LOWER SNAKE RIVER COMPENSATION PLAN:
Oregon Spring Chinook Salmon Evaluation Studies
2001 Annual Progress Report

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OREGON
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LOWER SNAKE RIVER
COMPENSATION PLAN

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Preface

This progress report provides summary information for Lower Snake River Compensation Plan (LSRCP) spring Chinook salmon programs operated by Oregon Department of Fish and Wildlife (ODFW) in the Grande Ronde and Imnaha river basins during 2001. These ongoing monitoring and evaluation programs provide technical, logistical and biological information to managers charged with maintaining viable Chinook salmon populations and associated fisheries in northeast Oregon.

The data in this report serve as the basis for assessing the success of meeting management objectives and were derived from hatchery inventories and standard databases (e.g., PSMFC, coded-wire tag) or through standard sampling techniques. 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, protocols are described in more detail. Additional descriptions of protocols can be found in the 2001 work statement (Carmichael and Ruzycki 2001). Coded-wire tag (CWT) data collected from 2001 adult returns were used to evaluate smolt-to-adult survival rates in production and experimental rearing and release groups. In 2001, experimental treatments from which salmon returned included, size at release and rearing density for Imnaha stock. Analysis of data for specific survival studies will be completed once all cohorts have returned and CWT data are complete for a given experiment. In addition, much of the data that we discuss in this report will be used in separate and specific evaluations of ongoing supplementation programs for Chinook salmon in the Grande Ronde and Imnaha river basins. We began fish 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, 1988, 1999 and 2004; Hoffnagle et al. 2005; Messmer et al. 1989, 1990, 1991, 1992 and 1993; Monzyk et al 2006a, 2006b) and United States v. Oregon production report (Carmichael et al. 1986b).

Within each section of this report, data are organized into salmon culture monitoring for juveniles, adults, CWT recoveries, compensation goals and estimates for total escapement. During the period covered in this report, Chinook salmon smolts from the 1999 cohort and parr from the 2000 cohort were released, Chinook salmon from the 1996-1998 cohorts returned to spawn, and adult Chinook salmon that returned to spawn were used to create the 2001 cohort.

Acknowledgments

Mike Gribble, Bob Lund, and many other hatchery personnel exhibited great dedication and provided essential assistance. Numerous personnel from 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 14-10-01-J043, a cooperative agreement with the Oregon Department of Fish and Wildlife.

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EXECUTIVE SUMMARY

In 2001 we released 123,014 smolts from the 1999 cohort into the Imnaha River. We estimated 90.8% of the released smolts were recognizably marked with adipose fin clips (ad clips). In addition, smolts produced from captive broodstock were released in the Grande Ronde Basin. We released 133,883 smolts from the 1999 cohort into the Lostine River with an estimated 93.7% recognizably marked with ad clips. We released 136,833 smolts into Catherine Creek with 94.9% of these fish recognizably marked with ad clips. We released 2,560 smolts into the upper Grande Ronde River and estimated that 97.6% of these smolts had recognizable ad clip marks. We also had an emergency release of 76,941 parr from the 2000 cohort into the Grande Ronde River with 99.0% of these fish recognizably marked with ad clips. In addition, we had an emergency release into Lookingglass Creek of 51,864 Catherine Creek stock parr from the 2000 cohort. We were unable to estimate percent ad clip for these fish prior to release. Emergency releases were due to raceway valve malfunctions on two raceways at Lookingglass Fish Hatchery.

In 2001, we trapped 2,003 hatchery- and 1,503 naturally-produced Chinook salmon on the Imnaha River. We trapped 627 Rapid River stock Chinook salmon on Lookingglass Creek along with 54 naturally-produced Chinook salmon. In addition, we captured 105 hatchery- and 338 naturally-produced Chinook salmon on the Lostine River, 31 hatchery- and 90 naturally-produced Chinook salmon on Catherine Creek, and 50 naturally-produced Chinook salmon on the upper Grande Ronde River.

We estimated that 3,797 Imnaha River hatchery Chinook salmon returned to the LSRCP compensation area in 2001, achieving 118.3% of the adult compensation goals for the Imnaha River Program. In the Grande Ronde River Basin, we estimated 1,068 Rapid River stock, 138 Lostine River, and 148 Catherine Creek hatchery Chinook salmon returned to the compensation area achieving 23.3% of the compensation goal for the basin. In 2001, we recovered 803 carcasses and found 641 redds during spawning ground surveys in the Imnaha River Basin. In the Grande Ronde Basin, we recovered 438 carcasses and found 868 redds. There were eight strays recovered on spawning grounds in 2001 within the Grande Ronde River Basin. Five strays were Rapid River stock Chinook salmon released into Lookingglass Creek and recovered in the Minam River (2), Wenaha River (2), and the Lostine River (1). A Lostine River adult Chinook salmon strayed into Lookingglass Creek, a Umatilla River adult strayed into the Minam River, and a Yakima River adult strayed into the Wenaha River.

INTRODUCTION

This report summarizes spring Chinook salmon monitoring data for the Lower Snake River Compensation Plan (LSRCP) facilities in 2001. The main objective of this report is to document and evaluate salmon culture performance for spring Chinook salmon 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, and to provide information to adapt the programs to most effectively meet management objectives. This report provides information on rearing and release operations for the 1999 and 2000 cohorts of juvenile Chinook salmon, the collection, spawning, and adult characteristics for the 2001 return of adult Chinook salmon, and the collection of eggs for the 2001 cohort.

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 by stock to each LSRCP broodstock collection facility.
4. Estimate annual hatchery returns to compensation areas and determine success in meeting mitigation goals.
5. Estimate annual smolt survival to Lower Granite Dam 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 all Imnaha and Grande Ronde 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 salmon populations.
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 2001, Chinook salmon from the 1999 cohort produced from Conventional Broodstock were released as smolts into the Imnaha River. In the Grande Ronde River Basin, smolts from the 1999 cohort produced from the Captive Broodstock Program were released into the Lostine River, Grande Ronde River, and Catherine Creek. In addition, we had an emergency release of parr from the 2000 cohort produced from the Grande Ronde River Captive Broodstock Program into the Grande Ronde River and a release of parr from the Catherine Creek Captive Broodstock Program into Lookingglass Creek. These releases were the result of raceway valve malfunctions on two raceways at Lookingglass Fish Hatchery and co-managers decision not to increase rearing densities by transferring parr to other raceways. Adult Chinook salmon from the 1996-1998 cohorts returned to spawn and were used as broodstock to create the 2001 cohort to be reared at Lookingglass Fish Hatchery. In 2001, experimental treatments from which salmon returned included, size at release and rearing density for Imnaha stock. Analysis of data for specific survival studies will be completed once all cohorts have returned and coded-wire tag (CWT) data are complete for a given experiment and will be presented in separate and specific reports for these experiments. 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 Grande Ronde and Imnaha river basins.

Juveniles

Green egg-to-smolt survival rates for the 1999 cohort of Chinook salmon released in 2001 were 72.8% for the Imnaha River Conventional Broodstock offspring, and 54.9% for Lostine River, 42.4% for Grande Ronde River, and 52.3% for Catherine Creek Captive Broodstock offspring (Table 1). The release of 123,014 smolts from the 1999 Imnaha River cohort was well below the specific annual mitigation goal of 490,000. This was the result of a poor 1999 return, as well as broodstock collection strategies that placed a large proportion of trapped hatchery and natural salmon above the weir to spawn naturally. The production goal for

the 1999 cohort of Lostine River, Grande Ronde River, and Catherine Creek Chinook salmon was set at 150,000 per stock. The release of 133,883 Lostine River and 136,833 Catherine Creek smolts was slightly below the production goal. The release of 2,560 Grande Ronde River smolts was well below the production goal and was because of a poor 1995 return that resulted in no captive broodstock collections. We attempted to mark all smolts from each stock of the 1999 cohort and all parr from the 2000 cohort with Ad clip+CWT. Unique CWT codes were used for each raceway at Lookingglass Fish Hatchery. We had good Ad clip+CWT mark rates for each stock from the 1999 cohort (Table 2): Imnaha (90.6%); Lostine (93.0%); Grande Ronde (97%); and Catherine Creek (93.7%). The 2000 Grande Ronde cohort had a mark rate of 96.0% but we were unable to determine application success for the 2000 Catherine Creek cohort released into Lookingglass Creek.

The 1999 cohort of Imnaha River Chinook salmon was reared in four raceways at Lookingglass Fish Hatchery. All Imnaha River Chinook salmon smolts were acclimated at the Imnaha Acclimation Facility starting 27-28 February 2001. Smolts were volitionally released beginning on 1 April 2001 and the remaining smolts were forced out on 16 April 2001 (Table 3). Lostine River Chinook salmon smolts were reared in six raceways at the hatchery and transported to the Lostine acclimation ponds. A broken pipe at the acclimation facility necessitated a forced emergency release on 29 March 2001. Catherine Creek Chinook salmon smolts were reared in six raceways and transported to Catherine Creek acclimation ponds on 8-9 March 2001. Smolts were volitionally released beginning 1 April 2001 and forced out on 16 April 2001. Grande Ronde River Chinook salmon smolts were reared in one raceway, transported to Grande Ronde acclimation ponds on 27 February and forced out on 26 March 2001. Smolt migration success was monitored based on first-time PIT-tag detections at mainstem dams. We observed slightly higher detection rates for the 1999 cohort than we observed for the 1998 cohort. Overall, smolts from the Imnaha River had higher detection rates than any Grande Ronde Basin stock (Table 3).

The 2000 cohort of Grande Ronde River Chinook parr were released into the Grande Ronde River on 2 October 2001. The 2000 cohort of Catherine Creek Chinook salmon parr produced from Captive Broodstock parents were released into Lookingglass Creek on 24 September 2001. This was the first release of Catherine Creek stock salmon into Lookingglass Creek in an effort to substitute Rapid River stock with a stock endemic to the Grande Ronde Basin. Parr releases were precipitated by raceway valve malfunctions at the hatchery.

Adults

The Imnaha River weir was installed on 24 May 2001, well before the target date of 15 June, and operated until 29 September 2001 (Table 4). We trapped 2,003 hatchery- and 1,503 naturally-produced salmon and retained 10.1% (237 hatchery; 116 natural) for broodstock (Table 5). The remaining salmon were either outplanted to Big Sheep and Lick creeks (517 hatchery Chinook salmon) or released above the weir to spawn naturally (1,249 hatchery, 1,387 natural). Age structure of salmon used for broodstock was determined from CWT age, scale age and length-at-age relationships (Figure 1). Age 4 adults were the dominant age group returning to the Imnaha River weir, comprising 65.5% of the hatchery- and 84.8% of the naturally-produced adults (Table 5). Age 3 males (jacks) comprised 30.4% of hatchery- and 4.0% of naturally-produced returns. Pre-spawn mortality of combined hatchery and natural Imnaha River Chinook salmon held at LFH was 2.7%. We spawned 51 hatchery and 47 natural females with 122

hatchery and 37 natural males (Table 5). We collected 459,276 eggs, which was below our goal of 576,500 green eggs**,** and incubated them at Lookingglass Fish Hatchery (Table 6). Mortality to shocking was high (39.3%) compared to previous years.

In 2001, a total of 627 Rapid River hatchery Chinook salmon (613 Ad-RV marked and 14 Ad-only) were collected at the weir on Lookingglass Creek (Table 4). An additional 54 naturally-produced Chinook salmon were collected. The majority of the hatchery- and naturally-produced fish were returned below the weir for a recreational fishery. Based on limited age information, 86.8% of the hatchery- and 70.3% of the naturally-produced adults were age 4. Age 3 males comprised 2.5% of hatchery- and 1.9% of naturally-produced returns. No fish were kept for broodstock at Lookingglass Fish Hatchery in an effort to replace Rapid River stock with stock endemic to the Grande Ronde Basin.

The Lostine River weir captured 105 hatchery- and 338 naturally-produced adult Chinook salmon and we retained 20% (19 hatchery, 68 natural) for broodstock (Table 5). The remaining fish were passed upstream to spawn naturally. Age 4 adults comprised 75.2% of the hatchery returns and were from the 1997 cohort produced from Conventional Broodstock parents (Table 5). Age 3 jacks comprised 23.8% of hatchery returns and were the 1998 cohort produced from Captive Broodstock parents, the first return of Captive Broodstock offspring. Age composition of naturally-produced adults was 90.5% age 4 and 2.4% age 3. Pre-spawning mortality of the fish held at Lookingglass Hatchery was 9.2%. We spawned eight hatchery and 28 natural females with three hatchery and 28 natural males. We collected 139,768 eggs, which was below the goal of 176,600 green eggs. Egg mortality to shocking was high (30.2%) compared to the egg mortality of 2000 Conventional Broodstock spawning (3.1%).

At the Catherine Creek weir, we captured 29 hatchery- and 90 naturally-produced Chinook salmon. All returning hatchery Chinook were jacks and were Captive Broodstock offspring. We kept and spawned 13 natural females with seven natural males (Table 5) and collected 41,826 eggs (Table 6). Egg mortality to shocking was high 36.8%. This was the first year of Conventional Broodstock spawning for Catherine Creek stock spring Chinook salmon.

At the upper Grande Ronde River weir, we captured 50 naturally-produced Chinook salmon. We released 29 above the weir to spawn naturally and 21 were kept for broodstock. We spawned eight natural females with eight natural males and had five pre-spawn mortalities (Table 5). We collected 29,580 eggs and mortality to shocking was 14.5%. This was the first year of Conventional Broodstock spawning for Grande Ronde River stock spring Chinook salmon.

Coded-Wire Tag Recoveries

We used coded-wire tag recoveries from adult returns, strays, and fisheries collections from experimental and production groups of each stock of Chinook salmon to evaluate hatchery treatments and assess the success of achieving mitigation goals and management objectives. Hatchery fish from all experimental and 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 results. 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. We summarized from the RMIS database the observed and expanded number of CWTs recovered in ocean and mainstem river fisheries as well as strays collected in and out of the Snake River Basin.

Expanded numbers in the RMIS database were the estimated number of CWT fish caught 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. We expanded observed recoveries from returning hatchery adults (from weir collections and spawning ground recoveries) from each cohort to the Imnaha, Lostine, and Grande Ronde rivers and Catherine Creek. Observed recoveries were expanded for unrecovered CWT adults by first estimating hatchery escapement to each stream for each cohort (see Monzyk et al. 2006a). For each stream, the total number of coded-wire tagged returns was estimated by multiplying the hatchery escapement estimate by the proportion of the cohort tagged at release and the weighted average tag retention rate for each cohort. The expanded number of recoveries for each CWT code group was estimated by multiplying the total number of CWT returns by the relative proportion of each CWT code within a cohort.

Nearly all CWT recoveries for hatchery Chinook salmon released in the Imnaha and Grande Ronde basins occurred in the Snake River Basin (Tables 7, 8, and 9). In 2001, we recovered 385 hatchery-reared Imnaha River Chinook salmon with a CWT from the 1996-1998 cohorts. These recoveries were expanded to an estimated 3,694 CWT returns to the Imnaha River with the following age distribution: 152 from the 1996 cohort; 2,435 from the 1997 cohort; and 1,107 from the 1998 cohort (Table7). We also estimated nine CWT salmon were recovered in ocean fisheries. We estimated 206 CWT marked Imnaha River salmon were recovered in the Columbia River (Table 10). In addition, 55 were recovered in the Deschutes Rivers and six strays were recovered elsewhere outside the Snake River basin: one from Cole Rivers Hatchery; an estimated three from Marion Forks Hatchery; one from Noble Creek; and one from the North Fork John Day River. Within the Snake River Basin, an estimated eight salmon strayed to the Tucannon River.

In 2001, we recovered 699 CWT marked Rapid River Chinook salmon from the 1996-1998 cohorts released from Lookingglass Fish Hatchery (Table 8). Of those, 446 CWT fish were recovered at the LFH weir or during spawning ground surveys on Lookingglass Creek. No ocean recoveries were reported but 242 were recovered from the Columbia River (Table 10). There were four strays recovered in the Deschutes River and seven strays within the Snake River Basin. Within the basin, two were recovered in the Minam River, two in the Wenaha River, two in the Lostine River, and one was recovered at the Imnaha River weir.

We recovered 46 hatchery-reared Lostine River Chinook salmon with a CWT from the 1997 and 1998 cohorts in 2001. These recoveries were expanded to an estimated 136 CWT returns to the Lostine River with the following age distribution: 103 from the 1997 cohort; and 33 from the 1998 cohort (Table 9). Two were recovered outside the Snake River Basin in the Deschutes River. Within the Snake River Basin, two were recovered in Johnson Creek (South Fork Salmon River basin) and one was recovered in Lookingglass Creek.

In 2001, we recovered 26 hatchery-reared Catherine Creek Chinook salmon with a CWT from the 1998 cohorts. These recoveries were expanded to an estimated 154 CWT returns to Catherine Creek, all from the 1998 cohort (Table 9). An estimated nine CWT marked Catherine Creek hatchery salmon were recovered in the Columbia River sport fishery, and two strays were recovered within the Snake River Basin (both in Lookingglass Creek).

Compensation Goals

The total number of hatchery-produced salmon for each stock that are recovered in fisheries, escape to the stream of release, or stray within or outside the Snake River basin can be estimated based on CWT recoveries, weir counts, redd counts, and mark-recapture estimates during spawning ground surveys. To calculate the return to the LSRCP Compensation Area, defined as the Snake River basin above Ice Harbor Dam, we summed all estimated escapement for the 2001 return year that occurred above Ice Harbor Dam.

We reached the adult compensation goal in 2001 for the Imnaha Basin (Table 10). We estimated 3,797 Imnaha River adults returned to the compensation area, 118.3% of the compensation goal for the basin. In the Grande Ronde Basin, we estimated 1,068 Rapid River adults, 138 Lostine River adults, 159 Catherine Creek adults and no Grande Ronde River adults returned to the compensation area (Table 11). Combined, these returns accounted for only 23.5% of Grande Ronde Basin compensation goal of 5,820 adults. The primary factors causing low hatchery returns in the basin were management strategies that reduced the number of Rapid River salmon released in the basin (1998 and 1999 cohorts) and newly initiated endemic broodstock programs that are yet to reach production goals.

The progeny-to-parent ratio for combined hatchery and natural origin Imnaha River salmon that spawned naturally in 1996 was 1.8, higher than the mean value since 1982 and above replacement for the first time in thirteen years (Figure 2). The progeny-to-parent ratio for the hatchery component was 13.1, better than naturally spawning salmon and well above replacement. The number of natural salmon that returned to the basin to spawn (2,502) was much higher than the 2000 return and much greater than the average return since 1990 (Figure 3).

Natural Escapement Monitoring

Stream surveys to enumerate spring Chinook salmon redds and to sample salmon carcasses were conducted as in previous years (see Monzyk et al. 2006a). We surveyed three streams in the Imnaha River Basin and nine in the Grande Ronde Basin.

In 2001, we counted 641 redds and recovered 803 carcasses in the Imnaha Basin (Table 13). All marked hatchery salmon recovered on spawning grounds were Imnaha stock (Table 12). Marked salmon comprised 48.7% of the recovered carcasses of known origin.

In the Grande Ronde Basin, we observed 868 redds and recovered 438 carcasses on the spawning grounds. We recovered eight marked hatchery strays in the Grande Ronde Basin that spawned naturally (Table 12). In Lookingglass Creek, one stray from the 1997 Lostine River cohort was recovered. In the Minam River, two strays that were released from Lookingglass Fish Hatchery (1997 cohort) and another from the Umatilla River (1997 cohort) were recovered. In the Wenaha River, two strays that were released from Lookingglass Fish Hatchery (1997 cohort), and one stray from the Yakima River were recovered. In the Lostine River, a stray that was released from Lookingglass Fish Hatchery (1997 cohort) was recovered. Marked salmon comprised 33.7% of the carcasses recovered and hatchery strays comprised 1.8% of the total carcasses recovered in the Grande Ronde Basin.

The majority of adults on the spawning grounds were age 4 salmon from the 1997 cohort for both the Imnaha River Basin (81.4%) and the Grande Ronde River Basin (82.5%) (Table 14). The spawning population was fairly equally distributed between males and females and between hatchery- and naturally-produced adults in the Imnaha River Basin. In the Grande Ronde River

Basin, the majority of the spawning population was female (63.8%). Also, adults of natural origin comprised the majority of spawners (89.0%).

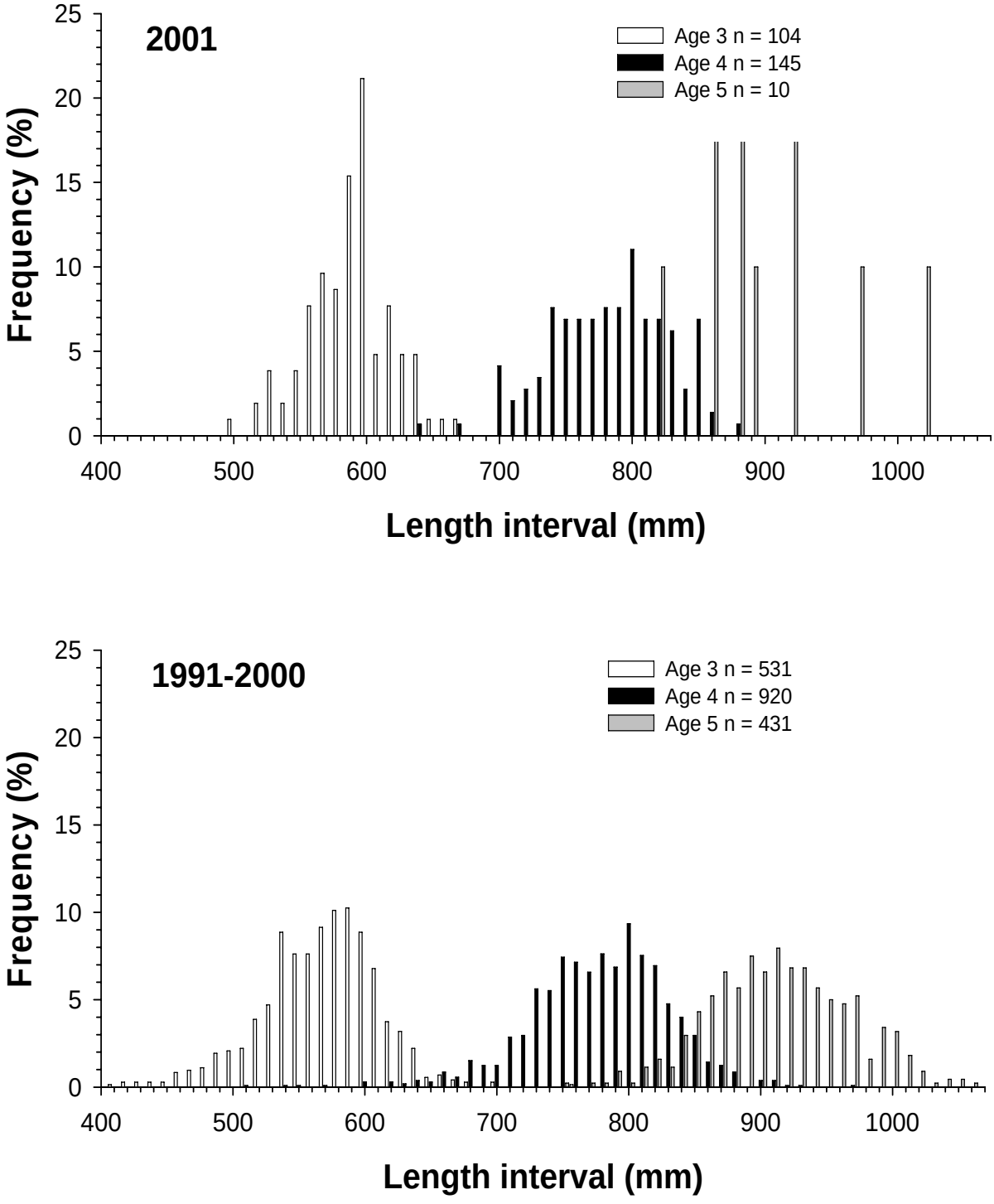

Figure 1. Length frequency-at-age relationship for Imnaha River Chinook salmon adults used as hatchery broodstock in 2001 (top) and from 1991-2000 (bottom).

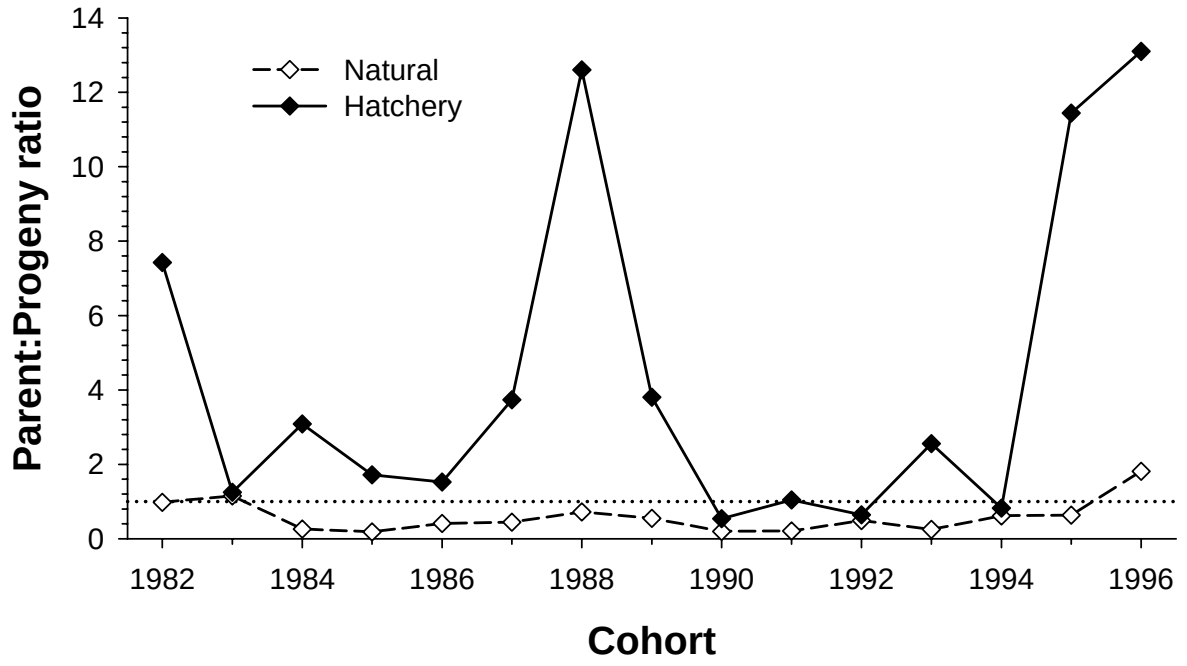

Figure 2. Progeny-to-parent ratios for completed cohorts (1982-1996) of Imnaha River Chinook salmon. Note: dotted line indicates P:P ratio=1.

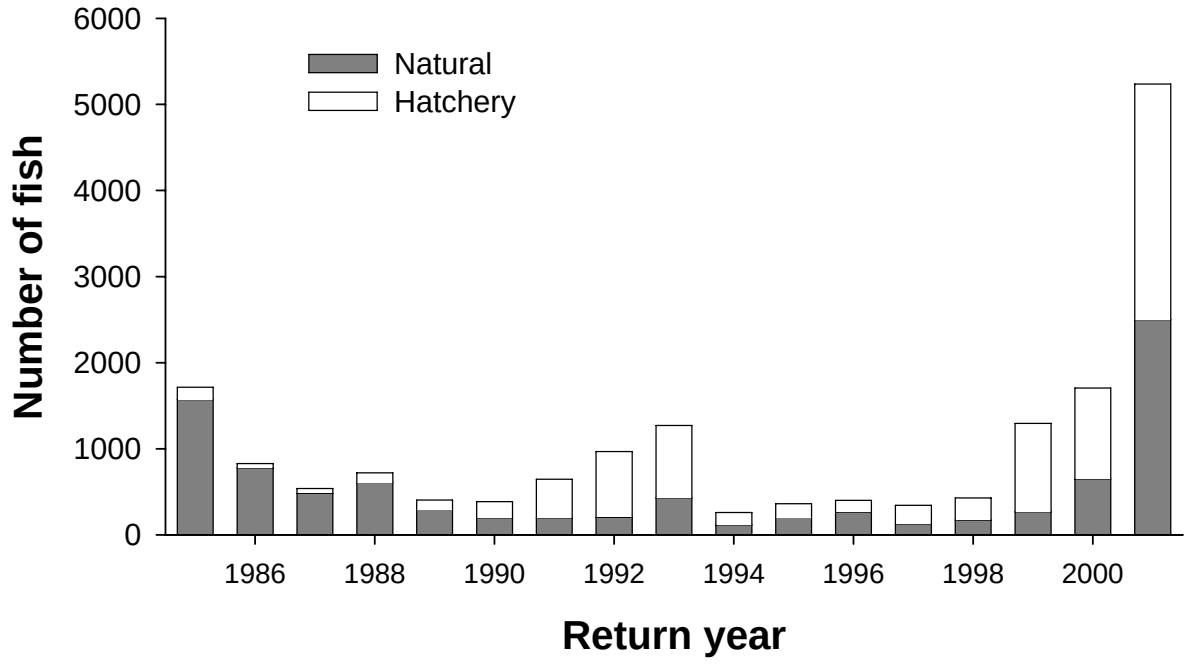

Figure 3. Estimated numbers of natural- and hatchery-origin Chinook salmon spawning in the Imnaha River, 1985-2001.

Table 1. Rearing summaries for the 1999 cohort of spring Chinook salmon smolts and 2000 cohort of spring Chinook salmon parr released into the Grande Ronde and Imnaha river basins in 2001.

Cohort, stock	Brookstock	Number of green eggs taken	Eyed eggs	Percent Survival		Total released
				Green -to- eyed	Eyed - to- smolt	
1999 cohort						
Imnaha River	Conventional	168,930	128,777	76.2	95.5	123,014
Lostine River	Captive	243,852	183,084	75.1	73.1	133,883
Grande Ronde River	Captive	6,043	3,565	59.0	71.8	2,560
Catherine Creek	Captive	261,764	194,187	74.2	70.5	136,833
2000 Cohort						
Grande Ronde River[a]	Captive	298,878	256,004	85.7	-	76,941
Catherine Creek[b]	Captive	299,154	219,095	73.2	-	51,864

[a] *Emergency release into Grande Ronde River on 2 October 2001 due to raceway 12 valve malfunction.*

[b] *Emergency release into Lookingglass Creek on 24 September 2001 due to raceway 10 valve malfunction.*

Table 2. Estimates of percent of adipose fin clip (Ad) and coded-wire tag application success for Imnaha River, Lostine River, Grande Ronde River, and Catherine Creek 1999 cohort and Grande Ronde River and Catherine Creek 2000 cohort spring Chinook salmon reared at Lookingglass Fish Hatchery and released in 2001. Targets were 100% Ad with CWT.

Stock, raceway	CWT code	Number checked	Ad clip, with CWT	Ad clip, no CWT	No Ad clip, with CWT	No Ad clip, no CWT
Imnaha River (1999)						
15	093057	501	89.0	0.6	10.4	0.0
16	093058	497	90.1	0.2	9.7	0.0
17	093059	501	94.2	0.0	5.8	0.0
18	093056	504	88.9	0.0	11.1	0.0
Total/mean		2,003	90.6	0.2	9.2	0.0
Lostine River (1999)						
2	093104	503	95.4	0.0	4.6	0.0
3	093060	90	91.1	3.3	5.6	0.0
3	093105	87	92.0	2.3	5.7	0.0
3	093062	320	92.8	3.1	3.1	0.1
4	093061	167	93.4	0.6	6.0	0.0
4	093103	334	93.1	0.6	6.0	0.3
5	093102	504	95.2	0.2	4.6	0.0
6	093063	506	90.7	0.4	8.9	0.0
7	093101	504	91.3	0.0	8.5	0.2
Total / mean		3,015	93.0	0.7	6.1	0.2
Grande Ronde (1999)						
13	093115	500	97.0	0.6	2.4	0.0
Total / mean		500	97.0	0.6	2.4	0.0
Catherine Creek (1999)						
9	093107	101	94.0	4.0	2.0	0.0
9	093111	400	95.3	3.3	1.5	0.0
10	093227	497	90.5	0.0	9.5	0.0
11	093226	189	94.7	1.6	3.2	0.5
11	093108	166	94.6	1.8	3.6	0.0
11	093106	145	95.2	1.4	3.4	0.0
12	093112	502	93.6	1.6	4.8	0.0
13	093113	500	94.2	0.0	5.2	0.6
14	093109	234	94.0	0.4	5.6	0.0
14	093110	267	94.0	0.4	5.2	0.4
Total/mean		3,001	93.7	1.2	5.0	0.2

Table 2 continued.

Stock, raceway	CWT code	Number checked	AD clip, with CWT	AD clip, no CWT	No AD clip, with CWT	No AD clip, no CWT
Grande Ronde (2000)						
12	093442	37	97.3	2.7	0.0	0.0
12	093444	352	95.7	3.1	1.1	0.0
12	093424	110	96.4	2.7	0.9	0.0
Total/mean		499	96.0	3.0	1.0	0.0
12	none	16,983	0	16,983	0	0
Catherine Creek (2000)[a]						
10	093434	n/a	n/a	n/a	n/a	n/a
10	093437	n/a	n/a	n/a	n/a	n/a

[a] *Unable to conduct tag retention test due to emergency release.*

Table 3. Mean size of Imnaha River, Lostine River, Grande Ronde River, and Catherine Creek 1999 cohort and Grande Ronde River and Catherine Creek 2000 cohort spring Chinook salmon, total number released, number PIT-tagged and percent detected at Snake and Columbia river dams in 2001.

Stock, raceway	Release date (1999)	Cohort	Life stage at release	CWT code	Fork Length (mm)		Weight (g)		Condition factor (K)		Total released[a]	Number PIT-tagged	Percent PIT tags detected[b]
					Mean	SD	Mean	SD	Mean	SD			
Imnaha River – released at Imnaha acclimation site													
15	1-16 APR	1999	Smolt	093057	127.6	9.4	24.5	5.0	1.20	0.18	35,863	6,811	72.3
16	1-16 APR	1999	Smolt	093058	124.8	12.5	24.4	5.7	1.25	0.37	35,880	6,807	72.4
17	1-16 APR	1999	Smolt	093059	129.2	11.3	27.7	5.7	1.33	0.20	33,238	6,808	73.7
18	1-16 APR	1999	Smolt	093056	132.7	15.2	26.0	11.5	1.11	0.33	18,033	496	73.6
Total/mean											123,014	20,922	72.8
Lostine River – released at Lostine acclimation site													
2	29 MAR	1999	Smolt	093104	119.5	8.7	20.9	3.9	1.27	0.11	34,124	3,495	45.4
3	29 MAR	1999	Smolt	093105 093062 093060	124.6	8.3	24.7	4.7	1.28	0.09	19,988	0	-
4	29 MAR	1999	Smolt	093061 093103	118.5	7.7	21.3	5.0	1.30	0.10	33,825	3,487	48.1
5	29 MAR	1999	Smolt	093102	121.8	9.3	23.2	5.8	1.29	0.10	14,360	475	53.1
6	29 MAR	1999	Smolt	093063	121.4	6.8	24.7	5.4	1.32	0.15	16,307	0	-
7	29 MAR	1999	Smolt	093101	121.8	6.6	23.7	3.4	1.31	0.07	15,279	430	27.2
Total/mean											133,883	7,887	46.1

[a] *Equals total number released in Table 1 by stock. Total released includes all fish with adipose clip and CWT (target 100%).*

[b] *Percent PIT tag detections are unique detections at all dams in the Snake and Columbia Rivers.*

Table 3 continued.

Stock, raceway	Release date (1999)	Cohort	Life stage at release	CWT code	Fork Length (mm) Mean	Fork Length (mm) SD	Weight (g) Mean	Weight (g) SD	Condition factor (K) Mean	Condition factor (K) SD	Total released[a]	Number PIT-tagged	Percent PIT tags detected[b]
Catherine Creek – released at Catherine Creek acclimation site													
9	1-16 APR	1999	Smolt	093107 093111	123.3	9.1	23.0	5.1	1.30	0.08	23,696	0	-
10	1-16 APR	1999	Smolt	093227	122.9	9.6	25.2	5.2	1.39	0.17	16,652	469	3.6[c]
11	1-16 APR	1999	Smolt	093226 093108 093106	127.6	15.0	27.1	8.4	1.29	0.17	20,920	0	-
12	1-16 APR	1999	Smolt	093112	118.2	10.2	20.4	4.4	1.31	0.19	25,498	6,801	48.8
13	1-16 APR	1999	Smolt	093113	118.3	9.5	21.2	3.6	1.33	0.17	25,534	6,823	50.8
14	1-16 APR	1999	Smolt	093109 093110	121.8	9.6	20.9	5.2	1.28	0.15	24,533	6,822	52.7
10	24 SEP	2000	Parr	093434 093437	-	-	-	-	-	-	51,864	499	7.0
Total/mean											188,697	20,914	48.7
Grande Ronde River – released at Grande Ronde acclimation site													
8	26 MAR	1999	Smolt	093115	135.8	13.9	32.6	8.7	1.28	0.11	2,560	495	49.7
12	2 OCT	2000	Parr	093444 093442 093424	-	-	-	-	-	-	76,941	500	20.8
Total/mean											79,501	1,000	35.2

[c] *Fish in raceway had high BKD levels.*

Table 4. Recoveries of adult spring Chinook salmon at northeast Oregon LSRCP weir facilities in 2001. No salmon were captured in any trap before 7 May or after 23 September.

		Imnaha River		Lostine River		Catherine Creek		Grande Ronde River		Lookingglass Creek	
Period	Week of year	Marked	Un-marked	Marked	Un-marked	Marked	Un-marked	Marked	Un-marked	Marked	Un-marked
Dates of operation		24 MAY – 29 SEP		27 APR – 3 OCT		31 MAR – 9 SEP		31 MAR –17 AUG		6 APR – 4 OCT	
7-13 MAY	19	-	-	0	0	0	0	0	0	1	0
14-20 MAY	20	-	-	0	0	0	0	0	0	56	16
21-27 MAY	21	0	0	0	0	0	10	0	9	233	15
28 MAY - 3 JUN	22	0	0	0	1	0	12	0	11	81	9
4-10 JUN	23	74	60	1	14	2	23	0	13	22	1
11-17 JUN	24	158	135	8	61	11	17	0	1	10	1
18-24 JUN	25	167	139	16	98	4	10	0	2	31	2
25 JUN – 1 JUL	26	382	404	16	56	4	4	0	1	5	0
2-8 JUL	27	356	306	10	33	7	11	0	1	3	2
9-15 JUL	28	181	138	3	5	0	0	0	0	36	1
16-22 JUL	29	151	65	6	5	0	0	0	0	16	2
23-29 JUL	30	247	68	5	7	0	0	0	0	0	0
30 JUL - 5 AUG	31	99	17	2	0	0	0	0	0	0	0
6-12 AUG	32	54	24	0	0	0	0	0	0	51	0
13-19 AUG	33	17	16	0	3	0	0	0	0	0	0
20-26 AUG	34	25	34	0	0	-	0	-	-	66	1
27 AUG - 2 SEP	35	61	75	17	17	-	2	-	-	12	2
3-9 SEP	36	20	15	16	17	3	1	-	-	2	2
10-16 SEP	37	10	7	5	18	-	-	-	-	2	0
17-23 SEP	38	1	0	0	3	-	-	-	-	0	0
Total		2,003	1,503	105	338	31	90	0	38[a]	627	54

[a] *An additional 12 adults were seined below the weir.*

Table 5. Number and disposition of adult spring Chinook salmon that returned to northeast Oregon LSRCP facilities in 2001 by origin, age, and sex.

	Hatchery							Natural							
	3		4		5			3		4		5			Grand
Stock, disposition	F	M	F	M	F	M	Total	F	M	F	M	F	M	Total	total
Imnaha River															
Trapped	1	608	805	506	40	43	2,003	0	60	608	658	94	83	1,503	3,506
Passed	0	199	598	383	34	35	1,249	0	51	557	611	87	81	1,387	2,636
Outplanted	0	280	138	87	5	7	517	0	0	0	0	0	0	0	517
Kept	1	129	69	36	1	1	237	0	9	51	47	7	2	116	353
Actual spawned	0	97	50	24	1	1	173	0	3	40	33	7	1	84	257
Killed, not spawned	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Pre-spawn mortality	1	32	19	12	0	0	64	0	6	11	13	0	1	31	95
Mean length (mm)[a]	620	577	781	724	865	887		-	533	783	779	889	853		
Standard deviation (mm)	NA	28.1	35.0	56.5	21.2	66.2		-	51.9	40.8	44.0	40.6	5.8		
Age composition (%)	>0.01	30.4	40.2	25.3	2.0	2.1	100	0	4.0	40.5	43.8	6.3	5.5	100	
Lookingglass Creek (Rapid River stock)															
Trapped[b]	0	16	254	290	21	46	627	0	1	26	12	4	11	54	671
Passed below weir[c]	0	1	4	1	2	6	459	0	1	26	12	4	11	54	503
Killed not spawned[c]	0	2	45	55	2	3	168	0	0	0	0	0	0	0	168
Mean length (mm)[a]	-	488	757	798	870	866		-	567	739	750	870	843		
Standard deviation (mm)	-	76.7	14.1	3.5	41.8	36.4		-		24.4	28.4	41.8	35.2		
Age composition (%)	-	2.5	40.5	46.3	3.3	7.4	100	-	1.9	48.1	22.2	7.4	20.3	100	

[a] *Mean length per age class determined from known age fish based on either CWT or scale data.*

[b] *Hatchery totals by age and sex are estimates based total trapped and age/sex proportion.*

[c] *Only 14 of 449 hatchery adults passed below weir and 107 of 168 hatchery adults killed not spawned had age and sex information collected. Of the adults with no age information, 218 males and 227 females were passed below the weir and 31 males and 30 females were killed for carcass study.*

Table 5 continued.

	Hatchery							Natural							
	3		4		5			3		4		5			
Stock, disposition	F	M	F	M	F	M	Total	F	M	F	M	F	M	Total	Grand total
Lostine River															
Trapped	0	25	44	35	1	0	105	0	8	136	170	6	18	338	444
Passed[d]	0	20	34	31	1	0	86	0	7	104	139	4	16	270	357
Kept	0	5	10	4	0	0	19	0	1	32	31	2	2	68	87
Actual spawned	0	0	8	3	0	0	11	0	1	28	28	1	2	60	71
Killed, not spawned	0	5	2	1	0	0	8	0	0	0	0	0	0	0	8
Pre-spawn mortality	0	0	0	0	0	0	0	0	0	4	3	1	0	8	8
Mean length (mm)[a]	-	523	767	742	823	812		-	513	756	741	830	850	-	
Standard deviation (mm)	-	45.8	23.9	55.1	30.0	14.6		-	50.8	27.8	34.8	30.3	50.2	-	
Age composition (%)	0	23.8	41.9	33.3	1.0	0	100	0	2.4	40.2	50.3	1.8	5.3	100	
Catherine Creek															
Trapped	0	31	0	0	0	0	31	0	9	40	33	3	3	90	121
Passed[e]	0	0	0	0	0	0	0	0	6	26	28	2	1	65	65
Kept	0	31	0	0	0	0	31	0	3	14	5	1	2	25	56
Spawned	0	0	0	0	0	0	0	0	2	13	4	0	1	20	20
Killed not spawned	0	31	0	0	0	0	31	0	0	0	0	0	0	0	31
Pre-spawn mortality	0	0	0	0	0	0	0	0	1	1	1	1	1	5	5
Mean length (mm)[a]	-	474	-	-	-	-		-	491	703	711	833	888	-	
Standard Deviation (mm)	-	37.3	-	-	-	-		-	66.0	36.1	47.9	225.9	67.9	-	
Age composition (%)	-	100	-	-	-	-	100	-	10.2	45.4	37.5	3.4	3.4	100	

[d] *Passed one wild male of unknown age.*

[e] *Passed two 2 salmon of unknown sex, one age 4 and one age 5.*

Table 5 continued.

	Hatchery							Natural							
	3		4		5			3		4		5			
Stock, disposition	F	M	F	M	F	M	Total	F	M	F	M	F	M	Total	Grand total
Grande Ronde River															
Trapped[f]	0	0	0	0	0	0	0	0	0	10	15	0	0	50	50
Passed[g]	0	0	0	0	0	0	0	0	0	8	11	0	0	29	29
Kept	0	0	0	0	0	0	0	0	0	10	9	0	2	21	21
Spawned	0	0	0	0	0	0	0	0	0	8	6	0	2	16	16
Pre-spawn mortality	0	0	0	0	0	0	0	0	0	2	3	0	0	5	5
Mean length (mm)[a]	-	-	-	-	-	-	-	-	-	732	737	-	820	-	
Standard Deviation (mm)	-	-	-	-	-	-	-	-	-	31.5	30.6	-	NA	-	
Age composition (%)	-	-	-	-	-	-	-	-	-	45.0	52.5	-	2.5	100	

[f] *38 total adults trapped at the weir, 13 of unknown sex. An additional 12 collected with seine below weir and kept for broodstock.*
[g] *Trapped and passed ten salmon of unknown sex. Eight were age 4 and one was age 5.*

Table 6. Timing of conventional broodstock spawning and spawning summaries for spring Chinook salmon at Lookingglass Fish Hatchery in 2001.

Stock, spawn date	Origin of parents	Number of parents F	Number of parents M[a]	Number of eggs collected	Number of eyed eggs	Percent mortality to shocking
Imnaha River						
14 AUG	Mixed	1	2	4,341	2,325	46.4
21 AUG	Mixed	6	8	27,600	10,770	60.9
28 AUG	Mixed	22	40	153,345	99,182	35.3
7 SEP	Mixed	54	92	255,343	158,011	39.6
11 SEP	Mixed	3	17	14,391	8,781	39.0
18 SEP	Mixed	1	2	4,256	3,472	18.4
Total/mean		87	161	459,276	282,541	39.3
Lostine River						
16 AUG	Mixed	1	2	3,816	848	77.8
23 AUG	Natural	4	4	14,904	9,444	36.6
	Mixed	11	10			
30 AUG	Natural	2	2	49,820	33,320	33.1
5 SEP	Mixed	13	12	52,411	41,176	20.9
11 SEP	Natural	3	3	13,315	10,055	23.3
18 SEP	Mixed	2	2	5,502	2,190	60.2
Total/mean		36	35	139,768	97,033	30.2
Catherine Creek						
16 AUG	Natural	1	2	Bad eggs		
23 AUG	Natural	3	3	10,112	9,175	7.8
30 AUG	Natural	6	4	20,201	9,920	47.4
5 SEP	Natural	3	2	11,513	6,473	43.8
Total/mean		13	11	41,826	25,568	36.8
Grande Ronde River						
30 AUG	Natural	1	2	3,081	2,697	12.5
5 SEP	Natural	3	3	11,632	10,545	9.3
11 SEP	Natural	4	4	14,867	12,097	18.6
Total/mean		8	9	29,580	25,339	14.3

[a] *The number of males in table are greater than the number kept because some males were recycled.*

Table 7. Expanded adult recoveries of coded-wire tagged Imnaha River spring Chinook salmon for the 2001 return year. Mainstem river recoveries were collected in Columbia/Snake rivers en route to the Imnaha River. In-basin strays were recovered in other streams within the Snake River basin. Out-of-basin strays were recovered from streams outside the Snake River Basin (not in the migration route) or in the upper Columbia River. Numbers in parentheses are unexpanded recoveries.

				Recovery location					
Cohort	Experimental group (target size at release and/or rearing density)	CWT code	Number released	Imnaha River[a]	Ocean catch[b]	Mainstem rivers[b]	In-basin strays[b]	Out-of-basin strays[b]	Total
1996[c]	30 g, 1/4 Density	092124	1,805	2	0	0	0	0	2
	30 g, 1/8 Density	092163	6,997	13	0	0	0	0	13
	18 g, 1/8 Density	092201	9,494	13	0	0	0	0	13
	18 g, 1/8 Density	092202	9,513	12	0	0	0	0	12
	30 g, 1/4 Density	092203	14,022	20	0	0	0	0	20
	30 g, 1/4 Density	092204	12,366	18	0	0	0	0	18
	18 g, 1/8 Density	092205	19,056	28 (1)	0	0	0	0	28
	30 g, 1/4 Density	092206	19,874	45	0	0	0	0	45
			93,127	152 (1)					152
1997	30 g, 1/2 Density	071248	26,796	185 (16)	0	17	0	3	205
	30 g, 1/4 Density	092558	13,308	104 (9)	0	10	0	2	116
	30 g, 1/4 Density	092559	14,872	127 (11)	0	11	0	1	139
	High BKD, not accl.	092609	10,278	58 (5)	0	11	0	1	70
	30 g, 1/4 Density	092612	13,395	115 (10)	0	8	0	0	123
	30 g, 1/4 Density	092613	13,363	185 (16)	0	10	0	3	198
	30 g, 1/4 Density	092614	13,997	69 (6)	0	7	0	1	77
	18 g, 1/4 Density	092615	22,385	415 (36)	0	37	0	5	457
	18 g, 1/4 Density	092616	21,787	381 (33)	4	17	0	2	404
	18 g, 1/2 Density	092619	44,712	796 (69)	3	14	0	8	821
	Total		194,893	2,435 (211)	7	142	0	26	2,610

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

Table 7 continued.

Cohort	Experimental group (target size at release and/or rearing density)	CWT code	Number released	Recovery location: Imnaha River[a]	Ocean catch[b]	Mainstem rivers[b]	In-basin strays[b]	Out-of-basin strays[b]	Total
1998	18 g	092821	18,633	96 (15)	0	9	0	2	107
	18 g	092822	18,617	83 (13)	2	0	0	7	92
	18 g	092823	18,618	96 (15)	0	3	0	0	99
	18 g	092824	18,624	83 (13)	0	0	0	0	83
	18 g	092825	18,600	141 (22)	0	10	0	2	153
	18 g	092826	15,245	45 (7)	0	20	0	3	68
	30 g	092827	17,590	115 (18)	0	0	0	9	124
	30 g	092828	17,585	160 (25)	0	0	4	4	168
	30 g	092829	17,581	166 (26)	0	20	4	4	194
	30 g	092830	18,894	122 (19)	0	2	0	4	128
	Total		179,987	1,107 (173)	2	64	8	35	1,216
	Grand Total		468,007	3,694 (385)	9	206	8	61	3,978

[c] *Used 2000 return year CWT proportion and 2001 escapement estimate to expand recoveries.*

Table 8. Expanded adult recoveries during the 2001 return year of coded-wire tagged Rapid River spring Chinook salmon, released as smolts from Lookingglass Fish Hatchery. Mainstem river recoveries were collected in Columbia/Snake/Grande Ronde rivers (other than Lower Granite Dam) en route to Lookingglass Creek (includes ocean recoveries). In-basin strays were fish collected in streams within the Snake River basin other than Lookingglass Creek. Out-of-basin strays were fish collected in streams outside the Snake River Basin (not in the migration route) or in the upper Columbia River.

				Recovery location					
Cohort	Experimental group[a]	CWT code	Number released	LFH weir[b]	Lower Granite Dam	Mainstem rivers	In-basin strays	Out-of-basin strays	Total
1996	Production	075309	31,880	6	0	0	0	0	6
	Production	075310	34,747	0	0	0	0	0	0
	Production	075311	33,216	2	0	1	0	0	3
	Production	075850	33,430	5	0	0	0	0	5
	Unmarked[c]	092207	51,131	1	0	0	0	0	1
	Unmarked[c]	092208	17,893	0	0	0	0	0	0
	Production	092209	12,760	2	0	10	0	0	12
	Production	092210	28,163	3	0	5	0	0	8
	Production	092211	31,006	3	0	0	0	0	3
	Production	092212	27,919	3	0	13	0	0	16
	Total		302,145	25	0	29	0	0	54
1997	Production	070148	56,638	77	0	25	1	3	106
	Production	070749	64,166	69	0	32	2	1	104
	Production	092620	66,301	83	0	55	1	0	139
	Production	092621	58,896	84	0	41	2	0	127
	Production	092622	66,142	108	0	60	1	0	169
	Total		312,143	421	0	213	7	4	645

[a] *All groups reared at target size of 22.8 g except CWT group 092207(reared at 10.8 g).*

[b] *Includes observed fish killed at weir and downstream passed fish collected during spawning ground surveys. Weir counts were not expanded to be consistent with previous years.*

[c] *Progeny were from unmarked parents.*

Table 8 continued.

Cohort	Experimental group[a]	CWT code	Number released	Recovery location					Total
				LFH weir[b]	Lower Granite Dam	Mainstem rivers	In-basin strays	Out-of-basin strays	
1998	Production	092819	57,290	0	0	0	0	0	0
Grand Total			671,578	446	0	242	7	4	699

Table 9. Expanded recoveries of coded-wire tagged spring Chinook salmon from the Lostine River and Catherine Creek for the 2001 return year. Mainstem river recoveries were collected in Columbia/Snake/Grande Ronde rivers en route to natal streams (includes ocean recoveries). In-basin strays were recovered in other streams within the Snake River basin. Out-of-basin strays were recovered from streams outside the Snake River Basin (not in the migration route) or in the upper Columbia River. Numbers in parenthesis are unexpanded recoveries.

				Recovery location				
Stock, cohort	Experimental group (rearing density and/or target size at release)	CWT code	Number released	Natal stream[a]	Ocean catch[b]	Mainstem rivers	In-basin strays[b]	Out-of-basin strays[b]	Total
Lostine River									
1997[c]	Production	092610	11,871	103 (30)	0	0	2 (2)	1 (1)	106
1998[d]	Production	092831	11,438	18 (6)	0	0	0	0	18
	Production	092832	9,743	0 (0)	0	0	0	1 (1)	1
	Production	092834	7,654	3 (1)	0	0	0	0	3
	Production	092835	2,783	9 (3)	0	0	0	0	9
	Production	092836	3,010	3 (1)	0	0	1 (1)	0	4
	Production	092841	477	0 (0)	0	0	0	0	0
	Total		35,105	33 (11)	0	0	1 (1)	1 (1)	35
Grand Total			46,976	136 (41)	0	0	3 (3)	2 (2)	141

[a] *Expansion based on predicted number of CWT fish returning (cohort escapement x proportion with CWT x tag retention rate).*
[b] *Estimated number of total CWT fish recovered from PSMFC and ODFW databases.*
[c] *1997 Lostine River returns were Conventional Broodstock progeny*

Table 9 continued.

Stock, cohort	Experimental group (rearing density and/or target size at release)	CWT code	Number released	Natal stream[a]	Recovery location: Ocean catch[b]	Mainstem rivers	In-basin strays[b]	Out-of-basin strays[b]	Total
Catherine Creek									
1998[d]	Production	092820	23,698	67 (10)	0	0	1 (1)	0	68
	Production	092833	11,261	60 (9)	0	9 (1)	1 (1)	0	70
	Production	092837	1,061	7 (1)	0	0	0	0	7
	Production	092838	1,064	13 (2)	0	0	0	0	13
	Production	092839	563	0	0	0			0
	Production	092842	502	7 (1)	0	0	0	0	7
	Total		38,149	154 (23)	0	9	2	0	165
Grand Total			38,149	154 (23)	0	9 (1)	2 (2)	0	165

[d] *All 1998 returns were Captive Broodstock progeny.*

Table 10. Catch and escapement distribution of Imnaha River hatchery adult spring Chinook salmon by recovery location in 2001. Data summarized through May 2005 from the PSMFC and ODFW CWT recovery databases.

	Imnaha River		
Location, recovery type	Observed recoveries	Expanded adults	Percent of total
Ocean catch	3	9	0.2
Columbia River			
Ceremonial and subsistence	30	82	2.0
Treaty net	16	47	1.2
Non-treaty net	3	6	0.1
Sport	6	70	1.7
Test fishery	1	1	>0.01
Deschutes River			
Trap	42	42	1.0
Sport	5	13	0.3
Ceremonial and subsistence	0	0	0.0
Strays			
Outside Snake River Basin	4	6	0.1
Within Snake River Basin[a]	2	8	0.2
Recruitment to river[a]	2055[b]	3,789[c]	93.0
Total catch and escapement		4,073	100
Return to compensation area[a]		3,797	93.2
Percent of compensation goal[d]		118.3	

[a] *Indicates areas defining the compensation area.*
[b] *Number of hatchery Chinook salmon observed at weir and on spawning ground surveys.*
[c] *Expansion factor is based on estimated escapement to Imnaha River of hatchery cohorts.*
[d] *The compensation goal for Imnaha stock is 3,210 adults.*

Table 11. Catch and escapement distribution of Grande Ronde Basin hatchery adult spring Chinook salmon by stock and recovery location in 2001 (CWT recovery data summarized through May 2005 from the PSMFC and ODFW databases).

	Lostine River			Catherine Creek			Rapid River		
Location, recovery type	Observed	Expanded adults	Percent of total	Observed	Expanded adults	Percent of total	Observed	Expanded adults	Percent of total
Ocean catch	0	0	0.0	0	0	0.0	0	0	0.0
Columbia River									
Ceremonial/subsistence	0	0	0.0	0	0	0.0	30	59	4.5
Treaty net	0	0	0.0	0	0	0.0	1	2	0.2
Non-treaty net	0	0	0.0	1	9	5.7	2	6	0.5
Sport	0	0	0.0	0	0	0.0	21	175	13.3
Test fishery	0	0	0.0	0	0	0.0			0.0
Snake River									
Sport[a]	0	0	0.0	0	0	0.0	0	0	0.0
Lower Granite Dam[a]	0	0	0.0	0	0	0.0	0	0	0.0
Deschutes River									
Trap	2	2	1.4	0	0	0.0	1	1	>0.1
Sport	0	0	0.0	0	0	0.0	1	3	0.2
Ceremonial/subsistence	0	0	0.0	0	0	0.0	0	0	0.0
Other Strays									
Outside Snake R. Basin	1	1	0.7	0	0	0.0	0	0	0.0
Within Snake R. Basin[a]	1	1	0.7	2	2	1.3	7	7	0.5
Recruitment to stream[a]	126[b]	137[c]	97.2	35[b]	157[c]	93.0	679[b]	1,061[d]	80.7
Total estimated return		141			168			1,314	
Compensation area return		138	97.9		159	94.3		1,068	81.3

[a] *Indicates areas within LRSCP compensation area.*
[b] *Number of hatchery Chinook salmon observed at weir and on spawning ground surveys.*
[c] *Expansion factor based on estimated escapement to natal stream of hatchery adults. Does not include adjustment for CWT loss.*
[d] *Expanded return based on mark recapture estimate of hatchery fish in Lookingglass Creek and hatchery fish kept at weir.*

Table 12. Summary of adipose-clipped Chinook salmon carcasses recovered in 2001 during spawning ground surveys in the Imnaha and Grande Ronde river basins.

Recovery location	CWT code	Number Recovered	Release site and cohort
Imnaha River Basin			
Imnaha River	092827	2	Imnaha Acclimation Pond (1998 cohort)
	092615	14	Imnaha Acclimation Pond (1997 cohort)
	092614	2	Imnaha Acclimation Pond (1997 cohort)
	092619	26	Imnaha Acclimation Pond (1997 cohort)
	071248	7	Imnaha Acclimation Pond (1997 cohort)
	092616	13	Imnaha Acclimation Pond (1997 cohort)
	092558	4	Imnaha Acclimation Pond (1997 cohort)
	092559	5	Imnaha Acclimation Pond (1997 cohort)
	092829	4	Imnaha Acclimation Pond (1998 cohort)
	092205	1	Imnaha Acclimation Pond (1996 cohort)
	092613	7	Imnaha Acclimation Pond (1997 cohort)
	092825	2	Imnaha Acclimation Pond (1998 cohort)
	092828	2	Imnaha Acclimation Pond (1998 cohort)
	092612	5	Imnaha Acclimation Pond (1997 cohort)
	092830	2	Imnaha Acclimation Pond (1998 cohort)
	092823	2	Imnaha Acclimation Pond (1998 cohort)
	092609	3	Imnaha Acclimation Pond (1997 cohort)
	092821	2	Imnaha Acclimation Pond (1998 cohort)
	092822	1	Imnaha Acclimation Pond (1998 cohort)
Lick Creek	092558	1	Imnaha Acclimation Pond (1997 cohort)
	092609	1	Imnaha Acclimation Pond (1997 cohort)
	092827	1	Imnaha Acclimation Pond (1998 cohort)
	092615	1	Imnaha Acclimation Pond (1997 cohort)
Grande Ronde River Basin			
Lookingglass Creek	092207	1	Lookingglass Creek (1996 cohort)
	092610	1	Lostine River (1997 cohort)
	092622	1	Lookingglass Creek (1997 cohort)
Minam River	070749	1	Lookingglass Creek (1997 cohort)
	092414	1	Umatilla River (1997 cohort)
	070148	1	Lookingglass Creek (1997 cohort)
Lostine River	092831	2	Lostine River (1998 cohort)
	092610	20	Lostine River (1997 cohort)
	092835	2	Lostine River (1998 cohort)
	092836	1	Lostine River (1998 cohort)
	092620	1	Lookingglass Creek (1997 cohort)

Table 12 continued.

Recovery location	CWT code	Number Recovered	Release site and cohort
Wenaha River	630863	1	Easton Pond (1997 cohort)
	092621	1	Lookingglass Creek (1997 cohort)
	092622	1	Lookingglass Creek (1997 cohort)
Catherine Creek	092820	1	Catherine Creek (1998 cohort)

Table 13. Summary of hatchery- and naturally-produced spring Chinook salmon carcass recoveries and number of redds discovered by stream during spawning ground surveys in 2001.

Basin, stream	Marked	Unmarked	Unknown Mark	Percent marked	Number of redds
Imnaha River Basin					
Big Sheep Creek	0	0	0	0	1
Imnaha River	339	362	90	48.3	635
Lick Creek	8	3	1	72.7	5
Totals	347	365	91	48.7	641
Grande Ronde River Basin					
Bear Creek	0	0	0	0	1
Hurricane Creek	1	12	1	7.7	30
Lostine River	34	75	12	31.2	131
Wallowa River	0	4	0	0	29
Grande Ronde River	0	7	1	0	15
Catherine Creek	7	51	1	12.1	133
Lookingglass Creek	81	11	0	88.0	86
Minam River	5	44	3	10.2	179
Wenaha River	12	71	5	14.5	264
Totals	140	275	23	33.7	868

Table 14. Age composition and length characteristics of hatchery- and naturally-produced spring Chinook salmon carcasses with known age, sex, and origin recovered during 2001 spawning ground surveys in the Imnaha and Grande Ronde river basins.

	Hatchery						Natural					
	3		4		5		3		4		5	
Basin, parameter	F	M	F	M	F	M	F	M	F	M	F	M
Imnaha River Basin												
Number	0	13	52	33	3	2	0	3	48	56	8	14
Percent of total	0.0	5.6	22.4	14.2	1.3	0.9	0.0	1.3	20.7	24.1	3.4	6.0
Mean fork length (mm)	-	605.0	796.4	796.5	894.0	857.5	-	548.3	792.6	790.9	887.5	885.8
Standard deviation	-	52.0	35.4	72.0	96.1	24.7	-	20.2	51.2	60.4	63.5	70.2
Grande Ronde River Basin												
Number	0	3	19	8	1	1	0	9	143	69	22	15
Percent of total	0.0	1.0	6.6	2.8	0.3	0.3	0.0	3.1	49.3	23.8	7.6	5.2
Mean fork length (mm)	-	498.3	759.5	812.9	900	820	-	569.4	741.2	761.7	844.6	861.8
Standard deviation	-	22..5	39.6	22.5	-	-	-	31.1	50.6	66.6	31.9	57.9

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