FISHERY RESEARCH

CAPTIVE REARING PROGRAM FOR SALMON RIVER CHINOOK SALMON

PROJECT PROGRESS REPORT
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Captive Rearing Program for Salmon River Chinook Salmon

Project Progress Report

2012 Annual Report

By

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ABSTRACT

During 2012, the Idaho Department of Fish and Game's (IDFG) Captive-reared Chinook Salmon Project (CCSP) continued to monitor the reproductive performance of captive-reared Chinook salmon *Oncorhynchus tshawytscha* released to spawn in natal streams. All captive rearing ended and the last remaining brood year (BY05) was released as mature adults to their natal waters in 2010. Evaluation of the contribution of released captive-reared Chinook salmon to natural adult returns remains the last evaluation for this project. Thus, tissue samples from Chinook salmon adults were collected at the East Fork Salmon River (EFSR) adult trap again in 2012 to assess production levels from volitional spawning events resulting from program releases in 2007—2009.

We include results from the 281 genetic tissue samples that were collected for genetic parentage from Chinook salmon adults that returned to the EFSR in 2011. The results from the analysis of the 2011 collection were used to evaluate program releases in 2006—2008. Of these adults, 210 were captured at the EFSR adult trap, and an additional 71 samples were collected from carcasses found below the trap. Of the 281 adult samples, 249 were successfully genotyped (208 trap adults and 41 carcass samples). In total, 165 of the 249 adults assigned to one or two parents with zero or one locus mismatch, for an overall assignment rate of 66%. Of the 2011 adult returns that assigned to a parent pair (n = 111), over 34% (n = 38) were progeny of captive reared adults. With the parentage analyses completed on the 2011 adult returns, the contribution of the 2006 spawn year is complete. In 2006, captive-reared adults released to spawn naturally (n = 141: 73 females, 68 males) constructed 12 redds. Parentage analyses have found these fish produced 25 progeny that returned as adults in 2009 (n = 3), 2010 (n = 14), and 2011 (n = 8). The assigned number was close to our predictions and demonstrates reproductive success of captive reared adults.

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INTRODUCTION

In 1992, Snake River Chinook salmon were listed as threatened under the Endangered Species Act (ESA; National Marine Fisheries Service [NMFS] 1992). Many sources of mortality have contributed to the decline in natural/wild Snake River Chinook salmon over several decades. However, until smolt-to-adult survival increases, our challenge is to preserve the existing metapopulation structure (by preventing local or demographic extinctions) of these stocks to ensure they remain extant to benefit from future recovery actions. This project is developing technology that may be used in the recovery of the listed Snake River spring/summer Chinook salmon evolutionarily significant unit (ESU), which consists of 28 subpopulations (i.e. breeding units or stocks); (McClure et al. 2003). Preserving the metapopulation structure of this ESU is consistent with previously approved Snake River Salmon Recovery Plans (NMFS 1995; Schmitten et al. 1997; McClure et al. 2003), and supports the Northwest Power and Conservation Council's (NPCC) goal of maintaining biological diversity while doubling salmon and steelhead runs (NPCC 1994).

Idaho and Oregon state, tribal, and federal fish managers met during 1993 and 1994 to discuss captive culture research and implementation in the Snake River basin. The outcome of those meetings was to initiate two programs: 1) the Oregon Department of Fish and Wildlife (ODFW) would initiate a captive broodstock program using selected Grande Ronde River Chinook salmon populations, and 2) the Idaho Department of Fish and Game (IDFG) would initiate captive rearing research using selected Salmon River Chinook salmon populations. Captive fish culture techniques begin by bringing naturally produced juveniles (eggs, parr, or smolts) into captivity and rearing them to sexual maturity in a hatchery. At this point, the two programs use different techniques. The F_1 generation in a captive rearing program (IDFG) is returned to their natal streams as mature adults and allowed to spawn naturally. Alternately, the F_1 generation from a captive broodstock program (ODFW) is spawned in the hatchery, where the resulting F_2 progeny are held until released as smolts. The F_2 generation is then released to its natal stream to emigrate volitionally while a subset remains in captivity for the next generation. The primary focus of these programs is to evaluate the effectiveness of the two forms of captive culture to meet population conservation objectives. Implicit within each research project is the objective to develop and test appropriate facilities and fish culture protocols specific to the captive culture of Chinook salmon for conservation and management of depressed populations.

Little scientific information regarding captive culture techniques for Pacific salmonids was available at the inception of these programs, but a substantial amount of new literature was published in the ensuing years. The Chinook Salmon Captive Propagation Technical Oversight Committee (CSCPTOC) was formed to convey this new information between the various state, federal, and tribal entities involved in the captive culture of Chinook salmon. The CSCPTOC meets quarterly, which allows an adaptive management approach to all phases of the program and provides a forum of peer review and discussion for all activities and culture protocols associated with this program. Flagg and Mahnken (1995) provided an initial literature review of captive rearing and captive broodstock technology, which provided the knowledge base upon which the program was designed. Using this work, the IDFG Captive Rearing Program for Salmon River Chinook salmon was initiated to further develop this technology by monitoring and evaluating captive-reared fish during rearing and post-release spawning phases. Since the program's inception, studies documenting the spawning behavior of captive-reared Chinook salmon (Berejikian et al. 2001b), coho salmon *O. kisutch* (Berejikian et al. 1997), and Atlantic salmon *Salmo salar* (Fleming et al. 1996) have been published. Other studies have also compared the competitive behavior of male captive-reared and natural coho salmon during

spawning (Berejikian et al. 2001a), and the competitive differences between newly emerged fry produced by captive-reared and natural coho salmon (Berejikian et al. 1999). Finally, Hendry et al. (2000) reported on the reproductive development of sockeye salmon *O. nerka* reared in captivity.

The IDFG captive rearing program was developed as a way to increase the number of naturally spawning adults and maintain metapopulation structure in selected populations at high risk of extinction while avoiding the impacts of multigenerational hatchery culture described in Reisenbichler and Rubin (1999). The strategy of captive rearing is to prevent cohort collapse in the target populations by returning locally derived captive-reared adults to natural spawning areas to augment depressed natural escapement (or replace it in years when no natural escapement occurs). This maintains the continuum of generation-to-generation smolt production and provides the opportunity for population maintenance or increase, should environmental conditions prove favorable for that cohort. However, the success of the captive rearing approach to produce adults with the desired morphological, physiological, and behavioral attributes to spawn successfully in the wild remains somewhat elusive (Fleming and Gross 1992, 1993; Joyce et al. 1993; Flagg and Mahnken 1995).

The IDFG captive rearing program was initiated in 1995 with the collection of brood year (BY) 1994 Chinook salmon parr from three study streams. Since then, naturally spawned Chinook salmon progeny from BY95-BY05 have been reared in captivity to continue the project. Hassemer et al. (1999, 2001), Venditti et al. (2002, 2003a, 2003b, 2005, 2013), Baker et al. (2006a, 2006b, 2007), Stark et al. (2008, 2009, 2012), Stark and Gable (2010), and Stark and Richardson (2011) summarize project activities from inception through 2011. The streams selected for inclusion in the captive rearing program include the Lemhi River (LEM), the East Fork Salmon River (EFSR), and the West Fork Yankee Fork Salmon River (WFYF). Project activities were completed on the LEM in 2003 with the release of mature BY99 adult fish, and shifting primarily to the EFSR from 2004 through present day (Figure 1).

All three study streams were selected because of their water temperature and water quality. Water temperatures are ideal for juvenile Chinook salmon rearing in all three streams, while water quality ranges from sufficient to ideal. Stream habitat quality ranges from relatively pristine to areas of riparian degradation caused by sedimentation, grazing, mining, logging, road building, and irrigation diversion. The EFSR drains a relatively sterile watershed of granitic parent material associated with the Idaho batholith. The lower 30 km of the EFSR runs through ranch and grazing property developed during the last century, but the upper reaches reflect near pristine conditions with little historical disturbance.

The goal of the captive rearing program is to evaluate the potential of captive rearing technology for the conservation of Snake River spring/summer Chinook salmon. There are two primary project objectives needed to accomplish this goal: 1) develop culture practices and facility modifications necessary to rear Chinook salmon to maturity having morphological, physiological, and behavioral characteristics similar to natural fish; and 2) evaluate the spawning behavior and success of captive-reared individuals under hatchery and natural conditions. These objectives divide the program into two functional units (fish culture and field evaluations), but the success of the program is dependent on the synchronous development of both. This report documents remaining field evaluation activities from January 1, 2012 through December 31, 2012. This project was coordinated with the Northwest Power and Conservation Council's Fish and Wildlife Program (NPCC 2000), identified as project 2007-40-300. Funding was provided through the Bonneville Power Administration under contract 54251.

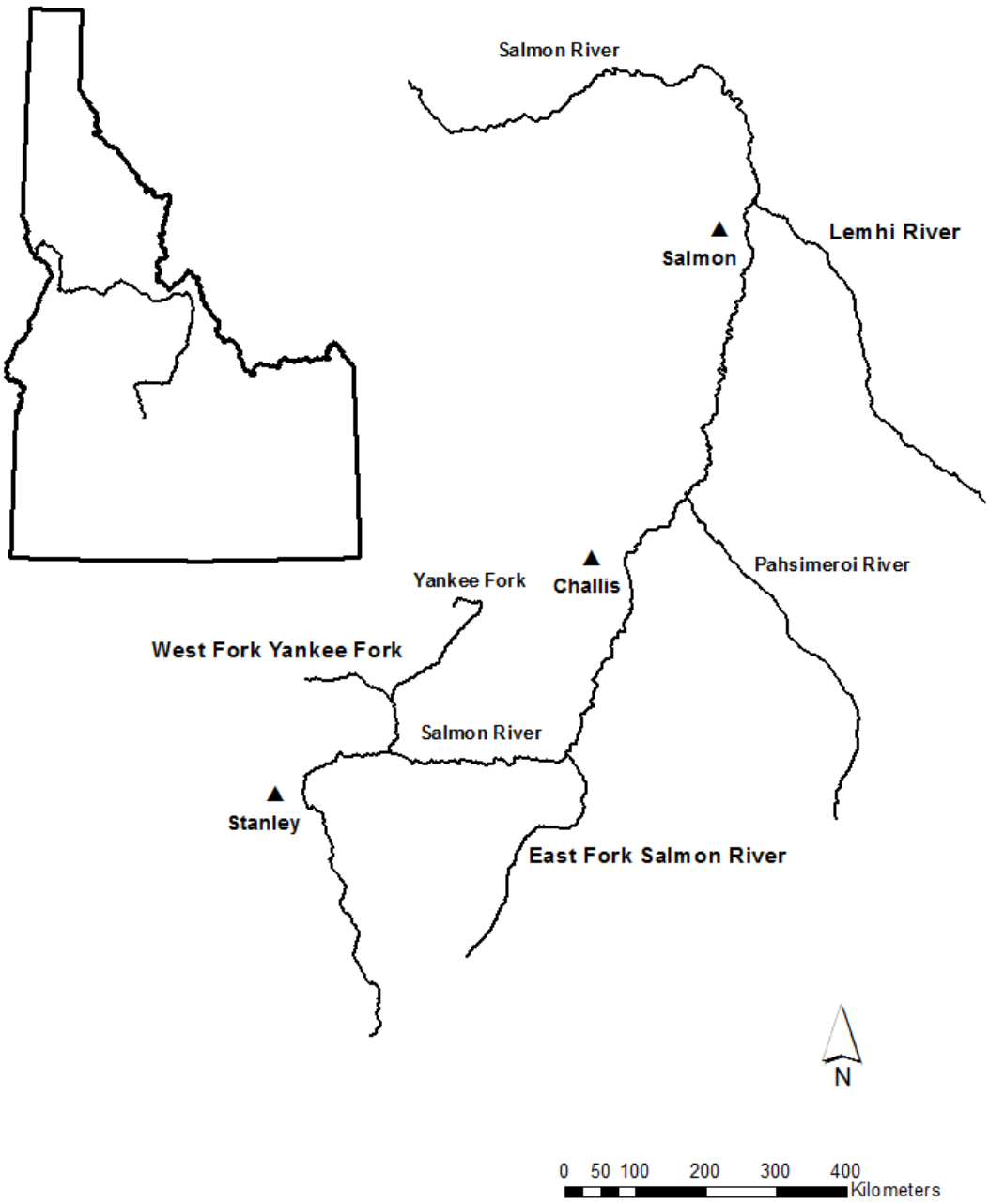

Figure 1. Location of study streams included in the Idaho Department of Fish and Game Captive Rearing Program for Salmon River Chinook Salmon.

METHODS

Methods utilized in the captive rearing program have changed over years; from the capture of rearing groups from the wild, development of captive rearing culture techniques, to evaluation of spawning behavior of captive fish in the wild. Captive culture ended in 2010 when the last remaining brood year (BY05) was transported from the NOAA Manchester saltwater facility to Idaho for release into study streams for volitional spawning. Detailed facility specifications are referenced in previous project annual reports (Hassemer et al. 1999, 2001; Venditti et al. 2002, 2003a, 2003b, 2005; Baker et al. 2006a, 2006b, 2007; Stark et al. 2008, 2009; and Stark and Gable 2010). Freshwater culture methods at Eagle FH and juvenile and adult rearing, marking, and transportation methods are summarized in Baker et al. (2007). Saltwater culture methods at the NOAA Manchester facility and juvenile and adult rearing, and transportation methods are summarized in Maynard et al. (2012). No further fish health monitoring or brood year growth and survival summaries remain. Studies comparing the emergence survival of progeny of natural spawning captive-reared versus wild Chinook salmon were completed in 2010.

Captive-rearing project evaluations were performed only on the EFSR in 2012. The Sawtooth FH satellite facility on the EFSR (EFSR adult trap) was utilized for adult return collections. The facility is located near Big Boulder Creek, approximately 29 river kilometers upstream from the confluence with the main Salmon River.

Adult Trapping

In 2012, the EFSR adult trap was operated to collect genetic samples from returning natural origin Chinook salmon, while many non-target species were also captured. During high flows, the trap was checked regularly between 0700 and 2000 (every 2-3 hours) to ensure proper settings and operation. The trap box was raised each morning and fish were netted. Chinook salmon were placed in a separate holding tank for further data collection. All other fishes were identified to species and measured to the nearest 0.1 cm. fork length (FL); genetic samples were collected on salmonids from fin punches and preserved in 95% ethanol. All fish were subsequently released upstream of the trap.

Trapped Chinook salmon were individually placed in an anesthetic bath containing MS-222 (50 mg/L) buffered with sodium bicarbonate. After each Chinook salmon was sedated, it was checked for visible marks, scanned for a coded-wire tag, sex was assigned based upon phenotypic characteristics, and FL was measured to the nearest 0.1 cm. If the fish was not a recapture, it received a numbered jaw tag (installed around the lower-left mandible), and a genetic sample was taken from the caudal fin with a hole punch and preserved in 95% ethanol. The hole punch and any forceps used to remove the sample were subsequently swabbed with isopropyl alcohol between specimens to reduce the possibility of DNA cross-contamination. The fish was then placed into a freshwater recovery bath until ready for release upstream of the trap. Total Chinook salmon numbers were reported to the IDFG Hatchery Trapping Database daily.

Spawning Ground Surveys

In 2012, all spawning observations were comprised of redd count surveys throughout the upper EFSR (above the trap) and carcass recoveries below the EFSR adult trap of natural/wild adult returns. Annual Chinook salmon aerial redd counts were conducted by IDFG in both the WFYF and EFSR trend sites in 2012. Redds were also surveyed via ground counts by the IDFG Captive Chinook salmon crew and Shoshone-Bannock Tribe Fisheries (SBT) crews.

We continued to conduct spawning ground surveys much more frequently (minimum of every 3rd day) as performed in 2011. However, in 2012 we extended our surveys even farther downstream, to include the first 17 kilometers below the EFSR adult trap in an effort to collect post-spawn carcasses. Genetic samples were collected from all natural/wild carcasses recovered below the trap, but only if not previously sampled at the trap (as evidenced by a jaw tag and fin punch). It should be noted, since carcass sampling started in earnest in 2009, we have not yet recovered a hatchery origin carcass in the EFSR (as evidenced by a missing/clipped adipose fin). These carcass genetic samples were genotyped along with the samples collected at the trap and included in our parentage analyses to assess adult-to-adult contribution from captive-reared fish. Fin ray samples were also collected from carcasses when in satisfactory condition, and inventoried and submitted to the IDFG aging lab. Fin ray ages were not yet complete from 2012 carcasses at the time of reporting.

Genetic Parentage Analyses

This project relies on parentage genetic analyses to determine the contribution of naturally spawning captive-reared adult Chinook salmon in the EFSR to natural/wild adult returns. In particular, parentage analysis was used to assign offspring (returning adults) to their parents (natural spawners or captive-reared spawners); (ISRP/ISAB 2009-1, pg. 69). Natural/wild returning adult Chinook salmon (parents) have been captured at the EFSR adult trap since 2004 and tissues collected from each fish. In addition, tissues have also been collected from all mature adult captive-reared Chinook salmon released to spawn naturally (parents) in the EFSR above the trap. Lastly, natural/wild returning adult Chinook salmon (offspring/progeny) will continue to be captured at the EFSR adult trap through 2014 and tissues collected from each fish for future parentage analyses.

Fin clips from adult Chinook salmon collected from the EFSR adult trap and from adult carcasses were genotyped and analyzed for genetic parentage to determine if they were the progeny of captive-reared parents previously released to spawn naturally in the EFSR. Genetic material from these adults was analyzed with samples from all captive-reared adults released to spawn, all previous years' natural adult returns, and all carcasses recovered from the study area. Parentage analyses for the samples was conducted using microsatellite markers (parental analysis: Estoup et al. 1998; Bernatchez and Duchesne 2000; Eldridge et al. 2002).

Genomic DNA was extracted from samples using the Nexttec Genomic DNA Isolation Kit from XpressBio (Thurmont, Maryland). All samples were genotyped with 13 standardized GAPS microsatellite loci (Oki100, OMM1080, Ots211, Ots212, Ots213, Ots201b, Ots208b, OtsG474, Ssa408, Ogo2, Ogo4, Ots3M, and Ots9; Seeb et al. 2007), and one additional non-standardized locus (Ots4). Fluorescently labeled PCR products were separated with an Applied Biosystems 3100 Fragment Analyzer and scored with GeneMapper software (Applied Biosystems). All genotyping was quality controlled by utilizing positive (known genotype) and negative (without DNA) controls in each run. Repetitive genotyping of ~12% of randomly selected individuals was completed to ensure reliability of genotyping results and for QA/QC measures.

Parentage (and thus age) of adults was determined through assignment procedures back to the parental genotype database using maximum likelihood analysis (with a zero or one mismatch cutoff) using the software program CERVUS 3.0 (available from www.fieldgenetics.com). This latest version of CERVUS has updated likelihood equations that increase the success of paternity assignment while accommodating genotyping error (Kalinowski et al. 2007).

Parents included all natural adults passed above the EFSR adult trap and all captive-reared adults released above the EFSR picket weir between 2006 and 2008. The tagging rate for progeny coming from Captive x Captive (C x C) crosses is very high (99%), while the rate for naturals is low, or even unknown. Thus, our ability to detect progeny from C x C crosses is very high. In this report, we summarize the 2011 returns and their assignments back to parents in those years. Following parentage analysis, the number of recruits per female was calculated as the proportion of offspring assigned to the respective number of captive females released or natural females trapped in a given spawn year. For this metric, only two-parent assignments were used and females were phenotypically identified at the trap.

RESULTS AND DISCUSSION

Adult Trapping

The EFSR adult trap facility was operated from June 14 through September 21, 2012. During this period a total of 244 adult natural/wild-origin Chinook salmon were captured and released upstream (Table 1). This total included 111 females and 133 males, of which 41 were jacks. Fin clips were collected from all of these natural/wild-origin Chinook salmon. One hatchery origin female Chinook salmon was trapped and subsequently relocated back to the main stem Salmon River. Hatchery origin adults likely stray from adjacent hatchery returns to either Sawtooth or Pahsimeroi hatcheries, and we recycle these fish back to the mainstem Salmon River. An additional 397 non-target fish were trapped and passed upstream including bull trout *Salvelinus confluentus*, westslope cutthroat trout *O. clarkii lewisii*, and mountain whitefish *Prosopium williamsoni* (Table 2).

Table 1. Age, fork length (cm), and sex of natural origin adult Chinook salmon captured at the East Fork Salmon River adult trap facility during 2012. Sex is the phenotypic sex assigned to individual fish at the time of capture. Ages were assigned according to the fork lengths of fish at the time of capture based upon previous length-at-age distributions from fin ray aged upper Salmon River Chinook salmon (Kennedy et al. 2011).

	Age 3 (<65 cm)		**Age 4 (65.0 - 82.9 cm)**		**Age 5 (>82.9 cm)**		
Sex	**#**	**%**	**#**	**%**	**#**	**%**	**Total**
Female	1	1	42	38	68	61	**111**
Male	0	0	63	68	29	32	**92**
Jack	41	100	0	0	0	0	**41**
Total	**42**	**17**	**105**	**43**	**97**	**40**	**244**

Table 2. Summary of non-target fish captured and passed upstream at the East Fork Salmon River adult trap during 2012.

Species	Number Trapped[a]
Bull trout[b]	303
Westslope cutthroat trout	6
Rainbow trout	0
Mountain whitefish	94
Catostomus spp.	0
Steelhead (juvenile)	0
Sockeye salmon	0
TOTAL	**403**

[a] Does not include 2012 recaptures.
[b] Includes two trap mortalities.

The number of Chinook salmon trapped in 2012 (244) was greater than in 2011 (210), but not as abundant as the 2010 return (275). Nonetheless, this year's return was the second highest since 1988, excluding years the trap was not operated (Figure 2). In addition, 25 of the 244 natural adult Chinook salmon trapped were found with PIT tags (Appendix A). Most Chinook salmon captured with PIT tags this year were tagged as adults while migrating through the Federal Columbia River Power System (FCRPS); (n = 20, 80%), at either the Bonneville Adult Facility on the Columbia River (n = 3) or at Lower Granite Dam (LGD) on the Lower Snake River (n = 17). Four PIT-tagged adult Chinook salmon were originally PIT tagged as juveniles, three from the EFSR and one from Hayden Creek on the Lemhi River. This Hayden Creek fish is the first confirmed wild stray we have detected at the EFSR via PIT tags.

During 2012, based upon the phenotypic sex assignments given at the time of trapping, females made up a much larger proportion of the total catch (45.5%) than recorded since trapping resumed in 2004 (Table 3). The sex ratio (Males:Females) this year was 1.2:1.0, which is nearly half the 2004—2011 average sex ratio (2.3:1.0). We captured nearly twice the number of females in 2012 as in 2011, despite trapping only 33 more fish. We also captured a lower proportion of jacks in 2012 (17%) than the average proportion captured from 2004-2011 (21%).

Assignment of sex at the time of trapping based on phenotypic expression of secondary sex characteristics is standard at most adult trapping facilities. However, it is also commonly recognized that these assignments are not completely accurate. Despite the availability of genotypic sexes for a portion of the 2011 adult returns that were successfully assigned parentage, apportioning these known sexes to the entire return was not performed for this trap data.

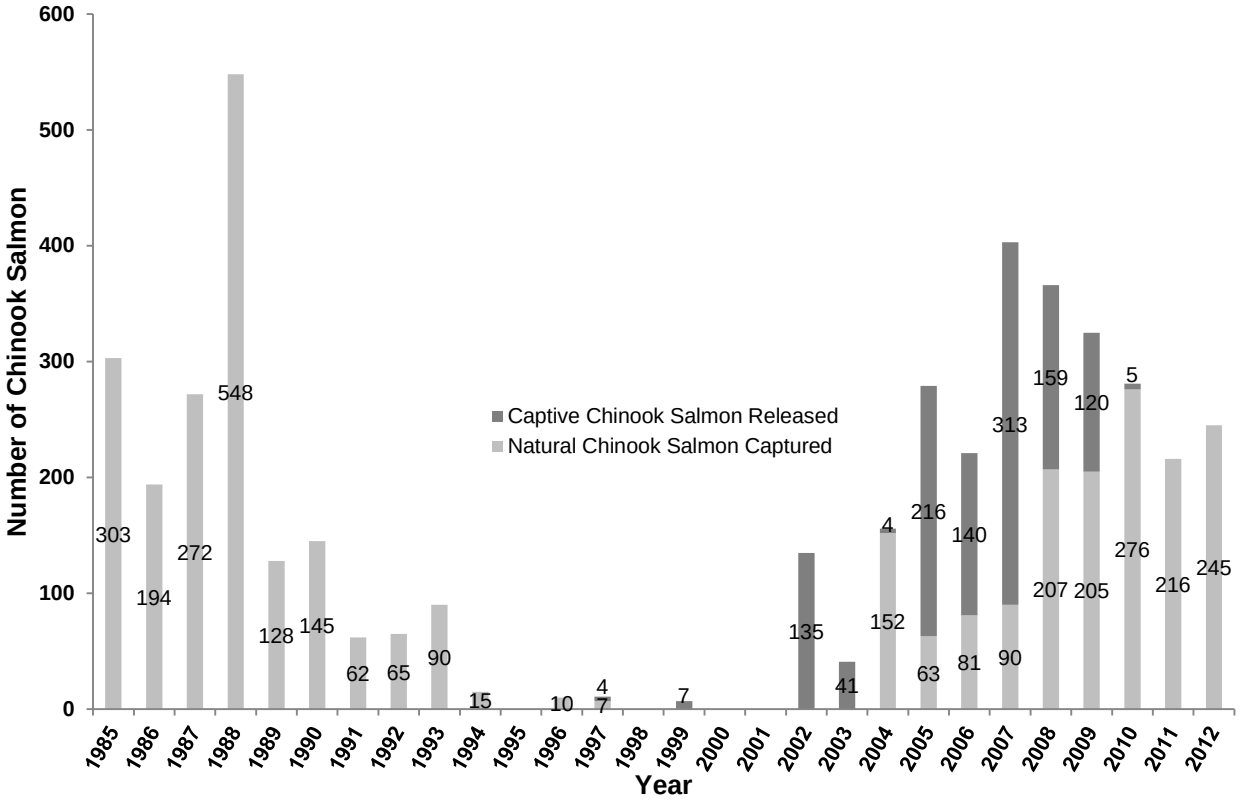

Figure 2. Natural adult Chinook salmon captured and released upstream at the East Fork Salmon River (EFSR) adult trap facility, and captive reared adults released into the EFSR upstream of the adult trap, 1985-2012. Hatchery Chinook salmon were not adipose clipped until 1994, thus trap numbers prior to this date include both natural and hatchery origin fish (1985-1998), since they were not discernible from each other.

Table 3. Sex composition (%) and sex ratio (M:F) of natural origin adult Chinook salmon captured and passed upstream at the East Fork Salmon River adult trap facility 2004-2012. All sex numbers are the phenotypic sex assigned to individual fish at the time of capture.

	Number of Chinook Salmon									
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Mean**
Female	45	21	21	27	63	61	72	62	111	**54**
	31%	33%	26%	30%	31%	32%	26%	29%	45%	**31%**
Male	69	31	40	29	107	82	163	102	92	**79**
	47%	49%	49%	33%	52%	42%	59%	48%	38%	**46%**
Jack	13	11	20	33	35	50	40	44	41	**32**
	9%	17%	25%	37%	17%	26%	15%	21%	17%	**20%**
Unknown	20	0	0	0	0	0	0	4	0	**3**
	14%	0%	0%	0%	0%	0%	0%	2%	0%	**2%**
Total	**147**	**63**	**81**	**89**	**205**	**193**	**275**	**212**	**244**	**168**
	Sex Ratio (M:F)									
Jacks Included	1.8	2.0	2.9	2.3	2.3	2.2	2.8	2.4	1.2	**2.3**
Jacks Excluded	1.5	1.5	1.9	1.1	1.7	1.3	2.3	1.6	0.8	**1.6**

Discharge (flow) of the EFSR during 2012 was near average during most of the year (Figure 3). However, discharge was drastically higher during early June compared to average. In contrast to 2011, spring discharge was higher and summer flows were lower in 2012. However, this did not appear to alter run timing of Chinook salmon during 2012 (Figure 4).

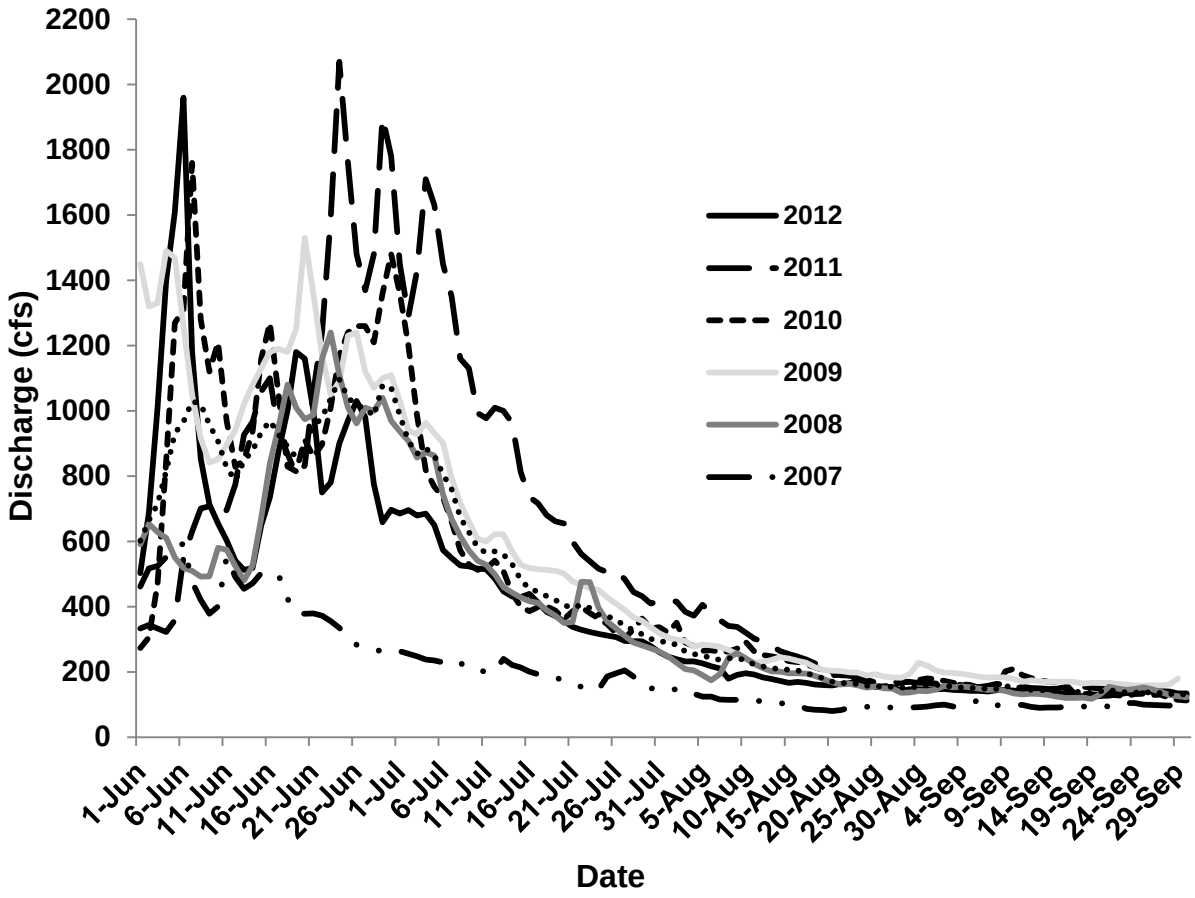

Figure 3. Discharge in cubic feet per second (cfs) of the East Fork Salmon River, June 1–September 30, 2007—2012.

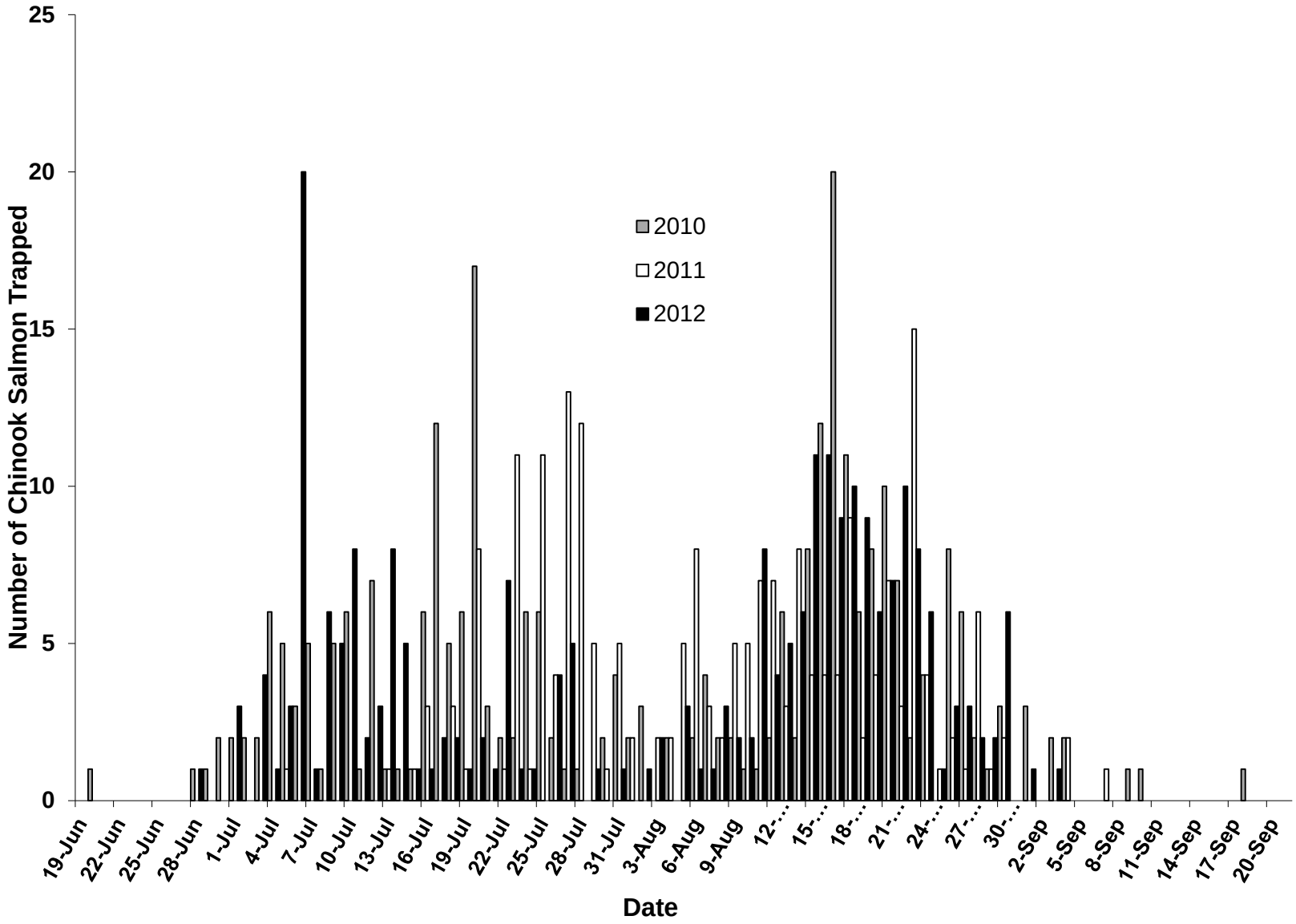

Figure 4. Timing of natural-origin Chinook salmon captured in the East Fork Salmon River adult trap, June 19 – September 21, 2010—2012.

Spawning Ground Surveys

Between August 11 and September 17, 2012, the field crews counted 63 Chinook salmon redds upstream of the EFSR adult trap (NS-1b), and an additional 148 were found within 17.1 km downstream of the trap during spawning ground surveys (Table 4); (Appendix B). Aerial surveys performed by IDFG Region 7 on September 5, 2012 found 43 redds in NS-1b, 52 redds in NS-1a, 62 redds in NS-2b, and an additional 44 redds in NS-2a, which extends from the mouth of the EFSR upstream to the mouth of Herd Creek (Table 5); (J. Flinders, Idaho Fish and Game, unpublished data).

During carcass surveys we recovered a total of 199 Chinook salmon carcasses: 173 below the EF adult trap and 26 above the trap (Table 4). One hundred forty-six were carcasses not previously sampled (untagged/unmarked), and 27 carcasses were fish previously captured, jaw-tagged, and released above the EFSR adult trap (Appendix C). These 27 previously trapped adults consisted of 16 males, four jacks, and seven females. Of the 26 carcasses above the trap, one of these carcasses was a fish without a jaw tag and no evidence of being captured at the trap (pelvic fin punch). Thus, it appears that at least one Chinook salmon was able to ascend either over the spillway or through the high velocity water below the east radial gate while flows were much too high to close the gate completely.

Fin ray samples were collected from 100 of the total 199 carcasses recovered, and all from downstream of the trap (Table 4). All fin ray samples were inventoried and submitted to the IDFG aging lab in fall 2012. Fin ray ages were not yet complete from 2012 carcasses at the time of reporting.

Table 4. Summary of natural origin Chinook salmon redds counted and carcasses collected by Captive Chinook Salmon Project (CCSP) transects and Spawning Ground Survey (SGS) trend transects, downstream and upstream of the adult trap on the East Fork Salmon River in 2012.

CCSP Transect					SGS Trend Transect				
			Carcasses					Carcasses	
Name	Distance from Trap (Km.)	Redds	Fin Rays Collected	All	Name	Description	Redds	Fin Rays Collected	All
N06	17.1	5	0	3	NS-2b	Herd Creek to 3.5 miles downstream of EFSR adult trap	76	25	67
N05	14.3	21	3	15					
N04	11.9	31	13	28					
N03	8.9	19	9	21					
N02	6.1	31	41	57	NS-1a	EFSR adult trap to 3.5 miles downstream	72	75	106
N01	2.9	41	34	49					
						Total Downstream	**148**	**100**	**173**
N1	1.3	8	0	3	NS-1b	EFSR adult trap to Bowrey Guard Station	63	0	26
N2	3.2	17	0	8					
N3	4.7	15	0	8					
N4	5.3	6	0	2					
N5	7.2	6	0	0					
N6	9.7	10	0	5					
N7	10.9	1	0	0					
						Total Upstream	**63**	**0**	**26**
						TOTAL ALL	**359**	**100**	**372**

Table 5. Number of redds observed from aerial counts on the West Fork Yankee Fork Salmon River (WFYF) and East Fork Salmon River (EFSR), 2002–2012. Ground counts were substituted in years aerial surveys were not conducted (WFYF, 2010—2012; EFSR, 2010).

		Number of Redds										
Stream	**Section Description**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
WFYF	WFYF mouth to Lightning Cr (NS-8) [1]	10	18	5	1	0	7	1	1	7	3	9
	Lightning Cr to Cabin Cr (NS-7) [2]	1	7	0	0	0	0	0	0	0	0	2
	Total	**11**	**25**	**5**	**1**	**0**	**7**	**1**	**1**	**7**	**3**	**11**
EFSR	Mouth of East Fork to Herd Cr (NS-2a) [3]	56	15	38	12	7	3	34	13	110	36	44
	Herd Cr to 3.5 mi downstream of EF Trap (NS-2b) [4]	79	60	37	18	19	31	40	24	119[a]	86[a]	62
	3.5 mi downstream of EF Trap to EF Weir (NS-1a) [5]	100	93	55	32		21	50	13			52
	EF Weir to Bowrey Guard Station (NS-1b) [6]	44	59	24	16	2	25	27	9	60	16	43
	Total	**279**	**227**	**154**	**78**	**28**	**80**	**151**	**59**	**289**	**138**	**201**

Section Start Waypoint - Section End Waypoint (WGS-84 datum; Zone 11):
[1]681207mE 4913151mN - 675543mE 4917302mN
[2]675543mE 4917302mN - 672961mE 4918255mN
[3]713337mE 4905174mN - 715846mE 4892489mN
[4]715846mE 4892489mN - 709618mE 4891548mN
[5]709618mE 4891548mN - 705656mE 4887911mN
[6]705656mE 4887911mN - 700640mE 4872303mN

[a] Aerial counts of SGS transects NS-2b and NS-1a were counted as one combined transect in 2010-2011.

Genetic Parentage Analyses

In 2012, we genotyped and performed genetic parentage analyses of fin tissue samples from a total of 281 Chinook salmon adults that returned to the EFSR in 2011 (Table 6). Of these adults, 210 were captured at the EFSR adult trap. An additional 71 samples were collected from carcasses found below the trap. Of the 281 adult samples, 249 were successfully genotyped (88.6%; 208 trap adults and 41 carcass samples).

Table 6. Number and type of genetic samples collected from 2011 adult Chinook salmon returns to the East Fork Salmon River and the number and percent of genetic samples successfully genotyped.

Collection Type	Collected	Genotyped Number	Genotyped %
Trapped	210	208	99.0
Carcasses	71	41	57.7
TOTAL	**281**	**249**	**88.6**

In summary, 165 adults assigned to one or two parents with zero or one locus mismatches, for an overall assignment rate of 66% (Table 7). Most of these adults (n = 122, 74%) were produced from at least one natural parent. Fewer adults were assigned at least one captive parent (n = 40). And three adults assigned to natural x captive crosses. The majority of all assignments (n = 106, 64%) were produced from fish that returned or were released in 2007 (age-4 in 2011). Of the fish assigned to two natural parents (n = 77), 15 adults were produced from adults that returned in 2006 (age-5), 51 adults were produced from adults that returned in 2007 (age-4), and 11 adults were produced from natural adults that returned in 2008 (age-3). Of the fish assigned to two captive-reared parents (n = 38), seven adults were produced from adults released in 2006 (age-5), 30 adults were produced from adults released in 2007 (age-4), and one adult was produced from adults released in 2008 (age-3, jack).

Of the single parent assignments (n = 47), most were assignments to a single natural parent (n = 45, 96%). Of the single parent natural assignments, 12 assigned to a spawn year 2006 (SY06), 23 to SY07, 10 to SY08. The two single parent captive-reared assignments both assigned to release year 2007 (age-4) males. The majority (64%) of single parent assignments from the 2011 adult returns were assigned to a female parent (with no male parent identified).

Overall parentage assignment rates have steadily increased in each successive adult return (progeny) from 4% in 2007, 29% in 2008, 37% in 2009, 56% in 2010, and the highest in 2011 (66%); (Table 8). Unassigned fish can result from genotyping errors or missing parents. A small number of potential parents at the trap were unsuccessfully genotyped (<3%), and an even lower genotyping error (<1%) could have contributed to some non-assignments. These results suggest that a significant number of unsampled parents contributed to the production of adults that returned to the trap again in 2011. Potential sources of unsampled parents include

precocial males, spawning below the trap that produces adult progeny returning to the trap, and fish that make it over the trap without being captured.

In 2011, carcasses were collected to determine if any captive-reared progeny were returning below the EFSR adult trap. Of the 90 carcasses recovered below the trap, 19 were adults that had been originally trapped, tagged, and released above the trap but subsequently passed downstream of the trap. Of these 19 previously trapped fish, 14 assigned to either one or two parents with zero or one locus mismatches. Twelve of these 14 fish were progeny of natural-origin Chinook salmon; seven from two parent assignments (5-SY07, 2-SY08) and five from a single natural parent (2-SSY07, 3-SY08). Only two adult returns, recovered as carcasses but previously trapped, assigned to captive-reared adults, both 2007 parent pairs. The remaining 71 carcasses were adult Chinook salmon not previously trapped (did not pass upstream of EFSR adult trap), with 41 of these samples successfully genotyped. Of these 41 fish, 11 assigned to either one or two natural parents with zero or one locus mismatch. Four carcasses assigned to two natural parents (2-SY06, 2-SY07), and seven carcasses assigned to natural single parents (3-SY06, 3-SY07, 1-SY08). No carcasses recovered below the trap that were not previously trapped assigned to captive-reared Chinook salmon. However, we anticipate continuing concentrated carcass collections downstream of the adult trap to ensure potential progeny from captive-reared fish are recovered and therefore have the possibility to be assigned to their respective parent(s).

These results demonstrate reproductive success of captive-reared Chinook salmon released to spawn. With the parentage analyses completed on the 2011 adult returns, the contribution of the 2006 spawn year is complete. In 2006, captive-reared adults release to spawn naturally (n = 141: 73 female, 68 male) constructed 12 redds (Baker et al. 2007). Parentage analyses have found these fish produced 25 progeny that returned as adults in (3-SY09, 14-SY10, 8-SY11). This magnitude of production equates to 0.35 recruits per female (Table 9). Not all adults from spawn years (SY) 2007 and 2008 have returned yet, but SY07 has already returned 30 progeny, with age-5 adults returning in 2012.

Considering these assignment rates and relative reproductive success, it is important to consider realistic expectations for captive-reared fish performance. To define expectations we modeled both natural and captive reared production to predict an adult return from a given spawn year. Based upon the number of females trapped (naturals) and released (captive) and redds created by those females, we estimated the number of redds per female (Table 10). Then, we utilized mean fecundity of females to estimate the number of eggs natural/wild returns and captive-reared releases would produce. We used the mean fecundity from 1985-1993 egg takes of wild female Chinook salmon captured at the EFSR adult trap, which were spawned and incorporated into the Sawtooth Fish Hatchery Chinook salmon broodstock (Rogers 1988, 1989, 1990; Alsager 1993a, 1993b; Chapman and Coonts 1993, 1994; Snider and Coonts 1998; Snider and Schilling 1998). The mean fecundity of captive-reared females used in our calculations was from females spawned in captivity in 2002-2004 (Venditti 2003b, 2005; Baker et al. 2006b).

We then multiplied their fecundity by the mean spawn-to-eyed-egg survival rates from emergence survival studies (Stark and Gable 2010, Stark et al. 2008, 2009) to estimate the number of eyed eggs that would be expected. Next, we used a hypothetical mean eyed-egg-to-smolt survival rate of 5% for both wild and captive-reared fish to estimate the number of smolts. Then, we applied a smolt to adult survival rate (SAR) of 2%, again for both groups, to estimate a total adult return for a given spawn year (Table 10). Lastly, we apportioned this total adult return from a given spawn year into abundance across three adult return years (Table 11). Annual

adult return projections were apportioned using the weighted mean age structure (age-class proportions) from assigned genotypic ages of 2009–2011 natural adult returns (Table 12).

A comparison of the reproductive success (progeny assigned) of wild and captive-reared adults in 2009-2011 reveals more progeny returned from wild fish than progeny from captive reared fish (Table 13). When we average the 2009-2011 percent of natural progeny projected, we find wild fish returned at 82% of our projections, while progeny from captive-reared fish returned at 86% of our projections.

Still another way to evaluate captive-reared reproductive success is to compare the production from a single year's egg collection to what would have been produced from the equivalent wild eggs left in natal gravels. As an example, in spawn year (SY) 2006 we collected 300 wild eggs from the EFSR. These eggs were brought into captivity and raised to maturity in captivity. In total (across three years), 70 mature adult females were released to spawn from the 2006 collection. Parentage analyses have since shown this complete spawn year returned 21 adults. Now if we apply 5% eyed-egg-to-smolt survival rate, a 2% smolt-to-adult survival rate, and assume a 1:1 sex ratio of adult returns to an equivalent 300 wild eyed-eggs left in the stream; we would end up with only 0.15 wild females. Then if we multiply 3.4 recruits per female (calculated from the complete parentage assignments of SY06 wild adults), we estimate SY06 wild fish would have only returned 0.51 wild adults. Therefore, standardizing the production on an 'egg-to-egg' basis for the complete SY06, captive-reared fish effectively achieved 40 times the survival of wild fish.

Of the 2011 adult returns that assigned to a parent pair (n = 118), over 34% (n = 38) were progeny from captive reared adult releases (Table 13). Furthermore, captive reared adult Chinook salmon released to spawn naturally in 2006 produced 25 progeny that returned as adults, yet we projected only ten fish to return. Our projections of captive reared contribution to adult returns were higher than our assignments in 2009-2011 returns, but lower than assigned for release year 2006 fish only. Therefore, it is apparent that progeny from captive reared fish released in 2006 attained higher survival (during at least one stage) than the survival rates used in our projections. However, on average captive reared progeny that returned as adults in 2009-2011 had survival rates lower than our projections utilize, at least at one stage of survival.

Thus far, a moderate number of adult returns have been assigned to captive-reared adults, and probability of contribution remains high in 2012 adult returns, because captive-reared releases in 2007 and 2008 demonstrated relatively strong spawning success (Appendix D). These parentage assignments should be considered minimum estimates of captive-reared production since an estimated seven wild/natural adult returns were harvested in the EFSR drainage by the Shoshone-Bannock Tribes in 2011 (Tardy 2012). These fish could have also assigned to parent pairs. Lastly, remaining project field efforts will include continued capture and genetic sampling of adult returns at the EFSR adult trap, but will also concentrate on obtaining fresh genetic samples from carcasses recovered below the trap. The parentage analysis and thus assignments for 2012 adult returns will be completed in the next reporting year (2013).

Table 7. Parentage assignments of adult Chinook salmon returns to the East Fork Salmon River in 2011, from 208 trapped and 41 carcasses successfully genotyped, summarized by assignment type, parent source crosses, and age. All assignments were with zero or one locus mismatch.

PROGENY ASSIGNMENTS													
2 Parents	**Captive x Captive**				**Natural x Captive**				**Natural x Natural[a]**				**Total All**
	Jacks	Age 4	Age 5	**Total**	Jacks	Age 4	Age 5	**Total**	Jacks	Age 4	Age 5	**Total**	
	1	30	7	**38**	2	0	1	**3**	11	51	15	**77**	**118**
1 Parent	**Captive x Unknown**								**Natural x Unknown[b]**				**Total All**
	Jacks	Age 4	Age 5	**Total**					Jacks	Age 4	Age 5	**Total**	
	0	2	0	**2**					10	23	12	**45**	**47**

[a] *Includes four NxN assignments from carcasses.*

[b] *Includes seven NxU assignments from carcasses.*

Total Assignments	**165**
No Assignments	**84**
Total	**249**
2 Parents Assigned	**47%**
1 Parent Assigned	**19%**
Total Assigned	**66%**

Table 8. Summary of samples genotyped, parentage assignment type and assignment rate of adult Chinook salmon returns to the East Fork Salmon River, 2004—2011.

	Parentage Assignment Rate								
Adult Return Year→	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**Total**
Total Genotyped Samples	**156**	**280**	**219**	**393**	**358**	**313**	**304**	**249**	**2440**
2 Parent Assignments				8	66	66	109	118	**367**
1 Parent Assignments	1	0	0	7	39	50	60	47	**204**
1 & 2-Parent Assignments	1	0	0	15	105	116	169	165	571
Invalid Assignments	0	0	0	0	10	14	21	9	**54**
No Assignment	151	63	80	74	86	63	113	75	**705**
Assignment Rate		0%	0%	4%	29%	37%	56%	66%	23%

Table 9. Number of females, redds, and redds per female of both captive-reared (C) and natural/wild (N) Chinook salmon in the East Fork Salmon River (EFSR) upstream of the adult trap; and subsequent progeny (adult returns) assigned to those spawn years and estimated recruits per female. All parentage assignments are to a parent pair with zero or one mismatch.

							Adult Return Assignments			
	Number of Females		Redds Produced[b]		Redds per Female		Progeny Assigned[d, e]		Recruits per Female	
Adult Spawn Year	C	N[a]	C[c]	N	C	N	C	N	C	N
1999	6	N.A.	1	4	0.17	N.A.	0	0	N.A.	N.A.
2000	0	N.A.	0	9	0.00	N.A.	0	0	N.A.	N.A.
2001	0	N.A.	0	12	0.00	N.A.	0	0	N.A.	N.A.
2002	37	N.A.	33	44	0.89	N.A.	0	0	N.A.	N.A.
2003	35	N.A.	N.A.	59	N.A.	N.A.	0	0	N.A.	N.A.
2004	4	45	1	21	0.25	0.46	0	86	N.A.	1.91
2005	28	21	11	17	0.44	0.81	1	43	N.A.	2.05
2006	73	21	12	16	0.21	0.78	25	106	0.34	5.05
2007	124	27	63	24	0.51	0.89	30	56	0.24	2.07
2008	111	63	55	45	0.50	0.71	3	11	0.03	0.17
2009	113	61	10	49	0.18	0.80			0.00	0.00
2010	5	72	1	60	0.20	0.83			0.00	0.00
2011	N.A.	62	N.A.	21	N.A.	0.34	N.A.		N.A.	0
2005 – 2010	**452**	**265**	**152**	**211**	**0.34**	**0.80**	**57**	**214**		

[a] The EFSR adult trap was not operated from 1998-2003, thus natural/wild return numbers and therefore fin clips are not available.
[b] Does not include redds counted below the EFSR adult trap (2009-66, 2010-119, 2011-63).
[c] No captive-reared fish survived to spawn post release in 2003 due to unknown causes (Venditti et al. 2004).
[d] Assignments from genetic samples taken from carcasses are not included here because redd data for carcasses are incomplete.
[e] Assignments to Captive x Natural and Natural x Captive crosses were summarized separately for both Captive and Natural (i.e. twice).
[f] Adult spawn years 2007 and 2008 are incomplete (i.e. not all possible progeny have returned yet).

Table 10. Projected natural/wild and captive-reared Chinook salmon production from spawn years 2005—2011 in the East Fork Salmon River.

Natural/Wild Chinook Salmon

Spawn Year	Number of Females	Redds	Redds per Female	Eggs per Female	Green Eggs	Spawn to Eyed Egg Survival[a]	Eyed Eggs	Eyed Egg to Smolt Survival[b]	Smolts	Smolt to Adult Survival[b]	Total Predicted Adult Return (across 3 yrs)
2005	21	17	0.81	5,589	95,013	90.6%	86,082	5.0%	4,304	2.0%	86
2006	21	16	0.78	5,589	92,024	90.6%	83,373	5.0%	4,169	2.0%	83
2007	27	24	0.89	5,589	134,136	90.6%	121,527	5.0%	6,076	2.0%	122
2008	63	45	0.70	5,589	251,505	90.6%	227,864	5.0%	11,393	2.0%	228
2009	61	49	0.82	5,589	273,861	90.6%	248,118	5.0%	12,406	2.0%	248
2010	72	60	0.83	5,589	335,340	90.6%	303,818	5.0%	15,191	2.0%	304
2011	62	21	0.34	5,589	117,369	90.6%	106,336	5.0%	5,317	2.0%	106
Mean	**47**	**33**	**0.74**	**5,589**	**185,607**	**90.6%**	**168,160**	**5.0%**	**8,408**	**2.0%**	**178**
Total	**327**	**232**									**1,177**

Captive-reared Chinook Salmon

Spawn Year	Number of Females	Redds	Redds per Female	Eggs per Female	Green Eggs	Spawn to Eyed Egg Survival[a]	Eyed Eggs	Eyed Egg to Smolt Survival[b]	Smolts	Smolt to Adult Survival[b]	Total Predicted Adult Return (across 3 yrs)
2005	28	11	0.39	1,200	13,200	70.5%	9,299	5.0%	465	2.0%	9
2006	73	12	0.16	1,200	14,400	70.5%	10,145	5.0%	507	2.0%	10
2007	124	63	0.51	1,200	75,600	70.5%	53,260	5.0%	2,663	2.0%	53
2008	111	55	0.50	1,200	66,000	70.5%	46,497	5.0%	2,325	2.0%	46
2009	113	10	0.09	1,200	12,000	70.5%	8,454	5.0%	423	2.0%	8
2010	5	1	0.20	1,200	1,200	70.5%	845	5.0%	42	2.0%	1
Mean	**76**	**25**	**0.31**	**1,200**	**30,400**	**70.5%**	**21,417**	**5.0%**	**1,071**	**2.0%**	**21**
Total	**454**	**152**									**129**

[a] Mean survival rates estimated from emergence survival experiments (2007-2009).
[b] Optimistic mean survival rates from the literature.

Table 11. Projected natural/wild and captive-reared Chinook salmon production from spawn years 2005—2011 in the East Fork Salmon River, apportioned across adult return years by weighted mean 2009—2011 genotypic age structure (proportions).

Natural/Wild Chinook Salmon

	Parents			Projected Adult Returns (Progeny)									
Brood Year	**Females**	**Redds**	**#/Female**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
2005	21	17	0.81	9	63	14							86
2006	21	16	0.78		9	61	14						83
2007	27	24	0.89			13	88	20					122
2008	63	45	0.70				25	166	37				228
2009	61	49	0.82					27	181	41			248
2010	72	60	0.83						33	221	50		304
2011	62	21	0.34							11	77	17	106
MEAN	**47**	**33**	**0.74**										**168**
TOTAL	**327**	**232**		**9**	**72**	**88**	**127**	**213**	**251**	**273**	**127**	**17**	**1,177**

Captive-reared Chinook Salmon

	Parents			Projected Adult Returns (Progeny)									
Brood Year	**Females**	**Redds**	**#/Female**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**		**Total**
2005	28	11	0.39	1	7	2							9
2006	71	12	0.17		1	7	2						10
2007	124	63	0.51			6	39	9					53
2008	111	55	0.50				5	34	8				46
2009	113	10	0.09					1	6	1			8
2010	5	1	0.20						0	1	0		1
2011	0	0	0.00							0	0	0	0
MEAN	**75**	**25**	**0.31**										**30**
TOTAL	**452**	**152**		**1**	**8**	**15**	**45**	**43**	**14**	**2**			**182**

Table 12. Annual and weighted mean genotypic age structure of 2009—2011 wild Chinook salmon adult returns that assigned to a parent pair with zero or one mismatch. Age was given based upon return year of assigned adult parents.

Adult Return Year		Genotypic Age 3	4	5	Total
2009	No.	10	34	22	66
	%	**15%**	**52%**	**33%**	
2010	No.	7	96	4	107
	%	**7%**	**90%**	**4%**	
2011	No.	14	79	21	114
	%	**12%**	**69%**	**18%**	
	Total	31	209	47	287
	Weighted Mean	**11%**	**73%**	**16%**	

Table 13. Comparison of projected Chinook salmon adult returns in 2009—2011 to assignments of 2009—2011 adult returns to natural or captive-reared Chinook salmon parents in the East Fork Salmon River. All parentage assignments are to a parent pair with 0 or 1 mismatch, and assignments from carcasses are excluded since redd data for carcasses are incomplete. Assignments to Captive x Natural and Natural x Captive crosses were totaled separately for both Captive and Natural (i.e. a single assignment to a C x N would have been counted once for captives and once for naturals).

Origin	Group	Adult Returns 2009	2010	2011	Total
Natural/Wild	**Projected**	72	88	127	**287**
	Assigned[a]	63	94	77	**234**
	% of Projected	88%	107%	61%	**82%**
Captive Reared	**Projected**	8	15	45	**69**
	Assigned[a]	3	15	38	**60**
	% of Projected	38%	100%	84%	**86%**
Total	**Projected**	80	103	172	**355**
	Assigned[a]	66	109	115	**290**
	% of Projected	83%	106%	67%	**82%**
Proportion of All Assigned	**Natural/Wild**	95%	86%	67%	**81%**
	Captive Reared	**5%**	**14%**	**33%**	**19%**

[a] See Appendix D for assignments by origin and adult return year.

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APPENDICES

Appendix A. PIT-tagged natural Chinook salmon captured at the East Fork Salmon River adult trap in 2012.

	First Capture (tagged)			Recapture				
PIT Number	Date	Location	Length (cm)	Date	Location	Length (cm)	Sex	Known Age
3D9.1C2DE876FD	5/8/2012	Bonneville Adult Facility	67.5	6/28/2012	EFSR	68.5	Female	
3D9.1C2CFED68F	9/17/2009	EFSR	6.8	7/3/2012	EFSR	73.5	Female	Age-4
3D9.1C2DB1AA3D	5/22/2012	Lower Granite Dam	N/A	7/6/2012	EFSR	91.0	Female	
3D9.1C2CFE62FB	9/20/2009	EFSR	7.5	7/6/2012	EFSR	66.8	Male	Age-4
3D9.1BF27B7F70	5/19/2009	Lower Granite Dam	11.2	7/6/2012	EFSR	87.5	Female	
3D9.1C2DB20D6F	5/25/2012	Lower Granite Dam	72.0	7/6/2012	EFSR	74.0	Male	
3D9.1C2DAC1D7A	5/18/2012	Lower Granite Dam	N/A	7/7/2012	EFSR	69.0	Female	
3D9.1C2DAC4C44	5/19/2012	Lower Granite Dam	N/A	7/8/2012	EFSR	76.5	Female	
3D9.1C2DB1ABC8	5/20/2012	Lower Granite Dam	N/A	7/10/2012	EFSR	85.0	Female	
3D9.1C2DABFD5A	5/26/2012	Lower Granite Dam	86.0	7/11/2012	EFSR	88.3	Female	
3D9.1C2DB4D39B	5/21/2012	Bonneville Adult Facility	61.0	7/13/2012	EFSR	62.5	Jack	
384.1B79764D72	5/9/2012	Bonneville Adult Facility	86.0	7/20/2012	EFSR	88.5	Female	
3D9.1C2DB1D3EA	6/3/2012	Lower Granite Dam	95.0	7/22/2012	EFSR	96.5	Female	
3D9.1C2CFDD592	3/31/2009	EFSR	7.9	7/22/2012	EFSR	88.2	Female	Age-5
3D9.1C2DB1EC7F	5/26/2012	Lower Granite Dam	91.0	7/31/2012	EFSR	91.5	Female	
3D9.1C2CFAE110		Unknown		8/5/2012	EFSR	91.7	Male	
3D9.1C2D107970	11/4/2009	Hayden Creek, Lemhi	9.6	8/11/2012	EFSR	72.0	Male	Age-4
3D9.1C2DB1B2D7	5/21/2012	Lower Granite Dam	N/A	8/15/2012	EFSR	89.5	Female	
3D9.1C2DB20DB4	5/24/2012	Lower Granite Dam	73.0	8/17/2012	EFSR	75.5	Male	
3D9.1C2DAC05E1	5/27/2012	Lower Granite Dam	74.0	8/18/2012	EFSR	75.6	Male	
3D9.1C2DAC2C10	5/28/2012	Lower Granite Dam	70.0	8/21/2012	EFSR	71.0	Female	
3D9.1C2DAC13F9	5/26/2012	Lower Granite Dam	98.0	8/21/2012	EFSR	101.0	Male	
3D9.1C2DB0783C	7/7/2012	Lower Granite Dam	53.0	8/22/2012	EFSR	53.5	Jack	
3D9.1C2DB1E110	5/25/2012	Lower Granite Dam	61.0	8/22/2012	EFSR	61.5	Jack	
3D9.1C2DB20AA1	6/18/2012	Lower Granite Dam	55.0	8/28/2012	EFSR	54.0	Jack	

Appendix B. Summary of Chinook salmon redds observed during ground counts in the East Fork Salmon River (EFSR) during 2012. Locations are GPS waypoints (WGS-84 datum).

Stream	Date Observed	Redd Name	Location Lat (N)	Location Long (W)	Section Name	SGR Trend Transect
EFSR	8/11/2012	R002BA	44.12889	-114.41963	N01	NS-1a
EFSR	8/11/2012	R003BA	44.11870	-114.42697	N01	NS-1a
EFSR	8/13/2012	R014BA	44.12883	-114.42011	N01	NS-1a
EFSR	8/13/2012	R015BA	44.12669	-114.42081	N01	NS-1a
EFSR	8/13/2012	R016BA	44.11926	-114.42427	N01	NS-1a
EFSR	8/13/2012	R007BA	44.11705	-114.42944	N01	NS-1a
EFSR	8/13/2012	R013BA	44.14215	-114.39832	N02	NS-1a
EFSR	8/13/2012	R012BA	44.14593	-114.39217	N03	NS-2b
EFSR	8/16/2012	R027KF	44.13297	-114.41074	N02	NS-1a
EFSR	8/16/2012	R028KF	44.13141	-114.41575	N02	NS-1a
EFSR	8/17/2012	R005BA	44.12889	-114.41963	N01	NS-1a
EFSR	8/17/2012	R006BA	44.11870	-114.42697	N01	NS-1a
EFSR	8/17/2012	R031KF	44.12593	-114.42071	N01	NS-1a
EFSR	8/17/2012	R033KF	44.12152	-114.42431	N01	NS-1a
EFSR	8/17/2012	R034KF	44.11905	-114.42456	N01	NS-1a
EFSR	8/17/2012	R038KF	44.11342	-114.43076	N1	NS-1b
EFSR	8/17/2012	R039KF	44.11010	-114.43436	N1	NS-1b
EFSR	8/17/2012	R040KF	44.10859	-114.43500	N1	NS-1b
EFSR	8/19/2012	R043BA	44.14486	-114.34493	N04	NS-2b
EFSR	8/19/2012	R044BA	44.14525	-114.35789	N04	NS-2b
EFSR	8/19/2012	R045BA	44.14540	-114.35921	N04	NS-2b
EFSR	8/19/2012	R046BA	44.14543	-114.35941	N04	NS-2b
EFSR	8/19/2012	R047BA	44.14528	-114.36366	N04	NS-2b
EFSR	8/19/2012	R022KF	44.14199	-114.32835	N05	NS-2b
EFSR	8/19/2012	R041BA	44.14322	-114.33648	N05	NS-2b
EFSR	8/19/2012	R042BA	44.14339	-114.33659	N05	NS-2b
EFSR	8/20/2012	R062BA	44.12950	-114.41848	N01	NS-1a
EFSR	8/20/2012	R063BA	44.12259	-114.42168	N01	NS-1a
EFSR	8/20/2012	R032KF	44.12463	-114.42377	N01	NS-1a
EFSR	8/20/2012	R066BA	44.11987	-114.42402	N01	NS-1a
EFSR	8/20/2012	R067BA	44.11948	-114.42391	N01	NS-1a
EFSR	8/20/2012	R068BA	44.11919	-114.42406	N01	NS-1a
EFSR	8/20/2012	R069BA	44.11874	-114.42509	N01	NS-1a
EFSR	8/20/2012	R070BA	44.11803	-114.42905	N01	NS-1a
EFSR	8/20/2012	R071BA	44.11796	-114.42897	N01	NS-1a
EFSR	8/20/2012	R072BA	44.11801	-114.42904	N01	NS-1a
EFSR	8/20/2012	R074BA	44.11718	-114.42937	N01	NS-1a
EFSR	8/20/2012	R075BA	44.11689	-114.42950	N01	NS-1a
EFSR	8/20/2012	R076BA	44.11670	-114.42953	N01	NS-1a
EFSR	8/20/2012	R052BA	44.14337	-114.39583	N02	NS-1a

Appendix B. Continued

Stream	Date Observed	Redd Name	Location		Section Name	SGR Trend Transect
			Lat (N)	Long (W)		
EFSR	8/20/2012	R025KF	44.14310	-114.39672	N02	NS-1a
EFSR	8/20/2012	R053BA	44.13752	-114.40602	N02	NS-1a
EFSR	8/20/2012	R026KF	44.13659	-114.40695	N02	NS-1a
EFSR	8/20/2012	R054BA	44.13593	-114.40733	N02	NS-1a
EFSR	8/20/2012	R055BA	44.13401	-114.40925	N02	NS-1a
EFSR	8/20/2012	R056BA	44.13316	-114.41100	N02	NS-1a
EFSR	8/20/2012	R059BA	44.13014	-114.41557	N02	NS-1a
EFSR	8/20/2012	R060BA	44.13013	-114.41587	N02	NS-1a
EFSR	8/20/2012	R061BA	44.13039	-114.41730	N02	NS-1a
EFSR	8/20/2012	R029KF	44.13050	-114.41771	N02	NS-1a
EFSR	8/20/2012	R049BA	44.14642	-114.37707	N03	NS-2b
EFSR	8/20/2012	R024KF	44.14694	-114.38228	N03	NS-2b
EFSR	8/20/2012	R050BA	44.14575	-114.39098	N03	NS-2b
EFSR	8/21/2012	R077BA	44.10503	-114.43838	N2	NS-1b
EFSR	8/21/2012	R078BA	44.10501	-114.43838	N2	NS-1b
EFSR	8/21/2012	R079BA	44.10014	-114.44229	N2	NS-1b
EFSR	8/21/2012	R081BA	44.09817	-114.44260	N2	NS-1b
EFSR	8/21/2012	R082BA	44.09757	-114.44263	N2	NS-1b
EFSR	8/21/2012	R083BA	44.09442	-114.44173	N2	NS-1b
EFSR	8/21/2012	R085BA	44.09305	-114.44276	N2	NS-1b
EFSR	8/21/2012	R086BA	44.09135	-114.44288	N2	NS-1b
EFSR	8/21/2012	R087BA	44.09026	-114.44335	N2	NS-1b
EFSR	8/21/2012	R088BA	44.09017	-114.44329	N2	NS-1b
EFSR	8/21/2012	R089BA	44.09009	-114.44320	N2	NS-1b
EFSR	8/21/2012	R090BA	44.08937	-114.44360	N3	NS-1b
EFSR	8/21/2012	R091BA	44.08835	-114.44434	N3	NS-1b
EFSR	8/21/2012	R092BA	44.08781	-114.44396	N3	NS-1b
EFSR	8/21/2012	R093BA	44.08673	-114.44442	N3	NS-1b
EFSR	8/21/2012	R094BA	44.08574	-114.44584	N3	NS-1b
EFSR	8/21/2012	R095BA	44.08146	-114.45148	N3	NS-1b
EFSR	8/21/2012	R096BA	44.08143	-114.45171	N3	NS-1b
EFSR	8/21/2012	R097BA	44.08174	-114.45260	N3	NS-1b
EFSR	8/21/2012	R098BA	44.08168	-114.45304	N3	NS-1b
EFSR	8/21/2012	R099BA	44.08104	-114.45292	N3	NS-1b
EFSR	8/21/2012	R100BA	44.08077	-114.45321	N3	NS-1b
EFSR	8/21/2012	R101BA	44.07994	-114.45367	N3	NS-1b
EFSR	8/22/2012	R020KF	44.15084	-114.30383	N06	NS-2b
EFSR	8/22/2012	R102BA	44.15081	-114.30387	N06	NS-2b
EFSR	8/22/2012	R021KF	44.14753	-114.31521	N06	NS-2b
EFSR	8/23/2012	R107BA	44.14337	-114.33821	N04	NS-2b
EFSR	8/23/2012	R108BA	44.14388	-114.3409	N04	NS-2b
EFSR	8/23/2012	R110BA	44.14481	-114.34554	N04	NS-2b
EFSR	8/23/2012	R111BA	44.14465	-114.35165	N04	NS-2b

Appendix B. Continued

Stream	Date Observed	Redd Name	Location		Section Name	SGR Trend Transect
			Lat (N)	Long (W)		
EFSR	8/23/2012	R112BA	44.14468	-114.3551	N04	NS-2b
EFSR	8/23/2012	R113BA	44.14539	-114.35705	N04	NS-2b
EFSR	8/23/2012	R114BA	44.14529	-114.36477	N04	NS-2b
EFSR	8/24/2012	R064BA	44.12344	-114.42356	N01	NS-1a
EFSR	8/24/2012	R030KF	44.12721	-114.42071	N01	NS-1a
EFSR	8/24/2012	R125KF	44.12743	-114.4206	N01	NS-1a
EFSR	8/24/2012	R126KF	44.12160	-114.42421	N01	NS-1a
EFSR	8/24/2012	R115KF	44.13971	-114.40162	N02	NS-1a
EFSR	8/24/2012	R116KF	44.13964	-114.40173	N02	NS-1a
EFSR	8/24/2012	R118KF	44.13639	-114.4068	N02	NS-1a
EFSR	8/24/2012	R119KF	44.13327	-114.41307	N02	NS-1a
EFSR	8/24/2012	R122KF	44.13011	-114.41644	N02	NS-1a
EFSR	8/25/2012	R132KF	44.14676	-114.38436	N03	NS-2b
EFSR	8/25/2012	R133KF	44.14672	-114.38506	N03	NS-2b
EFSR	8/25/2012	R129KF	44.14341	-114.33842	N04	NS-2b
EFSR	8/25/2012	R130KF	44.14478	-114.35174	N04	NS-2b
EFSR	8/25/2012	R131KF	44.14464	-114.35522	N04	NS-2b
EFSR	8/26/2012	R139KF	44.1284	-114.42077	N01	NS-1a
EFSR	8/26/2012	R124KF	44.12878	-114.41978	N01	NS-1a
EFSR	8/26/2012	R141KF	44.11919	-114.42873	N01	NS-1a
EFSR	8/26/2012	R142KF	44.11736	-114.42933	N01	NS-1a
EFSR	8/26/2012	R127KF	44.11891	-114.42504	N01	NS-1a
EFSR	8/26/2012	R128KF	44.1175	-114.42913	N01	NS-1a
EFSR	8/26/2012	R137KF	44.13351	-114.41236	N02	NS-1a
EFSR	8/26/2012	R117KF	44.13767	-114.40468	N02	NS-1a
EFSR	8/26/2012	R054BA	44.13593	-114.40733	N02	NS-1a
EFSR	8/26/2012	R120KF	44.13259	-114.41306	N02	NS-1a
EFSR	8/26/2012	R121KF	44.13013	-114.41633	N02	NS-1a
EFSR	8/26/2012	R123KF	44.13051	-114.41779	N02	NS-1a
EFSR	8/28/2012	R148KF	44.13784	-114.40530	N02	NS-1a
EFSR	8/28/2012	R149KF	44.13752	-114.40607	N02	NS-1a
EFSR	8/28/2012	R011BA	44.14682	-114.38078	N03	NS-2b
EFSR	8/28/2012	R134KF	44.14623	-114.38902	N03	NS-2b
EFSR	8/28/2012	R051BA	44.15740	-114.39117	N03	NS-2b
EFSR	8/28/2012	R147KF	44.14573	-114.39114	N03	NS-2b
EFSR	8/29/2012	R150KF	44.11353	-114.43066	N1	NS-1b
EFSR	8/29/2012	R151KF	44.11267	-114.43153	N1	NS-1b
EFSR	8/29/2012	R152KF	44.11245	-114.43186	N1	NS-1b
EFSR	8/29/2012	R153KF	44.10891	-114.43460	N1	NS-1b
EFSR	8/29/2012	R154KF	44.10585	-114.43848	N1	NS-1b
EFSR	8/29/2012	R156KF	44.09218	-114.44295	N2	NS-1b
EFSR	8/29/2012	R157KF	44.09038	-114.44352	N2	NS-1b
EFSR	8/29/2012	R084BA	44.09400	-114.44170	N2	NS-1b

Appendix B. Continued

Stream	Date Observed	Redd Name	Location		Section Name	SGR Trend Transect
			Lat (N)	Long (W)		
EFSR	8/29/2012	R158KF	44.088834	-114.44428	N3	NS-1b
EFSR	8/29/2012	R170BA	44.07933	-114.45441	N4	NS-1b
EFSR	8/29/2012	R171BA	44.07804	-114.45515	N4	NS-1b
EFSR	8/29/2012	R172BA	44.07795	-114.45533	N4	NS-1b
EFSR	8/29/2012	R173BA	44.07639	-114.45706	N4	NS-1b
EFSR	8/29/2012	R174BA	44.07404	-114.45852	N4	NS-1b
EFSR	8/29/2012	R175BA	44.07386	-114.45860	N5	NS-1b
EFSR	8/29/2012	R176BA	44.07248	-114.45912	N5	NS-1b
EFSR	8/29/2012	R177BA	44.07244	-114.45913	N5	NS-1b
EFSR	8/29/2012	R178BA	44.07066	-114.45901	N5	NS-1b
EFSR	8/29/2012	R179BA	44.07062	-114.45898	N5	NS-1b
EFSR	8/29/2012	R180BA	44.07003	-114.45850	N5	NS-1b
EFSR	8/29/2012	R181BA	44.05512	-114.46015	N6	NS-1b
EFSR	8/29/2012	R182BA	44.05452	-114.46000	N6	NS-1b
EFSR	8/29/2012	R183BA	44.05005	-114.46181	N6	NS-1b
EFSR	8/29/2012	R184BA	44.04811	-114.46159	N6	NS-1b
EFSR	8/29/2012	R185BA	44.04212	-114.46024	N6	NS-1b
EFSR	8/29/2012	R186BA	44.04195	-114.46040	N6	NS-1b
EFSR	8/29/2012	R187BA	44.04195	-114.46045	N6	NS-1b
EFSR	8/29/2012	R188BA	44.04193	-114.46072	N6	NS-1b
EFSR	8/30/2012	R161BA	44.12944	-114.41843	N01	NS-1a
EFSR	8/30/2012	R162BA	44.12894	-114.41911	N01	NS-1a
EFSR	8/30/2012	R163BA	44.12584	-114.42101	N01	NS-1a
EFSR	8/30/2012	R164BA	44.12587	-114.42117	N01	NS-1a
EFSR	8/30/2012	R165BA	44.12557	-114.42221	N01	NS-1a
EFSR	8/30/2012	R166BA	44.12144	-114.42416	N01	NS-1a
EFSR	8/30/2012	R167BA	44.12010	-114.42416	N01	NS-1a
EFSR	8/31/2012	R201BA	44.14342	-114.33966	N04	NS-2b
EFSR	8/31/2012	R202BA	44.14402	-114.34135	N04	NS-2b
EFSR	8/31/2012	R203BA	44.14465	-114.34305	N04	NS-2b
EFSR	8/31/2012	R204BA	44.14494	-114.35299	N04	NS-2b
EFSR	8/31/2012	R205BA	44.14503	-114.35332	N04	NS-2b
EFSR	8/31/2012	R206BA	44.14494	-114.35434	N04	NS-2b
EFSR	8/31/2012	R207BA	44.14470	-114.35595	N04	NS-2b
EFSR	8/31/2012	R208BA	44.14544	-114.35937	N04	NS-2b
EFSR	8/31/2012	R209BA	44.14523	-114.35492	N04	NS-2b
EFSR	8/31/2012	R210BA	44.14457	-114.36770	N04	NS-2b
EFSR	8/31/2012	R109BA	44.14494	-114.3468	N04	NS-2b
EFSR	8/31/2012	R189BA	44.14470	-114.31824	N05	NS-2b
EFSR	8/31/2012	R190BA	44.14473	-114.31835	N05	NS-2b
EFSR	8/31/2012	R191BA	44.14457	-114.31871	N05	NS-2b
EFSR	8/31/2012	R192BA	44.14449	-114.31873	N05	NS-2b
EFSR	8/31/2012	R193BA	44.14421	-114.32185	N05	NS-2b

Appendix B. Continued

Stream	Date Observed	Redd Name	Location		Section Name	SGR Trend Transect
			Lat (N)	Long (W)		
EFSR	8/31/2012	R194BA	44.14408	-114.32231	N05	NS-2b
EFSR	8/31/2012	R195BA	44.14261	-114.32549	N05	NS-2b
EFSR	8/31/2012	R196BA	44.14240	-114.32623	N05	NS-2b
EFSR	8/31/2012	R197BA	44.14217	-114.32732	N05	NS-2b
EFSR	8/31/2012	R198BA	44.14223	-114.32758	N05	NS-2b
EFSR	8/31/2012	R199BA	44.14224	-114.32919	N05	NS-2b
EFSR	8/31/2012	R200BA	44.14365	-114.33085	N05	NS-2b
EFSR	8/31/2012	R104BA	44.14420	-114.32193	N05	NS-2b
EFSR	8/31/2012	R105BA	44.14356	-114.32302	N05	NS-2b
EFSR	8/31/2012	R106BA	44.14253	-114.32397	N05	NS-2b
EFSR	8/31/2012	R169BA	44.15094	-114.30402	N06	NS-2b
EFSR	8/31/2012	R103BA	44.14753	-114.31535	N06	NS-2b
EFSR	8/31/2012	R168BA	44.03520	-114.46227	N7	NS-1b
EFSR	9/1/2012	R216BA	44.13765	-114.40605	N02	NS-1a
EFSR	9/1/2012	R218BA	44.13126	-114.41586	N02	NS-1a
EFSR	9/1/2012	R135KF	44.14248	-114.39828	N02	NS-1a
EFSR	9/1/2012	R136KF	44.14036	-114.40051	N02	NS-1a
EFSR	9/1/2012	R212BA	44.14665	-114.38437	N03	NS-2b
EFSR	9/1/2012	R213BA	44.14583	-114.3926	N03	NS-2b
EFSR	9/1/2012	R214BA	44.14580	-114.39267	N03	NS-2b
EFSR	9/1/2012	R145KF	44.14692	-114.38146	N03	NS-2b
EFSR	9/1/2012	R146KF	44.14678	-114.38269	N03	NS-2b
EFSR	9/4/2012	R048BA	44.14600	-114.37505	N03	NS-2b
EFSR	9/4/2012	R144KF	44.14436	-114.37020	N03	NS-2b
EFSR	9/4/2012	R221KF	44.14539	-114.35775	N03	NS-2b
EFSR	9/6/2012	R219BA	44.14252	-114.32523	N05	NS-2b
EFSR	9/6/2012	R220BA	44.14227	-114.32697	N05	NS-2b
EFSR	9/7/2012	R222BA	44.14427	-114.3242	N04	NS-2b
EFSR	9/7/2012	R223BA	44.14487	-114.34576	N04	NS-2b
EFSR	9/7/2012	R224BA	44.14460	-114.35066	N04	NS-2b
EFSR	9/7/2012	R225BA	44.14523	-114.35863	N04	NS-2b
EFSR	9/9/2012	R221KF	44.14539	-114.35775	N04	NS-2b
EFSR	9/12/2012	R226KF	44.09989	-114.44252	N2	NS-1b
EFSR	9/12/2012	R227KF	44.09056	-114.44378	N2	NS-1b
EFSR	9/12/2012	R155KF	44.09299	-114.44279	N2	NS-1b
EFSR	9/13/2012	R229KF	44.08179	-114.45256	N3	NS-1b
EFSR	9/13/2012	R159KF	44.08344	-114.44659	N3	NS-1b
EFSR	9/13/2012	R228KF	44.07407	-114.45859	N4	NS-1b
EFSR	9/14/2012	R301KF	44.05688	-114.46141	N6	NS-1b
EFSR	9/14/2012	R302KF	44.05174	-114.46167	N6	NS-1b
EFSR	9/16/2012	R230KF	44.14264	-114.3255	N05	NS-2b
EFSR	9/17/2012	R231KF	44.14627	-114.38897	N03	NS-2b

Appendix C. Summary of Chinook salmon carcasses collected in the East Fork Salmon River (EFSR), August 20—September 14, 2012. Locations are GPS waypoints (WGS-84 datum). Length measurements, sex (Unk = unknown), and samples were not collected (NC) from all carcasses.

Date		Length (cm)				Genetic No.			Adult	Captive	SGR	Location	
							Captive Project		Trap	Section	Trend		
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Jaw Tag	Name	Transect	Northing	Easting
8/20/12		96	88	M	Y	12-00931	C001			N02	NS-1a	44.14281	-114.39748
8/24/12	8/21/12	100	80	M	Y	12-00932	NC	194	194	N02	NS-1a	44.13297	-114.41052
8/24/12		97	73	M	Y	12-00940	C003			N02	NS-1a	44.13008	-114.41608
8/24/12		90	72	F	Y	12-00933	C004			N01	NS-1a	44.11908	-114.42458
8/24/12		90	73	F	Y	12-00934	C005			N01	NS-1a	44.11846	-114.42609
8/25/12		93	75	F	Y	12-00935	C006			N04	NS-2b	44.14631	-114.38850
8/25/12		89	70	F	Y	12-00936	C007			N03	NS-2b	44.14556	-114.39330
8/26/12		102	76	M	Y	12-00937	C008			N02	NS-1a	44.14277	-114.39764
8/26/12		90	71	F	Y	12-00938	C009			N02	NS-1a	44.13688	-114.40643
8/26/12		103	81	M	Y	12-00939	C010			N02	NS-1a	44.13597	-114.40714
8/26/12		85	77	F	Y	12-00941	C011			N02	NS-1a	44.13337	-114.41148
8/26/12		84	73	F	Y	12-00942	C012			N02	NS-1a	44.13029	-114.41699
8/26/12	8/15/12	75	57	M	Y	12-00950	NC	143	143	N01	NS-1a	44.12966	-114.41830
8/26/12		90	80	F	Y	12-00943	C014			N01	NS-1a	44.12824	-114.42106
8/26/12		85	68	F	Y	12-00949	C015			N01	NS-1a	44.12769	-114.42077
8/26/12	8/15/12	90	72	F	Y	12-00948	NC	147	147	N01	NS-1a	44.12639	-114.42088
8/26/12		92	73	F	Y	12-00944	C017			N01	NS-1a	44.12231	-114.42513
8/26/12		75	62	F	Y	12-00947	C018			N01	NS-1a	44.12109	-114.42410
8/26/12		102	79	F	Y	12-00946	C019			N01	NS-1a	44.11856	-114.42543
8/26/12	8/19/12	81	63	M	Y	12-01002	NC	184	184	N01	NS-1a	44.11848	-114.42859
8/26/12		92	74	F	Y	12-01001	C020			N01	NS-1a	44.11848	-114.42859
8/26/12	8/17/12	81	65	F	Y	12-00945	NC	160	160	N01	NS-1a	44.11848	-114.42859
8/26/12		64	48	J	Y	12-01010	C021			N01	NS-1a	44.11706	-114.42945
8/26/12		90	70	F	Y	12-01009	C022			N01	NS-1a	44.11706	-114.42945
8/27/12		90	73	F	Y	12-01003	C023			N04	NS-2b	44.14310	-114.33818
8/27/12		105	78	M	Y	12-01004	C024			N04	NS-2b	44.14515	-114.35780
8/27/12		90	72	F	Y	12-01006	C025			N04	NS-2b	44.14532	-114.35835
8/27/12		89	72	F	Y	12-01008	C026			N04	NS-2b	44.14560	-114.35986
8/27/12		102	78	M	Y	12-01005	C027			N04	NS-2b	44.14543	-114.35986
8/28/12		110	84	M	Y	12-00100	C013			N03	NS-2b	44.14600	-114.38834

Appendix C. Continued.

Date		Length (cm)				Genetic No.						Location	
							Captive Project		Adult	Captive	SGR		
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Trap Jaw Tag	Section Name	Trend Transect	Northing	Easting
8/28/12	8/16/12	61	NC	J	N	NC	NC	153	153	N02	NS-1a	44.13654	-114.40702
8/28/12		98	77	F	Y	12-00999	C016			N02	NS-1a	44.13529	-114.40746
8/28/12		91	72	F	Y	12-00998	C028			N02	NS-1a	44.13363	-114.40961
8/28/12		95	75	F	Y	12-00997	C029			N02	NS-1a	44.13359	-114.40969
8/28/12		102	78	M	Y	12-00995	C030			N02	NS-1a	44.13314	-114.41087
8/28/12		106	79	M	Y	12-00996	C031			N02	NS-1a	44.13335	-114.41148
8/28/12	8/23/12	63	49	J	Y	12-00993	NC	211	211	N02	NS-1a	44.13339	-114.41226
8/28/12		89	71	F	Y	12-00994	C032			N02	NS-1a	44.13170	-114.41489
8/28/12		102	77	M	Y	12-00992	C033			N02	NS-1a	44.13170	-114.41489
8/29/12	7/5/12	NC	NC	M	N	NC	NC	010	010	N6	NS-1b	44.05596	-114.46097
8/29/12	7/13/12	NC	NC	M	N	NC	NC	064	064	N6	NS-1b	44.05082	-114.46185
8/29/12	8/11/12	NC	NC	M	N	NC	NC	121	121	N6	NS-1b	44.04811	-114.46159
8/29/12	8/14/12	NC	NC	F	N	NC	NC	134	134	N6	NS-1b	44.04329	-114.46040
8/29/12	7/16/12	NC	NC	F	N	NC	NC	058	058	N1	NS-1b	44.11411	-114.43056
8/29/12	8/16/12	NC	NC	F	N	NC	NC	156	156	N1	NS-1b	44.10806	-114.43639
8/29/12	8/19/12	NC	NC	F	N	NC	NC	186	186	N2	NS-1b	44.10062	-114.44205
8/29/12		NC	NC	M	N	NC	C068			N2	NS-1b	44.09446	-114.44157
8/29/12	7/16/12	NC	NC	M	N	NC	NC	071	071	N2	NS-1b	44.09009	-114.44353
8/29/12	7/6/12	NC	NC	M	N	NC	NC	031	031	N2	NS-1b	44.09009	-114.44353
8/29/12	8/20/12	NC	NC	F	N	NC	NC	192	192	N3	NS-1b	44.08934	-114.44366
8/29/12	8/15/12	NC	NC	F	N	NC	NC	142	142	N3	NS-1b	44.08704	-114.44447
8/29/12	7/17/12	NC	NC	M	N	NC	NC	073	073	N3	NS-1b	44.08554	-114.44543
8/29/12	7/3/12	NC	NC	M	N	NC	NC	008	008	N3	NS-1b	44.08474	-114.44627
8/29/12	8/17/12	NC	NC	F	N	NC	NC	164	164	N3	NS-1b	44.08265	-114.44994
8/29/12	7/31/12	NC	NC	F	N	NC	NC	099	099	N3	NS-1b	44.08151	-114.45061
8/29/12		99	80	M	Y	12-00958	C034			N05	NS-2b	44.14542	-114.31651
8/29/12		67	53	M	Y	12-00959	C035			N03	NS-2b	44.14571	-114.39292
8/29/12		79	62	M	Y	12-00960	C036			N02	NS-1a	44.13803	-114.40546
8/29/12		97	89	F	Y	12-00961	C037			N02	NS-1a	44.13362	-114.41181
8/29/12		84	70	F	Y	12-00962	C038			N02	NS-1a	44.13320	-114.41295
8/29/12	8/18/12	NC	NC	M	N	NC	NC	172	172	N02	NS-1a	44.13192	-114.41561
8/29/12	8/22/12	90	73	F	Y	12-00963	NC	209	1309	N02	NS-1a	44.13071	-114.41570

Appendix C. Continued.

Date		Length (cm)				Genetic No.			Adult	Captive	SGR	Location	
							Captive Project		Trap	Section	Trend		
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Jaw Tag	Name	Transect	Northing	Easting
8/29/12		87	71	F	Y	12-00964	C039			N02	NS-1a	44.13033	-114.41695
8/29/12		88	72	F	Y	12-00965	C040			N02	NS-1a	44.13061	-114.41801
8/29/12		91	72	M	Y	12-00966	C041			N02	NS-1a	44.12222	-144.42468
8/29/12		91	73	F	Y	12-00967	C042			N02	NS-1a	44.12079	-114.42416
8/29/12		97	79	F	Y	12-00968	C043			N02	NS-1a	44.12004	-114.42416
8/30/12		86	70	M	Y	12-00951	C044			N05	NS-2b	44.14334	-114.33309
8/30/12		89	73	F	Y	12-00952	C045			N04	NS-2b	44.14468	-114.35181
8/30/12		95	76	F	Y	12-00953	C046			N04	NS-2b	44.14465	-114.35182
8/30/12		86	78	F	Y	12-00954	C047			N04	NS-2b	44.14538	-114.35835
8/30/12		102	84	F	Y	12-00955	C048			N04	NS-2b	44.14534	-114.35835
8/30/12		92	72	M	Y	12-00970	C070			N01	NS-1a	44.12842	-114.42085
8/30/12		102	82	M	Y	12-00991	C071			N01	NS-1a	44.12772	-114.42085
8/30/12	8/21/12	97	76	M	Y	12-01007	NC	198	198	N01	NS-1a	44.12772	-114.42085
8/30/12		75	58	F	Y	12-00957	C072			N01	NS-1a	44.12772	-114.42085
8/30/12		75	58	M	Y	12-00979	C073			N01	NS-1a	44.12701	-114.42049
8/30/12		86	73	F	Y	12-00980	C074			N01	NS-1a	44.12682	-114.42059
8/30/12		86	70	F	Y	12-00976	C075			N01	NS-1a	44.12547	-114.42299
8/30/12		85	73	F	Y	12-00969	C076			N01	NS-1a	44.12471	-114.42374
8/30/12		85	72	F	Y	12-00971	C077			N01	NS-1a	44.12435	-114.42336
8/30/12		99	83	M	Y	12-00972	C078			N01	NS-1a	44.12435	-114.42336
8/30/12	8/20/12	98	80	M	Y	12-00977	NC	193	193	N01	NS-1a	44.12237	-114.42525
8/30/12	8/16/12	91	75	F	Y	12-00978	NC	159	159	N01	NS-1a	44.12220	-114.42496
8/30/12	7/6/12	69	57	M	Y	12-00975	NC	023	023	N01	NS-1a	44.12206	-114.42462
8/30/12	8/19/12	72	59	M	Y	12-00973	NC	182	182	N01	NS-1a	44.12069	-114.42419
8/30/12		107	85	M	Y	12-00974	C079			N01	NS-1a	44.11846	-114.42578
8/30/12	8/13/12	43	35	J	N	NC	NC	129	129	N01	NS-1a	44.11846	-114.42578
8/30/12		91	75	F	N	NC	C080			N01	NS-1a	44.11856	-114.42860
8/30/12		84	70	F	N	NC	C081			N01	NS-1a	44.11856	-114.42860
8/30/12	unknown	78	61	M	N	NC	NC	NC	NC	N01	NS-1a	44.11856	-114.42860
8/31/12		97	75	F	Y	12-00981	C049			N03	NS-2b	44.14688	-114.37751
8/31/12		87	72	F	Y	12-00982	C050			N03	NS-2b	44.14606	-114.38730
8/31/12		82	65	F	Y	12-00983	C051			N03	NS-2b	44.14569	-114.39018

Appendix C. Continued.

Date		Length (cm)				Genetic No.						Location	
							Captive Project						
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Adult Trap Jaw Tag	Captive Section Name	SGR Trend Transect	Northing	Easting
8/31/12		80	63	M	Y	12-00984	C052			N03	NS-2b	44.14569	-114.39018
8/31/12	8/18/12	76	56	M	Y	12-00985	NC	171	171	N03	NS-2b	44.14569	-114.39018
8/31/12		NC	NC	M	N	NC	NC			N03	NS-2b	44.14554	-114.39349
8/31/12		77	59	M	Y	12-00986	C054			N02	NS-1a	44.14187	-114.39831
8/31/12		92	75	F	Y	12-00987	C055			N02	NS-1a	44.13728	-114.40379
8/31/12		99	79	F	Y	12-00988	C056			N02	NS-1a	44.13616	-114.40714
8/31/12		93	77	F	Y	12-00989	C057			N02	NS-1a	44.13618	-114.40709
8/31/12		86	67	M	Y	12-00990	C058			N02	NS-1a	44.13280	-114.41311
8/31/12	8/13/12	82	62	M	Y	12-00956	NC	135	135	N02	NS-1a	44.13145	-114.41357
8/31/12		87	71	F	Y	12-01011	C059			N02	NS-1a	44.13033	-114.41541
8/31/12		70	61	M	Y	12-01012	C060			N02	NS-1a	44.13007	-114.41680
8/31/12		93	75	F	Y	12-01013	C061			N02	NS-1a	44.13007	-114.41680
8/31/12		79	61	F	Y	12-01014	C062			N02	NS-1a	44.13034	-114.41698
8/31/12		69	56	M	Y	12-01015	C063			N02	NS-1a	44.13068	-114.41792
8/31/12		87	72	F	Y	12-01030	C082			N05	NS-2b	44.14368	-114.32278
8/31/12		84	70	F	Y	12-01029	C083			N04	NS-2b	44.14336	-114.33969
8/31/12		96	81	F	Y	12-01028	C084			N04	NS-2b	44.14336	-114.33969
8/31/12		101	79	M	Y	12-01027	C085			N04	NS-2b	44.14465	-114.35138
9/1/12		89	74	F	Y	12-01026	C086			N03	NS-2b	44.14675	-114.38497
9/1/12		78	65	F	Y	12-01024	C087			N02	NS-1a	44.14182	-114.39828
9/1/12		92	77	F	Y	12-01025	C088			N02	NS-1a	44.14182	-114.39828
9/1/12		83	68	F	Y	12-01023	C089			N02	NS-1a	44.14103	-114.39951
9/1/12		98	80	F	Y	12-01022	C090			N02	NS-1a	44.13747	-114.40236
9/1/12		91	74	F	Y	12-01021	C091			N02	NS-1a	44.13058	-114.41798
9/1/12		93	69	M	N	NC	C063			N01	NS-1a	44.12741	-114.42072
9/1/12		100	74	M	Y	12-01016	C064			N01	NS-1a	44.12171	-114.42440
9/1/12	8/23/12	88	74	F	Y	12-01017	NC	213	213	N01	NS-1a	44.12107	-114.42416
9/1/12		92	74	F	Y	12-01018	C066			N01	NS-1a	44.12109	-114.42416
9/1/12		98	76	F	Y	12-01019	C067			N01	NS-1a	44.11847	-114.42914
9/2/12		83	68	F	Y	12-01020	C069			N01	NS-1a	44.12943	-114.41818
9/2/12		94	79	F	N	NC	C092			N01	NS-1a	44.12709	-114.42064
9/2/12	8/15/12	106	95	M	N	NC	NC	148	148	N01	NS-1a	44.11860	-114.42521

Appendix C. Continued.

Date		Length (cm)				Genetic No.			Adult	Captive	SGR	Location	
							Captive Project		Trap	Section	Trend		
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Jaw Tag	Name	Transect	Northing	Easting
9/3/12		83	69	F	N	NC	C094			N06	NS-2b	44.14540	-114.31641
9/3/12		98	79	M	N	NC	C095			N05	NS-2b	44.14433	-114.32076
9/3/12		63	52	F	N	NC	C096			N05	NS-2b	44.14445	-114.32113
9/3/12		71	58	M	N	NC	C097			N05	NS-2b	44.14279	-114.32353
9/3/12		100	81	M	N	NC	C098			N05	NS-2b	44.14309	-114.33354
9/3/12		91	76	F	N	NC	C099			N05	NS-2b	44.14320	-114.33448
9/4/12		80	62	F	N	NC	C100			N04	NS-2b	44.14479	-114.34842
9/4/12		90	71	F	N	NC	C101			N04	NS-2b	44.14479	-114.34842
9/4/12		75	57	M	N	NC	C102			N04	NS-2b	44.14503	-114.35375
9/4/12	8/20/12	67	62	M	N	NC	NC	188	188	N04	NS-2b	44.14463	-114.35533
9/4/12		93	72	M	N	NC	C103			N04	NS-2b	44.14544	-114.36353
9/4/12		97	77	F	N	NC	C104			N04	NS-2b	44.14456	-114.36666
9/4/12	8/20/12	75	57	M	N	NC	NC	190	190	N03	NS-2b	44.14710	-114.38174
9/4/12	8/20/12	71	56	M	N	NC	NC	189	189	N03	NS-2b	44.14644	-114.38712
9/4/12		95	72	M	N	NC	C105			N03	NS-2b	44.14579	-114.39283
9/6/12		78	60	M	N	NC	C002			N06	NS-2b	44.14896	-114.30750
9/6/12		55	46	J	N	NC	C093			N06	NS-2b	44.14671	-114.31646
9/6/12		89	74	F	N	NC	C053			N05	NS-2b	44.14404	-114.32235
9/6/12		89	73	F	N	NC	C065			N05	NS-2b	44.14325	-114.32314
9/6/12		90	75	F	N	NC	C106			N05	NS-2b	44.14312	-114.33331
9/6/12		109	86	M	N	NC	C107			N05	NS-2b	44.14314	-114.33556
9/7/12		89	73	F	N	NC	C108			N04	NS-2b	44.14332	-114.33863
9/7/12		95	80	F	N	NC	C109			N04	NS-2b	44.14463	-114.35210
9/7/12		83	70	F	N	NC	C110			N04	NS-2b	44.14463	-114.35210
9/7/12		86	71	F	N	NC	C111			N04	NS-2b	44.14455	-114.35863
9/7/12		NC	NC	M	N	NC	NC			N04	NS-2b	44.14457	-114.36813
9/7/12		NC	NC	NC	N	NC	NC			N04	NS-2b	44.14457	-114.36813
9/7/12	7/5/12	57	44	J	N	NC	NC	012	012	N03	NS-2b	44.14444	-114.36877
9/7/12		36	29	J	N	NC	C112			N03	NS-2b	44.14594	-114.37373
9/7/12		89	73	F	N	NC	C113			N03	NS-2b	44.14654	-114.38273
9/7/12		78	67	F	N	NC	C114			N03	NS-2b	44.14653	-114.38702
9/7/12		86	72	F	N	NC	C115			N03	NS-2b	44.14624	-114.38821

Appendix C. Continued.

Date		Length (cm)				Genetic No.						Location	
							Captive Project						
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Adult Trap Jaw Tag	Captive Section Name	SGR Trend Transect	Northing	Easting
9/8/12		91	76	F	N	NC	C116			N02	NS-1a	44.14330	-114.39597
9/8/12		86	72	F	N	NC	C117			N02	NS-1a	44.14289	-114.39673
9/8/12		70	60	F	N	NC	C118			N02	NS-1a	44.14279	-114.39751
9/8/12		59	45	J	N	NC	NC			N02	NS-1a	44.14120	-114.39891
9/8/12		NC	NC	NC	N	NC	NC			N02	NS-1a	44.13947	-114.40170
9/8/12		53	43	J	N	NC	NC			N02	NS-1a	44.13648	-114.40704
9/8/12		95	78	F	N	NC	C119			N02	NS-1a	44.13648	-114.40704
9/8/12		90	74	F	N	NC	C120			N02	NS-1a	44.13351	-114.40939
9/8/12		85	71	F	N	NC	C121			N02	NS-1a	44.13351	-114.40939
9/8/12		69	55	M	N	NC	C122			N02	NS-1a	44.13298	-114.41085
9/8/12		87	73	F	N	NC	C123			N02	NS-1a	44.13265	-114.41315
9/8/12		NC	NC	NC	N	NC	NC			N02	NS-1a	44.13002	-114.41583
9/8/12		98	82	F	N	NC	C124			N02	NS-1a	44.13066	-114.41789
9/8/12		98	83	F	N	NC	C125			N01	NS-1a	44.12928	-114.41808
9/8/12		72	57	M	N	NC	C126			N01	NS-1a	44.12441	-114.42368
9/8/12		97	79	F	N	NC	C127			N01	NS-1a	44.12219	-114.42493
9/8/12		74	62	F	N	NC	C128			N01	NS-1a	44.12219	-114.42493
9/8/12	8/22/12	92	76	F	N	NC	NC	207	1307	N01	NS-1a	44.11916	-114.42402
9/8/12		87	74	F	N	NC	C129			N01	NS-1a	44.11857	-114.42878
9/8/12		88	75	F	N	NC	C130			N01	NS-1a	44.11857	-114.42878
9/8/12		91	77	F	N	NC	C131			N01	NS-1a	44.11857	-114.42878
9/9/12		NC	NC	NC	N	NC	NC			N05	NS-2b	44.14349	-114.32945
9/9/12		92	77	F	N	NC	C132			N05	NS-2b	44.14332	-114.33441
9/9/12		98	78	M	N	NC	C133			N05	NS-2b	44.14324	-114.33479
9/9/12		68	58	F	N	NC	C134			N04	NS-2b	44.14325	-114.33821
9/9/12		70	55	M	N	NC	C135			N04	NS-2b	44.14342	-114.33980
9/9/12		72	60	F	N	NC	C136			N04	NS-2b	44.14536	-114.35857
9/10/12		NC	NC	M	N	NC	NC			N03	NS-2b	44.14575	-114.39049
9/10/12		97	77	M	N	NC	NC	166	166	N03	NS-2b	44.14553	-114.39346
9/10/12		NC	NC	NC	N	NC	NC			N03	NS-2b	44.13363	-114.40952
9/10/12		71	56	F	N	NC	NC	237	237	N02	NS-1a	44.13005	-114.41613
9/12/12	8/14/12	NC	NC	NC	N	NC	NC	136	136	N1	NS-1b	44.11026	-114.43432

Appendix C. Continued.

Date		Length (cm)				Genetic No.						Location	
							Captive Project						
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Adult Trap Jaw Tag	Captive Section Name	SGR Trend Transect	Northing	Easting
9/12/12	8/23/12	NC	NC	NC	N	NC	NC	212	212	N2	NS-1b	44.11026	-114.43432
9/12/12	8/19/12	NC	NC	NC	N	NC	NC	179	179	N2	NS-1b	44.10479	-114.43841
9/12/12	8/21/12	NC	NC	NC	N	NC	NC	200	200	N2	NS-1b	44.09345	-114.44266
9/12/12	8/19/12	NC	NC	NC	N	NC	NC	183	183	N2	NS-1b	44.09214	-114.44266
9/13/12	8/26/12	NC	NC	NC	N	NC	NC	227	227	N3	NS-1b	44.08504	-114.44633
9/13/12	7/18/12	NC	NC	NC	N	NC	NC	74	74	N3	NS-1b	44.08068	-114.45309
9/13/12	7/22/12	NC	NC	NC	N	NC	NC	82	82	N4	NS-1b	44.07600	-114.45824
9/13/12	8/15/12	NC	NC	NC	N	NC	NC	146	146	N4	NS-1b	44.07600	-114.45824
9/14/12	8/23/12	NC	NC	NC	N	NC	NC	218	218	N6	NS-1b	44.04329	-114.46033

Appendix D. East Fork Salmon River (EFSR) Chinook salmon single and two-parent assignments, 2007–2011 adult returns.

Parent Source			Adult Returns (Progeny)								
Origin	**Group**	**Year**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Captive	**Spawn**	**2003**	0	0							0
		2004	0	4	0						4
	Adult Release	**2001**									
		2002	1								1
		2003	0	0							0
		2004	0	0	0						0
		2005		0	0	0					0
		2006			2	9	7				18
		2007				0	32				32
		2008					1				1
		2009									0
		2010									0
	Total		1	4	2	9	40	0	0	0	56
Captive X Natural		**2001**									
		2002	0								0
		2003	0	0							0
		2004	0	0	0						0
		2005		0	0	1					1
		2006			1	6	1				8
		2007				0	0				0
		2008					2				2
		2009									0
		2010									0
		Total	0	0	1	7	3	0	0	0	11
CAPTIVE ALL			**1**	**4**	**3**	**16**	**43**	**0**	**0**	**0**	**67**
Natural	**Adult Returns**	**2001**									
		2002	0								0
		2003	0	0							0
		2004	13	85	35						133
		2005		16	59	11					86
		2006			19	133	27				179
		2007				9	74				83
		2008					21				21
		2009									0
		2010									0
	Total		**13**	**101**	**113**	**153**	**122**	**0**	**0**	**0**	**502**
Total All			**14**	**105**	**116**	**169**[a]	**165**[b]	**0**	**0**	**0**	**569**

Represents a parent-progeny combination not biologically possible.

Future adult returns.

[a] Includes 6 genetic samples taken from carcasses (1 CxC, 1 CxN, 1 CxU, and 3 NxU)

[b] Includes 11 genetic samples taken from carcasses (4 NxN, and 7 NxU)

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