Lyons Ferry Hatchery Evaluation
Fall Chinook Salmon
Annual Report: 2017

by

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F14AC00010

August 2019

Citation of this publication: Oakerman, A., Bumgarner, J. and S. Golden. 2019. Lyons Ferry Hatchery Evaluation Fall Chinook Salmon Annual Report: 2017. Washington Department of Fish and Wildlife, Olympia, WA.
http://www.fws.gov/lsnakecomplan/reports/WDFWreports.html

Executive Summary

This report summarizes activities by the Washington Department of Fish and Wildlife's (WDFW) Lyons Ferry Hatchery (LFH) Evaluation Fall Chinook Salmon Program to include subyearling releases and spawning in 2017 as well as yearling and subyearling releases in 2018.

During 2017, WDFW collected 2,236 fish at Lower Granite Dam (LGR) and 169 fish at LFH for broodstock, monitoring and evaluation of our hatchery releases, and to estimate the run composition at LGR. Staff spawned 1,285 females for an estimated total green eggtake of 4,685,575; numerically more than full production goals listed in the 2008-2017 *United States v. Oregon* Management Agreement, but well within precision levels expected from large production hatcheries. At the end of the season, 33 females and 40 males were returned to the Snake River to spawn naturally. Green egg to eye-up survival was 93.2%. Based on hatchery records, overall average fecundity of females from LGR was 3,612, and 3,252 from those trapped at LFH. At LFH, of the 655 males spawned, 410 fish were used multiple times as a requirement of the permitting to minimize the use of jacks, and to incorporate larger/older fish in the broodstock. The estimated proportion of natural origin fish in broodstock (pNOB) (as determined from run-reconstruction methodologies) in the LFH broodstock was 26%. The pNOB estimated in the LFH broodstock from Parental Based Tagging (PBT) sampling of the broodstock was 35.2%, with the difference created by the multiple use of unmarked/untagged males, some of which are natural origin and therefore contributing to the higher pNOB rate in the broodstock.

In 2017, fork lengths in both yearling and subyearling adult returns were highly variable and there was considerable overlap between each of the salt water ages. Normally, adults/jacks from yearling production have been consistently larger than subyearlings at the same salt water age. Females from both yearling and subyearling programs consistently return at greater lengths than males of the same salt water age class. Minijacks (0-salt) comprised 2.6% of the total return; all from yearling releases. Yearling releases returned 1-salt jacks (41.3%) and jills (3.6%), while subyearlings returned no jills, and 4.4% returned as 1-salt jacks.

Hatchery staff released BY16 and BY 17 subyearlings into the Snake River at LFH and into the Grande Ronde River (GRR) near Cougar Creek in 2017 and 2018, and BY16 yearlings were released into the Snake River at LFH in 2018. All WDFW release groups (subyearling and yearling) were represented by a coded wire tag (CWT) group as identified in the *US v. Oregon* production tables, and also received passive integrated transponder (PIT) tags. PIT tags were present in 25,493 of the released onstation yearlings (BY16), 19,995 of the released subyearlings (BY16), and 20,000 of the released subyearlings (BY17); all of which will be used to monitor adult and jack returns in-season, monitor overshoot rates to LGR, and potentially to estimate total contribution to the Lower Snake River Compensation Plan (LSRCP) area (above Ice Harbor Dam). GRR releases were represented by 3,000 PIT tags in each release year.

Beginning 29 October 2017, staff conducted fall Chinook salmon redd surveys. A total of 229 redds (Chinook and coho) were counted and an additional 27 redds were estimated due to landowner restrictions resulting in 226 fall Chinook redds and 30 coho redds. Based on three fish/redd, the estimated number of fall Chinook spawners in the Tucannon River in 2017 was

678. Of the estimated total fall Chinook spawning escapement, 9.2% were recovered and sampled.

In Spring 2017 and 2018, a smolt trap was operated on the Tucannon River to estimate juvenile production of fall Chinook salmon, as well as other species. Captures of fall Chinook salmon were expanded by trapping efficiencies and for redds that occur below the smolt trap location. The total estimate of fall Chinook salmon emigrating from the Tucannon River was 7,907, and 30,491 in 2017 and 2018, respectively. Productivity (smolts per redd) from 2016BY and 2017BY spawning was estimated at 29 smolts per redd, and 93 smolts per redd, respectively.

The estimated run size of natural origin fall Chinook salmon to reach LGR was 6,930 fish $\geq$ 57 cm fork length and 641 fish 30 cm to <57 cm fork length. The remaining portion of the run consisted of 17,853 fish $\geq$ 57 cm fork length and 3,229 fish 30 cm to < 57 cm fork length, all hatchery origin from LFH, the Fall Chinook Acclimation Project (FCAP), Idaho Power Company (IPC), and Nez Perce Tribal Hatchery (NPTH) releases. The stray rate of out of basin fish to LGR in 2017 was estimated at 0.7%.

We estimate that a minimum of 11,101 fish released by WDFW or (12.1%) of the total LSRCP downriver mitigation objective (91,500 fish) was met in 2017. This estimate includes returns to the Snake River and fully expanded harvest recoveries outside of the Snake River.

WDFW releases contributed 3,294 jacks/jills and 4,785 adults (44.1%) of the LSRCP escapement goal (18,300 hatchery fish) to the Snake River Basin in 2017. An additional 240 minijacks (0-salt) were also estimated to have returned to the Snake River, but do not count toward the mitigation goal.

Fall Chinook salmon reared at LFH and released into the Snake River at LFH or near Couse Creek (CCD) in the mainstem Snake River, and into the GRR contributed to harvest outside the Snake River Basin in both sport (1,346) and commercial/tribal fisheries (2,911) in 2017. WDFW released fish were also recovered at hatcheries (one at Priest Rapids and four at Bonneville), one at Three Mile Dam fish trap on the Umatilla River and on spawning grounds (13 in the Columbia River at Hanford reach and four in the Similkameen River) outside of the Snake River Basin. Of the total number of fish recovered outside of the Snake River, 68.0% came from commercial/tribal fisheries, 31.4% from sport fisheries, 0.4% from spawning ground surveys, 0.1% were from hatcheries and 0.02% from fish traps.

The top five catch areas for yearlings (Y) and subyearlings (S) returning in 2017 were located in the Columbia River (Y=44.4%, S=49.4%), in the ocean off the coasts of British Columbia (Y=24.0%, S=23.0%), Washington (Y=23.0%, S=17.4%), Oregon (Y=6.7%, S=6.8%) and Alaska (Y=1.8%, S=5.8%). Overall, the single largest fishery was the Zone 6 Gillnet fishery (which harvested 25.6% of all the fish recovered outside of the Snake River Basin), and the catch consisted primarily of fish released as yearlings.

Two methodologies for estimating returns to the Snake River were compared; PIT tags and CWTs released from LFH. In 2017, yearling 0-salt through 2-salt returns had PIT tag estimates that were 1.9 times greater than the CWT estimates for the same age groups. For all years combined, PIT tagged returns of yearling fall Chinook salmon released at LFH estimated on

average 3.0, 1.3, and 1.1 times greater returns of 0-salt, 1-salt, and 2+ salt fish, respectively. Results for subyearlings have been the opposite. For all years combined, PIT tag returns were 0.8 and 0.9 times less for 1-salt and 2+salt fish, respectively, than estimated by using CWTs. Overall, it would appear that both methods produce comparable results.

Endangered Species Act (ESA) section 10 (a)(1)(A) Permit # 16607 was revised in June 2015 and is now referred to as permit # 16607 (amended). Overall we were within allowances of direct take of listed Snake River fall Chinook salmon for adult returns in 2017 and juvenile releases in 2018.

Acknowledgments

The Lyons Ferry Fall Chinook Salmon Hatchery Evaluation Program is the result of work by many individuals within the WDFW Fish Program. We want to thank all those who contributed to this program.

We would like to thank the Snake River Lab staff: Joe Bumgarner, Jerry Dedloff, Michael Gallinat, Jule Keller, Lance Ross, Dan Olson, and staff from the Dayton Fish Management office for their help in collecting the data.

We thank the personnel at LFH for their cooperation with sampling and providing information regarding hatchery operations. Thanks also to John Sneva (WDFW) for aging scales collected at LFH and LGR for the run reconstruction and broodstock aging.

We appreciate the efforts of Darren Ogden (NOAA Fisheries) and crew at LGR for trapping, tagging, and documenting fall Chinook salmon for transport to LFH. We also thank Allan Martin (COE) for providing summarized fallback data from the juvenile collection facility at LGR. We also thank Bill Young (NPT), Stuart Rosenberger (Idaho Power) for their assistance in estimating the run composition estimate at LGR in 2017, and Ben Sandford (NOAA) for bootstrapping the data to get bounds around the estimates.

We thank Joe Bumgarner, Alf Haukenes, and Rod Engle for reviewing a draft of this report and providing valuable comments.

Finally, we thank the U.S. Fish and Wildlife Service, Lower Snake River Compensation Plan Office, for providing funding and encouragement for this program.

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Introduction

Program Objectives

This report summarizes activities by the Washington Department of Fish and Wildlife's (WDFW) Lyons Ferry Hatchery (LFH) Fall Chinook Salmon Evaluation Program to include subyearling releases and spawning in 2017 as well as yearling and subyearling releases in 2018. WDFW's Snake River Lab (SRL) evaluation staff completed this work with federal fiscal year 2017/2018 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 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 (Fall Chinook Acclimation Project – FCAP) 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. 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 (HCD) 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 fall Chinook salmon 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 salmon goals and/or assumed objectives as stated in the LSRCP mitigation document.

Component	Number of adults [a]
Escapement to project area goal	18,300
Commercial harvest objective	54,900
Recreational harvest objective	18,300
Total hatchery fish	**91,500**
Maintain natural origin population	**14,363**

[a] As defined in the LSRCP document, "adults" include adults and jacks, but not minijacks.

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 what was originally assumed, and this has resulted in fewer adults being produced.
- The listing of Snake River fall Chinook salmon and Snake River steelhead under the Endangered Species Act (ESA) 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 Snake River fall Chinook salmon. Two of the programs, LSRCP(includes LFH and FCAP) and NPTH, are integrated programs aimed at increasing natural-origin fish abundance and harvest using supplementation and harvest mitigation releases, respectively. Fish released at LFH and FCAP facilities consist of both subyearling and yearling life stages, while NPTH releases are subyearlings only. Information about the NPTH is presented in NPT annual reports and is not presented here. The third program administered by IPC is primarily mitigation for lost production due to construction of the Hells Canyon Complex (HCC), and consists of subyearling releases. Releases occur at 10 locations throughout the Snake River basin, with most releases located above Lower Granite Dam (LGR). The three programs are highly coordinated in their operations,

[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 (MCN) 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.

including broodstock collection at LGR and fish transfers among facilities. One out of basin hatchery facility is used (Irrigon Hatchery) 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 and Hesse 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/tagged in some manner, with ~ 50% marked with an adipose fin clip. If changes to marking/tagging occurs, there is a notification process that needs to be followed per the permit #16607 issued from NOAA-Fisheries and amended in 2015 (NMFS 2015).

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

- The goal LSRCP program is to mitigate for decreased numbers of fall Chinook salmon 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 action taken for the LSRCP fall Chinook salmon 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 salmon program has been a conservation effort from the beginning.

- 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.

- The immediate goal of the FCAP is a concerted effort to ensure that the Snake River fall Chinook salmon above LGR 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

    1. Increase the natural population of Snake River fall Chinook salmon spawning above LGR.
    2. Sustain long-term preservation and genetic integrity of this population.
    3. Keep the ecological and genetic impacts of non-target fish populations within acceptable limits.
    4. Assist with the recovery of Snake River fall Chinook salmon.
    5. Provide harvest opportunities for both tribal and non-tribal anglers.

- 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 and the co-managers. The LSRCP program at LFH has been guided by the following objectives:

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

While recognizing the overarching purpose and goals established for the LSRCP and 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 v. Oregon* Management Agreement.

3. Spawn enough fish to retain 4.45 million eggs (WDFW 2017) to assure that production goals as stated in 2008–2017 *US v. Oregon* Management Agreement are met. Fecundities vary annually depending upon return age classes, but generally 1,300 spawned females make production 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), and estimate the numbers of natural origin fish escaping to spawn above LGR. To accomplish this, an additional 1,300-2,000 CWT fish must be recovered for run reconstruction at LGR.

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

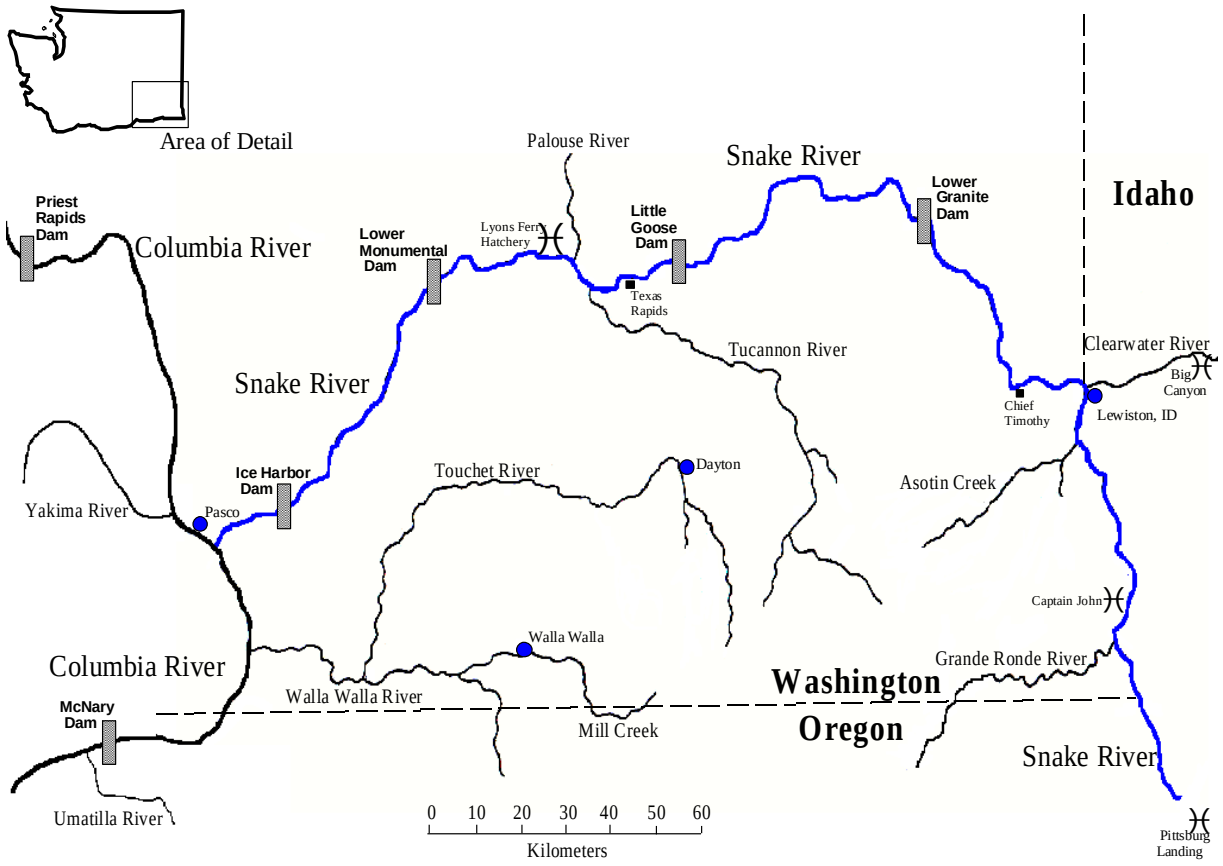
- The long-term total return goal is for a total return 24,750 hatchery-origin fish above LMO, which is comprised of 18,300 from LSRCP, 3,750 from NPTH, and 2,700 for IPC.

Natural-Origin Return Goals

- Achieve Endangered Species Act (ESA) delisting by attaining interim population abundance in the Snake River Evolutionary Significant Unit (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 short-term restoration goal is to achieve a population of 7,500 natural-origin fall Chinook (adults and jacks) salmon above LMO.

- Long term restoration goal is to achieve a population of 14,363 natural-origin fall Chinook (adults and jacks) salmon above LMO.



Rkm	Location
0.0	Snake River mouth
16.1	Ice Harbor Dam
66.9	Lower Monumental Dam
95.1	Lyons Ferry Hatchery
105.2	Texas Rapids Boat Launch
113.1	Little Goose Dam
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, acclimation sites, and major tributaries in the area.

Broodstock Collection and Management 2017

Fall Chinook salmon are collected at LGR for broodstock (Appendix A). Each year there is adiscrepancy between estimated numbers of fish collected and the numbers of fish processed/killed (Table 2). The discrepancies (<1.9%) are likely data recording errors.

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 are shunted back to the river and never used for broodstock. There was no incidental trapping of ESA-listed adult steelhead, spring Chinook salmon or sockeye salmon at LFH in 2017.

Table 2. Numbers of fall Chinook initially collected at LGR for broodstock, evaluation, and run construction needs in 2017.

Year	Trap location	Number collected/hauled for broodstock	Processed (killed)	Returned to Snake River	Difference from number collected/hauled
2017	LFH	169	169	0	0
	LGR	2,236	2,205	73	-42

Lower Granite Dam Trapping Operations

In 2017, fall Chinook trapping and hauling at LGR began 18 August. Trapping rates varied throughout the season (18 Aug – 12 Sept = 20%, 13-21 Sept = 33%, 22 Sept – 19 Nov = 20%) The arrival timing of males and females collected for broodstock at LGR and hauled to LFH is provided (Figure 2). Broodstock goals were met early on in 2017, but trapping continued throughout the run. 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, and gather length, sex, fin clip, and the presence of wire or PIT tag. Of the 8,473 salmon trapped at LGR, approximately 26.4% were hauled to LFH and 11.5% were hauled to NPT for the fall Chinook salmon broodstock program and run reconstruction needs.

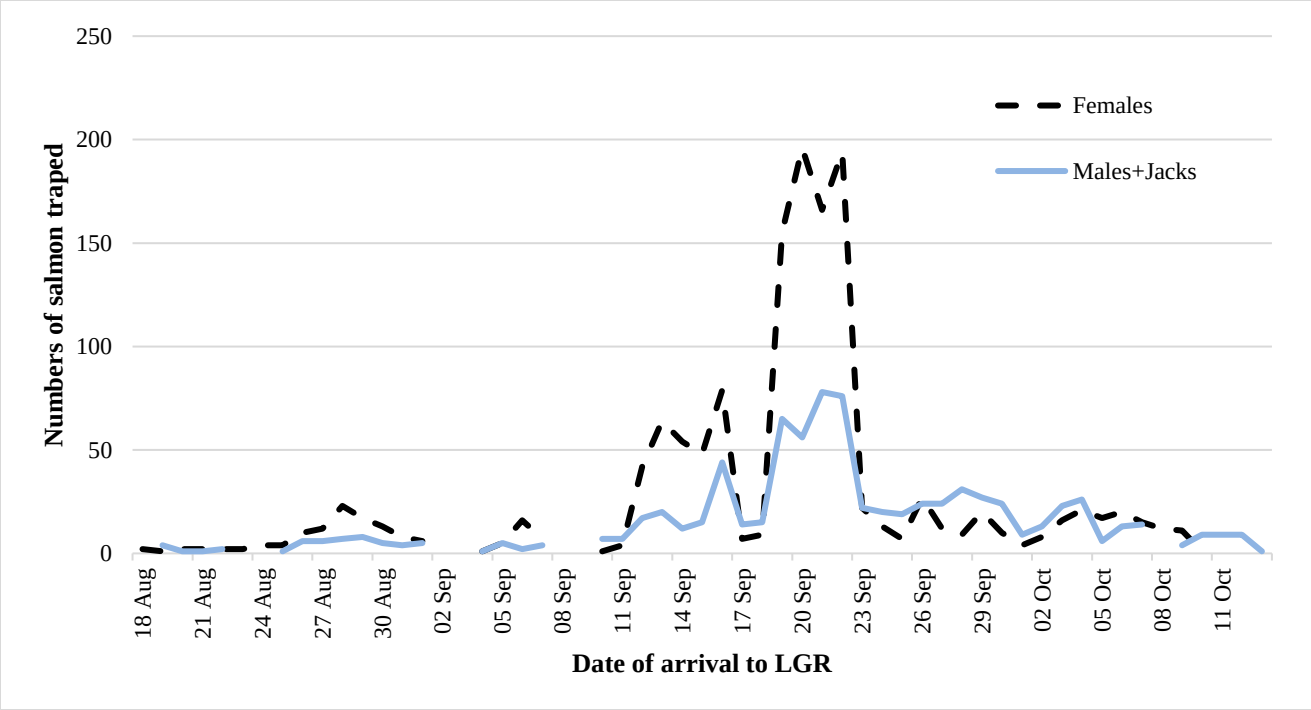


Figure 2. Arrival timing of fall Chinook at LGR that were trapped and hauled to LFH in 2017.

LFH Trapping Operations

Broodstock were collected at LFH periodically from 8 September through 13 October to fulfill needs not met by trapping at LGR. Trapping and sorting protocols are provided in Appendix D. A total of 169 fish were collected/processed at LFH in 2017.

Hatchery Operations 2017

Spawning Operations

Spawning and Egg Take

Fish transported from LGR to the adult holding ponds at LFH had approximately 0.3:1 sex ratio (males:females) in the adults (70 cm or greater), and 1.4:1 sex ratio for fish less than 70 cm. Size criteria for mating was set at 70 cm to reduce the number of unmarked/untagged jacks used for broodstock. Mate selection and spawning protocols changed weekly according to the numbers of males ripe during the spawn day and to allow for maximum use of larger, older aged, unmarked/untagged fish from LGR. The 2017 mating protocol at LFH is presented in Appendix D.

The duration, peak of spawning, eggtake, and percent egg mortality (Table 3), numbers of fish spawned (Table 4), and the number killed outright or died in the pond are provided (Table 5). Natural origin fish used for broodstock were identified post-spawning based on PIT tags recovered and Parental Based Tagging (PBT) results obtained at the end of the season. Milt from unmarked/ untagged males held overnight (24 and 31 October, 7 November) were used in matings the following day as a way to maximize the use of unmarked/untagged fish to maximize the proportion of natural origin fish contributing to the next generation. Composition of fish processed at LFH is presented in Appendix E. In 2017, eggtake goals were attained for LFH as required by the production priorities table per the 2008-2017 US v. Oregon Management Agreement (Appendix F).

Table 3. Duration and peak of spawning, egg take, and percent egg mortality at LFH, 1984-2017.

Year	Spawn duration Begin	End	Peak of spawning	Total egg take	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	3.1
2004	19 Oct	22 Nov	9 & 10 Nov	4,625,638	3.3
2005	18 Oct	29 Nov	15 & 16 Nov	4,929,630	3.5
2006	24 Oct	5 Dec	7 & 8 Nov	2,819,004	3.2
2007	23 Oct	3 Dec	13 & 14 Nov	5,143,459	3.3
2008	21 Oct	25 Nov	4 & 5 Nov	5,010,224	3.7
2009	20 Oct	18 Nov	9 & 10 Nov	4,574,182	4.7
2010	19 Oct	30 Nov	16 Nov	4,619,533	2.7
2011	18 Oct	21 Nov	7 & 8 Nov	4,723,501	3.5
2012[f]	16 Oct	13 Nov	6 Nov	4,526,108	3.1
2013	22 Oct	3 Dec	5 & 6 Nov	4,565,660	2.6
2014	22 Oct	18 Nov	12 & 13 Nov	4,787,615	3.6
2015	27 Oct	23 Nov	3 & 4 Nov	4,569,472	2.8
2016	25 Oct	21 Nov	1 & 2 Nov	4,951,188	2.7
2017	24 Oct	28 Nov	7 Nov	4,685,575	5.4

[a] Priority levels as listed in the 2008-2017 *US v. Oregon* Management Agreement production tables (Appendix F).
[b] Egg mortality includes eggs destroyed due to high 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 salmon.
[f] Priorities 12 and 14 are not included this year forward as the Transportation Study has ended.

Table 4. Spawn dates, numbers of fall Chinook salmon spawned, and weekly egg take at LFH in 2017. (Jacks are included with males).

Spawn Dates	Hatchery and Unknown Origin Males[a]	Natural Origin Males	Hatchery and Unknown Origin Females[a]	Natural Origin Females	Non-Viable [b]	Egg Take
24 & 25 Oct	48	26	108	74	0	665,422
31 Oct & 1 Nov	73	63	213	121	1	1,199,711
7 & 8 Nov	90	64	219	125	0	1,238,661
14 Nov	94	45	151	95	1	912,097
20 Nov	71	56	99	54	3	569,293
28 Nov	5	20	7	19	1	100,391
Totals	**381**	**274**	**797**	**488**	**6**	**4,685,575**

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

Table 5. Weekly summary and origins of mortality and surplus fall Chinook processed at LFH in 2017.

Week ending	Mortality						Killed Outright					
	LF/Snake R.[a]		Natural		Other/Unknown[b]		LF/Snake R.		Natural		Other/Unknown	
	F	M	F	M	F	M	F	M	F	M	F	M
2 Sep	0	0	0	0	0	2	0	0	0	0	0	0
9 Sep	0	0	0	0	1	0	0	0	0	0	0	0
16 Sep	0	0	0	0	0	0	0	0	0	0	0	0
23 Sep	0	0	2	0	0	0	0	0	0	0	0	0
30 Sep	1	1	2	0	0	0	0	0	0	0	0	0
7 Oct	1	0	1	0	1	0	0	0	0	0	0	0
14 Oct	0	0	1	0	0	0	0	0	0	0	0	0
21 Oct	2	0	1	0	0	0	0	0	0	0	0	0
28 Oct	3	1	4	0	0	1	1	218	0	8	2	21
4 Nov	1	1	0	3	1	1	3	2	0	0	4	4
11 Nov	5	2	3	1	3	3	0	0	0	1	4	2
18 Nov	1	5	0	1	3	1	0	0	0	0	3	0
25 Nov	4	13	0	1	4	2	9	5	0	0	3	0
2 Dec	5	18	6	6	5	3	0	0	0	0	1	0
9 Dec	3	4	1	0	0	0	0	0	0	0	0	0
Totals	**26**	**45**	**21**	**12**	**18**	**13**	**13**	**225**	**0**	**9**	**17**	**27**

[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

Collected broodstock not needed to fulfill program needs were returned to the Snake River at LFH on 28 November (Table 6). Fish were scanned for PIT tags, CWT and presence of an AD clip and the top of the caudal fin was clipped. Co-managers agreed in-season that these fish could be returned to the Snake River near LFH instead of above LGR due to the number released and that it would not affect run reconstruction estimates as the LGR trap had already closed for the season. Evidence suggests that all of these fish remained in the reservoirs between LMO and LGR, or went into the Palouse River since none were observed from the carcass recoveries in the Tucannon River.

Table 6. Estimated composition of fall Chinook salmon released into the Snake River near LFH at the end of the season in 2017.

Origin	Release age	Origin estimation method	Salt water age	Total age	Females	Males+Jacks	Total
Hatchery	Unknown	Clip/Wire/Scales	-	-	20	22	42
Unknown	Unknown		-	-	13	18	31
Totals					**33**	**40**	**73**

Effective Hatchery Population Size

To determine the effective population size of hatchery fall Chinook production in the Snake River, the number of males and females used at both LFH and NPTH were combined. At both hatcheries, larger males were mated with multiple females to more closely mimic what occurs in nature (Hankin 2009). In 2017, a total of 1,708 females and 915 males were spawned at both LFH and NPTH. Of the 915 males spawned, 481 were used multiple times to:

- maximize the number of larger and older aged adults used in crosses
- select fish with a greater chance of a subyearling life history,
- increase the number of natural origin fish used, and
- reduce the number of jacks used in the broodstock,

Due to the multiple use of males, procedures described in Busack (2007) were used to estimate the effective number of male breeders at both hatcheries and the effective number of male breeders at both hatcheries combined was 687.

Total effective hatchery population size was calculated by the following formula:

Total effective hatchery population size = (4 x (effective number of male breeders x total number of females in matings))/(effective numbers of male breeders + total number of females in matings)

$$1959 = (4 \times (687 \times 1708)) / (687 + 1708)$$

For the Snake River hatchery fall Chinook salmon population, the targeted minimum effective population size is 1,000. The critical threshold is thought to be around 500 (personal communication with Craig Busack PhD, NOAA fisheries). Based on the number of spawned fish at both LFH and NPTH since 2005, the program has been above the targeted minimum in all years (Figure 3). The general decline in the estimated hatchery effective population size observed since 2011 can be attributed to the multiple use of larger/older males in broodstock at both facilities, with less emphasis on spawning younger and smaller males (at a 1:1 spawning ratio) which was a common practice prior to 2011.

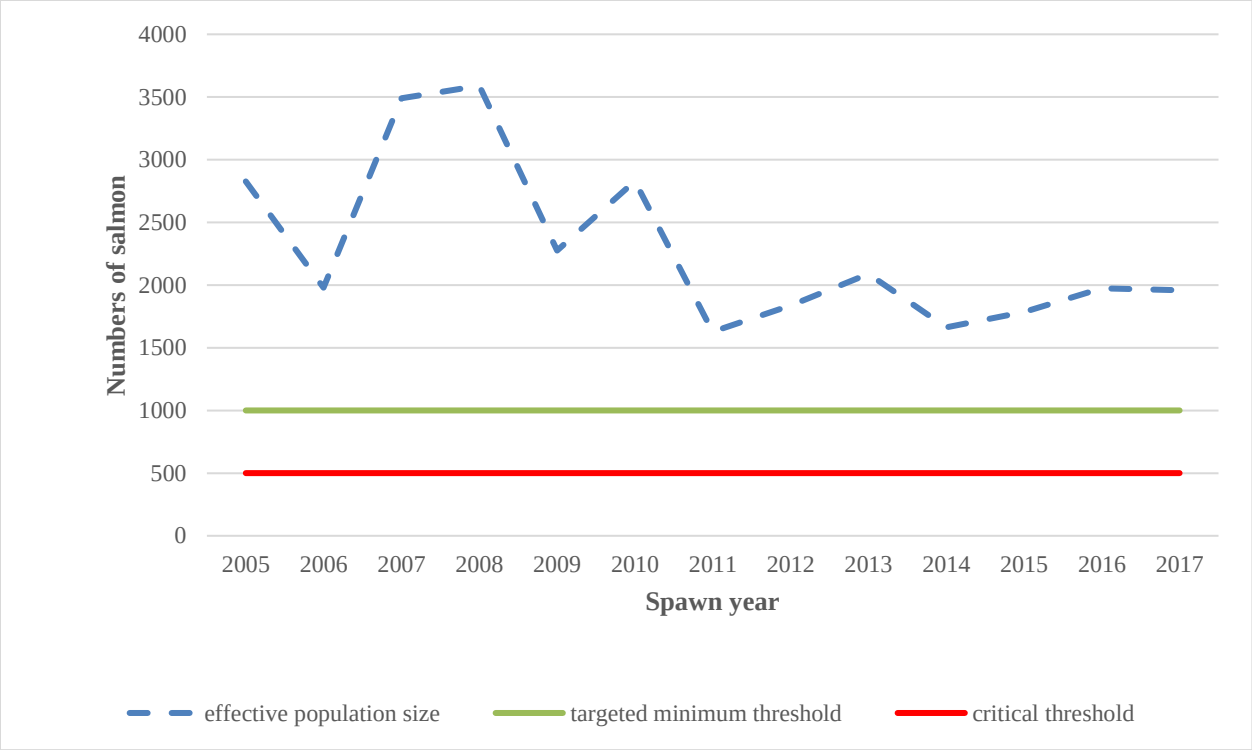


Figure 3. Estimated effective population size of the Snake River fall Chinook salmon spawned from both LFH and NPTH.

Broodstock Profile

This was the seventh year fin tissues were taken from all fish contributing to broodstock, including those that were spawned but not used (Appendix G). This was the second year PBT results were used to determine origin. PBT was used in conjunction with CWT and PIT tags to determine origin. This was the sixth year scales were taken on all fish contributing to broodstock in order to determine salt age and rearing type (subyearling, yearling, or reservoir reared subyearlings). Otoliths were also taken from the majority of unmarked/untagged fish (spawned and unspawned) by staff from the University of Idaho to determine where natural origin fall Chinook are rearing in the Snake River basin based on strontium levels (Hegg 2013).

A concentrated effort has occurred since 2010 to spawn larger sized males and females because of the large number of jacks and jills that had been used in the past. Salt water age composition of fish used as broodstock are summarized pre and post protocol change in 2010 (Figure 4–Figure 9). The origin composition of fall Chinook used for broodstock at LFH in 2017 is presented in Figure 10. By utilizing PBT results to determine origin, unknown origin fish used in broodstock decreased by 99.2% (Figure 11). Length frequencies of fall Chinook used for broodstock at LFH in 2017 are presented in Figure 12. Males used multiple times are counted multiple times in both figures and unknown origin can include both hatchery and natural origin fish. Median length was 79 cm for females and 75 cm for males. An estimated 8.6% of the males and 12.8% of the females that contributed gametes for production were returns from yearling releases.

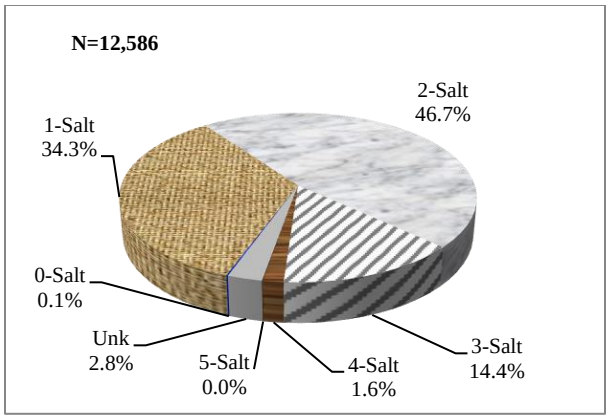


Figure 4. Salt age composition of all broodstock 2005 – 2009.

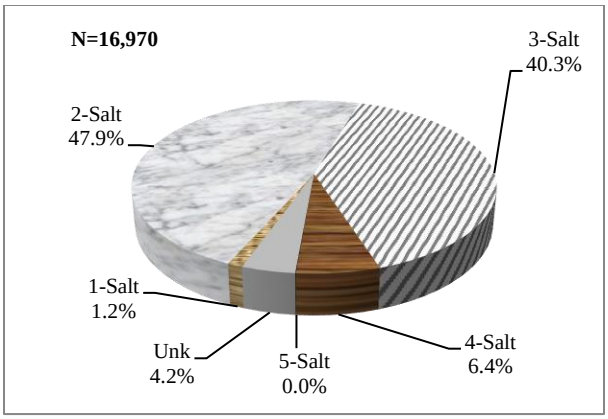


Figure 5. Salt age composition of all broodstock 2010 – 2017.

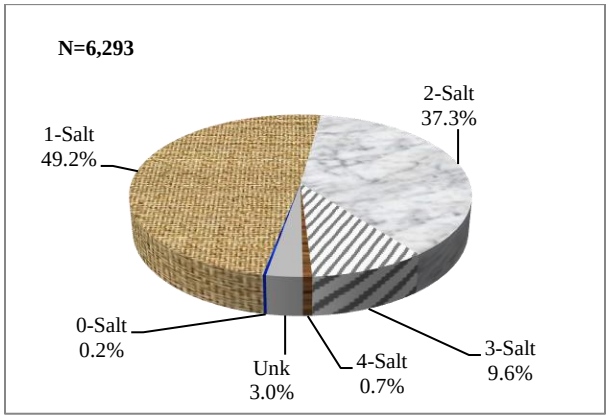


Figure 6. Male salt age composition of broodstock 2005 – 2009.

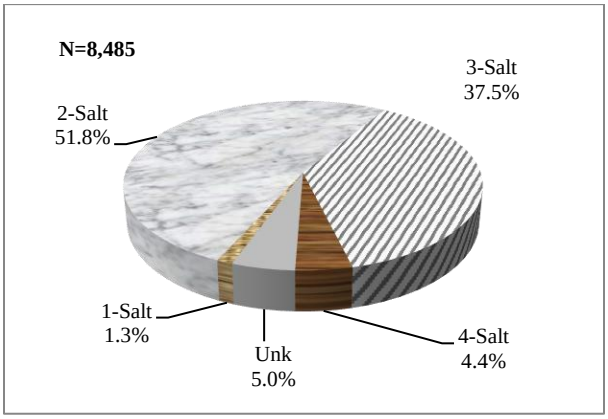


Figure 7. Male salt age composition of broodstock 2010 – 2017.

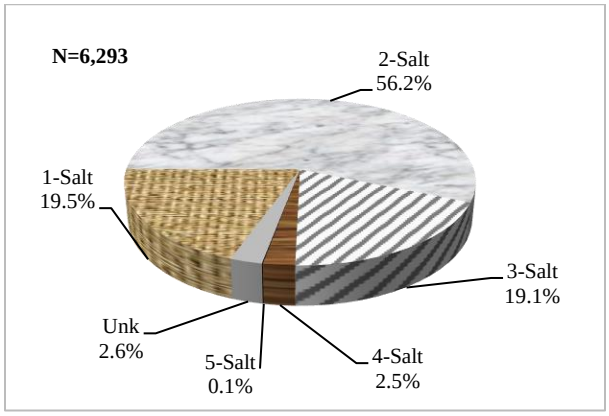


Figure 8. Female salt age composition of broodstock 2005 – 2009.

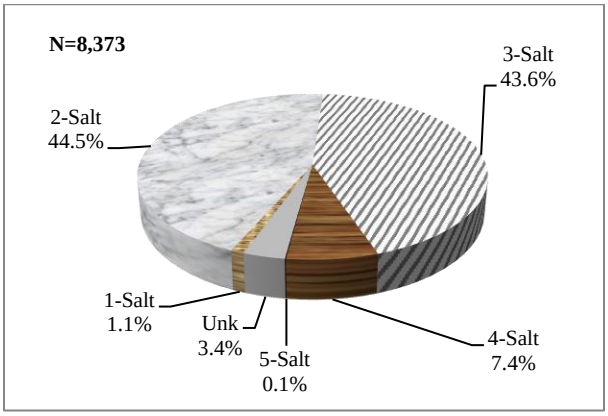


Figure 9. Female salt age composition of broodstock 2010 – 2017.

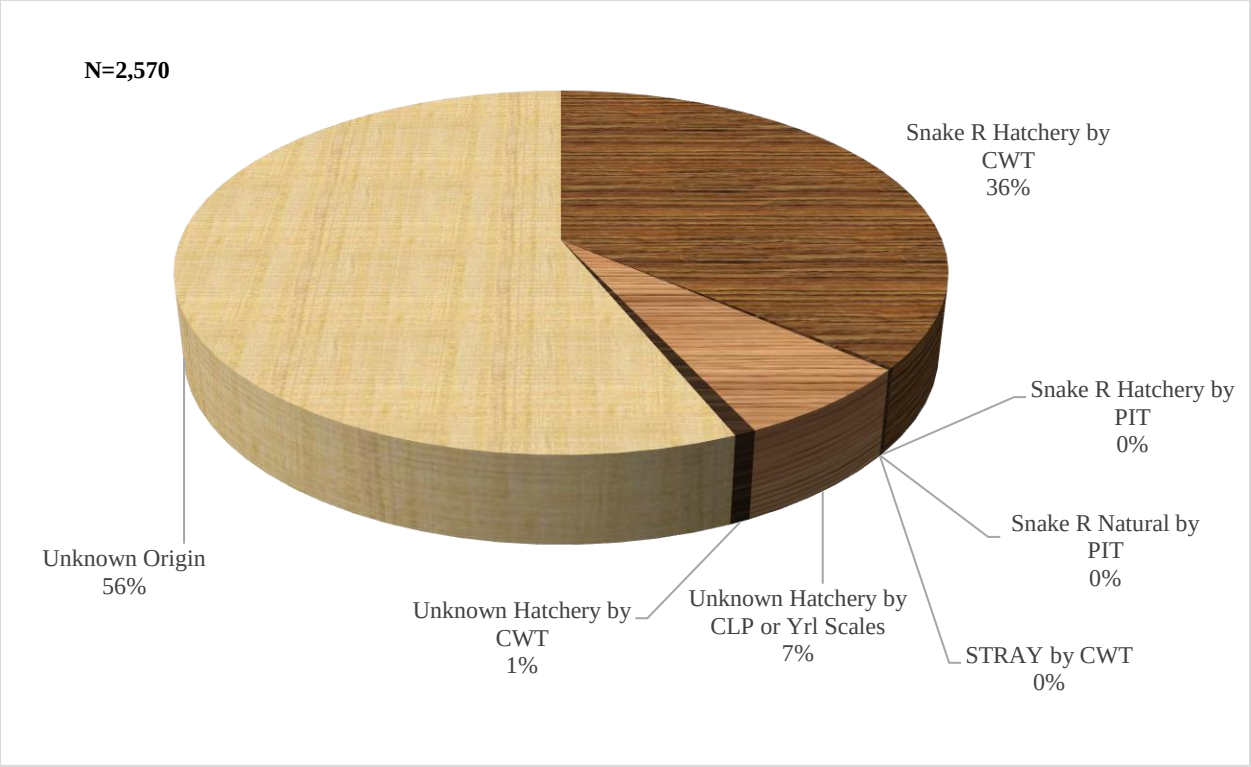


Figure 10. Percentages by fish origin <u>WITHOUT PBT ANALYSIS APPLIED</u> contributing to fall Chinook salmon broodstock at LFH during 2017.

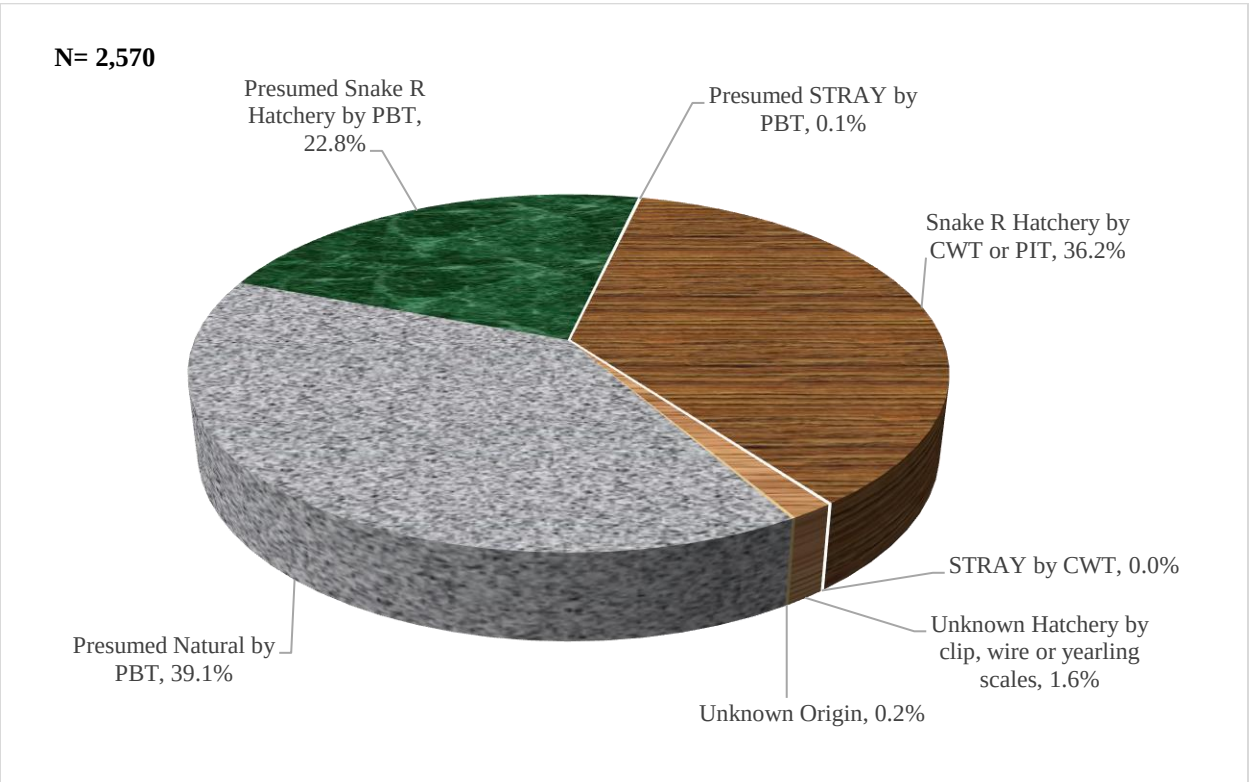


Figure 11. Percentages by fish origin <u>WITH PBT ANALYSIS APPLIED</u> contributing to fall Chinook salmon broodstock at LFH during 2017.

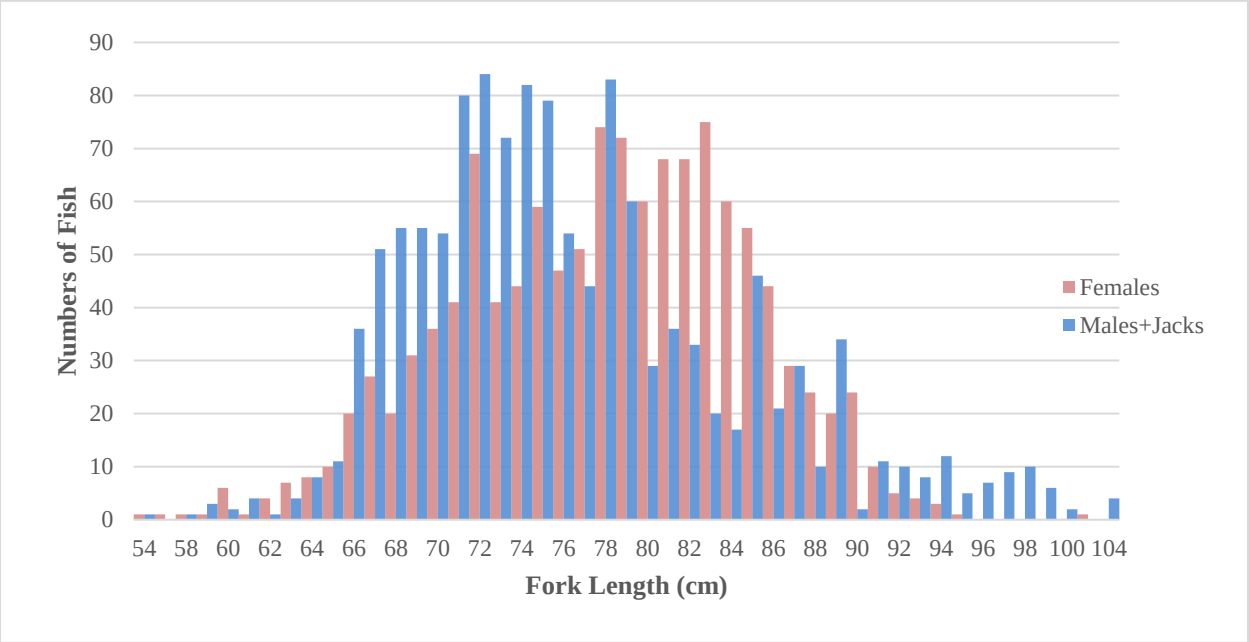


Figure 12. Fork lengths of fall Chinook salmon used as broodstock at LFH in 2017.

Males Used in Broodstock

Males hauled to LFH were trapped at LGR throughout the run (Figure 13), though a slightly higher percentage of males were trapped earlier in the season as compared to the overall return.

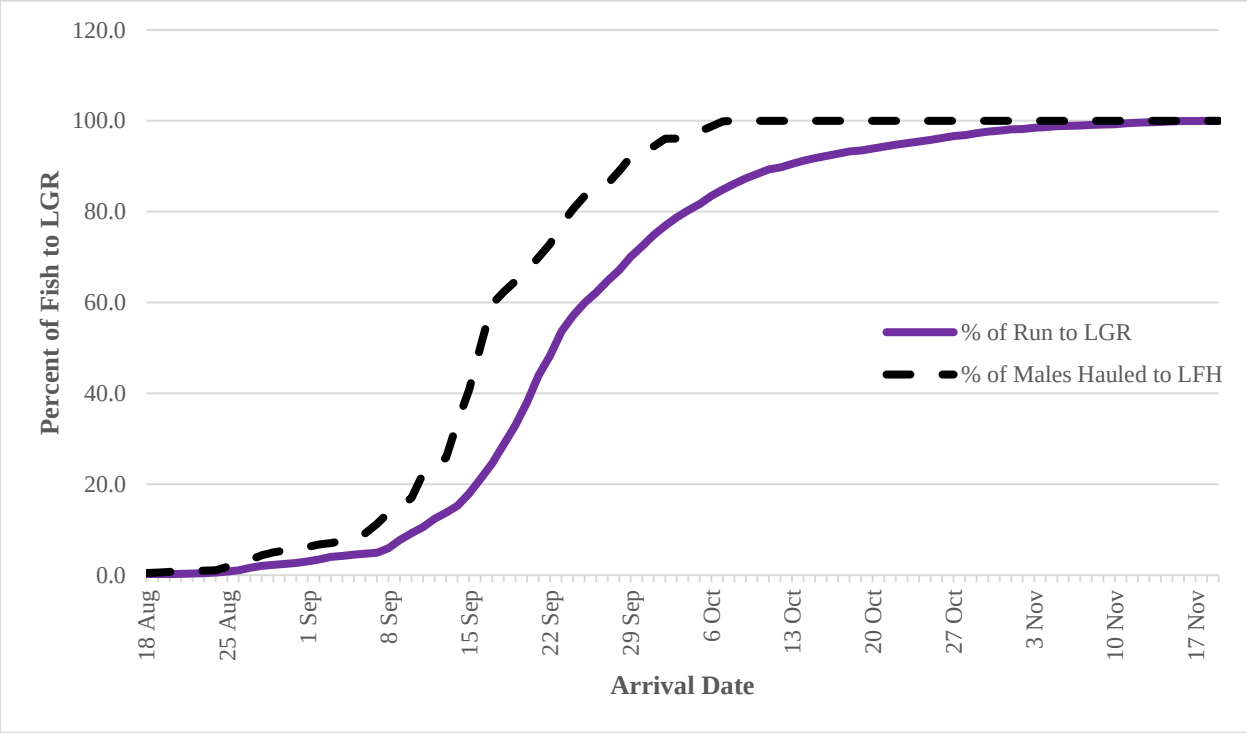


Figure 13. Arrival timing of male fall Chinook salmon at LGR compared to the arrival dates of fall Chinook salmon hauled to LFH during 2017.

Origin, including release site information, was determined for 30.9% of the males spawned based on CWT or PIT tag data and 25.2% from PBT. An additional 1.7% of the males were identified as hatchery origin based AD clip, lost/unreadable tags, or yearling scales with a hatchery check. Males that were unmarked/untagged represent 42.1% of the males spawned with 99.3% of those determined as natural by PBT. Of the total number of males spawned, 78.0% were from subyearlings, 9.0% were from yearlings, with the remaining 13.0% from unknown age or reservoir reared fish (**Error! Reference source not found.**).

Table 7. Origin and age of males that contributed to production at LFH, 2017.

	Times each male was used for mating					
Origin determination method / age	**1**	**2**	**3**	**4**	**6**	**Total unique**
Snake R hatchery by CWT, PIT						
subyearling reservoir reared 3 salt (age5)	2		1			**3**
subyearling 2 salt (age3)	37	28	8	1	1	**75**
subyearling 3 salt (age4)	19	31	10	2	2	**64**
subyearling 4 salt (age5)	2	6	1	1	1	**11**
yearling 1 salt (age3)	1	1				**2**
yearling 2 salt (age4)	10	21	6	1		**38**
yearling 3 salt (age5)	3	2	4			**9**
Presumed Snake R hatchery by PBT						
reservoir reared 2 salt (age4)		2				**2**
subyearling 1 salt (age3)	1					**1**
subyearling 2 salt (age3)	32	32	15	6	1	**86**
subyearling 3 salt (age4)	13	21	18	2	2	**56**
subyearling 4 salt (age5)	1	1	3	1	1	**7**
yearling 2 salt (age4)	1		1			**2**
unknown rear (age3)		3				**3**
unknown rear (age4)	2	3	2			**7**
STRAY by CWT						
yearling 2 salt (age4)	1					**1**
Presumed STRAY by PBT						
subyearling 3 salt (age4)	1					**1**
Undetermined hatchery by clip, wire or yearling scales						
subyearling 3 salt (age4)		3	2			**5**
subyearling 4 salt (age5)	1		2			**3**
yearling 1 salt(age3)	1					**1**
yearling 2 salt (age4)	1					**1**
yearling 3 salt (age5)	1					**1**
Presumed natural by PBT						
reservoir reared 1 salt (age3)	4	2	1			**7**
reservoir reared 2 salt (age4)	9	9	4	1	1	**24**
reservoir reared 3 salt (age5)	1	1	3			**5**
subyearling reservoir reared 1 salt (age3)	1					**1**
subyearling 1 salt (age 2)	1					**1**
subyearling 2 salt (age3)	48	28	12	1		**89**
subyearling 3 salt (age4)	27	28	27	1	1	**84**
subyearling 4 salt (age5)	7	7	6	2		**22**
yearling 2 salt (age4)		2				**2**
yearling 3 salt (age5)	1					**1**
yearling 4 salt (age6)	0	1				**1**
unknown age	15	10	8	4		**37**
Unknown origin						
subyearling 3 salt (age4)		1				**1**
subyearling 4 salt (age5)	1					**1**
Total unique males	**243**	**243**	**133**	**23**	**10**	**655**

Females Used in Broodstock

Females hauled to LFH were trapped at LGR throughout the season (Figure 14). Similar to the males, more females were collected from the early part of the run. Origin including release site information was determined for 42.4% the females spawned based on CWT or PIT tag data and 18.4% based on PBT. An additional 1.5% of the females were identified as hatchery origin based either on an AD clip, lost/unreadable tags or yearling scales with a hatchery check. Females that were not tagged or clipped represent 37.7% of the females spawned. Of the females that were not tagged or clipped, 99.8% were determined to be natural by PBT. The estimated age composition and origins of females contributing to broodstock at LFH are listed in **Error! Reference source not found.**. Similar to the males used in broodstock, of the total number of females spawned, 75.9% were from subyearlings, 12.8% were from yearlings, and the remaining 11.3% were from unknown age or reservoir reared fish.

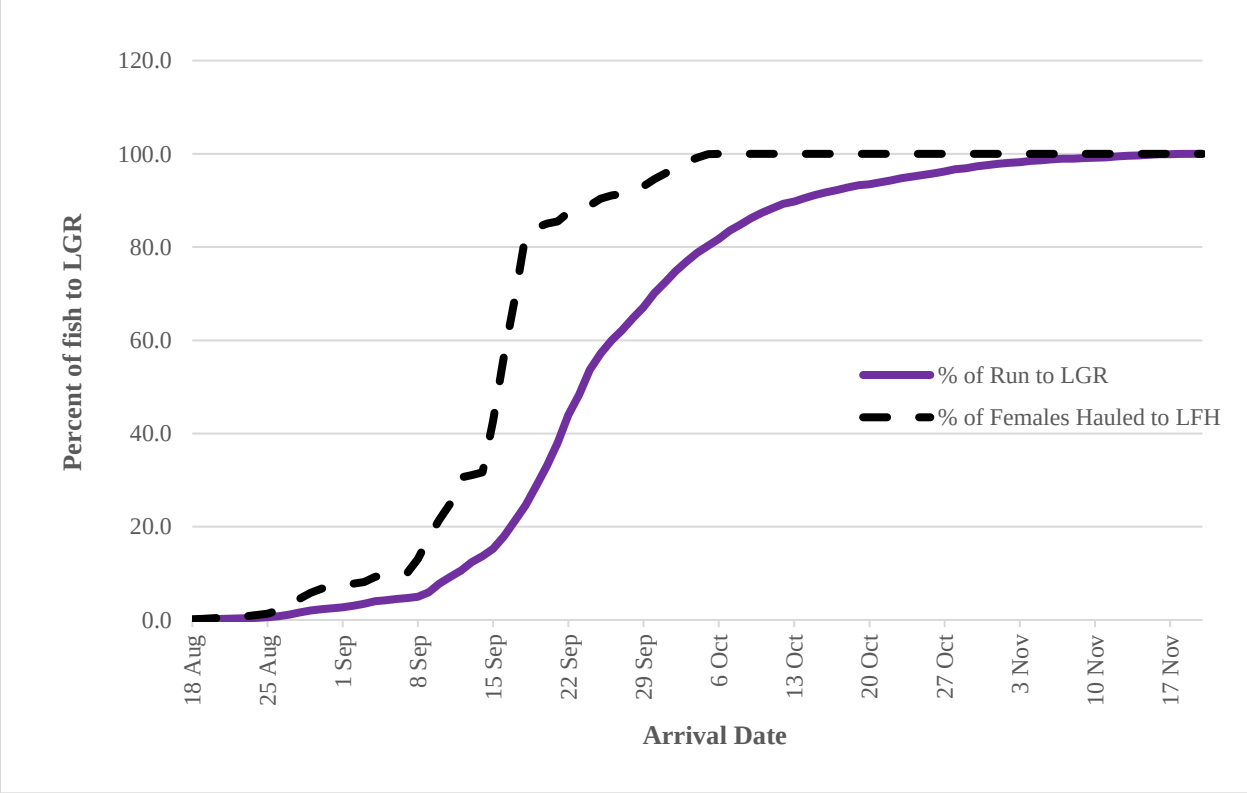


Figure 14. Arrival timing of female fall Chinook salmon at LGR compared to arrival dates of fall Chinook salmon hauled to LFH during 2017.

Table 8. Origins and age of females that contributed to production at LFH, 2017.

Origin determination method	Age	Number of females
Snake R hatchery		
Snake R hatchery by CWT or PIT	subyearling reservoir reared 2 salt (age4)	**1**
	subyearling reservoir reared 3 salt (age5)	**5**
	subyearling 2 salt (age3)	**112**
	subyearling 3 salt (age4)	**213**
	subyearling 4 salt (age5)	**53**
	subyearling 5 salt (age6)	**1**
	yearling 1 salt (age3)	**14**
	yearling 2 salt (age4)	**114**
	yearling 3 salt (age5)	**27**
	yearling 4 salt (age6)	**5**
Presumed Snake R hatchery by PBT	reservoir reared 2 salt (age4)	**1**
	subyearling 2 salt (age3)	**105**
	subyearling 3 salt (age4)	**74**
	subyearling 4 salt (age5)	**28**
	yearling 2 salt (age4)	**3**
	unknown rear (age3)	**7**
	unknown rear (age4)	**13**
	unknown rear (age5)	**4**
Undetermined hatchery		
Unknown hatchery by clip, wire or yearling scales	reservoir reared 3 salt (age 5)	**1**
	subyearling 2 salt (age3)	**4**
	subyearling 3 salt (age4)	**7**
	subyearling 4 salt (age5)	**3**
	unknown age	**4**
Presumed STRAY		
Presumed STRAY by PBT	subyearling 3 salt (age4)	**1**
Presumed natural		
Presumed natural by PBT	reservoir reared 2 salt (age4)	**50**
	reservoir reared 3 salt (age5)	**23**
	subyearling 2 salt (age3)	**47**
	subyearling 3 salt (age4)	**203**
	subyearling 4 salt (age5)	**117**
	yearling 2 salt (age4)	**2**
	unknown age	**42**
Unknown origin		
Unknown origin	subyearling 3 salt (age4)	**1**
Total		**1,285**

Fecundity

Fecundities were counted on a subsample of broodstock. Fecundity was estimated by counting and weighing 100 live eggs, applying the weight/egg calculation to the total weight of the live eggs, adding in counted dead eggs, and applying a 4% correction factor for water retention. Reproductive effort (ratio of gamete biomass to total body mass) was calculated for each female and used to determine which females might have lost some eggs prior to spawning (Knudsen et al 2008). Females whose egg mass weighed less than 10% of the total body weight were removed from the analysis. Females generally contributed 19% of their body weight toward egg production but no more than 28% (Figure 15).

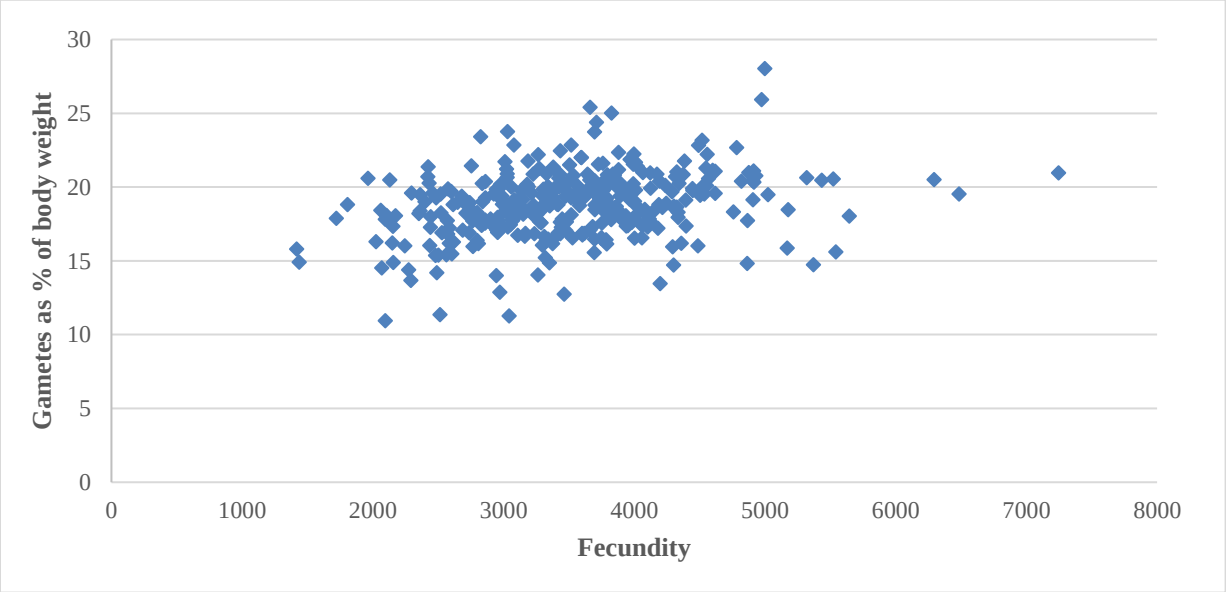


Figure 15. Gametes as percent of body weight for CWT hatchery broodstock at LFH in 2017.

Fecundity relationships were evaluated for Snake River hatchery yearling, subyearling, and subyearling reservoir reared groups as well as Snake River natural origin subyearling and reservoir reared subyearlings (from PBT results) (Figure 16-**Error! Reference source not found.**). Generally, fork lengths reliably predict fecundities for all rearing types of fall Chinook salmon, but were highly variable (1,417-6,485 eggs/fish) in all groups. Subyearling natural origin average fecundity was highest at 3,720 (mean FL 81cm), followed by subyearling hatchery fish at 3,436 (mean FL 77cm), with yearling hatchery fish the lowest at 2,826 (mean FL 73cm). Based on hatchery records, average fecundity of LGR females was 3,612, and LFH trapped females was 3,252. These fecundities are only of fish retained for broodstock and not the average fecundity of females returning to the Snake River Basin due to trapping and broodstock spawning protocols that minimize the collection of jills, and concentrate on larger sized females for broodstock.

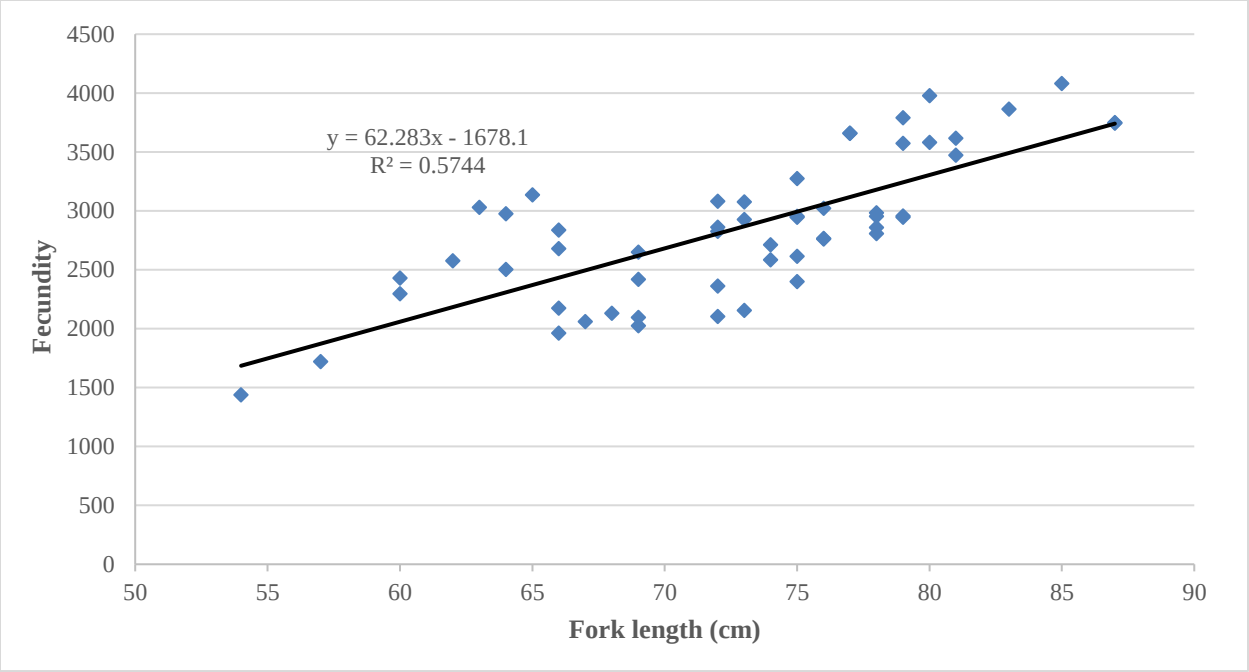


Figure 16. Yearling hatchery salmon fork length to fecundity relationships in 2017.

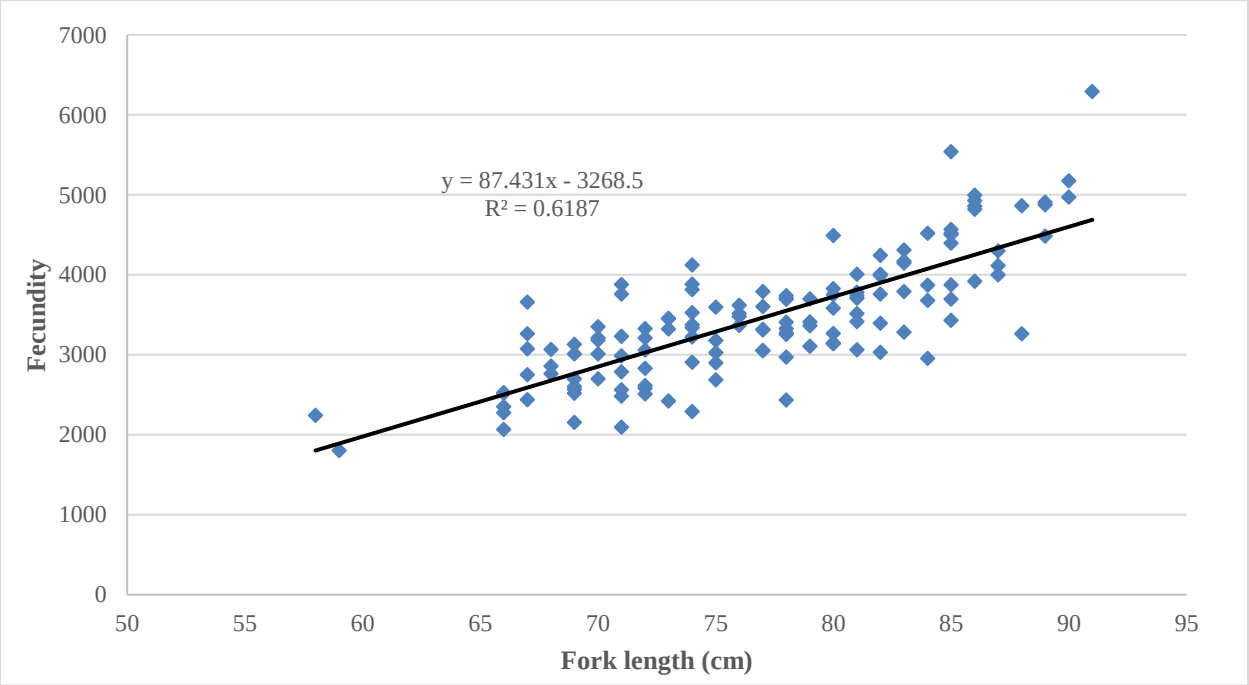


Figure 17. Subyearling hatchery salmon fork length to fecundity relationships in 2017.

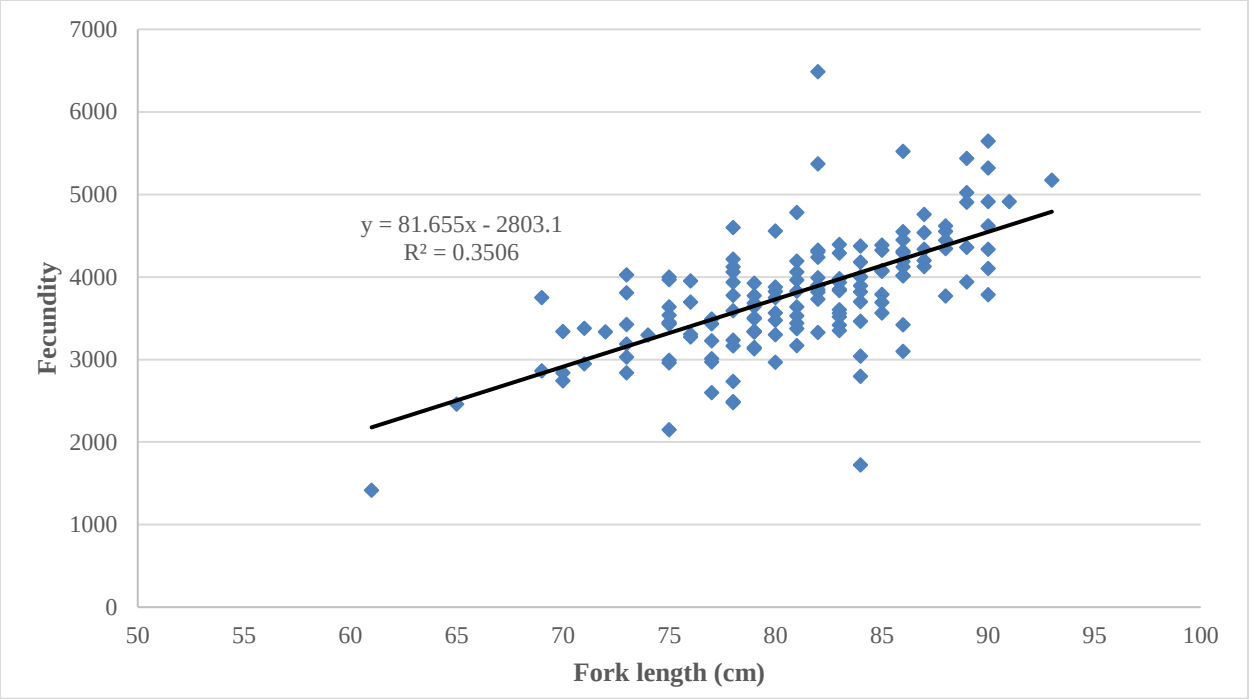


Figure 18. Subyearling and reservoir reared subyearling natural salmon fork length to fecundity relationships in 2017.

Inclusion of Natural Origin Fish

Unmarked/untagged fall Chinook salmon were incorporated into the broodstock beginning in 2002. In 2017, the estimated percent natural origin fish used in WDFW broodstock (pNOB) was 26% (Figure 19), and did not reach the 30% target. The overall pNOB for LFH and NPTH combined was 26.6%. To estimate pNOB, a dataset was constructed to reflect all parents contributing to production, broken into size categories by mark/clip, and used the same information estimated at LGR from the run reconstruction to estimated natural origin fish in the broodstock. Males used with multiple females were included multiple times. In 2017, the PBT results estimated pNOB at 35.2%, exceeding the 30% target (Figure 19).

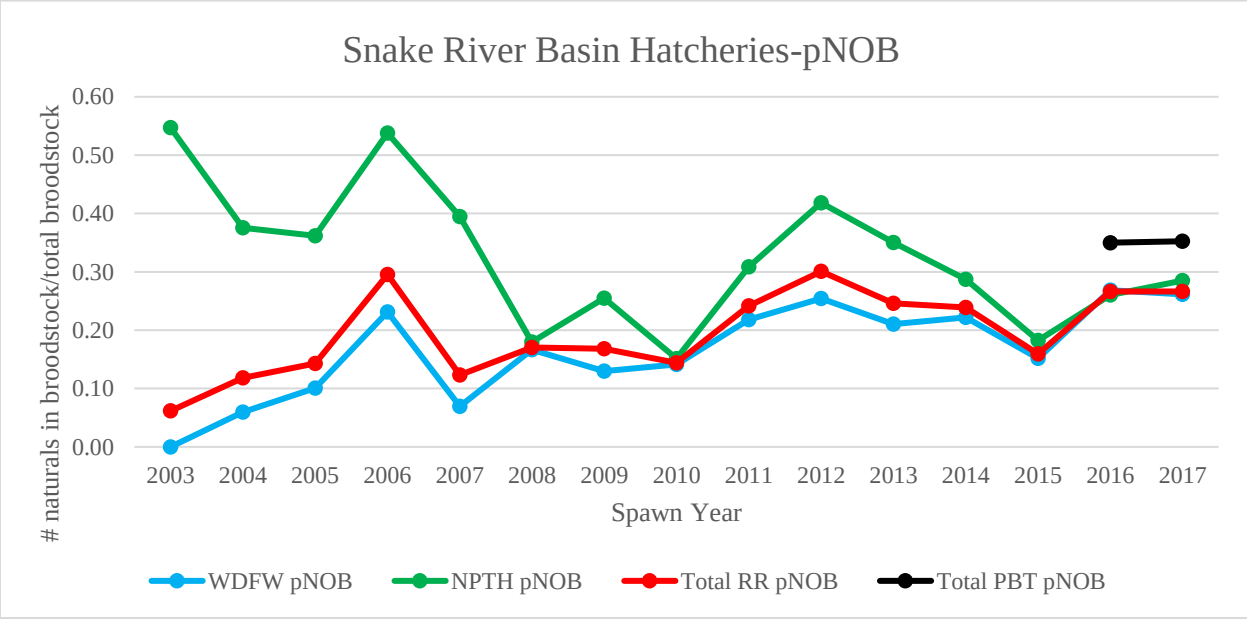


Figure 19. Estimated percent natural origin parents in broodstock at LFH, NPTH, and overall for Snake River basin hatchery production, 2003-2017.

Jacks and Jills in Broodstock

As described above, WDFW has implemented a size selective collection and mating protocols, with one of the main goals to reduce the contribution/influence of mini-jacks, jacks, and jills in the broodstock. We calculated saltwater age for wire tagged fish 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. Jacks and jills in broodstock should be considered minimum estimates because of the above explanation of potential biases in our estimates created by reservoir reared fish. Intensive monitoring of jacks and jills began in 2010 in order to minimize their contribution. This monitoring and subsequent management action has reduced the total matings with 0 and/or 1-salt parentage by 96.3% within the last eight years (Table 9).

Table 9. Number of matings of minijacks, jacks, and jills contributing to broodstock at LFH, 2010-2017, during size-selective mating protocols.

Year	0-salt	1-salt jack	1-salt jill	Number of matings containing jack x jill mating	% of total matings with 0-salt and/or 1-salt parentage
2000	195	609	157	127	80.4
2001	9	876	67	47	67.6
2002	4	480	11	9	24.7
2003	3	527	78	63	74.5
2004	28	943	254	204	77.3
2005	14	611	57	25	45.4
2006	1	519	121	91	70.0
2007	0	1138	480	408	83.0
2008	0	345	80	30	30.2
2009	1	539	503	143	69.6
Average	**26**	**659**	**181**	**115**	**62.3**
2010	0	38	2	0	3.2
2011	0	50	37	3	6.7
2012	0	2	3	0	0.4
2013	0	9	45	1	4.3
2014	0	0	0	0	0.0
2015	0	2	1	0	0.1
2016	0	5	3	0	0.6
2017	0	22	14	0	2.8
Average	**0**	**16.0**	**13.1**	**0.5**	**2.3**

Inclusion of Strays in Broodstock

The WDFW goal is to fully exclude strays from broodstock to maintain the genetic integrity of the fall Chinook LFH produces. In cases where we are broodstock limited, it was agreed that strays may be included in spawners up to 5%. To assure productions goals were met as mandated in the 2008-2017 *United States v. Oregon* Management Agreement, seven stray females were spawned and gametes were retained until the end of the spawning season. When it was verified that production goals could be met, the strays were culled. Strays retained as broodstock over the years are presented in Table 10. Males used multiple times are included multiple times in the table below.

Table 10. Historical use of out of basin strays in broodstock: 2007-2017.

Year	Total number of matings	Matings including Stray males[a]	Matings including Stray females	Number of matings containing stray x stray mating	% of total matings with stray parentage
2007	1,458	3	7	0	0.7%
2008	1,309	1	0	0	0.1%
2009	1,293	0	1	0	0.1%
2010	1,238	3	9	0	1.0%
2011	1,251	0	6	0	0.5%
2012	1,184	0	1	0	0.1%
2013	1,240	6	59	1	5.2%
2014	1,162	0	0	0	0.0%
2015	1,200	0	24	0	1.9%
2016	1,210	0	0	0	0.0%
2017	1,285	1	0	0	0.1%
Average	1,257	**1**	**10**	**0**	**1.0%**

[a] Males used multiple times are included multiple times.

Rearing and Marking and Tagging

Information regarding eggs taken, egg loss, eggs culled, eggs shipped or retained, and numbers of fish ponded is included in Table 11. Historical egg take and ponding information is listed in **Error! Reference source not found.**. Rearing followed standard hatchery procedures as described in the Snake River fall Chinook salmon HGMP available at http://www.fws.gov/lsnakecomplan/Reports/HGMPreports.htm. Detailed information regarding type and size of vessels used for rearing can be found in LFH Annual Reports available at http://www.fws.gov/lsnakecomplan/Reports/WDFWreports.html.
DONE

Table 11. Eggs taken and survival numbers by life stage of fall Chinook salmon spawned at LFH, brood years 2011-2017.

Brood year	Eggs taken	Egg loss	Eggs destroyed[a]	Eggs shipped	Eyed eggs retained	Fry ponded	Intended program
2011	4,723,501	165,001	0	1,785,600	2,772,900	960,000	Yearling
						1,812,900	Subyearling
2012	4,526,108	141,608	0	1,480,000	2,904,500	1,010,000	Yearling
						1,894,000	Subyearling
2013	4,565,660	119,550	0	1,558,800	2,887,310	980,000	Yearling
						1,907,310	Subyearling
2014	4,787,615	177,415	96,700	1,540,000	2,973,500	1,000,000	Yearling
						1,978,500	Subyearling
2015	4,569,472	127,974	132,098	1,540,000	2,769,400	930,000	Yearling
						1,839,400	Subyearling
2016	4,951,188	121,359	61,346	1,540,000	3,228,483	1,008,647	Yearling
						1,995,000	Subyearling
2017	4,685,575	212,043	48,940	1,541,282	2,883,310	930,000	Yearling
						1,912,017	Subyearling
2018	4,754,622	158,706	18,863	1,315,510	3,261,543	484,356	Yearling
						2,761,054	Subyearling

[a] Eggs culled due to ELISA results, stray, jill or jack matings.
DONE
Egg Inventory Report

Marking and tagging of fish was consistent with the 2008- 2017 *US v. Oregon* Management Agreement. LFH yearling (BY16) fish were ADCWT marked/tagged from 11-25 July and 13-19 July, respectively. After marking and tagging, all but ~36,000 fish (~18,000 ADCWT, ~18,000 CWT only) were diverted to the rearing lake. Staff performed tag and fin clip quality control checks from a sample of each group immediately prior to their movement to the rearing lake following PIT tagging (Table 12).

LFH subyearling (BY16) fish were ADCWT marked/tagged from 10-11 April 2017. Subyearling (BY17) were ADCWT marked/tagged 4-6 April 2018. All subyearlings were kept in raceways prior to release. Staff performed tag and fin clip quality control checks from a sample of each group prior to release.

GRR (BY16) fish were ADCWT marked/tagged 28 March 2017 and GRR (BY17) fish were ADCWT marked/tagged on 18 May 2018. Fish were kept in raceways prior to being trucked to their release site on the Grande Ronde River near Cougar Creek.

Table 12. Numbers of fall Chinook salmon sampled by WDFW for marking and tagging quality control checks.

Brood year /age	Release site	Mark type	CWT	Number sampled	AD/ CWT	AD clipped only	CWT only	Unmarked/ untagged
2016 Yearling	LFH	ADCWT	637203	1,910	1,894 (99.2%)	15 (0.8%)	1 (0.1%)	0 (0.0%)
	LFH	CWT only	637202	1,895	0 -	0 -	1,852 (97.8%)	43 (2.3%)
2016 Subyearling	LFH	ADCWT	637198	1,986	1,907 (96.0%)	70 (3.5%)	7 (0.4%)	2 (0.1%)
	GRR	ADCWT	637199	1,967	1,885 (95.8%)	77 (3.9%)	3 (0.2%)	2 (0.1%)
2017 Subyearling	LFH	ADCWT	637394	1,855	1,832 (98.8%)	13 (0.7%)	8 (0.4%)	2 (0.1%)
	GRR	ADCWT	637395	1,980	1,929 (97.4%)	41 (2.1%)	9 (0.5%)	1 (0.1%)

Staff have routinely PIT tagged the onstation yearling and subyearling releases for the purpose of monitoring outmigration timing, estimating adult returns in-season, and to compare two adult return/survival estimation methods (CWTs vs PIT tags). PIT Tag lists for each release group are submitted to PTAGIS and fish were assigned to monitor mode to allow them to be treated like non-PIT tagged fish when intercepted at the mainstem dams.

Staff PIT tagged 25,663 BY16 yearlings. Initial tag loss and mortalities of the PIT tagged yearlings could not immediately determined as the fish were diverted directly into the earthen rearing pond where they remained until release. After release, the pond and outlet structure were scanned for shed tags or tags from mortalities. A total of 170 shed tags (0.66%) from BY16 yearlings were detected, leaving an estimated 25,493 PIT tags representing the onstation yearling release.

Staff PIT tagged BY16 and BY17 onstation subyearlings, with all tagged fish returning directly to the raceways following PIT tagging. Tagging events in both years resulted in some mortalities that staff would then collect and reinsert into live fish. A total of 19,995 BY16 and 20,000 BY17 subyearlings were PIT tagged and released in 2017 and 2018, respectively. SRL and IPC staff PIT tagged 3,000 BY16 and 3,000 BY17 subyearlings at Irrigon fish hatchery for the sole purpose to monitor outmigration timing of the GRR release. PIT tags recovered from mortalities during tagging were reinserted prior to release into the GRR.

Juvenile Releases

Brood year 2016

Subyearling

Subyearling fall Chinook at LFH were released 31 May 2017. 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 204,579 fish were released as an ADCWT group. Hatchery staff conducted pound counts and calculated the release at 53.3 fish/lb (fpp). Fish used in the pound counts were set aside for SRL staff to subsample for individual lengths and weights (Table 13). Individual length/weight samples and average pound counts were identical to those obtained by hatchery staff. The release occurred during an increasing hydrograph. Historical subyearling releases from 2009 forward by WDFW, NPT, and IPC are provided in **Error! Reference source not found.**.

Subyearling fall Chinook reared at Irrigon FH were released into the Grande Ronde River (GRR) on 30 May 2015. An estimated 195,781 fish were released as an ADCWT group and 220,303 were released as unmarked/untagged. Fish were measured, 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 size was calculated at 45.9 fpp, identical to what was calculated from individual length/weight sampling from Snake River Lab (SRL) staff. The release occurred during a decreasing hydrograph.

Table 13. Length and weight data from subyearling fall Chinook salmon (BY16) sampled by WDFW and released into the Snake and GRR during 2017.

Length/weight data	Snake R at LFH	GRR at Cougar Creek
Sample date	30 May	26 May
CWT Code	637198	637199
Number sampled	204	206
Avg. length (mm)	87	92.5
Median length	87	93
Range of lengths	69-108	62-106
SD of lengths	6.9	5.7
CV of length (%)	7.9	6.2
Avg. weight (g)	8.5	9.9
SD of weight	2.3	1.8
Avg. K factor	1.25	1.23
FPP	53.3	45.9
Precocious (%)	0.0%	0.0%

Yearling

Yearling fall Chinook salmon at LFH were released from 2 to 5 April 2018, with peak emigration occurring on 2 and 3 April. Fish were measured, weighed, and visually appeared in good condition, with no external signs of BKD, pop-eye, descaling, or sexual precocity. An estimated 235,725 fish were released from the ADCWT group, and 229,467 were released from the CWT only group. Hatchery staff set aside fish throughout the release for SRL staff to subsample for individual lengths and weights (Table 14). Individual length/weight samples and pound count were very similar to that obtained by hatchery staff. The release occurred during an increasing hydrograph. Historical yearling releases from 2010 to the present by WDFW and NPT are provided in **Error! Reference source not found.**.

Table 14. Length and weight data from yearling fall Chinook salmon (BY16) released at LFH in 2018.

	Yearlings	
Length/weight data	**ADCWT**	**CWT only**
Sample date(s)	2-4 April	2-4 April
CWT code	637203	637202
Number sampled	204	222
Avg. length (mm)	160	161
Median length	160	160
Range of lengths	130-191	118-205
SD of lengths	11.4	14.5
CV of length (%)	7.1	9.0
Avg. weight (g)	42.6	44.3
SD of weight	9.3	12.3
Avg. K factor	1.03	1.05
FPP	10.6	10.2
Precocious (%)	0.0%	0.0%

Brood Year 2017

Subyearling

Subyearling fall Chinook at LFH were released 21 May 2018. These fish were reared in raceways 15-17 on the south side raceways of LFH. SRL staff only sampled out of raceway 17 due to signs of BKD in raceways 15 and 16. Of the fish in raceway 17, 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 total of 199,788 fish were released as an ADCWT group. Hatchery staff conducted pound counts and calculated the release at 56.0 fish/lb (fpp) for all three raceways. Fish used in the pound counts for raceway 17 were set aside for SRL staff to subsample for individual lengths and weights (Table 15). Individual length/weight samples and average pound counts were dissimilar to those obtained by hatchery staff from all three raceways. The release occurred during a decreasing hydrograph.

Subyearling fall Chinook reared at Irrigon FH were released into the GRR on 31 May 2018. An estimated 195,781 fish were released as an ADCWT group and 208,750 were released as unmarked/untagged. Fish were measured, 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 size was calculated at 46.7 fpp, compared 47.5 fpp from what was calculated from individual length/weight sampling from SRL staff (Table 15). The release occurred during a decreasing hydrograph.

Table 15. Length and weight data from subyearling fall Chinook salmon (BY17) sampled by WDFW and released into the Snake and GRR during 2018.

Length/weight data	Snake R at LFH	GRR at Cougar Creek
Sample date	30 May	26 May
CWT Code	637394	637395
Number sampled	200	200
Avg. length (mm)	84	94
Median length	83	95
Range of lengths	64-109	75-109
SD of lengths	6.9	5.7
CV of length (%)	8.2	6.0
Avg. weight (g)	6.9	9.5
SD of weight	1.8	1.7
Avg. K factor	1.13	1.12
FPP	65.7	47.5
Precocious (%)	0.0%	0.0%

Survival Rates to Release

The estimated number of eggs and fish present at life stages in the hatchery were used for 2014-2018 release years to calculate survival rates within the hatchery environment (Table 16). The original survival goal for the program was 80% [(9,160,000 subyearling juveniles/11,450,000 eggs) x 100] from USACOE 1975. The survival goal has been achieved each year for yearlings since 2003 and yearly since 1990 for subyearlings (**Error! Reference source not found.**).

Table 16. Estimated survivals (%) between various life stages at LFH for fall Chinook salmon, 2012-2016 yearling brood years and 2013-2017 subyearling broodyears.

Brood year	Release stage	Green egg-ponded fry	Ponded fry-release[a]	Green egg-release
2012	Yearling	95.9	99.9	95.8
2013	Yearling	97.4	94.6	91.2
	Subyearling	97.4	97.6	94.1
2014	Yearling	95.2	97.1	92.5
	Subyearling	95.2	98.5	93.8
2015	Yearling	94.6	100.1	94.7
	Subyearling	94.6	99.5	94.2
2016	Yearling	94.9	87.3	82.8
	Subyearling	94.9	94.2	94.2
2017	Subyearling	92.2	96.7	89.2
Yearling mean:	**%**	**95.7**	**95.0**	**90.7**
	SD	**1.1**	**7.0**	**6.6**
Subyearling mean:	**%**	**95.0**	**98.6**	**93.5**
	SD	**1.9**	**1.6**	**2.6**

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

Migration Timing

The PTAGIS website (www.ptagis.org) was queried on 26 June 2017, and 17 April 2019 for GRR and onstation yearling and subyearling releases. Interrogation summaries were used to populate Table 17-Table 21. Migration speed generally increased for all releases as fish moved downstream through the system (Figure 20- Figure 22), although, for some reason, the onstation subyearling release slowed their migration at IHR, then increased their speed through the lower Columbia River.

Table 17. Migration timing of BY16 PIT tagged subyearlings released near Cougar Creek in the GRR in 2017.

	Detection Facilities						
	LGR	**LGO**	**LMO**	**IHR**	**MCN**	**JDD**	**BONN[a]**
Number Detected	**300**	**410**	**178**	**60**	**138**	**117**	**155**
Median Travel Days from GRR[b]	11	13	12	15	19	20	23
Median Passage Date	10 Jun	12 Jun	11 Jun	13 Jun	18 Jun	19 Jun	22 Jun
First Detection Date	1 Jun	3 Jun	4 Jun	7 Jun	8 Jun	8 Jun	5 Jun
Last Detection Date	24 Jul	24 Jul	19 Jul	15 Jul	27 Jul	8 Sep	2 Aug
10% of Run Passage Date	3 Jun	6 Jun	7 Jun	8 Jun	11 Jun	13 Jun	15 Jun
90% of Run Passage Date	5 Jul	2 Jul	28 Jun	5 Jul	7 Jul	12 Jul	11 Jul
TDG on Median Date of Passage (%)[c]	121.4	116.9	115.2	118.3	119.7	115.9	117.9
Outflow on Median Date of Passage (kcfs)[c]	149.5	120.9	133.5	110.0	335.0	324.9	314.3
Spill on Median Date of Passage (kcfs)[c]	58.7	38.6	74.7	73.2	185.8	100.0	120.1

[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 18. Migration timing of BY16 PIT tagged subyearlings released at LFH in 2017.

	Detection Facilities				
	LMO	**IHR**	**MCN**	**JDD**	**BONN[a]**
Number Detected	**1,280**	**599**	**1,326**	**707**	**840**
Median Travel Days from LFH[b]	2	8	13	15	19
Median Passage Date	2 Jun	8 Jun	13 Jun	15 Jun	19 Jun
First Detection Date	31 May	1 Jun	3 Jun	5 Jun	3 Jun
Last Detection Date	5 Jul	4 Jul	7 Jul	30 July	14 Jul
10% of Run Passage Date	1 Jun	3 Jun	11 Jun	09 Jun	11 Jun
90% of Run Passage Date	12 Jun	15 Jun	7 Jun	23 Jun	27 Jun
TDG on Median Date (%)[c]	126.4	123.1	120.8	120.5	121.0
Outflow on Median Date (kcfs)[c]	179.4	153.7	381.2	391.8	352.4
Spill on Median Date (kcfs)[c]	101.4	100.7	211.6	153.2	158.0

[a] TDG, outflow and spill for BONN are detected six miles downstream at Warrendale.

[b] Travel days are calculated from the date of release.

[c] Detections are from the tailrace of each dam.

Table 19. Migration timing of BY16 PIT tagged yearlings released at LFH in 2018.

	Detection Facilities				
	LMO	**ICH**	**MCN**	**JDD**	**BONN[a]**
Number Detected	**5,181**	**1,409**	**2,318**	**3,822**	**1,116**
Median Travel Days from LFH[b]	9	11	16	19	20
Median Passage Date	11 Apr	13 Apr	18 Apr	21 Apr	22 Apr
First Detection Date	3 Apr	5 Apr	6 Apr	9 Apr	12 Apr
Last Detection Date	23 May	1 May	31 May	12 Jun	2 Jun
10% of Run Passage Date	5 Apr	7 Apr	9 Apr	14 Apr	16 Apr
90% of Run Passage Date	18 Apr	18 Apr	1 May	30 Apr	2 May
TDG on Median Date of Passage (%)[c]	118.1	119.2	119.9	118.0	117.4
Outflow on Median Date of Passage (kcfs)[c]	105.8	118.4	280.1	302.2	291.3
Spill on Median Date of Passage (kcfs)[c]	41.8	93.0	197.9	139.8	120

[a] TDG, outflow and spill for BONN are detected six miles downstream at Warrendale.

[b] Travel days are calculated from the date of release.

[c] Detections are from the tailrace of each dam.

Table 20. Migration timing of BY17 PIT tagged subyearlings released at LFH in 2018.

	Detection Facilities				
	LMO	**IHR**	**MCN**	**JDD**	**BONN[a]**
Number Detected	**1,544**	**661**	**1,223**	**966**	**1,018**
Median Travel Days from LFH[b]	3	10	14	18	18
Median Passage Date	24 May	31 May	4 Jun	8 Jun	8 Jun
First Detection Date	22 May	23 May	24 May	27 May	29 May
Last Detection Date	26 Jun	27 Jun	6 Jul	9 Jul	7 Jul
10% of Run Passage Date	22 May	26 May	31 May	03 Jun	4 Jun
90% of Run Passage Date	28 May	5 Jun	20 Jun	22 Jun	23 Jun
TDG on Median Date (%)[c]	120.7	124.1	120.5	116.7	115.2
Outflow on Median Date (kcfs)[c]	146.5	163.9	355.7	304.3	299.7
Spill on Median Date (kcfs)[c]	60.2	109.8	194.9	95.1	120.8

[a] TDG, outflow and spill for BONN are detected six miles downstream at Warrendale.

[b] Travel days are calculated from the date of release.

[c] Detections are from the tailrace of each dam.

Table 21. Migration timing of BY17 PIT tagged subyearlings released at GRR in 2018.

	Detection Facilities						
	LGR	**LGO**	**LMO**	**IHR**	**MCN**	**JDD**	**BONN[a]**
Number Detected	**199**	**225**	**127**	**44**	**114**	**104**	**136**
Median Travel Days from GRR[b]	11	19	21	27	23	25	25
Median Passage Date	11 Jun	19 Jun	21 Jun	27 Jun	23 Jun	25 Jun	25 Jun
First Detection Date	2 Jun	5 Jun	8 Jun	12 Jun	12 Jun	12 Jun	15 Jun
Last Detection Date	26 Jul	16 Jul	18 Jul	12 Jul	18 Jul	20 Jul	20 Jul
10% of Run Passage Date	3 Jun	10 Jun	11 Jun	16 Jun	17 Jun	18 Jun	19 Jun
90% of Run Passage Date	24 Jun	1 Jul	1 Jul	11 Jul	8 Jul	11 Jul	8 Jul
TDG on Median Date of Passage (%)[c]	116.4	115.7	118.2	115.6	119.0	115.1	114.5
Outflow on Median Date of Passage (kcfs)[c]	87.7	67.9	62.7	62.0	231.6	240.8	275.4
Spill on Median Date of Passage (kcfs)[c]	35.4	33.0	16.8	51.0	116.2	96.2	95.5

[a] TDG, outflow and spill for BONN are detected six miles downstream at Warrendale.

[b] Travel days are calculated from the date of release.

[c] Detections are from the tailrace of each dam.

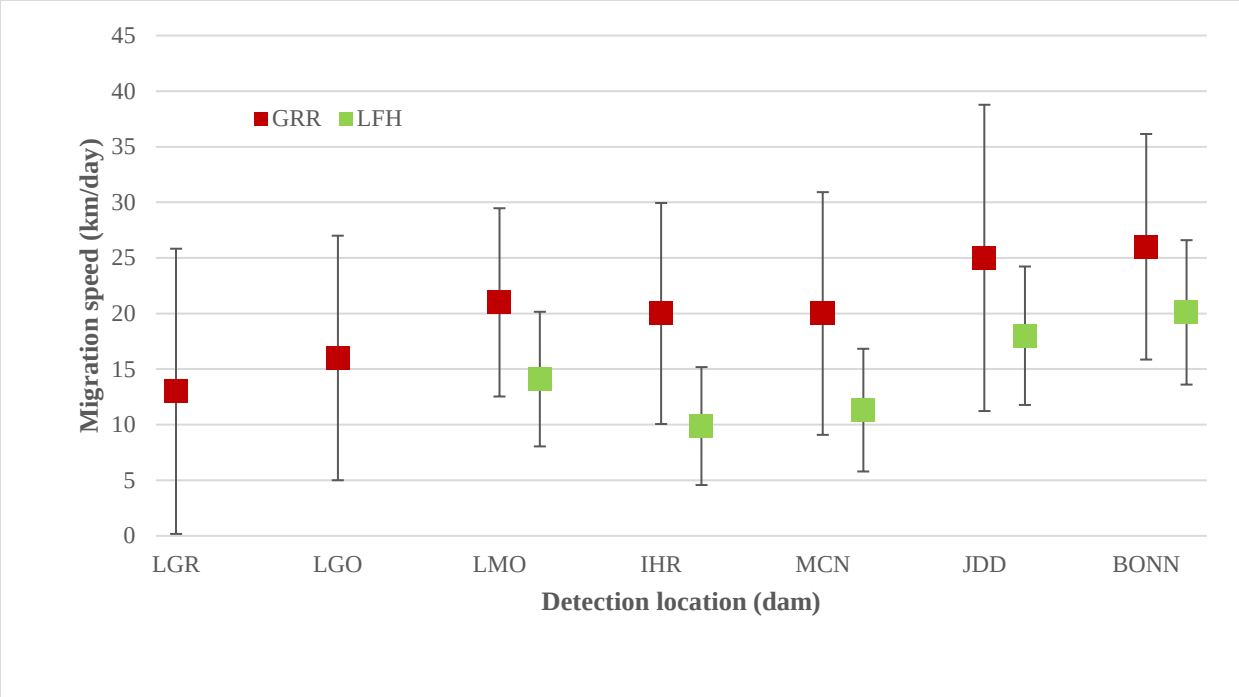


Figure 20. Migration speed and standard deviation of BY16 LFH and GRR subyearling fall Chinook salmon as they passed Snake and Columbia River dams in 2017.

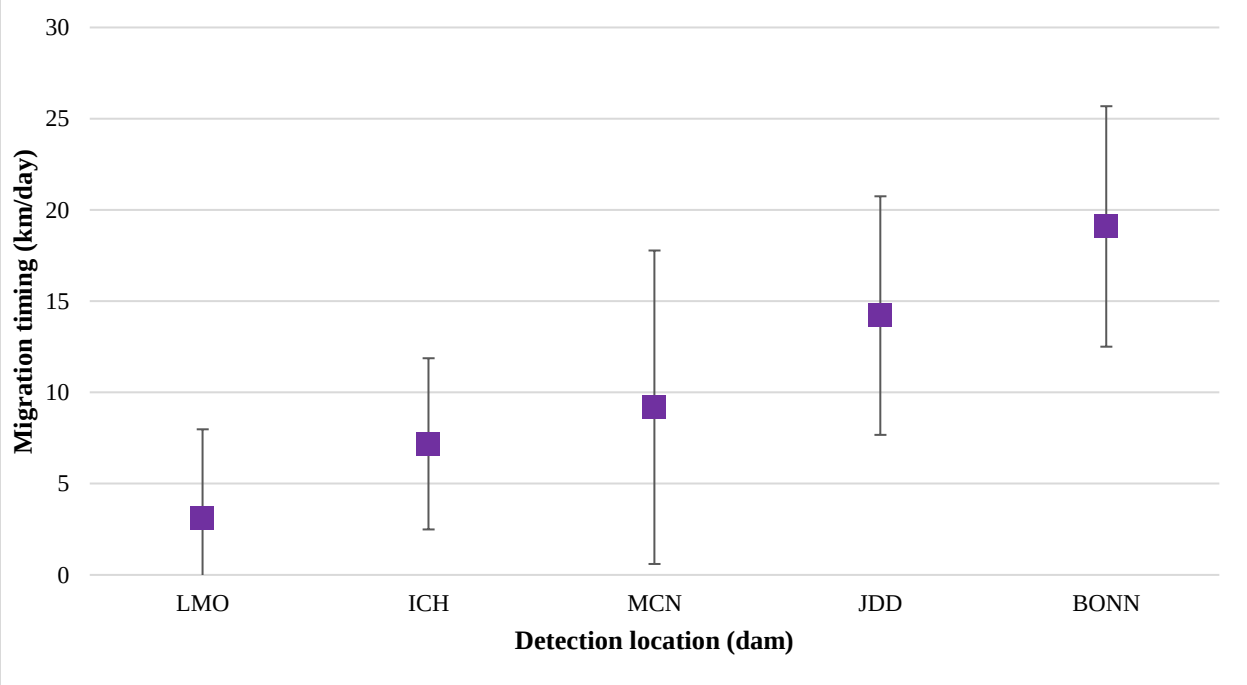


Figure 21. Migration speed and standard deviation of BY16 LFH yearling fall Chinook salmon as they passed Snake and Columbia River dams in 2018.

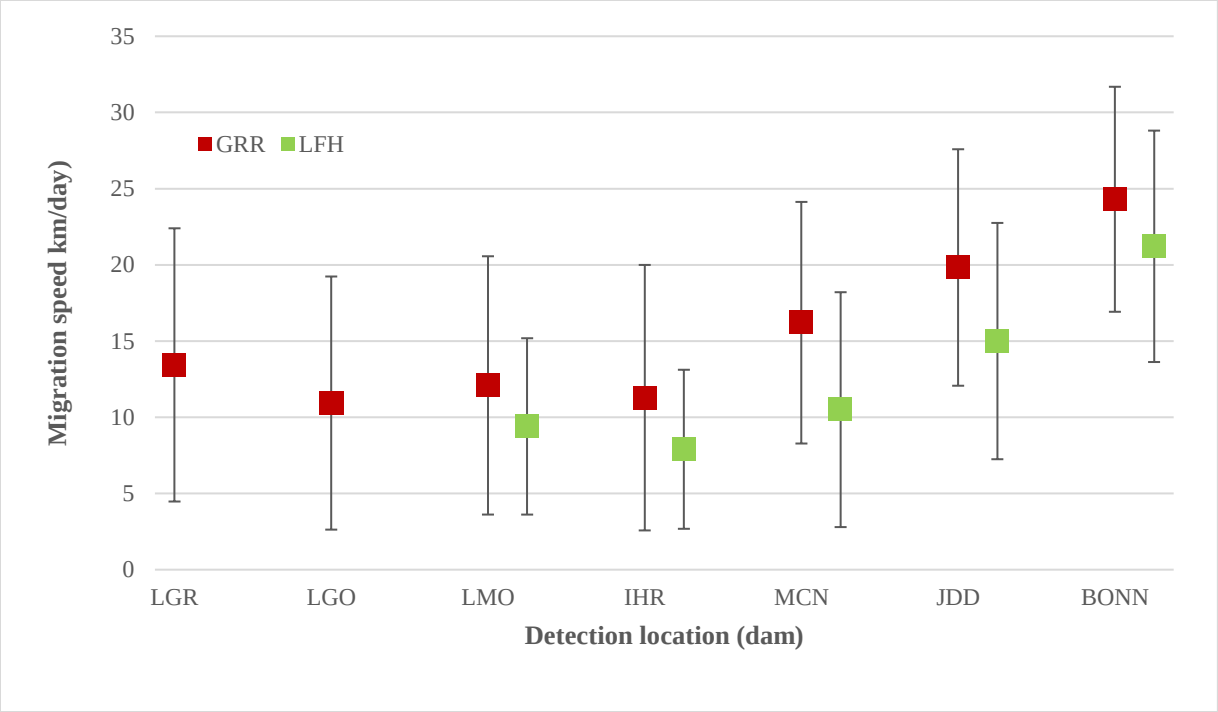


Figure 22. Migration speed and standard deviation of BY17 LFH and GRR subyearling fall Chinook salmon as they passed Snake and Columbia River dams in 2018.

Tucannon River Natural Production 2017

Adult Salmon Surveys

Fall Chinook Salmon Redd Surveys

WDFW personnel have conducted spawning ground surveys for fall Chinook salmon on the lower Tucannon River since 1985 (**Error! Reference source not found.**). Survey sections in 2017 covered the river from river kilometer (rkm) 1.1-33.6. The first 1.1 rkms 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. In addition the spawning habitat is poor in this area and it is presumed no spawning occurs there. During 2017, landowner access restrictions prevented the surveying of 1.5 rkms above the Starbuck Bridge within survey sections 5 and 6 (**Error! Reference source not found.**). Regular weekly surveys began the week of 29 October and continued until the week of 17 December.

A total of 229 redds (from all species) were counted in the Tucannon River (Table 22) and we estimate an additional 27 redds occurred in sections of river not surveyed due to access restrictions from landowners. Redds built in landowner restricted sections were estimated by calculating redds/km in an adjacent surveyed section and applying it to the non-surveyed area. While surveys could not be conducted during the weeks of 19 and 26 November, surveys did continue for three weeks after that so we assume any redds constructed during the no survey weeks were observed on these surveys and no corrections were made to the total estimate. An estimated 226 fall Chinook salmon and 30 coho salmon redds were constructed in the Tucannon River during 2017.

Table 22. Date and number of salmon redds and carcasses counted on the Tucannon River in 2017.

	Total redds [a]	Carcasses sampled	
Week beginning	Chinook & Coho [b]	Chinook	Coho
29 Oct	57	3	2
05 Nov	55	3	2
12 Nov	84	23	3
19 Nov[c]	No Data	No Data	No Data
26 Nov[c]	No Data	No Data	No Data
3 Dec	20	27	0
10 Dec	13	30	2
17 Dec[c]	0	4	0
Totals	**229**	**90**	**9**

[a] Observed redds not expanded for sections with access restrictions.
[b] Chinook & coho salmon redd data estimated through visual counts were combined.
[c] High flows and low visibility prevented surveys from being completed this week.

Escapement and Composition of the Fall Chinook Salmon Run in the Tucannon River

The total escapement to the Tucannon River is based on an expansion factor of three fish/redd. We believe this expansion factor provides a conservative estimate of fish spawning in the Tucannon River. Based on the three fish/redd expansion factor, we estimated 678 fall Chinook salmon and 90 coho salmon spawned in the Tucannon River in 2017. This resulted in an estimated 30,491 fall Chinook salmon emigrating the following year (Table 23). Staff recovered 90 fall Chinook salmon carcasses (13.3%) of the estimated total spawning escapement to the Tucannon River. Coho salmon carcasses were also recovered on the Tucannon River and can be found in **Error! Reference source not found.**.

Table 23. Estimated escapement, redd construction, and resulting estimates of smolts/redd and total number of emigrants from fall Chinook salmon spawning in the Tucannon River, 2001-2017.[a]

			Redd construction			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]
2001	219	14.9	65	8	73	336	24,545
2002	630	35.1	183	27	210	81	17,030
2003	474	65.8	143	15	158	460	72,656
2004	345	29.4	111	4	115	631	72,655
2005	198	60.0	61	5	66	320	21,170
2006 [e]	460	9.7	127	26	153	289	44,296
2007	326	7.0	93	16	109	Unknown [f]	Unknown [f]
2008	763	16.5	209	45	254	20	5,030
2009 [g]	756	10.7	217	35	252	147	36,991
2010	972	27.0	281	43	324	76	24,315
2011	906	4.2	278	24	302	67	20,331
2012	1,623	4.9	256	285 [h]	541	231	124,951
2013	1,158	8.5	261	125 [h]	386	24	9,262
2014	909	10.6	265	38	303	514	155,791
2015	1,518	8.9	295	211 [h]	506	148	74,869
2016	807	6.0	202	67	269	29	7,907
2017	678	12.0	201	25	226	93	30,491

[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] No estimate was made because the smolt trap sampling box had a hole in it and fish escaped
[g] First year of using new methodology to estimate proportion of fall Chinook salmon redds based upon proportions of fall Chinook salmon in carcass recoveries. Excludes one summer Chinook salmon redd located below the smolt trap.
[h] Adjustment includes estimates for weeks not walked due to temperature and water conditions.

The methodology used to estimate run composition of fall Chinook salmon in the Tucannon River was modified in 2012 to account for carcass recovery bias. Generally, more recoveries of females occur than males (particularly jacks and minijacks), primarily because females remain in the vicinity of redds when they die. The numbers of females were expanded to match the estimated number of redds, assuming 1 redd/female. The remainder of the run composition was based on the origins of males collected. CWT and scale analysis were used to determine the origin and age of each carcass**.** Compositions of recovered carcasses are presented in Table 24-Table 26.

Females represented 51.9% of the recoveries; primarily 2-salt and 3-salt fish. Tissue samples (fin clips or skin samples from the head) were collected and archived from 52 fall Chinook salmon (genetic sample numbers 17NP01, 5-9, 12-13, 15-18, 26-27, 28, 30-33, 35-37, 49-51, 53-55, 56-59, 61, 63-65, 67-69, 72, 75-77, 79-87) and one coho (17NQ04).

Table 24. Composition of wire tagged carcasses recovered and estimated run composition of fall Chinook salmon on the Tucannon River, 2017.

				Raw totals			Expanded to the run			
					M	M		M	M	
	Clip	CWT origin	CWT	F	≥53cm	<53cm	F	≥53cm	<53cm	Total
Inbasin wire fish	AD	LF13SO	636737	2	1	0	9	11	0	20
		LF13YO	636740	5	0	0	23	0	0	23
		LF13YO	636741	4	9	0	18	99	0	117
		LF14SO	636882	0	1	0	0	11	0	11
	NO	LF12YCJA	220338	2	0	0	9	0	0	9
		LF12YO	636584	1	0	0	5	0	0	5
		LF13YO	636740	14	6	0	65	65	0	130
		LF13YO	636741	1	0	0	5	0	0	5
		LF14YO	636885	5	5	0	23	55	0	78
		LF14YO	636886	0	1	0	0	11	0	11
Out-of-basin	AD	BONN12YUMA	90683	0	1	0	0	11	0	11
		BONN14YUMA	90944	0	1	0	0	11	0	11
		UMA13SUMA	90816	1	0	0	5	0	0	5
	NO	BONN11YUMA	90658	1	0	0	5	0	0	5
		BONN12YUMA	90682	1	0	0	5	0	0	5
		UMA13SUMA	90870	1	0	0	5	0	0	5
Totals				**38**	**25**	**0**	**177**	**274**	**0**	**451**

Table 25. Composition of untagged carcasses recovered and estimated run composition of fall Chinook salmon on the Tucannon River, 2017.

			Raw totals			Expanded to the run			
				M	M		M	M	
Origin	Clip	European age	F	≥53cm	<53cm	F	≥53cm	<53cm	Total
Hatchery	AD	0.2	0	2	0	0	21	0	21
		0.3	1	0	0	5	0	0	5
		1.2	1	0	0	5	0	0	5
Unknown	NO	0.2	2	7	0	10	73	0	83
		0.3	3	6	0	15	62	0	77
		0.4	1	2	0	5	21	0	26
		1.2	2	0	0	10	0	0	10
Totals			**10**	**17**	**0**	**50**	**177**	**0**	**227**

Table 26. Estimated composition of the fall Chinook salmon run to the Tucannon River by salt water age and origin, 2017.

	0 salt	1 salt		2+ salt			% of
Origin	Minijack	True jack	True jill	Adult F	Adult M	Total	return
Snake River hatchery (wire)	0	66	23	134	186	409	60.3%
Presumed Snake River hatchery (AD clip or yearling scales)	0	0	0	20	21	41	6.0%
Out-of-basin hatchery (wire)	0	0	0	20	22	42	6.2%
Unknown origin	0	0	0	30	156	186	27.5%
Totals	**0**	**66**	**23**	**204**	**385**	**678**	**100.0%**

Juvenile Salmon Emigration

Fall Chinook Salmon (2017 Outmigration Year)

Juvenile fall Chinook salmon (BY16) were observed at the Tucannon River smolt trap (rkm 3.0) from 23 February through 29 June 2017 (Figure 23). The last day of trapping was 7 July (Gallinat and Ross 2018). Trapping efficiency for fall Chinook salmon ranged from 5.6% to 15.8%. Staff captured 802 (including 14 mortalities) fall Chinook salmon in 2017. It was undetermined if the smolt trap was the cause of the mortalities. It is estimated that 6,422 (95% C.I. = 4,923-9,241) parr/smolts passed the trap during 2017. Based on 218 redds estimated above the smolt trap during 2016, an estimated 29.4 smolts/redd were produced. After including potential production from redds below the smolt trap in 2016 (51 additional redds), an estimated 7,907 naturally produced fall Chinook salmon parr/smolts left the Tucannon during 2017.

Staff PIT tagged 525 naturally produced fall Chinook salmon at the smolt trap from 11 May through 29 June 2017 to monitor the outmigration. Lengths of fall Chinook captured for the season ranged from 36-99 mm with a mean and median of 75 mm. Only fall Chinook >70 mm were PIT tagged. Migration timing and average speed (km/day) of naturally produced fall Chinook salmon leaving the Tucannon River to the Snake and Columbia River dams are presented in Table 27. Migration timing of naturally produced fall Chinook salmon leaving the Tucannon River in 2017.and Figure 24, respectively.

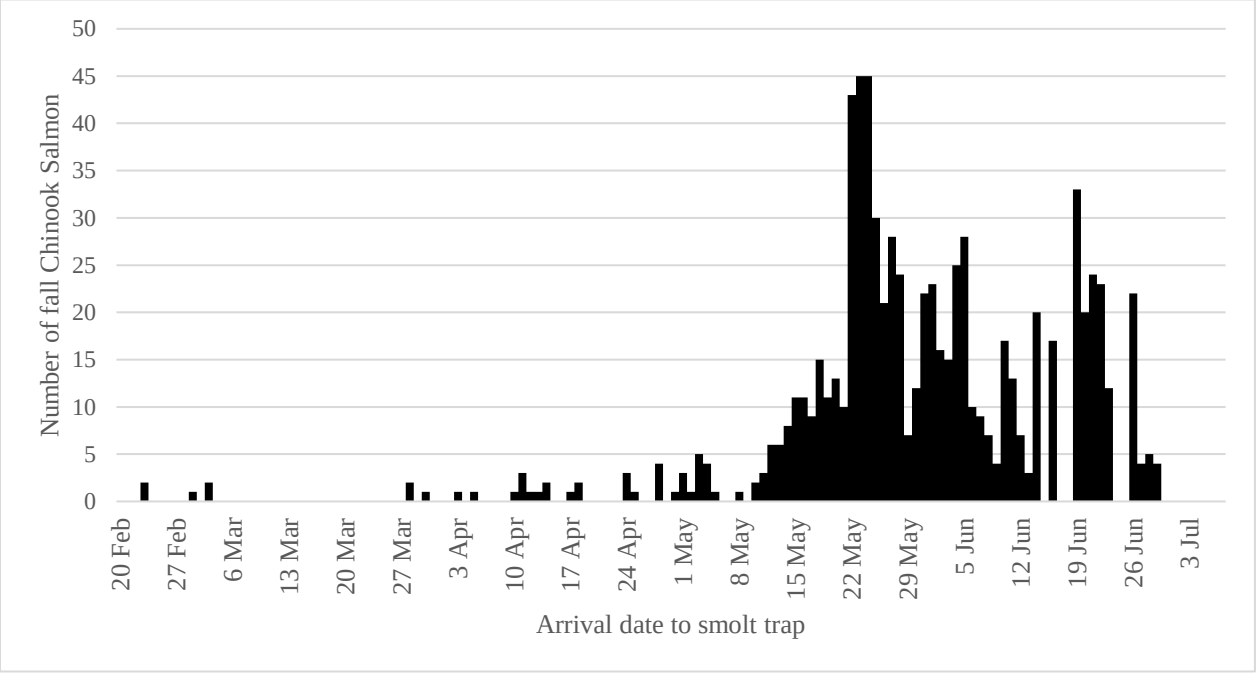


Figure 23. Migration timing of natural origin juvenile fall Chinook salmon captured at the Tucannon River smolt trap in 2017.

Table 27. Migration timing of naturally produced fall Chinook salmon leaving the Tucannon River in 2017.

	Detection Facilities				
	LMO	**ICH**	**MCN**	**JDD**	**BONN[a]**
Number Detected	**32**	**10**	**23**	**16**	**7**
Median Travel Days from TUC[b]	3	6	13	18	19
Median Passage Date	28 May	3 Jun	14 Jun	10 Jun	23 Jun
First Detection Date	23 May	27 May	28 May	1 Jun	9 Jun
Last Detection Date	3 Jul	11 Jun	9 Jul	15 Jul	8 Jul
10% of Run Passage Date	25 May	27 May	2 Jun	3 Jun	9 Jun
90% of Run Passage Date	18 Jun	11 Jun	27 Jun	28 Jun	6 Jul
TDG on Median Date of Passage (%)[c]	120.4	125.2	121.2	125.0	118.4
Outflow on Median Date of Passage (kcfs)[c]	137.3	168.7	390.0	451.3	365.2
Spill on Median Date of Passage (kcfs)[c]	60.1	114.2	219.6	187.3	177.1

[a] TDG, outflow and spill for BONN are detected six miles downstream at Warrendale.

[b] Travel days are calculated from the date of release.

[c] Detections are from the tailrace of each dam.

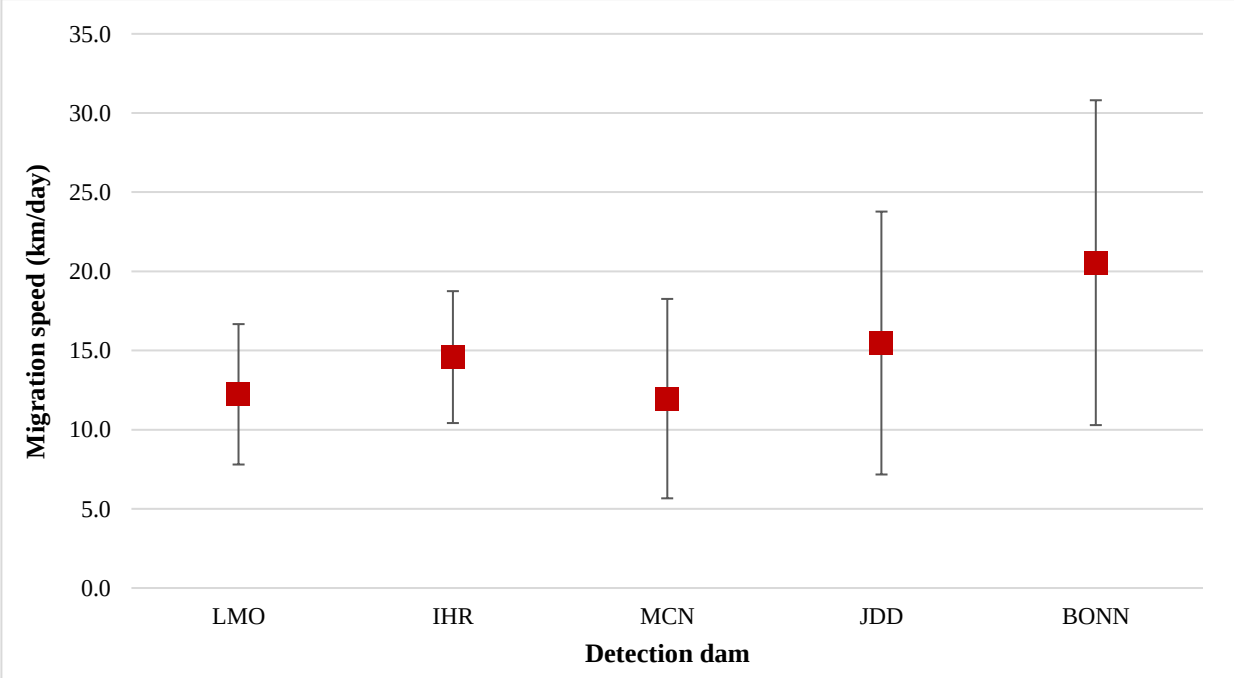


Figure 24. Migration speed and standard deviations of BY16 Tucannon River natural origin fall Chinook salmon in 2017.

Fall Chinook Salmon (2018 Outmigration Year)

Juvenile fall Chinook salmon (BY17) were observed at the Tucannon River smolt trap (rkm 3.0) from 9 February through 2 July 2018 (Figure 23). The last day of trapping was 6 July. No fall Chinook were PIT tagged at the trap during the 2018 outmigration year. Staff captured 876 (including 19 mortalities) fall Chinook salmon in 2018. It was undetermined if the smolt trap was the cause of the mortalities. It was estimated that 19,310 (95% C.I. = 11,175-37,993) parr/smolts passed the trap during 2018. Based on 207 redds estimated above the smolt trap during 2017 spawning ground surveys, an estimated 30,491 smolts/redd were produced. After including potential production from redds below the smolt trap in 2017 (19 additional redds), an estimated 30,491 naturally produced fall Chinook salmon parr/smolts left the Tucannon during 2018.

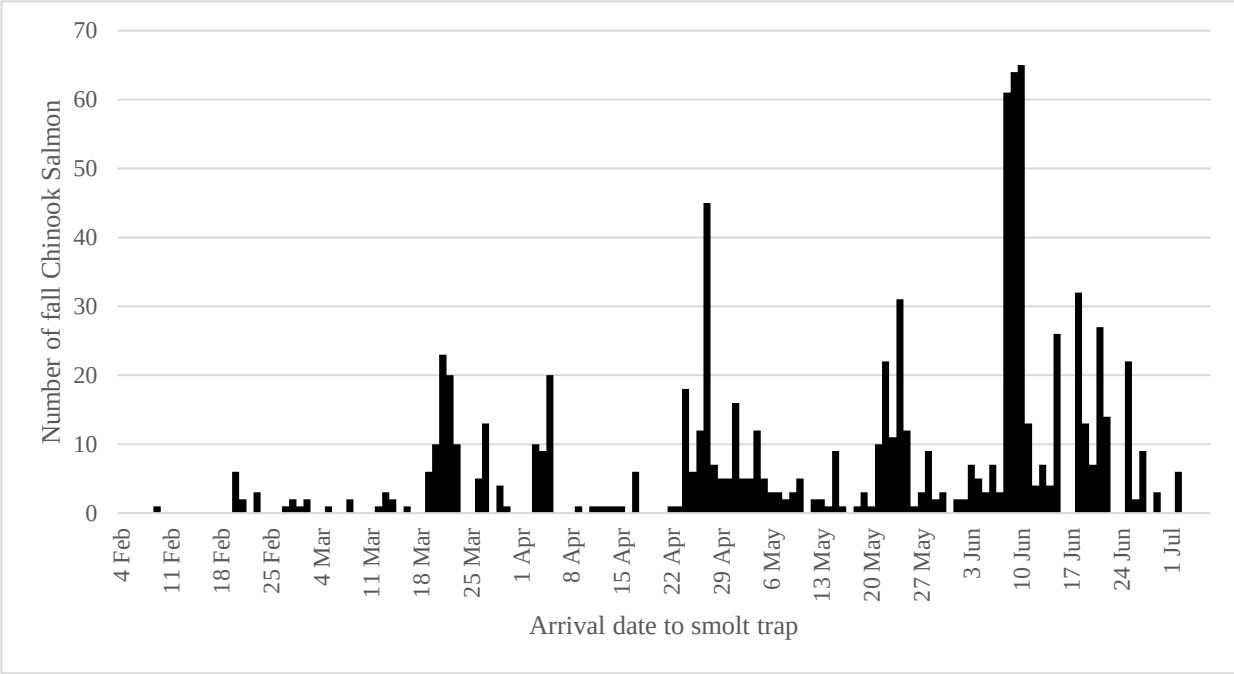


Figure 25. Migration timing of natural origin juvenile fall Chinook salmon captured at the Tucannon River smolt trap in 2018.

Fall Chinook Salmon Run Size and Composition 2017

Returns to LGR and Composition of Fish Returning to LGR

Chinook salmon (all runs) were counted 24 hours per day 15 June through 30 September and 16 hours per day from 1 October through 31 December at the counting window at LGR (U.S. Army Corps of Engineers, 2017). Fish are visually measured and grouped by total length (TL) at fish passage windows. Window counts (day and night) estimated 33,127 fall Chinook salmon (≥ 30 cm TL) reached LGR in 2017 (Figure 26), which includes 6,696 "jacks" by size (30 cm-55 cm TL).

Chinook salmon passing LGR after 17 August are designated as fall Chinook salmon based on arrival date, which may be inaccurate because of the overlap between the fall and summer Chinook salmon runs. In addition, fish counts do not include fish less than 30 cm long, or adjust for fish that crossed the dam and fell back through the juvenile bypass system, spillway, turbines, or locks, some of which may have reascended the ladder and were double counted.

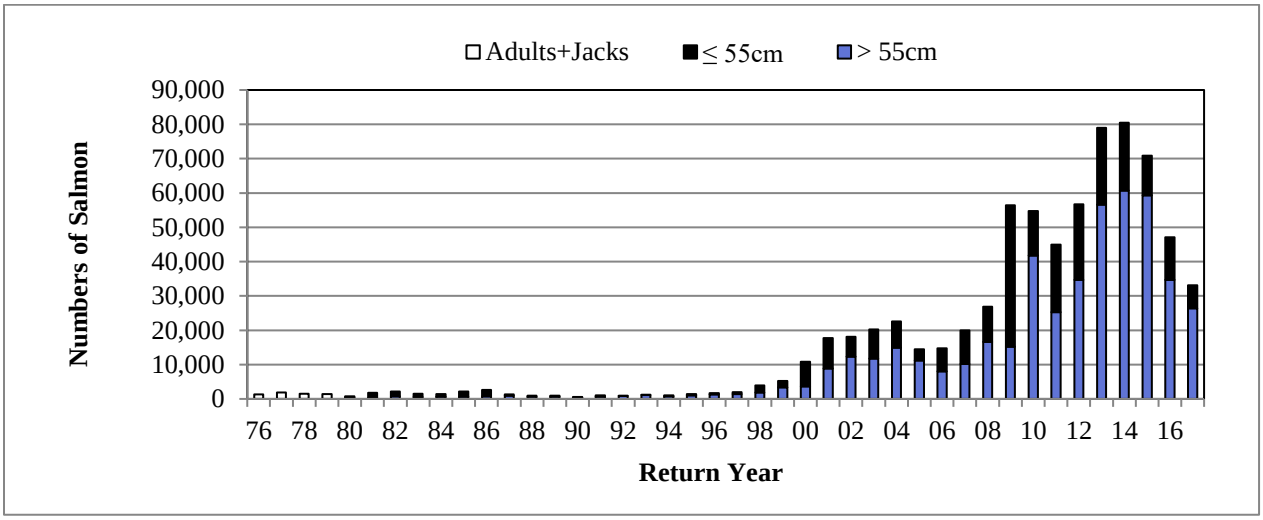


Figure 26. Fall Chinook salmon window counts at LGR, 1976-2017.

The Snake River fall Chinook salmon run reconstruction technical team annually estimates the run to LGR, and consists of staff from NPT, WDFW, IPC, NOAA, and the Columbia River Inter-Tribal Fish Commission (CRITFC) (Table 28). The estimates derived were bootstrapped by Ben Sandford of NOAA and confidence intervals were applied to the point estimates. The fall Chinook salmon run reconstruction technical team estimated 28,652 (including males less than 57 cm) fall Chinook salmon (26.4% wild, 72.9% inbasin hatchery, and 0.7% out of basin hatchery) reached LGR in 2017. The final run estimate to LGR was 13.5% less than window count estimates documented at www.fpc.org. . Females, regardless of size, were summarized together and males were summarized according to fork length (30 cm - 56 cm and ≥ 57 cm). The data is grouped by total age as requested by TAC. The data does not specifically show true jacks because age 2 fish consist of minijacks (0-salt yearlings) and jacks (1-salt subyearlings) and age 3 fish consist of jacks (1-salt yearlings) and adults (2-salt subyearlings).

Table 28. Estimated composition, standard errors, and confidence intervals for fall Chinook salmon reaching LGR during 2017

Estimates					Bootstrap standard error					Bootstrap 95% Confidence Interval Upper CI, Lower CI				
Total Run by Origin														
Origin	**F**	**M ≥57cm**	**M <57 cm**	**Total ≥57cm**	**Origin**	**F**	**M ≥57 cm**	**M <57 cm**	**Total ≥57cm**	**Origin**	**F**	**M ≥ 57cm**	**M <57 cm**	**Total ≥57 cm**
Total wild	3,215	3,715	641	6,930	Total wild	296	268	282	388	Total wild	2622, 3789	3306, 4366	40, 1195	6273, 7790
Total hatchery	9,893	7,960	3,229	17,853	Total hatchery	286	263	267	355	Total hatchery	9298, 10416	7385, 8405	2735, 3801	17033, 18451
Totals	13,107	11,675	3,870	24,782	Totals	191	176	133	183	Totals	12712, 13458	11332, 12053	3603, 4140	24425, 25139
Run by origin and age														
Origin	**F**	**M ≥57cm**	**M <57 cm**	**Total ≥57cm**	**Origin**	**F**	**M ≥57cm**	**M <57cm**	**Total ≥57cm**	**Origin**	**F**	**M ≥57cm**	**M <57 cm**	**Total ≥57 cm**
Wild age 2	45	9	550	54	Wild age 2	15	39	278	42	Wild age 2	19, 79	-79, 68	-55, 1075	-42, 124
Wild age 3	1,242	2,852	73	4,094	Wild age 3	142	205	74	245	Wild age 3	943, 1515	2504, 3322	-92, 196	3657, 4639
Wild age 4	1,048	624	12	1,673	Wild age 4	240	182	8	305	Wild age 4	565, 1516	286, 1006	0, 30	1081, 2299
Wild age 5	855	230	6	1,085	Wild age 5	126	66	7	139	Wild age 5	621, 1121	110, 360	0, 24	827, 1377
Wild age 6	25	0	0	25	Wild age 6	13	0	0	13	Wild age 6	2, 55	0, 0	0, 0	2, 55
Hat age 2	21	66	2,396	88	Hat age 2	10	50	336	51	Hat age 2	4, 42	0, 184	1761, 3131	13, 202
Hat age 3	2,398	3,899	833	6,297	Hat age 3	186	254	168	301	Hat age 3	2030, 2743	3384, 4358	500, 1150	5667, 6842
Hat age 4	5,982	3,347	0	9,328	Hat age 4	273	247	0	364	Hat age 4	5452, 6540	2857, 3831	0, 0	8594, 10072
Hat age 5	1,383	507	0	1,890	Hat age 5	144	100	0	171	Hat age 5	1085, 1657	318, 720	0, 0	1548, 2217
Hat age 6	60	0	0	60	Hat age 6	23	0	0	23	Hat age 6	18, 106	0, 0	0, 0	18, 106
Stray age 2	0	0	0	0	Stray age 2	0	0	0	0	Stray age 2	0, 0	0, 0	0, 0	0, 0
Stray age 3	0	20	0	20	Stray age 3	0	13	0	13	Stray age 3	0, 0	0, 49	0, 0	0, 49
Stray age 4	14	76	0	90	Stray age 4	10	34	0	37	Stray age 4	0, 37	17, 154	0, 0	26, 173
Stray age 5	34	36	0	70	Stray age 5	16	19	0	24	Stray age 5	6, 68	6, 76	0, 0	29, 123
Stray age 6	0	0	0	0	Stray age 6	0	0	0	0	Stray age 6	0, 0	0, 0	0, 0	0, 0
Stray AWT	0	10	0	10	Stray AWT	0	9	0	9	Stray AWT	0, 0	0, 30	0, 0	0, 30
Stray Wild	0	0	0	0	Stray Wild	0	0	0	0	Stray Wild	0, 0	0, 0	0, 0	0, 0

[a] AWT refers to agency wire tag with a 09 agency code.

Fallbacks at the LGR Juvenile Collection Facility

In 2017, construction at the Juvenile Fish Facility (JFF) at LGR prevented staff from collecting jack/adult fallbacks in the sample. Additionally, information from the separator is limited from 26 March-3 August, therefore, no fall Chinook salmon were encountered.

Characteristics of fall Chinook salmon reaching LGR Dam

The following figures use data from hatchery and natural origin fall Chinook handled at the LGR adult trap.

Sex Ratio

The estimated 2017 run reconstruction estimate consisted of 62.7% males+jacks. The sex ratio of the return was calculated at 1.2 males+jacks/female. After removal of fish for broodstock, fish passing LGR were 65.4% males resulting in 1.3 males+jacks/female.

Length Frequencies

Every salmon trapped at LGR was measured and the number of fish at each length were expanded by the trapping rate on the day they were captured to represent the overall run at that size during that day (Figure 27). Median fork length for males was 59.9 cm with a mean of 61.0 cm. Median fork length for females was 72.0 cm with a mean of 72.2 cm

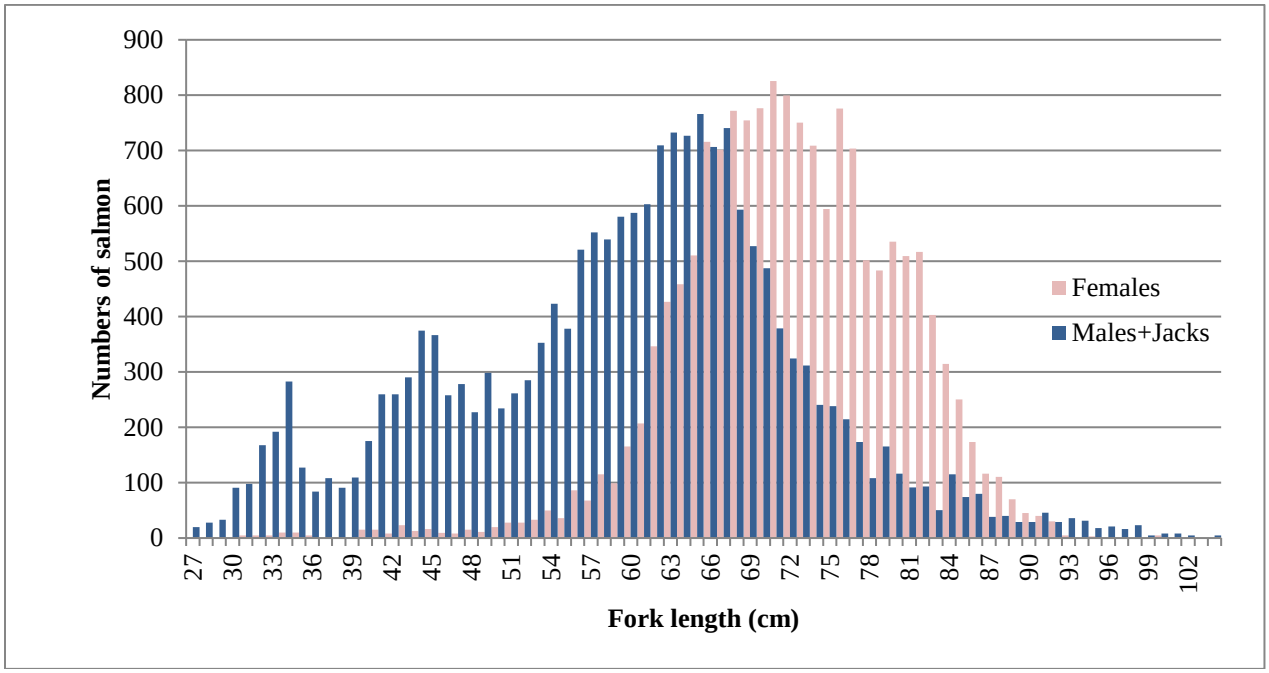


Figure 27. Estimated length frequencies of the fall Chinook salmon run to LGR by sex in 2017.

Status of Mitigation Requirements

Overall Mitigation Level

To estimate the overall mitigation return, certain caveats of the data are required. Salt water age was estimated by subtracting 1 from the total age of subyearlings and subtracting 2 from the total age of yearlings. These estimates underestimate jacks and overestimate adults because they do not take into account reservoir rearing of the subyearling component. Estimated recoveries of WDFW releases outside of the Snake River are fully expanded. The Regional Mark Processing Center (RMPC) website, www.rmpc.org, was queried on 29 December 2018 for the 2017 returns of CWT tagged fish associated with WDFW releases.

An estimated minimum 11,101 (12.1%) of the total LSRCP original mitigation objective of 91,500 fall Chinook salmon released by WDFW was achieved in 2017 with 4,280 of those recovered outside of the Snake River Basin.

Returns to the Project Area

An estimated minimum 6,524 fall Chinook salmon (adults+jacks) returned from WDFW releases into the project area, contributing 35.7% of the total LSRCP mitigation goal of 18,300 in 2017 (Table 29). Combining recoveries of fish harvested below LGR, killed at LFH, the carcasses recovered on Tucannon River and the estimated run to LGR provides the best estimate of mitigation returns (tagged and untagged fish). These estimates do not include inbasin hatchery returns from the FCAP, IPC and the NPTH programs.

Harvest in the Project area

In 2017, anglers in Washington were allowed a daily harvest of six adipose-clipped adult fall Chinook salmon and an unlimited number of jacks (clipped or unclipped).

On the Snake River (Washington and Idaho combined), there were 297 CWT recoveries (expanded or not expanded) reported in the Regional Mark Information System (RMIS) database from WDFW releases, with 163 captured below LGR (Table 30).

Table 29. Estimated returns of fall Chinook salmon released by WDFW to the Snake River and levels of mitigation goals met in 2017.

	Saltwater age						
	0-salt	1-salt		2-5 salt			
Location	Minijack [a]	Jack [b]	Jill [c]	Adult F	Adult M	Total ESTD (Adult+Jack)	% of LSRCP goal to the Snake River
Harvested FCH below LGR	163	32	98	20	13	163	0.9
LFH trapped and killed during processing	5	103	3	33	25	164	0.9
Estimated run to the Tucannon R.	0	66	23	204	385	678	3.7
Run to LGR [d] (wire+nowire)	72	1,419	122	2,130	1,848	5,519	30.2
Total	**240**	**1,620**	**246**	**2,387**	**2,271**	**6,524**	**35.7**

[a] Minijacks are males that did not spend a year in salt water.
[b] Jacks are males that spent 1 year in salt water.
[c] Jills are females that spent 1 year in salt water.
[d] Estimated run to LGR Dam for LFH, GRR and Couse Creek releases including fish hauled to LFH and NPTH for processing as well as fish released from the dam.

Table 30. Estimated Snake River basin recoveries in 2017 of wire tagged fall Chinook salmon released by WDFW as reported to RMIS on 12/29/2018.

		0-salt	1-salt	2-4 salt		
Freshwater sport location		Minijack	Jack	Adult	Total ESTD[a] Adult+Jack	% Catch by location
Below LGR	Snake R LMO-LGO	163	130	33	163	54.9
Above LGR	Snake LGR-ID	0	33	33	66	22.2
	Snake R above HWY12	0	0	65	65	21.9
	Snake R below Salmon R	0	2	0	2	0.7
	Snake R above Salmon R	0	0	1	1	0.3
Totals		**163**	**165**	**132**	**297**	

[a] The fish in the sections above and below the Salmon R are not an estimate of the total recoveries and are only what was observed as the sample size was too small to expand.

Recoveries Outside of the Snake River Basin

In 2017, approximately 4,280 (5.8%) of the 73,200 downriver fish harvest objective were harvested outside of the Snake River Basin from WDFW releases (onstation at LFH, CCD, and GRR) after expanding for sampling methodologies reported and including associated untagged fish estimated in catches (fully expanded estimates). For a greater description of methods used to expand CWT recoveries, see Oakerman et al. (2018).

Estimates of harvest for fish released by WDFW are listed in Table 31– Table 33 and do not include recoveries of fish released by the NPT (LSRCP-FCAP or NPTH programs) or ODFW or IDFG (IPC program).

Outside of the Snake River Basin, less than half (46.0%) of recoveries reported to RMIS occurred in saltwater locations and 54.0% occurred in freshwater locations, with 68.4% coming from commercial/tribal fisheries, 31.3% from sport fisheries, 0.4% from spawning ground surveys on the Hanford reach and Similkameen R, 0.1% were from hatcheries and 0.02% from fish traps. Harvest primarily occurred in the ocean off the coasts of Washington, British Columbia, and Oregon, but the single largest fishery contributor to harvest was the Zone 6 Tribal Gillnet fishery which accounted for 25.6% of all the fish harvested in 2017.

Table 31. Fully expanded recovery estimates of tagged and untagged fall Chinook salmon recovered in the Columbia River Basin (freshwater areas) during 2017 for WDFW releases. Minijacks are not included in the estimates.

		Yearlings			Subyearlings							Total recoveries	
		LFH			LFH		CCD		GRR				
Recovery area	Fishery/ Hatchery/ River	EST CWT	EST CWT adj a	Total EST wire+no wire[b]	EST CWT	EST wire+no wire	EST CWT	EST wire+no wire	EST CWT	EST wire+no wire	Total EST wire+no wire[b]	Grand total EST CWT	Grand total EST wire+no wire
COL R Gillnet	Zone 1-5 Non-tribal Net	49	84	84	24	24	5	5	28	28	57	106	141
	Zone 6 Tribal Net	426	769	771	166	167	8	9	148	148	323	749	1,094
River Seine	non-Columbia	1	1	1	0	0	0	0	0	0	0	1	1
COL R Sport	Zone 1-5 sport	156	156	156	42	42	0	0	38	38	80	236	236
Estuary Sport	COL R Estuary	300	300	300	74	74	7	7	47	47	128	428	428
Freshwater	Bonneville Pool	4	4	4	1	1	0	0	1	1	2	6	6
Sport	Deschutes R Sport	21	21	21	1	1	0	0	2	2	3	24	24
	Hanford Reach	4	4	4	3	3	0	0	0	0	3	7	7
Hatchery	Priest Rapids	0	0	0	0	0	0	0	1	1	1	1	1
	Bonneville	3	3	3	1	1	0	0	0	0	1	4	4
Carcass	Hanford Reach	13	13	13	0	0	0	0	0	0	0	13	13
Survey	Similkameen R	4	4	4	0	0	0	0	0	0	0	4	4
Fish Trap	Three Mile Dam (Umatilla)	0	0	0	1	1	0	0	0	0	1	1	1
	Totals	**983**	**1,360**	**1,362**	**313**	**314**	**20**	**20**	**265**	**265**	**599**	**1,581**	**1,961**

[a] Estimate adjusted for unclipped CWT fish caught in nonselective fisheries using visual detection method and electronic detections where unclipped CWT fish were not harvested at the same rate as the ADCWT fish

[b] Estimate adjusted for untagged fish caught in nonselective fisheries.

Table 32. Fully expanded recovery estimates of tagged and untagged fall Chinook salmon in areas outside of the Snake River Basin (saltwater areas) during 2017 for WDFW releases. Minijacks are not included in the estimates.

		Yearlings			Subyearlings							Total recoveries	
		LFH			LFH		CCD		GRR				
Region	Fishery	EST CWT	EST CWT adj	Total EST wire + no wire	EST CWT	EST wire + no wire	EST CWT	EST wire + no wire	EST CWT	EST wire + no wire	Total EST wire + no wire	Grand Total EST CWT	Grand Total EST wire + no wire
AK	Ocean Gillnet	2	4	4	0	0	0	0	2	2	2	4	5
	Ocean Seine	1	2	2	0	0	0	0	0	0	0	1	2
	Ocean Sport	4	8	8	0	0	4	4	19	19	23	26	31
	Ocean Troll	32	42	42	22	22	2	2	22	22	46	78	88
BC	Ocean Seine	1	2	2	0	0	0	0	0	0	0	1	2
	Ocean Troll	537	537	537	59	59	22	22	119	119	201	738	738
	Ocean Rod and Reel	1	2	2	0	0	0	0	0	0	0	1	2
	Sport (private)	100	195	195	11	11	11	11	25	25	47	147	242
HS	Trawl (CA/OR/WA)	3	3	3	0	0	0	0	1	1	1	4	4
OR	Estuary Sport	3	3	3	0	0	0	0	0	0	0	3	3
	Ocean Sport	17	17	17	2	2	0	0	3	3	5	22	22
	Ocean Troll	186	186	186	23	23	0	0	54	54	77	263	263
WA	Ocean Sport	257	257	257	51	51	5	5	34	34	90	347	347
	Treaty Troll	277	277	277	37	37	0	0	21	21	58	336	336
	Ocean Troll (non-treaty)	172	172	172	37	37	0	0	26	26	63	235	235
	Totals	**1,592**	**1,706**	**1,706**	**243**	**243**	**44**	**44**	**326**	**326**	**613**	**2,205**	**2,319**

Table 33. Fully expanded recovery estimates (tagged and untagged) of 2017 returns by region, rear type, and release location for fall Chinook salmon released by WDFW. Minijacks are not included in the estimates.

	Yearlings		Subyearlings								Yearlings and Subyearlings combined	
	LFH		LFH		CCD		GRR		Total subyearlings			
Region	ESTD wire+no wire	Recovery comp by region %	ESTD wire+no wire	Recovery comp by region %	ESTD wire+no wire	Recovery comp by region %	ESTD wire+no wire	Recovery comp by region %	ESTD wire+no wire	Recovery comp by region %	ESTD wire+no wire	Recovery comp by region %
COL R.(freshwater)	1,362	44.4%	314	56.3%	20	31.7%	265	44.8%	599	49.4%	1,961	45.8%
AK	55	1.8%	22	3.9%	6	8.9%	43	7.3%	70	5.8%	126	2.9%
BC	736	24.0%	71	12.7%	33	52.2%	144	24.4%	248	20.5%	984	23.0%
HS	3	0.1%	0	0.0%	0	0.0%	1	0.2%	1	0.1%	4	0.1%
OR	206	6.7%	25	4.6%	0	0.0%	57	9.6%	82	6.8%	288	6.7%
WA	706	23.0%	125	22.5%	5	7.2%	81	13.8%	211	17.4%	917	21.4%
Total recoveries	**3,068**		**556**		**64**		**591**		**1,211**		**4,280**	
Recoveries by rear type	**71.7%**								**28.3%**			

Total Age of Yearling and Subyearlings Recovered Outside of the Snake River Basin

The Columbia River was the primary area fish were recovered outside of the Snake River for both yearling and subyearling production groups (Table 34-Table 37)Table 37. Final locations of ADCWT subyearling fall Chinook salmon released into the Grande Ronde to areas outside of the Snake River Basin in 2017 by total age, based on estimated recoveries reported to RMIS as of 12/18/18. Fish from ADCWT yearling production and ADCWT subyearling production released into the Snake River at LFH were primarily recovered at ages 3 and 4. Subyearlings from CCD production were recovered only as age 4 fish as the last release occurred in 2013. Subyearlings released into the GRR were primarily recovered as age 3 fish, spending 2 years in the ocean.

Table 34. Final locations of ADCWT yearling fall Chinook salmon released onstation at LFH to areas outside of the Snake River basin in 2017 by total age, based on estimated recoveries reported to RMIS as of 12/18/18.

Brood year: Total age: Tag code: ADCWT at release: Total released (wires+nowire):	2014 3 (Jack) 636886 238,940 246,874	2013 4 636741 219,396 227,447	2012 5 636584 247,714 250,892	2011 6 636444 240,413 243,649	A+J Totals	Non-Snake R. recovery location comp %
AK	1	13	12	5	31	2.0%
BC	18	280	50	8	356	22.5%
COL	136	447	128	27	738	46.7%
HS	2	0	0	0	2	0.1%
OR	11	60	22	4	97	6.1%
WA	32	256	67	1	356	22.5%
Grand Total	200	1056	278	46	1580	
Percent of recoveries out-of-basin	**12.6%**	**66.8%**	**17.6%**	**2.9%**		

Table 35. Final locations of ADCWT subyearling fall Chinook salmon released onstation at LFH to areas outside of the Snake River Basin in 2017 by total age, based on estimated recoveries reported to RMIS as of 12/18/18.

Brood year: Total age: Tag code: ADCWT at release: Total released (wires+nowire):	2015 2 (Jack) 637038 187,799 202,460	2014 3 636882 189,788 219,359	2013 4 636737 203,004 209,972	2012 5 636574 210494 211,599	A+J Totals	Non-Snake R. recovery location comp %
AK	0	0	14	8	22	3.9%
BC	4	15	36	16	71	12.7%
COL	4	190	92	28	314	56.3%
OR	0	11	15	0	25	4.6%
WA	0	83	35	7	125	22.5%
Grand Total	7	299	192	58	556	
Percent of recoveries out-of-basin	**1.3%**	**53.6%**	**34.5%**	**10.5%**		

Table 36. Final locations of ADCWT subyearling fall Chinook salmon released into the Snake River near Couse Creek to areas outside of the Snake River Basin in 2017 by total age, based on estimated recoveries reported to RMIS as of 12/18/18.

Brood year: **Total age:** **Tag code:** **ADCWT at release:** **Total released (wires+nowire):**	**2012** **4** **636575** **202,159** **205,300**	**Totals**	**Non-Snake R. Recovery Location Comp %**
AK	6	6	8.9%
BC	33	33	52.2%
COL	20	20	31.7%
WA	5	5	7.2%
Grand Total	64	64	
Percent of recoveries out-of-basin	**100.0%**		

Table 37. Final locations of ADCWT subyearling fall Chinook salmon released into the Grande Ronde to areas outside of the Snake River Basin in 2017 by total age, based on estimated recoveries reported to RMIS as of 12/18/18.

Brood year: **Total age:** **Tag code:** **ADCWT at release:** **Total released (wires+nowire):**	**2014** **3** **636883** **199,938** **456,101**	**2013** **4** **636739** **191,711** **403,926**	**2012** **5** **636576** **216,159** **400,543**	**Totals**	**Non-Snake R. Recovery Location Comp %**
AK	16	17	10	43	7.2%
BC	79	54	11	144	24.2%
COL	183	67	20	271	45.5%
HS	0	1	0	1	0.2%
OR	48	4	0	52	8.7%
WA	74	6	5	85	14.2%
Grand Total	400	150	46	595	
Percent of recoveries out-of-basin	**67.2%**	**25.1%**	**7.7%**		

Estimated Returns to the Snake River using PIT tags and CWTs

PIT tags have been used in-season to assist with estimating returns to the Snake River and to estimate returns to areas below LGR. Over the years, broodstock trapping protocols have focused more on LGR in an effort to increase natural origin fish in broodstock, and less on trapping at LFH. With these changes, fish homing to LFH are not fully estimated using only returns to the Tucannon River and trapping at LGR because the fish might be remaining in the reservoir waiting for entry into LFH, and are also known to spawn in some of the dam tailraces, and in the Palouse River. In addition, fish less than 30 cm FL (mini-jacks – generally all from the yearling programs) are not counted at LGR nor are the traps equipped to contain these fish. To fully monitor returns, PIT tags may provide and advantage because they can be used to assess all age classes, regardless of size, where CWT data is limited in that respect.

To address these concerns, we compared two methods of estimating returns to the Snake River: 1) PIT tag detections at return and 2) estimated returns of CWT fish. PIT tag detections of our on-station releases were downloaded 22 January 2019 from www.ptagis.org. Comparisons of estimates of returns from juveniles released as yearlings are presented in Table 38. Return and survival estimates to the Snake River for yearling fall Chinook salmon released at LFH estimated using PIT tag detections in the Snake River through 2017. and Table 39 and Figure 28. Subyearlings are presented in

Table **40** and Table 41 and Figure 29. Data highlighted in red (CWT tables) are based on fish sampled in 2013, during the last 40% of the return due to delays at LGR caused by warm water temperatures which prevented trapping, and may therefore be biased.

For all years combined, PIT tagged returns of yearling fall Chinook salmon released at LFH estimated on average 3.0, 1.3, and 1.1 times greater returns of 0-salt, 1-salt, and 2+ salt fish, respectively, than estimated by using CWT's. Results for subyearlings have been the opposite. For all years combined, PIT tag returns were 0.8 and 0.9 times less for 1-salt and 2+salt fish, respectively, than estimated by using CWTs. Overall, it would appear that both methods produce comparable results.

Table 38. Return and survival estimates to the Snake River for yearling fall Chinook salmon released at LFH estimated using PIT tag detections in the Snake River through 2017.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total Return to Date (1-4 salts)
2006	4.0%	1.7%	0.8%	0.0%	0.0%	2.5%
	18,284	7,728	3,601	201	-	11,530
2007	0.4%	0.7%	0.3%	0.1%	0.0%	1.1%
	1,804	3,319	1,413	289	17	5,039
2008	0.6%	0.9%	0.5%	0.0%	0.0%	1.4%
	2,788	4,439	2,344	160	-	6,942
2009	0.4%	0.5%	0.4%	0.1%	0.0%	1.0%
	2,018	2,313	1,925	543	0	4,781
2010	0.4%	1.3%	0.9%	0.1%	0.0%	2.3%
	2,102	6,321	4,532	410	0	11,263
2011	0.6%	0.9%	1.0%	0.1%	0.0%	2.0%
	2,900	4,458	5,078	318	17	9,872
2012	0.5%	0.4%	0.3%	0.0%	-	0.7%
	2,684	1,857	1,418	236		3,512
2013	0.6%	0.8%	0.6%	-	-	1.4%
	3,116	3,697	2,721			6,417
2014	0.8%	0.5%	-	-	-	0.5%
	3,901	2,197				2,197
2015	0.4%	-	-	-	-	0.0%
	1,614					0
Average	0.9%	0.9%	0.6%	0.1%	0.0%	1.3%
	4,121	4,037	2,879	308	8	6,155

Table 39. Return and survival estimates to the Snake River for yearling fall Chinook salmon released at LFH estimated using CWT recoveries and return estimates through 2017. Cells highlighted in red indicate possible biased data due to trapping restrictions during 2013.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total return to date (1-4 salts)	Total release (wire+nowire)	Tag codes
2006	0.7%	2.2%	0.9%	0.0%	0.0%	3.1%	459,634	634092
	3,435	10,188	4,103	160	0	14,451		633987
2007	0.1%	0.5%	0.6%	0.1%	0.0%	1.2%	455,152	634680
	420	2,241	2,688	321	1	5,251		634681
2008	0.1%	0.6%	0.4%	0.1%	0.0%	1.1%	478,852	635165
	531	3,014	2,114	279	0	5,407		635166
2009	0.2%	0.5%	0.6%	0.1%-	0.0%	1.2%	463,729	635510
	1,097	2,165	2,948	298	0	5,411		635564
2010	0.2%	1.0%	0.7%	0.2%	0.0%	1.8%	490,000	636079
	1,128	4,842	3,387	742	20	8,992		636080
2011	0.7%	0.4%	0.7%	0.1%	0.0%	1.2%	489,500	636443
	3,658	1,818	3,248	682	18	5,766		636444
2012	0.4%	0.3%	0.3%	0.0%	-	0.6%	503,273	636583
	1,922	1,427	1,403	189		3,019		636584
2013	0.1%	0.2%	0.3%	-	-	0.4%	452,373	636740
	436	881	1,182			2,063		636741
2014	0.2%	0.2%	-	-	-	0.2%	487,177	636885
	745	1,129				1,129		636886
2015	0.0%	-	-	-	-	-	458,558	637040
	225							637041
Average	0.3%	0.7%	0.6%	0.1%	0.0%	0.9%		
	1,360	3,078	2,634	381	7	5,721	475,521	

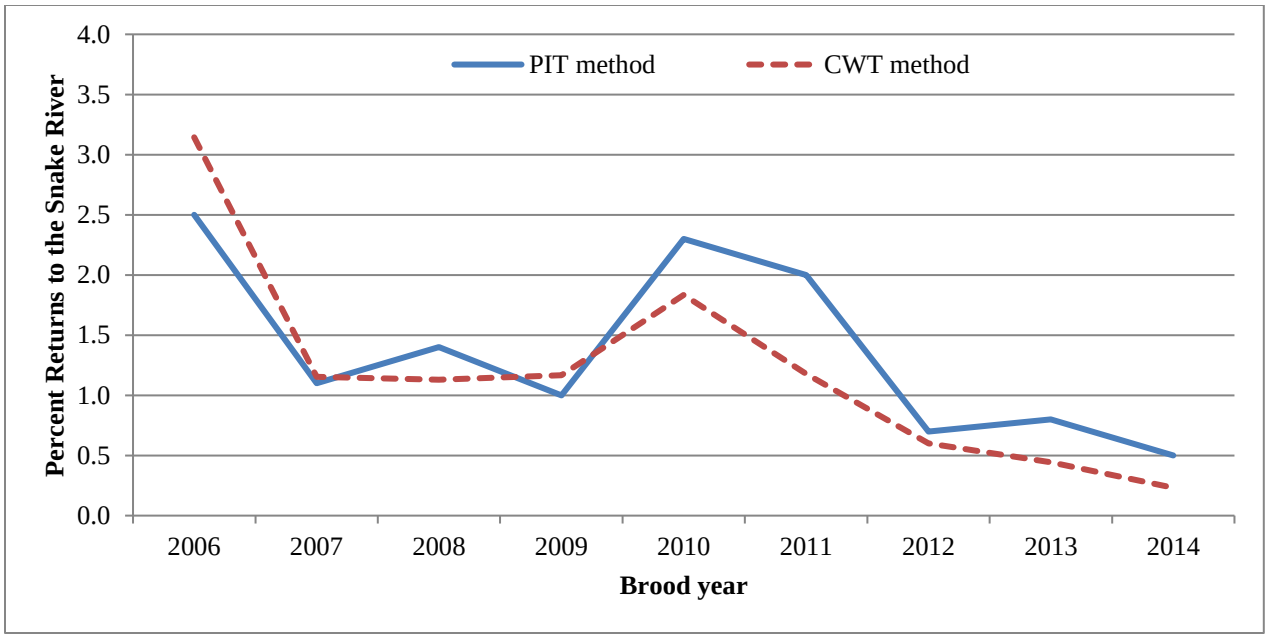


Figure 28. Percent survival of yearling releases from LFH to the Snake River using CWTs and PIT tags through return year 2017 for 1-4 salt fish.

Table 40. Return and survival estimates to the Snake River for subyearling fall Chinook salmon released at LFH estimated using PIT tag detections in the Snake River through 2017.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total Return to Date (1-4 salts)
2011	0.0%	0.1%	0.3%	0.1%	0.0%	0.5%
	0	252	504	242	0	997
2012	0.0%	0.1%	0.3%	0.1%	0.0%	0.5%
	0	278	685	107	43	1,113
2013	0.0%	0.1%	0.2%	0.0%	-	0.3%
	0	105	463	63		631
2014	0.0%	0.2%	0.2%	-	-	0.4%
	0	375	419			793
2015	0.0%	0.1%	-	-	-	0.1%
	0	142				142
2016	0.0%	-	-	-	-	0.0%
	0					0
Average	0.0%	0.1%	0.2%	0.1%	0.0%	0.3%
	0	230	518	137	21	613

Table 41. Return and survival estimates to the Snake River for subyearling fall Chinook salmon released at LFH estimated using CWT detections in the Snake River through 2017. Cells highlighted in red indicate possible biased data due to trapping restrictions during 2013.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total Return to Date (1-4 salts)	Total release (wire+nowire)	Tag codes
2011	0.0%	0.1%	0.1%	0.2%	0.0%	0.4%	200,900	636417
	0	242	206	424	25	897		
2012	0.0%	0.2%	0.4%	0.2%	0.0%	0.8%	211,599	636574
	0	467	843	487	49	1846		
2013	0.0%	0.1%	0.2%	0.1%	-	0.4%	209,972	636737
	0	230	321	157		708		
2014	0.0%	0.2%	0.1%	-	-	0.3%	219,359	636882
	0	491	268			759		
2015	0.0%	0.0%	-	-	-	0.0%	202,460	637038
	0	57				57		
2016	0.0%	-	-	-	-	-	204,579	637198
	0					-		
Average	0.00%	0.1%	0.2%	0.2%	0.0%	0.38%	208,145	
	0	297.4	409.5	356	37	853.4		

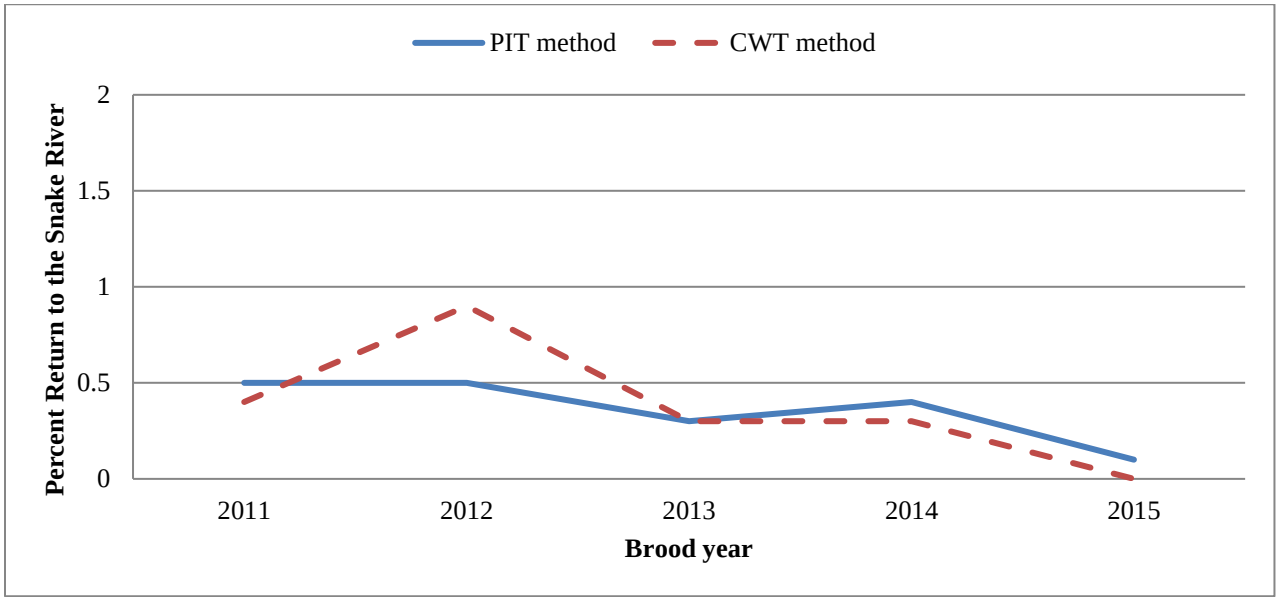


Figure 29. Percent returns of subyearling releases from LFH to the Snake River using CWTs and PIT tags through return year 2017 for 1-4 salt fish.

Estimated Returns above Bonneville Dam using PIT tags and CWTs

Similar to the preceding section, we estimated returns of fall Chinook salmon above Bonneville Dam in the Columbia and Snake rivers using PIT tags (all detections at or above Bonneville Dam) or CWTs (all recoveries above Bonneville Dam). Similar to the returns back to the Snake River, PIT tag estimates for yearlings resulted in combined averages that were 3.6, 1.4 times greater, and 0.9 times less for 0-salt, 1-salt, and 2+ salt fish compared to the CWT method. (Table 42 and Table 43, Figure 30). Survival for subyearlings using PIT tags resulted in 0.9 times less for 1-salt and 2+salt fish than estimated by CWTs (Table 44 and Table 45, Figure 31)

Table 42. Total return and survival estimates of yearling fall Chinook salmon released at LFH estimated using PIT tag detections in the Snake and Columbia rivers through 2017.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total survival estimate (1-4 salts)
2006	4.8%	2.1%	1.4%	0.1%	0.0%	3.6%
	21,916	9,814	6,260	402	0	16,476
2007	0.5%	0.8%	0.6%	0.1%	0.0%	1.5%
	2,417	3,830	2,741	426	17	7,013
2008	0.7%	1.1%	0.7%	0.0%	0.0%	1.8%
	3,516	5,185	3,143	231	18	8,576
2009	0.6%	0.5%	0.8%	0.2%	0.0%	1.5%
	2,810	2,468	3,586	916	0	6,970
2010	0.6%	1.6%	1.3%	0.1%	0.0%	3.0%
	2,840	7,848	6,502	591	0	14,941
2011	1.0%	1.0%	1.3%	0.1%	0.0%	2.4%
	4,944	4,978	6,201	587	34	11,799
2012	0.8%	0.4%	0.4%	0.1%	-	1.0%
	4,069	2,127	2,195	675	-	4,997
2013	0.9%	0.9%	0.8%	-	-	1.7%
	4,177	4,177	3,617	-	-	7,794
2014	0.5%	0.5%	-	-	-	0.5%
	2,204	2,606	-	-	-	2,606
2015	0.5%	-	-	-	-	0.0%
	2,204	-	-	-	-	0
Average	1.1%	1.0%	0.9%	0.1%	0.0%	1.7%
	5,110	4,782	4,280	547	11	8,117

Table 43. Total return and survival estimates of yearling fall Chinook salmon released at LFH estimated using freshwater CWT recoveries above Bonneville Dam and return estimates through 2017. Cells highlighted in red indicate possible biased data due to trapping restrictions during 2013.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total survival estimate (1-4 salts)	Total release (wire+nowire)	Tag codes
2006	0.8%	2.4%	1.4%	0.1%	0.0%	3.8%	459,634	634092
	3,639	11,153	6,283	248	3	17,687		633987
2007	0.1%	0.6%	0.9%	0.1%	0.0%	1.6%	455,152	634680
	456	2,623	4,116	473	10	7,222		634681
2008	0.1%	0.7%	0.6%	0.1%	0.0%	1.4%	478,852	635165
	531	3,555	2,911	412	0	6,878		635166
2009	0.3%	0.5%	0.9%	0.1%	0.0%	1.5%	463,729	635510
	1,167	2,299	4,066	455	0	6,820		635564
2010	0.2%	1.1%	1.0%	0.2%	0.0%	2.3%	490,000	636079
	1,149	5,317	4,862	949	20	11,148		636080
2011	0.8%	0.4%	0.8%	0.2%	0.0%	1.4%	489,500	636443
	3,712	2,177	4,047	827	73	7,124		636444
2012	0.4%	0.3%	0.4%	0.1%	-	0.8%	503,273	636583
	1,922	1,578	1,783	269		3,630		636584
2013	0.1%	0.2%	0.4%	-	-	0.6%	452,373	636740
	437	1,015	1,710			2,725		636741
2014	0.2%	0.3%	-	-	-	0.3%	487,177	636886
	772	1,249				1,249		636885
2015	0.1%	-	-	-	-	-	458,558	637040
	235					-		637041
Average	0.33%	0.72%	0.80%	0.13%	0.00%	1.52%	473,825	
	1,532	3,441	3,722	519	18	7,165		

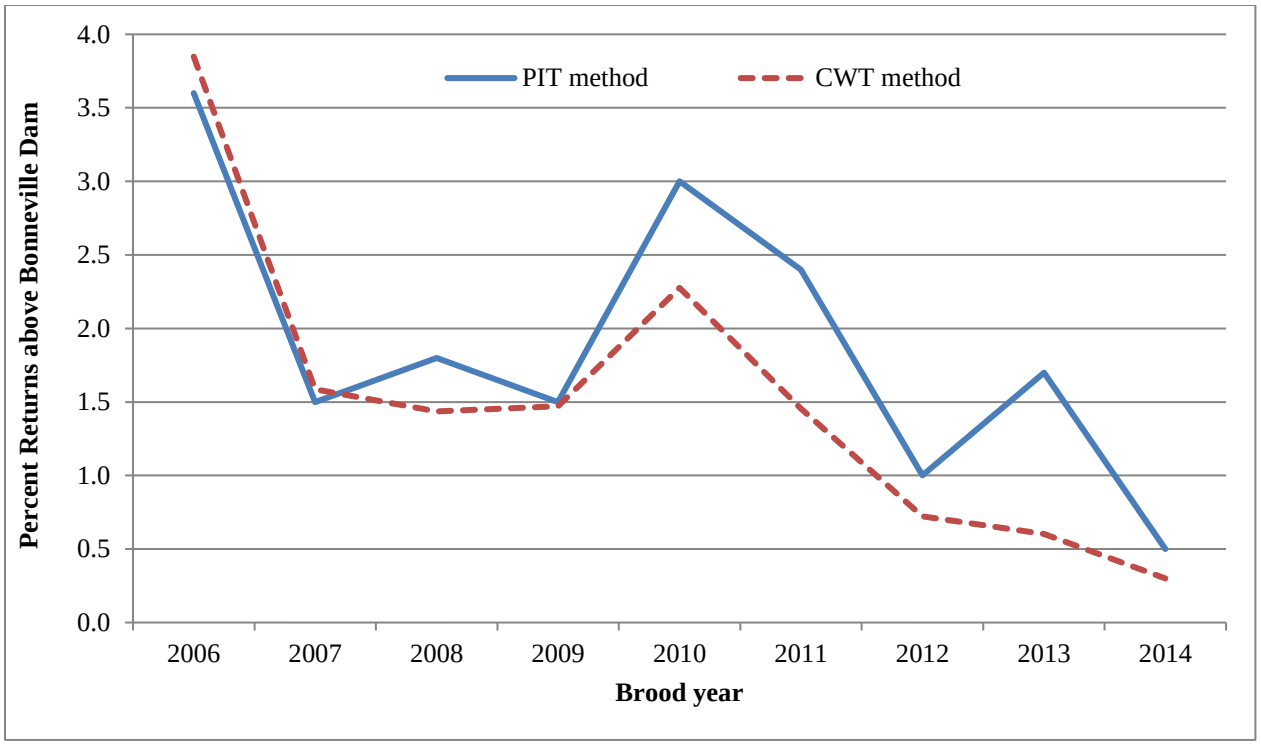


Figure 30. Percent return of yearling fall Chinook salmon released at LFH to areas above Bonneville Dam, including the Snake River, through return year 2017 for 1-4 salt fish.

Table 44. Total return and survival estimates of subyearling fall Chinook salmon released at LFH estimated using PIT tag detections in the Snake and Columbia rivers through 2017.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total survival estimate (1-4 salts)
2011	0.0%	0.2%	0.3%	0.2%	0.0%	0.7%
	0	322	655	373	10	1,360
2012	0.0%	0.2%	0.3%	0.1%	0.0%	0.6%
	0	332	738	214	86	1,370
2013	0.0%	0.1%	0.3%	0.1%	-	0.4%
	0	126	599	116		841
2014	0.0%	0.2%	0.3%	-	-	0.5%
	0	452	584			1036
2015	0.0%	0.1%	-	-	-	0.1%
	0	152				152
2016	0.0%	-	-	-	-	0.0%
	0					0
Average	0.0%	0.1%	0.3%	0.1%	0.0%	0.4%
	0	277	644	234	48	793

Table 45. Total return and survival estimates of subyearling fall Chinook salmon released at LFH estimated using freshwater CWT recoveries above Bonneville Dam and return estimates through 2017. Cells highlighted in red indicate possible biased data due to trapping restrictions during 2013.

Brood year	0-salt	1-salt	2-salt	3-salt	4-salt	Total survival estimate (1-4 salts)	Total release (wire+nowire)	Tag codes
2011	0.0% 0	0.1% 251	0.2% 302	0.2% 489	0.0% 36	0.5% 1,078	200,900	636417
2012	0.0% 0	0.2% 482	0.5% 957	0.3% 605	0.0% 60	1.0% 2,104	211,599	636574
2013	0.0% 0	0.1% 231	0.2% 406	0.1% 207	-	0.4% 844	209,972	636737
2014	0.0% 0	0.2% 502	0.2% 392	-	-	0.4% 894	219,359	636882
2015	0.0% 0	0.0% 57	-	-	-	0.0% 57	202,460	637038
2016	0.0% 0	-	-	-	-	- -	204,579	637198
Average	0.00% 0	0.12% 304.6	0.28% 514.25	0.20% 433.66667	0.00% 48	0.46% 995.4	208,145	

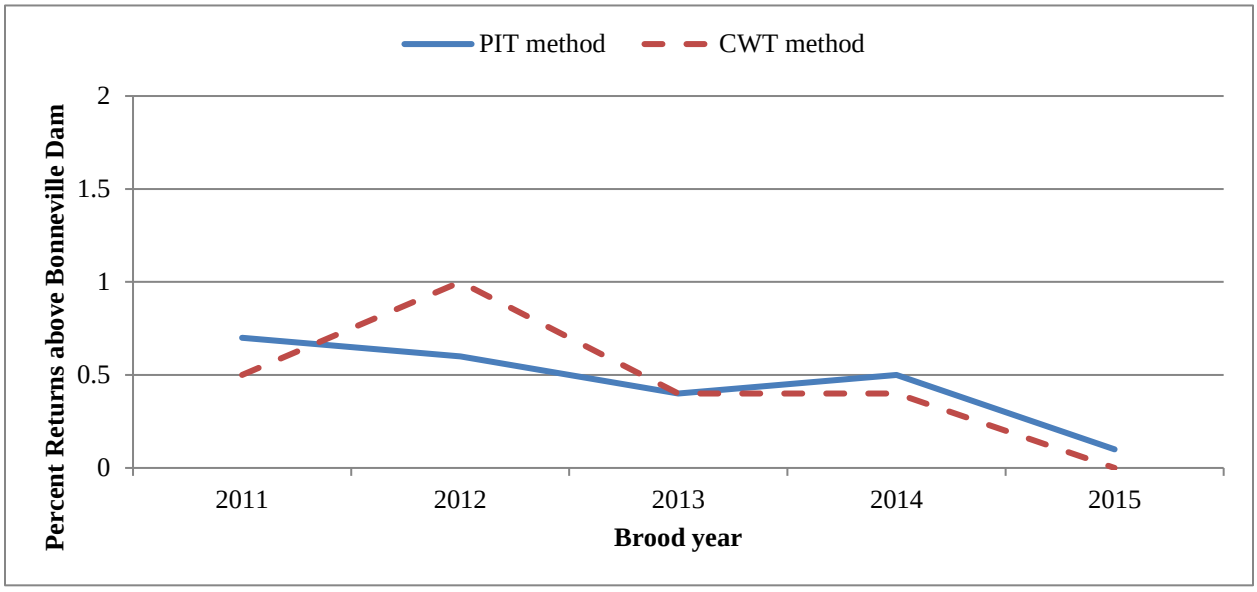


Figure 31. Percent return of subyearling fall Chinook salmon released at LFH to areas above Bonneville Dam, including the Snake River, through return year 2017 for 1-4 salt fish.

Direct Take of Listed Snake River fall Chinook Salmon During Fall of 2017 and Spring of 2018

Adult estimates for permit #16607 for LFH production and permit #16615 for NPTH production have been combined in the tables below. These "take" tables are in the format used during the time the work was conducted. Take tables were updated following the 2018 NOAA consultation of the program during the summer of 2018 (Section 10 Permits 16607-2R and 16615-2R), which will be presented in the next LSRCP fall Chinook report. In addition, during consultation, it was agreed that additional reporting requirements were needed for the program and covered under the Terms and Condition section of the Section 10 permits, with the timeframe beginning in 2018. The information required in Section 10 permit 16607-2R as specified in the Special Conditions, Research, Monitoring, and Evaluation section (page 9-10) and the Permit Reporting and Reauthorization Requirements (C-5a, i-ix). Information needed is included as tables in this document or was obtained and cited from the following documents (see lists below):

Direct take consists of adults spawned in 2017 at LFH and NPTH (highlighted in green), and eggs/loss/release data associated with BY17 subyearlings released in 2018 and BY16 yearlings released in 2018 that were part of LSRCP, LSRCP-FCAP, and IPC programs. Direct takes of listed Snake River fall Chinook salmon were calculated in Table 46 and Table 47 and were generally within limits. The number of unmarked/untagged juveniles released by these programs totaled 1,072,363 fish, which are not included in the tables below.

Additional information can also be found in reports provided by Nez Perce Tribe, and are referred to in the Conditions Table (Table 48) provided below.

1. Nez Perce Tribe Snake River Fall Chinook Salmon Monitoring and Evaluations Report (**M&E Report**)
2. 2018 Snake River Fall Chinook Salmon Spawning Summary Report (**Redd Report**)
3. Final abundance and composition of Snake River Fall Chinook salmon returning to Lower Granite Dam in 2017 (**Run Recon Report**)
4. 2017 NPTH SR fall Chinook production report (**Production Report**)

Table 46. Proposed permissible direct take and actual take of listed Snake River fall Chinook salmon adults returning in 2017 and juveniles released in 2018 for fish cultural purposes for the LFH, IPC, and FCAP programs. Red cells indicate take exceeded permitted limit and green cells combine take from LFH and NPTH programs.

Type of Take	Mark [a]	Annual take of listed fish by life stage							
		Egg/fry		Juvenile or smolt		Adult [b]		Carcass	
		Limit	Take	Limit	Take	Limit	Take	Limit	Take
Observe or harass [c]	No fin clip	0		0		1,000	0	0	
	AD clip	0		0		1,000	0	0	
Collect for transport [d]	No fin clip	0		0		0		0	
	AD clip	0		0		0		0	
Capture, handle, and release [e]	No fin clip	0		0		0		0	
	AD clip	0		0		0		0	
Capture, handle, tag/marked/tissue sample, and release [f]	No fin clip	0		810,455	782,541	1,500 [j]	130	0	
	AD clip	0		2,335,000	2,409,821	1,100 [j]	60	0	
Intentional lethal take [g]	No fin clip	0	48,940	0		2,600 [h]	2,026	0	
	AD clip	0		0		2,200 [h]	678	0	
Unintentional lethal take [i]	No fin clip	7.50%	6.47%	7.50%	10.10%	500	97	0	
	AD clip	7.50%	6.47%	7.50%	10.10%	450	38	0	

[a] "No fin clip" salmon include hatchery-origin and natural –origin fish. The majority of unclipped fish are hatchery origin.

[b] For purposes of this permit, adults are defined as fall Chinook salmon that are at least 3 years old that have spent at least 2 years in the ocean. Fish that spend only one year in the ocean, called "jacks" or "1-salts," represent a natural life history and are thought to contribute to natural production at a low but relatively constant level. These fish are almost exclusively males (females are called "jills"). Jack returns are highly variable and cannot be accurately forecasted. In-season management and take monitoring will classify fish less than 53 cm (FL) as jacks. Post-season reporting will be based on estimated ocean age. Adult take limits are based on programmatic needs-broodstock number and run-reconstruction numbers – and limits to the overall sampling rate, of the run at age, at the LGR trap and/or supplemental trapping efforts at Lyons Ferry Hatchery and Nez Perce Tribal Hatchery are not to exceed 20%. Any non-lethal take of jacks during trapping efforts is permitted.

[c] Contact with listed fish that could occur from migration delay at dam or traps. Specifically, this refers to fish trapped at LFH and returned to the river without handling, the vast majority being clipped and/or tagged hatchery fish.

[d] Take associate with weir or trapping operations where listed fish are captured and transported, These levels represent full broodstock collection at LGR – see intentional lethal take below.

[e] Take associated with weir or trapping operations where listed fish are captured, handled, and released upstream or downstream.

[f] Take of juveniles due to tagging/marking/PIT tagging prior to release and does not include 1,349,796 unclipped and untagged fish released by LSRCP and LSRCP-FCAP programs. The number shown assumes full production through priority 17 (able B4B. U.S. v. Oregon agreement [2009]) and does not include NPTH production. This number could vary depending on annual egg takes and survival in the hatchery.

[g] Intentional mortality of listed fish as broodstock only. Values represent total need for all program components (LFH, FCAP, NPTH, and IPC). Priority collection occurs at the LGR trap, alternative collection at LFH and NPTH.

[h] Take goal for natural-origin fish for broodstock is 1500 adults. Jacks can compose up to 10% of total broodstock collection

[i] Unintentional mortality from operation of adult traps, including loss of fish during trapping, transport, and holding prior to spawning or release back into the wild after broodstock sorting. Also includes estimates of in-hatchery incubation and rearing mortality, by life-stage. Adult mortality estimates based on 15% prespawning mortality, including adult trapping, holding, and transport.

[j] Adult fish in excess to broodstock needs that are returned to the river from the LFH and the NPTH. These fish are typically fin clipped for re-capture identification.

Table 47. Proposed permissible direct take and actual take of listed Snake River fall Chinook salmon adults returning in 2017 and juveniles released in 2018 for RM&E activities associated with the LFH fall Chinook salmon programs not directly related to fish culture. Red cells indicate take exceeded permitted limit and green cells combine take from LFH and NPTH programs.

		Annual take of listed fish by life stage							
		Egg/fry		Juvenile or smolt		Adult		Carcass	
Type of Take	Mark	Limit	Take	Limit	Take	Limit	Take	Limit	Take
Observe or harass [a]	No fin clip	0				200	133	0	
	AD clip	0				600	82	0	
Collect for transport [b]	No fin clip	0		0		0		0	
	AD clip	0		0		0		0	
Capture, handle, and release [c]	No fin clip	0		Up to 15% of natural juvenile production not to exceed 25,000 fish [h]	131			10	0
	AD clip	0						10	0
Capture, handle, tag/mark/tissue sample, and release [d]	No fin clip	0		2,700 [h]	657	4,000[i]	3,286	100	60
	AD clip	0				2,500[i]	1,983	300	30
Removal (e.g. broodstock) [e]	No fin clip	0		0		0		0	
	AD clip	0		0		0		0	
Intentional lethal take [f]	No fin clip	0		0		1,000[i]	133	0	
	AD clip	0		0		1,000[i]	93	0	
Unintentional lethal take [g]	No fin clip	0		300 [h]	14	0		0	
	AD clip	0		100 [h]	0	0		0	

[a] Contact with live, ESA-listed fish through juvenile and adult spawning surveys on the Tucannon River and adult spawning surveys on Asotin Creek.
[b] Take of listed fish for transportation only.
[c] Take associated with smolt trapping operations where listed fish are captured, handled, and released. Adult numbers represent adults captured, handled, and released from juvenile trapping operations.
[d] Take associated with adult and juvenile sampling and monitoring projects. These include; adult fall Chinook salmon trapped, handled, sampled, tagged and released from adult trapping facilities and weirs, carcass sampling during spawning ground surveys on the Tucannon River and Asotin Creek, and juvenile fall Chinook salmon captured, handled, sampled, tagged, and released from juvenile trapping, netting, and electro-fishing projects.
[e] RM&E activities do not include broodstock collection.
[f] Intentional mortality of hatchery fish as a result of run reconstruction needs. These are coded-wire tagged hatchery fish.
[g] Unintentional mortality of listed fish, including loss of fish during smolt trapping.
[h] WDFW activities associated with emigrant studies using rotary screw trap and spawning ground surveys on the Tucannon River.
[i] Adults (non-jacks) used for run reconstruction at LGR trap.
[j] Take associated with spawning ground surveys on Asotin Creek located above LGR Dam.

Table 48. Terms and Conditions for WDFW Section 10 Permit #16607-2R (2018).

Conditions	Response or reference for requested information
Annual adult return estimates for all ESA-listed salmonids encountered at the Lower Granite Dam adult trap.	See ESA permit 21951; Lower Granite Dam trapping permit (NOAA)
Fall Chinook salmon escapement to Lyons Ferry Hatchery, Nez Perce Tribal Hatchery and the South Fork Clearwater Weir (once in operation) by origin (marked, tagged, unknown and unmarked adults);	Escapement to LFH described within this report (Appendix E Table 3 and Appendix E Table 4, page 102. Escapement to NPTH provided in **NPTH Production Report**. The South Fork Clearwater trap was not operated in 2017.
Annual estimates of fall Chinook salmon escapement, and fall Chinook salmon redd counts, in natural spawning areas	Fall Chinook salmon escapement to the Tucannon River is provided in Table 25 and page 43 in this report. Fall Chinook salmon escapement to natural spawning areas above LGR are described the **NPTH M&E report**. Fall Chinook salmon redd counts above LGR are described in the **NPTH M&E report** and in the **NPT Redd report**
Carcass recovery data, including numbers, sex ratios, fish stock origin, mark observations, tributary location, and age class	Carcass recovery data from the Tucannon River is provided in Tables 26-27, pages 44-45 in this report. Carcass recovery data above LGR provided by NPT in the **M&E report** Hatchery Fraction section (page 20) and the "carcass" tab provided by NPT Permit Spreadsheet.
Number and origin of all fall Chinook salmon retained during broodstock collection and their final disposition	Number and origin of broodstock retained at Lyons Ferry Hatchery are provided in Tables 5-8 and pages 11-12, 20 and 22 in this report. For the number of broodstock retained and their disposition by NPTH, see the **NPT M&E report**. Also see the joint agency **Run Recon report** for additional information.
Trends in the relative, total annual abundances of natural- and hatchery-origin fall Chinook salmon escaping to the Snake River Basin upstream of Lower Granite Dam, and observations of any apparent effects of the hatchery program on fall	See the joint Agency **Run Recon report** for trends in total abundance of natural- and hatchery-origin fall Chinook salmon escaping to Lower Granite Dam; see "escapement" tab for trends in abundance of natural- and hatchery-origin fall Chinook escaping above Lower Granite Dam and; also see the **Redd report** for trends in

Chinook salmon escapement and spawning distributions in the Snake River Basin	index of abundance (redd counts) above Lower Granite Dam.
Unintentional injuries or mortalities of listed spring/summer, and fall Chinook salmon, steelhead, and sockeye that result from all operational activities	Captures of fall Chinook juveniles during RM&E activities by WDFW (Tucannon Smolt trapping) are provided in the smolt trapping section of this report (page 47). Incidental trapping of juveniles (spring Chinook or steelhead) in the Tucannon River are covered under other Section 10 reports. Incidental trapping of ESA-listed adult steelhead, spring Chinook salmon and sockeye salmon at LFH is available in this report (page 7).

Conclusions and Recommendations

The fall Chinook salmon program at LFH requires substantial coordination among a variety of State, Federal and Tribal agencies. The program is being managed to meet the goals and objectives of Tribal, state, and federal co-managers. Conclusions and recommendations listed below are not prioritized and represent only the opinion of WDFW Snake River Lab Evaluation staff.

1. The Snake River fall Chinook salmon run reconstruction methodologies were changed in 2013. Previous estimates at LGR using these new methods were reworked back to 2004. Prior to 2004, sub-sampling of VIE tagged fish with CWTs occurred at LFH which will require additional adjustments to the method, and have not been attempted at this time.

Recommendation: Assist the Snake River fall Chinook salmon Run Reconstruction group in developing methodologies to address sampling changes that occurred prior to 2004.

Recommendation: Continue to assist with documentation of historical methodologies used to develop run estimates.

2. Estimates of returns using PIT tags compared to CWTs vary by age at return and by juvenile life history rearing type but are not particularly significant. Tagging (PIT or CWT) constitutes a significant program cost annually and methods for monitoring and evaluating program performance need to be cost efficient in times of decreasing budgets.

Recommendation: Reduce the number of PIT tagged yearlings from 30,000 to 10,000 and continue to evaluate and summarize the use of both types of tagging to determine if some optimum proportion of PIT and CWT could be used to accurately portray fish performance and further reduce tagging costs.

3. In 2016 and 2017, PBT sampling at LGR was able to detect all inbasin hatchery returns which allows more precise (in theory) estimates of the numbers of natural origin fish in the overall return, and those that contribute to broodstock. Beginning in 2019, releases will be PBT marked by release site.

Recommendation: Work with the Snake River fall Chinook salmon run reconstruction technical group to derive run reconstruction estimates based solely on PBT results and compare with standardized CWT based run reconstruction estimates. Continue these comparisons for 5 years to determine if the run reconstruction based on CWTs is valid for profiling the return, or if another more accurate methodology should be adopted for the future. Work with FINS technical team to upload incubation data with intended release site in order to reference future returns by origin.

4. In prior years, evaluation staff monitored annual fecundities (by fork length) of fall Chinook salmon. Nearly all prior fecundity estimates consisted of hatchery origin fish, as few natural origin fish were included in the broodstock. With PBT, natural origin fish can now be

identified. There is an interest to determine if natural origin fish have similar fecundities as compare to hatchery origin fish, as a difference could alter broodstock collection criteria, and the information may be useful for other researchers estimating natural origin productivity.

Recommendation: Continue fecundity estimates of fish used for broodstock by origin, age, and release site through run year 2020. This evaluation began in 2016 and will continue through 2020 where fecundities will be compared of hatchery fish to wild fish, by age (as determined by PBT, PIT, scale analysis, and CWTs). This evaluation will document if there are any differences in fecundity from subyearling releases, yearling releases, and reservoir reared fish.

5. Fish from yearling programs have consistently shown to have higher SAR rate than subyearlings. However, yearlings have a high rate of 0-salt and 1-salt returns whereas subyearlings do not return as 0-salt fish and have minimal returns of 1-salt fish. As of 2019, releases of yearlings above LGR have been ceased, but releases at LFH will continue for the foreseeable future.

Recommendation: Continue to compare return information from yearling and subyearling release groups at LFH. Based on results and management priorities, discuss with the relevant parties to decrease or eliminate the yearling releases from LFH in the future.

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Appendix A: Fall Chinook Salmon Run to LFH, IHR, LMO, and LGR Dams: 2012-2017

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

Appendix A: Table 1. Numbers of fall Chinook salmon processed at LFH and window counts at IHR, LMO, and LGR dams, 2012-2017.

		Daytime counts				Night video [a]				Totals [b]	
		Through Oct		Nov and Dec		Through Oct		Nov and Dec			
Year	Location	Adults	Jacks	Adults	Jacks	Adults	Jacks	Adults	Jacks	≥ 53 cm FL	< 53 cm FL
2012	IHR	38,546	21,554	nc [c]	nc	nc	nc	nc	nc	38,546	21,554
	LMO	33,518	22,883	nc	nc	nc	nc	nc	nc	33,518	22,883
	LFH									193	6
	LGR	34,060	21,814	628	176	nc	nc	nc	nc	34,688	21,990
2013	IHR	57,850	19,133	nc	nc	nc	nc	nc	nc	57,850	19,133
	LMO	53,399	23,031	nc	nc	nc	nc	nc	nc	53,399	23,031
	LFH									1,025	42
	LGR	55,839	22,019	726	376	nc	nc	nc	nc	56,565	22,395
2014	IHR	61,389	17,944	nc	nc	nc	nc	nc	nc	61,389	17,944
	LMO	51,402	23,836	nc	nc	nc	nc	nc	nc	51,402	23,836
	LFH									0	0
	LGR	59,753	19,250	934	557	nc	nc	nc	nc	60,617	19,869
2015	IHR	62,978	10,008	nc	nc	nc	nc	nc	nc	62,978	10,008
	LMO	54,394	15,844	nc	nc	nc	nc	nc	nc	54,394	15,844
	LFH									234	9
	LGR	58,662	11,177	638	350	nc	nc	nc	nc	59,300	11,527
2016	IHR	36,713	13,066	nc	nc	nc	nc	nc	nc	36,713	13,066
	LMO	33,090	15,038	nc	nc	nc	nc	nc	nc	33,090	15,038
	LFH									0	0
	LGR	34,315	12,002	399	364	nc	nc	nc	nc	34,714	12,366
2017	IHR	26,393	5,057	nc	nc	nc	nc	nc	nc	26,393	5,057
	LMO	25,370	6,464	nc	nc	nc	nc	nc	nc	25,370	6,464
	LFH									43	37
	LGR	26,063	6,517	368	179	nc	nc	nc	nc	26,063	6,517

[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 2017

2017 Fall Chinook Trapping/Sampling Protocols at LGR

by

Debbie Milks, WDFW
Bill Arnsberg/Bill Young, NPT
Stuart Rosenberger, IPC
July 25, 2017

The following protocol presumes 24 hour trapping 7 days per week: The trapping rate will be set at 20% and kept at that level throughout the season, if possible. If the trap is swamped with fish: Shut down the 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.

Any changes to the duration of the sample will require an operculum punch. Begin with no punches for 20% then if the rate is changed use a right operculum punch if they are hauled to the hatcheries. If the trapping duration goes to 24 continuous hours then use a left operculum punch.

Scales sampled at the LGR Trap for run reconstruction needs will be mounted by WDFW/COE staff at LGR and sent to Olympia every two weeks. An additional two staff will be provided by WDFW as part of the Snake River Fall Chinook Salmon Fidelity and Fallback Study (radio telemetry) funded by BPA.

In an effort to reduce the numbers of jacks and jills hauled to the hatcheries and to reduce the numbers of fish sacrificed with wire for run reconstruction purposes the following protocols were approved by co-managers in the basin on 7/25/2017. The sub-sampling of wire tagged fish should allow for ample recoveries for evaluation purposes and the sub-sampling of unmarked/untagged fish will allow ample fecundity monitoring.

2017 Fall Chinook Trapping/Sampling Protocols at LGR

Protocols:

1) These protocols presume a 24 hour/day, 7 days per week trapping at 20%. Fish trapped during a 24 hour 7 day a week trapping period will not be operculum punched. If the systematic sampling rate is changed, all fish hauled to hatcheries must receive an operculum punch on the right side (ROP) and if trapping changes to only 4 hours per day (100%trap rate), all fish hauled to the hatcheries must receive an operculum punch on the left side (LOP).

2) Males and females will not be inoculated.

3) All fish > 70 cm will be hauled to LFH and NPTH. LFH will haul 70% and the NPT will haul 30%.

4) Sort by code fish follow the same haul/release protocol below unless the tag action code indicates that the fish should be radio tagged and released.

5) Wire tagged males <70 cm hauled to LFH.

6) Wire tagged females <70 will hauled to LFH and NPTH under the normal 70/30 split.

7) Unmarked/untagged females <70 will be hauled to LFH.

8) Jacks suspected of being summers will need to be subsampled for wires.

9) Only scale sample fish released from the trap. Do not scale sample hauled fish.

10) DNA sample all fish trapped regardless if hauled to hatchery or released.

Wire tagged fish:

Fork Length	Action
≥ 70cm	Haul all wires (DNA sample all)
<70 cm	Haul 1 out of 4 wires (put F in with "LARGES" for LFH and NPT and M go into tank for LFH), DNA sample all
	Release 3 out of 4 wires (DNA sample all)

Untagged fish:

Fork Length	Action
≥ 70 cm	Haul all fish (DNA sample all).
<70 cm	Haul 1 out of 4 F to LFH (DNA sample all). Release 3 out of 4 F (collect scales and DNA). Release all M (collect scales and DNA).

2017 Fall Chinook Trapping/Sampling Protocols at LGR

September 12, 2017

Changes to prior protocol are highlighted

Protocols:

1) These protocols presume a 24 hour/day, 7 days per week trapping at 33%. Fish hauled during the 33% sample will receive 1 operculum punch on the right side (1ROP).

2) Males and females will not be inoculated.

3) All fish > 70 cm will be hauled to LFH and NPTH. LFH will haul 70% and the NPT will haul 30%.

4) Sort by code fish follow the same haul/release protocol below unless the tag action code indicates that the fish should be radio tagged and released.

5) Wire tagged males <70 cm hauled to LFH.

6) Wire tagged females <70 will hauled to LFH and NPTH under the normal 70/30 split.

7) Unmarked/untagged females <70 will be hauled to LFH.

8) Jacks suspected of being summers will need to be subsampled for wires.

9) Only scale sample fish released from the trap. Do not scale sample hauled fish.

10) DNA sample all fish trapped regardless if hauled to hatchery or released.

Wire tagged fish:

Fork Length	Action
≥ 70cm	Haul all wires (DNA sample all)
<70 cm	Haul 1 out of 4 wires (put F in with "LARGES" for LFH and NPT and M go into tank for LFH), DNA sample all
	Release 3 out of 4 wires (DNA sample all)

Untagged fish:

Fork Length	Action
≥ 70 cm	Haul all fish (DNA sample all).
<70 cm	Haul 1 out of 4 F to LFH (DNA sample all). Release 3 out of 4 F (collect scales and DNA). Release all M (collect scales and DNA).

2017 Fall Chinook Trapping/Sampling Protocols at LGR

September 19, 2017

Changes to prior protocol are highlighted

Protocols:

1) These protocols presume a 24 hour/day, 7 days per week trapping at 33%. Fish hauled during the 33% sample will receive 1 operculum punch on the right side (1ROP).

2) Males and females will not be inoculated.

3) Only scale sample fish released from the trap. Do not scale sample hauled fish.

4) DNA sample all fish trapped regardless if hauled to hatchery or released.

Wire tagged fish:

Fork Length	Action
≥ 70cm	Haul all wires (DNA sample all)
<70 cm	No fish less than 70 to NPTH Females: Haul all. Put F in with Larges for LFH and during NPT time put F in separate tank for LFH. DNA sample all.
	Males: Haul 1 out of 4 wires to LFH and during NPT time put M in separate tank for LFH. DNA sample all Males: Release 3 out of 4 wires (DNA sample all)

Untagged fish:

Fork Length	Action
≥ 70 cm	Haul all fish (DNA sample all).
65cm-70 cm	No fish less than 70 to NPTH Males: Haul all unmarked/untagged to LFH and during NPT time put M in separate tank for LFH. Release all AD only and scale sample. DNA sample all Females: haul all to LFH (DNA sample all)
<65cm	Males: release all. DNA sample and scale sample all Females: Haul all. DNA sample all

2017 Fall Chinook Trapping/Sampling Protocols at LGR

October 3, 2017

Changes to prior protocol are highlighted

After conference call with co-managers:
LGR Trap rate remains at 20%.
Hauled fish do not need operculum punches.
DNA will continue to be taken on all fall Chinook trapped.
Scales will be taken on untagged fish released.
There are enough wire tagged fish already collected to satisfy run reconstruction needs so only hauling of fish for broodstock will occur.
NPTH will continue taking males (≥ 70 cm) for broodstock.
LFH will take females ≥ 75 cm for broodstock, pass females <75cm.
LFH is taking males 65-69cm unmarked/untagged, and all males ≥ 70 cm.

NPTH trap will remain open to trap large males.
LFH trap will remain open to trap large males.

2017 Fall Chinook Trapping/Sampling Protocols at LGR

October 10, 2017

Changes to prior protocol are highlighted

After conference call with co-managers:
LGR Trap rate remains at 20%.
Hauled fish do not need operculum punches.
DNA will continue to be taken on all fall Chinook trapped.
Scales will be taken on untagged fish released.
There are enough wire tagged fish already collected to satisfy run reconstruction needs and females to make eggtake so only hauling of males for broodstock will occur.
NPTH will continue taking males (≥ 70 cm) for broodstock.
Pass all females.
LFH is taking males 65-69cm unmarked/untagged, and all males ≥ 70 cm.

NPTH trap will remain open to trap large males.
LFH trap will remain open to trap large males.

2017 Fall Chinook Trapping/Sampling Protocols at LGR

October 17, 2017

Changes to prior protocol are highlighted

After conference call with co-managers:
LGR Trap rate remains at 20%.
Broodstock and run reconstruction needs have been met so all fish will be released at LGR.
DNA will continue to be taken on all fall Chinook trapped.
Scales will be taken on untagged fish released.

NPTH trap will remain open to trap large males.
LFH trap was closed today.

Appendix C: Systematic Sampling Rates at Lower Granite Dam 2003-2017

Appendix C Table 1. Dates, times, and trapping rates of fall Chinook salmon at LGR, 2003-2017.

Year	Date opened trap	Trap rate (%)	Date trap closed	Date/time trapping rate changed	Modified trapping rate (%)	Date/time trapping rate changed	Adjusted 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 8:00 am [c]	20	-	12 Sept 2:52 pm	12	26 Sept 3:00 pm	10	21 Nov
2009	18 Aug 7:37 am	12	-	9 Sept 7:25 am	9	-	nc	15 Nov
2010	22 Aug 11:05 am	12	10 Sept-10:50 am [d] 18 Sept-10:50 am [b]	18 Sept 3:00 pm	10	-	nc	18 Nov
2011	18 Aug 10:30 am	10	-	-	nc	-	nc	21 Nov
2012	28 Aug 10:36 am	15	-	-	nc	-	nc	19 Nov
2013	23 Sept 10:07 am	12	27 Sept- 3:00 pm [e]	1 Oct 2:22 pm	15	8 Oct 2:22 pm	20	24 Nov
2014	18 Aug 9:54 am	100	19&20 Aug [f] 22-29 Aug [f]	1 Sept 8:38 am	10	2 Oct 7:40	8	11 Nov
2015	22 Aug 7:55 am	100	23-26 Aug [f] 29 Aug [f]	31 Aug 8:39 am	12	-	nc	22 Nov
2016	18 Aug 8:28 am	19	-	-	nc	-	nc	20 Nov
2017	18 Aug 7:45 am	20	-	13 Sept	33	22 Sept	20	19 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 salmon.
[e] Trap was closed down at 3:00 pm for two hours due to large numbers of fall Chinook salmon.
[f] Trap closed down due to high water temperatures.

Appendix D: Trapping, Mating and Sampling Protocols at Lyons Ferry Hatchery 2017

2017 Trapping, Mating, and Sampling Protocols at LFH

LFH may start up the volunteer trap if a shortfall of females or males being collected at LGR happens.

Sorting protocol

Count and sex all fish: 1) Males and females.

Count LGR trapped females returned to the pond during the spawn day.

Sampling protocol

LFH staff processing DIPS: Document Fork length, sex, presence/absence of CWT, and PIT tag number. Take scales and a fin clip (DNA) on all untagged fish and take the snout of the fish if CWT is detected.

SRL staff processing during spawning days:

Processing table: Fin clips for DNA: take sample on every fish so data can be used for run reconstruction purposes, as well as profiling broodstock.

Scales: taken on all fish

Female broodstock total body weights
1st week of spawning: weigh first 50 females that have a CWT and the first 50 females that are unmarked/untagged (appear wild) and note fish ID number

2nd week-4th week: weigh first 25 females that have a CWT and 25 females that are unmarked/untagged each spawn day

Carcasses for nutrient enhancement: After otoliths are taken from the carcasses, a tote of fish will be filled and dumped into a bin next to the loading dock. These fish will be frozen separately and taken to the Tucannon River for nutrient enhancement after ELISA testing.

Mating protocol at LFH

Our goals are to maximize the use of potentially natural origin fish and larger/older aged fish and to exclude jills and strays from broodstock.

All wire tagged fish must wait until their CWTs are decoded before they are used in a mating.

Stray males will be culled based on CWTs. If broodstock limited, up to 56 stray females may be spawned and retained, presuming 1,112 matings are needed to make production. Any male used on a stray female must also be used on another female that will be retained for production (inbasin hatchery origin, or untagged unknown origin).

Wire tagged Males verified as adults can be used on multiple females.

Untagged Males $\geq$75 cm can be used on multiple females.

Untagged Males 70-74 cm will only be used in 1 x 1 crosses unless there is a shortage of males.

Males <70 cm will not be used in matings unless they are verified as adults. This size criteria may be adjusted in season.

Fecundity monitoring and Jills

All females will be spawned when ripe and the gametes will be held in incubators until we can determine if we have enough adult females to offset the culling, and to monitor fecundity. If we have enough adult females to make production goals, after eye up and fecundity estimation, jills will be culled. Jills verified by CWTs will be spawned with males of a larger fork length. Any male used on a jill must also be used on a larger or older aged fish that will be retained for production. This will be done to ensure if the jill is culled or a fry plant is made, the gametes from the male will still contribute elsewhere in production.

Mating protocol at LFH

September 19, 2017

Our goals are to maximize the use of potentially natural origin fish and larger/older aged fish and to exclude jills and strays from broodstock if possible.

All wire tagged fish must wait until their CWTs are decoded before they are used in a mating.

Stray males will be culled based on CWTs. If broodstock limited, up to 56 stray females may be spawned and retained, presuming 1,112 matings are needed to make production. Any male used on a stray female must also be used on another female that will be retained for production (inbasin hatchery origin, or untagged unknown origin).

Wire tagged Males verified as adults can be used on multiple females.

Untagged Males ≥75 cm can be used on multiple females.

Untagged Males 70-74 cm will only be used in 1 x 1 crosses unless there is a shortage of males.

Unmarked/untagged males 65-69 cm will be used in 1x1 crosses unless there is a shortage of males.

Males <65 cm will not be used in matings unless they are verified as adults. This size criteria may be adjusted in season.

Appendix E: Salmon Processed and Killed at LFH in 2017

(Age/Rearing states origin, brood year, age at release, and release site (LF12SO is a LFH hatchery origin fish from the 2012 brood year, released as a subyearling, onstation at LFH).

Appendix E Table 1: Estimated composition of non-wire tagged salmon trapped at LGR that were hauled to LFH and killed during 2017.

Age/Origin Determinations by Method	< 53 cm Males	Females	≥53 cm Males	Grand Total
Snake R. hatchery sub age 2(1salt) by PIT tag	0	0	1	1
Snake R. hatchery sub age 3(2salt) by PIT tag	0	0	1	1
Presumed Snake R. hatchery res rear age 4(2salt) by PBT	0	1	2	3
Presumed Snake R. hatchery sub age 2(1salt) by PBT	0	0	1	1
Presumed Snake R. hatchery sub age 3(2salt) by PBT	0	101	84	185
Presumed Snake R. hatchery sub age 4(3salt) by PBT	0	70	56	126
Presumed Snake R. hatchery sub age 5(4salt) by PBT	0	27	7	34
Presumed Snake R. hatchery yearling age 3(1salt) by PBT	1	0	0	1
Presumed Snake R. hatchery yearling age 4(2salt) by PBT	0	2	1	3
Presumed Snake R. hatchery unknown rear by PBT	0	22	12	34
Unknown hatchery res rear age 4(3salt) by clip or scales	0	1	0	1
Unknown hatchery subyearling age 2(1salt) by clip or scales	1	0	0	1
Unknown hatchery subyearling age 3(2salt) by clip or scales	0	4	1	5
Unknown hatchery subyearling age 4(3salt) by clip or scales	0	6	5	11
Unknown hatchery subyearling age 5(4salt) by clip or scales	0	3	2	5
Unknown hatchery yearling age 3(1salt) by clip or scales	0	0	1	1
Unknown hatchery yearling age 4(2salt) by clip or scales	0	0	1	1
Unknown hatchery yearling age 5(3salt) by clip or scales	0	0	1	1
Unknown hatchery unknown rear/age by clip or scales	0	1	0	1
Snake R. hatchery subyearling age 3(2salt) by PBT	0	0	1	1
Presumed natural res rear age 3(1salt) by PBT	0	0	7	7
Presumed natural res rear age 4(2salt) by PBT	0	52	24	76
Presumed natural res rear age 5(3salt) by PBT	0	23	5	28
Presumed natural sub age 2(1salt) by PBT	5	0	1	6
Presumed natural sub age 3(2salt) by PBT	0	54	100	154
Presumed natural sub age 4(3salt) by PBT	0	212	87	299
Presumed natural sub age 5(4salt) by PBT	0	118	22	140
Presumed natural sub res rear age 3(1salt) by PBT	0	0	1	1
Presumed natural yearling age 2(0salt) by PBT	0	4	2	6
Presumed natural yearling age 3(1salt) by PBT	0	0	1	1
Presumed natural unknown rear/age by PBT	0	46	39	85
Unknown origin res rear age 4(2salt) by scales	0	1	0	1
Unknown origin res rear age 5(3salt) by scales	0	0	1	1
Unknown origin subyearling age 2(1salt) by scales	2	0	0	2
Unknown origin subyearling age 3(2salt) by scales	1	6	8	15
Unknown origin subyearling age 4(3salt) by scales	0	8	4	12
Unknown origin subyearling age 5(4salt) by scales	0	5	4	9
Unknown origin unknown rear/age	0	2	1	3
Presumed STRAY subyearling age 4(3 salt) by PBT	0	0	1	1
Presumed STRAY subyearling unknown age by PBT	0	1	0	1
Total	**10**	**770**	**485**	**1,265**

Appendix E Table 2: Estimated composition of wire tagged salmon that were trapped at LGR, hauled to LFH, and killed during 2017.

Origin by CWT	CWT	Females	<53 cm Males	≥53 cm Males	Grand Total
LF11YBCA	220331	1	0	0	1
LF11YPLA	220334	2	0	0	2
LF12SBCA	220144	2	0	2	4
LF12SCCD	636575	2	0	2	4
LF12SCJA	220143	1	0	0	1
LF12SIPCHC	090703	1	0	0	1
LF12SO	636574	4	0	0	4
LF12SPLA	220145	3	0	0	3
	220146	2	0	1	3
LF12YBCA	220336	2	0	0	2
	220341	1	0	0	1
LF12YCJA	220338	3	0	1	4
	220339	2	0	0	2
LF12YO	636583	8	0	4	12
	636584	3	0	2	5
LF12YPLA	220337	1	0	0	1
	220340	0	0	1	1
LF13SBCA	220342	10	0	1	11
	220345	10	0	5	15
LF13SCJA	220343	4	0	3	7
	220346	5	0	5	10
LF13SCJA2	636738	6	0	0	6
LF13SGRRD	636739	10	0	4	14
LF13SIPCHC	090818	3	0	3	6
LF13SO	636737	12	0	2	14
LF13SPLA	220344	8	0	2	10
	220347	8	0	2	10
LF13YBCA	220348	4	0	1	5
	220351	10	0	0	10
LF13YCJA	220350	11	0	6	17
	220353	7	0	1	8
LF13YO	636740	34	0	13	47
	636741	33	0	14	47
LF13YPLA	220349	9	0	2	11
	220352	7	0	2	9
LF14SBCA	220356	4	0	2	6
	220357	8	0	3	11

Appendix E Table 2: Estimated composition of wire tagged salmon that were trapped at LGR, hauled to LFH, and killed during 2017.

Origin by CWT	CWT	Females	<53 cm Males	≥53 cm Males	Grand Total
LF14SCJA	220354	7	0	6	13
	220355	4	0	5	9
	220360	3	0	2	5
LF14SGRRD	636883	13	0	16	29
LF14SIPCHC	090888	8	0	6	14
LF14SO	636882	15	0	11	26
LF14SPLA	220358	9	1	7	17
	220359	7	1	8	16
LF14YBCA	220361	0	0	4	4
	220366	0	1	1	2
LF14YCJA	220363	1	3	4	8
	220364	1	0	2	3
LF14YO	636885	4	5	25	34
	636886	7	5	20	32
LF14YPLA	220362	0	2	1	3
	220365	0	0	2	2
LF15SBCA	220369	0	3	1	4
LF15SCJA	220367	0	2	0	2
	220368	0	1	0	1
LF15SCJA2	220373	0	1	0	1
LF15SO	637038	0	1	0	1
LF15SPLA	220371	0	2	0	2
	220372	0	1	0	1
LF15YCJA	220376	0	1	0	1
	220377	0	1	0	1
LF15YO	637040	0	1	0	1
LF15YPLA	220378	0	1	0	1
LOOKINGGLASS14YSPRLOSTINER	090953	0	0	1	1
NPTH11SNLVA	220218	1	0	0	1
NPTH12SCFA	220221	4	0	0	4
	220222	4	0	0	4
NPTH12SLGA	220219	5	0	1	6
	220220	2	0	1	3
NPTH12SNLV	220225	3	0	1	4
	220231	11	0	6	17
NPTH12SO	220226	2	0	0	2
	220232	6	0	1	7
NPTH13SCFA	220233	22	0	4	26

Appendix E Table 2: Estimated composition of wire tagged salmon that were trapped at LGR, hauled to LFH, and killed during 2017.

Origin by CWT	CWT	Females	<53 cm Males	≥53 cm Males	Grand Total
	220235	12	0	7	19
NPTH13SLGA	220234	9	0	4	13
	220236	18	0	2	20
NPTH13SNLVA	220238	16	0	5	21
	220240	24	0	11	35
NPTH13SO	220237	18	0	7	25
	220239	31	0	9	40
NPTH14SCFA	220227	6	0	2	8
	220228	2	0	5	7
NPTH14SLGA	220229	10	0	7	17
	220230	6	0	5	11
NPTH14SO	220245	5	0	5	10
	220246	3	1	3	7
	220247	5	0	5	10
	220248	3	0	5	8
NPTH15SCFA	220243	0	2	0	2
NPTH15SLGA	220241	0	3	0	3
	220242	0	3	0	3
NPTH15SO	220249	0	1	0	1
	220250	0	2	1	3
	220251	0	1	0	1
	220255	0	4	0	4
STRAY15YSUMMERCHELANFALLS	636936	0	1	0	1
BONN12YUMA	090682	2	0	1	3
	090683	0	0	1	1
	090684	1	0	0	1
BONN13YUMA	090866	0	0	1	1
	090867	0	0	1	1
BONN14YUMA	090944	0	0	1	1
	090945	0	0	1	1
UMA12SUMA	090704	1	0	0	1
UMA13SUMA	090817	1	0	0	1
UNREADABLE		3	0	1	4
IDFG14YSUMCHMCCALL	100296	0	0	1	1
KLICK13SFCH	636676	1	0	0	1
YAKA14YSPCHCLEELUM	190432	0	1	0	1
Total		**557**	**52**	**311**	**920**

Appendix E Table 3: Estimated composition of non-wire tagged salmon trapped and killed at LFH during 2017.

Age/Origin Determinations by Method	< 53 cm Males	Females	≥53 cm Males	Grand Total
Presumed Snake R. hatchery sub age 3(2salt) by PBT	0	2	0	2
Presumed Snake R. hatchery yearling age 3(1salt) by PBT	0	0	1	1
Presumed Snake R. hatchery yearling age 4(2salt) by PBT	0	0	1	1
Unknown hatchery subyearling age 3(2salt) by clip or scales	0	0	1	1
Unknown hatchery unknown rear/age by clip or scales	0	0	1	1
Unknown hatchery yearling age 3(1salt) by clip scales	0	0	1	1
Presumed natural yearling age 2(0salt) by PBT	1	0	0	1
Presumed natural yearling age 3(1salt) by PBT	0	0	1	1
Presumed natural yearling age 6(4salt) by PBT	0	0	1	1
Unknown origin unknown rear/age	0	0	1	1
Total	**1**	**2**	**8**	**11**

Appendix E Table 4: Estimated composition of wire tagged salmon that were trapped and killed at LFH during 2017.

Origin by CWT	CWT	Females	<53 cm Males	≥53 cm Males	Grand Total
LF11YO	636443	1	0	0	1
	636444	1	0	0	1
LF12SO	636574	3	0	0	3
LF12YO	636583	4	0	2	6
	636584	5	0	2	7
LF13SO	636737	4	0	0	4
LF13YO	636740	5	0	6	11
	636741	3	0	5	8
LF14SO	636882	2	0	6	8
LF14YO	636885	2	17	36	55
	636886	0	12	30	42
LF15SO	637038	0	1	0	1
LF15YO	637040	0	1	0	1
	637041	0	2	0	2
BONN12YUMA	090682	1	0	0	1
IDFG13SSUMCHPAHSIM	100264	1	0	0	1
UNREADABLE		1	2	1	4

LOST TAG	1	1	0	2
Total	**34**	**36**	**88**	**158**

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

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

	Production program				
Priority	**Rearing facility**	**Number**	**Age**	**Release location(s)**	**Marking [a]**
1	Lyons Ferry	450,000	1+	Onstation	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+	Onstation	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+	Captain John Rapids 2nd Release	200K ADCWT
~~12~~	~~DNFH/Umatilla~~	~~250,000~~	~~0+~~	~~Transportation Study[b,c]~~	~~250K PIT Tag only~~
13	Irrigon[d]	200,000	0+	Grande Ronde River	200K ADCWT
~~14~~	~~DNFH/Umatilla~~	~~78,000~~	~~0+~~	~~Transportation Study[b,c]~~	~~78K PIT tag only~~
15	Umatilla	200,000	0+	Hells Canyon Dam	200K ADCWT
16	Irrigon[d]	200,000	0+	Grande Ronde River	200K Unmarked
17	Umatilla	600,000	0+	Hells Canyon Dam	600K AD only
TOTAL	**Yearlings**	**900,000**			
	Subyearlings	**3,200,000[e]**			

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 salmon 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).

[e] Total does not include 328,000 from Transportation Study.

Appendix G: LFH 2017 Broodstock PBT Tissue Samples

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
0003	22230	0044	M6505	0084	3048	0224	1008
0004	22231	0045	M6507	0085	3039	0225	M6291
0005	22232	0046	M6509	0086	3054	0226	1014
0006	22233	0047	M6510	0087	3057	0227	1002
0007	22234	0048	M6512	0088	3046	0228	M6292
0008	22235	0049	3017	0089	3056	0229	1006
0009	22236	0050	M6516	0090	3044	0230	1015
0010	22237	0051	3028	0091	3031	0231	1016
0011	22238	0052	3024	0092	3061	0232	1017
0012	22239	0053	M6508	0093	3055	0233	1004
0013	22240	0054	M6506	0094	3050	0234	1018
0014	22241	0055	3030	0095	3020	0235	1019
0015	22242	0056	3033	0096	3011	0236	1020
0016	22243	0057	M6519	0097	3059	0237	1003
0017	22244	0058	M6504	0098	3060	0238	M6293
0018	22245	0059	3025	0099	3022	0239	23000
0019	22246	0060	3027	0100	3013	0240	M6294
0020	22247	0061	3045	0201	M6278	0241	M6295
0021	22651	0062	3032	0202	M6279	0242	M6296
0022	22652	0063	M6515	0203	M6280	0243	M6297
0023	22653	0064	3047	0204	M6282	0244	M6298
0024	22354	0065	M6517	0205	M6581	0245	1021
0026	23157	0066	3043	0206	22938	0246	1025
0027	23158	0067	3036	0207	M6283	0247	1024
0028	M6495	0068	M6518	0208	M6284	0248	1022
0029	M6497	0069	M6511	0209	M6285	0249	1026
0030	M6496	0070	M6513	0210	22945	0250	1028
0031	M6500	0071	3040	0211	M6286	0251	1029
0032	M6498	0072	M6520	0212	M6289	0252	1030
0033	M6499	0073	3041	0213	M6288	0253	1023
0034	3010	0074	3049	0214	1011	0254	1031
0035	M6502	0075	M6514	0215	1010	0255	1032
0036	M6501	0076	22153	0216	M6287	0256	M6299
0037	3014	0077	3038	0217	1012	0257	1027
0038	3012	0078	3026	0218	1009	0258	1035
0039	3008	0079	3034	0219	1013	0259	1034
0040	23159	0080	3037	0220	1007	0260	1033
0041	3019	0081	3042	0221	M6290	0261	1036
0042	3021	0082	3018	0222	1005	0262	1038
0043	M6503	0083	3035	0223	1001	0263	1039

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
0264	1037	0304	1071	0344	1103	0384	1125
0265	M6300	0305	1072	0345	1104	0385	1126
0266	1041	0306	1073	0346	1106	0386	M6333
0267	1040	0307	1074	0347	1105	0387	M6336
0268	1042	0308	M6308	0348	M6318	0388	1127
0269	1043	0309	1075	0349	1109	0389	M6335
0270	M6301	0310	M6309	0350	1110	0390	1129
0271	1046	0311	1076	0351	1107	0391	1128
0272	1045	0312	1077	0352	M6316	0392	M6337
0273	1047	0313	1078	0353	M6317	0393	1130
0274	1048	0314	1079	0354	M6319	0394	M6338
0275	1044	0315	M6310	0355	1108	0395	1131
0276	1049	0316	1080	0356	M6320	0396	M6339
0277	1050	0317	M6311	0357	M6321	0397	1132
0278	1051	0318	1081	0358	M6322	0398	M6340
0279	1052	0319	M6312	0359	1111	0399	1133
0280	M6302	0320	1082	0360	M6323	0400	M6341
0281	M6303	0321	M6313	0361	M6326	0401	1134
0282	1053	0322	1083	0362	1118	0402	1135
0283	1056	0323	M6314	0363	1116	0403	23089
0284	1054	0324	1085	0364	M6325	0404	1136
0285	1057	0325	1086	0365	1117	0405	23092
0286	1055	0326	1084	0366	M6327	0406	1137
0287	M6304	0327	1087	0367	1115	0407	M6342
0288	M6305	0328	1088	0368	M6328	0408	1140
0289	1061	0329	1089	0369	1119	0409	23097
0290	1059	0330	1090	0370	M6329	0410	1138
0291	1058	0331	1091	0371	1120	0411	1139
0292	1063	0332	1092	0372	1114	0412	M6343
0293	1062	0333	1093	0373	M6324	0413	M6344
0294	1064	0334	1094	0374	1122	0414	1141
0295	1060	0335	1099	0375	1121	0415	1142
0296	1065	0336	1095	0376	1113	0416	1143
0297	1066	0337	1100	0377	M6330	0417	23099
0298	1067	0338	1097	0378	1112	0418	M6346
0299	M6306	0339	1096	0379	M6332	0419	M6348
0300	M6307	0340	1098	0380	M6334	0420	M6347
0301	1069	0341	1101	0381	1124	0421	M6345
0302	1068	0342	1102	0382	1123	0422	23108
0303	1070	0343	M6315	0383	M6331	0423	M6349

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
0424	1147	0464	1178	0532	2019	0572	M6374
0425	1145	0465	1179	0533	2025	0573	M6376
0426	M6350	0466	1180	0534	2024	0574	M6377
0427	1148	0467	1181	0535	M6368	0575	2051
0428	1144	0468	1182	0536	2028	0576	2052
0429	M6351	0469	23148	0537	M6371	0577	2050
0430	1146	0470	1183	0538	2029	0578	2054
0431	1149	0471	1184	0539	2030	0579	M6375
0432	1150	0472	1185	0540	2027	0580	2053
0433	1151	0501	23150	0541	2026	0581	M6378
0434	1152	0502	M6354	0542	2031	0582	2055
0435	1153	0503	M6355	0543	M6370	0583	2056
0436	1154	0504	M6356	0544	2021	0584	M6379
0437	1155	0505	M6357	0545	2020	0585	2057
0438	1158	0506	2003	0546	M6358	0586	M6380
0439	1157	0507	2006	0547	M6359	0587	2058
0440	1159	0508	2005	0548	2018	0588	2059
0441	M6352	0509	2008	0549	2002	0589	2060
0442	1162	0510	2009	0550	2001	0590	2068
0443	1163	0511	2010	0551	2039	0591	2066
0444	1164	0512	2011	0552	2040	0592	2063
0445	1156	0513	M6362	0553	2038	0593	2070
0446	1161	0514	2007	0554	2033	0594	2071
0447	1160	0515	2012	0555	2041	0595	2067
0448	1165	0516	2015	0556	2046	0596	2065
0449	23114	0517	M6365	0557	2035	0597	2075
0450	M6353	0518	2017	0558	2043	0598	2061
0451	1166	0519	M6363	0559	2048	0599	2062
0452	1167	0520	2013	0560	2045	0600	2074
0453	1169	0521	M6366	0561	2032	0601	2077
0454	1168	0522	2014	0562	2037	0602	2078
0455	1170	0523	M6367	0563	2044	0603	2080
0456	1173	0524	M6364	0564	2047	0604	2073
0457	1171	0525	M6360	0565	2042	0605	2081
0458	1172	0526	2016	0566	2034	0606	2076
0459	1174	0527	M6361	0567	2036	0607	2072
0460	1175	0528	2004	0568	2049	0608	2069
0461	1176	0529	2023	0569	23151	0609	2084
0462	23137	0530	M6369	0570	M6372	0610	2064
0463	1177	0531	2022	0571	M6373	0611	2079

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
0612	M6381	0653	2116	0693	2139	0733	2232
0613	2088	0654	2114	0694	M6405	0734	M6468
0614	2087	0655	2113	0695	M6406	0735	2233
0615	2092	0656	M6386	0696	2140	0736	2193
0616	2090	0657	2117	0697	M6407	0737	2235
0617	2086	0658	M6400	0698	2142	0738	2231
0618	2091	0659	2104	0699	2144	0739	2234
0619	M6384	0660	2103	0700	M6408	0740	2221
0620	2085	0661	M6401	0701	M6458	0741	2192
0621	M6383	0662	2118	0702	M6460	0742	2236
0622	2089	0663	M6404	0703	M6461	0743	2237
0623	2083	0664	2112	0704	M6462	0744	2215
0624	2094	0665	2098	0705	M6463	0745	2216
0625	2093	0666	M6402	0706	2191	0746	2239
0626	2095	0667	2121	0707	2196	0747	2240
0627	2096	0668	2122	0708	23155	0748	2202
0628	M6382	0669	2120	0709	2198	0749	2238
0629	2082	0670	2123	0710	2194	0750	2205
0630	2097	0671	2119	0711	2199	0751	2227
0631	2100	0672	2101	0712	2203	0752	2241
0632	M6385	0673	2124	0713	2208	0753	2242
0633	M6387	0674	M6403	0714	2209	0754	2243
0634	M6390	0675	2125	0715	2214	0755	2244
0635	2106	0676	M6393	0716	2207	0756	2197
0636	M6391	0677	2102	0717	2200	0757	2204
0637	2107	0678	M6399	0718	M6466	0758	2206
0638	2108	0679	2115	0719	2220	0759	2211
0639	2109	0680	2126	0720	M6465	0760	2213
0640	M6388	0681	2127	0721	2219	0761	2245
0641	M6392	0682	2128	0722	2222	0762	2228
0642	2110	0683	2129	0723	M6467	0763	2201
0643	2099	0684	2130	0724	2224	0764	2249
0644	2105	0685	2131	0725	2223	0765	M6464
0645	M6396	0686	2132	0726	2210	0766	M6471
0646	M6397	0687	2133	0727	2226	0767	2251
0647	6395	0688	2134	0728	M6470	0768	M6472
0649	2111	0689	2135	0729	2229	0769	M6473
0650	M6398	0690	2136	0730	2225	0770	2254
0651	M6389	0691	2137	0731	2230	0771	2253
0652	M6394	0692	2138	0732	M6469	0772	2246

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
0773	2255	0814	2283	0855	2323	0905	3002
0774	2247	0815	2289	0856	2326	0906	3004
0775	2256	0816	2282	0857	M6482	0907	3006
0776	2252	0817	2290	0858	2325	0908	3005
0777	M6475	0818	2284	0859	2327	0909	3003
0778	M6474	0819	M6484	0860	2322	0910	M6526
0779	2257	0820	M6481	0861	2318	0911	3063
0780	2260	0821	M6487	0862	2313	0912	3009
0781	2250	0822	2300	0863	2328	0913	3015
0782	2261	0823	M6486	0864	2324	0914	M6522
0783	2259	0824	2295	0865	2329	0915	M6523
0784	2262	0825	M6489	0866	2332	0916	3067
0785	2263	0826	2296	0867	2331	0917	3065
0786	2248	0827	M6490	0868	M6485	0918	M6524
0787	M6476	0828	2302	0869	2330	0919	3016
0788	2267	0829	M6491	0870	2319	0920	23160
0789	2218	0830	2291	0871	2294	0921	M6527
0790	M6477	0831	2305	0872	2317	0922	3062
0791	2266	0832	2306	0873	2293	0923	M6528
0792	2271	0833	M6492	0874	2288	0924	3064
0793	2265	0834	2307	0875	2316	0925	3066
0794	2272	0835	2308	0876	2292	0926	3069
0795	2268	0836	2299	0877	2287	0927	3073
0797	2274	0837	M6483	0878	2280	0928	3070
0798	2275	0838	2297	0879	2285	0929	3068
0799	2273	0839	2303	0880	2212	0930	3071
0800	2264	0840	2309	0881	2195	0931	M6521
0801	2276	0841	2312	0882	2336	0932	3075
0802	2270	0842	2310	0883	2338	0933	3072
0803	2269	0843	M6494	0884	2337	0934	3074
0804	2278	0845	M6493	0885	2339	0935	3076
0805	2258	0846	2301	0886	2334	0936	3078
0806	M6478	0847	2304	0887	2340	0937	3077
0807	2277	0848	M6488	0888	2333	0938	M6529
0808	2217	0849	2311	0889	2335	0939	3079
0809	2281	0850	2314	0890	23156	0940	M6531
0810	M6480	0851	2320	0901	3052	0941	M6525
0811	2286	0852	2315	0902	3007	0942	M6530
0812	2279	0853	2298	0903	3058	0943	3029
0813	M6479	0854	2321	0904	3001	0944	M6533

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
0945	3023	0985	3103	1025	M6556	1065	M6563
0946	3053	0986	3096	1026	3138	1066	3163
0947	M6535	0987	3101	1027	M6561	1067	M6573
0948	3083	0988	3104	1028	3145	1068	3162
0949	3082	0989	3111	1029	3140	1069	M6575
0950	M6536	0990	M6541	1030	23161	1070	3167
0951	M6538	0991	M6544	1031	3144	1071	3166
0952	3080	0992	M6546	1032	3126	1072	M6588
0953	M6540	0993	M6543	1033	3128	1073	M6578
0954	M6539	0994	3116	1034	3117	1074	M6565
0955	3089	0995	3119	1035	3121	1075	M6581
0956	3091	0996	M6548	1036	3153	1076	M6564
0957	M6537	0997	M6549	1037	3146	1077	3165
0958	3090	0998	3125	1038	3150	1078	M6568
0959	M6534	0999	M6547	1039	3149	1079	M6583
0960	3085	1000	3120	1040	3156	1080	M6579
0961	3088	1001	3124	1041	3151	1081	M6584
0962	3086	1002	M6551	1042	3148	1082	M6571
0963	M6532	1003	3129	1043	3155	1083	3173
0964	3087	1004	M6553	1044	3161	1084	M6582
0965	3081	1005	M6552	1045	3154	1085	3169
0966	3084	1006	3130	1046	3147	1086	3168
0967	3095	1007	3135	1047	3134	1087	M6586
0968	3093	1008	M6554	1048	3115	1088	3172
0969	3099	1009	M6542	1049	3123	1089	3170
0970	3097	1010	3133	1050	3122	1090	3174
0971	3092	1011	M6555	1051	3160	1091	3171
0972	3094	1012	3137	1052	3152	1092	M6574
0973	3107	1013	M6557	1053	3159	1093	3176
0974	3109	1014	3136	1054	3158	1094	M6577
0975	3105	1015	3132	1055	3157	1095	3177
0976	3113	1016	3127	1056	3143	1096	M6576
0977	3106	1017	M6550	1057	3118	1097	3178
0978	3108	1018	M6560	1058	M6545	1098	3179
0979	3110	1019	3139	1059	M6567	1099	3182
0980	3112	1020	M6559	1060	M6570	1100	3181
0981	3102	1021	M6558	1061	M6562	1101	3175
0982	3114	1022	3141	1062	M6572	1102	3180
0983	3098	1023	3142	1063	M6566	1103	3164
0984	3100	1024	3131	1064	M6569	1104	M6585

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Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
1105	M6588	1145	M6606	1185	3213	1225	3253
1106	M6587	1146	M6603	1186	3218	1226	3256
1107	M6590	1147	M6622	1187	3226	1227	3257
1108	M6595	1148	M6611	1188	3221	1228	3255
1109	M6591	1149	M6618	1189	3228	1229	3259
1110	M6596	1150	M6627	1190	3211	1230	3260
1111	3183	1151	M6612	1191	3198	1231	2358
1112	M6597	1152	M6628	1192	3204	1232	3261
1113	M6592	1153	M6617	1193	M6626	1233	3262
1114	3191	1154	M6619	1194	3185	1234	M6637
1115	3189	1155	M6625	1195	M6602	1235	3268
1116	M6599	1156	M6621	1196	M6634	1236	M6636
1117	3188	1157	M6624	1197	3184	1237	3264
1118	3193	1158	M6629	1198	M6610	1238	3271
1119	M6594	1159	M6631	1199	M6589	1239	3266
1120	3194	1160	3214	1200	M6593	1240	3263
1121	3195	1161	M6633	1201	3231	1241	3272
1122	M6605	1162	M6632	1202	3232	1242	3273
1123	3192	1163	3219	1203	3233	1243	3265
1124	3197	1164	3220	1204	3234	1244	3274
1125	3196	1165	3216	1205	3235	1245	3269
1126	M6613	1166	M6623	1206	M6635	1246	3267
1127	M6600	1167	3217	1207	3236	1247	3270
1128	M6601	1168	3222	1208	3237	1248	3276
1129	3200	1169	M6598	1209	3238	1249	3275
1130	M6609	1170	3223	1210	3241	1250	3277
1131	3199	1171	3224	1211	3242	1251	3279
1132	3203	1172	M6608	1212	3240	1252	3287
1133	M6604	1173	3212	1213	3243	1253	3280
1134	M6614	1174	3215	1214	3239	1254	3283
1135	3202	1175	M6630	1215	3245	1255	3278
1136	M6607	1176	3227	1216	3246	1256	3281
1137	3186	1177	3209	1217	3244	1257	3284
1138	3206	1178	3225	1218	3247	1258	3286
1139	M6615	1179	3230	1219	3248	1259	3290
1140	3201	1180	3208	1220	3249	1260	3282
1141	M6616	1181	3205	1221	3250	1261	3292
1142	3190	1182	3210	1222	3251	1262	3294
1143	3187	1183	3207	1223	3252	1263	3289
1144	M6620	1184	3229	1224	3254	1264	3291

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
1265	3288	1305	3320	1410	22669	1506	M6657
1266	3295	1306	M6648	1411	22670	1507	M6658
1267	3297	1307	3319	1413	22671	1508	M6655
1268	3296	1308	3322	1414	22672	1509	M6660
1269	3285	1309	3323	1415	22673	1510	M6662
1270	3298	1310	M6650	1416	22674	1511	M6656
1271	3299	1311	3325	1417	22675	1512	M6651
1272	3300	1312	3321	1418	22676	1513	M6664
1273	3305	1313	3324	1419	22677	1514	4012
1274	3306	1314	3326	1420	22678	1515	M6665
1275	3304	1315	3328	1421	22679	1516	M6667
1276	3301	1316	3329	1422	22680	1517	4017
1277	3293	1317	3327	1423	22681	1518	M6670
1278	3302	1318	3330	1424	22682	1519	4019
1279	3303	1319	3331	1425	22683	1520	M6671
1280	M6638	1320	3332	1426	22684	1521	M6669
1281	M6639	1321	3333	1427	22685	1522	4021
1282	M6641	1322	3334	1428	22686	1523	4022
1283	23162	1323	3335	1429	22687	1524	4023
1284	M6643	1324	3336	1430	22688	1525	M6678
1285	M6640	1325	3337	1431	22689	1526	M6676
1286	M6644	1326	3338	1432	22690	1527	4020
1287	M6642	1327	3339	1433	22691	1528	4024
1288	M6645	1328	3340	1434	22692	1529	4025
1289	3307	1329	3341	1435	22693	1530	M6683
1290	M6647	1330	3342	1436	22694	1531	4026
1291	3308	1331	3343	1437	22695	1532	4027
1292	3309	1332	3344	1438	22696	1533	4028
1293	M6646	1333	3345	1439	22697	1534	M6682
1294	3311	1334	3346	1440	22698	1535	4029
1295	3313	1335	3347	1441	22699	1536	M6673
1296	3310	1401	22660	1442	22700	1537	M6666
1297	3312	1402	22661	1443	22701	1538	4030
1298	23163	1403	22662	1444	22702	1539	4031
1299	3317	1404	22663	1445	22703	1540	4016
1300	3316	1405	22664	1501	23171	1541	M6663
1301	3315	1406	22665	1502	M6653	1542	M6679
1302	M6649	1407	22666	1503	23112	1543	4034
1303	3318	1408	22667	1504	M6652	1544	4010
1304	3314	1409	22668	1505	M6654	1545	M6659

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Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
1546	6677	1586	4055	1626	M6687	1666	4097
1547	4036	1587	4049	1627	4077	1667	M6726
1548	M6675	1588	4056	1628	4073	1668	M6727
1549	4035	1589	4053	1629	4063	1669	4098
1550	4033	1590	4057	1630	4080	1670	M6725
1551	M6668	1591	4005	1631	4061	1671	4100
1552	4037	1592	4058	1632	4075	1672	4099
1553	M6680	1593	4006	1633	4078	1673	M6723
1554	4039	1594	4059	1634	4082	1674	4101
1555	4040	1595	M6686	1635	4083	1675	4103
1556	M6661	1596	4060	1636	4081	1676	4102
1557	4018	1597	M6684	1637	4079	1677	M6720
1558	M6674	1598	M6688	1638	4085	1678	4104
1559	M6672	1599	23173	1639	4086	1679	M6722
1560	4041	1600	M6685	1640	4084	1680	4105
1561	M6681	1601	M6691	1641	4087	1681	M6705
1562	4011	1602	M6690	1642	M6704	1682	M6721
1563	4032	1603	M6694	1643	M6702	1683	4106
1564	4042	1604	M6692	1644	M6707	1684	4107
1565	4043	1605	M6696	1645	M6708	1685	4108
1566	4044	1606	4067	1646	4088	1688	M6711
1567	4045	1607	4066	1647	M6703	1689	M6718
1568	4015	1608	M6697	1648	M6706	1690	4111
1569	4038	1609	4062	1649	M6710	1691	4113
1570	4047	1610	M6699	1650	4089	1692	4112
1571	4014	1611	M6698	1651	M6712	1693	4110
1572	4046	1612	4069	1652	4090	1694	4114
1573	4002	1613	4070	1653	4091	1695	4109
1574	4013	1614	4065	1654	M6714	1696	M6709
1575	4001	1615	M6695	1655	M6715	1697	4115
1576	4004	1616	M6701	1656	4093	1698	4116
1577	4048	1617	4071	1657	4092	1699	4117
1578	4009	1618	M6700	1658	M6713	1700	4121
1579	4007	1619	4068	1659	M6716	1701	4118
1580	4008	1620	4064	1660	4094	1702	4120
1581	4050	1621	4074	1661	4095	1703	4119
1582	4003	1622	M6693	1662	M6717	1704	M6729
1583	4052	1623	4072	1663	M6719	1705	M6732
1584	4051	1624	M6689	1664	4096	1706	M6733
1585	4054	1625	4076	1665	M6724	1707	M6734

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Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
1708	M6731	1748	M6749	1788	4172	1828	4202
1709	M6739	1749	23174	1789	4173	1829	4201
1710	4122	1750	4150	1790	M6769	1830	M6774
1711	M6737	1751	4145	1791	4167	1831	M6773
1712	4123	1752	4147	1792	4174	1832	4204
1713	4124	1753	4146	1793	M6758	1833	4206
1714	M6738	1754	4152	1794	M6765	1834	4207
1715	4125	1755	4148	1795	4176	1835	M6778
1716	4126	1756	4151	1796	4175	1836	M6779
1717	MM6736	1757	4149	1797	4163	1837	4203
1718	4127	1758	4155	1798	4178	1838	M6776
1719	M6730	1759	4154	1799	M6752	1839	M6771
1720	4128	1760	4153	1800	4179	1840	4209
1721	M6728	1761	4156	1801	4177	1841	4208
1722	4129	1762	4157	1802	M6759	1842	M6780
1723	M6742	1763	4158	1803	4180	1843	4210
1724	4130	1764	M6750	1804	M6755	1844	M6772
1725	4131	1765	M6762	1805	4183	1845	M6782
1726	M6740	1766	M6757	1806	4182	1846	M6781
1727	4135	1767	M6753	1807	M6770	1847	4213
1728	M6747	1768	4161	1808	4181	1848	4205
1729	4136	1769	4159	1809	4184	1849	4212
1730	4134	1770	4160	1810	23175	1850	4211
1731	M6746	1771	M6764	1811	4185	1851	4214
1732	4138	1772	M6760	1812	4186	1852	4216
1733	4137	1773	4164	1813	M6763	1853	M6775
1734	M6748	1774	M6756	1814	4187	1854	4217
1735	4139	1775	M6754	1815	4188	1855	4215
1736	4140	1776	4166	1816	4189	1856	4218
1737	M6744	1777	4165	1817	4190	1857	M6777
1738	4133	1778	4162	1818	4191	1858	4219
1739	4142	1779	M6766	1819	4193	1859	4220
1740	4141	1780	M6751	1820	4194	1860	4222
1741	4143	1781	4168	1821	4192	1861	4221
1742	M6745	1782	M6767	1822	4195	1862	4223
1743	4144	1783	4169	1823	4196	1863	4224
1744	M6741	1784	M6761	1824	4197	1864	4225
1745	4132	1785	M6768	1825	4198	1865	4226
1746	M6735	1786	4170	1826	4199	1866	4227
1747	M6743	1787	4171	1827	4200	1867	4228

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
1868	4229	1908	5006	1949	5020	1989	5037
1869	4230	1909	M6793	1950	5019	1990	M6821
1870	23176	1910	5001	1951	M6824	1991	5033
1871	4231	1911	5011	1952	M6833	1992	M6853
1872	4232	1912	5009	1953	M6830	1993	5038
1873	M6788	1913	M6798	1954	M6837	1994	5035
1874	M6784	1915	5008	1955	M6835	1995	M6848
1875	4233	1916	M6797	1956	M6831	1996	M6814
1876	M6785	1917	5007	1957	M6826	1997	5031
1877	4235	1918	23180	1958	M6828	1998	M6829
1878	4236	1919	M6799	1959	M6827	1999	5034
1879	M6787	1920	M6795	1960	M6820	2000	5039
1880	4234	1921	M6810	1961	5042	2001	M6868
1881	23177	1922	5014	1962	M6844	2002	5055
1882	4238	1923	5013	1963	M6846	2003	5054
1883	4237	1924	5012	1964	M6845	2004	5053
1884	M6789	1925	M6809	1965	M6849	2005	M6864
1885	4239	1926	M6800	1966	M6847	2006	5052
1886	M6790	1927	M6805	1967	M6843	2007	M6860
1887	M6791	1928	M6803	1968	M6839	2008	M6834
1888	4241	1929	5010	1969	M6838	2009	M6861
1889	4242	1930	M6807	1970	M6836	2010	M6857
1890	4243	1931	M6796	1971	5048	2011	5051
1891	4244	1932	5017	1972	5047	2012	M6859
1892	M6786	1933	5018	1973	5046	2013	5060
1893	M6783	1934	M6815	1974	M6822	2014	M6862
1894	4245	1935	M6813	1975	5041	2015	5059
1895	4240	1936	M6808	1976	M6841	2016	5058
1896	23178	1937	5016	1977	5045	2017	M6858
1897	4248	1938	M6806	1978	5044	2018	5057
1898	4249	1939	M6811	1979	M6840	2019	M6865
1899	4246	1940	5015	1980	5023	2020	5056
1900	4247	1941	M6825	1981	M6819	2021	M6869
1901	23179	1942	M6816	1982	5043	2022	5061
1902	M6792	1943	M6801	1983	M6842	2023	M6852
1903	M6794	1944	5022	1984	M6850	2024	5032
1904	5003	1945	M6802	1985	5036	2025	5064
1905	5002	1946	M6804	1986	M6818	2026	5063
1906	5004	1947	M6812	1987	5040	2027	M6851
1907	5005	1948	5021	1988	5049	2028	M6867

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
2029	5062	2070	5029	2110	5111	2150	5133
2030	M6855	2071	M6892	2111	5112	2151	M6905
2031	5073	2072	M6888	2112	M6875	2152	M6904
2032	M6856	2073	M6884	2113	5121	2153	M6908
2033	M6866	2074	M6883	2114	5118	2154	M6911
2034	5025	2075	M6879	2115	M6871	2155	5139
2035	M6854	2076	M6880	2116	M6872	2156	5138
2036	5070	2077	M6882	2117	M6878	2157	M6909
2037	M6832	2078	M6881	2118	5120	2158	23182
2038	5068	2079	M6876	2119	5093	2159	M6900
2039	5065	2080	M6874	2120	M6873	2160	5100
2040	5067	2081	M6898	2121	5124	2161	5146
2041	5079	2082	5103	2122	5123	2162	M6920
2042	23181	2083	M6893	2123	5116	2163	M6916
2043	M6863	2084	5097	2124	5087	2164	5144
2044	5050	2085	M6894	2125	5126	2165	M6919
2045	5071	2086	M6895	2126	5101	2166	5142
2046	5030	2087	M6890	2127	5089	2167	5140
2047	5069	2088	M6891	2128	M6885	2168	M6914
2048	5074	2089	M6887	2129	5095	2169	M6910
2049	M6823	2090	M6893	2130	5091	2170	5136
2050	5026	2091	M6901	2131	5132	2171	5151
2051	5084	2092	5105	2132	5130	2172	5137
2052	5086	2093	5102	2133	5125	2173	5150
2053	5081	2094	5108	2134	5131	2174	M6926
2054	5075	2095	5107	2135	5129	2175	5147
2055	5027	2096	M6897	2136	5127	2176	5148
2057	5085	2097	5098	2137	5090	2177	5149
2058	5066	2098	5106	2138	5128	2178	M6918
2059	5028	2099	M6889	2139	5094	2179	5145
2060	5080	2100	5099	2140	5104	2180	5141
2061	M6870	2101	5117	2141	M6886	2181	M6927
2062	5024	2102	M6877	2142	M6896	2182	M6912
2063	5082	2103	5119	2143	M6899	2183	M6923
2064	5076	2104	5092	2144	5134	2184	M6929
2065	5078	2105	5115	2145	5113	2185	5152
2066	M6817	2106	M6902	2146	5135	2186	5154
2067	5072	2107	5096	2147	5114	2187	M6925
2068	5077	2108	5110	2148	5112	2188	M6928
2069	5083	2109	5109	2149	5088	2189	M6924

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
2190	5153	2312	M6936	2353	M6952	2934	2158
2191	M6930	2313	M6935	2354	23205	2935	M6422
2192	M6921	2314	6008	2355	23207	2936	2159
2193	M6917	2315	6009	2356	23208	2937	M6420
2194	5160	2316	6010	2357	23209	2938	2160
2195	5157	2317	6011	2358	23210	2939	M6432
2196	5158	2318	6012	2359	23212	2940	2162
2197	5156	2319	M6938	2360	23215	2941	M6418
2198	M6915	2320	M6937	2902	2143	2942	2163
2199	5159	2321	6013	2903	2146	2943	2161
2200	M6913	2322	6014	2904	M6411	2944	M6434
2201	23192	2323	6015	2905	M6409	2945	2164
2202	23188	2324	6016	2906	M6410	2946	M6435
2203	23193	2325	M6940	2907	2147	2947	2165
2204	5161	2326	M6939	2908	2148	2948	M6440
2205	23187	2327	6017	2909	M6414	2949	2166
2206	5164	2328	6018	2910	2149	2950	M6437
2207	23191	2329	6019	2911	2150	2951	2167
2208	5163	2330	M6941	2912	M6415	2952	2168
2209	23186	2331	6020	2913	M6416	2953	M6442
2210	5162	2332	6021	2914	M6413	2954	2169
2211	5155	2333	6022	2915	M6412	2955	2170
2212	5165	2334	6023	2916	M6417	2956	M6443
2213	5143	2335	M6942	2917	2141	2957	M6433
2214	M6922	2336	M6945	2918	2151	2958	2172
2215	23183	2337	M6944	2919	M6421	2959	M6419
2216	M6903	2338	M6943	2920	2153	2960	2174
2217	M6907	2339	6024	2921	2152	2961	2171
2218	M6906	2340	6025	2922	M6425	2962	2173
2301	6001	2341	M6947	2923	2154	2963	M6444
2302	M6932	2342	M6948	2924	M6423	2964	2175
2303	6002	2343	M6946	2925	M6426	2965	M6441
2304	6003	2344	M6949	2926	2155	2966	M6439
2305	M6931	2345	M6950	2927	M6427	2967	2177
2306	M6933	2346	6026	2928	M6429	2968	2176
2307	M6934	2347	6027	2929	2156	2969	M6424
2308	6004	2349	M6951	2930	2157	2970	2178
2309	6005	2350	M6954	2931	M6430	2971	2179
2310	6006	2351	M6953	2932	M6428	2972	M6446
2311	6007	2352	M6955	2933	M6431	2973	2180

Appendix G Table 1: Lyons Ferry Hatchery 2017 broodstock PBT tissue samples by fish ID number.

Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID	Genetic ID	Fish ID
2974	M6448	2983	M6447	2990	M6436	2997	M6455
2975	2181	2984	2185	2991	M6452	2998	23153
2976	M6445	2985	M6438	2992	2188	2999	23154
2978	M6451	2986	M6449	2993	M6456	3000	M6459
2979	2183	2987	2182	2994	M6457	3001	22656
2980	M6454	2988	2186	2995	2189	3002	22657
2981	2184	2989	2187	2996	2190	3003	22658
2982	M6453						

Appendix H: Egg Take and Early Life Stage Survival Brood Years: 1990-2011

Appendix H Table 1: Egg take and survival numbers by life stage of Lyons Ferry origin fall Chinook salmon spawned at LFH, brood years 1990-2011.

Brood year	Eggs taken	Egg loss [a]	Eggs destroyed [b]	Eggs shipped[c]	Eyed eggs retained	Fry ponded	Intended program
1990	1,103,745	0		0	1,011,998	729,311	Yearling
						228,930	Subyearling
1991	906,411	0		0	828,514	807,685	Yearling
						0	Subyearling
1992	901,232	0		0	855,577	624,961	Yearling
						210,210	Subyearling
1993	400,490	0		0	363,129	352,461	Yearling
						0	Subyearling
1994	583,871	0		0	553,189	542,461	Yearling
						0	Subyearling
1995[d]	1,056,700	0		0	1,022,700	847,241	Yearling
						112,532	Subyearling
1996	1,433,862	0		0	1,377,202	941,900	Yearling
						419,677	Subyearling
1997	1,184,141	0		0	1,134,641	1,037,221	Yearling
						63,849	Subyearling
1998	2,085,155	0		0	1,978,704	916,261	Yearling
						1,010,344	Subyearling
1999	3,980,455	156,352		0	3,605,482	991,613	Yearling
						2,541,759	Subyearling
2000	3,576,956	53,176		115,891	3,249,377	998,768	Yearling
						2,159,921	Subyearling
2001	4,734,234	144,530		200,064	4,230,432	1,280,515	Yearling
						2,697,406	Subyearling
						125,600	Research
2002	4,910,467	44,900		1,195,067	3,540,000	1,032,205	Yearling
						2,376,251	Subyearling
						73,229	Research
2003	2,812,751	0		250,400	2,476,825	985,956	Yearling
						1,455,815	Subyearling
2004	4,625,638	0		1,053,278	3,421,751	914,594	Yearling
						2,191,102	Subyearling
						184,682	Research
2005	4,929,630	0		1,180,000	3,562,700[e]	980,940	Yearling
						2,078,206	Subyearling
						216,417	Research
2006	2,819,004	0		127,564	2,601,679	961,105	Yearling
						1,640,574	Subyearling
						2,000	Research
2007	5,143,459	0		1,761,500	3,212,900[f]	960,900	Yearling
						1,894,933	Subyearling
2008	5,010,224	0		1,810,800	2,969,200	1,000,000	Yearling
						1,969,200	Subyearling
2009	4,574,182	0		1,507,300	2,853,020	977,667	Yearling
						1,875,353	Subyearling
2010	4,619,533	124,433	0	1,630,000	2,865,100	980,000	Yearling
						1,885,100	Subyearling
2011	4,723,501	165,001	0	1,785,600	2,772,900	960,000	Yearling
						1,812,900	Subyearling

[a] Eggs from ELISA positive females were incorporated into the rest of the broodstock in 1997-1998 and 2003-2004.
[b] Eggs culled due to ELISA results, stray or stray mate, and jill or jack mate.
[c] Includes eyed eggs shipped for research.
[d] An overage of 58,500 fish was found during marking. This number was added (unexpanded) to total green and eyed eggs and fry ponded. Also includes 83,183 fry up to ponding that were accidentally released as strays. Back calculated to estimate 32,088 eggs for subyearlings and 91,808 eggs for escaped fry (resulting in 847,241 ponded for yearling release).
[e] This number includes 154,100 eyed-eggs that were destroyed as ponded fry and 30,000 eyed-eggs that were shipped as fry to NPTH in February 2006.
[f] This number includes 364,983 eyed-eggs that were destroyed as ponded fry in January and February 2007.

Appendix I: LFH/Snake River Origin Fall Chinook Salmon Releases Brood Years: 2008-2017

Appendix I 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]						PIT tagged[c]
						AD clip +CWT	CWT only	AD clip only	No clip or CWT	Total Released	FPP	
2009	S	2008	LFH	2 June	634995	191,407	823	8,230	235	200,695	51.7	1,509
2009	S	2008	Couse Creek Direct [vs. CJ1 Accl. Study]	26 May	634996	187,434	488	11,967	855	200,744	46.5	13,740
2009	S	2008	GRR-extras	2-3 June	612676	165,146	1,191	6,024	9,039	181,400	50.0	0
2009	S	2008	CJ1	26 May	610180	100,383	-	-	-	100,383	57.0	2,645
2009	S	2008	CJ1	26 May	610183	99,521	-	-	325,006	424,527	57.0	11,186
2009	S	2008	BC1	26 May	610179	100,093	-	-	-	100.093	62.5	2,901
2009	S	2008	BC1	26 May	610182	-	99,332	-	275,443	374,775	62.5	10,862
2009	S	2008	PL1	24 May	610181	95,227	-	5,012	-	100,239	59.3	3,320
2009	S	2008	PL1	24 May	610184	-	99,727	-	216,025	315,752	59.3	10,457
2009	S	2008	GRR-direct	28-29 May	634997	193,275	535	7,892	239,348	441,050	67.1	27,764
2009	S	2008	NPTH-Cedar Flats Accl.	9 June	612760	-	100,760	-	1,202	101,962	59.7	7,104
2009	S	2008	NPTH-Cedar Flats Accl.	9 June	612761	95,840	-	2,296	-	98,136	59.7	6,838
2009	S	2008	NPTH-Lukes Gulch Accl.	10 June	612762	-	98,025	-	11,008	109,033	51.6	7,276
2009	S	2008	NPTH-Lukes Gulch Accl.	10 June	612763	98,486	-	2,359	-	100,845	51.6	6,730
2009	S	2008	NPTH-North Lapwai Valley Accl.	15 May	612766	-	182,328	-	213,149	395,477	85.3	2,381
2009	S	2008	NPTH-North Lapwai Valley Accl.	15 May	612738	97,751	-	2,341	-	100,092	85.3	602
2009	S	2008	NPTH-Site 1705	8-12 June	612739	90,953	-	27,725	-	118,678	51.5	559
2009	S	2008	NPTH-Site 1705	8-12 June	612697	-	181,522	-	328,615	510,137	51.5	2,404
2009	S	2008	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	8 May	107582	53,095	-	16,465	-	69,560	54.7	5,090
2009	S	2008	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	8 May	107682	66,322	-	-	-	66,322	54.7	4,854
2009	S	2008	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	8 May	107482	66,957	-	-	-	66,957	54.7	4,900
2009	S	2008	Snake R. below HC Dam-Umatilla hatchery-IPC-direct	12-14 May	090228	233,692	-	569,793	-	803,485	60.2	55,488
2009	S	2008	Snake R. at Couse Creek-Surrogates	18 May-5 June	none	-	-	-	239,050	239,050		237,741
2009	S	2008	Clearwater R. at BC-Surrogates	29 June-17 July	none	-	-	-	91,621	91,621		91,015
2010	Y	2008	LFH	12-15 April	635166	250,814	169	2,542	678	254,203	9.8	13,479
2010	Y	2008	LFH	12-15 April	635165	-	221,376	-	3,273	224,649	9.8	13,487
2010	Y	2008	CJ1	5 April	220305	70,925	-	1,284	-	72,209	8.0	8,922

Appendix I 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]						PIT tagged[c]
						AD clip +CWT	CWT only	AD clip only	No clip or CWT	Total Released	FPP	
2010	Y	2008	CJ1	5 April	220300	-	81,467	-	961	82,428	8.0	10,184
2010	Y	2008	BC1	14 April	220303	70,043	-	1,993	-	72,036	9.0	8,925
2010	Y	2008	BC1	14 April	220302	-	79,756	-	1,907	81,663	9.0	10,117
2010	Y	2008	PL1	13 April	220304	70,834	-	984	-	71,818	9.3	8,902
2010	Y	2008	PL1	13 April	220301	-	80,417	-	1,244	81,661	9.3	10,123
2010	S	2009	LFH	25 May	635180	198,457	1,068	2,803	-	202,328	52.4	0
2010	S	2009	CJ1	24 May	220309	100,778	-	392	-	101,170	47.0	7,376
2010	S	2009	CJ1	24 May	220308	-	102,167	-	325,440	427,607	47.0	31,174
2010	S	2009	BC1	25 May	220307	100,461	-	441	-	100,902	52.3	7,587
2010	S	2009	BC1	25 May	220306	-	101,207	-	309,127	410,334	52.3	30,855
2010	S	2009	PL1	24 May	220311	100,537	-	765	-	101,302	50.5	7,725
2010	S	2009	PL1	24 May	220310	-	100,619	-	203,120	303,739	50.5	23,162
2010	S	2009	Couse Creek Direct [vs. CJ1 Accl. Study]	24 May	635181	199,326	926	2,381	529	203,162	58.0	15,445
2010	S	2009	GRR Direct	24 May	635182	197,252	-	2,868	186,720	386,720	42.0	30,488
2010	S	2009	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	6 May	104383	50,433	-	4,609	-	55,042	47.0	4,208
2010	S	2009	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	6 May	100142	64,144	-	5,862	-	70,006	47.0	5,352
2010	S	2009	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	6 May	106482	61,977	-	5,664	-	67,641	47.0	5,171
2010	S	2009	Snake R. below HC Dam-Umatilla hatchery-IPC-direct	25-27 May	090331	208,330	1,242	476,055	-	685,627	46.3	50,036
2010	S	2009	NPTH-Cedar Flats Accl.	14 June	612764	-	74,939	-	14,328	89,267	48.3	6,737
2010	S	2009	NPTH-Cedar Flats Accl.	14 June	612765	97,930	-	1,214	-	99,144	48.3	7,482
2010	S	2009	NPTH-Lukes Gulch Accl.	9 June	612747	-	99,116	-	415	99,531	44.4	8,208
2010	S	2009	NPTH-Lukes Gulch Accl.	9 June	612748	98,220	-	1,218	-	99,438	44.4	8,201
2010	S	2009	NPTH-North Lapwai Valley Accl.	14 May	220201	-	164,981	-	200,716	365,697	81.2	2,424
2010	S	2009	NPTH-North Lapwai Valley Accl.	14 May	220202	99,024	-	1,228	-	100,252	81.2	665
2010	S	2009	NPTH-Site 1705	7 June	220200	99,100	-	1,229	-	100,329	54.2	577
2010	S	2009	NPTH-Site 1705	7 June	612772	-	199,710	-	236,960	436,670	54.2	2509
2010	S	2009	Snake R. at Couse Creek-Surrogates	17 May- 4 June	none				197,569	197,569		195,493
2010	S	2009	Clearwater R. at BC-Surrogates	21 June- 9 July	none				116,162	116,162		114,017
2011	Y	2009	LFH	12-15 April	635564	226,621	462	308		227,391	9.9	14,927

Appendix I 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	Total Released	FPP	PIT tagged[c]
2011	Y	2009	LFH	12-15 April	635510	-	236,175	-	163	236,338	9.9	14,935
2011	Y	2009	CJ1	1 April	220315	71,407	-	867	-	72,274	10.3	8,862
2011	Y	2009	CJ1	1 April	220314	-	80,830	-	1,482	82,312	10.3	10,092
2011	Y	2009	BC1	14 April	220317	71,096	-	286	-	71,382	9.9	8,300
2011	Y	2009	BC1	14 April	220312	-	89,325	-	1,637	90,962	9.9	10,577
2011	Y	2009	PL1	12 April	220316	69,415	-	2,766	-	72,181	9.5	8,218
2011	Y	2009	PL1	12 April	220313	-	93,103	-	1,126	94,229	9.5	10,729
2011	S	2010	LFH	1 June	635998	200,502	283	1,415		202,200	50.0	0
2011	S	2010	CJ1	22 May	220119	100,967		200		101,167	45.3	8,037
2011	S	2010	CJ1	22 May	220120		100,986		314,327	100,986	45.3	32,992
2011	S	2010	BC1	25 May	220117	100,622		200		100,822	51.0	8,111
2011	S	2010	BC1	25 May	220115		100,748		307,576	408,324	51.0	32,847
2011	S	2010	PL1	23 May	220121	100,987		201		101,188	49.0	8,044
2011	S	2010	PL1	23 May	220122		100,999		211,097	100,999	49.0	24,811
2011	S	2010	Couse Creek Direct [vs. CJ1 Accl. Study]	2-3 June	635997	200,945	971	384		202,300	49.0	16,459
2011	S	2010	GRR Direct	24 May	635999	199,460	134	1,206	196,628	397,428	79.5	32,441
2011	S	2010	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	5 May	100153	167,137		15,769	11,903	194,809	48.2	14,927
2011	S	2010	Snake R. below HC Dam-Irrigon hatchery-IPC-direct	24-26 May	090447	195,414	397	435,100	7,989	638,900	81.0	36,925
2011	S	2010	NPTH-Cedar Flats Accl.	15 June	220205		103,007		323	103,330	54.5	8,244
2011	S	2010	NPTH-Cedar Flats Accl.	15 June	220206	96,604		5,622		102,226	54.5	8,155
2011	S	2010	NPTH-Lukes Gulch Accl.	14 June	220207		99,115		5,364	104,479	50.2	8,283
2011	S	2010	NPTH-Lukes Gulch Accl.	14 June	220208	101,688		1,315		103,003	50.2	8,166
2011	S	2010	NPTH-North Lapwai Valley Accl.	14 May	220203		202,265		206,799	409,064	75.0	2,392
2011	S	2010	NPTH-North Lapwai Valley Accl.	14 May	220204	99,174		1,282		100,456	75.0	588
2011	S	2010	NPTH-Site 1705	7-15 June	220210		201,980		224,365	426,345	52.5	2,412
2011	S	2010	NPTH-Site 1705	7 June	220209	94,893		5,523		100,416	52.5	568
2011	S	2010	NPTH late release-Site 1705	6-11 July	220211		99,907		313	100,220	93.0	1,038
2011	S	2010	NPTH late release-Site 1705	6-11 July	220212		94,673		91,694	186,367	93.0	1,931
2011	S	2010	Snake R. at Couse Creek-Surrogates	23 May-10 June	none				201,412			200,549
2011	S	2010	Clearwater R. at BC-Surrogates	20 June-8 July	none				114,356			111,580
2012	Y	2010	LFH	10-13 Apr	636080	246,918	660	495	989	249,062	10.4	14,930

Appendix I 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	Total Released	FPP	PIT tagged[c]
2012	Y	2010	LFH	10-13 Apr	636079		236,056		4,882	240,938	10.4	14,908
2012	Y	2010	CJ1	28 Mar	220321	72,233		432		72,665	10.3	8,881
2012	Y	2010	CJ1	28 Mar	220320		81,042		1,427	82,469	10.3	10,080
2012	Y	2010	BC1	12 Apr	220323	74,973		903		75,876	9.7	8,441
2012	Y	2010	BC1	12 Apr	220318		86,184		1,554	87,738	9.7	9,760
2012	Y	2010	PL1	11 Apr	220322	79,519		316		79,835	9.4	8,777
2012	Y	2010	PL1	11 Apr	220319		90,110		1,177	91,287	9.4	10,036
2012	S	2011	LFH	29-30 May	636417	198,228	261	2,270	141	200,900	50.0	19,943
2012	S	2011	CJ1	21 May	220326	101,194		202		101,396	47.0	20,586
2012	S	2011	CJ1	21 May	220327		100,818		303,514	404,332	47.0	20,469
2012	S	2011	BC1	23 May	220329	101,565				101,565	46.0	20,555
2012	S	2011	BC1	23 May	220328		101,327		308,737	410,064	46.0	20,507
2012	S	2011	PL1	22 May	220324	100,850		405		101,255	47.0	16,497
2012	S	2011	PL1	22 May	220325		100,500		200,645	301,145	47.0	16,373
2012	S	2011	Couse Creek Direct [vs. CJ1 Accl. Study]	29-30 May	636418	194,955	658	3,548	139	199,300	54.0	16,313
2012	S	2011	GRR Direct	24 May	636419	192,996		9,723	181,281	384,000	48.0	32,432
2012	S	2011	Snake R. below HC Dam-Oxbow hatchery-IPC-direct	3 May	100201	187,146		15,135		202,281	48.0	14,910
2012	S	2011	Snake R. below HC Dam-Irrigon hatchery-IPC-direct	22-24 May	090587	200,844	273	587,232	12,051	800,400	46.0	36,927
2012	S	2011	NPTH-Lukes Gulch Accl.	13 June	220213	94,079		5,305		99,382	49.6	8,179
2012	S	2011	NPTH-Lukes Gulch Accl.	13 June	220214		99,570		495	100,065	49.6	8,236
2012	S	2011	NPTH-Cedar Flats Accl.	12 June	220215	96,099		1,276		97,375	51.7	8,110
2012	S	2011	NPTH-Cedar Flats Accl.	12 June	220216		95,710		5,771	101,481	51.7	8,451
2012	S	2011	NPTH-North Lapwai Valley Accl.	8&30 May	220224		191,699		268,454	460,153	115/54	2,440
2012	S	2011	NPTH-North Lapwai Valley Accl.	8&30 May	220218	98,697		4,363		103,060	115/54	546
2012	S	2011	NPTH-Site 1705	11-15 June	220223		202,095		291,091	493,186	51/53	4,877
2012	S	2011	NPTH-Site 1705	11-15 June	220217	103,487		1,813		105,300	51/53	1,041
2012	S	2011	Snake R. at Couse Creek-Surrogates	21 May-8 June	none				227,992	227,992		226,786
2012	S	2011	Clearwater R. at BC-Surrogates	18 June-6 July	none				96,273	96,273		92,963
2013	Y	2011	LFH	10-12 Apr	636444	240,413	809	809	1,618	243,649	10.2	14,675
2013	Y	2011	LFH	10-12 Apr	636443		243,085		2,766	245,851	10.2	14,531
2013	Y	2011	CJ1	1 Apr	220335	71,930		580		72,510	9.5	1,372

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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	Total Released	FPP	PIT tagged[c]
2013	Y	2011	CJ1	1 Apr	220332		89,993		720	90,713	9.5	1,716
2013	Y	2011	BC1	17 Apr	220333	71,973		580		72,553	9.8	1,369
2013	Y	2011	BC1	17 Apr	220331		85,359		1,005	86,364	9.8	1,629
2013	Y	2011	PL1	16 Apr	220334	71,679		564		72,243	9.7	1,285
2013	Y	2011	PL1	16 Apr	220330		88,908		1,761	90,669	9.7	1,612
2013	S	2012	LFH	10 May	636574	210,494	138	967		211,599	68.0	19,772
2013	S	2012	CJ1	17 May	220141	101,234				101,234	47.0	1,497
2013	S	2012	CJ1	17 May	220143		100,631		297,721	398,352	47.0	1,489
2013	S	2012	BC1	22 May	220142	100,804		202		101,006	44.0	1,505
2013	S	2012	BC1	22 May	220144		99,807		301,474	401,281	44.0	1,488
2013	S	2012	PL1	20 May	220145	100,673		404		101,077	44.0	1,495
2013	S	2012	PL1	20 May	220146		101,085		195,865	296,950	44.0	1,495
2013	S	2012	Couse Creek Direct [vs. CJ1 Accl. Study]	9-10 May	636575	202,159	2,012	1,006	123	205,300	68.0	2,985
2013	S	2012	GRR Direct	21 May	636576	216,159	430	861	183,093	400,543	49.5	3,000
2013	S	2012	Snake R. below HC Dam-Irrigon hatchery-IPC-direct	20-22 May	90703	228,054	156	651,123	413	879,746	50.4	2,994
2013	S	2012	NPTH-Cedar Flats Accl.	10 June	220221		101,113		10,899	112,012	49.4	1,570
2013	S	2012	NPTH-Cedar Flats Accl.	10 June	220222	97,468		4,384		101,852	49.4	1,427
2013	S	2012	NPTH-Lukes Gulch Accl.	11 June	220219		94,062		11,357	105,419	48.5	1,545
2013	S	2012	NPTH-Lukes Gulch Accl.	11 June	220220	96,387		2,524		98,911	48.5	1,450
2013	S	2012	NPTH-North Lapwai Valley Accl.	10 May	220231		199,689		194,398	394,087	85.0	2,374
2013	S	2012	NPTH-North Lapwai Valley Accl.	10 May	220225	100,435		1,015		101,450	85.0	611
2013	S	2012	NPTH-Site 1705	7 June	220232		194,561		387,401	581,962	74.0	2,532
2013	S	2012	NPTH-Site 1705	13 June	220226	97,477		7,154		104,631	74.0	455
2014	Y	2012	LFH	8-11 April	636583		250,362		2,019	252,381	9.6	14,876
2014	Y	2012	LFH	8-11 April	636584	247,714	1,673	502	1,003	250,892	9.6	14,886
2014	Y	2012	CJ1	1 April	220338		86,972		350	87,322	9.9	530
2014	Y	2012	CJ1	1 April	220339	76,256		306		76,562	9.9	464
2014	Y	2012	BC1	17 April	220336		86,380		580	86,960	8.8	526
2014	Y	2012	BC1	17 April	220341	75,180		1,274		76,454	8.8	463
2014	Y	2012	PL1	14 April	220337		88,140		295	88,435	9.0	533
2014	Y	2012	PL1	14 April	220340	76,657		774		77,431	9.0	466
2014	S	2013	LFH	3 June	636737	203,004	402	5,896	670	209,972	50.0	19,969

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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	Total Released	FPP	PIT tagged[c]
2014	S	2013	CJ1	21 May	220346	101,241		2,801		104,042	47.0	1,024
2014	S	2013	CJ1	21 May	220343		99,142		308,643	407,785	47.0	975
2014	S	2013	BC1	22 May	220345	94,950		9,588		104,538	49.7	1,023
2014	S	2013	BC1	22 May	220342		98,628		324,660	423,288	49.7	966
2014	S	2013	PL1	20 May	220347	100,063		1,404		101,467	53.0	1,008
2014	S	2013	PL1	20 May	220344		99,455		199,946	299,401	53.0	989
2014	S	2013	CJ 2nd Release	6 June	636738	185,799		5,352		191,151	53.4	1,999
2014	S	2013	GRR Direct	21 May	636739	191,711	434	9,983	201,798	403,926	48.9	2,999
2014	S	2013	Snake R. below HC Dam-Irrigon hatchery-IPC-direct	19 May	090818	191,092	525	717,974	2,023	911,614	49.4	3,000
2014	S	2013	NPTH-Cedar Flats Accl.	10 June	220235		99,344		50,375	149,719	49.7	1,181
2014	S	2013	NPTH-Cedar Flats Accl.	10 June	220233	102,430		740		103,170	49.7	813
2014	S	2013	NPTH-Lukes Gulch Accl.	10 June	220236		103,285		50,399	153,684	47.6	1,203
2014	S	2013	NPTH-Lukes Gulch Accl.	10 June	220234	100,870		729		101,599	47.6	795
2014	S	2013	NPTH-North Lapwai Valley Accl.	11 June	220240		202,383		110,492	312,875	63.5	1,501
2014	S	2013	NPTH-North Lapwai Valley Accl.	11 June	220238	100,911		1,770		102,681	63.5	492
2014	S	2013	NPTH-Site 1705	11 June	220239		207,537		215,099	422,636	52.5	1,605
2014	S	2013	NPTH-Site 1705	11 June	220237	102,898		744		103,642	52.5	394
2015	Y	2013	LFH	6-8 April	636740		221,511		3,415	224,926	9.7	14,848
2015	Y	2013	LFH	6-8 April	636741	219,396	732	6,294	1,025	227,447	9.7	13,268
2015	Y	2013	CJ1	1 April	220353	72,145				72,145	9.6	470
2015	Y	2013	CJ1	1 April	220350		80,656		324	80,980	9.6	528
2015	Y	2013	BC1	10 April	220351	72,369		145		72,514	9.7	466
2015	Y	2013	BC1	10 April	220348		81,558		808	82,366	9.7	529
2015	Y	2013	PL1	9 April	220352	72,595		144		72,739	9.6	467
2015	Y	2013	PL1	9 April	220349		82,413		324	82,737	9.6	531
2015	S	2014	LFH	18 May	636882	189,788	429	21,922	7,220	219,359	58.0	19,906
2015	S	2014	CJ1	19 May	220355	95,493		6,312	102,311	204,116	49.6	8,363
2015	S	2014	CJ1	19 May	220354		96,612	17,161	220,490	334,263	49.6	13,695
2015	S	2014	BC1	21 May	220357	95,796		6,332	102,866	204,994	58.0	748
2015	S	2014	BC1	21 May	220356		94,575	28,759	219,163	342,497	58.0	1,250
2015	S	2014	PL1	13 May	220359	97,130		4,897	87,285	189,312	60.6	10,513
2015	S	2014	PL1	13 May	220358		96,274	1,084	111,340	208,698	60.6	11,590
2015	S	2014	CJ 2nd Release	5 June	220360	208,078		7,238	3,274	218,590	48.2	2,000

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						AD clip +CWT	CWT only	AD clip only	No clip or CWT	Total Released		
2015	S	2014	GRR Direct	18 May	636883	199,938	222	7,541	248,400	456,101	48.9	2,986
2015	S	2014	Snake R. below HC Dam-Irrigon hatchery-IPC-direct	11-13 May	090888	244,342	268	800,547	1,110	1,046,267	55.2	3,000
2015	S	2014	NPTH-Cedar Flats Accl.	2 June	220227		103,380		58,302	161,682	63.0	1,002
2015	S	2014	NPTH-Cedar Flats Accl.	2 June	220228	101,234		1,499	58,100	160,833	63.0	996
2015	S	2014	NPTH-Lukes Gulch Accl.	29 May	220230		102,539		59,367	161,906	66.4	1,000
2015	S	2014	NPTH-Lukes Gulch Accl.	29 May	220229	101,549		890	59,167	161,606	66.4	999
2015	S	2014	NPTH-Site 1705	4 June	220248		200,997		154,619	355,616	65.7	1,323
2015	S	2014	NPTH-Site 1705	4 June	220245	102,279	1,810	503	77,123	181,715	68.7	676
2015	S	2014	NPTH-Site 1705	29 May	220247		203,450		50,290	253,740	70.9	1,314
2015	S	2014	NPTH-Site 1705	29 May	220246	101,866	2,045	479	24,953	129,343	67.7	670
2016	Y	2014	LFH	4-6 April	636885		231,744		8,559	240,303	10.7	14,852
2016	Y	2014	LFH	4-6 April	636886	238,940	661	6,744	529	246,874	10.2	14,867
2016	Y	2014	CJ1	1 April	220364	70,821		135	1,083	72,039	9.7	427
2016	Y	2014	CJ1	1 April	220363		91,267		1,394	92,661	9.7	549
2016	Y	2014	BC1	8 April	220366	71,112		141	563	71,816	10.0	461
2016	Y	2014	BC1	28 March-8 April	220361		80,995		640	81,635	10.0	525
2016	Y	2014	PL1	7 April	220365	70,212		1,267	421	71,900	9.5	462
2016	Y	2014	PL1	7 April	220362		81,524		160	81,684	9.5	524
2016	S	2015	LFH	31 May	637038	187,799	964	12,250	1,447	202,460	53.8	19,951
2016	S	2015	CJ1	25 May	220367		100,540		202,711	303,251	54.8	15,467
2016	S	2015	CJ1	25 May	220368	99,210	598	1,793	104,383	205,984	54.8	10,506
2016	S	2015	BC1	26 May	220369		100,349		199,392	299,741	50.2	1,188
2016	S	2015	BC1	26 May	220370	98,974	1,011	1,420	99,593	200,998	50.2	797
2016	S	2015	PL1	20 May	220371		99,175		98,928	198,103	57.0	12,964
2016	S	2015	PL1	20 May	220372	98,913	1,199	1,798	98,073	199,983	57.0	13,088
2016	S	2015	CJ 2nd Release	10 June	220373	193,377	4,480	1,100	26	198,983	48.2	2,000
2016	S	2015	GRR Direct	31 May	637037	199,620	426	7,993	221,850	429,889	49.4	2,997
2016	S	2015	Snake R. below HC Dam-Irrigon hatchery-IPC-direct	16-18 May	091013	247,014	393	792,552	1,226	1,041,185	50.2	2,998
2016	S	2015	NPTH-Cedar Flats Accl.	6 June	220243		102,279		11,776	114,055	57.4	995
2016	S	2015	NPTH-Cedar Flats Accl.	6 June	220244	101,775	1,334	287	11,579	114,975	57.4	1,003
2016	S	2015	NPTH-Lukes Gulch Accl.	6 June	220241		101,622		9,781	111,403	50.9	994

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						AD clip +CWT	CWT only	AD clip only	No clip or CWT	Total Released		
2016	S	2015	NPTH-Lukes Gulch Accl.	6 June	220242	101,522	1,386	293	9,587	161,606	50.9	1,006
2016	S	2015	NPTH-Site 1705	7-8 June	220255		201,269		165,851	367,120	57.4	1,530
2016	S	2015	NPTH-Site 1705	7-8 June	220254	101,505	2,946	1,034	164,819	270,304	57.4	1,126
2016	S	2015	NPTH-Site 1705	7-8 June	220251		106,506		4,960	111,466	57.4	464
2016	S	2015	NPTH-Site 1705	7-8 June	220250		95,713		4,940	100,653	57.4	419
2016	S	2015	NPTH-Site 1705	7-8 June	220249	101,709	1,128	295	6,397	109,529	57.4	456
2016	S	2015	IHR gate well						3,000	3,000		
2017	Y	2015	LFH	3-5 April	637041		224,056		815	224,871	11.0	14,780
2017	Y	2015	LFH	3-5 April	637040	231,541	505	1,641		233,687	10.5	14,762
2017	Y	2015	CJ1	31 March	220376		84,661		3,656	88,318	10.7	807
2017	Y	2015	CJ1	31 March	220377	68,105	1,957	652		70,714	10.7	646
2017	Y	2015	BC1	11 April	220374		78,532		776	79,308	11.1	795
2017	Y	2015	BC1	11 April	220379	65,641	2,451	1,771		69,863	11.1	701
2017	Y	2015	PL1	7 April	220375		78,402		1,981	80,383	9.9	818
2017	Y	2015	PL1	7 April	220378	68,151	1,876	7,211		70,496	9.9	718
2017	S	2016	LFH	31-May	637198	196441	721	7211	206	204579	53.3	19995
2017	S	2016	LFH Accidental Early Release	20-Mar	220382		107862		200890	308752	140	
2017	S	2016	BC1	24-May	220386		108669		158289	266958	51.8	8519
2017	S	2016	BC1	24-May	220383	103301	3858	2786	157215	267160	51.8	8526
2017	S	2016	CJ1	23-May	220380		105379		161572	266951	50.9	12954
2017	S	2016	CJ1	23-May	220381	106180	3051	1017	157022	267270	50.9	12970
2017	S	2016	PL1	22-May	220384		107414		94838	202252	48.9	13002
2017	S	2016	PL1	22-May	220385	106698	2937	734	92124	202493	48.9	8405
2017	S	2016	GRR Direct	30-May	637199	195781	312	7997	220303	424393	45.9	3000
2017	S	2016	Pittsburg Landing	16-May	91138	206301	109	830917	109	1037436	48.5	2995
2017	S	2016	NPTH-Cedar Flats Accl.--Selway R	20-May	220253		103975		12288	116263	64	
2017	S	2016	NPTH-Cedar Flats Accl.--Selway R	20-May	220252	103567	1589	668	12115	117939	64	
2017	S	2016	NPTH-Lukes Gulch Accl.	7-Jun	220262		104357		14030	118387	50.9	990
2017	S	2016	NPTH-Lukes Gulch Accl.	7-Jun	220261	103854	2135	538	13858	120385	50.9	1007
2017	S	2016	NPTH-Site 1705-MF Clearwater R	30-May	220257		201037		85415	286452	84.9	1208
2017	S	2016	NPTH-Site 1705-MF Clearwater R	30-May	220259	100994	1067	441	85076	187578	84.9	791
2017	S	2016	NPTH-Site 1705-MF Clearwater R	13-Jun	220256		201745		126155	327900	64	1178
2017	S	2016	NPTH-Site 1705-MF Clearwater R	13-Jun	220260	100202	1567	516	125816	228101	59	819
2017	S	2016	Tucannon R-Intentional early release	10-Mar					100000	100000	~250	0

Appendix I 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]					FPP	PIT tagged[c]
						AD clip +CWT	CWT only	AD clip only	No clip or CWT	Total Released		
2018	Y	2016	LFH	2-Apr	637202		229467		5328	234795	10.4	14881
2018	Y	2016	LFH	2-Apr	637203	235725	124	1867		237716	10.4	14949
2018	Y	2016	BC1	7-Apr	220388		79688		787	80475	10.7	756
2018	Y	2016	BC1	7-Apr	220391	74106	2767	1999		78872	10.7	740
2018	Y	2016	CJ1	2-Apr	220389		77407		3343	80750	9.6	734
2018	Y	2016	CJ1	2-Apr	220392	76267	2192	731		79190	9.6	719
2018	Y	2016	PL1	10-Apr	220387		78532		1985	80517	10.1	775
2018	Y	2016	PL1	10-Apr	220390	76377	2102	525		79004	10.1	761
2018	S	2017	LFH	21-May	637394	197311	862	1400	215	199788	65.7	19995
2018	S	2017	BC1	23-May	220504	100022	604		159107	259733	49	8541
2018	S	2017	BC1	23-May	220505		99272		160293	259565	49	8536
2018	S	2017	CJ1	21-May	220502	100022	606		159639	260267	53	13005
2018	S	2017	CJ1	21-May	220503		100176		160837	261013	53	13025
2018	S	2017	PL1	22-May	220506	96631	2523	1746	105390	206290	47	11568
2018	S	2017	PL1	22-May	220507		99691		106583	206274	47	11567
2018	S	2017	CJ 2nd Release	8-Jun	220508	194125	5578	1860		201563	49	1993
2018	S	2017	GRR Direct	31-May	637395	203686	950	4329	208856	417821	47.5	3000
2018	S	2017	Salmon River	15-May	091185	201376	103	841583	2722	1045784	50.8	3000
2018	S	2017	NPTH-Cedar Flats Accl.--Selway R	4-Jun	220268	100387	962	857	174938	277144	49.5	2000
2018	S	2017	NPTH-North Lapwai Valley Accl.	9-May	220258	102250	1080	584	127142	231056	63	2100
2018	S	2017	NPTH-Lukes Gulch Accl.	30-May	220271	105359	373	581	206082	312395	55.7	1998
2018	S	2017	NPTH-Site 1705-MF Clearwater R	5-Jun	220266	103453	1162	926	538846	644387	57	1993

[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 J: Historical Estimated Survivals (%) Between Various Life Stages at LFH Brood Years: 1990-2012

Error! Reference source not found. **Table 1: Estimated survivals (%) between various life stages at LFH for fall Chinook salmon of LFH/Snake River hatchery origin.**

Brood year	Release age	Green egg-ponded fry	Ponded fry-release	Green egg-release
1990	Yearling	86.8	94.5	82.1
	Subyearling	86.8	98.0	85.1
1991	Yearling	89.1	94.1	83.8
1992	Yearling	92.7	96.5	89.5
	Subyearling	92.7	98.4	91.2
1993	Yearling	88.0	99.0	87.1
1994	Yearling	92.7	99.3	92.1
1995	Yearling	90.8	94.8	86.1
	Subyearling	90.8	99.0	89.9
1996	Yearling	95.0	76.6	72.8
	Subyearling	95.0	89.5	85.0
1997	Yearling	93.0	92.5	86.0
	Subyearling	93.0	97.6	90.8
1998	Yearling	92.4	94.8	87.6
	Subyearling	92.4	95.1	87.9
1999	Yearling	92.4	66.3	61.3
	Subyearling	92.4	95.2	87.9
2000	Yearling	92.8	91.3	84.8
	Subyearling	92.8	94.9	88.1
2001	Yearling	93.6	79.5	74.5
	Subyearling	93.6	98.1	91.9
2002	Yearling	95.3	86.8	82.8
	Subyearling	95.3	94.8	90.3
2003	Yearling	95.5	75.7	72.3
	Subyearling	95.5	95.1	90.8
2004	Yearling	93.0	96.8	90.1
	Subyearling	93.0	97.6	90.8
2005	Yearling	92.2	99.3	91.5
	Subyearling	92.2	104.9	96.7
2006	Yearling	95.7	95.4	91.3
	Subyearling	95.7	100.2	95.5
2007	Yearling	95.8	95.4	91.4
	Subyearling	95.8	100.3	95.5
2008	Yearling	95.8	95.3	91.3
	Subyearling	95.8	107.1	89.4
2009	Yearling	94.1	98.3	92.5
	Subyearling	94.1	100.2	94.0
2010	Yearling	96.4	101.9	98.2
	Subyearling	96.4	98.9	95.4
2011	Yearling	95.0	102.1	97.7
	Subyearling	95.0	98.2	96.4
2012	Subyearling	95.9	97.0	93.0
Yearling mean:	**%**	**93.1**	**92.1**	**85.8**
	SD	**2.6**	**9.4**	**8.9**
Subyearling mean:	**%**	**93.7**	**97.2**	**91.3**
	SD	**2.3**	**3.1**	**3.5**

Appendix K: Tucannon River Survey Sections and Historical Escapement

Error! Reference source not found. **Table 1: Description and length of sections, survey length, percent of reach surveyed, and estimated total number of fall Chinook salmon redds in the Tucannon River, 2017.**

Section	Description	Length of section (km)[a]	Length surveyed (km)	% of productive reach surveyed [b]	Estimated total # of redds [c]
1	Mouth of Tucannon R to highway 261 Bridge	2.8	1.7	100	12
2	Highway 261 Bridge to Smolt trap	0.2	0.2	100	7
3	Smolt trap to Powers Bridge	0.5	0.5	100	32
4	Powers Bridge to upper hog barns	1.2	1.2	100	29
5	Hog barns to Starbuck Br.	2.5	2.4	96	33
6	Starbuck Br. To Fletchers Dam	2.7	1.3	48	51
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	16
9	Ducharme's Bridge to Highway 12	5.5	5.5	100	18
10	Highway 12 to Brines Bridge	6.2	6.2	100	7
11	Brines Bridge to 4.7 km above Brines Bridge	4.7	4.7	100	0
	Total	**33.6**	**31.0**	**95**	**226**

[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.

Error! Reference source not found. **Table 2: Estimated escapement, % stray component of the run, and number of redds (observed and estimated), estimates of smolts/redd, and total number of emigrants from fall Chinook salmon spawning in the Tucannon River, and parent to progeny ratios, 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]
1985[d]	0	unknown	0	No estim	0	unknown	unknown
1986[e]	2[f]	unknown	0	No estim	0	unknown	unknown
1987	48	0	16	0	16	unknown	unknown
1988	78	0	26	0	26	unknown	unknown
1989	150	27.9	48	2	50	unknown	unknown
1990	186	30.8	62[g]	0	62	unknown	unknown
1991	150	20.0	50	0	50	unknown	unknown
1992	69	0	23	0	23	unknown	unknown
1993	84	6.3	28	0	28	unknown	unknown
1994	75	28.0	25	0	25	unknown	unknown
1995	87	33.3	29	0	29	unknown	unknown
1996	144	95.5	43	5	48	0.6[i]	29
1997	93	5.3	27	4	31	712	22,076
1998	132	7.1	40	4	44	15	666
1999	87	9.1	21	8	29	441	12,799
2000	60	27.8	19	1	20	468	9,352

[a] These preliminary estimates were 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 salmon.
[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.

Escapement and Composition of Coho Run to the Tucannon River in 2017

Coho constructed an estimated 30 redds when expanded for areas not surveyed. Of the nine total coho carcasses that were recovered, seven were hatchery origin yearlings resulting in a 77.8% hatchery and 22.2% unmarked/untagged total coho escapement estimate. A tissue sample (fin clip or head tissue) was collected and archived for all but one coho carcass due to its degraded condition upon sampling.

Juvenile Coho Emigration 2017

Juvenile coho salmon were also captured at the Tucannon River smolt trap in 2017. Staff captured only four coho in 2017, not enough to estimate trap efficiency, or to estimate the number of naturally produced coho parr and smolts that passed the Tucannon River smolt trap. Juvenile coho only were observed at the smolt trap from 1-6 June. Staff took fork lengths and weights on all four fish, ranging from 69-92 mm in length, with a mean of 76 mm. Weights ranged from 4.1-9.2 g. with a mean of 5.6 g. K-factors ranged from 1.15-1.28, with a mean of 1.22.

Juvenile Coho Emigration 2018

Juvenile coho salmon were also captured at the Tucannon River smolt trap. Staff captured 21 coho in 2018, with only on successful mark/recapture even. However, this was not enough to estimate trap efficiency for the season, or to estimate the total number of naturally produced coho parr and smolts that passed the Tucannon River smolt trap in 2018. Juvenile coho were observed at the smolt trap between 8 March and 10 June. Staff took fork lengths and weights on 20 coho fry/parr/smolts, ranging from 34-131 mm in length, with a mean of 81 mm. Weights ranged from 1.8-25.9 g. with a mean of 10.6 g. K-factors ranged from 1.02-1.54, with a mean of 1.19.