**GRANDE RONDE ENDEMIC SPRING CHINOOK SAMON
SUPPLEMENTATION PROJECT**

**LOSTINE RIVER
OPERATIONS AND MAINTENANCE**

2003 SMOLT ACCLIMATION AND ADULT RETURN REPORT

Period Covered: January 2003 through December 2003

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EXECUTIVE SUMMARY

The Nez Perce Tribe (NPT), through funding provided by the Bonneville Power Administration (BPA), has implemented a Chinook salmon supplementation program (250,000 smolts) on the Lostine River, a tributary to the Grande Ronde River of Oregon. The Grande Ronde Endemic Spring Chinook Salmon Supplementation project, which involves supplementation of the Upper Grande Ronde River and Catherine Creek in addition to the Lostine River, was established to prevent extirpation and increase the number of threatened Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*) returning to the Grande Ronde River.

This report covers the seventh season (1997-2003) of adult Chinook salmon broodstock collection in the Lostine River and the fifth season (1999-2003) of acclimating the resultant progeny. Production of Lostine River spring Chinook salmon smolts currently occurs at Lookingglass Fish Hatchery (LGH). The Lostine River supplementation program utilizes two strategies to obtain egg source for production of smolts for supplementation: captive broodstock and conventional broodstock. The captive broodstock strategy involves 1) capture of natural juvenile spring Chinook salmon smolts from the Lostine River, 2) rearing those to adult and spawning them, and 3) rearing the resultant progeny for eventual acclimation and release back into the Lostine River. The conventional broodstock strategy involves 1) capture of natural and hatchery origin adults returning to the Lostine River, 2) holding those adults and spawning them, and 3) rearing the resultant progeny for acclimation and release back into the Lostine River.

This report focuses on 1) the trapping and collection of adult spring Chinook salmon that return to the Lostine River, which provides the broodstock source for the conventional strategy and 2) the acclimation and release of juvenile spring Chinook salmon produced from the captive broodstock and conventional broodstock strategies.

In 2003, acclimation of Lostine River spring Chinook salmon smolts occurred from March 3, 2003 through to April 14, 2003 and a total of 242,776 smolts were acclimated and released. These smolts were produced from the brood year (BY) 2001 egg source and included captive broodstock (141,860) and conventional broodstock (100,916) origin smolts that were all progeny of Lostine River spring Chinook salmon.

Operation of the Lostine River adult monitoring and collection facility in 2003 began April 30th, the first Chinook was captured on May 16, 2003 and the last Chinook was captured on September 21, 2003. The weir and trap were removed on October 1, 2003.

A total of 464 adult Chinook, including jacks, were captured during the season. The composition of the run included 239 natural origin fish and 225 hatchery supplementation fish. There were no identified “stray” hatchery fish from other programs trapped. Of the fish captured, 45 natural and 4 hatchery supplementation adults were retained for broodstock and transported to LGH for holding and spawning, 366 adult Chinook were passed or transported above the weir to spawn naturally, and 49 hatchery origin adult jack Chinook were transported and outplanted in the Wallowa River and Bear Creek to spawn in underseeded habitat.

Of the 49 adults retained for broodstock at Lookingglass Hatchery, 21 natural females and no hatchery origin females were represented in spawning. These females produced a total of 106,609 eggs at fertilization. Eye-up was 95.50% which yielded a total of 101,811 conventional program eyed eggs. The fecundity averaged 5,077 eggs per female. These eggs were incubated and at Lookingglass Hatchery until eyed stage. At eye they were transferred to Oxbow Hatchery where they were reared to the fingerling state at which time they were transported back to LGH until they were smolts in the spring of 2005. Captive brood program eggs/fish will be added to the conventional program eggs to make up the entire juvenile release for the Lostine River program in 2005.

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1.0 INTRODUCTION

The Nez Perce Tribe Department of Fisheries Resource Management is implementing a supplementation program for Lostine River spring Chinook salmon in Northeast Oregon. This project is part of a larger effort to restore Endangered Species Act listed salmon in the Grande Ronde Subbasin known as the Grande Ronde Endemic Spring Chinook Salmon Supplementation Project (GRESPP).

The GRESPP is a cooperative project between the Nez Perce Tribe (NPT), Oregon Department of Fish and Wildlife (ODFW), Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and United States Fish and Wildlife Service (USFWS). This program was initiated in 1994 as a conservation measure in response to severely declining runs of Chinook salmon in the Grande Ronde Subbasin. The GRESPP utilizes supplementation with conventional and captive broodstock techniques to prevent extirpation and begin rebuilding of ESA listed spring Chinook. The Nez Perce Tribe is responsible for implementation, coordination, and facilitation of the Lostine River component of the GRESPP.

This report contains the results of activities performed under this project associated with 1) the trapping and collection of adult spring Chinook salmon that returned to the Lostine River in 2003 and 2) the acclimation and release of juvenile spring Chinook salmon in 2003 produced from the captive broodstock and conventional broodstock strategies from broodyear (BY) 2001. This report covers the seventh season (1997-2003) of adult Chinook salmon broodstock collection in the Lostine River and the fifth season (1999-2003) of acclimation of resulting Lostine River progeny.

Funding for this project is provided by Bonneville Power Administration (BPA Project 199800702).

Monitoring and Evaluation (M&E) activities associated with this project for 2003 are provided in a separate report (BPA Project 199604400) (Cleary et al. 2006).

1.1 BACKGROUND

Prior to the 1900s, returning adult Chinook salmon were estimated to number more than 1.5 million in the Snake River Basin (NMFS 1995). However, numerous stock assessments and review literature have documented the contemporary demise of these Snake River populations (Horner and Bjornn 1979; Howell et al. 1985; Nehlsen et al. 1991). In recognition of this decline, the National Marine Fisheries Service (NMFS 1992) listed Snake River spring and summer Chinook as threatened under the federal Endangered Species Act (ESA) in 1992. The Lostine River/ Wallowa River population of spring/summer Chinook experienced significant declines over the past several decades with redd counts in the Lostine River declining from a high of 893 redds in 1957 to 11 redds in 1995 (Ashe et al. 2000). This stock faced a high demographic risk of extirpation due to low escapement levels prior to 1999 (Mundy 1999).

In 1994, fisheries co-managers, ODFW, NPT, CTUIR, and USFWS implemented the Grande Ronde Basin Endemic Spring Chinook Supplementation Program in the Lostine River, Catherine Creek and the upper Grande Ronde River. The goal of this program is to prevent extinction of spring Chinook in the three tributaries, provide a future basis to reverse the decline in stock abundance, and ensure a high probability of population persistence. The GRESP proposes to increase the survival of spring Chinook salmon in the Grande Ronde River by increasing egg to smolt survival through hatchery incubation and rearing (80% survival as compared to 12% survival for wild/natural). An increase in adult returns and natural spawners would likewise increase the number of listed offspring. Artificial propagation under this program utilizes conventional and captive broodstock sources. The captive broodstock strategy involves 1) capture of natural juvenile spring Chinook salmon smolts from the Lostine River, 2) rearing those to adult and spawning them, and 3) rearing the resultant progeny for eventual acclimation and release back into the Lostine River. The conventional broodstock strategy involves 1) capture of natural and hatchery origin adults returning to the Lostine River, 2) holding those adults and spawning them, and 3) rearing the resultant progeny for acclimation and release back into the Lostine River.

The NPT is responsible for operating supplementation facilities (adult collection and holding and juvenile acclimation and release) on the Lostine River, while the CTUIR is responsible for operating supplementation facilities on the upper Grande Ronde River and Catherine Creek. ODFW is responsible, in coordination with the Tribes, NOAA Fisheries, and USFWS for production and activities occurring at Lookingglass Fish Hatchery, Irrigon Fish Hatchery, Bonneville Fish Hatchery, and Manchester Marine Laboratory. Co-managers cooperatively develop an Annual Operation Plan that outlines activities, coordination, and planning associated with the implementation of the GRESP.

The facilities and activities associated with the GRESP have been authorized under Endangered Species Act (ESA) Section 10 and Section 7 Permits and Biological Opinions. These documents include ESA Section 10 Permit No. 973, Permit No. 1011 (ODFW 1996), Modification of Permit No. 1011 and Permit No. 1164, FWS Section 7 Biological Opinion 501.1100, 1-4-98-F4 (bull trout), ESA Section 10 Applications: (ODFW 1998, BIA 1998), and NMFS Section 10 Biological Opinion (1998).

Production occurring under the GRESP is authorized under the Lower Snake River Compensation Plan (LSRCP) Program. LSRCP currently provides the facilities, equipment, and personnel to assist production, evaluations, and fish health monitoring of juveniles produced for release in the acclimation facilities funded by this project. The goals and objectives of this project are consistent with and/or recommended by the Columbia River Basin Fish and Wildlife Program (NPPC 1994 and 2000), the Grande Ronde Subbasin Plan (Watershed Professionals Network 2004), the Federal Columbia River Power System Biological Opinion (NMFS 2000 and USACE et al. 2004) and Wy-Kan-Ush-Mi Wa-Kish-Wit (CRITFC 1995).

BPA and NOAA Fisheries determined this project fulfilled RPA #177 (Safety Net Projects) in the 2000 FCRPS Biological Opinion (NMFS 2000). The Final Updated Proposed Action (USACE et al. 2004) states that, "BPA will continue to fund safety-net programs for this ESU, including the captive broodstock programs for the ...Grande Ronde River (Upper Grande Ronde,

Catherine Creek, and Lostine River populations) ...as long as NOAA Fisheries determines these programs to be an essential and effective contribution to reducing the risk of extinction for this ESU [Snake River].”

1.2 DESCRIPTION OF PROJECT AREA

The Lostine River is located within the Grande Ronde Subbasin in northeast Oregon (Figure 1). The river is a major tributary to the Wallowa River. The Lostine watershed encompasses an area of 70.9 sq. miles and is approximately 30 miles long (USGS, 1998). The upper section of the river is within national forest and is designated as a National Wild and Scenic River (Palmer, 1993). Mean annual flow is 200 cfs. Peak flows occur in late spring and early summer and average 800 cfs. Low flows occur in August and September and correspond to the latter part of the dry season and the demand for irrigation withdrawals. Average low flow is 50 cfs but extreme conditions can occur on dry years with flows dropping below 10 cfs in the area of the adult trapping facility (see Weir location on Figure 1) which is roughly 1 mile above the confluence of the Lostine River and the Wallowa River. Water quality in the Lostine River is considered good to excellent, however, the lower portion of the Lostine River is presently on the 303(d) list because of stream flow, habitat channelization and sediment impacts (GRESF 1998).

Figure 1 illustrates where the majority of Lostine River spring/summer Chinook activities covered in this report occur.

Figure 1. Map of Lostine River drainage in Northeast Oregon and location of acclimation and release facility and adult weir and trapping facility.

2.0 LOSTINE RIVER SMOLT ACCLIMATION 2003

The Lostine River Acclimation Facility was constructed in 1998 at approximately river mile 12 of the Lostine River (Figure 1). Access to the site is via Granger Road. The acclimation facility is located on private property and operation of the facility is provided through an agreement between Bonneville Power Administration and the property owners.

The facility consists of four 2,000 cubic foot raceways that are constructed of metal frames that have plywood bottoms and are lined with a dark PVC pond liner (Figure 2). The water for the facility is pumped from the Lostine River via submersible pumps that are powered by diesel generators. The water supply system has the ability to provide 5.8 cfs for fish culture to the facility. The intake location is variable with the maximum distance between intake and outfall of about 300 feet. The outfall pipes are routed through a PIT tag detection system that records and time stamps all PIT tagged fish as they leave the facility.

Figure 2. Lostine River Acclimation Facility.

2.1 OPERATIONS

The total number of smolts acclimated and released in 2003 was 242,776 with a total weight of 14,872 for an average size of 16.33 f/lb.

The acclimation of Lostine River spring Chinook salmon in 2003 occurred in two groups. The first group of 109,801 smolts was acclimated from March 3, 2003 to March 23, 2003. The second group of 132,975 was acclimated from March 24, 2003 to April 14, 2003. Each of the groups were allowed a period of opportunity to volitionally start migration. After several days of volitional release any remaining fish were forced to leave the facility into the Lostine River. The 2003 release data for the Lostine River is provided in Table 1 and Table 2. More detailed information on each release group can be found in Appendix A.

Figure 3. Lostine River Acclimation Facility.

Juvenile spring Chinook salmon for the first acclimation group were received from Lookingglass Fish Hatchery on March 3, 2003 (Table 1). At transfer, 68 fish escaped to the river. These fish were not in the total release from the facility. Volitional release started on March 17, 2003 and final force out was on March 23, 2003. Losses due to mortality during acclimation were very low: raceway A = 10, raceway B = 4, raceway C = 3, raceway D = 7. Fish were active and fed well. Total pounds of food fed per raceway were: raceway A = 105 lbs, raceway B = 105 lbs,

raceway C = 105 lbs, raceway D = 105 lbs (2.0 Moore Clark) for an assumed feed conversion of 1.2. In addition, maggots and crickets were fed for live diet training.

Table 1. Summary of the first group of fish acclimated and released at the Lostine River Acclimation Facility, 2003. AD = adipose fin clip, CWT = coded wire tag, VIE = visual implant elastomer.

Raceway ID at Lookingglass Hatchery – broodstock origin	Raceway ID at Lostine Acclimation Facility	No. Fish	Size (f/lb)	Weight (lbs.)	Length (in.)	Mark/ Broodstock source
Raceway 5	Raceway A	28,995	15.34	1,890	6.01	AD CWT, VIE Left Conventional
Raceway 5	Raceway B	29,001	15.34	1,890	6.01	AD CWT, VIE Left Conventional
Raceway 11	Raceway C	28,389	15.99	1,775	5.93	AD CWT/ Captive
Raceway 11	Raceway D	23,416	15.99	1,464	5.93	AD CWT/ Captive
Total		109,801	15.64	7,019	5.96	

Juvenile spring Chinook salmon for the second acclimation group were received from Lookingglass Fish Hatchery on March 24, 2003 and March 25, 2003 (Table 2). Volitional release started on April 1, 2003 and final force out was on April 14, 2003. Losses due to mortality during acclimation were low: raceway A = 11, raceway B = 25, raceway C = 25, raceway D = 16. Fish volitionally left the raceways during the second acclimation period and as a result the amount of food fed was: raceway A = 60 lbs, raceway B = 60 lbs, raceway C = 60 lbs, raceway D = 60 lbs (2.0 Moore Clark) for an assumed feed conversion of 1.2. In addition, maggots and crickets were fed for live diet training.

Table 2. Summary of the second group of fish acclimated and released at the Lostine River Acclimation Facility, 2003. AD = adipose fin clip, CWT = coded wire tag, VIE = visual implant elastomer.

Raceway ID at Lookingglass Hatchery – broodstock origin	Raceway ID at Acclimation Facility	No. Fish	Size (f/lb)	Weight (lbs.)	Length (in.)	Mark/ Broodstock source
Raceway 12	Raceway A	34,989	20.25	1,728	5.48	ADCWT/ VIE Left Eye Conventional
Raceway 4 & Raceway 12	Raceway B	33,830	18.38	1,840	5.67	ADCWT/ VIE Left Eye Conventional
Raceway 6	Raceway C	29,126	12.96	2,247	6.37	AD CWT Captive
Raceway 4	Raceway D	35,030	17.23	2,033	5.78	AD CWT Captive
Total		132,975	16.94	7,848	5.82	

All release information including tagging and marking for this 2003 release can be obtained from the Lostine River M&E Annual Report (BPA Project 199604400) (Cleary et al. 2006).

2.2 MAINTENANCE

The maintenance of the acclimation facility prior to fish transfer included snow removal, pond liner repairs, water line cleaning, repair of volitional release hoses, and access road maintenance. The yearly maintenance of the grounds included set-up of irrigation system, road maintenance and weed control.

2.3 MAJOR PROBLEMS OR CHALLENGES

There is a continual concern regarding the shifting river channel near the acclimation site where pumps are placed to provide the water source for the facility. The dynamic nature of the river has also caused concerns over bank erosion at the location of the facility. These elements are monitored to aid in management of the facility.

3.0 LOSTINE RIVER ADULT WEIR AND TRAP 2003

The Lostine River adult trapping facility is located at approximately river mile 1 of the Lostine River on the Wolfe Ranch property (Figure 1). Access to the site and the operation of the facility

is provided through an agreement with the property owners. The water conditions vary seasonally with a historic flow range of 2,550 cfs to less than 10 cfs. Either extreme in river flow causes problems with operation of the facility and adaptations are made on an as needed basis.

The original weir and trap was first constructed in 1997 and consisted of an array of tripods and pickets. This weir was fished from 1997 through 2000 with capture rates below 20% of the Chinook salmon adults returning to the Lostine River. The poor collection rate and cumbersome structure prompted changes designed and constructed by the project staff.

In 2001, a newly designed weir was installed. The new design allowed for quick removal of the weir in response to high flows that generally occur during the spring runoff. This new weir spans the entire river (about 75') and is composed of 10' tall linked panels that are attached to cables on the top and bottom (Figure 4). The bottom cables are fixed to the river bottom by a steel rail that in turn is anchored into the river bottom. The top of the weir panels are attached to another cable strung across the river that allows for the raising or lowering of the panels through the use of a large winch. The new weir system allows for easier and faster installation of the weir panels which permits a more certain date to begin trapping operations. The new system has also increased the catch rate for adult salmon returning to the Lostine River to an average of 75-80% of the run.

In addition to the new weir, a new trap and holding box was added in 2002. The new trap box measures 8' X 24' X 2.5' for a total holding space of 480 cubic feet. This new trap box increased holding space by nearly 4 times over the old holding box. This adaptation allows for greater numbers of fish to enter the holding area safely. The added space and adaptations were critical because the return of adult Chinook salmon to the Lostine River and the number of fish trapped and handled has increased substantially in the past seven years.

Figure 4. Technician Shawn Sealey performing maintenance on Lostine River weir.

3.1 ADULT TRAPPING

The adult trapping facility is staffed seven days a week and all fish trapped are sampled and removed daily to prevent injury and reduce stress to the fish as well as limit disruption of fish migrations. Protocols for operation of the Lostine River trapping facility follow basic adult trapping and handling procedures consistent with IHOT guidelines (1995), the Annual Operating Plan developed by co-managers, and Endangered Species Act Section 10 Permit #1149. All adult Chinook are netted, transported in water to a small (300 gallon) freshwater holding tank in the area where sample information is collected. One at a time fish are netted and placed in a 100 gallon anesthetizing container that contains 75 gallons of Tricane Methane Sulfonate (MS-222) solution at a concentration of 90 mg/l. Once anesthetized, each fish is examined for fin clips, punches, external tags, radio tags, PIT tags and VIE tags (Figure 5). Each fish is examined to determine sex and length, evaluated for physical condition and a record is made of injuries and their probable cause. An opercle punch is also applied so the fish can be identified later to evaluate run timing and release disposition. Opercle punches are retained for genetic samples to be used for genetic pedigree analysis (BPA Project 198609600). Fish that are retained for broodstock are also tagged with uniquely numbered Tyvek tags to allow for tracking while at LGH.

Figure 5. Technician Rusty Eschler examines an adult Chinook at Lostine River weir.

The Lostine River adult facility was operated April 30, through October 1, 2003. There were several interruptions (17 days total) in operations due to high spring run-off and there were a total of 135 active trapping days. The maximum water flow was 1,890 cfs and the minimum was 11 cfs. During 2003 operations, water temperatures ranged from 41.3 F on May 5, 2003 to 69.8 F on July 23, 2003.

The first adult was captured on May 16, 2003, seventeen days after the initial start of the facility operations. The last adult was captured on September 21, 2003. The adult trapping facility was closed on October 1, 2003.

A total of 464 adult Chinook were captured in 2003, with the composition being 239 (51.5%) natural unmarked adults and 225 (48.5%) hatchery supplementation adults (Table 3). The hatchery origin fish were composed of 33 from conventional broodstock and 192 from captive broodstock parents. No “stray” adults from other hatchery programs were captured at the Lostine River adult facility in 2003. The efficiency of the weir in collecting returning adults to the Lostine River was determined to be 56.25% by mark recapture data.

Table 3. Number of natural origin and hatchery origin spring Chinook salmon adults collected at the Lostine River adult trapping facility in 2003.

	Natural Adults	Hatchery Adults	Total
Jacks	11	73	84
Males	108	81	189
Females	120	71	191
Total	239	225	464

In addition to the target species, spring/summer Chinook salmon, the Lostine River adult facility also captured adult steelhead (*Oncorhynchus mykiss*), bull trout (*Salvelinas confluentus*), mountain whitefish (*Prosopium williamsoni*), rainbow trout (*Oncoryncus mykiss*) and suckers (*Catostomus sp.*). The total number of each non-target species captured during Lostine River weir/trap operations in 2003 is presented in Table 4.

Table 4. Number of non-target species of fish that were captured at the Lostine River adult trapping facility in 2003.

	Steelhead	Bull Trout	Whitefish	Rainbow	Sucker
Total	96	14	31	11	53

3.2 RUN TIMING

The first adult Chinook was captured on May 16, 2003 and the last was captured September 21, 2003 (Figure 7). Run timing of spring Chinook salmon to the Lostine River in 2003 was similar to run timing observed in previous years that the Lostine trapping facility has been operated (1997-2002). The largest portion (90.7%) of the fish returned in June and July and a smaller

number returned during the end of August to mid September (Figure 7). The days with the largest number of fish captured occurred on July 8, 2003 with 65 fish and July 12, 2003 with 54 fish. The arrival timing of hatchery adult Chinook salmon was in line with that of the natural adult Chinook salmon for the Lostine River. More detailed information on run timing is provided in the 1997-2004 Lostine River M&E Progress Report (Cleary et al. 2006).

Figure 6. Run timing of spring Chinook salmon adults captured at the Lostine River adult facility in 2003.

3.3 LENGTH AND AGE SUMMARIES

Age class designation of spring Chinook salmon that are captured at the Lostine River weir is done by comparing fish length to average historical length/age class data for Northeast Oregon spring Chinook salmon. The length-to-age correlation is: fish less than 630 mm are age 3 adults, fish that range from 630-850 mm are age 4 adults, and fish larger than 850 mm are age 5 adults. Length-to-age correlations will be developed specifically for the Lostine River spring Chinook salmon as more data is acquired for the Lostine River population. Fish examined at the weir are also identified by origin through fin clips and VIE (visual implant elastomer). Fish that have no fin clips or external marks are identified as natural origin. In 2005, the hatchery origin fish returning to the Lostine River were marked with both a coded wire tag (CWT) and an adipose fin clip. Fish that were produced from the conventional broodstock program also had a visual implant elastomer (VIE) tag in their eye. Fish that were produced from the captive broodstock program did not have a VIE tag. A summary of age composition, sex, and broodstock origin from the 2005 returns to the Lostine River is displayed in Table 5.

Table 5. Age composition, sex, and origin of Lostine River adult Chinook salmon captured in 2003.

Age	Sex	Number Natural Origin Adults	Number Hatchery Origin Adults	Total
3 Year Olds	Male	11	73	84
3 Year Olds	Female	0	0	0
4 Year Olds	Male	60	54	114
4 Year Olds	Female	79	48	127
5 Year Olds	Male	48	27	75
5 Year Olds	Female	41	23	64
Total		239	225	464

For additional information concerning length frequency and tag retention of natural and hatchery fish based upon current data please review the 1997-2004 Lostine River M&E Progress Report (Cleary et al. 2006)

3.4 INJURIES AND PRE-SPAWNING MORTALITY

Upon collection at the Lostine River weir, all fish are examined for physical injuries. The determination of injury cause relies upon crew experience and has some subjectivity involved. For instance, injuries observed displaying large bites of flesh removed from the fish and/or associated claw marks (termed “Golden Arches”) generally are acknowledged as being caused by seals. The term “headburn” is applied to fish whose skin (predominately around the head and eyes region) appears to have been peeled away, often with fungus or signs of rejuvenating skin. Finding a fish hook imbedded in the fishes flesh would be listed as a wound associated with a fishery.

There were 47 (10.13%) fish observed with outward injuries during the 2003 trapping year. Of the 47 injured fish, 19 (40.43%) were attributable to a condition called “headburn” (caused by high nitrogen levels in water around dams), and the remaining 28 (59.57 %) fish had injuries from miscellaneous events or the cause of injury could not be determined.

The rate of injury for 2003 was comparable to past return years. In 2003, there was one pre-spawn mortality recorded from handling, transportation and trapping activities from this project. Any pre-spawning mortality occurrences that occur during holding and handling prior to spawn at Lookingglass Hatchery are not recorded by this project.

3.5 FISH DISPOSITION AND ADULT HOLDING

Chinook salmon adults that are collected at the Lostine River trapping facility are managed for natural spawning and contribution to the hatchery broodstock. Fish are allocated to one of three disposition options: 1) release above the weir to spawn naturally, 2) retain for broodstock and

transfer to Lookingglass Hatchery for holding and spawning, or 3) outplant to underutilized habitat in adjacent Wallowa River and its tributaries. The determination of which fish are selected for broodstock, released in the Lostine River or outplanted is made using a “sliding scale” management tool developed by the co-managers (BIA 1998) and permitted by ESA Section 10 permit 1149.

The sliding scale management tool (Table 6) has an underlying premise, that at low population levels the greatest risk to persistence is demographic risk of extinction. In the sliding scale, then, fewer constraints are placed on the number of hatchery fish spawning naturally and the number of naturally produced fish spawned in the hatchery when population levels are low. Thus, fish benefit from the survival advantage provided by the hatchery. As population levels increase, demographic risks are of less concern and greater constraints are placed on the hatchery program to control genetic risks associated with hatchery rearing.

Table 6. Sliding scale management tool utilized for managing disposition of Lostine River Chinook salmon adults.

Estimated escapement to mouth (1)	Hatchery / Natural Ratio	Percent Natural Retained	Percent of Hatchery Adults Retained (2)	Percent Hatchery Fish Above Weir	Percent Broodstock of Natural Origin
<250	Any	40	40	N/A	N/A
251-500	Any	20	20	70	20 or less
>500	Any	20	N/A	50	30 or less

Notes:

- (1) Pre-season estimate of total escapement (N+H+C)
- (2) Conventional hatchery adults only, all captive brood adults released to spawn naturally or out-planted.

N/A Not a decision factor for this level of escapement, percentages determined by other criteria

N = the number of naturally produced adults

H = the number of conventional hatchery produced adults

C = the number of captive brood origin adults (BIA 1998)

Adult collection, transportation, and holding details are worked out annually by co-managers through the Annual Operation Plan process. In 2003, the adult return projection was greater than 500 and therefore, up to 20% of the natural origin fish could be retained for hatchery broodstock, 50% of the fish released above the weir to spawn naturally could be of hatchery origin and 30% of the hatchery broodstock could be natural fish. Due to an agreement between co-managers to ensure a minimum of 500 adult spawners in the Lostine River a decision was made to manage fish released above the weir to spawn naturally at 60% hatchery origin instead of 50% hatchery origin.

In 2003, based on the management strategy of the sliding scale tool, 49 adults were selected for hatchery broodstock (91.8% being natural origin and 8.2% being hatchery origin). One natural female was later returned and released back into the Lostine River because she matured early and

was not able to be spawned at Lookingglass Fish Hatchery. This returned fish was included in the 366 total adults that were trapped and released or transported within the Lostine River (53.0% being natural origin and 47.0% being hatchery origin) (Table 7). The remaining 49 hatchery adults were outplanted to underseeded areas of Bear Creek a tributary of the Wallowa River.

Table 7. Origin and composition of Lostine River spring Chinook retained for hatchery broodstock, released or transported above the Lostine River weir for natural spawning and outplanted to underseeded habitat to spawn naturally, in 2003.

	Natural	Hatchery	Total	Natural Percent	Hatchery Percent
Hatchery Broodstock – Transported to Lookingglass Hatchery	45 ¹	4	49	91.8 %	8.2%
Natural Spawners – Released or transported above Lostine River weir	194 ¹	172	366	53.0%	47.0%
Outplanted to Bear Creek to spawn naturally		49	49		100%
Total	239	225	464	57.6%	42.4%

¹ One natural female was later returned and released back into the Lostine River because she matured early and was not able to be spawned at Lookingglass Fish Hatchery. She is accounted for in the Hatchery Broodstock row.

Disposition of the spring Chinook adults collected at the Lostine River weir is summarized by age, sex, and broodstock origin in Table 8.

Table 8. Disposition of Lostine River spring Chinook based on age, sex, and origin composition for 2003.

	Adults Released Into Lostine River	Adults Retained & Transported to Lookingglass Fish Hatchery	Adults Out-planted to Wallowa River Tributaries	Total Adults
Natural Jacks	9	2	0	11
Natural Males	91	17	0	108
Natural Females	94	26	0	120
Hatchery Jacks	20	4	49	73
Hatchery Males	81	0	0	81
Hatchery Females	71	0	0	71
Total	366	49	49	464

Adults released to spawn naturally are carried upstream of the weir following recovery from anesthetic and gently returned to the Lostine River. Due to low flows in the Lostine River from

late July through September, fish that are released above the Lostine River weir typically must be transported by truck and released upstream. The low flows are a result of a naturally declining hydrograph exacerbated by withdrawal of water for irrigation from 14 different irrigation ditches.

These low flow conditions typically constrain adult fish passage in a section of the Lostine River between the adult weir and good holding and spawning habitat. Some years during late summer the Lostine River is often essentially dry when it reaches the town of Lostine, roughly 5 miles above the location of the weir. Downstream of the town of Lostine, the river is recharged via the Cross Country Canal irrigation ditch that comes in from the Wallowa River. During these conditions fish that are released to spawn naturally have to be transported in a fish transport vehicle by project staff upstream around an essentially dewatered section of the Lostine River and released in habitat with adequate water.

In 2003, a total of 203 (43.75%) of the 366 adult Chinook that were released above the Lostine River weir were transported past the dry zone.

Adults selected for broodstock are collected across the entire run of both hatchery and natural origin as described above. All captive broodstock origin adults are released to spawn naturally. Retained adults are given a uniquely numbered Tyvek tag that is attached to the gill plate. This provides a visual mark that allows for tracking of collection to spawn. Each retained adult is given injections under prescription of a veterinary doctor of oxytetracycline (at 10 mg/kg body weight) and erythromycin (at 20 mg/kg body weight) to maximize survival of the adults and the resulting progeny. Adults are then transferred to a fish transport tank/vehicle and transported 50 miles to Lookingglass Hatchery for holding and spawning.

In 2003, a total of 49 adults were selected for broodstock. Of these fish one natural female was unable to be incorporated into LGH program and was released back to the Lostine River. The remaining broodstock were composed of 44 natural origin and 4 hatchery origin fish. The natural origin fish were two jacks, 17 males and 25 females. The hatchery origin fish were four jacks, no males and no females (Table 8).

Adults selected to be outplanted in under-utilized habitat within the Wallowa River drainage are transferred to a separate fish transport tank/vehicle and transported within approximately 7-25 miles of the Lostine River and released to spawn naturally.

All adult fish are transported in 350 gallon fiberglass transport tanks that are fitted into the back of one ton, four-wheel drive pick-up trucks. The transport units provide supplemental oxygen and aeration to protect the safety of the fish. The tanks are filled with Lostine River water immediately prior to the start of removing fish from the holding area. To ensure the best possible survival of all transported fish, Poly-Aqua is added to the water in the transport tank. Poly-Aqua is a chemical which aides in recovery of the adult fish by protecting natural disease defense systems that are important to fish health. Typical transport time is less than an hour and ranges from 7-50 miles for a one way trip. Upon reaching the release destination, the fish are removed from the transport unit via nets and placed carefully into the water source.

In 2003, 252 fish were transported with no mortalities. Forty-nine fish were transported to Lookingglass Hatchery to be held for broodstock. One natural female was later returned and released back into the Lostine River because she matured early and was not able to be spawned at Lookingglass Fish Hatchery. A total of 203 fish were transported around the “dry zone” in the Lostine River and released to spawn naturally, and 49 adults were transported and released in Bear Creek of the Wallowa River to spawn naturally.

3.6 ADULT HOLDING AND SPAWNING

Adults that are selected for broodstock and transported to Lookingglass Hatchery (LGH) for holding are netted from the transport truck units into the holding tanks at LGH. These tanks are circular, 20 foot in diameter and made of fiberglass construction with netting stretched over the top to help prevent adults from jumping out.

Adult care at LGH is provided by the ODFW crew and primarily consists of regular formalin treatments. All retained adult Chinook held at LGH are handled in early August to provide a second injection of antibiotics and examined for maturity. Fish are thereafter handled on a weekly basis to determine maturity and spawned once they are ripe (Figure 7). Spawning for the Lostine River program occurs through mid to late September.

Figure 7. Lostine River adults being anesthetized prior to spawning at Lookingglass Hatchery.

The spawning sequence starts with the selection of ripe females and removal their eggs (Figure 8). After egg removal, the eggs are placed in Zip-lock bags and stored in climate controlled coolers. Next, males are selected, spawned into storage cups and placed inside the cooler next to the eggs. The coolers are then transported to the egg room for fertilization.

Fertilization occurs via a spawning matrix that is designed to include a natural fish in every mating. Most matrices are 2 X 2 crosses, where two females are spawned and fertilized with two

males. In the process, each female has her eggs split into two equal subgroups and two different males are applied to each subgroup. Thus each female has the opportunity to have two separate males as a mate. Of the four fish involved in this applied 2 X 2 matrix at least one has to be of natural origin. Fertilized eggs are then placed in incubation trays filled with a disinfecting iodine solution during water hardening and then the tray is placed under continuous flow of pathogen free water.

Figure 8. Technicians sort adult Chinook prior to spawning at LGH.

3.7 FISH PATHOLOGY

During spawning all adults have samples collected by fisheries pathologists. These samples are then examined and tested to determine the whether a fish is carrying bacterial, viral or parasitic diseases, such as bacterial kidney disease (BKD), infectious hematopoietic necrosis (IHN), infectious pancreatic necrosis (IPN), whirling disease (WHD), and North American viral hemorrhagic septicemia (NAVHS). General physical condition of each adult is also recorded.

In samples collected from the 21 females spawned in 2003, the BKD testing resulted in low optical densities of less than 0.200. No other pathogens were observed from samples taken in 2003. These results are comparable to previous years fish health.

3.8 INCUBATION AND EYE-UP

Eggs are incubated at LGH until they develop to a stage termed “eyed”. At this stage the eggs are developed enough to sort out dead eggs from the viable eggs and enumerate them then ship them to Oxbow Hatchery. After hatching and rearing to around 250 f/lb the next March-April, the resulting fish are transported back to LGH for final rearing. These activities are performed by the ODFW crews at the various facilities and the resulting data is reported by ODFW through an annual report to the Lower Snake River Compensation Plan office.

The 2003 spawn of Lostine River spring Chinook produced 106,609 green eggs that provided 101,811 eyed eggs after the 4,798 dead eggs were removed. The resulting percent eye-up for 2003 was 95.50% and the average fecundity was 5,077 eggs per female. This number of eyed eggs should produce approximately 100,000 smolts for acclimation and release back in the Lostine River in 2005.

4.0 SUMMARY

4.1 SMOLT ACCLIMATION

The acclimation and release of 242,776 smolts from the Lostine Acclimation facility in 2003 was the fifth year of operation for the facility (Table 9). Acclimation and release of both groups of fish from the facility went smoothly with no major problems.

The number of smolts released from the Lostine Acclimation facility in previous years is summarized in Table 10. In 1999, we released 11,378 conventionally produced smolts from the acclimation facility (the first artificially produced endemic Grande Ronde spring Chinook). The first release of captive broodstock progeny was 34,977 smolts in 2000 and a second release of 133,982 captive broodstock smolts occurred in 2001 (Table 9 and Figure 9). Combined releases of captive and conventionally produced smolts have occurred annually starting in 2002 with 109,015 (Table 9 and Figure 9).

Table 9. Summary of spring Chinook smolts acclimated and released from the Lostine River Acclimation facility in its five years of operation, 1999-2003.

Release Year	Number of Captive Brood Smolts	Number of Conventional Smolts	Total Smolt Release
1999	0	11,738	11,738
2000	34,977	0	34,977
2001	133,822	0	133,822
2002	77,551	31,464	109,015
2003	141,860	100,916	242,776
Total	388,210	144,118	532,328
Average	77,642	28,823	106,466

Figure 9. Composition of conventional and captive broodstock origin smolt releases in the Lostine River, 1999-2003.

In 2003, due to the number of juveniles and the desire to maintain low densities the need arose to acclimate and release the fish in two separate groups, or a split acclimation period, because the acclimation facility was not constructed large enough to hold the entire 250,000 smolt production all at the same time. In an effort to provide acclimation for all the fish prior to release there was an early acclimation period from late February to late March and a later acclimation period from early April to mid April. The Lostine monitoring and evaluation project will be evaluating these releases to determine effectiveness and whether there is a survival difference between the two groups.

Construction of the Northeast Oregon Hatchery on the Lostine River will alleviate the necessity to acclimate and release two groups of fish at different times. The new facility will rear these fish from egg to smolt and then release them into the Lostine River. The ponds will have capacity for the entire 250,000 smolt program. Until there is a decision to move forward with construction of the new facility we will be forced to utilize the split acclimation period approach.

4.2 ADULT WEIR AND TRAP

We have operated the adult trapping facility since 1997 for the collection of broodstock and baseline data on adult escapement to the Lostine River prior to supplementation. In 2003, a total of 464 adult Chinook were captured, composed of 239 (51.5%) natural unmarked adults and 225 (48.5%) hatchery supplementation adults. The majority of hatchery origin fish 192 (85.33%) had captive broodstock parents while 33 (14.67%) of the hatchery origin fish had conventional broodstock parents.

The number of adult natural and hatchery origin spring Chinook captured at the Lostine Adult Collection facility in previous years is summarized in Table 10 and Figure 10. A more detailed analysis on adult return and escapement to the Lostine River can be found in the 1997-2004 Lostine River M&E Progress Report (Cleary et al. 2006)

Table 10. Number of natural, conventional hatchery broodstock and captive hatchery broodstock origin spring Chinook salmon adults collected at the Lostine River adult trapping facility, 1997-2003.

	Natural Origin	Conventional Broodstock Origin	Captive Broodstock Origin	Total
1997	27	0	0	27
1998	23	0	0	23
1999	12	0	0	12
2000	64	27	0	91
2001	339	78	25	442
2002	265	14	264	543
2003	239	33	192	464
Total	969	152	481	1,602

Figure 10. Composition of adult spring Chinook captured at the Lostine Adult Collection facility, 1997-2003.

The Lostine River weir was determined to be effective at capturing 56.25% of the adults that returned to the Lostine River in 2004. This efficiency rating is the second best since the weir was first operated in 1997 (Figure 11). The efficiency of the weir was hindered by high river flows but still showed improvement due to several factors including improved weir design. With a fairly large return and an efficient weir there were days when the daily total of adults collected in the trap was near 80 fish per day. Having the new larger holding area made a big difference in being able to provide good fish handling and holding conditions.

Figure 11. Lostine River weir efficiency at collecting returning adult spring Chinook salmon to the Lostine River.

In 2003, a total of 49 adults (45 natural origin and 4 hatchery origin) were collected for broodstock and transported to Lookingglass Hatchery for adult holding and spawning. One natural female was returned to the Lostine River (Figure 12).

Figure 12. Natural and hatchery origin composition of Lostine River spring Chinook spawned for the conventional broodstock program, 1997-2003.

A total of 21 females were spawned to provide 106,609 green eggs (Table 11). A summary of females spawned, number of eggs, fecundity and eye up percentage is contained in Table 11.

Table 11. Summary of conventional broodstock and data on eggs produced from the Lostine River supplementation program. Note: There were insufficient number of adults captured and no conventional broodstock were spawned in 1998 and 1999.

	1997	2000	2001	2002	2003
Total Females Spawned	4	8	36	28	21
Total Eggs	17,540	38,900	156,260	133,447	106,609
Eggs per Female	4,385	4,863	4,341	4,766	5,077
Total Dead eggs	5,460	3,000	42,267	11,984	4,798
Total Live Eggs	12,080	35,900	113,993	121,463	101,811
Percent Eye	68.87	92.29	72.95	91.02	95.50

A complete summary of adult returns that have resulted from the juvenile releases of Lostine River supplementation program can be found in Table 12.

Table 12. Summary of Lostine River supplementation program releases and resultant adult returns, 1999-2003.

Brood Year	Total Smolts Released	3 Year Old Returns	4 Year Old Returns	5 Year Old Returns	Total Returns/ Release	Percent Return (SAR)	Total Non-jack Adults	Non-jack % (SAR)
1999	11,738	27	75	14	119	1.01	92	0.78
2000	34,977	25	246	49	319	0.91	294	0.84
2001	133,882	18	102	N/A	120	*0.09	*102	*0.08
2002	109,015	73	N/A	N/A	73	*0.07	N/A	N/A
2003	242,776	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* -- Incomplete data for the release, still have returning age classes in future.

N/A – No Adults for these return age classes yet.

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APPENDIX A: 2003 Lostine River total spring Chinook salmon smolt releases

Dates of Acclimation	LGH Raceway ID	Lostine Raceway ID – Broodstock Source	Fish Numbers Starting	Mortality	Release Numbers	Size (f/lb) @ Release	Length @ Release	Wt @ Release	Density Index @ Release
3/3/03 – 3/23/03	R5	A – Conventional	29,005	10	28,995	15.34	6.01	1,890	0.16
3/3/03 – 3/23/03	R5	B – Conventional	29,005	4	29,001	15.34	6.01	1,890	0.16
3/3/03 – 3/23/03	R11	C – Captive	28,392	3	28,389	15.99	5.93	1,775	0.15
3/3/03 – 3/23/03	R11	D - Captive	23,423	7	23,416	15.99	5.93	1,464	0.12
Total 1st Group			109,893	24	109,801	15.64	5.96	7,019	0.15
3/24/03 – 4/14/03	R12	A – Conventional	35,000	11	34,989	20.25	5.48	1,728	0.16
3/24/03 – 4/14/03	R4 & R12	B – Conventional	33,855	25	33,830	18.38	5.67	1,840	0.16
3/25/03 – 4/14/03	R6	C – Captive	29,151	25	29,126	12.96	6.37	2,247	0.18
3/24/03 – 4/14/03	R4	D - Captive	35,046	16	35,030	17.23	5.78	2,033	0.18
Total 2nd Group			133,052	77	132,975	16.94	5.82	7,848	0.17
Total Acclimated Release			242,945	101	242,776 99.93% survival	16.33	5.89	14,867	0.16