	27.0	281	43	324	76	24,315	Pending

[a] Numbers presented in this table may be different from prior reports and represent the most accurate estimates of escapement and production in the Tucannon to date.
[b] These estimates were derived using three fish per redd and no adjustments were made for super imposition of redds.
[c] This estimate was derived using redds counted above the smolt trap and estimates of emigration the following spring.
[d] 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.
[e] Includes approximately 2.3% summer Chinook in escapement that contributed to production estimate.
[f] Estimate through age 4 returns.
[g] No estimate was made because the smolt trap sampling box had a hole in it and fish escaped.
[h] Estimate through age 3 returns.
[i] First year of using new methodology to estimate proportion of fall Chinook redds based upon proportions of fall Chinook in carcass recoveries. Excludes one summer Chinook redd located below the smolt trap.

CWT and scale analysis were used to determine the origin and age of each carcass. The composition of fall Chinook carcasses in Table 25 and Table 26 consists primarily of adult (2-5 salt) females (59.5%). Fish with out-of-basin hatchery scale patterns were assigned to the Snake R. hatchery group because estimates of strays made by using CWT recoveries resulted in a lesser stray estimate: indicating an overestimate when scale determinations were used. DNA was

collected from 21 fall Chinook carcasses (ID #s 10JR001 - 10JR002, 10JR004, 10JR006 - 10JR023) for archiving.

Table 25. Composition of carcasses recovered and estimated run composition of fall Chinook on the Tucannon River, 2010.

				Raw Totals			Expanded to Run			
	Age and Origin	CWT Origin	CWT	F	M	<53 M	F	M	<53 M	Total
Wire Fish	HLF06YLCWT4	LF06YO	633987	21	2	0	125	12	0	**137**
			634092	16	4	0	95	24	0	**119**
	HLF07SSCWT3	LF07SO	634672	4	0	0	24	0	0	**24**
	HLF07YLCWT3	LF07YO	634680	5	8	0	30	47	0	**77**
			634681	1	5	1	6	30	6	**42**
	HLF08SSCWT2	LF08SO	634995	0	2	2	0	12	12	**24**
	HLF08YLCWT2	LF08YO	635165	0	0	1	0	0	6	**6**
			635166	0	1	2	0	6	12	**18**
	HNP07SSCWT3	NPTH07SO	612695	1	0	0	6	0	0	**6**
	HSN06YLCWT4	LF06YCJA	612511	1	0	0	6	0	0	**6**
	HSN07YLCWT3	LF07YPLA	612751	1	0	0	6	0	0	**6**
	HIP06SSCWT4	LF06SUMAIPC	070151	1	0	0	6	0	0	**6**
	HHS05YLCWT5	BON05YUMA	094450	1	0	0	6	0	0	**6**
	HHS06YLCWT4	BON06YUMA	094505	1	0	0	6	0	0	**6**
	HHS07SSCWT3	UMA07SUMA	090132	1	1	0	6	6	0	**12**
			090133	0	1	0	0	6	0	**6**
			090134	8	3	0	47	17	0	**64**
			090135	1	1	0	6	6	0	**12**
	HHS05YLAWT5	09BLANK	09BLANK	1	0	0	6	0	0	**6**
	HHS06YLAWT4	09BLANK	09BLANK	13	3	0	77	18	0	**95**
	HHS07YLAWT3	09BLANK	09BLANK	1	0	0	6	0	0	**6**
	HHSXXXXAWTX	09BLANK	09BLANK	3	3	0	18	18	0	**36**
	HHS05YLBWT5	BLANK	BLANK	1	0	0	6	0	0	**6**
	HHSXXXXBWTX	BLANK	BLANK	1	0	0	6	0	0	**6**
No Wire Fish	HLF06YLVIE4			1	0	0	6	0	0	**6**
	HXX06YLCLP4			2	0	0	12	0	0	**12**
	HXX06YLSCA4			7	0	0	42	0	0	**42**
	HXX07YLCLP3			0	1	0	0	6	0	**6**
	HXX07YLSCA3			0	2	1	0	12	6	**18**
	HXX07SSCLP3			3	3	0	18	18	0	**36**
	HXX55XXCLPX			2	1	1	12	6	6	**24**
	UXX05SSSCA5			3	2	0	21	9	0	**30**
	UXX06SSSCA4			0	3	0	0	18	0	**18**
	UXX07SSSCA3			3	2	3	21	9	18	**48**
Grand Total				**104**	**48**	**11**	**626**	**280**	**66**	**972**

Table 26. Estimated composition of fall Chinook run to Tucannon River by salt water age and origin, 2010.

Origin	0 Salt	1 Salt		2+ Salt			
	Minijack	True Jack	True Jill	Adult F	Adult M	Total	% of Return
Snake River Hatchery (wire, VIE)	24	107	42	268	36	477	49.1%
Presumed Snake River Hatchery (no wire+ADclip, or yearling scales)	6	24	0	84	24	138	14.2%
Out-of-basin hatchery (wire-CWT or BLANK)	0	0	6	184	71	261	26.8%
Unknown Origin (unmarked/untagged)	0	0	0	42	54	96	9.9%
Total	**30**	**131**	**48**	**578**	**185**	**972**	**100.0%**
% of return	**3.1%**	**13.5%**	**4.9%**	**59.5%**	**19.0%**		

Adult progeny to parent ratios

Fall Chinook returning to the Tucannon River have only replaced themselves one year since 1992 (Appendix J) and that occurred with the 1993 spawners. Completed returns from BY01-BY05 resulted in a calculated five year average adult progeny to escapement ratio of 0.19 returns/potential spawner (Table 24) and 0.56 returns/redd.

Coho

Coho produced an estimated 12 redds when expanded for areas not surveyed. Six coho carcasses were recovered resulting in a 16.7% sample of the total Coho escapement estimate. The majority of coho were untagged hatchery fish (Table 27). DNA was collected from 5 Coho carcasses (10JR003, 10JR005, and 10JR098-10JR100) for archiving.

Table 27. Composition of coho carcasses recovered on the Tucannon River in 2010.

Origin	Females		Males		Totals
	No clip	Unknown	No clip	Unknown	
No Wire Hatchery (Scales)	1	0	2	0	3
Unknown origin	3	0	0	0	3
Total	**4**	**0**	**2**	**0**	**6**

Juvenile Salmon Emigration

Fall Chinook

Juvenile fall Chinook (BY09) were observed at the smolt trap (Rkm 3.0) from 1 February through 9 July 2010 when the trap was pulled for the season (Gallinat and Ross, 2010). Trapping efficiency for fall Chinook ranged from 9.2% to 25.2 % (Table 28). Median passage date at the smolt trap for fall Chinook was 9 June. Staff captured 3,959 fall Chinook, and estimated that 27,533 (95% C.I. = 22,857-34,367) naturally produced fall Chinook smolts passed the smolt trap during 2010. Based on 188 redds estimated above the smolt trap during 2009, a calculated 147 smolts/redd were produced. After including juvenile production from below the smolt trap, an estimated 36,991 naturally produced fall Chinook smolts left the Tucannon during 2010.

Staff selected fish by size in the same proportions as trapped, with a goal of measuring 20 fish per day. A Total of 1,110 fall Chinook were measured (Figure 13) and ranged from 33-113 mm fork length and averaged 73 mm with a median of 75 mm. Lengths and weights were taken on 258 fish. For this group, fork lengths ranged from 48-105 mm, with a mean of 77 mm and a median of 77 mm. Weights ranged from 1.1 g to 13.9 g, with a mean of 6.1 g and median of 5.8 g. K-factors ranged from 0.93-1.67, with a mean and median of 1.25. 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.

Table 28. Trapping efficiency estimates for fall Chinook and Coho at smolt trap on the Tucannon River in 2010.

Week Beginning	Fall Chinook Recapture efficiency	Coho Recapture efficiency
25 April	unknown	6.7%
02 May	unknown	0.0%
09 May	unknown	12.5%
16 May	unknown	2.2%
23 May	16.7%	14.8%
30 May	9.2%	36.7%
06 June[a]	13.2%	10.5%
13 June	20.9%	24.7%
20 June	25.2%	4.8%
27 June	20.5%	0.0%
06 July	15.0%	unknown

[a] The trap had stopped twice during this week due to large debris in the river.

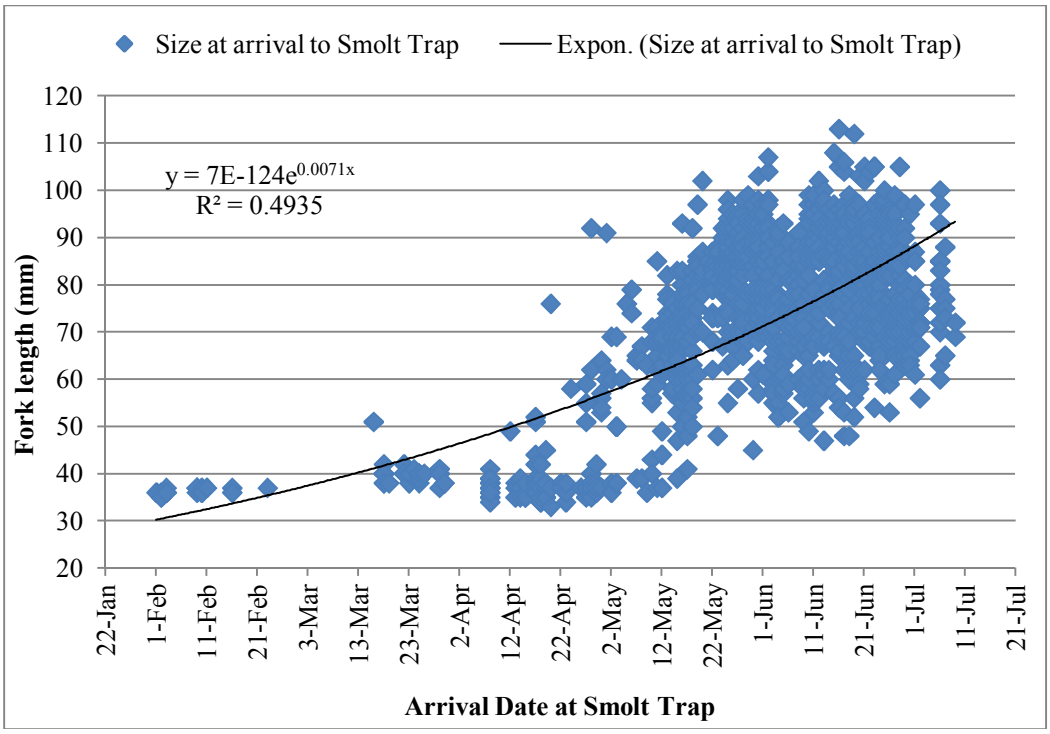


Figure 13. Arrival dates and sizes of natural origin fall Chinook trapped on the Tucannon River in 2010.

Coho

Juvenile coho salmon were incidentally captured at the smolt trap. Mark-recapture trap efficiencies were calculated and were highly variable ranging from 0.0 % to 36.7 % for individual capture efficiency tests. Staff captured 634 coho and estimate that 4,741 (95% C.I. = 3,230-7,237) naturally produced coho parr and smolts passed the Tucannon River smolt trap during 2010. Scales were not collected on coho so we were unable to determine brood year of the emigrants.

Juvenile coho were observed at the smolt trap from 22 February through 6 July. Median passage date was 2 June. Staff took lengths on 566 fish (Figure 14) which ranged from 32-155 mm in length, with a mean of 84 mm and median of 85 mm. Lengths and weights were taken on 128 fish. Lengths ranged from 53-146 mm with a mean of 86 mm and a median of 83 mm. Weights ranged from 1.8 g to 30.4 g and averaged 8.6 g with a median of 7.3 g. K-factors ranged from 0.95-1.53, with a mean and median of 1.22.

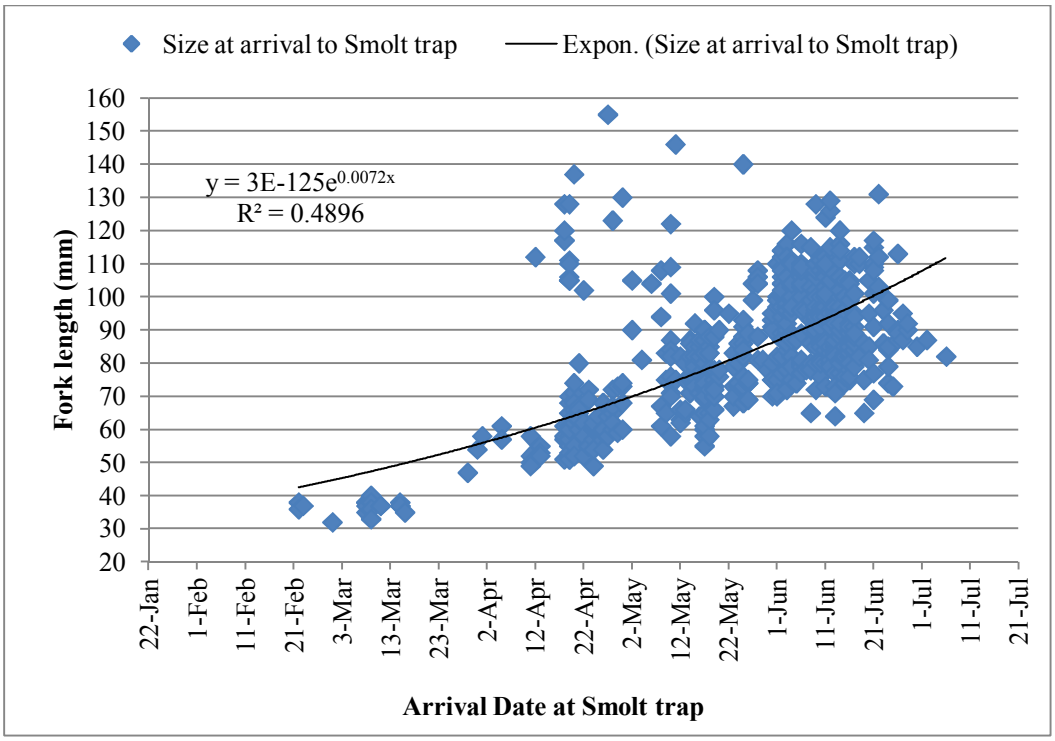


Figure 14. Arrival dates and sizes of natural origin coho trapped on the Tucannon River in 2010.

Fall Chinook Run Size and Composition 2010

Return to LFH

Fish trapped at LFH are not systematically trapped and 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 shown in Table 29.

Table 29. Estimated composition of fall Chinook trapped at LFH and killed in 2010 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	0	0	2	5	7	1.7
Bonneville	0	0	0	0	0	0	0.0
Umatilla	0	0	0	2	2	4	1.0
NPTH	0	0	0	0	0	0	0.0
LSRCP	17	50	8	205	123	403	97.3
Natural	0	0	0	0	0	0	0.0
Total	**17**	**50**	**8**	**209**	**130**	**414**	

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 K. At the time of printing this report, a finalized run reconstruction was not completed for 2010. Run reconstruction methods are currently being revised to reduce bias and improve estimates. The preliminary estimated composition of the run to LGR for fish $\geq$ 53 cm FL was 10,113 natural origin and 32,508 hatchery fish, with an overall stray rate of 2.2%. The preliminary estimated composition of fish < 53 cm FL was 1,063 natural origin and 12,151 hatchery fish with an overall stray rate of 0.1%.

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, 2010). Window counts estimated 41,815 adults and 12,895 jacks (30 cm-52 cm) reached LGR Dam in 2010 (Figure 11). 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 include fish less than 30 cm long, are not adjusted for fish that crossed the dam and fell back through the juvenile bypass system (fallback event), nor are adjusted for fish that re-crossed the dam after a fallback event (double counting).

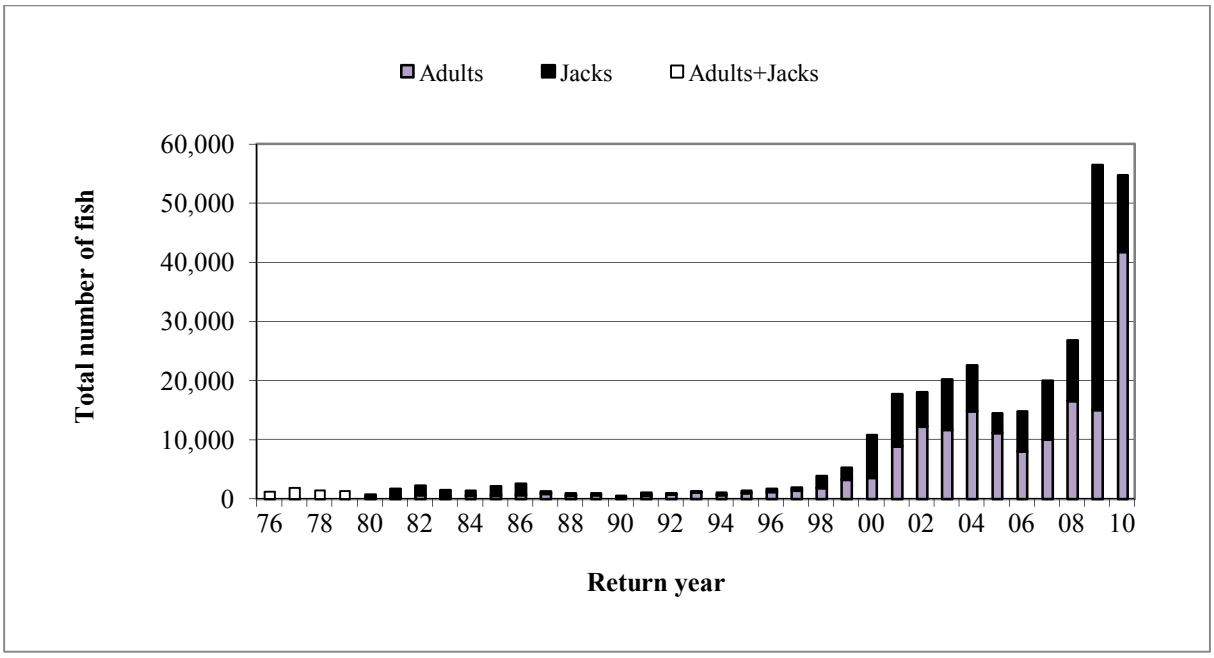


Figure 15. Fall Chinook window counts at LGR Dam, 1976-2010

Fallbacks

A total of 1,585 fallback events were counted at the juvenile collection facility (Table 30) and the separator (Table 31) located below LGR Dam. These fallback events occur when fish encounter the traveling screens that bypass fish away from the turbines and shunt them to the juvenile collection facility. Fish can also fallback over the spillway, go through the turbines, or go through the navigation lock, but we cannot estimate fallback for those routes.

Table 30. Documented fallbacks of Chinook at the LGR juvenile collection facility during 2010 by clip, wire, and VIE.

Run	Fin clip	Wire	VIE	<30cm	30-50cm[a]	Grand Total
Chinook[b]	AD	No wire	LR			0
			No VIE	11	65	76
		Wire	LR			0
			NoVIE	3	5	8
	No clip	No wire	LR			0
			NoVIE	12	81	93
		Wire	LR		1	1
			NoVIE	5	9	14
Fall Chinook Total				**31**	**161**	**192**
% Hatchery Origin				**61.3%**	**49.7%**	**51.6%**
% known yearling releases from LFH				**0.0%**	**0.6%**	**0.5%**

[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. More than half of fish less than 50 cm fork length were hatchery fish. An estimate of at least 62.9% of the fish ≥53 cm sampled at the separator were of hatchery origin based solely on adipose clips(Table 31), but we expect the rate is actually much greater.

Table 31. Composition of fallbacks at the LGR Dam separator in 2010 by clip and length.

Clip	<53cm[a]	≥53 cm[a]	Grand Total
AD Clip	590	212	802
No Clip	469	125	594
Grand Total	**1,059**	**337**	**1,396**

[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 16) the trap was operated.

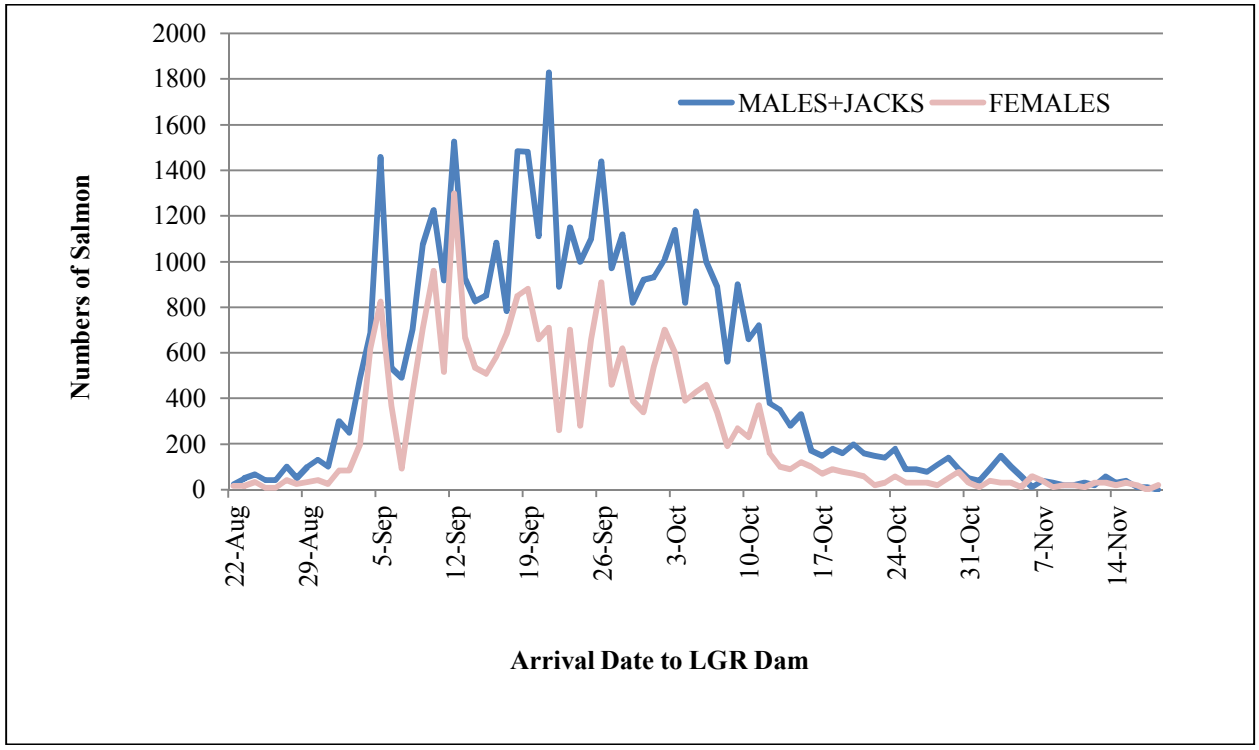


Figure 16. Run timing of fall Chinook to LGR Dam by sex in 2010.

Sex Ratio

We estimated the 2010 return consisted of 65.8% males (1.9 males/female), including jacks. After removal of fish for broodstock, the fish estimated passing LGR Dam were 74.2% males resulting in a 2.9 males/female ratio of potential in-river spawners.

Length Frequencies

Fish trapped at LGR were measured and numbers of fish at each length were expanded to account for trapping rate (Figure 17). Median fork length for males and females was 64 cm and 74 cm, respectively. Figure 18 shows the length frequencies of fish passing LGR Dam after broodstock was removed. Median fork length of fish passing LGR Dam was 60 cm for males and 73 cm for females.

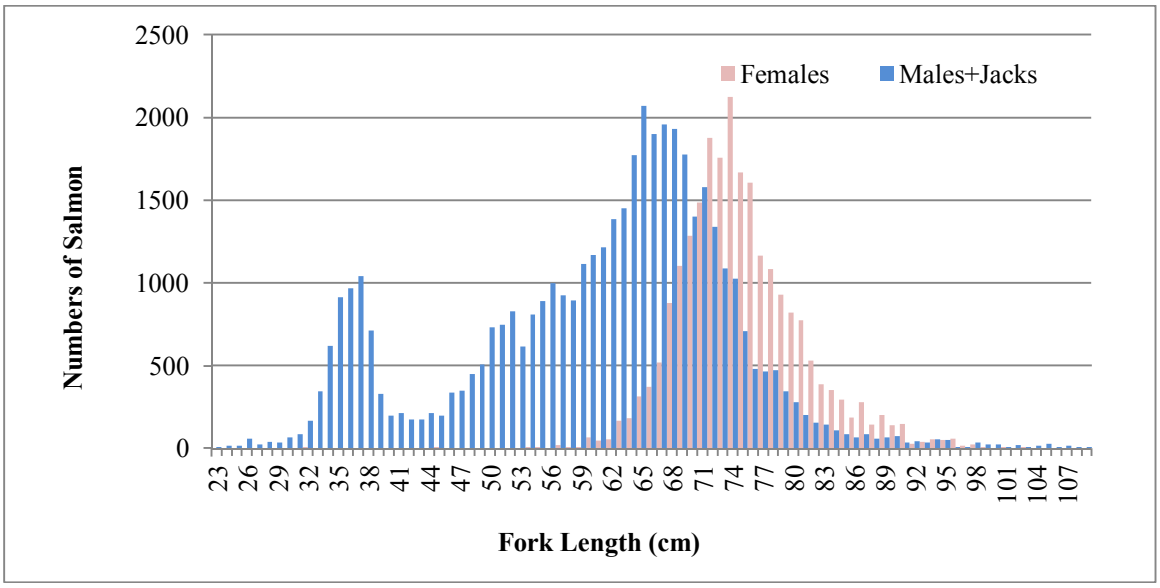


Figure 17. Length frequencies of the fall Chinook run to LGR Dam by sex in 2010.

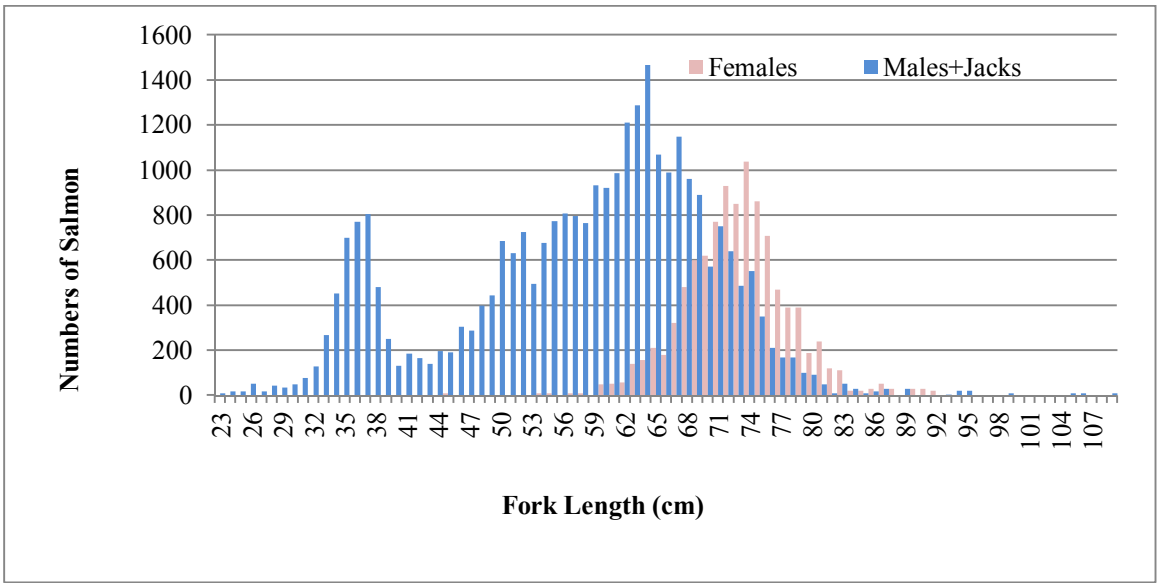


Figure 18. Length frequencies of fall Chinook passing LGR Dam by sex in 2010.

Status of Mitigation Requirements

Overall Mitigation Level

In 2010 we estimate at least 68.7% of the total LSRCP mitigation goal of 91,500 fish was met. An estimated minimum of 27,233 fall Chinook (adults + jacks) returned from WDFW and FCAP releases to the Snake River, and at least an additional 35,616 fall Chinook were recovered outside of the Snake River basin, totaling 62,849 fish contributing to LSRCP mitigation in 2010. Estimated recoveries of WDFW releases outside the Snake River are fully expanded, but the FCAP recoveries only include CWT recoveries and are not expanded to account for untagged fish associated with those groups or adjusted for detection method. Mitigation numbers presented in this report should therefore be considered minimum estimates.

Returns to the Project Area

The LSRCP mitigation goal of 18,300 fish returning to the Snake River was exceeded in 2010 (Table 32). Combining recoveries of fish harvested below LGR Dam, killed at LFH, and the estimated 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 or NPTH programs.

Table 32. Preliminary estimated returns of LSRCP fall Chinook to the Snake River and levels of mitigation goals met in 2010.

	Saltwater age						
	0 salt	1 salt		2-5 salt[a]			% of LSRCP goal to Snake River.
Location	Mini jack[b]	Jack[c]	Jill[d]	Adult F	Adult M	Total (A+J)	
Harvested FCH below LGR[e]	0	73	0	1	17	91	0.5
LFH trapped and killed during processing	17	50	8	209	130	397	2.2
Run to Tucannon R[f].	30	131	48	578	185	942	5.1
Run to LGR dam (prelim LSRCP est CWT)[g]	4,449	5,782	1,149	7,417	5,439	19,787	108.1
Run to LGR dam (prelim LSRCP est nowire)	58	998	30	1,543	2,610	5,181	28.3
Run to LGR dam (PTAGIS reported surrogates)[h]	6	106[h]	unk	unk	729[i]	835	4.6
Total	**4,560**	**7,140**	**1,235**	**9,748**	**9,110**	**27,233**	**148.8%**

[a] Age 3 subyearling wire tagged reservoir reared jacks and jills are included because scales were not taken at LFH.
[b] Minijacks are males that did not spend a year in salt water.
[c] Jacks are males that spent 1 year in salt water.
[d] Jills are females that spent 1 year in salt water.
[e] Harvest as documented on 9/15/11 download from RMIS website.
[f] Estimated run to the Tucannon River.
[g] Preliminary estimated run to LGR Dam based on adjusted window counts (includes fish hauled to LFH and NPTH for processing as well as fish released from the dam). Does not include pre and post trapping counts at the window.
[h] PTAGIS website was queried 4/19/12 for this data. Saltwater ages=return year-broodyear-1.
[i] No sex determinations at detection site so jills are included with jacks and females are included with males.

This was the third year jack fisheries occurred in the Snake River basin (Table 33) since 1988 and the second year of an adult Chinook fishery since LFH was constructed. In 2010 fishers

were allowed to harvest two adipose clipped adults and four jacks. Washington opened a jack fishery and Idaho opened an adult and jack fishery. Fish harvested above LGR Dam are not identified separately in the table below because those fish were included in the estimated run to LGR Dam.

Table 33. Estimated sport recoveries of wire tagged LSRCP program fish in the Snake River basin in 2010 as reported to RMIS.

		Saltwater age					
		0-salt	1-salt		2-5 salt		
Freshwater sport location		Minijack	Jack	Jill	F	M	Total
BELOW LGR	SNAKE L. MON – LGO DAM	0	73	0	1	10	84
	SNAKE R TO IHR DA<	0	0	0	0	7	7
ABOVE LGR	CLWTR: LEN - OROF BR	0	2	1	1	1	5
	SNAKE R ABOVE SAL R	2	0	0	1	4	7
	SNAKE R BELOW SAL R	0	10	0	22	81	113
		2	**85**	**1**	**25**	**103**	**215**

As previously stated, the 2010 run reconstruction has not been 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, and estimated numbers of PIT tagged fish tagged at Dworshak hatchery that were part of the Corps of Engineers transportation study. No expansions were made for fish counted (n=327) at the window prior to 8/22 or after 11/18 to assure the mitigation estimate is conservative.

In 2010, during the days the trap was operated, the preliminary run size based on trapping rates expanded to 66,216 fall Chinook reaching LGR, compared to 55,835 fish estimated using window counts adjusted for night passage. To remain conservative in our estimates, we reduced our preliminary run estimates to match the magnitude of the run as counted at the window at LGR Dam.

Recoveries outside of the Snake River Basin

At a minimum, 48.7% of the harvest goal (73,200 fish) was met through returns from LSRCP releases. An estimated 24,136 salmon were harvested from WDFW releases after expanding for sampling methodologies reported and including associated untagged fish estimated in catches (fully expanded estimates). An additional 11,542 CWT tagged fish from FCAP releases as reported by RMIS (not fully expanded for untagged fish harvested or adjusted for detection method) although we do not include them further in this report.

To document where recoveries of LFH/Snake River hatchery fish occurred in 2010, the RMIS database was queried on 15 September 2011 for all tag recoveries of LSRCP released fish. Estimates of harvest for fish released by WDFW are listed in Table 34 and Table 35. RMIS estimated recoveries were expanded to account for associated untagged fish intercepted in fisheries and on spawning grounds. Estimates were further expanded to account for discrepancies in reporting as explained in the following sections.

Of the WDFW releases encountered in fisheries, the majority of harvest occurred in the combined ocean fisheries (56%) primarily off the coasts of Washington and British Columbia, but the single largest fishery harvest was the Columbia River Zone 6 Gillnet fishery which consisted of 31% of all the fish harvested in 2010. Commercial fisheries (Tribal and non-Tribal) contributed to 69% of the fish captured in fisheries.

Straying of WDFW released fish to hatcheries and rivers outside of the Snake River basin occurs at a very low level. We expanded the number of CWTs reported on the RMIS website to account for untagged fish associated with each release. At hatcheries, depending upon spawning protocols all, some, or none of these fish could have been included in broodstock. During 2010 we estimate as many as 12 fish strayed into hatcheries. On spawning grounds another 50 were estimated to have been present during spawning/carcass surveys.

Harvest Adjustments for Non-Selective Fisheries

Non-selective fisheries retain any fall Chinook captured and include all the commercial and tribal net fisheries as well as the WA and OR sport fisheries in the Columbia River and Canadian and Alaskan sport fisheries. 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 that were associated with a tagcode/# ADCWT in the release) = Revised ESTD total take

Table 34. Estimated recoveries of tagged and untagged fall Chinook in freshwater areas outside of the Snake River basin in 2010 for WDFW releases

			Yearling		Subyearlings								
			LFH		LFH		CCD		GRR				
Region	Recovery area	Fishery/Hatchery/River	ESTD CWT	Total ESTD wire + nowire	ESTD CWT	ESTD wire + nowire	ESTD CWT	ESTD wire + nowire	ESTD CWT	ESTD wire + nowire	Total ESTD wire + nowire	Sum ESTD CWT	Sum ESTD wire + nowire
CA	Spawning Ground	ABOVE RED BLUFF DAM	12	24	-	-	-	-	-	-	-	12	24
COL	COL R Gillnet Zone 1 - 5	COL R Gillnet Zone 1 - 5	793	1,610	176	179	192	221	29	161	560	1,190	2,170
	COL R Gillnet Zone 6	ABOVE BNVILLE NET	2,822	5,663	590	604	554	613	92	552	1,768	4,057	7,431
	COL R Sport	Columbia River Sport	245	478	61	63	51	60	25	65	187	383	665
	COL R Test	ABOVE BNVILLE TEST	1	-	-	-	-	-	-	-	-	1	-
	Estuary Sport	COL R ESTUARY	117	231	35	35	24	25	4	11	71	180	302
	Freshwater Sport (Drano LK/Hanford)		-	-	15	15	10	10	-	-	24	24	24
	Hatchery	PRIEST RAPIDS	1	1	-	-	1	1	-	-	1	2	2
	ODFW Hatcheries	BONNEVILLE	-	-	-	-	-	-	1	2	2	1	2
	Other Oregon Hatcheries	CTUIR UM R BROOD PDS	-	-	-	-	3	4	1	2	7	4	7
	Mid-Columbia River Sport	BONNEVILLE POOL UPR	2	4	1	1	1	1	-	-	2	4	6
		JOHN DAY POOL LWR	-	-	-	-	1	1	-	-	1	1	1
	Spawning Ground	HANFORD REACH	5	5	-	-	5	6	-	-	6	10	11
		VERNITA BAR	-	-	-	-	-	-	5	10	10	5	10
OR	Freshwater Sport	ILLINOIS R (ROGUE R)	3	6	-	-	-	-	-	-	-	3	6
		ROGUE R (GRANTS PASS	1	2	-	-	-	-	-	-	-	1	2
	Estuary Sport	COOS BAY ESTUARY SPT	-	-	-	-	1	1	-	2	3	1	3
		ROGUE R ESTUARY	-	-	-	-	1	2	-	-	2	1	2
	ODFW Hatcheries	ROUND BUTTE TRAP	1	2	-	-	-	-	-	-	-	1	2
	River Seine (non-Columbia)	LOBSTER CR (ROGUE R)	2	4	-	-	-	-	-	-	-	2	4
	Spawning Ground Survey	TILLAMOOK R SPAWN	1	2	-	-	-	-	-	-	-	1	2
WA	Spawning Ground	LEWIS R -NF 27.0168	-	-	2	2	-	-	-	-	2	2	2
	Treaty Drift Gillnet		2	4	-	-	-	-	-	-	-	2	4
Total Freshwater Recoveries			**4,008**	**8,037**	**879**	**898**	**844**	**946**	**157**	**803**	**2,647**	**5,888**	**10,684**

Table 35. Estimated recoveries of tagged and untagged fall Chinook in Saltwater areas outside of the Snake River basin in 2010 for WDFW releases.

Recovery area			Yearling		Subyearlings								
			LFH		LFH		CCD		GRR				
			ESTD CWT	Total ESTD wire + nowire	ESTD CWT	ESTD wire + nowire	ESTD CWT	ESTD wire + nowire	ESTD CWT	ESTD wire + nowire	Total ESTD wire + nowire	Sum ESTD CWT	Sum ESTD wire + nowire
AK	Experimental Area Troll		4	8	1	1	3	3	-	-	4	8	12
	Marine Sport (DE,DT,MB,MR,MS)		-	-	3	3	4	4	-	-	7	7	7
	Terminal Area Drift Gillnet		2	3	-	-	-	-	-	-	-	2	3
	Traditional Drift Gillnet		7	13	2	2	-	-	-	-	2	8	15
	Traditional Troll		51	106	28	29	58	65	13	53	146	151	252
BC	Gillnet		2	2	-	-	-	-	-	-	-	2	2
	Marine Sport		21	34	-	-	-	-	-	-	-	21	34
	Seine		1	1	-	-	1	1	-	-	1	2	2
	Sport		998	1,816	206	210	235	275	23	140	625	1,462	2,441
	Troll-Freezer Boat		218	235	78	78	62	64	14	29	172	372	407
	Troll-Ice Boat		1,542	1,614	293	297	178	193	50	106	596	2,064	2,210
CA	Commercial Troll		-	-	2	3	-	-	-	-	3	2	3
	Sport		8	17	-	-	-	-	-	-	-	8	17
	Unknown	BIG LAG.-CENTERV.	8	16	-	-	8	10	-	13	22	16	38
		PIGEON PT.	2	4	-	-	-	-	-	-	-	2	4
COL	Marine Sport		163	167	39	40	31	38	3	6	84	236	251
HS	At-Sea Bottom Trawl Bycatch		7	8	-	-	-	-	-	-	-	7	8
	At-Sea Hake Midwater Trawl Bycatch		243	284	15	15	68	93	-	-	107	325	391
OR	Ocean Sport		163	296	10	10	8	9	5	17	36	186	333
	Ocean Troll		354	696	64	65	71	80	2	83	229	490	925
	OSU Experimental Ocean Purse Seine		26	27	2	2	1	1	2	3	6	31	33
WA	Marine Sport		2,685	2,747	241	245	179	199	77	136	580	3,182	3,327
	Non-treaty Drift Gillnet		13	13	-	-	-	-	-	-	-	13	13
	OSU Experimental Ocean Purse Seine		38	39	7	7	7	8	3	4	19	55	58
	Set Gillnet		7	8	-	-	-	-	-	-	-	7	8
	Treaty Drift Gillnet		29	32	1	1	-	-	-	-	1	30	33
	Treaty Troll		857	889	126	128	126	139	24	44	310	1,133	1,199
	Troll (Non-treaty)		1,075	1,119	108	110	93	105	53	93	308	1,329	1,427
Total Salt water recoveries			8,524	10,197	1,226	1,244	1,132	1,285	270	727	3,256	11,151	13,453
Total recoveries (Freshwater + Saltwater)			**12,532**	**18,233**	**2,105**	**2,142**	**1,975**	**2,231**	**427**	**1,530**	**5,903**	**17,039**	**24,136**

Electronic Detection Method

Electronic detection method means all fish were scanned 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 that were associated with a tagcode/(# ADCWT in the release + # CWT in the release) = Revised ESTD total take.

Overall, RMIS recovery estimates for 2010 accounted for 76% of the fully expanded subyearling and 69% of the yearling recovery estimates of WDFW released fish.

Saltwater age of yearling and subyearlings recovered outside of the Snake Basin

Recoveries in 2010 from yearling releases were primarily from 2-salt fish (Table 36) whereas subyearling released fish were primarily recovered as 2-salt and 4-salt fish (Table 37 - Table 40). Data were summarized only for ADCWT marked releases in the tables below.

Table 36. Final locations of ADCWT yearling fall Chinook released by WDFW to Freshwater and Ocean areas outside of the Snake River basin in 2010 by total age. .

Brood year:	**2007**	**2006**	**2005**	**2004**	**2003**	
Total age:	**3 (Jack)**	**4**	**5**	**6**	**7**	
Tag code:	634680	633987	633598	633283	631768 &631769	
ADCWT at release:	221,147	231,990	226,442	224,640	234,105	
Total released (wires+nowire)	227,364	233,663	252,390	224,853	234,427	**Totals**
Freshwater recoveries:	300	2406	709	640	0	4,054
CA	12					12
COL	288	2398	709	637		4,032
OR		5		3		8
WA		2				2
Saltwater recoveries:	472	3191	883	797	0	5,342
AK	6	34	22	5		66
BC	117	995	483	242		1,836
CA		10		8		19
COL	3	55	19	24		100
HS		86	24	65		175
OR	19	359	12	121		511
WA	329	1652	323	332		2,635
Grand Total	7,72	5,597	1,591	1,436		9,397
Percent of release recovered	**0.34%**	**2.40%**	**0.63%**	**0.64%**	**0.0%**	

Table 37. Final locations of ADCWT subyearling fall Chinook released at LFH to freshwater and ocean areas outside of the Snake River basin in 2010 by total age.

Brood year:	**2008**	**2007**	**2006**	**2005**	**2004**	
Total age:	**2 (Jack)**	**3[a]**	**4**	**5**	**6**	
Tag code:	634995	634672	633986	633582	632787	
ADCWT at release:	192230	196993	193246	201158	196301	
Total released (wires+nowire)	200695	200733	199817	202210	200171	**Totals**
Freshwater recoveries:	20	380	53	430	9	891
COL	20	380	51	430	9	889
WA			2			2
Saltwater recoveries:	13	540	58	620	11	1,242
AK		2		33		34
BC		219	22	337	5	583
CA					3	3
COL		7	4	28		40
HS				15		15
OR	2	50		25		76
WA	11	262	32	182	4	491
Grand Total	34	919	110	1,049	20	2,133
Percent of release recovered	**0.02%**	**0.46%**	**0.06%**	**0.52%**	**0.01%**	

[a] Age 3 subyearlings include reservoir reared jacks (1-salt).

Table 38. Final locations of ADCWT subyearling fall Chinook released near Couse Creek (part of the acclimated vs direct study) to freshwater and ocean areas outside of the Snake River basin in 2010 by total age.

Brood year:	**2008**	**2007**	**2006**	**2005**	**2004**	
Total age:	**2 (Jack)**	**3[a]**	**4**	**5**	**6**	
Tag code:	634996	634671		633583	610155	
ADCWT at release:	187922	197852	0	195963	185338	
Total released (wires+nowire)	200744	230401	0	200820	200191	**Totals**
Freshwater recoveries:	25	362		407	26	820
COL	25	361		407	25	818
OR		1			1	2
Saltwater recoveries:	9	520		525	50	1103
AK		17		46	2	65
BC		137		263	23	423
CA		9				9
COL		16		13	3	32
HS		33		25	16	74
OR	1	66		22		90
WA	8	240		156	6	410
Grand Total	34	881		932	75	1923
Percent of release recovered	**0.02%**	**0.38%**		**0.46%**	**0.04%**	

[a] Age 3 subyearlings include reservoir reared jacks (1-salt).

Table 39. Final locations of ADCWT subyearling fall Chinook released near Couse Creek (late release) to freshwater and ocean areas outside of the Snake River basin in 2010 by total age.

Brood year:	**2008**	**2007**	**2006**	**2005**	**2004**	
Total age:	**2 (Jack)**	**3[a]**	**4**	**5**	**6**	
Tag code:				610178		
ADCWTat release:	0	0	0	208682		
Total released (wires+nowire)	0	0	0	211508		**Totals**
Freshwater				89		89
COL				89		89
Ocean				120		120
AK				4		4
BC				82		82
COL				1		1
WA				33		33
Grand Total				209		209
Percent of release recovered				**0.10%**		

[a] Age 3 subyearlings include reservoir reared jacks (1-salt).

Table 40. Final locations of ADCWT subyearling fall Chinook released on the Grande Ronde to freshwater and ocean areas outside of the Snake River Basin in 2010 by total age.

Brood year:	**2008**	**2007**	**2006**	**2005**	**2004**	
Total age:	**2 (Jack)**	**3[a]**	**4**	**5**	**6**	
Tag code:	612676			633584	632782	
ADCWT at release:	166337	0	0	196965	192478	
Total released (wires+nowire)	181400	0	0	409165	200772	**Totals**
Freshwater	9			259	24	292
COL	9			259	24	292
Ocean	5			255	27	287
AK				12	7	20
BC				153	9	162
COL				6		6
OR	3			10		13
WA	2			74	11	87
Grand Total	14			514	51	579
Percent of release recovered	**0.01%**			**0.13%**	**0.03%**	

[a] Age 3 subyearlings include reservoir reared jacks (1-salt).

Smolt to Adult Returns estimated using PIT tags and CWTs

This task was listed in the 2010-2011 statement of work and was presented in the 2009 Annual report (Milks 2011).

Reference Population

We have continued our search to identify reference populations for comparisons with Snake River fall Chinook. After reviewing reports on Sacramento Winter Chinook (USFWS 2008), Trinity River Basin salmon (Sinnen 2010), and the HSRG Review and Recommendations regarding fall Chinook in the upper Willamette River we have determined those stocks are not appropriate candidates as reference populations. The Deschutes River fall Chinook continue to be a potentially viable reference population. We will continue this work jointly with NOAA and the co-managers as part of expanded RM&E to address BiOp concerns.

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.

1. 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 are double counted at the window, or the number that again 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 Dam to spawn.

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

Recommendation: Conduct a radio tag study. Radio tag PIT tagged LFH onstation released fish once they return to LGR to document fallback and spawning location.

2. Concerns have been raised about onstation released fall Chinook passing LGR Dam, which could be considered straying away from the release site. We cannot currently estimate 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 attempt to document final location of these fish.

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

3. 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 estimation of adult returns through PIT tag detections at Snake River dams.

4. Fecundity counts have been performed for several years and have been used to develop trapping protocols and estimate numbers of females to spawn to reach production goals. Comparisons of fecundities of natural fish and hatchery fish are an important metric that needs to be completed but 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 origin.

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

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

5. Fall Chinook returning to the Tucannon River are not replacing themselves. More review needs to be done regarding natural events or habitat conditions that might be responsible for such low reproductive success (e.g. - high flow events).

Recommendation: Estimate adult progeny/female and adult female progeny/female spawner.

Recommendation: Review flows (and dramatic flow events) in the Tucannon to determine if reduced productivity is a function of scouring events and at what flow level that occurs.

6. Two ages of coho are intercepted at the smolt trap each year but we are unable to determine age due to overlaps in fish size. The ages of coho need to be identified in order to estimate productivity of coho in the Tucannon River.

Recommendation: Take scales on larger sized coho to determine true age of outmigrants.

7. Ages of fish presented in this report under estimate jacks. Scales are primarily taken on untagged fish so salt water ages are accurate and take into account reservoir rearing. Salt water ages of wire tagged fish are calculated by subtracting 1 year from the total age of subyearlings and 2 years from the total age of yearlings. This method does not take into account reservoir rearing of subyearlings and therefore over estimates the saltwater age.

Recommendation: Take random samples of wire tagged fish during processing at LFH to profile reservoir rearing.

Recommendation: Focus scale collection on fish trapped at LGR to maximize subyearlings in samples.

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Appendix A: Fall Chinook Run to LFH, IHR, LMO, and LGR Dams: 2006-2010

(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, 2006-2010.

		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
2006	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
	LFH									1,534	427
	Tucannon R.									386	88
	LGR Dam	7,974	6,551	74	170	nc	nc	nc	nc	8,048	6,721
2007	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
	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
2008	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
	LFH									1208	792
	Tucannon R.									486	277
	LGR Dam	16,443	10,076	185	152	nc	nc	nc	nc	16,628	10,228
2009	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
	LFH									542	742
	Tucannon R.									653	103
	LGR Dam	15,058	40,973	109	312	nc	nc	nc	nc	15,167	41,285
2010	IHR Dam	46,541	12,230	nc	nc	nc	nc	nc	nc	46,541	12,230
	LOMO Dam	42,718	15,408	nc	nc	nc	nc	nc	nc	42,718	15,408
	LFH									339	75
	Tucannon R.									751	221
	LGR Dam	41,311	12,730	504	165	nc	nc	nc	nc	41,815	12,895

[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 2010

2010 Fall Chinook Trapping/Sampling Protocol

by

Debbie Milks, WDFW
Bill Arnsberg, NPT
August 18, 2010

Executive summary:

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

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

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.

WDFW is providing 2 staff for helping with the broodstock collection activities at LGR. Scales sampled at the LGR Trap for LFH and NPTH broodstock will be mounted by WDFW staff 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.

Males, jacks and minijacks will all be entered on the data forms as males.

In an effort to reduce the numbers of jills and jacks hauled to the hatcheries and to reduce the numbers of fish sacrificed with wire for run reconstruction purposes the following protocol was approved by co-managers in the basin on 8/17/2010. The sub-sampling of wire tagged fish should allow for ample recoveries for evaluation purposes.

Protocol:

1) COLLECT & HAUL: All <u>WIRE TAGGED</u> FCH > 64 cm and every fifth wire tagged FCH < 65cm. Please give 2-ROP punches. For fish hauled to LFH please keep fish <65cm in a tank separate from the larger fish. For fish slated for NPT there is no need to separate them into size categories.

2) PASS: 4 out 5 <u>WIRE TAGGED</u> FCH <65 cm regardless of sex (even females). Please give 2-LOP punch.

3) COLLECT & HAUL: ALL untagged FCH >64 cm. Please give 2-ROP punch. Take scales on every third untagged fish that does not have a PIT tag until September 28 then increase the sampling to 100%.

4) PASS: ALL untagged FCH <65. Please give 2-LOP punch. Take scales on every female and take scales on 1 out of 3 males that do not have a PIT tag.

Note: Overall numbers of scales collected should be similar to what was collected in 2009. If the trapping rate changes, the numbers of operculum punches will be reduced to 1-ROP for hauled fish and 1-LOP for released fish.

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 2-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 PITTag, 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 2010
    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)

2010 Fall Chinook Trapping/Sampling Protocol

by

Debbie Milks, WDFW
Bill Arnsberg, NPT
August 18, 2010
August 20, 2010

Executive summary:

The trapping rate will be set at 12%. The gates will open for 1.8 minutes, 4 times/hour. The tagging/sampling protocol for broodstock shipped to LFH and NPTH will be the same.

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 shut down.

WDFW is providing 2 staff for helping with the broodstock collection activities at LGR. Scales sampled at the LGR Trap for LFH and NPTH broodstock will be mounted by WDFW staff 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.

Males, jacks and minijacks will all be entered on the data forms as males.

In an effort to reduce the numbers of jills and jacks hauled to the hatcheries and to reduce the numbers of fish sacrificed with wire for run reconstruction purposes the following protocol was approved by co-managers in the basin on 8/17/2010. The sub-sampling of wire tagged fish should allow for ample recoveries for evaluation purposes.

Protocol:

1) COLLECT & HAUL: All WIRE TAGGED FCH ≥ 65 cm and every fifth wire tagged FCH < 65cm. Please give 2-ROP punches. Please keep fish <65cm in a tank separate from the larger fish. ALL of these fish will be hauled to LFH.

2) PASS: 4 out 5 WIRE TAGGED FCH <65 cm regardless of sex (even females). Please give 2-LOP punch.

3) COLLECT & HAUL: ALL untagged FCH ≥65 cm. Please give 2-ROP punch. Take scales on every third untagged fish that does not have a PIT tag until September 28 then increase the sampling to 100%.

4) PASS: ALL untagged FCH <65. Please give 2-LOP punch. Take scales on every female and take scales on 1 out of 3 males that do not have a PIT tag.

Note: Overall numbers of scales collected should be similar to what was collected in 2009.
If the trapping rate changes, the numbers of operculum punches will be reduced to 1-ROP for hauled fish and 1-LOP for released fish.

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 2-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 2-LOP and be scale sampled according to protocols listed above. Place scales in an envelope then mount them on cards for age and origin determinations. Please give the filled cards to the WDFW truck driver and we will mail them in for analysis. Please do this bi-monthly to expedite data results.
                c. If these fish (with operculum punches) 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 PITTag, 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 seasons 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 2010
    ii. At seasons 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)

2010 Fall Chinook Trapping/Sampling Protocol

by

Debbie Milks, WDFW
Bill Arnsberg, NPT
August 18, 2010
August 20, 2010
September 17, 2010

Executive summary:

At the end of the day on September 18 the trapping rate will be decreased to 10%. The mark will be changed to 1-ROP for fish hauled to the hatcheries and 1-LOP for fish released.

We will still trap enough fish to make eggtake goals and satisfy run reconstruction needs. The return has a higher percentage of females than we have seen in the past and in addition they are larger than were seen in 2009. The modification to the protocol would ensure that smaller untagged females would be released. In addition, females with wire that are also PIT tagged would be released. PIT tags will be used to determine the origin of wire tagged fish and this change to the protocol would reduce the numbers of fish we sacrifice for run reconstruction purposes. A similar change will occur with the males as well. Specific changes to the protocol are identified below.

We anticipate that the NPTH broodstock needs will be met this weekend. Once broodstock needs are met the rest of the fish will be hauled to LFH according to the protocol listed below.

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

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.

WDFW is providing 2 staff for helping with the broodstock collection activities at LGR. Scales sampled at the LGR Trap for LFH and NPTH broodstock will be mounted by WDFW staff 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.

Males, jacks and minijacks will all be entered on the data forms as males.

In an effort to reduce the numbers of jills and jacks hauled to the hatcheries and to reduce the numbers of fish sacrificed with wire for run reconstruction purposes the following protocol was

approved by co-managers in the basin on 9/17/2010. The sub-sampling of wire tagged fish should allow for ample recoveries for evaluation purposes.

Protocol:

1) COLLECT & HAUL: All NON-PIT tagged WIRE TAGGED FEMALES and Males (regardless of size). Please give 1-ROP punch.

2) PASS: Pass ALL PIT tagged WIRE TAGGED FEMALES and Males (regardless of size). Please give 1-LOP punch.

3) COLLECT & HAUL: ALL untagged FEMALES ≥80 cm. Collect 1 out of 3 untagged MALES ≥ 75 cm (up to a maximum of 100 males). Please give 1-ROP punch. Take scales on every third untagged fish that does not have a PIT tag until September 28 then increase the sampling to 100%.

4) PASS: ALL untagged FEMALES FCH <80. Pass all untagged Males <75cm. Pass 2 out of 3 untagged males > 75 cm. Please give 1-LOP punch. Take scales on 1 out of 3 FEMALES and Males that do not have a PIT tag.

2010 Fall Chinook Trapping/Sampling Protocol

by

Debbie Milks, WDFW
Bill Arnsberg, NPT
August 18, 2010
August 20, 2010
September 17, 2010
September 20, 2010

Executive summary:

At the end of the day on September 18 the trapping rate will be decreased to 10%. The mark will be changed to 1-ROP for fish hauled to the hatcheries and 1-LOP for fish released.

We will still trap enough fish to make eggtake goals and satisfy run reconstruction needs. The return has a higher percentage of females than we have seen in the past and in addition they are larger than were seen in 2009. The modification to the protocol would ensure that smaller untagged females would be released. In addition, females with wire that are also PIT tagged would be released. PIT tags will be used to determine the origin of wire tagged fish and this change to the protocol would reduce the numbers of fish we sacrifice for run reconstruction purposes. A similar change will occur with the males as well. Specific changes to the protocol are identified below.

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

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.

WDFW is providing 2 staff for helping with the broodstock collection activities at LGR. Scales sampled at the LGR Trap for LFH and NPTH broodstock will be mounted by WDFW staff 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.

Males, jacks and minijacks will all be entered on the data forms as males.

In an effort to reduce the numbers of jills and jacks hauled to the hatcheries and to reduce the numbers of fish sacrificed with wire for run reconstruction purposes the following protocol was approved by co-managers in the basin on 9/20/2010. The sub-sampling of wire tagged fish should allow for ample recoveries for evaluation purposes.

Protocol:

1) COLLECT & HAUL: Every other NON-PIT tagged WIRE TAGGED FEMALE and Male ≥80cm and 1 out of 4 NON-PIT tagged WIRE TAGGED Females and Males <80 cm. Please give 1-ROP punch.

2) PASS: Pass ALL PIT tagged WIRE TAGGED FEMALES and Males (regardless of size). Please give 1-LOP punch.

3) COLLECT & HAUL: Every other untagged FEMALE and Male ≥80 cm. Please give 1-ROP punch. Take scales on every third untagged fish that does not have a PIT tag until September 28 then increase the sampling to 100%.

4) PASS: Every other untagged FEMALE and Male ≥ 80cm. ALL untagged FEMALES and Males FCH <80 cm. Please give 1-LOP punch. Take scales on 1 out of 3 FEMALES and Males that do not have a PIT tag.

Appendix C: Systematic Sampling Rates at Lower Granite Dam 2003-2010

Appendix C 1. Dates, times, and trapping rates of fall Chinook at Lower Granite Adult trap, 2003-2010.

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
2010	22 Aug 11:05 am	12	10 Sept-10:50 am [d] 18 Sept-10:50am [b]	18 Sept 3:00pm	10		nc	18 Nov

[a] No change (nc) was made to the trapping rate.
[b] Trap was closed down for two hours each day.
[c] Trap was operated between 8-8:30 am, then 12:30-12:55 pm, then 2:20-3:02 pm on 24 Aug due to water temperature restrictions. Full operation began 25 August
[d] Trap was closed down at 10:50 am for three hours due to large numbers of fall Chinook.

Appendix D: Trapping and Sorting Protocol at Lyons Ferry Hatchery 2010

2010 Fall Chinook Trapping/Sampling Protocol

Trap 20 fish less than 75cm and 20 fish ≥ 75 on 9/14/2010 to determine sex ratio and composition of males.
Tally females by length and return to pond.
Tally males and kill males with wire to determine age.

Begin trapping the third week of September (9/20/2010).
Schedule will be determined based on run comp of fish sampled on 9/14/2010.

FCH
71 cm or greater
-goal is 1027 fish (228 females)
-should have 25% of females by October 6 at sorting
49 -71 cm
-Collect 100 fish
-goal is to get sex comp for fish in this size range
-We are using this size range to allow us to detect onstation subyearlings because they were not PIT tagged like the yearlings.

<49cm:
-Do not trap any.
We will use PIT tag detections to estimate yearling return of BY08 fish. Since the return is minijacks is primarily (99%) onstation yearlings this will cover our data needs.

2010 Sorting Plan

LGR pond:

Work the LGR Pond containing fish ≥65cm "bigs"

Count females, males
Double check number and side of operculum punches
For fish that do not have 2-ROP:
Give 2-ROP punch and make note of sex, clips, wire of that fish, and what operculum punches they had.

Work the LGR Pond containing fish <65 cm "smalls"

Count females and males
Sacrifice 30 males with wire to determine age at return by fork length
Double check number and side of operculum punches
For fish that do not have 2-ROP:
Give 2-ROP punch and make note of sex, clips, wire of that fish, and what operculum punches they had.

LFH pond:
This pond has a different size category because the composition at return is primarily yearlings consisting of larger sized jacks.

Count females, males (≥ 71 cm), females and males (<71cm)

Sacrifice 20 males (<71cm) with wire to determine age at return by fork length

Appendix E: Key of Origin Codes used in 2010

Appendix E 1. 2010 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 location 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	PITtag	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	BWT	Blank wire tag	5	total age
		NP	Nez Perce Tribal Hatchery releases	08	2008			AWT	Agency wire tag	6	total age
		GR	Grande Ronde River	09	2009			WIR	Lost/Unreadable tag	X	unknown
		IP	Idaho Power	55	unknown			VIE	Visual Implant		
		XX	unknown					CLP	Fin Clip		

Appendix E 1. 2010 Key for Origin Codes

Some Examples	Definition
HCL05SSPIT5	Hatchery origin Clearwater River 2005 subyearling rearing history by PIT tag age 5
HHS04XXBWT6	Hatchery origin out-of-basin stray, 2004 brood year, no rearing history, blank wire tag, age determined by scales
HHS55XXAWTX	Hatchery origin out-of-basin stray unknown broodyear agency wire tagged unknown age
HLF06SSCWT4	Hatchery origin Lyons Ferry 2006 subyearling CWT age 4
HXX55XXCLPX	Hatchery origin unknown location unknown brood year unknown rearing history Adipose clipped unknown age
HXX06SSCLP4	Hatchery origin unknown location 2006 subyearling Adipose clipped age 4 by scales
USN06RRPIT4	Unknown origin Snake River 2006 Reservoir reared PIT tagged age 4
UXX55XXSCAX	Unknown origin unknown location unknown brood year Scale unknown age
UXX04RRSCA6	Unknown origin unknown location 2004 Reservoir Reared Scale age 6
HCL08SSCWT2	Hatchery origin Clearwater River 2008 subyearling CWT age 2
HSN07SSCWT3	Hatchery origin Snake River 2007 subyearling CWT age 3
HIP07SSCWT3	Hatchery origin Idaho Power 2007 subyearling CWT age 3
HIP06SSCWT4	Hatchery origin Idaho Power 2006 subyearling CWT age 4
HGR05SSCWT5	Hatchery origin Grande Ronde River 2005 subyearling CWT age 5
Summers, Springers, Steelhead and COHO	
COHOCL06	Coho, Clearwater 2006 brood year
SUMMERSN06SSCWT4	Summer Chinook, Snake River2006 subyearling CWT age 4
SUMMERWEN05SSCWT5	Summer Chinook, Wenatchee River 2005 subyearling CWT age 5
STH55XXVISX	Steelhead unknown location unknown brood year Visual species ID unknown age

Appendix F: DNA Samples Selected to Represent 2010 Broodstock at LFH

Appendix F. Table 1. DNA Samples Selected to Represent Broodstock at LFH in 2010.

DNA ID	Sex	ID	Trap site	FL cm	VIE	Fin clip	Wire	PITtag	CWT	Origin	New Age Origin	Juvenile tag site	Juvenile release site	Juvenile release site (Rkm)
10JP001	F	1008	LGR	89	NE	NO	N	3D9.1C2CC33992			HCL07SSPIT3	LYFE	BCCAP	
10JP005	F	2016	LGR	71	NE	AD	N				HXX07SSCLP3			
10JP006	F	2001	LGR	81	LR	AD	Y		633598	LF05YO	HLF05YLCWT5			
10JP008	F	2027	LGR	86	NE	NO	Y	3D9.1BF24400C1	612709	NPTH05SO	HNP05SSCWT5	LGR	LGRRTR	522.173
10JP016	F	2087	LFH	90	LR	NO	Y		633597	LF05YO	HLF05YLCWT5			
10JP034	F	3114	LGR	94	NE	AD	Y		108977	LF05SIPCPLA	HIP05SSCWT5			
10JP035	F	3150	LGR	80	NE	AD	Y		612694	NPTH07SNLVA	HNP07SSCWT3			
10JP038	F	3164	LGR	84	NE	AD	Y		612512	LF06YPLA	HSN06YLCWT4			
10JP046	F	4035	LGR	93	NE	AD	Y		612698	NPTH05SO	HNP05SSCWT5			
10JP050	F	4040	LGR	95	NE	NO	Y		612653	NPTH05SCFA	HNP05SSCWT5			
10JP051	F	4079	LGR	90	NE	AD	Y		612699	NPTH06SO	HNP06SSCWT4			
10JP066	F	4263	LGR	79	NE	NO	Y		610177	LF05SCJA	HSN05SSCWT5			
10JP073	F	5045	LGR	89	NE	NO	Y		612510	LF05YPLA	HSN05YLCWT5			
10JP074	F	5058	LGR	78	NE	AD	Y		612512	LF06YPLA	HSN06YLCWT4			
10JP076	F	5077	LGR	76	NE	NO	N	3D9.1C2CD7C8DE			HSN07SSPIT3	LYFE	PLAP	522.346
10JP077	F	5078	LGR	81	NE	AD	Y		612694	NPTH07SNLVA	HNP07SSCWT3			
10JP084	F	6040	LGR	80	NE	NO	Y		612734	NPTH06CFA	HNP06SSCWT4			
10JP085	F	6031	LGR	85	NE	AD	Y		612699	NPTH06SO	HNP06SSCWT4			
10JP089	F	6054	LGR	72	NE	AD	N				HXX07SSCLP3			
10JP091	F	6052	LGR	74	NE	AD	N				HXX07SSCLP3			
10JP098	F	6074	LGR	85	NE	AD	Y		612699	NPTH06SO	HNP06SSCWT4			
10JP107	J	M1114	LFH	66	LR	AD	Y		634680	LF07YO	HLF07YLCWT3			
10JP108	M	M1115	LFH	84	NE	AD	Y		633598	LF05YO	HLF05YLCWT5			
10JP109	J	M1116	LFH	68	LR	AD	Y		634680	LF07YO	HLF07YLCWT3			
10JP111	M	M1131	LGR	80	NE	AD	Y		634672	LF07SO	HLF07SSCWT3			
10JP113	M	M1133	LGR	72	NE	NO	N	3D9.1C2CD27B61			UXX07SSSCA3			
10JP115	M	M1139	LGR	75	NE	NO	Y		612695	NPTH07SO	HNP07SSCWT3			
10JP121	M	M1270	LGR	95	NE	NO	N	3D9.1BF275F413			USN06SSPIT4	LGR	LGRRRR	522.173

Appendix F. Table 1. DNA Samples Selected to Represent Broodstock at LFH in 2010.

DNA ID	Sex	ID	Trap site	FL cm	VIE	Fin clip	Wire	PITtag	CWT	Origin	New Age Origin	Juvenile tag site	Juvenile release site	Juvenile release site (Rkm)
10JP122	M	M1275	LGR	78	NE	AD	N				HXX07SSCLP3			
10JP129	M	M1308	LGR	72	NE	AD	N				HXX07SSCLP3			
10JP130	M	M1320	LGR	76	NE	NO	N				UXX06RRSCA4			
10JP131	M	M1323	LGR	71	NE	AD	N	3D9.1C2CD79239			HSN07SSPIT3	LYFE	CJRAP	522.263
10JP132	M	M1328	LGR	70	NE	NO	N	3D9.1C2CC661FA			HSN07SSPIT3	DWOR	SNAKE3	522.253
10JP134	M	M1330	LGR	79	NE	NO	N				UXX07SSSCA3			
10JP136	M	M1333	LGR	78	NE	NO	N				UXX07SSSCA3			
10JP138	M	M1334	LGR	73	NE	NO	N	3D9.1C2C66C564			HSN07SSPIT3	DWOR	SNAKE3	522
10JP153	M	M1541	LFH	87	NE	NO	N				UXX07SSSCA3			
10JP158	M	M1550	LGR	73	NE	AD	N	3D9.1C2CC746C2			HIP07SSPIT3	UMAH	SNAKE4	522.395
10JP160	M	M1552	LGR	71	NE	AD	N				HXX07SSSCA3			
10JP162	M	M1673	LGR	67	NE	NO	N	3D9.1C2CC4E2AA			HCL07SSPIT3	LYFE	BCCAP	
10JP165	M	M1675	LGR	71	NE	NO	N				UXX07SSSCA3			
10JP166	M	M1678	LGR	77	NE	AD	N				HXX07SSCLP3			
10JP171	J	M1793	LFH	71	LR	AD	Y		634680	LF07YO	HLF07YLCWT3			
10JP173	M	M1797	LFH	65	NE	NO	Y		LOST TAG	LOST TAG	HXX06YLWIR4			
10JP174	M	M1790	LFH	65	NE	AD	Y		634672	LF07SO	HLF07SSCWT3			
10JP178	M	M1848	LGR	68	NE	AD	N				HXX07SSCLP3			
10JP181	M	M2054	LGR	66	NE	NO	Y		612695	NPTH07SO	HNP07SSCWT3			
10JP184	M	M2068	LGR	72	NE	AD	N				HXX07SSCLP3			
10JP187	M	M2071	LGR	71	NE	NO	N	3D9.1C2CC6BBAF			HSN07SSPIT3	LYFE	PLAP	522.346
10JP188	J	M2072	LGR	65	NE	NO	Y		612755	LF07YCJA	HSN07YLCWT3			
10JP191	M	M2076	LGR	66	NE	AD	Y		612716	NPTH07SO	HNP07SSCWT3			
10JP195	M	M2087	LGR	65	NE	NO	N				UXX07SSSCA3			
10JP196	M	M2081	LGR	65	NE	NO	Y		612736	NPTH07CFA	HNP07SSCWT3			
10JP198	M	M2085	LGR	66	NE	AD	N	3D9.1C2CCA028C			HIP07SSPIT3	OXBO	SNAKE4	522.395
10JP199	M	M2109	LGR	76	NE	NO	N				UXX06RRSCA4			
10JQ001	F	1001	LGR	84	NE	NO	N				UXX06SSSCA4			

Appendix F. Table 1. DNA Samples Selected to Represent Broodstock at LFH in 2010.

DNA ID	Sex	ID	Trap site	FL cm	VIE	Fin clip	Wire	PITtag	CWT	Origin	New Age Origin	Juvenile tag site	Juvenile release site	Juvenile release site (Rkm)
10JQ003	F	1003	LGR	86	NE	NO	N				UXX07SSSCA3			
10JQ004	F	1004	LGR	87	NE	NO	N				HXX06YLSCA4			
10JQ007	F	2015	LGR	78	NE	NO	N				UXX07SSSCA3			
10JQ010	F	2021	LGR	90	NE	NO	N				UXX06RRSCA4			
10JQ011	F	3007	LGR	79	NE	NO	N	3D9.1C2CD3A30D			HSN07SSPIT3	LYFE	CJRAP	522.263
10JQ012	F	3002	LGR	82	NE	NO	N	3D9.1C2CAE8B04			HSN07SSPIT3	NPTH	NPTH	
10JQ013	F	3009	LGR	80	NE	NO	N				UXX07SSSCA3			
10JQ014	F	3014	LGR	85	NE	NO	N				UXX55XXSCAX			
10JQ017	F	3019	LGR	81	NE	NO	N				UXX07SSSCA3			
10JQ018	F	3024	LGR	86	NE	NO	N	3D9.1BF27AC9CF			HSN06RRPIT4	LGR	LGRRTR	522.173
10JQ020	F	3030	LGR	92	NE	NO	N				UXX05SSSCA5			
10JQ021	F	3119	LGR	74	NE	NO	N	3D9.1C2CD8DACB			HCL07SSPIT3	LYFE	BCCAP	
10JQ023	F	3122	LGR	75	NE	NO	N				UXX07SSSCA3			
10JQ025	F	3135	LGR	99	NE	NO	N	3D9.1BF2504F2C			HCL05RRPIT5	DWOR	BCCAP	
10JQ028	F	4057	LGR	90	NE	NO	N				UXX06SSSCA4			
10JQ030	F	4092	LGR	95	NE	NO	N				UXX05SSSCA5			
10JQ031	F	4138	LGR	69	NE	NO	N	3D9.1C2C5CFC93			HSN07SSPIT3	DWOR	SNAKE3	522.265
10JQ032	F	4151	LGR	87	NE	NO	N	3D9.1BF2760B86			USN06RRPIT4	LGR	LGRRTR	522.173
10JQ033	F	4154	LGR	73	NE	NO	N				UXX07SSSCA3			
10JQ034	F	4141	LGR	76	NE	AD	N	3D9.1C2CC20F32			HIP07SSPIT3	UMAH	SNAKE4	522.395
10JQ037	F	5039	LGR	79	NE	NO	N	3D9.1C2CC8A748			HCL07SSPIT3	LYFE	BCCAP	
10JQ038	F	5059	LGR	71	NE	NO	N	3D9.1C2CC959AA			HIP07SSPIT3	OXBO	SNAKE4	522.395
10JQ039	F	5069	LGR	71	NE	NO	N	3D9.1C2C5DDA18			HSN07SSPIT3	DWOR	SNAKE3	522.253
10JQ042	F	5080	LGR	86	NE	NO	N	3D9.1BF24519C7			USN06RRPIT4	LGR	LGRRTR	522.173
10JQ044	F	6020	LGR	83	NE	NO	N	3D9.1BF234AB08			USN06RRPIT4	LGR	LGRRRR	522.173
10JQ047	F	6005	LGR	81	NE	NO	N				UXX06SSSCA4			
10JQ049	F	6034	LGR	81	NE	NO	N				UXX06RRSCA4			
10JQ050	F	6060	LGR	73	NE	NO	N				UXX07SSSCA3			

Appendix F. Table 1. DNA Samples Selected to Represent Broodstock at LFH in 2010.

DNA ID	Sex	ID	Trap site	FL cm	VIE	Fin clip	Wire	PITtag	CWT	Origin	New Age Origin	Juvenile tag site	Juvenile release site	Juvenile release site (Rkm)
10JQ051	M	M1101	LGR	78	NE	NO	N				UXX07SSSCA3			
10JQ053	M	M1103	LGR	79	NE	NO	N	3D9.1C2D3F132D			UXX06SSPIT4	BONAFF	BONAFF	234
10JQ060	M	M1189	LGR	108	NE	NO	N				UXX06SSSCA4			
10JQ062	M	M1247	LGR	78	NE	NO	N				UXX07SSSCA3			
10JQ063	M	M1248	LGR	82	NE	AD	N				HXX07SSCLP3			
10JQ065	M	M1246	LGR	77	NE	AD	N				HXX07SSCLP3			
10JQ075	M	M1287	LGR	92	NE	NO	N				UXX05SSSCA5			
10JQ078	M	M1555	LGR	69	NE	NO	N	3D9.1C2CD8DDE4			HSN07SSPIT3	LYFE	BCCAP	
10JQ079	M	M1556	LGR	95	NE	NO	N				UXX05SSSCA5			
10JQ080	M	M1561	LGR	71	NE	NO	N				UXX07SSSCA3			
10JQ084	M	M1575	LGR	94	NE	NO	N				UXX55XXSCAX			
10JQ087	M	M1858	LGR	71	NE	NO	N				UXX07SSSCA3			
10JQ091	M	M1868	LGR	69	NE	NO	N				UXX07SSSCA3			
10JQ093	M	M1876	LGR	80	NE	AD	N				HXX07SSCLP3			
10JQ094	M	M2067	LGR	74	NE	NO	N				HXX06YLSCA4			
10JQ098	M	M2101	LGR	78	NE	NO	N				UXX07SSSCA3			

Appendix G: *United States v. Oregon* Production and Marking Table

Appendix G 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 H: LFH/Snake River Origin Fall Chinook Releases Brood Years: 2004-2009

Appendix H. Table 1. 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			2,498
2005	S	2004	CJ1 Acclimated [vs. CCdirect]	28-31 May	610154	94,164	87,888	9,015	314,020	46.8			3,494
2005	S	2004	Snake R. below HC Dam-Oxbow hatchery-IPC	28 April	106676	53,548	-	4,726	-	61.5			3,098
2005	S	2004	Snake R. below HC Dam-Oxbow hatchery-IPC	28 April	109370	21,094	-	1,861	-	61.5			1,209
2005	S	2004	Snake R. below HC Dam-Oxbow hatchery-IPC	28 April	100471	20,578	-	1,816	-	61.5			1,180
2005	S	2004	Snake R. below HC Dam-Oxbow hatchery-IPC	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	25-26 May	073336	211,302	-	186,402	-	50.4			2,492
2005	S	2004	Snake R. below HC Dam-Umatilla hatchery-IPC	8-12 May	none	-	-	394,055	-	63.0			0
2005	S	2004	NPTH1	17 May	612669	-	106,079	-	74,575	120.8			Unk
2005	S	2004	NPTH1	17 May	612672	140,171	-	365	98,176	120.8			Unk
2005	S	2004	NPTH1	17 May	610108	-	194,334	-	100,753	115.3			Unk
2005	S	2004	NPTH1	17 May	612670	101,580	-	408	52,876	115.3			Unk
2005	S	2004	NPTH1	17 May	none	-	-	-	57,764	110.0			Unk
2005	S	2004	Couse Creek Direct [vs. CJ1 Accl.]	26 May	610155	183,401	1,937	14,853	-	49.2			3,465
2005	S	2004	Snake R. at Couse Creek	23 May	none	-	-	-	234,030	59.0			0
2005	S	2004	Grande Ronde R.	25 May	632782	191,868	610	8,050	241	56.0			0
2005	S	2004	Grande Ronde R. unmarked	24 May	none	-	-	-	281,688	66.0			0
2005	S	2004	LFH	27 May	632787	195,367	934	3,870	-	51.0			1,498
2005	S	2004	Snake R at Couse Creek-Surrogates	16-27 May	none				124,783	113			124,447
2005	S	2004	Clearwater R at BC-Surrogates	21 June-08 July	none				47,790	110.6			45,790
2006	Y	2004	LFH	5-10 April	633283	223,151	1,489	213	-	9.8	LR	92.5	0

Appendix H. Table 1. 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	LFH	5-10 April	633284	-	220,952	-	4,195	10.3	LR	89.6	0
2006	Y	2004	PL1	05 April	610150	66,987	-	2,516	-	10.3			2,320
2006	Y	2004	PL1	05 April	610153	-	77,644	-	2,410	10.3			2,673
2006	Y	2004	BC1	12-13 April	610148	66,732	-	1,965	-	9.3			2,642
2006	Y	2004	BC1	12-13 April	610144	-	59,465	-	1,636	9.3			2,394
2006	Y	2004	CJ1	11-14 April	610151	70,185	-	490	-	8.9			2,284
2006	Y	2004	CJ1l	11-14 April	610152	-	78,156	-	2,291	8.9			2,600
2006	S	2005	Snake R. below HC Dam-Oxbow hatchery-IPC	02 May	109477	66,879	-	1,091	-	80.3			0
2006	S	2005	Snake R. below HC Dam-Oxbow hatchery-IPC	02 May	109577	68,040	-	1,110	-	80.3			0
2006	S	2005	Snake R. below HC Dam-Oxbow hatchery-IPC	02 May	108977	41,257	-	673	-	80.3			0
2006	S	2005	Snake R. below HC Dam-Umatilla hatchery-IPC	09-10 May	none	-	-	330,172	1,993	80.3			23,969
2006	S	2005	PL1-Umatilla hatchery-IPC	22-24 May	094419	185,413	-	211,654	-	52.5			24,162
2006	S	2005	CJ1	25-29 May	610177	-	99,366	-	306,594	45.6			2,792
2006	S	2005	CJ1	25-29 May	610176	98,699	-	2,313	-	45.6			695
2006	S	2005	BC1	25-26 May	610175	-	98,994	-	304,613	56.7			46,698
2006	S	2005	BC1-t	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	01 June	633582	200,369	789	790	263	52.3			12,095
2006	S	2005	GRR	19-21 June	633584	196,630	335	3,467	208,733	50.6			25,357
2006	S	2005	Snake R at Couse Creek-Surrogates	15 May-03 Jun	none	-	-	-	229,097	115.0			229,063
2006	S	2005	Clearwater R at BC-Surrogates	19 Jun-09 July	none	-	-	-	150,054	83.0			109,186
2006	S	2005	NPTH-North Lapwai Valley Accl.	17 May	612707	-	98,670	-	1,148	72.3			unk

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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	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
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	2-6 April	633598	226,442	-	1,805	24,143	11.0	LR	87.8	0
2007	Y	2005	LFH	2-6 April	633597	-	220,825	5,489	24,457	10.1	LR	85.5	0
2007	Y	2005	PL1	16-17 April	612505	64,106	-	128	2,291	10.0			2,252
2007	Y	2005	PL1	16-17 April	612510	-	72,805	-	476	10.0			2,481
2007	Y	2005	PL1	16-17 April	612661	6,863	-	-	14	10.0			233
2007	Y	2005	BC1	18-19 April	612507	67,891	-	-	-	10.0			2,128
2007	Y	2005	BC1	18-19 April	612508	-	77,220	-	10,369	10.0			2,746
2007	Y	2005	CJ1	13 April	612506	69,180	-	112	9,911	10.0			1,996
2007	Y	2005	CJ1	13 April	612509	-	78,588	-	708	10.0			1,999
2007	S	2006	LFH	23 May	633986	191,436	1,810	6,000	571	61.3			0
2007	S	2006	LFH-Unassociated	23 May	none	-	-	-	875	103.0			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	08 May	101273	11,247	-	1,419	-	55.0			1,067
2007	S	2006	Snake R. below HC Dam-Oxbow hatchery-IPC-	08 May	104480	48,621	-	6,135	-	55.0			4,613

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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]
2007	S	2006	Snake R. below HC Dam-Oxbow hatchery-IPC	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
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	2 June	634672	194,723	2,270	3,606	134	48.7			0
2008	S	2007	Couse Creek Direct [vs. CJ1 Accl]	28 May	634671	195,058	2,794	2,129	30,420	59.1			16,054
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 [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	10-15 June	612695	-	149,162	-	1,368	50.7			928
2008	S	2007	Snake R. below HC Dam-	6 May	107171	22,795	-	2,369	-	51.4			2,022

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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]
			Oxbow hatchery-IPC										
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC	6 May	103680	55,816	-	5,799	-	51.4			4,952
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC	6 May	107502	55,004	-	5,714	-	51.4			4,880
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC	6 May	107271	23,092	-	2,399	-	51.4			2,048
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC	6 May	104381	17,650	-	1,833	-	51.4			1,566
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC-	20-22 May	090136	142,500	-	627,850	-	44.0			64,436
2008	S	2007	Snake R. below HC Dam-Oxbow hatchery-IPC-										
2008	S	2007	Snake R at Couse Creek-Surrogates	19 May- 5 June	none	-	-	-	203,185	Unk			201,845
2008	S	2007	Clearwater R at BC-Surrogates	23 June-11 July	none	-	-	-	111,719	unk			105,444
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.]	26 May	634996	187,434	488	11,967	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

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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]
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	8 May	107582	64,892	-	7,289	-	54.7			5,090
2009	S	2008	Snake R. below HC Dam-Oxbow hatchery-IPC	8 May	107682	65,514	-	7,359	-	54.7			4,854
2009	S	2008	Snake R. below HC Dam-Oxbow hatchery-IPC	8 May	107482	51,950	-	5,836	-	54.7			4,900
2009	S	2008	Snake R. below HC Dam-Umatilla hatchery-IPC	12-14 May	090228	233,692	-	569,793	-	60.2			55,488
2009	S	2008	Snake R at Couse Creek-Surrogates	18 May-5 June	none	-	-	-	237,829	Unk			237,741
2009	S	2008	Clearwater R at BC-Surrogates	29 June-17 July	none	-	-	-	90,912	unk			90,039
2010	Y	2008	LFH	12-15 April	635166	250,814	169	2,542	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
2010	S	2009	LFH	25 May	635180	198,457	1,068	2,803	-	52.4			0
2010	S	2009	CJ1	24 May	220309	100,778	-	392	-	47.0			7,376
2010	S	2009	CJ1	24 May	220308	-	102,167	-	325,440	47.0			31,174

Appendix H. Table 1. 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]
2010	S	2009	BC1	25 May	220307	100,461	-	441	-	52.3			7,587
2010	S	2009	BC1	25 May	220306	-	101,207	-	309,127	52.3			30,855
2010	S	2009	PL1	24 May	220311	100,537	-	765	-	50.5			7,725
2010	S	2009	PL1	24 May	220310	-	100,619	-	203,120	50.5			23,162
2010	S	2009	Couse Creek Direct [vs. CJ1 Accl.]	24 May	635181	199,326	926	2,381	529	58.0			15,445
2010	S	2009	GRR Direct	24 May	635182	197,252	-	2,868	186,720	42.0			30,488
2010	S	2009	Snake R. below HC Dam-Oxbow hatchery-IPC	6 May	104383	50,433	-	401	-	47.0			0
2010	S	2009	Snake R. below HC Dam-Oxbow hatchery-IPC	6 May	100142	64,144	-	510	-	47.0			0
2010	S	2009	Snake R. below HC Dam-Oxbow hatchery-IPC	6 May	106482	61,977	-	493	-	47.0			0
2010	S	2009	Snake R. below HC Dam-Oxbow hatchery-IPC	6 May	none	-	-	14,844	-	47.0			14,731
2010	S	2009	Snake R. below HC Dam-Umatilla hatchery-IPC	25-27 May	090331	208,330	1,242	476,055	-	46.3			50,036
2010	S	2009	NPTH-Cedar Flats Accl.	14 June	612765	-	74,939	-	14,328	48.3			6,737
2010	S	2009	NPTH-Cedar Flats Accl.	14 June	612764	97,930	-	1,214	-	48.3			7,482
2010	S	2009	NPTH-Lukes Gulch Accl.	9 June	612747	-	99,116	-	415	44.4			8,208
2010	S	2009	NPTH-Lukes Gulch Accl.	9 June	612748	98,220	-	1,218	-	44.4			8,201
2010	S	2009	NPTH-North Lapwai Valley Accl.	14 May	220201	-	164,981	-	200,716	81.2			2,424
2010	S	2009	NPTH-North Lapwai Valley Accl.	14 May	220202	99,024	-	1,228	-	81.2			665
2010	S	2009	NPTH-Site 1705	7 June	220200	99,100	-	1,229	-	54.2			577
2010	S	2009	NPTH-Site 1705	7 June	612772	-	199,710	-	236,960	54.2			2509
2010	S	2009	Snake R at Couse Creek-Surrogates	17 May- 4 June	none				195,534				195,493
2010	S	2009	Clearwater R at BC-Surrogates	21 June- 9 July	none				113,162				112,577
2011	Y	2009	LFH	12-15 April	635564	226,621	462	308		9.9			14,657
2011	Y	2009	LFH	12-15 April	635510	-	236,175	-	163	9.9			15,233
2011	Y	2009	CJ1	1 April	220315	71,407	-	867	-	10.3			8,862
2011	Y	2009	CJ1	1 April	220314	-	80,830	-	1,482	10.3			10,092

Appendix H. Table 1. 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]
2011	Y	2009	BC1	14 April	220317	71,096	-	286	-	9.9			8,300
2011	Y	2009	BC1	14 April	220312	-	89,325	-	1,637	9.9			10,577
2011	Y	2009	PL1	12 April	220316	69,415	-	2,766	-	9.5			8,218
2011	Y	2009	PL1	12 April	220313	-	93,103	-	1,126	9.5			10,729

[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 I: Historical Size at Age of Return of CWT LSRCP Origin Fish Processed by WDFW

(Size at return of fish processed may not represent the full run depending upon trapping and sampling protocols. WDFW and LSRCP releases are included. Total age = Return year- brood year. Historical recoveries (1985-1987) of subyearling fall Chinook released from Hagerman National Fish hatchery are not included. Caution must be taken when comparing historical data because of changes in the program including addition of releases upstream of LGR Dam. Another item for consideration is the BY89 which was progeny from broodstock consisting of a large proportion of strays. Although the BY89 is presented in Appendix I, they were never used as broodstock when they returned.)

Appendix I Table 1. Size at age of return in 1985-1990 by sex for CWT LSRCP fish processed by WDFW that were part of yearling production.

Return Year	Sex		Total Age at Return					
			2(Minijack)	3(Jack)	4	5	6	7
1985	Male	N=	1870	-	-	-	-	-
		Median (cm)	**35**	**-**	**-**	**-**	**-**	**-**
		Range (cm)	29-53	-	-	-	-	-
	Female	N=	15	-	-	-	-	-
		Median (cm)	**35**	**-**	**-**	**-**	**-**	**-**
		Range (cm)	30-40	-	-	-	-	-
1986	Male	N=	48	636	-	-	-	-
		Median (cm)	**36**	**57**	**-**	**-**	**-**	**-**
		Range (cm)	31-40	37-70	-	-	-	-
	Female	N=	-	15	-	-	-	-
		Median (cm)	**-**	**63**	**-**	**-**	**-**	**-**
		Range (cm)	-	50-73	-	-	-	-
1987	Male	N=	240	88	553	-	-	-
		Median (cm)	**36**	**54**	**79**	**-**	**-**	**-**
		Range (cm)	29-45	40-64	41-100	-	-	-
	Female	N=	1	1	867	-	-	-
		Median (cm)	**-**	**-**	**78**	**-**	**-**	**-**
		Range (cm)	35	66	46-98	-	-	-
1988	Male	N=	225	239	55	110	-	-
		Median (cm)	**35**	**55**	**68**	**97**	**-**	**-**
		Range (cm)	26-43	35-66	55-93	55-111	-	-
	Female	N=	-	2	42	165	-	-
		Median (cm)	**-**	**-**	**74**	**88**	**-**	**-**
		Range (cm)	-	64-67	58-90	54-106	-	-
1989	Male	N=	81	226	203	21	3	-
		Median (cm)	**34**	**54**	**70**	**85**	**92**	**-**
		Range (cm)	30-46	33-66	44-93	63-105	84-94	-
	Female	N=	-	4	202	38	4	-
		Median (cm)	**-**	**64**	**75**	**82**	**93**	**-**
		Range (cm)	-	58-66	54-89	60-93	76-104	-
1990	Male	N=	293	75	71	57	2	-
		Median (cm)	**34**	**54**	**73**	**93**	**-**	**-**
		Range (cm)	28-40	43-62	58-93	62-102	103-109	-
	Female	N=	-	2	120	94	1	1
		Median (cm)	**-**	**-**	**75**	**83**	**-**	**-**
		Range (cm)	-	54-61	56-86	68-94	84	89

Appendix I Table 2. Size at age of return in 1991-1996 by sex for CWT LSRCP fish processed by WDFW that were part of yearling production.

Return			Total Age at Return					
Year	Sex		2(Minijack)	3(Jack)	4	5	6	7
1991	Male	N=	-	197	71	44	8	-
		Median (cm)	**-**	**52**	**73**	**94**	**89**	**-**
		Range (cm)	-	31-65	45-88	61-109	86-101	-
	Female	N=	-	2	123	89	9	-
		Median (cm)	**-**	**-**	**73**	**81**	**92**	**-**
		Range (cm)	-	57-74	60-86	56-95	79-103	-
1992	Male	N=	129	-	160	18	-	4
		Median (cm)	**34**	**-**	**73**	**89**	**-**	**88**
		Range (cm)	29-39	-	46-110	60-102	-	70-97
	Female	N=	-	-	241	31	1	3
		Median (cm)	**-**	**-**	**71**	**80**	**-**	**88**
		Range (cm)	-	-	55-90	68-88	85	79-94
1993	Male	N=	102	58	-	60	1	-
		Median (cm)	**33**	**51**	**-**	**85**	**-**	**-**
		Range (cm)	28-41	40-68	-	51-99	77	-
	Female	N=	-	2	-	102	-	-
		Median (cm)	**-**	**-**	**-**	**80**	**-**	**-**
		Range (cm)	-	53-75	-	67-94	-	-
1994	Male	N=	241	283	54	-	4	-
		Median (cm)	**35**	**53**	**75**	**-**	**83**	**-**
		Range (cm)	29-51	36-82	42-91	-	76-98	-
	Female	N=	-	4	86	-	10	-
		Median (cm)	**-**	**58**	**73**	**-**	**79**	**-**
		Range (cm)	-	57-63	58-86	-	67-92	-
1995	Male	N=	1781	230	26	122	-	-
		Median (cm)	**35**	**55**	**78**	**78**	**-**	**-**
		Range (cm)	22-47	41-72	51-90	57-105	-	-
	Female	N=	-	14	53	175	-	1
		Median (cm)	**-**	**61**	**75**	**75**	**-**	**-**
		Range (cm)	-	56-68	60-90	55-95	-	80
1996	Male	N=	380	374	238	18	2	-
		Median (cm)	**33**	**51**	**72**	**90**	**-**	-
		Range (cm)	27-47	37-66	54-98	77-105	77-83	-
	Female	N=	-	20	314	32	1	-
		Median (cm)	**-**	**60**	**74**	**83**	**-**	-
		Range (cm)	-	54-80	56-92	70-92	95	-

Appendix I Table 3. Size at age of return in 1997-2002 by sex for CWT LSRCP fish processed by WDFW that were part of yearling production.

Return Year	Sex		Total Age at Return					
			2(Minijack)	3(Jack)	4	5	6	7
1997	Male	N=	434	401	224	55	-	-
		Median (cm)	**34**	**50**	**70**	**90**	**-**	-
		Range (cm)	28-40	37-68	48-93	57-104	-	-
	Female	N=	-	-	347	116	2	-
		Median (cm)	**-**	**-**	**73**	**82**	**-**	-
		Range (cm)	-	-	55-89	57-97	77-102	-
1998	Male	N=	136	1770	289	136	2	-
		Median (cm)	**35**	**52**	**70**	**88**	**-**	-
		Range (cm)	22-43	33-73	45-97	56-121	96-98	-
	Female	N=	1	142	301	351	3	-
		Median (cm)	**-**	**57**	**73**	**84**	**77**	-
		Range (cm)	34	49-78	49-91	61-106	77-82	-
1999	Male	N=	358	394	570	42	10	-
		Median (cm)	**36**	**53**	**69**	**89**	**96**	-
		Range (cm)	30-49	37-70	45-95	63-104	76-108	-
	Female	N=	-	14	741	96	27	-
		Median (cm)	**-**	**61**	**72**	**85**	**89**	-
		Range (cm)	-	49-70	53-86	64-96	74-99	-
2000	Male	N=	410	1067	187	97	1	-
		Median (cm)	**36**	**59**	**70**	**88**	**-**	**-**
		Range (cm)	28-44	34-72	55-95	59-110	86	-
	Female	N=	-	109	293	249	4	-
		Median (cm)	**-**	**64**	**77**	**82**	**92**	**-**
		Range (cm)	-	54-74	54-89	58-94	91-92	-
2001	Male	N=	14	858	221	29	3	1
		Median (cm)	**34**	**57**	**75**	**91**	**97**	**78**
		Range (cm)	32-40	39-74	57-98	69-103	84-103	78
	Female	N=	-	60	614	111	13	-
		Median (cm)	**-**	**63**	**77**	**84**	**92**	-
		Range (cm)	-	52-76	55-95	65-98	79-100	-
2002	Male	N=	219	471	241	35	2	-
		Median (cm)	**35**	**55**	**74**	**98**	**85**	**-**
		Range (cm)	27-51	40-67	51-96	71-112	73-97	-
	Female	N=	-	6	505	94	3	-
		Median (cm)	**-**	**64**	**77**	**86**	**86**	**-**
		Range (cm)	-	60-80	51-93	73-97	84-87	-

Appendix I Table 4. Size at age of return in 2003-2008 by sex for CWT LSRCP fish processed by WDFW that were part of yearling production.

Return			Total Age at Return					
Year	Sex		2(Minijack)	3(Jack)	4	5	6	7
2003	Male	N=	690	846	232	24	-	-
		Median (cm)	**35**	**54**	**72**	**88**	**-**	-
		Range (cm)	27-53	31-78	47-90	62-105	-	-
	Female	N=	-	63	269	158	3	-
		Median (cm)	**-**	**62**	**76**	**83**	**90**	-
		Range (cm)	-	45-68	52-88	68-101	85-96	-
2004	Male	N=	329	1444	259	21	3	-
		Median (cm)	**36**	**59**	**69**	**95**	**99**	-
		Range (cm)	30-43	40-74	54-97	60-113	86-101	-
	Female	N=	-	249	513	104	4	-
		Median (cm)	**-**	**64**	**74**	**84**	**88**	-
		Range (cm)	-	44-84	57-91	65-98	70-95	-
2005	Male	N=	438	472	346	69	1	-
		Median (cm)	**36**	**58**	**71**	**84**	**-**	-
		Range (cm)	29-47	43-71	50-96	60-106	84	-
	Female	N=	-	55	917	192	7	-
		Median (cm)	**-**	**64**	**77**	**86**	**83**	-
		Range (cm)	-	50-82	52-90	61-95	74-90	-
2006	Male	N=	660	964	109	8	-	-
		Median (cm)	**35**	**59**	**71**	**75**	**-**	-
		Range (cm)	28-45	41-80	56-86	67-95	-	-
	Female	N=	-	125	266	88	8	-
		Median (cm)	**-**	**65**	**76**	**84**	**85**	-
		Range (cm)	-	49-74	60-88	70-99	74-96	-
2007	Male	N=	281	1759	285	5	-	-
		Median (cm)	**33**	**60**	**73**	**83**	**-**	-
		Range (cm)	27-56	42-79	52-98	76-92	-	-
	Female	N=	-	513	780	35	2	-
		Median (cm)	**-**	**63**	**76**	**83**	**-**	-
		Range (cm)	-	50-83	58-96	75-93	80-84	-
2008	Male	N=	1244	723	120	6	-	-
		Median (cm)	**35**	**57**	**75**	**82**	**-**	-
		Range (cm)	28-54	32-79	59-99	75-100	-	-
	Female	N=	-	75	494	58	-	-
		Median (cm)	**-**	**65**	**78**	**83**	**-**	-
		Range (cm)	-	57-80	60-97	62-92	-	-

Appendix I Table 5. Size at age of return in 2009 by sex for CWT LSRCP fish processed by WDFW that were part of yearling production.

Return Year	Sex		Total Age at Return					
			2(Minijack)	3(Jack)	4	5	6	7
2009	Male	N=	43	1293	130	5	-	-
		Median (cm)	**34**	**59**	**74**	**89**	**-**	**-**
		Range (cm)	29-42	39-75	56-92	76-96	-	-
	Female	N=	-	546	388	11	1	-
		Median (cm)	**-**	**65**	**77**	**85**	**80**	**-**
		Range (cm)	-	53-88	61-90	80-92	80	-

Appendix I Table 6: Size at age of return in 1985-1990 by sex for CWT LSRCP fish processed by WDFW that were part of subyearling production.

Return			Total Age at Return						
Year	Sex		1(Minijack)	2(Jack)	3[a]	4	5	6	7
1985	Male	N=	-	-	-	-	-	-	-
		Median (cm)	**-**	**-**	**-**	**-**	**-**	**-**	-
		Range (cm)	-	-	-	-	-	-	-
	Female	N=	-	-	-	-	-	-	-
		Median (cm)	**-**	**-**	**-**	**-**	**-**	**-**	-
		Range (cm)	-	-	-	-	-	-	-
1986	Male	N=	-	34	-	-	-	-	-
		Median (cm)	**-**	**45**	**-**	**-**	**-**	**-**	-
		Range (cm)	-	32-55	-	-	-	-	-
	Female	N=	-	-	-	-	-	-	-
		Median (cm)	**-**	**-**	**-**	**-**	**-**	**-**	-
		Range (cm)	-	-	-	-	-	-	-
1987	Male	N=	-	24	80	-	-	-	-
		Median (cm)	**-**	**44**	**65**	**-**	**-**	**-**	-
		Range (cm)	-	37-51	49-76	-	-	-	-
	Female	N=	-	-	37	-	-	-	-
		Median (cm)	**-**	**-**	**72**	**-**	**-**	**-**	-
		Range (cm)	-	-	58-81	-	-	-	-
1988	Male	N=	-	153	29	27	-	-	-
		Median (cm)	**-**	**45**	**61**	**88**	**-**	**-**	-
		Range (cm)	-	32-57	48-74	**62-100**	-	-	-
	Female	N=	-	-	2	32	-	-	-
		Median (cm)	**-**	**-**	**75**	**81**	**-**	**-**	-
		Range (cm)	-	-	74-76	66-99	-	-	-
1989	Male	N=	-	6	113	19	5	-	-
		Median (cm)	**-**	**44**	**63**	**81**	**100**	**-**	-
		Range (cm)	-	43-50	41-76	57-95	96-105	-	-
	Female	N=	-	-	42	48	5	-	-
		Median (cm)	**-**	**-**	**72**	**81**	**85**	**-**	-
		Range (cm)	-	-	59-79	58-92	74-93	-	-
1990	Male	N=	-	6	8	50	17	-	-
		Median (cm)	**-**	**49**	**63**	**92**	**101**	**-**	**-**
		Range (cm)	-	45-55	50-70	57-101	83-110	-	-
	Female	N=	-	-	3	105	16	-	-
		Median (cm)	**-**	**-**	**63**	**84**	**92**	**-**	**-**
		Range (cm)	-	-	59-69	62-99	65-103	-	-

[a] Age 3 subyearlings include reservoir reared jacks (1-salt).

Appendix I Table 7: Size at age of return in 1991-1996 by sex for CWT LSRCP fish processed by WDFW that were part of subyearling production. (Fish highlighted in red were returns of BY89 subyearlings, progeny of broodstock with a high stray component)

Return			Total Age at Return						
Year	Sex		1(Minijack)	2(Jack)	3[a]	4	5	6	7
1991	Male	N=	-	45	10	4	19	1	-
		Median (cm)	**-**	**46**	**63**	**77**	**101**	**-**	**-**
		Range (cm)	-	40-56	49-95	72-88	84-109	98	-
	Female	N=	-	-	3	11	31	1	-
		Median (cm)	**-**	**-**	**70**	**80**	**90**	**-**	**-**
		Range (cm)	-	-	68-73	68-89	73-98	92	-
1992	Male	N=	-	24	59	3	-	-	-
		Median (cm)	**-**	**68**	**67**	**80**	**-**	**-**	**-**
		Range (cm)	-	40-54	48-79	70-83	-	-	-
	Female	N=	-	-	21	14	-	2	1
		Median (cm)	**-**	**-**	**71**	**76**	**-**	**-**	**-**
		Range (cm)	-	-	61-84	61-88	-	79-99	92
1993	Male	N=	-	-	42	23	-	-	-
		Median (cm)	**-**	**-**	**69**	**84**	**-**	**-**	**-**
		Range (cm)	-	-	58-85	68-99	-	-	-
	Female	N=	-	-	20	44	2	-	-
		Median (cm)	**-**	**-**	**71**	**80**	**-**	**-**	**-**
		Range (cm)	-	-	62-79	72-89	66-87	-	-
1994	Male	N=	-	134	-	27	4	-	-
		Median (cm)	**-**	**45**	**-**	**86**	**89**	**-**	**-**
		Range (cm)	-	36-54	-	69-101	83-103	-	-
	Female	N=	-	-	-	67	7	-	-
		Median (cm)	**-**	**-**	**-**	**81**	**88**	**-**	**-**
		Range (cm)	-	-	-	71-90	82-92	-	-
1995	Male	N=	-	-	180	-	8	1	-
		Median (cm)	**-**	**-**	**64**	**-**	**103**	**-**	**-**
		Range (cm)	-	-	46-87	-	88-107	104	-
	Female	N=	-	-	79	-	19	-	-
		Median (cm)	**-**	**-**	**69**	**-**	**89**	**-**	**-**
		Range (cm)	-	-	54-78	-	82-102	-	-
1996	Male	N=	-	-	-	68	-	1	-
		Median (cm)	**-**	**-**	**-**	**82**	**-**	**-**	**-**
		Range (cm)	-	-	-	54-102	-	103	-
	Female	N=	-	-	-	126	-	-	-
		Median (cm)	**-**	**-**	**-**	**79**	**-**	**-**	**-**
		Range (cm)	-	-	-	62-90	-	-	-

[a] Age 3 subyearlings include reservoir reared jacks (1-salt).

Appendix I Table 8: Size at age of return in 1997-2002 by sex for CWT LSRCP fish processed by WDFW that were part of subyearling production.

Return			Total Age at Return						
Year	Sex		1(Minijack)	2(Jack)	3[a]	4	5	6	7
1997	Male	N=	-	-	-	-	5	-	-
		Median (cm)	**-**	**-**	**-**	**-**	**107**	**-**	**-**
		Range (cm)	-	-	-	-	76-121	-	-
	Female	N=	-	-	-	-	12	-	-
		Median (cm)	**-**	**-**	**-**	**-**	**87**	**-**	**-**
		Range (cm)	-	-	-	-	75-93	-	-
1998	Male	N=	-	69	-	-	-	-	-
		Median (cm)	**-**	**46**	**-**	**-**	**-**	**-**	**-**
		Range (cm)	-	35-58	-	-	-	-	-
	Female	N=	-	-	-	-	-	-	-
		Median (cm)	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		Range (cm)	-	-	-	-	-	-	-
1999	Male	N=	-	-	146		-	-	-
		Median (cm)	**-**	**-**	**62**		**-**	**-**	**-**
		Range (cm)	-	-	44-89		-	-	-
	Female	N=	-	-	45		-	-	-
		Median (cm)	**-**	**-**	**70**		**-**	**-**	**-**
		Range (cm)	-	-	60-76		-	-	-
2000	Male	N=	-	634		37	-	-	-
		Median (cm)	**-**	**46**	**-**	**80**	**-**	**-**	**-**
		Range (cm)	-	34-64	-	57-94	-	-	-
	Female	N=	-	-	-	101	-	-	-
		Median (cm)	**-**	**-**	**-**	**80**	**-**	**-**	**-**
		Range (cm)	-	-	-	59-91	-	-	-
2001	Male	N=	-	515	567	-	3	-	-
		Median (cm)	**-**	**46**	**66**	-	**99**	**-**	**-**
		Range (cm)	-	32-62	42-89	-	93-100	-	-
	Female	N=	-	-	375	-	26	-	-
		Median (cm)	**-**	**-**	**70**	**-**	**88**	**-**	**-**
		Range (cm)	-	-	57-87	-	75-93	-	-
2002	Male	N=	-	181	434	144	-	-	-
		Median (cm)	**-**	**43**	**65**	**83**	**-**	**-**	**-**
		Range (cm)	-	35-55	40-91	60-101	-	-	-
	Female	N=	-	-	130	499	-	-	-
		Median (cm)	**-**	**-**	**71**	**82**	**-**	**-**	**-**
		Range (cm)	-	-	55-81	50-99	-	-	-

[a] Age 3 subyearlings include reservoir reared jacks (1-salt).

Appendix I Table 9: Size at age of return in 2003-2008 by sex for CWT LSRCP fish processed by WDFW that were part of subyearling production.

Return			Total Age at Return						
Year	Sex		1(Minijack)	2(Jack)	3[a]	4	5	6	7
2003	Male	N=	-	148	63	33	3	-	-
		Median (cm)	**-**	**43**	**64**	**80**	**100**	**-**	**-**
		Range (cm)	-	32-54	47-78	67-100	98-108	-	-
	Female	N=	-	-	11	91	21	-	-
		Median (cm)	**-**	**-**	**70**	**82**	**90**	**-**	**-**
		Range (cm)	-	-	63-73	65-97	78-97	-	-
2004	Male	N=	-	73	162	4	-	-	-
		Median (cm)	**-**	**50**	**62**	**72**	**-**	**-**	**-**
		Range (cm)	-	34-58	41-78	57-73	-	-	-
	Female	N=	-	-	41	27	10	-	-
		Median (cm)	**-**	**-**	**68**	**81**	**87**	**-**	**-**
		Range (cm)	-	-	56-77	51-88	59-99	-	-
2005	Male	N=	-	39	39	22	2	-	-
		Median (cm)	**-**	**47**	**65**	**74**	**-**	**-**	**-**
		Range (cm)	-	38-58	51-78	62-93	70-100	-	-
	Female	N=	-	-	16	61	4	2	-
		Median (cm)	**-**	**-**	**70**	**79**	**87**	**-**	**-**
		Range (cm)	-	-	65-81	70-89	86-94	82-88	-
2006	Male	N=	-	38	26	4	1	-	-
		Median (cm)	**-**	**48**	**63**	**85**	**-**	**-**	**-**
		Range (cm)	-	38-56	56-76	69-91	80	-	-
	Female	N=	-	-	14	16	12	2	-
		Median (cm)	**-**	**-**	**73**	**80**	**84**	**-**	**-**
		Range (cm)	-	-	63-81	73-89	65-95	87-89	-
2007	Male	N=	-	520	31	2	-	-	-
		Median (cm)	**-**	**48**	**68**	**-**	**-**	**-**	**-**
		Range (cm)	-	34-57	53-82	69-83	-	-	-
	Female	N=	-	-	16	16	3	-	-
		Median (cm)	**-**	**-**	**70**	**79**	**81**	**-**	**-**
		Range (cm)	-	-	67-75	73-87	77-86	-	-
2008	Male	N=	-	75	376	1	1	-	-
		Median (cm)	**-**	**48**	**68**	**65**	**89**	**-**	**-**
		Range (cm)	-	31-55	46-85	65	89	-	-
	Female	N=	-	-	176	5	-	-	-
		Median (cm)	**-**	**-**	**73**	**78**	**-**	**-**	**-**
		Range (cm)	-	-	55-82	69-85	-	-	-

[a] Age 3 subyearlings include reservoir reared jacks (1-salt).

Appendix I Table 10: Size at age of return in 2009 by sex for CWT LSRCP fish processed by WDFW that were part of subyearling production.

Return			Total Age at Return						
Year	Sex		1(Minijack)	2(Jack)	3[a]	4	5	6	7
2009	Male	N=	-	611	17	28	-	-	-
		Median (cm)	**-**	**48**	**67**	**78**	**-**	**-**	**-**
		Range (cm)	-	39-61	52-80	63-107	-	-	-
	Female	N=	-	-	16	102	-	-	-
		Median (cm)	**-**	**-**	**73**	**83**	**-**	**-**	**-**
		Range (cm)	-	-	65-80	70-94	-	-	-

[a] Age 3 subyearlings include reservoir reared jacks (1-salt).

Appendix J: Tucannon River Survey Sections and Historical Escapement

Error! Reference source not found.**Appendix J 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, 2010.**

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	56
2	Highway 261 Bridge to Smolt trap	0.2	0.2	100	7
3	Smolt trap to Powers Bridge	0.5	0.5	100	35
4	Powers Bridge to upper hog barns	1.2	1.2	100	50
5	Hog barns to Starbuck Br.	2.5	2.4	96	49
6	Starbuck Br. To Fletchers Dam	2.7	1.3	48	48
7	Fletcher's Dam to Smith Hollow	2.9	2.9	100	21
8	Smith Hollow to Ducharme's Sheep Ranch Br.	4.4	4.4	100	24
9	Ducharme's Bridge to Highway 12	5.5	5.5	100	25
10	Highway 12 to Brines Bridge	6.2	6.2	100	9
11	Brines Bridge to 4.7 Rkm above Brines Bridge	4.7	4.7	100	0
	Total	**33.6**	**31.0**	**95**	**324**

[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 J 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, 1985-2000.

	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

[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 K: Salmon Processed and killed at LFH in 2010

(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 K Table 1. Estimated composition of non-wire tagged salmon trapped and killed at LFH during 2010.

Age/Origin Determinations by Method	<53cm Males	Males	Females	Grand Total
Snake R. hatchery LR only yearling age 5	0	0	1	1
Unknown hatchery AD sub age 3 by scales	0	5	0	5
Unknown hatchery yearling age 5 by scales	0	1	0	1
Unknown hatchery age/origin by AD clip	1	1	0	2
Unknown origin sub age 3 by scales	0	8	3	11
Unknown age/origin (Presume hatchery)	0	0	4	4
Total	**1**	**15**	**8**	**24**

Appendix K Table 2. Estimated composition of wire tagged fall salmon trapped and killed at LFH during 2010.

Program	Origin/CWT	CWT	<53 cm Males	Males	Females	Grand Total
Bonneville/Umatilla	09BLANK	09BLANK	0	5	2	7
Umatilla	UMA06YUMA	094506	0	0	1	1
	UMA07SUMA	090134	0	1	0	1
		090135	0	1	1	2
LSRCP	LF04YO	633284	0	1	0	1
	LF05YO	633597	0	0	3	3
		633598	0	3	5	8
	LF06SO	633986	0	0	1	1
	LF06YBCA	612513	0	1	0	1
		612516	0	1	0	1
		612514	0	1	0	1
	LF06YO	633987	0	34	88	122
		634092	0	52	91	143
	LF07SBCA	612517	0	1	0	1
	LF07SPLA	612519	0	1	0	1
	LF07SIPCHC	090136	0	1	0	1
	LF07SO	634672	0	11	4	15
	LF07YO	634680	0	30	2	32
		634681	1	17	6	24
	LF08YO	635165	9	0	0	9
		635166	6	1	0	7
	LOST TAG	unknown age	0	3	5	8
		Total	**16**	**165**	**209**	**390**

Appendix K. Table 3. Estimated composition of non-wire tagged salmon trapped at LGR Dam that were hauled to LFH and killed during 2010.

Age/Origin Determinations by Method	<53cm Males	Males	Females	Grand Total
Snake R. Natural sub age 3 by PIT tag	0	3	0	3
Snake R. Natural res rear age 4 by PIT tag	0	0	1	1
Snake R. hatchery LR only yearling age 4	0	1	1	2
Snake R. hatchery res rear age 3 by PIT tag	0	8	0	8
Snake R. hatchery res rear age 5 by PIT tag	0	0	2	2
Snake R. hatchery sub age 2 by PIT tag	1	1	0	2
Snake R. hatchery sub age 3 by PIT tag	0	199	93	292
Snake R. hatchery sub age 5 by PIT tag	0	0	2	2
Snake R. hatchery yearling age 4 by PIT tag	0	0	1	1
Unknown Snake R., res rear age 3 by PIT tag	0	3	1	4
Unknown Snake R., res rear age 4 by PIT tag	0	9	14	23
Unknown Snake R., sub res rear age 4 by PIT tag	0	1	4	5
Unknown Snake R., sub age 3 by PIT tag	0	2	0	2
Unknown Snake R., sub age 4 by PIT tag	0	8	4	12
Unknown Snake R., sub age 5 by PIT tag	0	0	1	1
Unknown Snake R., unknown age by PIT tag	0	1	0	1
Unknown hatchery AD sub age 3 by scales	0	96	82	178
Unknown hatchery AD sub age 4 by scales	0	0	2	2
Unknown hatchery AD sub age 5 by scales	0	0	4	4
Unknown hatchery age/origin by AD clip	0	7	12	19
Unknown hatchery yearling age 4 by scales	0	3	3	6
Unknown hatchery yearling age 5 by scales	0	0	1	1
Unknown origin res rear age 3 by scales	0	6	0	6
Unknown origin res rear age 4 by scales	0	29	37	66
Unknown origin res rear age 5 by scales	0	2	6	8
Unknown origin sub res rear age 3 by scales	0	0	1	1
Unknown origin sub res rear age 4 by scales	0	2	3	5
Unknown origin sub res rear age 5 by scales	0	2	1	3
Unknown origin sub age 2 by scales	1	1	0	2
Unknown origin sub age 3 by scales	0	236	123	359
Unknown origin sub age 4 by scales	0	22	35	57
Unknown origin sub age 5 by scales	0	13	23	36
Unknown age/origin (Presume hatchery)	0	21	34	55
Total	**2**	**676**	**491**	**1,169**

Appendix K Table 4. Estimated composition of wire tagged salmon that were trapped at LGR, hauled to LFH, and killed during 2010.

Origin/CWT	CWT	<53 cm Males	Males	Females	Grand Total
STRAY unknown age	09BLANK	0	13	33	46
KLICK05SO	633578	0	0	1	1
UMA06YUMA	094505	0	1	3	4
	094506	0	0	3	3
UMA07SUMA	090132	0	1	0	1
	090133	0	2	1	3
	090134	0	12	8	20
	090135	0	9	7	16
UMA08SUMA	090223	1	1	0	2
	090226	1	1	0	2
LF05SBCA	610174	0	0	1	1
LF05SCCD1	633583	0	0	2	2
LF05SCJA	610177	0	0	2	2
LF05SGRRD	633584	0	1	0	1
LF05SIPCPLA	108977	0	0	1	1
LF05SO	633582	0	1	1	2
LF05YBC	612507	0	0	2	2
LF05YO	633597	0	1	3	4
	633598	0	0	5	5
LF05YPLA	612510	0	0	2	2
LF06SCJA	612728	0	0	1	1
LF06SIPCHC	103880	0	0	1	1
LF06SO	633986	0	0	2	2
LF06YBCA	612513	0	7	18	25
	612516	0	10	30	40
LF06YCJA	612511	0	9	28	37
	612514	0	8	41	49
LF06YO	633987	0	17	78	95
	634092	2	11	91	104
LF06YPLA	612512	0	2	15	17
	612515	0	6	26	32
LF07SBCA	612517	1	31	19	51
	612520	0	20	16	36
LF07SCCD	634671	0	28	32	60
LF07SCJA	612518	0	30	18	48
	612521	0	8	10	18
LF07SGRRD	634670	0	17	7	24
LF07SICPHC	090136	0	52	61	113
	103680	0	15	15	30
	104381	0	6	9	15
	107171	0	4	10	14
	107271	0	2	2	4
	107502	0	14	11	25
LF07SO	634672	0	39	35	74

Appendix K Table 4. Estimated composition of wire tagged salmon that were trapped at LGR, hauled to LFH, and killed during 2010.

Origin/CWT	CWT	<53 cm Males	Males	Females	Grand Total
LF07SPLA	612519	0	12	25	37
	612522	0	17	18	35
LF07YBCA	612750	2	8	0	10
	612753	0	9	0	9
LF07YCJA	612752	1	18	1	20
	612755	0	9	0	9
LF07YO	634680	4	43	4	51
	634681	2	48	7	57
LF07YPLA	612751	0	4	1	5
	612754	1	5	0	6
LF08SBCA	610179	3	4	0	7
	610182	4	1	0	5
LF08SCCD	634996	3	3	0	6
LF08SCJA	610180	4	3	0	7
	610183	3	0	0	3
LF08SGRRD1	634997	6	0	0	6
LF08SGRRD2	612676	4	0	0	4
LF08SICPHC	090228	1	2	0	3
	107482	1	0	0	1
	107682	0	1	0	1
LF08SO	634995	6	2	0	8
LF08SPLA	610181	1	3	0	4
	610184	0	1	0	1
LF08YBCA	220302	6	0	0	6
	220303	5	1	0	6
LF08YCJA	220300	32	1	0	33
	220305	36	0	0	36
LF08YO	635165	5	0	0	5
	635166	11	0	0	11
LF08YPLA	220301	14	0	0	14
	220304	10	0	0	10
NPTH05SCFA	612653	0	0	1	1
NPTH05SNLVA	612671	0	0	1	1
	612707	0	0	1	1
NPTH05SO	612698	0	0	1	1
	612709	0	0	1	1
NPTH06SCFA	612734	0	0	1	1
NPTH06SNLVA	612710	0	0	1	1
NPTH06SO	612696	0	0	3	3
	612699	0	0	4	4
NPTH07SCFA	612736	0	15	5	20
NPTH07SLGA	612737	0	19	16	35
NPTH07SNLVA	612694	1	39	19	59
NPTH07SO	612695	0	12	5	17

Appendix K Table 4. Estimated composition of wire tagged salmon that were trapped at LGR, hauled to LFH, and killed during 2010.

Origin/CWT	CWT	<53 cm Males	Males	Females	Grand Total
NPTH07SO	612716	0	19	11	30
NPTH08SCFA	612760	5	0	0	5
NPTH08SLGA	612762	5	0	0	5
	612763	3	1	0	4
NPTH08SNLVA	612738	2	0	0	2
	612766	1	0	0	1
NPTH08SO	612697	1	0	0	1
	612739	3	1	0	4
LOST TAG	Lost Tag	1	7	10	18
TAG CUT SHORT	Tag Cut Short	1	0	0	1
TAG SCRATCHED	Unreadable	0	3	1	4
COHO08CLW	612775	1	0	0	1
Total		**194**	**690**	**788**	**1,672**

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