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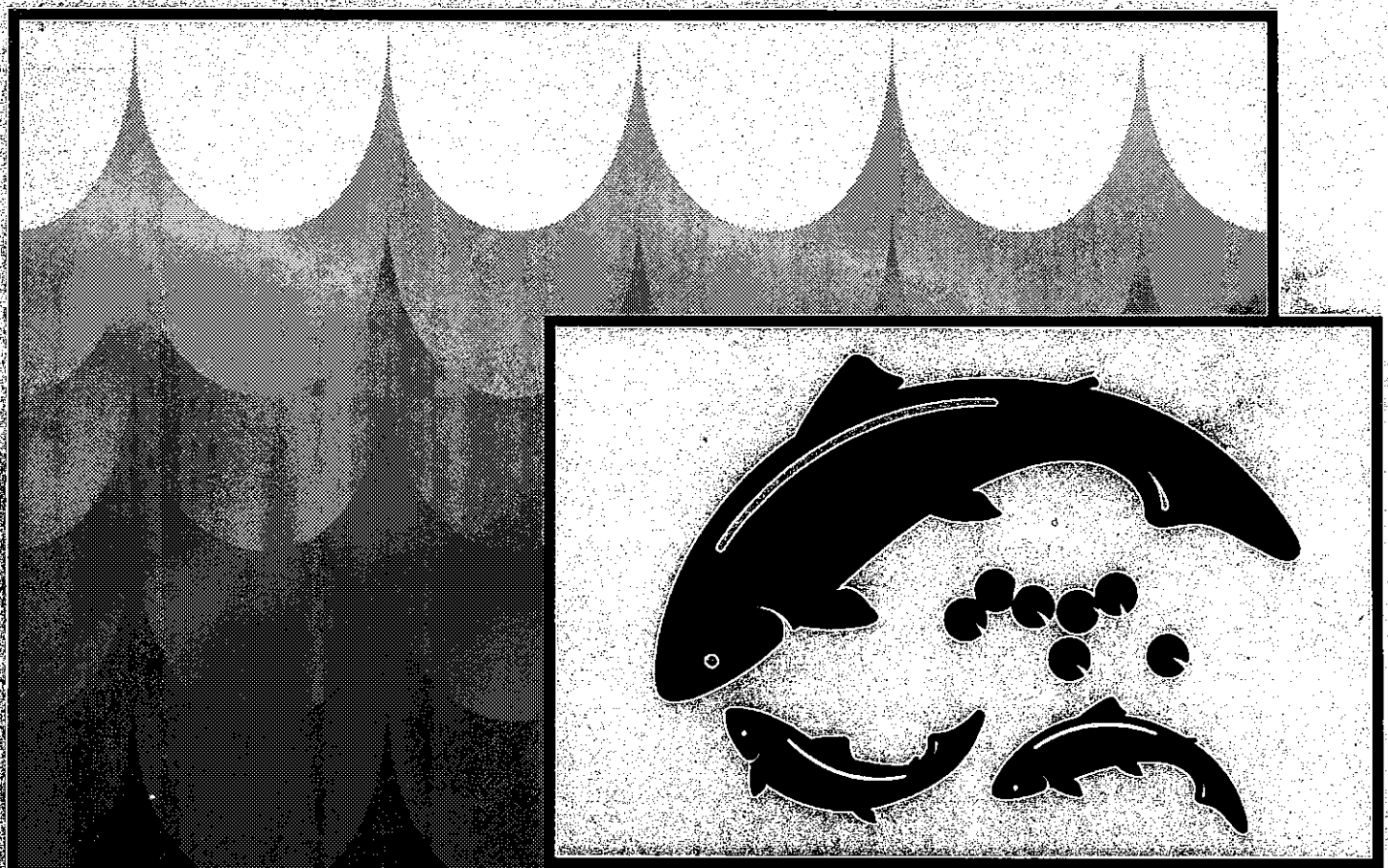
Lyons Ferry Hatchery Evaluation Trout Report: 1997-98



by Steve Martin, Mark Schuck, Joseph Bumgarner, Jerry Dedloff and Arthur Viola

Washington Department of
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Lyons Ferry Hatchery Evaluation
Trout Report 1997-98

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to

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Lower Snake River Compensation Plan Office
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Acknowledgments

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Table of Contents

List of Tables

List of Figures

Abstract

In 1998 as part of the Lower Snake River Compensation Plan (LSRCP) mitigation program, Lyons Ferry Complex (LFC) released 806,268 summer steelhead (154,407 lbs) at an average size of 5.2 fish/lb. A total of 248,254 rainbow trout (79,920 lbs) were reared and stocked into 35 waters at an average size of 3.1 fish/lb. Additionally, 152,488 fry and 53,744 fingerling rainbow trout (4,288 lbs) were reared and provided to Idaho.

Ten groups of juvenile steelhead were freeze branded, coded-wire tagged (CWT), adipose and ventral fin clipped and released into four area rivers. Two groups were released directly into the Tucannon River, one at Marengo and the other at Enrich Road, to continue our study of smolt behavior and contribution to the LSRCP area. Two groups were released into the Touchet River from Dayton Acclimation Pond (AP) for contribution and size-at-release studies; four groups were released from Lyons Ferry Hatchery (LFH) as a tagging/fin clipping survival study; and two groups were released from Cottonwood AP into the Grande Ronde River for a contribution study.

We implanted Passive Integrated Transponder (PIT) tags into ten study groups to monitor their migration timing and success. Two groups of steelhead were released from LFH directly into the Tucannon River at two locations, one group was released from LFH, one group from the Dayton AP, one group from Cottonwood AP and five groups of wild outmigrants were trapped and released from our smolt trap on the Tucannon River. Relative emigration performance to collector dams on the Snake and Columbia rivers was measured and physical characteristics of successful emigrants characterized. Detection rates varied among the groups, similar to results seen in previous years, but appear to be directly related to the collector facility collection efficiency. However, within the Tucannon River, wild migrants were detected at Lower Monumental Dam at nearly twice the rate as the hatchery fish released in that river.

LFH trapped 5,947 adult steelhead during the summer and fall of 1997, of those, 56% were female. Only two wild fish were trapped. WDFW recovered 1,380 CWT/branded fish (23% of fish trapped). LFH spawned 279 females and 280 males which produced 1,460,967 eggs. Fecundity of one- and two-ocean age females averaged 4,759 and 6,051 eggs/female, respectively. No three-ocean age females were spawned in 1998.

We surveyed 11,000 steelhead anglers who caught 4,018 steelhead from area rivers and we recovered 223 CWTs from study groups. Estimates of angler effort, total harvest and tagged fish harvested were summarized. The average angler required 10.8 hours to catch a fish.

We estimated that releases of juvenile steelhead from Washington's LSRCP facilities in 1995 and 1996 returned 9,689 adult steelhead to the Snake, Tucannon, Grande Ronde, Asotin and Walla

Walla rivers in 1997-98. That return is 208% of the steelhead mitigation goal established for the Washington program as defined by the LSRCP.

The numbers of naturally produced young-of-the-year (0-age) steelhead in LSRCP rivers were similar to 1997 although highly variable. Older age fish (>0-age) populations were stable or increased in most rivers, and generally showed the increasing trend begun in 1997 over the previous several years.

Extremely high, turbid river conditions in the spring of 1998 prevented estimation of adult steelhead spawning escapement in the Tucannon River. Estimates were completed for the Touchet River and for Asotin Creek. Escapement, based on spawning increased in both Asotin Creek and the Touchet River in 1998 from recent years.

Introduction

This annual report is one of a continuing series describing Washington Department of Fish and Wildlife's (WDFW) progress toward meeting trout (resident and anadromous) mitigation goals established in the Lower Snake River Compensation Plan (LSRCP). The study period for this report was 1 July 1997 through 30 June 1998, but the report includes summer juvenile steelhead population data collected in August of 1998.

The LSRCP program began in Washington in 1981 with construction of Lyons Ferry Hatchery (LFH). Refurbishing of the Tucannon Fish Hatchery (TFH) followed in 1984-85. Three remote acclimation ponds (AP) were built along the Tucannon, Touchet and Grande Ronde rivers to acclimate juvenile steelhead before release. These facilities make up the Lyons Ferry Complex (LFC).

The Lyons Ferry Evaluation study assesses whether the complex produces fish that meet mitigation goals (USCE 1975). It also determines what parts of the mitigation program may adversely affect salmonids listed under the Endangered Species Act (ESA) or other natural salmonid populations, and recommends actions to improve the facilities' effectiveness.

Recent declines in adult wild/natural steelhead escapement, and the proposed listing by the National Marine Fisheries Service (NMFS) of Snake River steelhead under the ESA as "Threatened", reinforces the need to monitor populations of wild salmonids in rivers receiving LFC fish. Our wild steelhead density and population estimates, and population estimates from smolt trapping are used to assess the potential effects of hatchery fish on natural populations, as well as determine whether hatcheries can be used in recovering ESA listed populations.

Methods/Results/Discussion

Hatchery Operation Monitoring

Juvenile Production

Trout and steelhead production from LFC was closely monitored. Rainbow trout production and survivals from LFC by brood year (BY) have remained relatively constant in recent years (Table 1). Number of fish planted (fry + catchable) represents total annual production. In 1997-98, 248,254 (79,920 lbs) catchable size rainbow trout were produced by the LFC (Appendix G). Catchable trout averaged 3.1 fish/lb at release in spring 1998. Also in 1997-98, 152,488 rainbow trout fry (1,640 lbs) and 53,744 fingerlings (2,648 lbs) were reared for Idaho's LSRCP program[1]. 1997-98 production from BY96 rainbow trout represents 100.2% of the LSRCP program's 84,000 pound goal.

Table 1. Rainbow trout production and survival rates at LFC, brood years 1986-96.

Stock (BY)	Eggs received	Fry produced	(Egg-to-fry survival)	Fish Planted		(Fry-to-outplant survival)
				fry (lbs)	catchable (lbs)	
Spokane (86)	464,500	377,393	81.2%	100,289 (973)	136,045 (41,570)	62.6%
Spokane (87)	501,500	446,694	89.1%	147,993 (5,903)	266,360 (92,225)	92.8%
Spokane (88)	530,700	426,153	80.3%	207,186 (18,972)	226,690 (91,829)	100.0%
Spokane (89)	758,090	652,535	86.1%	272,164 (7,589)	264,974 (98,088)	82.3%
Spokane (90)	618,000	596,670	96.5%	257,780 (6,162)	218,917 (97,264)	79.9%
Spokane (91)	696,220	637,285	91.5%	269,387 (8,639)	271,052 (108,956)	84.8%
Spokane (92)	603,200	648,731	90.9%	242,366 (6,981)	286,604 (106,325)	96.4%
Spokane (93)	615,600	600,308	97.5%	276,602 (7,867)	263,521 (85,013)	89.9%
Spokane (94)	690,200	660,944	95.7%	319,125 (10,111)	216,837 (72,088)	81.1%
Spokane (95)	685,610	656,301	95.7%	209,905 (7,144)	291,028 (87,570)	76.3%
Spokane (96)	677,420	626,030	92.4%	266,626 (7,748)	248,254 (79,920)	82.4%

Note: The precision of hatchery methods at times measure survival between life stages as > 100%; 100% is reported as a maximum in these situations.

Life stage survivals of steelhead at LFC were highly variable between stocks and among years. Fish health, presence of pathogens such as Infectious Hematopetic Necrosis (IHNV), and spawning conditions at LFC and at remote spawning sites (Cottonwood Cr. adult trap), have all affected survival of the LFH and Wallowa stock steelhead (Table 2).

[1] Additional fry not needed for yearling/catchable production were released as fry in Washington waters. These fish are included in the totals of Table 1 for survival calculations.

Table 2. Survival by life stage of steelhead spawned at Lyons Ferry Complex, brood years 1987-98.

Stock	BY	Eggs taken	Eggs retained (%)		Fry produced (% egg-fry survival)[1]		Smolts produced (% fry-smolt survival)	
Wallowa	1992	558,437	198,747	(35.6)	186,656	(93.9)	160,017	(85.7)
	1993	533,995	289,198	(54.2)	271,970	(94.0)	165,630	(60.9)
	1994	644,886	366,115	(56.8)	302,397	(82.6)	144,503	(47.8)
	1995	511,283	335,489	(65.6)	321,050	(95.7)	263,449	(82.0)
	1996	601,979	430,394	(71.5)	447,569	(100.0)	274,886	(64.1)
	1997	536,723	401,270	(74.8)	317,590	(79.1)	252,211	(79.4)
	1998	868,973	479,606 [2]	(55.2)	475,181	(99.1)		
Lyons Ferry	1987	1,111,506	1,095,906	(98.6)	983,901	(89.8)	665,658	(67.6)[3]
	1988	941,756	818,148	(86.9)	793,240	(96.9)	597,607	(75.3)
	1989	1,263,237	957,074	(75.8)	941,000	(98.3)	0	(0.0)[4]
	1990	2,570,676	1,483,485	(57.7)	1,002,320	(67.6)	635,635	(63.4)
	1991	1,296,249	1,165,315	(89.9)	1,115,368	(95.7)	357,497	(32.1)[5]
	1992	1,239,055	905,438	(73.1)	416,265	(46.0)	387,767	(93.2)[6]
	1993	1,211,053	940,022	(77.6)	860,983	(91.6)	611,417	(71.0)
	1994	1,352,296	899,350	(66.5)	845,316	(94.0)	558,130	(66.0)
	1995	1,772,477	929,597	(52.4)	895,882	(96.4)	610,545	(68.2)
	1996	1,614,636	1,151,363	(71.3)	1,148,114	(99.7)	807,253	(70.3)[7]
	1997	1,090,638	962,705	(88.3)	809,845	(84.1)	569,264	(70.3)[8]
	1998	1,460,967	934,247	(63.9)[9]	768,522	(82.3)		

[1] The imprecision of hatchery methods at times measures survival between life stages as >100%. 100% is reported as a maximum in these situations.
[2] Destroyed 285,785 viable, disease free, eyed eggs that were in excess of program needs.
[3] An additional 203,857 were outplanted as pre-smolts (fry-outplant survival = 88.4%)
[4] Losses to IHNV = 100%
[5] Includes 92,116 fish planted as sub-smolts: an estimated 172,000 fish lost to bird predation in lake.
[6] Destroyed 378,257 fish infected with IHNV.
[7] Includes 191,000 fry planted into Sprague Lake.
[8] Includes 15,207 fry planted into Rock Lake
[9] 308,666 eggs discarded from IHNV positive females

Fish Marking

All hatchery steelhead were marked for harvest management with an adipose (AD) fin clip. In addition some study groups of fish were marked with:

- Coded wire tag (CWT), both standard length and length-and-a-half, left ventral (LV) fin clip, and freeze brand for specific contribution studies,
- Passive Integrated Transponder (PIT) tags in juvenile fish to monitor emigration success and to identify the characteristics of successful smolts, and migration timing.

Adipose fins were clipped during August/September 1997. CWTs, freeze brands and LV clips were applied during January/February 1998. Ten groups of juvenile steelhead were freeze branded, CWT tagged, AD and LV fin clipped and released into four area rivers (Appendix A). Tag codes and freeze brands were reported to the Pacific States Marine Fishery Commission (PSMFC) for publication in their annual report.

Fish Releases

Pre-release samples were collected from LFC's release points to characterize each release population (Table 3).

Table 3. Mean fork lengths, weights, Co-efficient of Variation (CV), condition factors (K) and percentage of fish sampled as smolts/transitionals, of LFC steelhead prior to release, 1998.

Location (sample date)	N	Mean length (mm)	CV	Mean weight (g)	(fish/lb)	K	% Smolts/ transitionals
Dayton Pond (3/23)	503	186	14.3	78.6	5.8	1.15	94.3
Tucannon River							
Marengo (4/9, 15)	597	211	10.1	99.7	4.6	1.06	99.1
Enrich Road (4/9, 16)	486	206	10.5	92.9	4.9	1.06	98.6
Cottonwood AP (3/24)	452	186	15.1	75.9	6.0	1.11	94.5
Snake River (4/9)	350	204	10.3	92.5	4.9	1.06	99.0
Walla Walla (4/14, 20, 21, 22)	527	214	12.4	99.7	4.5	1.02	94.7

Two groups were released directly into the Tucannon River, one at Marengo and the other at Enrich Road, to continue our study of smolt behavior and for contribution to the LSRCP area. Two groups were released into the Touchet River from Dayton AP for contribution studies. To assess the relative detectability and survival of length-and-a-half versus standard length CWT tagged steelhead, four groups were released from LFH. Two CWT groups were released from Cottonwood AP into the Grande Ronde River for a contribution study.

Hatchery Smolt Emigration

Migration Through Dams

We calculated relative smolt passage during down river migration in the Snake and Columbia rivers from freeze brands sampled at Snake and Columbia river dams (Fish Passage Center 1997-1999, unpublished data) A Passage Index[2], and estimated median and 95% passage time (days)

[2] Passage Index is a relative indicator of group passage within a migration year and does not represent survival. A passage index is calculated by dividing daily fish collection by the proportion of flow passing through the sampled unit or powerhouse.

for each freeze brand group released in 1996-98 was determined (Table 4). Passage index data for Lyons Ferry Hatchery and Tucannon River releases in the table are for migration to McNary Dam for years 1995-1997, and to Lower Monumental Dam for migration year 1998. Migration time for Touchet and Walla Walla rivers' releases are to McNary Dam. Migration time for Grande Ronde releases is days to Lower Granite Dam.

Table 4. Estimated passage of freeze branded LFC steelhead at first downstream collector dam from site of release, 1995-98 (Fish Passage Center 1998, unpublished data).

Brand	Release Site	Passage Index	Number[1] Released	% of Release	Size (#/lb)	Passage(d)[2] 50%	Passage(d)[2] 95%
1996							
RA-IT-1	Snake R. from LFH	3,529	19,945	17.7	5.3	11	22
LA-IT-1	Snake R. from LFH	4,292	19,850	21.6	5.3	14	32
LA-IT-3	Snake R. from LFH	5,318	19,076	27.9	5.1	12	32
LA-IV-1	Touchet R. from Dayton AP	8,137	38,616	21.1	4.5	24	41
LA-IV-3	Touchet R. from Dayton AP	5,355	38,262	14.0	4.3	27	39
RA-IV-1	Tucannon R. @ Marengo	3,259	29,611	11.0	5.0	13	37
RA-IV-3	Tucannon R. from Curl AP	2,338	27,202	8.6	4.9	21	45
1997							
RA-IL-3	G. Ronde R. @ Cottonwood[3]	13,931	38,032	36.6	6.8	14	31
LA-S-1	Snake R. from LFH	3,779	19,508	19.4	4.5	20	63
LA-S-2	Snake R. from LFH	3,888	19,495	19.9	4.5	20	32
RA-S-1	Snake R. from LFH	3,962	19,536	20.3	4.5	22	27
RA-S-2	Snake R. from LFH	3,083	20,333	15.2	4.5	19	55
LA-IC-1	Touchet R. from Dayton AP	7,894	29,795	26.5	5.9	22	48
LA-IC-3	Touchet R. from Dayton AP	6,856	29,621	23.1	6.9	21	44
RA-IC-1	Tucannon R. @ Marengo	4,288	29,756	14.4	4.6	24	40
RA-IC-3	Tucannon R. from Curl AP	4,632	27,530	16.8	6.8	20	39
1998							
RA-IJ-3	G. Ronde @ Cottonwood[3]	12,206	25,064	48.7	6.0	13	20
RA-IJ-1	G. Ronde @ Cottonwood	8,156	24,901	32.8	6.0	15	26
LA-H-2	Snake R. from LFH	8,546	21,108	40.5	5.0	9	33
RA-H-2	Snake R. from LFH	5,295	20,238	26.2	5.1	8	27
LA-H-1	Snake R. from LFH	9,703	20,040	48.4	4.7	7	20
RA-H-1	Snake R. from LFH	9,848	20,431	48.2	5.1	7	20
LA-7U-1	Touchet R. from Dayton AP	1,527	20,804	7.3	5.8	15	30
RA-7U-1	Touchet R. from Dayton AP	1,298	20,041	6.5	5.8	13	31
LA-IJ-3	Tucannon R. @ Enrich	7,368	25,043	29.4	4.9	13	28
LA-IJ-1	Tucannon R. @ Marengo	7,828	25,283	31.0	4.7	12	32

[1] Adjusted for brand loss.

[2] Migration time in days to McNary Dam (1995-97) from the release sites and distances as follows: Dayton AP- 95.7 miles; Curl AP - 135.5 miles; LFH - 90.3 miles; Marengo - 119.2 miles; Walla Walla River - 45.1 miles. In 1998 migration time in days to L. Monumental Dam for following release sites and distances: LFH - 16.4 miles; Marengo - 45.4 miles; Enrich - 38 miles.

[3] Migration time in days to Lower Granite Dam from Cottonwood AP - 89.9 miles.

Migration Success

Ten separate groups of steelhead were PIT tagged during March-May (Table 5). The emigration performance of fish released from LFH (Group 1), Cottonwood Pond on the Grande Ronde River (Group 2), Dayton AP on the Touchet River (Group 3), and Marengo (Group 4) and Enrich (Group 5) on the Tucannon River, were compared to each other and to the five groups (Groups 6,7,8,9 and 10) of wild fish tagged at the smolt trap on the Tucannon River. Cumulative unique PIT tag detections from one of the Snake or Columbia river dams provided a total detection history for each tag group (Table 6). A full analysis of the five year PIT tag study of juvenile hatchery steelhead migration behavior will be undertaken and reported separately. However, results from the 1998 releases were consistent with previous years data which showed that larger, leaner fish appear to be more successful migrants. Furthermore, no parr or precocious males were detected during the 1998 spring/summer migration.

Estimates of Residual Steelhead

The potential for residual hatchery steelhead to negatively affect natural salmonid populations through competition, displacement or predation was identified as a concern by NMFS after chinook salmon were listed as threatened under ESA. WDFW began a series of experiments to examine methods to reduce residualism starting in 1992. In spring 1998, we attempted to estimate the number of hatchery released juvenile steelhead that residualized in the Tucannon and Touchet rivers, and in an index area of the Grande Ronde River. The methods used on the Grande Ronde were similar to those used in 1994 (Viola and Schuck 1995), but we changed methods on the Tucannon River as compared to the past. Methodologies for the Tucannon and Touchet rivers for 1998 is provided below.

Tucannon River

In 1998 hatchery steelhead were released at Marengo (River mile (Rm) 24.7) and Enrich Road (Rm 17.1); the residual population estimates were determined from Marengo downstream to Territorial Bridge (Rm 12.5). To conduct the estimate, we clipped the right ventral (RV) fin of 3,000 rainbow trout and released them in groups of 1,500 at Marengo and Enrich Road, one week prior to conducting the estimate on June 1. The river was divided into eight strata between Marengo and Territorial Road and each strata was fished with hook and line. Anglers recorded the number of hatchery steelhead and rainbow trout they caught. A mark-recapture residual steelhead population estimate was then calculated for the Tucannon River between Marengo and Territorial Bridge following methods described by Ricker (1958).

Of the 160,068 steelhead released into the Tucannon River in 1998, an estimated 18,171 (11.3%) residualized.

Table 5. Characteristics of PIT tag groups released by Lyons Ferry Evaluation, 1998.

						Tucannon River Wild Fish				
Tag date(s)	Lyons Ferry (Group # 1) 22 Apr-9 May	Cottonwood (Group #2) 22 May	Dayton AP (Group #3) 28 May	Enrich (Group #4) 21 April	Marengo (Group #5) 30 Apr-14 May	Week 1 (Group #6) Apr 29-May 1	Week 2 (Group #7) May 5	Week 3 (Group #8) May 13	Week 4 (Group #9) May 20-22	Week 5 (Group #10) May 27-28
Smolt										
(%)	**10.5%**	**7.0%**	**15.4%**	**18.1%**	**19.0%**	**51.1%**	**39.6%**	**28.0%**	**10.0%**	**11.9%**
n	37	24	53	63	66	47	40	28	8	12
length (mm)	226	205	204.6	214.6	214.9	203.8	194.5	193.4	193.4	178.9
CV	7.4	8.0	13.5	6.5	7.1	9.8	7.3	7.6	3.8	7.8
weight (g)	115.5	95.7	99.4	100.0	101.9	89.4	77.2	75.2	68.2	57.8
K-factor	0.97	1.10	1.14	1.00	1.00	1.02	1.00	1.02	0.99	1.00
Transitional (%)	**88.6%**	**87.3%**	**79.1%**	**80.2%**	**80.2%**	**48.9%**	**60.4%**	**72.0%**	**89.9%**	**88.1%**
n	310	298	272	279	279	45	61	72	71	89
length (mm)	201.6	185	185.4	201.9	203.3	180.8	182.0	176.1	165.8	169.4
CV	9.8	14.3	13.5	10.1	11.0	9.2	8.4	7.5	6.9	8.5
weight (g)	90.0	74.7	76.7	90.6	94.5	61.9	62.2	56.6	44.5	49.6
K-factor	1.07	1.10	1.15	1.07	1.09	1.02	1.01	1.02	0.99	1.00
Parr										
(%)	**0%**	**4.1%**	**4.1%**	**0.9%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
n	0	14	14	3	0	0	0	0	0	0
length (mm)		150	146.7	138.7						
CV		24.2	28.9	2.7						
weight (g)		43.7	46.2	31.6						
K-factor		1.08	1.22	1.19						
Precocious										
(%)	**0.9%**	**1.5%**	**1.5%**	**0.9%**	**0.9%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
n	3	5	5	3	3	0	0	0	0	0
length (mm)	175.0	159	193	217.7	188.3					
CV	17.3	24.0	7.3	8.2	12.6					
weight (g)	69.1	51.8	87.4	127.1	83.1					
K-factor	1.2	1.12	1.19	1.22	1.20					

Table 6. Unique detections of PIT tags in steelhead released into the Tucannon, Touchet and Snake rivers, 1998[1].

Release Location	Release date(s)	Number tagged	Detected [2] L. Monumental #	L. Monumental %	McNary #	McNary %	John Day #	John Day %	Bonneville #	Bonneville %	Total #	Total %
Lyons Ferry	20 April	350	113	32.3	23	6.6	36	10.3	13	3.7	185	52.9
Cottonwood	17 April	343	22	6.4	3	0.9	3	0.9	2	0.6	235	68.5
Dayton	17 April	347	0	0.0	29	8.4	28	8.1	15	4.3	73	21.0
Tucannon												
Enrich	13 April	350	85	23.4	22	6.3	11	3.1	15	4.3	133	38.0
Marengo	13 April	350	97	27.7	23	6.6	16	4.6	14	4.0	150	42.9
Wild wk 1	29 April	98	57	58.2	7	7.1	2	2.0	2	2.0	68	69.4
Wild wk 2	5 May	103	64	62.1	4	3.9	12	11.7	2	1.9	82	79.6
Wild wk 3	13 May	103	62	60.2	4	3.9	5	4.9	3	2.9	74	71.8
Wild wk 4	20 May	80	24	30.0	3	3.8	7	8.8	2	2.5	36	45.0
Wild wk 5	27 May	102	47	46.1	7	6.9	12	11.8	3	2.9	69	67.6
Total wild		486	254	52.3	25	5.1	38	7.8	12	2.5	329	67.7

[1] Detections reported to PITAGIS through 10/31/98.

[2] Number detected are unique tags not previously detected at upstream dams. Each tag is reported only once at the first dam where it was detected and in the total for the group.

Touchet River

To determine the extent of residualism on the Touchet River, the last week of May we released a total of 2,074 marked rainbow trout at six locations between the South and North Fork Touchet River confluence and the Washington State Park. Those locations were then fished with hook and line one week after stocking. Methods were the same as used on the Tucannon River in 1998. Of 125,000 steelhead released from the Dayton AP, we estimated that 11,504 of those residualized (9.2%).

Grande Ronde River

We estimated the number of residual hatchery-released steelhead present in a one mile index area of the Grande Ronde River near Cottonwood Creek during July 1998. WDFW personnel sampled the river from approximately 1/4 mile above to 3/4 mile below Cottonwood AP. Hatchery reared juvenile steelhead were caught with hook and line, marked with a caudal punch and released on 8 July. Fish were recaptured with hook and line on 16 July. A Petersen mark and recapture method (Ricker 1958) was used to estimate that 490±19 (p=.05) hatchery reared juvenile steelhead were present within the index section of river (Table 7).

Table 7. The numbers of hatchery reared residual steelhead present in an index area of the Grande Ronde River near Cottonwood Creek, WA, 1994-98.

Year	Number Released	Fish/lb	Number ± 95% CI Residuals	% of release
1994	273,000	4.8	1,961	0.72
1995	206,182	5.0	831 ± 28	0.40
1996	250,000	5.6	816 ± 52	0.33
1997	250,262	6.8	86 ± 8	0.03
1998	252,211	6.0	490 ± 19	0.19

Our residual steelhead abundance estimates exhibit annual variation. However, the estimated number of residual steelhead within the one mile index section of the Grande Ronde River is extremely low. The Cottonwood AP is not managed to reduce the abundance of residual steelhead in the Grande Ronde River.

Smolt Trapping on the Tucannon River

WDFW operated a 5 ft rotary screw trap intermittently at Rm 2 on the Tucannon River between 8 September 1997 and 9 July 1998 to estimate the numbers of migrating wild and hatchery juvenile steelhead. The number of days the trap was run for each month was as follows: September - 21, October - 15, November - 4, December - 8, January - 8, February - 11, March - 22, April - 23, May - 21, June - 22, and July - 5 days. Each week we attempted to determine trap efficiency by clipping a portion of the caudal fin on captured migrants and releasing them upstream about 0.6

river mile. The percent of marked fish recaptured was used as an estimate of weekly trapping efficiency. When insufficient fish were captured for trap efficiency estimates, data from other time periods with similar flows and turbidity were used. During the peak out-migration (March - May) the trap was generally operated five days each week. To estimate potential juvenile migrants passing when the trap was not operated, we calculated the average number of fish trapped for three days before and three days after non-trapping periods. The mean number of fish trapped daily, was then divided by the estimated trap efficiency to calculate fish passage. The estimated number of fish passing each day was then applied to each day the trap was not operated. Wild steelhead captured after June 1 that were less than 100 mm were considered BY 1998, therefore are not included in this report.

Wild Steelhead

During the 1997/1998 trapping season, we captured 1,759 wild steelhead smolts at the trap. More than 96 percent of the migrant smolts were captured between 1 March and 6 June, with only about 1,000 fish (3.5%) estimated to have migrated past the trap during other months (Table 8). In addition to the smolts captured in our trap, 1,490 newly emerged fry also were captured between 15 April and 9 June. We were unable to estimate the total number of fry passing the trap, nor is the fate of these fish known. Newly emerged fry were typically between 26 and 35 mm fork length and are not included in BY 1998 production.

Of the 1,759 steelhead smolts captured, scale samples were taken from 730, and 656 of those were readable. Four different brood years were observed from those scales (Figure 1). Percent age composition based on the scale readings was as follows: 56.6% Age 1, 40.3% Age 2, 3.0% Age 3, and 0.1% Age 5 (one fish). To estimate the number of migrants from each brood year,

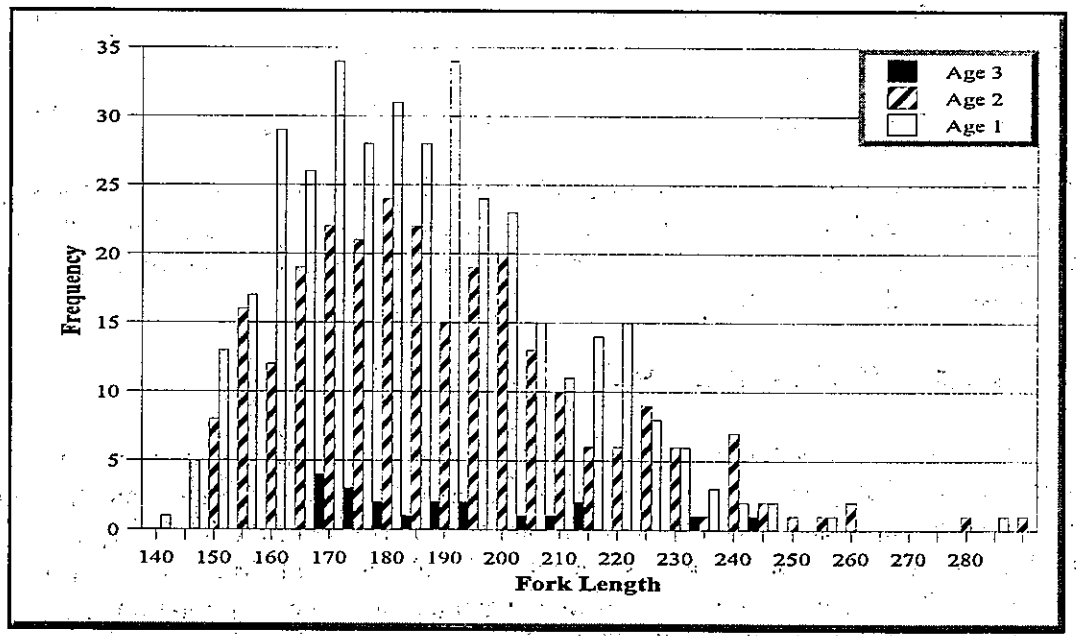

Figure 1. Age composition and length distribution of wild steelhead trapped from the Tucannon River, 1997-98.

weekly age compositions based on scale samples collected for that week were applied to each weeks' smolt estimate. Scales were not collected from fish captured between September and February, so the age composition is assumed to be the mean of the season. Based on the catches and estimated trapping efficiencies, 29,744 wild steelhead smolts migrated out of the Tucannon River (Table 8). The majority of fish entering the smolt trap originated from the 1997 brood year. Average size and condition (K) factor, for both hatchery and wild fish captured, decreased over the main migration period (April-June) (Table 9). Peak of migration for wild steelhead was 3-9 May.

Table 8. Weekly and total population estimates and characteristics of wild steelhead migrants from the Tucannon River, 8 September 1997 through 9 July 1998 Tucannon River, 1998.

	Brood Years			
Sample period beginning	BY 97	BY 96	BY 95	Total
Sept. - Feb.	425	302	23	750
22 February	17	11	0	28
01 March	9	6	0	15
08 March	57	0	0	57
15 March	64	64	0	128
22 March	0	42	0	42
29 March	141	23	0	164
05 March	291	173	0	464
12 April	145	340	48	533
19 April	1,378	1,104	103	2,585
26 April	1,814	1,705	253	3,772
03 May	5,903	3,666	286	9,855
10 May	2,495	1,748	109	4,352
17 May	1,962	1,143	35	3,140
24 May	1,363	973	0	2,336
31 May	759	506	0	1,265
07 June	129	86	0	215
14 June	26	17	0	43
Totals	**16,978**	**11,909**	**857**	**29,744**

Table 9. Mean fork length, standard deviation (SD), sample size (n) and condition factor (K) by week of natural and hatchery steelhead captured in the smolt trap on the Tucannon River, 1998.

	Natural Steelhead				Hatchery Steelhead			
Sample Period	Mean fork length (mm)	SD	n	K	Mean fork length (mm)	SD	n	K
3/08-3/15	156	14.1	2	1.14				
3/15-3/21	188	25.7	7	1.06	215	15.0	40	1.0
3/22-3/29	218	21.7	3	0.92	217	15.2	90	0.9
3/29-4/07	189	14.6	8	1.0	217	19.0	71	0.9
4/07-4/12	215	28.3	8	1.0	225	16.9	40	0.9
4/13-4/19	206	18.9	13	1.1	214	28.1	39	0.9
4/20-4/26	215	21.5	80	1.1	212	20.7	75	1.0
4/27-5/03	195	21.5	225	1.0	212	23.0	36	1.0
5/04-5/10	185	15.7	237	1.0	198	24.9	19	0.9
5/11-5/17	180	15.6	175	1.0	191	---.-	1	-.-
5/18-5/24	168	13.7	122	1.0	216	---.-	1	-.-
5/25-5/31	171	13.7	16	1.0	255	---.-	1	-.-
6/01-6/07	166	19.0	51	1.0				
6/08-6/14	168	16.9	11	0.9				
6/15-6/21	101	--.-	1	-.-				

Hatchery Steelhead

Hatchery steelhead were released into the Tucannon River at two separate location in 1998, at Marengo Bridge (48,283 fish; Rm 24.7) and Enrich Road (111,785 fish; Rm 17.1) from 13 to 21 April, 1998. Approximately 40,000 of the fish released from each location were uniquely freeze branded and tagged with a CWT for evaluation purposes. Both groups were released directly into the river following transportation from LFH. During the 1997/1998 trapping season, we captured 1,757 hatchery steelhead smolts at the trap. Hatchery steelhead smolts were captured between 15 April and 24 June, with 90% of the captures occurring between 15 April and 15 May. Based on catches and estimated trapping efficiencies, a total of 114,545 (72% of the release) migrated past the trap in 1998. Low trap efficiencies for capturing hatchery fish (1-2%) make a poor estimate, therefore no confidence intervals are calculated for the estimate.

Adult Steelhead Returns

Adult Traps

Tucannon Hatchery Trap

A permanent adult steelhead and salmon trap was installed in 1998 at the TFH. The trap consists of a barrier (dam) and a series of ladders around the barrier similar to those at mainstem Snake River dams that allow fish to ascend the river. The trap is a 12 ft x 12 ft x 5 ft section of the ladder which fish enter through a funnel. The trap was checked daily by hatchery personnel

beginning in October and continuing through 30 June 1998. During the trapping season, 75 steelhead were trapped, measured, sex and origin determined, and released upstream (Appendix B).

Lyons Ferry Hatchery Trap

Adult steelhead were trapped at LFH from 1 July through 14 November 1997. WDFW trapped 3,328 female (55.96%) and 2,619 male (44.04%) adult steelhead. Of the fish trapped, two were wild (0.03%), 1,390 (23.4%) were CWT/branded fish (Appendix C), and the rest were untagged hatchery (AD clip only) fish. Mortality during trapping and holding was 936 fish (15.7%). At completion of trapping, all fish were inspected for fin clips, readable brands, and sex and origin (wild/hatchery) were determined. Snouts were collected from all ventral fin clipped fish.

During January and February of 1998, 279 adult female steelhead were spawned [3] with 280 males at LFH (Table 2). Known one-ocean age fish contributed 57.3% (837,665) of the eggs and comprised 58.5% of returning coded-wire tagged fish (Appendix C). Two-ocean age fish contributed 42.7% (623,302) of the eggs and represented 41.5% of returning coded wire tags. No three-ocean age fish were spawned in 1998. Average fecundity of one and two-ocean age females was 4,759 and 6,051 eggs/female, respectively. Mean lengths of one and two-ocean age female steelhead spawned at LFH in 1998 were 58.7 cm (n=176) and 70.6 cm (n=103), respectively. Known one and two-ocean age male steelhead spawned at LFH in 1998 averaged 59.8 cm (n=215) and 72.6 cm (n=65), respectively.

Fish originating from upstream hatcheries, injured fish, wild fish, and fish not needed for broodstock were released (4,083 fish). We clipped the top lobe of the caudal fin (TC) of all the fish released (wild fish were not clipped). Of the TC fish released we estimated that 1,063 (26%) were harvested in the sport fishery. Once again as in 1997, the majority (96.3% of TC fish harvested) were caught in close proximity to Little Goose Dam, LFH, or caught in the Tucannon River. The remainder were harvested in the Walla Walla or Touchet rivers, or in the Snake River below Lower Monumental Dam.

Cottonwood Creek Trap

During March and April 1998, 383 female (53.2%) and 337 male (46.8%) adult steelhead were trapped at the Cottonwood AP. Known one-ocean age females contributed 48.9% (399,698) of the eggs taken, while two-ocean age females contributed 51.1% (417,157) of the eggs. Average fecundity of one and two-ocean age females was 4,345 and 6,046 eggs/female, respectively. Mean length for one-ocean age females was 59.7 cm (n=92), and 72.2 cm (n=69) for two-ocean age females. Mean length for spawned males was 61.1 cm (n=116) and 73.2 cm (n=48) for one and two-ocean age fish, respectively. All trapped hatchery fish were either spawned or killed on

[3] Two hundred seventy-nine females were killed during the spawning process, viable eggs were retained from only 220 of those fish. Eggs (308,666) from IHNV positive females were destroyed.

site to prevent swamping of wild spawning steelhead in Cottonwood Creek, or adjacent streams. Carcasses were distributed in Cottonwood Cr. and the Grande Ronde River for nutrient enhancement.

Passage at Dams

The National Marine Fishery Service (NMFS) monitored adult passage at Lower Granite Dam (LGD) as part of their migration research (J. Harmon, NMFS, personal communication). CWT tagged adult steelhead entering the LGD trap were sampled for fin clips and freeze brands, then released (Table 10).

Table 10. Adult returns of LFH steelhead to Lower Granite Dam in run years 1995-1997, from smolts released in 1994-1996 (numbers are freeze brand recoveries).

		Number of adults observed			Total [1]		
		Run Year			adjusted	Smolts	%
Brand	Release site	1995	1996	1997	adults	released	survival
1994							
RA-7U-1	Curl LK. Tucannon R.	42	11	0	57	16,682	0.342
RA-7U-3	Curl LK. Tucannon R	45	14	0	64	16,661	0.384
LA-7U-1	Curl LK. Tucannon R.	59	4	0	66	16,665	0.396
RA-IT-1	Walla Walla R.	94	13	0	110	20,165	0.546
RA-IT-3	Walla Walla R.	100	4	0	110	20,093	0.547
LA-IT-1	Walla Walla R.	75	14	0	92	20,002	0.460
1995							
LA-H-1	Snake River @ LFH		420	161	581	40,170	1.446
RA-H-1	Walla Walla R.		165	39	204	25,067	0.814
RA-H-2	Walla Walla R.		153	38	191	25,233	0.757
LA-IC-1	Dayton AP - Touchet R.		191	107	298	20,133	1.480
LA-IC-3	Dayton AP - Touchet R.		132	65	197	20,041	0.983
RA-IC-1	Dayton AP - Touchet R.		203	96	299	20,221	1.479
LA-IJ-1	Curl LK. Tucannon R.		130	54	184	18,288	1.006
RA-IJ-1	Curl LK. Tucannon R.		121	55	176	18,124	0.971
RA-IJ-3	Curl LK. Tucannon R.		107	54	161	17,150	0.939
1996							
LA-IV-1	Dayton AP - Touchet R.			130	130	39,292	0.331
LA-IV-3	Dayton AP - Touchet R.			120	120	39,397	0.305
RA-IV-1	Curl LK. Tucannon R.			205	205	29,135	0.704
RA-IV-3	Tucannon @ Marengo			29	29	26,652	0.109
RA-IT-1	Snake River @ LFH			96	96	19,820	0.484
LA-IT-3	Snake River @ LFH			71	71	19,493	0.364
LA-IT-1	Snake River @ LFH			73	73	19,514	0.374

[1] Observed brands adjusted for brand loss as measured at release (see Appendix A).

Steelhead Creel Surveys

WDFW personnel surveyed steelhead sport anglers within the LSRCP area of Washington (see Schuck et al. 1990 for methods). Sport fishing for steelhead was open on the Snake and Columbia rivers from 1 September 1997 through 31 March 1998, and on tributaries to the Snake River from 1 September 1997 through 15 April 1998. Anglers could keep only AD clipped fish, some of which were also LV clipped indicating the presence of a CWT. The objectives of our creel surveys on the Snake and Grande Ronde rivers were: 1) estimate the number of LFC steelhead in the Washington sport catch; 2) obtain lengths, weights, sex, age, and duration of ocean residency of LFC origin fish in the harvest, and; 3) estimate angler catch rates, and exploitation of tagged adult LFC steelhead.

WDFW and Oregon Department of Fish and Wildlife (ODFW) conducted a joint survey of anglers on the lower Grande Ronde River. Angler effort, catch rates, harvest, and CWT recoveries and expansions were calculated by ODFW as described in Carmichael et al. (1988).

Lower Snake River and Tributaries

We used adjusted WDFW state-wide steelhead harvest estimates (Appendix D) for 1997-98 to estimate our CWT sample rates and to estimate harvest by tag code for each fishery. During the 1997-98 steelhead season, we surveyed 11,000 anglers that fished over 43,000 hours and caught more than 4,000 fish within the LSRCP area in SE Washington (Table 11).

Table 11. Steelhead creel survey results for fall 1997 and spring 1998.

Area	Anglers Interviewed	Hours Fished	Fish Caught	Catch Rate (fish/hr)
McNary Pool	57	248.3	8	0.032
Wallula area	705	1,861.3	105	0.056
Walla Walla	779	2,029.8	188	0.092
Mill Creek	33	49.5	5	0.101
Ice Harbor Dam	1,709	7,149.5	369	0.052
Lower Mon. Dam	282	794.5	42	0.053
Touchet River	439	940.5	176	0.189
Tucannon River	487	1,317.8	321	0.244
Little Goose Dam	2,593	13,680.8	802	0.058
Lower Granite Dam	165	600.8	27	0.045
Snake R. section 228				
boats anglers	1,381	4,600.9	550	0.119
shore anglers	327	1,251.1	84	0.067
Grande Ronde (WA)[1]	1,169	4,939.5	837	0.169
Grande Ronde (OR)[2]	874	3,800.4	504	0.133
Total	**11,000**	**43,264.5**	**4,018**	**0.092**

[1] Bogan's (RM 26.2) to the Oregon border (RM 38.7).
[2] Oregon border (RM 38.7) to Wildcat Creek (RM 53.3).

Grande Ronde River

During the 1997-98 steelhead season, anglers fished an estimated 19,984 hours on the Grande Ronde River from Bogan's Oasis (Rm 26.2) upstream to the Oregon State line (Rm 38.7). Catch, harvest and effort estimates by month are provided in Table 12. Fish age by sex from fish sampled on the Grande Ronde is summarized in Table 13.

Table 12. Estimated angler effort, catch rates, and harvest for steelhead anglers on a portion of the Grande Ronde River in Washington, 1997-98 (Flesher, Oregon Department of Fish and Wildlife, unpublished data).[1]

Month	Effort Hours (95% CI)	Catch Rate-F/HR (95% CI)	Total Catch[2] (95% CI)	Fish Kept (95% CI)	Marked Fish Released (95% CI)	Unmarked Fish Released (95% CI)
1997						
Sept.[3]	570	0.16	91	25	19	47
	(301)	(0.07)	(38)	(21)	(16)	(37)
Oct.	5,010	0.124	620	338	197	85
	(589)	(0.044)	(222)	(155)	(126)	(59)
Nov.	4,603	0.154	709	366	194	149
	(870)	(0.044)	(204)	(126)	(88)	(80)
Dec.	2,313	0.164	379	157	169	54
	(363)	(0.033)	(76)	(53)	(55)	(30)
1998						
Jan.	1,425	0.188	268	171	88	10
	(551)	(0.069)	(98)	(105)	(73)	(16)
Feb.	2,961	0.140	413	166	179	57
	(926)	(0.037)	(110)	(63)	(104)	(57)
Mar.	3,005	0.092	275	192	64	20
	(1,280)	(0.036)	(111)	(84)	(39)	(19)
Apr.	97	0	0	0	0	0
Total	19,984	0.138	2,755	1,415	910	422
	(2031)	(0.018)	(364)	(256)		

[1] Only that portion of the Grande Ronde between RM 26.2 - 38.7 (State HWY 3 crossing to Oregon state line).
[2] Estimates for fish numbers are rounded to the nearest whole number.
[3] No confidence interval calculated.

Table 13. Age and sexual composition of steelhead sampled from anglers' creels on the Grand Ronde River during the 1997/98 steelhead season (Flesher, Oregon Department of Fish and Wildlife, unpublished data).

		Age[1]		
Sex	Number	1:1	1:2	2:1
Male	91	78%	17%	5%
Female	143	55%	45%	0%

[1] Age designation is for years of growth (freshwater:saltwater).

Contribution of LFC Steelhead to Fisheries

WDFW personnel collected snouts from 223 sport caught steelhead with CWTs. All snouts, except Grande Ronde River recoveries, were examined by WDFW for CWTs. We estimated harvest of CWTs sampled by WDFW personnel, for fisheries in the Columbia and Snake Rivers (Appendix D, Table 1), and in the Grande Ronde River (Appendix D, Table 2).

We estimated harvest and the percent smolt-to-adult return (SAR) by release year for LFC steelhead within the Columbia River and Snake River basins (Table 14) [4]. All four 1995 release groups exceeded the production escapement goal of 0.5% SAR to the LSRCP area (Table 15).

Table 14. Adult returns of LFC steelhead (percent smolt-to-adult survival) to fisheries in the Columbia and Snake rivers, fall 1997 and spring 1998.

Release year		**1995**		
Release site	Touchet R. @ Dayton	Tuc. R. from Curl AP	Walla Walla R.	Snake R @ LFH
CWT code(s)	63/57/14, 15, 16	63/57/17, 18, 48	63/54/42, 43	63/57/28
Brands(s)	LA-IC-1,3 RA-IC-1	RA-IJ-1,3 LA-IJ-1	RA-H-1 RA-H-2	LA-H-1
Number Released [1]	60,246	52,646	49,955	39,736
Fishery				
L. Col. sport	48 (0.079)	15 (0.028)	32 (0.064)	39 (0.098)
Zone 6 Net	12 (0.020)	9 (0.017)	12 (0.024)	26 (0.065)
Deschutes R. trap	0	5 (0.009)	0	0
Umatilla R. trap	0	34 (0.064)	0	0
L. Ferry Hat.	218 (0.362)	34 (0.064)	120 (0.240)	192 (0.483)
Snake R. sport	75 (0.124)	52 (0.099)	13 (0.026)	26 (0.065)
Tucannon R. sport	32 (0.053)	42 (0.080)	23 (0.046)	0
Walla Walla sport	43 (0.071)	0	31 (0.062)	0
Touchet R. sport	102 (0.169)	0	0	0
Idaho sport	1 (0.002)	2 (0.004)	1 (0.002)	1 (0.002)
Ocean recoveries	3 (0.005)	0	0	1 (0.002)
LSRCP Total	**471** **(0.782)**	**130** **(0.247)**	**218** **(0.436)**	**218** **(0.549)**
Grand Total	534 (0.886)	193 (0.367)	232 (0.464)	285 (0.717)

[1] Number released has been adjusted for tag loss.

[4] Data are summarized from sampling programs conducted by Federal, state and Tribal agencies.

Table 14. Adult returns of LFC steelhead (percent smolt-to-adult survival) to fisheries in the Columbia and Snake rivers, fall 1997 and spring 1998 (continued).

Release year		**1996**			
Release site	Touchet R. @ Dayton	Tuc. R. from Curl AP	Tuc. R. direct	Snake R @ LFH	
				Std wire	1-1/2 wire
CWT code(s)	63/60/30, 31	63/60/32	63/60/33	63/60/34	63/60/35, 36
Brand(s)	LA-IV-1, 3	RA-IV-3	RA-IT-1	RA-IT-1	LA-IT-1, 3
Number Released [1]	78,689	26,652	29,135	19,820	39,007
Fishery					
L. Col. sport	50 (0.064)	8 (0.030)	24 (0.082)	15 (0.076)	14 (0.036)
Zone 6 Net	43 (0.055)	1 (0.004)	16 (0.055)	21 (0.106)	16 (0.041)
L. Ferry Hat.	396 (0.497)	17 (0.064)	69 (0.237)	117 (0.590)	199 (0.510)
Snake R. sport	70 (0.089)	8 (0.030)	16 (0.055)	5 (0.025)	28 (0.072)
Tucannon R. sport	22 (0.028)	10 (0.038)	38 (0.130)	0	0
Walla Walla sport	30 (0.038)	0	0	0	0
Touchet R. sport	71 (0.090)	0	0	0	0
Idaho sport	4 (0.005)	0	0	0	1 (0.003)
Other non-LSRCP	1 (0.001)	4 (0.015)	13 (0.045)	0	0
LSRCP Total	**593** **(0.754)**	**35** **(0.131)**	**123** **(0.422)**	**122** **(0.616)**	**228** **(0.584)**
Grand Total	687 (0.873)	48 (0.180)	176 (0.604)	158 (0.797)	258 (0.661)

[1] Number released has been adjusted for tag loss.

Table 15. Adult returns of LFC steelhead released in 1995 (percent smolt-to-adult survival) to the Columbia and Snake rivers for run years 1996 and 1997.

Release Year		**1995**		
Release site	Touchet R. @ Dayton	Tuc. R. from Curl AP	Walla Walla R	Snake R. @ LFH
CWT code(s)	63/57/14, 15, 16	63/57/17. 18, 48	63/54/42, 43	63/57/28
Brand(s)	LA-IC-1, 3 RA-IC-1	RA-IJ-1, 3 LA-IJ-1	RA-H-1 RA-H-2	LA-H-1
Number Released [1]	60,246	52,646	49,955	39,736
Fishery				
L. Col. sport	91 (0.151)	68 (0.129)	105 (0.210)	56 (0.141)
Zone 6 Net	37 (0.061)	26 (0.049)	28 (0.056)	40 (0.101)
Deschutes R. trap	0	7 (0.013)	0	0
L. Ferry Hat.	816 (1.354)	120 (0.228)	537 (1.075)	674 (1.696)
Snake R. sport	178 (0.295)	154 (0.292)	111 (0.222)	81 (0.204)
Tucannon R. sport	171 (0.284)	94 (0.178)	71 (0.142)	0
Mill Cr. sport	0	0	53 (0.106)	0
Walla Walla sport	63 (0.104)	0	120 (0.240)	0
Touchet R. sport	168 (0.279)	0	0	0
Idaho sport	23 (0.038)	13 (0.025)	102 (0.204)	62 (0.156)
Ocean recoveries	3 (0.005)	0	0	0
LSRCP Total	**1,419** **(2.355)**	**381** **(0.724)**	**994** **(1.989)**	**817** **(2.056)**
Grand Total	1,550 (2.573)	482 (0.916)	1,127 (2.256)	913 (2.298)

[1] Number released has been adjusted for tag loss.

Returns to Spawning Grounds

In 1998, WDFW attempted to estimate steelhead spawning escapement in the Touchet and Tucannon rivers and Asotin Creek. Steelhead spawning grounds were surveyed to estimate the number of redds/mile as discussed by Schuck et al.(1993). Index areas established in 1992, 1993 and 1995 were used in 1998. Many attempts were made to survey area rivers, however consistently high and turbid river conditions prevented accurate surveys in the Tucannon River, hence no reliable estimate could be made. Estimates of redds in the Touchet River and Asotin Creek were completed (Appendix E).

Contribution Toward LSRCP Goal

To compare returning LFC adult steelhead to the LSRCP goal, we estimated yearly contributions to fisheries and escapement rates for CWT groups, and computed cumulative SAR for each tag code (Tables 14 and 15). Appropriate SAR estimates were applied to total steelhead releases by river for each return year to estimate returns. Where no CWTs had been released, average or closely related SARs were used to estimate returns.

We estimate that LSRCP steelhead smolts released into SE Washington streams in 1995 and 1996 returned at least 9,689 adult steelhead to the LSRCP area of the Snake River Basin during the 1997 run year (Table 16). This return is 208% of the steelhead goal (4,656) established for Washington.

Table 16. Estimated LSRCP adult steelhead returns in run year 1997, for specific rivers for the release years shown.

Release Year	Asotin Creek	G. Ronde River	Snake River	Touchet River	Tucannon River	Walla Walla River	Total
1995	196	1,060	700	943	980	693	4,572
1996	228	1,183	421	1,004	1,085	1,282	5,117
Total	424	2,243	1,121	1,947	2,065	1,975	9,689

Trends in Naturally Produced Juvenile Steelhead, 1983-1998

As in previous years, WDFW sampled (electrofished with a multiple removal method (Zippin 1958)) established index sites and estimated total juvenile steelhead densities (Appendix F) and populations (Mendel 1984, Hallock and Mendel 1985, Schuck and Mendel 1987, Schuck et al. 1990, 1991, 1993-1998).

The following survey sections of Asotin Creek and the Touchet and Tucannon rivers were sampled:

- North Fork Asotin Creek: From the confluence with the South Fork upstream 4.6 miles to the U.S. Forest Service boundary.
- South Fork Asotin Creek: From the confluence with the North Fork upstream 3.5 miles to first bridge crossing.
- Main Asotin Creek: From Headgate County Park upstream to the Forks.
- North Fork Touchet River: From the confluence with the South Touchet upstream 11.1 miles.
- South Fork Touchet River: From the mouth upstream 15.7 miles.
- Wolf Fork of North Fork Touchet River: From the mouth upstream 10.3 miles.
- Tucannon River: From Cummings Bridge (Rm 34.6) upstream to the confluence with Panjab Creek (Rm 45.6).

Asotin Creek

We electrofished six index sites within each survey section of the main forks of Asotin Creek. In 1998, 0-aged steelhead abundance was the highest recorded since 1983 (Figures 2 and 3). The reason for the increase in survival is unknown. Spawning escapement may have been significantly greater in 1997, egg to juvenile survival may have been enhanced by the 1996 flood, or both. The abundance of >0-aged fish in both the North and South Forks was somewhat higher in 1998 than in 1996 and 1997, (Figures 2 and 3, respectively).

We electrofished four sites in main Asotin Creek in 1998 which had been sampled in previous years. Mean densities (fish/100 m^2) for both 0-aged and >0-aged naturally produced steelhead were higher than observed in 1997, and similar to densities seen in previous years (Appendix E).

Touchet River

In 1998, 0-aged steelhead populations were moderately high in all forks of the river relative to levels recorded since 1983. The populations of >0-aged fish were much higher than recorded since 1994 in the North Fork, and higher than ever recorded in both the South and Wolf forks (Figures 4, 5, 6).

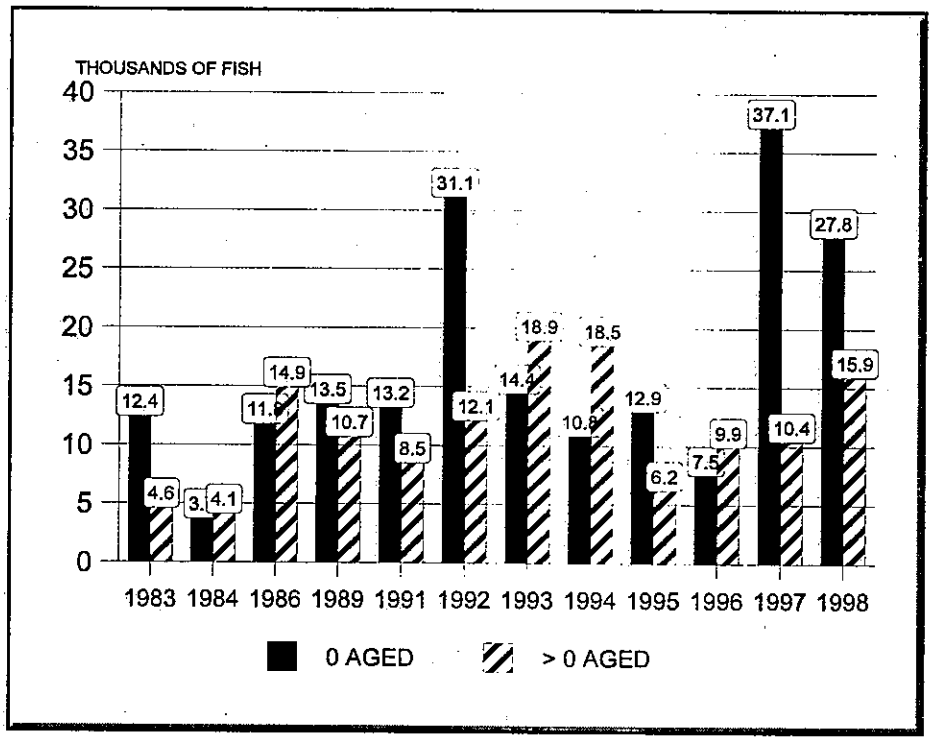

Figure 2. Estimates of juvenile steelhead abundance on the North Fork Asotin Creek from confluence with the South Fork upstream 4.6 miles to the U.S. Forest Service boundary, 1983-98.

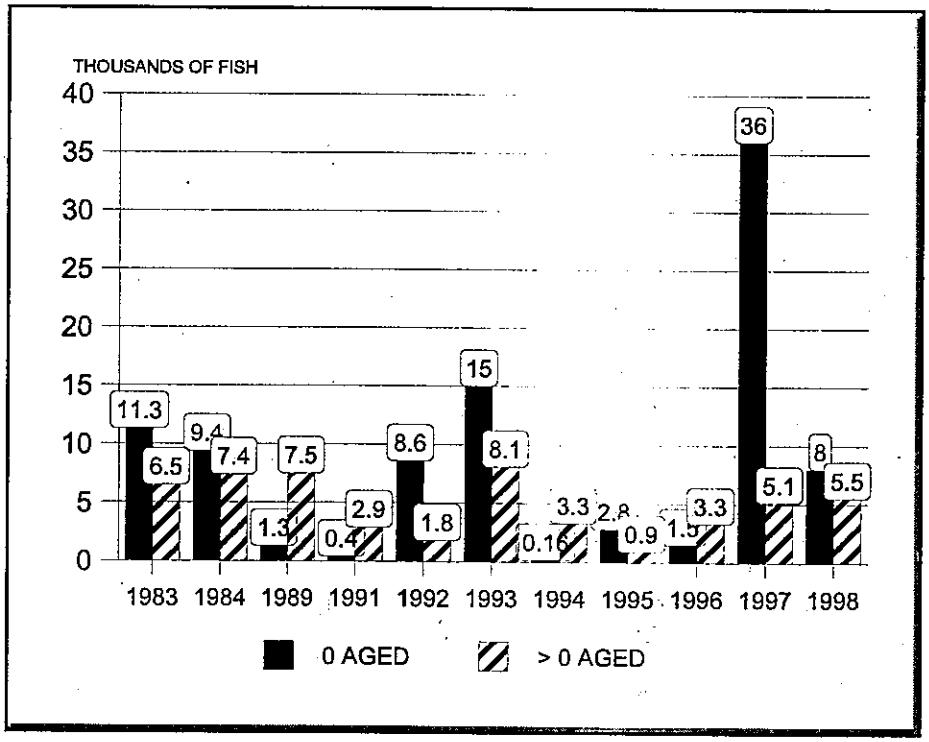

Figure 3. Estimates of juvenile steelhead abundance on South Fork Asotin Creek from the mouth upstream 3.5 miles to the first bridge crossing, 1983-98.

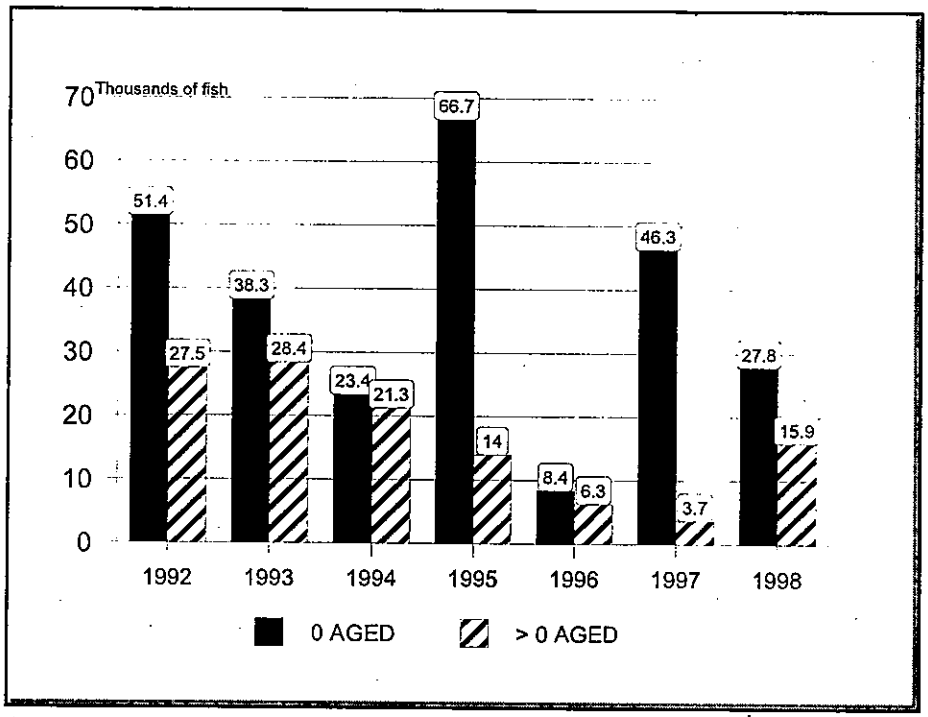

Figure 4. Estimates of juvenile steelhead abundance (in thousands) on North Fork Touchet River, from the mouth upstream 11.1 miles, 1992-98.

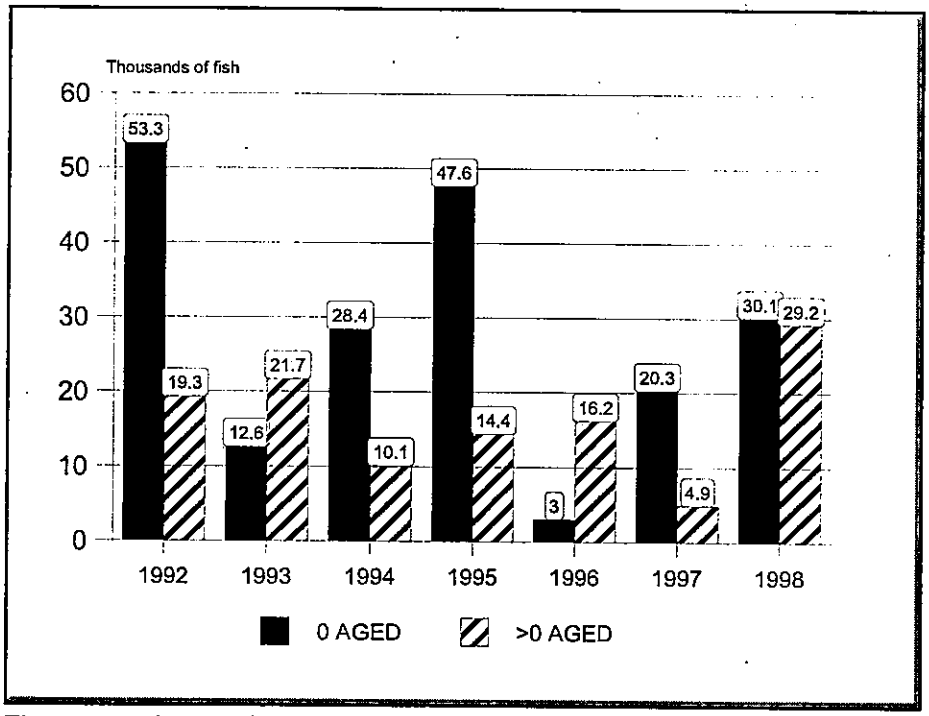

Figure 5. Estimates of juvenile steelhead abundance on South Fork Touchet River, from the mouth upstream 15.7 miles, 1992-98.

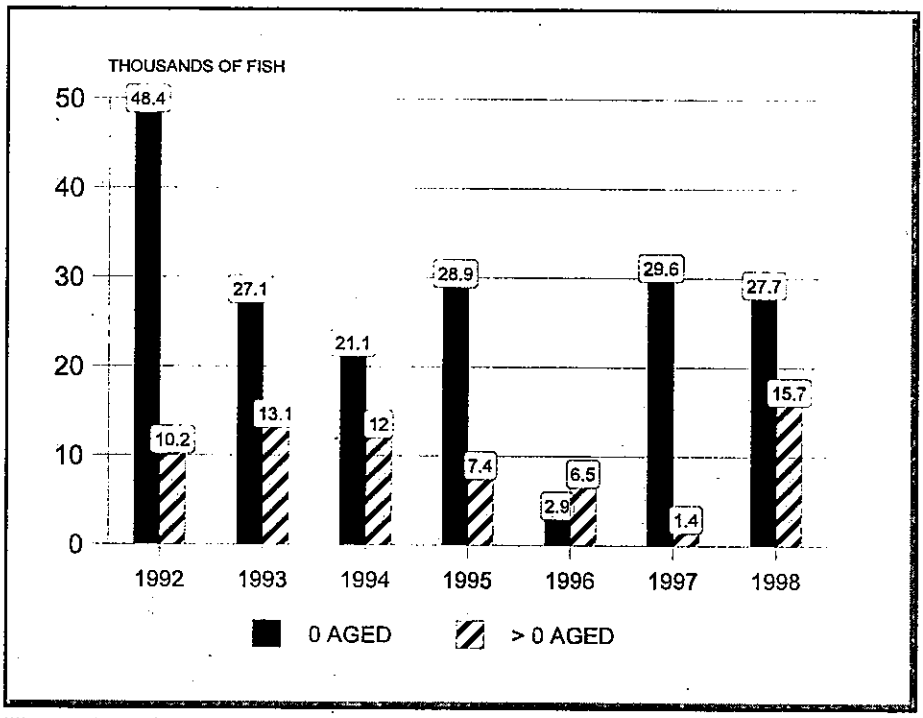

Figure 6. Estimates of juvenile steelhead abundance (in thousands) on Wolf Fork of North Fork Touchet River, from the mouth upstream 10.3 miles, 1992-98.

Tucannon River

Populations of all ages of juvenile steelhead were the highest estimates since 1992. The abundance of >0-aged steelhead appears to have reversed its decline and was the highest since 1990 (Figure 7).

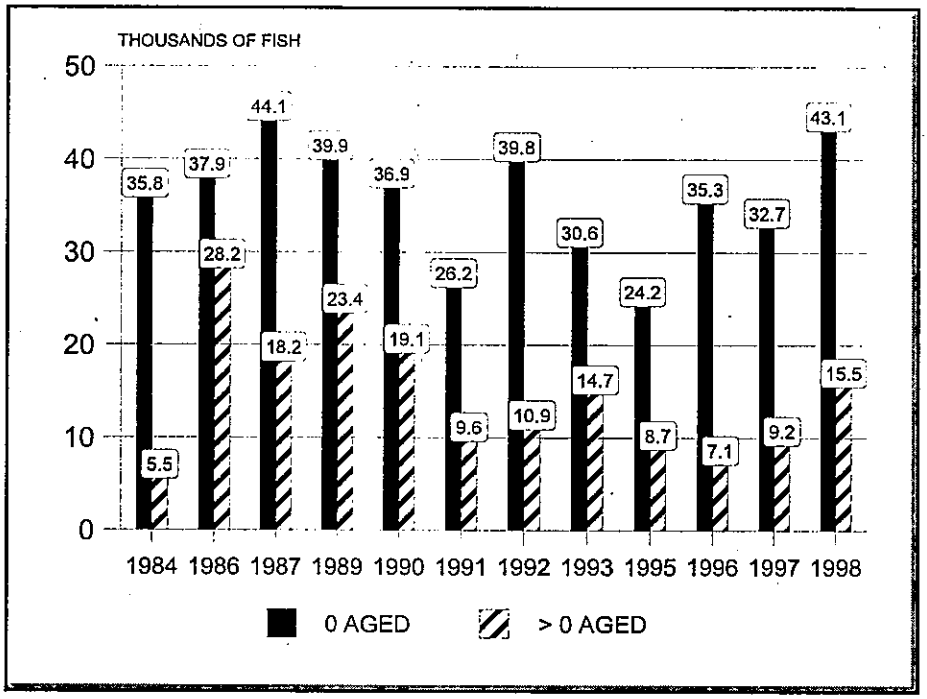

Figure 7. Estimates of juvenile steelhead abundance in the Tucannon River from Camp 1 (RM 34.6), upstream 11.6 miles to Panjab Bridge, for most years between 1984-98.

Comparison of Electrofishing and Snorkeling Estimates of Juvenile Steelhead

Beginning in 1996 snorkel estimates of juvenile steelhead populations in the Tucannon River were also completed. During the 1996 work a comparison of the two methods showed that snorkeling was unreliable for 0-age fish (Schuck et al. 1998). Estimates for fish >0-age were statistically equal to electrofishing estimates, but we concluded that each methodology had its limitations; electrofishing underestimated populations in very deep sites and snorkeling underestimated populations in very shallow sites. Further, a difference in the calculated river surface area from each methodology (likely a result of sample size differences) affected population abundance estimates (calculated by multiplying surface area times juvenile steelhead density per 100 m^2 stream surface).

In 1998 we used stream surface area calculated from snorkel sites rather than from the fewer number of electrofishing sites. No 0-age juvenile steelhead estimates were attempted and the comparison of estimates was restricted to the HMA section of the Tucannon (see description above for electrofishing stream reaches). Restrictions imposed on electrofishing under ESA limited the number of sites sampled with electrofishing, therefore the Marengo and Wilderness reaches were not sufficiently sampled to allow a comparison to snorkeling.

The 1998 results were similar to those seen in 1997. Estimates for >0-age steelhead were 16,335 ± 4,106 (n=6) and 14,732 ± 2,616 (n=27) from electrofishing and snorkeling respectively. The two estimates were over lapping and we consider the results for the two estimates to be equal. WDFW is evaluating the need for 0-age population data to determine whether a continuation of electrofishing is warranted. We hope to expand the comparison in 1999 to include more of the Tucannon River.

Conclusions and Recommendations

While attempting to develop hatchery management procedures (acclimation, size and time of release, location of release, etc.) to maximize fish survival (SAR) and minimize the effects of a large hatchery program on ESA listed populations of salmonids, considerable insights to the biology of steelhead have been gained. A better understanding of the physical attributes of successful smolts, and conversely of residual steelhead, should significantly improve program success while decreasing negative effects on all wild salmonid populations. WDFW is committed to the development of new broodstocks from wild origin fish where needed. We believe that stock origin is just one factor that can affect homing (straying) performance. Beginning with the 1998 release year, we released tagged groups of fish from Tucannon, Grande Ronde and Walla Walla systems, and from Lyons Ferry. Returns of straying tagged fish will be closely monitored.

Washington's LSRCP steelhead and trout program has consistently returned adult steelhead and provided recreational opportunity for put/take trout fisheries from catchable rainbow, in excess of the LSRCP goals. In an effort to maintain successful mitigation in an ESA environment, we offer the following conclusions and recommendations from our 1997-98 studies:

1. The survival of acclimated steelhead released from Curl Lake AP on the Tucannon River remains at, or only slightly above, the minimum goal (0.5%). The survival of releases in other rivers, both acclimated and direct, far exceed those on the Tucannon. Based on the results of our study, we believe the problem may stem from Curl Lake AP's location (too high in the basin) and/or LFH stock compatibility for use in the Tucannon.

   Recommendation: continue direct release of juvenile steelhead at or below RM 25.8 (Marengo). Evaluate the results and compare with previous CWT experimental results.

   Recommendation: begin the development of a new Tucannon River broodstock for use in the LSRCP program that may more successfully return fish to the basin. Collect DNA samples from steelhead populations throughout the region to help characterize population diversity, and to act as a baseline to which future samples can be compared.

   These actions will be crucial as mitigation for the LSRCP, and supplementation for ESA recovery are addressed within the Snake River system.

2. Survival, based on both PIT tag and CWT results, is greater for larger, leaner more smolted steelhead.

   Recommendation: release juvenile steelhead from LFC at 4 fish/lb, rather than 5/lb as has been the goal in recent years. Condition factor (K) should be equal to or less than 1.0 at release.

3. Residualism of hatchery reared steelhead was similar to percentages seen in previous years. However, the release of fish lower in the Tucannon located residual fish outside the primary rearing area of juvenile salmon and steelhead.

   Recommendation: see number one above.

4. The release of Wallowa stock juvenile steelhead from the Cottonwood Cr. AP is a successful portion of Washington's mitigation program, however recent studies from other agencies have raised concerns about Wallowa stock stray rates into other river systems.

   Recommendation: continue the use of Wallowa stock steelhead trapped at Cottonwood AP for use in the Grande Ronde River and marking (ADLV-CWT) of test groups to determine if Cottonwood AP released fish stray into down-river and local tributaries.

   Recommendation: Continue DNA sampling of natural populations in Washington's portion of the basin (begun in 1999) and coordinate sample analysis with ODFW and Tribal co-managers to most effectively utilize population genetics data. Cooperate in the development of a steelhead hatchery and Genetics Management Plan (HGMP) for the Grande Ronde basin.

5. Both adult spawning and juvenile abundance increased in Washington's LSRCP rivers in 1998. We attribute these increases to improving ocean conditions for anadromous salmonids coast wide, and possibly improved incubation success within local rivers. The floods of 1996 and 1997 scoured large sections of streams, some of which had become severely embedded with sediment over time. The scouring relocated channels and provided large bars of loose spawning gravel, relatively free of sediment. Fry and parr abundance may have benefitted. We have not determined whether hatchery origin fish are effectively contributing to the populations. There is increasing concern by NMFS and other researchers that the reproductive success of hatchery fish is poor and is decreasing basin productivity.

   Recommendation: continue to monitor population abundance and increase the use of snorkel surveys to improve estimates.

   Recommendation: devise studies to estimate the relative reproductive success of hatchery reared and wild steelhead in LSRCP rivers of Washington.

Literature Cited

Carmichael, R.W., R. T. Messmer and B.A. Miller. 1988. Summer Steelhead Creel Surveys in the Grande Ronde, Wallowa and Imnaha rivers for the 1987-88 Run Year. Progress Report, 1988. Oregon Department of Fish and Wildlife, Portland, Oregon.

Hallock, D. and G. Mendel 1985. Instream Habitat Improvement in Southeastern Washington; 1984 Annual Report (Phase III). Washington Department of Game report to U.S. Army Corps of Engineers.

Mendel, G. 1984. Instream Habitat Improvement in Southeastern Washington. 1983 Annual Report (Phase II). Washington Department of Game.

Ricker, W. 1958. Handbook of Computations for Biological Statistics of Fish Populations. Fisheries Research Board of Canada, Bulletin 119. 300 p.

Schuck, M. and G. Mendel 1987. Lyons Ferry Evaluation Study. Part II: 1985-86 Annual Report. Assessment of production from Lyons Ferry/Tucannon Hatchery Complex; and field studies summary. Washington Department of Wildlife to USFWS, Report No. FR1/LSR-87-8.

Schuck, M., A. Viola and S. Nostrant. 1990. Lyons Ferry Evaluation Study: Annual Report 1988-89 . Washington Department of Wildlife Report to the USFWS. Report No. AFF1/LSR-90-04.

Schuck, M., A. Viola and S. Nostrant. 1991. Lyons Ferry Evaluation Study: Annual Report 1989-90 . Washington Department of Wildlife Report to the USFWS. Report No. AFF1/LSR-92-02.

Schuck, M., A. Viola and M. Keller. 1993. Lyons Ferry Evaluation Study: Annual Report 1991-92. Washington Department of Wildlife Report to the USFWS. Report No. AFF1/ LSR-93-08.

Schuck, M., A. Viola and M. Keller. 1994. Lyons Ferry Evaluation Study: Annual Report 1992-93. Washington Department of Wildlife Report to the USFWS. Report No. AFF1/ LSR-94-08.

Schuck, M., A. Viola and M. Keller. 1995. Lyons Ferry Evaluation Study: Annual Report 1993-94. Washington Department of Fish and Wildlife Report to the USFWS. Report No. H95-06.

Schuck, M., A. Viola and M. Keller. 1996. Lyons Ferry Trout Evaluation Study: 1994-95 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. H96-06.

Schuck, M., A. Viola and J. Dedloff. 1997. Lyons Ferry Trout Evaluation Study: 1995-96 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. H97-08.

Schuck, M., A. Viola, J. Bumgarner and J. Dedloff. 1998. Lyons Ferry Trout Evaluation Study: 1996-97 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. H98-10.

U.S. Army Corps of Engineers District, Walla Walla, Washington. 1975. Special Report: Lower Snake River Fish and Wildlife Compensation Plan. 95 pgs. Plus appendices.

Washington Department of Fish and Wildlife. 1999. 1997-98 Steelhead Sport Catch Summary.

Zippin, C. 1958. The Removal Method of Population Estimation. Journal of Wildlife Management. 22(1):82-90.

Appendix A

Smolt releases from Lyons Ferry Complex, 1995-1998

Appendix A Table 1. Smolt Releases from Lyons Ferry Complex, 1995-1998.

Location	R.M.	Number released	Pounds released	Date m/dd	Stock	CWT Code	Brand	Fin Clips	Size #/lb	CWT loss %	Brand loss %
1995 (Brad)											
Asotin Creek	0.5	22,000	5,000	4/26	L. Ferry			AD	4.4		
Asotic Creek	0.5	13,800	3,000	5/01	L. Ferry			AD	4.6		
Grande Ronde River	29.0	206,182	41,236	4/05-28	Wallowa			AD	5.0		
Mill Creek	2.7	15,200	400	4/19	L. Ferry			AD	3.8		
Snake R. @ LFH	58.0	20,094	5,152	4/20	L. Ferry	63/57/28	LA-H-1	ADLV	3.9	1.08	NA
Snake R. @ LFH	58.0	20,076	6,084	4/20	L. Ferry	63/57/28	LA-H-1	ADLV	3.3	1.08	NA
Snake R. @ LFH	58.0	9,702	2,488	4/20	L. Ferry			AD	3.9		
Snake R. @ LFH	58.0	3,329	876	4/24	L. Ferry			AD	3.8		
Snake R. @ LFH	58.0	6,793	1,544	4/26	L. Ferry			AD	4.4		
Snake R. @ LFH	58.0	6,978	1,586	5/02	L. Ferry			AD	4.4		
Touchet R. @ Dayton	53.0	20,133	5,369	4/05-30	L. Ferry	63/57/14	LA-IC-1	ADLV	3.75	0.13	1.50
Touchet R. @ Dayton	53.0	20,221	5,392	4/05/30	L. Ferry	63/57/15	RA-IC-1	ADLV	3.75	0.37	0.37
Touchet R. @ Dayton	53.0	20,041	5,344	4/05-30	L. Ferry	63/57/16	LA-IC-3	ADLV	3.75	0.37	1.00
Touchet R. @ Dayton	53.0	60,315	16,084	4/05-30	L. Ferry			AD	3.75		
Tucannon R. from Curl	41.0	17,150	3,236	4/11-5/18	L. Ferry	63/57/48	RA-IJ-3	ADLV	5.3	3.53	1.21
Tucannon R. from Curl	41.0	18,288	3,451	4/11-5/18	L. Ferry	63/57/18	LA-IJ-1	ADLV	5.3	0.97	1.46
Tucannon R. from Curl	41.0	18,124	3,420	4/11-5/18	L. Ferry	63/57/17	RA-IJ-1	ADLV	5.3	0.74	0.87
Tucannon R. from Curl	41.0	92,508	17,454	4/11-5/18	L. Ferry			AD	5.3		
Curl Lake		7,298	1,225	retained	L. Ferry			AD	6.0		
Curl Lake		6,914	1,160	retained	L. Ferry			ADLV	6.0		
Walla Walla River	35.0	25,233	6,820	4/18	L. Ferry	63/54/42	RA-H-2	ADLV	3.7	0.74	1.73
Walla Walla River	30.2	25,067	6,775	4/18	L. Ferry	63/54/43	RA-H-1	ADLV	3.7	0.63	1.39
Walla Walla River	30.2	9,300	2,405	4/18	L. Ferry			AD	3.9		
Walla Walla River	36.1	15,600	4,000	4/19	L. Ferry			AD	3.9		
Walla Walla River	35.0	14,400	4,000	4/19	L. Ferry			AD	3.6		
Walla Walla River	30.2	16,400	4,000	4/20	L. Ferry			AD	4.1		
Walla Walla River	34.0	12,000	3,000	4/20	L. Ferry			AD	4.0		
Walla Walla River	34.0	15,990	4,100	4/21	L. Ferry			AD	3.9		
Walla Walla River	35.0	13,500	3,000	5/02	L. Ferry			AD	4.5		
Walla Walla River	36.1	11,385	2,475	5/02	L. Ferry			AD	4.6		
Wildcat Ck, in OR.	1.0	50,051	10,010	4/24	Wallowa			AD	5.0		
Total		**814,072**	**183,686**					**Mean =**	**4.3**	**0.96**	**1.19**

Appendix A Table 1. Smolt Releases from Lyons Ferry Complex, 1995-1998 (continued).

Location	R.M.	Number released	Pounds released	Date m/dd	Stock	CWT Code	Brand	Fin Clips	Size #/lb	CWT loss %	Brand loss %
1996 (8498)											
Asotin Creek	0.5	38,500	7,945	4/19	L. Ferry			AD	4.8		
Grande Ronde River	28.7	249,530	49,906	4/30	Wallowa			AD	5.0		
Mill Creek	2.7	17,550	3,900	4/17	L. Ferry			AD	4.5		
Mill Creek	2.7	2,448	480	4/18	L.Ferry			AD	5.1		
Mud Creek	0.05	13,919	2,717	4/19	Wallowa			AD	5.1		
Snake R. @ LFH	58.0	5,000	980	4/18	L. Ferry			AD	5.1		
Snake R. @ LFH	58.0	20,153	3,802	4/19	L. Ferry	63/60/36	LA-IT-1	ADLV	5.3	3.2	1.5
Snake R. @ LFH	58.0	6,500	1,300	4/19	L. Ferry			AD	5.0		
Snake R. @ LFH	58.0	20,122	3,946	4/19	L. Ferry	63/60/35	LA-IT-3	ADLV	5.1	3.1	5.2
Snake R. @ LFH	58.0	20,167	3,805	4/19	L. Ferry	63/60/34	RA-IT-1	ADLV	5.3	1.7	1.1
Touchet R. @ Dayton	54.0	40,065	9,307	4/30	L. Ferry	63/60/31	LA-IV-3	ADLV	4.3	1.7	4.5
Touchet R. @ Dayton	54.0	40,017	8,893	4/30	L. Ferry	63/60/30	LA-IV-1	ADLV	4.5	1.8	3.5
Touchet R. @ Dayton	54.0	54,528	12,393	4/30	L. Ferry			AD	4.4		
Tucannon R. from Curl	40.0	111,371	22,729	5/29	L. Ferry			AD	4.9		
Tucannon R @ Marengo	25.8	30,464	6,093	4/15	L. Ferry	63/60/33	RA-IV-1	ADLV	5.0	4.3	2.8
Tucannon R. from Curl	40.0	27,871	5,688	5/29	L. Ferry	63/60/32	RA-IV-3	ADLV	4.9	4.4	2.4
Walla Walla River	35.0	55,165	11,950	4/17	L. Ferry			AD	4.6		
Walla Walla River	30.2	30,775	6,950	4/16	L. Ferry			AD	4.4		
Walla Walla River	35.0	29,190	6,950	4/16	L. Ferry			AD	4.2		
Walla Walla River	30.2	1,805	354	4/18	L. Ferry			AD	5.1		
Walla Walla River	35.0	32,065	6,950	4/18	L. Ferry			AD	4.6		
Walla Walla River	30.2	21,000	5,000	4/17	L. Ferry			AD	4.2		
Total		**868,205**	**182,038**					**Mean =**	**4.8**	**2.9**	**3.0**

By95 Wallowa stock = 263449 52623 (5.0 fpp)

Lyons ferry stock = 604756 129415 (4.7 fpp)

Total = 868205 182038 (4.8 fpp)

Appendix A Table 1. Smolt Releases from Lyons Ferry Complex, 1995-1998 (continued).

Location	R.M.	Number released	Pounds released	Date m/dd	Stock	CWT Code	Brand	Fin Clips	Size #/lb	CWT loss %	Brand loss %
1997											
Asotin Creek	0.5	39,997	5,753	4/22	L. Ferry			AD	7.0		
Grande Ronde River	28.7	210,728	30,989	4/30	Wallowa			AD	6.8		
Grande Ronde River	28.7	39,534	5,814	4/30	Wallowa	63/63/39	RA-IL-3	ADLV	6.8	1.1	3.8
Grande Ronde in OR	45.4	24,624	5,130	4/24	Wallowa			AD	4.8		
Mill Creek	2.7	21,900	3,000	4/23	L. Ferry			AD	7.3		
Snake R. @ LFH	58.0	20,195	4,478	4/28	L. Ferry	63/62/58	LA-S-1	ADLV	4.5	1.3	3.4
Snake R. @ LFH	58.0	19,975	4,429	4/19	L. Ferry	63/61/33	RA-S-1	ADLV	4.5	3.2	2.2
Snake R. @ LFH	58.0	20,769	4,605	4/19	L. Ferry	63/61/34	RA-S-2	ADLV	4.5	1.7	2.1
Snake R. @ LFH	58.0	20,223	4,484	4/19	L. Ferry	63/62/59	LA-S-2	ADLV	4.5	1.3	3.6
Touchet R.@ Dayton	54.0	30,341	5,142	4/30	L. Ferry	63/61/21	LA-IC-1	ADLV	5.9	1.0	1.8
Touchet R. @ Dayton	54.0	30,164	4,372	4/30	L. Ferry	63/21/22	LA-IC-3	ADLV	6.9	0.8	1.8
Touchet R. @ Dayton	54.0	82,319	11,930	4/30	L. Ferry			AD	6.9		
Tucannon R. from Curl	40.0	82,027	12,059	5/20	L. Ferry			AD	6.8		
Tucannon R. from Curl	40.0	27,978	4,114	5/20	L. Ferry	63/63/37	RA-IV-3	ADLV	6.8	1.7	1.6
Tucannon R. @ Marengo	25.8	29,966	6,530	4/22	L. Ferry	63/63/38	RA-IV-1	ADLV	4.6	1.2	0.7
Walla Walla River	35.0	18,865	3,850	4/15	L. Ferry			AD	4.9		
Walla Walla River	35.0	27,000	5,000	4/17	L. Ferry			AD	5.4		
Walla Walla River	35.0	35,500	5,000	4/22	L. Ferry			AD	7.1		
Walla Walla River	30.2	37,850	7,500	4/16	L. Ferry			AD	5.0		
Walla Walla River	30.2	47,750	8,750	4/21	L. Ferry			AD	5.5		
Walla Walla River	30.2	4,015	550	4/23	L. Ferry			AD	7.3		
Total		**871,720**	**143,479**					**Mean =**	**6.1**	**1.5**	**2.3**

B496 Wallowa stock = 274886 41933 6.6 Fpp
Lyons Ferry stock = 596834 101546 5.9 Fpp
Total = 871720 143479 6.1 Fpp

Appendix A Table 1. Smolt Releases from Lyons Ferry Complex, 1995-1998 (continued).

Location	R.M.	Number released	Pounds released	Date m/dd	Stock	CWT Code	Brand	Fin Clips	Size #/lb	CWT loss %	Brand loss %
1998											
Grande Ronde River	28.7	2,000	275	3/31	Wallowa			AD	7.3		
Grande Ronde River	28.7	25,064	4,205	4/23	Wallowa	63/61/28	RA-IJ-3	ADLV	6.0	0.4	2.6
Grande Ronde River	28.7	24,901	4,178	4/23	Wallowa	63/61/27	RA-IJ-1	ADLV	6.0	0.6	8.9
Grande Ronde River	28.7	200,246	33,598	4/23	Wallowa			AD	6.0		
Mill Creek	2.7	9,165	1,950	4/17	L. Ferry			AD	4.7		
Snake R. @ LFH	58.0	8,970	1,950	4/17	L. Ferry			AD	4.6		
Snake R. @ LFH	58.0	20,431	4,006	4/20	L. Ferry	63/01/08	RA-H-1	ADLV	5.1	0.8	5.9
Snake R. @ LFH	58.0	21,108	4,221	4/20	L. Ferry	63/63/59	LA-H-2	ADLV	5.0	0.5	3.2
Snake R. @ LFH	58.0	20,040	4,264	4/20	L. Ferry	63/01/07	LA-H-1	ADLV	4.7	1.1	2.3
Snake R. @ LFH	58.0	20,238	3,968	4/20	L. Ferry	63/01/09	RA-H-2	ADLV	5.1	0.3	3.6
Snake R. @ LFH	58.0	3,055	650	4/21	L. Ferry			AD	4.7		
Touchet R. @ Dayton	54.0	84,282	15,666	4/30	L. Ferry			AD	5.4		
Touchet R. @ Dayton	54.0	20,804	3,599	4/30	L. Ferry	63/04/24	LA-7U-1	ADLV	5.8	1.3	8.0
Touchet R. @ Dayton	54.0	20,041	3,467	4/30	L. Ferry	63/04/23	RA-7U-1	ADLV	5.8	0.7	13.2
Tucannon R. @ Enrich	17.4	25,043	5,110	4/14	L. Ferry	63/61/30	LA-IJ-3	ADLV	4.9	0.9	2.9
Tucannon R. @ Enrich	17.4	38,549	8,202	4/16	L. Ferry			AD	4.7		
Tucannon R. @ Enrich	17.4	16,470	3,050	4/21	L. Ferry			AD	5.4		
Tucannon R. @ Enrich	17.4	31,723	6,518	4/21	L. Ferry			AD	4.9		
Tucannon R. @ Marengo	25.8	25,283	5,379	4/13	L. Ferry	63/61/29	LA-IJ-1	ADLV	4.7	0.8	5.1
Tucannon R. @ Marengo	25.8	23,000	5,000	4/15	L. Ferry			AD	4.6		
Walla Walla River	35.0	34,875	8,750	4/14	L. Ferry			AD	4.0		
Walla Walla River	35.0	19,200	4,000	4/20	L. Ferry			AD	4.8		
Walla Walla River	35.0	34,080	6,400	4/22	L. Ferry			AD	5.3		
Walla Walla River	30.2	12,900	3,000	4/15	L. Ferry			AD	4.3		
Walla Walla River	30.2	24,000	5,000	4/16	L. Ferry			AD	4.8		
Walla Walla River	30.2	40,800	8,000	4/21	L. Ferry			AD	5.1		
Total		**806,268**	**154,407**					**Mean =**	**5.2**	**0.8**	**5.1**

BY 97

Wallowa – 252211 42256 lbs 6.0fpp

LF – 554057 112151 lbs 4.9fpp

Appendix B

Steelhead Trapped at Tucannon Hatchery Trap Spring 1998

Appendix B Table 1. Steelhead trapped at TFH trap during 1998.

Date[1]	Origin (W/H)	Sex	Marks	Length (cm)	Condition	DNA sample
2/24	H	F	AD	-		-
2/24	H	M	AD	-		-
3/2	H	M	AD	-		-
3/2	H	F	AD	-		-
3/12	H	M	AD	-		-
3/12	H	F	AD	-		-
3/13	H	M	AD	-		-
3/13	H	F	AD	-		-
3/13	H	F	AD	-		-
3/15	Wild	M	-	-		-
3/15	H	M	AD	-		-
3/15	H	F	AD	-		-
3/15	H	M	AD	-		-
3/16	H	M	AD	-		-
3/16	H	F	AD	-		-
3/16	H	M	AD	-		-
3/16	H	F	AD	-		-
3/16	H	F	AD	-		-
3/16	Wild	M	-	-		-
3/19	H	M	AD	-		-
3/19	H	M	AD	-		-
3/19	H	M	AD	-		-
3/21	H	F	AD	-		-
3/23	H	F	AD	-		-
3/23	H	M	AD	-		-
3/23	H	F	AD	-		-
3/25	H	M	AD	-		-
3/26	H	M	AD	61		-
3/26	H	F	AD	61		-
3/26	H	F	AD	71		-
3/26	H	M	AD	61		-
3/26	H	F	AD	61		-
3/26	H	F	AD	61		-
3/26	H	M	AD	56		-
3/26	H	F	AD	56		-
3/26	H	M	AD	61		-
3/26	H	F	AD	56		-
3/26	H	F	AD	61		-
3/27	Wild	M	-	66.5		98AJ-1
3/27	Wild	F	-	58.5		98AJ-2
4/1	H	M	AD	60		98AJ-3
4/1	H	F	AD	62.5		98AJ-4
4/2	H	M	AD	61		-

[1] Trapping dates:2/20/98 to 7/2 /98 inclusive. All fish were passed upstream from the trap upon arrival.

Appendix B Table 1. Steelhead trapped at TFH trap during 1998 (continued).

Date[1]	Wild/Hatchery	Sex	Marks	Length (cm)	Condition	DNA sample
4/2	H	F	AD	66		98AJ-5
4/3	H	M	AD	59		98AJ-6
4/3	H	F	AD	61		98AJ-7
4/3	H	M	AD	63		98AJ-8
4/4	H	F	AD	54.5		98AJ-9
4/6	H	F	AD	67		98AJ-10
4/7	H	M	AD	60		98AJ-11
4/7	Wild	M	-	63		98AJ-12
4/7	Wild	F	-	60		98AJ-13
4/8	H	M	AD	60		98AJ-14
4/10	H	F	AD	68.5		98AJ-15
4/11	Wild	F	-	69		98AJ-16
4/11	H	M	AD	62.5		98AJ-17
4/12	H	M	AD	59.5		98AJ-18
4/17	Wild	F	-	60		98AJ-19
4/17	Wild	M	-	62		98AJ-20
4/20	H	F	AD	54.5		98AJ-21
4/20	H	M	AD	61		98AJ-22
4/20	H	M	AD	62	no left eye	98AJ-23
4/21	H	F	AD	69		98AJ-24
4/21	H	F	AD	58		98AJ-25
4/21	H	F	AD	61		98AJ-26
4/22	Wild	M	-	-		98AJ-27
4/22	Wild	F	-	-		98AJ-28
4/23	H	M	AD	63		98AJ-29
5/5	Wild	M	-	56		98AJ-30
5/6	Wild	F	-	56	spawned out	98AJ-31
5/19	Wild	F	-	56		98AJ-32
5/19	Wild	M	-	57		98AJ-33
5/27	H	M	AD	64		98AJ-34
6/13	H	F	AD	62	BY 99 fish??	98AJ-35
7/2	H	F	AD	64	Spawned out	98AJ-36

[1] Trapping dates:2/20/98 to 7/2 /98 inclusive. All fish were passed upstream from the trap upon arrival.

Appendix C

Summary of Steelhead Trapped at LFH in 1997

Appendix C Table 1. Summary of adult steelhead trapped at LFH in 1997.

Freeze Brand	CWT Code	Stock	Release Site		Actual Tag Return
1995					
RA-H-1	63/54/43	LFH	Walla Walla River		57
RA-H-2	63/54/42	LFH	Walla Walla River		61
LA-H-1	63/57/28	LFH	Snake River		190
LA-IJ-1	63/57/18	LFH	Tucannon River (Curl AP)		18
RA-IJ-1	63/57/17	LFH	Tucannon River (Curl AP)		9
RA-IJ-3	63/57/48	LFH	Tucannon River (Curl AP)		7
RA-IC-1	63/57/15	LFH	Touchet River		67
LA-IC-1	63/57/14	LFH	Touchet River		70
LA-IC-3	63/57/16	LFH	Touchet River		78
				Total	**557**
1996					
RA-IT-1	63/60/34		Snake River		116
LA-IT-1	63/60/36		Snake River		88
LA-IT-3	63/60/35		Snake River		109
LA-IV-1	63/60/30		Touchet River		207
LA-IV-3	63/60/31		Touchet River		185
RA-IV-1	63/60/33		Tucannon River (Marengo)		68
RA-IV-3	63/30/32		Tucannon River (Curl AP)		17
				Total	**790**
			AD only		**4,552**
			Wild		2
			LVRV		1
			ADLV released		2
			No tag		36
			Unrecognizable tag		4
			Not mark sampled		3
				TOTAL	**5,947**

Appendix D

Coded-Wire Tag Expansions for LSRCP Rivers in SE Washington

Appendix D Table 1. Coded wire tag expansions, fall 1997 and spring 1998.

River	Section									
Snake River	**228**									
		Sept[2]	Oct	Nov	Dec	Jan	Feb	Mar			
Sample size		2	203	163	0	0	0	0			
Harvest[1]		127	1990	1608	425	181	94	33		Tags	**Estimated**
Sample rate		**0.016**	**0.102**	**0.101**	**0.000**	**0.000**	**0.000**	**0.000**	**CWT**	recovered	**harvest**
			3	2					71160	5	49
			1						71161	1	10
			1	1					71216	2	20
			1						71217	1	10
			2						75821	2	20
			1						104511	1	10
			1						104512	1	10
				1					104625	1	10
				1					075825	1	10
			1						635716	1	10
				1					635718	1	10
			1						635748	1	10
Snake River	**252**									
		Sept	Oct [2]	Nov [2]	Dec	Jan	Feb	Mar			
Sample size		10	12	1							
Harvest[1]		161	784	774	201	198	114	54		Tags	**Estimated**
Sample rate		**0.062**	**0.015**	**0.001**					**CWT**	recovered	**harvest**
		1							52458	1	16
		1							53212	1	16
		1							71218	1	16
			1						104728	1	1
			1						635714	1	1
			1						635717	1	1
			1						636031	1	1
			1						636033	1	1
			1						636036	1	1
			1						No Tag	1	1
			1						Tag not	collected	

Appendix D Table 1. Coded wire tag expansions, fall 1997 and spring 1998 (continued).

Snake River 167

	Sept	Oct	Nov	Dec	Jan [2]	Feb	Mar			
Sample size	2	59	54	27	7	0	0			
Harvest [1]	23	147	342	198	178	171	188		Tags	Estimated
Sample rate	**0.087**	**0.401**	**0.158**	**0.136**	**0.039**	**0.000**	**0.000**	**CWT**	recovered	**harvest**
			1					71160	1	6
			1					102006	1	6
			1					102026	1	6
				1				103050	1	7
					1			104523	1	1
			1					104538	1	6
		1						635443	1	2
		1						635714	1	2
			1					635715	1	6
		3	1					635716	4	14
			1					635718	1	6
		1		1				636031	2	10
				1				636033	1	7
			1					636035	1	6
		1						636036	1	2

Snake River 166

	Sept	Oct	Nov	Dec	Jan	Feb	Mar			
Sample size	49	319	185	29	13	0	0			
Harvest [1]	415	1480	1196	439	218	191	415		Tags	Estimated
Sample rate	**0.118**	**0.216**	**0.155**	**0.066**	**0.060**	**0.000**	**0.000**	**CWT**	recovered	**harvest**
			1	1				52461	2	22
		1						52462	1	5
		1						70920	1	5
	1	1						71159	2	13
		1						71162	1	5
	1							75821	1	8
		1						102001	1	5
				1				102010	1	15
		1						102014	1	5
		1						102017	1	5
			1					102025	1	6
		1						102027	1	5
		2						103046	2	9
								103049	1	17
	1	1						103052	2	13
		1						103058	1	5
		1						103511	1	5
		1						103512	2	13
			1					103515	1	6
		1						104516	1	5

Appendix D Table 1. Coded wire tag expansions, fall 1997 and spring 1998 (continued).

Snake River 166 (continued)

	Sept	Oct	Nov	Dec	Jan	Feb	Mar			
Sample size	49	319	185	29	13	0	0			
Harvest [1]	415	1480	1196	439	218	191	415		Tags	**Estimated**
Sample rate	**0.118**	**0.216**	**0.155**	**0.066**	**0.060**	**0.000**	**0.000**	**CWT**	recovered	**harvest**
		1						104518	1	5
			1					104533	1	6
	1							104539	1	8
		2						104621	2	9
			1					104660	1	6
		1	1					104728	2	11
		1	1					635442	2	11
	1		1					635714	2	15
		1	1					635715	2	11
		3						635717	3	14
			1					635718	1	6
		1	1					635728	3	26
		1						635748	1	5
	1	1	1					636030	3	20
	2	3						636031	5	31
	1							363033	1	8
		1						636034	1	5
			1					636035	1	6
		1						636036	1	5
	1	3		1				No Tag	4	

Snake River 165

	Sept [2]	Oct	Nov	Dec [2]	Jan	Feb	Mar			
Sample size	3	75	166	3	0	0	0			
Harvest [1]	97	586	1239	502	100	67	127		Tags	**Estimated**
Sample rate	**0.031**	**0.128**	**0.134**	**0.006**	**0.000**	**0.000**	**0.000**	**CWT**	recovered	**harvest**
			1					52055	1	7
			1					52460	1	7
		1						53407	1	8
			1					71159	1	7
			1					71163	1	8
			2					71216	2	15
		1						75833	1	8
		1						102025	1	8
		1						104539	1	8
		1						104728	1	8
		1						635714	1	8
		1						635716	1	8
		1						636030	1	8

Appendix D Table 1. Coded wire tag expansions, fall 1997 and spring 1998 (continued).

Snake River 165

	Sept [2]	Oct	Nov	Dec [2]	Jan	Feb	Mar			
Sample size	3	75	166	3	0	0	0			
Harvest [1]	97	586	1239	502	100	67	127		Tags	**Estimated**
Sample rate	**0.031**	**0.128**	**0.134**	**0.006**	**0.000**	**0.000**	**0.000**	**CWT**	recovered	**harvest**
		1						636032	1	8
		1						636035	1	8
		1	6					No Tag	7	8

Snake River 164

	Sept	Oct	Nov	Dec	Jan	Feb	Mar			
Sample size	3	13	0	0	0	0	0			
Harvest [1]	10	30	47	80	30	13	0		Tags	**Estimated**
Sample rate	**0.30**	**0.433**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**CWT**	recovered	**harvest**
									0	0

Tucannon R. 189

	Sept	Oct	Nov	Dec	Jan	Feb	Mar [2]			
Sample size	6	23	63	36	8	5	1			
Harvest [1]	46	124	272	199	51	24	24		Tags	**Estimated**
Sample rate	**0.130**	**0.185**	**0.232**	**0.181**	**0.157**	**0.208**	**0.042**	**CWT**	recovered	**harvest**
	1		1					635442	2	12
		1		1				635443	2	11
		1	1	1				635714	3	15
	1							635715	1	8
			2					635716	2	9
		2	1					635717	3	15
		2			1			635718	3	17
			1	1				635748	2	10
		3		1				636030	4	22
		1	1					636032	2	10
	1	2	2	2				636033	7	38
			2			1		Lost Tag	3	

Appendix D Table 1. Coded wire tag expansions, fall 1997 and spring 1998 (continued).

Touchet River 185

	Sept	Oct	Nov	Dec [2]	Jan	Feb	Mar			
Sample size	0	0	12	2	11	20	36			
Harvest [1]	0	7	88	57	57	145	127		Tags	Estimated
Sample rate	0.000	0.000	0.136	0.035	0.193	0.138	0.283	CWT	recovered	harvest
			2				1	635714	3	18
			4			3	1	635715	8	55
			1			1	4	735716	6	29
					1	3		636030	4	27
				1	2	3	3	363031	9	44
						1	6	Lost Tag	7	

Mill Creek 106

	Sept	Oct	Nov	Dec [2]	Jan	Feb	Mar			
Sample size	0	0	0	1	1	0	1			
Harvest [1]	0	4	7	21	7	18	11		Tags	Estimated
Sample rate	0.000	0.000	0.000	0.048	0.143	0.000	0.091	CWT	recovered	harvest

Grande Ronde 75

	Sept	Oct [2]	Nov	Dec	Jan	Feb	Mar			
Sample size	0	2	0	0	0	0	0			
Harvest [1]	40	750	1062	636	398	608	865		Tags	Estimated
Sample rate	0.000	0.003	0.000	0.000	0.000	0.000	0.000	CWT	recovered	harvest

Walla Walla 194

	Sept [2]	Oct	Nov	Dec [2]	Jan	Feb [2]	Mar [2]			
Sample size	4	70	29	9	0	8	2			
Harvest [1]	152	693	399	262	110	209	53		Tags	Estimated
Sample rate	0.026	0.101	0.073	0.034	0.000	0.038	0.038	CWT	recovered	harvest
		1						635442	1	10
	1	2						635443	3	21
		3	1					635714	4	43
		1						636030	1	10
		2						636031	2	20

Appendix D Table 1. Coded wire tag expansions, fall 1997 and spring 1998 (continued).

McNary Pool 45
Columbia R.

	Sept [2]	Oct	Nov	Dec	Jan	Feb	Mar			
Sample size	1	49	28	0	0	0	0			
Harvest[1]	70	425	486	231	85	39	44			
Sample rate	**0.014**	**0.115**	**0.058**	**0.000**	**0.000**	**0.000**	**0.000**	**CWT**	Tags recovered	**Estimated harvest**
		1						53331	1	9
			1					70656	1	17
		1						103515	1	9
		1						104728	1	9

[1] WDFW sport catch estimates; based on catch record returns (WDFW 1998).
[2] Sample rate of <0.05 considered too small for reliable expansions.

Appendix D Table 2. Observed and expanded numbers of ADLV + CWT marked steelhead recovered on the Grande Ronde River in Washington during the 1997-98 steelhead season.

Tag Code	Release Site	Brood Year	Number Observed	Number Expanded

[1] Direct release into Deer Creek.
[2] Acclimated and then released into Deer Creek.

Appendix E

Estimates of Steelhead Redds for SE Washington Rivers that are Part of the LSRCP Program

Appendix E Table 1. Estimates of steelhead redds for Washington Rivers that are part of the LSRCP program.

River	Location	Miles	Redds/Mile	Total Redds
Asotin Creek				
North Fork	From mouth upstream	6.0	5.3	32
Main	From the mouth upstream	7.0	2.7	19
Charlie Creek	From the confluence bridge downstream to Charlie Creek	1.3	No Estimate	
Touchet River				
South Fork	From mouth upstream	19.1	6.4	122
North Fork	From confluence upstream	11.1	8.6	96
Wolf Fork	From mouth upstream	10.3	10.8	111
Robinson Fork of Wolf Fork	From mouth upstream	5.5	No Estimate	
Tucannon River				
Upper	From Sheep Creet to Panjab bridge	4.7	1.1	5a
Middle	From Panjab bridge downstream to hatchery	9.8	5.5	54[a]
Lower	From hatchery downstream to Highway 12	17.5	8.3	145[a]
Cummings Ck	From mouth upstream	7.0	2.0	14
Panjab Creek	From mouth upstream	3.4	No Estimate	

[a] Estimate based only on index samples. A complete and final survey of the entire river was precluded by high muddy river flows.

Appendix F

Juvenile Steelhead Densities for SE Washington Rivers that are Part of the LSRCP Program

Appendix F Table 1. Juvenile steelhead densities for SE Washington rivers that are part of the LSRCP program.

Average number of juvenile steelhead (#/100 square meters of stream surface) for sites sampled by sample year.

Years Sampled	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Tucannon River																
0-aged steelhead		16.0		18.4	20.6		18.1	19.1	13.0	17.4	14.6		11.0	15.8	16.5	17.2
>0 aged steelhead		2.5		13.7	8.5		10.6	9.8	6.5	4.8	7.0		4.0	3.2	4.6	6.4
Cummings Ck.																
0-aged steelhead											43.2	42.9	32.4	47.8		12.5
>0 aged steelhead											26.3	20.4	29.6	16.6		12.7
NF Asotin Ck.																
0-aged steelhead	23.7	6.6		29.7			22.8		22.1	56.9	36.8	20.4	23.4	13.0	24.0	44.6
>0 aged steelhead	8.7	7.5		37.6			18.0		14.2	22.2	28.1	34.9	11.2	17.4	6.7	25.5
SF Asotin Ck.																
0-aged steelhead	44.3	39.0					6.0		1.8	50.0	78.7	0.8	34.6	2.0	32.5	32.9
>0 aged steelhead	25.3	30.6					34.0		13.9	10.4	42.5	16.4	11.4	11.2	4.6	22.8
Main Asotin Ck.																
0-aged steelhead											49.1	36.8	47.7	62.8	33.4	52.2
>0 aged steelhead											22.1	39.6	13.1	12.2	6.9	10.2
Charlie Ck.																
0-aged steelhead			73.0									19.0		64.4		18.3
>0 aged steelhead			37.6									20.0		15.3		49.0
NF Touchet R.																
0-aged steelhead										35.5	26.0	20.8	42.5	4.9	28.5	15.4
>0 aged steelhead										19.0	19.3	18.9	8.9	3.6	2.3	4.9
SF Touchet R.																
0-aged steelhead										42.8	8.7	16.2	31.1	1.9	11.6	16.7
>0 aged steelhead										15.5	15.0	5.8	9.5	10.2	2.8	16.2
Wolf Fk Touchet R.																
0-aged steelhead										41.1	21.8	20.2	25.0	2.3	22.8	23.6
>0 aged steelhead										8.7	10.5	11.5	6.4	5.3	5.4	13.4

Appendix G

Trout Plants from Lyons Ferry Complex, 1998

Appendix G: Table 1. Trout plants from Lyons Ferry Complex, 1998.

County	Location	No. of Plants	Pounds of Fish	No. Fish Planted
Adams	Sprague Lake	1	1,790	5,012
	Total Rainbows		*1,790*	*5,012*
Asotin	Asotin Creek	1	715	2,074
	Golf Course Pond	6	6,365	21,272
	Headgate Pond	1	560	2,072
	Silcott Pond	2	1,110	4,086
	West Evans Pond	5	5,857	19,201
	Total Rainbows		*14,607*	*48,705*
Columbia	Beaver Lake	2	605	1,807
	Blue Lake	7	6,925	20,358
	Curl Lake	5	3,985	12,990
	Dam Pond	1	715	2,002
	Dayton Jv. Pond	2	635	2,090
	Deer Lake	3	1,575	5,061
	Donnie Lake	1	70	252
	Orchard Pond	1	690	2,001
	Rainbow Lake	6	5,516	16,924
	Spring Lake	5	3,018	9,243
	Touchet R. (GB)	1	2,830	9,205
	Tucannon R.	1	1,040	3,016
	Watson	4	4,920	16,126
	Total Rainbows		*31,124*	*95,946*
	Browns(GB)		*2,830*	*9,205*
Franklin	Dalton Lake	2	6,800	20,040
	Marmes Pond	1	345	1,001
	Total Rainbows		*7,145*	*21,041*
Garfield	Baker's Pond	1	315	1,008
	Casey Pond	1	145	507
	Pataha Creek	1	280	1,036
	Total Rainbows		*740*	*2,551*
Walla Walla	Bennington Lake	4	7,168	21,213
	College Place Pond	3	1,364	3,676
	Fishhook Pk. Pond	2	1,781	7,959
	Jefferson Park Pond	2	610	2,094
	Mill Creek	1	1,852	5,000
	Quarry Pond	2	6,850	20,545
	Total Rainbows		*19,625*	*58,706*
Whitman	Garfield Pond	1	571	1,998
	Gilcrest Pond	2	938	3,496
	Pampa Pond	1	1,390	5,004
	Riparia Pond (RB)	1	375	1,050
	Riparia Pond (GB)	1	456	2,189
	Rock Lake (RB)	1	325	1,007
	Rock Lake (GB)	1	293	1,054
	Union Flat Creek	1	510	1,581
	Total Rainbows		*4,889*	*16,293*
	Browns(GB)		*749*	*3,243*
Total Rainbows			**79,920**	**248,254**
Total Browns			**3,579**	**12,448**

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