

# **Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead Annual Report 2003 Run Year**

by

Joseph D. Bumgarner  
Jerry Dedloff  
Mike Herr

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

to

U.S. Fish and Wildlife Service  
Lower Snake River Compensation Plan Office  
1387 Vinnell Way, Suite 343  
Boise, Idaho 83709  
Cooperative Agreements #'s 14110-2-J050, 14110-3-J051

**December 2004**

# Acknowledgments

---

The ongoing success of the steelhead and trout program is the result of the coordinated and dedicated efforts of many Washington Department of Fish and Wildlife (WDFW) employees, as well as employees from other State and Federal Agencies. We especially thank Don Peterson, Doug Maxey, Dick Rogers, and the Lyons Ferry/Tucannon staff for their hard work, insight, and assistance of activities conducted at Lyons Ferry Complex for the last year.

We thank Jon Hansen, Marsha White, and Larry Barrett, of Idaho Fish and Game for their assistance in conducting joint Snake River creel surveys and providing coded-wire tag recoveries from Idaho fisheries. We also thank Rich Carmichael's crew from Oregon Department of Fish and Wildlife, especially Mike Flesher, for their leadership in conducting the Grande Ronde River creel survey and providing the CWT recoveries. Jerry Harmon and the other NOAA Fisheries personnel at Lower Granite Dam provided data on adult freeze-branded steelhead passage. Henry Franzoni from the Fish Passage Center provided freeze brand and VIE tag smolt data collected at the dams to calculate passage index. Dave Marvin and John Tenney with Pacific States Marine Fisheries Commission provided valuable assistance with our PIT tag files. The accuracy and timeliness of all the data provided by the above individuals is always appreciated.

We thank additional WDFW personnel (John Sneva, Jim Shaklee, Susan Markey, and Lynn Anderson) for their assistance with portions of the project.

We thank Mark Schuck, Glen Mendel, Dan Herrig, Chris Starr, Todd Pearsons, and Jim Scott for their critical review of the draft annual report.

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

# Table of Contents

---

List of Figures.....	i
List of Tables.....	ii
Introduction.....	1
Production Goals of Steelhead and Rainbow Trout Stocks.....	2
In-Hatchery Survival.....	2
Marking.....	4
Juvenile Releases.....	5
Smolt Migration.....	6
Tucannon River Natural Smolt Production.....	7
Broodstock Collections / Adult Returns.....	8
Lyons Ferry Trap.....	8
Cottonwood Creek Trap.....	9
Tucannon FH Trap.....	10
Lower Tucannon Adult Trap.....	10
Touchet River Adult Trap.....	11
Lower Granite Adult Trap.....	12
Creel Surveys.....	13
Walla Walla Subbasin.....	14
Spawning Ground Surveys.....	14
Natural Juvenile Production in Area Rivers.....	19
Genetic Analysis.....	20
Literature Cited.....	27
Appendix A.....	28

## List of Figures

---

Figure 1. Map of major rivers and streams in Southeast Washington, and Lyons Ferry Complex facilities. ....	1
Figure 2. MDS of genetic distances among Tucannon and Touchet steelhead collections from NTSYS-pc. Genetic distances (Cavalli-Sforza and Edwards) were calculated using GENDIST in PHYLIP. ....	19
Figure 3. Neighbor-joining consensus tree of Cavalli-Sforza and Edwards distances among collections from PHYLIP. Numbers at the nodes indicate the percentage of 10,000 trees in which the collections beyond the node grouped together and only values over 65% are shown. ....	22

# List of Tables

---

Table 1. Summary of rainbow trout plants from Lyons Ferry Complex, 2004.....	3
Table 2. Number spawned, average fecundity, and survival by life state of LFH stock steelhead spawned at LFH, 2003 and 2004 brood years. ....	4
Table 3. Summer steelhead smolt releases from Lyons Ferry Complex, 2004 .....	5
Table 4. Mean fork lengths, weights, condition factor, co-efficient of variation, fish per pound, and the percent of each release visually documented as a precociously mature from LFC steelhead prior to release, 2004.....	6
Table 5. Estimated passage of freeze branded or VIE tagged LFC summer steelhead at the first downstream collector dam from site of release, 2003 release year .....	7
Table 6. Unique detections of PIT tags from natural and endemic stock steelhead tagged and released from the Tucannon River smolt trap, 2003. ....	7
Table 7. Estimated production of natural-origin steelhead smolts from the Tucannon River by migration (1996-2003) and brood year (1995-2002).....	8
Table 8. Summary of tagged adult summer steelhead trapped at LFH for the 2003 run year / 2004 brood year.....	9
Table 9. Summary of tagged adult summer steelhead trapped at Cottonwood Trap for the 2003 run year / 2004 brood year. ....	10
Table 10. Summary of fresh and salt-water age composition of natural origin adult steelhead from the Tucannon River, 2000-2004 brood years.....	11
Table 11. Summary of fresh and salt-water age composition of natural origin adults from the Touchet River, 1994-1995 and 1999-2004 brood years.....	12
Table 12. Adult returns of LFH freeze branded or VIE tagged steelhead to Lower Granite Dam in run years 2001-2003, from smolts released in 2000-2002. ....	13
Table 13. Steelhead angler interview results for fall/winter/spring of the 2003 run year from Washington State licensed anglers.....	14

Table 14. Start and stop coordinates for stream reaches, index sections, and final walks for summer steelhead spawning ground surveys in the Tucannon and Touchet rivers, and Asotin Creek, 2004. ....	15
Table 15. Results of summer steelhead redd surveys in the Tucannon River, 2004. ....	14
Table 16. Results of summer steelhead redd surveys in the Touchet River, 2004. ....	15
Table 17. Results of summer steelhead redd surveys in Asotin Creek, 2004. ....	16
Table 18. Summary of mean fish density (Fish/100 m <sup>2</sup> ) and population estimates of Age 0 summer steelhead in Asotin Creek, and Touchet and Tucannon rivers for specific tributaries/reaches in 2003. ....	19
Table 19. Summary of mean fish density (Fish/100 m <sup>2</sup> ) and population estimates of Age 1+ summer steelhead in Asotin Creek, and Touchet and Tucannon rivers for specific tributaries/reaches in 2003. ....	20
Table 20. Summary of mean fish density (Fish/100 m <sup>2</sup> ) and population estimates of hatchery endemic stock summer steelhead residuals in the Touchet and Tucannon rivers for specific tributaries/reaches in 2003. ....	20

# Introduction

This abbreviated 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 covers between 1 July 2002 and 30 June 2004. Smolt trapping information for the 2003/2004 migration will be presented in a future report, as population estimates were not completed at time of report printing. In addition, coded-wire tag recoveries/expansions from the summer steelhead sport fishery in the Columbia and Snake river basins will be presented in future reports.

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

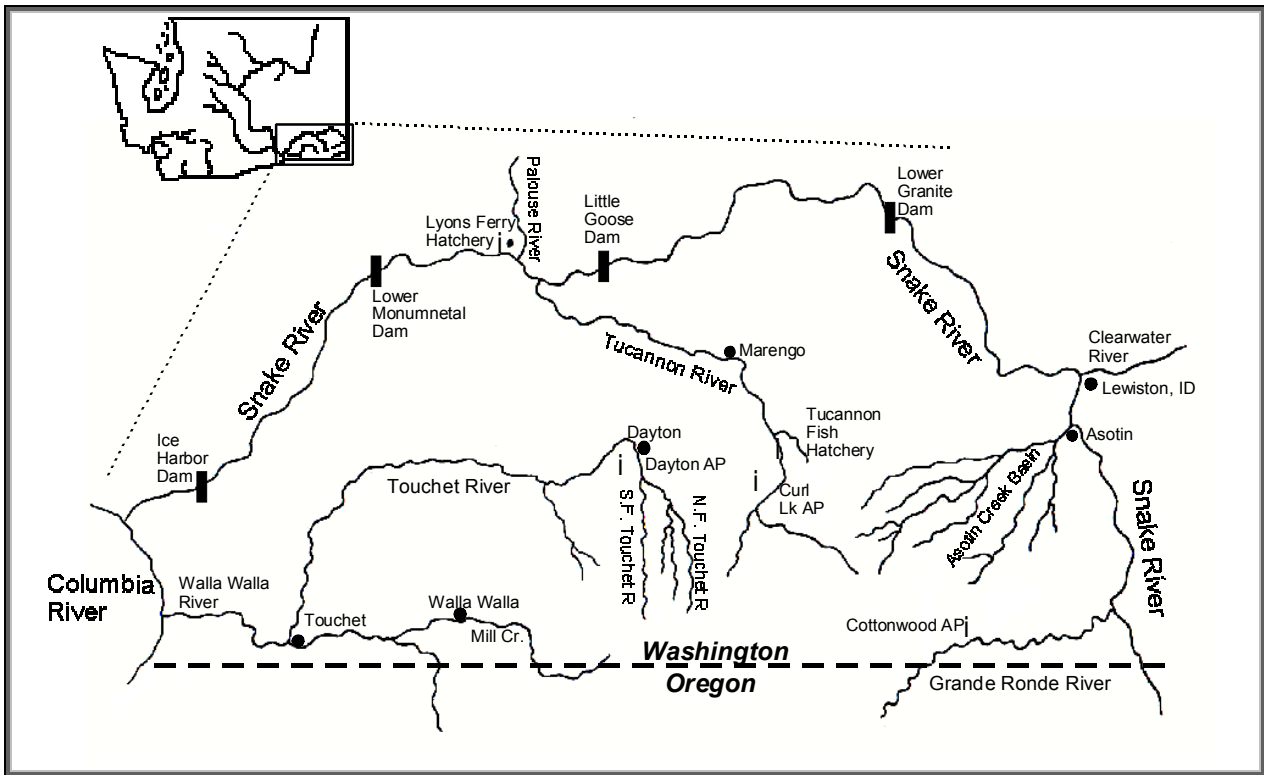


Figure 1. Map of major rivers and streams in Southeast Washington, and Lyons Ferry Complex facilities.

## **Production Goals of Steelhead and Rainbow Trout Stocks**

The Lyons Ferry Complex (LFC) consists of Lyons Ferry Hatchery (LFH), Tucannon Fish Hatchery (TFH), Cottonwood Acclimation Pond (AP), Curl Lake AP, and Dayton AP. Overall program objectives and recent program production changes have been previously described (Bumgarner et. al. 2003). The LFC currently uses four stocks of steelhead to produce smolts for release into the Snake (60,000 of LFH stock), Tucannon (100,000 of LFH stock, 50,000 of Tucannon Endemic stock), Grande Ronde (160,000 of Wallowa Stock), Walla Walla (100,000 of LFH stock), and Touchet rivers (85,000 of LFH stock, 50,000 of Touchet Endemic stock). All steelhead smolt releases for the program are planned for a release size of 4.5 fish/lb.

The LSRCP mitigation trout program has focused primarily on providing recreational fishing opportunities in southeast Washington. Currently, the LFC goal is to produce 237,500 trout (79,900 lbs) for release into southeast Washington. The LFC will produce another 150,000 (3,000 lbs) fry (Spokane stock), and 50,000 (3,333 lbs) fingerlings (Kamloops stock) for Idaho Fish and Game's (IDFG) LSRCP program. Recent Endangered Species Act (ESA) listings of chinook, steelhead, and bull trout has caused the stocking of rainbow trout from LFC into Washington State area waters to be shifted exclusively to small lakes and ponds to reduce the potential negative affects on listed species. During the report period, stocking of LSRCP produced rainbow trout within Washington (Table 1) and to the State of Idaho went as planned.

## **In-Hatchery Survival**

Survival rates of steelhead at LFC remain highly variable among stocks and among years. Fish health problems (e.g., cold water disease), presence of pathogens such as Infectious Hematopoetic Necrosis virus (IHNV), and spawning conditions at LFC and at remote spawning sites (Cottonwood Creek adult trap), have all affected in hatchery survival (Table 2). In addition, bird predation in the large rearing ponds at Lyons Ferry in 2004 was especially high on the Wallowa stock fish, and to a lesser degree on the LFH stock fish. Netting over the lakes will be installed in 2004 to reduce this impact.

Table 1. Summary of rainbow trout plants (catchable size) from Lyons Ferry Complex, 2004. Represents both LSRCP and State funded programs.

County	Location	Number of Plants	LSRCP lbs of fish planted	LSRCP # of fish planted	State lbs of fish planted	State # of fish planted
Adams	Sprague Lake	1	806	2,500		
	Total	1	806	2,500		
Asotin	Golf course Pond	8	4,621	16,335	784	450
	Headgate Pond	1	477	2,003		
	Silcott Pond	2	1,100	3,920		
	West Evans Pond	10	6,693	19,980	549.5	400
	Total	21	12,891	42,238	1,333.5	850
Columbia	Beaver Lake	2	320	1,004		
	Big Four Lake	2	1,000	3,000	728	300
	Blue Lake	15	5,573	17,385	699.5	431
	Curl Lake	6	3,123	12,007	381	200
	Dam Pond	1	417	1,043		
	Dayton Jv. Pond	6	1,033	3,502	191.5	100
	Deer Lake	3	906	3,068		
	Donnie Lake	1	94	404		
	Orchard Pond	1	500	1,500		
	Rainbow Lake	12	5,703	17,535	588	366
	Spring Lake	10	3,735	11,008	433	300
	Watson Lake	10	4,766	14,795	415	300
	Total	69	27,170	86,701	3,116	1,997
Franklin	Dalton Lake	7	7,119	22,502	666	300
	Marmes Pond	2	768	2,000		
	Total	9	7,887	24,502	666	300
Garfield	Baker's Pond	2	528	1,519		
	Casey Pond	1	122	500		
	Total	3	650	2,019		
Walla Walla	Bennington Lake	9	7,630	21,899	428	200
	Fishhook Pk. Pond	3	1,455	5,047	166	100
	Lions Park Pond	5	1,060	3,205	183	100
	Quarry Pond	7	6,585	22,099	666	300
	Total	24	16,730	52,250	1,443	700
Whitman	Garfield Pond	2	455	2,002	41.5	25
	Gilcrest Pond	2	273	1,201	41.5	25
	Pampa Pond	3	1,482	5,001	370	200
	Riparia Pond	1	518	1,500		
	Union Flat Creek	1	455	1,501		
	Total	9	3,183	11,205	453	250
<b>Total Rainbows</b>		<b>136</b>	<b>69,317</b>	<b>221,415</b>	<b>7,011.5</b>	<b>4,097</b>



Table 2. Number spawned, average fecundity, and survival by life state of LFH stock steelhead spawned at LFH, 2003 and 2004 brood years.

BY	Spawned		Average eggs/ female	Eggs taken	Eggs retained <sup>a</sup>	Percent retained	Fry	Egg-fry survival	Smolts	Fry- smolt survival
	female	male								
<b>Wallowa Stock</b>										
2003	65	65	4,632	301,080	215,097	71.4	206,062	95.8	137,915	66.9
2004	68	105	4,683	318,430	290,391	91.2	286,536	98.7		
<b>Lyons Ferry Stock</b>										
2003	126	257	3,837	483,462	418,195	86.5	408,944	97.8	310,209	75.9
2004	129	259	3,832	494,380	414,258	83.8	408,462	98.6		
<b>Tucannon Stock</b>										
2003	11	19	5,255	73,573	46,143	62.7	45,220	98.0	42,967	95.0
2004	16	15	4,723	75,560	59,911	79.3	58,882	98.3		
<b>Touchet Stock</b>										
2003	16	17	5,163	82,602	75,059	90.9	70,198	93.5	58,733	83.7
2004	15	10	4,408	66,125	56,066	84.8	55,358	98.7		

<sup>a</sup> The number of eggs retained includes all losses from green egg to eye up (mortality and eggs destroyed due to IHN).

## Marking

All production steelhead from the LFH or Wallowa stocks were marked with an adipose (AD) fin clip prior to release for harvest management. Study groups within the LFH and Wallowa stocks of fish were marked with one or a combination of the following: Coded Wire Tag (CWT), left ventral (LV) fin clip, and freeze brands for specific contribution studies and/or to document straying (Table 3). The Tucannon and Touchet rivers endemic steelhead stocks are not currently managed for harvest: therefore adipose fins were not clipped prior to release. In January 2004, the Tucannon and Touchet endemic stocks were tagged with a CWT and given a red Visual Implant Elastomer (VIE) tag behind the eye for external identification (Table 3). Evaluation staff conducted quality control tag/mark checks on all release groups. In addition, Passive Integrated Transponder (PIT) tags were inserted in about 10,000 fish in each of the endemic stocks prior to release in 2004. Since the endemic stocks are not marked for sport harvest, we will rely on adult PIT tag detections at the mainstem dams to determine smolt-to-adult survival rates for these groups to evaluate the success of each program and how best to proceed for stock recovery. An assessment of downstream migration success from these PIT tag groups will be presented in future reports.

Table 3. Summer steelhead smolt releases from Lyons Ferry Complex, 2004 (Note: All WDFW CWT codes begin with “63”)

Location (Stock)	Rkm	Date	Total release	Marked release <sup>a</sup>	CWT code	Marks/Brand/VIE	Lbs	Size #/lb	CWT %Loss	Brand/VI %Loss
Grande Ronde @ Cottonwood AP (Wallowa)	45.9	4/1-4/31	137,915	40,202	15 / 23	ADLV LA-S-1	28,732	4.8	0.6579	7.2368
Snake River @LFH (LFH)	92.8	4/16-4/20	59,993	20,305	21 / 88	ADLV LA-IJ-1	13,770	4.4	1.1618	4.8963
Tucannon River @ Enrich Br (LFH)	31.3	4/15-4/23	83,726	20,322	21 / 87	ADLV RA-IJ-1	19,029	4.4	0.5947	6.3721
Touchet River @ Dayton AP (LFH)	86.4	4/1-4/31	86,347	20,098	21 / 89	ADLV	21,587	4.0	0.9760	na
Walla Walla River (LFH)	56.0	4/20-4/23	80,143	20,105	21 / 70	ADLV	17,810	4.5	0.9607	na
Tucannon River @ Curl Lake Intake (Tucannon)	64.0	4/06, 4/26	42,967	42,967	15 / 66	CWT ONLY RR VIE	8,951	4.8	1.1838	7.7592
Touchet River @ NF Touchet Bridge (Touchet)	91.5	4/15, 5/06	58,733	58,733	11 / 83	CWT ONLY LR VIE	11,858	5.3	4.5151	4.9443

<sup>a</sup> The number shown as marked released has not been adjusted for tag/mark loss.

## Juvenile Releases

Evaluation staff collected pre-release samples for all LFC release locations in 2004 to characterize each release population (Table 4). Release size goals for the Wallowa and LFH stocks were met; however, overall production was short in each stock due to heavier than expected bird predation in the rearing ponds in 2003/2004 (Table 3). Plans for 2004 include the netting of both rearing ponds to reduce bird predation loss. Due to extended spawn timing and rearing difficulties, both Touchet and Tucannon endemic stocks were size graded and split into two groups each. One group from each was comprised of smaller sized fish and the second of each group were of larger size fish. The smaller sized fish were fed greater rations in an attempt to bring them up to the proper size prior to release. This effort was successful for the Tucannon stock, but the small sized fish in the Touchet endemic stock never caught up and in the end they had to be released at a size smaller than desired. Additional measures to eliminate these size differences, that have been a continual problem in the endemic stock programs from the beginning, continue to be investigated.

Table 4. Mean fork lengths, weights, condition factor (K), co-efficient of variation (CV), fish per pound (FPP), and the percent of each release visually documented as a precociously mature from LFC steelhead prior to release, 2004.

Location (Stock)	Date	N	Avg LN (mm)	Avg WT (g)	K	CV	FPP	Percent precocious
Cottonwood (Wallowa)	3/30	229	199.0	94.1	1.13	14.5	4.8	0.00%
	4/13	228	206.6	92.3	0.99	14.7	4.9	0.50%
Tucannon (LFH)	4/14	248	213.8	103.4	1.03	9.3	4.4	0.00%
Tucannon (Endemic-Large)	4/05	273	207.5	96.2	1.04	10.1	4.7	0.00%
Tucannon (Endemic-Small)	4/20	373	196.7	91.0	1.11	16.3	5.0	0.54%
Touchet (LFH)	3/31	273	207.4	102.2	1.11	10.6	4.4	0.40%
	4/13	253	224.4	127.5	1.10	10.3	3.6	0.00%
Touchet (Endemic-Large) <sup>a</sup>	4/14	271	217.1	112.7	1.06	10.8	4.0	2.04%
Touchet (Endemic-Small) <sup>a</sup>	5/04	321	183.0	68.0	1.04	15.3	6.7	1.01%
Walla Walla (LFH)	4/14	220	211.3	101.7	1.06	11.5	4.5	0.00%
Lyons Ferry (LFH)	4/14	201	207.4	95.6	1.05	10.1	4.7	0.04%
Lake #1 <sup>b</sup> (LFH)	4/19	266	227.3	107.2	0.90	7.2	4.2	0.00%
	4/20	316	229.4	111.0	0.91	7.2	4.1	0.00%

<sup>a</sup> Precocious rates were determined from PIT tagging in mid-March. All other rates were determined at pre-release sampling on the date provided in the table.

<sup>b</sup> Fish removed from Lake#1 were released in the Tucannon and Walla Walla rivers, and on-station at Lyons Ferry.

## Smolt Migration

We calculated relative smolt passage during down river migration in the Snake River (Cottonwood, Tucannon and Lyons Ferry releases) and the Columbia River (Touchet Endemic stock releases) from PIT tags, freeze brands, VIE tags sampled at the juvenile bypass facilities located at dams (Fish Passage Center unpublished data). A Passage Index, and estimated median and 95% passage time (days) for each freeze brand and/or VIE group released from the 2004 release year were determined (Table 5). The passage indices determined in 2004 were similar to previous years (Bumgarner et. al. 2003).

During the spring of 2003, we PIT tagged groups of natural and endemic stock steelhead at the Tucannon River smolt trap to monitor downstream migration success to each of the dams located on the Snake and Columbia rivers. Cumulative unique PIT tag detections were summarized and provided detection histories for both the natural and endemic origin groups (Table 6). Besides unique detections, we also used the SURPH model (Smith et. al. 1994) to estimate survival of both groups of fish from the smolt trap to Lower Monumental Dam (Table 6). Survival based on unique detections or estimated based on the SURPH model to Lower Monumental Dam were not different.

Table 5. Estimated passage of freeze branded or VIE tagged LFC summer steelhead at the first downstream collector dam from site of release, 2003 release year (FPC 2003, unpublished data)

Brand	Release site	Passage index	Number released <sup>a</sup>	Percent of release	Size (#/lb)	Passage days	
						50%	95%
LA-IC-1	Cottonwood AP	7,857	40,366	19.5	5.3	10	29
RA-2-2	Tucannon River	3,361	20,735	16.2	4.7	7	24
LA-2-2	Lyons Ferry Hatchery	6,598	21,041	31.4	4.6	6	23
Right Green VIE	Tucannon River	9,124	40,756	22.4	5.3	43	57
Left Green VIE	Touchet River	5,167	27,316	18.9	4.9	34	64

<sup>a</sup> Adjusted for freeze brand or VIE tag loss following tagging

Table 6. Unique detections of PIT tags from natural and endemic stock steelhead tagged and released from the Tucannon River smolt trap, 2003.

Group	Number Tagged	Detection facility <sup>a</sup>					Total	SURPH Est to LMO
		LMO	MCN	JDA	BONN			
Tucannon R. @smolt trap (Endemic)	710	316 (44.5%)	45 (6.3%)	35 (4.9%)	33 (4.7%)	429 (60.4%)	0.84 (C.I. = 0.04)	
Tucannon R. @smolt trap (Natural)	2153	568 (26.4%)	273 (12.7%)	99 (4.6%)	147 (6.8%)	1087 (50.5%)	0.82 (C.I. = 0.03)	

<sup>a</sup> Detection Facilities: LGR - Lower Granite Dam, LGO - Little Goose Dam, LMO – Lower Monumental Dam, MCN - McNary Dam, JDA – John Day Dam, BONN - Bonneville Dam.

## Tucannon River Natural Smolt Production

We operated a 5 ft rotary screw trap at rkm 2.7 on the Tucannon River between fall of 2002 and spring 2003 to estimate the numbers of migrating natural steelhead smolts. Methods to estimate smolt production have been previously described (Bumgarner et. al. 2003, Bumgarner et. al. 2002). During the 2002/2003 trapping season (trap operation: 10 October, 2002 to 1 July, 2003), we captured 3,137 natural origin steelhead smolts at the trap, for an estimated 19,919 total smolt out-migration (Table 7). About 93% of the migrant smolts were captured between 15 March and 15 June. Age composition based on the scale readings and expanded smolt estimate was 49.8% Age 1, 45.6% Age 2, and 4.6% Age 3. During the main out-migration period (March-early June) mean length, weight, and K-factor for natural fish captured was 171.8 mm, 42.9g and 0.96, respectively. The mean size of smolts captured was smaller than in previous years, largely due to the greater percentage of Age 1 smolts. Peak of migration for natural steelhead was 26 May, with an estimated 1,000 smolts migrating past the trap on that day.

Table 7. Estimated production of natural-origin steelhead smolts from the Tucannon River by migration (1996-2003) and brood year (1995-2002).

Migration year	Brood Year								Totals
	1995	1996	1997	1998	1999	2000	2001	2002	
1995/1996 <sup>a</sup>	5,583								14,667
1996/1997 <sup>a</sup>	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
2001/2002				17	498	10,824	8,050		19,389
2002/2003						915	9,085	9,920	19,920
Totals	15,384	18,823	34,066	35,031	29,142	23,651	17,135		

<sup>a</sup> Scales were not collected during the 1995/1996 or 1996/1997 migration years. Age composition for those years are 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.

## Broodstock Collections / Adult Returns

As part of our annual broodstock collection and research activities, WDFW hatchery and evaluation staffs operate a series of adult steelhead traps in SE Washington rivers. Lyons Ferry hatchery staff operates the LFH and Cottonwood Creek adult traps. Tucannon Fish Hatchery (TFH) staff operates the upper Tucannon adult trap, and evaluation staff operates an adult trap on the lower Tucannon River, and the Touchet River trap in Dayton.

### Lyons Ferry Trap

At LFH, adult steelhead were trapped from 1 September through 15 November 2003. A total of 2,145 adult steelhead (1,129 female (52.6%) and 1,016 male (47.4%)) were trapped. Fish to be retained for broodstock were sorted on 17 and 19 November. All fish not needed for broodstock or retained to recover CWTs were returned to the Snake River to contribute to the sport fishery (1,466). Of all the fish trapped, three were wild origin (unmarked). We recovered 383 fish with CWTs (Table 8). Age composition based on CWT recoveries was 88.2% one-ocean, 11.6% two-ocean, and 0.2% three-ocean. Mortality during trapping, holding, and spawning was 151 fish (7.04% of all fish trapped), most of which occurred during October and November during holding. Pre-spawning mortality rate was lower in 2004 compared to previous years (1999 – 28.8%, 2000 – 10.3%, 2001 – 25.3, 2002 – 10.3%, 2003 – 10.1%). During January and February of 2004, 129 females were spawned with 259 males, producing 494,380 fertilized eggs (Table 2) for the LFH stock program. Eggs from 6 females were destroyed due to presence of IHNV (26,714 eggs). Fecundities of one-ocean and two-ocean females were 3,694 and 5,160 eggs, respectively.

## Cottonwood Creek Trap

At the Cottonwood Creek Trap, 844 adult steelhead (495 female, 349 male) were collected in 2004. In addition, a total 16 wild (unmarked fish) were captured. Age composition based on CWT recoveries and fork lengths was 66.2% one-ocean and 33.8% two-ocean. Sixty-eight females were spawned with 105 males, producing 305,626 fertilized eggs. The eggs from three females (12,804) that tested positive for IHNV were destroyed. Average fecundity of one and two-ocean age females was 3,871 and 5,331 eggs/female, respectively. During 2004, fish that did not contain CWT's or were not spawned were passed above the trap to spawn naturally. All carcasses from spawning and fish that were killed outright to retrieve the CWT's were distributed in upper Cottonwood Creek for nutrient enhancement, or donated to Walla Walla community college for science lab dissections. We recovered 112 fish with CWT's (Table 9); all but one was originally released on-site at Cottonwood AP, the other was a Tucannon Endemic stock fish.

Table 8. Summary of tagged adult summer steelhead trapped at LFH for the 2003 run year / 2004 brood year.

Brood year	Freeze Brand	CWT code	Stock	Release site	Number of tags
1999	RA-2-2	63 / 13 / 09	Wallowa	Grande Ronde @Cottonwood AP	1
	RA-IC-1	63 / 13 / 07	Lyons Ferry	Snake River – On Station	0
	LA-IC-1	63 / 13 / 05	Lyons Ferry	Tucannon River @ Marengo	0
	LA-IC-3	63 / 13 / 06	Lyons Ferry	Tucannon River @ Enrich	0
	LA-2-2	63 / 13 / 08	Lyons Ferry	Touchet River @ Dayton AP	0
<b>Total</b>					<b>1</b>
2000	LA-IJ-1	63 / 02 / 81	Wallowa	Grande Ronde @Cottonwood AP	0
	RA-S-1	63 / 11 / 39	Lyons Ferry	Snake River – On Station	21
	LA-S-1	63 / 10 / 53	Lyons Ferry	Tucannon River	7
	NONE	63 / 01 / 15	Lyons Ferry	Touchet River @ Dayton AP	7
	NONE	63 / 11 / 40	Lyons Ferry	Walla Walla River	9
<b>Total</b>					<b>44</b>
2001	LA-IT-1	63 / 11 / 78	Wallowa	Grande Ronde @Cottonwood AP	2
	RA-IV-3	63 / 12 / 70	Lyons Ferry	Snake River – On Station	144
	LA-IV-1	63 / 12 / 78	Lyons Ferry	Tucannon River	44
	NONE	63 / 12 / 79	Lyons Ferry	Touchet River @ Dayton AP	80
	NONE	63 / 12 / 69	Lyons Ferry	Walla Walla River	66
<b>Total</b>					<b>336</b>
----- Lost tags, Unreadable tags, No Wire -----					26
<b>Grand Total</b>					<b>407</b>

Table 9. Summary of tagged adult summer steelhead trapped at Cottonwood Trap for the 2003 run year / 2004 brood year.

Brood year	Freeze brand	CWT code	Stock	Release site	CWT	Number of tags
2000	LA-IJ-1	63 / 02 / 81	Wallowa	Cottonwood AP	Recovered	36
2001	LA-IT-1	63 / 11 / 78	Wallowa	Cottonwood AP	Recovered	75
2001	NA	63 / 09 / 70	Tucannon End	Tucannon River @ Curl Lake	Recovered	1
					Lost	2
					No Tag	4
<b>Grand Total for Year</b>						<b>118</b>

### Tucannon FH Trap

A permanent adult steelhead and salmon trap was installed in 1998 at the TFH water intake diversion dam. Natural and Tucannon River endemic stock origin steelhead are enumerated, sampled, and passed upstream to spawn, while LFH stock fish are returned to below the trap. In 2004 hatchery staff trapped 33 natural, five Tucannon River endemic stock, and five LFH stock hatchery-origin steelhead.

### Lower Tucannon Adult Trap

Evaluation staff deployed a temporary trap at rkm 17.7 in the lower Tucannon River during the fall/winter of 2003/2004. The objective was to enumerate the natural-origin steelhead in the Tucannon River, and to collect natural-origin fish for a new hatchery broodstock (Bumgarner et. al. 2002). The trap was deployed on 2 September with intermittent operation through 23 March. We operated the trap intermittently to allow unrestricted passage of all species in case the weir/trap were causing delays in migration. In all, 67 natural fish (30 males and 37 females), 15 Tucannon River endemic stock, and 196 LFH hatchery fish were trapped. We collected 33 natural fish (17 females and 16 males) for broodstock. Natural origin fish that were not collected for broodstock were passed upstream after length and sex were determined, and scales samples were collected. During 2003/2004, pre-spawning loss (0 fish) was again lower than the previous year because of more aggressive fungus control treatments. During February, March, and April of 2004, 16 adult females were spawned with 15 males at LFH. Total eggtake was estimated at 75,560 (Table 2). Natural fish trapped at the lower Tucannon Trap consisted of 56.9% one-ocean and 43.1% two-ocean age fish (Table 10). In addition to the summer steelhead captured in the lower trap, we also captured or found on the weir pickets eight spring chinook, 19 fall chinook, eight coho salmon, one bull trout, one whitefish, and seven suckers.

Table 10. Summary of fresh and salt-water age composition<sup>a</sup> of natural origin adult steelhead from the Tucannon River, 2000-2004 brood years.

Year	Age 1.1		Age 1.2		Age 2.1		Age 2.2		Age 3.1		Age 3.2		Repeat spawners
	N	%	N	%	N	%	N	%	N	%	N	%	
2000	18	25.0	6	8.3	36	50.0	7	9.7	5	6.9	0	0.0	NONE
2001	0	0	13	27.1	13	27.1	19	39.6	0	0.0	3	6.3	NONE
2002	5	8.8	10	17.5	29	50.9	10	17.5	3	5.3	0	0.0	NONE
2003	0	0	4	3.9	29	28.2	56	54.4	5	4.9	6	5.8	YES <sup>b</sup>
2004	0	0	0	0.0	42	40.8	13	12.6	5	4.9	0	0.0	YES <sup>c</sup>
<b>Combined</b>	<b>23</b>	<b>6.7</b>	<b>33</b>	<b>9.7</b>	<b>149</b>	<b>43.7</b>	<b>105</b>	<b>30.8</b>	<b>18</b>	<b>5.3</b>	<b>9</b>	<b>2.6</b>	<b>---</b>

<sup>a</sup> Age reporting protocol is F.S, where F=freshwater years and S=saltwater years of age.

<sup>b</sup> Three fish sampled in 2003 were repeat spawners, one fish was 1.1S, two were 2.1S for 3.6% of the run.

<sup>c</sup> One fish sampled in 2004 was a repeat spawner (2.1S1).

### Touchet River Adult Trap

Evaluation staff operated the adult trap in the Touchet River from 2 February to 2 July in 2004. We trapped 102 (70.8%) natural, and 25 (17.4%) LFH hatchery origin, and 17 (11.8%) Touchet River endemic hatchery origin steelhead. An additional 23 LFH hatchery origin steelhead were captured between 25 May until 2 July, though we consider these fish to be mainly 2004 run year fish based on their date of capture and condition. Sex ratio of natural steelhead was skewed toward females (72.6%) while the sex ratio in the hatchery steelhead (both stocks) was skewed towards males (67.4%). We collected 30 natural origin fish (16 females and 14 males) for broodstock. Pre-spawning mortality was low in 2004 with two fish dying (6.7%). For the season, 15 females were spawned with 10 males yielding 66,125 eggs. Natural fish trapped in 2004 consisted of 82.5% one-ocean and 17.5% two-ocean age (Table 11). In addition to trapping summer steelhead, we also captured 10 spring chinook (four wild, six hatchery (three of which were determined to be from the Tucannon River based on the Right Red VIE tag behind the eye), 65 bull trout, 226 bridgeline suckers, one northern pike minnow, 17 brown trout, and seven whitefish in the Touchet adult trap.



Table 11. Summary of fresh and salt-water age composition<sup>a</sup> of natural origin adults from the Touchet River, 1994-1995 and 1999-2004 brood years.

BY	Age 1.1		Age 1.2		Age 2.1		Age 2.2		Age 3.1		Age 3.2		Age 4.1		Age 4.2		Repeat spawners	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
1994	0	0.0	0	0.0	6	28.6	8	38.1	3	14.3	3	14.3	0	0.0	0	0.0	0.0	YES <sup>b</sup>
1995	0	0.0	0	0.0	0	0.0	5	85.7	0	0.0	0	0.0	0	0.0	1	14.3	14.3	NONE
1999	0	0.0	1	3.2	18	58.1	9	29.0	2	6.5	0	0.0	0	0.0	0	0.0	0.0	YES <sup>c</sup>
2000	1	3.2	1	3.2	17	54.8	8	25.8	3	9.7	1	3.2	0	0.0	0	0.0	0.0	NONE
2001	1	0.6	14	8.0	84	48.3	40	23.0	15	8.6	9	5.2	1	0.6	0	0.0	0.0	YES <sup>d</sup>
2002	6	4.8	3	2.4	84	67.7	20	16.1	6	4.8	3	2.4	0	0.0	0	0.0	0.0	YES <sup>e</sup>
2003	0	0.0	8	6.7	20	16.7	73	60.8	2	1.7	10	8.3	0	0.0	0	0.0	0.0	YES <sup>f</sup>
2004	0	0.0	1	0.8	47	39.2	18	15.0	18	15.0	2	1.7	1	0.8	0	0.0	0.0	YES <sup>g</sup>
<b>Totals</b>	<b>8</b>	<b>1.3</b>	<b>28</b>	<b>4.6</b>	<b>276</b>	<b>45.6</b>	<b>182</b>	<b>301</b>	<b>49</b>	<b>8.1</b>	<b>28</b>	<b>4.6</b>	<b>2</b>	<b>0.3</b>	<b>1</b>	<b>0.2</b>		

<sup>a</sup> Age reporting protocol is F.S, where F=freshwater years and S=saltwater years of age.

<sup>b</sup> One fish sampled in 1994 was a repeat spawner, 2.1S for 4.8% of the run.

<sup>c</sup> One fish sampled in 1999 was a repeat spawner, 2.1S for 3.2% of the run.

<sup>d</sup> Ten fish sampled in 2001 were repeat spawners, eight fish were 2.1S, and two were 2.1S1 for a total of 5.7% of the run.

<sup>e</sup> Two fish sampled in 2002 were repeat spawners, one fish was 2.1S, and one was 2.1S for a total of 1.6% of the run.

<sup>f</sup> Six fish sampled in 2003 were repeat spawners, one fish was 1.1S, four were 2.1S, and one was 3.1S for a total of 5.8% of the run.

<sup>g</sup> Ten fish sampled in 2004 were repeat spawners, four were 2.1S, one was 3.1S, five were 2.1S1, and one was 2.1SS for a total of 8.1% of the run.

We also operated a Logie 2100C Resistivity Fish Counter at the Touchet River trap. Our main objective in 2004 was to video validate the counter for accuracy. This was accomplished by linking a digital video recorder to the counter so video footage would be archived each time the counter detected a change in bulk resistance over the counter. We experience several technical difficulties during the season, but in the end determined that 41 summer steelhead, 3 spring chinook, 3 brown trout and 19 bull trout passed over the counter ramp in 2004. An additional 43 un-identifiable fish crossed the counter. An addition camera and re-adjustment of current cameras should help in better determining species next year.

## Lower Granite Adult Trap

At Lower Granite Dam, NOAA Fisheries operates the adult trapping facility to monitor the migration and passage of salmon and steelhead throughout the year. All coded-wire tagged fish passing through the ladder are diverted to a holding area where they are sampled. During the 2003 run year, large returns of both summer steelhead and fall Chinook salmon required a systematic sub-sample operation (11% sample rate of the entire run, not just coded-wire tagged fish) of the adult trap through the run. Based on the sample rate, we expanded the observed number of freeze brands to calculate total of each freeze brand that would have potentially been trapped. Returns of branded fish to LGD (Table 12) have been used to estimate minimum return rates of WDFW steelhead release groups back to the Snake River at LGD. However, initial data analysis has shown the new trapping rate initiated in 2002/2003 may have severely limited our ability to utilize

freeze brand data in the future. The use of freeze brands will have to be evaluated for coming years.

Table 12. Adult returns of LFH freeze branded or VIE tagged steelhead to Lower Granite Dam in run years 2001-2003, from smolts released in 2000-2002.

Release Year	Release site	Adults by run year			Total adults	Branded smolts released <sup>a</sup>	Percent survival
		2001	2002	2003			
<b>2000</b>							
RA-2-2	Cottonwood - Grande R.	2,514	442	0	2,956	74,026	3.993
RA-IC-1	Snake River @ LFH	290	24	0	314	19,361	1.622
LA-2-2	Dayton AP - Touchet R.	209	47	0	256	37,077	0.690
LA-IC-3	Tucannon @ Marengo	256	17	0	273	19,807	1.378
LA-IC-1	Tucannon @ Enrich	296	21	0	317	19,143	1.656
<b>2001</b>							
LA-IJ-1	Cottonwood - Grande R.		696	127	823	40,301	2.042
RA-S-1	Snake River @ LFH		39	9	48	19,837	0.242
LA-S-1	Tucannon River		60	0	60	19,871	0.302
LY-VIE	Tucannon River @Curl		3	0	3	51,977	0.006
RY-VIE	Touchet River @ NF		0	0	0	33,750	0.000
<b>2002<sup>b</sup></b>							
LA-IT-1	Cottonwood - Grande R.			264	264	38,934	0.678
RA-IV-3	Snake River @ LFH			36	36	18,590	0.194
LA-IV-1	Tucannon River			82	82	19,647	0.417
LA-IT-3	Touchet River @ Dayton			45	45	18,742	0.240
RR-VIE	Tucannon River @Curl			18	18	55,870	0.032
LR-VIE	Touchet River @ NF			9	9	41,258	0.022

<sup>a</sup> Observed brands or VI adjusted for brand/VI loss as measured at release.

<sup>b</sup> Estimates for 2003 were based on an 11% sample rate for the season.

## Creel Surveys

WDFW personnel surveyed steelhead sport anglers within the LSRCP area of Washington (see Schuck et. al. 1990 for methods). The creel surveys allow us to recover CWTs from fish. We then estimate the number of LFC steelhead in the Washington sport catch in SE Washington using WDFW sport harvest estimates from punch cards. Also, data from each week's surveys are summarized during the season and provided to the local news media to assist anglers. During the 2003/2004 steelhead season we surveyed 9,463 anglers that caught 3,984 fish within the LSRCP area of Washington (Table 13). A total of 1,507 natural origin fish (37.8% of the total catch documented from creel surveys alone) were caught and released during the 2003/2004 season. All CWT's collected during the fishery were extracted and sent to Olympia for eventual inclusion in the PSMFC/CWT database maintained in Portland, OR. In addition, we cooperated with ODFW by conducting a joint survey of anglers on the lower Grande Ronde River of 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 will be supplied by ODFW when the data are complete. Coded-wire tag recoveries from this effort were sent to ODFW in La Grande for processing.

Table 13. Steelhead angler interview results for fall/winter/spring of the 2003 run year from Washington State licensed anglers.

<b>River Basin</b> River section description <sup>a</sup>	River section number	Anglers Surveyed	Total hours fished	Natural fish released	Hatchery fish kept	Hatchery fish released	Catch rate (hr/fish)
<b>Columbia River</b>							
McNary Dam to Pasco	533	1,348	3,909.5	66	115	4	21.1
<b>Walla Walla Subbasin</b>							
Walla Walla River	659	453	1,146.0	72	63	10	7.9
Mill Creek	655	0	0.0	0	0	0	0.0
Touchet River	657	180	524.8	65	46	54	3.2
<b>Snake River</b>							
Mouth to IHR	640	13	43.5	0	3	0	14.5
IHR to LMD	642	2,965	9,015.8	144	216	2	24.9
LMD to LGD	644	1,916	9,342.8	154	358	24	17.4
LGD to LGR	646	629	1,974.3	40	79	4	16.1
LGR to Hwy 12 Br	648	308	2,095.0	43	63	7	18.5
Hwy 12 Br upstream	650	1,274	8,133.8	767	1,078	94	4.2
Tucannon River	653	379	1,195.0	162	111	99	3.2
<b>Totals</b>		<b>9,465</b>	<b>37,380.3</b>	<b>1,513</b>	<b>2,132</b>	<b>298</b>	<b>9.4</b>

<sup>a</sup> Abbreviations as follows: IHR=Ice Harbor Dam, LMD=Lower Monumental Dam, LGD=Little Goose Dam, LGR=Lower Granite Dam, Hwy=Interstate Highway. Data from sections 648 and 650 include data collected by IDFG.

## Spawning Ground Surveys

During the spring of 2004, evaluation staff surveyed spawning grounds in select reaches of the Tucannon and Touchet rivers and Asotin Creek for steelhead redds. Start and stop coordinates for each stream reach and index areas are provided (Table 17). From these surveys we estimated the total number of redds in each (Tables 14, 15 and 16). Poor spring time river flows in 2004 may have affected the spawning distribution in the Touchet and Tucannon rivers.

Table 14. Start and stop coordinates (latitude and longitude) for stream reaches, index sections, and final walks for summer steelhead spawning ground surveys in the Tucannon and Touchet rivers, and Asotin Creek, 2004.

<b>Stream – Surveyed Section</b>	<b>Upstream coordinates (Start)</b>	<b>Downstream coordinates (Stop)</b>
<b>Tucannon River</b>		
<i>Reach 1</i>	46 18' 35.87" N, 117 39' 22.73" W	46 29' 20.29" N, 117 57' 37.79" W
Index 5	46 27' 40.61" N, 117 51' 27.24" W	46 27' 56.86" N, 117 53' 50.01" W
Index 4	46 25' 17.55" N, 117 43' 47.51" W	46 26' 25.58" N, 117 44' 56.02" W
Index 3	46 20' 01.59" N, 117 40' 31.61" W	46 22' 07.18" N, 117 41' 25.48" W
<i>Reach 2</i>	46 11' 18.29" N, 117 37' 25.95" W	46 18' 35.87" N, 117 39' 22.73" W
Index 2	46 17' 07.30" N, 117 39' 19.88" W	46 18' 10.78" N, 117 39' 08.30" W
Index 1	46 13' 42.41" N, 117 43' 17.29" W	46 15' 17.97" N, 117 40' 17.24" W
<i>Reach 3</i>	46 15' 49.62" N, 117 36' 55.61" W	46 19' 57.76" N, 117 40' 25.73" W
Final Walk 1	46 15' 49.62" N, 117 36' 55.61" W	46 19' 57.76" N, 117 40' 25.73" W
<b>Touchet River</b>		
<i>NF Touchet Reach</i>	46 11' 21.53" N, 117 49' 19.79" W	46 18' 05.41" N, 117 57' 30.80" W
Index 1	46 14' 27.25" N, 117 51' 56.92" W	46 15' 39.65" N, 117 52' 32.37" W
Final Walk 1	46 11' 21.53" N, 117 49' 19.79" W	46 12' 59.19" N, 117 50' 55.27" W
Final Walk 2	46 16' 50.07" N, 117 54' 13.70" W	46 17' 52.53" N, 117 57' 07.63" W
<i>SF Touchet Reach</i>	46 09' 08.74" N, 117 58' 24.02" W	46 18' 05.41" N, 117 57' 30.80" W
Index 1	46 11' 58.77" N, 117 57' 17.27" W	46 13' 41.14" N, 117 56' 31.33" W
Final Walk 1	46 09' 08.74" N, 117 58' 24.02" W	46 11' 58.77" N, 117 57' 17.27" W
Final Walk 2	46 14' 57.38" N, 117 55' 52.14" W	46 15' 48.71" N, 117 56' 19.04" W
<i>WF Touchet Reach</i>	46 08' 56.71" N, 117 52' 29.14" W	46 16' 27.10" N, 117 53' 42.41" W
Index 1	46 12' 49.31" N, 117 56' 11.01" W	46 14' 12.87" N, 117 53' 632.43" W
Final Walk 1	46 08' 56.71" N, 117 52' 29.14" W	46 12' 49.31" N, 117 56' 11.01" W
Final Walk 2	46 14' 12.87" N, 117 53' 32.43" W	46 16' 27.10" N, 117 53' 42.41" W
<b>Asotin Creek</b>		
<i>Main Asotin Creek Reach</i>	46 16' 21.42" N, 117 17' 27.79" W	46 19' 34.44" N, 117 06' 18.82" W
Index 1	46 16' 26.00" N, 117 17' 28.69" W	46 17' 57.12" N, 117 15' 15.54" W
Index 2	46 19' 02.37" N, 117 14' 12.30" W	46 19' 39.27" N, 117 12' 12.90" W
Index 3	46 19' 51.03" N, 117 09' 57.42" W	46 19' 45.33" N, 117 09' 14.59" W
Final Walk 1	46 17' 57.12" N, 117 15' 15.54" W	46 19' 02.37" N, 117 14' 12.30" W
<i>NF Asotin Creek Reach</i>	46 13' 01.76" N, 117 23' 45.40" W	46 16' 21.42" N, 117 17' 27.79" W
Index 1	46 15' 43.98" N, 117 17' 44.69" W	46 16' 21.42" N, 117 17' 27.79" W
Index 2	46 16' 10.79" N, 117 21' 28.57" W	46 14' 41.39" N, 117 20' 06.97" W
Final Walk 1	46 13' 01.76" N, 117 23' 45.40" W	46 14' 10.79" N, 117 21' 28.57" W
Final Walk 2	46 14' 41.29" N, 117 20' 06.79" W	46 14' 35.82" N, 117 18' 53.24" W
<i>SF Asotin Creek Reach</i>	46 11' 32.61" N, 117 19' 14.57" W	46 16' 21.42" N, 117 17' 27.79" W
Index 1	46 13' 32.43" N, 117 16' 47.97" W	46 15' 04.18" N, 117 17' 18.28" W
Final Walk 1	46 11' 32.61" N, 117 19' 14.57" W	46 16' 21.42" N, 117 17' 27.79" W
<i>Charley Creek Reach</i>	46 16' 58.50" N, 117 23' 49.12" W	46 17' 18.92" N, 117 16' 38.71" W
Index 1	46 17' 05.56" N, 117 20' 30.14" W	46 17' 15.21" N, 117 18' 13.23" W
Final Walk 1	46 16' 58.50" N, 117 23' 49.12" W	46 17' 05.56" N, 117 20' 30.14" W
Final Walk 2	46 17' 15.21" N, 117 18' 13.23" W	46 17' 17.80" N, 117 17' 05.28" W

Table 15. Results of summer steelhead redd surveys in the Tucannon River, 2004.

<b>Stream</b> Section surveyed	Est. Rkm	Dates Surveyed	Redds counted	Total redds	Exp. # of redds	% of total reach surveyed	Total est. redds for reach	
<b>Tucannon River Basin</b>	<b>73.6</b>		<b>50</b>	<b>50</b>	<b>57</b>	<b>63.9</b>	<b>122</b>	
<b>Reach 1 - HWY 12 to Hatchery Intake</b>	<i>38.0</i>		<i>21</i>	<i>21</i>	<i>28</i>	<i>30.0</i>	<i>93</i>	
Index 5 - 2 miles above Enrich to Enrich	4.6	4/2, 4/12, 4/27	3, 3, 3	9	11			
Index 4 - Bridge 10 to Marengo Bridge	3.4	4/2, 4/12, 4/27	1, 1, 1	3	3			
Index 3 – Cummings Bridge to Bridge 14	3.4	4/2, 4/12, 4/27	1, 2, 6	9	14			
<b>Reach 2 - Hatchery Intake to Sheep Creek</b>	<i>25.0</i>		<i>13</i>	<i>13</i>	<i>13</i>	<i>100</i>	<i>13</i>	
Index 2 - Beaver/Watson to Camp 6	3.4	Neither Section was surveyed in 2004 due to lack of fish captured at the Tucannon						
Index 1 - Little Tucannon to Curl Lake	3.4	Hatchery Intake Trap. Redds based on females passed above trap.						
<b>Reach 3 - Cummings Creek (Old Mine to Mouth)</b>	<i>10.6</i>	<i>5/18</i>	<i>16</i>	<i>16</i>	<i>16</i>	<i>100</i>	<i>16</i>	

Table 16. Results of summer steelhead redd surveys in the Touchet River, 2004.

<b>Stream</b> Section surveyed	Est. Rkm	Dates Surveyed	Redds counted	Total redds	Exp. # of redd	% of total reach surveyed	Total est. redds for reach
<b>Touchet River Basin</b>	<b>56.3</b>		<b>80</b>	<b>80</b>	<b>92</b>	<b>70.3</b>	<b>133</b>
<i>North Fork Touchet Reach – MP 13 to Mouth</i>	<i>24.8</i>		<i>28</i>	<i>28</i>	<i>30</i>	<i>45.1</i>	<i>66</i>
Index 1 - LE of Frames to LE Sterns House	2.7	4/7, 4/19, 4/29, 5/11	5, 6, 4, 0	15			
Final Walk 1 - Bridge at MP 13 to Br @ MP 11	4.2	5/11	5	5			
Final Walk 2 - Warren orchard to Baileysburg Br.	4.3	5/11	8	8			
<i>South Fork Touchet Reach – Upper Cabins to Mouth</i>	<i>15.0</i>		<i>18</i>	<i>18</i>	<i>21</i>	<i>79.3</i>	<i>26</i>
Index 1 - Camp Nancy Lee down 2.2 miles	3.7	4/7, 4/19, 4/29, 5/17	5, 6, 3, 0	14			
Final Walk 1 - Cabins to Camp Nancy Lee	6.4	5/17	2	2			
Final Walk 2 – 1.1 rd miles above Bridge 2	1.8	5/17	2	2			
<i>Wolf Fork Touchet Reach – Newby Cabin to Mouth</i>	<i>16.5</i>		<i>34</i>	<i>34</i>	<i>41</i>	<i>100</i>	<i>41</i>
Index 1 - (Bridge above Nelsons to Robinson fork bridge)	3.6	4/7, 4/16, 4/28, 5/13	5, 5, 5, 2	17			
Final Walk 1 - Newby Cabin to Upper Index	7.9	5/13	4	4			
Final Walk 2 - Lower Index to Mouth	5.0	5/13	13	13			

Table 17. Results of summer steelhead redd surveys in Asotin Creek, 2004.

Stream Section surveyed	Est. Rkm	Dates surveyed	Redds counted	Total redds	Exp. # of redds	% of total reach surveyed	Total est. redds for reach
<b>Asotin Creek Basin</b>	<b>57.6</b>		<b>242</b>	<b>242</b>	<b>254</b>	<b>74.7</b>	<b>386</b>
<i>Mainstem Asotin Creek Reach – NF/SF Confluence to George Creek Mouth</i>	<i>21.4</i>		<i>139</i>	<i>139</i>	<i>145</i>	<i>56.0</i>	<i>258</i>
Index 1 - NF/SF confluence ↓ 2.4 road miles	4.3	4/1, 4/13, 4/21	28, 14, 4	46			
Index 2 - 2 miles above Headgate Park to Headgate Park	3.7	4/1, 4/8, 4/21	28, 15, 2	45			
Index 3 - 0.7 mile above green house	1.2	4/1, 4/8, 4/21	13, 4, 0	17			
Final Walk 1 - Between index 1 and index 2	2.8	4/21	31	31			
<i>North Fork Asotin Creek Reach – 2<sup>nd</sup> FS Fence to Mouth</i>	<i>12.8</i>		<i>56</i>	<i>56</i>	<i>60</i>	<i>81.7</i>	<i>74</i>
Index 1 - End of old rd down 1.5 red miles	2.6	4/8, 4/23, 4/29	11, 9, 3	23			
Index 2 - Lick Creek to confluence	1.7	3/26, 4/8, 4/21, 4/29	7, 5, 2, 0	14			
Final Walk 1 - Second FS Fence to top of index	4.3	4/29	13	13			
Final Walk 2 - Bottom of index down 1 mile	1.7	4/29	6	6			
<i>South Fork Asotin Creek Reach – Old Chimney to Mouth</i>	<i>11.4</i>		<i>5</i>	<i>5</i>	<i>5</i>	<i>100.0</i>	<i>5</i>
Index 1 - Schlee Bridge down 2 rd miles	3.4	4/8, 4/21	0, 0	0			
Final Walk 1 - Old chimney to mouth (includes index)	8.0	4/25	5	5			
<i>Charley Creek Reach – Old Corral to Mouth</i>	<i>10.9</i>		<i>42</i>	<i>42</i>	<i>44</i>	<i>90.3</i>	<i>49</i>
Index 1 - 3.2 miles above Koch Gate down 2.0 miles	3.4	4/8, 4/23, 4/30	23, 4, 2	29			
Final Walk 1 - Old Corral to top of index	4.1	4/30	2	2			
Final Walk 2 – Bottom of index down 1 mile	1.8	4/30	6	6			

## Natural Juvenile Production in Area Rivers

As in previous years, WDFW electrofished (multiple pass removal method (Zippin 1958)) index sites to estimate juvenile steelhead densities and derive population estimates for specific river reaches (Tables 18 and 19). Another objective of our surveys was to document the number of hatchery residual steelhead from the endemic steelhead broodstock program. The potential for residual hatchery steelhead to negatively affect natural salmonid populations through competition, displacement, or predation was identified as a concern by NOAA Fisheries after chinook salmon were listed as threatened under the 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 (Viola and Schuck 1995; Schuck et. al. 1998; Martin et. al. 2000). During 2003, we estimated residual hatchery steelhead (LFH stock and Endemic stocks) in the Tucannon and Touchet rivers through the use of electrofishing surveys (Table 20). Estimated residualism is therefore a minimum as mortality and harvest would have occurred before electrofishing surveys were complete. In addition, there may be a bias in the residual estimates due to bias in electrofishing that tend to underestimate larger sized fish within a site as they are not as easily captured by the method. Estimated residualism for the Tucannon River in 2003 was 4.7% of endemic stock release and 1.7% of LFH stock release. Estimated residualism for the Touchet River in 2003 was 8.2% of endemic stock release and 0.9% of LFH stock release. The size of endemic stock residuals in the Touchet and Tucannon rivers was 222.6 mm (SD=28.4), and 181.8 (SD=36.4), respectively. The Touchet stock residuals were considerable larger than their mean size at release (Touchet = 199.3 mm), but the Tucannon stock residuals were similar to their release size (Tucannon = 186.6 mm). It appears that only larger sized fish residualized in the Touchet stock, while the Tucannon stock had more of a range of sizes. Summer steelhead densities per site, site descriptions, and other sensitive species captured during electrofishing surveys are provided in Appendix A.

Table 18. Summary of mean fish density (Fish/100 m<sup>2</sup>) and population estimates of Age 0 summer steelhead in Asotin Creek, and Touchet and Tucannon rivers for specific tributaries/reaches in 2003.

Basin	Reach	Sites	Mean Density	Population Estimate	95% C.I.
Asotin Creek	Mainstem	5	51.86	92,574	12,825
	North Fork	5	36.96	36,400	10,751
	South Fork	5	83.64	38,535	4,928
	Charley Cr.	5	57.67	19,900	5,553
Touchet	Mainstem	8	25.51	51,330	32,760
	North Fork	7	54.17	110,488	24,142
	South Fork	8	32.78	40,494	13,986
	Wolf Fork	7	42.99	57,516	12,189
	Robinson Fork	5	39.63	10,988	3,403
Tucannon Mainstem	Marengo	5	26.62	54,310	33,225
	Hartsock	4	29.70	47,717	14,983
	HMA	5	14.66	30,658	10,318
	Wilderness	2	8.37	6,389	4,117
	Cummings Cr.	5	48.91	12,779	4,122



Table 19. Summary of mean fish density (Fish/100 m<sup>2</sup>) and population estimates of Age 1+ summer steelhead in Asotin Creek, and Touchet and Tucannon rivers for specific tributaries/reaches in 2003.

Basin	Reach/Strata	Sites	Mean Density	Population Estimate	95% C.I.
Asotin Creek	Mainstem	5	15.52	27,701	12,925
	North Fork	5	18.72	18,440	5,377
	South Fork	5	36.22	16,687	3,014
	Charley Cr.	5	38.37	13,240	5,461
Touchet	Mainstem	8	2.91	5,845	4,395
	North Fork	7	16.71	34,083	10,891
	South Fork	8	17.20	21,249	10,638
	Wolf Fork	7	16.20	21,678	7,893
	Robinson Fork	5	27.43	7,604	3,542
Tucannon Mainstem	Marengo	5	3.97	8,103	8,241
	Hartsock	4	9.09	14,606	4,619
	HMA	5	7.11	14,859	7,179
	Wilderness	2	11.40	8,706	457
	Cummings Cr.	5	28.32	7,398	3,973

Table 20. Summary of mean fish density (Fish/100 m<sup>2</sup>) and population estimates of hatchery endemic stock summer steelhead residuals in the Touchet and Tucannon rivers for specific tributaries/reaches in 2003.

Basin	Reach/Strata	Sites	Mean Density	Population Estimate	95% C.I.
Touchet	Mainstem	8	0.18	353	305
	North Fork	7	0.90	1833	1840
	South Fork	8	0.08	102	139
	Wolf Fork	7	0.21	285	255
	Robinson Fork	5	0.00	0	0
Tucannon	Marengo	5	0.00	0	0
	Hartsock	4	0.02	29	57
	HMA	5	0.96	2003	2359
	Wilderness	2	0.00	0	0

## Genetic Analysis

Since 1998, the Snake River Lab and WDFW's Fish Management staff have periodically collected samples from SE Washington summer steelhead populations (adult and juvenile) for genetic stock analysis. Samples have been collected from the Walla Walla, Touchet and Tucannon River basins, and LFH stock. The following two graphs represent a brief summary of the analysis completed to date (Figures 2 and 3). A more complete analysis is available upon request. Results indicate that each of these natural stocks (Tucannon, Touchet, and Walla Walla) remain genetically distinct from the LFH stock despite years of hatchery stocking in each basin. Tucannon and LFH stocks are more similar and indicate some introgression between the two. Further analysis of additional samples from more years and other locations needs to occur, and long-term monitoring of the genetic characteristics of the new endemic broodstock(s) should occur because of the small founding populations sizes currently used.

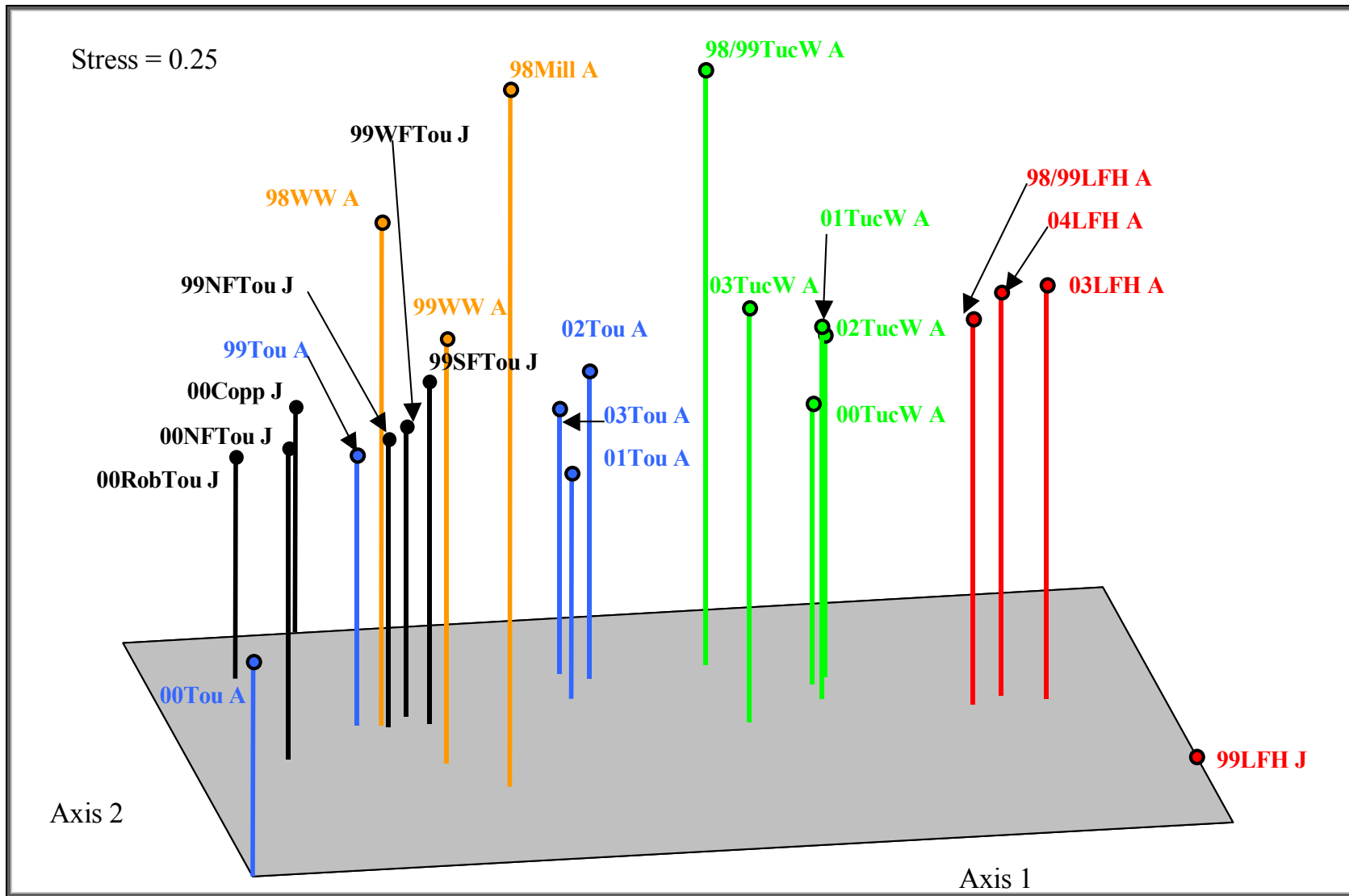


Figure 2. MDS of genetic distances among Tucannon and Touchet steelhead collections from NTSYS-pc. Genetic distances (Cavalli-Sforza and Edwards) were calculated using GENDIST in PHYLIP. Samples were collected either for adults (A) or juveniles (J). Lyons Ferry Stock fish are indicated in red, Tucannon wild stock are indicated in green, Touchet wild stock adult samples are indicated in blue, Walla Walla River wild stock are indicated in orange, and Touchet River tributary juvenile samples are indicated in black.

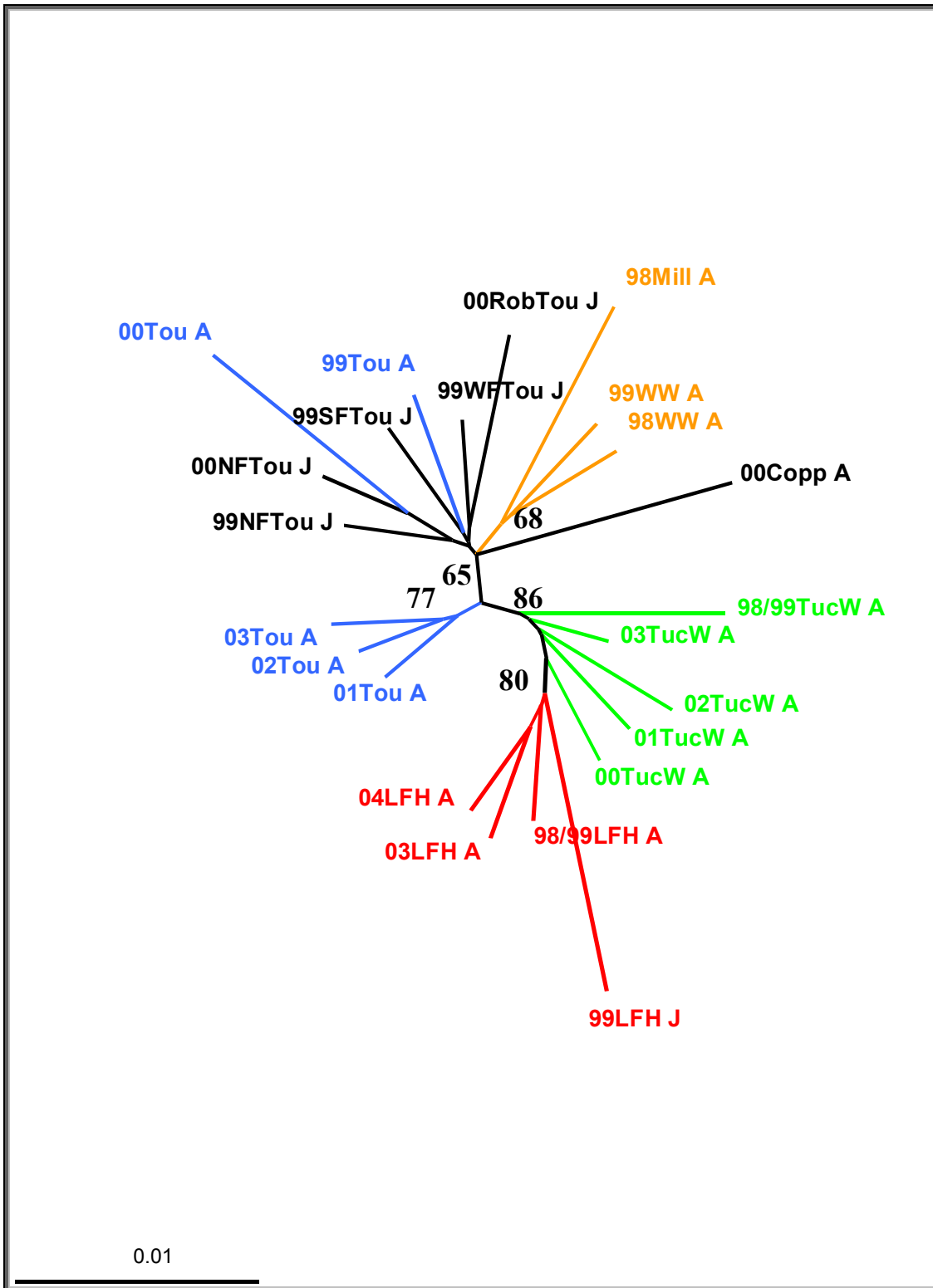


Figure 3. Neighbor-joining consensus tree of Cavalli-Sforza and Edwards distances among collections from PHYLIP. Numbers at the nodes indicate the percentage of 10,000 trees in which the collections beyond the node grouped together and only values over 65% are shown. Lyons Ferry Stock fish are indicated in red, Tucannon wild stock are green, Touchet wild stock adult samples are blue, Walla Walla River wild stock are orange, and Touchet River tributary juvenile samples are indicated in black.

## Conclusions and Recommendations

In summary, the LFC summer steelhead program (LFH and Wallowa stock only) continues to meet and/or exceed its original mitigation goals by supplying large returns for harvest within the Lower Snake River area. Preliminary calculations based on adult trapping, spawning ground and creel surveys, we estimated that a minimum of 5,475 LFH stock and 2,065 Wallowa stock fish returned in 2004. That represents 174% and 138% of the Washington mitigation goal for each of these stocks, respectively.

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, has significantly improved program success while decreasing negative effects on all wild salmonid populations. Further evaluation and monitoring of impacts to listed and non-target populations must occur to fully assess these impacts (i.e. reproductive success of hatchery and native fish where they co-exist), and to implement changes in the future. In the past year production of both LFH and Wallowa stocks were decreased as our data showed we were returning more fish back to the project area than needed for the mitigation program. Determining the degree or rate of straying of LFH and Wallowa stocks and their potentially negative impacts to local populations continues to be a difficult task, but a high priority. Returns of straying tagged fish will be closely monitored, and an upcoming LSRCP report from WDFW releases will document stray rates for the program. Genetic stock characterization needs to continue, especially with the new broodstock developments, and additional analysis is needed in the Tucannon River to determine the degree of stock introgression from the LFH stock.

In an effort to maintain successful mitigation in an ESA environment, we offer the following conclusions/recommendations from our studies, and offer additional areas of interest that should be pursued in the future to answer critical questions:

1. The NOAA Fisheries ruled that LSRCP hatchery steelhead jeopardized listed steelhead populations within the Snake and Columbia river basins (NMFS 1999), 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 somewhat successful, but more data are needed before a final conclusion is reached, and we expand the use of these local broodstocks. Current adult traps we use for capturing broodstock are not adequate for adult return evaluation. In addition, since none of the fish released are marked for harvest, we have no other way of accounting for these fish upon return. Further, to be truly successful, hatchery rearing of these endemic stocks needs to be improved (growth during rearing and size at release – see #4 below).

The numbers of fish used to develop these endemic broodstocks are very low, raising genetic concerns for the future. At present, none of the adult fish that return would ever be used as broodstock in the hatchery. If the program should expand, it will require collecting more unmarked (wild) fish from the river, potentially causing further damage to these listed stocks.

Another alternative would be to collect juveniles from the river and conduct a small-scale captive broodstock program. Given the broader genetic base from this method, adults produced could be collected in the future for the hatchery broodstock, with only a few wild fish required each year for genetic contribution.

Adult traps have been utilized to collect the standard hatchery steelhead stocks, develop new endemic stocks, or to assess stock/population potential in other areas. In addition, they provide an opportunity to collect tagged (ADLV+CWT) hatchery steelhead that may come from the LRSCP 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 on a trial basis. We recommend that a large number of the endemic steelhead be PIT tagged prior to release. Adult PIT tag detection capabilities should be able to provide answers on adult return rates where current adult traps fall short.

**Recommendation:** Beginning in the spring/summer of 2005, collected natural origin summer steelhead eggs and/or juveniles from the upper Tucannon River and transport them to Lyons Ferry Hatchery for a small scale captive broodstock program. Rear these fish to maturity and spawn them for gametes to supply the endemic program.

**Recommendation:** Modify/improve existing adult traps to evaluate each endemic program and provide recommendations for each broodstock. Continue to investigate barrier types that can be used at the Dayton Adult Trap and Tucannon Fish Hatchery adult trap to improve trapping efficiency at each trap.

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

2. The release of Wallowa stock juvenile steelhead from Cottonwood Creek AP is a successful portion of Washington's mitigation program. In addition to the Cottonwood AP releases, the ODFW also releases large numbers (up to 1.2 million) of Wallowa stock steelhead into the upper Grande Ronde River. However, CWT recoveries from fisheries and traps 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 smolts from Cottonwood AP to re-evaluate this potential straying issue. Within the next year, the ODFW will produce a report describing the stray rates of Wallowa stock and other Snake River basin steelhead stocks into the Deschutes River. However, due to their analysis method (need of a good terminal trapping location to obtain CWT's), data from the Cottonwood AP releases were not included because it lacks a good adult trap. As such, WDFW will conduct another analysis using data from our Cottonwood release groups, but using Lower Granite Dam as the final observation point in the Snake River (use of freeze brand recoveries observed at the dam). Preliminary data analysis suggests that straying of Cottonwood fish into the Deschutes River is minimal (i.e. <5%). Therefore, abandoning the use of this stock based on the stray issue into the Deschutes River may be unfounded.

**Recommendation:** Continue the use of Wallowa stock steelhead (at a reduced smolt production level) trapped at Cottonwood AP for use in the Grande Ronde River and continue marking (ADLV+CWT) test groups to determine if Cottonwood AP released fish stray into down-river and local tributaries. Provide a summary report documenting the amount of straying into the Deschutes River from Cottonwood AP fish.

3. Genetic stock analysis between Tucannon and Touchet river natural origin steelhead, and LFH stock steelhead continues to be analyzed. Previous results indicate that each of these groups remain genetically distinct from each other despite years of supplementation in each basin (Bumgarner et. al. 2003, this report). Tucannon and LFH stock are more similar and indicate some introgression between the two stocks may have occurred. The Touchet River stock appears to be more intact.

We also suspect there may be some differences in the Tucannon River natural origin fish within the watershed. Large numbers of hatchery origin fish have been documented spawning in the lower Tucannon River (Marengo and downstream), and we've documented a large number of Age 1 smolts leaving the system. We suspect that these Age 1 smolts maybe offspring of mixed or hatchery origin parents. However, upon adult return and possible collection for the new endemic broodstock program, they are indistinguishable from fish that may have reared in the upper Tucannon River (more likely natural origin parents).

**Recommendation:** Long-term monitoring of the genetic characteristics of the new endemic broodstock should occur because of the small founding populations used for the hatchery broodstock. In addition, further analysis of the Tucannon and LFH stock needs to occur. Additional samples from both the LFH and natural stock should be collected. Genetic comparisons should be made between natural origin fish captured from the lower Tucannon Trap and the Tucannon FH adult trap, and by freshwater age class determined from scales (Age 1 versus Age 2,3 smolts).

4. Beginning with program inception, WDFW has utilized freeze brand recoveries at Lower Granite Dam to estimate minimum smolt-to-adult survival from specific release groups at LFC. In particular, these have been very insightful for the Cottonwood AP releases in the Lower Grande Ronde River. Freeze brand recoveries at Lower Granite Dam have typically estimated 2-3 times the number of fish that we can document returning based on CWT recoveries and expansions. This is mainly been due to lack of adequate fishery sampling in the Snake River above Lower Granite Dam, where large fisheries occur, especially near the mouth of the Clearwater River.

For the last 8-10 years, fall chinook returns to the Snake River have been increasing, mainly due to the fall chinook program conducted at LFC. These increased returns, in addition larger runs of summer steelhead, have overloaded the adult trap and personnel at Lower Granite Dam. As such, trapping procedures for fall chinook and summer steelhead during the fall were altered. The old trapping procedure used a CWT detector in the fish ladder, and diverted only fish with wire into the trapping area. For example, we have typically tagged fish from Cottonwood at a 20-40% rate, equating to expansion rate of about 2-5. The new trapping protocol was set up to collect roughly 11-15% of the entire run passing through the

ladder at Lower Granite Dam. As such, the number of CWT/freeze branded fish in the sample at Lower Granite dropped considerably. So now instead of expanding the recoveries by a factor of 2-4, we have to expand by a factor of 25-30.

Discussions are on going among multiple agencies about the future operation of the adult trap at Lower Granite Dam. Depending on the final outcome of these discussions, we may need to consider the phasing out of freeze branding from the LFC summer steelhead program.

**Recommendation:** As an agency, participate in the discussions about modifications to the adult trap at Lower Granite Dam. Provide managers our data needs and determine if the new trap and trapping protocols will provide an adequate sample size for determining adult returns of summer steelhead based on freeze brands.

# Literature Cited

---

- Bumgarner, J., M. Small, L. Ross, and J. Dedloff. 2003. Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead and Trout Report 2001 and 2002 Run Years to USFWS Lower Snake River Compensation Plan Office. Report # FPA03-15.
- Bumgarner, J., M. Schuck, S. Martin, J. Dedloff and L. Ross. 2002. Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead and Trout Report 1998, 1999 and 2000 Run Years to USFWS Lower Snake River Compensation Plan Office. Report # FPA02-09.
- Carmichael, R.W., R. T. Messmer and B.A. Miller. 1988. Summer Steelhead Creel Surveys in the Grande Ronde, Wallowa and Imnaha rivers for the 1987-88 Run Year. Progress Report, 1988. Oregon Department of Fish and Wildlife, Portland, Oregon.
- Martin, S., M. Schuck, J. Bumgarner, J. Dedloff and A. Viola. 2000. Lyons Ferry Hatchery Evaluation, Trout Report: 1997-98. Washington Department of Wildlife Report to the USFWS. Report No. FPA00-11.
- Schuck, M., A. Viola and S. Nostrant. 1990. Lyons Ferry Evaluation Study: Annual Report 1988-89. Washington Department of Wildlife Report to the USFWS. Report No. AFF1/LSR-90-04.
- Schuck, M., A. Viola, J. Bumgarner and J. Dedloff. 1998. Lyons Ferry Trout Evaluation Study: 1996-97 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. H98-10.
- Smith, S. G., J.R. Skalski, J.W. Schlechte, A. Hoffmann, and V. Cassen, J.R. 1994. Statistical Survival Analysis of Fish and Wildlife Tagging Studies. Contract # DE-BI79-90BP02341. Project 89-107. Bonneville Power Administration. Portland. Oregon.
- Viola, A. E., and M. L. Schuck. 1995. A method to reduce the Abundance of residual hatchery steelhead in rivers. *North American Journal of Fisheries Management*. 15:488-493.
- Zippin, C. 1958. The Removal Method of Population Estimation. *Journal of Wildlife Management*. 22(1):82-90.



---

## **Appendix A**

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

---

Appendix A: Table 1. Summary of juvenile summer steelhead / rainbow trout densities (fish/100 m<sup>2</sup>) by age class for SE Washington rivers that are a part of the LSRCP Program.

<b>Age 0 Steelhead / Rainbow Trout</b>									
Stream Name	Asotin Creek				Touchet River			Tucannon River	Cummings Creek
Year	Main	North Fork	South Fork	Charley Creek	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
2001	35.6	33.9	68.8	38.5	23.6	13.8	13.6	17.8	14.8
2002	37.1	40.4	84.7	65.8	48.0	52.1	43.4	27.2	54.9
2003	51.9	36.9	83.6	57.7	54.2	32.8	42.9	21.7	48.9
<b>Age 1+ Steelhead / Rainbow Trout</b>									
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	26.3
1994	39.6	34.9	16.4	20.0	18.9	5.8	11.5	---	20.4
1995	13.1	11.2	21.7	---	8.9	9.5	6.4	4.0	29.6
1996	12.2	17.4	11.2	15.3	3.6	10.2	5.3	3.2	16.6
1997	6.9	6.7	4.6	---	2.3	2.8	7.4	4.6	---
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
2001	19.7	30.4	29.8	23.6	13.7	13.6	11.6	6.9	8.6
2002	12.0	19.7	24.7	19.4	12.1	10.7	6.6	4.3	27.4
2003	15.5	18.7	36.2	38.3	16.7	17.2	16.2	7.20	28.3

Appendix A: Table 2. Densities of juvenile steelhead/rainbow trout (fish/100 m<sup>2</sup>) from electrofishing sites in the Tucannon River basin, and Asotin Creek, 2003.

Stream Site Name	Est. rkm	Site length (m)	Mean width (m)	Area (m <sup>2</sup> )	Fish/100m <sup>2</sup> Age 0	Fish/100m <sup>2</sup> Age 1+	Fish/100m <sup>2</sup> Legal (>203mm)
Tucannon River							
TUC1-00	22.0	125	8.52	1,065.00	12.58	0.28	0.00
TUC2-00	28.0	125	12.42	1,552.50	12.88	2.00	0.00
TUC3-00	31.9	125	13.12	1,640.00	40.37	1.83	0.00
TUC4-00	34.1	125	13.41	1,676.25	14.91	1.91	0.06
TUC5-00	36.7	125	8.52	1,190.00	52.35	3.78	0.00
TUC6-00	41.8	125	10.01	1,251.25	42.76	12.47	0.00
TUC7-00	46.3	125	11.01	1,376.25	22.23	7.48	0.00
TUC8-00	49.1	125	11.32	1,415.00	23.18	10.46	0.00
TUC9-00	52.7	125	8.85	1,106.25	30.64	5.97	0.00
TUC10-00	57.1	125	11.09	1,386.25	24.31	4.33	0.00
TUC11-00	61.2	125	13.91	1,738.75	14.49	6.44	0.06
TUC12-00	64.4	125	11.83	1,475.75	10.89	6.02	0.07
TUC13-00	68.4	125	9.69	1,211.25	10.73	4.54	0.25
TUC14-00	73.2	125	8.50	1,062.50	12.89	13.55	0.28
TUC15-00	75.8	125	7.38	922.50	5.64	11.71	0.00
TUC16-00	78.5	125	8.36	1,045.00	11.10	11.10	0.00
Cummings Creek							
CC-1-01	0.0	50	3.54	177.00	31.64	3.95	0.00
CC-2-01	1.8	50	3.63	181.50	39.12	17.63	0.00
CC-3-01	3.8	50	3.50	175.00	76.57	41.14	0.00
CC-4-01	5.8	50	2.76	138.00	56.52	33.33	0.00
CC-5-02	7.7	50	2.90	145.00	40.69	45.52	0.00
Asotin Creek							
MA-1-01	4.4	110	7.26	799.00	52.94	8.64	0.13
MA-2-01	7.8	110	8.45	929.50	38.41	6.67	0.00
MA-3-01	11.5	110	8.99	989.10	56.11	21.33	0.10
MA-4-01	15.2	110	9.06	996.60	51.98	14.85	0.00
MA-5-00	19.0	110	7.94	873.00	59.91	25.77	0.11
North Fork							
NFA-1-0	1.6	90	7.61	685.00	38.10	15.77	0.15
NFA-2-0	3.8	90	7.91	711.90	25.57	14.61	0.14
NFA-3-0	7.0	90	6.59	593.25	51.07	28.66	0.17
NFA-4-0	9.6	90	8.65	778.91	46.86	18.40	0.89
NFA-5-0	11.8	90	7.71	693.90	23.20	15.13	0.00
South Fork							
SFA-1-0	0.6	55	3.99	219.31	80.25	29.64	0.00
SFA-2-0	3.0	55	3.12	171.42	74.67	30.92	1.17
SFA-3-0	5.4	55	4.04	222.44	79.57	40.46	1.35
SFA-4-0	8.2	55	4.21	231.61	104.92	31.95	0.00
SFA-5-0	10.9	55	3.07	168.85	78.77	45.01	0.59
Charley Creek							
CC-1-00	1.0	50	3.44	172.14	48.22	24.98	0.00
CC-2-00	3.7	50	3.09	154.44	40.79	29.79	1.29
CC-3-00	6.4	50	3.40	170.00	77.06	53.53	0.00
CC-4-00	9.1	50	3.73	186.43	44.52	21.99	0.00
CC-5-00	11.8	50	3.09	154.29	77.77	59.62	0.65

Appendix A: Table 3. Densities of juvenile steelhead/rainbow trout (fish/100 m<sup>2</sup>) from electrofishing sites in the Touchet River basin, 2003.

Stream Site Name	Est. Rkm	Site length (m)	Mean width (m)	Area (m <sup>2</sup> )	Fish/100m <sup>2</sup> Age 0	Fish/100m <sup>2</sup> Age 1+	Fish/100m <sup>2</sup> Legal (>203mm)
Touchet River (Main)							
MT-1-01	70.5	175	11.61	2,031.35	16.05	0.54	0.00
MT-2-01	72.9	175	12.19	2,132.81	10.55	0.19	0.00
MT-3-01	76.1	175	14.12	2,471.54	11.65	1.34	0.00
MT-4-01	79.2	175	11.36	1,988.00	35.36	2.16	0.00
MT-5-01	81.6	175	11.56	2,023.44	29.90	1.88	0.00
MT-6-01	84.0	175	14.36	2,513.75	10.10	1.67	0.04
MT-7-01	87.0	175	13.75	2,405.58	10.39	9.69	0.00
MT-8-01	90.3	175	11.64	2,037.29	80.11	5.69	0.05
North Fork							
NFT-1-01	0.1	100	10.00	1,000.00	70.60	4.10	0.00
NFT-2-01	2.0	105	11.81	1,239.96	45.97	13.55	0.00
NFT-3-01	6.8	100	9.07	906.67	58.57	17.65	0.44
NFT-4-01	9.1	100	5.92	592.00	37.16	13.68	0.17
NFT-5-01	12.4	100	8.39	839.23	32.41	18.11	0.60
NFT-6-01	14.8	100	6.70	670.00	62.09	56.63	0.45
NFT-7-01	17.7	100	5.68	567.69	72.40	22.55	1.06
South Fork							
SFT-1-02	0.1	90	4.65	418.91	65.41	11.94	0.00
SFT-2-02	3.9	75	8.41	630.94	22.19	6.50	0.00
SFT-3-02	7.1	75	6.60	495.00	27.88	5.66	0.00
SFT-4-02	10.4	75	6.31	473.18	30.01	17.54	0.21
SFT-5-02	13.5	75	5.38	403.64	33.20	7.93	0.00
SFT-6-02	16.7	75	3.79	284.25	21.11	39.40	0.35
SFT-7-02	19.6	75	5.01	375.75	46.57	18.63	0.00
SFT-8-02	25.3	75	4.12	309.00	15.86	28.16	1.29
Wolf Fork							
WFT-1-01	0.2	100	7.35	735.45	28.42	9.65	0.14
WFT-2-01	2.1	100	8.38	837.78	53.00	10.86	0.00
WFT-3-01	4.3	100	11.05	1,105.46	28.95	14.84	0.00
WFT-4-01	6.6	100	9.05	905.00	47.40	13.59	0.00
WFT-5-01	8.6	100	6.00	600.00	33.83	16.17	0.83
WFT-6-01	10.6	105	9.10	955.50	58.19	32.65	0.10
WFT-7-01	12.6	100	5.83	582.73	51.14	14.59	0.00
Robinson Fork							
RFT-1-01	0.8	60	3.91	234.67	41.33	28.55	0.00
RFT-2-01	2.4	60	3.34	200.40	41.42	8.48	0.00
RFT-3-01	3.8	60	3.64	218.40	60.90	25.64	0.00
RFT-4-01	5.6	60	3.02	181.20	24.28	48.01	1.10
RFT-5-01	7.2	60	6.42	205.20	30.21	25.34	0.00

Appendix A: Table 4. Estimated number of other sensitive species captured from electrofishing sites in the Tucannon River basin, and Asotin Creek, 2003.

Stream Site Name	Bull Trout Age 0	Bull Trout Age 1+	Bull Trout legal (>203mm)	Whitefish (Legal)	Spring Chinook	Hatchery Steelhead	Endemic Hatchery Steelhead
Tucannon River							
TUC1-00	0	0	0	0	3	0	0
TUC2-00	0	0	0	0	3	46	0
TUC3-00	0	0	0	0	67	18	0
TUC4-00	0	0	0	1	10	1	0
TUC5-00	0	0	0	2	23	4	0
TUC6-00	0	0	0	0	34	2	0
TUC7-00	0	0	0	0	107	1	1
TUC8-00	0	2	1	0	73	0	0
TUC9-00	0	0	0	0	61	0	0
TUC10-00	0	0	0	2	186	1	1
TUC11-00	0	1	1	0	124	0	2
TUC12-00	0	2	1	0	22	0	47
TUC13-00	0	1	2	1	111	0	7
TUC14-00	1	4	0	0	176	0	9
TUC15-00	7	7	0	0	82	0	0
TUC16-00	0	4	9	0	15	0	0
Cummings Creek							
CC-1-01	0	0	0	0	7	0	0
CC-2-01	0	1	0	0	0	0	0
CC-3-01	0	0	0	0	0	0	0
CC-4-01	0	0	0	0	0	0	0
CC-5-02	0	0	0	0	0	0	0
Asotin Creek							
MA-1-01	0	0	0	0	1	NA	NA
MA-2-01	0	0	0	0	0	NA	NA
MA-3-01	0	0	0	0	0	NA	NA
MA-4-01	0	0	0	0	6	NA	NA
MA-5-00	0	0	0	0	17	NA	NA
North Fork							
NFA-1-0	0	0	0	0	39	NA	NA
NFA-2-0	0	0	0	0	33	NA	NA
NFA-3-0	0	0	0	0	0	NA	NA
NFA-4-0	0	0	0	0	1	NA	NA
NFA-5-0	0	1	0	0	0	NA	NA
South Fork							
SFA-1-0	0	0	0	0	1	NA	NA
SFA-2-0	0	0	0	0	2	NA	NA
SFA-3-0	0	0	0	0	0	NA	NA
SFA-4-0	0	0	0	0	0	NA	NA
SFA-5-0	0	0	0	0	0	NA	NA
Charley Creek							
CC-1-00	0	0	0	0	0	NA	NA
CC-2-00	0	0	0	0	0	NA	NA
CC-3-00	0	0	0	0	0	NA	NA
CC-4-00	0	0	0	0	0	NA	NA
CC-5-00	0	0	0	0	0	NA	NA

Appendix A: Table 5. Estimated number of other sensitive species captured from electrofishing sites in the Touchet River basin, 2003.

Stream Site Name	Bull Trout Age 0	Bull Trout Age 1+	Bull Trout legal (>203mm)	Whitefish <sup>a</sup>	Brown Trout <sup>b</sup>	Spring Chinook	Hatchery Steelhead	Endemic Hatchery Steelhead
Touchet River (Main)								
MT-1-01	0	0	0	0	0	0	0	0
MT-2-01	0	0	0	0	0	0	1	1
MT-3-01	0	0	0	0	1 (legal)	0	1	1
MT-4-01	0	0	0	0	0	0	8	5
MT-5-01	0	0	0	0	0	0	4	1
MT-6-01	0	0	0	0	0	0	5	3
MT-7-01	0	0	0	0	0	1	30	5
MT-8-01	0	0	0	0	7 (4 0's, 3 1+'s)	2	10	14
North Fork								
NFT-1-01	0	1	0	0	0	1	4	5
NFT-2-01	0	0	0	2 (legal)	2 (Age 0, legal)	3	1	44
NFT-3-01	0	1	0	0	1 (legal)	1	0	10
NFT-4-01	0	1	0	0	1 (legal)	1	0	2
NFT-5-01	0	1	1	0	0	0	0	4
NFT-6-01	0	1	0	0	0	0	0	1
NFT-7-01	0	1	1	0	0	0	0	1
South Fork								
SFT-1-02	0	0	0	0	0	0	1	5
SFT-2-02	0	0	0	0	0	0	0	0
SFT-3-02	0	0	0	0	0	0	0	0
SFT-4-02	0	0	0	0	0	0	2	0
SFT-5-02	0	0	0	0	0	0	0	0
SFT-6-02	0	0	0	0	0	0	0	0
SFT-7-02	0	0	0	0	0	0	0	0
SFT-8-02	0	0	0	0	0	0	0	0
Wolf Fork								
WFT-1-01	0	0	0	0	1 (Age 0)	4	0	5
WFT-2-01	0	1	0	0	0	1	0	1
WFT-3-01	0	7	1	0	0	2	0	4
WFT-4-01	0	3	0	0	0	0	0	3
WFT-5-01	0	2	3	0	1 (legal)	1	0	0
WFT-6-01	0	1	0	0	0	0	0	0
WFT-7-01	0	1	0	0	0	0	0	0
Robinson Fork								
RFT-1-01	0	0	0	0	0	0	0	0
RFT-2-01	0	0	0	0	0	0	0	0
RFT-3-01	0	0	0	0	0	0	0	0
RFT-4-01	0	0	0	0	0	0	0	0
RFT-5-01	0	0	0	0	0	0	0	0

<sup>a</sup> Whitefish have been observed as Age 0 or legal based on size.

<sup>b</sup> Brown Trout have been observed to have at least three age classes in the Touchet River. We have designated age based on length at time of capture.

Appendix A: Table 6. 2003 Electofishing site locations for the Tucannon River, Cummings Creek, and Asotin Creek.

Stream / Site name	Approximate site location/description
<b>Tucannon River</b>	
TUC1-00	100' below Highway 12 Bridge (Road Mile 13.5)
TUC2-00	100 m above Enrich Bridge (Road Mile 17.1)
TUC3-00	milepost 6 on Tucannon Road (Road Mile 19.5)
TUC4-00	100 m below King Grade Bridge (Road Mile 20.9)
TUC5-00	Hovrud's Silt Basin, Part of site includes some bad habitat restoration (RM 23.2)
TUC6-00	Across from MP 12, above Marengo Bridge (Road Mile 25.7)
TUC7-00	½ way between Br 11 and Br 12, near Donohue's Hay Barn (Road Mile 28.3)
TUC8-00	100 m above Bridge 13 (Road Mile 30.6)
TUC9-00	Across from Last Resort RV Park, Byers Habitat Site (Road Mile 32.9)
TUC10-00	Across from Campground 2, Rock Cliff below site (Road Mile 35.3)
TUC11-00	Across from Campground 5, USFS Info Board (Road Mile 37.8)
TUC12-00	Across from Big 4 Lake, top is at the overflow from lake (Road Mile 40.0)
TUC13-00	Across from Camp Wooten, old HMA 15 (Road Mile 42.3)
TUC14-00	100' above Cow Camp Bridge (Road Mile 44.5)
TUC15-00	Upper End of Wild Campground 2 (Road Mile 46.7) FS Blocked road to CG.
TUC16-00	Above Winchester Creek (Road Mile 48.2)
<b>Cummings Creek</b>	
CC1-01	~50 m above mouth of Cummings Creek
CC2-02	1.2 miles above the Gate along the Cummings Creek Trail Road
CC3-02	2.4 miles above the Gate along the Cummings Creek Trail Road
CC4-02	3.6 miles above the Gate along the Cummings Creek Trail Road
CC5-02	4.8 miles above the Gate along the Cummings Creek Trail Road
<b>Asotin Creek</b>	
AC1-01	~200m above bridge at George Creek mouth, behind Joe Curl's house
AC2-01	½ way between George Creek and Headgate Park
AC3-01	~100m upstream of Headgate Park Dam
AC4-01	~2.5 miles below confluence bridge, public fishing access area
AC5-01	Upper end of 1998 meander reconstruction (Frank Koch's property)
<b>North Fork Asotin</b>	
NF1-00	~20m above mouth of Lick Creek
NF2-00	1.4 miles above Lick Creek Crossing
NF3-00	3.0 miles below upper USFS fence line (where Pinkham Trail enters)
NF4-00	1.4 miles below upper USFS fence line
NF5-00	6.4 miles above Lick Creek Crossing, upper USFS fence line at Pinkham Trail
<b>South Fork Asotin</b>	
SF1-00	~300m above South Fork mouth, where Campbell Grade Rd comes off of hillside
SF2-00	2 miles above mouth of South Fork
SF3-00	~50 m downstream from Schlee Bridge
SF4-00	1.7 miles above Schlee Bridge
SF5-00	3.4 miles above Schlee Bridge
<b>Charley Creek (Asotin)</b>	
CC1-02	Frank Koch's water diversion ditch, ¼ mile up from main Gate at Koch's house
CC2-02	1.7 miles above main Gate at Koch's house
CC3-02	2.9 miles above main Gate at Koch's house
CC4-02	4.4 miles above main Gate at Koch's house
CC5-02	5.9 miles above main Gate at Koch's house

Appendix A: Table 7. 2003 Electrofishing site locations for the Touchet River.

Site name	Approximate site location/description
<b>Main Stem</b>	
MT1-01	Upstream from Waitsburg City Park Bridge (Road Mile 44.3)
MT2-01	Billy Carter's property, ¼ mile below Lower Hogeve Rd. (Road Mile 46.1)
MT3-01	Behind Bickelhaupt's pond, ½ mile below State Park Bridge (Road Mile 47.7)
MT4-01	Behind Lewis and Clark State Park (Road Mile 48.5)
MT5-01	~100m above Rose Gulch Bridge (Road Mile 49.9)
MT6-01	~50m below Ward Road Bridge (Road Mile 51.4)
MT7-01	½ mile below mouth of Patit Creek (Road Mile 53.5)
MT8-01	~50m below mouth of South Touchet (Road Mile 56.1)
<b>North Fork</b>	
NFT1-01	~50m above the mouth of the South Touchet (Road Mile 0.1)
NFT2-01	~100m above Vernon Marll's Bridge (Road Mile 1.2)
NFT3-01	~50m above Wolf Fork Bridge (Road Mile 4.2)
NFT4-01	~100m above MP 7 on North Touchet Road (Road Mile 5.7)
NFT5-01	Behind Jerry Dedloff's House (Road Mile 7.6)
NFT6-01	~50m above Bridge at MP 11 (Road Mile 9.2)
NFT7-01	~20m above last bridge on North Touchet Rd. at MP 13 (Road Mile 11.0)
<b>South Fork</b>	
SFT1-01	~20m up from mouth (Road Mile 0.0)
SFT2-02	downstream of Pettyjohn Bridge (Road Mile 2.4)
SFT3-02	2 miles above Pettyjohn Bridge (Road Mile 4.4)
SFT4-02	4 miles above Pettyjohn Bridge (Road Mile 6.4)
SFT5-02	~100m above Camp Nancy Lee Bridge (Road Mile 8.4)
SFT6-02	2 miles above Camp Nancy Lee Bridge (Road Mile 10.4)
SFT7-02	4 miles above Camp Nancy Lee Bridge (Road Mile 12.4)
SFT8-02	Belwo Mouth of Griffen Fork Creek (Road Mile 14.4)
<b>Wolf Fork</b>	
WF1-01	~100m above mouth of the Wolf Fork, behind Fairchild's house
WF2-01	1.2 miles above Wolf Fork Bridge
WF3-01	2.4 miles above Wolf Fork Bridge
WF4-01	Gibbon's Bridge (Road Mile 3.7)
WF5-01	Donnelly's Bridge (Road Mile 5.2)
WF6-01	½ mile below Martin's Bridge (Road Mile 6.7)
WF7-01	Mouth of Coates Creek (Road Mile 7.8)
<b>Robinson</b>	
RF1-01	½ Mile upstream from bridge at mouth
RF2-01	1.5 miles upstream from bridge at mouth
RF3-01	2.4 miles upstream from bridge at mouth
RF4-01	3.5 miles upstream from bridge at mouth
RF5-01	4.5 miles upstream from bridge at mouth





*Washington Department of*  
**FISH AND WILDLIFE**  
*Fish Program*  
*Science Division*

This program received Federal financial assistance from the U.S. Fish and Wildlife Service. It is the policy of the Washington State Department of Fish and Wildlife (WDFW) to adhere to the following: Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972. The U.S. Department of the interior and its bureaus prohibit discrimination on the basis of race, color, national origin, age, disability and sex 9 in education programs). If you believe you have been discriminated against in any program, activity, or facility, WDFW ADA Coordinator at 600 Capitol Way North, Olympia, Washington 98501-1091 or write to:

U.S. Fish and Wildlife Service  
Office of External Programs  
4040 N. Fairfax Drive, Suite 130  
Arlington, VA 22203