

Juvenile Salmonid Monitoring in the Mainstem Trinity River, California, 2022

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Disclaimers

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Executive Summary — This report presents juvenile salmonid emigration monitoring data collected in 2022 at both the Pear Tree rotary screw trap site (PTRST; river kilometer [rkm] 118) and the Willow Creek rotary screw trap site (WCRST; rkm 34) in the mainstem Trinity River, California. Information collected from this project contributes is used to assess effectiveness of the Trinity River Restoration Program's habitat and flow management actions for restoring the salmonid populations of the Trinity River. Monitoring at PTRST is conducted to estimate the number of outmigrating juvenile salmonids passing the site during the sampling season. Monitoring at WCRST is conducted to estimate juvenile salmonid population size and emigration timing during the monitoring period. In 2022, one 8-ft diameter rotary screw trap was operated at PTRST from January 10 through August 27, with successful sampling for 153 days of the 229-day sampling period. At WCRST, three 8-ft diameter rotary screw traps were operated from March 8 through August 22, with successful sampling for 63 days of the 140-day sampling period.

Efficiency estimates and catch data were used to estimate weekly and seasonal outmigration abundance of both naturally and hatchery-origin sub-populations of age-0 juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) migrating downstream past PTRST and WCRST using a Bayesian time-stratified population estimation method. At PTRST an estimated 2,184,157 (95% Credible Interval (CI): [1,449,292, 3,155,526]) natural-origin age-0 Chinook Salmon and 1,540,408 (95% CI: [941,625, 2,215,026]) age-0 hatchery Chinook Salmon passed the site between January 10 and August 27. At WCRST between March 8 and August 22, an estimated 1,328,853 (95% CI: [870,052, 1,888,524]) naturally-origin age-0 Chinook Salmon and 727,493 (95% CI: [435,008, 1,084,027]) age-0 hatchery released Chinook Salmon passed the site. Age of salmonid outmigrants, mean length by week, migration rates, and hatchery contributions were estimated. Catch data were used to calculate proportional discharge-based abundance indices for juvenile Coho Salmon (*O. kisutch*) and steelhead (*O. mykiss*).

Juvenile salmonid emigration target dates to assess the timing at which 80% of the juvenile salmonid population had passed Willow Creek (WC80), are used to inform water temperature and discharge management in the mainstem Trinity River. The WC80 estimate which 80% of the juvenile Chinook Salmon population passed WCRST, inferred

from the Bayesian time-stratified population estimates, was Week of the Year WOY 24 (June 12–19), which occurred before the TRRP management target date of July 4. The estimated time at which 80% of the natural Coho Salmon age-1+ population passed the WCRST, as inferred from the proportional discharge-based abundance index, was WOY 21 (May 22–29). The estimated time at which 80% of the natural steelhead age-1+ population passed the WCRST, as inferred from the proportional discharge-based abundance index, was WOY 22 (May 29–June 5).

Introduction

This report presents annual data collected to: (1) evaluate the production of juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) from the upper 65 kilometers of the mainstem Trinity River below Lewiston Dam, the primary restoration reach of the Trinity River Restoration Program (TRRP); and (2) provide data to estimate production and determine outmigrant timing of juvenile salmonids through the lower Trinity River in response to managed flow releases, thermal regimes, and restoration efforts. Information collected by this project is needed to address key uncertainties outlined in the TRRP Science Plan (Pickard et al. 2022).

Juvenile salmonid emigration from the mainstem Trinity River has been monitored since 1989 using rotary screw traps. This data series report summarizes the outmigrant monitoring data collected in 2022 cooperatively by the U.S. Fish and Wildlife Service, Hoopa Valley Tribal Fisheries Department, and Yurok Tribal Fisheries Program at Pear Tree (PTRST) and Willow Creek (WCRST) rotary screw trap sites on the mainstem Trinity River (Figure 1). This data series report intends to provide timely dissemination of data to local managers, for inclusion in agency databases, and provide basic biological information to evaluate the effectiveness of habitat restoration and flow management actions undertaken by the TRRP to restore the fishery resources of the Trinity River (USDOI 2000). In addition to quantifying salmonid outmigrant production and timing, other biological data from the outmigrating salmonid populations are recorded and assessed.

Technical reports synthesizing long-term datasets developed by this project will be periodically published to evaluate trends in outmigrant salmonid production, outmigrant timing, hatchery contribution, and health (e.g., Pinnix et al. 2022). Monitoring emigrating juvenile salmonid populations in conjunction with habitat availability and suitability studies is expected to provide a direct evaluation of TRRP restoration efforts because these studies focus on the early freshwater life-history phase which is directly affected by instream conditions and management actions. In addition, this information is intended to be used by the TRRP to aid in the development of a salmon production model for the Trinity River.

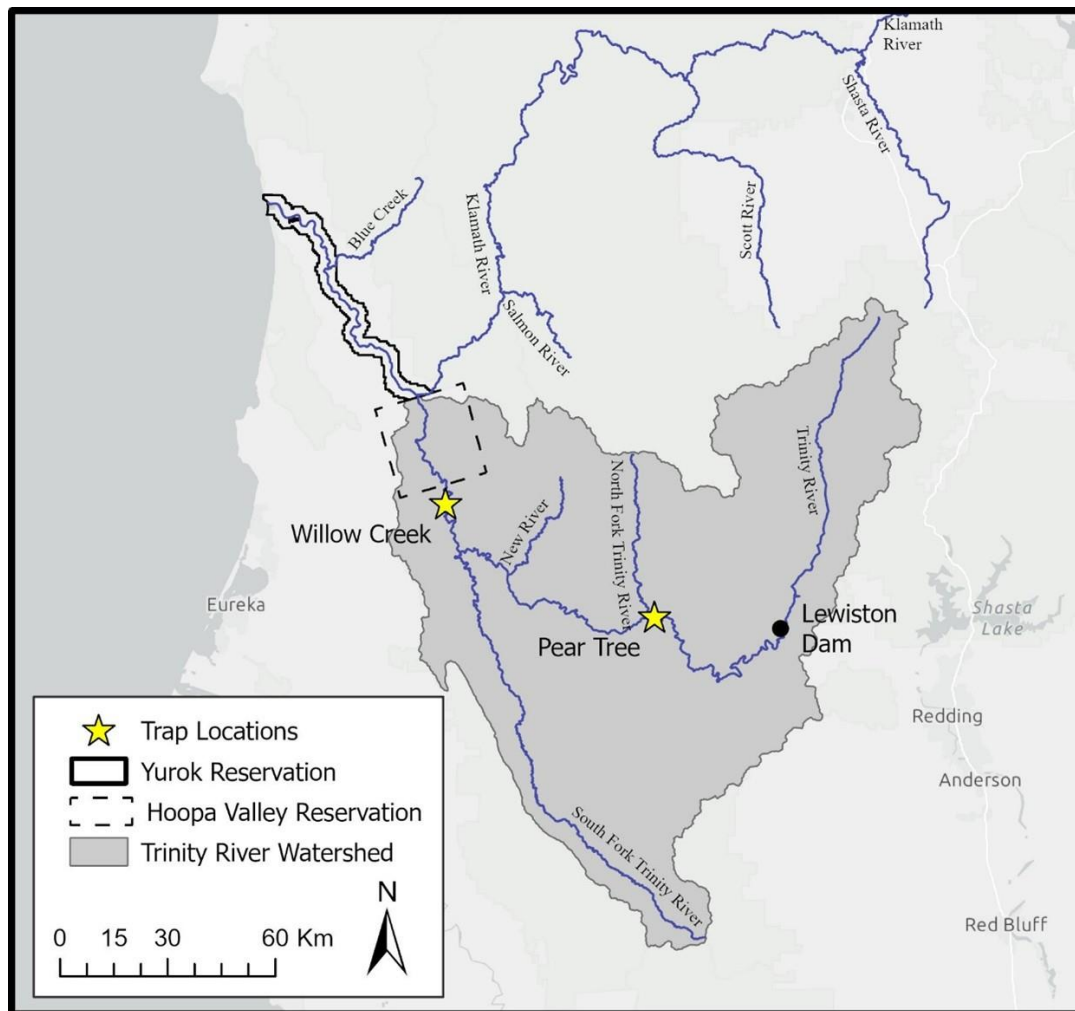


Figure 1. Location of the Trinity River Rotary Screw Trap sites near Willow Creek (rkm 34) and Pear Tree Gulch (rkm 118), California, operated by the Yurok Tribal Fisheries Program, U.S. Fish and Wildlife Service, and the Hoopa Valley Tribal Fisheries Department.

Methods

Trap Design and Operation

At PTRST, sampling was conducted using a single 2.4-m diameter rotary screw trap. The trap generally operated from January 10 to August 27 to span the greatest portion of the expected emigration of natural-origin age-0 juvenile Chinook Salmon from the study reach (Green and Petros 2005; Schwarz et al. 2009; Petros 2011).

At WCRST, sampling was conducted by deploying one to three 2.4-m diameter rotary screw traps, depending on river conditions such as magnitude of river discharge and debris load. Traps were deployed from March 8 through August 22 to sample the majority of outmigrating age-0 Chinook Salmon. This timeframe allows sufficient data to

be collected for evaluating emigration patterns and relative abundances of natural- and hatchery-origin age-0 Chinook Salmon, as well as including Coho Salmon and steelhead smolt outmigration periods.

Traps at both sites were anchored with 0.95-cm diameter aircraft cable to a series of steel fence stakes. One or two 0.1 m x 0.15 m x 6.0 m (4 in x 6 in x 10 ft) beams were used to support the traps in place away from the bank. Screw trap cone revolutions per minute were used to determine optimal trap placement at each site; low cone revolutions (i.e., <4 revolutions per minute) necessitated moving the trap into faster water, high revolutions (i.e., >9 revolutions per minute) necessitated moving the trap to slower water or lifting the cone out of the water. Traps were fished on the edge of the thalweg during high river discharge and incrementally moved back into the thalweg as river discharge decreased. When deployed, the bottom of the cone was generally <1 m from the river bottom. The overnight sample period is defined as the time period between the setting of the trap one day and removal of captured fish approximately 24 hours later. This period encompassed all hours between sunset and sunrise, when the majority of juvenile salmonids have been found to emigrate based on past sampling. Generally, trap checks at PTRST occurred around 1700 hours the day the trap was set and 0800 hours the following morning, with the morning check marking the end of one sample period. At WCRST, trap checks in the late morning or early afternoon marked the end of one sample day. At both locations the frequency of daily trap checks increased during peak emigration periods, with the frequency dictated by water temperatures, fish numbers and mortality rates.

Daily trap catch data were summarized by Week of the Year (WOY), with the first day of WOY 1 commencing on the Sunday before January 1 (Table 1). All WOYs are seven days in length except the ninth WOY during leap years, which is eight days in length.

Water Flow and Temperature Measurements

Normal cone operating depth was 1.2 m for the 2.4-m traps and 0.8 m for the 1.5-m trap. Daily velocity measurements were taken at the time traps were checked directly in front of the cone as follows: the submerged portion of the cone was divided into three cells (right, center, left); within each cell, velocity was measured at 0.2 and 0.8 of the cone operating depth for 60 seconds using a General Oceanics® digital flowmeter (Model 2030, General Oceanics, Inc. 1983). Discharge sampled was calculated at each cell by multiplying cell area (ft²) by its corresponding mean water velocity (ft/s). The values for each cell were then summed to estimate total river discharge sampled in cubic feet per second (ft³/s). Discharge and water temperature records for PTRST were produced by USGS from data collected at USGS Water Resources gauge station #11-526400, which is situated approximately 61 m downstream of the trap site. Discharge data from U.S. Geological Survey Water Resource gauge station Hoopa (#11-530000 at rkm 19.9) on the Trinity River was used as a surrogate measure of mean daily river discharge at WCRST.

At PTRST, water temperature data was collected using thermometer deployed in the trap livewell. Temperature data was recorded at the start of each trap check. At WCRST, water temperature data were collected daily using a YSI ProSolo temperature and dissolved oxygen probe.

Biological Sampling Procedures

All juvenile fish handled were anesthetized with Aqui-S 20e prior to processing. Up to 30 individuals of each species, age class (based on size), with and without hatchery marks, were randomly sampled (biosampled) from the daily catch. Biosampled salmonids were measured to the nearest mm fork length (FL), weighed to the nearest 0.1 g by digital scale, and examined for external marks (stains, fin clips, tattoos, and brands) and physical irregularities. All captured salmonids that were not biosampled were tallied by species, age, and origin, and examined for external marks.

Juvenile Chinook Salmon were classified as age-0 (young-of-year) or age-1, based on size and date of capture. Coho Salmon were classified as either age-0 or age-1; the latter of which were much larger in size, more silvery in color, and lacked distinct parr marks. Steelhead were classified by age based on length–age analysis from a subsample of scales collected from WCRST or by length-frequency distribution from PTRST. Analysis of scale samples collected from unmarked steelhead over the sampling season provided length-to-age relationships. Un-aged steelhead were assigned an age based on the length–age relationship derived from scale-aged samples.

When present, daily samples of hatchery-marked Chinook Salmon were collected at WCRST. A missing adipose fin (ad-clip) was the external marker indicating a Chinook Salmon with a coded-wire tag (CWT) embedded in the snout. Within the Trinity River, a target constant fractional marking rate of 25% is used for Chinook Salmon. A maximum of five ad-clipped Chinook Salmon were collected daily and stored in a freezer for later CWT retrieval. Occasionally, ad-clipped fish were also used for disease analysis, after their CWTs were removed. Hatchery-marked Chinook Salmon were not regularly collected at PTRST.

Any salmonid mortality in the live box was checked for a fin clip and measured if included in the subsample. If a salmonid escaped during netting or handling before it could be identified to species or checked for a hatchery mark (i.e., adipose fin or maxillary clip), it was counted in the sample tally as ‘unknown’. Unknown salmonids were not included in catch totals.

Non-target species, fish other than Chinook Salmon, Coho Salmon, or steelhead, were identified to genus or species and enumerated. Additionally, for Brown Trout, lamprey ammocetes, and sturgeon, up to five specimens of each species were measured to FL. Total length (TL) was measured on species without a forked caudal fin.

All anesthetized fish not collected were allowed to recover in buckets of river water before being released downstream of the trap. If any adult salmonids were captured, their FL was recorded before release.

Hatchery and Natural Stocks Identification

The catch of Chinook Salmon, Coho Salmon, and steelhead was separated by hatchery or natural origin based on their external marks. Hatchery release strategies for Chinook Salmon consist of fingerling releases in the spring and yearling releases in the fall. These two distinct release periods prompted the division of the trapping season into spring and fall monitoring periods. The spring monitoring period was designated as WOY 1–39 and

the fall period as WOY 40–52 in years when extended sampling was conducted. Currently, this project does not sample during the fall monitoring period, though year-round sampling has occurred in past year. Hatchery-reared steelhead and Coho Salmon are typically volitionally released as smolts or yearling-plus (age-1) in early spring.

Chinook Salmon Abundance Estimation

At both PTRST and WCRST, the weekly number of hatchery-origin Chinook Salmon caught was estimated by dividing the number of ad-clipped fish by the Trinity River Hatchery (TRH) fin-clip rate (approximately 25%). The estimated number of natural-origin Chinook Salmon in the weekly catch were calculated as the difference between the total weekly Chinook Salmon catch and the estimated number of hatchery-origin Chinook Salmon.

Weekly hatchery and natural stock contribution was estimated under the assumptions that 1) differential post-release mortality between ad-clipped and non-ad clipped fish of the same release group is negligible, 2) ad-clip and non-clip Chinook Salmon are equally vulnerable to capture, and 3) mark-fraction estimates of Chinook Salmon released from TRH are accurate.

At the beginning and end of the hatchery fish emigration period, juvenile Chinook Salmon of hatchery origin may have been captured but not represented by ad clipped fish. If no ad-clipped hatchery Chinook Salmon were captured within a given week, the hatchery contribution for that week could not be differentiated from the natural component and all Chinook Salmon captured during that week were assumed to be of natural origin. Conversely, when the ad-clipped proportion of the weekly catch equaled or exceeded the clip fraction of the most recent release of Chinook Salmon from TRH, all Chinook Salmon captured during that week were assumed to be of hatchery origin.

Coho Salmon Abundance Estimation

All hatchery Coho Salmon released from TRH were marked with an adipose clip (AD-clip). The weekly contribution of natural-origin Coho Salmon to the catch was estimated by subtracting the catch of marked hatchery fish from the total catch.

Steelhead Abundance Estimation

All hatchery steelhead released from TRH were marked with an ad-clip. The weekly contribution of natural-origin steelhead to the catch was estimated by subtracting the catch of marked hatchery fish from the total catch.

Abundance Indices – Emigration Timing

A weekly flow-based abundance index for each age class of Chinook Salmon, Coho Salmon, and steelhead was estimated for each WOY based on catch-effort data. Daily abundance indices ($Index_{DC}$) for each species and development stage were calculated by the following equation:

$$Index_{DC} = \frac{Catch_{DC}}{Q_c/Q}$$

where:

$Catch_{DC}$ = Sum of daily catch of a species/life stage/age class from all traps.

Q_C = Sum of discharge sampled (ft³/s) by all traps

Q = Mean daily river discharge (ft³/s) at trap site

Weekly abundance indices ($Index_{CWOYi}$) were calculated for each WOY using the following equation:

$$Index_{CWOYi} = \frac{\sum Index_{DC}}{(\frac{nt_i}{TD_i})}$$

where:

nt_i = Number of days in the WOY with at least one trap fishing

TD_i = Sum of the days in the WOY

The estimated proportion of hatchery-origin fish, based on catches of marked fish and marking rates, were used to apportion abundance indices into hatchery and natural production. The usefulness of this index as an estimator of abundance is contingent upon assumptions that abundance is directly proportional to the percentage of river flow sampled and that individuals from a given species are equally susceptible to capture. The abundance index is not intended to represent a population estimate but rather used to compare relative abundance between weeks during the trapping season, and between years.

Emigration duration is defined as the period of time between the first and last WOYs that a species of a given age and origin is present in the catch. This definition applies strictly to the sampling period and is potentially longer for species of a given age and origin that have a longer emigration period than the sampling period. Emigration peaks are defined as the largest weekly abundance index for a species of a given age and origin. Abundance indices are greatly influenced by river discharge, which should be considered when comparing indices within or between years for absolute numbers of fish passing a site. However, abundance indices are generally thought to be adequate indicators of emigration timing and duration if sampling occurred in all weeks of the appropriate sampling period (Schwarz et al. 2009).

Migration Rate

Migration rates were estimated for hatchery Chinook Salmon, hatchery steelhead, and hatchery Coho Salmon by dividing the distance (rkm) traveled by the number of days elapsed between the initial hatchery release date and capture date at each trap site for specific CWT codes or marked fish. Migration rates reported as maximum, average, and median. Due to constant fractional marking rates and volitional releases, mean and median migration rates were not calculated for Chinook Salmon release groups.

Population Estimation

An intensive mark-recapture technique was employed to generate separate population estimates for natural and hatchery age-0 Chinook Salmon. Weekly and total abundance of

natural-origin age-0 Chinook Salmon outmigrating past PTRST and WCRST were estimated using a Bayesian time-stratified population estimation method (Calvert et al. 2009; Payton and Som 2021). This method requires the following weekly data: total age-0 Chinook Salmon with adipose fins, total adipose fin-clipped age-0 Chinook Salmon (and associated hatchery clip rate), trapping effort (sample fraction, described below), trap efficiency marks released, and trap efficiency marks recaptured. The numbers of age-0 Chinook Salmon with and without adipose fins were summarized from the weekly trapping data and fin-clip rates were reported by TRH.

Traps were not operated a full seven days each week, and due to operational logistics and disruptions (e.g., flawed sets due to debris), daily catches were not completed every day as originally planned. To account for variable and less than full effort, the number of days the site was operated within each j^{th} week was divided by seven, termed sampling fraction:

$$s_j = \frac{d_j}{7}$$

Mark-Recapture Technique

Hatchery-origin age-0 Chinook Salmon, provided by TRH, were used for mark-recapture trap efficiency tests at both trap locations. Marked test fish were released approximately 0.5–0.8 km upstream of the trap site to be tested. At least three meso-habitat units, including at least one riffle, were included between the release site and the trap site to allow the fish enough time and space to distribute across the river channel similarly to a natural population passing the trap site. Due to the length of the sampling week, two or three recapture days were available after the release of marked fish. These capture efficiency trials were essential data for estimating abundance via the Bayesian time-stratified model. Mark-recapture efficiency tests could not be conducted for Coho Salmon or steelhead due to the limited availability of these species, so production estimates were not generated for these species.

One or two types of marks were utilized in 2022, either freeze brands or Bismark Brown Y diazo dye. Freeze brands were applied only to hatchery-origin juvenile Chinook Salmon at TRH, which were held in raceways until brands became fully visible (approximately 5–10 days). Branded fish were transported to the appropriate release site in insulated tanks filled with aerated water. At the release site, a sample of the freeze branded fish was evaluated for mark quality; the proportion of fish with poor quality marks was applied to the release total and excluded from the total amount released. Hatchery fish with unique brands for each WOY and site were delivered from the hatchery weekly. Bismark Brown Y marking was applied to only hatchery-origin juvenile Chinook Salmon from TRH following Rawson (1984). The Bismark Brown Y was applied at the release site after fish were counted and transported from the hatchery.

Fish marked for trap efficiency trials were released around one hour before sunset approximately 0.9 km upstream near the stream margin (PTRST) or in late-afternoon at approximately 0.4 km upstream into a large, still pool (WCRST) to allow mixing with the population of emigrating in-river wild fish yet to pass the sampling site. During periods

with low daily captures, fish were held for several days until adequate numbers for estimating trap efficiency were available. All recaptured fish were identified and recorded during normal trapping operations but were not counted as part of the catch for that day.

Results

Sampling Efforts

In 2022, trapping at PTRST began in the second week of January and trapping at WCRST was initiated in early March (Table 2). Sampling occurred at both sites in each sampling week, although occasionally traps were not run for complete sample weeks. To ensure that the greatest portion of the natural Chinook Salmon emigration, as well as portions of the hatchery and natural Coho Salmon (*O. kisutch*) and steelhead (*O. mykiss*) smolt emigration were sampled, efforts were made to install the traps as early as possible and continue sampling throughout the summer. Sampling at PTRST has occurred between early January and late August since 2007, and sampling at Willow Creek has occurred from March through August since 2005. Sampling in 2022 did not occur year-round, therefore annual production estimates and indices are only calculated from data collected within the sampling timeframe. Data are grouped by Week of the Year (WOY; Table 1). Graphs of water temperature and discharge through the sampling periods are presented in Figure 2.

Table 1. Week of the Year (WOY) and corresponding first calendar date.

WOY	Week start	WOY	Week start	WOY	Week start
1	Dec 26	18	Apr 24	35	Aug 21
2	Jan 02	19	May 01	36	Aug 28
3	Jan 09	20	May 08	37	Sep 04
4	Jan 16	21	May 15	38	Sep 11
5	Jan 23	22	May 22	39	Sep 18
6	Jan 30	23	May 29	40	Sep 25
7	Feb 06	24	Jun 05	41	Oct 02
8	Feb 13	25	Jun 12	42	Oct 09
9	Feb 20	26	Jun 19	43	Oct 16
10	Feb 27	27	Jun 26	44	Oct 23
11	Mar 06	28	Jul 03	45	Oct 30
12	Mar 13	29	Jul 10	46	Nov 06
13	Mar 20	30	Jul 17	47	Nov 13
14	Mar 27	31	Jul 24	48	Nov 20
15	Apr 03	32	Jul 31	49	Nov 27
16	Apr 10	33	Aug 07	50	Dec 04
17	Apr 17	34	Aug 14	51	Dec 11
				52	Dec 18

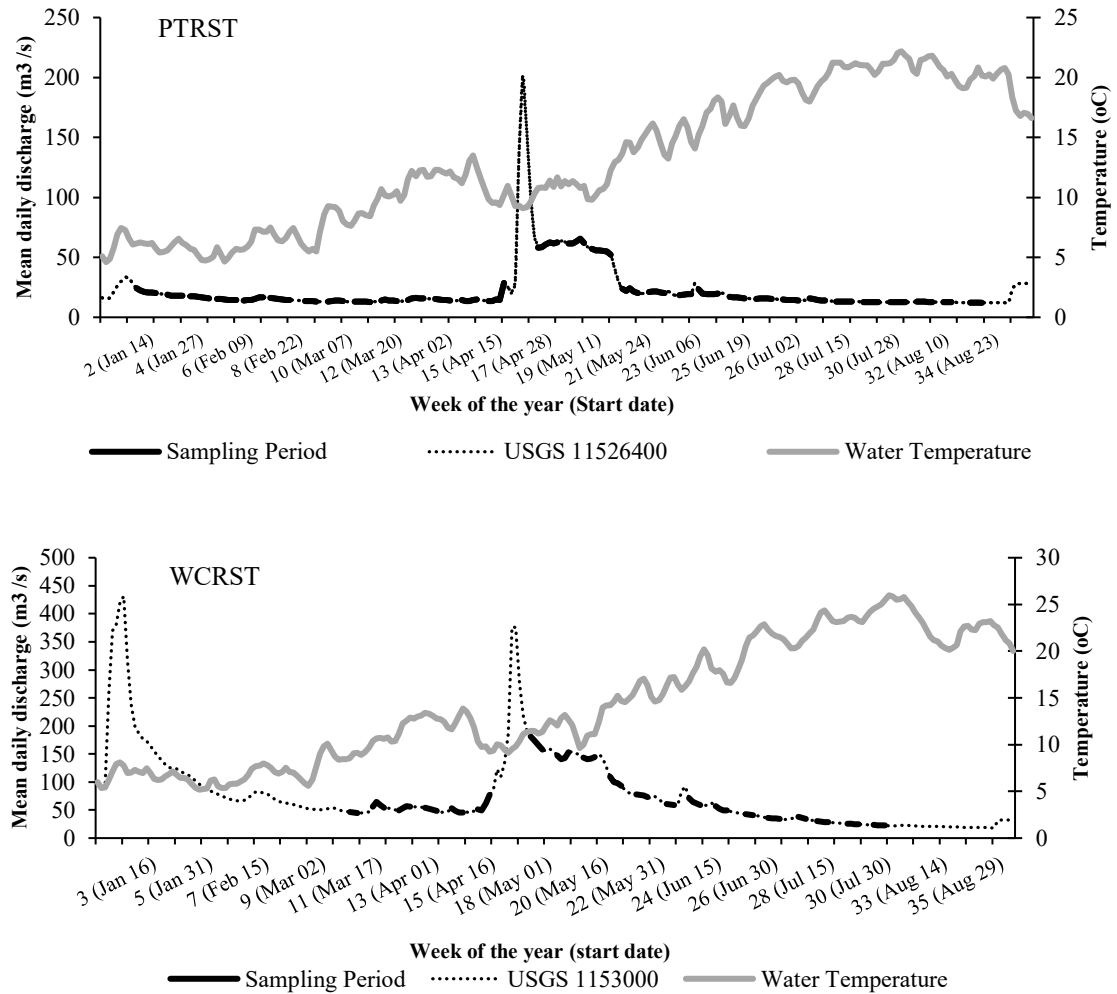


Figure 2. Mean daily discharge (m³/s) in the Trinity River recorded near Helena (U.S. Geological Survey Water Resource gage station #11-526400) and Hoopa (U.S. Geological Survey Water Resource gage station #11-530000), California, and mean daily water temperatures (°C) recorded at USGS gage #11-526400 and the Willow Creek Rotary Screw Trap (WCRST) in 2022. USGS gage #11-526400 is located approximately 100 m downstream of the Pear Tree Rotary Screw Trap (PTRST). USGS gage #11-530000 is located approximately 13.36 km downstream of the Willow Creek Rotary Screw Trap (WCRST). The bolded sections on discharge series indicate sampled flows and the lightly dotted sections indicate non-sampled flows.

Table 2. Period and duration of 2022 spring/summer monitoring and percent of time sampled at Pear Tree Rotary Screw Trap site (PTRST; rkm 118) and Willow Creek Rotary Screw Trap site (WCRST; rkm 34) in the Trinity River, California. Distinct days are total number of days sampled with at least one trap.

Site	Trap	Start-end dates	Trapped	Possible	Rate
PTRST	1 (2.4 m)	Jan 10 – Aug 27	153	229	66.8%
Distinct days		Jan 10 – Aug 27	153	229	66.8%
WCRST	1 (2.4 m)	Mar 29 – Aug 02	61	126	48.4%
	2 (2.4 m)	Mar 15 – Aug 02	69	140	49.3%
	3 (2.4 m)	Mar 08 – Aug 02	67	147	45.6%
Distinct days		Mar 08 – Aug 02	69	147	46.9%

Catch Totals

Catch totals of salmonids of interest (Chinook Salmon, Coho Salmon, and steelhead) are presented in Table 3. Chinook Salmon were the most captured salmonid at both sites, comprising approximately 96% of the total anadromous salmonid catch at both PTRST and WCRST. Hatchery salmonid releases from TRH are presented in Table 4. Catch totals of common non-target, fish species are presented in Table 5. Sampling periods at both trap sites missed portions of each respective population that emigrated before or after trapping operations. Natural age-0 Chinook Salmon were captured on the first day of trap operation at both sites, indicating that some age-0 Chinook Salmon emigrated before trap installation. A total of 42 age-1 hatchery Chinook Salmon were caught at PTRST, and 11 were captured at WCRST. Natural age-1 Coho Salmon were captured at the beginning of the sampling period at both trap sites, indicating that portions of each respective population emigrated prior to trap installation.

Abundance Estimates

The Bayesian time-stratified population estimates for natural age-0 Chinook Salmon were 2,184,157 (95% Credible Interval (CI): [1,449,292, 3,155,523]) and 1,328,853 (95% CI: [870,052, 1,888,524]) at PTRST and WCRST, respectively (Figure 3; Appendix 7, 8). The age-0 hatchery Chinook Salmon abundance estimates were 1,487,866 (95% CI: [941,625, 2,215,026]) at PTRST and 727,493 (95% CI: [435,008, 1,084,027]) at WCRST.

Abundance Indices

Age-0 natural-origin Coho Salmon abundance indices were 2,061 and 3,958 at PTRST and WCRST, respectively (Figure 5; Table 6, Appendix 3, Appendix 4). The abundance indices for age-1 natural-origin Coho Salmon were 1,700 and 211 at PTRST and WCRST, respectively. Abundance indices of hatchery age-1 Coho Salmon were 6,409 and 3,055 at PTRST and WCRST, respectively.

At PTRST, abundance indices of natural age-0 and age-1 steelhead were 7,980 and 6,922, respectively (Figure 6; Table 6; Appendix 5). Abundance indices of natural age-0 and age-1 steelhead at WCRST were 4,389 and 10,714, respectively (Figure 6; Table 6; Appendix 6). Abundance indices of hatchery age-1 steelhead were 452 at PTRST and

6,889 at WCRST. No Age-2 steelhead were captured at PTRST or WCRST.

Table 3. Juvenile salmonid catch totals in 2022 for trapping at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34), on the Trinity River, California, operated by the Hoopa Valley Tribal Fisheries Department, U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, and the Yurok Tribal Fisheries Program. Hatchery fish totals are expanded catch based on adipose fin clip rate. NA = Not Applicable (i.e., no fish of a particular age class exist in the Trinity River).

Site	Species	Hatchery age-0	Hatchery age-1+	Natural age-0	Natural age-1+	Total
PTRST	Chinook Salmon	16,051	42	55,082	109	55,082
	Coho Salmon	NA	231	212	118	561
	Steelhead	NA	45	955	479	1,479
WCRST	Chinook Salmon	8,546	11	28,209	144	36,909
	Coho Salmon	NA	137	136	8	281
	Steelhead	NA	272	317	486	1,076

Table 4. California Department of Fish and Game, Trinity River Hatchery juvenile salmonid releases, 2022. AD-clipped = adipose fin clipped fish.

Species	Release season	Number released	Percentage ad- clipped or marked	Release dates
Chinook Salmon ¹	Spring	1,343,605	24.5	05/13 – 10/21
	Fall	2,455,183	24.5	05/02 – 10/21
Coho Salmon ^{2,3}	Spring	336,503	99.9	04/15 – 04/24
Steelhead	Spring	512,136	99.9	04/22 – 04/28

¹Chinook Salmon releases includes both spring-run and fall-run races.

²Coho Salmon were marked with a right maxillary clip.

³Coho Salmon volitional release end date unavailable

Table 5. Catch totals of non-target fish species captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) on the mainstem Trinity River, California, 2022.

Common name	Species	Life stage	PTRST	WCRST
Lamprey	<i>Entosphenus</i> spp.	Ammocoete	495	411
		Eyed juvenile	163	63
		Adult	3	4
Sucker	<i>Catostomus</i> spp.		93	1,489
Speckled Dace	<i>Rhinichthys osculus</i>		1,622	361
Three-Spine Stickleback	<i>Gasterosteus aculeatus</i>		475	443
Golden Shiner	<i>Notemigonus crysoleucas</i>		0	4
Sculpin	<i>Cottus</i> spp.		0	19
Green Sturgeon	<i>Acipenser medirostris</i>	Juvenile	0	0
Brown Trout	<i>Salmo trutta</i>	Juvenile	74	53
Sunfish	<i>Lepomis</i> spp.		3	3
Sockeye Salmon	<i>Oncorhynchus nerka</i>	Juvenile	0	0
Fathead Minnow	<i>Pimephales promelas</i>	Juvenile	0	19
Chum Salmon	<i>Oncorhynchus keta</i>		0	0

Table 6. Juvenile salmonid proportional discharge-based abundance indices at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2022. NA = Not Applicable (i.e., no fish of a particular age class exist in the Trinity River).

Site	Species	Hatcher y age-0	Hatcher y age-1	Natural age-0	Natural age-1	Total
PTRST	Chinook Salmon	183,143	479	443,624	1,232	628,478
	Coho Salmon	NA	6,409	2,061	1,700	10,170
	Steelhead	NA	452	7,980	6,922	15,354
WCRST	Chinook Salmon	173,488	1,769	480,299	5,527	661,082
	Coho Salmon	NA	3,055	3,958	211	7,224
	Steelhead	NA	6,889	4,389	10,714	21,992

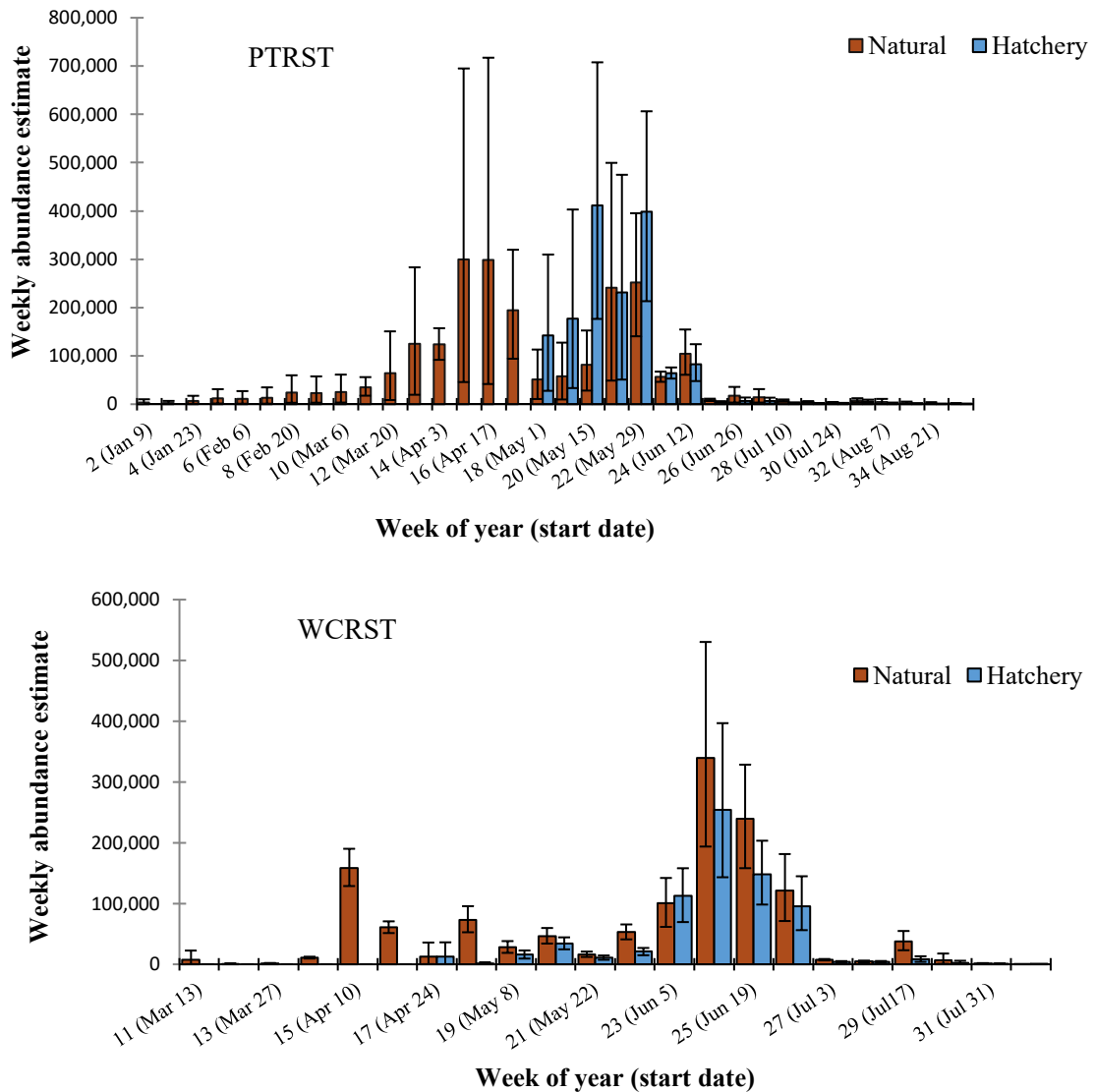


Figure 3. Weekly Bayesian time-stratified population estimates of natural age-0 and hatchery age-0 Chinook Salmon (*Oncorhynchus tshawytscha*) captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in the Trinity River, California 2022. Error bars represent one standard deviation of the mean weekly estimate.

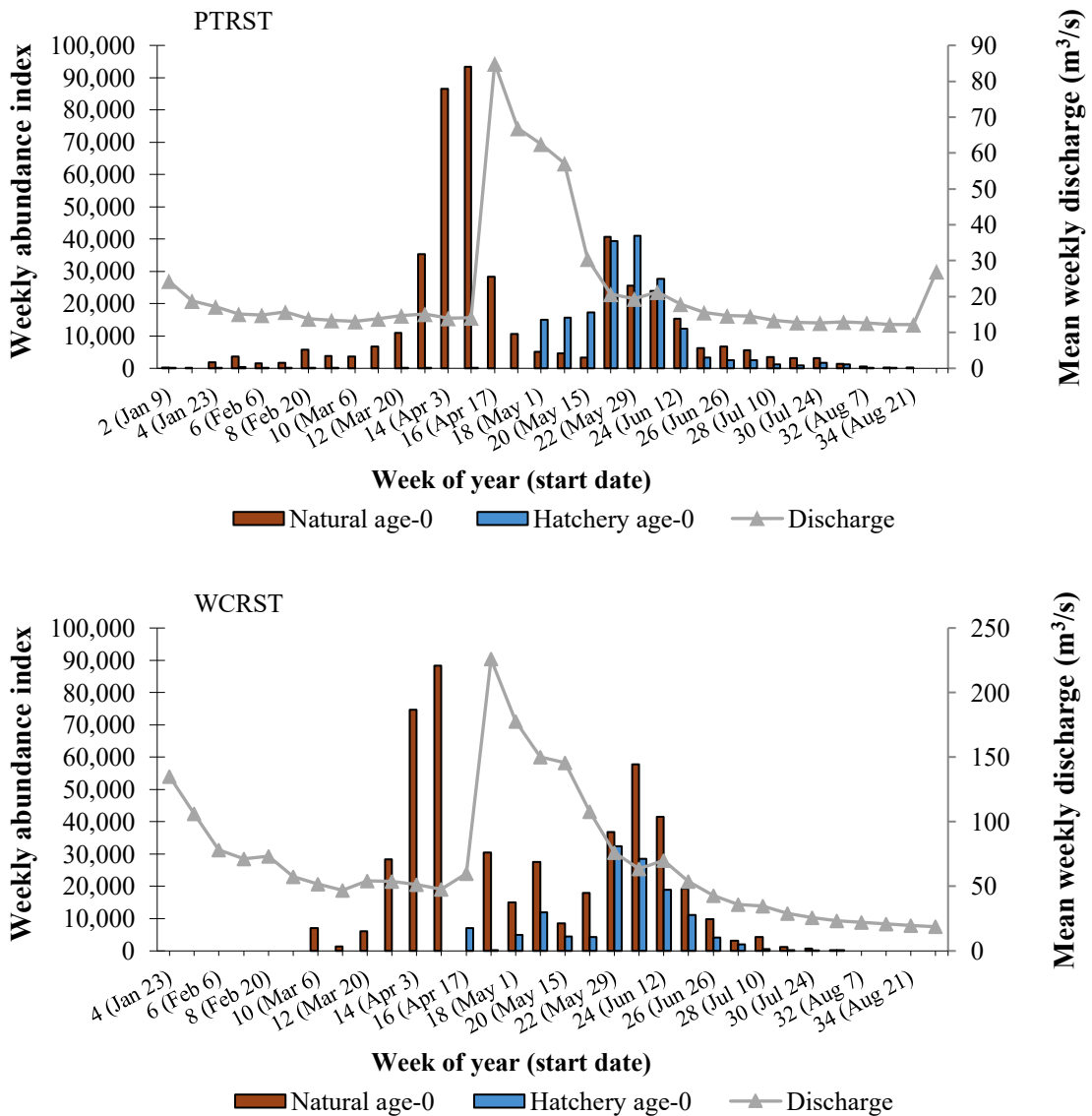


Figure 4. Weekly proportional discharge-based abundance indices for natural age-0 and hatchery age-0 Chinook Salmon (*Oncorhynchus tshawytscha*) captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in the Trinity River, California 2022.

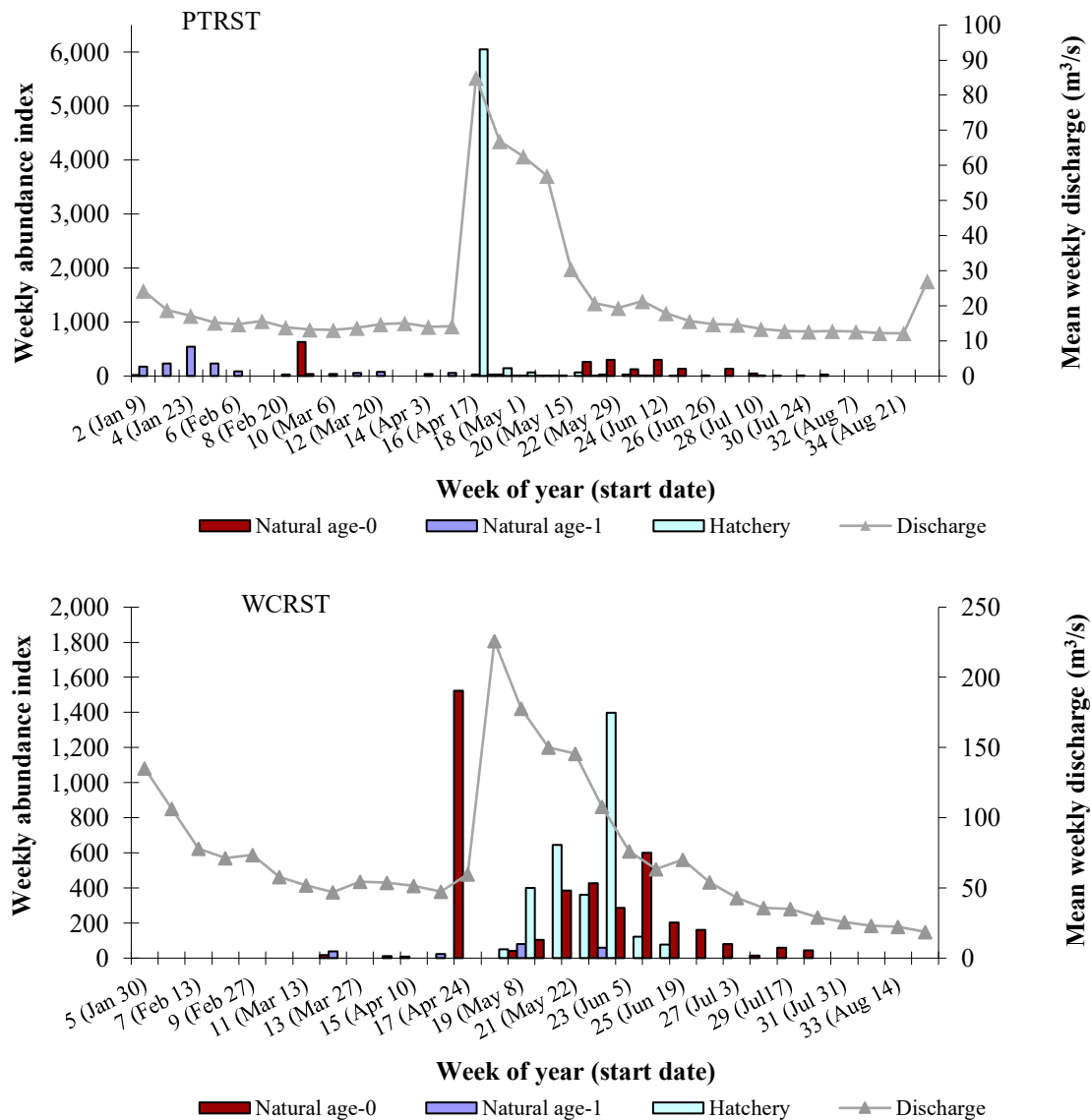


Figure 5. Weekly proportional discharge-based abundance indices for natural age-0, natural age-1, and hatchery age-1 Coho Salmon (*Oncorhynchus kisutch*) captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in the Trinity River, California 2022.

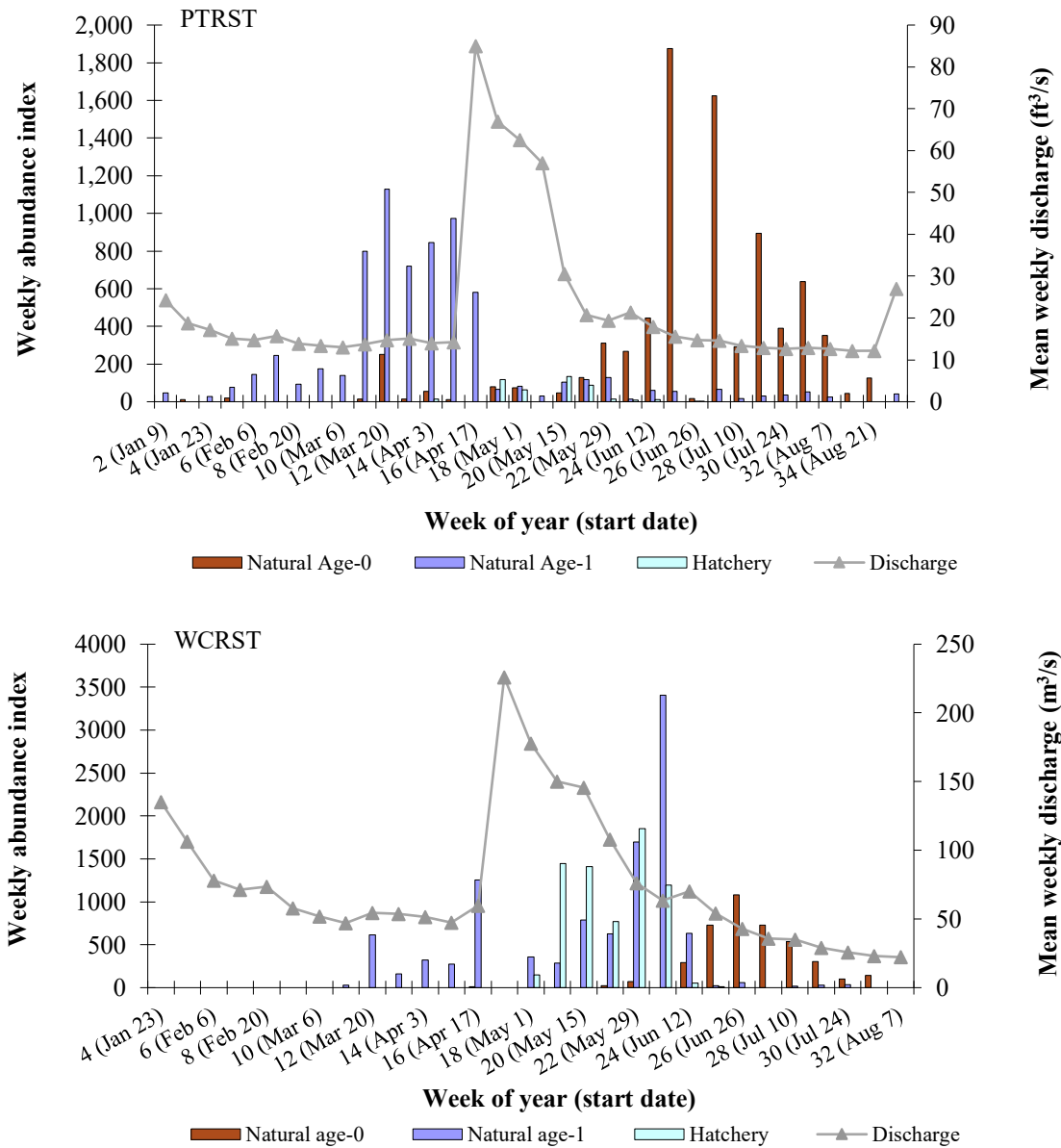


Figure 6. Weekly proportional discharge-based abundance indices for natural age-0, natural age-1, natural age-2, and hatchery age-1 steelhead (*Oncorhynchus mykiss*) captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in the Trinity River, California 2022.

Hatchery/Natural Contribution

Chinook Salmon were captured at PTRST and WCRST throughout the 2022 sampling season with the spring/summer emigration dominated by natural-origin fish at PTRST and WCRST, comprising 57.8% and 64.6%, respectively, of the total Bayesian time-stratified population estimates (Appendix 1, 2, 7, 8).

Age-1 Coho Salmon smolts were predominantly hatchery origin at PTRST and comprised 63.0% of the total age-1 proportional discharge-based index in 2022 (Appendix 3). At WCRST, age-1 Coho Salmon emigrants of hatchery origin comprised 93.5% of the total age-1 proportional discharge-based index in 2022 (Appendix 4).

Based on proportional discharge-based abundance indices at PTRST and WCRST, age-1 hatchery steelhead comprised 2.9% (Appendix 5) and 39.1% (Appendix 6), respectively, of the total age-1 steelhead abundance indices at each respective site.

Chinook Salmon Population Estimation

During the 2022 sampling season, freeze-branded and photonicallly-marked hatchery Chinook Salmon were delivered to the trap sites to estimate weekly trap efficiencies for generating population estimates (Appendix 7, 8). Weekly stratified mark-recapture population estimates of emigrating age-0 Chinook Salmon were calculated for both natural- and hatchery-origin sub-populations (Figure 3). At PTRST an estimated 2,210,344 (95% CI: [1,449,292, 3,155,526]) natural-origin age-0 Chinook Salmon and 1,487,866 (95% CI: [941,625, 2,215,026]) age-0 hatchery Chinook Salmon passed the site between January 10 and August 27. At WCRST between March 8 and August 22, an estimated 1,328,853 (95% CI: [870,052, 1,888,524]) natural-origin age-0 Chinook Salmon and 727,493 (95% CI: [435,008, 1,084,027]) age-0 hatchery Chinook Salmon passed the site.

Outmigrant Timing

The Chinook Salmon population in the Trinity River is composed of both natural- and hatchery-origin fish of both spring and fall runs. The vast majority of juveniles during the spring/summer emigration period emigrate as age-0 fish, with the natural and hatchery emigration periods overlapping (Table 7; Appendix 1, 2). Natural age-0 Chinook Salmon emigration peaked during WOY 15 at PTRST and WOY 23 at WCRST. Hatchery age-0 Chinook Salmon emigration peaked from WOY 20 to WOY 22 at PTRST and WOY 23 at WCRST. The week marking the cumulative passage of 80% of the natural juvenile Chinook Salmon population at WCRST (WC80), as inferred from the Bayesian time-stratified population estimate, was WOY 24 (June 12–18), before the TRRP management target date of July 4 (TRRP and ESSA 2009).

Table 7. Juvenile salmonid emigration duration and peak as inferred from proportional discharge-based abundance indices at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2022. Values represent week of the year.

Site	Species	Emigration duration			Emigration peak		
		Natural age-0	Natural age-1+	Hatchery	Natural age-0	Natural age-1+	Hatchery
PTRST	Chinook Salmon	02–34	06–15	18–35	15	10	21
	Coho Salmon	17–32	02–23	16–24	23	4	16
	Steelhead	03–34	02–35	14–23	25	12	20
WCRST	Chinook Salmon	11–32	11–32	17–32	19	15	24
	Coho Salmon	12–30	12–22	18–24	21	19	22
	Steelhead	16–32	11–32	18–25	26	21	21

The Coho Salmon population in the Trinity River is composed of both natural-origin and hatchery populations. The majority of Trinity River Coho Salmon emigrate to the ocean as age-1 smolts while the emigration of age-0 fish is presumably a redistribution of rearing juveniles. Natural age-1 Coho Salmon were captured in the first week of sampling at PTRST and the second week at WCRST. Emigration continued into July (WOY 28) at PTRST, and June (WOY 26) at WCRST. (Table 7; Appendix 4). Capture data and past observations suggests that the sampling period did not encompass the entire natural-origin age-1 Coho Salmon emigration. The week marking the cumulative passage of 80% of the natural-origin age-1 Coho Salmon population at WCRST, as inferred from the abundance index, was WOY 21 (May 22–28). Natural age-1 Coho Salmon emigration peaked in WOY 4 at PTRST and WOY 19 at WCRST (Table 7; Appendix 4). Hatchery Coho Salmon emigration peaked in WOY 16 at PTRST and WOY 22 at WCRST.

Steelhead in the Trinity River are composed of both natural populations that exhibit highly variable juvenile life history patterns, as well as a hatchery-origin component. The majority of age-0 steelhead were captured from April through June at WCRST and PTRST, (Table 7, Appendix 5, 6). Age-1 and older natural steelhead were present throughout the sampling period at PTRST and WCRST. The majority of hatchery-origin age-1 steelhead passed PTRST and WCRST by mid-May. The week marking the cumulative passage of 80% of the natural steelhead smolt population at WCRST, as inferred from the proportional discharge-based abundance index, was WOY 22 (May 29–June 4, Table 7, Appendix 5). Natural age-0 steelhead emigration peaked in WOY 25 at PTRST and WOY 26 at WCRST. Natural age-1 steelhead emigration peaked in WOY 12 at PTRST and WOY 21 at WCRST. Hatchery steelhead emigration peaked in WOY 20 at PTRST and WOY 21 at WCRST.

Migration Rate

Maximum migration rates for hatchery Chinook Salmon were 32 and 79 km/day at PTRST and WCRST, respectively (Table 8). Average and median migration rates cannot be accurately calculated for Chinook Salmon due to the 25% targeted constant fractional marking rate. Maximum migration rates for hatchery Coho Salmon were 16 and 12 km/day at PTRST and WCRST, respectively (Table 8). Average migration rates for

hatchery Coho Salmon were 9.0 and 4.0 km/day at PTRST and WCRST, respectively (Table 8). Median migration rates for hatchery Coho Salmon were 2.3 and 3.6 km/day at PTRST and WCRST, respectively (Table 8). Maximum migration rates for hatchery steelhead were 65 and 21 km/day at PTRST and WCRST, respectively (Table 8). Average migration rates for hatchery steelhead were 2.6 and 5.0 km/day at PTRST and WCRST, respectively (Table 8). Median migration rates for hatchery steelhead were 2.1 and 4.4 km/day at PTRST and WCRST, respectively (Table 8). Maximum, average, and median migration rates of salmonids released from TRH are presented in Table 8.

Fish Size

Age-0 Chinook Salmon weekly mean fork length at PTRST was relatively constant from week 2 through week 9, apparently due to continued fry emergence, then increased through the remainder of the season (Figure 7; Appendix 9, 10). Age-0 Chinook Salmon weekly mean fork length increased steadily at WCRST through mid-June and stabilized through the summer with the arrival of hatchery fish. Little change in the fork lengths of age-1 Chinook Salmon at PTRST from week 4 to week 15 was detected. Age-1 Chinook Salmon showed little change in fork lengths throughout the season at WCRST.

Natural age-0 Coho Salmon fork lengths remained steady at PTRST while they generally increased as the season at WCRST (Appendix 11, Appendix 12). Hatchery age-1 Coho Salmon fork lengths showed no weekly or seasonal trend at either trapping site. Natural age-1 Coho Salmon fork lengths sampled at PTRST showed a slight seasonal increase but weekly means were quite variable. WCRST natural age-1 Coho showed no discernable seasonal trend, likely due to inadequate sample size and tributary inputs.

Natural age-0 steelhead fork lengths generally increased through the sampling season at PTRST (Figure 9; Appendix 13, Appendix 14). Natural age-1+ steelhead fork length was generally unchanged from week 3 to week 15 and increased steadily from week 15 to the end of the season (Figure 9; Appendix 13, Appendix 14). At WCRST, age-0 steelhead fork lengths showed no discernable trends, age-1 steelhead showed a slight decrease in fork length in the middle of June. Hatchery steelhead fork lengths were variable throughout the season at both PTRST and WCRST.

Table 8. Juvenile salmonid maximum migration rate from Trinity River Hatchery to Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) sampling sites, operated by the Hoopa Valley Tribal Fisheries Department, U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, and the Yurok Tribal Fisheries Program, 2022.

Site	Species	First released	Date first captured	Duration (days)	Migration Rates (km/day)		
					Maximum	Average	Median
PTRST	Chinook Salmon	5/2/2022	5/3/2022	1	64.0	NA	NA
	Coho Salmon	4/15/2022	4/27/2022	12	16.0	9.0	2.3
	Steelhead	4/22/2022	4/26/2022	4	16.0	2.6	2.1
WCRST	Chinook Salmon	5/2/2022	5/3/2022	1	146	NA	NA
	Coho Salmon	4/15/2022	4/27/2022	12	12.0	4.0	3.6
	Steelhead	4/22/2022	4/27/2022	5	21.0	5.0	4.4

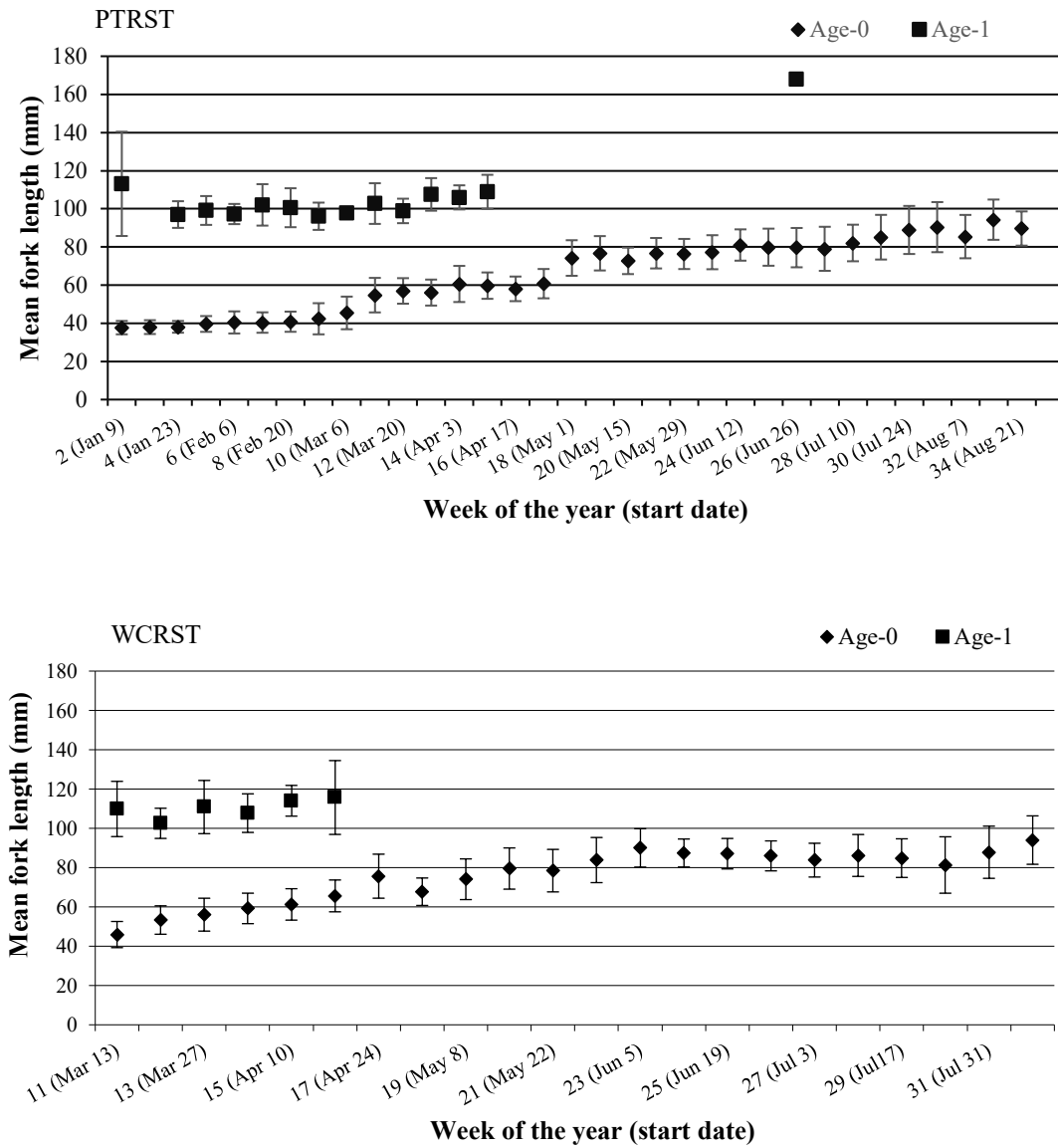


Figure 7. Weekly mean fork lengths of age-0 and age-1 Chinook Salmon (*Oncorhynchus tshawytscha*) captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2022. Error bars represent one standard deviation of the mean.

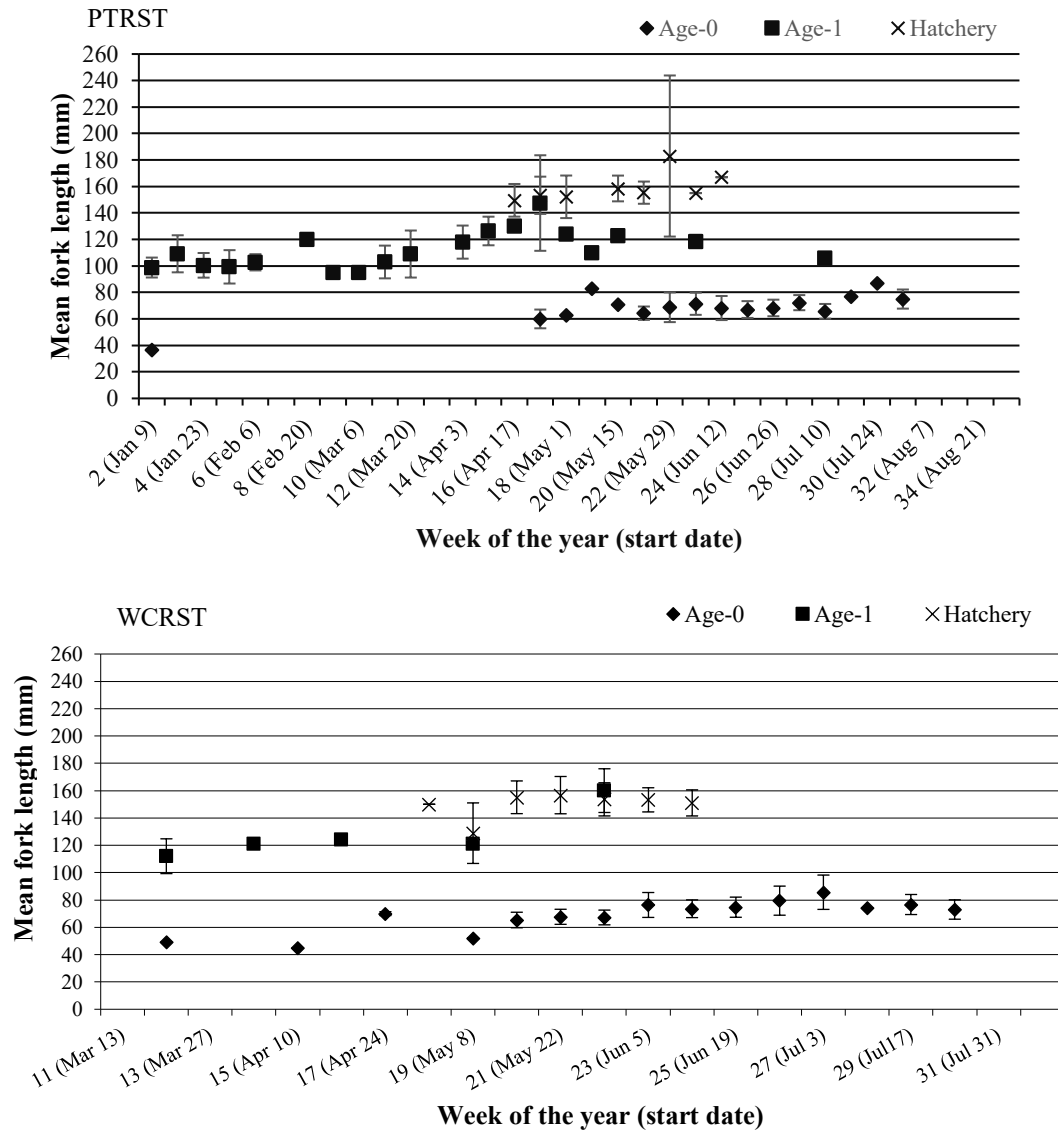


Figure 8. Weekly mean fork lengths for natural age-0, natural age-1, and hatchery Coho Salmon (*Oncorhynchus kisutch*) captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2022. Error bars represent one standard deviation of the mean.

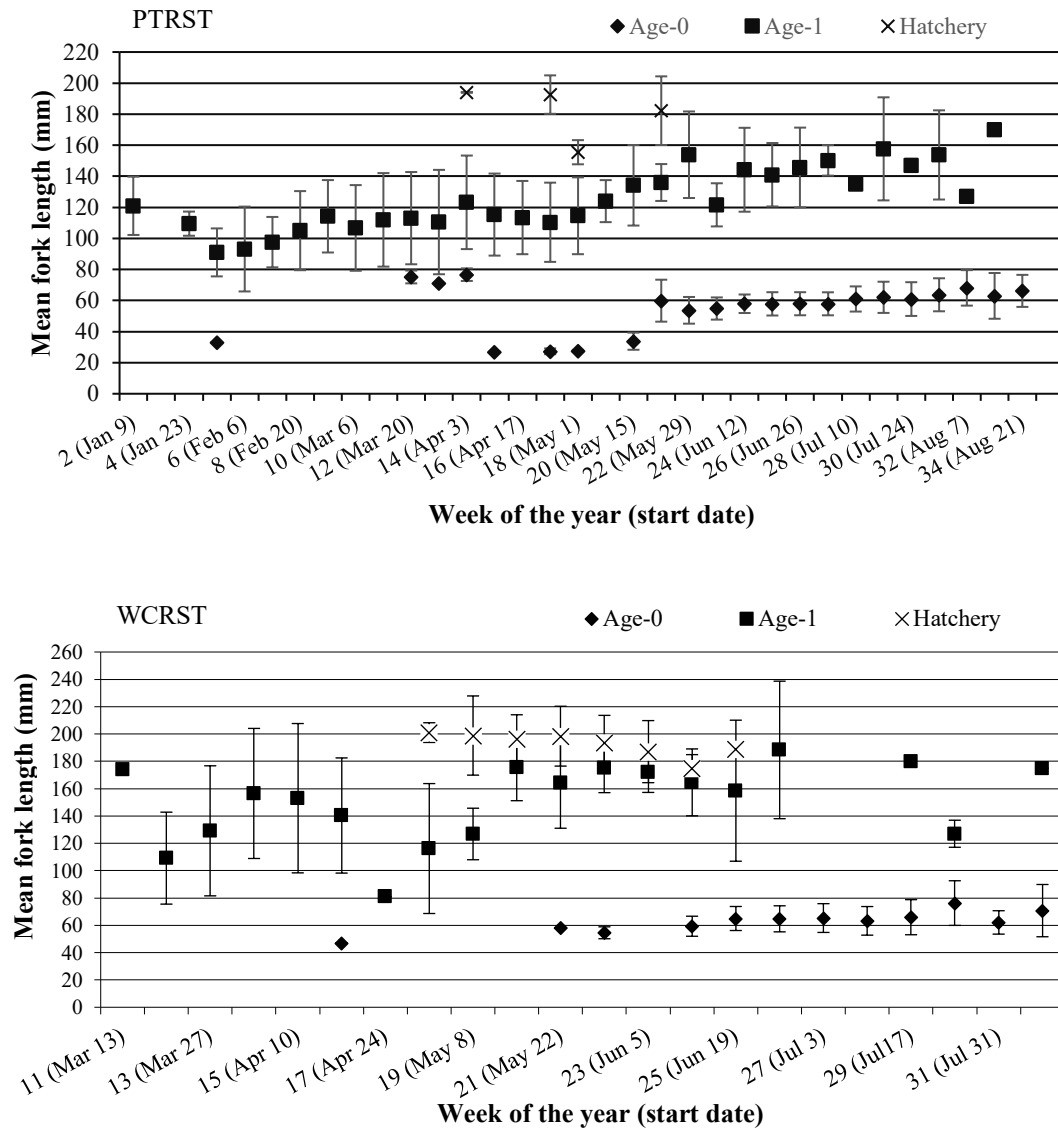


Figure 9. Weekly mean fork lengths for natural age-0, age-1, age-2, and hatchery age-1 steelhead (*Oncorhynchus mykiss*) captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2022. Error bars represent one standard deviation of the mean.

Fish Condition

Fulton's condition factor ($K = 100,000 * (\text{weight}/\text{length}^3)$) was calculated on a subsample of age-0 (pooled natural and hatchery) Chinook Salmon larger than 50 mm, age-1 natural Coho Salmon, and age 1+ natural steelhead. Due to the inability to determine the origin of unmarked individuals, clipped and non-clipped juvenile Chinook Salmon were pooled in weekly mean calculations.

Chinook Salmon age-0 mean weekly condition factors were variable at the onset of sampling and showed no obvious seasonal trend at either site (Figure 10, Appendix 15). Age-1 natural Coho Salmon weekly mean condition factors were variable throughout the season at both PTRST and WCRST (Figure 11, Appendix 16), however, it should be noted that there were several weeks in which only one individual was captured at either site. The weekly mean condition factor of natural age-1+ steelhead showed no obvious trend at either PTRST or WCRST (Figure 12, Appendix 17).

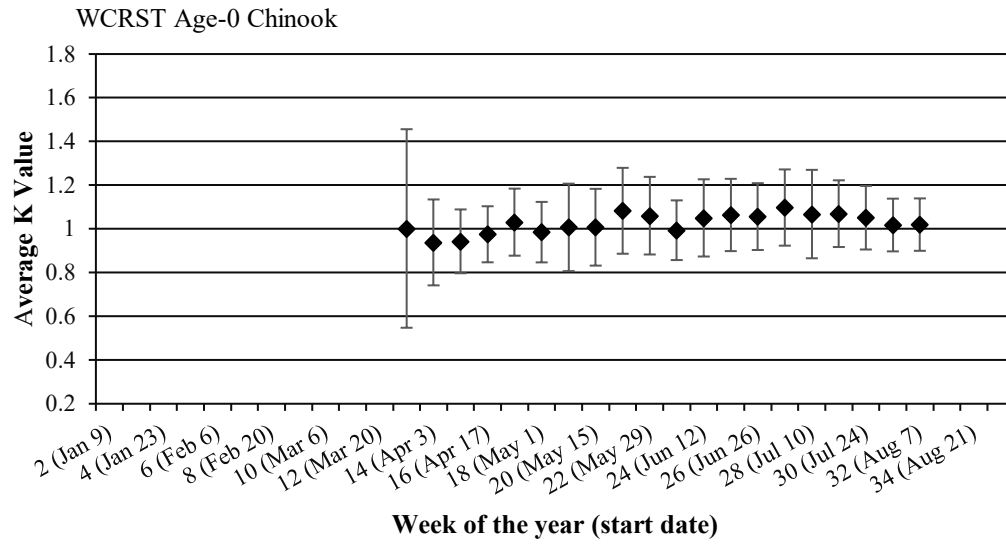


Figure 10. Weekly mean K value for pooled hatchery and natural age-0 Chinook Salmon (*Oncorhynchus tshawytscha*) captured at Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2022. Age-0 Chinook Salmon condition factor unavailable for Pear Tree Rotary Screw Trap in 2022. Error bars represent one standard deviation of the mean.

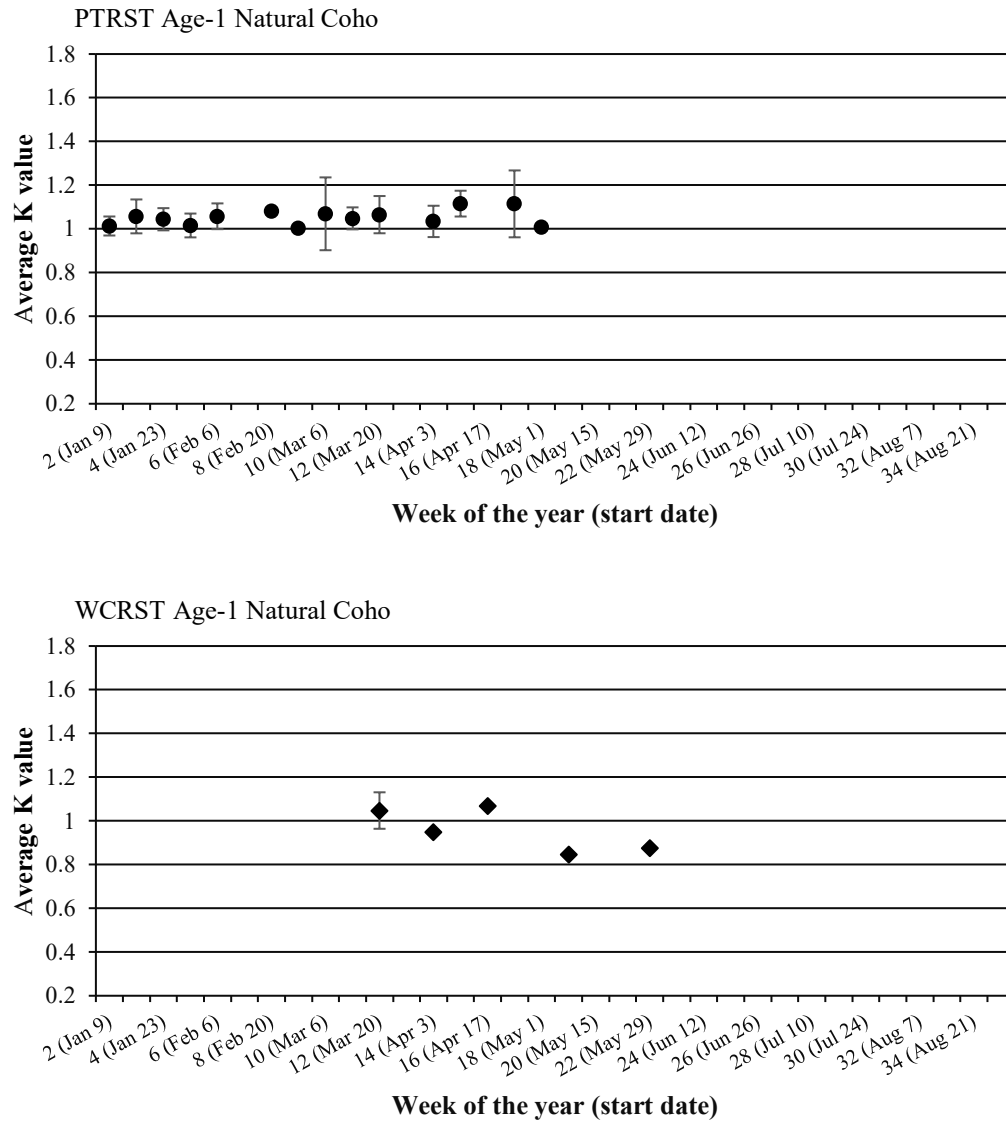


Figure 11. Weekly mean K value for natural age-1 Coho Salmon (*Oncorhynchus kisutch*) captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2022. Error bars represent one standard deviation of the mean.

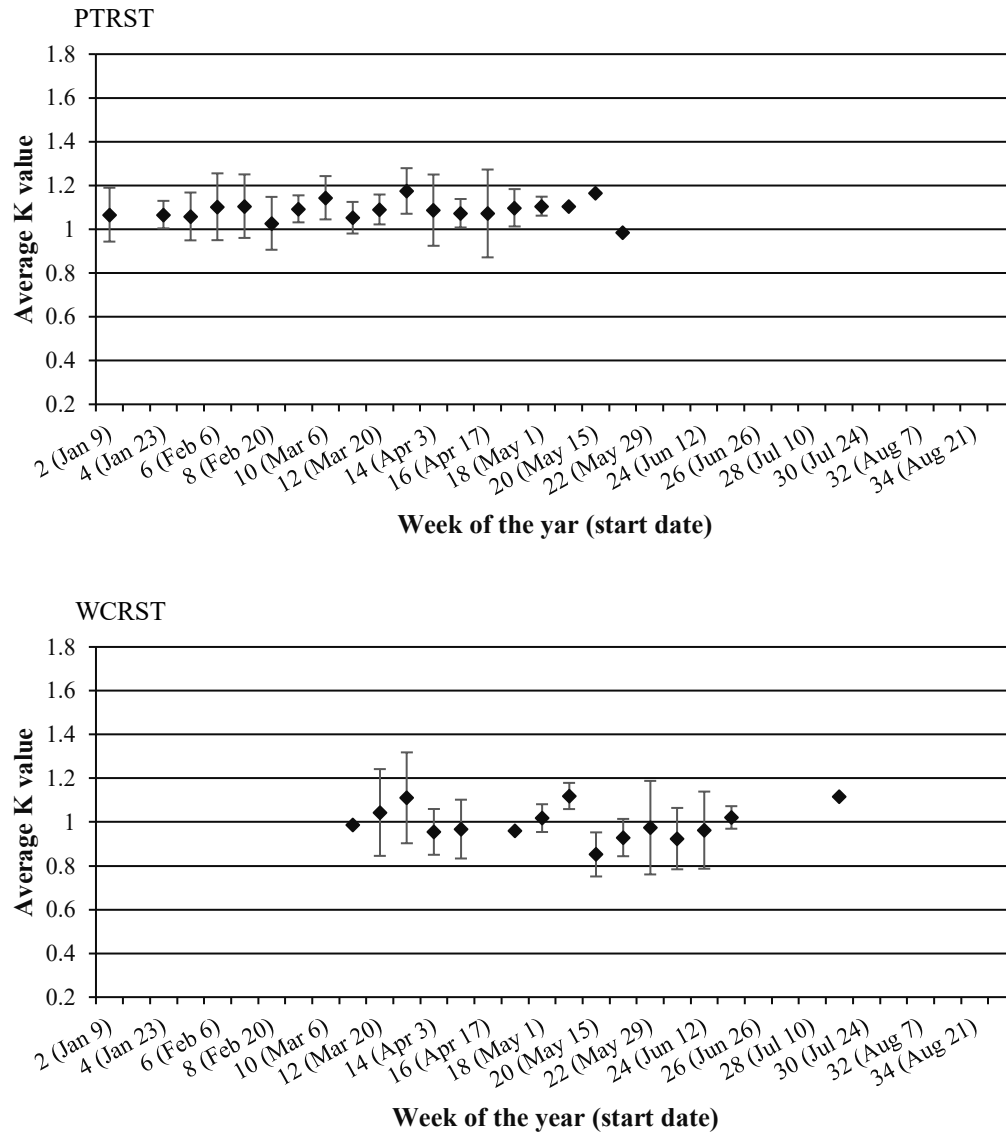


Figure 12. Weekly mean K value for natural age-1+ steelhead (*Oncorhynchus mykiss*) captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2022. Error bars represent one standard deviation of the mean.

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Acknowledgements

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Appendices

Appendix 1. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly Chinook Salmon catches and abundance indices, 2022. NC = no clip, AD = adipose fin clip.

Week starting	Week of year	Mean daily discharge m3/s	Trap days sampled	Weekly Chinook Salmon catch						Weekly Chinook Salmon index					
				Hatchery			Natural		Catch total	Hatchery			Natural		Index total
				NC	AD	Age-1	Age-0	Age-1		NC	AD	Age-1	Age-0	Age-1	
1/9/2022	2	24.3	4	8	0	3	18	0	29	91	0	34	205	0	331
1/16/2022	3	18.8	4	0	0	0	9	0	9	0	0	0	103	0	111
1/23/2022	4	17.2	5	6	0	5	170	0	181	68	0	57	1,940	0	2,564
1/30/2022	5	15.2	5	29	0	18	314	0	361	331	0	205	3,583	0	7,000
2/6/2022	6	14.8	5	6	0	2	133	20	161	68	0	23	1,518	228	5,112
2/13/2022	7	15.7	5	9	0	3	148	13	173	103	0	34	1,689	148	4,257
2/20/2022	8	13.9	4	9	0	3	510	2	524	103	0	34	5,819	23	16,101
2/27/2022	9	13.3	5	6	0	2	329	1	338	68	0	23	3,754	11	7,386
3/6/2022	10	13.1	5	0	0	0	314	1	315	0	0	0	3,583	11	5,469
3/13/2022	11	13.8	5	0	0	0	587	41	628	0	0	0	6,698	468	9,274
3/20/2022	12	14.7	5	9	0	3	958	8	978	103	0	34	10,931	91	15,336
3/27/2022	13	15.1	5	6	0	2	3,092	8	3,108	68	0	23	35,280	91	43,792
4/3/2022	14	14.0	5	0	0	0	7,581	7	7,588	0	0	0	86,500	80	105,073
4/10/2022	15	14.2	5	3	0	1	8,179	7	8,190	34	0	11	93,323	80	99,497
4/17/2022	16	85.0	2	0	0	0	2,488	0	2,488	0	0	0	28,388	0	76,035
4/24/2022	17	67.0	4	0	0	0	931	0	931	0	0	0	10,623	0	12,196
4/31/2022	18	62.6	5	992	322	0	454	0	1,768	11,319	3,674	0	5,180	0	18,437
5/8/2022	19	57.1	5	1,047	330	0	407	0	1,784	11,946	3,765	0	4,644	0	17,378
5/15/2022	20	30.5	5	1,140	370	0	287	0	1,797	13,007	4,222	0	3,275	0	17,700
5/22/2022	21	20.7	5	2,606	846	0	3,571	0	7,023	29,735	9,653	0	40,745	0	68,962
5/29/2022	22	19.4	4	2,717	882	0	2,240	0	5,839	31,001	10,064	0	25,559	0	75,794
6/5/2022	23	21.3	5	1,836	596	0	2,096	0	4,528	20,949	6,800	0	23,916	0	10,976
6/12/2022	24	18.0	5	816	265	0	1,344	0	2,425	9,311	3,024	0	15,335	0	29,117
6/19/2022	25	15.6	5	216	70	0	552	0	838	2,465	799	0	6,298	0	11,552
6/26/2022	26	14.7	5	169	55	0	598	1	823	1,928	628	0	6,823	0	70
7/3/2022	27	14.6	4	169	55	0	497	0	721	1,928	628	0	5,671	0	9,593
7/10/2022	28	13.4	5	83	27	0	313	0	423	947	308	0	3,571	0	3,956
7/17/2022	29	12.8	5	62	20	0	271	0	353	707	228	0	3,092	0	3,591
7/24/2022	30	12.6	5	111	36	0	273	0	420	1,267	411	0	3,115	0	3,903
7/31/2022	31	12.9	5	77	25	0	123	0	225	879	285	0	1,403	0	2,352
8/7/2022	32	12.7	4	6	2	0	46	0	54	68	23	0	525	0	677
8/14/2022	33	12.2	3	9	3	0	22	0	34	103	34	0	251	0	510
8/21/2022	34	12.2	5	0	0	0	25	0	25	0	0	0	285	0	261
8/28/2022	35	27.0	1	0	0	0	0	0	0	0	0	0	0	0	0
Totals			153	12,147	3,904	42	38,880	109	55,082	138,598	44,545	479	443,624	1,232	684,363

Appendix 2. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Chinook Salmon catches and abundance indices, 2022. NC = no clip, AD = adipose fin clip.

Week starting	Week of year	Mean daily discharge m ³ /s	Trap days sampled	Weekly Chinook Salmon catch						Weekly Chinook Salmon index					
				Hatchery			Natural		Catch total	Hatchery			Natural		Index total
				NC	AD	Age-1	Age-0	Age-1		NC	AD	Age-1	Age-0	Age-1	
3/6/2022	11	47.0	4	0	0	0	171	5	176	0	0	0	7,132	300	7,433
3/13/2022	12	54.4	8	0	0	2	68	15	85	0	0	38	1,336	382	1,755
3/20/2022	13	53.7	8	0	0	4	342	21	367	0	0	70	6,054	732	6,856
3/27/2022	14	51.6	12	0	0	3	2,665	33	2,701	0	0	33	28,432	618	29,083
4/3/2022	15	47.6	12	0	0	2	7,058	41	7,101	0	0	22	74,636	781	75,439
4/10/2022	16	59.9	10	0	0	0	4,808	29	4,837	0	0	0	88,274	643	88,917
4/17/2022	17	226.0	1	9	3	0	0	0	12	7,043	2,286	0	0	0	9,329
4/24/2022	18	177.8	8	3	1	0	546	0	550	238	77	0	30,516	0	30,831
5/1/2022	19	150.2	8	117	38	0	264	0	419	4,904	1,592	0	14,987	0	21,482
5/8/2022	20	145.8	10	450	146	0	809	0	1,405	11,880	3,856	39	27,541	15	43,332
5/15/2022	21	107.9	11	197	64	0	397	0	658	4,539	1,473	47	8,606	207	14,872
5/22/2022	22	76.3	11	324	105	0	1,085	0	1,514	4,226	1,372	318	18,035	331	24,281
5/29/2022	23	63.5	6	893	290	0	1,063	0	2,246	32,359	10,503	487	36,769	684	80,803
6/5/2022	24	70.1	11	1,420	461	0	2,512	0	4,393	28,466	9,239	317	57,835	203	96,060
6/12/2022	25	53.9	12	1,618	525	0	3,458	0	5,601	18,944	6,149	144	41,513	70	66,819
6/19/2022	26	42.9	9	773	251	0	1,298	0	2,322	11,077	3,595	73	19,208	9	33,962
6/26/2022	27	35.8	12	379	123	0	869	0	1,371	4,217	1,369	21	9,832	43	15,482
7/3/2022	28	34.9	9	148	48	0	227	0	423	1,961	636	42	3,232	62	5,933
7/10/2022	29	29.1	12	71	23	0	416	0	510	616	200	31	4,243	44	5,134
7/17/2022	30	25.6	12	22	7	0	88	0	117	268	87	12	1,142	33	1,541
7/24/2022	31	23.2	9	22	7	0	49	0	78	31	10	74	713	149	977
7/31/2022	32	22.2	3	6	2	0	15	0	23	208	68	0	265	221	761
Totals			198	6,452	2,094	11	28,209	144	36,909	130,976	42,511	1,769	480,299	5,527	661,082

Appendix 3. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly Coho Salmon catches and abundance indices, 2022.
R-MAX = right maxillary clip.

Week starting	Week of year	Mean daily discharge	Trap days sampled	Weekly Coho Salmon catch				Weekly Coho Salmon index			
				Hatchery R-MAX	Natural		Catch total	Hatchery R-MAX	Natural		Index total
					Age-0	Age-1			Age-0	Age-1	
1/9/2022	2	24.3	4	0	2	15	17	0	23	171	194
1/16/2022	3	18.8	4	0	0	19	19	0	0	234	234
1/24/2022	4	17.2	5	0	0	38	38	0	0	538	538
1/30/2022	5	15.2	5	0	0	12	12	0	0	233	233
2/6/2022	6	14.8	5	0	0	4	4	0	0	83	83
2/13/2022	7	15.7	5	0	0	0	0	0	0	0	0
2/20/2022	8	13.9	4	0	0	1	1	0	0	31	31
2/27/2022	9	13.3	5	0	36	1	37	0	629	35	664
3/6/2022	10	13.1	5	0	0	2	2	0	0	35	35
3/13/2022	11	13.8	5	0	0	4	4	0	0	59	59
3/20/2022	12	14.7	5	0	0	5	5	0	0	78	78
3/27/2022	13	15.1	5	0	0	0	0	0	0	0	0
4/3/2022	14	14.0	5	0	0	3	3	0	0	42	42
4/10/2022	15	14.2	5	0	0	5	5	0	0	61	61
4/17/2022	16	85.0	2	198	0	1	199	6,051	0	31	6,082
4/24/2022	17	67.0	4	11	2	2	15	144	26	26	196
4/31/2022	18	62.6	5	6	1	1	8	63	10	10	83
5/8/2022	19	57.1	5	1	1	1	3	10	10	10	29
5/15/2022	20	30.5	5	8	1	0	9	71	8	0	79
5/22/2022	21	20.7	5	3	27	1	31	29	265	10	304
5/29/2022	22	19.4	4	2	23	0	25	26	299	0	325
6/5/2022	23	21.3	5	1	51	2	54	2	124	5	131
6/12/2022	24	18.0	5	1	25	0	26	12	300	0	312
6/19/2022	25	15.6	5	0	10	0	10	0	138	0	138
6/26/2022	26	14.7	5	0	14	0	14	0	1	0	1
7/3/2022	27	14.6	4	0	10	0	10	0	133	0	133
7/10/2022	28	13.4	5	0	4	1	5	0	44	9	53
7/17/2022	29	12.8	5	0	1	0	1	0	10	0	10
7/24/2022	30	12.6	5	0	1	0	1	0	9	0	9
7/31/2022	31	12.9	5	0	3	0	3	0	31	0	31
8/7/2022	32	12.7	4	0	0	0	0	0	0	0	0
8/14/2022	33	12.2	3	0	0	0	0	0	0	0	0
8/21/2022	34	12.2	5	0	0	0	0	0	0	0	0
8/28/2022	35	27.0	1	0	0	0	0	0	0	0	0
Total			154	231	212	118	561	6,409	2,061	1,700	10,170

Appendix 4. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Coho Salmon catches and abundance indices, 2022. R-MAX = right maxillary clip.

Week starting	Week of year	Mean daily discharge m3/s	Trap days sampled	Weekly Coho Salmon catch				Weekly Coho Salmon index			
				Hatchery	Natural		Catch	Hatchery	Natural		Index
				R-MAX	Age-0	Age-1	total	R-MAX	Age-0	Age-1	total
3/6/2022	11	47.0	4	0	0	0	0	0	0	0	0
3/13/2022	12	54.4	8	0	1	2	3	0	19	38	57
3/20/2022	13	53.7	8	0	0	0	0	0	0	0	0
3/27/2022	14	51.6	12	0	0	1	1	0	0	11	11
4/3/2022	15	47.6	12	0	1	0	1	0	10	0	10
4/10/2022	16	59.9	10	0	0	1	1	0	0	23	23
4/17/2022	17	226.0	1	0	2	0	2	0	1,524	0	1,524
4/24/2022	18	177.8	8	1	0	0	1	50	0	0	50
5/1/2022	19	150.2	8	7	1	1	9	400	40	79	519
5/8/2022	20	145.8	10	18	3	0	21	647	105	0	751
5/15/2022	21	107.9	11	17	18	0	35	362	384	0	745
5/22/2022	22	76.3	11	87	27	3	117	1,397	428	60	1,884
5/29/2022	23	63.5	6	4	9	0	13	122	287	0	410
6/5/2022	24	70.1	11	3	26	0	29	78	601	0	679
6/12/2022	25	53.9	12	0	17	0	17	0	203	0	203
6/19/2022	26	42.9	9	0	12	0	12	0	160	0	160
6/26/2022	27	35.8	12	0	9	0	9	0	81	0	81
7/3/2022	28	34.9	9	0	1	0	1	0	14	0	14
7/10/2022	29	29.1	12	0	6	0	6	0	59	0	59
7/17/2022	30	25.6	12	0	3	0	3	0	44	0	44
7/24/2022	31	23.2	9	0	0	0	0	0	0	0	0
7/31/2022	32	22.2	3	0	0	0	0	0	0	0	0
Total			198	137	136	8	281	3,055	3,958	211	7,224

Appendix 5. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly steelhead catches and abundance indices, 2019.AD = adipose fin clip.

Week starting	Week of year	Mean daily discharge	Trap days sampled	Weekly steelhead catch					Weekly steelhead index				
				Hatchery AD	Natural			Catch total	Hatchery AD	Natural			Index total
					Age-0	Age-1	Age-2			Age-0	Age-1	Age-2	
1/9/2022	2	24.3	4	0	0	4	0	4	0	0	46	0	46
1/16/2022	3	18.8	4	0	1	0	0	1	0	12	0	0	12
1/23/2022	4	17.2	5	0	0	2	0	2	0	0	28	0	28
1/30/2022	5	15.2	5	0	1	4	0	5	0	19	78	0	97
2/6/2022	6	14.8	5	0	0	7	0	7	0	0	146	0	146
2/13/2022	7	15.7	5	0	0	10	0	10	0	0	246	0	246
2/20/2022	8	13.9	4	0	0	3	0	3	0	0	92	0	92
2/27/2022	9	13.3	5	0	0	8	0	8	0	0	175	0	175
3/6/2022	10	13.1	5	0	0	8	0	8	0	0	139	0	139
3/13/2022	11	13.8	5	0	1	54	0	55	0	15	797	0	812
3/20/2022	12	14.7	5	0	16	72	0	88	0	251	1,129	0	1,380
3/27/2022	13	15.1	5	0	1	51	0	52	0	14	719	0	733
4/3/2022	14	14.0	5	1	4	61	0	66	14	55	845	0	914
4/10/2022	15	14.2	5	0	1	80	0	81	0	12	972	0	984
4/17/2022	16	85.0	2	0	0	19	0	19	0	0	581	0	581
4/24/2022	17	67.0	4	9	6	5	0	20	118	79	65	0	262
4/31/2022	18	62.6	5	6	7	8	0	21	63	73	83	0	219
5/8/2022	19	57.1	5	0	0	3	0	3	0	0	29	0	29
5/15/2022	20	30.5	5	13	6	10	0	29	135	48	103	0	286
5/22/2022	21	20.7	5	9	13	12	0	34	88	128	118	0	334
5/29/2022	22	19.4	4	1	24	10	0	35	13	312	130	0	454
6/5/2022	23	21.3	5	4	108	8	0	120	10	267	15	0	291
6/12/2022	24	18.0	5	1	37	5	0	43	12	444	60	0	516
6/19/2022	25	15.6	5	0	136	4	0	140	0	1,875	55	0	1,930
6/26/2022	26	14.7	5	1	206	9	0	216	0	18	1	0	18
7/3/2022	27	14.6	4	0	122	5	0	127	0	1,623	67	0	1,690
7/10/2022	28	13.4	5	0	31	2	0	33	0	291	18	0	309
7/17/2022	29	12.8	5	0	88	3	0	91	0	895	31	0	926
7/24/2022	30	12.6	5	0	42	4	0	46	0	390	37	0	427
7/31/2022	31	12.9	5	0	61	5	0	66	0	638	52	0	690
8/7/2022	32	12.7	4	0	28	2	0	30	0	351	25	0	376
8/14/2022	33	12.2	3	0	3	0	0	3	0	45	0	0	45
8/21/2022	34	12.2	5	0	12	0	0	12	0	125	0	0	125
8/28/2022	35	27.0	1	0	0	1	0	1	0	0	42	0	42
Total			154	45	955	479	0	1,479	452	7,980	6,922	0	15,354

Appendix 6. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly steelhead catches and abundance indices, 2022.
AD = adipose fin clip.

Week starting	Week of year	Mean daily discharge m³/s	Trap days sampled	Weekly steelhead catch					Weekly steelhead index				
				Hatchery AD	Natural			Catch total	Hatchery AD	Natural			Index total
					Age-0	Age-1	Age-2+			Age-0	Age-1	Age-2+	
3/13/2022	11	47.0	4	0	0	1	0	1	0	0	29	0	29
3/20/2022	12	54.4	8	0	0	31	0	31	0	0	613	0	613
3/27/2022	13	53.7	8	0	0	9	0	9	0	0	159	0	159
4/3/2022	14	51.6	12	0	0	30	0	30	0	0	325	0	325
4/10/2022	15	47.6	12	0	0	29	0	29	0	0	276	0	276
4/17/2022	16	59.9	10	0	1	67	0	68	0	11	1,256	0	1,266
4/24/2022	17	226.0	1	0	0	1	0	1	0	0	0	0	0
5/1/2022	18	177.8	8	3	0	7	0	10	149	0	358	0	507
5/8/2022	19	150.2	8	29	0	6	0	35	1,448	0	284	0	1,732
5/15/2022	20	145.8	10	48	0	29	0	77	1,408	0	785	0	2,194
5/22/2022	21	107.9	11	34	1	29	0	64	773	24	627	0	1,424
5/29/2022	22	76.3	11	117	4	102	0	223	1,850	71	1,699	0	3,619
6/5/2022	23	63.5	6	38	0	104	0	142	1,196	0	3,406	0	4,603
6/12/2022	24	70.1	11	2	13	32	0	47	53	292	632	0	977
6/19/2022	25	53.9	12	1	61	2	0	64	12	727	23	0	762
6/26/2022	26	42.9	9	0	74	3	0	77	0	1,080	59	0	1,139
7/3/2022	27	35.8	12	0	65	0	0	65	0	731	0	0	731
7/10/2022	28	34.9	9	0	38	0	0	38	0	537	14	0	551
7/17/2022	29	29.1	12	0	31	1	0	32	0	307	29	0	335
7/24/2022	30	25.6	12	0	8	2	0	10	0	98	38	0	136
7/31/2022	31	23.2	9	0	10	0	0	10	0	141	0	0	141
8/7/2022	32	22.2	3	0	11	1	0	12	0	371	101	0	473
			198	272	317	486	0	1,075	6,889	4,389	10,714	0	21,992

Appendix 7. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly age-0 Chinook Salmon population estimate input and results, 2022NC = no clip, AD = adipose fin clip.

Week starting	Week year	Sampling fraction	Catch NC	Catch AD	Marks released	Marks recaptured	Recapture rate	Est. natural	Est. natural lower bound	Est. natural upper bound	Est. hatchery	Est. hatchery lower bound	Est. hatchery upper bound
1/9/2022	2	0.57	26	0	0	0	---	3,735	201	10,229	0	0	0
1/16/2022	3	0.57	9	0	0	0	---	2,532	189	6,859	0	0	0
1/23/2022	4	0.71	176	0	0	0	---	7,194	846	17,439	0	0	0
1/30/2022	5	0.71	343	0	0	0	---	12,704	1,438	31,082	0	0	0
2/6/2022	6	0.71	139	0	0	0	---	11,002	1,018	27,121	0	0	0
2/13/2022	7	0.71	157	0	0	0	---	13,443	1,106	34,838	0	0	0
2/20/2022	8	0.57	519	0	0	0	---	24,392	2,921	59,850	0	0	0
2/26/2022	9	0.71	335	0	0	0	---	22,854	3,112	57,609	0	0	0
3/6/2022	10	0.71	314	0	0	0	---	25,132	3,459	61,262	0	0	0
3/13/2022	11	0.71	587	0	407	10	0.025	35,282	17,670	56,092	0	0	0
3/20/2022	12	0.71	967	0	408	0	0.000	64,437	8,668	150,815	0	0	0
3/27/2022	13	0.71	3,098	0	0	0	---	125,145	19,573	283,419	0	0	0
4/3/2022	14	0.71	7,581	0	607	55	0.091	123,805	91,856	157,317	0	0	0
4/10/2022	15	0.71	8,182	0	618	0	0.000	299,516	45,806	695,033	0	0	0
4/17/2022	16	0.29	2,488	0	0	0	---	298,772	41,725	717,262	0	0	0
4/24/2022	17	0.57	931	0	1,037	7	0.007	194,927	94,141	319,763	0	0	0
4/31/2022	18	0.71	1,446	322	1,632	1	0.001	51,596	10,742	113,158	142,865	27,665	309,807
5/8/2022	19	0.71	1,454	330	1,632	0	0.000	57,405	9,779	127,475	176,980	33,409	403,027
5/15/2022	20	0.71	1,427	370	1,222	4	0.003	81,993	28,167	152,605	411,096	176,595	707,743
5/22/2022	21	0.71	6,177	846	1,202	0	0.000	241,249	48,828	499,653	231,408	50,953	474,960
5/29/2022	22	0.57	4,957	882	794	9	0.011	252,087	140,622	395,413	398,175	213,253	606,365
6/5/2022	23	0.71	3,932	596	2,457	134	0.055	56,526	46,273	67,442	64,611	53,022	76,064
6/12/2022	24	0.71	2,160	265	839	10	0.012	104,246	60,897	154,656	82,585	47,872	124,198
6/19/2022	25	0.71	768	70	710	68	0.096	9,013	6,662	11,418	4,777	3,296	6,337
6/26/2022	26	0.71	767	55	0	0	---	17,445	3,459	35,822	6,523	1,431	13,867
7/3/2022	27	0.57	666	55	736	1	0.001	14,675	3,456	31,273	6,514	1,305	13,543
7/10/2022	28	0.71	396	27	653	41	0.063	7,332	5,077	9,832	2,603	1,496	3,873
7/17/2022	29	0.71	333	20	801	64	0.080	4,910	3,559	6,402	1,540	855	2,278
7/24/2022	30	0.71	384	36	695	77	0.111	3,638	2,604	4,646	1,983	1,295	2,772
7/31/2022	31	0.71	200	25	796	15	0.019	7,717	4,129	12,360	5,955	2,808	9,516
8/7/2022	32	0.57	52	2	0	0	---	4,928	610	10,999	1,414	141	3,453
8/14/2022	33	0.43	31	3	0	0	---	2,173	193	5,399	855	46	2,238
8/21/2022	34	0.71	25	0	0	0	---	1,609	102	4,251	278	3	859
8/28/2022	35	0.14	0	0	0	0	---	742	7	2,386	247	0	893
Totals			51,027	3,904	17,246	496	0.029	2,184,157	1,449,292	3,155,526	1,540,408	941,625	2,215,026

¹ Fraction of possible trap days successfully sampled each week

Appendix 8. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly age-0 Chinook Salmon population estimate input and results, 2022. NC = no clip, AD = adipose fin clip.

Week starting	Week year	Sampling fraction ¹	Catch NC	Catch AD	Marks released	Marks recaptured	Recapture rate	Est. natural	Est. natural lower bound	Est. natural upper bound	Est. hatchery	Est. hatchery lower bound	Est. hatchery upper bound
3/13/2022	11	0.57	171	0	0	0	NA	7,275	275	22,610	0	0	0
3/20/2022	12	0.57	68	0	1,464	197	0.13	911	659	1,141	0	0	0
3/27/2022	13	0.57	342	0	300	100	0.33	1,843	1,494	2,190	0	0	0
4/3/2022	14	0.57	2,665	0	280	122	0.44	10,945	9,491	12,546	0	0	0
4/10/2022	15	0.57	7,058	0	1,133	88	0.08	158,371	128,732	190,085	0	0	0
4/17/2022	16	0.57	4,808	0	918	128	0.14	60,788	51,418	70,680	0	0	0
4/24/2022	17	0.14	9	3	0	0	NA	12,999	326	35,826	12,410	295	36,177
5/1/2022	18	0.57	549	1	3,347	44	0.01	72,626	52,734	95,611	1,604	207	3,337
5/8/2022	19	0.57	381	38	2,502	42	0.02	27,920	18,826	38,166	16,082	9,420	22,767
5/15/2022	20	0.57	1,259	146	1,880	57	0.03	45,903	34,151	59,762	33,920	24,590	44,348
5/22/2022	21	0.57	594	64	1,909	84	0.04	16,245	12,095	20,904	10,856	7,483	14,526
5/29/2022	22	0.57	1,409	105	2,206	80	0.04	52,806	41,032	65,591	21,115	14,886	26,940
6/5/2022	23	0.57	1,956	290	959	24	0.03	100,790	61,594	142,078	112,274	69,513	158,080
6/12/2022	24	0.57	3,932	461	1,039	12	0.01	339,575	193,729	530,365	254,576	143,217	396,748
6/19/2022	25	0.57	5,076	525	1,052	27	0.03	239,082	158,137	328,432	148,068	98,281	203,345
6/26/2022	26	0.57	2,071	251	670	15	0.02	121,434	71,208	181,408	95,842	56,229	144,865
7/3/2022	27	0.57	1,248	123	1,265	256	0.20	7,589	6,396	8,736	4,456	3,511	5,345
7/10/2022	28	0.57	375	48	945	110	0.12	4,675	3,210	6,090	4,060	2,802	5,459
7/17/2022	29	0.57	487	23	1,114	19	0.02	37,801	23,129	54,832	8,371	4,024	13,267
7/24/2022	30	0.57	110	7	785	2	0.00	7,044	750	17,730	2,345	165	5,899
7/31/2022	31	0.57	71	7	817	55	0.07	1,290	617	2,015	818	291	1,429
8/7/2022	32	0.57	21	2	497	51	0.10	940	49	1,726	699	94	1,496
Totals			34,660	2,094	25,082	1,513	0.06	1,328,853	870,052	1,888,524	727,493	435,008	1,084,027

¹ Fraction of possible trap days successfully sampled each week

Appendix 9. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly Chinook Salmon fork lengths, 2022.

Week starting	Week of year	Chinook Salmon									
		Age-0					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD
1/9/2022	2	18	37.7	35	50	3.5	11	113.1	90	170	27.3
1/16/2022	3	8	38.0	34	44	3.6	---	---	---	---	---
1/23/2022	4	111	38.1	35	60	3.1	5	97.0	89	104	7.0
1/30/2022	5	120	39.6	35	55	4.1	44	99.1	76	116	7.6
2/6/2022	6	68	40.5	35	58	5.8	22	97.3	89	112	5.3
2/13/2022	7	93	40.4	34	56	5.4	15	102.1	86	127	10.9
2/20/2022	8	120	40.8	35	60	5.3	14	100.6	88	127	10.2
2/27/2022	9	89	42.4	35	63	8.2	9	96.1	80	105	7.1
3/6/2022	10	126	45.4	34	69	8.6	1	98.0	98	98	NA
3/13/2022	11	130	54.7	36	76	9.1	41	102.8	85	134	10.7
3/20/2022	12	158	57.0	38	77	6.7	20	98.9	84	113	6.4
3/27/2022	13	161	56.1	41	75	6.8	16	107.6	96	129	8.5
4/3/2022	14	182	60.6	35	86	9.5	7	106.0	96	116	6.3
4/10/2022	15	159	59.7	40	79	6.9	11	108.9	92	124	8.9
4/17/2022	16	60	58.1	45	73	6.5	---	---	---	---	---
4/24/2022	17	127	60.8	48	85	7.7	---	---	---	---	---
4/31/2022	18	268	74.2	46	96	9.3	---	---	---	---	---
5/8/2022	19	300	76.7	47	100	9.0	---	---	---	---	---
5/15/2022	20	293	72.7	51	95	6.9	---	---	---	---	---
5/22/2022	21	331	76.7	54	109	8.0	---	---	---	---	---
5/29/2022	22	257	76.3	43	98	7.9	---	---	---	---	---
6/5/2022	23	330	77.3	51	98	8.9	---	---	---	---	---
6/12/2022	24	250	81.0	53	105	8.2	---	---	---	---	---
6/19/2022	25	251	79.9	50	107	9.7	---	---	---	---	---
6/26/2022	26	204	79.7	52	105	10.3	1	168.0	168	168	NA
7/2/2022	27	207	79.0	49	105	11.5	---	---	---	---	---
7/10/2022	28	213	82.1	64	104	9.6	---	---	---	---	---
7/17/2022	29	219	85.1	61	109	11.7	---	---	---	---	---
7/24/2022	30	225	88.9	54	115	12.6	---	---	---	---	---
7/31/2022	31	166	90.4	61	118	13.1	---	---	---	---	---
8/7/2022	32	53	85.5	63	115	11.4	---	---	---	---	---
8/14/2022	33	35	94.3	67	110	10.6	---	---	---	---	---
8/21/2022	34	71	89.7	73	116	9.0	---	---	---	---	---
8/28/2022	35	---	---	---	---	---	---	---	---	---	---

¹Natural and Hatchery combined

Appendix 10. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Chinook Salmon fork lengths, 2022.

Week starting	Week of year	Chinook Salmon ¹									
		Age-0					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD
3/13/2022	11	114	45.9	36	69	6.7	6	109.8	94	129	14.0
3/20/2022	12	68	53.3	41	72	7.2	17	102.5	91	116	7.7
3/27/2022	13	196	56.1	38	78	8.4	20	110.8	99	162	13.5
4/3/2022	14	353	59.2	39	85	7.8	11	107.7	91	125	9.8
4/10/2022	15	360	61.3	36	85	8.0	3	114.0	105	119	7.8
4/17/2022	16	298	65.6	39	89	8.1	3	115.7	94	127	18.8
4/24/2022	17	8	75.6	55	89	11.2	0	---	---	---	---
5/1/2022	18	150	67.7	49	86	7.0	0	---	---	---	---
5/8/2022	19	187	74.1	53	98	10.4	0	---	---	---	---
5/15/2022	20	320	79.5	53	102	10.5	0	---	---	---	---
5/22/2022	21	289	78.4	45	112	10.8	0	---	---	---	---
5/29/2022	22	460	83.8	52	108	11.5	0	---	---	---	---
6/5/2022	23	287	90.0	55	116	9.8	0	---	---	---	---
6/12/2022	24	469	87.4	57	110	7.1	0	---	---	---	---
6/19/2022	25	602	87.1	25	110	7.8	0	---	---	---	---
6/26/2022	26	500	86.0	21	104	7.6	0	---	---	---	---
7/3/2022	27	427	83.8	26	109	8.6	0	---	---	---	---
7/10/2022	28	276	86.2	27	107	10.7	0	---	---	---	---
7/17/2022	29	327	84.8	29	111	9.8	0	---	---	---	---
7/24/2022	30	110	81.3	24	111	14.3	0	---	---	---	---
7/31/2022	31	78	87.8	30	115	13.3	0	---	---	---	---
8/7/2022	32	23	94.0	71	121	12.3	0	---	---	---	---

¹Natural and Hatchery combined.

Appendix 11: Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly Coho Salmon fork lengths, 2022.

Week dstarting	Week of year	Natural Coho Salmon										Hatchery Coho Salmon				
		Age-0					Age-1					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
1/9/2022	2	2	36.5	36	37	0.7	15	98.8	86	111	7.5	---	---	---	---	---
1/16/2022	3	---	---	---	---	---	17	109.2	85	135	14.0	---	---	---	---	---
1/23/2022	4	---	---	---	---	---	31	100.5	83	120	9.3	---	---	---	---	---
1/30/2022	5	---	---	---	---	---	6	99.3	85	119	12.6	---	---	---	---	---
2/6/2022	6	---	---	---	---	---	4	102.8	95	109	6.1	---	---	---	---	---
2/13/2022	7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2/20/2022	8	---	---	---	---	---	1	120.0	120	120	NA	---	---	---	---	---
2/27/2022	9	---	---	---	---	---	1	95.0	95	95	NA	---	---	---	---	---
3/6/2022	10	---	---	---	---	---	2	95.0	94	96	1.4	---	---	---	---	---
3/13/2022	11	---	---	---	---	---	4	103.0	88	115	12.4	---	---	---	---	---
3/20/2022	12	---	---	---	---	---	5	109.0	95	135	17.8	---	---	---	---	---
3/27/2022	13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4/3/2022	14	---	---	---	---	---	3	118.0	104	128	12.5	---	---	---	---	---
4/10/2022	15	---	---	---	---	---	5	126.4	111	141	10.8	---	---	---	---	---
4/17/2022	16	---	---	---	---	---	1	130.0	130	130	NA	30	149.6	130	188	12.3
4/24/2022	17	2	60.0	55	65	7.1	2	147.5	122	173	36.1	11	153.4	133	185	14.1
4/31/2022	18	1	63.0	63	63	NA	1	124.0	124	124	NA	5	152.2	132	177	16.1
5/8/2022	19	1	83.0	83	83	NA	1	110.0	110	110	NA	---	---	---	---	---
5/15/2022	20	1	71.0	71	71	NA	1	123.0	123	123	NA	8	158.5	146	176	9.7
5/22/2022	21	27	64.3	55	79	5.0	---	---	---	---	---	3	155.3	150	165	8.4
5/29/2022	22	25	68.8	48	96	11.2	---	---	---	---	---	2	183.0	140	226	60.8
6/5/2022	23	51	71.5	56	96	8.4	2	118.5	115	122	4.9	1	155.0	155	155	NA
6/12/2022	24	25	68.2	47	98	9.1	---	---	---	---	---	1	167.0	167	167	NA
6/19/2022	25	10	67.1	58	77	6.3	---	---	---	---	---	---	---	---	---	---
6/26/2022	26	14	68.3	58	80	6.3	---	---	---	---	---	---	---	---	---	---
7/3/2022	27	10	72.3	65	85	5.7	---	---	---	---	---	---	---	---	---	---
7/10/2022	28	4	65.8	62	74	5.6	1	106.0	106	106	NA	---	---	---	---	---
7/17/2022	29	1	77.0	77	77	NA	---	---	---	---	---	---	---	---	---	---
7/24/2022	30	1	87.0	87	87	NA	---	---	---	---	---	---	---	---	---	---
7/31/2022	31	3	75.0	67	81	7.2	---	---	---	---	---	---	---	---	---	---
8/7/2022	32	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/14/2022	33	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/21/2022	34	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/28/2022	35	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Appendix 12. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Coho Salmon fork lengths, 2022.

Week starting	Week of year	Natural Coho Salmon										Hatchery Coho Salmon				
		Age-0					Age-1					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
3/13/2022	11	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
3/20/2022	12	1	49.0	49	49	NA	2	112.0	103	121	12.7	0	---	---	---	---
3/27/2022	13	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
4/3/2022	14	0	---	---	---	---	1	121.0	121	121	NA	0	---	---	---	---
4/10/2022	15	1	45.0	45	45	NA	0	---	---	---	---	0	---	---	---	---
4/17/2022	16	0	---	---	---	---	1	124.0	124	124	NA	0	---	---	---	---
4/24/2022	17	2	70.0	69	71	1.4	0	---	---	---	---	0	---	---	---	---
5/1/2022	18	0	---	---	---	---	0	---	---	---	---	1	150.0	150	150	NA
5/8/2022	19	1	52.0	52	52	NA	1	121.0	121	121	NA	7	128.9	113	174	22.1
5/15/2022	20	3	65.3	59	70	5.7	0	---	---	---	---	17	155.1	128	172	12.0
5/22/2022	21	15	67.7	56	80	5.5	0	---	---	---	---	17	156.7	114	175	13.7
5/29/2022	22	27	67.2	58	81	5.4	3	160.0	144	176	16.0	86	153.6	116	175	12.1
6/5/2022	23	9	76.3	62	84	9.1	0	---	---	---	---	4	153.3	140	158	8.8
6/12/2022	24	26	73.5	61	92	6.5	0	---	---	---	---	3	151.0	142	161	9.5
6/19/2022	25	17	74.7	61	89	7.4	0	---	---	---	---	0	---	---	---	---
6/26/2022	26	12	79.5	68	105	10.6	0	---	---	---	---	0	---	---	---	---
7/3/2022	27	9	85.7	71	107	12.6	0	---	---	---	---	0	---	---	---	---
7/10/2022	28	1	74.0	74	74	NA	0	---	---	---	---	0	---	---	---	---
7/17/2022	29	6	76.7	64	86	7.3	0	---	---	---	---	0	---	---	---	---
7/24/2022	30	2	73.0	68	78	7.1	0	---	---	---	---	0	---	---	---	---
7/31/2022	31	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
8/7/2022	32	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---

Week starting	Week of year	Natural steelhead										Hatchery steelhead				
		Age-0					Age-1					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
1/8/2022	2	---	---	---	---	---	4	121	101	145	18.8	---	---	---	---	---
1/15/2022	3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1/22/2022	4	---	---	---	---	---	2	109.5	104	115	7.8	---	---	---	---	---
1/29/2022	5	1	33	33	33	NA	4	91	76	108	15.4	---	---	---	---	---
2/5/2022	6	---	---	---	---	---	6	93.2	60	134	27.3	---	---	---	---	---
2/12/2022	7	---	---	---	---	---	5	97.6	72	114	16.2	---	---	---	---	---
2/19/2022	8	---	---	---	---	---	2	105	87	123	25.5	---	---	---	---	---
2/26/2022	9	---	---	---	---	---	8	114.3	83	159	23.3	---	---	---	---	---
3/5/2022	10	---	---	---	---	---	8	106.8	69	154	27.6	---	---	---	---	---
3/12/2022	11	---	---	---	---	---	54	111.9	70	203	30.1	---	---	---	---	---
3/19/2022	12	16	75.2	68	80	4.1	72	113	64	180	29.7	---	---	---	---	---
3/26/2022	13	1	71	71	71	NA	51	110.5	62	217	33.6	---	---	---	---	---
4/2/2022	14	3	76.7	72	79	4	61	123.2	75	194	30.1	1	194	194	194	NA
4/9/2022	15	1	27	27	27	NA	72	115.3	80	185	26.4	---	---	---	---	---
4/16/2022	16	---	---	---	---	---	19	113.4	73	151	23.6	---	---	---	---	---
4/23/2022	17	6	27.3	26	31	1.9	5	110.4	86	145	25.5	5	192.6	180	213	12.4
4/30/2022	18	3	27.7	27	28	0.6	7	114.6	85	162	24.7	2	155.5	150	161	7.8
5/7/2022	19	---	---	---	---	---	3	124	110	137	13.5	---	---	---	---	---
5/14/2022	20	6	33.8	27	41	5.5	10	134.2	102	187	25.9	---	---	---	---	---
5/21/2022	21	13	59.9	42	81	13.5	12	136	114	160	11.9	4	182.3	156	210	22.1
5/28/2022	22	24	53.7	27	69	8.6	8	153.9	100	184	27.9	---	---	---	---	---
6/4/2022	23	98	54.9	39	73	7.1	8	121.6	110	146	13.9	---	---	---	---	---
6/11/2022	24	30	57.9	50	75	6	5	144.2	112	177	27	---	---	---	---	---
6/18/2022	25	122	57.9	40	83	7.5	4	141	122	170	20.4	---	---	---	---	---
6/25/2022	26	121	58	42	79	7.4	9	145.7	109	193	25.7	---	---	---	---	---
7/2/2022	27	108	57.9	37	84	7.4	4	150.3	140	163	9.8	---	---	---	---	---
7/9/2022	28	30	61	49	78	8.1	1	135	135	135	NA	---	---	---	---	---
7/16/2022	29	88	62.1	46	99	10	3	157.7	129	194	33.2	---	---	---	---	---
7/23/2022	30	40	61	41	88	10.9	2	147	144	150	4.2	---	---	---	---	---
7/30/2022	31	55	63.7	45	99	10.6	4	153.8	123	187	28.7	---	---	---	---	---
8/6/2022	32	24	68.2	53	98	11.4	1	127	127	127	NA	---	---	---	---	---
8/13/2022	33	3	63	54	80	14.7	1	170	170	170	NA</					

Appendix 14. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly steelhead fork lengths, 2022.

Week starting	Week of year	Natural steelhead										Hatchery steelhead				
		Age-0					Age-1					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
3/13/2022	11	0	---	---	---	---	1	174.0	174	174	NA	0	---	---	---	---
3/20/2022	12	0	---	---	---	----	32	109.2	76	196	33.6	0	---	---	---	----
3/27/2022	13	0	---	---	---	---	9	129.1	94	240	47.6	0	---	---	---	---
4/3/2022	14	0	---	---	---	---	31	156.5	74	230	47.6	0	---	---	---	---
4/10/2022	15	0	---	---	---	----	29	153.0	82	270	54.7	0	---	---	---	----
4/17/2022	16	1	47.0	47	47	NA	67	140.3	76	227	42.1	0	---	---	---	----
4/24/2022	17	0	---	---	---	----	1	81.0	81	81	NA	0	---	---	---	---
5/1/2022	18	0	---	---	---	----	6	116.2	90	212	47.5	3	201.0	195	209	7.2
5/8/2022	19	0	---	---	---	---	6	126.8	110	156	18.9	29	198.9	119	230	28.9
5/15/2022	20	0	---	---	---	----	29	175.5	107	229	24.3	44	196.2	159	247	17.9
5/22/2022	21	1	58.0	58	58	NA	29	164.5	67	228	33.5	34	198.4	118	239	21.9
5/29/2022	22	4	54.5	48	57	4.4	102	175.2	116	218	18.1	116	193.6	118	240	20.1
6/5/2022	23	0	---	---	---	----	102	172.2	123	205	15.0	36	187.1	152	275	22.7
6/12/2022	24	13	59.3	49	75	7.3	32	164.6	118	210	24.5	2	175.0	168	182	9.9
6/19/2022	25	61	65.0	51	98	8.8	2	158.5	122	195	51.6	1	189.0	189	189	NA
6/26/2022	26	74	64.7	45	88	9.5	3	188.3	135	235	50.3	0	---	---	---	----
7/3/2022	27	66	65.3	40	91	10.5	0	---	---	---	----	0	---	---	---	----
7/10/2022	28	39	63.3	45	95	10.5	0	---	---	---	----	0	---	---	---	----
7/17/2022	29	31	65.9	50	101	12.8	1	180.0	180	180	NA	0	---	---	---	----
7/24/2022	30	8	76.3	48	102	16.3	2	127.0	120	134	9.9	0	---	---	---	----
7/31/2022	31	10	62.1	51	78	8.5	0	---	---	---	----	0	---	---	---	----
8/7/2022	32	11	70.7	45	96	19.1	1	175.0	175	175	NA	0	---	---	---	----

Appendix 15. Fulton's condition factor (K) for pooled natural and hatchery age-0 Chinook Salmon with FL >50 mm from the Willow Creek Rotary Screw Trap site, 2022. Age-0 Chinook condition factor from Pear Tree Rotary Screw Trap unavailable for 2022.

Week starting	Week of year	Willow Creek trap site		
		n	Average K	SD of K
1/9/2022	2	---	---	---
1/16/2022	3	---	---	---
1/23/2022	4	---	---	---
1/30/2022	5	---	---	---
2/6/2022	6	---	---	---
2/13/2022	7	---	---	---
2/20/2022	8	---	---	---
2/27/2022	9	---	---	---
3/6/2022	10	---	---	---
3/13/2022	11	19	0.995	0.197
3/20/2022	12	39	0.890	0.200
3/27/2022	13	143	1.002	0.454
4/3/2022	14	310	0.938	0.197
4/10/2022	15	328	0.943	0.146
4/17/2022	16	289	0.975	0.128
4/24/2022	17	5	1.031	0.153
5/1/2022	18	148	0.985	0.138
5/8/2022	19	149	1.007	0.200
5/15/2022	20	204	1.008	0.176
5/22/2022	21	215	1.083	0.197
5/29/2022	22	348	1.060	0.178
6/5/2022	23	177	0.994	0.137
6/12/2022	24	237	1.050	0.177
6/19/2022	25	355	1.064	0.165
6/26/2022	26	270	1.056	0.153
7/3/2022	27	300	1.098	0.174
7/10/2022	28	220	1.068	0.202
7/17/2022	29	296	1.070	0.153
7/24/2022	30	95	1.051	0.145
7/31/2022	31	69	1.018	0.121
8/7/2022	32	21	1.020	0.120
8/14/2022	33	---	---	---
8/21/2022	34	---	---	---
8/28/2022	35	---	---	---

Appendix 16. Fulton's condition factor (K) for natural age-1 Coho Salmon from the Pear Tree and Willow Creek Rotary Screw Trap sites, 2022.

Week starting	Week of year	Pear Tree trap site			Willow Creek trap site		
		n	Average K	SD of K	n	Average K	SD of K
1/9/2022	2	15	1.013	0.044	---	---	---
1/16/2022	3	18	1.057	0.078	---	---	---
1/23/2022	4	32	1.044	0.051	---	---	---
1/30/2022	5	7	1.016	0.054	---	---	---
2/6/2022	6	4	1.058	0.059	---	---	---
2/13/2022	7	---	---	---	---	---	---
2/20/2022	8	1	1.082	NA	---	---	---
2/27/2022	9	1	1.003	NA	---	---	---
3/6/2022	10	2	1.069	0.167	---	---	---
3/13/2022	11	4	1.048	0.050	---	---	---
3/20/2022	12	5	1.065	0.085	2	1.047	0.083
3/27/2022	13	---	---	---	---	---	---
4/3/2022	14	3	1.034	0.072	1	0.948	NA
4/10/2022	15	5	1.116	0.059	---	---	---
4/17/2022	16	---	---	---	1	1.070	NA
4/24/2022	17	2	1.114	0.153	---	---	---
5/1/2022	18	1	1.007	NA	---	---	---
5/8/2022	19	---	---	---	1	0.847	NA
5/15/2022	20	---	---	---	---	---	---
5/22/2022	21	---	---	---	---	---	---
5/29/2022	22	---	---	---	3	0.877	0.006
6/5/2022	23	---	---	---	---	---	---
6/12/2022	24	---	---	---	---	---	---
6/19/2022	25	---	---	---	---	---	---
6/26/2022	26	---	---	---	---	---	---
7/3/2022	27	---	---	---	---	---	---
7/10/2022	28	---	---	---	---	---	---
7/17/2022	29	---	---	---	---	---	---
7/24/2022	30	---	---	---	---	---	---
7/31/2022	31	---	---	---	---	---	---
8/7/2022	32	---	---	---	---	---	---
8/14/2022	33	---	---	---	---	---	---
8/21/2022	34	---	---	---	---	---	---
8/28/2022	35	---	---	---	---	---	---

Appendix 17. Fulton's condition factor (K) for natural age-1+ steelhead from the Pear Tree and Willow Creek Rotary Screw Trap sites, 2022.

Week starting	Week of year	Pear Tree trap site			Willow Creek trap site		
		n	Average K	SD of K	n	Average K	SD of K
1/9/2022	2	4	1.066	0.123	---	---	---
1/16/2022	3	---	---	---	---	---	---
1/23/2022	4	2	1.067	0.063	---	---	---
1/30/2022	5	4	1.058	0.109	---	---	---
2/6/2022	6	7	1.103	0.153	---	---	---
2/13/2022	7	6	1.105	0.145	---	---	---
2/20/2022	8	3	1.027	0.121	---	---	---
2/27/2022	9	8	1.093	0.062	---	---	---
3/6/2022	10	8	1.144	0.099	---	---	---
3/13/2022	11	54	1.053	0.072	1	0.987	NA
3/20/2022	12	72	1.090	0.068	31	1.044	0.198
3/27/2022	13	51	1.175	0.104	9	1.111	0.208
4/3/2022	14	62	1.087	0.163	30	0.955	0.105
4/10/2022	15	73	1.073	0.065	26	0.968	0.134
4/17/2022	16	19	1.072	0.201	66	0.966	0.110
4/24/2022	17	10	1.098	0.085	1	0.960	NA
5/1/2022	18	10	1.105	0.043	6	1.018	0.063
5/8/2022	19	3	1.104	NA	3	1.119	0.060
5/15/2022	20	10	1.166	NA	29	0.852	0.101
5/22/2022	21	16	0.986	NA	26	0.929	0.085
5/29/2022	22	---	---	---	98	0.974	0.214
6/5/2022	23	---	---	---	98	0.924	0.140
6/12/2022	24	---	---	---	31	0.963	0.176
6/19/2022	25	---	---	---	2	1.021	0.052
6/26/2022	26	---	---	---	3	0.957	0.096
7/3/2022	27	---	---	---	---	---	---
7/10/2022	28	---	---	---	---	---	---
7/17/2022	29	---	---	---	1	1.115	NA
7/24/2022	30	---	---	---	2	1.242	0.201
7/31/2022	31	---	---	---	---	---	---
8/7/2022	32	---	---	---	1	0.993	NA
8/14/2022	33	---	---	---	---	---	---
8/21/2022	34	---	---	---	---	---	---
8/28/2022	35	---	---	---	---	---	---