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Stanislaus Watershed Team Annual Summary of Activities Water Year 2023

Central California Area Office, Folsom, CA

Interior Region 10 - California-Great Basin



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Stanislaus Watershed Team Annual Summary of Activities Water Year 2023

New Melones Reservoir, CA

Interior Region 10 - California-Great Basin

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Cover Photo: Recently restored habitat at Kerr Park along the Stanislaus River (Cramer Fish Sciences/Jesse Anderson)

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Acronyms and Abbreviations

Term	Definition
AF	Acre-feet
BA	Biological Assessment
BiOp	Biological Opinion
CDEC	California Data Exchange Center
CDFW	California Department of Fish & Wildlife
cfs	cubic feet per second
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CV	Central Valley
cy	Cubic yards
Districts	Oakdale and South San Joaquin Irrigation Districts
DO	Dissolved Oxygen
DWR	California Department of Water Resources
ESA	Endangered Species Act of 1973 (Section 7)
LTO	Long term operations of CVP
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OBB	Stanislaus River at Orange Blossom Bridge (CDEC gauge)
OID	Oakdale Irrigation District
PA	Preferred Alternative
PSMFC	Pacific States Marine Fisheries Commission
Reclamation	U.S. Bureau of Reclamation
rm	River mile
ROD	Record of Decision
SEWD	Stockton East Water District
SOG	Stanislaus Operations Group
SRP	Stepped Release Plan
SSJID	South San Joaquin Irrigation District
SWP	State Water Project
SWT	Stanislaus Watershed Team

Term	Definition
SWRCB	State Water Resources Control Board
TAF	Thousand-acre feet
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish & Wildlife Service
WIF	Winter Instability Flow
WY23	Water year 2023

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Chapter 1 Introduction and Background

1.1 Introduction

This Summary of Activities provides an overview of biological, fishery, and operational discussions, as well as operational decisions related to the Stanislaus River in Water Year 2023 (WY23) in compliance with the United States Bureau of Reclamation's (Reclamation) 2020 Record of Decision (ROD) for the Coordinated Long-Term Operation of the Central Valley Project (CVP) and State Water Project (SWP) and analyzed in the 2019 National Marine Fisheries Service (NMFS) Biological Opinion (BiOp).

1.2 Background

The Stanislaus River is important to a variety of stakeholders, including fishery management agencies, the public, water users, and federal government agencies. The United States Army Corps of Engineers (USACE), the United States Fish and Wildlife Service (USFWS), NMFS, California Department of Fish and Wildlife (CDFW), and the State Water Resources Control Board (SWRCB) in conjunction with Reclamation are agencies that hold trust responsibilities for fishery and water resources in the Stanislaus River. Reclamation is responsible for operating the East Side Division, which includes New Melones Dam and powerplant. The East Side Division is operated to provide flood control, water supply, power generation, general recreation, water quality, and fish and wildlife enhancement. A partnership between the Oakdale Irrigation District (OID) and the South San Joaquin Irrigation District (SSJID) (collectively, the Districts), known as the Tri Dam Project, own and operate multiple features on the Stanislaus River. These include Donnell's and Beardsley dams and reservoirs (upstream of New Melones) and Tulloch Dam and Reservoir (downstream of New Melones). The Districts own Goodwin Dam and Reservoir located downstream of Tulloch Dam. A map of key locations in or near the Stanislaus River watershed is provided in Figure 1-1.

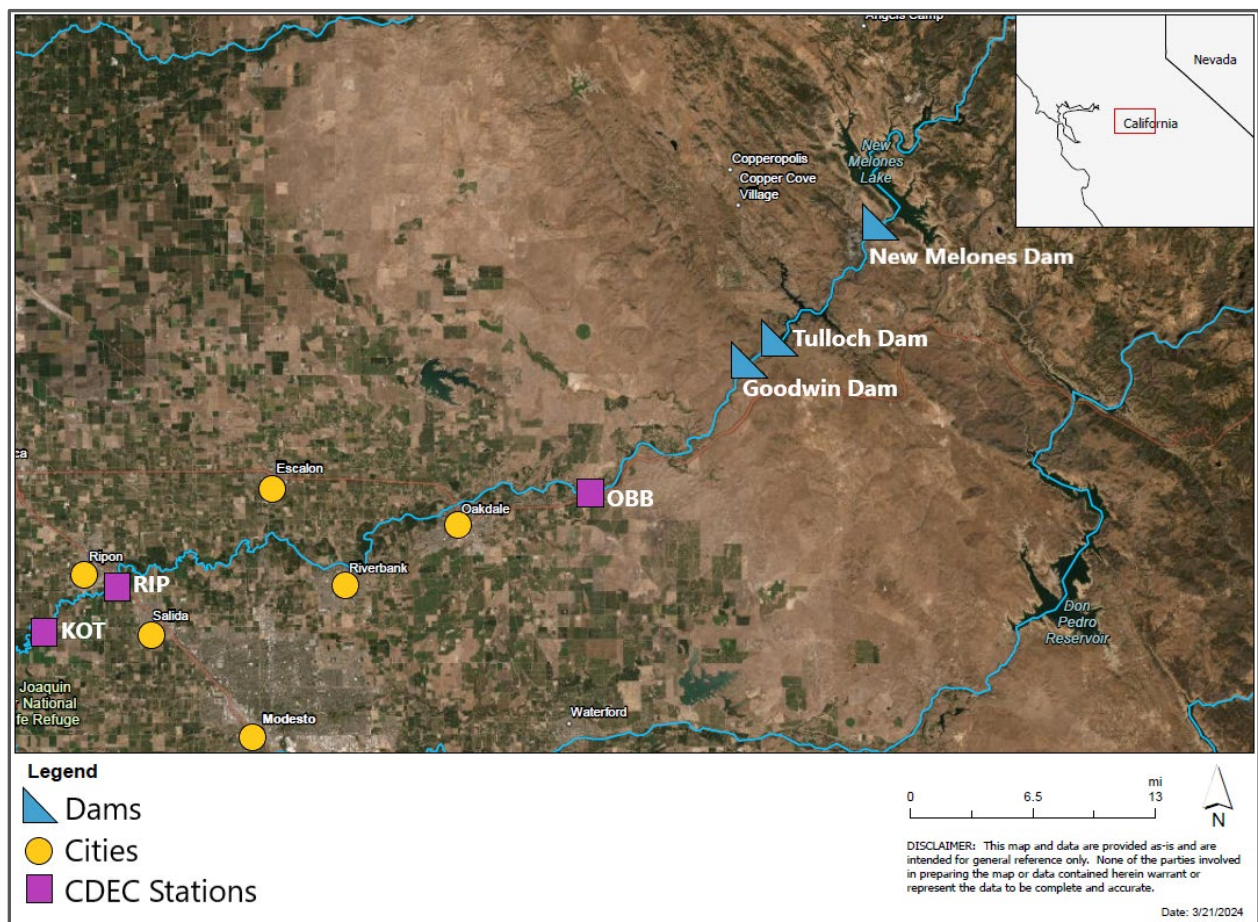


Figure 1-1. Key locations on or near the Stanislaus River watershed.

1.3 SWT Membership

On March 18, 2020 the Stanislaus Watershed Team (SWT) convened for the first time. Reclamation contracted with a meeting facilitation management firm to help develop and implement a transition plan for the technical team from Stanislaus Operations Group (SOG) to SWT. In July 2020, local stakeholders (the Districts and Stockton East Water District [SEWD]) were incorporated into the SWT.

SWT member agencies and local stakeholders during WY23 included:

- Reclamation
- USFWS
- NMFS
- CDFW

- California Department of Water Resources (DWR)
- SWRCB
- SSJID
- SEWD
- OID
- FISHBIO
- PSMFC

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Chapter 2 Preferred Alternative

2.1 Summary of Preferred Alternative Action Components

Implementation of the 2020 ROD began on February 19, 2020. The Preferred Alternative (PA) for the Stanislaus River operations includes flow and non-flow components (Table 2-1), summarized below.

Table 2-1 Components of the Preferred Alternative Related to the Stanislaus River System per Table 4-7 in Chapter 4 of the Biological Assessment (BA)

Component
Seasonal Operations
Stanislaus River Stepped Release Plan (including pulse flows)
Alteration of Stanislaus DO requirement
Spawning and rearing habitat restoration
Temperature Management Study
Yellow-billed cuckoo surveys

The following non-flow components of the PA are not discussed in this report as they have not been standing topics of discussion at SWT meetings during WY22.

- Temperature Management Study: Reclamation has been studying approaches to improving temperature for listed species on the lower Stanislaus River, including evaluating the utility of conducting temperature measurements/profiles in New Melones Reservoir. Reclamation is in the end stages of developing updated temperature models for all our rivers including the Stanislaus River. Once the Stanislaus River temperature model has completed testing and finalizing, Reclamation can start evaluating different means to improve temperatures in the lower Stanislaus River.
- Yellow-billed cuckoo surveys: Reclamation will coordinate with the USFWS to develop a baseline survey for the Yellow-billed cuckoo. The survey for this action would focus on the critical habitat areas, associated project sites, and occupied habitat within the action area. This project has not yet started and coordination with USFWS is ongoing.
- Alteration of Stanislaus DO Requirement: During the summer, Reclamation is required to maintain applicable dissolved oxygen standards on the lower Stanislaus River for species protection. Reclamation currently operates to a 7.0 mg/L dissolved oxygen requirement

at Ripon from June 1 to September 30. Reclamation proposed to move the compliance location to Orange Blossom Bridge (OBB), where the species are primarily located at that time of year. This proposal has not yet been enacted.

Chapter 3 SWT Discussion Topics

The following outlines topics consistent with the 2020 ROD components, as well as other agenda items, discussed at monthly SWT meetings from October 2022 through September 2023. Meeting notes and supplemental SWT documents were made available to SWT members and posted on the SWT Technical Group website (found here: <https://www.usbr.gov/mp/bdo/stanislaus-watershed-team.html>).

3.1 Monthly Discussion Topics

- Hydrology and temperature updates
- Operations Update and Forecast
- Stanislaus River Forum Call Review
- Fish Monitoring and Studies
- Restoration Project Updates
- Progress Update on Proposed Action Elements
- Flow Planning (seasonal)

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Chapter 4 Water Operations Summary

4.1 Water Year Conditions and Operations

The WY23 Stanislaus River operations were heavily influenced by the critically dry hydrology in the San Joaquin Valley. The WY 2023 Fall Pulse Flow occurred October 12, 2022, through November 10, 2022. Following the Fall Pulse Flow, the Stanislaus River flows were held at the minimum Stepped Release Plan (SRP, Appendix A) flow of 200 cfs. New Melones began WY23 with 619 TAF of storage. However, the California Department of Water Resources, bulletin 120, Water Supply Index forecasts from February 1, 2023 onward were consistently above normal or wet at the 90th percentile exceedance. Actual inflows to the reservoir were consistently at or above the forecasted inflows. Goodwin releases were set at 1,500 cfs beginning March 10, 2023 and were held at that level with brief reductions to retrieve egg baskets and remove the weir at Riverbank. Beginning June 30, 2023 releases were 1,500 cfs Monday through Friday and were reduced to 750 cfs on Saturday and Sunday for recreational safety concerns. Dissolved oxygen was not a concern this year as the increased release level easily maintained the standard. Releases were ramped down to 400 cfs on September 2, 2023, and again reduced to 300 cfs on September 28, 2023. New Melones end of 2023 Water Year storage was 1,896 TAF, an increase of 1,277 TAF from the beginning of Water Year storage of 619 TAF. Salinity standards were not an issue in 2023 as they were met through existing flows.

4.2 New Melones Stepped Release Plan

The Stanislaus River watershed has annual obligations that can exceed the average annual runoff in a given year due to several factors, including SWRCB water rights decisions D-1641, D-1422 and D-1616, the 1987 CDFW agreement, CVPIA (Central Valley Project Improvement Act) objectives, ESA (Endangered Species Act) requirements, the 1988 Agreement and Stipulation with OID and SSJID, riparian water right diverters, and CVP water delivery contracts.

The SRP (Appendix A) described in the 2020 ROD represents Reclamation's contribution to any current flow objectives on the Lower San Joaquin River at Vernalis excluding Ripon DO requirements and Vernalis salinity and flow requirements in D-1641.

Reclamation operates New Melones Reservoir (to provide targeted releases measured at Goodwin Dam) in accordance with an SRP that varies by hydrologic condition/water year type as shown in Table 4-1.

Table 4-1. New Melones SRP Annual Releases by Water Year Type

Water Year Type	Annual Release (TAF)
Critical	185.3
Dry	234.2
Below normal	345.7
Above normal	345.7
Wet	483.7

The SRP is implemented with a default daily hydrograph and the ability to shape monthly and seasonal flow volumes to meet specific biological objectives. The complete daily hydrograph for the New Melones SRP is available in [Appendix A](#) of this report.

4.3 Flow Management

The WY23 classifications for determining minimum flows are provided in Table 4-2. The water year classification was based on the San Joaquin Valley “60-20-20” Water Year Hydrologic Classification (60-20-20). The 60-20-20 index was developed for D-1641 implementation, and it provides operations that better represent current hydrology of the San Joaquin River Basin and correlates more closely to water year types for other nearby tributaries.

Table 4-2. Water Year Classification by Month during WY23

Month	Water Year Index (60-20-20) 90% Exceedance	Water Year Type (60-20-20) 90% Exceedance
October	1.5	Critical
November	1.5	Critical
December	1.5	Critical
January	2.2	Dry
February	3.77	Above Normal
March	4.64	Wet
April	6.23	Wet
May	6.31	Wet
June	6.31	Wet

Month	Water Year Index (60-20-20) 90% Exceedance	Water Year Type (60-20-20) 90% Exceedance
July	6.31	Wet
August	6.31	Wet
September	6.31	Wet

4.4 Seasonal Operations

4.4.1 WY 2023 Fall Pulse Flow

A Fall Pulse Flow is one component of the daily flow schedule in the SRP pursuant to Section 4.10.6.1 of Reclamation and DWR's Proposed Action for the coordinated long-term operations (LTO) of the CVP and the SWP, dated October 2019, and the corresponding BiOp issued pursuant to Section 7 of the ESA by National Oceanic and Atmospheric Administration's (NOAA) NMFS, dated October 21, 2019. As noted on page 4-81 of the Biological Assessment (BA), "the New Melones SRP will be implemented similarly to current operations under the 2009 biological opinion with a default daily hydrograph, and the ability to shape monthly and seasonal flow volumes to meet specific biological objectives." On page 4-82 of the Biological Assessment, it is further described that "The Stanislaus Watershed Team will also provide input on the shaping and timing of monthly or seasonal flow volumes to optimize biological benefits."

At the September 21, 2022, SWT meeting, the technical team discussed the alternatives for the Fall Pulse Flow schedule. Based on discussion, and in order to accommodate flows needed for important carcass studies and recreational activities on the Stanislaus River, the SWT provided feedback on this option.

The Alt-1 schedule (Figure 4-1) has the same total volume (41,454 AF, including base flows) for the October 1-November 5 period as the default SRP Critical schedule, as described in the Water Accounting Section of this plan. Reclamation and the SWT believe that the Alt-1 reshaping optimizes biological benefits by improving instream conditions and providing an attraction cue for adult salmonids returning to spawn in the Stanislaus River. Higher flows are expected to reduce water temperature (or at least buffer daily maximum water temperature) to provide conditions suitable for the migration and holding of adult salmonids. By starting the Fall Pulse Flow on October 12 and extending the reshaped Fall Pulse Flow into November, SWT expects the higher-than-base flows will help buffer water temperatures during the seasonal transition to cooler air temperatures. Scheduled flows in Alt-1 are down to base flows by the 1st of November, before peak spawning is expected to occur. The higher flows will also inundate some shallow water habitat which may provide rearing juvenile steelhead with short-term growth benefits as well as potential refuge from predation.

Some key features of the Alt-1 Fall Pulse Flow include:

- As in the default schedule, higher fall flows (compared to base flows) are intended to provide an attraction cue for salmonids returning to spawn.
- Reshaping the single pulse identified in the default SRP schedule into a three-peak pulse period increases flow variability within the season. This variability is expected to deter spawning at the higher flows that will not be sustained through egg incubation and fry emergence.
- The time frame of the Alt-1 pulse (which has an earlier start, and it is slightly longer in duration, compared to the default SRP schedule) is expected to provide temperature buffering from mid-October through early November.
- Other considerations for in-basin interests: No flows >1,500 cfs are scheduled in consideration of concerns regarding agricultural seepage.

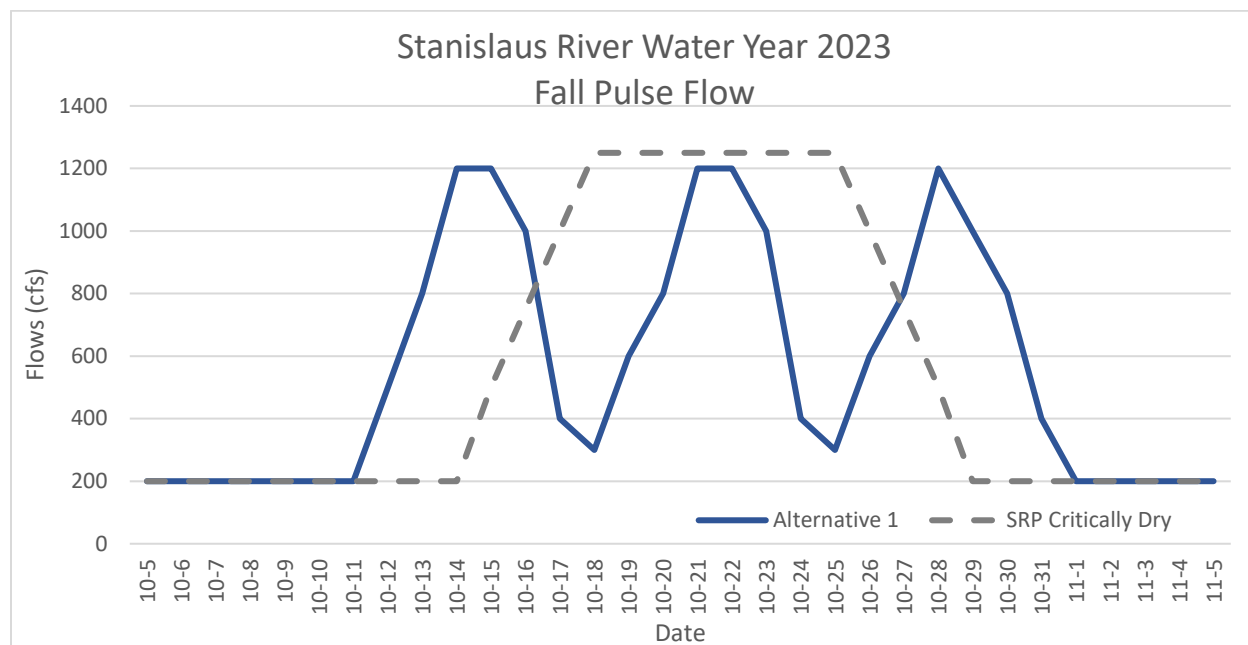


Figure 4-1. Figure showing daily flows from October through mid-November in both the default SRP-Critical schedule and Alternative 1 schedule.

4.4.2 Water Year 2023 Winter Instability Flows

Winter Instability Flows (WIFs) in January and February are a component of the daily flow schedule in the SRP proposed in Reclamation's October 2019 BA, evaluated in NMFS's October 2019 BiOp, and implemented per the February 2020 ROD. As noted in the 2019 BA (p. 4-81), the "SRP will be implemented similarly to current operations under the 2009 BiOp with a default daily hydrograph, and the ability to shape monthly and seasonal flow volumes to meet specific biological objectives." The 2019 BA further notes (p. 4-82) that "The Stanislaus Watershed Team

will also provide input on the shaping and timing of monthly or seasonal flow volumes to optimize biological benefits.”

January

For January 2023, Reclamation planned to implement a WIF that was reshaped according to the alternative flow schedule for the water year type in effect (dry). The numerous storms that took place during that month, required for Reclamation to operate Tulloch Reservoir to maintain its flood control conservation space. These flow fluctuations helped achieve the same biological objectives that would have occurred with the WIF. Reclamation in coordination with NMFS agreed that since the biological objectives had been met with the flood control flows, there was no need to implement the January WIF. The SWT was informed of this decision during the January 18 monthly meeting.

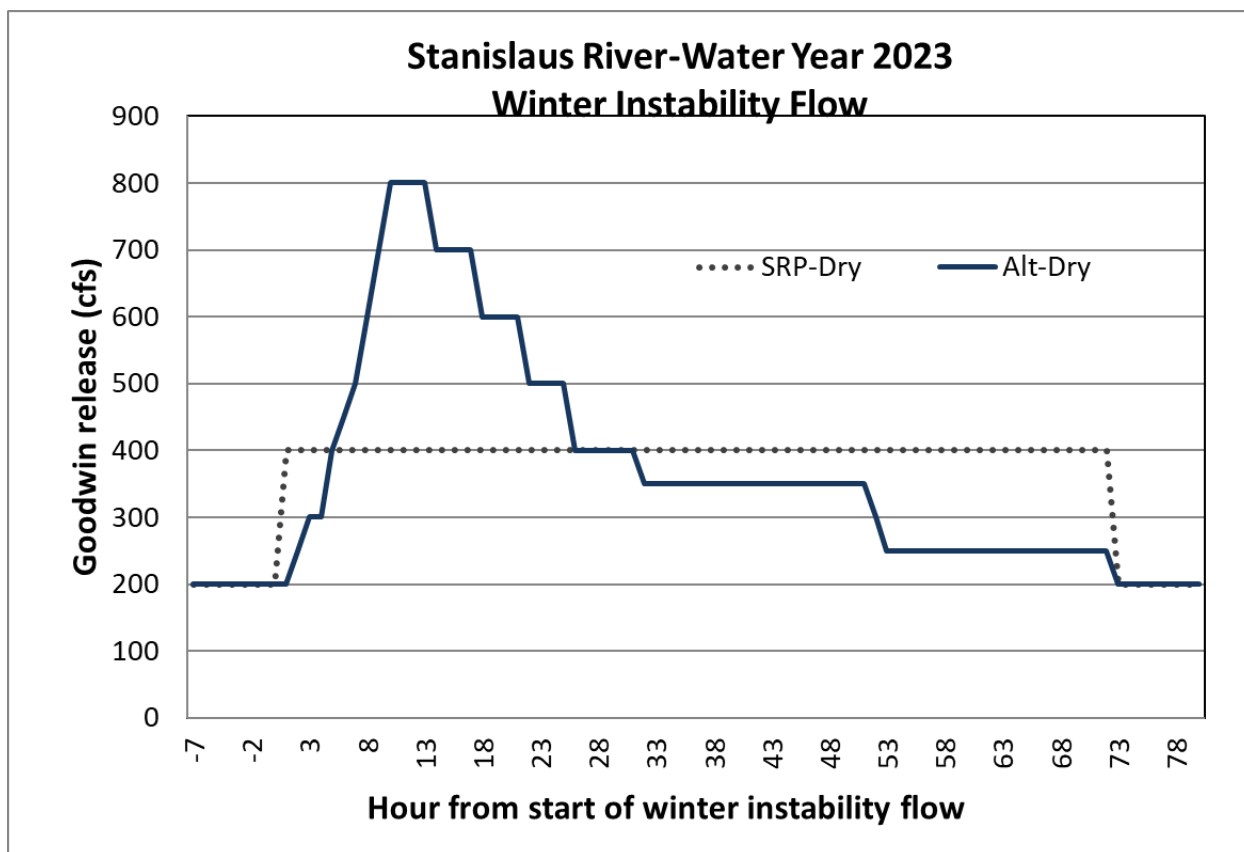


Figure 4-2. Hourly flows in the default SRP and proposed Alternative schedules for a Dry water year type.

February

Water Volume Accounting For February 2023, Reclamation planned to implement a WIF that is reshaped according to the alternative flow schedule (described in Figure 4-2) for the water year type in effect (dry). The alternative flow schedule has the same volume (1.19 TAF) as the

default SRP schedule for the Dry water year type but has been reshaped to include higher-peak flows and variability. The SWT reviewed and provided feedback on this flow alternative to provide greater variability in the winter hydrograph, which simulates a small storm pulse.

Reshaping The shape of the alternative flow schedule, with a rapidly rising limb and staggered descending limb, is a flow pattern associated with storm events. Reshaping the sub-daily flow pattern to increase the peak flow to 900 cfs for three hours on the first day of the pulse may help inundate a greater portion of the Honolulu Bar restoration area and will likely allow at least partial inundation of the Lancaster Road restoration area. Short-term inundation of shallow water habitat can provide benefits to rearing salmonids such as temporary spatial refuges from large predators, increased temperatures that may allow short-term increases in growth rate, and increased capture of terrestrial food and nutrients to the main channel.

According to the SRP flow schedule, the annual February WIF set to begin on the 5th. In the past, WIFs, pulses of regulated flows, have been shifted in time to coincide with a natural storm event. This allows to better capture the characteristics of a natural hydrograph (i.e., runoff, turbidity, meteorological conditions) associated with a storm event. With this approach, Reclamation would schedule the WIF to be initiated on February 24 to coincide with a predicted storm even in the area. The SWT suggested Reclamation follows this method for the February WIF. The timing of the WIF also takes into consideration the needs of our partner agencies to safely conduct surveys in the river.

The Alt-Above Normal was developed with support of the SWT and included a Day 1 peak of 900 cfs. The flows decrease in a staggered manner after that until they reach SRP base flows (200 cfs) by the first hour of day 5.

4.4.3 Spring Pulse Flows

New Melones Reservoir releases were at 1,500 cfs beginning March 10 and continued at that level until June 30 for flood control purposes. Due to the continued high releases at 1,500 cfs, there was no opportunity for a Spring Pulse Flow in WY23. Prolonged releases above 1500 cfs create water level issues in agricultural lands adjacent to the Stanislaus River. Prolonged releases above 1500 cfs are prohibited outside of flood control operations.

4.5 Storage Management and Flood Control Releases

During WY23 New Melones experienced a prolonged flood control operation. Beginning March 10, releases were increased to 1,500 cfs at Goodwin Dam and were held at that level until June 30, at which time releases were dropped to 750 cfs on Saturday and Sundays for recreational safety but increased back to 1,500 cfs during the week. This was due in part to an extremely large snowpack which melted later than normal in the spring in addition to the need to draw New Melones storage down to the fall flood control level in preparation for WY24 precipitation season. There were several short-term Tulloch Flood control releases over the winter due to

local high inflows into Tulloch Reservoir. Tulloch flood control releases were made from: December 28, 2022 through Jan 3, 2023; January 8 – 11, 2023; and January 13 -18, 2023 (See Figure 4-5).

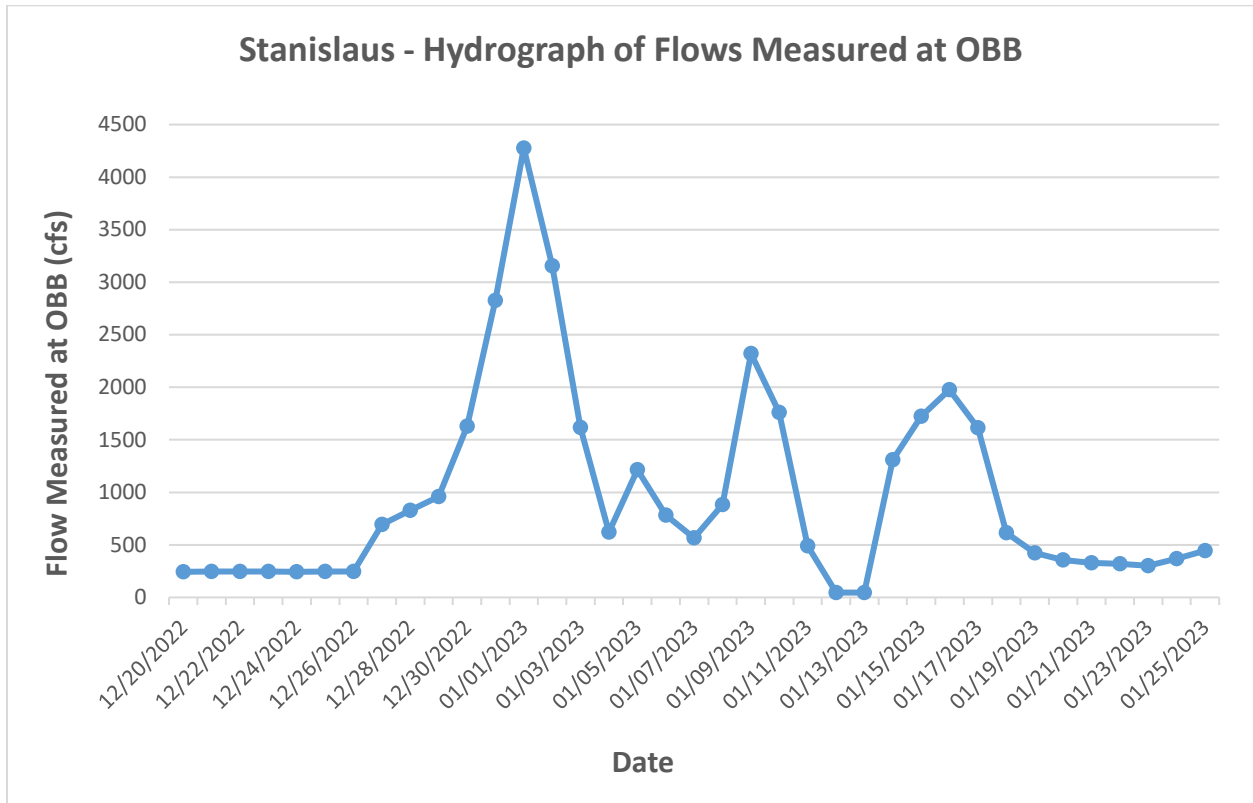


Figure 4-3. Hydrograph of flows measured at OBB on the Stanislaus River showing flood releases.

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Chapter 5 Stanislaus River Fish Monitoring Data and Non-flow Conservation Measures

5.1 Fish Monitoring Data

Monitoring data from the Stanislaus River are summarized below for both fall-run Chinook salmon (*Oncorhynchus tshawytscha*) and Central Valley (CV) steelhead (*Oncorhynchus mykiss*). The locations of monitoring sites are shown in Figure 5-1.



Figure 5-1. Locations of fish monitoring efforts on the Stanislaus River

5.1.1 CDFW Brood Year 2022 Escapement Summary

California Department of Fish and Wildlife (CDFW) began conducting fall-run Chinook salmon escapement and redd surveys on October 4, 2022, and concluded surveying on January 12, 2023. The preliminary Stanislaus River escapement estimate for 2022 fall-run Chinook salmon, as reported in the June 26, 2023 GrandTab California Central Valley Chinook Escapement Database

Report compiled by CDFW), was 3,639 fish (compared to 466 fish on the Tuolumne River and 142 fish on the Merced River; the Merced River total combines 67 fish taken at the Merced River Hatchery and 75 fish estimated in-river adult returns). During the survey season, 1,122 carcasses were found and had samples collected (scales, otoliths, and coded wire tag if present). In addition, 788 skeletons were tallied and chopped, for a total of 1,910 individual Chinook handled during the survey. The Honolulu Bar side channel (riffle K1S) was not surveyed for most of November and December due to it being dry and disconnected. During the 2022 survey, high flows became an issue in late December (week 13). Rain events with increased flow and high turbidity during weeks 13-15 prevented several riffles from being surveyed. Due to the poor visibility, it is likely that most fresh carcasses and recaptures were not found during these weeks. Figure 5-2 illustrates these survey results along with flow (cfs) at Orange Blossom Bridge (OBB), mean daily spill and temperature, and the thermal limit for incubation; note in this figure that live and redd counts are summed by week and also that average flows at OBB peaked at 4,275 cfs on January 1, 2023 and again at 2,320 cfs on January 9, 2023 which is not shown on the figure.

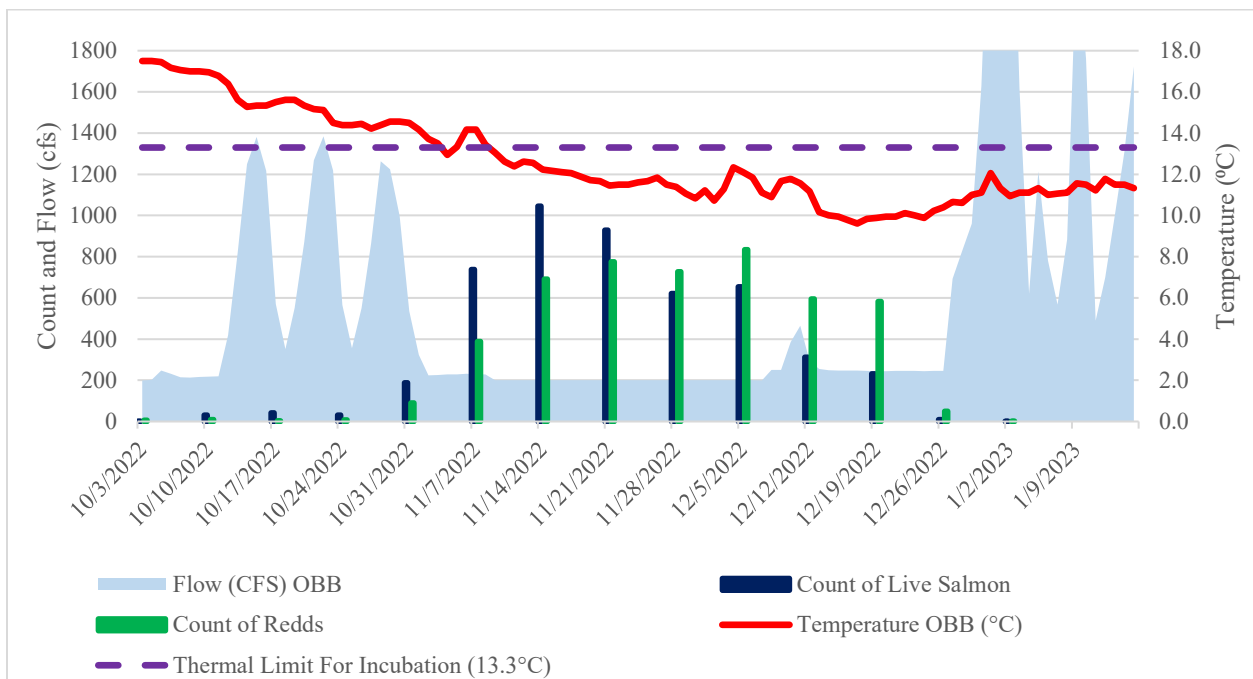


Figure 5-2. Stanislaus Escapement Survey 2022 summary - weekly live salmon and redd counts, mean daily spill and temperature measured at OBB (RM 46)

In 2022, four fish were found with enough eggs present to be classified as unspawned and five other fish had enough eggs present to be classified as partially spawned. In 2022, one male released enough milt during processing to be considered a partially spawned mortality. However, male fish were not always intentionally squeezed to check for milt, so the number of partially spawned males is likely higher than observed.

Maximum weekly redd counts are used when analyzing the distribution of spawning because no effort is made to avoid counting the same redd every time a riffle was surveyed; this means maximum weekly redd counts provide the best estimation of overall spawning within a riffle. Redds were built throughout the survey area, with riffles closer to Goodwin Dam having more use than riffles further downstream. Figure 5-3 illustrates the sum of maximum redd counts by river mile (note riffle at RM 57 was added this year, previously there were no identified riffles in mile 57). Throughout the 15-week survey period, CDFW observed a maximum of 1,104 redds on the Stanislaus River (compared to 286 on the Tuolumne River and 157 on the Merced River).

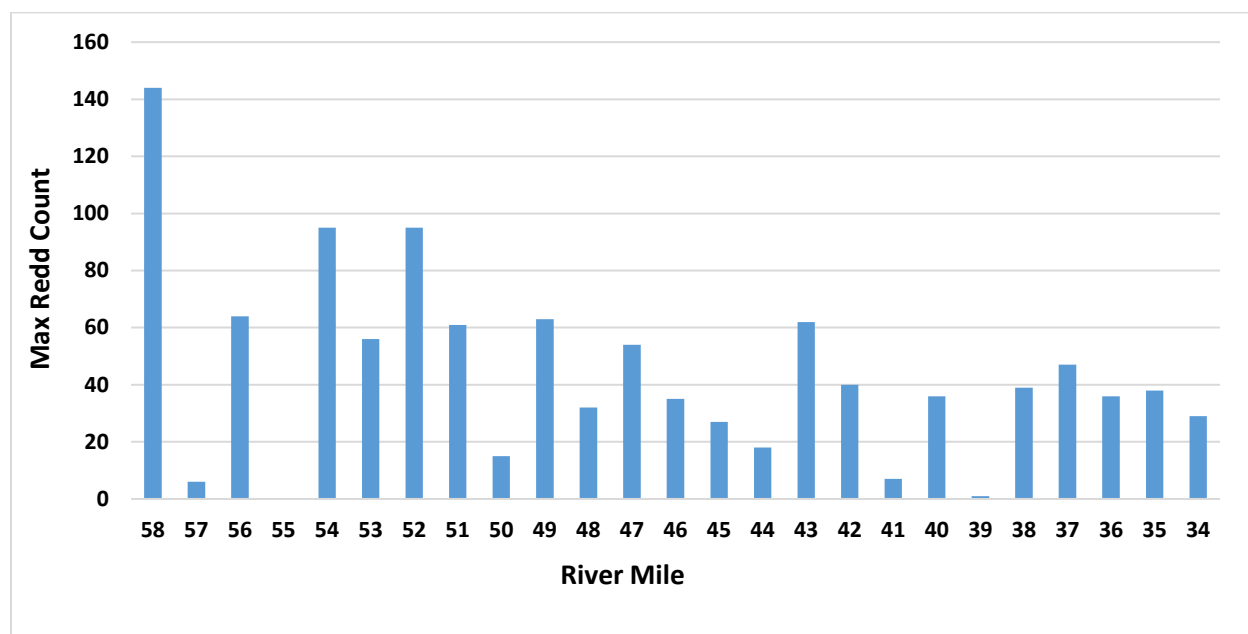


Figure 5-3. Sum of maximum redd counts by river mile.

Two hundred sixty-five coded wire tags (CWT) were recovered from carcasses during the 2022 escapement survey. Most of the tagged fish came from the Mokelumne River Hatchery and were released in 2019. Brood years 2018, 2019, and 2020 were all represented in the CWTs with fish coming from the Feather River Hatchery, Merced River Hatchery, and Nimbus Hatchery in addition to the Mokelumne (Table 5-1).

Table 5-1 Table of Coded Wire Tag Results from the 2022 Escapement Survey.

Hatchery	Release Location	Brood Year 2018	Brood Year 2019	Brood Year 2020	Total
Feather River Hatchery	Fort Baker – Minor Pt	0	0	1	1
Feather River Hatchery	Mare Island Net Pen	0	3	0	3
Merced River Hatchery	San Joaquin River – Sherman Island Net Pen	0	1	3	4
Mokelumne River Hatchery	Fort Baker – Minor Pt	0	58	5	63
Mokelumne River Hatchery	Half Moon Bay – John PR Net	0	17	2	19
Mokelumne River Hatchery	Monterey – Major Pt	0	0	3	3
Mokelumne River Hatchery	San Joaquin River – Sherman Island Net Pen	3	123	14	140
Mokelumne River Hatchery	Santa Cruz Harbor	0	10	2	12
Nimbus Hatchery	Mare Island Net Pen	1	6	4	11
Nimbus Hatchery	Wickland Oil Net Pen	0	0	1	1
UNKNOWN	TAG NOT FOUND / LOST	-	-	-	8
Grand Total		4	218	35	265

The Honolulu Bar side channel is a restoration project that was completed in 2012 to provide salmonid spawning and rearing habitat. However, in the years since then, the river and side channel morphology have changed to the point where the side channel now has the potential to strand fish and dewater redds following the transition from high to base flows. The side channel was once again disconnected in 2022, both before the Fall Pulse Flows and again afterwards as

the river transitioned back to base flow conditions (200 cfs). However, unlike in 2021, adult stranding was not observed in the Honolulu Bar side channel in 2022. Below are images of what the side channel can look like as it disconnects at lower flows.



Figure 5-4. Pictures of Honolulu Bar during dewatering in 2022.

5.1.2 CDFW *O. mykiss* Redd Survey Summary

(*Field differentiation between the resident rainbow trout and anadromous steelhead is not currently possible; therefore, we use *O. mykiss* in this summary.)

The 2023 CDFW Stanislaus River *Oncorhynchus mykiss* redd survey began on January 3, 2023 with the first two weeks of the *O. mykiss* redd survey overlapping with the last two weeks of the Chinook salmon escapement survey. Surveys continued weekly through April 27, 2023. There were no surveys for the weeks of January 16 and 23, from February 27 through March 20, and the week of April 3rd due to high flows and turbidity. During the 17-week survey period a total of nineteen *O. mykiss* were observed, with four of these estimated to be greater than 400 mm in fork length. Figure 5-5 illustrates these survey results along with mean daily flow and temperature (note that live counts are summed by week).

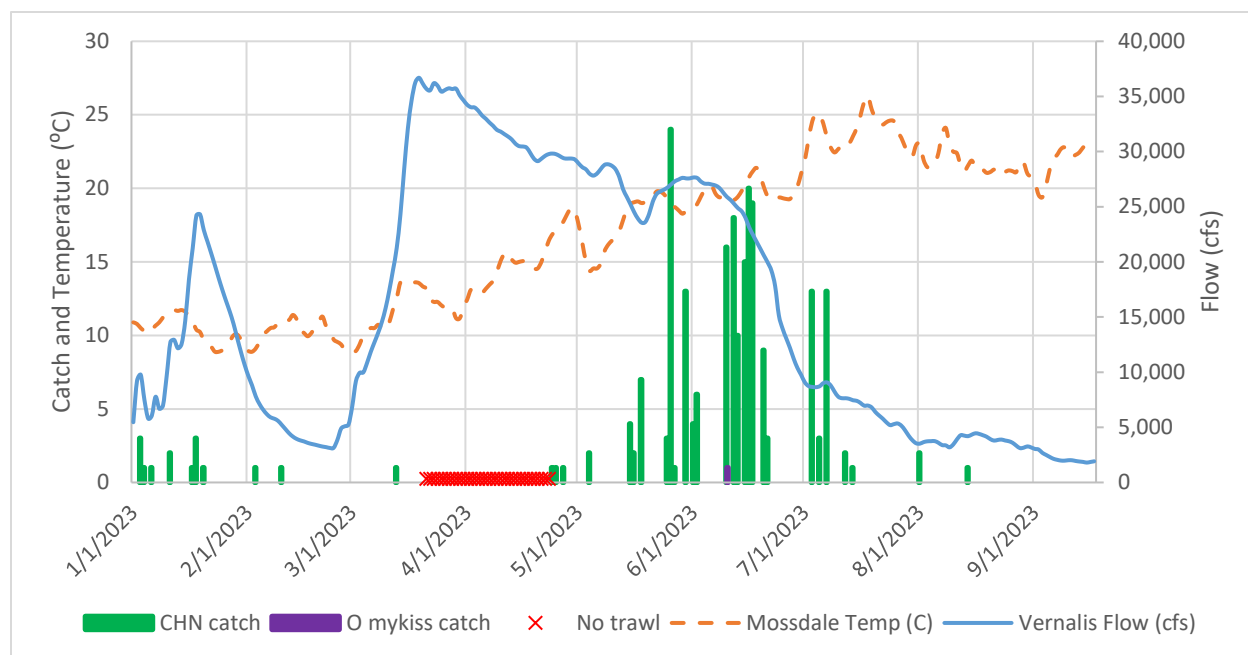


Figure 5-5. 2023 Stanislaus *O. mykiss* redd survey summary - Weekly counts of live *O. mykiss* by size class, mean daily flow and temperature measured at OBB.

Zero live lampreys and one live Chinook were observed during the survey. Fourteen redds were identified as belonging to *O. mykiss*. These redds were located between RM 58.3 and 48.9. The majority, 13, were found during January and February, with one additional redd found on April 18. One lamprey redd was found at RM 36.7 on February 22, 2023. Two Chinook redds were also observed during overlap of the Escapement Survey and *O. mykiss* surveys. Zero *O. mykiss* carcasses were found during the redd survey, but two were found during the Chinook escapement survey (Table 5-2).

Table 5-2. Date, Sex, Fork Length, and Location of the Two *O. mykiss* Found During the Escapement Survey

Date	Sex (M/F)	Fork Length (cm)	River Mile
11/14/2022	F	20	58.2
11/20/2022	F	22	58.1

5.1.3 Stanislaus Weir

Reclamation funded FISHBIO to conduct adult fish monitoring at the Stanislaus River weir near Riverbank, California (approximately river mile 31, see Figure 5-6). Monitoring at the weir near Riverbank (for upstream passage of adult salmonids) began for the season on September 15, 2022, and ended on May 3, 2023, with some periods of interruptions due to high flows. The cumulative net upstream passage through May 3, 2023, was 3,798 Chinook (at least 24% were ad-clipped, indicating a hatchery origin; presence/absence of adipose fin could not be determined on 48 fish) and six *O. mykiss*. All six of the *O. mykiss* exceeded the 406 mm length (size range 462 mm to 755 mm) criterion for steelhead (M. Hellmair, personal communication, June 2023) and were adipose fin clipped indicating hatchery origin. The timing of Chinook salmon passage at the weir is shown in Figure 5-7; Figure 5-8 shows seasonal passage timing compared to the passage timing of the previous five years. The timing of *O. mykiss* passage at the weir is shown in Figure 5-9 and an example *O. mykiss* is shown in Figure 5-10.

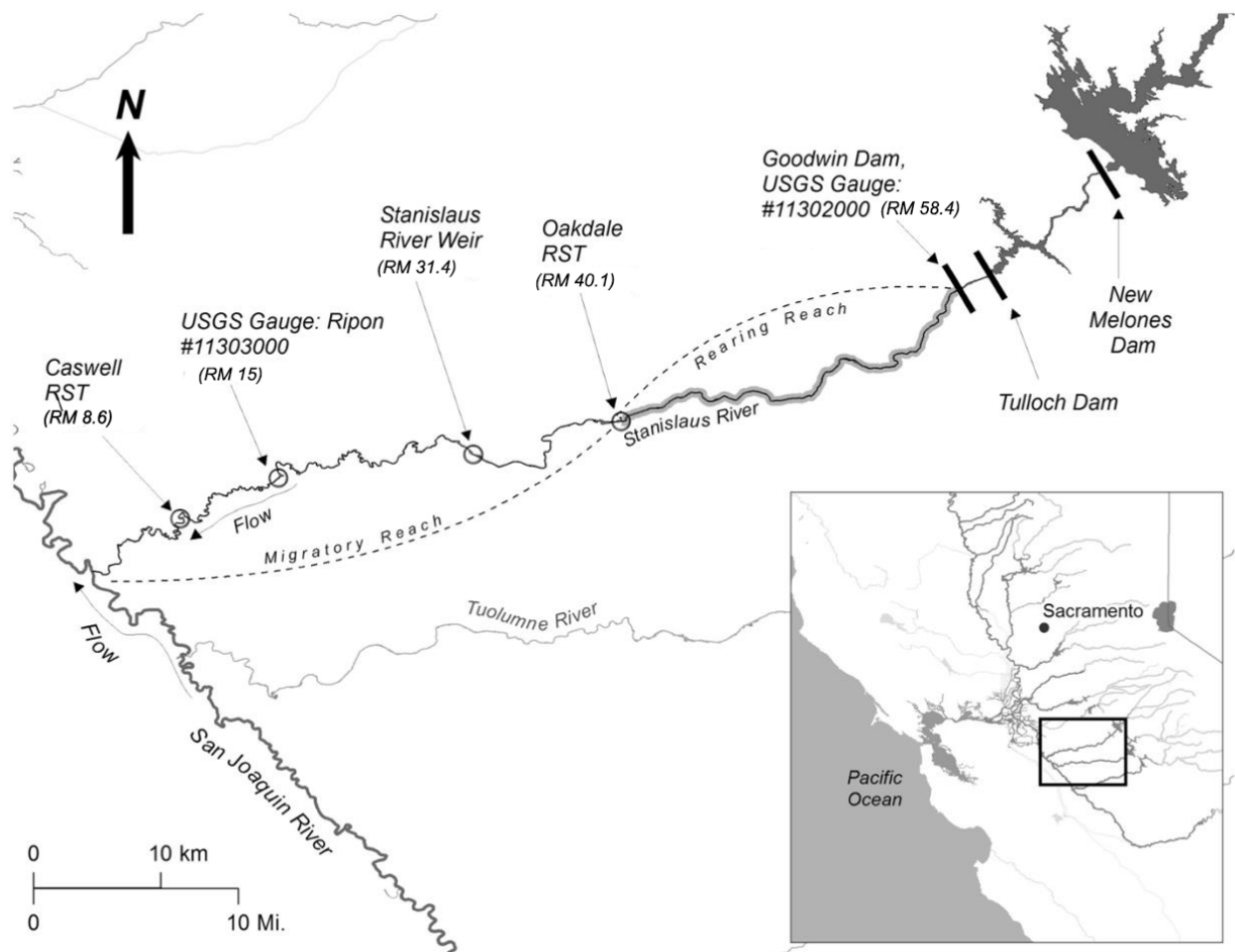


Figure 5-6. Map of Stanislaus River fish sampling stations, flow gauges and dams. The highlighted area between Goodwin Dam and Oakdale RST indicates salmonid spawning area. Map courtesy of FISHBIO.

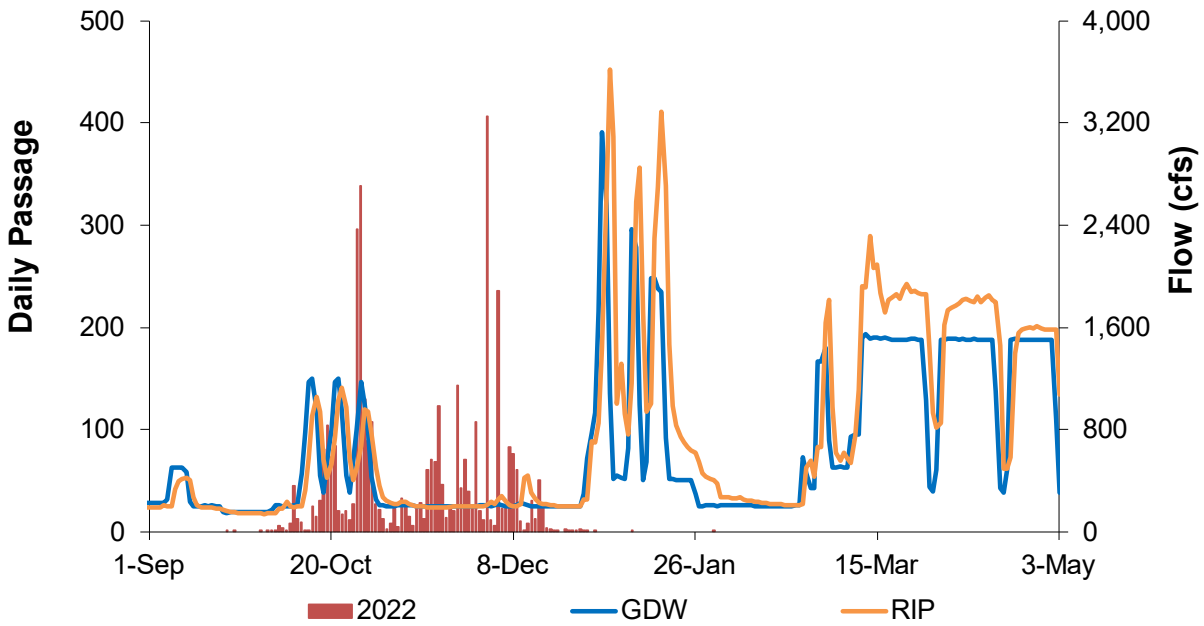


Figure 5-7. Daily Chinook salmon passage through May 3, 2023 at the Stanislaus River weir near Riverbank. Figure courtesy of FISHBIO.

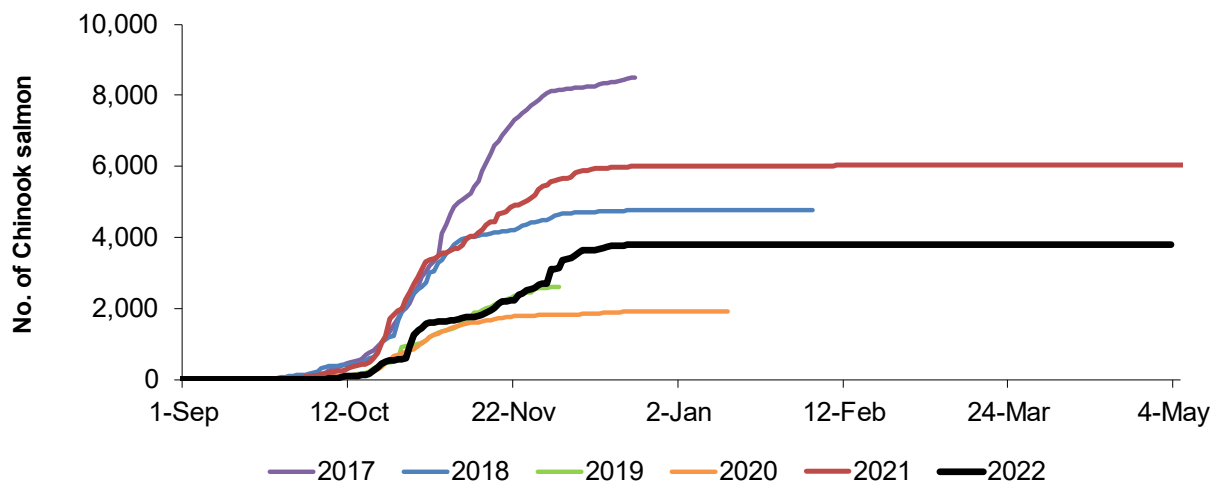


Figure 5-8. Cumulative count of Chinook salmon passage through May 3, 2023, at the Stanislaus River weir near Riverbank. Figure courtesy of FISHBIO.

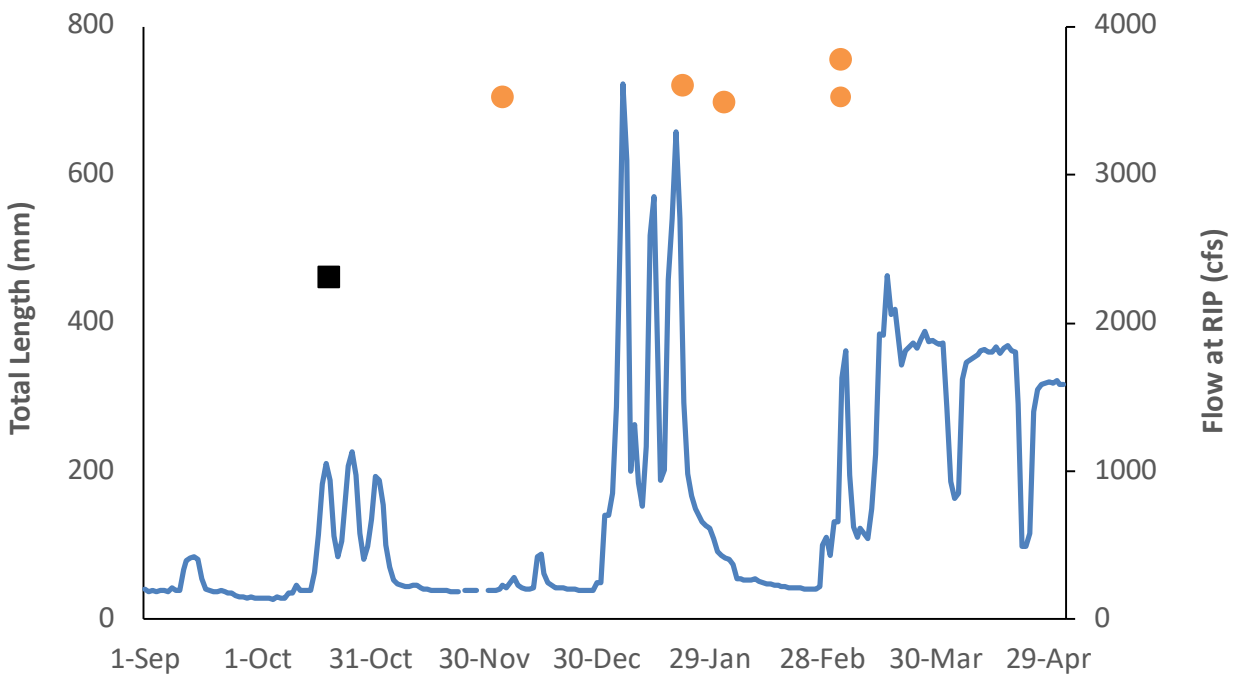


Figure 5-9. Net upstream passages of *O. mykiss* detected at the Stanislaus River weir during the 2022/2023 monitoring season.

Note: Orange colored symbols represent fish captured in the trap box. The black box represents passive detection by Vaki RiverWatcher only. Figure courtesy of FISHBIO.



Figure 5-10. Male steelhead trapped, processed, and tagged at the Stanislaus River weir on 3/5/2023 (755 mm TL, 3.860 g). Photo courtesy of FISHBIO.

5.1.4 Rotary Screw Traps near Oakdale

Rotary screw trap sampling at Oakdale (approximately river mile 40) was funded by The Districts and conducted by FISHBIO for the 2023 outmigration season for monitoring of outmigrating juvenile salmonids. Sampling at Oakdale began on January 20, 2023, and ended on June 23, 2023. A total of 55,683 juvenile Chinook salmon and 22 *O. mykiss* were captured at the Oakdale trap in 2023. Chinook salmon catch timing and fork lengths at the Oakdale sampling location are summarized in Figures 5-11 and 5-12; *O. mykiss* catch timing and fork lengths are summarized in Figure 5-13 (figures provided by FISHBIO).

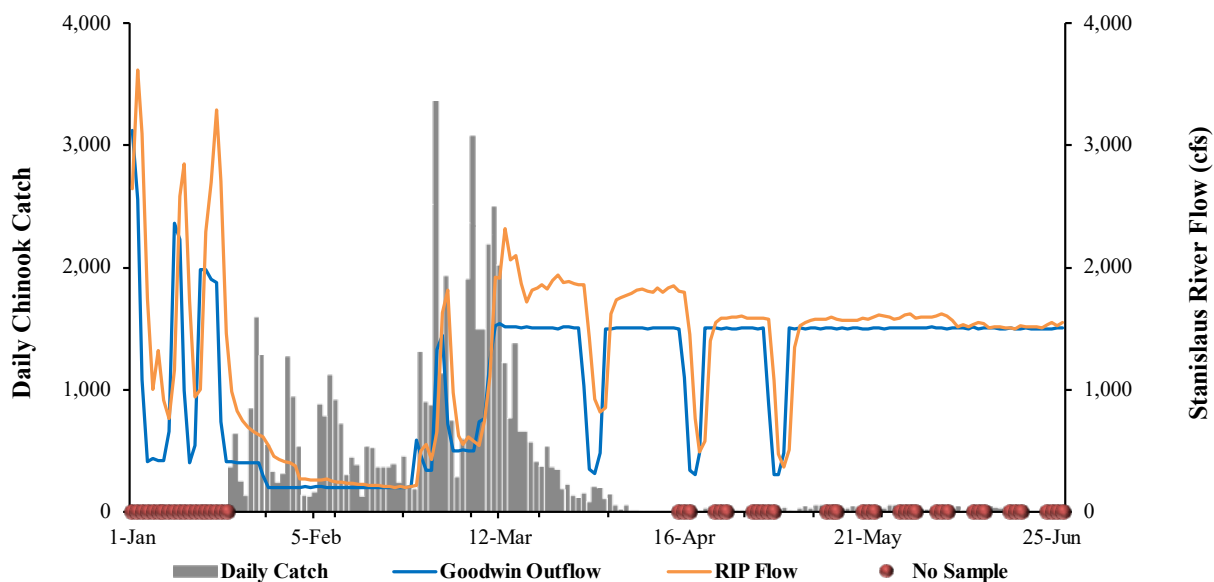


Figure 5-11 Juvenile Chinook catch through June 23, 2023, at the rotary screw trap near Oakdale. Figure provided by FISHBIO.

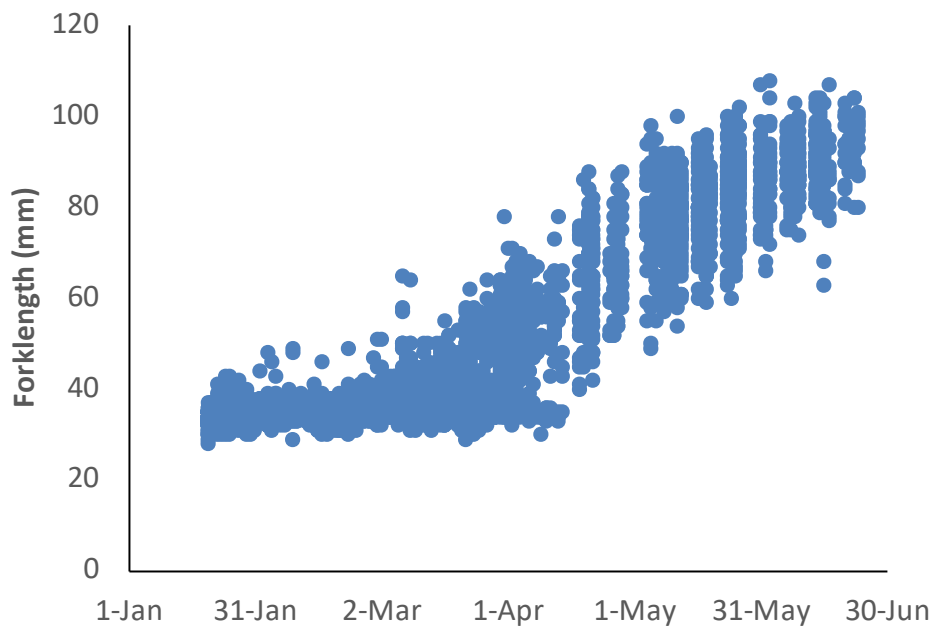


Figure 5-12. Fork lengths of juvenile Chinook catch through Jun 23, 2023, at the rotary screw trap near Oakdale. Figure provided by FISHBIO.

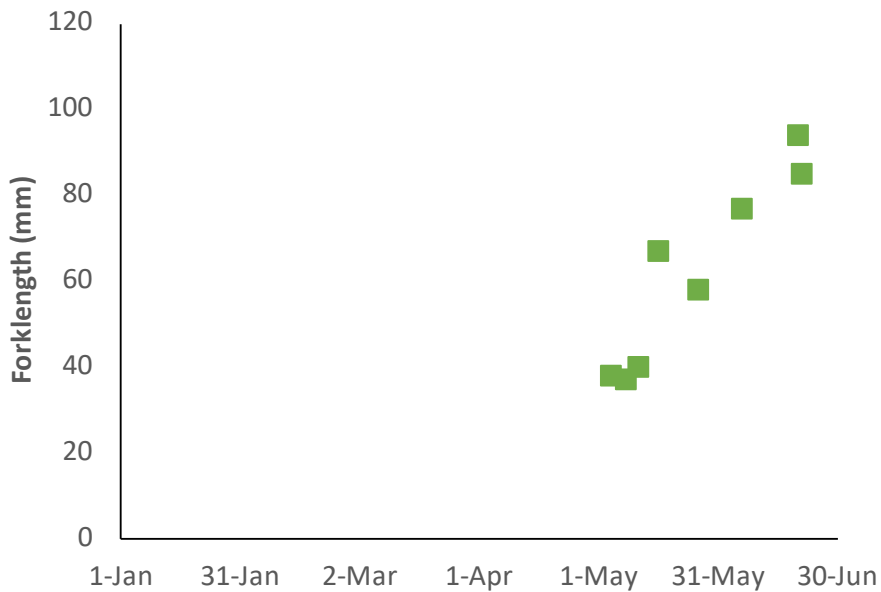


Figure 5-13. Fork lengths of *O. mykiss* catch through June 23, 2023, at the rotary screw trap near Oakdale. Figure provided by FISHBIO.

5.1.5 Rotary Screw Traps near Casswell

Rotary screw trap sampling at Caswell Memorial State Park (approximately river mile 9) was funded by USFWS and conducted by Pacific States Marine Fisheries Commission (PSMFC) and USFWS for the 2023 season for monitoring of out-migrating juvenile salmonids.

Sampling for the 2023 survey season began on January 22, 2023 and ended on July 19 with 153 days of sampling effort in the 179-day season. Two 8-foot diameter RSTs were deployed at the Caswell Memorial State Park trapping site in a side-by-side configuration. Total catch for the season was 2,293 unmarked Chinook salmon, 2 unmarked *O. mykiss* smolts, and 175 lamprey. The *O. mykiss* were captured on February 28 and June 26 and measured 246 mm and 225 mm, respectively. Chinook catch timing and fork lengths from the Caswell RST sampling location are summarized in Figures 5-12, 5-13, and 5-14 (figures provided by PSMFC).

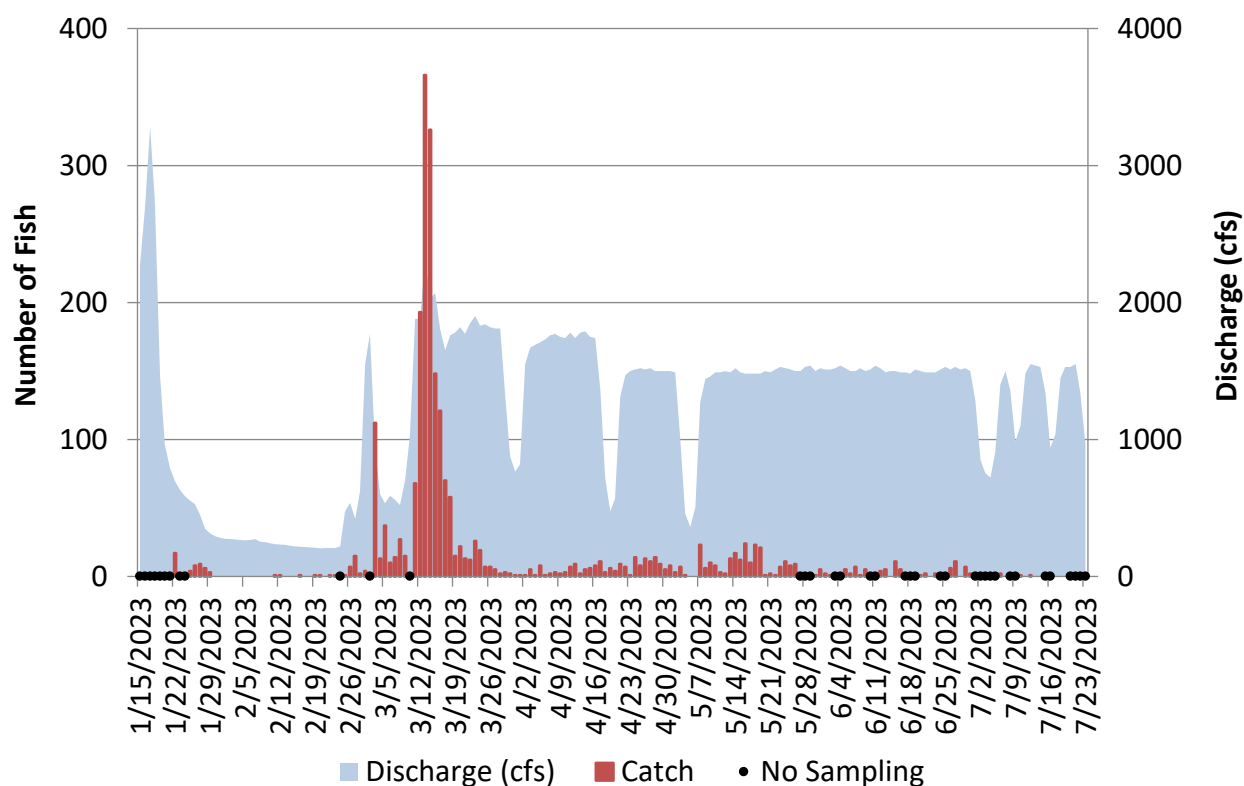


Figure 5-14. Daily catch of unmarked Chinook salmon and daily average discharge at Ripon during the 2023 Stanislaus River at Caswell Memorial State Park rotary screw trap survey season. Data provided by PSMFC.

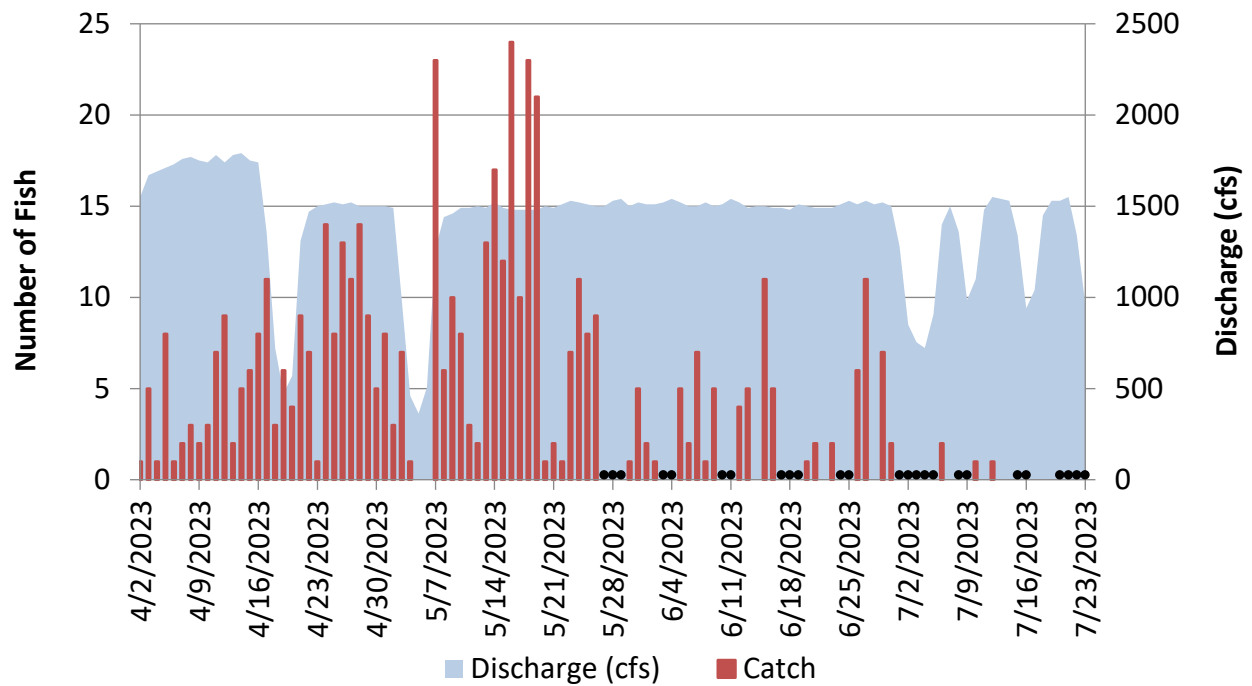


Figure 5-15. Daily catch of unmarked Chinook salmon and daily average discharge at Ripon between April 2, 2023 and July 23, 2023 during the 2023 Stanislaus River at Caswell Memorial State Park rotary screw trap survey season. Data provided by PSMFC.

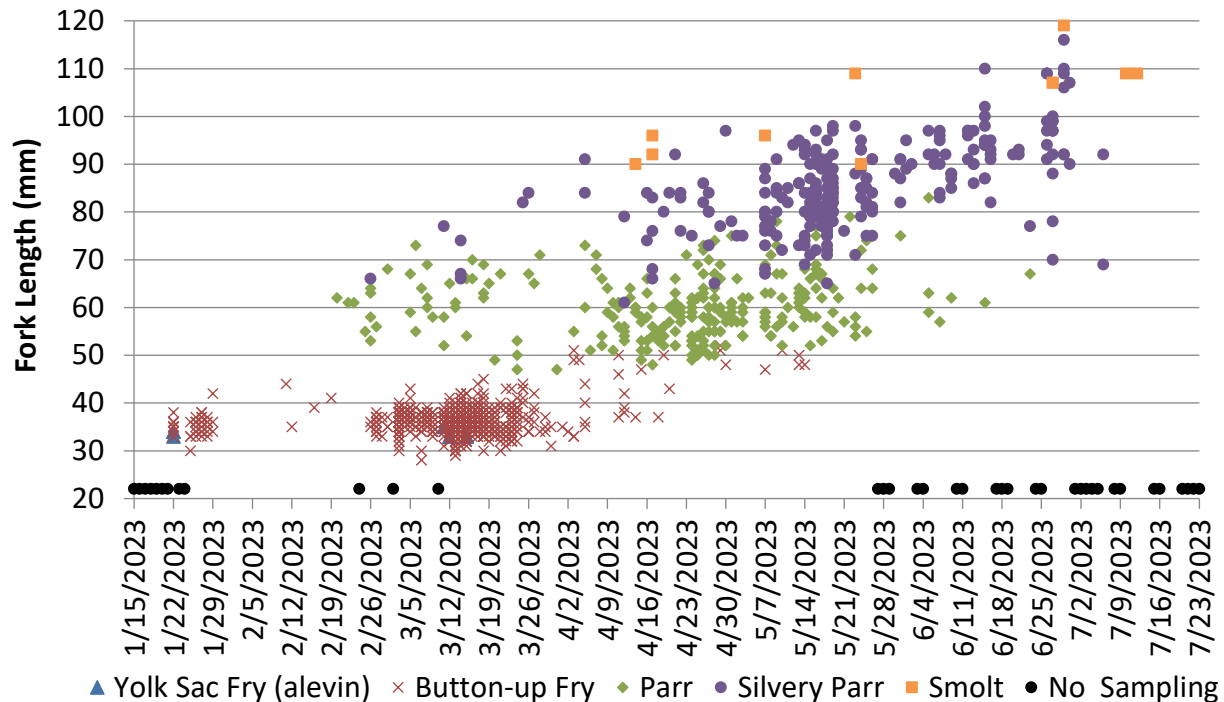


Figure 5-16. Daily fork length distribution by life stage of unmarked Chinook salmon measured during the 2023 Stanislaus River at Caswell Memorial State Park rotary screw trap survey season. Data provided by PSMFC.

5.1.6 Mossdale Trawl on San Joaquin River

The Mossdale Trawl is a Kodiak or pair trawl located at RM 54 on the San Joaquin River. The trawl was operated cooperatively by CDFW and USFWS from January through March, and from July through September of 2023. In April, May, and June, the trawl was operated by CDFW. CDFW has operated a trawl at Mossdale during the spring Chinook salmon outmigration season since the early 1990s to document the size and timing of juvenile salmonids leaving the San Joaquin Basin.

In 2023, 227 non-marked Chinook salmon were caught by the Mossdale Trawl as well as one *O. mykiss* smolt (table 5-3). Chinook salmon ranged in length from 32mm to 140mm. Eleven chinook were captured in January and another three were caught during February and March which ranged in fork length from 32mm to 40mm with an average of 35mm. The trawl was suspended from March 21 through April 23rd due to high flow blocking access to the survey location. When the trawl resumed on April 24, one Chinook was caught; catch continued through April, May, and June, and then continued into July with catch decreasing after July 14th. There were three additional Chinook caught in August, two on August 1 and one final individual caught on August 14. It is likely that Chinook were migrating past Mossdale while the trawl was suspended, so the catch numbers included in this report should be considered an undercount.

Figure 5-14 illustrates these catch counts along with flow at Vernalis (cfs), temperature at Mossdale (C), and the time period trawling could not occur ("No trawl" on figure).

Table 5-3. Date and Fork Length of the One *O. mykiss* Captured by the Trawl

Date	Fork Length (mm)	Notes
6/10/2023	375	DNA collected

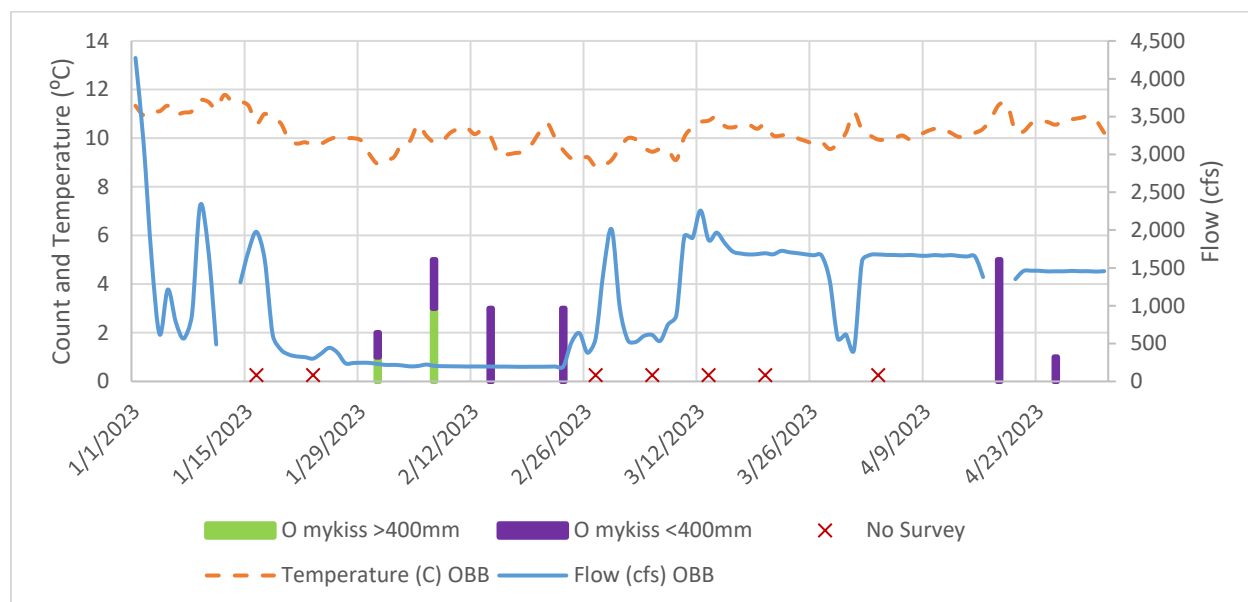


Figure 5-17. Catch of non-marked Chinook (CHN) and *O. mykiss*, flow at Vernalis and temperature at Mossdale.

An estimate of the number of juvenile outmigrants captured at the trawl is not available at this time, and raw counts of catch do not provide meaningful comparisons of fish numbers between years. Raw counts can be used to look at timing of the out-migration which can be compared between years. Figure 5-15 shows the cumulative timing of out-migrating juvenile Chinook captured by the trawl. Although the trawl was suspended due to high flows in April, the cumulative timing of the run still provides valuable information about the juvenile outmigration. Half of the 2023 cohort passed Mossdale by June 12, while 90% had passed by July 3rd, this is later than in past years including 2017, another wet year where half the cohort had passed by May 20 and 90% by May 30 (Table 5-4).

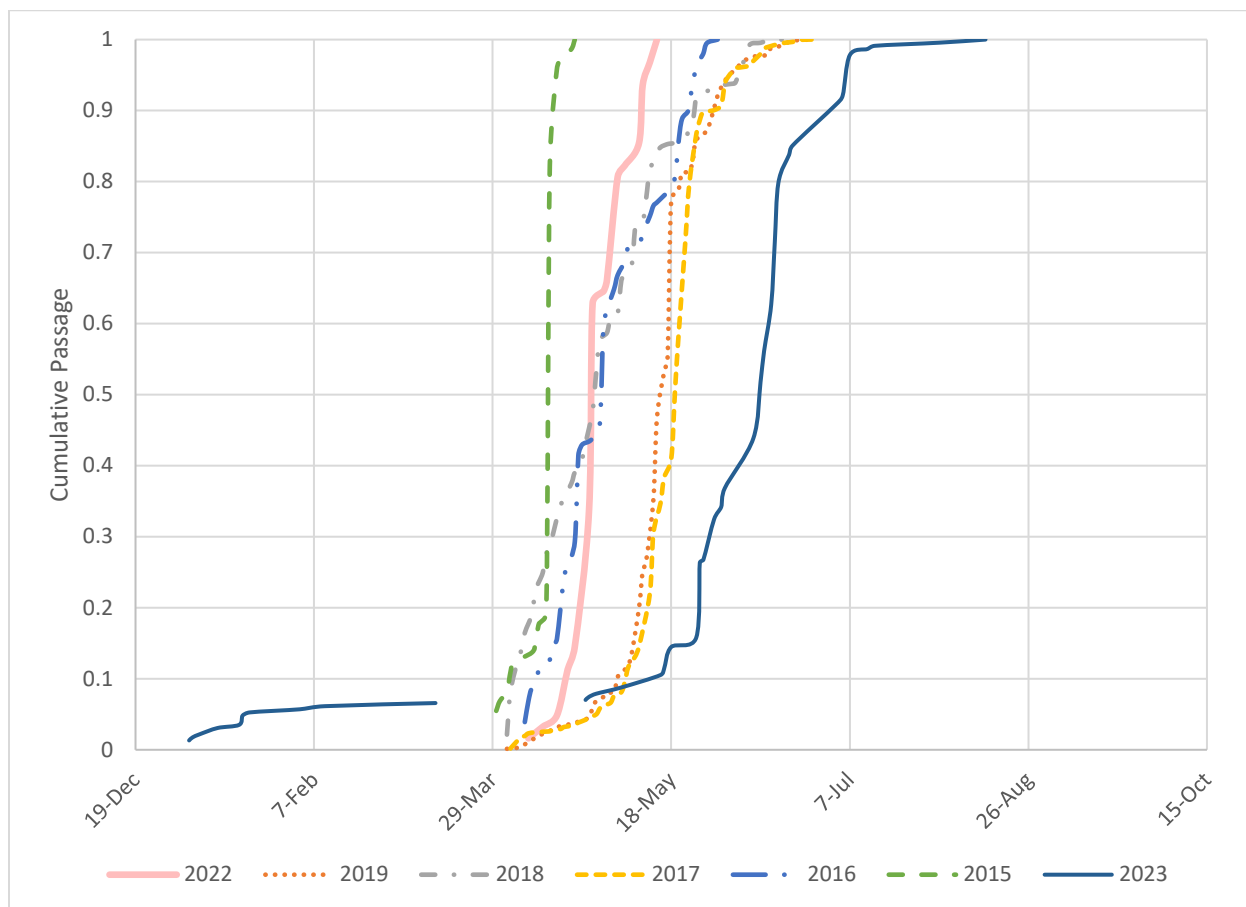


Figure 5-18. Cumulative fraction of juvenile chinook passage at Mossdale 2023-2015.

Note: 2020 and 2021 data were omitted due to gaps in sampling caused by COVID-19 restriction limiting the ability to conduct fieldwork.

Table 5-4. Dates for 50% and 90% of the juvenile cohort passing Mossdale from 2015 through 2023.

Year	50%	90%
2023	12-Jun	3-Jul
2022	26-Apr	10-May
2021	--	--
2020	--	--
2019	16-May	30-May
2018	27-Apr	25-May
2017	20-May	30-May
2016	29-Apr	23-May
2015	14-Apr	16-Apr

Note: 2020 and 2021 data were omitted due to gaps in sampling caused by COVID-19 restriction limiting the ability to conduct fieldwork.

5.2 Conservation Measures

As part of the Preferred Alternative, conservation measures were proposed to avoid, minimize, or compensate for CVP and SWP project effects. These two conservation measures were the focus of attention in WY23:

- Spawning Habitat Restoration: Under the CVPIA (b)(13) program, Reclamation's annual goal of gravel placement is approximately 4,500 tons in the Stanislaus River.
- Rearing Habitat Restoration: Reclamation proposes to construct an additional 50 acres of rearing habitat adjacent to the Stanislaus River by 2030.

Tables 5-6 through 5-9 detail these efforts.

Table 5-5. Gravel augmentation annual averages over different time periods.

Time Period	Average or Annual Gravel Addition (cubic yards)	Annual Target	Percent of Target Achieved (cubic yards)
1994-2008	3,647 cy	N/A	N/A
2009-2014	1,995 cy	8,333 cy*	24%
2015-2019	1,759 cy	8,000 cy**	22%
2020 (ROD)	15,000 tons	4,500 tons	300%
2021	7,200 tons	4,500 tons	160%
2022	0	4,500 tons	0%
2023	0	4,500 tons	0%

*Action III.2.1 “catch-up” requirement is for the “addition of 50,000 cubic yards of gravel by 2014.” The 8,333 cubic yard annual target is an approximation, assuming the 50,000 target is uniformly spread over the six-year 2009-2014 period. NMFS had granted an extension.

**Action III.2.1 “maintenance” requirement is for the “minimum addition of 8,000 cubic yards per year for the duration of the Project Actions.”

Table 5-6. Completed gravel augmentation habitat restoration projects on the Stanislaus River 2009 to present.

Project	Project extent
Goodwin Canyon at cable crossing (rm56) 2011	2,941 cubic yards
Goodwin Canyon at float tube pool (rm56) 2012	1,765 cubic yards
Goodwin Canyon at cable crossing (rm56) 2015	4,706 cubic yards
Main channel and floodplain bench at Honolulu Bar (rm50) 2012	8,000 cubic yards total used for spawning riffles in main channel and 0.7-acre floodplain bench
Buttonbush (rm48) 2017	2,838 cubic yards
Rodden Road (rm43) 2018	1,250 cubic yards
Goodwin Canyon (rm58) 2020	15,000 tons*
Goodwin Canyon (rm58) 2021	7,200 tons

*15,000 tons = 10,000 cubic yards

Table 5-7. Completed habitat restoration projects on the Stanislaus River from 2009 to present.

Project	Project Extent
Lancaster Road side-channel (rm48) 2011	640 linear feet of side-channel and 2 acres of floodplain habitat
Side-channel at Honolulu Bar (rm50) 2012	Improvement of existing side-channel to reduce stranding risk
Floodplain at Honolulu Bar(rm50) 2012	2.4 acres of floodplain habitat
Buttonbush (rm48) 2017	4.4 acres of side-channel and floodplain habitat and 2,400 linear feet of side-channel habitat
Rodden Road (rm43) 2018	4.9 acres of side-channel habitat
Goodwin Canyon Float Tube Pool (rm58) 2020	0.25 acre of side-channel habitat located on the south-side/downstream end of the Float Tube Pool.
Honolulu Bar Maintenance (rm50) 2020	Maintenance was conducted in the project area to redirect flow into the side channel. Scour of gravel in the main channel had reduced flows into the side-channel. The project would be improved with the addition of more gravel to the main channel and installing a gravel bench on the upstream side of the island.

Table 5-8. In-progress gravel and habitat restoration projects.

Project	Project extent
Goodwin Canyon (rm58)	Anticipated gravel: 4,500 cubic yards (cy)/year as described in the 2020 ROD.
Migratory Corridor Rehabilitation – Buffington Restoration (rm2-3)	Anticipated 5.6 acres of seasonally inundated habitat in the lower river. Designs in progress.
Stanley Wakefield Wilderness Area (Kerr Park) Restoration (rm43)	Designs complete with CDFW funding. Construction complete in FY24. Anticipated 8.5 acres.

Table 5-9 Potential gravel and habitat restoration projects.

Project	Project extent
Two Mile Bar (rm56)	Potential gravel augmentation site Not likely a viable habitat restoration project in the near-term because of land access issues.
Honolulu Bar Phase II (rm51)	Anticipated gravel and habitat: TBD
Lovers Leap (rm52)	Anticipated gravel and habitat: TBD
Honolulu Bar Gravel augmentation (rm50)	Anticipated gravel and habitat: TBD
Tortuga (rm42)	Anticipated gravel: 3,500 cy Anticipated habitat: 2 acres
Mohler Tract (rm12)	Anticipated 5 acres
Caswell State Park (rm8)	Acres TBD

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Chapter 6 References

- Bay Delta Live. (2020). DJFMP Highlights. <https://www.baydeltalive.com/fish/djfmphighlights>
- CDFW. (2023). GrandTab 2023.06.26 California Central Valley Chinook Escapement Database Report. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=84381>
- Guignard, J., Peterson, M., Pilger, T., and Hellmair, M. 2022. Memorandum – Stanislaus River Steelhead Monitoring: September 2021-May 2022. Prepared by Fishbio for U.S. Bureau of Reclamation. August 2022.
- National Marine Fisheries Service (NMFS). 2009. Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project. NMFS-Southwest Region, Long Beach, California. 844 pages plus appendices. http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocap.html
- NMFS. 2011. Letter transmitting the 2009 Reasonable and Prudent Alternative with 2011 Amendments. NMFS Southwest Region, Long Beach, California. April 7. http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocap.html,
- NMFS. 2019. Biological Opinion on Long-Term Operation of the Central Valley Project and State Water Project. NMFS, West Coast Region. <https://repository.library.noaa.gov/view/noaa/22046>
- United States Bureau of Reclamation (USBR). 2019. Biological Assessment on the Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project. Central Valley Project, Mid-Pacific Region. <https://www.usbr.gov/mp/bdo/lto/biop.html>
- USBR. 2020. Record of Decision (ROD). Reinitiation of Consultation on the Coordinated Long-Term Modified Operations of the Central Valley Project and State Water Project. https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=39181
- Zeug, S.C., Sellheim, K., Watry, C., Wikert, J.D. and Merz, J. (2014), Response of juvenile Chinook salmon to managed flow: lessons learned from a population at the southern extent of their range in North America. *Fish Manag Ecol*, 21: 155-168. doi:10.1111/fme.12063