LOWER SNAKE RIVER COMPENSATION PLAN:
Oregon Summer Steelhead Evaluation Studies
2014 Annual Progress Report

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OREGON
Fish & Wildlife

LOWER SNAKE RIVER
COMPENSATION PLAN
Hatchery Program

This report is available at: http://www.fws.gov/lsnakecomplan/Reports/ODFWreports.html

Front cover photo is of an adult steelhead swimming in the Wallowa River.

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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 2014. 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 2009-2011 broods returned to spawn, and steelhead from the 2013 brood were released as smolts. Adult steelhead that returned to spawn were used to create the 2014 brood.

ACKNOWLEDGMENTS

We would like to thank hatchery managers Ron Harrod and Marc Garst, as well as Terry Blessing, Chad Aschenbrenner and 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 Chris Starr, Joe Krakker, Steve Yundt, Julie Collins, and Rod Engle, who provided administrative and technical support. This project was funded by the U.S. Fish and Wildlife Service under the Lower Snake River Compensation Plan, contract numbers F14AC00042 and F16AC00030, a cooperative agreement with the Oregon Department of Fish and Wildlife.

CORRECTION

Table 5 summarizes the travel time to Lower Granite Dam of smolts that volitionally left the Little Sheep Creek Acclimation Facility and the percent of those smolts detected at lower Snake River dams. In this report we have re-calculated the percent detected to include detections at all four Lower Snake River Dams (Lower Granite, Lower Monumental, Little Goose, and Ice Harbor), rather than only at Lower Granite Dam. Additional changes to Table 5 were made to correctly match travel times with their corresponding brood year. 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 each of our objectives for 2014. In this report, we present data and results for objectives 1, 2, 3, 4, and 6. To accomplish objective 5, project staff participated in planning and coordination with co-managers to develop and write the annual operation plan. Data and results for objective 7 are published in separate annual creel survey reports (*e.g., Flesher et al. 2015).*

The production goal of 800,000 Wallowa stock smolts was achieved in 2014, with 831,978 smolts released. The Imnaha stock production goal of 215,000 smolts was also achieved with 239,614 smolts released.

In 2014, 1,886 and 1,530 Wallowa stock hatchery steelhead returned to Wallowa Fish Hatchery and the Big Canyon Facility, respectively. In addition, 22 Wallowa stock adults were captured by angling in October and transferred to the Wallowa Fish Hatchery, where they were held until the following spring and spawned for the early returning Fallbrood program. Lastly, we trapped 8 natural steelhead at Wallowa Fish Hatchery and 48 natural steelhead at the Big Canyon Facility, which were released to spawn naturally. At the Little Sheep Creek Facility, we trapped 768 Imnaha stock hatchery and 124 natural steelhead adults. Of these, a total of 156 hatchery and 103 natural steelhead were released above the weir, and 211 hatchery steelhead

were outplanted to Big Sheep Creek. During spawning in the spring of 2014, we collected 574,600 Wallowa stock production eggs, 553,900 Wallowa fall broodstock eggs, and 310,900 Imnaha stock eggs.

In the 2013-14 run year, the compensation area goal of 9,184 Wallowa stock adults above Lower Granite Dam was not met but the Imnaha stock goal of 2,000 adults was met. We have met the Wallowa stock compensation area goal eleven times in our program history, and the Imnaha stock compensation area goal thirteen times. We estimate that 7,781 Wallowa stock hatchery steelhead (84.7% of goal), and 3,451 Imnaha stock hatchery steelhead (172.6% of goal) returned to the LSRCP compensation area in 2014.

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 *(Oncorhynchus mykiss)*. We report on juvenile steelhead rearing and release activities for the 2013 brood year (BY) released in 2014. Included are collection, spawning, and adult characteristics for the 2014 returns, returns from experimental releases, supplementation in Little Sheep Creek, and success toward achieving compensation goals.

The Grande Ronde and Imnaha river steelhead hatchery programs were initiated in 1976 and 1982 in response to the rapid decline in Snake River steelhead abundance. Annual adult mitigation, brood year specific smolt-to-adult return and total smolt-to-adult survival rates, and annual smolt production goals were established to compensate for the estimated annual loss of 48% of adult production. Adaptive management has resulted in current interim smolt production goals of 800,000 (ODFW Wallowa stock released into the Grande Ronde) and 215,000 (Imnaha stock) smolts; less than the original goals of 1,350,000 and 330,000 smolts. Based on original smolt production goals it was assumed that 27,552 Wallowa stock and 6,000 Imnaha stock adults would be produced annually. Furthermore, 66.7% of these fish were expected to be harvested below the compensation area, defined as the watershed above Lower Granite Dam, resulting in compensation area adult return goals of 9,184 Wallowa stock and 2,000 Imnaha stock.

In general, the data in this report were derived from hatchery inventories and standard databases (e.g., 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. 2012, Carmichael et al. 2013). Coded-wire tag (CWT) data collected from 2014 adult returns were used to evaluate smolt-to-adult survival rates in experimental rearing and release groups. In 2014, the only experimental treatments from which fish returned were second generation progeny from early returning (fall-collected) broodstock. In 2014, smolts were released at Wallowa Hatchery that were third generation progeny of early returning (fall-collected) broodstock for an experimental comparison with progeny of standard production broodstock. Methods for the fall broodstock experiment are described in Warren et al. (2011a). 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

each 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; Clarke et al. 2014; Clarke et al. 2015; Flesher et al. 2005a; 2009a; Gee et al. 2007; 2008; Messmer et al. 1989; 1990; 1991; 1992; 1993; Jonasson et al. 1994; 1995; 1996; Ruzycki et al. 2003; Warren et al. 2009; 2010; 2011a; 2011b; 2012; 2013;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; 2005b; 2007; 2008a; 2008b; 2009b; 2010; 2011; 2012; 2013; 2014), a United States vs. Oregon production report (Carmichael et al. 1986b), a five-year study plan (Carmichael 1989), and journal articles (Clarke et al. 2010; 2011; 2014).

RESULTS AND DISCUSSION

Juveniles

Wallowa stock egg-to-eyed embryo survival for the 2013 BY was 92.8%, within the range of recent brood years (1993-2012 BY range = 71.8-93.8%), and embryo-to-smolt survival was 77.7%, within the range of recent brood years (1993-2012 BY range = 65.0-98.3%; Table 1). Imnaha stock egg-to-embryo survival for the 2013 BY was 85.0%, within the range of recent brood years (1993-2012 BY range = 76.7-92.1%), and embryo-to-smolt survival was 84.3%, within the range of recent brood years (1993-2012 BY range = 79.5-98.5%; Table 1). We released 831,978 Wallowa stock smolts in 2014, exceeding our production goal of 800,000 smolts. For the Imnaha stock, we released 239,614 Imnaha stock smolts, which also exceeded our production goal of 215,000 smolts (Tables 1 and 3). Hatchery managers attempt to meet production goals every year; however, variation in mortality at various stages of rearing, from fertilized eggs to acclimated 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.

Beginning with BY 2013 releases, a programmatic decision was made to eliminate ventral fin clipping of steelhead for purposes of identifying the presence of coded-wire tags. Electronic scanning is now used to detect wire in hatchery fish harvested in fisheries and recovered at hatchery traps. However, one raceway of coded-wire tagged Wallowa production stock continue to be left ventral fin clipped (AdLV and CWT) to assess the effect that ventral clips have on smolt-to-adult survival, and Wallowa fall broodstock continue to be right ventral clipped so that returning adults may be visually identified at hatchery weirs and collected for broodstock. Hatchery fish continue to be adipose fin clipped. To evaluate different rearing and release strategies, we tagged and released six groups of Wallowa stock steelhead and one group of Imnaha stock steelhead smolts with adipose clips and coded-wire-tags (Ad and CWT), and four groups of Wallowa fall broodstock with adipose-right ventral clips and coded-wire tags (AdRV and CWT; Table 2). We marked 98.2 and 99.5% of Wallowa and Imnaha stock smolts with an adipose fin clip, which was within the range of recent brood years for Wallowa stock (1993-2012

BY range = 95.6-99.9%) and within the range of recent brood years for Imnaha stock (1993-2012 BY range = 96.1-100.0). Fin clip quality and tag retention for release groups averaged 98.2% for Wallowa stock, within the range of recent years (1993-2012 BY range = 89.1-99.3%) and 99.5% for Imnaha stock, which exceeded the range of recent years (1993-2012 BY range = 84.7-99.0%). Details of experimental and production releases for the 2013 BY, including the number of fish implanted with passive integrated transponder (PIT) tags, are shown in Table 3.

Densities of residual hatchery steelhead averaged 1.9 fish/100m^2 at index sites in the Grande Ronde basin in 2014 (Table 4), whereas wild *O. mykiss* averaged 9.7 fish/100m^2. In the Imnaha basin, densities of residual hatchery steelhead and wild *O. mykiss* were 12.9 and 0.9 fish/100m^2. Since sampling for residual hatchery steelhead began in 1996, we have observed a clear pattern of higher densities of residual hatchery steelhead than wild *O. mykiss* in the Imnaha basin index sites.

Adults

Returning PIT-tagged adults from the 2009 to 2011 broods were detected at mainstem dams during the 2013-14 run year. Of the 268 Wallowa stock adults detected at Bonneville Dam on the Columbia River, 180 were detected at Lower Granite Dam on the Snake River. For the Imnaha stock, 224 of the 344 adults detected at Bonneville Dam were detected at Lower Granite Dam (Table 6). Weirs were installed to capture adult steelhead on 4 February at Wallowa Fish Hatchery, 19 February at Big Canyon Facility, and 21 February at Little Sheep Creek Facility (Table 7). Returns to the Little Sheep Creek Facility were predominantly hatchery fish, with 124 (13.9%) natural steelhead. Similar to Little Sheep Creek, most of the adults that returned to the Big Canyon Facility were of hatchery origin, with only 48 (3.0%) natural steelhead. In addition, 8 (0.4%) natural steelhead returned to Wallowa Fish Hatchery. Seventy-six percent of hatchery adults that returned to Wallowa Fish Hatchery and Big Canyon Facility spent one year in the ocean (Table 8) and 88% of hatchery fish that returned to Little Sheep Creek Facility spent one year in the ocean before returning. Of the natural origin fish, 75% (93 of 124), 71% (34 of 48), and 75% (6 of 8) of the Little Sheep Creek Facility, Big Canyon Facility, and Wallowa Fish Hatchery, respectively, spent one year in saltwater before returning.

The majority of hatchery adults that returned to Wallowa Fish Hatchery in 2014 were spawned or killed (Table 8). In 2014, Big Canyon Facility 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 215 adult hatchery steelhead from Wallowa Fish Hatchery and the Big Canyon Facility to local ponds for harvest opportunities. However, fish captured at Big Canyon Facility are no longer returned to the Wallowa River for further angling opportunities. At the Big Canyon Facility, 48 natural fish were passed above the weir to spawn naturally. We retained 14% of the hatchery fish and 17% of the natural fish for spawning at Little Sheep Creek Facility, and outplanted hatchery adults to Big Sheep Creek to spawn naturally. Twenty-nine of the 232 outplanted fish (10%) were recaptured at least once at the Little Sheep Creek Facility in 2014. One hundred three natural and 156 hatchery adults were released above the weir in Little Sheep Creek to spawn naturally. In addition, 11 natural males were spawned and then passed above the weir, resulting in 60% of fish above the weir being of hatchery origin. Of the 259 fish passed into Little Sheep Creek, 1 fell back and were recaptured at the weir (Table

9). Length-at-age data for Wallowa and Imnaha stock adults are presented in Figures 1 and 2, respectively.

We conducted multiple spawning surveys for steelhead that were passed above the Big Canyon Facility weir into Deer Creek using protocols described in Gee et al. (2008). In 2014, a total of 48 steelhead were passed above the weir, of which 18 were females (Table 10). Eighteen redds were counted, which was 100% of the total number of redds constructed, assuming that each female constructs one redd.

In 2014, we reached our egg take goal for the Wallowa stock with 1,128,500 green eggs collected. Of these, 574,600 were for production and 553,900 were for the fall broodstock evaluation. We collected 310,900 green Imnaha stock eggs, thus we did not meet our goal of 313,850 eggs. Mortality from green egg-to-eyed embryo from six weekly spawns ranged from 2.0-11.3% for Wallowa production stock, 3.3-12.2% for fall broodstock, and from 3.5-21.8% for Imnaha stock (Table 11).

Experimental Group Returns

The number of coded-wire tag (CWT) and adipose-clipped adults that were harvested or returned to collection sites is 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 for evaluating 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, dispatched, 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 BY 2009 to 2011 occurred during the 2013-14 run year, including the eighth year of adult returns from the Wallowa fall broodstock experiment. Of approximately 200,000 total coded-wire-tagged fish released for both production and fall brood groups, a total of 1,023 Wallowa fall brood and 1,382 Wallowa production CWTs were recovered (Table 12). We had Wallowa stock recoveries from 23 CWT codes (Table 12) and Imnaha stock recoveries from two CWT codes (Table 13).

Adult return data from the first generation of the fallbrood experiment became complete in this fiscal year, with results showing that average smolt-to-adult survival (SAS) rates were similar between the two groups (fallbrood = 1.84%, production = 1.80%) but the fallbrood strayed at a higher rate (7.64%) than the standard production groups (5.01%). However, due to their earlier return timing to the Grande Ronde River the fallbrood was harvested at a higher rate (9.4 adults harvested per 1,000 smolts released compared to 8.0 for the standard production). We will provide analysis of second generation data from this experiment as it becomes available.

Compensation Area Goals

Goals for smolt-to-adult return (SAR) rates and the number of adults produced to the compensation area are 0.68% and 9,184 for the Grande Ronde basin (Wallowa stock) and 0.61% and 2,000 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 2013-14 run year, 7,781 hatchery origin adults returned to the compensation area, representing 84.7% of the compensation area goal (Table 14). For the Imnaha stock, we estimate that 3,451 adults returned to the compensation area, representing 172.6% of the compensation area goal. Age composition of returning adults is shown in Table 15. Development of the compensation plan goals assumed that twice as many adult steelhead would be harvested in downriver fisheries as return to the compensation area (USACOE 1975); however, that harvest level was not reached for either stock.

There are three principal factors that influence success in meeting the compensation goals: number of smolts released for the brood years that produced the adults; SAS rates to the mouth of the Columbia River; 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 adult production compensation goal eleven times (1997-98, 2001-02, 2003-04, 2004-05, 2005-06, 2006-07, 2007-08, 2008-09, 2009-10, 2010-11, and 2011-12 run years) for the Wallowa program, and thirteen times for the Imnaha program (1992-93, 2001-02, 2002-03, 2003-04, 2004-05, 2005-06, 2006-07, 2007-08, 2008-09, 2009-10, 2010-11, 2011-12 and 2013-14 run years). For both the Grande Ronde and Imnaha programs, we have met our smolt production goals in most years. Returns in the 2013-14 run year represent the final returns of the 2009 BY. For the 2009 BY, SAS for the Wallowa and Imnaha stocks were above average at 1.82% and 1.55%, respectively (Figure 3). Smolt-to-adult return to the compensation area above Lower Granite Dam has reached our goal in only eleven of the last 25 brood years for both Wallowa and Imnaha stocks (Figure 4). This suggests that low SAS rates may be the primary factor for rarely achieving our adult compensation goals. However, the SAR compensation area goal has been reached in each of the last eleven years for Imnaha stock and in ten of the last eleven years for Wallowa stock. For the Wallowa stock, 20% of the CWT recoveries in the 2013-14 run year occurred downstream of the compensation area. For Imnaha stock, 21% of the recoveries in the 2013-14 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. Hatchery and natural origin fish are used both for hatchery spawning and they are passed above the weir to spawn naturally; therefore, progeny-per-parent ratios include both hatchery and natural origin parents. Progeny-per-parent ratios for naturally spawning fish were below 1.0 for completed brood years 1987-1994, 1998, and 2001-2008 and above 1.0 for completed brood years 1995-1997, 1999, and 2000 (Figure 5). Progeny-per-parent ratios for fish spawned in the hatchery (weir returns only) have been above 1.0 for all brood years except 1991. Hatchery ratios exceeded natural ratios for all brood years except for the 1991 and 1997 broods. 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 6).

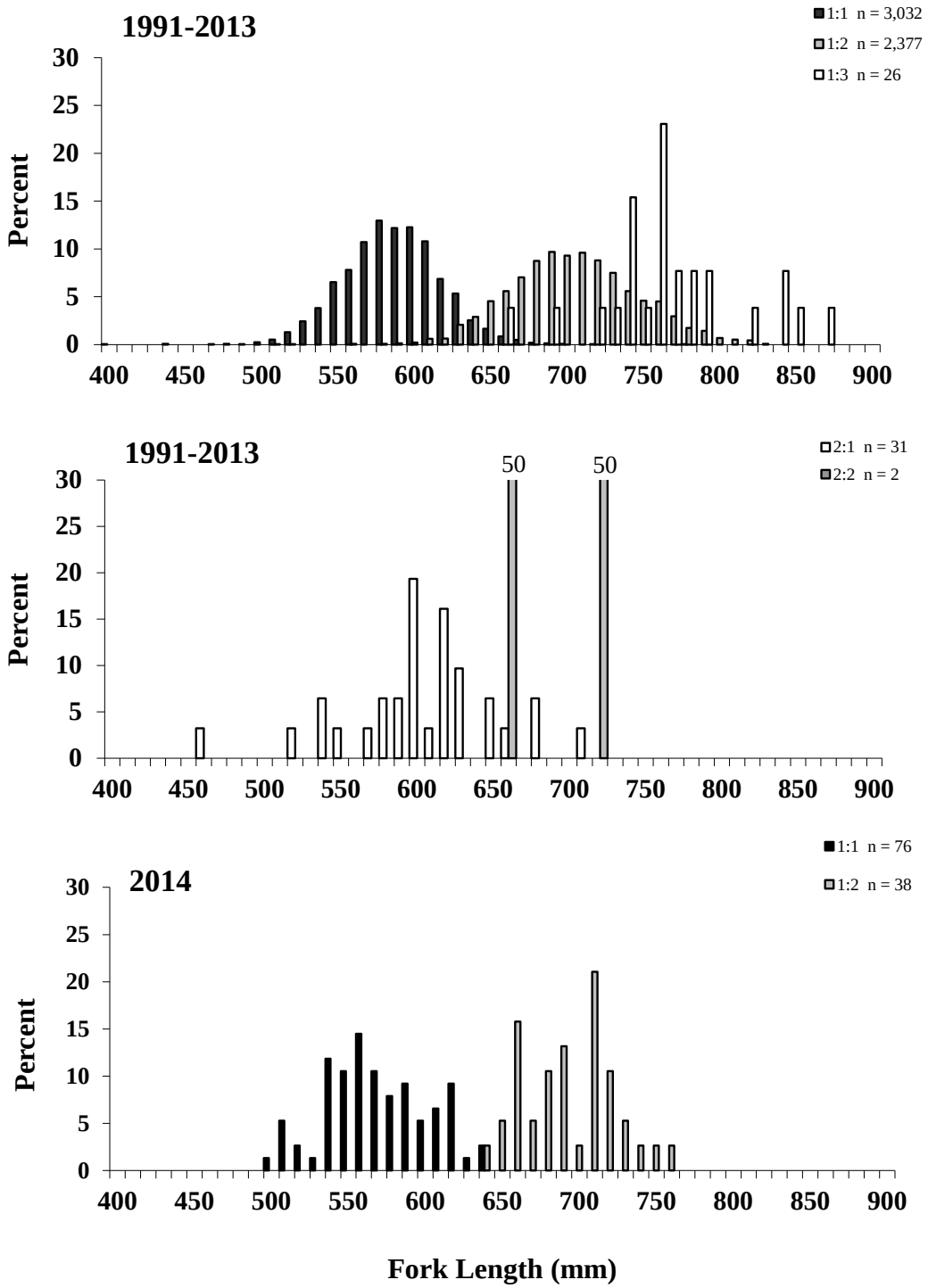

Figure 1. Length-at-age relationships based on scale analysis for hatchery adult returns of one freshwater age (top) and two freshwater age (middle) Wallowa stock summer steelhead from 1991 to 2013, and in 2014 (bottom).

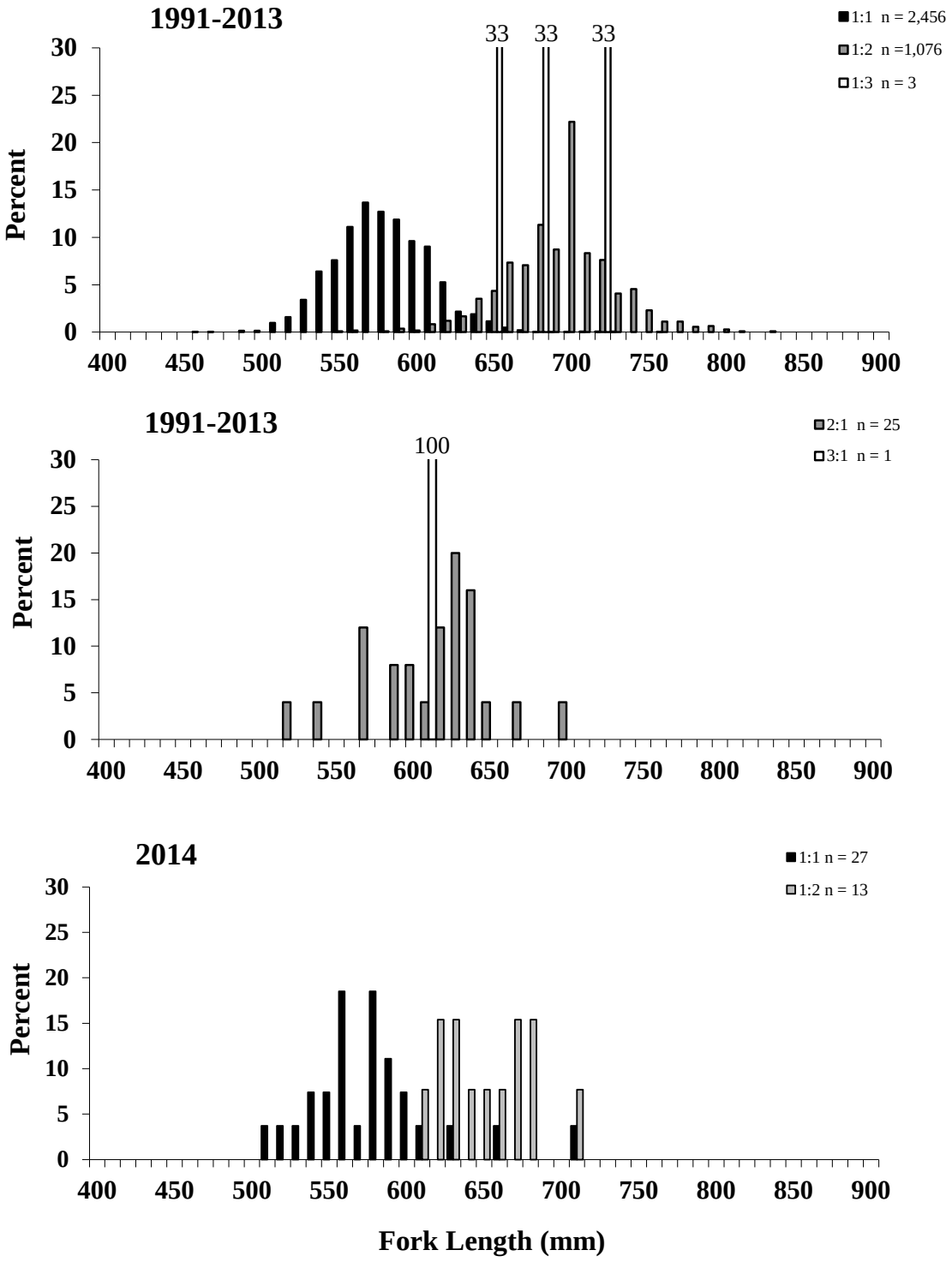

Figure 2. Length-at-age relationships based on scale analysis for hatchery adult returns of one freshwater age (top), and two and three freshwater age (middle) Imnaha stock summer steelhead from 1991 to 2013, and in 2014 (bottom).

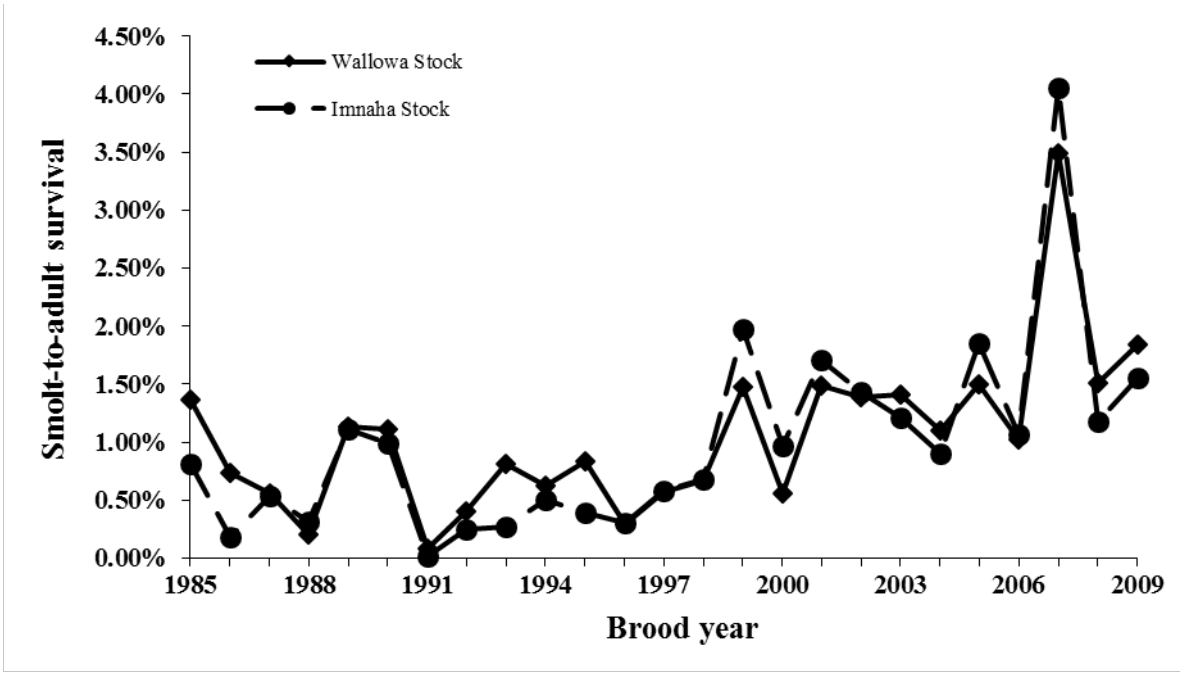

Figure 3. Smolt-to-adult survival (SAS) for Wallowa and Imnaha stock summer steelhead, 1985-2009 brood years. Data is based on CWT recoveries.

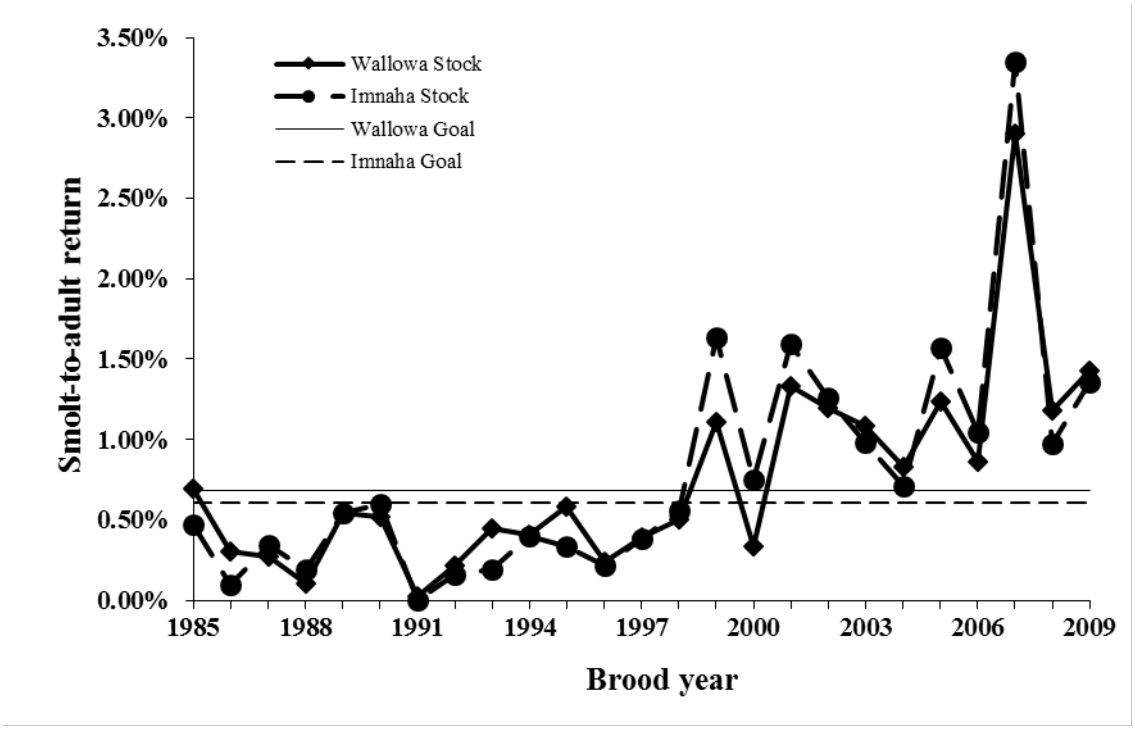

Figure 4. Smolt-to-adult return (SAR) to the compensation area above Lower Granite Dam for Wallowa and Imnaha stock summer steelhead, 1985-2009 brood years. The Wallowa stock goal is 0.68% and the Imnaha stock goal is 0.61%. Data is based on CWT recoveries.

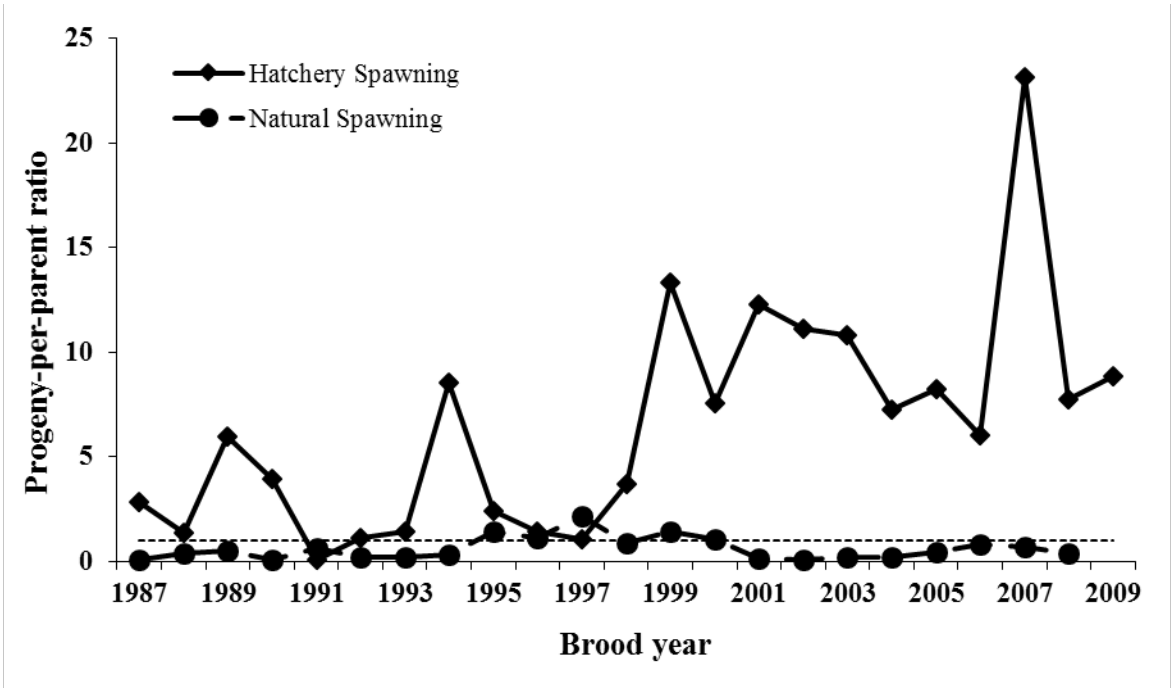

Figure 5. Progeny-to-parent ratios for Little Sheep Creek summer steelhead, 1987-2009 brood years. Both types of spawning include hatchery and natural origin parents. Dotted line represents replacement (P:P ratio = 1.0). Natural origin steelhead data for the 2009 brood year is not yet available.

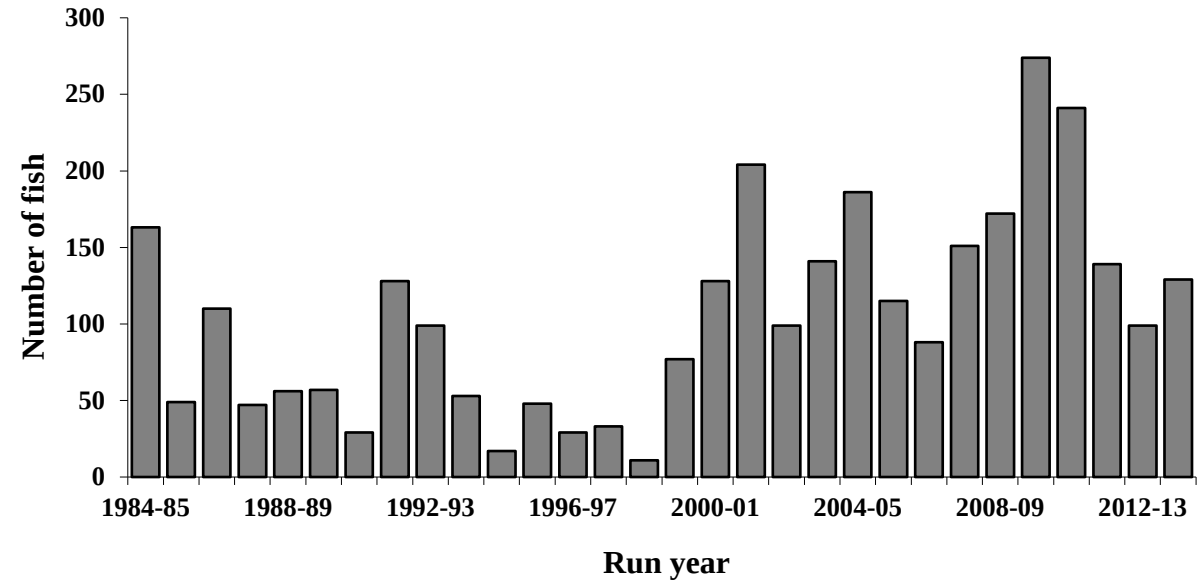

Figure 6. Returns of naturally produced summer steelhead to Little Sheep Creek, run years 1984-85 to 2013-14.

Table 1. Summary of egg collection and juvenile survival for 2013 brood year summer steelhead released in the Grande Ronde and Imnaha river basins at LSRCP facilities in 2014. Embryos that were culled from or not part of production were subtracted from the calculation of embryo-to-smolt survival.

Stock	Number of eggs taken	Eyed embryos	Total smolts released	Estimated survival rate	
				Egg-to-embryo	Embryo-to-smolt
Wallowa	1,443,500	1,340,000[a]	834,257[b]	92.8	77.7
Imnaha	351,950	299,200[c]	239,614	85.0	84.3

[a] *Includes 265,800 embryos that were euthanized because they were excess to program needs and 1,200 embryos that were transferred to the Salmon and Trout Enhancement Program (STEP) coordinator.*
[b] *Includes a total of 2,279 fish that were outplanted to Wallowa Wildlife Pond and Victor Pond as rainbow trout at the end of the volitional release period from the Big Canyon Facility. These fish were determined to be mostly male and were expected to residualize.*
[c] *Includes 15,000 embryos that were euthanized because they were excess to program needs.*

Table 2. Estimates of fin clip quality and coded-wire tag retention for 2013 brood year summer steelhead reared at Irrigon Fish Hatchery and released in 2014. Experimental group indicates treatment and rearing raceway number. Wallowa and Imnaha stocks were intended to be 100% adipose fin-clipped. Fall brood (progeny of broodstock collected in early fall) were AdRV (adipose + right ventral fin-clipped) if they were released at Wallowa Hatchery and Ad only at Big Canyon. Wire tagged standard production groups were Ad+CWT, except for pond 8 which remained AdLV+CWT. Wire tagged fall brood were 100% AdRV+CWT if released at Wallowa and 100% Ad + CWT at Big Canyon.

Experimental group	Tag code	Number checked		Percent					
		CWT	Ad[a]	CWT+ Clips[b]	CWT+ no clip	No CWT + clip	No CWT + no clip	Ad	No Ad
				Wallowa Stock					
Fall Brood, 7	090771	534	-	97.4	0.2	2.0	0.4	-	-
Fall Brood, 11	090774	600	-	98.6	0.2	1.0	0.2	-	-
Fall Brood, 19	090773	553	-	97.1	0.2	2.4	0.3	-	-
Fall Brood, 15	090779	552	-	98.9	0.2	0.2	0.7	-	-
Production, 8	090772	511	-	93.7	5.5	0.6	0.0	-	-
Production, 10	090775	562	-	98.4	0.0	1.6	0.0	-	-
Production, 14	090777	465	-	99.1	0.2	0.7	0.0	-	-
Production, 18	092745	551	-	99.8	0.0	0.0	0.2	-	-
Production, 23	090780	518	-	99.6	0.2	0.2	0.0	-	-
Production, 25	090776	541	-	99.4	0.4	0.2	0.0	-	-
Average	-	539	210	98.2	0.7	0.9	0.2	99.4	0.6
				Imnaha Stock					
Production, 28	090770	557	310	99.5	0.0	0.3	0.2	98.1	1.9
Overall average		540	223	98.3	0.7	0.8	0.2	99.2	0.8

[a] *Adipose fin (Ad) clip quality checks occurred during pre-release sampling at acclimation ponds.*
[b] *A programmatic decision to discontinue ventral fin clipping to indicate the presence of a CWT began with brood year 2013. Fish in pond 8 were left ventral fin clipped (CWT+AdLV) to determine the effect of ventral fin clips on post release survival.*

Table 3. Details of experimental and production groups of 2013 brood year summer steelhead released in the Grande Ronde (Wallowa stock) and Imnaha (Imnaha stock) river basins in 2014. Experimental group indicates release strategy and rearing raceway number(s). All groups were reared at Irrigon Hatchery and acclimated. Target size was 113 g (±SD) for Wallowa stock and 100 g for Imnaha stock. LGD indicates Lower Granite Dam; percent migration includes ±95% confidence intervals.

Experimental group, Raceway	Transfer date	Release date	Tag code	Fork length (mm)	Weight (g)	Condition factor	Total fish Released	PIT tags released	Percent migration to LGD[a]
				Wallowa stock					
Spring Creek									
Production, 8	Jan 21-24	April 7-8	090772	206 (20)	94.2 (24.9)	1.06 (0.07)	23,428	1,980	72.2 ± 4.1
Production, 10	Jan 21-24	April 7-8	090775	201 (20)	90.6 (29.3)	1.09 (0.08)	24,571	1,478	73.0 ± 4.6
Production, 14	Jan 21-24	April 6-8	090777	203 (23)	91.7 (24.4)	1.12 (0.13)	24,650	1,394	73.9 ± 5.3
Production, 14[b]	Jan 21-24	April 6-8	-	N/A	N/A	N/A	17,215	-	-
Production, 8, 10, 12	Jan 21-24	April 7-8	-	201 (20)	90.6 (29.3)	1.09 (0.08)	77,507	-	-
Fall Broodstock, 7	Jan 21-24	April 7-8	090771	207 (24)	93.3 (32.0)	1.16 (0.67)	27,428	2,163	72.6 ± 4.2
Fall Broodstock, 7[c]	Jan 21-24	April 7-8		N/A	N/A	N/A	18,788		
Fall Broodstock, 11	Jan 21-24	April 6-8	090774	209 (21)	106.5(32.2)	1.22 (0.82)	24,133	2,181	75.3 ± 3.8
Fall Broodstock, 9,11,13[c]	Jan 21-24	April 6-8		N/A	N/A	N/A	97,710	-	-
Production, 25	April 8-9	April 20-May 2	090776	212 (23)	97.7 (32.9)	1.11 (0.72)	26,148	2,186	91.8 ±4.9
Production, 22, 25[b]	April 8-9	April 20-May 2	-	N/A	N/A	N/A	59,136	-	-
Fall Broodstock, 19	April 8-9	April 20-May 2	090773	209 (23)	94.1 (29.2)	1.02 (0.06)	24,209	2,184	88.0 ±5.0
Fall Broodstock, 19, 21[c]	April 8-9	April 20-May 2	-	N/A	N/A	N/A	57,539	-	-
Deer Creek									
Fall Broodstock, 15	Feb 24	April 15-17	090779	215 (22)	102.7 (26.7)	1.02 (0.30)	25,018	2,196	85.4 ± 4.6
Fall Broodstock, 15, 17[b]	Feb 24	April 15-17	-	N/A	N/A	N/A	55,521	-	-
Production, 18	Feb 26	April 16-17	092745	212 (21)	96.0 (28.6)	1.02 (0.06)	26,028	2,140	93.9 ± 5.4
Production, 16, 18[b]	Feb 26	April 16-17	-	N/A	N/A	N/A	58,681	-	-
Production, 23	April 17	April 24-May 7	090780	211 (19)	96.4 (24.5)	1.02 (0.07)	25,649	4,336	92.3 ± 3.5
Production, 20, 23[b]	April 17	April 24-May 7	-	N/A	N/A	N/A	54,173	-	-
Production, 24, 26	April 18	April 24-May 7	-	212 (20)	98.2 (26.7)	1.02 (0.06)	84,446	-	-
Total released							831,978	22,238	
				Imnaha stock					
Little Sheep									
Production, 28	Feb 26-28	Mar 26–April 22	090770	194 (20)	81.7 (26)	1.08 (0.07)	25,379	8,450	78.0 ± 1.7
Production, 27-32[b]	Feb 26-28	Mar 26-April 22	-	N/A	N/A	N/A	214,235	13,425	81.9 ± 1.4[d]
Total released							239,614	21,875	

[a] *Percent of PIT tag release groups that migrated to Lower Granite Dam are Cormack-Jolly-Seber estimated survival probabilities made using the Columbia River DART website.*
[b] *CWT codes 090777, 090776, 092745, 090780, 090775 and 090770 were Ad+CWT and were in the same acclimation ponds as fish that were Ad-only, therefore these groups were not distinguishable based on an external mark.*
[c] *CWT codes 090771, 090774, 090779and 090773 were AdRV+CWT and were in the same acclimation ponds as fish that were AdRV-only, therefore these groups were not distinguishable based on an external mark.*
[d] *Percent migration to LGD was calculated from PIT tags in raceways 30 and 32.*

Table 4. Density (±95% confidence interval) and mean fork length (standard deviation in parentheses) of residual hatchery steelhead, wild rainbow trout/juvenile steelhead, and juvenile chinook salmon from index sites on Deer (Grande Ronde basin) and Little Sheep (Imnaha basin) creeks in 2014. Hatchery steelhead were classified as residuals after 20 June. HSTS indicates residual hatchery steelhead, WSTS indicates wild rainbow trout/juvenile steelhead for ages one and older, and WCHS indicates young-of-the-year wild chinook salmon.

Location[a]	Date	Species	Area (m^2)	Size of fish (mm)			Density[b] (fish/100m^2)
				N	Fork length	Range	
Grande Ronde basin							
Deer Cr.	23 July	HSTS	359.0	7	194.6 (55.0)	129-245	1.9 ± 0.3
Deer Cr.	23 July	WSTS	359.0	20	113.2 (23.3)	82-155	9.7 ± 38.4
Deer Cr.	23 July	WCHS	190.2	3	82.3 (5.5)	76-86	2.0 ± 5.8
Imnaha basin							
Little Sheep Cr.	22 July	HSTS	529.0	63	178.6 (36.4)	100-260	12.9 ± 0.5
Little Sheep Cr.	22 July	WSTS	529.0	4	101.3 (28.8)	78-143	0.9 ± 1.9

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

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

Table 5. Travel days to Lower Granite Dam (LGD) and percent of the PIT tagged releases that were uniquely detected at the four lower Snake River dams for Little Sheep Creek smolts that departed the acclimation pond during the early, middle, and late periods of the volitional release. The early and late time periods were defined as the first and last 25% of the release period, which was typically a minimum of 28 days. The middle time period includes 50% of the release period or 14 days. Values in bold are corrections from prior reporting years (explained on page ii).

Brood Year	Travel Days to LGD			Percent Detected		
	Early	Middle	Late	Early	Middle	Late
2008	34.2	27.5	27.2	**64.1**	**62.6**	**59.3**
2009	41.7	33.4	32.8	39.1	40.9	39.5
2010	**42.5**	**36.7**	**27.7**	**56.9**	**47.2**	**46.0**
2011	**35.4**	**28.8**	**22.3**	**56.5**	**47.0**	**49.3**
2012	**39.5**	**33.8**	**22.5**	**52.4**	**49.3**	**43.6**
2013	42.0	37.0	22.0	63.5	57.9	63.0
Mean	39.2	32.9	25.8	55.4	50.8	50.1

Table 6. Number of PIT tags released and unique adult PIT tag detections at Bonneville and Lower Granite dams during the 2013-14 run year by stock and brood year.

Brood year	PIT tags released	Age at return	Adult Detections	
			Bonneville Dam	Lower Granite Dam
		Wallowa Stock		
2009	23,093	5	0	0
2010	22,187	4	43	26
2011	22,381	3	225	154
Total	67,661		268	180
		Imnaha Stock		
2009	21,698	5	0	0
2010	21,900	4	50	30
2011	21,937	3	287	194
Total	65,535		344	224

Table 7. Timing of adult steelhead returns to LSRCP facilities in 2014 by location and origin.

Period	Week of the year	Number of fish trapped[a]					
		Wallowa		Big Canyon		Little Sheep	
		Hatchery	Natural	Hatchery	Natural	Hatchery	Natural
Jan 22-28	4	-	-	-	-	-	-
Jan 29-Feb 04	5	-	-	-	-	-	-
Feb 05-11	6	0	0	-	-	-	-
Feb 12-18	7	0	0	-	-	-	-
Feb 19-25	8	0	0	0	0	0	0
Feb 26-Mar 04	9	0	0	111	0	26	1
Mar 05-11	10	55	0	333	9	50	1
Mar 12-18	11	455	1	197	6	89	1
Mar 19-25	12	329	0	212	2	13	0
Mar 26-Ap 01	13	221	0	146	2	81	7
Apr 02-Apr 08	14	247	0	131	2	60	4
Apr 09-15	15	268	3	208	7	142	12
Apr 16-22	16	157	3	64	4	67	11
Apr 23-29	17	76	1	64	3	46	5
Apr 30-May 06	18	40	0	31	3	160	63
May 07-13	19	20	0	25	7	12	6
May 14-20	20	11	0	8	3	23	8
May 21-27	21	1	0	0	0	2	2
May 28-June 03	22	0	0	-	-	0	0
Jun 04-10	23	-	-	-	-	-	-
Jun 11-17	24	-	-	-	-	-	-
June 18-24	25	-	-	-	-	-	-
Total		1,880	8	1,530	48	771	121

[a] *The ladder was opened on 4 February at Wallowa Fish Hatchery, and weirs were installed 19 February at Big Canyon Facility (Deer Creek) and 21 February at Little Sheep Creek Facility. Adult collections ended 2 June at Wallowa Fish Hatchery, 26 May at Big Canyon Facility, and 2 June at Little Sheep Creek Facility.*

Table 8. Number, disposition, and mean fork length (mm) of adult steelhead that returned to LSRCP facilities in 2014 by stock, origin, estimated age (freshwater:saltwater), and gender. M indicates male and F indicates female.

Facility, stock, disposition	Hatchery[a]									Natural[b]											Grand total
	1:1		1:2		2:1		1:3			2:1		2:2		2:3		3:1		3:2			
	M	F	M	F	M	F	M	F	Total	M	F	M	F	M	F	M	F	M	F	Total	
Wallowa Hatchery (Wallowa Stock-Production)																					
Trapped	750	357	87	155	4	11	0	3	1367	4	1	1	0	0	0	1	0	1	0	8	1367
Passed	0	0	0	0	0	0	0	0	0	4	1	1	0	0	0	1	0	1	0	8	8
Outplanted	8	1	0	1	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	10
Kept	742	356	87	154	4	11	0	3	1357	0	0	0	0	0	0	0	0	0	0	0	1357
Mortality	3	0	1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	5
Spawned	86	51	31	66	0	0	0	0	234	0	0	0	0	0	0	0	0	0	0	0	234
Killed[c]	653	305	55	88	4	11	0	3	1119	0	0	0	0	0	0	0	0	0	0	0	1119
Wallowa Hatchery (Wallowa Stock-Fallbrood)																					
Trapped	280	162	24	43	0	1	0	1	511	0	0	0	0	0	0	0	0	0	0	0	511
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	280	162	24	43	0	1	0	1	511	0	0	0	0	0	0	0	0	0	0	0	511
Mortality	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Spawned	104	83	14	34	0	1	0	1	237	0	0	0	0	0	0	0	0	0	0	0	226
Killed[c]	175	79	10	9	0	0	0	0	273	0	0	0	0	0	0	0	0	0	0	0	273
Wallowa Hatchery (Total Returns)																					
Trapped	1030	519	111	198	4	12	0	4	1878	2	1	1	0	0	0	3	0	1	0	8	1886
Fork length (mm)	572	561	698	684	-	-	-	-		-	-	-	-	-	-	-	-	-	-		
Standard deviation	29	35	34	27	-	-	-	-		-	-	-	-	-	-	-	-	-	-		
Sample size	37	39	16	22	-	-	-	-		-	-	-	-	-	-	-	-	-	-		
Wallowa Hatchery (Fall Broodstock)																					
Transferred to WFH	12	8	0	2	0	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	22
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	12	8	0	2	0	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	22
Mortality	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
Spawned	9	6	0	2	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	17
Killed	1	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3

Table 8. Continued.

Facility, stock, Disposition	Hatchery[a] 1:1 M	1:1 F	1:2 M	1:2 F	2:1 M	2:1 F	1:3 M	1:3 F	Total	Natural[b] 2:1 M	2:1 F	2:2 M	2:2 F	2:3 M	2:3 F	3:1 M	3:1 F	3:2 M	3:2 F	Total	Grand Total
Big Canyon Facility (Wallowa stock)																					
Trapped	644	427	126	317	3	7	0	6	1530	10	5	3	5	0	0	13	6	3	3	48	1578
Passed	0	0	0	0	0	0	0	0	0	10	5	3	5	0	0	13	6	3	3	48	48
Outplanted	75	40	51	25	3	7	0	4	205	0	0	0	0	0	0	0	0	0	0	0	205
Returned to river[d]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kept	569	387	75	292	0	0	0	2	1325	0	0	0	0	0	0	0	0	0	0	0	1325
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]	569	386	75	292	0	0	0	2	1325	0	0	0	0	0	0	0	0	0	0	0	1325
Fork length (mm)	-	-	-	-	-	-	-	-		463	-	-	-	-	-	505	-	-	-		
Standard deviation	-	-	-	-	-	-	-	-		4	-	-	-	-	-	-	-	-	-		
Sample size	-	-	-	-	-	-	-	-		2	-	-	-	-	-	1	-	-	-		
Little Sheep Creek Facility (Imnaha stock)																					
Trapped	370	305	49	44	0	0	0	0	768	35	43	8	22	0	0	8	7	0	1	124	892
Passed	52	84	11	9	0	0	0	0	156	27	39	6	16	0	0	7	7	0	1	103	259
Outplanted	108	77	18	8	0	0	0	0	211	0	0	0	0	0	0	0	0	0	0	0	211
Kept	210	144	20	27	0	0	0	0	401	8	4	2	6	0	0	1	0	0	0	21	422
Mortality	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spawned[e]	47	41	8	15	0	0	0	0	111	8	4	2	6	0	0	1	0	0	0	21	132
Killed[f]	163	103	12	12	0	0	0	0	290	0	0	0	0	0	0	0	0	0	0	0	290
Fork length (mm)	567	577	659	642	-	-	-	-		-	-	557	553	634	658	556	561	-	-		
Standard deviation	21	50	40	24	-	-	-	-		-	-	43	18	2	36	19	60	-	-		
Sample size	10	17	4	9	-	-	-	-		-	-	19	21	2	13	5	6	-	-		

[a] *Wallowa stock hatchery ages apportioned using CWT data and 121 scale samples collected in 2014; Imnaha stock hatchery ages apportioned using CWT data, 115 scale samples from 2014. Mean fork lengths are from fish with scale samples collected in 2014.*

[b] *Wallowa stock (Wallowa Hatchery and Big Canyon Facility) natural steelhead ages apportioned using historical data (220 samples) and 2014 data (3 samples); Little Sheep Creek Facility natural steelhead ages apportioned using 2013 data (40 samples) and 2014 data (57 samples). Mean fork lengths are from fish with scale samples collected in 2014.*

[c] *For Wallowa stock steelhead, 920 fish that returned to Wallowa Hatchery and 1,074 fish that returned to Big Canyon Facility were euthanized and donated to local food banks. In addition, 46 fish from Wallowa Hatchery and 120 fish from Big Canyon Facility were euthanized and donated to local schools for educational purposes. For Imnaha stock steelhead, 161 fish that returned to Little Sheep Creek Facility were euthanized and donated to local food banks.*

[d] *Hatchery steelhead are no longer recycled to the Wallowa River fishery for additional angler opportunity.*

[e] *Includes 11 natural males that were live-spawned and passed above the weir.*

[f] *Includes 17 hatchery males and 4 hatchery females that were initially outplanted to Big Sheep Creek. These 21 fish were subsequently recaptured at the weir and euthanized.*

Table 9. Number of adult summer steelhead trapped at the Little Sheep Creek Facility weir that were either outplanted to Big Sheep Creek or passed above the weir, and were subsequently recaptured, 1999-2014.

	Big Sheep Creek			Little Sheep Creek		
	Number of fish		%	Number of fish		%
Year	Outplanted	Recaptured[a]	Recaptured[b]	Passed[c]	Recaptured[a]	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	14.2	823	138	16.8
2005	1,555	109	7.0	461	37	8.0
2006	1,934	703	36.3	356	53	14.9
2007	1,315	168	12.8	241	14	5.8
2008	1,365	382	28.0	291	23	7.9
2009	869	394	45.3	281	15	5.3
2010	1,450	166	11.4	346	6	1.7
2011	401	154	38.4	306	2	0.7
2012	350	175	50.0	241	13	5.4
2013	58	5	8.6	245	20	8.2
2014	232	29	12.5	270	1	0.4
Mean	-	-	23.8	-	-	7.7

[a] *Total number of recaptures, including multiple 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.*

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

Table 10. Summary of summer steelhead spawning surveys in Deer Creek above the Big Canyon Facility weir, 2002-2014. In prior years an index of redd visibility had been reported in this table; however, due to inconsistent methods for making calculations, a new method is being evaluated and will be available in the future.

	Passed			Redds	Fish per	Females	% Redds	Redds
Year	Females	Males	Total	counted	redd	per redd	counted[a]	per mile[b]
2002	120	89	209	84	2.49	1.43	70	8.4
2003	92	48	140	64	2.19	1.44	70	6.4
2004	47	20	67	46	1.46	1.02	98	4.6
2005	42	35	77	35	2.20	1.20	83	3.5
2006[c]	55	41	96	58	1.66	0.95	105	5.8
2007	27	21	48	41	1.17	0.66	152	4.1
2008	23	38	61	15	4.07	1.53	65	1.5
2009	42	38	80	21	3.81	2.00	50	2.1
2010	85	49	134	84	1.60	1.01	99	8.4
2011	75	58	133	28	4.75	2.68	37	2.8
2012	34	34	68	22	3.09	1.54	65	2.2
2013	41	22	63	33	1.91	1.24	80	3.3
2014[d]	18	30	48	18	2.67	1.00	100	1.8

[a] *Calculated as number of redds counted ÷ number of females passed x 100. Assumes each female built one redd.*

[b] *Twelve miles of stream were surveyed in 2002, 2003, 2007-2010, and in 2012-2013. Ten miles of stream were surveyed in 2004-06 and in 2011. Redds per mile are based on the lower ten miles, since redds have not been observed between RM 10-12.*

[c] *Includes an estimated seven additional hatchery steelhead (4 females and 3 males) that escaped above the weir prior to weir installation, based on marked and unmarked fallbacks at weir.*

[d] *Includes an estimated 3 additional hatchery steelhead (1 female and 2 males) that escaped above the weir prior to weir installation. However, the total passed column does not include 3 steelhead passed above the weir after May 16, 2014 because stream surveys were discontinued prior to that date.*

Table 11. Spawning summaries for summer steelhead at LSRCP facilities in 2014. The percent mortality is from green egg to eyed embryo after shocking.

Spawn date, lot number	Parental origin[a]	Number of females spawned[b]	Number of eggs	Eyed embryos[c]	% mortality
		Wallowa Hatchery (Wallowa stock)			
3/12, WA510	Production	17	83,000	73,600	11.3
	Fall Broodstock	12	54,200	47,600	12.2
3/19, WA511	Production	22	110,700	103,200	6.8
	Fall Broodstock	27	115,300	101,300	12.1
3/26, WA512	Production	25	116,200	108,900	6.3
	Fall Broodstock	42	193,400	174,800	9.6
4/02, WA513	Production	24	116,600	108,400	7.0
	Fall Broodstock	32	134,200	128,400	4.3
4/9, WA514	Production	18	92,200	89,200	3.3
	Fall Broodstock	12	50,800	48,400	4.7
4/16, WA515	Production	11	55,900	54,800	2.0
	Fall Broodstock	2	6,000	5,800	3.3
Subtotal	Production	117	574,600	538,100	6.4
	Fall Broodstock	127	553,900	506,300	8.6
Total		244	1,128,500	1,044,400	7.5
		Little Sheep Creek Facility (Imnaha stock)			
3/18, LI610	Hatchery	4	19,300	15,100	21.8
4/01, LI611	Hatchery	7	27,714	36,900	4.9
	Mixed		11,086		
4/08, LI612	Hatchery	10	44,300	41,300	6.8
4/15, LI613	Hatchery	9	31,267	43,100	8.1
	Mixed		15,633		
4/22, LI614	Hatchery	14	37,371	58,500	10.6
	Mixed		28,029		
4/29, LI615	Hatchery	7	11,829	25,800	6.5
	Mixed		15,771		
5/6, LI616	Hatchery	15	41,160	66,200	3.5
	Mixed		27,440		
Subtotal	Hatchery	66	162,436	.286,900	7.7
	Mixed		79,861		
Total		66	310,900	262,900	7.7

[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] *Number of males spawned equals the number of females spawned.*

[c] *Includes 1,400 Wallowa production stock eyed embryos that were transferred to the Salmon and Trout Enhancement Program (STEP). Also includes 5,400 eyed embryos from Wallowa Fall broodstock and 12,000 eyed embryos from Wallowa Production broodstock that were euthanized because they were excess to program needs.*

Table 12. Summary of anadromous adult recoveries of coded-wire tagged (CWT) Wallowa stock summer steelhead for the 2013-14 run year. All CWT fish were of hatchery origin and were released into either Deer Creek (at Big Canyon Facility) or Spring Creek (at Wallowa Hatchery). Data were summarized as available through August 2016.

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
2009						
Deer Cr.	Production, April	094680	1	0	0	1
Spring Cr.	Fallbrood, April	094676	1	0	0	1
	Fallbrood, April	094677	0	0	1	1
2010						
Deer Cr.	Production, April	090319	36	13	36	85
	Production, May	090318	21	9	28	58
Spring Cr.	Production, April	090320	11	0	25	36
	Production, April	090321	15	15	3	33
	Production, April	090322	10	0	30	40
	Production, May	090317	11	7	37	55
	Fallbrood, April	090297	13	0	21	34
	Fallbrood, April	090298	8	2	23	33
	Fallbrood, April	090299	9	2	17	28
	Fallbrood, May	090316	10	14	35	59
2011						
Deer Cr.	Production, April	090429	76	18	111	205
	Production, May	090430	50	9	81	140
Spring Cr.	Production, April	090425	76	13	129	218
	Production, April	090426	69	9	72	150
	Production, April	090427	72	6	134	212
	Production, May	090428	36	5	108	149
	Fallbrood, April	090421	65	33	136	234
	Fallbrood, April	090422	82	40	135	257
	Fallbrood, April	090424	70	18	108	196
	Fallbrood, May	090423	45	27	108	180
	Total recoveries		787	240	1,378	2,405

[a] *Experimental groups include the release strategy. All releases were targeted for four fish per pound (113 g/fish). All fish were acclimated. April releases were forced (over a 24-hour period) and May releases were volitional (1-3 weeks) unless otherwise noted.*

[b] *Actual number of CWT fish that were released into Spring Creek and recovered at the Wallowa Hatchery weir or released into Deer Creek 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] *Estimated number (from creel surveys and harvest card returns) of CWT fish that were harvested in the Grande Ronde River basin fisheries, and in-basin stray recoveries.*

[d] *Estimated number (from PSMFC and ODFW databases) of CWT fish that were recovered in the ocean, mainstem Columbia, Deschutes or Snake river fisheries, or in tributaries outside the Grande Ronde River basin. Unexpanded data were used when CWT expansion factors were 25 or greater due to low sampling rates.*

Table 13. Summary of anadromous adult recoveries of coded-wire tagged (CWT) Imnaha stock summer steelhead for the 2013-14 run year. All CWT fish were of hatchery origin and were released into Little Sheep Creek at the Little Sheep Creek Facility. Data were summarized as available through August 2016.

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
2010						
Little Sheep	Production, April	090296	12	0	96	108
2011						
Little Sheep	Production, April	090420	63	14	319	396
	Total recoveries		75	14	415	504

[a] *Experimental groups include the release strategy. All releases were targeted for five fish per pound (91 g/fish). All Little Sheep fish were acclimated and volitionally released over a four-week period.*

[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 CWT fish that were harvested in the Imnaha River basin fishery.*

[d] *Estimated number (from PSMFC and ODFW databases) of CWT fish that were recovered in the ocean, mainstem Columbia, Deschutes or Snake river fisheries, or in tributaries outside the Imnaha River basin. Unexpanded data were used when CWT expansion factors were 25 or greater due to low sampling rates.*

Table 14. Harvest and escapement distribution of adult summer steelhead by recovery location for the 2013-14 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 August 2016. "-" 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 harvest	0	0	0.0	0	0	0.0
Columbia River harvest						
Treaty net	119	380	4.1	34	281	6.5
C and S	0	0	0.0	0	0	0.0
Sport	317	949	10.3	68	573	13.2
Test	0	0	0.0	0	0	0.0
Tributary sport	4	11	0.1	0	0	0.0
Deschutes River harvest						
Sport	35	103	1.1	5	44	1.0
C and S	0	0	0.0	0	0	0.0
Strays						
Outside Snake R. basin [a]	7	23	0.2	0	0	0.0
Within Snake R. basin*	3	15	0.2	1	9	0.2
Snake River sport, tribs. harvest*	896	2,982	32.2	307	2,568	59.0
Oregon tributary harvest* [b]	237	1,375	14.9	14	106	2.4
Other in-basin escapement* [c]	-	-	-	-	-	-
Hatchery weir* [d]	787	3,409	36.9	75	768	17.7
Total estimated return	2,405	9,247	100	504	4,349	100
Return to compensation area		7,781			3,451	
Percent of compensation goal		84.7			172.6	

** 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] CWT data from Warm Springs National Fish Hatchery was unavailable for the 2013-14 run year. Therefore, total returns in areas outside of the Snake River basin may be underestimated.

[b] Harvest in Oregon tributaries are estimates based on angler surveys and harvest card returns.

[c] 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.

[d] Total returns to the hatchery weir are actual numbers, except for the Imnaha stock where we estimated the 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.

Table 15. Harvest and escapement distribution of adult summer steelhead by age and recovery location for the 2013-14 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 August 2016. "-" indicates not sampled or undefined.

	Total returns by age							
	Wallowa Stock				Imnaha Stock			
Location	Age 3	Age 4	Age 5	Total	Age 3	Age 4	Age 5	Total
Ocean harvest	0	0	0	0	0	0	0	0
Columbia River harvest								
Treaty net	198	182	0	380	212	69	0	281
C and S	0	0	0	0	0	0	0	0
Sport	753	196	0	949	477	96	0	573
Test	0	0	0	0	0	0	0	0
Tributary sport	11	0	0	11	0	0	0	0
Deschutes River harvest								
Sport	103	0	0	103	44	0	0	44
C and S	0	0	0	0	0	0	0	0
Strays								
Outside Snake R. basin	17	5	1	23	0	0	0	0
Within Snake R. basin*	15	0	0	15	9	0	0	9
Snake River sport, tribs. harvest*	2,475	507	0	2,982	2,073	495	0	2,568
Oregon tributary harvest* [a]	1,036	339	0	1,375	77	29	0	106
Other in-basin escapement* [b]	-	-	-	-	-	-	-	-
Hatchery weir* [c]	2,621	778	10	3,409	675	93	0	768
Total estimated return	7,229	2,007	11	9,247	3,567	782	0	4,349

** 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 for the Imnaha stock where we estimated the 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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