FISHERY RESEARCH

CAPTIVE REARING PROGRAM FOR SALMON RIVER CHINOOK SALMON

PROJECT PROGRESS REPORT
January 1, 2013—December 31, 2013

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Captive Rearing Program for Salmon River Chinook Salmon

Project Progress Report

2013 Annual Report

By

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ABSTRACT

During 2013, the Idaho Department of Fish and Game's (IDFG) Captive 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 2013 to assess production levels from volitional spawning events resulting from program releases in 2008-2010. In 2013, 260 adults were trapped.

We included results from the 380 genetic tissue samples that were collected for genetic parentage from Chinook Salmon adults that returned to the EFSR in 2012. The results from the analysis of the 2012 collection were used to evaluate program releases in 2007-2009. Of these adults, 244 were captured at the EFSR adult trap, and an additional 136 samples were collected from carcasses found below the trap. Of the 380 collected samples, 357 were successfully genotyped (243 trap adults and 114 carcass samples). In total, 120 of the adults assigned to two parents and an additional 79 fish assigned to only one parent for an overall assignment rate of 56%. Of the 2012 adult returns that assigned to a parent pair (n = 120), over 23% (n = 28) were progeny of captive reared adults. With the parentage analyses completed on the 2012 adult returns, the contribution of the 2007 spawn year is complete. In 2007, captive-reared adults released to spawn naturally (n = 313: 113 females, 200 males) constructed 63 redds. Parentage analyses have found these fish produced 49 progeny that returned as adults in 2010 (n = 0), 2011 (n = 30), and 2012 (n = 19). 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).

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 experimental 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 juveniles. 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. 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 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.

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 completed on the WFYF with the last captive adult releases in 2010. Post-release evaluations shifted primarily to the EFSR in 2004 and have continued 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 with similar morphological, physiological, and behavioral characteristics as natural fish; and 2) evaluate the spawning behavior and success of captive-reared individuals in the natural environment. 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, 2013 through December 31, 2013. 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.

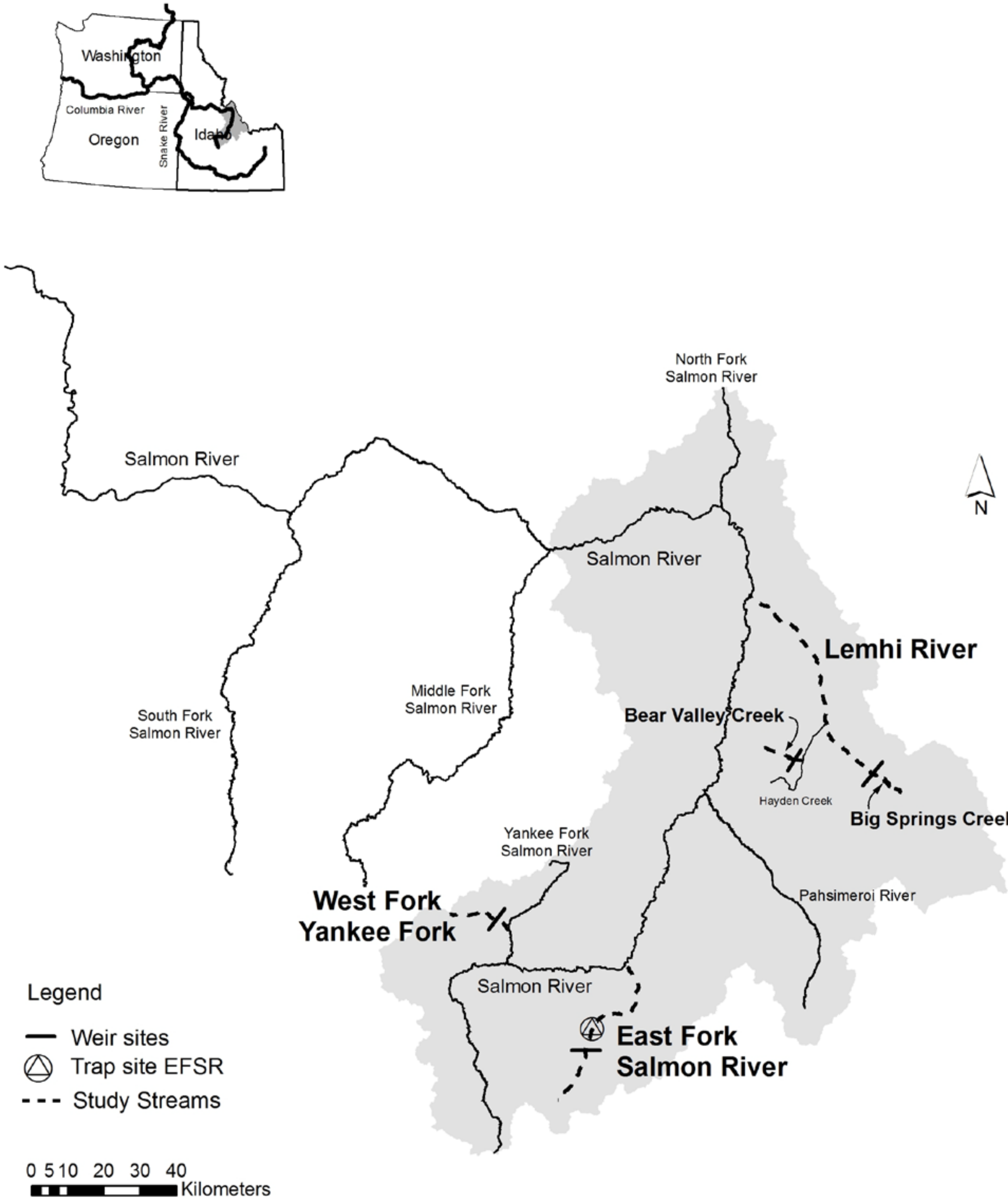

Figure 1. Location of study streams included in the Idaho Department of Fish and Game Captive Rearing Program for Salmon River Chinook Salmon.

METHODS

Culture

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 2013. 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 2013, 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 2013, 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 2013. 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 2012, including surveys in 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 or PIT-tag from a hatchery release group). 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 2013 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 (captive) adult Chinook Salmon in the EFSR to natural/wild (wild) adult returns. In particular, parentage analysis was used to assign offspring (returning adults) to their parents (wild spawners or captive spawners); (ISRP/ISAB 2009-1, pg. 69). 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 Chinook Salmon released to spawn naturally (parents) in the EFSR above the trap. Lastly, 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 were collected from adult Chinook Salmon collected from the EFSR adult trap and from adult carcasses 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 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 approximately 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 adults released above the EFSR picket weir between 2007 and 2009. 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 due to a large spawning component below the trap. Thus, our ability to detect progeny from C x C crosses is very high but our ability to detect N x N crosses is lower. In this report, we summarize the 2012 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. Due to the large spawning component below the trap, the number of trapped females is an underestimate of the true number of natural females spawning in the EFSR but the number of released captive females is the true number.

RESULTS AND DISCUSSION

Adult Trapping

The EFSR adult trap facility was operated from June 13 through September 21, 2013. During this period a total of 260 adult natural Chinook Salmon were captured and released upstream (Table 1). This total included 56 females and 204 males, of which 121 were jacks. Fin clips were collected from all of these natural/wild-origin Chinook Salmon. 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. However, no hatchery fish were captured at the EFSR adult trap in 2013. An additional 346 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). Non-target fish also included two Sockeye salmon, which were transferred to the IDFG Eagle Fish Hatchery.

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 2013.

	Age 3 (<65.0 cm)		**Age 4 (65.0 - 82.9 cm)**		**Age 5 (>82.9 cm)**		
Sex	**#**	**%**	**#**	**%**	**#**	**%**	**Total**
Female	0	0	21	38	35	63	**56**
Male	0	0	63	76	20	24	**83**
Jack	121	100	0	0	0	0	**121**
Total	**121**	**47**	**84**	**32**	**55**	**21**	**260**

Sex is the phenotypic sex assigned to individual fish at the time of capture.

* *Ages were assigned according to fork lengths and established length-at-age distributions from fin ray aged upper Salmon River Chinook Salmon (Kennedy et al. 2011).*

Table 2. Summary of non-target fish captured and passed upstream at the East Fork Salmon River adult trap during 2013.

Species	**Number Trapped**[a]
Bull trout[b]	323
Westslope cutthroat trout	2
Rainbow trout	1
Mountain whitefish	18
Catostomus spp.	0
Steelhead (juvenile)	0
Sockeye salmon	2
TOTAL	**346**

[a] Does not include 2013 recaptures.
[b] Includes five trap mortalities.

The number of Chinook Salmon trapped in 2013 (260) was greater than in 2012 (244), and 2011 (212), and the second highest since 1988, excluding years the trap was not operated (Figure 2). In addition, 40 of the 260 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 = 39, 85%); one of the adults detected with a PIT-tag was originally tagged as a juvenile at the EFSR juvenile screw trap (SALEFT). Of the 39 fish tagged as adults, four were tagged at the Bonneville Adult Facility (BON) on the Columbia River, and 34 were tagged at the Lower Granite Dam adult facility (GRA) on the Lower Snake River. Adult travel time from LGD to the EFSR adult trap ranged from 26-95 days, and averaged 56.5 days (Appendix A). The average travel time in 2013 was roughly four days shorter than the 2009-2012 average of 60.9 days.

During 2013, based upon the phenotypic sex assignments given at the time of trapping, jacks made up a much larger proportion of the total catch (47%) than recorded since trapping resumed in 2004 (Table 3). The proportion of jacks captured was more than double the average proportion captured from 2004-2012 (20%). The sex ratio (Males:Females) this year was 3.6:1.0, which is much higher than the 2004—2012 average sex ratio (2.2:1.0).

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 adult returns that were successfully assigned parentage, apportioning these known sexes to the entire return was not performed for this trap data.

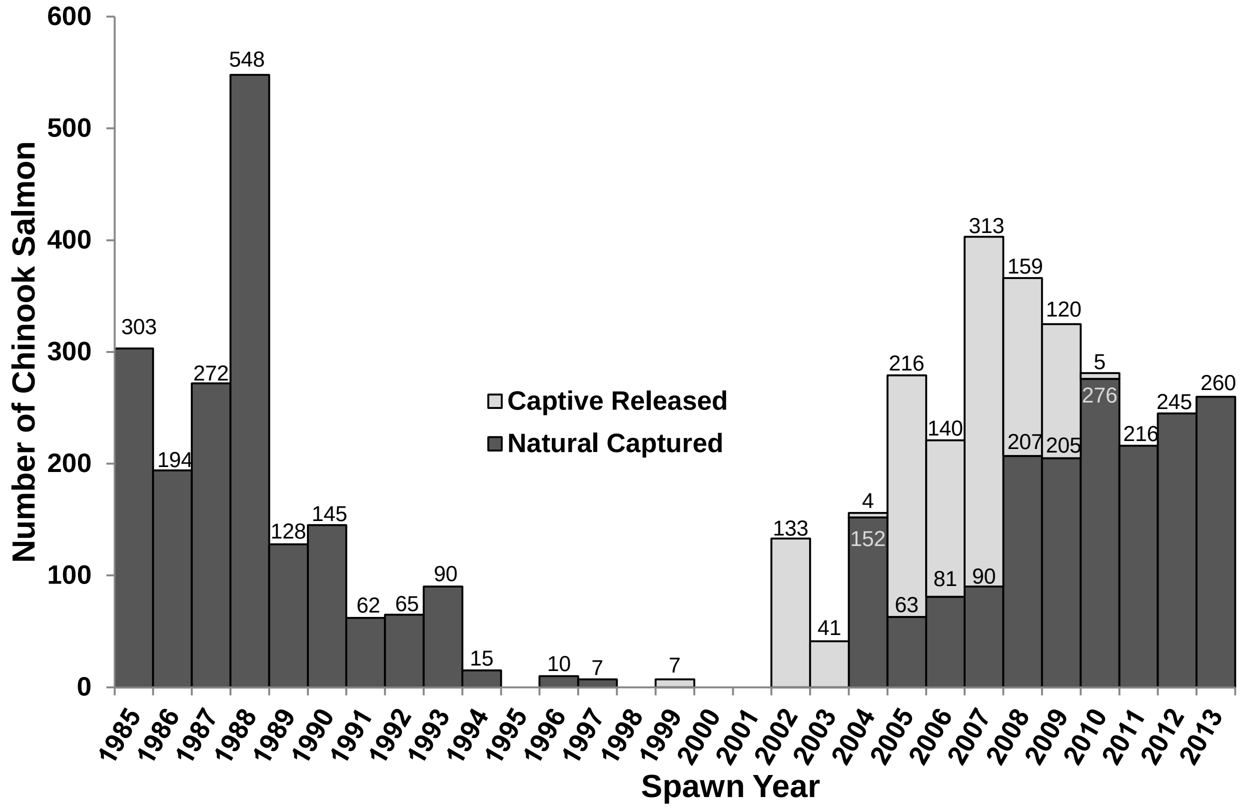

Figure 2. Natural adult Chinook Salmon captured and released upstream at the East Fork Salmon River (EFSR) adult trap facility, and captive adults released into the EFSR upstream of the adult trap, 1985-2013.

* *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 2004-2013.

	Number of Chinook Salmon										
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Mean**
Female	45	21	21	27	63	61	72	62	111	56	**54**
	31%	33%	26%	30%	31%	32%	26%	29%	45%	22%	**31%**
Male	69	31	40	29	107	82	163	102	92	83	**80**
	47%	49%	49%	33%	52%	42%	59%	48%	38%	32%	**45%**
Jack	13	11	20	33	35	50	40	44	41	121	**41**
	9%	17%	25%	37%	17%	26%	15%	21%	17%	47%	**23%**
Unknown	20	0	0	0	0	0	0	4	0	0	**2**
	14%	0%	0%	0%	0%	0%	0%	2%	0%	0%	**2%**
Total	**147**	**63**	**81**	**89**	**205**	**193**	**275**	**212**	**244**	**260**	**177**
	Sex Ratio (M:F)										
Jacks Included	1.8	2.0	2.9	2.3	2.3	2.2	2.8	2.4	1.2	3.6	**2.3**
Jacks Excluded	1.5	1.5	1.9	1.1	1.7	1.3	2.3	1.6	0.8	1.5	**1.5**

* *All sex numbers are the phenotypic sex assigned to individual fish at the time of capture.*

Discharge (flow) of the EFSR during 2013 was well below average during most of the year (Figure 3). In contrast to 2012, spring and summer discharge was lower in 2013. However, this did not appear to alter run timing of Chinook Salmon during 2013 (Figure 4).

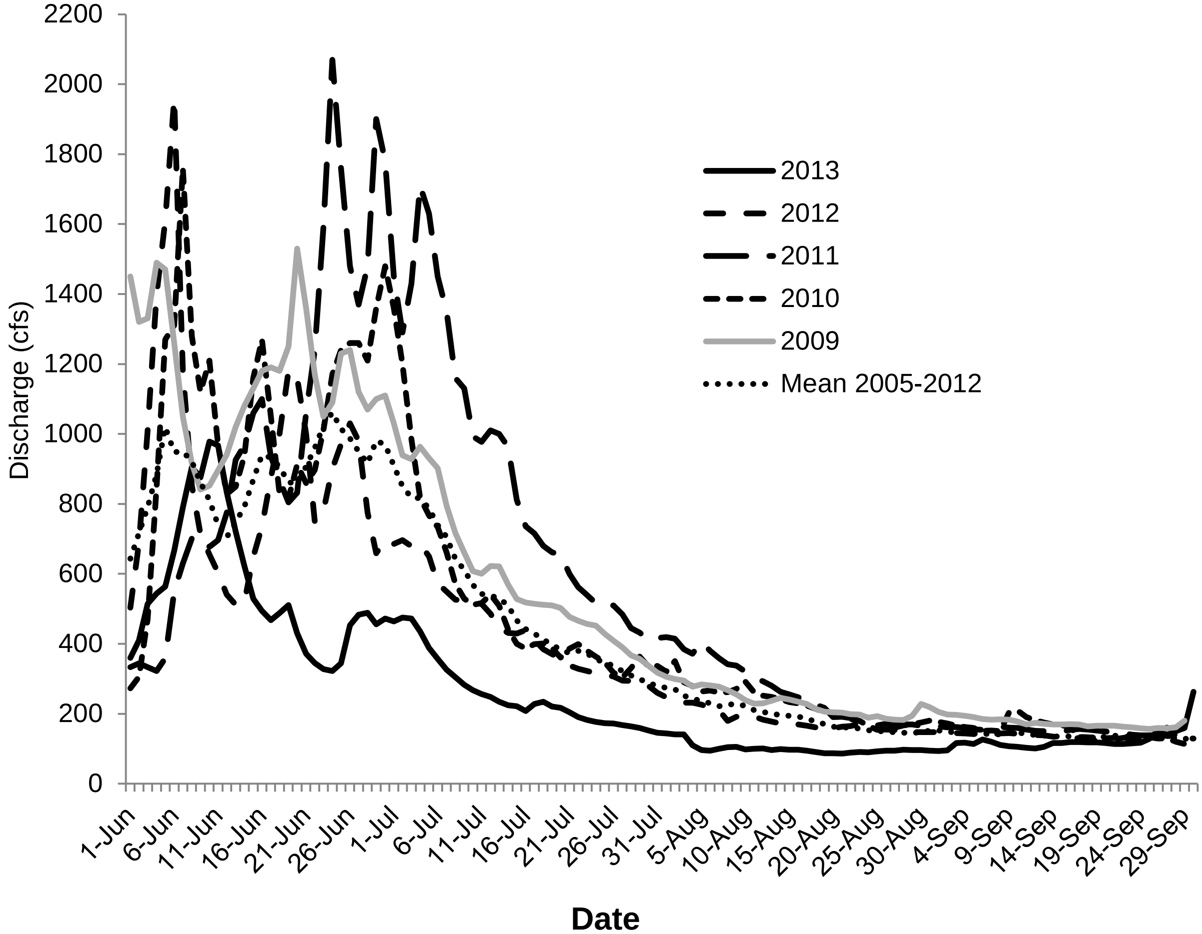

Figure 3. Discharge in cubic feet per second (cfs) of the East Fork Salmon River, June 1–September 30, 2007—2013.

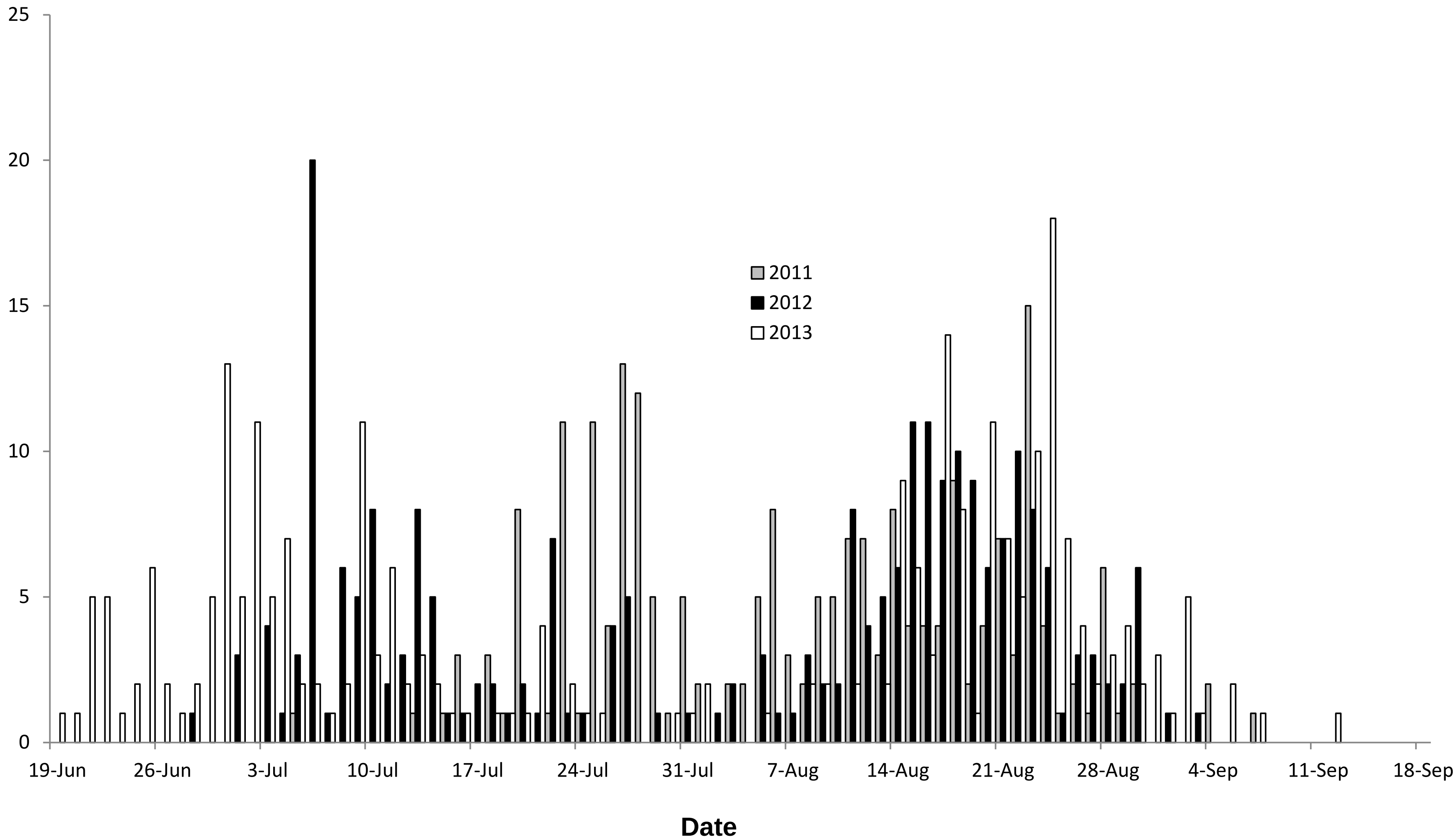

Figure 4. Timing of natural origin Chinook Salmon captured in the East Fork Salmon River adult trap, June 19 – September 21, 2011—2013.

Spawning Ground Surveys

Between August 9 and September 20, 2013, the field crews counted 47 Chinook Salmon redds upstream of the EFSR adult trap (NS-1b), and an additional 89 redds 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 4, 2013 found 28 redds in NS-1b, 37 redds in NS-1a, 15 redds in NS-2b. NS-2a, which extends from the mouth of the EFSR upstream to the mouth of Herd Creek (Table 5), was not collected due to poor visibility; (J. Flinders, Idaho Fish and Game, unpublished data).This poor visibility was the result of a series of strong thunderstorms producing heavy downpours and localized flooding on September 3rd and 4th, 2013. Additionally, several lower tributaries were observed to have deposited heavy sediment loads into the EFSR, downstream of the EFSR adult trap. This sediment was found widely dispersed throughout the middle reaches of the EFSR, and may have adversely impacted egg survival in completed Chinook Salmon redds.

During carcass surveys in the EFSR, samples were recovered from a total of 120 Chinook Salmon carcasses: 107 below the adult trap and 13 above the trap (Table 4). Seventy nine were carcasses not previously sampled (untagged/unmarked), and 41 carcasses were fish previously captured, jaw-tagged, and released above the EFSR adult trap (Appendix C). These 41 previously trapped adults consisted of 15 males, 14 jacks, and 12 females. Fin ray samples were collected from 20 of the total 120 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 2013. Age determinations were not yet complete from 2013 fin rays collected from carcasses at the time of reporting. However, ages of adult Chinook Salmon determined from 97 of the 100 fin rays collected from carcasses in the EFSR during 2012 consisted of 19 age-4 (19.6%), 77 age-5 (79.4%), and one age-6 fish (1.0%); (Appendix D).

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 2013.

Captive Chinook Transect					SGR Trend Transect				
	Distance from Trap		Carcasses					Carcasses	
Name	(Km.)	Redds	Fin Rays Collected	All	Name	Description	Redds	Fin Rays Collected	All
N06	17.1	7		10	NS-2b	Herd Creek to 3.5 miles downstream of EFSR adult trap	47	6	52
N05	14.3	22	3	22					
N04	11.9	8	1	7					
N03	8.9	10	2	13					
N02	6.1	17	2	24	NS-1a	EFSR adult trap to 3.5 miles downstream	41	9	55
N01	2.9	24	7	31					
						Total Downstream	**88**	**15**	**107**
N1	1.3	7	1	2	NS-1b	EFSR adult trap to Bowery Guard Station	47	5	13
N2	3.2	8	1	2					
N3	4.7	8	0	1					
N4	5.3	4	1	3					
N5	7.2	4	1	2					
N6	9.7	11	1	3					
N7	10.9	4							
N8		0							
N9		1							
						Total Upstream	**47**	**5**	**13**
						TOTAL ALL	**135**	**20**	**120**

Table 5. Number of redds observed from aerial counts on the West Fork Yankee Fork Salmon River (WFYF) and East Fork Salmon River (EFSR), 2002–2013.

		Number of Redds											
Stream	**Section Description**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
WFYF	WFYF mouth to Lightning Cr (NS-8) [1]	10	18	5	1	0	7	1	1	7	3	9	7
	Lightning Cr to Cabin Cr (NS-7) [2]	1	7	0	0	0	0	0	0	0	0	2	7
	Total	**11**	**25**	**5**	**1**	**0**	**7**	**1**	**1**	**7[a]**	**3[a]**	**11[a]**	**14**
EFSR	Mouth of East Fork to Herd Cr (NS-2a) [3]	56	15	38	12	7	3	34	13	110	36	44	NC[b]
	Herd Cr to 3.5 mi downstream of EF Trap (NS-2b) [4]	79	60	37	18	19	31	40	24	119[b]	86[a]	62	15
	3.5 mi downstream of EF Trap to EF Weir (NS-1a) [5]	100	93	55	32		21	50	13			52	37
	EF Weir to Bowrey Guard Station (NS-1b) [6]	44	59	24	16	2	25	27	9	60	16	43	28
	Total	**279**	**227**	**154**	**78**	**28**	**80**	**151**	**59**	**289[a]**	**138**	**201**	**135**

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] *Ground counts were substituted in years aerial surveys were not conducted (WFYF, 2010—2012; EFSR, 2010).*
[b] *Aerial counts of SGS transects NS-2b and NS-1a were counted as one combined transect in 2010-2011.*
[c] *Not collected after the Sept. 3rd 2013 flood event because the water turbidity made it impossible to see redds.*

Genetic Parentage Analyses

In 2013, we genotyped and performed genetic parentage analyses of fin tissue samples from a total of 380 Chinook Salmon adults that returned to the EFSR in 2012 (Table 6). Of these adults, 244 were captured at the EFSR adult trap, and an additional 136 samples were collected from carcasses found below the trap, from fish not previously trapped). Of the 380 adult samples, 357 were successfully genotyped (93.9%; 243 trap adults and 114 carcass samples).

Table 6. Number and type of genetic samples collected from 2012 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	244	243	99.6
Carcasses	136	114	83.8
TOTAL	**380**	**357**	**93.9**

In summary, 120 adults assigned to two parents for an assignment rate of 34%. In addition, 79 adults assigned to one single parent for an assignment rate of 22%. Most of the single parent assignments (n = 73) were to a single natural parent and fewer adults were assigned to only one captive parent (n = 6). The majority (70%) of single parent assignments from the 2012 adult returns were assigned to a female parent (with no male parent identified). Of the 120 parent pair assignments, 92 of the fish assigned to natural parents, 24 assigned to captive parents and four adults assigned to a natural x captive crosses (Table 7). The age structure of the natural assignments was: 47 adults were produced from adults that returned in 2007 (age-5), 43 adults were produced from adults that returned in 2008 (age-4), and 2 adults were produced from natural adults that returned in 2009 (age-3, jack). The age structure of the captive assignments was: 19 adults were produced from adults released in 2007 (age-5), 5 adults were produced from adults released in 2008 (age-4), and 0 adults were produced from adults released in 2009 (age-3, jack).

Total parentage assignment rates (both captive and natural origin, and both one and two parent assignments) 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%); 2012 was slightly lower (56%); (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 2012. Potential sources of unsampled parents include precocial males, adults spawning below the trap that produces adult progeny returning to the trap, and fish that make it over the trap without being captured. Given the number of redds and carcasses detected below the trap, the second hypothesis seems the most likely explanation for missing parents.

In 2012, carcasses were collected to determine if any captive-reared progeny were returning below the EFSR adult trap. Of the 173 carcasses recovered below the trap, 27 were adults that had been originally trapped, tagged, and released above the trap but subsequently passed downstream of the trap. The remaining 146 carcasses were adult Chinook Salmon not previously trapped (did not pass upstream of EFSR adult trap), and 114 of these samples were successfully genotyped. Of these 114 carcasses, 11 carcasses assigned to two natural parents (8-SY07, 3-SY08), and eleven carcasses assigned to a single natural parent (8-SY07, 3-SY08). Five carcasses assigned to two captive parents (5-SY07), and three carcasses assigned to a single captive parent (3-SY08). This demonstrates that not all of the captive fish return to the trap and that there is considerable spawning below the trap.

These results demonstrate reproductive success of captive-reared Chinook Salmon released to spawn. With the parentage analyses completed on the 2012 adult returns, the contribution of the 2007 captive release year is complete. In 2007, captive-reared adults release to spawn naturally (n = 313: 113 female, 200 male) constructed 63 redds (Stark et al. 2008). Parentage analyses have found these fish produced 49 progeny that returned as adults in (0-SY10, 30-SY11, 19-SY12). This magnitude of production equates to 0.43 recruits per female (Table 9) and 0.25 recruits per male. Not all adults from spawn years (SY) 2008 and 2009 have returned yet, but SY08 has returned 11 progeny so far.

Considering these assignment rates and reproductive success, it is important to consider realistic expectations for captive fish performance. To define expectations we modeled both natural and captive 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 returns and captive 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 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 natural and captive 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 2009–2012 natural adult returns (Table 12).

A comparison of the reproductive success (progeny assigned) of natural and captive adults in 2009-2012 reveals more progeny returned from wild fish than progeny from captive fish (Table 13). When we average the 2009-2012 percent of natural progeny projected, we find natural fish returned at 78.8% of our projections, while progeny from captive fish returned at 78.9% of our projections.

Still another way to evaluate captive reproductive success is to compare the production from three years of egg collections to what would have been produced from the equivalent number of wild eggs left in natal gravels. As an example, during collection years 1999-2005 we collected an average of 300 natural eggs per year from the EFSR. These eggs were brought into the hatchery and raised to maturity in captivity. So, if we consider approximately 900 eggs were collected across three years (2002-2004) to comprise the 2007 releases, which included 113 mature adult females released to spawn naturally in the EFSR. Parentage analyses have since shown this complete spawn year recruited 49 adult progeny across return years 2010-2012. 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 900 wild eyed-eggs left in the stream; we would end up with only 0.45 natural females. Then if we multiply 3.89 recruits per female (calculated from the complete parentage assignments of SY07 natural adults), we estimate SY07 natural fish would have only returned 1.75 natural adults. Therefore, standardizing the production on an 'egg-to-egg' basis for the complete SY07, captive fish effectively achieved 28 times the survival of natural fish.

Thus far, a moderate number of adult returns have been assigned to captive adults, and probability of contribution remains high in 2013 adult returns, because captive releases in 2008 demonstrated relatively strong spawning success (Appendix E). 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 2013 adult returns will be completed in the next reporting year (2014).

Table 7. Parentage assignments of adult Chinook Salmon returns to the East Fork Salmon River in 2012, from 243 trapped and 114 carcasses successfully genotyped, summarized by assignment type, parent source crosses, and age.

PROGENY ASSIGNMENTS[a]													
	Captive x Captive[b]				**Natural x Captive**				**Natural x Natural[c]**				**Total**
2 Parents	Jacks	Age 4	Age 5	**Total**	Jacks	Age 4	Age 5	**Total**	Jacks	Age 4	Age 5	**Total**	**All**
	0	5	19	**24**	1	3	0	**4**	2	43	47	**92**	**120**
	Captive x Unknown[d]								**Natural x Unknown[e]**				**Total**
1 Parent	Jacks	Age 4	Age 5	**Total**					Jacks	Age 4	Age 5	**Total**	**All**
	0	4	2	**6**					3	42	28	**73**	**79**

Total Assignments	**199**
No Assignments	**158**
Total	**357**
2 Parents Assigned	**34%**
1 Parent Assigned	**22%**
Total Assigned	**56%**

[a] *All assignments were with zero or one locus mismatch.*
[b] *Includes five CxC assignments from carcasses.*
[c] *Includes eleven NxN assignments from carcasses.*
[d] *Includes three CxU assignments from carcasses.*
[e] *Includes eleven NxU assignments from carcasses.*

Table 8. Summary of samples genotyped, parentage assignment type and assignment rate of adult Chinook Salmon returns to the East Fork Salmon River, 2004—2012.

Adult Natural Return (Progeny) Assignments

Adult Return Year→	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Total**
Total Genotyped Samples	**156**	**280**	**219**	**393**	**358**	**313**	**304**	**249**	**357**	**2629**
2 Parent Assignments	[redacted]			8	66	66	108	118	120	**486**
1 Parent Assignments	1	0	0	7	39	50	60	47	79	**283**
1 & 2-Parent Assignments	1	0	0	15	105	116	168	165	199	**769**
Invalid Assignments	0	0	0	0	10	14	21	9	8	**62**
No Assignment	151	63	80	74	86	63	113	75	150	**855**
Assignment Rate	1%	0%	0%	4%	29%	37%	55%	66%	56%	**29%**

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.

Adult Spawn Year	Number of Females		Redds Produced		Redds per Female		Adult Return Assignments: Progeny Assigned[e]		Adult Return Assignments: Recruits per Female	
	C	N[b]	C	N[c]	C	N	C	N	C	N
1999	7	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	47	N.A.	N.A.	44	N.A.	N.A.	0	0	N.A.	N.A.
2003[d]	18	N.A.	N.A.	59	N.A.	N.A.	0	0	N.A.	N.A.
2004	4	45	1	16	0.25	0.36	0	86	N.A.	1.91
2005	43	21	11	15	0.26	0.71	0	43	N.A.	2.05
2006	73	21	16	4	0.22	0.19	21	110	0.29	5.24
2007	113	27	63	26	0.56	0.96	49	105	0.43	3.89
2008[f]	112	63	45	40	0.40	0.63	8.5	56.5	0.08	0.90
2009[f]	112	61	18	50	0.16	0.82	0.5	2.5	0.004	0.04
2010	5	72	1	60	0.20	0.83	N.A.	N.A.	N.A.	N.A.
2005 – 2010	**462**	**310**	**155**	**211**	**0.34**	**0.68**	**79**	**403**	**N.A.**	**N.A.**

[a] All parentage assignments are to a parent pair with zero or one mismatch.

[b] The EFSR adult trap was not operated from 1998-2003, thus natural return numbers and genetics samples were not collected.

[c] Does not include redds counted below the EFSR adult trap (2009-66, 2010-119, 2011-63, 2012-201).

[d] No captive-reared fish survived to spawn post release in 2003 due to unknown causes (Venditti et al. 2004).

[e] Assignments to CxN and NxC crosses were summarized separately for both Captive and Natural (i.e. split in half).

[f] Adult spawn/release years 2008 and 2009 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—2012 in the East Fork Salmon River.

Natural/Wild Chinook

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]	Predicted Adult Return
2005	21	15	0.71	5,589	83,835	90.6%	75,955	5.0%	3,798	2.0%	76
2006	21	4	0.19	5,589	22,356	90.6%	20,255	5.0%	1,013	2.0%	20
2007	27	26	0.96	5,589	145,314	90.6%	131,654	5.0%	6,583	2.0%	132
2008	63	40	0.63	5,589	223,560	90.6%	202,545	5.0%	10,127	2.0%	203
2009	61	50	0.82	5,589	279,450	90.6%	253,182	5.0%	12,659	2.0%	253
2010	72	60	0.83	5,589	335,340	90.6%	303,818	5.0%	15,191	2.0%	304
2011	62	20	0.32	5,589	111,780	90.6%	101,273	5.0%	5,064	2.0%	101
2012	111	63	0.57	5,589	352,107	90.6%	319,009	5.0%	15,950	2.0%	319
Mean	**55**	**35**	**0.63**	**5,589**	**194,218**	**90.6%**	**175,961**	**5.0%**	**8,798**	**2.0%**	**176**
Total	**438**	**278**									**1,408**

Captive-reared Chinook

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]	Predicted Adult Return
2005	43	11	0.26	1,200	13,200	70.5%	9,299	5.0%	465	2.0%	9
2006	73	16	0.22	1,200	19,200	70.5%	13,526	5.0%	676	2.0%	14
2007	113	63	0.56	1,200	75,600	70.5%	53,260	5.0%	2,663	2.0%	53
2008	112	45	0.40	1,200	54,000	70.5%	38,043	5.0%	1,902	2.0%	38
2009	112	18	0.16	1,200	21,600	70.5%	15,217	5.0%	761	2.0%	15
2010	5	1	0.20	1,200	1,200	70.5%	845	5.0%	42	2.0%	1
Mean	**76**	**26**	**0.30**	**1,200**	**30,800**	**70.5%**	**21,699**	**5.0%**	**1,085**	**2.0%**	**22**
Total	**458**	**154**									**130**

[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—2012 in the East Fork Salmon River, apportioned across adult return years by weighted mean 2009—2012 genotypic age structure (proportions).

Natural/Wild Chinook

Brood Year	Parents: Females	Parents: Redds	Parents: #/Female	Projected Adult Returns (Progeny): 2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
2005	21	15	0.71	10	42	23								76
2006	21	4	0.19		3	11	6							20
2007	27	26	0.96			18	74	40						132
2008	63	40	0.63				28	113	62					203
2009	61	50	0.82					35	142	77				253
2010	72	60	0.83						42	170	92			304
2011	62	20	0.32							14	57	31		101
2012	111	63	0.57								9	147	163	319
MEAN	**55**	**35**	**0.63**											**176**
TOTAL	**438**	**278**		**10**	**45**	**52**	**108**	**188**	**245**	**261**	**158**	**95**	**163**	**1,162**

Captive-reared Chinook

Brood Year	Parents: Females	Parents: Redds	Parents: #/Female	Projected Adult Returns (Progeny): 2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
2005	46	11	0.24	1	5	3								9
2006	70	12	0.17		1	6	3							10
2007	122	63	0.52			7	30	16						53
2008	112	55	0.49				6	26	14					46
2009	112	10	0.09					1	5	3				8
2010	5	1	0.20						0	0	0			1
2011	0	0	0.00							0	0	0		0
MEAN	**75**	**25**	**0.31**											**30**
TOTAL	**452**	**152**		**1**	**7**	**16**	**38**	**43**	**19**	**3**	**0**	**0**		**182**

Table 12. Annual and weighted mean genotypic age structure of 2010—2012 wild Chinook Salmon adult returns that assigned to a parent pair with zero or one mismatch.

		Genotypic Age			
Adult Return Year		**3**	**4**	**5**	**Total**
2010	No.	7	96	3	107
	%	**7%**	**90%**	**4%**	
2011	No.	14	79	21	114
	%	**12%**	**69%**	**18%**	
2012	No.	3	48	53	120
	%	**3%**	**43%**	**55%**	
	Total	24	223	77	341
	Weighted Mean	**15%**	**51%**	**34%**	

* *Age was given based upon return year of assigned adult parents.*

Table 13. Comparison of projected Chinook Salmon adult returns in 2010—2012 to assignments of 2009—2012 adult returns to natural or captive-reared Chinook Salmon parents in the East Fork Salmon River.

		Adult Returns			
Origin	**Group**	**2010**	**2011**	**2012**	**Total**
Natural	**Projected**	53	104	185	**342**
	Assigned	97.0	78.5	94.0	**269.5**
	% of Projected	181%	76%	51%	**78.8%**
Captive	**Projected**	15	38	44	**97**
	Assigned	11.0	39.5	26.0	**76.5**
	% of Projected	71%	104%	59%	**78.9%**
Total Chinook	**Projected**	69	142	229	**440**
	Assigned	108.0	118.0	120.0	**346**
	% of Projected	157%	83%	52%	**78.6%**
Proportion Assigned	**Natural**	89.8%	66.5%	78.3%	**77.7%**
	Captive	**10.2%**	**33.5%**	**21.7%**	**22.3%**

**All parentage assignments are to a parent pair with 0 or 1 mismatch.*
**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).*
**See Appendix D for assignments by origin and adult return year.*

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APPENDICES

Appendix A. PIT-tagged adult Chinook Salmon captured at the East Fork Salmon River adult trap (SALEFT-A) in 2013, originally tagged as either juveniles at the East Fork Salmon River juvenile screw trap (SALEFT-J), or tagged as adults in 2013 in the Federal Columbia River Power System (FCRPS) at either Bonneville Dam adult facility (BON) or Lower Granite Dam adult facility (GRA).

	First Capture (tagged)			Recapture				Travel Days
PIT Number	Date	Location	Length (cm)	Date	Location	Length (cm)	Sex	(GRA - SALEFT-A)
3D9.1C67C5352D	8/19/2010	SALEFT-J	63.0	6/22/2013	SALEFT-A	71.0	Male	41
3D9.1BF275D0C3	4/12/2012	GRA	106.0	8/17/2013	SALEFT-A	55.5	Jack	55
3D9.1C2DB1E8E5	5/3/2013	GRA	1020.0	6/26/2013	SALEFT-A	102.5	Male	54
3D9.1C2DB0B5FC	5/7/2013	GRA	690.0	8/8/2013	SALEFT-A	69.1	Male	93
3D9.1C2DE91465	5/10/2013	BON	650.0	7/2/2013	SALEFT-A	67.5	Male	28
3D9.1C2DB0675C	5/10/2013	GRA	840.0	7/9/2013	SALEFT-A	84.8	Female	60
3D9.1C2DAED37B	5/15/2013	GRA	790.0	7/30/2013	SALEFT-A	79.5	Female	76
3D9.1C2DAEE729	5/15/2013	GRA	580.0	8/14/2013	SALEFT-A	58.3	Jack	91
3D9.1C2DAC58F5	5/17/2013	GRA	510.0	8/20/2013	SALEFT-A	51.3	Jack	95
384.3B239E9595	5/19/2013	BON	N/A	8/28/2013	SALEFT-A	45.6	Jack	84
3D9.1C2DAE942C	5/20/2013	GRA	840.0	6/28/2013	SALEFT-A	85.5	Female	39
3D9.1C2DE8B449	5/20/2013	BON	520.0	7/12/2013	SALEFT-A	53.5	Jack	42
3D9.1C2DAD44EB	5/21/2013	GRA	670.0	7/9/2013	SALEFT-A	68.0	Male	49
3D9.1C2DAD6F53	5/21/2013	GRA	650.0	8/18/2013	SALEFT-A	64.8	Male	89
3D9.1C2DAC37BC	5/22/2013	GRA	990.0	6/29/2013	SALEFT-A	101.0	Male	38
3D9.1C2DAEC6EE	5/22/2013	GRA	580.0	7/3/2013	SALEFT-A	59.4	Jack	42
3D9.1C2DB5479A	5/22/2013	GRA	510.0	8/9/2013	SALEFT-A	51.8	Jack	79
3D9.1C2DAC4EE2	5/23/2013	GRA	450.0	7/4/2013	SALEFT-A	44.8	Jack	42
3D9.1C2DB4E8D1	5/23/2013	GRA	470.0	8/23/2013	SALEFT-A	48.0	Jack	92
3D9.1C2DAD883D	5/24/2013	GRA	480.0	6/29/2013	SALEFT-A	48.7	Jack	36
3D9.1C2DB52E04	5/24/2013	GRA	690.0	7/2/2013	SALEFT-A	70.0	Female	39
3D9.1C2DAED00B	5/29/2013	GRA	610.0	7/13/2013	SALEFT-A	62.3	Jack	45
3D9.1C2DB4E07D	5/30/2013	GRA	470.0	8/23/2013	SALEFT-A	48.5	Jack	85
3D9.1C2DAD6B53	5/31/2013	GRA	910.0	7/5/2013	SALEFT-A	91.7	Female	35
3D9.1C2E087F92	6/3/2013	BON	525.0	7/7/2013	SALEFT-A	53.0	Jack	26
3D9.1C2E03769A	6/4/2013	BON	500.0	7/11/2013	SALEFT-A	50.0	Jack	27

Appendix A. Continued.

PIT Number	First Capture (tagged) Date	Location	Length (cm)	Recapture Date	Location	Length (cm)	Sex	Travel Days (GRA - SALEFT-A)
3D9.1C2DAEB6F0	6/4/2013	GRA	720.0	8/17/2013	SALEFT-A	75.0	Male	74
3D9.1C2DB32ED7	6/5/2013	GRA	920.0	7/11/2013	SALEFT-A	94.0	Male	36
3D9.1C2DB0923D	6/6/2013	GRA	920.0	7/21/2013	SALEFT-A	93.0	Female	45
3D9.1C2DB32F59	6/11/2013	GRA	630.0	7/13/2013	SALEFT-A	65.0	Female	32
3D9.1C2DB08203	6/12/2013	GRA	440.0	8/17/2013	SALEFT-A	44.7	Jack	66
3D9.1C2DB09156	6/13/2013	GRA	690.0	8/14/2013	SALEFT-A	70.0	Male	62
3D9.1C2DB06074	6/13/2013	GRA	720.0	8/22/2013	SALEFT-A	75.2	Male	70
3D9.1C2DAD608A	6/28/2013	GRA	580.0	8/14/2013	SALEFT-A	60.0	Jack	47
3D9.1C2DAEDD83	7/2/2013	GRA	490.0	8/15/2013	SALEFT-A	50.0	Jack	44
3D9.1C2DAEBAD9	7/5/2013	GRA	600.0	8/9/2013	SALEFT-A	60.8	Jack	35
3D9.1C2DAEB5D6	6/14/2013	GRA	760.0	8/16/2013	SALEFT-A	78.2	Male	63
3D9.1C2DB52FBB	6/14/2013	GRA	540.0	8/17/2013	SALEFT-A	55.1	Jack	64
3D9.1C2DAD59AC	6/14/2013	GRA	660.0	8/23/2013	SALEFT-A	66.6	Male	68
3D9.1C2DAEAF44	6/14/2013	GRA	610.0	8/25/2013	SALEFT-A	62.0	Jack	72

Appendix B. Summary of Chinook Salmon redds observed during ground counts in the East Fork Salmon River (EFSR) during 2013. Locations are GPS waypoints (WGS-84 datum).

Stream	Date Observed	Redd Name	Location Lat (N)	Location Long (W)	Section Name	SGR Trend Transect
EFSR	8/12/13	R004BA	44.12896	-114.41908	N01	NS-1a
EFSR	8/12/13	R005BA	44.12476	-114.42376	N01	NS-1a
EFSR	8/17/13	R018BA	44.12587	-114.42117	N01	NS-1a
EFSR	8/17/13	R020BA	44.12584	-114.42103	N01	NS-1a
EFSR	8/17/13	R021BA	44.12560	-114.42166	N01	NS-1a
EFSR	8/17/13	R022BA	44.12154	-114.42421	N01	NS-1a
EFSR	8/17/13	R027BA	44.11880	-114.42744	N01	NS-1a
EFSR	8/17/13	R028BA	44.11800	-114.42914	N01	NS-1a
EFSR	8/17/13	R029BA	44.11712	-114.42944	N01	NS-1a
EFSR	8/17/13	R030BA	44.11644	-114.42957	N01	NS-1a
EFSR	8/20/13	R051BA	44.11946	-114.42392	N01	NS-1a
EFSR	8/20/13	R052BA	44.11771	-114.42909	N01	NS-1a
EFSR	8/20/13	R053BA	44.11727	-114.42931	N01	NS-1a
EFSR	8/20/13	R023BA	44.11919	-114.42413	N01	NS-1a
EFSR	8/20/13	R024BA	44.11913	-114.42428	N01	NS-1a
EFSR	8/20/13	R025BA	44.11877	-114.42509	N01	NS-1a
EFSR	8/20/13	R026BA	44.11877	-114.42509	N01	NS-1a
EFSR	8/26/13	R059BA	44.12945	-114.41840	N01	NS-1a
EFSR	8/26/13	R060BA	44.12671	-114.42078	N01	NS-1a
EFSR	8/26/13	R061BA	44.12587	-114.42111	N01	NS-1a
EFSR	8/26/13	R062BA	44.12378	-114.42297	N01	NS-1a
EFSR	8/26/13	R063BA	44.11879	-114.42513	N01	NS-1a
EFSR	8/29/13	R091BA	44.11710	-114.42931	N01	NS-1a
EFSR	9/1/13	R104BA	44.11873	-114.42702	N01	NS-1a
EFSR	8/17/13	R014BA	44.13971	-114.40157	N02	NS-1a
EFSR	8/17/13	R016BA	44.13641	-114.40675	N02	NS-1a
EFSR	8/17/13	R017BA	44.13000	-114.41636	N02	NS-1a
EFSR	8/20/13	R047BA	44.14222	-114.39838	N02	NS-1a
EFSR	8/20/13	R048BA	44.13772	-114.40602	N02	NS-1a
EFSR	8/20/13	R049BA	44.13548	-114.40700	N02	NS-1a
EFSR	8/20/13	R050BA	44.13044	-114.41824	N02	NS-1a
EFSR	8/20/13	R015BA	44.13738	-114.40393	N02	NS-1a
EFSR	8/25/13	R021KF	44.13969	-114.40160	N02	NS-1a
EFSR	8/28/13	R032KF	44.13052	-114.41783	N02	NS-1a
EFSR	8/28/13	R018KF	44.14314	-114.39655	N02	NS-1a
EFSR	8/28/13	R020KF	44.14038	-114.40050	N02	NS-1a
EFSR	8/29/13	R088BA	44.13641	-114.40675	N02	NS-1a
EFSR	8/29/13	R090BA	44.11913	-114.42428	N02	NS-1a
EFSR	8/29/13	R019KF	44.14310	-114.39660	N02	NS-1a
EFSR	9/1/13	R013BA	44.14331	-114.39575	N02	NS-1a
EFSR	9/1/13	R089BA	44.13641	-114.40675	N02	NS-1a

Appendix B. Continued.

Stream	Date Observed	Redd Name	Location Lat (N)	Long (W)	Section Name	SGR Trend Transect
EFSR	8/14/13	R002KF	44.08171	-114.45305	N3	NS-1b
EFSR	8/14/13	R005KF	44.07411	-114.45850	N4	NS-1b
EFSR	8/15/13	R008KF	44.06050	-114.46087	N5	NS-1b
EFSR	8/15/13	R009KF	44.05673	-114.46134	N6	NS-1b
EFSR	8/15/13	R011KF	44.04215	-114.46027	N6	NS-1b
EFSR	8/18/13	R031BA	44.11262	-114.44316	N1	NS-1b
EFSR	8/18/13	R032BA	44.09183	-114.44249	N2	NS-1b
EFSR	8/18/13	R033BA	44.09013	-114.44325	N2	NS-1b
EFSR	8/18/13	R035BA	44.08083	-114.45316	N3	NS-1b
EFSR	8/18/13	R036BA	44.07995	-114.45367	N3	NS-1b
EFSR	8/21/13	R054BA	44.07805	-114.45522	N4	NS-1b
EFSR	8/21/13	R055BA	44.07790	-114.45601	N4	NS-1b
EFSR	8/21/13	R056BA	44.07410	-114.45863	N4	NS-1b
EFSR	8/21/13	R057BA	44.07244	-114.45911	N5	NS-1b
EFSR	8/21/13	R058BA	44.07002	-114.45849	N5	NS-1b
EFSR	8/21/13	R007KF	44.07072	-114.45911	N5	NS-1b
EFSR	8/27/13	R003TG	44.98022	-114.46468	C5	NS-1b
EFSR	8/27/13	R064BA	44.11287	-114.43100	N1	NS-1b
EFSR	8/27/13	R065BA	44.11153	-114.43303	N1	NS-1b
EFSR	8/27/13	R066BA	44.10896	-114.43459	N1	NS-1b
EFSR	8/27/13	R067BA	44.10577	-114.43862	N1	NS-1b
EFSR	8/27/13	R068BA	44.09768	-114.44253	N2	NS-1b
EFSR	8/27/13	R069BA	44.09366	-114.44223	N2	NS-1b
EFSR	8/27/13	R070BA	44.09066	-114.44369	N2	NS-1b
EFSR	8/27/13	R071BA	44.09029	-114.44334	N2	NS-1b
EFSR	8/27/13	R072BA	44.09029	-114.44334	N2	NS-1b
EFSR	8/27/13	R074BA	44.08733	-114.44403	N3	NS-1b
EFSR	8/27/13	R075BA	44.08147	-114.45143	N3	NS-1b
EFSR	8/27/13	R076BA	44.08097	-114.45293	N3	NS-1b
EFSR	8/27/13	R001TG	44.02814	-114.46468	N7	NS-1b
EFSR	8/27/13	R002TG	44.02788	-114.46449	N7	NS-1b
EFSR	8/27/13	R034BA	44.08578	-114.44571	N3	NS-1b
EFSR	8/28/13	R077BA	44.05692	-114.46133	N6	NS-1b
EFSR	8/28/13	R078BA	44.05603	-114.46108	N6	NS-1b
EFSR	8/28/13	R079BA	44.05531	-114.46028	N6	NS-1b
EFSR	8/28/13	R080BA	44.05293	-114.46107	N6	NS-1b
EFSR	8/28/13	R081BA	44.05187	-114.46162	N6	NS-1b
EFSR	8/28/13	R082BA	44.05029	-114.46172	N6	NS-1b
EFSR	8/28/13	R083BA	44.05008	-114.46184	N6	NS-1b
EFSR	8/28/13	R084BA	44.04831	-114.46202	N6	NS-1b
EFSR	8/28/13	R085BA	44.04193	-114.46074	N6	NS-1b
EFSR	8/28/13	R086BA	44.03379	-114.46217	N7	NS-1b
EFSR	8/28/13	R087BA	44.02814	-114.46468	N7	NS-1b

Appendix B. Continued.

Stream	Date Observed	Redd Name	Location Lat (N)	Long (W)	Section Name	SGR Trend Transect
EFSR	9/12/13	R033KF	44.11356	-114.43047	N1	NS-1b
EFSR	9/12/13	R034KF	44.11356	-114.43047	N1	NS-1b
EFSR	9/15/13	R035KF	44.09351	-114.44267	N2	NS-1b
EFSR	9/15/13	R036KF	44.08513	-114.44631	N3	NS-1b
EFSR	8/9/13	R001BA	44.14641	114.37709	N03	NS-2b
EFSR	8/9/13	R002BA	44.14584	114.39127	N03	NS-2b
EFSR	8/17/13	R006BA	44.11876	-114.42699	N01	NS-2b
EFSR	8/19/13	R040BA	44.14471	-114.35599	N04	NS-2b
EFSR	8/19/13	R042BA	44.14551	-114.35933	N04	NS-2b
EFSR	8/19/13	R043BA	44.14551	-114.35933	N04	NS-2b
EFSR	8/19/13	R044BA	44.14527	-114.36470	N04	NS-2b
EFSR	8/19/13	R037BA	44.14426	-114.32191	N05	NS-2b
EFSR	8/19/13	R039BA	44.14259	-114.32555	N05	NS-2b
EFSR	8/20/13	R045BA	44.14674	-114.37926	N03	NS-2b
EFSR	8/20/13	R046BA	44.14667	-114.38441	N03	NS-2b
EFSR	8/20/13	R012BA	44.14678	-114.38272	N03	NS-2b
EFSR	8/24/13	R014KF	44.14261	-114.32487	N05	NS-2b
EFSR	8/24/13	R038BA	44.14256	-114.32509	N05	NS-2b
EFSR	8/27/13	R027KF	44.14450	-114.31860	N05	NS-2b
EFSR	8/27/13	R028KF	44.14205	-114.32985	N05	NS-2b
EFSR	8/27/13	R024KF	44.15077	-114.30383	N06	NS-2b
EFSR	8/27/13	R025KF	44.14725	-114.31235	N06	NS-2b
EFSR	8/29/13	R001ES	44.15337	-114.30141	N06	NS-2b
EFSR	8/29/13	R012KF	44.14464	-114.31824	N05	NS-2b
EFSR	8/29/13	R015KF	44.14204	-114.32738	N05	NS-2b
EFSR	8/29/13	R017KF	44.14689	-114.38582	N03	NS-2b
EFSR	8/29/13	R026KF	44.14472	-114.31805	N05	NS-2b
EFSR	8/29/13	R030KF	44.14238	-114.33118	N05	NS-2b
EFSR	8/29/13	R023KF	44.15131	-114.30353	N06	NS-2b
EFSR	8/30/13	R094BA	44.14562	-114.39304	N03	NS-2b
EFSR	8/31/13	R097BA	44.14427	-114.32150	N05	NS-2b
EFSR	8/31/13	R098BA	44.14320	-114.33652	N05	NS-2b
EFSR	8/31/13	R029KF	44.14215	-114.33020	N05	NS-2b
EFSR	8/31/13	R002ES	44.14601	-114.31640	N06	NS-2b
EFSR	9/1/13	R031KF	44.14250	-114.33159	N05	NS-2b
EFSR	9/1/13	R006TG	44.14698	-114.38657	N03	NS-2b
EFSR	9/4/13	R102BA	44.14536	-114.35706	N04	NS-2b
EFSR	9/4/13	R105BA	44.14500	-114.35303	N04	NS-2b
EFSR	9/5/13	R096BA	44.14458	-114.31870	N05	NS-2b
EFSR	9/6/13	R093BA	44.14672	-114.38549	N03	NS-2b
EFSR	9/7/13	R109BA	44.14426	-114.32148	N05	NS-2b
EFSR	9/7/13	R110BA	44.14318	-114.33446	N05	NS-2b
EFSR	9/7/13	R107BA	44.14813	-114.31006	N06	NS-2b

Appendix B. Continued.

Stream	Date Observed	Redd Name	Location Lat (N)	Location Long (W)	Section Name	SGR Trend Transect
EFSR	9/7/13	R108BA	44.14806	-114.31029	N06	NS-2b
EFSR	9/7/13	R101BA	44.14500	-114.35438	N04	NS-2b
EFSR	9/7/13	R106BA	44.14527	-114.36493	N04	NS-2b
EFSR	9/8/13	R103BA	44.14539	-114.39354	N03	NS-2b
EFSR	9/9/13	R111BA	44.14225	-114.32752	N05	NS-2b
EFSR	9/9/13	R112BA	44.14206	-114.32885	N05	NS-2b
EFSR	9/9/13	R113BA	44.14242	-114.33153	N05	NS-2b
EFSR	9/18/13	R114BA	44.14210	-114.32763	N05	NS-2b
EFSR	9/20/13	R115BA	44.14261	-114.32559	N05	NS-2b
EFSR	9/20/13	R115BA	44.14261	-114.32559	N05	NS-2b

Appendix C. Summary of Chinook Salmon carcasses collected in the East Fork Salmon River (EFSR), August 9—September 17, 2013. 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			Location	
							Captive Project		Trap	Captive	SGR		
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Jaw Tag	Section Name	Trend Transect	Northing	Easting
8/9/13	**	**	**	**	**	**	C001	**	**	N02	NS-1a	44.14657	114.38443
8/25/13	**	98.0	75.0	M	Y	13-00012	C002	**	**	N02	NS-1a	44.14298	-114.39693
8/25/13	8/18/13	65.0	**	M	N/A	**	**	165	165	N02	NS-1a	44.13149	-114.41339
8/26/13	**	78.0	85.0	F	Y	13-00002	C003	**	**	N01	NS-1a	44.12925	-114.41804
8/26/13	**	79.2	86.8	F	Y	13-00001	C004	**	**	N01	NS-1a	44.12550	-114.42300
8/26/13	**	81.0	89.5	F	Y	13-00003	C005	**	**	N01	NS-1a	44.12228	-114.42521
8/26/13	**	73.2	81.0	F	Y	13-00004	C006	**	**	N01	NS-1a	44.12001	-114.42415
8/26/13	**	75.7	83.3	F	Y	13-00005	C007	**	**	N01	NS-1a	44.11873	-114.42724
8/27/13	**	48.0	43.0	M	Y	13-00006	**	Unk	Unk	N1	NS-1b	44.11093	-114.43397
8/27/13	6/28/13	83.5	75.7	F	Y	13-00007	**	026	026	N2	NS-1b	44.09221	-114.44287
8/27/13	**	**	**	**	**	**	**	Unk	Unk	N4	NS-1b	44.07735	-114.45632
8/27/13	7/9/13	90.5	83.3	F	Y	13-00008	**	082	082	N4	NS-1b	44.07600	-114.45857
8/27/13	**	46.5	35.5	M	Y	13-00011	C008	**	**	N05	NS-2b	44.14439	-114.31950
8/27/13	**	77.0	63.5	F	Y	13-00013	C009	**	**	N05	NS-2b	44.14257	-114.32470
8/28/13	**	91.0	74.0	F	Y	13-00020	C021	**	**	N03	NS-2b	44.14631	-114.38850
8/28/13	8/14/13	83.0	76.0	F	Y	13-00009	**	134	134	N5	NS-1b	44.07311	-114.45884
8/28/13	6/25/13	60.0	53.0	M	Y	13-00010	**	019	019	N6	NS-1b	44.05615	-114.46101
8/28/13	6/22/13	91.0	83.0	F	N	**	**	009	009	N6	NS-1b	44.05187	-114.46162
8/28/13	6/28/13	80.0	73.0	F	N	**	**	025	025	N6	NS-1b	44.05053	-114.46173
8/28/13	8/17/13	73.0	56.0	M	Y	13-00015	**	158	158	N01	NS-1a	44.12342	-114.42358
8/28/13	**	44.0	35.0	M	Y	13-00019	C023	**	**	N01	NS-1a	44.12233	-114.42525
8/28/13	**	73.0	55.0	M	N	**	C024	**	**	N01	NS-1a	44.11891	-114.42474
8/28/13	**	92.0	75.0	F	N	**	C022	**	**	N01	NS-1a	44.11861	-114.42797
8/29/13	**	88.0	70.0	F	Y	13-00017	C010	**	**	N04	NS-2b	44.14534	-114.35848
8/29/13	**	93.0	**	F	N	**	C011	**	**	N03	NS-2b	44.14690	-114.37800
8/29/13	**	72.0	54.0	M	Y	13-00016	C012	**	**	N03	NS-2b	44.14582	-114.30090

Appendix C. Continued.

Date		Length (cm)					Genetic No.		Adult			Location	
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Captive Project Carcass	Captive Project Trap	Trap Jaw Tag	Captive Section Name	SGR Trend Transect	Northing	Easting
8/29/13	**	83.0	76.0	F	Y	13-00014	C033	**	**	N02	NS-1a	44.13768	-114.40244
8/29/13	8/14/13	48.4	**	M	N	**	**	137	137	N02	NS-1a	44.13641	-114.40675
8/29/13	8/17/13	73.0	66.0	M	N	**	**	155	155	N02	NS-1a	44.13339	-114.41151
8/29/13	8/23/13	66.6	**	M	N	**	**	198	198	N02	NS-1a	44.13142	-114.41404
8/29/13	8/14/13	68.0	59.0	M	N	**	**	135	135	N01	NS-1a	44.12197	-114.42456
8/29/13	**	68.5	64.0	F	Y	13-00018	C025	**	**	N05	NS-2b	44.14208	-114.32748
8/30/13	**	82.0	73.0	M	N	**	C013	**	**	N02	NS-1a	44.14021	-114.40096
8/30/13	**	86.0	78.0	M	N	**	C014	**	**	N02	NS-1a	44.13621	-114.40708
8/31/13	**	76.0	70.0	F	N	**	C015	**	**	N05	NS-2b	44.14521	-114.31645
8/31/13	**	89.0	82.0	F	N	**	C016	**	**	N04	NS-2b	44.14468	-114.35544
8/31/13	**	94.0	86.0	F	N	**	C017	**	**	N04	NS-2b	44.14559	-114.36131
9/1/13	7/13/13	52.5	47.0	M	N	**	**	104?	104?	N03	NS-2b	44.14661	-114.38014
9/1/13	6/30/13	48.0	42.0	M	N	**	**	044	044	N03	NS-2b	44.14574	-114.39272
9/1/13	Unknown	63.0	56.0	M	N	**	**	Unk	Unk	N02	NS-1a	44.13729	-114.40618
9/1/13	**	99.0	88.0	M	N	**	C018	**	**	N02	NS-1a	44.13319	-114.41107
9/1/13	**	83.0	73.0	F	N	**	C019	**	**	N02	NS-1a	44.13008	-114.41624
9/1/13	**	97.0	86.0	M	N	**	C020	**	**	N01	NS-1a	44.12727	-114.42062
9/1/13	**	72.0	64.0	M	N	**	C026	**	**	N01	NS-1a	44.12239	-114.42509
9/1/13	**	89.0	81.0	F	N	**	C027	**	**	N01	NS-1a	44.12116	-114.42414
9/1/13	**	93.0	84.0	F	N	**	C028	**	**	N01	NS-1a	44.12041	-114.42439
9/1/13	**	60.0	55.0	M	N	**	C029	**	**	N01	NS-1a	44.11846	-114.42561
9/1/13	8/24/13	82.0	73.0	F	N	**	**	1318	1318	N01	NS-1a	44.11858	-114.42876
9/1/13	8/18/13	78.0	71.0	F	N	**	**	171	171	N01	NS-1a	44.11858	-114.42876
9/1/13	**	78.0	71.0	F	N	**	C030	**	**	N01	NS-1a	44.11858	-114.42876
9/1/13	**	87.0	78.0	F	N	**	C031	**	**	N01	NS-1a	44.11838	-114.42901
9/2/13	**	71.0	64.0	M	N	**	C032	**	**	N04	NS-2b	44.14467	-114.35196
9/3/13	**	81.0	65.0	M	N	**	C047	**	**	N01	NS-1a	44.12712	-114.42078

Appendix C. Continued.

Date		Length (cm)					Genetic No.		Adult			Location	
							Captive Project		Trap	Captive	SGR		
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Jaw Tag	Section Name	Trend Transect	Northing	Easting
9/3/13	8/17/13	91.0	79.0	F	N	**	C048	158	158	N01	NS-1a	44.12346	-114.42362
9/3/13	**	65.0	52.0	M	N	**	C034	**	**	N03	NS-2b	44.14581	-114.37322
9/4/13	**	88.0	70.0	F	N	**	C035	**	**	N02	NS-1a	44.14308	-114.39683
9/4/13	**	**	**	**	N	**	**	**	**	N02	NS-1a	44.13784	-114.40209
9/4/13	9/1/13	48.0	40.0	J	N	**	**	1350	250	N02	NS-1a	44.13784	-114.40209
9/4/13	8/24/13	73.0	56.0	M	N	**	**	1313	213	N02	NS-1a	44.13728	-114.40341
9/4/13	**	68.0	56.0	F	N	**	C036	**	**	N02	NS-1a	44.13180	-114.41568
9/4/13	**	68.0	52.0	M	N	**	C052	**	**	N01	NS-1a	44.12403	-114.42219
9/4/13	**	64.0	50.0	M	N	**	C053	**	**	N01	NS-1a	44.12403	-114.42219
9/4/13	8/11/13	77.0	**	M	N	**	**	130	130	N01	NS-1a	44.12403	-114.42219
9/4/13	8/17/13	71.0	**	M	N	**	**	153	153	N01	NS-1a	44.12403	-114.42219
9/4/13	8/9/13	52.0	**	M	N	**	**	127	127	N01	NS-1a	44.12403	-114.42219
9/4/13	8/27/13	77.0	58.0	M	N	**	**	1337	237	N04	NS-2b	44.14553	-114.35979
9/4/13	8/21/13	54.0	39.0	M	N	**	**	187	187	N03	NS-2b	44.14600	-114.37546
9/4/13	8/25/13	61.5	46.0	M	N	**	**	1329	229	N03	NS-2b	44.14652	-114.38384
9/4/13	**	69.0	53.0	F	N	**	C051	**	**	N03	NS-2b	44.14679	-114.38525
9/4/13	8/14/13	48.5	37.0	M	N	**	**	134	134	N03	NS-2b	44.14623	-114.38731
9/5/13	**	90.0	70.0	F	N	**	C037	**	**	N05	NS-2b	44.14498	-114.31696
9/5/13	**	44.0	**	J	N	**	**	**	**	N05	NS-2b	44.14426	-114.32054
9/5/13	**	87.0	70.0	F	N	**	C038	**	**	N05	NS-2b	44.14242	-114.32469
9/6/13	8/23/13	50.0	**	J	N	**	**	201	201	N02	NS-1a	44.14017	-114.40071
9/6/13	8/11/13	74.0	**	M	N	**	**	129	129	N02	NS-1a	44.13816	-114.40199
9/6/13	8/22/13	73.0	**	M	N	**	**	193	193	N02	NS-1a	44.13816	-114.40199
9/6/13	**	54.0	40.0	J	N	**	C039	**	**	N01	NS-1a	44.12884	-114.41895
9/6/13	**	**	**	J	N	**	**	**	**	N01	NS-1a	44.12665	-114.42091
9/6/13	8/26/13	75.0	60.0	F	N	**	**	1333	233	N01	NS-1a	44.11678	-114.42957
9/6/13	**	71.0	64.0	M	N	**	C040	**	**	N03	NS-2b	44.14654	-114.38392

Appendix C. Continued.

Date		Length (cm)					Genetic No.					Location	
							Captive Project		Adult Trap Jaw	Captive Section	SGR Trend		
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Rays	Aging Lab	Carcass	Trap	Tag	Name	Transect	Northing	Easting
9/7/13	**	77.0	69.0	F	N	**	C041	**	**	N06	NS-2b	44.14741	-114.31207
9/7/13	**	88.0	81.0	F	N	**	C042	**	**	N06	NS-2b	44.14690	-114.31668
9/7/13	**	53.0	47.0	M	N	**	C043	**	**	N06	NS-2b	44.14540	-114.31650
9/7/13	**	50.0	44.5	M	N	**	C044	**	**	N05	NS-2b	44.14489	-114.31755
9/7/13	**	**	**	**	N	**	C045	**	**	N05	NS-2b	44.14489	-114.31755
9/7/13	**	102.0	92.0	M	N	**	C046	**	**	N05	NS-2b	44.14431	-114.32030
9/7/13	**	103.0	93.0	M	N	**	C048	**	**	N05	NS-2b	44.14325	-114.33543
9/7/13	8/20/13	46.0	41.0	M	N	**	**	180	180	N04	NS-2b	44.14352	-114.34010
9/8/13	**	46.0	41.0	M	N	**	C054	**	**	N03	NS-2b	44.14626	-114.38725
9/8/13	**	46.0	41.0	M	N	**	C055	**	**	N03	NS-2b	44.14629	-114.38857
9/8/13	8/18/13	**	**		N	**	**	167	167	N02	NS-1a	44.14316	-114.39611
9/8/13	**	76.0	71.0	F	N	**	C056	**	**	N02	NS-1a	44.14201	-114.39822
9/8/13	8/20/13	47.0	43.0	M	N	**	**	147	147	N02	NS-1a	44.13781	-114.40545
9/8/13	9/2/13	71.0	62.0	M	N	**	**	1351	1351	N01	NS-1a	44.12696	-114.42071
9/8/13	Unknown	73.0	66.0	M	N	**	**	Unk	Unk	N01	NS-1a	44.12406	-114.42231
9/9/13	**	54.0	48.0	M	N	**	C049	**	**	N06	NS-2b	44.14916	-114.30724
9/9/13	**	44.0	41.0	M	N	**	C050	**	**	N06	NS-2b	44.14737	-114.31597
9/9/13	**	41.0	38.0	M	N	**	C057	**	**	N05	NS-2b	44.14471	-114.31804
9/9/13	**	70.0	64.0	M	N	**	C058	**	**	N05	NS-2b	44.14444	-114.31915
9/9/13	**	52.0	46.0	M	N	**	C059	**	**	N05	NS-2b	44.14444	-114.31915
9/9/13	**	69.0	63.0	M	N	**	C060	**	**	N05	NS-2b	44.14395	-114.32240
9/9/13	7/11/13	69.0	63.0	M	N	**	**	094	094	N05	NS-2b	44.14316	-114.33327
9/11/13	**	77.0	61.0	M	N	**	C061	**	**	N06	NS-2b	44.15190	-114.30284
9/11/13	**	80.0	65.0	F	N	**	C062	**	**	N06	NS-2b	44.14958	-114.30656
9/11/13	**	74.0	60.0	M	N	**	C063	**	**	N06	NS-2b	44.14952	-114.30672
9/11/13	**	71.0	53.0	M	N	**	C064	**	**	N06	NS-2b	44.14806	-114.31012
9/11/13	**	74.0	57.0	M	N	**	C065	**	**	N05	NS-2b	44.14450	-114.31872

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
9/11/13	**	90.0	71.0	F	N	**	C066	**	**	N05	NS-2b	44.14445	-114.31872
9/12/13	8/8/13	86.0	69.0	F	N	**	**	125	125	N1	NS-1b	44.11398	-114.43047
9/13/13	**	96.0	77.0	F	N	**	C067	**	**	N02	NS-1a	44.13726	-114.40298
9/14/13	**	57.0	44.0	M	N	**	C068	**	**	N05	NS-2b	44.14240	-114.32536
9/14/13	**	92.0	74.0	F	N	**	C069	**	**	N05	NS-2b	44.14212	-114.32823
9/15/13	8/23/13	**	**	F	N	**	**	206	206	N2	NS-1b	44.10146	-114.44138
9/15/13	8/14/13	**	**	M	N	**	**	136	136	N3	NS-1b	44.08831	-114.44426
9/17/13	Unknown	**	**	Unk	N	**	**	Unk		N4	NS-1b	44.07622	-114.45895
9/17/13	8/26/13	**	**	F	N	**	**	1335	1335	N5	NS-1b	44.07140	-114.45899
9/18/13	**	52	46	M	N	**	C070	**	**	N06	NS-2b	44.14661	-114.31655
9/18/13	**	47	43	M	N	**	C071	**	**	N05	NS-2b	44.14239	-114.32690
9/18/13	**	104	92	M	N	**	C072	**	**	N05	NS-2b	44.14239	-114.32690
9/19/13	**	84.0	68.0	F	N	**	C073	**	**	N04	NS-2b	44.14529	-114.36379

Appendix D. Adult Chinook Salmon ages determined from fin rays of carcasses collected in the East Fork Salmon River (EFSR) during 2012.

Carcass Sample	Date Recovered	Fork Length (cm)	Fin Ray Age
12-00931	8/20/2012	96	5
12-00932	8/24/2012	101	5
12-00933	8/24/2012	90	5
12-00934	8/24/2012	90	5
12-00940	8/24/2012	97	5
12-00935	8/25/2012	93	5
12-00936	8/25/2012	89	5
12-00945	8/26/2012	81	4
12-00947	8/26/2012	75	4
12-00950	8/26/2012	75	4
12-01002	8/26/2012	81	4
12-00937	8/26/2012	102	5
12-00938	8/26/2012	90	5
12-00939	8/26/2012	103	5
12-00941	8/26/2012	85	5
12-00942	8/26/2012	84	5
12-00943	8/26/2012	90	5
12-00944	8/26/2012	92	5
12-00946	8/26/2012	102	5
12-00948	8/26/2012	90	5
12-00949	8/26/2012	85	5
12-01001	8/26/2012	92	5
12-01009	8/26/2012	90	5
12-01010	8/26/2012	64	N:A
12-01003	8/27/2012	90	5
12-01004	8/27/2012	105	5
12-01005	8/27/2012	102	5
12-01006	8/27/2012	90	5
12-01008	8/27/2012	89	5
12-00993	8/28/2012	63	4
12-00992	8/28/2012	95	5
12-00994	8/28/2012	89	5
12-00995	8/28/2012	102	5
12-00996	8/28/2012	106	5
12-00997	8/28/2012	95	5
12-00998	8/28/2012	91	5
12-00999	8/28/2012	98	5
12-01000	8/28/2012	110	N:A
12-00959	8/29/2012	67	4
12-00960	8/29/2012	79	4
12-00958	8/29/2012	99	5
12-00961	8/29/2012	97	5
12-00962	8/29/2012	84	5
12-00963	8/29/2012	90	5
12-00964	8/29/2012	87	5
12-00965	8/29/2012	88	5

Appendix D. Continued.

Carcass Sample	Date Recovered	Fork Length (cm)	Fin Ray Age
12-00966	8/29/2012	91	5
12-00967	8/29/2012	91	5
12-00968	8/29/2012	97	5
12-00973	8/30/2012	72	4
12-00975	8/30/2012	69	4
12-00980	8/30/2012	75	4
12-00951	8/30/2012	86	5
12-00952	8/30/2012	89	5
12-00953	8/30/2012	95	5
12-00954	8/30/2012	86	5
12-00955	8/30/2012	102	5
12-00957	8/30/2012	86	5
12-00969	8/30/2012	85	5
12-00970	8/30/2012	92	5
12-00971	8/30/2012	85	5
12-00972	8/30/2012	99	5
12-00974	8/30/2012	107	5
12-00976	8/30/2012	86	5
12-00978	8/30/2012	91	5
12-00979	8/30/2012	86	5
12-00991	8/30/2012	102	5
12-01007	8/30/2012	97	5
12-00977	8/30/2012	98	6
12-00956	8/31/2012	82	4
12-00984	8/31/2012	80	4
12-00985	8/31/2012	76	4
12-00986	8/31/2012	77	4
12-00990	8/31/2012	86	4
12-01012	8/31/2012	70	4
12-01014	8/31/2012	79	4
12-01015	8/31/2012	69	4
12-00981	8/31/2012	97	5
12-00982	8/31/2012	87	5
12-00983	8/31/2012	82	5
12-00987	8/31/2012	92	5
12-00988	8/31/2012	99	5
12-00989	8/31/2012	93	5
12-01011	8/31/2012	87	5
12-01027	8/31/2012	101	5
12-01028	8/31/2012	96	5
12-01029	8/31/2012	84	5
12-01030	8/31/2012	87	5
12-01013	8/31/2012	93	N:A
12-01024	9/1/2012	78	4
12-01016	9/1/2012	100	5
12-01017	9/1/2012	88	5
12-01018	9/1/2012	92	5

Appendix D. Continued.

Carcass Sample	Date Recovered	Fork Length (cm)	Fin Ray Age
12-01019	9/1/2012	98	5
12-01021	9/1/2012	91	5
12-01022	9/1/2012	98	5
12-01023	9/1/2012	83	5
12-01025	9/1/2012	92	5
12-01026	9/1/2012	89	5
12-01020	9/2/2012	89	5

Appendix E. East Fork Salmon River (EFSR) Chinook Salmon single and two-parent assignments, 2007–2012 adult returns.

Parent Source			Adult Returns (Progeny)								
Origin	**Group**	**Year**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
	Spawn	**2003**	0	0							0
		2004	0	4	0						4
Captive	**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	21			53
		2008					1	9			9
		2009						0			0
		2010									0
	Total		1	4	2	9	40	29	0	0	85
Captive X Natural		**2001**									
		2002	0								0
		2003	0	0							0
		2004	0	0	0						0
		2005		0	0	0					0
		2006			1	6	1				8
		2007				0	0	0			0
		2008					2	3			5
		2009						1			1
		2010									0
		Total	0	0	1	6	3	4	0	0	14
CAPTIVE ALL			**1**	**4**	**3**	**15**	**43**	**33**	**0**	**0**	**99**
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	75			159
		2008					21	85			106
		2009						5			5
		2010									0
	Total		**13**	**101**	**113**	**153**	**122**	**166**	**0**	**0**	**668**
	Total All		**14**	**105**	**116**	**169**[a]	**165**[b]	**199**	**0**	**0**	**767**

(Black) Represents a parent-progeny combination not biologically possible.
(Grey) 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)
[c] Includes 30 genetic samples taken from carcasses (11 NxN, 5 CxC, 3 CxU, and 11 NxU)

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