

Lyons Ferry Complex Hatchery Evaluation:
Summer Steelhead and Trout Report
1998, 1999, and 2000 Run Years

by

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Abstract

As part of the Lower Snake River Compensation Plan (LSRCP) mitigation program, Lyons Ferry Complex (LFC) released summer steelhead into area rivers, and rainbow trout were stocked into local lakes and rivers during the springs of 1999, 2000 and 2001. Additionally, fry and fingerling rainbow trout were reared and provided to Idaho.

During 1999-2001, groups of juvenile steelhead were freeze branded, coded-wire tagged (CWT), Visual Elastomer (VI) tagged, adipose and ventral fin clipped and released into the Tucannon, Walla Walla, Touchet, Snake, and Grande Ronde rivers. Not all release locations were given marked groups during the three release years. In addition, Passive Integrated Transponder (PIT) tags were inserted into many of the hatchery origin study groups to monitor their migration timing and success through the Snake and Columbia River dams. Natural origin steelhead from the Tucannon River were also tagged at the Tucannon River smolt trap. Detection rates and migration timing varied among the groups but appear to be directly related to bypass efficiency at each collector facility.

Residualism of hatchery released steelhead in the Tucannon River was monitored through hook and line methods in 1999. Residualism rates were similar to previous estimates. During 2000, intensive creel surveys were conducted on the Touchet River to assess impacts on natural origin steelhead. Impacts to natural steelhead from the trout fishery appear to be minimized by angler preference for larger sized fish.

Natural origin steelhead have been captured at the Tucannon River smolt trap during all three run years. Age, length, and total estimated number of smolts varied slightly between years, which was likely due to environmental conditions and number of spawning adults. Peak out-migration was similar among the years.

Adult trapping was accomplished at numerous remote traps and hatchery facilities during the study period. Adult collections occurred at Lyons Ferry Hatchery and Cottonwood trap for the collection of standard hatchery broodstocks (Lyons Ferry and Wallowa stocks). In addition, endemic broodstock programs were investigated and initiated on the Touchet and Tucannon rivers. These programs may eventually replace the Lyons Ferry Stock in each of the rivers. Efforts to date have been successful, with improved stock performance (survival) in the hatchery for both stocks. Test trapping was also conducted on small tributaries of the Grande Ronde to assess the potential for endemic broodstock development to replace the Wallowa stock. Results from these traps were not encouraging, as numbers of natural fish were too low to develop programs. Many hatchery fish were captured, indicating that the stocks were likely a mixture of hatchery and natural fish.

Freeze-brand data from adult steelhead captured at Lower Granite Dam was provided by National Marine Fisheries Service. The data that was compiled provided insight to the potential rates of straying of Lyons Ferry stock steelhead into the upper Snake River Basin. Also, freeze-brand data on the Wallowa Stock fish released from the Grande Ronde River at Cottonwood AP, provided an estimate of adult returns to the project area, which have generally been more reliable than coded-wire tag estimates.

Creel surveys were conducted in all three run years, though data is only complete for the 1998/1999 and 1999/2000 run years. Each year we surveyed about 6,000 steelhead anglers. Overall catch rates varied slightly between the years. Estimates of angler effort, total harvest and tagged fish harvested were summarized. We also cooperated with Oregon Department of Fish and Wildlife (ODFW) to conduct creel surveys on the Lower Grande Ronde River in Washington. Grande Ronde creel data (total catch, effort hours, etc.) were summarized by ODFW and provided to WDFW for inclusion into this report.

Based on harvest estimates and returns to traps, we estimated total adult returns for the 1995 to 1999 run years of steelhead from the LFC. Run years have varied slightly, but most years have greatly exceeded the LSCRCP goals of 4,655 adult steelhead. Returns over the 5-year period have varied between 114%-297% of the LSCRCP steelhead mitigation goal established for Washington.

Spawning ground surveys were conducted in the Tucannon River, portions of the Touchet River, and portions of the Asotin Creek basin for 1999, 2000, and 2001. River flows varied between years and made surveys difficult in 2000. Estimated number of redds and spawners were derived for each year.

Electrofishing surveys on the Tucannon and Touchet rivers, and Asotin Creek were conducted during July and August each year. Areas sampled and site lengths were increased in 2000. Estimates provided are for the same river reaches as in previous years. The numbers of naturally produced steelhead in LSCRCP rivers were similar to previous years and appear to be generally stable.

In summary, the Lyons Ferry summer steelhead program is meeting its original mitigation goals by supplying above adequate returns for harvest within the Lower Snake River area. However, impact to listed salmonid species and other non-target taxa are probably not within acceptable levels. Further evaluation and monitoring must occur to fully assess these impacts. In the interim, new production goals for the Lyons Ferry and Wallowa Stock program need to be established to reduce impacts.

Introduction

This multi-year annual report is one in 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 reporting period for this multi-year report was 1 July 1998 through 30 June 2001.

The LSRCP program began in the State of Washington in 1981 with construction of Lyons Ferry Hatchery (LFH). Refurbishing of the Tucannon Fish Hatchery (TFH) followed in 1984-85. In addition to the hatchery construction/modifications, three remote acclimation ponds (AP) were built along the Tucannon, Touchet, and Grande Ronde rivers to acclimate juvenile summer steelhead¹ before release. All of these facilities (Figure 1) make up the Lyons Ferry Complex (LFC).

The LFC steelhead program began as an “in kind, in place” replacement under the mitigation program, with goals to maintain genetic integrity of steelhead stocks. Unfortunately, non-endemic steelhead stocks were established for the programs. These non-endemic stocks were used generally as “supplementation” stocks to the natural populations within the basins they were planted since they were allowed to escape into the natural spawning areas. However, that strategy is not the current goal, and supplementation to the natural populations with these stock is considered undesirable. Actions have been taken where possible to reduce this impact.

The Lyons Ferry Evaluation study assesses whether the LFC produces fish that meet mitigation goals (USACE 1975). The evaluation program also attempts to determine what parts of the mitigation program may adversely affect listed salmonid populations protected under the Endangered Species Act (ESA), and recommends actions to improve the facilities' effectiveness.

Recent declines in adult natural² steelhead escapement, and the eventual listing by the National Marine Fisheries Service (NMFS) of Snake River and Mid-Columbia steelhead under the ESA as “Threatened”, reinforces the need for continual monitoring of natural steelhead and salmon populations in rivers receiving LFC fish. Natural juvenile density and population estimates, and population estimates from smolt trapping (Tucannon River only) 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. Further, because of federal rulings on the risks of the hatchery stocks, the project has been tasked with deciding what course of action should be taken with our hatchery steelhead stocks to lessen effects to ESA listed fish.

¹ Throughout this report, the term “steelhead” refers to summer steelhead, unless otherwise noted in the text.

² Throughout this report, the term “natural” steelhead refers to fish that were reared in the stream, but could have been produced by parents of either wild or hatchery origin.

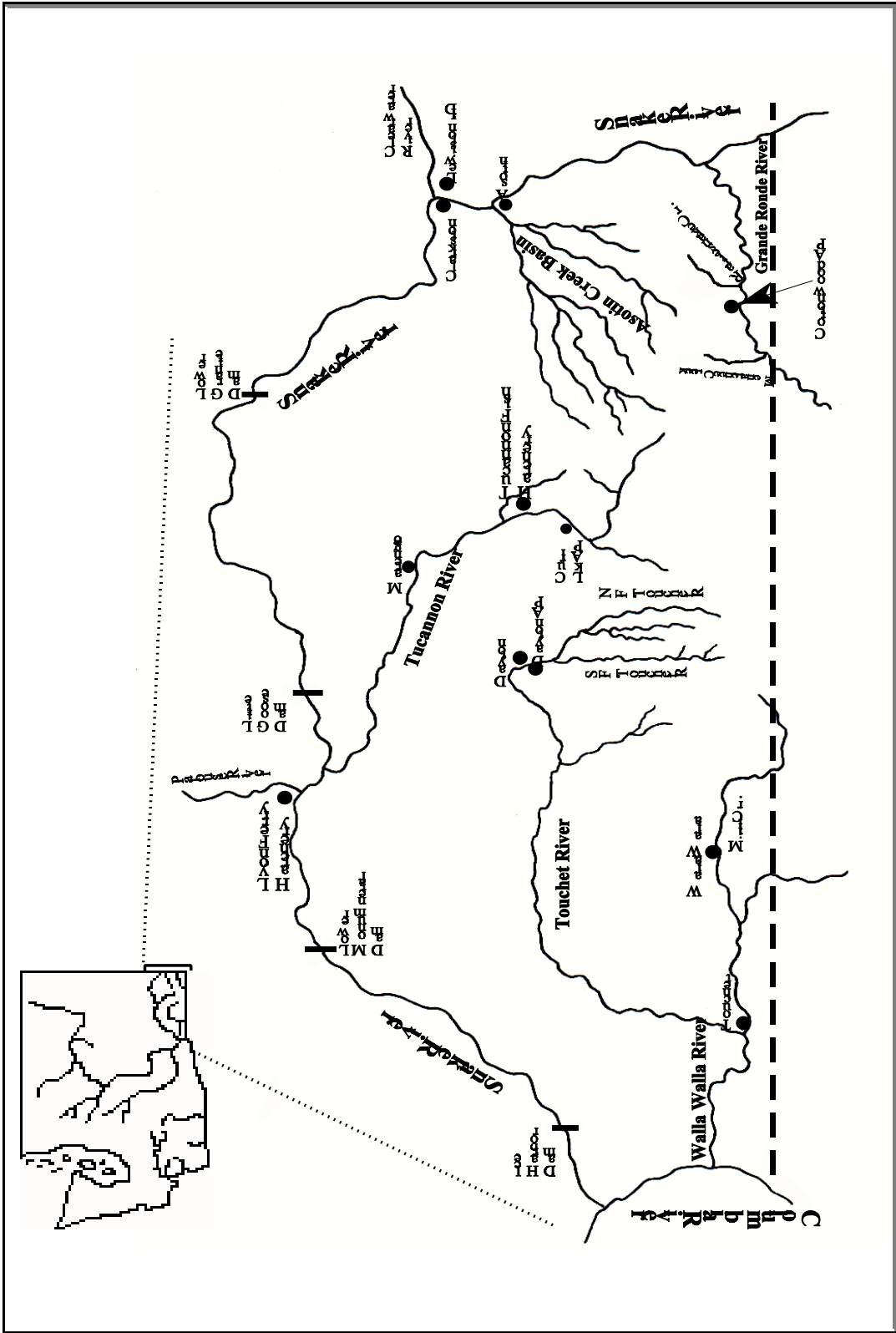


Figure 1. Map of major rivers and streams in Southeast Washington, and Lyons Ferry Complex Facilities.

Methods/Results/Discussion

Hatchery Operation Monitoring

Rainbow Trout Production

As part of the LSRCP mitigation program, WDFW has produced rainbow trout (various stocks) over the years for release into rivers and lakes in southeast Washington for recreational fishing opportunities. Original goals of the LSRCP were to provide 93,000 lbs (3 fish/lb) to the area, of which 6,100 lbs were destined for Idaho waters (USFWS 1998). Currently, the LFC goal is to produce 237,500 trout (79,900 lbs) for release into southeast Washington. For the Idaho Fish and Game (IDFG) LSRCP program, LFC will produce 150,000 (3,000 lbs) fry (Spokane Stock), and 50,000 (3,333 lbs) fingerlings (Kamloops Stock). With ESA listings of chinook, steelhead and bull trout in more recent years, stocking of rainbow trout from LFC into area waters has been shifted mainly to small lakes and ponds to reduce the negative affects to listed species that reside in rivers.

Between 1999 and 2001, WDFW provided fry and fingerlings to Idaho Fish and Game for release into Idaho waters for recreational fishing opportunities. The number of fish provided generally satisfied the current goals. In 1999, 151,170 rainbow trout fry (2,691 lbs) and 50,500 fingerlings (2,701 lbs) were reared and transferred for Idaho's LSRCP program. In 2000, 151,776 rainbow trout fry (2,232 lbs) and 50,500 fingerlings (2,700 lbs) were reared and transferred to Idaho. In 2001, 152,791 rainbow trout fry (1,874 lbs) were transferred to Idaho. All fingerlings were transferred during October of each year.

Rainbow trout (mainly Spokane Stock) for the LSCRP program are reared at both LFH and TFH. Performance of the Spokane Stock production from LFC has been monitored for many years (Table 1). Survivals by brood year (BY) have remained relatively constant in recent years. Number of fish planted (fry + catchable) represents total annual production of LSRCP rainbow trout. A State funded trout program also contributes to overall production within the area. In 1999, 2000, and 2001, LFC produced 334,423 (102,013 lbs), 264,309 (81,915 lbs), and 260,003 (87,855 lbs), respectively, catchable size rainbow trout and released them into southeast Washington waters (Appendix A). Catchable trout represents both LSRCP and State funded trout programs. Catchable trout averaged 3.3, 3.2, and 3.0 fish/lb at release in spring 1999, 2000, and 2001 respectively.

Table 1. LSRCP produced rainbow trout (Spokane Stock) and survival rates at LFC, brood years 1986-2000.

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%
Spokane (97)	570,000	568,362	99.7%	189,961 (3,735)	393,776 (116,373)	100.0%
Spokane (98)	545,000	543,801	99.8%	160,900 (2,726)	239,767 (81,440)	73.7%
Spokane (99)	545,000	515,070	94.5%	189,788 (2,725)	191,065 (76,553)	73.9%
Spokane (00)	545,000	475,348	87.2%	205,091 (2,011)		

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

Steelhead Production

The LFC currently produces four separate stocks of steelhead that supply the smolts released into the Snake, Tucannon, Grande Ronde, Walla Walla and Touchet rivers. All smolt releases into LSRCP area waters are planned for a release size of 4 fish/lb. Production goals (numbers of fish) have been reduced in recent years for both the LFH and Wallowa stocks produced at LFC due to jeopardy rulings by NMFS rising from concerns about impacts to natural stocks.

The LFH stock are collected by the trapping facility at LFH, with the current smolt production goal set at 420,000 annually. The LFH stock steelhead are released into the Snake River at LFH (60,000 smolts), the lower Tucannon River at River Kilometer (Rkm) 27.2 (135,000 smolts), the Walla Walla River at Rkm 36.8-56.0 (125,000 smolts), and the Touchet River at Dayton AP (100,000 smolts).

The Wallowa stock are collected by trapping fish in Cottonwood Creek (tributary to the Grande Ronde), with the current production goal of 200,000. All Wallowa stock steelhead produced from LFC are released into the Grande Ronde from Cottonwood AP.

In 2000 and 2001, we initiated the development of two endemic stocks for the Tucannon and Touchet rivers. Interim smolt goals for each program during the development/evaluation stage have been set at 50,000. Natural (unmarked) fish collected from the Tucannon and Touchet rivers have been the broodstock source.

Life stage survivals of steelhead at LFC remain highly variable between stocks and among years. Fish health problems (i.e. cold water disease), presence of pathogens such as Infectious Hematopoietic Necrosis virus (IHNV), and spawning conditions at LFC and at remote spawning sites (Cottonwood Creek adult trap), have all affected survival of the LFH and Wallowa stock steelhead (Table 2). The newly developed endemic stocks in the Tucannon and Touchet Rivers have had slightly better survival in the hatchery than the LFH and Wallowa stocks.

Fish Marking and Releases

All hatchery steelhead production from the LFH or Wallowa stocks produced at LFC were marked with an adipose (AD) fin clip prior to release for harvest management. The Tucannon and Touchet river endemic steelhead stocks are not currently managed for harvest, so adipose fins were not to be clipped prior to release. However, a portion of the 2000 BY Tucannon endemic stock were adipose fin clipped by accident (23,054). Both the Tucannon and Touchet endemic stocks were coded-wire tagged (CWT) and given a yellow elastomer Visual Implant (VI) tag behind the eye for external identification (Appendix B, Table 1). Visual Implant tag color will vary in the future for BY designation.

Study groups within the LFH and Wallowa stocks of fish were marked with one or a combination of the following: CWT (both standard length and length-and-a-half tags), left ventral (LV) fin clip, and freeze brands for specific contribution studies (Appendix B). Most of the groups were released for eventual documentation of survival and contribution to fisheries. Other groups, such as those released on-station from LFH between 1997-1999 were to assess the relative detectability and survival of length-and-a-half versus standard length CWT tagged steelhead, and AD clipped versus ADLV clipped fish. Another objective of the marked released groups was an attempt to determine stray rates of LFC produced fish from their release locations. Further, small groups within each of the release sites (except the Walla Walla River) were tagged with Passive Integrated Transponder (PIT) tags to monitor migration success (detection at downstream dams), and migration timing. Tag codes, freeze brands, and VI tags were reported to the Pacific States Marine Fishery Commission (PSMFC) for publication. Pre-release samples were collected by evaluation staff for all LFC release locations to characterize each release population (Table 3).

Table 2. Survival by life stage of steelhead spawned at Lyons Ferry Complex, BY 1987-2001.

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)	268,803 (56.6)
	1999	601,699	389,664 (64.8)	389,664 (100.0)	274,146 (70.4)
	2000	523,011	322,238 (61.6)	322,238 (100.0)	215,584 (66.9) ³
	2001	504,182	381,427 (75.7)	253,743 (66.5)	
Lyons Ferry	1987	1,111,506	1,095,906 (98.6)	983,901 (89.8)	665,658 (67.6) ⁴
	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) ⁵
	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) ⁶
	1992	1,239,055	905,438 (73.1)	416,265 (46.0)	387,767 (93.2) ⁷
	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) ⁸
	1997	1,090,638	962,705 (88.3)	809,845 (84.1)	569,264 (70.3) ⁹
	1998	1,460,967	934,247 (63.9) ¹⁰	768,522 (82.3)	567,732 (73.9)
	1999	1,140,813	807,374 (70.8)	807,374 (100.0)	495,864 (61.4)
	2000	871,856	650,867 (74.7)	617,380 (94.9)	381,686 (61.8) ¹¹
2001	800,350	636,727 (79.6)	505,451 (79.4)		
Tucannon	2000	80,850	71,971 (89.0)	71,971 (100.0)	60,020 (83.4)
	2001	113,563	101,497 (89.4)	98,836 (97.4)	
Touchet	2000	53,139	43,572 (82.0)	43,296 (99.4)	36,487 (84.3)
	2001	67,861	52,116 (76.8)	52,116 (100.0)	

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 Release goal was changed from 250,000 to 200,000 during rearing. Excess smolts (50,270) were planted as catchable trout into area lakes.

⁴ An additional 203,857 were outplanted as pre-smolts (fry-outplant survival = 88.4%)

⁵ Losses to IHNV = 100%

⁶ Includes 92,116 fish planted as sub-smolts: an estimated 172,000 fish lost to bird predation in lake.

⁷ Destroyed 378,257 fish infected with IHNV.

⁸ Includes 191,000 fry planted into Sprague Lake.

⁹ Includes 15,207 fry planted into Rock Lake

¹⁰ 308,666 eggs discarded from IHNV positive females

¹¹ Survival to the smolt stage was low due to excessive bird predation at Lyons Ferry prior to release.

Table 3. Mean fork lengths, weights, Co-efficients of Variation (CV), and condition factors (K) of LFC steelhead prior to release, 1999-2001.

Location	Mean length			Mean weight		
	N	(mm)	CV	(g)	Fish/lb	K
1999						
Dayton Pond (LFH)	515	198.2	15.4	92.8	4.9	1.12
Tucannon River Enrich (LFH)	510	223.2	9.7	117.9	3.8	1.02
Cottonwood AP (Wallowa)	433	211.3	10.1	106.2	4.3	1.09
Snake River (LFH)	488	227.7	10.6	135.3	3.4	1.11
Walla Walla (LFH)	500	210.4	12.9	94.7	4.8	0.98
2000						
Dayton Pond (LFH)	349	220.2	10.8	126.9	3.6	1.16
Tucannon River Enrich and Marengo (LFH)	345	217.9	8.8	115.4	3.9	1.10
Cottonwood AP (Wallowa)	602	194.4	15.1	87.3	5.2	1.09
Snake River (LFH)	345	216.6	10.1	112.3	4.0	1.08
2001						
Touchet River						
Dayton Pond (LFH)	349	229.4	9.7	144.8	3.1	1.16
Touchet R. (Endemic)	507	164.4	18.1	54.0	8.4	1.09
Tucannon River						
Enrich Road (LFH)	186	234.6	9.7	139.5	3.3	1.04
Tucannon R. (Endemic)	497	185.1	13.4	72.8	6.2	1.09
Cottonwood AP (Wallowa)	770	200.4	12.7	90.1	5.0	1.08
Snake River (LFH)	346	237.5	9.7	134.9	3.4	0.99
Walla Walla (LFH)	156	229.4	9.5	130.4	3.5	1.05

Hatchery Smolt Emigration

Freeze Brands

We calculated relative smolt passage during down river migration in the Snake and Columbia rivers from freeze brands sampled at the juvenile bypass facilities located at each dam on the Snake and Columbia rivers (Fish Passage Center unpublished data). A Passage Index³, and estimated median and 95% passage time (days) for each freeze brand group released from the 1998 to 2000 release years was determined (Table 4). Passage index data for LFH and Tucannon River releases in the table are for migration to Lower Monumental Dam. The passage index for

³ 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.

the Touchet River release was for migration to McNary Dam, and Lower Granite Dam was used for the release in the Grande Ronde River at Cottonwood. The percent of each release sampled based on the passage index can vary significantly from year to year because collection efficiency is dependent on river flow and spill rates at the dams.

Table 4. Estimated passage of freeze branded LFC steelhead at the first downstream collector dam from site of release, 1998-2000 (FPC 2001, unpublished data).

Brand	Release Site	Passage Index	Number ¹ Released	% of Release	Size (#/lb)	Passage(d)	
						50%	95%
1998							
RA-IJ-3	G. Ronde @ Cottonwood	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
1	Tucannon R. @ Enrich	7,368	25,043	29.4	4.9	13	28
LA-IJ-3	Tucannon R. @ Marengo	7,828	25,283	31.0	4.7	12	32
LA-IJ-1							
1999							
RA-IT-3	Grande Ronde @ Cottonwood	39,524	85,365	46.3	4.3	27	43
RA-IT-1	Tucannon River @ Marengo	16,136	40,062	40.3	3.5	25	41
RA-IV-1	Snake River @ Lyons Ferry	9,321	19,641	47.5	3.5	18	37
RA-IV-3	Snake River @ Lyons Ferry	9,156	19,658	46.6	3.5	15	44
LA-IV-1	Snake River @ Lyons Ferry	8,822	19,646	44.9	3.7	10	37
LA-IV-3	Snake River @ Lyons Ferry	10,717	19,592	54.7	3.5	21	38
2000							
RA-2-2	Grande Ronde @ Cottonwood	22,915	74,026	30.9	5.5	29	39
LA-2-2	Touchet River @ Dayton	4,713	37,077	12.7	3.6	36	58
LA-IC-1	Tucannon River @ Marengo	7,339	19,343	37.9	4.2	13	35
LA-IC-3	Tucannon River @ Enrich Br	7,016	19,602	35.8	3.9	10	36
RA-IC-1	Snake River @ Lyons Ferry	12,963	19,361	66.9	4.0	8	25

¹ Adjusted for brand loss.

Juvenile PIT Tag Results

During the springs of 1998-2001, we PIT tagged several groups of hatchery origin steelhead and a few groups of natural origin steelhead (Tucannon River) to monitor downstream migration success and timing to each of the dams located on the Snake and Columbia rivers. Detections of releases from 2001 extended past the reporting period and will be presented in the next annual report. Cumulative unique PIT tag detections from one of the Snake or Columbia river dams were summarized and provided a total detection history for each tag group. All detections at each facility were utilized to provide a history of run timing (minimum reported sample size of three).

For each year presented, though not at all release locations or years, larger size (i.e. more smolted) hatchery fish were generally detected at a greater rate compared to smaller hatchery fish within the same released groups (Table 5). This was consistent with results presented in previous reports (Schuck et al. 1996) where smaller size fish were detected at lower rates. Larger fish may survive better than smaller or, this may indicate a tendency of the smaller fish to residualize in the river after release. Fish released from Dayton AP in the Touchet River consistently show this trend. Conversely, detection rates of natural and hatchery origin smolts captured and tagged at the Tucannon River smolt trap based on size were not generally different. This was likely because fish captured at the smolt trap may have been true migrants, and the process of residualism may have already occurred.

Table 5. Mean lengths of detected and un-detected PIT tagged steelhead from different release groups for the 1998-2000 release years.

Year	Cottonwood AP Hatchery Release		Lyons Ferry Hatchery Release		Tucannon River Hatchery Release		Dayton AP Hatchery Release		Smolt Trap Natural Origin		Smolt Trap Hatchery Origin	
	Not Det	Det	Not Det	Det	Not Det	Det	Not Det	Det	Not Det	Det	Not Det	Det
1998	174.9	189.1*	203.3	204.7	203.1	206.8*	184.3	196.4*	176.7	181.8*	----	----
1999	209.8	211.4	227.3	227.0	225.6	224.9	194.9	203.3*	184.9	187.1	222.9	222.2
2000	188.2	201.1*	217.2	216.1	217.2	218.9	218.3	226.6*	185.1	183.9	221.7	220.8

* t-test significant at the $\alpha=0.5$ level.

Grand Ronde River Releases: Since 1998, we have PIT tagged and released about 350 steelhead smolts annually from Cottonwood AP (Table 6). Most of the fish were detected at Lower Granite Dam in all three years. Detection rates between years were not similar due to variable spill and flow at the collection facilities which affects overall detection efficiency. For an unknown reason, proportions of PIT tagged fish were not similar to the passage index from branded fish (Table 4). While detection rates have differed, migration arrival timing to each of the facilities was consistent from year to year (Table 7).

Table 6. Unique detections of PIT tags from steelhead released into the Grande Ronde River from Cottonwood AP, 1998-2000.

Release Year	Number Tagged	Detection Facility ^a								Total (%)
		SNJ	LGR	LGO	LMO	MCN	JDA	BONN	TWX	
1998	343	2	167	35	22	3	3	2	1	235 (68.5)
1999	345	0	127	77	31	6	2	8	1	252 (73.0)
2000	354	0	134	29	11	3	0	2	1	180 (50.8)

^a Detection Facilities: SNJ - Snake River Juvenile trap at Clarkston, Wa, LGR - Lower Granite Dam, LGO - Little Goose Dam, LMO - Lower Monumental Dam, MCN - McNary Dam, JDA - John Day Dam, BONN - Bonneville Dam, TWX - Jones Beach Towed Array.

Table 7. Peak and median passage date of PIT tagged fish to detection facilities on the Snake and Columbia rivers from steelhead released into the Grande Ronde River at Cottonwood AP, 1998-2000 (n=3 for each data shown).

Release Year	Detection Facility								
	SNJ	LGR	LGO	LMO	MCN	JDA	BONN	TWX	
1998	NA	4/27, 4/28	5/01, 5/04	5/06, 5/07	5/10, 5/10	5/09, 5/12	5/14, 5/15	5/12, 5/12	
1999	NA	4/28, 4/29	5/04, 5/02	5/04, 5/06	5/08, 5/11	6/01, 5/20	6/01, 5/17	5/16, 5/16	
2000	NA	4/29, 4/30	5/04, 5/04	5/11, 5/08	5/09, 5/11	5/02, 5/05	5/16, 5/17	5/19, 5/19	

LFH Releases: Each year, we have PIT tagged and released about 350 steelhead smolts from LFH (Table 8). Releases from LFH were used as a comparison to the Tucannon River releases given their close proximity. As expected, the majority of the fish were detected at Lower Monumental Dam. Detection rates were similar in 1998 and 2000, but still varied due to different spill and flow conditions at the collection facilities which affects overall detection efficiency. Detection rates from fish released at LFH compared to the Tucannon River were greater, as expected, given the closer distance to Lower Monumental Dam. For an unknown reason, detection rates of PIT tagged fish were not similar to the passage index observed from brand marking (Table 4). Migration timing to each of the facilities was consistent from year to year (Table 9)

Table 8. Unique detections of PIT tags from steelhead released into the Snake River from LFH, 1998-2000.

Release Year	Number Tagged	Detection Facility					Total (%)
		LMO	MCN	JDA	BONN	TWX	
1998	350	113	23	36	13	0	185 (52.9)
1999	348	165	19	20	10	1	215 (61.8)
2000	345	114	28	17	20	0	179 (51.9)

Table 9. Peak and median passage date of PIT tagged fish to detection facilities on the Snake and Columbia rivers from steelhead released into the Snake River at LFH, 1998-2000 (n=3 for each date shown).					
Release Year	Detection Facility				
	LMO	MCN	JDA	BONN	TWX
1998	4/24, 5/01	5/08, 5/09	5/08, 5/13	5/04, 5/11	NA
1999	4/21, 4/30	5/06, 5/09	5/05, 5/13	5/10, 5/19	5/15, 5/15
2000	4/22, 4/24	5/08, 5/06	5/05, 5/05	5/08, 5/08	NA

Tucannon River Releases: Groups of PIT tagged releases have been more variable in the Tucannon River because of different release locations for hatchery origin steelhead, and because a smolt trap was operated on the lower Tucannon River that captures both natural and hatchery origin steelhead.

Steelhead from LFH have been direct stream released at Marengo (Rkm 39.9) or Enrich (Rkm 28.0) bridge between the spring of 1998 and 2000. Prior PIT tag releases have occurred at Marengo Bridge only. Results from those release can be found in Martin et al (2000) and Schuck et al (1998). Overall detection rates from the Tucannon River direct stream release points (Table 10) have been lower compared to groups released at LFH (Table 8). We have attributed most of that difference to mortality following release (unknown rate at this time) and residualization (Viola and Schuck 1995).

Natural steelhead were PIT tagged at the Tucannon River smolt trap in 1997 and every year since. Greater detection rates of natural fish compared to hatchery fish released in the Tucannon and from LFH were observed (Martin et al 2000, and Table 10). This observed difference prompted us to test whether hatchery steelhead tagged at the smolt trap (presumed true migrants) would be detected at similar rates to natural fish. Results from these paired releases in 1999 and 2000 supported this hypothesis (no differences), though our statistical power is low because of samples size. However, it appears to indicate that once mortality and residualized fish have been separated from the migratory group, relative survival (i.e., detection rates) between the natural and hatchery steelhead is similar (not significantly different).

Detection rates of hatchery origin PIT tagged fish released into the Tucannon River were more similar to the passage index observed from brand marking (Table 4). Migration timing of hatchery fish released from Marengo and Enrich were similar among years (Table 11). Further, migration timing of natural and hatchery fish PIT tagged at the Tucannon River smolt trap were similar, though in some instances, natural fish appeared to migrate downstream more quickly than their hatchery-origin counterparts (Table 12); though the differences are slight and based on small sample sizes.

Table 10. Unique detections of PIT tags from steelhead released into the Tucannon River from direct stream releases or captured and released from the Tucannon River smolt trap, 1998-2000.

Year	Release Dates	Release Location	Number Tagged	Detection Facility					Total (%)
				LMO	MCN	JDA	BONN	TWX	
1998									
Hatchery	4/13	Tuc R. @Enrich	350	85	22	11	15	0	133 (38.0)
Hatchery	4/13	Tuc R. @ Marengo	350	97	23	16	14	0	150 (42.9)
Natural	4/29	Smolt Trap	98	57	7	2	2	0	68 (69.4)
Natural	5/05	Smolt Trap	103	64	4	12	2	0	82 (79.6)
Natural	5/13	Smolt Trap	103	62	4	5	3	0	74 (71.8)
Natural	5/20	Smolt Trap	80	24	3	7	2	0	36 (45.0)
Natural	5/27	Smolt Trap	102	47	7	12	3	0	69 (67.6)
1998 Total		Hatchery	700	182	45	27	29	0	283 (40.4)
		Natural	486	254	25	38	12	0	367 (75.5)
1999									
Hatchery	4/12-21	Tuc R. @ Marengo	300	138	12	14	5	0	169 (56.3)
Natural	4/22-23	Smolt Trap	41	31	1	1	1	0	34 (82.9)
Hatchery	4/22	Smolt Trap	98	71	1	2	4	0	78 (79.6)
Natural	4/28-29	Smolt Trap	77	36	8	3	5	1	53 (68.8)
Hatchery	4/28	Smolt Trap	107	70	4	5	7	0	86 (80.4)
Natural	5/05-07	Smolt Trap	51	32	6	3	0	0	41 (80.4)
Hatchery	5/05-07	Smolt Trap	100	58	3	6	4	1	72 (72.0)
Natural	5/12-14	Smolt Trap	98	48	3	7	4	0	62 (63.3)
Hatchery	5/12-13	Smolt Trap	98	49	8	5	4	1	67 (68.4)
Natural	5/19	Smolt Trap	100	41	13	7	4	0	65 (65.0)
Hatchery	5/19	Smolt Trap	100	56	9	2	4	0	71 (71.0)
1999 Total		Hatchery	300	138	12	14	5	0	169 (56.3)
		Natural	367	188	31	21	14	1	255 (69.5)
		Hat. @Smolt Trap	503	304	25	20	23	2	374 (74.4)
2000									
Hatchery	4/22	Tuc R. @ Marengo	345	85	26	13	5	0	129 (37.4)
Natural	4/25-26	Smolt Trap	75	37	2	4	4	0	47 (62.7)
Hatchery	4/25-26	Smolt Trap	91	34	13	7	5	1	60 (65.9)
Natural	5/05-06	Smolt Trap	114	20	14	1	9	0	44 (38.9)
Hatchery	5/05	Smolt Trap	90	20	5	2	3	1	31 (34.4)
Natural	5/11-13	Smolt Trap	95	17	9	2	2	0	30 (31.6)
Hatchery	5/11-13	Smolt Trap	90	15	7	0	8	0	30 (33.3)
Natural	5/18-19	Smolt Trap	86	18	3	2	5	1	29 (33.7)
Hatchery	5/18-19	Smolt Trap	91	27	7	2	0	1	37 (40.7)
Natural	5/24-26	Smolt Trap	100	32	3	0	3	0	38 (38.0)
Hatchery	5/24-26	Smolt Trap	95	17	5	1	0	0	23 (24.2)
Natural	6/01-03	Smolt Trap	86	11	12	2	1	1	27 (31.4)
Hatchery	6/01-03	Smolt Trap	57	4	3	0	1	0	8 (14.0)
2000 Total		Hatchery	345	85	23	13	5	0	129 (37.4)
		Natural	556	135	43	11	24	2	215 (38.7)
		Hat. @Smolt Trap	514	117	40	12	17	3	189 (36.8)

Table 11. Peak and median passage date of PIT tagged fish to detection facilities on the Snake and Columbia rivers from hatchery steelhead released into the Tucannon at Marengo or Enrich bridges, 1998-2000 (n\$3).

Release Year	Location	Detection Facility				
		LMO	MCN	JDA	BONN	TWX
1998	Enrich	5/05, 5/02	5/08, 5/08	5/10, 5/14	5/04, 5/08	NA
	Marengo	5/04, 5/03	5/06, 5/06	5/11, 5/10	5/10, 5/10	5/10, 5/10
1999	Marengo	4/28, 5/07	5/24, 5/13	5/24, 5/24	5/16, 5/20	NA
2000	Marengo	4/25, 4/30	5/02, 5/04	5/04, 5/05	5/12, 5/09	NA

Table 12. Peak and median passage date of PIT tagged fish to detection facilities on the Snake and Columbia rivers from wild and hatchery steelhead captured/released at the Tucannon River smolt trap, 1998-2000 (n\$3).

Release Year	Release Date	Origin	Detection Facility				
			LMO	MCN	JDA	BONN	TWX
1998	4/29	Wild	5/04, 5/04	5/07, 5/07	5/10, 5/10	5/11, 5/14	NA
	5/05	Wild	5/08, 5/08	5/10, 5/11	5/13, 5/13	5/15, 5/15	NA
	5/13	Wild	5/15, 5/15	5/18, 5/18	5/21, 5/21	5/20, 5/22	NA
	5/20	Wild	5/23, 5/23	5/25, 5/25	5/27, 5/27	5/28, 5/28	NA
	5/27	Wild	5/28, 5/29	5/30, 5/30	6/01, 6/01	6/03, 6/03	NA
1999	4/22-23	Natural	4/24, 4/25	4/28, 4/28	5/05, 5/05	5/04, 5/05	NA
	4/22	Hatchery	4/24, 4/27	4/29, 5/02	5/05, 5/05	5/05, 5/08	NA
	4/28-29	Natural	5/01, 5/01	5/03, 5/04	5/07, 5/07	5/09, 5/09	NA
	4/28	Hatchery	5/01, 5/01	5/04, 5/05	5/09, 5/10	5/09, 5/10	NA
	5/05-07	Natural	5/08, 5/08	5/11, 5/12	5/17, 5/17	5/19, 5/19	NA
5/05-07	Hatchery	5/08, 5/08	5/11, 5/11	5/14, 5/16	5/15, 5/16	NA	
5/12-14	Natural	5/15, 5/15	5/19, 5/19	5/23, 5/23	5/25, 5/23	NA	
	Hatchery	5/15, 5/15	5/19, 5/19	5/21, 5/21	5/23, 5/23	5/24, 5/24	
5/19	Natural	5/21, 5/21	5/24, 5/24	5/26, 5/26	5/30, 5/29	NA	
	Hatchery	5/22, 5/22	5/25, 5/25	5/27, 5/28	5/30, 5/30	NA	
2000	4/25-26	Natural	4/27, 4/29	5/02, 5/02	5/02, 5/03	5/06, 5/07	NA
	4/25-26	Hatchery	4/28, 4/30	5/01, 5/03	5/07, 5/06	5/09, 5/09	NA
	5/05-06	Natural	5/07, 5/07	5/09, 5/09	5/13, 5/13	5/14, 5/15	NA
	5/05	Hatchery	5/11, 5/09	5/12, 5/12	5/14, 5/14	5/17, 5/17	NA
	5/11-13	Natural	5/14, 5/15	5/18, 5/18	5/22, 5/22	5/24, 5/24	NA
	5/11-13	Hatchery	5/14, 5/18	5/16, 5/18	NA	5/25, 5/25	NA
	5/18-19	Natural	5/23, 5/23	5/27, 5/27	5/28, 5/28	5/30, 5/30	6/02, 6/02
5/18-19	Hatchery	5/23, 5/23	5/30, 5/30	5/31, 5/28	5/31, 5/31	NA	
5/24-26	Natural	5/27, 5/27	5/29, 5/30	NA	6/04, 6/04	NA	
5/24-26	Hatchery	5/28, 5/28	5/31, 5/31	NA	NA	NA	
6/01-03	Natural	6/04, 6/04	6/06, 6/06	NA	NA	NA	
6/01-03	Hatchery	6/04, 6/04	6/07, 6/07	NA	NA	NA	

Touchet River Releases: Each year between 1998 and 2000, we PIT tagged and released about 350 steelhead smolts from the Dayton AP (Table 13). Detection rates from this release group have generally been low, as McNary Dam is the first detection facility. Results from PIT tagged fish were not similar to the passage index from branded fish (Table 4), nor was migration timing consistent among years. In the 1999 out-migration, fish were very late at arriving to the downstream detection facilities compared to 1998 or 2000 (Table 14). This apparent late out-migration was observed in the Tucannon River release at Marengo the same year, but releases from LFH and the Grande Ronde did not show this same trend. We suspect the low spring flows in the Tucannon and Touchet rivers during 1999 might have delayed fish from quickly exiting the rivers.

Table 13. Unique detections of PIT tagged steelhead released in the Touchet River from Dayton AP, 1998-2000.

Release Date	Number Tagged	Detection Facility				Total (%)
		MCN	JDA	BONN	TWX	
1998	347	29	28	15	1	73 (21.0)
1999	353	31	23	12	0	66 (18.7)
2000	349	28	11	10	1	50 (14.3)

Table 14. Peak and median passage date of PIT tagged fish to detection facilities on the Columbia Rivers from steelhead released into the Touchet River from Dayton AP, 1998-2000 (n\$3).

Release Year	Detection Facility			
	MCN	JDA	BONN	TWX
1998	5/05, 5/05	5/07, 5/10	5/07, 5/09	NA
1999	5/27, 5/23	5/29, 5/28	5/31, 5/29	NA
2000	5/06, 5/06	4/29, 5/09	5/09, 5/14	NA

Adult PIT Tag Results

The use of PIT tags has been beneficial in describing characteristics of successful migrants from our steelhead releases in Southeast Washington (Schuck et al, 1996, 1997, 1998, Martin et al 2000), and providing information on timing to each detection facility. All of our studies with PIT tags were designed for juvenile evaluation purposes only. Adult evaluation was not considered, or expected to be, an integral portion of those studies due to the low number of adult detections expected at the two detection facilities (Bonneville and Lower Granite Dam). While small samples sizes from adult detections would not be valid on their own to describe smolt-to-adult survival rates, we chose to use them in conjunction with coded-wire tag recoveries to describe performance of particular release groups.

The number of PIT tags detected in adult steelhead have been low as expected (Table 15). Smolt-to-adult survival rates are similar to rates estimated by coded-wire tag recoveries for the different release groups (Appendix C). Further, since natural-origin smolts are not tagged, results from PIT tagged releases provided some insight regarding smolt-to-adult survival rates of natural origin smolts from the Tucannon River.

From the data provided in Table 15, three release groups were not detected as adults (LFH release group in 1996, Tucannon River releases in 1997). In 1996, the only other release group to compare to the LFH group was at Marengo in the Tucannon River, with only one adult detected, and indications of very poor survival for that release year. This is further supported by data presented in Table 30, and Appendix C. For the 1997 releases, all release groups for the year indicate the survival was down, with only one detection from the LFH and Dayton release groups.

Table 15. PIT tag detections of adult steelhead at Bonneville (BONN) and Lower Granite Dam (LGR) from various WDFW LFC release locations, and estimated smolt-to-adult (SAR) survival rates.

Release Year	Origin	Release Location	Number PIT tagged	Detection Facility		SAR to BONN (%)	SAR to LGR (%)
				BONN ^a	LGR ^b		
1998	Hatchery	Cottonwood AP	343	3	2	0.875	0.583
1999 ^c	Hatchery	Cottonwood AP	345	7	7	2.029	2.029
1995	Hatchery	Lyons Ferry Hatchery	191	5	5	2.618	2.618
1996	Hatchery	Lyons Ferry Hatchery	350	0	0	0.000	0.000
1997	Hatchery	Lyons Ferry Hatchery	361	1	1	0.277	0.277
1998	Hatchery	Lyons Ferry Hatchery	350	6	5	1.714	1.429
1999 ^c	Hatchery	Lyons Ferry Hatchery	348	2	1	0.574	0.287
1996	Hatchery	Tucannon River @ Marengo	350	1	1	0.286	0.286
1997	Hatchery	Tucannon River @ Marengo	349	0	0	0.000	0.000
1998	Hatchery	Tucannon River @ Marengo/Enrich	700	9	8	1.286	1.143
1999 ^c	Hatchery	Tucannon River @ Marengo	300	7	6	2.333	2.000
1999	Hatchery	Tucannon River @ Smolt Trap	503	10	9	1.988	1.789
1997	Natural	Tucannon River @ Smolt Trap	254	0	0	0.000	0.000
1998	Natural	Tucannon River @ Smolt Trap	486	2	2	0.412	0.412
1999 ^c	Natural	Tucannon River @ Smolt Trap	367	6	5	1.635	1.362
1997	Hatchery	Dayton AP	701	1	1	0.143	0.143
1998	Hatchery	Dayton AP	347	3	2	0.865	0.576
1999 ^c	Hatchery	Dayton AP	353	2	1	0.567	0.283

^a Detection numbers at Bonneville include fish detected at LGR since they would have had to pass Bonneville to get to LGR. Detection capabilities for adults at Bonneville Dam were operational in 1998.

^b Detection capabilities for adults at Lower Granite Dam were operational in 1995.

^c Complete returns of fish released in 1999 (two-salt ocean age) were not complete at time of data extraction from PITTAGIS.

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. In the early 1990's, WDFW began a series of experiments to examine methods to reduce residualism. Results from the Tucannon, Touchet, and Grande Ronde rivers have been provided in the past (Schuck et al. 1998, Martin et al. 2000) In spring 1999, we attempted to estimate the number of hatchery released juvenile steelhead that residualized in the Touchet River only.

Touchet River Residualism

The distribution and relative abundance of residual steelhead and natural juvenile steelhead in the Touchet River was determined by exploratory fishing the week of May 13. Fishing occurred at 1.6 kilometer (km) intervals from approximately 16 km above Dayton in the North Touchet River downstream to 4.8 km below Waitsburg, and in the lower five km of the South Touchet River. At each 1.6 km interval, fishing occurred for a minimum of 20 minutes and the number of residual steelhead and natural juvenile steelhead caught was recorded. Catch rate (number caught per minute) was then calculated for each 1.6 km interval.

On 24 May, 1999, we released 2,014 marked rainbow trout at four locations on the Touchet River between Bailyburg (Rkm 90.7) and Waitsburg (Rkm 70.9) to assess residual steelhead abundance and distribution in the river. A total of 514 fish were released at Site #1 (Star Bridge; Rkm 90.4), 496 at Site #2 (Warren's; Rkm 83.2), 497 at Site #3 (Lewis and Clark Trail State Park; Rkm 77.1), and 506 at site #4 (Hogeye Bridge; Rkm 73.8). After allowing three days for the fish to disperse, we hook-and-line sampled each location with small, treble-hooked spinners. Each location was divided into three strata, the upper 1/3, middle 1/3, and lower 1/3 and catch was recorded for each site. Trout were stocked into the lower portion of the upper one-third. This allowed us to test the assumption that rainbow trout disperse equally upstream and downstream, and if not, then this approach would allow us to utilize the data most appropriate in a mark-recapture experiment. Two anglers sampled each site and recorded the number of rainbow trout, and residual and natural steelhead caught. All rainbow trout and natural steelhead were released back into the river, and residual steelhead were measured and sacrificed so that sex could be determined. Each site was fished for six hours ensuring complete sampling of all habitat types within the site.

At sites #1-4, the estimated number of residual steelhead was 1,917, 1,417, 3,486, and 575, respectively. When these numbers were expanded to represent reaches one through four, the number of residual steelhead per reach was 5,234, 3,360, 7,808, and 2,007, respectively. The total residual population estimate for the Touchet River was 18,411, or 14.7% of the 125,000 released into the Touchet River. The abundance of naturally produced juvenile steelhead was greater in the upper sections, and residual steelhead were of greater abundance in the lower three sections.

Rainbow trout appeared to move downstream after release, as only one was captured in the upper 1/3 of any site. If the upper 1/3 of each site is deleted from the analysis and a mark recapture estimate calculated for the lower 2/3 of each site, the population abundance of residual steelhead increases dramatically. For instance, at location 1, the estimate would increase from 1,198 fish/km to 1,636 fish/km. At location 2, the number would increase from 886 fish to 1,050 fish/km. At location 3 and 4 the number would increase from 2,179 fish/km to 2,440 fish/km and from 359 fish/km to 470 fish/km, respectively. Expansion of these numbers results in a total residual population estimate of 27,617 or 22.1% of the hatchery steelhead released. Our assumption that rainbow disperse equally upstream and downstream has profound implications on the results. For example, in previous years, rainbow trout were released at various locations in the river and sampling occurred along the river's length from Bailysburg to Waitsburg. The number of rainbow and residual steelhead captured was recorded and a mark recapture population estimate was calculated. Using that approach in 1999 would have resulted in a total population estimate of 6,691, or 5.3% of the 125,000 released.

The dilemma of whether the number of fish caught at specific locations versus the total number of fish caught throughout the river more accurately represents the actual number of residual steelhead is perplexing. If specific population estimates are calculated and expanded, the number of residuals is 5-times greater than if the number of fish caught throughout the entire river is used to calculate the population estimate. We believe the site specific analysis conducted in 1999 probably over-estimated the population because the rainbow dispersed out of the 1.6 km site, resulting in an erroneous use of a marked fish number of 500. In the future, it is recommended that sampling occur at, and downstream as far as 4.8 km from rainbow trout release locations. Sampling the entire river more accurately estimates the population because it will occur throughout the range in which rainbow dispersed.

Rainbow Trout Sport Fishery on the Touchet River

On a nearly annual basis, about 2,000 rainbow trout, and 10,000 brown trout were planted into the Touchet River near the town of Dayton, Washington, for a local sport fishery. Hatchery steelhead residuals of LFH stock released from Dayton AP were also present to be taken in the sport fishery. Stocking of brown trout was recently discontinued due to pending ESA listings at the time, and recommendations of WDFW's Wild Salmonid Policy (1997). After the listings of Columbia and Snake River natural steelhead under the ESA, further concerns were raised as to the negative effects this fishery may have on the natural steelhead population. In spring, 2000, WDFW monitored the trout fishery near Dayton from 1 June (trout fishing opener) until 2 July. We hoped to estimate the number of natural origin steelhead that were captured during one month of the trout fishery for a popular reach of the Touchet River. Catch estimates of residual hatchery steelhead and stocked rainbow trout would also be calculated.

Angler effort counts were conducted at 6AM, 8AM, 10 AM, 3PM, 5PM, and 7PM two to three times a week. Effort counts were made by walking from the confluence of the North and South Forks of the Touchet River to the City of Dayton Water Treatment Plant (4.3 Rkm). This section was divided into areas above and below the Dayton AP intake dam. While other areas downstream of Dayton are fished by anglers, we selected the reach because of heavy angler effort within the survey area because of limited resources to conduct the survey, and the area was known to hold large numbers of residual steelhead. After each count was completed, creel surveyors used the rest of their time to interview anglers for the number of hours/fish and their total catch. Fish that were kept by anglers were also measured at that time. A catch rate (catch/hr) from the anglers sampled was then calculated for each week.

From previous census surveys, it was determined that many of the anglers released fish after capture. Further, we had serious questions about angler's ability to distinguish between natural or hatchery steelhead, or stocked rainbow trout that were released. Therefore, evaluation staff conducted weekly catch composition surveys within the survey area. Hook and line sampling was used, with all staff using small spinning lures. The percent of natural and hatchery steelhead, and rainbow trout were then calculated for areas above and below the intake dam. Staff also collected approximate lengths from their catch to document what percent of the those would be legal for fisherman to keep (minimum size 8" or ~200 mm). Based on the data from the catch composition surveys, only about 20% of the natural origin steelhead were of legal size for harvest.

From our surveys, we estimated that 7,926 trout (all origins) were captured by anglers during the study period. We estimate that 1,408 (17.8%) of those were natural origin steelhead (Table 16); though less than 2% are believed to have been kept by anglers. Samples collected from anglers indicate that larger fish were selected at a greater rate over the smaller hatchery steelhead residuals or natural steelhead (>50% of the retained fish were stocked rainbow trout). The stocked rainbow trout were utilized the most from the anglers, with over 50% of the catch retained by the anglers. In contrast, only 20% of the residual steelhead were retained, even though residual steelhead provide the largest percent of the catch. This is likely due to their slightly smaller size compared to the stocked rainbow.

From this census we believe that harvest of natural origin steelhead during the rainbow trout fishery on the Touchet River is minimal. In fact, delayed mortality from hooking and/or handling stress may actually be a greater threat to the listed population. For example, a 10-20% hooking mortality rate would potentially kill between 140-280 fish, nearly five times the estimated harvest of natural steelhead from our surveys in 2000. Concerning the effectiveness of the fishery to remove hatchery residuals, the results are mixed because angler preference tends to remove only the larger residuals from system. It would become more effective if regulations were changed to allow unlimited harvest of the residuals (fish will adipose fins missing).

As is, the fishery appears to cause little impact to natural fish, and is only somewhat effective in removing residuals. However, since the fishery is centered around the city of Dayton, there are economic benefits to the local sporting shops, and it provides easy access to juvenile and adult anglers within the city.

Table 16. Summary of fish size based on the catch composition sample, creel sample, and estimated catch and the number of fish retained by group (natural, residual steelhead, rainbow trout), in the Touchet River trout fishery.

ORIGIN	Catch Composition Sample			Fishery Creel Sample			Estimated Catch	Percent of Estimated Catch	Estimated Number Retained	Percent of Catch
	N	Mean Ln (mm)	SD	N	Mean Ln (mm)	SD				
Natural	90	156.5	40.7	4	264.8	28.1	1,408	17.8	27	1.9
Residual SH	231	238.2	47.7	167	254.0	26.0	5,538	69.9	1,112	20.1
Rainbow	77	244.9	38.6	76	264.9	26.6	980	12.4	506	51.6
TOTALS	397	221.4	56.2	247	257.6	26.6	7,926		1,645	20.8

Smolt Trapping on the Tucannon River

WDFW operated a 5 ft rotary screw trap at Rkm 3 on the Tucannon River between fall of 1998 and spring 2001 to estimate the numbers of migrating natural steelhead smolts. The trap was operated intermittently during the slower migration periods (fall and winter), but trapping was intensified (5-7 days/week) during the spring when the main out-migration occurs. Trapping during the summer (July-September) was not conducted due to the lack of fish migrating during that time of year. This lack of migration is due to extreme water temperatures that exceed 80 °F frequently during the summer.

Each week during the main out-migration (March-May) we attempted to determine trap efficiency by clipping a portion of the caudal fin on captured migrants and releasing them upstream of the trap about one river kilometer. 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. 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 per day was then applied to each day the trap was not operated.

1998/1999 Trapping

During the 1998/1999 trapping season (trap operation: 10/28/1998 to 7/08/1999), we captured 2,852 natural steelhead smolts at the trap, for an estimated 24,229 total smolt out-migration. More than 96% of the migrant smolts were captured between 15 March and 15 June, with only about 1,000 of the fish (3.6%) estimated to have migrated past the trap during other times (Table 17). In addition to the smolts captured in the trap, 273 newly emerged fry also were captured between 7 May and 8 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 the smolt production estimates. Of the 2,852 steelhead smolts captured, scale samples were taken from 1,229, with 1,064 of those readable. Three different brood years were represented by those scales (Figure 2). Age composition based on the scale readings and expanded smolt estimate was 37.1% Age 1, 58.2% Age 2, and 4.7% Age 3. Bias in the age composition is not suspected due to the large overlap in length frequency distribution (Figure 2).

Table 17. Natural steelhead smolt estimates from the Tucannon River, 1998/1999 to the 2000/2001 season.

Month	1998/1999 Migration				1999/2000 Migration				2000/2001 Migration			
	Age			Total	Age			Total ^a	Age			Total ^b
	1	2	3		1	2	3		1	2	3	
Oct.	0	0	0	0	175	253	0	428	687	21	0	708
Nov.	23	0	0	23	276	212	0	488	5026	53	0	5,079
Dec.	326	0	0	326	268	382	0	650	856	3	0	859
Jan.	372	47	0	419	87	249	0	336	19	97	0	116
Feb.	23	0	0	23	80	102	0	182	0	88	0	88
Mar.	13	141	0	154	86	286	30	402	0	39	0	39
Apr.	430	2,163	167	2,760	1,823	3,240	368	5,431	471	4,451	329	5,251
May	7,118	11,174	889	19,181	10,277	17,449	2,604	30,330	4698	8,786	609	14,093
Jun.	695	571	77	1,343	1,825	2,896	277	4,998	155	209	7	371
Jul.	0	0	0	0	0	0	0	0	0	0	0	0
	9,000	14,095	1,133	24,229	14,897	25,069	3,279	43,282	11,912	13,747	945	26,612

a Two Age 4 fish were captured during May that expanded out to 37 Age 4 fish. Grand total in table has been adjusted to account for these fish.

b One Age 4 fish was captured during May that expanded out 8 Age 4 fish. Grand total in the table has been adjusted to account for these fish.

To estimate the number of migrants from each brood year, weekly age compositions based on scale samples collected for that week were applied to each weeks' smolt estimate (Table 17). Scales were collected from fish captured between mid-January and mid-June which covers 98% of the estimated migration, so the age composition is accurately reflected for the season. The majority of fish captured in the smolt trap originated from the 1997 brood year (Age 2). Mean length and K-factor for natural fish captured was 186.5 mm and 1.00 during the main migration period (March-May). Peak of migration for natural steelhead was 20 May for the 1998/1999 out-migration, with an estimated 2,800 smolts migrating past the trap on that day.

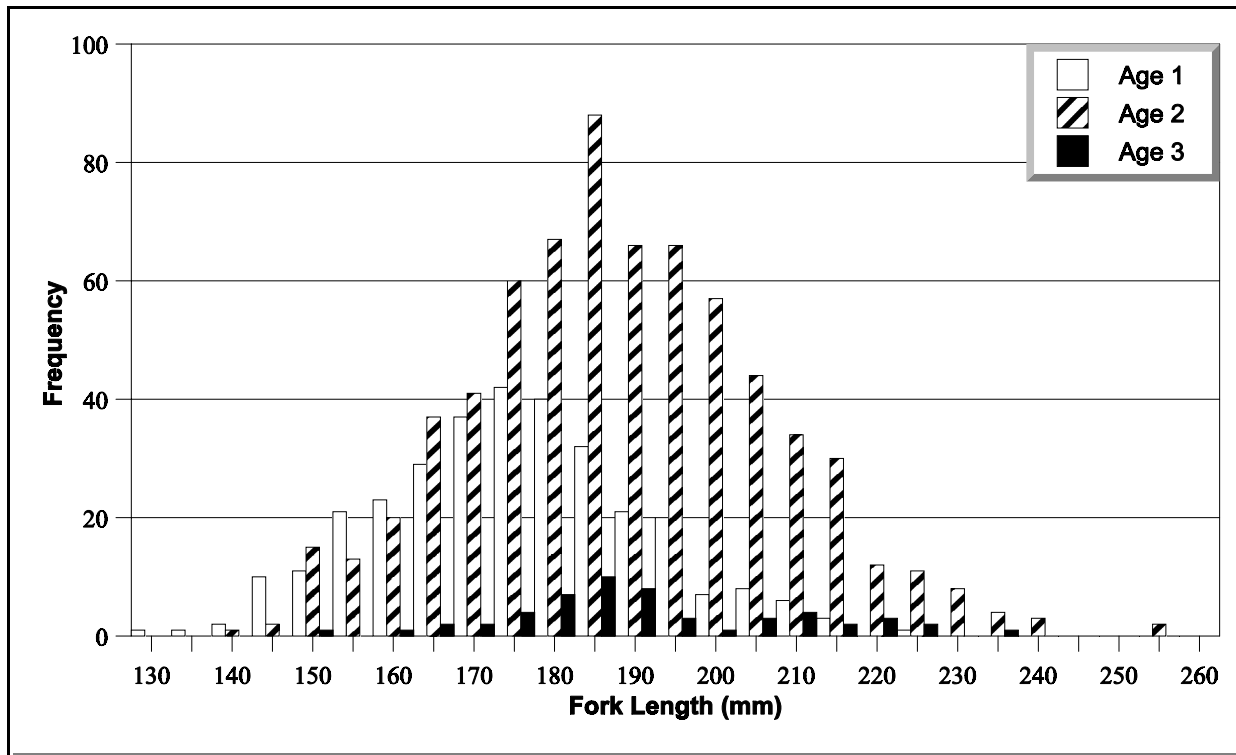


Figure 2. Length distribution by age of natural steelhead smolts trapped from the Tucannon River from March-June during the 1998/1999 migration.

1999/2000 Trapping

During the 1998/1999 trapping season (trap operation: 10/01/1999 to 06/29/2000), we captured 2,124 natural steelhead smolts at the trap for an estimated total of 43,335 out-migrants. More than 92% of the migrant smolts were captured between 15 March and 15 June, with only about 2,200 fish (7.2%) estimated to have migrated past the trap during other times (Table 8). As in previous years, 1,089 newly emerged fry were captured between 23 April and 29 June. Estimates of fry passing the trap were not made. Size of newly emerged fry was similar to previous years. Of the 2,124 steelhead smolts captured, scale samples were taken from 1,318, with 1,021 of those readable. Three main brood years were documented from those scales (Figure 3), with an additional two fish documented as Age 4 smolts.

Age composition based on the scale readings and expanded smolt estimate was 34.4% Age 1, 57.9% Age 2, 7.6% Age 3, and 0.08% Age 4. Scales were collected from fish captured between November and mid-June which covered 99% of the estimated migration, so the age composition is accurately reflected for the season. Again, the majority of fish captured in the smolt trap originated from the 1998 brood year (Age 2). Mean size and K-factor for natural fish captured was 187.4 and 1.01 during the main migration period (March-May). Peak of migration for

natural steelhead during the 1999/2000 outmigration was 22 May, with an estimated 1,160 smolts migrating past the trap on that day.

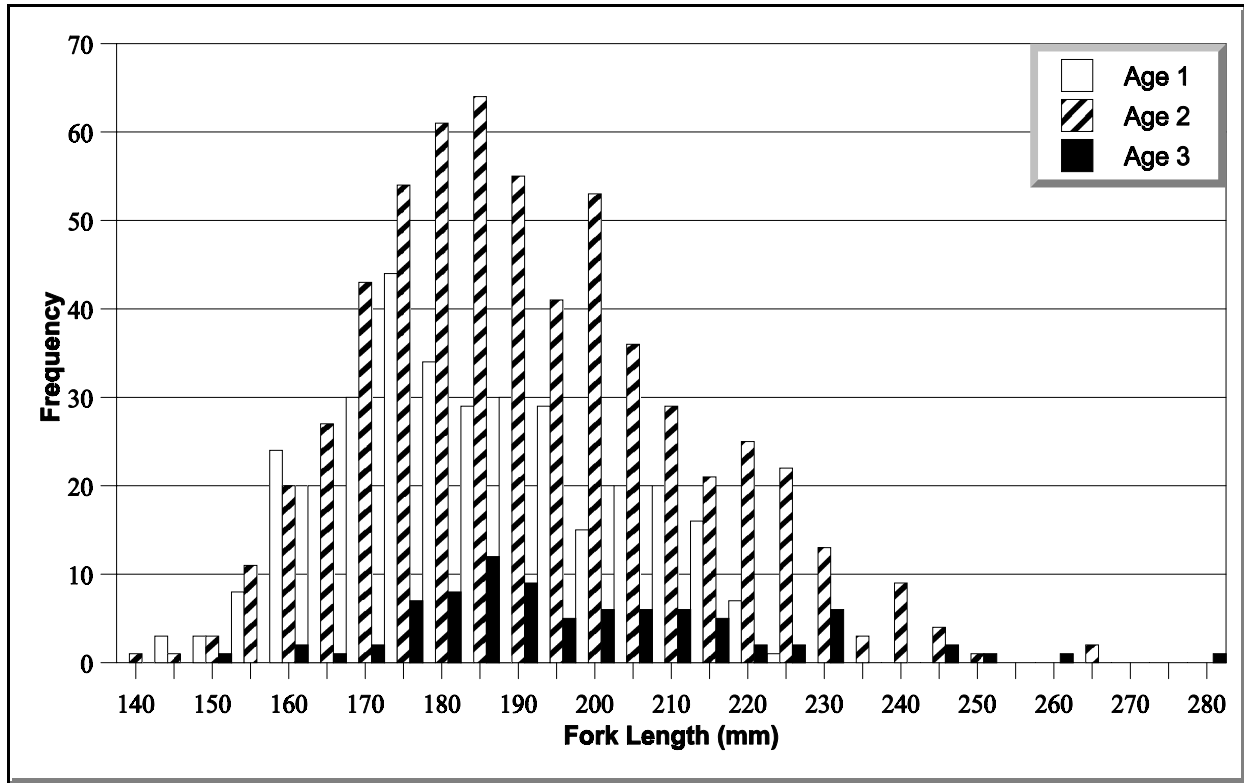


Figure 3. Length distribution by age of natural steelhead smolts trapped from the Tucannon River from March-June during the 1999/2000 migration.

2000/2001 Trapping

During the 2000/2001 trapping season (trap operation: 10/16/2000 to 06/30/2001), we captured 3,270 natural steelhead smolts at the trap, for an estimated total of 26,604 out-migrants. More than 74% of the estimated smolts migrated between 15 March and 15 June, with 6,879 fish (26%) estimated to have migrated past the trap during other times (Table 8), mainly November, 2000. As in 1998, 1999, and 2000, newly emerged fry (365) were captured between 9 March and 29 June. Captured fry were of similar size compared to previous years. Of the 3,270 steelhead smolts captured, scale samples were taken from 1,174, with 1,019 of those readable. Three main different brood years were observed from those scales (Figure 4), and one age 4 fish was also observed. Age composition based on the scale readings and expanded smolt estimate was 44.8% Age 1, 51.7% Age 2, 3.5% Age 3, and 0.03% Age 4.

Scales were collected from fish captured between mid-October and mid-June which covers nearly all of the estimated migration, so age composition is accurately reflected for the season. The majority of fish entering the smolt trap originated from the 1999 brood year (Age 2). Mean size and K-factor for natural fish captured was 183.3 and 1.01 during the main migration period (March-May). Peak of migration for natural steelhead was 1 May for the 2000/2001 out-migration, with an estimated 1,666 smolts migrating past the trap on that day. Overall mean length in 2001 was the smallest within the past four years and is reflective of smaller Age 1 and Age 2 smolts (Table 18). Age three smolts have typically been the largest over the past four years.

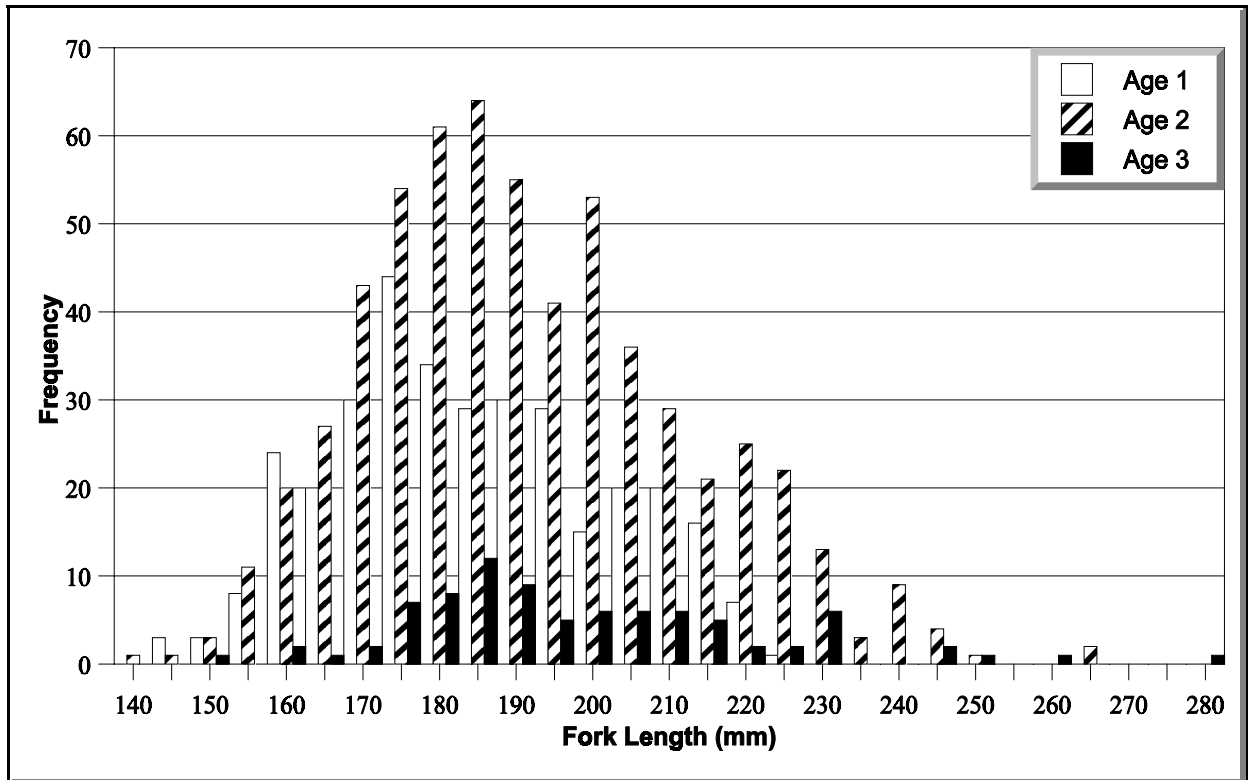


Figure 4. Length distribution by age of natural steelhead smolts trapped from the Tucannon River from March-June during the 2000/2001 migration.

Table 18. Sample size (N), mean length (Ln), and coefficient of variation (CV) of natural origin summer steelhead smolts captured between March and June at the Tucannon River migrant trap in 1998-2001.

Year	Age 1			Age 2			Age 3		
	N	Ln (mm)	CV	N	Ln (mm)	CV	N	Ln (mm)	CV
1998	371	183.1	12.5	264	187.0	13.5	20	190.5	11.4
1999	316	173.1	9.5	682	186.5	10.0	54	189.2	9.4
2000	334	182.3	9.9	598	189.3	10.8	85	196.5	11.7
2001	171	170.5	9.8	452	186.4	9.9	28	197.3	8.6

Overall production by brood year has varied considerably according to our estimates, with the 1997 and 1998 broods producing over 34,000 smolts each (Table 19). Productions from the 1995 and 1996 broods were considerably lower and were likely effected by the floods in 1996 and 1997. In addition, the age composition from the 1997/1998 migration year was skewed to a younger age because of the flood events (Figure 5).

Table 19. Estimated production of natural-origin steelhead smolts from the Tucannon River by migration (1995-2001) and brood year (1993-2000).

Migration Year	Brood Year								
	1993	1994	1995	1996	1997	1998	1999	2000	Totals
1995/1996 ^a	835	8,249	5,583						14,667
1996/1997 ^a		908	8,967	6,069					15,944
1997/1998			834	11,584	16,684				29,096
1998/1999				1,133	14,095	9,000			24,229
1999/2000				37	3,279	25,069	14,897		43,282
2000/2001					8	945	13,747	11,912	26,612
Totals	NC	NC	15,384	18,823	34,066	35,014	NC	NC	

^a Scales were not collected during the 1995/1996 or 1996/1997 migration years. Age composition for those is based on mean age composition from the 1998/1999 to 2000/2001 migration years. Age 4 fish were not included in the calculation based on their low frequency.

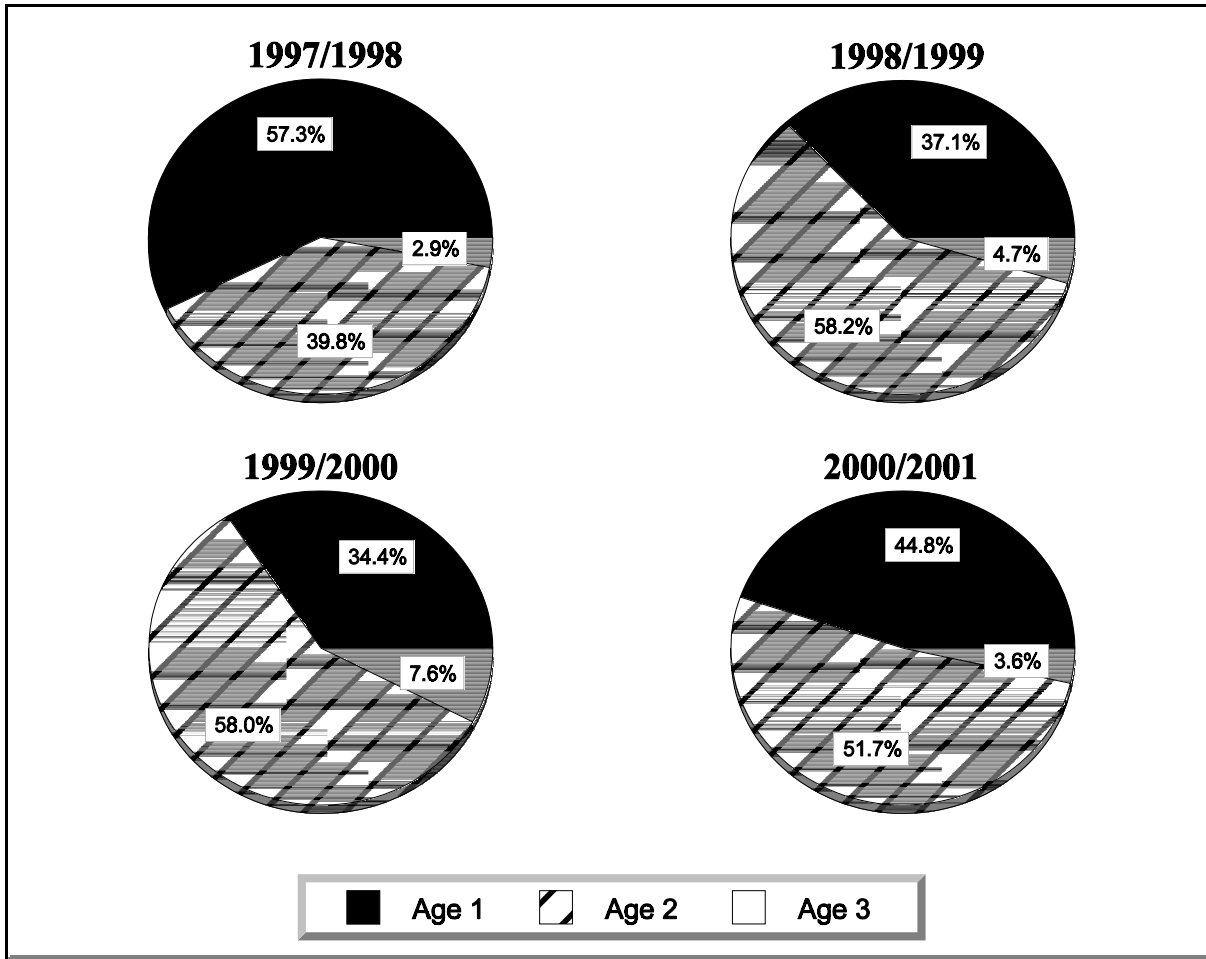


Figure 5. Estimated smolt age composition (based on scales) by migration year for Tucannon River summer steelhead.

Adult Steelhead Traps and Spawning

As part of our annual broodstock collection and research interests, WDFW hatchery or evaluation staff operates a series of adult steelhead traps in SE Washington rivers and creeks. Lyons Ferry hatchery staff operated the LFH and Cottonwood Creek adult traps, and assisted with trapping on two small tributaries to the Grande Ronde River [Menatchee Creek (2001), and Rattlesnake Creek (2000)]: Tucannon Fish Hatchery (TFH) staff operates the upper Tucannon adult trap; and evaluation staff has operated an adult trap on the lower Tucannon River, and the Touchet River trap in Dayton. The purpose and results from each trapping location are described in the following sections.

Tucannon Hatchery Trap (Upper)

A permanent adult steelhead and salmon trap was installed in 1998 at the TFH water intake diversion dam. The trap consists of a barrier (dam) and a fish ladder around the barrier, similar to those at mainstem Snake River dams that allow fish to ascend the river. The trap is a 12' x 12' x 5' section of the ladder which fish enter through a funnel. The trap is generally operated from February through September, and checked daily by hatchery personnel. Records are kept for captured steelhead, spring chinook, and bull trout. Steelhead and bull trout are enumerated, sampled and passed upstream to spawn. Some spring chinook are collected for broodstock (Gallinat et al, 2001), and the rest are passed upstream to spawn naturally. No natural or hatchery-origin steelhead have been collected for broodstock from the TFH trap during this report period, though natural steelhead have been collected for broodstock in the past (Schuck et al. 1995). Samples collected from natural steelhead have included length, scales, DNA (fin clip or opercle punch), and sex determination. Steelhead trapping is reported by brood year at the TFH (1 June of the previous year to 31 May of the current year). Fish captured after June 1 are bright and appear fresh from the ocean.

1999-2001 Trapping

In 1999, 22 natural-origin and 30 hatchery-origin steelhead were captured in the trap. Fish were sampled and then released upstream of the trap to spawn naturally (Appendix D, Tables 1 & 2). In 2000, 16 natural-origin and 10 hatchery-origin steelhead were captured in the trap. Captured fish were sampled and all hatchery fish were put back downstream of the trap to spawn naturally. This decision was partially based on the NMFS ruling about LFH stock steelhead constituting jeopardy to the listed population. We felt this action would lessen any negative effects the LFH stock steelhead may have on the natural fish. In 2001, 11 natural-origin and 4 hatchery-origin steelhead were trapped. Natural fish were released upstream to spawn in the upper Tucannon basin and all hatchery-origin fish were released downstream. During the 2001 run, low spring river flows and little trap attraction water possibly caused fish to avoid the adult trap. To make sure passage into the upper basin was not restricted, we opened the fish ladder to allow unrestrictive passage from 18 through 26 April. The trap ladder was closed on 27 April to begin spring chinook trapping. Timing of trapped fish among the years has been consistent.

Tucannon River Trap (Lower)

A temporary adult steelhead trap (weir with metal pickets and 3' x 4' trap box) was set up at Rkm 17.7 in the fall/winter of 1999/2000 and again in 2000/2001 (Figure 6). The objective of this trap was to enumerate and describe the natural-origin steelhead in the Tucannon River, and to evaluate the potential for collecting natural-origin fish for a new hatchery broodstock. In 1999, WDFW began drafting the Tucannon River Hatchery and Genetics Monitoring Plan (HGMP). The HGMP specifically outlines WDFW's plan to develop a new endemic steelhead hatchery

broodstock for use in the Tucannon River. As an interim goal, WDFW proposed collection of 16 pairs throughout the run timing for spawning in the hatchery which should produce 50,000 smolts for release. By December 1999, WDFW and the co-managers agreed that collection of natural-origin fish for broodstock should begin, with the understanding that the HGMP would be completed before the following season.



Figure 6. Lower Tucannon River adult steelhead trap.

2000 Brood Trapping and Spawning

We started collecting natural-origin fish for broodstock in December 1999. However, by that time, Tucannon River water temperatures were very cold and nearly all fish movement had stopped. Fearing that either all the fish had passed the trap location, or that spring flows might inhibit effective trapping or damage the trap, we supplemented the broodstock collection by hook and line methods. In all, 35 natural and 27 hatchery fish were trapped (Appendix D, Tables 3 and 4), and 32 natural fish were collected for broodstock from the trap. Fourteen additional fish were collected with hook-and-line. Fish that were not collected for broodstock

were passed upstream after length and sex were determined, and scale and DNA samples were collected. The number of fish collected exceeded the number of proposed broodstock needed because of pre-spawning loss in 2000. Formalin treatments to control fungus on the fish was not applied early during the spawning season, and fish were unable to overcome the fungus infections. Pre-spawning loss (27.5%) was attributed to handling of fish from trapping, hook-and-line, and spawning operations.

During March and April of 2000, 16 adult female steelhead were spawned with 21 males at LFH. Total eggtake in 2000 was estimated at 80,850. Age composition of spawned females was 87.5% one-ocean age fish with a mean fecundity of 4,973, and 12.5% two-ocean age fish with a mean fecundity of 5,616. No three-ocean age fish were spawned in 2000. Mean lengths of one and two-ocean age female steelhead spawned at LFH in 2000 were 59.4 cm (n=14) and 66.0 cm (n=2), respectively. Age composition and mean length of spawned males was 91.8% one-ocean age fish [62.0 cm (n=22)], and 9.2% two-ocean fish [75.5 cm (n=2)]. No three-ocean age males were collected in the 2000 brood year.

In all, we collected scales samples from 29 natural-origin females and 47 natural-origin males from the 2000 brood year (includes samples collected at the TFH adult trap). Five different age classes were documented in 2000 (Table 20). The predominant freshwater life history is Age 2 (Figure 7), and one-salt ocean age (Figure 8). Freshwater life history observed from the adult scales is similar to the age composition documented at the Tucannon River smolt trap, and is consistent for both brood years. The dominant ocean age at return was different for the two years provided.

Year	Age 1.1		Age 1.2		Age 2.1		Age 2.2		Age 3.1		Age 3.2	
	N	%	N	%	N	%	N	%	N	%	N	%
2000	14	25.5	4	7.3	29	52.7	4	7.3	4	7.3	0	0.0
2001	0	0.0	8	27.6	8	27.6	11	37.9	0	0.0	2	6.9
Combined	14	16.7	12	14.3	37	44.0	15	17.9	4	4.8	2	2.4

* Age reporting protocol is F.S, where F=freshwater years and S=saltwater years of age.

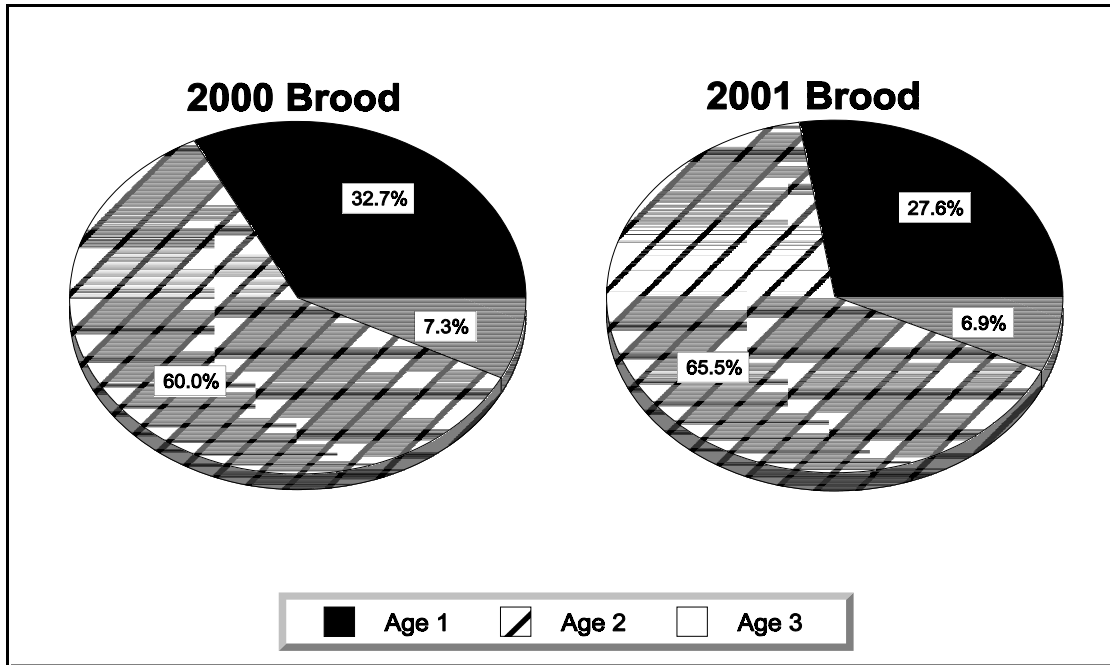


Figure 7. Freshwater age composition of natural origin steelhead in the Tucannon River based on adult scale collections.

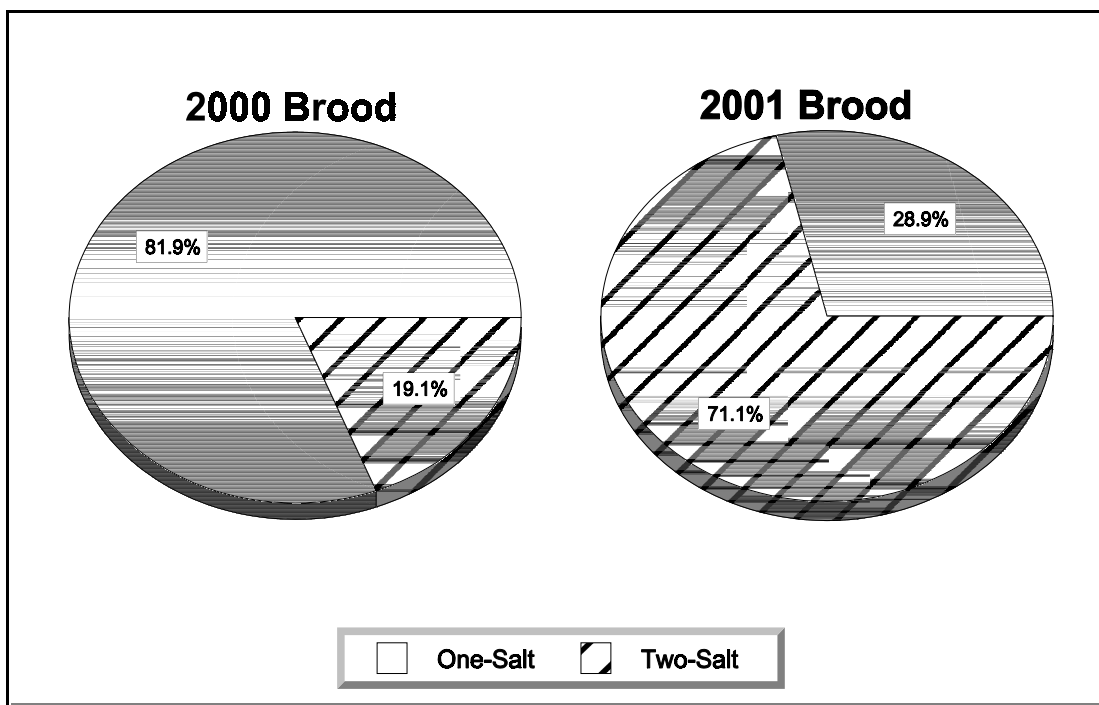


Figure 8. Saltwater age composition of natural origin steelhead in the Tucannon River based on adult scale collections.

2001 Brood Trapping and Spawning

On 20 September 2000, we began installation of the weir/trap at Rkm 17.7. However, delays in getting final NMFS approval of the HGMP prevented us from completing installation to begin trapping. Final approval to trap was not given until 30 October, and trapping began that day. The fall of 2000 was unusually cool, and water temperatures in the Tucannon River dropped quickly. As in 1999, fish movement into the trap from November until late February was almost non-existent. Hook and line methods were used once again to supplement broodstock needs. In all, 35 natural fish (17 males and 18 females) and 14 hatchery fish were trapped (Appendix D, Tables 3 and 4), of which 26 natural fish (11 females and 15 males) were collected for broodstock. Ten fish (7 females and 3 males) were collected by hook and line for broodstock. Fish that were not collected for broodstock were passed upstream after length and sex were determined, and scales and DNA samples were collected. During 2001, pre-spawning loss (6 fish, 16.7%) was lower than the previous year because of more aggressive formalin treatments to control fungus.

During February and March of 2001, 15 adult female steelhead were spawned with 15 males at LFH. Total egg take in 2001 was estimated at 113,563, which greatly exceeded the goal for the program. The reason for the large take was due to older age females with much greater fecundity than expected (one fish had an estimated 12,408 eggs). Age composition of spawned females was 26.7% one-ocean age fish with a mean fecundity of 4,657, and 73.3% two-ocean age fish with a mean fecundity of 8,630. No three-ocean age fish were spawned in 2001. Mean fork lengths of one and two-ocean age female steelhead spawned at LFH in 2001 were 58.3 cm (n=4) and 73.4 cm (n=11), respectively. Age composition and mean length of spawned males was 40.0% one-ocean age fish [60.7 cm (n=6)], and 60.0% two-ocean age fish [75.8 cm (n=9)]. No three-ocean age males were collected in the 2001 brood year.

In all, we obtained scales samples from 23 natural origin females and 25 natural origin males from the 2001 brood year (samples from the lower Tucannon trap and TFH trap). Four different age classes were documented in 2001 (Table 20). The predominant freshwater life history was Age 2 (Figure 6), and two-salt ocean age (Figure 7). Freshwater life history observed from the adult scales was similar to the age composition documented at the Tucannon River smolt trap, and was consistent for both 2000 and 2001 brood years.

Touchet River Trap

On the Touchet River near the town of Dayton, WDFW personnel had previously operated an adult trap at the water intake structure to the Dayton AP between 1993-1995 (Schuck et al, 1994-1996). The purposes of these trapping efforts were to determine the potential for developing a local steelhead broodstock for the Touchet River, and to assess adult/redd ratios to better estimate spawner abundance. Trapping efforts were successful, though trap efficiency needed

improvement for a broodstock development program and to assess the adult/redd ratios. During the 1996 flood, portions of the intake structure that were used as part of the trap were destroyed, and further trapping efforts were temporarily halted.

Following the listing of mid-Columbia River summer steelhead in 1999 (which includes the Touchet River natural stock), WDFW revisited the idea of developing an endemic broodstock for the Touchet River. Repairs and modifications were made to the trap prior to fish returning in 1999. The following sections will report intentions and results of adult steelhead trapping conducted during 1999-2001.

1999 Brood Trapping

The pending listing of mid-Columbia steelhead under the ESA prompted WDFW to re-visit the question of the feasibility of creating an endemic broodstock for LFH. Currently, LFH stock steelhead (origin of the LFH stock is from outside the Walla Walla basin) are released in the Touchet River. The intent for the 1999 trapping was to determine if 1) the existing trap would be adequate to develop a new broodstock, 2) document the ratio of natural and hatchery fish to the trap site to estimate total hatchery influence in the upper Touchet River, and 3) collect biological data (length, sex, age and genetic samples) to describe the natural population.

The adult trap was operated from 21 January to 21 June in 1999. A total of 42 natural and seven hatchery origin (14.3%) steelhead were captured and released (Appendix D, Tables 5 and 6). The percent of hatchery fish captured was similar to trapping between 1993-1995 (10.5%), and indicates that relatively few hatchery fish go into the upper Touchet River basin. We therefore believed that Touchet River steelhead stock integrity remained mostly intact. Trapping efficiency in 1999 was calculated to be a maximum of 18.5%, based on estimated fish spawning from redd surveys. The estimate is considered a maximum because not all areas above the trap are surveyed. From the trapping efforts in 1999, it appeared likely that we could proceed with developing a broodstock for the hatchery. Prior to the 2000 trapping season, discussions occurred with the co-managers and NMFS about requirements to proceed.

2000 Brood Trapping and Spawning

With the listing of mid-Columbia steelhead finalized, trapping results from 1999, and discussions with co-managers about new stock development, a 5-year test project was developed to evaluate the performance/feasibility of a new broodstock on the Touchet River. For the interim study period, WDFW would develop an HGMP (similar to the Tucannon River) with short-term and long-term broodstock goals, and management intent for the Touchet River. A draft HGMP was developed but could not be processed in time prior to the trapping season. However, a verbal agreement with NMFS and the co-managers was reached and natural origin fish were collected for broodstock. Similar to the Tucannon River, we proposed taking 16 pairs for the broodstock

to produce 50,000 smolts. The intent for the 2000 trapping was therefore identical to 1999, except that feasibility was no longer an issue and broodstock would be collected for the hatchery program. In addition, the decision to not pass any hatchery origin fish upstream was confirmed with the co-managers. Managers hoped to minimize any potential negative impacts of hatchery fish to natural fish.

The adult trap was operated from 6 January to 30 June in 2000. Trapping was not as successful in 2000, as only 31 natural and eight hatchery origin (21.1%) steelhead were captured and released (Appendix D, Tables 5 and 6). The percent of hatchery fish captured was higher than in previous years. Trapping efficiency in 2000 was calculated as a maximum of 17.1%, based on estimated fish spawning from redd surveys.

We collected 20 fish (13 females and 7 males) for broodstock. All broodstock were collected between 14 March and 18 April. Pre-spawning loss was 5% (1 female); therefore, 12 females were spawned with seven males yielding 53,139 eggs for the program. Age composition of spawned females was 83.3% one-ocean age fish with a mean fecundity of 4,291, and 16.7% two-ocean age fish with a mean fecundity of 5,114. Mean lengths of one and two-ocean age female steelhead spawned at LFH in 2001 were 60.1 cm (n=10) and 71 cm (n=2), respectively. Age composition and mean length of spawned males was 71.4% one-ocean age fish [59.9 cm (n=5)], and 28.6% two-ocean age fish [76.0 cm (n=2)]. No three-ocean age females or males were captured in the 2000 brood year.

2001 Brood Trapping and Spawning

Prior to the 2001 trapping period, evaluation staff designed an additional trapping section at the intake facility (Figure 9). The addition was built with hopes of increasing our trapping efficiency. We wanted to obtain a larger sample of the run that would insure adequate broodstock, and better characterize the population. It was also felt that the new trapping area would be more fish friendly, since it had more holding room, and flows through the trap box would be reduced compared to the old trap. The two adult traps were operated from 15 March to 17 June in 2001. Trapping was very successful in 2001 as 184 natural and 41 hatchery origin (18.2%) steelhead were captured (Appendix D, Table 5 and 6). The percent of hatchery fish captured was similar to 2000 trapping, but higher than documented in a previous years. Trapping efficiency in 2001 was calculated as a maximum of 87.2% based on estimated fish spawning from redd surveys. While this was a considerable increase in trapping efficiency, the increase could not be directly linked to the new trap. Stream flows in 2001 were very low compared to 1999 and 2000. Fish likely had a harder time jumping over the intake dam compared to previous years. However, the new trap did capture many more fish overall (69.5% of the fish) compared to the old trap (30.5% of the fish).

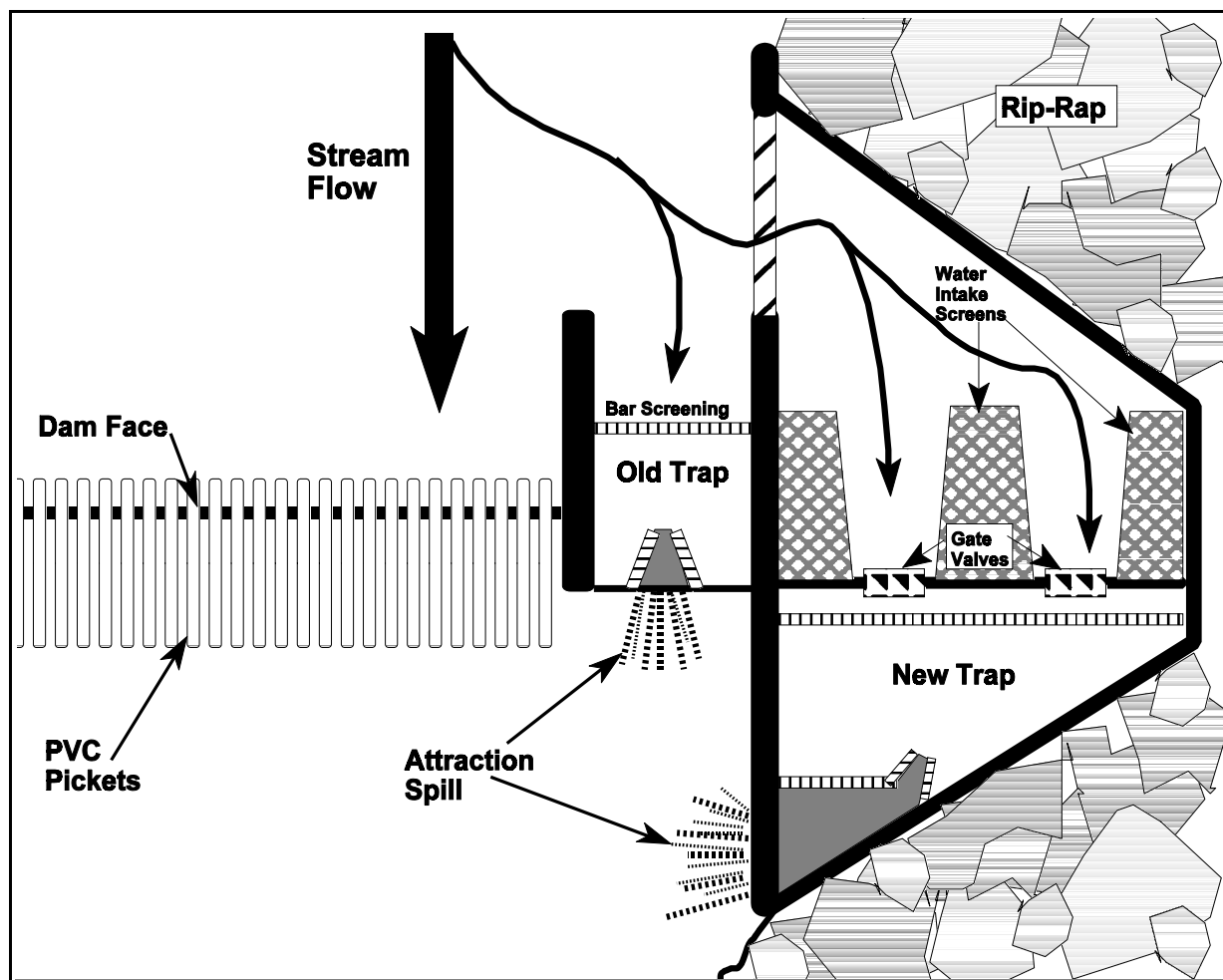


Figure 9. Depiction of Touchet River Adult traps (drawing not to scale).

Of the 2001 brood natural fish trapped between 19 March and 14 May (183), we collected 35 (20 females and 15 males) for broodstock. All broodstock were collected between 19 March and 7 April, which was skewed to the early part of the run because we didn't realize how effective our new trap might be. Pre-spawning loss at Lyons Ferry in 2001 was considerably higher with 10 fish dying prior to spawning. Loss was attributed to additional handling (length/scale/genetic samples collected prior to fish transport) and inadequate formalin treatments at the hatchery. In the end 11 males were spawned with 14 females yielding 53,139 eggs for the program. Age composition of spawned females was 42.9% one-ocean age fish with a mean fecundity of 4,088 and 57.1% two-ocean age fish with a mean fecundity of 5,417. Three of the females in the two-salt age group were repeat spawners. Mean lengths of one and two-ocean age female steelhead spawned at LFH in 2001 were 58.6 cm (n=6) and 67.8 cm (n=8), respectively. All eleven spawned males were one-salt fish with a mean length of 59.5 cm. No three-ocean age females or males were captured in the 2000 brood year.

Age Composition of Touchet River Steelhead (1993-1995, 1999-2001)

During nearly all years the Touchet River adult trap has been operated, scales have been collected from natural-origin fish to describe the freshwater and ocean age composition. Samples were limited in most years because of limited trapping due to stream flows and overall poor trapping efficiency. From the samples collected, a variety of life history patterns have been documented over the years (Table 21). While geographically similar to the Tucannon River, age composition for natural steelhead in the Touchet River is different. A larger proportion of juveniles that rear in the Touchet River spend two years in the stream before migrating (Figure 10), compared to the Tucannon River that has a strong Age 1 smolt component. Ocean age at return is similar to the Tucannon though, with the one-salt age class being dominant. The most striking (and perhaps most interesting) discovery has been the documentation of repeat spawners (Figure 11) in the Touchet River, while none have been documented in the Tucannon River. Roughly 5% of the returning fish are repeat spawners. Some repeat spawners have returned the following year, with a few spending an additional year in the ocean before returning. Two possible explanations exist for why we have not documented repeat spawners in the Tucannon; 1) sample size of scales collected has been too small to document the occurrence, or 2) the two additional mainstem dams that Tucannon River adult steelhead have to navigate causes additional mortality compared to the Touchet River fish, thus eliminating repeat spawners from their life history.

Table 21. Age composition (Freshwater.Saltwater) of natural origin adults from the Touchet River, 1994-1995 and 1999-2001 brood years.

Brood Year	Age 1.1		Age 1.2		Age 2.1		Age 2.2		Age 3.1		Age 3.2		Age 4.1		Age 4.2	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1994	0	0.0	0	0.0	4	24.0	7	41.0	3	18.0	3	18.0	0	0.0	0	0.0
1995	0	0.0	0	0.0	0	0.0	4	80.0	0	0.0	0	0.0	0	0.0	1	20.0
1999	0	0.0	0	0.0	15	75.0	5	25.0	0	0.0	0	0.0	0	0.0	0	0.0
2000	1	4.8	1	4.8	11	52.4	5	23.8	2	9.5	1	4.8	0	0.0	0	0.0
2001	0	0.0	11	10.0	57	50.0	27	23.0	11	10.0	7	6.0	1	1.0	0	0.0
Totals	1	0.6	12	6.8	87	49.2	48	27.1	16	9.0	11	6.2	1	0.6	1	0.6

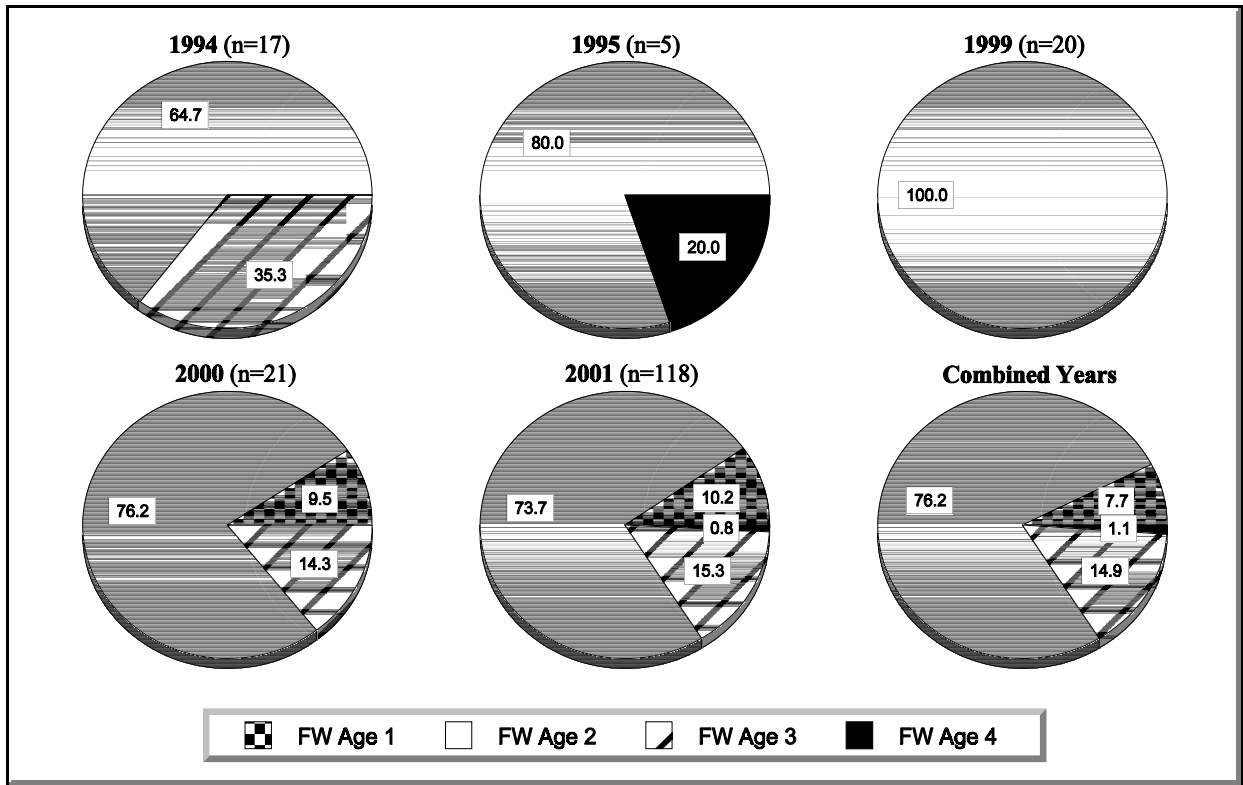


Figure 10. Freshwater age composition (determined from adult scales) of natural origin steelhead in the Touchet River, 1994-1995 and 1999-2000 brood years.

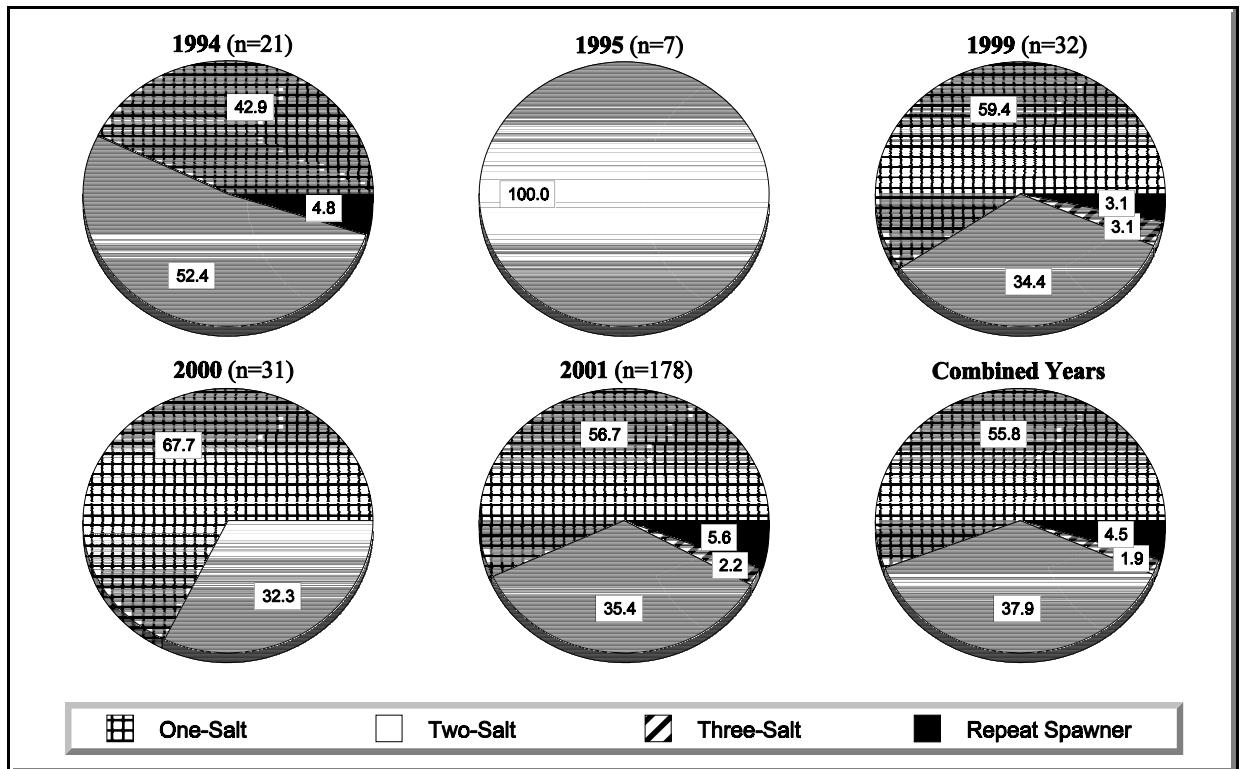


Figure 11. Saltwater age composition (determined from adult scales) of natural origin steelhead in the Touchet River, 1994-1995 and 1999-2001 brood years.

Lyons Ferry Hatchery Trap

Lyons Ferry Hatchery staff operates an on-station adult trap to collect steelhead (LFH stock) from the Snake River for broodstock and for evaluation purposes. Steelhead entering the Snake River during the summer are subject to higher river temperatures, hence many fish find refuge in the cool water exiting LFH. Many of the WDFW LFC tagged fish return to the hatchery (regardless of their release location), so it allows us to collect many fish from our different tag/release groups to determine adult contributions to the mitigation goal. The juvenile production goal for LFH stock steelhead has varied over the years. In the most recent years, LFH stock production has been reduced due to ESA listings of summer steelhead in the Snake and Mid-Columbia rivers. LFH stock steelhead were determined by NMFS as constituting jeopardy to the listed population due to straying of fish into natural production areas.

The smolt production goal for LFH stock steelhead in 1999 was initially 470,000, but was later reduced to 420,000 in response to the endemic broodstock developments in the Tucannon and Touchet rivers. Broodstock goals for 1999 were 200 females and 200 males (an additional 100% (400 fish) were retained as a contingency group in case there was detection of IHNV in the broodstock). For 2000 and 2001, the broodstock goal was reduced to 350 fish (750 total). Most

of the fish retained for broodstock during all three years consisted of coded-wire tagged fish to obtain recoveries from the tag study being conducted at LFH. In all three years, more than 750 total fish were retained and sampled for CWT's.

1999 Brood Trapping, Sorting, and Spawning

Adult steelhead were trapped at LFH from 2 July through 17 November 1998. We trapped 1,780 female (59.9%) and 1,193 male (40.1%) adult steelhead. Fish were sorted on 19 August, 22 September, and 18 November. All fish not needed for broodstock or retained for the CWT study were top caudal fin clipped and returned to the Snake River to contribute to the sport fishery (1,514). Of all the fish trapped, 23 were wild (0.8%). We recovered 460 fish with CWT's (Appendix E, Table 1), from spawning and pre-spawning losses. Mortality during trapping, holding and spawning was 856 fish (28.8% of trapped fish). During January and February of 1999, 227 females were spawned with 253 males producing 1,140,813 eggs. Eggs and fry in excess of program needs were destroyed (493,334). Fecundity of one-salt and two-salt females was 4,538 and 6,512 eggs, respectively.

2000 Brood Trapping, Sorting, and Spawning

Adult steelhead were trapped at LFH from 2 July through 16 November 1999. We trapped 2,238 female (58.8%) and 1,570 male (41.2%) adult steelhead. Fish were sorted on 28-30 September, 4 October, and 19 November. All fish not needed for broodstock or retained for the CWT study were top caudal fin clipped and returned to the Snake River to contribute to the sport fishery (2,820). Of all the fish trapped, 12 were wild (0.3%). We recovered 770 fish with CWT's (Appendix E, Table 2). Mortality during trapping, holding, and spawning was 395 fish (10.3% of trapped fish). During January and February of 2000, 183 females were spawned with 188 males producing 871,856 eggs. Eggs in excess of program needs were destroyed (220,989 eggs). Fecundity of one-salt and two-salt females was 4,745 and 5,850 eggs, respectively.

2001 Brood Trapping, Sorting, and Spawning

Adult steelhead were trapped at LFH from 4 July through 14 November 2000. We trapped 1,758 female (60.0%) and 1,170 male (40.0%) adult steelhead. Fish were sorted on 30 September, 2 October, and 20 November. All fish not needed for broodstock or retained for the CWT study were returned to the Snake River to contribute to the sport fishery (1,711). Of all the fish trapped, 66 were wild (2.3%). We recovered 630 fish with CWT's (Appendix E, Table 3). Mortality during trapping, holding, and spawning was 740 fish (25.3% of all fish trapped). During January and February of 2001, 151 females were spawned with 242 males producing 800,350 eggs. Eggs in excess of program needs were destroyed. Fecundity of one-salt and two-salt females was 4,763 and 6,605 eggs, respectively.

Cottonwood Creek Trap

The adult trap at Cottonwood Creek, a tributary of the Grande Ronde River, has been operated since 1992. This trap provides steelhead broodstock (Wallowa Stock) to produce smolts that will be released from the Cottonwood AP (same location). These releases support a large steelhead sport fishery on the Grande Ronde River. Generally, 80-100 females are needed to provide adequate eggs for the program. Trapped fish in excess of broodstock needs have been, 1) released above the trap for natural spawning, 2) killed and given to the Nez Perce Tribe or, 3) killed and distributed to the upper Cottonwood Creek for nutrient enhancement.

1999 Brood Trapping and Spawning

In spring 1999, hatchery staff operated the adult steelhead trap on Cottonwood Creek. During March and April, 130 female (47.1%) and 146 male (52.9%) adult steelhead were trapped. Age composition based on CWT recoveries and fork lengths was 84.8% one-ocean and 15.2% two-ocean. All hatchery fish were retained for spawning purposes and to prevent swamping of the natural-origin fish on the spawning grounds. A total of 102 females were spawned for an eggtake of 601,669 eggs. Eggs in excess of program needs were destroyed. Average fecundity of one and two-ocean age females was 4,626 and 6,142 eggs/female, respectively. All trapped hatchery fish were either spawned or killed. Carcasses were disposed of by distributing them in Cottonwood Creek and the Grande Ronde River for nutrient enhancement.

2000 Brood Trapping and Spawning

Hatchery staff operated the adult steelhead trap on Cottonwood Creek in 2000. During March and April 2000, 157 female (56.1%) and 131 male (43.9%) adult steelhead were trapped. Age composition based on CWT recoveries and fork lengths was 83.7% one-ocean and 16.3% two-ocean. A total of 105 females were spawned in 2000, producing 523,011 eggs. Eggs in excess of program needs were destroyed. Average fecundity of one and two-ocean age females was 4,640 and 5,795 eggs/female, respectively. All trapped hatchery fish were either spawned or killed. Carcasses were disposed of by distributing them in Cottonwood Creek for nutrient enhancement.

2001 Brood Trapping and Spawning

During March and April, 422 female (56.4%) and 327 male (43.6%) adult steelhead were trapped at the Cottonwood Creek adult trap. Age composition based on CWT recoveries and fork lengths was 71.4% one-ocean and 28.6% two-ocean. A total of 94 females were spawned in 2001, producing 504,182 eggs. Eggs in excess of program needs were destroyed. Average fecundity of one and two-ocean age females was 4,591 and 5,961 eggs/female, respectively. During 2001, fish that were not spawned were allowed to go above the trap to spawn. All carcasses from spawning were distributed in upper Cottonwood Creek for nutrient enhancement.

Grande Ronde River Tributary Adult Trapping

The 1999 Hatchery Biological Opinion issued by NMFS ruled that continued releases of Wallowa Stock steelhead into the Grande Ronde River constituted jeopardy to natural populations in the Grande Ronde and other basins. This was based on recoveries of Wallowa Stock steelhead (released by both WDFW and Oregon Department of Fish and Wildlife (ODFW)) in other rivers, (mainly Deschutes River, Oregon). As such, WDFW and ODFW were confronted with the possibility of eliminating the Wallowa Stock steelhead program in the Grande Ronde River basin. However, mitigation responsibilities as defined under the LSRCP identified that there must be sport harvest opportunities in the Grande Ronde River. This will require some hatchery releases, but of an appropriate stock. The NMFS suggested that new steelhead broodstocks be developed for the Grande Ronde River by 2008. To investigate this potential, we used the weir/trap equipment from the lower Tucannon River and set up traps on Rattlesnake Creek (March-May 2000), and Menatchee Creek (March-April 2001). These tributaries were chosen because of; 1) a limited number of small tributaries within the State of Washington, 2) convenient access and location, and 3) having the greatest potential to collect future broodstock should we choose to develop a local broodstock.

Rattlesnake Creek Trap

Evaluation staff set up the adult trap at Rkm 1.7 on Rattlesnake Creek on 27 March 2000 (Figure 12). The first fish was captured on 30 March and last fish (an unsampled kelt on the upstream side of the trap) was on 18 April. All captured fish were measured, opercle punched (to identify that they had been captured), and punches from unmarked fish were saved for DNA samples. For the season, we captured 55 fish (12 natural, 43 hatchery). Seventeen of the 43 hatchery fish captured were small residual steelhead from the previous years release of steelhead in the basin, most likely from Cottonwood AP. Given the large number of hatchery fish and relatively small number of natural fish present in this tributary, and the close proximity to Cottonwood AP, it's likely that Rattlesnake Creek has been greatly influenced by strays from the Cottonwood AP facility.

At this time, we consider Rattlesnake Creek an inappropriate source to collect natural-origin broodstock in the future. At the same time, WDFW and ODFW initiated a genetics characterization study to examine the steelhead stock profile in the Grande Ronde River basin. Genetic samples were to be collected from juvenile steelhead throughout the basin and compared with the Wallowa stock. Samples were collected in the fall of 1999 and 2000, and will be



Figure 12. Rattlesnake Creek adult steelhead trap, spring 2000.

collected again in 2001. Samples from Washington tributaries were collected from Rattlesnake, Cougar, Menatchee, and Crooked creeks. Samples collected in 1999 showed genetic differences among all Washington populations, though sample sizes were limited. Future analysis from all three collection years will be necessary before a full assessment can be made. The genetic samples may indicate that even though the Wallowa stock steelhead are present in the tributaries, they may not be successful spawners. The decision could then be reached to collect natural origin spawners in the future and create an endemic broodstock.

Menatchee Creek Trap

Evaluation staff set up the adult trap at Rkm 0.4 on Menatchee Creek on 12 March, 2001 (Figure 13). Hatchery personnel at Cottonwood AP tended the trap 1-2 times a day. The first fish was captured on 14 March and the final fish was captured on 10 April. For the season, we captured only 17 fish (13 natural, 4 hatchery). Given the size of Menatchee Creek (about twice the flow of Rattlesnake Creek) the results from trapping were extremely disappointing. We had expected many more steelhead (either origin) to utilize the creek. We still consider Menatchee Creek to have the greatest potential to develop a new broodstock because it is located 12 Rkm's above Cottonwood AP, and perhaps had less straying from the Cottonwood releases. Genetic samples collected from juveniles between 1999-2001 have yet to be analyzed. It's possible the many hatchery fish have spawned in Menatchee Creek over the years and have integrated into the natural population. With landowner permission, we will likely trap again in Menatchee Creek in 2002 for further evaluation.



Figure 13. Menatchee Creek adult steelhead trap, spring 2001.

Passage at Dams

At Lower Granite Dam (LGD), NMFS operates the adult trapping facility to monitor the migration and passage of salmon and steelhead throughout the year (Ken Thomas, NMFS 2001). All coded-wire tagged fish are diverted to a holding area where they are sampled by NMFS personnel. CWT tagged adult steelhead entering the LGD trap were sampled for fin clips and freeze brands, then released. Returns of branded fish to LGD (Table 22) can be used to estimate return rates of our steelhead release groups back to the Snake River at LGD.

Table 22. Adult returns of LFH steelhead to Lower Granite Dam in run years 1997-2000, from smolts released in 1996-1999 (numbers are freeze brand recoveries).

Release Year	Brand	Release site	Number of adults observed				Total ¹ adjusted adults	Branded smolts released	% survival
			1997	1998	1999	2000			
1996									
	LA-IV-1	Dayton AP - Touchet R.	130	26			162	38,616	0.419
	LA-IV-3	Dayton AP - Touchet R.	120	26			153	38,246	0.400
	RA-IV-1	Tucannon @ Marengo	205	45			257	29,626	0.868
	RA-IV-3	Curl LK. Tucannon R.	29	7			37	27,197	0.136
	RA-IT-1	Snake River @ LFH	96	16			113	19,943	0.568
	LA-IT-3	Snake River @ LFH	71	18	1		91	19,082	0.461
	LA-IT-1	Snake River @ LFH	73	23			101	19,845	0.531
1997									
	RA-IL-3	Cottonwood - Grande R.		128	29		157	38,051	0.429
	LA-IC-1	Dayton AP - Touchet R.		131	18		149	29,786	0.510
	LA-IC-3	Dayton AP - Touchet R.		57	11		68	29,633	0.234
	RA-IC-1	Tucannon @ Marengo		126	26	1	153	29,768	0.517
	RA-IC-3	Curl LK. Tucannon R.		48	20		68	27,542	0.251
	LA-S-1	Snake River @ LFH		50	5		55	19,516	0.292
	LA-S-2	Snake River @ LFH		63	9		72	19,499	0.383
	RA-S-1	Snake River @ LFH		45	17		62	19,528	0.325
	RA-S-2	Snake River @ LFH		45	14		59	20,335	0.296
1998									
	RA-IJ-1	Cottonwood - Grande R.			101	84	185	22,760	0.889
	RA-IJ-3	Cottonwood - Grande R.			129	127	256	24,588	1.061
	LA-7U-1	Dayton AP - Touchet R.			115	23	138	19,285	0.772
	RA-7U-1	Dayton AP - Touchet R.			80	26	106	17,496	0.694
	LA-IJ-1	Tucannon @ Marengo			213	100	313	24,196	1.352
	LA-IJ-3	Tucannon @ Enrich			230	96	326	24,492	1.361
	LA-H-1	Snake River @ LFH			98	47	145	19,679	0.750
	LA-H-2	Snake River @ LFH			92	35	127	20,559	0.634
	RA-H-1	Snake River @ LFH			103	45	148	19,450	0.799
	RA-H-2	Snake River @ LFH			70	52	122	19,651	0.636
1999									
	RA-IT-1	Tucannon @ Marengo				253	253	19,473	0.643
	RA-IT-3	Cottonwood - Grande R.				1,062	1,062	85,365	1.316
	RA-IV-1	Snake River @ LFH				96	96	19,641	0.497
	RA-IV-3	Snake River @ LFH				209	209	19,658	1.088
	LA-IV-1	Snake River @ LFH				95	95	19,646	0.491
	LA-IV-3	Snake River @ LFH				76	76	19,592	0.395
¹ Observed brands adjusted for brand loss as measured at release.									

Applying this method to releases of steelhead below LGD (Tucannon, Touchet, and Walla Walla rivers, and on-station at LFH) has limitations. Fish from those release groups would not necessarily return to LGD, though these returns may give an approximation to the degree these release groups may stray from their release location. Freeze-brand recovery information obtained at LGD from fish released in the Grande Ronde River at Cottonwood AP is more applicable. In fact, for some years the number of observed freeze brands at LGD from the Cottonwood AP release was greater than was estimated from coded-wire tag expansions collected in sport fisheries or at trapping facilities. In such cases, it may be more accurate to estimate SARs based on freeze brand data at LGD, combined with harvest rates below LGD.

Steelhead Creel Surveys

WDFW personnel survey steelhead sport anglers within the LSRCF area of Washington (see Schuck et al. 1990 for methods). Sport fishing for steelhead is open yearly on the Snake and Columbia rivers from 1 September through 31 March, and on tributaries to the Snake River from 1 September through 15 April. Anglers can 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 River and its tributaries (Tucannon, Walla Walla, Touchet, Mill Creek and the Grande Ronde) are numerous. Data from each week's surveys are summarized during the season and provided to the local news media to assist anglers. Further, from our surveys we attempt to estimate the number of LFC steelhead in the Washington sport catch in SE Washington. This was accomplished by using adjusted WDFW state-wide steelhead punch card harvest estimates (WDFW 2000, WDFW 2002; Appendix F) for the 1998-99 and 1999-2000 fishery to estimate our CWT sample rates and to estimate harvest by tag code for each fishery. Lastly, our surveys allow us to obtain lengths, weights, sex, age, and duration of ocean residency of LFC origin fish harvested.

Catch Rates

During the 1998-1999 steelhead season, we surveyed nearly 6,000 anglers that fished over 22,000 hours and caught 1,332 fish within the LSRCF area in SE Washington (Table 23). A total of 279 natural fish (20.9% of the total catch documented from creel surveys alone) were caught and released in the 1998-1999 season.

Table 23. Steelhead creel survey results for fall 1998 and spring 1999.

River section description ^a	Old section number	New section number	Anglers interviewed	Hours fished	Natural fish caught	Hatchery fish caught	Catch rate (hr/fish)
Columbia River							
McN Dam to Pasco	45	533	480	1,576.5	20	61	19.5
Walla Walla River	194	659	289	697.5	11	25	19.4
Mill Creek	106	655	22	25.0	0	0	0.0
Touchet River	185	657	245	509.3	16	23	13.1
Tucannon River	189	653	222	631.5	18	51	9.2
Snake River							
Mouth to IHR	164	640	6	23.8	0	0	0.0
IHR to LOMO	165	642	1,237	3,911.8	30	100	30.0
LOMO to LGD	166	644	1,357	6,513.3	52	307	18.1
LGD to LGR	167	646	592	2,168.0	14	80	23.1
LGR to HWY 12 Br	252	648	353	1,340.3	9	46	24.4
HWY Br upstream	228	650	1,078	5,006.8	109	360	10.7
Totals			5,881	22,403.8	279	1,053	16.8

^a Abbreviations as follows: McN=McNary Dam, IHR=Ice Harbor Dam, LOMO=Lower Monumental Dam, LGD=Little Goose Dam, LGR=Lower Granite Dam, HWY=Interstate Highway.

During the 1999-2000 steelhead season, we surveyed over 6,000 anglers that fished over 23,000 hours and caught 1,655 fish within the LSRCP area in SE Washington (Table 24). A total of 402 natural fish (24.3% of the total catch documented from creel surveys alone) were caught and released in the 1999-2000 season. Effort and hours fished were generally the same between the two seasons, but overall catch rate improved in 1999/2000.

Table 24. Steelhead creel survey results for fall 1999 and spring 2000.

River Section Description	Old Section Number	New Section Number	Anglers Interviewed	Hours Fished	Natural Fish Caught	Hatchery Fish Caught	Catch rate (hr/fish)
Columbia River							
McN Dam to Pasco	45	533	444	1,172.5	16	30	25.5
Walla Walla River	194	659	399	927.0	22	48	13.2
Mill Creek	106	655	18	24.5	1	5	4.1
Touchet River	185	657	138	276.5	6	18	11.5
Tucannon River	189	653	346	1055.0	46	194	4.4
Snake River							
Mouth to IHR	164	640	4	9.5	0	0	0.0
IHR to LOMO	165	642	1,176	3,179.5	29	69	32.4
LOMO to LGD	166	644	1,834	8,773.0	113	437	15.9
LGD to LGR	167	646	990	3,755.5	46	163	17.9
LGR to HWY 12 Br.	252	648	69	340.5	4	11	22.7
HWY Br upstream	228	650	1,062	4,056.5	119	278	10.2
Totals			6,480	23,570.0	402	1,253	14.2

Grande Ronde River

We cooperated with ODFW by conducting a joint survey of anglers on the lower Grande Ronde River (in both Washington and Oregon). Angler effort, catch rates, and harvest were calculated by ODFW as described in Carmichael et al. (1988). Total sample of fish, estimated harvest, and CWT's recovered by ODFW from the Grande Ronde fishery in Washington were supplied by ODFW (Mike Flesher; personal communication 2000 and 2001). We then added additional samples/tag recoveries from the mouth of the Grande Ronde, and from the Shoemaker Access (Rkm 25.6). All samples were then combined and expanded using the state wide harvest estimates from punch cards.

1998/1999 Season

During the 1998-1999 steelhead season, anglers fished an estimated 16,667 hours on the Grande Ronde River from Bogan's Oasis (Rkm 41.9) upstream to the Oregon State line (Rkm 61.9). Total estimated catch, harvest, and effort by month are provided (Table 12).

1999/2000 Seasons

During the 1999-2000 steelhead season, anglers fished an estimated 22,036 hours on the Grande Ronde River from Bogan's Oasis upstream to the Oregon State line. Total estimated catch, harvest and effort by month are provided (Table 25). More effort was put forth in 1999/2000, though total catch was only slightly greater. Considerably more natural-origin fish were captured/released in 1999/2000 as well.

Table 25. Estimated angler effort, catch rates, and harvest for steelhead anglers on a portion of the Grande Ronde River in Washington, 1998-1999, and 1999-2000 (Mike Flesher, ODFW unpublished data, 2001)¹.

Run Year	1998				1999				Total
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	
1998									
Effort hours	363.6	2,164.5	1,333.2	576.6	985.2	2,709.0	5,948.1	2,587.6	16,667
Catch rate	0.0000	0.0496	0.0216	0.2263	0.1213	0.0937	0.2067	0.2046	0.1440
Total catch	0	107	29	131	120	254	1,229	530	2,400
Fish kept	0	19	10	56	44	152	417	191	889
Hatchery Released	0	34	5	36	43	49	704	290	1,161
Natural Released	0	54	14	39	33	53	108	49	350
Run Year	1999				2000				Total
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	
1999									
Effort hours	783.6	3,431.9	2,198.9	1,144.3	1,286.1	3,599.6	7,699.1	1,892.2	22,036
Catch rate	0.0382	0.0478	0.1145	0.0948	0.0879	0.1096	0.1456	0.1459	0.1116
Total catch	30	164	252	108	113	395	1,121	276	2,459
Fish kept	6	51	147	49	75	188	452	125	1,093
Hatchery Released	0	0	26	7	4	125	573	130	865
Natural Released	24	113	79	52	34	81	96	21	500

¹ Estimated fish captured have been rounded to whole numbers, so total of fish kept and released may not always add up to total catch.

Contribution of LFC Steelhead to Fisheries

WDFW, ODFW, and IDFG personnel collected snouts from 132 and 173 sport caught steelhead with CWTs from Washington licensed anglers during the 1998/1999 and 1999/2000 seasons, respectively. Coded-wire tags were processed by the recovery agencies, with the majority coming from WDFW. We then estimated expanded CWT fish sampled by WDFW, IDFG and ODFW personnel based on WDFW punch card estimates, for fisheries in the Columbia and Snake rivers, and tributaries to both (Appendix F, Table 1 and Table 2) for both the 1998/1999 and 1999/2000 steelhead fisheries, and in the Grande Ronde River (Appendix F, Table 3).

We estimated harvest and percent smolt-to-adult return (SAR) by release year for LFC steelhead within the Columbia River and Snake River basins⁴. Four of five 1996 release groups exceeded the production escapement goal of 0.5% SAR to the LSRCP area (Table 26). The only release group that did not exceed the goal was for fish released from Curl Lake AP. Survival of releases from Curl Lake have generally been below LSRCP goals (Appendix C, Table 7).

Table 26. Adult returns of LFC steelhead released in 1996 to the Columbia and Snake rivers for run years 1997 and 1998.					
Release year	1996				
Release site	Touchet R. @ Dayton	Tucannon R. @ Curl AP	Tucannon R. Direct Stream	Snake River @ Lyons Ferry	Snake River @ Lyons Ferry
Wire Type	Standard	Standard	Standard	Standard	1-1/2 length
CWT code(s)	63/60/30, 31	63/60/32	63/60/33	63/60/34	63/60/35, 36
Brands(s)	LA-IV-1,3	RA-IV-3	RA-IV-1	RA-IT-1	LA-IT-1,3
Number Released ¹	78,688	26,652	29,135	19,820	39,007
Fishery					
Ocean Recoveries	1	0	0	0	0
L. Col. sport	51	8	22	14	14
L. Col Net	63	1	16	19	16
L. Col Trib Sport	24	0	8	29	48
Deschutes R. trap	1	0	0	0	0
Umatilla R. trap	0	4	13	0	0
Other non-LSRCP	0	0	0	0	0
L. Ferry Hat.	448	20	82	134	232
Snake R. sport	111	6	35	33	45
Tucannon R. sport	16	7	48	0	0
Walla Walla sport	23	0	0	0	0
Touchet R. sport	29	0	0	0	0
Idaho sport	49	0	1	1	2
Grande Ronde	0	0	1	0	0
Other LSRCP	0	1	0	0	1
LSRCP Total	676	34	167	168	279
Smolt-to-Adult %	0.859	0.128	0.573	0.848	0.715
Grand Total	816	47	223	230	358
Smolt-to-Adult %	1.037	0.176	0.765	1.160	0.918
¹ Number released has been adjusted for tag loss.					

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

Survival of the 1997 releases were much lower compared to other years for nearly all groups. Additional recoveries may also be added in the future for other reporting agencies that could change the results shown (Table 27).

Table 27. Adult returns of LFC steelhead released in 1997 to the Columbia and Snake rivers for run years 1998 and 1999.				
Release year	1997			
Release site	Touchet R. @ Dayton	Grande Ronde @ Cottonwood AP	Tucannon R. @ Curl AP	Tucannon R. Direct Stream @Marengo
Wire Type	Standard	Standard	Standard	Standard
CWT code(s)	63/61/21, 22	63/63/39	63/63/37	63/63/38
Brands(s)	LA-IC-1,3	RA-IL-3	RA-IV-3	RA-IV-1
Number Released ¹	59,971	39,112	27,512	29,604
Fishery				
Ocean Recoveries	0	0	0	0
L. Col. sport	13	6	0	0
L. Col Net	4	2	2	4
L. Col Trib Sport	0	0	0	0
Deschutes R. trap	0	0	0	0
Umatilla R. trap	0	0	10	0
Other non-LSRCP	0	2	0	0
L. Ferry Hat.	181	0	12	36
Snake R. sport	60	42	13	23
Tucannon R. sport	27	0	0	6
Walla Walla sport	18	0	0	0
Touchet R. sport	10	0	0	0
Idaho sport	10	0	0	0
Grande Ronde	0	41	0	0
Other LSRCP	0	17	0	0
LSRCP Total	306	100	19	65
Smolt-to-Adult %	0.510	0.256	0.069	0.219
Grand Total	323	110	31	70
Smolt-to-Adult %	0.539	0.281	0.112	0.236

¹ Number released has been adjusted for tag loss.

Table 27, continued. Adult returns of LFC steelhead released in 1997 to the Columbia and Snake rivers for run years 1998 and 1999.

Release year	1997	
	Snake River @ Lyons Ferry	Snake River @ Lyons Ferry
Release site	Snake River @ Lyons Ferry	Snake River @ Lyons Ferry
Wire Type	Standard	1-1/2 length
CWT code(s)	63/61/33, 34	63/62/58, 59
Brands(s)	RA-S-1,2	LA-S-1,2
Number Released ¹	39,769	39,881
Fishery		
Ocean Recoveries	0	0
L. Col. sport	0	8
L. Col Net	0	4
L. Col Trib Sport	0	0
Deschutes R. trap	0	0
Umatilla R. trap	0	0
Other non-LSRCP	0	0
L. Ferry Hat.	68	82
Snake R. sport	17	25
Tucannon R. sport	0	0
Walla Walla sport	0	0
Touchet R. sport	0	0
Idaho sport	0	0
Grande Ronde	0	0
Other LSRCP	0	1
LSRCP Total	85	108
Smolt-to-Adult %	0.214	0.271
Grand Total	85	120
Smolt-to-Adult %	0.214	0.301

¹ Number released has been adjusted for tag loss.

While sampling the 1999/2000 fishery, we also collected fish from the 1998 release year (Table 28). However, data presented represents returns of one-salt steelhead only. Returns will be completed following final analysis of the 2000/2001 fishery. One-salt returns (from CWT recoveries) indicate that all release groups (except for the Grande Ronde release) will be above the 0.5% SAR goal for the LSRCP area. However, based on the freeze-brand recoveries from LGD (Table 22), an estimated 441 (SAR of 0.93%) fish from the Grande Ronde release were passed. Either sampling rates from fishery samples were inadequate, or additional reporting of recovered CWT's from the Grande Ronde and other release groups has yet to occur. At this time we believe that the Grande Ronde freeze-brand recoveries are more representative of actual returns for the run year.

Table 28. Adult returns of LFC steelhead to fisheries in the Columbia and Snake rivers, fall 1999 and spring 2000 (one-salt age fish), from the 1998 release year.

Release year	1998			
Release site	Touchet R. @ Dayton	Grande Ronde @ Cottonwood AP	Tucannon R. Direct Stream @ Marengo	Tucannon R. Direct Stream @ Enrich
Wire Type	Standard length	Standard length	Standard length	Standard length
CWT code(s)	63/04/23, 24	63/61/27, 28	63/61/29	63/61/30
Brands(s)	RA,LA-7U-1	RA-IJ-1,3	LA-IJ-1	LA-IJ-3
Number Released ¹	40,443	49,722	25,071	24,826
Fishery				
Ocean Recoveries	0	0	0	0
L. Col. sport	20	10	19	6
L. Col Net	9	9	9	5
L. Col Trib Sport	0	0	4	3
Deschutes R. trap	0	0	0	0
Umatilla R. trap	0	0	15	4
Other non-LSRCP	0	0	0	0
L. Ferry Hat.	217	1	50	45
Snake R. sport	132	44	15	91
Tucannon R. sport	73	0	63	25
Walla Walla sport	53	0	0	0
Touchet R. sport	25	0	0	0
Idaho sport	23	55	78	0
Grande Ronde	0	104	1	0
Other LSRCP	0	20	0	0
LSRCP Total	523	224	207	161
Smolt-to-Adult %	1.293	0.451	0.826	0.648
Grand Total	552	243	254	179
Smolt-to-Adult %	1.365	0.488	1.013	0.721

¹ Number released has been adjusted for tag loss.

Table 28, continued. Adult returns of LFC steelhead to fisheries in the Columbia and Snake rivers, fall 1999 and spring 2000 (one-salt age fish), from the 1998 release year.

Release year	1998	
Release site	Snake River @ Lyons Ferry	Snake River @ Lyons Ferry
Wire Type	Standard length	1-1/2 length
CWT code(s)	63/01/07, 63/63/59	63/01/08, 09
Brands(s)	LA-H-1,2	RA-H-1,2
Number Released ¹	40,822	40,444
Fishery		
Ocean Recoveries	0	0
L. Col. sport	9	20
L. Col Net	2	3
L. Col Trib Sport	0	0
Deschutes R. trap	0	0
Umatilla R. trap	0	4
Other non-LSRCP	0	0
L. Ferry Hat.	219	196
Snake R. sport	36	21
Tucannon R. sport	11	0
Walla Walla sport	0	0
Touchet R. sport	0	0
Idaho sport	0	0
Grande Ronde	0	0
Other LSRCP	0	0
LSRCP Total	266	217
Smolt-to-Adult %	0.652	0.537
Grand Total	277	244
Smolt-to-Adult %	0.679	0.603

¹ Number released has been adjusted for tag loss.

Steelhead Spawning Ground Surveys

From 1999-2001, WDFW estimated steelhead spawning escapement in portions of the Touchet and Tucannon rivers and Asotin Creek. Surveys were conducted at index sections (Appendix G) on a weekly or bi-weekly basis when possible, and “final walks” were completed at the end of the spawning season in sections that had not been previously walked. Index areas were chosen at random, and within the last few years were expanded in total length to reduce any bias based on the survey section. Redds counted in “final walk” sections were expanded using a redd erasure rate estimated from index areas. The total estimated redds were then expanded by the percent of the river not surveyed to estimate total redds within the survey reach. Estimated number of spawners and origin was based on sex ratios as determined from adult traps and creel surveys. Steelhead spawning grounds were surveyed to estimate the number of redds as discussed by Schuck et al.(1993), and to estimate the number of spawning fish (Table 29).

Table 29. Estimated number of steelhead redds and natural and hatchery spawners in portions of the Tucannon and Touchet rivers and Asotin Creek, 1999-2001 run years.

River reach description for estimated redds and spawners		Total estimated redds			Est. Number of natural spawners			Est. Number of hatchery spawners		
		1999	2000	2001	1999	2000	2001	1999	2000	2001
Asotin¹										
Mainstem	George Cr to Confl. Br.	103	62	215	140	85	294	None	None	None
North Fork	Confl Br. to F.S. fence	106	51	105	143	69	144	None	None	None
South Fork	Mouth to State Land Fence	40	36	33	55	49	45	None	None	None
Charley Cr.	Mouth to old corral	24	21	44	33	28	60	None	None	None
Totals		273	170	397	371	231	543			
Touchet²										
Mainstem	State Park to SF Confluence	20	15	NA	22	14	NA	24	3	NA
North Fork	Mouth to MP 13	71	69	54	82	65	61	14	17	14
South Fork	Mouth to Burnt Fork	61	64	67	71	60	74	12	15	17
Wolf Fork	Mouth to Green Fly	35	44	58	40	41	65	7	11	15
Robinson Fk	Mouth upstream 8 Rkm	9	16	9	10	15	10	2	4	2
Totals		196	208	188	226	181	211	38	47	47
Tucannon³										
Mainstem	Sheep Cr. to Highway 12	294	168	412	131	28	178	266	202	386
Cummings Cr.	Mouth upstream 6.4 Rkm	16	20	39	7	3	20	14	24	44
Totals		310	188	451	138	31	198	280	226	430

¹ We assume all natural spawners in Asotin Creek since no active hatchery program exists in the basin.

² Estimated number of natural and hatchery origin fish derived from collected at the Touchet River Trap.

³ Estimated number of natural and hatchery origin fish derived from creel census surveys.

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 a cumulative SAR for each tag code (Tables 26 to 28). Appropriate SAR estimates were applied to total steelhead releases by river for each return year to estimate returns. When no CWTs had been released for a particular release group, average or closely related SARs were used to estimate returns.

We estimate that LSRCP steelhead smolts released into SE Washington streams in 1992-1998 returned at least on average 9,498 adult steelhead annually over a 5-year period to the LSRCP area of the Snake River Basin (Table 30). This average return is 204% of the steelhead goal (4,656) established for the Washington portion of the LSRCP program. The 1998 run year was the lowest of the 5-year period, and was just 114% of the LSRCP goal.

Table 30. Estimated LSRCP adult steelhead returns in run year's 1995-1999, for specific rivers for the release years shown.

Run Year Release Year	Grande Ronde River	Asotin Creek ¹	Snake River	Tucannon River	Walla Walla River	Touchet River	Total
LSRCP Goal's	1501	130	500	875	900	750	4,656
1995							
1992				26		58	84
1993	919	428	781	337	214	5,595	3,274
1994	3,168	353	1,318	528	3,756	1,353	10,476
Total	4,087	781	2,099	891	3,970	2,006	13,834
1996							
1993				23	80	66	169
1994	352	39	154	74	368	276	1,263
1995	2,660	462	1,005	696	2,563	1,948	9,334
Total	3,012	501	1,159	793	3,011	2,290	10,766
1997							
1994					40		40
1995	1,060	196	700	980	693	943	4,572
1996	1,183	228	421	1,085	1,282	1,004	5,117
Total	2,243	424	1,121	2,065	2,015	1,947	9,729
1998							
1995				14			14
1996	226	42	98	172	230	180	948
1997	981	157	282	538	1304	1,090	4352
Total	1,207	199	380	724	1,534	1,270	5,314
1999							
1996			2				2
1997	212	34	23	43	137	115	564
1998	1,258	0	681	1,427	2,232	1,684	7,282
Total	1,470	34	706	1,470	2,369	1,799	7,848
5-year Average	2,403	388	1093	1189	2,580	1862	9,498
% of Goal	160.3%	298.5%	218.6%	135.9%	286.6%	248.3%	204%

¹ Releases at the mouth of Asotin Creek were stopped following the 1997 release years. We assume no fish returning.

Trends in Naturally Produced Juvenile Steelhead, 1983-2000

As in previous years, WDFW electrofished (multiple pass removal method (Zippin 1958)) established or new index sites to estimate juvenile steelhead densities and derive population estimates for specific river reaches (Mendel 1984, Hallock and Mendel 1985, Schuck and Mendel 1987, Schuck et al. 1990-1998). Survey sections in 2000 were expanded to cover more extensive river reaches than in previous years. This was an attempt to coordinate juvenile production sampling areas with spawning ground surveys (Figure 14). Estimates for additional river reach sections were not added to the following graphs so long-term trends within historical

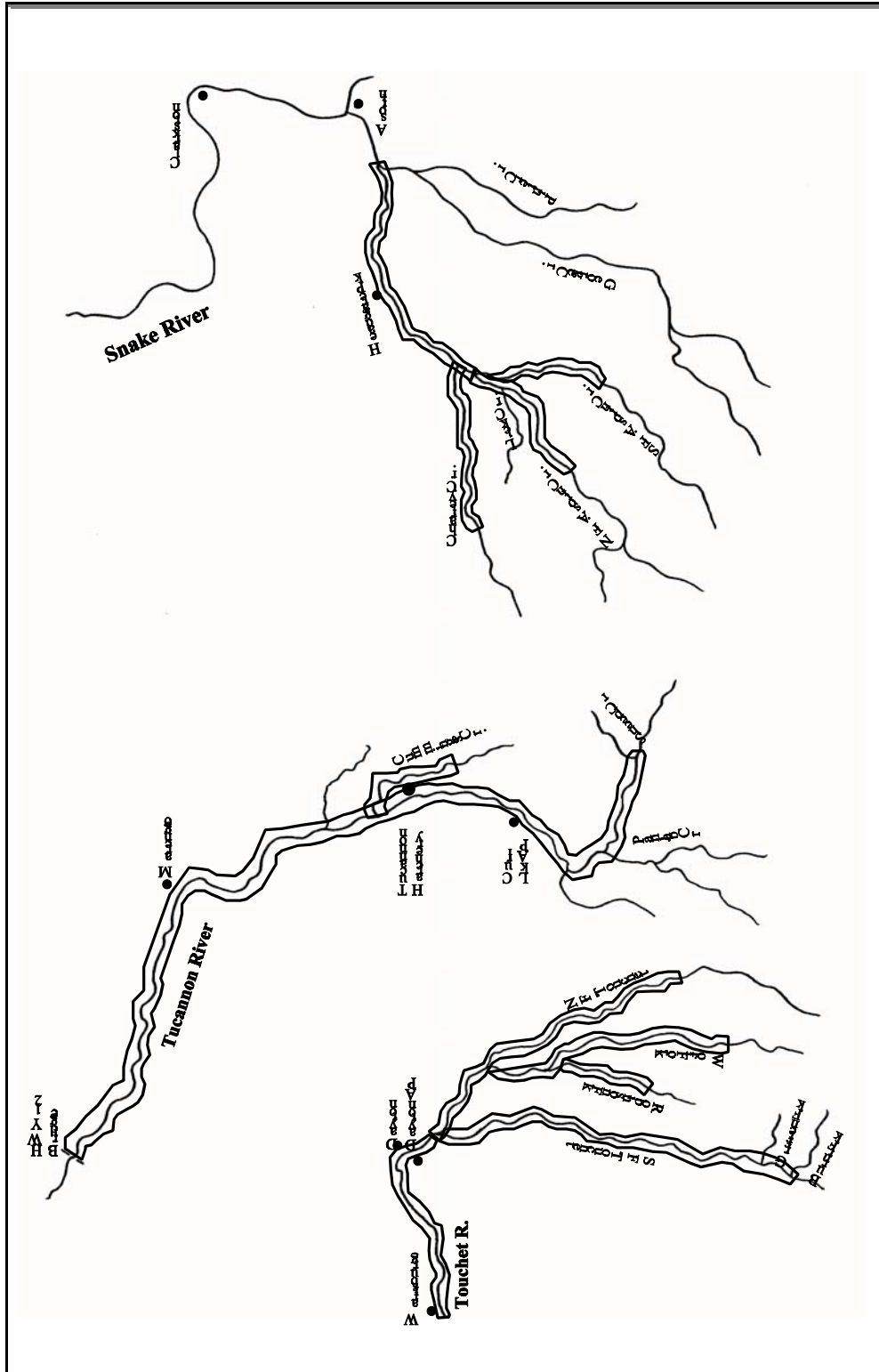


Figure 14. Area map showing surveying areas for which electrofishing surveys are expanded for in the Tucannon and Touchet rivers, and Asofin Creek, 2000.

reach sections could be continued. Expanded sections will be presented in future reports when additional data are available. Population time series graphs of estimated juvenile steelhead densities are calculated for portions of the Tucannon River, Touchet River (North, South and Wolf forks), and Asotin Creek (North and South forks). Densities of juvenile steelhead for other survey areas are provided in Appendix H. The following survey reach sections of Asotin Creek and the Touchet and Tucannon rivers were sampled in 1999 and 2000. Estimates provided in the graphs have been adjusted from previous reports due to errors in expansions factors.

- **Asotin Creek:** Main Asotin Creek: (1999) From Headgate County Park upstream to the North and South Forks confluence. (2000) From the Cloverland road turnoff bridge (4.8 km upstream from the mouth) upstream to the North and South Forks confluence. North Fork Asotin Creek: (1999) From the confluence with the South Fork upstream 7.4 Rkm to the U.S. Forest Service boundary. (2000) From the confluence with the South Fork upstream 10.4 Rkm to the U.S. Forest Service boundary (second fence). South Fork Asotin Creek: (1999) From the confluence with the North Fork upstream 5.6 Rkm to first bridge crossing. (2000) From the confluence with the North Fork upstream 9.6 Rkm to the old chimney (homestead) site. Charley Creek: (1999 and 2000) From the mouth upstream 11.8 Rkm to the old Corral.
- **Touchet River:** North Fork Touchet River: (1999 and 2000) From the confluence with the South Touchet upstream to the bridge at mile post 13. South Fork Touchet River: (1999 and 2000) From the mouth upstream 25.1 Rkm to the mouth of the Burnt Fork. Wolf Fork of North Fork Touchet River: (1999) From the mouth upstream 16.5 Rkm (Newby's Cabin). (2000) From the mouth upstream 18.4 Rkm to Green Fly Canyon.
- **Tucannon River:** Main Tucannon River: (1999) From Cummings Bridge (Rkm 55.4) upstream to the confluence with Panjab Creek (Rkm 74.5). (2000) From the Interstate HWY 12 Bridge upstream to Sheep Creek. Cummings Creek: (1999) From mouth upstream 6.4 Rkm. (2000) From mouth upstream 10.4 Rkm.

Asotin Creek

In 1999, we electrofished two sites in the Asotin Creek mainstem, six sites within each reach of the North and South forks, and five sites in Charley Creek. In 2000, we sampled four new index sites in the mainstem to cover more extensive river reaches where juvenile steelhead are believed to inhabit. River reaches were expanded in the North and South forks as well, though the total number of sites within each decreased due to time constraints. However, overall sample area was increased because site length was increased at each site to reduce potential bias in the juvenile densities based on habitat preference. Populations have remained relatively stable in the North Fork (Figure 15). Populations in the South Fork have been slightly more variable (Figure 16), with Age <0 production almost non-existent in some years. Further, low estimated production of

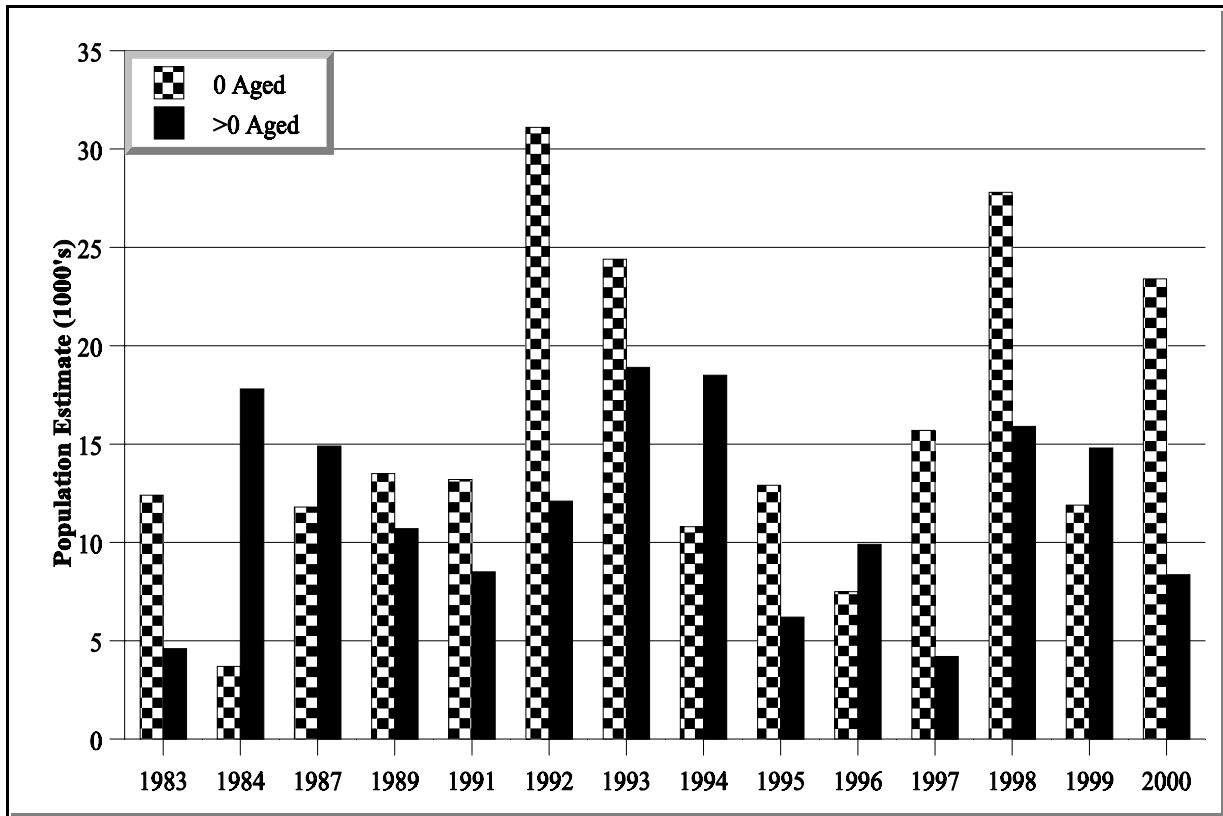


Figure 15. Estimates of natural juvenile steelhead abundance on the North Fork Asotin Creek from the confluence with the South Fork upstream 7.4 Rkm to U.S. Forest Service boundary, 1983-2000.

Age <0 has not always corresponded to a decrease in Age 1+ fish the following year. It is suspected that low sample size is likely influencing the results.

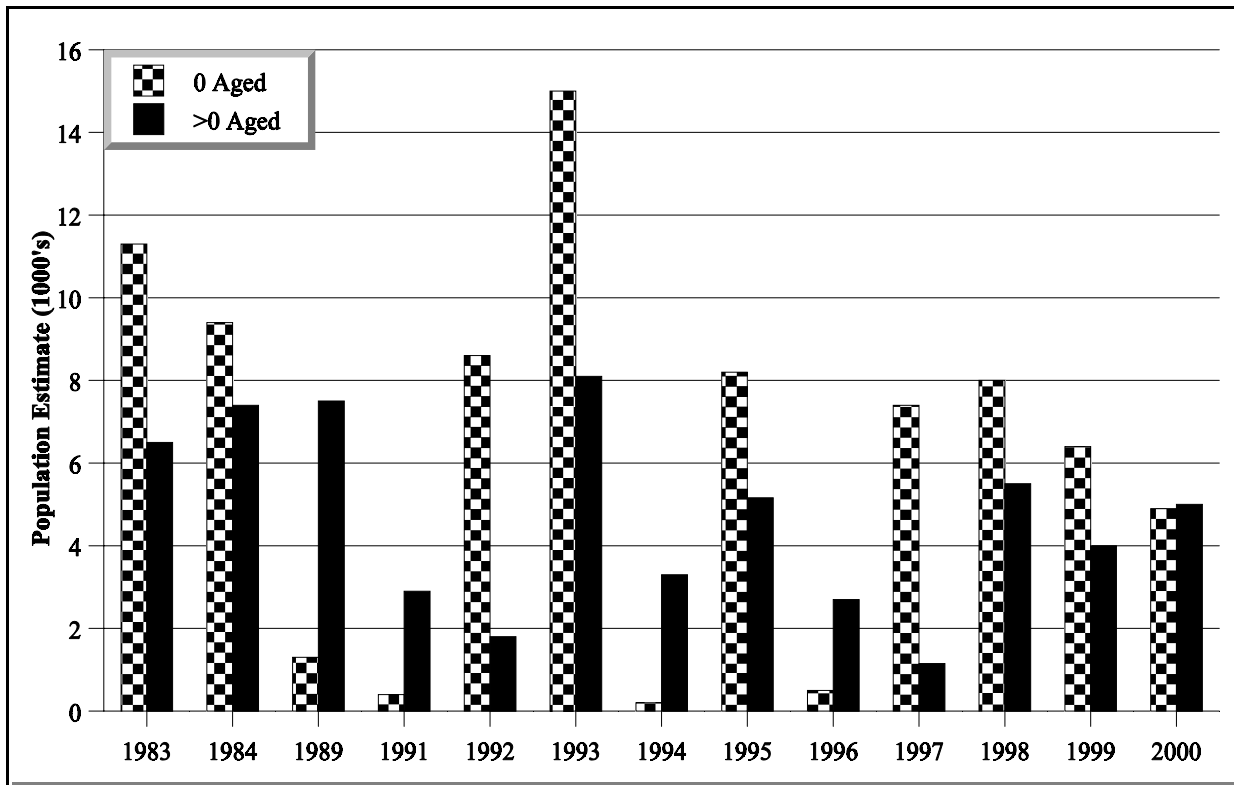


Figure 16. Estimates of natural origin juvenile steelhead abundance in the South Fork Asotin Creek from the mouth upstream 5.6 Rkm to the first bridge crossing, 1983-2000.

Touchet River

In 1999, three sites each were sampled in the North, South and Wolf forks of the Touchet River. In 2000, the number of sites was greatly increased in all forks. WDFW's fish management crew surveyed the North Fork of the Touchet River, while LSRCP evaluation staff concentrated on the Wolf Fork and South Fork. Cooperation between survey crews allowed better coverage and likely provided more accurate population estimates. Long-term trends in the Touchet River have varied considerably over the years. Age 1+ production in the North Fork declined rapidly in the late 1990's, but has appeared to rebound in 2000 (Figure 17). This is interesting considering that Age <0 production for some years (i.e., 1997 and 1998) was relatively high. Abundance trends for both the South Fork and Wolf Fork have also been variable over the years documented (Figures 18 and 19).

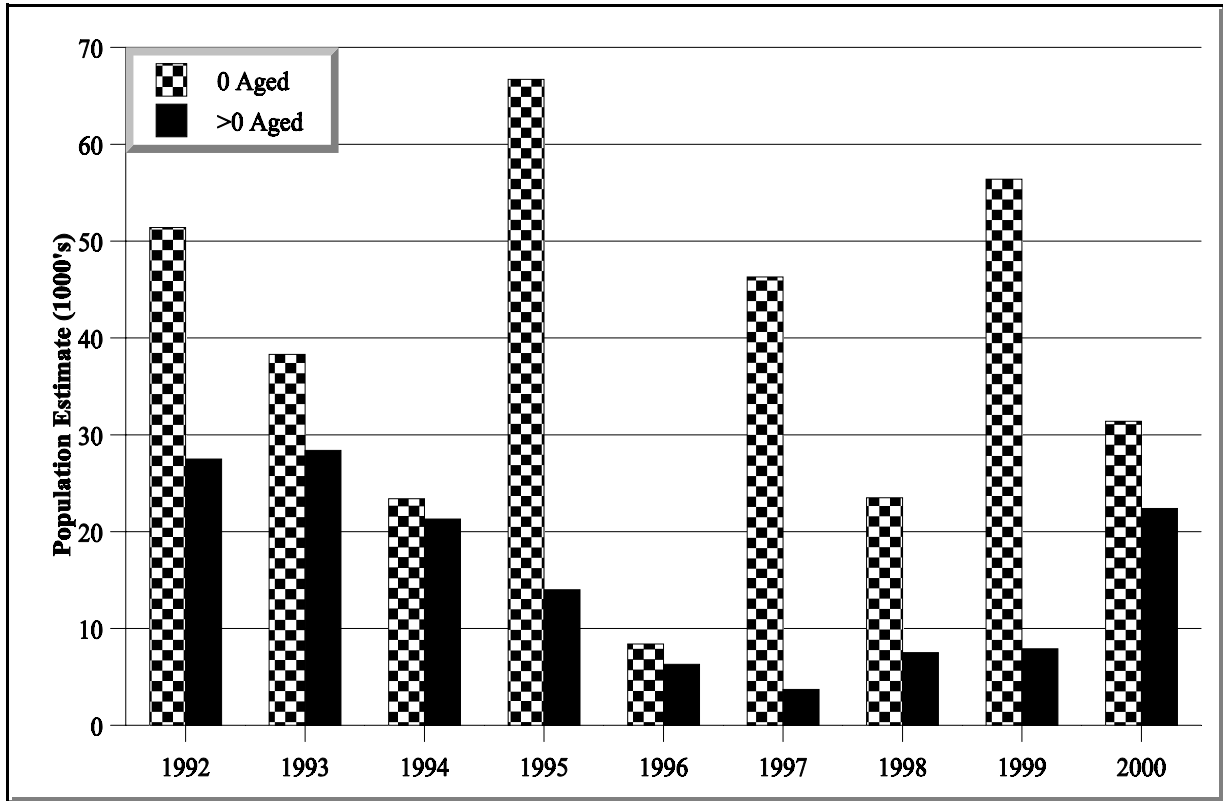


Figure 17. Estimates of natural juvenile steelhead abundance in the North Fork Touchet River, from the confluence with the South Fork upstream 17.8 Rkm, 1992-2000.

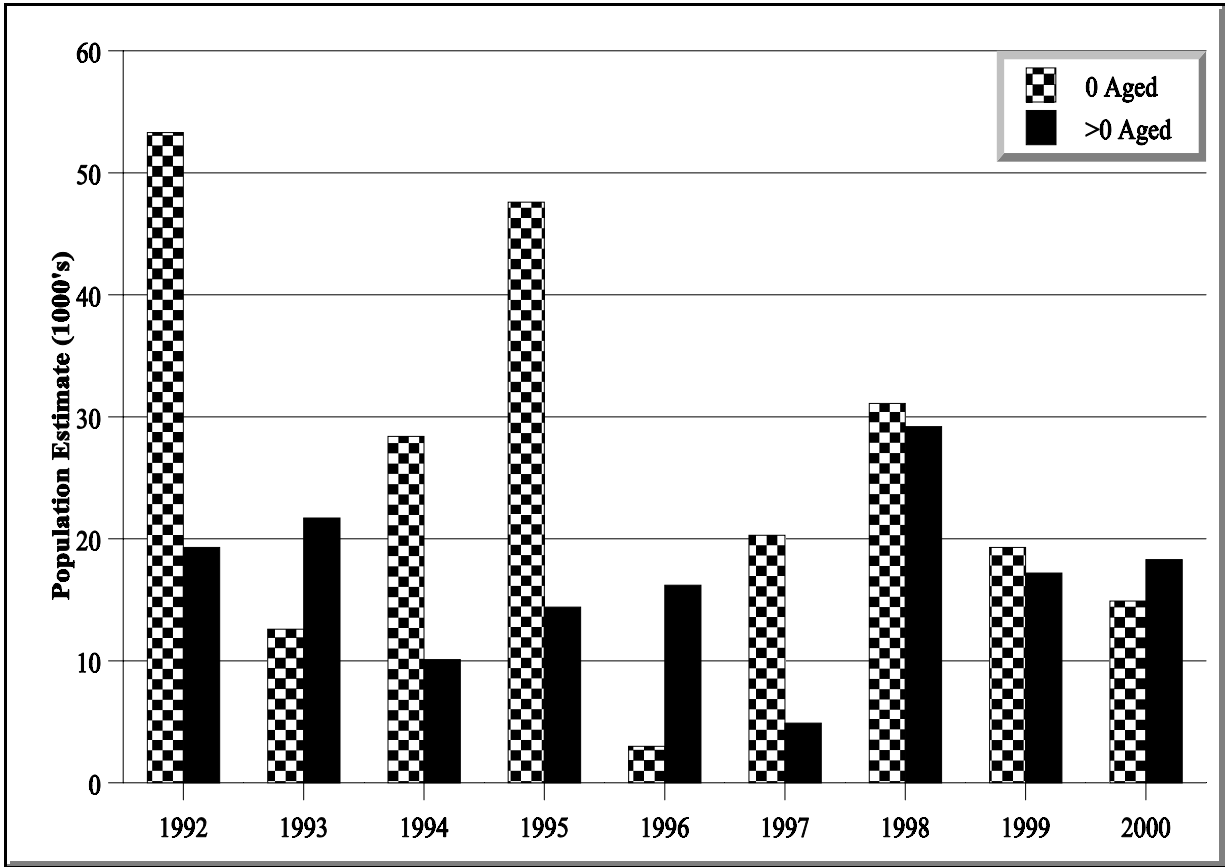


Figure 18. Estimates of natural juvenile steelhead abundance in the South Fork Touchet River, from the confluence with the North Fork upstream 25.1 Rkm, 1992-2000.

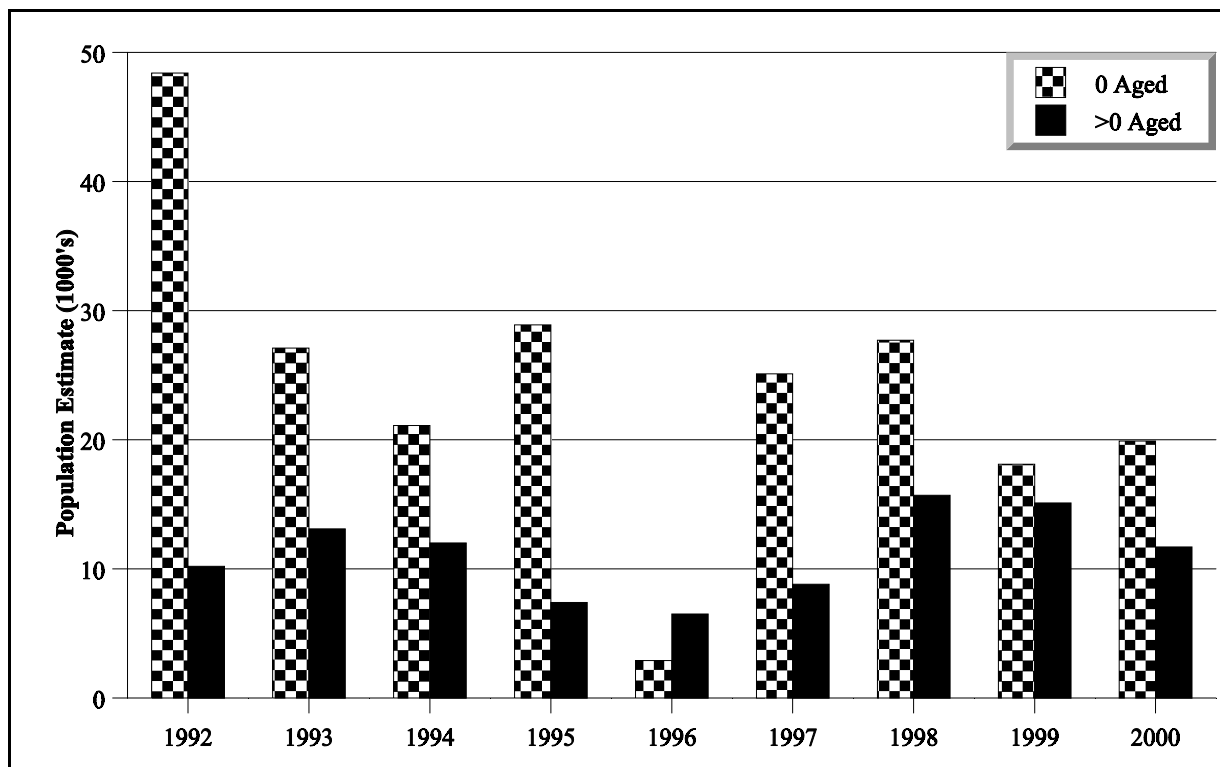


Figure 19. Estimates of natural juvenile steelhead abundance in the Wolf Fork Touchet River, from the confluence with the North Fork upstream 16.5 rkm, 1992-2000.

Tucannon River

Populations of age zero steelhead have remained relatively stable over time, possibly with a slight downward trend. Conversely, long-term trends in the Age 1+ steelhead within the reach described have generally declined over time. We believe that this trend can largely be attributed to an overall decrease in the number of adults spawning in the upper reaches of the Tucannon River (Figure 20). It was discovered in the early 1990's that the Tucannon Adult Trap (built primarily for spring chinook trapping) was impeding escapement of steelhead into the upper Tucannon River. At this time we speculate that no downward trend is visible in Age <0 steelhead because sample sites were skewed in distribution throughout the reach, with relatively high densities of Age <0 fish in two sites located below the adult trap. Densities of Age 1+ juveniles are generally less, and perhaps better indicate the status of the population.

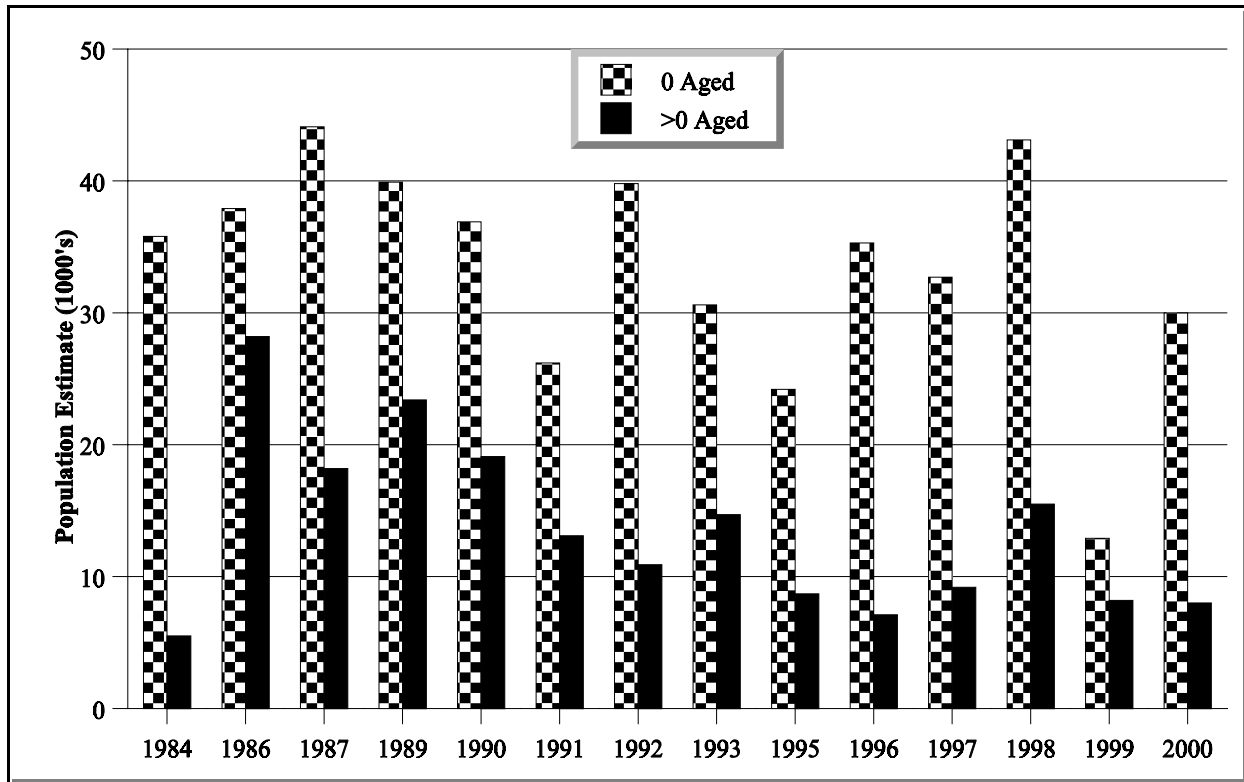


Figure 20. Estimates of natural juvenile steelhead abundance in the Tucannon River from Campground 1 (Rkm 55.4) upstream 19.1 Rkm to Panjab Bridge, from most years between 1984-2000.

Conclusions and Recommendations

While attempting to develop hatchery management procedures (acclimation, size and time of release, location of release, etc.) to maximize fish survival (SARs) 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 hatchery smolts, and conversely of residual steelhead, should significantly improve program success while decreasing negative effects on all wild salmonid populations. WDFW has 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 the Tucannon, Grande Ronde and Walla Walla systems, and from LFH. 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 studies:

1. The NMFS ruled that LSRCP hatchery steelhead jeopardized listed steelhead populations within the Snake and Columbia river basins, and called for the development of new endemic broodstocks for the hatchery steelhead program. Initial efforts in the Tucannon and Touchet rivers appear to be successful, but more data are needed before a final conclusion is reached. Decisions will also have to be made regarding the Wallowa Stock releases into the Grande Ronde Basin.

Adult traps have been utilized to collect the standard hatchery steelhead stocks, develop new endemic stocks, or to assess the potential in other areas. In addition, they provide an opportunity to collect tagged (ADLV+CWT) hatchery steelhead that may come from the LSRCP program to assist in determining success, or from other programs throughout the region.

Recommendation: Continue with development/evaluation of endemic broodstocks in the Tucannon and Touchet rivers.

Recommendation: Modify/improve existing adult traps to evaluate each endemic program and provide recommendation for each broodstock.

Recommendation: Continue to investigate adult returns to tributaries in the Washington portion of the Grande Ronde River. Set up an adult trap on Menatchee Creek in 2002 for further evaluations. Continue to coordinate with ODFW for efforts regarding future development of new endemic broodstocks for releases into the Grande Ronde Basin.

Recommendation: At all trapping locations, sacrifice all tagged (ADLV+CWT) adult steelhead to determine release points and assess straying of stocks.

2. In conjunction with #1, the LFH and Wallowa stock program returns have nearly always exceeded Washington's LSRCP mitigation goals. The LFH and Wallowa stock fish therefore have likely caused some impacts to the listed populations due to straying into non-native waters. Reductions in program releases from each of these stocks would lessen any negative impacts they may have on listed populations.

Recommendation: Compile return rate data (SAR's) for various release groups and determine appropriate stocking levels in each of the rivers to fulfill the LSRCP mitigation goals.

Recommendation: In the Tucannon River, shift all LFH stock steelhead release points to Enrich Bridge. Discontinue releases at Marengo to lessen the effects of returning adults on natural populations.

3. Over the years the evaluation project has PIT tagged numerous juvenile steelhead in attempts to answer study questions (i.e. residualism) or to monitor success/migration of hatchery and natural origin fish. Analysis has been limited to basic detections and timing to various mainstem Columbia and Snake river collection facilities. Models for PIT tagged fish have been developed specifically to estimate survival from releases to specific points downstream.

Adult detection capabilities for PIT tagged salmon/steelhead within the Columbia and Snake river basins is becoming more widespread. These capabilities can provide SAR estimates for release groups back to the project area to evaluate program success. While sample sizes have been limited, some insight was gained based on our current results, especially regarding natural origin steelhead from the Tucannon River.

Recommendation: Consolidate all past PIT tagged releases and analyze the data using the SURPH2 PIT tag model software, and present summaries of survivals in future annual reports or peer reviewed journals.

Recommendation: Examine all current releases of hatchery steelhead and determine which groups may be appropriate to increase the number of PIT tags used in each release.

Recommendation: Analyze cost benefits compared to standard CWT/freeze brand tags, and the data that can be obtained.

Recommendation: Continue to implant PIT tags in as many natural origin steelhead as possible from the Tucannon River smolt trap to estimate SARs.

4. The release of Wallowa stock juvenile steelhead from Cottonwood Creek AP is a successful portion of Washington's mitigation program, however information from other agencies have raised concerns about Wallowa stock stray rates into other river systems (mainly the Deschutes River in Oregon). Beginning in 1997, we started releasing tagged fish from Cottonwood AP to re-evaluate this potential straying issue

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

5. Natural origin steelhead return in the Tucannon and Touchet rivers over an extended period during the run. Collections for broodstock have become difficult given the relatively small number needed, and the time frame needed to hold fish prior to spawning. In addition, spawn timing is affected due to the holding facility temperature. Extended spawn timings and juvenile fish that avoid hatchery workers and feed are creating problems in the hatchery rearing phase by having populations with large size variation, and failure to meet size goals upon release; thereby likely hurting survival chances following release (SARs).

Recommendation: Continue to document run timing and spawn timing (when and how long) of natural fish collected for endemic broodstocks.

Recommendation: Develop broodstock collection protocols appropriate for each stock.

Recommendation: Discuss rearing protocols with hatchery personnel to best meet production goals for each endemic program.

6. Since the ESA listings and the development of WDFW's Wild Salmonid Policy (1997), we have tried to minimize the potential impact to listed fish in a variety of ways. Concerns have been raised in recent years regarding resident trout fisheries in local rivers, and impacts to listed fish that may be harvested by the fishery. In the spring of 2000, we evaluated this impact on the Touchet River, concluding that impacts were minimal given the apparent angler preference to larger size fish (stocked rainbows and hatchery residual steelhead).

Recommendation: Continue to allow limited sport fisheries on local rivers.

Recommendation: Discontinue stocking of rainbow trout into local rivers, but recommend fisheries take place in areas where hatchery steelhead releases occur (non-endemic stocks) to allow harvest of residual steelhead.

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Appendix A

Rainbow Trout Plants from Lyons Ferry Complex: 1999, 2000, and 2001

Appendix A, Table 1. Rainbow Trout plants from Lyons Ferry Complex, 1999. Represents both LSRCP and State funded programs.

County	Location	Number of Plants	LSRCP pounds of fish	LSRCP # fish planted	State pounds of fish	State # fish planted
Adams	Sprague Lake	4	6,493	67,886		
	<i>Total</i>		<i>6,493</i>	<i>67,886</i>		
Asotin	Asotin Creek	1	715	2,002		
	Golf Course Pond	8	8,499	22,477	648	300
	Headgate Pond	1	588	1,999		
	Silcott Pond	2	1,311	4,001		
	West Evans Pond	8	8,318	21,532	648	300
	<i>Total</i>		<i>19,431</i>	<i>52,011</i>	<i>1,296</i>	<i>600</i>
Columbia	Beaver Lake	3	702	2,016		
	Big Four	2	800	2,000	455	350
	Blue Lake	8	5,694	18,780	704	376
	Curl Lake	4	2,738	8,697	309	667
	Dam Pond	1	750	2,025		
	Dayton Jv. Pond	4	959	2,552		
	Deer Lake	3	1,580	4,593		
	Orchard Pond	1	770	2,002		
	Rainbow Lake	8	5,596	21,588	700	374
	Spring Lake	7	4,896	28,827	693	371
	Touchet R.	1	629	2,014		
	Tucannon R.	1	960	2,976		
	Watson	6	3,900	11,104	468	250
	<i>Total</i>		<i>29,974</i>	<i>109,174</i>	<i>3,329</i>	<i>2,388</i>
Franklin	Dalton Lake	2	8,550	20,155		
	Marmes Pond	2	556	1,502		
	<i>Total</i>		<i>9,106</i>	<i>21,657</i>		
Garfield	Baker's Pond	1	520	1,664		
	Casey Pond	1	150	510		
	Pataha Creek	1	357	1,000		
	<i>Total</i>		<i>1,027</i>	<i>3,174</i>		
Walla Walla	Bennington Lake	7	10,723	24,054		
	College Place Pond	5	1,478	4,312	377	290
	Fishhook Pk. Pond	2	1,820	6,188		
	Jefferson Park Pond	2	566	2,009		
	Mill Creek	1	650	2,015		
	Quarry Pond	3	9,773	24,655		
	<i>Total</i>		<i>25,010</i>	<i>63,233</i>	<i>377</i>	<i>290</i>
Whitman	Garfield Pond	1	575	2,070		
	Gilcrest Pond	2	862	3,020		
	Pampa Pond	1	3,030	5,000		
	Riparia Pond	1	960	2,400		
	Union Flat Creek	1	543	1,520		
	<i>Total</i>		<i>5,970</i>	<i>14,010</i>		
Total Rainbows			97,011	331,145	5,002	3,278

Appendix A, Table 2. Trout plants from Lyons Ferry Complex, 2000. Represents both LSRCP and State funded programs.

County	Location	Number of Plants	LSRCP pounds of fish	LSRCP # fish planted	State pounds of fish	State # fish planted
Adams	Sprague Lake	1	1,940	47,818		
	<i>Total</i>		<i>1,940</i>	<i>47,818</i>		
Asotin	Golf Course Pond	8	6,418	18,741	549	300
	Headgate Pond	1	625	2,000		
	Silcott Pond	2	1,145	3,976		
	West Evans Pond	9	7,178	19,947	732	400
	<i>Total</i>		<i>15,366</i>	<i>44,664</i>	<i>1,281</i>	<i>700</i>
Columbia	Beaver Lake	2	737	1,555		
	Big Four	2	1,020	2,040	452	303
	Blue Lake	10	6,676	18,990	564	306
	Curl Lake	8	4,255	12,151	607	264
	Dam Pond	2	920	2,649		
	Dayton Jv. Pond	6	1,414	3,245	231	107
	Deer Lake	3	912	3,038		
	Donnie Lake	2	124	423		
	Orchard Pond	1	715	2,038		
	Rainbow Lake	10	6,864	19,602	582	304
	Spring Lake	4	645	2,604	573	304
	Touchet R.	1	833	2,000		
	Watson	3	646	3,136	580	303
	<i>Total</i>			<i>25,101</i>	<i>73,471</i>	<i>3,589</i>
Franklin	Dalton Lake	5	5,950	20,117	578	301
	Marmes Pond	2	986	2,633		
	<i>Total</i>		<i>6,936</i>	<i>22,750</i>	<i>578</i>	<i>301</i>
Garfield	Baker's Pond	1	548	2,082		
	Casey Pond	1	138	524		
	<i>Total</i>		<i>686</i>	<i>2,606</i>		
Walla Walla	Bennington Lake	9	8,677	22,612	430	200
	College Place Pond	5	1,468	3,768	328	200
	Fishhook Pk. Pond	3	1,675	5,192	230	100
	Jefferson Park Pond	3	825	1,998	164	100
	Quarry Pond	5	6,699	21,726	303	582
	<i>Total</i>			<i>19,344</i>	<i>55,296</i>	<i>1,455</i>
Whitman	Garfield Pond	1	1130	1,921		
	Gilcrest Pond	1	1575	2,835		
	Pampa Pond	2	1,359	5,214	300	150
	Riparia Pond (RB)	1	625	2,000		
	Union Flat Creek	1	650	1,560		
	<i>Total</i>			<i>5,339</i>	<i>13,480</i>	<i>300</i>
Total Rainbows			74,712	260,085	7,203	4,224

Appendix A, Table 3. Trout plants from Lyons Ferry Complex, 2001. Represents both LSRCP and State funded programs.

County	Location	Number of Plants	LSRCP pounds of fish	LSRCP # fish planted	State pounds of fish	State # fish planted	
Asotin	Golf Course Pond	6	6,160	14,980	464	300	
	Headgate Pond	1	501	2,054			
	Silcott Pond	2	1,285	2,994			
	West Evans Pond	7	5,797	15,262	618	400	
	<i>Total</i>			<i>13,743</i>	<i>35,296</i>	<i>1,082</i>	<i>700</i>
Columbia	Beaver Lake	3	607	1,493			
	Big Four	2	1,130	2,463	450	300	
	Blue Lake	9	6,427	40,035	682	383	
	Curl Lake	5	2,280	8,557	680	300	
	Dam Pond	1	423	994			
	Dayton Jv. Pond	6	1,300	3,009	192	102	
	Deer Lake	3	941	2,101			
	Donnie Lake	1	211	401			
	Orchard Pond	2	665	1,504			
	Rainbow Lake	9	8,857	18,220	529	300	
	Spring Lake	8	4,027	11,845	581	301	
	Watson	6	5,276	12,786	615	300	
	<i>Total</i>			<i>32,154</i>	<i>103,408</i>	<i>3,729</i>	<i>1,986</i>
	Franklin	Dalton Lake ^a	5	11,206	46,465	450	300
Marmes Pond		2	935	2,001			
<i>Total</i>			<i>11,759</i>	<i>48,466</i>	<i>450</i>	<i>300</i>	
Garfield	Baker's Pond	1	290	870			
	Casey Pond	1	263	500			
	<i>Total</i>		<i>553</i>	<i>1,370</i>			
Walla Walla	Bennington Lake	5	7,156	18,103	318	200	
	Fishhook Pk. Pond	2	815	3,242	220	100	
	Jefferson Park Pond	2	435	1,000	159	100	
	Lions Park Pond	3	435	1,000	379	200	
	Quarry Pond ^b	6	9,508	33,961	450	300	
	<i>Total</i>			<i>18,349</i>	<i>57,306</i>	<i>1,526</i>	<i>900</i>
Whitman	Gilcrest Pond	2	1,573	3,498			
	Pampa Pond	3	1,570	4,012	440	200	
	Riparia Pond	1	417	1,001			
	Union Flat Creek	1	520	1,560			
	<i>Total</i>			<i>4,080</i>	<i>10,071</i>	<i>440</i>	<i>200</i>
Total Rainbows			80,638	255,917	7,227	4,086	
^a 31,406 of the fish stocked (4,362 lbs) were summer steelhead, Wallowa stock. ^b 18,864 of the fish stocked (2,620 lbs) were summer steelhead, Wallowa stock.							

Appendix B

Summer Steelhead releases from Lyons Ferry Complex, 1999-2001

Appendix B, Table 1. Summer steelhead smolt releases from Lyon Ferry Complex, 1999-2001

Location	Stock	Rkm	Release dates	Total release	Marked release	CWT code ^a	Brand	Marks Fin or VI color ^b	Lbs	Size #/lb	Cwt loss%	Brand/VI loss%
1999												
G. Ronde @ Cottonwood	Wallowa	45.9	4/30	268,803	90,333	04/60	RA-IT-3	ADLV	62,513	4.3	1.4	3.9
Snake R. @ LFH	LFH	92.8	4/15-23	22,115	20,121	10/05	RA-IV-3	ADLV	6,112	3.5	2.3	2.2
Snake R. @ LFH	LFH	92.8	4/15-23	21,959	19,965	10/02	LA-IV-1	ADLV	5,759	3.7	1.3	1.4
Snake R. @ LFH	LFH	92.8	4/15-23	21,954	19,960	10/03	RA-IV-1	ADLV	6,065	3.5	2.2	2.2
Snake R. @ LFH	LFH	92.8	4/15-23	21,964	19,971	10/04	LA-IV-3	ADLV	6,068	3.5	2.3	1.5
Touchet R. @ Dayton	LFH	86.4	4/30	124,651				AD	25,439	4.9		
Tucannon R. @ Enrich	LFH	27.2	4/16-23	88,977	19,830	10/01	RA-IT-1	ADLV	19,991	3.5-4.8	2.6	1.5
Tucannon R. @ Marengo	LFH	39.9	4/16-23	90,112	20,966	10/01	RA-IT-1	ADLV	20,491	3.4-4.8	3.0	1.5
Walla Walla River	LFH	56.0	4/23	176,000				AD	37,500	4.7		
2000												
G. Ronde @ Cottonwood	Wallowa	45.9	3/21-4/1	274,146	80,201	13/09	RA-2-2	ADLV	50,037	4.6-5.5	3.5	7.7
Snake R. @ LFH	LFH	92.8	4/17-27	59,942	20,168	13/07	RA-IC-1	ADLV	14,223	3.9-4.7	0.6	4.0
Touchet R. @ Dayton	LFH	86.4	4/1	124,654	40,127	13/08	LA-2-2	ADLV	34,820	3.6	2.1	7.6
Tucannon R. @ Enrich	LFH	27.2	4/17-27	71,468	20,003	13/05	LA-IC-3	ADLV	17,294	3.8-4.6	2.9	4.3
Tucannon R. @ Marengo	LFH	39.9	4/17-27	74,300	20,483	13/06	LA-IC-1	ADLV	16,760	4.2-4.6	1.9	3.3
Walla Walla River	LFH	56.0	4/17-21	165,500				AD	40,000	4.0-4.5		
2001												
G. Ronde @ Cottonwood	Wallowa	45.9	4/24	215,584	40,545	02/81	LA-II-1	ADLV	42,859	5.0	1.6	0.6
Snake R. @ LFH	LFH	92.8	4/16-24	53,551	20,401	11/39	RA-S-1	ADLV	16,908	3.2	3.3	2.6
Touchet R. @ Dayton	LFH	86.4	4/30	102,765	40,239	02/15		ADLV	33,149	3.1	2.0	
Touchet River	Touchet	91.5	5/01	36,487	36,487	13/39		None, RY	5,342	6.8	3.0	7.5
Tucannon R. @ Enrich	LFH	27.2	4/17-24	55,179	10,574	10/53	LAS-1	ADLV	18,285	3.0	2.8	1.8
Tucannon R. @ Marengo	LFH	39.9	4/17-24	66,211	9,627	10/53	LA-S-1	ADLV	21,552	3.1	2.8	1.8
Tucannon River	Tucannon	64.0	4/9-10	60,020	60,020	13/36,		AD, None	10,276	5.8	1.4	13.4
Walla Walla River	LFH	56.0	4/17-24	103,980	20,254	02/84		& LY	35,117	3.0	6.9	

^a WDFW agency CWT codes begin with 63.

^b VI color as follows: LY=Left Yellow, RY=Right Yellow

Appendix C

Estimated Total Returns by Brood Year for Lyons Ferry Complex Summer Steelhead from all CWT Release Groups (1982-1986 Broods)

Appendix C, Table 1. Expanded coded-wire tag recoveries of summer steelhead released into Asotin Creek using recovery data from fisheries, traps, and hatcheries. (Total returns do not include estimated fish that escaped to the spawning grounds)

Release Year	Columbia River Recovery Locations				LSRCP Recovery Locations				Total tags	Total tags to LSRCP	Total est. return to LSRCP	SAR to LSRCP area					
	Col. R. Ocean	Col. R. sport	Col. R. net	Col. R. trib	Col. R. trap/hatchery	Lyons Ferry	Snake sport	Snake R. trap/hatchery					Tucannon River	Walla Walla River	Touchet River		
1988																	
63/07/24	3	85	240	0	11	53	170	2	0	0	0	564	225	1,953	779	1.42	0.57
63/14/22																	

Appendix C, Table 2. Expanded Coded-wire tag recoveries of summer steelhead released into the Walla Walla River from fisheries, traps, and hatcheries. (Total returns do not include estimated fish that escaped to the spawning grounds.)

Release Year	Columbia River Recovery Locations				LSRCP Recovery Locations				Total tags	Total tags to LSRCP	Total est. return to LSRCP	SAR to LSRCP area					
	Col. R. Ocean	Col. R. sport	Col. R. net	Col. R. trib	Col. R. trap/hatchery	Lyons Ferry	Snake sport	Snake R. trap/hatchery					Tucannon River	Walla Walla River	Touchet River		
1990																	
63/39/09	0	7	107	0	0	27	0	1	0	21	2	165	51	546	169	0.42	0.13
63/39/10																	
1993																	
63/59/42	1	67	99	0	7	191	89	7	2	42	0	505	331	1,080	708	1.30	0.85
63/59/44																	
1994																	
63/53/12	1	371	101	4	5	92	324	3	45	393	30	1,369	887	3,677	2,382	2.30	1.49
63/53/13																	
63/53/14																	
1995																	
63/54/42	0	104	28	20	0	537	213	5	71	53	120	1,151	999	3,661	3,177	2.30	2.00
63/54/43																	

Appendix C, Table 3. Expanded Coded-wire tag recoveries of summer steelhead released into the Grande Ronde river at Cottonwood AP from fisheries, traps, and hatcheries. (Total returns do not include estimated fish that escaped to the spawning grounds.)

Release Year	Columbia River Recovery Locations					LSRCP Recovery Locations					Total tags	Total tags to LSRCP	Total est. return to LSRCP	SAR to LSRCP area				
	Ocean	Col. R. sport	Col. R. net	Col. R. trib	Col R. trap/hatchery	Lyons Ferry	Snake sport	Snake trap/hatchery	Tucannon River	Walla Walla River					Touchet River			
1985																		
62/16/27	3	102	550	0	13	13	258	1	0	0	0	0	940	272	1,533	444	1.20	0.35
62/16/28																		
1986																		
63/33/05	1	97	549	0	10	73	303	0	2	0	0	0	1,035	378	2,152	786	1.73	0.63
63/33/06																		
63/33/49																		
1987																		
63/38/40	1	97	667	2	19	8	417	0	4	0	3	1,218	432	3,058	1,085	1.52	0.54	
63/38/41																		
63/38/42																		
63/38/43																		
1997																		
63/63/39	0	6	2	0	2	0	83	0	11	0	0	0	104	94	665	601	0.27	0.24

Appendix C, Table 4. Expanded Coded-wire tag recoveries of summer steelhead released into the Wallowa River from fisheries, traps, and hatcheries. (Total returns do not include estimated fish that escaped to the spawning grounds.)

Release Year	Columbia River Recovery Locations					LSRCP Recovery Locations					Total tags	Total tags to LSRCP	Total est. return to LSRCP	SAR to LSRCP area				
	Ocean	Col. R. sport	Col. R. net	Col. R. trib	Col R. trap/hatchery	Lyons Ferry	Snake sport	Snake trap/hatchery	Tucannon River	Walla Walla River					Touchet River			
1983																		
63/28/39	0	13	225	22	22	11	51	189	0	0	0	0	533	251	1,556	733	0.86	0.40
63/28/40																		

Appendix C, Table 5. Expanded Coded-wire tag recoveries of summer steelhead released into the Touchet River from fisheries, traps, and hatcheries. (Total returns do not include estimated fish that escaped to the spawning grounds.)

Release Year	Brood year	Total release	Number tagged	Columbia River Recovery Locations				LSRCP Recovery Locations				Total tags	Total est. return to LSRCP	SAR total	SAR to LSRCP area					
				Ocean sport	Col. R. net	Col. R. trib	Col R. trap/hatchery	Lyons Ferry	Snake sport	Snake R. trap/hatchery	Tucannon River					Walla Walla River	Touchet River			
1988																				
63/49/47	1987	170,724	78,260	4	121	377	0	1	174	176	4	0	136	206	696	2,616	1,518	1.53	0.89	
63/49/49																				
63/50/28																				
63/50/30																				
1989																				
63/02/47	1988	158,466	81,103	3	38	195	0	0	346	222	4	47	28	120	767	1,960	1,499	1.24	0.95	
63/02/49																				
63/02/50																				
63/50/52																				
1990																				
63/39/07	1989	109,745	38,904	1	40	114	0	0	60	120	1	2	0	18	201	1,004	567	0.92	0.52	
63/39/08																				
1991																				
63/40/58	1990	148,520	120,198	5	156	438	0	4	924	632	7	58	114	188	2,376	3,121	2,376	2.10	1.60	
63/40/59																				
63/40/60																				
63/40/61																				
63/40/62																				
63/14/56																				
1992																				
63/59/47	1991	95,517	45,354	0	41	91	0	1	141	63	0	5	75	76	493	360	1,038	758	1.09	0.79
1993																				
63/46/49	1992	75,039	40,331	0	61	113	0	6	242	134	1	25	9	167	758	578	1,410	1,075	1.88	1.43
63/59/41																				
1995																				
63/57/14	1994	120,710	60,220	3	90	42	24	0	816	201	0	171	63	168	1,578	1,419	3,163	2,844	2.62	2.36
63/57/15																				
63/57/16																				
1996																				
63/60/30	1995	134,610	78,688	1	51	63	24	1	448	160	0	16	23	29	816	676	1,396	1,156	1.04	0.86
63/60/31																				
1997																				
63/61/21	1996	142,824	59,971	0	13	4	0	0	181	70	0	27	18	10	323	306	769	729	0.54	0.51
63/61/22																				

Appendix C, Table 6. Expanded Coded-wire tag recoveries of summer steelhead released into the Snake River from Lyons Ferry Hatchery from fisheries, traps, and hatcheries. (Total returns do not include estimated fish that escaped to the spawning grounds)

Release Year	Columbia River Recovery Locations			LSRCP Recovery Locations					Total est. return to LSRCP						
	Ocean	Col. R. sport	Col. R. net	Col. R. trib	Col. R. trap/hatchery	Lyons Ferry	Snake sport	Snake trap/hatchery	Tucannon River	Walla Walla River	Touchet River	Total tags to LSRCP	Total est. return to LSRCP	SAR to LSRCP area	
1983															
63/28/58	3	39	252	1	0	89	107	3	0	0	0	494	563	1.01	0.41
1985															
62/16/44	1	58	260	0	4	137	172	5	0	0	0	637	633	1.23	0.61
62/16/45															
1986															
63/33/03	17	159	866	0	4	161	189	3	2	0	0	1,401	355	1.406	0.35
63/33/05															
63/38/36															
63/38/37															
63/38/38															
1987															
63/39/03	1	99	511	0	0	477	321	4	0	0	0	1,413	2,253	1.39	0.79
63/39/13															
63/39/14															
63/39/15															
1988															
63/50/13	14	133	382	0	1	401	552	5	0	0	0	1,488	1,563	1.49	0.96
63/50/14															
63/50/16															
63/50/19															
1989															
63/01/32	0	76	160	0	0	406	387	2	15	0	0	1,046	829	1.09	0.84
63/55/08															
1990															
63/08/42	2	11	126	0	0	80	283	1	0	0	0	503	568	1.31	0.95
63/14/21															
1995															
63/57/28	1	56	40	0	11	674	143	0	0	0	0	925	1,377	2.33	2.06
1996															
63/60/34	0	28	35	77	0	366	81	1	0	0	0	588	448	1.00	0.76
63/60/35															
63/60/36															
1997															
63/62/58	0	8	4	0	0	150	42	1	0	0	0	205	197	0.26	0.24
63/62/59															
63/61/33															
63/61/34															

Appendix C, Table 7. Expanded Coded-wire tag recoveries of steelhead released into the Tucannon River at Curl Lake AP from fisheries, traps, and hatcheries.																					
Release Year	Brood year	Total release	Number tagged	Columbia River Recovery Locations				LSRCP Recovery Locations				Total tags	Total tags to LSRCP	Total return est. to LSRCP	SAR to LSRCP area						
				Ocean sport	Col. R. Col. R. net	Col. R. Col. R. trib	Col. R. Col. R. hatchery	Lyons Ferry sport	Snake Sport	Snake R. trap/hatchery	Tucannon River					Walla Walla River	Touchet River				
1985																					
62/16/29	1984	151,609	75,334	6	30	121	2	0	1	90	1	0	0	0	251	92	505	185	0.33	0.12	
62/16/30																					
1986																					
63/32/02	1985	141,068	80,015	1	29	179	0	0	19	44	2	10	0	0	284	75	501	132	0.35	0.09	
63/33/02																					
63/33/50																					
63/33/51																					
1987																					
63/38/38	1986	162,231	60,705	0	0	45	0	0	81	53	3	0	0	0	182	137	486	366	0.30	0.23	
63/38/45																					
63/39/03																					
1988																					
63/49/41	1987	161,293	59,963	2	3	102	0	0	34	123	4	58	5	0	331	224	890	603	0.55	0.37	
63/49/42																					
63/49/44																					
1989																					
63/50/35	1988	160,131	60,373	0	38	62	0	0	84	67	1	24	0	0	276	176	732	467	0.46	0.29	
63/50/49																					
63/50/50																					
1990																					
63/39/11	1989	79,252	39,596	6	36	139	0	0	27	90	4	0	16	2	320	139	640	278	0.81	0.35	
63/39/12																					
1991																					
63/14/52	1990	120,560	39,932	2	12	40	0	3	25	197	3	28	0	0	310	253	936	764	0.78	0.63	
63/14/55																					
1992																					
63/42/60	1991	70,056	29,255	0	0	8	0	0	22	14	0	3	0	0	47	39	113	93	0.16	0.13	
63/44/12																					
1993																					
63/48/15	1992	49,060	21,894	0	31	53	0	18	77	135	1	28	0	0	343	241	769	540	1.57	1.10	
1994																					
63/54/07	1993	135,359	49,258	0	60	35	4	24	10	78	1	77	0	0	289	166	794	456	0.59	0.34	
63/54/08																					
63/54/09																					
1995																					
63/57/17	1994	146,070	52,645	0	64	27	4	89	120	167	1	91	0	0	566	382	1,570	1,060	1.08	0.73	
63/57/18																					
63/57/48																					
1996																					
63/60/32	1995	139,242	26,652	0	8	1	0	4	20	6	1	7	0	0	47	34	246	178	0.18	0.13	
1997																					
63/63/37	1996	110,005	27,512	0	0	2	0	10	12	13	0	0	0	0	37	25	148	100	0.13	0.09	

Appendix C, Table 8. Expanded Coded-wire tag recoveries of summer steelhead released directly into the Tucannon River at Curl Lake, or 4.8 km above Curl Lake (1984) from fisheries, traps, and hatcheries. (Total returns do not include estimated fish that escaped to the spawning grounds.)

Release Year	Brood year	Total release	Number tagged	Columbia River Recovery Locations					LSRCP Recovery Locations					Total tags to LSRCP	Total est. return	SAR to LSRCP area									
				Ocean	Col. R. sport	Col. R. net	Col. R. trib	Col R. trap/hatchery	Lyons Ferry	Snake sport	Snake trap/hatchery	Tucannon River	Walla Walla River				Touchet River	Total tags to LSRCP	Total est. return to LSRCP	SAR total					
1984																									
63/32/12	1989	195,315	113,600	1	36	401	0	9	12	327	6	0	0	0	0	0	0	792	345	1,362	593	0.70	0.30		
63/32/13																									
63/32/14																									
63/32/15																									
1991																									
63/14/49	1990	40,216	39,734	10	49	82	0	1	85	242	5	63	0	0	0	0	0	537	395	544	400	1.35	0.99		
63/14/50																									
1992																									
63/42/63	1991	30,096	28,952	0	1	24	0	0	26	97	1	5	0	0	0	0	0	154	129	160	134	0.53	0.45		
63/48/16	1992	30,001	29,701	1	71	48	0	13	83	38	1	18	0	0	0	0	0	273	140	276	141	0.92	0.47		

Appendix C, Table 9. Expanded Coded-wire tag recoveries of summer steelhead released directly into the Tucannon River at Marengo Bridge from fisheries, traps, and hatcheries. (Total returns do not include estimated fish that escaped to the spawning grounds.)

Release Year	Brood year	Total release	Number tagged	Columbia River Recovery Locations					LSRCP Recovery Locations					Total tags to LSRCP	Total est. return	SAR to LSRCP area									
				Ocean	Col. R. sport	Col. R. net	Col. R. trib	Col R. trap/hatchery	Lyons Ferry	Snake sport	Snake trap/hatchery	Tucannon River	Walla Walla River				Touchet River	Total tags to LSRCP	Total est. return to LSRCP	SAR total					
1990																									
63/08/38	1989	40,012	39,732	3	11	127	0	4	3	63	3	0	0	0	0	0	0	216	71	218	72	0.54	0.18		
63/08/41																									
1991																									
63/14/44	1990	39,985	39,625	2	50	122	0	0	78	359	11	81	0	3	706	532	712	537	537	712	537	1.78	1.34		
63/14/47																									
1992																									
63/43/01	1991	29,888	29,410	2	9	23	0	0	23	20	0	7	0	0	84	50	85	51	51	85	51	0.29	0.17		
1993																									
63/48/17	1992	29,876	29,518	1	20	49	12	7	64	71	0	29	0	2	255	166	258	168	168	258	168	0.86	0.56		
1996																									
63/60/33	1995	30,464	29,135	0	22	16	8	13	82	37	0	48	0	0	223	167	233	175	175	233	175	0.77	0.57		
63/63/38	1996	29,966	29,604	0	0	4	0	0	36	23	0	6	0	0	69	65	70	66	66	70	66	0.23	0.22		

Appendix D

Adult Summer Steelhead Trapping Data: 1998-2001 from the Tucannon Fish Hatchery Trap, Lower Tucannon River Trap, and the Dayton Trap

Appendix D, Table 1. *Natural origin* summer steelhead trapped at the TFH trap during the 1998, 1999 and 2000 run years.

1998 Run Year				1999 Run Year				2000 Run Year			
Date	Length (cm)	Sex	DNA Sample	Date	Length (cm)	Sex	DNA Sample	Date	Length (cm)	Sex	DNA Sample
02/26	74	M	99AG-1	02/14	76.5	M		06/08	58	F	00AX-99
02/26	79	M	99AG-2	03/29	60	M	AX-84	03/29	57	M	01AA-76
03/01	70	M	99AG-3	03/29	62	M	AX-85	03/29	60	M	01AA-77
03/01	78	F	99AG-4	03/29	68	M	AX-86	04/17	60	M	01AA-78
03/03	63	M	99AG-13	04/06	60	F	AX-87	04/17	55	M	01AA-79
03/17	65	F	99AG-15	04/06	69	F	AX-88	04/17	70	F	01AA-80
03/24	72	F	99AG-16	04/06	63	M	AX-89	04/30	58	M	01AA-81
04/08	70	F	99AG-19	04/06	59	M	AX-90	04/30	64	M	01AA-82
04/08	68	F	99AG-20	04/10	78	F	AX-91	05/03	57	M	01AA-83
04/09	76	M	99AG-22	04/10	60	M	AX-92	05/05	57	M	01AA-84
04/15	57	M	99AG-24	04/10	69	M	AX-93	05/10	64	M	01AA-85
04/15	71	F	99AG-25	04/17	60	M	AX-94				
04/17	82	M	99AG-28	04/18	60	M	AX-95				
04/18	56	F	99AG-31	04/30	69	F	AX-96				
04/21	60	M	99AG-37	05/03	58	F	AX-97				
04/21	56	F	99AG-41	05/15	55	M	AX-98				
04/26	58	F	99AG-38								
05/10	67	F	99AG-39								
05/16	56	M	99AG-40								
05/18	53	F	99AG-42								
05/18	61	F	99AG-44								
05/19	68	F	99AG-45								

Appendix D, Table 2. *Hatchery origin* summer steelhead trapped at TFH trap during the 1998, 1999 and 2000 run years.

1998 Run Year				1999 Run Year				2000 Run Year			
Date	Length (cm)	Sex	DNA Sample	Date	Length (cm)	Sex	DNA Sample	Date	Length (cm)	Sex	DNA Sample
02/23	63.5	M		06/29	53.5	F		08/08	65	F	
02/26	--	F		06/30	57	F		04/12	66	M	
02/26	--	F		07/12	--	F		04/12	62	M	
02/26	--	F		02/14	66	F		04/12	61	M	
02/26	--	F		02/17	61	M					
02/26	--	M		03/28	73	M					
03/01	57	M		03/28	59	M					
03/01	68	F	99AG5	03/28	69	F					
03/01	78	M	99AG6	04/06	58	M					
03/01	66	F	99AG7	04/17	55	M					
03/02	56	M	99AG8								
03/03	58	M	99AG9								
03/03	64	F	99AG10								
03/03	73	F	99AG11								
03/03	55	M	99AG12								
03/04	65	F	99AG14								
03/26	56.5	F	99AG17								
03/26	58	M	99AG18								
04/09	55	F	99AG21								
04/15	71	F	99AG23								
04/15	51	F	99AG26								
04/15	56	M	99AG27								
04/17	57	F	99AG29								
04/17	57.5	M	99AG30								
04/19	54	F	99AG32								
04/19	57	M	99AG33								
04/19	61	M	99AG34								
04/19	60	M	99AG35								
04/19	56	F	99AG36								
05/18	60	F	99AG43								

Appendix D, Table 3. *Natural origin* summer steelhead trapped at the Lower Tucannon River Adult trap during the 1999 and 2000 run years.

1999 Run Year				2000 Run Year			
Date	Length (cm)	Sex	DNA Sample	Date	Length (cm)	Sex	DNA Sample
10/22	65	M	99IB1	11/02	69.5	F	01AA1
10/28	58	M	99IB2	01/16	74.5	F	01AA6
11/25	60	M	99IB4	01/26	60	M	01AA8
12/18	63.5	M		02/03	84	F	01AA9
12/18	68.5	F		02/03	83	M	01AA10
02/10	76	F		02/04	66	M	01AA11
02/21	63.5	F		02/05	--	F	
02/21	76	M		02/11	55	M	01AA14
02/21	76	M		02/13	77.5	M	01AA15
02/21	66	M		02/15	58	F	01AA17
02/21	66	M		02/19	80	M	01AA18
02/22	--	F		02/20	57.5	F	01AA20
02/22	--	F		02/20	58.5	M	01AA21
02/22	--	M		02/21	78.5	F	01AA23
02/22	--	M		02/21	74	F	01AA22
02/23	--	M		02/21	--	F	
02/23	--	M		02/22	71	F	01AA25
02/23	--	F		02/22	68.5	M	01AA26
02/23	--	F		02/22	82	M	01AA27
02/25	61	F		02/23	74.5	F	01AA28
02/27	--	F		02/23	67.5	F	01AA29
02/27	--	F		02/24	63	M	01AA30
02/27	--	F		02/24	71.5	M	01AA31
02/27	--	F		02/25	70	F	01AA32
02/27	--	M		02/25	76	F	01AA33
02/27	--	M		02/26	73.5	M	01AA34
02/27	--	M		02/26	71.5	F	01AA35
02/27	--	M		03/01	69	F	01AA36
02/29	--	F		03/02	71	F	01AA37
02/29	--	F		03/02	77	M	01AA38
03/02	--	F		03/03	75	M	01AA39
03/02	--	F		03/04	68	F	01AA40
03/03	--	F		03/04	64	M	01AA41
03/03	--	F		03/06	60	M	01AA42
03/03	--	F		03/06	73	M	01AA43

Appendix D, Table 4. *Hatchery origin* summer steelhead trapped at the Lower Tucannon River Adult Trap during the 1999 and 2000 run years.

1999 Run Year				2000 Run Year			
Date	Length (cm)	Sex	DNA Sample	Date	Length (cm)	Sex	DNA Sample
11/14	65	M		11/04	56.5	F	
11/25	57	F		02/05	67	M	
01/10	56	M		02/05	59	M	
01/18	60	F		02/05	70	M	
02/21	--	M		02/05	66.5	F	
02/21	--	F		02/22	64	M	
02/22	--	M		02/22	68	F	
02/23	--	M		02/23	65	F	
02/23	--	F		02/24	71	F	
02/23	--	M		02/27	65	F	
02/27	--	M		02/27	64	M	
02/27	--	M		03/05	66	F	
02/27	--	M		03/05	61	M	
02/27	--	M		03/06	73.5	M	
02/27	--	M					
02/27	--	F					
02/27	--	F					
02/28	--	F					
02/28	--	F					
02/29	--	F					
03/01	--	F					
03/02	--	F					
03/03	--	M					
03/03	--	F					
03/03	--	F					
03/03	--	F					

Appendix D, Table 5. *Natural origin* summer steelhead trapped at the Touchet Adult trap during the 1998 and 1999 run years.

1998 Run Year				1999 Run Year			
Date	Length (cm)	Sex	DNA Sample	Date	Length (cm)	Sex	DNA Sample
2/23	69	F	99AH1	3/14	70	F	
3/08	56	M	99AH2	3/14	78	M	
3/11	73	M	99AH3	3/14	54.5	M	
3/15	72	F	99AH4	3/15	--	F	
3/16	71.5	F	99AH5	4/06	74	M	
3/16	66	F	99AH6	4/12	65	F	
3/16	66.5	M	99AH7	4/12	61	M	
3/16	70	F	99AH8	4/12	60	M	
3/16	61	F	99AH9	4/12	72.5	F	
3/18	59	M	99AH10	4/13	54	F	
3/19	64	F	99AH11	4/13	61	F	
3/20	76	M	99AH12	4/13	60	F	
3/20	62	M	99AH13	4/14	59	M	
3/22	72	F	99AH14	4/15	63.5	F	
3/22	61.5	F	99AH15	4/17	56	F	
3/24	60	F	99AH16				
3/24	56	F	99AH17				
4/01	71	F	99AH18				
4/02	61.5	F	99AH19				
4/06	66.5	F	99AH20				
4/07	66	F	99AH21				
4/07	61	M	99AH22				
4/08	70.5	F	99AH23				
4/08	58	M	99AH24				
4/10	59.5	F	99AH25				
4/14	79.5	F	99AH26				
4/15	60	F	99AH27				
4/15	61.5	F	99AH28				
4/15	59	M	99AH29				
4/15	72.5	F	99AH30				

Appendix D, Table 5 (continued). *Natural origin* summer steelhead trapped at the Touchet Adult trap during the 2000 run year.

Date	Length (cm)	Sex	DNA Sample	Date	Length (cm)	Sex	DNA Sample	Date	Length (cm)	Sex	DNA Sample
3/19	74.5	F	01AT01	3/25	73	F	01AT50	4/07	61	F	01AT96
3/20	60	F	01AT02	3/25	72	F	01AT51	4/07	62	M	01AT97
3/20	56	F	01AT03	3/25	74	F	01AT52	4/10	57	F	01AT98
3/20	68	F	01AT04	3/25	60	F	01AT53	4/13	76	F	01AT99
3/20	62	F	01AT05	3/25	77	M	01AT54	4/13	70.5	F	01AT100
3/20	67	F	01AT06	3/25	70	F	01AT55	4/13	61	M	
3/20	61.5	M	01AT07	3/25	69	F	01AT56	4/13	58.5	F	
3/20	64	F	01AT08	3/25	53	M	01AT57	4/13	69.5	F	
3/20	58	M	01AT09	3/25	53	F	01AT58	4/13	56.5	F	
3/20	62	M	01AT10	3/25	60	F	01AT59	4/13	55.5	F	
3/20	66	M	01AT11	3/25	71	F	01AT60	4/13	65.5	F	
3/20	59.5	M	01AT12	3/25	56	F	01AT61	4/14	57	M	
3/20	72.5	F	01AT13	3/25	63	F	01AT62	4/14	66	F	
3/20	71	F	01AT14	3/25	69	F	01AT63	4/15	53	F	
3/20	79	M	01AT15	3/25	58	M	01AT64	4/15	71	F	
3/20	60.5	F	01AT16	3/25	57	M	01AT65	4/15	58	M	
3/20	73.5	F	01AT17	3/25	63	M	01AT66	4/16	64.5	M	
3/20	64.5	M	01AT18	3/26	55.5	F	01AT67	4/16	53	F	
3/20	56.5	F	01AT19	3/26	67	F	01AT68	4/16	61.5	M	
3/20	57	F	01AT20	3/26	67.5	F	01AT69	4/16	58	F	01AT101
3/20	72.5	M	01AT21	3/28	54	M	01AT70	4/16	55.5	M	
3/21	59.5	M	01AT22	3/28	74	F	01AT71	4/16	59	F	01AT102
3/22	56	M	01AT23	3/28	60	F	01AT72	4/16	56	M	01AT103
3/22	65	M	01AT24	3/28	--	F		4/16	55.5	F	01AT104
3/22	60	M	01AT25	3/28	--	F		4/17	73	F	
3/22	57	F	01AT26	3/29	56	F	01AT73	4/17	57	F	01AT105
3/22	61	M	01AT27	3/29	73.5	F	01AT74	4/17	57	F	
3/23	54	F	01AT28	3/29	59	M	01AT75	4/17	56	F	01AT106
3/23	56	M	01AT29	3/29	66	F	01AT76	4/17	75.5	F	01AT107
3/23	63	F	01AT30	3/29	74	F	01AT77	4/17	69	F	01AT108
3/23	52	F	01AT31	3/30	64	M	01AT78	4/17	77.5	M	01AT109
3/23	62	F	01AT32	3/30	64	F	01AT79	4/17	58.5	F	01AT110
3/23	55	F	01AT33	3/30	64	F	01AT80	4/17	67	F	
3/23	63.5	F	01AT34	3/31	--			4/17	74.5	M	
3/23	60.5	M	01AT35	4/01	59	F	01AT81	4/17	71	F	
3/23	69	M	01AT36	4/01	58.5	F	01AT82	4/17	58	M	
3/24	58	F	01AT37	4/01	56	M	01AT83	4/17	70.5	F	
3/24	64	F	01AT38	4/01	56.5	F	01AT84				
3/24	68	F	01AT39	4/01	65	F	01AT85				
3/24	61	F	01AT40	4/01	56	M	01AT86				
3/24	55	M	01AT41	4/02	71	F	01AT87				
3/24	73	F	01AT42	4/02	59	M	01AT88				
3/24	70	M	02AT43	4/02	69	F	01AT89				
3/24	52	F	01AT44	4/02	64	M	01AT90				
3/24	69	F	01AT45	4/02	57	F	01AT91				
3/25	74	F	01AT46	4/02	61	M	01AT92				
3/25	68	F	01AT47	4/06	62	F	01AT93				
3/25	77	F	01AT48	4/07	74	F	01AT94				
3/25	69	F	01AT49	4/07	71	M	01AT95				

Appendix D, Table 6. *Hatchery origin* summer steelhead trapped at Touchet River trap during the 1998, 1999 and 2000 run years.

1998 Run Year			1999 Run Year			2000 Run Year		
Date	Length (cm)	Sex	Date	Length (cm)	Sex	Date	Length (cm)	Sex
03/15	59	M	03/28	62.5	M	05/22	60.5	F
03/22	61.5	M	04/14	--	M	05/23	64	F
03/24	61	M	05/04	--	M	06/07	61	F
04/08	54.5	F	05/17	--	M	06/16	63	F
04/13	56	F				06/24	65.5	F
04/15	61	M				06/25	73	F
04/15	61	M				03/20	56	M
						03/21	70	M
						03/23	63.5	F
						03/24	63	F
						03/25	67	F
						03/25	58	F
						03/25	57	M
						03/26	73	F
						03/26	61	M
						03/28	56.5	F
						04/01	58	M
						04/01	68	F
						04/01	62	M
						04/01	73	F
						04/06	53	F
						04/16	56	M
						04/17	61	F
						04/17	61	M
						04/18	63	F
						04/18	70	F
						04/18	60	M
						04/19	52	F
						04/20	55.5	M
						04/22	58	F
						04/23	71	M
						04/23	61	M
						04/24	60.5	M
						04/26	--	M
						04/27	64.5	M
						04/27	62	M
						05/05	64	M

Appendix E

Summary of Coded-Wire Tagged Summer Steelhead Trapped at LFH in 1998, 1999, and 2000

Appendix E, Table 1. Summary of tagged adult steelhead trapped at LFH in 1998.

Brood year	Freeze brand	CWT code	Stock	Release site	Number of tags
1994	LA-IJ-1	63/57/18	LFH	Tucannon River	1
				Total	1
1995	LA-IV-1	63/60/30	LFH	Touchet River	31
	LA-IV-3	63/60/31	LFH	Touchet River	26
	RA-IV-3	63/60/32	LFH	Tucannon River	3
	RA-IV-1	63/60/33	LFH	Tucannon River	14
	RA-IT-1	63/60/34	LFH	Lyons Ferry	17
	LA-IT-3	63/60/35	LFH	Lyons Ferry	18
	LA-IT-1	63/60/36	LFH	Lyons Ferry	19
				Total	128
1996	None	07/53/30		Big Canyon Creek - Wallowa R.	1
	None	09/18/32		Little Sheep Creek - Imnaha R.	1
	None	10/52/10		McNabb Point - Salmon R.	1
	LA-IC-1	63/61/21	LFH	Touchet River	90
	LA-IC-3	63/61/22	LFH	Touchet River	64
	RA-I-C3	63/63/37	LFH	Tucannon River	12
	RA-I-C1	63/63/38	LFH	Tucannon River	35
	RA-S-1	63/61/33	LFH	Lyons Ferry	29
	RA-S-2	63/61/34	LFH	Lyons Ferry	28
	LA-S-1	63/62/58	LFH	Lyons Ferry	31
	LA-S-2	63/62/59	LFH	Lyons Ferry	38
				Total	330
1997	RA-H-1	63/01/08	LFH	Lyons Ferry	1
				Total	1
				Lost Tags, No Tags, Not Sampled and Unreadable Tags	23
				Total	23
GRAND TOTAL					483

Appendix E, Table 2. Summary of tagged and untagged adult steelhead trapped at LFH in 1999.

Brood year	Freeze brand	CWT code	Stock	Release site	Number of tags
1996	LA-IC-1	63/61/21	LFH	Touchet River	17
	LAIC-3	63/61/22	LFH	Touchet River	9
	RA-IC-1	63/63/38	LFH	Tucannon River	2
	RA-S-1	63/61/33	LFH	Lyons Ferry	7
	RA-S-2	63/61/34	LFH	Lyons Ferry	5
	LA-S-1	63/62/58	LFH	Lyons Ferry	7
	LA-S-2	63/62/59	LFH	Lyons Ferry	4
Total					51
1997	None	10/21/37		Shoup Bridge (Salmon River)	1
	RA-7U-1	63/04/23	LFH	Touchet River	96
	LA-7U-1	63/04/24	LFH	Touchet River	117
	LA-IJ-1	63/61/29	LFH	Tucannon River	49
	LA-IJ-3	63/61/30	LFH	Tucannon River	44
	RA-IJ-1	63/61/27	LFH	Grande Ronde River	1
	LA-H-1	63/01/07	LFH	Lyons Ferry	96
	LA-H-2	63/63/59	LFH	Lyons Ferry	119
	RA-H-1	63/01/08	LFH	Lyons Ferry	101
	RA-H-2	63/01/09	LFH	Lyons Ferry	92
Total					716
1998	RA-IV-1	63/10/03	LFH	Lyons Ferry	2
	LA-IV-3	63/10/04	LFH	Lyons Ferry	1
Total					3
Lost Tags, No Tags, Not Sampled and Unreadable Tags					56
Total					56
GRAND TOTAL					826

Appendix E, Table 3. Summary of tagged and untagged adult steelhead trapped at LFH in 2000.

Brood year	Freeze brand	CWT code	Stock	Release site	Number of tags
1996	None	09/24/45		Snake River (Bonneville Research)	1
	LA-IC-1	63/61/21	LFH	Touchet River	1
	LA-S-1	63/62/58	LFH	Lyons Ferry	1
Total					3
1997	None	10/45/57		Pahsimeroi Hatchery	1
	None	10/46/08		Sawtooth Hatchery	1
	None	10/45/60		Snake R. - Hells Canyon Dam	1
	LA-7U-1	63/04/24	LFH	Touchet River	31
	RA-7U-1	63/04/23	LFH	Touchet River	47
	LA-IJ-1	63/61/29	LFH	Tucannon River	22
	LA-IJ-3	63/61/30	LFH	Tucannon River	20
	LA-H-1	63/01/07	LFH	Lyons Ferry	41
	LA-H-2	63/63/59	LFH	Lyons Ferry	29
	RA-H-1	63/01/08	LFH	Lyons Ferry	33
	RA-H-2	63/01/09	LFH	Lyons Ferry	38
	Total				
1998	None	10/52/47		Hammer Creek (Salmon River)	1
	None	10/54/05		Shoup Bridge (Salmon River)	1
	None	10/52/58		Sawtooth Hatchery	1
	None	10/53/02		Sawtooth Hatchery	1
	None	09/25/61		Little Sheep cr. (Imnaha River)	1
	RA-IT-1	63/10/01	LFH	Tucannon	62
	RA-IT-3	63/04/60	LFH	Grande Ronde River	5
	LA-IV-1	63/10/02	LFH	Lyons Ferry	76
	LA-IV-3	63/10/04	LFH	Lyons Ferry	82
	RA-IV-1	63/10/03	LFH	Lyons Ferry	60
	RA-IV-3	63/10/05	LFH	Lyons Ferry	72
	Total				
1999	None	105425		Snake R. - Hells Canyon Dam	1
Total					1
Lost Tags, No Tags, Not Sampled and Unreadable Tags					10
Total					10
GRAND TOTAL					640

Appendix F

Coded-Wire Tag Expansions for Summer Steelhead Recovered in LSRCP Rivers in SE Washington for the 1998/1999 and 1999/2000 Steelhead Seasons

Appendix F: Table 1. Coded-wire tag expansions¹ for the fall 1998 and spring 1999 based on harvest estimates from punch card returns.

RIVER	SECTION										
Snake River	228	Highway 12 Interstate Bridge in Clarkston to Oregon Border									
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	91	204	47	0	0	0		Number		
Harvest	7	1134	1093	295	92	26	0		of	Estimated	
Sample rate	0.000	0.080	0.187	0.159	0.000	0.000	0.000	CWT	Tags	harvest	
		1	1					7/11/59	2	18	
		1	2					7/11/61	3	23	
			2					7/11/62	2	11	
		1	2					7/11/63	3	23	
			1					7/12/16	1	5	
		2						7/12/17	2	25	
			2					7/53/30	2	11	
			2					9/18/25	2	11	
		1	2					9/18/26	3	23	
		1	1					9/18/27	2	18	
		1	1					9/18/28	3	24	
		1	1					9/18/29	2	18	
			1					9/18/30	1	5	
			1					9/18/32	1	5	
			1					9/18/33	1	5	
			2					10/35/09	2	11	
			1	1				10/35/15	1	5	
	1							10/51/46	1	13	
	1							10/52/19	1	13	
	1							63/61/33	1	13	
	1							63/63/37	1	13	
	2		1					63/63/39	3	30	
	8		5					No Tag	14	133	
Snake River	252	Lower Granite Dam upstream to Highway 12 Interstate Bridge in Clarkston									
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	50	32	1	0	0	0				
Harvest	37	565	535	114	74	48	26		Tags	Estimated	
Sample rate	0.000	0.088	0.060	0.009	0.000	0.000	0.000	CWT	recovered	harvest	
		1						5/31/44	1	11	
			1					10/35/14	1	17	
			1					10/35/15	1	17	
		1						63/60/34	1	11	
		1						63/61/21	1	11	
			1					63/61/22	1	17	
		1						63/62/58	1	11	
			1					63/63/38	1	17	
Snake River	167	Little Goose Dam upstream to Lower Granite Dam									
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	1	11	36	28	0	3	1				
Harvest	4	114	170	103	44	78	18		Tags	Estimated	
Sample rate	0.250	0.096	0.212	0.272	0.000	0.038	0.056	CWT	recovered	harvest	
				1				5/24/58	1	4	
				2				5/32/12	2	7	
			1					5/31/45	1	5	
				1				10/45/30	1	4	
				1				10/52/03	1	4	
			2					63/60/30	2	9	
			1					63/60/31	1	5	
			2					63/61/21	2	9	
				1				63/61/22	1	4	
				1				63/61/33	1	4	
		1						63/62/59	1	10	
¹ Sample rate of <0.05 considered too small for reliable expansions.											

Appendix F: Table 1 continued. Coded-wire tag expansions¹ for the fall 1998 and spring 1999 based on harvest estimates from punch card returns.

RIVER	SECTION										
Snake River	166							Lower Monumental Dam upstream to Little Goose Dam			
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	8	188	58	31	0	1	10				
Harvest	81	798	524	225	192	192	63				
Sample rate	0.099	0.236	0.111	0.138	0.000	0.005	0.159				
								CWT	Tags recovered	Estimated harvest	
								5/24/60	1	4	
								5/42/06	1	4	
								5/42/07	1	4	
								7/11/61	1	4	
								7/53/30	1	4	
								9/18/28	1	4	
								9/18/29	1	7	
				1				9/18/30	1	4	
								9/18/32	1	9	
		2	1					10/20/29	3	17	
							1	10/30/53	1	6	
								10/35/09	1	4	
								10/35/10	1	4	
								10/35/14	2	8	
								10/45/37	1	4	
								10/51/05	1	4	
								10/51/46	1	7	
								10/51/47	1	7	
								10/51/54	1	4	
	1							10/51/59	1	10	
								10/52/05	1	4	
								10/52/13	1	4	
								63/60/30	1	4	
								63/61/21	2	18	
								63/61/22	1	4	
								63/62/58	1	4	
								1 63/63/39	1	6	
		3						No Tag	3	13	
Snake River	165							Ice Harbor Dam upstream to Lower Monumental Dam			
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	1	24	26	45	0	1	0				
Harvest	15	162	351	377	15	26	7				
Sample rate	0.067	0.148	0.074	0.119	0.000	0.038	0.000				
								CWT	Tags recovered	Estimated harvest	
								5/41/51	1	14	
								9/18/29	1	7	
								10/30/53	2	22	
								10/45/33	1	8	
								10/51/04	1	7	
								10/52/19	1	8	
								63/61/22	1	8	
								No Tag	1	8	
Tucannon River	189							Mouth of Tucannon River (HWY 261 Bridge) upstream			
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	9	2	9	9	0	0				
Harvest	3	89	42	54	42	38	19				
Sample rate	0.000	0.101	0.048	0.167	0.214	0.000	0.000				
								CWT	Tags recovered	Estimated harvest	
								63/60/33	3	24	
								63/61/21	3	21	
								63/63/38	1	6	

¹ Sample rate of <0.05 considered too small for reliable expansions.

Appendix F: Table 1 continued. Coded-wire tag expansions ¹ for the fall 1998 and spring 1999 based on harvest estimates from punch card returns.

RIVER	SECTION										
Snake River	164 Snake River Mouth upstream to Ice Harbor Dam										
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	0	0	0	0	0	0				
Harvest	0	0	18	26	4	0	0		Tags recovered	Estimated harvest	
Sample rate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	CWT	0	0	
Touchet River	185 Mouth of Touchet River (Walla Walla River) upstream										
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	0	0	0	1	1	2				
Harvest	0	3	0	0	3	16	16		Tags recovered	Estimated harvest	
Sample rate	0.000	0.000	0.000	0.000	0.333	0.063	0.125	CWT	63/61/21	1	3
					1						
Mill Creek	106 Mouth of Mill Creek (Walla Walla River) upstream										
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	0	0	0	0	0	0				
Harvest	0	3	0	0	10	0	3		Tags recovered	Estimated harvest	
Sample rate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	CWT	0	0	
Walla Walla	194 Mouth of the Walla Walla River upstream to the Oregon Border										
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	5	4	5	7	0	0				
Harvest	0	81	73	29	57	26	16		Tags recovered	Estimated harvest	
Sample rate	0.000	0.062	0.055	0.172	0.123	0.000	0.000	CWT	63/61/21	1	18
McNary Pool	45 Oregon Border (McNary Pool) to the Highway 395 Bridge in Pasco										
Columbia River	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	1	46	13	2	0	0	0				
Harvest	11	638	649	147	21	8	0		Tags recovered	Estimated harvest	
Sample rate	0.091	0.072	0.020	0.014	0.000	0.000	0.000	CWT			
		1							5/32/12	1	14
		1							5/40/06	1	14
		1							5/41/51	1	14
		1							10/20/29	1	14
		1							10/35/15	1	14
		1							10/52/21	1	14

¹ Sample rate of <0.05 considered too small for reliable expansions.

Appendix F: Table 2. Coded-wire tag expansions¹ for the fall 1999 and spring 2000 based on harvest estimates from punch card returns.

RIVER										
Snake River	228	Highway 12 Interstate Bridge in Clarkston to Oregon Border								
	Sept	Oct	Nov	Dec	Jan	Feb	Mar		Tags recovered	Estimated harvest
Sample size	0	80	43	59	17	0	0			
Harvest	185	1267	1032	374	178	35	3			
Sample rate	0.000	0.063	0.042	0.158	0.096	0.000	0.000	CWT		
			1					5/41/49	1	1
		1						5/42/07	1	16
				1				7/11/61	1	6
		1						7/12/47	1	16
				1				7/48/60	1	6
		1						9/18/26	1	16
				1				9/23/23	1	6
		1						9/23/24	2	22
				1				9/23/25	1	16
		2	2					9/23/26	4	34
		2						9/23/29	2	32
		1						9/23/30	1	16
		1						9/23/31	1	16
		1						10/21/38	1	16
		1						10/45/03	1	16
					1			10/45/53	1	10
		1						40/46/63	1	16
			1					63/01/08	1	1
		1	1					63/61/28	2	17
			2					63/61/29	2	2
		4	1					63/61/30	5	65
			1	1				63/63/39	2	7
Snake River	252	Lower Granite Dam upstream to Highway 12 Interstate Bridge in Clarkston								
	Sept	Oct	Nov	Dec	Jan	Feb	Mar		Tags recovered	Estimated harvest
Sample size	1	38	9	3	0	0	0			
Harvest	374	752	538	224	101	87	90			
Sample rate	0.003	0.051	0.017	0.013	0.000	0.000	0.000	CWT		
				1				5/41/49	1	1
		1						5/41/51	1	20
		1						5/41/53	1	20
		1						10/21/29	1	20
			1					63/01/07	1	1
		1						63/04/23	1	20
Snake River	167	Little Goose Dam upstream to Lower Granite Dam								
	Sept	Oct	Nov	Dec	Jan	Feb	Mar		Tags recovered	Estimated harvest
Sample size	2	45	79	25	10	0	0			
Harvest	35	409	434	294	122	161	196			
Sample rate	0.057	0.110	0.182	0.085	0.082	0.000	0.000	CWT		
		1						10/21/38	1	9
					1			10/21/39	1	12
				1				10/47/80	1	12
		1	1					63/01/07	2	15
		1	1					63/01/08	2	15
			2					63/04/23	2	11
	1							63/04/24	1	18
		1	1					63/31/29	2	15
			1					63/61/30	1	6
		1						63/63/38	1	9
	1		1					63/63/59	2	23
			1					Lost	1	5
			1	1				No tag	2	17

¹ Sample rate of <0.05 considered too small for reliable expansions.

Appendix F: Table 2 continued. Coded-wire tag expansions¹ for the fall 1999 and spring 2000 based on harvest estimates from punch card returns.

RIVER	SECTION									
Snake River	166 Lower Monumental Dam upstream to Little Goose Dam									
	Sept	Oct	Nov	Dec	Jan	Feb	Mar			
Sample size	139	164	54	26	11	0	1			
Harvest	689	1263	511	427	164	87	42			
Sample rate	0.202	0.130	0.106	0.061	0.067	0.000	0.024			
								CWT	Tags recovered	Estimated harvest
		1						05/39/63	1	8
		2						05/41/50	2	15
	1							05/41/53	1	5
			1					05/41/56	1	9
	1							05/42/07	1	5
		1						07/12/47	1	8
			1					09/18/36	1	9
	1							09/23/23	1	5
	1							09/23/25	1	5
	1							09/23/29	1	5
		1						10/21/30	1	8
	1							10/21/35	1	5
	1	1						10/21/41	2	13
		1						10/21/46	1	8
		2						10/46/63	2	15
				1				10/47/06	1	16
		1						10/52/25	1	8
				1				10/52/28	1	16
	1							63/01/07	1	5
	1							63/01/08	1	5
	5				1			63/04/23	6	40
	3	2						63/04/24	5	30
			2					63/61/27	2	19
		1						63/61/28	1	8
	1	1						63/61/29	2	13
	1	2						63/61/30	3	20
		1						63/63/59	1	8
		2	1					Lost	3	25
	1							No Tag	1	5
Snake River	165 Ice Harbor Dam upstream to Lower Monumental Dam									
	Sept	Oct	Nov	Dec	Jan	Feb	Mar			
Sample size	10	19	13	21	3	0	0			
Harvest	122	374	371	406	84	56	3			
Sample rate	0.082	0.051	0.035	0.052	0.036	0.000	0.000			
				1				CWT	Tags recovered	Estimated harvest
				1				05/41/47	1	19
				1				05/41/49	1	19
			1					09/23/27	1	1
				1				10/46/14	1	19
		1						10/47/20	1	20
	1							63/04/23	1	12
			1					63/04/24	1	1
Tucannon River	189 Mouth of Tucannon River (HWY 261 Bridge) upstream									
	Sept	Oct	Nov	Dec	Jan	Feb	Mar			
Sample size	3	27	26	51	13	0	0			
Harvest	22	294	285	325	169	27	18			
Sample rate	0.136	0.092	0.091	0.157	0.077	0.000	0.000			
				3				CWT	Tags recovered	Estimated harvest
				3				63/04/23	3	19
			2	1	2			63/04/24	5	54
				1				63/61/21	1	6
		2	2	1	1			63/61/29	6	63
	1		1	1				63/61/30	3	25
		1						63/63/59	1	11
				1				Lost	1	6
			1	1				No Tag	2	17
¹ Sample rate of ≤ 0.05 considered too small for reliable expansions.										

Appendix F: Table 2 continued. Coded-wire tag expansions ¹ for the fall 1999 and spring 2000 based on harvest estimates from punch card returns.

RIVER	SECTION										
Snake River	164 Snake River Mouth upstream to Ice Harbor Dam										
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	0	0	0	0	0	0				
Harvest	0	10	14	10	3	3	0		Tags recovered	Estimated harvest	
Sample rate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	CWT	0	0	
Touchet River	185 Mouth of Touchet River (Walla Walla River) upstream										
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	0	0	4	3	1	2				
Harvest	0	0	3	27	33	27	60		Tags recovered	Estimated harvest	
Sample rate	0.000	0.000	0.000	0.148	0.091	0.037	0.033	CWT	63/61/21	1	7
				1					63/04/23	2	18
				1	1				63/04/24	1	7
Mill Creek	106 Mouth of Mill Creek (Walla Walla River) upstream										
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	0	0	0	1	0	0	0				
Harvest	0	0	0	3	0	0	0		Tags recovered	Estimated harvest	
Sample rate	0.000	0.000	0.000	0.333	0.000	0.000	0.000	CWT	0	0	
Walla Walla	194 Mouth of the Walla Walla River upstream to the Oregon Border										
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	4	15	6	11	0	0	1				
Harvest	83	160	90	113	50	27	10		Tags recovered	Estimated harvest	
Sample rate	0.048	0.094	0.069	0.097	0.000	0.000	0.100	CWT	63/04/23	3	32
		3							63/04/24	2	21
		2							Lost	1	1
McNary Pool Columbia River	45 Oregon Border (McNary Pool) to the Highway 395 Bridge in Pasco										
	Sept	Oct	Nov	Dec	Jan	Feb	Mar				
Sample size	4	25	0	0	0	0	0				
Harvest	183	909	421	51	16	10	0		Tags recovered	Estimated harvest	
Sample rate	0.022	0.028	0.000	0.000	0.000	0.000	0.000	CWT	Lost	2	2
		2									

¹ Sample rate of <0.05 considered too small for reliable expansions.

Appendix F: Table 3. Coded-wire tag expansions¹ for the 1997/1998, 1998/1999 and 1999/2000 steelhead seasons in the Washington portion of the **Grande Ronde River** based on harvest estimates from punch card returns.

1997/1998												
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr		Tags	Estimated	
Sample size	0	18	59	38	18	97	193	34		recovered	harvest	
Harvest	40	750	1062	636	398	608	865	235				
Sample rate	0.000	0.024	0.056	0.060	0.045	0.160	0.223	0.145	CWT			
			1						7/09/20	1	18	
				1		1			7/11/59	2	23	
			2			2			7/11/60	4	49	
				1		1			7/11/62	2	23	
			1						7/11/63	1	18	
		1	1			2			7/12/16	4	32	
						1			7/58/22	1	6	
			1						7/58/24	1	18	
	1		1	2	1	2	2		no tag	9	75	
1998/1999												
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr		Tags	Estimated	
Sample size	0	5	8	15	8	54	130	63		recovered	harvest	
Harvest	0	208	178	139	133	17	504	127				
Sample rate	0.000	0.024	0.045	0.108	0.060	0.309	0.258	0.496	CWT			
					1	2			7/11/60	2	6	
									9/18/25	1	17	
								1	9/18/26	1	2	
			1			1			9/18/27	1	4	
					1				9/18/29	1	17	
		1				2	3	3	63/63/39	9	25	
							2	1	no tag	3	10	
1999/2000												
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr		Tags	Estimated	
Sample size	2	8	21	20	26	71	122	60		recovered	harvest	
Harvest	11	296	247	211	137	281	806	84				
Sample rate	0.182	0.027	0.085	0.095	0.190	0.253	0.151	0.714	CWT			
		1							7/12/47	1	1	
			1						9/23/24	1	12	
						1			9/23/26	1	4	
					1				9/23/27	1	5	
							1		9/23/30	1	7	
	1					1	2		9/23/31	2	9	
		1	1		1	3	2	1	63/61/27	9	45	
		1				4		5	63/61/28	12	37	
								3	63/63/39	3	4	
						1			no tag	1	4	

¹ Sample rate of ≤ 0.05 considered too small for reliable expansions.

Appendix G

Summary of Steelhead Spawning Ground Surveys in the Tucannon and Touchet Rivers, and Asotin Creek in 1999, 2000, and 2001

Appendix G, Table 1. Results of summer steelhead redd surveys in Asotin Creek, 1999.

Stream	Rkm	Dates Surveyed	Redds Counted	Total Redds	Expanded # of Redds ^a	Percent of Reach Surveyed	Total Estimated Redds for Reach
Mainstem (Totals)	11.7			44	78	75.7	103
Hoods Trailer, 9 3.2 road km	3.40	3/9, 3/16, 4/01, 4/09, 5/05	5, 4, 0, 5, 3	17	17		
Headgate Park, 9 1.6 road km	1.90	3/9, 3/16, 4/01, 4/09, 5/05	1, 1, 4, 3, 0	9	9		
Confluence Bridge, 9 1.6 road km	1.60	4/13	8	8	23		
3.2 km 9 Confluence Bridge, 9 1.6 km	1.60	4/13	5	5	14		
5.6 km 8 Cloverland Rd Br, 9 1.6 km	1.60	4/13	3	3	9		
2.4 km 8 Cloverland Rd Br, 9 1.6 km	1.60	4/13	2	2	6		
North Fork (Totals)	4.9			43	44	41.5	106
4.8 km 8 Lick Creek, 9 1.65 km	1.65	3/25, 3/31, 4/08, 5/05	1, 1, 5, 6	13	13		
1.6 km 8 Lick Creek, 9 1.65 km	1.65	3/16, 3/25, 3/31, 4/08, 5/05	4, 1, 3, 10, 5	23	23		
Upper Forest Service Fence, 9 1.6 km	1.60	5/06	7	7	8		
South Fork (Totals)	4.8			17	18	41.0	40
3.2 km 8 mouth, 9 1.6 km	1.6	3/31, 4/08, 4/13, 5/05	4, 3, 3, 1	11	11		
Old homestead Chimney, 9 1.6 km	1.6	5/06	5	5	6		
Schlee Bridge, 9 1.6 km	1.6	5/06	1	1	1		
Charley Creek (Totals)	8.0			17	19	71.8	24
Old Dam to Asotin Creek Road	4.9	3/25, 3/31, 4/09, 4/27	3, 3, 8, 1	15	15		
State land Fence, 9 to old dam	3.1	5/05	2	2	4		

^a Expanded number of redds were calculated for "final" walks only, index areas are not expanded. Expanded redds calculated by multiplying the redd erasure rate derived from index areas which area as follows: Mainstem = 2.89, North Fork = 1.125, South Fork = 1.22, Charley Cr = 1.875.

Appendix G, Table 2. Results of summer steelhead redd surveys in Asotin Creek, 2000.

Stream	Rkm	Dates Surveyed	Redds Counted	Total Redds	Expanded # of Redds ^a	Percent of Reach Surveyed	Total Estimated Redds for Reach
Mainstem (Totals)	13.1			36	53	84.5	62
Confluence Bridge to Charley Creek	3.2	3/24, 5/03	5, 1	6	6		
Hood Trailer, 9 3.2 km	3.2	3/24, 5/10	9, 1	10	10		
6.4 km 8 Cloverland Rd Br, 9 1.6 km	1.6	3/24, 5/10	9, 0	9	9		
Charley Creek, 9 1.6 km	1.6	5/04	4	4	10		
3.2 km 9 Hood Trailer, 9 1.9 km	1.9	5/10	4	4	10		
4.8 km 8 Cloverland Rd Br, 9 1.6 km	1.6	5/10	3	3	8		
North Fork (Totals)	4.9			21	21	41.5	51
4.8 km 8 Lick Creek, 9 1.65 km	1.65	4/12	6	6	6		
1.65 km 8 Lick Creek, 9 1.65 km	1.65	3/24, 4/12	3, 6	9	9		
Upper Forest Service Fence, 9 1.6 km	1.60	5/05	6	6	6		
South Fork (Totals)	6.4			21	22	60.4	39
3.2 km 8 mouth, to mouth	3.2	3/24, 4/12, 4/24, 5/03	3, 8, 3, 3	17	17		
Schlee Bridge, 8 1.6 km	1.6	4/24	1	1	1		
Schlee Bridge, 9 1.6 km	1.6	4/24	3	3	4		
Charley Creek (Totals)	8.0			16	16	77.7	21
State land fence to Asotin Creek Road	8.0	4/7, 4/24	15, 1	16	16		

^a Expanded number of redds were calculated for "final" walks only, index areas are not expanded. Expanded redds calculated by multiplying the redd erasure rate derived from index areas which area as follows: Mainstem = 2.5, North Fork = 1.0, South Fork = 1.13, Charley Cr = 1.06

Appendix G, Table 3. Results of summer steelhead redd surveys in Asotin Creek, 2001.									
Stream	Rkm	Dates Surveyed	Redds Counted	Total Redds	Expanded # of Redds^a	Percent of Reach Surveyed	Total Estimated Redds for Reach		
Mainstem (Totals)	14.8			199	205	95.5	215		
Confluence Br, 9-4.3 km	4.3	3/20, 3/29, 4/05, 4/16, 4/23	16, 22, 12, 13, 3	66	66				
3.3 km 8 and 9 Headgate Park	6.6	3/22, 3/29, 4/05, 4/16, 4/23	14, 24, 23, 11, 13	85	85				
Hoof Residence, to Cloverland Rd. Br.	2.8	4/20	27	27	30				
3.3 km 9 Headgate to next Br. crossing	1.1	4/23	21	21	24				
North Fork (Totals)	10.2			91	91	86.4	105		
5 km above Lick Cr, 9 to Lick Cr	5.0	3/20, 3/28, 4/05, 4/12, 4/19, 4/26	1, 21, 17, 20, 11, 5	75	75				
Upper F.S. fence, 9 to 5.2 km 8 Lick Cr.	5.2	4/26	16	16	16				
South Fork (Totals)	10.3			33	33	100.0	33		
3.2 km 8 mouth, to mouth	3.2	3/20, 3/29, 4/05, 4/16, 4/23	2, 3, 3, 2, 2	12	12				
State land fence to Schlee Bridge	5.4	4/25	17	17	17				
Schlee Bridge, down 1.7 km	1.7	4/25	4	4	4				
Charley Creek (Totals)	10.3			43	44	100.0	44		
State land fence to Asotin Creek Road	8.0	3/28, 4/05, 4/12, 4/19, 4/26	3, 18, 6, 2, 9	38	38				
Asotin Creek Road to mouth	0.4	4/26	0	0	0				
1.9 km 8 State Fence, back to fence	1.9	4/26	5	5	6				

^a Expanded number of redds were calculated for "final" walks only, index areas are not expanded. Expanded redds calculated by multiplying the redd erasure rate derived from index areas which area as follows: Mainstem = 1.127, North Fork = 1.0, South Fork = 1.0, Charley Cr = 1.152

Appendix G, Table 4. Results of summer steelhead redd surveys in the Tucannon River, and Cummings Creek, 1999.

Stream	Rkm	Dates Surveyed	Redds Counted	Total Redds	Expanded # of Redds ^a	Percent of Reach Surveyed	Total Estimated Redds for Reach
Tucannon (Totals)	36.4			147	172	59.0	294
2.4 km 8 Panjab Br., 9 to Panjab Br.	2.6	3/08, 3/17, 3/22, 4/01, 4/13, 4/23	0, 0, 0, 0, 0	0	0		
0.8 km 8 Cow Camp, 9 to Little Tuc.	1.5	3/08, 3/17, 4/01, 4/13, 4/23	0, 0, 0, 0, 0	0	0		
Big 4 to Campground 6	1.5	3/17, 4/01, 4/07, 4/13, 4/27, 4/30	1, 2, 0, 1, 0, 2	6	6		
Hatchery Bridge to Cummings Br.	2.3	3/15, 3/31, 4/06, 4/12, 4/23, 4/29	3, 5, 2, 3, 1, 0	14	14		
Cummings Br. To O'shawhnessys	1.2	3/15, 3/31, 4/06, 4/12, 4/23, 4/29	1, 1, 0, 2, 0, 1	5	5		
Bridge 12 to Bridge 11	2.0	3/08, 3/31, 4/06, 4/12, 4/23	4, 2, 4, 1, 3	14	14		
Bridge 10 to Bridge 9	1.3	3/15, 3/31, 4/07, 4/12, 4/23	1, 2, 0, 3, 0	6	6		
Bridge 9 to Marengo	2.1	3/15, 3/31, 4/06, 4/12, 4/23	1, 3, 7, 2, 1	14	14		
U.E. Kimbles to King Grade	2.2	3/15, 3/31, 4/06, 4/12, 4/23	2, 8, 13, 12, 0	35	35		
MP 29 to MP 28	1.7	4/30	0	1	1		
FS info board to Hatchery Intake	2.0	4/30	10	10	15		
Tumalum Cr to MP 18	2.0	4/30	0	0	0		
Hartscock Grade to MP 16	1.8	4/30	5	5	7		
Bridge 11 to Bridge 10	1.8	4/30	3	3	4		
Marengo Br. to silo	2.0	4/30	6	6	9		
Hovrud Silt basin to U.E. Kimbles	1.0	4/30	3	3	4		
MP 5 to Enrich	2.4	4/30	17	17	25		
Enrich Br to Upper Frames	2.7	4/30	3	3	4		
MP1 to Mom's Cafe	2.3	4/30	6	6	9		
Cummings Creek (Totals)	6.4			11	13	80.0	16
3.2 km 8 mouth, 9 to mouth	3.2	3/22, 4/15, 4/27	1, 6, 0	7	7		
6.4 km 8 mouth, 9 3.2 km	3.2	5/03	4	4	6		

^a Expanded number of redds were calculated for "final" walks only, index areas are not expanded. Expanded redds calculated by multiplying the redd erasure rate derived from index areas which area as follows: Tucannon River = 1.469, Cummings Creek = 1.4

Appendix G, Table 5. Results of summer steelhead redd surveys in the Tucannon River, and Cummings Creek, 2000

Stream	Rkm	Dates Surveyed	Redds Counted	Redds Expanded ^a	Percent of Reach Surveyed	Total Estimated Redds for Reach
Tucannon (Totals)	38.6		99	104	62.1	168
Beaver Watson to Deer Lake	2.1	4/10, 4/27	1, 5	6		
Hatchery intake to Cummings Br.	3.3	3/31, 4/10, 4/27, 5/02	3, 0, 1, 0	4		
Bridge 12 to Bridge 11	2.0	3/31, 4/10, 4/27	1, 3, 6	10		
Bridge 14 to Bridge 13	2.6	3/20, 4/04	3, 2	5		
Marengo Bridge to silo	1.8	3/20, 5/08	2, 2	4		
Bridge 10 to Bridge 9	1.3	3/20, 4/27	5, 3	8		
Bridge 9 to Marengo Br	2.1	3/20, 4/04, 4/27	4, 0, 4	8		
MP5 to Enrich Br.	2.2	3/21, 4/10, 5/01	5, 5, 5	15		
MPI to Highway 12	1.6	3/22, 4/10	5, 2	7		
King Grade to Corrals	2.2	3/21, 4/10, 5/01	9, 5, 0	14		
Hovruds Silt Basin to U.E. Kimbles	1.8	3/20, 4/10	2, 4	6		
Kimbles to King Grade	1.5	3/20	3	3		
Panjab Bridge to Little Tucannon	2.9	4/27	1	1		
Wooten Bridge to Curl Lake	2.5	4/27	2	2		
Curl Lake to Beaver/Watson	3.7	5/02	2	2		
Sheep Creek to LadyBug Flat CG	5.0	5/08	4	4		
Cummings Creek (Totals)	6.4		16	16	80.0	20
6.4 km 8 mouth, 9 to the mouth	6.4	5/02	16	16		

^a Expanded number of redds were calculated for "final" walks only, index areas are not expanded. Expanded redds calculated by multiplying the redd erasure rate derived from index areas which area as follows: Tucannon River = 1.45, Cummings Creek = NA

Appendix G, Table 6. Results of summer steelhead redd surveys in the Tucannon River, and Cummings Creek, 2001

Stream	Rkm	Dates Surveyed	Redds Counted	Total Redds	Expanded # of Redds ^a	Percent of Reach Surveyed	Total Estimated Redds for Reach
Tucannon (Totals)	45.9			297	304	73.8	412
Cow Camp to Curl Outlet	4.5	4/01, 4/11, 4/23, 5/08	0, 0, 1, 6	7	7		
Curl Outlet to Beaver/Watson	4.4	4/01, 4/11, 4/23, 5/08	1, 0, 3, 4	8	8		
Hatchery Intake to Russels	5.1	3/16, 3/22, 3/27, 4/06, 4/23, 5/07	0, 1, 4, 1, 11, 6	23	23		
Russels to Bridge 13	5.2	3/16, 3/22, 3/27, 4/06, 4/23, 5/07	2, 6, 6, 9, 5, 1	29	29		
Bridge 11 to Bridge 9	3.8	3/15, 3/23, 3/30, 4/06, 4/13, 4/20, 5/07, 5/18	2, 3, 10, 5, 4, 7, 2, 1	34	34		
Bridge 9 to Hovrud Silt Basin	3.8	3/15, 3/23, 3/30, 4/06, 4/13, 4/20, 5/07, 5/18	5, 16, 7, 12, 10, 7, 9, 0	66	66		
King Grade to Corrals (MP6)	3.6	3/08, 3/16, 3/22, 3/29, 4/06, 4/13, 4/20, 5/07, 5/17	1, 1, 6, 1, 14, 7, 6, 0, 0	36	36		
Corrals (MP6) to Enrich Rd	3.6	3/08, 3/16, 3/22, 3/29, 4/06, 4/13, 4/20, 5/07, 5/17	3, 6, 9, 10, 12, 5, 0, 4, 2	51	51		
MP1 to Mom's Cafe	2.4	3/21, 4/06, 4/11, 4/17	7, 8, 4, 8	27	27		
3.2 km above Panjab to Cow Camp	5	5/08	3	3	4		
Bridge 13 to Bridge 11	4.5	5/09	13	13	19		
Cummings Creek (Totals)	6.1			30	30	76.3	39
6.1 km 8 mouth, 9 to the mouth	6.1	3/30, 5/17	0, 30	30	30		

^a Expanded number of redds were calculated for "final" walks only, index areas are not expanded. Expanded redds calculated by multiplying the redd erasure rate derived from index areas which area as follows: Tucannon River = 1.48, Cummings Creek = NA

Appendix G, Table 7. Results of summer steelhead redd surveys in the Touchet River, 1999.

Stream	Rkm	Dates Surveyed	Redds Counted	Total Redds	Expanded # of Redds ^a	Percent of Reach Surveyed	Total Estimated Redds for Reach
Mainstem (Totals)	6.3			9	10	50.0	20
Highway 12 to Bob Warren's House	3.5	4/08, 5/10	5, 1	6	6		
South Touchet Mouth to Footbridge	2.8	5/10	3	3	4		
North Fork (Totals)	8.6			20	27	37.4	71
Frames lower fence to Sterns House	2.8	3/22, 3/30, 4/05, 4/13, 4/26, 5/06	1, 0, 6, 1, 5	13	13		
Marlls Bridge to Baileysburg	1.1	3/22, 3/30, 4/05, 4/13, 4/26, 5/10	0, 0, 3, 0, 3	6	6		
1.6 km 8 Frames upper fence, 9 1.6 km	1.7	5/10	3	3	4		
UE Warren Orchard to Marlls	3.0	5/10	3	3	4		
South Fork (Totals)	12.1			25	29	47.8	61
MP 7 to MP 5	3.4	3/22, 3/30, 4/05, 4/13, 4/26, 5/05	0, 1, 0, 6, 3,	12	12		
Burnt Fork to Griffen Fork	1.6	5/04	2	2	2		
SF cabins, down 1.6 km	1.6	5/04	2	4	5		
3.2 km 8 Camp Nancy Lee, 9 2.1 km	2.1	5/04	4	2	3		
MP 4 to MP 3	1.7	5/05	2	3	4		
MP 2 to MP 1	1.7	5/05	3	2	2		
Wolf Fork (Totals)	9.5			19	19	58.3	35
Bridge 8 Nelsons to Robinson Fork	3.1	3/22, 3/30, 4/05, 4/13, 4/26, 5/06	0, 0, 1, 0, 0,	6	6		
Newby's cabin 9 1.6 km	1.6	5/10	5	0	0		
3.2 km 9 Newby's, 9 1.6 km	1.6	5/10	0	2	2		
3.2 km 8 bridge at Nelson, 9 1.6 km	1.6	5/10	2	5	5		
1.6 km 9 Robinson Fork, 9 1.6 km	1.6	5/10	5	6	6		
Robinson Fork (Totals)	6.4			7	7	80.0	9
6.4 km above mouth, down 1.6 km	1.6	5/13	1	1	1		
4.6 km above mouth, down 1.6 km	1.6	5/13	1	1	1		
3.2 km above mouth, down 1.6 km	1.6	5/13	3	3	3		
1.6 km above mouth, down 1.6 km	1.6	5/11	2	2	2		

^a Expanded number of redds were calculated for "final" walks only, index areas are not expanded. Expanded redds calculated by multiplying the redd erasure rate derived from index areas which area as follows: Mainstem = 1.2, North Fork = 1.267, South Fork = 1.33, Wolf Fork = 1.0, Robinson Fork = NA

Appendix G, Table 8. Results of summer steelhead redd surveys in the Touchet River, 2000.

Stream	Rkm	Dates Surveyed	Redds Counted	Total Redds	Expanded # of Redds ^a	Percent of Reach Surveyed	Total Estimated Redds for Reach
Mainstem (Totals)	10.8			11	13	84.4	15
Highway 12 to Bob Warren's House	3.5	3/28, 5/11	1, 4	5	5		
South Touchet Mouth to Highway 12	2.8	5/11	2	2	3		
Warrens House to State Park	4.5	5/11	4	4	5		
North Fork (Totals)	13.6			40	41	59.1	69
Frames lower fence to Sterns House	2.8	3/28, 4/12, 5/01, 5/11	4, 3, 3, 5	15	13		
Marlls Bridge to Baileysburg	1.1	3/28, 5/01, 5/11	1, 1, 3	5	6		
MP 11 to Frames upper fence	2.8	5/11	4	4	4		
MP 13 to MP 11	3.3	5/11	11	11	11		
Sterns House to Wolf Fork	2.8	5/11	3	3	3		
Baileysburg to South Fork Confluence	0.8	5/11	2	2	2		
South Fork (Totals)	14.6			32	37	57.7	64
MP 7 to MP 5	3.3	3/27, 4/10, 5/01	2, 6, 1	9	9		
MP 4 to MP 2	3.3	3/27, 4/10, 5/01	3, 3, 2	8	8		
Burnt Fork, down 3.2 km	3.2	5/10	6	6	8		
4.8 km below Burnt Fork, down 3.2 km	3.2	5/10	7	7	9		
9.6 km below Burnt Fork, down 1.6 km	1.6	5/10	2	2	3		
Wolf Fork (Totals)	16.6			42	42	94.9	44
Bridge 8 Nelsons to Robinson Fork	3.1	3/28, 4/06, 4/20, 5/02	4, 0, 6, 2	12	12		
Newbys to bridge above Nelsons	9.2	5/05	17	17	17		
Robinson Fork, to mouth	4.3	5/05	13	13	13		
Robinson Fork (Totals)	7.8			16	16	97.5	16
3.2 km above 1 st gate, down to mouth	6.2	4/06, 4/13, 4/21, 5/04	0, 2, 7, 3	12	12		
4.8 km above gate, down 1.6 km	1.6	5/10	4	4	4		

^a Expanded number of redds were calculated for "final" walks only, index areas are not expanded. Expanded redds calculated by multiplying the redd erasure rate derived from index areas which area as follows: Mainstem = 1.25, North Fork = 1.05, South Fork = 1.31, Wolf Fork = 1.0, Robinson Fork = 1.0

Appendix G, Table 9. Results of summer steelhead redd surveys in the Touchet River, 2001.

Stream	Rkm	Dates Surveyed	Redds Counted	Total Redds	Expanded # of Redds ^a	Percent of Reach Surveyed	Total Estimated Redds for Reach
STREAM FLOWS AND VISIBILITY PREVENTED SURVEYS FROM BEING CONDUCTED							
Mainstem (Totals)				30	31	57.4	54
North Fork (Totals)	13.2			30	31	57.4	54
Bridge at MP11 to Frames Lower Fence	4.0	4/09, 4/16, 4/24, 5/17	0, 1, 0, 6	7	7		
Frames Lower Fence to Wolf Fork Br	4.0	4/09, 4/16, 4/24, 5/17	3, 4, 6, 2	15	15		
MP 13 to MP 11	3.3	5/24	7	7	8		
Marill's Br. To South Touchet Mouth	1.9	5/24	1	1	1		
South Fork (Totals)	16.9			40	47	66.8	67
Camp Nancy Lee Br to MP 5	4.1	3/14, 3/28, 4/06, 4/16, 4/25, 5/07	0, 1, 2, 7, 2, 2	14	14		
MP 5 to Bridge 2	4.2	3/14, 3/28, 4/06, 4/16, 4/25, 5/07	0, 0, 0, 6, 3, 0	9	9		
1.2 km below Griffen Fk, to Cabins	3.8	5/23	3	3	4		
Cabins to Camp Nancy Lee	4.8	5/23	16	16	20		
Wolf Fork (Totals)	13.1			41	44	74.9	58
Coates Creek to Passmors	4.2	3/26, 4/05, 4/11, 4/17, 4/24, 5/08	0, 1, 6, 5, 2, 1	15	15		
Passmors to MP2	4.1	3/26, 4/05, 4/11, 4/17, 4/24, 5/08	1, 2, 0, 3, 5, 3	14	14		
4.8 km 9 Coates Creek, 92.4 km	2.4	5/10	2	2	2		
2.4 km 9 Coated Creek, 92.4 km	2.4	5/10	10	10	13		
Robinson Fork (Totals)	6.2			7	7	77.5	9
3.2 km above 1 st gate, down to mouth	6.2	3/30, 4/16, 4/27, 5/25	0, 0, 0, 7	7	7		

^a Expanded number of redds were calculated for "final" walks only, index areas are not expanded. Expanded redds calculated by multiplying the redd erasure rate derived from index areas which area as follows: Mainstem =NA, North Fork = 1.17, South Fork = 1.24, Wolf Fork = 1.21, Robinson Fork = 1.0

Appendix H

Estimates of Juvenile Summer Steelhead Densities in SE Washington Rivers that are part of the LSRCP Program

Appendix H, Table 1. Mean juvenile steelhead densities (fish/100m²) by age class for SE Washington rivers that are part of the LSRCP Program.

Age 0 Steelhead / Rainbow									
Stream Name	Asotin Creek				Touchet River			Tucannon River	Cummings Creek
Year	Main	North Fork	South Fork	Charley Cr.	North Fork	South Fork	Wolf Fork	Main	Main
1983		23.7	44.3						
1984		6.6	39.0					16.0	
1985				73.0					
1986		29.7						18.4	
1987								20.6	
1988		45.8							
1989		22.8	6.0					18.1	
1990								19.1	
1991		22.1	1.8					13.0	
1992		56.9	50.0		35.5	42.8	41.1	17.4	
1993	49.1	36.8	78.7		26.0	8.7	21.8	14.6	43.2
1994	36.8	20.4	0.8	19.0	20.8	16.2	20.2		42.9
1995	47.7	23.4	34.5		42.5	31.1	25.0	11.0	32.4
1996	62.8	13.0	2.0	64.4	4.9	1.9	2.3	15.8	47.8
1997	33.4	24.0	32.5		28.5	11.6	21.1	16.5	
1998	52.2	44.6	32.9	18.3	15.4	16.7	23.6	17.2	12.5
1999	20.9	11.0	27.4	12.7	24.5	9.4	15.6	5.2	31.3
2000	26.6	41.9	21.8	43.0	15.6	10.9	15.3	19.3	40.3
Age 1+Steelhead / Rainbow									
Stream Name	Asotin Creek				Touchet River			Tucannon River	Cummings Creek
Year	Main	North Fork	South Fork	Charley Cr.	North Fork	South Fork	Wolf Fork	Main	Main
1983		8.7	25.3						
1984		7.5	30.6					2.5	
1985				37.6					
1986		37.6						13.7	
1987								8.5	
1988		8.1							
1989		18.1	34.0					10.6	
1990								9.8	
1991		14.2	13.9					6.5	
1992		22.2	10.4		19.0	15.5	8.7	4.8	
1993	22.1	28.1	42.5		19.3	15.0	10.5	7.0	
1994	39.6	34.9	16.4	20.0	18.9	5.8	11.5		26.3
1995	13.1	11.2	21.7		8.9	9.5	6.4	4.0	20.4
1996	12.2	17.4	11.2	15.3	3.6	10.2	5.3	3.2	29.6
1997	6.9	6.7	4.6		2.3	2.8	7.4	4.6	16.6
1998	10.2	25.5	22.8	49.0	4.9	16.2	13.4	6.4	12.7
1999	14.4	13.9	17.3	22.9	3.4	8.4	13.0	4.2	16.1
2000	9.7	16.6	22.3	17.9	11.2	13.3	8.9	4.9	17.3

Appendix H, Table 2. Densities of juvenile steelhead/rainbow trout (#/100m²) from electrofishing sites in the Tucannon River in 1999 and 2000.

Year	Stream Site Name	Est. Rkm	Site	Mean	Area (m ²)	Age 0	Age 1+	Total	
			Length (m)	Width (m)					
1999	Tucannon River (main)								
	R5	45.1	26.8	11.8	315.4	5.71	6.34	12.05	
	TNO-84	55.8	28.7	16.0	458.3	14.84	4.58	19.42	
	TNC1-84	56.0	30.0	13.3	399.0	9.27	4.76	14.04	
	TNS-2	64.3	30.0	11.2	336.9	8.01	2.67	10.69	
	TNC5-84	68.9	28.7	10.9	312.8	0.64	4.48	5.11	
	TN22	72.9	30.0	10.8	324.9	1.85	1.85	3.69	
	TN31-84	74.5	29.0	11.5	334.4	0.90	4.19	5.08	
	TN32H-96	76.1	29.7	6.7	198.1	0.00	4.54	4.54	
	Cummings Creek								
	CC0.5	0.8	30.0	3.1	93.0	61.29	17.20	78.49	
	CC1.5-96	5.8	30.0	3.4	102.0	1.96	12.75	14.71	
	CC2-93	6.6	18.2	3.6	65.0	30.78	18.47	49.25	
2000	Tucannon River (main)								
	TUC1-00	22.0	40.0	8.4	335.2	9.25	0.00	9.25	
	TUC2-00	28.0	40.0	11.9	477.0	36.06	1.26	37.32	
	TUC3-00	31.9	40.0	12.4	497.0	27.16	2.01	29.18	
	TUC4-00	34.1	36.0	12.3	443.7	27.72	8.34	36.06	
	TUC5-00	36.7	40.0	8.9	355.0	27.04	5.07	32.11	
	TUC6-00	41.8	40.0	10.1	404.0	15.59	0.25	15.84	
	TUC7-00	46.3	45.0	12.6	568.1	20.77	2.64	23.41	
	TUC8-00	49.1	40.0	9.9	397.0	21.66	4.79	26.45	
	TUC9-00	52.7	47.0	11.0	516.0	33.91	12.59	46.50	
	TUC10-00	57.2	40.0	12.1	485.0	17.94	8.25	29.19	
	TUC11-00	61.2	40.0	10.6	424.0	30.90	4.72	35.61	
	TUC12-00	64.4	40.0	9.7	388.0	11.86	1.03	12.89	
	TUC13-00	68.4	40.0	8.3	333.0	11.41	2.40	13.81	
	TUC14-00	73.2	40.0	9.6	383.2	4.96	4.18	9.13	
	TUC15-00	75.8	45.2	8.9	402.3	9.94	5.47	15.41	
	TUC16-00	78.5	54.0	6.1	330.5	2.12	15.13	17.25	
	Cummings Creek								
	CC1-00	0.1	40.0	3.5	140.0	25.00	2.86	27.86	
	CC2-00	4.0	40.0	3.9	156.0	48.08	21.15	69.23	
	CC3-00	6.7	50.0	3.0	150.0	56.67	20.00	78.67	
	CC4-00	10.4	40.0	2.9	116.0	29.31	25.00	54.31	
	Little Tucannon River								
LTR1-00	0.1	41.0	3.6	147.6	71.14	7.45	78.59		
LTR2-00	1.6	50.0	2.4	120.0	1.67	13.33	15.00		
LTR3-00	2.4	45.0	1.9	85.5	1.17	17.54	18.71		

Appendix H, Table 3. Densities of juvenile steelhead/rainbow trout (#/100m²) from electrofishing sites in Asotin Creek and its tributaries in 1999 and 2000.

Year	Stream Site Name	Est. Rkm	Site Length (m)	Mean Width (m)	Area (m ²)	Age 0	Age 1+	Total
1999	Asotin Creek (main)							
	MA1-93	12.0	32.3	9.7	313.3	9.89	16.92	26.81
	MA2-93	15.7	33.0	7.9	259.7	31.96	11.94	43.90
	North Fork							
	NA1	1.9	23.3	10.4	242.0	8.68	12.81	21.49
	NA2C	2.2	28.9	9.7	281.2	5.33	16.71	22.05
	NA3	2.5	27.3	9.5	259.4	22.75	18.51	41.26
	NA-4-84	3.0	34.3	6.2	213.7	9.36	10.76	20.12
	NA5	3.8	27.3	6.5	178.3	11.78	19.63	31.41
	NA-8-84	4.8	25.5	10.0	255.0	8.24	4.71	12.94
	South Fork							
	SA1	0.6	36.3	5.9	215.3	32.05	17.65	49.71
	SAC3	1.3	36.1	4.4	158.8	25.18	20.78	45.96
	SAB3	3.8	29.0	4.9	143.0	25.88	16.09	49.71
	SAC2	3.1	24.8	3.5	87.5	22.85	18.28	45.96
	SAC5	5.7	34.6	4.8	166.1	21.07	12.04	41.97
	SA7	5.8	27.3	4.4	120.9	37.21	19.02	41.12
	Charley Creek							
	CH4	1.5	31.0	3.3	103.2	9.7	23.3	33.0
	CH3	6.7	30.0	3.4	102.0	14.7	13.7	28.4
	CH2	9.6	34.0	4.6	157.4	11.4	33.0	44.4
	CH-1A	8.2	34.8	3.9	134.0	10.5	20.9	31.4
	CH2A	11.0	28.8	2.8	80.6	17.4	23.6	41.0
2000	Asotin Creek (main)							
	AC1-00	0.8	50.0	9.6	480.0	22.50	6.04	28.54
	AC2-00	5.1	50.0	11.4	570.0	46.49	3.86	50.35
	AC3-00	11.0	50.0	8.4	420.0	31.43	5.00	36.43
	AC4-00	14.7	50.0	8.5	420.0	19.76	4.76	24.52
	AC5-00	20.3	50.0	3.7	425.0	33.41	14.59	48.00
	North Fork							
	NF1-00	1.6	50.0	7.9	395.0	25.82	10.89	36.71
	NF2-00	3.8	50.0	6.6	330.0	33.94	22.12	56.06
	NF3-00	7.0	50.0	6.5	325.0	72.92	14.77	87.69
	NF4-00	9.6	50.0	6.9	345.0	56.52	13.62	70.14
	NF5-00	11.8	48.0	7.8	374.0	20.03	21.37	41.40
	South Fork							
	SF1-00	0.6	53.0	3.7	196.1	30.09	22.44	52.52
	SF2-00	3.0	62.0	5.1	316.2	9.17	21.51	30.68
	SF3-00	5.4	50.0	3.3	165.0	26.06	23.03	49.09
	SF4-00	8.2	52.0	3.7	192.4	25.47	25.47	50.94
	SF5-00	10.9	50.0	3.8	190.0	41.05	34.21	75.26
	Charley Creek							
	CC0-00	1.0	50.0	3.2	160.0	40.00	16.88	56.88
	CC1-00	3.1	50.0	3.2	160.0	61.25	11.25	72.50
	CC2-00	5.2	50.0	3.0	150.0	42.00	21.33	63.33
	CC3-00	7.3	50.0	3.4	170.0	34.71	18.24	52.94
CC4-00	9.4	50.0	3.3	165.0	41.21	18.79	60.00	
CC5-00	11.8	50.0	2.9	145.0	35.86	20.00	55.86	

Appendix H, Table 4. Densities of juvenile steelhead/rainbow trout (#/100m²) from electrofishing sites in the Touchet River in 1999 and 2000.

Year	Stream Site Name	Est. Rkm	Site Length (m)	Mean Width (m)	Area (m ²)	Age 0	Age 1+	Total
1999	North Fork							
	NFT3-93	1.0	51.5	10.5	542.3	40.57	0.55	41.12
	NFT2-92	9.5	28.5	9.1	258.5	22.05	3.87	25.92
	NFT1-93	17.7	28.8	7.7	222.6	10.78	5.84	16.62
	South Fork							
	SFT3-93	3.9	48.0	6.2	299.0	17.05	0.67	17.72
	SFT2-93	13.0	36.5	10.6	385.8	7.78	14.00	21.77
	SFT1-93	22.9	39.0	7.6	295.2	3.39	10.50	13.89
	Wolf Fork							
	WF1-92	14.8	28.3	7.4	208.9	14.86	25.89	40.75
WF2-92	4.9	33.9	8.7	295.9	16.56	6.76	23.32	
WF3-92	2.1	29.2	4.9	143.1	15.38	6.29	21.67	
2000	South Fork							
	SF1-00	1.2	30	5.0	151.2	3.97	0.00	3.97
	SF2-00	4.8	35.0	4.7	165.2	10.90	15.13	26.03
	SF3-00	8.0	30.0	6.5	196.2	16.82	1.02	17.84
	SF4-00	11.2	50.0	4.9	245.0	2.04	9.80	11.84
	SF5-00	14.4	50.0	5.9	297.0	17.85	10.44	28.28
	SF6-00	20.0	50.0	5.6	278.0	11.87	42.45	54.32
	SF7-00	21.6	50.0	5.5	277.0	12.64	14.44	27.08
	Wolf Fork							
	WF1-00	0.4	50.0	9.0	451.8	24.79	8.41	33.20
	WF2-00	2.7	50.0	10.5	532.0	21.99	4.89	26.88
	WF3-00	5.1	50.0	7.5	347.0	17.91	8.02	25.94
	WF4-00	8.3	40.0	9.2	366.4	17.74	10.92	28.66
	WF5-00	10.7	50.0	7.0	348.0	16.95	9.20	26.15
	WF6-00	12.3	50.0	7.7	384.0	6.77	9.90	16.67
	WF7-00	15.5	50.0	5.4	269.0	0.74	11.15	11.90
	WF8-00 ¹	17.9	50.0	3.0	149.0	0.00	15.44	15.44
	WF9-00 ¹	19.5	50.0	3.5	175.0	0.57	5.14	5.71
	WF10-00 ¹	21.4	71.0	3.4	241.4	0.00	1.66	1.66

¹ Data not used for population estimate, out of estimated reach area.

Appendix H, Table 5. Site locations for electrofishing sites during 1999 and 2000 for the Tucannon River and its tributaries.

Stream Name Site Name	Approximate Site Location
1999	
Tucannon River	
R5	Forty-nine meters above Bridge 11 on Tucannon River Road
TNO-84	Just below Cummings Creek Bridge.
TNC1-84	Near lower outhouse at Camp #2
TNS-2	100 upstream of Campground #6 outhouse
TNC5-84	Road mile 49.2, day use area just above large B.P.
TN22	Cow Camp Bridge
TN31-84	Just Below Panjab Bridge
TN32H-96	1.0 road miles upstream in the Wilderness, from fork in road just before Panjab Bridge
Cummings Creek	
CC0.5	0.5 miles above Gate, at site of old steelhead trap.
CC1.5-96	3.6 miles above Gate, below Forest Service Fence at outfitters camp.
CC2-93	4.1 road miles along Cummings Creek Trail road, log weir at lower end of site.
2000	
Tucannon River	
TUC1-00	~100 meters above HWY 12 Bridge. (Road Mile 13.5)
TUC2-00	~150 meters above Enrich Bridge (where 1997 habitat work was constructed) (Road Mile 17.1).
TUC3-00	Across from MP6 on Tucannon River Road (Road Mile 19.5)
TUC4-00	Upstream of King Grade Bridge (Road Mile 20.9)
TUC5-00	Hovrud's Silt Basin, Part of the site includes some bad habitat restoration (Road Mile 23.2).
TUC6-00	Across from MP 12, above Marengo Bridge (Road Mile 25.7)
TUC7-00	½ way between Bridge 11 and Bridge 12, near Howard Hay Barn (Road Mile 28.3)
TUC8-00	~10 meters upstream of Bridge 13 (Road Mile 30.6)
TUC9-00	Across from the Last Resort RV park, Byers Property, (Road Mile 32.9)
TUC10-00	Across from Campground #2, Tucannon River Road, Rock Cliff below site (Road Mile 35.3)
TUC11-00	Across from FS Info Board, Campground #5, Above large split in river (Road Mile 37.8)
TUC12-00	Across from Big 4 Lake (Road Mile 40.0)
TUC13-00	Camp Wooten Camp Ground (old HMA 15) (Road Mile 42.3)
TUC14-00	Cow Camp (Road Mile 44.5)
TUC15-00	Upper End of Wild Campground #2 (Road Mile 46.7) FS Block road to CG.
TUC16-00	Winchester Creek Road Mile 48.2
Cummings Creek	
CC1-00	~50 meters above the mouth of Cummings Creek.
CC2-00	2.5 miles above the Gate along the Cummings Creek Trail Road.
CC3-00	4.2 miles above the Gate along the Cummings Creek Trail Road.
CC4-00	To the old abandoned mine shaft at the end of the Cummings Creek Trail Road.
Little Tucannon	
LTR1-00	
LTR2-00	Below Tucannon River Road about ½ way to mouth
LTR3-00	~1 mile along the Little Tucannon Road from the Tucannon River road turnoff
	~1.5 miles along the Little Tucannon Road from the Tucannon River road turnoff.

Appendix H, Table 6. Site locations for electrofishing sites during 1999 and 2000 for Asotin Creek and its tributaries.

Stream Name Site Name	Approximate Site Location
1999	
Asotin Creek	
MA1-93	Behind Gene Theissen Ranch, 1/4 mile above Headgate Park, against rock cliff
MA2-93	3/4 mile below mouth of Charley Creek, next to road.
North Fork	
NA1	200 meters below Gate marking State Land Property
NA3	1.0 road miles above Gate marking State Land Property.
NA2C	1.8 road miles above Gate marking State Land Property.
NA-4-84	1.9 road miles above Gate marking State Land Property.
NA5	2.5 road miles above Gate marking State Land Property
NA-8-84	3.0 road miles above Gate marking State Land Property.
South Fork	
SA1	0.4 road miles from confluence bridge, 300 ft above Campbell Grade Road
SAC3	0.1 miles above 1 st Cattleguard.
SAB3	1/4 mile below open gate.
SAC2	1.95 road miles from confluence bridge
SAC5	3.55 road miles from confluence bridge
SA7	3.6 road miles from confluence bridge
Charley Creek	
CH4	0.6 miles above Frank Koch's Gate
CH3	3.9 miles above Frank Koch's Gate
CH2	5.7 miles above Frank Koch's Gate
CH-1A	7.2 miles above Frank Koch's Gate
CH-2A	9.35 miles above Frank Koch's Gate
2000	
Asotin Creek	
AC1-00	Middle part of Asotin City Part, bottom end is directly across from public restrooms.
AC2-00	~ 200 meters above bridge at George Creek mouth, lower end of Joe Curl home residence
AC3-00	~400 meters above sign painted on rock (CB7).
AC4-00	~ 1/2 mile above Gene Theissen house, ~100 meters above Theissen 9b 1998 habitat site.
AC5-00	Bottom end is ~ 50 meters above 1998 meander reconstruction site (Frank Koch's property)
North Fork	
NF1-00	Lick Creek pull off area, go to large pine with trail down to creek.
NF2-00	1.4 miles above Lick Creek Crossing.
NF3-00	3.0 miles below upper FS fence line, (where Pinkham Trail enters)
NF4-00	1.4 miles below upper FS fence line.
NF5-00	6.4 miles above Lick Creek Crossing, upper FS fence line at Pinkham Trail
South Fork	
SF1-00	~300 meters above the South Fork Mouth, where Campbell Grade Road from left come off hillside
SF2-00	2 road miles above the mouth of the South Fork
SF3-00	~50 meters below Schlee Bridge
SF4-00	1.7 miles above Schlee Bridge
SF5-00	3.4 miles above Schlee Bridge
Charley Creek	
CC0-00	~1/2 mile above mouth at Koch's water diversion.
CC1-00	1.5 miles above the main Gate at Koch's house
CC2-00	3.0 miles above the main Gate at Koch's house.
CC3-00	1.3 miles below CC4-00
CC4-00	End of road, ~7/10 of a mile above State land fence.
CC5-00	~1.5 miles above the end of the road

Appendix H, Table 7. Site locations for electrofishing sites during 1999 and 2000 for tributaries of the Touchet River.

Stream Site Name	Approximate Site Location
1999	
North Fork	
NFT3-93	7.1 miles above Wolf Fork Bridge, at Touchet river Road crossing ½ mile above pond by Lewis Creek.
NFT2-92	1.7 miles above Wolf Fork Bridge
NFT1-93	1/10 mile below South Fork Bridge
South Fork	
SFT3-93	Above Petty John Bridge
SFT2-93	1/10 mile below Camp Nancy Lee Bridge
SFT1-93	6 miles above Camp Nancy Lee Bridge, just below forks confluence.
Wolf Fork	
WF3-92	1.3 miles above Wolf Fork Bridge
WF2-92	1/10 mile below 1 st bridge crossing past the Robinson Fork mouth
WF1-92	Blue Gate
2000	
South Fork	
SF1-00	3/4 road miles above mouth, Eakins House
SF2-00	MP 3, just below first bridge on South Touchet Road
SF3-00	2 miles above MP 3, ~ where MP 5 should be
SF4-00	4.0 miles above MP 3, ~ where MP 7 should be
SF5-00	6.0 miles above MP 3~ where MP 9 should be
SF6-00	Mouth of Griffen Fork
SF7-00	Mouth of the Burnt Fork
Wolf Fork	
WF1-00	
WF2-00	~100 meters above the mouth of the Wolf Fork, behind Fairchilds house.
WF3-00	1.7 road miles above Wolf Fork Rd Bridge.
WF4-00	3.2 road miles above Wolf Fork Rd Bridge.
WF5-00	Upstream side of Donnelly Bridge
WF6-00	Downstream side of Martins Bridge
WF7-00	Below Cow Palace Bridge
WF8-00	Newby's Cabin
WF9-00	1.0 miles above Green Fly Canyon
WF10-00	2.0 miles above Green Fly Canyon, ~300 meter above FS fenceline.
	1/4 mile below large open meadow up in the Forest Service ground



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