Lyons Ferry Complex Hatchery Evaluation:
Summer Steelhead Annual Report
2013-2017 Run Years

by

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Cooperative Agreement # F16AC00033

December 2020

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 Doug Maxey, Tanner Gallaher, 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 these years. We also thank the permanent and temporary staff at the Snake River Lab for their valuable assistance during these years.

Special thanks to Michael Gallinat, Lance Ross, and 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.

We thank Don Whitney and staff of Idaho Fish and Game for their assistance in conducting joint Snake River creel surveys and providing CWT recoveries from Idaho fisheries. We also thank Jim Ruzycki and Lance Clarke and crew from Oregon Department of Fish and Wildlife, and especially Mike Flesher, for their leadership in conducting the Grande Ronde River creel survey and providing angler effort and catch data and providing CWT recoveries for expansion. 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 additional WDFW personnel (John Sneva, Lance Campbell, Gil Lensegrav, Lynn Anderson, and Ben Warren) for their assistance with portions of the project. A special thanks to Greg Lippert and all of his assistance with compiling and summarizing the data into the Snake River Lab's adult trap database.

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 WDFWs progress toward meeting summer steelhead and rainbow trout mitigation goals established under the Lower Snake River Compensation Plan (LSRCP). This report covers a total of five steelhead run years (2013-2017). Summaries provided cover the basic needs of the program. In some instances, additional discussion has been provided to further explain items, or 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. The LSRCP steelhead goal for Washington is 86,000 pounds and was achieved in all five year of this reporting period.

The LFC summer steelhead harvest mitigation programs, which historically consisted of LFH and Wallowa stocks, but now consists of Wallowa, Tucannon, and Touchet stocks, continues to meet and/or exceed the original mitigation goals to the Snake River Project area. From 1984 to 2017 run years, there has been only been one year where the project area goals haven't been met (1984), which was in part due to the program not being fully operational with the 1982 brood year releases. Due to a variety of factors, smolt-to-adult survivals to the project area have generally been 2-3 times higher than the original LSRCP assumed target survival for steelhead (0.5%) over the years. The higher smolt-to-adult survival is also in part because fishery harvest rates in the lower Columbia River fisheries have declined substantially since the program was initiated. Survival of hatchery steelhead from egg to smolt was greater than 75% for all stocks, and smolt release and marking/tagging goals for summer steelhead were met or within acceptable limits for the reporting period.

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 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 2002-2016 migration years) was 2.2% back to Bonneville Dam, and 1.7% to Ice Harbor Dam. Natural origin adults returning to the Tucannon River were estimated based on PIT tag detections. Average natural-origin adult return based on the PIT tags for the last ten run years is 187 fish; 98 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 River and Walla Walla River 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, including PIT tag reporting, coded-wire tag recoveries, and age composition for each natural and hatchery origin steelhead stock we monitor.

WDFW staff surveyed steelhead anglers within the LSRCP area of southeast Washington to estimate adult returns and complete run reconstruction efforts from 2013/14 through 2016/17. Summary results of those surveys (anglers, effort, number of fish captured) are provided.

In Spring of 2014-2018, spawning ground surveys were conducted to estimate the number of redds in index areas of the Touchet River and Asotin Creek (Asotin Creek surveys were stopped after 2016). Stream flows limited our ability to conduct surveys in some years. Based on a combination of data sources (stream surveys and adult trapping), information from adult traps on both streams, and using regression analysis in some instances, we estimate the total redds in the indexed areas of these streams.

Table of Contents

List of Figures

List of Tables

Introduction

This report encompasses run years 2013/14 through 2017/18 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 (USFWS 2018). The reporting period covers between 1 July 2013 and 30 September 2018, 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 of 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. Tucannon Fish Hatchery 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.

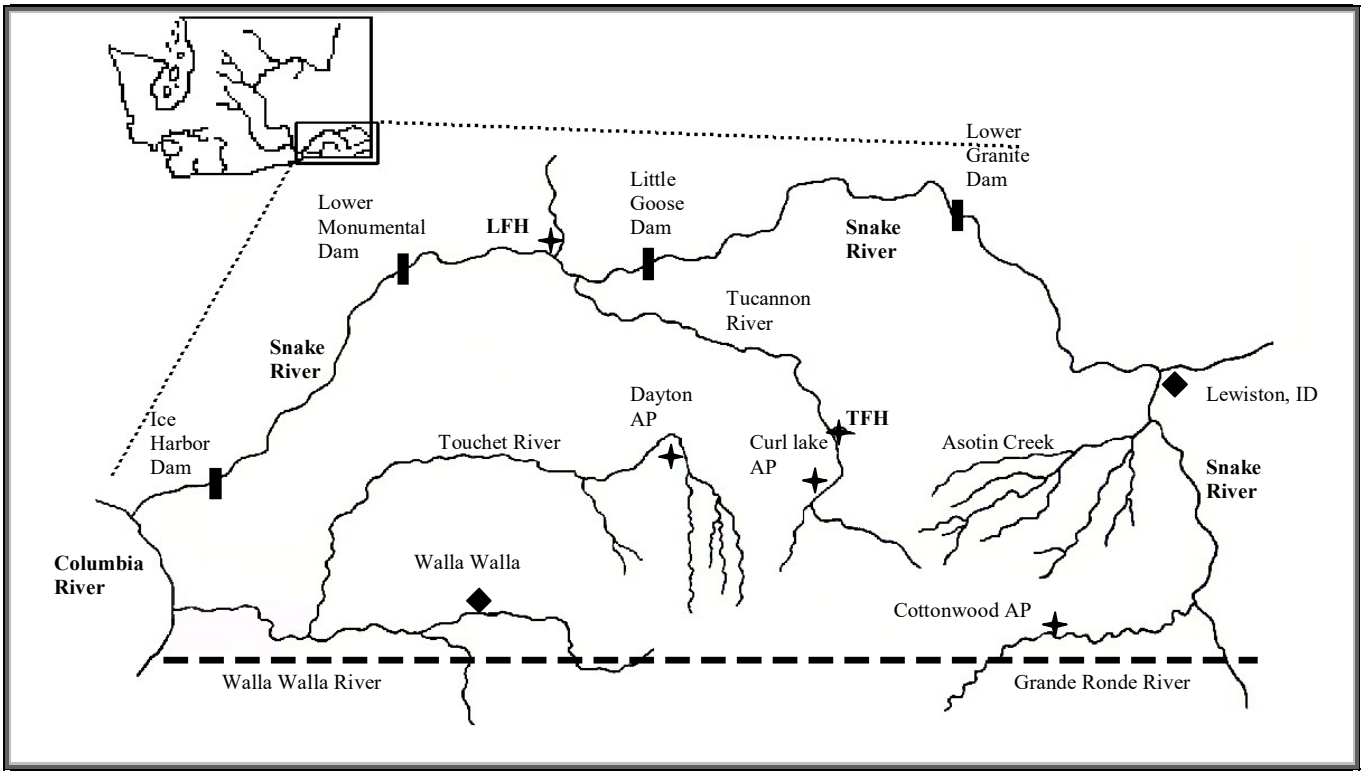


Figure 1. Map of major rivers and streams in southeast Washington, and LFC facilities.

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 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 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 Spokane stock trout for the Nez Perce Tribe's resident fish program (1,650 lbs) and Idaho Department of Fish and Game (IDFG) resident fall fishery program (17,600). During the report period, stocking of LSRCP produced rainbow trout stocked within Washington lakes/streams and transfers to Nez Perce Tribe and IDFG went as planned. Appendix A has LSRCP produced rainbow trout distributions over time.

Steelhead: The Washington LSRCP summer steelhead mitigation program goal is to produce a return of 4,656 adult steelhead to the project area fulfilling harvest and broodstock needs. The 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. The Walla Walla basin was added in the original LSRCP agreement for off-site mitigation because of the drastically reduced fishing opportunities for steelhead caused by the dams, in addition to the managers uncertainty surrounding survival through the hydro system in the Snake River basin. In addition, there is an adult summer steelhead harvest objective of 9,312 adults downstream of the project area (USFWS 2018).

Steelhead production program targets changed over the 2014-2018 juvenile release periods. Reasoning for these changes will be described in the juvenile release section. Lyons Ferry Complex used three summer steelhead stocks to produce smolts for releases into the Snake Tucannon, Grande Ronde, Walla Walla, and Touchet rivers enhancing recreational opportunities for steelhead anglers and for ESA recovery purposes. Release sizes of 4.5 fish/lb (100.8g/fish) are program targets regardless of release site or stock. 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 the rainbow trout production goals.

In-Hatchery Survival

One of our main tasks for the hatchery evaluation program is to track survival from 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 among years (Tables 1-3). 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 large numbers of living organisms. 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 survival standard used by WDFW 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 (Tables 1-3).

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 from year-to-year, 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.

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 (Tables 1 and 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, when 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 2018 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
Mean					85.7			83.7
(n)					19			18
SD					9.0			11.8

[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 2018 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	511,099	90.4
Mean					82.9			81.5
(n)					19			19
SD					10.1			11.1

[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] The 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

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 2018 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
Mean					86.1			83.5
(n)					19			19
SD					10.8			11.6

[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 stock destined for release between 2014 and 2018 were marked with an adipose (AD) fin clip, and a portion of each release group also received a coded-wire tag (CWT). Passive integrated transponder, or PIT tags, are also inserted prior to release (Tables 4 to 8). External marks and internal tags are used for selective fisheries harvest management, estimating smolt-to-adult survival, and to document straying. All non-harvest mitigation steelhead using Tucannon and Touchet endemic stocks are not adipose fin clipped but are correspondingly 100% CWT. 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 our 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).

As mentioned previously, production targets for some of the releases changed over the reporting period, as well as release location. Due to ESA concerns on the Tucannon River steelhead population, the Walla Walla River release of 100,000 smolts was eliminated following the 2017 release year. This reduction along with the desire to maintain the full mitigation harvest benefit that program production led to some of the Wallowa stock production shifted to the Cottonwood AP release (+25,000 smolts) and the Dayton AP release (+15,000). As the Tucannon steelhead program provided a more consistent and increased juvenile production, the on-station release at LFH was reduced from 110,000 to 60,000. All of these changes were prompted by ESA concerns in the Tucannon River because LFH, Walla Walla, and Dayton AP released fish have shown a propensity to stray into the Tucannon if the adult trap at LFH isn't operated for broodstock collection.

During the reporting period (2015-2018 migration years), WDFW and Oregon Dept. of Fish and Wildlife began an evaluation to compare performance (survival and straying) of Wallowa stock summer steelhead reared at either LFH or Irrigon Fish Hatchery. For WDFW's Cottonwood AP site, ~40,000 steelhead that were reared at Irrigon Fish Hatchery were transferred in to be released (~25,000 AD/CWT and 4,000 PIT tags), while ~40,000 steelhead that were reared at LFH were transferred to Wallowa Fish Hatchery (~4,000 PIT tags) for release. Comparable CWTs and PITs were also released at each site per respective marking/tagging of each agency standard release groups that would be used for comparison. Results to date indicate the steelhead reared at LFH and released in the Grande Ronde River perform about 2-times greater (smolt-to-adult survival) compared to those fish reared by ODFW at Irrigon Hatchery. More in-depth results of this study will be presented in a progress report completed in 2021.

In the Touchet River, the Touchet endemic stock release location was changed in 2016 from the North Fork Touchet River to the Dayton AP. This was done to increase smolt-to-adult survival rates for that program. In addition, per request of co-managers, WDFW started a parental origin mating evaluation in 2016 on the Touchet program. This involved collecting first-generation hatchery fish as Touchet broodstock. Parental crosses of WxW and HxW were reared separately at LFH and PIT tagged for adult return evaluation. To date, benefits (if any) have been marginal (SAR WxW group =0.45% [2016-2018 MY], SAR HxW group =0.52% [2016-2018 MY]). Regardless, this marginal improvement might be deemed great enough to make a program change soon, and/or decide the fate of this program overall. Results from this evaluation will be completed in the next few years.

Another change occurring among the steelhead programs was the release of the conservation group (non-clipped) into the Tucannon River. These fish had been released into the pool of the Curl Lake intake, but in 2017 the fish were transferred from TFH to Curl Lake after the spring Chinook Salmon were released. The acclimation period in Curl Lake for these fish is only a few weeks, and fish can leave the pond volitionally if they chose to. The change assumes a survival benefit by allowing time to recover from the stress of transport and leave on their own accord.

Prior to release each year, the WDFW Snake River Lab evaluation staff collect pre-release samples from all LFC release locations (Table 9). Generally, about 200 fish/group are sampled, with the goal to collect fish a day or two prior to release, so we can 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 in 2014 through 2018. Per NOAA Fisheries Biological Opinion requirements (NOAA Fisheries Biological Opinion, 2017), we assess percent precocial fish in each release group as an index of potential residualism.

Table 4. Summer steelhead smolt releases from Lyons Ferry Complex, 2014.

Location	Stock	Rkm	Date	Release Goal	Total release	AD-only 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	4/08-22	200,000	209,000	208,266	20,227	636587	None	6,000	40,980	5.1	1.2
Snake River @ LFH	WAL	92.8	4/14-18	110,000	117,500	116,623	20,082	636590	None	2,995	29,774	4.3	1.3
Touchet River @ Dayton AP	WAL	86.4	4/22-5/28	85,000	90,000	89,132	20,386	636588	None	3,000	14,754	6.1	1.0
Walla Walla River	WAL	48.0	4/15-18	100,000	109,436	108,263	20,117	636589	None	3,000	28,051	4.1	0.8
Tucannon River @ Curl Intake	TUC	66.5	4/22-23	50,000	49,759	0	47,769	636581	None	7,491	10,366	4.8	1.4
Tucannon River @ Marengo	TUC	41.2	4/21	50,000	40,724	40,146	27,166	636582	None	7,497	7,409	5.5	0.6
Touchet River @ NF Touchet Br.	TOU	91.5	4/23-24	50,000	49,523	0	46,921	636591	None	5,000	10,317	4.8	2.8

Table 5. Summer steelhead smolt releases from Lyons Ferry Complex, 2015.

Location (Stock)	Stock	Rkm	Date	Release Goal	Total release	AD-only 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	3/23-31	200,000	206,735	204,959	20,083	636744	None	9,975 [a]	41,347	5.0	3.0
Snake River @ LFH	WAL	92.8	4/08-10	60,000	75,456	74,634	20,384	636747	None	2,991	19,348	3.9	1.4
Touchet River @ Dayton AP	WAL	86.4	3/27-4/14	85,000	87,451	86,874	20,523	636745	None	2,989	20,337	4.3	1.3
Walla Walla River	WAL	48.0	4/10	100,000	110,751	110,002	20,516	636746	None	2,987	27,492	4.7	0.6
Tucannon River @ Curl Intake	TUC	66.5	4/15	50,000	50,363	0	50,111	636752	None	7,484	9,875	5.1	6.2
Tucannon River @ Marengo	TUC	41.2	4/13-14	50,000	56,508	52,479	3,950	636753	None	7,488	13,141	4.3	7.0
Touchet River @ NF Touchet Br.	TOU	91.5	4/15-17	50,000	48,711	0	46,183	636748	None	4,999	8,698	5.6	5.2

[a] Includes an additional 4,000 PIT Tags from Oregon Dept of Fish and Wildlife for Wallowa Stock Reciprocal Study

Table 6. Summer steelhead smolt releases from Lyons Ferry Complex, 2016.

Location (Stock)	Stock	Rkm	Date	Release Goal	Total release	AD-only 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	4/11-18	200,000	200,608	198,879	19,584	636890	None	9,996 [a]	40,940	4.9	3.4
Snake River @ LFH	WAL	92.8	4/13-18	110,000	100,857	97,474	18,898	636887	None	3,000	22,922	4.4	3.2
Touchet River @ Dayton AP	WAL	86.4	4/13-18	85,000	88,100	87,118	20,488	636889	None	2,999	19,578	4.5	1.7
Walla Walla River	WAL	48.0	4/11-13	100,000	101,594	97,353	19,938	636888	None	3,000	22,881	4.5	1.9
Tucannon River @ Curl Intake	TUC	66.5	4/18-5/09	50,000	50,529	0	50,276	636892	None	7,494	10,751	4.2	3.6
Tucannon River @ Marengo	TUC	41.2	4/18-19	50,000	44,089	43,115	24,474	636893	None	7,491	9,798	4.6	2.6
Touchet R. @Dayton AP (WxW)	TOU	86.4	4/13-18	25,000	16,153	0	15,580	636891	None	5,000	3,846	4.7	2.0
Touchet R. @Dayton AP (HxW)	TOU	86.4	4/13-18	25,000	31,522	0	30,655	636891	None	4,996	7,164	4.4	2.8

[a] Includes an additional 4,000 PIT Tags from Oregon Dept of Fish and Wildlife for Wallowa Stock Reciprocal Study

Table 7. Summer steelhead smolt releases from Lyons Ferry Complex, 2017.

Location (Stock)	Stock	Rkm	Date	Release Goal	Total release	AD-only 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	4/10-25	200,000	203,016	202,738	20,954	637045	None	9,993 [a]	43,195	4.7	1.3
Snake River @ LFH	WAL	92.8	4/11-14	110,000	81,021	80,565	20,461	637042	None	2,995	17,275	4.4	1.2
Touchet River @ Dayton AP	WAL	86.4	4/10-24	85,000	85,490	84,409	20,741	637043	None	3,000	19,881	4.3	1.9
Walla Walla River	WAL	48.0	4/10-11	100,000	66,530	65,796	20,115	637044	None	2,998	15,990	4.3	3.5
Tucannon River @ Curl Lake	TUC	66.0	4/24-5/08	50,000	49,545	0	49,055	636907	None	7,481	11,796	4.2	2.2
Tucannon River @ Marengo	TUC	41.2	4/13	100,000	22,613	21,826	22,154	636908	None	7,491	4,711	4.8	2.1
Touchet R. @Dayton AP (WxW)	TOU	86.4	4/10-24	25,000	23,310	0	23,256	637046	None	4,970	5,298	5.3	0.2
Touchet R. @Dayton AP (HxW)	TOU	86.4	4/10-24	25,000	34,080	0	33,627	637046	None	4,992	6,816	5.0	1.3

[a] Includes an additional 4,000 PIT Tags from Oregon Dept of Fish and Wildlife for Wallowa Stock Reciprocal Study

Table 8. Summer steelhead smolt releases from Lyons Ferry Complex, 2018.

Location (Stock)	Stock	Rkm	Date	Release Goal	Total release	AD-only 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	4/15-24	225,000	212,652	211,614	21,320	637204	None	9,998 [a]	40,895	5.2	0.4
Snake River @ LFH	WAL	92.8	4/16	60,000	65,159	64,768	0	No CWT	None	4,989	15,153	4.3	NA
Touchet River @ Dayton AP	WAL	86.4	4/15-25	100,000	101,000	100,271	21,264	637205	None	2,998	21,956	4.6	0.4
Tucannon River @ Curl Lake	TUC	66.0	5/7-18	50,000	52,531	0	52,379	637099	None	7,488	11,420	4.6	0.3
Tucannon River @ Marengo	TUC	41.2	4/17	100,000	64,692	64,124	26,322	636987	None	7,481	14,387	4.5	0.3
Touchet R. @Dayton AP (WxW)	TOU	86.4	4/15-25	25,000	21,401	0	21,129	637207	None	4,990	4,281	4.8	2.2
Touchet R. @ Dayton AP (HxW)	TOU	86.4	4/15-25	25,000	30,730	0	30,340	637207	None	4,997	6,145	5.2	0.6

[a] Includes an additional 4,000 PIT Tags from Oregon Dept of Fish and Wildlife for Wallowa Stock Reciprocal Study

Table 9. 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, 2014-2018.

Location (Stock)	Sample Date	Sample size (n)	Avg LN (mm)	Avg WT (g)	K	CV	FPP	Percent precocious
2014 Release Year								
Cottonwood (Wallowa)	4/8	200	191.8	88.5	1.21	14.0	5.1	1.0
Lyons Ferry (Wallowa)	4/17	200	208.7	102.2	1.07	13.7	4.8	0.0
Lake #1 (Wallowa) [a]	4/15-17	520	223.1	121.6	1.06	6.6	3.7	0.0
Touchet (Wallowa)	4/22	200	183.2	74.8	1.13	15.2	6.1	0.0
Walla Walla (Wallowa)	4/17	120	213.8	109.3	1.07	10.2	4.1	0.0
Tucannon (Endemic)	4/21	200	199.2	947	1.14	13.9	4.8	0.0
Touchet (Endemic)	4/21	200	198.0	94.9	1.16	15.8	4.8	0.0
2015 Release Year								
Cottonwood (Wallowa)	3/23	200	204.8	91.5	1.03	11.4	5.0	1.5
Lyons Ferry (Wallowa)	4/8	200	220.4	114.9	1.03	11.6	3.9	0.5
Lake #1 (Wallowa) [a]	4/9	200	225.9	116.7	1.00	8.8	3.9	0.0
Touchet (Wallowa)	3/25	200	211.1	105.0	1.08	10.9	4.3	1.0
Walla Walla (Wallowa)	4/8	200	206.6	96.3	1.04	12.8	4.7	0.5
Tucannon (Endemic)	4/13	200	195.8	88.8	1.10	15.7	5.1	0.5
Touchet (Endemic)	4/13	200	182.5	80.4	1.17	20.5	5.6	1.0
2016 Release Year								
Cottonwood (Wallowa)	4/5	200	205.2	92.4	1.05	16.0	4.9	0.0
Lyons Ferry (Wallowa)	4/11	200	213.6	103.6	1.05	15.4	4.4	0.0
Lake #1 (Wallowa) [a]	4/11	200	220.1	103.7	0.96	7.9	4.4	0.0
Touchet (Wallowa)	4/13	200	207.5	101.8	1.10	11.7	4.5	0.0
Walla Walla (Wallowa)	4/11	200	213.1	101.7	1.02	11.1	4.5	0.0
Tucannon (Endemic)	4/15	400	201.2	103.4	1.15	18.7	4.4	0.3
Touchet (Endemic)	4/13	400	202.4	99.9	1.12	15.2	4.5	0.3
2017 Release Year								
Cottonwood (Wallowa)	4/5	200	208.0	96.7	1.04	11.9	4.7	0.5
Lyons Ferry (Wallowa)	4/11	216	210.0	102.9	1.12	11.5	4.4	0.5
Lake #1 (Wallowa) [a]	4/11	203	220.2	105.9	0.98	7.4	4.3	0.5
Touchet (Wallowa)	3/31	172	204.4	105.3	1.19	11.5	4.3	0.0
Walla Walla (Wallowa)	4/11	216	207.0	96.9	1.05	11.9	4.7	0.9
Tucannon (Endemic)	4/11,20	420	202.1	101.6	1.13	17.0	4.5	1.0
Touchet (Endemic)	3/31	398	193.9	87.4	1.13	15.7	5.2	0.8
2018 Release Year								
Cottonwood (Wallowa)	4/4	189	198.6	86.4	1.07	10.8	5.2	0.0
Lake #3 (Wallowa) [a]	4/16	200	222.1	106.0	0.96	8.5	4.3	0.0
Touchet (Wallowa)	4/9	200	208.9	98.3	1.08	8.7	4.6	1.0
Tucannon (Endemic)	4/17,27	345	206.8	101.5	1.08	14.2	4.5	1.0
Touchet (Endemic)	4/10	363	194.9	90.3	1.12	18.5	5.0	0.6

[a] Fish removed from Lake#1 during April were released in the Walla Walla River or directly to the Snake River at Lyons Ferry.

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 were 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 to estimate the number and age composition of migrating natural steelhead smolts (Table 10). Methods to estimate smolt production are identical to those described in Gallinat et al. (2012) and based on the approach of Steinhorst et al. (2004). This method involves 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 as long as 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.

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 track 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). In addition to the array O&M, the BPA project also purchases 7,500 PIT tags for spring Chinook and pays for the PIT tagging of 15,000 Tucannon River spring Chinook (the remaining 7,500 tags are purchased by LSRCP). The average smolt-to-adult survival of natural origin summer steelhead from the Tucannon River (based on the PIT tags from 2002 through 2017 migration years) is 2.2% back to Bonneville Dam and 1.7% to the LSRCP project area above Ice Harbor Dam (Table 11).

Table 10. Smolt population estimates with upper and lower confidence intervals derived from the Tucannon River Smolt Trap, and proportions of each estimate by age class.

	Population Estimate			Smolt Age				Smolt Age %			
Migration Year	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	13,682	8,493	1,094	0	58.8	36.5	4.7	0.0
2013/14	16,194	12,537	21,948	9,994	5,690	510	0	61.7	35.1	3.1	0.0
2014/15	5,322	2,736	9,801	2,347	2,737	238	0	44.1	51.4	4.5	0.0
2015/16	25,047	22,138	28,881	11,346	12,824	877	0	45.3	51.2	3.5	0.0
2016/17	20,391	17,324	24,864	11,739	7,765	877	10	57.6	38.1	4.3	0.0
2017/18	23,797	18,562	31,109	8,874	13,346	1,577	0	37.3	56.1	6.6	0.0
Average 97/98 to 17/18	*18,091*			*7,824*	*9,235*	*1,022*	*9*	*41.7*	*52.5*	*5.8*	*0.1*

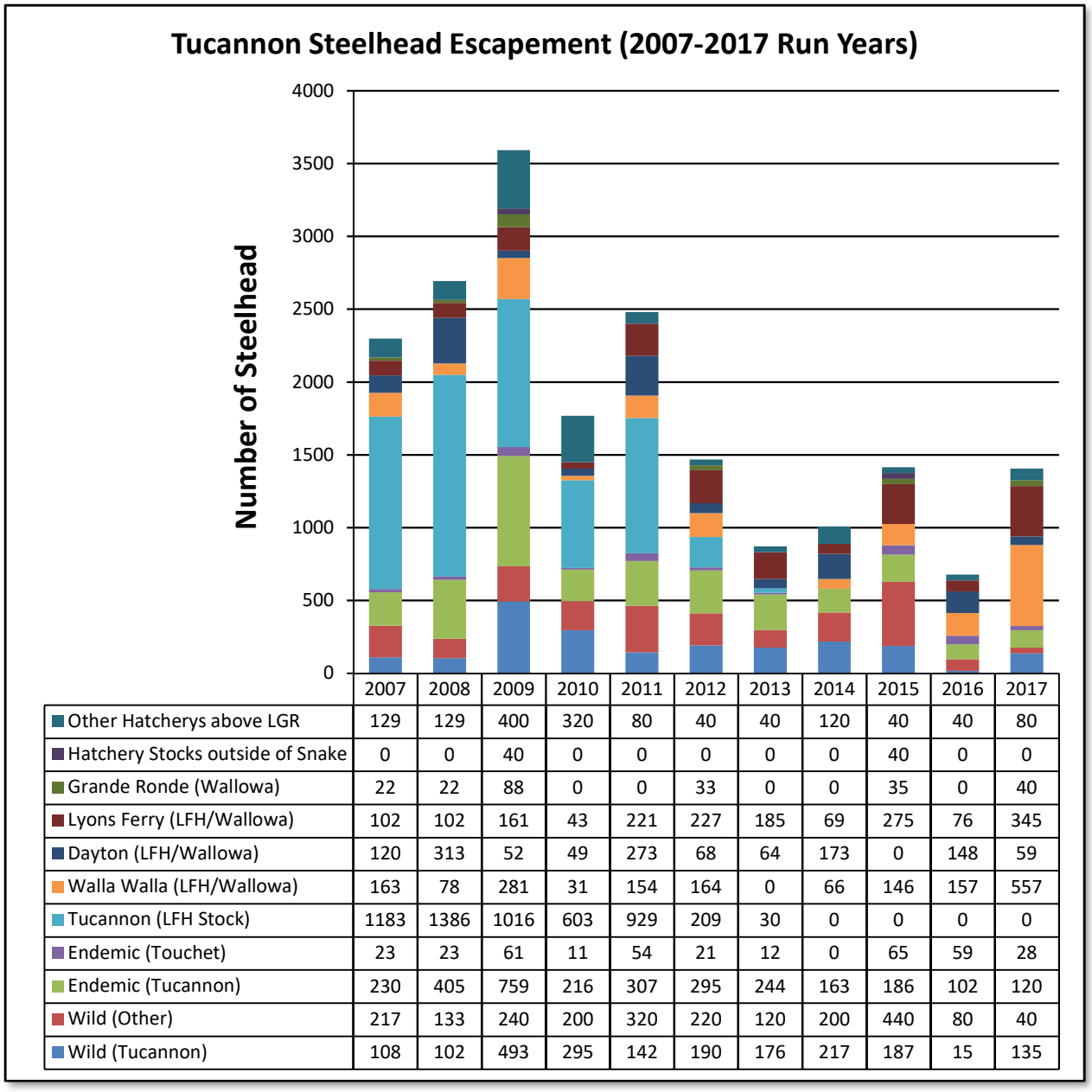
Table 11. Estimated smolt-to-adult survival rate of naturally produced summer steelhead smolts from the Tucannon River based on adult PIT tag detections at Bonneville and Ice Harbor dams, 1999-2017 migration years.

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	6	0.4%	6	0.4%
Geomean			**1.8%**		**1.4%**
Average			**2.2%**		**1.7%**

Note: 2018 migration year returns do not include 2-salt returns returning in the 2020 run.
[a] The number of PIT tags are for fish >124mm at time of tagging only (considered smolts).

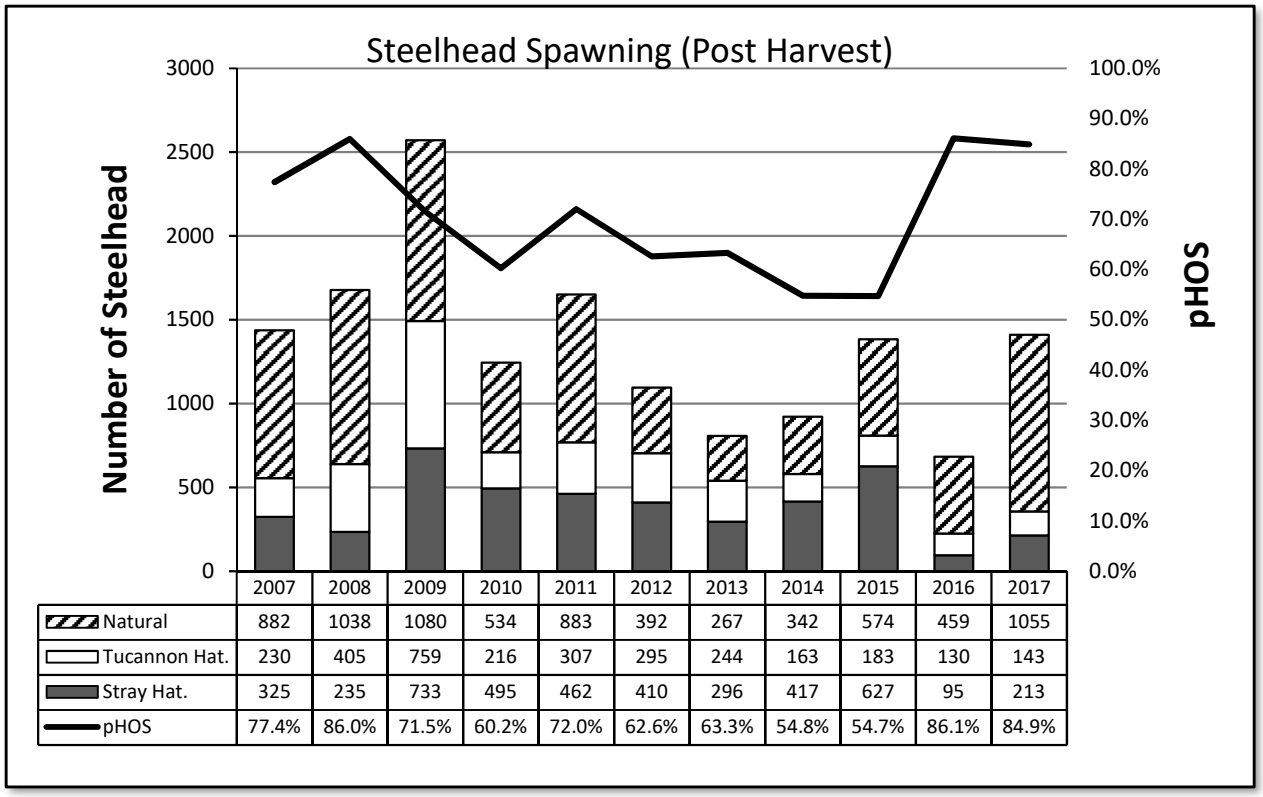
Adult Returns

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 wild origin returns to the Tucannon River are presented for the 2007-2017 run years (Figure 2). Estimates of the number of spawners by origin (post-harvest), and the proportion of hatchery origin spawners (pHOS) has been calculated (Figure 3). The estimates provided in Figures 2 and 3 represent actual fish detected by the arrays, not adjusted for array efficiency, so the actual number in all groups is likely higher. In most years, array efficiency for summer steelhead at the Lower Tucannon Array is generally >80%. Future years estimates may be adjusted to account for the array efficiency, and current estimates should be viewed conservatively.



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Other Hatcherys above LGR	129	129	400	320	80	40	40	120	40	40	80
Hatchery Stocks outside of Snake	0	0	40	0	0	0	0	0	40	0	0
Grande Ronde (Wallowa)	22	22	88	0	0	33	0	0	35	0	40
Lyons Ferry (LFH/Wallowa)	102	102	161	43	221	227	185	69	275	76	345
Dayton (LFH/Wallowa)	120	313	52	49	273	68	64	173	0	148	59
Walla Walla (LFH/Wallowa)	163	78	281	31	154	164	0	66	146	157	557
Tucannon (LFH Stock)	1183	1386	1016	603	929	209	30	0	0	0	0
Endemic (Touchet)	23	23	61	11	54	21	12	0	65	59	28
Endemic (Tucannon)	230	405	759	216	307	295	244	163	186	102	120
Wild (Other)	217	133	240	200	320	220	120	200	440	80	40
Wild (Tucannon)	108	102	493	295	142	190	176	217	187	15	135

Figure 2. Estimated escapement of summer steelhead into the Tucannon River, 2007-2017 run years. (Note: Estimates provided are considered minimum and represent only fish detected at the array, not adjusted for PIT array efficiency)



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Natural	882	1038	1080	534	883	392	267	342	574	459	1055
Tucannon Hat.	230	405	759	216	307	295	244	163	183	130	143
Stray Hat.	325	235	733	495	462	410	296	417	627	95	213
pHOS	77.4%	86.0%	71.5%	60.2%	72.0%	62.6%	63.3%	54.8%	54.7%	86.1%	84.9%

Figure 3. Estimated escapement post-harvest of summer steelhead into the Tucannon River, 2007-2017 run years.

Based on the data to date (Figure 2), the average of the Tucannon River natural origin stock return for the last eleven run years is 187 fish. This estimate is 98 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 release 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. In-stream tributary detectors (PIT tag arrays) are becoming more common and provide more information on returns and distributions into specific stream where they are present (i.e. Tucannon River). PIT tagging of our various hatchery steelhead stocks, and natural origin fish (Tucannon River) started at different times depending on monitoring needs or

PIT tags available. Therefore, the time series available to describe adult migratory patterns (by origin and/or hatchery stock) varies. Regardless, these times series have proven useful and continue to highlight one of the major issues we face in SE Washington; that of overshooting steelhead and straying.

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 12).

Similar to the 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 (Tables 13 and 14). Other Columbia Basin researchers have documented the same overshoot issue with steelhead from the John Day and Umatilla rivers. Many of the overshoot steelhead from the middle Columbia River populations end up in the Snake River, with some straying in the Tucannon River based on entry timing. We will continue to monitor this overshoot behavior and assess potential impacts to steelhead populations.

Two other LFC hatchery steelhead releases (LFH stock in the Snake River at LFH, and Cottonwood AP in the Grande Ronde) have also been PIT tagged in more recent years. 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 15). 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 12. Detections of PIT tagged Tucannon Endemic stock, Tucannon natural stock, and Lyons Ferry hatchery 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 Tucannon	% above 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	10	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	17	14	8	8	56.3%	23	60.5%	18.4%	21.1%
Totals	**1166**	**723**	**337**	**133**	**208**	**28.8%**	**546**	**46.8%**	**41.8%**	**11.4%**
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	0	1	10.0%	1	9.1%	81.8%	0.0%
2017	22	13	8	0	8	61.5%	16	72.7%	22.7%	0.0%
Totals	**378**	**241**	**113**	**39**	**48**	**21.3%**	**150**	**41.0%**	**49.3%**	**9.8%**
Lyons Ferry Hatchery Stock Summer Steelhead (Released into the lower Tucannon River)										
2007	295	208	50	45	41	20.2%	91	30.8%	53.9%	15.3%
2008[a]	192	100	68	32	19	19.4%	77	40.1%	43.2%	16.7%
2009	132	93	17	26	20	22.2%	37	28.0%	52.3%	19.7%
2010	96	71	7	26	13	18.8%	20	20.8%	52.1%	27.1%
2011	101	48	19	40	12	25.0%	31	30.7%	29.7%	39.6%
2012	16	9	4	4	3	33.3%	7	43.8%	31.3%	25.0%
2013	1	0	1	0	0	0.0%	1	100.0%	0.0%	0.0%
Totals	**833**	**529**	**166**	**173**	**108**	**20.4%**	**264**	**31.7%**	**47.5%**	**20.8%**

[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 13. Detections of PIT tagged Touchet River Endemic stock, Touchet River wild stock, and Lyons Ferry stock summer steelhead (Walla Walla and Dayton AP release groups) 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	Tucannon River
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%
Totals	**624**	**101**	**471**	**148**	**64**	**16.2%**	**75.5%**	**23.7%**	**10.3%**
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%
Totals	**493**	**75**	**378**	**110**	**48**	**15.2%**	**76.7%**	**22.3%**	**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 14. 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 above IHR	# Stayed above LGR	# Stayed Tucannon	Percent of those that passed McNary Dam [a] Into Walla2	Above IHR	Above LGR	Tucannon River
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%
Totals	**484**	**239**	**177**	**34**	**62**	**49.4%**	**36.6%**	**7.0%**	**12.8%**
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	13	5	2	0	56.5%	21.7%	8.7%	0.0%
Totals	**522**	**351**	**118**	**36**	**44**	**67.2%**	**22.6%**	**6.9%**	**8.4%**

[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 15. 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).

						Percent of those that passed Ice Harbor Dam		
Run Year	# Pass IHR	# Pass LGR	Total into Tucannon	Unknown Location	Stay Above Lower Granite	Into Tucannon	Unknown	Above 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%
Totals	**949**	**906**	**6**	**37**	**906**	**0.6%**	**3.9%**	**95.5%**
LFH/Wallowa Stock Summer Steelhead Released On-Station at LFH								
2009	57	25	5	33	19	8.8%	33.3%	57.9%
2010	41	20	1	25	15	2.4%	36.6%	61.0%
2011	49	18	5	33	11	10.2%	22.4%	67.3%
2012	35	16	4	21	10	11.4%	28.6%	60.0%
2013	64	25	4	41	19	6.3%	29.7%	64.1%
2014	64	34	4	33	27	6.3%	42.2%	51.6%
2015	49	25	8	19	22	16.3%	44.9%	38.8%
2016	30	19	3	10	17	10.0%	56.7%	33.3%
2017	34	23	9	7	18	26.5%	52.9%	20.6%
Totals	**423**	**205**	**43**	**222**	**158**	**10.2%**	**52.5%**	**37.4%**

Summer Steelhead Broodstock Collections / Adult Returns and Evaluations

As part of our annual broodstock collection and research activities, WDFW hatchery and evaluation staffs 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. Information presented below summarizes trapping, collection of broodstock, and hatchery spawning activities and any additional evaluation projects for the reporting period. Fecundity estimates by age class have remained very consistent over the course of the program for several of our managed brood stocks. In an upcoming report, there will be a more in-depth look of fecundities by age class (1-salt or 2-salt) for the programs.

Lyons Ferry Hatchery Trap

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 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 LFH trap was not run consistently after the 2012 run as there was no longer a need to collect broodstock because the program was switched over to the Wallowa stock (trapped at Cottonwood Creek on the Grande Ronde) beginning with the 2013 run. During years that either broodstock numbers were low at Cottonwood, or the Cottonwood adult trap was unable to collect broodstock due to low water conditions, the LFH trap would be operated to collect broodstock and/or the Oregon Department of Fish and Wildlife (ODFW) would collect and spawn broodstock for use. The ODFW can collect Wallowa broodstock from Big Canyon or Wallowa Hatchery adult traps.

Run Year 2015: Two adult steelhead were trapped in November 2015 during fall Chinook trapping. These two were killed for CWT extraction (Table 16).

Run Year 2016: The trap was operated in the spring to capture Wallowa stock steelhead, assisting with broodstock collection at Cottonwood. A total of 242 steelhead were captured (149 females [61.6%] and 93 males [38.4%]). Twenty-five steelhead had CWT extracted (Table 16). Age composition of the return based on CWT recoveries was 55.0% one-ocean, 45.0% two-ocean, and 0.0% three-ocean. Five recoveries were from residual steelhead that had entered trap after their release from Lyons Ferry Hatchery in the spring of 2015.

Run Year 2017: A total of 268 adult steelhead (157 females [58.6%] and 111 males [41.4%]) were trapped. Fish were retained for broodstock on March 13, 19, and 26, 2018. All fish not needed for broodstock were retained to recover CWTs and/or sacrificed. A total of 41 fish were killed for CWT extraction (Table 16). Age composition of the return based on CWT recoveries was 80.6% one-ocean, 19.4% two-ocean, and 0.0% three-ocean.

All steelhead trapped and/or retained from the LFH adult trap were scanned for PIT tags. For the 2018 brood (2017 run year), we detected two unique PIT tags in fish trapped for broodstock. All recovered PIT tag data was uploaded to PTAGIS per sampling and reporting protocols.

Table 16. Summary of CWT adult summer steelhead recovered at LFH during the 2015, 2016 and 2017 run years.

	CWT code	Stock	Release site	Number of CWTs
2015 Run Year				
2011 BY [a]	63 / 60 / 83	Wallowa	Walla Walla River	1
	63 / 60 / 82	Wallowa	Touchet River @ Dayton AP	1
			Total	**2**
2016 Run Year				
2013 BY [b]	63 / 65 / 89	Wallowa	Walla Walla River	1
	63 / 65 / 90	Wallowa	Lyons Ferry-On Station	7
	63 / 65 / 91	Touchet	Touchet River @ Dayton AP	1
2014 BY [b]	63 / 67 / 45	Wallowa	Touchet River @ Dayton AP	1
	63 / 67 / 47	Wallowa	Lyons Ferry-On Station	10
2015 BY [b]	63 / 68 / 87	Wallowa	Lyons Ferry-On Station	5
			Total	**25**
2017 Run Year				
2014 BY [b]	63 / 67 / 45	Wallowa	Touchet River @ Dayton AP	1
	63 / 67 / 47	Wallowa	Lyons Ferry-On Station	6
2015 BY [b]	63 / 68 / 87	Wallowa	Lyons Ferry-On Station	21
	63 / 68 / 88	Wallowa	Walla Walla River	10
	63 / 68 / 89	Wallowa	Touchet River @ Dayton AP	1
	63 / 68 / 92	Tucannon	Curl Lake	1
	09 / 09 / 66	Wallowa	Spring Cr.	1
			Total	**41**

[a] Fish trapped during fall Chinook trapping.

[b] Wallowa stock trapped at LFH to help meet broodstock goals for the WDFW Wallowa stock program.

Cottonwood Creek Trap

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 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 2013: 881 adult steelhead (408 [46.3%] male, 473 [53.7%] female) were trapped from March 5 to 29 April 2014. No natural origin fish were recorded. The number of natural origin fish captured during season is usually less than 10 fish. Age composition based on CWT recoveries of sampled hatchery origin fish was 82.5% one-ocean and 17.5% two-ocean. However, age composition based on fork length (≥65cm = 2-ocean), was 80.5% one-ocean and 19.5% two-ocean. For the season, 160 females and 163 males were spawned together for an egg-take total of 697,049 eggs. Initial egg loss was 15%, leaving an estimated 593,210 eyed eggs for production (Table 2). Twenty-one females were culled for IHNV. Eyed eggs that were retained equaled 493,449. All carcasses from spawned fish, or those killed to retrieve the CWTs, or were in excess of program needs were buried at LFH, donated to Asotin County foodbank, or provided to the Walla Walla Community College for science classroom dissections.

In 2014, hatchery staff used an automatic egg picker on all Wallowa stock steelhead, therefore, no fecundities were collected. We recovered 65 fish that had or should have had CWTs (Table 17). Sex ratio of CWT fish (43.9% male, 56.1% female) was similar to those that were trapped at large. All CWTs recovered from the 2013 run year were originally released on-site at Cottonwood AP.

All steelhead trapped and/or retained were scanned for PIT tags. For the 2014 brood, we detected 19 unique PIT tags in the fish trapped at Cottonwood. Ten were tagged and released from Cottonwood AP, while the others were tagged as juveniles or adults in the Columbia and Snake rivers at various locations. All recovered PIT tag data was uploaded to PTAGIS per sampling and reporting protocols.

Table 17. Summary of tagged adult summer steelhead trapped at Cottonwood Trap for the 2013-2017 run years.

Run Year	Brood Year	CWT code	Stock	Release site	Number of CWTs
2013	2010	63 / 55 / 67	Wallowa	Cottonwood AP	11
				LV clip - No CWT	2
	2011	63 / 60 / 84	Wallowa	Cottonwood AP	52
				Total	**65**
2014	2011	63 / 60 / 84	Wallowa	Cottonwood AP	10
	2012	63 / 64 / 48	Wallowa	Cottonwood AP	12
				Total	**22**
2015	2012	63 / 64 / 48	Wallowa	Cottonwood AP	14
	2013	63 / 65 / 87	Wallowa	Cottonwood AP	51
				Total	**65**
2016	2013	63 / 65 / 87	Wallowa	Cottonwood AP	13
	2014	63 / 67 / 44	Wallowa	Cottonwood AP	1
				Total	**14**
2017	2013	63 / 65 / 87	Wallowa	Cottonwood AP	1
	2014	63 / 67 / 44	Wallowa	Cottonwood AP	8
		63 / 68 / 90	Wallowa	Cottonwood AP	52
	2015	09 / 08 / 12	Wallowa	Cottonwood AP	4
		09 / 09 / 70	Wallowa	Cottonwood AP	36
				Total	**101**

Run Year 2014: 317 adult steelhead (139 [43.8%] male, 178 [56.2%] female) were trapped from April 7 to 21 April 2015. No natural origin fish were recorded. The number of natural origin fish captured during season is usually less than 10 fish. Age composition based on CWT recoveries of sampled hatchery origin fish was 52.4% one-ocean and 47.6% two-ocean. However, age composition based on fork length (≥65cm = 2-ocean), was 77.0% one-ocean and 23.0% two-ocean. For the season, 132 females and 104 males were spawned together for an egg-take total of 644,350 eggs. Initial egg loss was 25%, leaving an estimated 481,101 eyed eggs for production (Table 2). Eleven females were culled for IHNV. Eyed eggs that were retained equaled 436,101. Also, ODFW supplied 28 females and 3 males to achieve full egg take for the Wallowa stock. All carcasses from spawned fish, or those killed to retrieve the CWTs, or were in excess of program needs were buried at LFH, donated to Asotin County foodbank, or provided to the Walla Walla Community College for science classroom dissections.

In 2015, hatchery staff used an automatic egg picker on all Wallowa stock steelhead, therefore, no fecundities were collected. We recovered 23 fish that had or should have had CWTs (Table 17; 1 lost). Sex ratio of CWT fish (31.8% male, 68.2% female) was similar to those that were

trapped at large. All CWTs recovered from the 2014 run year were originally released on-site at Cottonwood AP.

All steelhead trapped and/or retained were scanned for PIT tags. For the 2015 brood, we detected 13 unique PIT tags in the fish trapped at Cottonwood. Three were tagged and released from Cottonwood AP, while the others were tagged as juveniles or adults in the Columbia and Snake rivers at various locations. All recovered PIT tag data was uploaded to PTAGIS per sampling and reporting protocols.

Run Year 2015: 637 adult steelhead (299 [46.9%] male, 338 [53.1%] female) were trapped from March 9 to 12 April 2016. No natural origin fish were recorded. The number of natural origin fish captured during season is usually less than 10 fish. Age composition based on CWT recoveries of sampled hatchery origin fish was 78.5% one-ocean and 21.5% two-ocean. However, age composition based on fork length (≥65cm = 2-ocean), was 75.1% one-ocean and 24.9% two-ocean. For the season, 155 females and 149 males were spawned together for an egg-take total of 673,395 eggs. Initial egg loss was 11%, leaving an estimated 600,140 eyed eggs for production (Table 2). No females were culled for IHNV. Eyed eggs that were retained equaled 600,140. All carcasses from spawned fish, or those killed to retrieve the CWTs, or were in excess of program needs were buried at LFH, donated to Asotin County foodbank, or provided to the Walla Walla Community College for science classroom dissections.

In 2016, hatchery staff used an automatic egg picker on all Wallowa stock steelhead, therefore, no fecundities were collected. We recovered 71 fish that had or should have had CWTs (Table 17). Sex ratio of CWT fish (57.7% male, 42.3% female) was similar to those that were trapped at large. All CWTs recovered from the 2015 run year were originally released on-site at Cottonwood AP.

All steelhead trapped and/or retained were scanned for PIT tags. For the 2016 brood, we detected 28 unique PIT tags in the fish trapped at Cottonwood. Thirteen were tagged and released from Cottonwood AP, while the others were tagged as juvenile or adult in the Columbia and Snake rivers at various locations. All recovered PIT tag data was uploaded to PTAGIS per sampling and reporting protocols.

Run Year 2016: 257 adult steelhead (73 [28.4%] male, 184 [71.6%] female) were trapped from March 7 to 25 April 2017. Three natural origin fish were recorded and passed upstream of the trap. Trapping for the remainder of the brood was conducted at LFH. Age composition based on CWT recoveries of sampled hatchery origin fish was 7.1% one-ocean and 92.9% two-ocean. However, age composition based on fork length (≥65cm = 2-ocean), was 30.3% one-ocean and 69.7% two-ocean. For the season, 124 females and 83 males were spawned together for an egg-take total of 721,329 eggs. Initial egg loss was 11%, leaving an estimated 639,661 eyed eggs for production (Table 2). No females were culled for IHNV. However, 180,993 were removed from

population to be released in Rock Lake as trout. Eyed eggs that were retained equaled 458,728. All carcasses from spawned fish, or those killed to retrieve the CWTs, or were in excess of program needs were buried at LFH, donated to Asotin County foodbank, or provided to the Walla Walla Community College for science classroom dissections.

In 2017, hatchery staff used an automatic egg picker on all Wallowa stock steelhead, therefore, no fecundities were collected. We recovered 16 fish that had or should have had CWTs (Table 17). Sex ratio of CWT fish (12.5% male, 87.5% female). Although, sample size was small sex ratio was like those that were trapped at large. All CWTs recovered from the 2016 run year were originally released on-site at Cottonwood AP.

All steelhead trapped and/or retained were scanned for PIT tags. For the 2017 brood, we detected 9 unique PIT tags in the fish trapped at Cottonwood. Six were tagged and released from Cottonwood AP, while the others were tagged as juvenile or adult in the Columbia and Snake rivers at various locations. All recovered PIT tag data was uploaded to PTAGIS per sampling and reporting protocols.

Run Year 2017: 895 adult steelhead (349 [39.0%] male, 546 [61.0%] female) were trapped from March 13 to 18 April 2018. Due to low water, most of the adult didn't arrive at the Cottonwood adult trap until after the smolts were released in early April. As a precaution, the trap at LFH was opened and all broodstock were collected and spawned at LFH in 2018. No natural origin fish were recorded. The number of natural origin fish captured during season is usually less than 10 fish. Age composition based on CWT recoveries of sampled hatchery origin fish was 39.6% one-ocean, 59.4% two-ocean, and 1.0% three-ocean. However, age composition based on fork length (≥65cm = 2-ocean), was 87.1% one-ocean and 12.9% two-ocean. For the season, 122 females and 73 males were spawned together for an egg-take total of 650,874 eggs. Initial egg loss was 13%, leaving an estimated 565,128 eyed eggs for production (Table 2). No females were culled for IHNV. Eyed eggs that were retained equaled 565,128. All carcasses from spawned fish, or those killed to retrieve the CWTs, or were in excess of program needs were buried at LFH, donated to Asotin County foodbank, or provided to the Walla Walla Community College for science classroom dissections.

In 2018, hatchery staff used an automatic egg picker on all Wallowa stock steelhead, therefore, no fecundities were collected. We recovered 122 fish that had or should have had CWTs (Table 17). Sex ratio of CWT fish (40.2% male, 59.8% female) was similar to those that were trapped at large. CWTs recovered from the 2017 run year were originally released on-site at Cottonwood AP including the ODFW CWT fish released from Cottonwood AP as part of the reciprocal study.

All steelhead trapped and/or retained were scanned for PIT tags. For the 2018 brood, we detected 13 unique PIT tags in the fish trapped at Cottonwood. Three were tagged and released from Cottonwood AP, while the others were tagged as juveniles or adults in the Columbia and

Snake rivers at various locations. All recovered PIT tag data was uploaded to PTAGIS per sampling and reporting protocols.

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 2013: For the 2013 run year (February-May), hatchery staff trapped 182 natural origin, 234 Tucannon River endemic stock and 12 Wallowa stock hatchery-origin steelhead (Tables 18 and 19). Thirty females (13 natural, 17 endemic origin) and 21 males (17 natural and three endemic origin) were collected for broodstock. Additionally, 11 natural males and one endemic male were live spawned at the adult trap and released, all 12 live-spawned males were used for fertilization at the hatchery. At the end of the spawning season, endemic origin fish contributed to 40.0% of the broodstock.

During March and April 2014, 29 females were spawned with 21 males at LFH. Total egg take was estimated at 165,612 (Table 1), and three of the spawned females tested positive for IHNV. Natural fish trapped from the TFH trap consisted of 86.4% one-ocean and 13.6% two-ocean age fish (Table 20). Of the 29 females spawned an average overall fecundity of 5,711 eggs. Individual fecundities by ocean age class were not collected in 2014. However, fecundity estimates by age class have remained very consistent over the course of the program.

Run Year 2014: 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. For the 2014 run year (February-May), hatchery staff trapped 337 natural origin, 175 Tucannon River endemic stock and six Wallowa stock hatchery-origin steelhead (Tables 18 and 19). Twenty-six females (16 natural, 10 endemic origin) and 24 males (23 natural and one endemic origin) were collected for broodstock. At the end of the spawning season, endemic origin fish contributed to 25.0% of the used broodstock.

During March and April 2015, 26 females were spawned with 18 males at LFH. Total egg take was estimated at 114,635 (Table 1), and eight spawned females tested positive for IHNV. Natural fish trapped from the TFH trap consisted of 47.4% one-ocean and 52.6% two-ocean age fish (Table 20). The 26 females spawned gave an average overall fecundity of 4,409 eggs.

Individual fecundities were collected in 2015. Fecundity estimates by age class have remained very consistent over the course of the program, and in upcoming report we'll provide a more in-depth look of fecundities by age class (1-salt or 2-salt) since this program was started.

Run Year 2015: Natural and Tucannon River hatchery endemic stock origin steelhead were enumerated, sampled, and passed upstream to spawn, while ad-clipped hatchery stock fish are returned to below the trap unless they are a fish with a CWT. Fish with a CWT are removed for tag extraction. For the 2015 run year (February-May), hatchery staff trapped 331 natural origin, 79 Tucannon River endemic stock and 72 ad-clipped hatchery-origin steelhead (Tucannon/Stray hatchery) (Tables 18 and 19). Thirty-one females (27 natural, 4 endemic origin) and 27 males (24 natural and 3 endemic origin) were collected for broodstock. At the end of the spawning season, endemic origin fish contributed to 11.3% of the used broodstock.

During March and April 2016, 29 females were spawned with 24 males at LFH. Total egg take was estimated at 140,638 (Table 1), and one of the spawned females tested positive for IHNV. Natural fish trapped from the TFH trap consisted of 53.8% one-ocean and 46.2% two-ocean age fish (Table 20). Of the 29 females spawned an average overall fecundity of 4,850 eggs.

Run Year 2016: Natural and Tucannon River hatchery endemic stock origin steelhead were enumerated, sampled, and passed upstream to spawn, while ad-clipped hatchery stock fish are returned to below the trap unless they are a fish with a CWT. Fish with a CWT are removed for tag extraction. For the 2016 run year (February-May), hatchery staff trapped 64 natural origin, 44 Tucannon River endemic stock and 31 ad-clipped hatchery-origin steelhead (Tucannon/Stray hatchery) (Tables 18 and 19). Thirty-eight females (9 natural, 29 endemic origin) and 12 males (5 natural and 7 endemic origin) were collected for broodstock. At the end of the spawning season, endemic origin fish contributed to 72.0% of the used broodstock.

During March and April 2017, 38 females were spawned with 12 males at LFH. Total egg take was estimated at 180,292 (Table 1), and zero of the spawned females tested positive for IHNV. Natural fish trapped from the TFH trap consisted of 31.4% one-ocean and 68.6% two-ocean age fish (Table 20). Of the 38 females spawned an average overall fecundity of 5,151 eggs.

Run Year 2017: Natural and Tucannon River hatchery endemic stock origin steelhead were enumerated, sampled, and passed upstream to spawn, while ad-clipped hatchery stock fish are returned to below the trap unless they are a fish with a CWT. Fish with a CWT are removed for tag extraction. For the 2017 run year (February-May), hatchery staff trapped 84 natural origin, 68 Tucannon River endemic stock and 134 Ad-clipped hatchery-origin steelhead (Tucannon/Stray hatchery) (Tables 18 and 19). Forty-eight females (11 natural, 33 endemic origin, 4 ad-clipped) and 30 males (10 natural, 19 endemic origin, 1 ad-clipped) were collected

for broodstock. At the end of the spawning season, endemic origin fish contributed to 66.7% of the used broodstock.

During March and April 2018, 47 females were spawned with 28 males at LFH. Total egg take was estimated at 211,515 (Table 1), and zero of the spawned females tested positive for IHNV. Natural fish trapped from the TFH trap consisted of 75.0% one-ocean and 25.0% two-ocean age fish (Table 20). Of the 47 females spawned an average overall fecundity of 4,500 eggs.

Table 18. Natural origin, hatchery LFH/Wallowa stock origin, and hatchery Tucannon endemic stock origin summer steelhead trapped at the Tucannon Fish Hatchery from the 1997-2017 run years.

	Natural			Hatchery LFH Stock			Hatchery Endemic Stock			Totals (Percent)	
Run Year	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
Totals	***1,157***	***1,136***	***2,293***	***295***	***167***	***462***	***766***	***1,022***	***1,788***	***53.1***	***44.5***

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

Table 19. Total number of fish trapped and passed upstream to spawn naturally at the Tucannon River Adult Trap, 1997-2017 run years.

Run	Natural Stock			Hatchery LFH Stock			Hatchery Endemic Stock		
Year	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
Totals	2,311	2,000	86.5	462	266	57.6	1,788	1,628	91.1

[a] Hatchery fish presumably Tucannon mitigation endemic stock or stray hatchery origin. Lyons Ferry stock was no longer returning during these years.

Table 20. Summary of fresh and salt-water age composition of natural origin adult steelhead from the Tucannon River, 2000-2018 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 overall 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	52.1	45.8	0.0		2.1	0.0	5.7	0.0	20.0	54.3	5.7	14.3	2.9
2018	75.0	8.3	0.0	16.7		0.0	0.0	8.3	50.0	16.7	25.0	0.0	0.0
All Years	**64.9**	**33.0**	**0.3**			**0.0**	**4.4**	**7.1**	**40.7**	**35.0**	**7.5**	**4.3**	**0.8**

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 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 smolt-to-adult survival 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 or were killed outright to obtain the CWT and 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 and provided to the Dayton food bank when possible.

Run Year 2013: For the season staff trapped 143 (76.9%) natural, 4 (2.1%) LFH hatchery origin and 39 (21.0%) Touchet River endemic hatchery origin steelhead (Tables 21 and 22). Natural steelhead trapped for the 2013 run year consisted of 63.6% one-ocean and 36.4% two-ocean age fish (Table 23). Sex ratio of natural origin fish was 55.2% female, while hatchery steelhead was 72.1% female. We collected 32 natural origin fish (16 females and 16 males) for broodstock. There was one male pre-spawning mortality (3.1%), but no females spawned tested positive for the IHN virus. Of the fish collected for broodstock, 14 females were spawned with 15 males yielding 63,758 eggs (Table 3). Since the run consisted of larger size (half of them age 2-ocean fish) with greater fecundity, not all females collected were needed to reach eggtake goals. The remaining one female and 15 live males (all used for spawning) were returned to the river on 15 April. Individual fecundities were not collected in 2014. However, fecundity estimates by age class have remained very consistent over the course of the program. For the 2013 run year, mean fecundities of the females were 4,554 eggs.

Table 21. Total number of male and female summer steelhead at the Touchet River Adult Trap (1992-1994, 1998-2017 run years).

Run	Natural			Hatchery LFH Stock			Hatchery Endemic Stock			Totals (Percent)	
Year	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

Table 22. Total number of fish trapped and passed upstream to spawn naturally at the Touchet River Adult Trap, 1992-1994, 1998-2017 run years.

Run		Natural			Hatchery LFH Stock			Hatchery Endemic Stock	
Year	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[a]	0	0	57	47	82
2016	42	25	60	17[a]	0	0	24	17	71
2017	90	73	81	81[a]	0	0	23	17	74

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

Table 23. Summary of fresh and salt-water age composition of natural origin adults from the Touchet River, 1994-1995 and 1999-2018 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	11	10.0	0	0	0	0	
2014	1	1.8	1	1.8	26	47.3	19	34.6	8	14.5	0	0	0	0	0	0	1.0
2015	3	4.1	4	5.4	20	27.0	36	48.6	3	4.1	8	10.8	0	0	0	0	
2016	0	0	0	0	22	25.6	45	52.3	7	8.1	11	12.8	0	0	1	1.2	3.0
2017	1	4.6	1	4.6	1	4.6	16	72.7	3	13.6	0	0	0	0	0	0	4.0
2018	2	4.0	1	2.0	30	60.0	11	22.0	6	12.0	0	0	0	0	0	0	
Totals	**57**	**1.3**	**114**	**2.4**	**1,023**	**30.1**	**779**	**25.0**	**182**	**5.9**	**123**	**3.7**	**4**	**0.1**	**3**	**0.7**	**3.9**

Run Year 2014: For the season staff trapped 200 (79.0.7%) natural, 30 (11.9%) LFH/Wallowa hatchery origin and 23 (9.1%) Touchet River endemic hatchery origin steelhead (Tables 21 and 22). Natural steelhead trapped for the 2014 run year consisted of 35.1% one-ocean and 64.9% two-ocean age fish (Table 23). Sex ratio of natural origin fish was 62.5% female, while hatchery steelhead was 62.3% female. Beginning in 2015 with approval of co-managers, we collected 24 natural origin fish (8 females and 16 males) and eight endemic females origin fish for broodstock. There was one male pre-spawning mortality (3.1%), but no females spawned tested positive for the IHN virus. Of the fish collected for broodstock, 15 females (2-ocean, except one) were spawned with 14 males yielding 97,660 eggs (Table 3). Since the run consisted mostly age 2-ocean fish with greater fecundity, not all females collected were needed to reach

eggtake goals. The remaining one female and 12 live males were returned to the river on 15 April. For the 2014 run year, mean fecundities of the two-ocean females were 6,638 eggs, respectively.

Run Year 2015: For the season staff trapped 250 (74.9%) natural, 27 (8.0%) LFH/Wallowa hatchery origin and 57 (17.1%) Touchet River endemic hatchery origin steelhead (Tables 21 and 22). Natural steelhead trapped for the 2015 run year consisted of 34.1% one-ocean and 65.9% two-ocean age fish (Table 23). Sex ratio of natural origin fish was 66.4% female, while hatchery steelhead was 50.0% female. We collected 36 total steelhead (12 natural origin females, 8 endemic origin females, and 16 natural origin males) for broodstock. There was two female pre-spawning mortality (5.5%), but no females spawned tested positive for the IHN virus. Of the fish collected for broodstock, 16 females were spawned with ten males yielding 79,254 eggs (Table 3). Since the collection consisted of both natural and hatchery females, some with greater fecundity, not all females were needed to reach eggtake goals. The remaining two females and 14 live males (11 used for spawning, three were not) were returned to the river on 11 April. For the 2015 run year, mean fecundities of the spawned females were 4,953 eggs, respectively.

Run Year 2016: For the season staff trapped 42 (50.6%) natural, 17 (20.5%) Wallowa hatchery origin and 24 (28.9%) Touchet River endemic hatchery origin steelhead (Tables 21 and 22). Natural steelhead trapped for the 2016 run year consisted of 22.7% one-ocean and 77.3% two-ocean age fish (Table 23). Sex ratio of natural origin fish was 69.0% female, while hatchery steelhead was 51.2% female. We collected 24 total steelhead (14 females and 10 males) for broodstock. There was zero pre-spawning mortality, and no females spawned tested positive for the IHN virus. Of the fish collected for broodstock, 12 females were spawned with ten males yielding 73,051 eggs (Table 3). Not all females collected were needed to reach eggtake goals. The remaining two females and 10 live males were returned to the river on 5 April. For the 2016 run year, mean fecundities of the females were 6,088 eggs, respectively.

Run Year 2017: For the season staff trapped 90 (46.4%) natural, 81 (41.7%) Wallowa hatchery origin and 23 (11.9%) Touchet River endemic hatchery origin steelhead (Table 21 and 22). Natural steelhead trapped for the 2017 run year consisted of 76.0% one-ocean and 24.0% two-ocean age fish (Table 23). Sex ratio of natural origin fish was 69.9% female, while hatchery steelhead was 55.8% female. We collected 22 total steelhead (12 females and 10 males) for broodstock. Three endemic females were collected while trapping at Lyons Ferry Adult trap. There was zero pre-spawning mortality. No females spawned tested positive for the IHN virus. Of the fish collected for broodstock, 12 females were spawned with seven males yielding 58,513 eggs (Table 3). The remaining 10 males were returned to the river on 17 April. For the 2017 run year, mean fecundities females were 4,876 eggs, respectively.

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 24).

Table 24. 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, 1999-2018). Data presented in this table is from February through the June annually.

	Spring Chinook						Bridgelip
Year	Natural	Hatchery	Bull trout	Brown trout	Whitefish	Pike Minnow	Sucker
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

Creel Surveys – Snake River and Tributaries

As mentioned earlier in the report, CWT recoveries of steelhead (mainly from the sport fishery in the Snake River and its tributaries) provided WDFW the basis for estimating adult steelhead returns to the project area. While the project has transitioned over to using PIT tags for estimating adult returns in more recent years, creel surveys are still being conducted mainly to estimate ESA impacts on natural origin steelhead caught and released during these fisheries, and for providing general catch rate statistics to local fisherman if queried.

During the reporting period, staff stationed out of the Snake River Lab, or in the Clarkston area surveyed sport anglers within the LSRCP area of Washington to recover CWTs from tagged steelhead using methods described in Schuck et al. (1990). Creel survey funding from LSRCP is

combined with WDFW under the Columbia River Endorsement Stamp, a standard fishing license and salmon/steelhead catch record card purchase by sport anglers, to execute the surveys. When possible, data from weekly surveys were summarized during the season and provided to the local news media to inform anglers (Table 25). The 2017 run year was the last year WDFW evaluation staff oversaw the creel surveys in the Snake River and its tributaries. The WDFW Fish Management office in Dayton is now responsible for creel surveys on steelhead, and LSRCP continues to provide a few months of salaries for conducting creel surveys by fish management.

Grande Ronde River

In addition to the creel surveys on the Snake River, Tucannon River, and in the Walla Walla Basin, we've continued to cooperate with ODFW in conducting a joint survey of anglers on the lower Grande Ronde River of Washington and Oregon. The area of the Grande Ronde within Washington included here is from the bridge on Highway 129 (at Bogan's Oasis Resort) to the Oregon Stateline, and it does not include downstream portions of the Grande Ronde River. Angler effort, catch rates, and harvest were estimated by ODFW staff as described in Carmichael et al. (1988). The total number of fish sampled during the fishery and estimated harvest by the joint surveys from the Grande Ronde fishery in the Washington portion were supplied by ODFW for the 2012 through 2017 run years (Table 26).

Table 25. Steelhead angler interview results for fall/winter/spring of the 2013-17 run year from Washington State licensed anglers.

River Basin River section description [a]	River section number	Anglers Surveyed	Total hours fished	Natural fish released	Hatchery fish kept	Hatchery fish released	Catch rate (hr/fish)
2013							
Columbia River Basin							
McNary Dam to Pasco	533	1,289	3,717	163	101	7	13.7
Snake River Basin							
Mouth to IHR	640	128	393	5	8	0	30.2
IHR to LMD	642	4,393	12,330	302	312	10	19.8
LMD to LGD	644	2,300	11,176	364	487	18	12.9
LGD to LGR	646	823	2,671	77	99	2	15.0
LGR to Hwy 12 Br.	648	938	4,345	48	93	1	30.6
Hwy 12 Br. Upstream	650	4,063	25,279	647	707	24	18.3
Lower Grande Ronde (Washington Only)	592	936	4,206	249	207	187	6.5
Tucannon River	653	168	388	16	18	2	10.8
Touchet River	657	0	0	0	0	0	0
Walla Walla River	659	1	8	0	1	0	8.0
2013 Total		***15,040***	***64,513***	***1,870***	***2,033***	***251***	***15.5***
2014							
Columbia River Basin							
McNary Dam to Pasco	533	666	2,010	71	84	1	12.9
Snake River Basin							
Mouth to IHR	640	96	394	12	26	0	10.4
IHR to LMD	642	2,239	6,635	229	263	4	13.4
LMD to LGD	644	1,490	5,780	213	394	19	9.2
LGD to LGR	646	541	1,634	61	66	2	12.7
LGR to Hwy 12 Br.	648	596	2,812	31	67	2	28.1
Hwy 12 Br. Upstream	650	3,002	17,439	874	738	33	10.6
Lower Grande Ronde (Washington Only)	592	1,470	6,223	367	365	348	5.8
Tucannon River	653	76	221	11	11	2	9.2
Touchet River	657	29	52	4	0	0	13.0
Walla Walla River	659	133	360	20	28	0	7.5
2014 Total		***10,338***	***43,560***	***1,893***	***2,042***	***411***	***10.0***
2015							
Columbia River Basin							
McNary Dam to Pasco	533	684	1,956	67	81	1	13.1
Snake River Basin							
Mouth to IHR	640	76	307	24	16	0	7.7
IHR to LMD	642	1,863	5,209	205	174	6	13.5
LMD to LGD	644	1,212	4,343	178	278	9	9.3
LGD to LGR	646	317	944	21	27	3	18.5
LGR to Hwy 12 Br.	648	830	3,896	57	32	0	43.8
Hwy 12 Br. Upstream	650	1,767	10,032	558	840	18	7.1
Lower Grande Ronde (Washington Only)	592	80	460	55	13	13	5.7
Tucannon River	653	28	57	2	2	0	14.3
Touchet River	657	38	51	5	24	2	1.6
Walla Walla River	659	117	269	14	14	0	9.6
2015 Total		***7,012***	***27,524***	***1186***	***1501***	***52***	***10.0***

Table 25 Continued.

River Basin River section description [a]	River section number	Anglers Surveyed	Total hours fished	Natural fish released	Hatchery fish kept	Hatchery fish released	Catch rate (hr/fish)
2016							
Columbia River Basin							
McNary Dam to Pasco	533	3	4	0	1	0	4
Snake River Basin							
Mouth to IHR	640	70	272	10	14	0	11.3
IHR to LMD	642	2,086	6,136	122	178	6	20.1
LMD to LGD	644	836	3,487	72	192	2	13.1
LGD to LGR	646	112	327	9	4	0	25.2
LGR to Hwy 12 Br.	648	700	3,135	647	88	0	25.5
Hwy 12 Br. Upstream	650	1,449	7,835	209	331	16	14.1
Lower Grande Ronde (Washington Only)	592	753	3,719	72	92	39	18.3
Tucannon River	653	8	38	0	1	0	38.0
Touchet River	657	71	105	6	16	6	3.8
Walla Walla River	659	44	83	5	0	0	16.6
2016 Total		***6,132***	***25,141***	***1,152***	***917***	***69***	***11.8***
2017							
Columbia River Basin							
McNary Dam to Pasco	533	1,941	6,820	221	250	5	14.3
Snake River Basin							
Mouth to IHR	640	92	438	4	8	0	36.5
IHR to LMD	642	4,786	14,575	287	408	6	20.8
LMD to LGD	644	2,138	10,322	323	514	9	12.2
LGD to LGR	646	741	2,620	74	82	1	16.7
LGR to Hwy 12 Br.	648	700	3,135	35	88	0	25.5
Hwy 12 Br. Upstream	650	4,063	25,279	647	707	24	18.3
Lower Grande Ronde (Washington Only)	592	1418	7058	201	407	222	8.5
Tucannon River	653	173	357	28	21	1	7.1
Touchet River	657	19	25	1	2	1	6.3
Walla Walla River	659	32	61	5	1	0	10.2
2017 Total		***16,103***	***70,690***	***1,826***	***2,488***	***269***	***15.4***

Table 26. Estimated angler effort, catch rates, and harvest for steelhead anglers on a portion of the Grande Ronde River in Washington, but near the Oregon border, run years 2012 through 2016 (Emily Tucker, ODFW, personal communication 11/15/2020).

	2012				2013				
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
Effort Hours	988.8	3853.2	3554.3	1721.2	390.2	5886.4	8161.7	n/a	24555.8
Catch Rate [a]	0.0190	0.0398	0.0809	0.1051	0.1762	0.1491	0.1830	n/a	0.7531
Total Catch [b]	19	153	288	181	69	878	1494	n/a	3082
Fish Kept	0	23	94	64	5	447	781	n/a	1414
Hatchery Released	0	45	45	34	15	176	240	n/a	788
Natural Released	19	86	149	83	49	255	240	n/a	881
	2013				2014				
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
Effort Hours	223.8	4649.0	2525.3	373.1	1837.2	1770.3	2595.8	n/a	13874.5
Catch Rate [a]	0	0.0219	0.0312	0.1808	0.0458	0.1107	0.0872	n/a	0.4776
Total Catch [b]	0	196	248	115	147	390	447	n/a	1543
Fish Kept	n/a	78	100	52	80	204	271	n/a	785
Hatchery Released	n/a	7	12	10	0	105	103	n/a	237
Natural Released	n/a	111	137	53	67	82	73	n/a	523
	2014				2015				
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
Effort Hours	873.9	3999.0	2222.6	856.8	1037.0	4004.7	8422.0	n/a	21452
Catch Rate [a]	0.0152	0.0654	0.0832	0.1364	0.2502	0.3008	0.2791	n/a	1.1303
Total Catch [b]	13	262	185	117	260	1205	2351	n/a	4393
Fish Kept	0	38	105	37	98	424	1111	n/a	1813
Hatchery Released	0	61	0	17	46	604	941	n/a	1669
Natural Released	13	162	80	62	115	176	299	n/a	907
	2015				2016				
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
Effort Hours	1007.5	4834.2	4306.8	525.3	1217.1	4328.5	4800.9	n/a	21020.3
Catch Rate [a]	0.1571	0.0697	0.1223	0.2798	0.3373	0.1847	0.3948	n/a	1.5457
Total Catch [b]	158	337	527	147	411	799	1895	n/a	4274
Fish Kept	10	44	153	63	167	608	902	n/a	1947
Hatchery Released	65	58	83	11	0	29	803	n/a	1049
Natural Released	84	235	291	73	243	163	190	n/a	1279
	2016				2017				
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
Effort Hours	734	4979	2796	154	55	2508	1872	n/a	13098
Catch Rate [a]	0.031	0.02	0.058	0.044	0.091	0.046	0.095	n/a	0.385
Total Catch [b]	22	96	201	7	10	118	228	n/a	682
Fish Kept	0	19	73	0	4	112	176	n/a	384
Hatchery Released	3	37	43	3	1	2	28	n/a	117
Natural Released	19	40	86	3	5	4	24	n/a	181
	2017				2018				
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
Effort Hours	536	4163	2266	634	1069	2392	5257	n/a	16317
Catch Rate [a]	0.000	0.035	0.129	0.153	0.251	0.099	0.158	n/a	0.118
Total Catch [b]	0	145	249	81	222	218	780	n/a	1695
Fish Kept	0	22	119	17	96	166	349	n/a	769
Hatchery Released	0	93	50	43	34	8	223	n/a	451
Natural Released	0	30	80	21	92	44	208	n/a	475

[a] Catch rate here is defined as the estimated fish captured divided by the hours fished.

[b] Estimated fish captured have been rounded to whole numbers, so total of fish kept and released may not always add up to total catch.

Spawning Ground Surveys

Over the course of this reporting period, evaluation staff conducted or attempted to conduct spawning ground surveys in the Touchet River and Asotin Creek. Redd surveys within these two streams have been conducted annually since 1986 (Tables 27 and 28). 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 adult trap) can be provided upon request.

In Asotin Creek, comparisons of weir estimates (funded by BPA) to LSRCP funded spawning ground survey spawner estimates, along with distribution of spawners in the basin as determined by PIT tag arrays were highly correlated. While highly correlated, spawning ground survey estimates were consistently lower (by about the same degree annually) compared to the weir estimates. As such, it was felt that the weir estimates were more accurate (weir captures typically account for >85% of the total estimate), so redd surveys were discontinued after 2016.

As typical with spring steelhead surveys, environmental conditions (high stream flows with poor visibility) often hamper our ability to be successful. These reporting years were no exception. For example, in 2017 and 2018, stream flows in most areas of the Touchet River could not be surveyed for one reason or another. The only successful walks completed in those years were in the SF Touchet River. In order to make estimates into the North, Wolf, and Robinson forks of the Touchet River, we used regression analysis with prior years to estimate what would have likely been present had surveys been completed. Confidence in the estimate of total redds for such years is not high. However, these estimates are correlated with estimated returns to the Touchet River based on PIT tags. As such, we feel they can be used in a general sense to track the overall status of the population of summer steelhead in the Touchet River.

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 27. Standardized redd estimates and redds/kilometer within index reaches of Asotin Creek in southeast Washington, 1986-2016.

Year	Mainstem (20.6 km)		North Fork (13.3 km)		South Fork (12.1 km)		Charley Creek (10.6 km)		Total
	Redds	Redds/km	Redds	Redds/km	Redds	Redds/km	Redds	Redds/km	Redds
1986	223	10.8	295	22.2	173	14.3	77	7.3	768
1987	129	6.3	194	14.6	89	7.4	91	8.6	503
1988	56	2.7	141	10.6	87	7.2	48	4.5	332
1989	130	6.3	50	3.8	28	2.3	16	1.5	224
1990	134	6.5	43	3.2	33	2.7	21	2.0	231
1991	147	7.1	58	4.4	28	2.3	20	1.9	253
1992	49	2.4	56	4.2	30	2.5	40	3.8	175
1993	354	17.2	145	10.9	63	5.2	48	4.6	610
1994	70	3.4	50	3.8	18	1.5	15	1.4	153
1995	199	9.7	79	5.9	38	3.1	27	2.6	343
1996	231	11.2	73	5.5	63	5.2	32	3.0	399
1997	140	6.8	69	5.2	13	1.1	19	1.8	241
1998	153	7.4	55	4.1	38	3.1	18	1.7	264
1999	174	8.4	105	7.9	33	2.7	22	2.1	334
2000	120	5.8	71	5.3	46	3.8	24	2.3	261
2001	300	14.6	116	8.7	42	3.5	53	5.0	511
2002	241	11.7	131	9.8	40	3.3	36	3.4	448
2003	285	13.8	103	7.7	36	3.0	40	3.8	464
2004	281	13.6	89	6.7	5	0.4	53	5.0	428
2005	372	18.1	74	5.6	19	1.6	41	3.9	506
2006	254	12.3	62	4.7	32	2.6	32	3.0	380
2007	160	7.8	38	2.9	44	3.6	44	4.2	286
2008	160	7.8	35	2.6	32	2.6	9	0.8	236
2009	146	7.1	56	4.2	28	2.3	22	2.1	252
2010	384	18.6	148	11.1	79	6.5	54	5.1	665
2011	253	12.3	174	13.1	81	6.7	59	5.6	567
2012[a]	274	13.3	134	10.1	65	5.4	51	4.8	524
2013	174	8.4	74	5.6	33	2.7	18	1.7	299
2014	73	3.5	32	2.4	29	2.4	27	2.5	161
2015	133	6.5	104	7.8	42	3.5	27	2.5	306
2016	72	3.5	74	5.6	90	7.4	30	2.8	266
2017	Spawning ground surveys were no longer conducted from 2017 forward. Use the Asotin								
2018	Creek weir estimates with PIT Tag detections for distributions.								

a No surveys could be conducted this year due to stream flows. Estimate of redds based on the Asotin Creek Weir escapement and PIT tag distributions into each tributary.

Table 28. Standardized redd estimates and redds/kilometer within index reaches of the Touchet River in southeast Washington, 1987-2018.

Year	North Fork (19.1 km)		South Fork (26.7 km)		Wolf Fork (17.5 km)		Robinson Fork (9.0 km)		Total
	Redds	Redds/km	Redds	Redds/km	Redds	Redds/km	Redds	Redds/km	Redds
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[a]	38	2.0	41	1.5	27	1.5	8	0.9	114
2018[a]	29	1.5	31	1.2	20	1.1	11	1.2	91

[a] Limited end of season survey completed due to stream conditions. Most estimates derived from surveys conducted on the SF Touchet River only.

Hatchery Smolt-to-Adult Survival Rates

Historically, CWT recoveries from fisheries, hatchery traps, or from in-river temporary traps have 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/trap 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 (LFH, Tucannon River, Walla Walla River, Dayton and Cottonwood AP release) have average survival rates that are greater than 3 times the assumed survival rates when the program initially started (Table 29). 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 overall performed rather poorly (Table 29)

In addition to the historical CWT data to estimate adult returns, WDFW began PIT tagging the standard mitigation production groups (all LFH and Wallowa stocks) from the 2008BY forward for estimating total adult returns to the project area. Comparison of the CWT and PIT tag derived estimates for total adult returns to the project area consistently showed that PIT tags provided a higher estimate compared to the CWT estimate (ranging from 15-25% greater). Based on that information, all LSRCP WDFW steelhead mitigation programs currently utilize PIT tags to estimate smolt-to-adult survival rates and adult returns to the LSRCP project area (Tables 29, 30). A combination of PIT tag detections at Bonneville Dam and CWT recoveries below Bonneville Dam are used to estimate total adults that return to the Columbia River mouth (Table 31).

Contributions to LSRCP Mitigation Goals

The LFC summer steelhead harvest mitigation programs, which historically consisted of LFH and Wallowa stocks, and currently are Wallowa and Tucannon stocks, continue to meet the original adult mitigation goals to the Snake River Project area for Washington (Table 30). From 1984 to 2017 run years, there has been only year where the project area goals were not met (1984), which was in part due to the program not being fully operational with the 1982 brood year releases. The achievement and in most years exceedance 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. As previously mentioned, the original mitigation program assumed a 2:1 downriver to project area harvest objective; therefore, a total downriver harvest mitigation objective would be 13,968. In 16 of the last 34 run years (47%), this total contribution objective has been met (Table 31).

Table 29. Smolt-to-adult return (SAR) survival to the lower Snake River project area of adipose clipped Lyons Ferry/Wallowa stock (LFH, Tucannon, Touchet, Walla Walla and Grande Ronde release groups) and Tucannon and Touchet endemic stocks.

Brood Year	Lyons Ferry		Tucannon		Dayton AP		Walla Walla		Grande Ronde		Tucannon	Touchet
	CWT	PIT	CWT	PIT	CWT	PIT	CWT	PIT	CWT	PIT	PIT	PIT
1982	1.20		1.48		1.72		1.57		0.83			
1983	1.11		1.23		1.33		1.16		1.27			
1984	2.13		0.65		2.94		2.73		1.93			
1985	1.56		0.62		1.79		1.66		1.58			
1986	2.53		0.96		3.04		2.82		1.50			
1987	2.04		0.98		1.64		1.39		2.13			
1988	1.06		0.75		1.41		1.19		1.10			
1989	1.26		1.55		0.97		0.54		1.31			
1990	1.59		1.05		2.22		1.88		1.82			
1991	0.43		0.35		0.96		0.81		0.49			
1992	1.06		1.38		2.29		1.53		1.21			
1993	1.71		0.80		3.15		2.66		1.69			
1994	3.62		2.04		4.85		3.37		3.77			
1995	1.19		0.60		1.50		1.26		1.24			
1996	0.53		0.53		0.91		0.77		0.44			
1997	1.47		2.07		2.52		2.13		1.00			
1998	1.39		1.70		1.47		1.36		2.03			
1999	3.72		3.17		4.00		3.37		4.01			
2000	1.38		1.32		1.00		1.35		2.21			
2001	1.53		1.89		1.73		1.56		1.82			
2002	1.91		1.79		1.73		2.18		1.73			
2003	1.31		1.20		1.55		1.30		2.19		0.41	0.35
2004	1.67		1.49		1.43		1.10		1.14		0.55	0.24
2005	2.33			3.63	2.17		1.85		3.08		1.20	0.34
2006	2.11			3.66		2.32		1.76	2.96		1.36	0.77
2007		4.67		3.54		4.40		2.23		5.25	3.43	0.88
2008 [a]		2.60		2.75		1.89		1.89		1.48		0.29
2009 [b]		2.67		2.95		2.23		2.54		2.28	0.94	0.67
2010		1.27				0.62		0.50		0.65	0.69	0.14
2011		1.98				1.95		1.13		1.40	0.84	0.30
2012		2.45				1.74		1.15		1.97	0.34	0.32
2013		1.44				0.93		1.03		2.08	0.59	1.08
2014		0.94				0.50		0.61		0.47	0.14	0.14
2015		1.08				1.00		1.17		1.59	0.34	0.52
2016		0.45				0.63		0.49		0.65	0.21	0.38
2017 [c]		0.94				0.43				0.31	0.18	0.19
Avg	1.73		1.65		1.86		1.60		1.74		0.80	0.44

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 was began in 2010.

c Estimates are for 1-salt returns only.

Table 30. Contribution of Lyons Ferry/Wallowa stock (LFH, Tucannon, Touchet, Walla Walla and Grande Ronde release groups), and Tucannon and Touchet endemic summer steelhead back to the LSRCP project area. Note: No Shading represents CWT derived estimates, lighter grey shading represents a combination of CWT and PIT tag estimates, darker grey shading is derived solely from PIT tags.

Run Year (Target/Goal)	LFH [a] (630)	Tucannon [b] (875)	Touchet [b] (750)	Walla Walla [a] (900)	Grande Ronde [a] (1,501)	Total Goal (4,656)	Percent of Goal
1984	1,013	1,233	736	1,054	424	4,460	95.8%
1985	1,553	1,836	1,439	1,671	3,261	9,760	209.6%
1986	3,771	1,495	4,076	3,838	6,161	19,341	415.4%
1987	2,786	770	2,303	2,149	2,645	10,653	228.8%
1988	5,047	1,571	3,754	3,729	2,781	16,882	362.6%
1989	4,378	2,353	4,070	4,345	6,011	21,157	454.4%
1990	1,494	1,234	2,013	1,789	3,363	9,893	212.5%
1991	2,038	1,506	2,346	1,155	2,476	9,521	204.5%
1992	2,107	2,160	2,511	3,038	5,304	15,120	324.7%
1993	548	1,217	2,055	2,123	2,835	8,778	188.5%
1994	2,199	978	1,517	913	3,414	9,021	193.8%
1995	4,468	1,594	4,752	4,923	4,844	20,581	442.0%
1996	3,003	2,112	4,287	5,188	9,222	23,812	511.4%
1997	2,201	1,834	3,737	3,270	4,938	15,980	343.2%
1998	701	744	1,379	1,560	1,844	6,228	133.8%
1999	1,099	2,531	2,524	2,983	1,591	10,728	230.4%
2000	1,210	2,822	1,994	2,529	4,681	13,236	284.3%
2001	2,418	5,240	4,949	5,825	11,450	29,882	641.8%
2002	778	1,894	1,620	1,937	5,659	11,888	255.3%
2003	937	1,740	1,781	1,261	3,443	9,162	196.8%
2004	1,229	2,839	2,011	2,418	3,279	11,776	252.9%
2005	839	1,200	1,244	909	4,509	8,701	186.9%
2006	1,167	1,627	1,881	1,380	1,578	7,633	163.9%
2007	1,330	4,228	1,880	1,764	4,504	13,706	294.4%
2008	1,250	4,325	2,188	1,542	5,185	14,490	311.2%
2009	1,378	5,275	3,989	2,266	9,335	22,244	477.7%
2010	1,737	3,479	2,198	1,945	2,958	12,318	264.6%
2011	2,159	3,472	2,215	2,638	3,765	14,249	306.0%
2012	1,729	916	897	813	1,845	6,200	133.2%
2013	2,386	410	1,274	589	1,920	6,579	141.3%
2014	3,291	347	1,925	1,501	4,191	11,255	241.7%
2015	2,343	420	1,252	985	3,230	8,229	176.7%
2016	989	324	1,018	1,117	2,819	6,267	134.6%
2017	1,211	243	987	1,181	2,798	6,420	137.9%
Average	***1,964***	***1,940***	***2,316***	***2,245***	***4,067***	***12,532***	***269.2%***
% of Target/Goal (all years)	**311.8%**	**221.7%**	**309.0%**	**249.4%**	**270.9%**	**269.2%**	
% of Target/Goal (last 10 years)	**293.2%**	**219.6%**	**239.2%**	**162.0%**	**253.5%**	**232.5%**	

[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 31. Total contribution of Lyons Ferry/Wallowa stock (LFH, Tucannon, Touchet, Walla Walla and Grande Ronde release groups), and Tucannon and Touchet endemic summer steelhead back to the Columbia River mouth, including project area returns. Note: No Shading represents CWT derived estimates, lighter grey shading represents a combination of CWT and PIT tag estimates, darker grey shading is derived solely from PIT tags.

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 Goal (13,968)	Percent of Goal
1984	1,547	1,447	882	919	741	5,536	39.6%
1985	2,247	2,272	1,853	1,852	4,310	12,534	89.7%
1986	4,955	2,009	5,363	5,042	8,076	25,445	182.2%
1987	4,309	1,076	3,420	3,213	4,286	16,304	116.7%
1988	7,462	2,025	5,296	5,321	4,991	25,095	179.7%
1989	5,648	2,858	5,313	5,873	8,105	27,797	199.0%
1990	1,830	1,466	2,676	2,430	4,152	12,554	89.9%
1991	2,603	1,820	2,900	1,532	3,067	11,922	85.4%
1992	3,223	2,908	3,748	4,159	6,564	20,602	147.5%
1993	692	1,460	2,560	2,834	3,444	10,990	78.7%
1994	2,959	1,324	1,968	1,306	4,435	11,992	85.9%
1995	5,676	2,127	5,876	6,615	5,966	26,260	188.0%
1996	3,206	2,486	4,539	5,662	10,055	25,948	185.8%
1997	2,543	2,177	4,121	4,031	5,550	18,422	131.9%
1998	756	780	1,442	1,682	2,040	6,700	48.0%
1999	1,141	2,735	2,622	3,165	1,704	11,367	81.4%
2000	1,304	3,281	2,134	2,754	5,433	14,906	106.7%
2001	2,663	5,899	5,501	6,597	12,797	33,457	239.5%
2002	935	2,457	1,882	2,079	5,986	13,339	95.5%
2003	1,002	2,101	1,776	1,400	3,631	9,910	70.9%
2004	1,557	2,973	2,221	2,531	3,423	12,705	91.0%
2005	1,020	1,550	1,731	1,350	5,085	10,346	74.1%
2006	1,326	1,860	2,040	1,480	1,731	7,785	55.7%
2007	1,459	6,439	2,356	2,321	5,337	17,912	128.2%
2008	1,531	6,065	2,985	1,797	5,809	18,187	130.2%
2009	1,597	7,441	5,594	3,155	10,208	27,995	200.4%
2010	2,370	4,793	2,827	2,588	4,314	16,892	120.9%
2011	2,892	4,459	3,014	3,462	5,250	19,077	136.6%
2012	2,324	1,215	1,253	939	3,154	8,886	63.6%
2013	3,267	630	1,765	908	3,429	9,999	71.6%
2014	4,599	518	2,547	2,008	6,502	16,174	115.8%
2015	3,181	722	1,656	1,433	4,643	11,635	83.3%
2016	1,145	490	1,359	1,555	4,172	8,721	62.4%
2017	1,627	468	1,209	1,914	3,727	8,945	64.0%
Average	***2,547***	***2,480***	***2,895***	***2,821***	***5,062***	***15,775***	***112.9%***
% of Target/Goal (all years)	**134.8%**	**94.5%**	**128.7%**	**104.5%**	**112.4%**	**112.9%**	
% of Target/Goal (last 10 years)	**129.8%**	**102.1%**	**107.6%**	**73.2%**	**113.7%**	**104.9%**	

[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 over the course of this reporting period, yet we still face some core challenges that should be addressed/considered as the steelhead program moves forward. Provided below are changes to the summer steelhead program at LFC over the past 5 years since a report was last completed, current studies that being evaluated, and program challenges that we still face.

Program changes that occurred over the reporting period:

- Transitioned from the use of the LFH stock (Touchet, Walla Walla and on-station releases) to Wallowa stock. This was done to create some rearing efficiencies at LFH and free up space for other potential programs.

- Elimination of the Walla Walla River release (2017 was the last release in the Walla Walla). This was implemented per ESA consultation with NOAA, with the evidence that many of these fish were ending up in the Tucannon River during the spawning season. In addition, Wallowa stock releases in the Touchet River and on-station at LFH are also slated for reduction/elimination for the same reason. Both releases could be transitioned to a local stock (Tucannon stock at LFH, Touchet stock at Dayton AP) at some point in the future. The timeframe for such changes is currently unknown and hinge on discussions with co-managers and production changes that could occur at LFH.

- Production changes that occurred during the reporting period.

Year	Stock	Release Location	Release number	Production change	New release number
2018	Wallowa	Cottonwood AP	200,000	Increased to	225,000
2018	Wallowa	Dayton AP	85,000	Increased to	100,000
2018	Wallowa	Lyons Ferry	110,000	Decreased to	60,000
2018	Wallowa	Walla Walla	100,000	Decreased to	0
2017	Tucannon	Tucannon River @ Marengo	50,000	Increased to	100,000

- Transitioned away from CWT's to estimate project area returns to using PIT Tags.

- Acclimation and volitional release of Tucannon River stock (conservation group) from Curl Lake AP beginning in 2017.

- Acclimation and volitional release of Touchet River stock from Dayton AP beginning in 2017.

Program studies currently underway:

- **Wallowa stock reciprocal study with ODFW.** This study will be completed when the 2020 run year is complete. A more in-depth progress report on the study results is planned for completion in early 2021. Results from this study could lead to additional rearing changes at LFH and Irrigon hatcheries in the future.

- **Touchet stock matings study.** WDFW incorporated first generation hatchery fish into the Touchet broodstock with brood years 2015-18 and 2016-2019 releases. WDFW is testing if the incorporation of some hatchery fish into the broodstock might improve rearing and performance of these fish (from domestication effects) compared those that are derived solely from natural origin parents. Result from this comparison will be completed following the 2021 run year.

Program Challenges:

- Overshoot of steelhead at mainstem hydroelectric projects - We continue to document the extent of overshooting steelhead in the SE Washington area. Many of the steelhead that overshoot eventually end up in places that aren't desired, and their impacts to natural steelhead populations is of concern. In the most recent Biological Opinion from NOAA Fisheries on steelhead program in NE Oregon/SE Washington identified many of WDFW hatchery steelhead releases (Touchet River, Walla Walla River, On-station at LFH) are returning and spawning in the Tucannon River in large numbers. While small in number, we've also observed the Touchet endemic stock in the Tucannon River, at relatively the same rate as the LFH/Wallowa stock steelhead had been straying into the Tucannon River.

- Reduction of program releases - Because of overshoot, actions have been taken that reduced or will further reduce/eliminate steelhead releases in Washington. Such program changes are impactful to a harvest mitigation program and to Washington's standpoint concerning the execution of the LSRCP program. WDFW is reluctant at this time to make any more overall steelhead production 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 fishing opportunity/mitigation for Washington anglers. To date, the

Touchet spring Chinook program is too new to evaluate, and the Touchet steelhead program hasn't performed to desired expectations that it could supplant the Wallowa stock from a harvest mitigation standpoint.

- Tucannon and Touchet endemic stock performance - Performance of both Tucannon and Touchet endemic stocks has been relatively poor compared the previous mitigation stocks used (LFH or Wallowa stocks). Based on how fish reared in the large rearing lakes at LFH perform, additional large rearing ponds have been proposed for construction (one for Tucannon steelhead, one for Touchet steelhead, and one for the Tucannon spring Chinook program). We believe these additional rearing ponds would improve the overall performance of the two steelhead stocks and make other changes to the Wallowa stock program more favorable.

- Tucannon Fish Hatchery adult trap - In years of low returns to the Tucannon FH adult trap, it's been difficult to meet broodstock. 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. Further, 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 option would be to uniquely mark (LV fin clip) all Tucannon origin steelhead (both conservation and mitigation groups) so they would be easily identifiable upon capture. In conjunction with the external mark, we initiated a conversation with NOAA Fisheries about increasing the program and replacing the LFH on-station release of Wallowa stock with Tucannon River stock. This strategy would allow for an additional broodstock trapping location (if uniquely marked) and would also address the overshoot/straying issue of on-station releases into the Tucannon River.

Recommendations:

- Provide a scientifically based production conversion rate of Wallowa stock steelhead if reared at LFH instead of Irrigon FH to managers across the Snake River Basin.
- Continue to evaluate Touchet spring Chinook and Touchet summer steelhead performance (adult returns) to inform management about production changes/potential in the future.
- Continue and broaden the discussion about transitioning Tucannon stock steelhead releases to supplant the Wallowa stock releases on-station at LFH.

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Appendix A

LSRCP Rainbow Trout Production from Lyons Ferry Complex 2014-2018

Appendix A: Table 1. Summary of rainbow trout plants (catchable size) from Lyons Ferry and Tucannon Fish Hatcheries, 2014.

County	Location	Number of Plants	LSRCP lbs of fish planted	LSRCP # of fish planted
Asotin	Golf Course Pond	11	6,403	14,407
	Headgate Park Pond	2	416	1,025
	West Evans Pond	10	5,999	13,091
Asotin Total		**23**	**12,818**	**28,523**
Columbia	Big Four Lake	2	1,259	2,300
	Blue Lake	16	8,765	21,041
	Curl Lake	8	5,797	11,858
	Dayton JV Pond	2	277	625
	Deer Lake	6	1,247	2,812
	Donnie Lake	1	192	500
	Orchard Pond	2	637	1,510
	Rainbow Lake	12	6,380	14,044
	Spring Lake	12	5,702	14,086
	Watson Lake	13	6,944	15,344
Columbia Total		**74**	**37,201**	**84,120**
Franklin	Dalton Lake	10	7,440	18,650
	Marmes Pond	4	802	2,449
Franklin Total		**14**	**8,242**	**21,099**
Walla Walla	Bennington Lake	11	9,392	19,743
	Hood Park Pond	6	1,694	3,258
	Jefferson Park Pond	8	1,110	2,200
	Lions Park Pond	2	212	425
	Quarry Pond	10	9,615	23,485
Walla Walla Total		**37**	**22,023**	**49,111**
Whitman	Garfield Pond	2	760	2,025
	Gilcrest Pond	2	238	525
	Pampa Pond	6	2,754	6,221
	Riparia Pond	2	255	525
	Rock Lake	2	9,836	29,507
	Union Flat Creek	1	238	500
Whitman Total		**15**	**14,080**	**39,303**
Totals for Year		***163***	***94,365***	***222,156***

Appendix A: Table 2. Summary of rainbow trout plants (catchable size) from Lyons Ferry and Tucannon Fish Hatcheries, 2015.

County	Location	Number of Plants	LSRCP lbs of fish planted	LSRCP # of fish planted
Asotin	Golf Course Pond	11	6,705	15,404
	Headgate Park Pond	2	445	1,025
	West Evans Pond	12	8,197	16,876
Asotin Total		**25**	**15,347**	**33,305**
Columbia	Big Four Lake	2	1,244	2,300
	Blue Lake	19	10,808	22,309
	Curl Lake	11	7,866	14,673
	Dayton JV Pond	3	540	1,150
	Deer Lake	9	2,267	4,678
	Donnie Lake	1	200	500
	Orchard Pond	2	547	1,500
	Rainbow Lake	14	5,875	12,515
	Spring Lake	15	6,950	15,168
	Watson Lake	11	5,167	11,561
Columbia Total		**87**	**41,463**	**86,354**
Franklin	Dalton Lake	9	6,473	15,490
	Marmes Pond	3	431	1,050
Franklin Total		**12**	**7,932**	**18,849**
Walla Walla	Bennington Lake	11	9,177	18,567
	Hood Park Pond	8	1,794	3,330
	Jefferson Park Pond	7	2,150	1,060
	Lions Park Pond	2	206	425
	Quarry Pond	9	7,818	18,245
	Fishhook Park Pond	4	1,330	3,100
Walla Walla Total		**41**	**21,385**	**45,817**
Whitman	Garfield Pond	2	656	1,550
	Gilcrest Pond	0	0	0
	Pampa Pond	6	2,649	6,163
	Riparia Pond	2	233	525
	Rock Lake	2	7,331	25,660
	Union Flat Creek	1	279	530
Whitman Total		**13**	**11,149**	**34,428**
Totals for Year		***178***	***96,249***	***216,444***

Appendix A: Table 3. Summary of rainbow trout plants (catchable size) from Lyons Ferry and Tucannon Fish Hatcheries, 2016.

County	Location	Number of Plants	LSRCP lbs of fish planted	LSRCP # of fish planted
Asotin	Golf Course Pond	11	6,858	15,021
	Headgate Park Pond	2	677	1,569
	West Evans Pond	11	6,676	14,814
Asotin Total		**24**	**14,212**	**31,404**
Columbia	Big Four Lake	2	764	1,598
	Blue Lake	20	9,805	24,351
	Curl Lake	8	4,284	8,431
	Dayton JV Pond	3	530	1,125
	Deer Lake	7	1,662	3,082
	Donnie Lake	1	163	400
	Orchard Pond	2	403	1,007
	Rainbow Lake	13	5,402	11,230
	Spring Lake	18	7,069	17,692
	Watson Lake	9	5,569	12,104
Columbia Total		**83**	**35,651**	**81,020**
Franklin	Dalton Lake	10	7,048	16,289
	Marmes Pond	3	484	1,080
Franklin Total		**13**	**7,531**	**17,369**
Walla Walla	Bennington Lake	12	9,242	20,095
	Hood Park Pond	6	2,638	5,362
	Jefferson Park Pond	8	1,006	1,963
	Lions Park Pond	2	193	378
	Quarry Pond	8	8,430	19,793
	Fishhook Park Pond	4	1,393	3,100
Walla Walla Total		**40**	**22,902**	**50,691**
Whitman	Garfield Pond	2	818	1,928
	Gilcrest Pond	1	61	150
	Pampa Pond	6	2,693	6,286
	Riparia Pond	2	259	525
	Rock Lake	5	8,700	27,160
	Union Flat Creek	1	224	560
Whitman Total		**17**	**11,149**	**34,428**
Totals for Year		***177***	***93,051***	***217,093***

Appendix A: Table 4. Summary of rainbow trout plants (catchable size) from Lyons Ferry and Tucannon Fish Hatcheries, 2017.

County	Location	Number of Plants	LSRCP lbs of fish planted	LSRCP # of fish planted
Asotin	Golf Course Pond	12	6,581	16,460
	Headgate Park Pond	2	434	1,078
	West Evans Pond	13	6,691	16,932
Asotin Total		**27**	**13,706**	**34,470**
Columbia	Big Four Lake	2	1,054	2,158
	Blue Lake	20	12,033	27,176
	Curl Lake	7	4,683	9,625
	Dayton JV Pond	6	623	1,178
	Deer Lake	8	1,718	4,158
	Donnie Lake	1	143	400
	Orchard Pond	4	700	1,673
	Rainbow Lake	5	2,088	5,504
	Spring Lake	16	6,393	15,278
	Watson Lake	13	8,118	18,505
Columbia Total		**82**	**37,553**	**85,655**
Franklin	Dalton Lake	11	8,212	20,727
	Marmes Pond	4	675	1,630
Franklin Total		**15**	**8,888**	**22,357**
Walla Walla	Bennington Lake	13	8,239	18,570
	Hood Park Pond	6	2,752	6,033
	Jefferson Park Pond	0	0	0
	Lions Park Pond	2	216	463
	Quarry Pond	9	8,430	19,793
	Fishhook Park Pond	3	1,699	4,125
Walla Walla Total		**33**	**22,902**	**50,691**
Whitman	Garfield Pond	3	864	2,175
	Gilcrest Pond	1	56	150
	Pampa Pond	7	2,946	6,382
	Riparia Pond	2	237	525
	Rock Lake	2	8,380	29,260
	Union Flat Creek	1	200	500
Whitman Total		**16**	**12,683**	**38,992**
Totals for Year		***173***	***94,691***	***233,061***

Appendix A: Table 5. Summary of rainbow trout plants (catchable size) from Lyons Ferry and Tucannon Fish Hatcheries, 2018.

County	Location	Number of Plants	LSRCP lbs of fish planted	LSRCP # of fish planted
Asotin	Golf Course Pond	12	6,896	17,258
	Headgate Park Pond	2	385	1,025
	West Evans Pond	12	6,949	17,341
Asotin Total		**26**	**14,230**	**35,624**
Columbia	Big Four Lake	2	963	2,098
	Blue Lake	21	11,259	27,806
	Curl Lake	5	3,993	8,534
	Dayton JV Pond	4	375	725
	Deer Lake	10	1,813	4,442
	Donnie Lake	1	138	400
	Orchard Pond	4	775	1,800
	Rainbow Lake	7	2,861	10,681
	Spring Lake	15	7,960	19,991
	Watson Lake	12	6,595	15,630
Columbia Total		**81**	**36,733**	**92,107**
Franklin	Dalton Lake	11	7,298	17,942
	Marmes Pond	4	750	1,600
Franklin Total		**15**	**8,048**	**19,542**
Walla Walla	Bennington Lake	13	7705	17,690
	Fishhook Park Pond	6	1,938	4,225
	Hood Park Pond	7	2,083	4,359
	Jefferson Park Pond	8	1,472	2,853
	Lions Park Pond	2	184	426
	Quarry Pond	10	8,520	20,617
Walla Walla Total		**46**	**21,902**	**50,170**
Whitman	Garfield Pond	2	755	2,025
	Gilcrest Pond	2	183	425
	Pampa Pond	7	2,837	6,113
	Riparia Pond	2	237	525
	Rock Lake	2	11,090	38,535
	Union Flat Creek	1	167	400
Whitman Total		**13**	**4,012**	**48023**
Totals for Year		***184***	***96,182***	***245,466***