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

2014 Annual Report

By

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ABSTRACT

During 2014, the Idaho Department of Fish and Game's (IDFG) Captive Chinook Salmon Project continued to monitor the reproductive performance of captive-reared Chinook Salmon *Oncorhynchus tshawytscha* released to spawn in natal streams. In 2010, all captive rearing ended and the last remaining brood year (BY05) was released as mature adults to their natal waters. 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 2014 to assess production levels from volitional spawning events resulting from program releases in 2009 and 2010. In 2014, 321 natural adults were trapped.

In this report, we included results from the 333 tissue samples that were collected to perform genetic parentage analyses on Chinook Salmon adults that returned to the EFSR in 2013. The results from these analyses of the 2013 collection were used to evaluate program releases in 2008-2010. Of the 330 sampled adults, 260 were captured at the EFSR adult trap, and an additional 73 samples were collected from carcasses found below the trap. Of the 333 collected samples, 321 were successfully genotyped at greater than 10 loci (260 trap adults and 61 carcass samples). In total, 121 of the adults assigned to two parents and an additional 75 fish assigned to only one parent for an overall assignment rate of 61%. Of the 2013 adult returns that assigned to a parent pair (n=121), over 10% (n=12) were progeny of captive reared adults. With the parentage analyses completed on the 2013 adult returns, the contribution of the 2008 spawn year is complete. In 2008, captive-reared adults released to spawn naturally (n=157: 111 females, 46 males) constructed 45 redds. Parentage analyses have found these fish produced 18 progeny that returned as adults in 2011 (n=1), 2012 (n=5), and 2013 (n=12). The assigned number was close to our predictions and further 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. 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 hatchery 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. The Oregon Department of Fish and Wildlife (ODFW) would initiate a captive broodstock program using selected Grande Ronde River Chinook Salmon populations and 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 rearing 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. Since the early 2000s we have not found any other captive rearing research performed upon Chinook Salmon, although this technique has been applied to Atlantic Salmon in Maine (Stark et al. 2014) and Steelhead in Washington State (Van Doornik et al. 2010). 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 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 and Gable (2010), Stark and Richardson (2011), and Stark et al. (2008, 2009, 2012, 2014a, 2014b) summarize project activities from inception through 2013. 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, 2014 through December 31, 2014. 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 62939.

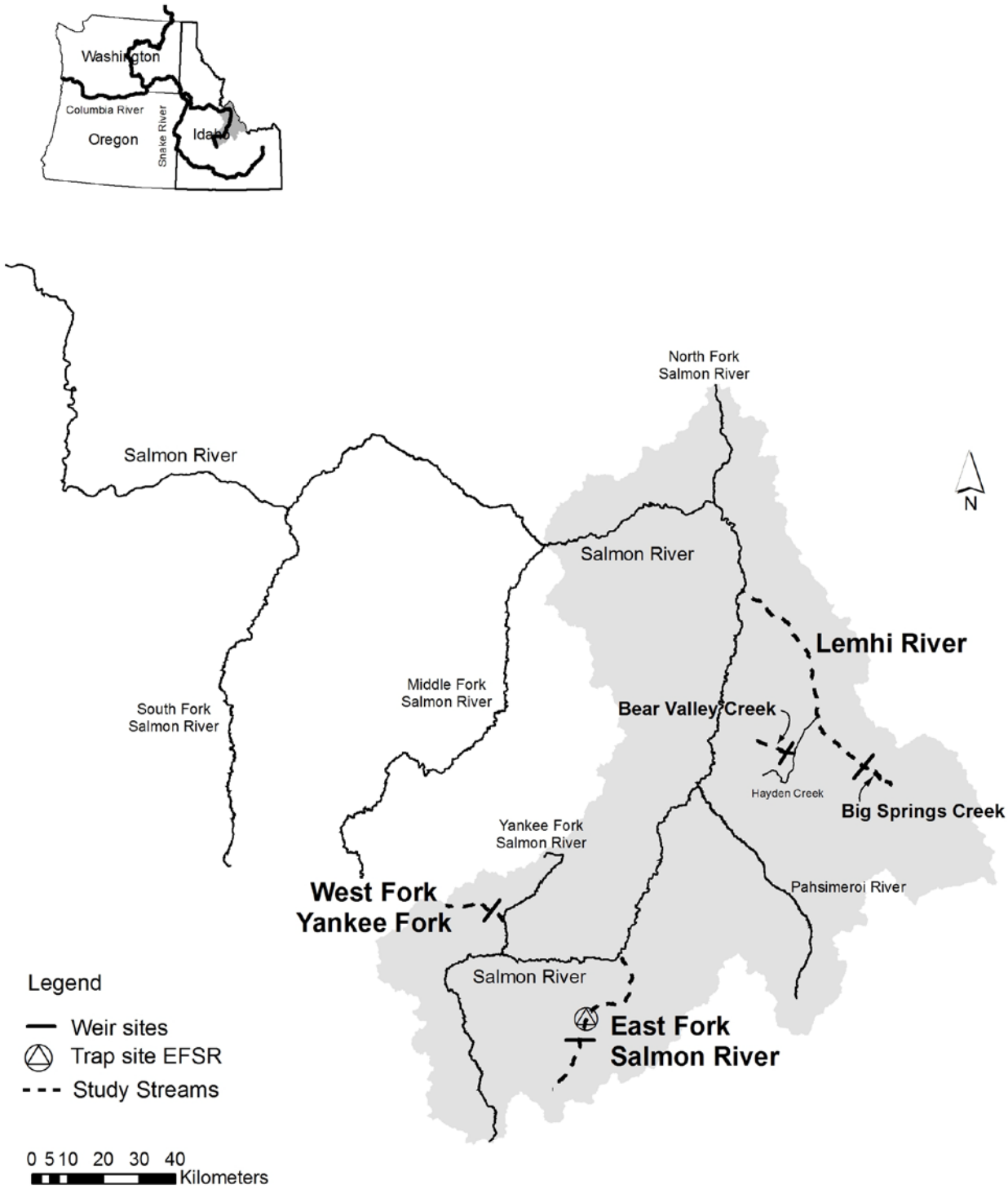

Figure 1. Location of study streams included in the Idaho Department of Fish and Game Captive Rearing Program for Salmon River Chinook Salmon.

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.

Captive rearing project evaluations were performed only on the EFSR in 2014. 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 2014, 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.

Spawning Ground Surveys

In 2014, 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 2014. 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 2014, 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). 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 2014 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. Wild returning adult Chinook Salmon (offspring/progeny) were captured at the EFSR adult trap in 2014 and tissues collected from each fish for 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; Seeb et al. 2007). Fluorescently labeled PCR products were separated with an Applied Biosystems 3730 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 adults released above the EFSR picket weir between 2008 and 2010. The mean tagging rate reported for both Captive (99.4%, 2002-2010) and Natural (99.8%, 2004-2013) fish has been

very high. However, tagging rate for naturals is likely considerably lower 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 2013 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 14 through September 21, 2014. During this period a total of 321 adult natural Chinook Salmon were captured and released upstream (Table 1). This total included 115 females and 201 males, of which 67 were jacks, as well as 5 fish of unknown sex. 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. In 2014 we captured three hatchery fish at the EFSR adult trap. 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). Non-target fish also included four 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 2014.

	Age 3 (<65 cm)		**Age 4 (65.0 - 82.9 cm)**		**Age 5 (>82.9 cm)**		
Gender	**#**	**%**	**#**	**%**	**#**	**%**	**Total**
Female	4	3%	82	71%	29	25%	115
Male	0	0%	122	91%	12	9%	134
Jack	67	100%	0	0%	0	0%	67
Unknown	0	0%	4	80%	1	20%	5
Total	71	22%	208	65%	42	13%	321

* *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 2014.

Species	Number Trapped[a]
Bull trout	296[b]
Westslope cutthroat trout	2
Rainbow trout	1
Mountain whitefish	101
Steelhead (adult)	1
Sockeye salmon	4
Total	**405**

Does not include 2014 Recaptures.

Includes 4 trap morts.

The number of Chinook Salmon trapped in 2014 (321) was greater than in 2013 (260) and 2012 (245), and is the highest since 1988, excluding years the trap was not operated (Figure 2). In addition, 44 of the 321 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 = 34, 79%), 3 of the adults detected with a PIT tag were originally tagged as a juveniles at the EFSR juvenile screw trap (SALEFT). Four fish were tagged as juveniles in Columbia River. One fish was categorized as an 'orphan tag' and is therefore of an unknown origin at the time of reporting. Of the 34 fish tagged as adults, 1 was tagged at the Bonneville Adult Facility (BON) on the Columbia River, 1 was tagged in a Columbia River tangle net, and 32 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 33-97 days, and averaged 62.7 days (Appendix A). The average travel time in 2014 was roughly 1.5 days longer than the 2009-2013 average of 60.2 days.

During 2014, based upon the phenotypic sex assignments given at the time of capture, males made up the largest proportion of trapped fish (42%) followed by females (36%). The remainder of returning fish were jacks (21%) and unknown (2%); (Table 3). 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 but will be at a later time (upon completion of the genotyping).

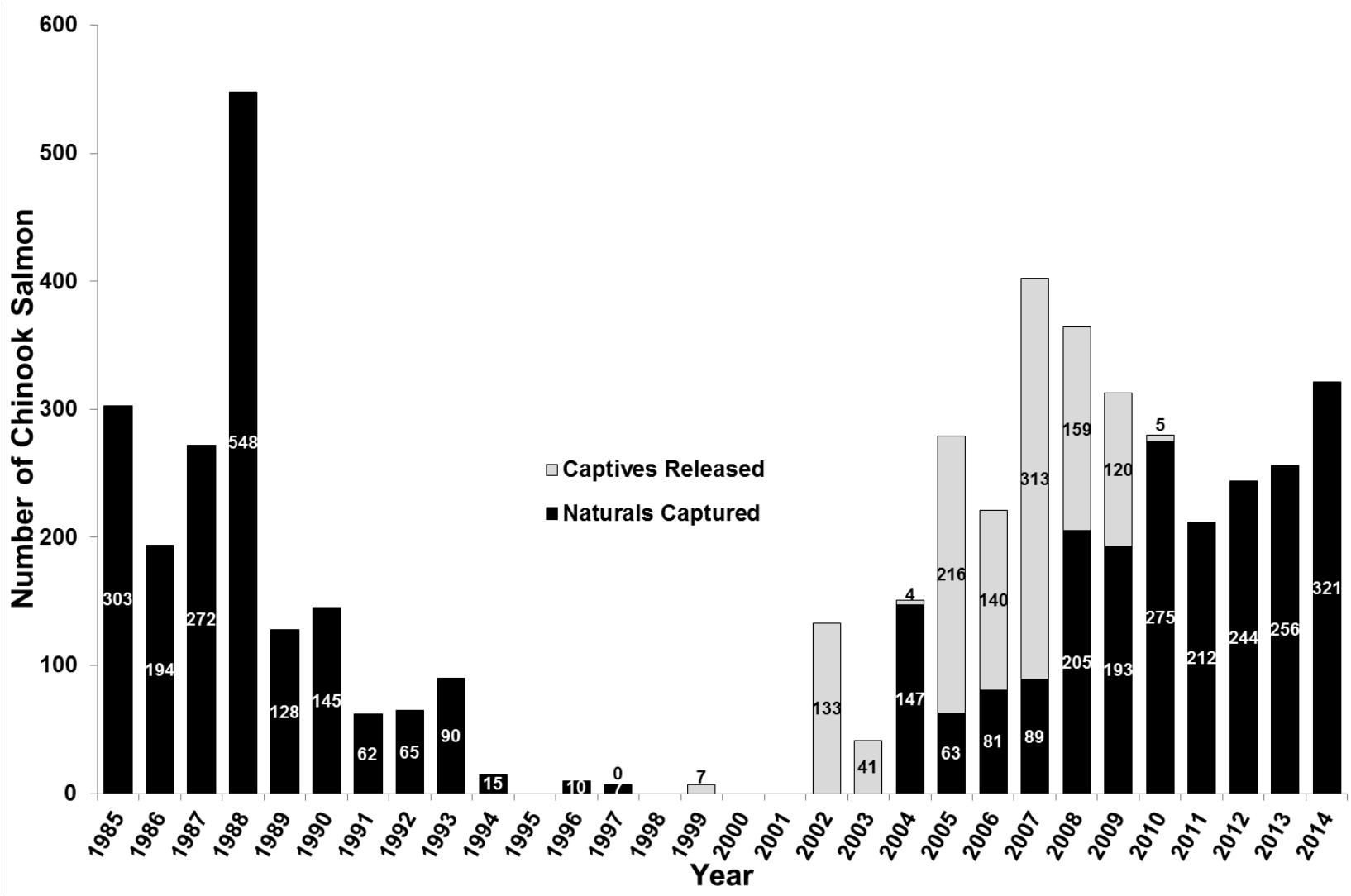

Figure 2. Natural adult Chinook Salmon captured and released upstream at the East Fork Salmon River (EFSR) adult trap facility, and captive adults released into the EFSR upstream of the adult trap, 1985-2013.

* *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 2004-2014.

	Number of Wild Chinook											
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Mean**
Female	45	21	21	27	63	61	72	62	111	56	115	**59**
	31%	33%	26%	30%	31%	32%	26%	29%	45%	22%	36%	**31%**
Male	69	31	40	29	107	82	163	102	92	83	134	**85**
	47%	49%	49%	33%	52%	42%	59%	48%	38%	32%	42%	**45%**
Jack	13	11	20	33	35	50	40	44	41	121	67	**43**
	9%	17%	25%	37%	17%	26%	15%	21%	17%	47%	21%	**23%**
Unknown	20	0	0	0	0	0	0	4	0	0	5	**3**
	14%	0%	0%	0%	0%	0%	0%	2%	0%	0%	2%	**2%**
Total	**147**	**63**	**81**	**89**	**205**	**193**	**275**	**212**	**244**	**260**	**321**	**190**
	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	1.7	**2.3**
Jacks Excluded	1.5	1.5	1.9	1.1	1.7	1.3	2.3	1.6	0.8	1.5	1.2	**1.5**

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

Discharge (flow) of the EFSR during 2014 was well below average during most of the year (Figure 3), which was also true of 2013 flows. However, this did not appear to alter run timing of Chinook Salmon during 2014 (Figure 4).

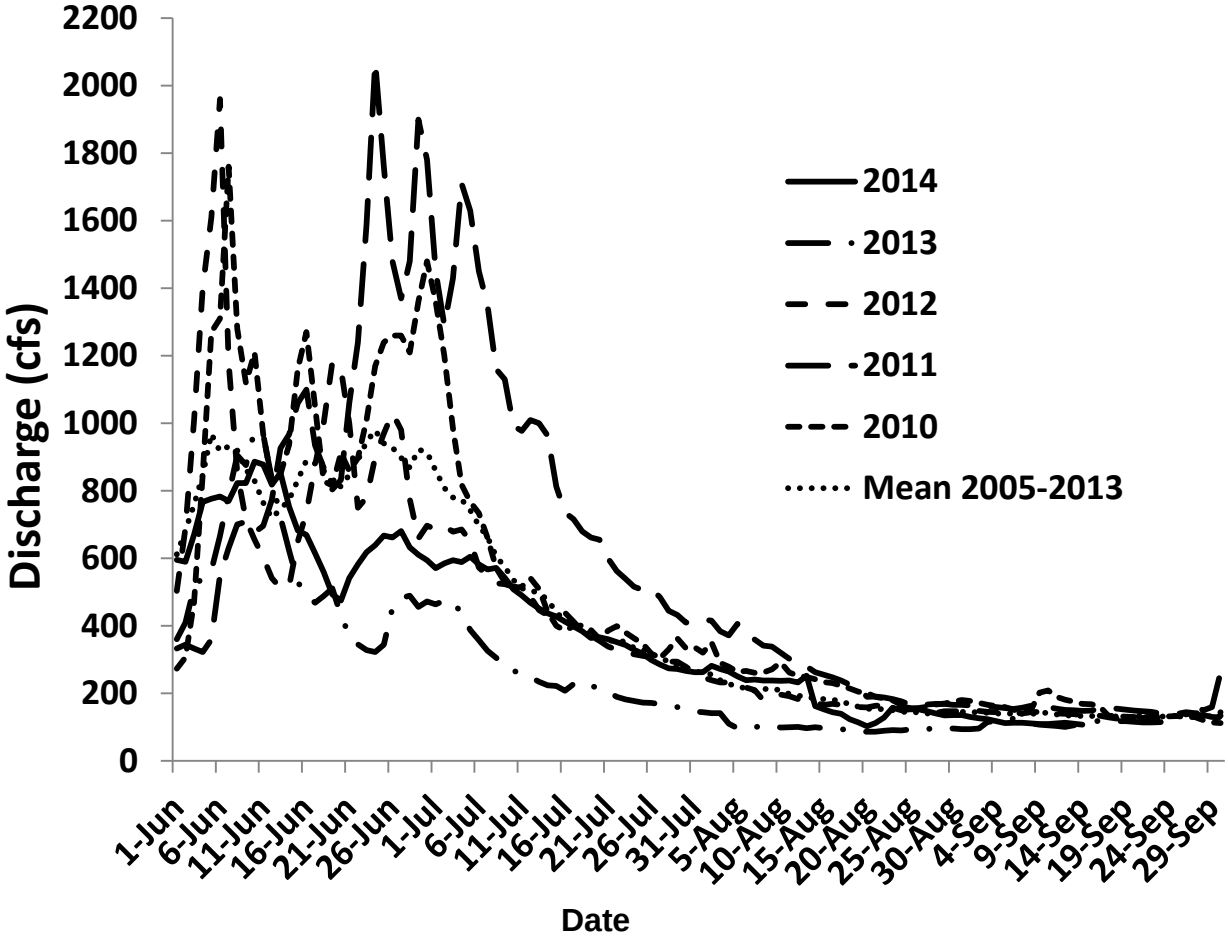

Figure 3. Discharge in cubic feet per second (cfs) of the East Fork Salmon River (EFSR), during June 1–September 30, 2010—2014. The dotted line represents the mean 2005-2013 EFSR discharge during the same period.

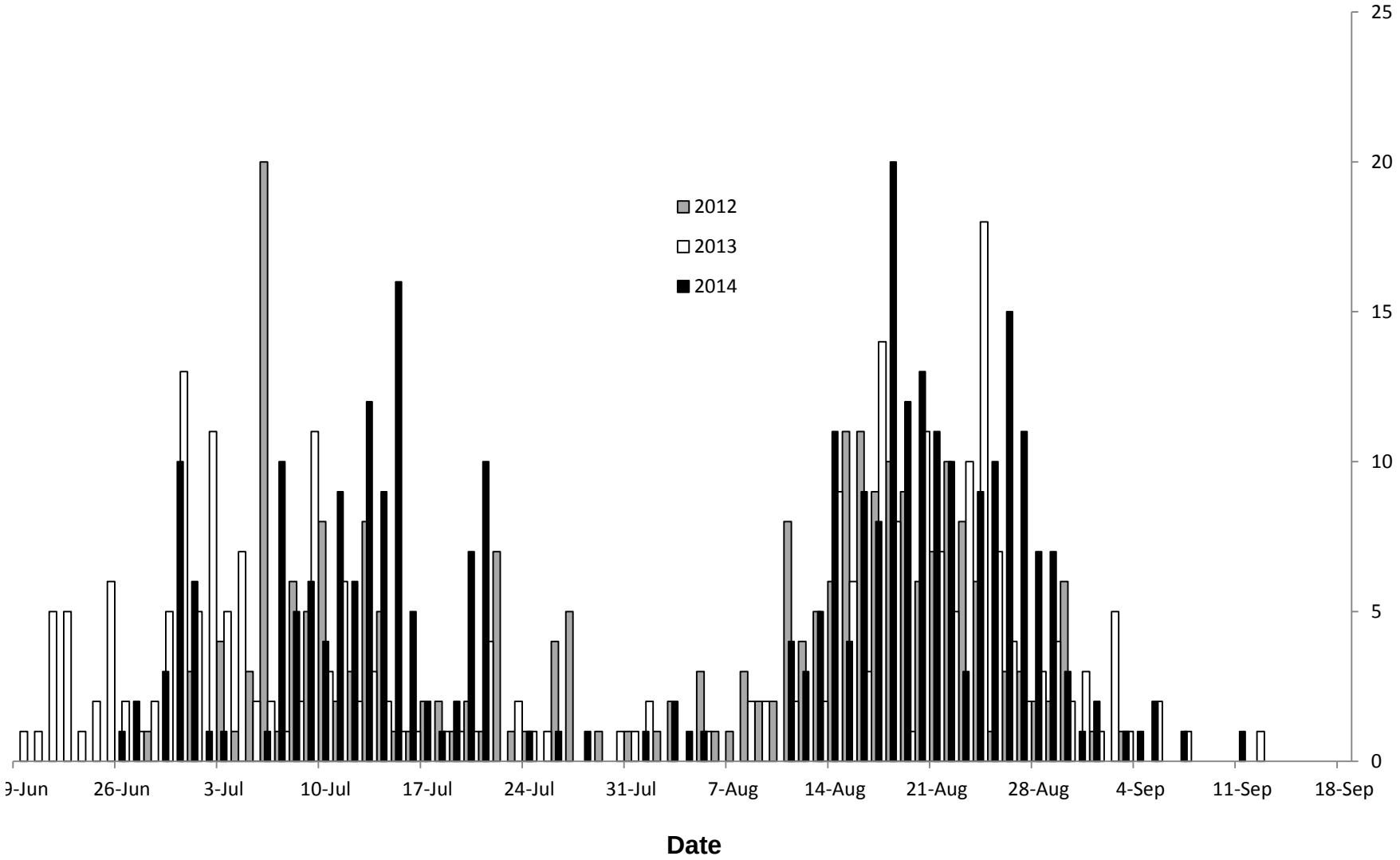

Figure 4. Timing of natural origin Chinook Salmon captured in the East Fork Salmon River adult trap, June 19 – September 21, 2012—2014.

Spawning Ground Surveys

Between August 7 and September 18, 2014, the field crews counted 86 Chinook Salmon redds upstream of the EFSR adult trap (NS-1b), and an additional 147 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 5, 2014 found 56 redds in NS-1b, 71 redds in NS-1a, 56 redds in NS-2b, and 87 redds in NS-2a for a total of 270 redds in the EFSR (Table 5).

During carcass surveys in the EFSR, samples were recovered from a total of 121 Chinook Salmon carcasses: 107 below the adult trap and 14 above the trap (Table 4). 92 were carcasses not previously sampled (untagged/unmarked), and 22 carcasses were adults that were previously captured, jaw-tagged, and released above the EFSR adult trap (Appendix C). It should be noted, although we do capture a few hatchery adults at the adult trap in higher hatchery return years; 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 and or detection of a PIT tag from a hatchery release group). These 22 previously trapped adults consisted of 9 males, 3 jacks, 7 females, and 3 unknown. Fin ray samples were collected from 106 of the total 121 carcasses recovered (Table 4). All fin ray samples were inventoried and submitted to the IDFG aging lab in fall 2014. Age determinations were not yet complete from 2014 fin rays collected from carcasses at the time of reporting. However, ages of adult Chinook Salmon determined from 20 fin rays collected from carcasses found in the EFSR during 2013 consisted of three age-3 (15%), 5 age-4 (25%), and 12 age-5 fish (60%); (Appendix D).

Table 4. Summary of natural origin Chinook Salmon redds counted during ground surveys 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 2014.

Captive Chinook Transect					SGR Trend Transect				
			Carcasses					Carcasses	
Name	Distance from Trap (Km.)	Redds	Fin Rays Collected	All	Name	Description	Redds	Fin Rays Collected	All
N06	17.1	9	6	7	NS-2b	Herd Creek to 3.5 miles downstream of EFSR adult trap	75	48	54
N05	14.3	14	11	12					
N04	11.9	34	11	15					
N03	8.9	18	20	20					
N02	6.1	34	33	36	NS-1a	EFSR adult trap to 3.5 miles downstream	72	47	53
N01	2.9	38	14	17					
						Total Downstream	**147**	**95**	**107**
N1	1.3	18	3	3	NS-1b	EFSR adult trap to Bowrey Guard Station	86	9	14
N2	3.2	25	2	4					
N3	4.7	10	2	4					
N4	5.3	10		1					
N5	7.2	8							
N6	9.7	6	2	2					
N7	10.9	6							
N8		1							
N9		2							
						Total Upstream	**86**	**9**	**14**
						TOTAL ALL	**233**	**104**	**121**

Table 5. Number of redds observed from aerial counts on the East Fork Salmon River (EFSR), 2002–2014.

Stream	Section Description	Number of Redds												
		2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
EFSR	Mouth of East Fork to Herd Cr (NS-2a) [1]	56	15	38	12	7	3	34	13	110	36	44	NC[c]	87
	Herd Cr to 3.5 mi downstream of EF Trap (NS-2b) [2]	79	60	37	18	19	31	40	24	119[b]	86[b]	62	15	56
	3.5 mi downstream of EF Trap to EF Trap (NS-1a) [3]	100	93	55	32		21	50	13			52	37	71
	EF Trap to Bowrey Guard Station (NS-1b) [4]	44	59	24	16	2	25	27	9	60	16	43	28	56
	Total	**279**	**227**	**154**	**78**	**28**	**80**	**151**	**59**	**289[a]**	**138**	**201**	**135**	**270**

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

[a] *Ground counts were substituted in years aerial surveys were not conducted (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 September 3, 2013 flood event because the water turbidity made it impossible to see redds.*

Genetic Parentage Analyses

In 2014, we genotyped and performed genetic parentage analyses of fin tissue samples from a total of 333 Chinook Salmon adults that returned to the EFSR in 2013 (Table 6). Of these adults, 260 were captured at the EFSR adult trap, and an additional 73 samples were collected from carcasses found below the trap, from fish not previously trapped. Of the 333 adult samples, 321 were successfully genotyped at greater than 10 loci (96.4%; 260 trap adults and 61 carcass samples).

Table 6. Number and type of genetic samples collected from 2013 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	260	260	100.0%
Carcasses	73	61	83.6%
TOTAL	**333**	**321**	**96.4%**

In summary, 121 adults assigned to two parents for an assignment rate of 38%. In addition, 75 adults assigned to one single parent for an assignment rate of 23%. Most of the single parent assignments (n = 72) were to a single natural parent and fewer adults were assigned to only one captive parent (n = 3). Of the 121 parent pair assignments, 104 of the fish assigned to natural parents, 12 assigned to captive parents and 5 fish assigned to natural x captive crosses (Table 7). Adult returns that assigned to two natural parents included 29 adults produced from adults that returned in 2008 (age-5); 46 adults were produced from adults that returned in 2009 (age-4), and 29 adults were produced from adults that returned in 2010 (age-3, jack). All of the 2013 adult returns that assigned to two captive parents were produced from captive adults released in 2008 (age-5). No 2013 adult returns assigned to parent pairs from captive releases in either 2009 (age-4) or 2010 (age-3).

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%), as well as 2013 (61.1%); (Table 8). Unassigned fish can result from genotyping errors or missing parents. A small number of potential parents at the trap were unsuccessfully genotyped (1%), 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 2013. Potential sources of unsampled parents include precocial males; adults spawning below the trap that produce 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 2013, 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, 17 were adults that had been originally trapped, tagged, and released above the trap but subsequently

passed downstream of the trap. The remaining 73 carcasses were adult Chinook Salmon not previously trapped (did not pass upstream of EFSR adult trap), and 61 of these samples were successfully genotyped. Of these 61 carcasses, 5 carcasses assigned to two natural parents (2-SY08, 3-SY09), and 9 carcasses assigned to a single natural parent (3-SY08, 5-SY09, 1-SY10). One carcass assigned to two captive parents (SY08). No carcasses assigned to a single captive parent. This demonstrates that not all of the captive fish return to the trap and that there is considerable spawning below the trap. Furthermore, we estimate we were only able to collect 25-50% of the total spawners as carcasses.

These results demonstrate reproductive success of captive-reared Chinook Salmon released to spawn. With the parentage analyses completed on the 2013 adult returns, the contribution of the 2008 captive release year is complete. In 2008, captive-reared adults release to spawn naturally (n = 157: 111 female, 46 male) constructed 45 redds (Stark et al. 2009). Parentage analyses have found these fish produced 21.5 progeny that returned as adults in (2.5-SY11, 6.5-SY12, 13.5-SY13). This magnitude of production equates to 0.14 recruits per spawner (all adults), 0.19 recruits per female and 0.48 recruits per male (Table 9). In comparison, Hess et al. (2012) found naturally spawning hatchery Chinook Salmon averaged 0.14 recruits per spawner (all adults), 0.24 recruits per female and 0.10 recruits per male (including jacks) in Johnson Creek, a tributary to the South Fork Salmon River, Idaho. Anderson et al. (2012) found much higher values for hatchery Chinook Salmon in the Cedar River, Washington; with mean values of 4.14 and 1.21 for females and males, respectively. Lastly, not all adults from spawn years (SY) 2009 and 2010 have returned yet, but SY09 has returned two progeny so far.

With the parentage analyses completed on the 2013 adult returns, the contribution of the 2008 natural-origin spawners is also complete. In 2008, 203 natural-origin adults (51 females, 152 males) constructed 40 redds (Stark et al. 2009). Parentage analyses have found these fish produced 86.5 progeny that returned as adults in (12.5-SY11, 44.5-SY12, 29.5-SY13). This magnitude of production equates to 0.43 recruits per spawner (all adults), 1.70 recruits per female and 0.57 recruits per male (including jacks). In comparison, estimates of reproductive success of wild Chinook Salmon from five different Salmon River tributary populations by Beamesderfer et al. (1997) averaged between 1.8 and 2.3 recruits per spawner (all adults).

Perhaps the most informative 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. Approximately 900 eggs were collected in 2003-2005 to comprise captives that matured in 2008, which included 111 adult females released to spawn naturally in the EFSR. Parentage analyses have since shown this captive release year recruited 22 adult progeny returned in 2011-2013. In comparison, we can hypothetically allow an equivalent 900 eggs to be left in their natal gravels and apply several wild life stage mortality or survival rates upon them. Thus, using a 5% eyed-egg-to-smolt survival rate, a 1.09% smolt-to-adult survival rate (SAR) for wild-origin Upper Salmon River Chinook Salmon (CSS 2014), and assuming a 1:1 sex ratio, we would end up with only 0.245 natural females. Then if we multiply 1.71 recruits per female (calculated from the complete parentage assignments of SY08 natural adults), we estimate SY08 natural fish would have only returned 0.419 natural adults. Therefore, comparing adult production on an egg-to-egg basis for the complete SY08, captive fish effectively produced approximately 52 times more adults than natural fish. While a number of assumptions are made in these calculations, it is the best way to

truly compare equivalent productivity of captive fish given they represent a subset of what would normally be natural production.

A moderate number of adult returns have been assigned to captive adults through the 2008 adult release group. However, since few fish were released in the last two years of captive adult releases (2009 and 2010), the probability of captive contribution is expected to be low in 2014 adult returns (Appendix E). Lastly, with the completion of the 2014 field season all project field evaluations have concluded. The parentage analysis and thus assignments for 2014 adult returns will be summarized in the project completion report in the next reporting year (2015).

Table 7. Parentage assignments of adult Chinook Salmon returns to the East Fork Salmon River in 2013, from 260 trapped and 73 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	0	12	**12**	0	3	2	**5**	29	46	29	**104**	**121**
	Captive x Unknown								**Natural x Unknown[d]**				**Total**
1 Parent	Jacks	Age 4	Age 5	**Total**					Jacks	Age 4	Age 5	**Total**	**All**
	0	2	1	**3**					34	26	12	**72**	**75**
											Total Assignments		**196**
											No Assignments		**102**
											Total		**333**
											2 Parents Assigned		**38%**
											1 Parent Assigned		**23%**
											Total Assigned		**61%**

[a] *All assignments were with zero or one locus mismatch.*
[b] *Includes one CxC assignments from carcasses.*
[c] *Includes four NxN assignments from carcasses.*
[d] *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—2013.

Adult Natural Return (Progeny) Assignments											
Adult Return Year→	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**
Genotyped Trapped adults	**152**	**63**	**80**	**89**	**201**	**193**	**303**	**249**	**357**	**321**	**2008**
2 Parent Assignments[a]				7	65	68	107	119	120	121	**607**
1 Parent Assignments	1	0	0	7	39	51	60	47	79	75	**359**
1 & 2-Parent Assignments	1	0	0	14	104	119	167	166	199	196	**966**
Invalid Assignments[b]	0	0	0	0	10	12	22	8	5	35	**92**
No Assignment	151	63	80	74	87	62	114	75	153	102	**961**
Assignment Rate	1%	0%	0%	16%	51.7%	61.7%	55.1%	66.7%	55.7%	61.1%	**48.1%**

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	6	N.A.	1	4	0.17	N.A.	0	N.A.	N.A.	N.A.
2000	0	N.A.	0	9	0.00	N.A.	0	N.A.	N.A.	N.A.
2001	0	N.A.	0	12	0.00	N.A.	0	N.A.	N.A.	N.A.
2002	69	N.A.	N.A.	44	N.A.	N.A.	0	N.A.	N.A.	N.A.
2003[d]	26	N.A.	N.A.	59	N.A.	N.A.	0	N.A.	N.A.	N.A.
2004	4	49	1	16	0.25	0.33	0	86	N.A.	1.76
2005	46	22	11	15	0.24	0.68	0	46	N.A.	2.09
2006	75	15	16	4	0.21	0.27	20	110	0.27	7.33
2007	118	25	63	26	0.53	1.04	49	105	0.42	4.20
2008	111	51	45	40	0.41	0.78	22	87	0.20	1.71
2009[f]	111	56	18	50	0.16	0.89	2	50	0.02	0.89
2010[f]	5	69	1	60	0.20	0.87	0	33	0.00	0.48
2005 – 2010	**470**	**387**	**155**	**211**	**0.33**	**0.74**	**93**	**431**	**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. 2005).
[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 2009 and 2010 are incomplete (i.e. not all possible progeny have returned yet).

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APPENDICES

Appendix A. PIT-tagged adult Chinook Salmon captured at the East Fork Salmon River adult trap (SALEFT-A) in 2014, originally tagged as either juveniles at the East Fork Salmon River juvenile screw trap (SALEFT-J), or tagged as adults in 2014 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					
PIT Number	**Date**	**Location**	**Length (cm)**	**Date**	**Location**	**Length (cm)**	**Sex**	**Known Age**	**Travel days from LGD to EFSR**
384.3B23ABD3DC	5/12/2014	Lower Granite Adult	73.0	6/30/2014	EFSR	73.8	Female		49
384.3B239B7A04	5/15/2014	Lower Granite Adult	76.0	7/1/2014	EFSR	78.0	Male		47
384.3B23ABC587	5/19/2014	Lower Granite Adult	65.0	7/1/2014	EFSR	65.0	Female		43
3D9.1C2DD50AD4	4/3/2014	Columbia Tangle Net	66.0	7/2/2014	EFSR	61.8	Jack		51
384.3B239B8F48	5/19/2014	Lower Granite Adult	68.0	7/3/2014	EFSR	69.6	Male		45
384.3B23ABF740	5/14/2014	Lower Granite Adult	71.0	7/9/2014	EFSR	73.0	Male		56
384.3B23ACEF65	5/22/2014	Lower Granite Adult	67.0	7/9/2014	EFSR	68.6	Male		48
384.3B23AC06C4	5/20/2014	Lower Granite Adult	82.0	7/11/2014	EFSR	84.0	Male		52
384.3B23ACFC32	5/12/2014	Lower Granite Adult	73.0	7/11/2014	EFSR	73.7	Male		60
384.3B23AD63CD	5/16/2014	Lower Granite Adult	75.0	7/11/2014	EFSR	76.1	Female		56
3D9.1BF27263C1	5/18/2012	Lower Granite Juv.	11.4	7/11/2014	EFSR	66.8	Male	Age-4	53
3D9.1C2D452336	6/5/2014	Lower Granite Adult	80.0	7/11/2014	EFSR	80.8	Female		36
3D9.1C2D46654F	5/22/2014	Lower Granite Adult	78.0	7/11/2014	EFSR	78.0	Female		50
384.3B23AC20DC	5/20/2014	Lower Granite Adult	65.0	7/11/2014	EFSR	66.1	Male		52
3D9.1C2DDD28EC	4/18/2012	Lower Granite Juv.	10.8	7/12/2014	EFSR	74.5	Male	Age-4	60
3D9.1C2D47EE22	6/10/2014	Lower Granite Adult	66.0	7/13/2014	EFSR	67.0	Female		33
384.3B23ABB12B	5/13/2014	Lower Granite Adult	80.0	7/15/2014	EFSR	81.5	Male		63
3D9.1C2D4887AA	6/2/2014	Lower Granite Adult	79.0	7/15/2014	EFSR	79.0	Female		43
3D9.1C2D953013	4/17/2012	EFSR	8.5	7/15/2014	EFSR	67.5	Male	Age-3	71
3D9.1C2D3CC1E0	4/27/2011	Snake juv. Trap	10.7	7/16/2014	EFSR	87.5	Female	Age-5	77
3D9.1C2D465369	6/10/2014	Lower Granite Adult	67.0	7/16/2014	EFSR	67.5	Female		36
3D9.1C2D4745AE	6/17/2014	Lower Granite Adult	71.0	7/20/2014	EFSR	71.8	Male		33
3D9.1C67C4555A	9/16/2011	EFSR	8.5	7/20/2014	EFSR	69.0	Male	Age-4	70
384.3B23ACDA63	5/12/2014	Lower Granite Adult	72.0	7/21/2014	EFSR	71.9	Female		70

Appendix A. Continued

	First Capture (tagged)			Recapture					
PIT Number	**Date**	**Location**	**Length (cm)**	**Date**	**Location**	**Length (cm)**	**Sex**	**Known Age**	**Travel days from LGD to EFSR**
3D9.1C67C53B59	9/21/2011	EFSR	7.6	7/21/2014	EFSR	80.5	Female	Age-4	41
384.3B23ABB704	5/20/2014	Lower Granite Adult	65.0	8/11/2014	EFSR	64.5	Male		83
384.3B23AD2629	5/19/2014	Lower Granite Adult	68.0	8/14/2014	EFSR	68.0	Male		87
3D9.1C2D4761FC		Orphan Tag		8/16/2014	EFSR	70.5	Female		57
384.3B239B2FBD	5/14/2014	Lower Granite Adult	70.0	8/18/2014	EFSR	73.0	Male		96
384.3B239BB7CD	5/19/2014	Lower Granite Adult	75.0	8/18/2014	EFSR	76.7	Male		91
384.3B23ABA58E	5/16/2014	Lower Granite Adult	68.0	8/18/2014	EFSR	68.0	Male		94
384.3B23ACD3F6	5/13/2014	Lower Granite Adult	63.0	8/18/2014	EFSR	62.5	Jack		97
3D9.1BF2751B19	5/13/2013	Snake juv. Trap	11.9	8/18/2014	EFSR	52.0	Jack	Age-3	82
384.3B23ABE8A1	5/20/2014	Lower Granite Adult	70.0	8/20/2014	EFSR	70.5	Female		92
384.3B23ACFDD1	6/3/2014	Lower Granite Adult	83.0	8/20/2014	EFSR	84.0	Male		78
3D9.1C2D463F72	6/18/2014	Lower Granite Adult	75.0	8/21/2014	EFSR	78.0	Male		64
3D9.1C2D4673D7	6/6/2014	Lower Granite Adult	44.0	8/21/2014	EFSR	43.2	Jack		76
3D9.1C2E038F29	6/13/2014	Bonneville Adult	84.0	8/21/2014	EFSR	85.0	Female		52
3D9.1C2D48A042	6/23/2014	Lower Granite Adult	75.0	8/22/2014	EFSR	75.0	Female		60
384.3B23AD1968	6/3/2014	Lower Granite Adult	41.0	8/26/2014	EFSR	40.2	Jack		84
3D9.1C2D473AD0	6/13/2014	Lower Granite Adult	67.0	8/30/2014	EFSR	68.6	Male		78
3D9.1C2D4659A6	6/25/2014	Lower Granite Adult	51.0	9/1/2014	EFSR	51.0	Jack		68

Appendix B. Summary of Chinook Salmon redds observed during ground counts in the East Fork Salmon River (EFSR) during 2014. Locations are GPS waypoints (WGS-84 datum).

Stream	Date Observed	Redd Name	Location		Section Name	SGR Trend Transect
			Lat (N)	Long (W)		
EFSR	8/7/14	R001KF	44.13319	-114.41113	N02	NS-1a
EFSR	8/23/14	R002BA	44.14084	-114.39945	N02	NS-1a
EFSR	8/23/14	R003BA	44.13964	-114.40159	N02	NS-1a
EFSR	8/23/14	R004BA	44.13741	-114.40389	N02	NS-1a
EFSR	8/23/14	R005BA	44.13776	-114.40536	N02	NS-1a
EFSR	8/23/14	R007BA	44.13591	-114.40734	N02	NS-1a
EFSR	8/23/14	R008BA	44.13346	-114.41195	N02	NS-1a
EFSR	8/23/14	R009BA	44.13251	-114.41308	N02	NS-1a
EFSR	8/23/14	R010BA	44.13128	-114.41373	N02	NS-1a
EFSR	8/23/14	R011BA	44.13151	-114.41575	N02	NS-1a
EFSR	8/23/14	R012BA	44.13093	-114.41582	N02	NS-1a
EFSR	8/23/14	R014BA	44.13013	-114.41649	N02	NS-1a
EFSR	8/23/14	R015BA	44.13049	-114.41779	N02	NS-1a
EFSR	8/23/14	R016BA	44.12942	-114.41847	N01	NS-1a
EFSR	8/23/14	R017BA	44.12942	-114.41847	N01	NS-1a
EFSR	8/23/14	R019BA	44.12942	-114.41847	N01	NS-1a
EFSR	8/23/14	R020BA	44.12668	-114.42082	N01	NS-1a
EFSR	8/23/14	R021BA	44.12589	-114.42116	N01	NS-1a
EFSR	8/23/14	R023BA	44.11929	-114.42412	N01	NS-1a
EFSR	8/23/14	R024BA	44.11914	-114.42419	N01	NS-1a
EFSR	8/23/14	R025BA	44.11881	-114.42512	N01	NS-1a
EFSR	8/23/14	R026BA	44.11881	-114.42512	N01	NS-1a
EFSR	8/23/14	R027BA	44.11879	-114.42783	N01	NS-1a
EFSR	8/23/14	R028BA	44.11802	-114.42909	N01	NS-1a
EFSR	8/23/14	R029BA	44.11727	-114.42919	N01	NS-1a
EFSR	8/23/14	R030BA	44.11727	-114.42919	N01	NS-1a
EFSR	8/23/14	R031BA	44.11702	-114.42934	N01	NS-1a
EFSR	8/23/14	R032BA	44.11702	-114.42934	N01	NS-1a
EFSR	8/24/14	R033BA	44.14333	-114.33784	N04	NS-2b
EFSR	8/24/14	R034BA	44.14337	-114.33841	N04	NS-2b
EFSR	8/24/14	R036BA	44.14409	-114.34138	N04	NS-2b
EFSR	8/24/14	R037BA	44.14494	-114.34404	N04	NS-2b
EFSR	8/24/14	R038BA	44.14479	-114.34549	N04	NS-2b
EFSR	8/24/14	R039BA	44.14486	-114.35621	N04	NS-2b
EFSR	8/24/14	R041BA	44.14539	-114.35942	N04	NS-2b
EFSR	8/24/14	R002KF	44.14525	-114.36366	N04	NS-2b
EFSR	8/24/14	R044BA	44.14571	-114.37285	N03	NS-2b
EFSR	8/24/14	R045BA	44.14602	-114.37518	N03	NS-2b
EFSR	8/24/14	R048BA	44.14659	-114.38450	N03	NS-2b
EFSR	8/24/14	R049BA	44.14673	-114.38578	N03	NS-2b
EFSR	8/24/14	R050BA	44.14573	-114.39122	N03	NS-2b
EFSR	8/24/14	R051BA	44.14525	-114.39389	N03	NS-2b

Appendix B.Continued

Stream	Date Observed	Redd Name	Location Lat (N)	Location Long (W)	Section Name	SGR Trend Transect
EFSR	8/27/14	R001BA	44.14215	-114.39844	N02	NS-1a
EFSR	8/27/14	R006BA	44.13637	-114.40682	N02	NS-1a
EFSR	8/28/14	R018BA	44.12942	-114.41847	N01	NS-1a
EFSR	8/27/14	R042BA	44.14539	-114.35942	N04	NS-2b
EFSR	8/27/14	R047BA	44.14671	-114.38056	N03	NS-2b
EFSR	8/26/14	R003KF	44.15077	-114.30385	N06	NS-2b
EFSR	8/26/14	R004KF	44.15075	-114.30392	N06	NS-2b
EFSR	8/26/14	R005KF	44.14428	-114.32193	N05	NS-2b
EFSR	8/26/14	R007KF	44.14213	-114.32742	N05	NS-2b
EFSR	8/27/14	R001MB	44.11374	-114.43063	N1	NS-1b
EFSR	8/27/14	R002MB	44.11374	-114.43079	N1	NS-1b
EFSR	8/27/14	R003MB	44.11354	-114.43066	N1	NS-1b
EFSR	8/27/14	R004MB	44.11351	-114.43061	N1	NS-1b
EFSR	8/27/14	R005MB	44.11268	-114.43150	N1	NS-1b
EFSR	8/27/14	R006MB	44.11272	-114.43163	N1	NS-1b
EFSR	8/27/14	R007MB	44.11105	-114.43381	N1	NS-1b
EFSR	8/27/14	R008MB	44.11055	-114.43420	N1	NS-1b
EFSR	8/27/14	R009MB	44.11006	-114.43430	N1	NS-1b
EFSR	8/27/14	R010MB	44.10920	-114.43452	N1	NS-1b
EFSR	8/27/14	R011MB	44.10899	-114.43456	N1	NS-1b
EFSR	8/27/14	R012MB	44.10801	-114.43547	N1	NS-1b
EFSR	8/27/14	R013MB	44.10809	-114.43579	N1	NS-1b
EFSR	8/27/14	R014MB	44.10811	-114.43606	N1	NS-1b
EFSR	8/27/14	R015MB	44.10571	-114.43859	N1	NS-1b
EFSR	8/27/14	R016MB	44.10013	-114.44223	N2	NS-1b
EFSR	8/27/14	R017MB	44.10001	-114.44238	N2	NS-1b
EFSR	8/27/14	R018MB	44.09827	-114.44255	N2	NS-1b
EFSR	8/27/14	R019MB	44.09806	-114.44228	N2	NS-1b
EFSR	8/27/14	R020MB	44.09756	-114.44258	N2	NS-1b
EFSR	8/27/14	R021MB	44.09759	-114.44257	N2	NS-1b
EFSR	8/27/14	R022MB	44.09649	-114.44203	N2	NS-1b
EFSR	8/27/14	R023MB	44.09595	-114.44176	N2	NS-1b
EFSR	8/27/14	R024MB	44.09591	-114.44180	N2	NS-1b
EFSR	8/27/14	R025MB	44.09561	-114.44170	N2	NS-1b
EFSR	8/27/14	R026MB	44.09352	-114.44265	N2	NS-1b
EFSR	8/27/14	R027MB	44.09351	-114.44266	N2	NS-1b
EFSR	8/27/14	R028MB	44.09295	-114.44273	N2	NS-1b
EFSR	8/27/14	R029MB	44.09178	-114.44252	N2	NS-1b
EFSR	8/27/14	R030MB	44.09177	-114.44260	N2	NS-1b
EFSR	8/27/14	R031MB	44.09114	-114.44366	N2	NS-1b
EFSR	8/27/14	R032MB	44.09073	-114.44387	N2	NS-1b
EFSR	8/27/14	R033MB	44.09018	-114.44334	N2	NS-1b
EFSR	8/27/14	R034MB	44.09010	-114.44338	N2	NS-1b

Appendix B.Continued

Stream	Date Observed	Redd Name	Location Lat (N)	Location Long (W)	Section Name	SGR Trend Transect
EFSR	8/27/14	R035MB	44.08838	-114.44427	N3	NS-1b
EFSR	8/27/14	R036MB	44.08733	-114.44404	N3	NS-1b
EFSR	8/27/14	R037MB	44.08575	-114.44515	N3	NS-1b
EFSR	8/27/14	R038MB	44.08571	-114.44579	N3	NS-1b
EFSR	8/27/14	R039MB	44.08194	-114.45043	N3	NS-1b
EFSR	8/27/14	R040MB	44.08133	-114.45138	N3	NS-1b
EFSR	8/27/14	R041MB	44.07997	-114.45369	N3	NS-1b
EFSR	8/27/14	R042MB	44.07945	-114.45422	N4	NS-1b
EFSR	8/27/14	R043MB	44.07818	-114.45515	N4	NS-1b
EFSR	8/27/14	R044MB	44.07749	-114.45627	N4	NS-1b
EFSR	8/27/14	R045MB	44.07653	-114.45692	N4	NS-1b
EFSR	8/27/14	R046MB	44.07634	-114.45692	N4	NS-1b
EFSR	8/27/14	R011KF	44.14386	-114.34160	N04	NS-2b
EFSR	8/27/14	R014KF	44.14463	-114.35181	N04	NS-2b
EFSR	8/27/14	R018KF	44.14650	-114.37700	N03	NS-2b
EFSR	8/27/14	R021KF	44.13781	-114.40216	N02	NS-1a
EFSR	8/28/14	R027KF	44.12908	-114.41846	N01	NS-1a
EFSR	8/28/14	R029KF	44.12901	-114.41909	N01	NS-1a
EFSR	8/28/14	R030KF	44.12900	-114.41930	N01	NS-1a
EFSR	8/28/14	R031KF	44.12878	-114.41959	N01	NS-1a
EFSR	8/28/14	R032KF	44.12887	-114.42010	N01	NS-1a
EFSR	8/28/14	R033KF	44.12841	-114.42081	N01	NS-1a
EFSR	8/28/14	R034KF	44.12801	-114.42114	N01	NS-1a
EFSR	8/28/14	R035KF	44.12473	-114.42384	N01	NS-1a
EFSR	8/28/14	R036KF	44.12164	-114.42435	N01	NS-1a
EFSR	8/28/14	R037KF	44.11871	-114.42692	N01	NS-1a
EFSR	8/28/14	R038KF	44.11840	-114.42750	N01	NS-1a
EFSR	8/28/14	R039KF	44.11782	-114.42905	N01	NS-1a
EFSR	8/28/14	R041KF	44.11688	-114.42957	N01	NS-1a
EFSR	8/28/14	R042KF	44.11633	-114.42973	N01	NS-1a
EFSR	8/28/14	R047MB	44.02816	-114.46461	N7	NS-1b
EFSR	8/28/14	R048MB	44.02816	-114.46461	N7	NS-1b
EFSR	8/28/14	R049MB	44.02809	-114.46471	N7	NS-1b
EFSR	8/28/14	R050MB	44.02809	-114.46471	N7	NS-1b
EFSR	8/28/14	R051MB	44.02700	-114.46545	N7	NS-1b
EFSR	8/28/14	R001JM	44.07333	-114.45862	N5	NS-1b
EFSR	8/28/14	R004JM	44.07087	-114.45912	N5	NS-1b
EFSR	8/28/14	R005JM	44.07012	-114.45841	N5	NS-1b
EFSR	8/28/14	R007JM	44.05701	-114.46147	N6	NS-1b
EFSR	8/28/14	R008JM	44.05685	-114.46141	N6	NS-1b
EFSR	8/28/14	R010JM	44.05442	-114.45988	N6	NS-1b
EFSR	8/28/14	R011JM	44.05269	-114.46167	N6	NS-1b
EFSR	8/28/14	R012JM	44.04814	-114.46168	N6	NS-1b

Appendix B.Continued

Stream	Date Observed	Redd Name	Location Lat (N)	Location Long (W)	Section Name	SGR Trend Transect
EFSR	8/28/14	R013JM	44.04533	-114.46004	N6	NS-1b
EFSR	8/31/14	R010KF	44.14372	-114.34102	N04	NS-2b
EFSR	8/31/14	R012KF	44.14420	-114.34235	N04	NS-2b
EFSR	8/31/14	R013KF	44.14451	-114.34319	N04	NS-2b
EFSR	8/31/14	R016KF	44.14526	-114.35863	N04	NS-2b
EFSR	8/31/14	R017KF	44.14542	-114.36186	N04	NS-2b
EFSR	8/31/14	R019KF	44.14653	-114.37713	N03	NS-2b
EFSR	8/31/14	R035BA	44.14385	-114.34109	N04	NS-2b
EFSR	8/31/14	R040BA	44.14531	-114.35783	N04	NS-2b
EFSR	8/31/14	R043BA	44.14522	-114.36381	N04	NS-2b
EFSR	8/31/14	R046BA	44.14660	-114.37726	N03	NS-2b
EFSR	8/31/14	R052BA	44.14333	-114.33784	N04	NS-2b
EFSR	8/31/14	R053BA	44.14334	-114.33935	N04	NS-2b
EFSR	8/31/14	R056BA	44.14451	-114.34319	N04	NS-2b
EFSR	8/31/14	R058BA	44.14488	-114.35305	N04	NS-2b
EFSR	8/31/14	R059BA	44.14473	-114.35593	N04	NS-2b
EFSR	8/31/14	R060BA	44.14531	-114.35783	N04	NS-2b
EFSR	8/31/14	R061BA	44.14539	-114.35942	N04	NS-2b
EFSR	8/31/14	R062BA	44.14522	-114.36469	N04	NS-2b
EFSR	8/31/14	R063BA	44.14454	-114.36782	N04	NS-2b
EFSR	8/31/14	R064BA	44.14600	-114.37514	N03	NS-2b
EFSR	8/31/14	R065BA	44.14710	-114.38224	N03	NS-2b
EFSR	8/31/14	R066BA	44.14589	-114.39135	N03	NS-2b
EFSR	8/31/14	R067BA	44.14576	-114.39217	N03	NS-2b
EFSR	9/1/14	R020KF	44.13958	-114.40175	N02	NS-1a
EFSR	9/1/14	R022KF	44.13770	-114.40599	N02	NS-1a
EFSR	9/1/14	R023KF	44.13762	-114.40605	N02	NS-1a
EFSR	9/1/14	R028KF	44.12901	-114.41871	N01	NS-1a
EFSR	9/1/14	R013BA	44.13016	-114.41595	N02	NS-1a
EFSR	9/1/14	R022BA	44.12185	-114.42449	N01	NS-1a
EFSR	9/1/14	R068BA	44.14345	-114.39586	N02	NS-1a
EFSR	9/1/14	R069BA	44.14321	-114.39646	N02	NS-1a
EFSR	9/1/14	R070BA	44.14215	-114.39844	N02	NS-1a
EFSR	9/1/14	R071BA	44.14031	-114.40061	N02	NS-1a
EFSR	9/1/14	R072BA	44.14031	-114.40061	N02	NS-1a
EFSR	9/1/14	R073BA	44.13792	-114.40229	N02	NS-1a
EFSR	9/1/14	R074BA	44.13540	-114.40229	N02	NS-1a
EFSR	9/1/14	R075BA	44.13397	-114.40922	N02	NS-1a
EFSR	9/1/14	R076BA	44.13012	-114.40229	N02	NS-1a
EFSR	9/1/14	R077BA	44.13012	-114.40229	N02	NS-1a
EFSR	9/1/14	R078BA	44.12559	-114.42170	N01	NS-1a
EFSR	9/1/14	R079BA	44.12552	-114.42227	N01	NS-1a
EFSR	9/1/14	R080BA	44.11942	-114.42394	N01	NS-1a

Appendix B.Continued

Stream	Date Observed	Redd Name	Location Lat (N)	Location Long (W)	Section Name	SGR Trend Transect
EFSR	9/3/14	R043KF	44.15162	-114.30284	N06	NS-1a
EFSR	9/3/14	R044KF	44.15101	-114.30398	N06	NS-1a
EFSR	9/3/14	R045KF	44.14974	-114.30614	N06	NS-1a
EFSR	9/3/14	R046KF	44.14970	-114.30634	N06	NS-1a
EFSR	9/3/14	R047KF	44.14678	-114.31826	N05	NS-1a
EFSR	9/3/14	R050KF	44.14265	-114.32529	N05	NS-1a
EFSR	9/3/14	R051KF	44.14267	-114.32561	N05	NS-1a
EFSR	9/3/14	R052KF	44.14223	-114.33078	N05	NS-1a
EFSR	9/3/14	R053KF	44.14318	-114.33516	N05	NS-1a
EFSR	9/4/14	R054KF	44.14398	-114.34192	N04	NS-1a
EFSR	9/4/14	R055KF	44.14479	-114.34496	N04	NS-1a
EFSR	9/4/14	R056KF	44.14422	-114.37049	N03	NS-1a
EFSR	9/4/14	R057KF	44.14686	-114.38590	N03	NS-1a
EFSR	9/4/14	R058KF	44.14697	-114.38643	N03	NS-1a
EFSR	9/3/14	R057BA	44.14477	-114.34828	N04	NS-2b
EFSR	9/4/14	R054BA	44.14385	-114.34109	N04	NS-2b
EFSR	9/3/14	R015KF	44.14526	-114.35706	N04	NS-2b
EFSR	9/3/14	R007KF	44.14213	-114.32742	N05	NS-2b
EFSR	9/3/14	R003KF	44.15077	-144.30385	N06	NS-2b
EFSR	9/5/14	R025KF	44.13028	-114.41727	N02	NS-1a
EFSR	9/5/14	R026KF	44.13000	-114.41877	N01	NS-1a
EFSR	9/5/14	R059KF	44.14060	-114.40055	N02	NS-1a
EFSR	9/5/14	R060KF	44.13816	-114.40227	N02	NS-1a
EFSR	8/27/14	R024KF	44.13134	-114.41431	N02	NS-1a
EFSR	8/31/14	R055BA	44.14395	-114.34123	N04	NS-2b
EFSR	8/28/14	R040KF	44.11747	-114.42900	N01	NS-1a
EFSR	9/9/14	R061KF	44.14352	-114.32981	N05	NS-2b
EFSR	9/9/14	R048KF	44.14483	-114.31826	N05	NS-2b
EFSR	9/9/14	R049KF	44.14428	-114.32159	N05	NS-2b
EFSR	9/9/14	R006KF	44.14263	-114.32555	N05	NS-2b
EFSR	9/12/14	R081BA	44.11265	-114.43165	N1	NS-1b
EFSR	9/12/14	R082BA	44.10824	-114.43482	N1	NS-1b
EFSR	9/12/14	R083BA	44.10811	-114.43610	N1	NS-1b
EFSR	9/12/14	R084BA	44.10180	-114.44042	N2	NS-1b
EFSR	9/12/14	R085BA	44.10098	-114.44172	N2	NS-1b
EFSR	9/12/14	R086BA	44.09756	-114.44258	N2	NS-1b
EFSR	9/12/14	R087BA	44.09364	-114.44209	N2	NS-1b
EFSR	9/12/14	R088BA	44.09759	-114.44257	N2	NS-1b
EFSR	9/12/14	R089BA	44.09123	-114.44329	N2	NS-1b
EFSR	9/12/14	R090BA	44.08930	-114.44366	N3	NS-1b
EFSR	9/12/14	R091BA	44.08188	-114.45044	N3	NS-1b
EFSR	9/12/14	R092BA	44.08164	-114.45288	N3	NS-1b
EFSR	9/13/14	R093BA	44.15088	-114.30387	N06	NS-2b

Appendix B.Continued.

Stream	Date Observed	Redd Name	Location		Section Name	SGR Trend Transect
			Lat (N)	Long (W)		
EFSR	9/13/14	R094BA	44.15005	-114.30537	N06	NS-2b
EFSR	9/13/14	R095BA	44.14409	-114.32224	N05	NS-2b
EFSR	9/13/14	R096BA	44.14365	-114.33085	N05	NS-2b
EFSR	9/14/14	R097BA	44.14571	-114.37312	N03	NS-2b
EFSR	9/15/14	R014JM	44.07920	-114.45444	N4	NS-1b
EFSR	9/15/14	R015JM	44.07817	-114.45517	N4	NS-1b
EFSR	9/15/14	R016JM	44.07660	-114.45660	N4	NS-1b
EFSR	9/15/14	R017JM	44.07402	-114.45849	N4	NS-1b
EFSR	9/15/14	R018JM	44.07809	-114.45528	N4	NS-1b
EFSR	9/15/14	R001JB	44.05672	-114.46152	N6	NS-1b
EFSR	9/15/14	R002JB	44.05672	-114.46152	N6	NS-1b
EFSR	9/15/14	R003JB	44.05671	-114.46133	N6	NS-1b
EFSR	9/15/14	R004JB	44.05581	-114.46047	N6	NS-1b
EFSR	9/15/14	R005JB	44.04819	-114.46163	N6	NS-1b
EFSR	9/15/14	R006JB	44.03183	-114.46137	N7	NS-1b
EFSR	9/15/14	R098BA	44.12211	-114.42477	N01	NS-1a
EFSR	9/16/14	R007JB	44.02800	-114.46467	N8	NS-1b
EFSR	9/16/14	R101BA	44.00275	-114.48229	N9	NS-1b
EFSR	9/16/14	R102BA	43.99362	-114.48561	N9	NS-1b

Appendix C. Summary of Chinook Salmon carcasses collected in the East Fork Salmon River (EFSR), August 31—September 15, 2014. 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.					Location	
Recovered (carcass)	Trapped (live)	Fork	Hyperal	Sex	Fin Ray No.	Carcass	Trap	Adult Trap Jaw Tag	Captive Section Name	SGR Trend Transect	Northing	Easting
8/31/2014	**	76.0	58.0	M	14-02601	C001	**	**	N03	NS-2b	44.14575	-114.37298
8/31/2014	8/14/2014	68.0	52.0	M	14-02602	**	155	155	N03	NS-2b	44.14587	-114.38979
9/1/2014	**	73.0	56.0	M	14-02603	C002	**	**	N02	NS-1a	44.13320	-114.40992
9/1/2014	8/12/2014	62.0	51.0	M	14-02604	**	144	144	N02	NS-1a	44.13138	-114.41399
9/1/2014	**	78.0	62.0	M	14-02605	C003	**	**	N02	NS-1a	44.13057	-114.41805
9/1/2014	**	80.0	63.0	F	14-02606	C004	**	**	N01	NS-1a	44.12889	-114.41854
9/1/2014	**	84.0	67.0	F	14-02607	C005	**	**	N01	NS-1a	44.12731	-114.42064
9/1/2014	**	78.0	62.0	F	14-02608	C006	**	**	N01	NS-1a	44.12417	-114.42348
9/1/2014	**	89.0	73.0	F	14-02609	C007	**	**	N01	NS-1a	44.12083	-114.42415
9/1/2014	8/18/2014	85.0	69.0	F	14-02610	**	191	191	N01	NS-1a	44.12083	-114.42415
9/4/2014	**	84.0	67.0	M	14-02637	C008	**	**	N04	NS-1a	44.14523	-114.35651
9/4/2014	**	67.0	52.0	M	14-02636	C009	**	**	N04	NS-1a	44.14540	-114.36313
9/4/2014	**	88.0	66.0	M	14-02640	C010	**	**	N03	NS-1a	44.14595	-114.37425
9/4/2014	8/16/2014	71.0	56.0	M	14-02639	**	173	173	N03	NS-1a	44.14602	-114.37537
9/4/2014	**	69.0	55.0	M	14-02638	C011	**	**	N03	NS-1a	44.14611	-114.37608
9/4/2014	8/19/2014	68.0	52.0	M	14-02631	**	207	207	N03	NS-1a	44.14658	-114.37720
9/4/2014	**	80.0	63.0	F	14-02632	C012	**	**	N03	NS-1a	44.14656	-114.38276
9/4/2014	**	95.0	73.0	M	14-02633	C013	**	**	N03	NS-1a	44.14654	-114.38319
9/4/2014	**	69.0	53.0	M	14-02635	C014	**	**	N03	NS-1a	44.14677	-114.38498
9/4/2014	**	80.0	na	M	14-02634	C015	**	**	N03	NS-1a	44.14676	-114.38531
9/4/2014	**	75.0	60.0	M	14-02627	C016	**	**	N03	NS-1a	44.14628	-114.38737
9/5/2014	**	94.0	75.0	F	14-02628	C017	**	**	N02	NS-1a	44.14201	-114.39845
9/5/2014	**	75.0	57.0	M	14-02629	C018	**	**	N02	NS-1a	44.14184	-114.39854
9/5/2014	**	71.0	54.0	M	14-02630	C019	**	**	N02	NS-1a	44.14060	-114.40055
9/5/2014	**	81.0	63.0	F	14-02625	C020	**	**	N02	NS-1a	44.13995	-114.40139
9/5/2014	**	78.0	64.0	F	14-02626	C021	**	**	N02	NS-1a	44.13618	-114.40717
9/5/2014	**	71.0	57.0	F	14-12624	C022	**	**	N02	NS-1a	44.13618	-114.40717
9/5/2014	**	78.0	59.0	M	14-02623	C023	**	**	N02	NS-1a	44.13307	-114.41088
9/5/2014	**	76.0	60.0	F	14-02621	C024	**	**	N02	NS-1a	44.13344	-114.41268
9/5/2014	**	46.0	36.0	M	14-02622	**	**	**	N02	NS-1a	44.13308	-114.41296
9/5/2014	**	80.0	60.0	M	**	C025	**	**	N02	NS-1a	44.13266	-114.41315
9/5/2014	8/21/2014	55.0	43.0	M	14-02691	**	235	235	N02	NS-1a	44.13266	-114.41315

Appendix C. Continued.

Date Recovered (carcass)	Date Trapped (live)	Length (cm) Fork	Length (cm) Hyperal	Sex	Fin Ray No.	Genetic No. Carcass	Genetic No. Trap	Adult Trap Jaw Tag	Captive Section Name	SGR Trend Transect	Location Northing	Location Easting
9/5/2014	**	74.0	56.0	M	14-02696	C026	**	**	N02	NS-1a	44.13266	-114.41315
9/5/2014	**	100.0	77.0	M	14-02692	C027	**	**	N02	NS-1a	44.13154	-114.41458
9/5/2014	**	78.0	59.0	M	14-02693	C028	**	**	N02	NS-1a	44.13154	-114.41458
9/5/2014	7/16/2014	82.0	62.0	M	**	**	107	107	N02	NS-1a	44.13107	-114.41576
9/5/2014	**	83.0	66.0	F	14-02694	C029	**	**	N02	NS-1a	44.13032	-114.41549
9/5/2014	**	89.0	68.0	F	14-02695	C030	**	**	N02	NS-1a	44.13030	-114.41727
9/5/2014	**	73.0	58.0	F	14-02698	C031	**	**	N01	NS-1a	44.12261	-114.42525
9/5/2014	**	76.0	60.0	F	14-02699	C032	**	**	N01	NS-1a	44.12022	-114.12022
9/5/2014	**	90.0	68.0	M	14-02700	C033	**	**	N01	NS-1a	44.12022	-114.12022
9/5/2014	**	94.0	75.0	F	14-02697	C034	**	**	N01	NS-1a	44.11856	-114.42523
9/5/2014	**	73.0	54.0	M	14-02690	C035	**	**	N01	NS-1a	44.11872	-114.42742
9/5/2014	**	79.0	51.0	F	14-02688	C036	**	**	N01	NS-1a	44.11799	-114.42908
9/5/2014	7/12/2014	76.0	na	M	**	**	62	62	N01	NS-1a	44.11856	-114.42523
9/6/2014	**	101.0	79.0	M	14-02687	C037	**	**	N04	NS-1b	44.14315	-114.33794
9/6/2014	**	70.0	55.0	M	14-02731	C038	**	**	N04	NS-1b	44.14328	-114.33966
9/6/2014	**	70.0	55.0	M	14-02732	C039	**	**	N04	NS-1b	44.14328	-114.33966
9/6/2014	**	77.0	63.0	F	14-02733	C040	**	**	N04	NS-1b	44.14328	-114.33966
9/6/2014	**	80.0	62.0	M	14-02734	C041	**	**	N04	NS-1b	44.14393	-114.34150
9/6/2014	**	88.0	71.0	F	14-02735	C042	**	**	N04	NS-1b	44.14520	-114.35653
9/6/2014	**	77.0	62.0	F	14-02736	C043	**	**	N04	NS-1b	44.14529	-114.36399
9/6/2014	**	91.0	70.0	M	14-02737	C044	**	**	N04	NS-1b	44.14439	-114.36852
9/6/2014	**	85.0	71.0	F	14-02738	C045	**	**	N03	NS-1b	44.14658	-114.37959
9/6/2014	8/22/2014	90.0	71.0	M	14-02739	**	242	242	N03	NS-1b	44.14660	-114.38272
9/6/2014	**	77.0	64.0	F	14-02740	C046	**	**	N03	NS-1b	44.14671	-114.38696
9/6/2014	**	80.0	66.0	F	14-02681	C047	**	**	N03	NS-1b	44.14567	-114.39191
9/7/2014	8/16/2014	51.0	42.0	M	14-02729	**	168	168	N01	NS-1a	44.14302	-114.39696
9/7/2014	**	68.0	53.0	M	14-02730	C048	**	**	N02	NS-1a	44.14282	-114.39767
9/7/2014	**	83.0	70.0	F	14-02723	C049	**	**	N02	NS-1a	44.14163	-114.39868
9/7/2014	**	80.0	66.0	F	14-02728	C050	**	**	N02	NS-1a	44.13800	-114.40228
9/7/2014	**	73.0	58.0	F	14-02725	C051	**	**	N02	NS-1a	44.13337	-114.41114
9/7/2014	**	69.0	55.0	M	14-02724	C052	**	**	N02	NS-1a	44.13293	-114.41309
9/7/2014	**	91.0	73.0	F	14-02683	C053	**	**	N02	NS-1a	44.13181	-114.41509
9/7/2014	**	76.0	59.0	M	14-02682	C054	**	**	N02	NS-1a	44.13181	-114.41509
9/7/2014	**	90.0	73.0	F	14-02684	C055	**	**	N02	NS-1a	44.13075	-114.14836

Appendix C. Continued.

Date Recovered (carcass)	Trapped (live)	Length (cm) Fork	Hyperal	Sex	Fin Ray No.	Genetic No. Carcass	Trap	Adult Trap Jaw Tag	Captive Section Name	SGR Trend Transect	Location Northing	Easting
9/8/2014	**	78.0	63.0	M	14-02726	C056	**	**	N01	NS-1a	44.12817	-114.42113
9/8/2014	8/21/2014	**	**	**	**	**	229	229	N01	NS-1a	44.12740	-114.42066
9/8/2014	**	78.0	62.0	**	14-02685	**	**	**	N01	NS-1a	44.12346	-114.42361
9/8/2014	**	79.0	65.0	F	**	C057	**	**	N01	NS-1a	44.11856	-114.42583
9/9/2014	**	81.0	67.0	F	14-02686	C058			N06	NS-2b	44.15202	-114.30288
9/9/2014	8/18/2014	74.0	59.0	M	14-02721	**	187	187	N06	NS-2b	44.15202	-114.30288
9/9/2014	**	67.0	51.0	unk	**	**	**	**	N06	NS-2b	44.14968	-114.30654
9/9/2014	**	85.0	66.0	M	14-02722	C059	**	**	N06	NS-2b	44.14753	-114.31178
9/9/2014	**	83.0	64.0	unk	**	C060	**	**	N05	NS-2b	44.14479	-114.31841
9/9/2014	8/22/2014	94.0	74.0	M	14-02710	**	241	241	N05	NS-2b	44.14416	-114.31980
9/9/2014	**	76.0	64.0	F	14-02727	C061	**	**	N05	NS-2b	44.14416	-114.31980
9/9/2014	**	56.0	45.0	unk	14-02709	C062	**	**	N05	NS-2b	44.14412	-114.32185
9/9/2014	**	84.0	70.0	F	14-02706	C063	**	**	N05	NS-2b	44.14412	-114.32185
9/9/2014	**	73.0	61.0	F	14-02708	C064	**	**	N05	NS-2b	44.14412	-114.32185
9/9/2014	**	63.0	50.0	M	14-02705	C065	**	**	N05	NS-2b	44.14239	-114.32601
9/9/2014	**	81.0	66.0	F	14-02707	C066	**	**	N05	NS-2b	44.14311	-114.32903
9/9/2014	**	80.0	63.0	M	14-02704	C067	**	**	N05	NS-2b	44.14311	-114.32903
9/9/2014	**	80.0	67.0	F	14-02703	C068	**	**	N05	NS-2b	44.14304	-114.33364
9/9/2014	**	80.0	68.0	F	14-02701	C069	**	**	N05	NS-2b	44.14304	-114.33364
9/9/2014	**	64.0	51.0	M	14-02702	C070	**	**	N04	NS-2b	44.14479	-114.34721
9/9/2014	**	83.0	70.0	F	**	C071	**	**	N04	NS-2b	44.14531	-114.35884
9/9/2014	8/27/2014	74.0	62.0	M	**	**	291	291	N04	NS-2b	44.14531	-114.35884
9/9/2014	**	72.0	60.0	unk	**	C072	**	**	N04	NS-2b	44.14531	-114.35884
9/9/2014	**	73.0	61.0	F	**	C073	**	**	N04	NS-2b	44.14528	-114.36465
9/10/2014	**	58.0	48.0	M	14-02720	C074	**	**	N03	NS-2b	44.14549	-114.37293
9/10/2014	**	76.0	63.0	F	14-02717	C075	**	**	N03	NS-2b	44.14603	-114.37566
9/10/2014	**	103.0	80.0	M	14-02711	C076	**	**	N03	NS-2b	44.14665	-114.38027
9/10/2014	**	95.0	78.0	F	14-02719	C077	**	**	N03	NS-2b	44.14355	-114.39548
9/10/2014	**	77.0	65.0	F	14-14291	C078	**	**	N02	NS-1a	44.14291	-114.39683
9/10/2014	**	88.0	69.0	M	14-02716	C079	**	**	N02	NS-1a	44.14141	-114.39865
9/10/2014	**	74.0	62.0	F	14-02713	C080	**	**	N02	NS-1a	44.13775	-114.40546
9/10/2014	**	77.0	62.0	F	14-02718	C081	**	**	N02	NS-1a	44.13171	-114.41490
9/10/2014	**	78.0	67.0	F	14-02715	C082	**	**	N02	NS-1a	44.13009	-114.41606
9/10/2014	**	81.0	68.0	F	14-02712	C083	**	**	N02	NS-1a	44.13029	-114.41714

Appendix C. Continued.

Date Recovered (carcass)	Date Trapped (live)	Length (cm) Fork	Length (cm) Hyperal	Sex	Fin Ray No.	Genetic No. Carcass	Genetic No. Trap	Adult Trap Jaw Tag	Captive Section Name	SGR Trend Transect	Location Northing	Location Easting
9/10/2014	**	82.0	68.0	F	**	C084	**	**	N02	NS-1a	44.13056	-114.41798
9/12/2014	7/14/2014	79.0	61.0	F	14-02741	**	79	79	N1	NS-1b	44.11389	-114.43075
9/12/2014	unk	82.0	65.0	M	14-02742	**	unk	unk	N1	NS-1b	44.11389	-114.43075
9/12/2014	8/29/2014	75.0	61.0	F	14-02743	**	309	309	N1	NS-1b	44.12265	-114.43165
9/12/2014	8/24/2014	75.0	59.0	F	14-02744	**	256	256	N2	NS-1b	44.10060	-114.44205
9/12/2014	7/28/2014	unk	unk	unk	**	**	132	132	N2	NS-1b	44.09391	-114.44172
9/12/2014	7/8/2014	unk	unk	unk	**	**	39	39	N2	NS-1b	44.09364	-114.44209
9/12/2014	8/20/2014	74.0	61.0	F	14-02745	**	217	217	N2	NS-1b	44.09016	-114.44341
9/12/2014	unk	unk	unk	unk	**	**	unk	unk	N3	NS-1b	44.08931	-114.44366
9/12/2014	unk	unk	unk	unk	**	**	unk	unk	N3	NS-1b	44.08931	-114.44366
9/12/2014	8/20/2014	78.0	63.0	F	14-02746	**	220	220	N3	NS-1b	44.08628	-114.44452
9/12/2014	8/25/2014	69.0	56.0	F	14-02747	**	270	270	N3	NS-1b	44.08234	-114.45022
9/13/2014	**	89.0	68.0	M	14-02748	C085	**	**	N06	NS-2b	44.15060	-114.30434
9/13/2014	**	70.0	54.0	M	14-02749	C086	**	**	N06	NS-2b	44.14967	-114.30646
9/13/2014	**	86.0	67.0	M	14-02750	C087	**	**	N06	NS-2b	44.14658	-114.31666
9/13/2014	**	70.0	54.0	M	14-02611	C088	**	**	N05	NS-2b	44.14470	-114.31850
9/14/2014	**	84.5	67.5	F	14-02612	C089	**	**	N03	NS-2b	44.14581	-114.39182
9/15/2014	unk	74.0	60.0	M	14-02651	**	unk	unk	N6	NS-1b	44.05664	-114.46139
9/15/2014	unk	75.0	63.0	F	14-02652	**	unk	unk	N6	NS-1b	44.05671	-114.46133
9/15/2014	unk	unk	unk	unk	**	**	unk	unk	N4	NS-1b	44.07947	-114.45429
9/15/2014	**	69.0	57.0	F	14-02613	C090	**	**	N02	NS-1a	44.14191	-114.39848
9/15/2014	**	88.0	70.0	F	14-02614	C091	**	**	N01	NS-1a	44.12229	-114.42521
9/15/2014	**	78.0	63.5	F	14-02615	C092	**	**	N01	NS-1a	44.12229	-114.42521

Appendix D. Adult Chinook Salmon ages determined from fin rays of carcasses collected in the East Fork Salmon River (EFSR) during 2013.

Carcass Sample	Date Recovered	Fork Length	Fin Ray Age
13-00001	8/26/2013	87	5
13-00002	8/26/2013	85	5
13-00003	8/26/2013	90	5
13-00004	8/26/2013	81	5
13-00005	8/26/2013	83	5
13-00006	8/27/2013	48	3
13-00007	8/27/2013	84	5
13-00008	8/27/2013	91	5
13-00009	8/28/2013	83	5
13-00010	8/27/2013	60	4
13-00011	8/27/2013	47	3
13-00012	8/25/2013	98	5
13-00013	8/27/2013	77	4
13-00014	8/29/2013	83	5
13-00015	8/28/2013	73	4
13-00016	8/29/2013	72	4
13-00017	8/29/2013	88	5
13-00018	8/29/2013	69	4
13-00019	8/28/2013	44	3
13-00020	8/28/2013	91	5

Appendix E. East Fork Salmon River (EFSR) Chinook Salmon single and two-parent assignments, 2007–2013 adult returns.

Parent Source			Adult Returns (Progeny)								
Origin	**Group**	**Year**	**2007**	**2008**	**2009**	**2010[a]**	**2011[b]**	**2012[c]**	**2013[d]**	**2014**	**Total**
Captive	Spawn	2003	0	0							0
		2004	0	1	0						1
	Adult Release	2001									
		2002	0								0
		2003	0	0							0
		2004	0	0	0						0
		2005		0	0	0					0
		2006			2	7	7				16
		2007				0	30	19			49
		2008					1	5	12		18
		2009						0	0		0
		2010							0		0
	Total		0	1	2	7	38	24	12	0	84
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					3	3	2		7
		2009						1	3		4
		2010							0		0
		Total	0	0	1	6	4	4	5	0	20
CAPTIVE ALL			**0**	**1**	**3**	**13**	**42**	**28**	**17**	**0**	**103**

Represents a parent-progeny combination not biologically possible.

Future adult returns.

[a] Includes 1 genetic samples taken from carcasses [1 CxN (RY06)]

[b] Includes 4 genetic samples taken from carcasses (4 NxN: 2-RY06, 2-RY07)

[c] Includes 30 genetic samples taken from carcasses [11 NxN: 8-RY07, 3-RY08; 5 CxC (RY07s); 3 CxU; and 11 NxU]

[d] Includes 16 genetic samples taken from carcasses (4 NxN (3-RY09, 1 RY08), 1 CxC (RY08), and 11 NxU)

Appendix E. Continued.

Parent Source			Adult Returns (Progeny)								
Origin	**Group**	**Year**	**2007**	**2008**	**2009**	**2010[a]**	**2011[b]**	**2012[c]**	**2013[d]**	**2014**	**Total**
Natural	**Adult Returns**	**2001**									
		2002	0								0
		2003	0	0							0
		2004	7	58	21						86
		2005		6	37	3					46
		2006			7	84	15				106
		2007				7	51	47			105
		2008					11	43	29		83
		2009						2	46		48
		2010							29		29
	Total		**7**	**64**	**65**	**94**	**77**	**92**	**104**	**0**	**503**
Total All			**7**	**65**	**68**	**107**	**119**	**120**	**121**	**0**	**607**

Represents a parent-progeny combination not biologically possible.

Future adult returns.

[a] Includes 1 genetic sample taken from carcasses [1 CxN (RY06)]

[b] Includes 4 genetic samples taken from carcasses (4 NxN: 2-RY06, 2-RY07)

[c] Includes 30 genetic samples taken from carcasses [11 NxN: 8-RY07, 3-RY08; 5 CxC (RY07s); 3 CxU; and 11 NxU]

[d] Includes 16 genetic samples taken from carcasses (4 NxN (3-RY09, 1 RY08), 1 CxC (RY08), and 11 NxU)

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