Cottonwood Creek
Fall Chinook Salmon
Carcass Survey

2011 Annual Report

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September 2012

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Abstract

Fall Chinook salmon *Oncorhynchus tshawytscha* are an important species for commercial and recreational fishing, in addition to their important role within the ecosystem. More than 32 million fall Chinook salmon are produced annually in California's Central Valley hatcheries, with a large percentage transported to San Pablo Bay for release. Transporting juveniles disrupts their natural outmigration process which can lead to reduced imprinting on their natal water source, which in turn can cause returning adult salmon to stray into non-natal streams, and can lead to negative impacts on wild populations. To monitor returning adult hatchery-origin salmon, kayak carcass surveys were performed weekly in 2011 from mid-October through mid-December on 20 miles of Cottonwood Creek, a tributary on the west side of the upper Sacramento River, to collect coded-wire tags, biological, and genetic samples, and associated information from fall Chinook salmon. We observed 435 carcasses during the survey period, representing 20.3% of the total fall Chinook salmon escapement into Cottonwood Creek. The peak recovery of fresh carcasses occurred during the week of 6 November 2011. The highest concentration of both redds and carcasses were found between stream miles 6 to 11. A total of 401 carcasses were sampled, and 54.9% were determined to be of hatchery origin. Hatchery-origin fish were predominately age-2 males. We believe the estimate of the proportion of hatchery-origin fish is likely higher within the survey area than for the entire fall Chinook population in Cottonwood Creek because the survey area was restricted above stream mile 19.2 and higher proportions of hatchery-origin fish were observed further downstream. The strong age-2 class of returning salmon influenced the proportion of hatchery- to natural-origin salmon and the sex ratio observed. A majority of hatchery-origin carcasses recovered were fall Chinook salmon from the Coleman National Fish Hatchery (85%) and the remaining fish were from the Feather River Hatchery (14% fall; 1% hybrid run). Future surveys would provide insight into annual variation of straying, spawn timing, spawning distribution, and proportion of hatchery-origin fall Chinook salmon in Cottonwood Creek and assist in assessing potential negative impacts on native salmonid populations resulting from straying hatchery-origin salmon.

Introduction

Annually, more than 32 million fall Chinook salmon (FCS) are currently produced at five hatcheries in the Central Valley of California, including Coleman National Fish Hatchery (NFH), Feather River Hatchery and the Feather River Hatchery Annex, Nimbus Hatchery, Mokelumne River Hatchery, and Merced River Hatchery. Hatchery production of Central Valley FCS contributes substantially to sport and commercial fisheries in ocean and inland areas. Releasing large numbers of hatchery propagated salmonids, however, can result in negative effects to naturally-produced salmonids. For example, artificial propagation can pose genetic risks to natural salmonid populations which can affect locally adapted gene complexes and have deleterious effects on fitness or survivorship (Hard *et al.* 1992; Cuenco *et al.* 1993; Waples 2007).

The potential for negative effects of hatchery fish to naturally-produced salmonids is reduced when hatchery fish return as adults to their hatchery of origin, or "home", and is greater when hatchery fish spawn in natural spawning areas, or "stray" (Quinn e*t al*. 1991; Williamson and May 2005). Naturally produced anadromous salmonids typically show a high level of fidelity to their natal spawning areas as a result of imprinting to environmental cues experienced by juvenile fishes throughout their rearing and downstream migration (Dittman and Quinn 1996).

Imprinting is disrupted and straying is increased for hatchery fish that are released at locations distant from the hatchery (Quinn 1993; Dittman and Quinn 1996). In recent years, many of the FCS produced at Central Valley hatcheries have been transported by truck to the downstream limit of the watersheds where they are typically acclimated to estuarine water conditions for several hours in net pens and released into San Pablo Bay. This practice has been shown to increase survival of juveniles by bypassing mortality that would otherwise occur during emigration, resulting in an increased abundance of salmon available for harvest (Kormos *et al.* 2012). At the same time, the practice of transporting juvenile salmon has also raised concerns about negative effects to naturally spawning salmon populations that may result from straying of adult hatchery-origin FCS (Williamson and May 2005).

Assessments of straying of adult hatchery-origin FCS in the Central Valley have been limited by low and inconsistent rates of marking or tagging of hatchery fish. Inadequate marking and tagging programs result in the inability to distinguish hatchery and natural FCS when they return to hatcheries and in natural spawning areas. Beginning in 2007, however, a representative portion of all hatchery production of FCS in the Central Valley has been marked with an adipose-fin clip and a coded-wire tag (CWT) has been inserted in the nasal cartilage. This program, called the Constant Fractional Marking (CFM) Program, targets 25% of FCS production releases to be marked and tagged on an annual basis (Buttars 2011). The overall objectives of the CFM program are:

1. To evaluate the contribution rates of hatchery fish to Central Valley Chinook salmon populations;
2. To evaluate the Central Valley propagation program's genetic and ecological effects on natural Chinook salmon populations;
3. To estimate exploitation rates of hatchery and natural Central Valley Chinook salmon in ocean and inland fisheries;
4. To evaluate the success of restoration actions designed to increase natural production of Central Valley Chinook salmon;
5. To evaluate the relative impacts of water project operations on hatchery and naturally-produced Chinook salmon; and,
6. To evaluate the recovery of listed stocks of Chinook salmon (Buttars 2011).

To meet the objectives of the CFM program, rigorous field sampling programs are necessary to survey natural spawning areas. In 2011, the California's Central Valley Salmonid Escapement Project Work Team distributed a plan to provide a framework for long-term monitoring programs to estimate, in a statistically valid manner, the abundance and trends in escapement of adult Central Valley Chinook salmon at the watershed level (Bergman *et al.* 2012). The main objective of this Central Valley In-river Chinook Salmon Escapement Monitoring Plan is to improve estimates of the total number of Chinook salmon that "escape" fisheries and return to natural spawning areas (i.e., 'escapement') and estimate the percent of escapement that are of hatchery origin. Biological data (e.g., sex ratios, age, and length distributions) and data collected during surveys of natural spawning areas is also used to enhance understanding of the life history, status, and health of each stock, and be used to improve management. This monitoring plan calls for systematic surveys of important spawning areas of the Central Valley to collect biological data and recover CWTs (Bergman *et al.* 2012).

Cottonwood Creek is a tributary on the west side of the upper Sacramento River (confluence RM 273). The Cottonwood Creek watershed, with its headwaters originating in the North Coast Mountain Range and Klamath Mountains, encompasses 929 square miles and has three main tributaries, the South Fork, the North Fork, and the Middle Fork (Figure 1). Cottonwood Creek has steep, narrow canyons starting from the headwaters and transitioning to wide, braided alluvial streams in the valley reach (CH2M Hill 2002). The watershed provides approximately 130 miles of potential spawning habitat for fall, late-fall, and spring Chinook salmon and steelhead trout (CH2M Hill 2002). Historically, escapement surveys in Cottonwood Creek have been infrequent and have varied in location, method, and methodology for estimating abundance, which produced sporadic and highly variable estimates of population size (CH2M Hill 2002, CalFish.org).

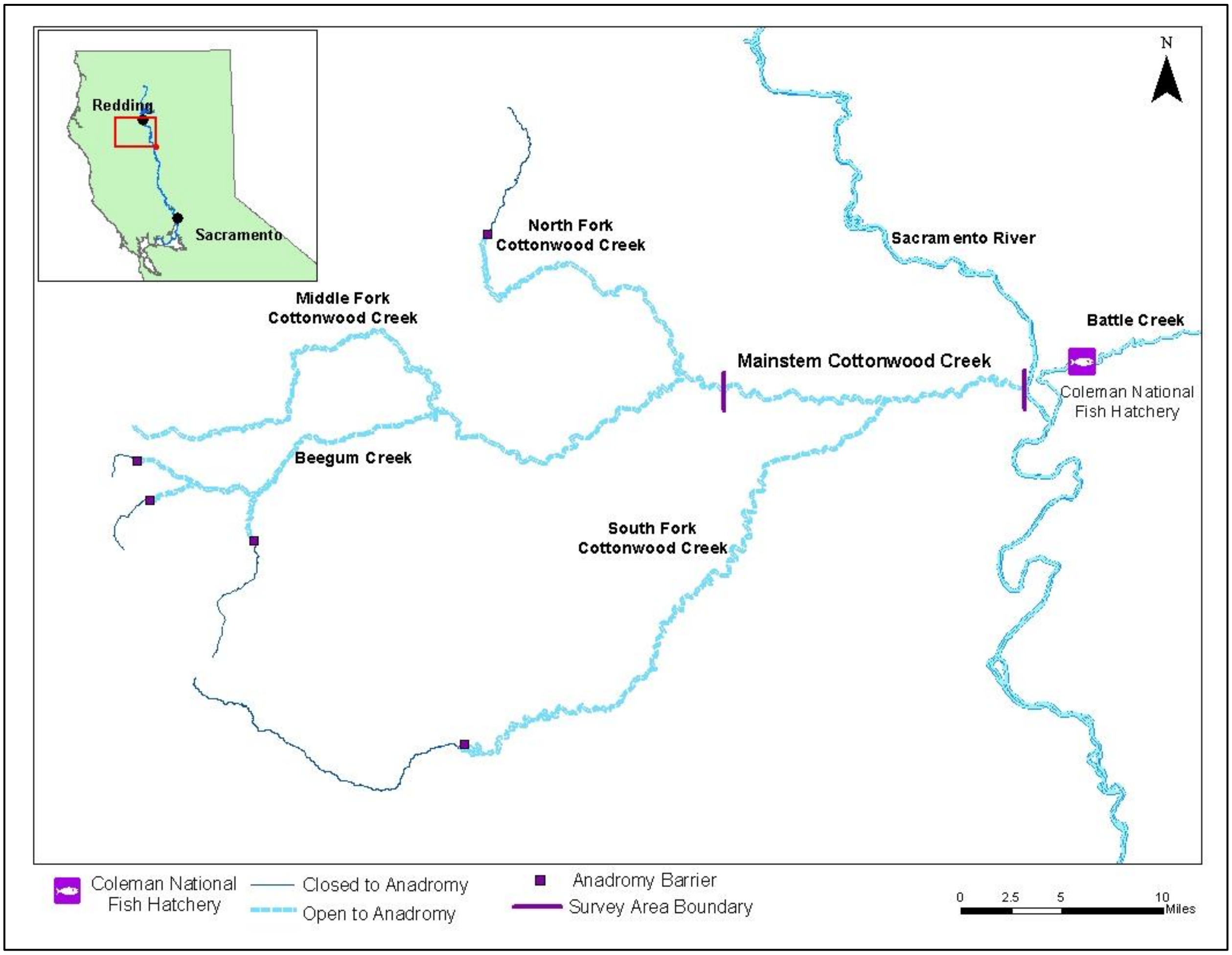


Figure 1. Map of the Cottonwood Creek watershed. Expanded area is indicated in red on the California state map. (Source: CH2M Hill 2002).

Starting in 2007, California Department of Fish and Game (CDFG) staff installed a partial weir and video monitoring equipment near the mouth of Cottonwood Creek to count salmon escapement into Cottonwood Creek (Grifantini *et al.* 2011). In 2010, an additional underwater camera was installed to determine if returning salmon had an adipose fin (Table 1). Full details of the design, function and results of the 2011 FCS video monitoring can be found in Killam and Merrick (2012). Kayak surveys provide additional data that complement video monitoring, including sex, fork length, and CWT recoveries which provide hatchery of origin and age class structure, and the ability to expand CWT data to account for unmarked hatchery-origin salmon.

Table 1. Numbers of fall Chinook salmon observed during video monitoring in Cottonwood Creek from 2007 through 2010. Adipose-fin clipped fall Chinook salmon were enumerated beginning in 2010 and the percentage of those fish within the estimated population is provided in parentheses for that year (Source: Killam and Merrick 2012).

Year	# of fall Chinook observed
2007	1250
2008	510
2009	1065
2010	1139 (8.1%)
2011	2144 (10.9%)

The goal of this monitoring project is to collect CWTs, biological, and genetic samples, and associated information from FCS in Cottonwood Creek, as recommended in the Central Valley In-river Chinook Salmon Escapement Monitoring Plan (Bergman *et al*. 2012). This information will be used to estimate the proportion of hatchery- and natural-origin FCS within the survey area, determine hatchery of origin for hatchery produced salmon straying into Cottonwood Creek, estimate the sex ratio of FCS within the survey area, and determine the age class structure of hatchery-origin FCS. Additionally, the study was designed to provide detailed spatial data on the distributions and abundances of salmon carcasses and redds.

Methods

Survey Area

We surveyed from the confluence of the Sacramento River and Cottonwood Creek upstream for approximately 19.2 miles, with the survey area divided into three reaches. Reach 1, the farthest upstream from the confluence of Cottonwood Creek and the Sacramento River, extended from stream mile (SM) 19.2 to SM 14.1. Reach 2 extended from the downstream limit of Reach 1 to SM 6.7. Reach 3 extended from SM 6.7 to the confluence of Cottonwood Creek with the Sacramento River. The take-out point for reach 3 was on the Sacramento River at the Steelhead Landing Boat Ramp in Lake California, an additional 1.1 miles downstream of the confluence of Cottonwood Creek (Figure 2). Additionally, we conducted one survey of the South Fork of Cottonwood Creek for 6.7 miles, ending 1 mile upstream of the confluence with the main stem of Cottonwood Creek.

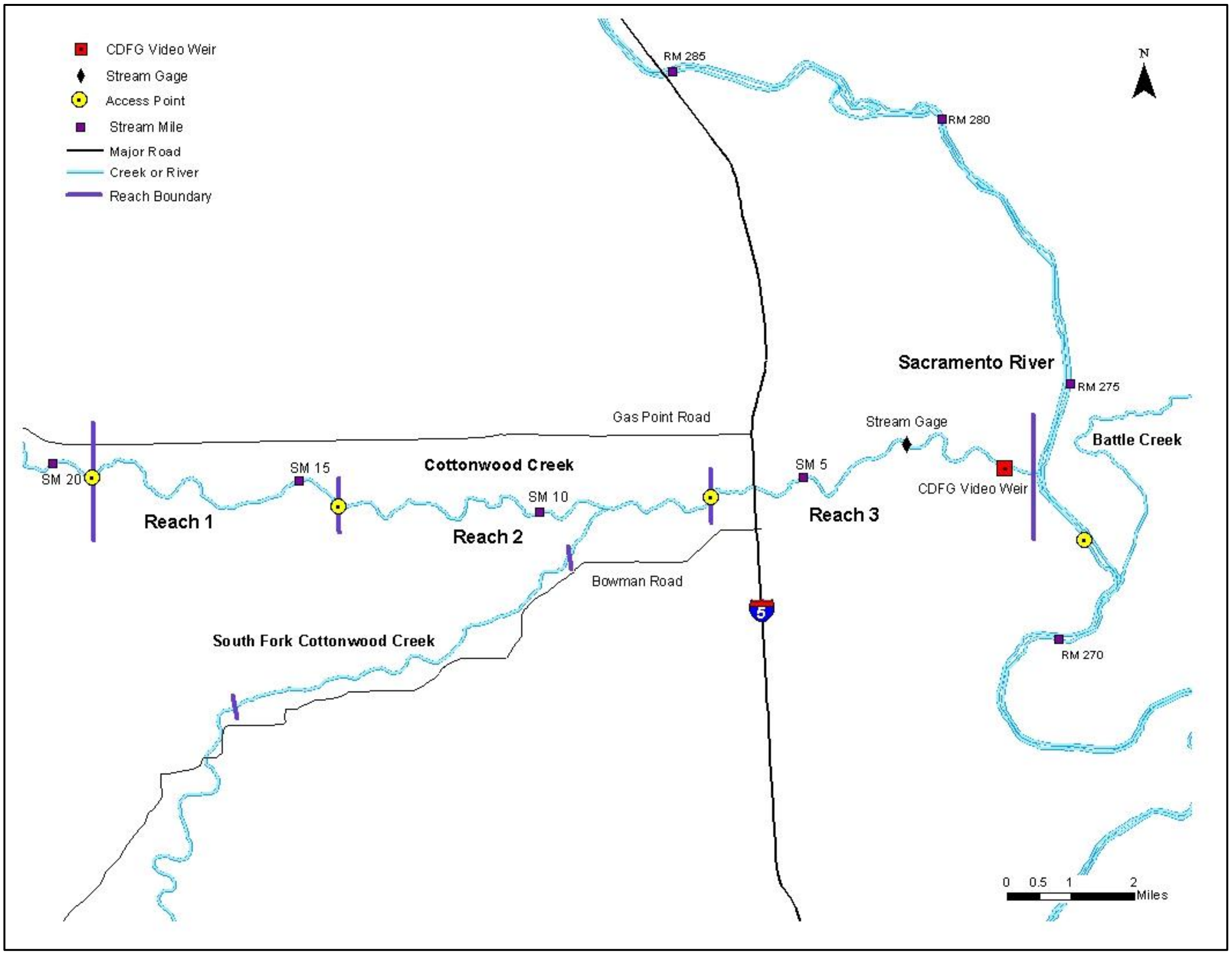


Figure 2. Fall Chinook salmon carcass survey area on Cottonwood Creek during fall 2011.

Sampling Protocol

The survey extended from 13 October 2011 through 16 December 2011 and encompassed the period of FCS spawning in Cottonwood Creek. The survey began prior to the beginning of FCS spawning in Cottonwood Creek and was terminated when the number of carcasses recovered was almost zero and most carcasses recovered were in an advanced state of decay indicating that spawning activity had subsided. Each of the three reaches was surveyed weekly, beginning with the reach farthest downstream and moving upstream on subsequent days. During most weeks, multiple reaches were surveyed simultaneously by different crews to increase the efficiency of shuttling vehicles.

To survey a reach of the creek, two observers kayaked downstream, with each observer focusing attention on opposite sides of the creek. Sampling gear included a data sheet, global positioning system (GPS) device, specimen vials, specimen knives, gaff hook, and a machete. Operator position on the kayak was generally in an upright kneeling position to encompass greater visibility of the creek while paddling. The depth of the creek was variable and at times it became so shallow that it was necessary to walk portions of the creek while surveying. Creek flows were retrieved from the U.S. Geological Survey (USGS) Water Data for the Nation website (http://nwis.waterdata.usgs.gov/nwis) for gauging station Cottonwood Creek near Cottonwood, CA

(USGS 11376000), prior to each survey to assist in assessing creek conditions and the ability of observers to safely and adequately conduct the surveys.

Carcasses were recovered using a 1.5 meter gaff hook as well as hand-picking from the shoreline or in shallow waters. The physical condition of each carcass was estimated as "fresh" or "non-fresh." A carcass was considered fresh if it had at least one clear eye, relatively firm body texture or pink gills. Data collected from carcasses included: date, location (survey reach, GPS waypoint), sex, spawn status (spawned, un-spawned, and unknown), fork length, and adipose fin status (absent, present, and unknown). Spawn status for females was defined as spawned (abdomen extremely flaccid and very few eggs remaining), un-spawned (abdomen firm and swollen or many eggs remaining), or unknown (indeterminable spawn status, usually due to predation on the carcass). The spawn status for males was always categorized as unknown. Fin status was categorized as either "absent", indicating the adipose fin was missing from the fish due to removal prior to being released from the hatchery , "present", indicating the adipose fin was intact on the carcass, or "unknown", which typically resulted when a carcass was either very deteriorated or had been subject to predation. The head was collected from fish with an adipose fin status of absent or unknown. Collected heads were transported to the Red Bluff Fish and Wildlife Office (RBFWO) and subsequently processed for CWT recovery as described in U.S. Fish and Wildlife Service (2005). Carcasses of unknown fin status were subsequently reclassified as "absent" if a CWT was recovered from the head or "present" if no CWT was recovered. A small piece of fin tissue, for genetic run determination and a patch of scales for age-class determination were collected from carcasses. Fin tissues were preserved in 100% ethanol and archived in the USFWS salmonid tissue archive at RBFWO. Scale patches were air dried prior to transferring to the CDFG Central Valley scale ageing project. After data were recorded and samples collected from individual fish, the carcass was cut in half with a machete to prevent resampling and returned to the creek.

Redd Sampling

Redd surveys were performed beginning on 26 October 2011. Redd locations were marked with a GPS point and visual flag along the shoreline. Locations with several redds in close proximity were marked with a single GPS point, flagged, and the number of redds was noted. Counts of the number of redds at previously flagged locations were not performed weekly. Instead, weekly redd surveys were limited to GPS marking and flagging only new redd locations, due to time constraints from processing a greater number of carcasses during the peak of survey. During the week of 27 November, 2011 a final survey was performed to estimate the number and distribution of redds within the survey area.

Data Analysis

Age, hatchery of origin, release group size, and release location were determined for fish with a CWT by decoding the CWT and querying the tag code in the Regional Mark Information System (RMIS; www.rmpc.org), based on protocol used in U.S. Fish and Wildlife Service (2005). The age of CWT fish was determined by identifying brood year relative to return year. Spatial distribution and sex composition were compared between natural-origin and hatchery-origin carcasses.

An expansion factor was calculated for each CWT group and the total number of fish represented by that CWT code was estimated by dividing the number of fish recovered with that CWT code by the expansion factor.

$$Expansion\ Factor = \frac{number\ of\ marked\ and\ tagged\ juvenile\ fish\ in\ a\ CWT\ group}{total\ marked\ and\ unmarked\ juvenile\ fish\ represented\ by\ the\ CWT\ group}$$

For example, if a CWT is recovered from a group of fish that had a 25% mark rate, then the expansion factor for this particular CWT would be 0.25, and the expanded number for each fish recovered would be 4. In this case, each CWT recovery represents 4 hatchery-origin fish, 1 marked fish and 3 unmarked fish. Based on these expanded numbers, hatchery-origin contribution percentages were calculated.

Results

Carcass Recoveries

We observed 435 carcasses during the survey period, representing 20.3% of the total FCS escapement (*N* = 2,144) into Cottonwood Creek in 2011 as estimated at the Cottonwood Creek video weir (Killam and Merrick 2012). Biological data, such as fork length, sex, and spawn condition, was recorded for 401 carcasses, and 360 fin tissue samples and 282 scale patches were collected. All data and percentages presented are based on the 401 carcasses with associated biological data unless otherwise noted. One hundred twenty-seven fresh and 274 non-fresh carcasses were recovered.

Coded-wire Tag Recoveries

The head was collected from 61 salmon carcasses, including 53 from salmon with an absent adipose fin and 8 from salmon with an unknown adipose fin status. A CWT was recovered from 54 of the heads collected. Tags were not detected in 6 heads (1 absent adipose fin and 5 unknown adipose fin status) and 1 tag was lost prior to being read. Three of the 8 heads collected from carcasses with unknown adipose fin status contained a CWT. The 5 carcasses of unknown adipose fin status from which no CWTs were recovered were reclassified as “present” adipose fin status for subsequent analyses. An additional fresh absent adipose fin fish was found without a head, most likely due to depredation (otters or scavengers). This carcass, along with the 1 lost CWT and the 1 head without a CWT from an absent adipose fin carcass, were categorized as “No CWT” for subsequent analysis, as described below.

Hatchery-origin Returns

Application of the expansion factors to the 57 hatchery-origin fish (54 CWT recoveries and 3 “No CWT”) to account for unmarked hatchery production yields an estimate of 220 hatchery-origin salmon recovered in the survey area, representing 54.9% of all sampled carcasses. Hatchery-origin carcasses categorized as “No CWT” were given an assumed expansion factor of 0.25, because most FCS are marked at a 25% fin-clip rate.

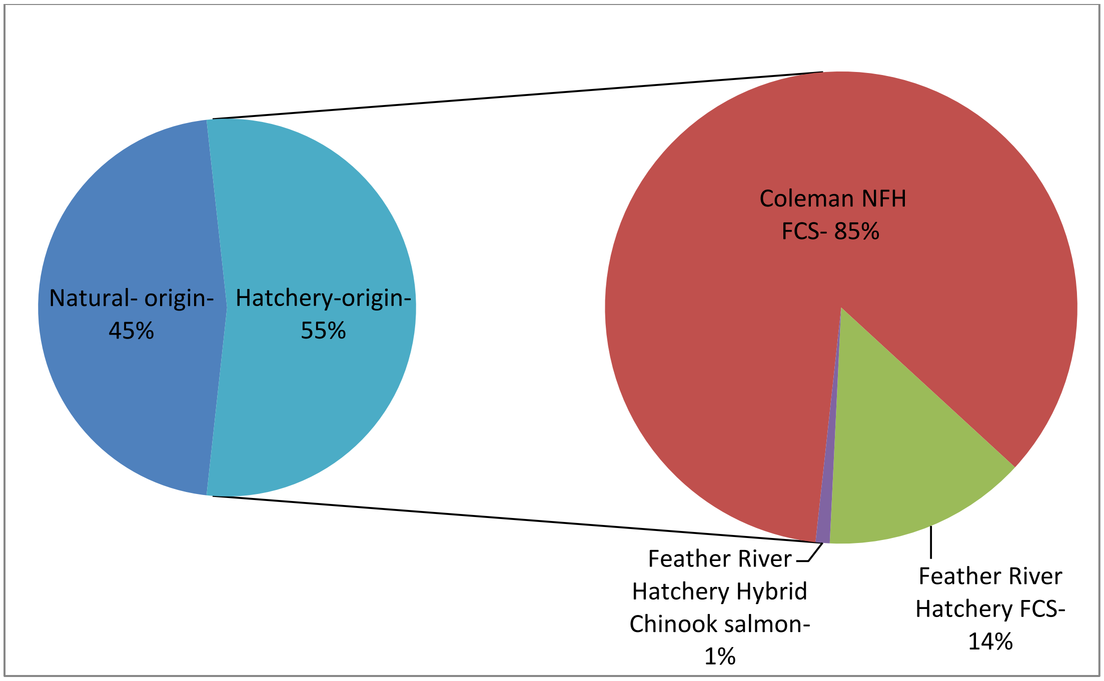


Figure 3. Hatchery contributions to 2011 fall Chinook salmon carcass recoveries in Cottonwood Creek based on CWT expansions.

CWT recoveries were classified as: Coleman NFH FCS onsite releases (*N* =38 recovered, *N* = 153 expanded), Coleman NFH FCS offsite (San Pablo Bay) releases (*N* = 6 recovered, *N* = 24 expanded), Feather River Hatchery FCS offsite (San Pablo Bay and Santa Cruz) releases (*N* = 8 recovered, *N* =29 expanded), Feather River hybrid (e.g., FCS x spring Chinook salmon) Chinook salmon offsite (San Pablo Bay and San Francisco Bay) releases, (*N* =2 recovered, *N* = 2 expanded), or no CWT (*N* =3 recovered, *N* = 12 expanded) (Figure 3). No late-fall Chinook salmon or spring Chinook salmon were recovered. Sixty-eight percent of recovered males were of hatchery-origin, and hatchery-origin females were 24.5% of all recovered females.

Temporal and Spatial Distribution
A total of 127 fresh carcasses were recovered with the peak recovery of fresh carcasses during the week of 6 November 2011, and the last fresh carcass was recovered on 30 November 2011. Numbers of fresh carcass recoveries by date were highest before and during this peak fresh carcass recovery week (6 November through 12 November 2011), with 56% of fresh females and 71% of fresh males recovered (Figure 4). The peak passage of FCS through the video station (*N* = 579) occurred during the week of 2 October 2011 (Killam and Merrick 2012).

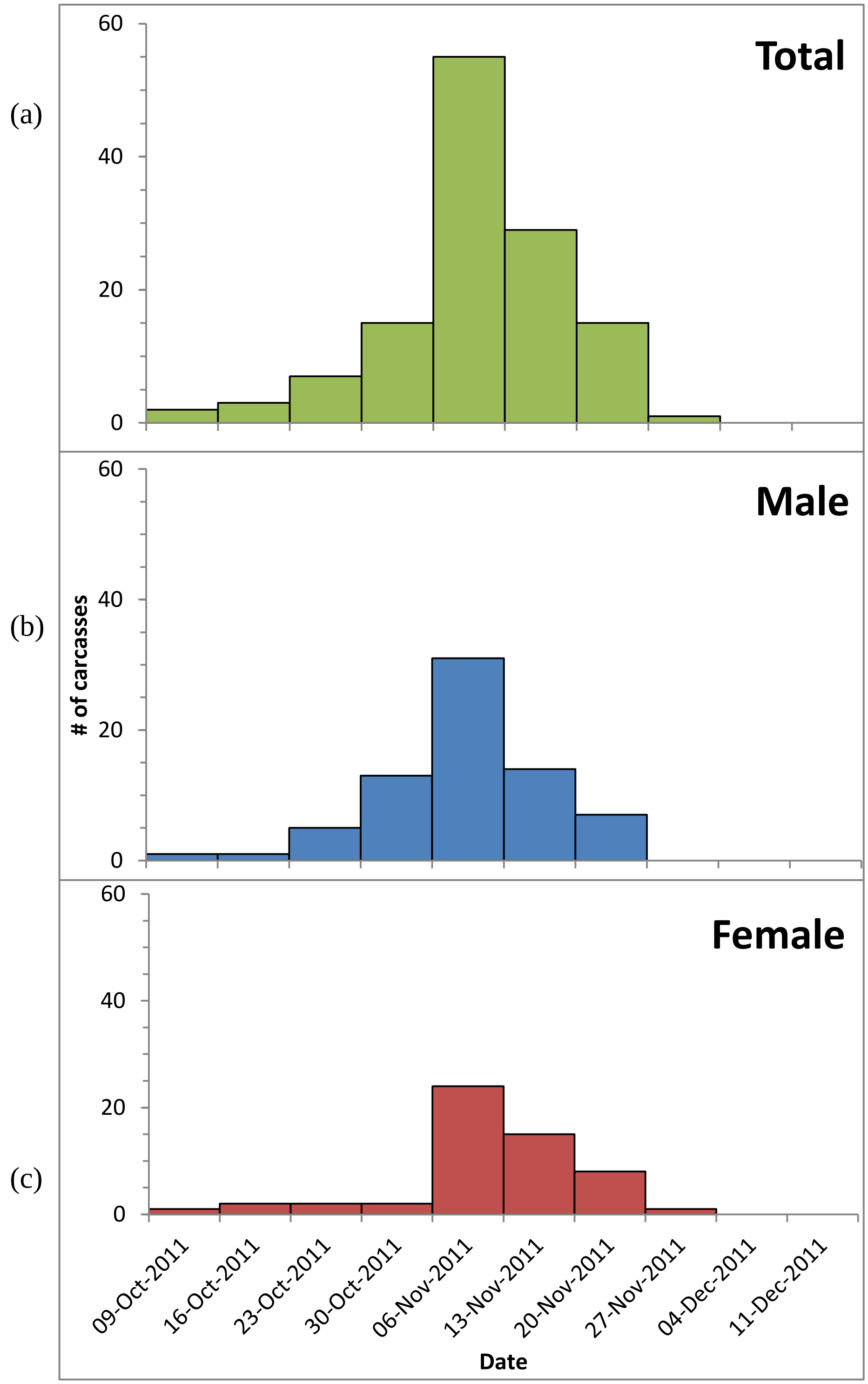


Figure 4. (a) Total fresh fall Chinook salmon carcasses recovered in Cottonwood Creek during fall 2011 by week beginning with date indicated (b) fresh adult male carcasses by week recovered (c) fresh female carcasses by week recovered.

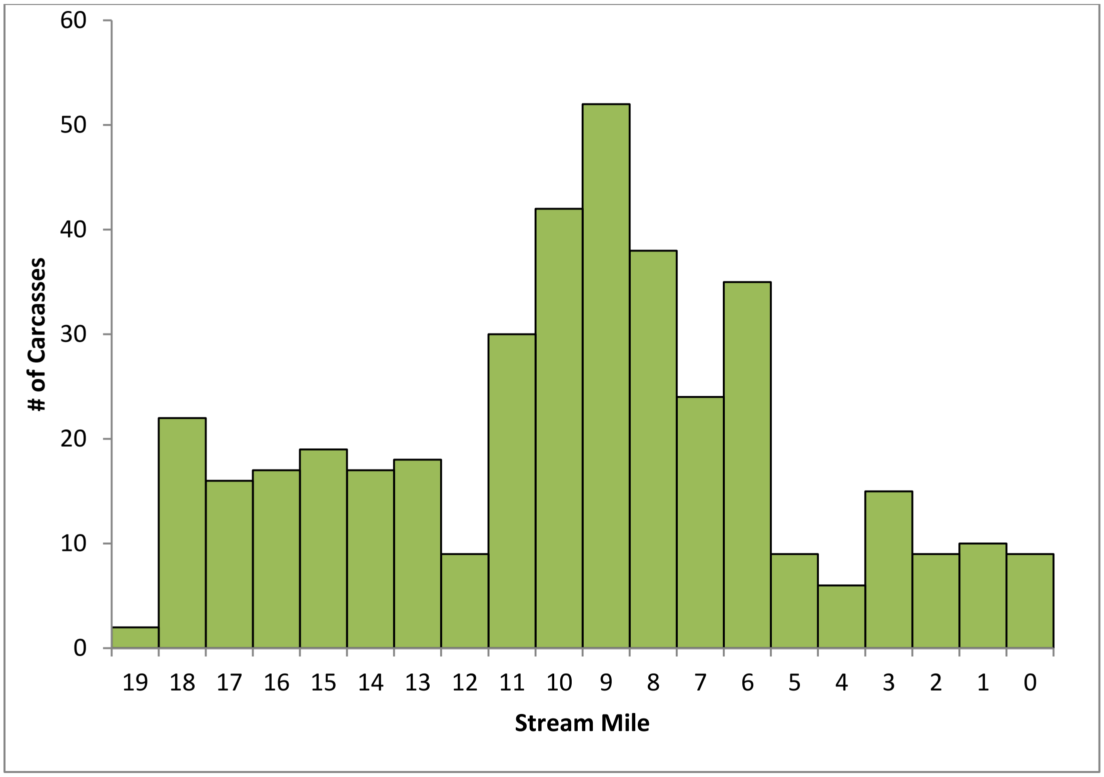


Figure 5. Fall Chinook salmon carcass distribution by stream mile in Cottonwood Creek during fall 2011.

The spatial distribution of recovered carcasses showed that the majority of the carcasses were found between SM 6 and SM 11 and the greatest number in SM 9, with 69.9% of carcasses found in or downstream of this section (Figure 5).

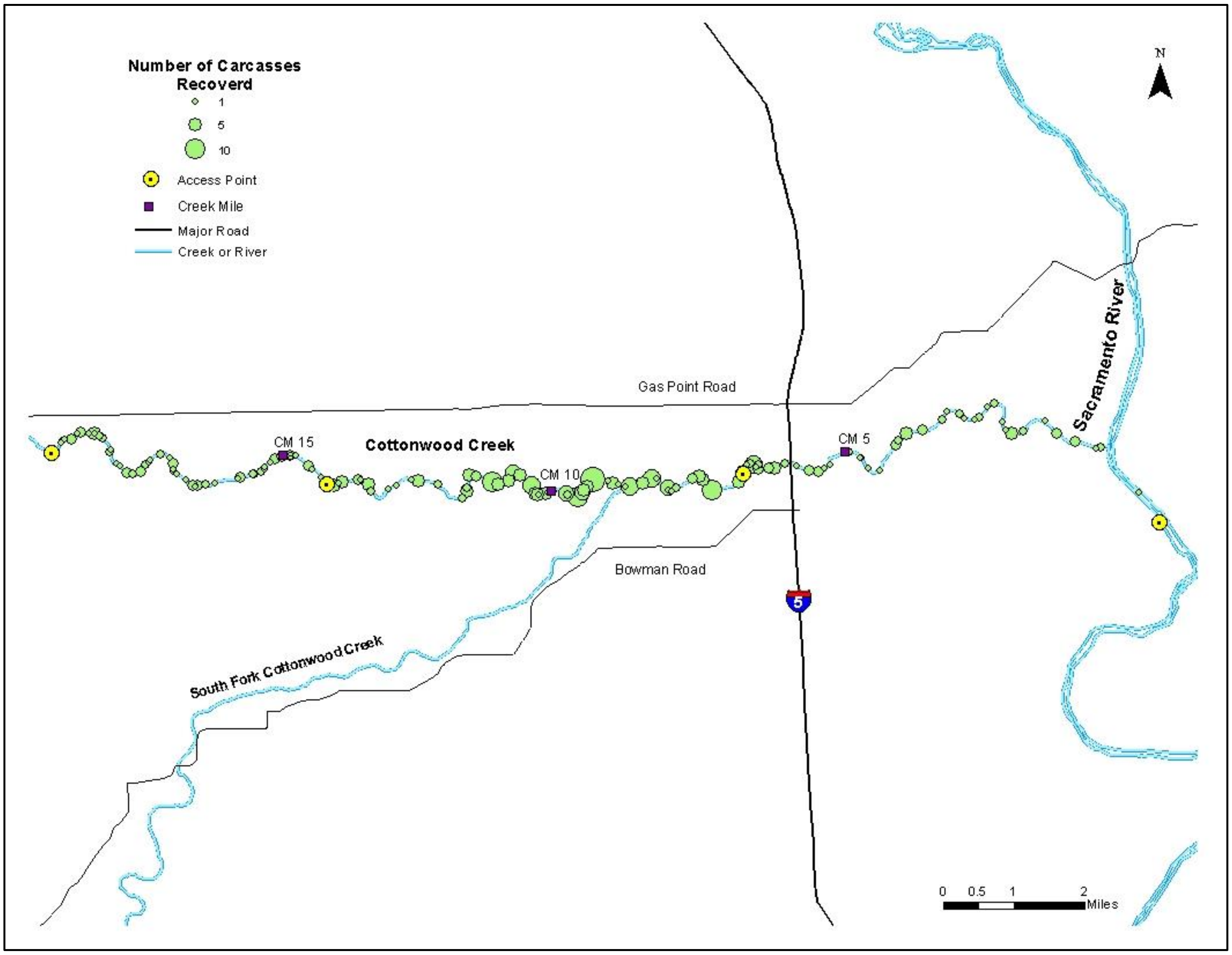


Figure 6. Fall Chinook salmon carcass distribution on Cottonwood Creek during fall 2011.

Analysis of spatial distribution of carcass recoveries showed the peak recovery area was between SM 6 and SM 11 (Figure 6). No carcasses were recovered on the one survey of the South Fork. A greater number of males were recovered farther downstream in the system than females. Only 3% of females were recovered downstream of the peak recovery area (SM 6- SM 11), compared to 19% of all males (Figure 7). During the single survey on the South Fork of Cottonwood creek, no carcasses were recovered.

(a)

(b)

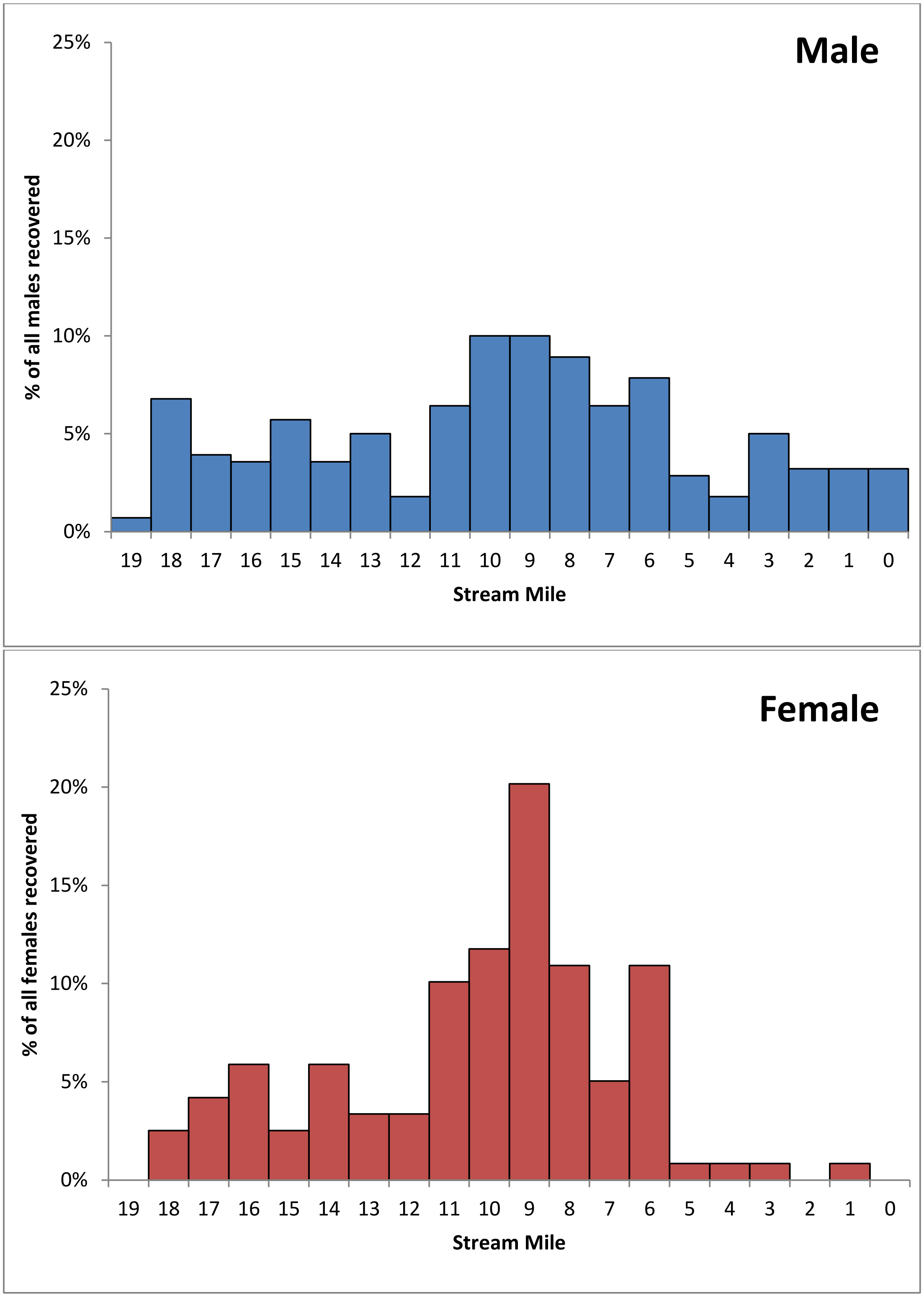
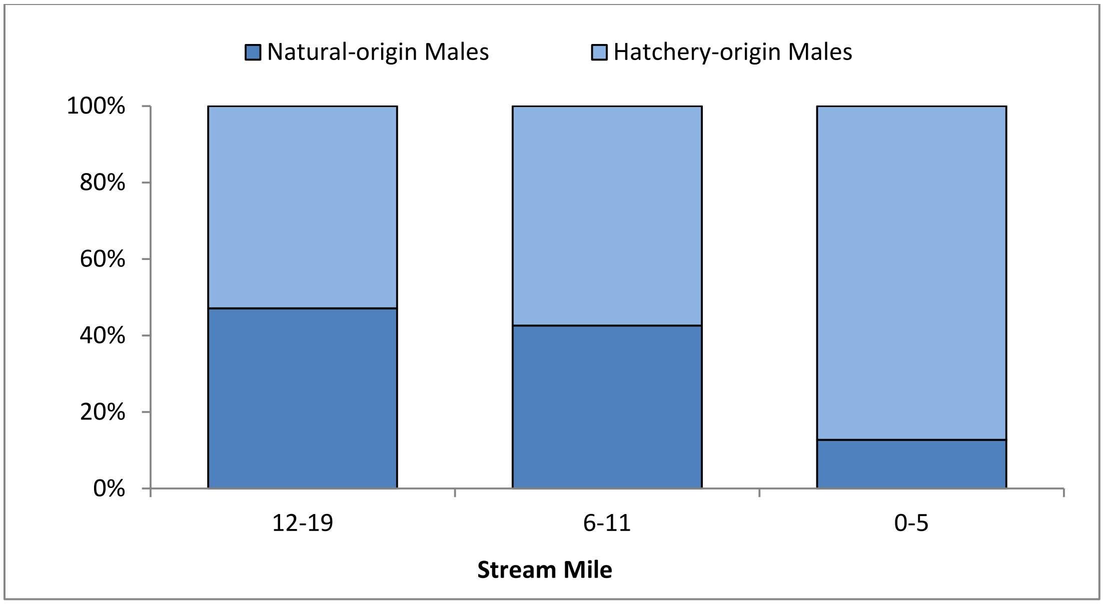


Figure 7. Proportion of total carcass recoveries for (a) males, and (b) females based on recovery location of fall Chinook salmon carcasses in Cottonwood Creek during fall 2011.

(a)



(b)

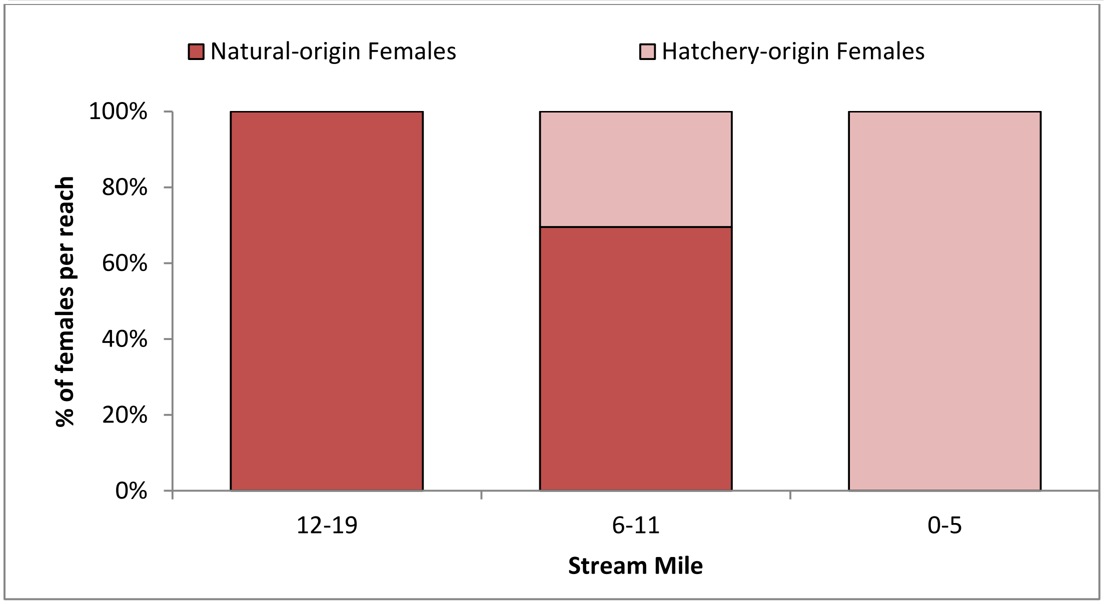
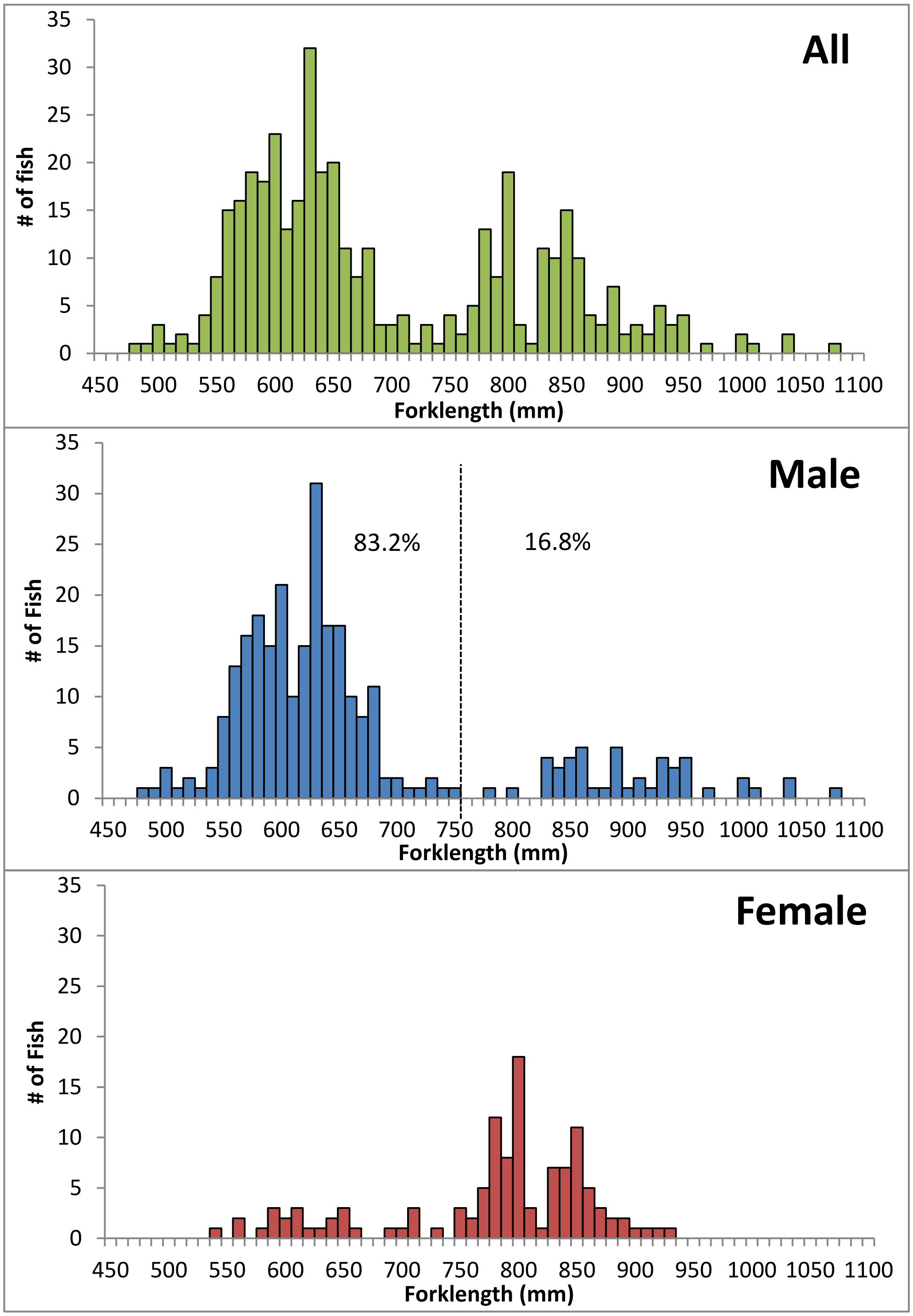


Figure 8. (a) Proportion of natural-origin males and hatchery-origin males of all fall Chinook salmon males recovered in Cottonwood Creek during fall 2011. (b) Proportion of natural-origin females and hatchery-origin females of all fall Chinook salmon females recovered in Cottonwood Creek during fall 2011.

The percentage of hatchery-origin fish recovered decreased for both males and females in survey areas farther upstream from the confluence with the Sacramento River (Figure 8). Hatchery-origin males comprised 87.3% of recoveries in SM 0- 5, 57.4% of recoveries in SM 6-11, and 52.9% of recoveries in SM 12-19. Hatchery-origin females comprised 100%, 30.5% and 0% of recoveries in SM 0-5, SM 6-11 and SM 12-19, respectively.

Composition and Length-at-Age



(a)
(b)
(c)

Figure 9. (a) Length frequency distributions of all fall Chinook salmon carcasses (*N* = 398) recovered on Cottonwood Creek, during fall 2011. (b) Length frequency distribution of male carcasses (*N* = 279). An estimated grilse cutoff was set at >750 mm and is shown as a dotted black line for males. Percentages of fish above and below this cutoff are shown. (c) Length frequency distribution of female carcasses (*N* = 119). A grilse cutoff was not determined for females due to small sample size.

Length frequency distribution analysis of all carcasses showed bi-modal distribution. Analysis of males recovered showed an approximate break at 750 mm between the modes (Figure 9). The 750 mm break was used to estimate proportions of grilse (age-2) and adult (age-3 and age-4) fish, with larger fish considered to be adults (17%; *N* = 47) and smaller fish considered to be grilse (83%; *N* = 232). Females, however, did not have a distinct bimodal distribution, likely as few females return at age 2. This assumption was supported by the lack of grilse female CWT recoveries (Figure 10).

Based on recovered CWTs, 80.8% of hatchery-origin carcasses were grilse (*N* = 178) and 19.2% were adult (*N* = 42 total; *N* = 34 age-3 and *N* = 8 age-4). One hundred percent of hatchery-origin females were adults (*N* = 29 total; *N* = 25 age-3 and *N* = 4 age-4), whereas 93.2% of hatchery-origin male carcasses were grilse (*N* = 178) and 6.8% were adults (*N* = 13 total; *N* = 9 age-3 and *N* = 4 age-4) (Figure 10).

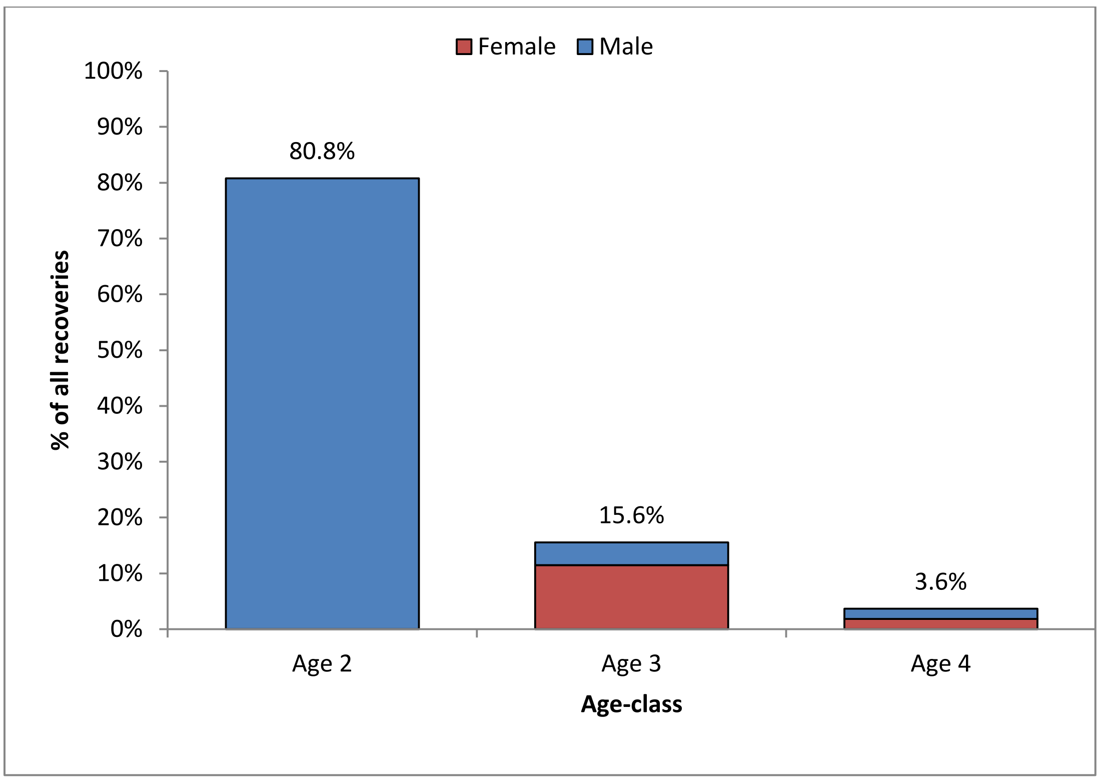


Figure 10. Age composition by sex of hatchery-origin fall Chinook salmon carcasses recovered in Cottonwood Creek during fall 2011.

Sex Ratio

Of the 401 carcasses recovered, 281 were males and 119 were females for a sex ratio of 2.4:1. Sex was not recorded for one carcass. The sex ratio for hatchery-origin males (*N* = 191) to hatchery-origin females (*N* = 29) was 6.6: 1, based on expanded CWT recoveries. Conversely, the sex ratio for natural-origin males (*N* = 90) to natural-origin females (*N* = 90) was 1:1, based on the assumption that the number of natural-origin males and females equals the total number of each sex minus the CWT expansion number.

Redds
A total of 147 redds were found at 76 different locations. No redds were observed within 2 miles of the confluence with the Sacramento River. The location of the highest concentration of redds correlates with the highest concentration of carcasses (Figure 5); 53% of redds were found between SM 6 to SM 11. Twenty two percent of redds were found downstream of SM 6 while 25% were found upstream of SM 11 (Figure 11).

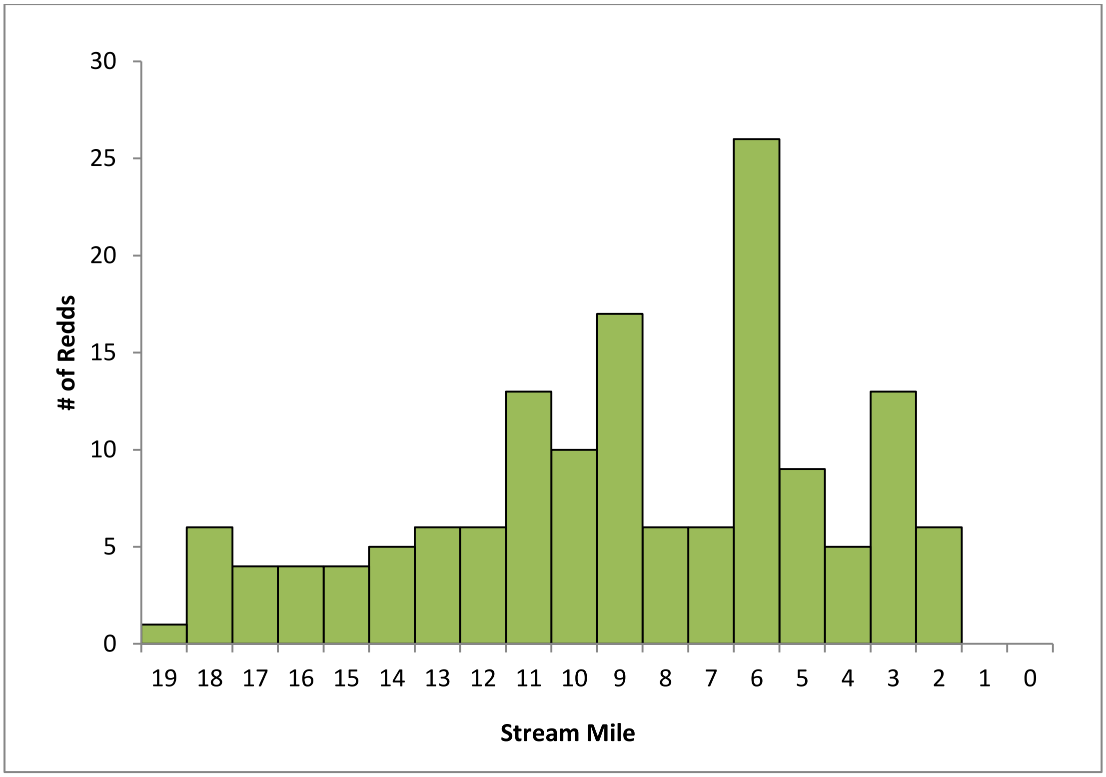


Figure 11. Redd distribution by stream mile in Cottonwood Creek during fall 2011.

Redd final counts during the week of 27 November 2011 were used to determine the distribution of salmon spawning within the survey area (Figure 12). It is expected that the total number of redds may be underestimated from diminished visibility due to sedimentation or deteriorated condition late in the spawning season, but we believe the data still represents an approximate distribution and abundance of spawning within the surveyed area of Cottonwood Creek.

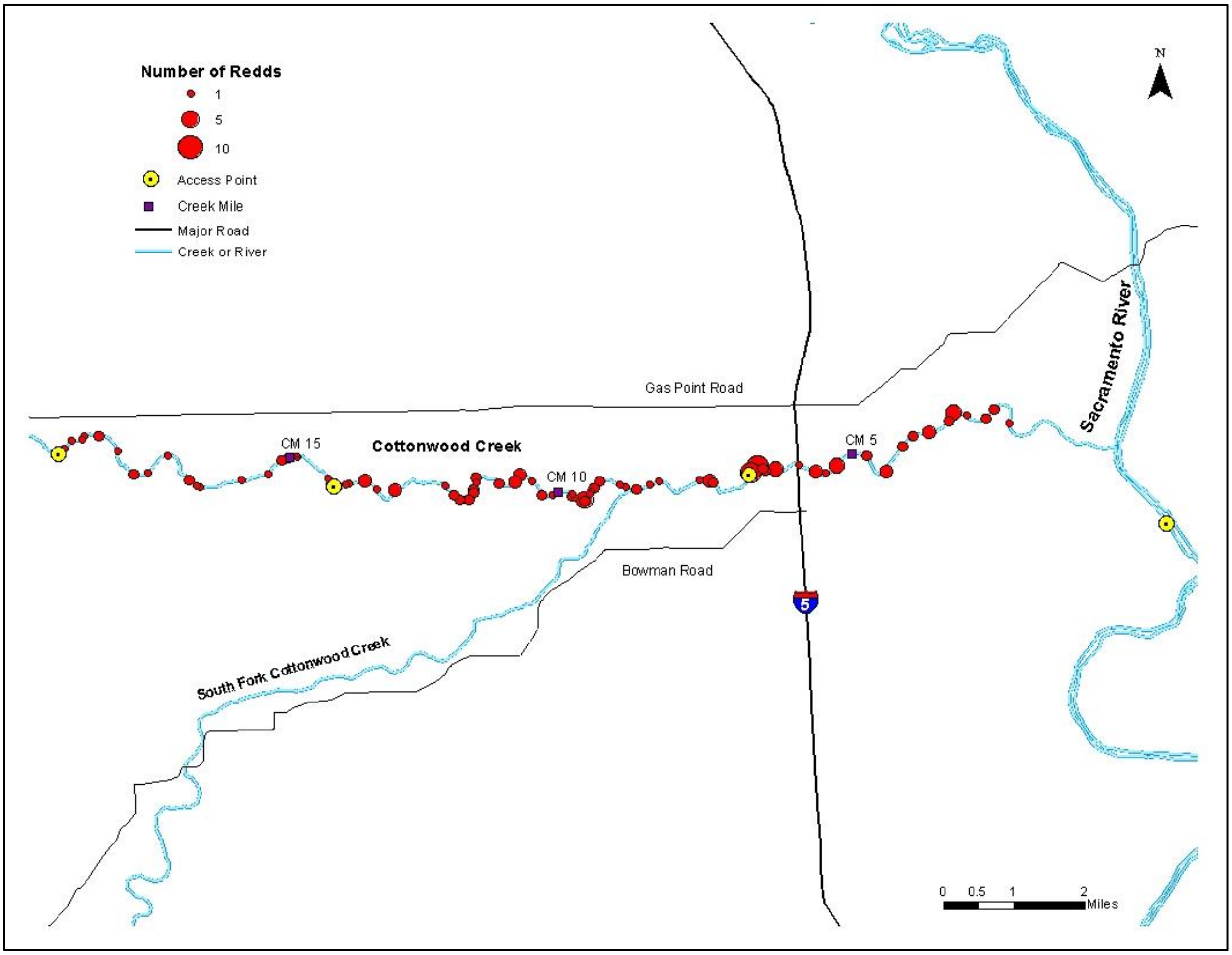


Figure 12. Redd distribution and abundance in Cottonwood Creek during the week of 27 November 2011.

Creek Conditions

Average flow in the creek during the survey period was 118 cubic feet per second (cfs) (min 92 cfs, max 278 cfs) (http:// nwis.waterdata.usgs.gov/nwis). Average water temperature over the entire period at the site of the video weir (SM 1) was 54.2 Fahrenheit (F) (min 40.7 F, max 71.1 F) (Doug Killam, California Department of Fish and Game, personal communication). The flows during FCS migration were within the range observed over the last 10 years. We did not, however, observe high flows late in the season, as was observed in 6 of the last 10 years (http://nwis.waterdata.usgs.gov/nwis).

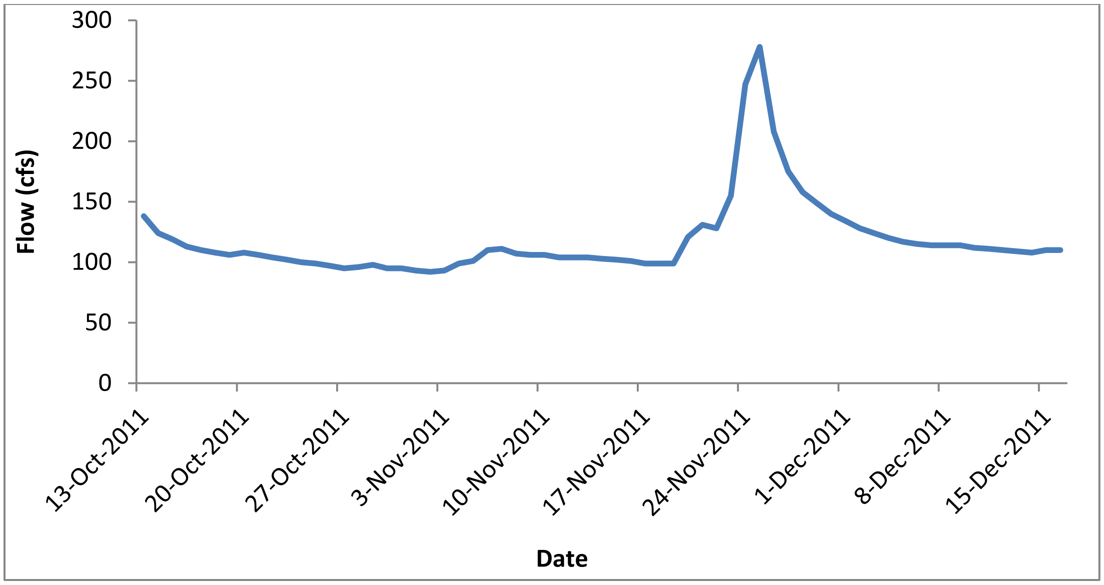


Figure 13. Flow in Cottonwood Creek from October 13, 2011-December 16, 2011 at the Cottonwood Creek near Cottonwood, CA gage (USGS 11376000) located downstream of the I-5 bridge.

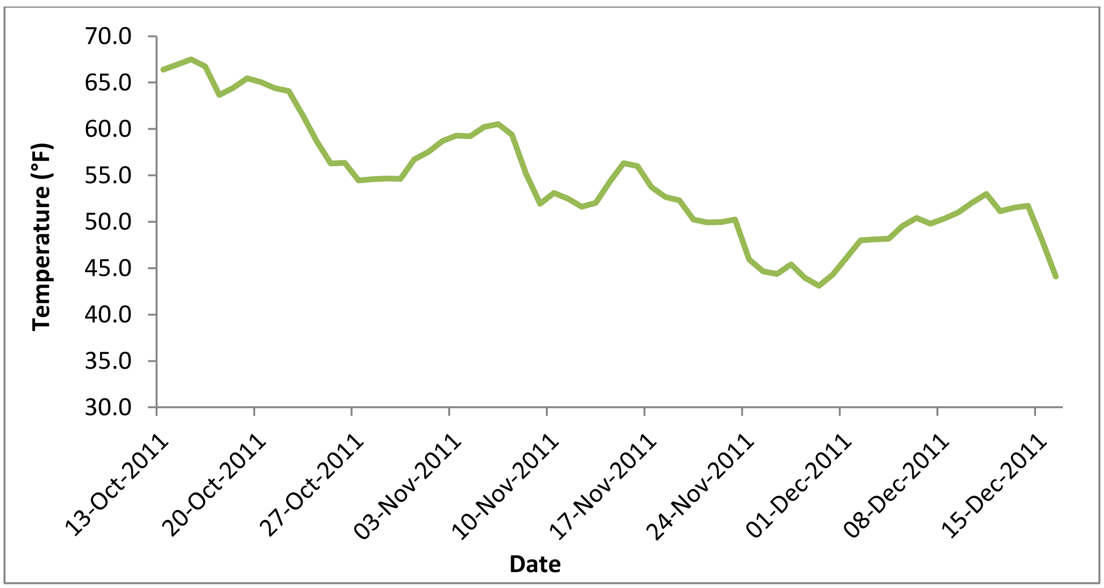


Figure 14. Average daily water temperature at the CDFG Cottonwood Creek video weir site (Doug Killam, CDFG, personal communication).

Discussion

Expansions of CWT recoveries showed that almost 55% of recovered carcasses in Cottonwood Creek were of hatchery-origin. Releases of FCS from Coleman NFH had the greatest contribution, followed by Feather River Hatchery fall and hybrid run Chinook salmon. Coleman NFH is located on Battle Creek in Anderson, CA, and the confluence of Battle Creek with the Sacramento River is only 2 miles downstream of the mouth of Cottonwood Creek. The proximal location of Cottonwood Creek to Coleman NFH is likely the reason for the high percentage of recovered hatchery-origin carcasses originating from this hatchery relative to other Central Valley Hatcheries.

The hatchery-origin recoveries were dominated by jacks, and this strong age-2 class among hatchery males influenced the sex ratio of recovered carcasses; hatchery-origin males were recovered at a rate 6.6 times greater than hatchery-origin females, compared to equal recovery ratios based on sex in natural-origin populations. Hatchery-origin males were recovered at a rate twice that of natural-origin males, whereas hatchery-origin females were recovered at one-third the rate of natural-origin females. This difference may be a factor of the high abundance of age-2 class hatchery-origin males, which was also been observed in other Sacramento River tributaries in 2011, or this data might suggest that hatchery-origin males stray at a higher rate than hatchery-origin females. Hatchery-origin Chinook salmon have been shown to return at an earlier age compared to natural-origin fish and these fish are predominantly males (Shearer and Swanson 2000, Shearer *et al*. 2000, Shearer *et al.* 2002, Larsen *et al*. 2004). Higher stray rates have been observed in transported hatchery-origin males than hatchery-origin females, and higher stray rates in younger age-class fish have been seen in other watersheds (Hard and Heard 1999). The opposite has been true, however, for age-class stray rates in other studies (Quinn *et al*. 1991; Pascual *et al*. 1995), so this variance in Cottonwood Creek cannot be exclusively attributed to either sex or age-class.

Fall Chinook salmon are historically valley floor spawners that remain in lower elevations (Yoshiyama *et al.* 2001). Historical data shows that a majority of FCS spawning within Cottonwood Creek occurred downstream of the confluence of the Middle and North Forks (SM 22) (CH2MHill 2002). FCS have been observed spawning in the North Fork of Cottonwood Creek (CH2MHill 2002), but the suitable habitat may be limited (Yoshiyama *et al.* 2001). FCS have historically spawned on the South Fork, but the extent of anadromous habitat is unclear (Yoshiyama *et al.* 2001; CH2MHill 2002). The south fork of Cottonwood Creek was surveyed once on 21 October 2011. Low water flow conditions and the observation of only a single live jack during our only survey of that area suggested that FCS spawning in the South Fork of Cottonwood Creek was unlikely, or nonexistent, in 2011, and surveys were discontinued. Comparatively, during the same week (16 October 2011 through 22 October 2011), 7 fresh carcasses were recovered on the mainstem of Cottonwood Creek, and live fish were observed.

Due to access permission from private streamside landowners, time, and personnel constraints, the survey was limited to approximately 20 miles of creek. Analysis of carcass distributions showed that a higher proportion of hatchery-origin FCS was found closer to the confluence with the Sacramento River. Additionally, a greater number and proportion of all males were found closer to the confluence than females, which is commonly seen in carcass surveys for Chinook salmon. Males are often observed moving downstream after spawning whereas females will typically guard their redds (Killam 2009). Therefore, the carcasses of females are usually found in closer proximity to spawning areas. Furthermore, carcasses and redds were found near the upstream boundary of surveyed areas, indicating that spawning upstream of the survey area likely occurred, and, based on our observations, may have consisted of a higher percentage of natural-origin salmon than hatchery-origin salmon. Due to the strong age-2 class hatchery-origin male returns, increasing proportion of natural-origin carcass recoveries farther upstream, and that our survey was limited to the first 19.2 miles of Cottonwood Creek, there may be a bias towards recovering hatchery-origin carcasses, as there may have been a potential for more natural-origin and female FCS recoveries further upstream. This implies that the proportion of hatchery-origin fish may be lower for the entire population of FCS in Cottonwood Creek than was observed on the survey.

The video weir operated by CDFG estimated the Cottonwood Creek FCS escapement at 2144, with 10.9% of returning FCS having clipped adipose fins (Killam and Merrick 2012). This carcass survey recovered 20.3% of the estimated escapement and 13.7% of recovered carcasses were adipose fin-clipped. Estimations of the hatchery-origin salmon escapement into Cottonwood Creek can be calculated using both carcass survey and video weir data. Based on CWT expansion factors from recovered carcasses, the hatchery-origin contribution was 54.9%, or 1177 salmon. Based on the adipose fin-clip rate seen at the CDFG video weir (10.9%), with an assumed expansion factor of 0.25 (due to the 25% constant fractional mark of FCS in the Central Valley), hatchery-origin contribution was 43.6% or 935 salmon.

Water turbidity can limit the ability to distinguish adipose fin-clipped salmon with the video weir, but in 2011 the water was clear, and there were no complications due to water clarity (Doug Killam, CDFG, personal communication). Based on the distributions of hatchery-origin carcasses further downstream in Cottonwood Creek compared to natural-origin carcasses, the lack of a data upstream of SM 19.2, and the lower proportion of adipose-fin clipped fish observed at the CDFG video weir, we believe the estimate of the proportion of hatchery-origin fish recovered within the survey area, is likely higher than for the entire fall Chinook population in Cottonwood Creek. We believe that the video weir estimate of hatchery-origin salmon escapement into Cottonwood Creek is more accurate for 2011, but the actual number of hatchery-origin fish is probably within the range of the two calculations (935-1177).

Carcass surveys were able to supplement the data collected by CDFG by providing biological samples, estimating the proportion of hatchery- and natural-origin FCS within the survey area, determining hatchery of origin for hatchery produced salmon straying into Cottonwood Creek, estimating the sex ratio of FCS within the survey area, and determining the age class structure of hatchery-origin FCS. Surveys were completed on a weekly basis; therefore, predation or other factors may have removed carcasses from the system before we had the opportunity to recover them. Aerial redd surveys, additional kayak carcass survey reaches, or an additional upstream video weir could provide increased understanding of the distribution of spawning of FCS within Cottonwood Creek. Collecting multiple years of data from Cottonwood Creek would allow us to assess the annually variability of hatchery-origin returns, sex ratio and age-class structure. Additionally, gaining access to a larger area of Cottonwood Creek and collecting data from other tributaries of the upper Sacramento River could expand knowledge of straying of hatchery-origin fish to evaluate potential impacts on natural salmonid populations.

Acknowledgements

Funding for this project was supplied by the Comprehensive Assessment and Monitoring Program. This report received editorial review from Kevin Niemela, Doug Threloff, Tricia Parker Hamelberg, Brenda Olson, Tricia Bratcher, Doug Killam, Brett Kormos, Stan Allen, and Alice Low . Data were collected through a cooperative effort from staff of the U.S. Fish and Wildlife Service (Sarah Austing, Curtis Brownfield, Andy Holland, Robert Null, Kevin Offill, Brenda Olson, Tricia Parker Hamelberg, and Doug Threloff), the Pacific States Marine Fisheries Commission (Kate Merrick and Molly Schmelzle) and the Department of Fish and Game (Tricia Bratcher), with cooperation from Stan Allen and Amy Roberts (PSMFC). We would like to sincerely thank the landowners along Cottonwood Creek for their cooperation and support, without which this study would not have been possible.

Literature Cited

Bergman, J.M., R. Nielson, and A. Low. 2012. Central Valley in-river Chinook salmon escapement monitoring plan. California Department of Fish and Game. Fisheries Branch Administrative Report: 2012-1.

Buttars, B. 2011. Constant fractional marking/ tagging program for Central Valley fall Chinook salmon, 2011 marking season. Pacific States Marine Fisheries Commission.

California Department of Fish and Game, comp. "Adult Return-Estimates of Spawning Population." *CalFish Query*. CalFish, 2009. Web. 21 Feb. 2012. <http://q.streamnet.org/Request.cfm?Cmd=BuildQuery&ID=90703&DataCategory=8&NewQuery=BuildCriteria&XML=T&XSL=http://www.calfish.org/portals/0/DataMaps/DataQuery/calfish2.xsl#>.

CH2MHill. 2002. Cottonwood Creek Watershed Assessment. Report prepared by CH2MHill (2525 Airpark Drive, Redding CA) for the Cottonwood Creek Watershed Group. http://twiki.sacriver.org/pub/Main/CottonwoodCreekWatershedAssessmentReport/CottonwoodCrk_Watershed_Assessment.pdf

Cuenco, M. L., T. W. H. Backman, and P. R. Mundy. 1993. The use of supplementation to aid in natural stock restoration. Pages 269-293 *in* J. G. Cloud and G. H. Thorgaard, eds. Genetic conservation of salmonid fishes. Plenum Press, New York.

Dittman, A. H., and T. P. Quinn. 1996. Homing in Pacific salmon: mechanisms and ecological basis. The Journal of Experimental Biology 199: 83-91.

Grifantini, M. C., G. Grifantini, R. Teubert, R. Aschbacher, and M. Mitchell. 2011. Video weir technology pilot project final project report 2007-2010 fall Chinook salmon escapements Cottonwood, Cow and Bear Creeks Shasta and Tehama County, CA. Western Shasta Resource Conservation District.

Hard, J. J., and W. R. Heard. 1999. Analysis of straying variation in Alaskan hatchery Chinook salmon (*Oncorhynchus tshawytscha*) following transplantation. Canadian Journal of Fisheries and Aquatic Science 56: 578-589.

Hard, J.J., R.P. Jones, Jr., M.R. Delarm, and R.S. Waples. 1992. Pacific salmon and artificial propagation under the Endangered Species Act. NOAA Technical Memorandum, NMFS-NWFSC-25. 25 pp.

Killam, D. 2009. Chinook salmon population for the upper Sacramento River basin in 2008. California Department of Fish and Game, Sacramento River Salmon and Steelhead Assessment Project Technical Report No. 09-1.

Killam, D. and K. Merrick. 2012. Results from the Cottonwood Creek video station for years 2007-2011 for fall-run Chinook salmon escapement. California Department of Fish and Game. RBFO Technical Report No. 01-2012.

Kormos, B., M. Palmer-Zwahlen, and A. Low. 2012. Recovery of coded-wire tags from the Chinook salmon in California's Central Valley escapement and ocean harvest in 2010. California Department of Fish and Game. Fisheries Branch Administrative Report 2012-02.

Larsen, D.A., B.R. Beckman, K.A. Cooper, D. Barrett, M. Johnston, P. Swanson, and W.W. DickHoff. 2004 Assessment of high rates of precocious male maturation in a spring Chinook salmon supplementation hatchery program. Transactions of the American Fisheries Society 133:98-120.

Pascual, M. A., T. P. Quinn, and H. Fuss. 1995. Factors affecting the homing of fall Chinook salmon from Columbia River Hatcheries. Transactions of the American Fisheries Society 124(3): 308-320.

Quinn, T. P., R. S. Nemeth, and D. O. McIsaac. 1991. Homing and straying patterns of fall Chinook salmon in the lower Columbia River. Transactions of the American Fisheries Society 120: 150-156.

Quinn, T. P. 1993. A review of homing and straying of wild and hatchery-produced salmon. Fisheries Research 18(1-2): 29-44.

Shearer, K. D., and P. Swanson. 2000. The effect of whole body lipid on early sexual maturation of 1+ age male Chinook salmon (*Oncorhynchus tshawytscha*). Aquaculture 190:343–367.

Shearer, K. D., P. Swanson, B. Campbell, B. R. Beckman, P. Parkins, and J. T. Dickey. 2000. The effects of growth rate and a low fat diet on the incidence of early sexual maturation in male spring Chinook salmon (*Oncorhynchus tshawytscha*). Pages 38–76 *in* B. A. Berejikian, editor. Research on captive broodstock programs for Pacific salmon. Report to Bonneville Power administration, contract 199305600, report DOE/BP-17895-1, Portland, Oregon.

Shearer, K. D., P. Swanson, B. Campbell, B. R. Beckman, P. Parkins, and J. T. Dickey. 2002. The effects of growth rate/size on the incidence of early sexual maturation in male spring Chinook salmon (*Oncorhynchus tshawytscha*). Pages 14–35 *in* B. A. Berejikian, editor. Research on captive broodstock programs for Pacific salmon. Report to Bonneville Power Administration, contract 199305600, report DOE/B-00005277-2, Portland, Oregon.

U.S. Fish and Wildlife Service. 2005. Summary of biological monitoring and sampling activities conducted at the Coleman National Fish Hatchery (NFH) by the Hatchery Evaluation Program during 2002-2003 spawning season. Red Bluff Fish and Wildlife Office Technical Report.

U.S. Geological Survey. Comp. "USGS 11376000 Cottonwood C nr Cottonwood CA". Web. http://nwis.waterdata.usgs.gov/nwis/nwisman/?site_no=11376000&agency_cd=USGS

Waples, R. S., M. J. Ford, and D. Schmitt. 2007. Empirical results of salmon supplementation in the Northeast Pacific: A preliminary assessment. pp. 383-403 in T. M. ert, ed. Ecological and Genetic Implications of Aquaculture Activities. Kluwer Academic Publishers.

Williamson, K. S., and B. May. 2005. Homogenization of fall-run Chinook salmon gene pools in the Central Valley of California, USA. North American Journal of Fisheries Management 25: 993-1009.

Yoshiyama, R. M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 2001. Historical and present distribution of Chinook salmon in the Central Valley drainage of California Pages: 71-176 *in* R. L. Brown, ed. Fish Bulletin 179. Contributions to the biology of Central Valley salmonids. Vol. 1. Sacramento, CA: Department of Fish and Game

Appendix I

Table A.1. Release information associated with coded wire tags recovered from Chinook salmon carcasses in Cottonwood Creek during fall 2011. Numbers of juvenile fish released are categorized based on juvenile retention data as follows: Clip/Tag = adipose fin-clipped with coded wire tag; No Clip/Tag = no adipose fin-clip with coded wire tag; Clip/ No Tag = adipose fin-clipped without coded wire tag; No Clip/ No Tag = no adipose fin-clip without coded wire tag.

CWT Code	Hatchery of Origin	Run	Release Location	Brood Year	Clip/ Tag	No Clip/ Tag	Clip/ No Tag	No Clip/ No Tag	Expansion Factor	Number Recovered	Expanded Number
054471	Coleman NFH	Fall	Coleman NFH	2007	338491	0	439	1017135	0.250	1	4.00
054873	Coleman NFH	Fall	Coleman NFH	2008	129807	0	0	389689	0.250	1	4.00
054886	Coleman NFH	Fall	Coleman NFH	2008	109292	0	271	328915	0.249	1	4.02
054890	Coleman NFH	Fall	Coleman NFH	2008	109171	0	0	327691	0.250	1	4.00
054891	Coleman NFH	Fall	Coleman NFH	2008	117384	0	0	352405	0.250	1	4.00
054896	Coleman NFH	Fall	Coleman NFH	2008	112556	0	0	338978	0.249	1	4.02
055183	Coleman NFH	Fall	Coleman NFH	2009	116291	282	0	349904	0.249	2	8.03
055185	Coleman NFH	Fall	Coleman NFH	2009	108389	0	0	325252	0.250	2	8.00
055186	Coleman NFH	Fall	Coleman NFH	2009	105794	0	0	317531	0.250	2	8.00
055188	Coleman NFH	Fall	Coleman NFH	2009	117670	0	311	355427	0.249	1	4.02
055190	Coleman NFH	Fall	Coleman NFH	2009	99672	0	0	304467	0.247	5	20.24
055191	Coleman NFH	Fall	Coleman NFH	2009	104281	0	0	313051	0.250	3	12.00
055192	Coleman NFH	Fall	Coleman NFH	2009	116800	0	0	350569	0.250	2	8.00
055193	Coleman NFH	Fall	Coleman NFH	2009	117720	0	0	353357	0.250	1	4.00

CWT Code	Hatchery of Origin	Run	Release Location	Brood Year	Clip/ Tag	No Clip/ Tag	Clip/ No Tag	No Clip/ No Tag	Expansion Factor	Number Recovered	Expanded Number
055194	Coleman NFH	Fall	Coleman NFH	2009	111590	0	0	336094	0.249	1	4.02
055197	Coleman NFH	Fall	Coleman NFH	2009	107617	0	0	323139	0.250	3	12.00
055198	Coleman NFH	Fall	Coleman NFH	2009	103920	0	0	311941	0.250	2	8.00
055199	Coleman NFH	Fall	Coleman NFH	2009	99659	0	0	300079	0.249	2	8.03
055221	Coleman NFH	Fall	Coleman NFH	2009	109482	0	550	330261	0.249	2	8.03
055222	Coleman NFH	Fall	Coleman NFH	2009	110067	0	788	332792	0.248	1	4.03
055223	Coleman NFH	Fall	Coleman NFH	2009	101711	0	0	305381	0.250	1	4.00
055225	Coleman NFH	Fall	Coleman NFH	2009	90698	0	0	272183	0.250	1	4.00
055226	Coleman NFH	Fall	Coleman NFH	2009	89598	0	224	269640	0.249	1	4.02
054871	Coleman NFH	Fall	Mare Island Net Pens	2008	137809	353	353	415703	0.249	1	4.02
055184	Coleman NFH	Fall	Mare Island Net Pens	2009	114091	0	0	347008	0.247	3	12.15
055187	Coleman NFH	Fall	Mare Island Net Pens	2009	118588	0	309	356835	0.249	1	4.02
055196	Coleman NFH	Fall	Mare Island Net Pens	2009	105240	0	0	316941	0.249	1	4.02
068604	Feather River Hatchery	Fall	San Pablo Bay Net Pens	2007	399244	0	0	1198460	0.250	1	4.00
068650	Feather River Hatchery	Fall	San Pablo Bay Net Pens	2008	144831	0	1496	439667	0.247	2	8.10
068670	Feather River Hatchery	Fall	San Pablo Bay Net Pens	2009	398016	494	494	1201929	0.249	1	4.02

CWT Code	Hatchery of Origin	Run	Release Location	Brood Year	Clip/ Tag	No Clip/ Tag	Clip/ No Tag	No Clip/ No Tag	Expansion Factor	Number Recovered	Expanded Number
068672	Feather River Hatchery	Fall	San Pablo Bay Net Pens	2009	400675	0	981	1206374	0.249	3	12.05
068675	Feather River Hatchery	Fall	Santa Cruz Harbor net pen	2009	118879	2468	987	0	0.972	1	1.03
068649	Feather River Hatchery	Hybrid	Mare Island Net pen	2008	167530	172	3011	0	0.981	1	1.02
062589	Feather River Hatchery	Hybrid	Tiburon Net Pens	2008	13010	0	334	334	0.951	1	1.05
No CWT	--	--	--	--	--	--	--	--	*0.250*	3	*12*
Total										57	220

Table A. 2. Biological data from Chinook salmon carcasses with a coded wire tag in Cottonwood Creek during fall 2011. " NTD" indicates there was no coded wire tag detected in the head, and "No Head" designates an adipose fin-clipped carcass for which no head was recovered, due to predation or deteriorated physical condition. One coded wire tag was lost prior to decoding. A sample number "0" indicates a tissue was not collected for the carcass, due to deteriorated physical condition.

Date	Sample	Sex	Fork length	Adipose Fin Status	Spawn Condition	Carcass Condition	Reach	Stream Mile	CWT Code
10/13/2011	1501	Female	700	Absent	Spawned	Fresh	3	6	062589
10/13/2011	1502	Male	560	Present	Unknown	Fresh	3	1	
10/19/2011	1503	Female	708	Present	Spawned	Non-Fresh	3	4	
10/19/2011	1504	Male	630	Absent	Unknown	Fresh	3	2	055183
10/19/2011	1505	Male	640	Absent	Unknown	Non-Fresh	3	0	055186
10/20/2011	1506	Female	820	Present	Spawned	Fresh	2	12	
10/20/2011	1581	Male	850	Present	Unknown	Non-Fresh	1	16	
10/20/2011	1582	Female	800	Present	Unknown	Fresh	1	13	
10/26/2011	1507	Male	570	Present	Unknown	Non-Fresh	3	6	
10/26/2011	1508	Male	600	Present	Unknown	Non-Fresh	3	3	
10/27/2011	0	Male	950	Present	Unknown	Non-Fresh	1	18	
10/27/2011	1509	Female	925	Present	Spawned	Fresh	2	11	
10/27/2011	1510	Male	630	Present	Unknown	Fresh	2	10	
10/27/2011	1511	Male	720	Present	Unknown	Fresh	2	8	
10/27/2011	1512	Male	620	Absent	Unknown	Fresh	2	8	055196
10/27/2011	1513	Male	600	Present	Unknown	Fresh	2	8	
10/27/2011	1583	Male	950	Present	Unknown	Non-Fresh	1	18	
10/27/2011	1584	Male	610	Unknown	Unknown	Non-Fresh	1	18	NTD
10/27/2011	1585	Male	640	Present	Unknown	Unknown	1	18	
10/27/2011	1586	Male	570	Present	Unknown	Fresh	1	17	
10/27/2011	1587	Female	590	Present	Spawned	Fresh	1	16	
10/27/2011	1588	Male	910	Present	Unknown	Non-Fresh	1	14	
11/2/2011	1514	Male	560	Present	Unknown	Non-Fresh	3	5	
11/2/2011	1515	Male	610	Present	Unknown	Non-Fresh	3	5	
11/2/2011	1516	Male	680	Absent	Unknown	Non-Fresh	3	4	055194
11/2/2011	1517	Male	610	Present	Unknown	Non-Fresh	3	2	
11/2/2011	1589	Male	930	Present	Unknown	Fresh	2	14	
11/2/2011	1590	Male	560	Absent	Unknown	Non-Fresh	2	13	055186
11/2/2011	1591	Male	930	Present	Unknown	Non-Fresh	2	11	
11/2/2011	1592	Male	630	Present	Unknown	Non-Fresh	2	10	
11/2/2011	1593	Male	560	Absent	Unknown	Non-Fresh	2	10	NTD
11/2/2011	1594	Male	970	Present	Unknown	Non-Fresh	2	10	
11/2/2011	1595	Male	650	Present	Unknown	Fresh	2	10	
11/2/2011	1596	Female	780	Present	Spawned	Non-Fresh	2	9	
11/2/2011	1597	Female	770	Present	Spawned	Non-Fresh	2	9	
11/2/2011	1598	Male	620	Present	Unknown	Non-Fresh	2	9	
11/2/2011	1599	Female	850	Absent	Spawned	Non-Fresh	2	9	068604
11/2/2011	1600	Male	730	Present	Unknown	Fresh	2	9	
11/2/2011	1601	Male	630	Present	Unknown	Non-Fresh	2	9	
11/2/2011	1602	Male	560	Present	Unknown	Non-Fresh	2	9	
11/2/2011	1603	Male	950	Present	Unknown	Fresh	2	9	
11/2/2011	1604	Male	1080	Present	Unknown	Fresh	2	9	
11/2/2011	1605	Male	580	Absent	Unknown	Non-Fresh	2	9	055190
11/2/2011	1606	Female	750	Present	Spawned	Non-Fresh	2	8	

Date	Sample	Sex	Fork length	Adipose Fin Status	Spawn Condition	Carcass Condition	Reach	Stream Mile	CWT Code
11/2/2011	1607	Female	780	Absent	Spawned	Non-Fresh	2	8	054891
11/2/2011	1608	Male	680	Present	Unknown	Fresh	2	8	
11/2/2011	1609	Male	660	Present	Unknown	Fresh	2	8	
11/2/2011	1610	Male	500	Present	Unknown	Non-Fresh	2	8	
11/2/2011	1611	Male	670	Absent	Unknown	Fresh	2	7	055190
11/2/2011	1612	Female	760	Present	Spawned	Non-Fresh	2	7	
11/2/2011	1613	Male	570	Present	Unknown	Fresh	2	8	
11/3/2011	1614	Male	590	Present	Unknown	Non-Fresh	1	19	
11/3/2011	1615	Male	550	Present	Unknown	Non-Fresh	1	18	
11/3/2011	1616	Male	600	Present	Unknown	Non-Fresh	1	18	
11/3/2011	1617	Female	805	Present	Spawned	Non-Fresh	1	18	
11/3/2011	1618	Male	570	Present	Unknown	Non-Fresh	1	18	
11/3/2011	1619	Male	670	Present	Unknown	Fresh	1	18	
11/3/2011	1620	Male	590	Present	Unknown	Non-Fresh	1	18	
11/3/2011	1621	Male	620	Present	Unknown	Non-Fresh	1	18	
11/3/2011	1622	Male	630	Present	Unknown	Fresh	1	18	
11/3/2011	1623	Male	640	Present	Unknown	Non-Fresh	1	18	
11/3/2011	1624	Male	630	Present	Unknown	Non-Fresh	1	18	
11/3/2011	1625	Male	830	Absent	Unknown	Non-Fresh	1	17	054471
11/3/2011	1626	Female	750	Present	Spawned	Fresh	1	17	
11/3/2011	1627	Male	880	Present	Unknown	Non-Fresh	1	17	
11/3/2011	1628	Female	870	Present	Spawned	Fresh	1	17	
11/3/2011	1629	Male	520	Present	Unknown	Non-Fresh	1	17	
11/3/2011	1630	Female	560	Present	Spawned	Non-Fresh	1	17	
11/3/2011	1631	Male	530	Absent	Unknown	Fresh	1	17	068675
11/3/2011	1632	Male	590	Present	Unknown	Non-Fresh	1	17	
11/3/2011	1633	Male	550	Absent	Unknown	Fresh	1	16	055184
11/3/2011	1634	Male	630	Present	Unknown	Non-Fresh	1	16	
11/3/2011	1635	Female	600	Present	Spawned	Non-Fresh	1	16	
11/3/2011	1636	Male	630	Present	Unknown	Non-Fresh	1	16	
11/3/2011	1637	Male	670	Present	Unknown	Non-Fresh	1	15	
11/3/2011	1638	Female	850	Present	Spawned	Non-Fresh	1	15	
11/3/2011	1639	Male	590	Present	Unknown	Non-Fresh	1	15	
11/3/2011	1640	Male	570	Present	Unknown	Non-Fresh	1	15	
11/3/2011	1641	Male	850	Present	Unknown	Non-Fresh	1	15	
11/3/2011	1642	Male	550	Absent	Unknown	Non-Fresh	1	14	055185
11/3/2011	1643	Male	590	Present	Unknown	Non-Fresh	1	14	
11/8/2011	1644	Female	840	Present	Spawned	Non-Fresh	3	6	
11/8/2011	1645	Female	830	Present	Spawned	Non-Fresh	3	6	
11/8/2011	1646	Male	630	Present	Unknown	Non-Fresh	3	6	
11/8/2011	1647	Male	570	Present	Unknown	Fresh	3	6	
11/8/2011	1648	Male	630	Present	Unknown	Non-Fresh	3	6	
11/8/2011	1649	Male	630	Present	Unknown	Non-Fresh	3	6	
11/8/2011	1650	Male	570	Present	Unknown	Non-Fresh	3	6	
11/8/2011	1651	Male	630	Present	Unknown	Fresh	3	6	
11/8/2011	1652	Male	910	Present	Unknown	Fresh	3	6	
11/8/2011	1653	Female	610	Present	Spawned	Fresh	3	6	
11/8/2011	1654	Male	890	Present	Unknown	Non-Fresh	3	6	
11/8/2011	1655	Male	630	Present	Unknown	Non-Fresh	3	5	
11/8/2011	1656	Male	830	Present	Unknown	Fresh	3	5	
11/8/2011	1657	Female	800	Present	Spawned	Non-Fresh	3	5	
11/8/2011	1658	Male	650	Absent	Unknown	Non-Fresh	3	5	055192
11/8/2011	1659	Male	630	Present	Unknown	Non-Fresh	3	5	

Date	Sample	Sex	Fork length	Adipose Fin Status	Spawn Condition	Carcass Condition	Reach	Stream Mile	CWT Code
11/8/2011	1660	Male	700	Absent	Unknown	Fresh	3	4	055190
11/8/2011	1661	Male	1010	Present	Unknown	Non-Fresh	3	4	
11/8/2011	1662	Male	580	Present	Unknown	Fresh	3	3	
11/8/2011	1663	Male	630	Present	Unknown	Non-Fresh	3	3	
11/8/2011	1664	Male	620	Present	Unknown	Non-Fresh	3	3	
11/8/2011	1665	Male	630	Present	Unknown	Non-Fresh	3	3	
11/8/2011	1666	Male	560	Present	Unknown	Fresh	3	3	
11/8/2011	1667	Male	590	Present	Unknown	Fresh	3	3	
11/8/2011	1668	Male	650	Present	Unknown	Fresh	3	3	
11/8/2011	1669	Male	890	Present	Unknown	Fresh	3	3	
11/8/2011	1670	Male	840	Absent	Unknown	Fresh	3	2	054896
11/8/2011	1671	Male	860	Absent	Unknown	Non-Fresh	3	2	055197
11/8/2011	1672	Male	860	Unknown	Unknown	Non-Fresh	3	2	NTD
11/8/2011	1673	Male	930	Present	Unknown	Non-Fresh	3	2	
11/8/2011	1674	Male	570	Absent	Unknown	Non-Fresh	3	1	055188
11/8/2011	1675	Male	660	Present	Unknown	Non-Fresh	3	0	
11/8/2011	1676	Male	620	Present	Unknown	Non-Fresh	3	0	
11/8/2011	1677	Male	1000	Present	Unknown	Fresh	3	0	
11/8/2011	1678	Male	570	Present	Unknown	Fresh	3	0	
11/8/2011	1679	Male	580	Present	Unknown	Fresh	3	0	
11/9/2011	0	Male	580	Present	Unknown	Non-Fresh	2	8	
11/9/2011	0	Male	660	Present	Unknown	Non-Fresh	2	8	
11/9/2011	0	Female	790	Present	Spawned	Fresh	2	8	
11/9/2011	0	Female	840	Present	Spawned	Fresh	2	9	
11/9/2011	0	Female	850	Present	Spawned	Non-Fresh	2	9	
11/9/2011	0	Female	830	Present	Spawned	Fresh	2	8	
11/9/2011	0	Male	640	Present	Unknown	Fresh	2	8	
11/9/2011	0	Male	630	Present	Unknown	Non-Fresh	2	9	
11/9/2011	1518	Male	590	Present	Unknown	Non-Fresh	1	18	
11/9/2011	1519	Female	850	Present	Spawned	Fresh	1	18	
11/9/2011	1520	Male	650	Absent	Unknown	Fresh	1	18	055184
11/9/2011	1521	Male	580	Present	Unknown	Non-Fresh	1	18	
11/9/2011	1522	Male	900	Present	Unknown	Fresh	1	17	
11/9/2011	1523	Male	580	Present	Unknown	Non-Fresh	1	17	
11/9/2011	1524	Male	630	Present	Unknown	Non-Fresh	1	17	
11/9/2011	1525	Male	600	Present	Unknown	Non-Fresh	1	16	
11/9/2011	1526	Male	630	Present	Unknown	Non-Fresh	1	16	
11/9/2011	1527	Male	640	Present	Unknown	Non-Fresh	1	15	
11/9/2011	1528	Male	940	Present	Unknown	Fresh	1	15	
11/9/2011	1529	Male	630	Present	Unknown	Non-Fresh	1	15	
11/9/2011	1530	Male	600	Present	Unknown	Fresh	1	15	
11/9/2011	1531	Male	640	Present	Unknown	Non-Fresh	1	15	
11/9/2011	1532	Male	620	Present	Unknown	Non-Fresh	1	15	
11/9/2011	1533	Female	890	Present	Spawned	Non-Fresh	1	15	
11/9/2011	1534	Female	800	Present	Spawned	Non-Fresh	1	14	
11/9/2011	1680	Female	780	Present	Spawned	Fresh	2	14	
11/9/2011	1681	Male	560	Present	Unknown	Non-Fresh	2	14	
11/9/2011	1682	Male	940	Present	Unknown	Fresh	2	13	
11/9/2011	1683	Male	0	Unknown	Unknown	Non-Fresh	2	13	068649
11/9/2011	1684	Male	630	Present	Unknown	Fresh	2	13	
11/9/2011	1685	Female	610	Present	Spawned	Fresh	2	13	
11/9/2011	1686	Male	650	Absent	Unknown	Non-Fresh	2	13	068670
11/9/2011	1687	Male	560	Present	Unknown	Non-Fresh	2	13	

Date	Sample	Sex	Fork length	Adipose Fin Status	Spawn Condition	Carcass Condition	Reach	Stream Mile	CWT Code
11/9/2011	1688	Female	800	Present	Spawned	Fresh	2	12	
11/9/2011	1689	Male	560	Present	Unknown	Non-Fresh	2	12	
11/9/2011	1690	Male	630	Present	Unknown	Fresh	2	12	
11/9/2011	1691	Female	560	Present	Spawned	Fresh	2	12	
11/9/2011	1692	Male	680	Present	Unknown	Non-Fresh	2	12	
11/9/2011	1693	Female	640	Present	Spawned	Non-Fresh	2	12	
11/9/2011	1694	Male	570	Present	Unknown	Fresh	2	11	
11/9/2011	1695	Male	560	Present	Unknown	Non-Fresh	2	11	
11/9/2011	1696	Male	690	Present	Unknown	Non-Fresh	2	11	
11/9/2011	1697	Female	830	Absent	Spawned	Fresh	2	11	054886
11/9/2011	1698	Male	600	Present	Unknown	Non-Fresh	2	11	
11/9/2011	1699	Female	800	Present	Spawned	Fresh	2	11	
11/9/2011	1700	Male	550	Absent	Unknown	Non-Fresh	2	11	055184
11/9/2011	1701	Male	650	Present	Unknown	Fresh	2	11	
11/9/2011	1702	Male	610	Present	Unknown	Fresh	2	10	
11/9/2011	1703	Male	890	Present	Unknown	Fresh	2	10	
11/9/2011	1704	Male	580	Absent	Unknown	Non-Fresh	2	10	055191
11/9/2011	1705	Male	870	Present	Unknown	Non-Fresh	2	10	
11/9/2011	1706	Male	550	Unknown	Unknown	Non-Fresh	2	10	NTD
11/9/2011	1707	Female	870	Present	Spawned	Fresh	2	10	
11/9/2011	1708	Female	770	Present	Spawned	Fresh	2	10	
11/9/2011	1709	Male	750	Present	Unknown	Non-Fresh	2	10	
11/9/2011	1710	Male	580	Absent	Unknown	Non-Fresh	2	10	068672
11/9/2011	1711	Female	770	Present	Spawned	Fresh	2	10	
11/9/2011	1712	Female	830	Present	Spawned	Fresh	2	10	
11/9/2011	1713	Female	770	Present	Spawned	Fresh	2	10	
11/9/2011	1714	Male	680	Present	Unknown	Non-Fresh	2	10	
11/9/2011	1715	Male	670	Present	Unknown	Fresh	2	10	
11/9/2011	1716	Female	800	Present	Spawned	Non-Fresh	2	9	
11/9/2011	1717	Female	780	Present	Spawned	Non-Fresh	2	9	
11/9/2011	1718	Female	850	Present	Spawned	Fresh	2	9	
11/9/2011	1719	Female	800	Present	Spawned	Fresh	2	9	
11/9/2011	1720	Female	580	Present	Spawned	Non-Fresh	2	9	
11/9/2011	1721	Male	860	Present	Unknown	Fresh	2	9	
11/9/2011	1722	Male	830	Present	Unknown	Fresh	2	9	
11/9/2011	1723	Female	840	Present	Spawned	Fresh	2	9	
11/9/2011	1724	Female	710	Present	Spawned	Fresh	2	9	
11/9/2011	1725	Female	780	Absent	Spawned	Fresh	2	9	068650
11/9/2011	1726	Female	900	Absent	Spawned	Fresh	2	9	054871
11/9/2011	1727	Male	670	Absent	Unknown	Fresh	2	9	068672
11/9/2011	1728	Female	810	Present	Spawned	Fresh	2	9	
11/9/2011	1729	Male	600	Absent	Unknown	Fresh	2	9	055185
11/9/2011	1730	Female	800	Present	Spawned	Fresh	2	8	
11/9/2011	1731	Male	580	Absent	Unknown	Non-Fresh	2	7	055187
11/9/2011	1732	Male	860	Absent	Unknown	Non-Fresh	2	7	054873
11/9/2011	1733	Male	610	Absent	Unknown	Non-Fresh	2	6	055198
11/16/2011	1734	Male	630	Present	Unknown	Non-Fresh	3	6	
11/16/2011	1735	Male	640	Present	Unknown	Non-Fresh	3	6	
11/16/2011	1736	Male	670	Absent	Unknown	Non-Fresh	3	6	055193
11/16/2011	1737	Female	840	Absent	Spawned	Non-Fresh	3	6	068650
11/16/2011	1738	Female	780	Present	Spawned	Non-Fresh	3	6	
11/16/2011	1739	Female	620	Present	Spawned	Non-Fresh	3	6	
11/16/2011	1740	Male	580	Present	Unknown	Non-Fresh	3	6	

Date	Sample	Sex	Fork length	Adipose Fin Status	Spawn Condition	Carcass Condition	Reach	Stream Mile	CWT Code
11/16/2011	1741	Female	780	Present	Spawned	Non-Fresh	3	6	
11/16/2011	1742	Male	520	Absent	Unknown	Non-Fresh	3	6	055226
11/16/2011	1743	Male	620	Present	Unknown	Non-Fresh	3	6	
11/16/2011	1744	Male	680	Present	Unknown	Non-Fresh	3	4	
11/16/2011	1745	Male	680	Present	Unknown	Non-Fresh	3	4	
11/16/2011	1746	Female	800	Present	Unspawned	Fresh	3	3	
11/16/2011	1747	Male	670	Present	Unknown	Non-Fresh	3	3	
11/16/2011	1748	Male	650	Absent	Unknown	Fresh	3	3	No head
11/16/2011	1749	Male	630	Absent	Unknown	Non-Fresh	3	3	055197
11/16/2011	1750	Male	640	Present	Unknown	Non-Fresh	3	2	
11/16/2011	1851	Male	570	Absent	Unknown	Non-Fresh	3	2	055222
11/16/2011	1852	Male	500	Present	Unknown	Non-Fresh	3	2	
11/16/2011	1853	Male	620	Present	Unknown	Non-Fresh	3	1	
11/16/2011	1854	Male	600	Absent	Unknown	Non-Fresh	3	1	Lost
11/16/2011	1855	Male	640	Present	Unknown	Non-Fresh	3	1	
11/16/2011	1856	Female	800	Absent	Spawned	Non-Fresh	3	1	054890
11/16/2011	1857	Male	650	Present	Unknown	Non-Fresh	3	1	
11/16/2011	1858	Male	570	Present	Unknown	Non-Fresh	3	0	
11/16/2011	1859	Male	590	Present	Unknown	Non-Fresh	3	0	
11/17/2011	0	Male	600	Present	Unknown	Non-Fresh	2	6	
11/17/2011	0	Male	580	Present	Unknown	Fresh	2	6	
11/17/2011	0	Male	630	Present	Unknown	Non-Fresh	2	7	
11/17/2011	0	Male	580	Present	Unknown	Non-Fresh	2	7	
11/17/2011	0	Female	750	Present	Spawned	Non-Fresh	2	8	
11/17/2011	0	Male	560	Present	Unknown	Non-Fresh	2	7	
11/17/2011	0	Male	490	Present	Unknown	Non-Fresh	2	8	
11/17/2011	0	Female	810	Present	Spawned	Non-Fresh	2	9	
11/17/2011	0	Female	870	Present	Spawned	Non-Fresh	2	8	
11/17/2011	0	Male	950	Present	Unknown	Fresh	2	8	
11/17/2011	0	Female	800	Present	Spawned	Non-Fresh	2	8	
11/17/2011	0	Male	640	Present	Unknown	Non-Fresh	2	8	
11/17/2011	0	Male	500	Present	Unknown	Non-Fresh	2	8	
11/17/2011	0	Male	570	Present	Unknown	Non-Fresh	2	9	
11/17/2011	0	Male	640	Present	Unknown	Non-Fresh	2	8	
11/17/2011	0	Male	640	Present	Unknown	Non-Fresh	2	9	
11/17/2011	0	Male	590	Present	Unknown	Non-Fresh	2	7	
11/17/2011	0	Female	830	Present	Spawned	Fresh	2	9	
11/17/2011	0	Male	620	Present	Unknown	Non-Fresh	2	9	
11/17/2011	0	Male	600	Present	Unknown	Fresh	2	9	
11/17/2011	0	Female	830	Present	Spawned	Non-Fresh	2	9	
11/17/2011	0	Male	620	Present	Unknown	Fresh	2	9	
11/17/2011	0	Unknown	880	Present	Unknown	Non-Fresh	2	9	
11/17/2011	0	Male	680	Present	Unknown	Non-Fresh	2	7	
11/17/2011	0	Female	660	Present	Spawned	Fresh	2	7	
11/17/2011	0	Male	660	Present	Unknown	Non-Fresh	2	7	
11/17/2011	0	Female	850	Present	Spawned	Fresh	2	7	
11/17/2011	0	Female	730	Present	Spawned	Non-Fresh	2	7	
11/17/2011	0	Male	580	Present	Unknown	Non-Fresh	2	7	
11/17/2011	0	Male	480	Present	Unknown	Non-Fresh	2	7	
11/17/2011	1535	Male	825	Present	Unknown	Non-Fresh	1	19	
11/17/2011	1536	Male	600	Present	Unknown	Non-Fresh	1	18	
11/17/2011	1537	Female	775	Present	Spawned	Non-Fresh	1	18	
11/17/2011	1538	Male	610	Present	Unknown	Non-Fresh	1	18	

Date	Sample	Sex	Fork length	Adipose Fin Status	Spawn Condition	Carcass Condition	Reach	Stream Mile	CWT Code
11/17/2011	1539	Male	1035	Present	Unknown	Non-Fresh	1	18	
11/17/2011	1540	Female	650	Present	Spawned	Non-Fresh	1	17	
11/17/2011	1541	Female	650	Present	Spawned	Non-Fresh	1	17	
11/17/2011	1542	Male	650	Absent	Unknown	Non-Fresh	1	16	055221
11/17/2011	1543	Female	800	Present	Spawned	Fresh	1	16	
11/17/2011	1544	Male	590	Present	Unknown	Non-Fresh	1	16	
11/17/2011	1545	Female	630	Present	Spawned	Fresh	1	16	
11/17/2011	1546	Female	540	Present	Spawned	Non-Fresh	1	16	
11/17/2011	1547	Female	840	Present	Spawned	Non-Fresh	1	16	
11/17/2011	1548	Male	930	Present	Unknown	Non-Fresh	1	16	
11/17/2011	1549	Male	610	Unknown	Unknown	Non-Fresh	1	15	NTD
11/17/2011	1550	Male	600	Present	Unknown	Fresh	1	15	
11/17/2011	1551	Male	885	Present	Unknown	Non-Fresh	1	15	
11/17/2011	1552	Male	650	Present	Unknown	Non-Fresh	1	15	
11/17/2011	1553	Male	650	Present	Unknown	Non-Fresh	1	15	
11/17/2011	1554	Female	910	Present	Spawned	Non-Fresh	1	14	
11/17/2011	1555	Male	640	Present	Unknown	Non-Fresh	1	14	
11/17/2011	1556	Female	780	Present	Spawned	Non-Fresh	1	14	
11/17/2011	1557	Male	678	Absent	Unknown	Non-Fresh	1	14	055197
11/17/2011	1558	Male	835	Present	Unknown	Non-Fresh	1	14	
11/17/2011	1559	Male	650	Present	Unknown	Non-Fresh	1	14	
11/17/2011	1560	Female	640	Present	Spawned	Fresh	1	14	
11/17/2011	1561	Female	850	Present	Spawned	Fresh	1	14	
11/17/2011	1860	Male	740	Present	Unknown	Non-Fresh	2	14	
11/17/2011	1861	Male	580	Present	Unknown	Non-Fresh	2	13	
11/17/2011	1862	Male	620	Present	Unknown	Fresh	2	13	
11/17/2011	1863	Male	600	Present	Unknown	Non-Fresh	2	13	
11/17/2011	1864	Male	630	Present	Unknown	Fresh	2	13	
11/17/2011	1865	Male	800	Present	Unknown	Non-Fresh	2	13	
11/17/2011	1866	Female	800	Present	Spawned	Non-Fresh	2	11	
11/17/2011	1867	Female	860	Present	Spawned	Non-Fresh	2	11	
11/17/2011	1868	Female	790	Present	Spawned	Non-Fresh	2	11	
11/17/2011	1869	Female	850	Present	Spawned	Fresh	2	11	
11/17/2011	1870	Female	850	Present	Spawned	Non-Fresh	2	11	
11/17/2011	1871	Male	640	Present	Unknown	Non-Fresh	2	11	
11/17/2011	1872	Male	610	Absent	Unknown	Non-Fresh	2	11	055199
11/17/2011	1873	Male	730	Present	Unknown	Non-Fresh	2	11	
11/17/2011	1874	Male	610	Present	Unknown	Non-Fresh	2	11	
11/17/2011	1875	Female	710	Present	Spawned	Non-Fresh	2	11	
11/17/2011	1876	Male	680	Present	Unknown	Non-Fresh	2	11	
11/17/2011	1877	Male	550	Present	Unknown	Non-Fresh	2	11	
11/17/2011	1878	Male	660	Present	Unknown	Non-Fresh	2	11	
11/17/2011	1879	Male	620	Present	Unknown	Non-Fresh	2	11	
11/17/2011	1880	Female	590	Present	Spawned	Non-Fresh	2	11	
11/17/2011	1881	Male	780	Present	Unknown	Non-Fresh	2	11	
11/17/2011	1882	Male	580	Present	Unknown	Non-Fresh	2	10	
11/17/2011	1883	Male	580	Present	Unknown	Non-Fresh	2	10	
11/17/2011	1884	Male	940	Present	Unknown	Fresh	2	10	
11/17/2011	1885	Female	770	Present	Spawned	Fresh	2	10	
11/17/2011	1886	Male	570	Present	Unknown	Non-Fresh	2	10	
11/17/2011	1887	Female	850	Present	Spawned	Fresh	2	10	
11/17/2011	1888	Female	610	Present	Spawned	Non-Fresh	2	10	
11/17/2011	1889	Female	600	Present	Spawned	Fresh	2	10	

Date	Sample	Sex	Fork length	Adipose Fin Status	Spawn Condition	Carcass Condition	Reach	Stream Mile	CWT Code
11/17/2011	1890	Male	850	Present	Unknown	Non-Fresh	2	10	
11/17/2011	1891	Male	670	Present	Unknown	Fresh	2	10	
11/17/2011	1892	Male	630	Absent	Unknown	Fresh	2	10	055190
11/17/2011	1893	Male	650	Present	Unknown	Fresh	2	10	
11/17/2011	1894	Female	800	Present	Spawned	Fresh	2	10	
11/17/2011	1895	Male	560	Present	Unknown	Non-Fresh	2	10	
11/17/2011	1896	Female	790	Present	Spawned	Non-Fresh	2	10	
11/17/2011	1897	Male	920	Present	Unknown	Non-Fresh	2	10	
11/17/2011	1898	Male	660	Present	Unknown	Non-Fresh	2	10	
11/17/2011	1899	Male	600	Present	Unknown	Non-Fresh	2	9	
11/17/2011	1900	Female	780	Present	Spawned	Non-Fresh	2	9	
11/17/2011	1901	Female	790	Present	Spawned	Fresh	2	9	
11/17/2011	1902	Female	860	Present	Spawned	Non-Fresh	2	9	
11/17/2011	1903	Male	630	Present	Unknown	Non-Fresh	2	9	
11/17/2011	1904	Male	600	Present	Unknown	Fresh	2	9	
11/17/2011	1905	Male	600	Present	Unknown	Non-Fresh	2	9	
11/17/2011	1906	Male	850	Present	Unknown	Non-Fresh	2	8	
11/17/2011	1907	Male	610	Absent	Unknown	Non-Fresh	2	8	055191
11/17/2011	1908	Male	560	Absent	Unknown	Non-Fresh	2	8	055225
11/17/2011	1909	Female	860	Present	Spawned	Fresh	2	8	
11/17/2011	1910	Male	600	Absent	Unknown	Non-Fresh	2	8	055191
11/17/2011	1911	Female	790	Present	Spawned	Non-Fresh	2	7	
11/17/2011	1912	Male	640	Present	Unknown	Non-Fresh	2	7	
11/17/2011	1913	Male	860	Present	Unknown	Non-Fresh	2	7	
11/17/2011	1914	Male	570	Absent	Unknown	Fresh	2	6	055190
11/22/2011	1562	Male	710	Present	Unknown	Non-Fresh	3	6	
11/22/2011	1563	Female	890	Unknown	Spawned	Non-Fresh	3	6	NTD
11/22/2011	1564	Female	790	Present	Spawned	Non-Fresh	3	6	
11/22/2011	1565	Male	660	Present	Unknown	Non-Fresh	3	6	
11/22/2011	1566	Female	800	Present	Spawned	Non-Fresh	3	6	
11/22/2011	1567	Female	650	Present	Spawned	Fresh	3	6	
11/22/2011	1568	Male	650	Unknown	Unknown	Non-Fresh	3	6	055192
11/22/2011	1569	Male	640	Present	Unknown	Non-Fresh	3	5	
11/22/2011	1570	Male	660	Present	Unknown	Non-Fresh	3	5	
11/22/2011	1571	Male	540	Present	Unknown	Non-Fresh	3	3	
11/22/2011	1572	Male	600	Present	Unknown	Non-Fresh	3	3	
11/22/2011	1573	Male	590	Present	Unknown	Non-Fresh	3	1	
11/22/2011	1574	Male	620	Present	Unknown	Fresh	3	1	
11/22/2011	1575	Male	620	Present	Unknown	Non-Fresh	3	16	
11/22/2011	1576	Male	690	Present	Unknown	Fresh	3	0	
11/22/2011	2094	Female	800	Present	Spawned	Fresh	2	14	
11/22/2011	2095	Male	840	Present	Unknown	Non-Fresh	2	13	
11/22/2011	2096	Female	840	Present	Spawned	Non-Fresh	2	13	
11/22/2011	2097	Male	700	Present	Unknown	Fresh	2	13	
11/22/2011	2098	Male	585	Absent	Unknown	Fresh	2	12	055199
11/22/2011	2099	Male	620	Present	Unknown	Non-Fresh	2	12	
11/22/2011	2100	Male	510	Present	Unknown	Non-Fresh	2	11	
11/22/2011	2101	Female	880	Present	Spawned	Non-Fresh	2	11	
11/22/2011	2102	Male	590	Present	Unknown	Non-Fresh	2	11	
11/22/2011	2103	Male	630	Present	Unknown	Non-Fresh	2	10	
11/22/2011	2104	Female	690	Present	Spawned	Non-Fresh	2	10	
11/22/2011	2105	Female	840	Present	Spawned	Fresh	2	10	
11/22/2011	2106	Male	660	Present	Unknown	Non-Fresh	2	10	

Date	Sample	Sex	Fork length	Adipose Fin Status	Spawn Condition	Carcass Condition	Reach	Stream Mile	CWT Code
11/22/2011	2107	Male	590	Present	Unknown	Non-Fresh	2	9	
11/22/2011	2108	Male	570	Present	Unknown	Non-Fresh	2	9	
11/22/2011	2109	Female	830	Present	Spawned	Fresh	2	9	
11/22/2011	2110	Male	580	Absent	Unknown	Fresh	2	9	055183
11/22/2011	2111	Male	1000	Present	Unknown	Non-Fresh	2	9	
11/22/2011	2112	Female	860	Present	Spawned	Fresh	2	9	
11/22/2011	2113	Female	850	Present	Spawned	Fresh	2	9	
11/22/2011	2114	Male	550	Present	Unknown	Fresh	2	9	
11/22/2011	2115	Female	920	Present	Spawned	Non-Fresh	2	8	
11/22/2011	2116	Male	540	Present	Unknown	Non-Fresh	2	8	
11/22/2011	2117	Female	790	Present	Spawned	Non-Fresh	2	8	
11/22/2011	2118	Male	890	Present	Unknown	Non-Fresh	2	8	
11/22/2011	2119	Male	590	Present	Unknown	Non-Fresh	2	8	
11/22/2011	2120	Female	590	Present	Spawned	Fresh	2	8	
11/22/2011	2121	Male	630	Present	Unknown	Non-Fresh	2	8	
11/22/2011	2122	Male	660	Present	Unknown	Non-Fresh	2	7	
11/22/2011	2123	Male	650	Present	Unknown	Non-Fresh	2	7	
11/22/2011	2124	Female	860	Present	Spawned	Non-Fresh	2	7	
11/22/2011	2125	Male	600	Present	Unknown	Non-Fresh	2	7	
11/22/2011	2126	Male	630	Present	Unknown	Fresh	2	7	
11/22/2011	2127	Male	600	Absent	Unknown	Non-Fresh	2	7	055223
11/23/2011	2128	Male	600	Absent	Unknown	Non-Fresh	1	17	055198
11/23/2011	2129	Female	780	Present	Spawned	Fresh	1	16	
11/30/2011	1577	Female	800	Present	Spawned	Fresh	3	6	
12/1/2011	1578	Male	1040	Present	Unknown	Non-Fresh	2	13	
12/1/2011	1579	Female	880	Present	Spawned	Non-Fresh	2	13	
12/1/2011	1580	Female	780	Present	Spawned	Non-Fresh	2	11	
12/1/2011	2015	Male	640	Present	Unknown	Non-Fresh	2	9	
12/1/2011	2016	Female	800	Present	Spawned	Non-Fresh	2	8	
12/1/2011	2130	Male	650	Present	Unknown	Non-Fresh	1	16	
12/1/2011	2131	Male	650	Present	Unknown	Non-Fresh	1	15	
12/1/2011	2132	Female	760	Present	Spawned	Non-Fresh	1	15	
12/8/2011	2017	Female	790	Present	Spawned	Non-Fresh	2	10	
12/8/2011	2018	Male	580	Present	Unknown	Non-Fresh	2	8	
12/8/2011	2020	Male	0	Unknown	Unknown	Non-Fresh	2	8	055221
12/9/2011	2021	Male	550	Absent	Unknown	Non-Fresh	1	17	068672
12/15/2011	2023	Male	680	Present	Unknown	Non-Fresh	2	10	