LOWER SNAKE RIVER COMPENSATION PLAN:
Oregon Summer Steelhead Evaluation Studies
2004 Annual Progress Report

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OREGON
Fish & Wildlife

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COMPENSATION PLAN

This report is available at: http://lsnakecomplan.fws.gov/

Front cover photo of returning adult steelhead taken by Ian Wilson.

ANNUAL PROGRESS REPORT

FISH RESEARCH PROJECT
OREGON

PROJECT TITLE: Lower Snake River Compensation Plan: Oregon Summer Steelhead Evaluation Studies

CONTRACT NUMBER: 14110-4-J071

PROJECT PERIOD: January 1, 2004 through December 31, 2004

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March 2008

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This project was financed by the U.S. Fish and Wildlife Service under
the Lower Snake River Compensation Plan.

Preface

The purpose of this progress report is to provide summary information for Lower Snake River Compensation Plan (LSRCP) summer steelhead (*Oncorhynchus mykiss*) programs operated by ODFW in the Grande Ronde and Imnaha river basins during 2004. These ongoing monitoring programs provide technical, logistical, and biological information to managers charged with maintaining viable salmon and steelhead populations and associated fisheries in Northeast Oregon. This report is organized into fish culture monitoring for juveniles, adults, CWT recoveries, and estimates for total escapement. During the period covered in this report, steelhead from the 1999-2001 broods returned to spawn, and steelhead from the 2003 brood were released as smolts. Adult steelhead that returned to spawn were used to create the 2004 brood.

Acknowledgments

We would like to thank hatchery managers Greg Davis and Mike Gribble, as well as many other hatchery personnel who exhibited great dedication and provided essential assistance. Numerous personnel from the Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service, the Nez Perce Tribe, and the Confederated Tribes of the Umatilla Indian Reservation provided enthusiastic support. We also thank Jim Ruzycki, project leader for the 2003-2004 run year, Chris Starr, and Joe Krakker, who provided administrative support. This project was funded by the U.S. Fish and Wildlife Service under the Lower Snake River Compensation Plan, contract numbers 1411-03-J050 and 1411-04-J071, a cooperative agreement with the Oregon Department of Fish and Wildlife.

Corrections

Complete code wire tag (CWT) information from the Warm Springs National Fish Hatchery and the Washington Department of Fish and Wildlife was not available when the 2003 report was published. We have updated tables 10 through 12 of the 2003 Annual Progress Report, which present summaries of CWT recovery estimates for the 2002-2003 run year, to reflect this new information. Updated tables are in the addendum. All changes are in bold.

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EXECUTIVE SUMMARY

Objectives

1. Document summer steelhead rearing and release activities at all LSRCP facilities.

2. Determine optimum rearing and release strategies that will produce maximum survival to adulthood for hatchery-produced summer steelhead smolts.

3. Document summer steelhead adult returns by stock to each LSRCP broodstock collection facility.

4. Determine if the total production of summer steelhead adults meets mitigation goals, and index annual smolt survival and adult returns to Lower Granite Dam for production groups.

5. Participate in planning activities associated with anadromous fish production and management in the Grande Ronde and Imnaha river basins, and participate in ESA permitting, consultation, and rearing activities.

6. Monitor natural spawning of summer steelhead in selected areas within the Grande Ronde Basin.

7. Determine the number of summer steelhead harvested annually and angler effort in recreational fisheries on the Grande Ronde, Wallowa, and Imnaha rivers.

Accomplishments and Findings

We accomplished all of our objectives for 2004. In this report, we present data and results for objectives 1, 2, 3, 4, and 6. More complete analyses, results, and discussion of rearing and release strategies for objective 2 are presented in separate special reports (e.g., Ruzycki et al. 2003). To accomplish objective 5, project staff participated in planning and coordination with co-managers and development and writing of the annual operation plan. Data and results for objective 7 are published in separate annual creel survey reports (Flesher et al. 2007).

The production goal of 870,000 Wallowa stock smolts was not achieved in 2004, with 783,822 smolts released. The Imnaha stock production goal of 330,000 smolts was not achieved in 2004, with 302,013 smolts released. In 2004, we released unclipped, blank-wire tagged smolts in Little Sheep Creek, and a group of unclipped, untagged smolts in Big Sheep Creek.

In 2004, 3,151 and 1,436 Wallowa stock hatchery steelhead returned to Wallowa Fish Hatchery and the Big Canyon Facility, respectively. In addition, we trapped 12 natural steelhead at Wallowa Fish Hatchery and 67 natural steelhead at the Big Canyon Facility, which were released to spawn naturally. At the Little Sheep Creek Facility, we trapped 2,613 Imnaha stock hatchery and 141 natural steelhead adults. Of these, we released 687 hatchery and 131 natural steelhead above the weir, and outplanted 1,719 hatchery steelhead to Big Sheep Creek. We began a Wallowa stock Fall broodstock experiment by collecting 105 adult steelhead in October

2003. During spawning in the spring of 2004, we collected 942,750 Wallowa stock eggs, 191,000 Wallowa stock Fall Broodstock eggs, and 432,180 Imnaha stock eggs.

For the 2003-2004 run year, the compensation goals of 9,184 Wallowa stock and 2,000 Imnaha stock adult steelhead above Lower Granite Dam were exceeded. We have met the Wallowa stock goal three times in our program history, and this is the third consecutive year we have met the Imnaha stock goal. We estimate that 11,700 Wallowa stock hatchery steelhead (127.4% of goal), and 4,896 Imnaha stock hatchery steelhead (244.8% of goal) returned to the LSRCP compensation area in 2004.

INTRODUCTION

The objectives of this report are to document fish culture practices, describe adult returns, and assess progress toward meeting LSRCP goals for Grande Ronde and Imnaha steelhead. We report on juvenile steelhead rearing and release activities for the 2003 brood year (BY) released in 2004. Included are collection, spawning, and adult characteristics for the 2004 returns, returns from experimental releases, supplementation in Little Sheep Creek, and success toward achieving compensation goals.

In general, the data in this report were derived from hatchery inventories and standard databases (i.e., Pacific States Marine Fisheries Commission Regional Mark Information System (RMIS), ODFW mark recovery) or through standard measuring techniques. As such, specific protocols are usually not described. In cases where expansions of data or unique methodologies were used, protocols are described in more detail. Additional descriptions of protocols can be found in our work statements (Carmichael et al. 2003; Carmichael and Hoffnagle 2004). Coded-wire tag (CWT) data that were collected from 2004 adult returns were used to evaluate smolt-to-adult survival rates in experimental rearing and release groups. In 2004, experimental treatments from which fish returned included forced vs. volitional release, and a pre-smolt release strategy. In 2004, experimental fish were released to evaluate acclimated vs. direct stream release strategies. We also released non-clipped, blank-wire tagged smolts, and unmarked, untagged smolts. Analysis of specific survival studies will be completed and published in separate reports once all brood years have returned and CWT data are complete for a given experiment. In addition, much of the data that we discuss in this report will be used in separate and specific evaluations of ongoing supplementation programs for steelhead in the Imnaha River Basin. We began culture evaluations in 1983 and have dramatically improved many practices. Progress for work completed in previous years is presented in annual progress reports (Carmichael and Wagner 1983; Carmichael and Messmer 1985; Carmichael et al. 1986a; 1987; 1988a; 1999; 2004; 2005a; 2005b; Gee et al. 2007; Messmer et al. 1989; 1990; 1991; 1992; 1993; Jonasson et al. 1994; 1995; 1996; Ruzycki et al. 2003; Whitesel et al. 1993), annual creel survey reports (Carmichael et al. 1988b; 1989; 1990; Flesher et al. 1991; 1992; 1993; 1994; 1995; 1996; 1997; 1999; 2000; 2001; 2004a; 2004b, 2005), a United States v. Oregon production report (Carmichael et al. 1986b), and a five-year study plan (Carmichael 1989). Progress of related work completed in 2004 is presented in the summer steelhead creel annual progress report (Flesher et al. 2007).

METHODS

Fall Broodstock Collection

During the fall of 2003, we began an experimental collection of Wallowa stock steelhead to develop a broodstock that emphasized fall entry into the Grande Ronde River. The primary goal of this program is to reduce straying into Columbia River tributaries. Because the Wallowa stock is endemic to the Snake River Basin and has been successful as a hatchery stock, we are attempting to modify their run timing and reduce potential problems cause by straying into Columbia River tributaries.

We attempted to collect 200 hatchery origin Wallowa stock adult summer steelhead by hook and line on the Lower Grande Ronde River between Wildcat Creek in Oregon and Boggan's Oasis in Washington from 13-17 October and 20-24 October 2003. Only hatchery (adipose-clipped) fish were kept for broodstock; all natural fish were released. In order to reduce mortality, fishing was only conducted when water temperatures were below 18^{o}C. Fish were kept in tubes after capture, anesthetized, tagged with passive integrated transponders (PIT), and then transported daily in a 525 gallon liberation truck to Wallowa Fish Hatchery, a one and a half hour trip. Fish were kept at Wallowa Fish Hatchery in adult holding ponds until the spring, when they were spawned with other Fall broodstock fish as they ripened. Tyvek tags were used to differentiate Fall broodstock fish from normal production fish. All progeny were marked with an adipose and right ventral fin clip to distinguish them from normal production Wallowa stock fish when they return as adults. Four groups of Fall broodstock progeny were CWT marked and PIT tagged to monitor migration rates into the Columbia River and its tributaries, and determine smolt to adult survival rates.

Deer Creek Spawning Ground Surveys

Deer Creek is a third-order tributary of the Wallowa River in the Grande Ronde River Basin of northeast Oregon. Beginning in 2002, we conducted repeat spawning ground surveys for steelhead redds on a bi-weekly basis throughout all known spawning habitat of Deer Creek and tributaries above a permanent weir and trap that collected all upstream migrating adult steelhead. The adult trap was operated each year as soon as conditions allowed, typically during January or early February, and trap operation continued for at least ten days after the last fish was captured. Trapped adults were inspected for fin clips, measured (FL), gender was recorded, and fish without any visible fin marks were passed above the weir after receiving a hole punch to their left operculum. Adults that fell back to the weir were collected if dead or moribund, inspected for operculum punches and spawning condition, and passed below the weir.

During the first year of the study, we conducted extensive surveys throughout the Deer Creek drainage above the weir to determine distribution of steelhead redds and spawning habitat. These initial surveys recorded no spawning activity in tributaries and no steelhead redds above stream mile eight. Subsequently, we established four survey reaches to enumerate redds by encompassing all previously identified spawning habitat and surveying the initial 10-12 miles of Deer Creek above the weir. Each year, we initiated surveys two weeks after the first female steelhead was passed above the weir. Although we attempted to survey every two weeks, surveys were occasionally delayed due to high water and poor visibility.

Steelhead redd surveys were based on standard ODFW methods (Susac and Jacobs 1999) and were conducted each year from March to June. Sites were surveyed up to six times to quantify the number of redds constructed at each site, with approximately two-week intervals between successive surveys to account for temporal variation in spawning activity. Survey reaches were approximately 2-3 miles in length. Surveyors walked downstream from the upstream end of each reach and counted all redds, live fish, and carcasses observed. New redds were flagged and the location marked with a GPS receiver. Flagging was marked with observation date, observer initials, location of redd in channel, and hung near redds. Care was taken to cause minimal disturbance to fish on redds.

During each survey, the number of flagged redds, new redds, and visibility of previously marked redds were recorded. Ideally, each section was to be surveyed by different surveyors on successive visits; however, this was not always logistically possible with the number of personnel available.

An index of redd visibility, indicating the number of days a redd was visible, was calculated by assigning a visibility code to all flagged redds. Visibility codes of C1 to C5 indicating clear (C1) or moderate (C2) visibility, visible only due to presence of a flag (C3), not visible due to water clarity (C4), and unidentifiable despite adequate water clarity (C5) were assigned to each flagged redd. We then calculated the number of days each redd was either clearly or moderately visible based on these subsequent surveys. If a new redd was not visible during the following survey, we used one-half of the interval (or seven days for a two week interval) for the number of days the redd was visible. Redds with missing flags or questionable redds were not included in the redd visibility calculation.

RESULTS AND DISCUSSION

Juveniles

Wallowa stock egg-to-eyed-embryo survival for the 2003 brood year (BY) was 89.1%, within the range of recent brood years (1993-2002 BY range = 71.8-91.6%), and embryo-to-smolt survival was 90.3%, also within the range of recent brood years (1993-2002 BY range = 89.4-97.5%; Table 1). Imnaha stock egg-to-embryo survival for the 2003 BY was 87.4%, within the range of recent brood years (1993-2002 BY range = 76.7-90.8%), and embryo-to-smolt survival was 89.5%, within the range of past years (1993-2001 BY range = 85.6-94.9%; Table 1). We released 783,822 Wallowa stock smolts in 2004, less than our production goal of 870,000 smolts. For the Imnaha stock, we released 302,013 Imnaha stock smolts, also less than our production goal of 330,000 smolts (Table 1). Hatchery managers attempt to meet production goals every year, however variation in mortality at various stages of rearing, from fertilizing eggs to acclimating smolts, results in fewer or more fish being released in any given year. Managers periodically adjust the number of eggs collected based on recent hatchery performance.

To evaluate different rearing and release strategies, we marked and released four groups of Wallowa stock steelhead and three groups of Imnaha stock steelhead smolts with adipose-left ventral clips and coded-wire-tags (AdLV and CWT), while a fourth group of Imnaha stock smolts were blank-wire-tagged but not adipose clipped (No Ad and BWT, Table 2). We marked 99.2% of Wallowa stock smolts and 99.3% of Imnaha stock smolts with an adipose fin clip, which was within the range of recent years (1993-2002 BY range = 98.4-99.6%). Fin clip quality and tag retention for experimental groups averaged 91.1% for Wallowa, within the range of recent years (1993-2002 BY range = 86.5-99.3%) and 90.1% for Imnaha stocks, also within the range of recent years (1993-2002 BY range = 86.5-99.3%). We also released 48,432 unclipped and untagged Imnaha stock smolts into Big Sheep Creek. Details of experimental and production releases for the 2003 BY are shown in Table 3.

Densities of residual hatchery steelhead were lower than those of wild *O. mykiss* at index sites in the Grande Ronde Basin in 2004 for the third time since sampling began in 1996 (Table 4). In the Imnaha Basin, residual hatchery steelhead had a higher density than wild *O. mykiss*, the same pattern that we have observed since sampling for residual hatchery steelhead began in 1996.

For the Imnaha Basin, 80.0% of residual hatchery steelhead were males, similar to the gender ratio observed in previous years.

Adults

Weirs were installed to capture adult steelhead on 28 January at Big Canyon Facility, 12 February at Wallowa Fish Hatchery, and 4 March at Little Sheep Creek Facility (Table 5). Returns to the Little Sheep Creek Facility were predominantly hatchery fish, with only 141 (5.1%) natural steelhead. Similar to Little Sheep Creek, most of the adults that returned to the Big Canyon Facility were of hatchery origin, with only 67 (4.5%) natural steelhead. In addition, 12 (0.4%) natural steelhead returned to Wallowa Fish Hatchery. Natural steelhead returned over the same time period as hatchery steelhead, but scarce natural adult returns make run timing comparisons difficult. The majority of hatchery adults that returned to Wallowa Fish Hatchery, Big Canyon Facility and Little Sheep Creek Facility spent one year in the ocean (Table 6). Eighty-four percent (119 of 141), 54% (36 of 67), and 50% (6 of 12) of natural fish returning to the Little Sheep Creek Facility, Big Canyon Facility, and Wallowa Fish Hatchery, respectively, spent one year in saltwater before returning. One hundred and five adult hatchery steelhead were collected for the Wallowa stock Fall broodstock collection.

The majority of hatchery adults that returned to Wallowa Fish Hatchery in 2004 were spawned or killed (Table 6). In 2004, Big Canyon hatchery returns were not needed for the Grande Ronde steelhead hatchery program due to the large number of adults returning to Wallowa Fish Hatchery. We outplanted 86 adult hatchery steelhead from Wallowa Fish Hatchery, and 47 hatchery adults from Big Canyon Facility to local ponds for harvest opportunities. In addition, 306 fish captured at Big Canyon Facility were returned to the Wallowa River for further angling opportunities. One hundred and thirty-three of these fish returned to the weir a second time and were euthanized. At the Big Canyon Facility, all 67 natural fish and no hatchery fish were passed above the weir to spawn naturally. In 2004 we were able to locate 100% of the redds constructed by natural females that passed above the weir (Table 8). We retained 8% of the hatchery fish and 7% of the natural fish for spawning at Little Sheep Creek Facility, and outplanted 1,719 hatchery adults to Big Sheep Creek to spawn naturally. Two hundred and forty-four of the 1,719 outplanted fish (14%) were recaptured at least once at the Little Sheep Creek Facility in 2004. One hundred and thirty-one natural and 687 hatchery adults were released above the weir in Little Sheep Creek to spawn naturally. In addition, 5 natural males were spawned and passed above the weir resulting in 84% of fish above the weir being of hatchery origin. Of the 823 fish passed into Little Sheep Creek, 138 were recaptured at the weir (Table 7). Length-at-age data for Wallowa and Imnaha stock adults are presented in Figures 1 and 2, respectively.

We accomplished our egg take goal for the Wallowa stock with 1,133,750 green eggs collected. Of these, 942,750 were for production and 191,000 were for the Fall broodstock evaluation. We collected 432,180 green Imnaha stock eggs, short of our goal of 448,000. Mortality from green egg-to-eyed embryo ranged from 5-17% for Wallowa stock from seven weekly spawns, 5-29% for Fall broodstock during 7 weekly spawns, and from 5-13% for Imnaha stock from eight weekly spawns (Table 9). Over the last ten brood years (1994-2003 BY), the

range of green egg-to-eyed embryo mortality was 1-29% for Wallowa stock and 1-57% for Imnaha stock.

Experimental Group Returns

The number of coded-wire tagged and adipose-clipped adults that were harvested or returned to collection sites are used to estimate various performance parameters. These numbers allow us to monitor our success toward meeting the LSRCP goals, to estimate stray rates, and to determine the contribution to recreational, tribal, and commercial fisheries. They also provide the basis evaluating of the success of experimental rearing and release strategies. Recoveries for each CWT code were summarized from the CWT recovery database maintained by PSMFC, ODFW's mark recovery database, and from data reported by the Washington Department of Fish and Wildlife and Idaho Department of Fish and Game. Our protocol was to collect and enumerate all fish marked with a CWT when they were spawned or died. A summary of these data is provided in this report. Final analyses, results, and discussion of production and release strategies will be presented in special reports once all adults have returned from the experimental groups.

Adult returns from the 1999-2001 brood years occurred in the 2003-2004 run year. Wallowa and Imnaha stock adults that returned in 2004 were from groups released to evaluate the benefits of forced versus volitional release (Wallowa and Big Canyon 1999, 2000 & 2001 BY) and pre-smolt release strategies (Imnaha 1999 BY). We had Wallowa stock recoveries from 14 CWT codes (Table 10) and Imnaha stock recoveries from 6 CWT codes (Table 11).

Compensation Goals

Goals for returns to the compensation area are 9,184 adults for the Grande Ronde Basin (Wallowa stock) and 2,000 adults for the Imnaha Basin (Imnaha stock). The compensation area is defined as the watershed above Lower Granite Dam. To provide a cumulative summary of disposition for all adults that returned to the compensation area, we expanded CWT recoveries to account for the non-CWT fish that returned.

For the Wallowa stock, we estimate that in the 2003-2004 run year, 11,700 hatchery origin adults returned to the compensation area, representing 127.4% of the compensation goal (Table 12). For the Imnaha stock, we estimate that 4,896 adults returned to the compensation area, accounting for 244.8% of the compensation goal.

There are three principle factors that influence success in meeting the compensation goal: number of smolts released for the brood years that produced the adults; smolt-to-adult survival (SAR); and capture of fish below the compensation area in fisheries and as out-of-basin strays. Over the history of the LSRCP project, we have now reached our compensation goal three times (1997-1998, 2001-2002, and 2003-2004 run years) for the Wallowa program, and for three consecutive years we have reached our compensation goal for the Imnaha program (2001-2002, 2002-2003, and 2003-2004 run years). For both the Grande Ronde and Imnaha programs, we have met our smolt production goals in most years. Returns in the 2003-2004 run year represent the final returns of the 1999 BY. For the 1999 BY, smolt-to-adult survival rates (SAS) for the Wallowa and Imnaha stocks were 1.464% and 1.941%, respectively (Figure 3). For both stocks,

BY 1999 SAS was the highest recorded in any program year. Although smolt-to-adult return (SAR) rates have not been calculated, it is likely that SAR program goals of 0.68% and 0.61% were met for the Wallowa and Imnaha rivers. This suggests that low smolt-to-adult survival may be the primary factor for rarely achieving our compensation goals. For the Wallowa stock, 8.2% of the recoveries for the 2003-2004 run year occurred downstream of the compensation area (Table 12). For the Imnaha stock, 6.2% of the recoveries for the 2003-2004 run year occurred downstream of the compensation area.

The Imnaha steelhead supplementation program allows us to evaluate and compare productivity (adult progeny produced per parent) of hatchery and naturally spawning fish. Progeny-per-parent ratios for naturally spawning fish have been below 1.0 for completed brood years 1987-1994, above 1.0 for completed brood years 1995-1997, and below 1.0 for 1998 brood year (Figure 4). Hatchery fish progeny-per-parent ratios (weir returns only) have been above 1.0 for all brood years except 1991. Hatchery ratios exceeded natural ratios for all brood years except 1991 and 1997. One purpose of the supplementation program is to enhance or stabilize natural fish abundance. Annual abundance of naturally-produced fish has been highly variable; however recent years of data suggest an increasing trend in natural returns (Figure 5).

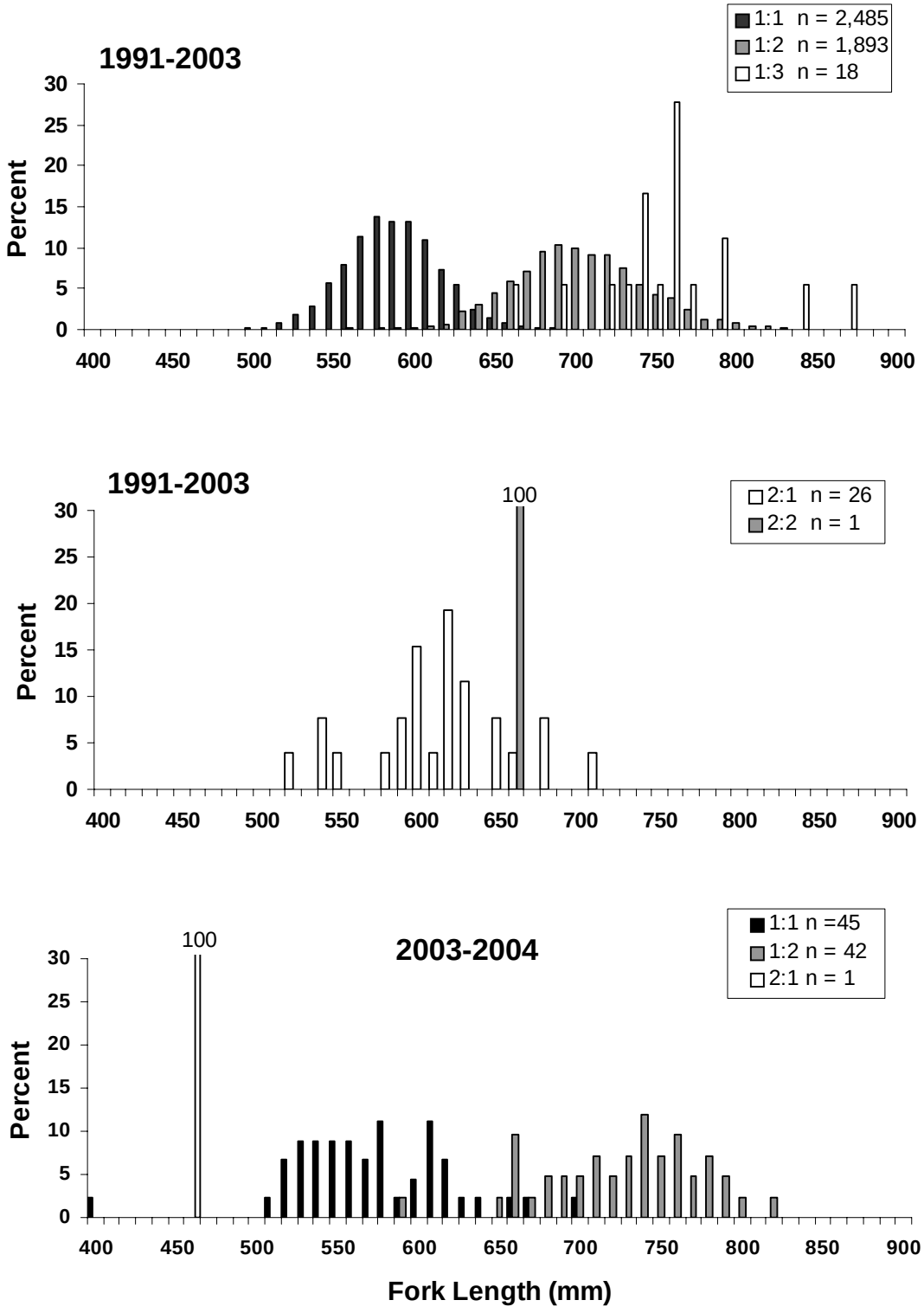

Figure 1. Length-at-age relationships based on scale analysis for adult returns of 1-freshwater age (top) and 2-freshwater age (middle) Wallowa stock summer steelhead of the 1991-2003 run years and the 2003-2004 run year (bottom).

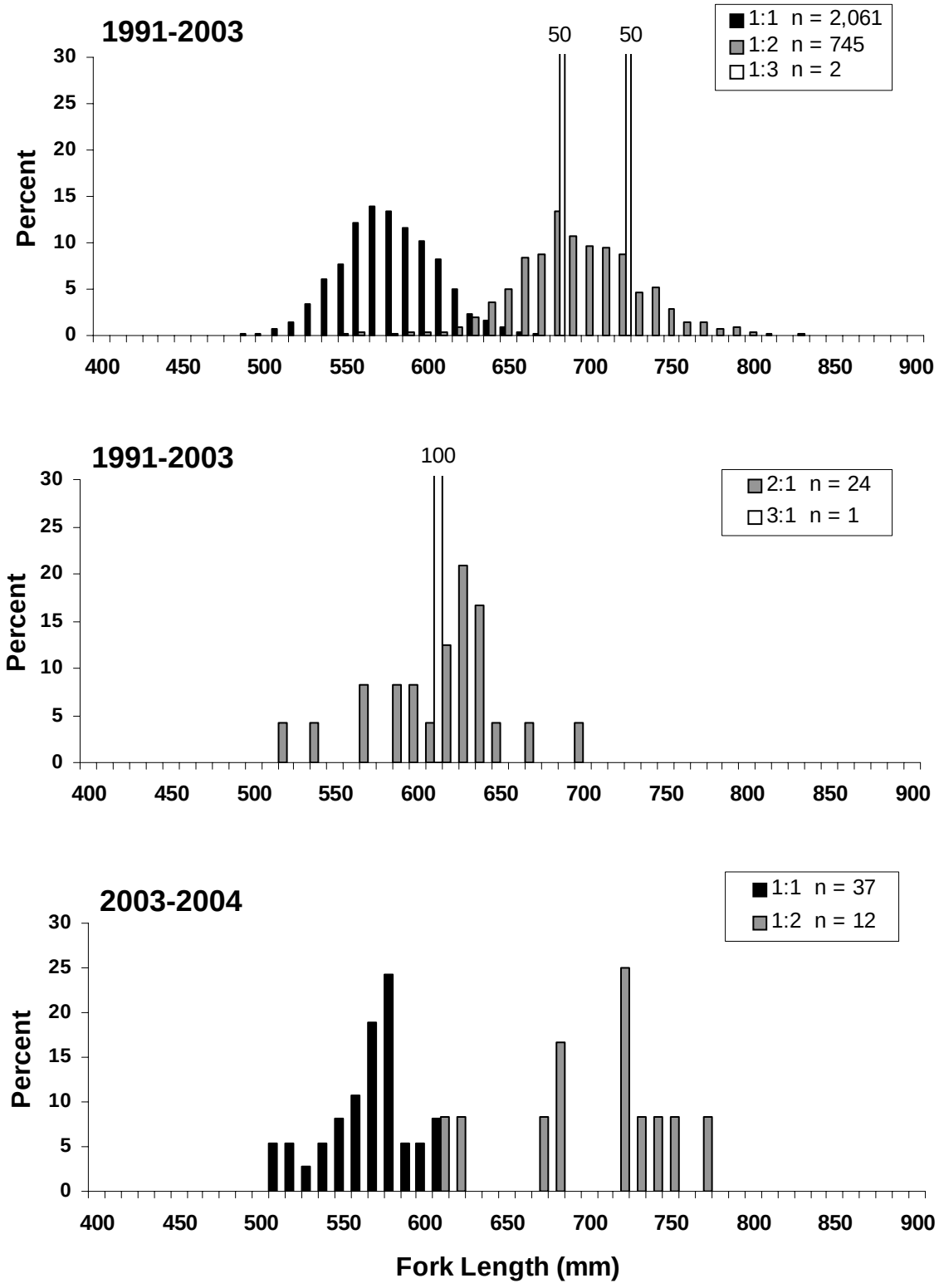

Figure 2. Length-at-age relationships based on scale analysis for adult returns of 1-freshwater age (top) and 2 or 3 freshwater age (middle) Imnaha stock summer steelhead of the 1991-2003 run years and the 2003-2004 run year (bottom).

Figure 3. Overall smolt-to-adult survival (SAS) for Wallowa and Imnaha stock summer steelhead, 1985-1999 brood years.

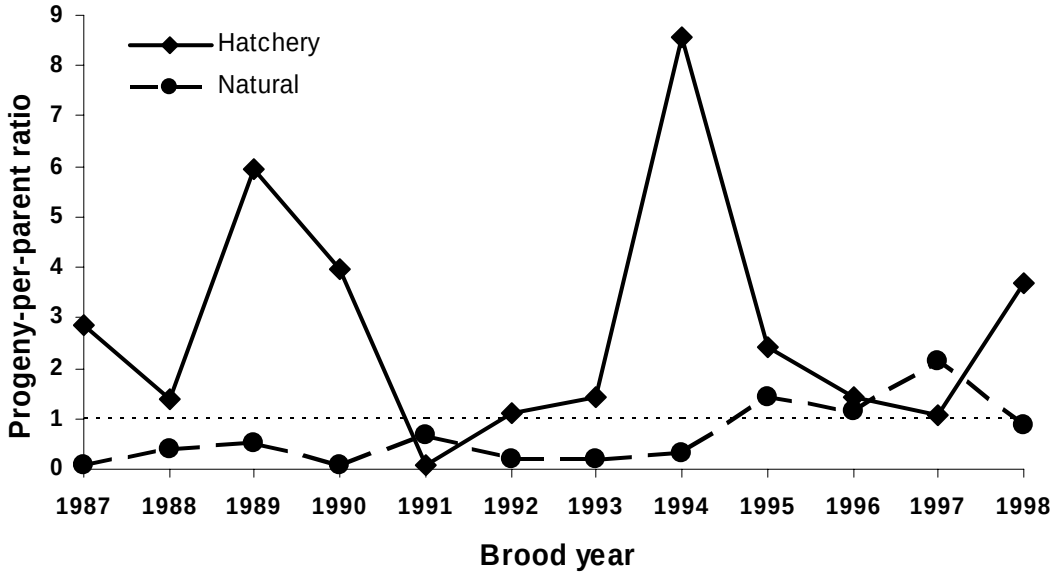

Figure 4. Progeny-to-parent ratios for Little Sheep Creek summer steelhead, 1987-1998 brood years. Dotted line represents replacement (P:P ratio =1).

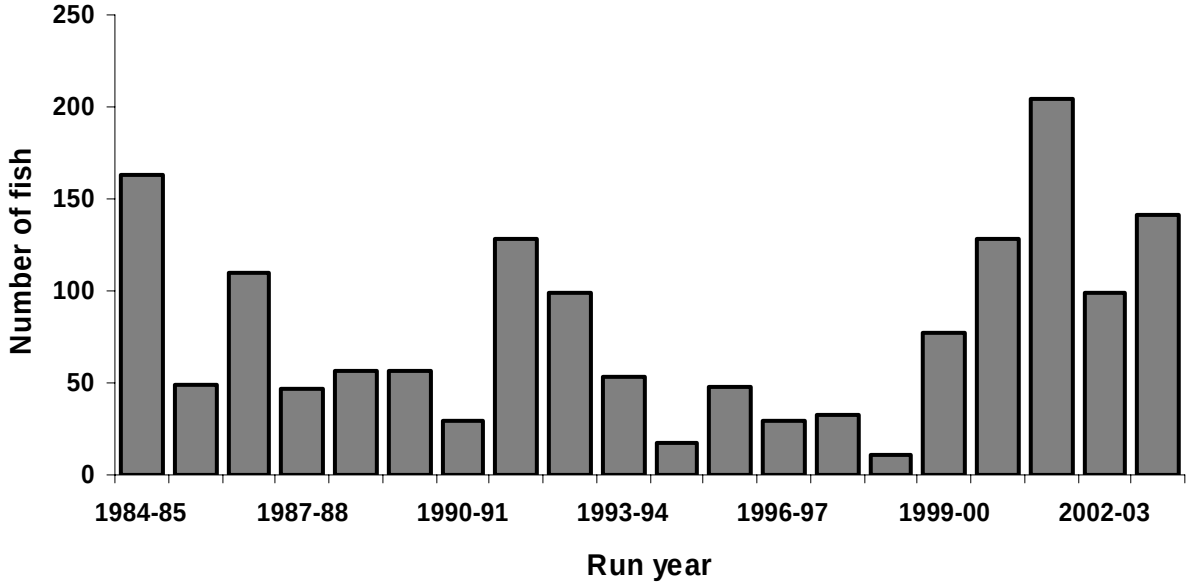

Figure 5. Returns of naturally-produced summer steelhead to Little Sheep Creek, run years 1984-85 to 2003-2004.

Table 1. Summary of egg collection and juvenile survival for 2003 brood year summer steelhead released in the Grande Ronde and Imnaha river basins at LSRCP facilities in 2004.

Stock	Number of eggs taken	Eyed embryos	Total smolts released	Estimated survival rate	
				Egg-to-embryo	Embryo-to-smolt[a]
Wallowa	1,206,310	1,075,400[b]	783,822	89.1	90.3
Imnaha	467,350	408,320[c]	302,013	87.4	89.5

[a] *Embryos that were culled from or not part of production were subtracted from the calculation of embryo-to-smolt survival.*

[b] *Includes 98,400 embryos that were culled because they were excess to program needs. Also includes 108,532 embryos that were overestimated in the inventory.*

[c] *Includes 70,926 embryos that were overestimated in the inventory.*

Table 2. Estimates of fin clip quality and coded-wire tag retention for 2003 brood year summer steelhead reared at Irrigon Fish Hatchery and released in 2004. Experimental group indicates treatment and rearing raceway number. Targets for both Wallowa and Imnaha stocks were 100% adipose clipped and release at mean weight of 91g, with the exception of Imnaha stock blank wire tagged fish that were not clipped. For experimental fish, targets for both stocks were 100% AdLV+CWT. Percentages for Ad and No Ad clips were not divided into experimental groups, just averaged for stock groups.

Experimental group	Tag code	Number checked		CWT + LV	CWT+ no LV	No CWT + LV	No CWT + no LV	Ad	No Ad
		Tag	Ad						
				Wallowa Stock					
Forced, 7	093914	494	-	91.7	5.5	2.8	0.0	-	-
Forced, 9	093915	498	-	93.4	4.6	2.0	0.0	-	-
Volitional, 13	093916	510	-	88.4	10.4	1.2	0.0	-	-
Volitional, 17	093917	509	-	91.0	7.3	1.7	0.0	-	-
Average		503	271[a]	91.1	7.0	1.9	0.0	99.2	0.8
				Imnaha Stock					
Forced, 23	093912	514	-	92.8	3.5	3.7	0.0	-	-
Forced, 24	093913	515	-	86.4	12.0	1.2	0.4	-	-
Forced, 23,25	Blank	510	-	0.0	99.6[b]	0.0	0.4	-	-
Direct Stream, 28	093911	501	-	91.2	6.2	1.8	0.8	-	-
Average (23,24,28)		510	289[c]	90.1	7.2	2.2	0.4	99.3	3.7

[a] *Four ponds were sampled with 302, 314, 212, and 257 fish, respectively. Sampling was not done by experimental group.*

[b] *These fish have blank CWT and no external marks (no Ad clip and no ventral clip).*

[c] *Two ponds were sampled with 263 and 315 fish, respectively.*

Table 3. Details of experimental and production groups of 2003 brood year hatchery summer steelhead released in the Grande Ronde (Wallowa stock) and Imnaha (Imnaha stock) river basins in 2004. Experimental group indicates release strategy and rearing raceway number(s). All groups were acclimated, except for Big Sheep Creek groups that were direct stream released. Target size for all fish was 91g. Standard deviations are shown in parentheses. LGD indicates Lower Granite Dam.

Experimental group[a]	Release date	Release location	Tag code	Fork length (mm)	Weight (g)	Condition factor	Total fish released	Percent migration to LGD[b]
			Wallowa stock					
Forced, 7	April 12-13	Spring Cr.	093914	215 (22)	114.8 (37.2)	1.07 (0.14)	24,655	72.5
Production, 1-8	April 12-13	Spring Cr.	-	214 (22)	105.7 (30.0)	1.08 (0.07)	383,390	-
Volitional, 13	April 28-May 5	Spring Cr.	093916	218 (19)	107.4 (29.5)	1.05 (0.06)	23,003	65.0
Production, 13,15,18	April 28-May 5	Spring Cr.	-	221 (21)	115.2 (34.7)	1.04 (0.08)	125,884	-
Forced, 9	April 12-13	Deer Cr.	093915	218 (21)	111.4 (32.6)	1.07 (0.06)	24,876	72.4
Production, 9,11,12,14,16	April 12-13	Deer Cr.	-	211 (21)	104.9 (30.5)	1.08 (0.06)	126,564	-
Volitional, 17	April 29-May 6	Deer Cr.	093917	219 (18)	107.8 (24.1)	1.03 (0.07)	24,077	72.9
Production, 17, 19	April 29-May 6	Deer Cr.	-	219 (19)	113.5 (30.7)	1.08 (0.07)	51,373	-
Total released[c]							783,822	
			Imnaha stock					
Forced, 23	April 11-12	L. Sheep Cr.	093912	210 (28)	104.3 (43.2)	1.06 (0.06)	24,741	60.4
Forced, 23,25	April 11-12	L. Sheep Cr.	Blank	207 (26)	98.1 (36.9)	1.07 (0.06)	49,344	-
Production, 21,23,25	April 11-12	L. Sheep Cr.	-	206 (24)	89.8 (29.3)	1.07 (0.05)	56,087	-
Forced, 24	April 28-29	L. Sheep Cr.	093913	202 (20)	86.2 (24.0)	1.04 (0.08)	22,901	69.5
Production, 22,24,26	April 28-29	L. Sheep Cr.	-	206 (23)	95.9 (31.9)	1.03 (0.07)	48,938	-
Direct Stream, 28	April 12-13	B. Sheep Cr.	093911	197 (25)	81.5 (27.8)	1.05 (0.06)	44,893	64.2
Direct Stream, 26,27,28	April 12-13	B. Sheep Cr.	-	212 (24)	104.0 (26.8)	1.05 (0.07)	55,109[c]	-
Total released[d]							302,013	

[a] *All fish were reared at Irrigon Fish Hatchery.*

[b] *Percent migration of PIT tag release groups to Lower Granite Dam is from Cormack-Jolly-Seber estimates of survival probabilities from the SURPH.2 program (Lady et al. 2001).*

[c] *Includes 48,432 unmarked, untagged fish. Without both a fin clip and a CWT, fish can not be included in the survival estimates.*

[d] *Based on our pre-release sampling, we observed 0% precocious males in both Wallowa and Imnaha stocks.*

Table 4. Density (±95% confidence interval) and mean fork length (and standard deviation) of residual steelhead from index sites during the summer in the Grande Ronde and Imnaha river basins in 2004. Hatchery steelhead smolts released in the spring (April-May) were classified as residuals after 20 June. HSTS indicates hatchery (adipose clipped) residual summer steelhead, WSTS indicates all wild *Oncorhynchus mykiss* except young-of-the-year (<70 mm).

			Area	Fork length (mm)			Gender [b]		Density [c]
Location [a]	Date	Species	(m^2)	N	Length	Range	N	% males	(#/100m^2)
				Grande Ronde Basin					
Deer Cr.	29 July	HSTS	270.9	14	164.1 (39.0)	105-251	1	100	9.2±18.7
Deer Cr.	29 July	WSTS	270.9	22	109.4 (17.6)	86-152	-	-	11.5±9.9
				Imnaha Basin					
L. Sheep	28 July	HSTS	476.1	62	171.2 (36.6)	98-252	10	80	13.8±1.0
L. Sheep	28 July	WSTS	476.1	28	115.6 (23.7)	84-169	-	-	6.9±2.0

[a] *Index sites located at Deer Creek (Rkm 0.1) near the Big Canyon Facility and Little Sheep Creek (Rkm 8.0) near the Little Sheep Creek Facility. Two adjacent sites were sampled at each location and each site typically included both riffle and pool habitat.*

[b] *These fish were AdLV+CWT marked residual steelhead that were euthanized and used for CWT recovery.*

[c] *Density (±95% confidence interval) was determined using a multiple pass removal method (Zippen 1958) with a backpack electrofisher (Smith-Root Model 12 or Model 12A) and block seines.*

Table 5. Timing of adult steelhead returns to LSRCP facilities in 2004 by location and origin.

	Week	Number of fish trapped [a]					
	of the	Wallowa[b]		Big Canyon		Little Sheep	
Period	year	Hatchery	Natural	Hatchery	Natural	Hatchery	Natural
Jan 22-28	4	-	-	0	0	-	-
Jan 29-Feb 04	5	-	-	0	0	-	-
Feb 05-11	6	-	-	0	0	-	-
Feb 12-18	7	0	0	0	0	-	-
Feb 19-25	8	29	0	0	0	-	-
Feb 26-Mar 04	9	93	0	5	0	0	0
Mar 05-11	10	195	0	6	0	23	0
Mar 12-18	11	443	0	147	2	293	14
Mar 19-25	12	823	2	418	7	551	35
Mar 26-Apr 01	13	411	5	377	16	284	7
Apr 02-08	14	608	2	0[c]	0[c]	761	34
Apr 09-15	15	315	3	237	19	412	20
Apr 16-22	16	141	0	106	10	125	4
Apr 23-29	17	53	0	75	6	104	17
Apr 30-May 06	18	31	0	44	4	50	8
May 07-13	19	8	0	19	1	6	1
May 14-20	20	0	0	0	1	1	0
May 21-27	21	0	0	2	1	3	1
May 28-Jun 03	22	0	0	0	0	0	0
Total		3,150	12	1,436	67	2,613	141

[a] *Weirs installed 28 January at Big Canyon Facility (Deer Cr.), and 4 March at Little Sheep Creek Facility ladder opened 12 February at Wallowa Fish Hatchery. Adult collections stopped on 3 June at Big Canyon Facility, 3 June at Little Sheep Creek Facility, and 21 May at Wallowa Fish Hatchery.*

[b] *Between 10/14/03 and 10/24/03 57 hatchery males and 49 hatchery females were collected between Wildcat Creek in Oregon and Boggan's Oasis in Washington and taken to Wallowa Fish Hatchery for the Fall broodstock. As these fish were caught by hook and line and did not return of their own volition, they are not included in the run timing.*

[c] *The trap was not sampled during this period of time. Fish trapped during this time are included in the following weeks' total.*

Table 6. Number, disposition, and mean fork length of adult steelhead that returned to LSRCP facilities in 2004 by stock, origin, age (freshwater:saltwater), and gender. M indicates male and F indicates female.

Stock, Disposition	Hatchery[a] 1:1 M	1:1 F	1:2 M	1:2 F	2:1 M	2:1 F	3:1 M	3:1 F	Total	Natural[b] 2:1 M	2:1 F	2:2 M	2:2 F	3:1 M	3:1 F	3:2 M	3:2 F	4:1 M	4:1 F	Total	Grand total
Wallowa Fish Hatchery (Wallowa Stock)																					
Trapped	1,731	876	293	236	3	12	0	0	3,151	1	1	1	2	3	1	2	1	0	0	12	3,163
Passed	0	0	0	0	0	0	0	0	0	1	1	1	2	3	1	1	1	0	0	11	11
Outplanted	73	0	13	0	0	0	0	0	86	0	0	0	0	0	0	0	0	0	0	0	86
Kept	1,658	876	280	236	3	12	0	0	3,065	0	0	0	0	0	0	1	0	0	0	0	3,066
Mortality	3	2	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5
Spawned	153	108	36	78	0	2	0	0	377	0	0	0	0	0	0	0	0	0	0	0	377
Killed[c]	1,502	766	244	158	3	10	0	0	2,683	0	0	0	0	0	0	1	0	0	0	1	2,684
Fork Length (mm)	578	561	739	710	458	-	-	-		-	-	-	-	-	-	-	-	-	-		
Standard deviation	62	31	55	40	-	-	-	-		-	-	-	-	-	-	-	-	-	-		
Sample size	24	21	19	23	1																
Wallowa Fish Hatchery (Wallowa Stock-Fall Broodstock)																					
Trapped	52	39	7	6	0	1	0	0	105	0	0	0	0	0	0	0	0	0	0	0	105
Passed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Outplanted	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kept	52	39	7	6	0	1	0	0	105	0	0	0	0	0	0	0	0	0	0	0	105
Mortality	12	0	1	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	13
Spawned	35	36	6	6	0	1	0	0	84	0	0	0	0	0	0	0	0	0	0	0	84
Killed[c,d]	5	3	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	8
Fork Length (mm)	587	544	688	-	-	654	-	-		-	-	-	-	-	-	-	-	-	-		
Standard deviation	44	28	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-		
Sample size	4	3	1			1															
Big Canyon Facility (Wallowa Stock)																					
Trapped	620	535	105	164	0	10	1	1	1,436	4	7	2	15	10	13	3	11	1	1	67	1,503
Passed	0	0	0	0	0	0	0	0	0	4	7	2	15[e]	10	13	3	11	1	1	67	67
Outplanted	21	19	0	6	0	1	0	0	47	0	0	0	0	0	0	0	0	0	0	0	47
Returned to River[f]	69	48	35	21	0	0	0	0	173	0	0	0	0	0	0	0	0	0	0	0	173
Kept	530	486	70	137	0	9	1	1	1,216	0	0	0	0	0	0	0	0	0	0	0	1,216
Mortality	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spawned	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killed[c, f]	530	486	70	137	0	9	1	1	1,216	0	0	0	0	0	0	0	0	0	0	0	1,216
Fork Length (mm)	-	-	-	-	-	-	-	-		595	602	790	706	-	610	-	665	-	-		
Standard deviation	-	-	-	-	-	-	-	-		7	16	-	24	-	-	-	7	-	-		
Sample size										2	3	1	5		1		2				

Table 6. Continued

Stock, Disposition	Hatchery[a] 1:1 M	1:1 F	1:2 M	1:2 F	2:1 M	2:1 F	3:1 M	3:1 F	Total	Natural[b] 2:1 M	2:1 F	2:2 M	2:2 F	3:1 M	3:1 F	3:2 M	3:2 F	4:1 M	4:1 F	Total	Grand total
Little Sheep Creek Facility (Imnaha stock)																					
Trapped	1,252	954	67	336	0	0	3	1	2,613	38	35	5	10	31	15	2	5	0	0	141	2,754
Passed	372	226	23	66	0	0	0	0	687	34	31	5	10	30	14	2	5	0	0	131	818
Outplanted	782	659	36	242	0	0	0	0	1,719	0	0	0	0	0	0	0	0	0	0	0	1,719
Kept	98	69	8	28	0	0	3	1	207	4	4	0	0	1	1	0	0	0	0	10	217
Mortality	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spawned[g]	84	62	7	28	0	0	0	0	181	4	4	0	0	1	1	0	0	0	0	10	191
Killed	14	7	1	0	0	0	3	1	26	0	0	0	0	0	0	0	0	0	0	0	26
Fork Length (mm)	568	556	705	692	-	-	-	-		-	593	-	-	-	567	-	-	-	-		
Standard deviation	26	27	72	43	-	-	-	-		-	66	-	-	-	-	-	-	-	-		
Sample size	21	16	4	8							2				1						

[a] *Wallowa stock ages apportioned using 97 scale samples collected in 2004; Imnaha stock ages apportioned using 75 scale samples from 2003 and 49 scale samples from 2004 in order to increase sample size. Lengths are from fish with 2004 scale samples.*

[b] *Wallowa and Big Canyon ages apportioned using historical data (113 samples) and 2004 data (15 samples); at Little Sheep Creek Facility historical data (67 samples), 2004 data (3 samples), 2006 data (56 samples), and 2007 data (42 samples) were used to increase sample size.*

[c] *For Wallowa stock, 1,626 fish that returned to Wallowa Fish Hatchery and 626 fish that returned to Big Canyon were euthanized and donated to local food banks.*

[d] *Includes one age 1:2 CWT fish (63-02-81) released from Washington Department of Fish and Wildlife's Cottonwood Acclimation Pond in April 2001. Also includes one age 1:1 CWT fish (63-12-78) released from Washington Department of Fish and Wildlife's Lyon's Ferry Hatchery on the Tucannon River in April of 2002.*

[e] *Includes one 635 mm 1:2 female, with a known age based on scale reading.*

[f] *Three hundred and six fish were returned to the river fishery. Of these, 87 males and 46 females returned to the weir a second time and were euthanized. These 133 fish are included in the "killed" category.*

[g] *Includes five natural males that were live-spawned and then passed above the weir.*

Table 7. Number of hatchery origin adult summer steelhead at the Little Sheep Creek Facility weir that were outplanted into Big Sheep Creek or passed into Little Sheep Creek and subsequently recaptured at the weir, 1999-2004.

	Big Sheep			Little Sheep		
	Number of Fish		%	Number of Fish		%
Year	Outplanted	Recaptured[a]	Recaptured[b]	Passed	Recaptured	Recaptured[b]
1999	42	6	14.3	80	1	1.3
2000	138	17	12.3	200	9	4.5
2001	354	48	13.6	784	89	11.4
2002	2,030	907	44.7	1,198	269	22.5
2003	1,403	439	31.3	387	36	9.3
2004	1,719	244	14.1	823	138	16.8
Mean	-	-	21.7	-	-	11.0

[a] *Total number of recaptures, including second and third time recaptures. For 1999-2002, recaptures were opercle punched at the weir and second and third time recaptures recorded.*
[b] *Total recaptured divided by total outplanted.*

Table 8. Summary of summer steelhead spawning ground surveys in Deer Creek above the Big Canyon Facility weir, 2002-2004.

Year	Females passed	Males passed	Total passed	Total redds	Fish/ redd	Females/ redd	% redds observed[a]	Redds/ mile[b]
2002	120	89	209	87	2.40	1.38	73	7.25
2003	92	48	140	64	2.19	1.44	70	5.33
2004	47	20	67	47	1.43	1.00	100	4.70

[a] *Total redds divided by females passed. Assume that each female passed constructs one redd.*
[b] *Twelve miles of stream were surveyed in 2002 and 2003; ten miles of stream were surveyed in 2004.*

Table 9. Spawning summaries for summer steelhead at LSRCP facilities in 2004. The percent mortality is from green egg to eyed embryo after shocking.

Spawn date, Lot number	Parental origin [a]	Number of eggs	Eyed embryos	% mortality
		Wallowa Hatchery (Wallowa stock)		
3/17, wa410	Production	90,800	86,400[b]	4.8
	Fall Broodstock	9,300	6,600	29.0
3/24, wa411	Production	131,800	117,500	10.8
	Fall Broodstock	28,600	20,750	27.4
3/31, wa412	Production	151,500	133,900	11.6
	Fall Broodstock	44,700	42,700	4.5
4/07, wa413	Production	168,100	142,900	15.0
	Fall Broodstock	40,850	37,300	8.7
4/14, wa414	Production	173,500	143,800	17.1
	Fall Broodstock	34,100	30,400	10.9
4/21, wa415	Production	142,500	129,100	9.4
	Fall Broodstock	8,150	4,500	44.2
4/28, wa416	Production	80,250	74,800	6.8
	Fall Broodstock	29,600	25,300	14.5
Subtotal	Production	938,450	827,000	11.7
Subtotal	Fall Broodstock	195,300	167,550	14.2
Total		1,133,750	994,550	12.3
		Little Sheep Creek Facility (Imnaha stock)		
3/23, li510	Mixed	52,490	47,920	8.7
3/30, li511	Mixed	125,650	115,900	7.8
4/06, li512	Hatchery	90,050	85,850	4.7
4/13, li513	Mixed	81,100	74,300	8.4
4/20, li514	Mixed	50,550	44,000	13.0
4/27, li515	Mixed	16,320	15,200	6.9
5/04, li516	Mixed	9,970	9,250	7.2
5/11, li517	Hatchery	6,050	5,700	5.8
Subtotal	Hatchery	96,100	91,550	4.7
Subtotal	Mixed	336,080	306,570	8.8
Total		432,180	398,120	7.9

[a] *In general, family groups were one male x one female for Wallowa stock and were matrix spawned (three males x three females) for Imnaha stock. Mixed eggs include both natural and hatchery parents.*

[b] *Includes 1,400 embryos that were transferred to the Salmon and Trout Enhancement Program (STEP) coordinator.*

Table 10. Summary of anadromous adult recoveries of coded-wire tagged (CWT) Wallowa stock summer steelhead for the 2003-2004 run year. All CWT fish were hatchery origin fish released into either Deer Creek (at Big Canyon Facility) or Spring Creek (at Wallowa Fish Hatchery). Data were summarized as available through December 2007.

Brood year, release site	Experimental group[a]	CWT code	Recoveries at weirs[b]	Other in-basin recoveries[c]	Out-of-basin recoveries[d]	Total recoveries[e]
1999						
Deer Cr.	Volitional	092936	1	0	0	1
	Forced	092937	1	0	0	1
2000						
Deer Cr.	Production	093215	15	0	6	21
	Forced	093216	18	0	14	32
	Volitional	093217	9	0	8	17
Spring Cr.	Production	093212	18	18	20	56
	Forced	093213	11	0	26	37
	Volitional	093214	4	0	51	42
2001						
Deer Cr.	Production	093407	78	25	111	214
	Forced	093408	80	37	80	197
	Volitional	093409	97	44	149	290
Spring Cr.	Production	093404	81	14	129	224
	Forced	093405	98	26	157	281
	Volitional	093406	95	12	137	244
Total recoveries			606	176	888	1,670

[a] *Experimental groups include the release (and rearing) strategy. All releases were targeted for five fish per pound (90.7g/fish).*

[b] *Actual number of CWT fish that were released into Spring Cr. and recovered at the Wallowa Fish Hatchery weir or released into Deer Cr. and recovered at the Big Canyon Facility weir. The protocol was to collect all CWT fish at the weirs for sampling at the hatchery during spawning.*

[c] *Actual number of CWT fish that were released into Spring Cr. and recovered at the Big Canyon Facility weir or released into Deer Cr. and recovered at the Wallowa Fish Hatchery weir plus the estimated number (from creel surveys and harvest card returns) of CWT fish that were harvested in the Grande Ronde River Basin fisheries.*

[d] *Estimated number (from PSMFC and ODFW databases) of total CWT fish that were recovered in the ocean, mainstem Columbia, Deschutes or Snake river fisheries, or in tributaries outside the Grande Ronde River Basin. When CWT expansion factors were greater than 24 (because of a low sampling rate) unexpanded data were used.*

[e] *Estimated total by summing all recoveries.*

Table 11. Summary of anadromous adult recoveries of coded-wire tagged (CWT) Imnaha stock summer steelhead for the 2003-2004 run year. All CWT fish were hatchery origin fish either released into Little Sheep Creek at Little Sheep Creek Facility or into Big Sheep Creek. Data were summarized as available through December 2007.

Brood year	Experimental group[a]	CWT code	Recoveries at weirs[b]	Other in-basin recoveries[c]	Out-of-basin recoveries[d]	Total recoveries[e]
1999						
Little Sheep	Pre-smolts	092706	4	0	0	4
2000						
Little Sheep	Production	093210	29	0	27	56
	Production	093211	21	6	39	66
2001						
Big Sheep	Production	090125	27	26	143	196
Little Sheep	Production	093402	168	5	117	290
	Production	093403	152	20	123	295
	Total recoveries		401	57	449	907

[a] *Experimental groups include the release strategy. All releases were targeted for five fish per pound (90.7 g/fish).*

[b] *Estimated number of CWT fish recovered at the Little Sheep Creek Facility weir based on actual number recovered at the weir and estimated number either passed above the weir to Little Sheep Creek or outplanted to Big Sheep Creek to spawn naturally.*

[c] *Estimated number (from creel surveys and harvest card returns) of total CWT fish that were harvested in the Imnaha River Basin fishery.*

[d] *Estimated number (from PSMFC and ODFW databases) of total CWT fish that were recovered in the ocean, mainstem Columbia, Deschutes or Snake river fisheries, or in tributaries outside the Imnaha River Basin. When CWT expansion factors were greater than 24 (because of a low sampling rate), unexpanded data were used.*

[e] *Estimated total by summing all recoveries.*

Table 12. Catch and escapement distribution of adult summer steelhead by recovery location for the 2003-2004 run year using the PSMFC and ODFW mark recovery databases. "C and S" indicates ceremonial and subsistence tribal fisheries. Data were summarized as available through December 2007. "-" indicates not sampled or undefined.

	Wallowa Stock			Imnaha Stock		
Location	Estimated CWT recoveries	Total return	Percent of total return	Estimated CWT recoveries	Total return	Percent of total return
Ocean catch	0	0	0.0	0	0	0.0
Columbia River						
Treaty net	46	278	2.2	33	120	2.3
C and S	0	0	0.0	0	0	0.0
Sport	75	496	3.9	54	150	2.9
Test	0	0	0.0	0	0	0.0
Tributary sport	1	4	0.0	1	4	0.1
Deschutes River						
Sport	8	25	0.2	11	33	0.6
C and S	0	0	0.0	0	0	0.0
Strays						
Outside Snake R. Basin	33	236	1.9	5	14	0.3
Within Snake R. Basin*	7	28	0.2	3	8	0.2
Snake River sport, tribs.*	718	4,111	32.3	342	1,067	20.5
Oregon tributaries* [a]	176	2,974	23.3	57	228	4.4
Other in-basin escapement* [b]	-	0	0.0	-	980	18.8
Hatchery weir* [c]	606	4,587	36.0	401	2,613	50.1
Total estimated return	1,670	12,739	100	907	5,217	100
Return to compensation area		11,700			4,896	
Percent of compensation goal		127.4			244.8	

** Indicates areas defining the compensation area. The compensation goal for Wallowa stock is 9,184 adults and the goal for Imnaha stock is 2,000 adults.*

[a] *Total returns to Oregon tributaries are harvest estimates based on angler surveys and harvest card returns.*

[b] *Total returns to other in-basin escapement areas are escapement estimates of off-station direct stream releases based on coded-wire tag returns of direct stream release groups at hatchery weirs.*

[c] *Total returns to the hatchery weir are actual numbers, except with the Imnaha stock where there is an estimated number of CWT fish recovered at the Little Sheep Creek Facility weir. This estimate is based on the actual number of CWT fish recovered at the weir and estimated number either passed above the weir to Little Sheep Creek or outplanted to Big Sheep Creek to spawn naturally.*

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Addendum to
Lower Snake River Compensation Plan:
Oregon Summer Steelhead Evaluation Studies
2003 Annual Progress Report

Table 10. Summary of anadromous adult recoveries of coded-wire tagged (CWT) Wallowa stock summer steelhead for the 2002-2003 run year. All CWT fish were hatchery fish released into either Deer Creek (at Big Canyon Facility) or Spring Creek (at Wallowa Fish Hatchery). Data were summarized as available through December 2007.

Brood year, release site	Experimental group[a]	CWT code	Recoveries at weirs[b]	Other in-basin recoveries[c]	Out-of-basin recoveries[d]	Total recoveries[e]
1999						
Deer Cr.	Production	092934	34	38	**57**	**129**
	Production	092935	37	26	**49**	**112**
	Volitional	092936	19	24	**65**	**108**
	Forced	092937	29	6	**46**	**81**
Spring Cr.	Production	092930	27	16	**75**	**118**
	Production	092931	32	22	**66**	**120**
	Volitional	092932	27	9	**65**	**101**
	Forced	092933	19	10	**118**	**147**
2000						
Deer Cr.	Production	093215	21	3	**39**	**63**
	Forced	093216	32	15	**69**	**116**
	Volitional	093217	30	6	**25**	**61**
Spring Cr.	Production	093212	30	17	**69**	**116**
	Forced	093213	30	11	**56**	**97**
	Volitional	093214	22	2	**37**	**61**
	Total recoveries		389	205	**836**	**1430**

[a] *Experimental groups include the release (and rearing) strategy. All releases were targeted for five fish per pound.*

[b] *Actual number of CWT fish that were released into Spring Cr. and recovered at the Wallowa Fish Hatchery weir or released into Deer Cr. and recovered at the Big Canyon Facility weir. The protocol was to collect all CWT fish at the weirs for sampling at the hatchery during spawning.*

[c] *Actual number of CWT fish that were released into Spring Cr. and recovered at the Big Canyon Facility weir or released into Deer Cr. and recovered at the Wallowa Fish Hatchery weir plus the estimated number (from creel surveys and harvest card returns) of CWT fish that were harvested in the Grande Ronde River Basin fisheries.*

[d] *Estimated number (from PSMFC and ODFW databases) of total CWT fish that were recovered in the ocean, mainstem Columbia, Deschutes or Snake river fisheries, or in tributaries outside the Grande Ronde River Basin. When CWT expansion factors were greater than 24 (because of a low sampling rate) unexpanded data were used.*

[e] *Estimated total by summing all recoveries.*

Table 11. Summary of anadromous adult recoveries of coded-wire tagged (CWT) Imnaha stock summer steelhead for the 2002-2003 run year. All CWT fish were hatchery fish released into Little Sheep Creek at Little Sheep Creek Facility. Data were summarized as available through December 2007.

Brood year	Experimental group[a]	CWT code	Recoveries at weirs[b]	Other in-basin recoveries[c]	Out-of-basin recoveries[d]	Total recoveries[e]
1998	Production	092561	3	0	0	3
1999	Pre-smolts	092706	2	0	0	2
	Production	092927	65	14	**53**	**132**
	Production	092928	53	6	**49**	**108**
	Production	092929	51	12	**17**	**80**
2000	Production	093210	117	13	**92**	**222**
	Production	093211	61	2	**79**	**142**
	Total recoveries		352	47	**290**	**689**

[a] *Experimental groups include the release strategy. All releases were targeted for five fish per pound.*

[b] *Estimated number of CWT fish recovered at the Little Sheep Creek Facility weir based on actual number recovered at the weir and estimated number either passed above the weir to Little Sheep Creek or outplanted to Big Sheep Creek to spawn naturally.*

[c] *Estimated number (from creel surveys and harvest card returns) of total CWT fish that were harvested in the Imnaha River Basin fishery.*

[d] *Estimated number (from PSMFC and ODFW databases) of total CWT fish that were recovered in the ocean, mainstem Columbia, Deschutes or Snake river fisheries, or in tributaries outside the Imnaha River Basin. When CWT expansion factors were greater than 24 (because of a low sampling rate), unexpanded data were used.*

[e] *Estimated total by summing all recoveries.*

Table 12. Catch and escapement distribution of adult summer steelhead by recovery location for the 2002-2003 run year using the PSMFC and ODFW mark recovery databases. "C and S" indicates ceremonial and subsistence tribal fisheries. Data were summarized as available through December 2007. "-" indicates not sampled or undefined.

	Wallowa Stock			Imnaha Stock		
Location	Estimated CWT recoveries	Total return	Percent of total return	Estimated CWT recoveries	Total return	Percent of total return
Ocean catch	3	19	0.2	0	0	0.0
Columbia River						
Treaty net	61	283	**2.7**	12	56	**1.4**
C and S	0	0	0.0	0	0	0.0
Sport	65	256	**2.4**	84	430	10.5
Test	0	0	0.0	0	0	0.0
Tributary sport	2	12	0.1	0	0	0.0
Deschutes River						
Sport	50	207	**2.0**	16	88	**2.1**
C and S	0	0	0.0	0	0	0.0
Strays						
Outside Snake R. Basin	**137**	**733**	**6.9**	**1**	**5**	**0.1**
Within Snake R. Basin*	**6**	**81**	**0.8**	1	5	0.1
Snake River sport, tribs.*	**512**	**2,894**	**27.3**	**176**	**858**	**20.9**
Oregon tributaries* [a]	205	**2,648**	**25.0**	47	239	**5.8**
Other in-basin escapement* [b]	-	0	0.0	-	510	**12.4**
Hatchery weir* [c]	389	3,458	**32.7**	352	1,907	**46.5**
Total estimated return	**1,430**	**10,591**	100	**689**	**4,098**	100
Return to compensation area		**9,081**			**3,519**	
Percent of compensation goal		**98.9**			**176.0**	

** Indicates areas defining the compensation area. The compensation goal for Wallowa stock is 9,184 adults and the goal for Imnaha stock is 2,000 adults.*

[a] *Total returns to Oregon tributaries are harvest estimates based on angler surveys and harvest card returns.*

[b] *Total returns to other in-basin escapement areas are escapement estimates of off-station direct stream releases based on coded-wire tag returns of direct stream release groups at hatchery weirs.*

[c] *Total returns to the hatchery weir are actual numbers, except with the Imnaha stock where there is an estimated number of CWT fish recovered at the Little Sheep Creek Facility weir. This estimate is based on the actual number of CWT fish recovered at the weir and estimated number either passed above the weir to Little Sheep Creek or outplanted to Big Sheep Creek to spawn naturally.*