2013

Yankee Fork Salmon River Chinook Salmon Run Report

Lytle P. Denny, William S. Youmans, and David J. Evans

Shoshone-Bannock Tribes

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Annual Report

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ABSTRACT

The Shoshone-Bannock Tribes initiated a Chinook salmon (*Oncorhynchus tshawytscha*) reintroduction project in Yankee Fork Salmon River, Idaho to assist in returning 2,000 adults to meet Tribal harvest and conservation objectives. The Tribes installed a temporary picket weir near Pole Flat Campground on June 13. Overall, 294 Chinook salmon were trapped in 2013, of which 85.4% were natural-origin and 14.6% hatchery-origin. Natural adults were released above the weir for natural spawning and 43 hatchery adults were outplanted above a secondary weir for natural spawning. Five Mile weir was installed on June 18 as a barrier to downstream migration only. An additional 281 hatchery-origin fish were obtained from Sawtooth Fish Hatchery and successfully outplanted into upper Yankee Fork. Tribal harvest accounted for the mortality of seven fish, three natural-origin and four hatchery outplants. Intensive spawning ground surveys were completed from August 13 – October 21 and 112 redds were observed. Using mark-recapture techniques we estimate 355 (±47) fish passed Pole Flat weir for an overall trapping efficiency of 82.05%. We observed 11 redds below Pole Flat weir.

PROGRAM PERSONNEL

Personnel included Lytle Denny, Manager/Biologist, William Youmans, Biologist, David Evans, Biologist, Carlos Lopez, Sr. Technician III, Rocco Chacon Jr., Technician II, and the following seasonal technicians: Michael Pahvitse, Joi Thomas, Noah Suppah, Jeremy Broncho, James Moss, Sheldon Small, Keith Moore, and Brodee Adakai.

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The Shoshone-Bannock Tribes (Tribes) provided the administrative framework and support for the Yankee Fork Chinook Salmon Program (YFCSP) to be successful. We are thankful to those individuals within the Tribal government that assisted us in one way or another, which enabled us to be successful. We would like to thank the Fort Hall Business Council for their continued program support. We are also thankful to have a leader like Chad Colter, which understands the complexities we face trying to implement such a vast program, located so far away from home (e.g., Fort Hall, Idaho). Lastly, we would like to thank everyone that worked for us, especially our technicians, for their dedication and sacrifice, as it can be extremely difficult working away from home and being away from your family for extended periods of time.

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In addition, we must thank the following agencies which supported the YFCSP including the U.S. Forest Service, U.S. Fish and Wildlife Service, Bonneville Power Administration, and National Oceanic and Atmospheric Administration (NOAA).

INTRODUCTION

Yankee Fork of the Salmon River (Yankee Fork) is an important spawning and rearing catchment for spring- and summer-run Chinook salmon (*Oncorhynchus tshawytscha*). Historically, the system supported a large Tribal Chinook salmon fishery (Reiser and Ramey 1987), but this fishery dwindled as the number of Chinook salmon returning to the Yankee Fork decline as a result of out-of-basin factors (e.g., hyrdropower). This ultimately resulted in a significant impact to Tribal cultural and subsistence-based linkages.

It cannot be understated how important it is to the Tribes to be able to harvest Chinook salmon in Yankee Fork, and throughout the Salmon River basin for that matter. Prior to the 1970's, Tribal Chinook salmon fisheries occurred throughout the Salmon River basin, managed soley under the authority of the Fort Bridger Treaty of July 3, 1868 (Treaty). During this period of time, Tribal salmon fisheries targeted naturally produced salmon. Throughout the 1970s, Chinook salmon hunting opportunities could be considered in flux, and towards the end of the 1970's, most salmon runs in Idaho, including Yankee Fork were at high risk of extinction.

By the 1980's, the majority of Chinook salmon runs in Idaho were fully depressed and Tribal harvest opportunities were severely constrained. During this period of time, the Tribes identified sanctuary and non-sanctuary (i.e., fishery) areas. Sanctuary areas included most, if not all of the natural production areas (e.g., Middle Fork), while fishery areas included places like Yankee Fork, the upper Salmon River, East Fork Salmon River, and the South Fork Salmon River; essentially where hatchery fish were released. As a result, numerous Tribal members grew accustomed to hunting Chinook salmon in these designated fishery areas. Very few Chinook salmon were harvested in this time period, with the exception of the occasional "bathtub" fisheries. The "bathtub" fisheries were nothing more than directed harvest, in a controlled environment, on hatchery fish outplanted in Yankee Fork and Panther Creek.

By the 1990's, Tribal fisherman use patterns fully transitioned to the hatchery fishery areas (e.g., South Fork Salmon River, upper Salmon River) and natural production fisheries were constrained to help rebuild these runs. Tribal fishing effort and harvest reached an all-time low, and policy directives focused on rebuilding habitat and restoring natural fish populations.

By the 2000's, Chinook salmon returns started to increase, especially hatchery returns. This peaked Tribal interest in fishing and provided a significant change in fishing opportunity, but the larger runs (relatively speaking) were short lived. During this period, Tribal members continued to focus their fishing efforts in the hatchery influenced areas, because natural fish were still not very abundant. Fisheries targeting natural-origin Chinook salmon gained popularity again, because fish could be found, and because of the cultural aspect these fisheries provided. In this era, Tribal policy makers directed attention to implementing an artificial propagation program in Yankee Fork that could

help offset Tribal harvest needs. In response, the Tribes developed the YFCSP to increase the number of Chinook salmon returning to Yankee Fork.

In 2004, NOAA, IDFG, and the Tribes agreed to initiate the YFCSP after a full review of the historic and current adult abundance trends, the artificial propagation history, regional plans, and management objectives. When planning the YFCSP, the Tribes, NOAA, and IDFG met on numerous occasions to ensure the artificial propagation strategy would meet each agencies goals and objectives. There was broad consensus to reintroduce a more closely related stock in Yankee Fork, rather than try and propagate the extant stock that was functionally extirpated, since the extant stock was identified to be highly differentiated genetically, but this likely reflected the outplanting of Rapid River stock in this tributary (ICTRT 2003). This group further determined the appropriate donor stock would need to be from the upper Salmon River and likely hatchery-origin, since all other natural-origin populations were at high risk of extinction. Hatchery stock from Sawtooth FH was identified as the appropriate source since it is located 31.7 rkm upriver from Yankee Fork. The group further agreed that the reintroduction effort would occur over the next several years and focus on a strategy of outplanting hatchery smolts and pre-spawn adults, then shifting to local broodstock collection within Yankee Fork, on adults returning from these efforts.

Project Background

The first juvenile smolt release associated with the YFCSP occurred in April 2006 and the first pre-spawn adult release occurred in July 2008 (Denny and Tardy 2010). Weir operations were initiated in 2008 along with intensive spawning ground surveys and harvest monitoring. A rotary screw trap was installed to monitor juvenile production in 2009 (Tardy and Denny 2010) and a PIT tag array was installed in lower Yankee Fork in 2012 (Denny et al 2012). In 2008, the Tribes also began developing plans to construct Crystal Springs Fish Hatchery (Crystal Springs) to propagate spring Chinook salmon for the YFCSP. The design for Crystal Springs also includes a permanent satellite facility which includes a permanent weir and adult holding ponds.

From 2008 – 2012, a total of 619 Chinook salmon have been trapped at Pole Flat weir (Table 1), of which 321 fish were natural-origin and 298 were hatchery-origin. However, of the 298 hatchery-origin fish trapped, 62% (n = 185) were trapped in 2008. In contrast, hatchery fish only account for 37% of the yearly return. Of the 321 natural-origin fish trapped, 50.5% were trapped in 2012. Overall, natural-origin fish account for 63% of the yearly return.

The largest number of fish trapped occurred in 2008, with 228 adults, of which 43 were natural and 185 were hatchery-origin. The fewest number of adults trapped occurred in 2010, with only 17 natural-origin adults. Since initiating adult trapping, the natural-origin fish return has consistently remained below the ICTRT viability threshold of 500 spawners. However, adult returns from broodyear (BY) 2008 and 2009 indicate the YFCSP is successfully increasing the number of natural-origin adults.

Table 1. Number and percentage of natural and hatchery-origin Chinook salmon trapped at Pole Flat weir from 2008 – 2012.

Year	Natural		Hatchery		Total
	n	%	*n*	%	
2008	43	18.9	185	81.1	228
2009	29	59.2	20	40.8	49
2010	17	100	0	0	17
2011	70	54.7	58	45.3	128
2012	162	82.2	35	17.8	197
Total	**321**		**298**		**619**
Average	**64.2**	**63**	**59.6**	**37**	**123.8**
St. Err.	**26.0**	**13.7**	**32.8**	**13.7**	**40.8**

Far fewer females tend to return to Yankee Fork than males. From 2008 – 2012, the average percentage of males returning to Yankee Fork is 63.8%, while the average return of females is 36.2% (Table 2). The overall sex ratio of males returning to Yankee Fork has ranged from a low of 51% in 2009 to a high of 86.7% in 2011. The overall female sex ratio has ranged from a low of 13.3% in 2011 to a high of 49% in 2009. The average natural-origin fish sex ratio is 66.4% male to 33.6% female. The average hatchery-origin fish sex ratio is 60.1% male to 39.9% female. It is likely the sex ratios are skewed towards males solely because Pole Flat weir is a picket style weir and typically installed after the run is already in progress and females tend to return earlier than males.

Table 2. Sex ratio of natural and natural Chinook salmon trapped at Pole Flat weir from 2008 – 2012.

	Natural		Hatchery		Total	
Year	% Males	% Females	% Males	% Females	% Males	% Females
2008	65.1	34.9	48.6	51.4	51.8	48.2
2009	55.2	44.8	45.0	55.0	51.0	49.0
2010	76.5	23.5			76.5	23.5
2011	75.7	24.3	100.0	0.0	86.7	13.3
2012	59.4	40.6	46.7	53.5	53.1	47.0
Average	**66.4**	**33.6**	**60.08**	**39.98**	**63.8**	**36.2**
St. Err	**4.3**	**4.3**	**13.3**	**13.3**	**7.4**	**7.5**

In 2013, the Tribes planned to operate two portable picket weirs to enumerate returning adult Chinook salmon, operate a rotary screw trap to monitor and measure juvenile life-stage abundance and survival, conduct harvest monitoring to determine how many fish were caught, conduct intensive spawning ground surveys to document spawning success, distribution, and effectiveness of spawners. This report covers the methods and results from YFCSP activities in 2013.

Program Phases, Goals, and Objectives

The number of adult Chinook salmon returning from program operations is the basis for determining whether management actions are successful. The long-term goal is to return 2,000 adult Chinook salmon to the Yankee Fork for broodstock, harvest, and natural production objectives. To accomplish this, the program has three implementation phases: (1) reintroduction; (2) propagation; and (3) conservation. Each phase has different goals and objectives and currently the YFCSP is implementing phase one reintroduction.

The first phase of this program is to reintroduce a closely adapted Chinook salmon stock in Yankee Fork. Numerous non-local stocks have been outplanted in Yankee Fork resulting in extremely poor productivity and severely low natural-origin adult abundance. The natural stock in Yankee Fork is believed to be functionally extirpated and Sawtooth (hatchery stock) was chosen as the source population for the reintroduction effort. Note, that Sawtooth obtained broodstock from mining the natural-origin Chinook salmon population returning to the upper Salmon River. Phase one reintroduction is accomplished by annually releasing hatchery fish (juveniles or adults) and allowing such fish to spawn naturally when they return to Yankee Fork, promoting local adaptation through natural processes. The goal of this phase is to return 1,000 adults (hatchery and natural) to Yankee Fork annually. We plan to meet this adult return goal by releasing 200,000 – 400,000 smolts (depending upon availability) and outplanting up to 1,500 pre-spawn adults. The adult return goal will be measured annually by the number of hatchery adults that return from smolt outplants and the number of naturally produced adults that return from outplants or naturally spawning fish. Phase one efforts will cease when the five year average adult abundance exceeds >1,000 natural and hatchery adults combined. In this phase, the Tribes may collect adults in Yankee Fork as a contingency plan for meeting the broodstock objective, when insufficient adults return to Sawtooth to meet both program needs.

In phase two, the program will terminate the outplanting of Sawtooth stock (juveniles and adults) and shift to collecting broodstock in the Yankee Fork from locally-adapted Chinook salmon returning from phase one efforts. The goal of this phase is to return 2,000 adults (hatchery and natural) annually and will be accomplished by releasing up to 600,000 smolts, contingent upon construction of the Crystal Springs Fish Hatchery and whether the facility is fully operational. The adult return goal will be measured annually by the number of hatchery adults that return from smolt outplants and the number of naturally produced adults that return from naturally spawning fish. A broodstock management sliding-scale schedule will be developed to determine the appropriate number of adults to release above the weirs for natural spawning, which meets the cultural objective of having fish spawn naturally. It is anticipated that a satellite facility will be constructed in Yankee Fork to fully accommodate adult trapping, holding, and spawning. The Tribes are anticipating constructing the satellite facility in 2015.

During phase one and two efforts, the Tribes plan to implement a detailed research, monitoring, and evaluation plan (Denny et al. 2012) to address management questions, provide status and trend monitoring, and to measure adult and juvenile abundance, survival, productivity, distribution, and diversity. If the Tribes determine that Chinook

salmon abundance and productivity reaches a point where the harvest and cultural objectives can be met through natural production, then the Tribes will consider implementing a "true" conservation program, which is our phase three plan.

Regardless of phase, the Tribes will continue to manage harvest in Yankee Fork according to the Tribal Resource Management Plan (TRMP) (Denny et al. 2010). The goal of the TRMP is to provide population specific harvest management of Chinook salmon in a manner that promotes recovery of the listed species while protecting, preserving, and enhancing rights reserved under the Treaty and any inherent rights. Annual harvest guidelines will be developed for natural and hatchery-origin Chinook salmon following the harvest rate schedules in the TRMP and harvest monitoring will be conducted to determine overall catch and harvest impact rates.

Study Area

Yankee Fork is located in the Salmon–Challis National Forest near Stanley, Idaho (Figure 1). The Yankee Fork flows through narrow canyons and moderately wide valleys with forest of lodgepole pine (*Pinus contorta*) (Richards and Cernera 1989). The Yankee Fork flows 41.8 kilometers (km) from north to south and enters the upper Salmon River at rkm 590.6. The Yankee Fork headwaters originate at an elevation of 2,500 m and the watershed enters the upper Salmon River at an elevation of 1,880 m. The drainage is composed of 313.8 km^2 and includes Yankee Fork proper and West Fork Yankee Fork (largest tributary), followed by other notable tributaries including Ramey, Cearly, Lightning, Cabin, Jordan, Five Mile, Greylock, and Eight Mile creeks. Average annual precipitation is roughly 68.6 cm, base flows are approximately 1.13 cubic meters per second (m^3s^{-1}), and mean flows are 6.99 m^3s^{-1}. Most of the system is characterized by highly erosive sandy and clay-loam soils.

Gold was discovered in the area in the 1800s, 1930s, and 1950s which prompted human settlements and as such mining has become part of the rich history in Yankee Fork. Mining activities resulted in the complete re-channeling of lower portions of the Yankee Fork from Jordan Creek to Pole Flat Campground and the deposition of extensive unconsolidated dredge piles. The dredged portion of the Yankee Fork floodplain is sparsely vegetated with long sections containing riparian habitat only near the stream and bank interface. However, most of the Yankee Fork watershed remains in good condition for the production of fish.

Within the entire drainage, the number of redds have ranged from over 600 in 1960's (Pollard 1985), to less than 10 in 1980's (Konopacky et al. 1986), to zero in 1984 and 1995 (Figure 20). Chinook salmon destined to the Yankee Fork enter the Columbia River during March through May, with spawning occurring in August and September (Bjornn 1960). Chinook salmon are exceptionally large fish, found to be comprised of primarily age^4 to age^5 adults having fork lengths exceeding 81 cm (Bjornn et al. 1964). Egg incubation extends into December, with emergence occurring in February or March (Reiser and Ramey 1987). Juveniles rear in freshwater until the spring (March-April) of their second year, prior to migrating to the ocean generally at a length of 100-130 mm (Bjornn 1960). The YFCSP has documented that the majority of juveniles leave Yankee

Fork as a pre-smolt with a much smaller percentage leaving as smolts (Tardy and Denny 2011).

Other fish species present in the Yankee Fork include bull trout (*Salvelinus confluentus*), westslope cutthroat trout (*O. clarki lewisii*), steelhead trout (*O. mykiss*), mountain whitefish (*Prosopium williamsoni*), shorthead sculpin (*Cottus confuses*), and mountain sucker (*Catostomus platyrhynchus*) (Richards and Cernera 1989).

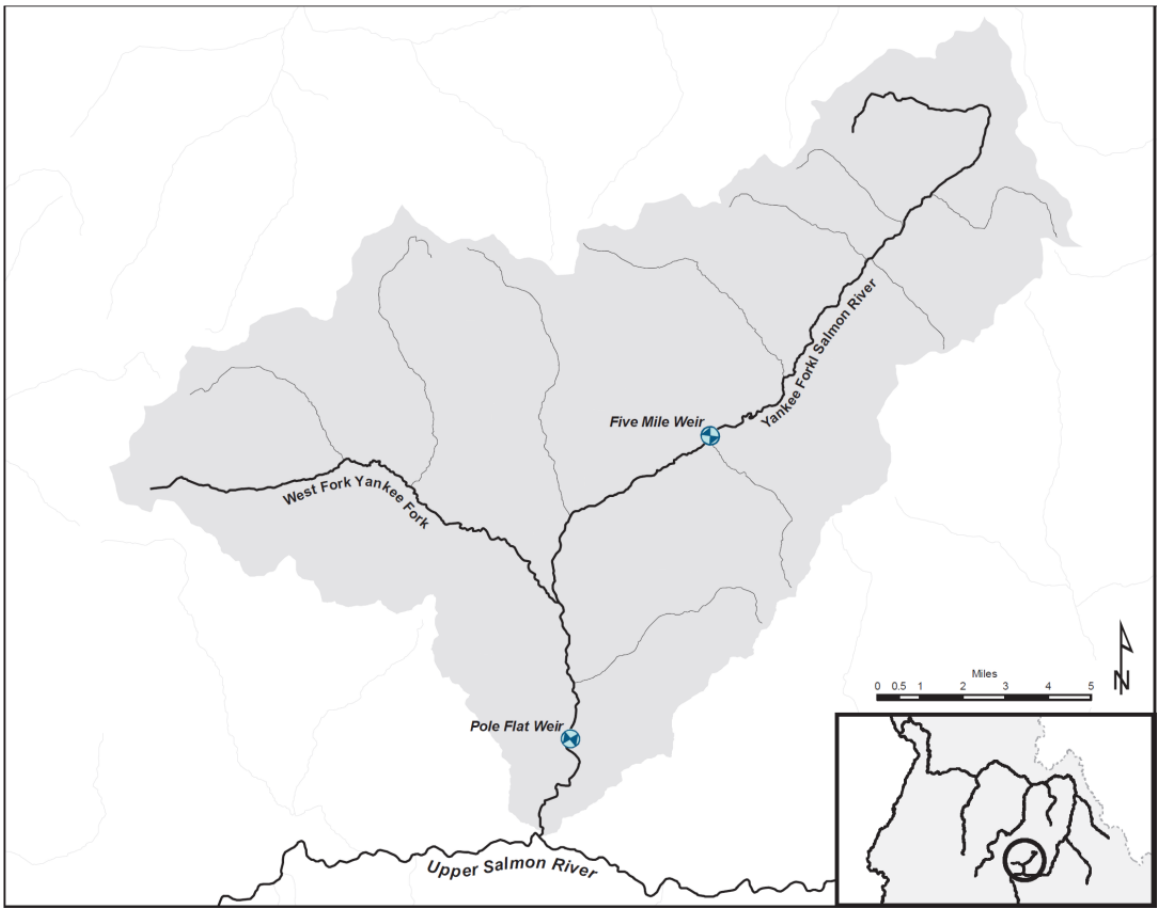


Figure 1. Map of Yankee Fork Salmon River, Idaho, displaying weir locations.

SMOLT RELEASE AND ACCLIMATION STUDY

The annual smolt release target is based upon an agreed-to sliding-scale production table developed specifically to address smolt release targets for the YFCSP and Sawtooth FH. The BY 11 smolt release objective was set at 200,000 juveniles however there were insufficient returns to Yankee Fork and Sawtooth FH in 2011 to collect broodstock for the YFCSP. Therefore, no smolts were released in 2013.

Juvenile Trapping

The Tribes installed a rotary screw trap (screw trap) in Yankee Fork in 2013 to monitor and evaluate yearling and subyearling juvenile Chinook salmon produced from BY 2011 and 2012.

The screw trap was installed on April 11 and removed on November 13. During spring run-off and while hatchery smolts were being released, the screw trap was temporarily removed. The screw trap was located approximately 5.0 rkm upstream from the confluence with the Salmon River (Figure 2). The screw trap was operated to enumerate BY 2010 yearling and BY 2011 sub-yearling migrants. BY 2010 yearling estimates were derived from data acquired on fish trapped during April 11 through May 31, which were greater than 70 mm fork length. BY 2011 subyearling estimates were derived from data acquired from on fish trapped from April 11 through May 31, which were less than 70 mm fork length, and all fish trapped from June 1 to November 13.

The screw trap is a fish monitoring device consisting of two floating pontoons, a rotating cylindrical corkscrew cone (1.5 m diameter), a live-well, and a clean-out drum (Figure 2). The screw trap was attached to a cable suspension system consisting of 5 cm braided steel cable spanning approximately 20 m across the river, connected to a large conifer stump on the west bank of the river and a live conifer on the east bank. The screw trap was attached to the main cable system using a cinch block pulley connected to a 15 m cable which is attached to each pontoon islet (Figure 2). The cinch block pulley allows the trap to be adjusted laterally across the stream thalweg.

Figure 2. Yankee Fork rotary screw trap, May 17, 2012.

Juvenile Chinook salmon and steelhead were processed following standard program protocols. The screw trap was checked on a daily basis between 07:00 – 11:00 hours.

Evident non-target species were enumerated, recorded, and released directly downstream of the trap with minimal handling. The daily catch of juvenile Chinook salmon was loaded into several 18.9 L buckets filled with fresh river water and transported to our tagging trailer consisting of a a 7' x 16' enclosed utility trailer. Each bucket of fish contained fresh river water and fitted with a Frabil© bucket aerator to increase oxygenation. Temperature and staff gauge measurements were recorded at the screw trap.

Our trapping protocol was established to conduct mark-recapture trials on two groups of fish; those ≥ 70 mm fork length and those ≤69 mm fork length. Fish ≤69 mm fork length are typically too small to tag with PIT tags and are therefore batch marked with a stain/dye, whereas fish ≥ 70 mm fork length are tagged with PIT tags. We set a daily target to PIT tag at 20 juvenile Chinook salmon per day. Biological data were acquired from all PIT tagged fish, including fork length (1.0 mm), weight (0.01 g), and tissue sampled. PIT tagged juveniles were released 1 rkm upstream of the trap at Maternity Hole for mark-recapture analysis of trap efficiency. Recaptured PIT tagged fish were transported to the downstream release site at Pole Camp Creek. During fish handling, mortalities were recorded as either the result of trapping or handling. If the mortality was a PIT tagged individual, the tag was recollected prior to disposing of the mortality downstream of the trap.

On Mondays, Wednesdays, and Fridays, juveniles ≤ 69 mm fork length were enumerated, sub-sampled for biological data (20 individuals), and used in a mark-recapture trial to estimate trap efficiency for this size class. Batch marking was completed by holding these fish for 45 minutes in Bismark Brown stain. These fish were then released 1.0 rkm upstream of the screw trap at Maternity Hole. Similar procedures were followed for recaptured fish from these trials as described above for PIT tag recaptured fish. On Tuesdays, Thursdays, Saturdays, and Sundays, juveniles ≤ 69 mm fork length were only enumerated and immediately released 0.2 rkm downstream of the screw trap near Pole Camp Creek.

The YFCSP used a fish tagging trailer to which is equipped with plug in outlets and two overhead florescent lights powered by a 3300 cc Honda generator (Figure 3). The trailer is outfitted with two storage cabinets set above a countertop fitted with a 15" x 15" sink and drain. Two storage cabinets reside below the countertop for additional storage. A laptop computer was plugged into the power outlet and connected to a Destron© loop-style PIT tag detector and reader. The sink was utilized as a basin for anesthetizing fish. Approximately 6.3 L of water was placed into the sink basin and treated with 0.5 ml of a 50:50 eugenol and water solution. Water containing anesthetic was drained into an 18.9 L bucket placed below the sink drain. During periods of inclement weather, the trailer was heated by a 18.7 L propane cylinder fitted with a heating element.

Figure 3. Yankee Fork screw trap tagging trailer.

Low trapping efficiency prevented us from capturing high enough numbers of fish to accomplish our program tagging quotas. Our staff made multiple attempts to increase trapping efficiency by adjusting the east/west positioning of the trap; however, high flows often impeded our ability to move the trap without compromising the safety of our crew.

From April 21 through May 9, the screw trap was not fishing due to high flows that prevented our team from safely boarding the screw trap and adjusting the east/west orientation (Figure 2). On May 9, flows receded to a level at which we were able to attempt adjusting the trap for higher trapping efficiency and return the trap to fishing status. An additional pulley was placed on the main cable approximately 5 m from the west bank, and a 10 mm Cordura© rope ran through the pulley and back to the east bank conifer, to anchor the trap in the thalweg, and to assist lateral movement of the screw trap. The trap was adjusted into a position that allowed our crew to safely board and monitor trapping efforts daily. However, the screw trap continued to fish poorly in the high flows and trapping efficiency was not increased. High flows continued through May and into the third week of June. From the period of April 11 through June, only 15 juvenile Chinook salmon were trapped. On June 25, we recorded the first recapture event of the 2012 juvenile trapping season.

During the month of July, flows receded quickly and trapping efficiency improved. However, nearly all fish trapped were juvenile steelhead trout or Chinook salmon $\leq$ 65 mm fork length. Flows receded to a point where staff had to raise the cone 6” on July 22 to keep the cone from grounding out on the stream substrate. We also positioned the screw trap 3 m closer to the east bank and the cone up another 6” on August 1. After raising the cone another 2” on August 9, and minimal improvement in trapping

efficiency, the Tribes were forced to consider a new strategy to improve screw trap efficiency. On August 10, a river rock fyke was built from the west bank to the left edge of screw trap, and a 2' x 4' steel panel placed from the east bank to the right edge of the trap, thus channeling the majority of flow directly into the cone of the screw trap. Additionally, our crew dug out substrate underneath the cone and pontoons of the trap to allow the cone to be lowered into its full fishing potential.

The adjustments on August 10 produced immediate improvements to trapping efficiency, but for the remainder of August and most of September, trapping continued to produce mainly juvenile steelhead trout and Chinook salmon ≤ 65 mm. On September 26, our crew again dug out substrate below the trap in an attempt to increase the number of cone revolutions per minute. Trapping efficiency improved dramatically and we were able to meet trapping protocols accordingly. For the remainder of the 2012 trapping season, all juvenile Chinook ≥ 65 mm fork length were PIT tagged and released 1 rkm above the screw trap at Maternity Hole.

In 2012, there were 1,587 juvenile Chinook salmon captured in screw trap operations with six (0.39%) mortalities recorded. Captures were slightly down from 1,625 juvenile Chinook salmon in 2011 and down significantly from the 34,706 juvenile Chinook salmon captured in 2010. A total of 627 juveniles were PIT tagged and tissue sampled for mark-recapture purposes and/or parental-based tagging, respectively. Of the 627 juveniles PIT tagged, 72 were recaptured, for an overall trap efficiency of 0.114 ± 0.014. This was an improvement to trap efficiency achieved in 2011 (0.06 ± 0.021) and mainly the results of screw trap modifications later in the season. However, the majority of recaptured fish were from the pre-smolt life history type.

The Tribes used the Peterson estimator (Chapman 1951) to estimate the number of juvenile Chinook moving past the screw trap by life stage (e.g., fry), where broodyear specific life-stage survival (S_t) is equal to the total number of juvenile Chinook salmon marked (M) times the total number of fish captured (C), divided by the total number of marked fish recaptured (R), as

$$S_t = \left[\frac{(M+1)(C+1)}{(R+1)}\right] - 1$$

Where M is equal to the sum of the number of fish marked daily (M_d) and released above the screw trap, as

$$M = \sum M_d$$

Where C is equal to the sum of the total number of fish captured daily (C_d), as

$$C = \sum C_d$$

Where R is equal to the sum of the number of marked fish recaptured daily (R_d), as

$$R = \sum R_d$$

The Tribes estimate 143 (± 183) BY10 smolts, 1,423 (± 1,547) BY11 parr, and 12,101 (± 2,543) BY11 pre-smolts migrated past the screw trap from April 11 through November 13. Due to insufficient recaptures, an overall estimate of BY11 fry migrants could not be calculated. Our overall minimum estimate for the 2012 juvenile migration season is 13,525 Chinook salmon juveniles.

Of the 1,587 juvenile Chinook salmon captured, 11 were BY 10 smolt (0.7%), two were BY 11 fry (0.1%), 88 were BY 11 parr (5.5%), and 1,486 were BY 11 pre-smolt (93.6%) (Figure 4). All 11 BY 10 smolts were PIT tagged, but none of these fish were recaptured. We did not mark the two BY 11 fry. Of the 88 BY 11 parr captured, approximately 31 were PIT tagged and one was recaptured. Of the 1,486 BY 11 pre-smolts captured, approximately 585 were PIT tagged and 71 recaptured.

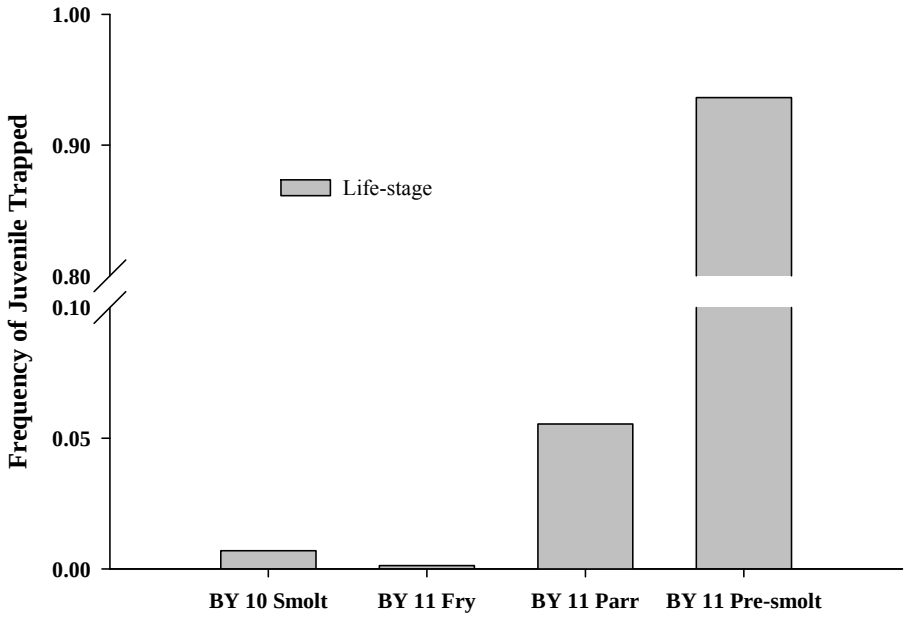


Figure 4. Frequency of life-stage specific juvenile Chinook salmon observed at the screw trap.

The overall movement of juvenile fish was highly skewed towards the pre-smolt life stage (Figure 5). As indicated above, we had difficulty operating the trap during high spring flows and this likely influenced our perception of fish movement by life-stage. However, our data suggests the 10^{th}, 50^{th}, and 90^{th} percentile of fish movement was observed on September 28, October 17, and October 26, respectively.

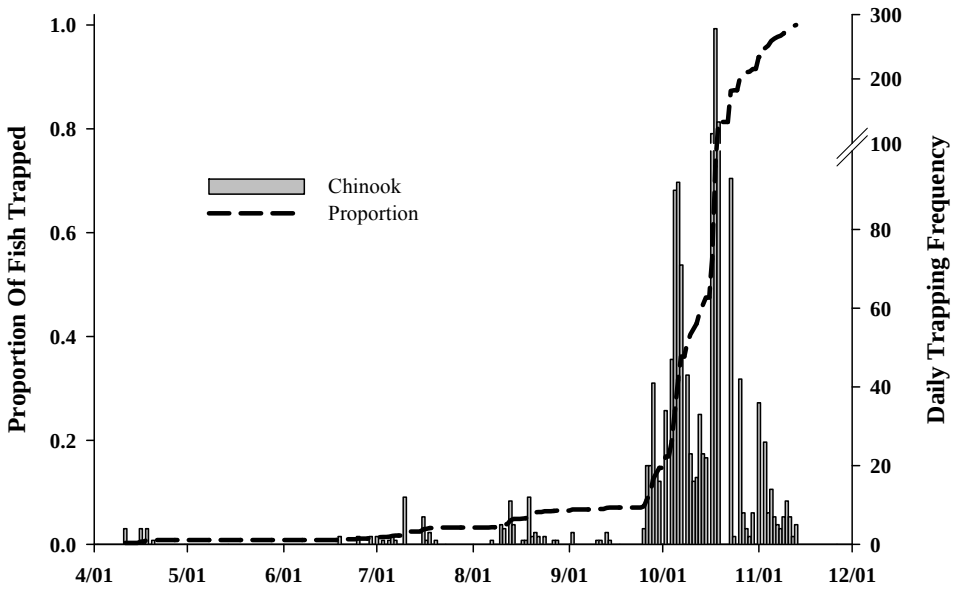


Figure 5. Daily trapping frequency and proportion of juvenile Chinook salmon observed at the screw trap.

Length weight relationships were derived for all juveniles migrating in 2012. The relationships were derived using the fish growth formula (Murphy et al. 1991).

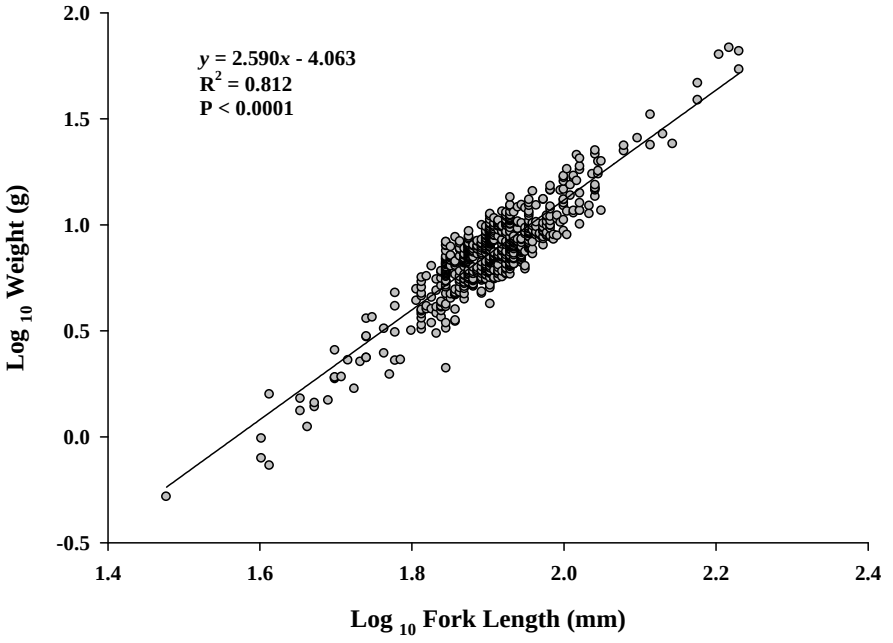
$$W = aL^b$$

Where *W* is weight, *L* is length, and *a* and *b* are parameters (i.e., *a* is the regression intercept and *b* is the regression slope). The parameters *a* and *b* were estimated by a linear regression of logarithmically transformed weight - length data. When weight and length data are transformed, the curvilinear relation between weight and length becomes "straightened", which allows for estimation of *a* and *b* by means of linear regression procedures. We used the formula $y = mx + b$ to find the slope of the linear regression to solve for *m*, which is equated to the slope *b* in the equation $W = aL^b$.

In general, *b* less than 3.0 represents fish that become less rotund as length increases and *b* greater than 3.0 represents fish that become more rotund as length increases. These are both examples of allometric growth. For most species and populations, *b* is greater than 3.0. If *b* equals 3.0, fish growth may be isometric, meaning that the shape does not change as the fish grows.

The length-weight relationship for all life stages of migrating juvenile Chinook in 2012 was significant (Figure 6). The *b* value of 2.59 indicates negative allometric growth, meaning that Yankee Fork juvenile Chinook salmon are becoming progressively thinner with increasing length; however, this does not necessarily indicate the low slope is the result of prey size or abundance deficiencies (Halseth et al., 1990). Although a low *b* factor indicates a fish has less cross sectional area per unit length than a high *b* value fish,

in salmonids, the *b* factor represents a streamlining body type, important for swimming function in higher velocity current (Jones et al. 1999). Ultimately, juvenile Chinook salmon in Yankee Fork exhibited exponential growth and this relationship was significant.



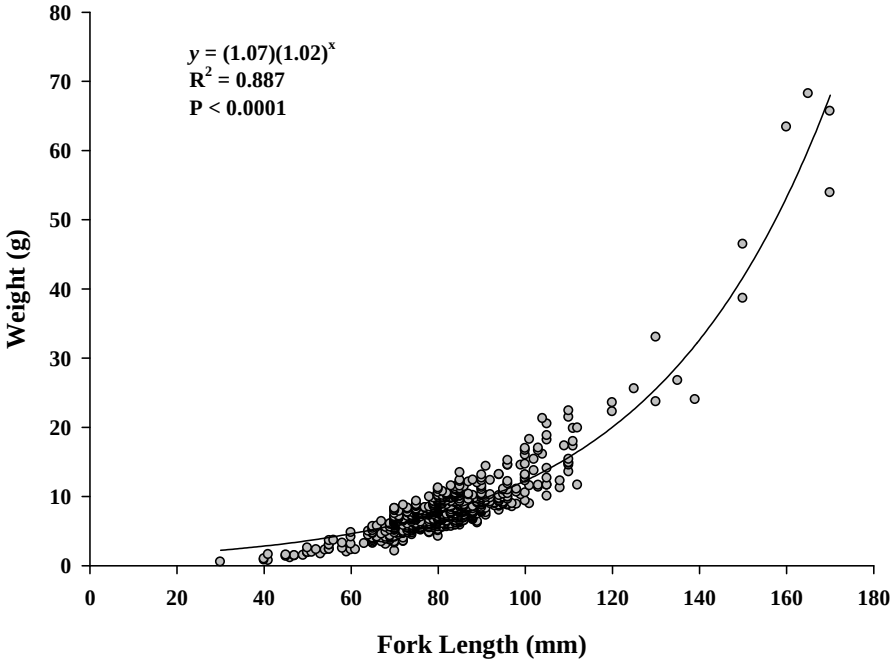


Figure 6. Length-weight relationship of juvenile Chinook salmon observed at the screw trap.

The length frequency of juvenile Chinook salmon ranged from 30 to 170 mm fork length and averaged 81.6 mm. (Figure 7). The majority of juveniles captured ranged from 76 –

80 cm fork length. A total of 10 juveniles were greater than 126 cm fork length. Due to trapping protocols, the length frequency data is likely biased for fish ≤ 65 cm fork length, since the majority of these fish were not handled.

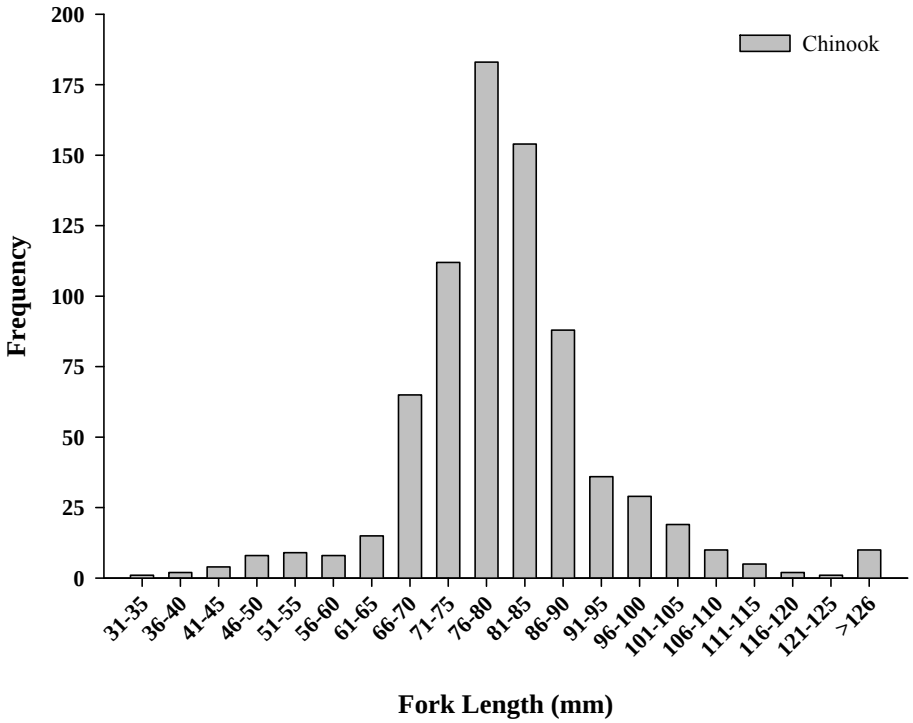


Figure 7. Length frequency of juvenile Chinook salmon.

We examined the fork length, weight, and condition factor of brood-year specific juvenile Chinook salmon emigrants (Figure 8). The overall fork length of each migrant group was not significantly different. Although BY 10 smolts exhibited slightly higher fork lengths, they were not significantly different than BY 11 parr or pre-smolt. However, BY 11 smolts exhibit less variability in fork length than did BY 11 parr. BY 11 parr exhibited a wide range of fork lengths indicating they are putting on significant growth during this period of time (i.e., June 1 – August 31). BY 11 pre-smolts exhibited less variable fork lengths, similar to BY 10 smolts, indicating that growth during this period of time is also minimal (i.e., September 1 – end of trapping). Each migrant group appeared to emigrate after reaching a weight of 8 grams (Figure 8). Consistent with our length data, we did not see a significant difference in weight between groups. BY 10 smolts and BY 11 pre-smolts are nearly the exact same weight at time of emigration, even though BY 10 smolts are slightly longer. This indicates that additional length is acquired during the overwinter stage, but no additional weight is gained. We looked at condition factor (*C*) of each migrant group. There was no significant difference in condition factor between migrant type. However, the mean condition factor for BY 10 smolts was lower than all other migrant types. The BY 11 pre-smolt migrant type exhibited the highest condition factor, although this relationship was not significant.

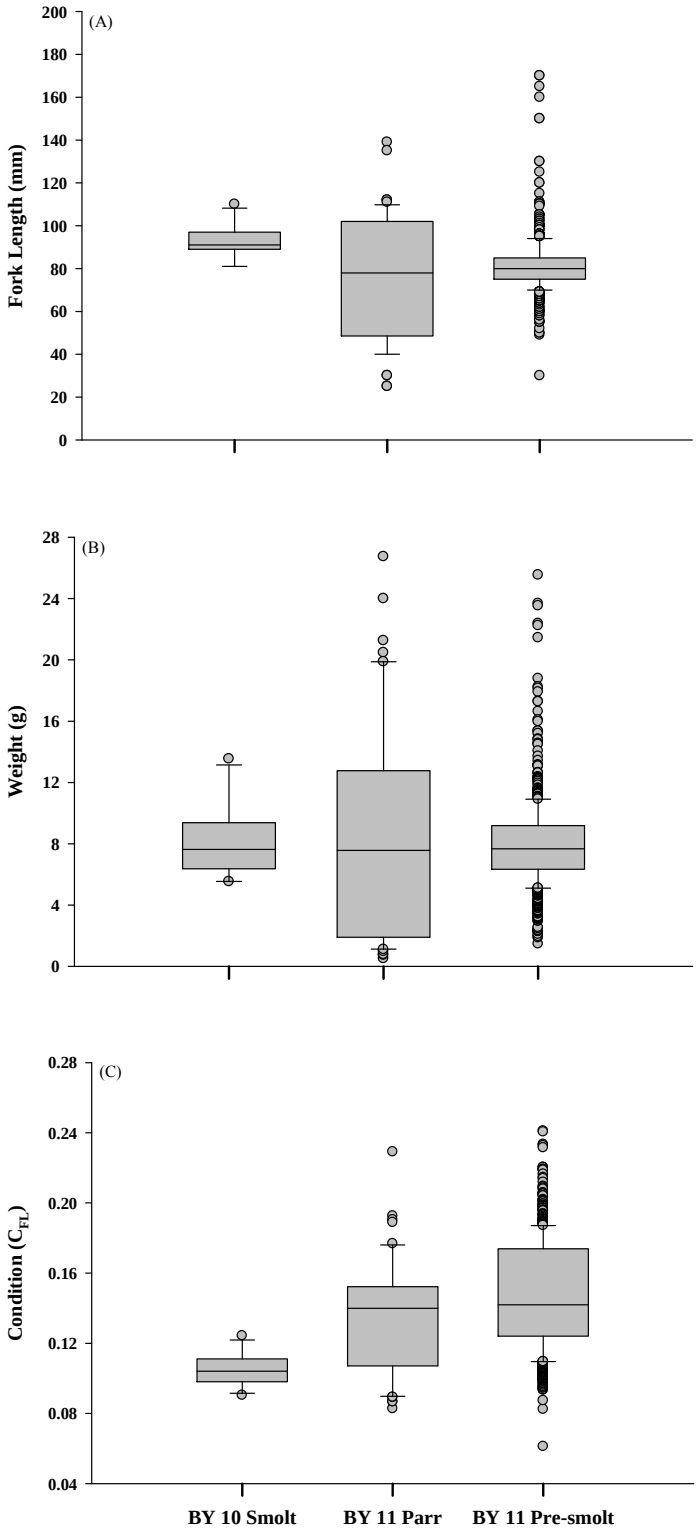


Figure 8. Fork length (mm) (a), weight (g) (b), and condition (C) of juvenile Chinook salmon. Box plots show the 10th, 25th, 50th, 75th, and 90th percentiles, and individual data points outside the 10th and 90th percentiles.

ADULT TRAPPING

The Tribes installed two portable picket weirs in Yankee Fork to manage the adult Chinook salmon return. Pole Flat weir was installed to enumerate all adult Chinook salmon that enter the catchment. Natural-origin fish trapped at Pole Flat weir were directly released above the weir after biological data was collected. Five Mile weir was installed to serve as a blocking weir to prevent outplanted hatchery-origin adults from moving downstream and spawning in undesirable locations.

Pole Flat Weir

Pole Flat weir is located approximately 5.22 rkm upstream from the confluence with the Salmon River (Figure 9). Pole Flat weir is a temporary structure consisting of two v-shaped picket weirs attached to an in-stream fish trap which supports a dry work station (Figure 9) (Denny et al. 2013). Given that, YFCSP personnel are responsible for safely installing and removing this device and each year we must balance safety with trap efficiency (i.e., number of fish trapped/escapement). We've determined that Pole Flat weir can be safely installed around ~14.2 m^3s^{-1} (~500 cfs) and therefore, YFCSP personnel track streamflows at the USGS gage station during June and July to determine when to schedule installation.

In 2013, Pole Flat weir was installed on June 13 when discharge reached 9.968 m^3s^{-1} (352 cfs). The weir was installed 20 m downstream of the 2012 site, in a location where the channel is deeper and thalweg more pronounced (Figure 9). We hypothesized this would improve trapping ability and allow us to maintain adequate water depth for holding fish in a low water year.

Over the past several years, YFCSP personnel have made annual modifications to improve trapping operations. Our first modifications occurred during the 2008 trapping season and included constructing additional picket weir panels, a larger in-stream trap box with a trapping device (Denny et al. 2010). These modifications immediately improved trapping operations; however salmon were able to jump out of the trap box or escape downstream through the fish trapping device. In addition, this in-stream trap box was difficult to enter and fish processing was slow. In 2009, we completely rebuilt the fish trap and trapping device (Tardy and Denny 2010). The new trap box worked much better, but the trapping device was still not fully containing fish. In 2010, we determined that a tapered proboscis and dry workstation would improve trapping configurations and fish handling (Tardy and Denny 2011). In 2011, we added a catwalk and two in-stream live-wells (Tardy and Denny 2012) and the device seemed to be working properly. However, from 2009 – 2011, very few adults were trapped to effectively test these configurations. In 2012, the numbers of fish increased and we quickly noticed that adult salmon were not getting trapped very effectively. We believed this issue was the direct result of the length of the entryway into the fish trap. Since trapping was already in progress, we removed the proboscis, shorted the device, and adjusted attraction flow (Denny et al. 2013). We observed immediate results and trapping continued under these configurations for the duration of the 2012 season. However, in 2012 we trapped more

bull trout and salmon than the previous three years and in doing so observed disproportionate normal mortality rates for smaller size fish (<45 cm).

Modifications were made to Pole Flat weir in 2013 primarily to decrease mortality on smaller migratory fish, to increase attraction flow at the entrance of the fish trap, and to improve the entryway into the fishtrap. To accomplish this, the panel on the downstream side of the trap box was completely rebuilt. The major change in the new panel included pre-drilling picket holes at 3.8 cm on the center as compared to 5.1 cm in the previous panel. We also shorted the v-shaped entryway to the fish trap, which reduced the overall length of the trapping device.

With these new configurations, the v-shaped picket weir was used to funnel upstream migrating adult Chinook salmon and non-target species to the inlet of the fish trap. We equipped the weir with a dry workstation to improve fish handling and stress (Figure 9). The workstation was supplied with a locked jobox, cooler, table, measuring board, and several buckets. The locked jobox contained a hand-held PIT tag reader, CWT wand, DNA vials, balance, batteries, eugenol, multiple O_2 diffusers, clipboard, data sheets, and hole punch.

We used two in-stream recovery live-wells to resuscitate and temporarily hold adult fish (Figure 9). Natural-origin adults were gently placed into the upstream live-well, through the bottomless bucket, and allowed to volitionally leave through an upstream or lateral 12.7 cm passage way. The downstream live-well was used to hold hatchery-origin adults until we were ready to transport them upstream above the Five Mile weir.

Pole Flat weir was checked on a daily basis, typically between 08:00 – 12:00 hours, for newly trapped Chinook salmon and non-target species. All fish were individually netted and transferred to an insulated cooler holding 75.6 L of fresh river water. Fish were anesthetized in the cooler using a 50:50 solution of eugenol and water. Approximately 1 ml of solution per 18.9 L of water was used to anesthetize fish.

Chinook salmon and non-target species were visually examined for phenotypic characteristics and to collect morphometric data. Each fish was visually examined to determine gender, measured to the nearest 0.5 cm, weighed to the nearest 0.1 kg, inspected for fin-clips, pre-existing marks, and injuries, scanned for external and internal tags, and sampled for tissue. The tissue sample was taken from the right operculum with a paper punch. The operculum punch also served as a mark, indicating the fish was trapped at Pole Flat weir and part of our mark-recapture evaluation for estimating total escapement above the weir. All natural-origin Chinook salmon were volitionally or directly released by hand above Pole Flat weir for natural spawning.

Hatchery-origin Chinook salmon were held in a recovery tub or placed in the live-well (depending upon quantity) and ultimately transported above Five Mile weir and released for natural spawning. Hatchery-origin fish were individually loaded into a fish tank mounted on a ¾ ton pick-up truck or loaded into larger cooler with river water. The decision to use the tank or cooler depended upon the quantity of salmon to be transported.

The fish tank contained one 1363.8 L compartment, a circulating pump, and was supplied with pure oxygen through a stone diffuser to increase oxygenation. The fish tank was filled with fresh river water directly pumped from Yankee Fork with a two horsepower water pump. IHOT guidelines were followed for transporting adult fish, which is approximately 0.45 kg of fish per 4.5 L of water. The cooler contained 94.5 L of fresh river water and was supplied with two – four oxygen diffusers.

The YFCSP has noticed an increase in the number of bull trout returning to the Yankee Fork. With the monitoring infrastructure already in place, we decided to PIT tag adult bull trout in 2013 to help us acquire information on residency, abundance, age structure, and migration timing. Ultimately, bull trout were handled similar to natural-origin Chinook salmon and released above Pole Flat weir.

Once all fish were enumerated and/or transported, the weir structure was cleaned and checked to ensure proper function. Staff snorkeled and/or walked the upstream and downstream periphery of the weir to ensure the structure was sealed and functioning properly. In addition, YFCSP personnel collected carcasses that had washed up on the weir face. All carcasses were visually examined for phenotypic characteristics and to collect morphometric data. All carcasses were used in the mark-recapture evaluation and processed for biological data. The caudal fin was removed from the carcass to prevent duplicate counting and fish was distributed below the weir for nutrient enrichment.

Figure 9. Pole Flat weir, catwalk, fish trap, live-wells, and work station.

Adult Trapping

The first Chinook salmon was trapped at Pole Flat weir on June 13, two days after installation. Overall, a total of 294 Chinook salmon were trapped at Pole Flat weir. An additional 33 were trapped a secondary time. The last Chinook salmon was trapped on September 19 and the weir was removed on September 24.

Seven pickets were pulled on the downstream right side of the weir routinely during mid-day to allow bull trout to by-pass by the structure. Pickets were pulled when bull trout were visually observed congregating around the upstream side of the weir. Bull trout quickly passed downstream when these pickets were pulled. Therefore, the time this modification was run was reduced in-season from 6.5 hours on both sides of the river on June 29 to the downstream right only (also 6.5 hours) on June 30 – July 1, and finally reduced to 1-2 hour intervals as needed the rest of the season. The majority of these double captured Chinook salmon were males (83.3%) indicating this may have been a mate selection behavior.

Of the 294 Chinook salmon trapped 43 were hatchery-origin and 251 were natural-origin. Gender was determined on all fish trapped at Pole Flat weir (Table 3). Our direct observations indicate 169 (57.5%) fish were male, 122 (41.5%) were female, and three fish were of unknown sex (1.0%). This reveals that the overall male:female sex ratio was skewed towards males. The sex ratio of hatchery-origin fish was 60.5% male and 39.5% female. The sex ratio of natural-origin fish was 57.0% male, 41.8% female and 1.2% unknown.

Table 3. Sex ratio of all fish, hatchery-origin fish, and natural-origin fish observed at Pole Flat weir.

Gender	Overall		Hatchery		Natural	
	Count	Sex Ratio	Count	Sex Ratio	Count	Sex Ratio
Females	122	41.5%	17	39.5%	105	41.8%
Males	169	57.5%	26	60.5%	143	57.0%
Unknown	3	1.0%			3	1.2%
Totals	294	100.0%	43	100.0%	251	100.0%

Chinook salmon migration occurred over a 96 day period from June 15 – September 19 (Figure 11). Returning Chinook salmon exhibited bi-modal run-timing distribution

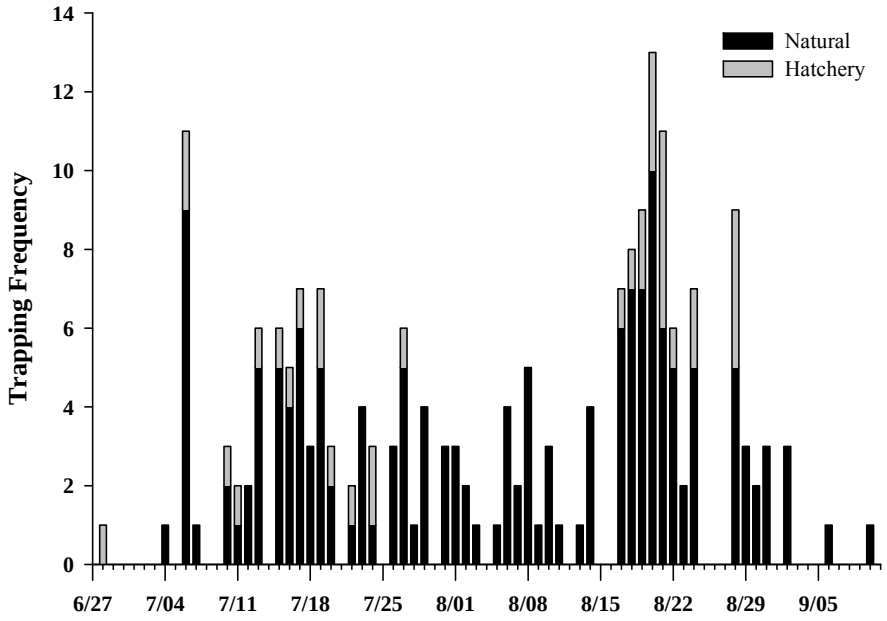
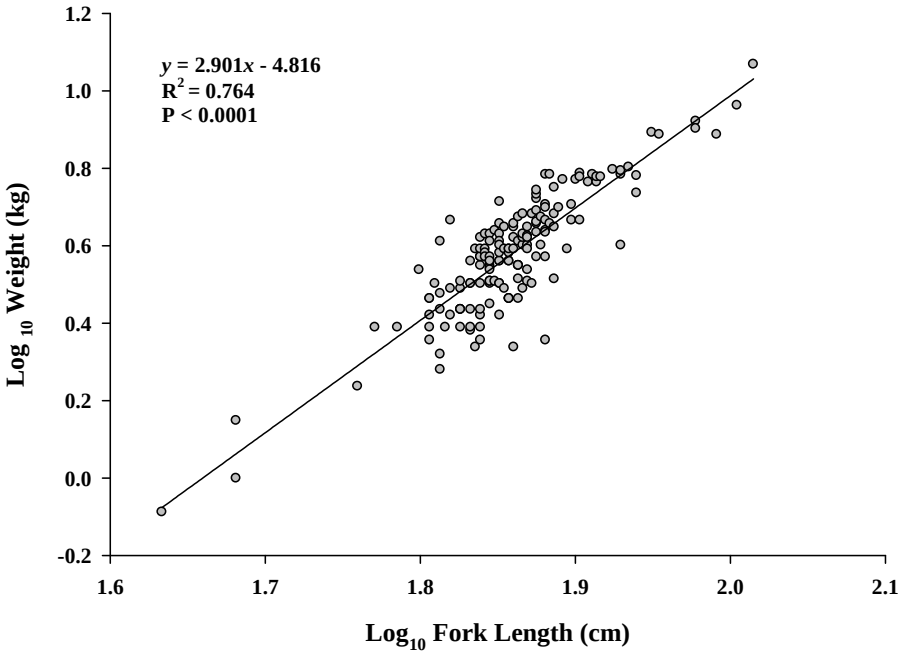


Figure 10. Trapping frequency of natural and hatchery-origin Chinook salmon at Pole Flat weir.

Out of the 294 fish trapped, approximately 293 were marked with a right operculum punch. One fish was accidentally marked with a left operculum punch. We also collected approximately 294 tissue samples that will be used in future parent-based tagging studies.

Of the 294 fish trapped, approximately 271 were weighed the nearest 0.01 kg. Fish weighed an average of 2.65 kg and ranged from 0.3 kg to 12.00 kg. The length-weight relationship for all adult Chinook salmon was significant (Figure 11). The *b* value of 2.90 indicates negative allometric growth, meaning that Yankee Fork adult Chinook salmon are becoming progressively thinner with increasing length. Ultimately, adult Chinook salmon in Yankee Fork exhibited exponential growth and this relationship was significant.



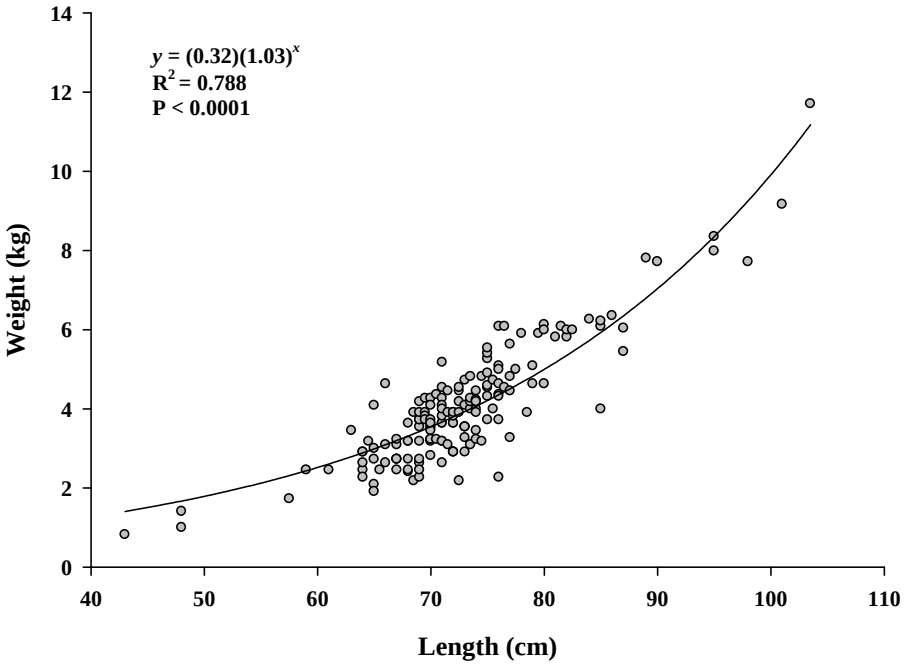


Figure 11. Length-weight relationship of adult Chinook salmon.

Run-Timing

The first hatchery-origin Chinook salmon was trapped on June 16 and the last hatchery-origin fish was trapped on September 3 for an overall migration period of 79 days. The

10th, 50th, and 90th percentile passage dates for hatchery-origin fish occurred on July 10, August 18, and August 24 (Figure 12). The first natural-origin Chinook salmon was trapped on July 4 and the last fish was trapped on September 10 for an overall migration period of 69 days. The 10th, 50th, and 90th percentile passage dates for natural-origin fish occurred on July 13, August 7, and August 28 (Figure 12). Overall, natural and hatchery-origin fish exhibited similar migration timing.

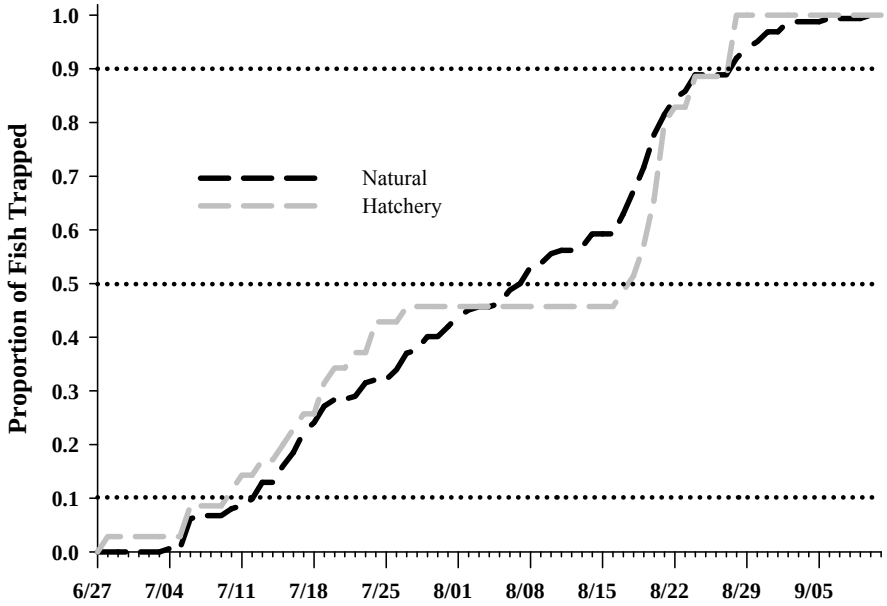


Figure 12. Run-timing of natural and hatchery-origin Chinook salmon at Pole Flat weir.

Age Structure

Age structure of Chinook salmon returning to Yankee Fork is determined by a length at age relationship developed by IDFG for use at Sawtooth (Table 4). These fork length categories are used to age all fish trapped at Pole Flat weir, since fish returning are either direct or indirect progeny of Sawtooth stock. Using the methodology listed above 105 fish were age3, 130 fish were age4, and 59 fish were age5 (Table 4). A total of 44.2% of the return was age4 fish.

Table 4. Age class totals for all Chinook salmon trapped at Pole Flat weir.

Fork Length (cm)	Year Class	Number	Percent
≤ 64	age3	105	35.7%
65-82	age4	130	44.2%
≥ 83	age5	59	20.1%

Of the 294 fish trapped at Pole Flat weir, the average fork length was 58.7 cm and ranged from 19 cm to 97 cm (Figure 13). We plotted the length frequency of hatchery (n = 30)

and natural-origin Chinook salmon (n = 133) to describe the overall length distribution of these two groups of fish. The average length of hatchery-origin fish was 68.5 cm and ranged from 43 – 80 cm, while the average length of natural-origin fish was 73.3 cm and ranged from 48 – 103.5 cm.

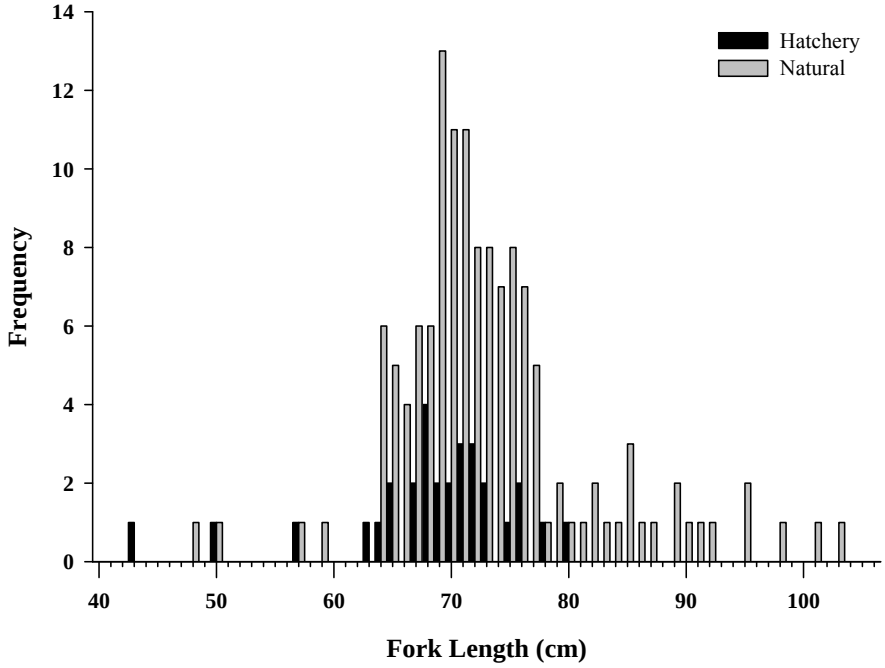


Figure 13. Length frequency of hatchery and natural-origin Chinook salmon trapped at Pole Flat weir.

In 2012, we anticipated a large return of age^3 and age^4 hatchery-origin Chinook salmon from the BY 08 and 09 smolt releases. We did not release any BY 07 hatchery smolts and therefore didn't expect any age^5 adults to return. We expected a robust return of age^3 and age^4 natural-origin adults and a much smaller return of age^5 adults. The age^5 natural-origin fish return is comprised from the 27 Chinook salmon redds observed during spawning ground surveys in 2007. In comparison, we observed 660 and 414 Chinook salmon redds in 2008 and 2009, respectively.

As expected, the hatchery-origin fish return was comprised of age^3 and age^4 adults (Figure 14). We didn't trap a single hatchery-origin fish greater than 80 cm fork length, indicating there were no age^5 adult returns. The natural-origin fish return was comprised primarily of age^4 adults (n = 106) which were produced from the 660 redds observed in 2008. Although we expected a sizeable return of age^3 adults from the 414 redds observed in 2009, only nine fish were trapped in 2012. Lastly, a total of 18 age^5 natural-origin adults were trapped.

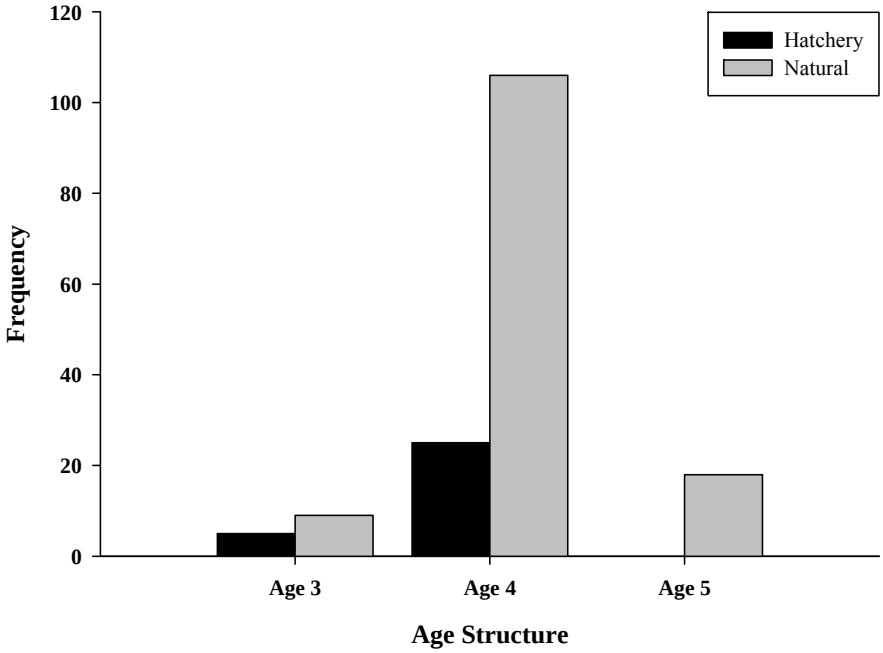


Figure 14. Age structure of hatchery and natural-origin Chinook salmon trapped at Pole Flat weir.

We estimated age for hatchery and natural-origin Chinook salmon males and females trapped at Pole Flat weir (Figure 15). As anticipated, we did not have any age^{5} hatchery-origin Chinook salmon return, since we didn't release any BY 07 juveniles. Of age^{3} hatchery-origin returns, approximately 6.7% were males and 10.0% were females. The females were likely misclassified males and future gender calls on fish ≤ 64 cm fork length will be closely examined. Of age^{4} hatchery-origin returns, approximately 40.0% were males and 43.3% were females. As expected the natural-origin adult return was comprised primarily of age^{4} adults. We found that 6.8% of the natural-origin fish returning were comprised of age^{3} males. Of the age^{4} natural-origin returns, approximately 45.1% were males and 34.6% were females. Of age^{5} natural-origin returns, approximately 7.5% were males and 6.0% were females.

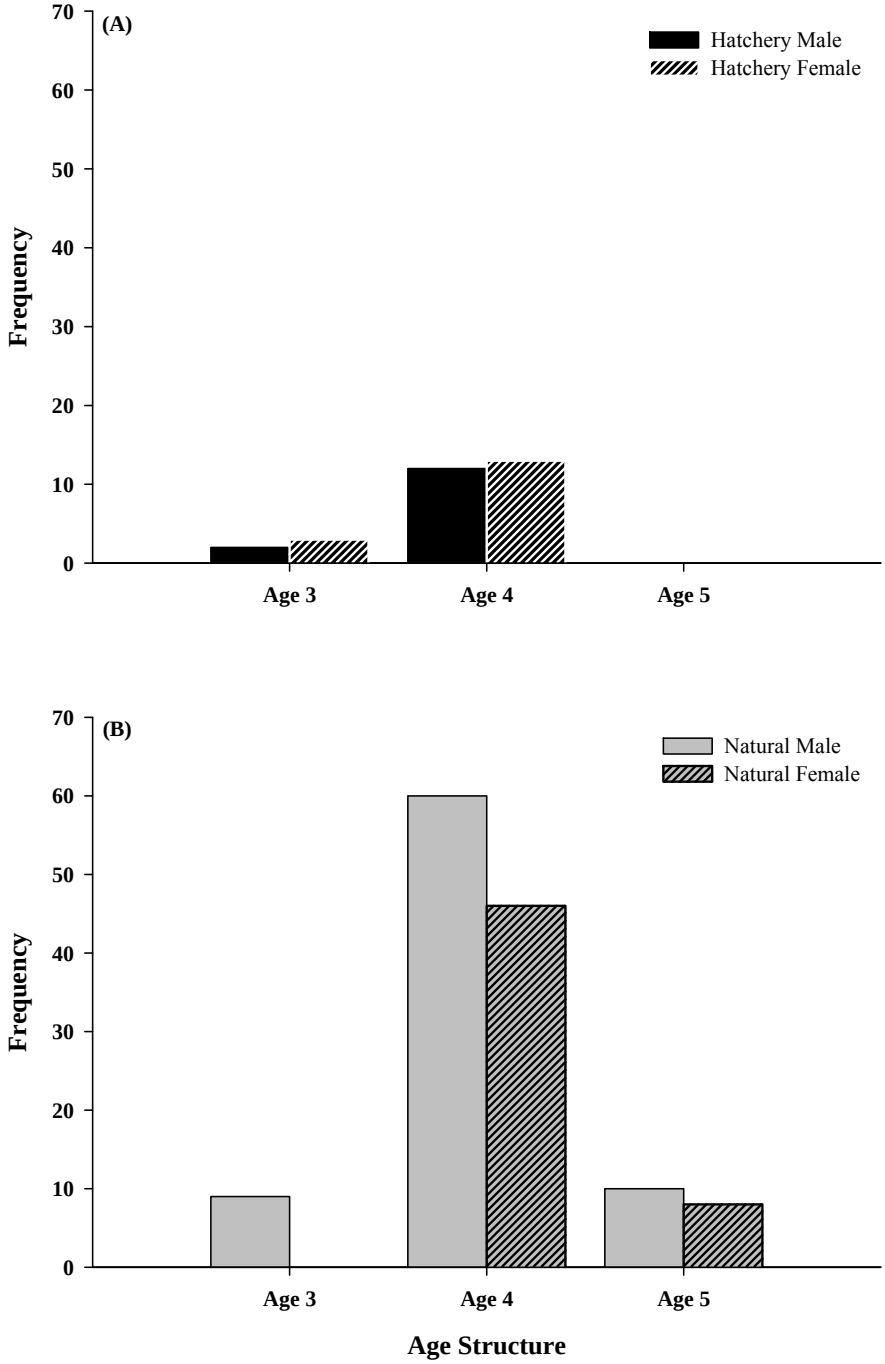


Figure 15. Age structure and gender of hatchery (A) and natural-origin (B) Chinook salmon trapped at Pole Flat weir.

Lastly, a total of 294 tissue samples were collected from adult fish trapped at Pole Flat weir. These tissue samples will be used to determine the relative reproductive success of fish spawning naturally in Yankee Fork. All tissue samples were stored in 95% ethanol and archived at the Fish and Wildlife Department.

Five Mile Weir

The secondary weir, referred to as Five Mile weir, was installed to serve primarily as a blocking weir that would prevent outplanted hatchery-origin fish from moving back downstream and spawning in the West Fork. Five Mile weir was installed on June 14 just upstream of the confluence with Five Mile Creek at rkm 21.59 and removed on September 21 (Figure 16). In 2013 the trap portion of the weir was removed to allow unobstructed passage upstream by migrating salmon, with the pickets left intact to obstruct hatchery fish from moving into the West Fork. One adult Chinook was caught before the live box was disassembled.

Five Mile weir is also a temporary structure consisting of a v-shaped picket weir attached to a fish trap and work station (Figure 16). This weir was designed and built by program staff entirely from steel to accommodate trapping Chinook salmon in upper Yankee Fork. This weir was also used to funnel upstream migrating adult Chinook salmon to the inlet of the fish trap, where they enter and become trapped through a tapered proboscis. In 2013 the front panel of the trap box was modified moving the pickets from 5.1 cm on center to 3.8 cm on center to reduce Bull Trout and smaller Chinook salmon mortality.

The left weir face consists of six tripods and five counterweights supporting three panels and 180 steel pickets (Figure 16). The right weir face consists of four tripods and four counterweights supporting two panels and 120 steel pickets. The fish trap consisted of two harps, four panels, a workstation, and two in-stream live-wells, similar to Pole Flat weir. Five Mile weir was not sandbagged, nor black mesh attached to the weir face.

Figure 16. Photo of Five Mile weir, fish trap, live-wells, and workstation.

A total of 15 adult Chinook salmon were trapped at Five Mile weir. The first fish was trapped on July 12 and the last fish was trapped on August 26. Of these fish, approximately 13 fish (86.7%) were previously trapped at Pole Flat weir and two escaped detection at Pole Flat weir. Approximately 11 fish (73.3%) were males and 4 fish (26.7%) were females. The average fork length of fish trapped at Five Mile weir was 73.8 cm and ranged from 65 – 91 cm. All of these fish were released above Five Mile weir for natural spawning.

HATCHERY ADULT OUTPLANTS

Pole Flat Weir Hatchery Outplants

As mentioned above, hatchery-origin Chinook salmon trapped at Pole Flat weir were removed and outplanted above Five Mile weir for natural spawning. This strategy was in place to prevent hatchery-origin fish from spawning in the West Fork.

Hatchery-origin fish trapped at Pole Flat weir were outplanted in the upper Yankee Fork at one of five locations (Table 5). Our records indicate 26 hatchery-origin fish out of the 30 (identified hatchery fish) trapped at Pole Flat weir were transported upstream. The other four fish were incidentally released above Pole Flat weir or escaped the live-well system. The majority of fish (57.7%) were released at Five Mile Bridge, followed by Five Mile weir itself (15.4%). Of the 26 fish outplanted above Five Mile weir, 42.3% (*n* = 11) were male and 57.7% (*n* = 15) were female. Approximately 25 fish were marked with a right operculum punch and one was accidentally marked with a left operculum punch.

Table 5. Number, location, and percentages of hatchery-origin male and female Chinook salmon trapped at Pole Flat weir and outplanted in upper Yankee Fork.

Outplant Location	Male	Female	Number	%
Five Mile Bridge	9	6	15	57.7%
Five Mile Weir	2	2	4	15.4%
Eightmile Creek	0	2	2	7.7%
Tenmile Bridge	0	2	2	7.7%
Unknown	0	3	3	11.5%
Total	**11**	**15**	**26**	
Percent	**42.3%**	**57.7%**		

Sawtooth Hatchery Outplants

The Tribes and IDFG reached agreement to outplant excess hatchery-origin adults trapped at Sawtooth Fish Hatchery in upper Yankee Fork, when fish are in excess of harvest and/or broodstock needs. The Tribes and IDFG agreed to an outplant quota of up to 1,500 hatchery adults in upper Yankee Fork, when available. In 2012, the Tribes worked cooperatively with IDFG to outplant excess hatchery-origin fish trapped at Sawtooth to bolster natural production within Yankee Fork.

Sawtooth hatchery-origin adults were transported in tanks mounted on three ¾ ton pick-up trucks and/or a large tanker truck provided by IDFG. On outplanting days, hatchery fish were crowded in the west pond at Sawtooth following normal protocols and individually netted out. The following biological data was collected from each outplant: fish identification #, gender, length (cm), genetic sample (0.5 cm^2), and vial #. Each fish was individually loaded into one of the truck tanks listed above and transported directly to Yankee Fork. Adult fish were either released using nets or funnel tubes (for large tanker truck).

The Tribes and IDFG outplanted approximately 1,054 hatchery-origin Chinook salmon adults trapped at Sawtooth in upper Yankee Fork (Table 6). YFCSP personnel assisted IDFG personnel with loading, sorting, crowding, and transporting fish from Sawtooth to upper Yankee Fork on July 12, 17, 19, 26, and September 6 and 7. Overall a total of 608 males (57.7%) and 446 females (42.3%) were outplanted. The Eightmile Creek outplanting location received the most adults (n = 398), followed by Tenmile Bridge (n = 347). A very late group of fish became available in September and these fish were scatter planted a various locations above Five Mile weir, with the exception of an estimated 40 fish outplanted between Jordan Creek and Five Mile weir. The first two outplants were skewed towards females at 66.5% and 54.5%. The last two major outplants on July 26 and September 6 were heavily skewed towards males at 100% and 70.6%, respectively.

Table 6. Number, location, and percentage of hatchery-origin male and female Chinook salmon trapped at Sawtooth and outplanted in upper Yankee Fork.

Date	Males	Females	Total	% males	% females	Outplant Location
7/12/2012	67	133	200	33.5%	66.5%	Eightmile Creek
7/17/2012	90	108	198	45.5%	54.5%	Eightmile Creek
7/19/2012	102	107	209	48.8%	51.2%	Temmile Bridge
7/26/2012	138	0	138	100.0%	0.0%	Temmile Bridge
9/6/2012	211	88	299	70.6%	29.4%	Various Locations
9/7/2012	0	10	10	0.0%	100.0%	Various Locations
Total	**608**	**446**	**1054**	**57.7%**	**42.3%**	

Of the 1,054 fish obtained from Sawtooth Fish Hatchery, the average fork length was 69.5 cm and ranged from 39 to 86 cm (Figure 17). We categorized length frequency into 5 cm bins to describe the overall length distribution. The largest length bin frequency was the range of 71-75 cm fork length at 23.8% of the outplants (n = 357). Approximately 15.6% of the outplants were age^3, followed by 83.6% age^4, and 0.9% age^5 (Figure 18). There were more males than females in all age classes.

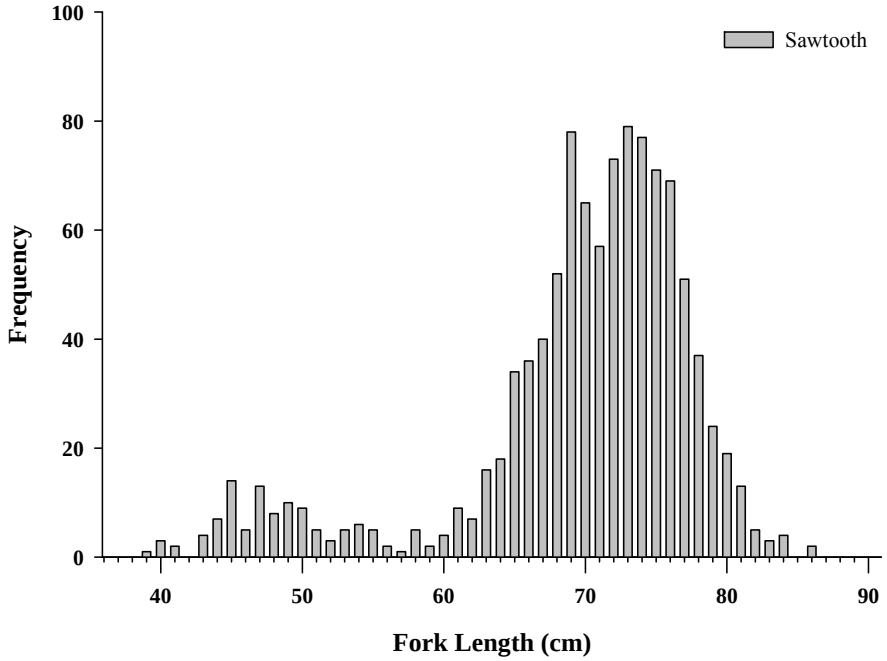


Figure 17. Length frequency of hatchery-origin Chinook salmon obtained from Sawtooth Fish Hatchery.

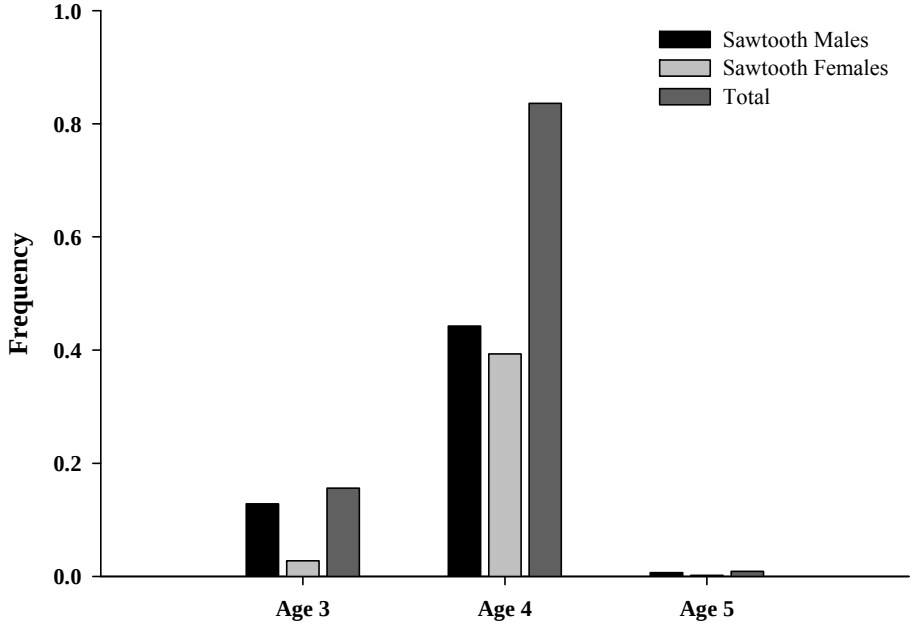


Figure 18. Age distribution of hatchery-origin Chinook salmon obtained from Sawtooth Fish Hatchery.

HARVEST MONITORING

Harvest guidelines for Yankee Fork were developed according to the TRMP (Denny et al. 2010) and included the number of natural and hatchery-origin Chinook salmon available for harvest. Chinook salmon fisheries were managed to achieve escapement and broodstock goals as the first priority. The harvest framework for natural-origin populations incorporates the Viable Population Thresholds (VPT) defined by the ICTRT for basic, intermediate, and large populations. Using the in-season forecast, the Tribes developed a harvest guideline in 2012 for Yankee Fork based upon population specific abundance estimates developed by co-managers in Idaho. The Tribes harvest guidelines were considered maximum harvest rates for Snake River spring/summer Chinook salmon returning to Yankee Fork. The harvest rate was determined based on the anticipated forecast of 500 hatchery and 441 natural-origin fish returning to Yankee Fork. This resulted in a harvest guideline of 196 hatchery and 66 natural-origin Chinook salmon.

The goal of harvest monitoring is to provide accurate and precise estimates of Chinook salmon harvest in all areas open to Chinook salmon fishing. This is accomplished by obtaining catch per unit effort (CPUE) data. Fishery monitors covered Yankee Fork on nearly a daily basis from June 28 to August 12, gathering data in the field from fisherman on the amount of time fished, number of fish caught, released, type of gear used (spear, snag, hook and line), origin, mark, and length from fish harvested. Where applicable, fishery personnel collected tissue samples from harvested Chinook salmon for later verification of genetic identity.

YFCSP staff conducted harvest monitoring over the course of the fishery. Data indicates staff completed 57 passes in Yankee Fork, observed 56 total fisherman for a total of 60 fishing days. Overall, a total of 7 fish were harvested of which 3 were natural-origin and 4 were hatchery-origin (Table 7).

Table 7. Yankee Fork harvest 2008 – 2012.

Year	Natural Adult Harvest	Hatchery Adult Harvest	Total Harvest
2008	1	0	1
2009	1	0	1
2010	1	0	1
2011	0	0	0
2012	43	199	242
2013	3	4	7
Total	**46**	**199**	**245**

SPAWNING GROUND SURVEYS

Redd Counts

Extensive spawning ground surveys were conducted in Yankee Fork and its major tributary, West Fork, to determine spawn timing, redd enumeration and distribution, abundance of live fish, and to collect carcasses for biological information. Spawning ground survey procedures were developed specifically for the YFCSP for hatchery

effectiveness monitoring and coordinated with the various programs and/or agencies conducting field work in the Yankee Fork.

Yankee Fork was sub-divided into seven distinct strata (Konapacky et al. 1986) and one additional strata (Eightmile Creek) was added in 2009 (Tardy and Denny 2010). However, the seven strata are based on distinct habitat units and do not always translate into realistic spawner survey reaches, with some strata being too long to reasonably survey in a given day. Therefore, survey reaches were divided into walkable stream sections with easy to locate start and stop points (Table 8). Yankee Fork was divided into nine survey reaches and walked bi-weekly during mid-day marking Chinook salmon redds and recovering carcasses. In the past, Yankee fork was surveyed weekly, but this season survey frequency was decreased due to technician shortages during the middle of the field season. West Fork was dived into two survey reaches (upper West Fork from Cabin Creek to Lightning Creek and lower West Fork from Lightning Creek to the confluence with Yankee Fork). Survey crews conducted four passes in reaches 1-7 and three passes in West Fork. Jordan and Eightmile Creeks (reaches 10 and 11) were not surveyed this season due to low water levels.

Table 8. Yankee Fork Spawning Ground Survey Reaches.

Survey Reach	Start Description	End Description	Start GPS Coordinate	End GPS Coordinate	Length (km)
1	YF mouth	Pole Flat Weir	N 44.269743° W 114.734579	N 44.303237° W 114.720407	5.23
2	Pole Flat Weir	WF confluence	N 44.303237° W 114.720407	N 44.349041° W 114.726469	5.83
3	WF confluence	Custer Pullout	N 44.349041° W 114.726469	N 44.385486° W 114.701587	5.6
4	Custer Pullout	Five Mile Weir	N 44.385486° W 114.701587	N 44.406184° W 114.654159	5.06
5	Five Mile Weir	Eight Mile Creek	N 44.406184° W 114.654159	N 44.426312° W 114.620585	4.87
6	Eight Mile Creek	Ten Mile Bridge	N 44.426312° W 114.620585	N 44.458197° W 114.589461	5.53
7	Ten Mile Bridge	Twelve Mile Bridge	N 44.458197° W 114.589461	N 44.483150° W 114.561433	4.01
8	WF mouth	Above WF canyon	N 44.349041° W 114.726469	N 44.375370° W 114.779630	6.08
9	Above WF canyon	Cabin Creek conf.	N 44.375370° W 114.779630	N 44.396926° W 114.828266	6.55
				Total km	48.76

Observers were provided standard gear (i.e., polarized sunglasses, data sheets, gps unit, ribbon, permanent markers, backpack, and genetic sampling kit) and covered the same area over the duration of the spawning season to increase the accuracy and precision of data collected. Chinook salmon redds were identified, recorded, and marked with an iridescent ribbon directly lateral to the apex of the redd. Observers recorded the

following information on the ribbon: date, observer initials, redd number, and stream position: (1) left bank, (2) middle, or (3) right bank. This information was linked to the data sheets, vials containing operculum punches (for genetic sampling), and otolith samples.

Carcasses encountered during the surveys were examined for fin clips, operculum punches, and external/internal tags following standard weir trapping protocols. We identified three categories for processing carcasses: (1) operculum punched, (2) not operculum punched, and (3) natural-origin. If the carcass had a pre-existing operculum punch, staff recorded gender, origin, fork length (cm), and percent spawned, noting that the fish was previously marked and handled. If the carcass was not marked with a pre-existing operculum punch, the following biological data was collected: gender, origin, fork length (cm), percent spawned, and genetic tissue sample (0.5 cm^2). If the carcass was a naturally produced Chinook salmon, biological data was collected as prescribed under categories one or two. The caudal fin was removed from all sampled carcasses and the carcass was placed back in the stream for nutrient enrichment.

Spawning ground surveys were conducted from August 13 – October 21 in correlation with past observed spawn timing in Yankee Fork, but extended this season due to a group of late outplanted fish. The third pass of spawning ground surveys was interrupted by rainstorms and the final pass occurred several weeks later during electroshocking surveys. Therefore, the final group of outplanted hatchery spanwers may be poorly represented by spawner survey data which only recorded 12 redds for this group of fish. There were 113 total redds identified in 48.76 rkms surveyed multiple times, resulting in an average of 2.4 redds/km (Table 9). We observed the majority of redds in survey reach 5 (Five Mile Creek – Eightmile Creek) with 46 total redds and 9.4 redds/km. The average survey reach was 5.4 km. The average number of redds per survey reach was 12.6 redds.

Table 9. Spawning Ground Survey Statistics.

Survey Reach	Length (km)	Total Redds	Redds per km
1	5.23	11	2.1
2	5.83	9	1.5
3	5.6	8	1.4
4	5.06	5	1.0
5	4.87	46	9.4
6	5.53	11	2.0
7	4.01	0	0.0
8	6.08	12	2.0
9	6.55	8	1.2
Totals	48.76	110	--
Average	5.4	12.2	2.3

Spawning ground surveys have been completed in Yankee Fork since 1952. From 1952 – 1984, single-pass aerial surveys were completed by IDFG to monitor the population

status. Since 1984, the Tribes have supplemented these surveys by completing multiple-pass ground surveys. Over this time period, there were no redds were observed in 1984 and 1995. The highest counts were observed in 2008 (n = 660) and 1968 (n = 615), respectively (Figure 19). Over the entire period (61 years) an average of 125 redds have been observed each year. Prior to initiating the YFCSP in 2008, the 10 year average (1998-2007) was 53.6 redds/year. Since initiating the YFCSP, the average has increased to 272 redds/year.

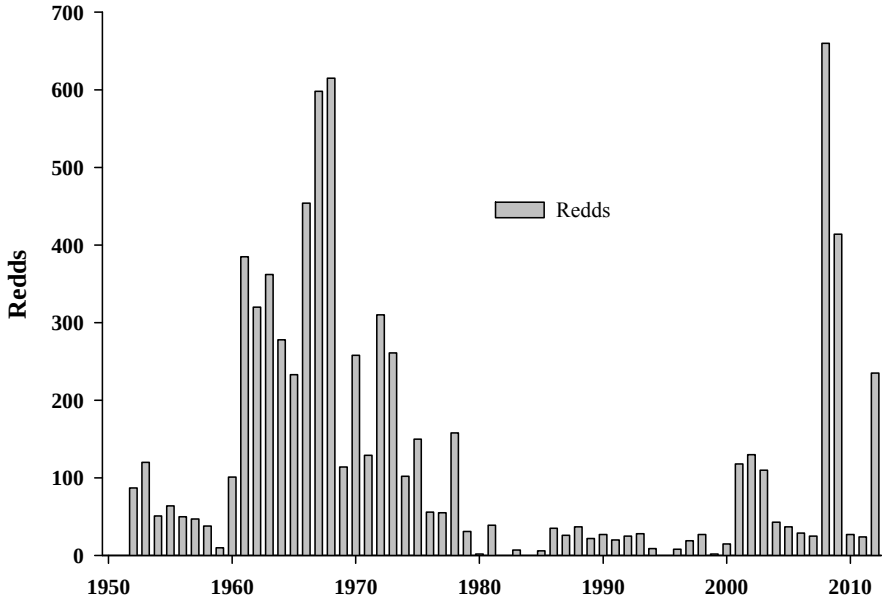


Figure 19. Chinook salmon redds in Yankee Fork, 1956 - 2012.

Carcass Surveys

Carcass surveys were completed concurrently during spawning ground surveys, and from fish recovered on the upstream side of both weirs during weir surveys. Surveys were conducted from August 13 – October 21. Staff collected a total of 79 carcasses from the confluence of Yankee Fork to Twelvemile Mile Bridge (Table 8). Of the carcasses recovered 21 were from hatchery outplanted adults and therefore were not included in mark-recapture population estimates, as well as five carcasses labeled "unknown". Unknown carcasses were missing heads, had damaged operculum, or were otherwise unable to be identified as "marked" or "escaped" fish. The other 58 carcasses were from naturally immigrating fish, of which eight were hatchery smolt release returns, 42 were of natural origin, and eight were unknown. There were three carcasses collected containing PIT tags. All carcasses containing PIT tags were fish tagged at Lower Granite Dam.

MARK-RECAPTURE EVALUATION

The YFCSP utilizes a mark-recapture methodology to determine total adult escapement above Pole Flat weir. The mark-recapture study was conducted with natural immigrating adults collected and marked at Pole Flat weir and subsequently recovered above this weir.

The mark-recapture study was conducted with natural immigrating returns between the Pole Flat weir and Twelve Mile Creek and West Fork. There were 294 naturally migrating salmon released above Pole Flat weir (1 of which was not included in calculations due to marking error). Of the carcasses recovered during spawner surveys 32 were clearly marked with a right operculum punch and seven were clearly unmarked. Therefore, these 39 fish comprised the capture event in mark-recapture analysis. All carcasses found below the marking site (Pole Flat Weir) were excluded from mark and recapture analysis. We used to the Peterson Estimator (Chapman 1951) to estimate escapement above Pole Flat weir, where adult escapement is equal to the total number of Chinook salmon marked (*M*) at Pole Flat weir times the total number of fish recovered (*C*) during spawning ground surveys or found on the weir faces, divided by the total number of marked fish recovered (*R*) during spawning ground surveys or found on the weir faces, as

$$AE = \left[\frac{(M+1)(C+1)}{(R+1)}\right] - 1$$

Using the method described by Chapman (1951), we estimate 355 salmon (±47) escaped past Pole Flat weir. We used the hatchery (17.8%) and natural (82.2%) fraction observed at Pole Flat weir to estimate origin. This results in an estimate return of 292 natural and 63 hatchery-origin fish. Overall trapping efficiency at Pole Flat Weir was 82.05%.

FISH PER REDD ESTIMATION

Pole Flat to Five Mile Weir

Although we estimate escapement above Pole Flat weir, we observed 16 redds below the weir that are not included in the mark-recapture escapement estimate. To estimate total adult abundance to Yankee Fork, we had to calculated a fish per redd value to estimate the number of fish that returned to Yankee Fork that spawned below Pole Flat weir.

Since a large number of hatchery-origin fish were outplanted in upper Yankee Fork (above Five Mile weir), we decided that we needed to exclude this area when developing our fish/redd expansion factor. The most realistic fish/redd expansion factor was determined to be in the area between Pole Flat and Five Mile weirs (survey reaches 2, 3, 4, and West Fork) which contained a total of 56 redds.

In order to figure out how many fish spawned in between Pole Flat and Five Mile weirs (survey reaches 2, 3, 4, and West Fork), we had to estimate the number of fish that passed Five Mile weir, to exclude these fish from our calculation. We were able to estimate Five Mile weir escapement by using the percent of carcasses (26.5%) found above this weir that were used in the mark-recapture evaluation. We applied this percentage (26.5%) to the Pole Flat weir escapement estimate of 283 adults and estimated that 75 fish likely passed Five Mile weir. Therefore, the number of live fish within the Pole Flat weir to Five Mile weir section, including West Fork equates to 208 fish. In the future, we plan to implement a secondary mark at Five Mile weir to improve our ability to estimate

escapement into upper Yankee Fork. A secondary mark-recapture study will improve our fish/redd calculations between Pole Flat and Five Mile weirs.

Again, we observed 56 redds between Pole Flat and Five Mile weirs, including West Fork and we estimate that 208 adults produced these redds. However, carcass surveys in these reaches identified a 7.14% pre-spawn mortality rate in female fish, resulting in an estimate loss of ten female fish before successful spawning. This results in 198 total spawners available to produce the 56 redds recorded. Male pre-spawn mortality is difficult at best to estimate in the wild and was not estimated, although observationally we are confident some male pre-spawn mortality occurred. These calculations result in an adjusted fish per redd ratio of 3.54 fish/redd (208 adults/56 redds). To determine escapement below Pole Flat weir, we applied the adjusted fish/redd ratio (3.54) to the number of redds observed below Pole Flat weir (n = 16) and estimate 57 fish were in this reach.

Above Five Mile Weir

Hatchery outplanted fish were subject to considerably different conditions than naturally migrating fish, such as additional handling, and in some groups of outplanted fish, significantly delayed spawning time due to holding in hatchery facilities. Additionally fishing pressure was much higher on the hatchery outplanted fish. Due to these factors, fish/redd estimates and pre-spawn mortality were calculated separately for the area above Five Mile weir.

Yankee Fork is a relatively clear stream and fish are visible even in deeper pools. Therefore, Tribal members were quickly able to locate groups of outplanted fish holding above Five Mile weir and focused their fishing efforts there. The Tribal fishery accounted for and estimated harvest of 199 outplanted and 43 natural-origin fish. This results in 855 outplanted fish (1,054 - 199) and 32 naturally returning fish (75 - 43) available for spawning.

Of the 1,054 fish outplanted from Sawtooth Fish Hatchery 608 (57.7%) were males and 446 females (42.3%). Carcass surveys identified 144 males (75.4%) and 47 females (24.6). All outplanted fish were uniquely marked with a left operculum punch at Sawtooth then transplanted to upper Yankee Fork. Therefore, the number of left punched fish is a census rather than an estimate. This group of fish then provides an excellent opportunity to test the accuracy of carcass surveys for sex composition estimates. Prior to carcass surveys YFCSP personnel hypothesized carcass surveys would be bias towards over counting males. Males typically travel between spawning events, fertilizing more than one redd and frequently washing up in riffles. Females tend to stay close to redd sites until death and often drop to the bottom of deeper pools and other areas where their carcasses are harder to locate. The actual outplant male:female ratio compared to the observed carcass male:female ratios support these observations, with higher male:female ratios found in carcass surveys than in the actual census. This pattern was also observed in the ratio of fish found on the upstream side of weir faces, likely representing moving fish, compared to carcass ratios found on foot surveys (fish staying near redd sites). In these surveys the male:female ratios were disproportionately higher on the weir faces.

Because of this, all male:female ratios in this study were conducted from live fish as opposed to carcass counts.

Of the 47 female outplanted carcasses recovered, five (10.6%) died before spawning (all had full egg sacs). Assuming this calculation represents the pre-spawn mortality rate for all outplanted females, we estimate an additional 47 females died before spawning (446 * 0.106), reducing the spawner abundance to 808 outplanted fish.

Carcass ratio calculations estimate 75 fish naturally migrated past Five Mile weir; however 43 of these were also captured in the Tribal fishery, resulting in a spawner abundance of 31 in this area. Therefore, the total number of adult spawners above Five Mile weir was estimated to be 839 fish. There were 163 redds in this region resulting in a fish/redd estimate of 5.15. This calculation supports the observation that hatchery outplanted adults were not spawning as successfully as naturally returning fish. In addition, this observation was primarily driven by a group of late outplanted fish (n = 309) that were acquired after hatchery broodstock goals at Sawtooth were met. This late outplant group likely had higher pre-spawn mortality rates and produced fewer redds.

Incidentally, if this late outplant group of fish was dropped from the fish/redd calculation, the number of fish/redd in this area drops to 3.31, which is very similar to the adjusted estimate from sections 2 – 4, and West Fork. Therefore, it is possible that hatchery outplanted adults had similar redd production when allowed to follow their natural spawn timing. This inference would of course have to be verified by further study. Unique batch marking of each group of outplanted fish would allow us to possibly track specific outplant group survival.

TOTAL ESCAPEMENT

Overall, we estimate a total of 340 natural and hatchery salmon returned to Yankee Fork in 2012. We estimate that 283 of these fish passed Pole Flat Weir and 57 remained below the weir to spawn. Of this return, 279 fish were natural-origin (82.2%) and 61 were hatchery-origin (17.8%). We further estimate that 202 fish were male and 138 fish were female. In addition to what returned naturally to Yankee Fork, we outplanted 1,054 adult hatchery fish obtained from Sawtooth, producing in an in-river total abundance of 1,394 Chinook salmon. However, harvest surveys estimated 242 fish were taken out of upper Yankee Fork above Five Mile weir in the Tribal fishery, (43 natural and 199 hatchery) leaving an adult escapement of 297 naturally migrating salmon (wild and hatchery origin) and 855 adult hatchery outplants, for a total of 1,152 fish. Female pre-spawn mortality rates indicate an additional 57 females died before spawning (10 naturally migrating and 47 outplants). This results in an estimated spawner abundance of 1,095 salmon in the Yankee Fork watershed that produce a total of 235 redds. This equates to an overall fish/redd ratio of 4.66 fish/redd.

DISCUSSION AND RECOMMENDATIONS

The YFCSP is designed to incorporate habitat restoration, harvest management, and artificial propagation to achieve the long term goal of returning 2,000 adults and is

annually operated to identify adaptive management strategies within and between seasons.

Hatchery smolt releases were conducted to investigate survival differences between direct stream and acclimated releases. Overall survival for the entire group was not significantly different to Lower Granite Dam. However, we cannot conclusively determine whether this finding is the result of juveniles not actually being acclimated or whether acclimation offered no survival benefit in 2012. Between groups, the acclimated release also showed similar travel time to Lower Granite Dam. These results were atypical of what has been observed with the BY 08 and BY 09 smolt releases. YFCSP personnel will need to re-evaluate the possibility of releasing BY11 hatchery smolts earlier in April to ensure juveniles imprint to Yankee Fork and thereby reduce straying. In addition, we need to carefully plan the Yankee Fork component of the Crystal Springs Fish Hatchery to address the issue on straying and acclimation. In addition, now that a PIT tag array exists in lower Yankee Fork, we need to closely look at in-basin survival between acclimated and direct stream released smolts. We will also need to ensure that any future acclimation releases are appropriately acclimated by properly securing the block nets.

Although we released a significant amount of BY 08 and BY 09 smolts in 2010 and 2011, hatchery-origin adult returns to Pole Flat weir were far short of expectations. There were significant BY 08 ad-intact/CWT adult strays to Sawtooth in 2011 and again in 2012, indicating BY 08 smolts did not imprint appropriately to Yankee Fork. Due to non-differential marking of the ad-clipped juveniles released at Sawtooth and Yankee Fork in 2010 and 2011, stray rates could not be determined for this group at this time. Stray rates for the ad-clipped group can and will be determine later through parent based tagging. Consistent with results in 2011, we trapped a higher frequency of ad-intact CWT adults (82.9%) as compared to ad-clipped adults (17.1%). The majority of these fish were from the BY 08 smolt release, which included fish released directly into Yankee Fork (not acclimated). Very few BY 09 adults return in 2012, indicating poorer survival for these fish.

Weir operations have improved dramatically since initiating the program in 2008. Staff has continually completed structural modifications to the weir and fish trap structures and have become confident installing the weir structures in higher flows. We have dramatically improved our ability to trap, capture, handle, and process returning Chinook salmon adults. A higher proportion of natural-origin males versus females is a clear indication that late trap installation is consistently missing the front portion of the run. Although this was not the case in 2012, we definitely need to ensure the fish trap and weir is properly secured on a daily basis by snorkeling the weir structures.

YFCSP personnel collected juvenile Chinook salmon emigration data at the screw trap when it was operational. We were unable collect sufficient mark-recapture data to fully estimate BY 10 smolts and BY 11 fry. This is the direct result of a temporary cable system that was drastically improved once discharge receded, but is not a new issue. Future juvenile trapping efforts need to focus on the ability to manipulate the screw trap

during higher flow periods. In addition, we need to ensure program personnel are properly implementing the protocols at the screw trap to ensure recaptured fish are detected. That said, results from screw trap operations, again confirm that the majority of juveniles are migrating from Yankee Fork as pre-smolts and a smaller proportion as parr.

Adult outplanting activities were well planned and implemented in 2012. The majority of outplanted fish were males and this occurred later in the season. The majority of females were outplanted in July when the Tribal fishery was on-going. The targeted harvest on outplanted adults was a success and numerous Tribal members were encouraged by the YFCSP, but future efforts need to ensure equal harvest on males and females.

Lastly, spawning ground surveys were completed throughout Yankee Fork in all areas where adult Chinook salmon spawn. Future efforts need to be made to improve the number of carcasses recovered during these surveys, which will improve our escapement estimates from mark-recapture data. In addition, efforts can be improved to start surveys in the late morning to improve our ability to detect redds and located carcasses. Now that everyone is properly trained and familiar with the survey transects, spawning ground surveys will improve.

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APPENDIX A: Regional Participation

Dates	Meeting	Location
10/4/2011	IDFG Mark/Tag Meeting	Boise, Idaho
10/5/2011	Supervisor's Meeeting	F & W Dept.
10/7/2011	Yankee Fork Tributary Assessment Meeting	F & W Dept.
10/10/2011	Fish and Wildlife Department Manager's Meeting	F & W Dept.
10/11/2011	YF PIT Tag Array Tour	Yankee Fork, Idaho
10/20/2011	Salmon/Challis National Forest Coordination Meeting	F & W Dept.
10/24/2011	Panther Creek Broodstock Selection	F & W Dept.
10/24/2011	Yankee Fork Pond Series 2 & 3 Habitat Enhancement and M&E Plan	F & W Dept.
10/26/2011	YF PIT Tag Array Site Test	Yankee Fork, Idaho
10/27/2011	YF Interdisciplinary Team Meeting	Challis, Idaho
10/29/2011	NOAA ESA Section 10 Permit Modification Meeting	F & W Dept.
11/3/2011	Yankee Fork Tributary Assessment Fish Data Exchange Conference Call	F & W Dept.
11/3/2011	Yankee Fork Pond Series 2 & 3 Restoration Project and M&E Design Meeting	F & W Dept.
11/4/2011	USFWS/SBT Coordination on Hagerman NFH Meeting	Hagerman, ID
11/7/2011	Program Staff Meeting	F & W Dept.
11/8/2011	NOAA 1127 & 16298 Permit Modification Conference Call	F & W Dept.
11/9/2011	ISU Outdoor Program & Yurt Construction/Assembly Planning Meeting	Pocatello, Idaho
11/14/2011	Yankee Fork Tributary Assessment Biological Data Gap Conference Call	F & W Dept.
11/15/2011	Yankee Fork Tributary Assessment Limiting Factors Analysis Meeting	F & W Dept.
11/15/2011	Yankee Fork Coordination Meeting	Water Res. Dept.
11/21/2011	Program Staff Meeting	F & W Dept.
11/28/2011	Crystal Springs FH Coordination – Internal Staff Meeting	F & W Dept.
11/30/2011	Crystal Springs FH Coordination – Design/Build, Concept Plans Meeting	F & W Dept.
12/2/2011	Timekeeping Training	Tribal Business Chamber
12/5/2011	Abernathy Fish Technology Center Genetics Research– Conference Call	F & W Dept.
12/5/2011	Technical Staff Meeting	F & W Dept.
12/5-6/2011	*U.S. v Oregon* Technical Advisory Committee Forecast – Conference Call	F & W Dept.
12/6/2011	Biomark Coordination for Yankee Fork PIT Tag Arrays – Conference Call	F & W Dept.
12/7/2011	Mitchell Act Pre-Meeting	F & W Dept.
12/7/2011	Mitchell Act DEIS Preferred Alternative – Conference Call	F & W Dept.
12/7/2011	SBT M&E Plan – Conference Call	F & W Dept.

12/8/2011	IDFG/SBT Anadromous Fish Coordination – Meeting	F & W Dept.
12/8/2011	ISU Outdoor Program Yurt Set-up – Meeting and Site Tour	Pocatello, Idaho
12/13/2011	RMETOC – Conference Call	F & W Dept.
12/16/2011	Coordinated Assessments – Conference Call	F & W Dept.
12/20/2011	LSRCP Steelhead Program Review – Conference Call	F & W Dept.
12/21/2011	Wells Fargo Training for Approvers & Secondary Approvers – Training	Tribal Business Chamber
12/28/2011	Program Staff Meeting	F & W Dept.
1/3/2012	Harvest Monitoring and Evaluation Plan Coordination – Conference Call	F & W Dept.
1/9/2012	Program Staff Meeting	F & W Dept.
1/10/2012	Panther Creek Broodstock Selection Paper – Conference Call	F & W Dept.
1/11/2012	LSRCP Steelhead Program Review – Conference Call	F & W Dept.
1/12/2012	EPA Action on Idaho Human Health Fish Consumption Guidelines - Meeting	F & W Dept.
1/12/2012	RM&E and Crystal Springs FH – Conference Call	F & W Dept.
1/17/2012	RM&E Plan Pre-bid Meeting	F & W Dept.
1/18/2012	Program Staff Meeting (Fish Identification Test)	F & W Dept.
1/20/2012	Yankee Fork Habitat and Supplementation M&E – Conference Call	F & W Dept.
1/25/2012	*US v Oregon* Production Advisory Committee	Portland, Oregon
1/26/2012	Columbia River Compact Hearing	Portland, Oregon
1/27/2012	Abernathy Fish Technology Center – Genetics Meeting	Longview, Washington
1/27/2012	Biomark – Meeting	Boise, Idaho
1/30/2012	Crystal Springs Fish Hatchery – Conference Call	F & W Dept.
1/30/2012	Yankee Fork Habitat and Supplementation M&E – Conference Call	F & W Dept.
1/31/2012	LSRCP Coordination Meeting	F & W Dept.
2/1/2012	RM&E Plan RFP Screening Meeting	F & W Dept.
2/3/2012	Salmon River TRMP and E/A Scoping – Conference Call	F & W Dept.
2/7/2012	Nutrient Flux Study Meeting	F & W Dept.
2/8/2012	Cramer Fish Sciences Independent Contractor Agreement Review	F & W Dept.
2/8/2012	EA/NEPA response to NOAA and TRMP	F & W Dept.
2/9/2012	Yankee Fork PIT Tag Array - Go-to-Meeting	F & W Dept.
2/9/2012	Abernathy Fish Technology Center - Go-to-Meeting	F & W Dept.
2/13/2012	Crystal Springs Fish Hatchery – Conference Call	F & W Dept.
2/14/2012	RMETOC – Conference Call	F & W Dept.
2/14/2012	PCSRF Biologist or Manager Position Meeting	F & W Dept.
2/22/2012	*U.S. v Oregon* Production Advisory Committee – Conference Call	F & W Dept.
2/29/2012	Oregon Chapter of the American Fisheries Society - PIT Tag Workshop	Eugene, Oregon
2/29 -	Oregon Chapter of the American Fisheries Society	Eugene, Oregon

3/2/2012		
3/7/2012	Program Staff Meeting	F & W Dept.
3/13/2012	B-Run Steelhead Meeting with IDFG and LSRCP	Boise, Idaho
3/14/2012	Springfield Fish Hatchery Design Meeting	Eagle, Idaho
3/15/2012	Field Protocols Training	F & W Dept.
3/15/2012	Crystal Springs Fish Hatchery – Conference Call	F & W Dept.
3/16/2012	Treaty Rights Seminar	Tribal Business Chamber
3/19/2012	PCSRF Annual Meeting – Conference Call	F & W Dept.
3/23/2012	Research, Monitoring, & Evaluation Plan – kickoff meeting	F & W Dept.
3/27 - 29/2012	YF PIT Tag Array Installation	Yankee Fork, Idaho
4/2/2012	Fish & Wildlife Dept. Manager's Meeting	F & W Dept.
4/3/2012	Go-to-Meeting with Biomark	Stanley, Idaho
4/3/2012	Yankee Fork Tributary Assessment Open House Meeting	Challis, Idaho
4/9/2012	Program Staff Meeting	F & W Dept.
4/11/2012	Yankee Fork Tour with IDFG	Yankee Fork, Idaho
4/14/2012	Tribal Member Treaty Rights Workshop	Fort Hall, Idaho
4/16/2012	Program Staff Meeting	F & W Dept.
4/17/2012	Yankee Fork Coordination Meeting	Fort Hall, Idaho
4/17/2012	Pond Series III Conference Call	F & W Dept.
4/18/2012	Yankee Fork Tributary Assessment Open House	Tribal Business Chamber
4/21/2012	Boys Club Steelhead Fishing Trip	Yankee Fork, Idaho
4/23/2012	Yankee Fork B-run Steelhead Conference Call	F & W Dept.
4/24/2012	Crystal Springs Fish Hatchery Step II Kickoff Meeting	Boise, Idaho
4/25/2012	Meeting with LSRCP regarding Yankee Fork Weir	Boise, Idaho
4/25/2012	IDFG Nampa Research Coordination Meeting	Nampa, Idaho
4/26/2012	Steelhead Run Reconstruction Meeting	Lewiston, Idaho
4/30/2012	Program Staff Meeting	F & W Dept.
4/30/2012	U.S. v Oregon Technical Advisory Committee Conference Call	F & W Dept.
5/1/2012	Snake Basin Coordination Meeting	F & W Dept.
5/7/2012	US v Oregon Technical Advisory Committee Conference Call	F & W Dept.
5/8/2012	Snake Basin Coordination Meeting	F & W Dept.
5/8/2012	Yankee Fork and Panther Creek Satellite Facilities Conference Call	F & W Dept.
5/14/2012	US v Oregon Technical Advisory Committee Conference Call	F & W Dept.
5/14/2012	Program Staff Meeting	F & W Dept.
5/15 - 16/2012	LSRCP Hatchery Production Meeting	Boise, Idaho
5/17/2012	Yankee Fork Satellite Facility Tour with USFS	Yankee Fork, Idaho
5/21/2012	US v Oregon Technical Advisory Committee Conference Call	F & W Dept.
5/30/2012	Crystal Springs Fish Hatchery Meeting	F & W Dept.
6/1-3/2012	Swift Water Rescue Workshop	ISU/Blackfoot, Idaho
6/4/2012	Fish and Wildlife Manager's Meeting	F & W Dept.
6/5/2012	Snake Basin Coordination Meeting	F & W Dept.

6/8/2012	Departmental Staff Meeting	F & W Dept.
6/11/2012	Chinook salmon Harvest Management Meeting	F & W Dept.
6/13/2012	Tribal Fisherman's Meeting	Tribal Business Chamber
6/14/2012	Informal meeting w/ FHBC on Chinook salmon fishing season	Tribal Business Chamber
6/19/2012	Tour Lower Granite Dam Trapping Facilities	Clarkston, Washington
6/19/2012	Crystal Springs 30% Internal Hatchery Review Conference Call	Clarkston, Washington
6/20 - 21/2012	LSRCP Steelhead Program Review Symposium	Lewiston, Idaho
6/26/2012	Snake Basin Coordination Meeting	Stanley, Idaho
7/3/2012	Snake Basin Coordination Meeting	F & W Dept.
7/5/2012	Program Management Transition Meeting	F & W Dept.
7/9/2012	Yankee Fork Chinook Salmon Project Tour w/ IDFG and NOAA-Fisheries	Yankee Fork, Idaho
7/10/2012	Yankee Fork Chinook Salmon Project Tour w/ Larry Murillo	Yankee Fork, Idaho
7/13/2012	Program Staff Meeting	Yankee Fork, Idaho
7/18/2012	Biomark and Yankee Fork PIT tag array	Yankee Fork, Idaho
7/19/2012	Yankee Fork Chinook Salmon Project Tour w/ Sawtooth Fish Hatchery staff	Yankee Fork, Idaho
7/20/2012	Program Staff Meeting	Yankee Fork, Idaho
8/7-8/2012	Spawning Ground Survey Training	McCall, Idaho
8/14/2012	Program Staff Meeting	F & W Dept.
8/15/2012	Crystal Springs Fish Hatchery 30% Design Review	Boise, Idaho
9/17/2012	Fish and Wildlife Department Staff Meeting	F & W Dept.