

Juvenile Salmonid Monitoring in the Mainstem Trinity River, California, 2023

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Executive Summary — This report presents juvenile salmonid emigration monitoring data collected in 2023 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. Information collected from this project is used to assess the 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 2023, one 8-ft diameter rotary screw trap was operated at PTRST from January 18 through September 1, with successful sampling for 130 days of the 227-day sampling period. At WCRST, three 8-ft rotary screw traps were operated from April 4 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 produced and hatchery-origin age-0 juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) passing PTRST and WCRST; estimates were generated using a Bayesian time-stratified population estimation method. At PTRST an estimated 2,830,758 (95% Credible Interval (CI): [1,726,083, 4,128,550]) natural-origin age-0 Chinook Salmon and 1,371,149 (95% CI: [711,544, 2,233,377]) age-0 hatchery-origin Chinook Salmon passed the site between January 15 and August 31. At WCRST between March 8 and August 22, an estimated 2,238,611 (95% CI: [78,745, 4,076,291]) natural-origin age-0 Chinook Salmon and 1,499,977 (95% CI: [574,916, 2,869,008]) age-0 hatchery 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 calculated to assess at the timing of which 80% of the emigrating juvenile Chinook Salmon had passed Willow Creek (WC80) are used to help manage water temperatures and discharge management in the mainstem Trinity River. The WC80 which 80% of the juvenile Chinook Salmon population passed WCRST, inferred from the Bayesian time-stratified population estimation, was Week of

the Year (WOY) 27 (July 2–8), which occurred during 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 20 (May 14–20). 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 23 (May 21–27).

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 2023 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.

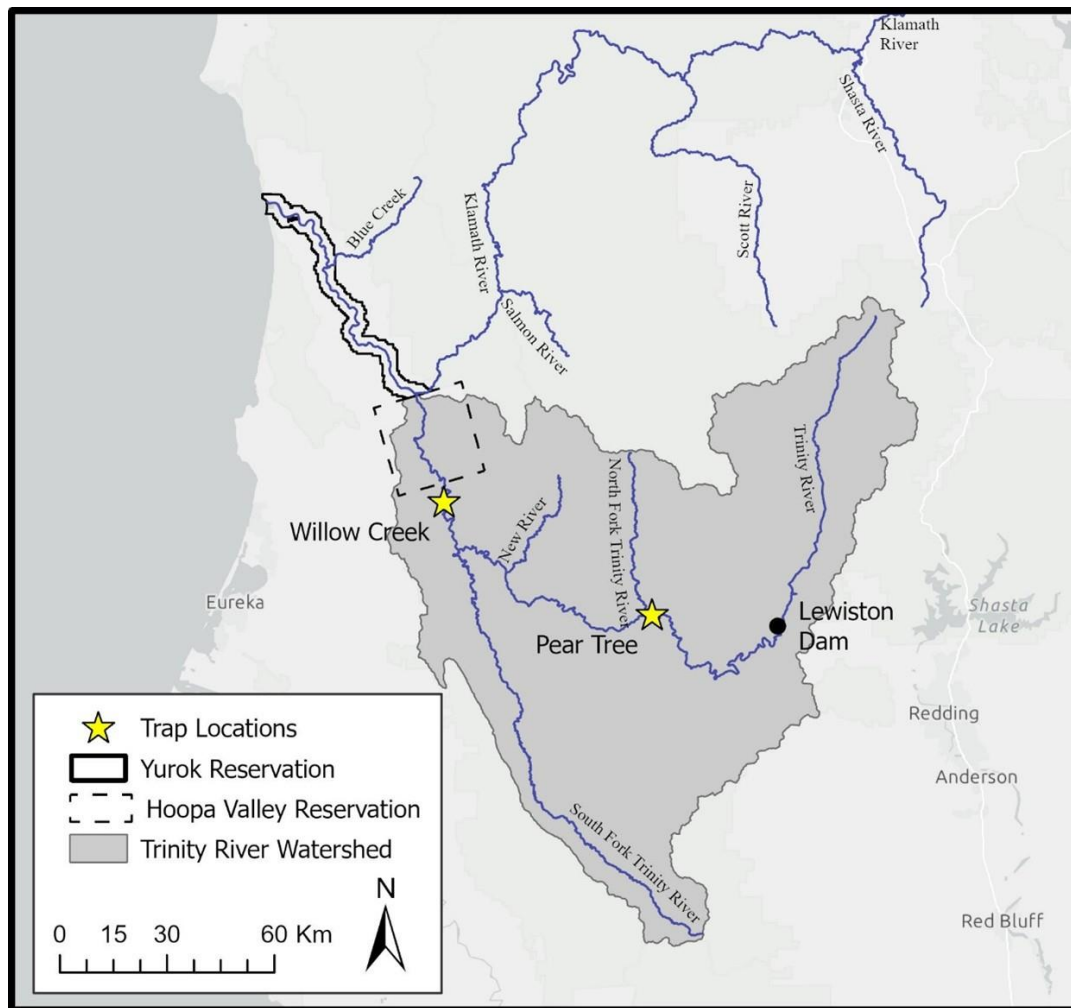


Figure 1. Location of the Trinity River Rotary Screw Trap sites near Willow Creek (rkm 34) and Pear Tree Gulch (rkm 118), California, operated by the Yurok Tribal Fisheries Program, U.S. Fish and Wildlife Service, and the Hoopa Valley Tribal Fisheries Department.

Methods

Trap Design and Operation

At PTRST, sampling was conducted using one 2.4-m diameter rotary screw trap. The trap was operated from January 18 to September 1 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 April 4 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 first 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 0.8m for the 1.5-m trap. Daily velocity measurements were taken at the time the traps were checked directly in front of the cone at each trap using a Global Water® digital flowmeter (Model FP111; Xylem, Inc. 2020). Mean water velocity (ft/s) was multiplied by the cross-sectional area sampled, yielding an estimate of volume of river discharge sampled (Q_s) 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 (Q) at WCRST.

At PTRST, water temperature data was collected using thermometer deployed in the trap livewell. Temperature data was recorded with each trap check. At WCRST, water temperature data were collected using a YSI Pro Solo ODO temperature and dissolved oxygen probe daily during trap checks.

Biological Sampling Procedures

All juvenile fish handled were anesthetized with Aquai-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, 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-origin Chinook Salmon were collected at WCRST. Trinity River Hatchery (TRH) dual-marks Chinook with an ad-clip and coded wire tag (CWT) at a target constant fractional marking rate of 25%. 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-origin 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 were 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 through 39 and the fall period as WOY 40 through 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 naturally produced 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-origin fish emigration period, non-adipose clipped hatchery-origin Chinook may have been encountered. 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

Starting in 2023, all hatchery-origin Coho Salmon released from TRH were marked with an adipose fin clip (ad-clip). The weekly contribution of natural-origin Coho Salmon to the catch was estimated by subtracting the catch of hatchery marked 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 hatchery marked 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-origin Chinook Salmon, hatchery-origin steelhead, and hatchery-origin Coho Salmon by dividing the distance 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-origin age-0 Chinook Salmon. Weekly and season total abundance of natural-origin age-0 Chinook Salmon outmigrating past the 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 intact adipose fins, total adipose fin-clipped age-0 Chinook Salmon (and associated hatchery clip rate), trapping effort (sample fraction, described below), marks released, and 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, some releases were performed at a further distance due to access related to flow conditions. 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 2023, 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 method (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 population of emigrating in-river fish yet to pass the sampling site. 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 2023, trapping at PTRST began in the third week of January and trapping at WCRST was initiated in early April (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-origin Coho Salmon and steelhead 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 2023 did not occur year-round, therefore annual production estimates and indices are only calculated from data within the sampling timeframe. Data are grouped by 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 beginning	WOY	Week beginning	WOY	Week beginning
1	Jan 1	18	Apr 30	35	Aug 27
2	Jan 8	19	May 7	36	Sep 3
3	Jan 15	20	May 14	37	Sep 10
4	Jan 22	21	May 21	38	Sep 17
5	Jan 29	22	May 28	39	Sep 24
6	-Feb 5	23	Jun 4	40	Oct 1
7	Feb 12	24	Jun 11	41	Oct 8
8	Feb 19	25	Jun 18	42	Oct 15
9	Feb 26	26	Jun 25	43	Oct 22
10	Mar 5	27	Jul 2	44	Oct 29
11	Mar 12	28	Jul 9	45	Nov 5
12	Mar 19	29	Jul 16	46	Nov 12
13	Mar 26	30	Jul 23	47	Nov 19
14	Apr 2	31	Jul 30	48	Nov 26
15	Apr 9	32	Aug 6	49	Dec 3
16	Apr 16	33	Aug 13	50	Dec 10
17	Apr 23	34	Aug 20	51	Dec 17
				52	Dec 24

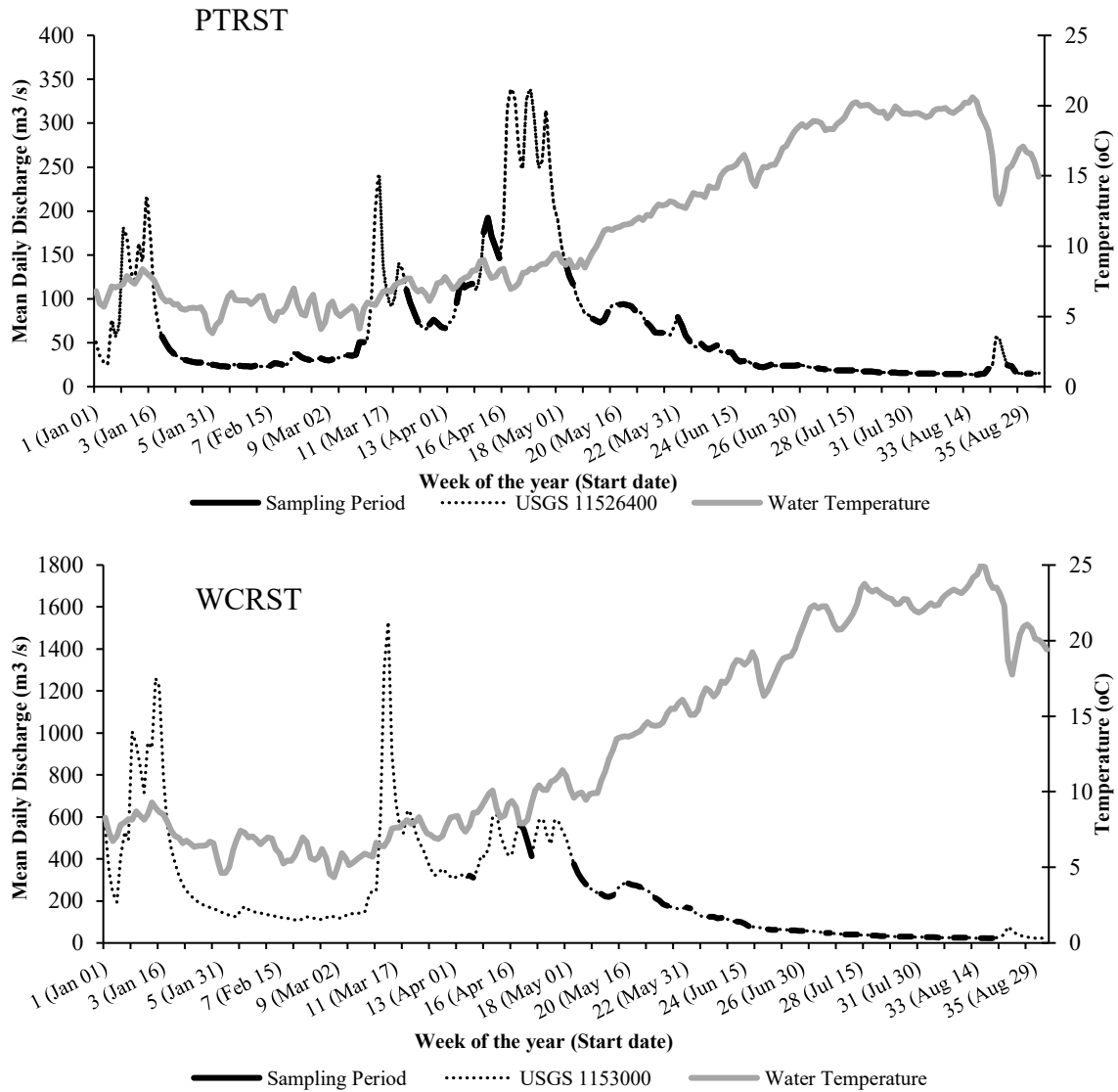


Figure 2. Mean daily discharge (m^3/s) in the Trinity River recorded near Helena (U.S. Geological Survey Water Resource gage station #11-526400) and Hoopa (U.S. Geological Survey Water Resource gage station #11-530000), California, and mean daily water temperatures ($^{\circ}\text{C}$) recorded at USGS gage #11-526400 and the Willow Creek Rotary Screw Trap (WCRST) in 2023.

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 2023 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). 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 19 – Sep 1	138	226	61.1%
Distinct days		Jan 19 – Sep 1	138	226	61.1%
WCRST	1 (2.4 m)	Apr 4 – Aug 22	55	140	39.3%
	2 (2.4 m)	Apr 13 – Aug 22	63	131	48.1%
	3 (2.4 m)	Jun 9 – Aug 22	37	74	50.0%
Distinct days		Apr 4 – Aug 22	63	140	45.0%

Catch Totals

Catch totals of the primary salmonids of interest (Chinook Salmon, Coho Salmon, and steelhead) are presented in Table 3. Chinook Salmon were the most commonly captured salmonid at both sites, comprising approximately 98% and 98.3% of the total anadromous salmonid catch at PTRST and WCRST, respectively. Hatchery salmonid releases from TRH are presented in Table 4. Catch totals of common non-target, fish species are presented in Table 5. 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 44 age-1 hatchery Chinook Salmon were caught at PTRST, while 4 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 2,830,758 (95% Credible Interval (CI): [1,726,083, 4,128,550]) at PTRST and 2,238,611 (95% CI: [78,745, 4,076,291]) at WCRST, respectively (Figure 3; Appendix 7, 8). The age-0 hatchery Chinook Salmon abundance estimates were 1,371,149 (95% CI: [711,544, 2,233,377]) at PTRST and 1,499,977 (95% CI: [574,916, 2,869,008]) at WCRST.

Abundance Indices

Age-0 natural-origin Coho Salmon abundance indices were 3,344 and 620 at PTRST and WCRST, respectively (Figure 5; Table 6, Appendix 3, 4). The abundance indices for age-1 natural-origin Coho Salmon were 861 and 326 at PTRST and WCRST, respectively. Abundance indices of hatchery age-1 Coho Salmon were 1,570 and 1,176 at PTRST and WCRST, respectively.

At PTRST, abundance indices of natural age-0 and age-1 steelhead were 2,834 and 3,836, respectively (Figure 6; Table 6; Appendix 5). Abundance indices of natural age-0 and age-1 steelhead at WCRST were 3,040 and 2,531, respectively (Figure 6; Table 6; Appendix 6). Abundance indices of hatchery age-1 steelhead were 631 at PTRST and 869 at WCRST. No Age-2 steelhead abundance index was made for PTRST. Sampling

periods at both trap sites missed portions of each respective population that emigrated before or after trapping operations.

Table 3. Juvenile salmonid catch totals in 2023 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	7,899	3	19,395	41	27,338
	Coho Salmon	NA	33	81	60	172
	Steelhead	NA	6	280	229	515
WCRST	Chinook Salmon	5,931	0	10,901	4	16,836
	Coho Salmon	NA	20	30	12	62
	Steelhead	NA	13	168	54	235

Table 4. California Department of Fish and Game, Trinity River Hatchery juvenile salmonid releases, 2023. AD-clipped = adipose fin clipped fish.

Species	Release season	Number released	Percentage AD-clipped or marked	Release dates
Chinook Salmon	Spring	898,598	24.5	05/15 – 06/01
	Spring	403,293	24.5	10/02 – 10/09
	Fall	1,501,385	24.5	06/16 – 07/08
	Fall	858,772	24.5	10/09 – 10/18
Coho Salmon	Spring	257,971	99.9	03/15 – 03/24
Steelhead	Spring	471,768	99.9	04/15 – 04/25

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

²Coho Salmon were marked with an ad-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, 2023.

Common name	Species	Life stage	PTRST	WCRST
Lamprey	<i>Entosphenus</i> spp.	Ammocoete	1,454	1164
		Eyed juvenile	101	2
		Adult		10
Sucker	<i>Catostomus</i> spp.		39	3,772
Speckled Dace	<i>Rhinichthys osculus</i>		703	168
Three-Spine Stickleback	<i>Gasterosteus aculeatus</i>		331	30
Golden Shiner	<i>Notemigonus</i>			
	<i>crysoleucas</i>		2	2
Sculpin	<i>Cottus</i> spp.			26
Green Sturgeon	<i>Acipenser medirostris</i>	Juvenile		11
Brown Trout	<i>Salmo trutta</i>	Juvenile	120	2
Sunfish	<i>Lepomis</i> spp.		12	5
Sockeye Salmon	<i>Oncorhynchus nerka</i>	Juvenile		0
Fathead Minnow	<i>Pimephales promelas</i>	Juvenile		0
Chum Salmon	<i>Oncorhynchus keta</i>			7

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, 2023. 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	Natural age-2+	Total
PTRST	Chinook Salmon	98,808	28	402,941	3,592	NA	505,369
	Coho Salmon	NA	1,570	3,344	861	NA	5,775
	Steelhead	NA	631	2,834	3,836	NA	7,301
WCRST	Chinook Salmon	105,591	0	130,289	670	NA	236,550
	Coho Salmon	NA	1,176	620	326	NA	2,122
	Steelhead	NA	869	3,040	2,531	NA	6,439

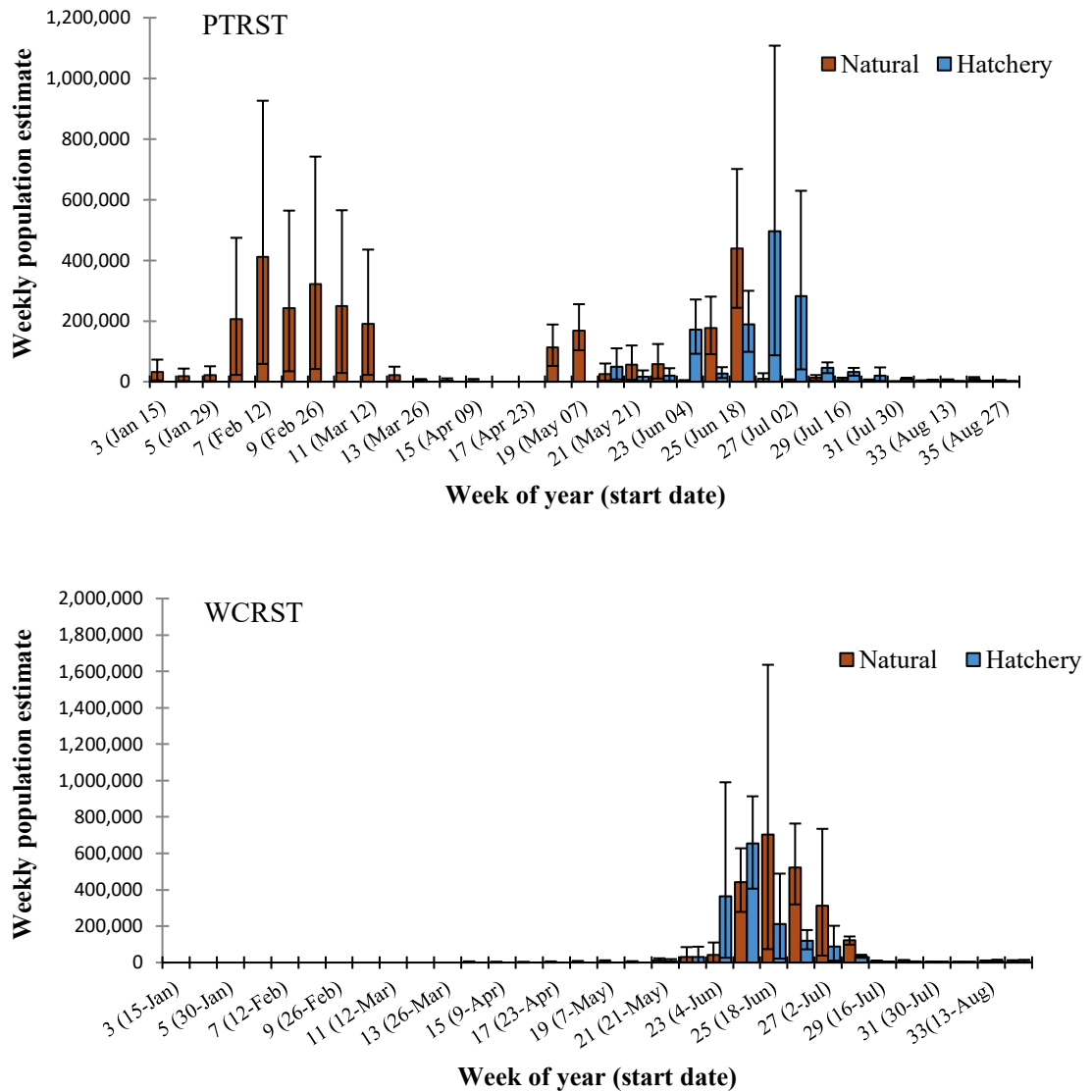


Figure 3. Weekly Bayesian time-stratified population estimates of natural and hatchery age-0 Chinook Salmon captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in the Trinity River, California, 2023. Error bars represent one standard deviation of the mean weekly estimate.

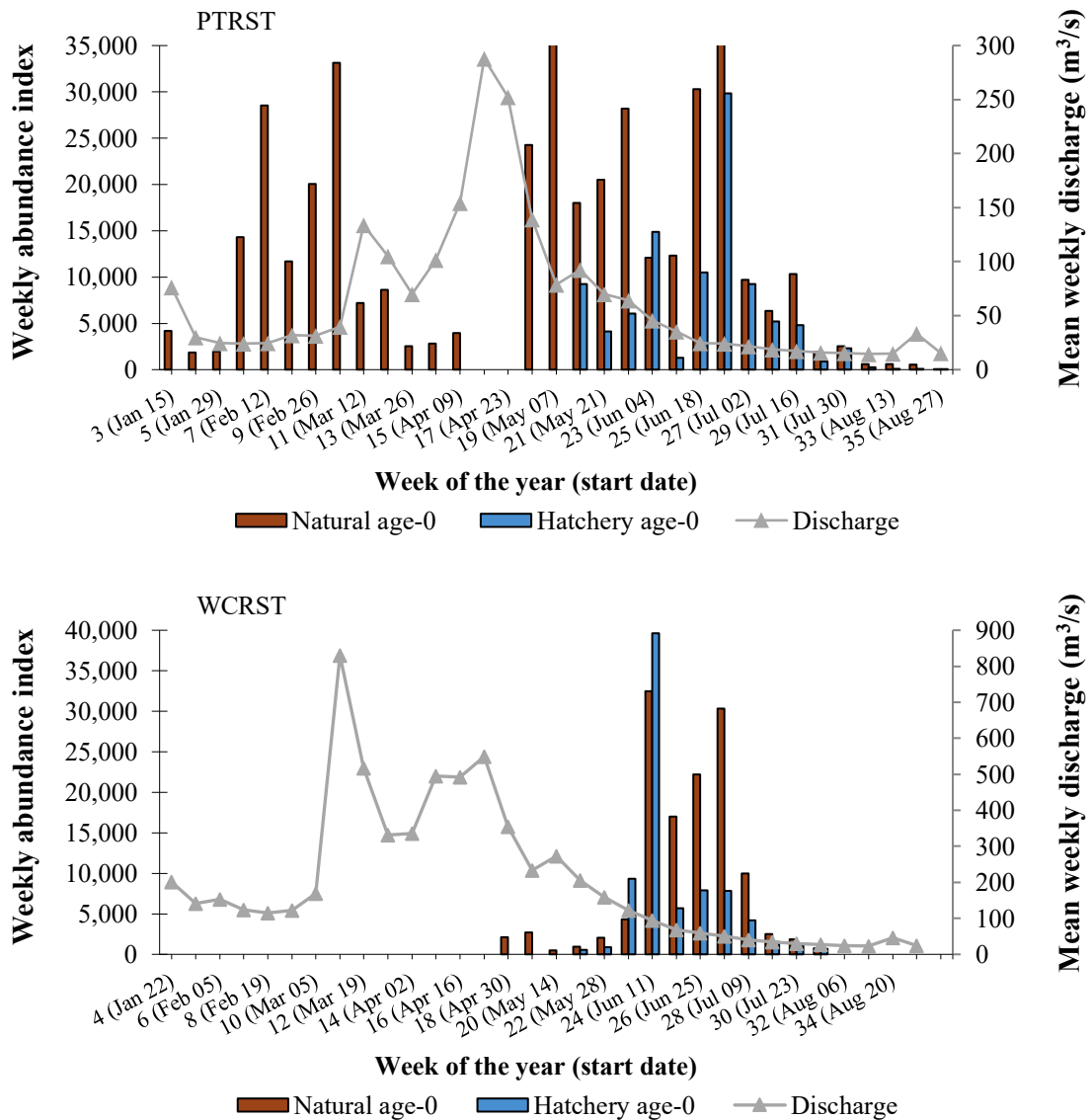


Figure 4. Weekly proportional discharge-based abundance indices for natural and hatchery age-0 Chinook Salmon captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in the Trinity River, California, 2023.

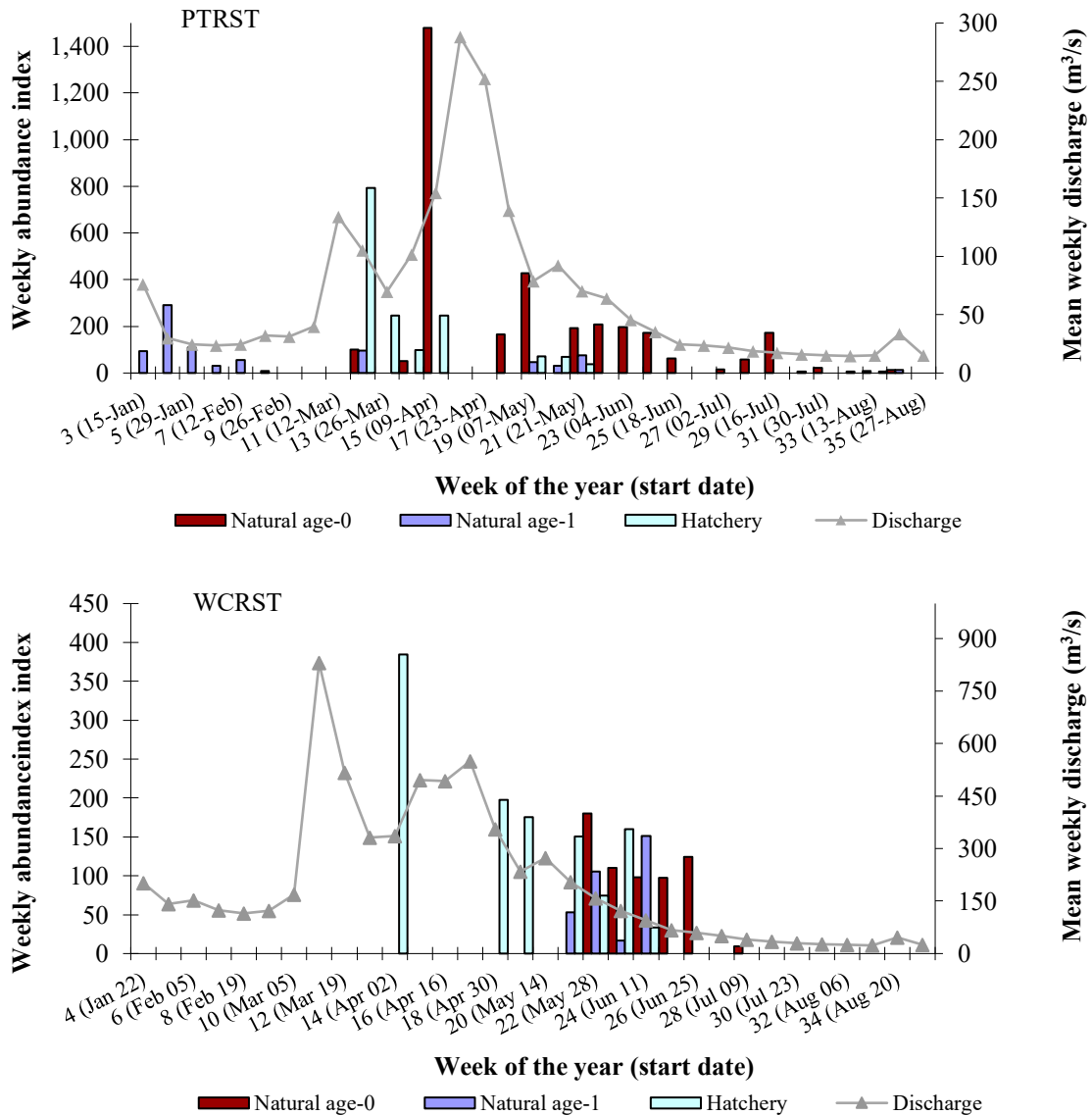


Figure 5. Weekly proportional discharge-based abundance indices for natural age-0, natural age-1, and hatchery age-1 Coho Salmon captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in the Trinity River, California, 2023.

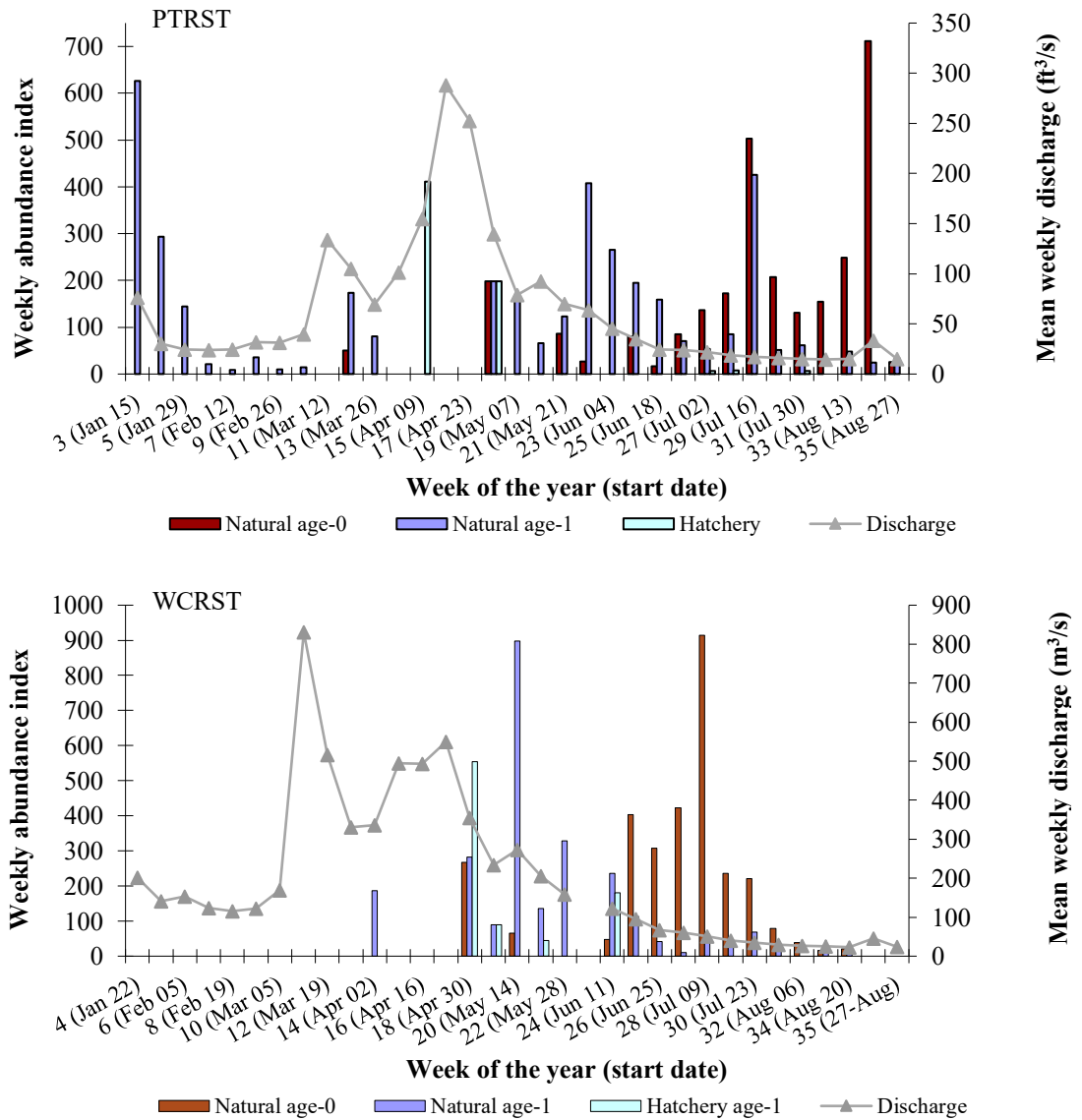


Figure 6. Weekly proportional discharge-based abundance indices for natural age-0, natural age-1, natural age-2, and hatchery age-1 steelhead captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in the Trinity River, California, 2023.

Hatchery/Natural Contribution

Chinook Salmon were captured at PTRST and WCRST throughout the 2023 sampling season with the spring/summer emigration dominated by natural-origin fish at PTRST and WCRST, comprising 68.1% and 59.5%, respectively, of the total Bayesian time-stratified population estimates (Appendix 7, 8).

Age-1 Coho Salmon smolts were predominantly natural origin at PTRST and comprised 64.8% of the total age-1 proportional discharge-based index in 2023 (Appendix 3). At WCRST, age-1 Coho Salmon emigrants of hatchery origin comprised 78.2% of the total age-1 proportional discharge-based index in 2023 (Appendix 4).

Based on proportional discharge-based abundance indices at PTRST and WCRST, age-1 hatchery steelhead comprised 14.1% (Appendix 5) and 25.6% (Appendix 6), respectively, of the total age-1 steelhead abundance indices at each respective site.

Chinook Salmon Population Estimation

During the 2023 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 naturally and hatchery-origin sub-populations (Figure 6). At PTRST an estimated 2,830,758 (95% CI: [1,726,083, 4,128,550]) natural-origin age-0 Chinook Salmon and 1,371,149 (95% CI: [711,544, 2,233,377]) age-0 hatchery Chinook Salmon passed the site between January 15 and August 31. At WCRST between March 8 and August 22, an estimated 2,238,611 (95% CI: [78,745, 4,076,291]) natural-origin age-0 Chinook Salmon and 1,499,977 (95% CI: [574,916, 2,869,008]) age-0 hatchery Chinook Salmon passed the site.

Outmigrant Timing

The Chinook Salmon population in the Trinity River is composed of both natural-origin and hatchery-origin fish of both spring and fall runs. The 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 had two distinct peaks at PTRST (WOY 7, WOY 25) and during WOY 26 at WCRST. Hatchery age-0 Chinook Salmon emigration peaked in WOY 27 at PTRST and WOY 24 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 27 (July 2–8), which occurred during 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 2023. 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	3–35	3–9	20–35	7	3	26
	Coho Salmon	12–34	3–34	12–21	24	4	12
	Steelhead	21–35	3–35	15–31	34	3	NA
WCRST	Chinook Salmon	15–33	14–20	21–33	26	20	24
	Coho Salmon	22–28	21–24	14–24	26	24	23
	Steelhead	18–33	14–33	18–23	26	23	23

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 emigration continued into August (WOY 34). Natural age-1 Coho Salmon were captured in mid-May and continued into June (WOY 24) at WCRST. (Table 7; Appendix 4). Capture data and past observations suggest 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 24 (June 11–17). Natural age-1 Coho Salmon emigration peaked in WOY 4 at PTRST and WOY 24 at WCRST. Hatchery Coho Salmon emigration peaked in WOY 12 at PTRST and WOY 23 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 May through July at WCRST and PTRST (Table 6, Appendix 5, 6). Age-1 or 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 early-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 23 (June 4–10). Natural age-0 steelhead emigration peaked in WOY 34 at PTRST and WOY 26 at WCRST. Natural age-1 steelhead emigration peaked in WOY 3 at PTRST and WOY 23 at WCRST. Hatchery steelhead emigration did not have a distinct peak at PTRST, and peaked in WOY 23 at WCRST.

Migration Rate

Maximum migration rates for hatchery Chinook Salmon were 64 and 16 km/day at PTRST and WCRST, respectively (Table 8). Maximum migration rates for hatchery Coho Salmon were 9 and 7 km/day at PTRST and WCRST, respectively (Table 8). Average migration rates for hatchery Coho Salmon were 2.8 and 2.2 km/day at PTRST and WCRST, respectively (Table 8). Median migration rates for hatchery Coho Salmon were 1.3 and 2.1 km/day at PTRST and WCRST, respectively (Table 8). Maximum migration rates for hatchery steelhead were 64 and 8 km/day at PTRST and WCRST, respectively (Table 8). Average migration rates for hatchery steelhead were 1.3 and 3.2 km/day at PTRST and WCRST, respectively (Table 8). Median migration rates for hatchery steelhead were 1.3 and 2.7 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, 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 WOY 3 through WOY 12, 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 throughout the season. Little change in the fork lengths of age-1 Chinook Salmon at PTRST was detected from week 3 to week 9. Age-1 Chinook Salmon showed little change in fork lengths throughout the season at WCRST.

Natural age-0 Coho Salmon fork lengths generally increased as the season progressed at PTRST and showed little variation at WCRST (Appendix 9, 10). 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. Natural age-1 steelhead fork length was generally unchanged from WOY 3 to WOY 15 and increased steadily from week 15 to the end of the season (Figure 9; Appendix 11, 12). At WCRST, age-0 steelhead fork lengths steadily increased throughout the season, age-1 steelhead showed a slight decrease in fork length in late June. Hatchery steelhead fork lengths increased across the few weeks they were observed at PTRST. Hatchery steelhead fork lengths were variable throughout the season at WCRST, likely due to inadequate sample size.

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, 2023.

Site	Species	First released	First captured	Duration (days)	Migration Rates (km/day)		
					Maximum	Average	Median
PTRST	Chinook Salmon	5/15/2023	5/16/2023	1	64	NA	NA
	Coho Salmon	3/15/2023	3/22/2023	6	9.1	2.8	1.3
	Steelhead	4/15/2023	4/15/2023	1	64.0	1.3	1.3
WCRST	Chinook Salmon	5/15/2023	5/24/2023	9	16	NA	NA
	Coho Salmon	3/15/2023	4/5/2023	22	7	2.2	2.1
	Steelhead	4/15/2023	5/3/2023	19	8	3.2	2.7

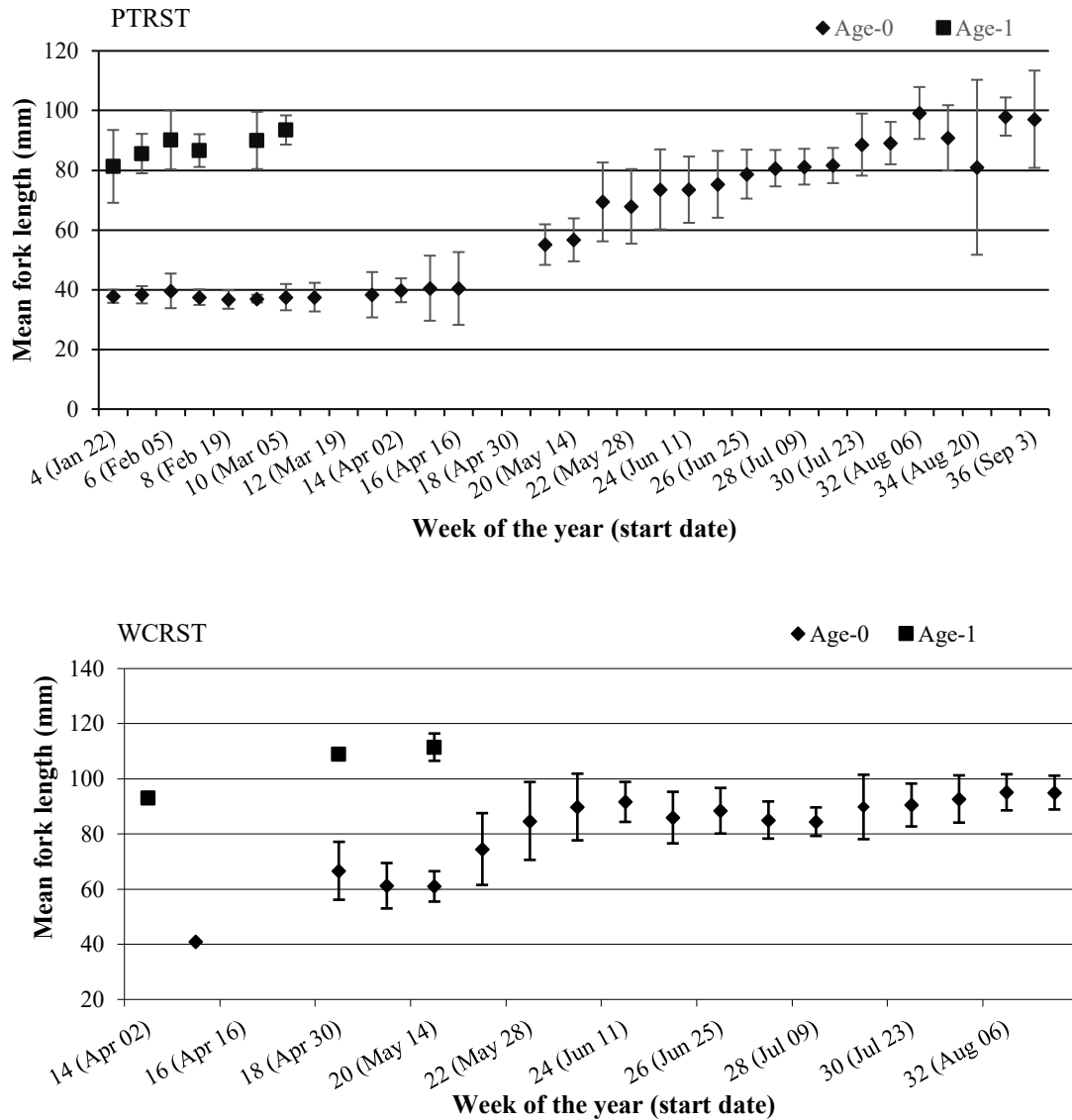


Figure 7. Weekly mean fork lengths of age-0 and age-1 Chinook Salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2023. Error bars represent one standard deviation of the mean.

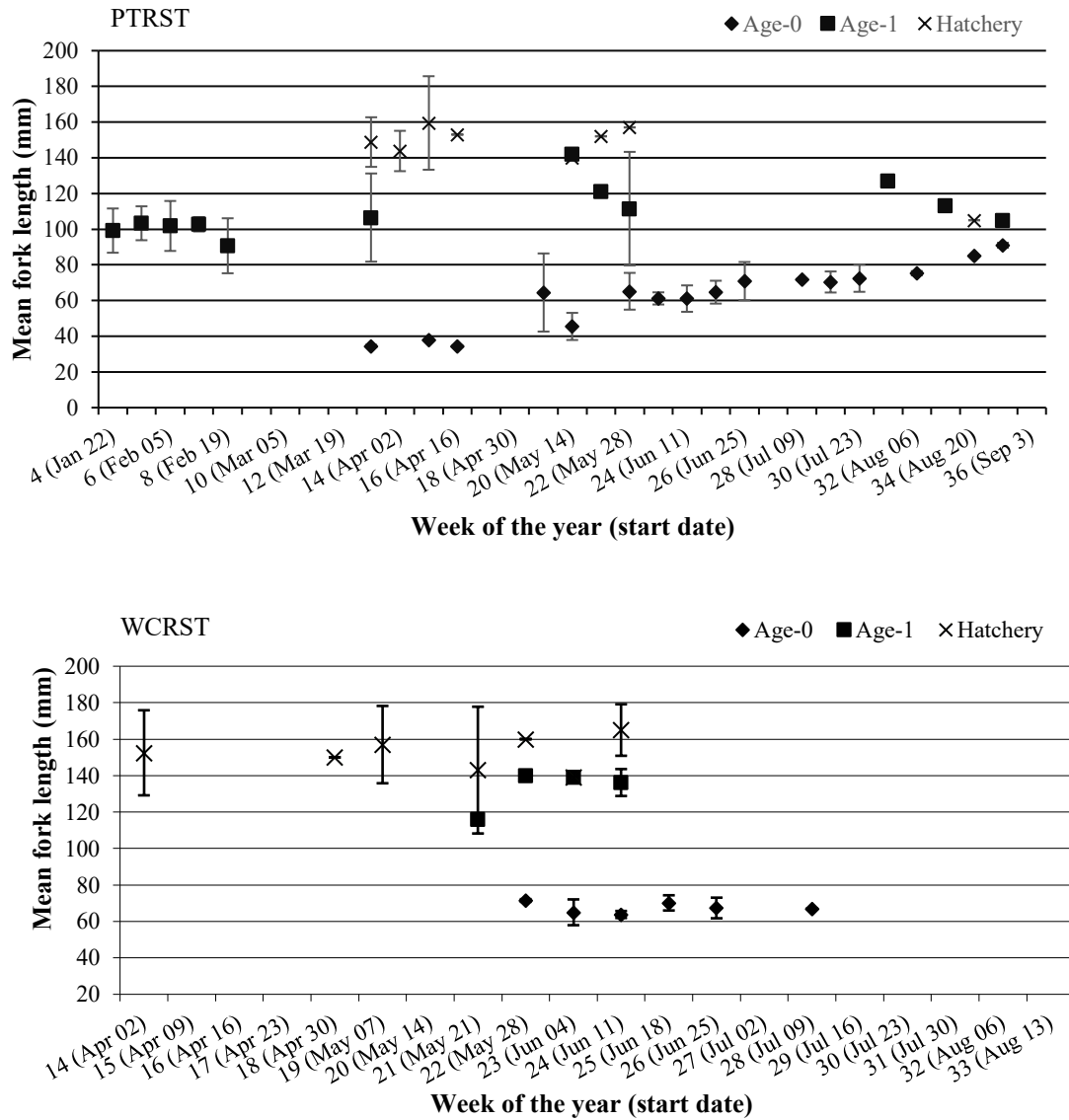


Figure 8. Weekly mean fork lengths for natural age-0, natural age-1, and hatchery Coho Salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2023. Error bars represent one standard deviation of the mean.

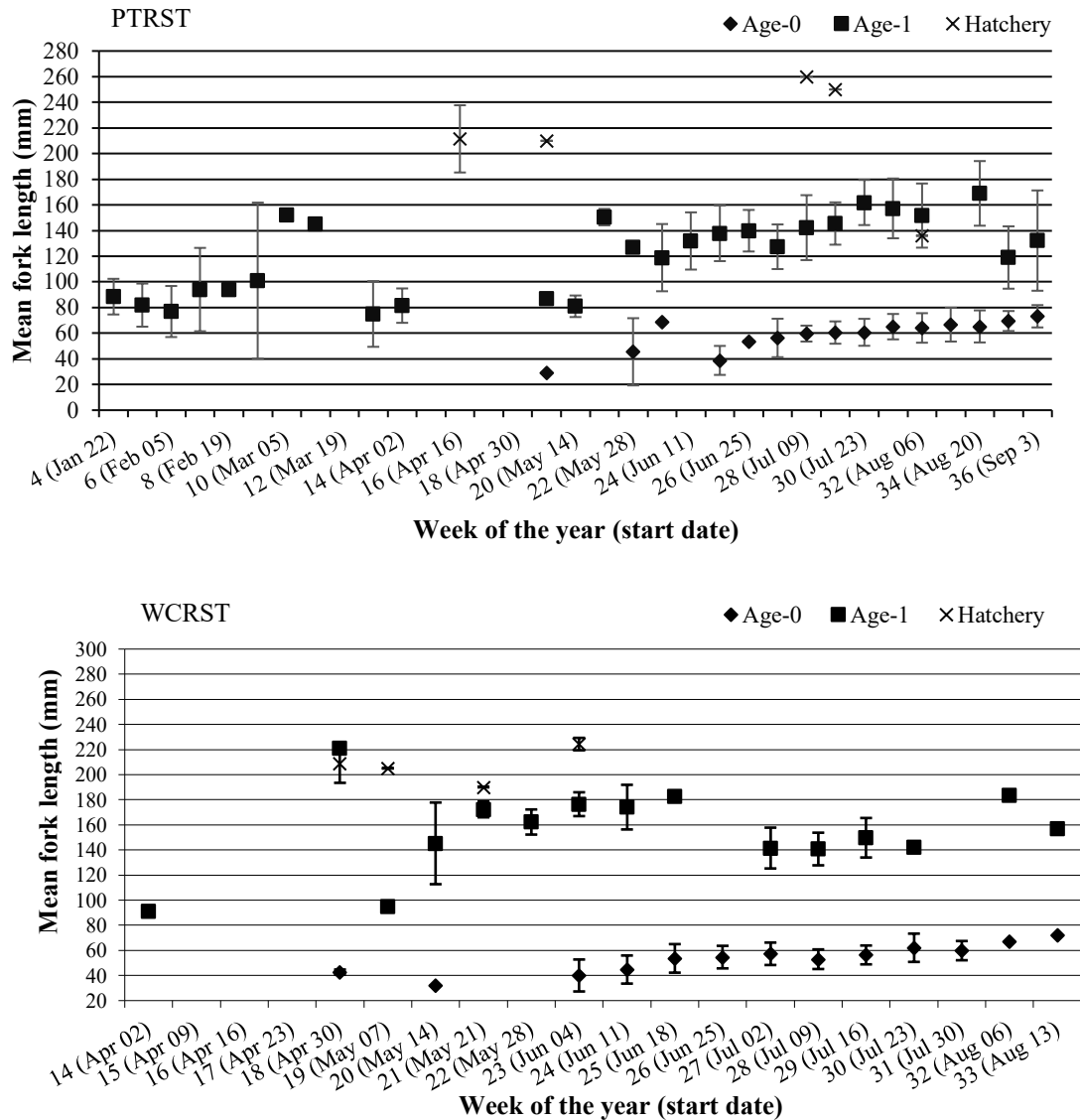


Figure 9. Weekly mean fork lengths for natural age-0, age-1, age-2, and hatchery age-1 steelhead captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2023. Error bars represent one standard deviation of the mean.

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 throughout the season and showed no obvious trend at either site (Figure 10, Appendix 13). Age-1 natural Coho Salmon weekly mean condition factors were generally greater over 1.000 at PTRST, though they were variable throughout the season at WCRST (Figure 11, Appendix 14), 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 was generally greater than 1.0 throughout the season at PTRST. They showed no obvious trend at WCRST (Figure 12, Appendix 15).

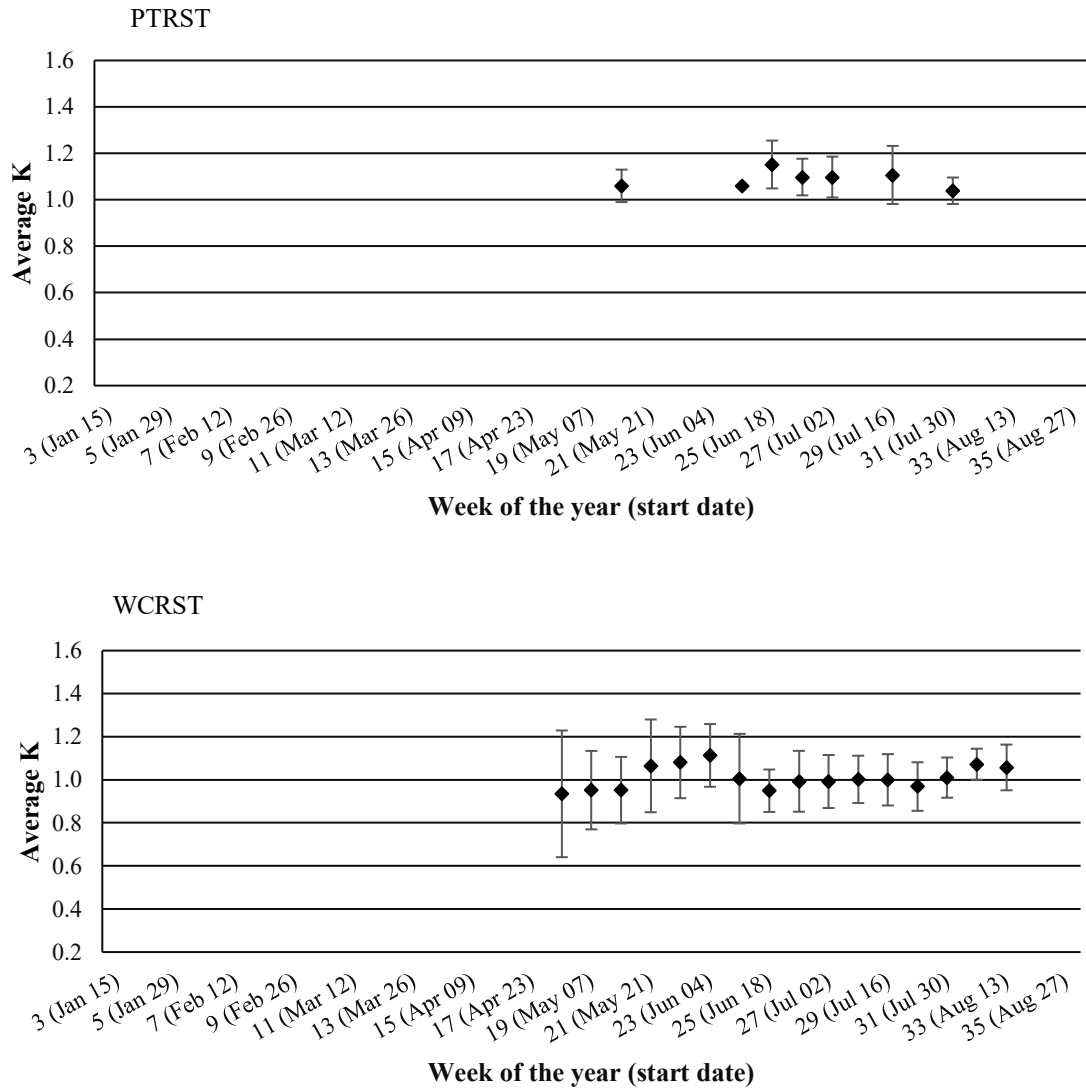


Figure 10. Weekly mean K value for pooled hatchery and natural age-0 Chinook Salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2023. Error bars represent one standard deviation of the mean.

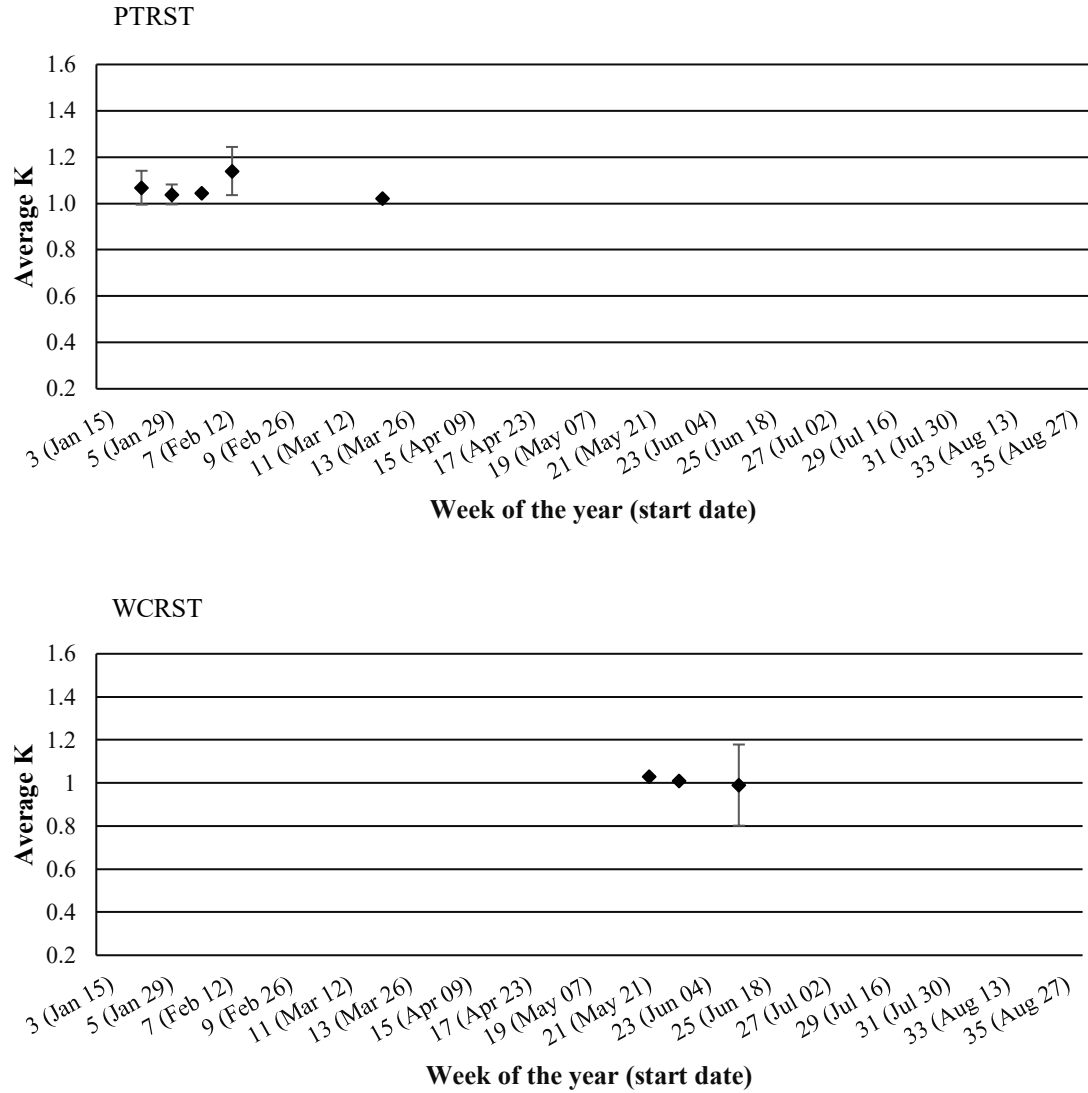


Figure 11. Weekly mean K value for natural age-1 Coho Salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2023. Error bars represent one standard deviation of the mean.

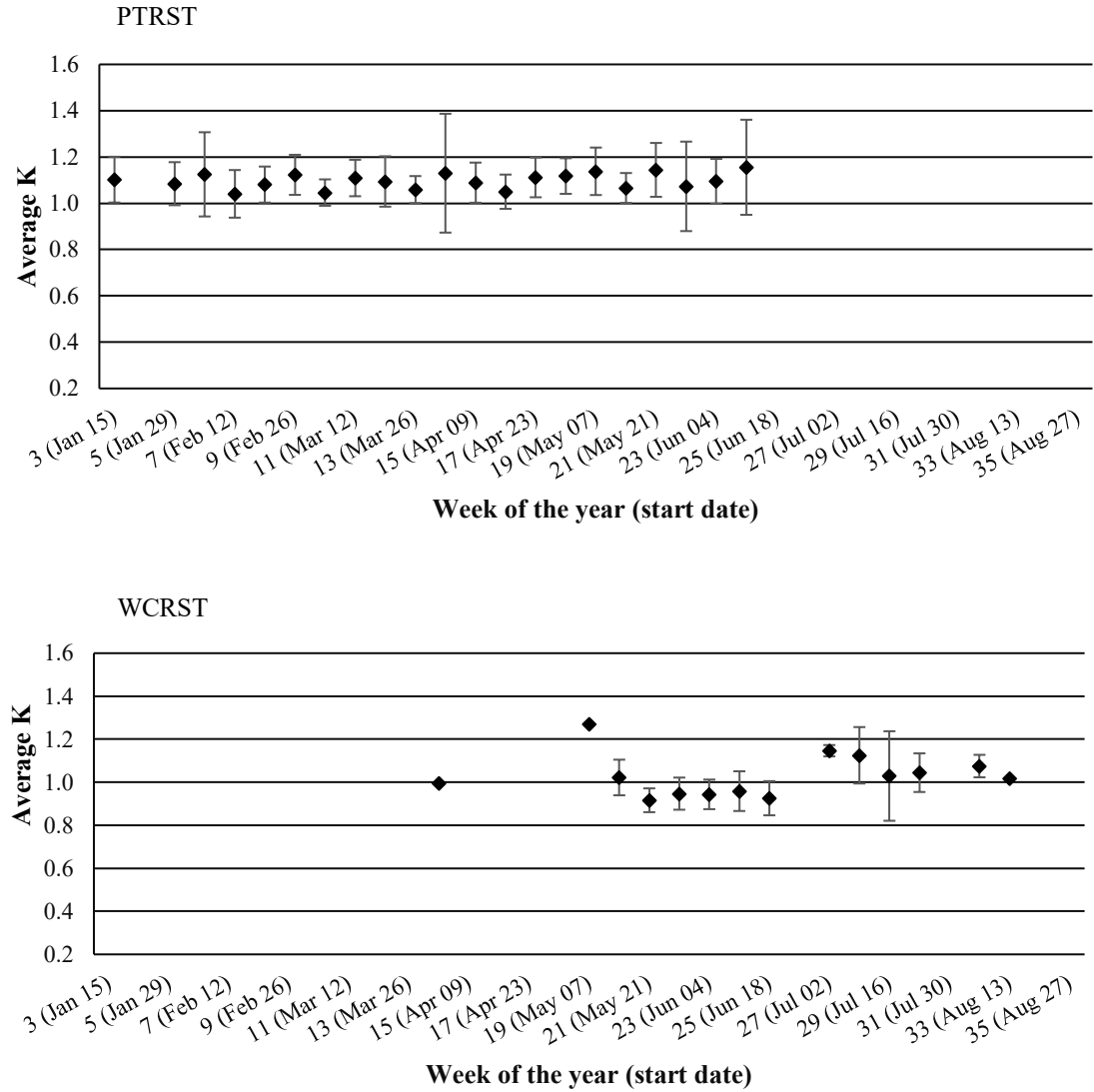


Figure 12. Weekly mean K value for natural age-1+ steelhead captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) in the Trinity River, California, 2023. Error bars represent one standard deviation of the mean.

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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, in the Trinity River, California, 2023. 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	
1/18/2023	3	76.1	4	0	0	0	220	10	230	0	0	0	4,160	215	4,375
1/25/2023	4	30.0	5	0	0	0	161	11	172	0	0	0	1,839	134	1,973
2/1/2023	5	24.5	5	0	0	0	205	11	216	0	0	0	1,924	99	2,023
2/8/2023	6	23.9	5	0	0	1	1,581	4	1,586	0	0	9	14,325	39	14,373
2/15/2023	7	24.4	5	0	0	0	2,982	0	2,982	0	0	0	28,519	0	28,519
2/22/2023	8	32.0	4	0	0	1	1,068	6	1,075	0	0	9	11,694	65	11,768
3/1/2023	9	31.2	4	0	0	1	1,665	1	1,667	0	0	10	20,040	10	20,060
3/8/2023	10	39.7	5	0	0	0	1,573	0	1,573	0	0	0	33,139	0	33,139
3/15/2023	11	133.8	1	0	0	0	291	0	291	0	0	0	7,168	0	7,168
3/22/2023	12	105.3	4	0	0	0	183	2	185	0	0	0	8,505	95	8,600
3/29/2023	13	69.7	5	0	0	0	65	0	65	0	0	0	2,526	0	2,526
4/5/2023	14	101.6	5	0	0	0	44	1	45	0	0	0	2,789	43	2,832
4/12/2023	15	154.6	5	0	0	0	16	1	17	0	0	0	3,748	206	3,954
4/19/2023	16	288.0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/26/2023	17	252.3	0	0	0	0	0	0	0	0	0	0	0	0	0
5/3/2023	18	139.4	3	0	0	0	235	0	235	0	0	0	24,290	0	24,290
5/10/2023	19	78.9	5	0	0	0	978	0	978	0	0	0	45,212	0	45,212
5/17/2023	20	92.3	5	193	62	0	308	0	563	6,987	2,247	0	11,191	0	20,425
5/24/2023	21	70.2	5	78	25	0	448	0	551	3,140	1,010	0	17,435	0	21,585
5/31/2023	22	63.9	5	112	36	0	615	3	766	4,601	1,479	0	23,635	75	29,791
6/7/2023	23	45.7	5	641	206	0	42	0	889	11,280	3,627	0	1,441	0	16,348
6/14/2023	24	35.2	5	84	27	0	803	67	981	963	310	0	10,569	866	12,707
6/21/2023	25	24.8	5	802	258	8	2,258	177	3,503	7,702	2,476	70	21,858	1,550	33,657
6/28/2023	26	23.9	5	2,062	663	1	1,713	0	4,439	22,532	7,245	10	18,331	0	48,118
7/5/2023	27	21.9	3	830	267	0	461	0	1,558	6,987	2,246	0	3,552	0	12,785
7/12/2023	28	18.7	5	547	176	0	418	1	1,142	3,936	1,266	0	2,947	7	8,155
7/19/2023	29	17.4	5	199	64	8	329	9	609	3,024	972	198	7,366	138	11,698
7/26/2023	30	15.9	5	84	27	0	175	3	289	659	212	0	1,309	25	2,205
8/2/2023	31	15.1	5	246	79	0	135	3	463	1,760	566	0	1,005	21	3,352
8/9/2023	32	14.6	5	31	10	0	58	1	100	212	68	0	404	7	691
8/16/2023	33	15.1	4	6	2	0	77	2	87	48	15	0	526	14	603
8/23/2023	34	33.4	3	6	2	0	64	0	72	55	18	0	476	0	549
8/30/2023	35	15.3	3	0	0	0	4	0	4	0	0	0	26	0	26
Totals			138	5,921	1,904	20	19,175	313	27,333	73,886	23,757	306	331,949	3,609	433,507

Appendix 2. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Chinook Salmon catches and abundance indices, in the Trinity River, California, 2023. 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-0	Age-1		
4/5/2023	14	336.2	3	0	0	0	0	1	1	0	0	0	186	186	
4/12/2023	15	495.3	1	0	0	0	1	0	1	0	0	0	0	0	
4/19/2023	16	493.0	4	0	0	0	0	0	0	0	0	0	0	0	
4/26/2023	17	549.8	0	0	0	0	0	0	0	0	0	0	0	0	
5/3/2023	18	355.3	4	0	0	0	9	1	10	0	0	2,128	282	2,410	
5/10/2023	19	233.8	4	0	0	0	24	0	24	0	0	2,728	0	2,728	
5/17/2023	20	273.4	6	0	0	0	7	2	9	0	0	518	202	719	
5/24/2023	21	205.0	8	9	3	0	34	0	46	568	184	945	0	1,698	
5/31/2023	22	158.3	4	9	3	0	24	0	36	881	286	2,067	0	3,234	
6/7/2023	23	122.1	9	481	156	0	39	0	676	9,320	3,024	4,320	0	16,664	
6/14/2023	24	94.8	10	1,904	618	0	1,633	0	4,155	39,598	12,850	32,478	0	84,926	
6/21/2023	25	67.4	9	293	95	0	1,266	0	1,654	5,694	1,848	16,992	0	24,534	
6/28/2023	26	60.0	12	669	217	0	3,742	0	4,628	7,874	2,555	22,231	0	32,660	
7/5/2023	27	50.5	6	240	78	0	1,108	0	1,426	7,845	2,546	30,336	0	40,726	
7/12/2023	28	40.6	12	431	140	0	1,945	0	2,516	4,196	1,362	9,978	0	15,535	
7/19/2023	29	34.8	12	157	51	0	439	0	647	1,513	491	2,478	0	4,483	
7/26/2023	30	29.9	12	129	42	0	408	0	579	1,063	345	1,874	0	3,282	
8/2/2023	31	27.1	12	89	29	0	130	0	248	696	226	727	0	1,649	
8/9/2023	32	24.8	12	52	17	0	78	0	147	387	122	402	0	911	
8/16/2023	33	23.2	12	12	4	0	17	0	33	89	29	87	0	205	
8/23/2023	34	46.2	3	0	0	0	0	0	0	0	0	0	0	0	
			155	4,478	1,453	0	10,901	4	16,836	79,724	25,867	130,289	670	236,550	

Appendix 3. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly Coho Salmon catches and abundance indices in the Trinity River, California, 2023. AD = adipose fin clip.

Week starting	Week of year	Mean Daily Discharge	Trap days sampled	Weekly Coho Salmon catch				Weekly Coho Salmon index			
				Hatchery	Natural		Catch	Hatchery	Natural		Index
				AD	Age-0	Age-1	total	AD	Age-0	Age-1	total
1/18/2023	3	76.1	4	0	0	4	4	0	0	93	93
1/25/2023	4	30.0	5	0	0	24	24	0	0	290	290
2/1/2023	5	24.5	5	0	0	12	12	0	0	109	109
2/8/2023	6	23.9	5	0	0	3	3	0	0	30	30
2/15/2023	7	24.4	5	0	0	6	6	0	0	55	55
2/22/2023	8	32.0	4	0	0	0	0	0	0	9	9
3/1/2023	9	31.2	4	0	0	0	0	0	0	0	0
3/8/2023	10	39.7	5	0	0	0	0	0	0	0	0
3/15/2023	11	133.8	1	0	0	0	0	0	0	0	0
3/22/2023	12	105.3	4	19	2	2	23	793	100	95	988
3/29/2023	13	69.7	5	6	0	0	6	246	0	0	246
4/5/2023	14	101.6	5	2	1	0	3	99	51	0	150
4/12/2023	15	154.6	5	1	6	0	7	246	1,480	0	1,726
4/19/2023	16	288.0	0	0	0	0	0	0	0	0	0
4/26/2023	17	252.3	0	0	0	0	0	0	0	0	0
5/3/2023	18	139.4	3	0	2	0	2	0	166	0	166
5/10/2023	19	78.9	5	1	8	1	10	72	428	46	546
5/17/2023	20	92.3	5	1	0	1	2	70	0	32	102
5/24/2023	21	70.2	5	1	5	2	8	37	192	75	304
5/31/2023	22	63.9	5	0	4	0	4	0	208	0	208
6/7/2023	23	45.7	5	0	11	0	11	0	196	0	196
6/14/2023	24	35.2	5	0	13	0	13	0	172	0	172
6/21/2023	25	24.8	5	0	7	0	7	0	63	0	63
6/28/2023	26	23.9	5	0	0	0	0	0	0	0	0
7/5/2023	27	21.9	3	0	2	0	2	0	16	0	16
7/12/2023	28	18.7	5	0	8	0	8	0	57	0	57
7/19/2023	29	17.4	5	0	6	0	6	0	173	0	173
7/26/2023	30	15.9	5	0	0	1	1	0	0	7	7
8/2/2023	31	15.1	5	0	3	0	3	0	21	0	21
8/9/2023	32	14.6	5	0	0	1	1	0	0	7	7
8/16/2023	33	15.1	4	1	1	0	2	7	8	0	15
8/23/2023	34	33.4	3	0	2	2	4	0	13	13	26
8/30/2023	35	15.3	3	0	0	0	0	0	0	0	0
Total			138	32	81	59	172	1,570	3,344	861	5,775

Appendix 4. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Coho Salmon catches and abundance indices in the Trinity River, California, 2023. AD = adipose fin clip.

Week starting	Week of year	Mean daily discharge	Trap days sampled	Weekly Coho Salmon catch				Weekly Coho Salmon index			
				Hatchery AD	Natural		Catch total	Hatchery AD	Natural		Index total
					Age-0	Age-1			Age-0	Age-1	
4/5/2023	14	336.2	3	2	0	0	2	385	0	0	385
4/12/2023	15	495.3	1	0	0	0	0	0	0	0	0
4/19/2023	16	493.0	4	0	0	0	0	0	0	0	0
4/26/2023	17	549.8	0	0	0	0	0	0	0	0	0
5/3/2023	18	355.3	4	1	0	0	1	197	0	0	197
5/10/2023	19	233.8	4	2	0	0	2	176	0	0	176
5/17/2023	20	273.4	6	0	0	0	0	0	0	0	0
5/24/2023	21	205.0	8	3	0	1	4	150	0	53	203
5/31/2023	22	158.3	4	1	2	1	4	75	180	106	360
6/7/2023	23	122.1	9	9	5	1	15	160	110	16	287
6/14/2023	24	94.8	10	2	5	9	16	34	98	151	283
6/21/2023	25	67.4	9	0	6	0	6	0	98	0	98
6/28/2023	26	60.0	12	0	11	0	11	0	124	0	124
7/5/2023	27	50.5	6	0	0	0	0	0	0	0	0
7/12/2023	28	40.6	12	0	1	0	1	0	10	0	10
7/19/2023	29	34.8	12	0	0	0	0	0	0	0	0
7/26/2023	30	29.9	12	0	0	0	0	0	0	0	0
8/2/2023	31	27.1	12	0	0	0	0	0	0	0	0
8/9/2023	32	24.8	12	0	0	0	0	0	0	0	0
8/16/2023	33	23.2	12	0	0	0	0	0	0	0	0
8/23/2023	34	46.2	3	0	0	0	0	0	0	0	0
				20	30	12	62	1,176	620	326	2,122

Appendix 5. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly steelhead catches and abundance indices in the Trinity River, California, 2023. AD = adipose fin clip, age-2 steelhead were not recorded in 2023.

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-0	Age-1	
1/18/2023	3	76.1	4	0	0	32	32	0	0	626	626
1/25/2023	4	30.0	5	0	0	25	25	0	0	293	293
2/1/2023	5	24.5	5	0	0	16	16	0	0	143	144
2/8/2023	6	23.9	5	0	0	2	2	0	0	21	21
2/15/2023	7	24.4	5	0	0	1	1	0	0	9	9
2/22/2023	8	32.0	4	0	0	4	4	0	0	37	36
3/1/2023	9	31.2	4	0	0	1	1	0	0	10	10
3/8/2023	10	39.7	5	0	0	1	1	0	0	14	14
3/15/2023	11	133.8	1	0	0	0	0	0	0	0	0
3/22/2023	12	105.3	4	0	1	4	5	0	50	174	224
3/29/2023	13	69.7	5	0	0	2	2	0	0	80	80
4/5/2023	14	101.6	0	0	0	0	0	0	0	0	0
4/12/2023	15	154.6	5	2	0	0	2	411	0	0	411
4/19/2023	16	288.0	0	0	0	0	0	0	0	0	0
4/26/2023	17	252.3	0	0	0	0	0	0	0	0	0
5/3/2023	18	139.4	3	1	1	1	3	198	198	198	594
5/10/2023	19	78.9	5	0	0	4	4	0	0	162	162
5/17/2023	20	92.3	5	0	0	2	2	0	0	66	66
5/24/2023	21	70.2	5	0	2	3	5	0	86	124	209
5/31/2023	22	63.9	5	0	1	13	14	0	27	408	435
6/7/2023	23	45.7	5	0	0	15	15	0	0	265	265
6/14/2023	24	35.2	5	0	5	15	20	0	80	195	275
6/21/2023	25	24.8	5	0	2	17	19	0	17	159	176
6/28/2023	26	23.9	5	0	7	7	14	0	85	70	155
7/5/2023	27	21.9	3	1	16	7	24	7	137	54	198
7/12/2023	28	18.7	5	1	24	12	37	8	172	85	265
7/19/2023	29	17.4	5	0	28	14	42	0	503	426	929
7/26/2023	30	15.9	5	0	27	7	34	0	207	51	258
8/2/2023	31	15.1	5	1	19	9	29	7	131	62	200
8/9/2023	32	14.6	5	0	23	0	23	0	155	0	155
8/16/2023	33	15.1	4	0	35	7	42	0	249	48	297
8/23/2023	34	33.4	3	0	85	3	88	0	711	24	735
8/30/2023	35	15.3	3	0	2	4	6	0	13	27	59
Total			133	6	278	228	512	632	2,821	3,833	7,301

Appendix 6. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly steelhead catches and abundance indices in the Trinity River, California, 2023. AD = adipose fin clip.

Week starting	Week of year	Mean daily discharge m ³ /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+	
4/5/2023	14	336.2	3	0	0	1	0	1	0	0	186	0	186
4/12/2023	15	495.3	1	0	0	0	0	0	0	0	0	0	0
4/19/2023	16	493.0	4	0	0	0	0	0	0	0	0	0	0
4/26/2023	17	549.8	0	0	0	0	0	0	0	0	0	0	0
5/3/2023	18	355.3	4	2	1	1	0	4	555	268	282	0	1,105
5/10/2023	19	233.8	4	1	0	1	0	2	89	0	89	0	178
5/17/2023	20	273.4	6	0	1	8	0	9	0	65	899	0	964
5/24/2023	21	205.0	8	1	0	3	0	4	44	0	135	0	180
5/31/2023	22	158.3	4	0	0	4	0	4	0	0	329	0	329
6/7/2023	23	122.1	9	9	2	9	0	20	180	48	235	0	464
6/14/2023	24	94.8	10	0	15	6	0	21	0	403	114	0	516
6/21/2023	25	67.4	9	0	17	2	0	19	0	308	41	0	349
6/28/2023	26	60.0	12	0	36	1	0	37	0	423	10	0	432
7/5/2023	27	50.5	6	0	29	2	0	31	0	914	63	0	977
7/12/2023	28	40.6	12	0	24	4	0	28	0	236	38	0	274
7/19/2023	29	34.8	12	0	23	7	0	30	0	221	68	0	289
7/26/2023	30	29.9	12	0	10	2	0	12	0	79	18	0	97
8/2/2023	31	27.1	12	0	5	0	0	5	0	39	0	0	39
8/9/2023	32	24.8	12	0	2	2	0	4	0	17	14	0	30
8/16/2023	33	23.2	12	0	3	1	0	4	0	21	8	0	30
8/23/2023	34	46.2	3	0	0	0	0	0	0	0	0	0	0
				13	168	54	0	235	869	3,040	2,531	0	6,439

Appendix 7. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly age-0 Chinook Salmon trapping effort, catch numbers, mark-recapture numbers, and population estimates and results in the Trinity River, California, 2023. NC = no clip, AD = adipose fin clip.

Week starting	Week of year	Sampling fraction ¹	Catch NC	Catch AD	Marks released	Marks recaptured	Recapture rate	Estimated natural	Natural LCI	Natural UCI	Estimated hatchery	Hatchery LCI	Hatchery UCI
1/15/2023	3	0.571	158	0	0	0	---	32,827	4,448	73,018	0	0	0
1/22/2023	4	0.714	96	0	0	0	---	18,750	2,321	43,379	0	0	0
1/29/2023	5	0.714	93	0	0	0	---	22,137	2,310	50,996	0	0	0
2/5/2023	6	0.714	1,470	0	0	0	---	206,274	22,538	474,515	0	0	0
2/12/2023	7	0.714	2,866	0	0	0	---	411,176	58,739	926,348	0	0	0
2/19/2023	8	0.571	998	0	0	0	---	243,258	34,467	564,169	0	0	0
2/26/2023	9	0.571	1,598	0	0	0	---	322,107	41,958	742,146	0	0	0
3/5/2023	10	0.714	1,482	0	0	0	---	250,292	28,917	565,407	0	0	0
3/12/2023	11	0.143	291	0	0	0	---	191,454	22,711	435,653	0	0	0
3/19/2023	12	0.571	87	0	0	0	---	21,607	2,995	49,761	0	0	0
3/26/2023	13	0.714	79	0	440	12	0.027	5,493	2,734	9,023	0	0	0
4/2/2023	14	0.714	29	0	1,640	7	0.004	4,909	712	11,134	0	0	0
4/9/2023	15	0.714	10	0	0	0	---	3,528	321	9,149	0	0	0
4/16/2023	16	0.000	---	---	0	0	---	---	---	---	---	---	---
4/23/2023	17	0.000	---	---	0	0	---	---	---	---	---	---	---
4/30/2023	18	0.429	189	0	1,978	5	0.003	113,802	52,151	188,657	0	0	0
5/7/2023	19	0.714	922	0	2,040	15	0.007	169,055	103,780	255,581	0	0	0
5/14/2023	20	0.714	290	56	1,669	2	0.001	25,541	3,891	60,134	48,744	7,679	110,122
5/21/2023	21	0.714	370	22	1,974	2	0.001	55,691	6,922	119,553	17,190	2,405	37,373
5/28/2023	22	0.714	521	34	0	0	---	57,554	10,564	124,393	20,249	3,270	44,628
6/4/2023	23	0.714	360	298	2,014	11	0.005	2,385	192	5,485	172,406	92,193	271,105
6/11/2023	24	0.714	685	22	1,835	8	0.004	176,848	90,754	280,601	27,800	12,217	48,101
6/18/2023	25	0.714	2,392	190	1,845	8	0.004	439,980	243,712	701,447	189,465	98,507	299,823
6/25/2023	26	0.714	1,868	622	0	0	---	9,984	333	28,072	496,638	87,160	1,107,888
7/2/2023	27	0.429	506	261	1,853	19	0.010	2,658	14	7,849	282,996	40,623	629,445
7/9/2023	28	0.714	538	120	1,844	31	0.017	12,650	4,065	22,042	45,677	28,321	63,848
7/16/2023	29	0.714	300	70	2,391	33	0.014	7,068	400	13,414	32,090	19,992	45,629
7/23/2023	30	0.714	111	27	0	0	---	2,547	14	7,454	20,656	2,967	47,269
7/30/2023	31	0.714	140	63	3,023	84	0.028	508	5	1,315	10,354	7,674	13,210
8/6/2023	32	0.714	54	8	2,992	42	0.014	2,449	99	4,605	3,919	1,532	6,849
8/13/2023	33	0.571	71	2	3,024	62	0.021	5,593	3,349	7,781	1,007	148	2,172
8/20/2023	34	0.429	61	2	2,465	30	0.012	10,479	5,884	15,385	1,332	28	3,229
8/27/2023	35	0.429	5	0	0	0	---	2,151	43	6,018	626	0	2,235
Totals		0.64	18,635	1,797	33,027	371	0	2,830,758	1,726,083	4,128,550	1,371,149	711,544	2,233,377

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 trapping effort, catch numbers, mark-recapture numbers, and population estimates and results in the Trinity River, California, 2023. NC = no clip, AD = adipose fin clip.

Week starting	Week of year	Sampling fraction ¹	Catch NC	Catch AD	Marks released	Marks recaptured	Recapture rate	Estimated natural	Natural LCI	Natural UCI	Estimated hatchery	Hatchery LCI	Hatchery UCI
4/5/2023	14	0.429	0	0	0	0	0.000	1,790	2	6,698	0	0	0
4/12/2023	15	0.143	1	0	0	0	0.000	1,178	2	4,210	0	0	0
4/19/2023	16	0.429	0	0	3,764	2	0.001	863	0	3,055	0	0	0
4/26/2023	17	0.000	0	0	0	0	0.000	1,987	5	6,538	0	0	0
5/3/2023	18	0.571	9	0	2,202	7	0.003	2,655	20	8,853	0	0	0
5/10/2023	19	0.571	24	0	1,178	0	0.000	4,363	108	12,407	0	0	0
5/17/2023	20	0.571	7	0	3,263	11	0.003	4,154	998	7,724	0	0	0
5/24/2023	21	0.571	43	3	2,795	12	0.004	12,605	2,792	23,551	9,103	1,173	19,045
5/31/2023	22	0.286	33	3	0	0	0.000	30,760	1,220	85,081	31,838	1,151	87,122
6/7/2023	23	0.571	520	156	1,345	7	0.005	41,007	1,454	110,322	365,060	26,316	990,556
6/14/2023	24	0.571	3,537	618	3,750	23	0.006	442,396	278,277	627,870	654,838	406,070	913,554
6/21/2023	25	0.429	1,559	95	802	7	0.009	702,964	73,813	1,636,206	210,807	21,803	488,590
6/28/2023	26	0.571	4,411	217	1,543	20	0.013	523,237	319,531	763,817	120,690	72,629	178,714
7/5/2023	27	0.286	1,348	78	0	0	0.000	311,116	38,688	734,806	87,028	10,485	202,171
7/12/2023	28	0.571	2,376	140	4,231	119	0.028	121,396	98,254	143,328	34,609	26,200	42,887
7/19/2023	29	0.571	596	51	1,663	150	0.090	8,856	7,076	10,728	4,169	2,993	5,577
7/26/2023	30	0.571	537	42	1,358	87	0.064	11,346	8,804	14,346	4,684	3,174	6,523
8/2/2023	31	0.571	219	29	1,492	81	0.054	4,312	2,760	6,096	3,874	2,464	5,553
8/9/2023	32	0.571	130	17	1,221	63	0.052	2,702	1,397	4,178	2,588	1,398	3,993
8/16/2023	33	0.571	29	4	2,310	9	0.004	5,119	35	11,604	7,213	1,379	15,716
8/23/2023	34	0.143	0	0	1,572	2	0.001	3,805	2	12,991	4,417	4	15,176
Total			15,379	1,453	34,489	600	0.020	2,238,611	835,236	4,234,408	1,540,918	577,240	2,975,175

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 in the Trinity River, California, 2023.

Week starting	Week of year	Chinook Salmon ¹									
		Age-0					Age-1				
		n	Mean	Min	Max	SD	n	Mean	Min	Max	SD
1/18/2023	3	93	37.8	31	46	2.2	9	81.3	66	100	12.2
1/25/2023	4	111	38.3	34	50	2.9	11	85.6	75	95	6.6
2/1/2023	5	166	39.4	12	64	5.8	9	90.2	76	109	9.9
2/8/2023	6	151	37.5	33	55	2.6	5	86.6	78	92	5.5
2/15/2023	7	148	36.5	33	41	3.1	--	--	--	--	--
2/22/2023	8	90	37.0	34	40	1.3	7	90.0	80	107	9.6
3/1/2023	9	91	37.5	29	75	4.4	2	93.5	90	97	4.9
3/8/2023	10	119	36.9	34	46	4.8	--	--	--	--	--
3/15/2023	11	--	--	--	--	--	--	--	--	--	--
3/22/2023	12	153	39.1	33	110	7.6	--	--	--	--	--
3/29/2023	13	57	39.8	35	53	4.0	--	--	--	--	--
4/5/2023	14	45	41.8	33	98	10.9	--	--	--	--	--
4/12/2023	15	17	43.3	36	89	12.2	--	--	--	--	--
4/19/2023	16	--	--	--	--	--	--	--	--	--	--
4/26/2023	17	--	--	--	--	--	--	--	--	--	--
5/3/2023	18	91	55.1	42	82	6.8	--	--	--	--	--
5/10/2023	19	148	56.7	42	79	7.2	--	--	--	--	--
5/17/2023	20	212	69.4	45	93	13.2	--	--	--	--	--
5/24/2023	21	213	67.9	41	99	12.5	--	--	--	--	--
5/31/2023	22	213	72.7	52	103	13.4	--	--	--	--	--
6/7/2023	23	172	73.5	53	101	11.1	--	--	--	--	--
6/14/2023	24	246	75.3	54	108	11.2	--	--	--	--	--
6/21/2023	25	348	78.7	57	106	8.2	--	--	--	--	--
6/28/2023	26	301	80.7	62	107	6.1	--	--	--	--	--
7/5/2023	27	178	81.2	66	102	6.0	--	--	--	--	--
7/12/2023	28	272	81.6	62	110	5.9	--	--	--	--	--
7/19/2023	29	238	88.6	66	116	10.4	--	--	--	--	--
7/26/2023	30	182	89.1	69	120	7.1	--	--	--	--	--
8/2/2023	31	268	99.2	72	124	8.7	--	--	--	--	--
8/9/2023	32	58	90.9	50	127	10.9	--	--	--	--	--
8/16/2023	33	25	88.3	48	177	29.3	--	--	--	--	--
8/23/2023	34	13	98.0	85	107	6.4	--	--	--	--	--
8/30/2023	35	9	97.1	60	115	16.3	--	--	--	--	--

¹Natural and hatchery combined

Appendix 10. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Chinook Salmon fork lengths in the Trinity River, California, 2023.

Week starting	Week of year	Chinook Salmon ¹									
		Age-0					Age-1				
		n	Mean	Min	Max	SD	n	Mean	Min	Max	SD
4/5/2023	14	0	---	---	---	---	1	93.0	93	93	---
4/12/2023	15	1	41.0	41	41	---	0	---	---	---	---
4/19/2023	16	0	---	---	---	---	0	---	---	---	---
4/26/2023	17	0	---	---	---	---	0	---	---	---	---
5/3/2023	18	9	66.7	51	84	10.5	1	109.0	109	109	---
5/10/2023	19	25	61.2	40	72	8.2	0	---	---	---	---
5/17/2023	20	7	61.0	52	66	5.5	2	111.5	108	115	4.9
5/24/2023	21	50	74.5	55	96	13.0	0	---	---	---	---
5/31/2023	22	35	84.7	54	108	14.1	0	---	---	---	---
6/7/2023	23	172	89.8	59	110	12.1	0	---	---	---	---
6/14/2023	24	123	91.6	68	110	7.3	0	---	---	---	---
6/21/2023	25	153	86.0	63	106	9.4	0	---	---	---	---
6/28/2023	26	364	88.4	63	125	8.3	0	---	---	---	---
7/5/2023	27	128	85.1	70	120	6.7	0	---	---	---	---
7/12/2023	28	364	84.5	69	101	5.2	0	---	---	---	---
7/19/2023	29	280	89.8	66	123	11.7	0	---	---	---	---
7/26/2023	30	296	90.5	73	120	7.8	0	---	---	---	---
8/2/2023	31	236	92.7	70	127	8.6	0	---	---	---	---
8/9/2023	32	119	95.1	79	121	6.6	0	---	---	---	---
8/16/2023	33	33	95.0	84	109	6.1	0	---	---	---	---

¹Natural and Hatchery combined.

Appendix 11. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly Coho Salmon fork lengths in the Trinity River, California, 2023.

[illegible]

Appendix 12: Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Coho Salmon fork lengths in the Trinity River, California, 2023.

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
4/5/2023	14	0	---	---	---	---	0	---	---	---	---	2	152.5	136	169	23.3
4/12/2023	15	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
4/19/2023	16	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
4/26/2023	17	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
5/3/2023	18	0	---	---	---	---	0	---	---	---	---	1	150.0	150	150	---
5/10/2023	19	0	---	---	---	---	0	---	---	---	---	2	157.0	142	172	21.2
5/17/2023	20	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
5/24/2023	21	0	---	---	---	---	1	116.0	116	116	---	3	143.0	103	166	34.8
5/31/2023	22	2	71.5	71	72	0.7	1	140.0	140	140	---	1	160.0	160	160	---
6/7/2023	23	2	65.0	60	70	7.1	1	139.0	139	139	---	2	139.0	138	140	1.4
6/14/2023	24	5	63.8	61	66	1.9	10	136.2	124	149	7.40	2	165.0	155	175	14.1
6/21/2023	25	6	70.2	65	75	4.2	0	---	---	---	---	0	---	---	---	---
6/28/2023	26	11	67.4	57	78	5.7	0	---	---	---	---	0	---	---	---	---
7/5/2023	27	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
7/12/2023	28	1	67.0	67	67	---	0	---	---	---	---	0	---	---	---	---
7/19/2023	29	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
7/26/2023	30	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
8/2/2023	31	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
8/9/2023	32	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
8/16/2023	33	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---

Appendix 13. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly steelhead fork lengths in the Trinity River, California, 2023.

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
1/18/2023	3	--	--	--	--	--	31	88.5	57	118	13.9	--	--	--	--	--
1/25/2023	4	--	--	--	--	--	25	81.9	54	112	16.8	--	--	--	--	--
2/1/2023	5	--	--	--	--	--	15	76.9	54	135	19.9	--	--	--	--	--
2/8/2023	6	--	--	--	--	--	2	94.0	71	117	32.5	--	--	--	--	--
2/15/2023	7	--	--	--	--	--	1	94.0	94	94	--	--	--	--	--	--
2/22/2023	8	--	--	--	--	--	2	101.0	58	144	60.8	--	--	--	--	--
3/1/2023	9	--	--	--	--	--	1	152.0	152	152	--	--	--	--	--	--
3/8/2023	10	--	--	--	--	--	1	145.0	145	145	--	--	--	--	--	--
3/15/2023	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3/22/2023	12	--	--	--	--	--	4	75.0	53	112	25.6	--	--	--	--	--
3/29/2023	13	--	--	--	--	--	2	81.5	72	91	13.4	--	--	--	--	--
4/5/2023	14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4/12/2023	15	--	--	--	--	--	--	--	--	--	--	2	211.5	193	230	26.2
4/19/2023	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4/26/2023	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5/3/2023	18	1	29.0	29	29	--	1	87.0	87	87	--	1	210.0	210	210	--
5/10/2023	19	--	--	--	--	--	4	81.0	72	90	8.4	--	--	--	--	--
5/17/2023	20	--	--	--	--	--	2	150.5	146	155	6.4	--	--	--	--	--
5/24/2023	21	2	45.5	27	64	26.2	2	127.0	127	127	0.0	--	--	--	--	--
5/31/2023	22	1	69.0	69	69	--	12	118.9	90	181	26.2	--	--	--	--	--
6/7/2023	23	--	--	--	--	--	15	131.9	104	179	22.3	--	--	--	--	--
6/14/2023	24	5	38.8	26	50	11.3	14	137.9	110	175	21.7	--	--	--	--	--
6/21/2023	25	2	53.5	53	54	0.7	16	139.9	118	182	16.2	--	--	--	--	--
6/28/2023	26	7	56.3	42	85	15.0	5	127.4	102	146	17.4	--	--	--	--	--
7/5/2023	27	16	59.7	50	71	6.2	7	142.3	120	190	25.3	1	260.0	260	260	--
7/12/2023	28	24	60.5	48	77	8.7	12	145.5	113	172	16.5	1	250.0	250	250	--
7/19/2023	29	27	60.7	30	79	10.5	8	161.9	137	189	17.6	--	--	--	--	--
7/26/2023	30	27	65.1	47	94	9.9	6	157.3	133	195	23.3	--	--	--	--	--
8/2/2023	31	18	64.1	45	91	11.5	7	151.7	113	180	25.0	1	136.0	136	136	--
8/9/2023	32	23	66.7	43	89	13.2	--	--	--	--	--	--	--	--	--	--
8/16/2023	33	35	65.3	37	88	12.5	3	169.0	140	185	25.2	--	--	--	--	--
8/23/2023	34	67	69.5	53	91	7.8	3	119.0	104	147	24.3	--	--	--	--	--
8/30/2023	35	4	73.2	64	84	8.7	5	132.2	102	200	39.1	--	--	--	--	--

Appendix 14. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly steelhead fork lengths, 2023.

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
4/5/2023	14	0	---	---	---	---	1	91.0	91	91	----	0	---	---	---	---
4/12/2023	15	0	---	---	---	---	0	---	---	---	----	0	---	---	---	----
4/19/2023	16	0	---	---	---	---	0	---	---	---	----	0	---	---	---	----
4/26/2023	17	0	---	---	---	---	0	---	---	---	----	0	---	---	---	----
5/3/2023	18	3	42.7	41	45	2.1	1	221.0	221	221	----	2	209.0	198	220	15.6
5/10/2023	19	0	---	---	---	---	1	95.0	95	95	----	1	205.0	205	205	----
5/17/2023	20	1	32.0	32	32	---	8	145.3	103	198	32.5	0	---	---	---	----
5/24/2023	21	0	---	---	---	---	3	172.3	165	176	6.4	1	190.0	190	190	----
5/31/2023	22	0	---	---	---	---	4	162.3	149	170	10.0	0	---	---	---	----
6/7/2023	23	2	40.0	31	49	12.7	9	176.4	162	194	9.5	3	224.3	221	230	4.9
6/14/2023	24	15	44.7	30	59	11.2	10	174.1	132	198	17.8	0	---	---	---	----
6/21/2023	25	16	53.6	32	82	11.4	2	182.5	182	183	0.7	0	---	---	---	----
6/28/2023	26	36	54.6	31	74	8.9	0	---	---	---	----	0	---	---	---	----
7/5/2023	27	29	57.3	38	75	8.9	2	141.5	130	153	16.3	0	---	---	---	----
7/12/2023	28	24	53.0	40	70	7.8	4	140.8	129	152	13.0	0	---	---	---	----
7/19/2023	29	28	56.4	45	73	7.5	7	149.7	130	170	15.7	0	---	---	---	----
7/26/2023	30	11	62.1	42	78	11.2	2	142.0	141	143	1.4	0	---	---	---	----
8/2/2023	31	5	59.8	50	70	7.7	0	---	---	---	----	0	---	---	---	----
8/9/2023	32	2	67	51	83	22.6	3	183.7	164	220	31.5	0	---	---	---	----
8/16/2023	33	3	72	55	105	28.6	8	156.8	134	180	18.1	0	---	---	---	----

Appendix 15. Fulton's condition factor (K) for pooled natural and hatchery age-0 Chinook Salmon with FL >50 mm from the Pear Tree and Willow Creek Rotary Screw Trap sites in the Trinity River, California,2023.

Week starting	Week of year	Pear Tree trap site			Willow Creek trap site		
		n	Mean K	Standard deviation	n	Mean K	Standard deviation
1/15/2023	3	---	---	---	---	---	---
1/22/2023	4	---	---	---	---	---	---
1/30/2023	5	---	---	---	---	---	---
2/5/2023	6	---	---	---	---	---	---
2/12/2023	7	---	---	---	---	---	---
2/19/2023	8	---	---	---	---	---	---
2/26/2023	9	---	---	---	---	---	---
3/5/2023	10	---	---	---	---	---	---
3/12/2023	11	---	---	---	---	---	---
3/19/2023	12	---	---	---	---	---	---
3/26/2023	13	---	---	---	---	---	---
4/2/2023	14	---	---	---	---	---	---
4/9/2023	15	---	---	---	1	4.063	---
4/16/2023	16	---	---	---	---	---	---
4/23/2023	17	---	---	---	---	---	---
4/30/2023	18	---	---	---	9	0.935	0.294
5/7/2023	19	---	---	---	25	0.952	0.182
5/14/2023	20	40	1.060	0.070	7	0.952	0.154
5/21/2023	21	---	---	---	50	1.065	0.215
5/28/2023	22	---	---	---	35	1.080	0.166
6/4/2023	23	---	---	---	172	1.113	0.604
6/11/2023	24	1	1.060	---	123	1.005	0.208
6/18/2023	25	46	1.152	0.103	153	0.949	0.099
6/25/2023	26	54	1.098	0.079	364	0.993	0.141
7/2/2023	27	88	1.098	0.088	128	0.992	0.123
7/9/2023	28	---	---	---	364	1.002	0.110
7/16/2023	29	70	1.107	0.125	279	1.000	0.119
7/23/2023	30	---	---	---	296	0.969	0.113
7/30/2023	31	77	1.039	0.057	236	1.010	0.093
8/6/2023	32	---	---	---	119	1.072	0.748
8/13/2023	33	---	---	---	33	1.057	0.106
8/20/2023	34	---	---	---	---	---	---
8/27/2023	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 in the Trinity River, California, 2023.

Week starting	Week of year	Pear Tree trap site			Willow Creek trap site		
		n	Mean K	Standard deviation	n	Mean K	Standard deviation
1/15/2023	3	---	---	---	---	---	---
1/22/2023	4	14	1.068	0.073	---	---	---
1/30/2023	5	10	1.039	0.043	---	---	---
2/5/2023	6	1	1.046	---	---	---	---
2/12/2023	7	3	1.140	0.104	---	---	---
2/19/2023	8	---	---	---	---	---	---
2/26/2023	9	---	---	---	---	---	---
3/5/2023	10	---	---	---	---	---	---
3/12/2023	11	---	---	---	---	---	---
3/19/2023	12	1	1.023	---	---	---	---
3/26/2023	13	---	---	---	---	---	---
4/2/2023	14	---	---	---	---	---	---
4/9/2023	15	---	---	---	---	---	---
4/16/2023	16	---	---	---	---	---	---
4/23/2023	17	---	---	---	---	---	---
4/30/2023	18	---	---	---	---	---	---
5/7/2023	19	---	---	---	---	---	---
5/14/2023	20	---	---	---	---	---	---
5/21/2023	21	---	---	---	1	1.031	---
5/28/2023	22	---	---	---	1	1.009	---
6/4/2023	23	---	---	---	1	0.856	---
6/11/2023	24	---	---	---	10	0.990	0.188
6/18/2023	25	---	---	---	---	---	---
6/25/2023	26	---	---	---	---	---	---
7/2/2023	27	---	---	---	---	---	---
7/9/2023	28	---	---	---	---	---	---
7/16/2023	29	---	---	---	---	---	---
7/23/2023	30	---	---	---	---	---	---
7/30/2023	31	---	---	---	---	---	---
8/6/2023	32	---	---	---	---	---	---
8/13/2023	33	---	---	---	---	---	---
8/20/2023	34	---	---	---	---	---	---
8/27/2023	35	---	---	---	---	---	---

Appendix 17. Fulton's condition factor (K) for natural age-1+ steelhead from the Pear Tree and Willow Creek Rotary Screw Trap sites in the Trinity River, California, 2023.

Week starting	Week of year	Pear Tree trap site			Willow Creek trap site		
		n	Mean K	Standard deviation	n	Mean K	Standard deviation
1/15/2023	3	79	1.102	0.099	---	---	---
1/22/2023	4	---	---	---	---	---	---
1/30/2023	5	32	1.085	0.093	---	---	---
2/5/2023	6	18	1.125	0.182	---	---	---
2/12/2023	7	27	1.041	0.103	---	---	---
2/19/2023	8	116	1.081	0.078	---	---	---
2/26/2023	9	31	1.123	0.086	---	---	---
3/5/2023	10	8	1.046	0.057	---	---	---
3/12/2023	11	38	1.109	0.079	---	---	---
3/19/2023	12	112	1.094	0.109	---	---	---
3/26/2023	13	25	1.059	0.058	---	---	---
4/2/2023	14	10	1.130	0.257	1	0.995	---
4/9/2023	15	59	1.089	0.087	---	---	---
4/16/2023	16	8	1.050	0.074	---	---	---
4/23/2023	17	92	1.112	0.086	---	---	---
4/30/2023	18	36	1.118	0.077	1	0.844	---
5/7/2023	19	11	1.138	0.103	1	1.271	---
5/14/2023	20	21	1.066	0.064	8	1.022	0.083
5/21/2023	21	23	1.144	0.116	3	0.916	0.055
5/28/2023	22	39	1.073	0.193	4	0.947	0.075
6/4/2023	23	8	1.095	0.097	9	0.944	0.069
6/11/2023	24	9	1.156	0.205	10	0.959	0.092
6/18/2023	25	---	---	---	2	0.926	0.079
6/25/2023	26	---	---	---	---	---	---
7/2/2023	27	---	---	---	2	1.147	0.026
7/9/2023	28	---	---	---	4	1.125	0.131
7/16/2023	29	---	---	---	7	1.029	0.208
7/23/2023	30	---	---	---	2	1.045	0.090
7/30/2023	31	---	---	---	---	---	---
8/6/2023	32	---	---	---	3	1.075	0.052
8/13/2023	33	---	---	---	1	1.018	---
8/20/2023	34	---	---	---	---	---	---
8/27/2023	35	---	---	---	---	---	---