State of California
Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE

ANNUAL REPORT
TRINITY RIVER BASIN SALMON AND STEELHEAD MONITORING PROJECT: CHINOOK AND COHO SALMON AND FALL STEELHEAD RUN-SIZE ESTIMATES USING MARK-RECAPTURE METHODS
2021-22 SEASON

On the cover: Photo of fish at Junction City weir with Klamath River Lamprey (*Entosphenus* similis) attached, 2021.

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CHINOOK SALMON, COHO SALMON AND FALL STEELHEAD RUN-SIZE ESTIMATES USING MARK-RECAPTURE METHODS

2021-22 SEASON

by

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FOREWORD

This is the California Department of Fish and Wildlife's Trinity River Basin Salmon and Steelhead Monitoring Project's 33rd annual report to the US Bureau of Reclamation, who fund the work through Cooperative Agreement Number R18AC200070.

This report presents work performed on the main stem Trinity River and at Trinity River Hatchery. Necessity for performing our Klamath-Trinity basin monitoring activities is outlined in several Acts of Congress including Public Law 386 (69 Stat. 719), August 12, 1955; Public Law 98-541, October 24, 1984; the "Trinity River Basin Fish and Wildlife Management Reauthorization Act" of 1995; and the Trinity River "Record of Decision," 2000.

ACKNOWLEDGMENTS

The 2021 field season was still not free of Covid-19, but our crews performed as we have come to expect. It was another tough season, but they who staff the CA Department of Fish and Wildlife projects were up to the task. We were fortunate to have nearly all our CDFW fisheries technicians return in 2021: Michael Bradford, Liv Carter, Chris Hubler, Lauren Meissner, Jane Sartori, Ron Smith, Steven Strite, and Ted Tillinghast. We were delighted to have Billy Colegrove back as the Hoopa Valley Tribal Fisheries (HVTF) crew member on the Junction City weir, and certainly appreciate our HVTF crew member at Willow Creek weir. We value the strong working relationship we have with, and help we get from, the HVTF crew members and staff during the installation and removal of the weirs, and whatever else comes up. This year we welcomed the help of Keike Yamasaki and Max Ramos of the Yurok Tribe Fisheries Department (YTF) at Junction City weir to facilitate the Trinity River Hatchery (TRH) Coho Salmon broodstock collection there.

We appreciate the cooperation of the CDFW's TRH staff during recovery efforts and Steve Strite, the Willow Creek Community Services District, TRH and Six River National Forest for access, off-season in-basin equipment storage, and general project support.

The CDFW monitoring program was approved by the Trinity Management Council and funded by the Bureau of Reclamation through the Trinity River Restoration Program office in Weaverville, CA. We thank the Trinity River Restoration Program, for their contract administration and recognize our contract manager, Derek Rupert, for his splendid attention to our program's funding.

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ABSTRACT

California Department of Fish and Wildlife's Trinity River Project conducted tagging and recapture operations from June 2021 through March 2022 to produce run-size, angler harvest, and spawner escapement estimates of spring and fall Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*O. kisutch*), and fall steelhead (*O. mykiss*) in the Trinity River basin. Monitoring results inform the Trinity River Restoration Program's adaptive management decision making process and help evaluate progress toward achieving fundamental objectives outlined in the Integrated Assessment Plan (TRRP 2009). Additionally, run-size estimates are used in annual fishery management decisions, feeding into the Pacific Fishery Management Council's Klamath River basin fishery regulation and harvest allocation process.

Using a Petersen mark-recapture methodology, we estimated 5,550 (95% CI 5,061 – 6,065) spring Chinook Salmon migrated into Trinity River basin upstream of Junction City weir. The run was comprised of an estimated 778 jacks (334 natural-origin [NOR] and 444 hatchery origin [HOR]) and 4,772 adults (691 NOR and 4,082 HOR). Using tags returned by anglers we estimate harvest of 0 jack and 147 adult spring Chinook, yielding a total escapement of 5,403 fish, including 2,005 spring Chinook that entered Trinity River Hatchery and 3,398 estimated natural area spawners. Escapement of 669 NOR adult spring Chinook Salmon is 11.2% of the Trinity River Restoration Program goal of 6,000.

An estimated 22,623 (95% CI 21,157 – 24,142) fall Chinook Salmon migrated upstream of Willow Creek weir in 2021. The run consisted of an estimated 3,390 jacks (2,761 NOR and 629 HOR) and 19,233 adults (5,673 NOR and 13,560 HOR). Using tags returned by anglers we estimate harvest of 47 jack and 600 adult fall Chinook Salmon, yielding an escapement of 21,976, including 5,967 that entered Trinity River Hatchery and 16,009 estimated natural area spawners. Escapement of 5,496 NOR adult fall Chinook Salmon is 8.9% of the 62,000 fish Trinity River Restoration Program goal.

Coho Salmon run-size and escapement in the Trinity River upstream of Willow Creek weir were both estimated at 4,694 (95% CI 3,850 – 5,791), as no Coho Salmon were reported as harvested. The escapement consisted of 323 jack (12 NOR and 311 HOR) and 4,371 adults (209 NOR and 4,161 HOR). Escapement of 209 NOR Coho Salmon adults was 14.9% of the Trinity River Restoration Program goal of 1,400 fish.

Coho Salmon run-size and escapement in the Trinity River upstream of Junction City weir were both estimated at 4,071 (95% CI 3,538 – 4,642), with no Coho Salmon reported as harvested. The escapement consisted of 246 jack (1 NOR and 245 HOR) and 3,825 adults (214 NOR and 3,611 HOR). An additional 36 adult Coho (15 NOR and 21 HOR) were removed from the river at Junction City weir and trucked to Trinity River Hatchery as part of a pilot broodstock collection project to implement the hatchery's genetic management plan (CDFW 2017).

Using a Petersen mark-recapture methodology we estimated 7,029 (95% CI 5,535 – 9,176) adult fall steelhead returned to the Trinity River basin upstream of Willow Creek weir. Anglers harvested an estimated 190 adult fall steelhead upstream of the weir, leaving 6,839 (3,088 NOR and 3,940 HOR) fish as potential spawners. Escapement of 3,088 NOR adult steelhead is 7.7% of the 40,000 fish Trinity River Restoration Program goal.

PROJECT OBJECTIVES

- Determine run-size, age composition, hatchery/natural origin proportions, distribution, and timing of adult Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*O. kisutch*), and steelhead (*O. mykiss*) in the Trinity River basin [Integrated Assessment Plan (IAP) assessment 13A – "Monitor adult escapement of hatchery and naturally produced spring and fall Chinook, coho, and fall steelhead (TRRP, 2009)]".
- Determine in-river sport angler harvest and spawner escapements of Trinity River Chinook Salmon, Coho Salmon, and steelhead [IAP assessments 16A, 17A, 18A, and 19A – "Monitor harvest (tribal, sport and commercial) of naturally produced spring Chinook, fall Chinook, coho and steelhead]".

1. INTRODUCTION

The California Department of Fish and Wildlife's (CDFW) Trinity River Project (TRP) annually monitors run-size and spawner escapement of spring Chinook Salmon in the Trinity River basin upstream of a weir near Junction City, California and the run-size and spawner escapement of fall Chinook Salmon, Coho Salmon, and adult fall steelhead (steelhead) in the Trinity River basin upstream of a weir near the town of Willow Creek, California. The project is conducted in cooperation with Hoopa Valley Tribal Fisheries (HVTF). We use a Petersen mark-recapture methodology to estimate run-size (the number of fish estimated to migrate from the ocean) into the Trinity River basin upstream of the weir sites. Spawner escapement is the number of fish that survive in-river tribal and recreational harvest to spawn in natural areas or enter Trinity River Hatchery (TRH). This is a continuation of studies that began in 1977.

Results from this investigation are provided to the Trinity River Restoration Program (TRRP) to help evaluate program objectives including natural-origin (NOR, progeny of fish that spawned in the river) salmonid escapement goals (13A, 17A, 16A, 18A and 19A) outlined in the IAP (TRRP 2009). Current Trinity River basin adult escapement goals set by the TRRP for NOR adults are 6,000 spring Chinook Salmon, 62,000 fall Chinook Salmon, 1,400 Coho Salmon and 40,000 steelhead. Similar goals for hatchery adult escapement are 3,000 spring Chinook, 9,000 fall Chinook, 2,100 Coho and 10,000 steelhead. Estimates from this project are used to assess progress toward the goals stated in the Record of Decision (ROD) (Interior, 2000), including increasing harvest opportunity for dependent fisheries. Data are also used in the short term to inform adaptive management decisions and stock management through the Pacific Fishery Management Council process, and in the long term for trend analysis in pre- and post-ROD fish populations, cross-functional ecological and physical evaluations, composition (race and proportion of hatchery-marked[1] or TRP-tagged[2] fish), spatial distribution, and timing of salmonid runs in the Trinity River basin.

[1] Adipose fin-clipped and/or coded-wire-tagged HOR Chinook and steelhead, and right-maxillary (RM)-clipped Coho.
[2] Serially numbered "spaghetti" tags applied by CDFW to salmonids on their up-river migration (spawning run).

2. METHODS

Our general study design employs a simple Petersen single mark-recapture experiment in which fish are marked at a weir (located near Junction City or Willow Creek), then recaptured at a single recovery location, TRH. A tag return program is integrated into the study design to estimate angler sport harvest. These methods have been followed essentially unchanged for the 44 years this project has been underway.

2.1. Trapping, Tagging, and Marking

2.1.1. Locations and Periods

Trapping and tagging operations were conducted from June 4 through December 21, 2021, by TRP and HVTF personnel at two temporary weir sites located on the main stem Trinity River (Figure 1).

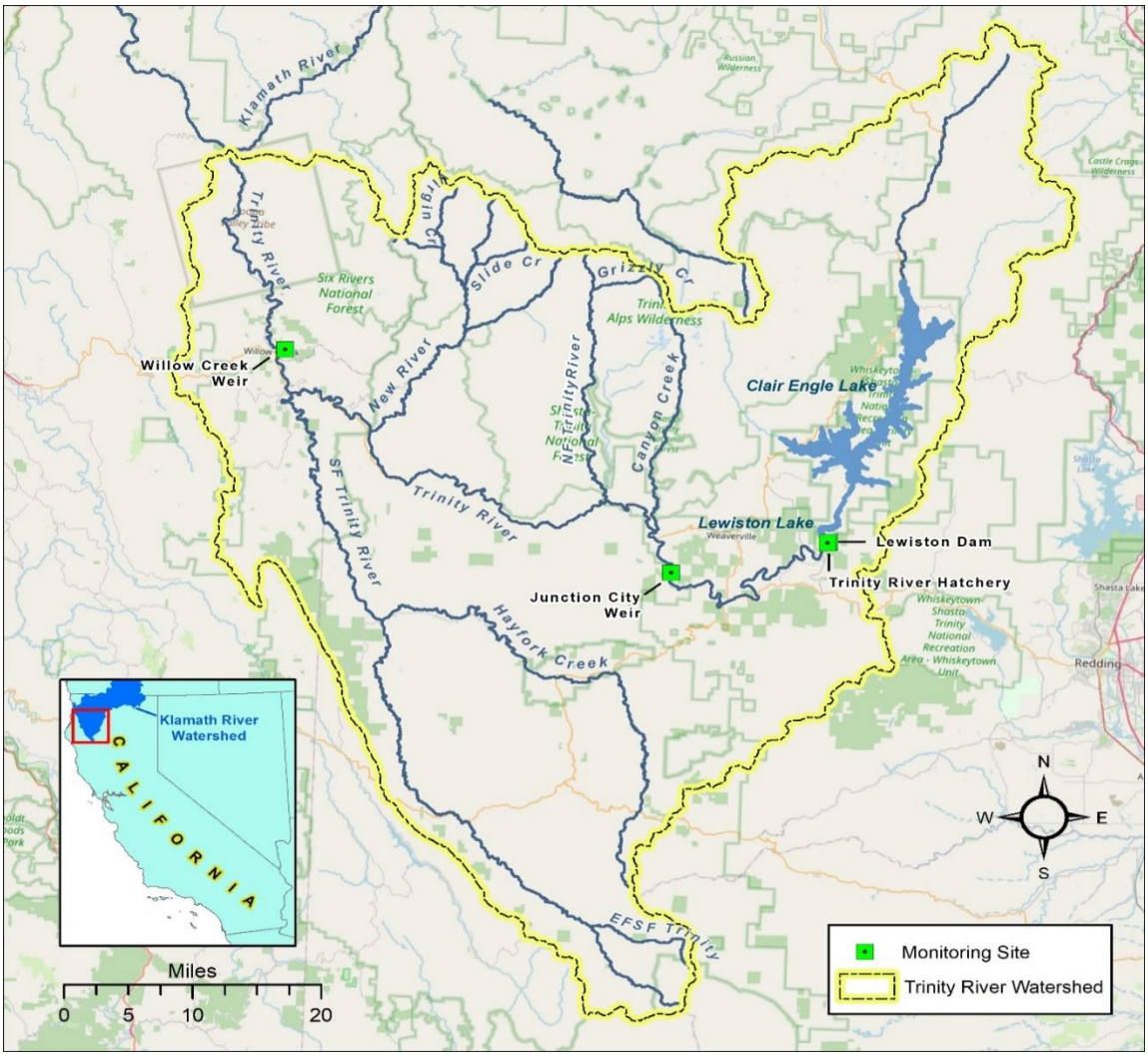


Figure 1. Location of trapping/tagging weirs near Willow Creek and Junction City, and Trinity River Hatchery, in the Trinity River basin, 2021.

Junction City weir (JCW) (Figure 2) was located near the town of Junction City at approximately 136.5 river kilometers (rkm) (~river mile 84.4) upstream from the Klamath River confluence near Weitchpec (40° 41' 0.24" N, 123° 1' 37.71" W). The JCW has traditionally operated primarily to capture, bio-sample, and tag spring Chinook Salmon, but due to its involvement in a pilot study associated with the Trinity River Hatchery genetic management plan (HGMP) it fished June 4 through December 21, 2021.

Figure 2. Junction City weir configuration in 2021. This shows the weir in trapping mode. Flow is right to left.

Willow Creek weir (WCW) (Figure 3) was located near the town of Willow Creek at approximately 41.8 rkm (~river mile 26.0) upstream from the Trinity River's confluence with the Klamath River (40º 56’ 43.8” N, 123º 36’ 47.016” W). The WCW was operated August 28 through October 21, 2021, primarily to capture, bio-sample and tag fall Chinook Salmon, Coho Salmon, and adult steelhead.

Trinity River Hatchery is located at rkm 179.8 (~river mile 111.7) just downstream of Lewiston Dam, the current terminus of anadromy on the main stem Trinity River. Pre-release clipping of fish reared at TRH is performed by TRP and HVTF staff to identify fish of hatchery origin. Standard operating procedure is for all steelhead and 25% of Chinook Salmon produced at TRH to be adipose fin-clipped (ad-clipped) prior to volitional release. Additionally, ad-clipped Chinook have coded-wire tags (CWT) inserted into their snout cartilage. All Coho Salmon reared at TRH have their right maxillary bone (RM) clipped as a hatchery identifier. Fish returning to TRH comprise the recapture sample for our mark-recapture study, and trapping was conducted there from September 7, 2021 through March 8, 2022.

Figure 3. Willow Creek weir in 2021, with standard boat gate and two traps. Looking downstream.

2.1.2. Weir and Trap Design

Bertoni (Alaskan-style) weirs operated at both sites consist of fixed picket sections, trap boxes (1-2 per weir) and a boat gate. Weirs were supported by wooden tripods set 2.5 m (8 ft) apart. Weir panels consisted of 3.0 m x 1.9 cm (10 ft x ¾ in) electrical conduit spaced less than 5.1 cm (2 in) apart on center, leaving a gap of 2.5 cm (1 in) between conduit pieces. Conduit was supported by three sections of aluminum channel arranged 0.92 m apart, which were connected to supporting tripods (Figure 4). The tripods were anchored with cable to 1.8 – 2.5 m (6-8 ft) T-posts driven into the stream bottom. Weir panels were angled at roughly a 45° angle, with the top of the weir standing 1.8 m above the river bottom.

Trap boxes were made of 1.9 cm (¾ in) electrical conduit spaced 2.5 cm apart and welded into panels. Panels were fastened together at the corners to produce a 2.5 m square box, which was fastened to a plywood floor and covered with a plywood lid. A fyke, also made of conduit panels, was installed on the downstream side of the trap to guide fish into the trap box and hinder their escape. Traps were placed on the upstream side of the weir, where 24 conduit pieces were raised to create an opening approximately 96 cm (3.1 ft). This opening allowed fish to pass through the weir and into the trap.

Figure 4. Photograph of Alaskan-style weir, tripods, support channels, and conduit (looking upstream).

To allow boat passage at JCW, a gate approximately 4.9 m (16 ft) wide is secured between two weir panels. The gate is constructed similarly to trap panels and is set perpendicular to the stream substrate. Weir personnel must remove and replace the gate panels to pass boats. A second trap box was installed near JCW trap box to act as a “holding pen” for Coho Salmon broodstock collection. At WCW, vinyl-coated chain-link material was affixed to tubular agricultural-type gates attached to tripods, which rest at the same angle as the rest of the weir when closed. A set of lightweight PVC and plastic mesh panels extend the height of the gates to prevent fish from jumping over the boat gate.

2.1.3. Trapping Schedule

Trapping at both weirs is scheduled five nights per week, beginning around dusk of each trapping night and continuing until mid-day of the next day. Fish are processed from the previous night's trapping at approximately 0830 hours, and again from the morning’s trapping at approximately 1230 hours, after which the weirs are opened.

The opening procedure entails pulling up approximately 24 conduit/pickets in every other panel (creating a 96 cm opening), opening the boat gate, and opening any traps. The weirs are also opened in the same manner for the “weekend” (Friday afternoon to Sunday at dusk for JCW and Tuesday afternoon to Thursday at dusk for WCW).

Opening the weirs to this degree was found to reduce migration delays as compared to smaller and fewer openings (Strange 2008).

Occasionally, trapping schedules are modified to allow for holidays, high flows that prevent trapping in a safe manner, or increasingly, fire evacuations. The weirs generally operate in flows ranging from 300 to 1,200 cubic feet per second (cfs), depending upon location. When the river is anticipated to rise above this level, conduit is raised (like the above description for afternoons and weekends) to allow unimpeded migration and to protect equipment. The weirs can usually be modified to safely remain in the river and withstand flows up to 3,500 cfs but will be removed from the river entirely if flows are anticipated to exceed 5,000 cfs. If a heavy debris load is anticipated the weirs will be removed or modified at lower flows. Trapping and tagging are not conducted if stream temperatures exceed 21º C.

2.1.4. Processing of Fish at Weirs

All salmonids are dip-netted, placed into a submerged cradle, measured to the nearest cm fork length (FL), and examined for hook, predator, or gill-net wounds or scars, fin clips, signs of disease or parasites, and external tags. Fish are not anesthetized and are released immediately after tagging to resume their upstream migration unless they appear stressed. Stressed fish are placed in an in-stream recovery tube until they can swim away on their own volition. Coho Salmon identified for the TRH broodstock collection at JCW were moved to an in-river holding pen, tagged with special project tags, and retained until trucked by YTF to TRH.

Each untagged, unspawned salmonid judged to be in good condition is tagged with a serially numbered 2 mm “spaghetti” tag (Floy Tag and Manufacturing, Inc. FT-4[3]). Tags are applied with a solid applicator needle through the fish's back approximately 2 cm below and 2 cm anterior to the posterior insertion of the dorsal fin. We tag all salmon regardless of length. Steelhead less than 42 cm FL are considered “half-pounders” (or immature) and are not tagged.

In 2021 we collected scales for age determination from Chinook Salmon in good condition at a rate of 50% at JCW (spring Chinook Salmon only) and 50% at WCW. Scales were removed from the left side of the fish above the lateral line and posterior to the dorsal fin with a sharp knife. Scale samples were then placed on Rite-in-the-Rain paper, folded, and put in a coin envelope labeled with the date, location, species, length, fin clip and tag number. Scales taken at JCW are archived at HVTF for analysis at a later date, while scales taken at WCW are taken to HVTF for reading and analysis to inform Klamath River basin fall Chinook Salmon age-specific escapement, river harvest and run-size estimates (KRTT 2022).

[3] The use of brand or trade names is for identification purposes only and does not imply the endorsement of any product by CDFW.

Chinook Salmon tagged at JCW received $10 and $20 reward tags at a 1:1 ratio, and ad-clipped adult steelhead received non-reward tags. Natural-origin steelhead (those with intact adipose fins) were not tagged at JCW. At WCW, Chinook were tagged with non-reward and $50 reward tags at a 1:1 ratio, while $20 reward tags and non-reward tags were applied to adult steelhead at a 1:1 ratio. All Coho Salmon at both JCW and WCW were tagged with non-reward tags. Half-pounder steelhead were not tagged at either weir.

2.2. Recovery of Tagged Fish

Fish tagged at JCW and WCW were recovered from four sources: (1) tags returned by anglers or other river users, (2) tags found during Trinity River spawner surveys, (3) tagging mortalities found on or near the tagging weirs, and (4) fish returning to Trinity River Hatchery.

2.2.1. Angler Tag Returns

Spaghetti tags applied at JCW and WCW are inscribed with a reward amount and the address of the CDFW field office in Arcata, CA. Tags returned to the Arcata office through May 1, 2022 were used to estimate harvest and catch-and-release rates in 2021. Tags returned after that date were not used for analysis due to the need for meeting annual reporting deadlines, nor were they generally processed for payment. Public service announcements distributed to press throughout the Northern California region, posted online in social media, and displayed in store-front windows throughout the Trinity basin encourages the same-season return of tags.

2.2.2. Spawner Surveys

Cooperative spawning ground surveys are conducted annually with the U.S. Fish and Wildlife Service, U.S. Forest Service, YTF, HVTF, and CDFW in the entire main stem Trinity River, except for a few reaches with limited spawning habitat or that are unsafe to survey. Tagged fish recovered in these surveys were examined for spawning success and project tags, and the resulting data are provided to the CDFW Arcata office. Spawner survey methods and results are presented in a separate report.

2.2.3. Weir Recovery

Dead salmonids recovered on the weir are measured to the nearest cm FL and examined for tags, fin clips, and spawning condition. Heads of ad-clipped Chinook Salmon are collected for later recovery of the CWT. After examination, carcasses are cut in half to prevent recounting and returned to the river downstream of the weir. Weekly surveys were scheduled via kayak in the 8.5 km (5.3 mi) upstream of WCW to look for tag mortalities. Periodic surveys were performed at JCW but less often since the water temperature at JCW leads to a much lower rate of tagging mortality there.

Tagged salmonids recovered dead at the weir, in spawning surveys, or reported dead by anglers were considered tagging mortalities if there was no evidence they had spawned, and they were recovered ≤30 days after tagging. Tagged fish recovered dead more than 30 days after tagging or those that had spawned, regardless of the number days after tagging, were not considered tagging mortalities. Tag mortalities are removed from the marked sample (see Section 2.4.6).

2.2.4. Trinity River Hatchery Recovery

Hatchery operations began September 9, 2021, for spring Chinook Salmon egg take and artificial spawning before the fish ladder was closed for a "spawning break." The October 8 to October 24 (parts or all of Julian weeks [JW] 41-43) spawning break is designed to temporally segregate the sympatric races of spring and fall runs of Chinook Salmon. After the break, egg take/spawning operations resumed for fall Chinook Salmon and Coho Salmon, followed by steelhead, which ended on March 8, 2022.

Spring Chinook Salmon egg take operations typically occurred twice per week, not including holdovers, from JW 36 to JW 41, with an egg take goal of 3 million spring Chinook Salmon eggs. Fall Chinook Salmon egg take occurred from JW 43 to JW 49, with an egg take goal of 6 million eggs. Coho Salmon egg take operations occurred once per week from JW 44 to JW 51 on a different weekday than fall Chinook Salmon, with a goal of 600,000 eggs. Finally, steelhead egg take and spawning occurred one day per week from JW 52 through JW 10 of the following year, with a goal of 800,000 eggs.

All fish processed out of the spawn house at TRH were sexed, measured to the nearest cm FL, and inspected for TRP applied tags, ad-clips, other fin clips, maxillary clips, or other tags or marks. Scales were collected from every 5th fall Chinook Salmon by HVTF personnel beginning in JW 43. Heads from all ad-clipped Chinook Salmon, indicating presence of a CWT, were collected regardless of whether the fish had been spawned or not. Heads were assigned a unique serially numbered "head tag number," placed in 4x6 inch plastic bags with the head tag, then placed in a freezer for later CWT extraction and analysis.

2.3. Recovery of Coded Wire Tags

All ad-clipped Chinook Salmon recovered dead at weirs, on spawning grounds or at TRH have the snout portion of their heads removed and put into a bag with a serially numbered head tag, recovery date, recovery location, species, run, sex, and length. Heads are frozen for later CWT extraction and decoding in the laboratory. The CWT code identifies the race, release type (fingerling or yearling), brood year (BY) and the location of release of each fish.

2.3.1. Chinook Salmon CWT Dissection

Heads from Chinook Salmon recovered at TRH, weirs, or during spawner surveys are processed in our office lab as follows:

1. Heads are removed from frozen storage and partially thawed.
2. Heads and corresponding head tag are removed from the storage bag one at a time.
3. Each head is scanned with a Northwest Marine Technologies FSD-I field “V” metal detector. A beep or red light from the machine indicates the presence of the tag (or other metal).
4. The head is cut into successively smaller pieces and each piece is passed through the detector until a small piece of head that contains the CWT is left. The CWT is then visually detected and removed using a magnetized pencil or knife.
5. The CWT is placed into a 2x3 inch sealed baggie which is stapled to the corresponding head tag for decoding. If no tag is detected in the initial and subsequent passes through the metal detector, then it is assumed the fish had shed its tag prior to recovery and a code (100000) is assigned to the head tag. If the tag was initially detected but lost during the dissection process a separate code (200000) is assigned to the head tag to indicate such. If the entire head is somehow lost, a code of 300000 is assigned.

All recovered CWTs are read using a stereo microscope equipped with a 10X wide-field eyepiece and a continuous magnification zoom range of 7X to 30X. Each CWT is removed from its bag with a magnetic wand, cleaned, and placed in a brass holder under the microscope. Care is taken to orient the tag with the start point on the left so the code can be correctly ascertained. The six-digit CWT code is read and transcribed to its head tag. If the CWT code is unreadable the head tag will be assigned a 400000 code. The CWTs are returned to their bags with their head tags and permanently archived.

All head tags and corresponding CWT codes are entered into a CWT database and merged into the TRH recovery database indexed by the “head tag number” field. Thus, each CWT code, along with the corresponding release information (including race, age, and origin) becomes associated with all TRH recovery information for each individual CWT fish.

2.4. Post-season Data Analysis

Methods used for estimating run-size, escapement, harvest, and hatchery-origin vs. natural-origin composition are similar for each of the three species and two sympatric runs, with slight variations.

2.4.1. Size Discrimination between Jack and Adult Chinook Salmon and Coho Salmon

The methods for separating jacks (age 2) from adults (age 3+) differs for spring vs. fall Chinook Salmon. Age composition of spring Chinook Salmon is determined from FL-frequency distribution analysis, while scale aging is used for fall Chinook Salmon. Combined length data of spring Chinook Salmon collected at JCW and TRH, excluding fish tagged at JCW and subsequently recovered at TRH, were analyzed to identify the nadir separating jacks and adults. Data were smoothed with a moving average of five, 1-cm increments to determine the nadir if it was not otherwise readily identifiable. The resulting jack/adult size division, or "cutoff," is used for all spring Chinook Salmon in all sectors. For fall Chinook Salmon, scales are collected from fish trapped at WCW and TRH to determine ages of individual fish. Age proportions are calculated directly from HVTF scale-read ages, separately for WCW and TRH. Age proportions at WCW are used for the entire fall run upstream of the weir, whereas age proportions at TRH are used only for TRH. Fall Chinook Salmon are also assigned a nadir-based jack/adult cutoff which is used only for estimating harvest and catch-and-release because scale samples are not available for those sectors.

Coho Salmon do not receive CWTs, and we do not collect or age their scales, so exact ages are unknown. The separation of jack and adult fish was based entirely on FL frequency distribution analysis, the age proportions of the run above WCW were based on the combined WCW and TRH proportions.

2.4.2. Size Discrimination between Adult and Immature Steelhead

All steelhead >41 cm FL were considered adults, and steelhead <42 cm FL were assumed to be half-pounders (immature fish presumed to have migrated to the ocean). Half-pounders are measured but not tagged at the weirs.

2.4.3. Separation of Spring and Fall Chinook Salmon Runs at the Hatchery and Weirs

Trinity River spring Chinook Salmon immigrate mainly between April and September, whereas fall Chinook Salmon immigrate August through December. Although there is temporal overlap of runs, for analysis we separate spring and fall runs based on a hard cut-off date determined independently each year, and we group data by JW to allow inter-annual comparisons of identical weekly periods (Appendix 1).

To determine the cut-off date at TRH, proportions of spring and fall Chinook Salmon arriving at TRH are estimated for each JW from expanded known-race CWT recoveries, and the week in which the proportion of fall Chinook Salmon exceeds the proportion of spring Chinook Salmon is designated as the first week of the fall run. The mid-October "spawning break" closure of the fish ladder usually, but not always, coincides with the cut-off date determined post-season.

Non-CWT Chinook Salmon TRP-tagged at the weirs and recovered at TRH were classified as spring or fall fish by the date they entered TRH. If they entered during the

period associated with spring Chinook Salmon, they were considered spring Chinook Salmon, if they entered TRH during the period associated with the fall run they were considered fall Chinook Salmon. At each weir, the JW in which the proportion of fall Chinook exceeds spring Chinook is designated as the first week of the fall run at that location. If there are two consecutive weeks with nearly identical proportions then the first week is designated spring-run and the second as fall- run.

2.4.4. Determining the Separation between Summer, Fall and Winter Steelhead Runs

Throughout this report we refer to fall adult steelhead when we are actually reporting on a mix of runs. Most of the steelhead we encounter at WCW are undoubtedly fall steelhead, but there is temporal overlap in the run-timing of the summer, fall, and winter runs, as suggested by a generally higher proportion of fish caught without adipose clips early in our sampling season (i.e. mid-August), and again toward the end of the season (November). The TRH endeavors to produce fall steelhead (100% of which are marked with an ad-clip before release). Until such time as we can distinguish the runs from each other we will continue to refer to all the steelhead we catch at Willow Creek weir as fall steelhead. It is also important to note that an unknown portion of the total steelhead run, or of the fall run, is represented by the estimates provided herein, which could be best described as a minimum estimate of the total steelhead run.

2.4.5. Estimating Numbers of Spring and Fall Chinook Salmon at Trinity River Hatchery

Hatchery escapement is a direct count of the number of fish processed through the hatchery. A constant fractional marking program was instituted at TRH for Chinook Salmon in BY 2000 to mark 25% of each release group. Coded wire tag analysis yields the number of Chinook with ad-clips and CWTs. However, to account for the respective numbers of spring and fall Chinook Salmon without CWTs entering TRH, we expand the numbers of tags recovered from each returning CWT group by the ratio of tagged to total Chinook (production multiplier) when they were originally released (same strain, BY, release site, release group and release date). For example, 87,269 spring Chinook Salmon of CWT group 06-09-54 plus 283,043 unmarked spring Chinook Salmon raised with them were released directly from TRH in June of 2017. The expanded estimate for each returned CWT fish of this group is 4.24334 ([87,269+283,043]/87,269). Thus, each CWT fish that returned to TRH was expanded by its production multiplier to estimate the total number of hatchery-origin (HOR) spring or fall Chinook Salmon that entered the hatchery. If more Chinook Salmon entered the hatchery than could be accounted for by the expansion of all CWT groups, we assumed the additional fish were of natural origin (NOR). Conversely, if the expanded number of HOR fish exceeds the number of fish entering TRH, we assume all fish entering TRH are HOR. We designated these fish as spring or fall run in the same proportions that were determined by the expansion of the CWT groups by their week of entry.

2.4.6. Effectively Tagged Fish

The total number of fish tagged at each weir is greater than the number of fish that effectively remain in the marked population due to various types of tag loss. The number of "effectively" tagged fish was determined by subtracting from the total those fish that were classified as tagging mortalities (fishing having died before spawning, within 30 days of being tagged), tagged fish recovered downstream of the tagging site, and those fish whose tags were removed by catch-and-release anglers.

2.4.7. Run-size Estimates

Run-size estimates in 2021 for spring and fall Chinook Salmon, Coho Salmon and adult steelhead were calculated using Chapman's version of the Petersen single census method, as modified by Ricker (1975):

$$N = \frac{(M+1)(C+1)}{(R+1)}$$

where

$N = estimated\ run\ size$
$M = the\ number\ of\ effectively\ tagged\ fish$
$C = the\ number\ of\ fish\ examined\ for\ tags\ at\ TRH$
$R = the\ number\ of\ TRP - tagged\ fish\ recovered\ at\ TRH$

Assumptions of the mark-recapture estimator include 1) fish tagged at the weir are a random sample representative of the population; 2) tagged and untagged fish are equally vulnerable to recapture at TRH; 3) all Project tags are recognized upon recovery; 4) tagged and untagged fish are randomly mixed throughout the population and among the fish recovered at TRH; and 5) we account for all tagging mortalities.

Each year we attempt to tag and recover enough fish to obtain 95% confidence limits within ±10% of the run-size estimate. We use criteria established by Chapman (1948) to select a confidence interval estimator.

2.4.8. Harvest Estimates and Catch-and-Release Rates

Generally, the steelhead fishery is mostly catch-and-release, and anglers return reward and non-reward tags at approximately the same rate, but in the Chinook Salmon fishery reward tags are often returned at a higher rate than non-reward tags (this year at 10x the rate). When reward tags are returned at a higher rate than non-reward tags, we use only reward tag returns to determine harvest rates. If non-reward tags are returned at the same or higher rates than reward tags, we combine the two to determine harvest rates. Harvest rates for each species, run, and age class (jacks or adults) are calculated by dividing the number of tags returned by anglers from harvested fish by the number of fish that were effectively tagged.

The number of fish of each species, run, and age class harvested upstream of the respective weir was estimated by multiplying the respective harvest rate by the relevant run-size.

We estimated catch-and-release rates for each species, run and age class by dividing the number of tags returned by anglers from fish caught-and-released by the number of fish effectively tagged plus the number of fish reported as released.

2.4.9. Hatchery- and Natural-Origin Composition of Run-size Estimates

Estimating the total return of individual CWT groups depends first and foremost on a basin run-size estimate. Total run-size and CWT return estimates for spring and fall Chinook Salmon are calculated for the Trinity River basin upstream of the JCW and WCW, respectively. Escapement, harvest, and corresponding CWT estimates for natural spawning areas below the respective weirs and in the ocean are not included in the estimates presented in this report.

We estimated contribution rates of HOR Chinook Salmon to total spring and fall Chinook Salmon run-sizes by expanding each individual CWT recovery by its corresponding hatchery production multiplier (total releases represented by each CWT release group/CWT fish released). In doing this, we assume that marked fish are representative of their unmarked counterparts.

The information needed to estimate the numbers of salmon of a specific CWT group that returned to the Trinity River basin and contributed to fisheries and spawner escapements are: a) jack and adult total run-size, b) angler harvest rates of jacks and adults, c) proportion of the run comprised of ad-clipped fish, d) proportions of CWT groups recovered at TRH, and e) CWT release group-specific hatchery production multipliers.

No Chinook Salmon from BY 2019 were marked or tagged by HVTF at TRH in 2020 due to Covid-19. An alternative method to estimate jack HOR proportions of fall Chinook Salmon was devised by the Klamath River Technical Team (KRTT 2022, Appendix 2). Using that method, the jack HOR proportions for both spring and fall Chinook Salmon were estimated (Table 1) above WCW and JCW.

We estimate the contribution of HOR Coho Salmon to the Trinity River runs above WCW or JCW by applying the RM clip percentage observed at each weir to the run-size estimate. Likewise, with steelhead, we apply the ad-clip rate observed at WCW to estimate percent hatchery origin.

Table 1. Mean proportions of age-2 Trinity River hatchery-origin Chinook Salmon among total age-2 fish by sector in the Trinity River basin based on data from 2002 to 2019.

	Sector	Proportion TRH
Fall Chinook Salmon, Trinity River basin, above Willow Creek weir	recreational fishery	0.240
	natural area escapement	0.164
	hatchery escapement	0.845
Spring Chinook Salmon, Trinity River basin, above Junction City weir	recreational fishery	0.497
	natural area escapement	0.391
	hatchery escapement	0.845

In 2021 JCW trapped until December 24 to support a pilot project to provide Coho Salmon broodstock to TRH as part of the genetics management plan. Thirty-six adult Coho were removed from the river at JCW and transported by truck to TRH. These 36 fish were not included in the mark-recapture estimation of run-size we made for the basin above either WCW or JCW because they were not effectively tagged nor were they "recovered" at TRH, meaning they did not get there of their own volition.

Any single digit disagreement in numbers throughout this report is due solely to rounding discrepancies.

3. RESULTS

3.1. Run-size, Escapement and Harvest Estimates

Using a Petersen single census mark-recapture methodology, we estimated 5,550 (95% CI 5,061 – 6,065) spring Chinook Salmon migrated into Trinity River basin upstream of JCW in 2021 (Table 2, Appendix 3, Appendix 4). The run was comprised of an estimated 778 jacks (334 NOR and 444 HOR) and 4,772 adults (691 NOR and 4,082 HOR) (Appendix 5, Appendix 6)**.** We estimate 0 jack and 147 adult spring Chinook Salmon were harvested, yielding an escapement of 5,403 fish, including the 2,005 spring Chinook that entered TRH and 3,398 estimated natural area spawners (Table 3). Spawning escapement of 669 NOR adult spring Chinook Salmon is 11.2% of the TRRP goal of 6,000 (Table 4). This year's run-size estimate of 5,550 is approximately 36.4% of the 43-year average of 15,259 since 1978. Estimated spring Chinook Salmon run-size has ranged from 2,381 fish in 1991 to 62,692 fish in 1988 (Appendix 3).

An estimated 22,623 (95% CI 21,157 – 24,142) fall Chinook Salmon (3,390 jack and 19,233 adults) migrated into the Trinity River basin upstream of WCW in 2021 (Table 2, Appendix 7, Appendix 8). The run consisted of an estimated 2,761 NOR and 629 HOR jacks and 5,673 NOR and 13,560 HOR adult fall Chinook Salmon (Appendix 9, Appendix 10). Using tags returned by anglers we estimate 647 (47 jack and 600 adult) fall Chinook Salmon were harvested, yielding an escapement of 21,976, including the 5,967 fall Chinook that entered TRH and the 16,009 estimated natural area spawners (Table 3). Spawning escapement of 5,496 NOR adult fall Chinook Salmon is 8.9% of the 62,000 fish TRRP goal (Table 4). This year's run-size estimate of 22,623 is approximately 57.3% of the 45-year average of 39,453 since 1977. Estimated fall Chinook Salmon run-size has ranged from 6,196 fish in 2016 to 147,888 fish in 1986 (Appendix 7).

Coho Salmon run-size and escapement in the Trinity River upstream of WCW were both estimated at 4,694 (95% CI 3,850 – 5,791) because no Coho Salmon were reported as harvested (Table 2, Appendix 11, Appendix 12). The run consisted of 323 jack (12 NOR and 311 HOR) and 4,371 adults (209 NOR and 4,161 HOR) (Appendix 13, Appendix 14), with 2,346 of those fish entering TRH and an estimated 2,348 escaping to spawn in natural areas (Table 3). The estimated escapement of 209 NOR Coho Salmon adults is 14.9% of the TRRP goal of 1,400 fish (Table 4). This year's run-size estimate of 4,694 is approximately 31.7% of the 45-year average of 14,794 since 1977. Estimated Coho Salmon run-size has ranged from 655 in 2017 to 59,079 in 1987 (Appendix 11).

Coho Salmon run-size and escapement in the Trinity River upstream of Junction City weir were both estimated at 4,071 (95% CI 3,538 – 4,642), with no Coho Salmon reported as harvested (Table 2). The escapement consisted of 246 jack (1 NOR and 245 HOR) and 3,825 adults (214 NOR and 3,611 HOR), with 2,346 of those fish escaping to TRH, and an estimated 1,725 escaping to spawn in natural areas (Table 3). Thirty-six adult Coho (15 NOR and 21 HOR) were removed from the river at JC weir

and trucked to Trinity River Hatchery as part of a pilot project to implement the hatchery's genetic management plan (CDFW 2017). They were not included in the estimation of the Coho Salmon run-size upstream of either WCW or JCW because they did not get to TRH of their own volition.

An estimated 7,029 (95% CI 5,535 – 9,176) adult fall steelhead returned to the Trinity River basin upstream of WCW (Table 2, Appendix 15). Anglers harvested an estimated 190 HOR adult fall steelhead upstream of the weir, leaving 6,839 (3,088 NOR and 3,751 HOR) fish as potential spawners (Table 3, Appendix 15) of which 1,433 returned to the hatchery, and an estimated 5,406 escaped to natural areas. The estimated escapement of 3,088 NOR steelhead adults is 7.7% of the TRRP goal of 40,000 (Table 4). This year's run-size is 52.1% of the average of 13,495 since 1980, with a range from 2,972 in 1998 to 53,885 in 2007 (Appendix 15).

Table 2. Run-size estimates and 95% confidence limits for Trinity River basin spring and fall Chinook Salmon, Coho Salmon, and adult fall steelhead during the 2021-22 season.

Species/ run	Area of Trinity River basin for run-size estimate	Stratum [a]	Trinity River Hatchery recoveries: Number effectively tagged [b]	Trinity River Hatchery recoveries: Number examined for tags [c]	Trinity River Hatchery recoveries: Number of tags in sample	Run-size estimate [d]	Confidence limits 1-p = 0.95	Confidence limit estimator
Spring Chinook Salmon	Upstream of Junction City weir	Jacks	123	307	25	778	5,061 - 6,065	Normal Approximation
		Adults	930	1,698	355	4,772		
		Total	1,053	2,005	380	5,550		
Fall Chinook Salmon	Upstream of Willow Creek weir	Jacks	274	102	9	3,390	21,157 - 24,142	Normal Approximation
		Adults	2,640	5,865	759	19,233		
		Total	2,914	5,967	768	22,623		
Coho Salmon	Upstream of Willow Creek weir	Jacks	25	148	11	323	3,850 - 5,791	Poisson Approximation
		Adults	160	2,198	81	4,371		
		Total	185	2,346	92	4,694		
Coho Salmon	Upstream of Junction City weir	Jacks	15	148	6	246	3,538 - 4,642	Normal Approximation
		Adults	317	2,198	185	3,825		
		Total	332	2,346	191	4,071		
Fall steelhead	Upstream of Willow Creek weir	Adults	298	1,433	60	7,029	5,535 - 9,176	Poisson Approximation

a/ Jacks = two-year-old salmon; adults = three years or older; steelhead adults = fish greater than 41 cm FL.

b/ The number of effectively tagged fish was corrected for tagging mortalities, and fish that had their tags removed (caught and released).

c/ Numbers of spring and fall Chinook Salmon were estimated from expansion of coded wire tag recoveries at Trinity River Hatchery; Coho Salmon and steelhead numbers were actual recoveries.

d/ For jack and adult estimates of total run size: spring Chinook Salmon was based on the proportion of jacks to adults observed at JCW and TRH combined, Coho Salmon were based on size cutoff from length frequency analysis at WCW/TRH or JCW/TRH combined; and scale-aged proportions at WCW were used for fall Chinook Salmon.

Table 3. Estimates of Trinity River basin spring and fall Chinook Salmon, Coho Salmon, and adult fall steelhead run-size, angler harvest, and spawner escapement during the 2021-22 season.

Species/ run	Area of Trinity River basin for run-size estimate	Stratum [a]	Run-size estimate	Angler Harvest		Spawner Escapement		
				Harvest rate [b]	Number of fish [c]	Natural area spawners [d]	Trinity River Hatchery	Total
Spring Chinook Salmon	Upstream of Junction City weir	Jacks	778	0.0%	0	471	307	778
		Adults	4,772	3.1%	147	2,927	1,698	4,625
		Total	5,550		147	3,398	2,005	5,403
Fall Chinook Salmon	Upstream of Willow Creek weir	Jacks	3,390	1.4%	47	3,241	102	3,343
		Adults	19,233	3.1%	600	12,768	5,865	18,633
		Total	22,623		647	16,009	5,967	21,976
Coho Salmon	Upstream of Willow Creek weir [e]	Jacks	323	0.0%	0	175	148	323
		Adults	4,371	0.0%	0	2,173	2,198	4,371
		Total	4,694		0	2,348	2,346	4,694
Coho Salmon	Upstream of Junction City weir [e]	Jacks	246	0.0%	0	98	148	246
		Adults	3,825	0.0%	0	1,627	2,198	3,825
		Total	4,071		0	1,725	2,346	4,071
Fall adult steelhead	Upstream of Willow Creek weir	Natural	3,088	0.0%	0	3,017	71	3,088
		Hatchery	3,940	4.8%	190	2,389	1,362	3,751
		Total	7,029		190	5,406	1,433	6,839

a/ Jacks = two-year-old salmon, adults = three years old or older, steelhead adults were fish greater than 41 cm FL.

b/ Harvest rates were based on the return of reward tags for spring and fall Chinook Salmon and steelhead. There was no legal Coho Salmon harvest allowed, nor any reported.

c/ Calculated as the run-size times the harvest rate.

d/ Calculated as run-size minus angler harvest minus hatchery escapement. Natural area spawners includes both wild and hatchery fish that spawn in areas outside Trinity River Hatchery. Any difference between these numbers and others throughout this report are due to rounding.

e/ Thirty-six adult Coho Salmon were removed from the river at Junction City weir and trucked to Trinity River Hatchery to meet pilot goals. They were not included in estimating the Coho Salmon run-size above either weir.

Table 4. Estimates of contribution of natural-origin and hatchery-origin adult spring and fall Chinook Salmon, Coho Salmon, and adult fall steelhead to the Trinity River basin spawner escapement during the 2021-22 season.

Species/ run	Area of Trinity River	Origin	Total Spawner Escapement: Natural area spawners [a]	Total Spawner Escapement: Trinity River Hatchery	Total Spawner Escapement: Total	Natural-origin contribution to escapement: TRRP Goal	Natural-origin contribution to escapement: % of Goal
Spring Chinook Salmon	Upstream of Junction City weir	Natural	449	220	**669**	6,000	11.2%
		Hatchery	2,478	1,478	3,956		
		Total	2,927	1,698	4,625		
Fall Chinook Salmon	Upstream of Willow Creek weir	Natural	4,763	733	**5,496**	62,000	8.9%
		Hatchery	8,005	5,132	13,137		
		Total	12,768	5,865	18,633		
Coho Salmon	Upstream of Willow Creek weir [b]	Natural	158	51	**209**	1,400	14.9%
		Hatchery	2,014	2,147	4,161		
		Total	2,173	2,198	4,371		
Coho Salmon	Upstream of Junction City weir [b]	Natural	163	51	**214**	No TRRP goal	
		Hatchery	1,464	2,147	3,611		
		Total	1,627	2,198	3,825		
Fall-run steelhead	Upstream of Willow Creek weir	Natural	3,017	71	**3,088**	40,000	7.7%
		Hatchery	2,389	1,362	3,751		
		Total	5,406	1,433	6,839		

a/ Natural area spawners includes both wild and hatchery fish that spawn in areas outside Trinity River Hatchery. Any difference between these numbers and others throughout this report are due to rounding.
b/ Thirty-six adult Coho Salmon were removed from the river at Junction City weir and trucked to Trinity River Hatchery to meet HGMP goals. They were not included in estimating the Coho Salmon run-size above either weir.

3.2. Spring Chinook Salmon

3.2.1. Spring Chinook Salmon Trapping and Tagging

The CDFW and HVTF installed JCW on June 3, 2021 and trapped the first night (JW 23). Trapping went smoothly until a forest fire forced the crew to evacuate (JWs 32 – 34). We resumed trapping during JW 35, but damage sustained during the HVT ceremonial Boat Dance flows suspended fishing again until JW 38. Trapping continued until December 21, 2021 (JW 51) when we removed the weir for the season.

A total of 1,848 Chinook Salmon were trapped at JCW over 109 trap-nights in 2021, of which 1,070 (Figure 5, Table 5) were determined to be spring Chinook Salmon (see Section 2.4.3). The number of spring Chinook trapped at JCW peaked at 74.8 fish per night during JW 25. All spring Chinook trapped at JCW in 2021 were tagged.

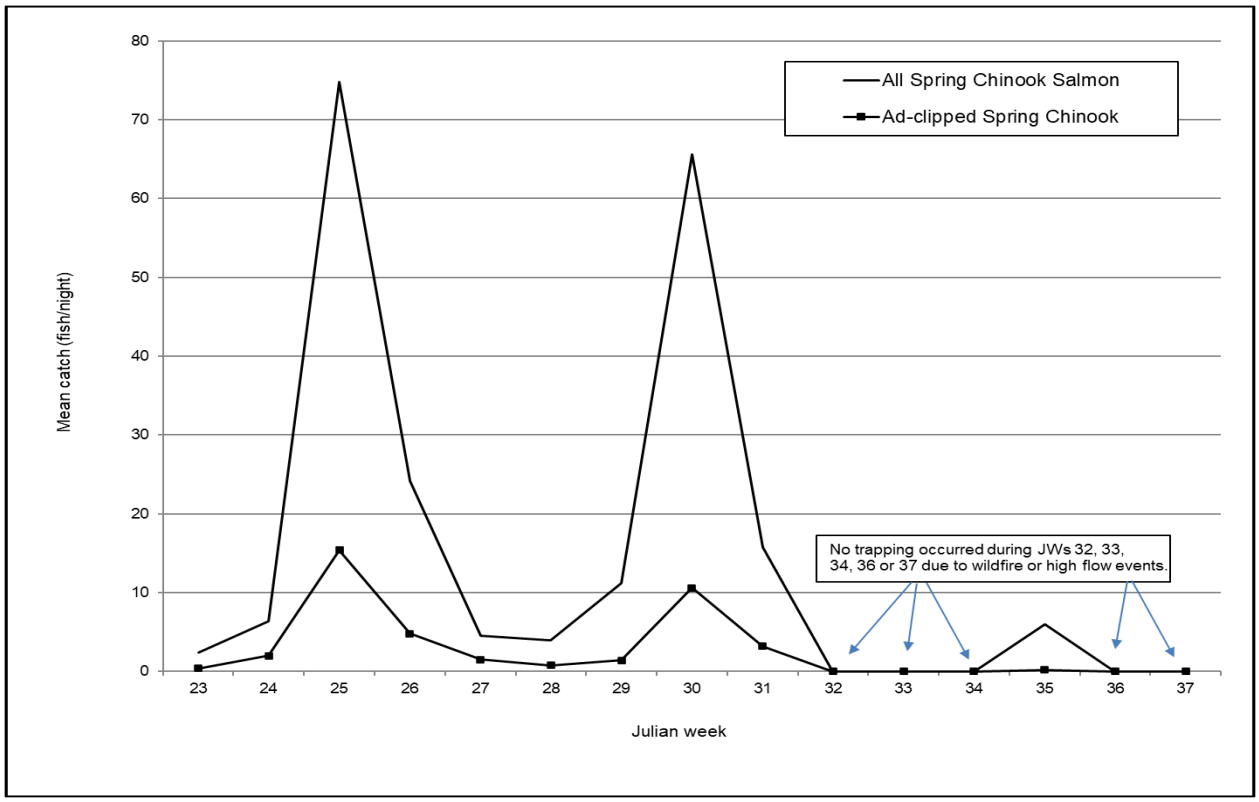


Figure 5. Mean catch by week of spring Chinook Salmon at Junction City weir on the Trinity River, 2021.

Spring Chinook Salmon trapped at JCW averaged 60.7 cm FL and ranged from 37 cm to 91 cm FL (Figure 6, Appendix 17). Fork length frequency distribution analysis, including all spring Chinook either trapped at JCW or recovered at TRH, showed the nadir separating jacks from adults was between 49 and 50 cm FL.

Table 5. Weekly summary of Chinook Salmon trapped at Junction City weir on the Trinity River during 2021.

Julian week	Inclusive dates	Nights trapped	Number trapped [a] Jacks [b]	Ad-clip Jacks [c]	Adults	Ad-clip Adults	Total trapped	Ad-clips total	Fish/ night	Ad-clips /night
23	4-Jun - 10-Jun	5			12	2	12	2	2.4	0.4
24	11-Jun - 17-Jun	5	1		31	10	32	10	6.4	2.0
25	18-Jun - 24-Jun	5	11		363	77	374	77	74.8	15.4
26	25-Jun - 1-Jul	5	11		110	24	121	24	24.2	4.8
27	2-Jul - 8-Jul	4	2		16	6	18	6	4.5	1.5
28	9-Jul - 15-Jul	5	4		16	4	20	4	4.0	0.8
29	16-Jul - 22-Jul	5	1		55	7	56	7	11.2	1.4
30	23-Jul - 29-Jul	5	69	1	259	52	328	53	65.6	10.6
31	30-Jul - 5-Aug	5	18		61	16	79	16	15.8	3.2
32	6-Aug - 12-Aug	0	--	--	--	--	--	--	--	--
33	13-Aug - 19-Aug	0	--	--	--	--	--	--	--	--
34	20-Aug - 26-Aug	0	--	--	--	--	--	--	--	--
35	27-Aug - 2-Sep	5	7		23	1	30	1	6.0	0.2
36	3-Sep - 9-Sep	0	--	--	--	--	--	--	--	--
37	10-Sep - 16-Sep	0	--	--	--	--	--	--	--	--
38	17-Sep - 23-Sep	2	5		57	9	62	9	31.0	4.5
39	24-Sep - 30-Sep	5	8		130	24	138	24	27.6	4.8
40	1-Oct - 7-Oct	5	6		249	42	255	42	51.0	8.4
41	8-Oct - 14-Oct	5	20		80	11	100	11	20.0	2.2
42	15-Oct - 21-Oct	5	16		113	17	129	17	25.8	3.4
43	22-Oct - 28-Oct	4	5		16	2	21	2	5.3	0.5
44	29-Oct - 4-Nov	5	5		17	2	22	2	4.4	0.4
45	5-Nov - 11-Nov	4	1		29	3	30	3	7.5	0.8
46	12-Nov - 18-Nov	5	1		10	2	11	2	2.2	0.4
47	19-Nov - 25-Nov	4	1		9	2	10	2	2.5	0.5
Total Chinook Salmon		93	192	1	1,656	313	1,848	314	19.9	3.4
Total Spring Chinook [d]		49	124	1	946	199	1,070	200	21.8	4.1

a/ Trapping at Junction City weir took place June 4 - December 21, 2021 (Julian weeks [JW] 23-51). No Chinook were trapped after JW 47.

b/ Spring Chinook Salmon <50 cm FL were considered jacks in 2021. There was no pre-release marking of Trinity River hatchery Chinook Salmon in 2020 due to Covid-19. Any jack identified as having an adipose clip is actually a short adult.

c/ Adipose fin-clipped Chinook Salmon. Number shown is a subset of weekly jack and adult totals.

d/ Chinook Salmon trapped at JCW prior to JW 38 were designated spring run in 2021, those trapped after JW 37 were not used in spring Chinook Salmon analysis throughout this report.

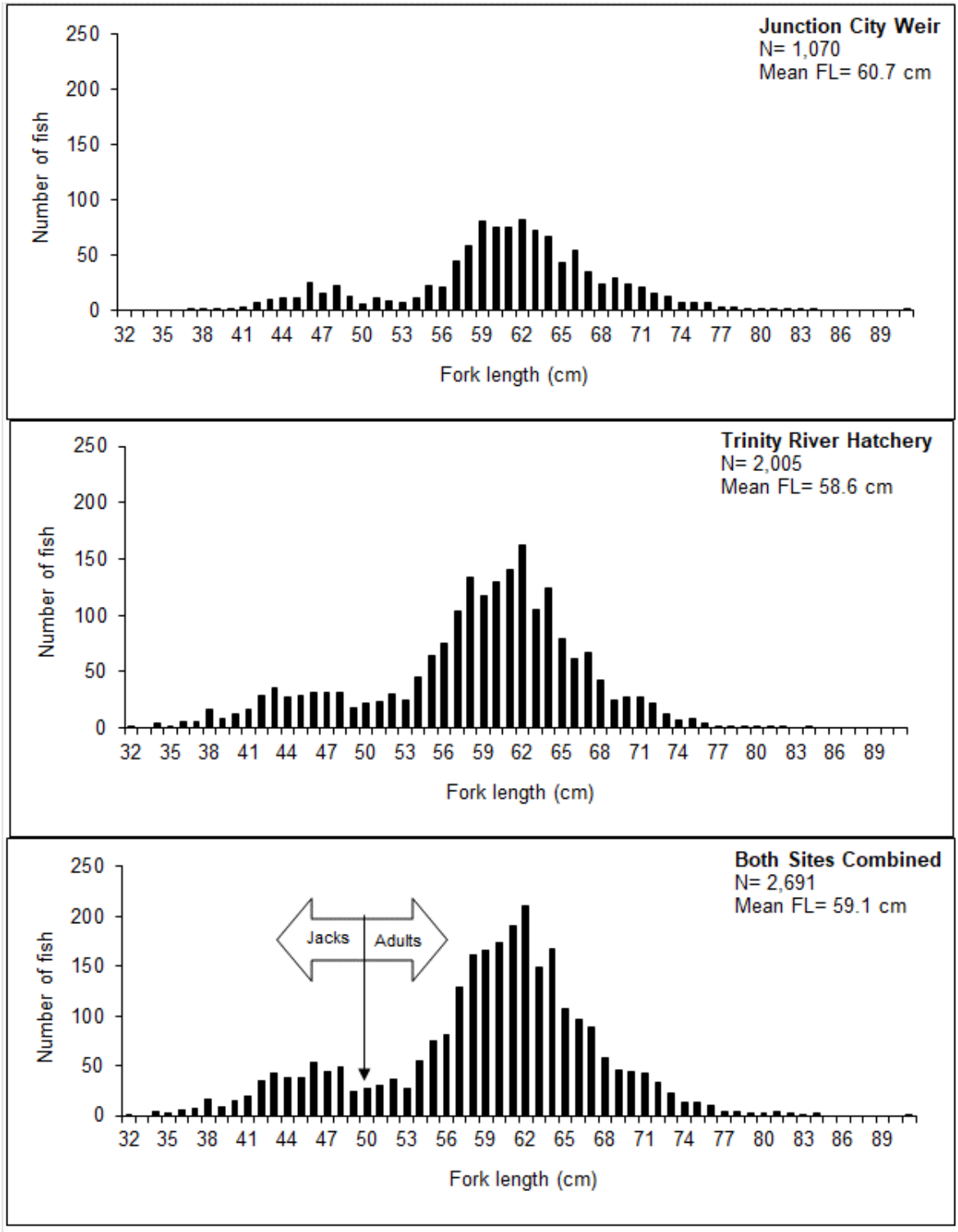


Figure 6. Spring Chinook Salmon fork lengths (cm) observed at Junction City weir, Trinity River Hatchery, and both sites combined during the 2021-22 season. Fish trapped at JCW then recovered at TRH are only included once in the "combined" (bottom) graph. Arrows denote the size used to separate jacks and adults.

Spring Chinook Salmon jacks averaged 45.6 cm FL and adults averaged 62.7 cm FL. Using 50 cm FL as the minimum adult size, only 11.6% (124 of 1,070) of the spring Chinook Salmon trapped at JCW were considered jacks. Ad-clipped fish comprised 18.7% (200 of 1,070) of the spring Chinook Salmon trapped at JCW.

3.2.2. Spring/Fall Run Chinook Salmon Separation and Run Timing

We recovered 7,973 Chinook Salmon at TRH in 2021 (Appendix 18), of which 1,630 (20.4%) had ad-clips. We recovered CWTs from 353 known (ad-clipped with a readable CWT) spring Chinook Salmon and we recovered CWTs from 1,231 known fall Chinook Salmon; the remaining 47 ad-clipped fish had either shed their CWT (27 fish) or the CWT was lost or unreadable (20 fish). Those 47 Chinook were classified as spring-run (12 fish) or fall (35 fish) based on their date of entry into TRH, resulting in a total of 365 spring CWT Chinook Salmon (Appendix 19) and 1,266 fall CWT Chinook Salmon (Appendix 20).

Four hundred fifty-eight Chinook Salmon tagged at JCW were subsequently recovered at TRH between JW 36 and 47 (Appendix 18). Based on timing of Chinook passage at JCW, the arrival dates of JCW-tagged fish at TRH, and CWT analysis, we designated the 380 Chinook Salmon that passed through JCW before JW 38 to be spring-run (Figure 7).

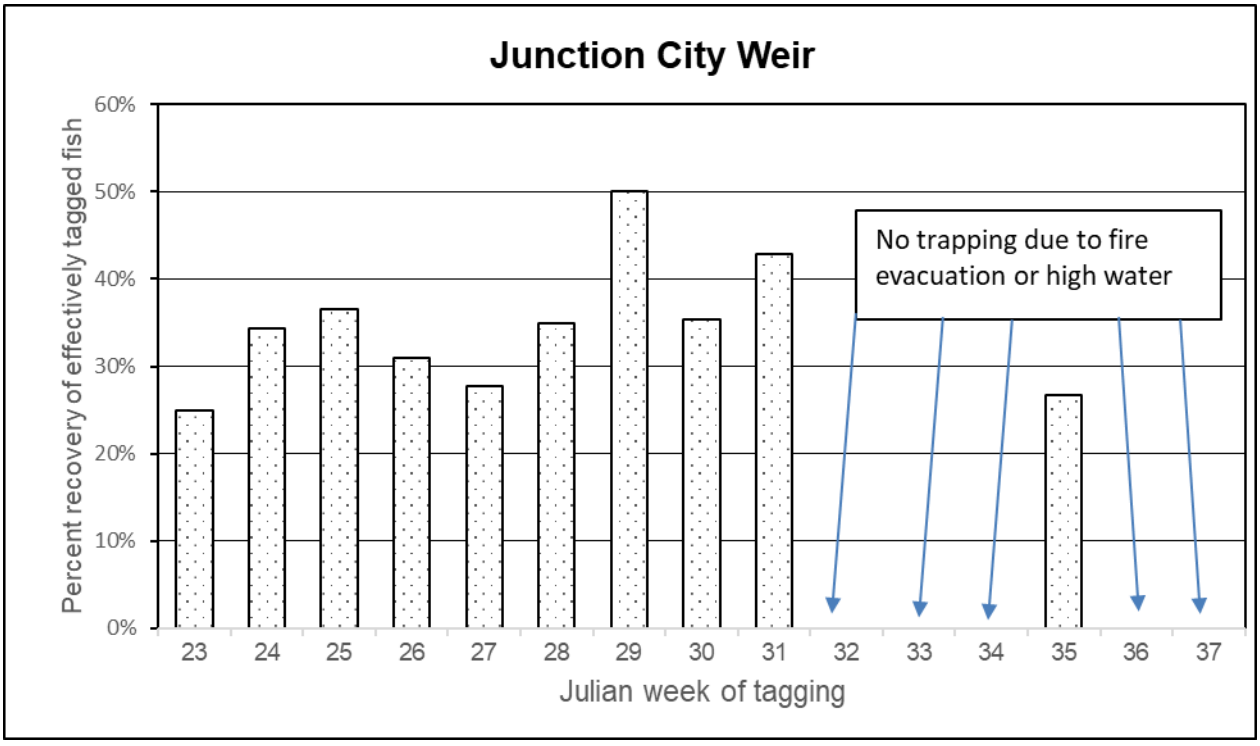


Figure 7. Percent of spring Chinook Salmon tagged at Junction City weir recovered at Trinity River Hatchery during the 2021-22 season.

Seven hundred seventy-three Chinook Salmon tagged at WCW were subsequently recovered at TRH, 5 prior to JW 42 and 768 between JW 43 and JW 48 (Appendix 18). According to our protocol (see Section 2.4.3) we designated all Chinook Salmon tagged after JW 35 at WCW in 2021 as fall Chinook Salmon (Figure 8).

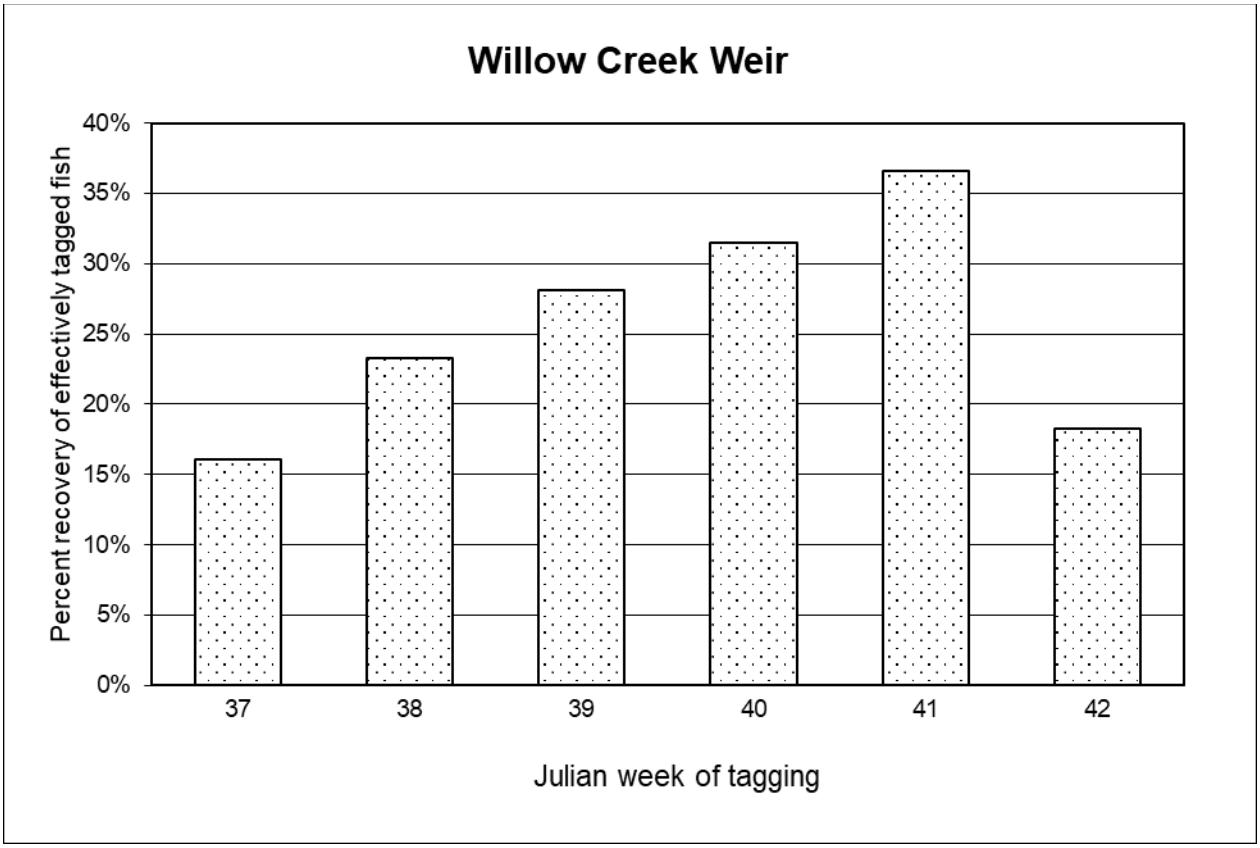


Figure 8. Percent of fall Chinook Salmon tagged at Willow Creek weir recovered at Trinity River Hatchery during the 2021-22 season.

3.2.3. Spring Chinook Salmon Recovery

3.2.3.1. Angler Tag Recovery

Anglers reported harvesting 18 (0 jack and 18 adult) TRP-tagged spring Chinook Salmon, resulting in an estimated harvest of 147 (0 jacks and 147 adults) with harvest rates upstream of JCW of 0.0% for jacks and 3.1% for adults (Table 3 Appendix 17). There were 13 (1 jack and 12 adult) tags returned from spring Chinook Salmon in the catch-and-release fishery, resulting in catch-and-release rates of 0.9% for jacks and 1.3% for adults. There were 11 (2 jacks and 9 adult) loose tags returned (found, no live fish attached).

3.2.3.2. Spawner Survey Recovery

Mainstem Trinity River Chinook Salmon spawner surveys were conducted from September 13 to December 7, 2021. There were 35 (2 jack and 33 adult) TRP-tagged

spring Chinook recovered during spawner surveys in 2021. None of those tags were recovered from unspawned dead fish less than 30 days after tagging, so none were identified as tagging mortalities (Appendix 17).

3.2.3.3. Tagging Mortalities

There were four adult spring Chinook Salmon identified as tagging mortalities at JCW in 2021. These tags were omitted from the number of tagged fish used to estimate run size.

3.2.3.4. Trinity River Hatchery Recovery

Spring Chinook Salmon began entering TRH on September 7, 2021 (JW 36). All the spring-run arrived before the spawning break that began in JW 41 (Appendix 18). Recovery of spring Chinook Salmon peaked in JW 38 with 437 fish, while the peak of spring CWT recovery was in JW 36 (Appendix 19). Of the 1,053 spring Chinook Salmon tagged at JCW, 380 (25 jacks and 355 adults) or 36.1% were recovered at TRH (Appendix 17). Based on run-timing determined from CWT recoveries, an estimated 2,005 (307 jack and 1,698 adult) spring Chinook Salmon returned to TRH in 2021. Of those 2,005 fish, 372 (18.6%) had ad-clips and 1,633 (81.4%) did not.

3.2.3.5. Size and Age of Trapped Fish

Spring Chinook Salmon trapped at TRH averaged 58.6 cm FL (Figure 6, Appendix 17). Fork length distribution analysis shows the nadir separating jacks from adults was between 49 and 50 cm FL. Data from known age, hatchery-marked spring Chinook Salmon that entered TRH supported the minimum adult fork length of 50 cm (Appendix 21) because there was only a single CWT fish smaller than 50 cm. Because there was no marking or CWT application of BY 2019 we have no known age-2 length data. The mean length of known age-3 fish averaged 61.4 cm FL, 69.3 cm FL for known age-4 fish, and 75.7 cm FL for known age-5 fish. Applying the minimum adult size of 50 cm FL, an estimated 11.6% and 15.3% of observed spring Chinook Salmon were jacks at JCW and TRH, respectively.

3.2.4. Spring Chinook Salmon Coded-Wire Tag Recovery and Hatchery Origin Contribution to Runs

The 353 readable CWTs recovered from spring Chinook Salmon at TRH represented 13 CWT release groups from BYs 2016 – 2018 (ages 3-5) (Appendix 19). In 2021 we recovered three age-5 CWTs, the last returns of the complete BY 2016 cohort. Of the 379,630 (274,477 fingerling and 105,153 yearling) BY 2016 spring Chinook Salmon released from TRH with CWTs, 2,214 (0.58%) returned to the Trinity River between 2018 – 2021, below the 0.62% combined mean, but the strongest showing since BY 2009 (Figure 9, Appendix 22). For a complete accounting of run-size, percent return, harvest and spawner escapements for TRH HOR spring Chinook Salmon by release group see Appendix 23.

Based on the total estimated spring Chinook Salmon run-size upstream of JCW (778 jacks, 4,772 adults), the estimated angler harvest rate (0.0% jacks, 3.1% adults), and

the percentage of ad-clipped spring Chinook Salmon at TRH also containing CWTs (97.2%), we estimate the contribution of CWT spring Chinook Salmon to the total run of spring Chinook Salmon upstream of JCW to be 980 in 2021, all adults (Appendix 24). The run is estimated to include 30 CWT spring Chinook Salmon harvested by anglers, 355 recovered at TRH and 595 available to spawn in natural areas. The age composition of 2021 CWT spring Chinook Salmon returns was 0 (0.0%) age-2, 839 (85.6%) age-3, 133 (13.8%) age-4, and 9 (0.9%) age-5 fish.

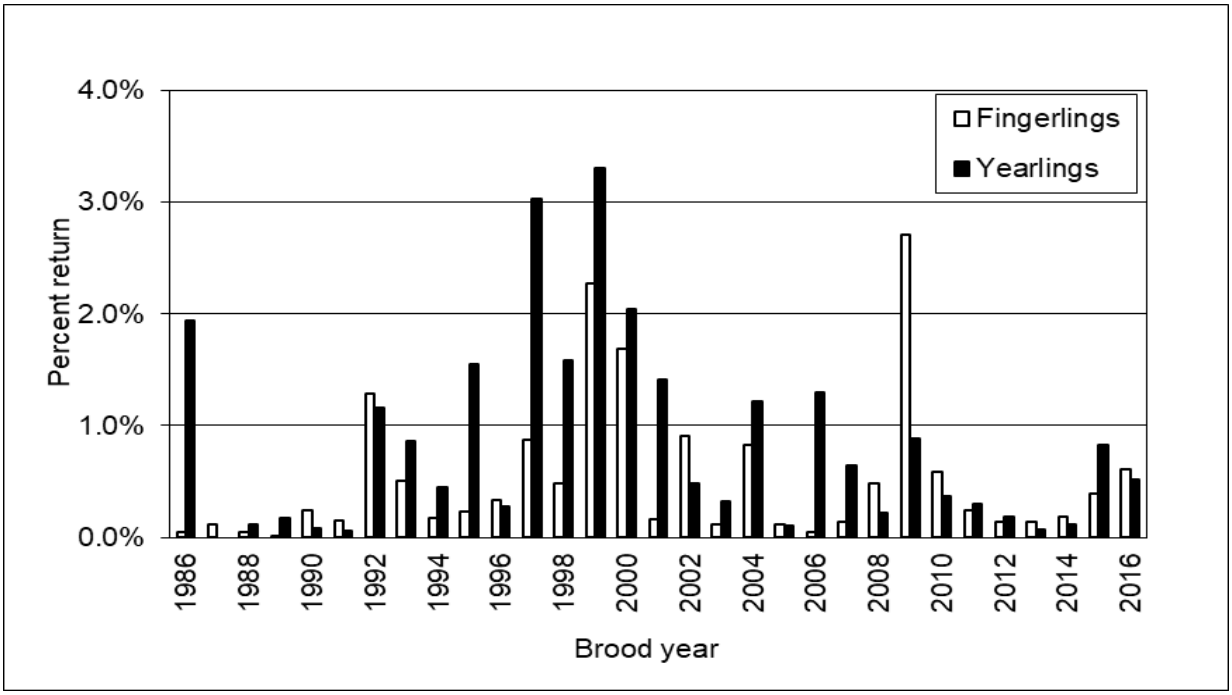


Figure 9. Percent return of Trinity River Hatchery produced, coded-wire tagged spring Chinook Salmon, brood years 1986 - 2016, based on estimated returns upstream of Junction City weir.

Applying production multipliers to CWT recoveries allows for the estimation of HOR spring Chinook Salmon contributions to the total Trinity River spring Chinook Salmon run-size upstream of JCW. In 2021, an estimated 4,525 (443 jack, 4082 adult) HOR spring Chinook Salmon returned to the Trinity River upstream of JCW, which represents 82.5% of the combined HOR and NOR run and is above the 30 year mean of 61.1% (Figure 10, Appendix 25).

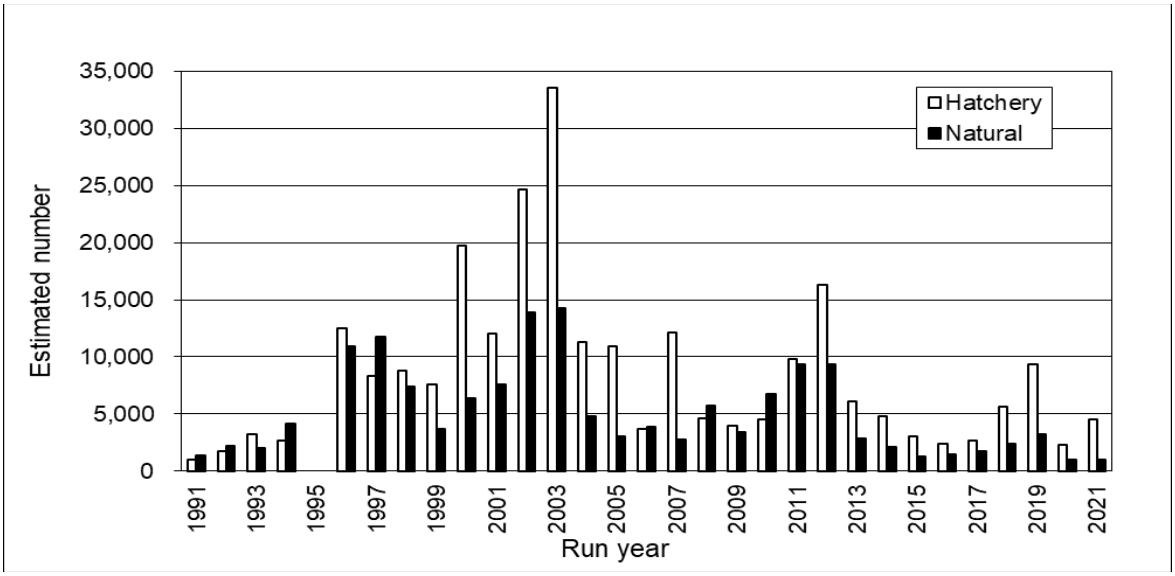


Figure 10. Estimated contribution of Trinity River Hatchery-origin and natural-origin spring Chinook Salmon to total run-size upstream of Junction City weir, 1991 - 2021.

3.3. Fall Chinook Salmon

3.3.1. Fall Chinook Salmon Trapping and Tagging

We initiated trapping at Willow Creek weir the night of August 27 (JW 35) and processed our first fish the next morning. We fished for five nights before we were forced to evacuate due to a forest fire. In JW 36 the flows for the HVT ceremonial Boat Dance carried enough large woody debris to partially destroy the weir. We were able to rebuild and started trapping again September 11 (JW 37) and continued trapping until October 21 (JW 42) when a flow event much larger than forecasted forced us to remove as much of the weir as possible before the rest was washed out. Due to sustained elevated flows and equipment loss, the weir was not reinstalled after this event.

A total of 3,367 Chinook Salmon were trapped at WCW over 37 nights in 2021, 3,102 of which (caught in the 32 days of trapping in JWs 37-42) were determined to be fall Chinook Salmon (see Section 2.4.3). Tags were applied to 3,028 of those fish, and 73 were not tagged due to poor condition. The number of fall Chinook trapped at WCW peaked at 160.0 fish per night during JW 39, with a mean of 96.9 fish per night across the fall Chinook Salmon trapping period (Table 6, Figure 11).

Table 6. Weekly summary of Chinook Salmon trapped at Willow Creek weir on the Trinity River during 2021.

Julian week [a]	Inclusive dates	Nights trapped	Number trapped [a] Jacks [b]	Ad-clip [c] Jacks	Adults	Ad-clip Adults	Total	Ad-clip total	Fish/ night	Ad-clipped/ night
35	27-Aug - 2-Sep	5	136		132	12	268	12	53.6	2.4
36	3-Sep - 9-Sep	0	--	--	--	--	--	--	--	--
37	10-Sep - 16-Sep	4	47		237	36	284	36	71.0	9.0
38	17-Sep - 23-Sep	6	88		763	125	851	0	141.8	0.0
39	24-Sep - 30-Sep	5	74		726	119	800	119	160.0	23.8
40	1-Oct - 7-Oct	5	33		600	118	633	118	126.6	23.6
41	8-Oct - 14-Oct	5	4		260	48	264	48	52.8	9.6
42	15-Oct - 21-Oct	7	41		229	43	270	43	38.6	6.1
	Total Chinook Salmon	37	423	0	2,947	501	3,370	376	91.1	10.2
	Total Fall Chinook	32	287	0	2,815	489	3,102	364	96.9	11.4

a/ Trapping at Willow Creek weir took place August 28 - October 21, 2021 (Julian weeks [JW] 35-42).
We determined JW 37 the beginning of the fall Chinook Salmon run.

b/ Chinook Salmon <52 cm FL were considered jacks.

c/ Adipose fin-clipped Chinook Salmon. Number shown is a subset of weekly jack and adult totals. There was no pre-release marking of Trinity River Hatchery Chinook Salmon in 2020 due to Covid-19, therefore, no jack ad clips.

d/ Chinook Salmon trapped at WCW prior to JW 37 were designated spring run and were not used in fall Chinook Salmon analysis throughout this report.

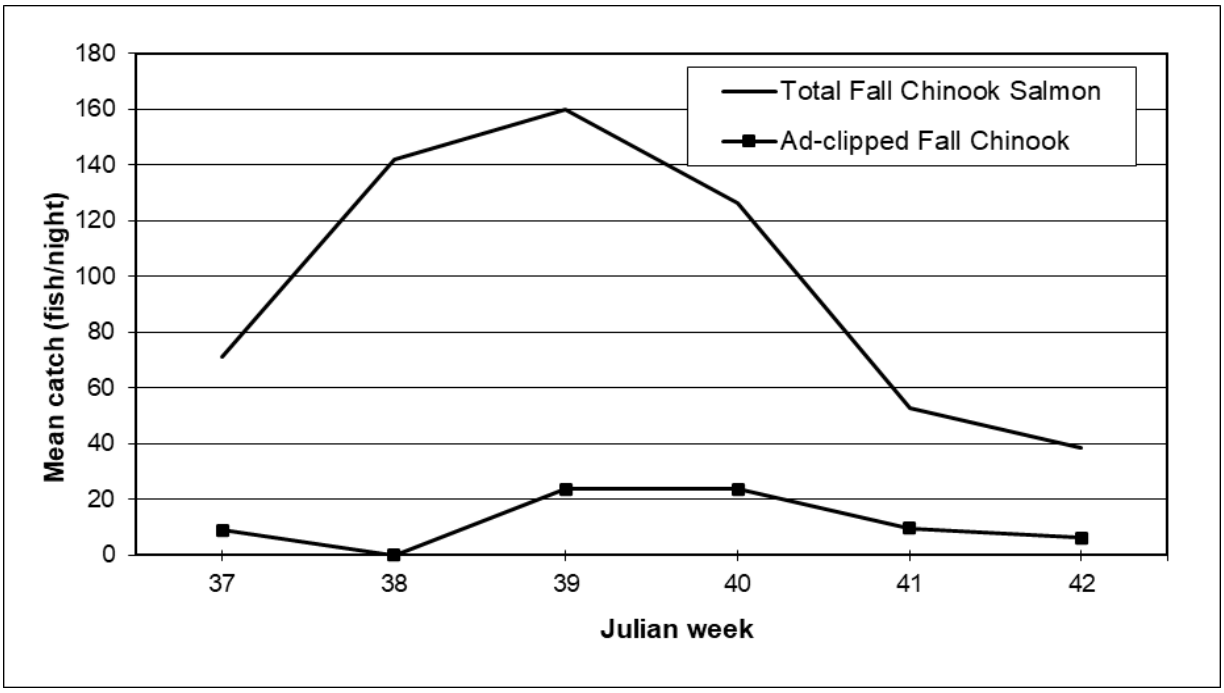


Figure 11. Mean catch per night of fall Chinook Salmon at Willow Creek weir on the Trinity River, 2021.

Fall Chinook Salmon trapped at WCW averaged 62.2 cm FL and ranged from 36 cm to 89 cm FL (Figure 12, Appendix 26). For assigning age classes to the fall run we used HVTF's scale age proportions (see Section 2.4.1). We also performed a FL distribution analysis which assigned a nadir-based jack/adult cutoff of 52 cm FL. We used the 52 cm FL minimum adult size only for harvest and catch-and-release fishery estimation because scale samples are not available for those sectors. Ad-clipped fish comprised 15.8% (489 of 3,102) of the fall Chinook Salmon trapped at WCW (Appendix 26).

3.3.2. Fall Chinook Salmon Recovery

3.3.2.1. Angler Tag Recovery

Anglers returned tags from 48 (3 jack and 45 adult) TRP-tagged fall Chinook Salmon (Appendix 26) resulting in an estimated harvest of 647 (47 jack and 600 adult) fall Chinook Salmon (Appendix 8). The estimated harvest rate of fall Chinook upstream of WCW was 1.4% for jacks and 3.1% for adults. There were 114 tags (10 jacks and 104 adults) returned from the catch-and-release fishery, and there were 108 (1 jack and 107 adults) loose tags returned (found, no live fish attached).

3.3.2.2. Spawner Survey Recovery

There were 184 (5 jack and 179 adult) TRP-tagged fall Chinook Salmon recovered during spawner surveys in 2021 (Appendix 26). No tags were recovered from unspawned dead fish less than 30 days after tagging, so none were identified as tagging mortalities.

3.3.2.3. Tagging Mortalities

There was one observed fall Chinook Salmon tagging mortality at WCW in 2021 (Appendix 26).

3.3.2.4. Trinity River Hatchery Recovery

Eight known fall (CWT) Chinook Salmon entered TRH prior to the spawning break (three in JW 39 and five in JW 40)(Appendix 20), but the fall run was determined to begin JW 43 according to our protocol (Section 2.4.3) and continued through JW 1 (Appendix 18). Recovery of fall Chinook Salmon peaked in JW 46 with 1,568 fish, but the peak week for fall CWT Chinook Salmon recovery was JW 44. Of the 2,914 fall Chinook Salmon effectively tagged at WCW, 768 (9 jack and 759 adult) or 26.0%, were recovered at TRH. Based on run timing determined from CWT recoveries, an estimated 5,967 (102 jack and 5,865 adult) fall Chinook Salmon returned to TRH in 2021. Of the 5,967 fall Chinook that entered TRH in 2021 we observed 1,257 (21.1%) with ad-clips and 4,710 (78.9%) with no clip.

3.3.2.5. Size and Age of Trapped Fish

Fall Chinook Salmon trapped at TRH averaged 63.0 cm FL (Figure 12). Because there was no marking or CWT application of BY 2019, we have no known age-2 length data. Data from known age, hatchery-marked fall Chinook Salmon that entered TRH indicated a minimum adult fork length of 54 cm (Appendix 27). There was quite a bit of overlap

between sizes of age-3 and age-4 fish and their mean lengths were not as markedly different as we usually observe. The known age-3 yearlings were 46 – 82 cm FL with an average of 62.4 cm FL while known age-4 fish averaged 68.8 cm FL. Applying the proportions determined from HVT scale analysis, jacks comprised 1.7% and adults 98.3% of fall Chinook Salmon entering TRH.

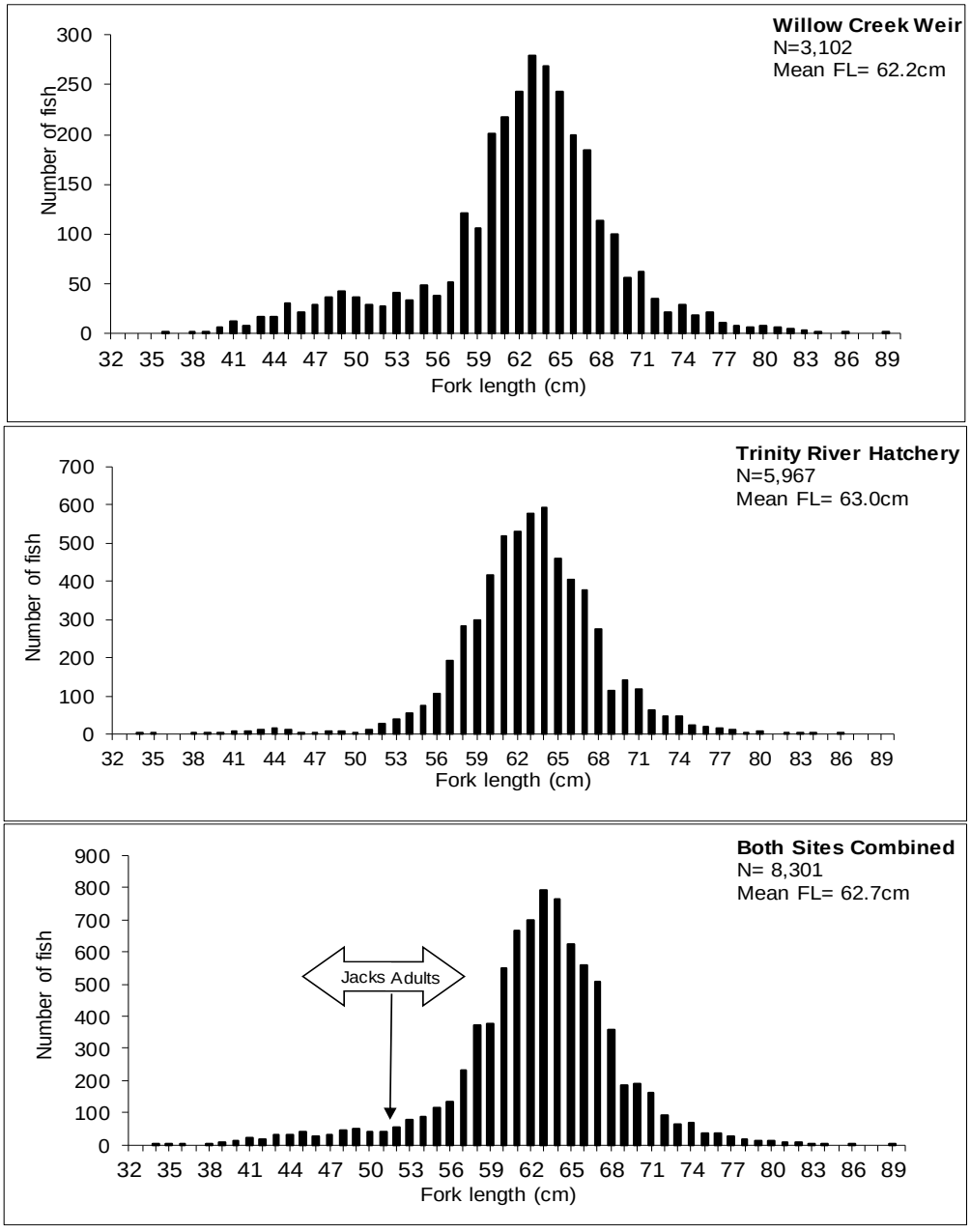


Figure 12. Fall Chinook Salmon fork lengths (cm) observed at Willow Creek weir, Trinity River Hatchery, and both sites combined during the 2021-22 season. Fish trapped at WCW and subsequently recovered at TRH are only included once in the "combined" (bottom) graph, and the arrow denotes the size used to separate jack and adults for harvest and catch and release fishery estimates.

3.3.3. Fall Chinook Salmon Coded-Wire Tag Recovery and Hatchery Origin Contribution to Runs

The 1,231 CWTs recovered from fall Chinook Salmon at TRH represented 15 CWT release groups from BYs 2017 – 2018 (ages 3-4) (Appendix 20). There were no known age-5 fall Chinook Salmon recovered in 2021, and we considered the 2016 BY to have completed their life-cycle this year. Of the 247,474 (0 fingerling and 247,474 yearling) fall Chinook Salmon released from TRH with CWTs for BY 2016, 1,063 (0.43%) returned between 2018 – 2021, far below the mean of 0.71% (Figure 13, Appendix 28). For a complete accounting of run-size, percent return, and harvest and spawner escapement estimates for TRH HOR fall Chinook Salmon by release group see Appendix 29.

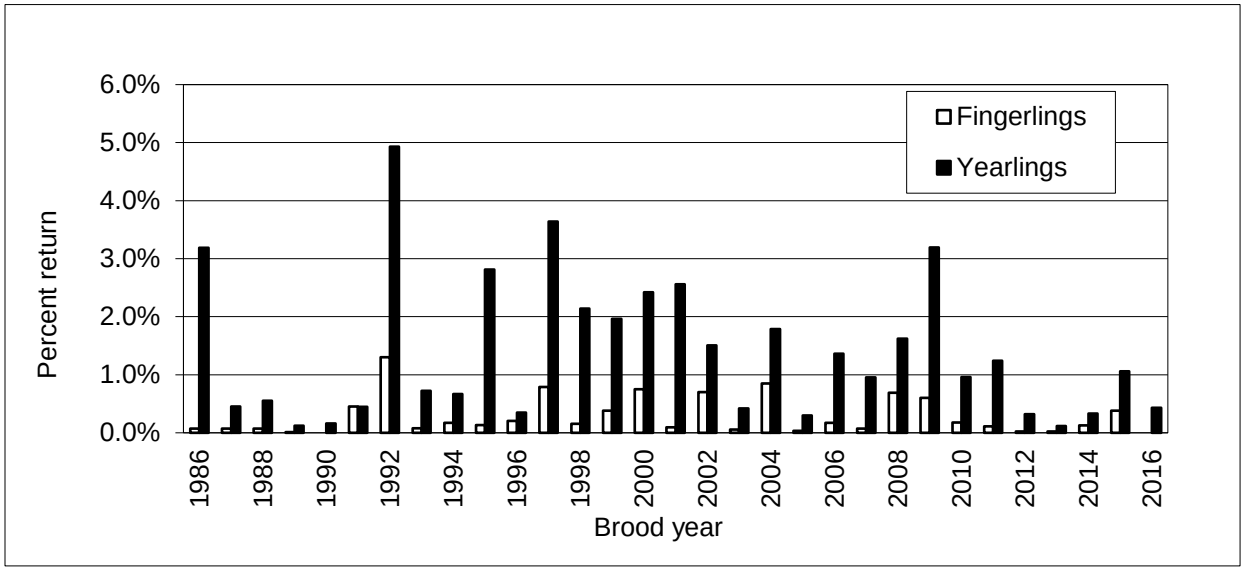


Figure 13. Percent return of Trinity River Hatchery produced, coded-wire tagged fall Chinook Salmon, brood years 1986 - 2016, based on estimated returns upstream of Willow Creek weir.

Based on the total estimated fall Chinook Salmon run size upstream of WCW (3,390 jacks and 19,233 adults), the estimated angler harvest rate (1.4% jacks, 3.1% adults), and the percentage of ad-clipped fall Chinook Salmon at WCW also containing readable CWTs (98.6%), we estimate the contribution of fall CWT Chinook Salmon to the total run upstream of WCW to be 3,300 in 2021, including 0 jacks and 3,300 adults (Appendix 30). The run is estimated to include 103 CWT fall Chinook Salmon harvested by anglers, 1,249 recovered at TRH and 1,948 available to spawn in natural areas. The age composition of 2021 CWT fall Chinook Salmon returns was 0 (0.0%) age-2, 1,175 (95.5%) age-3, 56 (4.5%) age-4, and 0 (0.0%) age-5 fish.

Applying production multipliers to CWT recoveries allows for the estimation of HOR fall Chinook Salmon contributions to the total Trinity River fall Chinook Salmon run-size upstream of WCW. In 2021, an estimated 13,754 (617 jack, 13,137 adult) HOR fall Chinook Salmon returned to the Trinity River upstream of WCW (Figure 14**)** which represents 60.8% of the combined HOR and NOR run and is more than the 31-year mean of 50.3% (Appendix 31).

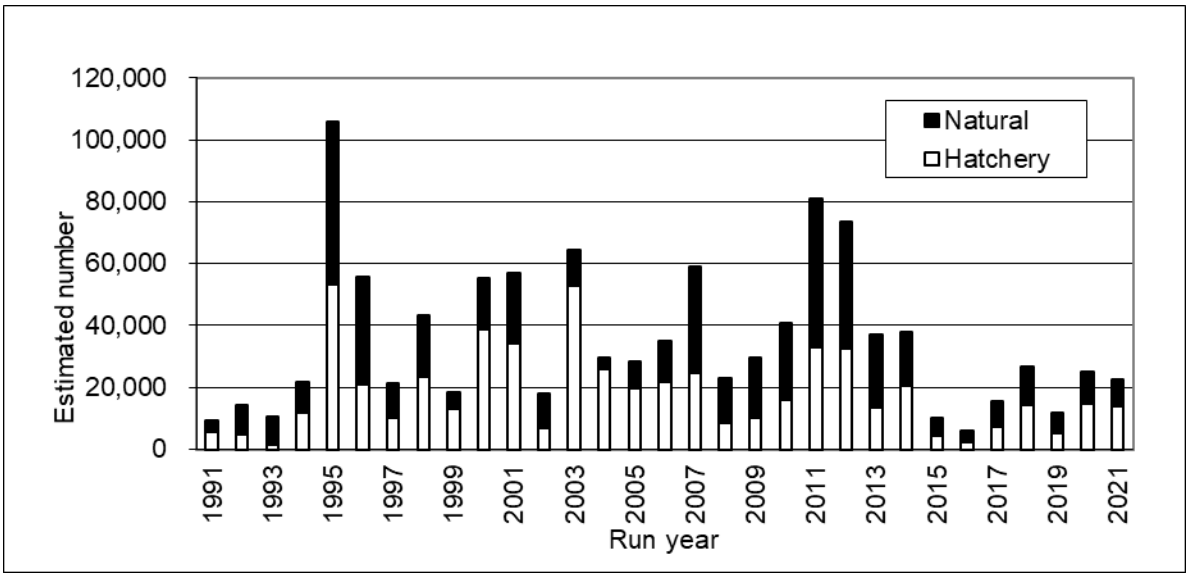


Figure 14. Hatchery- and natural-origin contributions to total fall Chinook Salmon run-size upstream of Willow Creek weir, 1991 – 2021.

3.4. Coho Salmon

3.4.1. Coho Salmon Trapping and Tagging

A total of 194 Coho Salmon (27 jacks and 167 adults) were trapped at WCW between JWs 37 and 42 in 2021, all but eight of which were tagged (Table 7, Appendix 32). Trapping averaged 5.2 Coho Salmon per night and peaked in JW 40 at 15.0 per night (Figure 15). Right maxillary clipped fish, indicating TRH origin, comprised 95.4% (185 of 194) of Coho Salmon trapped at WCW.

A total of 373 Coho Salmon (16 jacks and 357 adults) were trapped at JCW between JWs 40 and 51, all but three of which were tagged (Table 8, Appendix 33). Trapping averaged 7.0 Coho per night and peaked in JW 45 at 26.3 per night (Figure 16). Right maxillary clipped fish comprised 94.6% (353 of 373) of Coho Salmon trapped at JCW. Thirty-six (15 NOR and 21 HOR) Coho Salmon trapped at JCW were tagged with special project tags and transported to TRH by YTF staff for a pilot broodstock project.

Coho Salmon trapped at WCW, JCW and TRH averaged 61.8 cm FL, 67.2 cm FL and 63.6 cm FL, respectively, with a combined average of 64.0 cm FL **(**Figure 17). Using length distribution analysis of Coho Salmon trapped at WCW, JCW and TRH, the nadir separating jack from adult Coho Salmon was between 49 and 50 cm FL. Based on the nadir, jacks comprised 13.9% of the run at WCW, 4.3% of the run at JCW and 6.2% at TRH.

Table 7. Weekly summary of Coho Salmon trapped in the Trinity River at Willow Creek weir during 2021.

Julian week	Inclusive dates	Nights trapped	Number trapped [a] Jacks [b]	RM clip Jacks [c]	Adults	RM clip Adults	Total trapped	Total RM clips	Fish/ night
35	27-Aug - 2-Sep	5					0	0	0
36	3-Sep - 9-Sep	0					0	0	0
37	10-Sep - 16-Sep	4			2	2	2	2	0.5
38	17-Sep - 23-Sep	6			10	10	10	10	1.7
39	24-Sep - 30-Sep	5	2	2	44	43	46	45	9.2
40	1-Oct - 7-Oct	5	8	8	67	62	75	70	15.0
41	8-Oct - 14-Oct	5	10	9	27	27	37	36	7.4
42	15-Oct - 21-Oct	7	7	7	17	15	24	22	3.4
	Total:	37	27	26	167	159	194	185	
	Mean:								5.2

a/ Trapping at Willow Creek weir took place August 28 - October 21, 2021 (Julian weeks 35-42).

b/ Coho <50cm FL were considered jacks.

c/ Right maxillary clipped Coho Salmon. Number shown is a subset of weekly jack and adult totals.

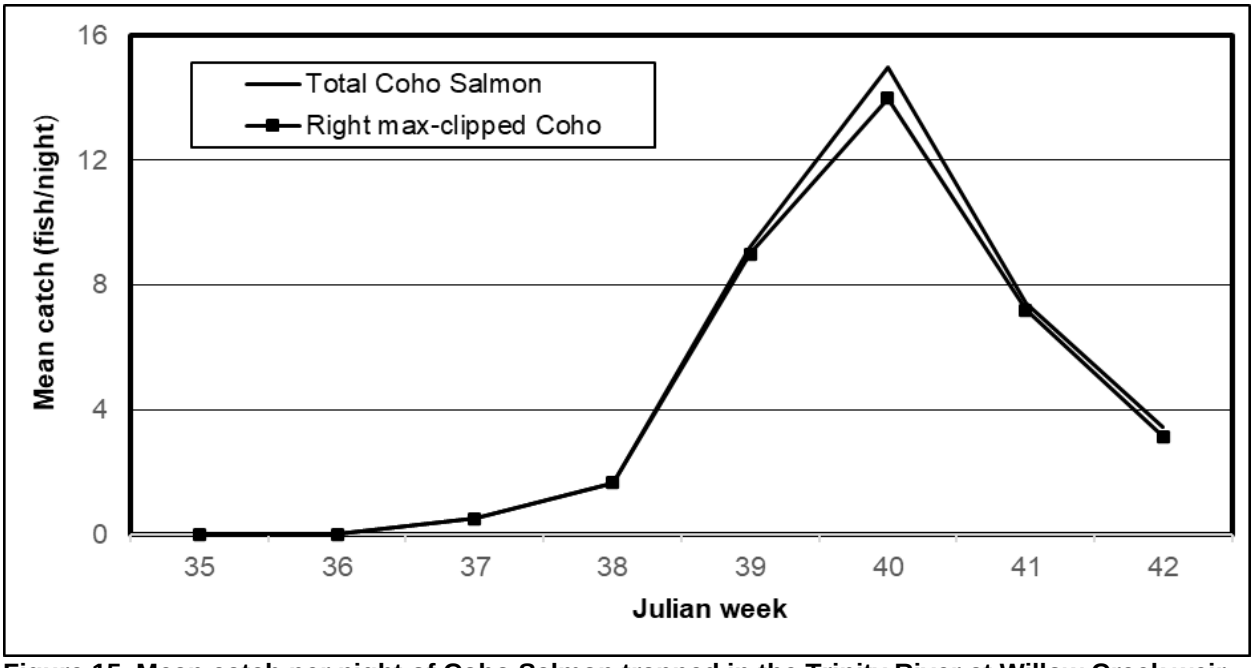


Figure 15. Mean catch per night of Coho Salmon trapped in the Trinity River at Willow Creek weir, 2021.

Table 8. Weekly summary of Coho Salmon trapped in the Trinity River at Junction City weir during 2021.

			Number trapped [a]						
Julian week	Inclusive dates	Nights trapped	Jacks [b]	RM clip [c] Jacks	Adults	RM clip Adults	Total trapped	Total RM clips	Fish/ night
40	1-Oct - 7-Oct	5	2	2	11	11	13	13	2.6
41	8-Oct - 14-Oct	5			2	2	2	2	0.4
42	15-Oct - 21-Oct	5			7	7	7	7	1.4
43	22-Oct - 28-Oct	4	2	2	13	13	15	15	3.8
44	29-Oct - 4-Nov	5			46	46	46	46	9.2
45	5-Nov - 11-Nov	4	1	1	104	93	105	94	26.3
46	12-Nov - 18-Nov	5	4	4	70	63	74	67	14.8
47	19-Nov - 25-Nov	4			35	34	35	34	8.8
48	26-Nov - 2-Dec	4	1	1	22	21	23	22	5.8
49	3-Dec - 9-Dec	5	4	4	13	13	17	17	3.4
50	10-Dec - 16-Dec	4	1	1	31	31	32	32	8.0
51	17-Dec - 23-Dec	3	1	1	3	3	4	4	1.3
	Total:	53	16	16	357	337	373	353	
	Mean:								7.0

a/ Trapping at Junction City weir took place June 4 - December 21, 2021 (Julian weeks [JW] 35-51). We trapped Coho Salmon only from JWs 40 - 51.

b/ Coho Salmon <50cm FL were considered jacks.

c/ Right maxillary clipped Coho Salmon. Number shown is a subset of weekly jack and adult totals.

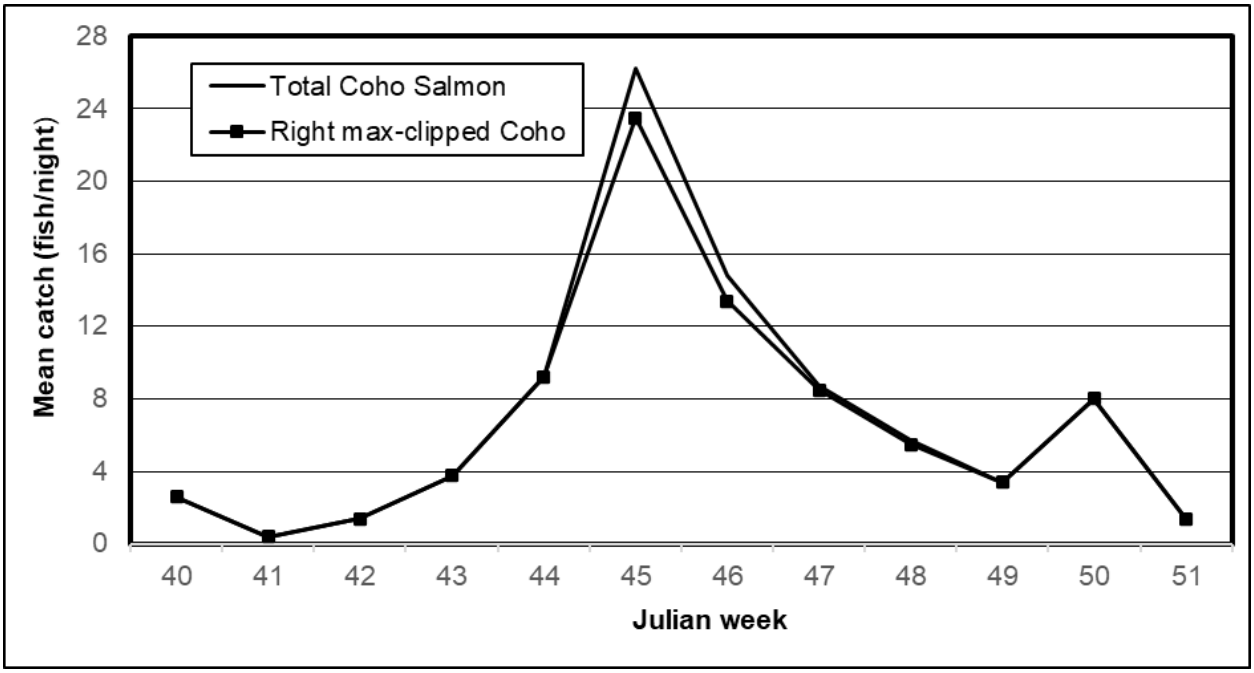


Figure 16. Mean catch per night of Coho Salmon trapped in the Trinity River at Junction City weir, 2021.

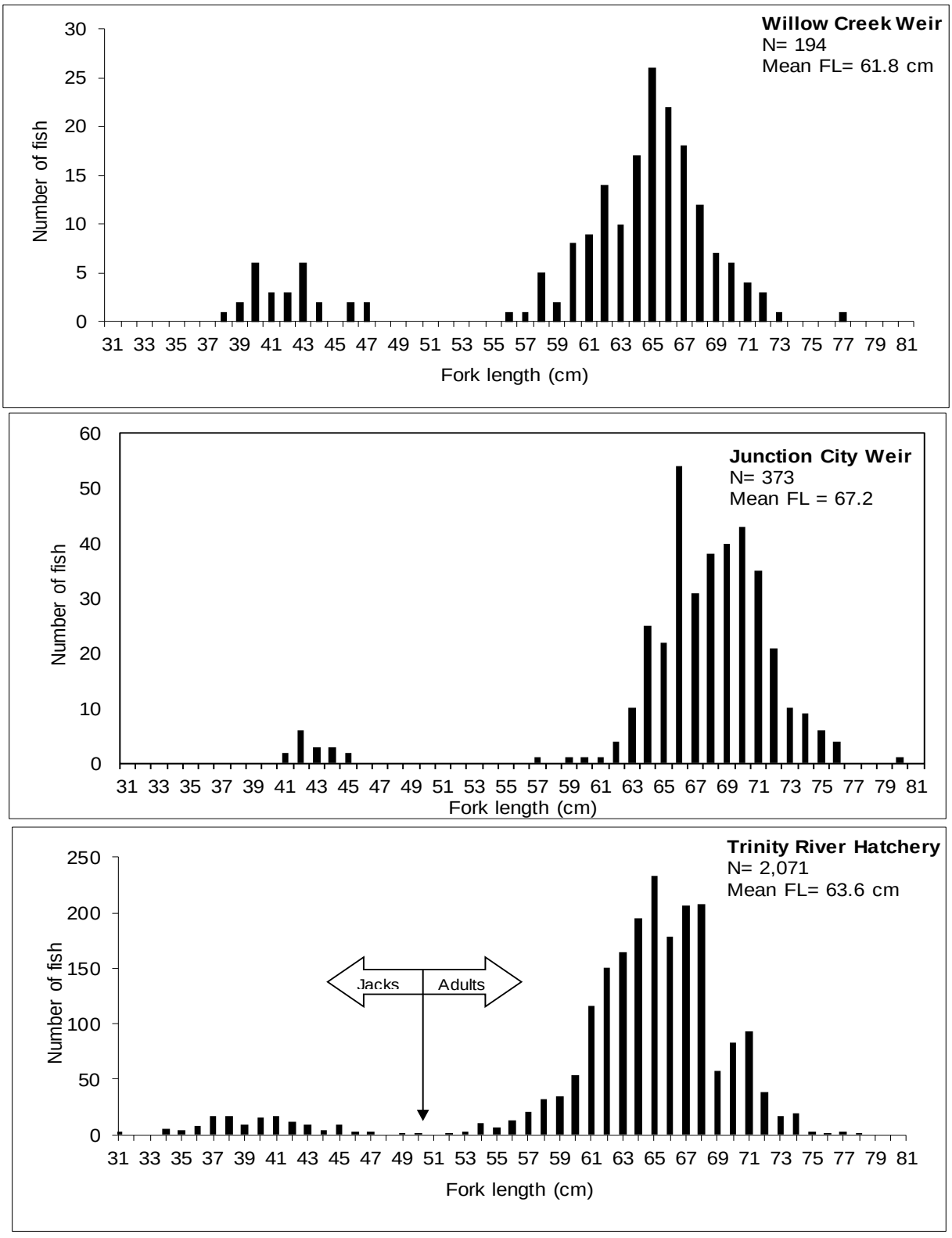


Figure 17. Coho Salmon fork lengths (cm) observed at Willow Creek weir, Junction City weir and Trinity River Hatchery (exclusive of weir-tagged fish) during the 2021-22 season. The arrow denotes the size used to separate jack and adults for analysis.

3.4.2. Coho Salmon Recovery

3.4.2.1. Angler Tag Recovery

There was no reported harvest of TRP-tagged Coho Salmon in 2021 at WCW, and one tag was returned from the catch-and-release fishery, leaving 185 effectively tagged fish at WCW. There was one tag found loose (no fish attached) and returned (Appendix 32).

There was no reported harvest of TRP-tagged Coho Salmon in 2021 at JCW, and one tag was returned from the catch-and-release fishery, leaving 332 effectively tagged fish at JCW. There were seven tags found loose (no fish attached) and returned (Appendix 33).

3.4.2.2. Spawner Survey Recovery

There were eight WCW-tagged Coho Salmon tags (Appendix 32) recovered during spawner surveys in 2021. There were four JCW-tagged Coho Salmon tags recovered, one of which was recovered from an unspawned fish less than 30 days after tagging, so was identified as a tagging mortality (Appendix 33).

3.4.2.3. Tagging Mortalities

There were zero observed Coho Salmon tagging mortalities at either WCW or JCW in 2021.

3.4.2.4. Trinity River Hatchery Recovery

The first Coho Salmon entered TRH during JW 40 and they continued returning through JW 2 of 2022 (Appendix 18). A total of 2,346 Coho Salmon (148 jacks and 2,198 adults) were recovered at TRH during the season. An additional 36 (0 jacks and 36 adults) were transported by truck from JCW to TRH as part of the HGMP pilot broodstock collection project.

Of the 185 Coho Salmon effectively tagged at WCW, 92 (11 jack and 81 adult) or 50.0% were recaptured at TRH (Appendix 32). Of the 332 Coho effectively tagged at JCW, 184 (6 jack and 178 adult) or 55.4% were recaptured at TRH (Appendix 33). The 36 adult Coho Salmon that were transported by truck were not included in the effectively tagged fish at JCW.

Of the 2,382 Coho Salmon that entered TRH in 2021, including the 36 transported there from JCW, we observed 2,315 (97.2%) with RM clips while 67 (2.8%) had no clip. Unclipped fish are assumed to be NOR.

3.4.3. Coho Salmon Hatchery-Origin Contributions to Run

In 2021 96.3% of jack (age 2, from BY 2019) and 95.2% of adult (age 3, from BY 2018) Coho Salmon encountered at WCW were RM-clipped, therefore we estimate 4,473 (311 jacks and 4,161 adults) of the 4,694 Coho Salmon returning to the Trinity River basin above WCW in 2021 were of hatchery-origin. Likewise, 100% of jacks and 94.4% of adults encountered at JCW were RM-clipped so we estimate 3,855 (245 jacks and

3,611 adults) of the 4,071 Coho Salmon returning to the Trinity River basin above JCW in 2021 were hatchery-origin.

For information about the BY 2020 juvenile Coho Salmon marking at TRH in 2022, or for more brood year performance information, refer to Appendix 34.

3.5. Adult Fall Steelhead

3.5.1. Adult Fall Steelhead Trapping and Tagging

A total of 336 steelhead (6 half-pounders and 330 adults) were trapped at WCW between JWs 35 and 42, and 329 of the 330 adults were tagged (Table 9, Figure 18). Steelhead trapping peaked in JW 37 when we averaged 16.3 steelhead per night, and ad-clipped steelhead peaked the same week at 8.3 per night. Hatchery-origin fish comprised 56.1% (185 of 330) of the adult steelhead trapped at WCW. Steelhead trapped at WCW and TRH averaged 55.3 and 57.3 cm FL, respectively, with a combined average of 56.9 cm FL (Figure 19).

Table 9. Weekly summary of fall steelhead trapped in the Trinity River at Willow Creek weir during 2021.

			Number trapped [a]						
Julian week	Inclusive dates	Nights trapped	1/2 lbers [b]	Ad-clipped 1/2 lbers [c]	Adults	Ad-clipped Adults	Total	Ad-clip total	Fish/ night
35	27-Aug - 2-Sep	5	1	0	47	31	48	31	9.6
36	3-Sep - 9-Sep	0	--	--	--	--	--	--	--
37	10-Sep - 16-Sep	4	2	2	63	31	65	33	16.3
38	17-Sep - 23-Sep	6	0	0	56	33	56	33	9.3
39	24-Sep - 30-Sep	5	1	0	53	38	55	38	10.8
40	1-Oct - 7-Oct	5	0	0	30	17	30	17	6.0
41	8-Oct - 14-Oct	5	1	0	7	0	8	0	1.6
42	15-Oct - 21-Oct	7	1	1	74	35	75	36	10.7
	Total:	37	6	3	330	185	336	188	
	Mean:								9.1

a/ Trapping at Willow Creek weir took place August 28 - October 21, 2021 (Julian weeks 35-42).

b/ Steelhead <42 cm FL were considered 1/2 lbers (half-pounders).

c/ Adipose fin-clipped steelhead. Number shown is a subset of weekly half-pounder and adult totals.

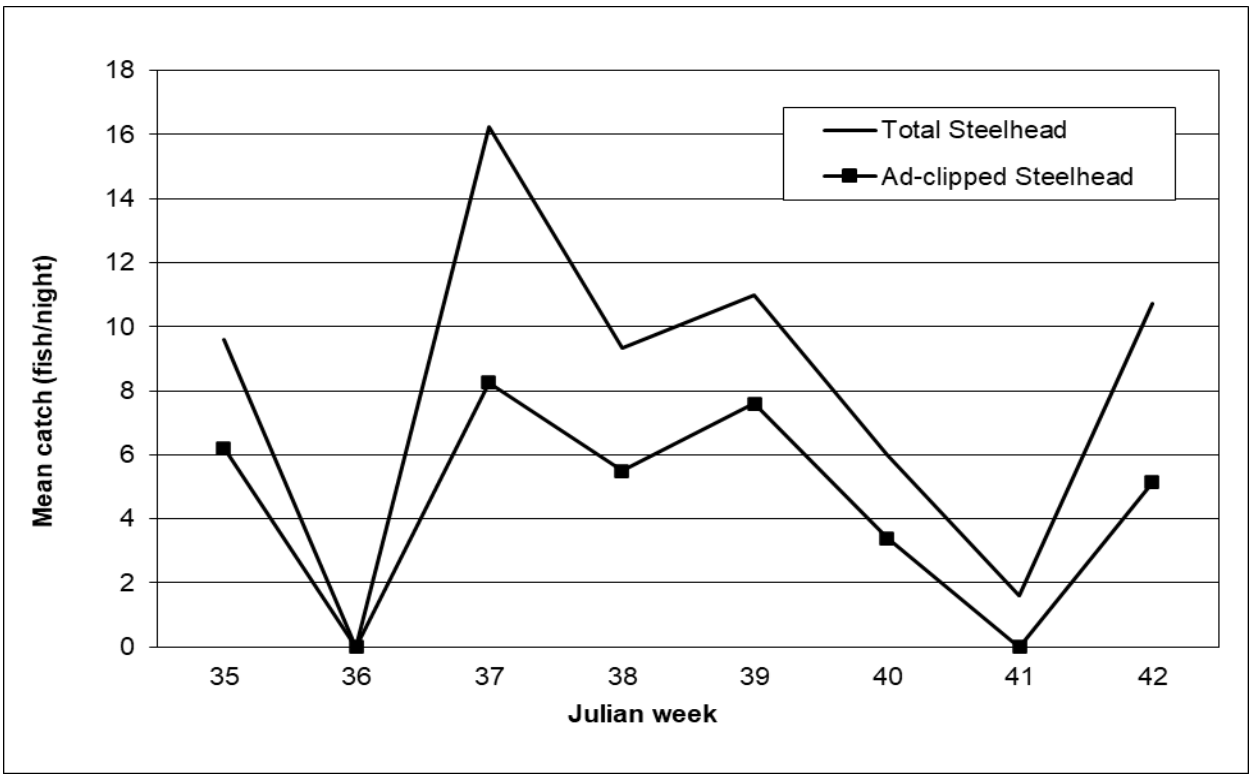


Figure 18. Mean catch of fall steelhead in the Trinity River at Willow Creek weir, 2021.

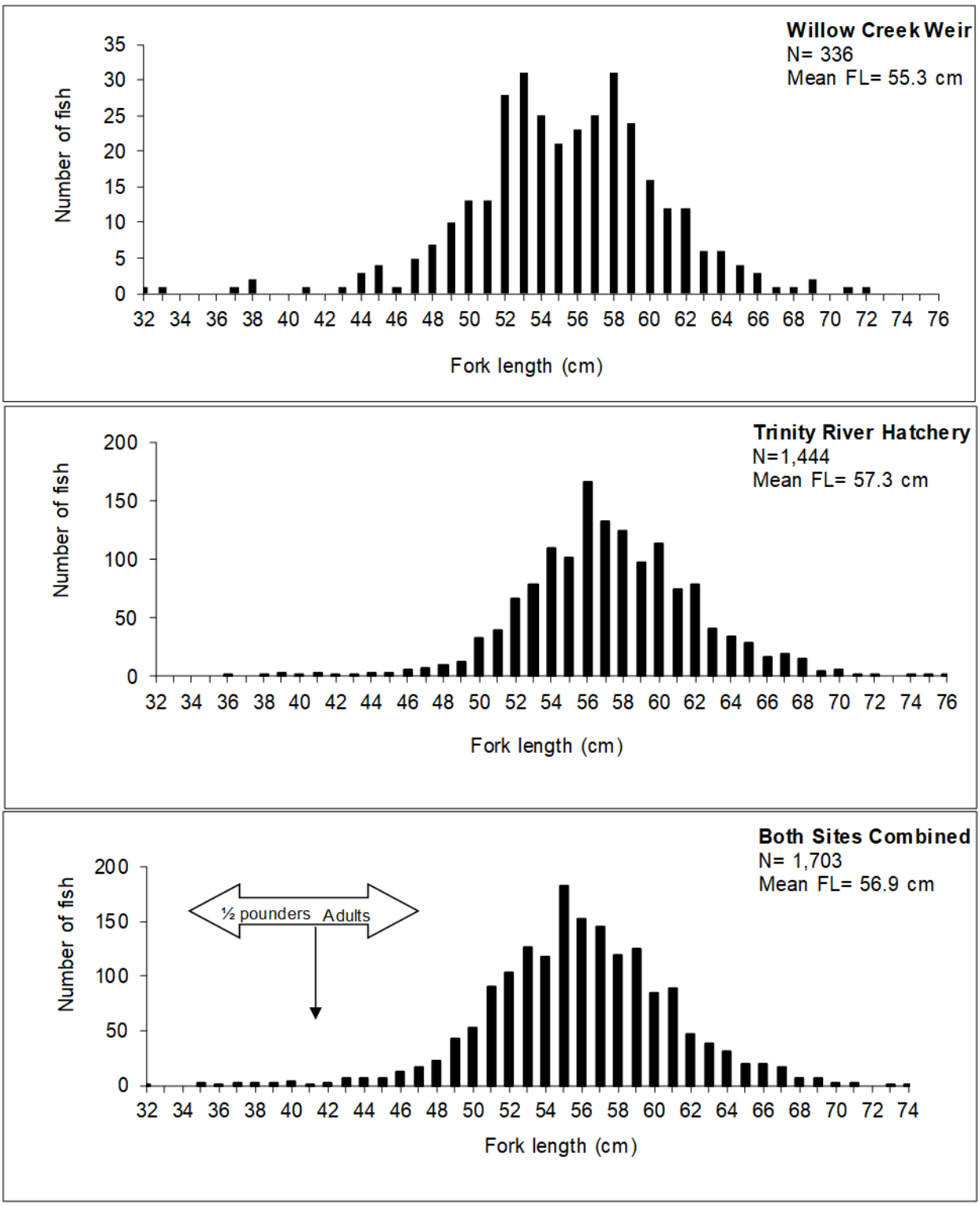


Figure 19. Steelhead fork lengths (cm) observed at Willow Creek weir, Trinity River Hatchery and both sites combined during the 2021-22 season. Fish trapped at WCW then recovered at TRH are only included once in the "combined" (bottom) graph. Arrow denotes the size used to separate half pounders and adults for analysis.

Estimating escapement of steelhead upstream of JCW is not an objective of this project, but steelhead are trapped there, and ad-clipped steelhead are tagged for qualitative studies not reported here. Steelhead were trapped at JCW every week from JW 24 to 51 that we were trapping and peaked in JW 45 with 32 fish. Four half-pounders and 218 adult steelhead were trapped, including 110 ad-clipped adults, many of which were trapped during JWs 40-45. Thirty-seven steelhead trapped at JCW were subsequently recovered at TRH.

3.5.2. Adult Fall Steelhead Recovery

3.5.2.1. Angler Tag Recovery

There were eight TRP-tagged ad-clipped steelhead reported as harvested in 2021 and one tag found loose on the riverbank and returned by anglers or other river users (Appendix 35). There were 30 tags returned from the catch-and-release fishery, 18 HOR and 12 NOR steelhead. No harvest of NOR fish was reported, nor was it lawfully allowed.

3.5.2.2. Spawner Survey Recovery

There was one (effectively) TRP-tagged steelhead recovered during spawner surveys in 2021.

3.5.2.3. Tagging Mortalities

There was one adult steelhead identified as a tagging mortality at WCW in 2021.

3.5.2.4. Trinity River Hatchery Recovery

Steelhead entered TRH during every week the fish ladder was open (Appendix 18). Recovery peaked in JW 7 of 2022 when 126 steelhead entered TRH. A total of 1,444 steelhead (1,433 adults and 11 half pounders) were recovered at TRH during the season. Of the 298 steelhead effectively tagged at WCW 60 (20.1%) were recaptured at TRH. Hatchery-origin fish comprised 95.0% (1,362 of 1,433) of the adult steelhead recovered at TRH in the 2021-22 season (Table 4).

3.5.3. Adult Fall Steelhead Hatchery-Origin Contribution to Run

All TRH-reared steelhead receive an adipose clip before release to the Trinity River. We estimate the contribution of hatchery-origin fish to the total Trinity River run by applying the ad-clip percentage of steelhead at WCW to the total run-size estimate. In 2021 56.1% of adult steelhead encountered at WCW were ad-clipped (Table 9), therefore we estimate 56.1%, or 3,940, of the 7,029 adult fall steelhead run estimate above WCW to be of hatchery-origin.

4. DISCUSSION

4.1. Factors Influencing Run-Size, Harvest and Escapement Estimates

Attaining adult NOR salmonid production goals while providing dependent tribal and non-tribal harvest are fundamental objectives of the TRRP. Factors that directly affect salmonid run-size and, therefore, progress toward TRRP goals, include availability and quality of habitat for all life stages, natural mortality, and the amount of ocean and in-river harvest. Environmental conditions are also contributing factors and include ocean-atmospheric climate variability over the North Pacific Ocean that result in inter-annual and inter-decadal changes in Pacific salmon survival (Beamish, et. al 2009). In addition, assessing progress toward meeting TRRP objectives depends on the accurate estimation of run sizes and escapements for adult salmonids.

Accuracy and precision of mark-recapture field studies and data analyses directly influence escapement estimates. Accuracy of the modified Petersen mark-recapture estimator relies on a set of assumptions, and estimator bias can occur if assumptions are violated. For example, unaccounted tagging mortality creates a positive bias in mark-recapture studies (Hankin 2001). Hankin makes evident the magnitude of potential bias in the following scenario: “If 90% of untagged fish that pass the WCW survive to arrive at TRH”…”but only 75% of WCW-tagged fish survive to arrive at TRH, then the approximate proportional bias of the total run-size estimator would be (0.90/0.75) – 1 = 1.29 – 1 = 0.29, so that the estimator would have a positive proportional bias of almost 30%”. We take steps to minimize tagging-associated mortality through our operational protocol at the weirs. In the past we observed most tagging mortalities when water temperatures were high (near 22° C), therefore trapping is suspended if water temperatures exceed 21°C. In addition, fish are not tagged if deemed in poor condition or if they have already spawned. We account for tagging mortalities through recovery of tagged fish found dead during surveys conducted upstream of the weir sites throughout the trapping season, in the main stem Trinity spawning surveys, and by checking any TRP-tagged carcasses washed back on the weir for signs of spawning. Tagged fish that are judged to have died due to the stress of handling and/or tagging are removed from the tagged population for purposes of estimating total escapement. Reliance on experienced crew and adherence to protocol contributes to a relatively small number of tagging mortalities.

Interruption in trapping, or missing part of the run, may violate the assumption that fish trapped and tagged at the weir are a random sample representative of the population. Most often interruption of trapping during the season or missing part of the run before or after the trapping season is due to high river flow (with forest fire evacuations, unfortunately, increasingly becoming a secondary cause). Flow variability results from storm events and releases from Lewiston Dam, both of which affect the timing and duration of high-flow events. The water year designation for the Trinity River in 2021 was “Critically Dry,” which corresponds to an allocation of 369,000 acre-feet of water for release to the Trinity River (Interior 2000). Flows were low enough to install JCW on

June 4 (JW 23), and we were able to operate on schedule through August 5 (JW 31) when we were forced to evacuate an active forest fire that kept us out of the water JWs 32-34. We were able to get a single week (JW 35) of trapping in before the HVT ceremonial Boat Dance flows from Lewiston Dam caused an operational pause for 2.5 weeks in September (JWs 36-38), after which we were able to trap JCW through December 21 (Appendix 36). Based on run timing at JCW, we believe we missed few of the spring Chinook Salmon, and none of the Coho Salmon, our two target species there. We saw good numbers of fall Chinook Salmon at WCW, which had begun to decline, when high flows beginning on October 21 (Appendix 37) ended trapping at WCW for the season. We suspect we missed the tail end of the fall Chinook Salmon and Coho Salmon runs at WCW and most of the steelhead that we typically see from mid-October to mid-November.

Estimates of total run size is not affected by potential bias of estimated age proportions when a pooled (vs. stratified) Peterson estimator is used, but biased age proportions will result in biased adult estimates. We know splitting the run into jack and adults based on a hard length cutoff (i.e. using the nadir of FL frequency distribution analysis) will assign some fish to the wrong age class. However, when we have compared jack vs. adult proportions based on mixture distribution analyses vs. our FL frequency distribution analysis, bias associated with using the nadir appeared to be insignificant (Kier and Hileman 2016). We rely on scale-age proportions for fall Chinook Salmon, but we will continue to use length distribution analysis for spring Chinook and Coho Salmon until funding can be obtained to extend scale-based aging. We assume scale-based aging is the least biased method for fish without CWTs.

Estimates of hatchery contributions to total run-size are based, in part, on the overall run-size estimates for each race of Chinook Salmon and corresponding expansion of CWT recoveries. Consequently, they are subject to the precision and potential biases associated with the mark-recapture estimates, as well as the accuracy of reported CWT expansion factors. The effect of this potential bias is most relevant to estimates of NOR and HOR fish spawning in natural areas because hatchery recoveries are actual counts, whereas NOR and HOR proportions in natural spawning grounds are estimated by subtracting angler harvest and expanded CWT recoveries from the natural-area run size estimate. Estimation of HOR vs. NOR proportions also rely on accurate estimates of expansion factors. If the reported expansion factor is greater or less than the true proportion of HOR fish with CWTs, total hatchery returns would be over- or under-estimated, respectively. In addition, we assume the CWT fish that enter the hatchery are representative of the entire CWT population, but if an age or release type of HOR Chinook is more likely to stray than others, then the estimated proportions of HOR fish, based on fish recovered at TRH, will be biased. The TRH-origin Chinook tag groups recovered during the 2021 carcass surveys, as in most years, were similar in proportion to those that entered TRH.

Run-size estimates have the potential for bias (which are positive under most scenarios) in many cases due to violations of underlying assumptions of the estimator. However, biases that may affect estimates of total run-size may not affect hatchery contribution

rates since hatchery contribution rates are based on ad-clip rates observed at either JCW or WCW (although this year we had the lack of ad-clips and CWTs on the 2019 BY to consider when calculating these rates). Even if total run-size was biased, the ad-clip rate would remain the same and result in the same hatchery contribution rates. If, however, HOR fish are more or less vulnerable to capture at the weirs than their natural counterparts, the estimated contribution of hatchery fish could be biased. This could occur, for example, if the run timing of hatchery fish coincided with weir operations more so than natural fish, or vice versa. It could also occur if the weirs were size selective and there is a systematic difference in size distributions of NOR vs. HOR fish. We believe trapping at JCW spanned much of the spring Chinook and Coho Salmon runs thus reducing potential bias due to vulnerability of capture based on timing; and we believe trapping spanned much of the fall Chinook and most of the Coho Salmon runs at WCW as well. We have the least confidence in our steelhead estimate this year. We currently do not have a method to evaluate potential size selection at weirs, other than noting the range of FLs (21-91 cm including the Klamath small-scale suckers we frequently trap at WCW) or how they compare in size to returning fish at TRH, which they did in 2021.

The amount of sport and commercial ocean harvest, in-river sport harvest and tribal harvest affect salmon and steelhead run-size and escapement. Only in-river recreational harvest affects escapement above the weirs because all in-river tribal harvest occurs downstream of our weirs. Ocean harvest rates and in-river harvest quotas are determined by the Pacific Fisheries Management Council only for the combined Klamath-Trinity fall Chinook Salmon stock and can range from no harvest up to two-thirds of the projected run-size to the basin. Thus, dependent fisheries may have a large impact on fall Chinook Salmon escapement to the basin and to the Trinity River. In 2021 the adult (> 23” total length) quota for the entire Klamath-Trinity Basin fall Chinook Salmon run was 1,221, with the Trinity recreational harvest share (33.0%) of 402 fish. Of the 402 fish allocated to recreational harvest, an estimated 561 (505 upstream of WCW, and 56 below WCW) were provisionally estimated as harvested (CDFW 2022a). With updated information (additional tags returned between January 22 and May 1) we estimate the Trinity recreational harvest estimate to increase to 703 (647 upstream of WCW, and 56 below WCW). Provisionally, the estimated in-river Trinity basin-wide combined tribal and recreational harvest of spring Chinook Salmon was 1,264 (CDFW 2021b) with 147 estimated to have been taken in the recreational fishery upstream of JCW. Coho Salmon are protected from recreational harvest entirely.

Our harvest estimates are based on TRP tags returned by anglers. Unreported angler harvest of tagged fish results in an under-estimate of harvest rate and a corresponding over-estimate in escapement, even if the total run size is unbiased. Although the number of TRP tags returned is sufficient to generate a harvest estimate, we continue to try to increase the rate of tag return. We have noticed in the past even when we tag similar numbers of Chinook Salmon and steelhead, tags are returned from the steelhead fishery at a greater rate than from the salmon fishery. Likely explanations for this difference include the longer steelhead season, the fact that migrating steelhead tend to be more active feeders than Chinook Salmon, and potential negative bias in tag return rates for Chinook Salmon.

For several years we attempted to run a side-study, similar to Heubach et al. (1992), to determine the reward level at which 100% of the tags are returned (one of our harvest estimate assumptions) per Bradford and Hankin's (2012) recommendation. Early analysis seemed to show that anglers tend to return tags with greater rewards at higher rates than tags with lessor or no value, as expected. However, small sample size continues to thwart our efforts to make robust conclusions from the study overall. Likely we will not obtain sufficient information to evaluate this assumption until run sizes and harvest quotas increase substantially. One thing we observed as we increased the proportion of higher value tags was an increase in the number of people actively seeking those tags during activities other than fishing. In 2021 we again received tags returned by a few people who intentionally searched for them by scouring riverbanks or diving pools below heavily spawned areas of the river. These tags do provide us with some spawning distribution information, but they are not used for the estimation purposes for which reward tags are intended.

Our goal is to trap and tag 5 – 10% of target run at each weir. In 2021 we sampled 19.3% of the estimated spring Chinook Salmon run at JCW. In our second year at the new WCW Kimtu site, we improved from 0.6% trap efficiency in 2020 to 13.7% of the estimated fall Chinook Salmon run in 2021. Water levels (elevated flows) largely dictate when we can trap at either weir, but in 2021 we also lost trapping nights to forest fire evacuations. As mentioned before, JCW was out of commission for three weeks (JWs 32-34) due to fire and for two weeks (JWs 36-37) due to high flows. Willow Creek weir was in the water but not trapping due to fire when flows increased and damaged the weir with woody debris, causing missed trapping JW 35-36. Trapping ended for the season after high flows caused weir damage at end of JW 42. Flows did not recede enough at WCW to allow any further trapping for the season, causing us to miss the tail end of the Coho Salmon run and much of the steelhead run, both of which we sampled at an estimated 4-5%.

4.2 Spring Chinook Salmon

Results from the 2021 mark-recapture study indicate an estimated adult escapement of 4,625 (80% higher than the previous year), but all those gains were HOR fish. The 5,550 total run-size was 36.4% of the 42-year average and the contribution of NOR adults to total adults in the escapement dropped from 21% last year to the lowest since 2002 at 14%. The TRRP annual escapement goal of 6,000 NOR adult spring Chinook inched back its all-time low of 8.9% last year to 11.2% this year (Figure 19).

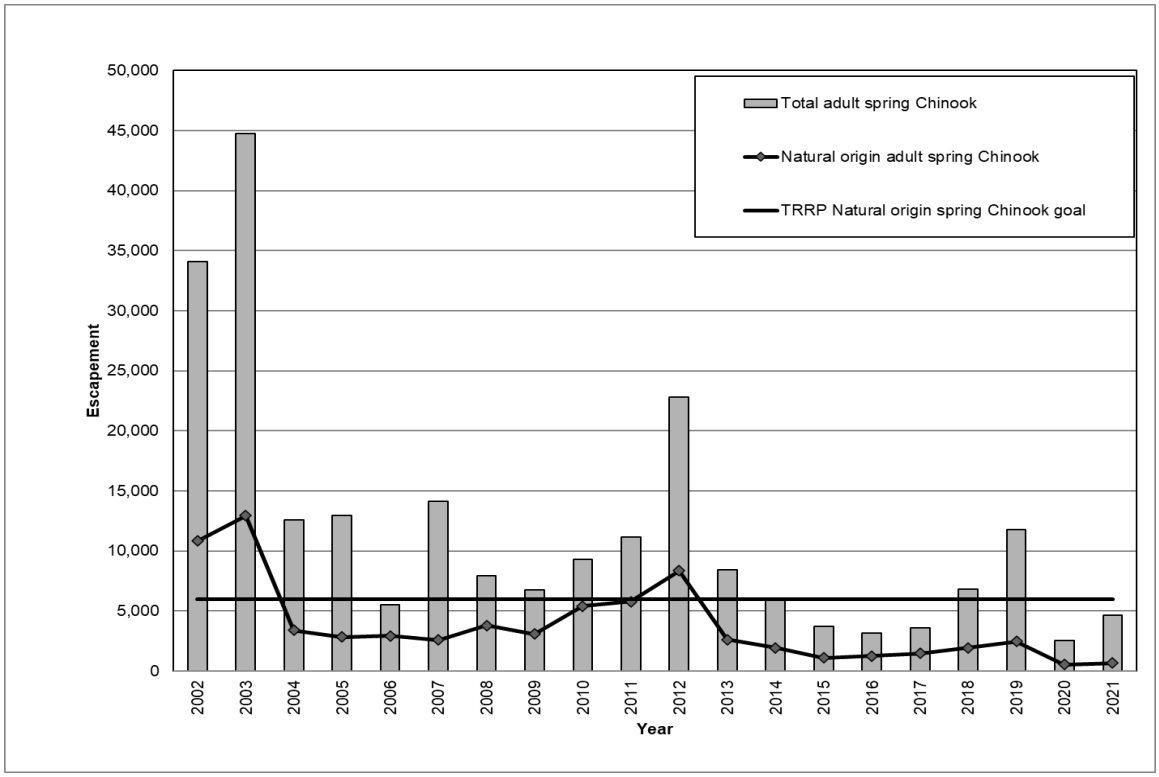


Figure 20. Total adult escapement, and escapement of natural-origin spring Chinook Salmon to the Trinity River upstream of Junction City weir, 2002-2021.

Prince, et al. (2017) found spring Chinook Salmon to be genetically distinct from their fall counterparts, and the Karuk Tribe and the Salmon River Restoration Council petitioned NOAA Fisheries to list them as their own Evolutionarily Significant Unit (ESU) under the Federal Endangered Species Act. After much anticipation, NOAA Fisheries determined in 2021 that Southern Oregon Northern California Coastal (SONCC) spring-run Chinook Salmon (which include those in the Klamath/Trinity basin) do not qualify for their own ESU (NMFS 2021). The CA Fish and Game Commission, however, voted to list Klamath-Trinity River spring Chinook Salmon as a threatened species under the California Endangered Species Act with the Notice of Findings in December 2021 (FGC 2021). The Commission still allows the harvest of these fish at this time.

4.3. Fall Chinook Salmon

The 2021 fall Chinook Salmon run-size of 22,623 was ranked 31st of the 45-year period of record and is 57.3% of the average run-size of 39,453 across those years. The 2021 escapement of 5,496 NOR adult fall Chinook returning to the Trinity basin is well below the 62,000 TRRP goal (Figure 21).

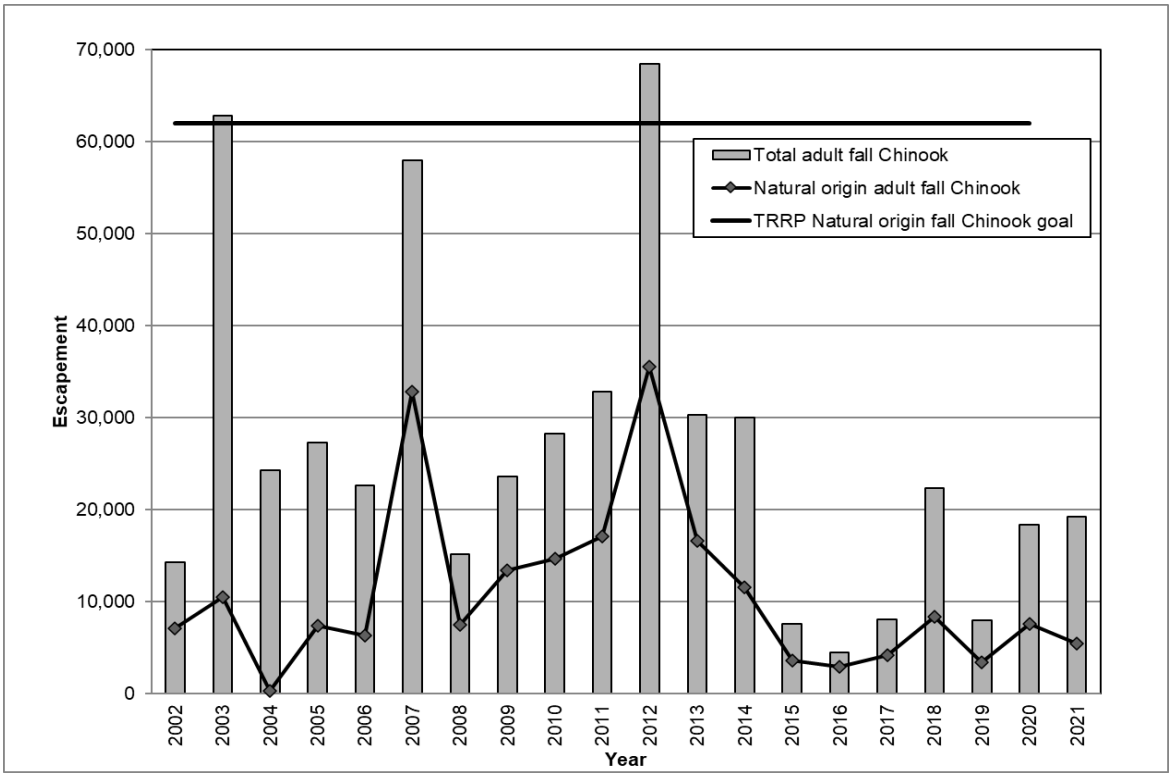


Figure 21. Total adult escapement, and escapement of natural-origin fall Chinook Salmon to the Trinity River upstream of Willow Creek weir, 2002-2021.

Estimating the portion of unmarked HOR jack (2019 BY) in the total jack component of the Chinook run this year was fairly straightforward, but as they will be lumped in the adult category with two other age classes next year, we may have to come up with a new method to follow that BY class through its three additional years of returns.

The HVT operated their harvest weir downstream of WCW in 2021 and reported a tribal harvest (including gill net and hook and line) of nearly 3,100 fall Chinook Salmon to the Pacific Fishery Management Council (KRTT 2022).

4.4. Coho Salmon

The 2021 run-size estimate of Coho Salmon above WCW of 4,694 was 31.7% of the average run of 14,794 and the 35th lowest in the 45-year record (Figure 22), but it is also the largest run size since 2014. Adult Coho comprised 93% of the estimated run this year, after 59.0% of the estimated run were jacks in 2020. Natural origin adults made up only 4.5% of the estimated total run which was 14.9% of the TRRP goal of 1,400.

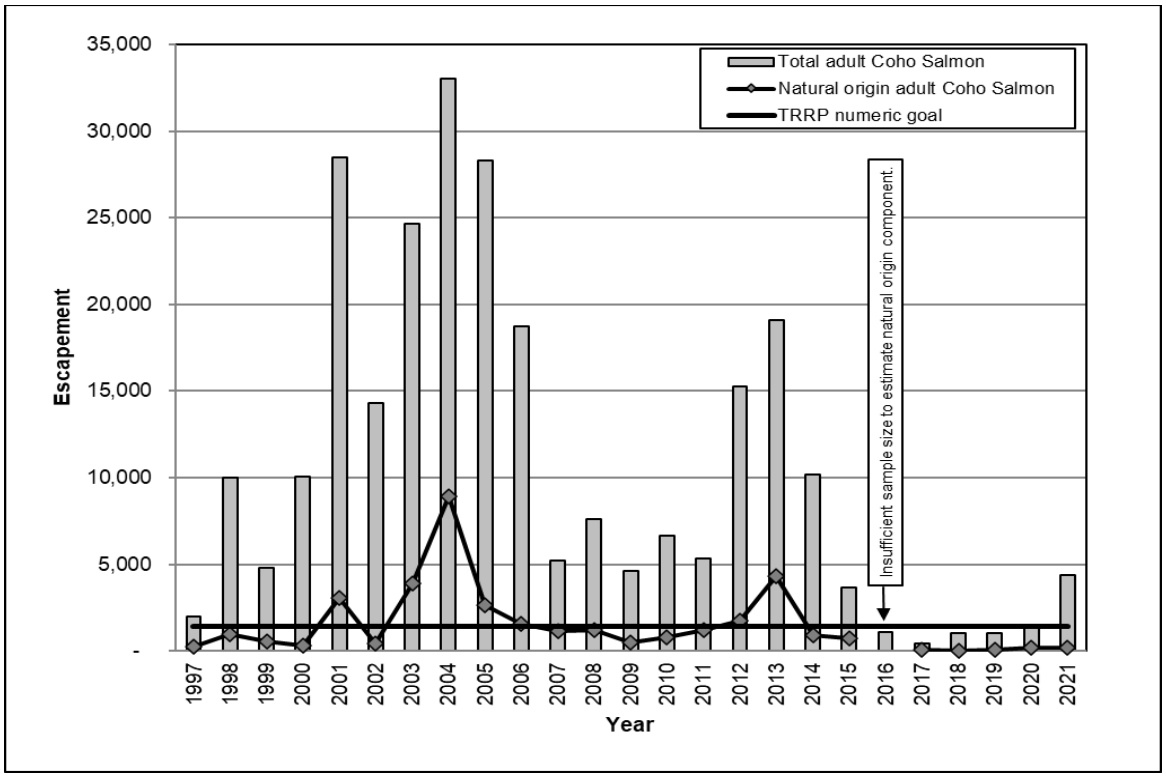


Figure 22. Total adult escapement, and escapement of natural-origin Coho Salmon to the Trinity River upstream of Willow Creek weir, 1997-2021.

In late 2014, under EPIC v. Lehr, et al (2014), production of Coho Salmon at TRH was reduced from 500,000 to 300,000 until an HGMP could be adopted. That plan (CDFW 2017) was submitted in 2017 and recently approved by NOAA Fisheries. A biological opinion (NMFS 2020) “4d Limit for Trinity River Coho Salmon HGMP” has been issued. Part of the implementation of the HGMP is the removal of Coho Salmon, both HOR and NOR, from the river to be used for broodstock at TRH. This year was the pilot year of that project. Operationally it meant JCW remained trapping through the Coho Salmon run (it has traditionally been removed at the end of September), and that fish identified as potential broodstock were placed in an in-river holding pen at JCW and trucked by YTF to TRH. This practice will occur for the foreseeable future. Coho Salmon production goals at TRH may change depending on the success or failure to meet the goals of the HGMP.

4.5 Adult Fall Steelhead

The 2021 run-size estimate for adult fall steelhead of 7,029 is ranked 25th over the 38-year period of record and is 52.1% of the average run-size of 13,495. The 2021 total escapement of 6,839 adult steelhead was comprised of 45.2% NOR fish (Figure 23), just above the average of 44.7%, but only 7.7% of the 40,000 fish TRRP goal.

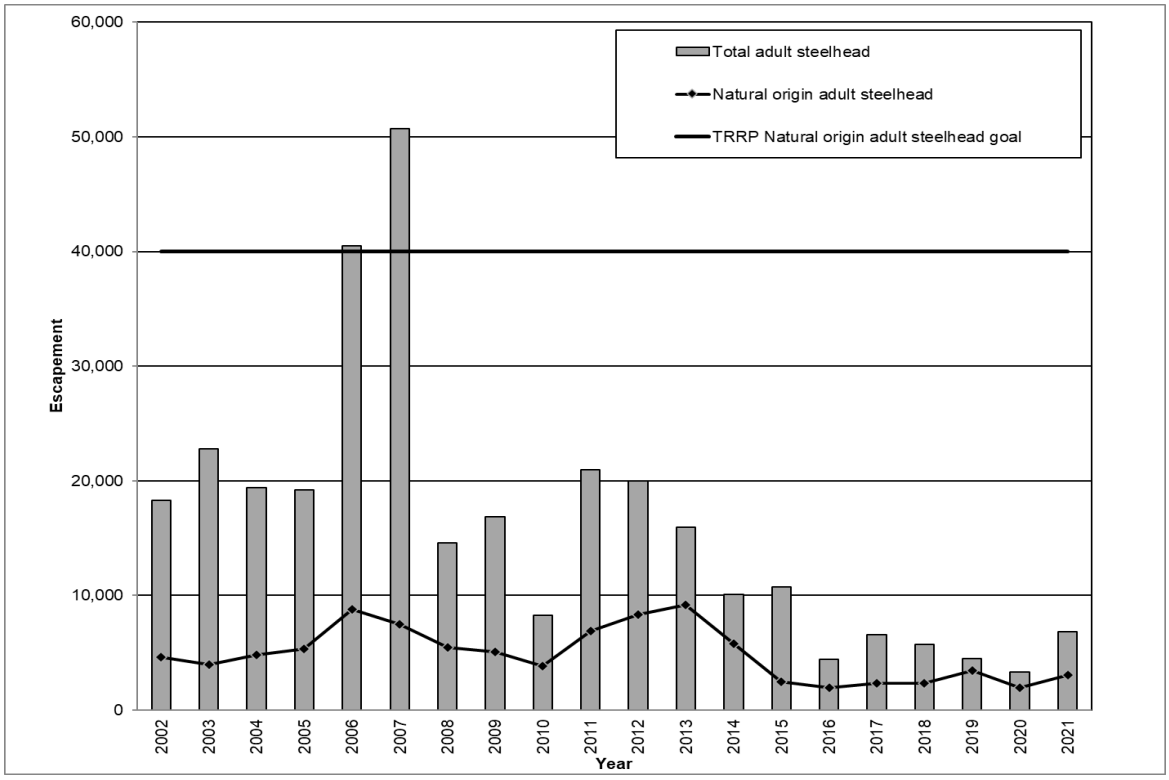


Figure 23. Total adult escapement, and escapement of natural-origin steelhead to the Trinity River upstream of Willow Creek weir, 2002-2021.

The lawsuit and consent decree that curtailed production of Coho Salmon at TRH also mandated production of steelhead be reduced from 800,000 to no more than 448,000 and imposed limitations on the timing of smolt release. Hatchery-origin fish generally make up a large proportion of populations of steelhead and Coho Salmon in the Trinity River. Consequently, these reductions in hatchery production were expected to have a large effect on total returns for these species, which makes it impossible to associate the recent decline in population size solely to recent changes in environmental conditions such as persistent drought or poor ocean conditions.

Recreational harvest has been limited to hatchery-origin steelhead since 1998. Pre-1998 harvest rates on steelhead averaged 13.4% but has since dropped to 3.2%. While the catch-and-release fishery continues to be more popular than harvest among steelhead anglers, fewer hatchery-origin steelhead in the river translates to less harvest opportunity to recreational anglers.

5. RECOMMENDATIONS

- Run-size and escapement estimates of NOR and HOR spring and fall Chinook Salmon, Coho Salmon, and adult fall steelhead in the Trinity River basin should be continued on an annual basis to maintain short- and long-term baselines which help assess TRRP objectives and inform adaptive management decision making.

- Management and operations of the TRRP and TRH should be coordinated to ensure that objectives for natural fish production and hatchery management goals are synchronized across restoration and mitigation programs.

6. REFERENCES

Beamish, R.J., B.E. Riddell, K.L. Lange, E. Farley Jr., S. Kang, T. Nagasawa, V. Radchenko, O. Temnykh, and S. Urawa. 2009. The effects of climate change on Pacific salmon – A summary of published literature. North Pacific Anadromous Fish Commission. www.npafc.org. 11 pp.

Bradford, M. and D. Hankin. 2012. Trinity River Restoration Program (TRRP) adult salmonid monitoring evaluation. TRRP. Weaverville, CA. 47 pp.

CA Department of Fish and Wildlife (CDFW). 2022a. Klamath River basin fall Chinook Salmon spawner escapement, in-river harvest, and run-size estimates, 1978 – 2021 (aka Fall Chinook mega-table). Klamath/Trinity Program. CA Dept. Fish and Wildlife. Arcata, CA. 18 pp.

CA Department of Fish and Wildlife (CDFW). 2022b. Klamath River basin spring Chinook Salmon spawner escapement, in-river harvest, and run-size estimates, 1980 – 2021 (aka spring Chinook mega-table). Klamath/Trinity Program. CA Dept. Fish and Wildlife. Arcata, CA. 17 pp.

CA Department of Fish and Wildlife (CDFW). 2017. Hatchery and genetics management plan for Trinity River Hatchery Coho Salmon. Prepared for National Oceanic and Atmospheric Administration – National Marine Fisheries Service, in cooperation with Bureau of Reclamation. Redding, CA. 117 pp.

CA Fish and Game Commission (FGC). 2021. Notice of Findings – Listing as Threatened is Warranted (December 2021) Upper Klamath-Trinity River Spring Chinook Salmon https://fgc.ca.gov/CESA#uktrscs

Chapman, D. G. 1948. A mathematical study of confidence of salmon populations calculated from sample tag ratios. Int. Pac. Sal. Fish. Comm. Bull. 2:69-85.

Environmental Protection Information Center (EPIC) v. Lehr, et al. 2014. 13-02293-MMC. US District Court, Northern District. San Francisco Division.

Hankin, D. 2001. A preliminary evaluation of the performance of methods used to estimate spawning escapement of Chinook Salmon in the Trinity River. Contract Agreement #000203 between the Hoopa Valley Tribal Fisheries Department and the Humboldt State University Foundation.

Heubach, B., M. Lau, and E. Miller. 1992. Annual run-size, angler harvest, and spawner escapement of Chinook and Coho Salmon in the Trinity River basin. Job IV. Pages 93-104 *in* K. Urquhart and R. Carpenter, editors. Annual report of the Trinity River Basin Salmon and Steelhead Monitoring Project, 1990-91 season.

Kier, MC, J. Hileman, and K. Lindke. 2021. Chinook and Coho Salmon and fall-run steelhead run-size estimates using mark-recapture methods; 2019-20 season. Final annual report of the CA Dept. Fish and Wildlife, Trinity River Basin Salmon and Steelhead Monitoring Project. 118 pp.

Kier, MC, J. Hileman, and K. Lindke. 2020. Chinook and Coho Salmon and fall-run steelhead run-size estimates using mark-recapture methods; 2018-19 season. Final annual report of the CA Dept. Fish and Wildlife, Trinity River Basin Salmon and Steelhead Monitoring Project. 117 pp.

Kier, MC, J. Hileman, and K. Lindke. 2019. Chinook and Coho Salmon and fall-run steelhead run-size estimates using mark-recapture methods; 2017-18 season. Final annual report of the CA Dept. Fish and Wildlife, Trinity River Basin Salmon and Steelhead Monitoring Project. 99 pp.

Kier, MC, and J. Hileman. 2016. Chinook and Coho Salmon and fall-run steelhead run-size estimates using mark-recapture methods; 2015-16 season. Final annual report of the CA Dept. Fish and Wildlife, Trinity River Basin Salmon and Steelhead Monitoring Project. 96 pp.

Klamath River Technical Team (KRTT). 2022. Klamath River fall Chinook Salmon age-specific escapement, river harvest and run-size estimate, 2021 run. 27 pp.

National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS). 2021. Listing Endangered and Threatened Wildlife; 12-Month Findings on Petitions to List Spring-Run Oregon Coast Chinook Salmon and Spring-Run Southern Oregon and Northern California Coastal Chinook Salmon as Threatened or Endangered Under the Endangered Species Act (83 FR 45970, 08/17/2021). Accessed at: https://www.federalregister.gov/documents/2021/08/17/2021-17211/listing-endangered-and-threatened-wildlife-12-month-findings-on-petitions-to-list-spring-run-oregon

National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS). 2020. Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response. 4d Limit for Trinity River Coho Salmon Hatchery and Genetic Management Plan. NMFS Consultation Number: WCRO-2019-03414. https://govtribe.com/file/government-file/c05-attachment-2-esa-section-7a2-biological-opinion-06-11-20-dot-pdf

Pacific Fishery Management Council (PFMC). 2021. Preseason Report I: Stock abundance analysis and environmental assessment Part I for 2021 Ocean Salmon Fishery Regulations. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 101, Portland, Oregon 97220-1384.

Prince, D.J, S. M. O'Rourke, T. Q. Thompson, O. A. Ali, H. S. Lyman, I. K. Saglam, T. J. Hotaling, A. P. Spidle, and M. R. Miller. 2017. The evolutionary basis of premature migration in Pacific salmon highlights the utility of genomics for informing conservation. Sci. Adv. 3, e1603198.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Bull. Fish. Res. Bd. Can. No. 191.

Strange, J. 2008. Adult Chinook Salmon migration in the Klamath River Basin: 2007 Biotelemetry Monitoring Study, Final Report. Yurok Tribal Fisheries Program.

Trinity River Restoration Program (TRRP), ESSA Technologies Ltd. 2009. Integrated Assessment Plan, Version 1.0 – September 2009. Draft report prepared for the Trinity River Restoration Program. Weaverville, CA. 285 pp.

United States Fish and Wildlife Service (USFWS). 2021. URL: Trinity River mainstem redd survey update, 2021 Summary. Potentially available at https://www.fws.gov/library/collections/arcata-fac-salmon-spawning-survey-data-klamath-and-trinity-rivers

United States Department of the Interior (Interior). 2000. Record of Decision. Trinity River Mainstem Fishery Restoration Final Environmental Impact Statement/ Environmental Impact Report. December 2000. 43 pp.

United States Office of the Federal Register (USOFR). 2020. Volume 85, Issue 200 (October 15, 2020). 85 FR 65390. Notice of availability of the Final Environmental Assessment and Finding of No Significant Impact associated with the Trinity River Hatchery and Genetic Management Plan for Southern Oregon Northern California Coast coho Salmon hatchery production.

7. APPENDICES

Appendix 1. List of Julian weeks and their calendar date equivalents.

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

* Eight-day Julian week only during leap years

**Eight-day Julian week every year

Appendix 2. Estimation of age-2 Trinity River hatchery-origin abundances in the absence of coded-wire tag recoveries (from KRTT (2022), Appendix G, page 21).

Fall Chinook Salmon reared at and released from Trinity River hatchery are marked by the removal of the adipose fin and implanted with coded wire tags at an approximate 25% rate annually for subsequent recovery in fisheries, freshwater escapement, and in hatchery returns. Tag recoveries are used to estimate the age-specific number of hatchery-origin fish in each recovery sector. No Chinook Salmon from brood year 2019 were marked or tagged at Trinity River hatchery due to travel and physical distancing limitations associated with the COVID-19 global pandemic. Consequently, Trinity River hatchery origin (TRH-origin) age-2 fish caught in ocean fisheries and returning to the Klamath River basin in 2021 were indistinguishable from natural-origin fish, and hatchery contributions to this age class could not be estimated using established methods. Accurate estimates of hatchery contributions to age classes 2-4 are necessary for estimation of fishery impact rates on hatchery and natural-origin stocks in ocean and terminal fisheries via cohort reconstructions. These estimates are also relevant to future fishery planning using the Klamath Ocean Harvest Model.

Estimation of the TRH-origin contribution to age-2 harvest or escapement in each relevant sector was estimated for the 2021 run year by multiplying the long-term un-weighted average proportion of TRH-origin fish among the total within each sector by the estimated total age-2 numbers within the same sector. Specifically, the number of age-2 TRH-origin fish within a given sector was estimated as:

$$TRH_{2021} = \tau_{2021} * \frac{\sum_{i=1}^{n} {TRH_i}/{\tau_i}}{n}$$

Where

$TRH_i =$ number of age-2 TRH-origin fall Chinook Salmon estimated within a given sector in year i,

$\tau_i =$ total number of age-2 fall Chinook Salmon estimated within a given sector in year i, irrespective of origin (hatchery or natural), and

$n =$ number of years for which estimates of TRH_i and τ_i were available from 2001 to 2019.

Members of the Klamath River Technical Team (KRTT) agreed on the simplifying assumption that no age-2 TRH-origin fish strayed to natural spawning areas in the Klamath River or its tributaries (excluding the Trinity River), Iron Gate hatchery, or to rivers outside the Klamath basin. Consequently, age-2 TRH-origin fish were estimated only for the six sectors summarized in Table 1. The quantities TRH_i for fishery sectors were derived from the Klamath cohort reconstruction input table kohminland.dbf, and quantities τ_i were obtained from historic KRTT reports. These data were available starting in the 2001 run year. The quantities TRH_i and τ_i for Trinity River natural area escapement and returns to Trinity River hatchery were obtained from the 2020 CDFW

annual run size report (Kier et al. 2021). These data were available starting in the 2002 run year. Run year 2020 was excluded from all analyses because the proportion of TRH-origin fish was a considerable outlier in several sectors. For example, more than 80% of age-2 harvest in the lower Klamath River recreational fishery was estimated to be TRH-origin in 2020, whereas the next highest percent since 2001 was less than 24% (Figure 1). All data points shown in Figure 1 were used to calculate the values presented in Table 1.

Table 1. Mean proportions of age-2 Trinity River hatchery-origin fish among total age-2 fish in six sectors of harvest or escapement in the Klamath River basin based on data from 2001 (fishery sectors) or 2002 (escapement sectors) to 2019.

Sector		Proportion TRH
lower Klamath River	recreational fishery	0.040
	tribal fishery	0.030
Trinity River	recreational fishery	0.125
	tribal fishery	0.029
	natural area escapement	0.164
	hatchery escapement	0.845

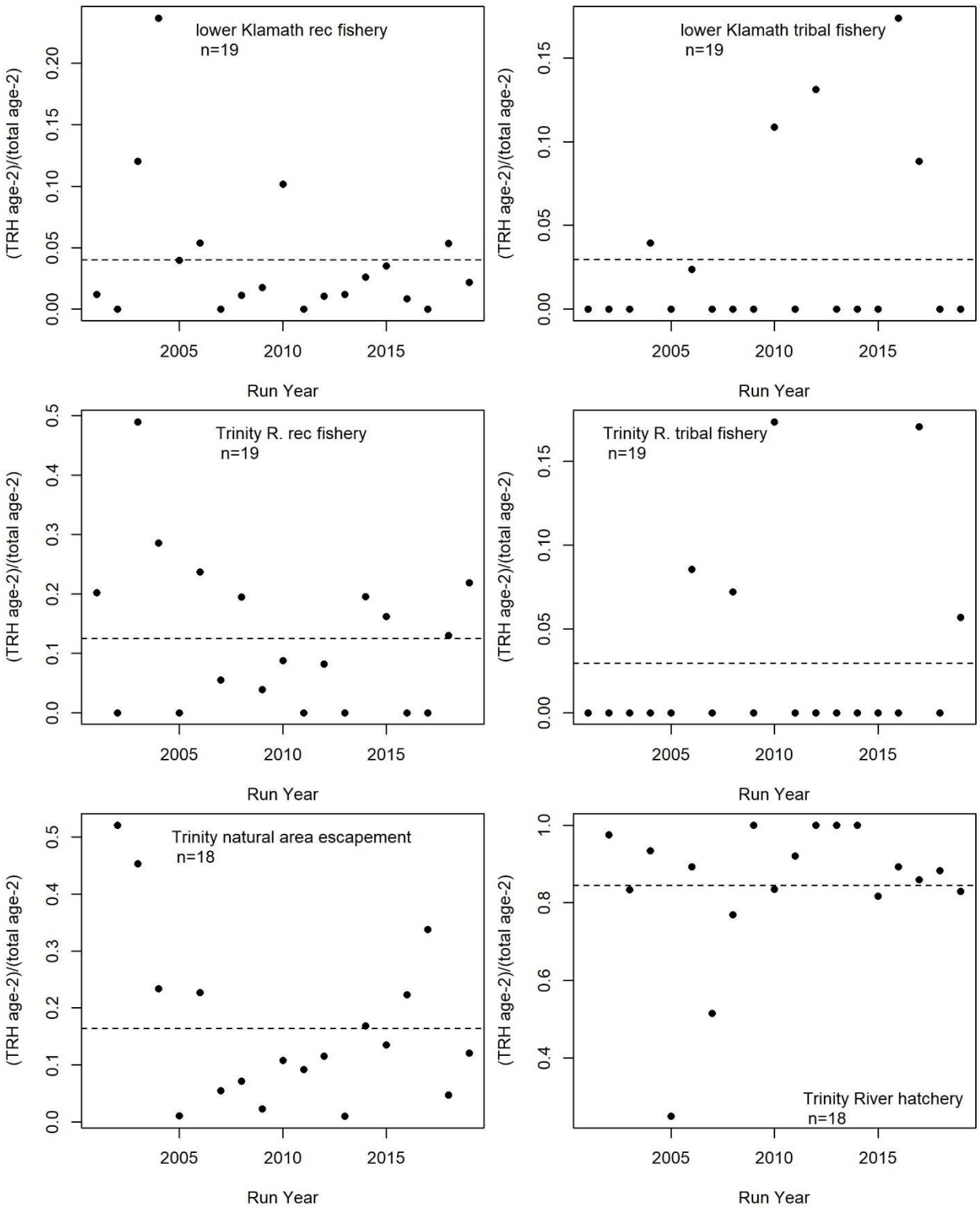


Figure 1. Time series of the proportion of age-2 Trinity River hatchery-origin fall Chinook Salmon among total age-2 fall Chinook Salmon in various harvest and escapement sectors in the Klamath River basin. Sample sizes (n) and estimated mean proportions (dashed lines) are shown for each sector.

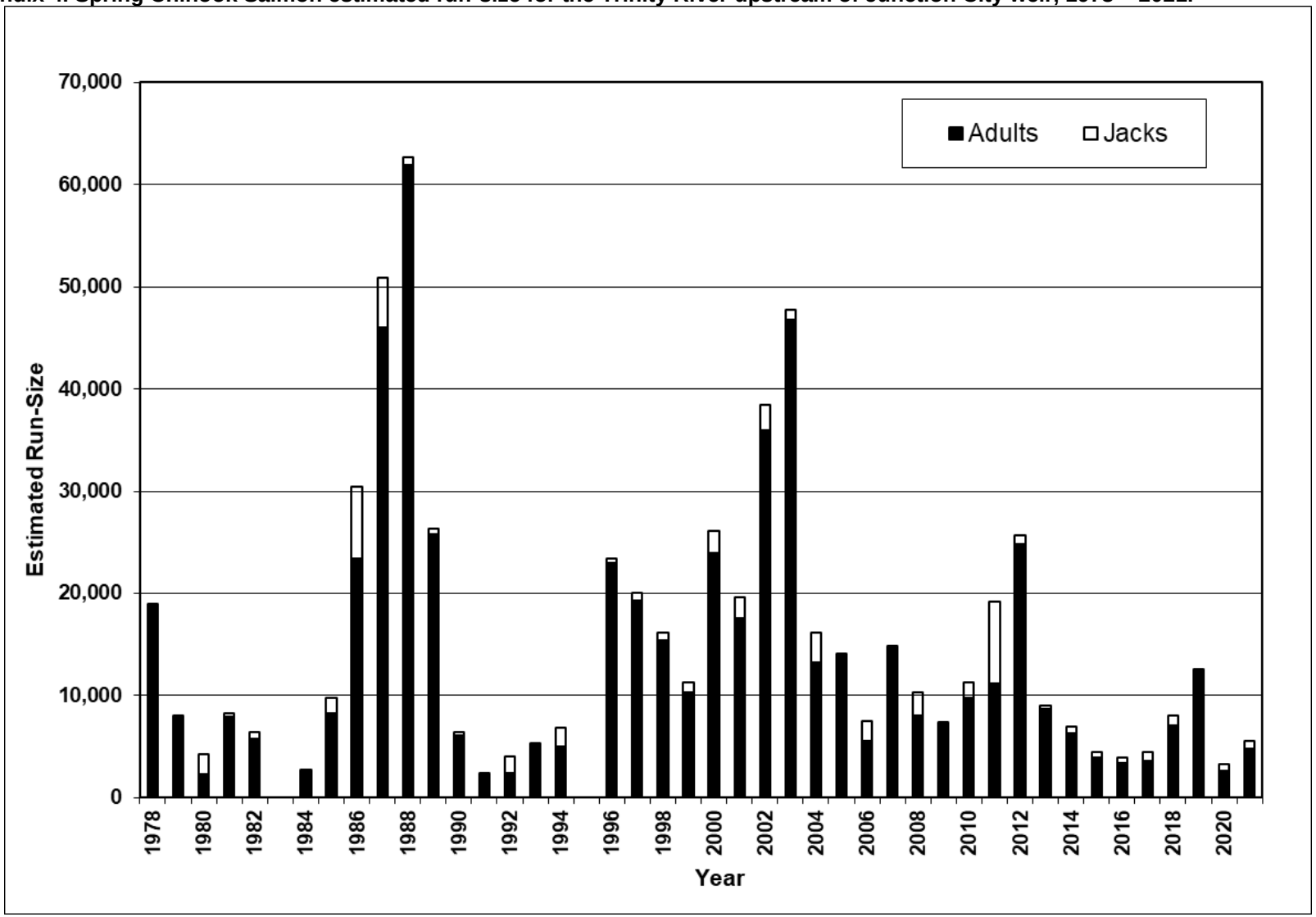
Appendix 3. Spring Chinook Salmon run-size, spawner escapement, and angler harvest estimates for the Trinity River upstream of Junction City weir, 1978 – 2021.

	Run-size estimate					Spawner escapements						Angler harvest			
						Natural Area Spawners [a]			Trinity River Hatchery						
	Jacks [b]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total	
Year	Number	%	Number	%											
1977	no estimates					no estimates			385	1,124	1,509	no estimates			
1978	190	1.0	18,816	99.0	19,006	29	14,384	14,413	153	3,680	3,833	8	752	760	c/
1979	113	1.4	7,964	98.6	8,077	0	5,008	5,008	113	1,658	1,771	0	1,298	1,298	
1980	1,949	45.9	2,301	54.1	4,250	1,312	1,614	2,926	353	547	900	284	140	424	
1981	347	4.2	7,913	95.8	8,260	242	3,362	3,604	95	2,405	2,500	10	2,146	2,156	
1982	656	10.3	5,731	89.7	6,387	387	3,868	4,255	150	1,226	1,376	119	637	756	
1983	no estimates					no estimates			385	930	1,315	no estimates			
1984	255	9.4	2,465	90.6	2,720	140	1,354	1,494	76	736	812	39	375	414	
1985	1,434	14.8	8,278	85.2	9,712	799	4,897	5,696	508	2,645	3,153	127	736	863	d/
1986	7,018	23.1	23,403	76.9	30,421	4,335	13,371	17,706	1,461	7,083	8,544	1,222	2,949	4,171	
1987	4,858	9.5	46,016	90.5	50,874	2,577	29,083	31,660	1,387	8,466	9,853	894	8,467	9,361	
1988	720	1.1	61,972	98.9	62,692	241	39,329	39,570	377	13,905	14,282	102	8,738	8,840	
1989	502	1.9	25,804	98.1	26,306	435	18,241	18,676	17	4,983	5,000	50	2,580	2,630	
1990	265	4.1	6,123	95.9	6,388	126	2,880	3,006	104	2,433	2,537	35	810	845	
1991	190	8.0	2,191	92.0	2,381	92	1,268	1,360	71	614	685	27	309	336	
1992	1,671	41.5	2,359	58.5	4,030	944	942	1,886	533	1,313	1,846	194	104	298	d/
1993	68	1.3	5,164	98.7	5,232	37	2,111	2,148	31	2,630	2,661	0	423	423	d/
1994	1,793	26.4	4,995	73.6	6,788	550	2,897	3,447	944	1,943	2,887	299	155	454	d/
1995	no estimates					no estimates			385	8,722	9,107	no estimates			
1996	489	2.1	22,927	97.9	23,416	370	16,283	16,653	119	5,131	5,250	0	1,513	1,513	d/
1997	768	3.8	19,271	96.2	20,039	543	13,049	13,592	225	4,892	5,117	0	1,330	1,330	d/
1998	802	5.0	15,365	95.0	16,167	567	9,057	9,624	184	4,679	4,863	51	1,629	1,680	d/
1999	1,028	9.1	10,265	90.9	11,293	440	5,968	6,408	547	3,671	4,218	41	626	667	d/
2000	2,159	8.3	23,923	91.7	26,082	1,264	10,846	12,110	571	11,594	12,165	324	1,483	1,807	d/
2001	2,065	10.5	17,556	89.5	19,621	1,178	10,284	11,462	629	6,366	6,995	258	906	1,164	d/
2002	2,575	6.7	35,910	93.3	38,485	1,883	23,674	25,557	617	10,440	11,057	75	1,796	1,871	d/
2003	1,039	2.2	46,756	97.8	47,795	909	30,211	31,120	130	14,512	14,642	0	2,033	2,033	d/

	Run-size estimate					Spawner escapements						Angler harvest			
						Natural Area Spawners [a]			Trinity River Hatchery						
	Jacks [b]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total	
Year	Number	%	Number	%											
2004	2,929	18.1	13,218	81.9	16,147	1,708	7,314	9,022	985	5,251	6,236	236	653	889	d/
2005	55	0.4	13,929	99.6	13,984	30	6,003	6,033	25	6,966	6,991	0	961	961	d/
2006	1,963	26.2	5,520	73.8	7,483	1,127	2,955	4,082	819	2,565	3,384	17	0	17	d/
2007	135	0.9	14,700	99.1	14,835	80	8,154	8,234	55	5,981	6,036	0	565	565	d/
2008	2,218	21.6	8,065	78.4	10,283	1,741	4,470	6,211	329	3,437	3,766	148	158	306	d/
2009	260	3.5	7,166	96.5	7,426	191	3,724	3,915	69	3,000	3,069	0	442	442	d/
2010	1,554	13.8	9,731	86.2	11,285	1,309	6,810	8,119	245	2,457	2,702	0	463	463	d/
2011	8,087	42.1	11,132	57.9	19,219	5,217	7,309	12,526	2,758	3,823	6,581	112	0	112	d/
2012	813	3.2	24,804	96.8	25,617	542	16,117	16,659	109	6,712	6,821	163	1,976	2,139	d/
2013	281	3.1	8,680	96.9	8,961	185	5,956	6,141	96	2,482	2,578	0	243	243	d/
2014	660	9.5	6,298	90.5	6,958	282	2,833	3,115	362	3,255	3,617	16	210	226	d/
2015	490	11.1	3,918	88.9	4,408	250	1,980	2,230	240	1,748	1,988	0	190	190	d/
2016	545	14.0	3,359	86.0	3,904	250	1,331	1,581	277	1,830	2,107	18	198	216	d/
2017	802	18.1	3,623	81.9	4,425	481	2,459	2,940	246	1,134	1,380	75	29	104	d/
2018	927	11.5	7,105	88.5	8,032	507	4,352	4,859	420	2,488	2,908	0	265	265	d/
2019	246	2.0	12,366	98.0	12,612	161	7,344	7,505	68	4,410	4,478	17	612	629	d/
2020	709	21.4	2,600	78.6	3,309	336	1,567	1,903	303	957	1,260	69	76	145	d/
2021	778	14.0	4,772	86.0	5,550	471	2,927	3,398	307	1,698	2,005	0	147	147	d/

a/ Natural area spawners includes both natural origin and hatchery origin fish that spawn in areas outside Trinity River Hatchery.
b/ Jacks are two-year-old salmon, adults are three years old or older.
c/ The 1978 sport harvest of spring Chinook Salmon was limited by a salmon fishing closure beginning August 25, 1978.
d/ The sport harvest of adult spring Chinook Salmon was subject to seasonal and size limit restrictions.

Appendix 4. Spring Chinook Salmon estimated run-size for the Trinity River upstream of Junction City weir, 1978 – 2021.



Note: No estimate in 1983 or 1995 due to lack of funding.

Appendix 5. Spring Chinook Salmon run-size, spawner escapement, and angler harvest estimates for the Trinity River upstream of Junction City weir, 2002 – 2021, showing natural- and Trinity River Hatchery-origin composition.

	Run-size estimate					Spawner escapement						Angler harvest [c]		
						Natural Area Spawners [b]			Trinity River Hatchery					
	Jacks [a]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total
Year / Origin	Number	Percent	Number	Percent										
2002 NATURAL	1,238	10%	11,398	90%	12,636	1,109	10,097	11,206	87	722	809	41	579	620
2002 TRH	1,337	5%	24,512	95%	25,849	774	13,577	14,351	530	9,718	10,248	34	1,217	1,251
2002 TOTAL	**2,575**	**7%**	**35,910**	**93%**	**38,485**	**1,883**	**23,674**	**25,557**	**617**	**10,440**	**11,057**	**75**	**1,796**	**1,871**
2003 NATURAL	740	5%	13,509	95%	14,249	729	11,490	12,219	11	1,432	1,443	0	587	587
2003 TRH	299	1%	33,247	99%	33,546	180	18,721	18,901	119	13,080	13,199	0	1,446	1,446
2003 TOTAL	**1,039**	**2%**	**46,756**	**98%**	**47,795**	**909**	**30,211**	**31,120**	**130**	**14,512**	**14,642**	**0**	**2,033**	**2,033**
2004 NATURAL	1,266	26%	3,556	74%	4,822	1,009	2,966	3,975	154	410	564	103	180	283
2004 TRH	1,663	15%	9,662	85%	11,325	699	4,348	5,047	831	4,841	5,672	133	473	606
2004 TOTAL	**2,929**	**18%**	**13,218**	**82%**	**16,147**	**1,708**	**7,314**	**9,022**	**985**	**5,251**	**6,236**	**236**	**653**	**889**
2005 NATURAL	-14	0%	3,032	100%	3,018	-2	2,028	2,026	-11	799	788	0	206	206
2005 TRH	69	1%	10,897	99%	10,966	32	3,975	4,007	36	6,167	6,203	0	755	755
2005 TOTAL	**55**	**0%**	**13,929**	**100%**	**13,984**	**30**	**6,003**	**6,033**	**25**	**6,966**	**6,991**	**0**	**961**	**961**
2006 NATURAL	914	24%	2,911	76%	3,825	792	2,418	3,210	114	494	608	8	0	8
2006 TRH	1,049	29%	2,609	71%	3,658	335	537	872	705	2,071	2,776	9	0	9
2006 TOTAL	**1,963**	**26%**	**5,520**	**74%**	**7,483**	**1,127**	**2,955**	**4,082**	**819**	**2,565**	**3,384**	**17**	**0**	**17**
2007 NATURAL	56	2%	2,680	98%	2,736	67	1,705	1,772	-11	862	851	0	113	113
2007 TRH	79	1%	12,020	99%	12,099	13	6,449	6,462	66	5,119	5,185	0	452	452
2007 TOTAL	**135**	**1%**	**14,700**	**99%**	**14,835**	**80**	**8,154**	**8,234**	**55**	**5,981**	**6,036**	**0**	**565**	**565**
2008 NATURAL	1,846	32%	3,860	68%	5,706	1,614	3,210	4,824	108	571	679	123	79	202
2008 TRH	372	8%	4,205	92%	4,577	127	1,260	1,387	221	2,866	3,087	25	79	104
2008 TOTAL	**2,218**	**22%**	**8,065**	**78%**	**10,283**	**1,741**	**4,470**	**6,211**	**329**	**3,437**	**3,766**	**148**	**158**	**306**
2009 NATURAL	175	5%	3,278	95%	3,453	155	2,672	2,827	20	404	424	0	202	202
2009 TRH	85	2%	3,888	98%	3,973	36	1,052	1,088	49	2,596	2,645	0	240	240
2009 TOTAL	**260**	**4%**	**7,166**	**96%**	**7,426**	**191**	**3,724**	**3,915**	**69**	**3,000**	**3,069**	**0**	**442**	**442**

	Run-size estimate					Spawner escapement						Angler harvest [c]		
						Natural Area Spawners [b]			Trinity River Hatchery					
	Jacks [a]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total
Year / Origin	Number	Percent	Number	Percent										
2010 NATURAL	1,020	15%	5,756	85%	6,776	959	5,066	6,025	61	321	382	0	368	368
2010 TRH	534	12%	3,975	88%	4,509	350	1,744	2,094	184	2,136	2,320	0	95	95
2010 TOTAL	**1,554**	**14%**	**9,731**	**86%**	**11,285**	**1,309**	**6,810**	**8,119**	**245**	**2,457**	**2,702**	**0**	**463**	**463**
2011 NATURAL	3,592	38%	5,781	62%	9,373	3,350	5,577	8,927	193	204	397	50	0	50
2011 TRH	4,495	46%	5,351	54%	9,846	1,867	1,732	3,599	2,565	3,619	6,184	62	0	62
2011 TOTAL	**8,087**	**42%**	**11,132**	**58%**	**19,219**	**5,217**	**7,309**	**12,526**	**2,758**	**3,823**	**6,581**	**112**	**0**	**112**
2012 NATURAL	251	3%	9,060	97%	9,311	116	7,569	7,685	31	788	819	105	703	808
2012 TRH	562	3%	15,744	97%	16,306	426	8,548	8,974	78	5,924	6,002	58	1,273	1,331
2012 TOTAL	**813**	**3%**	**24,804**	**97%**	**25,617**	**542**	**16,117**	**16,659**	**109**	**6,712**	**6,821**	**163**	**1,976**	**2,139**
2013 NATURAL	146	5%	2,669	95%	2,815	127	2,487	2,614	19	116	135	0	67	67
2013 TRH	135	2%	6,011	98%	6,146	58	3,469	3,527	77	2,366	2,443	0	176	176
2013 TOTAL	**281**	**3%**	**8,680**	**97%**	**8,961**	**185**	**5,956**	**6,141**	**96**	**2,482**	**2,578**	**0**	**243**	**243**
2014 NATURAL	132	6%	1,998	94%	2,130	49	1,559	1,608	80	372	452	3	66	211
2014 TRH	528	11%	4,300	89%	4,828	233	1,274	1,507	282	2,883	3,165	13	144	15
2014 TOTAL	**660**	**9%**	**6,298**	**91%**	**6,958**	**282**	**2,833**	**3,115**	**362**	**3,255**	**3,617**	**16**	**210**	**226**
2015 NATURAL	177	13%	1,146	87%	1,323	123	817	940	55	273	327	0	56	56
2015 TRH	313	10%	2,772	90%	3,085	127	1,163	1,290	185	1,475	1,661	0	134	134
2015 TOTAL	**490**	**11%**	**3,918**	**89%**	**4,408**	**250**	**1,980**	**2,230**	**240**	**1,748**	**1,988**	**0**	**190**	**190**
2016 NATURAL	178	12%	1,337	88%	1,515	155	1,168	1,323	17	90	107	6	79	85
2016 TRH	367	15%	2,022	85%	2,389	95	163	258	260	1,740	2,000	12	119	131
2016 TOTAL	**545**	**14%**	**3,359**	**86%**	**3,904**	**250**	**1,331**	**1,581**	**277**	**1,830**	**2,107**	**18**	**198**	**216**
2017 NATURAL	309	17%	1,466	83%	1,775	322	1,429	1,751	-42	25	-17	29	12	41
2017 TRH	493	19%	2,157	81%	2,650	159	1,030	1,189	288	1,109	1,397	46	17	63
2017 TOTAL	**802**	**18%**	**3,623**	**82%**	**4,425**	**481**	**2,459**	**2,940**	**246**	**1,134**	**1,380**	**75**	**29**	**104**

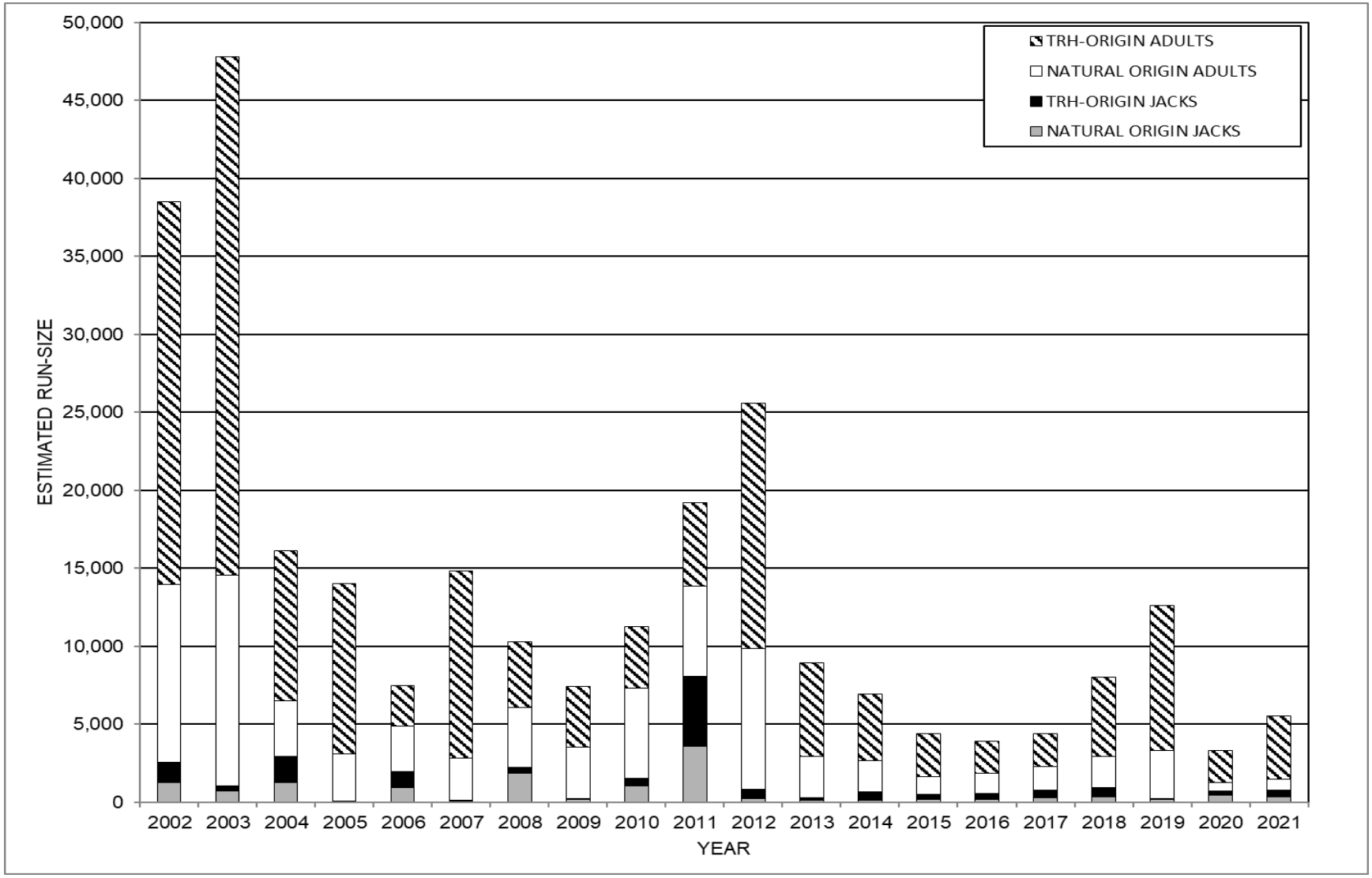
	Run-size estimate					Spawner escapement						Angler harvest [c]		
						Natural Area Spawners [b]			Trinity River Hatchery					
	Jacks [a]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total
Year / Origin	Number	Percent	Number	Percent										
2018 NATURAL	346	15%	2,032	85%	2,378	295	1,650	1,945	51	288	339	0	75	75
2018 TRH	581	10%	5,073	90%	5,654	212	2,702	2,914	369	2,200	2,569	0	190	190
2018 TOTAL	**927**	**12%**	**7,105**	**88%**	**8,032**	**507**	**4,352**	**4,859**	**420**	**2,488**	**2,908**	**0**	**265**	**265**
2019 NATURAL	185	6%	3,061	94%	3,245	153	1,960	2,113	15	488	503	0	127	127.4
2019 TRH	61	1%	9,305	99%	9,367	8	5,384	5,392	53	3,922	3,975	5	485	490
2019 TOTAL	**246**	**2%**	**12,366**	**98%**	**12,612**	**161**	**7,344**	**7,505**	**68**	**4,410**	**4,478**	**17**	**612**	**629**
2020 NATURAL	433	44%	551	56%	985	315	394	709	75	141	216	0	16	16
2020 TRH	276	12%	2,049	88%	2,325	21	1,173	1,194	228	816	1,044	27	60	87
2020 TOTAL	**709**	**21%**	**2,600**	**79%**	**3,309**	**336**	**1,567**	**1,903**	**303**	**957**	**1,260**	**69**	**76**	**145**
2021 NATURAL	334	33%	691	67%	1,025	87	449	736	48	220	267	0	21	21
2021 TRH	444	10%	4,082	90%	4,525	184	2,478	2,662	259	1,478	1,738	0	126	126
2021 TOTAL	**778**	**14%**	**4,772**	**86%**	**5,550**	**471**	**2,927**	**3,398**	**307**	**1,698**	**2,005**	**0**	**147**	**147**

a/ Jacks are two-year-old salmon, adults are three years old or older.

b/ Natural area spawners includes both natural origin and hatchery origin fish that spawn in areas outside Trinity River Hatchery.

c/ The sport harvest of spring Chinook Salmon was subject to seasonal and size limit restrictions.

Appendix 6. Spring Chinook Salmon estimated run-size for the Trinity River upstream of Junction City weir, 2002 – 2021, showing natural-origin and Trinity River Hatchery (TRH)-origin composition.



Appendix 7. Fall Chinook Salmon run-size, spawner escapement, and angler harvest estimates for the Trinity River upstream of Willow Creek weir, 1977 - 2021.

	Run-size estimate					Spawner escapements						Angler harvest			
						Natural Area Spawners [a]			Trinity River Hatchery						
	Jacks [e]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total	
Year	Number	Percent	Number	Percent											
1977	14,318	43.5	18,596	56.5	32,914	9,737	13,501	23,238	2,177	2,035	4,212	2,404	3,060	5,464	
1978	6,037	14.0	37,086	86.0	43,123	4,712	31,052	35,764	1,325	6,034	7,359	Fishing closure		0	b/
1979	5,665	35.0	10,520	65.0	16,185	3,936	8,028	11,964	964	1,335	2,299	765	1,157	1,922	
1980	21,549	62.7	12,797	37.3	34,346	16,837	7,700	24,537	2,256	4,099	6,355	2,456	998	3,454	
1981	8,366	28.6	20,884	71.4	29,250	5,906	15,340	21,246	1,004	2,370	3,374	1,456	3,174	4,630	
1982	14,938	52.2	13,653	47.8	28,591	8,149	9,274	17,423	4,235	2,058	6,293	2,554	2,321	4,875	
1983	1,240	4.7	25,138	95.3	26,378	853	17,284	18,137	271	5,494	5,765	116	2,360	2,476	
1984	4,575	34.8	8,556	65.2	13,131	3,416	5,654	9,070	766	2,166	2,932	393	736	1,129	
1985	53,062	81.6	11,954	18.4	65,016	29,454	9,217	38,671	18,166	2,583	20,749	5,442	154	5,596	c/
1986	27,506	18.6	120,382	81.4	147,888	20,459	92,548	113,007	3,609	15,795	19,404	3,438	12,039	15,477	
1987	9,325	8.9	95,287	91.1	104,612	5,949	71,920	77,869	2,453	13,934	16,387	923	9,433	10,356	
1988	18,113	20.3	71,309	79.7	89,422	10,626	44,616	55,242	4,752	17,352	22,104	2,735	9,341	12,076	
1989	2,991	6.4	43,631	93.6	46,622	2,543	29,445	31,988	239	11,132	11,371	209	3,054	3,263	
1990	634	6.3	9,358	93.7	9,992	241	7,682	7,923	371	1,348	1,719	22	328	350	
1991	681	7.4	8,526	92.6	9,207	382	4,867	5,249	205	2,482	2,687	94	1,177	1,271	
1992	2,932	20.7	11,232	79.3	14,164	2,563	7,139	9,702	211	3,779	3,990	158	314	472	c/
1993	3,381	32.2	7,104	67.8	10,485	2,473	5,898	8,371	736	815	1,551	172	391	563	c/
1994	7,494	34.2	14,430	65.8	21,924	2,505	10,906	13,411	4,442	3,264	7,706	547	260	807	c/
1995	9,892	9.4	95,833	90.6	105,725	9,262	77,876	87,138	76	15,178	15,254	554	2,779	3,333	c/
1996	5,072	9.1	50,574	90.9	55,646	4,478	42,646	47,124	249	6,411	6,660	345	1,517	1,862	c/
1997	3,767	17.6	17,580	82.4	21,347	2,845	11,507	14,352	820	5,387	6,207	102	686	788	c/
1998	2,307	5.3	40,882	94.7	43,189	1,974	24,460	26,434	192	14,296	14,488	141	2,126	2,267	c/
1999	6,583	35.6	11,933	64.4	18,516	4,154	6,753	10,907	2,027	5,037	7,064	402	143	545	d/
2000	3,163	5.7	52,310	94.3	55,473	1,964	24,880	26,844	1,028	26,018	27,046	171	1,412	1,583	d/

2001	1,214	2.1	55,895	97.9	57,109	914	36,152	37,066	204	17,971	18,175	96	1,772	1,868	d/
2002	3,812	21.0	14,344	79.0	18,156	2,566	10,310	12,876	1,078	3,475	4,553	168	559	727	d/
2003	1,547	2.4	62,815	97.6	64,362	758	31,195	31,953	634	29,752	30,386	155	1,867	2,022	d/
2004	5,224	17.7	24,310	82.3	29,534	3,839	11,545	15,384	1,059	12,384	13,443	327	381	708	d/
2005	899	3.2	27,332	96.8	28,231	751	12,717	13,468	48	13,758	13,806	100	856	956	d/
2006	12,290	35.2	22,622	64.8	34,912	8,228	14,566	22,794	3,938	8,056	11,994	124	0	124	d/
2007	886	1.5	57,987	98.5	58,873	765	38,967	39,732	33	18,081	18,114	89	939	1,028	d/
2008	7,856	34.2	15,141	65.8	22,997	6,861	10,408	17,269	801	4,451	5,252	194	281	475	d/
2009	6,018	20.3	23,575	79.7	29,593	5,732	15,663	21,395	141	7,353	7,494	145	559	704	d/
2010	12,554	30.8	28,238	69.2	40,792	10,969	20,301	31,270	1,458	7,749	9,207	127	188	315	d/
2011	35,277	43.6	45,542	56.4	80,819	32,527	30,810	63,337	1,840	13,882	15,722	910	851	1,761	d/
2012	5,243	7.1	68,423	92.9	73,666	5,120	49,317	54,437	92	17,461	17,553	31	1,644	1,675	d/
2013	6,717	18.2	30,272	81.8	36,989	6,582	25,675	32,257	135	3,717	3,852	0	880	880	d/
2014	6,938	18.3	30,892	81.7	37,830	6,603	23,105	29,708	221	6,975	7,196	114	812	926	d/
2015	2,750	26.5	7,615	73.5	10,365	2,505	4,451	6,956	224	3,129	3,353	21	35	56	d/
2016	1,661	26.8	4,535	73.2	6,196	1,260	3,353	4,613	401	1,142	1,543	0	40	40	d/
2017	7,355	47.6	8,100	52.4	15,455	5,492	4,330	9,822	1,863	3,770	5,633	0	0	0	d/
2018	4,446	16.6	22,402	83.4	26,848	4,075	14,499	18,574	171	7,142	7,313	200	761	961	d/
2019	2,993	24.6	9,150	75.4	12,143	2,740	7,575	10,315	213	1,373	1,586	40	203	243	d/
2020	6,607	26.5	18,350	73.5	24,957	3,791	13,734	17,525	2,816	4,288	7,104	0	328	328	d/
2021	3,390	15.0	19,233	85.0	22,623	3,241	12,768	16,009	102	5,865	5,967	47	600	647	d/

a/ Natural area spawners includes both wild and hatchery fish that spawn in areas outside Trinity River Hatchery.

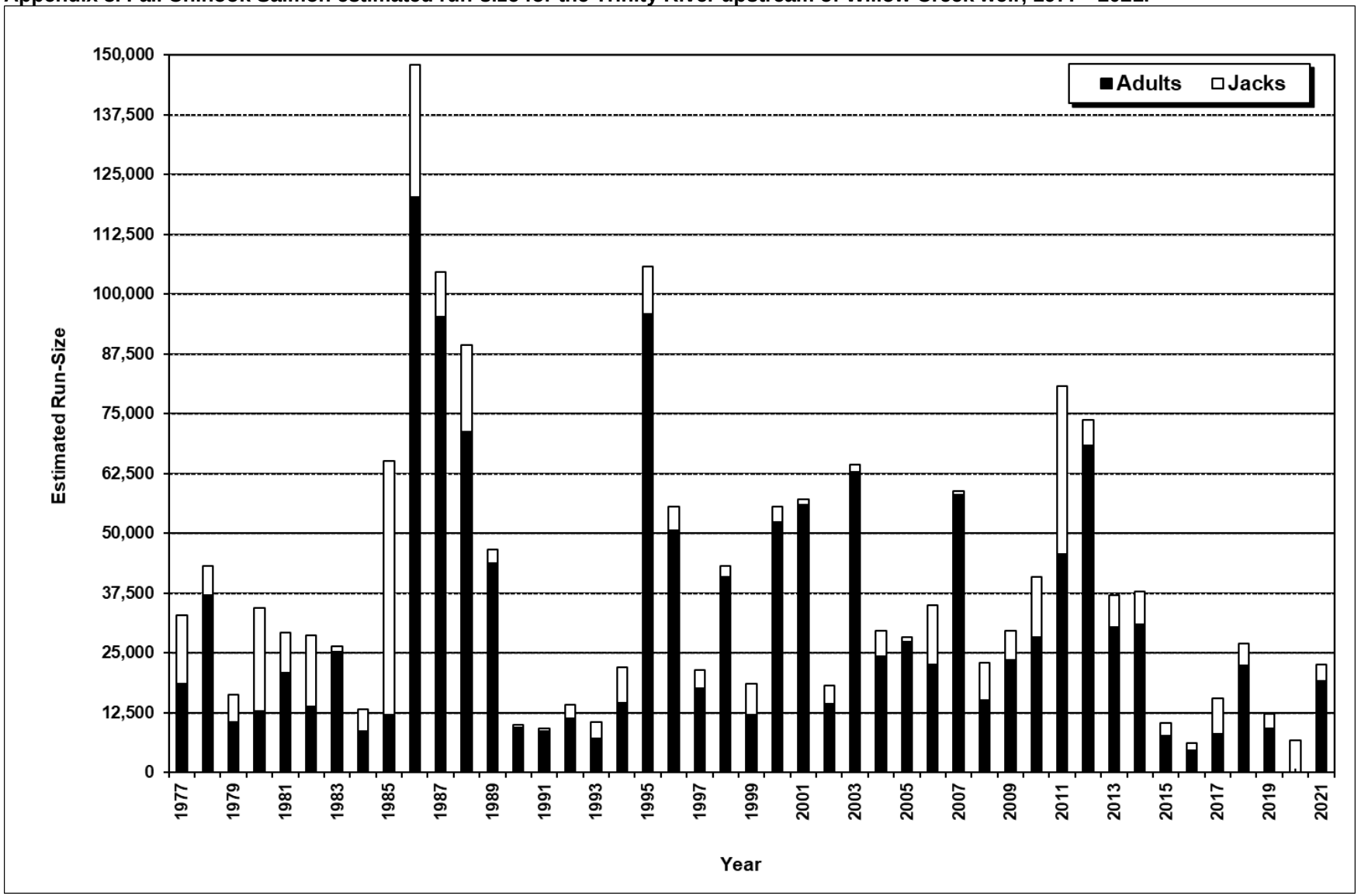
b/ The 1978 sport harvest of fall Chinook was restricted by a salmon fishing closure beginning August 25, 1978.

c/ The sport harvest of adult fall Chinook was subject to seasonal and size limit restrictions.

d/ The 1999-2021 sport harvest of Klamath Basin fall Chinook was managed with a quota system. The quota for adult fall Chinook was 957 in 1999; 693 in 2000; 9,834 in 2001; 6,926 in 2002; 10,800 in 2003; 4,700 in 2004; 1,262 in 2005, zero in 2006, 10,600 in 2007, 20,500 in 2008, 30,800 in 2009, 12,000 in 2010, 7,900 in 2011, 67,600 in 2012, 40,006 in 2013, 4,128 in 2014, 14,133 in 2015, 1,110 in 2016, zero (no allowable harvest) in 2017, 3,490 in 2018, 7,637 in 2019, 1,296 2020, and 1,221 in 2021.

e/ Jacks are two-year-old fish, adults are a minimum of three years old.

Appendix 8. Fall Chinook Salmon estimated run-size for the Trinity River upstream of Willow Creek weir, 1977 - 2021.



Appendix 9. Fall Chinook Salmon estimated run-size, spawner escapement, and angler harvest estimates for the Trinity River upstream of Willow Creek weir, 2002 – 2021, showing natural- and Trinity River Hatchery-origin composition.

	Run-size estimate					Spawner escapements							Angler harvest			
						Natural Area Spawners [a]			Trinity River Hatchery							
	Jacks [b]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total		Jacks	Adults	Total	
Year / Origin	Number	Percent	Number	Percent												
2002 NATURAL	1,314	15.1	7,367	84.9	8,681	1,231	6,549	9,019	26	523	549		57	295	352	
2002 TRH	2,498	26.4	6,977	73.6	9,475	1,335	3,761	3,857	1,052	2,952	4,004		111	264	375	
2002 TOTAL	**3,812**	21.0	**14,344**	79.0	**18,156**	**2,566**	**10,310**	**12,876**	**1,078**	**3,475**	**4,553**		**168**	**559**	**727**	d/
2003 NATURAL	579	5.1	10,839	94.9	11,418	415	9,273	9,688	105	1,243	1,349		58	322	380	
2003 TRH	968	1.8	51,976	98.2	52,944	343	21,922	22,265	529	28,509	29,037		97	1,545	1,642	
2003 TOTAL	**1,547**	**2.4**	**62,815**	**97.6**	**64,362**	**758**	**31,195**	**31,953**	**634**	**29,752**	**30,386**		**155**	**1,867**	**2,022**	d/
2004 NATURAL	3,210	90	369	10	3,578	2,941	-223	2,718	70	595	664	c/	200	-3	197	
2004 TRH	2,014	8	23,941	92	25,956	898	11,768	12,666	989	11,789	12,779		127	384	511	
2004 TOTAL	**5,224**	**17.7**	**24,310**	**82.3**	**29,534**	**3,839**	**11,545**	**15,384**	**1,059**	**12,384**	**13,443**		**327**	**381**	**708**	d/
2005 NATURAL	879	10.3	7,678	89.7	8,557	743	6,364	7,107	36	1,065	1,101		100	247	347	
2005 TRH	20	0.1	19,654	99.9	19,674	8	6,353	6,361	12	12,693	12,705		0	609	609	
2005 TOTAL	**899**	**3.2**	**27,332**	**96.8**	**28,231**	**751**	**12,717**	**13,468**	**48**	**13,758**	**13,806**		**100**	**856**	**956**	d/
2006 NATURAL	6,845	52	6,299	48	13,144	6,358	5,114	11,472	421	1,185	1,606		66	0	66	
2006 TRH	5,445	25	16,323	75	21,768	1,870	9,452	11,322	3,517	6,871	10,388		58	0	58	
2006 TOTAL	**12,290**	**35.2**	**22,622**	**64.8**	**34,912**	**8,228**	**14,566**	**22,794**	**3,938**	**8,056**	**11,994**		**124**	**0**	**124**	d/
2007 NATURAL	819	2.4	33,421	97.6	34,240	723	31,412	32,135	16	1,457	1,473		81	552	633	
2007 TRH	67	0.3	24,566	99.7	24,633	42	7,555	7,597	17	16,624	16,641		8	387	395	
2007 TOTAL	**886**	**1.5**	**57,987**	**98.5**	**58,873**	**765**	**38,967**	**39,732**	**33**	**18,081**	**18,114**		**89**	**939**	**1,028**	d/
2008 NATURAL	6,723	46.6	7,689	53.4	14,412	6,373	6,951	13,324	185	599	784		165	138	303	
2008 TRH	1,133	13.2	7,452	86.8	8,585	488	3,457	3,945	616	3,852	4,468		29	143	172	
2008 TOTAL	**7,856**	34.2	**15,141**	65.8	**22,997**	**6,861**	**10,408**	**17,269**	**801**	**4,451**	**5,252**		**194**	**281**	**475**	d/
2009 NATURAL	5,733	29.4	13,788	70.6	19,521	5,602	12,537	18,139	-9	921	912	c/	141	330	471	
2009 TRH	285	2.8	9,787	97.2	10,072	130	3,126	3,256	150	6,432	6,582		4	229	233	
2009 TOTAL	**6,018**	20.3	**23,575**	79.7	**29,593**	**5,732**	**15,663**	**21,395**	**141**	**7,353**	**7,494**		**145**	**559**	**704**	d/
2010 NATURAL	10,125	40.6	14,814	59.4	24,939	9,782	14,104	23,886	241	611	852		102	99	201	
2010 TRH	2,429	15.3	13,424	84.7	15,853	1,187	6,197	7,384	1,217	7,138	8,355		25	89	114	
2010 TOTAL	**12,554**	30.8	**28,238**	69.2	**40,792**	**10,969**	**20,301**	**31,270**	**1,458**	**7,749**	**9,207**		**127**	**188**	**315**	d/
2011 NATURAL	30,462	63.5	17,482	36.5	47,944	29,530	15,470	45,000	146	1,688	1,834		786	327	1,113	
2011 TRH	4,815	14.6	28,060	85.4	32,875	2,997	15,340	18,337	1,694	12,194	13,888		124	524	648	
2011 TOTAL	**35,277**	43.6	**45,542**	56.4	**80,819**	**32,527**	**30,810**	**63,337**	**1,840**	**13,882**	**15,722**		**910**	**851**	**1,761**	d/
2012 NATURAL	4,514	11.0	36,416	89.0	40,931	4,530	34,702	39,232	-42	838	796	c/	31	1,644	1,675	
2012 TRH	729	2.2	32,007	97.8	32,735	590	14,615	15,205	134	16,623	16,757		4	769	773	
2012 TOTAL	**5,243**	**7.1**	**68,423**	**92.9**	**73,666**	**5,120**	**49,317**	**54,437**	**92**	**17,461**	**17,553**		**31**	**1,644**	**2,448**	d/
2013 NATURAL	6,514	27.6	17,104	72.4	23,618	6,515	16,689	23,204	-1	-82	-83	c/	0	498	498	
2013 TRH	203	1.5	13,168	98.5	13,371	67	8,986	9,053	136	3,799	3,935		0	382	382	
2013 TOTAL	**6,717**	**18.2**	**30,272**	**81.8**	**36,989**	**6,582**	**25,675**	**32,257**	**135**	**3,717**	**3,852**		**0**	**880**	**880**	d/

	Run-size estimate					Spawner escapements						Angler harvest				
						Natural Area Spawners [a]			Trinity River Hatchery							
	Jacks [b]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total		Jacks	Adults	Total	
Year / Origin	Number	Percent	Number	Percent												
2014 NATURAL	5,553	32.0	11,814	68.0	17,367	5,492	11,528	17,020	-19	10	-9	c/	80	276	356	
2014 TRH	1,385	6.8	19,078	93.2	20,463	1,111	11,577	12,688	240	6,965	7,205		34	536	570	
2014 TOTAL	**6,938**	**18.3**	**30,892**	**81.7**	**37,830**	**6,603**	**23,105**	**29,708**	**221**	**6,975**	**7,196**		**114**	**812**	**926**	d/
2015 NATURAL	2,226	38.1	3,609	61.9	5,834	2,167	3,576	5,744	41	16	57		17	17	34	
2015 TRH	524	11.6	4,006	88.4	4,531	338	875	1,212	183	3,113	3,296		4	18	22	
2015 TOTAL	**2,750**	**26.5**	**7,615**	**73.5**	**10,365**	**2,505**	**4,451**	**6,956**	**224**	**3,129**	**3,353**		**21**	**35**	**56**	d/
2016 NATURAL	1,022	25.5	2,987	74.5	4,008	979	2,853	3,831	43	108	151		0	26	26	
2016 TRH	639	29.2	1,548	70.8	2,188	281	500	782	358	1,034	1,392		0	14	14	
2016 TOTAL	**1,661**	**26.8**	**4,535**	**73.2**	**6,196**	**1,260**	**3,353**	**4,613**	**401**	**1,142**	**1,543**		**0**	**40**	**40**	d/
2017 NATURAL	3,901	48.3	4,180	51.7	8,081	3,639	3,785	7,424	262	395	657		0	0	0	
2017 TRH	3,454	46.8	3,920	53.2	7,374	1,853	545	2,398	1,601	3,375	4,976		0	0	0	
2017 TOTAL	**7,355**	**47.6**	**8,100**	**52.4**	**15,455**	**5,492**	**4,330**	**9,822**	**1,863**	**3,770**	**5,633**		**0**	**0**	**0**	d/
2018 NATURAL	4,087	32.1	8,650	67.9	12,737	3,883	7,538	11,421	20	819	839		184	293	477	
2018 TRH	359	2.5	13,752	97.5	14,111	192	6,961	7,153	151	6,323	6,475		16	468	484	
2018 TOTAL	**4,446**	**16.6**	**22,402**	**83.4**	**26,848**	**4,075**	**14,499**	**18,574**	**171**	**7,142**	**7,313**		**200**	**761**	**961**	d/
2019 NATURAL	3,323	48.2	3,564	51.8	6,887	3,205	3,441	6,646	35	16	50		83	108	191	
2019 TRH	624	12.4	4,399	87.6	5,023	439	2,900	3,339	170	1,365	1,536		16	133	149	
2019 TOTAL	**3,947**	**33.1**	**7,963**	**66.9**	**11,910**	**3,644**	**6,341**	**9,985**	**205**	**1,381**	**1,586**		**98**	**241**	**340**	d/
2020 NATURAL	2,504	24.4	7,779	75.6	10,284	2,177	7,113	9,290	327	527	854		0	139	139	
2020 TRH	4,103	28.0	10,571	72.0	14,674	1,614	6,621	8,235	2,489	3,761	6,250		0	189	189	
2020 TOTAL	**6,607**	**26.5**	**18,350**	**73.5**	**24,957**	**3,791**	**13,734**	**17,525**	**2,816**	**4,288**	**7,104**		**0**	**328**	**328**	d/
2021 NATURAL	2,761	32.7	5,673	67.3	8,434	2,710	4,763	7,473	16	733	749		36	177	213	
2021 TRH	629	4.4	13,560	95.6	14,189	531	8,005	8,536	86	5,132	5,218		11	423	434	
2021 TOTAL	**3,390**	**15.0**	**19,233**	**85.0**	**22,623**	**3,241**	**12,768**	**16,009**	**102**	**5,865**	**5,967**		**47**	**600**	**647**	**d/**

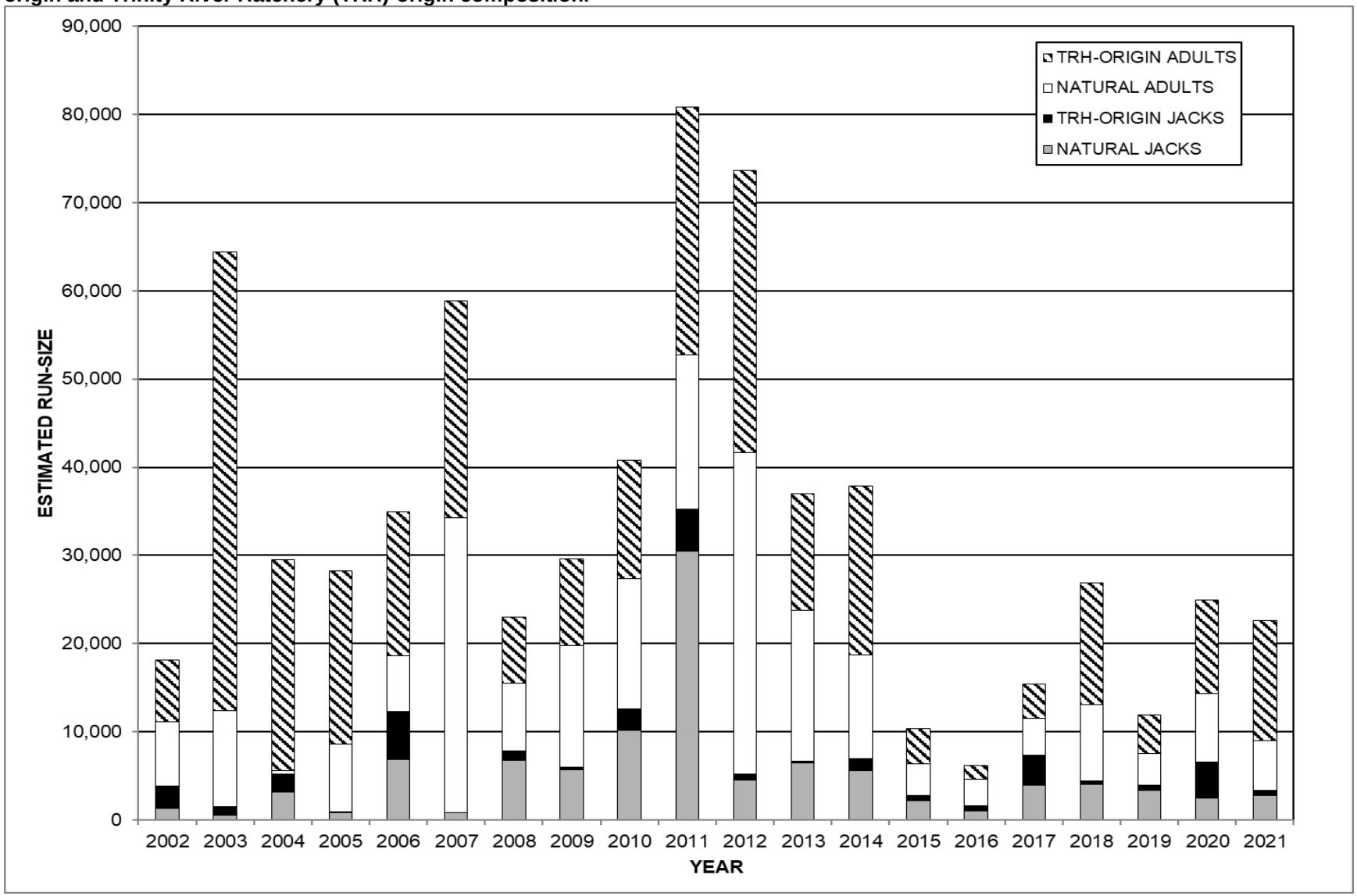
a/ Natural area spawners include both wild and hatchery fish that spawn in areas outside Trinity River Hatchery.

b/ Jacks are two-year-old fish, adults are a minimum of three years old.

c/ Negative numbers occur when the estimated number of hatchery fish, based on expansion of coded-wire tag recoveries for sampling and production, exceeds the estimated total number of fish.

d/ The 1999-2018 sport harvest of Klamath Basin fall Chinook was managed with a quota system. The quota for adult fall Chinook was 957 in 1999; 693 in 2000; 9,834 in 2001; 6,926 in 2002; 10,800 in 2003; 4,700 in 2004; 1,262 in 2005; zero (no allowable harvest) in 2006; 10,600 in 2007; 20,500 in 2008; 30,800 in 2009; 12,000 in 2010; 7,900 in 2011; 67,600 in 2012; 40,006 in 2013; 4,128 in 2014; 14,133 in 2015; 1,110 in 2016; zero (no allowable harvest) in 2017; 3,490 in 2018; 7,637 in 2019; 1,296 in 2020, and 1,221 in 2021.

Appendix 10. Fall Chinook Salmon estimated run-size for the Trinity River upstream of Willow Creek weir, 2002 - 2021, showing natural-origin and Trinity River Hatchery (TRH)-origin composition.



Appendix 11. Coho Salmon run-size, spawner escapement, and angler harvest estimates for the Trinity River upstream of Willow Creek weir, 1977 - 2021.

	Run-size estimate					Spawner escapements						Angler harvest			
	Number	Percent	Number	Percent		Natural Area Spawners [a]			Trinity River Hatchery						
YEAR	Jacks [e]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total	
1977	3,106	80.5	752	19.5	3,858	1,756	25	1,781	1,230	698	1,928	120	29	149	
1978	6,685	73.2	2,447	26.8	9,132	4,309	1,168	5,477	2,376	1,279	3,655	Fishing closure[b]		0	
1979	9,067	78.0	2,557	22.0	11,624	5,567	1,695	7,262	2,793	742	3,535	707	120	827	
1980	2,499	41.0	3,595	59.0	6,094	954	1,817	2,771	1,545	1,778	3,323			0	
1981	6,144	56.0	4,826	44.0	10,970	3,486	1,995	5,481	1,994	2,529	4,523	664	302	966	
1982	2,021	17.5	9,508	82.5	11,529	1,158	5,097	6,255	823	3,975	4,798	40	436	476	
1983	536	27.2	1,435	72.8	1,971	295	788	1,083	192	514	706	49	133	182	
1984	15,208	77.2	4,486	22.8	19,694	6,188	2,971	9,159	7,727	1,134	8,861	1,293	381	1,674	
1985	9,216	23.7	29,717	76.3	38,933	4,798	21,586	26,384	4,237	7,549	11,786	181	582	763	[c]
1986	18,909	67.6	9,063	32.4	27,972	13,034	6,247	19,281	5,402	2,589	7,991	473	227	700	
1987	7,253	12.3	51,826	87.7	59,079	3,975	28,398	32,373	2,865	20,473	23,338	413	2,955	3,368	
1988	2,731	7.0	36,173	93.0	38,904	1,850	22,277	24,127	743	12,073	12,816	138	1,823	1,961	
1989	290	1.5	18,462	98.5	18,752	208	13,274	13,482	77	4,893	4,970	5	295	300	
1990	412	10.6	3,485	89.4	3,897	234	1,981	2,215	173	1,462	1,635	5	42	47	
1991	265	2.9	8,859	97.1	9,124	164	6,163	6,327	98	2,590	2,688	3	106	109	
1992	2,378	23.0	7,961	77.0	10,339	1,168	5,565	6,733	1,210	2,372	3,582	0	24	24	
1993	573	10.2	5,048	89.8	5,621	416	3,024	3,440	93	2,024	2,117	64	0	64	
1994	613	71.9	239	28.1	852	453	105	558	160	134	294	0	0	0	
1995	634	3.9	15,477	96.1	16,111	370	10,680	11,050	264	4,503	4,767	0	294	294	
1996	1,269	3.5	35,391	96.5	36,660	1,149	25,308	26,457	120	9,835	9,955	0	248	248	[d]
1997	5,951	75.0	1,984	25.0	7,935	5,038	1,097	6,135	871	887	1,758	42	0	42	[d]
1998	2,471	19.8	10,009	80.2	12,480	1,494	5,995	7,489	977	4,014	4,991	0	0	0	[d]
1999	623	11.3	4,912	88.7	5,535	234	1,696	1,930	389	3,118	3,507	0	98	98	[d]
2000	5,486	35.3	10,046	64.7	15,532	4,560	6,585	11,145	926	3,461	4,387	0	0	0	[d]
2001	3,670	11.4	28,470	88.6	32,140	2,644	18,715	21,359	1,026	9,755	10,781	0	0	0	[d]
2002	1,709	10.7	14,307	89.3	16,016	1,006	7,812	8,818	703	6,495	7,198	0	0	0	[d]
2003	3,501	12.4	24,651	87.6	28,152	2,038	14,255	16,293	1,463	10,396	11,859	0	0	0	[d]

	Run-size estimate					Spawner escapements						Angler harvest			
	Number	Percent	Number	Percent		Natural Area Spawners [a]			Trinity River Hatchery						
YEAR	Jacks [e]		Adults		Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total	
2004	5,819	15.0	33,063	85.0	38,882	4,742	23,117	27,859	1,077	9,906	10,983	0	40	40	[d]
2005	3,093	9.8	28,326	90.2	31,419	1,341	11,702	13,043	1,731	16,624	18,355	21	0	21	[d]
2006	1,369	6.8	18,709	93.2	20,078	708	8,870	9,578	661	9,839	10,500	0	0	0	[d]
2007	545	9.5	5,205	90.5	5,750	270	2,552	2,822	275	2,653	2,928	0	0	0	[d]
2008	2,379	23.8	7,603	76.2	9,982	1,730	3,064	4,794	649	4,539	5,188	0	0	0	[d]
2009	1,762	27.5	4,634	72.5	6,396	888	2,157	3,045	874	2,477	3,351	0	0	0	[d]
2010	1,278	16.1	6,669	83.9	7,947	752	2,770	3,522	526	3,899	4,425	0	0	0	[d]
2011	9,722	64.6	5,318	35.4	15,040	6,792	3,394	10,186	2,886	1,924	4,810	44	0	44	[d]
2012	3,389	18.2	15,268	81.8	18,657	2,510	7,912	10,422	879	7,357	8,236	0	0	0	[d]
2013	2,819	12.9	19,087	87.1	21,906	2,392	12,883	15,275	427	6,204	6,631	0	0	0	[d]
2014	3,338	24.7	10,199	75.3	13,537	2,401	7,228	9,629	937	2,971	3,908	0	0	0	[d]
2015	935	20.2	3,684	79.8	4,619	657	625	1,282	278	3,059	3,337	0	0	0	[d]
2016 [f]	208	15.7	1,117	84	1,325	163	635	798	45	482	527	0	0	0	[d]
2017	244	37.3	411	63	655	94	141	235	150	270	420	0	0	0	[d]
2018	427	28.7	1,059	71	1,486	241	503	744	186	556	742	0	0	0	[d]
2019	10	0.9	1,063	99	1,073	4	420	424	6	643	649	0	0	0	[d]
2020	1,974	58.7	1,388	41	3,362	602	426	1,028	1,372	962	2,334	0	0	0	[d]
2021	323	6.8	4,371	93	4,694	175	2,173	2,348	148	2,198	2,346	0	0	0	

a/ Natural area spawners includes both wild and hatchery fish that spawn in areas outside Trinity River Hatchery.

b/ The 1978 sport harvest of Coho was essentially eliminated by a salmon fishing closure beginning August 25, 1978.

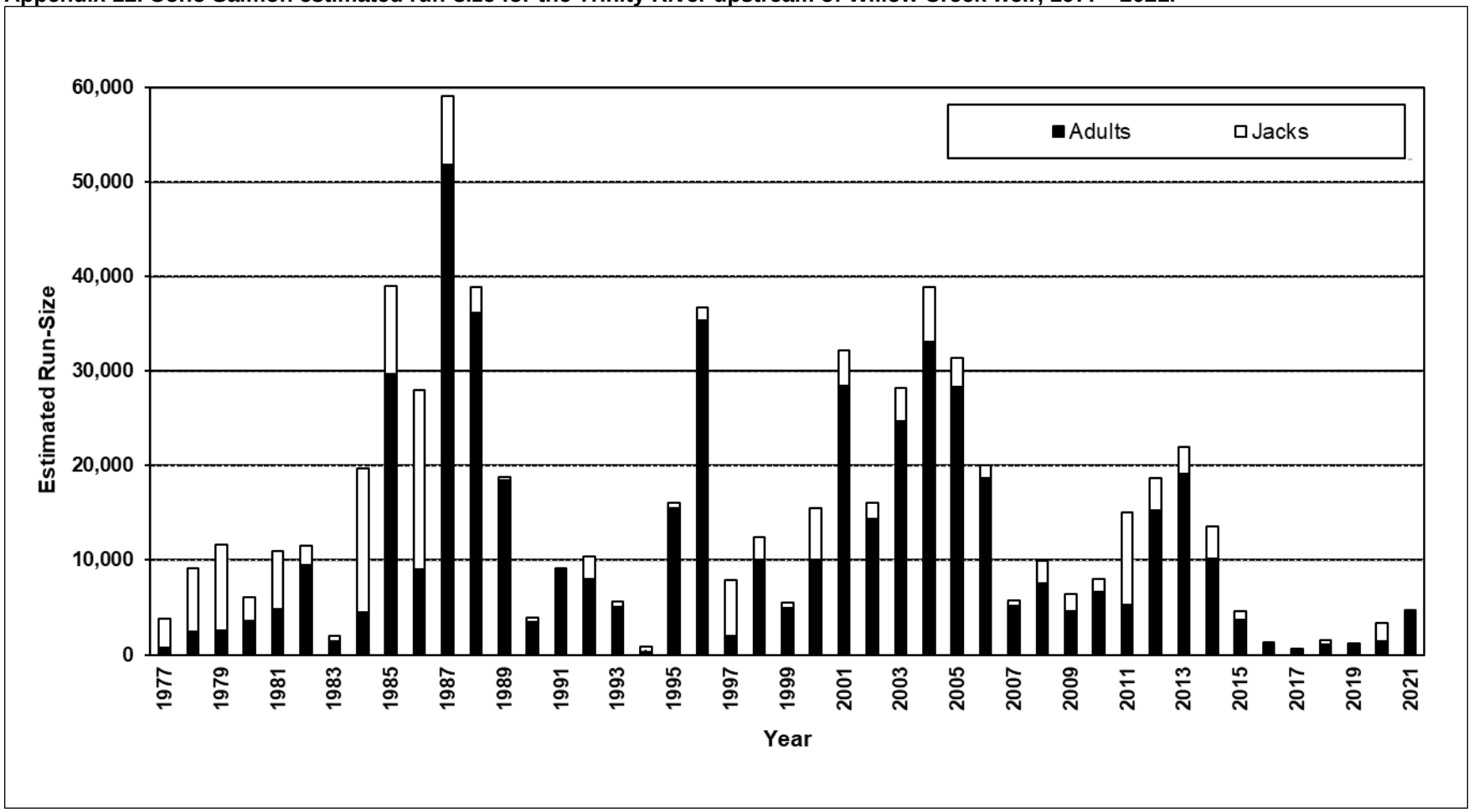
c/ The 1985 sport harvest of adult Coho was limited by a closure for the taking of salmon > 55 cm total length beginning September 22, 1985.

d/ The 1996-2020 sport fishery was closed to the take of Coho Salmon.

e/ Jacks are two-year-old fish, adults are three years old.

f/ Methods used to estimate the run-size and escapement of Coho in 2016 differs from those in other years due to insufficient sample marked at Willow Creek weir.

Appendix 12. Coho Salmon estimated run-size for the Trinity River upstream of Willow Creek weir, 1977 - 2021.



Appendix 13. Coho Salmon run-size, spawner escapement, and angler harvest estimates for the Trinity River upstream of Willow Creek weir, 1997 - 2021, showing natural- and Trinity River Hatchery (TRH)-origin composition.

		Run-size estimate			Spawner escapement						Angler harvest [d]		
					Natural Area Spawners [a]			Trinity River Hatchery					
YEAR	Origin	Jacks [b]	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total
1997	Natural	277	481	758	224	461	685	13	20	33	40	0	40
	TRH	3,879	3,298	7,177	3,021	2,431	5,452	858	867	1,725	0	0	0
	TOTAL	**4,156**	**3,779**	**7,935**	**3,245**	**2,892**	**6,137**	**871**	**887**	**1,758**	**40**	**0**	**40**
1998	Natural	131	1,001	1,132	123	886	1,009	8	115	123	0	0	0
	TRH	2,340	9,008	11,348	1,371	5,109	6,480	969	3,899	4,868	0	0	0
	TOTAL	**2,471**	**10,009**	**12,480**	**1,494**	**5,995**	**7,489**	**977**	**4,014**	**4,991**	**0**	**0**	**0**
1999	Natural	31	556	586	23	453	477	8	103	111	0	0	0
	TRH	592	4,356	4,949	217	1,239	1,455	375	3,021	3,396	0	96	96
	TOTAL	**623**	**4,912**	**5,535**	**240**	**1,692**	**1,932**	**383**	**3,124**	**3,507**	**0**	**96**	**96**
2000	Natural	197	342	539	187	288	475	10	54	64	0	0	0
	TRH	5,289	9,704	14,993	4,373	6,297	10,670	916	3,407	4,323	0	0	0
	TOTAL	**5,486**	**10,046**	**15,532**	**4,560**	**6,585**	**11,145**	**926**	**3,461**	**4,387**	**0**	**0**	**0**
2001	Natural	297	3,075	3,372	295	2,945	3,240	2	130	132	0	0	0
	TRH	3,373	25,395	28,768	2,349	15,770	18,119	1,024	9,625	10,649	0	0	0
	TOTAL	**3,670**	**28,470**	**32,140**	**2,644**	**18,715**	**21,359**	**1,026**	**9,755**	**10,781**	**0**	**0**	**0**
2002	Natural	138	458	596	123	372	495	15	86	101	0	0	0
	TRH	1,571	13,849	15,420	883	7,440	8,323	688	6,409	7,097	0	0	0
	TOTAL	**1,709**	**14,307**	**16,016**	**1,006**	**7,812**	**8,818**	**703**	**6,495**	**7,198**	**0**		**0**
2003	Natural	163	3,930	4,093	149	3,264	3,414	14	666	680	0	0	0
	TRH	3,338	20,721	24,059	1,889	10,991	12,880	1,449	9,730	11,179	0	0	0
	TOTAL	**3,501**	**24,651**	**28,152**	**2,038**	**14,255**	**16,294**	**1,463**	**10,396**	**11,859**	**0**	**0**	**0**
2004	Natural	154	8,901	9,055	145	7,830	7,975	9	1,071	1,080	0	0	0
	TRH	5,665	24,162	29,827	4,597	15,287	19,884	1,068	8,835	9,903	0	40	40
	TOTAL	**5,819**	**33,063**	**38,882**	**4,742**	**23,117**	**27,859**	**1,077**	**9,906**	**10,983**	**0**	**40**	**40**
2005	Natural	81	2,648	2,729	71	1,728	1,799	10	920	930	0	0	0
	TRH	3,012	25,678	28,690	1,270	9,974	11,244	1,721	15,704	17,425	21	0	21
	TOTAL	**3,093**	**28,326**	**31,419**	**1,341**	**11,702**	**13,043**	**1,731**	**16,624**	**18,355**	**21**	**0**	**21**

		Run-size estimate			Spawner escapement						Angler harvest [d]		
					Natural Area Spawners [a]			Trinity River Hatchery					
YEAR	Origin	Jacks [b]	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total
2006	Natural	38	1,586	1,624	34	1,416	1,450	4	170	174	0	0	0
	TRH	1,331	17,123	18,454	674	7,454	8,128	657	9,669	10,326	0	0	0
	TOTAL	**1,369**	**18,709**	**20,078**	**708**	**8,870**	**9,578**	**661**	**9,839**	**10,500**	**0**	**0**	**0**
2007	Natural	42	1,157	1,199	37	940	977	5	217	222	0	0	0
	TRH	503	4,048	4,551	233	1,612	1,845	270	2,436	2,706	0	0	0
	TOTAL	**545**	**5,205**	**5,750**	**270**	**2,552**	**2,822**	**275**	**2,653**	**2,928**	**0**	**0**	**0**
2008	Natural	89	1,223	1,312	83	861	944	6	362	368	0	0	0
	TRH	2,290	6,381	8,671	1,647	2,204	3,851	643	4,177	4,820	0	0	0
	TOTAL	**2,379**	**7,604**	**9,983**	**1,730**	**3,065**	**4,795**	**649**	**4,539**	**5,188**	**0**	**0**	**0**
2009	Natural	117	525	643	114	438	552	3	87	94	0	0	0
	TRH	1,645	4,108	5,753	774	1,718	2,492	871	2,390	3,258	0	0	0
	TOTAL	**1,762**	**4,633**	**6,396**	**888**	**2,156**	**3,044**	**874**	**2,477**	**3,352**	**0**	**0**	**0**
2010	Natural	44	817	861	34	624	658	10	193	203	0	0	0
	TRH	1,233	5,852	7,085	717	2,146	2,863	516	3,706	4,222	0	0	0
	TOTAL	**1,277**	**6,669**	**7,946**	**751**	**2,770**	**3,521**	**526**	**3,899**	**4,425**	**0**	**0**	**0**
2011	Natural	208	1,205	1,413	187	991	1,178	21	214	235	0	0	0
	TRH	9,514	4,113	13,627	6,606	2,403	9,009	2,865	1,710	4,575	44	0	44
	TOTAL	**9,722**	**5,318**	**15,040**	**6,793**	**3,394**	**10,187**	**2,886**	**1,924**	**4,810**	**44**	**0**	**44**
2012	Natural	192	1,774	1,966	184	1,577	1,761	8	197	205	0	0	0
	TRH	3,198	13,494	16,692	2,327	6,335	8,662	871	7,159	8,030	0	0	0
	TOTAL	**3,390**	**15,268**	**18,658**	**2,511**	**7,912**	**10,423**	**879**	**7,356**	**8,235**	**0**	**0**	**0**
2013	Natural	152	4,305	4,457	149	3,948	4,097	3	357	360	0	0	0
	TRH	2,667	14,782	17,448	2,243	8,935	11,177	424	5,847	6,271	0	0	0
	TOTAL	**2,819**	**19,087**	**21,905**	**2,392**	**12,883**	**15,274**	**427**	**6,204**	**6,631**	**0**	**0**	**0**
2014	Natural	99	902	1,001	94	823	917	5	79	84	0	0	0
	TRH	3,239	9,297	12,536	2,307	6,405	8,712	932	2,892	3,824	0	0	0
	TOTAL	**3,338**	**10,199**	**13,537**	**2,401**	**7,228**	**9,629**	**937**	**2,971**	**3,908**	**0**	**0**	**0**

		Run-size estimate			Spawner escapement						Angler harvest [d]		
					Natural Area Spawners [a]			Trinity River Hatchery					
YEAR	Origin	Jacks [b]	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total	Jacks	Adults	Total
2015	Natural	65	748	814	57	459	517	8	289	297	0	0	0
	TRH	870	2,936	3,805	600	166	765	270	2,770	3,040	0	0	0
	TOTAL	**935**	**3,684**	**4,619**	**657**	**625**	**1,282**	**278**	**3,059**	**3,337**	**0**	**0**	**0**
2016 [d]	Natural	163	635	798	insufficient sample to make estimation of composition			0	74	74	0	0	0
	TRH	45	482	527				45	408	453	0	0	0
	TOTAL	**208**	**1,117**	**1,325**	**163**	**635**	**798**	**45**	**482**	**527**	**0**	**0**	**0**
2017	Natural	9	57	65	8	34	41	1	23	24	0	0	0
	TRH	236	354	590	87	107	194	149	247	396	0	0	0
	TOTAL	**244**	**411**	**655**	**94**	**141**	**235**	**150**	**270**	**420**	**0**	**0**	**0**
2018	Natural	18	42	60	17	1	18	1	41	42	0	0	0
	TRH	409	1,017	1,426	224	502	726	185	515	700	0	0	0
	TOTAL	**427**	**1,059**	**1,486**	**241**	**503**	**744**	**186**	**556**	**742**	**0**	**0**	**0**
2019	Natural	5	104	109	4	63	67	1	41	42	0	0	0
	TRH	5	960	965	0	358	358	5	602	607	0	0	0
	TOTAL	**10**	**1,064**	**1,074**	**4**	**421**	**425**	**6**	**643**	**649**	**0**	**0**	**0**
2020	Natural	47	173	220	29	138	168	18	35	53	0	0	0
	TRH	1,927	1,214	3,141	573	287	860	1,354	927	2,281	0	0	0
	TOTAL	**1,974**	**1,388**	**3,362**	**602**	**426**	**1,028**	**1,372**	**962**	**2,334**	**0**	**0**	**0**
2021	Natural	12	209	221	11	158	169	1	51	52	0	0	0
	TRH	311	4,161	4,473	164	2,041	2,178	147	2,147	2,294	0	0	0
	TOTAL	**323**	**4,371**	**4,694**	**175**	**2,173**	**2,348**	**148**	**2,198**	**2,346**	**0**	**0**	**0**

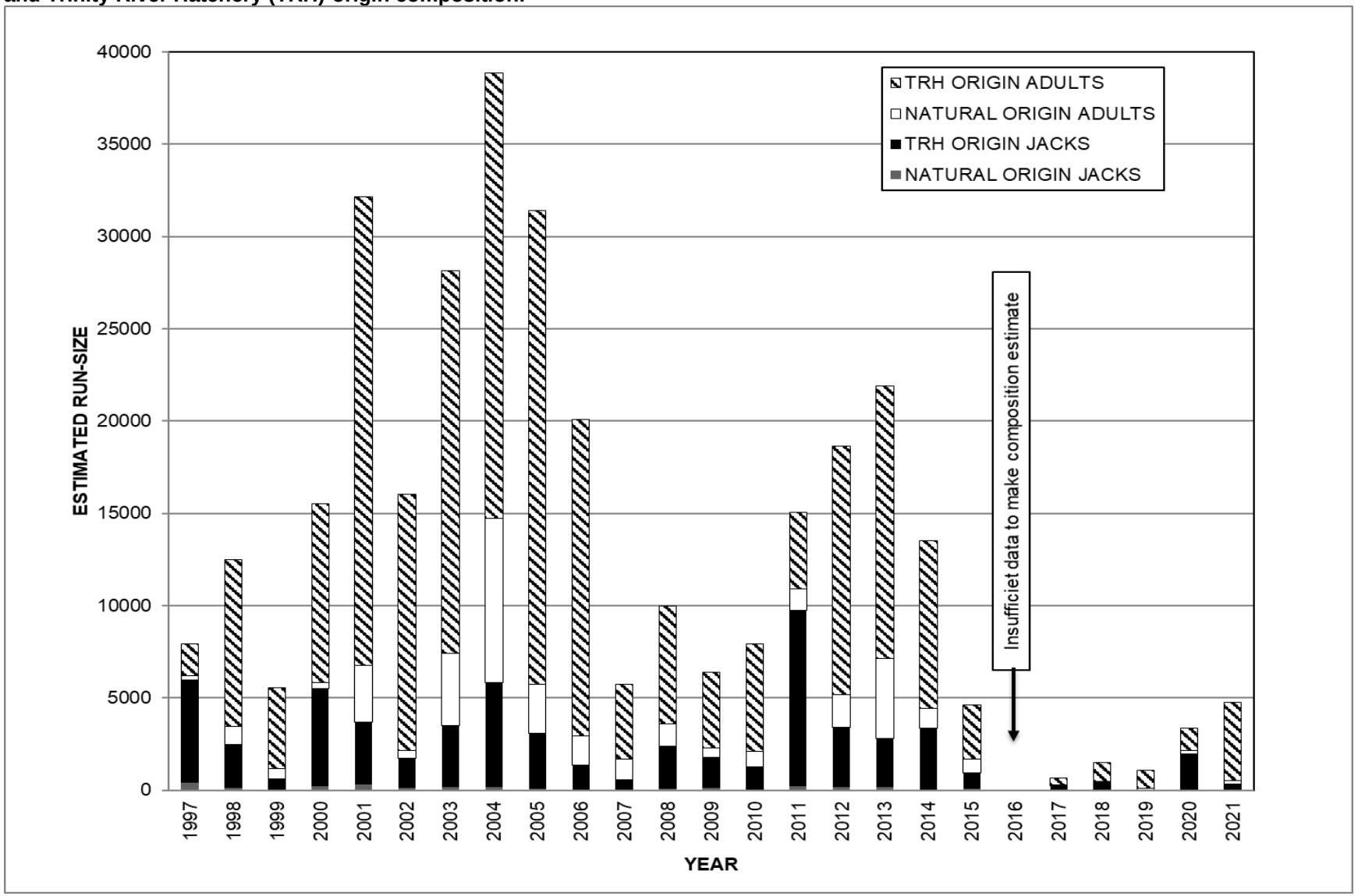
a/ Natural area spawners include both wild and hatchery fish that spawn in areas outside Trinity River Hatchery.

b/ Jacks are two-year-old fish, adults are three years old.

c/ The 1996-2020 sport fishery was closed to the take of Coho Salmon.

d/ Methods used to estimate run-size and escapement of Coho Salmon in 2016 differs from other years due to insufficient sample size.

Appendix 14. Coho Salmon estimated run-size for the Trinity River upstream of Willow Creek weir, 1997 - 2021, showing natural-origin and Trinity River Hatchery (TRH)-origin composition.



Appendix 15. Fall adult steelhead (>41 cm FL) run-size, spawner escapement, and angler harvest estimates for the Trinity River upstream of Willow Creek weir, 1977 - 2021.

	Run-size estimate					Spawner escapement						Angler harvest			
						Natural Area Spawners [a]			Trinity River Hatchery						
	Hatchery [b]		Wild [c]			Hatchery	Wild	Total	Hatchery	Wild	Total	Hatchery	Wild	Total	
Year	#	%	#	%	Total										
1977	No estimates					No estimates			269	16	285	No estimates			
1978	"					"			628	55	683	"			
1979	"					"			329	53	382	"			
1980	8,449	33.7	16,645	66.3	25,094	5,101	14,462	19,563	1,903	102	2,005	1,445	2,081	3,526	
1981	No estimates					No estimates			892	112	1,004	No estimates			
1982	2,106	20.0	8,426	80.0	10,532	971	6,889	7,860	634	79	713	501	1,458	1,959	
1983	No estimates of hatchery/wild origin				8,605			6,661			599			1,345	
1984	"				7,833			6,430			142			1,261	
1985	No estimates					No estimates					461	No estimates			
1986	"					"					3,780	"			
1987	"					"					3,007	"			
1988	No estimates of hatchery/wild origin				12,743			11,926[d]			817	"			
1989	"				37,276			28,933			4,765			3,578	
1990	"				5,348			3,188			930			1,230	
1991	"				11,417			8,631			446			2,340	
1992	1,315	43.2	1,731	56.8	3,046	759	1,540	2,299	430	25	455	126	166	292	
1993	1,894	58.4	1,349	41.6	3,243	801	1,176	1,977	875	10	885	218	163	381	
1994	1,477	34.8	2,767	65.2	4,244	878	2,410	3,288	403	8	411	196	349	545	
1995	1,595	37.2	2,693	62.8	4,288	1,424	1,867	3,291	681	24	705	147	145	292	
1996	8,598	82.4	1,837	17.6	10,435	4,127	1,703	5,830	3,964	48	4,012	507	86	593	
1997	No estimates of hatchery/wild origin				5,212			4,267			429			516	
1998	"				2,972			2,463			441			68	[e]
1999	"				5,470			3,817			1,571			82	[e]
2000	"				8,042			7,097			768			177	[e]
2001	"				12,638			9,938			2,333			367	[e]
2002	14,408	75.6	4,650	24.4	19,058	7,715	4,551	12,266	5,996	42	6,038	697	57	754	[e]
2003	19,245	83.0	3,947	17.0	23,192	8,717	3,837	12,554	10,182	42	10,224	346	68	414	[e]

	Run-size estimate					Spawner escapement						Angler harvest			
						Natural Area Spawners [a]			Trinity River Hatchery						
	Hatchery [b]		Wild [c]			Hatchery	Wild	Total	Hatchery	Wild	Total	Hatchery	Wild	Total	
Year	#	%	#	%	Total										
2004	15,038	75.7	4,817	24.3	19,855	8,937	4,732	13,669	5,688	37	5,725	413	48	461	[e]
2005	14,049	72.4	5,363	27.6	19,412	5,782	5,280	11,062	8,080	63	8,143	187	20	207	[e]
2006	32,609	78.8	8,781	21.2	41,390	20,272	8,660	28,932	11,509	38	11,547	828	83	911	[e]
2007	46,379	86.1	7,506	13.9	53,885	31,923	7,405	39,328	11,366	31	11,397	3,090	70	3,160	[e]
2008	9,538	63.5	5,477	36.5	15,015	6,680	5,415	12,095	2,471	24	2,495	386	38	424	[e]
2009	13,314	72.5	5,047	27.5	18,361	7,704	4,877	12,581	4,234	17	4,251	1,376	154	1,530	[e]
2010	4,640	54.9	3,811	45.1	8,451	2,468	3,749	6,217	2,000	37	2,037	172	25	197	[e]
2011	14,969	68.3	6,932	31.7	21,901	8,344	6,850	15,194	5,700	50	5,750	925	32	957	[e]
2012	12,253	59.4	8,359	40.6	20,612	6,060	8,215	14,275	5,685	52	5,737	507	92	599	[e]
2013	7,389	44.5	9,205	55.5	16,594	4,521	9,039	13,560	2,295	80	2,375	573	86	659	[e]
2014	4,460	43.4	5,822	56.6	10,282	1,822	5,691	7,513	2,499	62	2,561	139	69	208	[e]
2015	8,713	78.0	2,454	22.0	11,167	5,043	2,417	7,460	3,235	37	3,272	436	0	436	[e]
2016	2,568	56.6	1,972	43.4	4,540	943	1,927	2,870	1,557	17	1,574	68	28	96	[e]
2017	4,498	65.7	2,348	34.3	6,846	2,249	2,295	4,544	1,996	53	2,049	253	0	253	[e]
2018	3,531	60.0	2,354	40.0	5,885	1,543	2,289	3,832	1,859	37	1,896	129	28	157	[e]
2019	1,088	23.9	3,459	76.1	4,547	689	3,443	4,132	370	16	386	30	0	30	[e]
2020	1,413	42.2	1,936	57.8	3,349	802	1,904	2,706	558	32	590	53	0	53	[e]
2021	3,940	56.1	3,088	43.9	7,029	3,017	2,389	5,406	1,362	71	1,433	190	0	190	[e]

a/ Natural area spawners includes both wild and hatchery fish that spawn in areas outside Trinity River Hatchery.

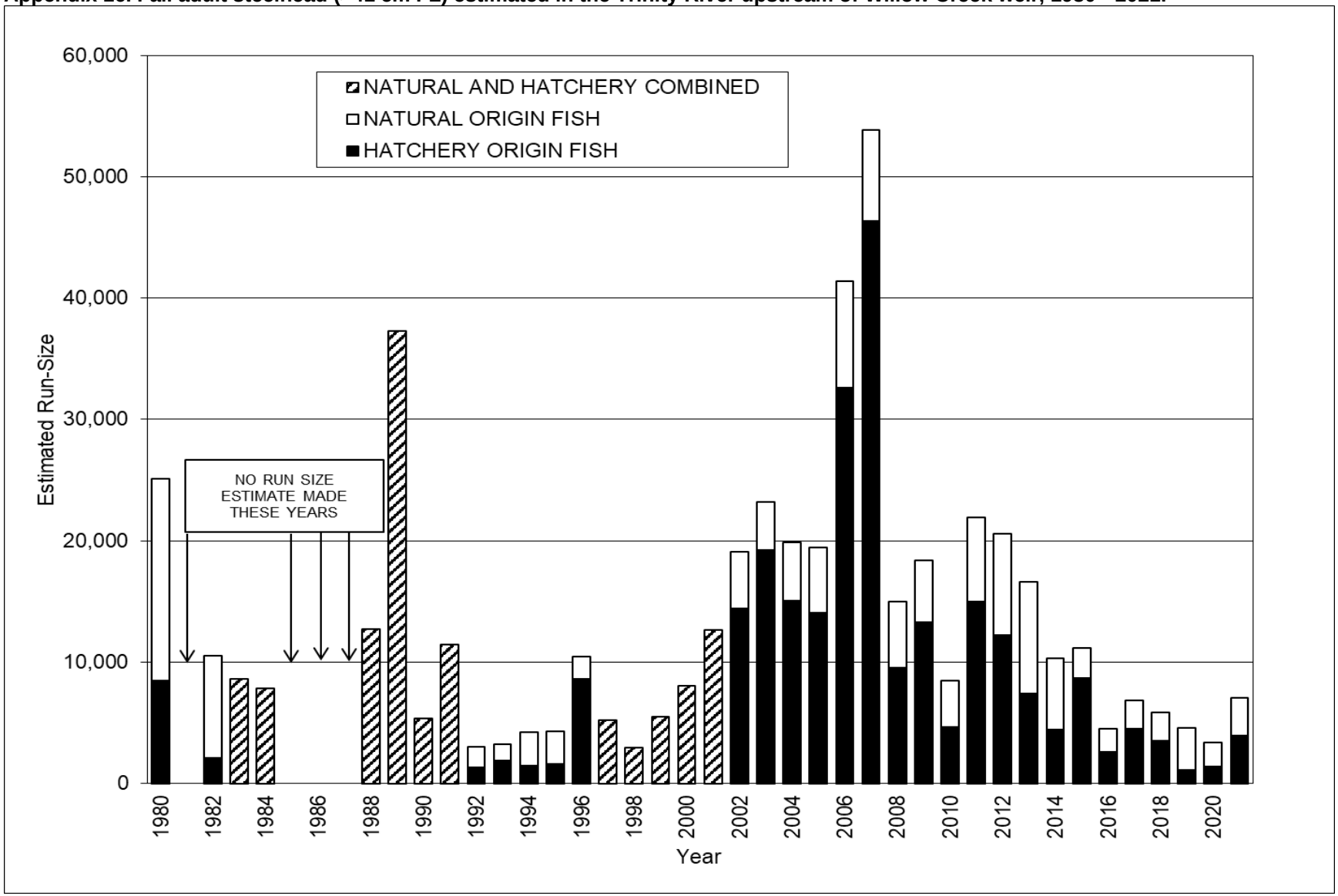
b/ Trinity River Hatchery-produced steelhead.

c/ Naturally-produced steelhead.

d/ Natural area spawner escapement reflects an overestimate due to the unknown number of fish harvested by anglers upstream of Willow Creek Weir.

e/ Harvest was limited to hatchery-produced fish only. Hatchery fish are those with an adipose fin-clip.

Appendix 16. Fall adult steelhead (>41 cm FL) estimated in the Trinity River upstream of Willow Creek weir, 1980 - 2021.



Appendix 17. Fork length (FL) distribution of spring Chinook Salmon trapped and tagged at Junction City weir (JCW), and subsequently recovered during the 2020-21 season.

	JCW [a]		Recoveries							
FL (cm)	Trapped and Tagged [b]	Ad-clips [c]	Tag Morts [d]	Angler Harvest [e]	TRH [f] Recoveries	Carcass [g] Recoveries	Found Tags [h]	Angler Released [i]	Total Recoveries	% Recoveries
37	1								0	0.0
38	2				1				1	50.0
39	1								0	0.0
40	2								0	0.0
41	3				1		1		2	66.7
42	7				1				1	14.3
43	10				4	1			5	50.0
44	11				1	1			2	18.2
45	11				2				2	18.2
46	25				2			1	3	12.0
47	15				2		1		3	20.0
48	23	1			5				5	21.7
49	13				6				6	46.2
50	6								0	0.0
51	11				3				3	27.3
52	9	2			2	1			3	33.3
53	7				4				4	57.1
54	12	1			2	1	1	1	5	41.7
55	22	8			11			1	12	54.5
56	21	3			14				14	66.7
57	45	14		1	20	1	1		23	51.1
58	59	17			31	1	1		33	55.9
59	81	22		2	33	1	1	1	38	46.9
60	76	15		4	31		2	2	39	51.3
61	75	16		1	25	4	1	3	34	45.3
62	83	18		3	35	4			42	50.6
63	72	11		1	28	3		1	33	45.8
64	67	13	1	2	23	6			32	47.8
65	44	10		2	17	2		1	22	50.0
66	55	10	1		18	2			21	38.2

67	35	6		1	13			1	15	42.9
68	24	9		1	9	3		1	14	58.3
69	30	4			9	1			10	33.3
70	24	7			7	2	1		10	41.7
71	21	4	1		6				7	33.3
72	16	3			5				5	31.3
73	13				4		1		5	38.5
74	8	1			2				2	25.0
75	8	2			3				3	37.5
76	7	2	1						1	14.3
77	3								0	0.0
78	3					1			1	33.3
79	2								0	0.0
80	1								0	0.0
81	2								0	0.0
82	1								0	0.0
83	1	1							0	0.0
84	1								0	0.0
85									0	--
86									0	--
87									0	--
88									0	--
89									0	--
90									0	--
91	1								0	0.0
Totals:	1,070	200	4	18	380	35	11	13	461	43.1%
Mean FL:	60.7	62.3	69.3	62.1	60.9	62.4	58.2	60.0	61.0	
Total jacks: [j]	124	1	0	0	25	2	2	1	30	24.2%
Total adults:	946	199	4	18	355	33	9	12	431	45.6%

a/ Trapping at JCW took place June 4 - December 21, 2021 (Julian weeks 23-51). b/ All spring Chinook trapped at JCW in 2021 were tagged.

c/ Ad-clip = Adipose fin clipped fish. d/ Tagged fish found dead and unspawned within 30 days of tagging are considered tagging mortalities.

e/ Fish reported as harvested by anglers.

f/ Trapping occurred at Trinity River Hatchery September 7, 2021 - March 8, 2022 (JWs 36-10; closed parts or all of JWs 41-43).

g/ Fish recovered in upper Trinity River spawner surveys. h/ Fish tags found loose or on dead fish and returned by river users.

i/ Fish caught and released by anglers, their tag removed. j/ Spring Chinook Salmon<50 cm FL were considered jacks in 2021.

Appendix 18. Total number (by entry week) and numbers of Junction City weir (JCW) and Willow Creek weir (WCW) tagged Chinook Salmon, Coho Salmon and adult steelhead that entered Trinity River Hatchery (TRH) during the 2021-22 season.

		Chinook Salmon					Coho Salmon			Steelhead [b]	
		Total	Spring run		Fall run		Total	Tagged	Tagged	Total	Tagged
Julian		entering	tagging site		tagging site		entering	at	at	entering	at
week	Inclusive dates [a]	TRH	JCW	WCW	JCW	WCW	TRH	JCW	WCW	TRH	WCW
36	3-Sep - 9-Sep	423	186							1	
37	10-Sep - 16-Sep	429	56							3	
38	17-Sep - 23-Sep	437	72	2						4	
39	24-Sep - 30-Sep	393	57	1						2	
40	1-Oct - 7-Oct	324	9		1	2	1			4	
41	8-Oct - 14-Oct										
42	15-Oct - 21-Oct						2	2			
43	22-Oct - 28-Oct	864		2	41	217	136	8	39	93	3
44	29-Oct - 4-Nov	1,470			22	238	125	11	34	110	8
45	5-Nov - 11-Nov	1,066			10	172	76	45	11	41	3
46	12-Nov - 18-Nov	1,568			3	109	477	36	4	14	
47	19-Nov - 25-Nov	771			1	26	392	53	3	72	5
48	26-Nov - 2-Dec	210				4	357	26		81	4
49	3-Dec - 9-Dec	8					300	11		59	2
50	10-Dec - 16-Dec	8					400	8	1	53	4
51	17-Dec - 23-Dec	0					57	18		9	2
52	24-Dec - 31-Dec	1					45	1		22	3
1	1-Jan - 7-Jan	1					1			54	2
2	8-Jan - 14-Jan						13			77	6
3	15-Jan - 21-Jan									97	6
4	22-Jan - 28-Jan									103	3
5	29-Jan - 4-Feb									85	2
6	5-Feb - 11-Feb									91	1
7	12-Feb - 18-Feb									126	3
8	19-Feb - 25-Feb									109	2
9	26-Feb - 4-Mar									48	1
10	5-Mar - 11-Mar									86	
	Totals:	7,973	380	5	78	768	2,382[c]	219	92	1,444	60

a/ Trapping occurred at TRH September 7, 2021 - March 8, 2022 (JWs 36-10; closed parts or all of JWs 41-43).
b/ This includes all steelhead (both half-pounders and adults).
c/ This total includes 36 fish that were transported from JCW as part of the HGMP broodstock pilot project. The number of Coho Salmon the entered TRH of their own volition was 2,346.

Appendix 19. Recoveries at Trinity River Hatchery (TRH), by Julian week, of ad-clipped spring Chinook Salmon during the 2020-21 season.

Coded-wire tag number and release type [b]	Brood year	Entry Julian Week					Totals
		36	37	38	39	40	
060954-f	2016	1					1
060955-f	2016	1					1
060961-y	2016	1					1
061297-f	2017	1					1
061489-f	2017	2					2
061490-f	2017			1	1		2
061491-f	2017			2			2
061496-y	2017	22	3	11	5		41
061543-y	2018	119	36	29	33	3	220
061945-f	2018	13	6	4	1	1	25
061946-f	2018	12	7	1	1		21
062016-f	2018	9	4	3	6	1	23
062017-f	2018	6	1	3	2	1	13
Lost CWT [c]		1	1				2
No CWT [d]		7		2	1		10
Weekly totals:		195	58	56	50	6	
Total:							365

a/ Trapping occurred at TRH September 7, 2021 - March 8, 2022 (JWs 36-11; closed all or parts of JWs 41-43).

b/ Release types are either fingerling (f) or yearling (y).

c/ CWTs were lost or unreadable. Chinook with lost or unreadable tags recovered before JW 42 were considered spring run.

d/ No CWTs were recovered from these ad-clipped fish. Chinook with shed tags recovered before JW 42 were considered spring run.

Appendix 20. Recoveries at Trinity River Hatchery (TRH), by Julian week, of ad-clipped fall Chinook Salmon during the 2020-21 season.

CWT number and release type [b]	Brood year	Number of ad-clipped fall Chinook Salmon entering TRH, by Julian week [a]												
		39	40	43	44	45	46	47	48	49	50	51	52	Totals
060594-f	2017			1			1							2
060708-f	2017				1	2		1						4
061492-f	2017					1								1
061493-f	2017					1								1
061495-f	2017				1									1
061497-y	2017	1		16	9	5	4	4	3	1	1			44
061498-y	2017				1	1	1							3
061547-f	2018			9	13	6	2		1					31
061548-f	2018			15	17	14	9	2						57
062018-f	2018			14	15	7	5	1	1					43
062019-f	2018			5	13	6	7	1	1		1			34
062020-f	2018			9	18	11	12	2	1					53
062021-f	2018			5	10	15	16	5						51
061903-f	2018				2	1		1	1					5
062022-y	2018	2	5	267	248	174	125	63	16				1	901
Lost CWT [c]				1	3	5	3	4	2					18
No CWT [d]				5	5	2	2	3						17
Weekly totals:		3	5	347	356	251	187	87	26	1	2	0	1	
Total:														1,266

a/ Trapping occurred at TRH September 7, 2021 - March 8, 2022 (JWs 36-10; closed all or parts of JWs 41-43).

b/ Release types are either fingerling (f) or yearling (y).

c/ CWTs were lost or unreadable. Chinook with lost or unreadable tags recovered after JW 41 were considered fall Chinook.

d/ No CWTs were recovered from these ad-clipped fish. Chinook with shed tags recovered after JW 41 were considered fall Chinook.

Appendix 21. Fork length distribution of coded-wire tagged, Trinity River Hatchery origin spring Chinook Salmon recovered at TRH during the 2020-21 season. [a]

FL	Brood Years (BY)													
	2016			2017					2018					
(cm)	060954-f	060955-f	060961-y	061297-f	061489-f	061490-f	061491-f	061496-y	061543-y	061945-f	061946-f	062016-f	062017-f	Total
42														0
43									1					1
44														0
45														0
46														0
47														0
48														0
49														0
50									2			1		3
51									2			1		3
52									1	1			1	3
53								1	1					2
54									8	1				9
55									10	1			2	13
56									16	1	1			18
57									27		1	1		29
58									26		1	1	1	29
59									21	1		2	1	25
60								1	21	3	1	4	1	31
61								2	14	2	3	1	1	23
62								4	18	1	4	2	1	30
63								2	14	2	2	2	2	24
64								3	14	4	2	2		25
65								6	11	4		1	1	23
66								2	7		2	3		14
67						1		7	1	1	1	1	1	13
68							1	1	3	1	1		1	8
69				1				2	2					5
70			1			1		3		1		1		7
71								4		1	1			6
72					1		1	2			1			5

73														0
74					1			1						2
75														0
76		1												1
77														0
78														0
79														0
80														0
81	1													1
Totals:	1	1	1	1	2	2	2	41	220	25	21	23	13	353
Mean	81.0	76.0	70.0	69.0	73.0	68.5	70.0	66.1	59.6	62.3	63.1	61.4	60.6	61.3

a/ Trapping occurred at Trinity River Hatchery September 7, 2021 - March 8, 2022 (JWs 36-10; closed parts or all of JWs 41-43).
Notes: Age at release f=fingerling and y=yearling and there were not any BY 2019 fish marked because of Covid-19.

Appendix 22. Percent return of Trinity River Hatchery-origin, coded-wire tagged spring Chinook Salmon, brood years 1986-2016.

	Fingerling releases			Yearling releases		
Brood year	Number released	Number of returns	Percent return [a]	Number released	Number of returns	Percent return
1986	197,113	103	0.05%	101,030	1,960	1.94%
1987	185,718	208	0.11%	0	0	---
1988	181,698	84	0.05%	98,820	112	0.11%
1989	186,413	7	0.00%	102,555	176	0.17%
1990	196,908	479	0.24%	94,639	82	0.09%
1991	198,277	297	0.15%	110,797	68	0.06%
1992	215,038	2,766	1.29%	109,856	1,272	1.16%
1993	222,056	1,125	0.51%	111,525	958	0.86%
1994	113,236	202	0.18%	113,491	513	0.45%
1995 [b]	196,211	450	0.23%	101,934	1,581	1.55%
1996	222,950	743	0.33%	112,464	312	0.28%
1997	209,155	1,834	0.88%	147,507	4,471	3.03%
1998	176,968	845	0.48%	137,602	2,186	1.59%
1999	148,380	3,372	2.27%	129,919	4,288	3.30%
2000	261,193	4,422	1.69%	99,304	2,029	2.04%
2001	253,248	412	0.16%	104,627	1,480	1.41%
2002	244,754	2,217	0.91%	106,139	514	0.48%
2003	265,556	310	0.12%	104,974	339	0.32%
2004	253,830	2,095	0.83%	104,478	1,269	1.21%
2005	263,108	317	0.12%	107,607	111	0.10%
2006	486,833	229	0.05%	104,019	1,354	1.30%
2007	180,083	252	0.14%	96,803	626	0.65%
2008	229,956	1,107	0.48%	104,078	231	0.22%
2009	161,053	4,364	2.71%	108,824	959	0.88%
2010	168,702	994	0.59%	97,128	361	0.37%
2011	167,205	406	0.24%	97,771	292	0.30%
2012	260,105	349	0.13%	101,471	192	0.19%
2013	258,761	349	0.13%	103,872	75	0.07%
2014	246,945	451	0.18%	102,032	121	0.12%
2015	260,691	1,005	0.39%	107,160	891	0.83%
2016	274,477	1,668	0.61%	105,153	546	0.52%
Means:	222,149	1,079	0.58%	104,115	947	0.98%

a/ Based on estimated returns upstream of Junction City weir. Does not include ocean harvest, in-river harvest, or escapement below Junction City weir.

b/ No estimate was produced in 1995, returns of age 2 - 5 Chinook from that year are hatchery returns only

Appendix 23. Brood year release and return data for Trinity River Hatchery (TRH)-origin, CWT spring Chinook Salmon returning to the Trinity River basin upstream of Junction City weir, 2017 - 2021.

Release data						Estimated returns					
CWT	Brood					Run-	% of	Angler	Spawning escapement		
code [a]	year	Date [b]	Number	Site	Age	size	release	harvest	TRH [c]	Natural	Total [f]
060705	2016	06/16-23/2017	2,588	TRH	2	0	0.00	0.0	0	0	0
060705	2016				3	5	0.10	0.2	2	3	5
060705	2016				4	3	0.05	0.1	1	1	2
060705	2016				5	0	0.00	0.0	0	0	0
				Totals: [d]		8	0.29	0.3	3	4	7
				Total adults: [e]		8	0.29	0.3	3	4	7
060954	2016	06/16-23/2017	87,269	TRH	2	86	0.10	0.0	55	32	86
060954	2016				3	513	0.59	25.4	206	282	488
060954	2016				4	58	0.07	1.7	23	33	56
060954	2016				5	3	0.00	0.1	1	2	3
				Totals:		660	0.76	27.2	284	348	633
				Total adults:		574	0.66	27.2	230	317	546
060955	2016	06/16-23/2017	73,142	TRH	2	16	0.02	0.0	10	6	16
060955	2016				3	333	0.46	16.5	133	183	317
060955	2016				4	50	0.07	1.5	20	29	49
060955	2016				5	3	0.00	0.1	1	2	3
				Totals:		402	0.55	18.1	165	219	384
				Total adults:		386	0.53	18.1	154	214	368
060956	2016	06/16-23/2017	101,275	TRH	2	19	0.02	0.0	12	7	19
060956	2016				3	451	0.45	22.3	181	248	429
060956	2016				4	93	0.09	2.7	37	53	90
060956	2016				5	0	0.00	0.0	0	0	0
				Totals:		563	0.56	25.0	230	308	538
				Total adults:		544	0.54	25.0	218	301	519
060961	2016	10/21-26/2017	105,153	TRH	2	19	0.02	0.0	12	7	19
060961	2016				3	436	0.41	21.6	175	240	414
060961	2016				4	88	3.40	2.6	35	50	85
060961	2016				5	3	0.00	0.1	1	2	3
				Totals:		546	3.83	24	223	299	521
				Total adults:		527	3.82	24	211	292	502

060963	2016	4/11-6/06/17	10,203	River	2	0	0.00	0.0	0	0	0
060963	2016				3	30	0.30	1.5	12	17	29
060963	2016				4	5	0.05	0.1	2	3	5
060963	2016				5	0	0.00	0.0	0	0	0
				Totals:		35	0.34	1.6	14	19	34
				Total adults:		35	0.34	1.6	14	19	34
060616	2017	4/11-5/15/18	5,101	River	2	0	0.00	0.0	0	0	0
060616	2017				3	0	0.00	0.0	0	0	0
060616	2017				4	0	0.00	0.0	0	0	0
061496	2017	10/01-10/18	107,506	TRH	2	5	0.00	0.3	4	1	5
061496	2017				3	158	0.15	4.6	63	91	154
061496	2017				4	114	0.11	3.5	41	69	110
061297	2017	06/08-22/18	50,511	River	2	1	0.00	0.1	1	0	1
061297	2017				3	13	0.02	0.4	5	7	12
061297	2017				4	3	0.01	0.1	1	2	3
061489	2017	06/08-22/18	53,841	TRH	2	2	0.00	0.2	2	0	2
061489	2017				3	13	0.02	0.4	5	7	12
061489	2017				4	6	0.01	0.2	2	3	5
061490	2017	06/08-22/18	55,671	TRH	2	1	0.00	0.1	1	0	1
061490	2017				3	10	0.02	0.3	4	6	10
061490	2017				4	6	0.01	0.2	2	3	5
061491	2017	06/08-22/18	53,829	TRH	2	6	0.01	0.4	5	1	6
061491	2017				3	5	0.01	0.1	2	3	5
061491	2017				4	6	0.01	0.2	2	3	5
061945	2018	5/27-6/03/19	59,198	TRH	2	38	0.06	3.7	31	3	34
061945	2018				3	69	0.12	2.1	25	42	67
061946	2018	5/27-6/03/19	54,023	TRH	2	11	0.02	1.1	9	1	10
061946	2018				3	59	0.11	1.8	21	36	57
062016	2018	5/27-6/03/19	52,522	TRH	2	5	0.01	0.5	4	0	4
062016	2018				3	64	0.12	2.0	23	39	62
062017	2018	5/27-6/03/19	31,607	TRH	2	7	0.02	0.7	6	1	7
062017	2018				3	36	0.11	1.1	13	22	35
061543	2018	10/01-07/19	94,582	TRH	2	4	0.00	0.4	3	0	3
061543	2018				3	611	0.65	18.8	221	371	592
062023	2018	5/07-6/17/19	11,546	River	2	1	0.01	0.1	1	0	1

062023	2018	3	0	0.00	0.0	0	0	0

a/ CWT = coded-wire tag.
b/ Chinook Salmon released during June were fingerlings, those released in October were yearlings.
c/ TRH = Trinity River Hatchery.
d/ Totals are presented only for brood year 2016. These fish have reached five years of age and are considered to have completed their life cycle.
e/ The term "adults" includes Chinook Salmon aged three through five.
f/ Rounding sometimes makes for seeming addition errors in this column.
NOTE: There was no CWT application or marking to the 2019 brood year fish due to Covid-19 pandemic.

Appendix 24. Run-size, angler harvest and spawning escapement estimates, and associated expanded estimates, by tag code, of Trinity River Hatchery (TRH)-origin spring Chinook Salmon returning to the Trinity River basin during the 2020-21 season. [a]

CWT code [b]	BY	Age	TRH expansion factor [d]	TRH Total CWTs [e]	Percent of total CWTs	Run-size	Expanded run-size [f]	Angler harvest	Expanded angler harvest [f]	Spawning escapement					
										TRH	Ex-panded TRH [f]	River	Ex-panded River [f g]	Total [h]	Ex-panded Total
Adults															
060954-f	16	5	4.24	1.0	0.3%	3	11.8	0.1	0.4	1.0	4.3	1.7	7.2	2.7	11.5
060955-f	16	5	4.16	1.0	0.3%	3	11.6	0.1	0.4	1.0	4.2	1.7	7.1	2.7	11.3
060961-y	16	5	4.36	1.0	0.3%	3	12.1	0.1	0.4	1.0	4.4	1.7	7.4	2.7	11.8
061297-f	17	4	4.08	1.0	0.3%	3	11.4	0.1	0.4	1.0	4.1	1.7	6.9	2.7	11.0
061489-f	17	4	4.03	2.0	0.6%	6	22.4	0.2	0.7	2.0	8.1	3.4	13.6	5.4	21.7
061490-f	17	4	4.07	2.0	0.6%	6	22.5	0.2	0.7	2.0	8.1	3.4	13.6	5.4	21.8
061491-f	17	4	4.09	2.0	0.6%	6	22.6	0.2	0.7	2.0	8.2	3.4	13.7	5.4	21.9
061496-y	17	4	4.07	41.2	11.6%	114	463.0	3.5	14.3	41.2	167.7	69.0	281.1	110.2	448.8
061945-f	18	3	4.18	25.2	7.1%	69	290.3	2.1	8.9	25.2	105.1	42.2	176.2	67.4	281.4
061946-f	18	3	4.17	21.2	6.0%	59	244.1	1.8	7.5	21.2	88.4	35.5	148.2	56.7	236.6
062016-f	18	3	4.17	23.1	6.5%	64	266.4	2.0	8.2	23.1	96.5	38.8	161.7	61.9	258.2
062017-f	18	3	4.17	13.1	3.7%	36	150.4	1.1	4.6	13.1	54.5	21.9	91.3	34.9	145.8
061543-y	18	3	4.18	221.3	62.3%	611	2,552.8	18.8	78.6	221.3	924.6	370.9	1,549.6	592.1	2,474.2
Adult totals:				**355.0**	**100.0%**	**980**	**4,081.5**	**30.2**	**125.7**	**355.0**	**1,478.2**	**595.0**	**2,477.6**	**950.1**	**3,955.8**
Jacks	19 [i]	2													
Jack totals:				**0.0**	**0.0%**		**443.0**		**-**		**259.0**		**184.0**		**443.0**
Spring Chinook CWT				**355.0**		**980**	**4,524.5**	**30.2**	**125.7**	**355.0**	**1,737.2**	**595.0**	**2,661.6**	**950.1**	**4,398.8**

a/ Estimate is for upstream of Junction City weir. b/ CWT=coded-wire tag code. Fish are of the same race and release type (f=fingerling and y=yearling).
c/ BY=brood year. d/ Expansion factors used to account for untagged releases of the same BY and release type for each CWT group.

e/ Number of ad-clipped fish observed at Trinity River Hatchery, expanded by the number of ad-clipped fish with lost or unreadable tags.

f/ Expanded run-size, angler harvest, TRH escapement and river (natural area) escapement estimates are the product of each of those respective estimates multiplied by the TRH expansion factors.

g/ River (natural area) escapement estimates equal the total escapement minus the TRH escapement.

h/ Run-size estimate minus harvest estimate equals escapement estimate.

i/ No BY 2019 Chinook were marked at TRH in 2020 due to the Covid-19 pandemic. For how the BY 2019 hatchery contributions were estimated, see Appendix 2.

Appendix 25. Estimated contribution of Trinity River Hatchery (TRH)-origin spring Chinook Salmon to the total estimated run-size upstream of Junction City weir, 1991-2021 seasons.

Year	Run-size	TRH-origin component	Natural-origin component	% TRH composition
1991	2,381	1,016	1,365	42.7%
1992	4,030	1,794	2,236	44.5%
1993	5,232	3,206	2,026	61.3%
1994	6,788	2,659	4,129	39.2%
1995	No estimate	No estimate	No estimate	No estimate
1996	23,416	12,524	10,892	53.5%
1997	20,039	8,303	11,736	41.4%
1998	16,167	8,774	7,393	54.3%
1999	11,293	7,616	3,677	67.4%
2000	26,083	19,730	6,353	75.6%
2001	19,622	12,051	7,571	61.4%
2002	38,485	24,599	13,886	63.9%
2003	47,795	33,546	14,249	70.2%
2004	16,147	11,324	4,823	70.1%
2005	13,984	10,966	3,018	78.4%
2006	7,483	3,649	3,834	48.8%
2007	14,835	12,099	2,736	81.6%
2008	10,283	4,577	5,706	44.5%
2009	7,426	3,973	3,453	53.5%
2010	11,285	4,505	6,780	39.9%
2011	19,219	9,846	9,373	51.2%
2012	25,617	16,306	9,311	63.7%
2013	8,961	6,146	2,815	68.6%
2014	6,959	4,828	2,131	69.4%
2015	4,408	3,085	1,323	70.0%
2016	3,904	2,389	1,515	61.2%
2017	4,425	2,650	1,775	59.9%
2018	8,032	5,654	2,378	70.4%
2019	12,612	9,367	3,245	74.3%
2020	3,309	2,325	984	70.3%
2021	5,550	4,525	1,025	81.5%
Mean:	13,526	8,468	5,058	61.1%

Appendix 26. Fork length (FL) distribution of fall Chinook Salmon trapped and tagged at Willow Creek weir (WCW), and subsequently recovered during the 2021-22 season.

	WCW [a]			Recoveries							
FL (cm)	Total Trapped	Total Tagged [b]	Ad-clips [c]	Tag Morts [d]	Angler Harvest [e]	TRH [f]	Carcass Survey [g]	Found Tags [h]	Angler Released [i]	Total Recoveries	% Recoveries
36	1	1								0	0.0
37										0	--
38	1	1								0	0.0
39	2	2								0	0.0
40	7	7								0	0.0
41	13	13							1	1	7.7
42	8	8						1	1	2	25.0
43	17	17	1				1		1	2	11.8
44	17	15								0	0.0
45	30	30				3			1	4	13.3
46	22	22				1	1		2	4	18.2
47	29	28				2				2	7.1
48	36	35					1			1	2.9
49	42	39	2		1	1	1		2	5	12.8
50	37	37				1	1		1	3	8.1
51	29	29	1		2	1			1	4	13.8
52	27	25				2				2	8.0
53	41	39	2		1	2		1	1	5	12.8
54	34	33	4		2	5	1	1	2	11	33.3
55	48	47	5		1	10	2	1	2	16	34.0
56	37	36	7			8	4		1	13	36.1
57	52	52	6			12	4	1	2	19	36.5
58	121	118	22		1	32	5	6	4	48	40.7
59	106	104	22		2	26	6	3	7	44	42.3
60	201	200	36		2	69	11	4	9	95	47.5
61	217	209	42		5	68	14	5	7	99	47.4
62	243	235	56		4	72	17	8	5	106	45.1
63	279	272	43		8	67	26	13	13	127	46.7
64	270	266	52		3	95	19	13	10	140	52.6
65	243	238	38		6	78	17	12	11	124	52.1
66	199	193	39			49	13	12	7	81	42.0
67	184	182	32		2	50	12	9	7	80	44.0

68	113	111	24		1	33	5	4	2	45	40.5
69	100	98	20	1	1	26	11	2	4	45	45.9
70	56	53	8		2	9	2	2	2	17	32.1
71	62	62	8		1	18	6	1		26	41.9
72	35	34	4			4	2	3	3	12	35.3
73	21	21	4			4	1	2	3	10	47.6
74	29	28	2		2	7	1	1	1	12	42.9
75	19	18	4			6				6	33.3
76	22	21	2			4				4	19.0
77	11	11				2		1		3	27.3
78	8	6	1		1	1			1	3	50.0
79	7	7								0	0.0
80	8	8								0	0.0
81	6	6	1					2		2	33.3
82	5	5	1							0	0.0
83	4	4								0	0.0
84	1	1								0	0.0
85										0	--
86	1	1								0	0.0
87										0	--
88										0	--
89	1	1								0	0.0
Totals:	3,102	3,029	489	1	48	768	184	108	114	1,223	40.4
Mean FL:	62.2	62.2	63.6	69.0	62.7	63.4	63.3	64.3	62.0	63.3	
Total jacks: [J]	291	260	4	0	3	9	5	1	9	27	10.4
Total adults:	2,811	2,745	485	1	45	759	179	107	104	1,195	43.5

a/ Trapping at Willow Creek weir took place August 28 - October 21, 2021 (Julian weeks 35-42). Chinook trapped at WCW after JW 35 were considered fall Chinook.

b/ Seventy-three fall Chinook Salmon were not tagged due to poor condition.

c/ Ad-clip = Adipose fin clipped fish.

d/ Tagged fish found dead and unspawned within 30 days of tagging are considered tagging mortalities.

e/ Fish reported as harvested by anglers.

f/ Trapping occurred at Trinity River Hatchery September 7, 2021 - March 8, 2022 (JWs 36-10; closed parts or all of JWs 41-43).

g/ Fish recovered in upper Trinity River spawner surveys.

h/ Fish tags found loose or on dead fish and returned by anglers or other river enthusiasts.

i/ Fish caught and released by anglers, their tag removed.

j/ Fall Chinook <52 cm FL were considered jacks in 2021 (for this analysis).

Appendix 27. Fork length (FL) distribution of coded-wire tagged, Trinity River Hatchery (TRH)-origin fall Chinook Salmon recovered at TRH during the 2021-22 season.

	Brood Years and Tag Codes															
	2017							2018								
FL (cm)	060594-f	060708-f	061492-f	061493-f	061495-f	061497-y	061498-y	061547-f	061548-f	062018-f	062019-f	062020-f	062021-f	061903-f	062022-y	TOTALS
38																0
39																0
40																0
41																0
42																0
43																0
44																0
45																0
46															1	1
47															1	1
48																0
49															3	3
50															2	2
51															1	1
52												1			1	2
53											1				6	7
54						1		1		1			1		10	14
55						1				1		1	1		8	12
56									2	1		1	2		20	26
57	1							3		1	1	1		1	28	36
58						1		2	5	4		3	2		49	66
59									2	5	4	7	2		42	62
60								2	5	1	4	4	4	2	78	100
61								3	5	3	4	7	6	1	78	107

62					1	1		4	8	6	2	3	4		80	109
63		1				1		4	6	3	3	7	6		97	128
64						1		2	9	6	2	4	9		104	137
65						2		2	5	5	3	4	4		71	96
66	1					2		2	4		2	5	3		66	85
67						5		2	3	3	3	1	1	1	55	74
68			1			1		1	2	2	2	1	1		32	43
69		1				4		1			2	1	2		16	27
70						6		1	1		1	1	2		16	28
71						2	1	1		1					17	22
72						4						1			7	12
73		2				2	1								5	10
74						1							1		4	6
75						2									1	3
76																0
77				1		2										3
78						1	1									2
79						2										2
80						1									1	2
81																0
82															1	1
83																0
84						1										1
85																0
Totals:	2	4	1	1	1	44	3	31	57	43	34	53	51	5	901	1,231
Mean	61.5	69.5	68.0	77.0	62.0	69.8	74.0	62.8	62.6	62.1	63.0	62.1	62.9	61.0	62.8	

a/ Trapping occurred at Trinity River Hatchery September 7, 2021 - March 8, 2022 (JWs 36-10; closed parts or all of JWs 41-43).
Note: Age at release: f = fingerlings, y = yearlings.

Appendix 28. Percent return of Trinity River Hatchery-origin, coded-wire tagged fall Chinook Salmon, brood years 1986-2016.

	Fingerlings -f			Yearlings-Y			f + Y combined		
Brood year	Number released	Number of returns	Percent return	Number released	Number of returns	Percent return	Number released	Number of returns	Percent return
1986	393,955	292	0.07%	153,700	4,899	3.19%	547,655	5,191	0.95%
1987	172,980	129	0.07%	92,300	418	0.45%	265,280	547	0.21%
1988	194,197	138	0.07%	143,934	796	0.55%	338,131	934	0.28%
1989	201,622	21	0.01%	143,978	174	0.12%	345,600	195	0.06%
1990	0	0	---	103,040	166	0.16%	103,040	166	0.16%
1991	206,416	937	0.45%	115,300	517	0.45%	321,716	1,454	0.45%
1992	192,032	2,503	1.30%	108,894	5,369	4.93%	300,926	7,872	2.62%
1993	201,032	158	0.08%	110,336	798	0.72%	311,368	956	0.31%
1994	216,563	374	0.17%	113,124	756	0.67%	329,687	1,130	0.34%
1995	216,051	285	0.13%	110,327	3,106	2.82%	326,378	3,391	1.04%
1996	217,981	445	0.20%	112,746	394	0.35%	330,727	839	0.25%
1997	216,772	1,707	0.79%	313,080	11,396	3.64%	529,852	13,103	2.47%
1998	184,781	292	0.16%	334,726	7,173	2.14%	519,507	7,465	1.44%
1999	181,301	693	0.38%	296,892	5,833	1.96%	478,193	6,526	1.36%
2000	522,316	3,909	0.75%	216,593	5,245	2.42%	738,909	9,154	1.24%
2001	499,919	476	0.10%	230,055	5,894	2.56%	729,974	6,370	0.87%
2002	508,963	3,563	0.70%	236,319	3,561	1.51%	745,282	7,124	0.96%
2003	534,219	289	0.05%	225,798	944	0.42%	760,017	1,233	0.16%
2004	486,369	4,125	0.85%	218,386	3,909	1.79%	704,755	8,034	1.14%
2005	488,466	157	0.03%	227,903	675	0.30%	716,369	832	0.12%
2006	486,833	849	0.17%	238,156	3,240	1.36%	724,989	4,089	0.56%
2007	446,316	324	0.07%	244,661	2,330	0.95%	690,977	2,654	0.38%
2008	518,269	3,576	0.69%	259,330	4,211	1.62%	777,599	7,787	1.00%
2009	496,761	2,988	0.60%	230,461	7,361	3.19%	727,222	10,349	1.42%
2010	475,062	856	0.18%	231,430	2,221	0.96%	706,492	3,077	0.44%
2011	406,418	461	0.11%	200,337	2,489	1.24%	606,755	2,950	0.49%
2012	393,038	84	0.02%	221,247	714	0.32%	614,285	798	0.13%
2013	526,760	136	0.03%	239,886	280	0.12%	766,646	416	0.05%
2014	338,088	430	0.13%	236,204	788	0.33%	574,292	1,218	0.21%
2015	461,047	1,747	0.38%	239,139	2,535	1.06%	700,186	4,282	0.61%
2016	0	0	--	247,474	1,063	0.43%	247,474	1,063	0.43%
Means:	334,985	1,030	0.30%	199,863	2,879	1.38%	534,848	3,910	0.71%

a/ Based on estimated returns upstream of Willow Creek weir. Does not include ocean harvest, in-river harvest, or escapement below Willow Creek weir.

Appendix 29. Run-size, percent return, in-river sport harvest, and spawner escapement estimates for Trinity River Hatchery (TRH)-origin, coded-wire tagged (CWT) fall Chinook Salmon returning to the Trinity River basin upstream of Willow Creek weir during the period 2018 – 2021.

Release data						Estimated returns					
CWT [a] code	Brood year	Date [b]	Number	Site	Age	Run-size	% of release	River harvest	Spawning escapement TRH [c]	Spawning escapement Natural	Spawning escapement Total [g]
060962	2016	10/21-26/2017	247,474	TRH	2	91.1	0.04	4.1	36.4	50.6	87.0
060962					3	915.0	0.37	27.7	284.0	603.2	887.2
060962					4	56.9	0.02	2.9	56.9	100.2	157.1
060962					5	0.0	0.00	0.0	0.0	0.0	0.0
				Totals: d/		1063.0	0.43	34.7	377.3	754.0	1131.3
				Total adults: e/		971.9	0.39	30.6	340.9	703.4	1044.3
061497	2017	06/08-22/18	244,018	TRH	2	121.1	0.05	3.0	33.0	85.1	118.1
061497					3	2030.8	0.83	36.4	722.4	1272.0	1994.4
061497					4	118.2	0.05	3.7	44.7	69.8	114.5
061492	2017	06/08-22/18	81,503	TRH	2	11.0	0.01	0.3	3.0	7.7	10.7
061492					3	45.6	0.06	0.8	16.2	28.6	44.8
061492					4	2.7	0.00	0.1	1.0	1.6	2.6
061493	2017	10/01-10/18	82,197	River	2	0.0	0.00	0.0	0.0	0.0	0.0
061493					3	45.8	0.06	0.8	16.3	28.7	45.0
061493					4	2.7	0.00	0.1	1.0	1.6	2.6
061494	2017	06/08-22/18	84,414	TRH	2	7.3	0.01	0.2	2.0	5.2	7.2
061494					3	48.6	0.06	0.9	17.3	30.4	47.7
061494					4	0.0	0.00	0.0	0.0	0.0	0.0
061495	2017	06/08-22/18	81,704	TRH	2	7.3	0.01	0.2	2.0	5.2	7.2
061495					3	77.2	0.09	1.4	27.4	48.3	75.7
061495					4	2.7	0.00	0.1	1.0	1.6	2.6
060708	2017	06/08-22/18	82,823	TRH	2	3.7	0.00	0.1	1.0	2.6	3.6
060708					3	45.7	0.06	0.8	16.2	28.6	44.8
060708					4	10.8	0.01	0.3	4.1	6.4	10.5
060594	2017	06/08-22/18	76,609	TRH	2	3.7	0.00	0.0	1.0	2.6	3.6

060594					3	74.4	0.10	1.3	26.5	46.6	73.1
060594					4	5.3	0.01	0.2	2.0	3.2	5.2
061498	2017	06/08-10/10/18	12,003	River	2	0.0	0.00	0.0	0.0	0.0	0.0
061498					3	74.0	0.62	1.3	26.3	46.4	72.7
061498					4	8.0	0.07	0.3	3.0	4.8	7.8
061547	2018	06/15-07/02/19	85,586	TRH	2	118.7	0.139	0.0	72.0	46.7	118.7
					3	82.9	0.097	2.6	3.0	4.8	7.8
061548	2018	06/15-07/02/19	86,013	TRH	2	118.8	0.138	0.0	72.1	46.7	118.8
061548					3	152.5	0.177	4.8	57.7	90.1	147.8
062018	2018	06/15-07/02/19	87,328	TRH	2	112.1	0.128	0.0	68.0	44.1	112.1
062018					3	115.0	0.132	3.6	43.5	67.9	111.4
062019	2018	06/15-07/02/19	86,552	TRH	2	68.7	0.079	0.0	41.7	27.0	68.7
062019						91.2	0.105	2.8	34.5	53.8	88.3
062020	2018	06/15-07/02/19	91,553	TRH	2	80.4	0.088	0.0	48.8	31.6	80.4
062020					3	142.1	0.155	4.4	53.8	83.9	137.7
062021	2018	06/15-07/02/19	84,647	TRH	2	62.2	0.073	0.0	37.7	24.4	62.2
062021					3	137.2	0.162	4.3	51.9	81.0	132.9
061903	2018	06/18-08/26/19	9,365	River	2	18.4	0.197	0.0	11.2	7.2	18.4
061903					3	13.7	0.146	0.4	5.2	8.1	13.2
062022	2018	10/04-14/19	240,578	TRH	2	419.9	0.175	0.0	254.8	165.1	419.9
062022					3	2415.2	1.004	75.4	914.0	1425.9	2339.9

a/ CWT = coded-wire tag.

b/ Chinook Salmon released during June were smolts, those released in October were yearlings.

c/ TRH = Trinity River Hatchery.

d/ Totals are presented only for brood year 2016. These fish have reached five years of age and are considered to have completed their life cycle.

e/ The term "adults" includes Chinook aged three through five.

f/ Experimental release group. Fish used in screw trap efficiency studies; released near North Fork Trinity River or Willow Creek.

g/ Rounding sometimes makes for seeming addition errors in this column.

Appendix 30. Run-size, angler harvest, spawning escapement estimates, and associated expanded estimates, by tag code, of Trinity River Hatchery (TRH) orgin fall Chinook Salmon returning to the Trinity River during the 2021-22 season. [a]

CWT code [b]	BY [c]	Age	TRH expansion factor [d]	TRH Total CWTs [e]	Percent of total CWTs	Run-size	Ex-panded run-size [f]	Angler harvest	Ex-panded angler harvest [f]	Spawning escapement					
										TRH	Ex-panded TRH [f]	River	Ex-panded River [fg]	Escape ment Total [h]	Ex-panded Total
Adults															
060594-f	17	4	4.03	2.0	0.2%	5.3	21.5	0.2	0.7	2.0	8.1	3.2	12.7	5.2	20.8
060708-f	17	4	4.03	4.1	0.3%	10.8	43.7	0.3	1.4	4.1	16.5	6.4	25.8	10.5	42.3
061492-f	17	4	4.05	1.0	0.1%	2.7	10.9	0.1	0.3	1.0	4.1	1.6	6.4	2.6	10.6
061493-f	17	4	4.08	1.0	0.1%	2.7	11.0	0.1	0.3	1.0	4.2	1.6	6.5	2.6	10.7
061495-f	17	4	4.05	1.0	0.1%	2.7	10.8	0.1	0.3	1.0	4.1	1.6	6.4	2.6	10.4
061497-y	17	4	4.05	44.7	3.6%	118.2	478.8	3.7	14.9	44.7	181.2	69.8	282.6	114.5	463.8
061498-y	17	4	4.27	3.0	0.2%	8.0	34.4	0.3	1.1	3.0	13.0	4.8	20.3	7.8	33.3
061547-f	18	3	4.07	31.4	2.5%	82.9	337.3	2.6	10.5	31.4	127.6	48.9	199.1	80.3	326.7
061548-f	18	3	4.06	57.7	4.6%	152.5	619.4	4.8	19.3	57.7	234.4	90.0	365.6	147.8	600.0
062018-f	18	3	4.11	43.5	3.5%	115.0	472.8	3.6	14.8	43.5	178.9	67.9	279.1	111.4	458.0
062019-f	18	3	4.11	34.5	2.8%	91.2	374.6	2.8	11.7	34.5	141.8	53.8	221.1	88.3	362.9
062020-f	18	3	4.09	53.8	4.3%	142.1	581.7	4.4	18.1	53.8	220.1	83.9	343.4	137.7	563.5
062021-f	18	3	4.13	51.9	4.2%	137.2	566.9	4.3	17.7	51.9	214.5	81.0	334.7	132.9	549.2
061903-f	18	3	4.40	5.2	0.4%	13.7	60.1	0.4	1.9	5.2	22.7	8.1	35.5	13.2	58.2
062022-y	18	3	4.11	914.0	73.2%	2,415.2	9,936.0	75.4	310.0	914.0	3,760.2	1,425.8	5,865.8	2,339.9	9,626.0
			Adult totals:	**1,249.0**	**100.0%**	**3,300.4**	**13,559.8**	**103.0**	**423.1**	**1,249.0**	**5,131.6**	**1,948.4**	**8,005.1**	**3,197.4**	**13,136.7**
Jacks	19 [i]	2													
			Jack totals:	**0.0**	**0.0%**		**628.0**		**11.0**		**86.0**		**531.0**		**617.0**
Fall Chinook CWT and estimated unmarked BY 19 Totals:							**14,187.8**		**434.1**		**5,217.6**		**8,536.1**		**13,753.7**

a/ Estimate is for upstream of Willow Creek weir. b/ CWT = coded-wire tag code. Fish are of the same race and release type (f=fingerling and y=yearling).
c/ BY=brood year. d/ Expansion factors used to account for untagged releases of the same BY and release type for each CWT group.
e/ Number of ad-clipped fish observed at Trinity River Hatchery, expanded by the number of ad-clipped fish with lost or unreadable tags.
f/ Expanded run-size, angler harvest, TRH escapement and river (natural area) escapement estimates are the product of each of those respective estimates multiplied
g/ River (natural area) escapement estimates equal the total escapement minus the TRH escapement.
h/ Run-size estimate minus harvest estimate equals escapement estimate.
i/ No BY 2019 Chinook were marked at TRH in 2020 due to the Covid-19 pandemic. For how the BY 2019 hatchery contributions were estimated, see Appendix 2.

Appendix 31. Estimated contribution of Trinity River Hatchery (TRH) origin fall Chinook Salmon to the total estimated run-size upstream of Willow Creek weir, 1991-2021 seasons.

Year	Run-size	TRH component	Natural component	% TRH composition
1991	9,207	5,597	3,610	60.8%
1992	14,164	4,651	9,513	32.8%
1993	10,485	1,499	8,986	14.3%
1994	21,924	11,880	10,044	54.2%
1995	105,725	53,263	52,462	50.4%
1996	55,646	20,824	34,822	37.4%
1997	21,347	9,977	11,370	46.7%
1998	43,189	23,536	19,653	54.5%
1999	18,516	13,081	5,435	70.6%
2000	55,473	38,881	16,592	70.1%
2001	57,109	33,984	23,125	59.5%
2002	18,156	6,884	11,272	37.9%
2003	64,362	52,944	11,418	82.3%
2004	29,534	25,956	3,578	87.9%
2005	28,231	19,674	8,557	69.7%
2006	34,912	21,768	13,144	62.4%
2007	58,873	24,633	34,240	41.8%
2008	22,997	8,585	14,412	37.3%
2009	29,593	10,072	19,521	34.0%
2010	40,792	15,853	24,939	38.9%
2011	80,818	32,875	47,943	40.7%
2012	73,666	32,735	40,931	44.4%
2013	36,989	13,371	23,618	36.1%
2014	37,829	20,463	17,366	54.1%
2015	10,365	4,531	5,834	43.7%
2016	6,196	2,188	4,008	35.3%
2017	15,450	7,393	8,057	47.9%
2018	26,848	14,111	12,737	52.6%
2019	11,910	5,023	6,887	42.2%
2020	24,957	14,674	10,283	58.8%
2021	22,623	13,754	8,869	60.8%
Mean:	35,093	18,215	16,878	50.3%

Appendix 32. Fork length (FL) distribution of Coho Salmon trapped and tagged at Willow Creek weir and subsequently recovered during the 2021-22 season.

FL (cm)	Willow Creek Weir			Recoveries							
	Total Trapped	Total Tagged [b]	RM-clips [c]	Tag Morts [d]	Angler Harvest [e]	TRH [f]	Carcass survey [g]	Found Tags [h]	Angler Released [i]	Total Recovered	% Recovered
38	1	1	1			1				1	100.0
39	2	2	2							0	0.0
40	6	5	5			3	1			4	80.0
41	3	3	3			2				2	66.7
42	3	3	3			2				2	66.7
43	6	5	6			1				1	20.0
44	2	2	2							0	0.0
45										0	--
46	2	2	2			1				1	50.0
47	2	2	2			1				1	50.0
48										0	--
49										0	--
50										0	--
51										0	--
52										0	--
53										0	--
54										0	--
55										0	--
56	1	1	1							0	0.0
57	1	1	1							0	0.0
58	5	5	5			1				1	20.0
59	2	2	2			1				1	50.0
60	8	8	8			6				6	75.0
61	9	9	8			3	1			4	44.4
62	14	14	13			6	1			7	50.0
63	10	9	10			6				6	66.7
64	17	17	16			8				8	47.1
65	26	26	24			11		1	1	13	50.0
66	22	20	21			11	2			13	65.0
67	18	18	17			10	1			11	61.1
68	12	12	12			9				9	75.0

69	7	6	7			3				3	50.0
70	6	6	6			2				2	33.3
71	4	4	3			3	1			4	100.0
72	3	1	3				1			1	100.0
73	1	1	1			1				1	100.0
74											--
75											--
76											--
77	1	1	1							0	0.0
Totals:	194	186	185	0	0	92	8	1	1	102	54.8
Mean FL:	61.8	61.8	61.8	--	--	62.4	--	--	--	62.5	
Total jacks: [j]	27	25	26	0	0	11	1	0	0	12	48.0
Total adults:	167	161	159	0	0	81	7	1	1	90	55.9

a/ Trapping at Willow Creek weir took place August 28 - October 21, 2021 (Julian weeks 35 - 42).
b/ Eight trapped Coho went untagged in 2021 due to poor condition.
c/ RM-clips = Right maxillary clipped fish of Trinity River Hatchery origin.
d/ Tagged fish found dead and unspawned within 30 days of tagging are considered tagging mortalities.
e/ Fish reported as harvested by anglers.
f/ Trapping occurred at Trinity River Hatchery Sept 7, 2021 - Mar 8, 2022 (JWs 36-10; closed parts or all of JWs 41-43).
g/ Fish tags recovered in upper Trinity River spawner surveys.
h/ Fish tags found loose or on a dead fish and returned by anglers or other river users.
i/ Fish reported as caught and released by anglers, their tag removed.
j/ Coho <50 cm FL were considered jacks in 2021.

Appendix 33. Fork length (FL) distribution of Coho Salmon trapped and tagged at Junction City weir (JCW), and subsequently recovered during the 2021-22 season. [a]

	Junction City Weir				Recoveries							
FL (cm)	Total Trapped	Total Tagged [b]	RM-clips [c]	TRH via truck	Tag Morts [d]	Angler Harvest [e]	TRH [f]	Carcass survey [g]	Found Tags [h]	Angler Released [i]	Total Recovered	% Recovered
41	2	1	2				1				1	100.0
42	6	6	6				2				2	33.3
43	3	3	3				1				1	33.3
44	3	3	3								0	0.0
45	2	2	2				1				1	50.0
46											0	--
47											0	--
48											0	--
49											0	--
50											0	--
51											0	--
52											0	--
53					1						1	--
54											0	--
55											0	--
56											0	--
57	1	1	1	1							1	100.0
58											0	--
59	1	1	1						1		1	100.0
60	1	1	1				1				1	100.0
61	1	1		1							1	100.0
62	4	4	4				4				4	100.0
63	10	10	8	3			6				9	90.0
64	25	25	24				17				17	68.0
65	22	22	20	2			9				11	50.0
66	54	53	51	10			20				30	56.6
67	31	31	30	3			13	1	1		18	58.1
68	38	38	34	3			20	2	1		26	68.4
69	40	40	38	3			20		1		24	60.0

70	43	43	42	2			25		2	1	30	69.8
71	35	34	34	4			17				21	61.8
72	21	21	20	1			10		1		12	57.1
73	10	10	9	2			6				8	80.0
74	9	9	9				6				6	66.7
75	6	6	6	1			3				4	66.7
76	4	4	4				2				2	50.0
77											0	--
78											0	--
79											0	--
80	1	1	1								0	0.0
Totals:	373	370	353	36	1	0	184	3	7	1	232	62.7
Mean FL:	67.2	67.2	67.2	67.4	53.0	--	67.6	67.7	67.9	70.0	67.5	
Total jacks: [j]	16	15	16	0	0	0	5	0	0	0	5	33.3
Total adults:	357	355	337	36	1	0	179	3	7	1	227	63.9

a/ Trapping at Junction City weir took place June 4 - December 21, 2021 (Julian weeks 23 -51).
b/ Three trapped Coho went untagged in 2021 due to poor condition.
c/ RM-clips = Right maxillary clipped fish of Trinity River Hatchery origin.
d/ There was one tagged fish found dead (in the spawning surveys) and unspawned within 30 days of tagging (considered a tagging mortality) in 2021.
e/ Fish reported as harvested by anglers. There were zero reported as harvested by anglers in 2021.
f/ Trapping occurred at Trinity River Hatchery Sept 7, 2021 - Mar 8, 2022 (JWs 36-10; closed parts or all of JWs 41-43).
g/ There were three JCW tagged Coho recovered in upper Trinity River spawner surveys.
h/ There were seven tags found loose or on dead fish and returned by anglers or other river users in 2021.
i/ There was one Coho reported as caught and released by anglers, their tag removed, in 2021.
j/ Coho <50 cm FL were considered jacks in 2021.

Appendix 34. Juvenile Coho Salmon Marking at Trinity River Hatchery.

To distinguish natural origin (NOR) from hatchery-origin (HOR) Coho Salmon in the Trinity River, CA Department of Fish and Wildlife crew excised the right maxillaries (RM) of the Trinity River Hatchery (TRH) BY 2020 yearling Coho Salmon from January 3 to March 18, 2022. Marking of TRH Coho Salmon has been performed since 1994.

Approximately 2% of the post-marking production (6,835) was sampled during quality control that was performed March 28 and March 29, 2022. Based on our 2% by raceway quality control sampling for RM clip quality and FL prior to volitional release, we estimate that 99.9% of TRH BY 2020 production release were effectively marked with a right maxillary clip. Subtracting post-marking losses and factoring in an estimate for unmarked individuals generated during quality control, a total of 336,503 (336,051 marked (direct count) and 452 unmarked (estimated) individuals were volitionally released by April 21, 2022.

We estimate 336,051 of the 336,503 yearling Coho released from TRH were effectively marked with a RM clip (Table CA1). Based on the quality control sampling, an estimated 99.9% of the BY 2020 production was effectively RM clipped. A court-mandated decrease in production from approximately 500,000 to no more than 300,000 Coho began with the 2013 BY (CDFW 2017).

Table CA10. Production, marking totals, and quality control data for BY 2020 TRH Coho Salmon volitionally released in March and April 2022.

Raceway	Net marked	QC # checked	Estimated % unmarked	Effectively marked [a]	Estimated unmarked releases	Marked releases	***Total released***
J3-J4	81,432	1,857	0.05%	81,433	44	81,365	***81,409***
J1-J2	79,880	1,693	0.00%	79,880	0	79,809	***79,809***
O3 - O4	83,289	1,634	0.49%	83,297	408	83,217	***83,625***
O1 - O2	91,714	1,651	0.00%	91,714	0	91,660	***91,660***
Total	336,315	6,835	0.54%	336,324	452	336,051	***336,503***

Coho Salmon Returns

Coho Salmon of the Trinity River typically have a three-year life-cycle with juveniles rearing in freshwater during their first year, then migrating to the ocean. After approximately one year at sea, jacks (mostly males) return to the river as two-year-olds and a year later as three-year-old adults (Table CA11). Coho adults (age 3) returning to the Trinity River in 2021-22 were of BY 2018, Coho Salmon jacks (age 2) were of BY 2019.

Table CA11. Release and recovery data for right maxillary-clipped Coho Salmon recovered at Trinity River Hatchery (TRH) during the 2021-22 season.

Release data						TRH Recovery data					Number recovered	
						Males		Females		Total	Tagging site	
Mark	Egg source	Brood year	Date	Number	Site	No.	FL [a]	No.	FL [a]	No.	WCW	JCW
RM [b]	TRH	2018	3/20-26/2020	329,342	TRH	1,121	66.5	1,047	64.4	2,168	81	199
RM [b]	TRH	2019	3/19-25/2021	289,851	TRH	147	40.1	0	--	147	11	5
					Total Coho:	1,268		1,047		2,315	92	204

a/ FL = Mean fork length in cm.

b/ Since 1996, all Coho Salmon produced at TRH have received a right maxillary clip (RM). Coho Salmon <50 cm FL were classified as brood year 2019 and Coho Salmon >49 cm FL were classified as brood year 2018. Age cutoff based on fork length distribution.

Total percent return for RM-clipped TRH-origin Coho from BY 2018 was 1.87%. Since 1994 the BY total return rate has averaged 2.5% and ranged from 0.17 to 6.60 %. (

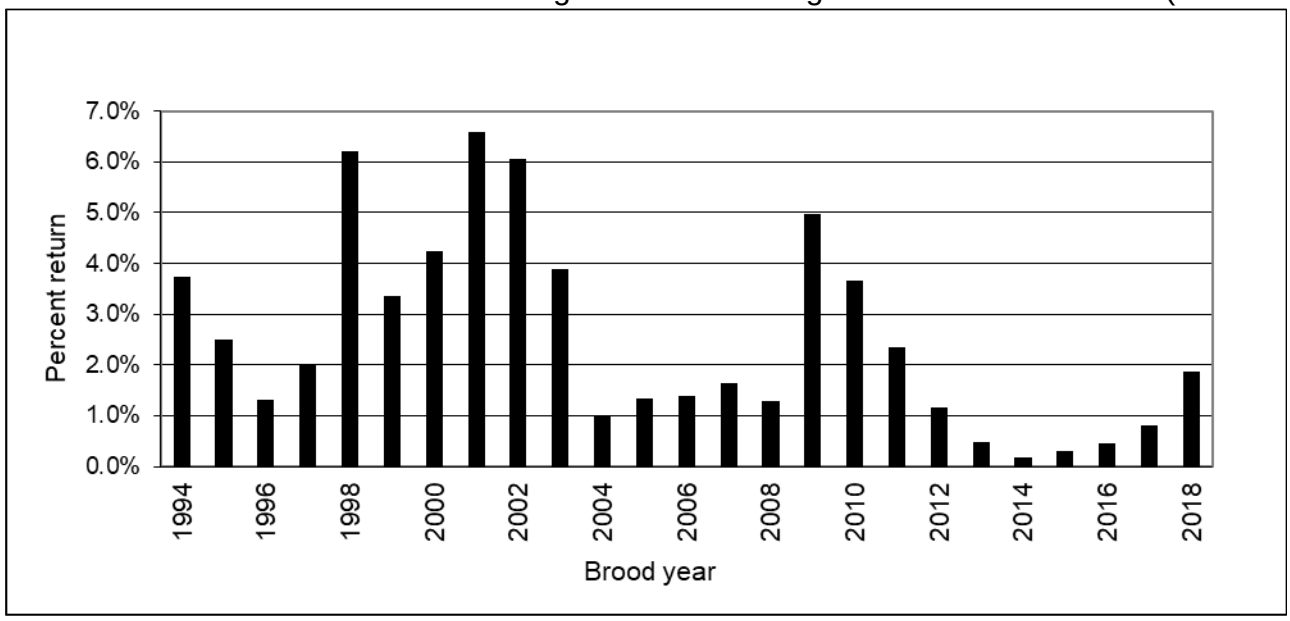


Figure CA24).

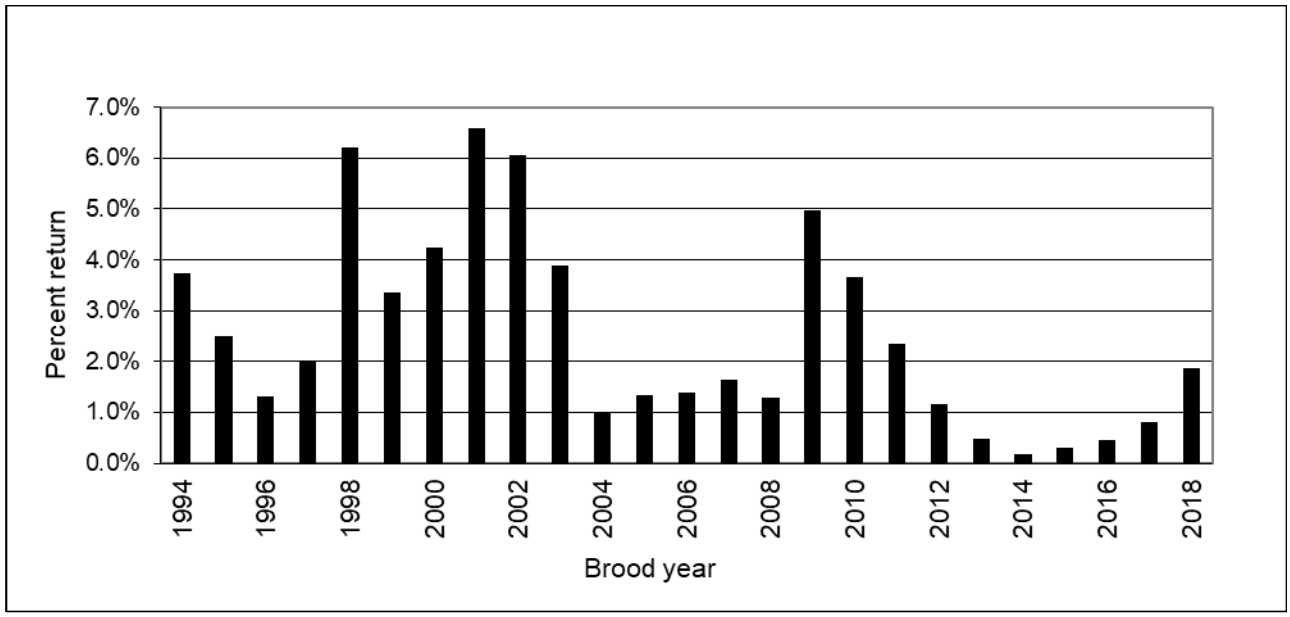


Figure CA24. Percent return of Trinity River Hatchery origin Coho Salmon to Trinity River Hatchery, 1994 – 2018.

The 2021 estimated escapement and run-size of Coho Salmon to the Trinity River (above Willow Creek weir) was an estimated 4,766 fish. This consisted of 324 jacks (12 NOR, 312 HOR) and 4,442 adults (213 NOR and 4,229 HOR) for a total of 95.3% HOR fish.

Table CA3. Run-size, harvest and spawner escapement estimates for right maxillary clipped, Trinity River Hatchery-produced Coho Salmon returning to the Trinity River upstream of Willow Creek weir, brood years, 1994 – 2018.

Release data				Return data						
Brood year	Date	Effective Number	Site	Age	Run-size	% of release	In-river harvest	Spawner Escapement TRH	Natural	Total
1994	3/17-21/96	72,311	TRH	2	970	1.34%	0	105	865	970
				3	1,732	2.40%	0	867	865	1,732
				Totals:	2,702	3.74%	0	972	1,730	2,702
1995	3/17-21/97	580,880	TRH	2	5,552	0.96%	39	858	4,655	5,513
				3	9,008	1.55%	0	3,899	5,109	9,008
				Totals:	14,560	2.51%	39	4,757	9,764	14,521
1996	3/16-20/98	513,663	TRH	2	2,340	0.46%	0	969	1,371	2,340
				3	4,357	0.85%	86	3,015	1,256	4,271
				Totals:	6,697	1.30%	86	3,984	2,627	6,611
1997	3/15-22/99	517,196	TRH	2	592	0.11%	0	381	211	592
				3	9,704	1.88%	0	3,407	6,297	9,704
				Totals:	10,296	1.99%	0	3,788	6,508	10,296
1998	3/15-20/00	493,233	TRH	2	5,289	1.07%	0	916	4,373	5,289
				3	25,395	5.15%	0	9,625	15,770	25,395
				Totals:	30,684	6.22%	0	10,541	20,143	30,684
1999	3/15-22/01	512,986	TRH	2	3,373	0.66%	0	1,024	2,349	3,373
				3	13,849	2.70%	0	6,409	7,440	13,849
				Totals:	17,222	3.36%	0	7,433	9,789	17,222
2000	3/17-19/02	524,238	TRH	2	1,571	0.30%	0	688	883	1,571
				3	20,721	3.95%	0	9,730	10,991	20,721
				Totals:	22,292	4.25%	0	10,418	11,874	22,292
2001	3/17-19/03	416,201	TRH	2	3,338	0.80%	0	1,449	1,889	3,338
				3	24,162	5.81%	40	8,835	15,287	24,122
				Totals:	27,500	6.60%	40	10,284	17,176	27,460
2002	3/15-18/04	516,906	TRH	2	5,665	1.10%	0	1,068	4,597	5,665
				3	25,678	4.97%	0	15,704	9,974	25,678

				Totals:	31,343	6.06%	0	16,772	14,571	31,343
2003	3/14-18/05	520,847	TRH	2	3,012	0.58%	21	1,269	1,721	2,990
				3	17,123	3.29%	0	7,454	9,669	17,123
				Totals:	20,135	3.90%	21	8,723	11,390	20,113
2004	3/15-20/06	545,199	TRH	2	1,331	0.24%	0	657	674	1,331
				3	4,048	0.74%	0	2,436	1,612	4,048
				Totals:	5,379	0.99%	0	3,093	2,286	5,379
2005	3/15-20/07	511,961	TRH	2	503	0.10%	0	270	233	503
				3	6,381	1.25%	0	4,177	2,204	6381
				Totals:	6,884	1.34%	0	4,447	2,437	6,884
2006	3/15-20/08	455,482	TRH	2	2,290	0.50%	0	643	1,647	2,290
				3	4,067	0.89%	0	2,386	1,681	4,067
				Totals:	6,357	1.40%	0	3,029	3,328	6,357
2007	3/16-20/09	457,478	TRH	2	1,645	0.36%	0	871	774	1,645
				3	5,852	1.28%	0	3,706	2,146	5,852
				Totals:	7,497	1.64%	0	4,577	2,920	7,497
2008	4/6-8/10	413,178	TRH	2	1,233	0.30%	0	516	707	1,233
				3	4,113	1.00%	0	1,710	2,403	4,113
				Totals:	5,346	1.29%	0	2,226	3,110	5,336
2009	3/15-28/11	490,998	TRH	2	10,982	2.24%	0	2,862	8,120	10,982
				3	13,494	2.75%	0	7,159	6,335	13,494
				Totals:	24,476	4.98%	0	10,021	14,455	24,476
2010	3/15-26/12	489,429	TRH	2	3,198	0.65%	0	871	2,327	3,198
				3	14,782	3.02%	0	5,847	8,935	14,782
				Totals	17,980	3.67%	0	6,718	11,262	17,980
2011	3/15-20/13	511,618	TRH	2	2,667	0.52%	0	424	2,243	2,667
				3	9,297	1.82%	0	2,892	6,405	9,297
				Totals	11,964	2.34%	0	3,316	8,648	11,964
2012	3/15-18/14	528,016	TRH	2	3,239	0.61%	0	932	2,307	3,239
				3	2,936	0.56%	0	2,770	166	2,936
				Totals	6,175	1.17%	0	3,702	2,473	6,175

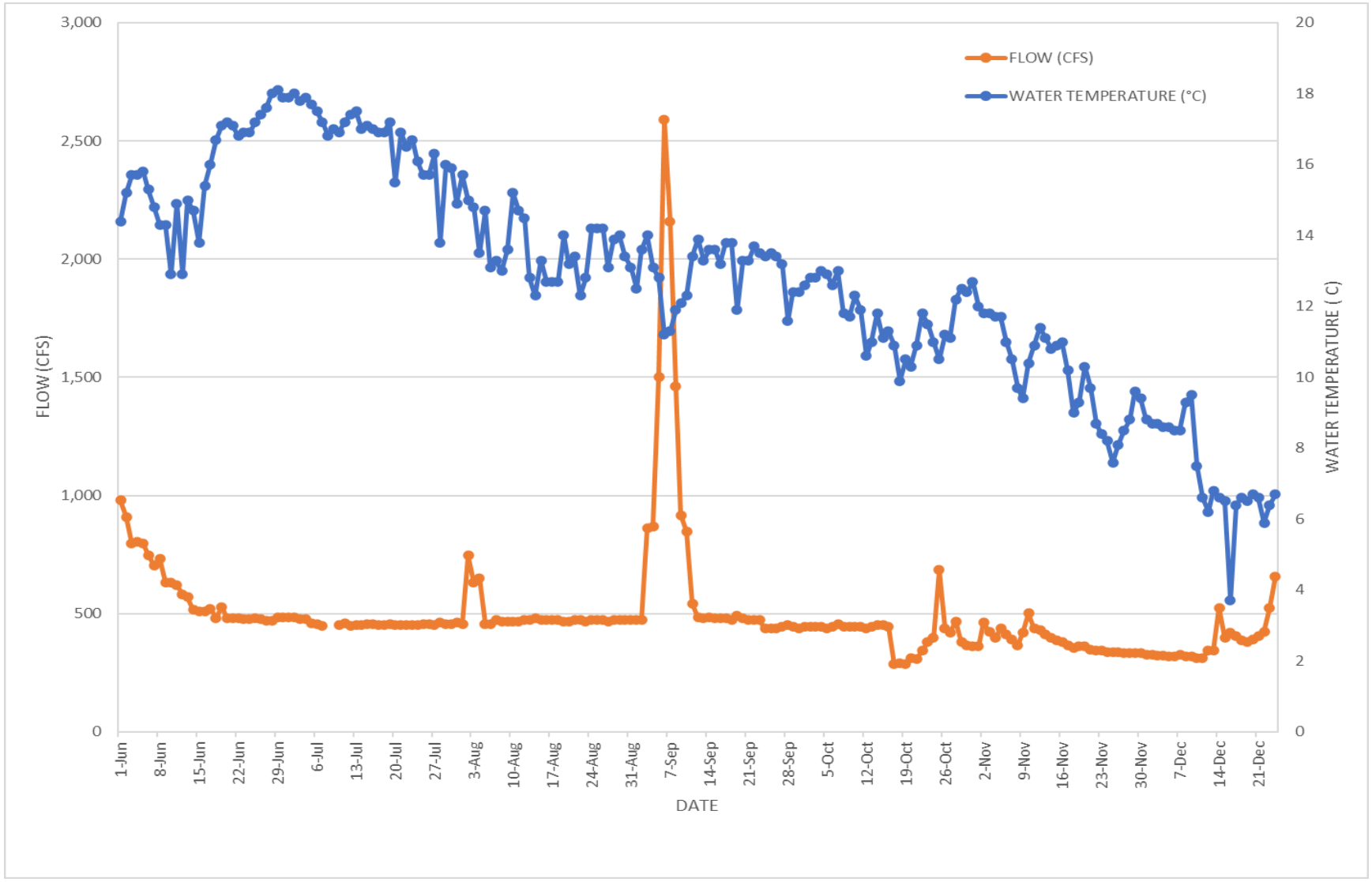
2013	3/15-23/15	287,720	TRH	2	870	0.30%	0	270	600	870
				3	482	0.17%	0	408	74	482
				Totals	1,352	0.47%	0	678	674	1,352
2014	3/15-21/2016	230,821	TRH	2	45	0.02%	0	45	0	45
				3	354	0.15%	0	247	107	354
				Totals	399	0.17%	0	292	107	399
2015	3/16-24/2017	248,102	TRH	2	236	0.10%	0	149	87	236
				3	515	0.21%	0	515	502	1,017
				Totals	751	0.30%	0	664	589	1,253
2016	3/15-25/2018	258,243	TRH	2	185	0.07%	0	185	224	409
				3	965	0.37%	0	602	358	960
				Totals	1,150	0.45%	0	787	582	1,369
2017	4/15-22/2019	149,807	TRH	2	5	0.00%	0	5	0	5
				3	1,214	0.81%	0	927	287	1,214
				Totals	1,219	0.81%	0	932	287	1,219
2018	3/20-26/2020	329,342	TRH	2	1,927	0.59%	0	1,354	573	1,927
				3	4,229	1.28%	0	2,168	2,061	4,229
				Totals	6,156	1.87%	0	3,522	2,634	6,156

Appendix 35. Fork length (FL) distribution of fall steelhead trapped and tagged at Willow Creek weir and subsequently recovered during the 2021-22 season.

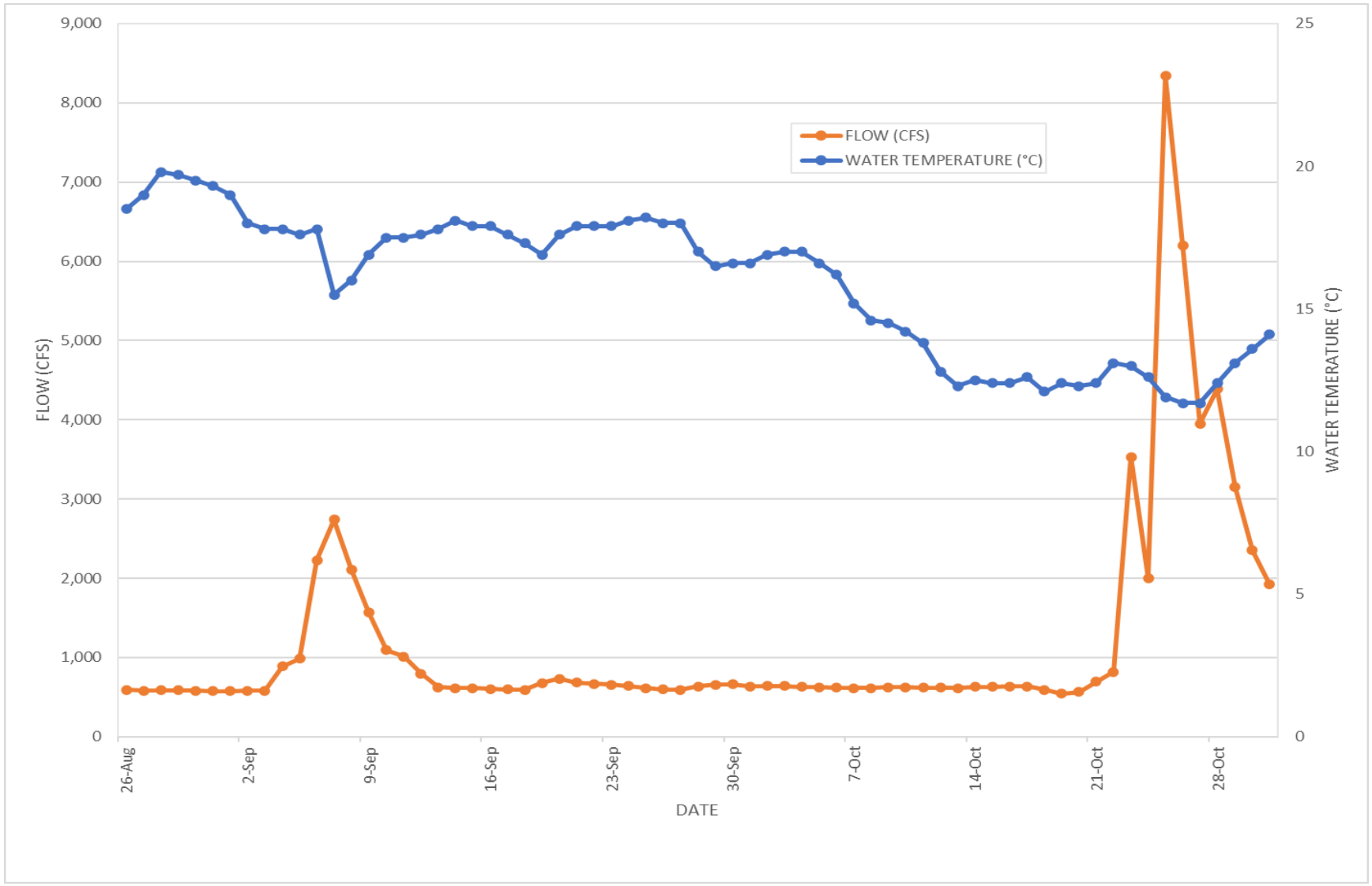
	WCW			Recoveries							
FL (cm)	Total Trapped	Total [b] Tagged	Ad-clips [c]	Tagging [d] Mortalities	Angler Harvest [e]	TRH [f]	Carcass survey [g]	Found Tags [h]	Angler Released [i]	Total Recoveries	% Recoveries
32	1		1							0	--
33	1									0	--
34										0	--
35										0	--
36										0	--
37	1		1							0	--
38	2		1							0	--
39										0	--
40										0	--
41	1									0	--
42										0	--
43	1	1								0	0.0
44	3	3								0	0.0
45	4	4							1	1	25.0
46	1	1							1	1	100.0
47	5	5								0	0.0
48	7	7	2							0	0.0
49	10	10	4			1			1	2	20.0
50	13	13	6			3			1	4	30.8
51	13	13	5						1	1	7.7
52	28	28	11			3			5	8	28.6
53	31	31	20		3	6			1	10	32.3
54	25	25	14			7				7	28.0
55	21	21	15			4		1	4	9	42.9
56	23	23	16		1	6	1		4	12	52.2
57	25	25	17		1	4			1	6	24.0
58	31	31	23	1		10			3	14	45.2
59	24	24	15		1	3			2	6	25.0
60	16	15	12		1	5				6	40.0
61	12	12	7			2			2	4	33.3

62	12	12	7		1	3			1	5	41.7
63	6	6	4							0	0.0
64	6	6	2			1			1	2	33.3
65	4	4	1			1			1	2	50.0
66	3	3	1							0	0.0
67	1	1	1							0	0.0
68	1	1								0	0.0
69	2	2	1							0	0.0
70										0	--
71	1	1								0	0.0
72	1	1	1			1				1	100.0
Totals:	336	329	188	1	8	60	1	1	30	101	30.7
Mean FL:	55.3	55.7	56.1	--	56.6	56.7	--	--	55.3	56.3	
Total 1/2lbers	6	0	3	0	0	0	0	0	0	0	
Total adults [j]:	330	329	185	1	8	60	1	1	30	101	30.7

a/ Trapping at Willow Creek weir took place August 28 - October 21, 2021 (Julian weeks 35 - 42).
b/ Seven steelhead were trapped but not tagged at WCW in 2021; 6 were half-pounders (too small), and 1 adult was in poor condition.
c/ Ad-clip = Adipose fin clipped fish.
d/ Tagged fish found dead and unspawned within 30 days of tagging are considered tagging mortalities.
e/ Fish reported as harvested by anglers.
f/ Trapping occurred at Trinity River Hatchery September 7, 2021 - March 8, 2022 (JWs 36-10; closed parts or all of JWs 41-43).
g/ Fish recovered in upper Trinity River spawner surveys.
h/ Fish tags found loose or on dead fish and returned by anglers or other river users.
i/ Fish caught and released by anglers, their tag removed.
j/ Adult steelhead are all those > 41 cm FL.



Appendix 36. Daily mean flow (CFS) and water temperature (°C) recorded at USGS gauge (11526250) for Trinity River upstream of Junction City, 2021.



Appendix 37. Daily mean flow (CFS) and water temperature (°C) recorded at USGS gauge (11530000) for Trinity River near Willow Creek weir, 2021.