

Lyons Ferry Hatchery Evaluations: Fall Chinook Salmon Annual Report (2023 Return/2024 Releases)

Authored by

Nell McGuan and Michael Herr
Washington Department of Fish and Wildlife
Fish Program/Science Division
600 Capitol Way N.
Olympia, Washington 98501-1091

to

U.S. Fish and Wildlife Service
Lower Snake River Compensation Plan Office
1387 South Vinnell Way, Suite 343
Boise, Idaho 83709
Cooperative Agreement #F220C00018

June 2025

Citation of this publication:

Nell McGuan and Michael Herr. 2025. Lyons Ferry Hatchery Evaluation Fall Chinook Salmon Annual Report: 2023 Return/2024 Releases. Washington Department of Fish and Wildlife, Olympia, WA. 70 pp. <http://www.fws.gov/office/lower-snake-river-compensation-plan/library>

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 2023 spawning and 2024 releases of yearlings and subyearlings.

The estimated run size of natural-origin (NOR) fall Chinook salmon to reach Lower Granite Dam (LGR) was 7,516 fish ≥ 57 cm fork length and 381 fish 30- <57 cm fork length. The remaining portion of the run consisted of 36,447 hatchery-origin (HOR) fish ≥ 57 cm and 1,726 HORs 30- <57 cm. Nearly all HOR fall Chinook salmon were 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 fall Chinook salmon to LGR in 2023 was estimated at $\sim 3.8\%$.

In 2023, WDFW collected 2,121 adults at LGR for broodstock, monitoring and evaluation of our hatchery releases, and to estimate the run composition at LGR.

LFH staff spawned 1,183 females for an estimated total green egg take of 4,592,362; within the 2018-2027 *United States v. Oregon* Management Agreement precision ($\pm 10\%$) levels expected of artificial production programs. Of the 690 males spawned at LFH, 458 were used multiple times to minimize the use of jacks, and to incorporate larger, older fish in the broodstock. At the end of the season, 47 females and 50 males were returned to the Snake River to spawn naturally.

The estimated proportion of NOR adults in all LFH and NPTH broodstock (pNOB), as determined from PBT was 17.8%. The estimated proportion of natural origin spawners (pNOS) by run reconstruction methods was 17.1%. Beginning in 2022, estimates for pNOB were no longer calculated by run reconstruction efforts. Instead, it will be calculated from PBT genetic samples.

In 2024, hatchery staff released yearling and subyearling fall Chinook salmon into the Snake River at LFH and subyearlings into the Grande Ronde River near Cougar Creek. All WDFW release groups (subyearling and yearling) were represented by a coded wire tag (CWT) group as identified in the *United States v. Oregon* production tables, and a representative sample also received passive integrated transponder (PIT) tags to monitor survival and migration rate through the hydro system.

Beginning the week of 15 October 2023, staff conducted fall Chinook salmon redd surveys in the lower Tucannon River. 640 fall Chinook redds and 56 coho redds were visually counted, with an additional 155 Chinook redds and 5 coho redds estimated due to landowner access and flow restrictions. Total estimated fall Chinook salmon redds equaled 755. Based on three fish/redd, the estimated number of fall Chinook spawners in the Tucannon River in 2023 was 2,265. Of the estimated total fall Chinook spawning escapement, 25% were recovered and sampled.

In the spring of 2024, 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 passing the smolt trap were expanded by trapping efficiencies and for redds that occur below the smolt trap. Total fall Chinook salmon emigrating from the Tucannon River was estimated at 204,605. Productivity (smolts/redd) from spawning was estimated at 271 smolts/redd.

In 2023 we estimate that a minimum of 12,329 (67.4%) returning adults and jacks that were from WDFW releases contributed to the LSRCP project area mitigation goal (18,300 fish). This estimate includes returns to LGR, and total fish estimated that remained between Ice Harbor Dam and LGR based on PIT Tag conversions. We estimate that a minimum of 21,276 (23.3%) returning adults/jacks that were from WDFW releases contributed to the total LSRCP mitigation objective (91,500 fish). This estimate includes all returns to the Snake River Basin and fully expanded recoveries outside of the Snake River.

Fall Chinook salmon reared at LFH and released into the Snake River at LFH or in the Grande Ronde River (GRR) contributed to multiple fisheries (troll, sport, net) within the ocean and in the Columbia River in 2023. Of the total returns in 2023, harvest from the various ocean and Columbia River fisheries accounted for 29% of the return.

Endangered Species Act (ESA) section 10 (a)(1)(A) Permit # 16607 was revised in the summer of 2018 and is now referred to as permit # 16607-2R (amended). Overall, we were within allowances of direct take of listed Snake River fall Chinook salmon (SRFCH) for adult returns in 2023 and juvenile releases in 2024. Discussions with NOAA-Fisheries on consistency and ease in reporting of ESA take for SRFC is ongoing.

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: Michael Gallinat, Dane Kiefel, Jule Keller, Lance Ross, Ryan Crane, Jenna Fortier, Samantha Ulrich, Robert Harris, and staff from the Dayton Fish Management office and the Clarkston Field office for their help in collecting fall Chinook data.

We thank all the hatchery personnel at LFH for their cooperation with sampling and providing information regarding hatchery operations. Thanks also to the collaboration efforts of the genetic labs analyzing tissue samples collected at LFH, LGR and Nez Perce Tribal Hatchery (NPTH). A special thanks to the teams of Todd Seamons (WDFW Genetic Lab), Rebekah Horne and Meghan Moore (Columbia River Inter-Tribal Fisheries Commission (CRITFC) Genetic Lab), Matt Cambell, Jesse McCane, and Audrey Harris (Idaho Department Fish and Game (IDFG) Genetic Lab). Additional gratitude to Andrew Claiborne (WDFW) and his staff at the scale aging lab in Olympia for aging scales collected at LFH, LGR, and Nez Perce Tribal Hatchery and for the run reconstruction analysis and profiling the age of broodstock.

We especially appreciate the efforts of Darren Ogden (NOAA Fisheries) and the crew at LGR for trapping, tagging, and documenting fall Chinook salmon for transport to LFH. We also thank Bill Young (NPT) and Stuart Rosenberger (Idaho Power), and John Powel (IDFG), and Ben Sandford for their assistance in estimating the run composition at LGR for the 2023 run year.

We thank Lindsay Ciepiela (WDFW) and Rod Engle (USFWS) for reviewing a draft of this report and providing valuable comments.

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

Table of Contents

Executive Summary	i
Acknowledgments	
Table of Contents	i
List of Tables	iii
List of Figures	v
List of Appendices	viii
Introduction	1
Definition of LSRCP Project Area and Measurement of Goal	1
Program Goals and Objectives	1
2023 Fall Chinook Salmon Run Size and Composition	5
Returns to LGR and Composition of Fish Returning to LGR	5
Fall Chinook salmon arriving at LGR Dam	8
Sex Ratio and Length Frequencies	8
Trapping and Broodstock Management 2023	9
Lower Granite Dam Trapping Operations 2023	9
Broodstock Collection and Management 2023	10
Hatchery Operations 2023	11
Spawning Operations	11
Spawning and Egg Take	11
Fish Returned to River	14
Effective Hatchery Population Size	15
Broodstock Profile	16
Males and Females Used in Broodstock	19
Inclusion of NOR fish in broodstock	19
Jacks and Jills and Stray Fall Chinook Salmon in Broodstock	20
Juvenile Rearing and Marking and Tagging	21
In Hatchery Survival Rates to Release	22
Fish Health Sampling	23
Juvenile Releases	23
PIT Tagging, Migration Timing, Travel Speed and Survival	25
Tucannon River Natural Production 2023	32
Spawning Ground Surveys	32
Escapement and Composition of the Fall Chinook Salmon Run in the Tucannon River	33
Juvenile Salmon Emigration	36
2024 Outmigration Year	36
Project Area Returns and Total Returns	38
Assumptions	39
Returns to the Project Area	39
Total Returns	40

Harvest in the Project Area	41
Recoveries by Region	42
Recoveries in the Ocean	42
Recoveries in the Columbia River Basin (excluding the Snake River)	43
Smolt-to-Adult Survival Rates (SAR and SAS)	44
Direct Take of Listed Snake River fall Chinook Salmon During Fall of 2023 and Spring of 2024	47
Recommendations and Conclusions.....	50
Literature Cited.....	52
Appendix A: Trapping and Sampling Protocols at LGR Adult Trap for 2023	54
Appendix B: Systematic Sampling Rates at Lower Granite Dam 2003-2023	58
Appendix C: Salmon Processed and Killed at LFH in 2023	62
Appendix D: Historical Use of Minijacks, Jacks, Jills and Strays in Broodstock at LFH	65
Appendix E: Egg Take and Early Life Stage Survival Brood Years: 1990-2013	67
Appendix F: LFH/Snake River Origin Fall Chinook Salmon Releases in 2024	69
Appendix G: Tucannon River Survey Sections and Historical Escapement.....	71

List of Tables

Table 1. Fall Chinook salmon LSRCP adult ^a return goals and/or assumed objectives.	2
Table 2. SRFCH production priorities for the LSRCP at LFH, FCAP and IPC per the <i>US v. Oregon Management Agreement</i> for brood years 2018-2027.....	Error! Bookmark not defined.
Table 3. Estimated composition, standard errors, and confidence intervals for Snake River fall Chinook salmon, males (M) and females (F) reaching LGR during 2023.	7
Table 4. Egg take and percent egg mortality of fall Chinook salmon at LFH, 1984-2023.	12
Table 5. Spawn dates, numbers of fall Chinook salmon spawned ^A , and weekly egg take at LFH in 2023. Jacks are included with males.	13
Table 6. Weekly summary and origins of mortality and surplus fall Chinook salmon processed at LFH in 2023.....	14
Table 7. Estimated composition based on PBT of SRFCH released into the Snake River near LFH at the end of the season in 2023.	14
Table 8. Origin of males and females that contributed to production (by PBT or CWT) at LFH, 2023.....	19
Table 9. Eggs taken and survival numbers by life stage of fall Chinook salmon spawned at LFH, brood years 2015-2023..	22
Table 10. Numbers of fall Chinook salmon sampled by WDFW for marking and tagging quality control checks.....	22
Table 11. Estimated survivals (%) between various life stages at LFH for fall Chinook salmon, 2014-2023 subyearling and yearling brood years.	23
Table 12. Length and weight data from fall Chinook salmon released at LFH or in the GRR in 2024.	24
Table 13. Migration timing of PIT tagged yearling fall Chinook released at LFH in 2024..	25
Table 14. Migration timing of PIT tagged subyearling fall Chinook released at LFH in 2024..	26
Table 15. Migration timing of PIT tagged subyearling fall Chinook released at GRR in 2024.....	26
Table 16. Date and number of salmon redds and carcasses counted on the Tucannon River in 2023.	33
Table 17. Estimated escapement, redd construction, and resulting estimates of smolts/redd and total number of emigrants from fall Chinook salmon spawning in the Tucannon River, 2001-2023 ^a	35
Table 18. Project area returns of WDFW released SRFCH salmon, 2003-2024 return years.	40
Table 19. Total returns of WDFW released SRFCH salmon, 2003-2024 return years.....	41

Table 20. Estimated (and fully expanded by tag rate) Snake River basin harvest recoveries in 2023 of wire tagged fall Chinook salmon released by WDFW as reported to RMIS on 12/2024.	41
Table 21. Fully expanded recovery estimates of tagged and untagged fall Chinook salmon recovered in all areas during the 2023 run year for WDFW releases. Minijacks are not included in the estimates.	42
Table 22. Fully expanded recovery estimates of tagged and untagged fall Chinook salmon recovered in the Ocean during the 2023 run year for WDFW releases. Minijacks are not included in the estimates.	43
Table 23. Fully expanded recovery estimates of tagged and untagged fall Chinook salmon recovered in the Columbia River Basin (all freshwater areas – but excluding Snake River Basin recoveries) during the 2023 run year for WDFW releases. Minijacks are not included in the estimates.	44
Table 24. Smolt-to-adult return (SAR) rates to the LSRCP project area for yearling (LFH 1+) and subyearling (LFH 0+ - LFH On-station release; GRR 0+ - Grande Ronde River release; CCD 0+ - Couse Creek release) fall Chinook salmon by WDFW, 2002-2020 release years.	45
Table 25. Total Smolt-to-adult survival (SAS) rates for yearling and subyearling fall Chinook salmon by WDFW, 2002-2020 release years.	46
Table 26. Terms and Conditions for WDFW Section 10 Permit #16607-2R (2018).	48

List of Figures

Figure 1. The Lower Snake River Basin showing locations of LFH, some of the SRFCH acclimation sites, and major tributaries in the area.	4
Figure 2. Snake River Fall Chinook salmon window counts at LGR, 1976-2023.	6
Figure 3. Estimated length frequencies of SRFCH sampled (and expanded by the daily trap rate) at the LGR adult trap in 2023.	9
Figure 4. Percent of fall Chinook at LGR that were trapped/hailed to LFH in 2023 compared to the overall return.	10
Figure 5. Start, end, and peak spawn days for fall Chinook salmon spawning at LFH, 1984-2023.	13
Figure 6. Estimated effective population size of the SRFCH salmon spawned from both LFH and NPTH.	16
Figure 7. Percentages by fish origin with PBT results contributing to fall Chinook salmon broodstock at LFH during 2023.	Error! Bookmark not defined.
Figure 8. Percentages of salt ages of fall Chinook salmon spawned at LFH before and after changes in broodstock spawning protocols.	18
Figure 9. Fork lengths of fall Chinook salmon spawned as broodstock at LFH in 2023.	18
Figure 10. Estimated percent NOR parents in the broodstock (pNOB) at LFH and NPTH combined, based on the run reconstruction estimate (2003-2021) or by PBT results from spawned fish at the hatchery, 2003-2023.	20
Figure 11. Survival and standard error of SRFCH subyearlings released into the Grande Ronde River near Cougar Creek to LGR, 2012-2024 migration years.	27
Figure 12. Average travel speed (Km/day with S.D.) and median travel speed (black dot) of SRFCH subyearlings released into the Grande Ronde River near Cougar Creek to LGR, McNary, and Bonneville Dams, 2012-2024 migration years.	28
Figure 13. Survival and standard error of SRFCH subyearlings released into the Snake River at LFH to Lower Monumental Dam, 2013-2024 migration years.	29
Figure 14. Average travel speed (km/day with S.E.) and median travel speed (black dot) of SRFCH subyearlings released into the Snake River at LFH to Lower Monumental, McNary, and Bonneville Dams, 2012-2024 migration years.	29
Figure 15. Survival and standard error of SRFCH yearlings released into the Snake River at LFH to Lower Monumental Dam, 2012-2024.	30
Figure 16. Average travel speed (km/day with S.E.) and median travel speed (black dot) of SRFCH yearlings released into the Snake River at LFH to Lower Monumental, McNary, and Bonneville Dams, 2012-2024 migration years.	31

Figure 17. Survival and standard error of SRFCH yearlings released into the Snake River at LFH to Lower Monumental Dam (LOMO), Ice Harbor, McNary, John Day, and Bonneville Dams, 2012-2024 migration years.	32
Figure 18. Estimated fall Chinook salmon redds in the Tucannon River based on three estimation techniques.	34
Figure 19. Relationship of the overall SRFCH return compared to estimated returns to the Tucannon River.	36
Figure 20. Migration timing of NOR juvenile fall Chinook salmon captured at the Tucannon River smolt trap in 2043.	37
Figure 21. Peak discharge during fall Chinook incubation in the Tucannon River versus the estimated natural log of smolt/redd determined at the Tucannon River smolt trap.....	38

List of Appendices

Appendix A: Trapping and Sampling Protocols at LGR Adult Trap for 2023	54
Appendix B: Systematic Sampling Rates at Lower Granite Dam 2003-2023	60
Appendix C: Salmon Processed and Killed at LFH in 2023	62
Appendix D: Historical Use of Minijacks, Jacks, Jills and Strays in Broodstock at LFH	65
Appendix E: Egg Take and Early Life Stage Survival Brood Years: 1990-2013	67
Appendix F: LFH/Snake River Origin Fall Chinook Salmon Releases in 2024	69
Appendix G: Tucannon River Survey Sections and Historical Escapement.....	71

Introduction

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 BY 2023 spawning, and both yearling and subyearling releases at LFH or in the Grande Ronde River that occurred in 2024. WDFW's Snake River Lab (SRL) evaluation staff completed this work with federal fiscal year 2023/2024 funds provided through the U.S. Fish and Wildlife Service (USFWS), under the Lower Snake River Compensation Plan (LSRCP).

Definition of LSRCP Project Area and Measurement of Goal

The LSRCP project area starts at Ice Harbor Dam (IHR) extending to Lower Granite Dam (LGR) and is inclusive of the Walla Walla Basin, a Columbia River Basin tributary in SE Washington adjacent to the Snake River basin. This area is inclusive of WDFW steelhead and spring Chinook programs for the LSRCP program (USFWS 2020). Measurement of the LSRCP fall Chinook salmon program goal is for adults and jacks returning to the project area which starts at IHR.

Program Goals and Objectives

The Snake River fall Chinook (SRFCH) program at LFH began in 1984 after construction of LFH was completed and is part of the LSRCP program authorized by Congress in 1976. The purpose of the LSRCP is to replace adult salmon and steelhead trout lost by construction and operation of four hydroelectric dams on the Lower Snake River in Washington. Specifically, the stated purpose of the plan was:

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

Subsequently in 1994, additional authorization was provided to construct juvenile acclimation facilities for SRFCH (Fall Chinook Acclimation Project – FCAP) 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 1975). 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.

To determine the LSRCP SRFCH mitigation goal, the escapement to the Snake River prior to construction of the four lower Snake River dams was estimated at 34,400 (WDFW 2002). This base estimation is encompassing of production above the Hells Canyon Complex, which is now unreachable by spawners. As such, current escapement goals reflect habitat that is not available to SRFCH (NOAA 2017). Lower Snake River dam construction and operation was expected to reduce the spawning escapement in two ways: 1) the slack water reservoirs created by the dams were expected to eliminate spawning area 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 SRFCH adult escapement by 18,300, which in turn became the adult mitigation goal for the program. Further, this reduction in natural spawning escapement was estimated to result in a harvest reduction to areas outside of the Snake River Basin: 1) coast-wide commercial/tribal harvest of 54,900 adults, and 2) recreational fishery harvest of 18,300 adults (Table 1). In summary, the expected total number of adults to all possible areas that would be produced as part of the LSRCP mitigation program was 91,500.

Table 1. Fall Chinook salmon LSRCP adult ^a return goals and/or assumed objectives.

Component	Number of adults
Escapement to project area goal	18,300
Outside of Snake River Basin Commercial/Tribal harvest objective	54,900
Outside of Snake River Basin Recreational harvest objective	18,300
Total Hatchery Origin (HOR) fish	91,500
Maintain Natural Origin (NOR) population	14,363

^a As defined in the LSRCP documentation, “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 at LFH and estimate the magnitude of benefits have changed.

- The listing of SRFCH 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 originally expected.

- Currently, three hatchery programs artificially propagate SRFCH. Two of the programs, LSRCP (includes LFH and FCAP) and Nez Perce Tribal Hatchery (NPTH), are integrated programs aimed at increasing natural-origin (NOR) fish abundance and harvest using supplementation and harvest mitigation releases. Fish released at LFH consist of both subyearling and yearling releases while the Grande Ronde River, FCAP facilities, and NPTH releases are subyearlings only starting with BY2018 (*United States v. Oregon* 2018). Information about the FCAP and NPTH programs are presented by the NPT in their annual reports to BPA and LSRCP and are not provided here. The third program, an integrated program administered by the Idaho Power Company (IPC), is primarily mitigation for lost production due to construction of the Hells Canyon Dam Complex (HCC), and consists of subyearling releases in the Salmon River (Idaho) near Hammer Creek. Releases from all these programs occur at 10 locations throughout the Snake River basin, with most releases located above LGR (Figure 1). All programs are highly coordinated in their operations, including broodstock collection at LGR and egg/juvenile fish transfers among facilities. One out-of-basin LSRCP hatchery facility is used (Irrigon Hatchery in Oregon) in addition to the in-basin facilities and acclimation sites.
- Mark/Tag types and quantities have been adopted under the 2018-2027 *United States v. Oregon* Management Agreement (*United States v. Oregon* 2018 – Table 2). At full production levels, not including NPTH production, ~53% of the hatchery-origin (HOR) produced fish are marked with an adipose (AD) fin clip and a portion are tagged with coded wire tags (CWT). If changes to marking/tagging occurs, there is a notification process that needs to be followed per permit #16607 – 2R issued to WDFW from NOAA-Fisheries and amended in 2018 (NMFS 2018).

HOR Return Goals

- In the early 2000s, as part of developing a management plan for SRFCH, Snake Basin co-managers developed an adult return goal for HOR fall Chinook to the Snake Basin. This adult return goal combined the various mitigation goals from the hatchery programs into a combined number for the basin. The LSRCP funded hatchery production has an established adult mitigation goal of 18,300 adults to the project area (above IHR) and the NPTH program has an adult return goal of 3,750 adults above Lower Monumental Dam. The IPC funded production has mitigation responsibility of releasing 1,000,000 juveniles annually, with no adult goal. For the combined goal, we added the current LSRCP funded program releases (LFH (including the Grande Ronde release) and all FCAP) – Note: a SAR of 0.56% would return 18,300 to the project area from all LFH and FCAP releases. Using the same survival assumptions for the current IPC program would result

in an adult return of 5,600. Combining these two with the NPTH adult goal (3,750) would result in a total HOR goal of 27,650.

NOR Return Goals

- Achieve ESA delisting by attaining interim population abundance in the Snake River Evolutionary Significant Unit (ESU) of at least 3,000 NOR SRFCH spawners (adults and jacks), 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 NOR SRFCH (adults and jacks) above IHR
- Long term restoration goal is to achieve a population of 14,363 NOR SRFCH (adults and jacks) above IHR.

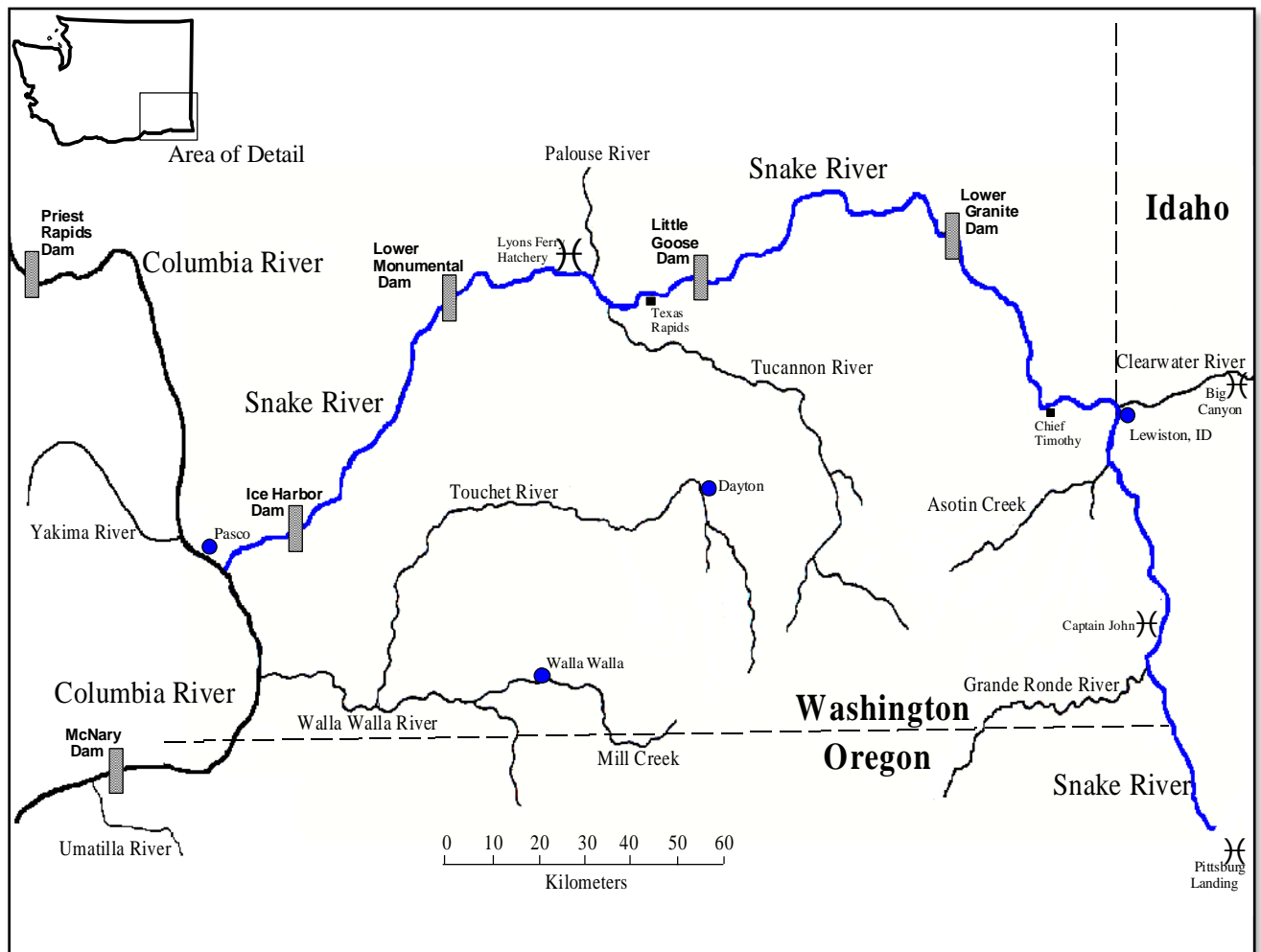


Figure 1. The Lower Snake River Basin showing locations of LFH, some of the SRFCH acclimation sites, and major tributaries in the area.

Table 2. SRFCH production priorities for the LSRCP at LFH, FCAP and IPC per the *US v. Oregon Management Agreement* for brood years 2018-2027.

Priority	Rearing facility	Release Number	Age	Release location	Marking/Tagging ¹
1	LFH	450,000	1+	On-station	450K ADCWT
2	LFH	450,000	0+	Captain John	200K ADCWT, 250K no clip
3	LFH	450,000	0+	Big Canyon	200K ADCWT, 250K no clip
4	LFH	500,000	0+	On-station	200K ADCWT, 300K no clip
5	LFH	400,000	0+	Pittsburg Landing	200K ADCWT, 200K no clip
6	LFH	200,000	0+	Captain John 2	200K ADCWT
7	LFH	200,000	0+	Big Canyon 2	200K ADCWT
8	LFH	200,000	0+	Pittsburg Landing 2	200K ADCWT
9	Irrigon	1,000,000	0+	Salmon River ²	200K ADCWT, 800K no clip
10	Irrigon	200,000	0+	Grande Ronde River	200K ADCWT
11	LFH	200,000	0+	On-station	200K no clip
TOTAL	Yearlings	450,000			
	Subyearlings	3,800,000			

¹ For all SRFCH hatchery programs, tissue samples are collected annually from broodstock and incorporated into a parentage-based tagging (PBT) baseline. The hatchery programs effectively ‘tag’ ~90-100% of annual releases. All release sites and groups will be PIT tagged and differentially PBT marked/tagged. PBT will be utilized for all fish, including those marked “no clip”. No clip means no adipose fin clip and no CWT wire mark.

² Beginning in 2018, the releases of subyearlings at Hells Canyon Dam were moved to the Salmon River. Several Parties are actively participating in the re-licensing of Idaho Power Company's Hells Canyon Complex and its operations. Idaho Power Company's mitigation responsibilities, including production numbers and release locations are a subject of these discussions.

2023 Fall Chinook Salmon Run Size and Composition

Returns to LGR and Composition of Fish Returning to LGR

Window Counts-

Chinook salmon (spring, summer, and fall runs) were counted at the LGR counting window in 2023. Fish are visually measured and grouped by total length (TL) at fish passage windows. Window counts (day and night) estimated that 52,418 SRFCH (≥ 30 cm TL) reached LGR in 2023 (Figure 2), which includes 5,417 “jacks” by size (30 cm-55 cm TL). Chinook salmon passing LGR after 18 August are designated as SRFCH based on arrival date, which may be inaccurate because of the overlap between the summer Chinook and fall Chinook runs. In addition, fish counts do not include fish less than 30 cm long or account for fish that crossed the dam and fell back through the juvenile bypass system, spillway, turbines, or locks, some of which may have re-ascended the ladder and were double counted.

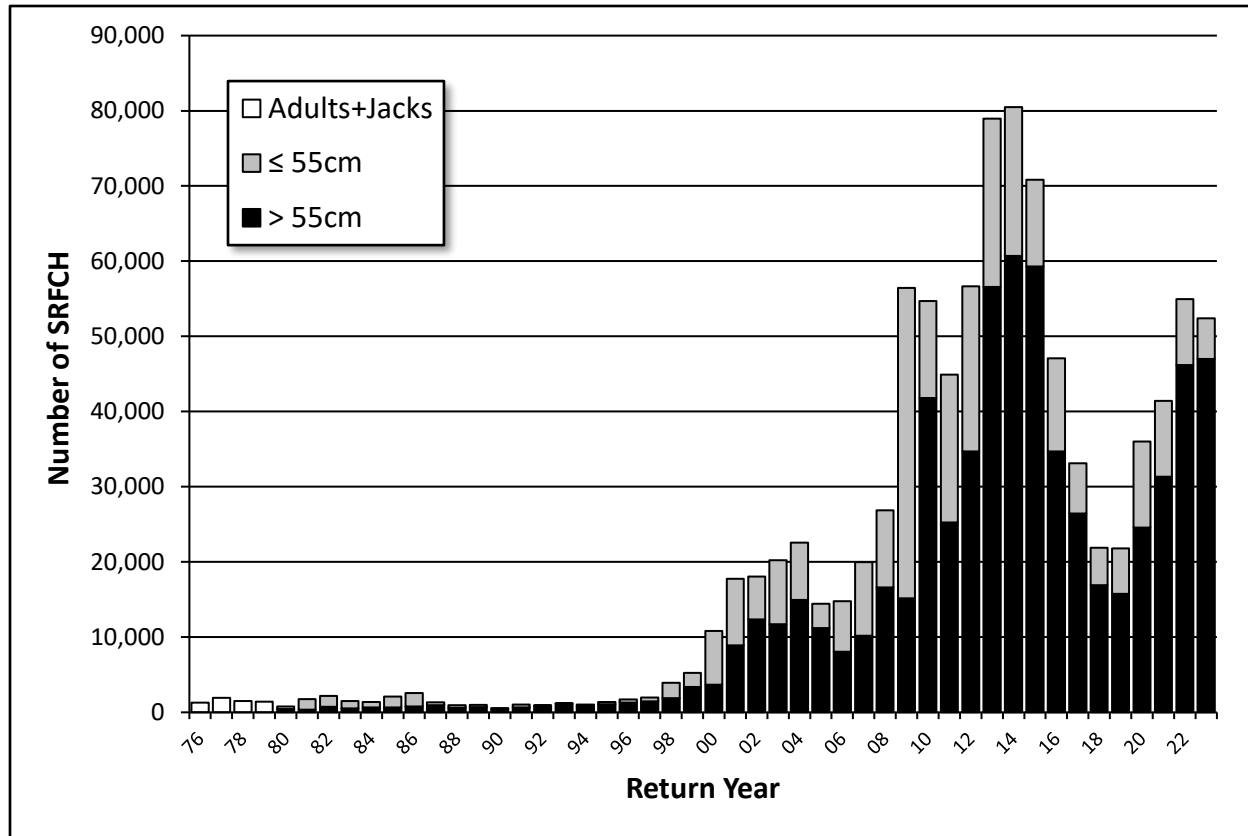


Figure 2. Snake River Fall Chinook salmon window counts at LGR, 1976-2023.

Run Reconstruction-

The SRFCH run reconstruction technical team annually estimates the run to LGR and consists of staff from WDFW, NPT, IPC, NOAA, and the Columbia River Inter-Tribal Fish Commission (CRITFC). In 2023 the run reconstruction team used Parent Based Tagging (PBT) for the SRFCH run reconstruction analysis. Previous run reconstructions were based on a combination of CWT tagging and window counts. The PBT method provides a non-invasive approach to collecting run composition data, eliminating the need to cull fish solely for CWT extraction. Tissue samples were collected from all fall Chinook sampled at LGR and a random subset was analyzed to determine hatchery parentage and origin. During the 70% trap rate period, 1 in 10 tissue samples were analyzed; during the 18% trap rate period, 1 in 3 samples were analyzed. Based on the PBT analysis, known hatchery samples were expanded by the PBT tag rate to estimate the total number of hatchery origin fish. The remaining fish were unknown hatchery and natural-origin fish. From this the run reconstruction team was able to estimate the Snake River fall Chinook run at large.

The SRFCH run reconstruction team uses a slightly different length criteria (30-56 cm fork length, and ≥ 57 cm) compared to the COE window counts. This was done based on recovered

CWT's that suggested the size range should be modified to better describe adult, jack, and mini-jack returns. The SRFCH run reconstruction technical team estimated through PBT analysis that 46,070 adult, jack, and mini-jack (including males <57 cm) SRFCH reached LGR in 2023 (Table 3). For adults and jacks only, an estimated 17.1% were natural-origin; 79.1% were in-basin hatchery-origin, and 3.8% were out-of-basin hatchery-origin. The final run estimate to LGR was 12.1% 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- 30-56 cm (jacks) and ≥ 57 cm (adults). The data is grouped by total age as requested by the Technical Advisory Committee (TAC) for forecasting future runs. For more information see *Snake River Chinook salmon Lower Granite Dam run reconstruction report; return year 2023*, Young et al. 2024.

Table 3. Estimated composition of Snake River fall Chinook salmon, males (M) and females (F) reaching LGR during 2023.

	Females	Males	Jacks (<57 cm)	Adults	Totals
Total natural	3,404	4,113	381	7,516	7,897
Total hatchery	20,051	16,396	1,726	36,447	38,173
Totals	23,454	20,509	2,107	43,963	46,070
Natural age 2	0	78	237	78	315
Natural age 3	138	1,028	132	1,166	1,298
Natural age 4	2,813	2,898	12	5,712	5,724
Natural age 5	452	108	0	560	560
Hat age 2	0	186	1,531	186	1,717
Hat age 3	1,074	4,631	138	5,705	5,844
Hat age 4	16,696	10,016	17	26,712	26,729
Hat age 5	1,443	712	0	2,155	2,155
Stray age 2	0	14	15	14	29
Stray age 3	0	131	25	131	155
Stray age 4	634	658	0	1,292	1,292
Stray age 5	204	48	0	252	252

Fall Chinook salmon arriving at LGR Dam

The following sections use data collected from HOR and NOR SRFCH handled at the LGR adult trap.

Sex Ratio and Length Frequencies

According to PBT analysis run reconstruction methods, 22,616 (49.1%) fish passing through LGR were considered males (includes adults, jacks and minijacks), and 23,454 (51.0%) were considered female. Based on the expanded sample, the sex ratio of SRFCH at LGR was estimated at 1:1 male to female. After removal of fish for broodstock, the sex ratio of SRFCH upstream of LGR remained 1:1 male to female.

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 of fall Chinook salmon at that size during that day (Figure 3). Overall, median fork length for males was 66.0 cm with a mean of 61.5 cm. Median fork length for females was 75.0 cm with a mean of 63.0 cm.

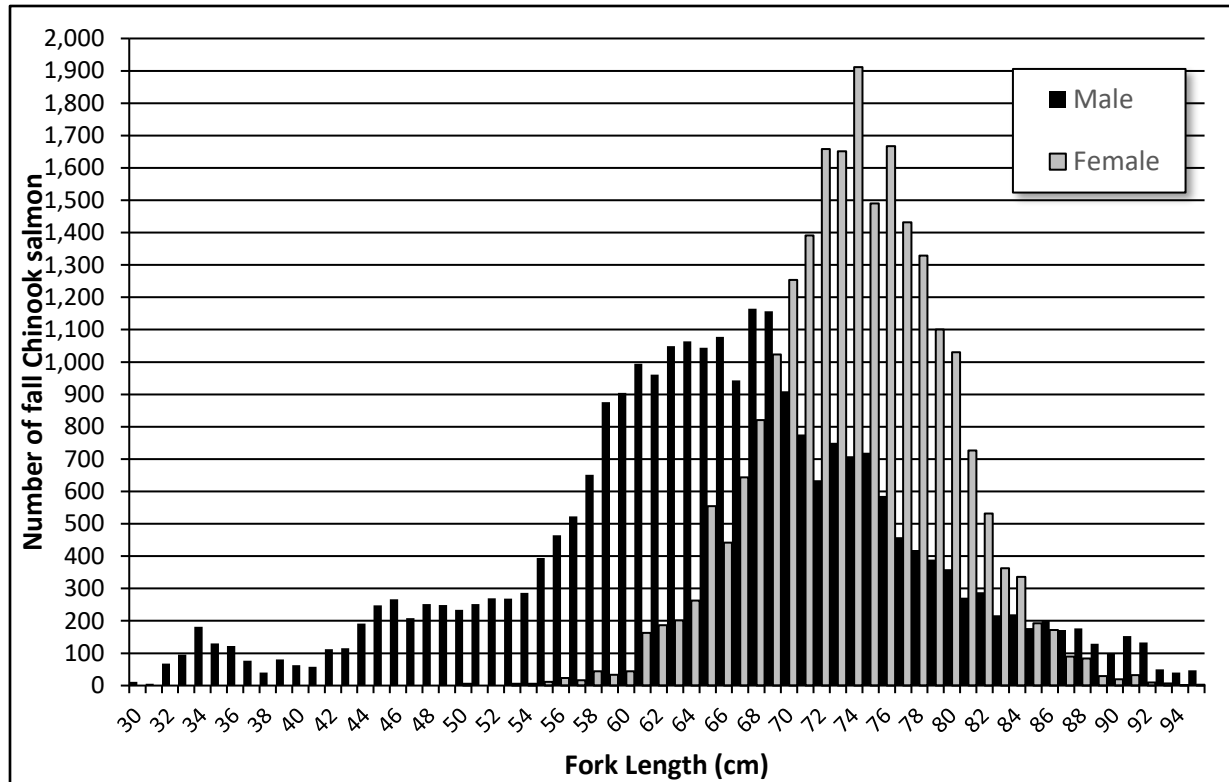


Figure 3. Estimated length frequencies of SRFCH sampled and expanded by the daily trap rate at the LGR adult trap in 2023.

Trapping and Broodstock Management 2023

Lower Granite Dam Trapping Operations 2023

In 2023, fall Chinook trapping and hauling at LGR began 18 August. Two trapping rates were used during the season (18 Aug – 30 Aug = 70%, 31 Aug – 15 Nov = 18%). These trapping rates were agreed to by the Snake River basin managers in an attempt to address multiple objectives: 1) collect more natural-origin and older aged fall Chinook for broodstock because they return in greater numbers at the front end of the run, 2) achieve the 30% pNOB target for the hatcheries, and 3) attempt to remain at a 20% or less handle rate impact on natural origin steelhead at LGR (steelhead generally return later than the fall Chinook). The arrival timing of males and females collected for broodstock at LGR and hauled to LFH compared to the run at large is provided (Figure 4). The majority of broodstock collection goals were met by the end of September, however, due to some mortalities post collection, additional fish were collected for broodstock in October. Fish not hauled for brood collection were passed upstream. Trapping protocols and changes that occurred in 2023 are presented in Appendix A. Historical trapping rates and operation dates of systematic sampling at LGR are presented in Appendix B. In general, NOAA

Fisheries and WDFW staff anesthetized the salmon and gathered length, sex, fin clip, and the presence of wire or PIT tag.

Of the 10,970 salmon trapped at LGR, approximately 19.5% were hauled to LFH and 9.1% were hauled to NPTH to satisfy brood collection. The program collected over 50% of the needed female brood by 30 August, and by 20 September, 100% of the female brood collection was completed. However, due to high mortalities, brood collection resumed 22 September and was subsequently concluded by 6 October. On 20 September, the run at large was 71% complete. By the end of the extended broodstock collection on 6 October, the run at large was 91% complete. Male brood collection was completed on 26 September at which the run at large was at 82% complete.

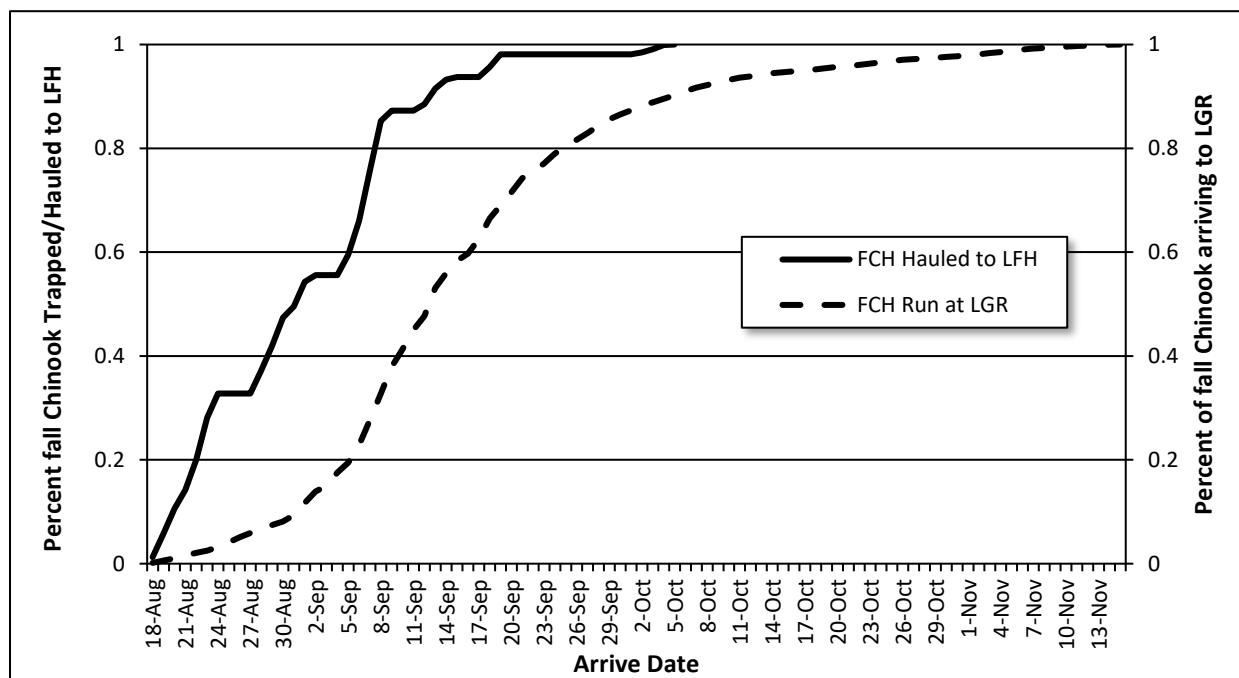


Figure 4. Percent of fall Chinook at LGR that were trapped/hailed to LFH in 2023 compared to the overall return.

Broodstock Collection and Management 2023

In 2023, all fall Chinook salmon collected for broodstock were trapped at LGR. No fish were trapped at LFH or NPTH. There were 3,114 fish collected and hauled for broodstock- 2,123 for LFH and 991 for NPTH. At LFH, 1,884 fish were spawned, 24 were non-viable or killed onsite, and 117 were dead in the pond (DIP). There were 97 fish that were not used for spawning and released into the Snake River at LFH. Each year there is a small discrepancy between the reported number of fish collected and hauled to LFH and the number of fish processed and killed at LFH. The discrepancies are likely data recording errors at either location.

Hatchery Operations 2023

Spawning Operations

Spawning and Egg Take

Fish transported from LGR to the adult holding ponds at LFH had approximately 0.60:1 M:F sex ratio in the adults. Size criteria for mating males was set at 70 cm to reduce the number of potential jacks (HOR and NOR) used for broodstock. Mate selection and spawning protocols changed weekly according to the number of males ripe during the spawn day and to allow for maximum use of larger, older aged, unmarked/untagged fish.

The total egg take and percent egg mortality by year (Table 4), duration and peak of spawning (Figure 5), numbers of fish spawned (Table 5), and the number killed outright or died in the pond (Table 6) are provided. Peak spawn timing has shifted approximately 1-week earlier since the program's inception in 1984, and the duration of spawning has decreased compared to early years in the program. Many factors are likely responsible for this shift:

- 1) Variable trapping locations (IHR, LFH or LGR) over the years or any combination of the three in any given year have provided broodstock.
- 2) Trapping earlier at LGR in more recent years and bringing brood to LFH earlier could alter spawn timing. Holding water temperatures at LFH are significantly cooler than the Snake River in August and September.
- 3) Broodstock availability compared to earlier years where the program was often broodstock limited and every fish was needed to fulfill program egg take goals.

Spawning for the 2023 fall Chinook season began 17 October. Eight females were non-viable (all eight were designated Snake River HOR by PBT). Ten females were culled due to high ELISA results (all ten were designated Snake River HOR by PBT). Two females were spawned and were a total loss (both were designated Snake River HOR by PBT). Natural-origin fish used for broodstock were identified post-spawning based on PBT results obtained at the end of the season. Composition of fish processed at LFH in 2023 is presented in Appendix C. In 2023, egg take goals were attained for LFH as required by the production priority table per the 2018-2027 *US v. Oregon* Management Agreement (Table 4).

Table 4. Egg take and percent egg mortality of fall Chinook salmon at LFH, 1984-2023.

Spawn Year	Total egg take	Egg mortality to eye-up (%) ^a	Spawn Year	Total egg take	Egg mortality to eye-up (%) ^a	Spawn Year	Total egg take	Egg mortality to eye-up (%) ^a
1984	1,567,823	21.6	1998	2,521,135	5.1	2012	4,526,108	3.1
1985	1,414,342	4.0	1999	4,668,267	9.4	2013	4,565,660	2.6
1986	592,061	4.0	2000	5,143,459	5.9	2014	4,787,615	3.6
1987	5,957,976	3.8	2001	4,734,234	6.4	2015	4,569,472	2.8
1988	2,926,748	3.4	2002	4,910,467	3.6	2016	4,951,188	2.7
1989	3,518,107	5.8	2003	2,812,751	3.1	2017	4,685,575	5.4
1990	3,512,571	8.3	2004	4,625,638	3.3	2018	4,754,622	3.3
1991	2,994,676 ^b	8.3	2005	4,929,630	3.5	2019	4,670,644	3.1
1992	2,265,557 ^b	6.0	2006	2,819,004	3.2	2020	4,603,680	3.1
1993	2,181,879	6.7	2007	5,143,459	3.3	2021 ^e	4,989,169	23.9
1994	1,532,404	5.1	2008	5,010,224	3.7	2022	4,746,926	2.6
1995	1,461,500	5.6 ^d	2009	4,574,182	4.7	2023	4,592,362	2.8
1996	1,698,309	4.6	2010	4,619,533	2.7			
1997	1,451,823 ^c	5.2	2011	4,723,501	3.5			

^a Egg mortality includes eggs destroyed due to high ELISA values.

^b An additional 9,000 eggs from stray females were given to Washington State University.

^c Does not include loss from 10,000 eggs from stray females given to University of Idaho. The egg loss from strays was 8.63% excluding eggs used in fertilization experiments.

^d Total egg take includes eggs from one coho female crossed with a fall Chinook salmon.

^e The high egg mortality in 2021 was isolated to a single bank of incubators at LFH which were used for a portion of egg take three and all egg take four. Eggs from take three that were in another bank of incubators were fine and had typical mortality levels. The reason for the high mortality in this single bank of incubators was never determined. Egg survival tests were conducted prior to the 2022 SRFCH spawn in this bank of incubators and mortality was again at a low level and the same as previous years.

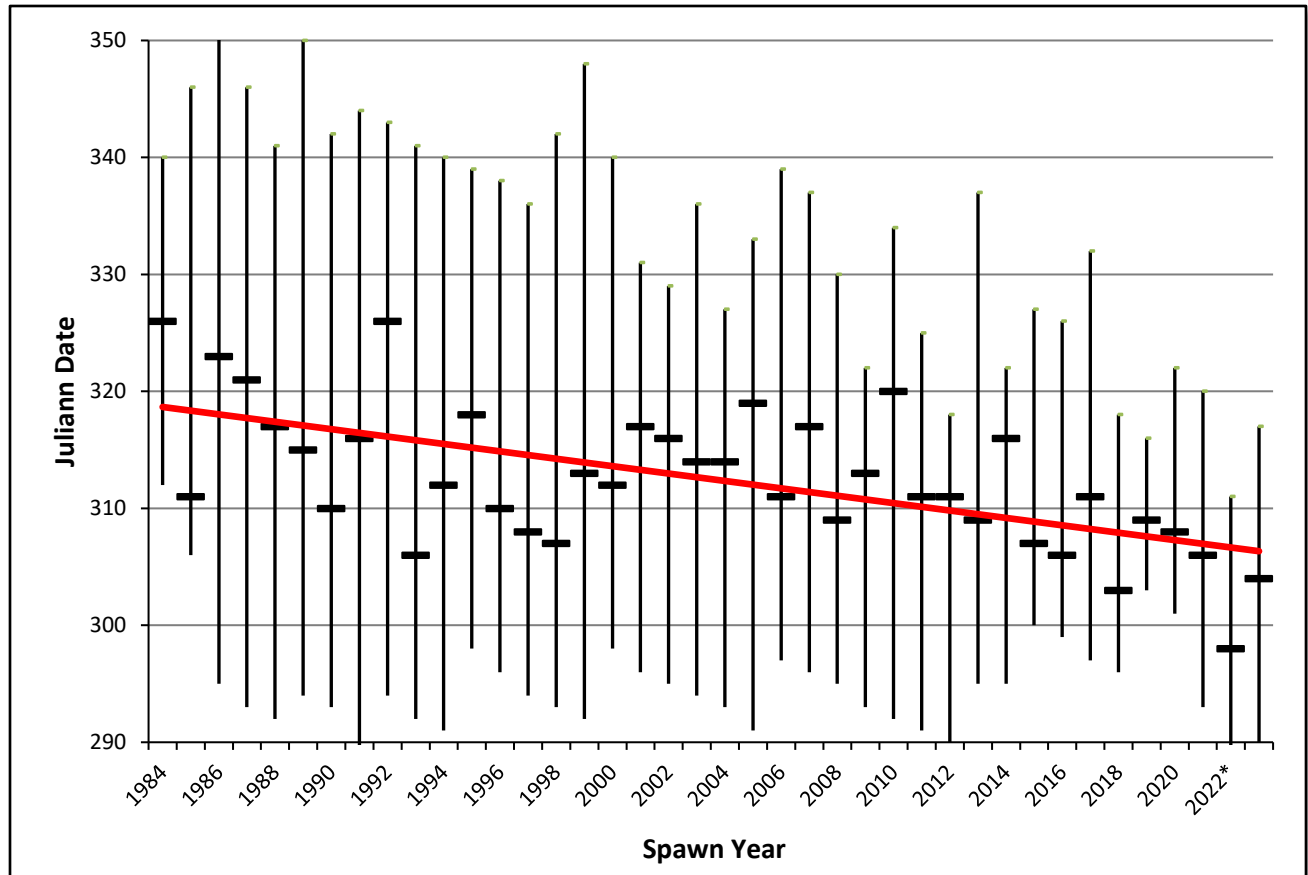


Figure 5. Start, end, and peak spawn days for fall Chinook salmon spawning at LFH, 1984-2023.

* Due to high egg loss in 2021, spawning started a week prior to normal spawn timing to test the egg bank with high egg loss.

Table 5. Spawn dates, numbers of fall Chinook salmon spawned^a, and weekly egg take at LFH in 2023. Jacks are included with males.

Spawn Dates	Males			Females			Egg Take
	HOR ^b	NOR	Unknown Origin ^c	HOR ^b	NOR	Unknown Origin ^c	
17 Oct	53	10		108	24		494,690
24 Oct	150	25	1	268	46	3	1,197,902
31 Oct	136	37		255	60	3	1,227,262
6 Nov	111	37	3	214	72	1	1,130,413
13 Nov	79	48	2	92	42	1	542,095
Totals	530	156	6	937	244	8	4,592,362

^a Numbers of fish presented include spawned fish whose progeny were later destroyed.

^b Numbers include Presumed Snake R, Unknown Hatchery and Stray Hatchery by PBT.

^c Numbers of fish presented are results that failed to genotype or failed to be tracked.

Table 6. Weekly summary and origins of mortality and surplus fall Chinook salmon processed at LFH in 2023.

Week Ending	Mortality						Killed Outright ^c					
	Snake R ^a		NOR		Other/Unknown ^b		Snake R		NOR		Other/Unknown	
	F	M	F	M	F	M	F	M	F	M	F	M
19 Aug												
26 Aug	1	4	4	1								
2 Sept		1		1		1						
9 Sept	1	2	1	1								
16 Sep	8	2	4	4								
23 Sep	13	3	3	1								
30 Sept	7	3	1	1								
7 Oct	1	1	1									
14 Oct	2		1	1								
21 Oct	3	1		1			1	2				
28 Oct	2	1	2		1			3		1		
4 Nov	3	5		4	1			1				
11 Nov	4	3	1	1	2	1				1		
18 Nov	3	3					3	2	1	1		
Totals	48	29	18	16		2	4	8	1	3	0	0

^a Includes known LFH or NPTH origin from PBT designations.

^b Includes undetermined HOR and NOR due to failed genotyped PBT samples or PBT samples failed to be tracked

^c Represents fish killed without spawning due to green eggs, already spawned out, or unreadable coded-wire tags

Fish Returned to River

Collected fall Chinook not needed to fulfill broodstock needs were returned to the Snake River at LFH on 15 November (Table 7). Fish were scanned for PIT tags, CWT, and presence of an AD clip. Co-managers agreed in-season that these fish could be returned to the Snake River near LFH instead of above LGR due to the expected number released and that it would not affect run reconstruction estimates as the LGR trap had already closed for the season.

Table 7. Estimated composition based on PBT of SRFCH released into the Snake River near LFH at the end of the season in 2023.

Date	Snake R ^a		NOR		Other/Unknown ^b		Total Released
	F	M	F	M	F	M	F+M
15 Nov	31	28	15	21	1	1	97

^a Includes known LFH or NPTH origin from PBT designations.

^b Includes undetermined HOR and NOR due to failed genotyped PBT samples or PBT samples failed to be tracked

Effective Hatchery Population Size

To determine the effective population size of HOR SRFCH production, the number of males and females spawned at both LFH and NPTH were combined. At both hatcheries, sometimes the larger males were mated with multiple females to mimic more closely what occurs in nature (Hankin 2009). In 2023, a total of 1,597 females and 1,067 unique males were spawned at both facilities combined. Of the 1,067 males spawned, 489 were used multiple times to:

- Increase the number of larger and older aged adults used in crosses,
- increase the number of NOR 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 (N_{em}) at both hatcheries. The estimate of N_{em} at both hatcheries combined in 2023 was 919. Total effective hatchery population size (N_e) for 2023 broodstock was calculated to be 2,333 fish.

For the SRFCH 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 6). There is a general decline in the estimated hatchery effective population size observed from 2011-2020 due to the use of older/larger males multiple times in broodstock at both facilities. With less emphasis on spawning younger and smaller males (at a 1:1 spawning ratio), modifications to spawning protocols beginning in 2021 that has helped increase the hatchery effective population size by limiting the number of times a male is used.

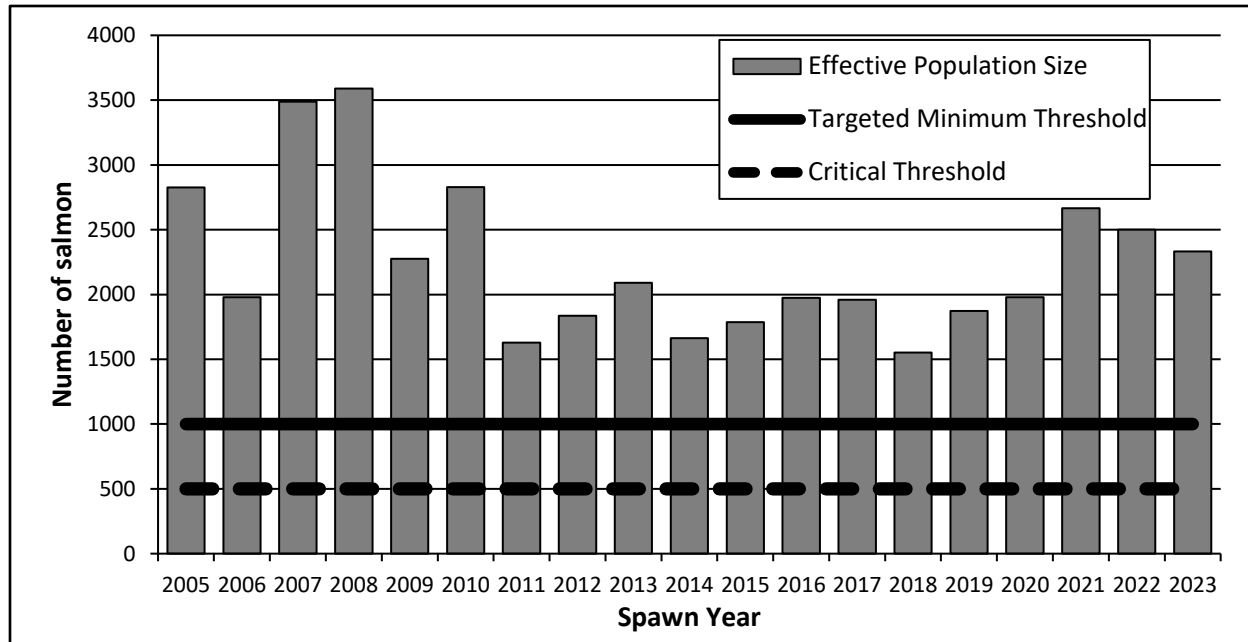


Figure 6. Estimated effective population size of the SRFCH salmon spawned from both LFH and NPTH.

Broodstock Profile

Since 2011, fin tissues have been taken from all fish contributing to broodstock. Since 2012, scales had been taken on all fish contributing to broodstock to determine salt age and rearing type (subyearling, yearling, or reservoir reared subyearlings). Starting in 2020, scales were not taken on fish with CWTs to reduce data redundancy and save resources. Now, these scales are only used for NOR ages and the data for HOR ages relies on PBT analysis. In previous years, PBT samples were collected at the LGR Adult Trap as well as Lyons Ferry Hatchery and Nez Perce Tribal Hatchery during spawning, resulting in two separate PBT analyses. In 2023, broodstock were PIT tagged at the LGR Adult Trap to join the data of a single fish from collection at the LGR Adult Trap through the spawning process. From this, it was only necessary to collect samples at spawning if they were missed at the LGR Adult Trap. Through the PBT process almost all fish were able to be identified back to release group (Figure 7).

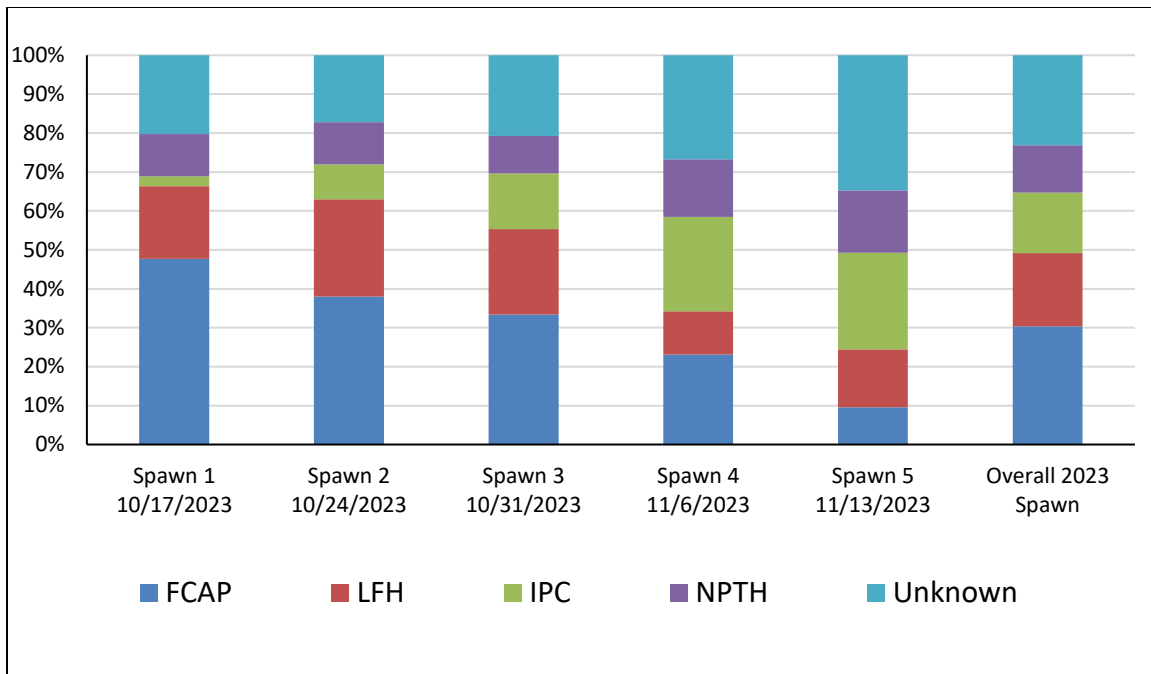


Figure 7. Percentages by fish origin (determined by PBT) contributing to fall Chinook salmon broodstock at LFH during 2023. “Unknown” group is comprised of assumed NOR SRFCH and stray FCH.

A concentrated effort has occurred since 2010 to spawn older, larger sized males and females because of the large number of jacks and some jills that had been used in the past. Saltwater age composition of fish used as broodstock are summarized pre- and post-protocol change in 2010 (Figure 8). Starting in 2018, the Grande Ronde River, FCAP facilities, and NPTH releases shifted to subyearling only releases, possibly affecting the age composition and size at return of broodstock. Length frequencies of SRFCH used for broodstock at LFH in 2023 are presented in Figure 9. Males used multiple times during spawning are not captured in this figure. Median length of fish used for broodstock was 80.5 cm for females and 83 cm for males.

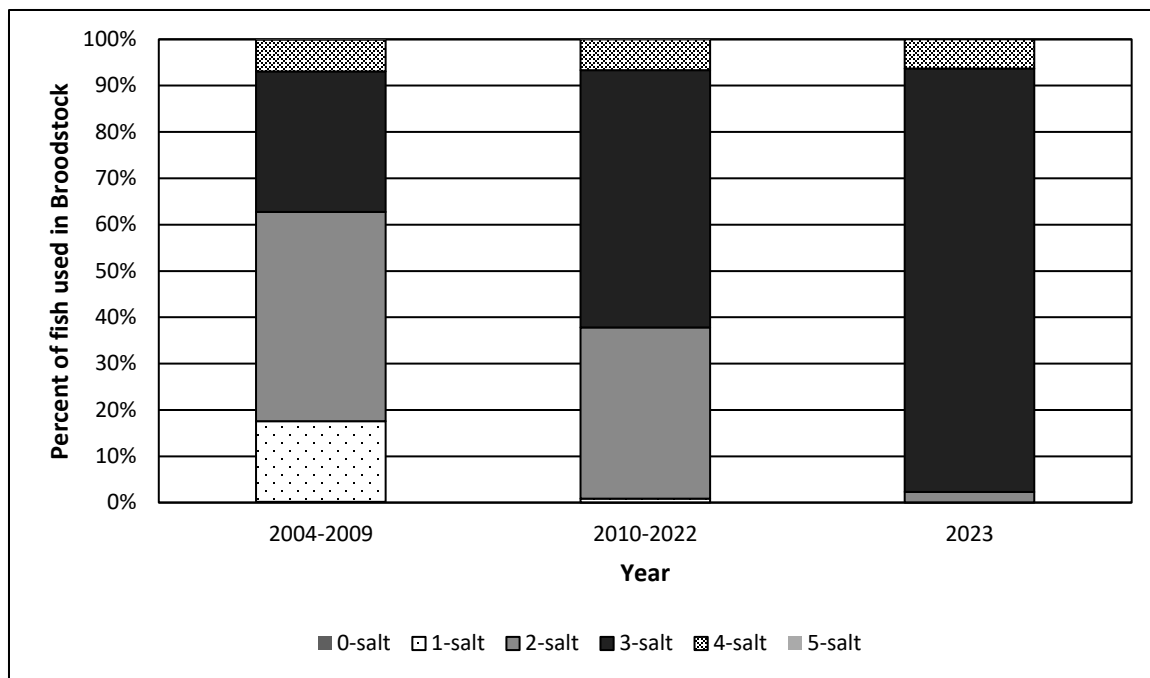


Figure 8. Percentages of salt ages of fall Chinook salmon spawned at LFH before (2004-2009) and after changes in broodstock spawning protocols (2010-2022) compared to spawn year 2023.

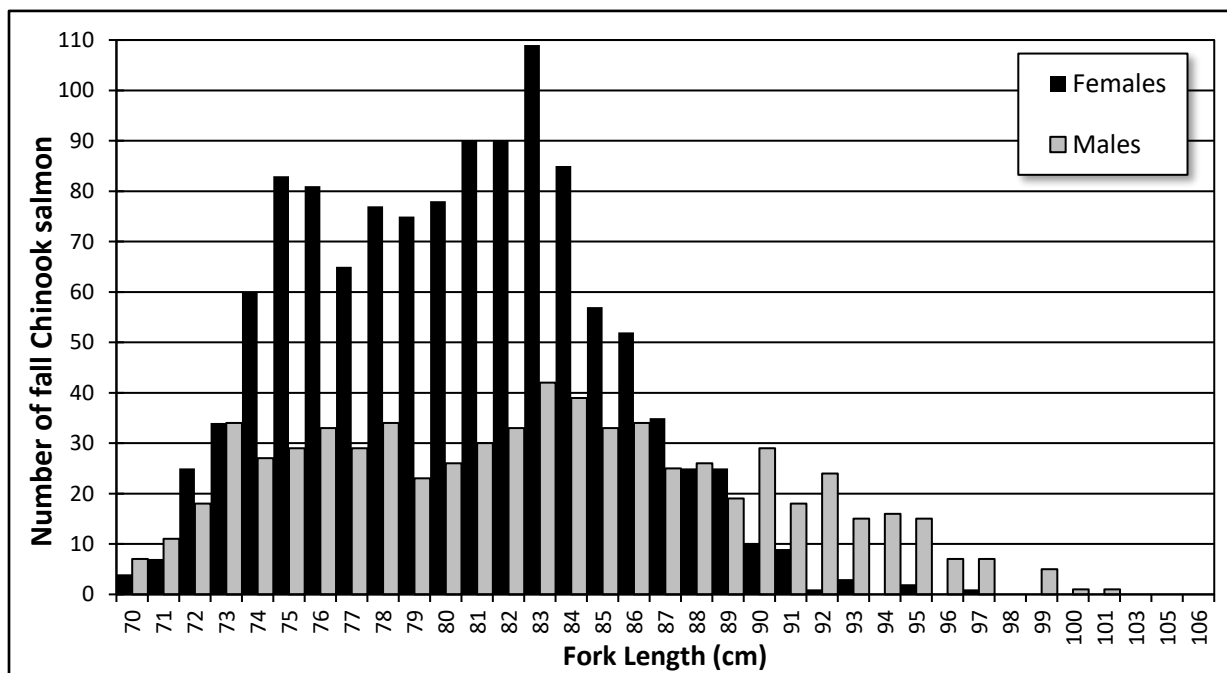


Figure 9. Fork lengths of fall Chinook salmon spawned as broodstock at LFH in 2023.

Males and Females Used in Broodstock

Origin was determined for both male and female fall Chinook contributing to production in 2023. Based on PBT data, 76.2% of the males spawned were determined to be Snake River HOR. Based on PBT 23.3% of the males were identified as Snake River NOR. An additional 3 males (0.5%) were not genotyped. At the start of spawning, the goal was not to exceed four females per male; however, 2 males were used 5 times (Table 8). Similar to the males, based on PBT, 77.4% of the females spawned were Snake River HOR, with PBT determining that 22.0% of the females were Snake River NOR. 7 females (0.6%) were not genotyped (Table 8).

Table 8. Origin of males and females that contributed to production (by PBT or CWT) at LFH, 2023.

Origin determination method	Times each fish was used for mating							
	1	2	3	4	5	6	Total unique	% Used
Males								
Snake R Hatchery	178	315	28	3	2		526	76.2%
Snake R Natural	52	104	4	1			161	23.3%
Unknown Hatchery							0	0.0%
Stray Hatchery							0	0.0%
Unknown Origin	2	1					3	0.5%
Total unique males	232	420	32	4	2	0	690	
	Females							
Snake R Hatchery	916						916	77.4%
Snake R Natural	260						260	22.0%
Unknown Hatchery	0						0	0.0%
Stray Hatchery	0						0	0.0%
Unknown Origin	7						7	0.6%
Total unique females	1,183						1,183	

Inclusion of NOR fish in broodstock

Inclusion of NOR fall Chinook salmon incorporated into broodstock was monitored from 2003 (Figure 10). The target percentage of pNOB for the program is 30%. Originally, to estimate the proportion of natural origin brood (pNOB), a dataset was constructed to reflect all parents that had the potential to contribute to production and used the estimated NOR at LGR from the run reconstruction method to determine the proportion of true NOR and account for unmarked/untagged hatchery fish in the broodstock. Since 2016, a separate estimate of pNOB

has been derived based on the fish spawned with origins determined from a combination of PBT, CWT, and PIT tags. Every fish collected for broodstock at LFH and NPTH has a fin clip cut which is then used for PBT analysis. The pNOB estimates from spawning have generally been higher than what was predicted from the run reconstruction due to the multiple use of males, since unmarked/untagged (more likely to be NOR) males are used multiple times. Historically, Figure 10 showed a comparison of the original RR estimate and the newer PBT estimate. Beginning in 2022, estimates for pNOB were no longer calculated by run reconstruction efforts. Estimates will continue to be calculated through PBT methods. In 2023, using PBT analysis, our pNOB for broodstock was 17.8%.

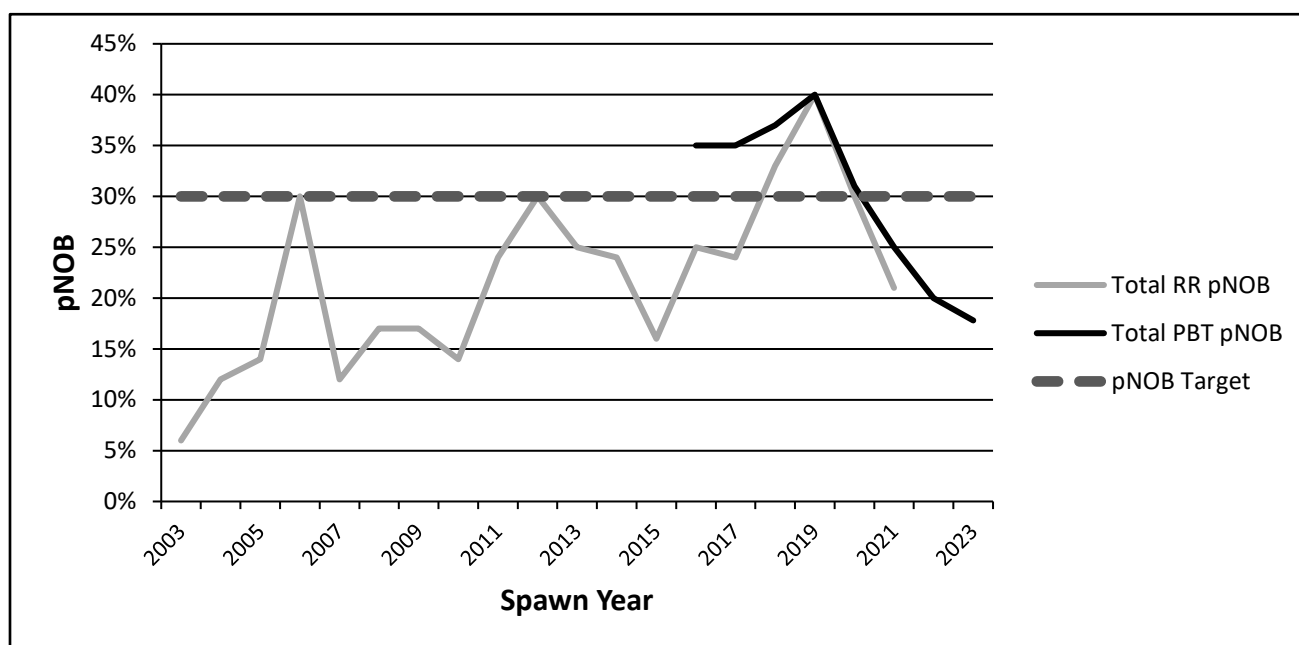


Figure 10. Estimated percent NOR parents in the broodstock (pNOB) at LFH and NPTH combined, based on the run reconstruction estimate (2003-2021) or by PBT results from spawned fish at the hatchery, 2016-2023. The pNOB target for the program is 30%. Beginning in 2022, the run reconstruction estimate is no longer estimating pNOB.

Jacks and Jills and Stray Fall Chinook Salmon in Broodstock

As described previously, WDFW has implemented a size selective collection and mating protocol, 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 has the potential to overestimate saltwater ages for subyearlings since reservoir rearing is not taken into consideration. Untagged fish are scale sampled and reservoir rearing is used to estimate the correct 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. Limited use of jacks and jills in the broodstock began in 2010 to minimize their overall contribution. This management action has reduced the total matings with 0 and/or 1-salt parentage over the last 13 years (Appendix D).

The WDFW preferred goal is to fully exclude strays from broodstock to maintain the genetic integrity of the SRFCH salmon that LFH produces. In cases where broodstock is limited, it was agreed that strays may be included up to 5% of the spawners. To assure production goals were met as mandated in the 2018-2027 *United States v. Oregon* Management Agreement, eleven females were designated as strays by PBT analysis after spawning occurred, and three males were designated strays by PBT analysis. These fish were spawned with designated Snake River origin fish and the gametes were retained. The overall average of stray x stray crosses is 0.06% of the total production from years 2007-2023. Strays retained as broodstock over the years are presented in Appendix D.

Juvenile Rearing and Marking and Tagging

Information regarding eggs taken, egg loss, eggs culled, eggs shipped or retained, and numbers of fish ponded are included in Table 9. Historical egg take and ponding information is listed in Appendix E. Rearing followed standard hatchery procedures as described in the SRFCH salmon HGMP available at the LSRCP website. Further detailed information regarding type and size of vessels used for rearing SRFCH can be found in LFH Annual Reports available at the LSRCP website. <http://www.fws.gov/office/lower-snake-river-compensation-plan/library>

Marking and tagging of fish was consistent with the 2018- 2027 *US v. Oregon* Management Agreement. The LFH yearling (BY22) fish were 100% ADCWT marked/tagged in the early summer of 2023. Staff performed tag and fin clip quality control checks from a sample prior to release from the raceway (Table 10). A portion of the subyearling release group (BY23) were ADCWT marked/tagged in the spring of 2024. All on-station release subyearlings (marked/tagged and unmarked/untagged) were diverted to the rearing lake after the yearlings were released in late March. Subyearling fall Chinook (BY23) reared at Irrigon FH were ADCWT marked/tagged in the spring of 2024 and released in late May.

Table 9. Eggs taken and survival numbers by life stage of fall Chinook salmon spawned at LFH, brood years 2015-2023.

Brood year	Eggs taken	Egg loss	Eggs culled ^a	Eggs shipped	Eyed eggs retained	Fry ponded	Intended program
2015	4,569,472	127,974	132,098	1,540,000	2,769,400	930,000 1,839,400	Yearling Subyearling
2016	4,951,188	121,359	61,346	1,540,000	3,228,483	1,008,647 1,995,000	Yearling Subyearling
2017	4,685,575	212,043	48,940	1,541,282	2,883,310	930,000 1,912,017	Yearling Subyearling
2018 ^b	4,754,622	158,706	18,863	1,315,510	3,261,543	484,356 2,761,054	Yearling Subyearling
2019	4,687,449	143,141	23,489	1,332,784	3,171,230	720,237 3,783,377	Yearling Subyearling
2020	4,603,680	141,273	58,258	1,311,219	3,092,930	462,636 2,493,880	Yearling Subyearling
2021	4,704,700	1,193,437	0 ^c	0 ^c	3,511,263	469,700 2,923,404	Yearling Subyearling
2022	4,611,400	109,139	15,207	1,376,246	3,110,808	467,774 2,778,560	Yearling Subyearling
2023	4,596,900	126,901	42,350	1,374,032	3,053,617	466,419 2,582,660	Yearling Subyearling

^a Eggs culled due to ELISA results, stray, jill or jack matings.

^b The decrease in yearling production, and increase in subyearling production, reflects the new 2018-2027 US v. Oregon Management Agreement

^c Due to egg loss, all eggs were kept. None of the eggs were culled or shipped.

Table 10. Numbers of fall Chinook salmon sampled by WDFW for marking and tagging quality control checks.

Brood Year	Group	Release site	Mark type	CWT	Number sampled	AD/CWT	AD clipped only	CWT only	Unmarked/untagged
2022	Yearling	LFH	ADCWT	638078	1,234	1214 (98.4%)	11 (0.89%)	9 (0.73%)	0 (0.00%)
2023	Subyearling	LFH	ADCWT	638509	1,079	1049 (97.2%)	27 (2.5%)	2 (0.19%)	1 (0.09%)
2023	Subyearling	GRR	ADCWT	638511	1,017	985 (96.9%)	26 (2.6%)	5 (0.49%)	1 (0.1%)

In Hatchery Survival Rates to Release

The estimated number of eggs and fish present at life stages in the hatchery were used for 2015-2024 release years to calculate survival rates within the hatchery environment (Table 11). The original survival goal for the program was 80% [(9,160,000 subyearling

juveniles/11,450,000 eggs) x 100] from USACE 1975. Prior to 2021, the survival goal had been achieved each year for yearlings since 2003 and each year for subyearlings since 1990 (Table 11).

Table 11. Estimated survivals (%) between various life stages at LFH for fall Chinook salmon, 2014-2023 subyearling and yearling brood years.

Brood year	Subyearling Green egg- poded fry %	Yearling Green egg- poded fry %	Subyearling Poded fry- release ^a %	Yearling Poded fry- release ^a %	Subyearling Green egg- release %	Yearling Green egg- release %
2014	95.2	95.2	98.5	97.1	93.8	92.5
2015	94.6	94.6	99.5	100.1	94.2	94.7
2016	94.9	94.9	94.2	87.3	94.2	82.8
2017	92.2	92.2	96.7	95.4	89.2	88.0
2018	94.4	95.3	98.9	91.9	93.3	86.7
2019	95.2	95.2	100.0	86.9	82.7	82.7
2020	95.0	95.0	99.9	86.0	94.0	82.0
2021	76.0	NA	75.1	NA	56.9	NA
2022	96.2	96.2	88.0	93.3	84.7	89.8
2023	97.0	99.2	99.2	97.0	96.1	96.1
Mean	92.9	92.3	94.7	92.7	87.0	88.2
SD	6.1	1.8	7.9	5.1	11.8	5.3

^a Survival estimates occasionally exceed 100% due to inventory tracking methodologies used at LFH.

Fish Health Sampling

Fish health sampling at LFH on SRFCH occurs occasionally or as needed. In the last few years, and for BY22 yearlings or BY23 subyearlings, no disease issues occurred. Currently, pre-transfer fish health sampling is required for all FCAP program fish since we are transferring them to another agency and across state boundaries. For the on-station releases at LFH, no pre-liberation fish health sampling occurs. However, WDFW plans on re-initiating pre-liberation fish health sampling for all transfer/release groups (and all species at LFH) in the near future.

Juvenile Releases

Yearling fall Chinook salmon were released at LFH from 25 March through 27 March 2024 (Table 12). At the time of release, a sample of fish were measured and weighed (n=215). Per NOAA Permitting, staff also look for and record any signs of sexual precocity; none were observed. Staff also looked for, but didn't visually observe any signs of BKD, pop-eye, or descaling in this group. An estimated total of 469,042 were released, with approximately 461,441 that were ADCWT, 4,181 were adipose only, an additional 3,420 were CWT only due to tagging error, and 0 were released as unmarked/untagged. Size at release was estimated at 10.5 fish/lb (fpp). 10,000 fish were given PIT tags to track movement throughout the basin and estimate SAR. Historical yearling and subyearling releases from 2010 to 2024 by WDFW, IPC and

NPT are available upon request to WDFW. All WDFW fall Chinook releases from 2024 are provided in Appendix F.

Subyearling fall Chinook salmon at LFH were released 21 May 2024. On the first day of release, a subsample of fish (n=412) were measured and weighed (Table 12). Per NOAA Permitting, staff also look for and record any signs of sexual precocity; none were observed. Staff also looked for, but didn't visually observe any signs of BKD, pop-eye, or descaling in this group. An estimated total of 566,294 were released, with 196,903 as an ADCWT group, 384 CWT only, 5,059 adipose fin clip only, and 363,948 were released as unmarked untagged. Staff tagged 15,000 fish with PIT tags before release. Size at release was estimated at 50.2 fpp.

Subyearling fall Chinook salmon reared at Irrigon FH were released into the GRR on 15 April 2024. An estimated 214,395 were released, with 207,649 as an ADCWT, 5,481 adipose fin clip only, 1,054 were CWT only, and 211 were unmarked/untagged. Staff also tagged 4,500 fish with PIT tags before release. A day prior to release, a subsample of fish (n=204) were measured and weighed (Table 12). Per NOAA Permitting, staff also look for and record any signs of sexual precocity; none were observed. Staff also looked for, but didn't visually observe any signs of BKD, pop-eye, or descaling in this group. ODFW staff provided pound counts and the release size was calculated at 46.5 fpp.

Table 12. Length and weight data from fall Chinook salmon released at LFH or in the GRR in 2024.

Length/weight data	Yearling Snake R at LFH	Subyearling Snake R at LFH	Subyearling GRR at Cougar Creek
Sample date(s)	25 March	29 April	24 April
CWT code	638078	638509	638511
Number sampled	215	412	204
Avg. length (mm)	160.2	89	94
Median length	160	91	95
Range of lengths	115-195	54-110	74-107
SD of lengths	10.6	10.3	6.2
CV of length (%)	6.6	11.6	6.6
Avg. weight (g)	42.9	8.8	9.7
SD of weight	8.6	2.5	2.0
Avg. K factor	1.03	1.21	1.16
FPP ^a	10.6	51.6	46.5
Precocious (%)	0.0%	0.0%	0.0%

^a The fish/lb sample shown here differs from what is reported by hatchery staff as a final number. Throughout each release, multiple pound count samples are taken by hatchery staff and are likely more accurate than the single sample taken by evaluation staff.

PIT Tagging, Migration Timing, Travel Speed and Survival

Staff have routinely PIT tagged a subset of the LFH and GRR releases for the purpose of juvenile survival estimates, monitoring outmigration timing, estimating adult returns in-season, and estimating conversion rates between IHR and LGR for the purpose of back-calculating the run reconstruction estimates to the project area (see section below on returns to the project area). PIT tag lists for each release group are submitted to PTAGIS and all fish were assigned to monitor mode to allow them to be treated like non-PIT tagged fish when intercepted at the mainstem dams, thereby representing the entire release group during out-migration.

Staff PIT tagged 10,000 BY22 yearlings on 25 March 2024 and 15,000 BY23 subyearlings on 20 May 2024. Tagged fish were held for one day in the release structure raceway following tagging, and then released directly to the Snake River with the non-tagged fish. Before fish were released, mortalities were collected and scanned for PIT tags. The holding raceway was then immediately scanned for shed tags after the PIT tagged fish were released to the river. Any tags from mortalities or shed tags recovered were re-inserted into new fish and released the same day. SRL and IPC staff PIT tagged 4,500 BY22 subyearlings on 25 April 2024 at Irrigon Fish Hatchery for release into the Grand Ronde, along with 4,500 PIT tags for the IPC release in the Salmon River. Tagged fish were held until release with non-tagged fish. Fish were released into the Grand Ronde on April 15th, and IPC fish were released into the Salmon River on April 14th.

The PTAGIS website (www.ptagis.org) was queried in April 2025 for the two LFH on-station releases and GRR release in 2024. Interrogation summaries were used to populate Tables 13-15.

Table 13. Migration timing of PIT tagged yearling fall Chinook released at LFH in 2024. Dam abbreviations are as follows: LMO – Lower Monumental, IHR – Ice Harbor, MCN – McNary, JDD – John Day, and BONN – Bonneville.

Yearlings released at LFH	LMO	IHR	MCN	JDD	BONN ^a
Number Detected	997	1015	856	273	223
Median Travel Days from LFH ^b	5	6	14	22	22
Median Passage Date	4/1	4/2	4/10	4/18	4/18
First Detection Date	3/28	3/30	4/3	4/6	4/8
Last Detection Date	4/23	4/21	5/22	5/27	5/27
10% of Run Passage Date	3/30	3/31	4/5	4/10	4/15
90% of Run Passage Date	4/5	4/5	4/15	4/28	4/26
TDG on Median Date (%) ^c	113.0	112.1	117.7	115.6	120.3
Average Discharge on Median Date of Passage (kcfs) ^c	52.6	43.8	139.4	192.0	190.2
Spill on Median Date (kcfs) ^c	7.9	8.4	65.1	110.6	140.3

^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 14. Migration timing of PIT tagged subyearling fall Chinook released at LFH in 2024. Dam abbreviations are as follows: LMO – Lower Monumental, IHR – Ice Harbor, MCN – McNary, JDD – John Day, and BONN – Bonneville.

Subyearlings released at LFH	LMO	IHR	MCN	JDD	BONN ^a
Number Detected	151	274	156	490	460
Median Travel Days from LFH ^b	4	8	11	15	18
Median Passage Date	5/25	5/29	6/1	6/5	6/8
First Detection Date	5/21	5/23	5/25	5/30	5/30
Last Detection Date	6/4	6/25	6/17	7/29	6/27
10% of Run Passage Date	5/22	5/25	5/28	6/2	6/4
90% of Run Passage Date	6/1	6/3	6/6	6/11	6/12
TDG on Median Date of Passage (%) ^c	118.3	116.3	120.5	116.3	121.5
Avg Discharge on Median Date of Passage (kcfs) ^c	70.0	71.5	195.6	249.3	242.8
Spill on Median Date of Passage (kcfs) ^c	57.1	57.9	89.3	178.6	148.4

^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 15. Migration timing of PIT tagged subyearling fall Chinook released at GRR in 2024. Dam abbreviations are as follows: LGR- Lower Granite, LGO- Little Goose, LMO – Lower Monumental, IHR – Ice Harbor, MCN – McNary, JDD – John Day, and BONN – Bonneville.

Subyearlings released at GRR	LGR	LGO	LMO	IHR	MCN	JDD	BONN ^a
Number Detected	737	173	18	32	27	85	112
Median Travel Days from GRR ^b	18	19	21	22	25	29	29
Median Passage Date	6/2	6/5	6/5	6/6	6/9	6/13	6/13
First Detection Date	5/19	5/24	5/29	6/2	6/1	6/3	5/31
Last Detection Date	7/12	6/25	6/30	7/6	6/22	7/2	7/6
10% of Run Passage Date	5/25	5/30	5/30	6/2	6/4	6/8	6/9
90% of Run Passage Date	6/16	6/6	6/15	6/23	6/18	6/23	6/20
TDG on Median Date of Passage (%) ^c	122.5	121.4	120.2	119.9	121.3	117.6	119.9
Avg Discharge on Median Date of Passage (kcfs) ^c	80.0	106.5	105.7	105.6	213.2	243.6	249.7
Spill on Median Date of Passage (kcfs) ^c	67.6	66.0	70.0	91.4	98.4	165.0	149.6

^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.

The on-station (both yearling and subyearling) and GRR subyearling releases have been PIT tagged for several years. In the following section we provide estimated survival and migration speed to the first dam of encounter (LGR or Lower Monumental), and the first and last dam of

encounter on the Columbia River (McNary and Bonneville), respectively (Figures 11-16). For most years provided below, downstream survival estimates for all groups were derived using DART (<http://www.cbr.washington.edu/dart>), but PITPRO is used on certain instances. PITPRO incorporates mortalities and recaptures into the estimated calculation, and occasionally will provide a valid survival estimate where DART doesn't. Comparison of survival estimates from these two programs when both are available are generally within a percent or two.

Survival to LGR from the GRR releases average about 75% but have varied widely over time from 45% to 100% (Figure 11). Migration speed to LGR has also decreased in the last few years and may explain the slightly lower survival to LGR (Figure 12).

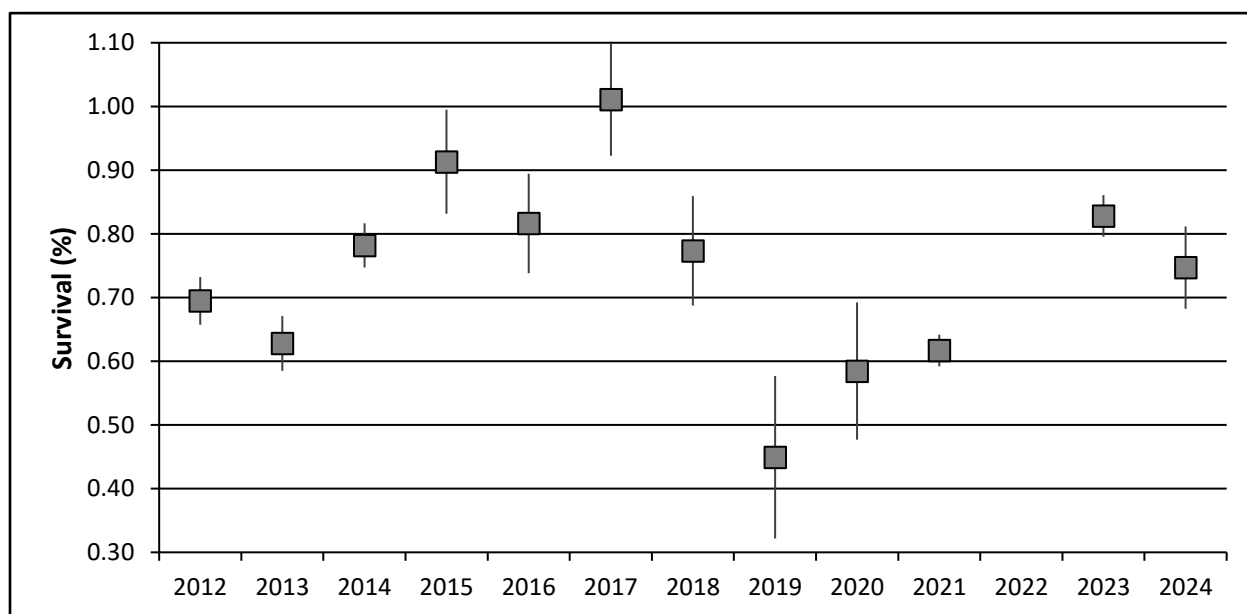


Figure 11. Survival and standard error of SRFCH subyearlings released into the Grande Ronde River near Cougar Creek to LGR, 2012-2024 migration years. Note: Due to egg loss for BY21, there is no release group for 2022.

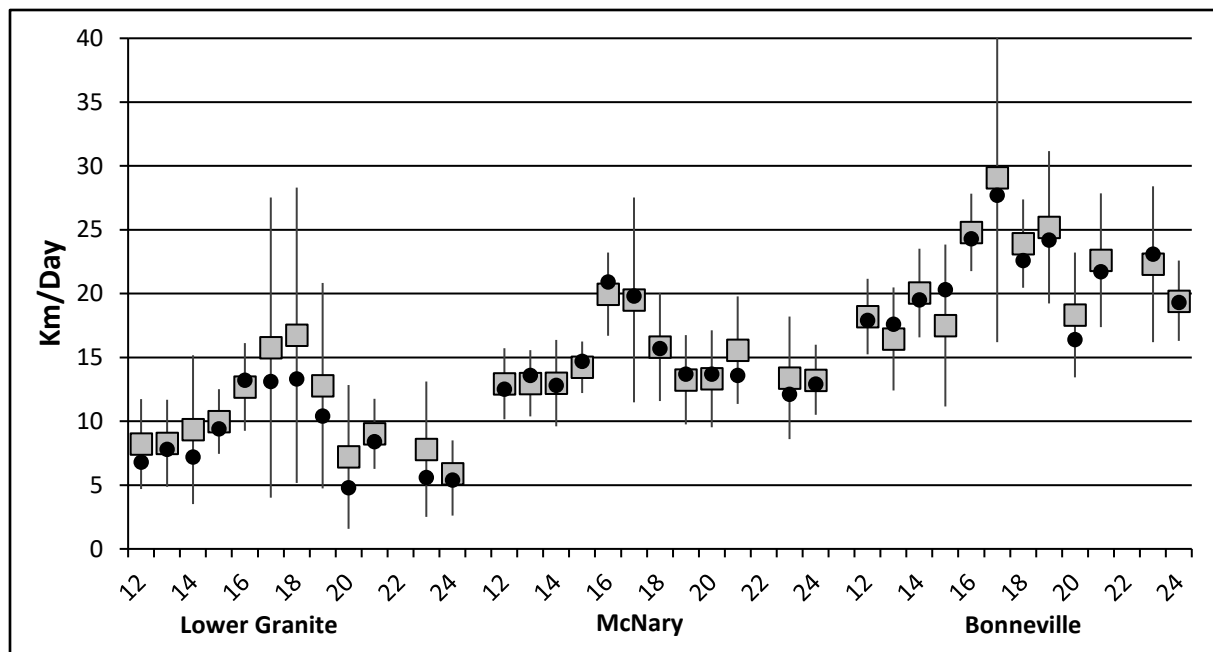


Figure 12. Average travel speed (Km/day with S.D.) and median travel speed (black dot) of SRFCH subyearlings released into the Grande Ronde River near Cougar Creek to LGR, McNary, and Bonneville Dams, 2012-2024 migration years. Note: Due to egg loss in BY21 there is no release group for release year 2022.

Survival of the on-station subyearling release to Lower Monumental Dam has declined in recent years, and due to low PIT tag detections, survival to Lower Monumental Dam could not be estimated for the 2024 migration year. (Figure 13). Migration speed has also decreased in the last few years and may explain the slightly lower survival to Lower Monumental Dam (Figure 14).

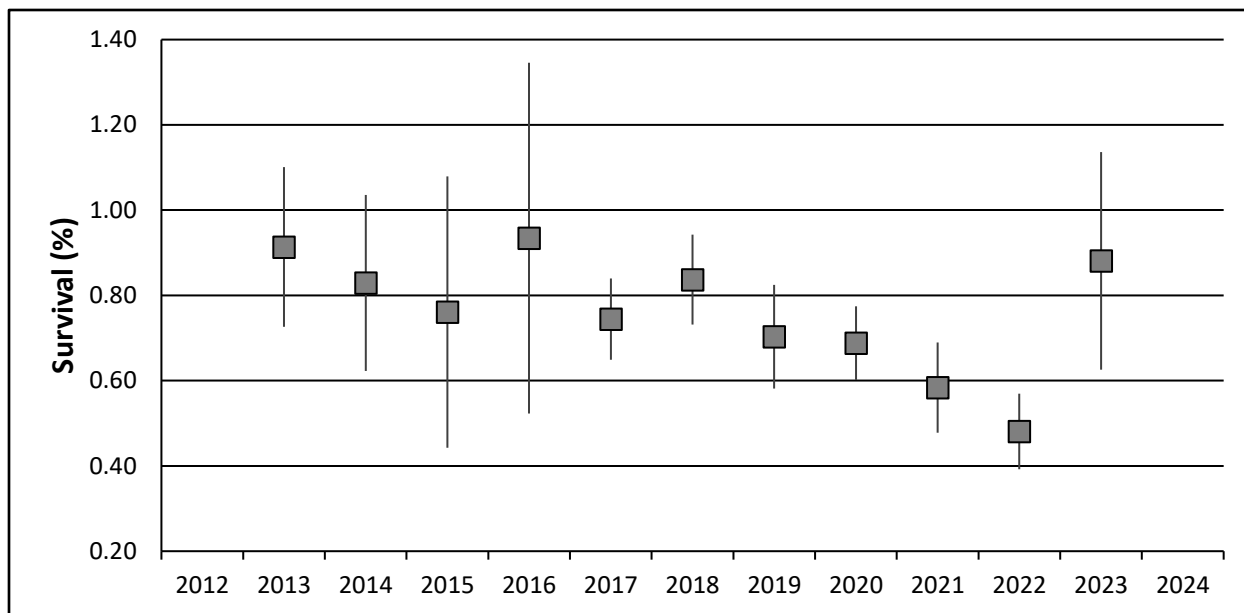


Figure 13. Survival and standard error of SRFCH subyearlings released into the Snake River at LFH to Lower Monumental Dam, 2013-2024 migration years. Note: An estimate for 2012 and 2024 could not be generated. 2021 and 2023 estimates from DART were not valid. PITPRO represents those estimates.

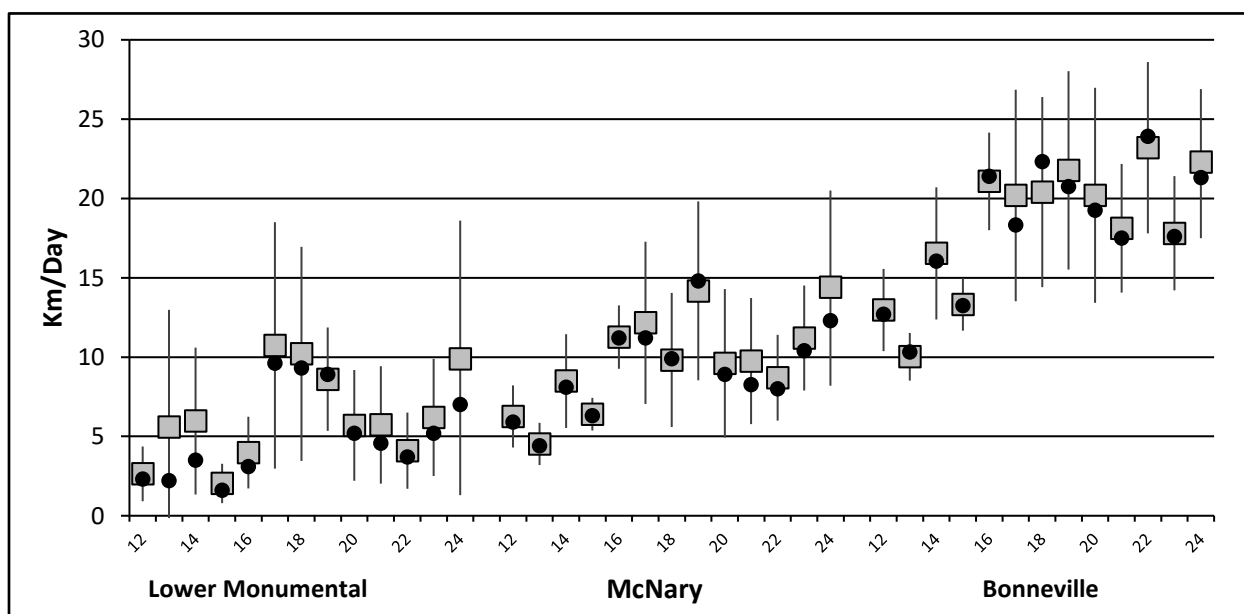


Figure 14. Average travel speed (km/day with S.E.) and median travel speed (black dot) of SRFCH subyearlings released into the Snake River at LFH to Lower Monumental, McNary, and Bonneville Dams, 2012-2024 migration years.

Survival of the on-station yearling release to Lower Monumental Dam was generally around 90% except from 2019-2022 (Figure 15). Yearling migration speed had generally remained constant over the years except the last four migration years (Figure 16). Yearlings are released

about 1.5 months earlier in the spring compared to the subyearling releases and flows and spill are usually lower than later spring months. Survival for 2024 was average compared to historical releases (Figure 15). Previously, yearling releases were in the second week of April, however from 2019-2022 releases were mid-March, in 2023 and 2024 the yearling release moved back to the beginning of April. Travel speed was similar to 2021. Bonneville (Figure 16).

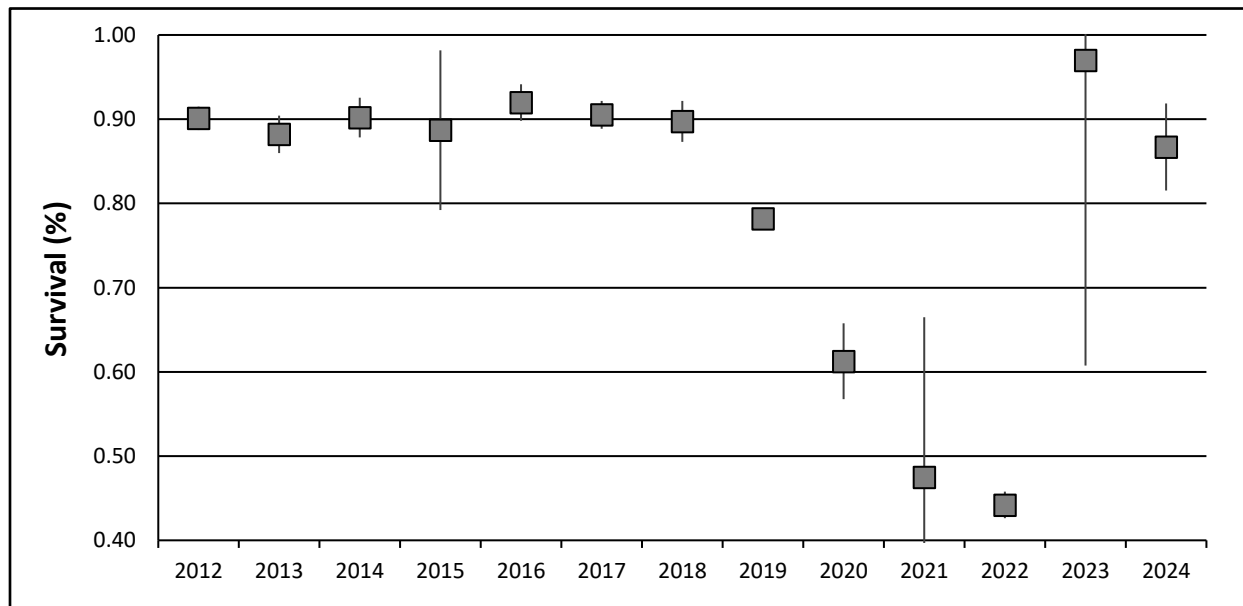


Figure 15. Survival and standard error of SRFCH yearlings released into the Snake River at LFH to Lower Monumental Dam, 2012-2024.

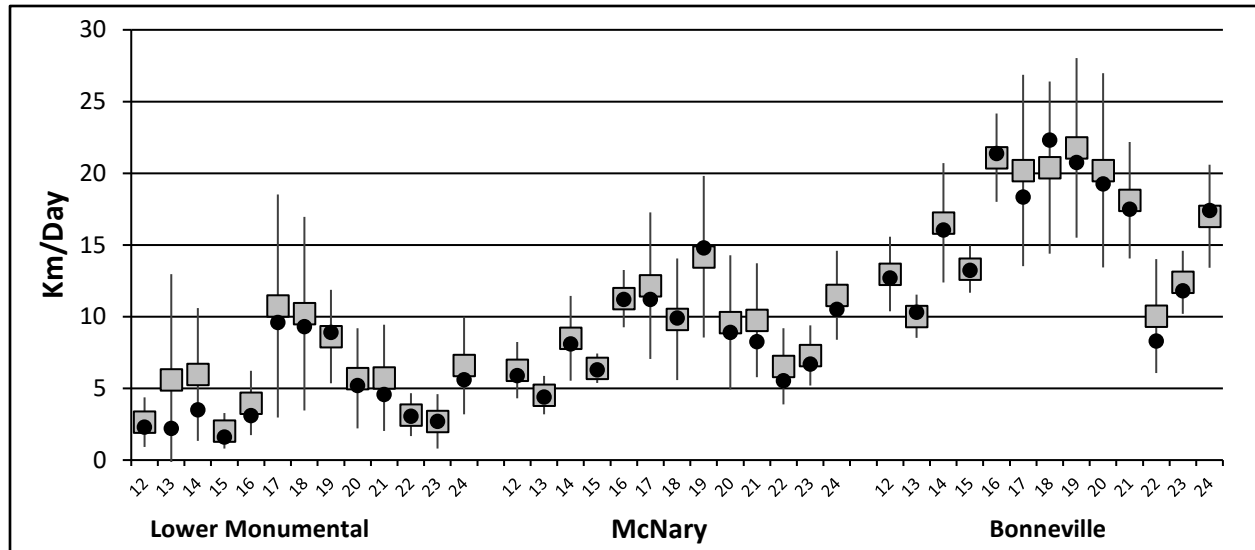


Figure 16. Average travel speed (km/day with S.E.) and median travel speed (black dot) of SRFCH yearlings released into the Snake River at LFH to Lower Monumental, McNary, and Bonneville Dams, 2012-2024 migration years.

The yearling release date was moved forward as a direct result of changes that were made to the SRFCH program during the re-negotiation of the 2018-2027 *US v Oregon* agreement. With an increase to the subyearling on-station release (200K to 700K), staff could utilize one of the large rearing lakes for the final 1.5-2 months of subyearling rearing, and it was hypothesized that this would benefit their post-release survival. To take advantage of this, the release time of yearlings was advanced by about two weeks. While reported survival to Lower Monumental Dam has dropped off considerably in the last four years, it's unclear if these estimates are completely valid. Since yearling fall Chinook are released generally 2-3 weeks prior to when the extended bypass screens are set in place at the dams, survival estimates are likely being biased low because many fish are passing the dams without being detected in the bypass facilities. Given that possibility, survival estimates to other downstream locations were also generated using DART to see if releasing this group of fish earlier has potentially had a negative effect on overall survival. Based on estimates to locations downstream, it does appear that previous years releases may be somewhat lower, but not to the extent as indicated by the survivals to Lower Monumental Dam (Figure 17). As of 2022, WDFW decided to move the yearling release back to approximately March 31, closer to when historical releases occurred.

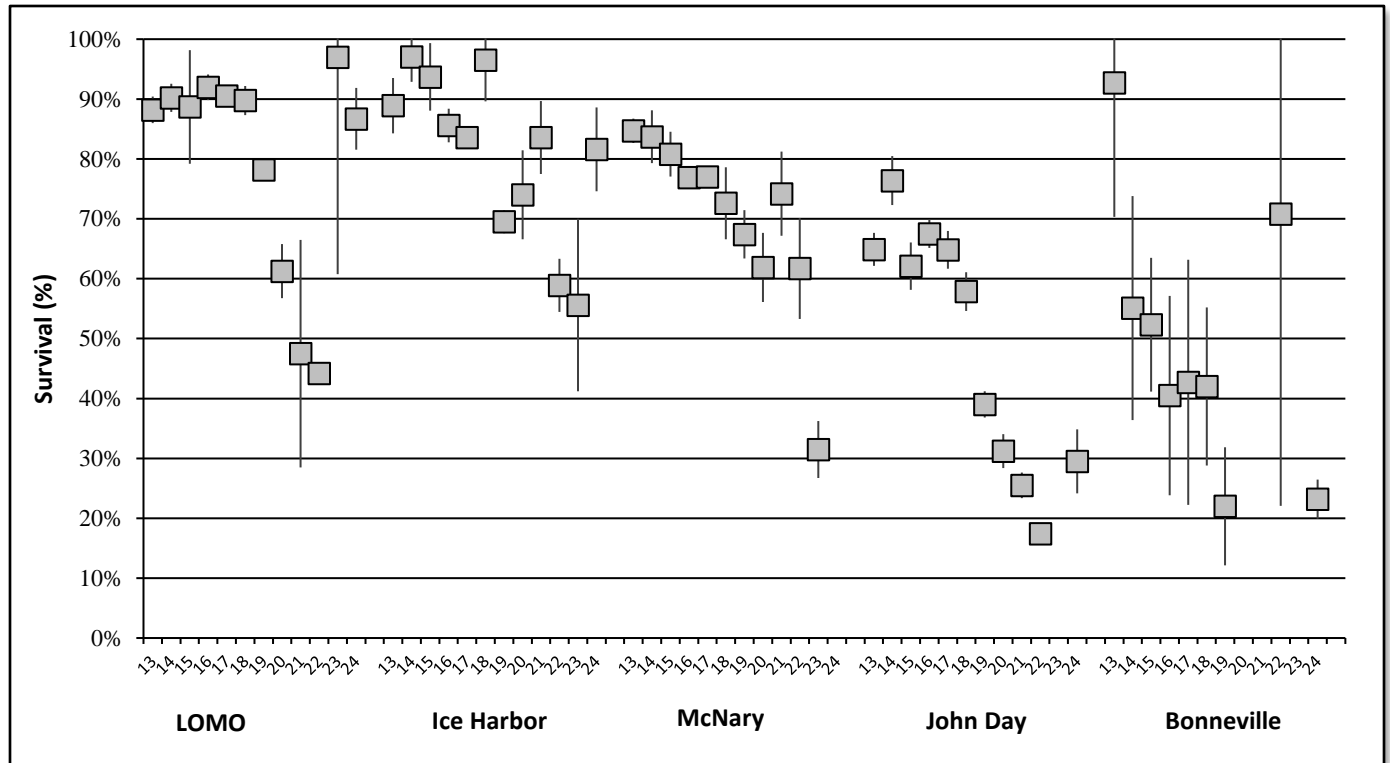


Figure 17. Survival and standard error of SRFCH yearlings released into the Snake River at LFH to Lower Monumental Dam (LOMO), Ice Harbor, McNary, John Day, and Bonneville Dams, 2012-2024 migration years.

Tucannon River Natural Production 2023

Spawning Ground Surveys

WDFW personnel have conducted spawning ground surveys for fall Chinook salmon on the lower Tucannon River since 1985 (Appendix H). Survey sections in 2023 covered the river from river kilometer (rkm) 1.1-22.4. The first 1.1 rkms of the Tucannon River are deep slack water from Lower Monumental Dam reservoir and no surveys or estimates are made for that area. Because of the slow, deep river flow in that area, spawning is considered minimal. During 2023, landowner access restrictions prevented the surveying of 1.6 rkms near the Starbuck Bridge within survey sections 5 and 6 (Appendix H). Regular weekly surveys began the week of 15 October and continued until the week of 26 November. Staff was unable to complete a survey the last two weeks because of a high flow event.

A total of 696 redds (combination of fall Chinook and coho) were counted in the surveyed areas of the Tucannon River (Table 16). Through our redd expansion of 3 fish/redd and based on the number of redds in adjacent survey sections it was estimated an additional 60 redds occurred in sections not surveyed. An adjustment factor was also applied to surveyed redds to account for the shortened survey period. An estimated total of 816 total redds (755 fall Chinook salmon and 61 coho salmon redds) were constructed in the Tucannon River during 2023.

Table 16. Date and number of salmon redds and carcasses counted on the Tucannon River in 2023.

Week beginning	Total redds ^a Chinook & Coho ^b	Carcasses sampled	
		Chinook	Coho
Prespawn survey 15 Oct	33	1	0
22 Oct	143	4	2
29 Oct	109	10	1
5 Nov	173	65	6
12 Nov	109	173	7
19 Nov	114	142	9
26 Nov	15	176	9
Totals	696	571	34

^a Observed redds not expanded for sections with access restrictions or the applied adjustment factor.

^b Chinook & coho salmon redd data estimated through visual counts were combined.

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

Previously, the estimated number of fall Chinook redds to the Tucannon River was based on the composition of redds (Chinook or coho) estimated by; 1) surveyor assignment of what species made a particular redd, or 2) from the proportions of carcasses recovered for the season. However, a standard method wasn't adopted. In 2020, evaluation staff began comparing three different methods to determine the most consistent way to provide an estimate of fall Chinook and coho for the future. These three methods are: 1) based on the proportion of fall Chinook and coho at the Lower Monumental Dam window counts and applied to the total number of redds, 2) based on individual redd determination from surveyors, and 3) based on the proportion of Chinook and coho carcass recovered. Fall Chinook and coho overlap in spawn timing and determining if a redd is a fall Chinook or coho can be difficult as most coho and 2-salt subyearling fall Chinook return at a similar size with similarly sized redds. Further, high flow events also cause issues with redd identification, especially when gravel scouring occurs or when water clarity is affected. These conditions make it difficult to identify new versus old redds or clearly see redds for identification purposes. The percent carcass recovery method can be biased by high water events, lack of carcasses due to predation or observers missing them, and misidentification. After our comparison, we believe utilizing the observed individual redd count as the most accurate and consistent representation for this year. The annual difference between the three estimation methods are minimal (Figure 18). Table 17 has been updated

from previous reports to show the updated redds, escapement (3 fish/redd), and juvenile productivity in the Tucannon River based on the Lower Monumental Dam counts.

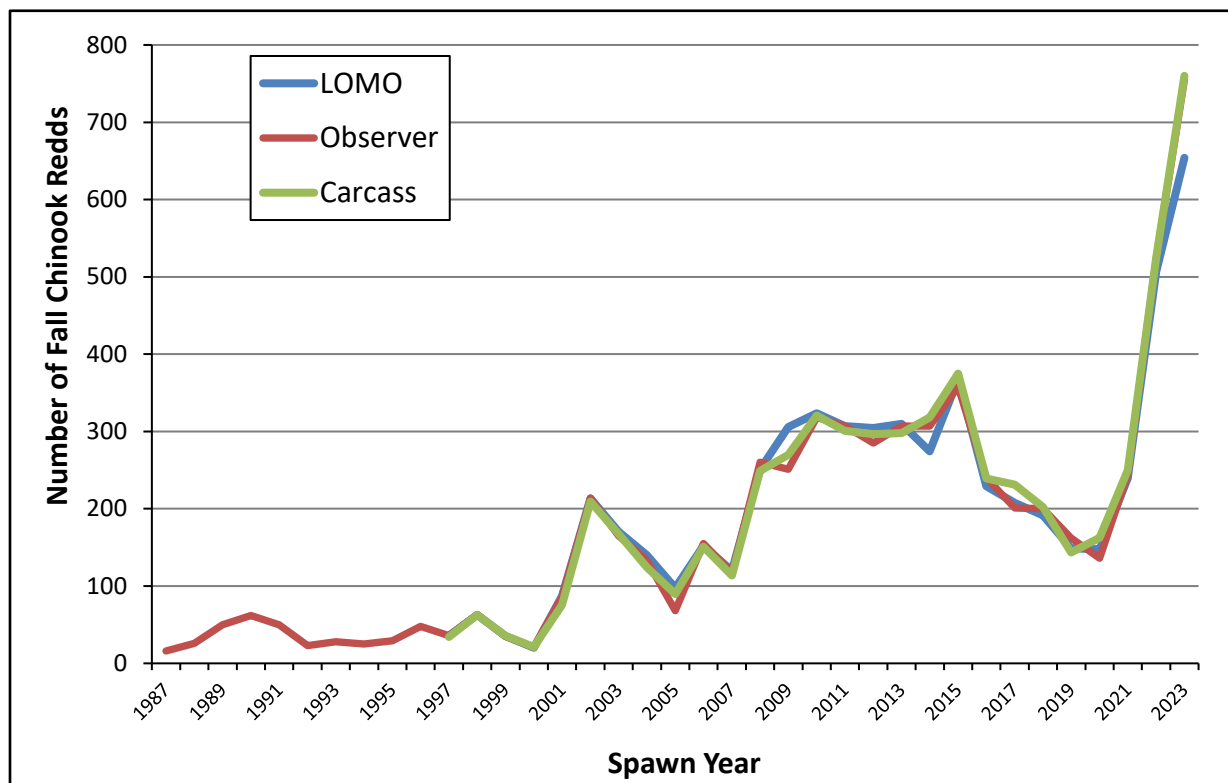


Figure 18. Estimated fall Chinook salmon redds in the Tucannon River based on three estimation techniques. The LOMO method uses the proportion of fall Chinook to coho at Lower Monumental Dam, the Observer methods uses “redd origin” as determined by surveyors, and the Carcass method relies on the proportion of fall Chinook to coho carcasses recovered from surveys.

Based on historical methods, total escapement to the Tucannon River is based on an expansion factor of three fish/redd. Based on the surveyor observed redd proportion method we estimated 2265 fall Chinook salmon spawned in the Tucannon River in 2023, the highest return to date (Table 17). Staff recovered 571 fall Chinook salmon carcasses (~25.2%) of the estimated total spawning escapement. A total of 183 coho salmon were estimated to have spawned, of which 34 carcasses (~18.6%) were recovered. The run of fall Chinook salmon into the Tucannon is typically correlated with the overall fall Chinook run into the Snake River Basin, except for 2022 (Figure 19).

Table 17. Estimated escapement, redd construction, and resulting estimates of smolts/redd and total number of emigrants from fall Chinook salmon spawning in the Tucannon River, 2001-2023, based on Lower Monumental Dam proportion method of redd origin. ^a

Brood year	Estimated escapement ^b	# Redds observed	# Redds in no access areas and other adj (est.)	Total # of redds (est.)	Estimated smolts/redd ^c	Total # estimated emigrants ^d
2001	261	65	12	87	271	23,577
2002	640	185	29	213	92	19,582
2003	511	143	22	170	421	71,693
2004	421	126	8	140	500	70,070
2005	293	61	7	98	215	20,995
2006	457	128	27	152	293	44,563
2007	359	103	15	120	Unknown ^f	Unknown ^f
2008	753	223	46	251	19	4,834
2009	917	200	29	306	121	36,956
2010	971	290	29	324	76	24,659
2011	921	280	27	307	66	20,199
2012	914	256	28	305	394	120,033
2013	930	287	20	310	31	9,458
2014	822	270	37	274	569	156,073
2015	1,103	324	34	368	127	46,702
2016	688	218	22	229	35	7,945
2017	623	177	254	208	102	21,094
2018	574	172	28	191	230	43,972
2019	447	140	21	149	11	1,666
2020	443	119	17	148	567	77,046
2021	719	231	13	240	175	42,657
2022	1,521	426	98	507	97	50,716
2023	2,265	640	60	755 ^g	271	204,605

^a Numbers presented in this table are different from prior reports and represent the most accurate estimates of escapement and production in the Tucannon to date.

^b Estimates were derived using three fish per redd; no adjustments were made for super imposition of redds.

^c Estimate was derived using total redds estimated above the smolt trap and the estimated emigration the following spring as measured at the smolt trap.

^d Estimate was derived using the smolt/redd estimate and applying it to the total number of redds in the Tucannon River.

^f No estimate was made because the smolt trap sampling box had a hole in it and fish escaped.

^g Estimate includes adjustment for lost survey days

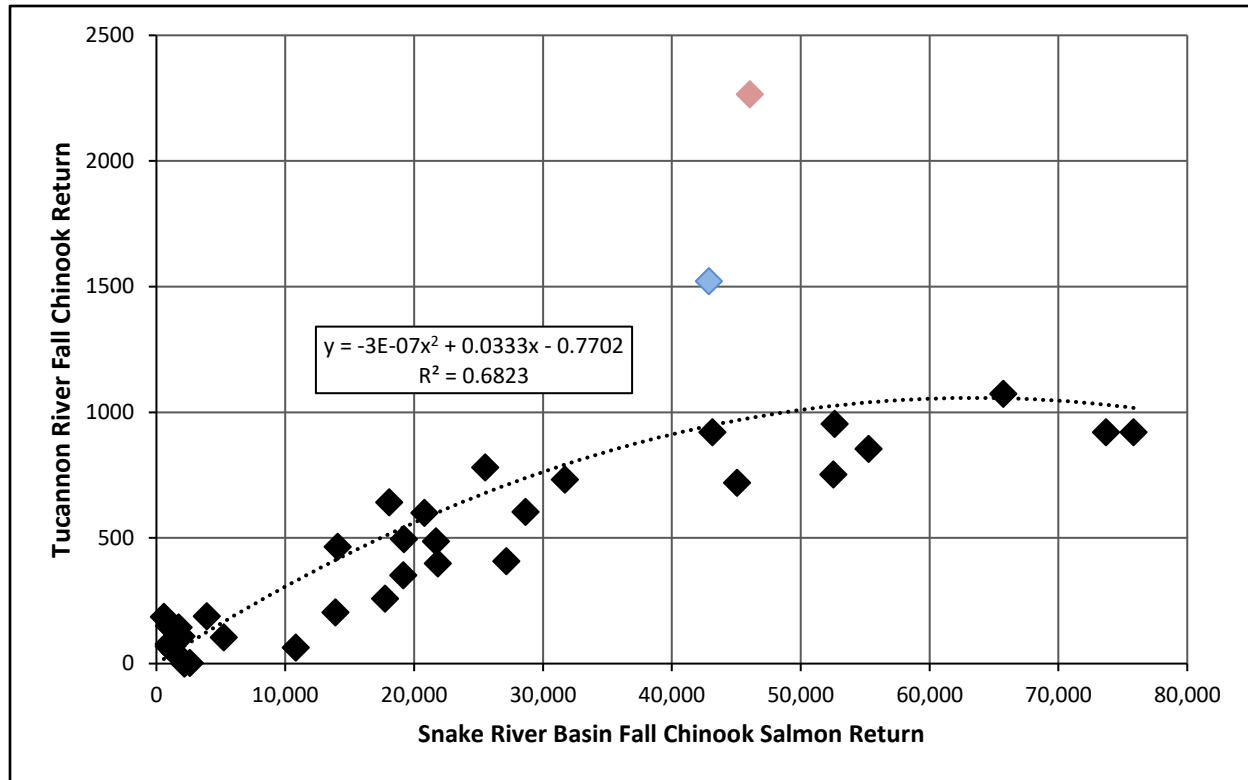


Figure 19. Relationship of the overall SRFCH return calculated through run reconstruction compared to estimated returns to the Tucannon River. Blue outlier represents 2022, red outlier represents 2023.

Generally, more recoveries of females occur than males, primarily because females remain in the vicinity of their redds when they die. In 2023 females represented 54.9% of the recoveries in the Tucannon River: primarily 2-salt and 3-salt fish. Males represented 41.9% of the recoveries; primarily 2-salt and 3-salt fish. Unknown sex represented 3.2% of the recoveries. Staff were unable to determine the species of 5 carcasses. Composition of the run consisted of 30.1% Snake River hatchery by coded wire tag, 8.6% out-of-basin by wire, 24.5% unknown hatchery origin by AD clip, yearling scales or lost coded wire tag, and 34.0% unknown origin (unmarked/untagged fish that could be hatchery or natural origin), another 2.8% are of unknown clip with no coded wire tag.

Juvenile Salmon Emigration

2024 Outmigration Year

Juvenile fall Chinook salmon (BY23) were captured at the Tucannon River smolt trap (rkm 3.0) from 15 February 2024 through 28 June 2024 (Figure 20). The last day of trapping was 30 June. Most fish captured in the trap from the end of January into the middle of May were newly emerged fry. Being so small, these fish are not used for trap efficiency tests, so the estimated

number passing the trap provided below is a minimum. No fall Chinook were PIT tagged at the trap during the 2024 outmigration year. From the middle of May to mid-July, the mean size of fall Chinook migrants was 58.2 mm and 5.7 g (K-factor 1.22). Trapping efficiency for fall Chinook salmon ranged from 14.83% to 46.29%. Staff captured 101,483 total fall Chinook during the 2024 trapping period, 39,619 were large enough to be included in trapping efficiency trials. Juvenile production of fall Chinook from the Tucannon River can be highly influenced by high stream flow events in the winter/early spring (Figure 21). Juvenile production can also be influenced by redd superimposition during large run years (mostly observed in lower river below the town of Starbuck, WA) and sediment input from Pataha Creek in some years.

From the middle of May 2024 to the end of July 2024, we estimated that 178,805 (95% C.I. = 169,655-188,617) parr/smolts passed the trap. This estimate does not include fish that we captured but were too small to run efficiency trials for, so this estimate is a minimum. Based on 661 fall Chinook salmon redds estimated above the smolt trap during 2023 spawning ground surveys, an estimated 271 smolts/redd were produced. After including potential production from redds below the smolt trap in 2023 (94 additional redds), we estimated that a minimum of 204,605 naturally produced fall Chinook salmon parr/smolts left the Tucannon River during 2024.

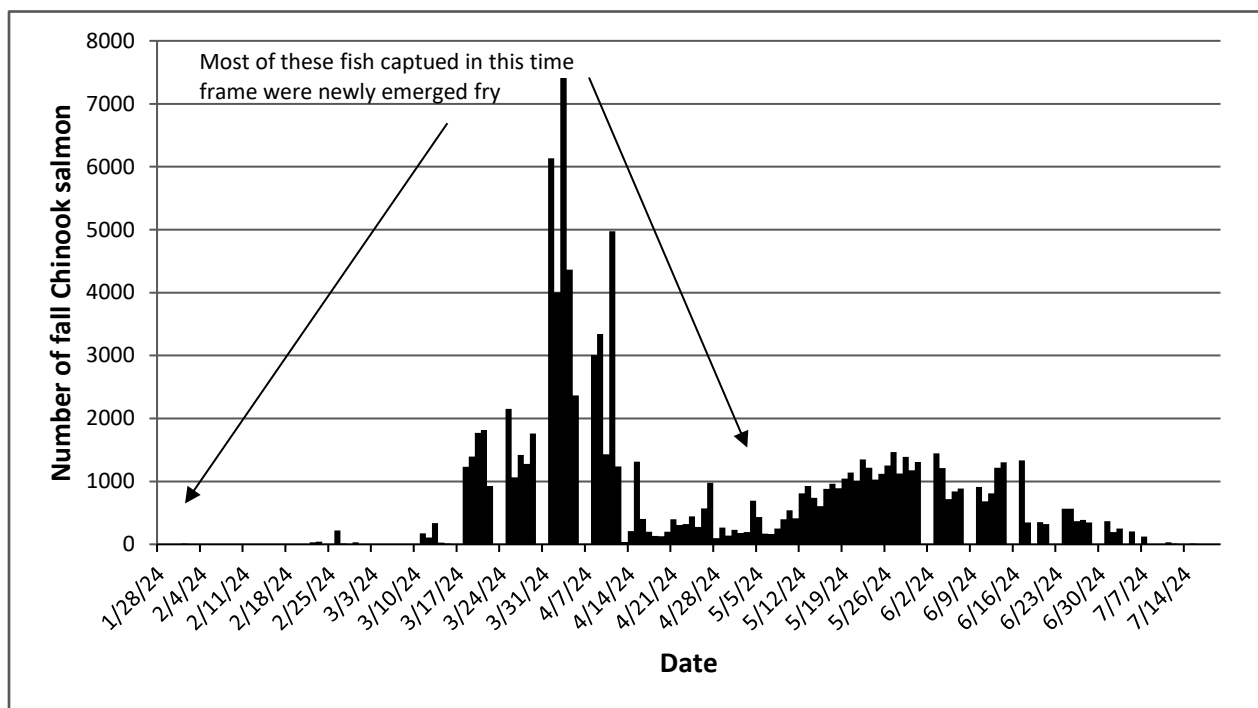


Figure 20. Migration timing of NOR juvenile fall Chinook salmon captured at the Tucannon River smolt trap in 2024.

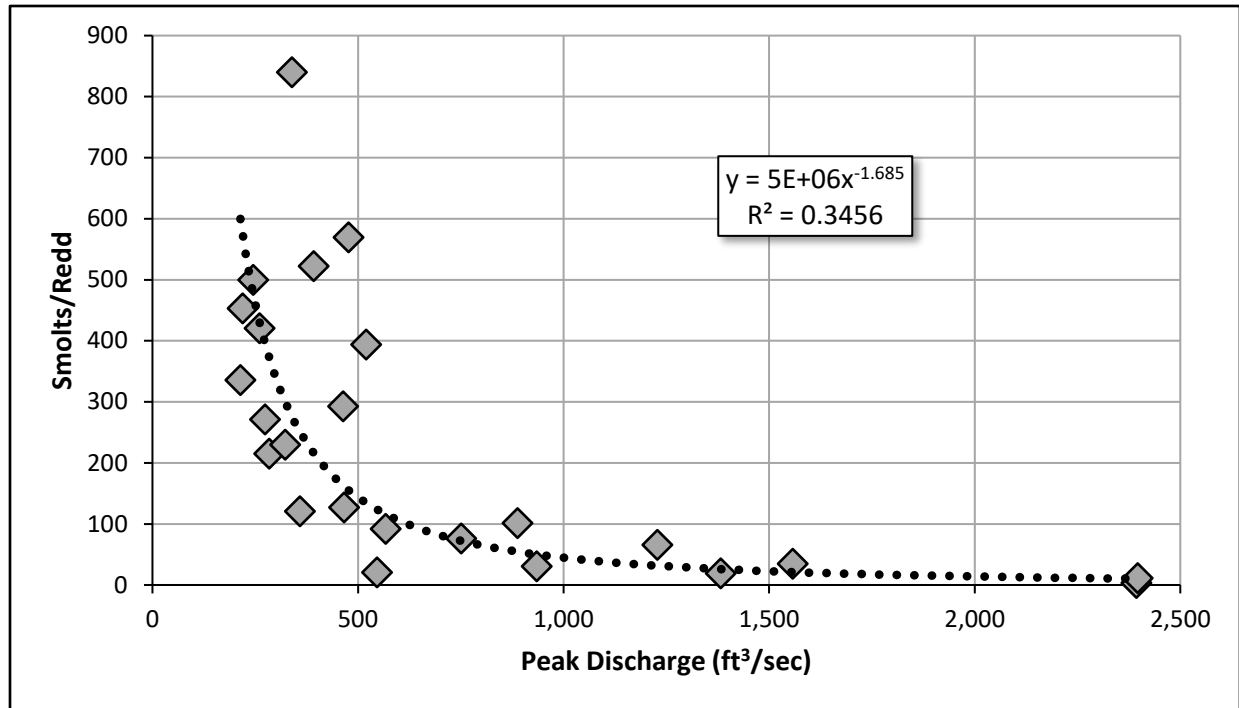


Figure 21. Peak discharge during fall Chinook incubation in the Tucannon River versus the estimated natural log of smolt/redd determined at the Tucannon River smolt trap.

Project Area Returns and Total Returns

As defined in the introduction, project area returns are calculated from the number of SRFCH salmon passing IHR. Strays from other Columbia River basin releases (Umatilla, Priest Rapids, Ringold, Klickitat, etc.) are known to cross IHR (Mendel et al 1993), and therefore inflate the number of fall Chinook counted into the Snake River, especially from IHR and Lower Monumental dams. The number of strays that reach LGR are considerably lower (generally <1%). Furthermore, the adult trap and sampling that occurs at LGR provides the best location to make an estimate of true SRFCH salmon. The systematic random sample of the fall Chinook run at LGR has been occurring since 2002 and provides the best dataset to estimate project area returns, as long as an estimate can be derived for fall Chinook that never make it back to LGR.

In the past, additional recoveries of fall Chinook from the Tucannon River and LFH adult trapping could be added to the estimate at LGR to estimate total project area returns. However, these estimates likely fell short of the true number due to fish spawning in locations that aren't regularly surveyed (in the tailraces below the dams, Palouse River), or from fishery removals. Another method that can be used to back-calculate the LGR run reconstruction

estimate is using PIT tags and their conversion rate from IHR to LGR. Hatchery origin fall Chinook salmon released above LGR have very high conversion rates (generally >97%), while the releases from LFH are more variable (yearlings ~50%, subyearling ~80%). By applying year specific PIT tag conversion rates to the LGR run reconstruction estimate – most importantly to the LFH on-station releases that return to LGR, project area returns to IHR can be estimated.

Assumptions

To estimate return (to the project area, or total) of WDFW releases, certain assumptions were applied:

- Saltwater age of returning groups were estimated by subtracting one from the total age of subyearlings and subtracting two from the total age of yearlings. These estimates potentially underestimate jacks and overestimate adults because it does not consider the potential reservoir rearing of the subyearling component. However, for LFH on-station and GRR releases of subyearlings, the component that holds over for another year in the reservoir appears to be relatively small, minimizing the overall effect.
- Only AD+CWT marked/tagged fish were used to estimate returns. For many years, CWT only releases occurred in the on-station release of yearlings. Electronic sampling in areas outside the Snake River has been inconsistent or completely lacking (ocean fisheries). As such, determining returns from CWT only tagged fish was problematic and time consuming (Milks et al, 2016). Since this is a different method than what was done previously, prior estimates of project area returns and total returns that were reported in previous fall Chinook annual reports were updated for inclusion within this report.
- The Regional Mark Processing Center (RMPC) website, www.rmhc.org, was queried December 2024 for any 2023 returns of CWT tagged fish associated with WDFW releases. Generally, most submissions to the RMPC database for the 2023 run year should have been finalized and submitted by this date.

In Tables 19-24 below, CWT recoveries were summed in a variety of ways to provide a more in-depth look at specific recoveries locations or recovery types. Totals from the tables may not add up to the same numbers provided in Table 18 or Table 19 due to rounding of estimates.

Returns to the Project Area

An estimated 12,329 fall Chinook salmon (adults+jacks) returned from WDFW releases into the project area in 2023, contributing to 67.4% of the LSRCP project area mitigation goal of 18,300

(Table 18). The return in 2023 was the highest estimated since 2015. Low return years are most likely due to poorer ocean conditions that have been experienced in the last few years. These estimates **do not include** in-basin hatchery returns from the FCAP, IPC and the NPTH release programs, except for the 2019 release year where some of the FCAP fish were released at LFH.

Table 18. Project area returns of WDFW released SRFCH salmon, 2003-2023 return years. The LSRCP Project Area goal is 18,300.

Run Year	LFH on-station yearling	LFH on-station subyearling	Grande Ronde subyearling	Couse Creek subyearling	Total return	Percent of goal
2003	3,503	225			3,728	20.4%
2004	7,680	401		37	8,111	44.3%
2005	3,101	188		34	3,323	18.2%
2006	2,439	208	62	8	2,724	14.9%
2007	6,832	1,054	257	596	8,740	47.8%
2008	3,896	1,263	142	861	6,162	33.7%
2009	16,968	3,268	600	1,823	22,659	123.8%
2010	11,719	2,137	1,297	1,207	16,360	89.4%
2011	11,830	1,439	1,180	865	15,314	83.7%
2012	9,240	1,932	1,877	1,555	14,604	79.8%
2013	11,277	2,153	1,188	1,211	15,829	86.5%
2014	7,895	1,570	1,557	1,254	12,277	67.1%
2015	8,724	1,592	1,582	616	12,514	68.4%
2016	4,209	1,412	1,326	383	7,330	40.1%
2017	2,588	472	1,305	44	4,409	24.1%
2018	3,616	910	807	0	5,333	29.1%
2019	1,843	452	627		2,922	16.0%
2020 ^a	1,066	1,110	1,403		3,579	19.6%
2021 ^a	1,954	2,810	1,244		6,008	32.8%
2022	3,862	4,656	881		9,399	51.4%
2023	3,584	7,917	828		12,329	67.4%

^a These estimates include fish that were part of the FCAP program that were released at Lyons Ferry in 2019. Pittsburg landing was not operated that year, and some fish destined for Captain Johns or Big Canyon were also released on-site at LFH, all due to weather conditions.

Total Returns

An estimated 21,276 fall Chinook salmon (adults+jacks) returned from WDFW releases in 2023, contributing 23.3% of the combined project area goal and out-of-basin objectives (91,500 – Table 19). These estimates **do not include** in-basin hatchery returns from the FCAP, IPC and the NPTH programs, except for the 2019 release year where some of the FCAP fish were released at LFH.

Table 19. Total returns of WDFW released SRFCH salmon, 2003-2023 return years. The LSRCP total mitigation target would be 91,500 adults and is inclusive of the 18,300 LSRCP Project Area goal.

Run Year	LFH on-station yearling	LFH on-station subyearling	Grande Ronde subyearling	Couse Creek subyearling	Total return	Percent of Total Mitigation
2003	6,350	483			6,833	7.5%
2004	11,353	469		37	11,859	13.0%
2005	6,527	329		52	6,908	7.5%
2006	4,803	316	62	30	5,211	5.7%
2007	10,704	1,178	370	729	12,981	14.2%
2008	6,398	1,953	368	1,465	10,184	11.1%
2009	23,428	3,703	878	2,392	30,401	33.2%
2010	19,826	3,111	1,548	1,911	26,396	28.8%
2011	17,507	2,160	1,717	1,545	22,929	25.1%
2012	13,852	2,873	3,575	2,290	22,590	24.7%
2013	16,463	3,263	2,963	2,518	25,207	27.5%
2014	15,063	2,535	2,899	2,224	22,721	24.8%
2015	13,853	2,295	3,270	1,115	20,533	22.4%
2016	8,800	2,283	2,121	777	13,981	15.3%
2017	5,887	1,084	2,451	110	9,532	10.4%
2018	6,874	1,156	1,187	3	9,220	10.1%
2019	2,804	661	816		4,281	4.7%
2020 ^a	1,797	1,341	1,969		5,107	5.6%
2021 ^a	4,090	3,949	2,032		10,071	11.0%
2022	8,365	9,557	1,549		19,471	21.3%
2023	6,071	13,867	1,338		21,276	23.3%

^a These estimates include fish that were part of the FCAP program that were released at Lyons Ferry in 2019. Pittsburg landing was not operated that year, and some fish destined for Captain Johns or Big Canyon were also released on-site at LFH, all due to weather conditions.

Harvest in the Project Area

In 2023, fall Chinook fisheries were open on the Snake River, including the boundary waters between Washington/Idaho, and in the Clearwater River. Recoveries of WDFW releases (including the FCAP fish released at LFH in 2019) were reported in the Regional Mark Information System (RMIS) database from these areas in 2023. The estimated CWT recoveries were expanded by the tag rate for each WDFW release group and provided below (Table 20).

Table 20. Estimated (and fully expanded by tag rate) Snake River basin harvest recoveries in 2023 of wire tagged fall Chinook salmon released by WDFW as reported to RMIS on 12/18/2024.

Group	1-Salt	2-4 Salt	Total ESTD	% by Group
LFH Yearling	25	239	264	36.3%
LFH Subyearling	13	404	417	57.4%
GRR Subyearling	11	35	46	6.3%
Total (All Groups)	48	678	727	

Recoveries by Region

From the download options in the RMIS database, CWT recoveries can be grouped into large geographic regions. The majority (63.5%) of estimated CWT recoveries come from the Columbia River Basin (Table 21), followed next by recoveries off the coast of Washington (17.4%).

Table 21. Fully expanded recovery estimates of tagged and untagged fall Chinook salmon recovered in all areas during the 2023 run year for WDFW releases. Minijacks are not included in the estimates.

Region	LFH – 1+		LFH – 0+		GRR – 0+		1+ and 0+ Combined	
	EST total recoveries	% by region	EST total recoveries	% by region	EST total recoveries	% by region	EST total recoveries	Percent by region
Freshwater (Columbia Basin)	1,911	63.6%	4,019	64.0%	309	58.2%	6,239	63.5%
CA	0	0.0%	0	0.0%	0	0.0%	0	0.0%
OR	57	1.9%	111	1.8%	9	1.7%	177	1.8%
WA	652	21.7%	950	15.1%	109	20.5%	1,711	17.4%
BC	209	7.0%	514	8.2%	43	8.1%	766	7.8%
AK	174	5.8%	688	11.0%	61	11.5%	923	9.4%
HS	2	0.01%	0	0.0%	0	0.0%	2	0.02%
Totals	3,006	30.6%	6,283	64.0%	531	5.4%	9,820	

Recoveries in the Ocean

Within the ocean, CWT recoveries can be split into a variety of fishery types, with the most common being Troll (both Treaty and non-Treaty), Gillnet/Seine fisheries, Trawl (salmon captured as bycatch), and Sport. For the WDFW releases that returned in 2023, 58.1% of the estimated CWT recoveries were recovered from the troll fisheries (both types), followed by sport fisheries at 38.8%, with gillnet/seine and trawl fisheries making up around 3% of the recoveries (Table 22).

Table 22. Fully expanded recovery estimates of tagged and untagged fall Chinook salmon recovered in the Ocean during the 2023 run year for WDFW releases. Minijacks are not included in the estimates.

Region ^a	Fishery	LFH – 1+	LFH – 0+	GRR – 0+	Grand Total	%
		Total Estimate	Total Estimate	Total Estimate		
CA	Troll				0	0.0%
	Sport				0	0.0%
OR	Troll	9			9	0.2%
	Trawl				0	0.0%
	Sport	48	111	9	168	4.7%
WA	Troll	178	430	35	643	18.0%
	Trawl	3			3	0.08%
	Troll (Treaty)	198	201	38	437	12.2%
	Mixed Net and Seine	3			3	0.08%
	Sport	270	318	37	625	17.5%
BC	Troll	101	116	24	241	6.7%
	Sport	87	293	14	394	11.0%
	Troll (Treaty)	21	106	4	131	3.7%
	Mixed Net and Seine				0	0.0%
AK	Troll	129	445	45	619	17.3%
	Sport	31	156	16	203	5.7%
	Gillnet/Seine	14	87		101	2.8%
	Troll (Treaty)				0	0.0%
HS	Trawl	2			2	0.06%
Totals		1,094	2,263	222	3,579	
	Fishery Type	Total Estimate	Total Estimate	Total Estimate	Grand Total	
All Regions Combined	Troll	636	1,298	146	2,080	58.1%
	Gillnet/Seine	17	87	0	104	2.9%
	Trawl	5	0	0	5	0.1%
	Sport	436	878	76	1,390	38.8%

^a Regions defined: CA = California; OR = Oregon; WA = Washington; BC = British Columbia; AK = Alaska; HS = High Sea

Recoveries in the Columbia River Basin (excluding the Snake River)

Within the Columbia River, CWT recoveries can be split into a variety of fishery types (Gillnet and sport) and zones (Estuary, Zone 1-5, and Zone 6), other hatcheries and on the spawning ground (SGS). For the 2023 run, the following summary is provided (excluding recoveries in the Snake River basin (Table 23)). As with previous years, most recoveries come from the Columbia River Net Fisheries (52.6%), with sport fisheries accounted for about 46.9%, and fish recovered at other hatcheries or fish traps outside of the Snake River basin at 0.9%.

Table 23. Fully expanded recovery estimates of tagged and untagged fall Chinook salmon recovered in the Columbia River Basin (all freshwater areas – but excluding Snake River Basin recoveries) during the 2023 run year for WDFW releases. Minijacks are not included in the estimates.

Recovery area	Fishery/Hatchery/River	LFH – 1+ Total Estimate ^a	LFH – 0+ Total Estimate ^a	GRR – 0+ Total Estimate ^a	Grand Total	%
COL R	Zone 1-5 Commercial	160	345	19	524	10.8%
Gillnet	Zone 6 Tribal Net	595	1288	136	2,019	41.8%
	COL R Estuary	335	676	32	1,043	21.6%
	Zone 1-5 sport	136	215	48	399	8.3%
COL R	Zone 6 Sport	44	0	15	59	1.2%
Sport	Handford Reach	0	17	0	17	0.4%
	Freshwater Net	0	0	0	0	0.0%
	Freshwater Sport	264	434	46	744	15.4%
Hatchery	Bonneville	0	0	0	0	0.0%
	Priest Rapids	0	8	0	8	0.2%
SGS	Col R and Tributaries	3	17	3	23	0.5%
Totals		1,537	3,000	299	4,836	

Smolt-to-Adult Survival Rates (SAR and SAS)

Within the original Special Report - Lower Snake River Fish and Wildlife Compensation Plan (COE 1975), smolt-to-adult return rates (SAR) to the defined project area for SRFCH were assumed to be 0.2%. This assumed rate, along with brood needs based on fecundity, egg-to-smolt survivals, numbers of smolts, and fish per pound at juvenile release were used to size the hatchery program at LFH. Since that time, additional hatchery SRFCH production programs in the Snake River have been added, and changes with hydrosystem operations (bypass and spill) have evolved since the 1970's.

SAR project area begins at Ice Harbor Dam. Harvest is tracked from IHR and LGR through CWT retrieval, and a conversion of PIT tags from IHR and LGR is calculated. At LFH, yearling and subyearling releases have occurred almost annually since 1985. Early in the program, yearling fall Chinook survived better than subyearlings- almost 10 times better (Bugert et al 1997). With management changes to the hydropower system (bypass and spill, and summer flow augmentations from Dworshak Reservoir), and changes to the subyearling release size, survival rate differences between yearling and subyearling releases became negligible. For LFH releases, subyearlings perform on average about ½ as well as yearling releases back to the project area when jack returns are excluded, smolt-to-adult returns for yearlings are 0.48% and

subyearlings are 0.23% (Table 24). However, yearling releases are known to produce proportionally more mini-jacks and jacks per adult compared to subyearling releases. When jacks are included, the average SAR performance difference is about 1/3 between subyearlings (0.38%) and yearlings (1.08%). Other WDFW subyearling release locations upstream of LGR have also occurred, these generally survive at a lower rate compared to the LFH on-station release of subyearlings (Table 24). Migration distance and predation are potential factors that could contribute to the differences observed between upstream and below LGR release sites.

As shown in the adult return sections, SRFCH are harvested from a variety of locations and fisheries. Generally, about 35-50% of the returns are taken before they return to the project area. This is reflected in the differences between the SAR and SAS rates for each release group in Tables 24 and 25.

Table 24. Smolt-to-adult return (SAR) rates to the LSRCP project area (IHR to LGR) for yearling (LFH 1+) and subyearling (LFH 0+ - LFH On-station release; GRR 0+ - Grande Ronde River release; CCD 0+ - Couse Creek release) fall Chinook salmon by WDFW, 2002-2020 release years.

Release Year	Adults and Jacks Combined				Adults Only			
	LFH 1+	LFH 0+	GRR 0+	CCD 0+	LFH 1+	LFH 0+	GRR 0+	CCD 0+
2002	1.34%	0.22%			0.83%	0.18%		
2003	1.28%	0.11%		0.08%	0.33%	0.05%		0.04%
2004	0.16%	0.06%			0.07%	0.04%		
2005	0.83%	0.07%	0.02%	0.01%	0.39%	0.03%	0.02%	0.01%
2006	1.54%	1.16%	0.12%	0.75%	0.41%	0.71%	0.14%	0.30%
2007	0.90%	0.19%			0.49%	0.08%		
2008	4.85%	2.42%	0.45%	1.19%	1.63%	1.09%	0.29%	0.53%
2009	2.01%	0.28%	0.21%	0.23%	1.12%	0.14%	0.13%	0.20%
2010	2.55%	1.08%	0.76%	0.85%	0.99%	0.66%	0.64%	0.61%
2011	1.71%	1.52%	0.20%	1.07%	0.90%	1.06%	0.12%	0.75%
2012	2.45%	0.47%	0.48%	0.26%	0.94%	0.33%	0.48%	0.26%
2013	1.85%	1.00%	0.30%	0.48%	1.10%	0.67%	0.24%	0.37%
2014	1.08%	0.46%	0.25%		0.44%	0.24%	0.23%	
2015	0.62%	0.44%	0.39%		0.31%	0.22%	0.27%	
2016	0.93%	0.13%	0.01%		0.67%	0.12%	0.01%	
2017	0.39%	0.24%	0.26%		0.27%	0.16%	0.16%	
2018	0.21%	0.18%	0.38%		0.17%	0.12%	0.28%	
2019	0.14%	0.50%	0.79%		0.09%	0.42%	0.66%	
2020	1.35%	1.46%	0.32%		0.99%	1.25%	0.30%	
Average	1.45%	0.63%	0.29%	0.55%	0.64%	0.40%	0.26%	0.34%
Geomean	1.08%	0.38%	0.19%	0.30%	0.48%	0.23%	0.18%	0.20%

Table 25. Total Smolt-to-adult survival (SAS) rates for yearling and subyearling fall Chinook salmon by WDFW, 2002-2020 release years.

Release Year	Adults and Jacks Combined				Adults Only			
	LFH 1+	LFH 0+	GRR 0+	CCD 0+	LFH 1+	LFH 0+	GRR 0+	CCD 0+
2002	2.06%	0.30%			1.42%	0.26%		
2003	2.04%	0.15%		0.11%	0.86%	0.08%		0.07%
2004	0.50%	0.11%			0.34%	0.08%		
2005	1.65%	0.08%	0.05%	0.02%	0.98%	0.04%	0.05%	0.03%
2006	2.16%	1.67%	0.24%	1.21%	0.76%	1.19%	0.26%	0.56%
2007	1.51%	0.24%			0.94%	0.13%		
2008	7.24%	3.13%	0.52%	1.73%	3.08%	1.75%	0.36%	1.01%
2009	3.25%	0.46%	0.35%	0.41%	2.02%	0.30%	0.27%	0.37%
2010	3.64%	1.71%	1.50%	1.42%	1.73%	1.28%	1.36%	1.15%
2011	2.77%	2.16%	0.39%	1.86%	1.76%	1.66%	0.31%	1.51%
2012	4.06%	0.78%	1.01%	0.47%	2.25%	0.63%	0.99%	0.46%
2013	3.06%	1.49%	0.57%	0.82%	2.07%	1.14%	0.49%	0.70%
2014	1.89%	0.68%	0.35%		1.10%	0.46%	0.32%	
2015	1.29%	0.70%	0.68%		0.83%	0.46%	0.54%	
2016	1.66%	0.20%	0.02%		1.31%	0.19%	0.02%	
2017	0.63%	0.28%	0.36%		0.45%	0.20%	0.26%	
2018	0.31%	0.31%	0.54%		0.26%	0.25%	0.44%	
2019	0.36%	0.56%	1.10%		0.54%	0.48%	0.96%	
2020	2.72%	2.76%	0.59%		2.24%	2.53%	0.57%	
Average	2.25%	0.94%	0.55%	0.89%	1.31%	0.69%	0.48%	0.65%
Geomean	1.71%	0.55%	0.38%	0.50%	1.08%	0.39%	0.33%	0.40%

Direct Take of Listed Snake River fall Chinook Salmon During Fall of 2023 and Spring of 2024

Take estimates for permit #16607-2R for LFH production and permit #16615-2R for NPTH production are reported annually in the WDFW Fall Chinook report to LSRCP and other reports (see list below and Table 26).

To complete this report per contract requirements, estimates of take associated with this program for the 2019 to 2023 spawns and juvenile releases from 2020 to 2024 will be reported in future WDFW Fall Chinook reports to LSRCP. In addition, during consultation, it was agreed that additional reporting requirements were needed to cover the Terms and Condition section of the Section 10 permits and Section 7 Biological Opinion reporting requirements, with the timeframe beginning in 2018. The information required is provided 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 list and Table 25).

Additional information can also be found in reports provided by the NPT and are referred to in the Conditions Table (Table 25) provided below.

1. Snake River Basin Adult Chinook and Steelhead Monitoring Annual Report.
2. 2023 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 2023 (**Run Recon Report**)
4. 2023 NPTH SR fall Chinook production report (**Production Report**)

Table 26. 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 LGR adult trap.	See ESA permit 21951; LGR trapping permit (NOAA)
Fall Chinook salmon escapement to LFH, NPTH and the South Fork Clearwater Weir (once in operation) by origin (marked, tagged, unknown and unmarked adults);	The LFH trap was not operated in 2023. Escapement to NPTH provided in Snake River Basin Adult Chinook and Steelhead Monitoring Annual Report . The South Fork Clearwater trap was not operated in 2023.
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 17 in this report. Fall Chinook salmon escapement to natural spawning areas above LGR are described the Snake River Basin Adult Chinook and Steelhead Monitoring Annual Report . Fall Chinook salmon redd counts above LGR are described in the Snake River Basin Adult Chinook and Steelhead Monitoring Annual Report and the Snake River Fall Chinook Salmon Spawning Summary .
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 on Table 16 in this report. Carcass recovery data above LGR provided by NPT in the Snake River Basin Adult Chinook and Steelhead Monitoring Annual Report 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 LFH are provided in Table 8, page 19 in this report. For the number of broodstock retained and their disposition by NPTH, see the Snake River Basin Adult Chinook and Steelhead Monitoring Annual Report . Also see the joint agency Run Recon report for additional information.

Conditions	Response or reference for requested information
Trends in the relative, total annual abundances of NOR and HOR fall Chinook salmon escaping to the Snake River Basin upstream of LGR, and observations of any apparent effects of the hatchery program on fall Chinook salmon escapement and spawning distributions in the Snake River Basin	See the joint Agency Run Recon report for trends in total abundance of NOR and HOR fall Chinook salmon escaping to LGR; see "escapement" tab for trends in abundance of NOR and HOR fall Chinook escaping above LGR and see the Snake River Fall Chinook Salmon Spawning Summary for trends in index of abundance (redd counts) above LGR.
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 (pages 36-38). 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 the LFH adult trap is not available as the trap did not operate in 2023.

Recommendations and Conclusions

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

1. As of 2016, PBT sampling at LGR was able to detect all in-basin hatchery returns which allows more precise (in theory) estimates of NOR fish in the overall return, and those that contribute to broodstock. Beginning with the 2019 release year and into the future, all SRFCH salmon releases will be identified by a PBT mark group at each release site.

Recommendation: Continue discussions with the run reconstruction technical team and fisheries managers regarding the future tagging levels/use/need of CWT's for SRFCH salmon and the needs for downstream fisheries. In addition, continue to work with the FINS technical team to upload fall Chinook spawning, rearing and release data to reference future returns by origin for the PBT analysis.

2. Fish from SRFCH yearling programs have generally shown a higher SAR rate as compared to subyearling releases. However, yearlings have a very high rate of 0-salt and 1-salt returns whereas subyearlings do not return as 0-salt fish and generally have lower returns of 1-salt fish. Beginning in 2020, releases of yearlings above LGR were ceased, but the release of yearlings at LFH have continued. A Snake River Basin wide discussion was initiated by WDFW to discuss the possible elimination of future yearling releases at LFH, with additional subyearling production (released at LFH, but also in other locations above LGR) so no net loss of returns would occur (Adult + Jack combined), and downriver or ocean fisheries should not be negatively impacted. A "white paper" was completed in the spring of 2022. Following that, all Snake Basin parties agreed to move a proposal forward through the Production Advisory Committee to eliminate the yearling releases at LFH beginning with brood year 2023, with additional subyearling production at LFH and upstream of Lower Granite Dam. In fall 2024 the Policy Committee approved to cease production of yearlings starting in spawn year 2024 and increase subyearling production and planting.

Recommendation: Monitor the last release of yearlings in 2025 then focus monitoring efforts on the new releases of SRFCH subyearlings. Adjust broodstock collection and spawning events to compensate for increase in subyearling production.

3. Since the late 1980's, WDFW evaluation staff have been conducting redd surveys in the lower Tucannon River to count and estimate fall Chinook redds. Beginning in 1997, coho salmon began returning to the Snake River basin from Tribal re-introduction efforts in the Columbia/Snake rivers. At that same time, WDFW staff began to periodically recover coho salmon carcasses and "observe" what were thought to be coho redds (based on size and location in the stream). However, it soon became apparent that some fall Chinook redds (made by "jills" from the hatchery yearling releases, or smaller 2-salt subyearlings) were in similar stream locations and with redd sizes similar to what are typically thought of as coho redds. These "observational" redd designations are further complicated by varied stream conditions and observer experience.

Over the past few years, evaluation staff have revisited all previous fall Chinook/coho spawning ground survey data. A standard methodology was developed to consistently estimate redds 1) in locations that can't be surveyed due to landowner access issues, and 2) when surveys are incomplete because of high stream flow conditions that sometimes happen near the end of the season. As part of this standardization process, it was discovered that the proportion of fall Chinook to coho salmon counted at the Lower Monumental Dam fish ladder are very similar to what has been estimated in the Tucannon River as determined from carcass or "observational" redd estimates. This is significant because nearly all the coho salmon returning to the Snake River are not destined for the Tucannon River. Coho salmon natural production in the Tucannon River as determined by smolt trap catches would suggest that not many would likely return as adults.

Conclusion: As explained earlier in the report, WDFW evaluation staff completed their evaluation of all three possible estimation methods. To provide consistent and more reliable estimates in the future, it was decided to adopt the proportion of fall Chinook to coho from Lower Monumental Dam window counts applied to the total number of estimated redds. However, with the 2023 year returning higher compared to this trend with a strong stock composition brood years 2018 and 2019, staff will continue to make observational notes regarding redd origin, and recovered carcasses will continue to provide a back-up should we start to see more deviations from the current relationship.

Literature Cited

Bugert, R. M., G. W. Mendel, and P. R. Seidel. 1997. Adult Returns of Subyearling and Yearling Fall Chinook Salmon Released from a Snake River Hatchery or Transported Downstream. *North American Journal of Fisheries Management* 17:638-651.

Busack, C. 2007. The Impact of Repeat Spawning of Males on Effective Number of Breeders in Hatchery Operations. *Aquaculture* (2007), doi:10.1016/j.aquaculture.2007.03.027.

Busack, C. 2015. Personal communication. NOAA fisheries.

Hankin, D.G., L.J. Fitzgibbons, and Y. Chen. 2009. Unnatural random mating policies select for younger age at maturity in hatchery Chinook salmon (*Oncorhynchus tshawytscha*) populations. *Canadian Journal of Fisheries and Aquatic Sciences*. 66: 1505–1521 (2009).

Milks, D., and A. Oakerman. 2016. Lyons Ferry Hatchery Evaluation Fall Chinook Salmon Annual Report: 2014. Washington Department of Fish and Wildlife, Olympia, WA.

NOAA (National Oceanic and Atmospheric Administration). 2017. ESA Recovery Plan for Snake River Fall Chinook Salmon (*Oncorhynchus tshawytscha*).

NMFS (United States Department of Commerce) and USFWS (Bureau of Sport Fisheries and Wildlife, United States Department of Interior). 1972. A Special Report on the Lower Snake River Dams: Ice Harbor, Lower Monumental, Little Goose, and Lower Granite in Washington and Idaho. 2018.

United States v. Oregon Management Agreement. 2018. United States v. Oregon Management Agreement 2018-2027.

U.S. Army Corps of Engineers. 1975. Special report: Lower Snake River Fish and Wildlife Compensation Plan. Walla Walla, WA.

U.S. Fish and Wildlife Service. 2020. Lower Snake River Compensation Plan: Fiscal Year 2018 Report. U.S. Fish and Wildlife Service, Lower Snake River Compensation Plan Office.

Young, B., Rosenberger, S., Herr, M., Fortier, J., Sandford, B., Harris, A. 2023. Snake River fall Chinook salmon Lower Granite Dam run reconstruction report; return year 2023. Nez Perce Tribe, Lapwai, ID.

Appendix A: Trapping and Sampling Protocols at LGR Adult Trap for 2023

2023 Fall Chinook Trapping / Sampling Protocols at LGR

August 18, 2023

Protocols:

- 1) This protocol assumes a 24 hour/day, 7 days per week trapping at 70% continuing through September 6th, and then dropping to 18% through the end of the season.
- 2) Males and females will not be inoculated or opercle punched.
- 3) All Unmarked/Untagged fish ≥ 70 cm will be PIT Tagged in the pelvic girdle, PBT sampled and hauled to LFH and NPTH. LFH will haul ~70% and the NPT will haul ~30%.
- 4) All Hatchery Origin fish (Wire tagged or AD-only) ≥ 80 cm will be PIT Tagged in the pelvic girdle, PBT sampled and hauled to LFH and NPTH. LFH will haul ~70% and the NPT will haul ~30%.
- 5) All Hatchery Origin fish <80 cm will be PBT sampled and released upstream (males and females).
- 6) All Unmarked/Untagged fish >29 cm to <70 cm will be 100% scale and PBT sampled and released upstream (males and females).
- 7) All wire tagged and AD-ONLY fish ≥ 29 cm to <80 cm will be PBT sampled and released upstream (males and females).

WIRE TAGGED and AD-ONLY FISH

Fork Length	Action
≥ 80 cm	Haul all fish (PIT tag in the pelvic girdle and PBT sample all)
>29 cm to <80 cm	Release all fish (PBT sample all)

UNMARKED/UNTAGGED FISH :

Fork Length	Action
≥ 70 cm	Haul all fish (PIT tag in the pelvic girdle and PBT sample all)
>29 cm to <70 cm	Release All (Scale and PBT sample all)
Injury Releases	Scale Sample all UM/UT fish released

2023 Fall Chinook Trapping / Sampling Protocols at LGR

August 29th, 2023

Protocols:

- 1) This protocol assumes a 24 hour/day, 7 days per week trapping at 70% August 18th through August 29th. Effective afternoon of August 30th; dropping to 18% through the end of the season.
- 2) Males and females will not be inoculated or opercle punched.
- 3) All Unmarked/Untagged fish ≥ 70 cm will be PIT Tagged in the pelvic girdle, PBT sampled and hauled to LFH and NPTH. LFH will haul ~70% and the NPT will haul ~30%.
- 4) All Hatchery Origin fish (Wire tagged or AD-only) ≥ 80 cm will be PIT Tagged in the pelvic girdle, PBT sampled and hauled to LFH and NPTH. LFH will haul ~70% and the NPT will haul ~30%.
- 5) All Hatchery Origin fish <80 cm will be PBT sampled and released upstream (males and females).
- 6) All Unmarked/Untagged fish >29 cm to <70 cm will be 100% scale and PBT sampled and released upstream (males and females).
- 7) All wire tagged and AD-ONLY fish ≥ 29 cm to <80 cm will be PBT sampled and released upstream (males and females).

WIRE TAGGED and AD-ONLY FISH

Fork Length	Action
≥ 80 cm	Haul all fish (PIT tag in the pelvic girdle an PBT sample all)
>29 cm to <80 cm	Release all fish (PBT sample all)

UNMARKED/UNTAGGED FISH :

Fork Length	Action
≥ 70 cm	Haul all fish (PIT tag in the pelvic girdle and PBT sample all)
>29 cm to <70 cm	Release All (Scale and PBT sample all)

2023 Fall Chinook Trapping / Sampling Protocols at LGR

September 9th, 2023

Protocols:

- 1) This protocol assumes a 24 hour/day, 7 days per week trapping at 70% August 18th through August 29th. Effective afternoon of August 30th; dropping to 18% through the end of the season.
- 2) Males and females will not be inoculated or opercle punched.
- 3) All Unmarked/Untagged fish ≥ 80 cm will be PIT Tagged in the pelvic girdle, PBT sampled and hauled to LFH and NPTH. LFH will haul ~70% and the NPT will haul ~30%.
- 4) All Hatchery Origin fish (Wire tagged or AD-only) ≥ 80 cm will be PIT Tagged in the pelvic girdle, PBT sampled and hauled to LFH and NPTH. LFH will haul ~70% and the NPT will haul ~30%.
- 5) All Hatchery Origin fish <80 cm will be PBT sampled and released upstream (males and females).
- 6) All Unmarked/Untagged fish >29 cm to <80 cm will be 100% scale and PBT sampled and released upstream (males and females).
- 7) All wire tagged and AD-ONLY fish ≥ 29 cm to <80 cm will be PBT sampled and released upstream (males and females).

WIRE TAGGED and AD-ONLY FISH

Fork Length	Action
≥ 80 cm	Haul all fish (PIT tag in the pelvic girdle an PBT sample all)
>29 cm to <80 cm	Release all fish (PBT sample all)

UNMARKED/UNTAGGED FISH :

Fork Length	Action
≥ 80 cm	Haul all fish (PIT tag in the pelvic girdle and PBT sample all)
>29 cm to <80 cm	Release All (Scale and PBT sample all)

2023 Fall Chinook Trapping / Sampling Protocols at LGR

September 19th, 2023

Protocols:

- 1) This protocol assumes a 24 hour/day, 7 days per week trapping at 70% August 18th through August 29th. Effective afternoon of August 30th; dropping to 18% through the end of the season.
- 2) Males and females will not be inoculated or opercle punched.
- 3) All Unmarked/Untagged fish ≥ 70 cm will be PIT Tagged in the pelvic girdle, PBT sampled and hauled to LFH and NPTH. LFH will haul ~70% and the NPT will haul ~30%.
- 4) All Hatchery Origin fish (Wire tagged or AD-only) ≥ 80 cm will be PIT Tagged in the pelvic girdle, PBT sampled and hauled to LFH and NPTH. LFH will haul ~70% and the NPT will haul ~30%.
- 5) All Hatchery Origin fish <80 cm will be PBT sampled and released upstream (males and females).
- 6) All Unmarked/Untagged fish >29 cm to <70 cm will be 100% scale and PBT sampled and released upstream (males and females).
- 7) All wire tagged and AD-ONLY fish ≥ 29 cm to <80 cm will be PBT sampled and released upstream (males and females).

WIRE TAGGED and AD-ONLY FISH

Fork Length	Action
≥ 80 cm	Haul all fish (PIT tag in the pelvic girdle an PBT sample all)
>29 cm to <80 cm	Release all fish (PBT sample all)

UNMARKED/UNTAGGED FISH :

Fork Length	Action
≥ 70 cm	Haul all fish (PIT tag in the pelvic girdle and PBT sample all)
>29 cm to <70 cm	Release All (Scale and PBT sample all)

2023 Fall Chinook Trapping / Sampling Protocols at LGR

October 2nd, 2023

Protocols:

- 1) This protocol assumes a 24 hour/day, 7 days per week trapping at 70% August 18th through August 29th. Effective afternoon of August 30th; dropping to 18% through the end of the season.
- 2) Males and females will not be inoculated or opercle punched.
- 3) All Unmarked/Untagged and Hatchery origin female fish ≥ 70 cm will be PIT Tagged in the pelvic girdle, PBT sampled and hauled to LFH and NPTH. LFH will haul ~70% and the NPT will haul ~30%.
- 4) All Unmarked/Untagged fish >29cm to <70cm will be 100% scale and PBT sampled and released upstream (males and females).
- 5) All wire tagged and AD-ONLY fish ≥ 29 cm to <70cm will be PBT sampled and released upstream (males and females).

WIRE TAGGED and AD-ONLY FISH

Fork Length	Action
≥ 70 cm fish	Haul all females (PIT tag in the pelvic girdle and PBT sample all)
>29cm to <70cm	Release all fish (PBT sample all)

UNMARKED/UNTAGGED FISH :

Fork Length	Action
≥ 70 cm	Haul all females (PIT tag in the pelvic girdle and PBT sample all)
>29cm to <70cm	Release All (Scale and PBT sample all)

Appendix B: Systematic Sampling Rates at Lower Granite Dam 2003-2023

Appendix B Table 1. Dates, times, and trapping rates of fall Chinook salmon at LGR, 2003-2023.

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
2018	18 Aug 7:00 am	70	-	8 Sept	20		nc	18 Nov
2019	18 Aug	70	6-12 Sept 8:06 am ^f	6 Sept	20	12 Sept 4:00pm 17 Sept	100 20	12 Nov
2020	18 Aug	80	-	2 Sept	18	-	nc	12 Nov
2021	18 Aug	70	3-6 Aug 7:30am ^f	2 Sept	18	-	nc	18 Nov
2022	18 Aug	60	-	30 Aug	18	-	nc	15 Nov
2023	18 Aug	70		31 Aug	18	-	nc	16 Nov

^a No change (nc) was made to the trapping rate.

^b Trap was closed 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 at 10:50 am for three hours due to large numbers of fall Chinook salmon.

^e Trap was closed at 3:00 pm for two hours due to large numbers of fall Chinook salmon.

^f Trap closed due to high water temperatures.

Appendix C: Salmon Processed and Killed at LFH in 2023

Appendix C Table 1: Estimated composition of non-wire tagged salmon trapped at LGR, hauled to LFH, and killed during 2023.

Age/Origin Determinations by Method	Females	< 53 cm Males	≥53 cm Males	Total
Snake R. HOR				1,295
Subyearling	825		450	1,275
Yearling	16		4	20
Unknown rear/age				
Snake R. NOR				432
Subyearling	216		141	357
Yearling	11		3	14
Unknown rear/age	35		36	61
Stray HOR				19
Subyearling	14		5	19
Yearling				
Unknown rear/age				
Unknown Origin				43
Subyearling	20		15	35
Yearling	1			1
Unknown rear/age	2		5	7
Total	1,140		659	1799

Appendix C Table 2. Estimated composition of wired salmon trapped at LGR, hauled to LFH, and spawned in 2023.

Origin by CWT	CWT	Females	<53 cm Males	≥53 cm Males	Grand Total
LF18SBCA	220511	2		1	3
	220512	2		1	3
LF18SCJA	220509	1		1	2
	220510	3			3
LF18SGRR	637420	3			3
LF18SIPCSAL	091286	3			3
LF18SO	637422	1			1
LF18SPLA	220513	2		4	6
	220514	1			1
LF18YO	637603	29		9	38
LF19SBCA	220197	7		9	16
	220198	5			5
LF19SCJA	220195	12		10	22
	220196	7		14	21
LF19SGRR	637759	5		1	6
LF19SIPCSAL	091459	8		5	13
LF19SO	637758	22		29	51
LF19SPLA	220199	27		28	55
	220282	6		4	10
LF19YO	637762	6		3	9
NPTH18SLAP	220270	3			3
NPTH18SLGA	220269	2		1	3
NPTH18SO	220272	2		1	3
NPTH19SCFA	220276	4		5	9
NPTH19SCR	220273			2	2
NPTH19SLGA	220275	6		3	9
NPTH19SNLVA	220277	11		7	18
UMA18YUMAR	091401	1			1
LOST TAG		1			1
Total		182	0	138	320

Appendix D: Historical Use of Minijacks, Jacks, Jills and Strays in Broodstock at LFH

Appendix D Table 1. Number of matings of minijacks, jacks, and jills contributing to broodstock at LFH 2000-2009 and 2010-2023 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
2018	0	5	0	0	0.4
2019	0	0	1	0	0.0
2020	0	0	0	0	0.0
2021	0	0	3	0	0.2
2022	0	0	0	0	0.0
2023	0	0	0	0	0.0
Average	0	9.5	7.8	0.3	1.3

Appendix D Table 2. Historical use of out of basin strays in broodstock: 2007-2023.

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%
2018	1,253	0	0	0	0.0%
2019	1,151	5	4	0	0.8%
2020	1,107	4	2	0	0.5%
2021	1,216	3	8	0	0.9%
2022	1,232	0	4	0	0.3%
2023	1,183	4	11	0	1.3%
Average	1,234	1.8	8.0	0.06	0.79%

^a Males used multiple times are included multiple times.

Appendix E: Egg Take and Early Life Stage Survival Brood Years: 2000-2013

Appendix E Table 1: Egg take and survival numbers by life stage of LFH origin fall Chinook salmon spawned at LFH, brood years 2000-2013.

Brood year	Eggs taken	Egg loss ^a	Eggs destroyed ^b	Eggs shipped ^c	Eyed eggs retained	Fry ponded	Intended program
2000	3,576,956	53,176	0	115,891	3,249,377	998,768 2,159,921	Yearling Subyearling
2001	4,734,234	144,530	0	200,064	4,230,432	1,280,515 2,697,406 125,600	Yearling Subyearling Research
2002	4,910,467	44,900	0	1,195,067	3,540,000	1,032,205 2,376,251 73,229	Yearling Subyearling Research
2003	2,812,751	0	0	250,400	2,476,825	985,956 1,455,815	Yearling Subyearling
2004	4,625,638	0	0	1,053,278	3,421,751	914,594 2,191,102 184,682	Yearling Subyearling Research
2005	4,929,630	0	0	1,180,000	3,562,700 ^e	980,940 2,078,206 216,417	Yearling Subyearling Research
2006	2,819,004	0	0	127,564	2,601,679	961,105 1,640,574 2,000	Yearling Subyearling Research
2007	5,143,459	0	0	1,761,500	3,212,900 ^f	960,900 1,894,933	Yearling Subyearling
2008	5,010,224	0	0	1,810,800	2,969,200	1,000,000 1,969,200	Yearling Subyearling
2009	4,574,182	0	0	1,507,300	2,853,020	977,667 1,875,353	Yearling Subyearling
2010	4,619,533	124,433	0	1,630,000	2,865,100	980,000 1,885,100	Yearling Subyearling
2011	4,723,501	165,001	0	1,785,600	2,772,900	960,000 1,812,900	Yearling Subyearling
2012	4,526,108	141,608	0	1,480,000	2,904,500	1,010,000 1,894,000	Yearling Subyearling
2013	4,565,660	119,550	0	1,558,800	2,887,310	980,000 1,907,310	Yearling 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 average of 58,500 fish were 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 F: LFH/Snake River Origin Fall Chinook Salmon Releases in 2024

Appendix F Table 1: LFH/Snake River HOR fall Chinook releases with number marked, tagged, and unmarked by release year and type. ^a

Release year	S/Y ^b	Brood year	Release location-type	Release date	CWT code	AD clip +CWT	CWT only	AD clip only	No clip or CWT	Total Released	FPP	PIT Tagged
2024	Y	2022	LFH	3/27/2024	638078	461441	3420	4181	0	469042	10.5	10000
Total yearling releases						461,441	3,420	4,181	0	469,042		10,000
2024	S	2023	LFH	5/26/2024	638509	196903	384	5059	363948	566294	50.2	15000
2024	S	2023	Captain John 1st	5/9/2024	220051	200610	500	1293	287826	490229	45.6	26,938
2024	S	2023	Big Canyon 1st	5/8/2024	220049	200628	500	1294	258567	460989	66.2	10,978
2024	S	2023	Pittsburg Landing 1st	5/1/2024	220047	202735	384	1307	205433	409859	58.4	25,952
2024	S	2023	Pittsburg Landing 2nd	5/22/2024	220048	203639	508	1313	9616	215076	50.2	4,489
2024	S	2023	Big Canyon 2nd	5/29/2024	220050	203627	508	1313	10596	216044	56.9	4,490
2024	S	2023	Captain John 2nd	5/28/2024	220052	205306	512	1324	8507	215649	47.7	4,496
2024	S	2023	Grand Ronde River Direct	4/15/2024	638511	207649	1054	5481	211	214395	50.0	4500
2024	S	2023	NPTH-Site 1705-MF Clearwater R	6/13/2024	220400	107688	4150	705	529763	642306	50.9	4,485
2024	S	2023	NPTH-Lukes Gulch Acclimation	6/12/2024	220419	105449	3796	239	147754	257238	47.6	4,492
2024	S	2023	Cedar Flats Acclimation	6/11/2024	220420	95707	2662	369	134610	233348	63.4	4,334
2024	S	2023	North Lapwai Valley Acclimation	5/3/2024	220418	107962	2869	384	103302	214517	70.6	4,493
2024	S	2023	Salmon River	4/16/2024	090060	263145	0	2166	851596	1116907	57.7	4500
Total subyearling releases						2,301,048	22,247	17,827	2,911,729	5,252,851		119,147

^a Numbers presented do not necessarily match hatchery records for fish per pound because of reporting constraints for the hatchery.

^b S/Y indicates subyearling or yearling rearing strategy.

^c This release is typically 100% ADCWT, however for 2023 it was 87% ADCWT due to a malfunction with the tagging trailer.

Appendix G: Tucannon River Survey Sections and Historical Escapement

Appendix G 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, 2023.

Section	Description	Length of section (km) ^a	Length surveyed (km)	% of productive reach surveyed ^b	Estimated total # of redds ^c
1	Mouth of river to Highway 261 Bridge	1.7	1.7	100	90
2	Highway 261 Bridge to Smolt trap	0.15	0.15	100	4
3	Smolt trap to Powers Bridge	0.7	0.7	100	75
4	Powers Bridge to Starbuck Br.	3.85	3.55	100	200
5 ^d					
6	Starbuck Br. To Fletchers Dam	2.7	1.4	51.9	87
7	Fletcher's Dam to Smith Hollow	3.0	3.0	100	57
8	Smith Hollow to Ducharme's Bridge.	4.6	4.6	100	98
9	Ducharme's Bridge to Highway 12	5.7	5.7	100	97
10	Highway 12 to Brines Road Bridge	6.2	6.2	100	45
11	Brines Road Bridge to King Grade	4.7	4.7	100	0
Total		33.3	31.7	95.2	755

^a Section lengths were measured using Google Earth Pro.

^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.

^d Section 4 and 5 data were combined together for data purposes

Appendix G Table 2: Estimated escapement, % stray component of the run, and number of redds (observed and estimated) in the Tucannon River, 1985-2000.

Year	Estimated escapement ^a	# Redds observed	# Redds in no access areas (estimate)	Total # of Redds (estimate)
1985 ^b	0	0	No estimate	0
1986 ^c	2 ^d	0	No estimate	0
1987	48	16	0	16
1988	78	26	0	26
1989	150	48	2	50
1990	186	62 ^e	0	62
1991	150	50	0	50
1992	69	23	0	23
1993	84	28	0	28
1994	75	25	0	25
1995	87	29	0	29
1996	144	43	5	48
1997	93	27	4	31
1998	132	40	4	44
1999	87	21	8	29
2000	60	19	1	20



This program receives Federal financial assistance from the U.S. Fish and Wildlife Service Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972. The U.S. Department of the Interior and its bureaus prohibit discrimination on the bases of race, color, national origin, age, disability, and sex (in educational programs). If you believe that you have been discriminated against in any program, activity, or facility, please contact the WDFW ADA Program Manager at P.O. Box 43139, Olympia, Washington 98504, or write to

Department of the Interior
Chief, Public Civil Rights Division
1849 C Street NW
Washington D.C. 20240