**CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE**

# MEMORANDUM

Date: August 12, 2026

To: Steve Tsao, Senior Environmental Scientist Supervisor
Department of Fish and Wildlife | Central Region

From: Vanessa Kollmar, Environmental Scientist
Department of Fish and Wildlife | Central Region

## Subject: Merced River Escapement Survey Report 2023

# State of California Department of Fish and Wildlife

## Merced River Escapement Report 2023

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Steve Tsao | CDFW Senior Environmental Scientist Supervisor

2026-08-12


*photo credit: Vanessa Kollmar, CDFW*

## Note to the Readers:

The 2023 Merced River Fall Chinook Salmon Escapement Survey summarizes our annual Chinook (Oncorhynchus tshawytscha) salmon escapement survey and analyzes fishery and environmental data on the Merced River. The report documents salmon migration timing, spawning temporally and spatially and estimates 2023 fall Chinook salmon spawning population in the Merced River. The report discusses challenges faced during our survey.

Information collected is used in the Department's Ocean Salmon Project Coded-Wire Tags recovery report and the California Central Valley Chinook Population Database Report known as GrandTab.

All data is reviewed by Ryan Kok and Christopher Diviney, Central Region, Lower San Joaquin River Research and Restoration, PO Box 10 La Grange, CA 95329.

All questions and comments should be directed to Vanessa Kollmar, Central Region, Lower San Joaquin River Research and Restoration, PO Box 10 La Grange, CA 95329, vanessa.kollmar@wildlife.ca.gov

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## Introduction

The Merced River, a 135-mile tributary of the San Joaquin River, begins in the Sierra Nevada Mountain Ranges near Yosemite National Park (NOAA 2022) and ends at its convergence with the San Joaquin River in Newman, California. Historically, the Merced River supported populations of both spring and fall-run Chinook salmon (Oncorhynchus tshwaytscha); however, environmental changes in the twentieth-century lead to the extirpation of spring-run Chinook salmon (Yoshiyama 1996). Fall-run Chinook salmon ("fall-run") populations are on the decline and have recently been listed as a "Species of Special Concern" by the National Marine Fisheries Service (NOAA 2022). Since 1953, the California Department of Fish and Wildlife (CDFW) has monitored the migration of adult fall-run Chinook to the Merced River in an effort to estimate the returning reproductive population (Azat 2025). In 2023 CDFW conducted its annual fall-run Chinook salmon escapement survey ("survey") with the objective to: 1. Collect data and analyze coded-wire tag (CWT) data from hatchery-origin Chinook salmon. 2. Collect sex and fork length data. 3. Collect tissue samples for age and life-history reconstruction analyses. 4. Collect data on redd distributions and redd formation timing. 5. Estimate the reproductive population of adult fall-run in the Merced River.

## Study Area

The survey covers 28 miles of the lower Merced River. It begins at the terminus of anadromy and ends downstream in Livingston, California. The survey is sub-divided into four sections (Figure 1). Section 1 begins at Crocker-Huffman Dam (RM52) and ends at the Snelling Road Bridge (RM47). Section 2 begins at Snelling Road Bridge and ends at the Highway 59 Bridge (RM42). Section 3 begins at the Highway 59 Bridge and ends at Shaffer Bridge in Winton, California (RM32). Section 4 begins at Shaffer Bridge and ends at Riverdance Farms in Livingston, California (RM24). In 2023, riffles were mapped with the Bad Elf Flex® Mini GPS Unit and drawn in ArcView®. Riffles within the study area were labeled using an alphanumeric labeling system that consists of a letter and a number (Table 1). The letters represent the RM, with "A" representing the first RM of the survey and the numbers representing the sequence of riffles within the mile.

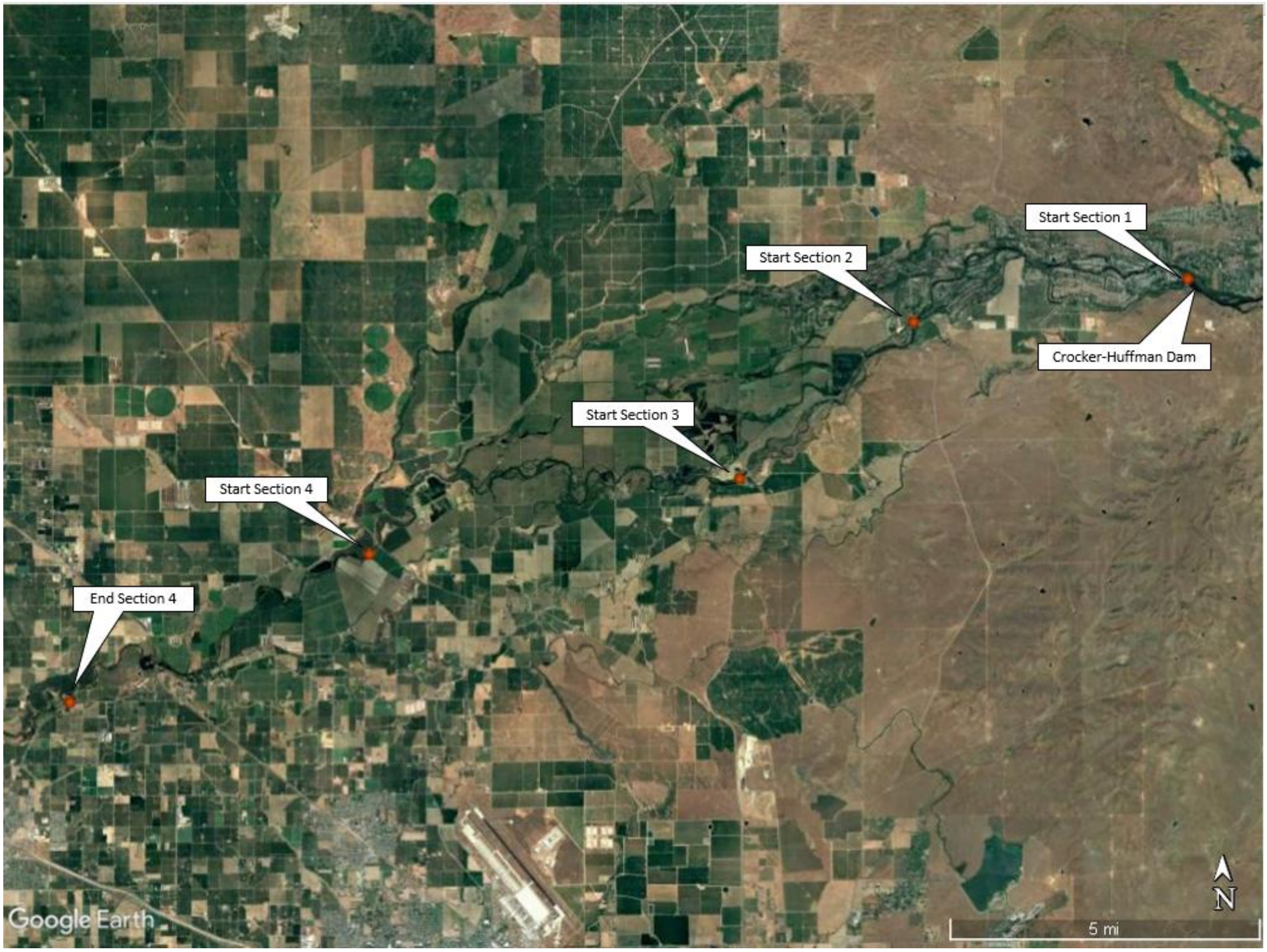



Figure 1. Satellite image of the lower Merced River showing the 28-mile surveyed area. (map data: Google Earth Pro)

Table 1. Riffle name reference table. Riffles are grouped by section and river miles are included in parenthesis.

| Section 1 | Section 2 | Section 3 | Section 3 (continued) | Section 4 |
|---|---|---|---|---|
| A1(52.0) | F2(46.3) | K1(41.7) | P4(35.7) | T3(31.9) |
| A2N(51.6) | F3(46.0) | K2(41.6) | P5(35.5) | T4(31.8) |
| A2S(51.6) | G1(45.6) | K3(41.5) | Q1(35.4) | U1(31.4) |
| A3(51.4) | G2(45.4) | K4(41.3) | Q2(35.2) | U2(31.2) |
| A4N(51.2) | G3(45.2) | K5(41.2) | Q3(35.1) | U3(30.9) |
| A4S(51.2) | G4(44.9) | L1(40.5) | Q4(34.9) | U4(30.8) |

| Section 1 | Section 2 | Section 3 | Section 3 (continued) | Section 4 |
|---|---|---|---|---|
| A5(51.0) | H1(44.7) | L2(40.3) | Q5(34.9) | V1(30.4) |
| B1(50.9) | H2(44.5) | L3(40.1) | R1(34.6) | V2(30.3) |
| B2N(50.8) | H3(44.0) | M1(39.7) | R2(34.2) | V3(30.2) |
| B2S(50.8) | I1(43.8) | M2(39.4) | R3(34.2) | W1(29.7) |
| B3(50.6) | I2(43.7) | M3(39.3) | R4(33.8) | W2(29.6) |
| B4(50.4) | I3(43.5) | M4(39.1) | S1(33.5) | W3(29.3) |
| B5(50.3) | I4(43.3) | M5(39.0) | S2(33.2) | W4(29.0) |
| B6(50.0) | I5(43.2) | N1(38.7) | S3(33.0) | X1(28.1) |
| C1(49.9) | I6(43.1) | N2(38.5) | S4(32.8) | X2(28.0) |
| C2(49.7) | I7(43.0) | N3(38.3) | T1(32.3) | X3(27.8) |
| C3N(49.4) | I8(42.9) | N4(38.2) | T2(32.1) | X4(27.8) |
| C3S(49.4) | J1(42.7) | N5(37.8) | - | Y1(27.6) |
| D1(48.5) | J2(42.5) | O1(37.5) | - | Z1(26.5) |
| D2(48.3) | J3(42.3) | O2(37.4) | - | Z2(25.9) |
| D3(48.1) | J4(42.1) | O3(37.3) | - | Z3(25.8) |
| E1(47.8) | - | O4(37.2) | - | AA1(25.7) |
| E2(47.1) | - | O5(37.0) | - | AA2(25.6) |
| F1(46.6) | - | O6(36.6) | - | AA3(25.5) |
| - | - | P1N(36.4) | - | AA4(25.2) |
| - | - | P1S(36.4) | - | AA5(25.1) |
| - | - | P2(36.2) | - | AB1(24.5) |
| - | - | P3(35.9) | - | AB2(24.1) |

# Methods

## Carcass Collection

Using traditional mark-recapture methods, weekly surveys were conducted by drift boat with a 2–3-person crew. When possible, areas inaccessible by boat were surveyed on foot. All recoverable carcasses were collected from each riffle complex (which includes a riffle, glide, and pool) were tagged, sampled, and released back into the current. Carcasses were categorized based on decomposition as fresh, decayed, or skeleton. Fresh carcasses were identified by one clear eye and firm muscle tissue (Figure 2), while decayed carcasses had cloudy eyes and soft muscle tissue (Figure 3). Fresh and decayed carcasses were fitted with aluminum tags attached to the lower jaw, enabling week-to-week tracking (Figure 3). Skeletons were defined as carcasses in advanced stages of decomposition, with severely fragmented or liquefied muscle tissue, or those heavily predated upon the point that they were no longer viable for recapture (Figure 4). All skeletons were counted and destroyed before being returned to the river.

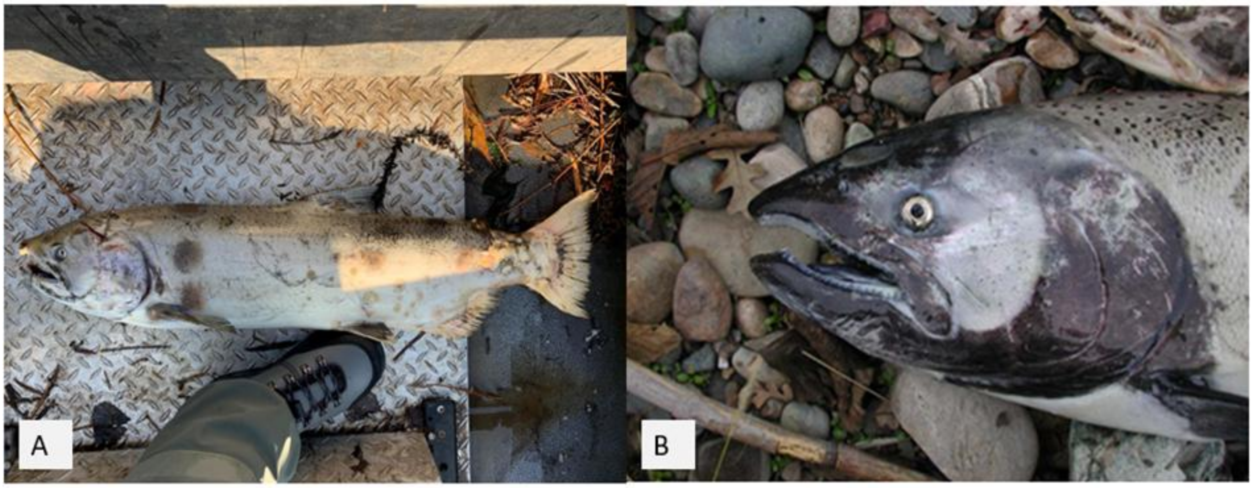



Figure 2. Fresh salmon carcass: A) Full body and B) Example of a clear eye.

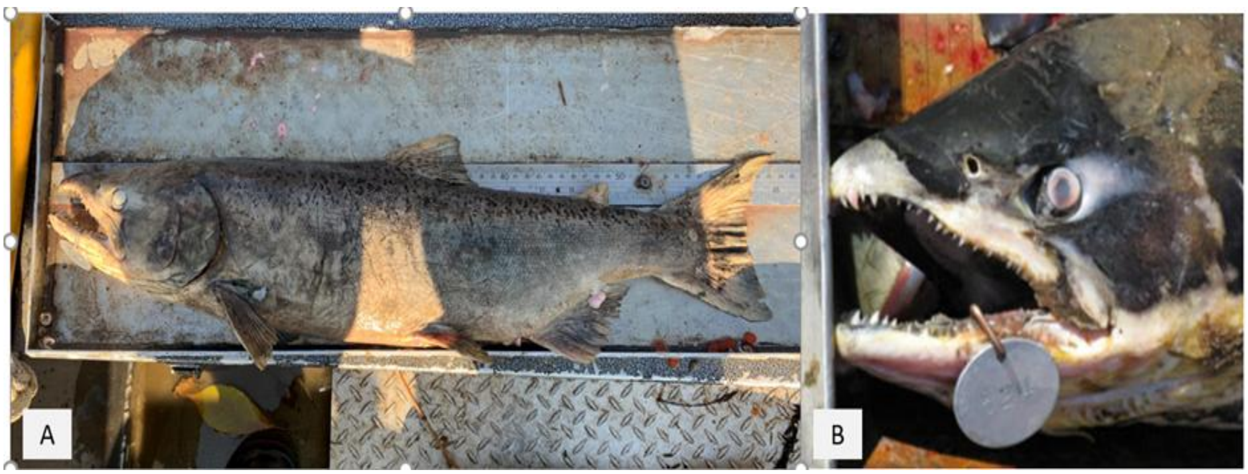



Figure 3. Decayed salmon carcass: A) Full body and B) Example of a clouded eye and positioning of the aluminum tag.


Figure 4. Various forms of skeleton carcasses. Seen here are fish in extreme stages of decay. Both A) and B) show the two more common skeleton stages observed during the survey. The bodies are extremely soft and covered with fungus. C) Is an example of a predated carcass that will not be viable for recapture.

## Sample Collection

Tissue samples collected from carcasses included scales, otoliths, DNA, eye lenses, and heads from hatchery-origin fish. Biometric data collected included fork length (cm) and sex. Scales were taken from above the lateral line, between the dorsal and adipose fins, and stored on wax paper inside sample envelopes. At the end of each day, envelopes were laid out on drying racks to air-dry before storing. Otoliths were extracted from the head, placed in Eppendorf tubes, and labeled with Shamrock® waterproof stickers. DNA was collected from the pectoral fin of all wild fish in the month of October. Samples were stored on wax paper and placed in sample envelopes. At the end of each day, envelopes were laid out on drying racks to air-dry before storing. DNA samples were taken on all wild fish in October in an effort to identify any spring-run Chinook spawning alongside the fall-run. Both eye lenses were extracted from wild fish using an 8 mm biopsy punch. Samples were placed in Eppendorf tubes and labeled with Shamrock® waterproof stickers. Heads from adipose-clipped fish (an indicator of hatchery origin) were preserved by freezing and sent out for post-season processing at CDFW's Tissue Archive Laboratory in West Sacramento. Biometric and biological data were used to assess the size and age composition of the annual spawning population. Scales and fork lengths were used to estimate fish age, otoliths are analyzed to reconstruct juvenile life history (from conception to ocean entry), and coded wire tags (CWTs) were used to determine hatchery origin and brood year.

## Environmental Data Collection

Flow and dam release data were obtained from the California Data Exchange Center, operated by the California Department of Water Resources. Flow gauges used were the "Merced River at Exchequer Dam" (EXC) and the "Merced River Below Crocker-Huffman Dam" (MBH). Water temperature data were collected using four HOBO temperature loggers maintained by CDFW, each programmed to record hourly readings year-round. Weather conditions were recorded in the field and categorized by survey staff. Water visibility was measured using a secchi disc (attached to a 17-foot line) with readings taken in the deepest pool of each survey section.

## Weekly Fish Distribution and Redd Counts

Using a single-pass method, weekly live fish and redd counts were conducted over the 15-week survey period. Surveys covered a total of 130 riffle matrices. At each riffle complex, staff used handheld tally counters to record the number of fresh (active) redds and live fish observed. Fresh Chinook redds were identified based on several key characteristics: (1) a pot-like depression with a "V"-shaped gravel tailspill that appeared cleaner and lighter in color than the surrounding substrate, and (2) the presence of a female holding over the cleaned gravel bed. Redds were considered fresh if a female was actively guarding them. Once the female died and the redd showed signs of aging—such as algal growth or debris accumulation—it was no longer counted. Because redds are not individually marked, they are counted multiple times over the course of the survey. To estimate the seasonal spawning activity, the maximum number of redds observed at each riffle over the season are summed together to give a sum of max redds for the season. Although this metric underestimates of the total number of redds, it provides a standardized index for spawning activity; and without individually marking each redd, the exact number of redds cannot be determined.

## Quality Control and Analysis

Information recorded on all samples was compared against field datasheets and then entered into a Microsoft Access database. Contents of the database were subsequently exported to R, where a series of quality control checks identified less obvious errors—such as multiple recaptures of the same tag within a week, tag duplication, transcription errors, and suspicious tag movements. After these checks, the data were aggregated into three tables: a covariates table, a live/redd/skeleton table, and a mark-recapture table. These tables were then used in the Cormack-Jolly-Seber (CJS) statistical model v2.1 that generates an escapement estimate.

# Results

## Survey

The survey was conducted over 15 weeks, beginning on October 3, 2023, and ending on January 11, 2024. The sampling protocol was modified in 2023 to include tissue collection from skeletonized carcasses. This change was implemented in response to the limited number of tissue samples collected in 2022, when only 20 carcasses were recovered. Anticipating another year of low returns, all opportunities to collect tissue samples were pursued, including samples from skeletonized carcasses when available. Covariate data collected from these skeletons were included in the model selection analysis; however, they were excluded from the escapement estimate because skeletonized carcasses were not part of the mark–recapture component of the survey.

At the start of the season, lenses were collected from all fresh and decayed carcasses. Beginning in Week 8, sampling was modified to collect lenses only from fresh carcasses. This change was implemented because reduced daylight hours became a limiting factor, preventing staff from processing all carcasses before dusk. By reducing handling time, staff were able to process more fish each day.

Additionally, the increased number of carcasses and skeletonized carcasses observed beginning in Week 8 required substantially more time to survey the upper reaches (Sections 1 and 2), where carcasses were typically concentrated. As a result, the lower reaches (Sections 3 and 4) could not always be surveyed. Specifically, Sections 3 and 4 were not surveyed during Week 9, and Section 4 was not surveyed during Weeks 10, 11, and 15.

## Environmental Conditions

In October, Merced Irrigation District released four blocks of water to attract migrating salmon to the Merced River (Figure 5). Each event lasted four-to-six days with peaks of 840 cfs (October 6), 2249 cfs (October 12), 1757 cfs (October 20) and 1909 cfs (October 26) as recorded at Crocker-Huffman Dam. Base flows in November through January averaged 183 cfs (Range: 156 cfs -206 cfs).

Water visibility varied throughout the season and among survey sections. In general, visibility increased with distance downstream from Crocker-Huffman Dam. Median visibility in Sections 1–4 was 7.0 ft, 9.0 ft, 9.5 ft, and 11.0 ft, respectively. Across the entire survey area, median visibility was 9.0 ft (range: 5.0–15.0 ft).

Water temperature also declined over the course of the season. At the start of the season water temperature below Crocker-Huffman averaged 14.1°C and by January it dropped to 11.7°C. Water temperature at Riverdance Farms (end of the survey area) averaged 16.4°C at the start of the survey and by late-December it dropped to 10.0°C.

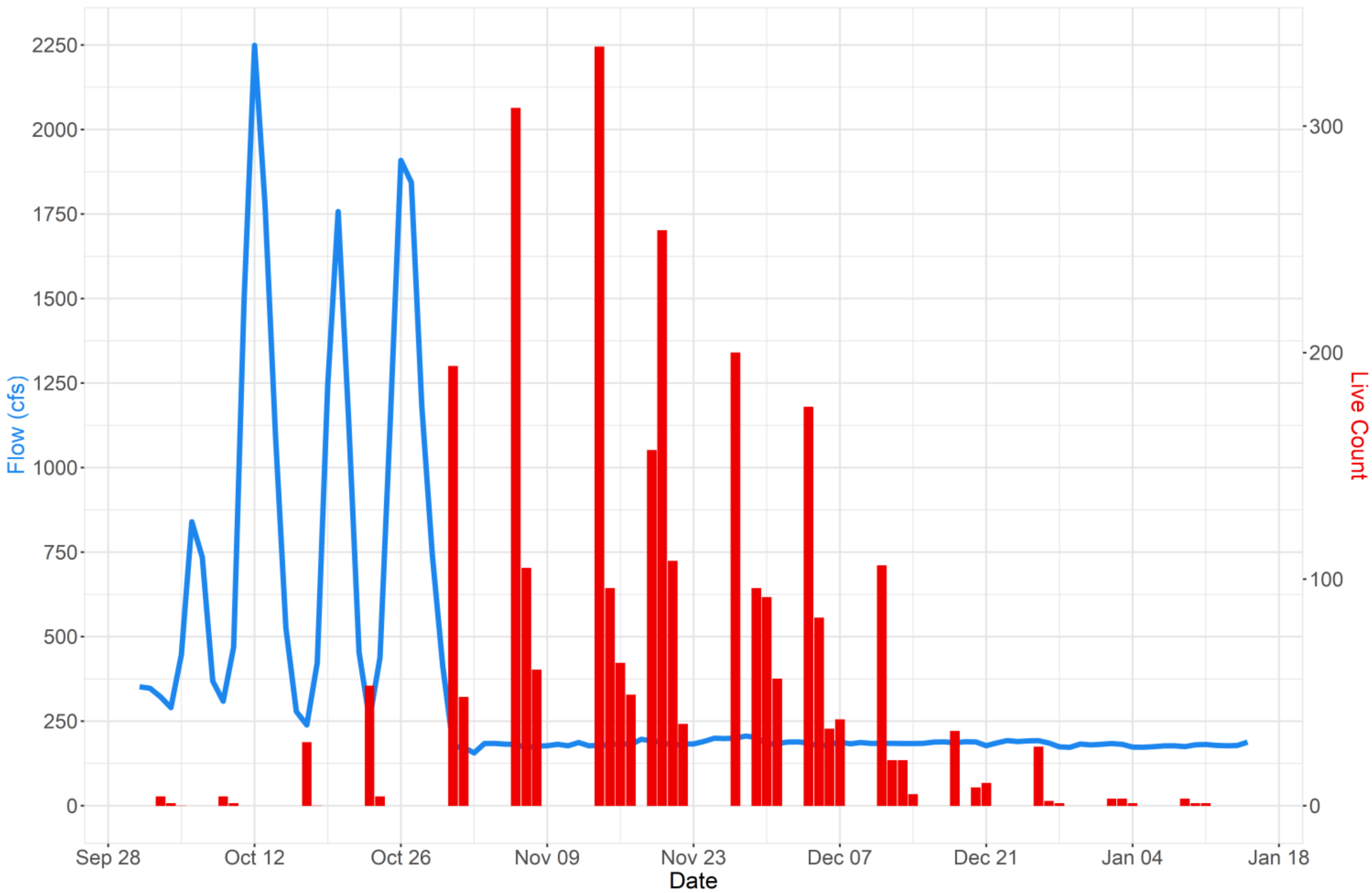



Figure 5. Flow overlaid with Chinook salmon observations on the Merced River October 2023 to January 2024.

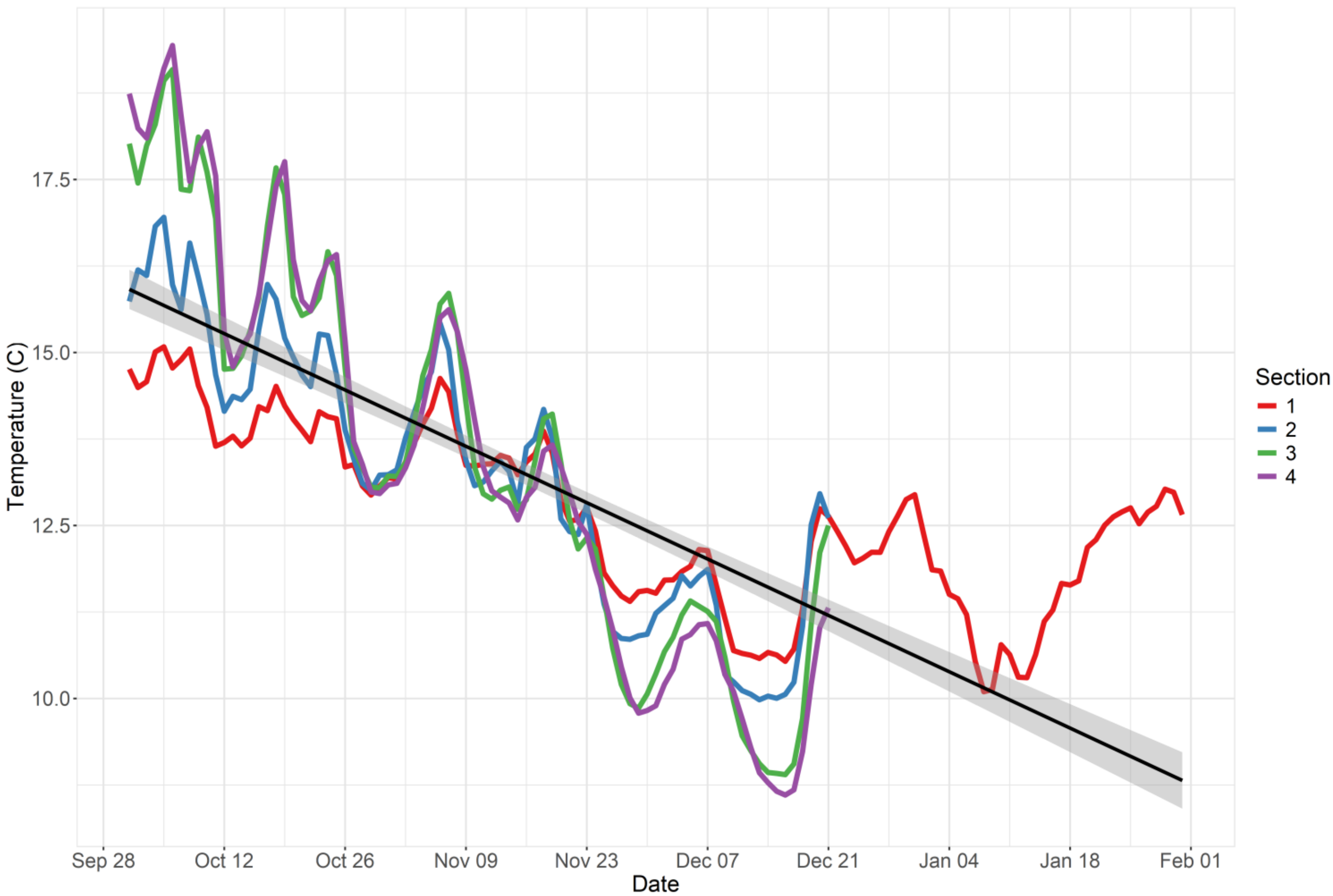



Figure 6. Temperature on the Merced River by section October 2023 to January 2024. Trend line is shown in black.

## Live, Redd, Skeleton and Carcass Distribution

The first "live" was observed on October 3, 2023 (Week 1) at RM 52. Weekly live counts increased until Week 8 where it peaked at 555 individuals (Table 2 & Figure 7). The last live was observed on January 11, 2024.

The first redd was observed on October 3, 2023 (Week 1) at RM 52. Redd counts steadily increased throughout the study area, peaking at 602 in Week 9 (Table 2 & Figure 7). The sum of the maximum number of redds for each riffle was 931. Section 1 had the most redd observations with a maximum redd count of 607 redds (Figure 8) accounting for nearly 65% off all observed redds.

In total, 708 carcasses were tagged in 2023 (Table 2). The first carcass was tagged on October 17, 2023 (Week 3) and the last was tagged on December 28, 2023 (Week 13). 253 carcasses were classified as "decayed" and 455 were classified as "fresh". Scale and otolith samples were collected from 708 carcasses and 9 skeletons. Lenses were collected from 269 carcasses and 206 heads from hatchery-origin fish were sent to the Tissues Archive Laboratory. Five DNA samples were collected in the month of October.

A total of 738 skeletons were recovered and destroyed between Weeks 5 through 15 (Table 2).

Table 2. Live, Redd, Skeleton and Carcass Recoveries by Week

| Week | Live | Redds | Skeletons | Carcass |
|---:|---:|---:|---:|---:|
| 1 | 5 | 1 | 0 | 0 |
| 2 | 5 | 0 | 0 | 0 |
| 3 | 28 | 0 | 0 | 1 |
| 4 | 57 | 6 | 0 | 0 |
| 5 | 242 | 96 | 14 | 1 |
| 6 | 473 | 292 | 17 | 33 |
| 7 | 543 | 584 | 85 | 118 |
| 8 | 555 | 584 | 83 | 105 |
| 9 | 444 | 602 | 228 | 221 |
| 10 | 331 | 472 | 147 | 134 |
| 11 | 151 | 463 | 78 | 62 |
| 12 | 51 | 182 | 47 | 29 |
| 13 | 29 | 40 | 19 | 4 |
| 14 | 7 | 10 | 11 | 0 |
| 15 | 5 | 1 | 9 | 0 |

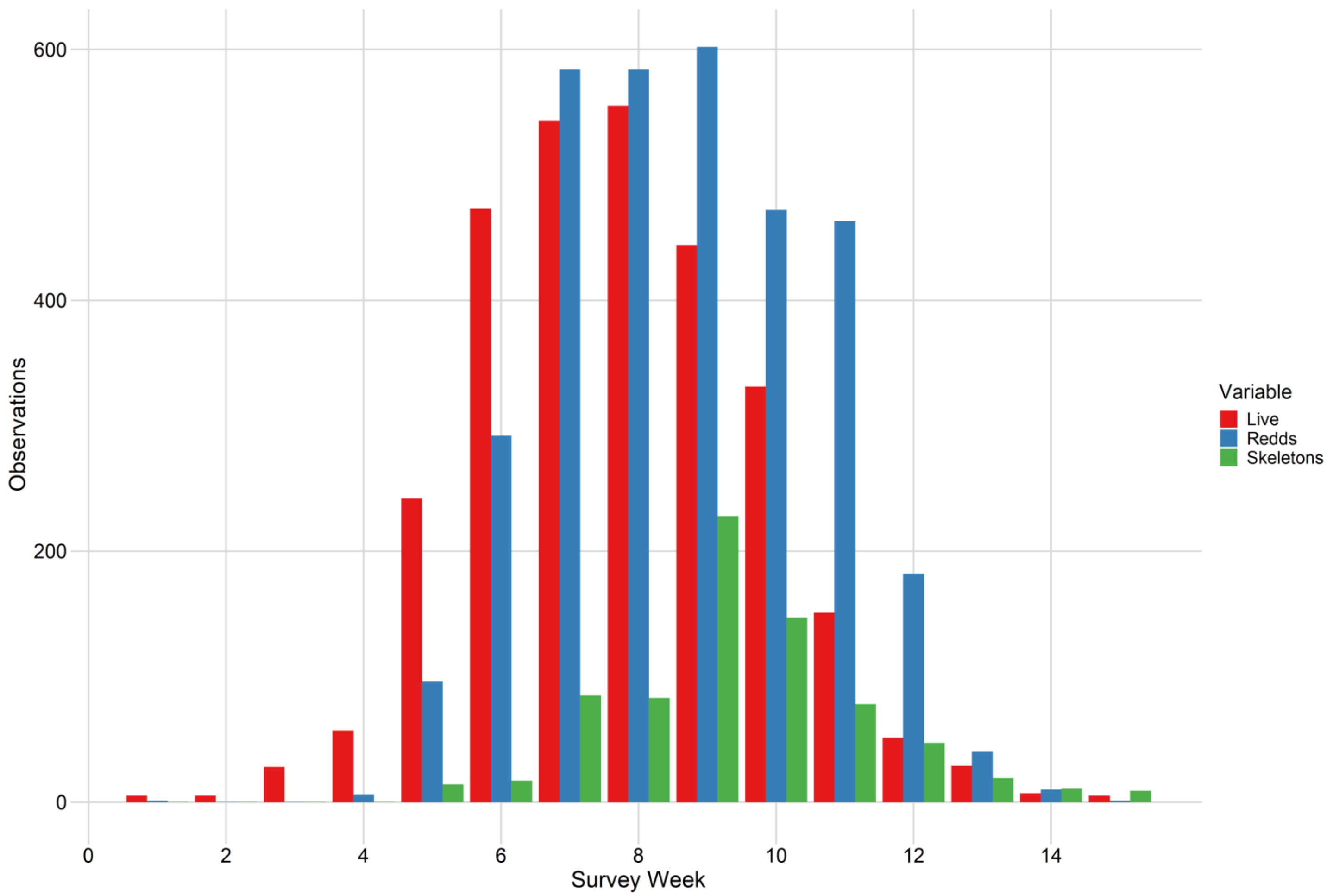



Figure 7. Live, Redd, Skeleton Observations by Week on the Merced River in 2023

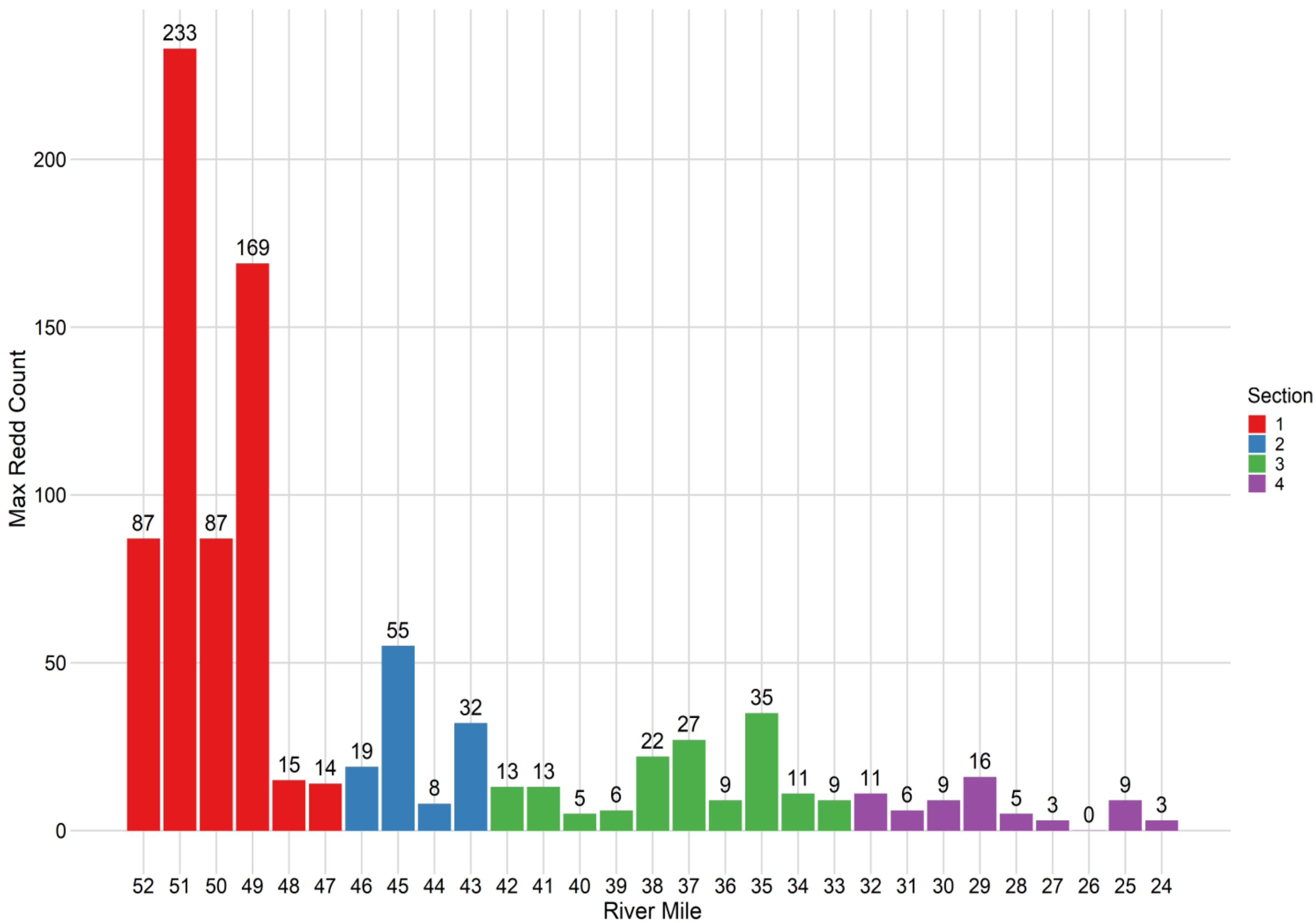



Figure 8. Maximum redd observations by river mile. This chart represents the largest number of redds observed within each riffle, over the course of the survey.

## Hatchery-origin Salmon

193 CWTs were recovered from 206 hatchery-origin salmon. Although rare, it is not uncommon for adipose fin clipped fish to be missing a CWT. Tags can be shed after injection and is the most common reason for a missing tag. 192 fish were identified as fall-run and one was identified as a spring-run from the San Joaquin River Conservation Hatchery. This spring-run was recovered one river mile downstream from the Crocker-Huffman Dam on October 17, 2023.

56% of the hatchery-origin salmon were female (n=115) and 44% were male (n=91). 85% were age-3 adults (n=164), 9% were age-2 sub-adults (n=18) and 6% were age-4 adults (n=11). 93% of the returned hatchery fish were from San Joaquin River Basin Hatcheries (i.e. the Merced River Fish Facility, San Joaquin Conservation Hatchery, and Mokelumne River Fish Hatchery). 7% were strays from the Sacramento River Basin (Table 3). For detailed information related to hatchery escapement and stray rates see the Recovery of

Coded-Wire Tags from Chinook Salmon in California’s Central Valley Escapement, Inland Harvest, and Ocean Harvest in 2023 Report published by the CDFW and Pacific States Marine Fisheries Commission.

Table 3. CWT Hatchery of Origin Data

| Hatchery of Origin | n |
|---|---|
| COLEMAN NFH | 1 |
| FEATHER R HATCHERY | 6 |
| MERCED R FISH FACIL | 20 |
| MOK R FISH INS | 158 |
| NIMBUS FISH HATCHERY | 7 |
| SAN JOAQ R CONSERVAT HAT | 1 |

## Sex and Fork Length

The ratio of male-to-female carcasses was 1:1.4 (n=295 male, n=413 female). Female fork lengths ranged from 54 cm to 94 cm with a median length of 78 cm. Male fork lengths ranged from 55 cm to 100 cm with a median length of 87 cm (Figure 9).

The “grilse” (sub-adult) breakpoints this year was 65 cm for females and 72 cm for males. Fish measuring less than or equal to these breakpoints were classified as grilse, whereas fish measuring greater than the breakpoints were classified as adult. 2.9% of females and 11.5% of males were classified as grilse (Table 4).

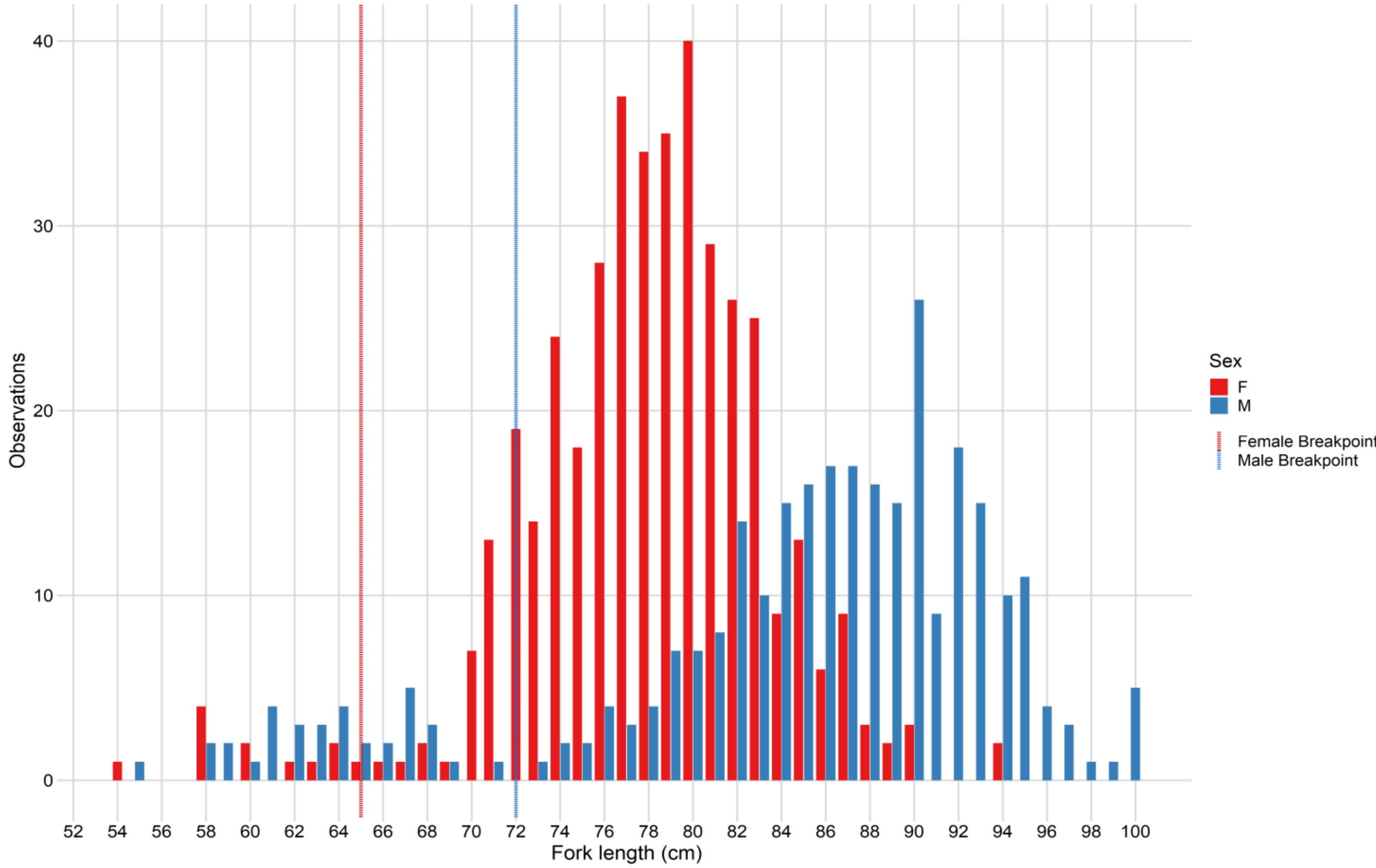



Figure 9. Fork length Distribution by Sex

Table 4. Grilse breakdown expanded to population level

| Category | Value |
|---|---:|
| Adult Female | 401 |
| Adult Male | 261 |
| Grilse Female | 12 |
| Grilse Male | 34 |
| Total No. Grilse | 46 |
| Total No. Adult | 662 |
| Total Tagged | 708 |
| Expanded Grilse Population | 154 |
| Expanded Adult Population | 2,217 |
| Percent Grilse | 6 |

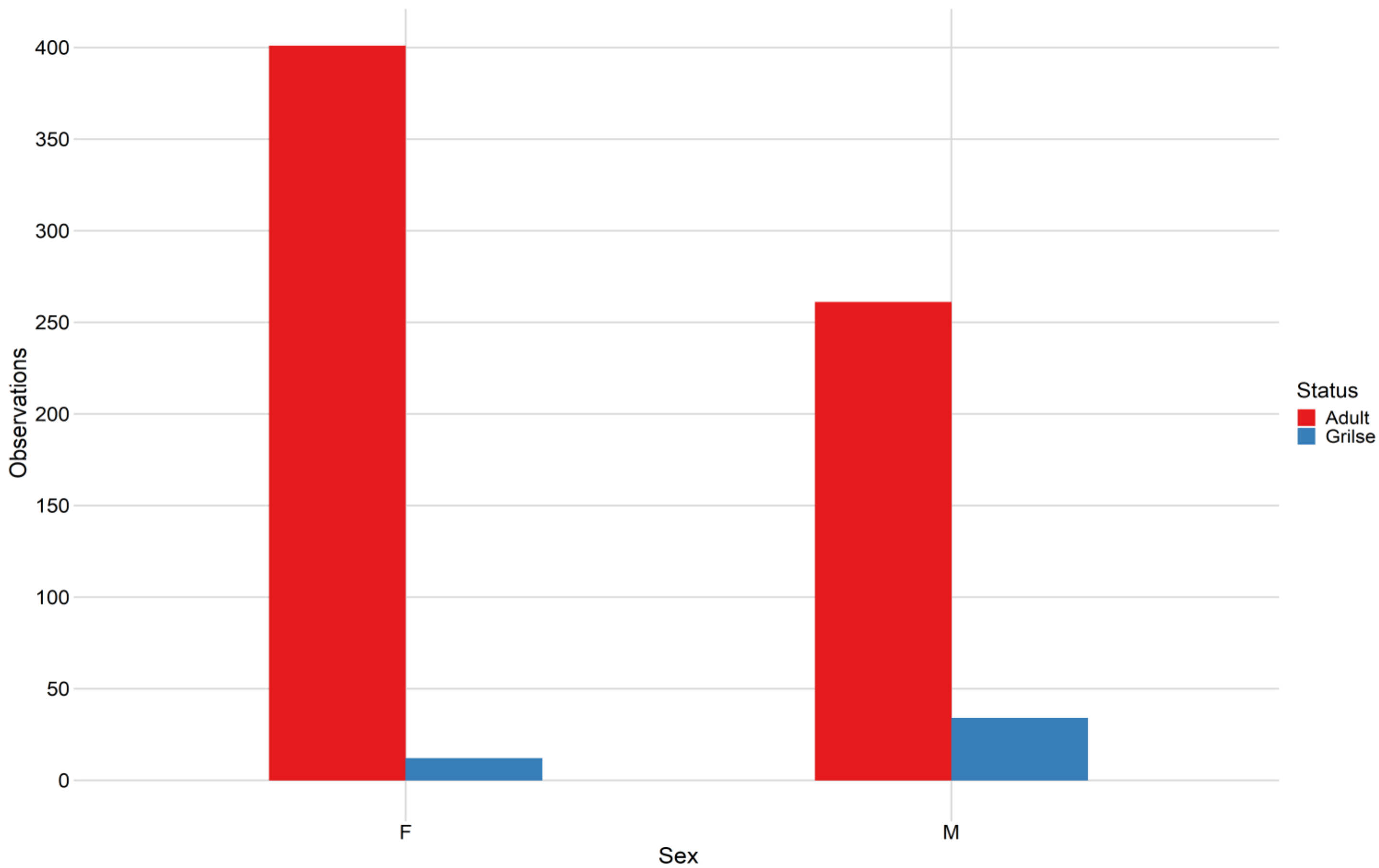


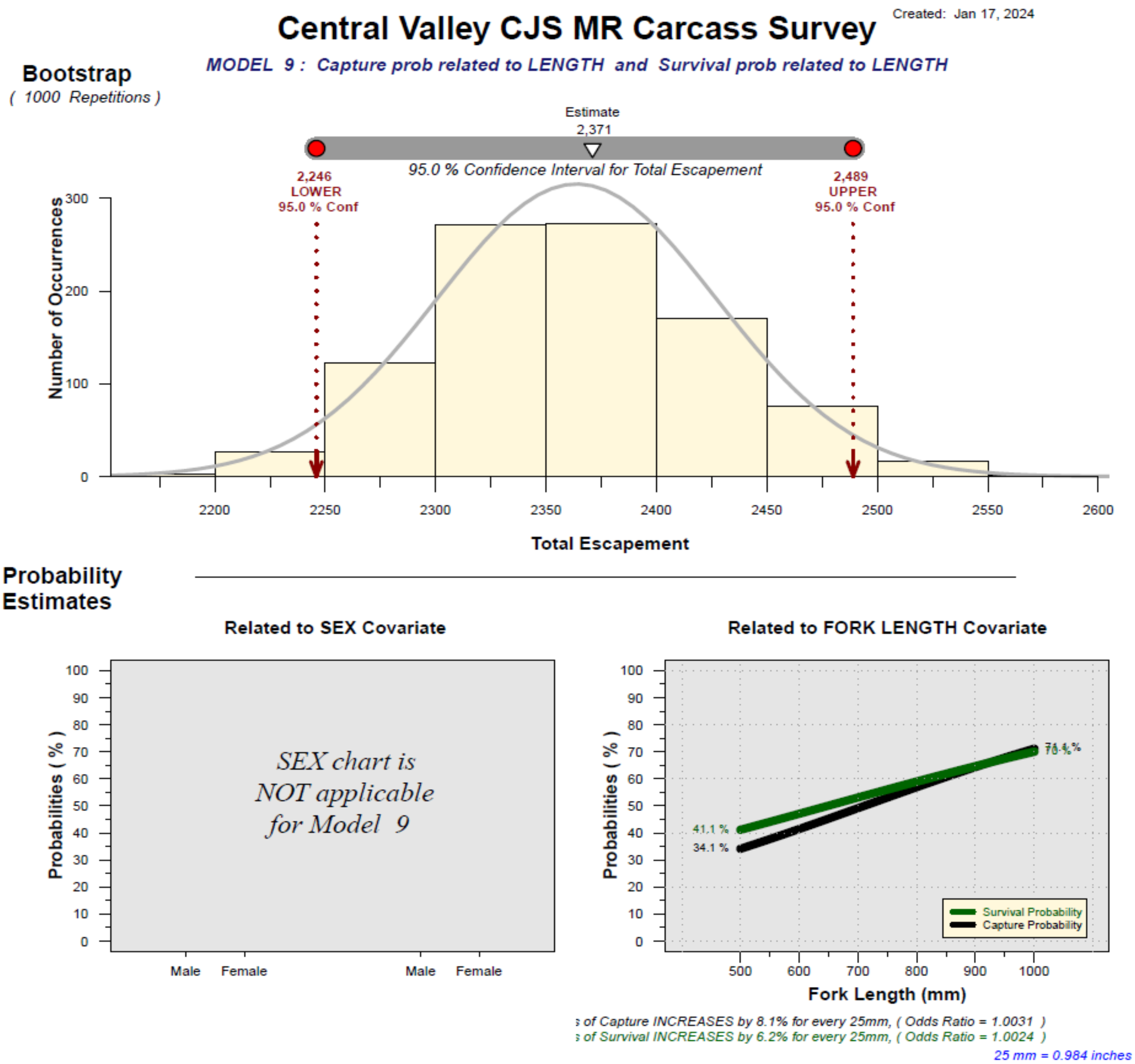

Figure 10. Adult and grilse breakdown by sex.

## Scale Read Age Determination

One method for aging Chinook salmon is through “scale reading.” Like counting tree rings, growth patterns on a salmon’s scale can be analyzed to estimate its age. Scale-based aging is generally reliable, though not without limitations. During migration, salmon reabsorb bodily tissues—including parts of the scales—which can erode the outer edges. This process shortens the scale and may lead to underestimating the fish’s true age. Accuracy can be evaluated by comparing scale read ages to known ages of hatchery-origin fish. The La Grange Field Office had an accuracy of 91.5% in 2023 for the Merced River samples (per comm Alex Xiong CDFW). This season 706 sets of scales were read. The dominant age class was age-3 representing 88.7% of the run. Grilse represented 6.4% and age-4 adults represented 4.9% of the run.

## Escapement Estimate

The CJS model identified Model 9 (Capture prob related to LENGTH and Survival prob related to LENGTH) as the best model for estimating the escapement population (Figure 11). This model estimated an escapement of 2,371 fish with a confidence interval of (2,246, 2,489) (Figure 12). In 2023 the Merced River Fish Facility (MRFF), trapped 894 salmon during the season. Since these fish are not included in the study but were Merced River returns, they were included in the final escapement estimate. This year's total escapement was 3,265 fish.




# Discussion

## Environmental Conditions

Water Year 2023 was classified as a Wet Water Year (DWR 2026). In September of 2023 Lake McClure was at 73% of capacity, holding 748,100 AF of water in their 1,024,600 AF reservoir (CDEC 2026). With the approaching rainy season (November through March) the Merced Irrigation District (MID) needed to make space in the reservoir. In coordination with CDFW, MID structured its water releases into four pulses that mimicked high-flow storm events. These pulses helped the Merced River's chemical signal reach the Delta and recruit Chinook salmon.

Following the pulse events, 14 salmon were discovered stranded below Crocker-Huffman Dam. Two fish were found dead on the southwest bank below the dam and 12 live fish were found trapped in a shallow pool on the northeast bank. On November 1, staff from the La Grange Field Office attempted to rescue the stranded fish and were able to successfully relocate one salmon to the river. Unfortunately, the remaining 11 died due to asphyxiation (from low dissolved oxygen) and stress.

## Live, Redd, Skeleton and Carcass Distribution

High flows in the spring of 2023 redistributed spawning gravel from restoration sites below Crocker-Huffman Dam to areas downstream, necessitating a remapping of riffles on the Merced River. These high flows also destroyed the agriculture dam located at Merced Irrigation District's Cuñeo Diversion near Henderson Park in Snelling, California. Following the dam's destruction, the side channel became a major migration corridor and spawning reach. Salmon and redds were first observed in the side channel during Week 4 of the survey, and by Week 9, a max weekly total of 96 redds had been documented. This riffle became the most heavily utilized riffle in the survey area.

Interestingly, the second most heavily utilized riffle, located adjacent to the Merced River Fish Facility, had the greatest number of live fish observations and carcass recoveries. In a pool immediately downstream of the hatchery's discharge pipes, hundreds of males schooled prior to spawning. These males subsequently accounted for the majority of skeletonized carcasses recovered within the survey reach.

## Hatchery-origin Salmon

This is the first year that San Joaquin River Restoration Program spring-run Chinook salmon have been confirmed spawning in the Merced River since the program began releasing fish in 2014 (PSMFC 2026). The carcass recovered on October 17 was identified as a four-year-old female from the San Joaquin River Conservation Hatchery. This female was located 1.7 RM downstream of Crocker-Huffman Dam. Her condition was fresh at the time of collection and she showed signs of spawning (caudal fin damage and lack of eggs attached to the skein). At this point in the survey the only recorded observation of a redd was one river mile upstream on October 3. It is unlikely that was her redd and more likely she spawned under a cluster of nearby willows (a popular spawning location) where staff were unable to see.

## Age and Sex Breakdown

There was a significant shift in age-class in 2023 (Xiong 2026). In the previous five years age-2 fish dominated the run. This year age-3 fish dominated the run, not only in the Merced River, but across the San Joaquin Basin. Older female fish are beneficial because they can produce more eggs and contribute to a larger juvenile population, therefore having an outsized effect on future recruitment.

## The Escapement Estimate

In 2023, CDFW closed California's recreational inland and ocean salmon fisheries (CDFW 2023), and the United States Department of Commerce subsequently closed the commercial salmon fishery (USDOC 2023). These closures were implemented in response to low ocean abundance forecasts and poor escapement estimates from 2022. By eliminating human harvest, salmon that would otherwise have been removed from the population were able to return to their natal streams to spawn. Although multiple factors likely influenced returns, the fishery closures, coupled with attraction flows, may have contributed to the largest escapement observed on the Merced River in the past five years (Table 6). Despite this increase, the long-term trend in the Merced River, and throughout much of the San Joaquin Basin, remains one of critically declining salmon populations (Figure 13). The La Grange Field Office monitors salmon escapement in three San Joaquin River tributaries: the Stanislaus, Tuolumne, and Merced rivers. In 2023, escapement in the Merced River was approximately twice that of the Stanislaus River and 2.4 times that of the Tuolumne River. The factors contributing to this disproportionately large return to the Merced River remain unclear and warrant further investigation.

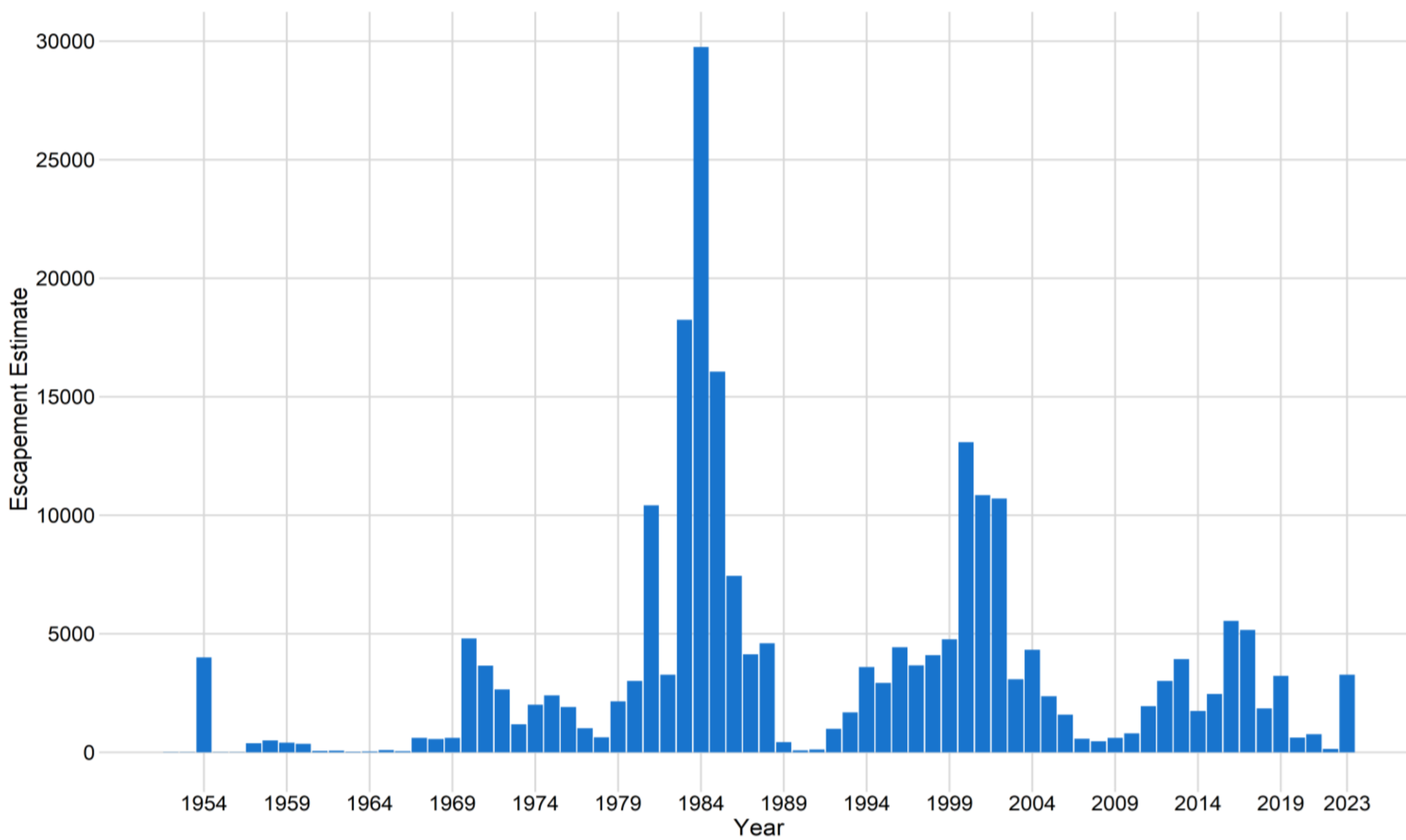



Figure 13. Historical Escapement Estimates 1952-2023

| Year | Escapement | Year | Escapement | Year | Escapement | Year | Escapement |
|---|---|---|---|---|---|---|---|
| 1952 | 0 | 1972 | 2648 | 1992 | 986 | 2012 | 3011 |
| 1953 | 0 | 1973 | 1172 | 1993 | 1678 | 2013 | 3924 |
| 1954 | 4000 | 1974 | 2000 | 1994 | 3589 | 2014 | 1733 |
| 1955 | 0 | 1975 | 2400 | 1995 | 2922 | 2015 | 2453 |
| 1956 | 0 | 1976 | 1900 | 1996 | 4432 | 2016 | 5537 |
| 1957 | 380 | 1977 | 1011 | 1997 | 3660 | 2017 | 5152 |
| 1958 | 500 | 1978 | 625 | 1998 | 4091 | 2018 | 1850 |
| 1959 | 400 | 1979 | 2147 | 1999 | 4766 | 2019 | 3225 |
| 1960 | 350 | 1980 | 3006 | 2000 | 13076 | 2020 | 611 |
| 1961 | 50 | 1981 | 10415 | 2001 | 10844 | 2021 | 754 |
| 1962 | 60 | 1982 | 3263 | 2002 | 10706 | 2022 | 142 |
| 1963 | 20 | 1983 | 18248 | 2003 | 3079 | 2023 | 3,265 |
| 1964 | 35 | 1984 | 29749 | 2004 | 4320 | | |
| 1965 | 90 | 1985 | 16052 | 2005 | 2363 | | |
| 1966 | 45 | 1986 | 7439 | 2006 | 1579 | | |
| 1967 | 600 | 1987 | 4126 | 2007 | 564 | | |
| 1968 | 550 | 1988 | 4592 | 2008 | 465 | | |
| 1969 | 600 | 1989 | 427 | 2009 | 604 | | |
| 1970 | 4800 | 1990 | 82 | 2010 | 797 | | |
| 1971 | 3651 | 1991 | 119 | 2011 | 1942 | | |

Table 6. Historical Escapement Estimates 1952-2023

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