Nez Perce Tribal Hatchery Monitoring and Evaluation Project

Fall Chinook Salmon (*Oncorhynchus tshawytscha*) Supplementation in the Clearwater River Subbasin

Annual Report 2009

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EXECUTIVE SUMMARY

This is year eight of fall Chinook salmon Monitoring and Evaluation (M&E) for the Nez Perce Tribal Hatchery (NPTH) located on the lower Clearwater River in Idaho. Phase I of the NPTH is to produce 1.4 million fall Chinook salmon for supplementation releases in the Clearwater River Subbasin. This was the first year full production releases were met. A total of 1,534,360 juveniles were released from the NPTH and associated acclimation facilities. The NPTH on-station release was 128,815 over the release goal of 500,000 juveniles. Since the fall Chinook run was greater than predicted during 2009, the constant trapping rate of 12% at Lower Granite Dam was lowered to 9% later in the season so as to not collect excess broodstock needed at Lyons Ferry Hatchery and NPTH. As a result, broodstock needs were met at both hatcheries.

This was the first year of full production fall Chinook releases at NPTH and associated acclimation sites since first releases in 2003. There were a total of 1,534,360 fish released with a total of 562,635 CWT only, 383,030 CWT/Ad-clip, 34,721 Ad-clip only, and 553,974 unmarked. Final CWT retention rates were high on all CWT groups and ranged between 0.977-0.991 (Table 2). The fish released at NPTH and Luke's Gulch was close to the target release size of 50.0 fish/lb at 51.5 and 51.6 fish/lb, respectively. The NLV release group, which was released about three weeks earlier than the other groups, had the smallest average size of 85.3 fish/lb. The Cedar Flats release group were slightly smaller (57.9 fish/lb) than the other upper Clearwater release group at Lukes Gulch. Condition factors (K-factors) on all release groups were good and ranged between 0.99 and 1.22.

We sampled a total of 1,178 natural Chinook salmon subyearlings on the lower Clearwater River of which 982 were large enough ($\geq$ 50 mm) to PIT tag. Average K-factor for natural fish was 1.03. Growth rates for the 498 PIT tagged hatchery fall Chinook recaptured from seining and at Lower Granite Dam ranged from 0.00 to 1.77 mm/d with an average of 0.63 mm/d. Estimated index survivals of PIT tagged natural subyearling fall Chinook salmon from the Clearwater River to Lower Granite Dam was 10%, but could not be calculated beyond Lower Granite Dam due to the low number of detections at downstream dams. The natural fish from the Clearwater River had 28 detections in 2010 as holdover yearlings, representing 2.8% of the total number PIT tagged, compared to 124 fish (12.6%) detected as subyearlings. Estimated index survival for the NPTH on-station release was 71.3% to Lower Granite Dam and 40.3% to McNary Dam. Estimated index survival for the acclimation releases were 63.4% and 48.1% for Cedar Flats, 73.7% and 60.8% for Luke's Gulch, and 70.3% and 49.6% for NLV to Lower Granite and McNary dams, respectively. As in previous years, the acclimated releases from Luke's Gulch and Cedar Flats migrated at a faster rate (21.3 and 17.7 Rkm/d, respectively) than other releases, while the natural fall Chinook from the Clearwater River migrated much slower (1.7 Rkm/d) on average to Lower Granite Dam.

Fall Chinook salmon subyearling releases at NPTH on the Clearwater, Luke's Gulch to the S.F. Clearwater, and Cedar Flats to the Selway River were made prior to warm (>16 ^{o}C) summer water temperatures. The release of the NLV acclimated group occurred a few weeks earlier because water temperatures were warming in Lapwai Creek and at the NLV facility. Temperatures in the upper Clearwater River Subbasin exceeded 20 ^{o}C throughout much of July and early August with the lower Clearwater varying between a more moderate 11-13 ^{o}C during that time period because of cold water releases from Dworshak Reservoir. Most first detections at Lower Granite Dam for all NPTH and associated acclimated releases occurred before temperatures exceed 20 ^{o}C in the Snake River. Cold water releases from Dworshak Reservoir moderated warm Snake River temperatures by 2-3 ^{o}C keeping water temperatures below 20 ^{o}C at Lower Granite Dam during July and August. Few detections of natural fall Chinook occurred from mid-July thru late September when temperatures in the Snake River were near or exceeding 20 ^{o}C. Natural subyearlings detections increased at Lower Granite Dam in October, with most detections occurring at the facility in November when temperatures on the Snake River and at Lower Granite Dam dropped to approximately 10 ^{o}C and below on average. Most hatchery fall Chinook detections occurred during the spill period at Lower Granite. In contrast, very few PIT tagged natural fall Chinook experienced summer spill as most detections occurred later in the fall.

We collected 121 natural subyearling Chinook salmon fin clips captured on the Clearwater River during 2009 for genetic analysis. All genetic samples were sent to the Columbia River Inter-Tribal Fish Commission (CRITFC) Hagerman Laboratory in Idaho and analyzed by the CRITFC staff to determine percent composition of spring/summer or fall Chinook salmon and to build upon baseline fall Chinook salmon genetic profiles. The 2009 genetic analysis will be combined with subsequent year's genetic monitoring data and provided in a later report. A total of 784 or 100% of the adult fall Chinook salmon incorporated into the NPTH broodstock were tissue sampled for genetic analysis as part of NOAA's parentage study. The results of this work will be published after another year of data collection. We also subsampled 249 fall Chinook salmon carcasses collected on the spawning grounds for genetic analysis. The 2009 genetic analysis will be combined with future genetic monitoring data and reported in a later NPTH M&E report.

A total of 1,184 fall Chinook salmon redds was observed in the Clearwater River during 2009. Included in the Clearwater redd count, 42 redds were observed in the mainstem above the confluence of the N.F. Clearwater River and one redd in the N.F. A total of 12 redds were observed in the lower S.F. Clearwater River, one redd observed in the lower Selway River, and no redds observed in the M.F. Clearwater River. A total of 1,198 redds were observed in the Clearwater River Subbasin which was the highest count since surveys began in 1988. Total fall Chinook redds estimated in the Snake River Basin above Lower Granite Dam was 3,467.

The total fall Chinook salmon returning to Lower Granite Dam (LGR) in 2009 was estimated to be 25,262 adults and 27,260 jacks for a total of 52,522 fish (Young et al. 2012). The estimate of 2009 fall Chinook salmon escapement above Lower Granite Dam was 20,685 adults and 23,007 jacks for a total of 43,692 fish. Jacks made up 52.7% of the fall Chinook run over LGR, however, natural/wild jacks made up only 3.1% of returning jacks. Natural/wild adults consisted of about 20.7% of the adult escapement above LGR in 2009.

A total of 257 fall Chinook salmon carcasses were collected in the lower Clearwater River from the Ahsahka Islands down to Cherry Lane below NPTH. There were a total of 168 females (65.4%) and 89 males (34.6%) collected. Of all female carcasses cut open and examined, 98.8% were 100% spawned-out with two females that retained about 100% of their eggs. Composition of carcasses collected resulted in identifying 208 hatchery origin fish (87.4%) and 30 natural origin fish (12.6%). The greatest number of carcasses were hatchery subyearlings that emigrated as subyearlings (60.3%), followed by hatchery yearling releases (17.7%), and thirdly by naturally produced subyearlings that held over or possibly reservoir reared and emigrated as yearlings (11.0%). Most carcasses collected (71.3%) returned at total age four followed by age three (22.4%), and lastly age five fish (6.3%). Two known out-of-Snake Basin hatchery "strays" made up 0.8% of all carcasses sampled.

During 2009, total coded wire tag recoveries resulted in a total of 189 NPTH and associated adult returns hauled from LGR to Lyons Ferry Hatchery (LFH) for brood and none volunteered into the LFH fish ladder. A total of 113 NPTH and associated returns were hauled to NPTH from LGR with 106 NPTH returns volunteering into the NPTH fish ladder. Since NPTH inception, there are three complete brood returns (5-yr olds) from 2003-2005 release years. A low smolt-to-adult return (SAR) of 0.025% was estimated for the first release in 2003 from NPTH on-station and a slightly higher 0.034% for the North Lapwai Valley Acclimation Pond. The highest estimated SAR of 0.267% form complete returns of all age classes was from the second on-station release at NPTH in 2003. The lowest SAR of 0.016% was estimated for the 2005 emergency NPTH on-station release during the spring flood that occurred.

A grand total of 2,153 fall Chinook salmon were processed at NPTH during 2009 for broodstock. A total of 1,828 fall Chinook were hauled from LGR for broodstock which consisted of 399 females and 1,429 males. A total of 325 fall Chinook volunteered to the NPTH fish ladder which consisted of 192 females and 133 males. The highest contribution of females to the broodstock from all specific release locations was 19.4% LFH on-station yearlings, 17.0% unmarked/untagged hatchery subyearlings, followed by 11.0% NPTH on station releases. The highest male contribution from all release locations was 19.1% Big Canyon yearlings, 15.7% unmarked/untagged hatchery subyearlings, and 14.1% LFH yearlings. Total contribution of natural origin females incorporated into the NPTH brood was 3.5% and 12.1% for males. Total age composition of females processed at NPTH resulted in 36.7% age-3, 56.7% age-4, and 5.1% age-5. Total age composition of males processed at NPTH resulted in 44.3% age-2, 46.9% age-3, 8.3% age 4, and 0.5% age-5.

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INTRODUCTION

Chinook salmon (*Oncorhynchus tshawytscha)* and other native fishes have been a crucial part of the diet, culture, economy, and spirituality of the Nez Perce people. Immense declines in salmon populations over the last century have affected the tribe's ability to preserve a principle element of its culture and identity. As a sovereign nation, the Nez Perce Tribe has an implied right to govern the management of natural resources within their traditional territory. The United States is obligated to ensure that treaty rights are perpetuated for the benefit of the tribe (BPA et al. 1997).

The National Marine Fisheries Service (NMFS) listed the Snake River fall Chinook salmon as "threatened" in 1992 in accordance with provisions of the Endangered Species Act (NMFS 1992) and included the Clearwater River Subbasin fall Chinook salmon as part of the evolutionarily significant unit (ESU). As such, the Snake River fall Chinook salmon is considered and managed as one population within the Snake River Basin (Zimmerman et al. 2007 Draft). Fall Chinook salmon within the Clearwater River Subbasin represent an important component of the Snake River ESU fall Chinook salmon population. Maintenance and function of fall Chinook salmon population dynamics within the Clearwater Subbasin itself will play an important role in recovery of the Snake River fall Chinook salmon.

The Nez Perce Tribal Hatchery (NPTH) was approved for construction to rear and release 1.4 million subyearling fall Chinook salmon and 625,000 spring Chinook salmon in the Clearwater River Subbasin starting in 2002. The NPTH produced its first release of subyearling fall Chinook salmon in 2003 (Arnsberg et al. 2007).

Since supplementation may pose some risk to natural populations, the primary purpose of the NPTH Monitoring and Evaluation (M&E) program is to evaluate the performance of hatchery released fall Chinook salmon and the potential risks to the natural fall Chinook salmon population (Hesse and Cramer 2000). The NPTH was constructed based on the NATURES rearing approach as an attempt to produce Chinook salmon more closely mimicking the phenotypic, genetic, and behavioral characteristics of natural origin Chinook salmon populations (Maynard et al., 2001). The NPTH program has the following goals (BPA et al. 1997):

1. Protect, mitigate, and enhance Clearwater Subbasin anadromous fish resources.
2. Develop, reintroduce, and increase natural spawning populations of salmon within the Clearwater Subbasin.
3. Provide long-term harvest opportunities for Tribal and non-Tribal anglers within Nez Perce Treaty lands within four generations (20 years) following project initiation.
4. Sustain long-term fitness and genetic integrity of targeted fish populations.
5. Keep ecological and genetic impacts to non-target populations within acceptable limits.
6. Promote Nez Perce Tribal Management of Nez Perce Tribal Hatchery Facilities and production areas within Nez Perce Treaty lands (BPA et al. 1997).

The NPTH M&E Project is designed to provide information that enables adaptive management of the NPTH (Hesse and Cramer 2000). Proper adaptive management will require information from multiple life stages of hatchery and natural spring, fall, and early-fall Chinook salmon.

Supplementation benefits to be evaluated under the proposed M&E program include increases in the distribution, abundance, and harvest of hatchery and natural Chinook salmon populations in the Clearwater River Subbasin. To measure these benefits, changes in the abundance of Chinook salmon in the mainstem Clearwater River and its tributaries will be monitored over the next 15 to 20 years (Hesse and Cramer 2000). In addition to measuring project-related benefits, the M&E Program is designed to provide information on the capacity of the natural environment to support Chinook salmon production, give early warning of adverse effects caused by the project on resident biota, and track trends in environmental quality, management, and policy that may affect project success**.**

The M&E project examines the performance and status of hatchery and natural fish, and effects to non-targeted fish populations, sustainability of harvest, and communicates its findings to enable adaptive management of NPTH. Treatment streams are Lolo, Newsome, and Meadow creeks (Selway River) for spring Chinook salmon, the lower reaches of the South Fork Clearwater and Selway rivers for early-fall Chinook salmon, and the mainstem Clearwater River below Lolo Creek for fall Chinook salmon. Outcomes in these treatment streams will be compared to those in similar non-treatment (reference) streams and other hatchery programs to distinguish treatment effects from the effects of environmental variation.

Summary of NPTH M&E Project Goals and Objectives:

<u>Long Term Goals:</u>

Monitor and evaluate results of the NPTH so that operations can be adaptively managed to optimize hatchery and natural production, sustain harvest, and minimize deleterious ecological effects.

<u>OBJECTIVES:</u>

Objective 1. Determine if program targets for contribution rate of hatchery fish are being achieved and can be improved.

Objective 2. Determine the increase/decrease in natural production that results from supplementation of Chinook salmon in the Clearwater Subbasin, and relate them to limiting factors.

Objective 3. Estimate ecological and genetic effects to fish populations.

Objective 4. Determine how harvest opportunities for spring, early-fall, and fall Chinook salmon can be optimized for tribal and non-tribal anglers within Nez Perce Treaty lands.

Objective 5. Effectively communicate monitoring and evaluation program approach and findings to resource managers.

This 2009 annual report details monitoring and evaluation activities associated with the fall Chinook salmon component of the Nez Perce Tribal Hatchery program from January 1 through December 31, 2009, thus providing data that will be used to analyze the effectiveness of supplementation activities. We also summarize adult returns from all NPTH and associated fall Chinook releases from hatchery releases in 2003 to present. The first seven years of NPTH M&E fall Chinook salmon results can be found in annual reports (Arnsberg and Kellar 2007a,b,c,d; Arnsberg et al. 2007, Arnsberg et al. 2010, Arnsberg and Kellar 2014). A Supplementation Symposium for the first five-years of NPTH Production and Monitoring & Evaluation results was held in January 2009.

STUDY AREA

The Clearwater River Subbasin, located in north-central Idaho, is the largest tributary to the Snake River in yearly average runoff of about 11 Ma/f. The subbasin extends from its mouth at 200 m elevation on the Idaho-Washington border to its headwaters in the Bitterroot Mountains along the Idaho-Montana border at nearly 2,750 m, encompassing a drainage area of approximately 25,000 km^2. Dworshak Dam, located on the North Fork Clearwater River 3 km upstream of its confluence with the Clearwater, is the only dam in the Clearwater River Subbasin. Contributing about 40% of the Clearwater's annual flow, historical high spring flows in the lower Clearwater have been greatly reduced for flood control and shifted to higher flows during low flow summer periods. Also, with selective water temperature releases, Dworshak Dam moderates cold winter water temperatures and maximum summer temperatures in the lower Clearwater River (Arnsberg et al. 1992).

The NPTH M&E study area for fall Chinook salmon supplementation encompasses the lower Clearwater River, North Fork (N.F.) Clearwater River (mouth up to Dworshak Dam), Middle Fork (M.F.) Clearwater River, lower South Fork (S.F.) Clearwater River, lower Selway River, and lower portions of smaller tributaries including Potlatch River and Lapwai Creek (Figure 1).

The NPTH and all facilities associated with rearing, acclimation and release of fall Chinook salmon in the Clearwater River Subbasin are described below. A more detailed description of rearing and acclimation sites can be found in the Nez Perce Tribal Hatchery Program Final Environmental Impact Statement (BPA et al. 1997).

Nez Perce Tribal Hatchery

The NPTH, located on the lower Clearwater River 38 km above its mouth at Tribal Allotment 1705, is the central incubation and rearing facility for spring and fall Chinook salmon (Figure 1). Incubation for all Chinook salmon occurs at NPTH, with early rearing of one million fish in inside troughs and final rearing and acclimation of 500,000 fall Chinook salmon in two earthen and river rock-lined ponds. Fall Chinook salmon can be volitionally released or forced from the ponds directly to the Clearwater River.

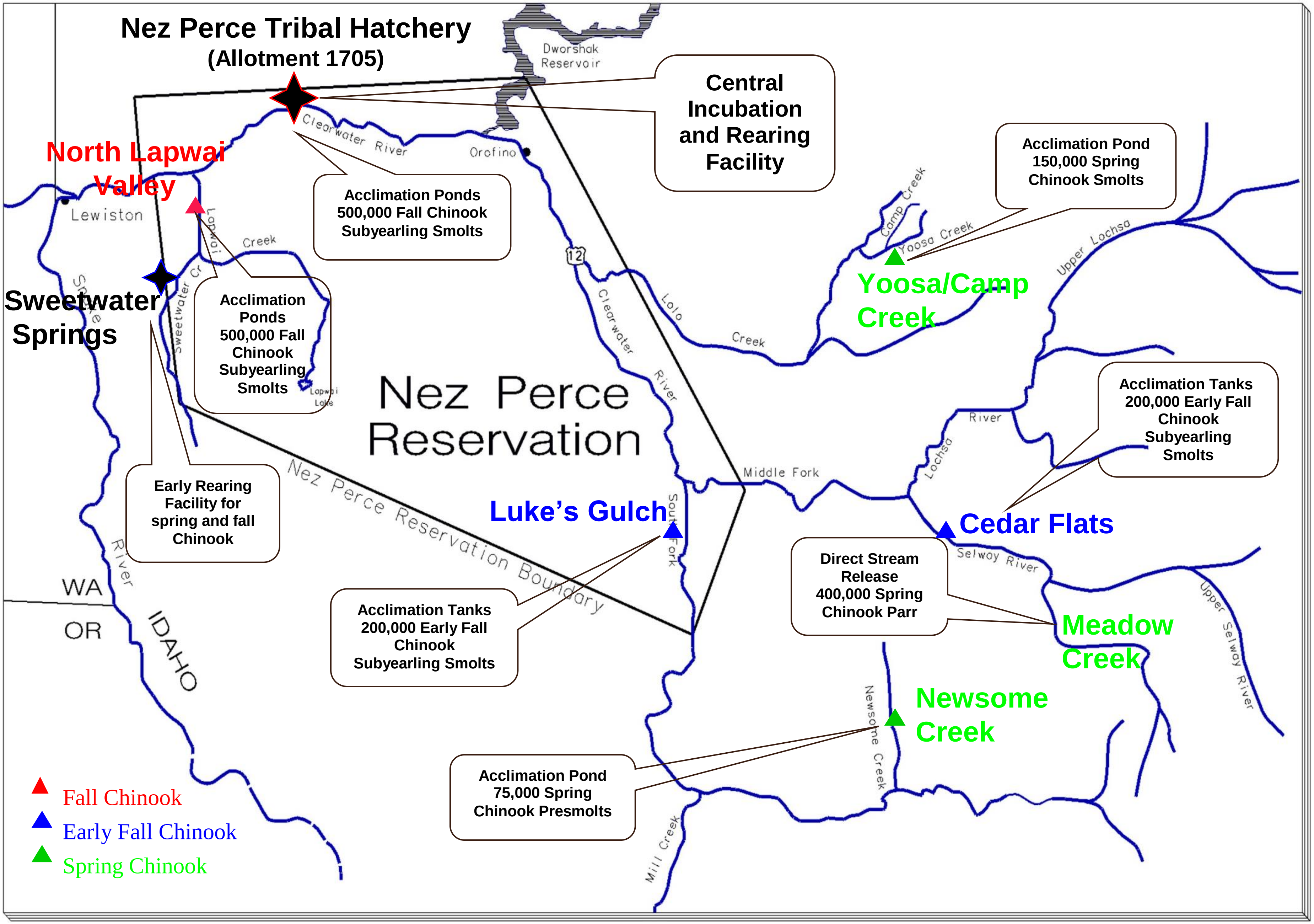

Figure 1. Nez Perce Tribal Hatchery and Chinook salmon acclimation and early rearing facilities within the Clearwater River Subbasin.

Sweetwater Springs

Sweetwater Springs is located approximately 20 km southeast of Lewiston, Idaho and feeds the westernmost fork of Sweetwater Creek which is a tributary to Lapwai Creek (Figure 1). This facility will be used to accommodate up to 400,000 early fall Chinook salmon fry to be grown and transferred to Cedar Flats on the Selway River and Luke's Gulch on the South Fork Clearwater River for final acclimation and release (200,000 subyearling smolts at each facility).

North Lapwai Valley Acclimation Pond

Lapwai Creek drains directly into the mainstem Clearwater River 19 km upstream from its confluence with the Snake River (Figure 1). Approximately 1 km above the mouth of Lapwai Creek, two river rock-lined acclimation ponds were constructed to serve as final rearing and acclimation of 500,000 fall Chinook salmon that will be transferred from NPTH. Fall Chinook salmon can be volitionally released or forced from the North Lapwai Valley (NLV) acclimation ponds into Lapwai Creek. This site was selected so adult returns would home and spawn in the lower Clearwater River where there is an abundance of under-utilized spawning habitat (Arnsberg et al. 1992).

Luke's Gulch Acclimation Facility

Luke's Gulch Acclimation Site is located on the S.F. Clearwater River 13 km upstream of its mouth (Figure 1). Final rearing and acclimation of early fall Chinook salmon at this site will occur in ten 5.8 m diameter circular aluminum tanks and fish will be released directly into the S.F. Clearwater River. The target number of subyearlings for release will be 200,000 which will be transferred as fry from NPTH or Sweetwater Springs if this facility is utilized for early rearing.

Cedar Flats Acclimation Facility

Cedar Flats Acclimation Facility is located on the Selway River 8 km above its mouth and confluence with the Lochsa River which forms the M.F. Clearwater River (Figure 1). Cedar Flats is a developed site just east of the United States Forest Service (USFS) Selway District Ranger Station. Final rearing and acclimation at this site will also occur in ten 5.8 m diameter circular aluminum tanks and fish will be released directly to the Selway River. The target number of subyearlings for release will be 200,000 which will be transferred as fry from NPTH or Sweetwater Springs if this facility is utilized for early rearing.

METHODS

Supplementation

The Nez Perce Tribe's supplementation program for fall Chinook salmon began in 1997 on the Clearwater River with the acclimation and release of Lyons Ferry Hatchery (LFH) fall Chinook salmon yearlings and subyearlings from the Big Canyon Creek Acclimation Facility (Rkm 57). Fall Chinook release numbers, life stages, associated marks, and results from 1998-2005 Fall Chinook Acclimation Project (FCAP) releases can be found in annual reports by Rocklage (1998), Rocklage and Kellar (2005a,b,c,d), Rocklage (2005), Rocklage and Johnson (2008) and are available on the web: (https://www.cbfish.org/PiscesPublication.mvc/SearchByTitleDescriptionAuthorOrDate).

All releases from NPTH and associated facilities are scheduled to be subyearlings, the historic dominant life history characteristic for "ocean type" emigration and for the "wild" or natural Snake River fall Chinook salmon. NPTH fish will be differentially coded wire tagged to measure adult returns as compared to the FCAP fall Chinook salmon. As part of our aerial redd surveys and carcass collections in the Clearwater River Subbasin, we report all fall Chinook salmon contributions, including FCAP, LFH, and out-of-Snake Basin strays in the carcass recovery section of this report. We also report all fall Chinook salmon contributions in the NPTH spawning summary for 2009. A more detailed summary on NPTH production and hatchery operations during 2009 is provided in the Nez Perce Tribal Hatchery Complex Annual Report (Rodgers et al. 2010).

This year (2009) was the seventh year for fall Chinook salmon subyearling releases from NPTH. This year was also the seventh year the adult fish ladder was opened for fall Chinook salmon volunteers into the hatchery facility from the Clearwater River. This was the fourth year for supplementation of fall Chinook salmon in the upper Clearwater River Subbasin at Luke's Gulch on the S.F. Clearwater River and Cedar Flats on the Selway River.

Monitoring and Evaluation

Baseline fall Chinook salmon data collection for adult spawner abundance, spawn timing, and habitat evaluations has been occurring in the Clearwater River since 1988 and in major tributaries including the S.F. Clearwater River since 1992, M.F. Clearwater River and lower Selway River since 1994. The M&E on fish produced from NPTH facilities began in 2003. Standardized performance measures quantified and utilized in program performance evaluations are described in Table 1. Some small scale production experiments may also occur as part of the M&E program. A large scale U.S. Army Corps of Engineers (Corps) Transportation/Spill study, initiated in 2006, involved passive integrated transponder (PIT) tagging additional production fall Chinook salmon, other than for standard juvenile emigration survivals, at Luke's Gulch and Cedar Flats Acclimation facilities.

Table 1. Standardized performance measures and definitions quantified for evaluation of Nez Perce Tribal Hatchery fall Chinook production.

Performance Measure		Definition
Abundance	Adult Escapement (to Snake Basin upstream of Lower Granite Dam)	Number of adult fish, including jacks that have "escaped" past fisheries to Lower Granite Dam. Partitioned by origin, age, and release group. Based on run-reconstruction.
	Index of Spawner Abundance - redd counts	Counts of redds in spawning areas via multiple pass extensive area aerial counts.
	Hatchery Fraction	1) Percent of fish on spawning ground that originated from a hatchery. Determined from carcass sampling for individual spawning aggregates. 2) Also reported for total spawner abundance upstream of Lower Granite Dam. From run-reconstruction. 3) Percentage of fish used in broodstock of Snake Basin hatchery origin.
	Ocean/Mainstem Harvest	Raw measure (primary). Number of fish caught in ocean, mainstem or tributary fisheries (commercial, tribal, or recreational). Determined from CWT commercial landings, creel surveys, etc.
	Hatchery Production Abundance	Raw measure (primary). Number of parr, presmolts, or smolts released from a hatchery per year.
	Run Prediction	Derived measure. Short-term forecast of expected adult returns to some point (e.g., mouth of Columbia, or Snake River) based on current data (e.g., # smolts out, prior years adult returns, etc.).
Survival – Productivity	Smolt-to-Adult Return Rate	Raw measure (secondary): Number of adults from a given brood year returning to a point (e.g. LGR dam) divided by the number of smolts that left this point 1-3 years prior, integrated over all return years.
	Juvenile Survival to Lower Granite Dam	Raw measure (secondary): Survival rate measure estimated from detection of PIT tagged smolts at first mainstem dam, or model derived survival rates based on detections at first and second mainstem dams (e.g. using SURPH). Smolts or parr are tagged in the tributary rearing areas.
	Juvenile Survival to all Mainstem Dams	Raw measure (secondary): Survival from first dam where stock enters mainstem Columbia or Snake River to Bonneville. Derived from PIT tag detections.
	Post-release Survival	Raw measure (secondary): Survival from release (e.g., parr, presmolt, or smolt) to further sampling points (e.g., rotary screw traps at outlet of tributary, first mainstem dam encountered by smolts, dam encountered on return).
Distribution	Adult Spawner Spatial Distribution	Raw measure: Tributary spawner distribution – extensive estimates of where spawners are found within a tributary. Subbasin spawner distribution - presence/absence surveys across multiple tributaries within a subbasin.
	Stray Rate	1) Percentage of non-Snake Basin hatchery origin adults in the spawner abundance estimate based on run-reconstruction. 2) Percentage of non-Snake Basin hatchery origin fish included in hatchery broodstock (based on known mark type and scale-pattern origin determination).
Life History	Age Class Structure	Derived measure: The proportion of escapement composed of individuals of different brood years, typically assessed via length measurements and length at age relationships, from analysis of calcified structures, using scales, and recovering marks.
	Age–at–Return	Raw measure (primary): Age distribution of spawners on spawning ground determined from length at age relationships, scale analysis, calcified structure analysis, or mark recovery from carcass surveys.
	Age–at-Emigration	Raw measure (primary): Age distribution of emigrants (e.g., proportion of emigrants as subyearling vs holdover or reservoired reared) from tributaries, estimate determined from PIT tag detections at mainstem Snake and Columbia River dams.
	Size-at-Emigration/Release	1) Size distribution and average (length, weight) of emigrants (e.g., proportion of emigrants at fry, parr, presmolt, and smolt stages) from tributaries determined from seine, fyke nets, or rotary screw trap. 2) Length frequency, average length, and fish/lb estimates for each release group within 3 days of release (start of volitional).
	Condition of Juveniles at Emigration	Derived measure: A species-specific length to weight relationship used as an index of growth (W/L^3). Comparative length/weight data are determined from in-hatchery evaluations, tributaries and beach seining, fyke nets and rotary screw trap operation.
	Adult Spawner Sex Ratio	Raw measure (primary): Carcass or weir counts.
	Juvenile Emigration Timing	Raw measure (primary): Distribution of emigration dates within major tributaries. Peak, range and 10^{th}-90^{th} percentiles.
	Water Temperature	Raw Measure: Water temperatures of all supplementation study streams.

Chinook salmon abundance and population trends can be assessed by monitoring juvenile densities, juvenile emigration numbers, adult escapement and spawning (Steward 1996, Hesse and Cramer 2000, Johnson et al. 2007). Accurate estimates of abundance and escapement are needed to determine the success of supplementation efforts. For the lower Clearwater River, emigration timing and survival are assessed by beach seining and PIT tagging naturally produced fall Chinook salmon and a subsample of all hatchery subyearling release groups. During 2009, through the Corps Transportation/Spill study, we installed two 8' rotary "screw" traps in the lower Clearwater River at the railroad bridge near Spalding (Rkm 20.0) to collect additional naturally produced fall Chinook for PIT tagging. Additionally, we employed a larger 350' by 12' seine in open water in the lower 3-4 km impounded section of the Clearwater to capture fall Chinook salmon rearing in that "reservoir type" environment.

Fall Chinook salmon adult escapement was estimated through aerial redd surveys and counts/releases over Lower Granite Dam (the last dam in a series of eight on the Columbia and Snake rivers). We estimated adult natural and hatchery fall Chinook salmon spawning contributions to the lower Clearwater River through carcass collections and identification of hatchery marks or tags and through scale sample analysis. We also monitored and evaluated NPTH spawning composition of hatchery and natural fall Chinook salmon spawned for the 2009 broodyear.

Performance Measures

Fish population performance measures (Table 1) address how the fish populations are meeting NPTH management objectives. Performance measures are derived from data collected during juvenile and adult monitoring and evaluation activities. We report on most performance measures listed in this table while others will take several years of data collection before analysis can be performed. For example, ocean/mainstem harvest estimates are often not reported by various agencies until the following year and sometimes longer after the harvest has occurred. In the following methods, we describe those performance measures that were evaluated during 2009 along with constrains that limited full evaluation of the performance measure.

Juvenile Monitoring

Life History, Emigration Timing, and Survival Estimates

During 2009, we beach seined along the lower Clearwater River shoreline areas below the North Fork Clearwater River where most fall Chinook salmon spawning occurred in 2008. We targeted naturally produced fall Chinook salmon subyearlings and hatchery subyearlings released from NPTH and associated acclimation facilities. Fall Chinook salmon hatchery Yearlings and subyearlings from FCAP are released earlier in the spring, emigrate immediately, and usually have emigrated downstream of the lower Clearwater River when annual beach seining begins.

Evaluation parameters for natural and hatchery fall Chinook captured included fish size, growth rates if already PIT tagged, emigration timing and survival to the Snake River dams. We used experimental 30.5 m x 1.8 m and 15.2 m x 1.2 m beach seines (0.48 cm mesh) with weighted multi-stranded mudlines with center bags of the same mesh size. The larger seine was pulled from the back of a jet boat deck in a large arc until approximately half the net was deployed, then the boat was directed to shore in which all crew members assisted in pulling the seine to shore. The less accessible beach seining sites required the smaller seine pulled from the shoreline utilizing personnel in the water wearing neoprene waders. Later in the season, we employed a larger seine (106.7 m x 3.7 m x 3.7 m deep bag) in the lower Clearwater open water areas. All salmonids captured were placed in 18.9 L buckets and then placed in larger aerated 114 L plastic holding bins. Salmonids were anesthetized in a 3 ml tricaine methanesulfonate (MS-222) stock solution (100 g/L) per 19 L of water buffered with a sodium bicarbonate solution. All Chinook salmon subyearlings were measured to the nearest 1 mm fork length and weighed to the nearest 0.1 gm with a digital Ohaus portable advanced balance.

All natural fall Chinook salmon captured and PIT tagged by seining and rotary screw trapping are included in the emigration timing and survival analysis. We PIT tagged Chinook salmon subyearlings following methods developed by Prentice et al. (1990a, 1990b) and protocols established by the PIT Tag Steering Committee (1992). All subyearling Chinook salmon ($\geq$ 60 mm) fork length that were not hatchery marked or had the appearance of being an unmarked hatchery fish were PIT tagged with standard length 12 mm tags. As part of the Corps study we used 8.5 mm PIT tags for fall Chinook that measured 50-59 mm fork length. We checked all Chinook salmon for the presence of an adipose fin clip and/or a coded wire tag that would signify a hatchery fish using a Northwest Marine Technologies Field Sampling Detector model FSD-I. Our tagging goal was a minimum of 1,000 and up to a maximum of 8,000 natural subyearling fall Chinook salmon for our M&E study and another 10,000 natural fish for the COPRS study. After at least a 20-30 minute recovery period, we released all Chinook salmon juveniles back to the river where captured. Records of all new PIT tagged fish and PIT tag recaptures were submitted to the PIT Tag Information System (PTAGIS). All PIT tag files were uploaded under the Project Leader's BDA coordinator ID and natural fish identified as 13W (1 = Chinook salmon, 3 = fall run, and W = wild rearing type).

Detections and travel times of PIT tagged fish at the Lower Snake River and Columbia River dams were obtained from PTAGIS. The combined probability of survival and emigration as a subyearling of PIT tagged subyearlings from point of release to the Lower Snake River dams were estimated by the Cormack, Jolly, and Seber (1964, 1965, and 1965, respectively, as cited in Smith et al. 1994) methodology using the Survival Using Proportional Hazards (SURPH) computer modeling program (Lady et al. 2002). However, this model assumes that all fish arriving at Lower Granite Dam have an equal probability of detection. Because a proportion of the Snake River fall Chinook salmon subyearlings emigrate later in the fall/winter and early spring after detection facilities are shut down, this basic assumption is violated. Since we are unable to determine the proportion of fish that migrate when detection facilities are shut down, the model results are an underestimate (or index) of fall Chinook salmon survival to Lower Granite, depending on the proportion that hold over for a given year and emigrate as yearlings.

Hatchery Tagging

The NPTH M&E staff coded wire tagged and ad-clipped fish with the Auto-Fish Tagging Trailer designed by Northwest Marine Technology and purchased through the Bonneville Power Administration (BPA). Tagging goals for NPTH and NLV in 2009 were to tag each subyearling fall Chinook salmon release group with a unique CWT code (200,000) for adult return evaluations and have a 100,000 CWT/ad-clip group for fishery evaluations (Rocklage and Hesse, 2004). The acclimation sites at Cedar Flats and Luke's Gulch are to receive 100,000 CWT/ad-clips and 100,000 CWT only at each site.

To investigate emigration timing and survival through the mainstem hydro-system, our PIT tagging goals for all hatchery fall Chinook salmon subyearling releases were approximately 3,000 fish for 2009 at all four sites. In addition as part of the Corps study, an additional 11,000 tags were provided to tag additional subyearlings at each of the up-river acclimation sites at Luke's Gulch and Cedar Flats.

Length and weight data from PIT tagging were used to calculate a release condition factor (K) (Tesch 1971) using the following equation:

$$\hat{K} = \frac{W}{L^3} \times 100{,}000$$

Where:
W = weight in grams,
L = length in millimeters,
and 100,000 is a constant used as a scalar.

Condition factor (Tesch 1971) can be a useful indicator of fish health, since individuals with a low condition factor might be considered light for their length, a potential indication of malnutrition or disease (Wootton 1990).

Flow and Temperature

Flow data for the Clearwater River were obtained from the U.S. Geological Survey (USGS) Spalding, Idaho gauging station online at *http://waterdata.usgs.gov/id/nwis/current/?type=flow*. We placed Onset temperature loggers in lower Lapwai Creek at NLV, and upstream in the lower South Fork Clearwater, Selway, and Middle Fork Clearwater rivers. Flow, temperature, and spill data for the Snake River at Lower Granite Dam were provided by the Corps and obtained online at *http://www.cbr.washington.edu/dart/river.html*.

Genetic Monitoring

The target goal for genetic analysis was 100 non-lethal upper caudal fin clips from natural subyearling Chinook salmon captured by seining on the lower Clearwater River. An additional 100 natural fall Chinook salmon subyearlings were targeted for genetic monitoring through the Corps study. Tissue samples were placed in vials of alcohol and sent to the Hagerman Laboratory in Idaho for deoxyribonucleic acid (DNA) analysis by the Columbia River Inter-Tribal Fish Commission (CRITFC) staff. Analyses determine percent composition of spring/summer or fall Chinook salmon and will build upon baseline fall Chinook salmon genetic profiles. The 2009 genetic analysis will be combined with future genetic monitoring data and reported in a later NPTH M&E report.

Adult Monitoring

Spawning Ground Surveys

We used aerial (by helicopter) spawning ground surveys as an index of spawner abundance and distribution. We scheduled surveys from the end of September to first part of December along the entire Clearwater River (120 km), lower N.F. Clearwater River (2 km), entire M.F. Clearwater River (37 km), S.F. Clearwater River from the mouth to the town of Harpster (22.5 km), and on the Selway River (31 km) from the mouth to Selway Falls (Figure 2). On each survey, we mapped, took weekly photographs, and documented spawn timing, number and distribution of fall Chinook salmon redds. Redd surveys were conducted from mid-morning to mid-day to take advantage of the best lighting conditions. We noted general weather conditions, water discharges at USGS gauging stations on the Clearwater River (Spalding and Orofino, Idaho), S.F. Clearwater River (Harpster, Idaho), and lower Selway River (Lowell, Idaho). We noted general water transparencies (poor to excellent) on each survey, with excellent being ≥ 5 m, good being 3-4 m, and poor < 3 m. We report Clearwater River Subbasin redd survey results since 1988, the year surveys began (Arnsberg et al. 1992). Total fall Chinook salmon redds in the Snake River Basin above Lower Granite Dam (LGR) are reported for 2009. We also report the estimated adult escapement above LGR (Young et al. 2012) and calculate the adult/redd number comparing that to the average adult/redd ratio since 1987 (Garcia et al. 2008). Finally, we regressed fall Chinook salmon redds counted in the Snake River Basin above Lower Granite Dam from 1987-2009 (Garcia et al. 2010) with adult (not including jacks) escapement over Lower Granite Dam from past years' run estimates (*US v Oregon* Technical Advisory Committee unpublished data; Washington Department of Fish and Wildlife unpublished data; Sands 2003; Steinhorst et al. 2006, 2007; Young et al. 2012) to obtain a correlation coefficient.

Escapement and Carcass Recoveries

Adult fall Chinook salmon escapement to the Clearwater River Subbasin was estimated from redd counts in the Snake River Basin and the number of fish estimated over Lower Granite Dam through the fall Chinook salmon run reconstruction process (Young et al. 2012). This process takes into account of the number of natural and hatchery fish returning to Lower Granite and subtracts the number hauled to LFH and NPTH for broodstock and the number of fallback through the dam. Also, when NPTH opens the adult fish ladder to obtain additional broodstock, that number of hatchery and natural fish must be subtracted out of the total escapement to the Clearwater River from the natural spawning population.

During redd surveys, Chinook salmon carcasses seen from the air were mapped and retrieved the same or following day. Biological information collected included fork length, sex composition, percent egg retention, identification of hatchery marks, and scale samples to determine natural or hatchery origin, total age, subyearling or reservoir reared emigration life history, and years spent in the ocean. Snouts were collected from any carcass with an adipose fin clip or CWT and wire extracted later in the lab, read, and location and date of release identified. After processing, tails were removed from carcasses to ensure fish were not re-sampled and returned to the general area where found. Scale samples were sent to the Washington Department of Fish and Wildlife (WDFW) Olympia Lab for analysis.

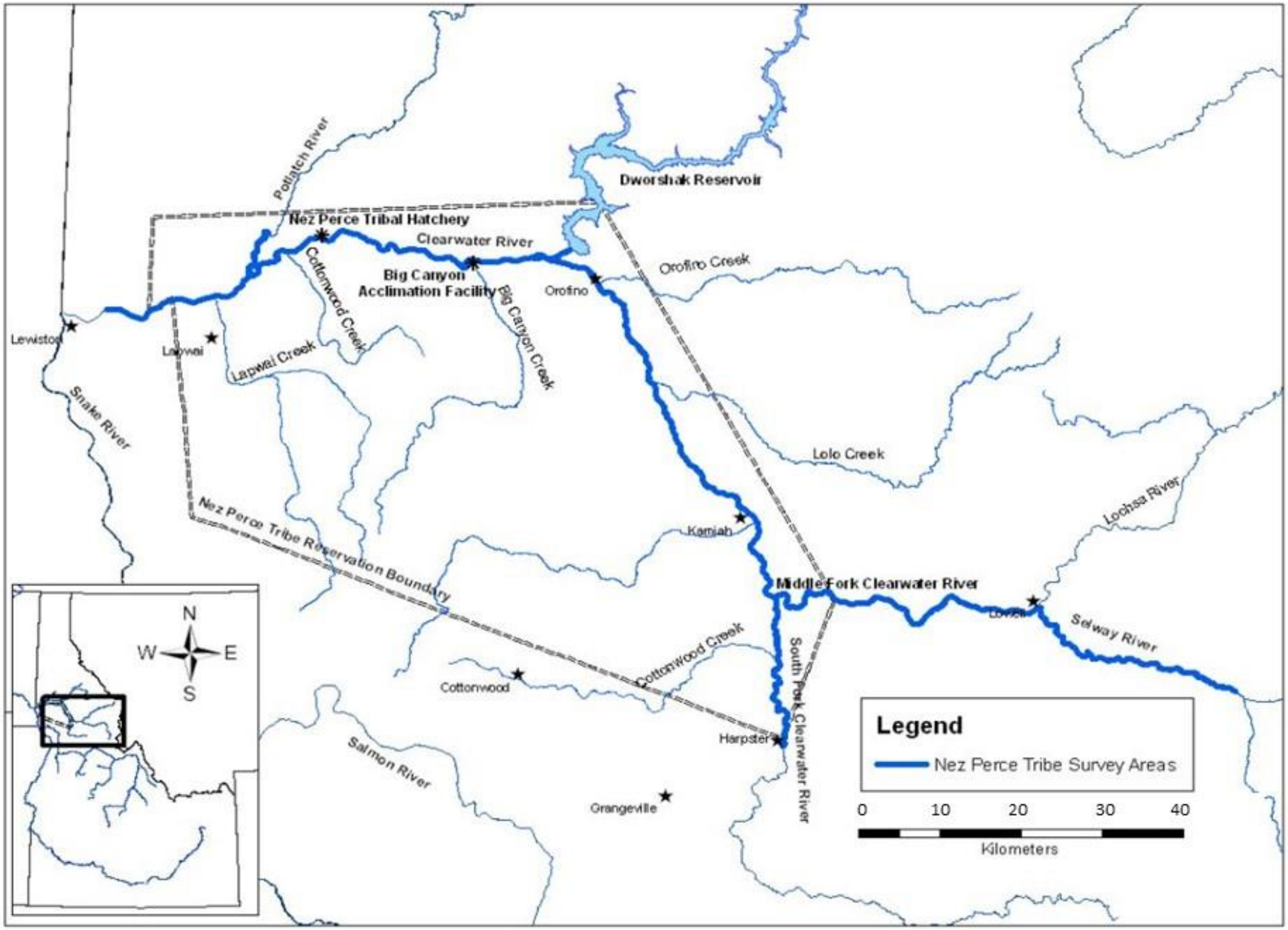

Figure 2. Fall Chinook salmon aerial redd survey areas within the Clearwater River Subbasin conducted by the Nez Perce Tribe.

Smolt-to-Adult Return Estimates

Smolt-to-adult returns (SAR's) estimates were calculated through run reconstruction to Lower Granite Dam (Young et al. 2012). This was the sixth year for returning adults from the first NPTH and NLV releases in 2003 and is the only the second complete brood return for NPTH releases, however we do see a few age six returning fall Chinook, however, these tend to be mostly from naturally produced fish. We present total CWT returns processed at NPTH and at LFH for each NPTH release group for the last five years (2004-2008). We include NPTH released fish processed from LFH because they receive a larger proportion of fish for broodstock than NPTH (about 70/30 split) through random trapping at Lower Granite Dam. Adult returns are summarized from 2004-2009, expanded for trapping rates at Lower Granite Dam, and a total SAR is given for each release group. We also include NPTH and associated release groups adult contributions to ocean and freshwater fisheries as reported to the Regional Mark Processing Center (RMPC). The SARs back to the Snake River and contributions to all fisheries are reported as smolt-to-adult survivals (SASs).

Hatchery Spawning

Before the 2009 fall Chinook salmon run began, the Lower Granite Dam trapping rate was set at a 12% sampling rate of the entire run. Because the fall Chinook run was strong along with the steelhead run, the trapping rate was reduced to 9% during the run in order to handle all the fish at Lower Granite Dam. The NPTH began hauling fall Chinook adults from Lower Granite on August 24. The NPTH also opened the adult fish ladder to the mainstem Clearwater River beginning October 9 to collect additional fall Chinook salmon broodstock. The adult fish ladder stayed opened continually until November 24. During 2009, there were more than enough fall Chinook salmon adults for NPTH to meet full production of 1.4 million subyearlings for 2010 releases, therefore, this was the second consecutive year excess adults were outplanted into the habitat to spawn naturally.

Spawning of volunteer and hauled fall Chinook salmon from Lower Granite Dam occurred weekly from October 13 to November 24 at NPTH for a total of seven spawn weeks (one day/wk). Monitoring and evaluation staff collected biological information on all fish spawned that included: fork length, identification of hatchery marks (ad-clips, visible implant elastomer (VIE) tags, etc.) and removing snouts containing a CWT. The CWTs were read immediately after spawning to determine origin so that known "strays" could be excluded from the broodstock. Scales were also taken to determine origin (hatchery or natural), total age, emigration strategy (i.e. either subyearling, yearling, and "reservoir reared" life history), and years spent in the ocean. A fin clip was also taken from all spawned fish for DNA analysis as collaboration on a parentage study with the National Oceanic and Atmospheric Administration (NOAA). The main emphasis of this study is to examine if the "holdover" or yearling life history trait is genetically linked to parents that exhibited the trait.

Genetic Monitoring

We collected tissue samples from all fall Chinook salmon adult carcasses collected from the spawning grounds that were in fair to good condition and all fall Chinook salmon spawned at

NPTH for DNA analysis. A representative subsample of at least 200 carcasses would be analyzed. Samples consisted of opercle punches from each individual stored in separate vials of alcohol labeled with the fish ID number, date, and where it was taken. All samples were sent to the Hagerman Laboratory and analyzed by CRITFC staff to build upon baseline fall Chinook salmon genetic profiles and examine genetic differentiation between Snake River Basin and known "stray" fall Chinook salmon. However, as mentioned above, all NPTH spawned fish were sampled for DNA in 2009 as part of NOAA's parentage study. Results for the 2009 carcass samples will be in a later comprehensive genetic analysis report.

RESULTS

Supplementation

During the 2008 fall Chinook salmon run, gametes were taken from fish hauled from Lower Granite Dam and adult volunteers to the NPTH fish ladder for 2009 subyearling releases. Subyearlings were coded wire tagged and adipose fin clipped prior to release and were close to target goals. There were a total of 1,534,360 fish released with a total of 562,635 CWT only, 383,030 CWT/Ad-clip, 34,721 Ad-clip only, and 553,974 unmarked (Table 2). Final CWT retention rates were high on all CWT groups and ranged between 0.977-0.991 (Table 2). The fish released at NPTH and Luke's Gulch was close to the target release size of 50.0 fish/lb at 51.5 and 51.6 fish/lb, respectively. The NLV release group, which was released about three weeks earlier than the other groups, had the smallest average size of 85.3 fish/lb. The Cedar Flats release group were slightly smaller (57.9 fish/lb) than the other upper Clearwater release group at Lukes Gulch. The condition factors (K-factors) on all release groups were good and ranged between 0.99 and 1.22 (Table 2).

Monitoring and Evaluation

Juvenile Monitoring

Life History, Emigration Timing and Survival Estimates

We sampled a total of 1,178 natural Chinook salmon subyearlings on the lower Clearwater River of which 982 were large enough to PIT tag (Table 3). Fall Chinook subyearlings averaged 56.5 mm fork length during the first week of sampling and 103 out of 408 fish captured were large enough to PIT tag with the standard 12 mm tags, while 163 juveniles were tagged with the 8.5 m tags. Only 316 juveniles were tagged with the smaller tags during the entire sampling season. Flows steadily decreased until Dworshak Dam releases began the first week in July which kept flows relatively steady until early August when fall Chinook salmon sampling catch rates in the flowing portions of the Clearwater River decreased. Sampling in the impounded portion of the lower Clearwater River began the week of July 23 using a modified beach seine. The last sampling day was August 25 with 42 Chinook salmon captured and PIT tagged on the impounded portion of the lower Clearwater River at approximately Rkm 4.0.

Table 2. Fall Chinook salmon released, number coded wire tag (CWT), final CWT retentions, number adipose fin clipped (Ad-clip), number unmarked/untagged, number passive integrated transponder (PIT) tagged, fish per pound (fpp), and condition factor (K-factor) at release from Nez Perce Tribal Hatchery (NPTH) on-station and associated acclimation facilities, 2009.

Release Site	Release Dates	Total Release Number	Number CWT only	Number CWT/ Ad-clip	Number Ad-clip only	Number Unmarked/ Untagged	CWT Codes	Final CWT Retention	Fish/ lb	K-Factor	Number PIT Tagged
NPTH On-station	6/8-6/12	628,815	181,522	90,953	27,725	328,615	CWT=612697 AD/CWT= 612739	0.988 0.977	51.5	1.05	2,963
North Lapwai Valley	5/15	495,569	182,328	97,751	2,341	213,149	CWT=612766 AD/CWT= 612738	0.991 0.977	85.3	1.22	2,983
Cedar Flats[1]	6/9	200,098	100,760	95,840	2,296	1,202	CWT=612760 AD/CWT= 612761	0.988 0.977	57.9	1.01	13,918
Luke's Gulch[1]	6/10	209,878	98,025	98,486	2,359	11,008	CWT=612762 AD/CWT= 612763	0.988 0.977	51.6	0.99	13,984
	Subtotals	1,534,360	562,635	383,030	34,721	553,974					33,848

[1]Approximately 11,000 additional fish were PIT tagged in collaboration with the Corps transportation study.

Table 3. Weekly number, average fork length, number passive integrated transponder (PIT) tagged natural subyearling fall Chinook salmon sampled on the lower Clearwater River, and percent of total Dworshak Dam spill in relation to total discharge, 2009.

Week of	Range of near shore Temps. (°C)	Clearwater River Avg. Weekly Temps.[1] (°C)	Clearwater River Avg. Weekly Flows[1] (m^3/s)	Dworshak Dam Spill %	Total Number Captured	Number PIT Tagged	Weekly Average Fork Lth. (mm)
June 22	10.0 - 13.1	12.6	679	0	408	266	56.46
June 29	13.5 - 17.1	14.5	504	0	308	256	58.64
July 6	11.8 - 14.2	12.9	468	0	100	99	74.04
July 13	11.3 - 13.6	12.6	450	0	135	134	72.24
July 20	9.9 - 12.6	11.6	447	20.1	121	121	72.84
July 27	9.2 - 11.8	10.8	456	22.5	25	25	79.04
Aug 3	9.4 - 11.4	10.7	415	17.9	48	48	77.52
Aug 17	10.8 - 11.2	11.1	390	9.88	33	33	101.09
Aug 24	11.9 - 12.0	11.8	288	0	0	0	0
Totals					1,178	982	

[1]Obtained from the USGS gauging station at Spalding.

We recaptured 25 natural PIT tagged Chinook salmon and measured growth rates between 0 to 1.5 mm/d with an average of 0.77 mm/d. Average condition factor (K) for the natural fish was 1.03. Growth rates for the 48 PIT tagged recaptured hatchery fish from NPTH hatchery and acclimation sites ranged from 0 to 0.84 mm/d with an average of 0.50 mm/d. Average condition factor (K) for the hatchery fish at time of tagging was 1.01, 1.05, 0.99, and 1.22 for the Cedar Flats, NPTH, Luke's Gulch, and NLV releases, respectively (Table 2).

Length frequencies for the natural subyearling fall Chinook sampled in the lower Clearwater River during the months of June, July and August are provided in Figure 3. We sampled 170 subyearlings during June and July that were 49 mm or less and too small to be PIT tagged with 8.5 mm tags, while no fish sampled were too small to tag in August (Figure 3).

As in 2008, the Cedar Flats 2009 release had the highest number of fish from NPTH releases that were detected in 2010 as yearlings with a total of 56 (0.91%) (Table 4). The natural fish from the Clearwater River had 29 detections in 2010 as yearlings, which represented 18.95% of the total number PIT tag detections for this group.

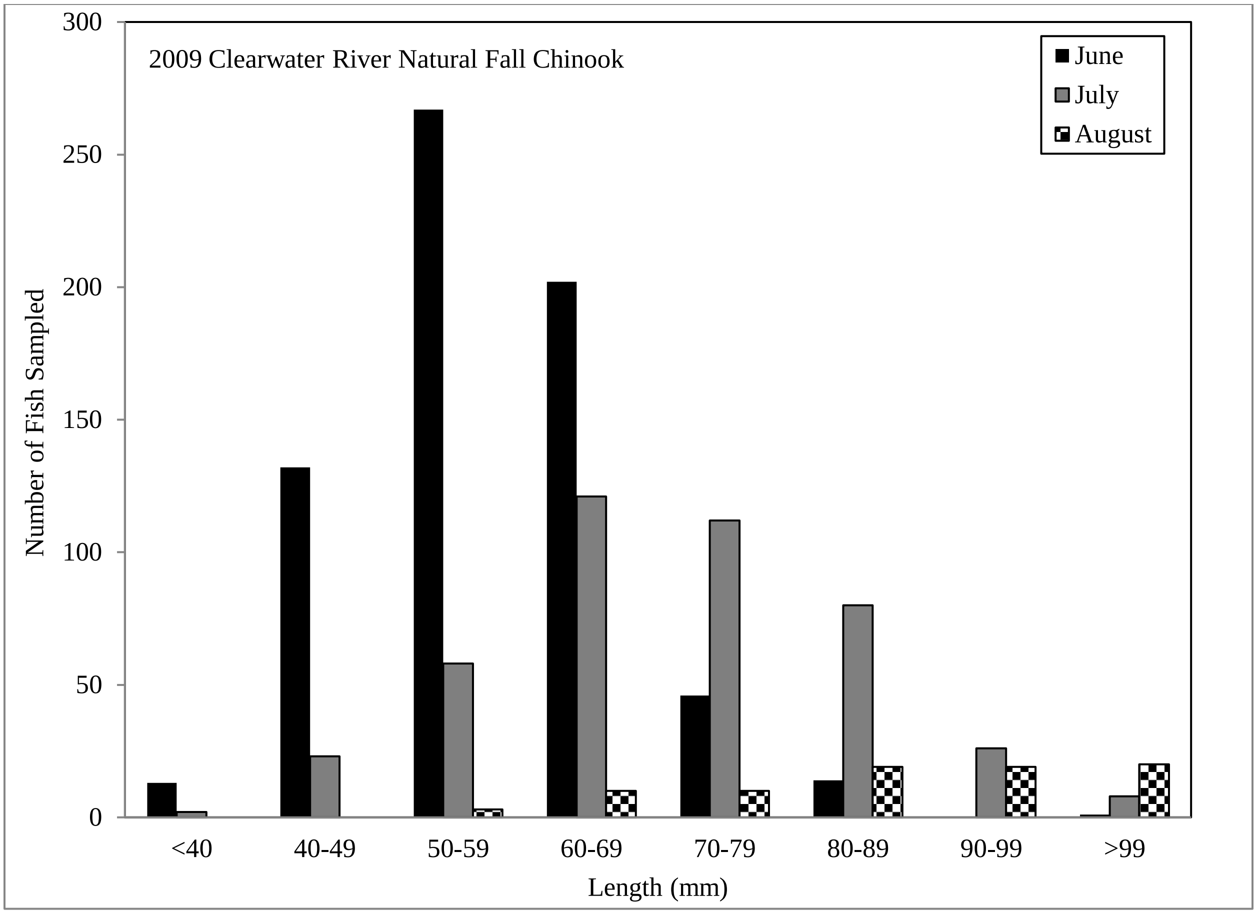

Figure 3. Length frequencies of natural fall Chinook salmon sampled in the lower Clearwater River, 2009.

Table 4. Unique PIT tag detections at all hydrosytem juvenile detection facilities from releases of fall Chinook salmon subyearlings in the lower Clearwater River, Nez Perce Tribal Hatchery (NPTH) and associated acclimation facilities, 2009.

Release Site	Unique PIT Tag Detections	Detected as Subyearlings In 2009	Detected as Yearlings In 2010
Clearwater Naturals	90	65 (72.22%)	25 (22.78%)
NPTH On-Station	1,043	1,041 (99.81%)	2 (0.19%)
Cedar Flats	4,936	4,890 (99.07%)	46 (0.93%)
Luke’s Gulch	6,108	6,097 (99.82%)	11 (0.18%)
N. Lapwai Valley	1,326	1,326 (100%)	0 (0%)

Estimated index survival of PIT tagged natural subyearling fall Chinook salmon from the Clearwater River to Lower Granite Dam was 10%, but could not be calculated to McNary Dam (Table 5). Index survival represents a minimum survival estimate because it does not include fish migrating during non-operational period during winter, "holdovers" or those fish that overwintered and migrated as yearlings. Estimated index survival for the NPTH on-station release was 71% to Lower Granite Dam and 40% to McNary Dam. Estimated index survival for the acclimation releases were 63% and 48% for Cedar Flats, 74% and 61% for Luke's Gulch, and 70% and 50% for NLV to Lower Granite and McNary dams, respectively (Table 5).

Table 5. Estimated index survivals (using SURPH) with 95% confidence intervals (CI's) from passive integrated transponder (PIT) tagged releases of natural fall Chinook salmon subyearlings in the lower Clearwater River and Nez Perce Tribal Hatchery (NPTH) releases to Lower Granite and McNary dams, 2009 **(**LGR = Lower Granite Dam, MCN = McNary Dam, CI = confidence interval at the 95% level).

Release Site	Release PIT Tag Number	Index Survival to LGR (95% CI's)	Index Survival to MCN (95% CI's)
Clearwater Naturals	982	0.10 [0.08 - 0.14]	-----[a]
NPTH On-Station	2,963	0.71 [0.64 - 0.81]	0.40 [0.33 - 0.44]
Cedar Flats	13,918	0.63 [0.60 - 0.67]	0.48 [0.43 - 0.50]
Luke's Gulch	13,984	0.74 [0.70 - 0.78]	0.61 [0.55 - 0.65]
N. Lapwai Valley	2,983	0.70 [0.64 - 0.78]	0.50 [0.43 - 0.58]

[a]Insufficient detections to calculate survival.

The major juvenile detection facilities with most detections, similar to previous years, were Lower Granite, Little Goose, and McNary dams. A total of 17,345 PIT tagged fall Chinook juveniles were detected at all lower Snake and Columbia River juvenile facilities in 2009, of which 70% were detected at Lower Granite, Little Goose, and McNary dams. Total detections were also used to establish mean migration rates to these three detection points for natural and hatchery subyearling fall Chinook salmon tagged in 2009 (Figure 4). As in previous years, the acclimated releases from Luke's Gulch and Cedar Flats migrated at a faster rate (21.3 and 17.7 Rkm/d, respectively) than the other releases, while the natural fall Chinook from the Clearwater River migrated much slower (1.7 Rkm/d) on average to Lower Granite Dam (Figure 4). All of the hatchery releases migrated at a faster rate to all three major juvenile detection facilities than did the natural fall Chinook tagged in the lower Clearwater River. Migration rates for natural releases from the Clearwater to McNary Dam and subsequent detection facilities could not be calculated due to insufficient PIT tag detections.

Most PIT tag release groups had adequate detections during 2009 to derive an index of the 10th, 50th, and 90th percentile arrival dates at selected downstream dams (Table 6). Insufficient detections at lower juvenile facilities prevented arrival timing calculations for the natural fall Chinook PIT tag group below Little Goose Dam. The 50% arrival timing for the Clearwater

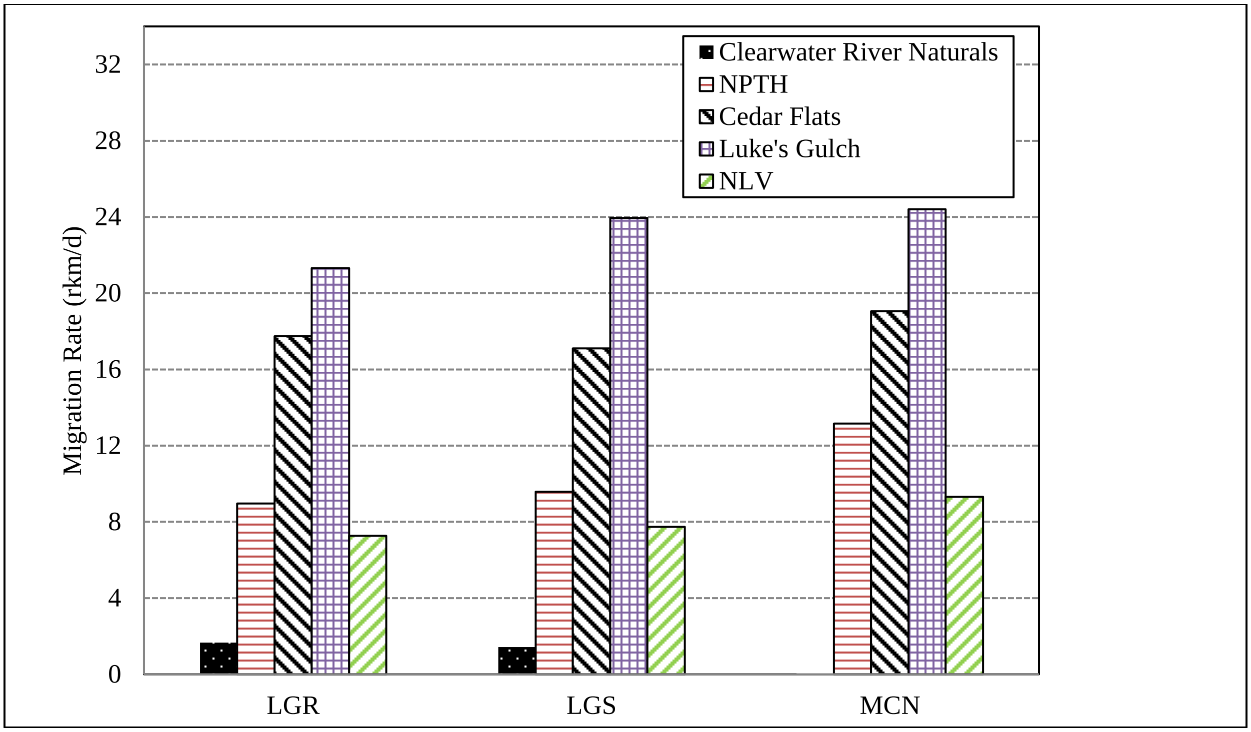

Figure 4. Total detection mean migration rate to selected Snake and Columbia River dams of passive integrated transponder (PIT) tagged Clearwater River natural fall Chinook salmon subyearlings, Nez Perce Tribal Hatchery (NPTH) on-station releases, and acclimated releases at Cedar Flats, Luke's Gulch, and North Lapwai Valley (NLV) 2009 (LGR = Lower Granite Dam, LGS = Little Goose Dam, MCN = McNary Dam.

Table 6. Detections for the 10th, 50th, and 90th percentile arrival timing at Lower Granite Dam (LGR) of natural fall Chinook salmon passive integrated transponder (PIT) tagged on the lower Clearwater River, Nez Perce Tribal Hatchery (NPTH) on-station releases, and acclimated releases at Cedar Flats, Luke's Gulch, and North Lapwai Valley in 2009.

Release Group	Release Date	Lower Granite Dam (LGR) PIT Tag Detections (*n*)	% Arrival Timing to LGR		
			10%	50%	90%
Clearwater River Naturals	6/22 – 8/25	67	7/16	11/8	11/24
NPTH On-Station	6/8	380	6/13	6/19	7/1
Cedar Flats	6/9	1947	6/16	6/21	7/9
Luke's Gulch	6/10	2299	6/16	6/19	6/29
North Lapwai Valley (NLV)	5/15	291	5/19	5/29	6/19

River naturals was November 8 at Lower Granite. The 50% arrival timing at Lower Granite Dam was June 19 for the Luke's Gulch release, June 21 for Cedar Flats, June 19 for the NPTH release group, and May 29 for the NLV group (Table 6).

Temperature and Flow

Fall Chinook salmon subyearling releases at NPTH on the Clearwater, Luke's Gulch on the S.F. Clearwater, and Cedar Flats on the Selway River were made prior to warm (>16 ^{o}C) summer water temperatures (Figure 5). The release of the NLV acclimated group was a few weeks earlier because water temperatures were warming at the NLV facility and in Lapwai Creek (Figure 5). Temperatures in the upper Clearwater River Subbasin exceeded 20 ^{o}C throughout much of July and early August with the lower Clearwater moderating between 11-13 ^{o}C during that time period because of cold water releases from Dworshak Reservoir. This is the time period that most of the natural fall Chinook sampling occurred on the lower Clearwater River (Figure 5).

Most PIT-tag detections at Lower Granite Dam for all NPTH and associated acclimated releases occurred before temperatures exceeded 20 ^{o}C in the Snake River (Figure 6). Cold water releases from Dworshak Reservoir moderated warm Snake River temperatures by 2-3 ^{o}C keeping water temperatures at or below 20 ^{o}C at Lower Granite Dam during July-August. Few detections of natural fall Chinook occurred from July thru mid-September when temperatures in the Snake River were near 20 ^{o}C (Figure 6). There were more natural subyearlings first detected at Lower Granite Dam in Late September and October when temperatures on the Snake River and at Lower Granite Dam dropped to approximately 18 ^{o}C and below (Figure 6).

While the subyearling release from NLV occurred prior to peak spring flows on the lower Clearwater River, the releases at NPTH on the Clearwater, Luke's Gulch on the S.F. Clearwater, and Cedar Flats on the Selway River were made after peak spring flows (Figure 7). While these releases were made on the descending limbs of their respective hydrographs, sampling Clearwater natural fall Chinook could not begin until the Clearwater flows were below 8,000 m^3/s (Figure 7). PIT tag detections at Lower Granite Dam (LGR) in relation to mean daily flows and spill recorded at LGR of the Clearwater naturals and all combined hatchery fall Chinook releases from NPTH and associated acclimation facilities are shown in Figure 8. Most hatchery detections occurred during the spill period at Lower Granite (Figure 8). In contrast, very few of the PIT tagged natural fish experienced summer spill as most detections occurred later in the fall (Figure 8).

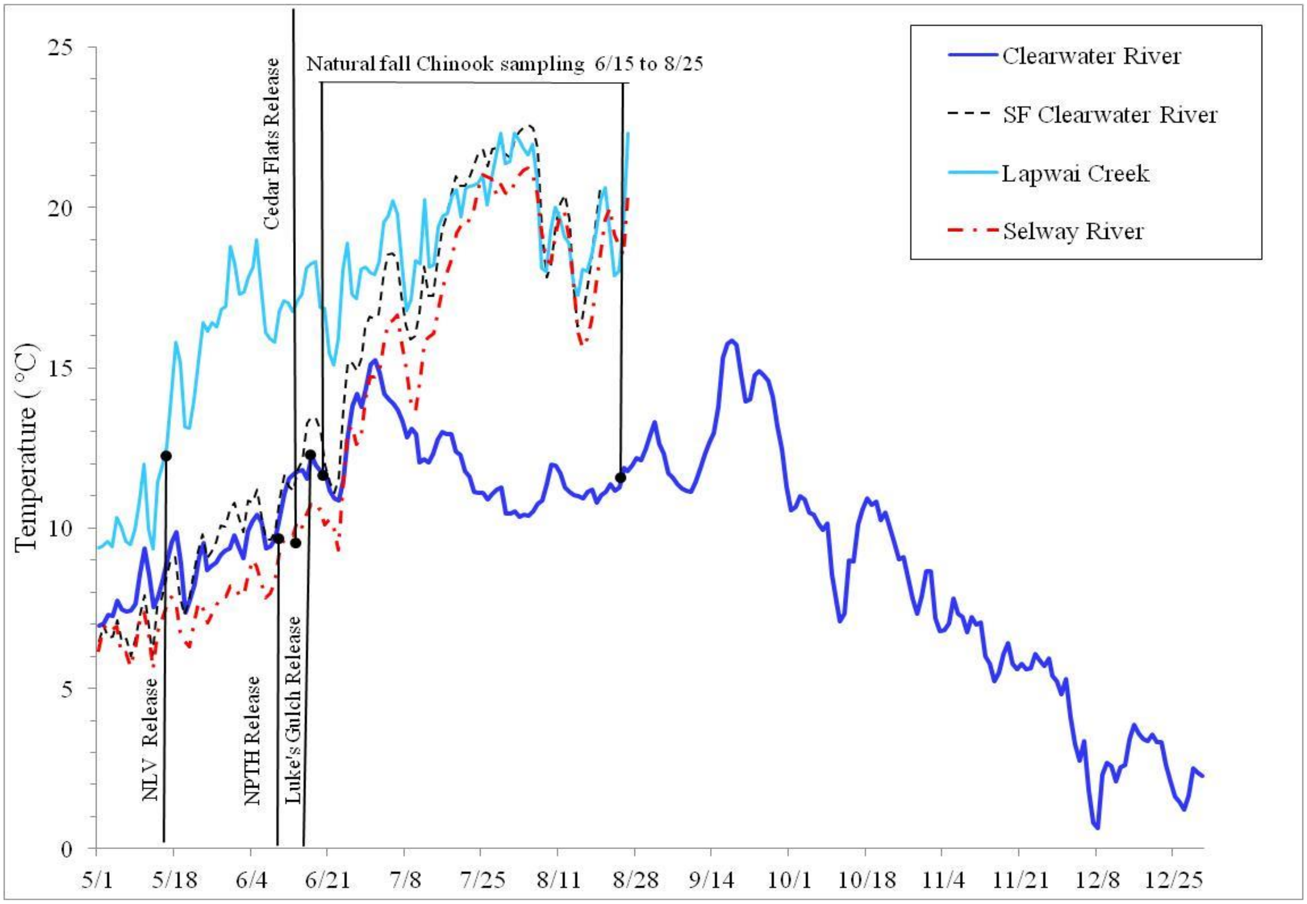

Figure 5. Mean daily temperatures recorded in the Clearwater River Subbasin, timing of natural fall Chinook sampling on the Clearwater River and hatchery releases from Nez Perce Tribal Hatchery (NPTH), Cedar Flats, Luke's Gulch, and North Lapwai Valley (NLV), 2009.

Genetic Monitoring

We collected a random non-lethal subsample (upper caudal fin clips) from 121 natural subyearling Chinook salmon captured on the Clearwater River during 2009. All genetic samples were sent to the Hagerman Laboratory in Idaho and analyzed by the CRITFC staff to determine percent composition of spring/summer or fall Chinook salmon and to build upon baseline fall Chinook salmon genetic profiles. The 2009 genetic analysis will be combined with subsequent year's genetic monitoring data and provided in a later report.

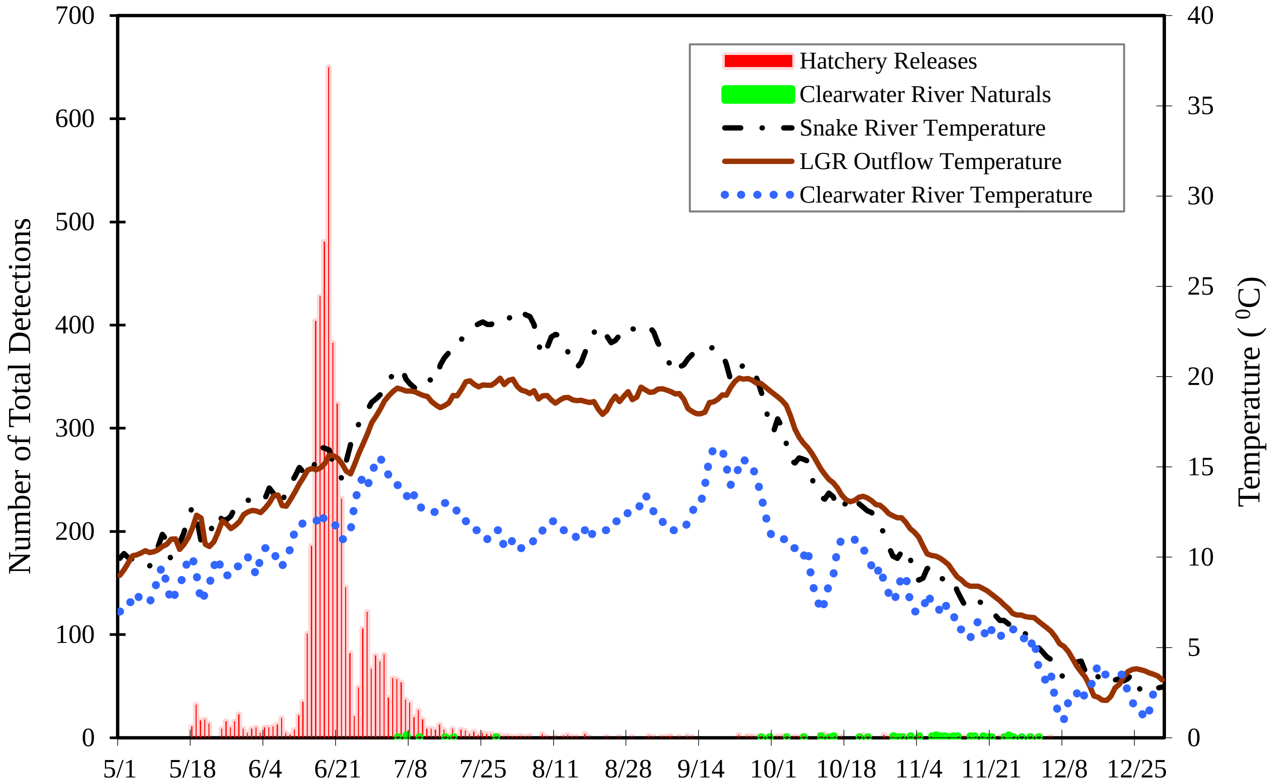

Figure 6. First passive integrated transponder (PIT) tag detections of Clearwater River natural and combined hatchery releases from Nez Perce Tribal Hatchery, Cedar Flats, Luke's Gulch, and North Lapwai Valley fall Chinook salmon at Lower Granite Dam in relation to mean daily temperatures recorded in the Clearwater River (USGS Spalding gauge), Snake River (USGS Anatone gauge) and at Lower Granite Dam (LGR), 2009.

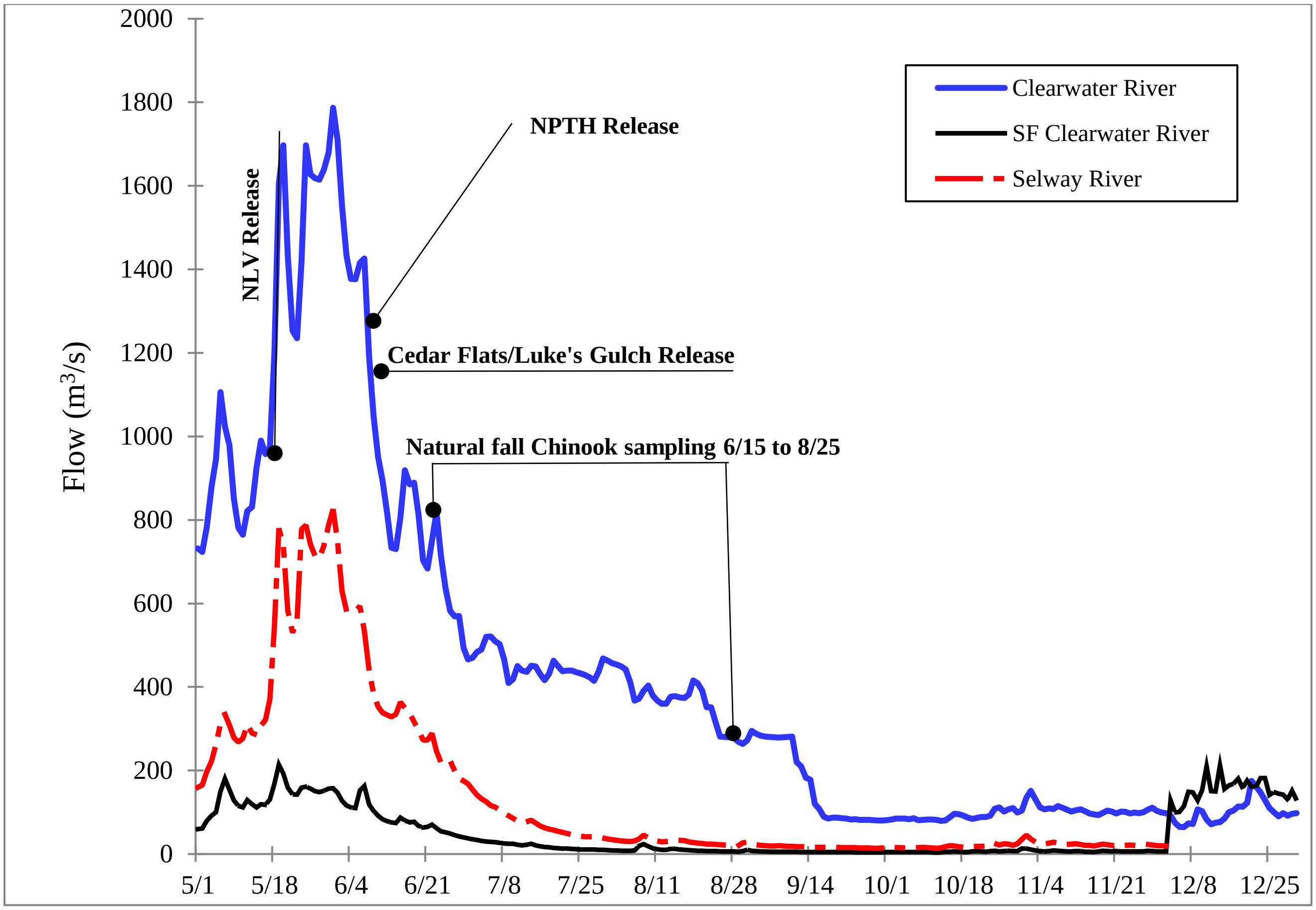

Figure 7. Mean daily flows recorded in the Clearwater River Subbasin, timing of natural fall Chinook sampling on the Clearwater River and hatchery releases from Nez Perce Tribal Hatchery (NPTH), Cedar Flats, Luke's Gulch, and North Lapwai Valley (NLV), 2009.

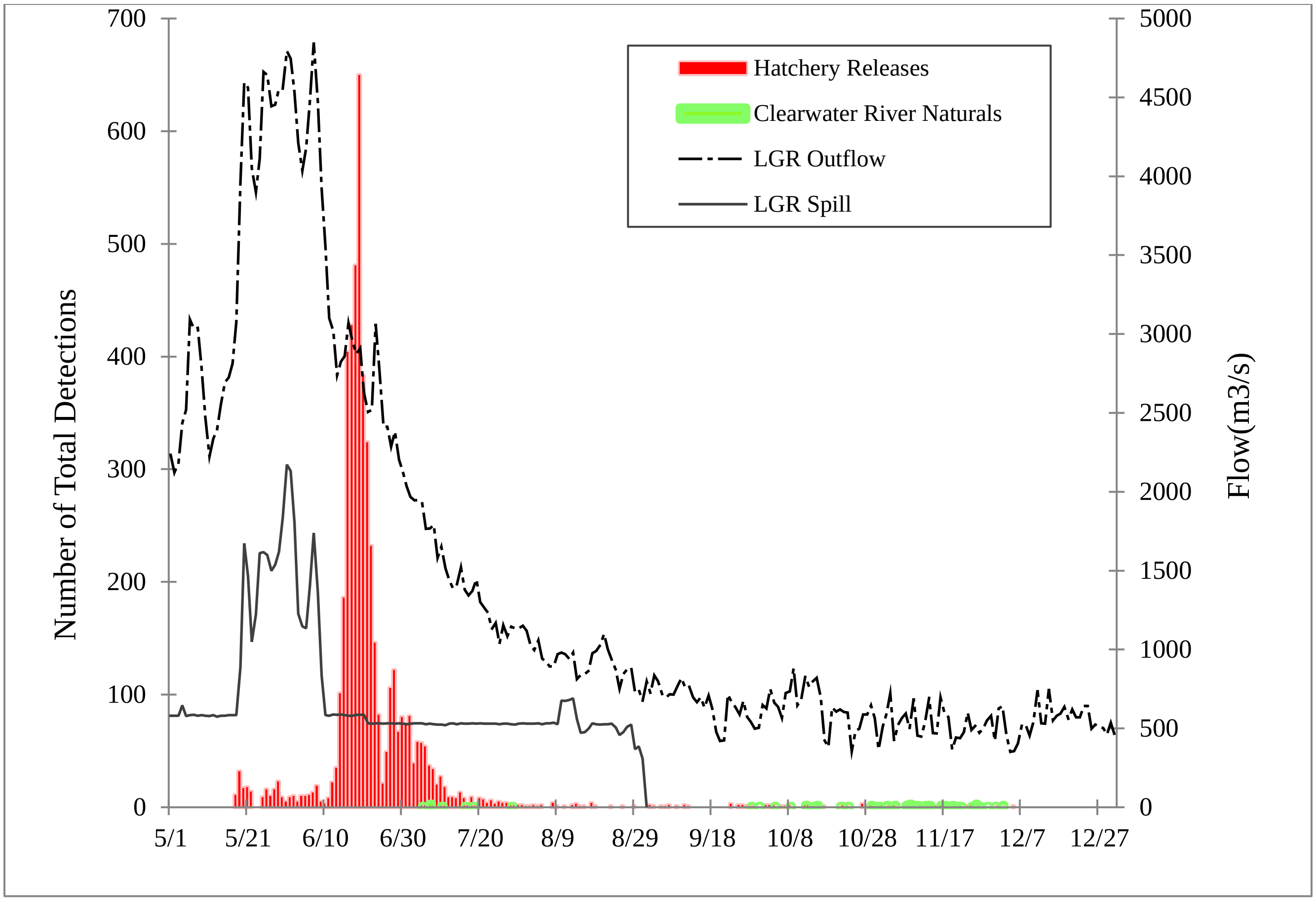

Figure 8. First passive integrated transponder (PIT) fall Chinook detections of Clearwater River naturals and combined hatchery releases from Nez Perce Tribal Hatchery, Cedar Flats, Luke's Gulch, and North Lapwai Valley at Lower Granite Dam (LGR) in relation to mean daily flows and spill recorded at the dam, 2009.

Adult Monitoring

Spawning Ground Surveys

We observed a total of 1,184 fall Chinook salmon redds in the Clearwater River in 2009 (Appendix A). Included in the Clearwater redd count, 42 redds were observed in the mainstem above the confluence of the N.F. Clearwater River. Surveys were conducted on the N.F. Clearwater River on the same dates at the lower Clearwater (Appendix A) and no redds were observed, however, an NPTH staff member observed one fall Chinook redd in the N.F. No redds were seen on October 19 and November 16 on the lower Potlatch River. A total of 12 redds were observed in the lower S.F. Clearwater River, one redd observed in the lower Selway River, and no redds observed in the M.F. Clearwater River. A total of 1,198 redds were observed in the Clearwater River Subbasin which was the highest count since surveys began in 1988 (Figure 9).

Aerial redd surveys began on the Clearwater River September 21 and no fall Chinook salmon redds were observed, therefore, the initiation of spawning began a week later as one redd was observed on September 28 (Appendix A). A peak of 331 redds were observed on November 9 and survey conditions were good. Water transparencies began and ended with excellent conditions. The last survey was conducted on December 2 with 49 new redds observed. The lowest flows (2,810 cfs at Spalding) occurred on September 28 and October 12 surveys with the highest flow (3,840 cfs) recorded on both October 26 and November 9 surveys (Appendix A).

There were a total of 3,467 fall Chinook salmon redds counted in the Snake River Basin above Lower Granite Dam in 2009 and 252 redds estimated below Granite in the Tucannon River (Arnsberg et al. 2010; Figure 10). The 2009 fall Chinook redd count represents the highest count in the Snake River Basin since surveys began in 1988 (Figure 10). The adult escapement above Lower Granite Dam was estimated to be 17,266 adults during 2009 (Young et al. 2012). The adult-to-redd ratio above Lower Granite Dam was calculated to be 6.0 adults/redd in 2009 with an average of 6.15 adults/redd averaged across all years since 1987 (Figure 11). Redd counts showed a high correlation ($R^2 = 0.934$) with yearly escapement estimates over Lower Granite Dam (Figure 11). Using the adult/redd number of 6.0 in 2009, the estimated adult escapement to the Clearwater River Subbasin was approximately 7,147 adults (1-ocean fish or jacks/jills not included).

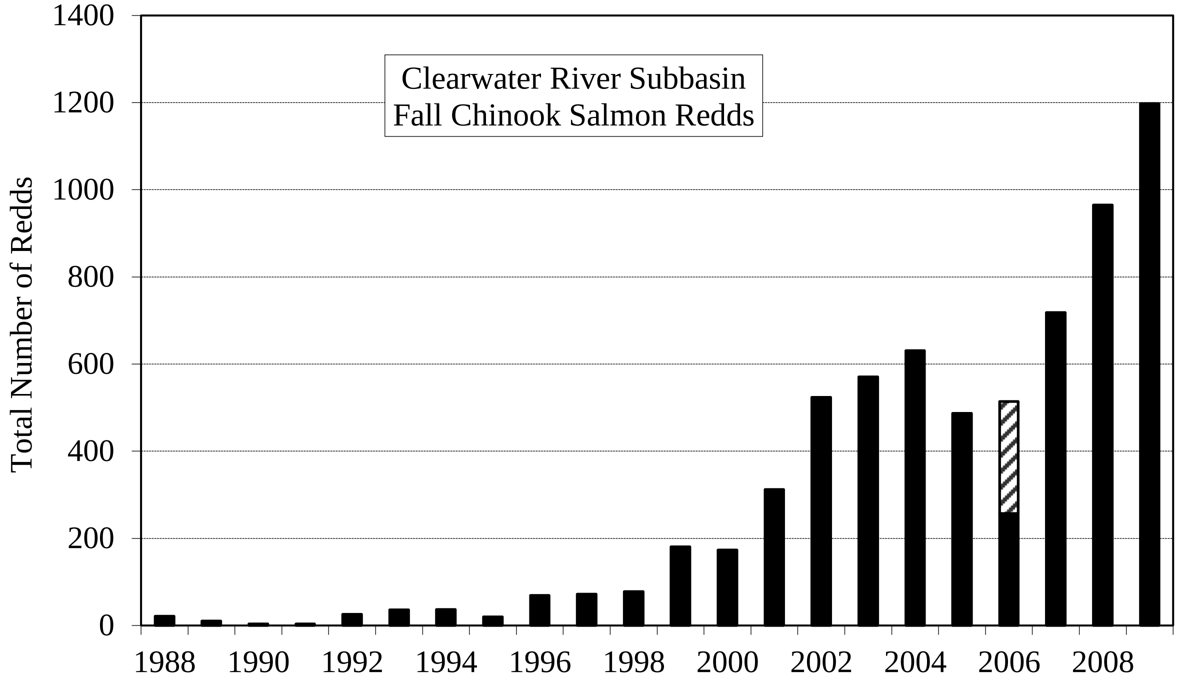

Figure 9. Fall Chinook salmon redds counted in the Clearwater River Subbasin, 1988-2009 (cross hatch in 2006 was an estimated redd number missed because of turbid water conditions and incomplete surveys).

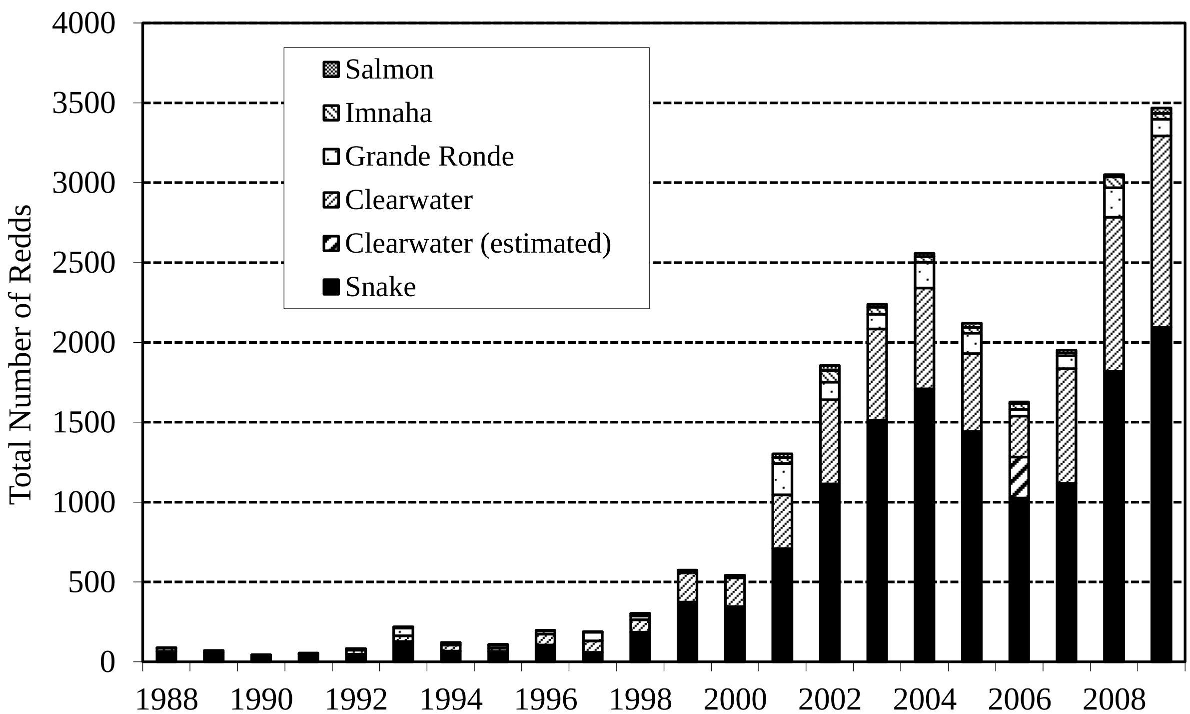

Figure 10. Fall Chinook salmon redds counted in the Snake River Basin above Lower Granite Dam, 1988-2009 (Clearwater River estimated number missed for 2006 only).

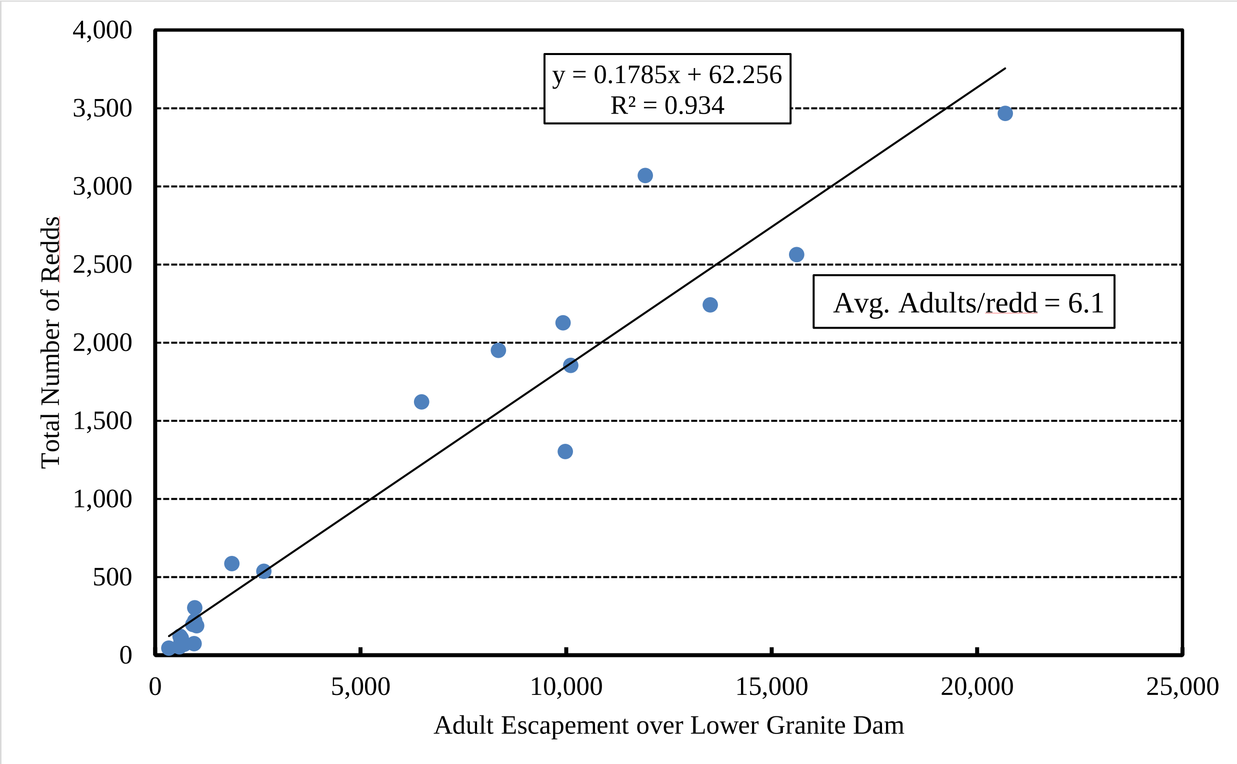

Figure 11. Fall Chinook salmon redds counted in the Snake River Basin above Lower Granite Dam and adult (not including jacks) escapement regression over Lower Granite Dam from run reconstructions and the average fish/redd (1987-2009).

Escapement and Carcass Recoveries

The total fall Chinook salmon returning to Lower Granite Dam in 2009 was estimated to be 25,262 adults and 27,260 jacks for a total of 52,522 fish (Young et al. 2012). The estimate of 2009 fall Chinook salmon escapement above Lower Granite Dam was 20,685 adults and 23,007 jacks for a total of 43,692 fish. Jacks made up 52.7% of the fall Chinook run over Lower Granite, however, natural/wild jacks made up only 3.1% of returning jacks. Natural/wild adults consisted of about 20.7% of the adult escapement above LGR in 2009 (Young et al. 2012).

A total of 257 fall Chinook salmon carcasses were collected in the lower Clearwater River from the Ahsahka Islands down to Cherry Lane below NPTH (Appendix B). There were a total of 168 females (65.4%) and 89 males (34.6%) collected. Of all female carcasses cut open and examined, 98.8% were 100% spawned-out (eggs were spent) with two females that retained about 100% of their eggs (Appendix B).

Analysis of the composition of fall Chinook salmon carcasses collected in the Clearwater River using coded wire tags, PIT tags, adipose fin clips, and scale readings resulted in identifying 208 hatchery origin fish (87.4%) and 30 natural origin fish (12.6%) (Table 7, Appendix B). There were 19 carcasses with no hatchery marks or tags (unknown origins) in which scales were regenerated or deteriorated and could not be read (Table 7, Appendix B).

Table 7. Number of each age class, percent of total sampled identified by emigration life history type from coded wire tags, PIT tags, adipose fin clips, and scale analysis; fork length (cm) range and average fork length in parenthesis of adult fall Chinook salmon carcasses (n = 257) collected in the lower Clearwater River, 2009 (20 unknown origins and/or life history type not included in percentages).

Emigration Life History type	No. Age 3 Fk lth Range (avg.)	No. Age 4 Fk lth Range (avg.)	No. Age 5 Fk lth Range (avg.)	Total of Life History type (% of total)
Subyearling Hat release/Subyearling Emigration	22 (9.3%) 66-86 (72)	118 (49.8%) 70-111 (84)	3 (1.3%) 80-86 (84)	143 (60.3%)
Subyearling Hat release/ Reservoir Reared	6 (2.5%) 66-82 (73)	3 (1.3%) 79-84 (81)	2 (0.8%) 88-107 (98)	11 (4.6%)
Subyearling Hat release/ Unknown emigration	-----	9 (0.0%) 74-87 (79)	-----	9 (3.8%)
Yearling Hat Release	19 (8.0%) 59-83 (65)	21 (9.3%) 65-95 (77)	2 (0.8%) 79-89 (84)	42 (17.7%)
Natural Subyearling Emigration	1 (0.4%) 62 (62)	3 (1.3%) 79-84 (81)	-----	4 (1.7%)
Natural Reservoir Reared	5 (2.1%) 63-67 (65)	14 (5.9%) 74-96 (85)	7 (3.0%) 84-98 (92)	26 (11.0%)
Yearling Out-of-Snake Basin Hatchery Strays	-----	1 (0.4%) 75 (75)	1 (0.4%) 88 (88)	2 (0.8%)
Unknown Hatchery (lost wire)	-----	-----	-----	1
Unknown Origin (no marks/tags) scales unreadable	-----	-----	-----	19
Total Collected by Age	53 (22.4%)	169 (71.3%)	15 (6.3%)	257

The greatest number of carcasses collected in the Clearwater River were hatchery subyearlings that emigrated as subyearlings (60.3%), followed by hatchery yearling releases (17.7%), and thirdly by naturally produced subyearlings that held over or possibly reservoir reared and emigrated as yearlings (11.0%) (Table 7). Most carcasses collected (71.3%) returned at total age four followed by age three (22.4%), and lastly age five fish (6.3%). There were no age two or age six carcasses collected that were identified. Two known (from wire) out-of-Snake Basin hatchery "strays" made up 0.8% of the carcasses sampled in the Clearwater River (Table 7).

Smolt-to-Adult Return Estimates

Total coded wire tag recoveries of fall Chinook salmon processed at NPTH and LFH from 2005-2009 for NPTH and associated subyearling acclimation releases from 2004-2008 releases are given in Table 8. A total of 189 NPTH and associated returns were hauled from Lower Granite Dam to LFH for brood and none volunteered into the LFH fish ladder during 2009 (Table 8). A total of 113 NPTH and associated returns were hauled to NPTH from Lower Granite Dam with 106 fish volunteering into the NPTH fish ladder during 2009. Prior to 2009, returns in 2004-2008 totaled 413 fish from NPTH and associated releases that were hauled to LFH and 8 fish that volunteered into the LFH fish ladder compared to 141 and 231 fish that were hauled and volunteered into NPTH (Table 8).

The fall Chinook salmon run reconstruction estimates from 2004-2009 (expanded for trapping rates at Lower Granite Dam) and estimated contributions in the ocean and Columbia River fisheries are provided in Table 9. Since NPTH inception, there are three complete brood returns (5-yr olds) from 2003-2005 release years. A low smolt-to-adult return (SAR) of 0.025% was estimated for the first release in 2003 from NPTH on-station and a slightly higher 0.034% for the North Lapwai Valley Acclimation Pond. The highest estimated SAR of 0.267% form complete returns of all age classes was from the second on-station release at NPTH in 2003. The lowest SAR of 0.016% was estimated for the 2005 emergency NPTH on-station release during the spring flood that occurred. The SAR's for incomplete returns for the 2006 releases look promising and are already much higher than initial previous years releases (Table 9).

Generally there were more recoveries reported in ocean fisheries than in freshwater fisheries which occurs mostly in the Columbia River (Table 9). Higher smolt-to-adult survivals (SAS) estimates that includes fishery contributions usually have higher SARs (fish returning to the Snake River) as well (Table 9). The highest SAS of 1.189% has been for the Cedar Flats release group in 2006 with age-5 fish returning in 2010 that needs to be factored in (Table 9).

Table 8. Total coded wire tag recoveries (2005-2009) at Nez Perce Tribal Hatchery (NPTH) and Lyons Ferry Hatchery (LFH) from NPTH and associated acclimation releases from 2004-2008 (includes hauled fish from Lower Granite Dam and volunteers (VOL) into each hatchery (not expanded for trapping rates at Lower Granite Dam).

Fall Chinook Release Data				2005-2008 Returns		2009 Returns		Total CWTs Recovered
Release Location	First Release Date	Total Release Number	Fish/ lb	# LFH Hauled/ VOL	# NPTH Hauled/ VOL	# LFH Hauled/ VOL	# NPTH Hauled/ VOL	
NPTH*	6/4/04	169,596	55.2	9/2	3/27	0/0	0/0	41
NPTH (emerg. release-flood)*	6/7/05	869,300	110-120	11/3	3/18	0/0	0/3	38
North Lapwai Valley	5/17/06	199,746	72.3	87/1	33/48	10/0	1/34	214
Cedar Flats	6/13/06	25,774	32.9	35/0	17/2	1/0	0/1	56
Lukes Gulch	6/13/06	25,391	36.6	25/0	6/2	1/0	2/2	39
NPTH	6/8/06	432,097	59.0	195/2	64/131	25/0	6/42	465
North Lapwai Valley	5/22/07	163,431	50.9	6/0	2/1	1/0	1/2	13
Cedar Flats	6/11/07	24,988	47.3	3/0	1/0	0/0	0/0	4
Lukes Gulch	6/4/07	24,955	37.2	1/0	0/0	0/0	1/0	2
NPTH	6/11/07	491,424	37.9	41/0	12/1	11/0	10/20	95
North Lapwai Valley	5/15/08	168,624	73.4	0/0	0/0	64/0	32/0	96
Cedar Flats	6/12/08	100,294	59.3	0/0	0/0	31/0	15/0	46
Lukes Gulch	6/12/08	100,368	46.0	0/0	0/0	41/0	22/2	65
NPTH	6/10-6/15/08	495,936	50.7	0/0	0/0	53/0	23/0	76
			Totals	413/8	141/231	238/0	113/106	1,250

*Complete return years.

Table 9. Estimated fall Chinook Salmon smolt-to-adult returns (SARs) and smolt-to-adult survivals (SASs) for Nez Perce Tribal Hatchery (NPTH) on-station and associated subyearling releases from 2003-2006 (coded wire tag recoveries as reported to the Regional Mark Processing Center (RMPC) using estimated numbers i.e. expanded, and expanded numbers at Lower Granite Dam (Snake River recoveries) through run reconstructions (includes 1-ocean returns).

Release Location	Release Year	Total # coded wire tags	Total Ocean Fisheries recoveries	Total Freshwater Fisheries recoveries	Total Snake River recoveries	Grand Total recoveries	SAR's (%) to Snake	Total SAS's %
North Lapwai Valley*	2003	167,967	16	3	57	76	0.034	0.045
NPTH 1st release*	2003	193,643	8	0	49	57	0.025	0.029
NPTH 2nd release*	2003	97,932	37	0	261	298	0.267	0.304
NPTH*	2004	163,830	7	0	86	93	0.052	0.057
NPTH Emerg. Release*	2005	542,164	5	6	88	99	0.016	0.018
North Lapwai Valley	2006	198,108	170	79	764	1,013	0.386	0.511
Cedar Flats	2006	25,478	34	0	269	303	1.056	1.189
Lukes Gulch	2006	25,099	18	0	172	190	0.685	0.757
NPTH	2006	296,606	302	57	1650	2,009	0.556	0.677

*Complete returns and recoveries.

Hatchery Spawning

Fall Chinook adults were first counted on August 18 at Lower Granite Dam (LGR), although there is some overlap on either side of that date with summer Chinook salmon. Conditions for trapping during 2009 was favorable and began on August 18 and production staff began hauling fall Chinook from LGR to NPTH on August 20. The last haul date from Lower Granite Dam was October 30. A total of 1,828 fall Chinook were hauled from LGR for broodstock which consisted of 399 females (Appendix C) and 1,429 males (Appendix D). A total of 325 fall Chinook volunteered to the NPTH fish ladder which consisted of 192 females (Appendix C) and 133 males (Appendix D). A grand total of 2,153 fall Chinook salmon were processed at NPTH during 2009. For both NPTH and LFH, fall Chinook salmon broodstock needs were met in 2009.

Of the 591 females processed at NPTH, 494 were spawned, 54 died in the pond prior to spawning, 30 were killed and not used for brood, and 13 excess females were outplanted back to the river to spawn naturally (Appendix C). Males were more abundant than females for the 2009 return, however, there was a high percentage of 1-ocean "jacks". A total of 1,562 males were processed with 319 spawned, 81 died in the pond prior to spawning, 1,127 were killed and not used for brood, and 35 were outplanted back to the river to spawn naturally (Appendix D). Most males killed and not used were hauled from LGR, mostly 1-ocean jacks, and were sacrificed to read coded wire tags for run reconstruction purposes. In order to possibly decrease the number of returning jacks in the future, spawning was intentionally limited to older and larger males and some were spawned with up to five females.

This was the third year for a full adult return (5-year old fish) back to the Clearwater River Subbasin from subyearling releases at the NPTH and the NLV acclimation site in 2003-2005. Of all NPTH released fish, only two females (Appendix C) and one male (Appendix D) were total age-5 and volunteered into the NPTH fish ladder. A total of 128 females and 133 males were processed that were from prior years NPTH and associated acclimated releases. Of the 128 females, 117 were spawned and incorporated into the broodstock which represented 25.9% of the total broodstock as compared with only 24 males or 7.5% of the brood. As with other release groups throughout the basin, most returning NPTH and associated release males were 1-ocean "jacks" and not used for brood.

The highest contribution of females to the broodstock from all specific release locations was 96 LFH on-station yearlings, 84 unmarked/untagged hatchery subyearlings, followed by 55 NPTH on station releases, which represented 19.4%, 17.0%, and 11.1% of all brood, respectively (Appendix C). The highest male contribution from all release locations was 61 Big Canyon yearlings, 50 unmarked/untagged hatchery subyearlings, and 45 LFH yearlings, which represented 19.1%, 15.7% and 14.1% of all brood, respectively (Appendix D). Broodstock contributions with these three release groups were actually higher since some older age class and larger males were used to spawn multiple females.

The highest composition of all hauled fall Chinook females from LGR was 46.5% hatchery subyearling origin, 45.3% hatchery yearling origin, followed by 4.8% wild/natural origin (Appendix C). There was a total of six known out-of-Snake Basin hatchery strays which represented 1.5% of all hauled females from LGR. The highest composition of volunteer females into NPTH was 71.4% hatchery subyearling origin, 22.4% hatchery yearling origin, followed by 3.1% unknown hatchery yearlings). There were no known out-of-Snake Basin hatchery female strays that volunteered into NPTH during 2009.

The highest composition of all hauled fall Chinook males from LGR was 55.6% hatchery subyearling origin, 37.4% hatchery yearling origin, followed by 2.9% wild/natural origin (Appendix D). There were 20 known out-of-Snake Basin hatchery male strays that represented 1.4% of all males hauled from LGR. The highest composition of volunteer males into NPTH was 57.1% hatchery yearling origin, 35.3% hatchery subyearling origin, followed by 3.0% wild/natural origin (Appendix D). There were no known out-of-Snake Basin hatchery male strays that volunteered into NPTH during 2009.

Total contribution of natural origin females incorporated into the NPTH brood during 2009 was 3.5% of all females spawned with 57.1% of those were identified as reservoir reared or held over and emigrated as yearlings (Appendix C). Total known contribution of natural origin males incorporated into the brood was 6.7% of all males spawned with 81.0% of those identified as reservoir reared (Appendix D). The total estimated incorporation of natural origin males into the brood was 12.1% that includes juveniles PIT tagged at LGR emigrating late in the fall as well as unmarked/untagged males spawned where scales were unreadable (Appendix D).

Total age composition of all fall Chinook salmon females processed at NPTH resulted in 36.7% age-3, 56.7% age-4, and 5.1% age-5 of fish that could be identified (Appendix C). Of the age-3 one ocean "jills" used for brood, 70.0% were yearling releases and 18.6% were 2-ocean subyearlings. There were 10 age-3 females from subyearling hatchery releases and one age-3 natural origin female that reservoir reared and used for brood. There was only one known 1-ocean subyearling "jill" processed but not used for brood. Percentages of females incorporated into the brood were similar to those processed as few females were sacrificed and not used in the egg take (Appendix C).

Total age composition of all fall Chinook salmon males processed (not necessarily used for brood) at NPTH resulted in 44.3% age-2, 46.9% age-3, 8.3% age 4, and 0.5% age-5 of the fish that could be identified (Appendix D). Of all age-2 males processed, 99.9% were 1-ocean subyearling "jacks" and only one was a "mini" jack from a yearling release which was not used for brood. A total of 11 age-2 male jacks were used for brood representing 3.8% of all males used. Of all age-3 males used in the brood, 81.4% were from hatchery yearling releases, 11.0% were hatchery subyearlings that "reservoir reared" and emigrated as yearlings, and 7.6% were wild/natural subyearlings that reservoir reared. The incorporation of true 1-ocean "jacks" into the NPTH broodstock was 43.8% of all males used, however, this is skewed high because larger males were used to spawn more than once and with up to six females.

Genetic Monitoring

A total of 784 or 100% of the adult fall Chinook salmon incorporated into the NPTH broodstock were tissue sampled for DNA analysis as part of NOAA's parentage study. The results of this work will be published after another year of data collection. We also subsampled 249 (out of 257) fall Chinook salmon carcasses collected on the spawning grounds for DNA analysis. The 2009 genetic analysis will be combined with future genetic monitoring data and reported in a later NPTH M&E report.

DISCUSSION

Supplementation

This was the first year NPTH met production goals since inception in 2003 and exceeded the 1.4 million release goal by 134,360 fish. Coded wire tagging and ad-clip groups were slight less than the goal of 600,000 CWT only and 400,000 CWT/ad-clip with very high CWT retentions on all groups. The fish released at NPTH, Luke's Gulch, and Cedar Flats were close to the target release size of 50.0 fish/lb, however, because of warm water temperatures in Lapwai Creek, the NLV release group was released earlier at an average smaller size (85.3 fish/lb).

Monitoring and Evaluation

Juvenile Monitoring

Life History, Emigration Timing and Survival Estimates

In contrast to previous years, the NLV group had the highest PIT tag detection rate (69.7%) at all juvenile detection facilities compared to the rest of the hatchery releases (49.4%), even though it appears that the NLV group could have experienced more spill due to an earlier release at Lower Granite Dam than in 2009. The Clearwater River natural PIT tagged releases were detected at 9.2%, a direct result of the small PIT tag sample size. This group also may be moving through the hydrosystem when the PIT tag bypass detectors are shut down at the major Snake and Columbia river dams. Migration rates increased to each subsequent detection facilities for all groups except the natural juvenile releases from the Clearwater River and the Cedar Flats release, which showed a slight decrease from Lower Granite Dam to Little Goose Dam. This increase for the hatchery releases may be contributed to these fish reaching advanced stages of smoltification as they emigrate to farther reaches of the Snake and Columbia rivers. The NLV group migrated at a slower rate than the other hatchery releases and were released smaller and earlier, experiencing the higher flows from the Clearwater River and at Lower Granite Dam. It would be expected that these flows would possibly help these fish migrate at a faster rate downstream. These fish possibly exhibited slower migration rates due to their smaller release size and less advanced stages of smoltification. Small PIT tag sample sizes combined with low PIT tag detections below McNary Dam make it difficult to generate migration rates below McNary Dam for all release groups. Accurate survival estimates could be attained to Lower Granite and McNary dams for all hatchery releases due to larger PIT tag sample sizes and enough downstream detections to satisfy the SURPH model parameters. As in previous years, there are not enough detections at Lower Granite and subsequent facilities to estimate survival below Lower Granite Dam for the natural Fall Chinook juveniles from the Clearwater River. To accurately study the Clearwater River natural fall Chinook population and their life history using PIT tag technology, it is essential that detectors at all juvenile facilities are in operation for as long as possible.

Flow and Temperature

There was more flow and subsequent spill at Lower Granite Dam in 2009 compared to the previous ten year average. Water temperature extremes between the lower Clearwater River and the Snake River during natural fall Chinook emigration conditions show a difference of about 10 ^{o}C during mid-July through August, similar to recent years. Water temperatures on the Clearwater River were a cool 11-13 ^{o}C while at the same time the Snake River temperatures were 20-23 ^{o}C. This temperature difference may be a thermal barrier causing delayed Clearwater River natural fall Chinook salmon subyearling emigration resulting in significantly more holdovers or reservoir reared fish that emigrate the next year as yearlings. The cooler temperatures in the Clearwater River also delays emergence from the gravel and subsequent growth compared to the Fall Chinook in the Snake River. It is known that a portion of juveniles from the Clearwater River do not smolt and emigrate to the ocean as subyearlings, possibly because of these delays, thus effecting research parameters like PIT tag detections and subsequent emigration and survival estimates. The percentage of holdovers was 18.9% for the 2009 releases of all natural PIT tagged fall Chinook that were released in 2009 and detected in the spring of 2010. The sample size in 2009 was smaller due to a diminished sampling window as a result of longer periods of increased flows in the lower Clearwater River. Flows above 850 cms limit access to shoreline sampling areas.

Genetic Monitoring

We continued to collect genetic information on natural juvenile Chinook salmon subyearlings collected on the lower Clearwater River. We have reached our target level of at least 100 samples throughout each sampling season. The DNA analysis is used to separate out spring from fall Chinook salmon and will monitor fall Chinook genetic profiles over time. Also, with NOAA's parentage study beginning with the 2007 NPTH broodstock, and continuing in 2008-2009, we will be able to track juveniles through PIT tags to determine if the reservoir reared life history trait is genetically linked or influenced more by environmental changes within the Snake River Basin. The 2009 genetic analysis will be combined with the future years of genetic monitoring and analysis and reported in a later report along with a separate NOAA report.

Adult Monitoring

Spawning Ground Surveys

The 2009 aerial spawning ground surveys in the Clearwater River Subbasin resulted in the highest fall Chinook salmon redd count (1,184) since we started surveys in 1988. There were 42 redds observed in the upper mainstem Clearwater above the North Fork confluence which was 12 redds fewer than what was observed in 2005, the high count. A record high of 12 redds were counted in the South Fork Clearwater River with only 1 redd counted in the Selway River which was 4 redds less than the high count of 5 redds during 2008. We are expecting higher escapement numbers and redds in the upper Clearwater reaches in the future since full production releases were met for the first time this year.

The Clearwater River Subbasin fall Chinook salmon redd count represented 34.6% of the Snake River Basin redd count above Lower Granite Dam (n=3,467), which is higher than the average of about 30%. The calculated 6.0 adult-to-redd ratio above Lower Granite Dam was slightly lower than the average (6.2) and would tend to indicate that not many redds were missed in the basin during 2009. The redd counts in the Snake River Basin and escapement numbers over Lower Granite Dam continue to be highly correlated since intensive surveys began in 1987.

Escapement and Carcass Recoveries

The total fall Chinook salmon returning to Lower Granite Dam in 2009 was the highest estimate since before this last lower Snake River dam was completed in 1975. The estimated of 25,262 adults and 27,260 jacks to Lower Granite Dam was 4,577 adults and 4,253 higher than the previous record for the 2008 return (Young et al. 2012). Jacks made up 51.9% of the fall Chinook run to Lower Granite Dam in 2009 which is somewhat indicative of the following year's adult return.

Examining all 257 fall Chinook salmon carcasses collected in the lower Clearwater River, it appears that pre-spawn mortality was low as only 2 females retained eggs or about 1.2% of all females examined. Hatchery carcasses made up a high percentage (87.4%) of all carcasses collected, however, this was possibly skewed high because 7.4% had no marks/tags and scales that could not be read. Out-of-Snake Basin hatchery "strays" made up 0.8% of the carcasses sampled in the Clearwater River which was slightly lower than the 1.4% strays that were trapped and hauled from LGR to NPTH.

Smolt-to-Adult Return Estimates

This was the sixth year for fall Chinook salmon returns from NPTH and NLV releases that began in 2003 and the third year for a full age-class return up to 5-yr olds. The first full returns from NPTH on-station and NLV releases were low as was the return from the 2005 on-station emergency flood event release. However, the 2003 NPTH second release SAR of 0.27% was right on the target goal of returning 3,750 adults from a full production release of 1,400,000. Since 2009 was the first year of reaching and exceeding a full production release, higher returns are expected and already look promising for earlier age class returns.

Hatchery Spawning

A large return of fall Chinook salmon during 2009 was sufficient to capture enough broodstock for full production at both LFH and NPTH. Similar to the increased abundance at LGR, there were more fish than expected that volunteered into the NPTH fish ladder. This resulted in a surplus of broodstock needs and the unplanned outplanting of adults hauled from LGR (13 females and 35 males) late in the season to spawn naturally. Since there was a high jack return, most males killed and not used were hauled from LGR and were sacrificed for run reconstruction purposes. As was the practice beginning in 2008 and to possibly decrease the number of returning jacks in the future, spawning was intentionally limited to older and larger males with some spawned with up to five females.

Genetic Monitoring

As mentioned before, 2007 was the first year in which we analyzed 100% of the adult fall Chinook salmon incorporated into the NPTH broodstock in cooperation with NOAA's parentage study. Through this study, we may be able to determine if the holdover or "reservoir reared" life history trait is genetically-based or driven by environmental changes occurring in the basin. As this study is in its third year, it will take possibly another year of data collection before analysis and a report or publication is completed.

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Appendix A. Fall Chinook salmon aerial redd surveys with new redds observed during given flight date on the Clearwater River, 2009.

			New Redds Counted by Flight Date											
RM	RKM	LANDMARK	9/21	9/28	10/5	10/12	10/19	10/21	10/26	11/9	11/16	11/18	12/2	Totals
4.5	7.2	Island at Potlatch Mill									1			1
6.8	10.9	Below Casino								5				5
14.0	22.5	Catholic Creek												0
16.2	26.1	Above Gibbs Eddy Boat Ramp												0
17.3	27.8	Island Above Gibbs Eddy					2							2
18.0	29.0	Lower Myrtle		1	1	9	25		7	23	12			78
19.1	30.7	Lower Cottonwood			1	6	3		6	6				22
19.3	31.1	Mid Cottonwood-Channel								18	3			21
21.0	33.8	Below Cherrylane Bridge					1				1			2
21.7	34.9	Fir Island (Hwy 12 Side Channel)					4			1				5
22.0	35.4	Fir Island (Cherrylane-1705)				8	68		36	62	28		5	207
22.2	35.7	NPTH (1705) Ladder				1	13		77	17	10		3	121
23.3	37.5	Pine Creek							1					1
23.9	38.5	Below Thunderbird Market					3							3
25.1	40.4	Above Thunderbird Market					1		2		3			6
26.5	42.6	Above Bedrock Creek					5			16	6			27
27.5	44.2	Below Rest Area				2	3		4	7	3			19
28.4	45.7	Rest Area				3	10		16	8				37
29.2	47.0	Above Lenore Boat Ramp					1							1
30.1	48.4	House on Cliff			2	14	13				15			44
31.5	50.7	Below Tomahawk-Tree Farm			1	2	9		16		9			37
32.5	52.3	Below Tomahawk			2	4	7		30	38	43			124
32.8	52.8	Camp Tomahawk				1	3							4
34.0	54.7	Leaning Pine Hole							2	5	6		7	20
35.4	57.0	Below Old Peck Bridge				4	18		4	21	16		26	89
35.7	57.4	Above Old Peck Bridge				1	10		10	8	22			51
36.2	58.2	Above Old Peck Bridge				1	4		1		2			8
37.9	61.0	Snells Island			3	2	3							8
39.1	62.9	Below Pink House Boatramp							4	6				10
39.6	63.7	Above Pink House Boatramp								4				4
40.3	64.8	Ahsahka Islands				8	25		43	85	16		8	185

Appendix A. (continued).

RM	RKM	LANDMARK	New Redds Counted by Flight Date											
			9/21	9/28	10/5	10/12	10/19	10/21	10/26	11/9	11/16	11/18	12/2	Totals
43.2	69.4	Hwy. Dept. Garage								1				1
45.0	72.3	Above Mouth of Orofino Creek					1							1
49.2	79.2	Above Fords Creek												0
50.5	81.2	Above Fords Creek												0
51.0	82.0	Above B&B Gift Shop												0
51.2	82.4	Below Greer Bridge												0
52.3	84.1	Below Greer Bridge										1		1
52.5	84.4	Above Greer Bridge												0
52.8	84.9	Greer Grain Elevators												0
53.8	86.5	Above Greer Power Lines				1						4		5
58.2	93.6	Clearwater River-Canyon Area				3		6				14		23
62.3	100.3	Long Camp Boat Ramp												0
66.6	107.1	Above Kamiah Train Bridge						1				5		6
66.8	107.5	Above Kamiah Hwy 12 Bridge												0
67.1	107.9	Below Lawyer's Creek												0
69.6	111.9	Above freeze-core site										4		4
72.1	116.0	Below Dale's Cashway										1		1
		Totals	0	1	10	70	232	7	259	331	196	29	49	1184
		River Mile Start	4	4	4	4	4	45	4	4	4	45	4	
		River Mile End	45	45	45	75	45	75	45	45	45	75	75	
		Flow at Spalding Gauge (cfs)	2920	2810	2940	2810	3080	3040	3840	3840	3390	3500	3480	
		Avg. Temp at Spalding Gauge	13.7	13.5	10.2	6.9	10.8	10.3	9.4	6.8	5.5	6.6	4.1	
		Flow from Dworshak (cfs)	1700	1700	1700	1600	1600	1600	1600	1600	1600	1600	1600	
		Flow at Orofino Gauge (cfs)	1190	1070	1170	1090	1290	1390	2040	2070	1610	1880	1710	
		Avg. Temp at Orofino Gauge	18.2	16.3	11.8	5.9	10.9	10.4	8.3	5.1	3.2	2.9	2.5	
		General Observation Conditions	Excel	Excel	Excel	Excel	Excel	Excel	Good	Good	Excel	Excel	Excel	

Appendix B. Fall Chinook salmon carcasses collected in the Clearwater River Subbasin and the Grande Ronde River by the Nez Perce Tribe, 2009 (N = no, Y = yes, N/A = not applicable, U = Unknown; Location, Origin, and Age keys are at end of table).

Date	Fish ID	Fk Lth	Sex	% Spawned	CWT	Ad-Clip	VIE	Opercle punch	Scales taken	DNA taken	Comments	PIT Tag	CWT #	CWT/PIT Origin	Origin	Age	Sub Rel	Reservoir overwinter
10/21/09	09001	61	F	NA	NA	NA	N	N	Y	N	CHERRY LANE				R	R	R	R
10/29/09	09002	107	M	100	N	N	N	N	Y	Y					H	1.3	Y	Y
10/29/09	09003	87	F	100	N	N	N	N	Y	Y					W	1.3	W	Y
10/29/09	09004	95	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
10/29/09	09005	89	F	100	N	N	N	N	Y	Y					H	1.3	N	N
10/29/09	09006	96	F	100	N	N	N	N	Y	Y					R	R	R	R
10/29/09	09007	67	M	100	N	N	N	N	Y	Y					W	1.1	W	Y
10/29/09	09008	84	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
10/29/09	09009	63	M	100	N	N	N	N	Y	Y					W	1.1	W	Y
10/29/09	09010	96	F	100	N	N	N	N	Y	Y					W	1.3	W	Y
10/29/09	09011	96	F	100	N	N	N	N	Y	Y					W	1.2	W	Y
10/29/09	09012	84	F	100	N	N	N	N	Y	Y					W	1.2	W	Y
10/29/09	09013	86	F	100	N	N	N	N	Y	Y					R	R	R	R
10/29/09	09014	75	F	100	Y	Y	N	N	Y	Y			LOST	LOST	H	1.2	N	N
11/13/09	09015	84	F	100	Y	Y	N	N	Y	Y			633582	LF05SO	H	0.3	Y	N
11/13/09	09016	68	F	100	Y	Y	N	N	Y	Y			634092	LF06YO	H	1.1	N	N
11/13/09	09017	90	F	100	Y	Y	N	N	Y	Y			612508	LF05YBCA	H	1.2	N	N
11/13/09	09018	80	F	100	Y	Y	LR	N	Y	Y			633597	LF05YO	H	1.2	N	N
11/13/09	09019	85	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09020	98	M	100	N	N	N	N	Y	Y					W	1.3	W	Y
11/13/09	09021	82	F	100	Y	Y	N	N	Y	Y			LOST	LOST	H	0.3	Y	N
11/13/09	09022	78	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09023	82	M	100	N	N	N	N	Y	Y					R	R	R	R
11/13/09	09024	82	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09025	80	M	100	Y	N	N	N	Y	Y			612709	NPTH05SO	H	0.3	Y	N
11/13/09	09026	88	F	100	N	N	N	N	Y	Y					H	0.3	Y	N

11/13/09	09027	81	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09028	87	F	100	N	N	N	N	Y	Y					W	1.2	W	Y
11/13/09	09029	85	M	100	N	N	N	N	Y	Y					H	0.4	Y	N
11/13/09	09030	79	F	100	N	N	N	N	Y	Y					W	1.2	W	Y
11/13/09	09031	74	M	100	Y	Y	N	N	Y	Y			610174	LF05SBCA	H	0.3	Y	R
11/13/09	09032	79	F	100	N	N	N	N	Y	Y					W	0.3	W	N
11/13/09	09033	82	M	100	N	N	N	N	Y	Y		3D9.1BF24EE65D		LF05SSRSURR	H	0.3	Y	N
11/13/09	09034	88	F	100	N	N	N	N	Y	Y					R	R	R	R
11/13/09	09035	65	M	100	Y	N	N	N	Y	Y			LOST	LOST	H	1.2	N	N
11/13/09	09036	84	F	100	Y	Y	N	N	Y	Y			612671	NPTH05SNLVA	H	0.3	Y	N
11/13/09	09037	88	F	100	Y	N	N	N	Y	Y			610175	LF05SBCA	H	0.3	Y	N
11/13/09	09038	85	F	100	N	N	N	N	Y	Y					R	R	R	R
11/13/09	09039	81	F	100	Y	N	N	N	Y	Y			610175	LF05SBCA	H	0.3	Y	N
11/13/09	09040	88	F	100	N	N	N	N	Y	Y					H	1.3	Y	Y
11/13/09	09041	95	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09042	82	F	100	Y	Y	N	N	Y	Y			612698	NPTH05SO	H	0.3	Y	N
11/13/09	09043	97	M	100	N	Y	N	N	Y	Y					H	0.3	Y	N
11/13/09	09044	92	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09045	77	F	100	Y	Y	N	N	Y	Y			612671	NPTH05SNLVA	H	0.3	Y	N
11/13/09	09046	73	M	100	N	N	N	N	Y	Y					R	R	R	R
11/13/09	09047	84	F	100	N	Y	N	N	Y	Y					H	0.3	Y	N
11/13/09	09048	96	M	100	N	N	N	N	Y	Y					W	1.2	W	Y
11/13/09	09049	82	M	100	N	N	N	N	Y	Y					H	1.1	Y	Y
11/13/09	09050	67	M	100	N	N	N	N	Y	Y					R	R	R	R
11/13/09	09051	73	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09052	88	F	100	Y	N	N	N	Y	Y			BLANK	Umatilla Stray	H	1.3	N	N
11/13/09	09053	82	F	100	Y	N	N	N	Y	Y			610175	LF05SBCA	H	0.3	Y	R
11/13/09	09054	88	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09055	75	F	100	Y	N	LR	N	Y	Y			633597	LF05YO	H	1.2	N	N
11/13/09	09056	79	F	100	N	N	N	N	Y	Y					H	1.2	Y	Y

11/13/09	09057	100	M	100	Y	N	N	N	Y	Y			610175	LF05SBCA	H	0.3	Y	N
11/13/09	09058	84	F	100	N	N	N	N	Y	Y					H	1.2	Y	Y
11/13/09	09059	72	M	100	Y	Y	N	N	Y	Y			612729	LF06SBCA	H	0.2	Y	N
11/13/09	09060	81	M	100	Y	N	N	N	Y	Y			612709	NPTH05SO	H	0.3	Y	N
11/13/09	09061	93	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09062	83	M	100	Y	N	N	N	Y	Y			612516	LF06YBCA	H	1.1	N	N
11/13/09	09063	74	M	100	N	N	N	N	Y	Y					H	0.2	Y	N
11/13/09	09064	67	M	100	Y	N	N	N	Y	Y			612696	NPTH06SO	H	0.2	Y	N
11/13/09	09065	83	F	100	Y	N	N	N	Y	Y			610175	LF05SBCA	H	0.3	Y	N
11/13/09	09066	86	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09067	74	F	100	Y	N	N	N	Y	Y			610175	LF05SBCA	H	0.3	Y	R
11/13/09	09068	67	F	100	N	N	N	N	Y	Y					H	0.2	Y	N
11/13/09	09069	87	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09070	62	M	100	Y	N	N	N	Y	Y			612516	LF06YBCA	H	1.1	N	N
11/13/09	09071	79	F	100	Y	N	N	N	Y	Y			612707	NPTH05SNLVA	H	0.3	Y	R
11/13/09	09072	72	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09073	77	F	100	N	N	N	N	Y	Y					W	1.2	W	Y
11/13/09	09074	82	F	100	Y	N	N	N	Y	Y			612709	NPTH05SO	H	0.3	Y	R
11/13/09	09075	68	M	100	Y	N	N	N	Y	Y			612696	NPTH06SO	H	0.2	Y	N
11/13/09	09076	86	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09077	84	F	100	N	N	N	N	Y	Y					R	R	R	R
11/13/09	09078	74	F	100	N	N	N	N	Y	Y					W	1.2	W	Y
11/13/09	09079	82	F	100	Y	Y	N	N	Y	Y			612698	NPTH05SO	H	0.3	Y	N
11/13/09	09080	68	M	100	N	N	N	N	Y	Y					H	0.2	Y	N
11/13/09	09081	84	F	100	Y	N	N	N	Y	Y			610175	LF05SBCA	H	0.3	Y	N
11/13/09	09082	80	F	100	N	N	N	N	Y	Y					H	0.4	Y	N
11/13/09	09083	87	F	100	Y	N	N	N	Y	Y			612671	NPTH05SNLVA	H	0.3	Y	N
11/13/09	09084	82	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09085	73	F	100	Y	N	LR	N	Y	Y			633597	LF05YO	H	1.2	N	N
11/13/09	09086	87	F	100	N	N	N	N	Y	Y					H	0.3	Y	N

11/13/09	09087	80	F	100	N	N	N	N	Y	Y					W	0.3	W	N
11/13/09	09088	74	F	100	Y	N	N	N	Y	Y			612508	LF05YBCA	H	1.2	N	N
11/13/09	09089	82	F	100	N	N	N	N	Y	Y					W	1.2	W	Y
11/13/09	09090	86	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09091	84	F	100	N	N	N	N	Y	Y					W	1.2	W	Y
11/13/09	09092	83	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/13/09	09093	78	F	100	N	N	N	N	Y	Y					R	R	R	R
11/13/09	09094	79	F	100	N	N	N	N	Y	Y					H	0.2	Y	N
11/13/09	09095	80	F	100	Y	N	N	N	Y	Y	BCC		LOST	LOST	H	0.3	Y	N
11/13/09	09096	63	M	100	Y	N	N	N	Y	Y	BCC		90909	Umatilla Stray	H	1.1	N	N
11/13/09	09097	86	M	100	Y	N	N	N	Y	Y	BCC		612734	NPTH06SCFA	H	0.2	Y	N
11/13/09	09098	69	M	100	N	N	N	N	Y	Y	BCC				H	1.1	N	N
11/13/09	09099	75	M	100	N	N	N	N	Y	Y	BCC				H	0.2	Y	N
11/13/09	09100	68	M	100	N	N	N	N	Y	Y	BCC				H	0.2	Y	N
11/13/09	09101	87	F	100	Y	Y	N	N	Y	Y	BCC		633583	LF05SCCD1	H	0.3	Y	N
11/13/09	09102	104	M	100	N	N	N	N	Y	Y	BCC				R	R	R	R
11/16/09	09103	91	F	100	Y	N	N	N	Y	Y			612709	NPTH05SO	H	0.3	Y	N
11/16/09	09104	75	F	100	N	Y	N	N	Y	Y	NO SNOUT				H	0.3	Y	N
11/16/09	09105	80	M	100	N	N	N	N	Y	Y					H	1.1	Y	Y
11/16/09	09106	74	M	100	Y	Y	N	N	Y	Y			610178	LF05SCCD2	H	0.2	Y	N
11/16/09	09107	83	F	100	N	N	N	N	Y	Y					H	1.2	N	N
11/16/09	09108	78	M	100	Y	Y	N	N	Y	Y			612671	NPTH05SNLVA	H	0.3	Y	N
11/16/09	09109	88	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09110	76	F	100	Y	Y	N	N	Y	Y			610174	LF05SBCA	H	0.3	Y	N
11/16/09	09111	91	F	100	Y	N	N	N	Y	Y			612707	NPTH05SNLVA	H	0.3	Y	N
11/16/09	09112	84	F	100	Y	Y	N	N	Y	Y			633583	LF05SCCD1	H	0.3	Y	N
11/16/09	09113	79	F	100	Y	Y	N	N	Y	Y			610174	LF05SBCA	H	0.3	Y	N
11/16/09	09114	80	F	100	Y	N	N	N	Y	Y			612671	NPTH05SNLVA	H	0.3	Y	R
11/16/09	09115	82	F	100	Y	Y	N	N	Y	Y			633377	KLICK05SO	H	0.3	Y	N
11/16/09	09116	85	F	100	N	N	N	N	Y	Y					W	1.2	W	Y

11/16/09	09117	80	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09118	92	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09119	89	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09120	96	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09121	111	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09122	70	M	100	N	N	N	N	Y	Y					H	0.2	Y	N
11/16/09	09123	86	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09124	78	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09125	93	F	100	N	N	N	N	Y	Y					W	1.2	W	Y
11/16/09	09126	100	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09127	71	M	100	N	N	N	N	Y	Y					R	R	R	R
11/16/09	09128	82	F	100	Y	N	N	N	Y	Y			612709	NPTH05SO	H	0.3	Y	N
11/16/09	09129	84	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09130	69	M	100	Y	Y	N	N	Y	Y			612699	NPTH06SO	H	0.2	Y	N
11/16/09	09131	75	M	100	Y	N	N	N	Y	Y			90909	Umatilla Stray	H	1.2	N	N
11/16/09	09132	99	F	100	N	N	N	N	Y	Y					R	R	R	R
11/16/09	09133	88	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09134	85	F	100	Y	N	N	N	Y	Y			612707	NPTH05SNLVA	H	0.3	Y	N
11/16/09	09135	88	F	100	Y	Y	N	N	Y	Y			633582	LF05SO	H	0.3	Y	N
11/16/09	09136	85	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09137	85	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09138	80	M	100	Y	N	N	N	Y	Y			612696	NPTH06SO	H	0.2	Y	N
11/16/09	09139	83	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09140	66	M	100	N	N	N	N	Y	Y					W	1.1	W	Y
11/16/09	09141	75	M	100	Y	Y	N	N	Y	Y			610178	LF05SCCD3	H	0.3	Y	N
11/16/09	09142	65	M	100	Y	Y	N	N	Y	Y			612513	LF06YBCA	H	1.1	N	N
11/16/09	09143	85	M	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/16/09	09144	79	M	100	Y	N	N	N	Y	Y			610152	LF04YCJA	H	1.3	N	N
11/16/09	09145	67	M	100	N	N	N	N	Y	Y					H	1.1	N	N
11/18/09	09146	77	F	100	Y	Y	N	N	Y	Y			610174	LF05SBCA	H	0.3	Y	N

11/18/09	09147	94	M	100	Y	Y	N	N	Y	Y			633583	LF05SCCD1	H	0.3	Y	N
11/18/09	09148	81	F	100	Y	Y	N	N	Y	Y			612698	NPTH05SO	H	0.3	Y	N
11/18/09	09149	78	F	100	Y	Y	N	N	Y	Y			610178	LF05SCCD4	H	0.3	Y	N
11/18/09	09150	74	F	100	N	N	N	N	Y	Y					H	0.3	Y	N
11/18/09	09151	80	F	100	N	N	N	N	Y	Y					H	1.2	Y	Y
11/18/09	09152	90	F	100	N	N	N	N	Y	Y					R	R	R	R
11/20/09	09153	73	F	100	Y	Y	N	N	Y	Y	AHSHAKA ISLANDS		612729	LF06SBCA	H	0.2	Y	N
11/20/09	09154	62	M	100	Y	N	N	N	Y	Y	AHSHAKA ISLANDS		612514	LF06YCJA	H	1.1	N	N
11/20/09	09155	90	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09156	70	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	1.1	Y	Y
11/20/09	09157	85	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09158	81	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09159	84	F	100	Y	Y	N	N	Y		AHSHAKA ISLANDS		633583	LF05SCCD1	H	0.3	Y	N
11/20/09	09160	79	F	100	N	N	N	N	Y		AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09161	80	F	100	Y	N	N	N	Y		AHSHAKA ISLANDS		612508	LF05YBCA	H	1.2	N	N
11/20/09	09162	91	M	100	N	N	N	N	Y		AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09163	86	F	100	N	N	N	N	Y		AHSHAKA ISLANDS				H	0.4	Y	N
11/20/09	09164	59	F	100	Y	N	N	N	Y		AHSHAKA ISLANDS		612513	LF06YBCA	H	1.1	N	N
11/20/09	09165	71	F	100	Y	Y	N	N	Y		AHSHAKA ISLANDS		LOST	LOST	H	R	R	R
11/20/09	09166	86	F	100	N	N	N	N	Y		AHSHAKA ISLANDS				W	1.2	W	Y
11/20/09	09167	59	F	100	Y	Y	N	N	Y		AHSHAKA ISLANDS	3D9.1CD207D9D4	612511	LF06YCJA	H	1.1	N	N
11/20/09	09168	88	F	100	Y	Y	N	N	Y	Y	AHSHAKA ISLANDS		612671	NPTH05SNLVA	H	0.3	Y	N
11/20/09	09169	95	M	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	1.2	N	N
11/20/09	09170	80	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09171	84	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09172	88	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				W	1.3	W	Y
11/20/09	09173	82	M	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09174	90	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09175	87	F	100	Y	Y	N	N	Y	Y	AHSHAKA ISLANDS		633582	LF05SO	H	0.3	Y	N
11/20/09	09176	83	F	100	Y	Y	N	N	Y	Y	AHSHAKA ISLANDS		610176	LF05SCJA	H	0.3	Y	N

11/20/09	09177	83	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				R	R	R	R
11/20/09	09178	84	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09179	84	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				W	0.3	W	N
11/20/09	09180	79	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09181	85	F	100	Y	Y	N	N	Y	Y	AHSHAKA ISLANDS		633583	LF05SCCD1	H	0.3	Y	N
11/20/09	09182	63	M	100	Y	N	N	N	Y	Y	AHSHAKA ISLANDS		612514	LF06YCJA	H	1.1	N	N
11/20/09	09183	85	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				W	1.2	W	Y
11/20/09	09184	94	M	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09185	70	F	100	Y	Y	LR	N	Y	Y	AHSHAKA ISLANDS		633598	LF05YO	H	1.2	N	N
11/20/09	09186	67	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	1.2	N	N
11/20/09	09187	78	F	100	N	Y	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09188	82	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				H	0.3	Y	N
11/20/09	09189	82	F	100	Y	Y	N	N	Y	Y	AHSHAKA ISLANDS		633598	LF05YO	H	1.2	N	N
11/20/09	09190	73	F	100	Y	N	N	N	Y	Y	AHSHAKA ISLANDS		610175	LF05SBCA	H	0.3	Y	N
11/20/09	09191	85	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				W	1.2	W	Y
11/20/09	09192	94	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				W	1.3	W	Y
11/20/09	09193	84	F	100	N	N	N	N	Y	Y	AHSHAKA ISLANDS				R	R	R	R
11/20/09	09194	67	F	100	Y	Y	N	N	Y	Y	AHSHAKA ISLANDS		612511	LF06YCJA	H	1.1	N	N
11/20/09	09195	62	F	100	Y	Y	N	N	Y	Y	AHSHAKA ISLANDS		633987	LF06YO	H	1.1	N	N
11/20/09	09196	65	F	100	Y	N	N	N	Y	Y	CHERRY LANE		612514	LF06YCJA	H	1.1	N	N
11/20/09	09197	87	F	100	Y	Y	LR	N	Y	Y	CHERRY LANE		633598	LF05YO	H	1.2	N	N
11/20/09	09198	84	F	100	N	N	N	N	Y	Y	CHERRY LANE				W	1.3	W	Y
11/20/09	09199	91	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		633583	LF05SCCD1	H	0.3	Y	N
11/20/09	09200	68	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		612710	NPTH06SNLVA	H	0.2	Y	N
11/20/09	09201	76	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		633583	LF05SCCD1	H	0.3	Y	N
11/20/09	09202	64	F	100	Y	N	N	N	Y	Y	CHERRY LANE		612514	LF06YCJA	H	1.1	N	N
11/20/09	09203	78	F	100	Y	N	N	N	Y	Y	CHERRY LANE		610175	LF05SBCA	H	0.3	Y	N
11/20/09	09204	66	M	100	N	N	N	N	Y	Y	CHERRY LANE				R	R	R	R
11/20/09	09205	80	M	100	Y	N	N	N	Y	Y	CHERRY LANE		612508	LF05YBCA	H	1.2	N	N
11/20/09	09206	87	M	100	Y	Y	N	N	Y	Y	CHERRY LANE		612698	NPTH05SO	H	0.3	Y	R

11/20/09	09207	81	F	100	N	N	N	N	Y	Y	CHERRY LANE				H	0.3	Y	N
11/20/09	09208	62	M	100	N	N	N	N	Y	Y	CHERRY LANE				W	0.2	W	N
11/20/09	09209	90	F	100	N	N	N	N	Y	Y	CHERRY LANE				R	R	R	R
11/20/09	09210	85	F	100	N	N	N	N	Y	Y	CHERRY LANE				H	0.3	Y	N
11/20/09	09211	64	F	100	N	N	N	N	Y	Y	CHERRY LANE				W	1.1	W	Y
11/20/09	09212	70	M	100	Y	N	N	N	Y	Y	CHERRY LANE		612696	NPTH06SO	H	1.1	Y	Y
11/20/09	09213	74	F	100	N	N	N	N	Y	Y	CHERRY LANE		610174	LF05SBCA	H	0.3	Y	R
11/20/09	09214	82	F	100	N	N	N	N	Y	Y	CHERRY LANE		612671	NPTH05SNLVA	H	0.3	Y	N
11/23/09	09215	82	F	100	N	N	N	N	Y	Y	CHERRY LANE				H	0.3	Y	N
11/23/09	09216	76	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		633583	LF05SCCD1	H	0.3	Y	N
11/23/09	09217	99	M	100	N	N	N	N	Y	Y	CHERRY LANE				H	0.3	Y	N
11/23/09	09218	71	M	100	Y	N	LR	N	Y	Y	CHERRY LANE		633597	LF05YO	H	1.2	N	N
11/23/09	09219	71	M	100	Y	Y	N	N	Y	Y	CHERRY LANE		612699	NPTH06SO	H	0.2	Y	N
11/23/09	09220	74	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		612507	LF05YBCA	H	1.2	N	N
11/23/09	09221	74	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		612698	NPTH05SO	H	0.3	Y	N
11/23/09	09222	66	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		612699	NPTH06SO	H	0.2	Y	N
11/23/09	09223	66	F	100	N	N	N	N	Y	Y	CHERRY LANE				H	1.1	Y	Y
11/23/09	09224	77	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		633598	LF05YO	H	1.2	N	N
11/23/09	09225	78	M	100	Y	N	N	N	Y	Y	CHERRY LANE		612707	NPTH05SNLVA	H	0.3	Y	R
11/23/09	09226	71	M	100	Y	Y	N	N	Y	Y	CHERRY LANE		612729	LF06SBCA	H	1.1	Y	Y
11/23/09	09227	67	M	100	N	N	N	N	Y	Y	CHERRY LANE				W	1.1	W	Y
11/23/09	09228	70	M	100	Y	N	N	N	Y	Y	CHERRY LANE		612709	NPTH05SO	H	0.3	Y	N
11/23/09	09229	81	F	100	N	N	N	N	Y	Y	CHERRY LANE				H	0.3	Y	N
11/23/09	09230	78	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		610178	LF05SCCD5	H	0.3	Y	N
11/23/09	09231	73	F	100	Y	N	N	N	Y	Y	CHERRY LANE		612730	LF06SBCA	H	0.2	Y	N
11/23/09	09232	70	M	100	N	N	N	N	Y	Y	CHERRY LANE				H	0.2	Y	N
11/23/09	09233	82	F	100	Y	N	N	N	Y	N	CHERRY LANE		612709	NPTH05SO	H	0.3	Y	N
11/23/09	09234	77	F	100	N	N	N	N	Y	Y	CHERRY LANE				H	0.3	Y	N
11/30/09	09235	78	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		612698	NPTH05SO	H	0.3	Y	N
11/30/09	09236	86	F	100	N	N	N	N	Y	Y	CHERRY LANE				H	0.3	Y	N

11/30/09	09237	69	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		612511	LF06YCJA	H	1.1	N	N
11/30/09	09238	79	F	100	N	Y	N	N	Y	Y	CHERRY LANE				H	0.3	Y	N
11/30/09	09239	80	F	100	N	Y	N	N	Y	Y	CHERRY LANE				H	0.3	Y	N
11/30/09	09240	65	M	100	N	N	N	N	Y	Y	CHERRY LANE				R	R	R	R
11/30/09	09241	80	M	100	Y	Y	N	N	Y	Y	CHERRY LANE		610178	LF05SCCD6	H	0.3	Y	N
11/30/09	09242	81	M	100	Y	N	N	N	Y	Y	CHERRY LANE		612709	NPTH05SO	H	0.3	Y	N
11/30/09	09243	78	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		610176	LF05SCJA	H	0.3	Y	N
11/30/09	09244	61	F	100	Y	Y	LR	N	Y	Y	CHERRY LANE		633987	LF06YO	H	1.1	N	N
11/30/09	09245	81	M	100	N	Y	LR	N	Y	Y	CHERRY LANE				H	1.2	N	N
11/30/09	09246	63	M	100	Y	N	N	N	Y	Y	CHERRY LANE		LOST	LOST	H	1.1	N	N
11/30/09	09247	77	M	100	Y	Y	N	N	Y	Y	CHERRY LANE		633582	LF05SO	H	0.3	Y	N
11/30/09	09248	73	M	100	N	N	N	N	Y	Y	CHERRY LANE				H	0.2	Y	N
11/30/09	09249	73	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		633598	LF05YO	H	1.2	N	N
11/30/09	09250	70	F	100	Y	Y	N	N	Y	Y	CHERRY LANE		633597	LF05YO	H	1.2	N	N
12/2/09	09251	67	F	0	Y	Y	LR	N	Y	Y	BCC	3D9.1C2C3FC676	633987	LF06YO	H	1.1	N	N
12/2/09	09252	86	F	100	N	N	N	N	Y	Y	BCC				H	0.3	Y	N
12/2/09	09253	94	M	100	N	N	N	N	Y	Y	BCC				W	1.3	W	Y
12/2/09	09254	87	F	100	Y	N	N	N	Y	Y	BCC		610175	LF05SBCA	H	0.3	Y	N
12/2/09	09255	85	F	0	Y	Y	N	N	Y	Y	BCC		633582	LF05SO	H	0.3	Y	N
12/2/09	09256	84	F	100	N	Y	N	N	Y	Y	BCC				H	0.3	Y	N
12/2/09	09257	71	F	100	Y	N	N	N	Y	Y	BCC		612730	LF06SBCA	H	0.2	Y	N

***Location key:** Cherry Lane = Clearwater River at Cherrylane, BCC = Clearwater River near Big Canyon Creek.

***Age key:** examples: 0.1 = 2-year old that had a subyearling emigration and spent 1-year in salt water, 1.3 = 5-yr old that had a yearling emigration and spent 3-years in salt water. By scale analysis: W = wild or natural, H = hatchery release; Y = yes, N = no, R = regenerated scales that could not be read; Reservoir Overwinter = Subyearling that reservoir reared.

***Origin key** (from CWT or PIT tag): LF = Lyons Ferry Hatchery, 05 = 2005 Broodyear, Y = yearling release, S = subyearling release, O = on-station release, BCA = Big Canyon Acclimation release, CJA = Captain John Acclimation release, PA = Pittsburg Landing Acclimation release, NPTH = Nez Perce Tribal Hatchery, NLV = North Lapwai Valley acclimated release, LGA = Lukes Gulch Acclimation release, CFA = Cedar Flats Acclimation release, DWOR = Dworshak subyearling surrogate releases, CCD = Couse Cr. direct release, GRRD = Grande Ronde direct release, IPC = Idaho Power Company direct release at Hells Canyon Dam, BONN = tagged at Bonneville Dam as an adult, ICE = tagged as Ice Harbor Dam as an adult, LGRTR = Lower Granite Dam tailrace tagged as a juvenile emigrant, BLANK = Umatilla R. yearling release.

Appendix C. Fall Chinook salmon female origin and life history summary of fish hauled from Lower Granite Dam (LGR) and volunteers to Nez Perce Tribal Hatchery (NPTH) fish ladder that were processed at NPTH with total of each origin spawned for 2009 broodstock (origins from coded wire tags, visible implant elastomer tags, passive integrated transponder (PIT) tags, adipose fin clips, and scale readings; SP = spawned, DIP = died in pond, KO = killed outright and not used for broodstock i.e. green eggs, OUT = Outplanted to spawn naturally).

Origins of Females (N = 591 processed)	Brood Yr	Hauled from Lower Granite Dam Females (n = 400)				Volunteers to NPTH Females (n = 191)				Total Spawned/ Total (494/591)
		SP	DIP	KO	OUT	SP	DIP	KO	OUT	
	04					2				
NPTH (on-station release)	05	6				35	1			
subyearling emigration	06	2				10				55/56
NPTH (on-station release)	05					2				
reservoir reared	06	1	1							3/4
NPTH (on-station release)										
unknown emigration	05					2				2/2
NPTH-North Lapwai Valley	05	1				23	3			
release subyearling emigration	06					1				25/28
NPTH-North Lapwai Valley										
unknown emigration	05						1			0/1
NPTH-Lukes Gulch release	06	1								
subyearling emigration	05	2				2				4/4
NPTH-Cedar Flats release										
subyearling emigration	05					1				1/1
Big Canyon subyearlings	05	14	4	1		10				
subyearling emigration	06					3				27/32
Big Canyon subyearlings										
reservoir reared	06	2				3				5/5
Captain John subyearlings	05	2								
subyearling emigration	06	1								3/3
LFH-Hells Canyon (IPC) direct	05	8								
subyearling emigration	07		1							8/9
LFH on-station subyearlings	05	11		1						
subyearling emigration	06	2								13/14
Snake R. Couse Creek direct										
subyearling emigration	05	8	1	1						8/10
Grande Ronde direct										
subyearling emigration	05	2								2/2
Grande Ronde direct subyearling										
reservoir reared emigration	05	1								1/1
Snake R (Pit tag-LGR) hatchery	05	1								
subyearling emigration (by scales)	04	1								2/2
Snake R (Pit tag-LGR) hatchery	05	1								
subyearling reservoir reared	06	1			1					2/3
	04	3								

Snake R (Pit tag-LGR) natural suby reservoir reared (by scales)	06				1					3/4
Snake R (Pit tag-LGR) subyearling unknown/unknown emigration										
	06	1								1/1
LFH subs-Snake R surrogates (Corps study) sub emigration										
	05	16	3							16/19
LFH subs-Clearwater R surrogates (Corps study) reservoir reared	05	6								
	06	1								7/7
Wild/Natural Snake PIT tag subyearling emigration	04		1							
	05	1								1/2
Unmarked hatchery subyearlings (by scales) subyearling emigration	04	5			2	2				
	05	37	11	2	3	23	1			
	06	6	2	1	2	7				84/108
Unmarked hatchery subyearlings (by scales) reservoir reared	04	1	1							
	05	1	1							
	06	1	1			1				4/7
Unmarked hatchery subyearlings (lost wire) subyearling emigration										
	05					4				4/4
Wild/Natural subyearling emigration (by scales)	04	2								
	05	3	1							
	06			1	1					5/8
Wild/Natural reservoir reared (by scales)	04	2	2			1				
	05	1	1	1						
	06	1			1					5/10
Big Canyon yearlings	05	3	1			12	1			
	06	10			1	25	2			50/55
Captain John yearlings	05	3								
	06	17	2	5		1				21/28
Pittsburg Landing yearlings	05	2	1							
	06	7		3						9/13
LFH on-station yearlings	04	2								
	05	28	4			3				
	06	66	1	14						96/115
Umatilla R stray subyearlings										
	05	3								3/3
Umatilla R stray yearlings	04	2								
	06	1								3/3
Unknown hatchery yearling (by scales, lost wire)	05	1				2				
	06	1				1				6/6
Unknown hatchery yearling (by scales)	03		1							
	04		1							
	05	2	1		1	2				
	06									5/9
Unknown hatchery yearling ad-clip (by scales)										
	06	1				1				2/2

	Brood Yr	LGR SP	LGR DIP	LGR KO	LGR OUT	NPTH SP	NPTH DIP	NPTH KO	NPTH OUT	Total
Unknown hatchery (ad-clip) subyearling emigration (lost wire)	06					1				
Unknown hatchery (ad-clip) subyearling emigration	05	4								
Unknown origin (unknown broodyear and emigration)	?	3	2			2				7/9
Female Totals (by broodyear)	03		1							0/1
	04	18	5		2	5				23/30
	05	168	29	6	4	121	7			289/335
	06	123	7	24	7	54	2			177/217
	07		1							0/1
	?	3	2			2				5/7
Females Grand Total		312	45	30	13	182	9	0	0	494/591

Appendix D. Fall Chinook salmon male origin and life history summary of fish hauled from Lower Granite Dam (LGR) and volunteers to Nez Perce Tribal Hatchery (NPTH) fish ladder that were processed at NPTH with total of each origin spawned for 2009 broodstock (origins from coded wire tags, visible implant elastomer tags, passive integrated transponder (PIT) tags, adipose fin clips, and scale readings; SP = spawned, DIP = died in pond, KO = killed outright and not used for broodstock, OUT = Outplanted to spawn naturally).

Origins of Males (N = 1,562 processed)	Brood Yr	Hauled from Lower Granite Dam Males (n = 1,429)				Volunteers to NPTH Males (n = 133)				Total Spawned/ Total (319/1562)
		SP	DIP	KO	OUT	SP	DIP	KO	OUT	
NPTH (on-station) subyearling emigration	04					1				
	05					1				
	06	1		2		3				
	07		1	19						6/28
NPTH (on-station) reservoir reared	06	2		1		3	1			
	07			2						5/9
NPTH (on-station) unknown emigration	05					1				
	06					3				
	07			2						4/6
NPTH-North Lapwai Valley subyearling emigration	05					5		1		
	06			1		1				
	07	1	1	26						7/36
NPTH-North Lapwai Valley unknown emigration	05					1				
	07	1	1	3						2/6
NPTH-Lukes Gulch subyearling emigration	07			19			1	1		0/21
NPTH-Lukes Gulch emigration unknown	07			10						0/10
NPTH-Cedar Flats subyearling emigration	07			11						0/11

NPTH-Cedar Flats subyearling emigration unknown	07			6						0/6
Big Canyon subyearlings subyearling emigration	05	4	1			2				
	06			3						
	07		2	36				1		6/49
Big Canyon subyearlings reservoir reared	05									
	06			1		1		1		1/3
Big Canyon subyearlings unknown emigration	05	5								
	07			35		1				6/41
Captain John subyearlings subyearling emigration	05	2								
	06			2						
	07	1		30						3/35
Captain John subyearlings unknown emigration	05		1							
	07			19						0/20
Pittsburg L. subyearlings subyearling emigration										
	07	2		43						2/45
Pittsburg L. subyearlings unknown emigration										
	07		1	28						0/29
LFH-Hells Canyon Dam (IPC) direct subyearling emigration	06	1		1						
	07	2	1	99	3					3/107
LFH-Hells Canyon Dam (IPC) direct reservoir reared (by scales)										
	06	1								1/1
LFH-Hells Canyon Dam (IPC) direct unknown emigration										
	07			55						0/55
LFH on-station subyearlings subyearling emigration	05	4								
	06	1								
	07	1	3	62						6/71
Snake R. Couse Creek direct subyearling emigration	05	2								
	07		1	41						2/44
Snake R. Couse Creek direct unknown emigration										
	07			11						0/11
Grande Ronde direct subyearling emigration	05	2	1							
	07			7						2/10
Grande Ronde direct emigration unknown	05	1								
	07			13						1/14
Grande Ronde direct reservoir reared (by scales)										
	07			2						0/2
Snake R (Pit tag-LGR) hatchery subyearling emigration (by scales)	05		1							
	06	3			4					3/8
Snake R (Pit tag-LGR) hatchery subyearling reservoir reared										
	06	2	1	1						2/4
Snake R (Pit tag-LGR) natural suby subyearling emigration (by scales)	05	1								
	06	1								2/2
Snake R (Pit tag-LGR) natural suby reservoir reared (by scales)										
	06	2	1	2	3		1			2/9
	04	2								

Snake R (Pit tag-LGR) subyearling unknown/unknown emigration	05	3		1						
	06	8	3	3	1					13/21
LFH subs-Snake R surrogates (Corps study) sub emigration										
	05	2		2						2/4
LFH subs-Snake R surrogates (Corps study) emigration unknown	05	5		1						
	07			11						5/17
LFH subs-Clearwater R surrogates (Corps study) sub emigration	05	1								
	06	1			2					2/4
LFH subs-Clearwater R surrogates (Corps study) reservoir reared	05	1								
	06			1						1/2
LFH subs-Clearwater R surrogates (Corps study) emigration unknown	05	2		1						
	06			1						
	07			3						2/7
Wild/Natural Clearwater R PIT tag reservoir reared										
	06				1					0/1
Wild/Natural Clearwater R PIT tag emigration unknown										
	06			1						0/1
Wild/Natural Snake R PIT tag subyearling emigration	05	1								
	06				1					1/2
Unmarked hatchery subyearlings (by scales) subyearling emigration	04	1								
	05	28	1	1		7				
	06	7		3	2	5	1			
	07	1		28		1	1			50/87
Unmarked hatchery subyearlings (by scales) reservoir reared	05									
	06	4		4	4	2				6/14
Wild/Natural subyearling emigration (by scales)	04		1							
	05	1	1							
	06	1		2						2/6
Wild/Natural reservoir reared (by scales)	04	1								
	05	4								
	06	8	1		4	1	1	1		14/21
Big Canyon yearlings	05		2	1		6		1		
	06	16	4	80		41	4	14		61/167
Captain John yearlings										
	06	10	2	60	1		1	1		10/75
Pittsburg Landing yearlings	05			1						
	06	11	7	63	1					11/83
LFH on-station yearlings	05	9			1	1				
	06	32	22	193	1	3	3	1		45/264
LFH on-station yearlings direct at Asotin Creek										
	07			1						0/1
Umatilla R stray yearlings	04	2								
	06	2		9						4/13
Umatilla R stray subyearlings subyearling emigration	05	1								
	07		1	5						1/7
	05									

Unknown hatchery yearling (by scales, ad-clip, lost wire)	06		2	1						0/3
Unknown hatchery yearling (by scales, lost wire)										
	06	1		1						1/2
Unknown hatchery yearling (by scales, no wire)	05	1		1						
	06	5			1					6/8
Unknown hatchery subyearling (ad-clip, lost wire) sub emigration	05			1						
	07		1	15						0/17
Unknown hatchery (ad-clip, lost wire) emigration unknown										
	?					2				2/2
Unknown hatchery subyearling (by scales, lost wire) sub emigration	05		1							
	06	1								
	07			4						1/6
Unknown hatchery subyearling (lost wire) reservoir reared										
	06					1				1/1
Unknown hatchery subyearling (ad-clip) subyearling emigration	05				1					
	06				1					
	07			5	1					0/8
Unknown hatchery (ad-clip) emigration unknown										
	?			1						0/1
Unknown origin (lost wire, ad-clip) emigration unknown										
	?			1						0/1
Unknown hatchery (lost wire) emigration unknown										
	?			2						0/2
Unknown origin (no marks/tags) emigration unknown										
	?	7		4	2	3	1			10/17
Male Totals (by broodyear)	04	6	1	0	0	1	0	0	0	7/8
	05	80	9	10	2	24	0	2	0	104/127
	06	121	43	436	27	64	12	18	0	185/721
	07	9	13	651	4	2	2	2	0	11/683
	?	7	0	8	2	5	1	0	0	12/23
Males Grand Total		223	66	1105	35	96	15	22	0	319/1562