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Salmonid Gamete Preservation in the Snake River Basin

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SALMONID GAMETE PRESERVATION IN THE SNAKE RIVER BASIN

2004 Annual Report

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ABSTRACT

In spite of an intensive management effort, Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) populations in the Northwest have not recovered and are currently listed as threatened species under the Endangered Species Act. In addition to the loss of diversity from stocks that have already gone extinct, decreased genetic diversity resulting from genetic drift and inbreeding is a major concern. Reduced population and genetic variability diminishes the environmental adaptability of individual species and entire ecological communities. The Nez Perce Tribe (NPT), in cooperation with Washington State University (WSU) and the University of Idaho (IU), established a germplasm repository in 1992 in order to preserve the remaining salmonid diversity in the region.

The germplasm repository provides long-term storage for cryopreserved gametes. Although only male gametes can be cryopreserved, this project preserves the genetic diversity of these stocks and provides management options for future species recovery actions. NPT efforts have focused on preserving salmon and steelhead gametes from the major river subbasins in the Snake River basin. However, the repository is available for all management agencies to contribute gamete samples from other regions and species.

In 2004 a total of 410 viable semen samples were collected and added to the germplasm repository. This included the gametes from 252 male Chinook salmon from the Lostine River, Catherine Creek, upper Grande Ronde River, Imnaha River (Lookingglass Hatchery), Lake Creek, South Fork Salmon River, Johnson Creek, Big Creek, Capehorn Creek, Marsh Creek, Pahsimeroi River (Pahsimeroi Hatchery), and upper Salmon River (Sawtooth Hatchery); gametes from 125 male steelhead from the Little Sheep Creek, South Fork Salmon River (SFSR) and Johnson Creek (SFSR tributary); gametes from 19 Kootenai River male white sturgeon (contributed by the Kootenai Tribe) and gametes from 9 Kootenai River male burbot (contributed by the Kootenai Tribe). To date, a total of 2,492 Columbia River male Chinook salmon, 1,336 Columbia River male steelhead gamete samples, 22 Kootenai River male white sturgeon gamete samples and 9 Kootenai River male burbot gamete samples are preserved in the repository. Samples are stored in independent locations at the UI and WSU.

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INTRODUCTION

The goals of genetic conservation are to reduce the possibility of extinction and ensure the maintenance and recovery of a species as a functioning ecological unit of the environment. While preventative actions for conserving species such as population monitoring, habitat protection and enhancement and harvest controls are preferred, these measures frequently are not implemented until populations have reached critically low levels. Once this occurs, conservation strategies using artificial environments such as zoos, botanical gardens and live or frozen gene banks are often required (Bartley 1998). Although it is often difficult to decide when to use the more intensive actions, measures aimed at conserving the genetic diversity of a species should be implemented prior to a severe population collapse. Therefore, once a species threatened by a population collapse is identified, a combination of preventative and intensive measures should begin in order to prevent further loss of genetic diversity and preserve long-term evolutionary potential.

Nehlsen et al. (1991) concluded that least 106 major populations of salmon and steelhead on the west coast of the United States are extinct, and an additional 214 salmon, steelhead, and sea-run cutthroat trout stocks are at risk of extinction. As a first step in the recovery of anadromous fish stocks, National Oceanographic and Atmospheric Administration Fisheries (NOAAF) listed 39 salmonid populations as threatened or endangered under the Endangered Species Act (ESA). Included in this list are all of the remaining wild populations of spring/summer and fall Chinook salmon and steelhead in the Snake River basin. These populations warrant protection because they possess unique genetic and life history attributes of the species and thus represent distinct population segments.

The recovery effort for these species has mainly focused on habitat protection and enhancement, hatchery construction, harvest controls, fish barging, and ‘fish-friendly’ changes in dam operation. Although these measures have been in place for decades, many populations continue to decline. Recently more intensive practices such as supplementation and captive brood rearing have begun. As opposed to conventional hatcheries, these programs utilize local stocks and attempt to minimize selection during all aspects of their life history. Although it is too early to judge the success of these programs, the one thing that has been recognized is the importance of using local stocks for recovery.

The threat of a significant loss of genetic diversity in native fish stocks warrants the establishment of gene banks for the long-term storage of fish germplasm. A gene bank containing a collection of germplasm from multiple river basins preserves the greatest level of genetic diversity and enables recovery programs to use local stocks. This serves as insurance against population collapse and extirpation and provides options for future management programs by providing an opportunity for rebuilding lost stocks or maintaining genetic diversity caused by population bottlenecks (Ryder et al. 2000). At present, cryopreservation of male gametes is the only means of storing fish germplasm for extended periods of time. It was estimated that the storage time for fish semen held in liquid nitrogen are between 200 and 32,000 years (Ashwood-Smith 1980; Whittingham 1980; and Stoss 1983). Although preservation of the maternal nuclear DNA component has been accomplished with some mammals (Rall and Fahy 1985, Fahning and Garcia 1992, Dobrinsky et al. 1991, Ali and Shelton 1993, Kono et al. 1988, Trounson and Mohr 1983, Hayashi et al. 1989), it has not been accomplished with fish. Successful development of methods to preserve female gametes is an active area of research and would greatly increase the ability to recover extinct salmonid stocks.

NPT initiated Chinook salmon (*O. tshawytscha)* cryopreservation activities in 1992 (Kucera and Blenden 1999) in response to the severely reduced returns of adult Chinook salmon in Big Creek (a tributary of the Middle Fork Salmon River). In subsequent years, a more comprehensive gene banking effort was initiated (Faurot et al. 1998) including collections from additional Chinook spawning aggregates in the Snake River basin and collections from steelhead (*O. mykiss*) populations in the region (Armstrong and Kucera 1999). By collecting from numerous populations of spring and summer Chinook salmon and steelhead across the entire Snake River basin, we hope to preserve the greatest amount of endemic salmonid diversity. Some of this diversity is reflected by the variable size, migration and spawning timing and age structure found in different populations of these fish. For example, adult Chinook salmon migrating upstream past Bonneville Dam from March through May, and June through July are categorized as spring- and summer-run fish respectively (Burner 1951). Some streams in the Snake River are considered to have only spring Chinook, some mainly summer-run fish (e.g., those in the South Fork Salmon River), and some both forms (e.g., Middle Fork Salmon River and upper Salmon River). In most cases where the two forms coexist, spring-run fish spawn earlier and in the headwaters of the tributaries, whereas summer Chinook spawn later and farther downstream (Matthews and Waples 1991).

Snake River basin steelhead spawning areas are well isolated from other populations and include the highest elevations for spawning (up to 2,000 meters) as well as the longest migration distance from the ocean (up to 1,500 kilometers; Busby et al. 1996). Steelhead from the Snake River basin can be categorized into two major groups known as A-run and B-run fish. The A-run group passes Bonneville Dam (Columbia River kilometer 235) before August 25 and the B-run group pass Bonneville after August 25 (CBFWA 1990, IDFG 1994). A-run steelhead are defined as predominately one ocean fish, while B-run steelhead are defined as two ocean (IDFG 1994). B-run steelhead tend to be larger, averaging 11-15 pounds (or 5-7 kilograms) with maximum size up to 35 pounds (or 16 kilograms).

This annual report details NPT germplasm preservation activities from 2004 and updates the status of the long-term repository. Goals of the cryopreservation project are: 1) preserve the genetic diversity of listed salmonid populations at high risk of extirpation through application of cryogenic techniques, 2) maintain gene bank locations at independent sites for the short-term, and 3) establish and maintain a long-term regional germplasm repository.

METHODS

Description of Spawning Aggregates

The cryopreservation project managed by NPT currently seeks to preserve male spring and summer Chinook salmon and steelhead gametes in the Snake River basin (Figure 1). The large number of subbasins within this region has resulted in a genetically diverse collection of anadromous species. The following is a list of the sub-basins and locations that were sampled in 2004.

CHINOOK SALMON

Grande Ronde River Subbasin

1. Catherine Creek (collected at Lookingglass Hatchery)
2. Upper Grande Ronde River (collected at Lookingglass Hatchery)
3. Lostine River (collected at Lookingglass Hatchery)

Salmon River Subbasin

1. Lake Creek
2. Johnson Creek
3. Marsh Creek
4. Capehorn Creek
5. Big Creek
6. South Fork Salmon River (SFSR - collected at the SFSR weir, McCall Fish Hatchery)
7. Upper Salmon River (collected at Sawtooth Fish Hatchery)
8. Pahsimeroi River (collected at Pahsimeroi Fish Hatchery)

Imnaha River Subbasin

1. Imnaha River (collected at Lookingglass Hatchery)

STEELHEAD

Salmon River Subbasin

1. South Fork Salmon River
2. Johnson Creek

Imnaha River Subbasin

1. Little Sheep Creek (collected at Little Sheep Creek weir)

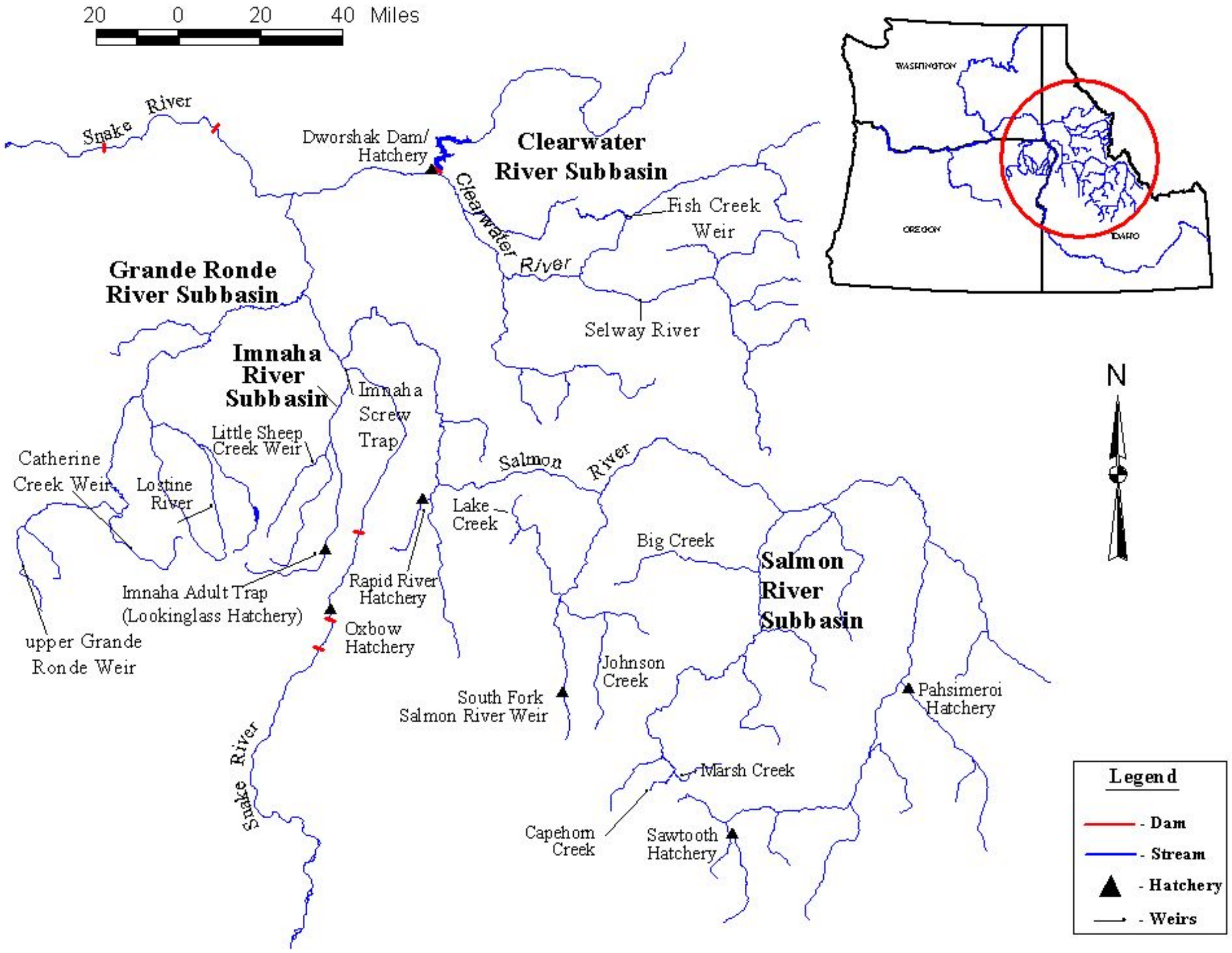

Figure 1. Map showing the Snake River basin Chinook salmon and steelhead sampling locations for 2004.

Fish Collection and Handling

Chinook salmon spawning ground surveys were usually conducted on pre-determined stream reaches before handling any fish. Redd counts also determined where in each stream the collection of adult males would be most effective. Several team members located adults and visually identified male salmon, being careful not to disturb the fish. Actively spawning females and males paired with females were avoided so as not to disrupt spawning. Males were identified by secondary sexual characteristics such as a kype (greatly extended, narrowed snout, turned down at tip, also an enlarged lower jaw), large teeth, and a slim caudal peduncle that is not as worn as the female salmon. Personnel were instructed to stay away from any existing or active redds (i.e. where salmon are on the nests). A snorkeler entered the water to find solitary males, looking under cut banks, in logjams, in backwater habitats, etc. From the vantage point underwater, this person identified fish for others to collect. Inadvertently caught females were immediately released from the net without ever being out of the water and the capture was recorded.

All adult male salmon were collected by hand or dip net in that order of preference. Hand collections involved walking or swimming up to the identified fish and grasp the fish at caudal peduncle, putting the fish into a dip net and keeping the fish in the water, pointing upstream, until ready to place in the tank. Dip net collection involved placing several dip netters in a position below the fish, being careful to avoid redds, while several upstream people slowly herd fish towards the netters. The large dip nets are held in the water in a line effectively blocking the stream until the fish swims into the net.

Captured fish were held in the stream while a portable tank was set up along the stream. Fish were immobilized using anesthetic so they could be handled faster and less stressfully. The anesthesia was delivered by placing the fish in a portable tank filled with 135 liters of water containing 90 mg/l of tricane methanesulfonate (MS-222, Finquel^{TM}) anesthesia and approximately 180 mg/l sodium bicarbonate ($NaHCO_3$) to buffer the acidity of the MS-222. The fish was constantly monitored while in the tank and the time to sedation was noted. The sedated fish was rinsed in the fresh water of the stream and the abdomen dried to reduce water contamination prior to collecting the milt. Milt was collected in a plastic Whirl Pak bag by gently squeezing the abdomen (Figure 2).

Figure 2. Collecting Chinook salmon milt from anaesthetized fish at Big Creek.

General biological information such as fork length, mid-eye to hypural plate length, general condition and external marks were recorded following semen collection (Figure 3). Caudal fin tissue was collected and preserved in ethyl alcohol for later genetic (DNA) analysis and scales were taken for age assessment and scale pattern analysis. Stream water was gently poured over the salmon's head and gills to start the recovery from the MS-222 and reduce stress on the fish while this information was collected. Following sampling and data collection, the anesthetized salmon were immediately returned to a slow water area and assisted until it fully recovered. After the fish is released into the stream, the tank was emptied well away from the stream to prevent the release of chemicals into the stream proper.

Spring/summer Chinook salmon gametes were also collected at weirs and hatchery traps. Fish were either anesthetized by personnel working the traps or euthanasied following production spawning. Milt was then collected using the standard protocol (see above).

Figure 3. Anaesthetized male Chinook salmon on portable tank for measurements.

The brood year of each sampled fish was determined initially using length data and will be modified following scale analyses if the scales provide a better estimate of age. We used the following length age relationship to determine the ages of Chinook salmon: <66 cm - age 3, 66-90 cm - age 4 and >90 cm – age 5.

In 2003 we obtained ESA section 10 permit approval to capture adult steelhead males by angling (Permit # 1134). The permit states that we were limited to artificial lures and barbless hooks.

The preferred method involved locating male steelhead away from active redds and targeting these fish. At other times we fished deep holding water. Once hooked, fish were brought in as rapidly as possible, netted and held in the water until the anesthesia tank was set up. Sperm was taken as described for Chinook salmon above. The fish were measured (fork length) and a tissue sample was taken for DNA analysis. Fish were revived by holding them in the current until they swam away. We used the following length age relationship to determine the ages of steelhead collected from the Imnaha River subbasin (Little Sheep, Cow and Lightning Creeks): <64 cm - age 3 and > 64 cm – age 4. We used the following length age relationship to determine the ages of steelhead collected from the South Fork Salmon River (B-run steelhead; data from Dworshak National Fish Hatchery): <72 cm – age 3, 72 – 93 cm – age 4 and >93 cm – age 5.

Semen Handling and Cryopreservation

The amount of semen obtained varied greatly by individual fish and by species. Chinook salmon produced greater volumes of milt (averaging > 5 ml), whereas steelhead produced less (average 2-4 ml). If greater than approximately 5 ml of semen were collected then the sample is separated into equal aliquots and poured into two separately labeled Whirl Pak ™ bags so the sample can be sent to two independent locations for freezing. The bags are aerated using a foot pump then placed in an insulated cooler containing wet ice. Because it is critical to avoid placing the samples directly on the ice, newspaper was placed over the ice to insulate the samples.

Semen samples were shipped to, cryopreserved and stored at both WSU and the UI within 12 hours of collection. Sperm quality was determined by estimating the percentage of motile sperm following the addition of a sperm activating solution (Mounib 1978). Samples were frozen in 0.5 ml French straws (IMV International, Minneapolis, Minnesota). Samples were stored in large cryopreservation tanks under liquid nitrogen (Figure 4).

Figure 4. Example of a liquid nitrogen tank used to store Chinook salmon and steelhead gametes.

RESULTS

The Chinook salmon and steelhead spawning aggregates and hatcheries in the Snake River basin where gametes were collected in 2004 have a diverse history of transfers, stocking, and straying. It is important to understand how the history of broodstock development, management and stocking has influenced the samples in the gene bank. A detailed description of the spawning aggregates sampled for cryopreservation can be found in Armstrong and Kucera (2001).

Gametes from 252 male Chinook salmon (Table 1) were collected and cryopreserved from eleven populations in 2004. Collections occurred over a two-month period from August 3, 2004 to September 28, 2004. Gametes were collected 187 unmarked, natural-origin fish and 65 marked, hatchery-origin fish. Two females were accidentally captured and immediately released. Motility of the sperm ranged from 0 – 90%.

Gametes from 125 male steelhead (Table 2) were collected and cryopreserved from three populations in 2004. Collections occurred over a two-month period from March 25 to May 16, 2004. Fish were collected at Little Sheep Creek adult trap and by angling in the South Fork Salmon River and Johnson Creek. Motility of the sperm ranged from 0 – 90%.

The Nez Perce Tribe germplasm repository accepts gametes for long term storage from other comanagers in the Columbia River basin. In 2004 male gametes from 19 Kootenai River white sturgeon and 9 Kootenai River burbot where contributed by the Kootenai Tribe as part of the recovery program for these species. These gamete samples will be available for future recovery efforts in the Kootenai River subbasin.

Table 1. Locations and numbers of spring and summer Chinook salmon semen samples cryopreserved in the Snake River basin in 2004.

Spawning Aggregate	Total Samples	Unmarked Fish[a]	Marked Fish[b]	Females Captured	Collection Dates	Sperm Motility (%)
Lostine River	39	17	22	0	8/25, 9/1, 8 & 20	50-90
Catherine Creek	7	6	1	0	9/4 & 20	70-90
Grande Ronde River	8	7	1	0	9/2, 9 & 20	70-90
Imnaha River	25	25	0	0	8/24, 31, 9/8 & 20	50-90
S. Fork Salmon River	15	13	2	0	8/30 & 3	10-90
Lake Creek	26	26	0	1	8/3, 10 & 15	0-90
Johnson Creek	60	53	7[c]	0	8/17,18, 23,24, 26, 27, 31, 9/1, 3	0-90
Big Creek	22	22	0	1	8/6, 11 & 17	0-90
Capehorn Creek	0	0	0	0	8/12	-
Marsh Creek	5	5	0	0	8/12 & 19	60-90
Pahsimeroi River	20	0	20	0	9/28	30-90
Upper Salmon River	25	13	12	0	9/2 & 10	30-90
Totals	252	187	65	2	8/3 – 9/28	0-95

[a]Non fin-clipped fish, natural-origin
[b]Fin-clipped or tagged fish, hatchery-origin
[c]Marked with a coded wire tag (CWT) and/or visual implant elastomer (VIE) tag

Table 2. Locations and numbers of steelhead semen samples cryopreserved from the Snake River basin in 2004.

Spawning Aggregate	Total Samples	Un-marked Fish[a]	Marked Fish[b]	Females Captured	Collection Dates	Sperm Motility (%)
Little Sheep Creek	100	3	97	0	3/30, 4/13, 20, 27	0-90
Johnson Creek	1	1	0	0	4/29	90
South Fork Salmon River	24	24	0	16	4/8, 16, 23, 29	10-90
Totals	125	28	97	16	3/25 – 5/16	0-90

[a]Non fin-clipped fish, natural origin
[b]Fin-clipped or tagged fish, hatchery origin

2004 Chinook Salmon Gamete Collections

Lostine River

In 2004 the gametes from 39 male Chinook salmon were cryopreserved from fish trapped at the adult weir on the Lostine River and spawned at Lookingglass Hatchery. The collection included gametes from 22 adipose fin clipped, hatchery-origin males and 17 unmarked, natural-origin males. Based on the length data (Appendix B), three age 3, thirty-four age 4 and one age 5 fish were sampled from brood years 2001, 2000 and 1999, respectively. Length was not determined for one fish. Collections from 1994 to 2004 have preserved a total of 140 Lostine River male gamete samples in the gene bank (Appendix A).

Upper Grande Ronde

In 2004 the gametes from eight male Chinook salmon were cryopreserved from fish trapped at the adult weir on the upper Grande Ronde River and spawned at Lookingglass Hatchery. The collection included gametes from one adipose fin clipped, hatchery-origin males and seven unmarked, natural-origin males. Based on the length data (Appendix B), three age 3 and five age 4 fish were sampled from brood years 2001 and 2000, respectively. Collections from 2001 to 2004 have preserved a total of 35 Grand Ronde River male gamete samples in the gene bank (Appendix A).

Catherine Creek

In 2004 the gametes from seven male Chinook salmon were cryopreserved from fish trapped at the adult weir on the Catherine Creek and spawned at Lookingglass Hatchery. The collection included gametes from one adipose fin clipped, hatchery-origin male and six unmarked, natural-origin males. Based on the length data (Appendix B), two age 3 and five age 4 fish were sampled from brood years 2001 and 2000, respectively. Length was not determined for two fish. Collections from 2001 to 2004 have preserved a total of 31 Catherine Creek male gamete samples in the gene bank (Appendix A).

Imnaha River

In 2004 the gametes from 25 Chinook salmon were cryopreserved from fish trapped in the Imnaha River and spawned at Lookingglass Fish Hatchery. All were unmarked, natural-origin males. Based on the length data (Appendix B), one age 3, seventeen age 4 and four age 5 fish were sampled from brood years 2000, 1999 and 1998, respectively. Length was not determined for three fish. Collections from 1994 to 2004 have preserved a total of 450 Imnaha River male gamete samples in the gene bank (Appendix A). Of these, 209 were from marked hatchery males and 241 were from unmarked natural males.

South Fork Salmon River

In 2004 the gametes from 15 male Chinook salmon were cryopreserved from fish trapped at the adult weir on the South Fork Salmon River (McCall Hatchery, Idaho Department of Fish and Game - IDFG). The collection included gametes from two marked (left ventral fin clip - LV or CWT), supplementation males (natural- and hatchery-origin cross) and 13 unmarked, natural-origin males. Based on the length data (Appendix B), five age 3 and ten age 4 fish were sampled from brood years 2001 and 2000, respectively. Collections from 1996 to 2004 have preserved a total of 364 South Fork Salmon River male gamete samples in the gene bank (Appendix A). Of these, 183 were from non-ESA-listed hatchery-origin males, 83 were from ESA listed, supplementation males, and 96 were from unmarked, ESA-listed natural-origin males.

Lake Creek

In 2004 the gametes from 26 unmarked, natural-origin male Chinook salmon were cryopreserved from fish netted in Lake Creek. One female Chinook salmon was incidentally netted and immediately released. Based on the length data (Appendix B), 25 age 4 and one age 5 fish were sampled, originating from brood years 2000 and 1999, respectively. Collections from 1996 to 2004 have preserved a total of 135 Lake Creek male gamete samples in the gene bank (Appendix A).

Johnson Creek

In 2004 the gametes from 60 male Chinook salmon were cryopreserved from fish captured in Johnson Creek and at the NPT adult weir. The collection included gametes from 21 males captured at the Johnson Creek adult weir and spawned at McCall Hatchery's South Fork Salmon

River facility as part of the Johnson Creek supplementation project, 29 males captured at the NPT Johnson Creek adult weir and immediately released upstream and 10 males netted in Johnson Creek. Based on the length data (Appendix B), 10 age 3, 42 age 4 and two age 5 fish were sampled, originating from brood years 2001, 2000 and 1999, respectively. Length was not determined for six fish. Collections from 1997 to 2004 have preserved a total of 298 Johnson Creek male gamete samples in the gene bank (Appendix A).

Big Creek

In 2004 the gametes from 22 unmarked, natural-origin male Chinook salmon were cryopreserved from fish netted in Big Creek. One adipose-clipped fish was captured (milt was not collected). One female Chinook salmon was incidentally netted and immediately released. Based on the length data (Appendix B), four age 3, 16 age 4 and two age 5 fish were sampled, originating from brood years 2001, 2000 and 1999, respectively. Collections from 1992 to 2004 have preserved a total of 155 Big Creek male gamete samples in the gene bank (Appendix A).

Capehorn Creek

In 2004 no male Chinook salmon were captured from Capehorn Creek. Few spawning fish were observed and no solitary males identified. Collections from 1997 to 2004 have preserved a total of 27 Capehorn Creek male gamete samples in the gene bank (Appendix A).

Marsh Creek

In 2004 the gametes from 5 unmarked, natural-origin male Chinook salmon were cryopreserved from fish netted in Marsh Creek. One adipose fin clipped Chinook salmon was captured but milt was not collected. Based on the length data (Appendix B), two age 3 and three age 4 fish were sampled indicating that they originated from brood year 2001 and 2000, respectively. Collections from 1997 to 2004 have preserved a total of 92 Marsh Creek male gamete samples in the gene bank (Appendix A).

Pahsimeroi River

In 2004 the gametes from 20 Pahsimeroi River male Chinook salmon were cryopreserved from fish spawned at Pahsimeroi Hatchery. The collection included gametes from 17 adipose fin-clipped, hatchery-origin males and three CWT supplementation-origin males (cross between hatchery- and natural-origin fish). Based on the length data (Appendix B), five age 3, 14 age 4 and one age 5 fish were sampled, originating from brood years 2001, 2000 and 1999, respectively. Collections from 1999 to 2004 have preserved a total of 205 Pahsimeroi River male gamete samples in the gene bank (Appendix A). Of these, 170 were from marked, hatchery fish, 34 were from unmarked, natural fish and 3 were from supplementation fish.

Upper Salmon River

In 2004 the gametes from 25 upper Salmon River male Chinook salmon were cryopreserved from fish spawned at Sawtooth Fish Hatchery. The collection included gametes from 13 unmarked, natural-origin males and 12 adipose fin clipped, hatchery-origin males. Based on the length data (Appendix B), all 25 were age 4 fish, originating from brood year 2000. Collections from 1997 to 2004 have preserved a total of 318 upper Salmon River male gamete samples in the gene bank (Appendix A). Of these, 67 were from marked hatchery fish, 26 were from marked supplementation fish and 227 were from unmarked natural fish.

2004 Steelhead Gamete Collections

Little Sheep Creek

In 2004 the gametes from 100 male steelhead were cryopreserved from fish spawned at the Little Sheep Creek adult weir. The collection included gametes from 97 adipose fin clipped hatchery-origin males and three unmarked, natural-origin males. Based on the length data (Appendix C), 70 age 3 and six age 4 fish were sampled, originating from brood years 2001 and 2000, respectively. Length was not determined for 24 fish. Collections from 1999 to 2004 have preserved a total of 450 Little Sheep Creek male gamete samples in the gene bank (Appendix A). Of these, 425 were from marked hatchery fish and 25 were from unmarked natural fish (Appendix A).

South Fork Salmon River

In 2004 the gametes from 24 unmarked, natural-origin male steelhead were cryopreserved from fish captured by angling in the South Fork Salmon River. The gametes from five other males were collected but not cryopreserved due to low volume and poor quality. Sixteen females were inadvertently captured and immediately released. Based on the length data (Appendix C), three age 3, eighteen age 4 and one age 5 were sampled. Length was not determined for 2 fish. Collections from 2003 to 2004 have preserved a total of 41 SFSR male gamete samples in the gene bank (Appendix A).

Johnson Creek

In 2004 gametes from one unmarked, natural-origin male steelhead was cryopreserved from fish captured by angling in Johnson Creek. Based on the length data (Appendix C), this was an age 4 fish. Collections from 1999 to 2004 have preserved a total of four Johnson Creek male gamete samples in the gene bank (Appendix A).

Status of Germplasm Collections in the Snake River Basin

NPT initiated the gene bank effort in 1992 with collections of milt from Big Creek spring Chinook salmon. Since that time sampling effort has increased to include Chinook salmon and steelhead from most of the major river subbasins in the Snake River basin (Appendix A). Regional support for the project was evident by the addition of cryopreserved samples collected state management agencies and Native American Tribes. These agencies utilized NPT's long-term repository to store cryopreserved gametes from other imperiled salmon populations and species in the Columbia River drainage. The repository also includes gamete samples from Redfish Lake sockeye (IDFG), Yakima River spring Chinook salmon (Washington Department of Fish and Wildlife - WDFW), Grande Ronde River subbasin Chinook salmon captive broodstock programs (NPT – see below), Kootenai River white sturgeon (Kootenai Tribe) and Kootenai River Burbot (Kootenai Tribe).

Grande Ronde River Chinook Salmon Captive Broodstock Project

A Grande Ronde River subbasin spring Chinook salmon captive broodstock program, comanaged by Oregon Deparment of Fish and Wildlife, Confederated Tribes of the Umatilla Indian Reservation and NPT, was initiated in 1995 with the collection of juvenile salmon (500 parr) from the Lostine River, Catherine Creek and upper Grande Ronde River. This program is an attempt to maximize the species reproductive potential and to preserve the population through use of acclimated smolt releases to return a threshold number of spawning Chinook salmon adults to the three rivers (Kline et al. 2003). Semen was cryopreserved from the male Chinook salmon in order to maintain a repository of genetic material from these captive fish. The project maintains a repository at Bonneville Hatchery. Half of the straws from each male are transported to the germplasm repository at University of Idaho as insurance against catastrophic failure at the Bonneville repository. No samples were added to the repository in 2004. The total number of samples stored in the repository from this captive broodstock project is 680. Of these, 232 were from the Lostine River, 180 were from the upper Grande Ronde River, and 268 were from Catherine Creek.

Fertility Trials

Fertility trials were not conducted in 2004.

Use of Cryopreserved Gametes in 2004

No gametes from the repository were requested or used in 2004.

Salmonid Genetic Analysis

An important objective of the Salmonid Gamete Preservation project is to report the genetic composition of the fish in the genebank and evaluate the effectiveness of the collection verses the extant population. Genetic diversity information from fish in the repository is used to evaluate the level genetic diversity contained in the gamete repository and serve as a baseline that can be used to monitor shifts or losses of genetic variation over time (Servheen et al. 2001).

In 2004, tissue samples were collected from the majority of Chinook salmon and steelhead captured and spawned for cryopreservation. These samples will be analyzed and incorporated into a larger analysis of the within and among population spatial and temporal genetic diversity of all samples in the repository.

DISCUSSION

Sustained productivity of salmonids in the Pacific Northwest is possible only if the genetic resources that are the basis of such productivity are maintained (National Research Council 1996). Because much of the genetic diversity that historically existed has already been lost, the germplasm repository is an effort to conserve the genetic diversity that remains in existing salmon and steelhead populations and allow for future management options. Although we have attempted to sample and preserve salmonid genetic diversity within the major river subbasins in the Snake River basin, the spawning aggregates sampled may represent a small portion of the total genetic diversity in the Snake River basin. Consequently, collections should continue from these and additional populations until an adequate number of individuals from multiple populations have been sampled.

Since the program was initiated in 1992, NPT has been very successful cryopreserving Chinook salmon gametes from both hatchery and natural populations. In contrast, few gametes from naturally-spawned steelhead have been collected and cryopreserved. Chinook salmon spawn in late summer during periods of low water flows, making it relatively easy to spot and capture spawning adults from natural spawning grounds. Steelhead spawn in the spring during periods of high water and inclement weather making them essentially inaccessible to capture with nets or seines. Thus, a majority of the steelhead gametes came from easily accessible hatchery-origin fish. In 2003 we began collecting naturally-spawning adult male steelhead using angling. This method proved effective based on the 17 steelhead gamete samples collected from the South Fork Salmon River. In 2004 we collected gamete samples from 24 SFSR and 1 Johnson Creek steelhead using this method.

Fertility trials were not conducted in 2004 because we were unable to obtain eggs. Conducting fertility trials is a top priority of the project and will be conducted in 2005.

Tissue samples were collected from nearly all fish sampled in 2004. The Chinook salmon samples were sent to the Hagerman Aquaculture Research Institution where they were added to the collection from previous year. Funding constraints make it impossible to genotype and analyze all samples in the collection in a single year. Thus, samples from 2004 will be genotyped and analyzed in 2005.

Although no requests for cryopreserved gametes were made in 2004, we believe that more requests will be made to use cryopreserved semen in hatchery production programs and in research. We recommend and support only the ethical use of cryopreserved genetic material from the germplasm repository. The judicious use of this vital genetic resource is imperative.

To that end, we will provide criteria for accessing and using cryopreserved semen samples from the germplasm repository that will assist in rational use and inventory management. A form has been developed to request cryopreserved semen from the germplasm repository and is available for use (Appendix D). The semen request form's main function is for inventory management of the 0.5ml straws and 5.0 ml straws. Semen requests are reviewed by the Snake River Germplasm Repository Committee to ensure rational use. The Snake River Germplasm Repository Committee, consist of Tribal and University personnel, meets following a request for germplasm and decides based on availability, scientific merit and ESA compliance.

Understanding the distribution of the samples obtained from an organism with a non-discrete generation time is critical for preserving the greatest level of diversity. This project set a goal of preserving gametes from at least 100 males per brood year for at least one generation from each spawning aggregation. Equalizing the collection of milt from adults across an entire generation will preserve of the greatest amount of genetic diversity. However, collecting 100 samples/year for an entire generation has not been possible given the low number of returning adults and the difficulty in capturing adult males. Generally, collections ranged from 10 – 40 samples per year per spawning aggregation. Thus it was inevitable that collections would need to continue for multiple generations in order to reach the sampling goal. For this reason we required a method that would quantify the distribution of collections that occurred over multiple generations. This method, referred to as the Effective Brood Year (EBY) analysis, could deal with sample collections from multiple age classes over multiple years. Just as an effective population size was defined as the theoretical size of a population under ideal conditions (see Hedrick 2000 or any genetics text for an explanation of effective population size), effective brood year is the theoretical brood year an organism originated from. By analyzing the demographic makeup of the fish that contributed gametes to the collection each year, assigning them to the actual brood years that they originated, this method enabled us to estimate the overall distribution of samples in the genebank.

Generation times were calculated as the average number of years it takes for 95% of the individuals from a brood year to return. Fish were designated to actual brood years based on length/frequency data. The number of effective brood years in a generation is equal to the number of years per generation. The time it takes to collect a specified number of samples per effective brood year will vary depending on the number and age of the fish sampled each year. Fish collected as 3, 4 and 5 year olds in one year originated from 3 different brood years and thus 3 different effective brood years. The first effective brood year was arbitrarily set as the first year of collection and proceeded for the number of years in a generation. For example, let say we made two collections of 500 gamete samples, collection 1 consisted of 50 samples/year for consecutive 10 years (2 Chinook salmon generations) and collection 2 consisted of 10 yearly collections of 100, 100, 0, 20, 20, 80, 80, 40, 0, 60 (2 Chinook salmon generations). Assuming similar demographic composition among the years (approximately similar number of 3, 4 and 5 year old fish each brood year), the former collection would preserve more diversity compared to the latter. By evenly sampling fish over two generations, collection 1 maximized the potential diversity from the population. In contrast, collection 2 underrepresented the extant diversity of the population because certain brood years were overrepresented and others were underrepresented.

To date, none of the populations have met the goal of collecting 500 samples for Chinook salmon (based on a generation time of 5 years) and 400 - 500 samples for steelhead (based on a generation time of 4 years for A-run hatchery fish and 5 years for B-run hatchery fish). However, a number of collections from non-ESA listed hatchery populations are represented by large numbers of individuals that may have an adequate number of samples to mitigate genetic diversity problems in the source populations. Young and Kucera (2002) recommended not collecting additional samples from North Fork Clearwater steelhead (Dworshak National Fish Hatchery), Pahsimeroi River steelhead (Pahsimeroi Fish Hatchery) and Snake River steelhead from Oxbow Fish Hatchery and made recommendations for future collections from Imnaha River Chinook salmon, South Fork Salmon River Chinook salmon and Little Sheep Creek steelhead. We will not repeat those analyses in this report, but will update the status of the 2004 collections in relation to the recommendations of Young and Kucera (2002). With the exception of those listed above, all Chinook salmon and steelhead populations listed in Appendix Table A1 and A2 do not have sufficient number of gamete samples and will require additional sample collections in 2004.

In 2004 gamete samples were collected from three populations that contain a large number of samples to warrant an EBY analysis (Imnaha River Chinook salmon, South Fork Salmon River Chinook salmon and Little Sheep Creek steelhead). The status of the 2004 collections from Imnaha River Chinook salmon and South Fork Salmon River Chinook salmon will be discussed with respect to the recommendations of Young and Kucera (2002).

Imnaha River Chinook Salmon

Young and Kucera (2002) recommended collecting gametes from natural-origin fish in order to preserve the greatest level of diversity from this population and to concentrate collections on fish from effective brood year 1 (2004 five year old fish), as it was underrepresented in the repository. In 2004 we collected gametes from 25 natural-origin fish including 5 fish representing effective brood year 1. Targeted collections from fish representing effective brood year 1 over the past two years resulted in the collection of gametes from 13 fish. In spite of this effort, fish from effective brood year 1 remain underrepresented in the repository (Figure 5) and will not be available again for collection until 2007. In fact, fish from this brood year were relatively rare across the entire Snake River basin (based on our collections). The gene bank contains gametes from 475 Imnaha River male Chinook salmon including 209 marked hatchery-origin fish and 266 wild fish.

RECOMMENDATIONS - Although a large number of samples have been collected from this population, additional collections, focusing on wild-origin fish, are warranted because of the importance of this ESA-listed stock and the fact that nearly half of the samples were from hatchery-origin fish. Focusing our collection on natural-origin fish will preserve the greatest level of diversity from this population.

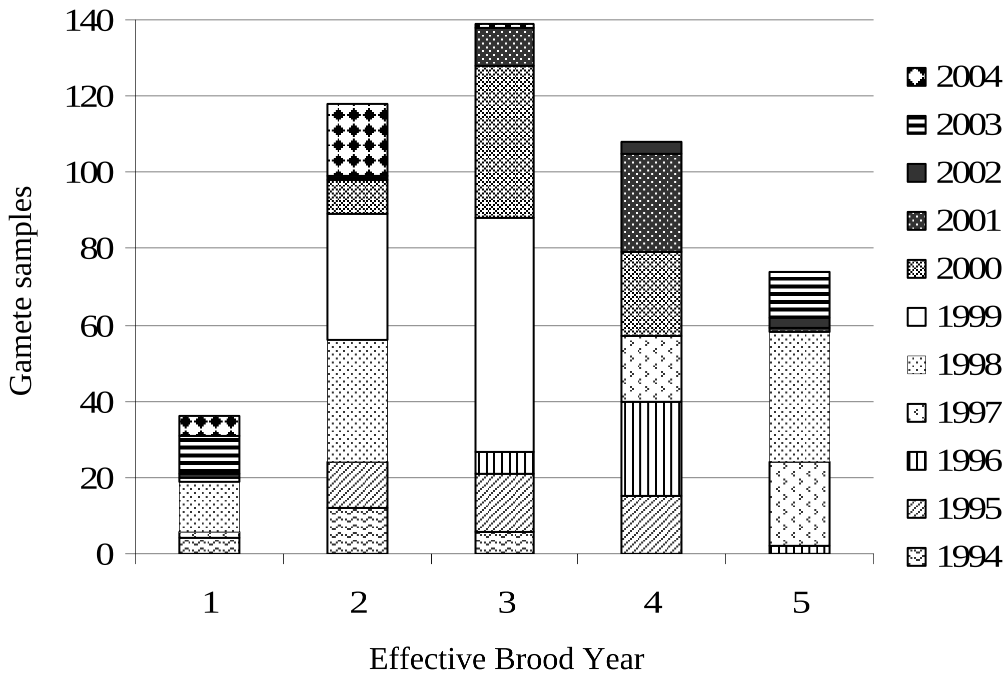

Figure 5. Graph showing the number of gametes collected from Imnaha River Chinook salmon per effective brood year over a 5-year generation.

South Fork Salmon River Chinook Salmon

Young and Kucera (2002) recommended collecting gametes from natural-origin fish in order to preserve the greatest level of diversity from this population and to concentrate collections on fish from effective brood year 4 (2004 five year old fish), as it was underrepresented in the repository. In 2004 we collected gametes from 15 natural-origin fish however, no fish representing effective brood year 4 were obtained. The collection of brood year 4 were limited by a low number of 5 year-old fish returning in 2004. Targeted collections from fish representing effective brood year 4 over the past two years resulted in the collection of gametes from 6 fish. In spite of the targeted effort, fish from effective brood year 4 remain underrepresented in the repository (Figure 6) and will not be available again for collection until 2007. Similar to 2003, we significantly increase the number of gametes from natural-origin fish by collecting milt directly at the trap as IDFG personnel sorted hatchery- and natural-origin fish. The gene bank now contains gametes from 364 South Fork Salmon River male Chinook salmon including 183 marked hatchery-origin fish, 83 supplementation fish (hatchery-origin x natural-origin) and 96 natural-origin fish.

RECOMMENDATIONS – The 183 hatchery-origin fish are adequate as a buffer against potential loss of diversity in the hatchery population. Increasing the collection of wild-origin fish will be a priority as it maximizes the diversity of the collection.

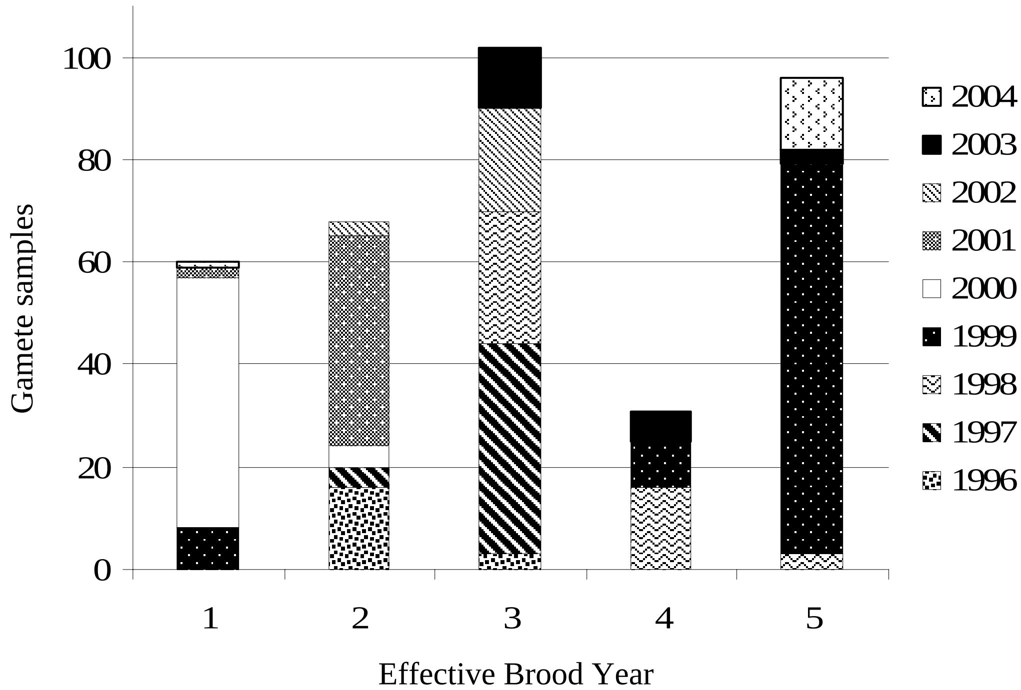

Figure 6. Graph showing the number of gametes collected from South Fork Salmon River Chinook salmon per effective brood year over a 5-year generation.

Little Sheep Creek Steelhead

Young and Kucera (2002) recommended collecting gametes from hatchery- and natural-origin fish in order to preserve the greatest level of diversity from this population. In 2004 we collected gametes from 100 Little Sheep Creek male steelhead including ninety-seven marked hatchery-origin fish and three unmarked natural-origin fish. The gene bank contains gametes from 450 Little Sheep Creek male steelhead including 425 marked hatchery-origin fish and 25 natural-origin fish. Oregon Department of Fish and Wildlife (ODFW) hatchery managers designate age groups by the following lengths: <64 cm – age 3 and >64 cm – age 4 and the generation time of the hatchery population is 4 years since nearly all fish return as 3 and 4 year olds (Mike Flesher, ODFW, personal communication). The generation time of the natural-origin fish was unknown. Of the 100 fish sampled, 7 were from effective brood year 4 and 93 were from effective brood year 1. Using these lengths along with the run composition for each year, the number of fish from each brood year represented in the gene bank was calculated (Figure 7).

RECOMMENDATIONS – The Little Sheep Creek steelhead collection of 450 samples meets the goal of collection 100 fish per brood year for a complete generation. Consequently, we will no longer intensively sample from this population. However, we will target wild-origin males from this population and collect a limited number of hatchery-origin males for cryopreservation in large 5.0 ml straws. Increasing the collection of natural-origin fish from all brood years will maximize the diversity of the collection from this drainage. The low milt production generally observed in steelhead made it impossible to meet the needs of the conservation aspect of the program (large number of small 0.5 ml straws) and pursue management flexibility by freezing milt in large 5.0 ml straws. Now that the conservation goal has been accomplished, freezing milt in 5.0 ml straws will provide future management options by making it possible to fertilize large batches of eggs (Wheeler and Thorgaard, 1991).

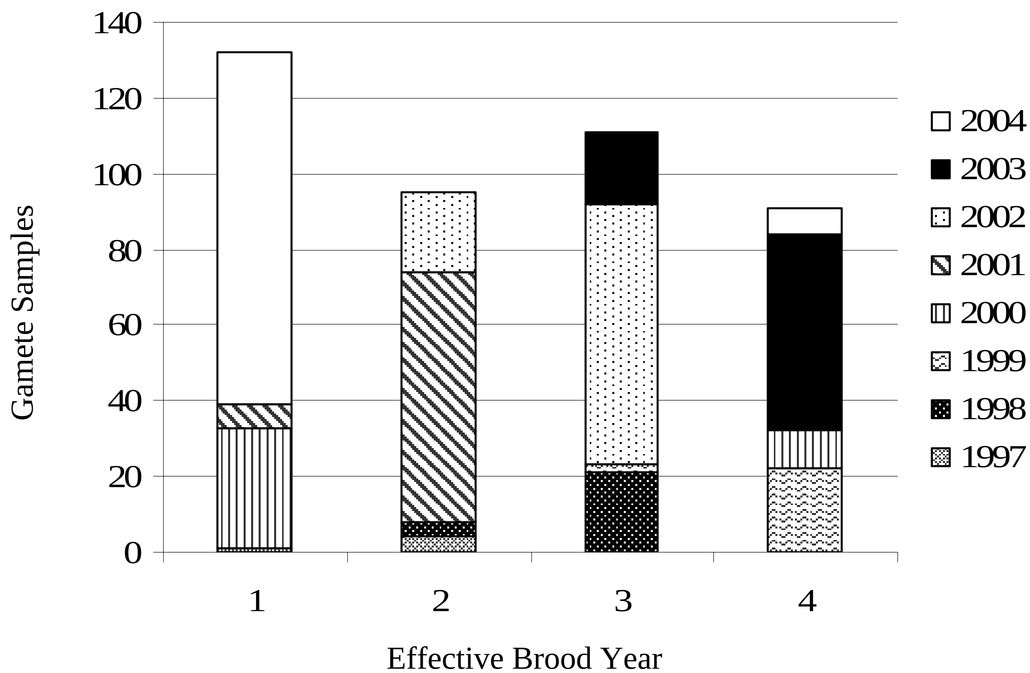

Figure 7. Graph showing the number of gametes collected from the Little Sheep Creek steelhead per effective brood year over a 4-year generation.

RECOMMENDATIONS

1. Continue collecting gametes from Chinook salmon populations throughout the Snake River basin.
2. Utilize angling as a method of collecting gametes from steelhead populations throughout the Snake River basin.
3. Complete a genetic analysis of the chinook salmon contained in the genebank and compare it to the source populations.
4. Continue tissue sample collections from all of the fish that are sampled in order to perform critical genetic analyses.
5. Research techniques to optimize 5.0 ml straw freezing and thawing protocols that will improve fertilization rates.
6. Continue fertility trials on cryopreserved gametes in order to evaluate the freezing techniques.
7. Work to establish a Regional Germplasm Repository for gene conservation of imperiled fish and wildlife species.

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This report and annual reports from 1997-2003 are available on the Internet through BPA Fish and Wildlife Publications at:

http://www.efw.bpa.gov/cgi-bin/efw/FW/publications.cgi

APPENDICIES

Appendix A. Gamete samples collected from 1992 through 2004

Table A1. Snake River basin Chinook salmon samples cryopreserved from 1992 through 2004.

Spawning Aggregate	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	Totals
Lostine River	39	16	19	33	18	2	3	2	3	1	4			140
Upper Grande Ronde River	8	10	8	9										35
Catherine Creek	7	8	5	11										31
Rapid River					51	68	98							217
South Fork Salmon River	15	26	23	44	54	93	45	45	19					364
Lake Creek	26	32	18	28	15	6	3	4	3					135
Johnson Creek	60	54	58	62	35	5	17	7						298
Big Creek	22	31	21	50	7	0	1	6	0	0	0	10	7	155
Capehorn Creek	0	15	1	2	1	0	6	2						27
Marsh Creek	5	16	34	24	7	0	2	4						92
Pahsimeroi River	20	17	39	50	50	31								205
Upper Salmon River	25	20	54	48	40	40	41	51						318
Imnaha River	25	23	7	37	71	95	79	41	33	42	22			475
Totals	252	268	286	398	349	340	295	162	58	43	26	10	7	2,492

Table A2. Snake River basin steelhead samples cryopreserved from 1993 through 2004.

Spawning Aggregate	2004	2003	2002	2001	2000	1999	1998	1997	1994	1993	Totals
North Fork Clearwater River			63	81	89	62					295
Selway River									5*		5
Fish Creek			3	1	1					10*	15
Grande Ronde River				1	1						2
South Fork Salmon River	24	17									41
Johnson Creek	1			1		2					4
Pahsimeroi River			63	60	40	47					210
Imnaha River					2						2
Little Sheep Creek	100	70	95	78	52	25	25	5			450
Cow Creek		2									2
Lightning Creek		1									1
Snake River			58	73	98	76					305
Totals	125	90	280	295	281	214	25	5	5	10	1,336

* Samples collected by the USGS/ National Biological Survey.

Appendix B. Data from Chinook salmon collected in 2004.

Table A3. Collection date, fork lengths, percent motilities and number of straws from Chinook salmon collected in 2004.

Location	Date	Fork length (cm)	Genebank #	WSU motility (%)	WSU # of 0.5 ml straws	UI motility (%)	UI # of 0.5 ml straws
Pahsimeroi Hatchery	9/28/2004	78	NPT-246-04	90	20	60	19
Pahsimeroi Hatchery	9/28/2004	69	NPT-247-04	90	20	70	20
Pahsimeroi Hatchery	9/28/2004	65	NPT-248-04	70	20	70	18
Pahsimeroi Hatchery	9/28/2004	72	NPT-249-04	80	20	50	19
Pahsimeroi Hatchery	9/28/2004	90	NPT-250-04	40	20	80	20
Pahsimeroi Hatchery	9/28/2004	53	NPT-251-04	?	20	30	19
Pahsimeroi Hatchery	9/28/2004	62	NPT-252-04	90	20	70	20
Pahsimeroi Hatchery	9/28/2004	84	NPT-253-04	80	20	80	20
Pahsimeroi Hatchery	9/28/2004	93	NPT-254-04	90	20	80	20
Pahsimeroi Hatchery	9/28/2004	74	NPT-255-04	80	20	70	20
Pahsimeroi Hatchery	9/28/2004	58	NPT-256-04	UI		90	10
Pahsimeroi Hatchery	9/28/2004	64	NPT-257-04	90	20	70	20
Pahsimeroi Hatchery	9/28/2004	76	NPT-258-04	80	20	20	16
Pahsimeroi Hatchery	9/28/2004	76	NPT-259-04	50	20	80	20
Pahsimeroi Hatchery	9/28/2004	84	NPT-260-04	90	20	60	18
Pahsimeroi Hatchery	9/28/2004	76	NPT-261-04	UI		70	20
Pahsimeroi Hatchery	9/28/2004	85	NPT-262-04	90	20	60	20
Pahsimeroi Hatchery	9/28/2004	82	NPT-263-04	70	20	90	20
Pahsimeroi Hatchery	9/28/2004	85	NPT-264-04	50	20	(WSU)	
Pahsimeroi Hatchery	9/28/2004	85	NPT-265-04	40	20	70	19
Lake Creek	8/3/2004	69	NPT-001-04	90	20	95	20
Lake Creek	8/3/2004	72	NPT-002-04	60	20	90	17
Lake Creek	8/3/2004	82	NPT-003-04	60	20	5	17
Lake Creek	8/3/2004	69	NPT-004-04	20	20	90	20
Lake Creek	8/3/2004	80	NPT-005-04	50	20	10	20
Lake Creek	8/3/2004	89	NPT-006-04	70	20	90	13
Lake Creek	8/3/2004	73	NPT-007-04	60	20	90	20
Lake Creek	8/10/2004	75	NPT-016-04	10	20	60	19
Lake Creek	8/10/2004	79	NPT-017-04	10	20	70	18
Lake Creek	8/10/2004	73	NPT-018-04	60	20	50	19
Lake Creek	8/10/2004	75	NPT-019-04	20	20	80	18
Lake Creek	8/10/2004	78	NPT-020-04	60	20	80	20
Lake Creek	8/10/2004	80	NPT-021-04	20	20	(WSU)	
Lake Creek	8/10/2004	79	NPT-022-04	70	20	80	19
Lake Creek	8/10/2004	82	NPT-023-04	90	20	90	19
Lake Creek	8/10/2004	70	NPT-024-04	80	10	50	7
Lake Creek	8/10/2004	75	NPT-025-04	10	10	80	18
Lake Creek	8/10/2004	82	NPT-026-04	80	20	90	17
Lake Creek	8/15/2004	79	NPT—04	40	20		
Lake Creek	8/15/2004	81	NPT-38-04	70	20	80	11
Lake Creek	8/15/2004	82	NPT-39-04	UI	20	40	10
Lake Creek	8/15/2004	77.5	NPT-40-04	5	10	0	12
Lake Creek	8/15/2004	81	NPT-41-04	5	20	70	20
Lake Creek	8/15/2004	94.5	NPT-42-04	70	20	80	20
Lake Creek	8/15/2004	83	NPT-43-04	70	20	70	10
Lake Creek	8/15/2004	73	NPT-44-04	30	10	90	20
Big Creek	8/6/2004	67	NPT-08-04	40	20	80	9
Big Creek	8/6/2004	83	NPT-09-04	20	20	60	10
Big Creek	8/6/2004	80	NPT-10-04	0	20	50	20
Big Creek	8/6/2004	79	NPT-11-04	5	20	10	18
Big Creek	8/6/2004	83.5	NPT-12-04	5	20	80	19
Big Creek	8/6/2004	80	NPT-13-04	80	20	90	19
Big Creek	8/6/2004	80	NPT-14-04	5	20	70	19
Big Creek	8/6/2004	79	NPT-15-04	90	20	90	7
Big Creek	8/11/2004	75	NPT-27-04	UI		90	19
Big Creek	8/11/2004	81	NPT-28-04	10	20	60	20
Big Creek	8/11/2004	94	NPT-29-04	5	20	50	20
Big Creek	8/11/2004	46	NPT-30-04	90	20	(WSU)	

Location	Date	Fork length	Genebank #	WSU motility	WSU # of 0.5 ml straws	UI motility	UI # of 0.5 ml straws
Big Creek	8/11/2004	75.5	NPT-31-04	40	20	90	20
Big Creek	8/11/2004	76	NPT-32-04	10	20	0	10
Big Creek	8/11/2004	71	NPT-33-04	90	10	90	6
Big Creek	8/17/2004	76	NPT-45-04	70	20	70	19
Big Creek	8/17/2004	93	NPT-46-04	50	20	80	17
Big Creek	8/17/2004	86.5	NPT-47-04	UI	20	70	19
Big Creek	8/17/2004	67	NPT-48-04	20	20	80	20
Big Creek	8/17/2004	74	NPT-49-04	80	20	90	20
Big Creek	8/17/2004	77	NPT-51-04	5	20	60	20
Big Creek	8/17/2004	53	NPT-52-04	90	20	80	10
Marsh Creek	8/12/2004	86	NPT-34-04	50	20	90	19
Marsh Creek	8/12/2004	50	NPT-35-04	20	10	60	9
Marsh Creek	8/12/2004	61.5	NPT-36-04	5	10	80	10
Marsh Creek	8/19/2004	82	NPT-65-04	80	20	60	14
Marsh Creek	8/19/2004	84.5	NPT-66-04	80	20	80	20
Johnson Creek	8/17/2004	75	NPT-53-04	90	20	(WSU)	
Johnson Creek	8/17/2004	71	NPT-54-04	5	20	70	18
Johnson Creek	8/17/2004	57	NPT-55-04	90	10	80	18
Johnson Creek	8/17/2004	78	NPT-56-04	90	20	80	10
Johnson Creek	8/18/2004	70	NPT-57-04	90	20	70	15
Johnson Creek	8/18/2004	70	NPT-58-04	70	20	70	17
Johnson Creek	8/18/2004	108	NPT-59-04	70	20	80	18
Johnson Creek	8/18/2004	69	NPT-60-04	90	20	70	16
Johnson Creek	8/18/2004	77	NPT-61-04	50	20	80	18
Johnson Creek	8/18/2004	107	NPT-62-04	80	20	70	20
Johnson Creek	8/18/2004	58	NPT-63-04	80	10	80	6
Johnson Creek	8/18/2004	52	NPT-64-04	80	10	90	18
Johnson Creek	8/23/2004	74	NPT-68-04	30	10	80	20
Johnson Creek	8/23/2004	82	NPT-69-04	90	10	80	10
Johnson Creek	8/23/2004	68	NPT-70-04	60	10	0	20
Johnson Creek	8/23/2004	72	NPT-71-04	90	20	70	17
Johnson Creek	8/23/2004	51	NPT-72-04	90	10	60	9
Johnson Creek	8/23/2004	1050	NPT-73-04	10	10	80	17
Johnson Creek	8/23/2004	67	NPT-74-04	90	10	80	10
Johnson Creek	8/24/2004	83	NPT-75-04	60	20	30	20
Johnson Creek	8/24/2004	Unk	NPT-76-04	90	10	80	10
Johnson Creek	8/24/2004	80	NPT-77-04	90	20	80	19
Johnson Creek	8/24/2004	69	NPT-78-04	80	20	90	17
Johnson Creek	8/24/2004	74	NPT-79-04	90	10	90	19
Johnson Creek	8/24/2004	65	NPT-80-04	90	0	90	9
Johnson Creek	8/24/2004	77	NPT-81-04	80	20	50	19
Johnson Creek	8/24/2004	74	NPT-82-04	90	20	80	20
Johnson Creek	8/24/2004	79	NPT-83-04	90	20	90	18
Johnson Creek	8/24/2004	76	NPT-84-04	80	10	80	20
Johnson Creek	8/24/2004	76	NPT-85-04	90	20	60	20
Johnson Creek	8/24/2004	74	NPT-86-04	UI		80	9
Johnson Creek	8/24/2004	77	NPT-87-04	80	20	70	10
Johnson Creek	8/26/2004	77	NPT-90-04	80	20	90	20
Johnson Creek	8/26/2004	77	NPT-91-04	10	20	60	20
Johnson Creek	8/26/2004	73	NPT-92-04	60	10	10	20
Johnson Creek	8/27/2004	77	NPT-101-04	60	20	(WSU)	
Johnson Creek	8/27/2004	82	NPT-102-04	60	10	90	19
Johnson Creek	8/27/2004	71	NPT-103-04	90	10	90	10
Johnson Creek	8/27/2004	74	NPT-104-04	90	20	70	20
Johnson Creek	8/27/2004	69	NPT-105-04	90	20	80	12
Johnson Creek	8/27/2004	49	NPT-106-04	UI		80	3
Johnson Creek	8/27/2004	77	NPT-107-04	90	20	70	20
Johnson Creek	8/27/2004	74	NPT-108-04	60	20	(WSU)	
Johnson Creek	8/31/2004	52	NPT-118-04	80	10	WSU	
Johnson Creek	8/31/2004	Unk	NPT-119-04	90	20	80	20
Johnson Creek	8/31/2004	53	NPT-120-04	50	10	70	10
Johnson Creek	8/31/2004	53	NPT-121-04	50	20	60	19
Johnson Creek	8/31/2004	72	NPT-122-04	70	20	70	10

Location	Date	Fork length	Genebank #	WSU motility	WSU # of 0.5 ml straws	UI motility	UI # of 0.5 ml straws
Johnson Creek	8/31/2004	73	NPT-123-04	UI		0	10
Johnson Creek	8/31/2004	55	NPT-124-04	80	20	90	10
Johnson Creek	8/31/2004	85	NPT-125-04	10	20	60	20
Johnson Creek	8/31/2004	52	NPT-126-04	50	20	WSU	
Johnson Creek	8/31/2004	63	NPT-127-04	UI		50	10
Johnson Creek	8/31/2004	79	NPT-128-04	80	20	30	10
Johnson Creek	8/31/2004	64	NPT-129-04	90	20	90	18
Johnson Creek	9/1/2004	75	NPT-143-04	60	10	40	10
Johnson Creek	9/1/2004	Unk	NPT-144-04	10	20	50	10
Johnson Creek	9/1/2004	70	NPT-145-04	20	20	70	20
Johnson Creek	9/1/2004	Unk	NPT-146-04	40	20	80	18
Johnson Creek	9/1/2004	Unk	NPT-147-03	90	20	90	20
Johnson Creek	9/1/2004	81	NPT-148-04	60	20	70	20
Johnson Creek	9/1/2004	63	NPT-149-04	40	20	80	19
Johnson Creek	9/1/2004	74	NPT-150-04	10	20	70	20
Johnson Creek	9/1/2004	107	NPT-151-04	70	20	80	20
Johnson Creek	9/1/2004	Unk	NPT-152-04	10	20	70	10
Johnson Creek	9/1/2004	57	NPT-153-04	70	20	70	20
Johnson Creek	9/3/2004	76	NPT-188-04	90	20	90	20
Johnson Creek	9/3/2004	88	NPT-189-04	70	20	90	20
Johnson Creek	9/3/2004	73	NPT-190-04	10	20	50	20
Johnson Creek	9/3/2004	68	NPT-191-04	80	20	80	19
SFSR	8/30/2004	70	NPT-109-04	70	20	80	20
SFSR	8/30/2004	79	NPT-110-04	UI		60	20
SFSR	8/30/2004	70	NPT-111-04	40	20	70	20
SFSR	8/30/2004	81	NPT-112-04	40	20	80	20
SFSR	8/30/2004	88	NPT-113-04	90	20	80	20
SFSR	8/30/2004	88	NPT-114-04	10	20	10	20
SFSR	8/30/2004	79	NPT-115-04	90	20	90	20
SFSR	8/30/2004	79	NPT-116-04	50	20	80	20
SFSR	8/30/2004	66	NPT-117-04	90	20	90	20
SFSR	9/3/2004	69	NPT-182-04	90	20	90	20
SFSR	9/3/2004	74	NPT-183-04	90	20	90	20
SFSR	9/3/2004	74	NPT-184-04	80	20	90	20
SFSR	9/3/2004	74	NPT-185-04	90	20	80	20
SFSR	9/3/2004	74	NPT-186-04	60	20	80	20
SFSR	9/3/2004	69	NPT-187-04	90	20	90	20
upper SR, Sawtooth	9/2/2004	80	NPT-167-04	70	20	80	20
upper SR, Sawtooth	9/2/2004	82	NPT-168-04	10	20	60	18
upper SR, Sawtooth	9/2/2004	74	NPT-169-04	UI		80	10
upper SR, Sawtooth	9/2/2004	77	NPT-170-04	10	20	70	12
upper SR, Sawtooth	9/2/2004	81	NPT-171-04	70	20	80	20
upper SR, Sawtooth	9/2/2004	78	NPT-172-04	50	20	90	18
upper SR, Sawtooth	9/2/2004	74	NPT-173-04	90	20	80	20
upper SR, Sawtooth	9/2/2004	76	NPT-174-04	90	20	90	20
upper SR, Sawtooth	9/2/2004	69	NPT-175-04	90	20	(WSU)	
upper SR, Sawtooth	9/2/2004	76	NPT-176-04	90	20	90	19
upper SR, Sawtooth	9/2/2004	72	NPT-177-04	70	20	80	20
upper SR, Sawtooth	9/2/2004	78	NPT-178-04	90	20	80	20
upper SR, Sawtooth	9/10/2004	82	NPT-205-04	40	20	70	15
upper SR, Sawtooth	9/10/2004	87	NPT-206-04	50	20	60	20
upper SR, Sawtooth	9/10/2004	70	NPT-207-04	40	20	80	20
upper SR, Sawtooth	9/10/2004	72	NPT-208-04	70	20	70	20
upper SR, Sawtooth	9/10/2004	83	NPT-209-04	10	20	30	20
upper SR, Sawtooth	9/10/2004	84	NPT-210-04	10	20	90	20
upper SR, Sawtooth	9/10/2004	72	NPT-211-04	60	20	30	20
upper SR, Sawtooth	9/10/2004	75	NPT-212-04	70	20	80	20
upper SR, Sawtooth	9/10/2004	74	NPT-213-04	80	20	70	20
upper SR, Sawtooth	9/10/2004	76	NPT-214-04	40	20	70	20
upper SR, Sawtooth	9/10/2004	90	NPT-215-04	10	20	70	20
upper SR, Sawtooth	9/10/2004	72	NPT-216-04	50	20	60	20
upper SR, Sawtooth	9/10/2004	70 (?)	NPT-217-04	UI		60	20
Imnaha River	8/24/2004	Unk	NPT-88-04	80	20	80	18

Location	Date	Fork length	Genebank #	WSU motility	WSU # of 0.5 ml straws	UI motility	UI # of 0.5 ml straws
Imnaha River	8/24/2004	Unk	NPT-89-04	90	20	80	20
Imnaha River	8/31/2004	73.5	NPT-130-04	80	20	80	10
Imnaha River	8/31/2004	63	NPT-131-04	UI		90	18
Imnaha River	8/31/2004	72	NPT-132-04	80	20	90	20
Imnaha River	8/31/2004	76	NPT-133-04	80	20	80	19
Imnaha River	8/31/2004	79.5	NPT-134-04	80	20	70	19
Imnaha River	8/31/2004	79	NPT-135-04	80	20	90	20
Imnaha River	8/31/2004	68	NPT-136-04	80	20	WSU	
Imnaha River	8/31/2004	73	NPT-137-04	90	20	70	18
Imnaha River	8/31/2004	68	NPT-138-04	UI		70	20
Imnaha River	8/31/2004	101	NPT-139-04	90	20	90	20
Imnaha River	8/31/2004	71.5	NPT-140-04	90	20	90	19
Imnaha River	8/31/2004	70	NPT-141-04	90	20	70	18
Imnaha River	8/31/2004	76	NPT-142-04	90	20	90	20
Imnaha River	9/8/2004	76	NPT-192-04	70	20	80	20
Imnaha River	9/8/2004	71.5	NPT-193-04	40	20	(WSU)	
Imnaha River	9/8/2004	80	NPT-194-04	70	20	50	20
Imnaha River	9/8/2004	Unk	NPT-195-04	60	20	(WSU)	
Imnaha River	9/8/2004	105	NPT-196-04	90	19	90	19
Imnaha River	9/20/2004	112	NPT-241-04	90	20	90	20
Imnaha River	9/20/2004	91	NPT-242-04	10	20	0	19
Imnaha River	9/20/2004	70	NPT-243-04	90	20	(WSU)	
Imnaha River	9/20/2004	69	NPT-244-04	80	20	70	20
Imnaha River	9/20/2004	76	NPT-245-04	90	20	90	20
Catherine Creek	9/2/2004	Unk	NPT-181-04	UI		90	19
Catherine Creek	9/20/2004	Unk	NPT-230-04	90	20	(WSU)	
Catherine Creek	9/20/2004	93	NPT-231-04	UI		70	10
Catherine Creek	9/20/2004	71	NPT-232-04	90	20	(WSU)	
Catherine Creek	9/20/2004	60	NPT-233-04	90	20	90	20
Catherine Creek	9/20/2004	70	NPT-234-04	80	20	90	20
Catherine Creek	9/20/2004	48	NPT-235-04	UI		80	10
Grande Ronde R.	9/2/2004	71	NPT-179-04	UI		80	4
Grande Ronde R.	9/2/2004	77	NPT-180-04	UI		90	10
Grande Ronde R.	9/9/2004	57	NPT-203-04	90	20	70	10
Grande Ronde R.	9/20/2004	44	NPT-236-04	90	20	(WSU)	
Grande Ronde R.	9/20/2004	67	NPT-237-04	50	20	80	20
Grande Ronde R.	9/20/2004	66	NPT-238-04	90	20	80	20
Grande Ronde R.	9/20/2004	50	NPT-239-04	UI		90	20
Grande Ronde R.	9/20/2004	69	NPT-240-04	90	20	80	20
Lostine River	8/25/2004	77	NPT-93-04	80	20	90	20
Lostine River	8/25/2004	Unk	NPT-94-04	70	20	90	20
Lostine River	8/25/2004	72.5	NPT-95-04	80	20	70	20
Lostine River	8/25/2004	82	NPT-96-04	80	20	80	20
Lostine River	8/25/2004	77	NPT-97-04	80	20	80	20
Lostine River	8/25/2004	93	NPT-98-04	UI		90	20
Lostine River	8/25/2004	77	NPT-99-04	90	20	80	20
Lostine River	8/25/2004	88	NPT-100-04	90	20	60	20
Lostine River	9/1/2004	82	NPT-154-04	90	20	80	20
Lostine River	9/1/2004	75.5	NPT-155-04	80	20	(WSU)	
Lostine River	9/1/2004	54.5	NPT-156-04	UI		80	20
Lostine River	9/1/2004	80.5	NPT-157-04	90	20	80	20
Lostine River	9/1/2004	71	NPT-158-04	90	20	90	19
Lostine River	9/1/2004	77.5	NPT-159-04	80	20	(WSU)	
Lostine River	9/1/2004	74	NPT-160-04	UI		80	20
Lostine River	9/1/2004	71	NPT-161-04	90	20	(WSU)	
Lostine River	9/1/2004	72	NPT-162-04	90	20	80	20
Lostine River	9/1/2004	85	NPT-163-04	UI		90	10
Lostine River	9/1/2004	78	NPT-164-04	80	20	80	19
Lostine River	9/1/2004	79	NPT-165-04	90	20	80	20
Lostine River	9/1/2004	74	NPT-166-04	80	20	90	20
Lostine River	9/8/2004	79	NPT-197-04	90	20	50	20
Lostine River	9/8/2004	75	NPT-198-04	90	20	80	20
Lostine River	9/8/2004	88	NPT-199-04	70	20	80	20

Location	Date	Fork length	Genebank #	WSU motility	WSU # of 0.5 ml straws	UI motility	UI # of 0.5 ml straws
Lostine River	9/8/2004	75.5	NPT-200-04	70	20	70	20
Lostine River	9/8/2004	69.5	NPT-201-04	UI		80	20
Lostine River	9/8/2004	72.5	NPT-202-04	60	20	90	20
Lostine River	9/20/2004	75	NPT-218-04	UI		80	10
Lostine River	9/20/2004	81	NPT-219-04	70	20	80	20
Lostine River	9/20/2004	79	NPT-220-04	70	20	70	20
Lostine River	9/20/2004	68	NPT-221-04	90	20	(WSU)	
Lostine River	9/20/2004	49	NPT-222-04	90	20	60	20
Lostine River	9/20/2004	54	NPT-223-04	70	20	80	20
Lostine River	9/20/2004	70	NPT-224-04	90	20	70	20
Lostine River	9/20/2004	81	NPT-225-04	UI		80	20
Lostine River	9/20/2004	77.5	NPT-226-04	80	20	(WSU)	
Lostine River	9/20/2004	80	NPT-227-04	UI		60	20
Lostine River	9/20/2004	74	NPT-228-04	90	20	(WSU)	
Lostine River	9/20/2004	74	NPT-229-04	UI		70	20

Appendix C. Data from steelhead collected in 2004.

Table A4. Collection date, fork lengths, percent motilities and number of straws from steelhead collected in 2004.

Location	Date	Fork Length	Fin Clip	Gene Bank #	Motility	# 0.5 ml straws
Little Sheep Creek	3/30/2004	572	Y	NPT-114-03	70	18
Little Sheep Creek	3/30/2004	545	Y	NPT-115-03	80	18
Little Sheep Creek	3/30/2004	565	Y	NPT-116-03	90	19
Little Sheep Creek	3/30/2004	693	Y	NPT-117-03	70	17
Little Sheep Creek	3/30/2004	501	Y	NPT-118-03	60	18
Little Sheep Creek	3/30/2004	585	Y	NPT-119-03	80	19
Little Sheep Creek	3/30/2004	578	Y	NPT-120-03	60	17
Little Sheep Creek	3/30/2004	597	Y	NPT-121-03	0	18
Little Sheep Creek	3/30/2004	Unk	Y	NPT-122-03	0	17
Little Sheep Creek	3/30/2004	620	N	NPT-123-03	50	7
Little Sheep Creek	3/30/2004	Unk	Y	NPT-124-03	0	20
Little Sheep Creek	3/30/2004	566	Y	NPT-125-03	0	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-126-03	50	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-127-03	90	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-128-03	80	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-130-03	90	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-131-03	90	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-133-03	80	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-134-03	80	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-135-03	90	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-136-03	90	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-137-03	80	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-138-03	90	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-139-03	90	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-400-03	90	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-401-03	90	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-402-03	50	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-403-03	90	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-404-03	90	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-405-03	90	10
Little Sheep Creek	4/6/2004	Unk	Y	NPT-406-03	80	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-407-03	90	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-408-03	80	20
Little Sheep Creek	4/6/2004	Unk	Y	NPT-409-03	90	20
Little Sheep Creek	4/13/2004	740	Y	NPT-410-03	90	19
Little Sheep Creek	4/13/2004	530	Y	NPT-411-03	90	19
Little Sheep Creek	4/13/2004	580	Y	NPT-412-03	90	19
Little Sheep Creek	4/13/2004	760	Y	NPT-413-03	80	20
Little Sheep Creek	4/13/2004	580	Y	NPT-414-03	90	8
Little Sheep Creek	4/13/2004	550	Y	NPT-415-03	90	18
Little Sheep Creek	4/13/2004	580	Y	NPT-416-03	80	20
Little Sheep Creek	4/13/2004	590	Y	NPT-417-03	80	19
Little Sheep Creek	4/13/2004	670	Y	NPT-418-03	90	20
Little Sheep Creek	4/13/2004	610	Y	NPT-419-03	90	20
Little Sheep Creek	4/13/2004	665	Y	NPT-420-03	90	20
Little Sheep Creek	4/13/2004	640	Y	NPT-421-03	70	8
Little Sheep Creek	4/13/2004	590	Y	NPT-422-03	80	20
Little Sheep Creek	4/13/2004	575	Y	NPT-423-03	90	20
Little Sheep Creek	4/13/2004	530	Y	NPT-424-03	80	19
Little Sheep Creek	4/13/2004	570	Y	NPT-425-03	80	20
Little Sheep Creek	4/13/2004	580	Y	NPT-426-03	90	19
Little Sheep Creek	4/13/2004	580	N	NPT-427-03	90	10
Little Sheep Creek	4/20/2004	575	Y	NPT-428-03		
Little Sheep Creek	4/20/2004	535	Y	NPT-429-03		
Little Sheep Creek	4/20/2004	605	Y	NPT-430-03		
Little Sheep Creek	4/20/2004	570	Y	NPT-431-03		
Little Sheep Creek	4/20/2004	606	Y	NPT-432-03		
Little Sheep Creek	4/20/2004	570	Y	NPT-433-03		
Little Sheep Creek	4/20/2004	576	Y	NPT-434-03		
Little Sheep Creek	4/20/2004	580	Y	NPT-435-03		
Little Sheep Creek	4/20/2004	560	Y	NPT-436-03		

Location	Date	Fork Length	Fin Clip	Straw #	Motility	# 0.5 ml straws
Little Sheep Creek	4/20/2004	612	Y	NPT-437-03		
Little Sheep Creek	4/20/2004	604	Y	NPT-438-03		
Little Sheep Creek	4/20/2004	590	Y	NPT-439-03		
Little Sheep Creek	4/20/2004	620	Y	NPT-440-03		
Little Sheep Creek	4/20/2004	605	Y	NPT-441-03		
Little Sheep Creek	4/20/2004	590	Y	NPT-442-03		
Little Sheep Creek	4/20/2004	555	Y	NPT-443-03		
Little Sheep Creek	4/20/2004	595	Y	NPT-444-03		
Little Sheep Creek	4/20/2004	575	Y	NPT-445-03		
Little Sheep Creek	4/20/2004	621	Y	NPT-446-03		
Little Sheep Creek	4/20/2004	561	Y	NPT-447-03		
Little Sheep Creek	4/20/2004	584	Y	NPT-448-03		
Little Sheep Creek	4/20/2004	565	Y	NPT-449-03		
Little Sheep Creek	4/20/2004	555	Y	NPT-450-03		
Little Sheep Creek	4/27/2004	580	Y	NPT-470-03	80	18
Little Sheep Creek	4/27/2004	560	N	NPT-471-03	70	20
Little Sheep Creek	4/27/2004	570	Y	NPT-472-03	90	19
Little Sheep Creek	4/27/2004	580	Y	NPT-473-03	70	17
Little Sheep Creek	4/27/2004	610	Y	NPT-474-03	80	19
Little Sheep Creek	4/27/2004	590	Y	NPT-475-03	80	9
Little Sheep Creek	4/27/2004	557	Y	NPT-476-03	90	20
Little Sheep Creek	4/27/2004	590	Y	NPT-477-03	70	7
Little Sheep Creek	4/27/2004	560	Y	NPT-478-03	80	19
Little Sheep Creek	4/27/2004	560	Y	NPT-479-03	80	18
Little Sheep Creek	4/27/2004	600	Y	NPT-480-03	80	18
Little Sheep Creek	4/27/2004	590	Y	NPT-481-03	80	18
Little Sheep Creek	4/27/2004	550	Y	NPT-482-03	90	20
Little Sheep Creek	4/27/2004	600	Y	NPT-483-03	80	20
Little Sheep Creek	4/27/2004	580	Y	NPT-484-03	90	18
Little Sheep Creek	4/27/2004	570	Y	NPT-485-03	80	20
Little Sheep Creek	4/27/2004	530	Y	NPT-486-03	90	18
Little Sheep Creek	4/27/2004	575	Y	NPT-487-03	90	18
Little Sheep Creek	4/27/2004	605	Y	NPT-488-03	80	8
Little Sheep Creek	4/27/2004	585	Y	NPT-489-03	70	19
Little Sheep Creek	4/27/2004	590	Y	NPT-490-03	80	18
Little Sheep Creek	4/27/2004	620	Y	NPT-491-03	90	18
Little Sheep Creek	4/27/2004	600	Y	NPT-492-03	90	18
Little Sheep Creek	4/27/2004	540	Y	NPT-493-03	80	19
Little Sheep Creek	4/27/2004	610	Y	NPT-494-03	90	19
SFSR	4/8/2004	71	no			
SFSR	4/8/2004	Unk	no	NPT-490-03	90	20
SFSR	4/8/2004	93	no	NPT-491-03	10	20
SFSR	4/8/2004	88	no	NPT-492-03	90	20
SFSR	4/8/2004	88	no	NPT-493-03	70	20
SFSR	4/8/2004	91	no	NPT-494-03	40	20
SFSR	4/16/2004	71	no	NPT-106-03	90	20
SFSR	4/16/2004	81	no	NPT-107-03	70	20
SFSR	4/16/2004	79	no	NPT-495-03	70	20
SFSR	4/16/2004	92	no	NPT-496-03	50	20
SFSR	4/16/2004	88	no	NPT-497-03	10	20
SFSR	4/16/2004	69	no	NPT-498-03	90	20
SFSR	4/16/2004	89	no	NPT-499-03	80	20
SFSR	4/16/2004	90	no	NPT-500-03	90	20
SFSR	4/23/2004	91	no	NPT-108-03	10	20
SFSR	4/23/2004	93	no	NPT-109-03	90	20
SFSR	4/23/2004	84	no	NPT-452-03	20	20
SFSR	4/23/2004	88	no	NPT-453-03	90	20
SFSR	4/23/2004	84	no	NPT-454-03	90	20
SFSR	4/23/2004	Unk	no	NPT-455-03	80	20
SFSR	4/23/2004	90	no	NPT-456-03	50	20
SFSR	4/29/2004	91	no	NPT-458-03	90	20
SFSR	4/29/2004	71	no	NPT-459-03	50	20
SFSR	4/29/2004	86	no	NPT-460-03	5	10
SFSR	4/29/2004	95	no	NPT-461-03	90	20
Johnson Creek	4/29/2004	89	no	NPT-457-03	90	20

Appendix D. Snake River Germplasm Repository Cryopreserved Semen Request Form

Snake River Germplasm Repository Committee
P.O. Box 1942, 125 South Mission St
McCall, ID 83638
Phone: (208) 634-5290
Fax: (208) 634-4097

Snake River Germplasm Repository Cryopreserved Semen Request Form

Name: ____Affiliation: ______________________
Phone number: (______)__________________________Address: ________________________
Date of request: _________________________________Date need by: ____________________
Species/stock requested: __________________________Hatchery or wild/natural: _________
Number of straws needed: _______0.5ml, _______5.0ml
Reason for request (clearly demonstrate need or type of hatchery program): _______________
____
____
____
____
____
____
Fertilization experience using cryopreserved semen: __________________________________
____
____
____
Name, address, and phone number of person samples should be delivered to: ______________
____
____

Please use additional papers as necessary.

The salmon managers of the Snake River Basin are concerned with how cryopreserved samples are being used and retain the right to refuse samples for inappropriate use of the threatened salmonid species gametes. The Nez Perce Tribe can arrange to deliver and assist in the fertilization of eggs. Please call William Young at the McCall Field Office (address above) to coordinate transfer. The Nez Perce Tribe also may request data on the performance of the semen (percent of eggs fertilized, post-thaw sperm motility, etc.).

Signature: ____Date: ________________