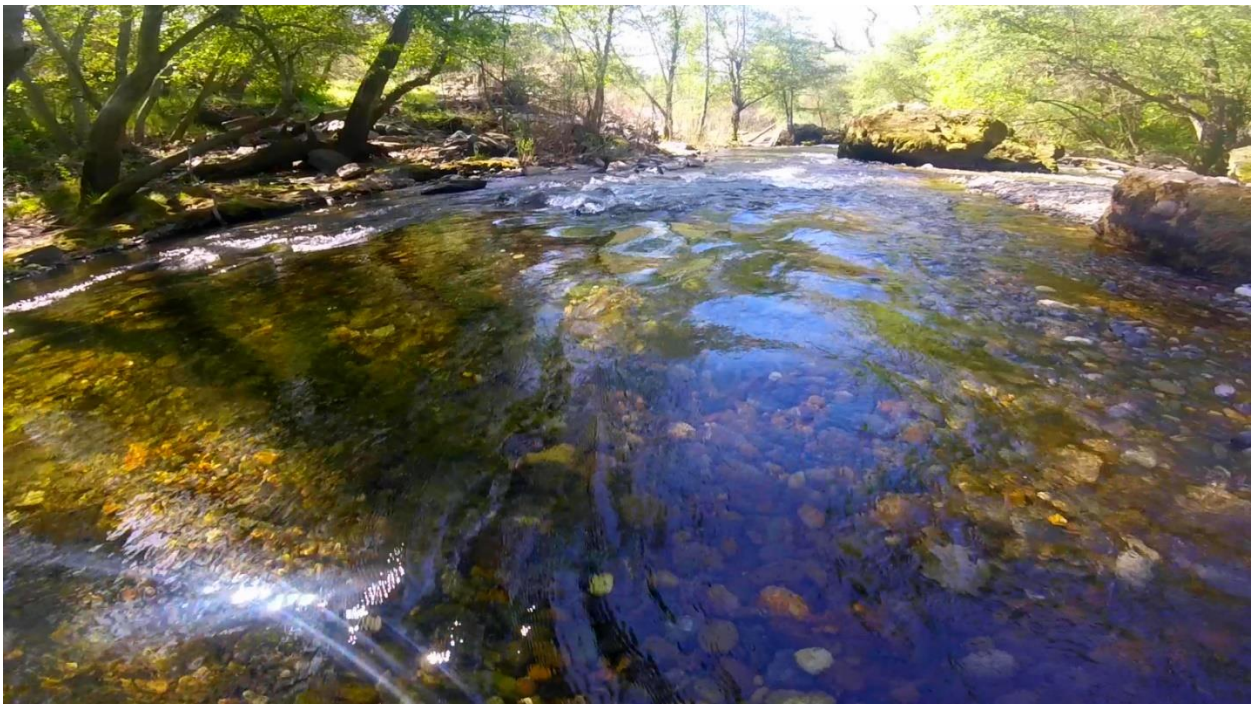
Stanislaus Watershed Team Annual Summary of Activities Water Year 2022

Central California Area Office, Folsom, CA
Interior Region 10- California-Great Basin



Cover Photo: Stanislaus River. Credit: Ryan Kok, CDFW

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public

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Stanislaus Watershed Team Annual Summary of Activities Water Year 2022

New Melones Reservoir, CA
Interior Region 10- California-Great Basin

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Acronyms and Abbreviations

Term	Definition
AF	Acre-feet
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
D-1422	California State Water Resources Control Board Water Rights Decision 1422
Districts	Oakdale and South San Joaquin Irrigation Districts
D.O.	Dissolved Oxygen
ESA	Endangered Species Act of 1973 (Section 7)
GWD	Stanislaus River at Goodwin Dam (CDEC gauge)
KF or KFS	Knights Ferry
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OBB	Stanislaus River at Orange Blossom Bridge (CDEC gauge)
PA	Proposed Action
PSMFC	Pacific States Marine Fisheries Commission
Reclamation	U.S. Bureau of Reclamation
rm	River mile
RPA	Reasonable and Prudent Alternative
RIP	Stanislaus River at Ripon (CDEC gauge for dissolved oxygen)
ROD	Record of Decision
SEWD	Stockton East Water District
SOG	Stanislaus Operations Group
SRP	New Melones Stepped Release Plan
SWP	State Water Project
SWT	Stanislaus Watershed Team
SWRCB	State Water Resources Control Board

Term	Definition
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish & Wildlife Service
USGS	United States Geological Survey
WAPA	Western Area Power Administration
WIF	Winter Instability Flow
WOMT	Water Operations Management Team
WY22	Water Year 2022

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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 2022 (WY22) 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 Donnells 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.

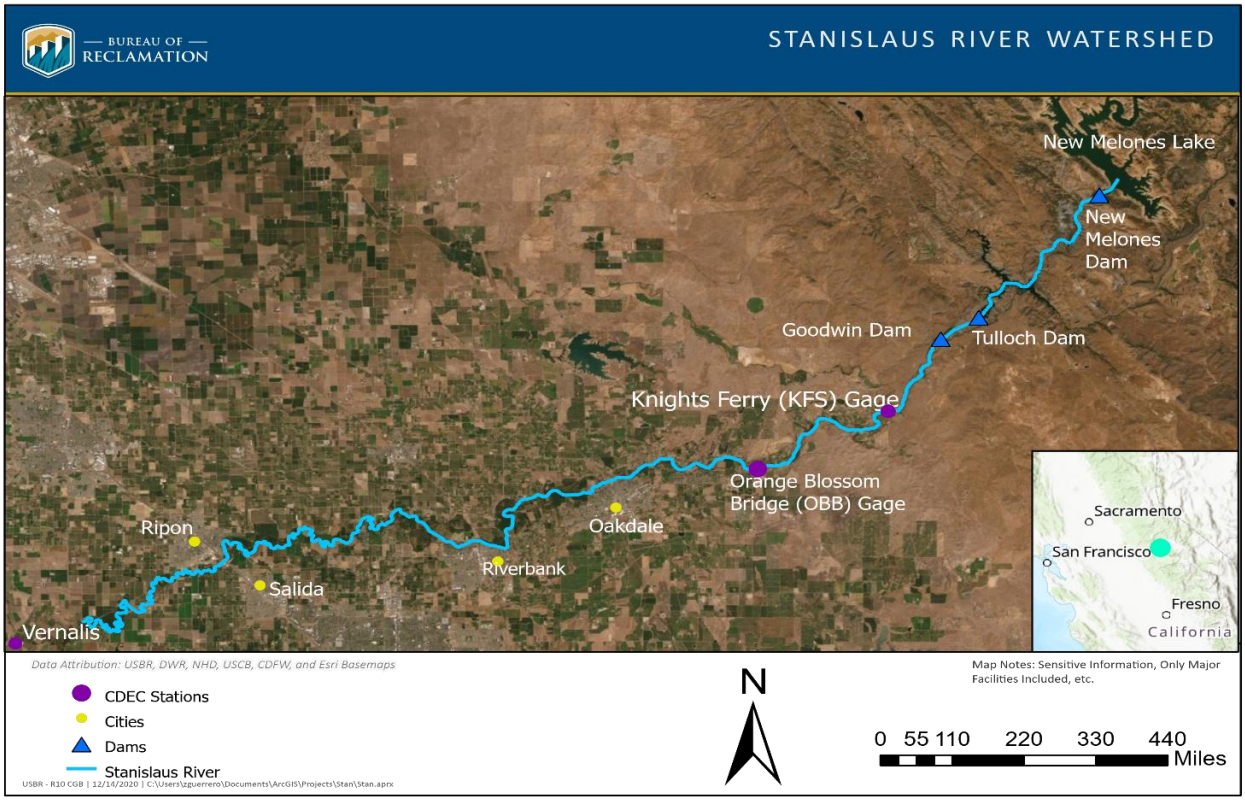

Figure 1-1. Key locations in or near the Stanislaus River watershed.

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 WY22 included:

- Reclamation
- USFWS
- NMFS
- CDFW
- California Department of Water Resources (DWR)
- SWRCB
- SSJID
- SEWD
- OID

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

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 will study approaches to improving temperature for listed species on the lower Stanislaus River, to include evaluating the utility of conducting temperature measurements/profiles in New Melones Reservoir. Reclamation is in the process of developing updated temperature models for all our rivers including the Stanislaus River. This process is expected to take a minimum of three years. Once the Stanislaus River temperature model is developed, then 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.

- 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 proposes to move the compliance location to Orange Blossom Bridge, 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 2021 through September 2022. Meeting notes and supplemental SWT documents were made available to SWT members and posted on the SWT Technical Group website[1].

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)

Chapter 4 Water Operations Summary

4.1 Water Year Conditions and Operations

The WY22 Stanislaus River operations were heavily influenced by the critically dry hydrology in the San Joaquin Valley. The 2021 Fall Pulse flow occurred October 12, 2020, through November 4, 2021. Following the Fall Pulse Flow, the Stanislaus River flows were held at the minimum Stepped Release Plan (SRP, Appendix A) flow of 200 cfs, due to the critically dry hydrology. New Melones began WY22 with 842 TAF of storage. However, the California Department of Water Resources, bulletin 120, Water Supply Index forecasts from December 1, 2021 onward were consistently critically dry at the 90th percentile exceedance. Actual inflows to the reservoir were consistently at or below the forecasted inflows. After the completion of the Spring Pulse Flow, releases were kept at 800 cfs to meet the Vernalis Basw Flow Objective. Beginning July 1, 2022 releases above base flow

[1] The SWT Technical Team webpage can be found here: https://www.usbr.gov/mp/bdo/stanislaus-watershed-team.html

level were made to maintain compliance with the Dissolved Oxygen Standard at Ripon. Releases were ramped down to the base release of 150 cfs on September 21, 2022. New Melones end of 2022 Water Year storage was 619 TAF, 223 TAF down from the beginning of Water Year storage of 842 TAF.

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 objectives, ESA requirements, the 1988 Agreement and Stipulation with OID and SSJID, riparian water right diverters, and CVP water delivery contracts.

The Stepped Release Plan (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.

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 WY22 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 WY22

Month	Water Year Index (60-20-20) 90% Exceedance	Water Year Type (60-20-20) 90% Exceedance
October	1.3	Critical
November	1.3	Critical
December	1.3	Critical
January	2.2	Dry
February	1.7	Critical
March	1.3	Critical
April	1.3	Critical
May	1.5	Critical
June	1.5	Critical
July	1.5	Critical
August	1.5	Critical
September	1.5	Critical

4.4 Seasonal Operations

4.4.1 WY 2022 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 federal Endangered Species Act (ESA) by NOAA's National Marine Fisheries Service (NMFS), dated October 21, 2019. As noted on page 4-81 of the Biological Assessment, "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 15, 2021, SWT meeting, the technical team discussed the alternatives for the fall pulse flow schedule. Based on this discussion, and to accommodate flows needed for important Chinook Salmon carcass studies and recreational activities on the Stanislaus River, the SWT provided feedback on Alternative-1 (Alt-1).

The Alt-1 schedule (Figure 4-1) had the same total volume (41,455 AF, including base flows) for the October 1-November 15 period as the default SRP Critical schedule. Reclamation, and the SWT, believed that the Alt-1 reshaping optimized biological benefits by improving instream conditions and provided an attraction cue for adult salmonids returning to spawn in the Stanislaus River. Higher flows were 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 the second week of October and extending the reshaped fall pulse flow into November, SWT expected the higher-than-base flows to help buffer water temperatures during the seasonal transition to cooler air temperatures. Scheduled flows in Alt-1 were reduced to base flows in early November, before peak spawning was expected to occur.

Some key features of the Alt-1 fall pulse included:

- As in the default schedule, higher fall flows (compared to base flows) were intended to provide an attraction cue for salmonids returning to spawn.
- Reshaping the single pulse identified in the default SRP schedule into multiple peaks increased flow variability which was expected to deter spawning at the higher flows that would not be sustained through egg incubation and fry emergence.
- The time frame of the Alt-1 pulse (which is slightly longer in duration compared to the default SRP schedule) was expected to provide temperature buffering from mid-October through early November when ambient water temperatures would improve.

For WY 2022, Reclamation implemented a reshaped fall pulse flow according to the flow schedule described in Alt-1 (see full details in Appendix B)

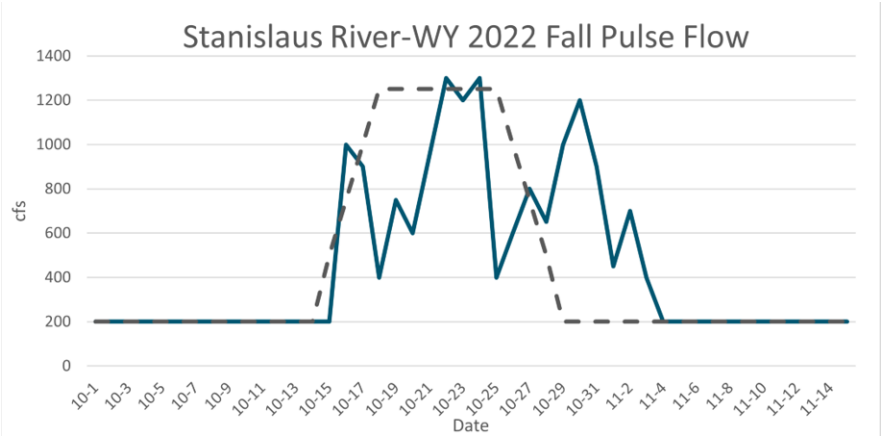

Figure 4-1 Figure showing daily flows from October through mid-December in both the default SRP-Critical schedule and Alternative 1 schedule

4.4.2 Water Year 2022 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 biological opinion 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."

4.4.2.1 January

The Stanislaus Watershed Team (SWT) discussed a WY 2022 WIF proposal on December 15, 2021, and January 19, 2022. For WY 2022, the Long-term Operations Interagency Coordination Team approved a proposal to pilot increased ramping rates for winter instability flows in Critical and Dry years (Appendix C). The SWT provided feedback on an alternative flow schedule (Alt-Dry 1; Figure 4-2) that provided greater variability in the winter hydrograph to simulate a small storm pulse.

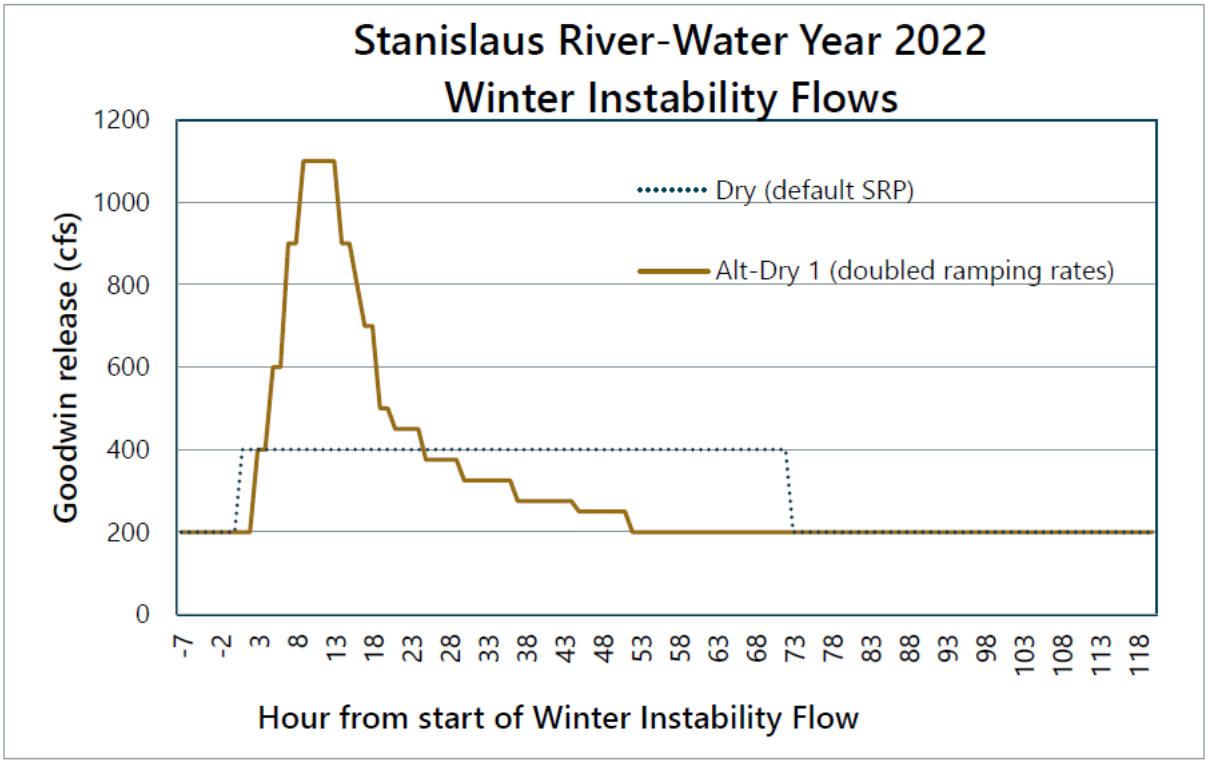

Figure 4-2. Hourly flows in the default SRP and proposed Alternative schedules for a Dry water year type.

The alternative flow schedule had the same volumes (1.19 TAF) as the default SRP schedule for the Dry water year type but was reshaped to include higher peak flows and variability. Reshaping the sub-daily flow pattern to increase the peak flow to 1,100 cfs for part of the first day of the pulse was intended to inundate a greater portion of the Honolulu Bar restoration area and to allow at least partial inundation of the Lancaster Road restoration area. Short-term inundation of shallow water habitat can provide benefits to rearing salmonids (e.g., 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 January WIF is scheduled to begin on January 3rd. In the past, WIFs have been shifted in time to coincide with a natural storm event to better capture the characteristics of a natural hydrograph (i.e., runoff, turbidity, meteorological conditions) associated with a natural storm event co-occurring with the pulse of regulated flow. The internal and interagency coordination as well as dry weather conditions caused the timing of the WIF to be pushed to the end of the month January 28-30. As planned in the ramping rates proposal, CDFW conducted some stranding surveys after the WIF was implemented using increased ramping rates. No rescues were planned due to the expectation of increased flows that would reconnect any stranded pools.

For WY 2022, Reclamation implemented a reshaped winter instability flow according to the flow schedule described in Alt-Dry 1 (see full details in Appendix D).

4.4.2.2 February

SWT had a preliminary discussion about the February WIF at the January 19, 22 SWT meeting. Soon after, it became clear that downstream regulatory demands would result in high Goodwin releases through most of February that would exceed any reshaped, scheduled, WIF. Therefore, SWT did not provide feedback on a reshaped February WIF. Reclamation's Goodwin releases in February 2022 satisfied the volume of the February WIF (Dry year) in the SRP.

SWT did provide to Reclamation information on some activities in the Stanislaus River that could be affected by the sustained higher flows and offered a suggested flow schedule for February and early April that would best accommodate those activities. Reclamation was able to accommodate the following: maintain flows at less than 1500 cfs to allow the weir to operate, plan for 450 cfs weekly at Goodwin Canyon for the CDFW steelhead survey and provide two days at 300 cfs to allow safe retrieval of steelhead egg cages.

4.4.3 Spring Pulse Flows

The Spring Pulse Flow is a component of the daily flow schedule in the SRP proposed in Reclamation's 2019 BA, evaluated in NMFS's 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 biological opinion 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."

At the March 16, 2022, SWT meeting, the technical team discussed, reviewed, and provided feedback on the Alt-Critical 1 option for the WY 2021 spring pulse flow (Figure 4-3). The Alt-Critical 1 schedule had the same total volume (67,240 AF, including base flows) for the April 15-May 15 period as the default SRP Critical schedule. Reclamation, and the SWT, believed that the Alt-Critical 1 reshaping optimized biological benefits by providing a spring pulse flow that could cue anadromy and improve migratory conditions in both the Stanislaus River and in the mainstem San Joaquin River and southern delta. In the Stanislaus River, higher flows were expected to reduce water temperature (or at least buffer daily maximum water temperature) and inundate some shallow water habitat which may provide juvenile salmonids with short-term growth benefits as well as

potential refuge from predation. In the mainstem San Joaquin River and south delta, higher flows from the Stanislaus River (and other San Joaquin tributaries) were expected to convey out-migrating salmonids more rapidly along their migratory pathway, which could improve outmigration success.

Some key features of the Alt-Critical 1 spring pulse included:

- As in the default schedule, higher spring flow (compared to winter base flows) were intended to cue outmigration and improve migratory conditions downstream.
- Reshaping the single pulse identified in the default SRP schedule into a multi-peak pulse period increased flow variability within the season. This variability was expected to provide opportunities for a broader range of salmonid outmigration timing since variability in flow cues outmigration as well as flow magnitude (Zeug et al. 2014).
- The time frame of the Alt-Critical 1 pulse aligned closely with the default SRP pulse flow period.

If possible given other operational constraints, SWT encouraged USBR to keep flows at or below 500 cfs on Tuesdays during April in support of steelhead redd surveys in the canyon.

For WY 2022, Reclamation implemented a reshaped spring pulse flow according to the flow schedule described in Alt-Critical-1 (see Appendix E for details).

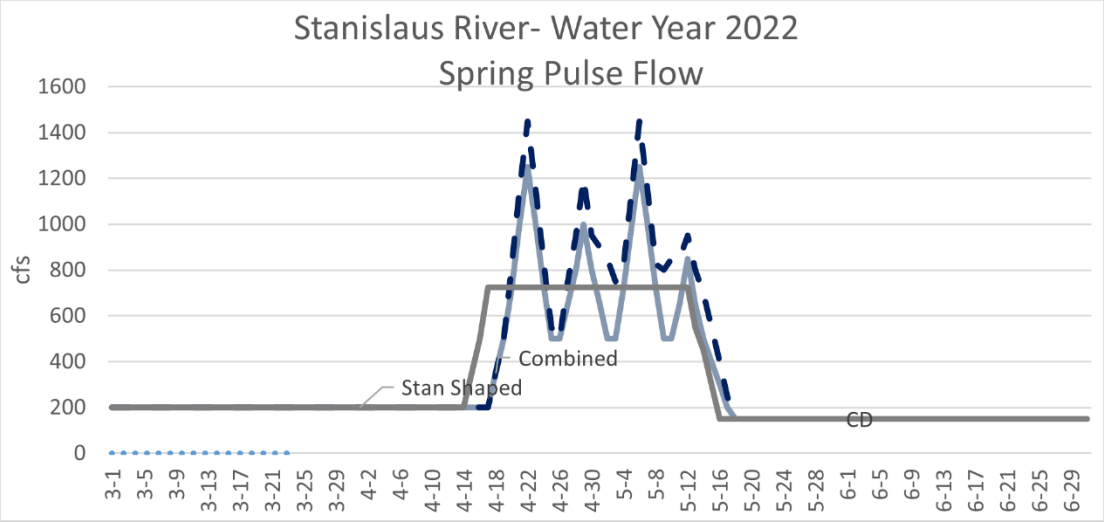

Figure 4-3 Daily flows in the default SRP[2] and proposed Alternative schedule for a Critical water year type

[2] The SRP Critical default presented here does not incorporate ramping rates.

4.5 Storage Management and Flood Control Releases

Due to the Critically Dry hydrology experienced in WY22, New Melones storage never reached flood control levels, so no flood control operations were needed this year. There was a short-term Tulloch Flood control release on xxx due to local high inflows into Tulloch Reservoir. Goodwin Dam releases were increased on December 15, 2021, from 200 cfs to 400 cfs, and were subsequently reduced from 400 cfs back to the base flow of 200 cfs on December 20, 2021.

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 California Department of Fish and Wildlife Brood Year 2021 Escapement Summary

California Department of Fish and Wildlife (CDFW) began conducting fall-run Chinook salmon escapement and redd surveys on October 4, 2021, and concluded surveying on January 13, 2022.

The preliminary Stanislaus River 2021 escapement estimate for fall-run Chinook Salmon, as reported in the July 7, 2022, GrandTab, was 4,344 fish (compared to 186 fish on the Tuolumne River and 754 fish on the Merced River; the Merced River total combines 267 fish taken at the Merced River Hatchery and 487 fish estimated in-river adult returns). During the survey season 840 carcasses were found and had samples collected (scales, otoliths, and coded wire tag [CWT] if present). In addition, 1,083 skeletons were tallied and chopped, for a total of 1,923 individual Chinook handled during the survey. There were two riffles that were only partially surveyed and skipped in many weeks, due to either a dry channel or high flows impeding access.

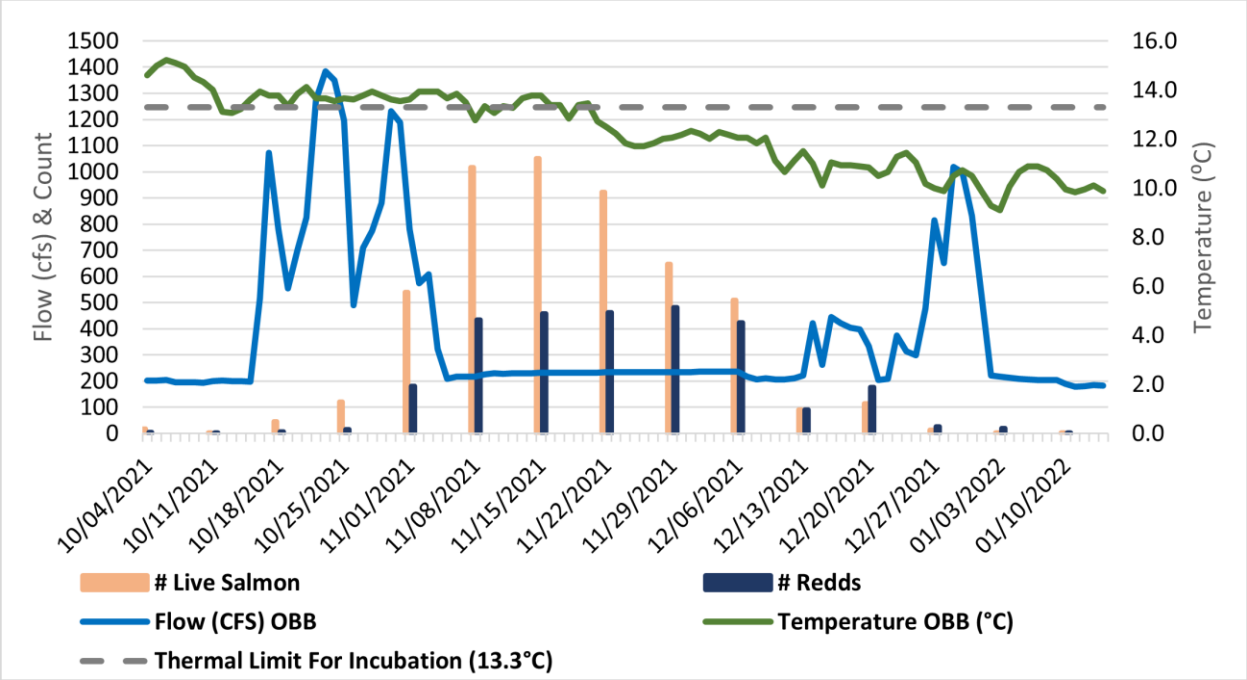

Figure 5-2 Weekly live and redd counts, mean daily spill and temperature measured at Orange Blossom Bridge (OBB) RM 46 for the 2021 Stanislaus Escapement Survey. Note: live and redd counts are summed by week.

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 5-2). Throughout the 15-week survey period, CDFW observed a maximum of 703 redds on the Stanislaus River (compared to 221 on the Tuolumne River and 218 on the Merced River).

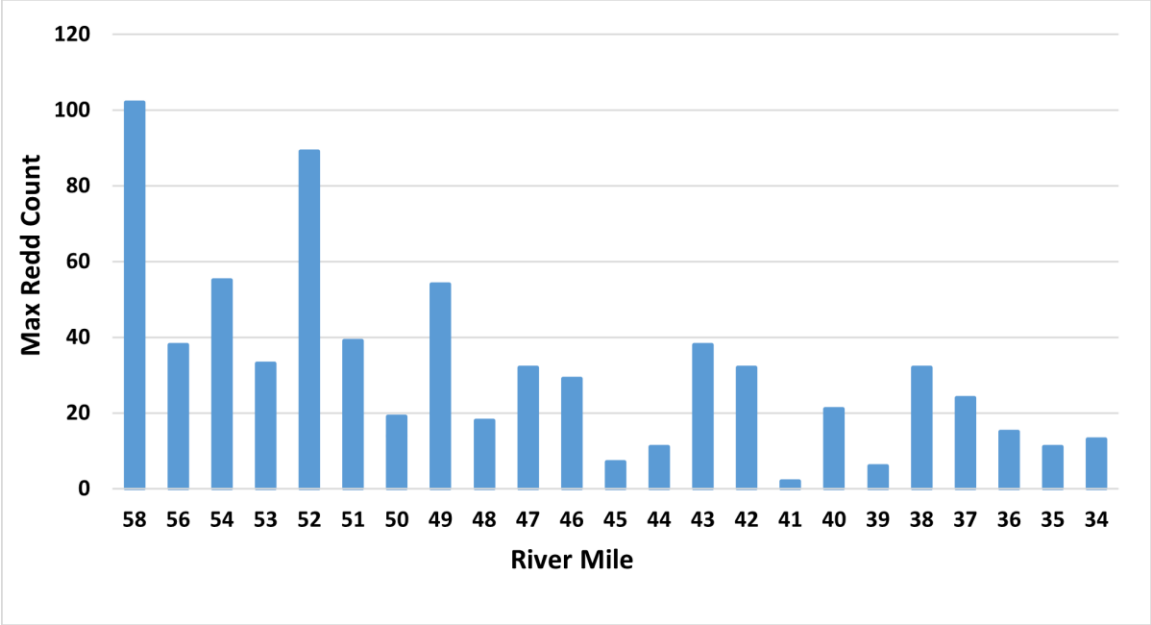

Figure 5-3 Sum of maximum redd counts by river mile.

Two hundred eight coded wire tags were recovered from carcasses during the 2021 escapement survey. Most of the tagged fish came from the Mokelumne River Hatchery and were released in 2019. Brood years 2017, 2018 and 2019 were all represented in the CWTs with fish coming from the Feather River Hatchery, Merced River Hatchery, Nimbus Hatchery and San Joaquin River Hatchery in addition to the Mokelumne (Table 5-1). Most of the hatchery fish were identified as fall run, but the two fish released from the San Joaquin River Hatchery from brood year 2018 were identified as spring run. This is the first year that Spring Run from the San Joaquin Restoration program were positively identified in the Stanislaus River.

Table 5-1.

Hatchery	Brood Year			Total
	2017	2018	2019	
Feather River Hatchery	4	6	1	11
Merced River Hatchery		10	3	13
Mokelumne River Hatchery	13	54	100	167
Nimbus Hatchery	4	2	6	12
San Joaquin River Hatchery		2		2
TAG NOT FOUND				3
Grand Total	21	74	110	208

5.1.2 California Department of Fish and Wildlife *O. mykiss** Redd Survey Summary

(*****Field differentiation between the resident Rainbow Trout and anadromous Steelhead is not currently possible, due to this we use *O. mykiss* in this summary.)

The 2022 CDFW Stanislaus River *O. mykiss* redd survey began on January 4, 2022 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, 2022. There was no survey the week of January 24, 2022 due to staffing issues, and two riffles were only partially surveyed or skipped in many weeks due to a dry channel or high flows. During the 17-week survey period a total of 118 live *O. mykiss* were observed, with 19 of these estimated to be greater than 400 mm in fork length.

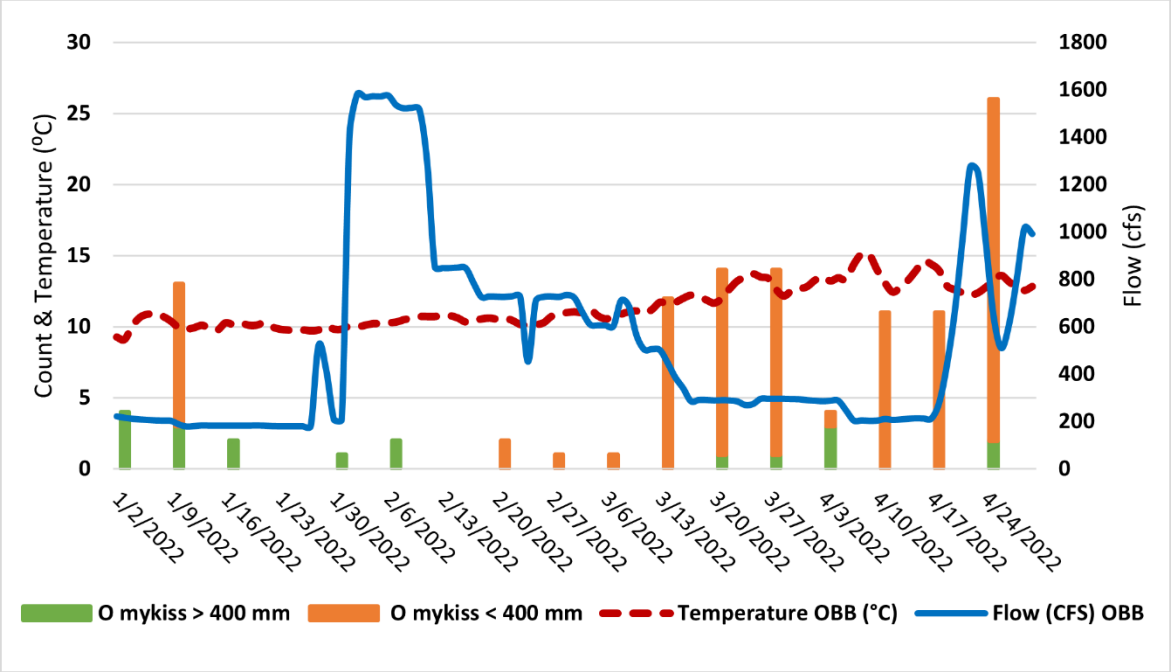

Figure 5-4 Weekly Live *O. mykiss* counts by size class, mean daily flow and temperature measured at Orange Blossom Bridge (OBB) for the 2022 Stanislaus *O. mykiss* redd Survey. Note: live counts are summed by week.

Three live lampreys and six live Chinook were observed during the survey. Zero redds were identified as belonging to *O. mykiss*. Seven lamprey redds were found in sections three and four (downstream of Valley Oak Recreation Area, RM 44). One Chinook redd was also observed during the survey period. Zero *O. mykiss* carcasses found during the redd survey, but seven were found during the 2021 Chinook escapement survey, table 5-1. One dead lamprey and zero dead Chinook were found during the redd survey.

Table 5-2 Date, sex, fork length, and location of the seven *O. mykiss* found during the escapement survey

Date	Sex (M/F)	Fork Length (cm)	River Mile
12/6/2021	M	38	56.8
12/1/2021	M	39	46.2
11/29/2021	F	38	58.3
11/29/2021	M	40	58.0

11/21/2021	M	30	58.3
11/3/2021	F	32	41.9
11/1/2021	M	17.5	56.8

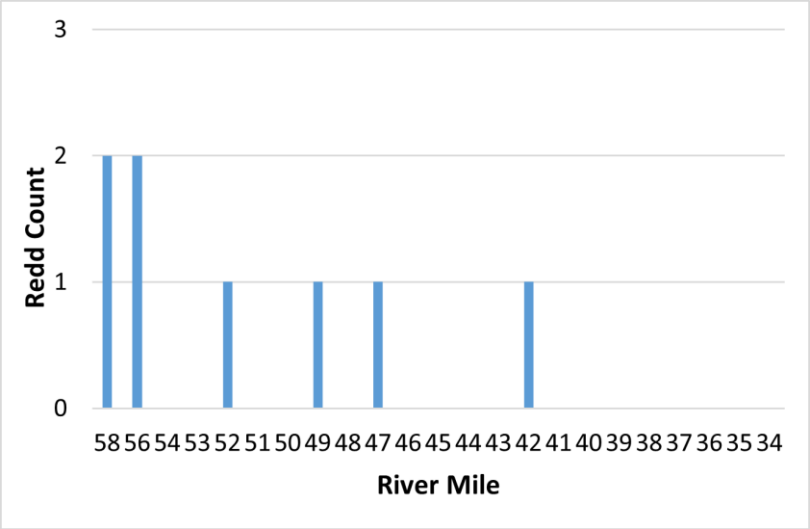

Figure 5-5 *O. mykiss* redds by river mile of the seven *O. mykiss* found during the escapement survey

Five *O. mykiss* carcasses were located and collected during the 2022 *O. mykiss* redd survey, with another three carcasses found during the 2021 Chinook escapement survey. Zero dead Chinook or lamprey were found during the redd survey. Out of the eight *O. mykiss* carcasses collected four were female and the other four were male. Of the four female fish collected, three were found to still have eggs and were considered unspawned or partially spawned.

5.1.3 Stanislaus Weir

The U.S. Bureau of Reclamation funded FISHBIO to conduct adult fish monitoring at the Stanislaus River weir near Riverbank, California (approximately river mile 31). Monitoring at the weir near Riverbank (for upstream passage of adult salmonids) began for the season on September 8, 2021 and ended on May 23, 2022. The cumulative net upstream passage through May 23, 2022, was 6,032 Chinook (at least 23.7% were ad-clipped, indicating a hatchery origin; presence/absence of adipose fin could not be determined on 96 fish) and 50 *O. mykiss*. Of the 50 net upstream passages of *O. mykiss*, 27 exceed the 406 mm length criterion for steelhead (Guignard *et al.* 2022). Among the 27 recorded steelhead passing through the weir (estimated size range 409 - 580 mm), 17 had adipose fin clips indicating hatchery origin, four had an intact adipose fin indicating natural origin, and for six individuals the state of the adipose fin could not be determined. Of the 23 net upstream passages of *O. mykiss* with an estimated length smaller than 406 mm (size range 184 - 400 mm), two had adipose fin clips indicating hatchery origin, 18 had an intact adipose fin, and for three individuals the state of the adipose fin could not be determined. The timing of Chinook Salmon passage at the weir is shown in Figure 5-6; Figure 5-7 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 5-8

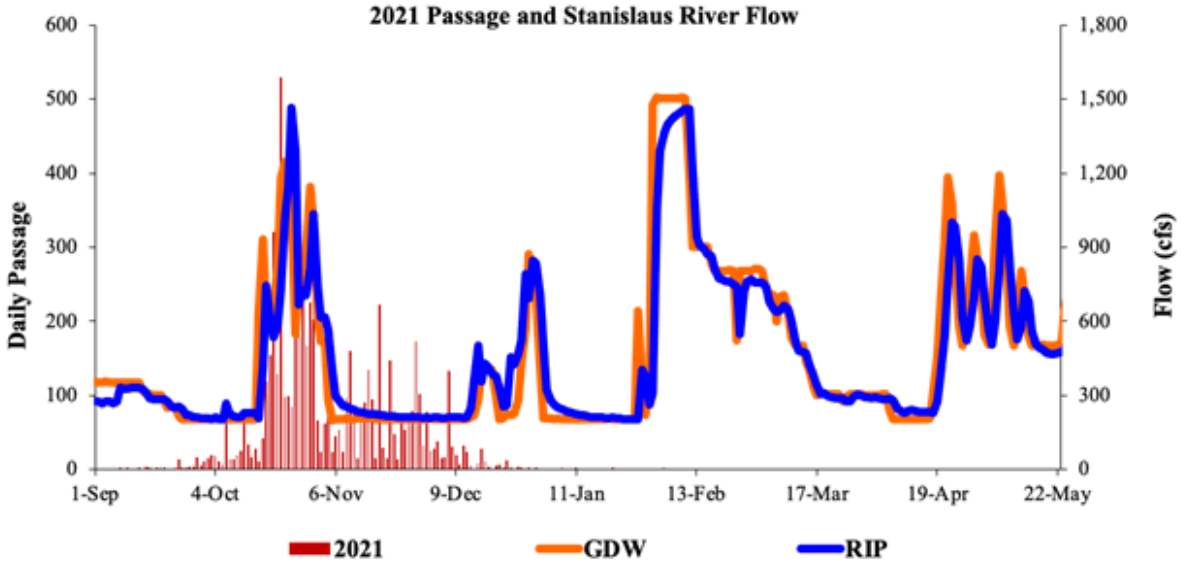

Figure 5-6. Daily Chinook salmon passage through May 23, 2022, at the Stanislaus River weir near Riverbank. Data courtesy of FISHBIO.

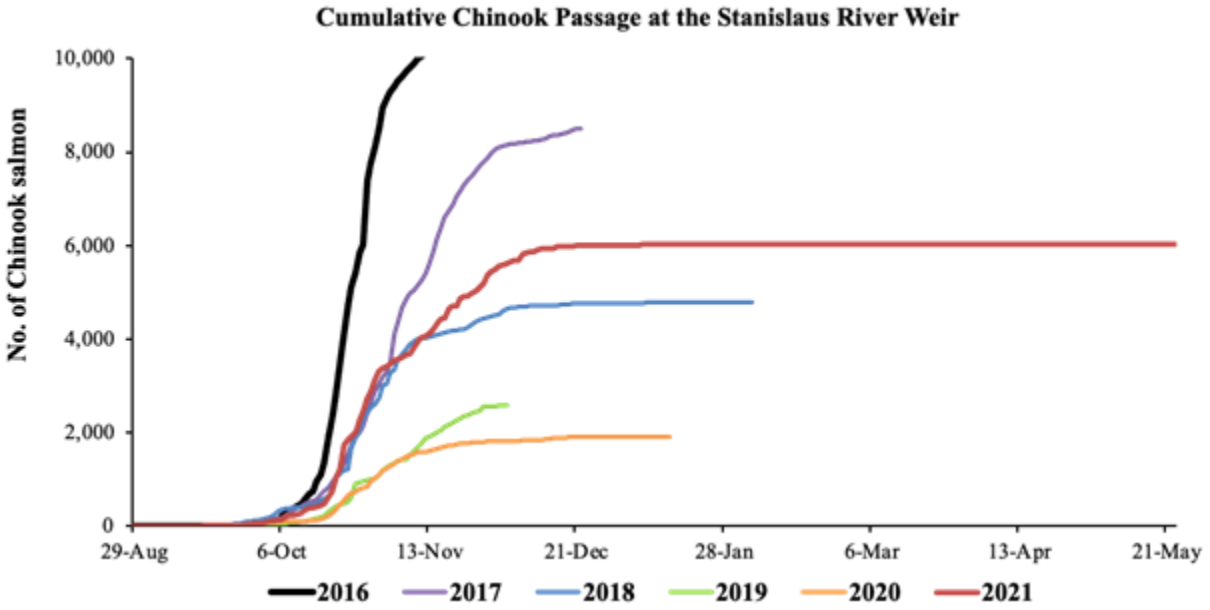

Figure 5-7. Cumulative Chinook Salmon passage through May 23, 2022, at the Stanislaus River weir near Riverbank. Data courtesy of FISHBIO.

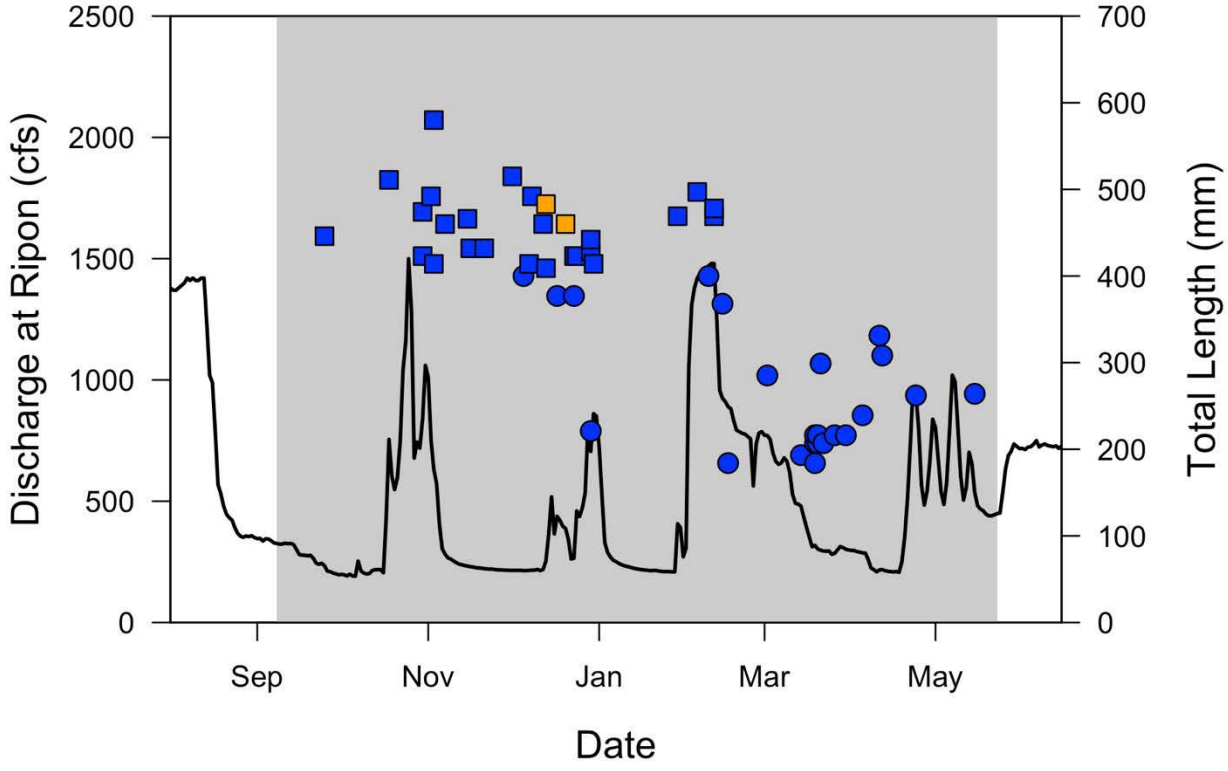

Figure 5-8. Net upstream passages of O. mykiss detected at the Stanislaus River weir during the 2021/2022 monitoring season. Individuals with an estimated length larger than 406 mm are indicated by squares, smaller individuals are indicated with a circle. Orange colored symbols represent fish captured in the trap box. Data courtesy of FISHBIO, excerpted from Guignard et al. 2022.

5.1.4 Rotary Screw Traps near Oakdale and Caswell

Rotary screw trap sampling at Oakdale (approximately river mile 40) was funded by The Districts Caswell RST, PSMFC and conducted by FISHBIO for the 2022 outmigration season for monitoring of outmigrating juvenile salmonids. Sampling at Oakdale began in early January and ended in late June. Sampling at Oakdale began on January 25, 2022 and ended on May 20, 2022. A total of 24,420 juvenile Chinook Salmon 23 *O. mykiss* were captured at the Oakdale trap in 2022. Chinook catch timing and fork lengths at the Oakdale sampling location are summarized in Figures 5-9 and 5-10 (figures provided by FISHBIO).

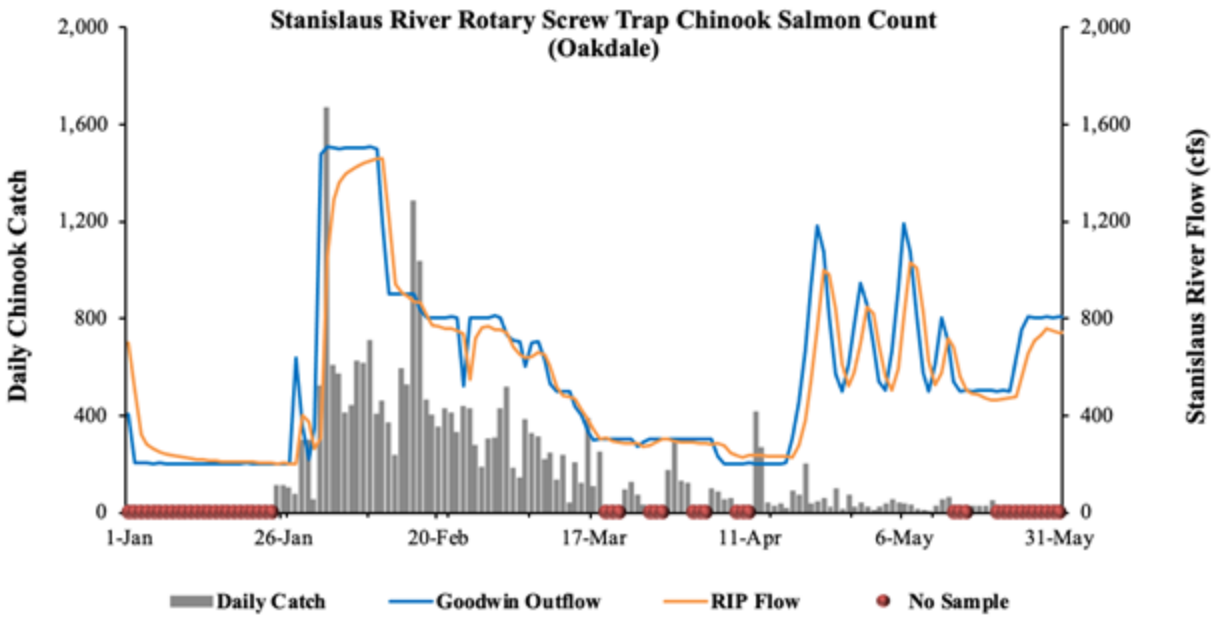

Figure 5-9. Juvenile Chinook catch through May 20, 2022, at the rotary screw trap near Oakdale. Figure provided by FISHBIO.

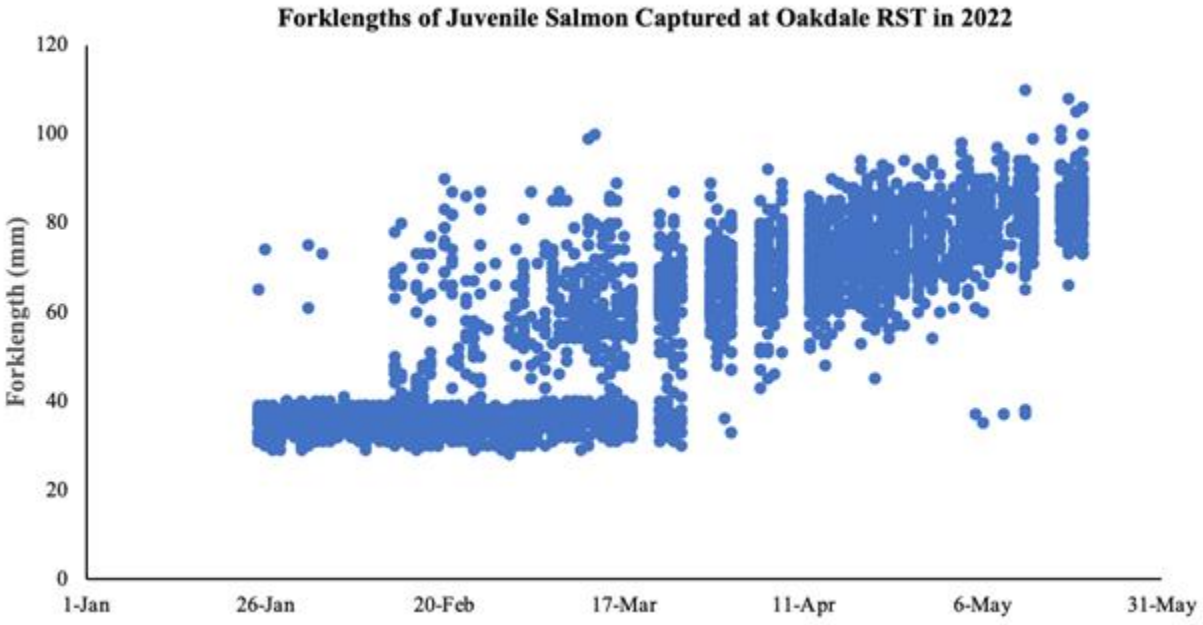

Figure 5-10. Fork lengths of juvenile Chinook catch through May 20, 2022, at the rotary screw trap near Oakdale. Data provided by FISHBIO.

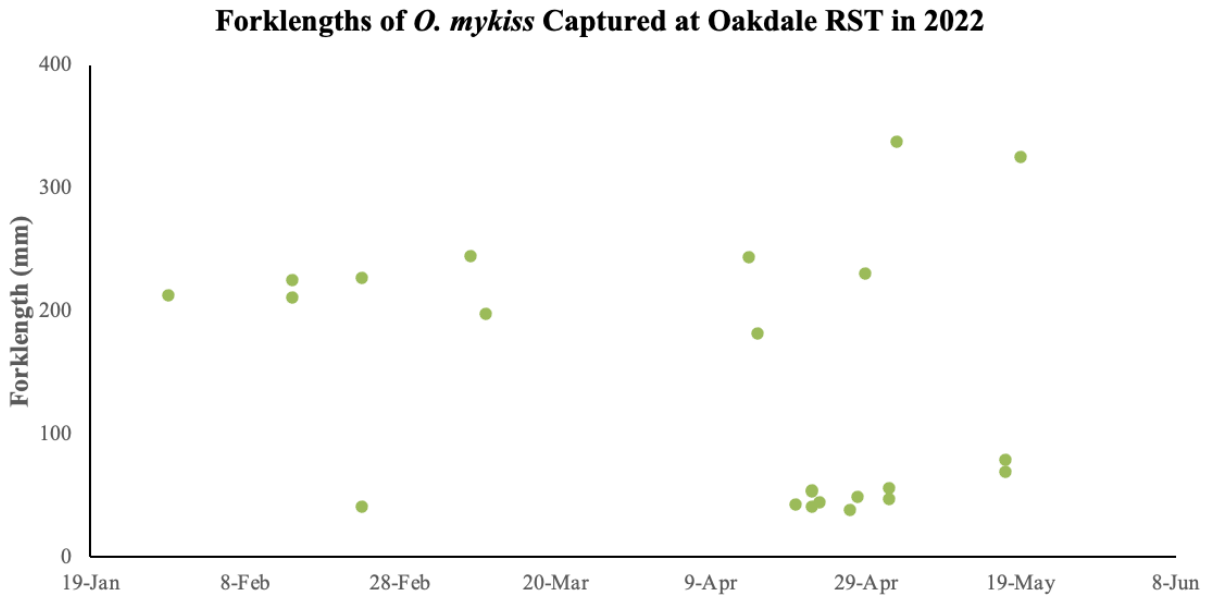

Figure 5-11. Fork lengths of *O. mykiss* catch through May 20, 2022, at the rotary screw trap near Oakdale. Data provided by FISHBIO.

Rotary screw trap sampling at Caswell (approximately river mile 9) was funded by USFWS and conducted by PSMFC for the 2022 season for monitoring of outmigrating juvenile salmonids. Sampling began at Caswell on January 6, 2022 and ended on June 8, 2022. Total catch for the season included 989 unmarked Chinook Salmon and 253 lamprey. No *O. mykiss* were captured during the 2022 season. Chinook catch timing and fork lengths from the Caswell sampling location are summarized in Figures 5-11 and 5-12 (figures provided by PSMFC).

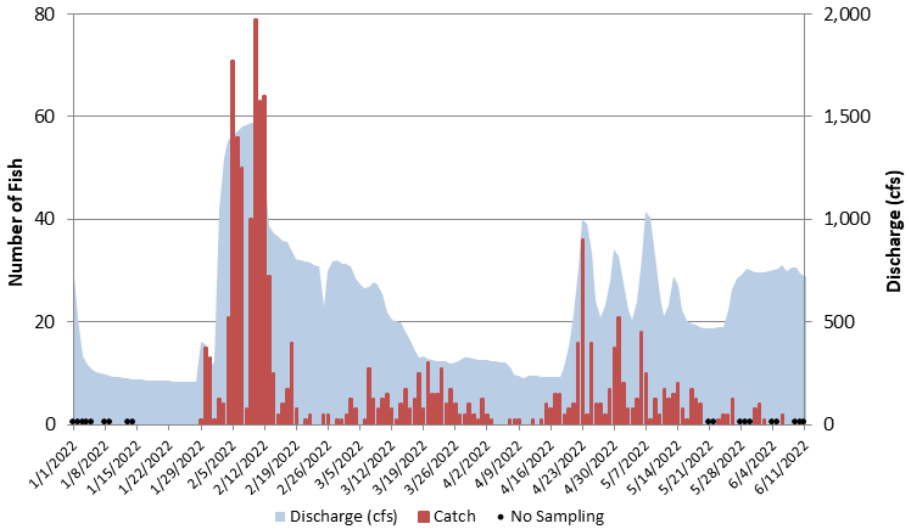

Figure 5-12. Daily catch of unmarked Chinook salmon and daily average discharge at Ripon during the 2022 Stanislaus River rotary screw trap survey season. Data provided by PSMFC.

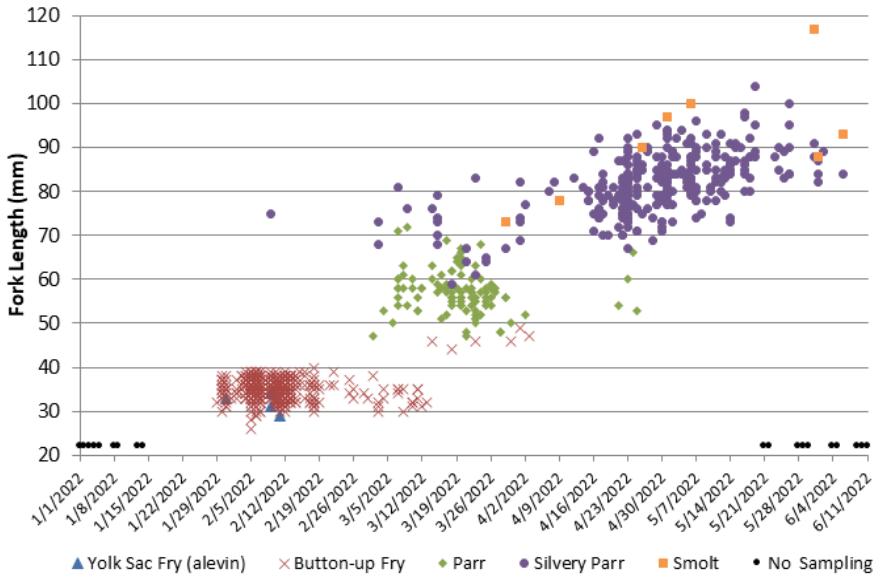

Figure 5-13. Daily fork length distribution by life stage of unmarked Chinook Salmon measured *during the 2022 Stanislaus River rotary screw trap survey season. Data provided by PSMFC.*

5.1.5 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 US Fish and Wildlife Service (USFWS) from January through March, and from July through September of 2022. In April, May, and June, the trawl was operated by CDFW. CDFW has operated a trawl at Mossdale during the spring outmigration season since the early 1990's to document the size and timing of juvenile salmonids leaving the San Joaquin basin.

In 2022 67 non-marked Chinook were caught by the Mossdale Trawl as well as three *O. mykiss* smolts (table 5-2, Figure 5-13). Chinook ranged in length from 33mm to 118mm. Two Chinook were captured in February on the 4th and 11th of 37 and 33mm respectively then none were captured again until April 1st. Chinook catch continued through April and ended in mid-May with the last two chinook caught on May 14th, 2022.

Table 5-3 Date and fork length of the three *O. mykiss* captured by the trawl

Date	Fork Length (mm)
4/19/2022	206
5/16/2022	220
5/27/2022	300

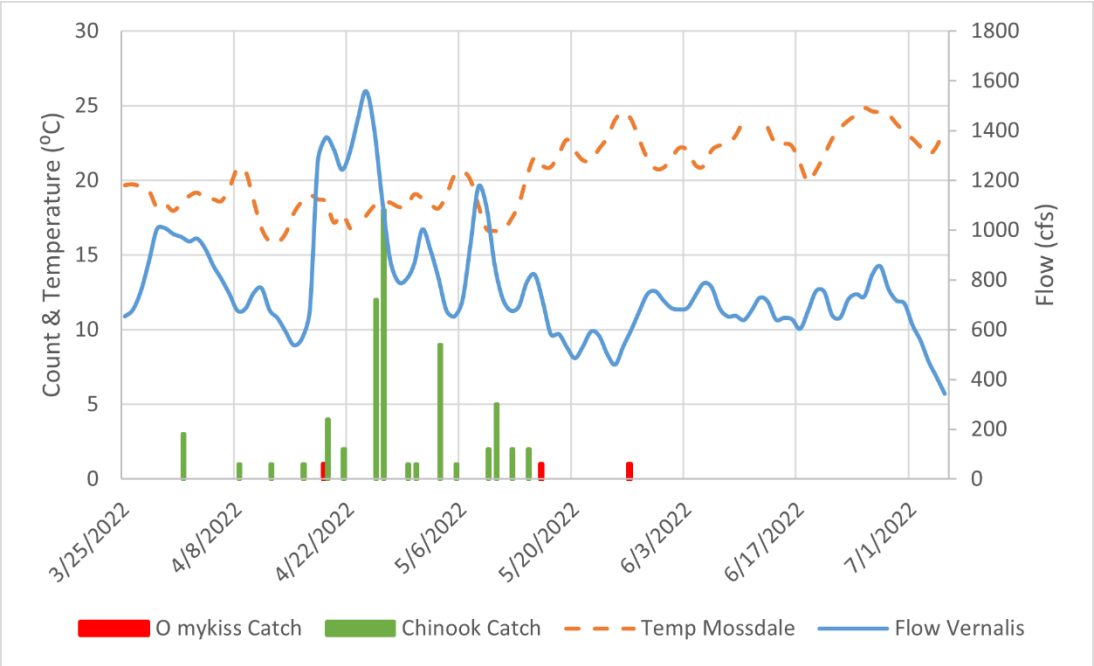

Figure 5-14. Catch of non-marked Chinook and O. mykiss, flow at Vernalis and temperature at Mossdale in April and May 2022. Note 2 fish caught in February not included

Estimates 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 5-14 shows the cumulative timing of out-migrating juvenile Chinook captured by the trawl. The 2022 cohort appeared to pass Mossdale by mid-May, which is earlier than most years except 2015, a severe drought year.

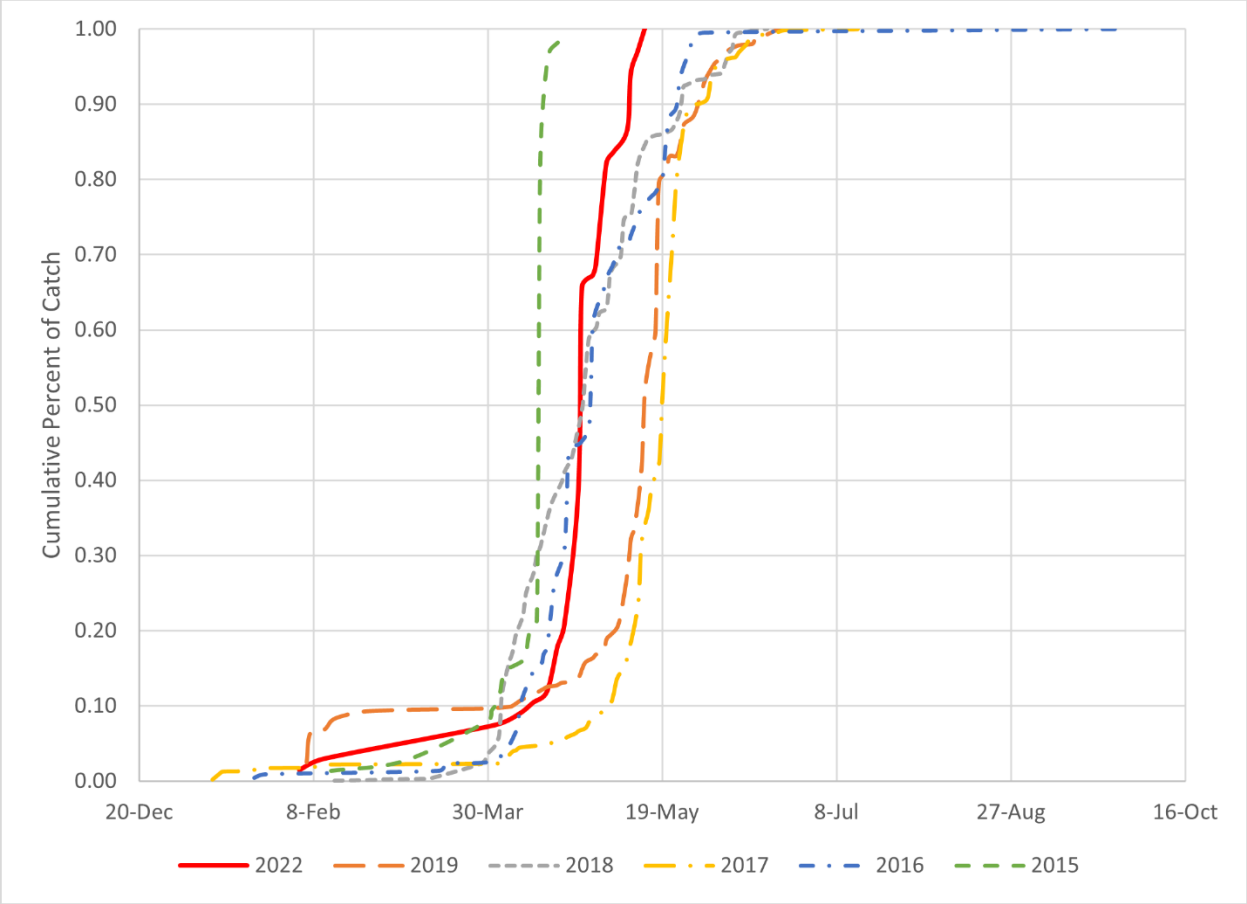

Figure 5-15. Cumulative fraction of juvenile chinook passage at Mossdale 2022-2015. Note- 2020 and 2021 data were omitted due to gaps in sampling caused by COVID-19.

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 WY21:

- 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.

Table 5-4. Gravel augmentation annual averages over different time periods.

Time Period	Average or Annual Gravel Addition	Annual Target	Percent of Target Achieved
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%

*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 5-5. 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

Project	Project extent
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 5-6. 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 5-7. 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 10+ 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. Permitting ongoing. Anticipated 10 acres.

Table 5-8. 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

Chapter 6 References

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