Nez Perce Tribal Hatchery Monitoring and Evaluation Project

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

Annual Report 2014

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EXECUTIVE SUMMARY

For this 2014 report we have incorporated the Nez Perce Tribal Hatchery (NPTH) M&E Project and the Fall Chinook Acclimation Project (FCAP) M&E. This is year thirteen of fall Chinook salmon Monitoring and Evaluation (M&E) for the Nez Perce Tribal Hatchery (NPTH) located on the lower Clearwater River in Idaho and year nineteen for the FCAP Project. Phase I of the NPTH is to produce 625,000 spring and 1.4 million fall Chinook salmon for supplementation releases in the Clearwater River Subbasin. The NPTH fall Chinook salmon subyearling release goal of 1.4 million was met and exceeded by 60,006 fish for 2014. For the FCAP subyearlings, total releases were close to the goal of 1.4 million with a total of 1,438,521 fish reported released. A second group consisting of an additional 191,151 subyearlings were transferred from Lyons Ferry Hatchery (LFH) to the Captain John Rapids acclimation site and released approximately two weeks after the first group subyearlings were released. The FCAP total release goal of 450,000 yearlings was exceeded by 43,164 fish. A grand total of 3,572,842 fall Chinook salmon were released by the Nez Perce Tribe in 2014. Coded wire tagging (CWT) and marking (adipose fin clipping) goals were met for all fall Chinook releases in 2014. Final CWT retention rates were high on all CWT groups and ranged between 0.93-1.0. The average condition factors (K-factors) were good on all NPTH and FCAP release sites, ranging between 1.08 and 1.24.

All fall Chinook salmon yearling and subyearling releases from FCAP and NPTH facilities were made prior to warm (>16 ^{o}C) summer water temperatures. The releases for the FCAP yearlings occurred in early and mid-April while the FCAP subyearlings were released in late May. The Captain John yearling release was made on April 1, two weeks earlier than the Big Canyon and Pittsburg Landing yearling releases due to an earlier acclimation timing. The second group of subyearlings at Captain John was released on June 5, after a short two week acclimation period. The subyearlings releases from NPTH facilities occurred in mid-June, except for the North Lapwai Valley acclimated group which was released three weeks earlier because water temperatures were warming in Lapwai Creek and at the facility. Temperatures in the upper Clearwater River Subbasin exceeded 20 ^{o}C throughout much of July and August with the lower Clearwater varying between a more moderate 11-13 ^{o}C during the same period because of cold water releases from Dworshak Reservoir. Most first detections at Lower Granite Dam (LGR) for all FCAP, 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 or near 20 ^{o}C at LGR during July and August. Detections of natural fall Chinook occurred from mid-August thru mid-November when temperatures at LGR were 20 ^{o}C and below. Most hatchery fall Chinook detections from FCAP and NPTH releases occurred during the spill period at LGR. In contrast, few PIT tagged natural fall Chinook could have experienced summer spill as most detections occurred later in the fall after spill had stopped at Lower Granite Dam.

Through beach seining we sampled a total of 956 natural Chinook salmon subyearlings on the lower Clearwater River of which 879 were large enough ($\geq$ 50 mm) to PIT tag. We only recaptured four natural fish that averaged 1.55 mm of growth per day. Average K-factor for natural fish was 1.11 at the time of tagging. Estimated index survivals of PIT tagged natural subyearling fall Chinook salmon from the Clearwater River to LGR was 24.0%, but could not be

calculated to McNary Dam. The natural fish from the Clearwater River had 41 detections in 2015 as holdover yearlings, representing 29.7% of the total number of unique PIT tags detected. Only 20 (0.6%) hatchery fall Chinook released in 2014 from the NPTH and associated acclimation facilities were detected in 2015 as holdovers. The FCAP yearling 2014 releases were not detected as juveniles holdovers in 2015, while there were only three (0.5%) holdover yearling detections from FCAP subyearling releases. Estimated index survival for the NPTH on-station release was 72.0% to LGR and 46.0% to McNary Dam. The estimated index survivals for the NPTH acclimation releases were 66.0% and 40.0% for Cedar Flats, 84.0% and 48.0% for Luke's Gulch, and 76.0% and 57.0% for NLV to LGR and McNary Dam, respectively. The estimated index survival to LGR for subyearling releases from FCAP facilities ranged between 73.0% from Big Canyon to 84.0% from the Captain John Rapids acclimation sites. Estimated index survival to LGR for the FCAP yearling acclimated releases ranged between 88.0% and 92.0% from the Captain John Rapids and Big Canyon acclimation sites, respectively. As in previous years, the NPTH acclimated releases from Luke's Gulch and Cedar Flats migrated at a faster rate (22.1 and 15.0 Rkm/d, respectively) than the other NPTH releases to LGR, while the natural fall Chinook from the Clearwater River migrated much slower (1.93 Rkm/d) on average to LGR. The yearling and subyearling releases from the PLAP facility migrated at a faster rate (16.9 and 18.5 Rkm/d, respectively) to LGR than the other FCAP releases.

During the 2014 aerial fall Chinook surveys, we observed a total of 2,936 redds in the mainstem Clearwater River. There were 2,798 redds counted in the Clearwater, 4 redds observed in the N.F. Clearwater River and no redds seen in the Potlatch River. In the upper Clearwater River we observed a total of 138 redds in the mainstem, 73 redds in the M.F. Clearwater, 40 redds in the Selway River, and 65 redds in the S.F. Clearwater River. This year was the highest count (3,118 redds) in the Clearwater River Subbasin since surveys began in 1988. We observed a total of 340 redds on the Grande Ronde River which represents the highest count since surveys began in 1986. There were 2 fall Chinook redds incidentally observed by NPT steelhead project staff on Joseph Creek, a lower tributary to the Grande Ronde River. There were a total of 103 redds observed on the Imnaha River during 2014, the second highest count since 1991. An aerial survey conducted on the Salmon River resulted in 42 redds observed, also the second highest count since 1991. There was a total of 6,413 fall Chinook salmon redds counted and/or estimated above Lower Granite Dam and 302 redds estimated in the Tucannon River for a total of 6,715 redds in the Snake River Basin during 2014. The 2014 fall Chinook redd estimate represents the highest in the Snake River Basin since intensive surveys began in 1988.

The total fall Chinook salmon returning to Lower Granite Dam in 2014 was estimated to be 59,502 adults and 13,962 jacks for a total of 73,464 fish. During 2014, the number of fall Chinook salmon trapped and hauled from LGR to NPTH and LFH for broodstock needs and run reconstruction purposes was 897 and 3,082 fish, respectively. After subtracting hauled fish from the LGR return estimate and fallback through LGR, the preliminary fall Chinook salmon escapement estimate to the spawning grounds was 52,989 adults and 12,383 jacks for a total of 65,372 fish. It was estimated that the natural adult escapement above Lower Granite was 13,141 (24.8%) and 3,678 (29.7%) natural jacks. A total of 98 fall Chinook salmon carcasses were collected in the Snake River Basin during 2014. There was a total of 27 females (27.6%) and 71 males (72.4%) among carcasses collected in the Clearwater River. Of all female carcasses cut open and examined, 100% were spawned-out or eggs were spent, therefore no pre-spawned mortalities were found. Analysis of the composition of fall Chinook salmon carcasses resulted in

identifying 53.2% hatchery subyearlings that emigrated as subyearlings, 31.9% unmarked/untagged subyearlings that emigrated as subyearlings, 7.4% hatchery subyearlings that reservoir reared, 5.3% natural origin fish that reservoir reared, and lastly 2.1% hatchery yearlings. There were no known out-of-Snake Basin hatchery "strays" found among carcasses sampled. Most carcasses collected returned at total age-4 (67.0%), followed by age-3 fish (31.9%), and lastly by age-2 or jacks (1.1%).

Examining the NPTH and associated acclimated smolt-to-adult returns (SAR), the 2009 and 2010 release groups had similar and the lowest SARs back to the Snake River and ranged between 0.23% and 0.38%. The highest SARs occurred for the 2008 release groups and ranged between 0.88% for the NPTH group and 1.46% NLV group. The highest harvest rates for the 2008 releases was also observed for the NLV 2008 release group with a calculated SAS of 2.07%. The lowest FCAP subyearling SARs and SASs was observed for the 2009 release groups with Pittsburg Landing having the lowest average SAR at 0.13% with Captain John and Big Canyon only slightly higher at 0.24%. The highest subyearling SARs also were seen for the 2008 releases across all acclimation sites with Captain John release group having highest average SAR and SAS (1.63% and 2.26%, respectively). The highest average FCAP yearling SAR and SAS was also for the 2008 release groups with Captain John having the highest average SAR of 3.1% back to the Snake River and also the highest average harvest rate of 1.1%, for a total SAS of 4.2%. For the 2009 and 2010 yearling releases, the lowest average SAR (0.28%) was seen for the 2009 Pittsburg groups with the Big Canyon 2010 release groups having the highest (0.60%). Ocean and freshwater harvest rates for the all release groups were fairly proportional to the SARs back to the Snake River.

Water temperatures during 2014 were favorable for trapping at Lower Granite Dam on August 18 and NPTH staff began hauling that same day. Later in the spawn season to ensure enough fish for brood, a total of 21 female and 20 male gametes were transferred from LFH to NPTH which were all originally trapped at LGR. Also, a total of three males and one female was transferred to NPTH from Dworshak National Fish Hatchery (DNFH) that volunteered into the adult fish ladder. A total of 942 fall Chinook were processed at NPTH which consisted of 515 females and 423 males from LGR and one female and three males from DNFH. There were a total of 413 females and 319 males used for broodstock with some larger males spawned with up to five females. The greatest broodstock contribution of females (39.2%) was unmarked/ untagged fish with a subyearling emigration life history scale pattern, followed by NPTH and associated acclimated releases (16.2%), yearling releases from FCAP and on-station LFH (16.0%), and then by FCAP subyearlings (9.0%). The greatest male broodstock contribution (39.5%) was also unmarked/untagged subyearlings showing a subyearling emigration life history, followed by NPTH and associated acclimation releases (18.8%), yearling releases from FCAP and LFH (11.0%), and lastly by FCAP subyearling releases (7.5%). Total age composition of all fall Chinook salmon females used for broodstock at NPTH resulted in 86.7% age-4, 6.8% age-5, and 4.6% age-3 of fish that could be identified. There were no 1-ocean females processed. Total age composition of all males used for broodstock at NPTH resulted in 71.8% age-4, 20.4% age-3, and 5.6% age-5 of fish that could be identified. There was one 1-ocean yearling jack used for brood and two subyearling 1-ocean jacks that had a reservoir reared emigration life history.

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Nez Perce Tribal Hatchery monitoring and evaluation of fall Chinook salmon supplementation in the Clearwater River Subbasin would not be possible without the dedication of the field biologists, technicians and office personnel. The contributions and efforts of Mark Pishl, Charles Axtell, Carol Reuben, and Richard Johnson to the monitoring and evaluation program have been invaluable. We also thank Ryan Kinzer for his timely review of this report. We thank Lance Campbell and John Sneva of the Washington Department of Fish and Wildlife for adult fall Chinook salmon scale reading and analysis. Shawn Narum of the Columbia River Inter-Tribal Fish Commission processed and analyzed the genetic samples collected. We also thank Hanna Dondy-Kaplan of the Bonneville Power Administration for her patience, assistance and support.

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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 and Snake rivers above Lower Granite Dam (LGR) represent an important component of the Snake River ESU fall Chinook salmon population. Maintenance and function of fall Chinook salmon population dynamics within these systems and their tributaries will play an important role in recovery of the Snake River fall Chinook salmon.

In 1994, through *U.S. v. Oregon*, the Nez Perce Tribe (NPT) reached an agreement with States and Federal agencies to release yearling fall Chinook salmon beginning in 1996 as replacement of lost production from adults trapped at LGR and hauled to Lyons Ferry Hatchery (LFH) for broodstock needs and to cull non-Snake River Basin strays. The agreement stipulated the release of 450,000 yearlings annually on-station from LFH and outplanting an additional 450,000 to acclimation facilities upstream of LGR to supplement natural fall Chinook salmon production. The NPT operates the Fall Chinook Acclimation Project (FCAP), which consists of two juvenile acclimation facilities along the Snake River and one along the Clearwater River with the intent of effectively enhancing population size and distributing natural fall Chinook salmon spawning throughout the existing habitat areas above LGR. The FCAP facilities began operation at Pittsburg Landing on the Snake River in 1996, Big Canyon Creek on the Clearwater River in 1997 and at Captain John Rapids on the Snake River in 1998. In addition, due to sufficient broodstock levels at LFH, subyearling fall Chinook salmon have been available for release from the FCAP facilities since 1997.

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 and FCAP 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 both the Clearwater and Snake river Subbasins. To measure these benefits, changes in the abundance of Chinook salmon in these systems and their tributaries will be monitored over the next 15 to 20 years (Hesse and Cramer 2000). In addition to measuring project-related benefits, the NPTH and FCAP M&E programs are 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.

These combined M&E projects examine 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 and FCAP. Treatment streams in the Clearwater River include the lower reaches of the South Fork Clearwater, Middle Fork Clearwater and Selway rivers for early-fall Chinook salmon, and the mainstem Clearwater River for fall Chinook salmon. Treatment streams in the Snake River basin include the mainstem Snake River above Asotin, Washington and the lower Grande Ronde, Imnaha and Salmon rivers.

Monitoring and Evaluation Project Goals and Objectives:

<u>Long Term Goals:</u>

Monitor, evaluate, and provide recommendations to adaptively manage NPTH and FCAP programs in order to optimize hatchery and natural production, sustain harvest, and minimize deleterious ecological effects.

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. The primary goal of the FCAP program is to monitor and evaluate pre- and post-release juvenile fall

Chinook condition, survivals, migration timing, migration rates, travel times and movement patterns, then provide feedback to co-managers for project specific and basin wide management and decision-making.

OBJECTIVES:

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 River, Snake River, associated tributaries, and treatment streams.

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 2014 annual report details monitoring and evaluation activities associated with the fall Chinook salmon component of the Nez Perce Tribal Hatchery and FCAP programs from January 1 through December 31, 2014, thus providing data that will be used to analyze the effectiveness of supplementation activities. In the report we summarize NPTH and FCAPE acclimated fall Chinook releases from 2008 to 2010 and complete adult returns along with contributions to ocean and freshwater fisheries. In addition, we include 2014 fall Chinook release numbers, and hatchery and natural origin juvenile survivals and emigration timing statistics. Also reported as part of the FCAP M&E are 2014 fall Chinook salmon aerial redd counts on the lower Grande Ronde, Imnaha, and Salmon rivers. The first 10 years of NPTH M&E fall Chinook salmon results can be found in annual reports under primary author Arnsberg on the Columbia Basin Fish and Wildlife Program's website: https://www.cbfish.org/PiscesPublication.mvc/SearchByTitleDescriptionAuthorOrDate. A Supplementation Symposium for the first five-years of NPTH Production and Monitoring & Evaluation was held in January 2009 and other symposiums are scheduled every five years after. Earlier FCAP M&E results can be found in annual reports by primary author Rocklage under the same above website.

STUDY AREA

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).

The FCAP M&E study area for fall Chinook salmon supplementation encompasses all treatment streams and tributaries of the lower Clearwater River and free flowing Snake River above Asotin, Washington (Figure 2). The Fall Chinook Acclimation Project (FCAP) release facility location and descriptions are also described below.

Nez Perce Tribal Hatchery (NPTH) Facilities

The NPTH, located on the lower Clearwater River 38 km above its mouth at Tribal Allotment 1705, and 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.

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).

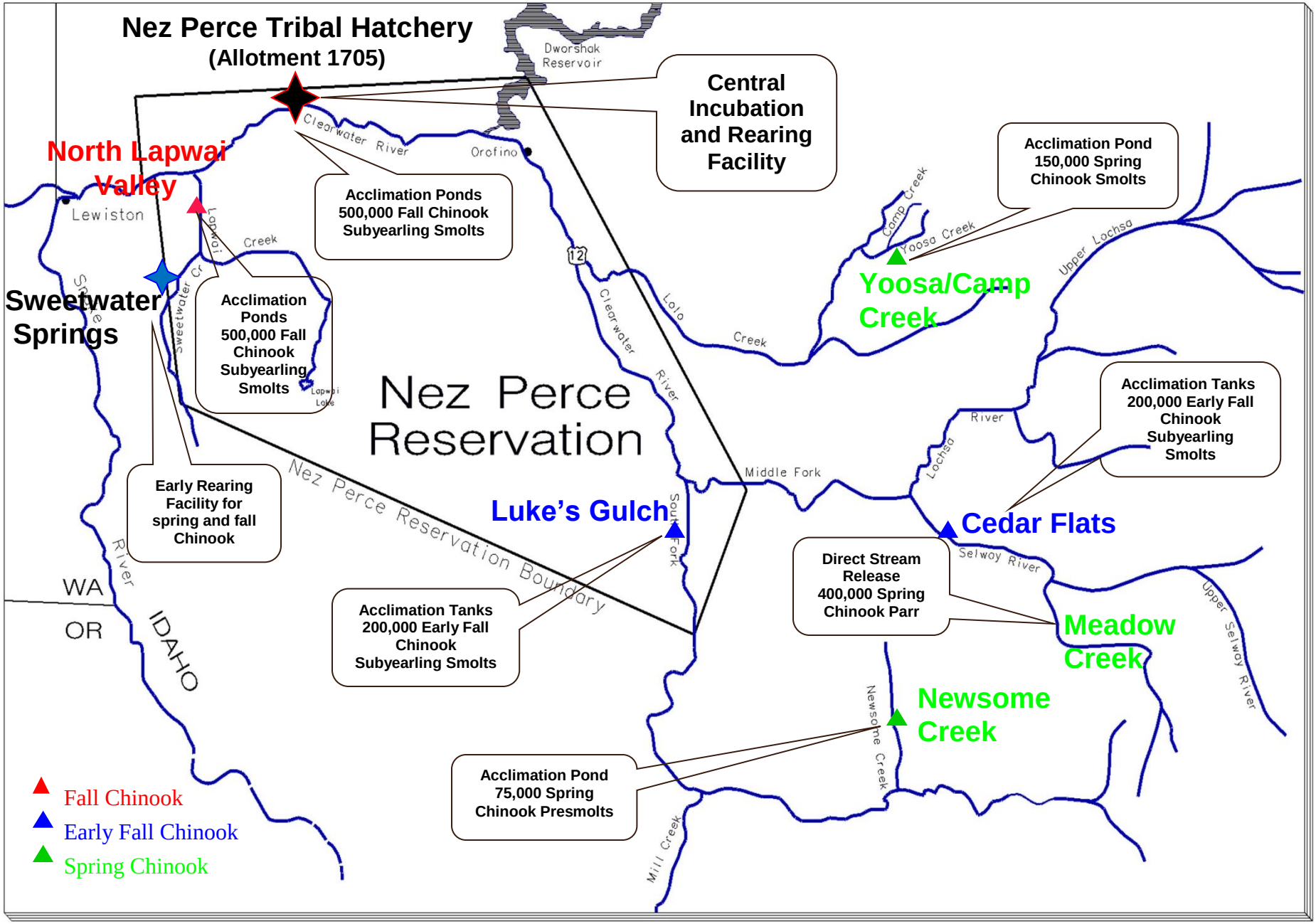

Figure 1. Nez Perce Tribal Hatchery and Chinook salmon acclimation and early rearing facilities within the Clearwater River Subbasin.

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.

Fall Chinook Acclimation Project (FCAP) Facilities

Big Canyon Creek Acclimation Facility

Located on the Clearwater River at Big Canyon Creek (Rkm 57) (Figure 2) this facility is the final rearing and acclimation site for 150,000 yearling and 500,000 subyearling fall Chinook salmon. Juveniles are held in sixteen 5.8 m diameter circular aluminum tanks and fish released directly to the Clearwater River.

Pittsburg Landing Acclimation Facility

Located on the Snake River at Pittsburg Landing (Rkm 346) (Figure 2) this facility is the final rearing and acclimation site for 150,000 yearling and 400,000 subyearling fall Chinook salmon. Juveniles are held in sixteen 5.8 m diameter circular aluminum tanks and fish released directly to the Snake River.

Captain John Rapids Acclimation Facility

Located on the Snake River at Pittsburg Landing (Rkm 263) (Figure 2) this facility is the final rearing and acclimation site for 150,000 yearling and 500,000 subyearling fall Chinook salmon. Juveniles are acclimated in a single in-ground 150'X 50' acclimation pond and released volitionally with any fish remaining by the final release date forced out by draining the pond.

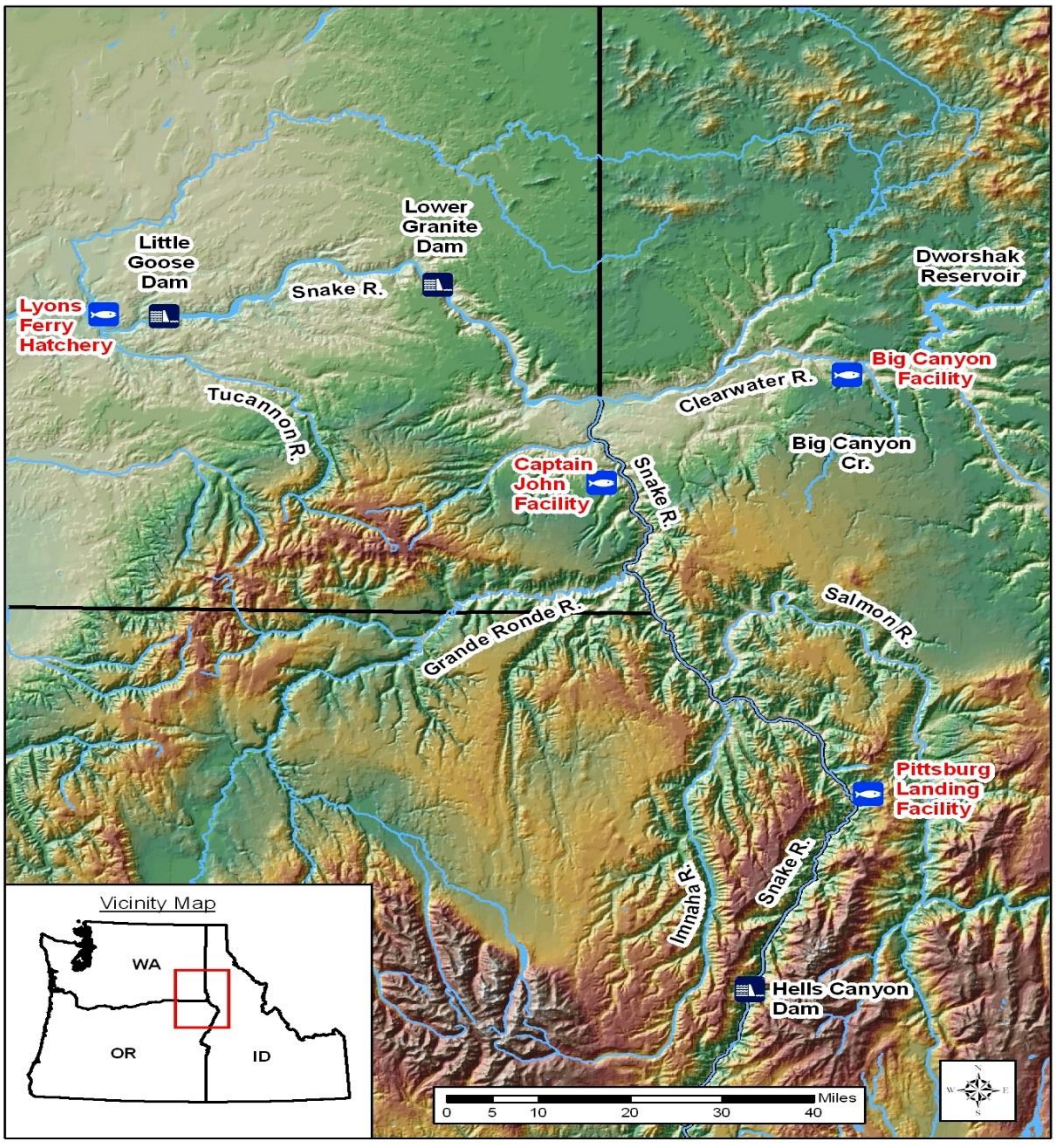

Figure 2. Lyons Ferry Hatchery and Fall Chinook Acclimation Project (FCAP) facilities including Pittsburg Landing and Captain John on the Snake River and Big Canyon on the Clearwater River.

METHODS

Supplementation

This was the 18th year for FCAP yearling and subyearling production releases of fall Chinook into the Snake River Subbasin. It is also the 11th year for fall Chinook salmon subyearling releases from NPTH into the Clearwater River Subbasin. However, after working out new facility issues, 2009 was the first year where full production of 1.4 million subyearlings was accomplished and slightly exceeded at NPTH and associated acclimation facilities. Fall Chinook release numbers, release dates, marking and tagging numbers for NPTH and FCAP releases for 2014 are reported in this report.

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 (Arnsberg and Statler 1995). The M&E on fish produced from NPTH facilities began in 2003 (Arnsberg et al. 2007). Fall Chinook salmon spawning surveys began in the mainstem Snake River in 1986. The M&E program on fish produced from FCAP facilities began in 1997. Standardized performance measures quantified and utilized in program performance evaluations are described in Table 1.

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.

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 the fall Chinook run reconstruction analysis. We also monitored and evaluated NPTH spawning composition of hatchery and natural fall Chinook salmon spawned for the 2014 broodyear.

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.

Performance Measures

Fish population performance measures (Table 1) address how fish populations are meeting NPTH and FCAP 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 and mainstem freshwater 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 2014 along with constraints that limited full evaluation of the performance measure in an annual report.

Juvenile Monitoring

Life History, Emigration Timing, and Survival Estimates

During 2014, we beach seined along the lower Clearwater River shoreline areas below the North Fork Clearwater River where most fall Chinook salmon spawning occurred in 2013. We primarily target naturally produced fall Chinook salmon subyearlings in the lower Clearwater River, while secondarily collect any PIT tag recapture information from the FCAP, NPTH and associated acclimation facility hatchery releases. Fall Chinook salmon hatchery yearlings and subyearlings from the 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. In 2014, we also employed hook and line sampling using lightweight tackle and small flies to sample natural fall Chinook near river kilometer three of the Clearwater River near Lewiston, Idaho. 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 are included in the emigration timing and survival analysis, along with the PIT tagged fish that were released from the FCAP, NPTH, and associated acclimation facilities. We PIT tagged fall Chinook salmon juveniles following methods developed by Prentice et al. (1990a, 1990b) and protocols established by the PIT Tag Steering Committee (1992). Subyearling Chinook salmon $\geq$ 60 mm fork length that were not hatchery origin based on an adipose fin clip, coded wire tag, or had the

appearance of being an unmarked hatchery fish were PIT tagged with standard length 12 mm tags. These fish were considered natural. Natural fish were generally much smaller at the time of seining with slightly different coloration and more prominent parr marks than hatchery fish. We used 8.5 mm PIT tags for natural 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. After a minimum 10 minute recovery period, we released all Chinook salmon juveniles back to the river where captured.

All FCAP yearling and subyearling releases were PIT tagged at Lyons Ferry Hatchery prior to transfer to associated acclimation sites, while all NPTH subyearlings were PIT tagged at each acclimation site after transfer. PIT tagging was completed using a Wells Cargo gooseneck trailer converted for use with five fresh-flow stainless steel PIT tagging stations. Standard sterile 12 mm PIT tags using BIOMARK's HPT-12 pre-loaded trays and MK-25 rapid implant guns were used on all hatchery PIT tag samples. 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), hatchery fish as 13H (1 = Chinook salmon, 3 = fall run, and H = hatchery rearing type), and recaptures as 15U (1 = Chinook salmon, 5 = unknown run, and U = unknown rearing type).

To investigate emigration timing and survival through the mainstem hydro-system, 2014 project PIT tagging goals for all hatchery fall Chinook salmon subyearling releases from NPTH and FCAP facilities was approximately 2,000 fish at all sites, while the FCAP yearling groups received 1,000 PIT tags each. 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 subyearling emigration 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.

The NPTH M&E staff coded wire tagged and ad-clipped fish from NPTH releases with the Auto-Fish Tagging Trailer designed by Northwest Marine Technology and purchased through the Bonneville Power Administration (BPA). Tagging goals for 2014 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). Washington Department of Fish and Wildlife (WDFW) staff coded wire tagged and ad-clipped fish at Lyons Ferry Hatchery prior to transfer for all FCAP yearling and subyearling releases. Tagging goals were accomplished in 2014 for NPTH and FCAP releases.

The CWT retention rates were measured initially during tagging and final retention rates were measured at least three weeks after tagging on 500 fish per release group.

Length and weight data from PIT tagging were used to calculate condition factor (K) at the time of tagging and from pre-release samples done one day prior to releases (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

Due to budget constraints, we did not collect fin clips from any natural fall Chinook salmon captured on the Clearwater River during 2014. Genetic samples taken on juveniles during beach seining efforts in prior years will be summarized and provided in a later report.

Adult Monitoring

Spawning Ground Surveys

We used aerial (by helicopter) spawning ground surveys as an index of fall Chinook salmon spawner abundance and distribution. We scheduled 3-4 surveys from the first part of October to the end of November along the entire Clearwater River (120 km), lower Potlatch River (6.5 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 3). As part of the FCAP M&E, we conducted aerial redd surveys on the Grande Ronde River from the mouth up to the highway bridge above Troy, OR (Rkm 84.8), on the Imnaha River from the mouth up to the town of Imnaha (19.5 km) (Figure 4), and on the Salmon River from the mouth up to French Creek above Riggins (168 km) (Figure 5).

On each survey, we mapped, took photos, documented spawn timing, number and distribution of fall Chinook salmon redds. 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, ID), S.F. Clearwater River (Harpster, ID), lower Selway River (Lowell, ID), Grande Ronde River (Troy, OR), Imnaha River (Imnaha, OR), and Salmon River (Whitebird, ID). We recorded general water transparencies (poor to excellent) on each survey, with excellent being > 4 m, good being 3-4 m, and poor < 3 m. We report a summary of Snake River Basin fall Chinook survey results since 1988, the year surveys began in the Clearwater River.

Total fall Chinook salmon redds in the Snake River Basin above Lower Granite Dam (LGD) are reported for 2014 (Arnsberg et al. 2015). We also report the estimated adult escapement above LGD (Young et al. 2015) and calculate the adult/redd number for 2014 and average adults/redd since 1988. Finally, we regressed fall Chinook salmon redds counted in the Snake River Basin above Lower Granite Dam from 1988 – 2014 with adult (not including jacks) escapement over Lower Granite Dam from past year's 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; Young et al. 2014; Young et al. 2015) to obtain a correlation coefficient.

Escapement and Carcass Recoveries

Adult fall Chinook salmon escapement to the Clearwater River Subbasin for 2014 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. 2015). This process included members from the *US v Oregon* Technical Advisory Committee (TAC), LFH and NPTH monitoring and evaluation, and NOAA Fisheries. Total 2014 fall Chinook salmon escapement estimates have been completed for natural and hatchery fish to Lower Granite Dam (Young et al. 2015) and are included in this report.

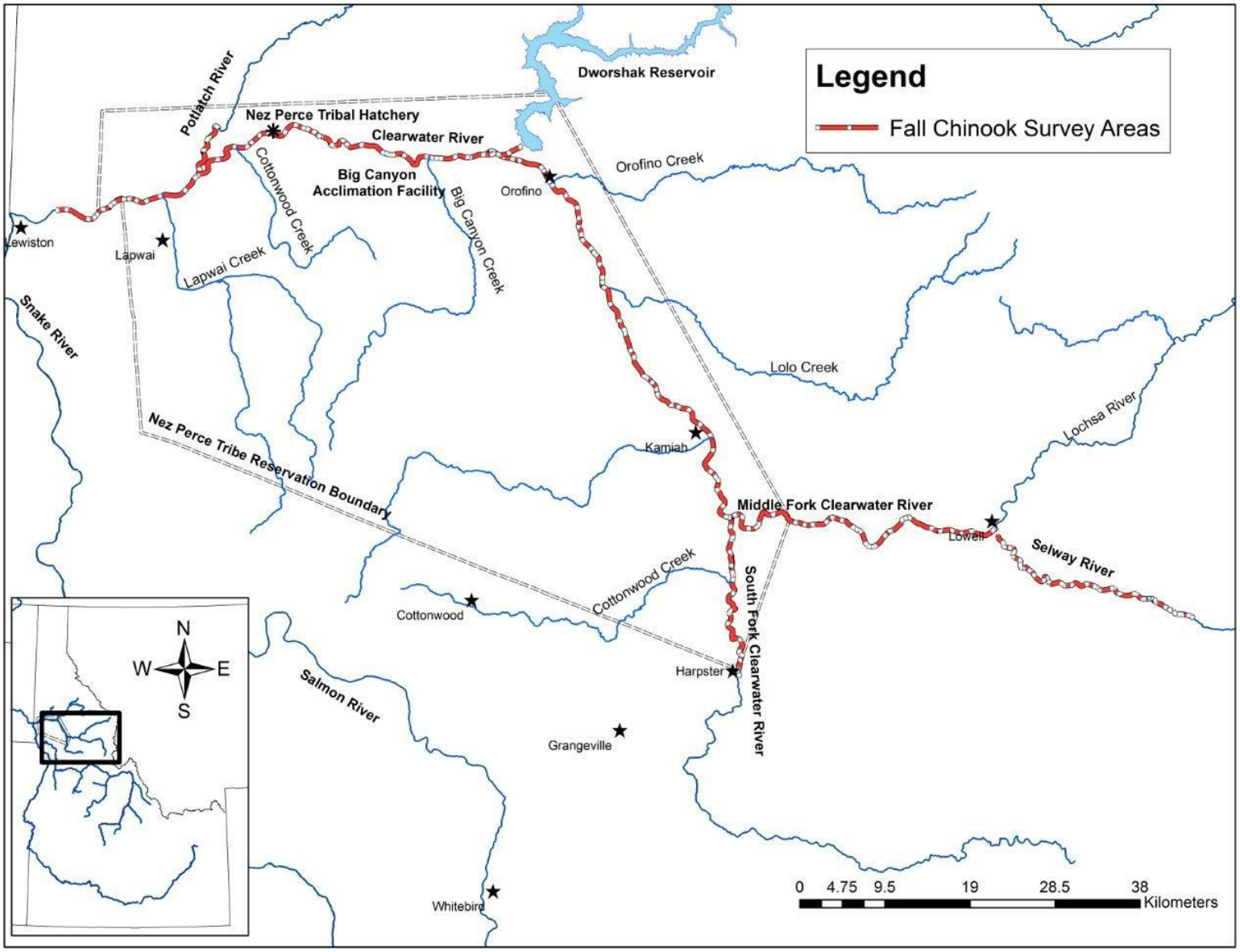

Figure 3. Fall Chinook salmon aerial redd survey areas within the Clearwater River Subbasin conducted by the Nez Perce Tribe.

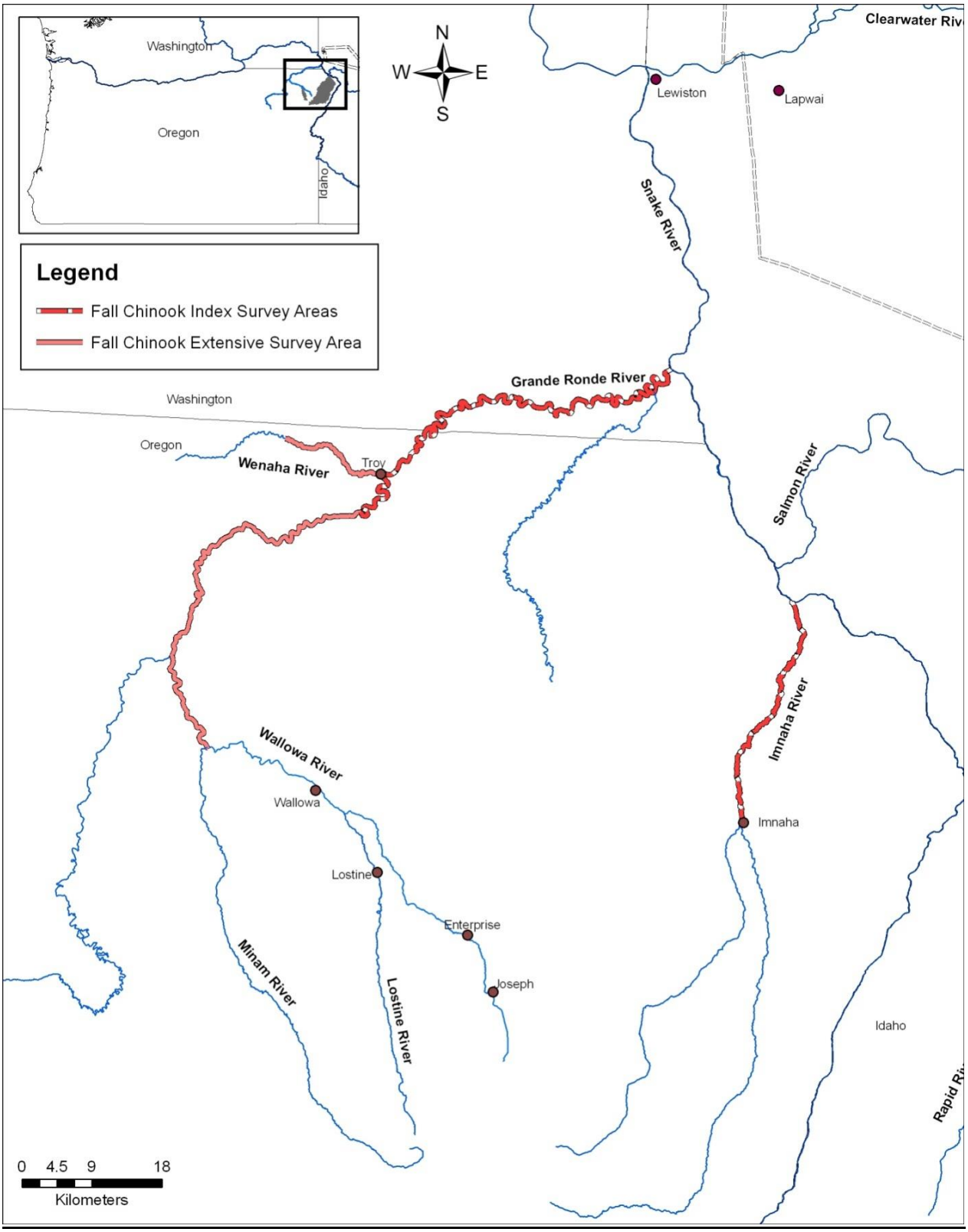

Figure 4. Fall Chinook salmon aerial redd survey areas within the Grande Ronde and Imnaha River subbasins conducted by the Nez Perce Tribe.

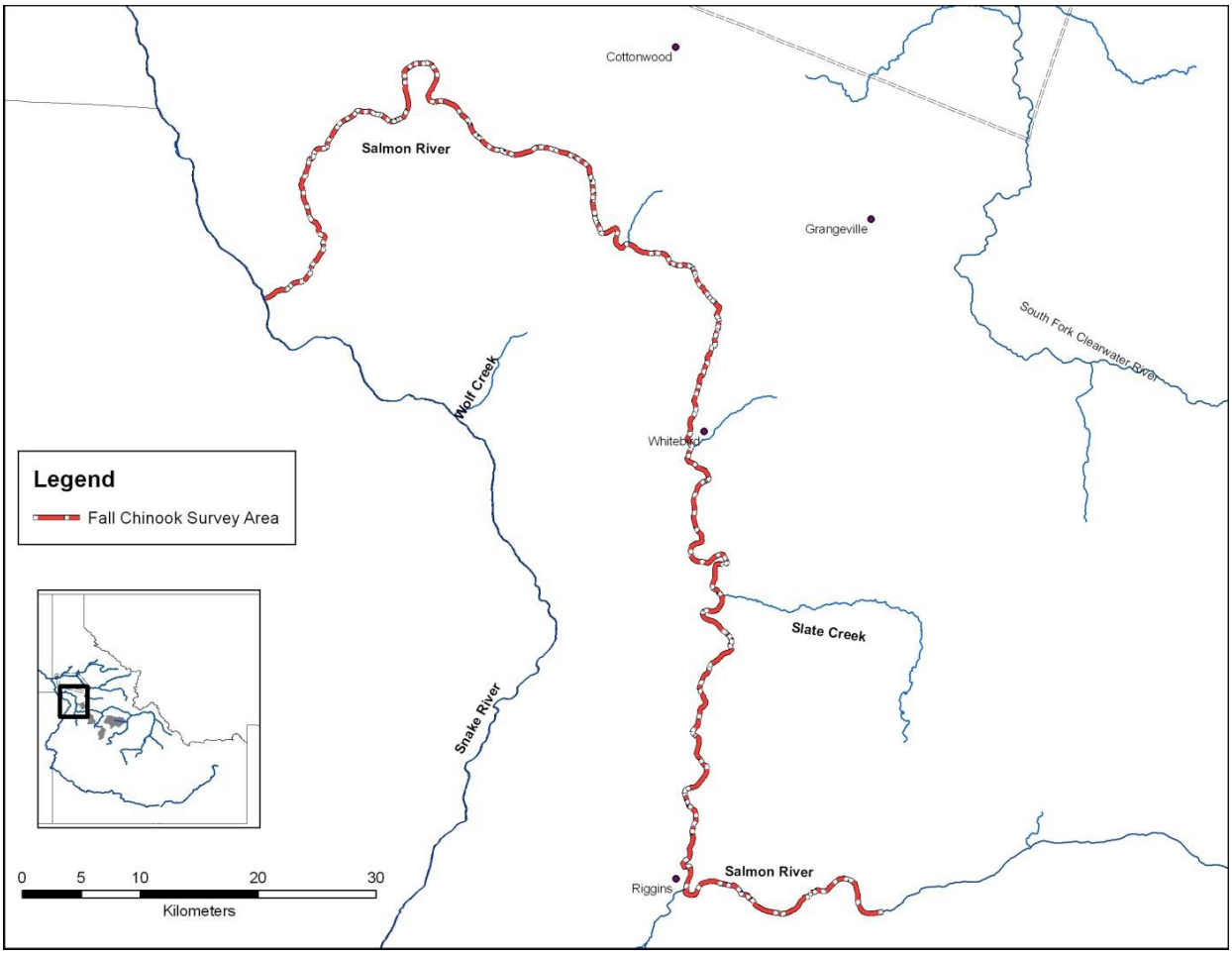

Figure 5. Fall Chinook salmon aerial redd survey areas within the Salmon River conducted by the Nez Perce Tribe.

During 2014, fall Chinook salmon carcasses in the lower Clearwater River were numerous just a few weeks after spawning commenced and were collected below major spawning reaches as time permitted. Biological information collected included fork length, sex composition, percent egg retention, identification of hatchery marks, coded wire tags, PIT tags, and scale samples to determine total age, subyearling or reservoir reared emigration life history, and years spent in the ocean. Scale analysis is no longer a reliable tool to determine hatchery from natural or wild fish and has not been used for that purpose in recent years. Percent natural spawners above Lower Granite Dam is now determined by a hatchery subtraction method through the fall Chinook run reconstruction process (Young et al. 2012). 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 river for nutrient enhancement. Scale samples were sent to the Washington Department of Fish and Wildlife (WDFW) Olympia Lab for analysis.

Smolt-to-Adult Return Estimates

Smolt-to-adult returns (SARs) estimates were calculated through yearly fall Chinook run reconstructions to Lower Granite Dam (Young et al. 2012, 2014, 2015). The most recent three years of complete returns of fall Chinook salmon from releases at NPTH, associated acclimation sites, and FCAP sites are summarized. This would include up to age-5 returning adults for the 2007 – 2009 subyearling and 2006 – 2008 yearling broodyears. Adult returns are summarized, expanded for trapping rates at Lower Granite Dam, and a total SAR is given for each release group. We also include fall Chinook salmon contributions in ocean and freshwater fisheries as reported to the Regional Mark Processing Center (RMPC) and calculate an SAS (smolt-to-adult survival) for each release group.

Hatchery Spawning

Before the 2014 fall Chinook salmon run began, the Lower Granite Dam (LGR) trapping rate was set at a 10% sampling rate of the entire run. Water temperatures were favorable for trapping fall Chinook on August 18 and the NPTH staff began hauling fish on that date. During 2014, NPTH did not open the fish ladder to collect additional broodstock. As such and later anticipating a shortage of brood, a total of four fall Chinook (3 males and 1 female) trapped at Dworshak National Fish Hatchery were transported to NPTH along with 20 additional females from LFH to make broodstock at NPTH for 2015 releases.

Spawning of fall Chinook salmon at NPTH occurred weekly from October 21 to November 18 at NPTH for a total of five spawn weeks. 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, radio tags, PIT tags, etc.) and removing snouts containing a CWT. The CWTs were read immediately after spawning to determine origin so that known "strays" may be excluded from the broodstock. Scales were taken to determine total age, emigration strategy (i.e. either subyearling, hatchery yearling, or "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 parental based tagging (PBT) effort on all Snake River fall Chinook salmon at LFH and NPTH that began in 2011 and continued through 2014.

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 for later DNA analysis, if desired. Funding to run DNA analysis was not budgeted for carcasses in 2014 since tissue samples were taken at LGR, LFH, and NPTH for PBT analysis. All fall Chinook salmon spawned at NPTH were 100% tissue sampled for PBT and were sent to the Hagerman Laboratory and analyzed by CRITFC for analysis. Results for the 2014 PBT analysis will be in a later comprehensive report.

RESULTS

Supplementation

During the 2013 fall Chinook salmon run, gametes were taken from fish hauled from Lower Granite Dam with volunteers into the NPTH fish ladder for 2014 subyearling releases which met release goals (Table 2). Fall Chinook taken for brood at LFH for all FCAP releases also met target release goals. All fall chinook releases in 2014 were coded wire tagged and adipose fin clipped prior to release as planned, meeting target goals (Table 2). There were a total of 493,164 yearling fall Chinook released at the three FCAP sites exceeding the release goal by 43,164 fish. Subyearlings released at FCAP facilities were also exceeded the release goal of 1.4 million fish by 38,521 fish. There was also a second subyearling release at Captain John of 191,151 that was the prior year's Couse Creek direct stream release group. The NPTH on-station and NLV releases goals of 500,000 subyearlings at each site was exceeded by 126,278 at NPTH while the NLV group was short of the release goal by 84,444 fish. Upriver NPTH acclimation sites exceeded the release goal of 200,000 at each facility by 52,889 fish at Cedar Flats and 55,283 fish at Lukes Gulch. A grand total of 3,572,842 fall Chinook salmon were released by the Nez Perce Tribe in 2014 (Table 2). Final CWT retention rates were high on all CWT groups and ranged between 0.93-1.0. Condition factors (K-factors) were also high on all release groups and ranged between 1.08 and 1.24 (Table 2).

Monitoring and Evaluation

Juvenile Monitoring

Life History, Emigration Timing, and Survival Estimates

We sampled a total of 956 natural fall Chinook salmon subyearlings on the lower Clearwater River of which 879 were large enough to PIT tag (Table 3). Sampling did not start until the week of June 23 due to high spring flows. During the first week of sampling, 85 fall Chinook subyearlings were captured and PIT tagged, averaging 53.1 mm fork length (Table 3). During the entire sampling season, 128 (14.6%) juveniles were tagged with the smaller 8.5 mm PIT tags. Flows decreased sharply until Dworshak Dam releases began the second week in July which kept flows relatively on a slow decline until late August and early September. Hook and line sampling in the impounded portion of the lower Clearwater River at river kilometer three occurred from July 15 thru August 14, resulting in 421 natural fall Chinook salmon subyearlings PIT tagged. The last sampling day in the Clearwater River was August 14. We recaptured four natural PIT tagged Chinook salmon and measured growth rates between 0.5 to 3.0 mm/d with an average of 1.6 mm/d. Average condition factor (K) for the natural fall Chinook was 1.11. Average condition factor (K) for all hatchery releases at NPTH and FCAP facilities are reported in Table 2.

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, and condition factor (K-factor) at release from Fall Chinook Acclimation Facilities (FCAP) and at Nez Perce Tribal Hatchery (NPTH) acclimation facilities, 2014.

Release Site/ Life Stage	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
Captain Johns 1+	3/28	163,884	86,972	76,256	306	350	CWT=220338 AD/CWT= 220339	1.000 1.000	9.9	1.15	994
Pittsburg Landing 1+	4/11	165,866	88,140	76,657	774	295	CWT=220337 AD/CWT= 220340	1.00 0.990	9.0	1.11	999
Big Canyon 1+	4/12	163,414	86,380	75,180	1,274	580	CWT=220336 AD/CWT= 220341	0.990 0.980	8.8	1.14	989
Captain Johns 0+	5/21	511,827	99,142	101,241	2,801	308,643	CWT=220343 AD/CWT= 220346	0.980 0.970	47.0	1.21	1,999
Pittsburg Landing 0+	5/20	400,868	99,455	100,063	1,404	199,946	CWT=220344 AD/CWT= 220347	0.980 0.990	53.0	1.12	1,997
Big Canyon 0+	5/22	525,826	98,628	94,950	7,588	324,660	CWT=220342 AD/CWT= 220345	0.980 0.930	49.7	1.19	1,989
Captain Johns 2nd 0+	6/6	191,151	0	185,799	5,352	0	AD/CWT= 636738	0.970	53.4	1.20	1,999
NPTH On-station 0+	6/11	526,278	207,537	102,898	744	215,099	CWT=220239 AD/CWT= 220237	0.990 0.990	52.5	1.10	1,999
Cedar Flats 0+	6/10	252,889	99,344	102,430	740	50,375	CWT=220235 AD/CWT= 220233	0.990 0.990	49.7	1.10	1,994
Luke's Gulch 0+	6/10	255,283	103,285	100,870	729	50,399	CWT=220236 AD/CWT= 220234	0.990 0.990	47.6	1.08	1,998
North Lapwai Valley 0+	5/22	415,556	202,383	100,911	1,770	110,492	CWT=220240 AD/CWT= 220238	0.990 0.980	63.5	1.24	1,993
Totals		***3,572,842***	***1,171,266***	***1,117,255***	***23,482***	***1,260,839***					***18,950***

Table 3. Weekly number, average fork length, and number passive integrated transponder (PIT) tagged natural subyearling fall Chinook salmon sampled on the lower Clearwater River, 2014.

Week of	Clearwater River Avg. Weekly Temps.[1] (^{0}C)	Clearwater River Avg. Weekly Flows[1] (cfs)	Dworshak Dam Spill (%)	Total Number Captured	Number PIT Tagged	Weekly Average Fork Lth. (mm)	Weekly Average Condition Factor (K)
June 23	13.0	24,773	0.00	133	85	53.08	1.05
June 30	12.7	27,139	0.74	339	319	62.45	1.09
July 7	13.3	23,959	22.82	59	54	64.76	1.12
July 14	13.4	19,146	22.57	13	13	101.62	1.16
July 21	13.2	14,747	4.15	253	251	100.10	1.12
July 28	12.1	15,485	20.91	49	49	106.44	1.13
Aug 4	12.6	12,463	0.00	101	99	110.35	1.13
Aug 11	11.7	12,975	8.05	9	9	115.44	1.16
Totals				956	879		

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

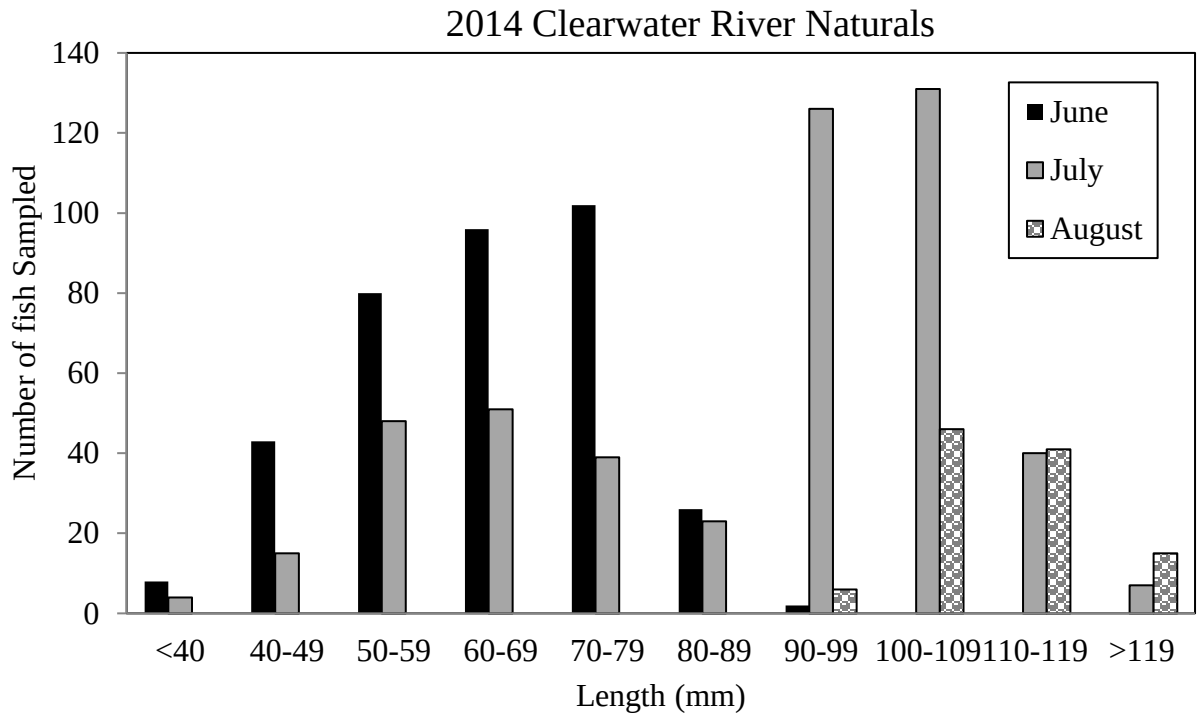

Figure 6. Length frequencies of natural fall Chinook salmon sampled in the lower Clearwater River, 2014.

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 6. We did not sample any subyearlings during August that were 90 mm or less (Figure 6).

For NPTH and associated releases, the Luke's Gulch and North Lapwai Valley releases showed the highest number of unique detections at all juvenile detection points below Lower Granite (Table 4). The Clearwater River natural PIT tag group was detected at 15.7% at all juvenile detection sites below Lower Granite Dam. Unique detections for 2014 FCAP releases are reported in Table 5. As in previous years, very few NPTH and FCAP PIT tagged fish were detected as yearlings in 2015 (Table 4, Table 5), in contrast to 41 (29.7%) Clearwater River naturals (Table 4).

Estimated index survival of PIT tagged natural subyearling fall Chinook salmon from the Clearwater River to Lower Granite Dam was 24%, but could not be calculate to McNary Dam (Table 6). Index survival includes subyearlings that were detected up until the detection facility at Lower Granite is shut down, and does not include "holdovers" or those fish that overwintered and migrated as yearlings. Estimated index survival for hatchery production releases from NPTH and FCAP releases are shown in Table 6 and Table 7, respectively.

Table 4. Unique PIT tag detections at all hydrosytem juvenile detection facilities from passive integrated transponder (PIT) tagged releases of fall Chinook salmon subyearlings (0+) in the lower Clearwater River, Nez Perce Tribal Hatchery (NPTH) and associated acclimation facilities, 2014.

Release Site	Brood Year	Release Strategy	Unique PIT Tag Detections	Detected in Migratory Year 2014	Detected as Holdovers In 2015
Clearwater Naturals	2013	0+	138	97 (70.30%)	41 (29.70%)
NPTH On-Station	2013	0+	740	729 (98.50%)	11 (1.50%)
Cedar Flats	2013	0+	682	675 (99.00%)	7 (1.00%)
Luke's Gulch	2013	0+	921	920 (99.90%)	1 (0.10%)
North Lapwai Valley	2013	0+	866	865 (99.90%)	1 (0.10%)

Table 5. Unique PIT tag detections at all hydrosytem juvenile detection facilities from passive integrated transponder (PIT) tagged releases of hatchery fall Chinook salmon yearlings (1+) and subyearlings (0+) from the Fall Chinook Acclimation Project (FCAP) in the lower Clearwater River at the Big Canyon Acclimation facility (BCCAP) and on the Snake River at the Pittsburg Landing (PLAP) and Captain John Rapids (CJRAP) acclimation facilities, 2014.

Release Site	Brood Year	Release Strategy	Unique PIT Tag Detections	Detected in Migratory Year 2014	Detected as Holdovers In 2015
BCCAP	2012	1+	607	607 (100%)	0 (0.00%)
	2013	0+	948	946 (99.80%)	0 (0.00%)
PLAP	2012	1+	622	622 (100%)	0 (0.00%)
	2013	0+	1073	1073 (100%)	0 (0.00%)
CJRAP	2012	1+	667	667 (100%)	0 (0.00%)
	2013	0+	1127	1,127 (100%)	0 (0.00%)
CJRAP 2nd	2013	0+	621	618 (99.50%)	3 (0.50%)

Table 6. 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, 2014 (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	879	0.24 (0.17 - 0.36)	-----[a]
NPTH On-Station	1,999	0.72 (0.63 - 0.83)	0.46 (0.39 - 0.54)
Cedar Flats	1,994	0.66 (0.57 - 0.78)	0.40 (0.32– 0.47)
Luke's Gulch	1,998	0.84 (0.75 - 0.95)	0.48 (0.40 - 0.56)
North Lapwai Valley (NLV)	1,993	0.76 (0.68 - 0.86)	0.57 (0.46 - 0.72)

[a]Insufficient downstream detections to calculate survival.

Table 7. Estimated index survivals (using SURPH) with 95% confidence intervals (CI's) from passive integrated transponder (PIT) tagged releases of hatchery fall Chinook salmon yearlings (1+) and subyearlings (0+) from the Fall Chinook Acclimation Project (FCAP) in the lower Clearwater River at the Big Canyon Acclimation facility (BCCAP) and on the Snake River at the Pittsburg Landing (PLAP) and Captain John Rapids (CJRAP) acclimation facilities to Lower Granite and McNary dams, 2014 (LGR = Lower Granite Dam, MCN = McNary Dam, CI = confidence interval at the 95% level).

Release Site	Release Strategy	Release Pit Tag Number	Index Survival to LGR (95% CI's)	Index Survival to MCN (95% CI's)
BCCAP	1+	989	0.92 (0.84 - 1.01)	0.67 (0.54 - 0.84)
	0+	1,989	0.73 (0.67 - 0.80)	0.65 (0.54 - 0.82)
PLAP	1+	999	0.90 (0.83 - 0.99)	0.53 (0.42– 0.69)
	0+	1,999	0.82 (0.75 - 0.89)	0.49 (0.41 - 0.54)
CJRAP	1+	994	0.88 (0.82 - 0.94)	0.76 (0.59 - 0.99)
	0+	1,997	0.84 (0.78 - 0.92)	0.74 (0.62 - 0.88)
CJRAP 2nd	0+	1,999	0.66 (0.56 - 0.81)	0.57 (0.43 - 0.74)

Total detections represents the total number of PIT tags detected at each dam and not necessarily unique detections. The major juvenile detection facilities with the most detections continue to be Lower Granite, Little Goose, and McNary dams. Total detections were also used to establish mean migration rates to these three detection points for natural subyearlings from the lower Clearwater River and hatchery releases from the FCAP and NPTH acclimation facilities in 2014 (Figure 7, Figure 8, Figure 9). As in previous years, the acclimated releases from Luke's Gulch and Cedar Flats migrated at a faster rate than the other NPTH releases, while the natural fall Chinook from the Clearwater River migrated much slower on average to Lower Granite Dam (Figure 7). The yearling and subyearling releases from the PLAP facility migrated at a faster rate to Lower Granite Dam than the other FCAP releases (Figure 8, Figure 9). All PIT tag release groups had adequate detections during 2014 to derive an index of the 10th, 50th, and 90th percentile arrival dates to Lower Granite Dam (Table 8, Table 9). The 90th Percentile arrival date to Lower Granite Dam for the 2014 natural fall Chinook released in the Clearwater River occurred on November 8 (Table 8). Cumulative arrival timing for all natural and hatchery releases are shown in Figure 10.

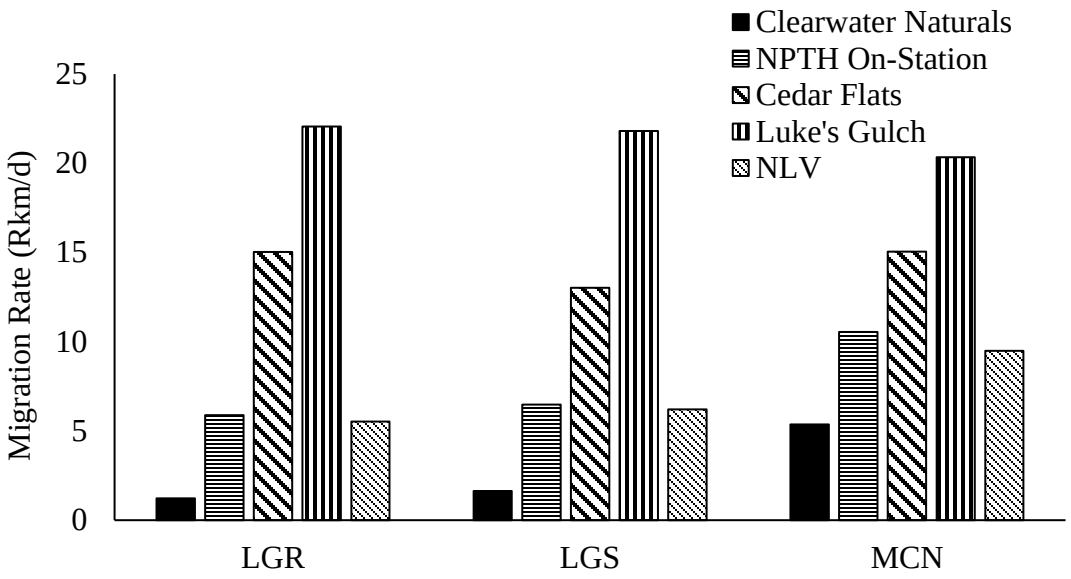

Figure 7. Total detection mean migration rate to selected Snake and Columbia River dams of passive integrated transponder (PIT) tagged Clearwater River natural fall Chinook salmon subyearlings, Nez Perce Tribal Hatchery (NPTH) on-station releases, and acclimated releases at Cedar Flats, Luke's Gulch, and North Lapwai Valley (NLV) 2014 (LGR = Lower Granite Dam, LGS = Little Goose Dam, MCN = McNary Dam).

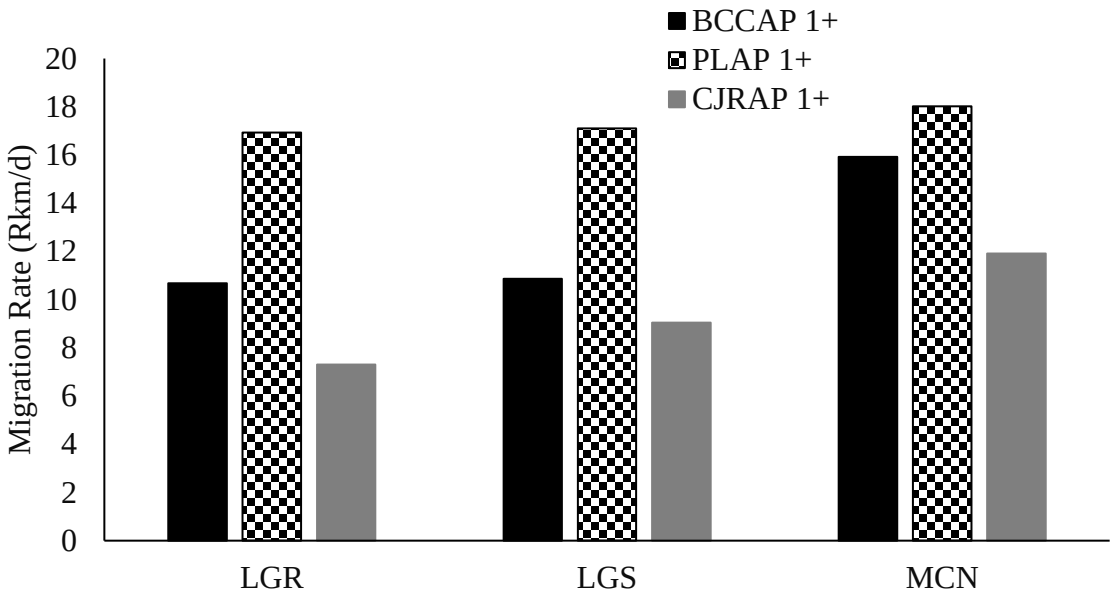

Figure 8. Total detection mean migration rate to selected Snake and Columbia River dams of passive integrated transponder (PIT) tagged releases of hatchery fall Chinook salmon yearlings (1+) from the Fall Chinook Acclimation Project (FCAP) in the lower Clearwater River at the Big Canyon Acclimation facility (BCCAP) and on the Snake River at the Captain John Rapid (CJRAP) and Pittsburg Landing (PLAP) acclimation facilities, 2014 (LGR = Lower Granite Dam, LGS = Little Goose Dam, MCN = McNary Dam).

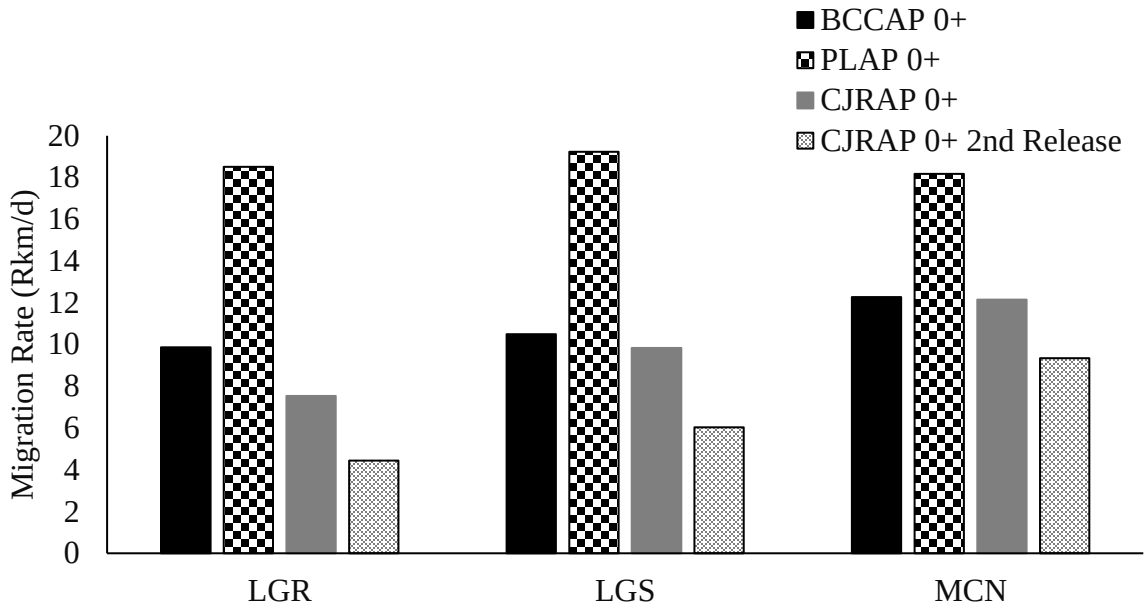

Figure 9. Total detection mean migration rate to selected Snake and Columbia River dams of passive integrated transponder (PIT) tagged releases of hatchery fall Chinook salmon subyearlings (0+) from the Fall Chinook Acclimation Project (FCAP) in the lower Clearwater River at the Big Canyon Acclimation facility (BCCAP) and on the Snake River at the Captain John Rapid (CJRAP) and Pittsburg Landing (PLAP) acclimation facilities, 2014 (LGR = Lower Granite Dam, LGS = Little Goose Dam, MCN = McNary Dam).

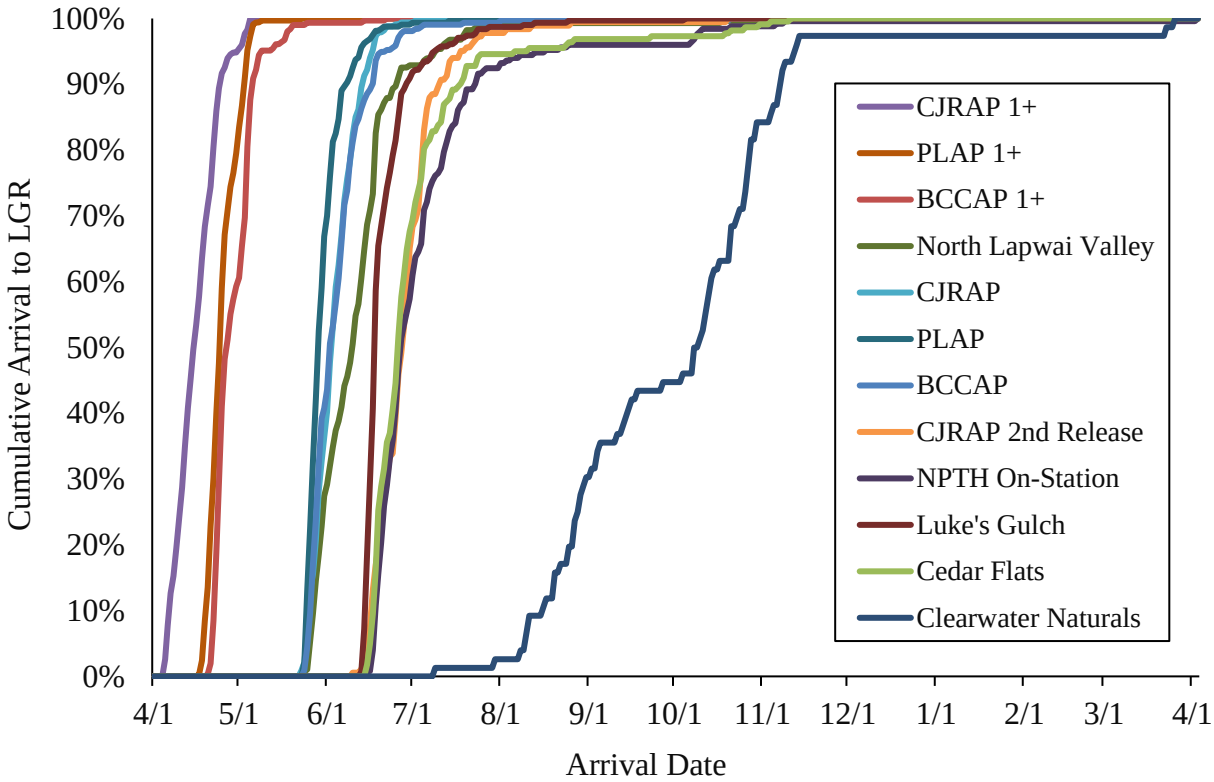

Figure 10. Cumulative arrival timing of Clearwater River natural and hatchery releases from the NPTH and FCAP acclimation facilities to Lower Granite Dam (LGR) in 2014.

Table 8. Total detections for the 10th, 50th, and 90th percentile arrival timing to Lower Granite Dam 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 2014.

Release Group	Release Strategy	Release Date	Lower Granite Dam (LGR) PIT Tag Detections	% Arrival Timing to LGR		
			n	10%	50%	90%
Clearwater River Naturals	0+	6/25-8/6	76	8/16	10/8	11/8
NPTH On-Station	0+	6/11	251	6/18	6/27	7/23
Cedar Flats	0+	6/10	222	6/18	6/26	7/18
Luke's Gulch	0+	6/10	307	6/15	6/18	6/29
North Lapwai Valley (NLV)	0+	5/22	281	5/27	6/10	6/26

Table 9. Total detections for the 10th, 50th, and 90th percentile arrival timing from passive integrated transponder **(**PIT) tagged releases of hatchery fall Chinook salmon yearlings (1+) and subyearlings (0+) from the Fall Chinook Acclimation Project (FCAP) in the lower Clearwater River at the Big Canyon Acclimation facility (BCCAP) and on the Snake River at the Pittsburg Landing (PLAP) and Captain John Rapid (CJRAP) acclimation facilities to Lower Granite Dam 2014.

Release Group	Release Strategy	Release Date	Lower Granite Dam (LGR) PIT Tag Detections	% Arrival Timing to LGR		
			n	10%	50%	90%
CJRAP	1+	4/1	348	4/7	4/16	4/25
PLAP	1+	4/14	332	4/20	4/24	5/3
BCCAP	1+	4/17	307	4/23	4/27	5/6
CJRAP	0+	5/20	333	5/26	6/3	6/14
PLAP	0+	5/20	320	5/25	5/29	6/8
BCCAP	0+	5/21	314	5/27	6/2	6/17
CJRAP 2nd	0+	6/5	183	6/17	6/28	7/11

Temperature and Flow

All fall Chinook subyearling releases from NPTH and FCAP facilities were made prior to warm (>16 ^{o}C) summer water temperatures. The releases of FCAP yearlings occurred in early and mid-April, while the FCAP subyearlings were released in May with temperatures still cool in the Clearwater and Snake rivers. The CJRAP yearling release was made two weeks earlier than the BCCAP and PLAP yearling releases due to an earlier acclimation schedule. The second group of subyearlings acclimated at the Captain John Rapids facility was released June 6, approximately two weeks after the first group of subyearlings were released. The subyearling releases from NPTH facilities occurred approximately mid-June, except for the NLV acclimated group which was released three weeks earlier on May 22. 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 much cooler 11-13 ^{o}C during the period of cold water releases from Dworshak Reservoir. Most detections at Lower Granite Dam (LGR) for all FCAP, NPTH and associated acclimated releases occurred before temperatures exceeded 20 ^{o}C in the Snake River (Figure 11). Cold water releases from Dworshak Reservoir moderated warm Snake River temperatures by 2-3 ^{o}C keeping water temperatures below 20 ^{o}C at LGR during July and August. Detections of natural fall Chinook occurred from mid-August thru mid-November when temperatures at LGR were 20 ^{o}C and below (Figure 11).

Detections of natural subyearling at LGR began late September, continuing through mid-November when the juvenile detection facility was de-watered for the winter months (Figure 11). While the NLV release occurred prior to peak flows (Figure 12), the releases from NPTH, Cedar Flats, and Luke's Gulch releases were made after peak flows on the Clearwater River (Figure 12). All yearling and subyearling releases from the FCAP facilities were made prior to peak flows in the Clearwater and Snake rivers (Figure 13), with the exception of the second release from the Captain John Rapids facility which was made after peak flows on the Snake River (Figure 13). While these releases were made during higher spring flows, sampling Clearwater natural fall Chinook could not begin until the Clearwater flows were well below 30,000 cubic feet per second (Figure 12). PIT tag detections at 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 14. Most hatchery detections occurred during the spill period at LGR (Figure 14). In contrast, few natural fish might have experienced summer spill as most PIT tag detections occurred later in the fall when LGR stopped spilling (Figure 14).

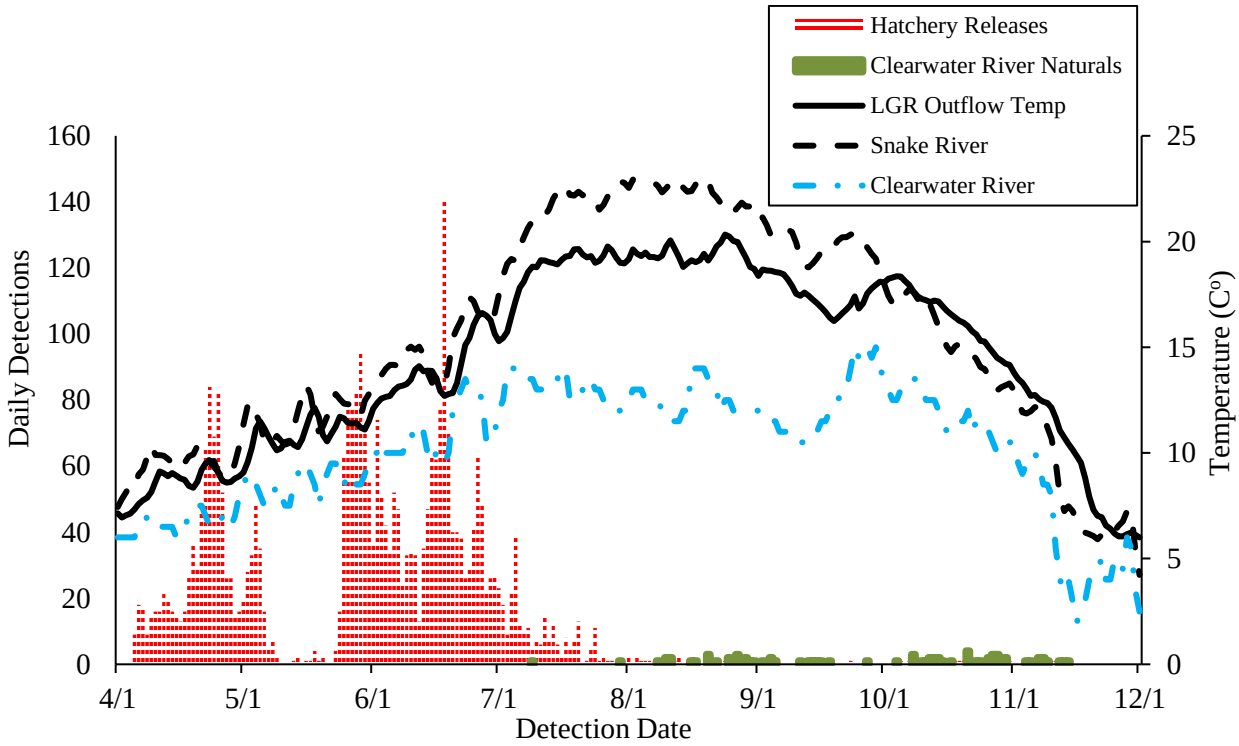

Figure 11. Passive integrated transponder (PIT) fall Chinook detections of Clearwater River naturals and combined detections from the Nez Perce Tribal Hatchery, Cedar Flats, Luke's Gulch, North Lapwai Valley, and FCAP facilities at Lower Granite Dam in relation to mean daily temperatures recorded in the Clearwater River (USGS Spalding gauge), Snake River (USGS Anatone gauge) and at Lower Granite Dam (LGR), 2014.

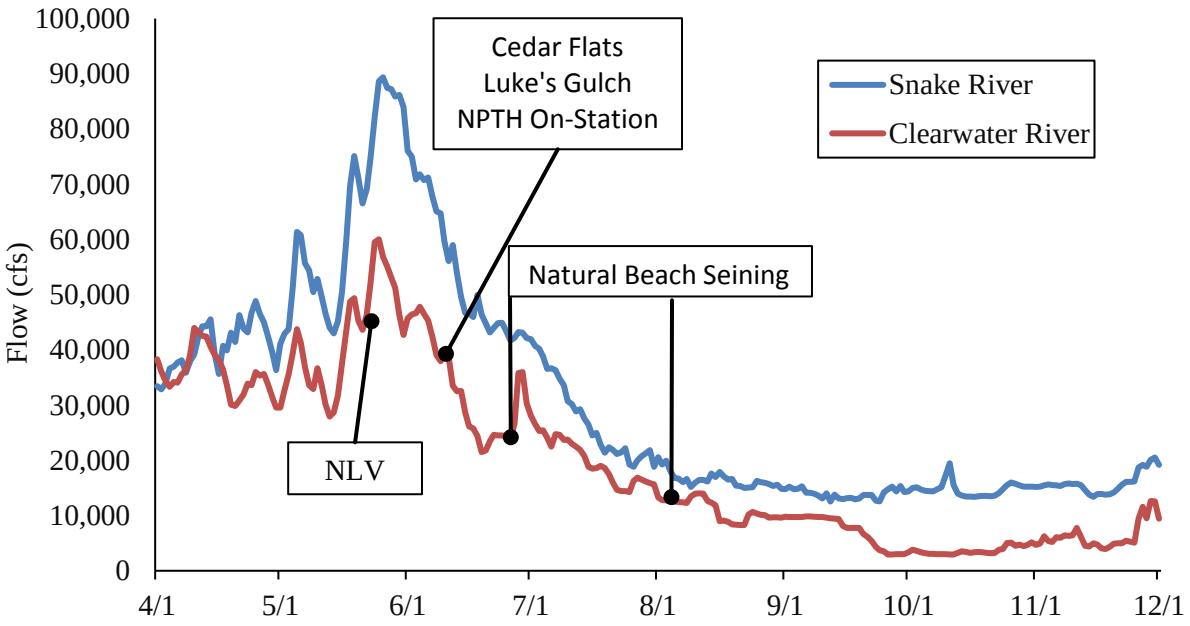

Figure 12. Mean daily flows recorded in the Clearwater River Subbasin, timing of natural fall Chinook sampling on the Clearwater River and hatchery releases from Nez Perce Tribal Hatchery (NPTH), Cedar Flats, Luke's Gulch, and North Lapwai Valley (NLV), 2014.

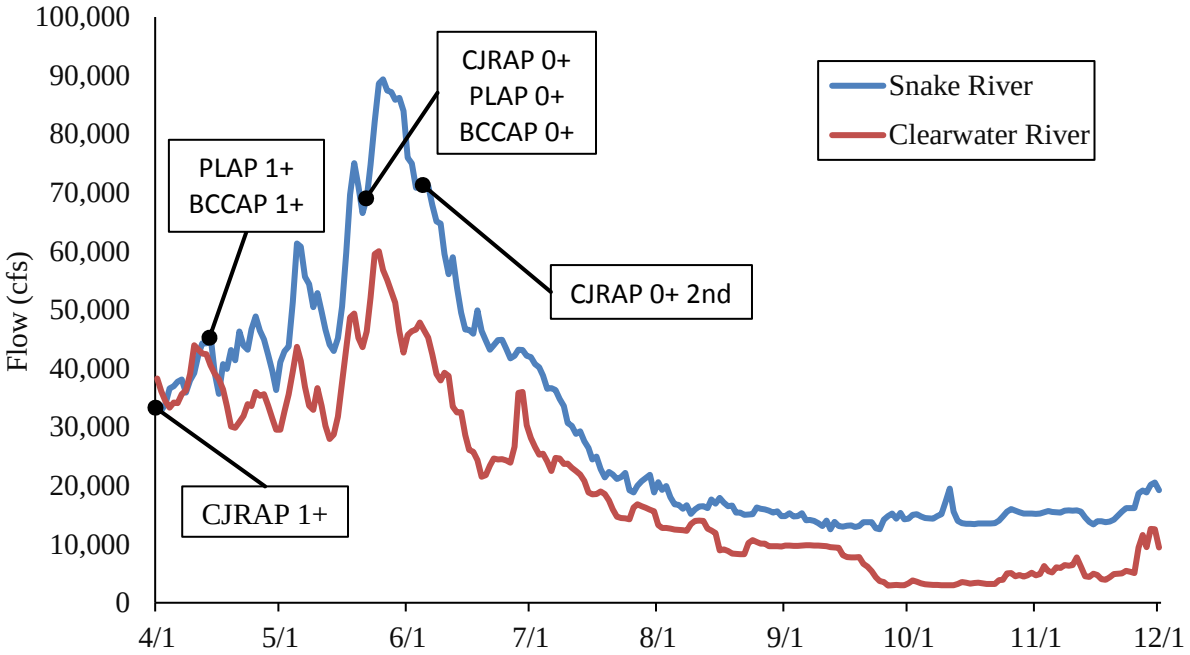

Figure 13. Release timing of hatchery fall Chinook salmon yearlings (1+) and subyearlings (0+) from the Fall Chinook Acclimation Project (FCAP) in the lower Clearwater River at the Big Canyon Acclimation facility (BCCAP) and on the Snake River at the Pittsburg Landing (PLAP) and Captain John Rapid (CJRAP) acclimation facilities in relation to mean daily flows recorded in the Clearwater River (USGS Spalding gauge) and the Snake River (USGS Anatone gauge), 2014.

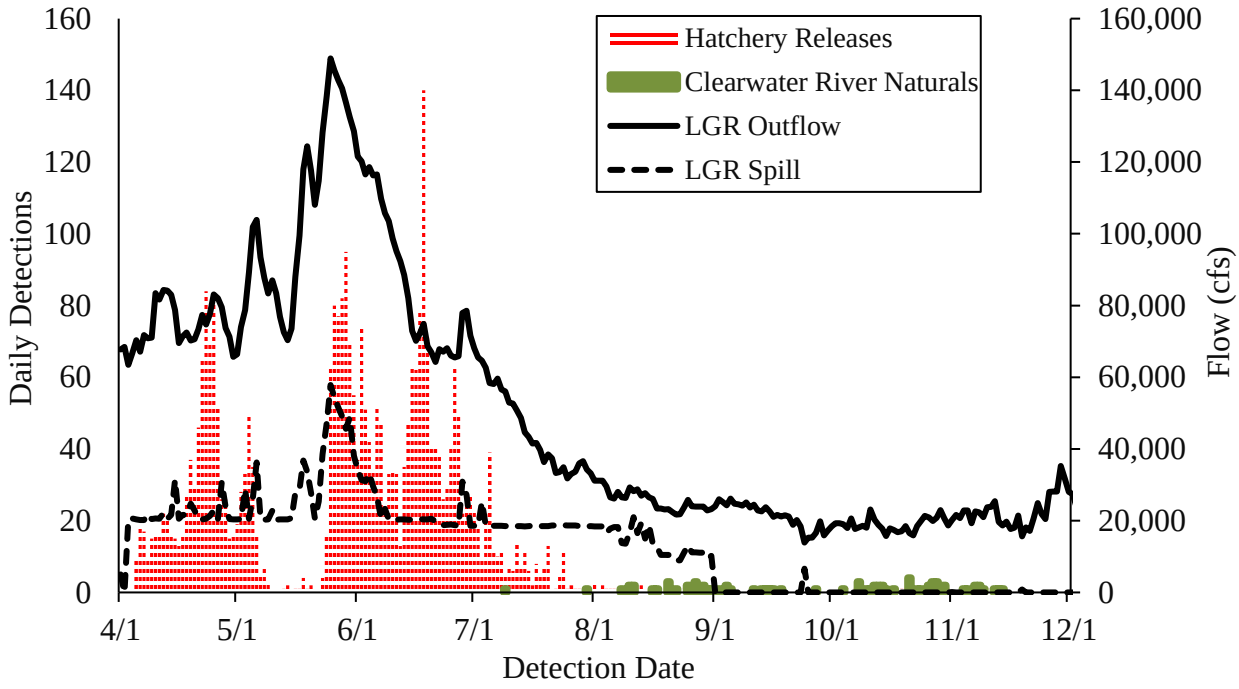

Figure 14. Passive integrated transponder (PIT) Fall Chinook detections of Clearwater River naturals and combined detections from the Nez Perce Tribal Hatchery, Cedar Flats, Luke's Gulch, North Lapwai Valley, and FCAP facilities at Lower Granite Dam (LGR) in relation to mean daily flows and spill recorded at the dam, 2014.

Genetic Monitoring

Due to budget constraints, we did not collect fin clips from any natural fall Chinook salmon captured on the Clearwater River during 2014. Genetic samples taken on juveniles during beach seining efforts in prior years will be summarized and provided in a later report.

Adult Monitoring

Spawning Ground Surveys

During aerial fall Chinook surveys during 2014, we observed a total of 2,936 redds in the mainstem Clearwater River (Arnsberg et al. 2015; Appendix A). There were 234 redds observed during the first survey on October 13 in the lower Clearwater, 1,016 new redds observed on October 27, and 1,548 new redds observed on November 17 for a total of 2,798 redds counted. There was a total of 4 redds observed on the N.F. Clearwater River and no redds seen in the Potlatch River. The upper Clearwater (from the N.F. Clearwater upstream to the M.F. Clearwater) was surveyed on October 15, October 29, and November 19. In the upper Clearwater River we observed 20, 56, and 62 new redds for a total of 138 redds. The S.F. Clearwater, M.F. Clearwater, and the Selway rivers were surveyed on the same dates as the upper Clearwater surveys, with the exception of the S.F. Clearwater which became to windy to survey on October 15. Survey counts were 20, 34, and 19 redds in the M.F. Clearwater for a total of 73 redds. Survey counts were 7, 20, and 13 for the Selway River for a total of 40 redds. Survey counts on the S.F. Clearwater were 48 and 17 redds for a total of 65 redds. Survey conditions were good to excellent on most surveys, therefore not many redds were thought to have been missed (Arnsberg et al. 2015; Appendix A).

During the fall Chinook spawning period, Dworshak Reservoir discharges remained stable between 1,600 – 1,700 cfs (Appendix A). Flows on the lower Clearwater (USGS Gauging Station at Spalding, ID) were a low 3,236 cfs on the first survey, increased to 4,497 cfs on the second survey, and decreased to 4,039 cfs on the last Clearwater River survey. Since 2010, the mean number of redds occurring in the Clearwater River Subbasin has been 2,315 ranging between 1,621 and 3,118 (Figure 15). The lowest redd count for the Clearwater River Subbasin, since intensive surveys began was 4 redds in both 1990 and 1991, while the highest count was 3,118 redds in 2014 (Arnsberg et al. 2015).

A total of two aerial surveys were conducted on the Grande Ronde River resulting in a total of 340 redds observed. Surveys on 22 October and 5 November resulted in 48 and 292 new redds counted, respectively. A last survey scheduled 19 November was not conducted due to rains and turbid water, therefore some redds may have been missed. There were 2 fall Chinook redds incidentally observed by NPT steelhead project staff on lower Joseph Creek on 10 December and included the Grande Ronde Basin total (Figure 16). Survey conditions were excellent on the first survey and good on the last survey. Flows were a low 690 cfs (USGS Gauging Station at Troy, OR) on the first survey and increased to 866 cfs on the second and last survey with decreasing water visibilities. Since 2010, the mean number of redds counted in the Grande Ronde River Subbasin has been 265, ranging from 154 to 340 (Figure 16). The lowest redd count for the Grande Ronde Subbasin since intensive surveys began, was zero in 1989 and 1991, while the highest count was 340 in 2014 (Arnsberg et al. 2015).

One aerial survey conducted 5 November on the Imnaha River resulted in 103 redds observed. The first survey scheduled 22 October with the Grande Ronde was cancelled because of increasing high winds and the last survey scheduled 19 November was cancelled because of rains and turbid water. Since the only survey was conducted early in November, a number of redds were thought to have been missed in the Imnaha. Since 2010, the mean number of redds observed in the Imnaha River has been 76, ranging from 24 to 132 (Figure 16). The lowest redd count for the Imnaha River, since intensive surveys began was zero redds in 1994, while the highest count was 132 in 2010 (Arnsberg et al. 2015).

One aerial survey conducted 24 November on the Salmon River resulted in 42 redds observed. Only one survey was scheduled on the Salmon this year because of budget constraints. Salmon River flow was moderate at 5,410 cfs (USGS Gauging Station at Whitebird, ID) during the survey and conditions were fair, therefore, a few redds were probably missed, especially deep water redds. Since 2010, the mean number of redds occurring in the Salmon River has been 35, ranging between 8 and 60 (Figure 16). The lowest redd count for the Salmon River, since intensive surveys began in 1992, was zero redds in both 1999 and 2000, while the highest count was 60 in 2011 (Arnsberg et al. 2015).

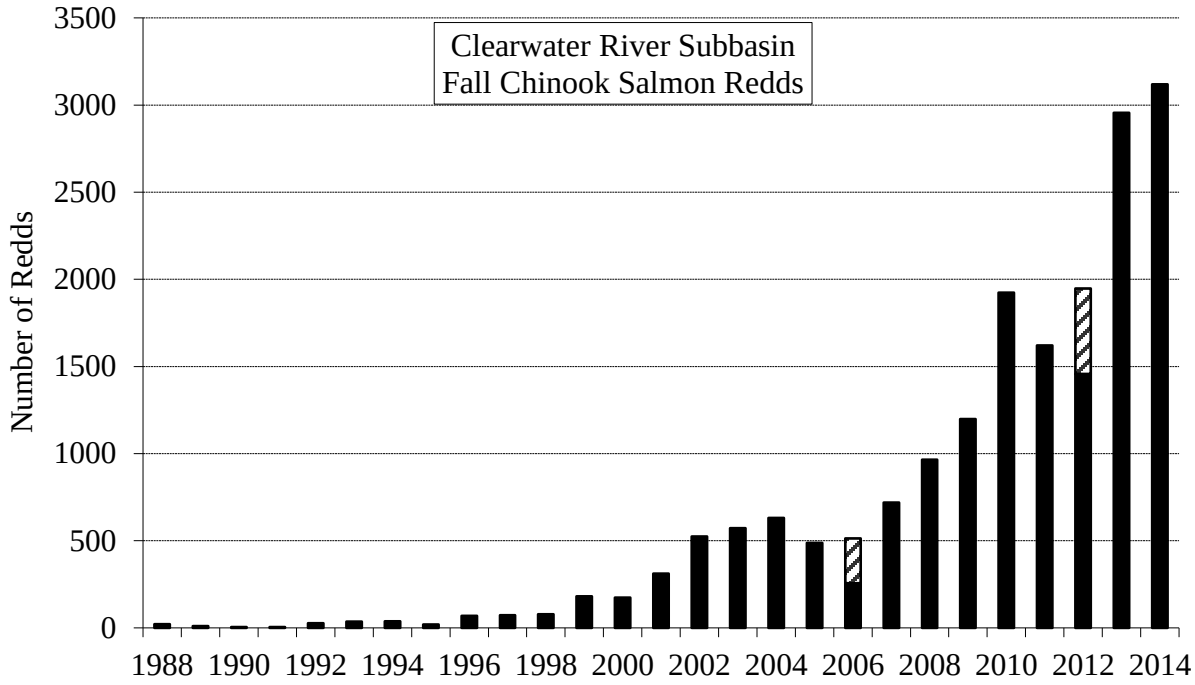

Figure 15. Fall Chinook salmon redds counted in the Clearwater River Subbasin, 1988-2014 (cross hatches indicates an estimated redd number missed due to turbid water conditions and incomplete surveys).

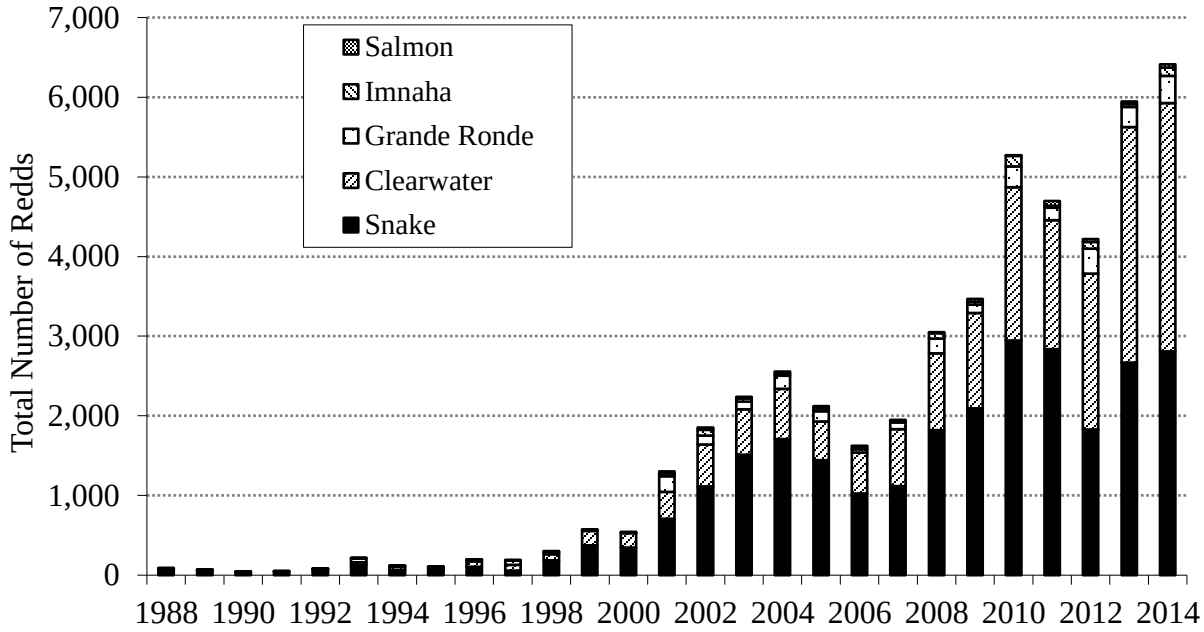

Figure 16. Fall Chinook salmon redds counted in the Snake River Basin above Lower Granite Dam, 1988-2014.

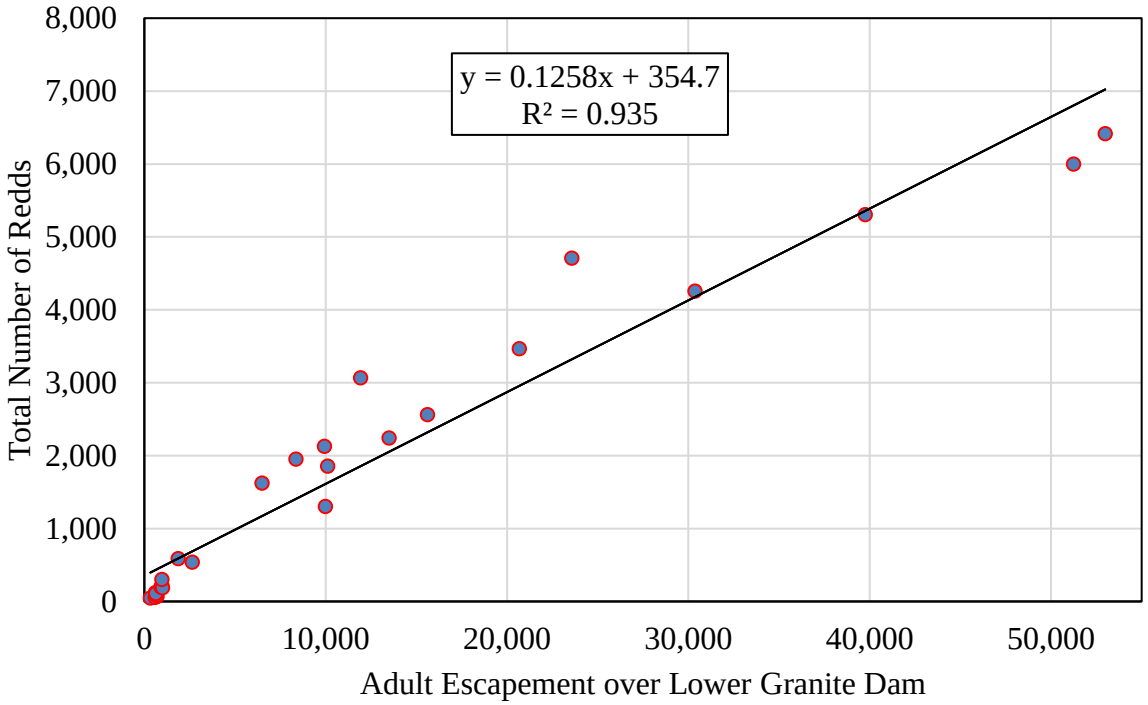

Figure 17. Fall Chinook salmon redds counted in the Snake River Basin above Lower Granite Dam and adult (not including jacks) escapement regression over Lower Granite Dam from run reconstructions, 1988-2014.

There were a total of 6,413 fall Chinook salmon redds counted and/or estimated above Lower Granite Dam and 302 redds estimated in the Tucannon River for a total of 6,715 redds in the Snake River Basin during 2014 (Arnsberg et al. 2015). The 2014 fall Chinook redd estimate represents the highest in the Snake River Basin since surveys began in 1988 (Figure 16). The adult escapement above Lower Granite Dam in 2014 was estimated to be 52,989 adults (Young et al. 2015). The adult-to-redd ratio above Lower Granite Dam was calculated to be 8.3 adults/redd in 2014 with an average of 6.1 adults/redd averaged across all years since 1988. Redd counts continue to show a high correlation ($R^2 = 0.935$) with yearly escapement estimates over Lower Granite Dam (Figure 17). Using the adult/redd number of 8.3 in 2014, the estimated escapement to the Clearwater River Subbasin was approximately 25,879 adult fall Chinook salmon (1-ocean fish or jacks not included).

Escapement and Carcass Recoveries

The total fall Chinook salmon returning to Lower Granite Dam (LGR) in 2014 was estimated to be 59,502 adults and 13,962 jacks for a total of 73,464 fish (Young et al. 2015). During 2014, the number of fall Chinook salmon trapped and hauled from LGR to NPTH and LFH for broodstock needs and run reconstruction purposes was 897 and 3,082 fish, respectively. After subtracting hauled fish from the LGR return estimate and fallback through LGR, the fall Chinook salmon escapement estimate was 52,989 adults and 12,383 jacks for a total of 65,372 fish (Young et al. 2015). It was estimated that the natural adult escapement above LGR was 13,141 (24.8%) and 3,678 (29.7%) natural jacks. Natural adults and natural jacks combined made up 25.7% of the fall Chinook escapement above Lower Granite Dam in 2014.

A total of 98 fall Chinook salmon carcasses were collected in the Snake River Basin during 2014 (Appendix B). There was a total of 27 females (27.6%) and 71 males (72.4%) among carcasses collected in the Clearwater River. Of all female carcasses cut open and examined, 100% were spawned-out or eggs were spent, therefore no pre-spawned mortalities were found (Appendix B).

The breakdown of fall Chinook salmon carcasses of subyearling and yearling hatchery released fall Chinook salmon, number of unknown fish (scale analysis could not determine for certain if hatchery or natural), natural fish that reservoir reared by scale analysis, and out-of-Snake Basin hatchery strays are summarized in Table 10. A total of four unmarked/untagged carcasses could not be analyzed because scales could not be read. Analysis of the composition of fall Chinook salmon carcasses resulted in identifying 53.2% hatchery subyearlings that emigrated as subyearlings, 31.9% unmarked/untagged subyearlings that emigrated as subyearlings, 7.4% hatchery subyearlings that reservoir reared, 5.3% natural origin fish that reservoir reared, and lastly 2.1% hatchery released yearlings (Table 10). The unmarked/untagged fish contains a proportion of NPTH released fish as about 30% of the subyearlings released are not coded wire tagged or adipose fin clipped. There were no known out-of-Snake Basin hatchery "strays" found among carcasses sampled. Most carcasses collected returned at total age-4 (67.0%), followed by age-3 fish (31.9%), and lastly by age-2 or jacks (1.1%) (Table 10). There were no age-5 or age-6 carcasses collected.

Table 10. Number of each age class, percent of the total sample identified by emigration life history type from coded wire tags, adipose fin clips, and scale analysis; fork length (cm) range and average fork length in parenthesis of total age 2-5 fall Chinook salmon carcasses (n=94) collected in the Clearwater River Subbasin during 2014.

Release Strategy/Emigration Life History type	No. Age 2 Fk Lth Range (avg.)	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	1 (1.1%) 48 (48)	17 (18.1%) 42-72 (66)	32 (34.0%) 62-89 (76)	0	50 (53.2%)
Subyearling Hat Release/ Reservoir Reared	0	1 (1.1%) 42 (42)	6 (6.4%) 56-79 (70)	0	7 (7.4%)
Yearling Hat Release	0	0	2 (2.1%) 57 (57)	0	2 (2.1%)
Unknown with Subyearling Emigration	0	11 (11.7%) 58-73 (65)	19 (20.2%) 69-86 (77)	0	30 (31.9%)
Natural Reservoir Reared	0	1 (1.1%) 48 (48)	4 (4.3%) 48-68 (61)	0	5 (5.3%)
Total Collected by Age	1 (1.1%)	30 (31.9%)	63 (67.0%)	0 (0.0%)	94

Smolt-to-Adult Return Estimates

The fall Chinook salmon run reconstruction estimates from 2009 – 2014 (Young et al. 2012, 2014, 2015), expanded for trapping rates at Lower Granite Dam and estimated contributions in the ocean and Columbia River fisheries (as reported to RMPC) from NPTH and associated acclimation site releases are provided in Table 11 and Figure 18. The 2009 and 2010 release groups had similar and the lowest SARs back to the Snake River and ranged between 0.23% and 0.38%. The highest SARs occurred for the 2008 release groups and ranged between 0.88% for the NPTH group and 1.46% NLV group. The highest harvest rates for the 2008 releases was also observed for the NLV 2008 release group with a calculated SAS of 2.07%. Ocean and freshwater harvest rates for the all release groups were fairly proportional to the SARs back to the Snake River (Table 11, Figure 18).

The lowest FCAP subyearling SARs and SASs was observed for the 2009 release groups with Pittsburg Landing having the lowest average SAR at 0.13% with Captain John and Big Canyon only slightly higher at 0.24% (Table 12, Figure 19). The highest SARs also were seen for the 2008 releases across all acclimation sites with Captain John release group having the highest average SAR and SAS (1.63% and 2.26%, respectively). Harvest rates between release sites across all year were similar and proportional to SARs back to the Snake River (Figure 19).

Table 11. 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 2008-2010 (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	SARs (%) to Snake	Total SASs %
North Lapwai Valley	2008	167,976	590	441	2,451	3,482	1.46	2.07
Cedar Flats	2008	99,641	309	13	1,027	1,349	1.03	1.35
Lukes Gulch	2008	99,456	213	7	1,383	1,603	1.39	1.61
NPTH	2008	249,827	558	393	2,186	3,137	0.88	1.26
North Lapwai Valley	2009	280,079	53	29	702	784	0.25	0.28
Cedar Flats	2009	196,600	80	45	438	563	0.23	0.29
Lukes Gulch	2009	196,511	68	23	626	717	0.32	0.37
NPTH	2009	272,475	62	44	1,025	1,131	0.38	0.42
North Lapwai Valley	2010	264,005	268	154	702	1,124	0.27	0.43
Cedar Flats	2010	172,869	117	113	438	668	0.25	0.39
Lukes Gulch	2010	197,336	249	226	626	1,101	0.32	0.56
NPTH	2010	298,810	590	365	1,025	1,980	0.34	0.66

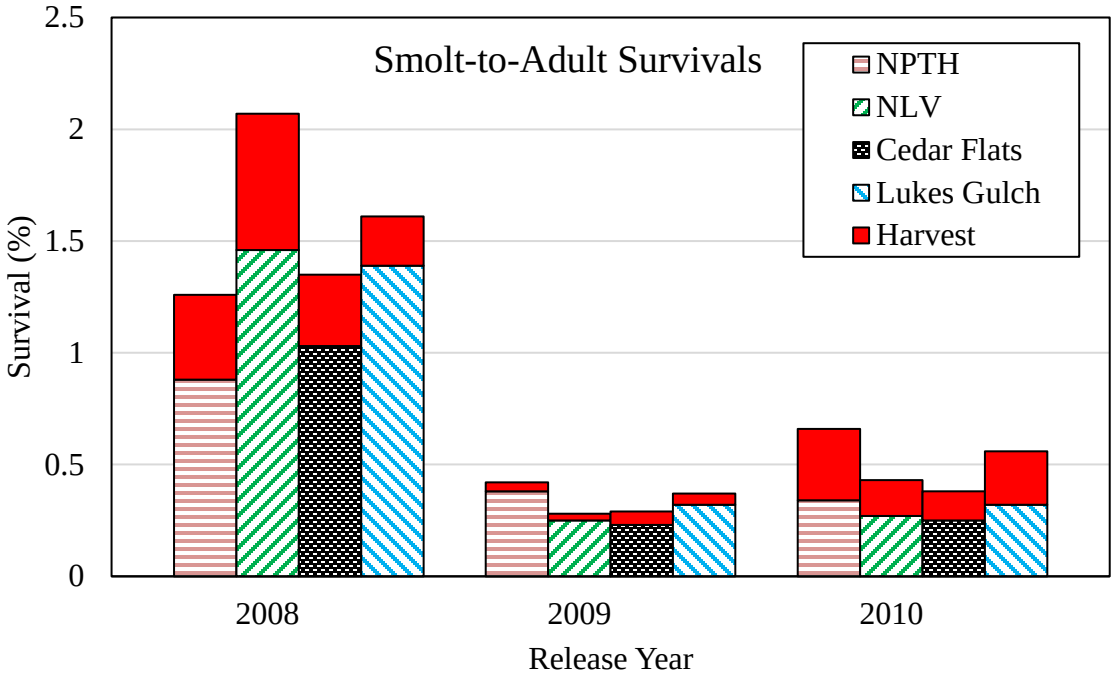

Figure 18. Fall Chinook salmon smolt-to-adult returns (SARs) to the Snake River plus ocean and freshwater harvest estimates (in red) for total smolt-to-adult survivals (SASs) from juvenile subyearling releases at Nez Perce Tribal Hatchery (NPTH) and associated acclimation sites at North Lapwai Valley (NLV), Cedar Flats, and Lukes Gulch (includes 1-ocean fish).

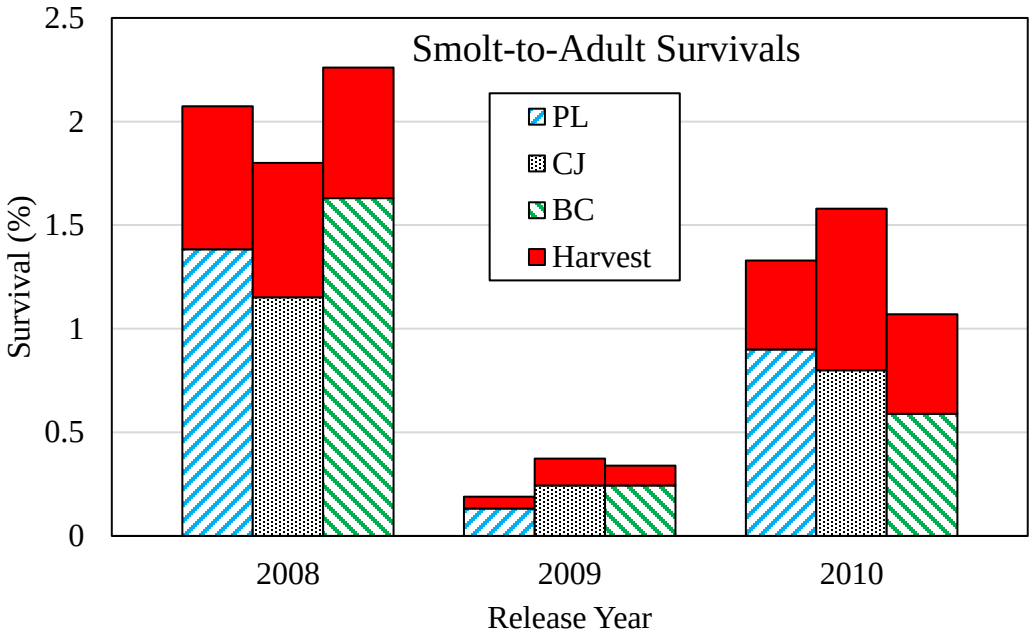

Figure 19. Fall Chinook salmon smolt-to-adult returns (SARs) to the Snake River plus ocean and freshwater harvest estimates (in red) for total smolt-to-adult survivals (SASs) from juvenile subyearling releases from the Fall Chinook Acclimation Project (FCAP) at Pittsburg Landing (PL), Captain John Rapids (CJ), and at Big Canyon Creek (BC) acclimation sites (includes 1-ocean fish).

Table 12. Estimated fall Chinook Salmon smolt-to-adult survivals (SASs) for the Fall Chinook Acclimation Project (FCAP) subyearling acclimated releases from 2008-2010 (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/strategy	Release year	Total # coded wire tags	Total # coded wire tags + ad-clipped	CWT code	Total Ocean Fisheries recoveries	Total Freshwater Fisheries recoveries	Total Snake R. recoveries	Grand Total recoveries	SARs (%) to Snake	Total SASs (%)
Pittsburg Landing	2008	99,802	-	612522	270	12	1,206	1,488	1.21	1.49
Pittsburg Landing	2008	-	99,371	612519	507	586	1,550	2,643	1.56	2.66
Captain Johns	2008	98,734	-	612521	183	0	778	961	0.79	0.97
Captain Johns	2008	-	98,282	612518	507	586	1,492	2,585	1.52	2.63
Big Canyon	2008	99,367	-	612520	270	10	1,416	1,696	1.43	1.71
Big Canyon	2008	-	98,903	612517	581	389	1,902	2,872	1.92	2.90
Pittsburg Landing	2009	99,727	-	610184	31	0	55	86	0.06	0.09
Pittsburg Landing	2009	-	95,227	610181	43	40	203	286	0.21	0.30
Captain Johns	2009	99,521	-	610183	32	5	199	236	0.20	0.24
Captain Johns	2009	-	100,383	610180	131	91	288	510	0.29	0.51
Big Canyon	2009	99,332	-	610182	35	3	191	229	0.19	0.23
Big Canyon	2009	-	100,093	610179	78	77	294	449	0.29	0.45

Table 12. Continued.

Release Location/strategy	Release year	Total # coded wire tags	Total # coded wire tags + ad-clipped	CWT code	Total Ocean Fisheries recoveries	Total Freshwater Fisheries recoveries	Total Snake R. recoveries	Grand Total recoveries	SARs (%) to Snake	Total SASs (%)
Pittsburg Landing	2010	100,619	-	220310	197	15	815	1,027	0.81	1.02
Pittsburg Landing	2010	-	101,302	220311	276	386	807	1,469	0.80	1.45
Captain Johns	2010	102,167	-	220308	360	90	834	1,284	0.82	1.26
Captain Johns	2010	-	100,778	220309	422	704	785	1,911	0.78	1.90
Big Canyon	2010	101,207	-	220306	238	20	603	861	0.60	0.85
Big Canyon	2010	-	100,461	220307	279	432	595	1,306	0.59	1.30

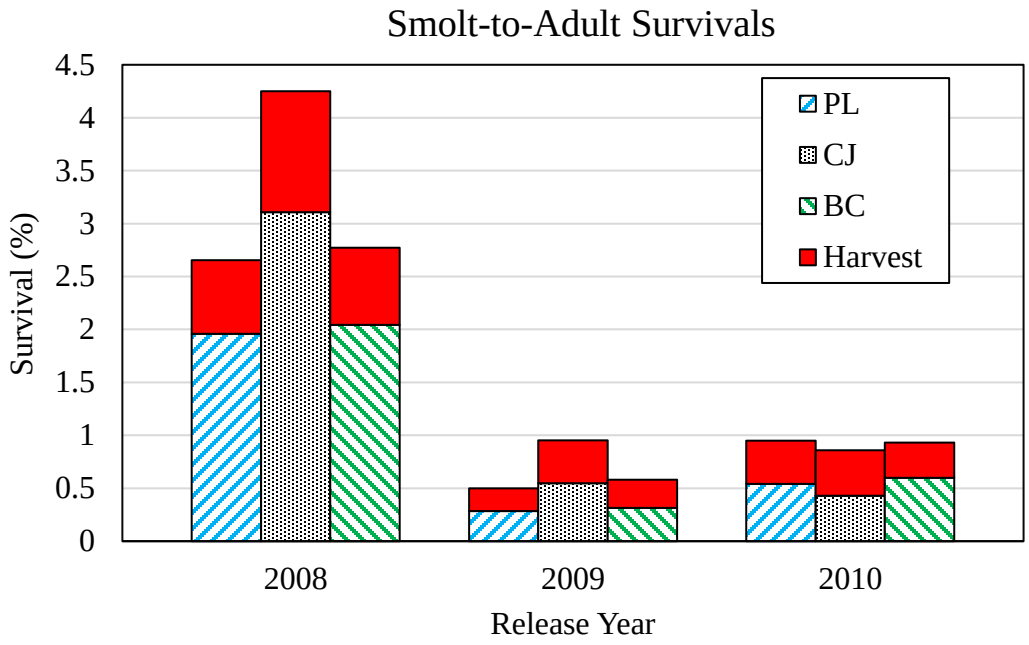

Figure 20. Fall Chinook salmon smolt-to-adult returns (SARs) to the Snake River plus ocean and freshwater harvest estimates (in red) for total smolt-to-adult survivals (SASs) from juvenile yearling releases from the Fall Chinook Acclimation Project (FCAP) at Pittsburg Landing (PL), Captain John Rapids (CJ), and at Big Canyon Creek (BC) acclimation sites (includes 1-ocean fish).

The highest average FCAP yearling SAR and SAS was also for the 2008 release groups with Captain John having the highest average SAR of 3.1% back to the Snake River and also the highest average harvest rate of 1.1%, for a total SAS of 4.2% (Table 13, Figure 20). For the 2009 and 2010 releases, the lowest average SAR (0.28%) was seen for the 2009 Pittsburg group with the Big Canyon 2010 release group having the highest (0.60%). Similar to the FCAP subyearling and NPTH and associated release groups, harvest rates were similar within years across all three release sites and fairly proportional to the SARs back to the Snake River (Figure 20).

Table 13. Estimated fall Chinook Salmon smolt-to-adult survivals (SASs) for the Fall Chinook Acclimation Project (FCAP) yearling acclimated releases from 2008-2010 (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 # coded wire tags + ad-clipped	CWT code	Total Ocean Fisheries recoveries	Total Freshwater Fisheries recoveries	Total Snake R. recoveries	Grand Total recoveries	SARs (%) to Snake	Total SASs (%)
Pittsburg Landing	2008	81,476	-	612515	331	0	1,676	2,007	2.06	2.46
Pittsburg Landing	2008	-	68,129	612512	401	311	1,254	1,966	1.84	2.89
Captain Johns	2008	82,934	-	612514	489	5	2,442	2,936	2.94	3.54
Captain Johns	2008	-	69,056	612511	721	519	2,283	3,523	3.31	5.10
Big Canyon	2008	77,749	-	612516	304	14	1,894	2,212	2.44	2.85
Big Canyon	2008	-	68,199	612513	474	269	1,089	1,832	1.60	2.69
Pittsburg Landing	2009	78,673	-	612754	86	0	233	319	0.30	0.41
Pittsburg Landing	2009	-	71,169	612751	153	82	193	428	0.27	0.60
Captain Johns	2009	66,821	-	612755	156	10	288	454	0.43	0.68
Captain Johns	2009	-	70,325	612752	187	205	462	854	0.66	1.21
Big Canyon	2009	80,783	-	612753	108	25	262	395	0.32	0.49
Big Canyon	2009	-	80,783	612750	191	108	245	544	0.30	0.67

Table 13. Continued.

Release Location	Release year	Total # coded wire tags	Total # coded wire tags + ad-clipped	CWT code	Total Ocean Fisheries recoveries	Total Freshwater Fisheries recoveries	Total Snake R. recoveries	Grand Total recoveries	SARs (%) to Snake	Total SASs (%)
Pittsburg Landing	2010	93,103	-	220313	148	8	436	2,163	0.47	2.32
Pittsburg Landing	2010	-	69,415	220316	261	253	434	948	0.63	1.37
Captain Johns	2010	80,830	-	220314	166	4	298	468	0.37	3.54
Captain Johns	2010	-	71,407	220315	170	320	361	851	0.51	1.19
Big Canyon	2010	89,325	-	220312	121	11	422	554	0.47	2.85
Big Canyon	2010	-	71,096	220317	201	199	545	945	0.77	1.33

Hatchery Spawning

Fall Chinook adults are 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. Water temperatures were favorable for trapping on August 18 and NPTH staff began hauling that same day. The last haul date from LGR was October 1 when enough broodstock was thought to be hauled. Later in the spawn season to ensure enough brood, a total of 21 female and 20 male gametes were transferred from LFH to NPTH which were all originally trapped at LGR. Also, a total of three males and one female was transferred to NPTH from Dworshak National Fish Hatchery (DNFH) that volunteered into the adult fish ladder.

A total of 942 fall Chinook were processed at NPTH during 2014 which consisted of 515 females and 423 males from LGR and one female and three males from DNFH, which are shown together for females processed and spawned (Appendix C) and males processed and spawned (Appendix D). There were a total of 413 females used for broodstock, 78 died in the pond prior to spawning, and 25 were green or the eggs not viable (labeled as KO or killed outright in Appendix C). One female that died in pond prior to spawning was identified as a Crooked River summer Chinook by coded wire tag. A total of 319 males were used for broodstock, 33 died in the pond prior to spawning, and 74 were killed outright and not used for brood (Appendix D).

The greatest broodstock contribution of females (n=162 or 39.2%) was unmarked/untagged fish with a subyearling emigration life history scale pattern (Appendix C). The unmarked/untagged unknown origin fish contains natural or wild fish and a proportion of NPTH and NLV fish as well since not all hatchery fish are marked/tagged. NPTH and associated acclimated releases contributed 16.2% (n=67) to the brood. All yearling releases from FCAP and on-station LFH contributed 16.0% (n=66) to the broodstock. Subyearlings released from FCAP made up 9.0% (n=37) of the female brood. There were three out-of-Snake River Basin hatchery strays processed and two contributed to the female broodstock for 2014 (Appendix C).

The greatest male broodstock contribution (n=126 or 39.5%) was also unmarked/untagged subyearlings showing a subyearling emigration life history by scales (Appendix D). The NPTH and associated acclimation releases contributed 18.8% (n=60) to the brood. FCAP subyearling releases contribute 7.5% (n=24) to the brood while yearling releases from FCAP and LFH together contributed 11.0% (n=35). Some larger and older age class males were spawned up to five times with different females. A total of five out-of-Snake River Basin hatchery strays were identified and two (0.6%) were used for broodstock (Appendix D).

Total age composition of all fall Chinook salmon females used for broodstock at NPTH resulted in 86.7% age-4, 6.8% age-5, and 4.6% age-3 of fish that could be identified (Appendix C). There were no 1-ocean females processed. Total age composition of all males used for broodstock at NPTH resulted in 71.8% age-4, 20.4% age-3, and 5.6% age-5 of fish that could be identified (Appendix D). There was one 1-ocean yearling jack used for brood and two subyearling 1-ocean jacks that had a reservoir reared emigration scale pattern. There were no age-6 fall Chinook processed at NPTH during 2014.

Genetic Monitoring

Beginning in 2011, parental based tagging (PBT) was initiated at both LFH and NPTH for all broodstock. Since we were slightly short on males to spawn on a one-to-one ratio during 2014, we used the larger males multiple times in the spawning (Appendix D). The results of PBT will be a better tracking of parents to returning offspring and monitoring and evaluation of different rearing and release strategies. We also subsampled 97% (n=95) of the fall Chinook salmon carcasses collected on the spawning grounds and archived for later DNA analysis if desired and funds are available. A comprehensive genetic analysis report on NPTH broodstock and carcass recovery will be forthcoming in a later publication.

DISCUSSION

Supplementation

Fall Chinook taken for the 2013 brood at NPTH and LFH for all FCAP exceeded release goals for the 2014 releases. All fall chinook releases in 2014 were coded wire tagged and adipose fin clipped prior to release as planned, meeting target goals. A grand total of 3,572,842 fall Chinook salmon were released by the Nez Perce Tribe in 2014, the highest number since recent supplementation efforts began in the Snake River above Lower Granite Dam in 1996.

Monitoring and Evaluation

Juvenile Monitoring

Life History, Emigration Timing, and Survival Estimates

All of the FCAP and NPTH hatchery fall Chinook releases migrated at a significantly faster rate than the natural subyearling fall Chinook from the Clearwater River. Hatchery fall Chinook migration rate from release to each detection point seems to be impacted by the release location and the distance each location is from the beginning of Lower Granite Dam pool near Lewiston, Idaho. The emigration timing and life history strategies may be directly correlated with size at release, release date, and smoltification timing. PIT tag detections were sufficient for survival to be estimated to Lower Granite Dam. While survival to McNary Dam was calculated for all project hatchery fall Chinook releases, the smaller sample sizes of PIT tagged releases in 2014 from each releases site seems to have negatively impacted the precision of the SURPH estimate to McNary. The Lower Granite Dam juvenile bypass and PIT tag detectors are usually operational from late March thru the end of October, but continued operation in 2014 into mid-November. This extended operation especially enhances the emigration timing and survival estimates for the Clearwater River natural subyearling fall Chinook, providing more time and detections at Lower Granite Dam. In previous years when the PIT tag detectors are shut down on October 31, there were not yet enough detections at Lower Granite and subsequent facilities to estimate survival below Lower Granite for the natural Clearwater River releases. 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

In 2014, there was more inflow and subsequent spill at Lower Granite Dam from March to April compared to the ten year average (2004-2013), but was very consistent for the rest of 2014. Over 90% of the hatchery FCAP and NPTH releases had reached Lower Granite Dam during periods of high inflow and subsequent spill, while the majority of PIT tag detections of natural fall Chinook at the dam occurred during periods of low flow and lack of spill. 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. The colder water in the Clearwater River as compared to the Snake River during egg incubation also delays emergence from the spawning beds and subsequent growth and smoltification, further delaying emigration.

Genetic Monitoring

As mentioned earlier, because of budget constraints, we did not collect tissue samples of Chinook salmon juveniles beach seined in the lower Clearwater River during 2014. Past analysis showed a high proportion of fall Chinook, as opposed to spring and summer Chinook, collected in previous years. A genetic analysis report will be forthcoming on the natural Chinook salmon juveniles collected in previous years. Also since we are now doing PBT analysis on all Chinook salmon broodstock, we may be able to determine more accurately the composition of natural and hatchery spring, summer, or fall Chinook juveniles from beach seining in the future if that is desirable to fishery managers.

Adult Monitoring

Spawning Ground Surveys

There were a total of 6,413 fall Chinook salmon redds counted and/or estimated above Lower Granite Dam that represents the highest in the Snake River Basin since surveys began in 1988. The adult escapement above Lower Granite Dam in 2014 was estimated to be 52,989 adults which also represented the highest estimate since the lower Snake River dams were completed in 1975. The adult-to-redd ratio of 8.3 adults/redd in 2014 was higher than the previous 26 year average of 6.1 adults/redd suggesting a number of redds may have been missed in the basin. This is the second year in a row since intensive redd surveys began in the Snake River Basin in 1988 that the Clearwater River Subbasin fall Chinook redd count has exceeded the mainstem Snake River by 130 redds in 2013 and by 310 redds in 2014.

Escapement and Carcass Recoveries

Fall Chinook salmon returning to LGR in 2014 (59,502 adults and 13,962 jacks) for a total of 73,464 fish has been the highest estimate since LGR was completed in 1975. After subtracting out fish hauled to NPTH and LFH for broodstock needs, the fall Chinook escapement estimate to the spawning grounds was 52,989 adults and 12,383 jacks for a total of 65,372 fish, which was also the highest escapement estimate. Natural adults and natural jacks combined made up 25.7% of the fall Chinook escapement above Lower Granite Dam in 2014. The total carcasses collected in 2014 was low compared to redds observed in the Clearwater River Subbasin due to more effort given to the upper Clearwater spawning areas. Extra effort was given to the upper Clearwater, however, carcasses were hard to find and not as abundant as in the lower reaches where most spawning occurs.

Smolt-to-Adult Return Estimates

The 2009 and 2010 release groups all had similar and the lowest SARs back to the Snake River, except for the FCAP subyearling releases in 2010 which had much higher SARs and SASs than the NPTH and associated releases and even the FCAP yearling releases during that year. The highest SARs and SASs occurred for all 2008 release groups with the highest SAR back to the Snake River of 3.1% for the Captain John releases. Relatively high harvest rates occurred for all groups and seemed proportional to the SARs calculated back to the Snake River. Harvest rates shown are biased low because it includes only what has been reported in RMPC. However, it is obvious with these double index groups, that the non-ad-clipped groups were under-represented in the harvest by an order of magnitude. It has long been known that not all agencies conducts electronic sampling and only scans ad-clipped Chinook salmon in their sub-sampling protocols, however, this was thought to occur most often in ocean fisheries. However, we are also seeing the same trend in the reporting of the freshwater harvest rates, especially in the lower Columbia River where most fall Chinook are harvested. Investigation into possible adjusting harvest rates for the non-clipped groups will be analyzed and summarized in a later report.

Hatchery Spawning

There were a total of 413 females used for broodstock in 2014 which provided more than target number of subyearlings for 2015 releases. A total of 319 males were actually spawned and a few larger and older age class males were spawned with up to five females. Since we obtained most all brood from the Lower Granite fish trap with the exception of three males hauled from DNFH, we targeted larger (>70 cm fork length) fish which limited the number of 1-ocean fish into the brood. It was suggested that spawning older age class fish may reduce the number of returning jacks which became quite high since the hatchery programs started. Looking at the age composition of fall Chinook salmon used for broodstock at NPTH in 2014, only 1 female and 3 males were 1-ocean fish, therefore, selection of the minimum size of 70 cm seemed appropriate in eliminating jacks into the brood.

Genetic Monitoring

As mentioned earlier, parental based tagging (PBT) was initiated at both LFH and NPTH for all broodstock since 2011 and continued through 2014. The results of PBT will be a better tracking of parents to returning offspring and monitoring and evaluation of different rearing and release

strategies. Also, PBT analysis will enhance the run reconstruction process and provide more accurate estimates of the natural fall Chinook escapement above Lower Granite Dam. A comprehensive genetic analysis report on NPTH broodstock will be forthcoming in a later report.

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Appendix A. Fall Chinook salmon aerial redd surveys with new redds observed during given flight date on the Clearwater River, 2014.

RM	RKM	LANDMARK	New Redds Counted by Flight Date						
			10/13	10/15	10/27	10/29	11/17	11/19	Totals
4.5	7.2	Across From Paper Mill			1				1
6.1	9.8	Just above IDFG fish trap			2		1		3
7.3	11.7	Just above NPT Casino			5		1		6
8.5	13.7	Lower Hog Island					1		1
9.0	14.5	Middle Hog Island					2		2
10.6	17.1	Just above 95 Bridge	1						1
10.9	17.5	Island Just Above 95 Bridge			2		19		21
12.4	20.0	Above RR Bridge at Spalding					1		1
13.8	22.2	Catholic Creek			5		6		11
15.9	25.6	Below Gibbs Eddy Boat Ramp	1		3				4
16.1	25.9	Above Gibbs Eddy Boat Ramp	1						1
17.0	27.4	Lower inside Island above Gibbs					1		1
17.8	28.6	Inside bend below Myrtle	8						8
18.0	29.0	Lower Myrtle	12		35		33		80
18.3	29.4	Just above Myrtle Boat Ramp	2		16		22		40
18.9	30.4	Just below Cottonwood Island	22		3		13		38
19.3	31.1	Mid Cottonwood-Channel			15		10		25
19.9	32.0	Tip of Cottonwood Island-Hwy side	4		4		88		96
20.4	32.8	Run Below Cherry Lane Boat Ramp					18		18
20.8	33.5	Cherrylane Boat Ramp	11		155		178		344
21.4	34.4	Fir Island (Hwy 12 Side Channel)			5		7		12
21.8	35.1	Fir Island (North Main Channel)	32		310		408		750
22.2	35.7	NPTH (1705) Ladder	5		112		46		163
22.6	36.4	Just above NPTH fish ladder			109		142		251
23.0	37.0	1/2 km above NPTH fish ladder			2		25		27
23.3	37.5	Pine Creek			5		13		18
23.9	38.5	Below Thunderbird Market			52		38		90
25.1	40.4	Above Thunderbird Market			12				12
26.3	42.3	Just above Bedrock Creek	4				16		20
26.8	43.1	Above Bedrock Creek	9		3		11		23
27.4	44.1	Below Big Eddy			8		112		120
27.7	44.6	Big Eddy Tail Out	3				20		23
28.4	45.7	Rest Area			6		16		22
29.2	47.0	Lenore Boat Ramp					4		4
30.1	48.4	House on Cliff			4				4
32.0	51.5	Below Arrowhead Camp-Tree Farm	14				8		22
32.2	51.8	Below Arrowhead Camp-Tree Farm	3				4		7
32.7	52.6	Just above Arrowhead Camp	5						5
33.1	53.3	Above Arrowhead Camp	3		17		40		60
34.0	54.7	Leaning Pine Hole	10				7		17
35.0	56.3	Below Mouth of Big Canyon Cr	4						4
35.3	56.8	Below Old Peck Bridge	19		29		112		160
36.2	58.2	Above Old Peck Bridge			10		30		40
36.5	58.7	0.3 km Above Old Peck Bridge					5		5
39.1	62.9	Below Pink House Boatramp			8				8
39.6	63.7	Above Pink House Boatramp	5		2				7

Appendix A (continued).

RM	RKM	LANDMARK	New Redds Counted by Flight Date						
			10/13	10/15	10/27	10/29	11/17	11/19	Totals
40.0	64.4	Ahsahka Islands	28		26		17		71
40.1	64.5	Ahsahka Islands	10		10		65		85
40.3	64.8	Ahsahka Islands	18		40		8		66
0.2	0.3	N.F. Clearwater			1		3		4
43.7	70.3	Upper end of Airport runway						22	22
44.7	72.0	Bend above Mouth of Orofino Cr						3	3
49.4	79.5	Below Greer Bridge				2		6	8
51.6	83.0	Below Greer Bridge				4		3	7
52.3	84.2	Below Greer Bridge				1			1
52.7	84.8	Above Greer Grain Elevators				13		5	18
53.6	86.2	Above Greer Power Lines		8				8	16
62.6	100.8	Below Kamiah						7	7
63.1	101.5	Big Island below Kamiah		3		15		3	21
65.5	105.4	Below Kamiah Train Bridge						3	3
66.5	107.0	Above Kamiah Train Bridge				3			3
67.9	109.3	Just above Lawyer's Creek		2		11			13
68.7	110.5	Just below freeze-core site		6		4		1	11
71.2	114.6	Below Kooskia						1	1
72.5	116.7	Below Kooskia				3			3
74.6	120.0	Just below S.F. Clearwater River		1					1
		Totals	234	20	1017	56	1551	62	2940
		River Mile Start	4	44	4	44	4	44	
		River Mile End	44	98	44	98	44	98	
		Flow at Spalding Gauge (cfs)	3,236	NA	4,497	NA	4,039	NA	
		Avg. Temp at Spalding Gauge (^{0}C)	12.5	NA	10.6	NA	2.2	NA	
		Flow from Dworshak (cfs)	1,700	1,700	1,700	1,700	1,600	1,600	
		Flow at Orofino Gauge (cfs)	NA	1,590	NA	2,560	NA	2,860	
		Avg. Temp at Orofino Gauge (^{0}C)	NA	11.7	NA	8.8	NA	0.0	
		General Observation Conditions	Excel	Excel	Fair	Good	Good	Good	

Appendix B. Fall Chinook salmon carcasses collected in the Clearwater River by the Nez Perce Tribe, 2014 (N = no, Y = yes, U = Unknown; DNA taken: 1 = good condition, 2 = fair, 3 = poor; CWT Origin and Age keys are at end of table).

Date	Fish ID #	Fork Lth	Sex	Percent Spawned	CWT	Ad-Clip	Scales taken	DNA taken	CWT #	CWT Origin	Pit Tag	PIT tag Origin	European Age	Total Age	Origin Scale Data	Condition
11/3	14001	700	M	100	Y	Y	Y	2	220217	NPTH11SO			0.2	3	H	
11/3	14002	640	M	100	N	N	Y	2					0.2	3	U	
11/3	14003	520	M	100	Y	N	Y	2	220223	NPTH11SO			0.2	3	H	
11/3	14004	660	M	100	N	N	Y	2					0.2	3	U	
11/3	14005	645	M	100	Y	N	Y	0	220210	NPTH10SO			0.3	4	H	
11/3	14006	775	M	100	Y	N	Y	2	220210	NPTH10SO			0.3	4	H	
11/3	14007	690	M	100	N	N	Y	2					0.3	4	U	
11/3	14008	480	M	100	N	N	Y	2					1.2	4	W	RR
11/3	14009	675	M	100	N	N	Y	2					0.2	3	U	
11/3	14010	420	M	100	Y	N	Y	2	220232	NPTH12SO			0.2	3	H	
11/3	14011	780	F	100	Y	Y	Y	2	220209	NPTH10SO			R		H	
11/3	14012	795	F	100	N	N	Y	2					0.3	4	U	
11/3	14013	765	F	100	N	N	Y	2					0.3	4	U	
11/3	14014	660	M	100	N	N	Y	2					R		U	
11/3	14015	640	M	100	N	N	Y	2					1.2	4	H	SRR
11/3	14016	680	M	100	N	N	Y	2					1.2	4	W	RR
11/3	14017	610	M	100	N	N	Y	2					0.2	3	U	
11/3	14018	730	M	100	Y	N	Y	2	220210	NPTH10SO			0.3	4	H	
11/3	14019	700	M	100	Y	N	Y	2	220218	NPTH11SNLVA			0.2	3	H	
11/3	14020	500	M	100	Y	N	Y	2	220232	NPTH12SO			0.2	3	H	
11/3	14021	680	M	100	N	N	Y	2					0.2	3	U	
11/3	14022	615	M	100	N	Y	Y	2					0.3	4	H	
11/3	14023	760	F	100	Y	Y	Y	2	220117	LF10SBCA			0.3	4	H	
11/3	14024	610	M	100	N	N	N	0					R		U	
11/3	14025	790	M	100	N	N	Y	2					0.3	4	U	
11/3	14026	570	M	100	Y	N	Y	2	220331	LF11YBCA			1.2	4	H	
11/3	14027	570	M	100	Y	N	Y	2	220331	LF11YBCA			1.2	4	H	
11/3	14028	710	M	100	Y	N	Y	2	220211	NPTH10SO			1.2	4	H	

Appendix B (continued).

Date	Fish ID #	Fork Lth	Sex	Percent Spawned	CWT	Ad-Clip	Scales taken	DNA taken	CWT #	CWT Origin	Pit Tag	PIT tag Origin	European Age	Total Age	Origin Scale Data	Condition
11/3	14029	420	M	100	N	N	Y	2					1.1	3	H	SRR
11/3	14030	730	M	100	Y	N	Y	2	220210	NPTH10SO			1.2	4	H	
11/3	14031	625	M	100	Y	Y	Y	2	220215	NPTH11SLGA			0.2	3	H	
11/3	14032	760	M	100	N	N	Y	2					0.3	4	U	
11/3	14033	655	M	100	Y	Y	Y	2	220218	NPTH11SNLVA			0.2	3	H	
11/3	14034	780	F	100	N	N	Y	2					0.3	4	U	
11/3	14035	810	F	100	N	N	Y	2					0.3	4	U	
11/3	14036	670	M	100	Y	Y	Y	2	220329	LF11SBCA			0.3	4	H	
11/3	14037	715	M	100	Y	Y	Y	2	220329	LF11SBCA			0.2	3	H	
11/3	14038	595	M	100	N	N	Y	2					1.2	4	W	RR
11/3	14039	690	M	100	Y	N	Y	2	220224	NPTH11SNLVA			0.2	3	H	
11/3	14040	800	F	100	Y	Y	Y	2	220209	NPTH10SO			0.3	4	H	
11/3	14041	700	M	100	N	N	Y	2					0.3	4	U	
11/3	14042	795	F	100	Y	Y	Y	2	220117	LF10SBCA			0.3	4	H	
11/3	14043	750	M	100	Y	Y	Y	2	220209	NPTH10SO			0.3	4	H	
11/3	14044	820	M	100	Y	N	Y	2	220203	NPTH10SNLVA			0.3	4	H	
11/3	14045	720	M	100	Y	Y	Y	2	220204	NPTH10SNLVA			0.3	4	H	
11/3	14046	790	F	100	N	N	Y	2					0.3	4	U	
11/3	14047	720	M	100	Y	N	Y	2	220210	NPTH10SO			0.3	4	H	
11/3	14048	690	M	100	Y	N	Y	2	220223	NPTH11SO			0.3	4	H	
11/3	14049	665	M	100	Y	Y	N	0	220218	NPTH11SNLVA			R	3	H	
11/3	14050	725	M	100	Y	N	Y	2	220223	NPTH11SO			0.3	4	H	
11/3	14051	740	F	100	N	N	Y	2					0.3	4	U	
11/3	14052	560	M	100	Y	N	Y	2	220223	NPTH11SO			1.2	4	H	RR
11/3	14053	685	M	100	Y	Y	Y	2	220117	LF10SBCA			0.3	4	H	
11/3	14054	700	F	100	Y	Y	Y	2	220208	NPTH10SLGA			0.3	4	H	
11/3	14055	600	M	100	N	N	Y	2					0.2	3	U	
11/3	14056	700	M	100	N	N	Y	2					0.3	4	U	
11/3	14057	780	F	100	Y	N	Y	2	220118	LF10SBCA			0.3	4	H	
11/3	14058	615	M	100	N	N	Y	2					0.2	3	U	

Appendix B (continued).

Date	Fish ID #	Fork Lth	Sex	Percent Spawned	CWT	Ad-Clip	Scales taken	DNA taken	CWT #	CWT Origin	Pit Tag	PIT tag Origin	European Age	Total Age	Origin Scale Data	Condition
11/3	14059	685	M	100	N	N	Y	2					0.2	3	U	
11/3	14060	635	M	100	Y	Y	Y	2	636417	LF11SO			0.2	3	H	
11/3	14061	740	F	100	N	N	Y	2					0.3	4	U	
11/3	14062	775	M	100	Y	Y	Y	2	220117	LF10SBCA			0.3	4	H	
11/3	14063	820	F	100	Y	N	Y	2	220210	NPTH10SO			0.3	4	H	
11/3	14064	440	M	100	Y	N	Y	2	220231	NPTH12SNLVA			0.2	3	H	
11/3	14065	890	M	100	Y	Y	Y	2	220208	NPTH10SLGA			0.3	4	H	
11/3	14066	475	M	100	N	N	Y	2					1.1	3	W	RR
11/3	14067	710	M	100	Y	N	Y	2	220214	NPTH11SNLVA			0.3	4	H	
11/3	14068	725	M	100	N	N	Y	2					0.2	3	U	
11/6	14069	730	M	100	N	N	Y	2			3D9.1C2DD0BA4A	LF11SDWORCRSUR	0.3	4	H	
11/6	14070	830	F	100	N	N	Y	2			3DD.00773B5285	BONNADULT	R		U	
11/6	14071	600	M	100	Y	Y	Y	2	220217	NPTH11SO			0.2	3	H	
11/6	14072	770	M	100	N	N	Y	2					0.3	4	U	
11/6	14073	870	F	100	Y	N	Y	2	220203	NPTH10SNLVA			0.3	4	H	
11/6	14074	860	F	100	N	N	Y	2					0.3	4	U	
11/6	14075	765	M	100	N	N	Y	2					0.3	4	U	
11/6	14076	760	F	100	Y	N	Y	2	220209	NPTH10SO			0.3	4	H	
11/6	14077	790	F	100	N	N	Y	2					0.3	4	U	
11/6	14078	870	M	100	Y	N	Y	2	220205	NPTH10SCFA			0.3	4	H	
11/6	14079	790	F	100	N	N	Y	2					1.2	4	H	SRR
11/6	14080	680	M	100	Y	N	Y	2	220224	NPTH11SNLVA			0.2	3	H	
11/6	14081	480	M	100	Y	N	Y	2	220231	NPTH12SNLVA			R		H	
11/6	14082	775	M	100	Y	Y	Y	2	220209	NPTH10SO			0.3	4	H	
11/6	14083	760	F	100	Y	N	Y	2	220203	NPTH10SNLVA			0.3	4	H	
11/6	14084	660	M	100	Y	Y	Y	2	220329	LF11SBCA			0.2	3	H	
11/6	14085	575	M	100	N	N	Y	2					0.2	3	U	
11/6	14086	680	M	100	N	N	Y	2					1.2	4	W	RR
11/6	14087	685	M	100	Y	N	Y	2	220203	NPTH10SNLVA			0.2	3	H	
11/6	14088	815	F	100	N	N	Y	2					0.3	4	U	

Appendix B (continued).

Date	Fish ID #	Fork Lth	Sex	Percent Spawned	CWT	Ad-Clip	Scales taken	DNA taken	CWT #	CWT Origin	Pit Tag	PIT tag Origin	European Age	Total Age	Origin Scale Data	Condition
11/6	14089	705	M	100	N	N	Y	2					R		U	
11/6	14090	755	M	100	N	N	Y	2					0.3	4	U	
11/6	14091	750	M	100	N	N	Y	2					0.3	4	U	
11/6	14092	690	M	100	Y	Y	Y	2	220326	LF11SCJA			0.2	3	H	
11/6	14093	780	F	100	N	N	Y	2					1.2	4	H	SRR
11/6	14094	750	F	100	Y	N	Y	2	220203	NPTH10SNLVA			0.3	4	H	
11/6	14095	740	F	100	Y	N	Y	2	220210	NPTH10SO			0.3	4	H	
11/6	14096	670	M	100	N	N	Y	2					0.2	3	U	
11/6	14097	865	F	100	Y	Y	Y	2	220205	NPTH10SCFA			0.3	4	H	
11/6	14098	790	F	100	Y	N	Y	2	220210	NPTH10SO			0.3	4	H	

***European 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, R = regenerated scales that could not be read. Origin scale data: W = wild or natural, H = hatchery, U = unknown. Condition: SRR = hatchery reservoir reared, RR = wild/natural that reservoir reared.

***Origin key** (from CWT or PIT tag): LF = Lyons Ferry Hatchery, NPTH = Nez Perce Tribal Hatchery, 09 = 2009 broodyear, 10 = 2010 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, NLVA = North Lapwai Valley acclimated release, LGA = Lukes Gulch Acclimation release, CFA = Cedar Flats Acclimation release, DWORCR = Dworshak subyearling surrogate release in Clearwater, 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,

Appendix C. Fall Chinook salmon female origin, broodyear, and life history summary of fish hauled from Lower Granite Dam that were processed at NPTH with total of each origin spawned for 2014 broodstock (origins from coded wire tags, passive integrated transponder (PIT) tags, adipose fin clips, and scale readings; SP = spawned, DIP = died in pond prior to spawning, KO = killed outright and not used for broodstock i.e. non-viable or green eggs).

Origins of Females (N = 516 processed)	Brood Yr	Hauled from Lower Granite Dam Females (n = 516)			Total Spawned/ Total (413/516)
		SP	DIP	KO	
NPTH (on-station release)	09	1		1	
subyearling emigration	10	27	6	3	28/38
NPTH-North Lapwai Valley	09	2			
release subyearling emigration	10	9	1	1	11/13
NPTH-Lukes Gulch release					
subyearling emigration	10	14	3		14/17
NPTH-Cedar Flats release					
subyearling emigration	10	14	3	2	14/19
	09	1			
Big Canyon subyearlings	10	9	4		
subyearling emigration	11	1			11/15
	09	1			
Captain John subyearlings	10	13	2	2	
subyearling emigration	11	1			15/19
Pittsburg L. subyearlings	10	10	2		
subyearling emigration	11	1		1	11/14
Hells Canyon Dam (IPC) direct	10	3	1		
subyearling emigration	11	3			6/7
LFH on-station subyearlings					
subyearling emigration	10	4			4/4
Snake R. Couse Creek direct	10	10	1		
subyearling emigration	11		1		10/12
Grande Ronde direct	10	2			
subyearling emigration	11	3			5/5
	09		1		
LFH subs-Snake R surrogates	10	9	4		
(Corps study) suby emigration	11	1			10/15
LFH subs-Clearwater R surrogates	10				
(Corps study) suby emigration	10	6		1	6/7
LFH subs-Clearwater R surrogates	09			1	
(Corps study) reservoir reared	10	1	1		1/3
Snake R (Pit tag-LGR)	09	1			
subyearling emigration	10	3			4/4
Snake R (Pit tag-LGR)	09	2			
subyearling reservoir reared	10	1			3/3

Appendix C (continued).

Origins of Females (N = 515 processed)	Brood Yr	Hauled from Lower Granite Dam Females (n = 516) SP	DIP	KO	Total Spawned/ Total (413/516)
Wild/Natural reservoir reared (by scales)	10	4			4/4
Unmarked/untagged subyearlings subyearling emigration*	09	12	5		162/198
	10	144	27	2	
	11	6	2		
Big Canyon yearlings	09			1	11/15
	10	11	3		
Captain John yearlings	09	1			15/15
	10	14			
Pittsburg Landing yearlings	09	5	1		20/26
	10	15	2	3	
LFH on-station yearlings	10	20	1		20/21
Umatilla Hatchery yearling stray	10			3	0/3
Umatilla Hatchery subyearling stray	09	1			1/1
Priest Rapids Hatchery subyearling stray	10	1		1	1/2
Unmarked/untagged hatchery yearlings (by scales)	09			1	1/2
	10	1			
Unknown hatchery (lost wire) no ad-clip subyearling emigration	10	1	1		1/2
Unknown hatchery (lost wire) ad-clip subyearling emigration	11	1			1/1
Unknown hatchery (lost wire) no ad-clip emigration unknown	?	1			1/1
Unknown hatchery (ad-clip only) subyearling emigration	09	1			15/19
	10	12	2	2	
	11	2			
Crooked River Summer Chinook (wire only)	10		1		
Unknown origin (no wire, clips) emigration unknown	?	7	3		8/9
Female Totals (by broodyear)	09	28	7	4	28/39
	10	358	65	20	358/443
	11	19	3	1	19/23
	?	8	3	0	8/11
Females Grand Total		413	78	25	413/516

*Contains one 2010 BY female hauled from DNFH that was spawned.

Appendix D. Fall Chinook salmon male origin, broodyear, and life history summary of fish hauled from Lower Granite Dam that were processed at NPTH with total of each origin spawned for 2014 broodstock (origins from coded wire tags, passive integrated transponder (PIT) tags, adipose fin clips, and scale readings; SP = spawned, DIP = died in pond prior to spawning, KO = killed outright and not used for broodstock).

Origins of Males (N = 426 processed)	Brood Yr	Hauled from Lower Granite Dam Males (n = 426) SP	DIP	KO	Total Spawned/ Total (319/426)
NPTH (on-station release) subyearling emigration	09	1			
	10	23		3	
	11	6			30/33
NPTH (on-station release) reservoir reared					
	10	1			1/1
NPTH-North Lapwai Valley release subyearling emigration	10	12			
	11	4	1	1	16/18
NPTH-Lukes Gulch release subyearling emigration	10	4	2	1	
	11	2			6/9
NPTH-Cedar Flats release subyearling emigration*	10	4		1	
	11	2			6/7
Big Canyon subyearlings subyearling emigration	10	8	1		
	11	2	1	3	10/15
Captain John subyearlings subyearling emigration	10	2	1	1	
	11	4	1	3	6/12
Pittsburg L. subyearlings subyearling emigration	10	1		1	
	11	7	1	2	8/12
Hells Canyon Dam (IPC) direct subyearling emigration	10	1	1		
	11	5			6/7
LFH on-station subyearlings subyearling emigration	10	2			
	11	1		1	3/4
Snake R. Couse Creek direct subyearling emigration	10	6		1	
	11	2		1	8/10
Grande Ronde direct subyearling emigration	10	1		1	
	11	1		3	2/6
Snake R (Pit tag-LGR) subyearling emigration	09	2			
	10	4			
	11		1		6/7
Snake R (Pit tag-LGR) natural suby reservoir reared (by scales)	09	1			
	10	1			2/2
LFH subs-Snake R surrogates (Corps study) sub emigration	09	1			
	10	9			10/10
LFH subs-Clearwater R surrogates (Corps study) reservoir reared	10	2		1	
	11	1	1		3/5

Appendix D (continued).

Origins of Males (N = 426 processed)	Brood Yr	Hauled from Lower Granite Dam Males (n = 426) SP	DIP	KO	Total Spawned/ Total (319/426)
LFH subs-Clearwater R surrogates (Corps study) suby emigration*	10	7	1	1	7/9
Unmarked/untagged subyearlings subyearling emigration	09	7	1		
	10	98	9	21	
	11	21	3	12	126/172
Unmarked/untagged subyearlings reservoir reared	09		1		
	10	2	1		
	11	1		1	3/6
Big Canyon yearlings	09	1			
	10	8		4	
	11	1			10/14
Captain John yearlings	10	11	1		11/12
Pittsburg Landing yearlings	09	2			
	10	6			8/8
LFH on-station yearlings	09	1			
	10	5		4	6/10
Umatilla Hatchery yearling stray (by wire, ad-clip)	10	2		3	2/5
Umatilla Hatchery subyearling stray (by wire, ad-clip)	10			1	0/1
Unknown hatchery subyearling (ad-clip) lost wire	11	1			1/1
Unknown hatchery subyearling (no ad-clip) lost wire	10	1		1	1/1
Unknown hatchery subyearling (ad-clip) no wire	09	1			
	10	7	3	1	
	11	4		1	12/17
Unknown hatchery yearling (by scales)	09	1			
	10	1			2/2
Unknown origin (no marks, tags) emigration unknown	?	7	2		7/9
Male Totals (by broodyear)	09	18	2	0	18/20
	10	229	20	46	229/295
	11	65	9	28	65/102
	?	7	2	0	7/9
Males Grand Total		319	33	74	319/426

*Contains one 2011 BY Cedar Flats, and two 2010 BY Clearwater surrogate males that were trapped and hauled from DNFH and were spawned at NPTH.