

Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead Annual Report 2022 Run Year

by
Michael Herr
Lance A. Ross
Michael P. Gallinat

Washington Department of Fish and Wildlife
Fish Program / Science Division
Hatchery & Wild Interactions Unit
600 Capital Way North
Olympia, Washington 98501-1091

to

U.S. Fish and Wildlife Service
Lower Snake River Compensation Plan Office
1387 Vinnell Way, Suite 343
Boise, Idaho 83709
Cooperative Agreement # F16AC00033

March 2025

Acknowledgments

The ongoing success of the steelhead and trout program is the result of the coordinated and dedicated efforts of many Washington Department of Fish and Wildlife (WDFW) employees, as well as employees from other State and Federal Agencies. We especially thank Ace Trump, Dan Pounds, Derek Gloyn, Matt Miller, and the Lyons Ferry/Tucannon staff for their hard work, insight, and assistance with summer steelhead monitoring and evaluation activities conducted at Lyons Ferry Complex for this past year. We also thank the permanent and temporary staff at the Snake River Lab for their valuable assistance during this reporting period.

Special thanks to Michael Gallinat, Dane Kiefel and all the temporary technicians for the operation of the Tucannon River smolt trap. Current evaluations of Tucannon River steelhead center on the use of PIT tags, which start at the smolt trap by PIT tagging natural origin smolts and subsequently using the smolt trap estimates to expand adult PIT tag detections at the mainstem dams and instream PIT Tag Arrays.

Nicole Tancreto with Pacific States Marine Fisheries Commission provided valuable assistance with our PIT tag files. The accuracy and timeliness of all the data provided by the above individuals is always appreciated.

We thank Rod Engle (LSRCP M&E Coordinator) and Alf Haukenes (WDFW Hatchery and Wild Interactions Unit Leader), for their critical review of the draft report.

Finally, we thank the entire staff of the Lower Snake River Compensation Plan Office (LSRCP) for their firm support in funding these monitoring and evaluation studies.

Executive Summary

This annual report is one in a continuing series describing WDFW's progress toward meeting summer steelhead and rainbow trout mitigation goals established under the Lower Snake River Compensation Plan (LSRCP). Due to a variety of circumstances, this report covers steelhead run year 2022. Summaries provided cover the basic needs of the program. In some instances, additional discussion has been provided to further explain something that occurred, or to describe program changes that have occurred over this period.

Stocking of LSRCP-produced rainbow trout within Washington went as planned and achieved the LSRCP goal for rainbow trout plants. Survival of hatchery steelhead from egg to smolt was generally greater than 75% for all stocks. Marking and tagging goals were also met. However, smolt release goals over the last few years have not been met for all programs. Shortages have been due to lack of broodstock from low returns and poor recruitment to the TFH adult trap (Tucannon Stock), predation (Wallowa Stock) noted from observations of otters in the large rearing lakes, and from the accidental release of fish from LFH due to the failed rubber gasket on the drum screen in the rearing lake.

We continued smolt trapping on the Tucannon River to estimate the number of natural origin migrant steelhead for each migration year, and PIT tags are inserted into all natural origin steelhead at the smolt trap for estimating adult returns. Average smolt-to-adult survival of wild origin summer steelhead from the Tucannon River (based on the PIT tag returns from 2002-2021 migration years) was 1.78% back to Bonneville Dam, and 1.38% to Ice Harbor Dam. Natural origin adults returning to the Tucannon River were estimated based on PIT tag detections. Average natural origin adult returns based on the PIT tags for the last thirteen run years is 208 fish; 77 fish below the NOAA Fisheries recommended critical population threshold. Tucannon River (natural and hatchery endemic stock origin) steelhead continue to exhibit a disturbing adult migration pattern, with about 60% returning to, and between 40-45% remaining above, Lower Granite Dam. We also have observed a large percentage of Touchet and Walla Walla rivers release groups returning to the Snake River, with only a small percentage documented as returning to their release location.

As part of our ongoing annual broodstock collection and monitoring activities, WDFW hatchery and evaluation staff operate a series of traps in southeast Washington. We report the number of fish captured and released at all trap locations, composition of hatchery and wild origin fish, coded-wire tag recoveries (where appropriate) and age composition for each natural and hatchery origin steelhead stock we monitor. All data and CWT's recovered were transferred to Olympia for inclusion into the RMIS Regional CWT database.

During the spring of 2023 evaluation staff attempted spawning ground surveys to estimate the number of redds in index areas of the Touchet River. Stream flows in 2023 were high and greatly limited our ability to conduct surveys, and as such, the data should be used with caution. Based on those stream surveys, information from the Dayton Adult Trap, and using regression analysis in some instances, we estimate the total redds in the indexed areas of the Touchet River.

Over the years, a combination of coded-wire tag recoveries from fisheries, hatcheries, in-river, and PIT tag detections have provided the basic data to estimate minimum smolt-to-adult return rates of LFH, Wallowa, Touchet, and Tucannon stock summer steelhead from the hatchery program. Due to a variety of factors, smolt-to-adult survivals to the project area have generally been 2-3 times higher than the LSRCP assumed original target rate (0.5%) over the years, with only some of the last few run years falling short. We provide a complete summary of smolt-to-adult survivals from the program beginning with the 1982 brood year, based on CWT and/or PIT tags.

The LFC summer steelhead harvest mitigation programs, which historically consisted of LFH and Wallowa stocks, but now consist of Wallowa and Tucannon stocks, continues to meet and/or exceed the original mitigation goals to the Snake River Project area in most years. From 1984 to 2022 run years, there has been five years where the project area goals haven't been met (1984, 2018-2021). The shortfall in 1984 was due in part to the program not being fully operational with the 1982 brood year releases. The last four low years have fallen short due to poor out-migration or ocean conditions which have severely affected steelhead returns throughout the entire Pacific Northwest.

Table of Contents

Acknowledgments	2
Executive Summary	3
Table of Contents	i
List of Figures.....	iii
List of Tables	v
Introduction	10
Program Objectives.....	10
Definition of LSRCP Project Area	11
Measurement of LSRCP Steelhead Goals for Washington	11
Production Goals of Rainbow Trout and Summer Steelhead Stocks.....	12
Rainbow Trout:	12
Steelhead:	12
In-Hatchery Survival.....	12
Disease Protocols	13
Marking, Tagging, and Release	16
Hatchery Smolt Outmigration Speed and Survival	19
Cottonwood AP Releases.....	20
Touchet River and Dayton AP Releases	22
LFH On-station Releases	24
Tucannon River Releases.....	26
Tucannon River Natural Steelhead Smolt Production, Smolt-to-Adult Survival, and Adult Return Estimates	27
Smolt Outmigration	28
2022 Migration Year	29
2023 Migration Year	30
Smolt-to-Adult Survival.....	31
Tucannon River Adult Escapement	31
Adult Migratory Patterns Based on PIT tags	34
Summer Steelhead Broodstock Collections / Adult Returns.....	40
Wallowa Stock Trapping	40
Run Year 2022:	40
Tucannon Fish Hatchery Trap	41
Run Year 2022:	41
Touchet River Adult Trap	45
Run Year 2022:	46
Spawning Ground Surveys	51
Hatchery Smolt-to-Adult Survival Rates.....	53

Contributions to LSRCP Mitigation Goals.....	53
Conclusions and Recommendations	57
Literature Cited	59
Appendix A	60
Appendix B	62
Appendix C	65

List of Figures

Figure 1. Map of major rivers and streams in southeast Washington, and LFC facilities.	11
Figure 2. Estimated average travel speed (Km/day with S.D.) and median travel speed (black dot) of Wallowa stock summer steelhead released from Cottonwood AP in the Grande Ronde River to McNary Dam 2008-2023 migration years.	21
Figure 3. Estimated survival (S.E.) of Wallowa stock summer steelhead released from Cottonwood AP in the Grande Ronde River to Lower Granite Dam, 2008-2023 migration years.	21
Figure 4. Estimated average travel speed (km/day with S.D.) and median travel speed (black dot) of LFH/Wallowa stock and Touchet endemic stock summer steelhead released from Dayton AP or in the Touchet River to McNary Dam, 2004-2023 migration years. Note: no releases of Wallowa stock steelhead occurred from Dayton AP in 2022.	22
Figure 5. Estimated survival (S.E.) of LFH/Wallowa stock and Touchet endemic stock summer steelhead released from Dayton AP or in the Touchet River to McNary Dam, 2007-2023 migration years.	23
Figure 6. Relationship of juvenile steelhead survivals between Touchet and LFH/Wallowa stock to McNary Dam, 2007 to 2023 migration years.	23
Figure 7. Relationship of smolt-to-adult survival between Touchet and LFH/Wallowa stock, 2007 to 2020 brood years.	24
Figure 8. Estimated average travel speed (km/day with S.D.) and median travel speed (black dot) of LFH/Wallowa stock summer steelhead released on-station at Lyons Ferry Hatchery into the Snake River to McNary Dam, 2008-2023 migration years. Note: no PIT tagged releases in 2022 due to accidental release.	25
Figure 9. Estimated survival (S.E.) of LFH/Wallowa stock summer steelhead released from on-station at Lyons Ferry Hatchery into the Snake River to Lower Monumental Dam, 2008-2023 migration years. Note: no PIT tagged releases in 2022 due to accidental release.	25
Figure 10. Estimated average travel speed (km/day with S.D.) and median travel speed (black dot) of Tucannon Endemic stock (conservation and mitigation groups) summer steelhead released into the upper Tucannon River at Curl Lake Intake, Curl Lake AP, or at Marengo to McNary Dam, 2004-2023 migration years.	26
Figure 11. Estimated survival (S.E.) of Tucannon Endemic stock (conservation and mitigation groups) summer steelhead released into the Tucannon River at Curl Lake Intake, Curl Lake AP, or at Marengo to Lower Monumental Dam, 2004-2022 migration years (excluding 2009 as there was no production that year. MY20-21 the mitigation group did not produce reliable estimates of survival and neither group did in MY 22).	27
Figure 12. General migration timing of natural origin summer steelhead from the Tucannon River, 2021/2022 migration year. (Note: all size categories are included here (<80, 80-124mm, >124mm).	29
Figure 13. General migration timing of natural origin summer steelhead from the Tucannon River, 2022/2023 migration year. (Note: all size categories are included here (<80, 80-124mm, >124mm).	30
Figure 14. Estimated escapement of summer steelhead into the Tucannon River, 2009-2022 run years. Estimates provided represent fish detected, and then adjusted by the Lower Tucannon River (LTR) array efficiency.	32

Figure 15. Estimated natural and hatchery composition escapement post-harvest of summer steelhead into the Tucannon River, 2009-2022 run years.....	33
Figure 16. Conversion rates from Bonneville Dam to Ice Harbor Dam of hatchery summer steelhead released at Cottonwood AP on the Grande Ronde River, Lyons Ferry on the Snake River, or in the Tucannon River, and natural origin fish from Tucannon River (2005-2022 Run Years).	34
Figure 17. Conversion rates from Bonneville Dam to McNary Dam of hatchery summer steelhead released in the Walla Walla River or from Dayton AP, and natural origin fish from the Walla Walla Basin (2008-2022 Run Years).....	35

List of Tables

Table 1. Numbers of males and females spawned, eggs taken, and survival by life state of Tucannon River endemic stock summer steelhead spawned at LFH, 2000 to 2023 brood years.	14
Table 2. Numbers of males and females spawned, estimated eggs taken, eyed up and then retained for program needs, and estimated survival by life stage of Wallowa stock summer steelhead spawned at Cottonwood Creek and transferred to LFH, 1992 to 2023 brood years.	15
Table 3. Numbers of males and females spawned, eggs taken, and survival by life state of Touchet River endemic stock summer steelhead spawned at LFH, 2000 to 2023 brood years.	16
Table 4. Summer steelhead smolt releases from Lyons Ferry Complex, 2023.	17
Table 5. Mean fork lengths, weights, condition factor (K), co-efficient of variation (CV), fish per pound (FPP), and the percent of visually apparent precocious mature males from LFC steelhead prior to release, 2023.	17
Table 6. Smolt population estimates with upper and lower confidence intervals derived from the Tucannon River Smolt Trap, and proportions of each estimate by age class. *Combined point estimates due to truncated trapping periods, should be considered a minimum estimate.	28
Table 7. Estimated smolt-to-adult survival rate of naturally produced summer steelhead smolts from the Tucannon River based on adult PIT tag detections at Bonneville and Ice Harbor dams, 1999-2022 migration years.	31
Table 8. Detections of PIT tagged Tucannon Endemic stock and Tucannon natural stock summer steelhead released into the Tucannon River that passed Ice Harbor Dam (IHR) and Lower Granite Dam (LGR).	36
Table 9. Detections of PIT tagged Lyons Ferry/Wallowa stock summer steelhead released in the Walla Walla River or from Dayton AP in the Touchet River that crossed McNary Dam, Ice Harbor Dam (IHR), and Lower Granite Dam (LGR).	37
Table 10. Detections of PIT tagged Touchet River Endemic stock and Touchet/Walla Walla Basin natural stock that crossed McNary Dam, Ice Harbor Dam (IHR), and Lower Granite Dam (LGR).	38
Table 11. Detections of PIT tagged Wallowa and/or LFH stock summer steelhead released on-station at LFH or into the Grande Ronde River at Cottonwood AP that passed Ice Harbor Dam (IHR) and Lower Granite Dam (LGR).	39
Table 12. Summary of CWT adult summer steelhead recovered at either Cottonwood or LFH adult traps during the 2022 run years.	41
Table 13. Natural origin, hatchery LFH/Wallowa stock origin, and hatchery Tucannon endemic stock origin summer steelhead trapped at the Tucannon Fish Hatchery from the 1997-2022 run years.	43
Table 14. Total number of fish trapped and passed upstream to spawn naturally at the Tucannon River Adult Trap, 1997-2022 run years.	44
Table 15. Summary of fresh and salt-water age composition of natural origin adult steelhead from the Tucannon River, 2000-2023 brood years. Note: this table does not include 3-ocean age fish, or those with freshwater age 4. Only a few of those individuals have been documented over all years (0.04%)	45

Table 16. Total number of male and female summer steelhead at the Touchet River Adult Trap (1992-1994, 1998-2022 run years).	47
Table 17. Total number of fish trapped and passed upstream to spawn naturally at the Touchet River Adult Trap, 1992-1994, 1998-2022 run years.....	48
Table 18. Summary of fresh and salt-water age composition of natural origin adults from the Touchet River, 1994-1995 and 1999-2023 brood years.	49
Table 19. Total number of spring Chinook, bull trout, brown trout, whitefish, northern pike minnow, and bridgelip sucker captured in the Touchet River Adult Trap (1993-1995, 1999-2023). Data presented in this table is from the period January through the month of September annually.....	50
Table 20. Standardized redd estimates and redds/kilometer within index reaches of the Touchet River in southeast Washington, 1987-2023.....	52
Table 21. Smolt-to-adult return (SAR) survival of adipose clipped Lyons Ferry and/or Wallowa stock (LFH, Tucannon, Touchet, Walla Walla and Grande Ronde release groups) Tucannon and Touchet endemic stocks to the defined lower Snake River project area for Washington’s steelhead programs.....	54
Table 22. Contribution of Lyons Ferry stock (LFH, Tucannon, Touchet, Walla Walla release groups) or Wallowa stock (Grande Ronde release group) summer steelhead back to the lower Snake River project area. Lighter grey shading represents a combination of CWT and PIT estimates, darker grey shading is derived solely from PIT tag estimates.	55
Table 23. Contribution of Lyons Ferry stock (LFH, Tucannon, Touchet, Walla Walla release groups) or Wallowa stock (Grande Ronde release group) summer steelhead back to the Columbia River. Lighter grey shading represents a combination of CWT and PIT estimates, darker grey shading is derived solely from PIT tag estimates.	56

Introduction

This report encompasses run year 2022 and is one in a continuing series describing Washington Department of Fish and Wildlife's (WDFW) progress toward meeting specific in-place and in-kind mitigation goals on summer steelhead (*Oncorhynchus mykiss*) and rainbow trout established by the Lower Snake River Compensation Plan (LSRCP) Program. The reporting period covers between 1 July 2022 and 30 June 2023, unless otherwise noted.

Program Objectives

Legislation under the Water Resources Act of 1976 authorized the establishment of the Lower Snake River Compensation Plan (LSRCP) to help mitigate for the losses of salmon and steelhead runs due to construction and operation of the Snake River dams and authorized hatchery construction and production in Washington, Idaho, and Oregon as a mitigation tool (USACE 1975). The steelhead trout/resident fish (*Oncorhynchus mykiss*) portion of the LSRCP as administered by WDFW for the State of Washington was based on two essential criteria: 1) anadromous summer steelhead losses attributable to hydroelectric dam construction on the Snake River amounting to 4,656 adult summer steelhead destined for Washington, and 2) resident fisheries (resident fisheries that were identified to be effected were rainbow trout, smallmouth bass (*Micropterus dolomieu*), sturgeon (*Acipenser transmontanus*), channel catfish (*Ictalurus punctatus*), and crappie (*Pomoxis sp.*)). It was determined that these resident fisheries would be diminished by 67,500 angler days of recreation annually. Hatchery facilities capable of producing enough steelhead smolt to return 4,656 adult summer steelhead back to the project area (Snake River mouth, including the Walla Walla basin) were designed. Additionally, 93,000 pounds of catchable size (3 fish/lb) trout were produced to offset the losses to the resident fisheries. Eventually, 7,000 pounds of catchable rainbow were foregone in-lieu of improving instream habitat in various streams in southeastern Washington leaving the mitigation goal of 86,000 trout, 7,000 of which is for Idaho waters.

The LSRCP program in Washington State began in 1981 with construction of Lyons Ferry Hatchery (LFH). Refurbishing of the Tucannon Fish Hatchery (TFH) followed in 1984-1985. In addition to the hatchery construction and modifications, three remote acclimation ponds (AP) were built along the Tucannon (Curl Lake AP), Touchet (Dayton AP), and Grande Ronde (Cottonwood AP) rivers to acclimate juvenile summer steelhead before release. All these facilities make up WDFW's Lyons Ferry Complex (LFC) (Figure 1).

Originally, the LFH was constructed to produce 931,200 steelhead smolts (8 fish/lb – 116,400 pounds) and 45,000 pounds of legal rainbow trout. TFH was repaired and updated to produce 41,000 pounds of legal rainbow trout (completing 86,000 lbs of trout in total for mitigation), and aid in the propagation of spring Chinook in the Tucannon River. Various actions (e.g. ESA, smolt performance, etc..) have compelled the program to change its production goals over the years.

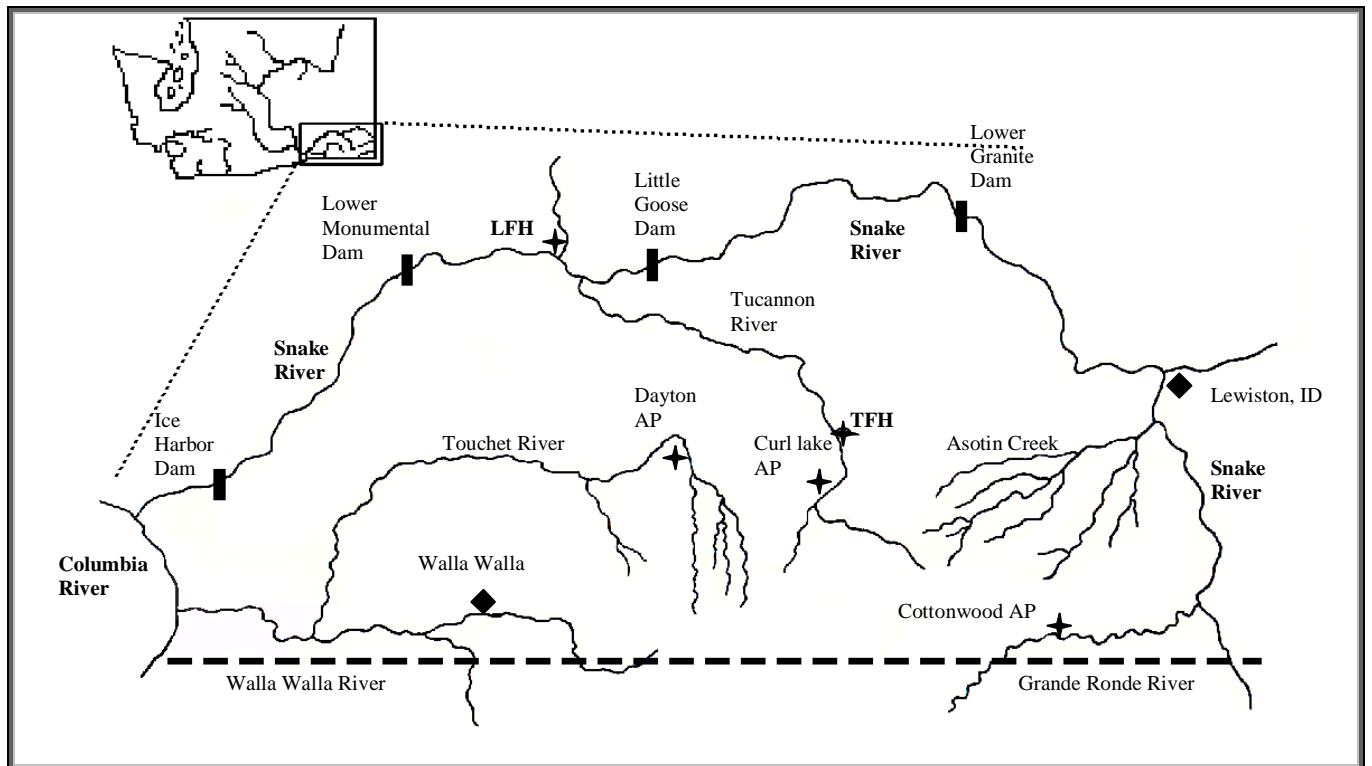


Figure 1. Map of major rivers and streams in southeast Washington, and LFC facilities.

Definition of LSRCP Project Area

The LSRCP project area starts at Ice Harbor Dam extending to Lower Granite Dam and is inclusive of the Walla Walla Basin, a Columbia River Basin tributary in SE Washington adjacent to the Snake River basin.

Measurement of LSRCP Steelhead Goals for Washington

For summer steelhead programs within the State of Washington (4,656 of the 55,100 total LSRCP steelhead goal) measurement of LSRCP program returns is to the project area (Ice Harbor Dam) except for those programs in the Walla Walla Basin which are measured at McNary Dam. Harvest contributions of LSRCP program steelhead in the ocean and within the Columbia River downstream of the defined project area for Washington will also be included in summary reporting to convey the entire benefit of the LSRCP program.

Production Goals of Rainbow Trout and Summer Steelhead Stocks

Rainbow Trout: The Washington LSRCP mitigation trout program has focused on providing recreational fishing opportunities in southeast Washington. The current LFC goal is to produce 78,300 pounds (~235,000 fish) of catchable sized (2.5 fish/lb; generally, >8in) Spokane stock trout for release into southeast Washington area lakes to address 67,500 lost angler days of recreation. The LFC also produces 1,650 pounds (~19,250 fish) Spokane stock trout for the Nez Perce Tribe's resident fish program and Idaho Department of Fish and Game (IDFG) resident fall fishery program (~17,600 fish). During the report period, stocking of LSRCP produced rainbow trout stocked within Washington lakes (Appendix A), and transfers to Nez Perce Tribe and IDFG went as planned.

Steelhead: The Washington LSRCP summer steelhead mitigation program is to produce a return of 4,656 adult steelhead to the project area fulfilling harvest and broodstock needs. In addition, there is an additional harvest objective of 9,312 adults downstream of the project area (USFWS 2018).

Steelhead production program targets remained unchanged for the 2023 juvenile release period. During this reporting year, LFC used three summer steelhead stocks to produce smolts for releases into the Snake, Tucannon, Grande Ronde, and Touchet rivers enhancing recreational opportunities for steelhead anglers and for ESA recovery purposes. Release sizes of 4.5 to 5.5 fish/lb (100.8 to 52.5 g/fish), with 4.5 fish/lb current applied to the Wallowa stock program, and the 5.5 fish/lb currently applied to the Touchet and Tucannon stock programs. Targeting 4.5 fish/lb for the two endemic programs led to fish that generally had higher K-factors than desired at release. Any excess production of Wallowa stock will be determined early in the rearing cycle and planted as fry/fingerlings in area lakes and may also contribute to rainbow trout fisheries but are not inclusive to the rainbow trout production goals.

In-Hatchery Survival

One of our main tasks for the hatchery evaluation program is to track survival of the different stocks of steelhead over time and recommend any changes to improve efficiency of the program. Survival of summer steelhead at LFC facilities remains highly variable among stocks and years (Table 1, Table 2, and Table 3). Fish health problems such as Bacterial cold-water disease or Infectious Hematopoietic Necrosis virus (IHNV), spawning conditions, and remote spawning sites have all affected in-hatchery survival rates over the years. The hatchery survival estimates presented in the following tables may include inaccuracies due to bias and/or error in quantifying. These inaccuracies are likely due to one or a combination of the following: water

weight, egg/fish size variability, scale error, or inconsistent methodologies among staff members. The WDFW survival targets used for the LSRCP program is 80% for green-egg to eyed-egg, and 75% for eyed-egg to smolt release, which, on average, have been met for all three current stocks over the history of the program (Table 1, Table 2, and Table 3).

Disease Protocols

Generally, the largest contributor to mortality between eyed-egg to smolt has been bacterial cold-water disease. The severity of the disease varies annually, but it has been documented nearly every year in all stocks. Historically, two occurrences of IHNV outbreaks in the early 1990's decimated steelhead production (Schuck et al, 1991). Biosecurity measures at the hatchery were increased (viral testing of ovarian fluid, single fish isolated incubation, culling of positive females, etc..) and future outbreaks ceased.

Historically, for the Touchet and Tucannon stocks (since both are derived from ESA listed parents), culling of eggs from IHNV positive females was not an option. Therefore, when IHNV positive females were detected, swim up fry were reared for a few weeks in an isolated rearing vessel, then released as fry into their respective rivers (Table 1, Table 3). Beginning in 2017, WDFW Fish Health staff felt that the biosecurity protocols in place for spawning and rearing of summer steelhead were adequate to not require culling of eggs anymore, which then stopped the need for fry plants in the Touchet and Tucannon stocks.

Table 1. Numbers of males and females spawned, eggs taken, and survival by life state of Tucannon River endemic stock summer steelhead spawned at LFH, 2000 to 2023 brood years.

BY	Spawned		Green Eggs taken	Eyed Eggs	% Green to Eyed Egg Survival	Eggs Retained for program needs	Smolts	% retained eggs to smolt survival
	Female	Male						
2000	16	21	80,850	71,971	89.0	71,971	60,020	83.4
2001	15	15	113,563	101,197	89.1	101,197	58,616	57.9
2002	13	16	74,204	66,969	90.2	66,969	43,688	65.2
2003	14	18	73,573	46,143	62.7	46,143	42,967	93.1
2004	16	15	78,109	62,460	80.0	62,460	61,238	98.0
2005	14	25	77,131	71,933	93.3	71,933	65,245	90.7
2006	13	16	72,520	67,341	92.9	67,341	62,940	93.5
2007	13	12	64,129	59,970	93.5	59,970	57,230	95.4
2008	1	1	3,054	2,537	83.1	2,400	0 ^a	0.0
2009	10	9	77,279	68,959	89.2	68,959	57,562 ^b	92.2
2010	11	11	89,791	81,100	90.3	81,100	77,683	95.8
2011	21	20	121,597	117,919	97.0	117,919	51,124 ^c	81.7
2012	17	19	93,065	72,274	77.7	72,274	58,357	80.7
2013	25	20	150,614	132,460	87.9	132,460	90,483	68.3
2014	29	21	165,612	148,390	89.6	148,390	106,871	72.0
2015	26	24	114,635	102,511	89.4	102,511	94,618	92.3
2016	29	24	140,638	95,063	67.6	95,063	72,158	75.9
2017	36	12	180,292	145,813	80.9	145,813	117,223	80.4
2018	47	28	211,515	188,378	89.1	174,365 ^d	157,789	90.5
2019	34	24	160,114	142,328	88.9	142,328	100,461	70.6
2020	26	8	133,200	124,378	93.4	124,378	110,241	88.6
2021	29	14	127,101	123,567	97.2	123,567	117,122	94.8
2022	20	17	80,459	72,033	89.5	72,033	59,203	82.2
2023	41	22	226,122	176,284	78.0	176,284		
Mean (N)					86.6 (24)			83.8 (22)
SD					8.3			11.1
^a Production of 2,400 was considered inadequate to be of value, these were planted as fry.								
^b A total of 5,999 fry were planted into the Tucannon River as these were high titer positive progeny for IHNV.								
^c A total of 45,236 fry were planted into the Tucannon River as these were high titer positive progeny for IHNV.								
^d A total of 14,012 fry Ad-clipped were planted in the Tucannon River during water pipeline emergency.								

Table 2. Numbers of males and females spawned, estimated eggs taken, eyed up and then retained for program needs, and estimated survival by life stage of Wallowa stock summer steelhead spawned at Cottonwood Creek and transferred to LFH, 1992 to 2023 brood years.

BY	Spawned		Green Eggs taken	Eyed Eggs	% Green to Eyed Egg Survival	Eggs Retained for program needs	Smolts	% retained eggs to smolt survival
	Female	Male						
1992	113	225	558,437	371,375	66.5	423,759 ^a	341,899	80.7
1993	96	96	533,995	392,595	73.5	289,198	322,508	100.0
1994	118	118	644,886	446,029	69.2	366,115	256,233	69.9
1995	99	99	511,283	412,493	80.7	335,489	263,449	78.5
1996	125	125	601,979	582,994	96.8	460,294	274,886	59.7
1997	101	101	536,723	401,270	74.8	401,270	252,211	62.9
1998	173	169	868,973	769,543	88.6	479,606	268,803 ^b	82.4
1999	129	116	625,039	418,970	67.0	389,664	274,146 ^c	82.1
2000	107	116	523,011	322,238	61.6	322,238	215,584 ^d	82.5
2001	97	108	504,182	381,427	75.7	260,000	182,722	70.3
2002	82	87	455,502	360,811	79.2	319,479	236,627	74.1
2003	65	65	327,477	315,616	96.4	242,557	137,915 ^e	85.9
2004	68	105	345,565	326,475	94.5	326,475	150,442 ^f	80.6
2005	60	70	282,675	274,586	97.1	274,586	169,390	61.7
2006	120	115	316,059	290,903	92.0	290,903	159,242 ^g	93.5
2007	106	97	340,589	310,479	91.2	242,710	175,961	72.5
2008	85	85	275,958	241,638	87.6	214,695	170,232	79.3
2009	113	125	494,638	463,442	93.7	172,367 ^h	163,197	94.7
2010	56	48	244,487	212,618	87.0	242,648	197,839	81.5
2011	106	82	522,967	411,077	78.6	193,180	176,902	91.6
2012	120	120	632,738	239,993	77.5	239,993	205,913	85.8
2013	144	135	847,000	642,273	75.8	599,732	525,936	87.7
2014	160	163	697,049	593,210	85.1	493,449	480,393	97.3
2015	132	104	645,000	539,286	83.6	494,286	491,159	99.4
2016	155	149	673,395	600,140	89.1	590,664	436,057	73.8
2017	124	83	721,329	639,661	88.7	458,728 ⁱ	378,811	82.6
2018	122	73	650,874	565,128	86.8	565,128 ^j	511,099	90.4
2019	100	101	448,600	436,713	97.4	436,713 ^l	395,294	90.5
2020	101	99	522,823	466,146	89.2	466,146	369,552	79.3
2021	95	43	496,987	442,556	89.0	442,556	386,352 ^m	87.3
2022	120	165	548,735	468,017	85.3	468,017 ^k	346,730	81.8
2023	104	103	557,541	495,225	88.8			
Mean (N)					84.0 (32)			81.9 (31)
SD					9.6			10.3

^a Additional eggs were brought in from ODFW to make program needs.

^b A total of 126,361 fry/parr/fingerlings were planted into area lakes from over production.

^c A total of 45,824 fry/parr/fingerlings were planted into area lakes from over production.

^d A total of 50,270 fry/parr/fingerlings were planted into area lakes from over production.

^e A total of 70,455 fry/parr/fingerlings were planted into area lakes from overproduction.

^f A total of 146,481 fry/parr/fingerlings were planted into area lakes from overproduction.

^g A total of 112,751 fry/parr/fingerlings were planted into area lakes from over production.

^h Total number of eggs retained includes 40,000 received from ODFW Wallowa Hatchery to supplement the losses from IHNv positive females spawned at Cottonwood.

ⁱ A total of 180,933 fry/parr/fingerlings were planted into area lakes from over production

^j A total of 125,125 fry/parr/fingerlings were planted into area lakes from over population

^k A total of 44,000 fry/parr/fingerlings were planted into area lakes from over population

^l ODFW Wallowa Hatchery provided the eggs needed for program.

^m A failed rubber gasket on the drum screen in the rearing lake made it possible for fish to escape. An estimated 249,770 fish were therefore released on-station at LFH, but the time period in which they could have left was from October 2021 to February 2022.

Table 3. Numbers of males and females spawned, eggs taken, and survival by life state of Touchet River endemic stock summer steelhead spawned at LFH, 2000 to 2023 brood years.

BY	Spawned		Green Eggs taken	Eyed Eggs	% Green to Eyed Egg Survival	Eggs Retained for program needs	Smolts	% Retained eggs to smolt survival
	Female	Male						
2000	12	7	53,139	43,572	82.0	43,572	36,487	83.7
2001	14	11	69,269	53,750	77.6	53,750	45,501	84.7
2002	14	17	70,843	66,460	93.8	66,460	31,440	47.3
2003	16	17	82,602	75,059	90.9	75,059	58,733	78.3
2004	15	10	68,511	58,451	85.3	58,451	55,706	95.3
2005	18	15	78,813	75,991	96.4	75,991	52,476 ^a	97.7
2006	18	18	88,668	85,730	96.7	85,730	58,989 ^b	85.5
2007	16	17	73,101	69,626	95.2	69,626	48,298 ^c	69.4
2008	13	11	66,520	62,279	93.6	62,279	55,255 ^d	97.4
2009	15	13	72,543	69,801	96.2	69,801	62,517 ^e	89.6
2010	15	13	75,596	65,055	86.1	65,055	62,037	95.4
2011	12	13	74,408	64,860	87.2	64,860	54,386	83.9
2012	17	13	81,555	45,418	55.7	45,418	38,726	85.3
2013	10	8	65,469	56,877	86.9	56,877	49,523	87.1
2014	14	15	63,758	59,924	94.0	59,924	48,711	81.3
2015	15 ^f	14	97,660	63,582	65.1	63,582	47,675	75.0
2016	16 ^f	12	79,254	65,207	82.3	65,207	57,390	88.0
2017	12 ^f	10	73,051	60,154	82.3	60,154	52,131	86.7
2018	12 ^f	7	58,513	52,163	89.1	52,163	39,379	75.5
2019	14	15	70,150	55,068	78.5	55,068	48,529	88.1
2020	10	7	54,788	53,417	97.5	53,417	48,990	91.7
2021	16	11	85,119	73,513	86.4	73,513	53,924	73.4
2022	16	15	72,615	65,795	90.6	65,795	54,237	82.4
2023	17	13	94,405	61,701	65.4	61,701		
Mean (N)					85.6 (24)			83.6 (23)
SD					10.7			10.7

^a A total of 21,765 eggs/fry were planted into the Touchet River as these were high titer positive progeny for IHNV.
^b A total of 14,276 eggs/fry were planted into the Touchet River as these were high titer positive progeny for IHNV.
^c High fry-smolt loss was due to stress induced mortality of 20,389 fish caused by overcrowding during the PIT tagging operation.
^d A total of 5,400 eggs were planted into the Touchet River as these were high titer positive progeny for IHNV.
^e A total of 5,345 fry were planted into the Touchet River as these were high titer positive progeny for IHNV
^f Up to half females are Touchet endemic.

Marking, Tagging, and Release

All harvest mitigation production groups using Wallowa or Tucannon stocks destined for release in 2023 were marked with an adipose (AD) fin clip, and a portion of each release group also received a coded-wire tag (CWT) and a PIT tag prior to release (Table 4). External marks and internal tags are used for selective fisheries harvest management, estimating smolt-to-adult survival, and to document straying. Non-harvest mitigation steelhead using Tucannon and Touchet endemic stocks are not adipose fin clipped but are correspondingly 100% CWT.

Table 4. Summer steelhead smolt releases from Lyons Ferry Complex, 2023.

	Stock	Rkm	Date	Release Goal	Total release	AD release	CWT release	CWT code	Other marks	PIT Tags	Lbs	Size #/lb (4.5/lb goal)	CWT % Loss
Grande Ronde @ Cottonwood AP	WAL	45.6	4/3-4/28	225,000	223,740	223,740	51,610	638482,638419	None	4K,2K	40,680	5.5	1.38
Snake River @ LFH	WAL	92.8	4/3-4/5	60,000	30,495	30,495	13,033	638482,638419	5k Max	10K	6,930	4.4	1.38
Touchet River @ Dayton AP	WAL	86.4	4/10-4/14	100,000	92,495	92,495	21,181	638482,638419	None	5K	23,124	4	1.38
Tucannon River @ Curl Lake	TUC	66.5	4/21-4/28	50,000	50,635	0	50,220	638238	None	5K	9,206	5.5	0.82
Tucannon River @ Marengo	TUC	41.2	4/19-4/21	100,000	8,568	8,568	8,568	638377	None	8,568	1,992	4.3	0
Touchet R. @Dayton AP (WxW)	TOU	86.4	4/21-4/28	50,000	54,237	0	53,464	638418	None	5k	9,685	5.6	1.27

Table 5. Mean fork lengths, weights, condition factor (K), co-efficient of variation (CV), fish per pound (FPP), and the percent of visually apparent precocious mature males from LFC steelhead prior to release, 2023.

Location (Stock)	Sample Date	Sample size (n)	Avg LN (mm)	Avg WT (g)	K	CV	FPP	Percent precocious
2023 Release Year								
Cottonwood (Wallowa)	28-Mar	211	199.8	82.3	1.01	8.5	5.5	0.5
Snake (Wallowa)	5-Apr	215	218	104.3	0.98	10.6	4.4	0
Touchet (Wallowa)	3-Apr	218	225.7	114.6	0.98	8.7	4	0.5
Tucannon (TUC) Mitigation	12-Apr	272	204.2	105.1	1.08	17.2	4.3	0.7
Tucannon (TUC) Conservation Bigs	12-Apr	217	210	102.4	1.07	11.3	4.4	0
Tucannon (TUC) Conservation Small	12-Apr	204	179.2	68.6	1.12	14.2	6.6	0
Touchet (TOU) W x W Bigs	30-Mar	228	205.9	94.8	1.06	9.3	4.8	0.0
Touchet (TOU) W x W Small	21-Apr	206	183.2	70.9	1.09	13.9	6.4	0.5

In the past, CWTs recovered from sport harvest or from adult trap returns provided a minimum estimated number of fish back to the project area, with an unknown number of fish escaping to the spawning grounds. From the 2010 run year forward, all hatchery steelhead releases in SE Washington were represented with PIT tags. Returns from PIT tags have provided better accounting of returns as compared to CWT's. As such, WDFW has shifted the adult accounting effort and now uses adult PIT tag returns to estimate total contribution of hatchery summer steelhead to the project area for mitigation assessment. Tagging levels (CWT and PIT) for steelhead evaluations were provided in Bumgarner et al, 2015.

Prior to release each year, the WDFW Snake River Lab evaluation staff collect pre-release samples from all LFC release locations (Table 5). Generally, approximately 200 fish/group are sampled, with the goal to collect fish a day or two prior to release, in order to best characterize the fish at release. For Cottonwood and Dayton acclimation sites the sample is collected a day or two before the volitional release period. All release groups from all stocks were close to or above program goals (number of fish and size of fish (target 4.5 -5.5 fish/lb) in 2023. Per NOAA Fisheries Biological Opinion requirements (NOAA Fisheries Biological Opinion, 2017), we provide the percent precocial fish in each release group as an index of potential residualism.

Beginning with the 2023 on-station release of Wallowa stock steelhead, in addition to the 5,000 PIT tag release group, there will be an additional release group of 5,000 PIT tags accompanied with a right maxillary clip. This experiment will be conducted with BY 2022 through BY 2024 to test the efficacy of this mark as an observational tool for broodstock collection at the Tucannon Fish Hatchery Trap. Because the supplementation groups have underperformed, and the mitigation groups are not differentially marked from other stray hatchery groups, this has led to years that brood is not made for the Tucannon stock. This mark might allow hatchery staff to quickly identify potential Tucannon stock brood to collect for future brood usage. Evaluation staff will use the Wallowa on-station release to test the feasibility of marking, and then any effects on juvenile or total survival before implementing in the Tucannon endemic stock. This experiment should have results completed by RY 28.

Hatchery Smolt Outmigration Speed and Survival

In 2017 and 2018, NOAA fisheries completed their review of WDFW steelhead programs in SE Washington. Per those reviews, Biological Opinions were completed, as well as Section 10 (Tucannon), Section 7 (Wallowa stock) or 4(d) (Touchet) permits were obtained. Within the Biological Opinions, terms and conditions were set to describe annual monitoring metrics for each hatchery program (Appendix B). One requirement was to provide a metric for the juvenile outmigration of each release group, specifically an index of the travel speed of juvenile's post-

release within the action area. The action area was defined through the Snake River Basin, so McNary Dam was used for each release group as the location to estimate travel speed based on PIT tag detections. NOAA Fisheries determined through their PCD Risk model that travel speeds of >5 km/day were considered adequate to not severely impact natural origin fish (either through competition or predation).

In addition to determining travel speed for each release group, WDFW felt it would be useful to estimate survivals to the first downstream mainstem dam encountered for each release group. The first dam of encounter must be used to estimate survival as Snake River Basin release groups are subject to possible transport at Lower Granite, Little Goose, and Lower Monumental dams which can bias survival estimates if fish are passing those dams when transportation is occurring. Estimating and reporting downstream survival is not a requirement of the Biological Opinions but may be useful in describing/explaining future adult return success or failures.

Cottonwood AP Releases

At the Cottonwood AP release site, PIT tags have been implanted and released in summer steelhead since 2008. Average and median travel speeds to McNary Dam have ranged between 10-20 km/day (Figure 2), well above the travel speed criteria set in the Biological Opinion. Except for the 2022 and 2023 migration years, estimated survival to Lower Granite Dam has generally been above 70% for all years, with most years ranging between 80-90% (Figure 3).

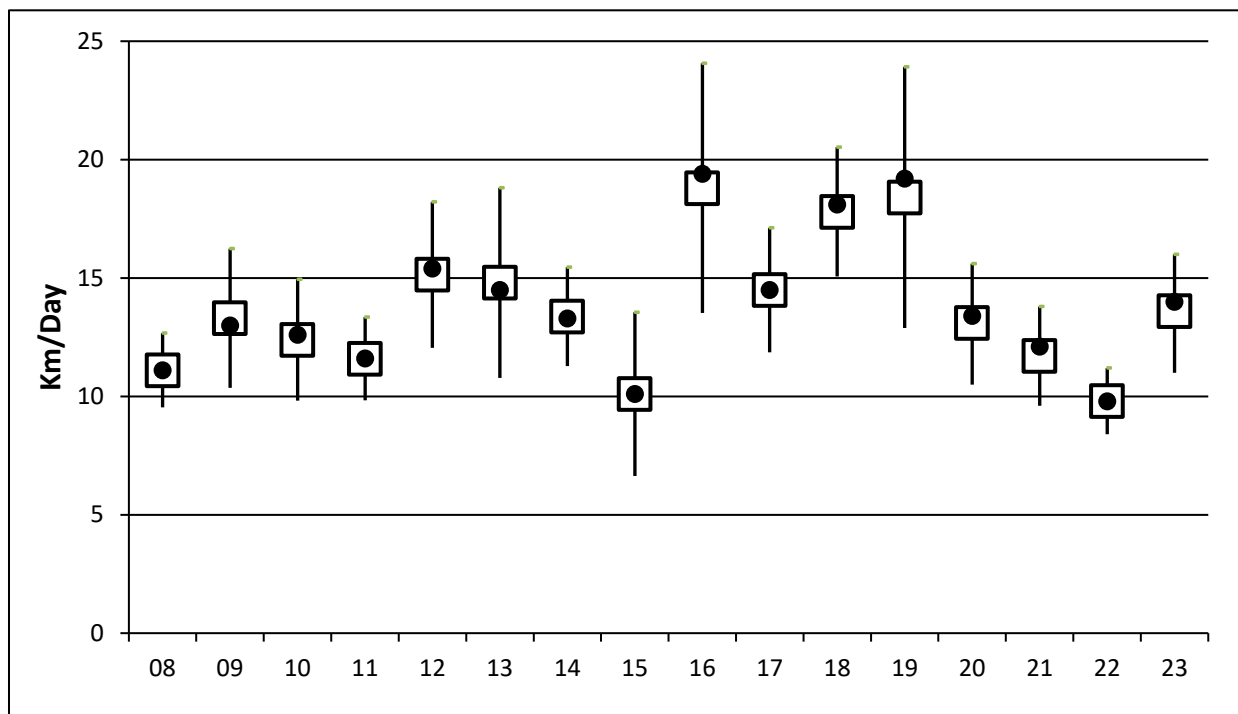


Figure 2. Estimated average travel speed (Km/day with S.D.) and median travel speed (black dot) of Wallowa stock summer steelhead released from Cottonwood AP in the Grande Ronde River to McNary Dam 2008-2023 migration years.

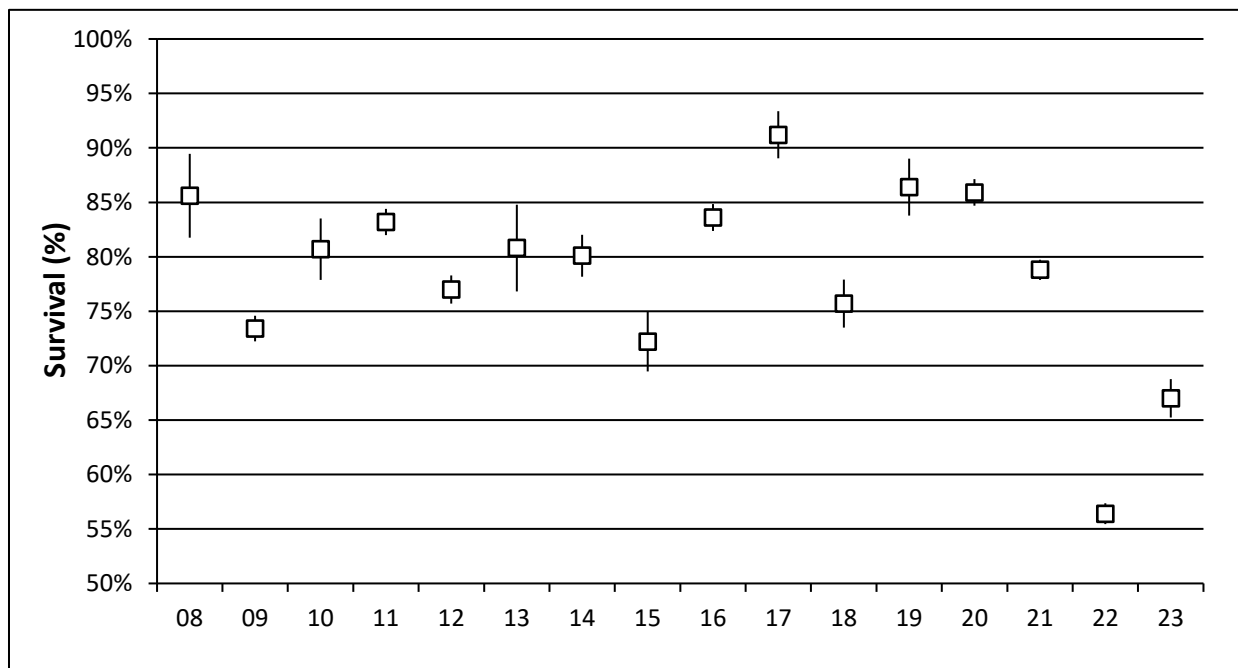


Figure 3. Estimated survival (S.E.) of Wallowa stock summer steelhead released from Cottonwood AP in the Grande Ronde River to Lower Granite Dam, 2008-2023 migration years.

Touchet River and Dayton AP Releases

For Touchet River releases (Touchet or LFH/Wallowa stocks), PIT tags have been utilized since 2004 or 2007, respectively. Average and median travel speeds to McNary Dam for both stocks have generally been between 5-10 km/day (Figure 4), with only a few years below the NOAA travel speed criteria. Estimated survival to McNary Dam for the Touchet stock has generally ranged from 5-35% over the years (except 2021 where survival to McNary Dam was estimated at 70%). Survival had appeared to be increasing in more recent years, which we initially attributed as a direct response to some rearing changes at LFH. However, estimated survival in 2020 and 2022 had once again dropped off. Estimated survival to McNary Dam for the LFH/Wallowa stock has generally been around 50% for all years (Figure 5), with survival of both groups, while different except for 2014 and 2021 migration years, appear to be strongly correlated (Figure 6), suggesting that migration conditions are applying similar pressures on downstream survival in most years. Survivals to McNary Dam for the LFH/Wallowa stock have generally been 2-times those of the Touchet stock. This apparent survival difference to McNary Dam has also generally been reflected in the smolt-to-adult survival rates observed for these two stocks released in the Touchet River (Figure 7).

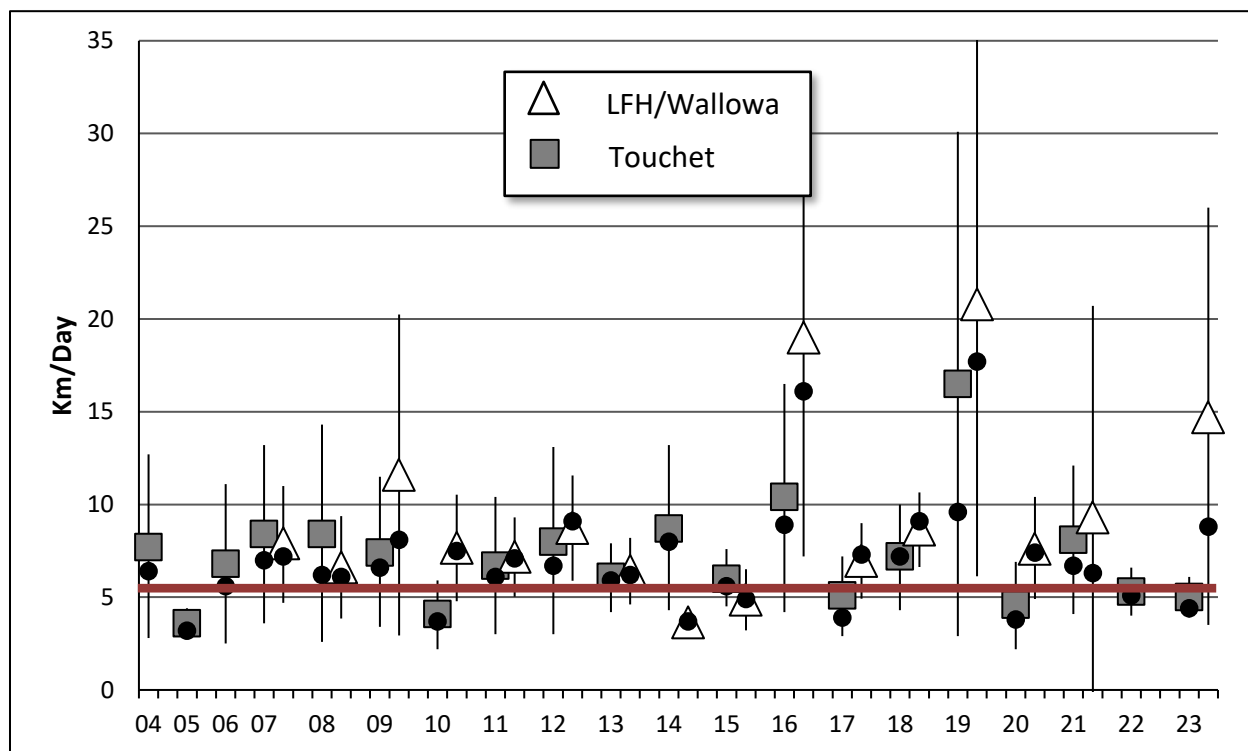


Figure 4. Estimated average travel speed (km/day with S.D.) and median travel speed (black dot) of LFH/Wallowa stock and Touchet endemic stock summer steelhead released from Dayton AP or in the Touchet River to McNary Dam, 2004-2023 migration years. Note: no releases of Wallowa stock steelhead occurred from Dayton AP in 2022.

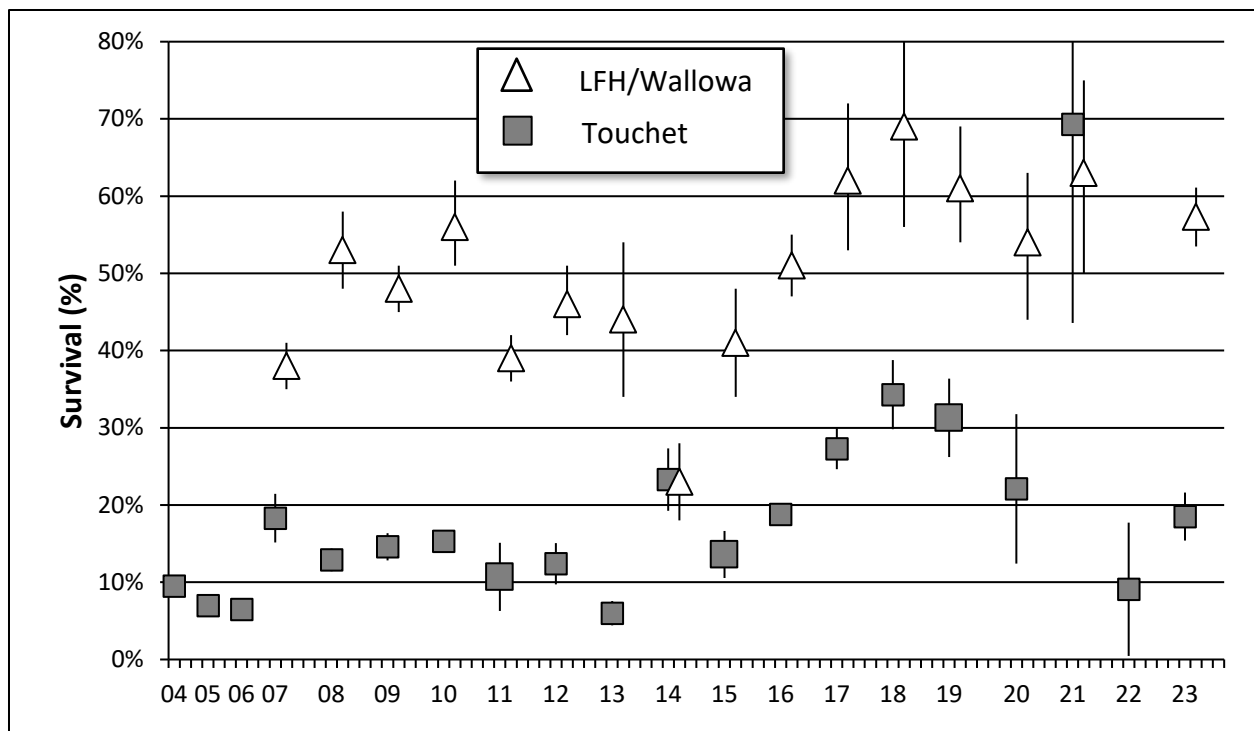


Figure 5. Estimated survival (S.E.) of LFH/Wallowa stock and Touchet endemic stock summer steelhead released from Dayton AP or in the Touchet River to McNary Dam, 2007-2023 migration years.

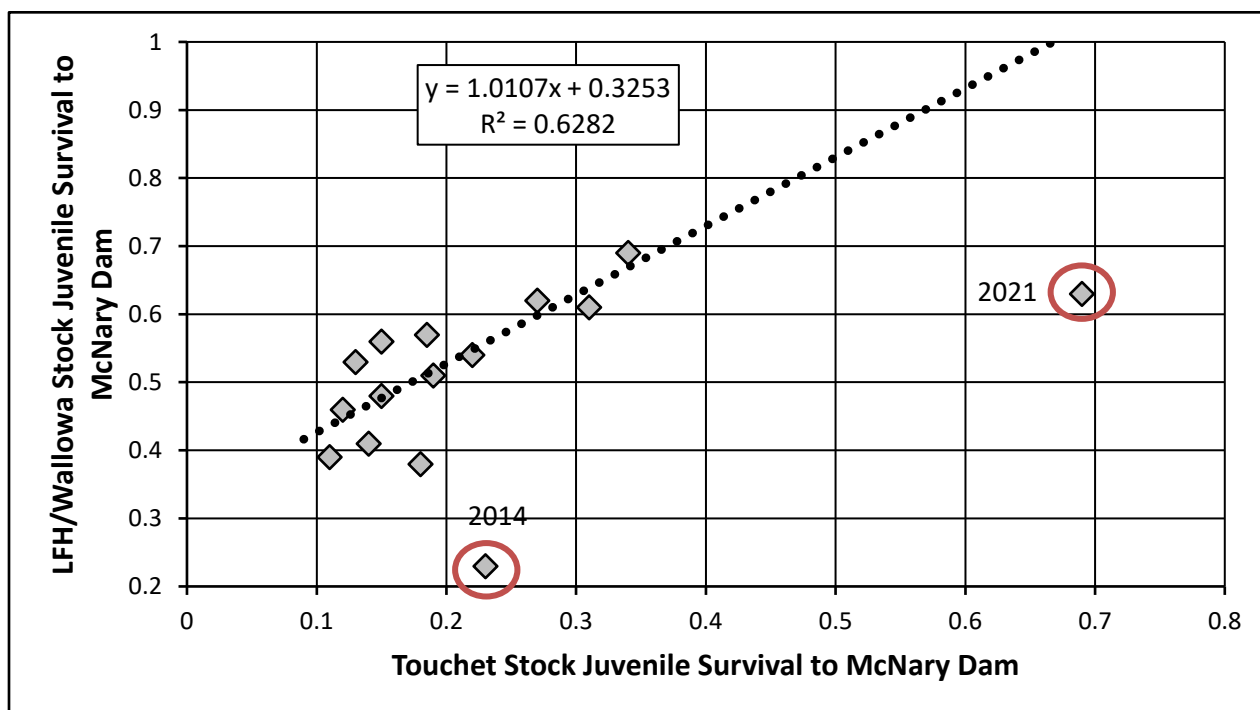
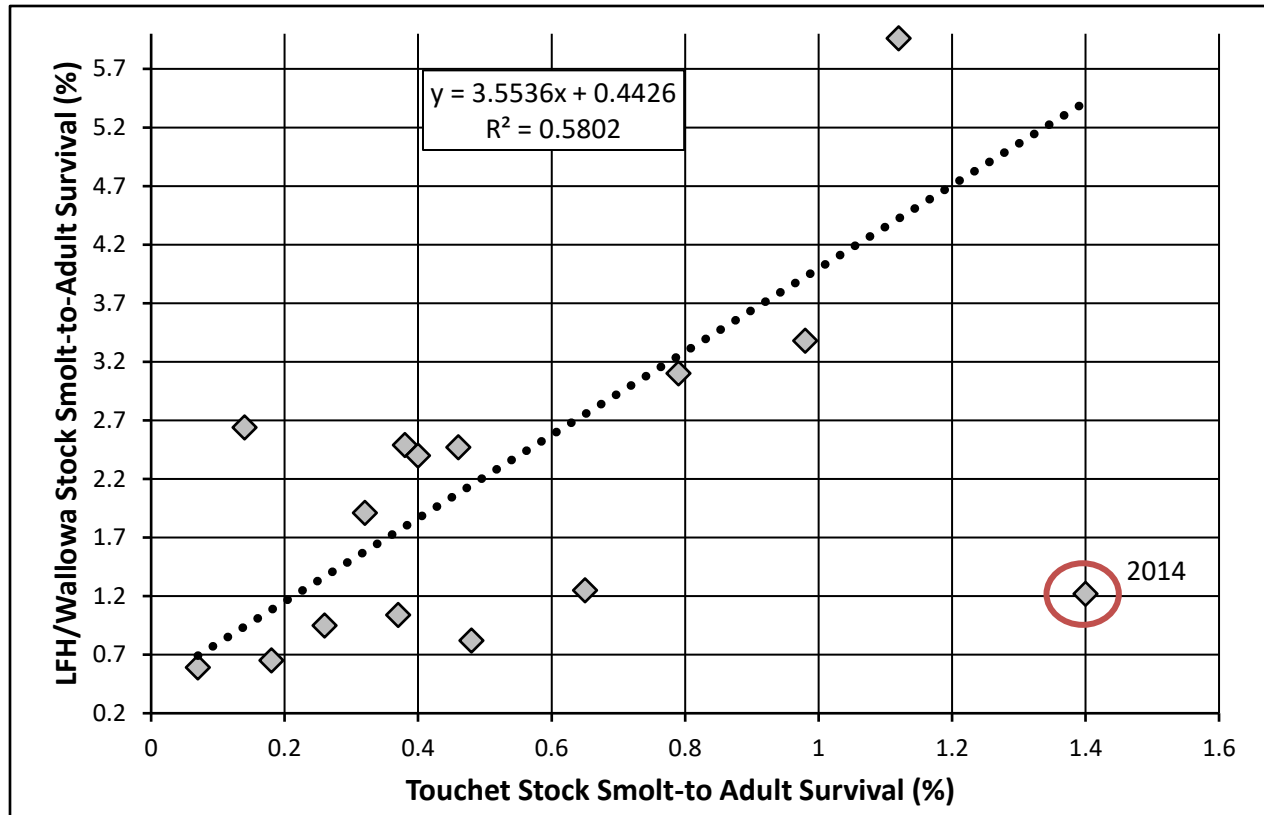


Figure 6. Relationship of juvenile steelhead survivals between Touchet and LFH/Wallowa stock to McNary Dam, 2007 to 2023 migration years.



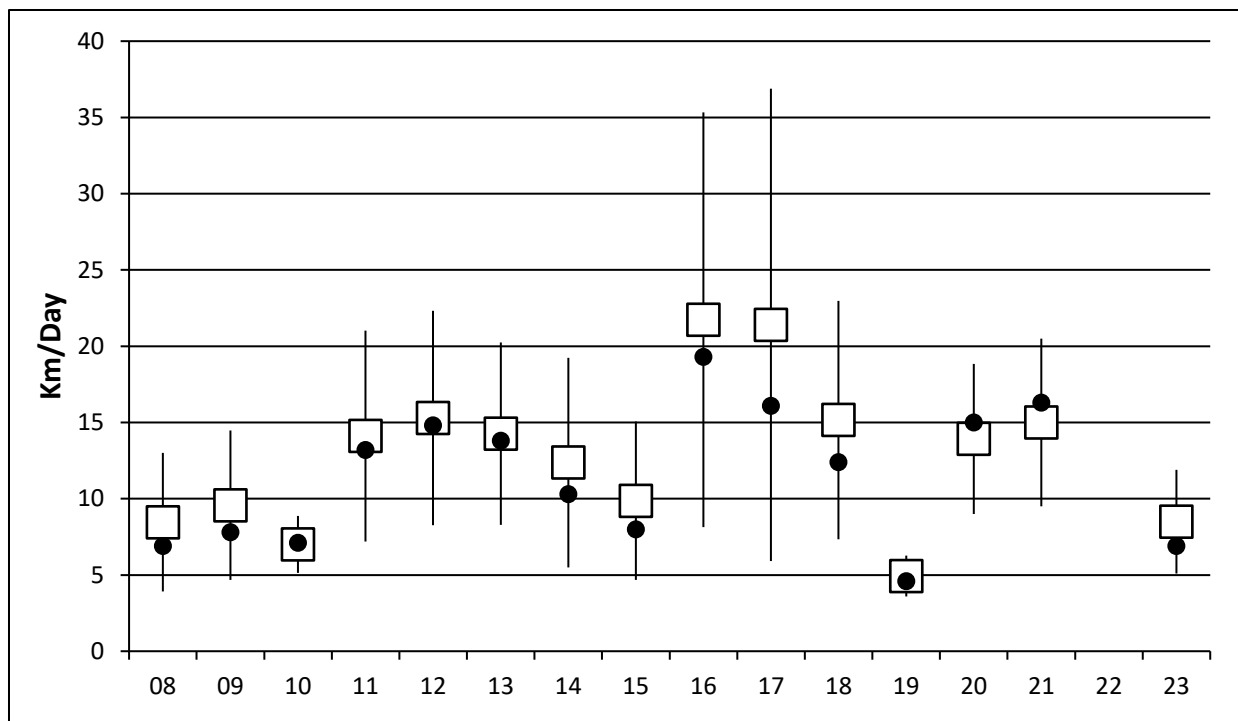


Figure 8. Estimated average travel speed (km/day with S.D.) and median travel speed (black dot) of LFH/Wallowa stock summer steelhead released on-station at Lyons Ferry Hatchery into the Snake River to McNary Dam, 2008-2023 migration years. Note: no PIT tagged releases in 2022 due to accidental release.

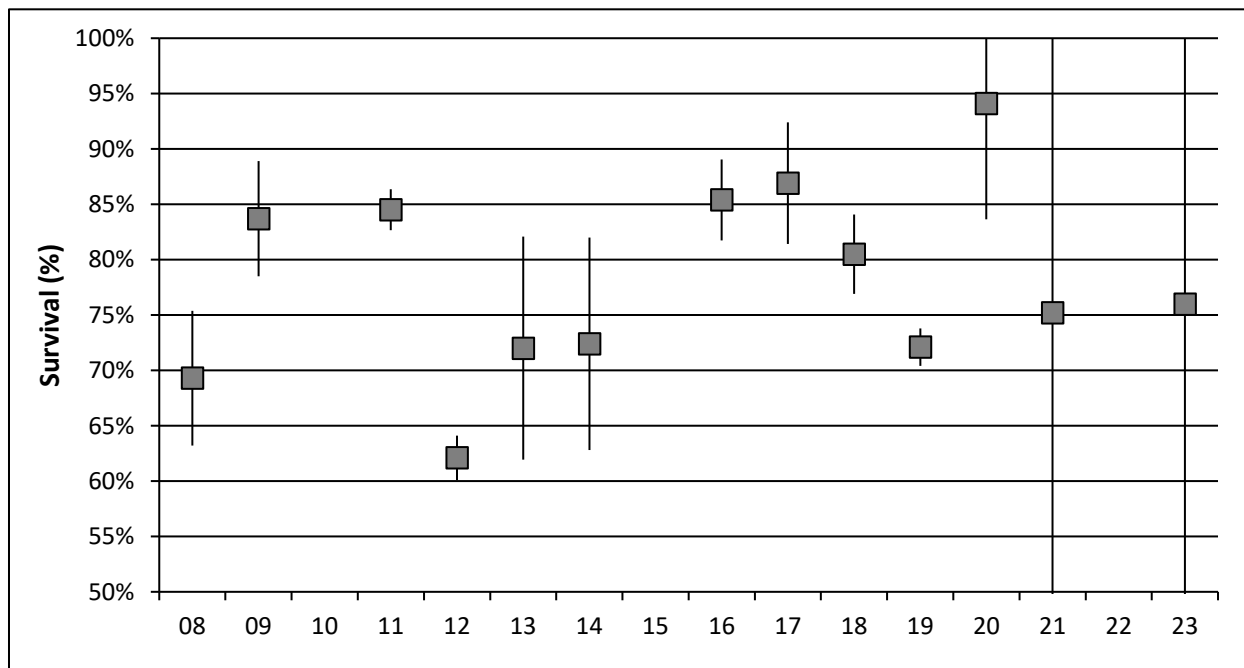


Figure 9. Estimated survival (S.E.) of LFH/Wallowa stock summer steelhead released from on-station at Lyons Ferry Hatchery into the Snake River to Lower Monumental Dam, 2008-2023 migration years. Note: no PIT tagged releases in 2022 due to accidental release.

Tucannon River Releases

For Tucannon River endemic stock releases, PIT tags have been utilized since 2004. Average and median travel speeds to McNary Dam range between 4-11 km/day (Figure 10), with only two years below the 5 km/day NOAA criteria. Travel speeds between the mitigation and conservation groups are generally very similar. Estimated survival to Lower Monumental Dam has varied widely, ranging from 20-70% with an overall average of about 40% (Figure 11). Note: in some of the more recent years, valid survival estimates have not been produced and is thought to be related to the flex-spill program at the Snake River dams which has limited the number of detections used to generate estimates.

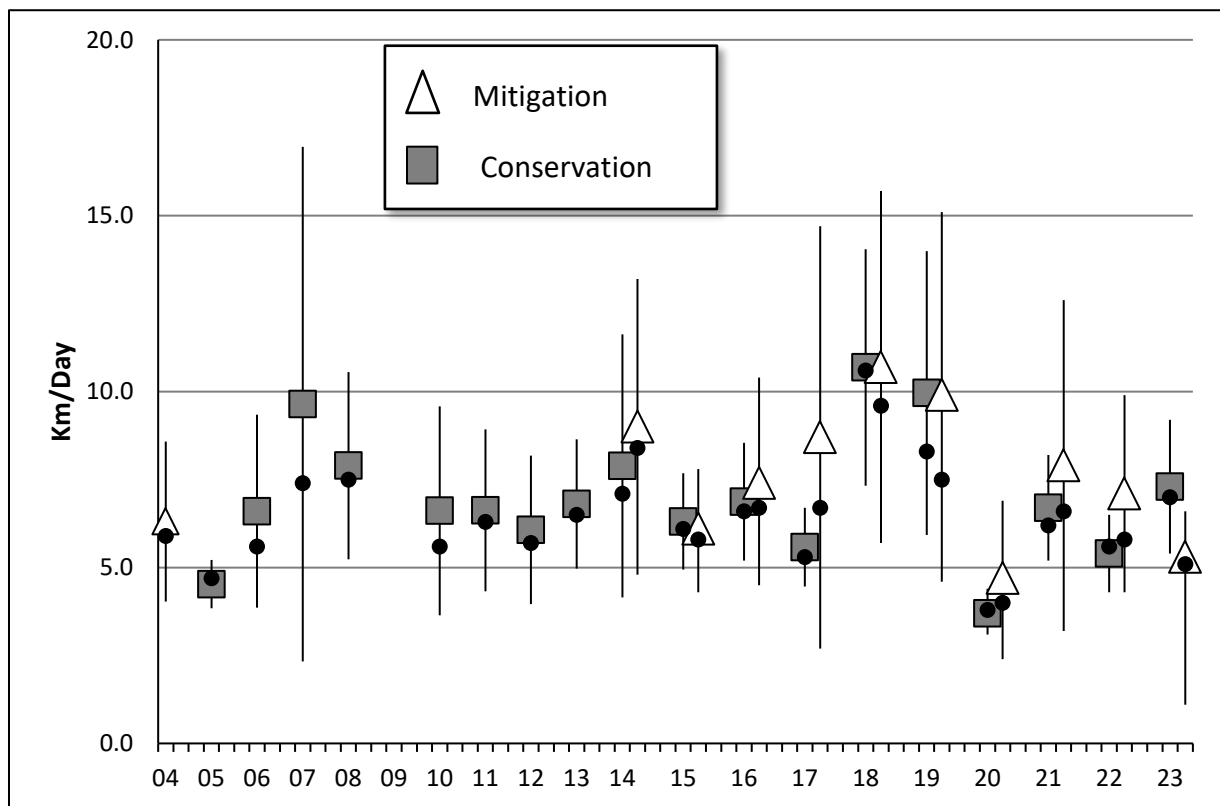


Figure 10. Estimated average travel speed (km/day with S.D.) and median travel speed (black dot) of Tucannon Endemic stock (conservation and mitigation groups) summer steelhead released into the upper Tucannon River at Curl Lake Intake, Curl Lake AP, or at Marengo to McNary Dam, 2004-2023 migration years.

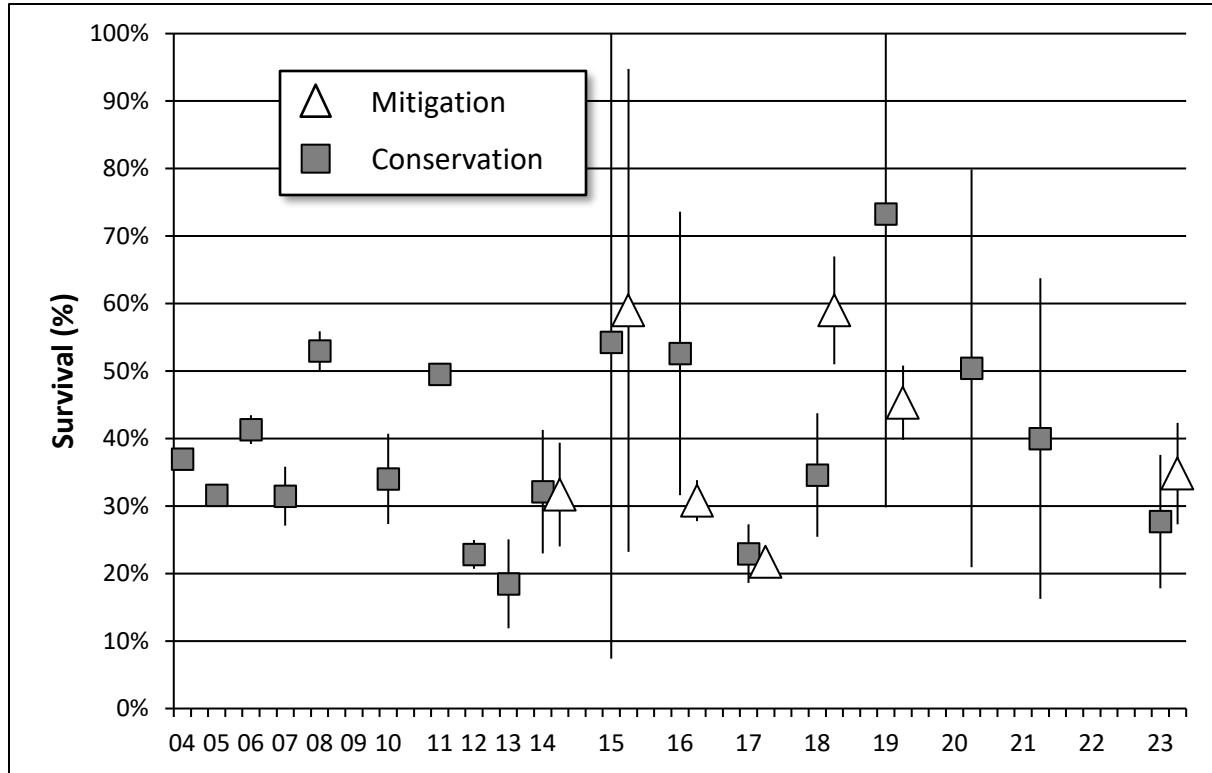


Figure 11. Estimated survival (S.E.) of Tucannon Endemic stock (conservation and mitigation groups) summer steelhead released into the Tucannon River at Curl Lake Intake, Curl Lake AP, or at Marengo to Lower Monumental Dam, 2004-2022 migration years (excluding 2009 as there was no production that year. MY20-21 the mitigation group did not produce reliable estimates of survival and neither group did in MY 22).

Tucannon River Natural Steelhead Smolt Production, Smolt-to-Adult Survival, and Adult Return Estimates

Natural-origin steelhead monitoring in the Tucannon River began in 1986 with redd surveys and juvenile electrofishing surveys. In 1997, with the addition of a rotary screw trap, smolt production from the basin could be monitored, and also provided an opportunity to tag (PIT) fish to monitor downstream migration (timing and survival) and possibly adult returns. Juvenile electrofishing surveys ceased in 2007 and redd surveys were generally inadequate to estimate spawners for the entire basin. Hence smolt trapping, PIT tagging, and installation of in-stream PIT tag arrays (2005) have allowed for some longer time-series of natural production and returns to be documented.

Smolt Outmigration

During the reporting period, evaluation staff continued to operate a 1.5m rotary screw trap at rkm 3.0 on the Tucannon River. Methods to estimate smolt production are identical to those described in Gallinat et al. (2012) based on the approach of Steinhorst et al. (2004). This involved using a Bailey-modified Lincoln-Peterson estimation with 95% bootstrap confidence intervals by running the Gauss Run-Time computer program (version 7.0). Bootstrap iterations numbered 1,000. The program allows for the division of the out-migration trapping season into strata with similar capture efficiencies if at least seven marked recaptures occurred. Strata with less than seven recaptures were grouped with either the preceding or following strata, depending upon similarity in trapping/flow conditions. Where river conditions were similar, we used our best judgment to group the strata.

Table 6. Smolt population estimates with upper and lower confidence intervals derived from the Tucannon River Smolt Trap, and proportions of each estimate by age class. *Combined point estimates due to truncated trapping periods, should be considered a minimum estimate.

Migration Year	Population Estimate			Smolt Age				Smolt Age %			
	Pop (N)	Lower	Upper	Age 1	Age 2	Age 3	Age 4	Age 1	Age 2	Age 3	Age 4
1997/98	30,060	20,396	46,888	17,224	11,964	872	0	57.3	39.8	2.9	0.0
1998/99	17,990	14,628	22,381	6,674	10,470	846	0	37.1	58.2	4.7	0.0
1999/00	17,758	12,770	25,967	6,109	10,285	1,350	14	34.4	57.9	7.6	0.1
2000/01	22,636	17,384	31,097	10,141	11,696	792	7	44.8	51.7	3.5	0.0
2001/02	7,818	5,573	11,610	3,308	4,338	165	7	42.3	55.5	2.1	0.1
2002/03	16,688	13,615	21,219	8,310	7,610	768	0	49.8	45.6	4.6	0.0
2003/04	13,124	10,708	17,242	2,992	8,990	1,116	26	22.8	68.5	8.5	0.2
2004/05	15,812	11,347	24,786	3,210	9,329	3,257	16	20.3	59.0	20.6	0.1
2005/06	9,092	7,722	10,911	1,491	6,574	1,018	9	16.4	72.3	11.2	0.1
2006/07	11,500	9,683	13,837	1,392	9,619	483	6	12.1	83.7	4.2	0.1
2007/08	26,099	20,189	34,647	6,316	16,991	2,766	26	24.2	65.1	10.6	0.1
2008/09	9,033	7,120	11,638	3,830	4,833	361	9	42.4	53.5	4.0	0.1
2009/10	15,348	13,428	17,891	11,846	3,116	384	2	77.2	20.3	2.5	0.0
2010/11	27,288	23,352	31,880	9,332	17,219	737	0	34.2	63.1	2.7	0.0
2011/12	25,636	19,969	33,760	14,152	10,049	1,384	51	55.2	39.2	5.4	0.2
2012/13	23,269	19,421	28,612	7,469	13,845	1,908	47	32.1	59.5	8.2	0.2
2013/14	16,194	12,537	21,948	9,626	6,005	550	13	59.4	37.1	3.4	0.1
2014/15	5,322	2,736	9,801	1,843	2,903	576	0	34.6	54.6	10.8	0.0
2015/16	25,047	22,138	28,881	10,767	13,101	1,179	0	43.0	52.3	4.7	0.0
2016/17	20,391	17,324	24,864	10,345	9,140	894	12	50.7	44.8	4.4	0.1
2017/18	23,797	18,562	31,109	8,414	14,035	1,348	0	35.3	59.0	5.7	0.0
2018/19	20,534	16,882	25,953	7,854	11,151	1,494	35	38.2	54.3	7.7	0.2
2019/20	35,325*	N/A	N/A	18,623	15,395	1,307	0	52.7	43.6	3.7	0.0
2020/21	38,710	26,862	60,839	21,328	16,000	1,340	42	55.1	41.3	3.5	0.1
2021/22	50,021	37,390	70,521	26,696	22,506	792	27	53.4	45.0	1.6	0.0
2022/23	20,382	15,524	27,816	3,602	14,527	2,158	95	17.7	71.3	10.6	0.4
<i>Totals</i>											
97/98 to 22/23	544,874			232,894	281,691	29,845	444	40.1	53.7	6.1	0.1

2022 Migration Year

During the 2021/2022 trapping season the trap was operated from 30 October, 2021 to 16 July, 2022. A total of 1,500 natural steelhead (>124mm) migrants were captured for the season. We estimated 50,021 total migrants (95% CI: 37,390 – 70,521; Table 6) A total of 379 migrants were less than 125mm (358 were between 80-124mm, the rest were nearly emerged fry). Most of the fish between 80-124mm were captured during the fall months, and the newly emerged fry in the late spring. The number of fish in this size category is normally much smaller (<100 for a season). No migration estimate is made for fish smaller than 125mm due to their general infrequency of capture and unknown trapping efficiency. Age composition of migrating smolts >124mm was 53.4% Age 1, 45.0% Age 2, 1.6% Age 3, and 0.1% Age 4. Mean length, weight, and K-factor for >124mm natural fish captured (all age groups combined) was 158.2 mm (SD=20.0), 42.7g and 1.03, respectively. Peak out-migration in the Fall was 15 October with an estimated 890 summer steelhead migrants past the trap on that day. Peak out-migration in the Spring was 27 May with an estimated 971 summer steelhead migrants past the trap on that day. Summer steelhead were captured migrating from the Tucannon River from October 2021 thru June 2022. There was also a third peak between the fall and spring season on 5 January with an estimated 1,392 emigrants past the trap on that day (Figure 12). It should be noted that catches are not necessarily reflective of total outmigration on a particular day as trapping efficiencies vary throughout the trapping season.

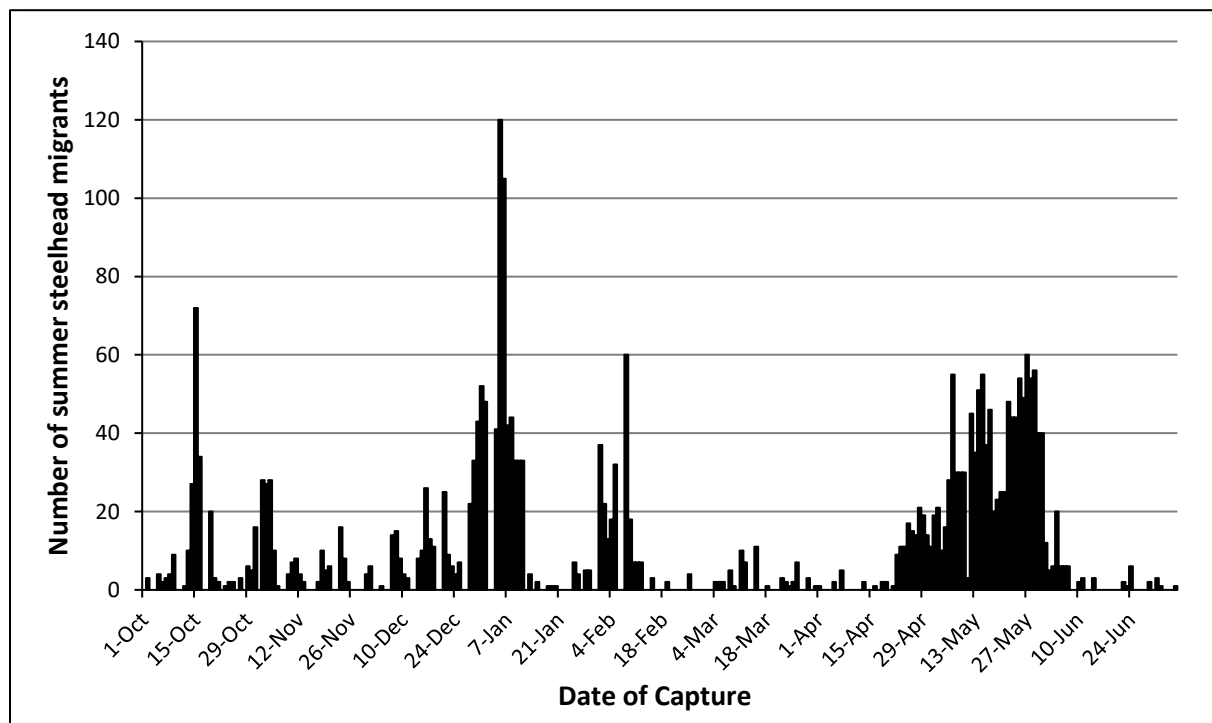


Figure 12. General migration timing of natural origin summer steelhead from the Tucannon River, 2021/2022 migration year. (Note: all size categories are included here (<80, 80-124mm, >124mm)).

2023 Migration Year

During the 2022/2023 trapping season the trap was operated from 30 September 2022 to 30 June, 2023. A total of 1,424 natural steelhead (>124mm) migrants were captured, for an estimated 20,382 total migrants (95% CI:15,524 – 27,816–; **Error! Reference source not found.**). One hundred forty-two migrants were less than 125mm (24 were between 80-124mm, the rest were nearly emerged fry). No migration estimate is made for fish smaller than 125mm due to their infrequency of capture and unknown trapping efficiency. Age composition of migrating smolts >124mm was 17.7% Age 1, 71.3% Age 2, 10.6% Age 3, and 0.5% Age 4. Mean length, weight, and K-factor for >124mm natural fish captured (all age groups combined) was 172.0 mm (SD=20.6), 56.5 g and 1.06, respectively. Peak out-migration was 3 May with an estimated 631 summer steelhead migrants past the trap on that day. Summer steelhead were captured migrating from the Tucannon River from October 2022 through June 2023 (Figure 13). It should be noted that catches are not necessarily reflective of total outmigration on a particular day as trapping efficiencies vary throughout the trapping season.

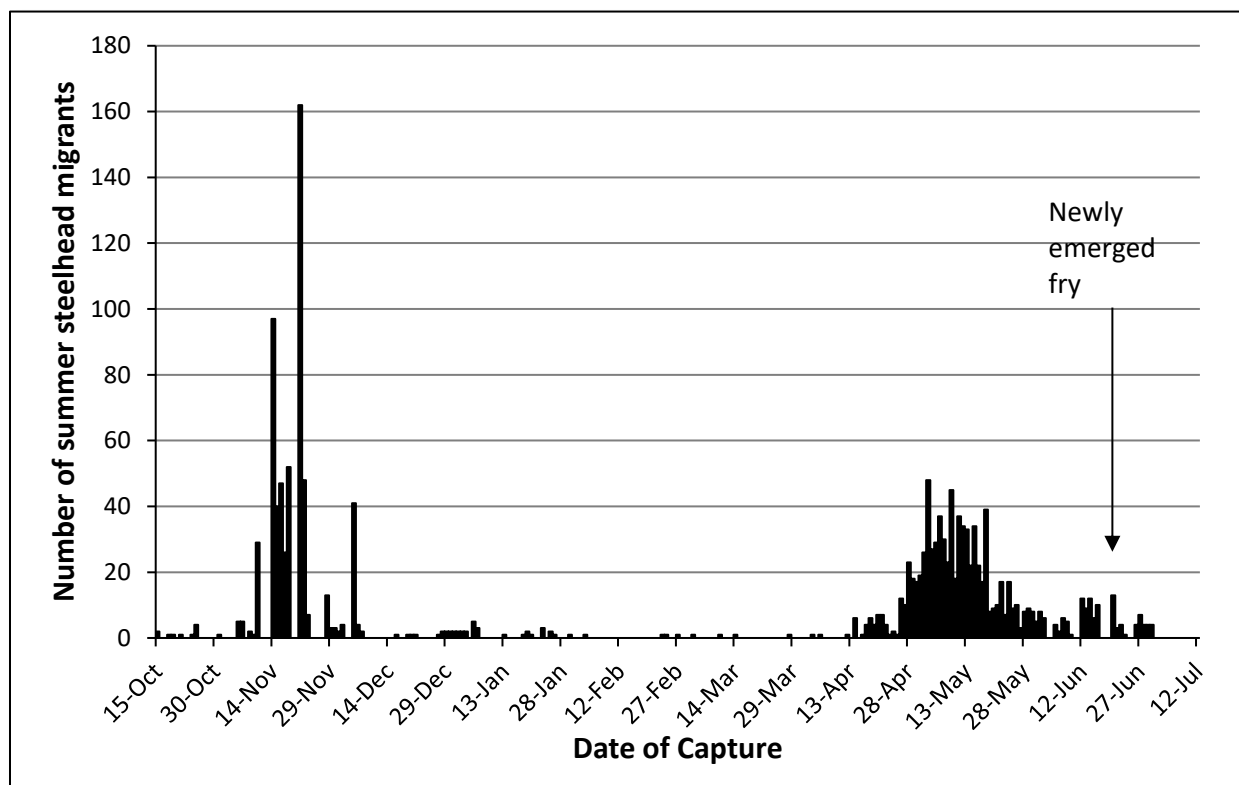


Figure 13. General migration timing of natural origin summer steelhead from the Tucannon River, 2022/2023 migration year. (Note: all size categories are included here (<80, 80-124mm, >124mm).

Smolt-to-Adult Survival

Staff continue to PIT tag natural origin steelhead migrants from the Tucannon River smolt trap to estimate smolt-to-adult survival and estimate adult returns through the use of a series of four PIT Tag arrays in the Tucannon River Basin (operations and maintenance funded by Bonneville Power Administration project #2010-050-00). The average smolt-to-adult survival of natural origin summer steelhead from the Tucannon River (based on the PIT tags from 2002 through 2021 migration years) is 1.9% back to Bonneville Dam and 1.5% to the LSRCP project area above Ice Harbor Dam (Table 7).

Table 7. Estimated smolt-to-adult survival rate of naturally produced summer steelhead smolts from the Tucannon River based on adult PIT tag detections at Bonneville and Ice Harbor dams, 1999-2022 migration years.

Smolt Migration Year	Number of steelhead tagged ^a	Bonneville Dam	Survival	Ice Harbor Dam	Survival
2002	1,506	39	2.6%	31	2.1%
2003	1,556	35	2.2%	28	1.8%
2004	1,984	31	1.6%	17	0.9%
2005	1,835	27	1.5%	20	1.3%
2006	1,417	33	2.3%	18	1.3%
2007	300	8	2.7%	5	1.7%
2008	1,087	68	6.3%	55	5.1%
2008	1,200	35	2.9%	26	2.3%
2010	2,632	82	3.1%	65	2.4%
2011	3,087	28	0.9%	17	0.6%
2012	2,200	54	2.4%	49	1.9%
2013	2,967	80	2.7%	71	2.4%
2014	1,506	22	1.5%	20	1.3%
2015	281	2	0.7%	2	0.7%
2016	3,418	32	0.9%	24	0.7%
2017	2,287	10	0.4%	6	0.3%
2018	1,434	23	1.5%	16	1.0%
2019	2,113	4	0.2%	3	0.1%
2020	2,565	32	1.2%	26	1.0%
2021	1,575	13	0.8%	10	0.6%
2022 ^b	2,280	13	0.6%	13	0.6%
Geomean			1.49%		1.11%
Average			1.92%		1.48%

^a The number of steelhead PIT tagged at the smolt trap are for fish >124mm only.

^b 1-salt returns only, these are not included in the geomean or average calculations.

Tucannon River Adult Escapement

Recently, WDFW has consolidated BPA and LSRCP funding to better determine the escapement of all summer steelhead into the Tucannon River. Through the combination of smolt trapping, PIT Tagging, and installation of four PIT Tag Arrays in the Tucannon River Basin, estimates of

adult escapement are more readily derived. Estimates of natural, endemic and LFH stock origin (Tucannon River releases only), and other hatchery and natural origin returns to the Tucannon River are presented for the 2009-2021 run years (Figure 14). Estimates of the number of spawners by origin (post-harvest), and the proportion of hatchery origin spawners (pHOS) has been calculated (Figure 15). The estimates provided in Figures 14 and 15 represent fish detected by the arrays and then adjusted for array efficiency. In most years, array efficiency for summer steelhead at the Lower Tucannon Array is generally >80%.

Tucannon Steelhead Escapement

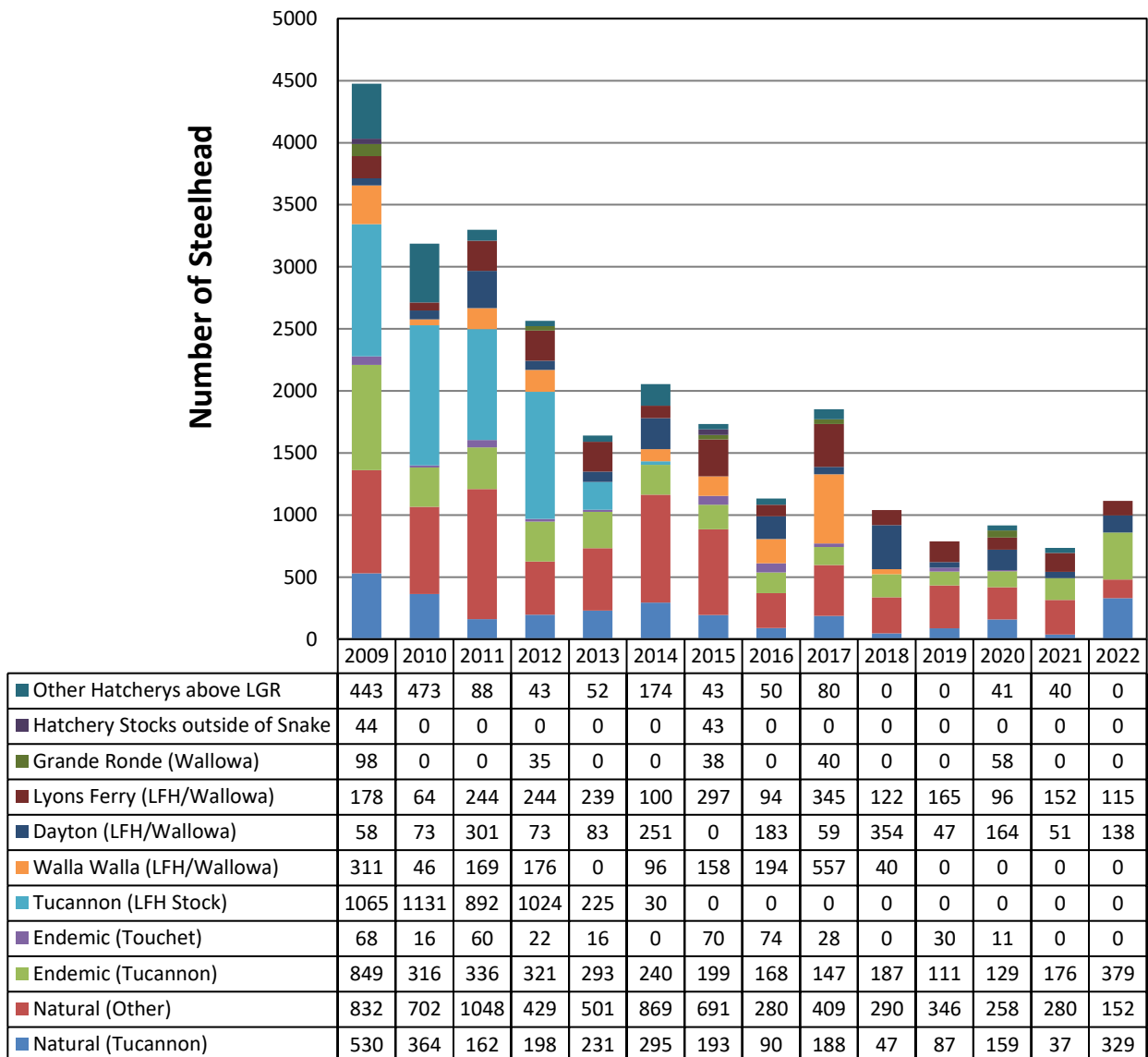


Figure 14. Estimated escapement of summer steelhead into the Tucannon River, 2009-2022 run years. Estimates provided represent fish detected and then adjusted by the Lower Tucannon River (LTR) array efficiency.

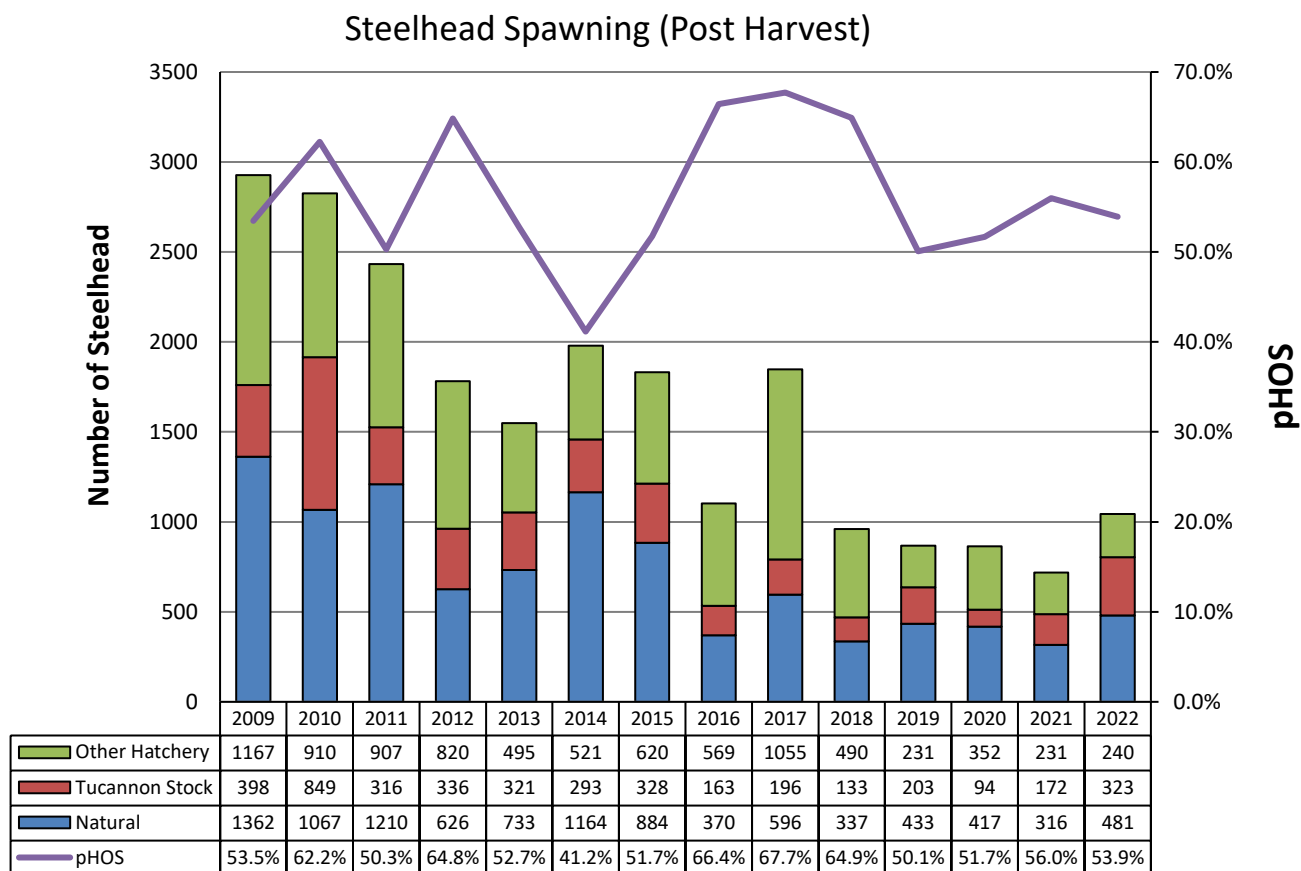


Figure 15. Estimated natural and hatchery composition escapement post-harvest of summer steelhead into the Tucannon River, 2009-2022 run years.

Based on the data to date (Figure 14), the average of the Tucannon River natural origin stock return for the last fourteen run years is 208 fish. This estimate is 77 fish below the critical minimum abundance threshold (MAT) of natural-origin adults (285 spawners) described in WDFW's Fishery Management Evaluation Plan (FMEP). However, other small tributaries along the Snake River and proximal to the Tucannon River are also considered part of the Tucannon population at this time. WDFW is funded by BPA to monitor some of these other streams. To date, most of these smaller streams do not have that many natural origin fish returning, and many have considerable amounts of hatchery origin fish entering them (mainly from the Tucannon hatchery program, or released from Lyons Ferry, Touchet and Walla Walla river releases). Discussions with NOAA Fisheries should occur at some point in the future to see if these small streams should remain in the Tucannon population or be treated separately.

Adult Migratory Patterns Based on PIT tags

PIT tag detectors in the adult ladders of mainstem Columbia and Snake River dams have been in place for a number of years and allow the estimation of conversion rates from Bonneville Dam to either McNary Dam (for Walla Walla Basin releases) or to Ice Harbor Dam (for releases in the Snake River relative to the LSRCP mitigation goal). In addition, in-stream tributary detectors (PIT tag arrays) have become more common and provide more information on returns and distributions into specific streams where they are present (e.g. Tucannon River, Walla Walla River). PIT tagging of our various hatchery steelhead stocks, and natural origin fish in some places (e.g. Tucannon River) started at different times depending on monitoring needs or PIT tags available. Therefore, the time series available to describe adult migratory conversion rates and patterns (by origin and/or hatchery stock) varies. Regardless, these time-series have proven useful and continue to highlight one of the major issues we face in SE Washington; that of overshooting steelhead and straying.

From Bonneville Dam to McNary or Ice Harbor Dam, conversion rates of WDFW LSRCP steelhead groups remain relatively high and consistent from year to year (Figures 16 and 17). Conversion rates of natural origin steelhead from either the Walla Walla Basin or the Tucannon River are very similar to the hatchery origin groups (Figures 16 and 17).

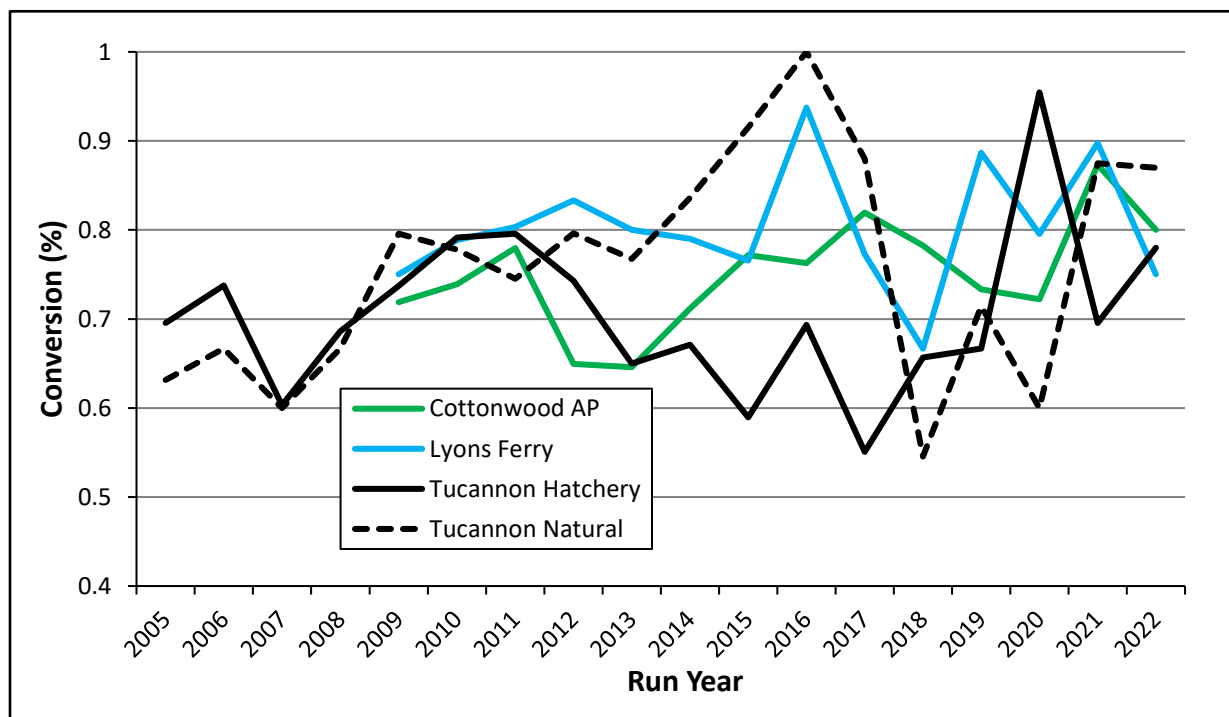


Figure 16. Conversion rates from Bonneville Dam to Ice Harbor Dam of hatchery summer steelhead released at Cottonwood AP on the Grande Ronde River, Lyons Ferry on the Snake River, or in the Tucannon River, and natural origin fish from Tucannon River (2005-2022 Run Years).

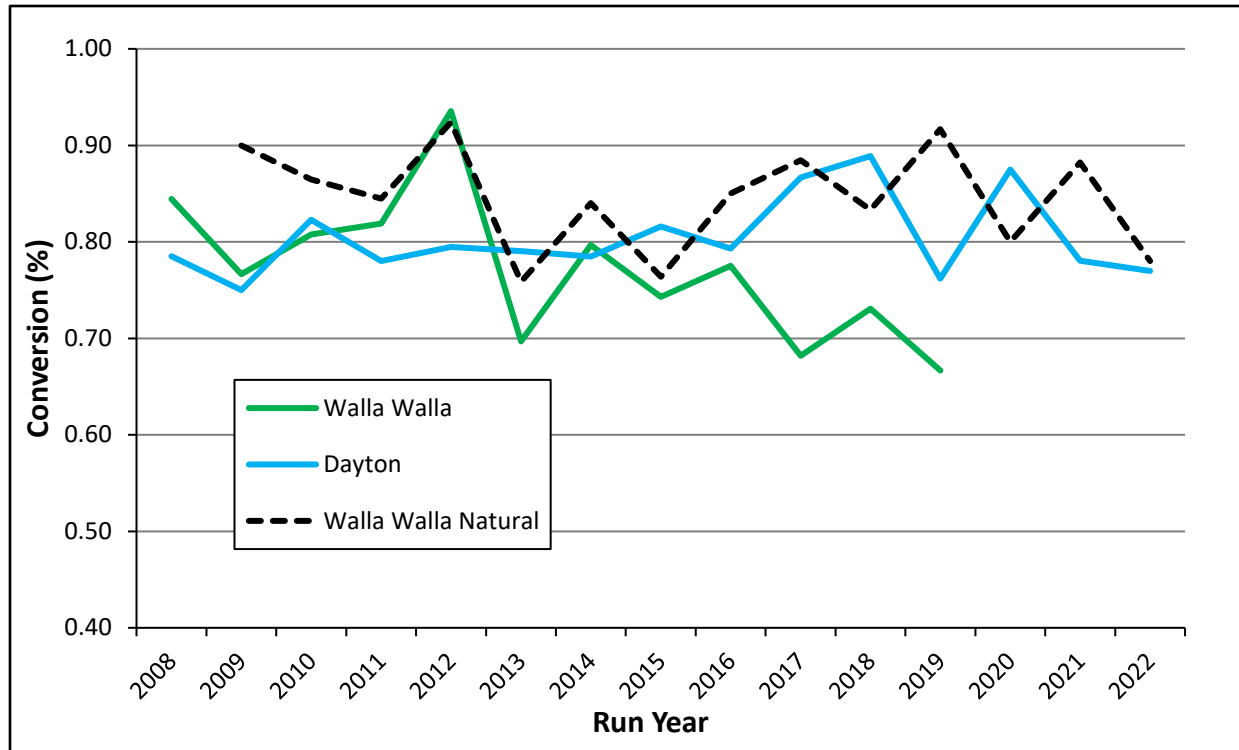


Figure 17. Conversion rates from Bonneville Dam to McNary Dam of hatchery summer steelhead released in the Walla Walla River or from Dayton AP, and natural origin fish from the Walla Walla Basin (2008-2022 Run Years).

Over the duration of the reporting period, WDFW continued to monitor the general distribution of adult hatchery and natural origin summer steelhead from the Tucannon River, which as shown in previous reports, migrate past the Tucannon River and may remain upstream of Lower Granite Dam (Table 8), though it appears in more recent years that a higher percentage fish are able to fallback to the Tucannon River for both hatchery and natural origin fish. This increase in fallback rate to the Tucannon River could be a result of increased spill that has started earlier in the spring in the last 4-5 years, interment fall spill, or greater detection capabilities at PIT tag array sites due to improvements in technology.

Similar to groups of steelhead from the Tucannon River, we see natural and hatchery origin summer steelhead within the Walla Walla River Basin overshoot and may remain above Ice Harbor Dam in the Snake River (Table 9, Table 10). Other Columbia Basin researchers have documented the same overshoot issue with steelhead from the John Day and Umatilla rivers (Jim Ruzycki, Oregon Dept. of Fish and Wildlife pers comm). Many of the overshoot steelhead from the middle Columbia River populations end up in the Snake River as well, with some straying and spawning in the Tucannon River. We will continue to monitor this overshoot behavior and assess potential impacts to steelhead populations.

Table 8. Detections of PIT tagged Tucannon Endemic stock and Tucannon natural stock summer steelhead released into the Tucannon River that passed Ice Harbor Dam (IHR) and Lower Granite Dam (LGR).

Run Year	# Pass IHR	# Pass LGR	# that Initially Enter Tucannon	Unknown Location	# Back to Tucannon from LGR	% fallback rate to Tucannon from LGR	Total into Tucannon ^a	Percent of those that passed Ice Harbor Dam		
								% into	% above	%
								Tucannon	LGR	Unknown
Tucannon Endemic Hatchery Stock Summer Steelhead										
2005	32	24	5	3	4	16.7%	9	28.1%	62.5%	9.4%
2006	59	36	19	4	6	16.7%	25	42.4%	50.8%	6.8%
2007	73	50	17	8	15	30.0%	32	43.8%	45.2%	11.0%
2008 ^a	118	79	34	12	21	26.6%	55	46.6%	43.2%	10.2%
2009	334	215	96	25	49	22.8%	145	43.4%	49.1%	7.5%
2010	114	72	28	17	15	20.8%	43	37.7%	47.4%	14.9%
2011	39	18	20	2	7	38.9%	27	69.2%	25.6%	5.1%
2012	52	23	26	4	9	39.1%	35	67.3%	25.0%	7.7%
2013	78	49	18	12	32	65.3%	50	64.1%	20.5%	15.4%
2014	98	55	29	16	17	30.9%	46	46.9%	36.7%	16.3%
2015	79	54	19	6	16	29.6%	35	44.3%	48.1%	7.6%
2016	52	31	12	14	9	29.0%	21	40.4%	32.7%	26.9%
2017	38	16	14	8	9	56.3%	23	60.5%	18.4%	21.1%
2018	44	22	12	12	13	59.1%	25	56.8%	15.9%	27.3%
2019	32	20	6	13	2	10.0%	8	25.0%	34.4%	40.6%
2020	21	14	5	2	6	42.9%	12	57.1%	33.3%	9.5%
2021	32	13	16	3	8	61.5%	24	75.0%	15.6%	9.4%
2022	78	25	33	19	20	80.0%	54	66.7%	6.4%	26.9%
Totals	1,374	816	409	180	258	31.6%	669	48.7%	38.1%	13.2%
Tucannon Natural Stock Summer Steelhead										
2005	24	13	5	6	3	23.1%	8	33.3%	41.7%	25.0%
2006	16	13	3	0	1	7.7%	4	25.0%	75.0%	0.0%
2007	24	12	8	4	2	16.7%	10	41.7%	41.7%	16.7%
2008 ^a	10	5	3	1	2	40.0%	5	50.0%	40.0%	10.0%
2009	39	26	10	3	5	19.2%	15	38.5%	53.8%	7.7%
2010	35	18	11	6	3	16.7%	14	40.0%	42.9%	17.1%
2011	38	23	12	7	7	30.4%	19	50.0%	31.6%	18.4%
2012	43	26	17	0	8	30.8%	25	58.1%	41.9%	0.0%
2013	33	20	9	4	4	20.0%	13	39.4%	48.5%	12.1%
2014	51	34	13	5	4	11.8%	17	33.3%	56.9%	9.8%
2015	54	40	11	3	6	15.0%	17	31.5%	63.0%	5.6%
2016	11	10	0	1	1	10.0%	1	9.1%	81.8%	9.1%
2017	22	13	8	1	8	61.5%	16	72.7%	22.7%	4.5%
2018	6	3	2	1	2	66.7%	4	66.7%	16.7%	16.7%
2019	10	5	4	1	0	0.0%	4	40.0%	50.0%	10.0%
2020	12	6	4	2	4	66.7%	8	66.7%	16.7%	16.7%
2021	7	5	2	0	1	20.0%	3	42.9%	57.1%	0.0%
2022	24	10	13	1	6	60.0%	19	79.2%	16.7%	4.2%
Totals	459	282	135	46	67	23.8%	202	44.0%	46.0%	9.4%

^a The Tucannon River PIT tag array was taken out by high stream flow in January 2009 (2008 Run Year). Estimates of fish back to Tucannon were adjusted upwards based on average springtime entries (65% for natural and endemic stock, and 30% for LFH stock).

Table 9. Detections of PIT tagged Lyons Ferry/Wallowa stock summer steelhead released in the Walla Walla River or from Dayton AP in the Touchet River that crossed McNary Dam, Ice Harbor Dam (IHR), and Lower Granite Dam (LGR).

Run Year	# Passed McNary	# Entered Walla2	# Stayed above IHR	# Stayed above LGR	# Stayed Tucannon	Percent of those that passed McNary Dam ^a			
			Into Walla2	Above IHR		Above LGR	Into Tucannon		
LFH/Wallowa Stock Summer Steelhead Released @ Dayton Acclimation Pond on the Touchet River									
2008	95	11	75	22	10	11.6%	78.9%	23.2%	10.5%
2009	150	19	123	44	21	12.7%	82.0%	29.3%	14.0%
2010	79	16	48	14	2	20.3%	60.8%	17.7%	2.5%
2011	78	9	64	18	12	11.5%	82.1%	23.1%	15.4%
2012	31	4	22	6	4	12.9%	71.0%	19.4%	12.9%
2013	49	12	35	10	2	24.5%	71.4%	20.4%	4.1%
2014	62	7	52	12	6	11.3%	83.9%	19.4%	9.7%
2015	31	4	24	12	0	12.9%	77.4%	38.7%	0.0%
2016	23	8	15	4	5	34.8%	65.2%	17.4%	21.7%
2017	26	11	13	6	2	42.3%	50.0%	23.1%	7.7%
2018	24	3	21	5	10	12.5%	87.5%	20.8%	41.7%
2019	16	5	11	6	1	31.3%	68.8%	37.5%	6.3%
2020	21	4	14	3	5	19.0%	66.7%	14.3%	23.8%
2021	32	17	13	6	2	53.1%	40.6%	18.8%	6.3%
2022	87	48	30	8	5	55.2%	34.5%	9.2%	5.7%
Totals	804	178	560	177	87	22.1%	69.7%	22.0%	10.8%
LFH/Wallowa Stock Summer Steelhead (Released in the lower Walla Walla River)									
2008	76	1	66	26	2	1.3%	86.8%	34.2%	2.6%
2009	82	11	60	13	11	13.4%	73.2%	15.9%	13.4%
2010	63	11	47	17	3	17.5%	74.6%	27.0%	4.8%
2011	86	8	71	10	7	9.3%	82.6%	11.6%	8.1%
2012	29	5	21	5	6	17.2%	72.4%	17.2%	20.7%
2013	23	8	14	6	0	34.8%	60.9%	26.1%	0.0%
2014	47	8	37	6	1	17.0%	78.7%	12.8%	2.1%
2015	26	5	21	11	4	19.2%	80.8%	42.3%	15.4%
2016	31	12	18	6	3	38.7%	58.1%	19.4%	9.7%
2017	30	6	23	5	11	20.0%	76.7%	16.7%	36.7%
2018	19	8	9	3	1	42.1%	47.4%	15.8%	5.3%
2019	2	1	1	0	0	50.0%	50.0%	0.0%	0.0%
Totals	514	84	388	108	49	16.3%	76.7%	21.3%	9.7%

^a Not all fish that crossed McNary Dam are shown in the table, a few were also detected at Priest Rapids Dam, Rock Island Dam, Rocky Reach Dam, and Wells Dam in the upper Columbia River.

Table 10. Detections of PIT tagged Touchet River Endemic stock and Touchet/Walla Walla Basin natural stock that crossed McNary Dam, Ice Harbor Dam (IHR), and Lower Granite Dam (LGR).

Run Year	# Passed McNary	# Entered Walla2	#	#	# Stayed Tucannon	Percent of those that passed McNary Dam ^a			
			Stayed above IHR	Stayed above LGR		Into Walla2	Above IHR	Above LGR	Into Tucannon
Touchet Endemic Hatchery Stock Summer Steelhead									
2005	29	2	11	0	8	6.9%	37.9%	0.0%	27.6%
2006	26	12	10	0	6	46.2%	38.5%	0.0%	23.1%
2007	18	6	9	1	4	33.3%	50.0%	5.6%	22.2%
2008	58	22	24	6	1	37.9%	41.4%	10.3%	1.7%
2009	74	35	28	9	11	47.3%	37.8%	12.2%	14.9%
2010	47	12	24	8	2	25.5%	51.1%	17.0%	4.3%
2011	49	28	14	0	8	57.1%	28.6%	0.0%	16.3%
2012	39	32	7	1	3	82.1%	17.9%	2.6%	7.7%
2013	13	10	3	0	1	76.9%	23.1%	0.0%	7.7%
2014	25	16	9	2	0	64.0%	36.0%	8.0%	0.0%
2015	31	14	16	3	7	45.2%	51.6%	9.7%	22.6%
2016	34	21	13	3	6	61.8%	38.2%	8.8%	17.6%
2017	41	29	9	1	5	70.7%	22.0%	2.4%	12.2%
2018	37	29	5	2	0	78.4%	13.5%	5.4%	0.0%
2019	32	9	17	5	4	28.1%	53.1%	15.6%	12.5%
2020	13	9	4	2	2	69.2%	30.8%	15.4%	15.4%
2021	6	5	1	0	0	83.3%	16.7%	0.0%	0.0%
2022	7	5	1	1	0	71.4%	14.3%	14.3%	0.0%
Totals	579	296	205	44	68	51.1%	35.4	7.6%	11.7%
Touchet/Walla Walla Basin Natural Stock Summer Steelhead									
2009	54	39	11	4	2	72.2%	20.4%	7.4%	3.7%
2010	83	36	26	7	8	43.4%	31.3%	8.4%	9.6%
2011	98	68	27	6	12	69.4%	27.6%	6.1%	12.2%
2012	85	61	19	6	8	71.8%	22.4%	7.1%	9.4%
2013	44	34	8	2	3	77.3%	18.2%	4.5%	6.8%
2014	63	49	13	5	2	77.8%	20.6%	7.9%	3.2%
2015	55	38	5	2	9	69.1%	9.1%	3.6%	16.4%
2016	17	13	4	2	0	76.5%	23.5%	11.8%	0.0%
2017	23	14	5	2	0	60.9%	21.7%	8.7%	0.0%
2018	15	11	4	3	2	73.3%	26.7%	20.0%	13.3%
2019	22	14	3	0	0	63.6%	13.6%	0.0%	0.0%
2020	12	12	0	0	0	100.0%	0.0%	0.0%	0.0%
2021	15	3	5	4	1	20.0%	33.3%	26.7%	6.7%
2022	22	14	4	1	2	63.6%	18.2%	4.5%	9.1%
Totals	608	406	134	44	49	66.8%	22.0%	7.2%	8.1%

^a Not all fish that crossed McNary Dam are shown in the table, a few were also detected at Priest Rapids Dam, Rock Island Dam, Rocky Reach Dam, and Wells Dam in the upper Columbia River.

Two other LFC hatchery steelhead releases (Snake River at LFH, and Cottonwood AP in the Grande Ronde) have also been PIT tagged. Releases of steelhead from LFH show a similar, but slightly lower, rate of overshoot as fish from the Tucannon River. Summer steelhead released

from Cottonwood AP show a high rate of conversion from Ice Harbor to Lower Granite Dam as expected, since they are destined for the Grande Ronde River (Table 11). Steelhead from Cottonwood may exhibit this overshoot behavior once they get above Lower Granite Dam, but the lack of PIT tag arrays in many of the larger river basins upstream of Lower Granite Dam (Clearwater, Salmon, Grande Ronde) do not allow a similar analysis at this time.

Table 11. Detections of PIT tagged Wallowa and/or LFH stock summer steelhead released on-station at LFH or into the Grande Ronde River at Cottonwood AP that passed Ice Harbor Dam (IHR) and Lower Granite Dam (LGR).

Run Year	# Pass IHR	# Pass LGR	Total into Tucannon	Unknown Location	Stay Above Lower Granite	Percent of those that passed Ice Harbor Dam		
						Into		Above
						Tucannon	Unknown	LGR
Wallowa Stock Summer Steelhead Released @ Cottonwood AP on the Grande Ronde River								
2009	174	168	2	4	168	1.1%	2.3%	96.6%
2010	85	82	0	3	82	0.0%	3.5%	96.5%
2011	138	130	0	8	130	0.0%	5.8%	94.2%
2012	63	58	1	4	58	1.6%	6.3%	92.1%
2013	62	57	0	5	57	0.0%	8.1%	91.9%
2014	121	116	0	5	116	0.0%	4.1%	95.9%
2015	98	96	1	1	96	1.0%	1.0%	98.0%
2016	90	87	0	3	87	0.0%	3.3%	96.7%
2017	118	112	2	4	112	1.7%	3.4%	94.9%
2018	72	66	0	6	66	0.0%	8.3%	91.7%
2019	33	33	0	0	33	0.0%	0.0%	100.0%
2020	52	48	1	3	48	1.9%	5.8%	92.3%
2021	62	61	0	1	61	0.0%	1.6%	98.4%
2022	92	86	0	6	86	0.0%	6.5%	93.5%
Totals	1,260	1,114	7	53	1,200	0.6%	4.2%	95.2%
LFH/Wallowa Stock Summer Steelhead Released On-Station at LFH								
2009	57	25	5	33	19	8.8%	57.9%	33.3%
2010	41	20	1	25	15	2.4%	61.0%	36.6%
2011	49	18	5	33	11	10.2%	67.3%	22.4%
2012	35	16	4	21	10	11.4%	60.0%	28.6%
2013	64	25	4	41	19	6.3%	64.1%	29.7%
2014	64	34	4	33	27	6.3%	51.6%	42.2%
2015	49	25	8	19	22	16.3%	38.8%	44.9%
2016	30	19	3	10	17	10.0%	33.3%	56.7%
2017	34	23	9	7	18	26.5%	20.6%	52.9%
2018	12	6	3	5	4	25.0%	41.7%	33.3%
2019	47	25	9	24	14	19.1%	51.1%	29.8%
2020	35	20	7	15	13	20.0%	42.9%	37.1%
2021	35	28	10	7	18	28.6%	20.0%	51.4%
2022	49	27	8	21	20	16.3%	42.9%	40.8%
Totals	601	312	80	294	227	13.3%	48.9%	37.8%

Summer Steelhead Broodstock Collections / Adult Returns

As part of our annual broodstock collection and research activities, WDFW hatchery and evaluation staff operate a series of adult steelhead traps in southeast Washington Rivers. These traps are primarily used for collection of broodstock, but in some instances, provide us with the opportunity to monitor and assess natural origin steelhead returns. The LFH staff operates the LFH and Cottonwood Creek adult traps. The TFH staff operates the upper Tucannon River adult trap, and the Snake River Lab evaluation staff operates the Touchet River adult trap in Dayton. The data presented summarizes trapping, collection of broodstock, and hatchery spawning activities and any additional evaluation projects for the reporting period.

Wallowa Stock Trapping

The Lyons Ferry adult trap is located the outflow of LFH, which empties directly to the Snake River. Fish traverse a ladder up to an adult holding pond, where a motorized crowder is used to push captured fish to one end of the adult holding pond. A small opening at the end of the pond limits the number of fish that are diverted to a manually operated sorting chute. In the fall months, summer steelhead and fall Chinook are trapped at the same time, with each diverted to separate adult holding ponds. In the spring trapping period, only summer steelhead are generally trapped, so there is no need for sorting. Fish not needed for broodstock (of either species) can be immediately diverted back to the Snake River. The adult trap at LFH has not been used since BY 2019.

The Cottonwood Creek Adult Trap is located about 200 meters upstream of the Cottonwood Creek mouth where it meets the Grande Ronde River. Fish enter a small holding area once they enter the trap. Fish in the trap area are sorted once or multiple times a day depending on expected returns and stream flows. Fish to be held for broodstock are netted to a holding area immediately upstream of the trap area, with all wild fish (unmarked/untagged) passed immediately upstream so they can spawn in Cottonwood Creek.

Run Year 2022:

A total of 1,432 adult steelhead (453 (31.6%) male, 979 (68.4%) female) were trapped from 1 March to 2 May 2023. No natural origin fish were recorded. The number of natural origin fish captured during the season is usually less than 10 fish. Age composition based on CWT recoveries of sampled hatchery origin fish was 34.6% one-ocean and 65.4% two-ocean. A

similar age composition based on fork length ($\geq 65\text{cm}$ = 2-ocean), was 30.2% one-ocean and 69.8% two-ocean. For the season, 104 females and 113 males were spawned together for an egg-take total of 557,541 eggs. Initial egg loss was 12%, leaving an estimated 495,225 eyed eggs for production (Table 2). No females were culled for IHNV. Eyed eggs that were retained for production equaled 495,225. All carcasses from spawned fish, those killed to retrieve the CWTs, or those in excess of program needs were buried at LFH or provided to the Walla Walla Community College for science classroom dissections.

In 2023, hatchery staff hand-picked all Wallowa stock steelhead. We recovered 26 fish that had CWTs (Table 12). Sex ratio of CWT fish (50.0% male, 50.0% female) was similar than those that were trapped at large. All CWTs recovered from the 2022 run year were originally released on-site at Cottonwood AP.

All steelhead trapped and/or retained were scanned for PIT tags. For the 2023 brood, we detected 7 unique PIT tags in the fish trapped at Cottonwood. Six were tagged and released from Cottonwood AP, while the remaining tag was implanted as an adult in the Columbia River at Bonneville Dam. All recovered PIT tag data was uploaded to PTAGIS per sampling and reporting protocols.

Table 12. Summary of CWT adult summer steelhead recovered at either Cottonwood or LFH adult traps during the 2022 run years.

	CWT code	Stock	Release site	Number of CWTs
2022 Run Year				
2019 BY	63 / 76 / 04	Wallowa	Grande Ronde @ Cottonwood CR	17
2020 BY	63 / 77 / 63	Wallowa	Grande Ronde @ Cottonwood CR	9
Total				26

Tucannon Fish Hatchery Trap

A permanent adult steelhead and salmon trap was installed in 1998 at the TFH water intake diversion dam. Natural and Tucannon River hatchery endemic stock origin steelhead are enumerated, sampled, and passed upstream to spawn, while Wallowa stock fish are returned to below the trap unless they are a fish with a CWT. Fish with an AD clip and CWT are removed for tag extraction and/or potential broodstock use.

Run Year 2022:

Natural and known Tucannon River hatchery endemic stock origin steelhead are enumerated, sampled, and passed upstream to spawn, while unknown hatchery fish are returned to below the trap unless they are a fish with a CWT. Fish with an AD clip and CWT are removed for tag

extraction. For the 2022 run year (March-May), hatchery staff trapped 152 natural origin, 70 Tucannon River conservation endemic stock and 35 mitigation endemic stock or stray hatchery-origin steelhead (Table 13, Table 14). Forty-one females (9 natural, 32 endemic origin) and 22 males (8 natural and 14 endemic origin) were collected for broodstock. At the end of the spawning season, endemic origin fish contributed to 78% of the used broodstock.

During March and April 2023, 41 females were spawned with 22 males at LFH. Total egg take was estimated at 226,122 (Table 1). Natural fish trapped from the TFH trap consisted of 83.3% one-ocean and 16.7% two-ocean age fish (Table 15). The 41 females spawned had an average overall fecundity was 5,515 eggs.

Table 13. Natural origin, hatchery LFH/Wallowa stock origin, and hatchery Tucannon endemic stock origin summer steelhead trapped at the Tucannon Fish Hatchery from the 1997-2022 run years.

Run Year	Natural			Hatchery LFH Stock			Hatchery Endemic Stock			Totals (Percent)	
	Male	Female	Total	Male	Female	Total	Male	Female	Total	% Natural	% Female
1997	8	10	18	31	47	78	NA	NA	NA	18.8	59.4
1998	9	13	22	14	19	33	NA	NA	NA	40.0	58.2
1999	12	6	18	5	5	10	NA	NA	NA	64.3	39.3
2000	9	1	10	3	0	3	NA	NA	NA	76.9	7.7
2001	75	103	178	24	4	28	NA	NA	NA	86.4	51.9
2002	30	34	64	9	3	12	NA	NA	NA	84.2	48.7
2003	23	10	33	5	0	5	4	1	5	78.6	25.6
2004	36	7	43	2	0	2	11	2	13	74.1	15.5
2005	12	8	20	1	0	1	7	11	18	51.3	48.7
2006	12	2	14	3	2	5	11	3	14	42.4	21.2
2007	6	4	10	5	0	5	6	2	8	43.5	26.1
2008	38	50	88	6	2	8	121	121	242	26.0	51.2
2009	181	142	323	3	5	8	183	147	330	48.9	44.5
2010	78	124	202	1	2	3	33	97	130	60.3	66.6
2011	78	108	186	0	2	2	104	107	211	46.6	54.4
2012	37	45	82	10	5	15	76	142	218	26.0	61.0
2013	105	77	182	8	4	12	79	155	234	42.5	55.1
2014	186	151	337	5	1	6	42	134	176	64.9	55.1
2015	152	179	331	61 ^a	11 ^a	72 ^a	51	28	79	68.7	45.2
2016	23	28	51	23 ^a	8 ^a	31 ^a	12	32	44	40.5	53.9
2017	47	34	81	76 ^a	47 ^a	123 ^a	26	40	66	30.0	44.8
2016	23	28	51	23 ^a	8 ^a	31 ^a	12	32	44	40.5	53.9
2017	47	34	81	76 ^a	47 ^a	123 ^a	26	40	66	30.0	44.8
2018	40	46	86	18 ^a	5 ^a	23 ^a	25	34	59	51.2	50.6
2019 ^b	26	27	53	11 ^a	2 ^a	13 ^a	3	12	15	65.4	50.6
2020	37	40	77	11 ^a	16 ^a	27 ^a	16	20	36	56.2	55.5
2021	50	28	78	25 ^a	3 ^a	28 ^a	11	6	17	63.4	30.1
2022	69	83	152	18 ^a	17 ^a	35 ^a	24	46	70	59.1	56.8
Totals	1,449	1,422	2,871	477	265	742	883	1,212	2,095	52.9	45.0

^a Hatchery fish presumably mitigation endemic stock or stray hatchery origin. Lyons Ferry stock no longer returning.

^b Hatchery fish and endemic stock were also captured at LFH adult trap not included in these totals.

Table 14. Total number of fish trapped and passed upstream to spawn naturally at the Tucannon River Adult Trap, 1997-2022 run years.

Run Year	Natural Stock			Hatchery LFH Stock			Hatchery Endemic Stock		
	Trapped	Passed	% Passed	Trapped	Passed	% Passed	Trapped	Passed	% Passed
1997	18	18	100	78	78	100	NA	NA	NA
1998	22	22	100	33	33	100	NA	NA	NA
1999	18	18	100	10	0	0	NA	NA	NA
2000	10	10	100	3	0	0	NA	NA	NA
2001	178	178	100	28	2	7	NA	NA	NA
2002	64	64	100	12	1	8	NA	NA	NA
2003	33	33	100	5	0	0	5	5	100
2004	43	43	100	2	1	50	13	13	100
2005	20	20	100	1	0	0	18	18	100
2006	14	14	100	5	0	0	14	14	100
2007	10	8	80	5	0	0	8	8	100
2008	88	68	77	8	0	0	242	235	97
2009	323	298	92	8	0	0	330	318	96
2010	202	157	78	3	0	0	130	125	96
2011	186	139	75	2	0	0	211	211	100
2012	87	58	67	15	0	0	218	204	94
2013	182	152	84	12	0	0	234	212	90
2014	337	306	91	6	0	0	176	166	94
2015	331	284	86	72 ^a	19 ^a	26 ^a	79	77	97
2016	64	51	80	31 ^a	31 ^a	100 ^a	44	8	18
2017	81	59	73	123 ^a	101	82 ^a	66	14	21
2018	86	66	77	23 ^a	1 ^a	4	59	17	29
2019	53	30	57	13 ^a	0	0	15	2	13
2020	77	59	77	27 ^a	0	0	36	12	33
2021	78	51	65	28 ^a	0	0	17	6	35
2022	152	133	88	35 ^a	0	0	70	24	34
Totals	2,757	2,339	85	588	267	45	1,985	1,689	85

^a Hatchery fish presumably mitigation endemic stock or stray hatchery origin. Lyons Ferry stock no longer returning.

Table 15. Summary of fresh and salt-water age composition of natural origin adult steelhead from the Tucannon River, 2000-2023 brood years. Note: this table does not include 3-ocean age fish, or those with freshwater age 4. Only a few of those individuals have been documented during all sample years (0.04%)

Brood Year	Endemic Hatchery Stock						Natural Tucannon Stock						
	% 1.1	% 1.2	% 1.3	% 2.1	% 2.2	Repeat	% 1.1	% 1.2	% 2.1	% 2.2	% 3.1	% 3.2	Repeat
2000	---	---	---			---	25.0	8.3	50.0	9.7	6.9	0.0	0.0
2001	---	---	---			---	0.0	27.1	27.1	39.6	0.0	6.3	0.0
2002	---	---	---			---	8.8	17.5	50.9	17.5	5.3	0.0	0.0
2003	---	---	---			---	0.0	3.9	28.2	54.4	4.9	5.8	3.6
2004	---	---	---			---	0.0	0.0	68.9	21.3	4.9	0.0	1.0
2005	---	---	---			---	4.8	10.3	31.9	45.5	4.5	2.3	0.6
2006	---	---	---			---	4.6	6.5	40.7	40.7	5.6	0.9	0.9
2007	88.8	11.2	0.0			0.0	2.0	14.3	32.7	36.7	8.2	4.1	0.0
2008	91.6	8.4	0.0			0.0	6.3	6.2	50.0	31.2	6.3	0.0	0.0
2009	79.7	19.7	0.6			0.0	0.0	2.7	50.7	16.0	14.7	9.3	2.7
2010	82.1	17.9	0.0			0.0	5.6	7.0	63.6	15.4	7.0	1.4	0.0
2011	0.0	97.0	3.0			0.0	0.8	1.6	23.8	61.9	4.0	7.9	0.0
2012	97.6	2.4	0.0			0.0	0.0	0.0	17.4	71.0	7.2	4.3	0.0
2013	68.8	31.2	0.0			0.0	5.5	4.1	19.2	60.3	4.1	5.5	1.4
2014	33.3	66.7	0.0			0.0	7.8	1.9	66.0	11.7	12.6	0.0	0.0
2015	36.1	63.9	0.0			0.0	5.3	15.8	38.6	31.6	3.5	5.3	0.0
2016	74.3	22.9	0.0			0.0	1.4	0.0	43.2	29.7	12.2	13.5	1.3
2017	22.9	77.1	0.0			0.0	9.8	7.3	17.1	46.3	4.9	12.2	2.4
2018	87.3	10.6	2.1			0.0	0.0	8.3	50.0	16.7	25.0	0.0	0.0
2019	50.0	50.0	0.0			0.0	8.0	24.0	48.0	12.0	8.0	0.0	0.0
2020	33.3	66.7	0.0			0.0	6.7	0.0	40.0	33.3	0.0	20.0	0.0
2021	52.4	47.6	0.0			0.0	0.0	16.7	0.0	83.3	0.0	0.0	0.0
2022	----	---	---			0.0	30.0	0.0	55.0	10.0	5.0	0.0	0.0
2023	---	---	---			0.0	0.0	13.9	8.3	63.9	5.6	8.3	0.0
All Years	59.9	39.6	.4			0.0	5.5	8.2	38.4	35.8	6.7	4.5	.6

Touchet River Adult Trap

The Touchet River adult trap located in Dayton near rkm 86.4 has been operated continuously each spring since 1999. Dates of annual operation have varied each year due to environmental or other conditions. The main purpose of the adult trap is to capture adult summer steelhead: some of which were to be collected for a new hatchery broodstock for use in the Touchet River. This program (similar in nature to the Tucannon River programs; see prior section) continues but is still considered experimental as overall survival (smolt-to-adult) has been less than optimal to move this program forward. Since 2000, nearly all LFH/Wallowa stock fish captured in the Touchet River adult trap have been returned downstream to either recycle through the fishery or

to separate them from the upriver spawning locations. Beginning in 2009, nearly all LFH stock fish captured were transported to the Dayton Juvenile Pond, were killed outright to obtain the CWT, or were provided to the Dayton food bank if possible. When LFH stock returns ceased in 2015, Wallowa stock steelhead were either returned downstream to recycle the fishery, transported to Dayton Juvenile Pond, or killed to obtain CWT, or provided to the Dayton food bank when possible.

Run Year 2022:

For the season staff trapped 365 (54.4%) natural, 271(40.1%) Wallowa hatchery origin and 35 (5.2%) Touchet River endemic hatchery origin steelhead (Table 16, Table 17). Natural steelhead trapped for the 2022 run year consisted of 17.3% one-ocean and 81.1% two-ocean age fish (Table 18). Sex ratio of natural origin fish was 72.3% female, while hatchery steelhead was 66.7% female. We collected 31 natural origin fish (18 females and 13 males) for broodstock. Of the fish collected for broodstock, 17 females were spawned with 13 males yielding 94,405 eggs (Table 3). The remaining wild female was returned to the river to spawn naturally. After initial egg loss of 34.6%, 61,701 eyed eggs were left on hand. For the 2022 run year, mean fecundity of the females was 5,553 eggs.

Table 16. Total number of male and female summer steelhead at the Touchet River Adult Trap (1992-1994, 1998-2022 run years).

Run Year	Natural			Hatchery LFH/Wallowa ^a Stock			Hatchery Endemic Stock			Totals (Percent)	
	Male	Female	Total	Male	Female	Total	Male	Female	Total	% Natural	% Female
1992	17	36	53	2	6	8	NA	NA	NA	86.8	68.9
1993	8	35	43	1	1	2	NA	NA	NA	95.6	80.0
1994	2	6	8	1	1	2	NA	NA	NA	80.0	70.0
1998	13	29	42	5	2	7	NA	NA	NA	85.7	63.3
1999	8	24	32	4	0	4	NA	NA	NA	88.9	66.7
2000	54	130	184	17	19	36	NA	NA	NA	83.6	67.7
2001	67	106	173	9	9	18	NA	NA	NA	90.6	60.2
2002	30	91	121	4	6	10	0	1	1	91.7	74.2
2003	29	73	102	19	8	27	11	5	16	70.3	59.3
2004	38	47	85	20	27	47	4	7	11	59.4	56.6
2005	65	99	164	6	8	14	8	28	36	76.6	63.1
2006	37	106	143	9	4	13	13	32	45	71.1	70.6
2007	35	84	119	9	6	15	7	20	27	73.9	68.3
2008	52	92	144	13	13	26	27	49	76	58.3	62.6
2009	267	334	601	35	47	82	42	108	150	72.2	58.7
2010	92	242	334	21	45	66	14	42	56	75.1	73.9
2011	61	114	175	2	8	10	16	33	49	74.8	66.2
2012	64	130	194	11	10	21	22	63	85	64.7	67.7
2013	64	79	143	3	1	4	9	30	39	76.9	59.1
2014	75	125	200	16	14	30	4	19	23	79.1	62.5
2015	84	166	250	18	9	27	24	33	57	74.9	62.3
2016	13	29	42	12	5	17	8	16	24	50.6	60.2
2017	28	62	90	41	40	81	5	18	23	46.4	61.9
2018	50	77	127	46	40	86	13	19	32	51.8	55.5
2019	44	118	162	51	38	89	4	22	26	58.5	64.3
2020	44	130	174	39	68	107	10	15	25	56.9	69.6
2021	87	94	169	153	80	233	4	10	14	42.3	43.0
2022	89	247	336	90	181	271	17	18	35	54.4	69.5
Totals	1,517	2,905	4,422	657	696	1,353	262	588	850	66.8%	63.2%

^a Wallowa stock returns from 2015 forward. Presumed Wallowa stock or stray hatchery stock.

Table 17. Total number of fish trapped and passed upstream to spawn naturally at the Touchet River Adult Trap, 1992-1994, 1998-2022 run years.

Run Year	Natural			Hatchery LFH/Wallowa ^a Stock			Hatchery Endemic Stock		
	Trapped	Passed	% Passed	Trapped	Passed	% Passed	Trapped	Passed	% Passed
1992	53	49	92	8	7	88	NA	NA	NA
1993	43	43	100	2	2	100	NA	NA	NA
1994	8	8	100	2	2	100	NA	NA	NA
1998	42	42	100	7	7	100	NA	NA	NA
1999	32	9	28	4	0	0	NA	NA	NA
2000	184	142	77	36	10	28	NA	NA	NA
2001	173	136	79	18	3	17	NA	NA	NA
2002	121	84	69	10	1	10	1	1	100
2003	102	69	68	27	1	4	16	16	100
2004	85	42	49	47	17	36	11	11	100
2005	164	120	73	14	0	0	36	34	94
2006	143	109	76	13	0	0	45	44	98
2007	119	93	78	15	1	7	27	27	100
2008	144	116	81	26	0	0	76	75	99
2009	601	566	94	82	0	0	150	150	100
2010	334	300	90	66	0	0	56	56	100
2011	175	143	82	10	0	0	49	49	100
2012	194	163	84	21	0	0	85	84	99
2013	143	111	78	5	0	0	39	39	100
2014	200	175	88	30	0	0	23	15	65
2015	250	221	88	27	0	0	57	47	82
2016	42	25	60	17	0	0	24	17	71
2017	90	73	81	81	0	0	23	17	74
2018	127	92	72	86	0	0	32	32	100
2019	162	136	84	89	0	0	26	26	100
2020	174	145	83	107	0	0	25	25	100
2021	181	145	80	233	0	0	14	14	100
2022	365	331	91	271	0	0	35	35	100
Totals	4,451	3,688	82.9	1,354	51	3.8	850	814	95.8

^aWallowa stock returns from 2015 forward. Presumed Wallowa or stray hatchery stock.

Table 18. Summary of fresh and salt-water age composition of natural origin adults from the Touchet River, 1994-1995 and 1999-2023 brood years.

BY	Age 1.1		Age 1.2		Age 2.1		Age 2.2		Age 3.1		Age 3.2		Age 4.1		Age 4.2		Repeat spawners
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	%
1994	0	0.0	0	0.0	6	28.6	8	38.1	3	14.3	3	14.3	0	0.0	0	0.0	4.8
1995	0	0.0	0	0.0	0	0.0	6	85.7	0	0.0	0	0.0	0	0.0	1	14.3	0.0
1999	0	0.0	1	3.2	18	58.1	9	29.0	2	6.5	0	0.0	0	0.0	0	0.0	3.2
2000	1	3.2	1	3.2	17	54.8	8	25.8	3	9.7	1	3.2	0	0.0	0	0.0	0.0
2001	1	0.6	14	8.0	84	48.3	40	23.0	15	8.6	9	5.2	1	0.6	0	0.0	5.7
2002	6	4.8	3	2.4	84	67.7	20	16.1	6	4.8	3	2.4	0	0.0	0	0.0	1.6
2003	0	0.0	8	6.7	20	16.7	73	60.8	2	1.7	10	8.3	0	0.0	0	0.0	5.8
2004	0	0.0	1	0.8	47	39.2	18	15.0	18	15.0	2	1.7	1	0.8	0	0.0	10.3
2005	0	0.0	0	0.0	37	44.0	21	25.0	15	17.9	8	9.5	0	0.0	0	0.0	3.6
2006	2	1.3	7	4.5	85	54.8	38	24.5	7	4.5	11	7.1	0	0.0	0	0.0	3.2
2007	2	1.4	11	7.9	46	32.9	54	38.6	7	5.0	14	10.0	1	0.7	0	0.0	2.9
2008	2	1.7	6	5.2	47	40.5	38	32.8	7	6.0	7	6.0	0	0.0	0	0.0	7.8
2009	3	2.1	0	0.0	81	56.3	21	14.6	19	13.2	8	5.6	0	0.0	0	0.0	8.3
2010	15	4.1	14	3.8	230	62.8	74	20.2	23	6.3	4	1.1	0	0.0	0	0.0	1.9
2011	3	1.4	9	4.3	54	25.6	114	54.0	16	7.6	10	4.7	0	0.0	0	0.0	2.6
2012	13	8.5	3	2.0	45	29.4	69	45.1	13	8.5	4	2.6	1	0.7	1	0.7	2.6
2013	2	1.8	29	26.4	26	23.6	42	38.2	0	0.0	11	10.0	0	0.0	0	0.0	0.0
2014	4	6.7	3	5.0	26	43.3	19	31.7	8	13.3	0	0.0	0	0.0	0	0.0	1.6
2015	3	4.0	5	6.7	20	26.7	36	48.0	3	4.0	8	10.6	0	0	0	0	0.0
2016	0	0.0	5	5.5	22	24.2	45	49.4	7	7.7	11	12.1	0	0.0	1	1.1	3.2
2017	1	4.3	2	8.7	1	4.3	16	69.6	3	13.1	0	0.0	0	0.0	0	0.0	11.5
2018	4	7.5	2	3.8	30	56.6	11	20.8	6	11.3	0	0	0	0	0	0	0.0
2019	2	2.2	5	5.5	41	45.0	27	29.7	9	9.9	5	5.5	2	2.2	0	0.0	2.1
2020	2	1.9	17	16.0	34	32.1	44	41.5	6	5.7	3	2.8	0	0.0	0	0.0	0.0
2021	0	0.0	9	9.1	8	8.1	72	72.7	2	2.0	8	8.1	0	0.0	0	0.0	1.0
2022	5	3.9	2	1.5	81	62.8	32	24.8	5	3.9	4	3.1	0	0.0	0	0.0	1.5
2023	4	2.0	31	15.7	23	11.7	110	55.8	7	3.6	19	9.6	0	0.0	0	0.0	1.0
Totals	75	2.6	188	6.4	1,213	41.5	1,065	36.4	212	7.2	163	5.6	6	0.2	3	0.1	3.3

In addition to trapping summer steelhead, we also capture spring Chinook salmon (*O. tshawytscha*), bull trout (*Salvelinus confluentus*), bridgelip suckers (*C. columbianus*), brown trout (*Salmo trutta*), and whitefish (*Prosopium williamsoni*) in the Touchet adult trap (Table 19).

Table 19. Total number of spring Chinook, bull trout, brown trout, whitefish, northern pike minnow, and bridgelip sucker captured in the Touchet River Adult Trap (1993-1995, 1999-2023). Data presented in this table is from the period January through the month of September annually.

Year	Spring Chinook		Bull trout	Brown trout	Whitefish	Pike Minnow	Bridgelip Sucker
	Natural	Hatchery					
1993	0	0	0	0	0	NA	NA
1994	0	0	3	3	0	NA	NA
1995	0	0	0	0	0	NA	NA
1999	0	0	20	4	5	NA	NA
2000	2	2	22	8	16	NA	NA
2001	24	7	43	14	4	NA	NA
2002	0	0	22	0	5	NA	NA
2003	2	1	45	19	40	2 (2)	663
2004	4	6	65	17	7	0	226
2005	4	1	49	6	8	1 (1)	171
2006	0	0	53	31	34	0	54
2007	1	3	31	13	18	0	13
2008	1	2	34	11	28	5 (5)	16
2009	15	13	104	10 (10)	32	2 (2)	64
2010	13	3	121	18 (18)	120	0	227
2011	1	0	124	2 (2)	59	0	36
2012	9	1	59	5 (5)	14	0	11
2013	2	2	41	0	17	2	14
2014	1	0	39	0	6	0	45
2015	5	0	41	1 (1)	66	0	0
2016	1	1	62	1 (1)	3	0	1
2017	0	0	32	0	1	0	0
2018	1	0	91	0	1	0	0
2019	0	0	28	0	0	0	0
2020	0	1	38	0	0	0	2
2021	6	2	33	0	4	0	1
2022	9	17	49	0	4	0	4
2023	2	4	61	0	1	0	0

Spawning Ground Surveys

Over the course of this reporting period, evaluation staff conducted or attempted to conduct spawning ground surveys in the Touchet River. Redd surveys within the Touchet River have been conducted annually since 1986 (Table 20). Due to the weather and stream flow conditions that can greatly affect the successfulness of redd surveys, we provide these redd estimates for trend analysis only. The estimated number of spawners within each of these streams as derived from the redd estimates (assuming a set females/redd of 0.8, and yearly or average sex ratios from the Touchet River adult trap) can be provided upon request.

Estimates of redds and spawners in the Touchet River from these index surveys, along with age composition and productivity measures were provided to NOAA Fisheries for the 2020 Status review. NOAA Fisheries was made fully aware of the limitations of the Touchet River estimates (redds, assumptions to estimate spawners, estimated of R/S productivity), but have indicated they will include the Touchet River as part of the status review.

Table 20. Standardized redd estimates and redds/kilometer within index reaches of the Touchet River in southeast Washington, 1987-2023.

Spawn Year	North Fork (19.0 KM)		South Fork (26.7 KM)		Wolf Fork (17.5 KM)		Robinson Fork (9.0 KM)		Total Redds
	Redds	Redds/km	Redds	Redds/km	Redds	Redds/km	Redds	Redds/km	
1987	99	5.2	147	5.5	100	5.7	34	3.7	380
1988	184	9.6	260	9.7	172	9.8	73	8.1	689
1989	65	3.4	71	2.7	42	2.4	20	2.2	198
1990	88	4.6	90	3.4	88	5.0	23	2.6	289
1991	66	3.5	61	2.3	72	4.1	14	1.6	213
1992	152	8.0	180	6.7	95	5.4	41	4.6	468
1993	65	3.4	107	4.0	36	2.1	20	2.2	228
1994	135	7.1	121	4.5	81	4.6	26	2.9	363
1995	98	5.1	116	4.3	83	4.7	17	1.9	314
1996	64	3.4	104	3.9	72	4.1	23	2.6	263
1997	56	2.9	39	1.5	65	3.7	16	1.7	176
1998	118	6.2	112	4.2	84	4.8	30	3.4	344
1999	82	4.3	131	4.9	49	2.8	19	2.1	281
2000	65	3.4	70	2.6	45	2.6	22	2.4	202
2001	55	2.9	84	3.1	57	3.3	17	1.9	213
2002	115	6.0	123	4.6	60	3.4	29	3.2	327
2003	160	8.4	125	4.7	100	5.7	37	4.2	422
2004	68	3.6	48	1.8	44	2.5	16	1.7	176
2005	116	6.1	94	3.5	91	5.2	28	3.1	329
2006	91	4.8	78	2.9	58	3.3	38	4.2	265
2007	160	8.4	133	5.0	97	5.5	32	3.6	422
2008	80	4.2	99	3.7	46	2.6	22	2.4	247
2009	88	4.6	102	3.8	56	3.2	25	2.8	271
2010	195	10.2	235	8.8	84	4.8	44	4.9	558
2011	140	7.3	146	5.5	88	5.0	34	3.8	408
2012	61	3.2	116	4.3	50	2.9	33	3.7	260
2013	174	9.1	144	5.4	139	7.9	44	4.9	501
2014	59	3.1	45	1.7	17	1.0	30	3.3	151
2015	139	7.3	97	3.6	95	5.4	25	2.8	356
2016	65	3.4	77	2.9	67	3.8	22	2.4	231
2017	38	2.0	41	1.5	27	1.5	8	0.9	114
2018	29	1.5	31	1.2	20	1.1	11	1.2	91
2019	35	1.8	22	0.8	12	0.7	13	1.4	82
2020	43	2.3	74	2.8	37	2.1	19	2.1	173
2021	91	4.8	105	3.9	98	5.6	27	3.0	321
2022	45	2.4	96	3.6	31	1.8	10	1.1	182
2023	32	1.7	11	0.4	25	1.4	27	3.0	95

Hatchery Smolt-to-Adult Survival Rates

Historically, CWT recoveries from fisheries, hatchery traps, or from in-river temporary traps provided the basic data to estimate minimum smolt-to-adult return rates on LFH and Wallowa stock summer steelhead from the WDFW steelhead program. These estimates are considered a minimum because there is no available adjustment to account for fish that escape the fisheries/traps and end up on the spawning grounds. Under the original LSRCP program design, the size of the steelhead programs was based on an assumed smolt-to-adult survival rate of 0.5% to the LSRCP project area. The LFH and Wallowa stock programs (released at LFH, Tucannon River, Walla Walla River, Dayton AP and Cottonwood AP) have mean survival rates that are generally three times greater than the assumed survival rates when the program initially started (Table 21). The Tucannon stock has performed slightly better than the 0.5% goal, but the Touchet has only surpassed that goal a few times and has performed less overall than what is desired, hence why no decision to implement that program has been made (Table 22).

In addition to the historical CWT data, WDFW implemented PIT tagging the standard mitigation production groups (all LFH and Wallowa stocks were PIT tagged from the 2008BY forward) for estimating total adult returns to the project area and to downstream locations. This was done because we knew that some proportion of the fish that return escape the fisheries and return to the spawning grounds. By comparing estimated CWT and PIT tag returns, we consistently found that PIT tags provided a higher estimate (range of 10-25%) of returns as compared to the CWT recoveries. Based on that information, all LSRCP WDFW steelhead mitigation programs currently utilize PIT tags to estimate smolt-to-adult survival rates, adult returns to the LSRCP project area, and adult returns to the Columbia River mouth (Tables 21, 22 and 23). Using the PIT tag method, estimates to the mouth of the Columbia River are derived from expanded PIT estimates at Bonneville Dam, and then adjusted upwards based on an average Zones 1-5 sport harvest from the mouth of the Columbia River to Bonneville Dam (determined from previous CWT recoveries from WDFW LSRCP steelhead releases).

Contributions to LSRCP Mitigation Goals

The LFC summer steelhead harvest mitigation programs, which historically consisted of LFH and Wallowa stocks, but now consists of Wallowa and Tucannon stocks, continues to meet and/or exceed the original mitigation goals to the Snake River Project area in most years (Table 23), with only a few exceptions when project area returns haven't been met. From RY 1984 to RY 2022, there have been five years where the project area goals haven't been met (1984, 2018-2021). The high achievement of the goal is also in part because fishery harvest rates in the lower Columbia River fisheries have declined substantially since the program was initiated. Hence the same, and sometimes even more fish returned to the project area even though hatchery production was reduced (beginning with the 2002 release year). As previously mentioned, the

original mitigation program assumed a 2:1 downriver to project area harvest rate; therefore, a total downriver harvest mitigation objective would be 13,968. In 16 of the last 38 run years (42%) this total contribution objective would have been met (Table 23).

Table 21. Smolt-to-adult return (SAR) survival of adipose clipped Lyons Ferry and/or Wallowa stock (LFH, Tucannon, Touchet, Walla Walla and Grande Ronde release groups) Tucannon and Touchet endemic stocks to the defined lower Snake River project area for Washington's steelhead programs.

Brood Year	Lyons Ferry CWT PIT	Tucannon CWT PIT	Dayton AP CWT PIT	Walla Walla CWT PIT	Grande Ronde CWT PIT	Tucannon PIT	Touchet PIT
1982	1.2	1.48	1.75	1.58	0.83		
1983	1.1	1.23	1.33	1.16	1.27		
1984	1.7	0.65	2.94	2.73	1.93		
1985	1.4	0.62	1.79	1.66	1.58		
1986	2.5	0.96	3.11	2.82	1.50		
1987	2.0	0.98	1.64	1.39	2.13		
1988	1.0	0.75	1.41	1.19	1.10		
1989	1.2	1.55	0.97	0.54	1.31		
1990	1.5	1.05	2.22	1.88	1.82		
1991	0.4	0.35	0.96	0.81	0.49		
1992	1.0	1.38	2.29	1.53	1.21		
1993	1.7	0.80	3.15	2.66	1.69		
1994	3.6	2.04	4.85	3.37	3.77		
1995	1.1	0.60	1.50	1.26	1.24		
1996	0.5	0.53	0.91	0.77	0.44		
1997	1.4	2.07	2.52	2.13	1.00		
1998	1.3	1.70	1.47	1.36	2.03		
1999	3.7	3.17	4.00	3.37	4.01		
2000	1.3	1.32	1.00	1.35	2.21		
2001	1.5	1.89	1.73	1.56	1.82		
2002	1.9	1.79	1.73	2.18	1.73		
2003	1.3	1.20	1.55	1.30	2.19	0.41	0.35
2004	1.6	1.49	1.43	1.10	1.14	0.55	0.24
2005	2.3		2.17	1.85	3.08	1.20	0.34
2006	2.1				2.96	1.36	0.77
2007		4.67				3.43	0.88
2008 ^a		2.60					0.29
2009 ^b		2.67				0.94	0.71
2010		1.27				0.69	0.16
2011		1.98				0.84	0.30
2012		2.45				0.34	0.32
2013		1.44				0.59	1.08
2014		0.94				0.14	0.14
2015		1.06				0.34	0.52
2016		0.45				0.21	0.38
2017		1.44				0.30	0.30
2018		0.58				0.04	0.05
2019		1.28				0.47	0.10
Avg	1.69	1.65	1.84	1.60	1.73	0.74	0.41
Geomean	1.48	1.37	1.58	1.43	1.47	0.48	0.31

a No production of Tucannon stock for this brood year due to lack of fish captured

b Last year LFH stock steelhead were released into the Tucannon River as full implementation of the Tucannon stock program began in 2010.

Table 22. Contribution of Lyons Ferry stock (LFH, Tucannon, Touchet, Walla Walla release groups) or Wallowa stock (Grande Ronde release group) summer steelhead back to the lower Snake River project area. Lighter grey shading represents a combination of CWT and PIT estimates, darker grey shading is derived solely from PIT tag estimates.

Run Year (Target/Goal)	LFH ^a (630)	Tucannon ^b (875)	Touchet ^b (750)	Walla Walla ^a (900)	Grande Ronde ^a (1,501)	Total (4,656)	Percent of Goal
1984	1,013	1,233	736	1,054	424	4,460	95.79%
1985	1,553	1,836	1,439	1,671	3,261	9,760	209.62%
1986	3,771	1,495	4,076	3,838	6,161	19,341	415.40%
1987	2,786	770	2,303	2,149	2,645	10,653	228.80%
1988	5,047	1,571	3,754	3,729	2,781	16,882	362.59%
1989	4,378	2,353	4,070	4,345	6,011	21,157	454.40%
1990	1,494	1,234	2,013	1,789	3,363	9,893	212.48%
1991	2,038	1,506	2,346	1,155	2,476	9,521	204.49%
1992	2,107	2,160	2,511	3,038	5,304	15,120	324.74%
1993	548	1,217	2,055	2,123	2,835	8,778	188.53%
1994	2,199	978	1,517	913	3,414	9,021	193.75%
1995	4,468	1,594	4,752	4,923	4,844	20,581	442.03%
1996	3,003	2,112	4,287	5,188	9,222	23,812	511.43%
1997	2,201	1,834	3,737	3,270	4,938	15,980	343.21%
1998	701	744	1,379	1,560	1,844	6,228	133.76%
1999	1,099	2,531	2,524	2,983	1,591	10,728	230.41%
2000	1,210	2,822	1,994	2,529	4,681	13,236	284.28%
2001	2,418	5,240	4,949	5,825	11,450	29,882	641.80%
2002	778	1,894	1,620	1,937	5,659	11,888	255.33%
2003	937	1,740	1,781	1,261	3,443	9,162	196.78%
2004	1,229	2,839	2,011	2,418	3,279	11,776	252.92%
2005	839	1,200	1,244	909	4,509	8,701	186.88%
2006	1,167	1,627	1,881	1,380	1,578	7,633	163.94%
2007	1,330	4,228	1,880	1,764	4,504	13,706	294.37%
2008	1,250	4,325	2,188	1,542	5,185	14,490	311.21%
2009	1,378	5,275	3,989	2,266	9,335	22,244	477.75%
2010	1,737	3,479	2,198	1,945	2,958	12,318	264.56%
2011	2,159	3,472	2,215	2,638	3,765	14,249	306.04%
2012	1,729	916	897	813	1,845	6,200	133.16%
2013	2,386	410	1,308	589	1,920	6,579	141.30%
2014	3,291	347	1,925	1,501	4,191	11,255	241.73%
2015	2,343	420	1,252	985	3,230	8,229	176.74%
2016	989	324	1,018	1,117	2,819	6,267	134.60%
2017	1,211	243	987	1,181	2,798	6,420	137.89%
2018	350	240	894	381	1,785	3,650	78.39%
2019	654	252	699	28	846	2,480	53.26%
2020	462	178	692	---	1,811	3,143	67.50%
2021	496	149	790	---	2,660	4,095	87.95%
2022	653	424	2,282	---	3,721	7,080	152.1%
Average	1,845	1,723	2,158	1,968	3,823	11,451	246%
% of Target/Goal (last 10 years)	1,283	299	1,181	578	2,578	5,920	127%

^a The LFH group includes releases of fish in other locations of the Snake River and Asotin Creek, the Walla Walla group includes releases of fish in Mill Creek, and the Grande Ronde include releases of fish from Wildcat Creek in Oregon.

^b This includes first returns of Tucannon and Touchet Endemics estimated by PIT tag returns.

Table 23. Contribution of Lyons Ferry stock (LFH, Tucannon, Touchet, Walla Walla release groups) or Wallowa stock (Grande Ronde release group) summer steelhead back to the Columbia River. Lighter grey shading represents a combination of CWT and PIT estimates, darker grey shading is derived solely from PIT tag estimates.

Run Year (Target/Goal)	LFH ^a (1,890)	Tucannon ^b (2,625)	Touchet ^b (2,250)	Walla Walla ^a (2,700)	Grande Ronde ^a (4,503)	Total (13,968)	Percent of Goal
1984	1,547	1,447	882	919	741	5,536	39.63%
1985	2,247	2,272	1,853	1,852	4,310	12,534	89.73%
1986	4,955	2,009	5,363	5,042	8,076	25,445	182.17%
1987	4,309	1,076	3,420	3,213	4,286	16,304	116.72%
1988	7,462	2,025	5,296	5,321	4,991	25,095	179.66%
1989	5,648	2,858	5,313	5,873	8,105	27,797	199.00%
1990	1,830	1,466	2,676	2,430	4,152	12,554	89.88%
1991	2,603	1,820	2,900	1,532	3,067	11,922	85.35%
1992	3,223	2,908	3,748	4,159	6,564	20,602	147.49%
1993	692	1,460	2,560	2,834	3,444	10,990	78.68%
1994	2,959	1,324	1,968	1,306	4,435	11,992	85.85%
1995	5,676	2,127	5,876	6,615	5,966	26,260	188.00%
1996	3,206	2,486	4,539	5,662	10,055	25,948	185.77%
1997	2,543	2,177	4,121	4,031	5,550	18,422	131.89%
1998	756	780	1,442	1,682	2,040	6,700	47.97%
1999	1,141	2,735	2,622	3,165	1,704	11,367	81.38%
2000	1,304	3,281	2,134	2,754	5,433	14,906	106.72%
2001	2,663	5,899	5,501	6,597	12,797	33,457	239.53%
2002	935	2,457	1,882	2,079	5,986	13,339	95.50%
2003	1,002	2,101	1,776	1,400	3,631	9,910	70.95%
2004	1,557	2,973	2,221	2,531	3,423	12,705	90.96%
2005	1,020	1,550	1,731	1,350	5,085	10,346	74.07%
2006	1,326	1,860	2,040	1,480	1,731	7,785	55.73%
2007	1,459	6,439	2,356	2,321	5,337	17,912	128.24%
2008	1,531	6,065	2,985	1,797	5,809	18,187	130.20%
2009	1,597	7,441	5,594	3,155	10,208	27,995	200.42%
2010	2,370	4,793	2,827	2,588	4,314	16,892	120.93%
2011	2,892	4,459	3,014	3,462	5,250	19,077	136.58%
2012	2,324	1,215	1,253	939	3,154	8,886	63.62%
2013	3,267	630	1,800	908	3,429	9,999	71.59%
2014	4,599	518	2,547	2,008	6,502	16,174	115.79%
2015	3,181	722	1,656	1,433	4,643	11,635	83.30%
2016	1,145	490	1,359	1,555	4,172	8,721	62.44%
2017	1,627	468	1,209	1,914	3,727	8,945	64.04%
2018	565	380	1,113	628	2,435	5,121	36.66%
2019	787	399	938	63	1,302	3,489	24.98%
2020	641	315	853	---	2,545	4,353	31.16%
2021	630	279	1,120	---	3,354	5,384	38.55%
2022	966	600	2,967	---	4,997	9,530	68.2
Average	2,312	2,213	2,703	2,477	4,788	14,467	103.6%
% of Target/Goal (last 10 years)	1,741	480	1,553	851	3,711	8,335	59.7%

^a The LFH group includes releases of fish in other locations of the Snake River and Asotin Creek, the Walla Walla group includes releases of fish in Mill Creek, and the Grande Ronde include releases of fish from Wildcat Creek in Oregon.

^b This includes first returns of Tucannon and Touchet Endemics estimated by PIT tag returns.

Conclusions and Recommendations

Due to a variety of reasons (ESA consultation, changing programs, new priorities, etc.) the summer steelhead program has undergone many changes, yet we still face some core challenges that should be addressed/considered as we move forward. Provided below are program highlights from the past year and program issues we face going forward.

Program highlights and potential changes that occurred over the reporting period:

- Estimation of strays in Wallowa Stock releases will only be calculated using PIT tags and not CWTs from RY 2017 forward. Because Wallowa stock releases (Dayton AP, On-station at LFH, and Cottonwood AP) are batched tagged in the earthen rearing lake at LFH, determination of stray rates by fish with the same CWT code released in different basins is not possible. Recoveries of CWTs from these release groups will still be used for survival and fishery contribution calculations, but it will be for the Wallowa stock contribution.
- Wallowa stock spawning occurred at Cottonwood Creek Adult trap in 2023. Brood collection at both DAT and TFH incorporated both fish hauled and held at LFH with additional live-spawned, natural males. Adequate numbers of adults were trapped and spawned to meet program objectives for all programs at all locations in 2023.

Program Challenges/Issues:

- Because of overshoot, actions have been taken (elimination of the Walla Walla River release) or are proposed to occur in the near future (elimination/reduction of Touchet River release of Wallowa stock, reduction of On-station release of Wallowa stock). Such program changes could be drastic from a harvest mitigation standpoint for the State of Washington, and without many other options to provide due mitigation under the LSRCP, WDFW is reluctant at this time to make any more changes. For example, elimination of the Wallowa stock in the Touchet River would be deemed acceptable if other programs (Touchet spring Chinook and/or Touchet steelhead) provide adequate returns from a harvest standpoint to provide relevant opportunity for the anglers. To date, the Touchet spring Chinook program is too new and adult returns from last year and returns in 2022 and 2023 are not promising that harvest will occur any time soon. Further, the Touchet steelhead program hasn't performed to desired expectations that it could supplant the Wallowa stock from a harvest mitigation standpoint.

- Performance of both Tucannon and Touchet endemic stocks has been relatively poor compared the previous mitigation stocks used (Lyons Ferry or Wallowa stocks). Based on how fish reared in the large rearing lakes at Lyons Ferry perform (Bumgarner et al. 2023), proposed changes to the Fall Chinook program could free up additional space in the large rearing lakes and allow for changes in rearing of Tucannon Stock fish. Additional large rearing ponds have been proposed for LFH (one for Tucannon, one for Touchet, and one for the Tucannon spring Chinook program). We believe these additional rearing ponds would improve the overall performance of these two stocks and make other changes to the Wallowa stock program more favorable.
- In years of low returns to the Tucannon FH adult trap, it's been difficult to meet program needs for the Tucannon stock. Because the trap is located high in the basin, overall low returns and low stream flows can often limit the number of fish captured in the trap. In addition, based on PIT tag returns and CWT recoveries, not all CWT only, AD clipped, or AD/CWT marked steelhead are from the Tucannon River, creating additional shortages. To address these concerns, one idea would be to uniquely mark (LV fin clip, or maxillary clip) all Tucannon origin steelhead (both conservation and mitigation groups) so they would be easily identifiable upon capture. Beginning with BY22 releases in MY23, on-station releases of Wallowa stock include a 5k PIT release with accompanying maxillary clip to test the efficacy of this mark/tag combination and how it will affect performance at different life stages. This experiment will continue for the next two brood years. In conjunction with the external mark, internal WDFW conversations have occurred replacing the on-station release of Wallowa stock with Tucannon River stock. This strategy would allow for an additional trapping location (if uniquely marked) and would also address the overshoot/straying issue of Wallowa stock released from LFH that return to and spawn in the Tucannon River.

Literature Cited

Bumgarner, J. D., and J.T. Dedloff. 2015. Lyons Ferry Hatchery Complex Summer Steelhead Evaluations: 2012 Run Year Annual Report to U.S. Fish and Wildlife Service, Cooperative Agreement #F13AC00096. Washington Department of Fish and Wildlife, Olympia, Washington. 48 pages.

Bumgarner, J. D., L. R. Clarke, M. W. Flesher, T. L. Miller, D. L. Eddy, J. T. Dedloff, J. Feldhaus, B. Sandford, and R. Twibell. 2023. Wallowa Stock Steelhead Reciprocal Study Final Report to the U.S. Fish and Wildlife Service Lower Snake River Compensation Plan, Boise, Idaho. 63 pages.

Gallinat, M.P., and L.A. Ross. 2012. Tucannon River Spring Chinook Salmon Hatchery Evaluation Program 2011 Annual Report to U.S. Fish and Wildlife Service, Cooperative Agreement 14110-B-J012. Washington Department of Fish and Wildlife, Olympia, Washington. Report # FPA12-02. 94 p.

Steinhorst, K., Y. Wu, B. Dennis, and P. Kline. 2004. Confidence intervals for fish outmigration estimates using stratified trap efficiency methods. *Journal of Agricultural, Biological, and Environmental Statistics* 9 (3): 284-299.

Schuck, M., A. Viola and S. Nostrant. 1991. Lyons Ferry Evaluation Study: Annual Report 1989-90. Washington Department of Wildlife Report to the USFWS. Report No. AFF1/LSR-91-08.

.

Appendix A

Rainbow Trout Plants from Lyons Ferry Complex 2023

Appendix A: Table 1. Summary of rainbow trout plants (catchable size) from Lyons Ferry and Tucannon Fish Hatcheries, 2023.

County	Location	Number of Plants	LSRCP # of fish planted	LSRCP LBS of fish planted
Asotin	Asotin Creek	0	0	0
	Golf Course Pond	6	14,147	5,697
	Silcott Pond	1	1,080	450
	West Evans Pond	6	15,923	4,135
	Asotin Total	13	31,150	10,282
Columbia	Blue Lake	10	17,925	6,844
	Curl Lake	2	7,600	3,040
	Dayton Juvenile Pond	5	1,325	567
	Deer Lake	5	3,286	1,364
	Orchard Pond	1	935	387
	Rainbow Lake	8	15,656	6,237
	Spring Lake	6	13,014	4,955
	Watson Lake	5	12,682	5,075
	Columbia Total	42	72,423	28,469
Franklin	Dalton Lake	6	15,560	6,524
	Marmes Pond	1	870	362
	Franklin Total	7	16,430	6,886
Walla Walla	Bennington Lake	3	14,550	5,820
	Hood Park Pond	4	8,572	3,456
	Jefferson Juvenile Pond	4	3,150	1,426
	Lions Park Pond	1	400	160
	Quarry Pond	6	9,883	7,433
	Walla Walla Total	18	36,505	18,295
Whitman	Garfield Pond	2	1,950	780
	Gilcrest Pond	1	1,000	400
	Pampa Pond	3	6,066	2,483
	Riparia Pond	1	525	237
	Rock Lake	1	27,025	8,325
	Union Flat Creek	1	500	200
	Whitman Total	9	37,086	12,425
Totals for Year		89	193,594	76,357

Appendix B

Annual Section 10 Permit #18025 Takes for 2022 Run Year, and NEOR/SEWA Terms and Conditions Biological Opinion Reporting Requirements

Appendix B; Table 1. Annual direct take of listed natural and hatchery-origin steelhead associated with the Tucannon Summer Steelhead Program, spawn year 2023.

Lifestage Life stage	Take Activity	Capture Method and Location	Fish Origin	Non-mortality (handling, marking and tagging)	2023	Mortalities	2023
Adult	Broodstock collection	Tucannon River Weir, Cummings Creek Weir, and hook and line	Natural	Up to 100% of fish at weir (~ 400)	152	Up to 52 fish ¹	12
			Hatchery	Up to 100% of fish at weir (~ 400)	105	Up to 98 fish ¹	16
Juvenile	Fish health sampling during rearing	Lyons Ferry Hatchery	Natural	Up to 100% of fish in culture (~150,000)	NA	Up to 1,500 fish	NA
Adult	RM&E	Penewawa, Alkali Flat, Deadman, Pataha, and Meadow Creek weirs	Natural	100% of fish at weirs (~ 400)	0	Up to 4	0
			Hatchery	100% of fish at weirs (~300)	0	Up to 2	0
Juvenile	RM&E	Tucannon screw trap	Natural	5,000	1,483	Covered in ITS (~100)	7
			Hatchery	7500	1,554	Covered in ITS (~150)	2

1 This take is based on a sliding scale; the greater the number of natural-origin returns to the weir, the greater the number used for broodstock.

Appendix B; Table 1. NOAA Terms and Conditions Biological Opinion reporting requirements for Lyons Ferry Hatchery Complex Summer Steelhead programs.

Metric of Interest	Stock [Release Group]	Links within Report, page #
Number and composition of Hatchery Broodstock (by stock and release), and collection dates	Wallowa (Grande Ronde) Wallowa (Snake) Wallowa (Touchet) Tucannon (Conservation) Tucannon (Mitigation) Touchet (Touchet)	Wallowa Stock Trapping, 9 Disease Protocols, 13 Wallowa Stock Trapping, 9 Wallowa Stock Trapping, 9 Tucannon Fish Hatchery Trap, 40 Tucannon Fish Hatchery Trap, 40 Touchet River Adult Trap, 44
The numbers, pounds, dates, locations, and tag/mark information of released fish. Average size of released juveniles and standard deviation. Precocial Maturation Rate Prior to Release	Wallowa (Grande Ronde) Wallowa (Snake) Wallowa (Touchet) Tucannon (Conservation) Tucannon (Mitigation) Touchet (Touchet)	Table 4 Table 4 Table 4 Table 4 Table 4 Table 4
Egg-to-smolt survival rate	Wallowa (Grande Ronde) Wallowa (Snake) Wallowa (Touchet)	Table 2 Table 2 Table 2

	Tucannon (Conservation) Tucannon (Mitigation) Touchet (Touchet)	<i>Table 1</i> <i>Table 1</i> <i>Table 3</i>
Disease outbreak occurrence, duration, and proportion of production lost at the hatchery and acclimation sites	Wallowa (Grande Ronde) Wallowa (Snake) Wallowa (Touchet) Tucannon (Conservation) Tucannon (Mitigation) Touchet (Touchet)	<i>Disease Protocols, 13</i>
Any unforeseen effects on ESA-listed fish	Wallowa (Grande Ronde) Wallowa (Snake) Wallowa (Touchet) Tucannon (Conservation) Tucannon (Mitigation) Touchet (Touchet)	<i>None for any of these years</i>
Steelhead encountered at adult traps (Cottonwood, Lyons Ferry, Tucannon, Touchet) and their disposition (passed, retained for broodstock, or culled)	Wallowa (Grande Ronde) Wallowa (Snake) Wallowa (Touchet) Tucannon (Conservation) Tucannon (Mitigation) Touchet (Touchet)	<i>Wallowa Stock Trapping, 39</i> <i>Wallowa Stock Trapping, 39</i> <i>Wallowa Stock Trapping, 39</i> <i>Tucannon Fish Hatchery Trap, 40</i> <i>Tucannon Fish Hatchery Trap, 40</i> <i>Touchet River Adult Trap, 45</i>
Distribution of hatchery- and natural-origin spawners in the Tucannon River population based on PIT tag detections. Estimated pHOS for the Tucannon River population	Tucannon (Conservation and Mitigation)	<i>For Spatial Distribution of Spawners See</i> <i>Tucannon BPA Report</i> <i>pHOS - Figure 15</i>
Smolt-to-adult survival rate as calculated by the operators in previous program evaluation reports	Wallowa (Grande Ronde) Wallowa (Snake) Wallowa (Touchet) Tucannon (Conservation) Tucannon (Mitigation) Touchet (Touchet)	<i>Table 211</i>
Post-release out-of-basin migration travel rate (km/day) of hatchery-origin juveniles to McNary Dam	Wallowa (Grande Ronde) Wallowa (Snake) Wallowa (Touchet) Tucannon (Conservation) Tucannon (Mitigation) Touchet (Touchet)	<i>Figure 2</i> <i>Figure 8</i> <i>Figure 4</i> <i>Figure 10</i> <i>Figure 10</i> <i>Figure 4</i>
Mean size and standard deviation, number, outmigration timing, and age structure of natural-origin juveniles (Tucannon River)	Tucannon River – Natural Origin Steelhead	<i>Tucannon River Natural Steelhead Smolt</i> <i>Production, Smolt-to-Adult Survival, and</i> <i>Adult Return Estimates, 27</i>
Estimated Straying of steelhead release groups from CWT recoveries or PIT tag detections	Wallowa (Grande Ronde) Wallowa (Snake) Wallowa (Touchet) Tucannon (Conservation) Tucannon (Mitigation) Touchet (Touchet)	<i>Appendix C</i>

Appendix C

Estimated straying of steelhead release groups from CWT recoveries or PIT tag detections

Appendix C; Table 1. Estimates of stray rates based on PIT tags (detections occurring after March 1) of LFH/Wallowa stock hatchery summer steelhead releases at Lyons Ferry Hatchery, 2007-2019 brood years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	PIT Tagged	Total Release	PIT Total Return	Detections after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2007	1,500	60,360	92	10	10.9%	3,702	402	
2008	1,500	65,050	47	4	8.5%	2,038	173	
2009	1,500	66,393	55	5	9.1%	2,434	221	
2010	4,000	164,813	49	5	10.2%	2,019	206	
2011	3,987	137,841	98	8	8.2%	3,388	277	
2012	2,496	146,358	76	9	11.8%	4,456	528	
2013	2,995	117,500	53	23	43.4%	2,079	902	
2014	2,991	75,456	29	13	44.8%	732	328	
2015	3,000	100,857	39	21	53.8%	1,311	706	
2016	2,995	81,021	15	9	60.0%	406	243	
2017	4,989	65,159	86	37	43.0%	1,123	483	
2018	3,991	59,352	27	13	48.1%	402	193	
2019	4,000	60,123	67	13	19.4%	1,008	195	
'07-'19	Totals		733	397	54.2%	25,099	4,859	
'13-'19	Totals		316	190	60.1%	6,659	2,858	

Appendix C; Table 2. Estimates of stray rates based on coded-wire tags (recoveries occurring after March 1) of LFH/Wallowa stock hatchery summer steelhead releases at Lyons Ferry Hatchery, 2000-2017 brood years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	Tag Code	CWT Tagged	Total Release	CWT Total Return	Recoveries after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2000	631139	19,726	53,551	299	0	0.0%	812	0	
2001	631270	19,236	62,612	354	19	5.4%	1152	62	4 at Dworshak Hatchery, likely trapped in the fall and held for broodstock
2002	631516	21,040	60,001	468	2	0.4%	1335	6	
2003	632188	20,069	59,993	326	0	0.0%	975	0	
2004	632364	19,244	63,036	371	3	0.8%	1215	10	
2005	633291	20,304	61,431	517	5	1.0%	1564	15	1 at Dworshak Hatchery, likely trapped in the fall and held for broodstock
2006	633667	19,885	59,983	511	1	0.2%	1541	3	
2007	634097	20,089	60,360	515	16	3.1%	1547	48	1 at Dworshak Hatchery, likely trapped in the fall and held for broodstock
2008	634684	20,528	65,050	390	3	0.8%	1236	10	
2009	635167	20,399	66,393	682	12	1.8%	2220	39	
2010	635568	19,665	164,813	180	3	1.7%	1509	25	
2011	636081	21,389	137,841	359	0	0.0%	2314	0	
2012	636446	20,686	146,358	168	28	16.7%	1189	198	
2013	636590	20,733	117,500	221	4	1.8%	1252	23	4 at Dworshak Hatchery, likely trapped in the fall and held for broodstock
2014	636747	20,384	75,456	44	0	0.0%	163	0	
2015	636887	19,565	100,857	41	4	9.8%	211	21	
2016	637042	20,461	81,021	33	1	3.0%	131	4	
2017	None	0	65,159						No CWT Group for this year
'00-'18				5,479	1510	1.8%	20,365	463	

^a All Wallowa stock fish were combined for rearing with 1 or 2 CWT codes from this year forward, so the onstation release at Lyons Ferry, Dayton AP, and Cottonwood AP are all together. Further analysis to split out by survival as determined by PIT tags would need to be applied to determine stray rates.

Appendix C; Table 3. Estimates of stray rates based on PIT tags (detections occurring after March 1) of LFH/Wallowa stock hatchery summer steelhead releases in the Walla Walla River, 2007-2016 brood years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	PIT Tagged	Total Release	PIT Total Return	Detections after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2006	4,999	97,766	108	6	5.6%	2112	117	
2007	3,500	101,581	99	5	5.1%	2873	145	
2008	3,499	108,951	81	4	4.9%	2522	125	
2009	3,500	107,120	108	4	3.7%	3305	122	
2010	3,996	102,341	22	0	0.0%	563	0	
2011	3,992	102,177	61	1	1.6%	1561	26	
2012	2,493	100,975	38	2	5.3%	1539	81	
2013	3,000	109,436	42	10	23.8%	1532	365	
2014	2,987	110,751	23	9	39.1%	853	334	
2015	3,000	101,594	47	12	25.5%	1592	406	
2016	2,998	66,530	22	4	18.2%	488	89	
'07-'16	Totals		651	57	8.0%	18,942	1,810	
'13-'16	Totals		134	35	26.1%	4,465	1,194	

Appendix C; Table 4. Estimates of stray rates based on coded-wire tags (recoveries occurring after March 1) of LFH/Wallowa stock hatchery summer steelhead releases in the Walla Walla River, 2000-2016 brood years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	Tag Code	CWT Tagged	Total Release	CWT Total Return	Recoveries after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2000	631140	18,865	103,980	178	0	0.0%	981	0	
2001	631269	18,938	99,859	244	11	4.5%	1287	57	
2002	631581	19,566	102,975	361	1	0.3%	1900	5	
2003	632170	20,002	80,143	317	0	0.0%	1270	0	
2004	632366	19,772	104,027	198	1	0.5%	1042	5	
2005	633292	19,686	100,345	412	4	1.0%	2100	20	
2006	633666	20,283	97,766	256	2	0.8%	1234	10	
2007	634096	19,956	101,581	175	0	0.0%	891	0	
2008	634686	20,871	108,951	262	1	0.4%	1368	5	
2009	635168	20,245	107,120	487	36	7.5%	2577	192	
2010	635569	20,790	102,341	67	0	0.0%	330	0	
2011	636083	21,204	102,177	177	0	0.0%	853	0	
2012	636445	20,412	100,975	177	0	0.0%	876	0	
2013	636589	20,634	109,436	143	0	0.0%	758	0	
2014	636746	20,516	110,751	25	0	0.0%	135	0	
2015	636888	20,342	101,594	44	0	0.0%	220	0	
2016	637044	20,115	66,530	11	4	36.4%	36	13	
'00-'16				3,534	60	1.70%	17,857	308	

Appendix C; Table 5. Estimates of stray rates based on PIT tags (detections occurring after March 1) of LFH/Wallowa stock hatchery summer steelhead releases at Dayton AP, 2006-2019 brood years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	PIT Tagged	Total Release	PIT Total Return	Detections after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2006	5,000	86,985	156	6	3.8%	2,714	104	
2007	3,500	87,063	193	11	5.7%	4,801	274	
2008	3,500	86,115	81	1	1.2%	1,993	25	
2009	3,499	86,737	102	6	5.9%	2,528	149	
2010	3,991	84,623	37	1	2.7%	785	21	
2011	3,976	89,322	85	5	5.9%	1,910	112	
2012	2,509	84,946	61	4	6.6%	2,065	135	
2013	3,000	90,000	34	12	35.3%	1,020	360	
2014	2,989	87,451	18	6	33.3%	527	176	
2015	2,999	88,100	35	12	34.3%	1,028	353	
2016	3,000	85,490	22	10	45.5%	627	285	
2017	2,998	101,000	30	8	26.7%	1,011	270	
2018	3,991	100,000	22	3	13.6%	551	75	
2019	3,997	101,036	98	6	6.1%	2,477	152	
'06-'19 Totals			974	91	9.3%	24,037	2,491	
'13-'19 Totals			259	57	22.0%	7,241	1,671	

Appendix C; Table 6. Estimates of stray rates based on PIT tags (detections occurring after March 1) of Touchet stock hatchery summer steelhead released in the Touchet River or from Dayton AP, 2003-2019 brood years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	PIT Tagged	Total Release	PIT Total Return	Detections after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2003	9,921	58,733	44	2	4.5%	260	12	
2004	9,988	55,706	26	1	3.8%	145	6	
2005	8,987	52,476	39	1	2.6%	228	6	
2006	8,495	58,989	82	3	3.7%	569	21	
2007	7,919	47,598	107	9	8.4%	643	54	
2008	12,993	53,663	31	1	3.2%	128	4	
2009	12,967	62,517	86	12	14.0%	415	58	
2010	4,997	62,037	15	1	6.7%	186	12	
2011	6,915	54,386	32	1	3.1%	252	8	
2012	4,982	38,726	20	5	25.0%	155	39	
2013	5,000	49,523	70	12	17.1%	693	119	
2014	4,999	48,711	9	0	0.0%	88	0	
2015	9,996	47,675	63	6	9.5%	300	29	
2016	9,962	57,390	46	5	10.9%	265	29	
2017	9,987	52,131	38	9	23.7%	198	47	
2018	9,996	39,375	7	0	0.0%	28	0	
2019	4,995	48,529	7	0	0.0%	68	0	
'03-'18 Totals			721	68	9.4%	4,622	443	
'13-'18 Totals			239	32	13.4%	1,640	223	

Appendix C; Table 7. Estimates of stray rates based on coded-wire tags (recoveries occurring after March 1) of LFH/Wallowa stock hatchery summer steelhead releases at Dayton AP, 2000-2017 brood years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	Tag Code	CWT Tagged	Total Release	CWT Total Return	Recoveries after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2000	630115	20,439	103,681	155	0	0.0%	786	0	
2001	631279	20,407	125,112	297	1	0.3%	1821	6	
2002	631580	20,611	100,445	294	0	0.0%	1433	0	
2003	632189	19,901	86,347	362	1	0.3%	1571	4	
2004	632367	18,857	86,270	254	2	0.8%	1162	9	
2005	633293	20,576	86,528	476	4	0.8%	2002	17	
2006	633665	20,435	86,985	270	6	2.2%	1149	26	
2007	634098	19,965	87,063	500	8	1.5%	2180	33	
2008	634683	20,701	86,115	236	2	0.8%	982	8	
2009	635170	20,517	86,737	526	15	2.9%	2224	63	1 at Dworshak Hatchery, likely trapped in the fall and held for broodstock
2010	635570	18,099	84,623	140	2	1.4%	655	9	
2011	636082	24,816	89,322	325	1	0.3%	1170	4	
2012	636447	20,654	84,946	245	1	0.4%	1008	4	
2013	636588	20,800	90,000	70	0	0.0%	303	0	
2014	636745	20,523	87,451	29	2	6.9%	124	9	
2015	636889	20,635	88,100	83	7	8.4%	354	30	
2016	637043	20,741	85,490	71	4	5.6%	293	16	
2017	637205	21,264	101,000	52	1	1.9%	247	5	
'00-'18				4,441	57	1.3%	19,462	244	

Appendix C; Table 8. Estimates of stray rates based on coded-wire tags (recoveries occurring after March 1) of Touchet stock hatchery summer steelhead releases in the NF Touchet River or at Dayton AP, 2003-2019 brood years (some brood years have no recoveries. Note: This group of fish are not ad-clipped for harvest which partially explains the lower recovery rate overall. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	Tag Code	CWT Tagged	Total Release	CWT Total Return	Recoveries after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2000	631339	35,349	36,487	0	0	0.0%	0	0	
2001	631177	36,565	45,501	0	0	0.0%	0	0	
2002	631530	27,716	31,440	5	0	0.0%	6	0	
2003	631183	56,081	58,733	2	1	50.0%	2	1	
2004	631185	54,396	55,706	21	1	4.8%	22	1	
2007	634164	48,298	45,976	13	3	23.1%	14	3	
2008	634689	55,255	51,647	18	0	0.0%	19	0	
2009	635172	62,517	62,216	13	1	7.7%	13	1	
2010	635482, 635571	62,037	61,246	19	1	5.3%	19	1	
2011	636077	54,386	53,069	29	0	0.0%	30	0	
2012	636440	38,726	37,627	20	0	0.0%	21	0	
2013	636591	49,523	48,626	59	2	3.4%	60	2	
2014	636748	48,711	46,183	8	0	0.0%	8	0	
2015	636891	47,675	46,235	16	0	0.0%	16	0	
2016	637046	57,390	56883	11	0	0.0%	11	0	
2017	637207	52,131	51469	16	0	0.0%	16	0	
2018	637402	39,379	38,359	0	0	0.0%	0	0	
2019	637605	48,529	42,274	4	0	0.0%	5	0	
'00-'19				254	9	3.5%	262	9	

Appendix C; Table 8. Estimates of stray rates based on PIT tags (detections occurring after March 1) of LFH/Wallowa stock hatchery summer steelhead releases at Cottonwood AP, 2007-2018 brood years.

Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	PIT Tagged	Total Release	PIT Total Return	Detections after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2007	4,000	175,961	290	5	1.7%	12,757	220	
2008	5,999	170,232	118	0	0.0%	3,348	0	
2009	5,998	163,197	190	0	0.0%	5,170	0	
2010	6,000	197,839	60	2	3.3%	1,978	66	
2011	5,978	176,902	120	1	0.8%	3,551	30	
2012	5,991	205,913	161	2	1.2%	5,534	69	
2013	6,000	209,000	174	3	1.7%	6,061	105	
2014 ¹	9,982	206,735	42	1	2.4%	870	21	
2015 ¹	9,996	200,608	174	4	2.3%	3,492	80	
2016 ¹	9,993	203,016	63	2	3.2%	1,280	41	
2017 ¹	9,998	212,652	33	3	9.1%	702	64	
2018	6,000	225,974	90	4	4.4%	3,390	151	
2019	6,000	234,135	144	2	1.4%	5,625	78	
'07-'18 Totals			1,515	27	1.8%	48,133	845	
'13-'19 Totals			720	19	2.6%	21,419	539	

¹ Includes Irrigon Hatchery reared fish with PIT tags from ODFW during the reciprocal study years.

Appendix C; Table 9. Estimates of stray rates based on coded-wire tags (recoveries occurring after March 1) of LFH/Wallowa stock hatchery summer steelhead releases at Cottonwood AP, 2000-2017 brood years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	Tag Code	CWT Tagged	Total Release	CWT Total Return	Recoveries after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2000	630281	39,905	215,584	758	4	0.5%	4096	22	
2001	631178	40,520	182,722	683	0	0.0%	3080	0	
2002	631523	40,366	236,627	628	3	0.5%	3681	18	
2003	631528	39,937	137,915	772	6	0.8%	2666	21	
2004	632677	35,781	150,442	386	2	0.5%	1623	8	
2005	633290	19,989	169,390	591	1	0.2%	5008	8	
2006	633664	18,640	159,242	561	2	0.4%	4793	17	
2007	634099	20,140	175,961	1142	11	1.0%	9973	96	
2008	634682	18,329	170,232	308	1	0.3%	2864	9	
2009	635171	20,756	163,197	789	0	0.0%	6205	0	
2010	635567	19,823	197,839	474	0	0.0%	4731	0	
2011	636084	21,506	176,902	514	0	0.0%	4228	0	
2012	636448	20,788	205,913	413	1	0.2%	4091	10	
2013	636587	20,753	209,000	281	2	0.7%	2830	20	
2014 ¹	636744, 090812	20,083	206,735	41	1	2.4%	422	10	
2015 ¹	636890, 090970	19,722	200,608	140	2	1.4%	1424	20	
2016 ¹	637045, 091078	20,954	203,016	108	0	0.0%	1046	0	
2017 ¹	637204, 091108	21,320	212,652	112	0	0.0%	1117	0	
'00-'18				8,701	36	0.4%	63,878	260	

¹ Includes ODFW Irrigon Hatchery reared fish with CWTs during the reciprocal study years.

Appendix C; Table 10. Estimates of stray rates based on PIT tags (detections occurring after March 1) of Tucannon stock hatchery summer steelhead releases in the Tucannon River, 2003-2018 brood years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	PIT Tagged	Total Release	PIT Total Return	Detections after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2003	9971	42,967	57	9	15.8%	246	39	
2004	9965	61,238	80	10	12.5%	492	61	
2005	8953	65,245	170	29	17.1%	1239	211	
2006	8500	62,940	166	29	17.5%	1229	215	
2007	11499	57,230	538	129	24.0%	2678	642	
2008								No production this brood year
2009	4995	57,562	63	15	23.8%	726	173	
2010	9997	77,683	97	22	22.7%	754	171	
2011	14916	51,124	187	64	34.2%	641	219	
2012	14990	58,357	85	20	23.5%	331	78	
2013	14988	90482	141	32	22.7%	851	193	
2014	14972	106871	30	5	16.7%	214	36	
2015	14985	94618	93	23	24.7%	587	145	
2016	14972	72158	45	14	31.1%	217	67	
2017	14969	117223	54	20	37.0%	423	157	
2018	14960	157789	63	15	23.8%	726	173	
2019	15441	100461	129	5	3.9%	839	33	
'03-'19	Totals		1,948	430	22.1%	11,603	2,483	

Appendix C; Table 11. Tucannon stock wild-origin summer steelhead tagged from the Tucannon River smolt trap, 2002-2020 migration years. Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Migration Year	PIT Tagged	Estimated Migration	PIT Total Return	Detections after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2002	1,506	7,818	39	6	15.4%	202	31	
2003	1,556	16,688	35	6	17.1%	375	64	
2004	1,984	13,124	31	2	6.5%	205	13	
2005	1,835	15,812	27	4	14.8%	233	34	
2006	1,417	9,092	33	5	15.2%	212	32	
2007	300	11,500	8	1	12.5%	307	38	
2008	1,087	26,099	68	21	30.9%	1633	504	
2009	1,200	9,033	35	8	22.9%	263	60	
2010	2,632	15,348	82	21	25.6%	478	122	
2011	3,087	27,288	28	7	25.0%	248	62	
2012	2,200	25,636	54	17	31.5%	629	198	
2013	2,967	23,269	80	27	33.8%	627	212	
2014	1,506	16,194	22	9	40.9%	237	97	
2015	281	5,322	2	0	0.0%	38	0	
2016	3,434	25,047	32	4	12.5%	233	29	
2017	2,355	20,391	10	1	10.0%	87	9	
2018	1,525	23,797	23	10	43.5%	359	156	
2019	2,172	20,534	4	1	25.0%	38	9	
2020	2,894	24,851	32	5	15.6%	276	43	
'02-'20	Totals		613	150	24.5%	6,680	1,713	
'14-'20			125	30	24.0%	1,268	343	

Appendix C; Table 12. Estimates of stray rates based on coded-wire tags (recoveries occurring after March 1) of Tucannon stock hatchery summer steelhead released in the Tucannon River 2000-2018 brood years (some years missing). Detections counted as strays are defined as those outside the normal migratory route the juveniles would have taken down the Snake/Columbia Rivers to the ocean.

Brood Year	Tag Code	CWT Tagged	Total Release	CWT Total Return	Recoveries after March 1	% Stray after March 1	Expanded Return	Expanded Stray	Comments
2000	631336	59,232	60,020	11	0	0.0%	11	0	
2001	630970	56,770	58,616	22	5	22.7%	23	5	
2002	631482	38,154	43,688	10	6	60.0%	11	7	
2003	631566	42,458	42,967	15	6	40.0%	15	6	
2004	631186	59,798	61,238	32	16	50.0%	33	16	
2007	634165	51,918	57,230	261	146	55.9%	288	161	
2009	635173	57,279	57,562	154	73	47.4%	155	73	
2010	635572	76,917	77,683	87	45	51.7%	88	45	
2011	636086	49,921	51,124	125	11	8.8%	128	11	
2012	636078	57,011	58,357	23	1	4.3%	24	1	
2013	636581, 636582	76,873	90,483	178	0	0.0%	210	0	
2014	636752, 636753	76,264	106,871	32	0	0.0%	45	0	
2015	636892, 636893	74,931	94,618	89	9	10.1%	112	11	
2016	636907, 636908	70,881	72,158	40	3	7.5%	41	3	1 at Dworshak Hatchery, likely trapped in the fall and held for broodstock
2017	636987, 637099	79,072	117,223	31	7	22.6%	46	10	
2018	637206, 637313	79,644	157,789	31	0	0.0%	61	0	
2019	637544, 637569	57,902	100,461	19	0	0.0%	33	0	
'00-18	Totals			1,160	328	28.3%	1,323	351	



This program receives Federal 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 Coordinator at 600 Capitol Way North, Olympia WA 98501 or write to:

U.S. Fish and Wildlife Service, Civil Rights Coordinator for Public Access 4401 N. Fairfax Drive,
Mail Stop: WSFR-4020, Arlington, VA 22203