LOWER SNAKE RIVER COMPENSATION PLAN:
Oregon Spring Chinook Salmon Evaluation Studies
2007 Annual Progress Report

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Preface

This annual progress report provides summary information for Lower Snake River Compensation Plan (LSRCP) spring Chinook salmon programs operated by the Oregon Department of Fish and Wildlife (ODFW) in the Imnaha and Grande Ronde river basins during 2007. Also included in this report are summaries of data collected at adult broodstock collection facilities operated by our co-managers, the Nez Perce Tribe (Lostine River) and the Confederated Tribes of the Umatilla Indian Reservation (Catherine Creek and upper Grande Ronde River), and funded by the Bonneville Power Administration. These ongoing monitoring and evaluation programs provide technical, logistical, and biological information to managers charged with maintaining viable natural Chinook salmon populations, and managing hatchery programs and recreational and tribal fisheries in northeast Oregon.

The data in this report serve as the basis for assessing the success of meeting our management objectives and were derived from hatchery inventories and standard databases (e.g., PSMFC, coded-wire tag), through standard sampling techniques or provided by other agencies. As such, specific protocols are usually not described. When possible, data obtained from different sources were cross-referenced and verified. In cases where expansions of data or unique methodologies were used, we describe protocols in more detail. Additional descriptions of protocols can be found in the 2007 work statement (Carmichael et al. 2007).

We used coded-wire tag (CWT) data collected from 2007 adult returns to evaluate smolt-to-adult survival rates, harvest, straying, escapement, and specific information on experimental results. In addition, much of the data that we discuss in this report will be used in separate and specific evaluations of ongoing supplementation and research programs for Chinook salmon in the Imnaha and Grande Ronde river basins. We began fish culture evaluations in 1983 and have 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; 1988; 1999; 2004; Messmer et al. 1989; 1990; 1991; 1992; 1993; Hoffnagle et al. 2005; Monzyk et al. 2006a; b; c; d; e; 2007; 2008a; b) and United States v. Oregon production report (Carmichael et al. 1986b).

In this report, data are organized into salmon culture monitoring for juveniles and adults, CWT recoveries, compensation goals, estimates for total adult escapement, and natural escapement monitoring. During the period covered in this report, Chinook salmon smolts from the 2005 brood year were released, Chinook salmon from the 2002-2004 brood years returned to spawn, and some of the returning adult Chinook salmon were used to create the 2007 brood year.

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EXECUTIVE SUMMARY

In 2007, we released 432,530 Chinook salmon smolts from the 2005 brood year into the Imnaha River. We estimated that 99% of these smolts were identifiably marked with an adipose fin clip (ad clip) and or coded-wire tag. In addition, we released 2005 brood year smolts from both the Grande Ronde Basin Spring Chinook Salmon Captive Broodstock Program and Conventional Broodstock Program into the Grande Ronde Basin. We released 21,573 Captive Broodstock smolts and 49,696 Conventional Broodstock smolts into Catherine Creek with 100% identifiably marked. We released 20,620 Captive Broodstock smolts and 118,803 Conventional Broodstock smolts into the upper Grande Ronde River with 97.9% identifiably marked. We did not release any smolts into Lookingglass Creek in 2007. We released 24,604 Captive Broodstock smolts and 205,406 Conventional Broodstock smolts into the Lostine River with 99.9% identifiably marked.

There was no difference in mean egg weight between age 4 hatchery and natural origin salmon. Age 5 natural returns had a greater mean egg weight than age 5 hatchery returns. The mean egg weight of salmon from the Imnaha River was greater than for salmon from the Grande Ronde Basin. Between stocks, we found significant differences in mean egg weight for age 4 hatchery and natural salmon, and for age 5 salmon, but not age 5 hatchery salmon.

We trapped 1,178 hatchery- and 153 naturally-produced Chinook salmon at the Imnaha River weir. In the Grande Ronde Basin we captured 165 hatchery- and 77 naturally-produced Chinook salmon in Catherine Creek, 40 hatchery- and 33 naturally-produced Chinook salmon in the upper Grande Ronde River, 197 hatchery- and 20 naturally-produced Chinook salmon in Lookingglass Creek. The Nez Perce Tribe reported that some members of their hatchery production staff had falsified weir data from 2001-2008, so some Lostine River data in this report are estimates. Approximately 382 hatchery- and 196 naturally-produced Chinook salmon were captured in the Lostine River.

We estimated that 1,595 Imnaha River hatchery Chinook salmon returned to the Lower Snake River Compensation Plan compensation area in 2007, achieving 49.7% of the hatchery adult compensation goal in the Imnaha River Basin. In the Grande Ronde River Basin, an estimated 196 Catherine Creek, 78 Grande Ronde River, 216 Lookingglass Creek, and approximately 390 hatchery adults returned to the Lostine River. These returns achieved 15.1% of the compensation goal for the Grande Ronde Basin.

The recruits-per-spawner ratio for naturally spawning Imnaha River salmon for the 2002 brood year was 0.07. This was the fourth consecutive year productivity was below replacement after three consecutive years of natural productivity levels above replacement. The recruits-per-spawner (R:S) ratio for the hatchery component was 4.3, better than naturally spawning salmon and above replacement. In the Grande Ronde Basin, the 2002 brood year R:S for the hatchery component was 4.7 in Catherine Creek, and 3.9 in the upper Grande Ronde River. The natural component R:S for the 2002 brood year was 0.3 in Catherine Creek and 1.1 in the upper Grande Ronde River. An R:S was not calculated for Lookingglass because no smolts were released in 2002. We did not calculate an R:S for the Lostine River.

In 2007, we observed 126 carcasses and found 277 redds during spawning ground surveys in the Imnaha River Basin, and one stray from the Umatilla River was recovered. In the Grande Ronde Basin, we observed 230 carcasses and found 442 redds. We recovered five known in-basin hatchery strays and one out-of-basin stray within the Grande Ronde Basin in 2007.

To monitor bacterial kidney disease (BKD), we collected 288 kidney samples from salmon from Grande Ronde Basin streams and 180 kidney samples from Imnaha River Chinook salmon in 2007. We found no difference in mean ELISA OD levels between hatchery-reared and natural Chinook salmon adults. Returning Captive broodstock F_1 generation adults had higher mean ELISA OD levels than Conventional Hatchery program offspring. We found no evidence that release of hatchery salmon is causing an increase in BKD prevalence in the monitored streams.

INTRODUCTION

This annual progress report summarizes spring Chinook salmon monitoring data for the Lower Snake River Compensation Plan (LSRCP) facilities in 2007. Also summarized are adult broodstock monitoring data collected in the Grande Ronde Basin by our co-managers the Nez Perce Tribe (NPT) and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). The main objectives of this report are to document and evaluate spring Chinook salmon culture performance for hatchery programs and achievement of management objectives in the Imnaha and Grande Ronde river basins. These data are used to design culture practices to optimize egg-to-smolt survival rate, smolt quality, smolt-to-adult survival rate, successful spawning in nature by hatchery-reared adults, and to provide information to adapt programs to most effectively meet management objectives. This report provides information on rearing and release operations for the 2005 brood year of juvenile Chinook salmon smolts, the collection of eggs for the 2007 brood year, Chinook spawning in nature, adult characteristics of adult Chinook salmon in the 2007 return year, and Bacterial Kidney Disease (BKD) monitoring.

LSRCP Chinook Salmon Program Objectives

1. Prevent extinction of Imnaha River, Lostine River, Catherine Creek, and upper Grande Ronde River Chinook salmon populations and ensure a high probability of population persistence well into the future, once causes of basin-wide declines have been addressed.
2. Establish adequate broodstock to meet annual production goals.
3. Establish a consistent total return of Chinook salmon that meets the LSRCP mitigation goal of 3,210 hatchery adults in the Imnaha Basin and 5,820 hatchery adults in the Grande Ronde Basin.
4. Re-establish historic tribal and recreational fisheries.
5. Minimize impacts of hatchery programs on resident stocks of game fish.
6. Operate the hatchery program so that the genetic and life history characteristics of hatchery fish mimic those of wild fish, while achieving mitigation goals.
7. Maintain genetic and life-history characteristics of natural Chinook salmon populations in the Imnaha River, Lostine River, Catherine Creek, and upper Grande Ronde River.
8. Maintain the genetic and life-history characteristics of the endemic wild populations of Chinook salmon in the Minam and Wenaha rivers.
9. Provide a future basis to reverse the decline in abundance of endemic Chinook salmon populations in the Imnaha and Grande Ronde river basins.

Research Monitoring and Evaluation Objectives

1. Document Chinook salmon 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 Chinook salmon smolts.
3. Document Chinook salmon adult returns to broodstock collection facilities in the Imnaha River, Lostine River, Catherine Creek, upper Grande Ronde River, and Lookingglass Creek.

4. Estimate annual hatchery returns to compensation areas and determine success in meeting mitigation goals.
5. Estimate annual smolt survival to Lower Granite Dam (LGD) for production and experimental groups.
6. Conduct index, extensive, and supplemental Chinook salmon spawning ground surveys for all populations in northeast Oregon to assess spawn timing and spawning distribution, and estimate natural spawner escapement.
7. Determine the proportion of naturally spawning spring Chinook salmon that are of hatchery origin in the Imnaha and Grande Ronde basin Chinook salmon populations.
8. Determine annual escapement and spawner numbers to estimate and compare productivity (recruits per spawner) for natural- and hatchery-produced fish in the Imnaha and Grande Ronde basin Chinook basins.
9. Compare life history characteristics (age structure, run timing, sex ratio, egg size, and fecundity) of hatchery and natural origin salmon.
10. Coordinate Chinook salmon broodstock marking programs for Lookingglass Fish Hatchery.
11. Participate in planning activities associated with anadromous salmon production and management in the Imnaha and Grande Ronde river basins and participate in ESA permitting, consultation, and recovery planning.

RESULTS AND DISCUSSION

During 2007, spring Chinook salmon from the 2005 brood year were released as smolts into the Imnaha River. In the Grande Ronde Basin, smolts from the 2005 brood year produced from the Conventional Broodstock program were released into Catherine Creek, the Grande Ronde River, and the Lostine River. Also released into Catherine Creek, the Grande Ronde River, and the Lostine River were smolts from the 2005 brood year produced from the Grande Ronde Basin Spring Chinook Salmon Captive Broodstock Program (Carmichael 2008). There were no smolts from the 2005 brood year released into Lookingglass Creek. Adult Chinook salmon from the 2002-2005 brood years, for all supplemental streams, that returned to spawn were used as broodstock to create the 2007 brood year and were reared at Lookingglass Fish Hatchery (LFH). Coded-wire-tag recoveries from adult hatchery returns were used to assess the success of achieving mitigation goals and management objectives. In addition, much of the data discussed in this report will be used in separate and specific evaluations of ongoing supplementation programs for Chinook salmon in the Imnaha and Grande Ronde river basins.

Juveniles

Green egg-to-smolt survival rate for the 2005 brood year of Imnaha River Chinook salmon released in 2007 was 81.4% (green egg-to-eyed egg survival rate, 85.2%; eyed egg-to-smolt survival rate, 98.0%) (Table 1). Green egg-to-smolt survival rates for Catherine Creek salmon were 69.5% for Captive Broodstock offspring and 92.8% for Conventional Broodstock offspring. For the Grande Ronde River, green egg-to-smolt survival rates were 56.9% for Captive Broodstock offspring and 76.6% for Conventional Broodstock offspring. For the Lostine River, green egg-to-smolt survival rates were 67.2% for Captive Broodstock offspring

and 87.7% for Conventional Broodstock offspring. Compared to the Conventional Broodstock Program, survival rates for the Captive Broodstock Program were consistently lower, mostly due to large numbers of eyed eggs being culled because of high enzyme-linked immunosorbent assay (ELISA) levels in female broodstock, in an effort to reduce the incidence of bacterial kidney disease (BKD) in their offspring. Co-managers decided to cull eyed eggs produced from females with ELISA levels $\geq$ 0.8 for Catherine Creek and Grande Ronde River stocks and $\geq$ 0.4 for Lostine River females.

Without accounting for age or stock, we found a significant (P = 0.0004) difference in mean egg weight (g) between hatchery (0.240 g) and natural (0.259 g) origin Chinook salmon. Incorporating the age of returning salmon, we found no difference (P = 0.2335) in mean egg weight between age 4 hatchery (0.236 g) and natural (0.223 g) returns. Mean egg weight of age 5 hatchery females (0.258 g) was significantly lower (P = 0.0045) than natural origin age 5 females (0.288 g). In general, the mean egg weight of Chinook salmon from the Imnaha River was greater than for salmon from the Grande Ronde Basin (Table 2). There was a significant difference in mean egg weight between stocks for age 4 hatchery (P < 0.0001) and natural (P = 0.0284) origin returns. For age 5 returns, we found no difference (P = 0.2937) in mean egg weight between stocks for returning hatchery salmon. There was a significant difference (P = 0.0001) in mean egg weight between stocks for age 5 natural origin returns.

The release of 432,530 smolts from the Imnaha River 2005brood year was below the long-term mitigation goal of 490,000, but above the specific annual production goal of 360,000[*] for this brood year (Table 1). The recently modified long-term mitigation goal for the Grande Ronde River Basin was set at 150,000 smolts for Catherine Creek and 250,000 smolts per year for each of the Lookingglass Creek, upper Grande Ronde River, and Lostine River populations. In Catherine Creek, we released 21,573 smolts produced from Captive Broodstock and 49,696 smolts produced from Conventional Broodstock (71,269 total). In the Grande Ronde River, we released 20,620 smolts produced from Captive Broodstock and 118,803 smolts produced from Conventional Broodstock (139,423 total). In Lookingglass Creek, we did not release any smolts. In the Lostine River, the release of 24,604 smolts produced from Captive Broodstock and 205,406 smolts produced from Conventional Broodstock (230,010 total) nearly achieved the mitigation goal. Mitigation goals were not achieved from the stocks due to numerous reasons. In the Captive Broodstock Program, low broodstock survival due to bacterial kidney disease and low fecundity due to slow broodstock growth have limited smolt production. In the Conventional Broodstock Program, low adult returns in 2005 limited the number of broodstock collected and subsequent smolt production (Monzyk et al. 2008). Also, in Lookingglass Creek, no returning adults from the 2005 brood year were spawned (Monzyk et al. 2008).

We evaluated the 2005 brood year smolts released in 2007 for mark application success from 6-8 February 2007, a few weeks prior to their release. We sampled at least 500 smolts from each raceway at LFH and checked for the presence of a coded-wire tag (CWT) and adipose fin clip quality (Table 3). We attempted to mark (ad clip+CWT) approximately 43% (three of seven raceways) of the Imnaha River. The remaining 57% of the Imnaha River smolts received only ad clips. For the portion of smolts receiving ad clip+CWT, we estimated that 95.5% were successfully marked with both marks. Fin clip application success was estimated at 98.3% for the portion receiving just ad clips. We estimated that 1.0% of the Imnaha River smolts had no identifiable mark (neither ad clip nor CWT). We attempted to mark all Catherine Creek smolts with ad clip+CWT and achieved an application rate of 96.4%. We estimated that 3.1% had an ad

[*] Due to space limitations at LFH, the annual production goal is less than the LSRCP mitigation goal.

clip but no CWT, 0.5% had a CWT but no ad clip, and none of the smolts released had no identifiable mark. Grande Ronde River smolts produced from the Conventional Broodstock Program received just CWTs. We estimated that 97.9% of these smolts retained their CWT marks so 2.1% had no identifiable mark when released. The smolts produced from the Grande Ronde River Captive Broodstock Program received an ad clip and CWT. We estimated 95.8% had an ad clip and a CWT, 1.9% had an ad clip but no CWT, 2.3% had a CWT but no ad clip, and none of smolts had no identifiable mark. We attempted to mark all Lostine River smolts released in 2007 with ad clip+CWT and achieved a 95.1% application success rate. We estimated 3.8% had an ad clip but no CWT, 1.0% had a CWT but no ad clip, and less than 0.1% of smolts had no identifiable mark.

Smolt migration success was monitored for all stocks based on survival to Lower Granite Dam (LGD). We developed release-recapture information for PIT-tagged smolts from each raceway to calculate Cormack-Jolly-Seber survival probabilities to LGD using the PIT Pro 4 Program (Westhagen and Skalski 2009) with a single release recapture model (Skalski et al. 1998). Mean stock survival was calculated as the weighted average of the raceways for each stock with the number of smolts in each raceway as the weight.

The Imnaha River 2005 brood year Chinook salmon were reared in raceways 12-18 at LFH (Table 3) and were acclimated at the Imnaha Acclimation Facility starting as early as 13 March 2007. Smolts in raceways 12-16 were volitionally released from 21-28 March and 31 March - 12 April 2007. Raceways 17 and 18 were added to the acclimation pond from 17-18 March 2007 and volitionally released from 31-March until 12 April 2007. All fish remaining in the acclimation ponds were forced out on 12 April 2007. The mean survival rate to LGD for Imnaha smolts released in 2007 was 66% (Table 4).

Catherine Creek Chinook salmon smolts produced from Captive Broodstock parents were reared in raceway 2 and smolts produced from Conventional Broodstock were reared in raceway 1 (Table 4). Smolts produced from both Captive Broodstock and Conventional Broodstock parents were transported to the Catherine Creek acclimation ponds on 12 March 2007. Smolts were volitionally released on 26 March 2007, and remaining smolts were forced out on 11 April 2007. The mean survival rate to LGD for Catherine Creek smolts was 32% and 33% for Conventional and Captive Broodstock, respectfully.

Grande Ronde River Chinook salmon smolts produced from Captive Broodstock parents were reared in raceway 6 and smolts produced from Conventional Broodstock were reared in raceways 3-5 (Table 4). Smolts from the Captive Broodstock Program were transported to the Grande Ronde River acclimation ponds on 12 March 2007, volitionally released on 19 March 2007 and the remaining smolts were forced out on 25 March 2007. Smolts from the Conventional Program were transported to the Grande Rond River acclimation ponds on 26 March 2007, volitionally released on 2 April 2007, and the remaining smolts forced out on 11 April 2007. Mean survival rates to LGD for Grande Ronde River stock was 48%. The Captive broodstock smolts survived at a lower rate, 34%, than the Conventional Broodstock (47-59%).

Lostine River Chinook salmon smolts produced from Captive Broodstock parents were reared in raceway 11 and smolts produced from Conventional Broodstock were reared in raceways 7-10 at LFH. Smolts from the Conventional Broodstock production group were transported to and released from the Lostine River acclimation ponds in two stages: early and late acclimation periods (Table 4). Smolts from the early acclimation were transported to the acclimation ponds as early as 5 March 2007. Smolts from the Captive Broodstock Program were part of the late release group. Volitional release of smolts began on 16 March 2007 and

remaining smolts were forced out on 26 March 2007. Smolts from the late acclimation period were transported to acclimation ponds from 26-27 March 2007, were volitionally released beginning on 7 April 2007, and remaining smolts were forced out on 17 April 2007. The Lostine River Conventional Broodstock released during early acclimation periods had lower survival rates to LGD, 53-54% (Table 4), than Conventional Broodstock smolts released during the late acclimation period, which had a survival probability of 66%. The Lostine River Captive Broodstock had a survival probability to LGD of 59%, intermediate to the early and late Conventional Broodstock smolts.

Adults

Imnaha River

The Imnaha River weir was installed on 1 June 2007 and operated until 19 September 2007 (Table 5). We trapped 1,151-hatchery and 180 naturally-produced salmon. After accounting for estimates of hatchery adults returns that lacked both a fin clips and CWT, we estimated that 1,178 hatchery (clipped and unclipped) and 153 naturally-produced salmon returned. We retained 213 hatchery- and 51 natural Chinook salmon for broodstock. To limit the number of hatchery salmon on spawning grounds, 28 jack hatchery salmon were retained for tribal ceremonial/subsistence, and 618 hatchery salmon were outplanted to Big Sheep and Lick Creeks (Table 6). The remaining salmon collected at the weir were released above the weir to spawn naturally (318 hatchery, 102 natural). Age structure of salmon captured at the weir was determined from CWT or scale analysis, when available, or from length-at-age relationships. Age structure of hatchery-produced adults collected at the weir was: 42% age 3; 53% age 4; and 5% age 5. This differed from the age structure of naturally-produced adults collected at the weir: 14% age 3; 51% age 4; and 35% age 5 (Table 6). We spawned 72 hatchery and 21 natural females with 82 hatchery and 23 natural males (Table 6). We collected 408,397 green eggs from broodstock (Table 7). Eggs were incubated at LFH and percent mortality to shocking was 25.8%.

Catherine Creek

The Catherine Creek weir was operated by personnel from the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) from 1 March to 31 July 2007. The last fish captured at the Catherine Creek weir was on 3 July 2007. Totals of 173 hatchery- and 75 naturally-produced adult Chinook salmon were captured with 104 hatchery and 44 natural salmon release above the weir to spawn naturally (Table 6). Additionally, 10 salmon identified as Catherine Creek stock were captured in the Lookingglass Creek weir. Age structure of hatchery-produced adults collected at the Catherine Creek and Lookingglass weirs were: 17% age 3; 73% age 4; and 10% age 5. Age structure of naturally-produced adults collected at the weir was: 8% age 3; 52% age 4; and 40% age 5. Adults used as broodstock to create the Catherine Creek 2007 brood year were from both natural and hatchery origin (Conventional Broodstock progeny only – returning Captive Broodstock progeny are allowed to spawn naturally or are removed but are not collected for Conventional broodstock due to domestication concerns). We spawned 31 hatchery and 14 natural females with 17 hatchery and 17 natural males. We collected 171,065 eggs and percent mortality to shocking was 14.5% (Table 7).

This is the second year we had a complete brood year return of Catherine Creek hatchery adults from both the Captive and Conventional Broodstock Programs (2001 and 2002 brood years). Returning Captive Broodstock adult Chinook were marked with an Ad clip and Conventional returns were marked with an Ad Clip and a VIE tag. Based on visual identification of returning adult Chinook, CTUIR staff identified 105 Captive and 75 Conventional adult Chinook returns. Three hatchery fish could not be identified as Captive or Conventional Broodstock. Subsequently, the age structure of Captive Broodstock progeny that returned to the Catherine Creek weir, determined from visual identification, was 23% age 3 (N = 25); 61% age 4 (N = 64); and 16% age 5 (N = 16). Age structure of the Conventional Broodstock progeny was 9% age 3 (N = 6); 86% age 4 (N = 64); and 6% age 5 (N = 5). Smolt-to-adult return rates (SAR) for the 2002 brood year, based on visual identification of Captive and Conventional adults, was the same as the 2001 brood year; 0.1% for Captive Broodstock progeny and 0.2% Conventional Broodstock progeny. However, we are not confident about the proportion of Captive and Conventional adults because we believe the VIE mark is not permanent; and therefore, unreliable. The loss of the VIE mark on Conventional returns would result in incorrectly identifying a Conventional return as a Captive return.

In 2007, CTUIR identified 79 Captive (1 age 3, 63 age 4, and 15 age 5), 22 Conventional (20 age 4 and 2 age 5), and an estimated three returning adult Chinook of unknown Broodstock origin were passed above the weir. Based on the number of fish passed above the weir, we would expect 78% of the carcasses recovered with a CWT would be from Captive Broodstock and 22% from Convential Broodstock. On spawning ground surveys, we recovered 12 carcasses with a CWT and five carcasses that were only marked with an AD clip. Of the 12 carcasses with a CWT, five were from Captive and seven were from Conventional Broodstock. These 12 CWT recoveries represent 42% (5 CWT's) of the Captive and 58% (7 CWT's) of the Conventional Broodstock passed above the weir. The higher than expected recovery of Conventional carcasses suggests VIE marks are not being identified at the weir.

Grande Ronde River

The upper Grande Ronde River weir was operated by CTUIR personnel from 21 March to 13 July 2007. The last fish captured at the Grande Ronde River weir was on 5 July 2007. Forty hatchery- and 33 naturally-produced adult Chinook salmon were captured. An additional 23 salmon that returned to the Lookingglass Creek weir were identified as Grande Ronde hatchery stock. Sixty hatchery and 16 natural salmon were retained for broodstock (Table 6). The remaining salmon caught at the Grande Ronde River weir were released above the weir to spawn naturally (3 hatchery, 16 natural). Age structure of hatchery returns to the weir was 27% age 3; 53% age 4; and 20% age 5. Age structure of naturally produced adults returning to the weir was 0% age 3; 61% age 4; and 39% age 5. Adults used as broodstock to create the Grande Ronde River 2007 brood year were from both natural and hatchery origin (Conventional Broodstock progeny only – returning Captive Broodstock progeny are allowed to spawn naturally or are removed but are not collected for Conventional broodstock due to domestication concerns). We spawned 25 hatchery and 6 natural females with 25 hatchery and 6 natural males. We collected 122,750 eggs and percent mortality to shocking was 19.2% (Table 7).

This is the second year we had a complete brood year return of Grande Ronde River hatchery adults from both the Captive Broodstock and Conventional Broodstock Programs (2001 and 2002 brood years). No Grande Ronde Captive Broodstock progeny were captured at weirs in 2007. Age structure of the Conventional Broodstock was 27% age 3; 56% age 4; and 17% age

5. Age structure of natural returns was 0% age 3; 61% age 4; and 39% age 5. Smolt to adult return rates (SAR) for the 2002 brood year Captive Broodstock progeny was 0.001% (1 age 4 female returned in 2006) and 0.2% for Conventional Broodstock progeny.

Lookingglass Creek

The Lookingglass Creek weir was operated by Lookingglass Hatchery (ODFW) personnel from 2 April to 18 September 2007. A total of 197 hatchery adults and 20 natural adults were collected at the weir. Twenty-two of the hatchery adults were strays from the Grande Ronde Conventional Broodstock Program, 10 were strays from Catherine Creek (9 Conventional and 1 Captive Broodstock). The Conventional Program strays were used as broodstock for their respective Conventional Programs, and the Captive Broodstock salmon (age 3 male) was sacrificed. Six natural age 3 males classified as Lookingglass Creek progeny were released above the weir. Two male adults identified as Rapid River stock were returned below the weir on 24 and 27 August, 2007. Eleven natural adults, assumed to be offspring of Rapid River hatchery adults that spawned naturally, were sacrificed as part of the management objective to phase out Rapid River stock in Lookingglass Creek and re-establish a stock endemic to the Grande Ronde Basin (Catherine Creek). We spawned 22 hatchery females with 15 hatchery males. We collected 68,055 eggs with percent mortality to shocking at 23.1% (Table 7).

Lostine River

In a letter from NPT dated 26 May 2009, co-managers were informed about inaccuracies associated with data collected at the Lostine River weir. The NPT determined that three aspects of data collection protocols were compromised or falsified between 2001 and 2008. The pass:keep criteria was not strictly followed, hatchery origin fish with poor or questionable quality adipose fin clips were recorded as natural origin fish, and genetic tissues were dropped or lost and replaced by a "backup supply of tissue" from previously sampled fish resulting in multiple samples from a single fish being recorded as multiple fish. The NPT created a rule set for evaluating all data collected between 2001 and 2008:

1) Any genetic sample matching two or more fish is defined as a group of replicates.
2) There can only be one real fish within a group of replicates with the exception of hatchery fish shown with a disposition of "kept" or "out-planted." If a hatchery fish has been duplicated as "kept" or "out-planted" assume replicate records represent actual fish.
3) Assume that records with dispositions of "kept" or "out-planted" represent the actual fish within a group of replicates. Eliminate all other records unless Rule 1 applies.
4) If the origin of the fish was not consistently duplicated within a group of replicates as either natural or hatchery, assign an unknown origin type to the fish.
5) Assume a fish was real if a valid PIT tag ID exists.

Using the rule set, an escapement estimate using mark-recapture data from spawning ground surveys and the modified weir records were used to estimate the number of returning hatchery and natural Chinook to the Lostine River between 2001 and 2007 (genetic data were not yet available for 2008). Additionally, there is doubt about the reliability of size data collected for fish handled at the Lostine River weir so we are not able to reliably report age structure for fish

handled at the weir (Table 6). At the time this report was prepared, we were not able to estimate the number of Captive and Conventional hatchery broodstock returns based on weir data.

The Lostine River weir was installed by NPT personnel on 15 May 2007 and operated until 28 September 2007 (Table 5). Adults used as broodstock in the 2007 brood year were both natural and hatchery origin (Conventional Broodstock progeny only – returning Captive Broodstock progeny are allowed to spawn naturally or are removed but are not collected for Conventional broodstock due to domestication concerns). This is the third year we had a complete brood year return of Lostine River hatchery adults from both the Captive Broodstock and Conventional Broodstock Programs (2001 brood year). We spawned 40 hatchery and 20 natural females with 26 hatchery and 15 natural males. We collected 267,350 eggs and percent morality to shocking was 13.3% (Table 7).

Coded-Wire Tag Recoveries

Hatchery salmon from most production groups were marked with a coded-wire tag (CWT) to provide basic information on survival, harvest, escapement, straying, and specific information on experimental groups, if any. Coded-wire tag recovery information for each CWT code group was obtained from the Regional Mark Information System (RMIS) CWT recovery database maintained by the Pacific States Marine Fisheries Commission.

The observed and estimated number of hatchery salmon from each CWT code group recovered in ocean and mainstem river fisheries, as well as strays collected in and out of the Snake River Basin, were summarized from the RMIS database. Estimated CWT recoveries in the RMIS database were expanded from observed recoveries based on sampling efficiencies at each recovery location. The RMIS database does not expand for recoveries observed in the Imnaha and Grande Ronde river basins. Therefore, we estimated total CWT marked hatchery adults from each code group (observed from weir collections and spawning ground recoveries) returning to the Imnaha River, Grande Ronde River, Lookingglass and Catherine creeks, and the Lostine River based on total escapement to each stream, sampling rate, and the proportion of each cohort marked with CWTs.

In the Imnaha River, observed recoveries were expanded for unrecovered CWT adults by first estimating hatchery escapement to the river for each brood year (see Monzyk et al. 2006a). The estimated total number of coded-wire tagged returns for each brood year was determined by multiplying the hatchery escapement estimate by the proportion of the brood year tagged at release and the weighted average tag retention rate for each brood year. The estimated total number of CWT returns was partitioned into each CWT code group by multiplying the total number of CWT returns by the relative proportion of each CWT code recovered within a brood year to give the expanded number of CWT returns for each tag group.

In the Grande Ronde River Basin, CWTs from Captive and Conventional broodstock programs were recovered at different sampling efficiencies. Recovery rates for Conventional Broodstock progeny are usually higher because CWTs are recovered from Conventional Broodstock progeny retained for broodstock, as well as from spawning grounds surveys, whereas Captive Broodstock recoveries are typically recovered only on spawning ground surveys, since none are retained for broodstock. This necessitated expanding CWT recoveries for Captive and Conventional hatchery returns separately using the method described above for the Imnaha River.

The NPT reported that some members of their hatchery production staff had falsified weir data from 2001-2008. One results of this is that for the Lostine River, we were unable to expand Captive and Conventional Broodstock recoveries in the same way we expanded for Catherine Creek and the upper Grande Ronde River because we are unable to rely on Lostine River weir data to correctly identify Captive and Conventional returns. Subsequently, we did not differentiate between broodstock origin, and simply expanded CWT recoveries as "hatchery" salmon using the method described for the Imnaha River. To estimate total return of hatchery and natural salmon to the Lostine River, we used two sets of non-weir data that was known to be reliable for an adult (age 4-5) estimate of hatchery and natural returns above the weir: 1) a mark recapture estimate was calculated using spawning ground survey carcass recoveries, and 2) weir data for 2007 that was reconciled by NPT research biologists using data known to be reliable. We used the percentage of untrapped adults above the weir to estimate the number of untrapped jacks above the weir. A fish/redd estimate was determined by dividing the total number of Chinook (all ages) above the weir by the number of redds above the weir. This fish/redd estimate was multiplied by the number of redds below the weir to estimate the number of untrapped fish below the weir. The estimate of untrapped fish above and below the weir was added to the number of known origin (i.e., hatchery or natural) Chinook handled at the weir to arrive at an estimate for the total return to the river. The proportions of known origin fish handled at the weir were used to partition the total return to the river into hatchery or natural returns. The hatchery jack estimate was determined to be the difference between the estimated total (age 3-5) return to the river of all hatchery returns and the estimated adult only (age 4-5) hatchery returns to the river. To estimate the number of adult returns, we used the total CWT recoveries for age 4 and 5 returns to estimate the proportion of returning adult hatchery Chinook.

In both the Imnaha and Grande Ronde basins, the exception to the CWT expansion method is when we did not have any CWT recoveries for a particular brood year, but weir data indicated adults from that brood year returned. In these cases, we estimated the total number of returning adults by age class. If the returning adults from the brood year were potentially comprised of more than one tag group, we partitioned the estimated CWT returns into individual code groups based on the relative proportion of tag group recoveries from the previous year's return. For the 2007 return, it was not necessary to partition CWT's in this manner.

For some stocks each year, excess adult hatchery returns are outplanted to nearby streams. CWTs from these stocks that were recovered in outplant streams were not considered strays, but rather were included in escapement calculations (e.g., SAR) for the stream to which they returned.

In 2007, 149 hatchery-reared Imnaha River Chinook salmon with a CWT from the 2002-2004 brood years were recovered. Nearly all of these CWT recoveries occurred in the Snake River Basin. Recoveries were expanded to an estimated 729 CWT marked adults returning to the Imnaha River (84% of total recoveries) with the following age distribution: 24 from the 2002 brood year (age 5); 425 from the 2003 brood year (age 4); and 280 from the 2004 brood year (age 3) (Table 8). In addition, we estimated that five CWT Imnaha River salmon were harvested in ocean fisheries, 129 were harvested in the Columbia River, none in the Snake River, and one was recovered as a stray within the Snake River Basin at Lyons Ferry Hatchery. Of the Columbia and Snake rivers recoveries, an estimated 42 were recovered in treaty net fisheries, 6 in non-treaty net fisheries, and 82 were recovered in sport fisheries (Table 9). We estimate, with expansions, that 1,593 hatchery adults returned to the Imnaha River, and two Imnaha strays were

recovered within the Snake Basin. After expanding, we estimate a total of 1,595 Chinook salmon returned to the compensation area.

We recovered 97 hatchery-reared Catherine Creek Chinook salmon with a CWT from the 2002-2004 brood years. Recoveries were expanded to an estimated 176 CWT marked adults returning to Catherine Creek with the following age distribution: 22 from the 2002 brood year (age 5); 126 from the 2003 brood year (age 4); and 28 from the 2004 brood year (age 3) (Table 10). Catherine Creek Chinook salmon were not recovered in ocean fisheries, 18 were recovered from the Columbia River, and 8 were recovered in the Snake River (Table 11). Of the Columbia and Snake Rivers recoveries, an estimated three were recovered in non-treaty net fisheries, and 23 were recovered in sport fisheries (Table 11).

We recovered 64 hatchery-reared Grande Ronde River Chinook salmon with a CWT from the 2002-2004 brood years in 2007. Recoveries were expanded to an estimated 75 CWT returns to the Grande Ronde River with the following age distribution: 11 from the 2002 brood year (age 5); 35 from the 2003 brood year (age 4); and 29 from the 2004 brood year (age 3) (Table 12). Grande Ronde River salmon were not recovered in ocean fisheries, nor the Columbia or Snake Rivers, and we did not identify any in-basin or out-of-basin strays (Table 11). The lack of identified recoveries outside the Grande Ronde River is probably a result of the fact that 48% of the 2002 brood year was released without an adipose fin clip, 99% of the 2003 brood year was released unclipped, and 99.6% of the 2004 brood year was released unclipped. Therefore, unless a snout is collected for all fish with an intact adipose fin, or a CWT wand is used to check for the presence or absence of a CWT for all fish handled that have an intact adipose fin, there is a chance that upper Grande Ronde Chinook salmon could mistakenly be identified as a natural returns and the CWT would not be recovered. Furthermore, many sport fisheries prohibit harvesting Chinook salmon with an intact adipose fin, further diminishing the chances of recovering a CWT from upper Grande Ronde River hatchery salmon.

We recovered 73 hatchery-reared Lookingglass Creek Chinook salmon with a CWT from the 2002-2004 brood years in 2007. Recoveries were expanded to an estimated 194 CWT returns to Lookingglass Creek with the following age distribution: 14 from the 2002 brood year (age 5); 93 from the 2003 brood year (age 4); and 87 from the 2004 brood year (age 3) (Table 13). Lookingglass Creek salmon marked with a CWT were not recovered in ocean fisheries. An estimated six were recovered in the Columbia/Snake river sport fisheries, five were recovered in non-treaty net fisheries, four were recovered as in-basin strays, and none were recovered as out-of-basin strays (Table 11). Of the in-basin strays, one was recovered on the Upper Grande Ronde River, one on the Lostine River, and two were recovered on the South Fork Salmon River.

We recovered 230 hatchery-reared Lostine River Chinook salmon with a CWT from the 2002-2004 brood years in 2007. These recoveries include 86 CWT's (85 Lostine River salmon and one Lookingglass Creek salmon) recovered at the Lostine River weir from fish collected for ceremonial/subsistence purposes by NPT that are not reported in RMIS. A total of 90 snouts were collected from fish at the weir in 2007 where the dates of capture, sex, and length were not recorded. Of the 90 recovered snouts, we recovered 86 CWT's, three CWT's were lost (lost CWT's are not counted in the total of recovered CWT's), and one snout did not have a CWT. Without the appropriate biological data, these data were not accepted by either the Oregon or RMIS CWT databases. The 2007 hatchery escapement estimate to the Lostine River, using weir data reconciled by NPT research staff, was 390 hatchery Chinook (age 3-5): Based on CWT recoveries and the estimated total return to the river of 252 hatchery adults (age 4-5), we

estimated that 87.1% of returning hatchery adults were Age 4, and 12.9% were age 5 for an approximate age structure of 138 age 3, 219 age 4, and 33 age 5. We recovered 15 CWT's from the 2002 brood year (Age 5), 101 from the 2003 brood year (age 4), and 88 from the 2004 brood year (age 3). This expanded to an estimated 387 CWT returns to the Lostine River with the following age distribution: 31 from the 2002 brood year; 219 from the 2003 brood year; and 137 from the 2004 brood year (Table 14). No Lostine River Chinook salmon were harvested in ocean fisheries, 61 were harvested in the Columbia River migration corridor, and four were recovered in the Snake River migration corridor (Table 11). Two strays were recovered outside the Snake River basin, one from the Deschutes River, and one from the Umatilla River. A total of 10 CWT salmon were recovered as in-basin strays, one at Lyons Ferry Hatchery, two at the Pahsimeroi trap, four at the Rapid River trap, one on the South Fork Salmon River, one on the Wallow River, and one returned to Lookingglass Hatchery.

Compensation Goals

To assess LSRCP success of achieving mitigation goals and management objectives, we determined the total number of hatchery-produced salmon for each stock that were caught in fisheries, escaped to the stream of release, or strayed within or outside the Snake River Basin. The number of hatchery-produced salmon that were caught in fisheries or strayed was based on estimated CWT recoveries from the RMIS database. Because not all of a cohort within a stock were CWT marked (i.e., ad only, failed CWT application), the estimated number recovered in each recovery location was further expanded by dividing it by the proportion of the cohort with CWT marks. The number of hatchery-produced salmon that escaped to the stream of release was determined using the method described in Monzyk et al. (2006a). To determine the return to the LSRCP Compensation Area, defined as the Snake River Basin above Lower Granite Dam, we summed all estimated escapement for the 2007 return year above Lower Granite Dam.

Imnaha River

The annual compensation goal for the Imnaha Basin is 3,210 hatchery adults. We estimated that 1,595 Imnaha River hatchery adults returned to the compensation area, 49.7% of the goal for the Imnaha River stock (Table 9). The primary factors causing hatchery returns below the compensation goal were low natural adult returns during the 2003 and 2004 brood years that limited broodstock collections and subsequent smolt production, as well as limited rearing capacity at Lookingglass Hatchery.

The recruits-per-spawner ratio for hatchery- and natural-origin Imnaha River salmon that spawned naturally in 2002 was 0.07, much lower than the 1997-2000 brood years, slightly higher than the 2001 brood year (0.05) and below replacement (Figure 1). The recruits-per-spawner (R:S) ratio for the hatchery component was 4.3, better than naturally spawning salmon, above replacement, but lower than the last seven years. The R:S ratios reported here include jacks and are not adjusted for estimates of pre-spawn mortality.

Grande Ronde Basin

In the Grande Ronde Basin, the annual compensation goal for all stocks combined was set at 5,820 hatchery adults. We estimated that 196 Catherine Creek, 78 Grande Ronde River, and 216 Lookingglass Creek, and 390 Lostine River, hatchery adults returned to the basin. The

combined return to the compensation area was 880 hatchery adults, 15.1% of the compensation goal. Several factors have caused these low hatchery returns to the basin. Low numbers of Conventional Broodstock collections and limited rearing space at LFH have resulted in low smolt production. Also, in many years, the Captive Broodstock Program has been beleaguered with low broodstock survival due to bacterial kidney disease and low fecundity due to slow broodstock growth rates (Hoffnagle et al. 2003; Carmichael et al. 2007).

For Catherine Creek and the upper Grande Ronde River, the 2002 brood year is only the second brood year where we were able to calculate R:S for hatchery salmon. The R:S rations include jacks and are not adjusted for estimates of pre-spawn mortality. In Catherine Creek, the 2001 brood year R:S was 2.6 and the 2002 brood year R:S was 4.7. In the upper Grande Ronde River, the R:S for the hatchery component from the 2001 and 2002 brood year were 6.6 and 3.9, respectfully. The R:S for the natural component from 2002 brood year in Catherine Creek was 0.31, and 1.1 in the upper Grande Ronde. An R:S was not calculated for Lookingglass Creek because no smolts were released in 2002. The NPT reported that some members of their hatchery production staff falsified weir data from 2001-2008. Therefore, we were unable to calculate an R:S for the Lostine River hatchery salmon because of uncertainty in actual hatchery and natural returns.

Natural Escapement Monitoring

Stream surveys to enumerate Chinook salmon redds and sample salmon carcasses were conducted as in previous years (see Monzyk et al. 2006a). We surveyed three streams in the Imnaha Basin and nine in the Grande Ronde Basin. In 2007, we counted 277 redds and observed 126 carcasses in the Imnaha Basin (Table 15). Redd counts in the basin were low compared to previous years and represent the fifth year in a row of declining counts since the 2002 return year (Figure 2). We recovered one Umatilla River hatchery Chinook on the Imnaha River (Table 16). All remaining CWTs from marked hatchery salmon on spawning grounds were from Imnaha stock (Table 16). The number of natural salmon that returned to the basin to spawn (149) was down considerably from the previous five years (Figure 3). Hatchery salmon comprised the majority (68.2%) of adults on the spawning grounds in the Imnaha River. On two tributary streams to the Imnaha River, Big Sheep Creek and Lick Creek, 100% of salmon carcasses recovered were hatchery origin, and were a result of hatchery outplants from the Imnaha River. For the entire Imnaha Basin, hatchery fish represented 70.8% of carcasses recovered in the Imnaha Basin (Table 15).

In the Grande Ronde Basin, we observed 442 redds and recovered 230 carcasses on the spawning grounds (Table 15). This is the third consecutive year of declining redd counts and is lower than the 502 redds counted in 2000 (Figure 2). We recovered five known in-basin strays. Three Catherine Creek and one Lostine River salmon were recovered in Lookingglass Creek. One Lostine River salmon, and one out-of-basin stray from the Hood River was recovered on the Wallowa River (Table 16). Hatchery salmon comprised 57.1% of the observed carcasses in the Grande Ronde Basin. In streams with hatchery supplementation programs, the number of natural salmon that returned was down slightly from the previous year and lower than the average since 1997 (Figure 4). The percentage of hatchery salmon on the spawning grounds was 77%, 79% and 67%, for Catherine Creek, the Upper Grande Ronde River and the Lostine River respectively (Table 15, Figures 6-8). On the Upper Grande Ronde River, high stream temperature in early

July resulted in high pre-spawn mortality. On 5 July, CTUIR recovered 15 hatchery and three natural origin Chinook carcasses below the weir (Figure 7).

We collected 180 kidney samples from Imnaha River Chinook salmon in 2007 (Table 17). Of those, 134 came from hatchery-reared salmon and 46 from natural salmon. We collected 136 samples at LFH and 44 from carcasses recovered on spawning ground surveys. Individual ELISA OD levels ranged from 0.056-1.189 and 98% were from salmon with ELISA OD level <0.2 (Table 18).

We collected 288 kidney samples from salmon from Grande Ronde Basin streams in 2007 (Table 17): 214 from hatchery-reared salmon and 74 from natural salmon. We collected 185 kidney samples from salmon spawned at LFH and 103 from salmon that spawned in nature and were recovered as carcasses during spawning ground surveys. Individual ELISA OD levels ranged from 0.055 - 2.392 but were generally low, with 98% of the samples being <0.2 OD units (Table 18). Mean ELISA OD levels for each Grande Ronde Basin stream in 2007 ranged from 0.0679 - 0.410.

Mean ELISA OD in the two wilderness streams (Minam and Wenaha rivers) were the highest (0.4097 and 0.2927, respectively), with both streams having a higher mean ELISA OD level than all of the supplemented streams. This was due to one fish in each stream with an ELISA OD level in the high category (2.392 and 1.362, respectfully) and low sample sizes from each stream (7 and 6).

We found no difference (P=0.3358) in mean ELISA OD levels between hatchery-reared and natural Chinook salmon adults, nor within any of the sampled streams (P◂0.1538). Returning adults from the Captive Broodstock F_1 generation had a higher (P=0.0403) mean ELISA OD level (0.1168; range: 0.063-0.897) than those of the Conventional Hatchery Program (0.0735; 0.056-0.154). Annual mean ELISA OD level has not changed for any of the monitored streams (P◂0.1802), except for the Lostine River, where mean ELISA OD level has decreased over time from 1997-2007 (P=0.0302). The change in the Lostine River mean ELISA OD levels was due to a decrease in the natural salmon (P=0.0213) from 1997-2008 - the mean ELISA OD level of the hatchery salmon did not change from 2001-2008 (P=0.7164).

We found no evidence that the release of hatchery salmon is causing an increase in BKD prevalence in the monitored streams. The only change that we saw was a decrease in mean ELISA OD level in natural salmon and at the levels that we measured, it was probably biologically meaningless. Even in the Grande Ronde River, where we have released smolts that were offspring of females with very high ELISA OD levels and from raceways in which there were BKD outbreaks, we saw no change in mean ELISA OD level. The Captive Broodstock Program has released offspring of females with ELISA OD levels >1.0, particularly into the Upper Grande Ronde River. Both natural and Conventional Hatchery Program females returning to Grande Ronde Basin streams tend to have low ELISA OD levels and those >0.2 are culled if they are spawned at LFH. Therefore, smolts released from the Conventional Hatchery Program are always from females with ELISA OD levels <0.2. It seems likely that any sick salmon that we may have released were either unable to survive in nature, leaving only the healthy fish to survive to maturation, or they were able to fight off the infection and return to spawn.

Acknowledgments

Bob Lund, Lookingglass Hatchery Manager, Diane Deal, Assistant Hatchery Manager, and many other hatchery personnel exhibited great dedication and provided essential assistance. Numerous personnel from ODFW, the U.S. Fish and Wildlife Service, U.S. Forest Service, the Nez Perce Tribe, and the Confederated Tribes of the Umatilla Indian Reservation were enthusiastically supportive during spawning ground surveys and spawning at Lookingglass Fish Hatchery. In addition, personnel from the Nez Perce Tribe and the Confederated Tribes of the Umatilla Indian Reservation provided much of the weir data summarized in this report. This project was funded by the U.S. Fish and Wildlife Service under the Lower Snake River Compensation Plan, contract number 14-11-07-J009, a cooperative agreement with the Oregon Department of Fish and Wildlife.

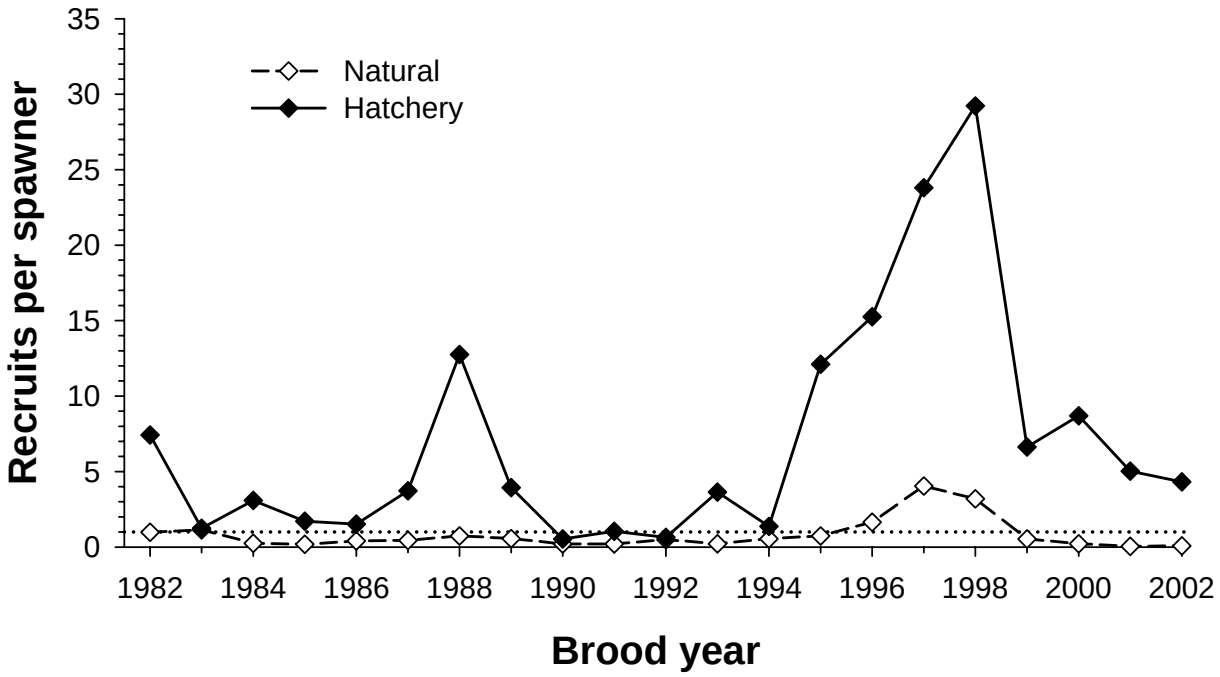

Figure 1. Recruits-per-spawner ratios (including jacks) for completed brood years (1982-2002) of Imnaha River Chinook salmon. Note: dotted line indicates recruits-per-spawner ratio=1.

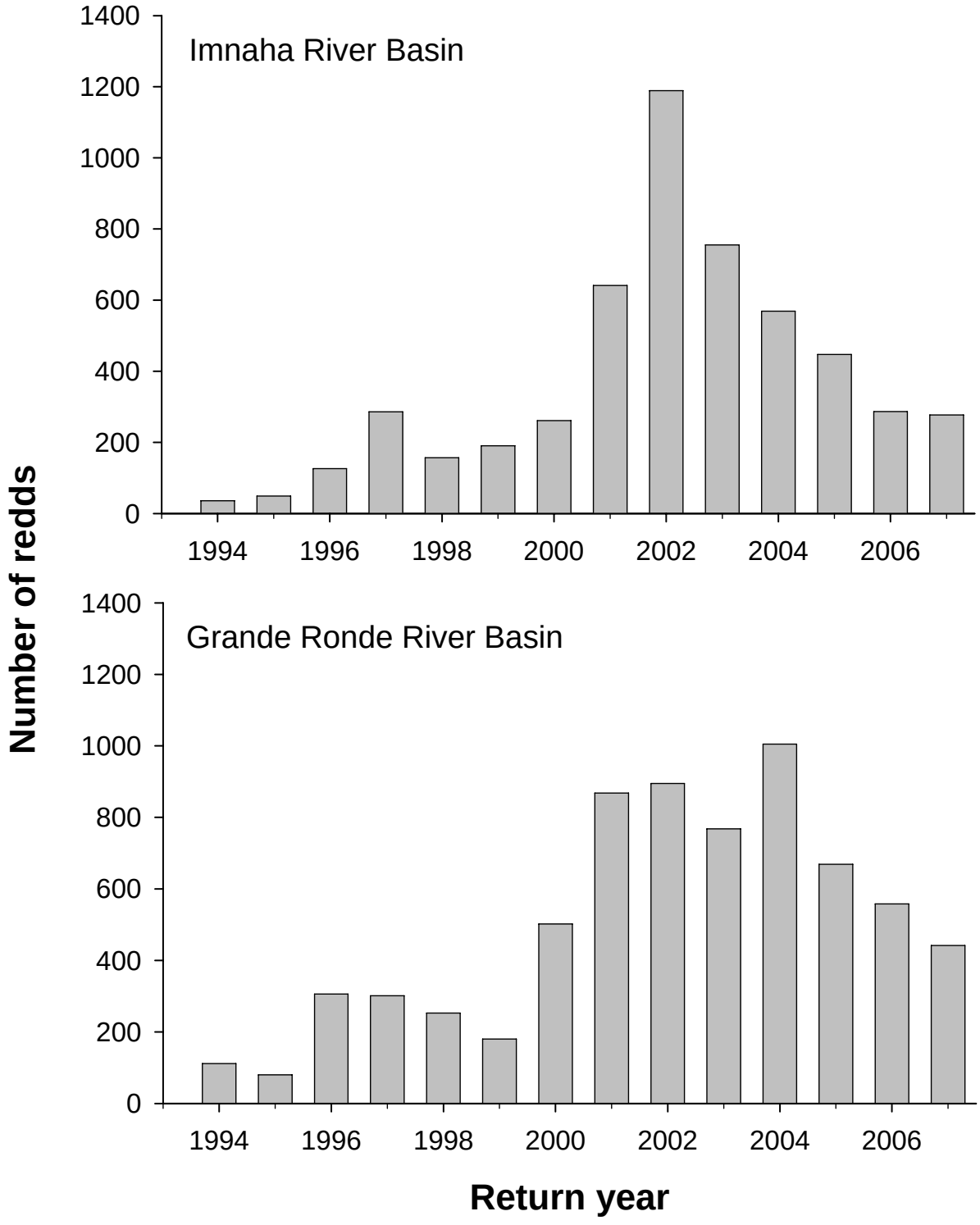

Figure 2. Redd counts in the Imnaha and Grande Ronde basins, 1994-2007.

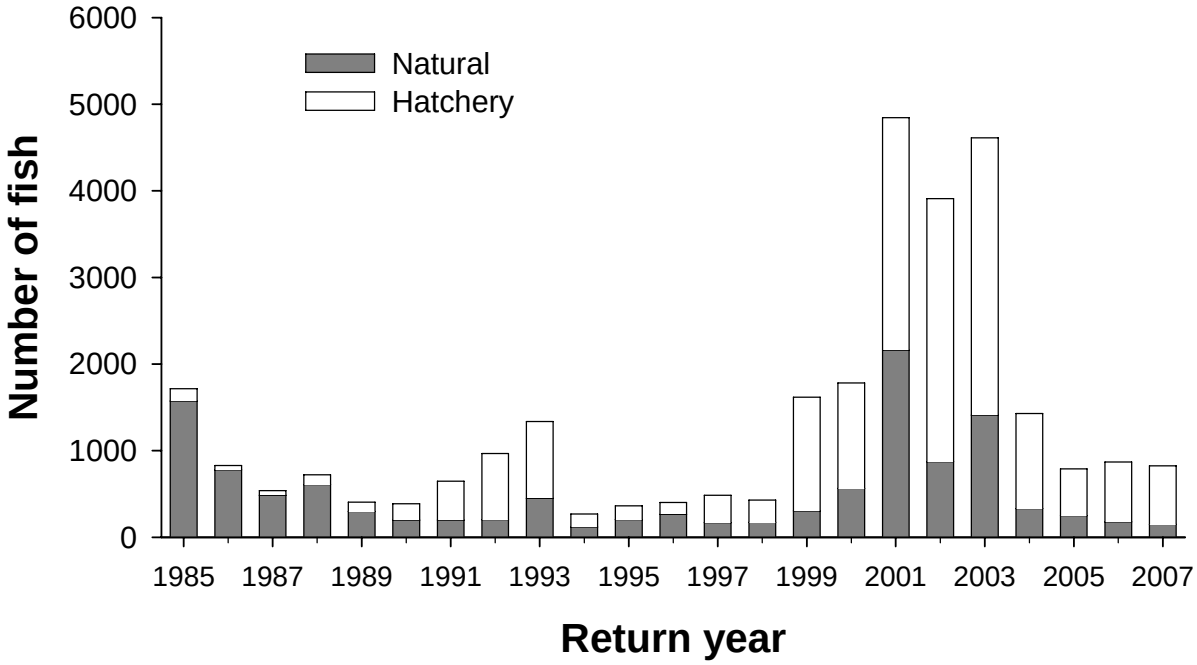

Figure 3. Estimated numbers of natural- and hatchery-origin spring/summer Chinook salmon (including jacks) that spawned naturally in the Imnaha River, 1985-2007.

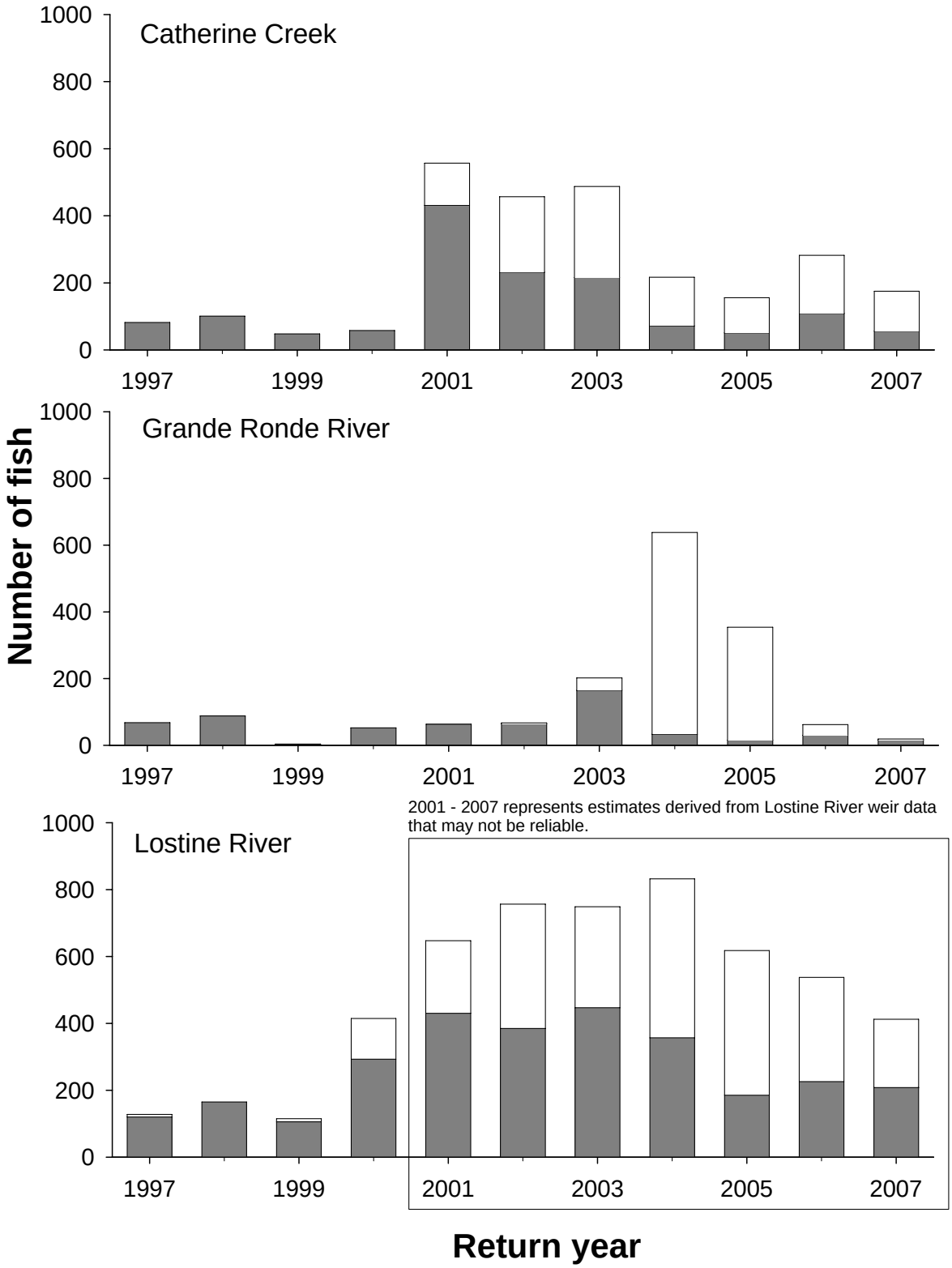

Figure 4. Estimated numbers of natural- and hatchery-origin Chinook salmon (including jacks) that spawned naturally in Catherine Creek, and the Grande Ronde and Lostine rivers, 1997-2007. The Nez Perce Tribe reported that some members of the hatchery production staff falsified weir data from 2001-208, therefore data for the Lostine River between 2001 and 2007 may not be reliable.

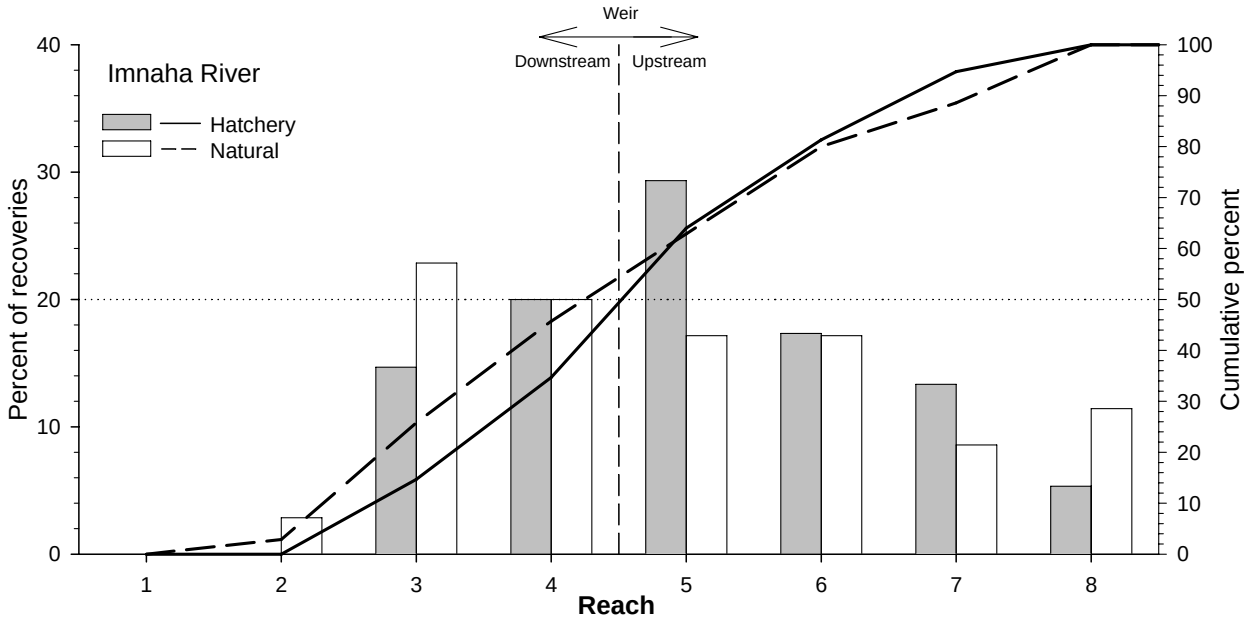

Figure 5. Number of natural and hatchery origin Chinook salmon carcasses recovered during the 2007 spawning ground surveys on the Imnaha River. Reach 1- Gorge to Freezeout Creek.Reach, Reach 2-Grouse Creek to the gorge, Reach 3-Crazyman Creek to Grouse Creek, Reach 4-Weir to Crazyman Creek, Reach 5-Mac's Mine to the weir, Reach 6-Mile post five (i.e. log) to Mac's Mine, Reach 7-Indian Crossing to mile post five (i.e., log), and Reach 8-Blue Hole to Indian Crossing.

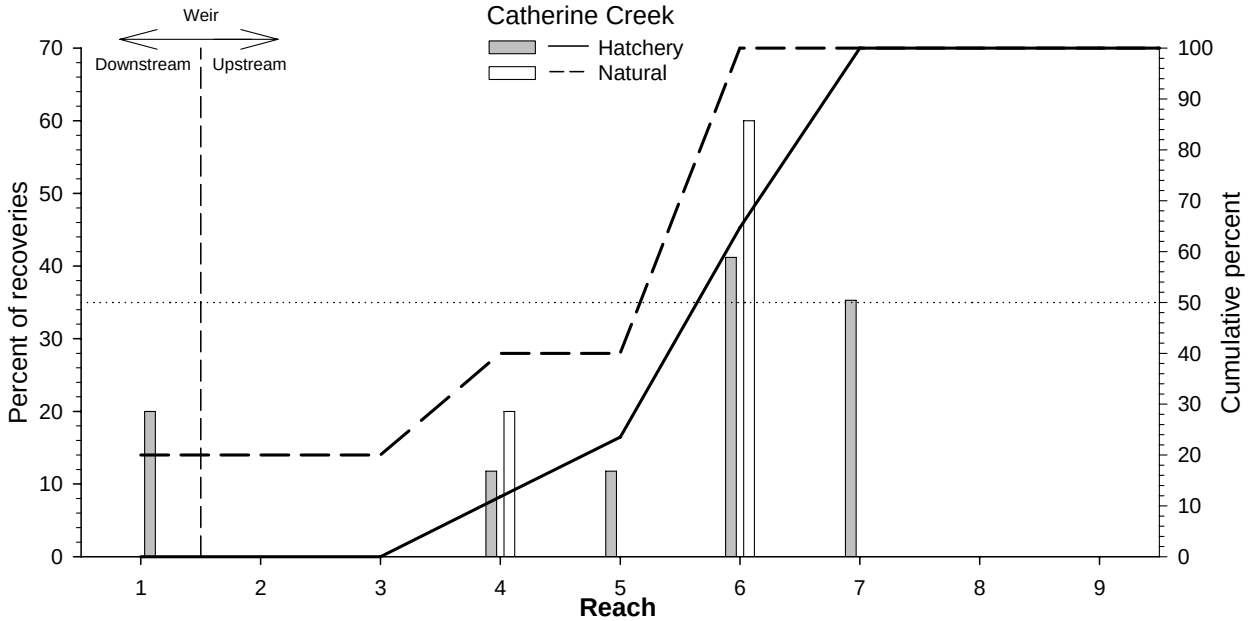

Figure 6. Number of natural and hatchery origin Chinook salmon carcasses recovered during the spawning ground surveys on Catherine Creek, 2007. Reach 1-Weir to 2nd Union Bridge, Reach 2-Bottom of Southern Cross Ranch to the Weir, Reach 3-Mile post five to top of Southern Cross Ranch, Reach 4-Badger Flat to mile post five, Reach 5-Highway Bridge to Badger Flat, Reach 6-7735 Bridge to Highway Bridge, Reach 7-Forks to 7735 Bridge, Reach 8-South Fork Catherine Creek, and Reach 9-North Fork Catherine Creek.

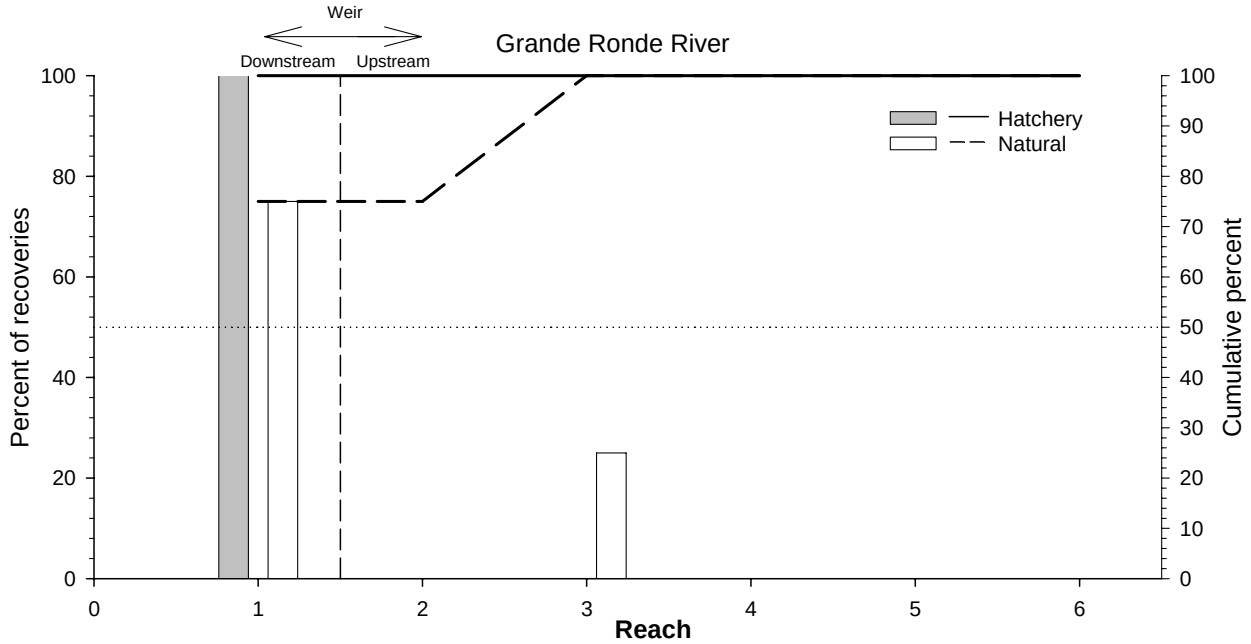

Figure 7. Number of natural and hatchery origin Chinook salmon carcasses recovered during spawning ground surveys on the Upper Grande Ronde River, 2007. Reach 1-Weir to Starkey Store Reach, Reach 2-Spoolcart Campground to the Weir, Reach 3-Time and a Half Campground to Spoolcart Campground, Reach 4-Forest Service Boundary below Vey Meadows to Time and a Half Campground, Reach 5-Carson Campground Bridge to Forest Service Boundary below acclimation facility, and Reach 6- Three Penny Claim to Carson Campground Bridge.

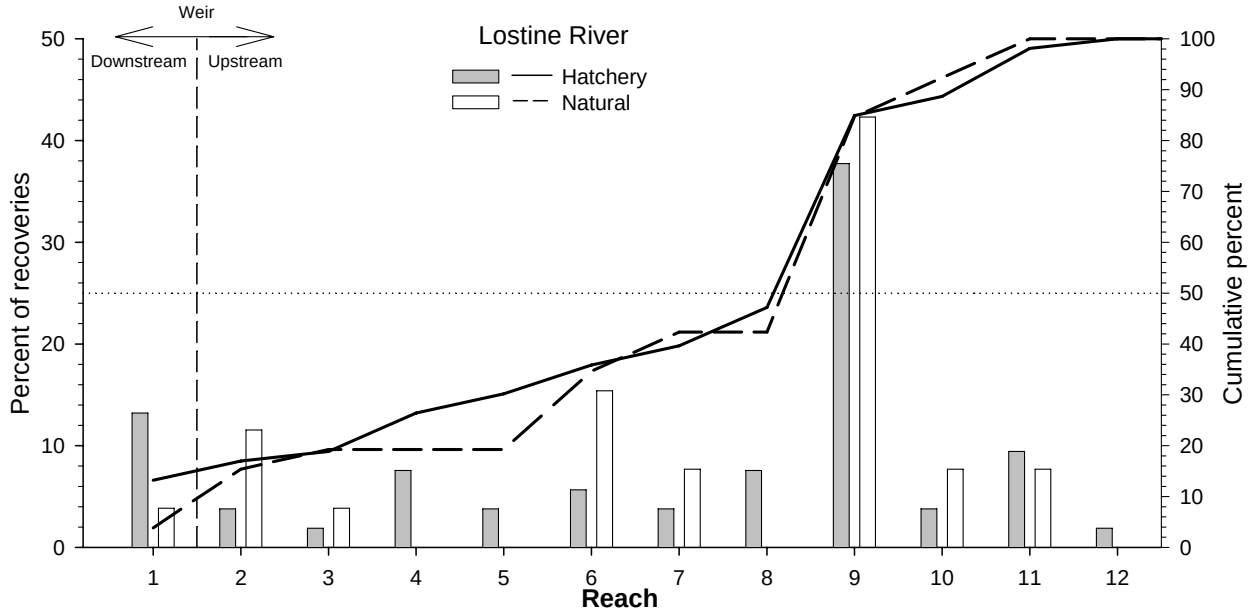

Figure 8. Number of natural and hatchery origin Chinook salmon carcasses recovered during the 2007 spawning ground surveys on the Lostine River. Reach 1-Weir to the Mouth, Reach 2-McLain's Ranch to the Weir, Reach 3-Highway 82 Bridge in Lostine to McLain's Ranch, Reach 4-Westside Ditch to the trout farm, Reach 5-Lostine River Ranch Bridge to Westside Ditch, Reach 6-Acclimation Facility to Lostine River Ranch Bridge, Reach 7-Six Mile Bridge to Acclimation Facility, Reach 8-Pole Bridge to Six Mile Bridge, Reach 9-Above Walla Walla Campground to Williamson Campground, Reach 10-Lapover Meadows to Bowman Trailhead, Reach 11-Turkey Flat to Lapover Meadows, Reach 12- Arrow Campground to French Campground.

Table 1. Rearing summaries for 2005 brood year juvenile spring Chinook salmon released into the Imnaha and Grande Ronde river basins in 2007.

Stock	Broodstock	Number of green eggs taken	Eyed eggs	Number culled[a]	Percent Survival: Green egg -to- eyed egg	Percent Survival: Eyed egg -to- smolt[b]	Percent Survival: Green egg -to- smolt[b]	Total smolts released
Imnaha River	Conventional	531,244	452,755	11,486	85.2	98.0	83.2	432,530
Catherine Creek	Captive	41,882	36,825	10,837	87.9	83.0	69.5	21,573
Catherine Creek	Conventional	53,530	50,668	0	94.7	98.1	92.8	49,696
Grande Ronde River	Captive	62,188	51,332	25,978	82.5	81.3	56.9	20,620
Grande Ronde River	Conventional	155,070	120,731	0	77.9	98.4	76.6	118,803
Lostine River	Captive	51,080	44,478	14,451	87.1	81.9	67.2	24,604
Lostine River	Conventional	234,218	207,291	0	88.5	99.1	87.7	205,406

[a] *Eggs were culled if enzyme-linked immunosorbent assay (ELISA) levels of female broodstock were ≥ 0.8 for Catherine Creek and the Grand Ronde River and ≥ 0.4 for the Lostine River.*

[b] *Embryos culled from production were subtracted from the calculation of eyed egg-to-smolt and green egg-to-smolt survival.*

Table 2. Number of female spring/summer Chinook salmon (*N)* and mean egg weight (g) by stock, origin (hatchery or natural), and age. Within an age class, shared letters are not significantly different (Tukey-kramer; P > 0.05) between stocks.

		Hatchery			Natural			
Stock		Age 4	Age 5	Total/ mean	Age 4	Age 5	Total/ mean	Grand total/ mean
Imnaha River	*N*	56	14	70	8	13	21	91
	Mean	0.250 ^{A}	0.270^{A}	0.254	0.238^{A}	0.310^{A}	0.274	0.261
Catherine Creek	*N*	31	--	31	6	8	14	45
	Mean	0.230^{A,B,C}	--	0.230	0.205^{B}	0.268^{A}	0.237	0.233
Grande Ronde River	*N*	17	8	25	3	3	6	31
	Mean	0.223^{B,C}	0.238^{A}	0.228	0.234 ^{A,B}	0.206^{A}	0.220	0.226
Lookingglass Creek	*N*	20	3	23	--	--	--	23
	Mean	0.211^{C}	0.250^{A}	.217	--	--	--	0.217
Lostine River	*N*	31	8	39	12	7	19	58
	Mean	0.239^{A,B}	0.262^{A}	0.243	0.233 ^{A,B}	0.306^{A}	0.270	0.249

Table 3. Estimates of percent adipose (Ad) fin clip and coded-wire tag application success for 2005 brood year spring Chinook salmon stocks reared at Lookingglass Fish Hatchery and released as smolts in 2007.

Stock, CWT code	Raceway	Broodstock	Number checked	Ad clip, with CWT	Ad clip, no CWT	No Ad clip, with CWT	No Ad clip, no CWT	Total released
Imnaha River								
093825	12	Conventional	521	95.0	1.7	2.7	0.6	61,648
093826	13	Conventional	514	94.8	2.3	2.5	0.4	61,805
094350	14	Conventional	504	96.6	2.2	1.2	0.0	61,741
Total/mean			1,539	95.5	2.1	2.1	0.3	185,194
Ad-only	15	Conventional	514	n/a	98.4	n/a	1.6	61,799
Ad-only	16	Conventional	515	n/a	97.1	n/a	2.9	61,805
Ad-only	17	Conventional	501	n/a	98.8	n/a	1.2	61,011
Ad-only	18	Conventional	529	n/a	98.7	n/a	1.3	62,721
Total/mean			2,059	n/a	98.3	n/a	1.7	247,336
Catherine Creek								
094357	1	Conventional	525	95.6	4.0	0.4	0.0	49,696
094361	2	Captive	519	97.1	2.3	0.6	0.0	21,573
Total/mean			1,044	96.4	3.1	0.5	0.0	71,269

Table 3 continued.

Stock, CWT code	Raceway	Broodstock	Number checked	Ad clip, with CWT	Ad clip, no CWT	No Ad clip, with CWT	No Ad clip, no CWT	Total released
Grande Ronde River								
094358	3	Conventional	500	n/a	n/a	98.2	1.8	39,366
094359	4	Conventional	513	n/a	n/a	99.6	0.4	39,290
093162	5	Conventional	522	n/a	n/a	95.8	4.2	40,147
Total/mean			1,535	n/a	n/a	97.9	2.1	118,803
094362	6	Captive	522	95.8	1.9	2.3	0.0	20,620
Total/mean			522	95.8	1.9	2.3	0.0	20,620
Lostine River								
094355	7	Conventional	504	90.7	7.7	1.2	0.4	50,604
094353	8	Conventional	487	95.3	3.7	1.0	0.0	53,313
094354	9	Conventional	500	96.8	2.6	0.6	0.0	49,693
094356	10	Conventional	507	94.7	4.3	0.8	0.2	51,796
094360	11	Captive	496	98.0	0.8	1.2	0.0	24,604
Total/mean			2,494	95.1	3.8	1.0	0.1	230,010

Table 4. Mean size of 2005 brood year spring Chinook salmon smolts, total number released into the Imnaha and Grande Ronde river basins, number PIT-tagged, and survival to Lower Granite Dam, 2007. Length, weight, and condition factor data collected 6-8 February 2007.

Stock, CWT code	Raceway	Program	Release date [a]	Fork Length (mm)		Weight (g)		Condition factor (K)		Total released	Number PIT-tagged	Survival to Lower Granite Dam
				Mean	SD	Mean	SD	Mean	SD			
Imnaha River												
093825	12	Conventional	21 MAR-12 APR	107.0	12.4	17.2	8.4	1.2	0.1	61,648	2,975	0.64
093826	13	Conventional	21 MAR-12 APR	111.1	11.1	16.2	5.9	1.1	0.3	61,805	2,981	0.67
094350	14	Conventional	21 MAR-12 APR	114.2	11.0	19.7	6.6	1.2	0.2	61,741	2,996	0.67
Ad-only	15	Conventional	21 MAR-12 APR	114.7	12.0	22.5	8.1	1.4	0.2	61,799	2,989	0.65
Ad-only	16	Conventional	21 MAR-12 APR	115.4	11.0	19.4	7.1	1.3	0.3	61,805	2,987	0.66
Ad-only	17	Conventional	31 MAR-12 APR	113.6	10.4	22.2	7.0	1.3	0.2	60,280	2,987	0.68
Ad-only	18	Conventional	31 MAR-12 APR	117.0	11.8	22.9	6.9	1.2	0.2	61,891	2,988	0.66
Total/mean										432,530	20,903	0.66
Catherine Creek												
094357	1	Conventional	26 MAR-11 APR	110.8	7.9	15.2	4.2	1.1	0.2	49,696	10,475	0.32
094361	2	Captive	26 MAR-11 APR	112.1	10.6	15.9	4.8	1.2	0.2	21,573	10,370	0.33
Total/mean										71,269	20,845	0.33
Grande Ronde River												
094358	3	Conventional	02 APR-11 APR	116.3	7.0	21.6	4.9	1.3	0.1	39,366	499	0.59
094359	4	Conventional	02 APR-11 APR	114.1	8.0	16.6	4.9	1.2	0.2	39,290	495	0.53
093162	5	Conventional	02 APR-11 APR	112.2	7.7	19.3	3.9	1.3	0.1	40,147	495	0.47
094362	6	Captive	19-25 MAR	114.5	9.7	19.2	5.0	1.3	0.1	20,620	496	0.34
Total/mean										139,423	1,985	0.48

Table 4 continued.

Stock, CWT code	Raceway	Program	Release date	Fork Length (mm)		Weight (g)		Condition factor (K)		Total released	Number PIT-tagged	Survival to Lower Granite Dam
				Mean	SD	Mean	SD	Mean	SD			
Lostine River												
094355	7	Conventional	07-17 APR	115.6	13.4	22.6	7.2	1.4	0.2	50,604	1,297	0.66
094353	8	Conventional	16-26 MAR	116.4	13.6	16.1	6.5	1.0	0.1	53,313	1,249	0.53
094354	9	Conventional	07-17 APR	114.4	12.8	19.2	9.0	1.1	0.3	49,693	1,249	0.66
094356	10	Conventional	16-26 MAR	111.5	12.3	17.9	6.0	1.3	0.1	51,796	1,183	0.54
094360	11	Captive	17-17 APR	112.8	8.5	15.9	5.1	1.1	0.2	24,604	1,465	0.59
Total/mean										230,010	6,443	0.60

[a] *For Imnaha River stock, volitional release of raceways 12-16 began 21 March and stopped 28 March. Raceways 17 and 18 were added to acclimation pond and the volitional release resumed 31 March until force out on 12 April.*

Table 5. Number of adult spring Chinook salmon handled each week at northeast Oregon LSRCP facilities, 2007. The total for the Imnaha River excludes recaptures of fish releasedd below the weir. The total for Lookingglass Creek includes stray hatchery fish from Catherine Creek and Grande Ronde River stock.

Period	Week of year	Imnaha River[a]		Lostine River[b]		Catherine Creek[c]		Grande Ronde River[c]		Lostine River[b]	
		Hatchery	Natural	Hatchery	Natural	Hatchery	Natural	Hatchery	Natural	Hatchery	Natural
Dates of trap operation:		1 JUN – 19 SEP		2 APR – 18 SEP		1 MAR- 31 JUL		21 MAR – 13 JUL		15 May – 28 SEP	
7-13 MAY	19	-	-	0	0	0	0	0	0		
14-20 MAY	20	-	-	2	0	0	1	1	0		
21-27 MAY	21	-	-	18	0	3	1	5	6		
28 MAY - 3 JUN	22	0	0	54	6	80	47	20	15		
4-10 JUN	23	0	0	20	0	16	4	2	1	The Nez Perce Tribe reported that some members of the hatchery production staff falsified weir data from 2001-2008. Therefore, these data are unreliable.	
11-17 JUN	24	2	0	37	7	44	17	5	6		
18-24 JUN	25	7	4	42	2	24	8	4	4		
25 JUN - 1 JUL	26	72	24	2	1	2	1	3	1		
2-8 JUL	27	47	15	4	1	1	0	0	0		
9-15 JUL	28	207	26	1	0	0	0	0	0		
16-22 JUL	29	233	38	0	0	0	0	-	-		
23-29 JUL	30	90	8	0	0	0	0	-	-		
30 JUL – 5 AUG	31	108	9	0	0	0	0	-	-		
6-12 AUG	32	74	6	1	0	-	-	-	-		
13-19 AUG	33	37	6	3	0	-	-	-	-		
20-26 AUG	34	82	12	7	1	-	-	-	-		
27 AUG – 2 SEP	35	136	29	1	1	-	-	-	-		
3-9 SEP	36	55	3	5	1	-	-	-	-		
10-16 SEP	37	1	0	0	0	-	-	-	-		
17-23 SEP	38	0	0	0	0	-	-	-	-		
24-30 SEP	39	-	-	-	-	-	-	-	-	-	-
Total		1151	180	197	20	170	79	40	33	197	20

[a]*Operated by Oregon Department of Fish and Wildlife*
[b]*Operated by Nez Perce Tribe*
[c]*Operated by Confederated Tribes of the Umatilla Indian Reservation*

Table 6. Number and disposition, by origin, age, and sex, of adult spring Chinook salmon returning to northeast Oregon LSRCP facilities in 2007. The numbers of Chinook trapped/passed above the weir were adjusted to account for the estimated number of returning unclipped hatchery fish without a coded wire tag (CWT).

	Hatchery							Natural							
Age	3		4		5			3		4		5			Grand total
Stock, Disposition	M	F	M	F	M	F	Total	M	F	M	F	M	F	Total	
Imnaha River															
Trapped[a]	496	0	376	243	25	38	1178	21	0	55	23	15	39	153	1331
Passed above the weir	10	0	172	108	10	18	318	21	0	34	10	12	25	102	420
Outplanted	398	0	29	72	7	12	618	0	0	0	0	0	0	0	618
Ceremonial/Subsistence	28	0	0	0	0	0	28	0	0	0	0	0	0	0	28
Kept[b]	55	0	75	63	4	16	213	0	0	21	13	3	14	51	264
Actual spawned	20	0	59	58	3	14	154	0	0	19	8	4	13	44	198
Killed, not spawned	11	0	6	1	0	0	18	0	0	0	0	0	0	0	18
Pre-spawn mortality	24	0	10	4	1	2	41	0	0	2	5	0	0	7	48
Mean length (mm)[c]	570		773	796	974	860		n/a	-	748	757	876	895		
(Sample Size)	(20)	-	(44)	(48)	(2)	(13)				(15)	(10)	(2)	(14)		
Weir age composition (%)	42.1	0.0	31.9	20.6	2.1	3.2	100	13.7	0.0	36.0	15.0	9.8	25.5	100	
Catherine Creek															
Trapped at Catherine Creek[d]	29	0	48	78	11	7	173	6	0	19	20	15	15	75	248
Passed above the weir	2	0	38	48	9	7	104	5	0	10	14	8	7	44	148
Returned to Lookingglass	3	0	2	5	0	0	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10
Kept[e]	30	0	12	35	2	0	79	1	0	9	6	5	8	29	108
Spawned	4	0	12	31	0	0	47	1	0	8	6	5	8	28	75
Killed not spawned	26	0	0	3	2	0	31	0	0	0	0	0	0	0	31
Pre-spawn mortality	0	0	0	2	0	0	1	0	0	1	0	0	0	1	2
Mean length (mm)[c]	501		774	734	827			415		727	718	883	841		
(Sample Size)	(5)	-	(11)	(28)	(2)	n/a		(1)	-	(8)	(6)	(4)	(7)		

Table 6 continued.

Stock, Disposition	Hatchery 3 M	Hatchery 3 F	Hatchery 4 M	Hatchery 4 F	Hatchery 5 M	Hatchery 5 F	Hatchery Total	Natural 3 M	Natural 3 F	Natural 4 M	Natural 4 F	Natural 5 M	Natural 5 F	Natural Total	Grand total
Upper Grande Ronde River (UGR)															
Trapped at UGR[d]	5	0	10	15	3	8	40	0	0	10	11	6	6	33	73
Passed above the weir	3	0	0	0	0	0	3	0	0	5	4	3	4	16	19
Returned to Lookingglass	12	0	6	3	1	1	23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	23
Kept[e]	13	0	16	18	4	9	60	0	0	5	5	3	3	16	76
Spawned	7	0	10	18	3	8	46	0	0	5	3	3	3	14	60
Killed not spawned	5	0	3	0	0	0	8	0	0	0	1	0	0	1	9
Pre-spawn mortality	2	0	3	0	1	1	6	0	0	0	2	0	0	2	8
Mean length (mm)[c]	470		756	729	904	821				728	675	893	755		
(Sample Size)	(12)	-	(15)	(17)	(4)	(8)		-	-	(4)	(2)	(2)	(3)		
Age composition (%)	26.5	0.0	25.0	28.1	6.3	14.1	100	0.0	0.0	30.3	30.3	18.2	21.2	100	
Lostine River															
Trapped	The Nez Perce Tribe reported that some members of the hatchery production staff falsified weir data from 2001-2008. Therefore, these data are unreliable.														
Passed															
Returned below weir															
Outplanted															
Kept[f]	3	0	32	36	1	8	71	2	0	16	15	2	7	42	125
Actual spawned	3	0	27	32	1	8	71	2	0	14	13	2	7	38	109
Killed, not spawned	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2
Pre-spawn mortality	0	0	5	4	0	0	9	0	0	1	1	0	0	2	11
Mean length (mm)[c]	522		775	759	847	844		553		780	765	908	868		
(Sample Size)	(3)	-	(32)	(36)	(1)	(8)		(2)	-	(16)	(15)	(2)	(7)		
Spawned fish age composition (%)	4.2	0.0	45.1	38.0	11.3	1.4	100	5.3	0.0	34.2	36.8	18.4	5.3	100	

Table 6 continued.

Stock, Disposition	Hatchery 3 M	Hatchery 3 F	Hatchery 4 M	Hatchery 4 F	Hatchery 5 M	Hatchery 5 F	Hatchery Total	Natural 3[i] M	Natural 3[i] F	Natural 4[j] M	Natural 4[j] F	Natural 5[j] M	Natural 5[j] F	Natural Total	Grand total
Lookingglass Creek															
Trapped [d,g]	58	0	36	58	10	3	165	7	0	6	4	2	1	20	185
Passed	0	0	25	36	5	1	67	6	0	0	0	0	0	6	73
Returned below weir	0	0	0	0	0	0	0	0	0	1	0	1	0	2	2
Kept[e,h]	58	0	11	22	5	2	98	0	0	5	4	1	1	11	109
Spawned	24	0	11	20	4	2	61	0	0	0	0	0	0	0	61
Killed not spawned	32	0	0	0	0	0	32	0	0	5	4	1	1	11	43
Pre-spawn mortality	3	0	0	2	1	0	6	0	0	0	0	0	0	0	6
Mean length (mm)[c]	490		719	717	865	856									
(Sample Size)	(23)	-	(6)	(14)	(4)	(2)		-	-	-	-	-	-		
Age composition (%)	35.1	0.0	21.8	35.2	6.1	1.8	100	35.0	-	30.0	20.0	10.0	5.0	100	

[a] *Number of fish per age class determination based on Imnaha River age-length key (<630 = Age 3; 630-850 = Age 4; >850 = Age 5)*
[b] *Age composition based on CWT data, scale ages, and the Imnaha River age-length key.*
[c] *Mean length per age class determined from known age fish based on either CWT, or scales.*
[d] *Number of fish per age class determination based on Catherine Creek/Grande Ronde River age-length key (≤ 600 = Age 3; 601-799 = Age 4; ≥800 = Age 5)*
[e] *Age composition based on CWT data, scale ages, and the Catherine Creek/Grande Ronde River age-length key.*
[f] *Age composition based on CWT data, scale ages, and the Lostine River age-length key (<630 = Age 3; 630-850 = Age 4; >850 = Age 5).*
[g] *Total does not include strays from Catherine Creek (10) or the Upper Grande Ronde River (23).*
[h] *Kept fish were strays from Catherine Creek and Grande Ronde River. The Catherine Creek and Grande Ronde River strays were used as broodstock for those programs.*
[i] *Assumed to be Lookingglass Creek stock.*
[j] *Assumed to be Rapid River stock.*

Table 7. Spawning summaries for the Conventional Broodstock of spring Chinook salmon at Lookingglass Fish Hatchery, 2007.

Stock, spawn date	Number of parents: Hatchery F	Hatchery M[ab]	Natural F	Natural M[a]	Number of green eggs collected	Average fecundity	Number of eyed eggs	Percent mortality to shocking
Imnaha River								
14 AUG	0	1	1	1	5,862	5,862	2,975	49.2
21 AUG	4	4	3	4	31,065	4,438	12,014	61.3
27 AUG	13	6	4	0	77,663	4,568	68,644	11.6
4 SEP	50	50	10	19	257,145	4,286	185,076	28.0
10 SEP	5	5	2	3	31,888	4,555	29,648	7.0
13 SEP	0	1	1	1	4,774	4,774	4,700	1.6
Total	72	67	21	28	408,397	4,391	303,057	25.8
Catherine Creek								
22 AUG	1	1	1	1	8,327	4,164	5,489	34.1
29 AUG	15	8	9	8	89,136	3,714	69,433	22.1
6 SEP	8	3	4	5	47,935	3,995	46,286	3.4
11 SEP	7	5	0	3	25,667	3,666	24,999	2.6
Total	31	17	14	17	171,065	3,801	146,207	14.5
Grande Ronde River								
15 AUG	1	2	0	0	4,449	4,449	1,045	76.5
6 SEP	4	3	2	3	24,685	3,526	18,018	27.0
11 SEP	12	13	2	0	55,994	4,000	45,145	19.4
17 SEP	8	7	2	3	37,622	3,762	34,928	7.2
Total	25	25	6	6	122,750	3,960	99,136	19.2
Lookingglass Creek								
29 AUG	8	8	0	0	24,848	3,106	16,636	33.0
9 SEP	14	34	0	0	40,285	2,878	32,891	18.4
11 SEP	1[c]	0	0	0	2,922	2,922	2,806	4.0
Total	23	34	0	0	68,055	2,959	52,333	23.1
Lostine River								
5 SEP	7	4	3	1	50,083	5,008	38,847	22.4
10 SEP	12	2	7	1	86,813	4,569	77,378	10.9
13 SEP	11	10	4	5	66,398	4,427	63,984	3.6
17 SEP	8	8	4	4	49,195	4,100	47,440	3.6
20 SEP	1	0	1	2	9,230	4,615	4	99.9
24 SEP	1	2	1	2	5,631	2,815	4,229	24.9
Total	40	26	20	15	267,350	4,456	231,882	13.3

[a] *The numbers of male parents is greater than the number kept because some males were spawned more than once.*

[b] *One hatchery male spawned as Catherine Creek stock brought in from the Lostine River weir was determined to be Catherine Creek stock due to presence of green VIE tag.*

[c] *This female returned to the Grande Ronde River weir and was spawned with Grande Ronde River males. CWT reading determined it to be of Lookingglass Creek stock.*

Table 8. Expanded recoveries by coded-wire tag group of Imnaha River spring/summer Chinook salmon for the 2007 return year. In-basin strays were recovered in non-natal streams in the Snake River Basin. Out-of-basin strays were recovered from streams outside the Snake/Columbia rivers migration corridor. Numbers in parenthesis are unexpanded CWT recoveries.

			Recovery location						
Brood year	CWT code	Number released	Imnaha River[a]	Ocean catch[b]	Columbia River[b]	Snake River[b]	In-basin strays[b]	Out-of-basin strays[b]	Total
2002[c]	093822	57,053	12 (4)	0	1 (1)	0	0	0	11
	093823	56,992	12 (4)	0	0	0	0	0	15
	Total	268,426	24 (8)	0	1 (1)	0	0	0	26
2003[d]	094032	73,839	174 (36)	0	39 (5)	0	1 (1)	1 (1)	210
	094033	72,247	140 (29)	1 (1)	16 (5)	0	0	1 (1)	163
	094034	73,763	111 (23)	0	17 (4)	0	0	1 (1)	129
	Total	219,849	425 (88)	1 (1)	72 (14)	0	1 (1)	3 (3)	502
2004[e]	094206	64,167	154 (11)	4 (2)	11 (3)	0	0	0	175
	094207	63,864	28 (2)	0	26 (4)	0	0	1 (1)	54
	094208	64,105	98 (7)	0	19 (3)	0	0	0	112
	Total	192,136	280 (20)	4 (2)	56 (10)	0	0	1 (1)	341
Grand Total		680,411	729 (116)	5 (3)	129 (25)	0	1 (1)	4 (4)	868

[a] *Expansion based on estimated number of CWT fish returning (brood year escapement x proportion with CWT x tag retention rate).*
[b] *Estimated number of total CWT fish recovered from PSMFC and ODFW databases.*
[c] *268,426 juvenile Chinook released from the 2002 brood year marked with an AD clip and no CWT.*
[d] *215,337 juvenile Chinook released from the 2003 brood year marked with an AD clip and no CWT.*
[e] *249,544 juvenile Chinook released from the 2004 brood year marked with an AD clip and no CWT.*

Table 9. Catch and escapement distribution of Imnaha River spring/summer hatchery Chinook salmon by stock and recovery location for the 2007 return year. The estimated CWT recoveries were summarized through 1 June 2009 from the PSMFC database and expanded to account for recoveries of adipose clipped Chinook without a CWT.

Location, recovery type	Estimated CWT recoveries	Expanded hatchery adults	Percent of total
Ocean catch	5	12	0.6
Columbia River			
Ceremonial and subsistence	0	0	0.0
Treaty net	42	88	4.6
Non-treaty net	6	13	0.7
Sport	81	187	9.8
Test fishery	0	0	0.0
Snake River			
Sport	0	0	0.0
Lower Granite Dam[a]	0	0	0.0
Deschutes River			
Trap	4	8	0.4
Sport	0	0	0.0
Ceremonial and subsistence	0	0	0.0
Other Strays			
Outside Snake River Basin	0	0	0.0
Within Snake River Basin[a]	1	2	0.1
Recruitment to river[a]	n/a	1,593[b]	83.8
Total catch/escapement		1,903	
Return to compensation area		1,595	
Percent of compensation goal (3,210 hatchery adults)		49.7	

[a] *Indicates areas defining the LSRCP compensation area.*
[b] *Estimated total return of hatchery Chinook to the Imnaha River. The estimate does not include an adjustment for CWT loss. This value accounts for an estimate of AD clip only returns.*

Table 10. Expanded adult recoveries by coded-wire tag group of Catherine Creek spring Chinook salmon for the 2007 return year. In-basin strays were recovered in non-natal streams in the Snake River Basin. Out-of-basin strays were recovered from streams outside the Snake River Basin or in the upper Columbia River. Numbers in parenthesis are unexpanded recoveries.

				Recovery location						
Brood year	Broodstock	CWT code	Number released	Catherine Creek[a]	Ocean catch[b]	Columbia River[b]	Snake River[b]	In-basin strays[b]	Out-of-basin strays[b]	Total
2002	Conventional	093840	70,071	4 (4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4
	Captive	093835	45,413	9 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9
	Captive	093836	46,384	9 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	9
	Total		161,868	22 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	22
2003	Conventional	070753	58,444	21 (18)	0 (0)	9 (3)	0 (0)	0 (0)	0 (0)	30
	Conventional	070754	59,036	34 (29)	0 (0)	0 (0)	0 (0)	2 (2)	0 (0)	36
	Captive	094039	34,415	14 (1)	0 (0)	8 (2)	0 (0)	1 (1)	0 (0)	23
	Captive	094040	34,412	57 (4)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	58
			186,307	126 (52)	0 (0)	18 (6)	0 (0)	3 (3)	0 (0)	147
2004	Captive	93427	28,824	7 (6)	0 (0)	0 (0)	4 (1)	0 (0)	0 (0)	7
	Captive	94215	16,780	11 (11)	0 (0)	0 (0)	4 (1)	1 (1)	0 (0)	11
	Conventional	94218	23,216	10 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10
			68,820	28 (27)	0 (0)	0 (0)	8 (2)	1 (1)	0 (0)	28
Grand Total			416,995	176 (85)	0 (0)	18 (6)	8 (2)	4 (4)	0 (0)	206

[a] *Expansion based on predicted number of CWT fish returning (brood year escapement x proportion with CWT x tag retention rate).*

[b] *Estimated number of total CWT fish recovered from PSMFC and ODFW databases.*

Table 11. Catch and escapement distribution of Grande Ronde Basin hatchery adult spring Chinook salmon by stock and recovery location for the 2007 return year. The estimated CWT recoveries were summarized through 1 June 2009 from the PSMFC database and expanded to account for recoveries of adipose clipped Chinook without a CWT.

	Catherine Creek			Grande Ronde River			Lookingglass Creek			Lostine River[a]		
Location, recovery type	Est. CWT	Expanded adults	Percent of total	Est. CWT	Expanded adults	Percent of total	Est. CWT	Expanded adults	Percent of total	Est. CWT	Expanded adults	Percent of total
Ocean catch	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
Columbia River												
Ceremonial/subsistence	0	0	0.0	0	0	0.0	0	0	0.0	85	87	15.5
Treaty net	0	0	0.0	0	0	0.0	0	0	0.0	10	10	1.8
Non-treaty net	3	4	1.8	0	0	0.0	5	8	3.4	2	2	0.4
Sport	15	18	8.0	0	0	0.0	5	7	2.6	50	51	9.1
Snake River												
Sport	8	8	3.5	0	0	0.0	1	2	0.8	4	4	0.7
Deschutes River												
Trap	0	0	0.0	0	0	0.0	0	0	0.0	1	1	0.2
Sport	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
Ceremonial/subsistence	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0
Other Strays												
Outside Snake R. Basin	0	0	0.0	0	0	0.0	0	0	0.0	1	1	0.2
Within Snake R. Basin[b]	4	4	1.8	0	0	0.0	4	5	2.1	9	9	1.6
Recruitment to stream[b]	n/a	192[c]	84.9	n/a	78[c]	100.0	n/a	211[c]	90.6	n/a	390[c,d]	70.5
Total estimated return		226			78			233			560	
Compensation area return		196			78			216			404	

[a] *90 snouts were recovered from the Lostine River weir for fish sacrificed for ceremonial/subsistence in 2007 that were unable to be associated with biological data or date of capture. CWT codes were recovered from 84 age 3 Chinook and 1 age 4 Chinook and 1 age 3 stray from Lookingglass. These data are not available in RMIS or the Oregon CWT Database.*

[b] *Indicates areas within LSRCP compensation area.*

[c] *Expansion factor based on estimated total return to natal stream of hatchery adults. Does not include adjustment for CWT loss.*

[d] *Escapement estimate based on revised weir data provided by Nez Perce Fisheries Research.*

Table 12. Expanded adult recoveries by coded-wire tag group of Grande Ronde River spring Chinook salmon for the 2007 return year. In-basin strays were recovered in non-natal streams in the Snake River Basin. Out-of-basin strays were recovered from streams outside the Snake/Columbia rivers migration corridor. Numbers in parenthesis are unexpanded recoveries.

				Recovery location						
Brood year	Broodstock	CWT code	Number released	Grande Ronde River[a]	Ocean catch[b]	Columbia River[b]	Snake River[b]	In-basin strays[b]	Out-of-basin strays[b]	Total
2002	Conventional	093833	69,856	11 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	11
	Captive	093832	15,676	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Captive	093834	59,387	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Total		144,919	11 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	11
2003	Conventional	094035	49,871	14 (12)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	14
	Conventional	094036	54,479	21 (18)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	21
	Captive	094127	1,019	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Total		105,369	35 (30)						35
2004	Conventional	094213	18,901	29 (24)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	29
	Total		18,901	29 (24)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	29
Grand Total			269,189	75 (64)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	75

[a] *Expansion based on predicted number of CWT fish returning (brood year escapement x proportion with CWT x tag retention rate).*
[b] *Estimated number of total CWT fish recovered from PSMFC and ODFW databases.*

Table 13. Expanded adult recoveries by coded-wire tag group for the 2007 return year of Lookingglass Creek spring Chinook salmon. In-basin strays were recovered in non-natal streams in the Snake River Basin. Out-of-basin strays were recovered from streams outside the Snake/Columbia rivers migration corridor. Numbers in parenthesis are unexpanded CWT recoveries.

			Recovery location						
Brood year	CWT code	Number released	Lookingglass Creek[a]	Ocean catch[b]	Columbia River[b]	Snake River[b]	In-basin strays[b]	Out-of-basin strays[b]	Total
2002	093837	15,843	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	093838	37,352	14 (1)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	15
	Total	53,195	14 (1)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	15
2003	093824	66,578	79 (13)	0 (0)	9 (4)	1 (1)	1 (1)	0 (0)	90
2004	094216	71,466	29 (16)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	29
	094217	73,769	58 (32)	0 (0)	0 (0)	0 (0)	4 (3)	0 (0)	62
	Total	145,235	87 (48)	0 (0)	0 (0)	0 (0)	4 (3)	0 (0)	91
Grand Total		265,008	180 (62)	0 (0)	10 (6)	1 (1)	5 (4)	0 (0)	196

[a] *Expansion based on estimated number of CWT fish returning (brood year escapement x proportion with CWT x tag retention rate).*
[b] *Expanded number of total CWT fish recovered from PSMFC and ODFW databases.*

Table 14. Expanded adult recoveries by coded-wire tag group of Lostine River spring Chinook salmon for the 2007 return year. In-basin strays were recovered in non-natal streams in the Snake River Basin. Out-of-basin strays were recovered from streams outside the Snake/Columbia rivers migration corridor. Numbers in parenthesis are unexpanded CWT recoveries.

				Recovery location						
Brood year	Broodstock	CWT code	Number released	Lostine River[a]	Ocean catch[c]	Columbia River[c]	Snake River[c]	In-basin strays[c]	Out-of-basin strays[c]	Total
2002	Conventional	093830	58,004	21 (10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	21
	Conventional	093831	58,366	6 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6
	Captive	093821	58,030	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)	1
	Captive	093827	12,830	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0
	Captive	093829	27,773	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2
	Captive	093839	26,727	2 (1)	0 (0)	7 (1)	0 (0)	0 (0)	0 (0)	9
	Total		241,730	31 (15)	0 (0)	7 (1)	0 (0)	0 (0)	1 (1)	39
2003	Conventional	094037	58,004	104 (48)	0 (0)	18 (3)	0 (0)	3 (3)	0 (0)	125
	Conventional	094038	58,366	82 (38[b])	0 (0)	10 (2)	0 (0)	1 (1)	0 (0)	93
	Captive	092348	58,030	20 (9)	0 (0)	20 (2)	0 (0)	0 (0)	0 (0)	40
	Captive	094041	12,830	13 (6)	0 (0)	1 (1)	0 (0)	0 (0)	1 (1)	15
	Total		187,230	219 (101)	0 (0)	49 (8)	0 (0)	4 (4)	1 (1)	273
2004[c]	Conventional	094209	64,582	61 (39[b])	0 (0)	0 (0)	4 (1)	2 (2)	0 (0)	67
	Conventional	094210	65,339	25 (16[b])	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	25
	Conventional	094211	49,052	20 (13[b])	0 (0)	2 (1)	0 (0)	3 (3)	0 (0)	25
	Conventional	094214	18,978	25 (16[b])	0 (0)	3 (1)	0 (0)	1 (1)	0 (0)	29
	Captive	094212	15,895	3 (2[b])	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3
	Captive	094248	25,087	3 (2[b])	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3
	Total		238,933	137 (88)	0 (0)	5 (2)	4 (1)	6 (6)	0 (0)	152
Grand Total			667,893	387 (204)	0 (0)	61 (11)	4 (2)	10 (10)	2 (2)	470

[a] *Expansions based on estimated escapement to the Lostine River using revised weir data provided by NPT Fisheries Research.*

[b] *Recovered from Lostine River weir without biological data and not included in RMIS or ODFW databases. 094038 = 1 tag; 094202 = 2 tags; 094248 = 2 tags; 094209 = 37 tags; 094210 = 16; 094211 = 13 tags; 094214 = 14 tags.*

[c] *Estimated number of total CWT fish recovered from PSMFC and ODFW databases.*

Table 15. Summary of hatchery and natural spring Chinook salmon carcasses recovered and number of redds observed by stream during spawning ground surveys, 2007.

Basin, stream	Hatchery	Natural	Unknown Origin	Percent hatchery	Number of redds
Imnaha River Basin					
Big Sheep Creek	3	0	0	100.0	6
Imnaha River	75	35	6	68.2	252
Lick Creek	7	0	0	100.0	19
Totals	85	35	6	70.8	277
Grande Ronde River Basin					
Bear Creek	0	0	0	0.0	0
Catherine Creek	17	5	0	77.3	59
Grande Ronde River[a]	15	4	0	78.9	1
Hurricane Creek	0	0	0	0.0	16
Lookingglass Creek	35	6	0	85.4	53
Lostine River	53	26	5	67.1	104
Minam River[b]	1	26	0	3.7	101
Wallowa River	2	4	0	33.3	22
Wenaha River	2	23	6	8.0	86
Totals	125	94	11	57.1	442

[a] Includes 15 hatchery and 3 natural origin Chinook carcasses collected below the weir on 5 July. Only one natural origin carcasses was recovered during regularly spawning ground surveys in August and September.
[b] Includes the Little Minam River

Table 16. Summary of adipose-clipped Chinook salmon carcasses with coded-wire tags recovered during spawning ground surveys, 2007.

Recovery location	Brood year	CWT code	Number recovered	Release site
Imnaha River Basin				
Big Sheep Creek[a]	2004	094206	1	Imnaha River
Imnaha River	2002	093823	2	Imnaha River
	2003	094032	9	Imnaha River
		094033	4	Imnaha River
		094034	6	Imnaha River
		094102	1	Umatilla River
	2004	094206	1	Imnaha River
		094208	2	Imnaha River
Lick Creek[a]	2002	093823	1	Imnaha River
	2003	094033	1	Imnaha River
Grande Ronde River Basin				
Catherine Creek	2002	093836	1	Catherine Creek
	2003	070753	3	Catherine Creek
		070754	4	Catherine Creek
		094040	4	Catherine Creek
Grande Ronde[b]	2002	093833	1	Grande Ronde River
	2003	094035	1	Grande Ronde River
	2004	094213	12	Grande Ronde River
Lookingglass Creek	2002	093831	1	Lostine River
		093838	1	Lookingglass Creek
	2003	070754	2	Catherine Creek
		093824	12	Lookingglass Creek
		094038	1	Lostine River
		094039	1	Catherine Creek
	2004	094216	1	Lookingglass Creek
Lostine River	2002	093829	1	Lostine River
		093830	3	Lostine River
		093831	2	Lostine River
		093839	1	Lostine River
	2003	092348	9	Lostine River
		094037	13	Lostine River
		094038	7	Lostine River
		094041	6	Lostine River
	2004	094209	1	Lostine River
Wallowa River	2003	094047	1	Hood R W FK
	2004	094211	1	Lostine River

[a] *Recoveries of Imnaha River adults are probably the result of outplanting.*
[b] *Fifteen carcasses recovered on 5 July below the weir. The CWT code for one carcass was lost.*

Table 17. Number sampled and mean, standard deviation (STD), minimum and maximum ELISA OD levels for hatchery-reared [Captive (CBS) and Conventional (CONV) broodstock programs] and natural adult Chinook salmon from streams in the Grande Ronde and Imnaha river basins and sampled at Lookingglass Fish Hatchery (LFH) or as carcasses on spawning ground surveys (SGS), 2007.

Population, origin	Program	Sampling location	N	ELISA OD			
				Mean	STD	Minimum	Maximum
Catherine Creek							
Hatchery	CONV	LFH	34	0.0796	0.0215	0.061	0.154
Hatchery	CBS	SGS	8	0.0875	0.0192	0.070	0.123
Hatchery	CONV	SGS	9	0.0816	0.0083	0.067	0.092
Natural		LFH	15	0.0749	0.0085	0.065	0.092
Natural		SGS	4	0.0795	0.0121	0.064	0.093
Grande Ronde River							
Hatchery	CBS	LFH	2	0.0645	0.0021	0.063	0.066
Hatchery	CONV	LFH	29	0.0709	0.0099	0.057	0.104
Hatchery		SGS	15	0.0619	0.0046	0.055	0.071
Natural		LFH	8	0.0700	0.0139	0.057	0.098
Natural		SGS	3	0.0653	0.0015	0.064	0.067
Lostine River							
Hatchery	CONV	LFH	49	0.0678	0.0107	0.056	0.103
Hatchery	CBS	SGS	7	0.1091	0.0398	0.076	0.175
Hatchery	CONV	SGS	8	0.0848	0.0102	0.070	0.101
Natural		LFH	23	0.0659	0.0071	0.057	0.084
Natural		SGS	5	0.0960	0.0141	0.082	0.117
Lookingglass Creek							
Hatchery	CONV	LFH	25	0.1562	0.4073	0.063	2.108
Hatchery	CBS	SGS	13	0.1471	0.2257	0.070	0.897
Hatchery	CONV	SGS	15	0.0815	0.0109	0.068	0.103
Natural		SGS	3	0.0813	0.0050	0.076	0.086
Minam River							
Natural		SGS	7	0.4097	0.8741	0.069	2.392
Wenaha River							
Natural		SGS	6	0.2927	0.5239	0.070	1.362
Imnaha River							
Hatchery	CONV	LFH	106	0.0849	0.1169	0.056	1.189
Hatchery	CONV	SGS	28	0.0785	0.0083	0.064	0.094
Natural		LFH	30	0.0739	0.0117	0.060	0.110
Natural		SGS	16	0.0799	0.0137	0.065	0.123

Table 18. Number and percent of natural and hatchery-reared [Captive (CBS) and Conventional (CONV) broodstock programs] adult Chinook salmon from streams in the Grande Ronde and Imnaha basins sampled for BKD with ELISA OD levels in each category, 2007.

Population, origin	Program	ELISA category: Low (<0.2) N	Low (<0.2) %	Moderate (0.2 - <0.8) N	Moderate (0.2 - <0.8) %	High (≥ 0.8) N	High (≥ 0.8) %	Total
Catherine Creek								
Hatchery	CBS	8	100	0	0	0	0	8
Hatchery	CONV	43	100	0	0	0	0	43
Natural		19	100	0	0	0	0	19
Grande Ronde River								
Hatchery	CBS	2	100	0	0	0	0	2
Hatchery	CONV	44	100	0	0	0	0	44
Natural		11	100	0	0	0	0	11
Lostine River								
Hatchery	CBS	7	100	0	0	0	0	7
Hatchery	CONV	57	100	0	0	0	0	57
Natural		28	100	0	0	0	0	28
Lookingglass Creek								
Hatchery	CBS	12	92	0	0	1	8	13
Hatchery	CONV	39	98	0	0	1	3	40
Natural		3	100	0	0	0	0	3
Minam River								
Natural		6	86	0	0	1	14	7
Wenaha River								
Natural		5	83	0	0	1	17	6
Imnaha River								
Hatchery	CONV	131	98	2	1	1	1	134
Natural		46	100	0	0	0	0	46

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