BUREAU OF RECLAMATION

Stanislaus Watershed Team Annual Summary of Activities Water Year 2021

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

U.S. Department of the Interior

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Cover Photo: Aerial view of the Stanislaus River and the South Main Canal in Goodwin Canyon. Credit: John Hannon, USBR

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

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Acronyms and Abbreviations

Term	Definition
AN	Above Normal water year type
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

Term	Definition
SWT	Stanislaus Watershed Team
SWRCB	State Water Resources Control Board
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
WY21	Water Year 2021

Contents

Page

List of Figures

List of Tables

Appendices

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 2021 (WY21) in compliance with the United Sates 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.

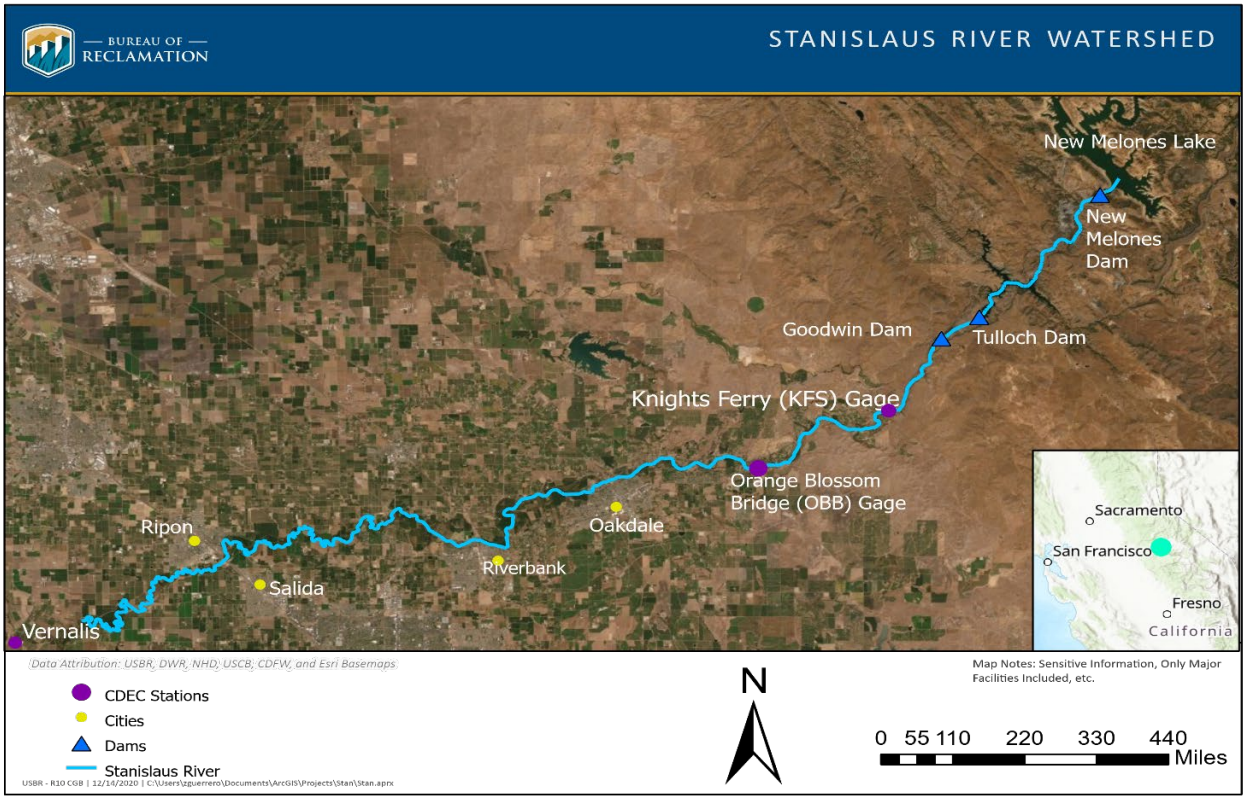

Figure 1-1. Key locations in or near the Stanislaus River watershed.

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 WY21 included:

- Reclamation
- USFWS
- NMFS
- CDFW
- 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 WY21.

- 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: Reclamation currently operates year-round to a 7.0 mg/L dissolved oxygen requirement at Ripon on the lower Stanislaus River. from June 1

to September 30. Reclamation proposes to move the compliance location to Orange Blossom Bridge (approximately the downstream extent of rearing habitat for over summering salmonids) for the summer period (June 1 to September 20). 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 2020 through September 2021. 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 WY21 Stanislaus River operations were heavily influenced by the critically dry hydrology in the San Joaquin Valley. The 2020 Fall Pulse flow occurred October 12, 2020, through November 4, 2020. 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. Early in WY21 New Melones storage was in relatively good condition having come into the water year with 1,519 TAF of storage. However, the WY21 hydrology was quite dry and actual inflows to the reservoir were consistently at or below inflows forecasted in the California Department of Water Resources, Bulletin 120 reports. During the period from February 9, 2021, to April 6, 2021, New Melones Dam was operated on several occasions to meet the D-1641 Vernalis salinity requirement. In April 2021,

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

the Spring Pulse Flow was implemented and ranged from 225 cfs to 1,500 cfs from April 7, 2021, to May 4, 2021. Following the Spring Pulse Flow, releases were increased to 500 cfs from May 5, 2021, to May 9, 2021, to meet the D-1641 Vernalis flow objective. Beginning May 10, 2021, and continuing through August 23, 2021, higher releases were made from New Melones to help meet D-1641 Delta Requirements. This is a highly unusual situation that resulted from the very dry hydrology and low reservoir storage throughout the entire CVP. Reclamation facilitated a water transfer from SEWD to Westlands Water District in the late summer period. Those releases were made from August 24, 2021, through September 13, 2021. For the remainder of September 2021 Reclamation gradually ramped the releases down toward base flow. New Melones end of 2021 Water Year storage was 842 TAF, 667 TAF down from the beginning of Water Year storage of 1,519 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 SRP (Appendix A) described in the 2020 ROD represents Reclamation's contribution gives the minimum required instream flows in the Stanislaus River. The flows can be higher to meet other regulatory requirements placed on New Melones such as flow objectives on the Lower San Joaquin River at Vernalis per D-1641.

Reclamation operates New Melones Reservoir (to provide targeted releases measured at Goodwin Dam) in accordance with a 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 D of this report.

4.3 Flow Management

The WY21 classifications for determining minimum flows are provided in Table 4-2. The water year classification for SRP implementation during WY21 was based on the 75% exceedance of the San Joaquin Valley Water Year Type Index (60-20-20). There was an understanding between Reclamation and NMFS to use the 75% exceedance, for WY21 only, with the objective to find out if this would bring more biological benefits. However, in December 2020, the forecast for the 75% turned critical (Table 4-2) so operations would have been the same under either exceedance. Implementation in future years may be based on the 90% exceedance forecast.

Table 4-2. Water Year Classification by Month during WY21. The SRP was implemented based on the year type based on the 75% exceedance; the year type based on the 90% exceedance is provided as background information.

Month	Water Year Index (60-20-20) 90% Exceedance	Water Year Type (60-20-20) 90% Exceedance	Water Year Index (60-20-20) 75% Exceedance	Water Year Type (60-20-20) 75% Exceedance
October	2.1[1]	Critical	2.2	Dry
November	2.1[1]	Critical	2.2	Dry
December	1.2	Critical	1.7	Critical
January	1.1	Critical	1.5	Critical
February	1.8	Critical	2.0	Critical
March	1.4	Critical	1.6	Critical
April	1.3	Critical	1.4	Critical
May	1.2	Critical	1.3	Critical
June	1.2[2]	Critical	1.3[2]	Critical
July	1.2[2]	Critical	1.3[2]	Critical
August	1.2[2]	Critical	1.3[2]	Critical

Month	Water Year Index (60-20-20) 90% Exceedance	Water Year Type (60-20-20) 90% Exceedance	Water Year Index (60-20-20) 75% Exceedance	Water Year Type (60-20-20) 75% Exceedance
September	1.2[2]	Critical	1.3[2]	Critical

[1] Based on May 2020 forecast
[2] Based on May 2021 forecast

4.4 Seasonal Operations

4.4.1 Fall 2020 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 16, 2020, 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, gravel placement 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 (62,373 AF, including base flows) for the October 13 -December 31 period as the default SRP Dry 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 would be 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 three-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 2021, Reclamation implemented a reshaped fall pulse flow according to the flow schedule described in Alternative 1 (Alt-1) (see details in Appendix B).

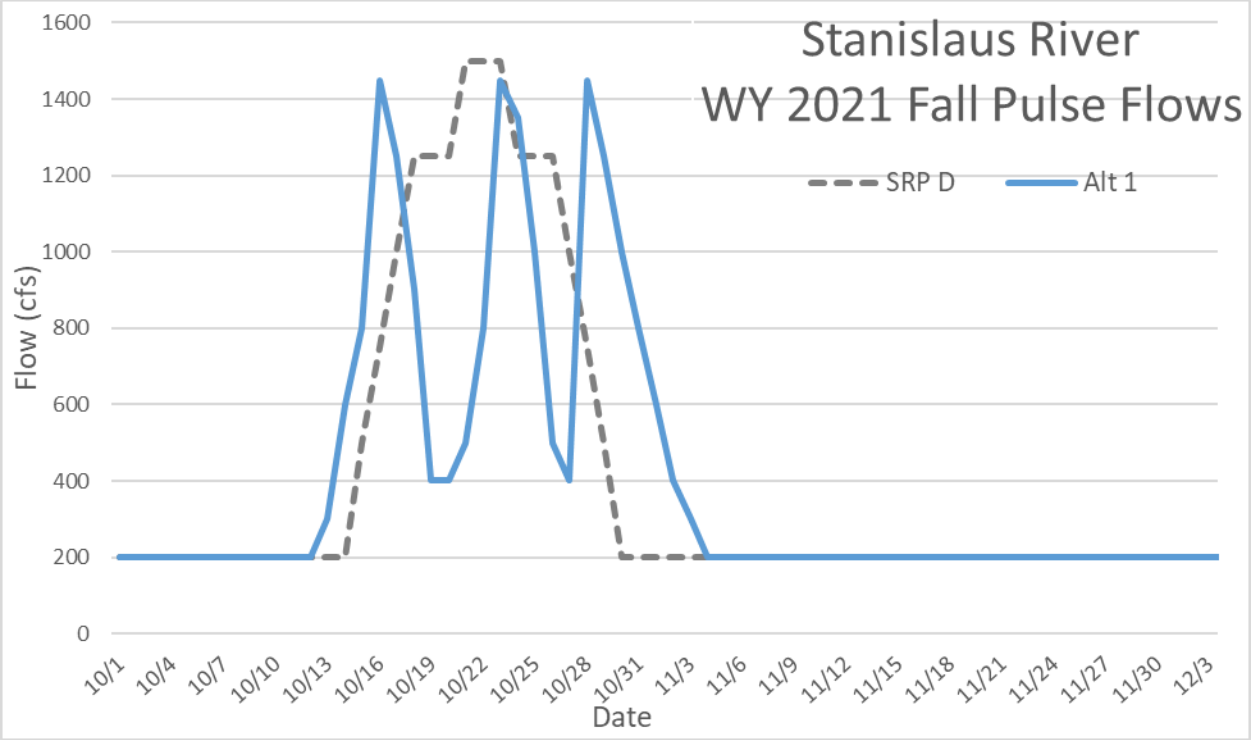

Figure 4-1 Figure showing daily flows from October 1 to December 3, 2020, in both the default SRP-Dry schedule and Alternative 1 schedule

4.4.2 Winter 2021 Instability Flows- January

Winter Instability Flows (WIF) 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."

For January 2021, the shape of each "Alternative" flow schedule, with its more rapidly rising limb and more slowly descending limb (Figure 4-2), is more typical of the flow pattern associated with storm events. Reshaping the sub-daily flow pattern to increase the peak flow to over 700 cfs for part of the first day of the pulse helped inundate a greater portion of the Honolulu Bar restoration area and likely allowed 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 within the main channel.

The alternative flow schedules had the same volumes as the default SRP schedule for the Critical water year type (793 AF) but were reshaped to include higher peak flows and variability. The SWT reviewed and provided feedback on an initial flow alternative (Alt-Critical 1) to provide variability in the winter hydrograph by simulating a small storm pulse, but a second Alternative (Alt-Critical 2; (Figure 4-2) was developed by Reclamation to better adhere to specified ramping rate requirements. Reclamation met with NMFS and USFWS to discuss this new proposed schedule and both agencies agreed that Alt-Critical 2 was adequate to implement given ramping rate restrictions.

Reclamation implemented a WIF that was: (a) reshaped according to the "Alternative" flow schedule, Alt-Critical 2, for the water year type in effect (critical; 793 AF), and (b) shifted in time to coincide with timing of installation of the Caswell Rotary Screw Trap (RST) by Pacific States Marine Fisheries Commission (PSMFC) (see Appendix C for details).

On January 7 and 8, 2021, Reclamation implemented a January 2021 WIF with peaks of 750 and 500 cfs.

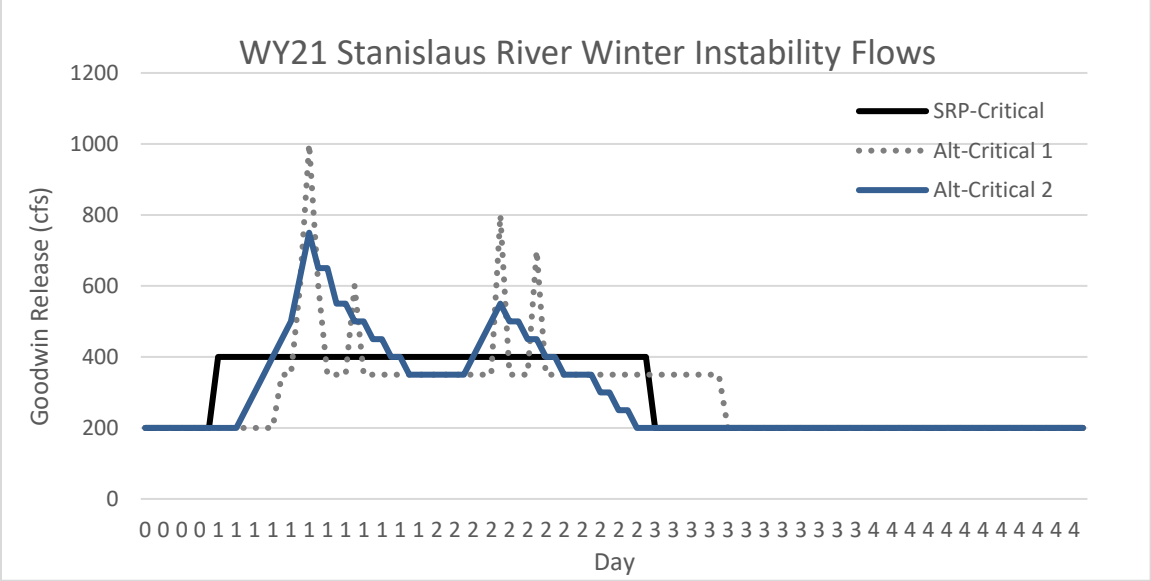

Figure 4-2. Flows, shown in two-hour increments, in the default SRP and proposed Alternative schedules for a Critical water year type.

4.4.3 Winter 2021 Instability Flows- February

On December 16, 2020, SWT advised a modified January 2021 WIF consistent with the intent of the February 2020 ROD. While the January 2021 WIF was revised by Reclamation (with input from

NMFS and USFWS) in a January 5, 2021, Operations Plan to better adhere to specified ramping rate requirements (as described in the previous section), the SWT decided to wait until its monthly meeting in January 2021 to advise an alternative flow schedule for February 2021.

The SWT reviewed and provided feedback on the February 2021 flow alternative (Alternative 1, Figure 4-3) during its January meeting (January 21, 2021). The Alternative-1 schedule had the same pulse volume as the default SRP schedule for the Critical water year type (793 AF, not including the base flow of 200 cfs), but was shaped to provide variability in the winter hydrograph by simulating a small storm-like pulse. The shape of the Alternative 1 flow schedule, with its more rapidly rising limb and more slowly descending limb, is more typical of the flow pattern associated with storm events. Reshaping the sub-daily flow pattern to increase the peak flow to 950 cfs the first day of the pulse was intended to provide enhanced mobilization of juvenile fall-run Chinook in February, help inundate a greater portion of restored and channel-margin habitats. 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 within the main channel.

On February 28, Reclamation implemented a February 2021 WIF that was: (a) reshaped according to the "Alternative" flow schedule for the water year type in effect (critical), and (b) shifted in time to (i) the second half of February, and (ii) to coincide with the timing of a storm event (see Appendix D for details).

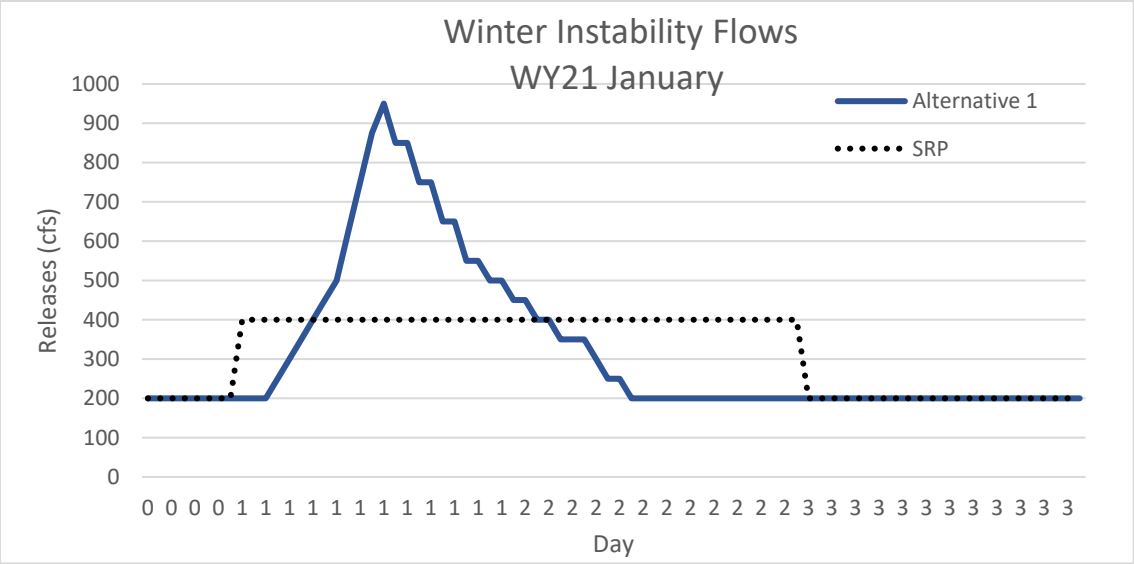

Figure 4-3. Daily flows, shown in two-hour increments, in the default SRP[2] and proposed Alternative schedule for a Critical water year type.

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

4.4.4 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 17, 2021, SWT meeting, the technical team discussed, reviewed, and provided feedback on the Alt-Critical 1 option for WY 2021 spring pulse flow (Figure 4-4). The Alt-Critical 1 schedule had the same total volume (67,240 AF, including base flows) for the March 16-June 30 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 an extended five-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 (which was similar in duration, though 5 days earlier in timing, compared to the default SRP schedule) provided some inundation of shallow-water habitat and temperature buffering during the pulse period; the extent of such benefits varied with flow throughout the spring pulse period. The timing of Alt-Critical 1 put most of the pulse volume in a 31-day window which aligned closely with the SRP pulse flow period.

Other considerations for in-basin interests:

- No flows less than 400 cfs are scheduled in consideration of research activities on non-native predators (supports boat electrofishing).
- Peaks coordinated with Tuolumne River pulse schedule to provide more steady flows on the mainstem San Joaquin River.

For WY 2021, Reclamation implemented a reshaped spring pulse flow according to the flow schedule described in Alt-Critical-1 (see appendix E for details).

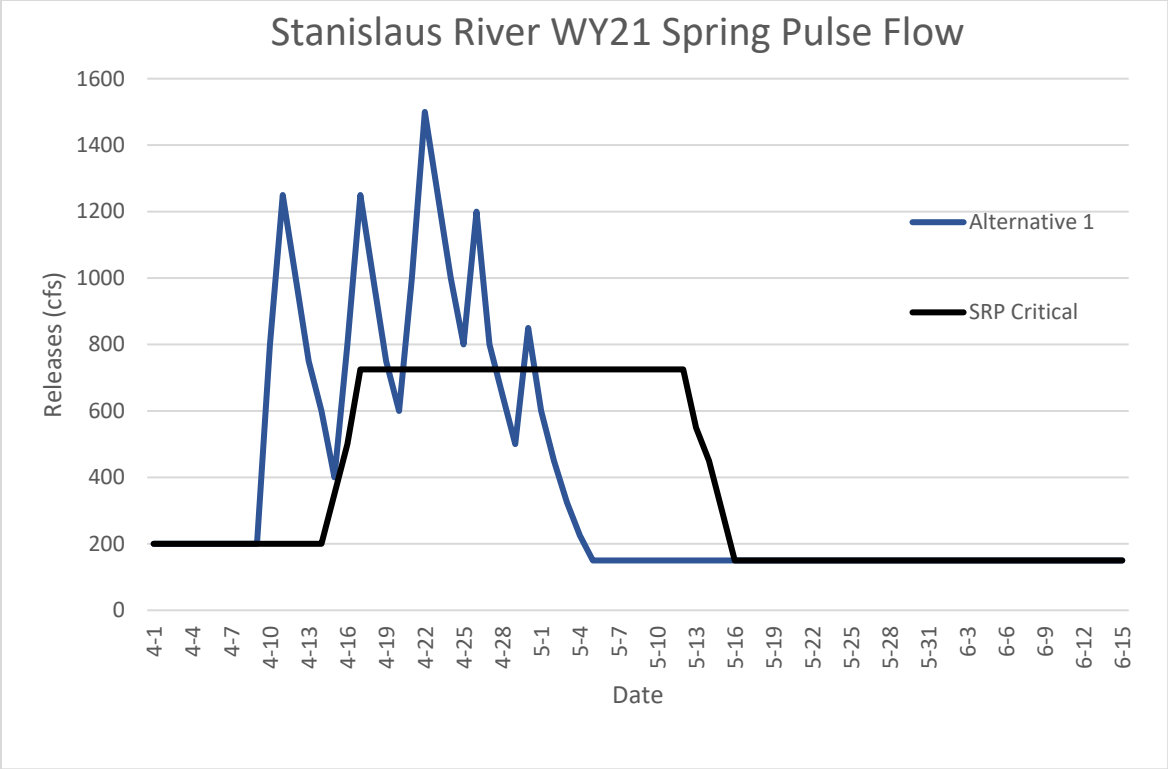

Figure 4-4 Daily flows in the default SRP[3] and proposed Alternative schedule for a Critical water year type

4.5 Storage Management and Flood Control Releases

Due to the dry hydrology experienced in WY21, New Melones storage never reached flood control levels, so no flood control operations were needed this year.

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

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 2020 Escapement Summary

California Department of Fish and Wildlife (CDFW) began conducting fall-run Chinook salmon escapement and redd surveys on October 6, 2020, and concluded surveying on December 15, 2020, due to the California Department of Public Health (CDPH) Regional Stay at Home order.

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 11-week survey period, CDFW observed a maximum of 364 redds on the Stanislaus River (compared to 285 on the Tuolumne River and 244 on the Merced River).

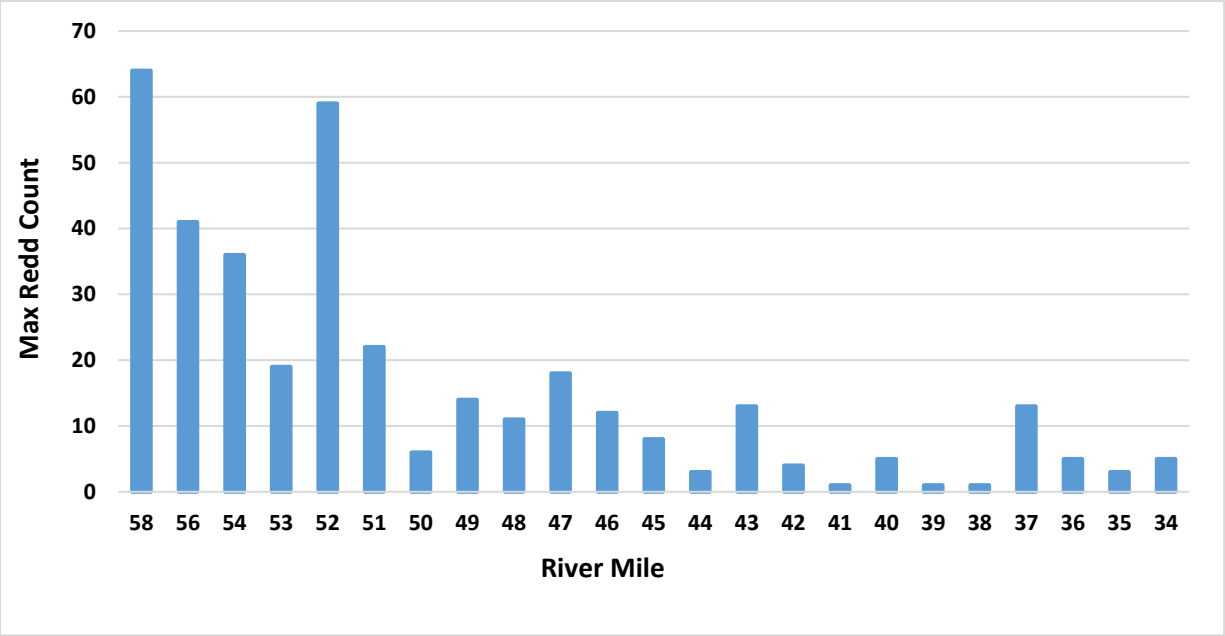

Figure 5-2. Sum of maximum redd counts as measured by river mile, measured from the confluence

The preliminary Stanislaus River escapement estimate for 2020 fall-run Chinook salmon, as reported in the June 30, 2021, Grand Tab, was 558 fish (compared to 271 fish on the Tuolumne River and 611 fish on the Merced River; the Merced River total combines 185 fish taken at the Merced River Hatchery and 426 fish estimated in-river adult returns). During the survey season, 162 carcasses were found, and samples (scales, otoliths, and coded wire tag if present) were taken. In addition, 166 skeletons were tallied and chopped, for a total of 328 individual Chinook handled during the survey. In addition to a truncated survey season, there were two riffles that were only partially surveyed due to COVID-19 restrictions. An overview of survey data is provided in Figure 5-3.

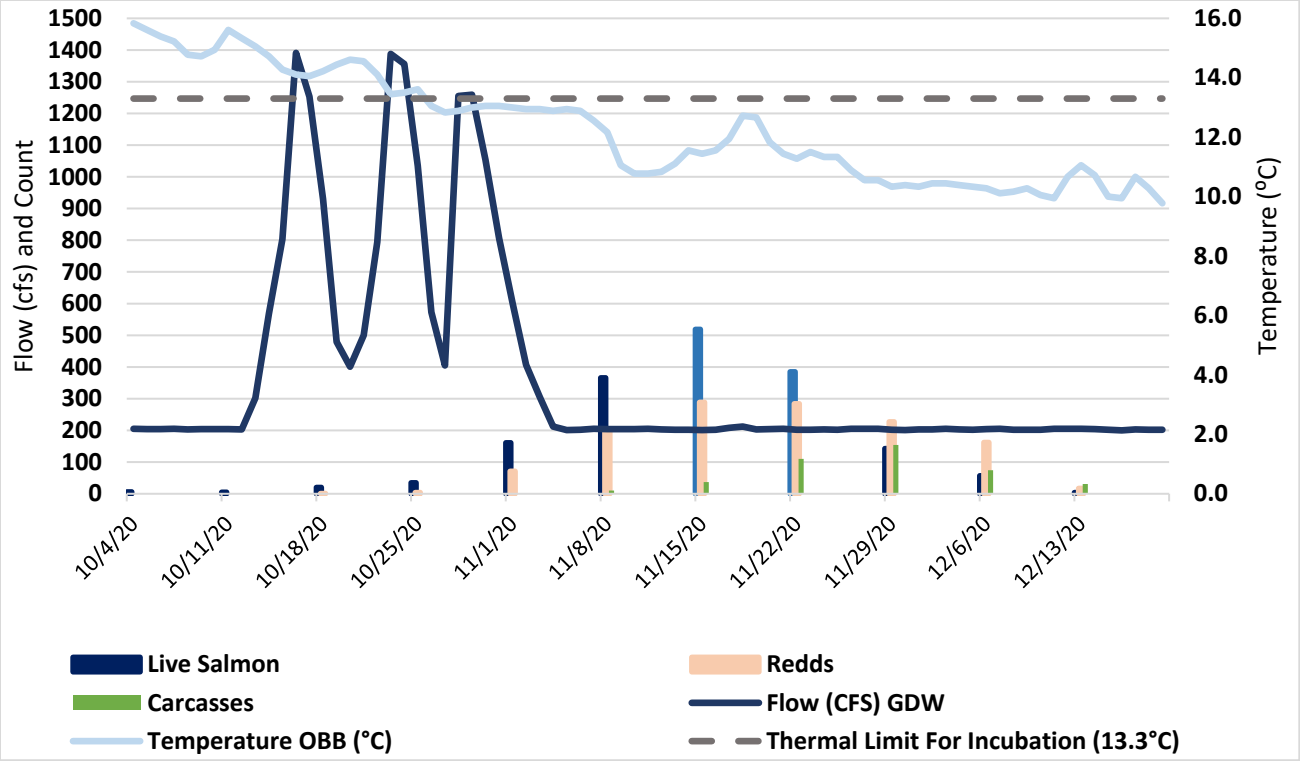

Figure 5-3. Weekly live, redd and carcass counts, mean daily spill measured at Goodwin Dam (GDW) and temperature measured at Orange Blossom Bridge (OBB; RM 46) for the 2020 Stanislaus Escapement Survey. Note: live, redd and carcass counts are summed by week.

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 2021 CDFW Stanislaus River *O. mykiss* redd surveys were planned to start the first week of January but were delayed due to the CDPH Regional Stay at Home order. Surveys began on February 2, 2021 and continued weekly through April 29, 2021. During the 13-week survey period a total of 88 live *O. mykiss* were observed, with 16 of these estimated to be greater than 400 mm in fork length (Figure 5-4).

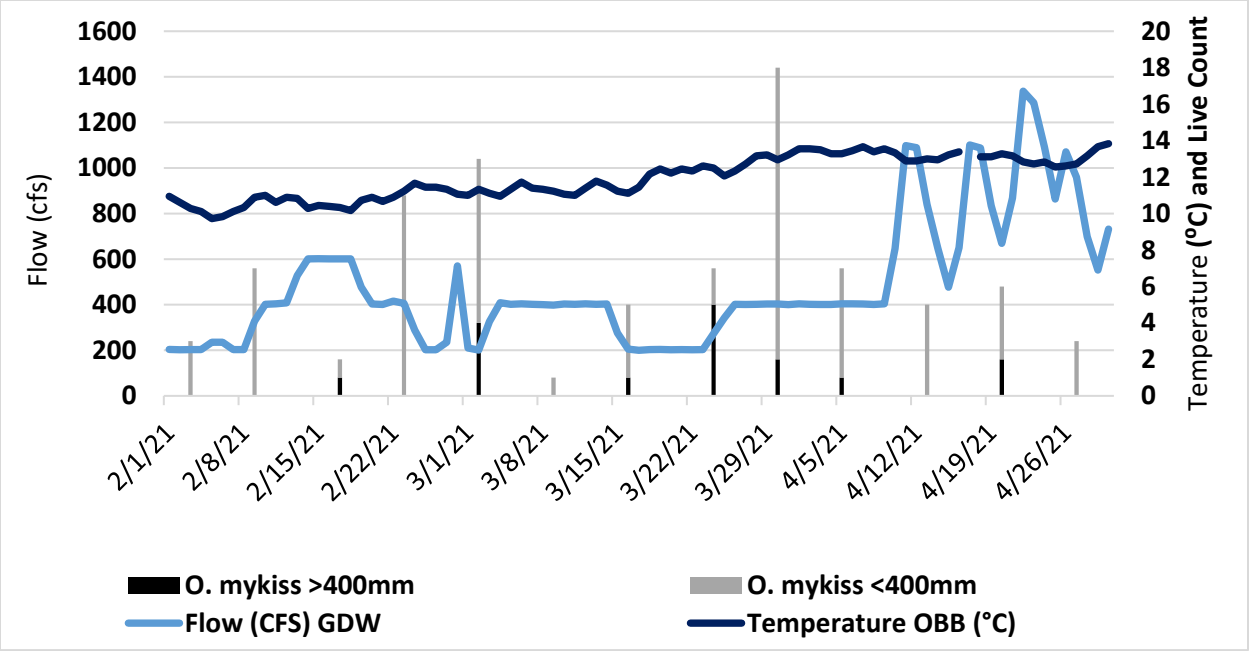

Figure 5-4: Weekly Live *O. mykiss* counts by size class, mean daily spill measured at Goodwin Dam (GDW) and temperature measured at Orange Blossom Bridge (OBB) for the 2021 Stanislaus *O. mykiss* redd Survey. Note: live counts are summed by week.

Five live lampreys were observed on redds and zero live Chinook on redds were observed during the survey. Eight redds were identified as being from *O. mykiss*, with another seven being identified as belonging to lamprey. All *O. mykiss* redds were found in sections 1, 2, and 3 (upstream of the Highway 120 bridge in Oakdale, RM 42), and all lamprey redds were found in sections 3 and 4 (downstream of Valley Oak Recreation Area, RM 44; Figure 5-5). Zero Chinook redds were observed during the survey period.

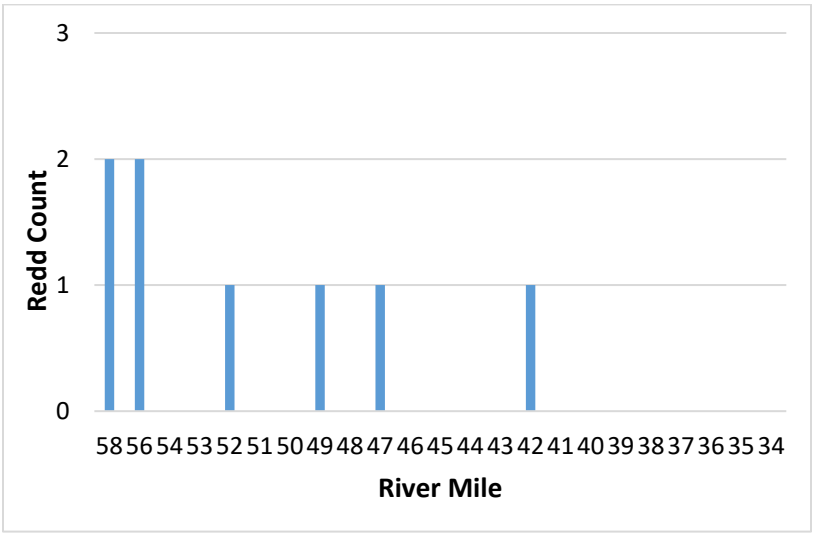

Figure 5-5. *O mykiss* redds by river mile

Five *O. mykiss* carcasses were located and collected during the redd survey, with another three carcasses found during the 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 Districts fund 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 10, 2020, and ended on January 14, 2021. The cumulative net upstream passage through January 14, 2021, was 1,906 Chinook (20% were ad-clipped, indicating a hatchery origin) and eight *Oncorhynchus mykiss* (one was ad-clipped; the ad-clipped *O. mykiss* was greater than 406 mm in length indicating possible anadromy). 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.

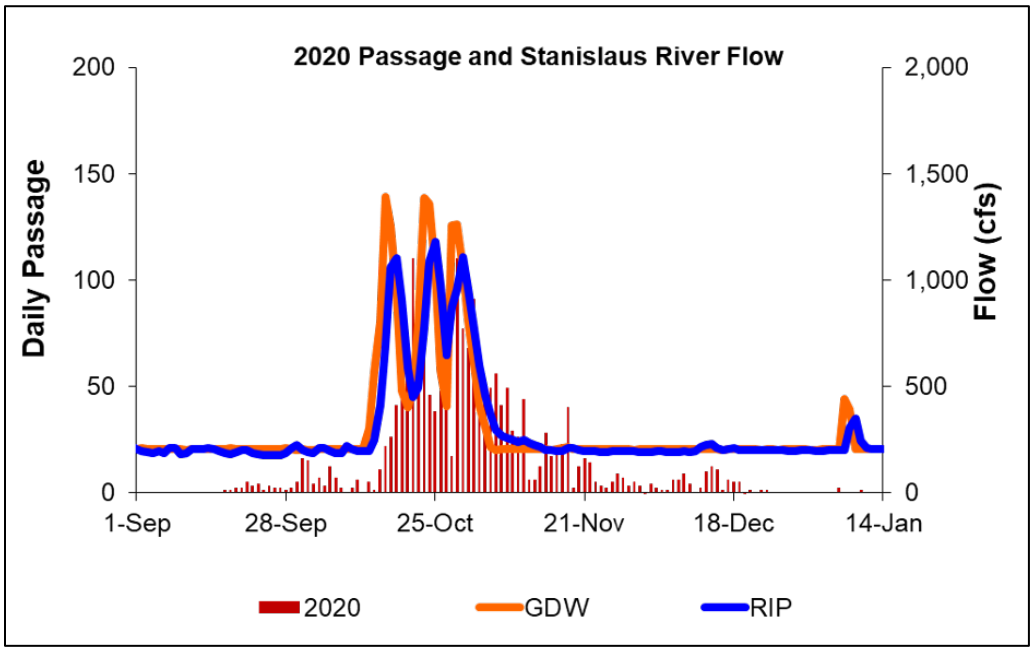

Figure 5-6. Daily Chinook salmon passage through January 14, 2021, at the Stanislaus River weir near Riverbank. Data courtesy of FISHBIO.

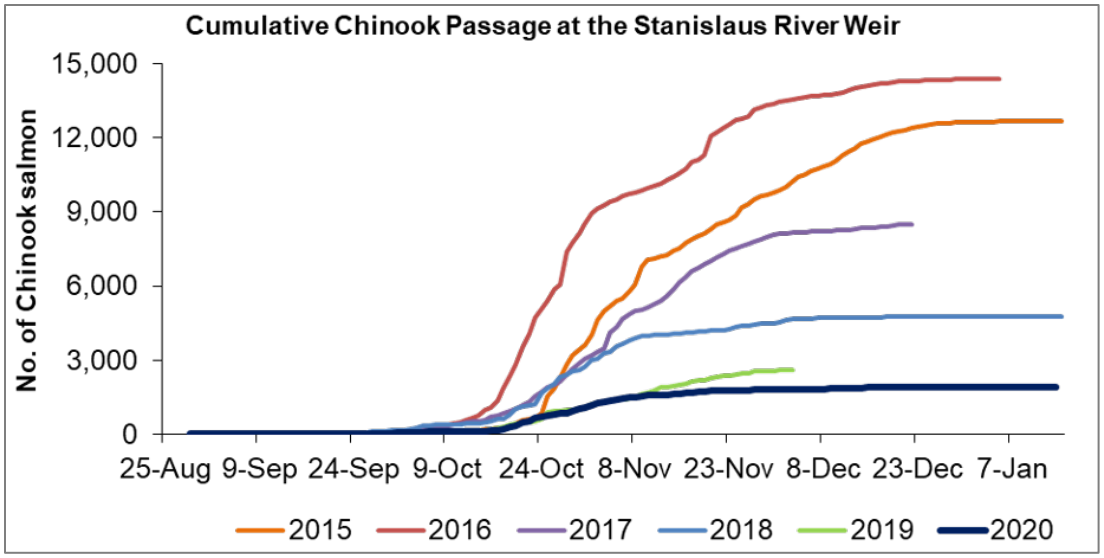

Figure 5-7. Cumulative Chinook salmon passage through January 14, 2021, at the Stanislaus River weir near Riverbank. Data courtesy of FISHBIO.

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 and conducted by FISHBIO for the 2021 outmigration season for monitoring of outmigrating juvenile salmonids. Sampling at Oakdale began in early January and ended in late June. A total of 15,564 juvenile Chinook salmon were captured at the Oakdale trap in 2021. Chinook catch timing and fork lengths at the Oakdale sampling location are summarized in Figures 5-8 and 5-9 (figures provided by FISHBIO).

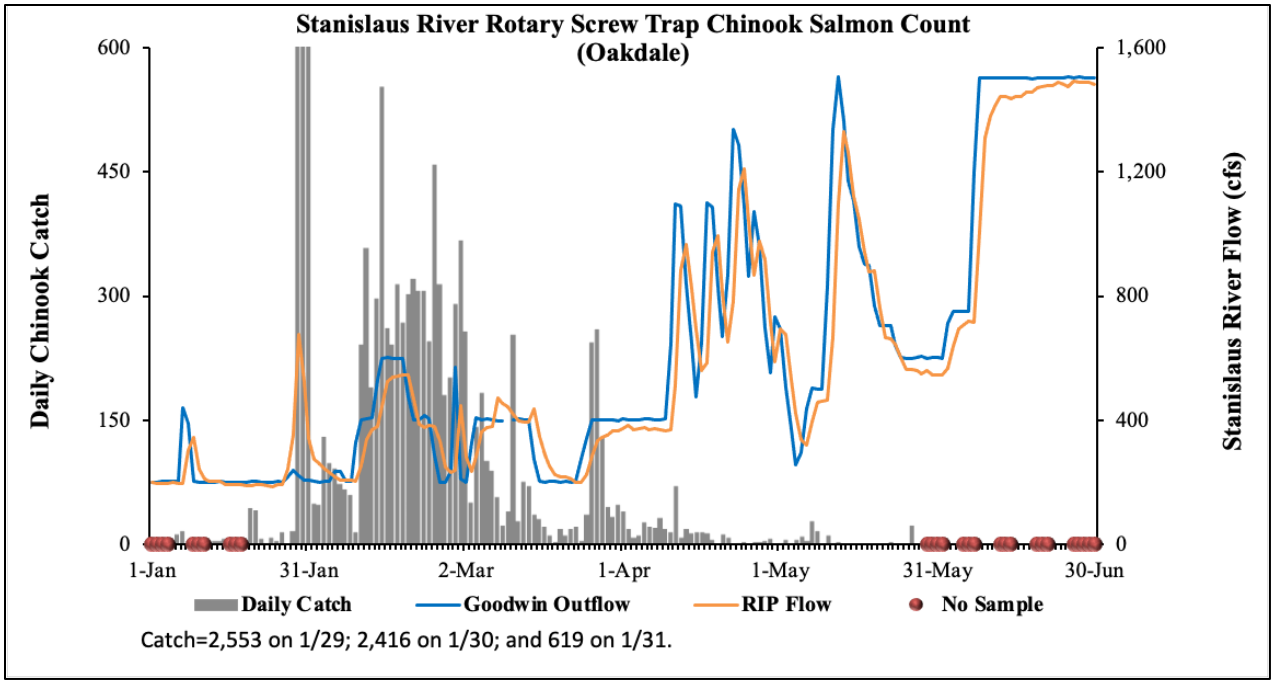

Figure 5-8. Juvenile Chinook catch through June 25, 2021, at the rotary screw trap near Oakdale. Figure provided by FISHBIO.

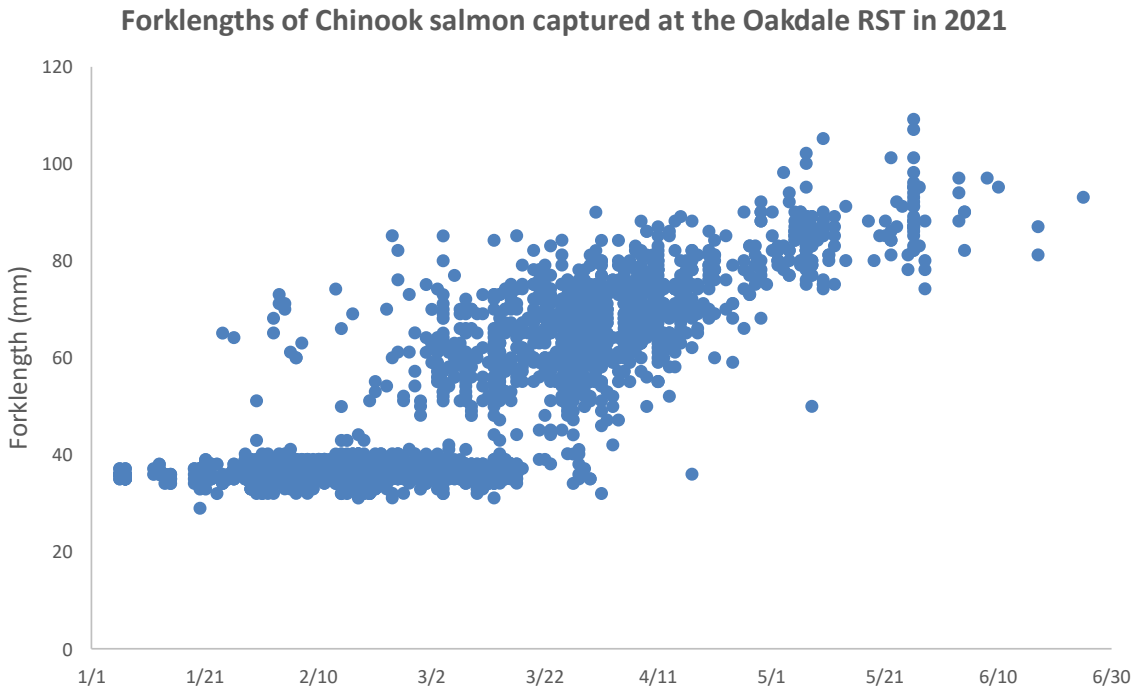

Figure 5-9. Fork lengths of juvenile Chinook catch through June 25, 2021, at the rotary screw trap near Oakdale. Data provided by FISHBIO.

Rotary screw trap sampling at Caswell (approximately river mile 9) was funded by USFWS and conducted by PSMFC for the 2020/2021 outmigration season for monitoring of outmigrating juvenile salmonids. Sampling began at Caswell on January 14, 2021, and ended on June 3, 2021. Total catch for the season included 199 fall-run-sized Chinook salmon and 3,444 lampreys. No steelhead, winter-run-sized Chinook salmon, or spring-run-sized Chinook salmon were caught. Chinook catch timing and fork lengths from the Caswell sampling location are summarized in Figures 5-10 and 5-11 (figures provided by PSMFC).

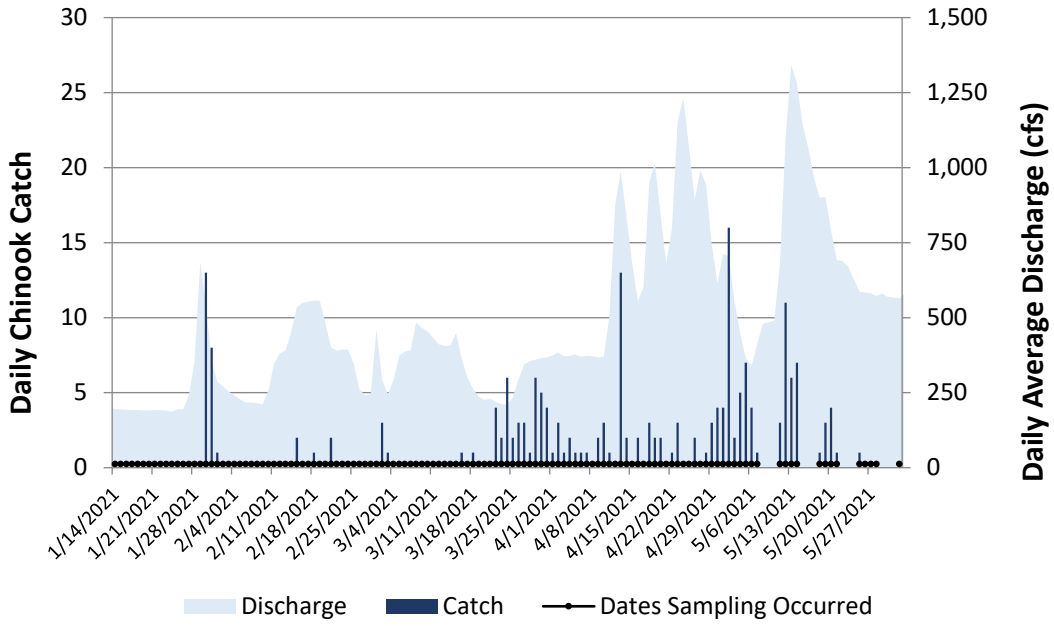

Figure 5-10. Daily catch of natural origin Chinook Salmon and daily average discharge at Ripon during the 2021 Stanislaus River rotary screw trap survey season. Data provided by PSMFC.

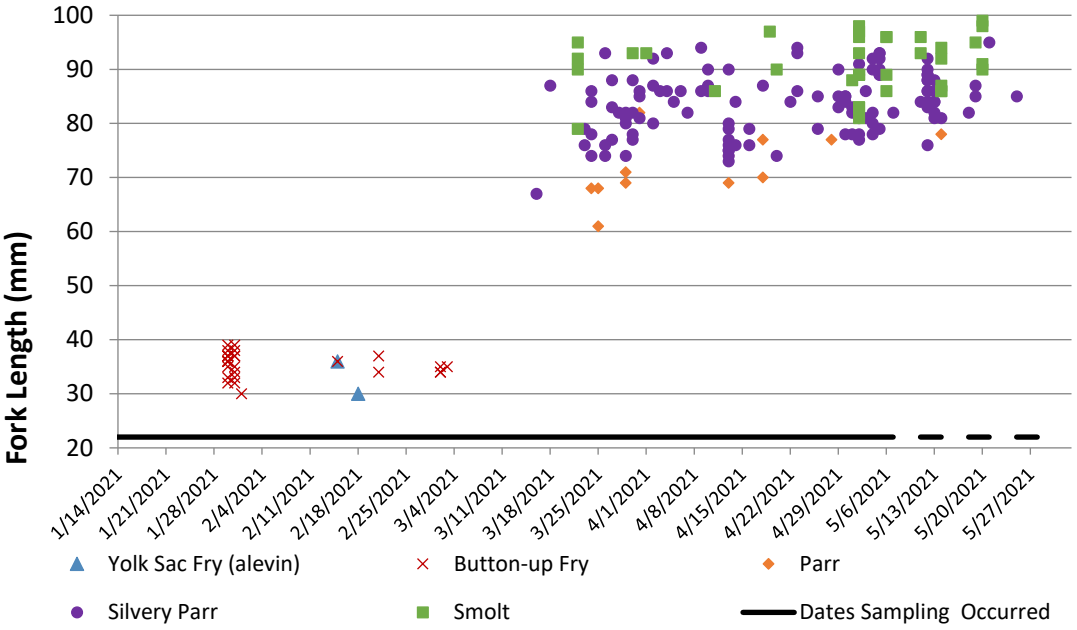

Figure 5-11. Daily fork length distribution by life stage of natural origin Chinook Salmon measured during the 2021 Stanislaus River rotary screw trap survey season. Data provided by PSMFC.

5.1.5 Mossdale Trawl on San Joaquin River

In a typical year, USFWS conducts the Mossdale Trawl on the mainstem San Joaquin River for much of the year and CDFW conducts the Mossdale Trawl in April, May, and June. Because of

COVID19 concerns, there were gaps in Mossdale trawl sampling for much of the year, as summarized below.

Date range	Mossdale Trawl sampling occurring?	Agency conducting sampling
10/26/20 to 11/30/20	Yes	USFWS
12/1/20 to 2/16/21	No	
2/17/21 to 3/1/21	Yes, but infrequently	USFWS
3/2/21 to 5/3/21	No	
5/4/21 to 5/7/21	Yes	USFWS
5/10/21 to 7/2/21	Yes	CDFW
7/6/21 to 9/29/21	Yes	USFWS

No salmonid catch was reported during the sporadic sampling from October through early March. For the period of May 4, 2021, through September 29, 2021, 95 unclipped Chinook salmon, zero clipped Chinook salmon and zero *O. mykiss* were caught in the trawl. The last salmonid catch of the water year was on June 18, 2021.

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 5-1. Gravel augmentation annual averages over different time periods.

Time Period	Average Gravel Added Annually	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%

*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 5-2. 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

Project	Project extent
Goodwin Canyon (rm58) 2020	15,000 tons*
Goodwin Canyon (rm58) 2021	7,200 tons

**15,000 tons = 10,000 cubic yards*

Table 5-3. Completed habitat restoration projects on the Stanislaus River from 2009 to present.

Project	Project Extent
Lancaster Roadside-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 5-4. 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 5-5. 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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Appendix A. New Melones SRP

New Melones Stepped Release Plan
Daily Hydrographs for Critical, Dry, Below Normal, Above Normal and Wet Year Types

New Melones Stepped Release Plan Daily Hydrographs for Critical Year Types

OCT	CFS	NOV	CFS	DEC	CFS	JAN	CFS	FEB	CFS	MAR	CFS	APR	CFS	MAY	CFS	JUN	CFS	JUL	CFS	AUG	CFS	SEP	CFS
1	200	1	200	1	200	1	200	1	200	1	200	1	200	1	725	1	150	1	150	1	150	1	150
2	200	2	200	2	200	2	200	2	200	2	200	2	200	2	725	2	150	2	150	2	150	2	150
3	200	3	200	3	200	3	400	3	200	3	200	3	200	3	725	3	150	3	150	3	150	3	150
4	200	4	200	4	200	4	400	4	200	4	200	4	200	4	725	4	150	4	150	4	150	4	150
5	200	5	200	5	200	5	200	5	400	5	200	5	200	5	725	5	150	5	150	5	150	5	150
6	200	6	200	6	200	6	200	6	400	6	200	6	200	6	725	6	150	6	150	6	150	6	150
7	200	7	200	7	200	7	200	7	200	7	200	7	200	7	725	7	150	7	150	7	150	7	150
8	200	8	200	8	200	8	200	8	200	8	200	8	200	8	725	8	150	8	150	8	150	8	150
9	200	9	200	9	200	9	200	9	200	9	200	9	200	9	725	9	150	9	150	9	150	9	150
10	200	10	200	10	200	10	200	10	200	10	200	10	200	10	725	10	150	10	150	10	150	10	150
11	200	11	200	11	200	11	200	11	200	11	200	11	200	11	725	11	150	11	150	11	150	11	150
12	200	12	200	12	200	12	200	12	200	12	200	12	200	12	725	12	150	12	150	12	150	12	150
13	200	13	200	13	200	13	200	13	200	13	200	13	200	13	550	13	150	13	150	13	150	13	150
14	200	14	200	14	200	14	200	14	200	14	200	14	200	14	450	14	150	14	150	14	150	14	150
15	500	15	200	15	200	15	200	15	200	15	200	15	350	15	300	15	150	15	150	15	150	15	150
16	750	16	200	16	200	16	200	16	200	16	200	16	500	16	150	16	150	16	150	16	150	16	150
17	1000	17	200	17	200	17	200	17	200	17	200	17	725	17	150	17	150	17	150	17	150	17	150
18	1250	18	200	18	200	18	200	18	200	18	200	18	725	18	150	18	150	18	150	18	150	18	150
19	1250	19	200	19	200	19	200	19	200	19	200	19	725	19	150	19	150	19	150	19	150	19	150
20	1250	20	200	20	200	20	200	20	200	20	200	20	725	20	150	20	150	20	150	20	150	20	150
21	1250	21	200	21	200	21	200	21	200	21	200	21	725	21	150	21	150	21	150	21	150	21	150
22	1250	22	200	22	200	22	200	22	200	22	200	22	725	22	150	22	150	22	150	22	150	22	150
23	1250	23	200	23	200	23	200	23	200	23	200	23	725	23	150	23	150	23	150	23	150	23	150
24	1250	24	200	24	200	24	200	24	200	24	200	24	725	24	150	24	150	24	150	24	150	24	150
25	1250	25	200	25	200	25	200	25	200	25	200	25	725	25	150	25	150	25	150	25	150	25	150
26	1000	26	200	26	200	26	200	26	200	26	200	26	725	26	150	26	150	26	150	26	150	26	150
27	750	27	200	27	200	27	200	27	200	27	200	27	725	27	150	27	150	27	150	27	150	27	150
28	500	28	200	28	200	28	200	28	200	28	200	28	725	28	150	28	150	28	150	28	150	28	150
29	200	29	200	29	200	29	200			29	200	29	725	29	150	29	150	29	150	29	150	29	150
30	200	30	200	30	200	30	200			30	200	30	725	30	150	30	150	30	150	30	150	30	150
31	200			31	200	31	200			31	200			31	150			31	150	31	150		
mo cfs	17900		6000		6200		6600		6000		6200		13800		12400		4500		4650		4650		4500
conv factor	1.984																						
mo af	35505	0	11901	0	12298	0	13091	0	11901	0	12298	0	27372	0	24595	0	8926	0	9223	0	9223	0	8926
yr af	2E+05																						

New Melones Stepped Release Plan Daily Hydrographs for Dry Year Types

OCT	CFS	NOV	CFS	DEC	CFS	JAN	CFS	FEB	CFS	MAR	CFS	APR	CFS	MAY	CFS	JUN	CFS	JUL	CFS	AUG	CFS	SEP	CFS
1	200	1	200	1	200	1	200	1	200	1	200	1	200	1	1000	1	200	1	200	1	200	1	200
2	200	2	200	2	200	2	200	2	200	2	200	2	200	2	1000	2	200	2	200	2	200	2	200
3	200	3	200	3	200	3	400	3	200	3	200	3	200	3	1000	3	200	3	200	3	200	3	200
4	200	4	200	4	200	4	400	4	200	4	200	4	200	4	1000	4	200	4	200	4	200	4	200
5	200	5	200	5	200	5	400	5	400	5	200	5	200	5	1000	5	200	5	200	5	200	5	200
6	200	6	200	6	200	6	200	6	400	6	200	6	200	6	1000	6	200	6	200	6	200	6	200
7	200	7	200	7	200	7	200	7	400	7	200	7	200	7	1000	7	200	7	200	7	200	7	200
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10	200	10	200	10	200	10	200	10	200	10	200	10	750	10	1000	10	200	10	200	10	200	10	200
11	200	11	200	11	200	11	200	11	200	11	200	11	1000	11	1000	11	200	11	200	11	200	11	200
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15	500	15	200	15	200	15	200	15	200	15	200	15	1000	15	1000	15	200	15	200	15	200	15	200
16	750	16	200	16	200	16	200	16	200	16	200	16	1000	16	800	16	200	16	200	16	200	16	200
17	1000	17	200	17	200	17	200	17	200	17	200	17	1000	17	600	17	200	17	200	17	200	17	200
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23	1500	23	200	23	200	23	200	23	200	23	200	23	1000	23	200	23	200	23	200	23	200	23	200
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27	1000	27	200	27	200	27	200	27	200	27	200	27	1000	27	200	27	200	27	200	27	200	27	200
28	750	28	200	28	200	28	200	28	200	28	200	28	1000	28	200	28	200	28	200	28	200	28	200
29	500	29	200	29	200	29	200			29	200	29	1000	29	200	29	200	29	200	29	200	29	200
30	200	30	200	30	200	30	200			30	200	30	1000	30	200	30	200	30	200	30	200	30	200
31	200			31	200	31	200			31	200			31	200			31	200	31	200		
mo cfs	19700		6000		6200		6800		6200		6200		23000		19550		6000		6200		6200		6000
conv factor	1.9835																						
mo af	39075	0		0	12298	0	13488	0	12298	0	12298	0	45621	0	38777	0	11901	0	12298	0	12298	0	11901

New Melones Stepped Release Plan Daily Hydrographs for Below Normal Year Types

OCT	CFS	NOV	CFS	DEC	CFS	JAN	CFS	FEB	CFS	MAR	CFS	APR	CFS	MAY	CFS	JUN	CFS	JUL	CFS	AUG	CFS	SEP	CFS
1	250	1	200	1	200	1	200	1	200	1	200	1	400	1	1500	1	900	1	250	1	250	1	250
2	250	2	200	2	200	2	200	2	200	2	200	2	750	2	1500	2	600	2	250	2	250	2	250
3	250	3	200	3	200	3	400	3	200	3	200	3	1000	3	1500	3	600	3	250	3	250	3	250
4	250	4	200	4	200	4	400	4	200	4	200	4	1250	4	1500	4	600	4	250	4	250	4	250
5	250	5	200	5	200	5	400	5	400	5	200	5	1500	5	1500	5	600	5	250	5	250	5	250
6	250	6	200	6	200	6	400	6	400	6	200	6	1700	6	1500	6	600	6	250	6	250	6	250
7	250	7	200	7	200	7	200	7	400	7	200	7	2000	7	1500	7	450	7	250	7	250	7	250
8	250	8	200	8	200	8	200	8	400	8	200	8	2000	8	1500	8	450	8	250	8	250	8	250
9	250	9	200	9	200	9	200	9	200	9	200	9	2000	9	1500	9	450	9	250	9	250	9	250
10	250	10	200	10	200	10	200	10	200	10	200	10	1500	10	1500	10	450	10	250	10	250	10	250
11	250	11	200	11	200	11	200	11	200	11	200	11	1500	11	1500	11	300	11	250	11	250	11	250
12	250	12	200	12	200	12	200	12	200	12	200	12	1500	12	1500	12	300	12	250	12	250	12	250
13	250	13	200	13	200	13	200	13	200	13	200	13	1500	13	1500	13	300	13	250	13	250	13	250
14	250	14	200	14	200	14	200	14	200	14	200	14	1500	14	1250	14	300	14	250	14	250	14	250
15	500	15	200	15	200	15	200	15	200	15	200	15	1500	15	1250	15	250	15	250	15	250	15	250
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18	1250	18	200	18	200	18	200	18	200	18	200	18	1500	18	1250	18	250	18	250	18	250	18	250
19	1500	19	200	19	200	19	200	19	200	19	200	19	2000	19	1250	19	250	19	250	19	250	19	250
20	1500	20	200	20	200	20	200	20	200	20	200	20	2000	20	1000	20	250	20	250	20	250	20	250
21	1500	21	200	21	200	21	200	21	200	21	200	21	2000	21	1000	21	250	21	250	21	250	21	250
22	1500	22	200	22	200	22	200	22	200	22	200	22	2000	22	1000	22	250	22	250	22	250	22	250
23	1500	23	200	23	200	23	200	23	200	23	200	23	1500	23	1000	23	250	23	250	23	250	23	250
24	1500	24	200	24	200	24	200	24	200	24	200	24	1500	24	1000	24	250	24	250	24	250	24	250
25	1500	25	200	25	200	25	200	25	200	25	200	25	1500	25	1000	25	250	25	250	25	250	25	250
26	1500	26	200	26	200	26	200	26	200	26	200	26	1500	26	1000	26	250	26	250	26	250	26	250
27	1500	27	200	27	200	27	200	27	200	27	200	27	1500	27	900	27	250	27	250	27	250	27	250
28	1250	28	200	28	200	28	200	28	200	28	200	28	1500	28	900	28	250	28	250	28	250	28	250
29	1000	29	200	29	200	29	200			29	200	29	1500	29	900	29	250	29	250	29	250	29	250
30	750	30	200	30	200	30	200			30	200	30	1500	30	900	30	250	30	250	30	250	30	250
31	500			31	200	31	200			31	200			31	900			31	250	31	250		
mo cfs	24000		6000		6200		7000		6400		6200		46100		38500		10900		7750		7750		7500
conv factor	1.9835																						
mo af	47604	0	11901	0	12298	0	13885	0	12694	0	12298	0	91439	0	76365	0	21620	0	15372	0	15372	0	14876

New Melones Stepped Release Plan Daily Hydrographs for Above Normal Year Types

OCT	CFS	NOV	CFS	DEC	CFS	JAN	CFS	FEB	CFS	MAR	CFS	APR	CFS	MAY	CFS	JUN	CFS	JUL	CFS	AUG	CFS	SEP	CFS
1	250	1	200	1	200	1	200	1	200	1	200	1	400	1	1500	1	900	1	250	1	250	1	250
2	250	2	200	2	200	2	200	2	200	2	200	2	750	2	1500	2	600	2	250	2	250	2	250
3	250	3	200	3	200	3	400	3	200	3	200	3	1000	3	1500	3	600	3	250	3	250	3	250
4	250	4	200	4	200	4	400	4	200	4	200	4	1250	4	1500	4	600	4	250	4	250	4	250
5	250	5	200	5	200	5	400	5	400	5	200	5	1500	5	1500	5	600	5	250	5	250	5	250
6	250	6	200	6	200	6	400	6	400	6	200	6	1700	6	1500	6	600	6	250	6	250	6	250
7	250	7	200	7	200	7	200	7	400	7	200	7	2000	7	1500	7	450	7	250	7	250	7	250
8	250	8	200	8	200	8	200	8	400	8	200	8	2000	8	1500	8	450	8	250	8	250	8	250
9	250	9	200	9	200	9	200	9	200	9	200	9	2000	9	1500	9	450	9	250	9	250	9	250
10	250	10	200	10	200	10	200	10	200	10	200	10	1500	10	1500	10	450	10	250	10	250	10	250
11	250	11	200	11	200	11	200	11	200	11	200	11	1500	11	1500	11	300	11	250	11	250	11	250
12	250	12	200	12	200	12	200	12	200	12	200	12	1500	12	1500	12	300	12	250	12	250	12	250
13	250	13	200	13	200	13	200	13	200	13	200	13	1500	13	1500	13	300	13	250	13	250	13	250
14	250	14	200	14	200	14	200	14	200	14	200	14	1500	14	1250	14	300	14	250	14	250	14	250
15	500	15	200	15	200	15	200	15	200	15	200	15	1500	15	1250	15	250	15	250	15	250	15	250
16	750	16	200	16	200	16	200	16	200	16	200	16	1500	16	1250	16	250	16	250	16	250	16	250
17	1000	17	200	17	200	17	200	17	200	17	200	17	1500	17	1250	17	250	17	250	17	250	17	250
18	1250	18	200	18	200	18	200	18	200	18	200	18	1500	18	1250	18	250	18	250	18	250	18	250
19	1500	19	200	19	200	19	200	19	200	19	200	19	2000	19	1250	19	250	19	250	19	250	19	250
20	1500	20	200	20	200	20	200	20	200	20	200	20	2000	20	1000	20	250	20	250	20	250	20	250
21	1500	21	200	21	200	21	200	21	200	21	200	21	2000	21	1000	21	250	21	250	21	250	21	250
22	1500	22	200	22	200	22	200	22	200	22	200	22	2000	22	1000	22	250	22	250	22	250	22	250
23	1500	23	200	23	200	23	200	23	200	23	200	23	1500	23	1000	23	250	23	250	23	250	23	250
24	1500	24	200	24	200	24	200	24	200	24	200	24	1500	24	1000	24	250	24	250	24	250	24	250
25	1500	25	200	25	200	25	200	25	200	25	200	25	1500	25	1000	25	250	25	250	25	250	25	250
26	1500	26	200	26	200	26	200	26	200	26	200	26	1500	26	1000	26	250	26	250	26	250	26	250
27	1500	27	200	27	200	27	200	27	200	27	200	27	1500	27	900	27	250	27	250	27	250	27	250
28	1250	28	200	28	200	28	200	28	200	28	200	28	1500	28	900	28	250	28	250	28	250	28	250
29	1000	29	200	29	200	29	200			29	200	29	1500	29	900	29	250	29	250	29	250	29	250
30	750	30	200	30	200	30	200			30	200	30	1500	30	900	30	250	30	250	30	250	30	250
31	500			31	200	31	200			31	200			31	900			31	250	31	250		
mo cfs	24000		6000		6200		7000		6400		6200		46100		38500		10900		7750		7750		7500
conv factor	1.9835																						
mo af	47604	0	11901	0	12298	0	13885	0	12694	0	12298	0	91439	0	76365	0	21620	0	15372	0	15372	0	14876

New Melones Stepped Release Plan Daily Hydrographs for Wet Year Types

OCT	CFS	NOV	CFS	DEC	CFS	JAN	CFS	FEB	CFS	MAR	CFS	APR	CFS	MAY	CFS	JUN	CFS	JUL	CFS	AUG	CFS	SEP	CFS
1	300	1	200	1	200	1	200	1	200	1	200	1	3000	1	3000	1	1200	1	300	1	300	1	300
2	300	2	200	2	200	2	200	2	200	2	350	2	3000	2	3000	2	1200	2	300	2	300	2	300
3	300	3	200	3	200	3	400	3	200	3	700	3	3000	3	3000	3	1200	3	300	3	300	3	300
4	300	4	200	4	200	4	400	4	200	4	1200	4	3000	4	3000	4	1200	4	300	4	300	4	300
5	300	5	200	5	200	5	400	5	400	5	1800	5	2300	5	2300	5	1200	5	300	5	300	5	300
6	300	6	200	6	200	6	400	6	400	6	2300	6	1500	6	1500	6	1200	6	300	6	300	6	300
7	300	7	200	7	200	7	400	7	400	7	3000	7	1200	7	1500	7	1200	7	300	7	300	7	300
8	300	8	200	8	200	8	200	8	400	8	3000	8	800	8	1500	8	1200	8	300	8	300	8	300
9	300	9	200	9	200	9	200	9	400	9	3000	9	800	9	1500	9	1000	9	300	9	300	9	300
10	300	10	200	10	200	10	200	10	200	10	3000	10	800	10	1500	10	1000	10	300	10	300	10	300
11	300	11	200	11	200	11	200	11	200	11	3000	11	800	11	1500	11	1000	11	300	11	300	11	300
12	300	12	200	12	200	12	200	12	200	12	3000	12	800	12	1500	12	1000	12	300	12	300	12	300
13	300	13	200	13	200	13	200	13	200	13	1200	13	800	13	1500	13	1000	13	300	13	300	13	300
14	300	14	200	14	200	14	200	14	200	14	800	14	800	14	1500	14	1000	14	300	14	300	14	300
15	500	15	200	15	200	15	200	15	200	15	800	15	800	15	1200	15	1000	15	300	15	300	15	300
16	750	16	200	16	200	16	200	16	200	16	800	16	800	16	1200	16	1000	16	300	16	300	16	300
17	1000	17	200	17	200	17	200	17	200	17	800	17	800	17	1200	17	1000	17	300	17	300	17	300
18	1250	18	200	18	200	18	200	18	200	18	800	18	800	18	1200	18	1000	18	300	18	300	18	300
19	1500	19	200	19	200	19	200	19	200	19	800	19	800	19	1200	19	1000	19	300	19	300	19	300
20	1500	20	200	20	200	20	200	20	200	20	800	20	800	20	1200	20	1000	20	300	20	300	20	300
21	1500	21	200	21	200	21	200	21	200	21	800	21	800	21	1200	21	1000	21	300	21	300	21	300
22	1500	22	200	22	200	22	200	22	200	22	800	22	800	22	1200	22	1000	22	300	22	300	22	300
23	1500	23	200	23	200	23	200	23	200	23	800	23	800	23	1200	23	1000	23	300	23	300	23	300
24	1500	24	200	24	200	24	200	24	200	24	800	24	800	24	1200	24	750	24	300	24	300	24	300
25	1500	25	200	25	200	25	200	25	200	25	800	25	800	25	1200	25	750	25	300	25	300	25	300
26	1500	26	200	26	200	26	200	26	200	26	800	26	800	26	1200	26	500	26	300	26	300	26	300
27	1500	27	200	27	200	27	200	27	200	27	1200	27	1500	27	1200	27	500	27	300	27	300	27	300
28	1250	28	200	28	200	28	200	28	200	28	1500	28	2300	28	1200	28	500	28	300	28	300	28	300
29	1000	29	200	29	200	29	200			29	2300	29	3000	29	1200	29	300	29	300	29	300	29	300
30	750	30	200	30	200	30	200			30	3000	30	3000	30	1200	30	300	30	300	30	300	30	300
31	500			31	200	31	200			31	3000			31	1200			31	300	31	300		
mo cfs	24700		6000		6200		7200		6600		47150		42000		48200		28200		9300		9300		9000
conv factor	1.9835																						
mo af	48992	0	11901	0	12298	0	14281	0	13091	0	93522	0	83307	0	95605	0	55935	0	18447	0	18447	0	17852

yr af 483676.5

Appendix B. 2020 Fall Pulse Flows Operation Plan

BUREAU OF RECLAMATION

Stanislaus Stepped Release Plan – Water Year 2021 Fall Pulse Flow

Operations Plan
October 9, 2020

This Stanislaus Stepped Release Plan (SRP) – Water Year (WY) 2021 Final Operations Plan details Reclamation's plan for operating the Stanislaus River to meet WY 2021 fall pulse flow requirements. The Final Operations Plan incorporates feedback from the Stanislaus Watershed Team (SWT) who convened September 16, 2020 to discuss a pulse flow Draft Operations Plan.

Background

A fall pulse flow is one component of the daily flow schedule in the Stanislaus River Stepped Release Plan (SRP) pursuant to Section 4.10.6.1 of the U.S. Bureau of Reclamation's (Reclamation) and California Department of Water Resources' (DWR) Proposed Action for the coordinated long term operation (LTO) of the Central Valley Project (CVP) and the State Water Project (SWP), dated October 2019 (Proposed Action, PA), and the corresponding Biological Opinion (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."

Water Volume Accounting

Reclamation intends to use the water accounting framework (which accommodates water year type changes in the winter and spring) used by the Stanislaus Operations Group (precursor to the SWT) to implement the SRP. Once snow surveys and hydrologic forecasting begins, the water year type is generally updated mid-month based on the snow surveys completed early in the month. To accommodate those potential changes in year type, the framework calculates the total required instream flow volume for a given period based on the default flow schedule in the SRP from the 16th of Month A to the 15th of Month B, based on the water year type determined by the Month A forecast. During the summer and fall, the water year type does not change but SWT will account for the SRP volume using this framework for consistency throughout the year.

The 60-20-20 San Joaquin Index (the index used to determine the water year type for SRP implementation) was "Dry" based on the May 1, 2020 forecast. The total required instream flow volume pursuant to the SRP for the October 1-December 31, 2020 period is detailed below:

Date range	Water Year Type	Total water volume in default schedule in SRP (acre-feet)
10/1/20-10/15/20	Dry	6,545
10/16/20-11/15/20	Dry	38,479
11/16/20-12/15/20	Dry	11,901
12/16/20-12/31/20	Dry	6,347
	Total	63,273

Reshaped SRP flows

For WY 2021, Reclamation intends to implement a reshaped fall pulse flow according to the flow schedule described in Alternative 1 (Alt-1) (see details in Attachment 1).

At the September 16, 2020 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 surveys, gravel placement, recreational activities and other stakeholder interests on the Stanislaus River, the SWT supported Alternative 1 (with a minor change in timing made after the meeting to correctly align preferred rafting flows to the weekends, as originally intended).

The Alt-1 schedule has the same total volume (62, 373 AF, including base flows) for the October 1 - December 31 period as the default SRP Dry schedule, as described in the Water Volume 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 the second week of October 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 in early November, before peak spawning is expected to occur.

Some key features of the Alt-1 fall pulse 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 **three-peaks increases flow variability** which 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 is slightly longer in duration compared to the default SRP schedule) is expected to provide temperature buffering from mid-October through early November.

Attachment 1

Reshaped alternative 1 for the WY 2021 fall pulse flow schedule for October 1 – December 31, 2020.

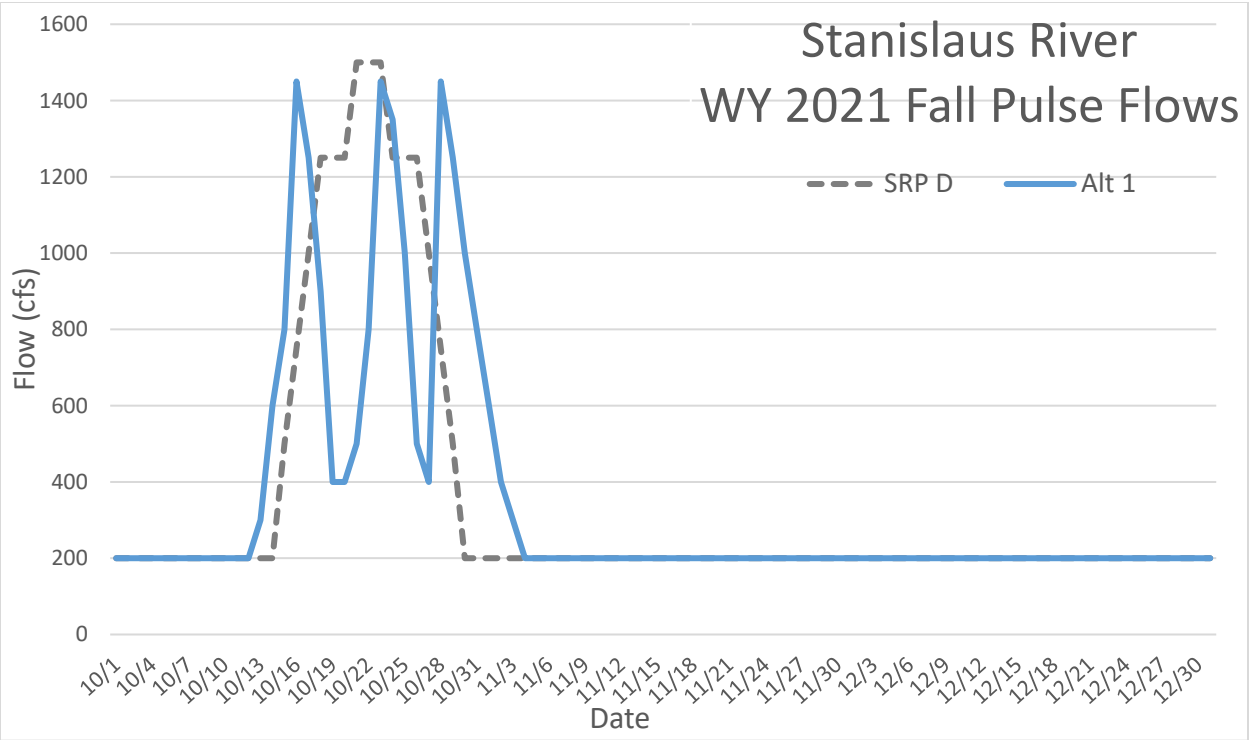

Figure 1. Figure showing daily flows from October 1 to December 31 in both the default SRP-Dry schedule and Alternative 1 schedule.

Table 1. Daily Flows under the SRP Dry and Alternative 1 for October – December 2020

Day	Date	SRP Dry Daily flow (cfs)	Alt 1 Daily flow (cfs)
T	10/1	200	200
F	10/2	200	200
S	10/3	200	200
S	10/4	200	200
M	10/5	200	200
T	10/6	200	200
W	10/7	200	200
T	10/8	200	200
F	10/9	200	200
S	10/10	200	200
S	10/11	200	200
M	10/12	200	200
T	10/13	200	300
W	10/14	200	600
T	10/15	500	800
F	10/16	750	1450
S	10/17	1000	1250
S	10/18	1250	900
M	10/19	1250	400
T	10/20	1250	400
W	10/21	1500	500
T	10/22	1500	800
F	10/23	1500	1450
S	10/24	1250	1350
S	10/25	1250	1000
M	10/26	1250	500
T	10/27	1000	400
W	10/28	750	1450
T	10/29	500	1250
F	10/30	200	1000
S	10/31	200	800
S	11/1	200	600
M	11/2	200	400
T	11/3	200	300
W	11/4	200	200
T	11/5	200	200
F	11/6	200	200
S	11/7	200	200
S	11/8	200	200
M	11/9	200	200
T	11/10	200	200
W	11/11	200	200
T	11/12	200	200
F	11/13	200	200
S	11/14	200	200
S	11/15	200	200
M	11/16	200	200
T	11/17	200	200
W	11/18	200	200
T	11/19	200	200
F	11/20	200	200
S	11/21	200	200
S	11/22	200	200
M	11/23	200	200
T	11/24	200	200
W	11/25	200	200
T	11/26	200	200
F	11/27	200	200
S	11/28	200	200
S	11/29	200	200
M	11/30	200	200
T	12/1	200	200
W	12/2	200	200
T	12/3	200	200
F	12/4	200	200
S	12/5	200	200
S	12/6	200	200
M	12/7	200	200
T	12/8	200	200
W	12/9	200	200
T	12/10	200	200
F	12/11	200	200
S	12/12	200	200
S	12/13	200	200
M	12/14	200	200
T	12/15	200	200
W	12/16	200	200
T	12/17	200	200
F	12/18	200	200
S	12/19	200	200
S	12/20	200	200
M	12/21	200	200

Day	Date	SRP Dry Daily flow (cfs)	Alt 1 Daily flow (cfs)
T	12/22	200	200
W	12/23	200	200
T	12/24	200	200
F	12/25	200	200
S	12/26	200	200

Day	Date	SRP Dry Daily flow (cfs)	Alt 1 Daily flow (cfs)
S	12/27	200	200
M	12/28	200	200
T	12/29	200	200
W	12/30	200	200
T	12/31	200	200

Table 2. Comparison of flows and water volumes between SRP Dry and Alt-1 from October 1 to December 31.

Schedules	SRP Dry	Alt- 1
Total cfs (October 1 - December 31)	31,900	31,900
Total acre-feet (October 1 - December 31)	63,273	63,273

Appendix C. January Winter Instability Flows Operations Plan

BUREAU OF RECLAMATION

Stanislaus Stepped Release Plan – Water Year 2021
Winter Instability Flows
Final Operations Plan (January 2021 Flows)

December 22, 2020 – REVISED January 5, 2021

This Stanislaus Stepped Release Plan (SRP) – Water Year (WY) 2021 Final Operations Plan (January 2021 Flows) details Reclamation's plan for operating the Stanislaus River to meet WY 2021 winter instability flow (WIF) requirements for January 2021 (February 2021 WIF requirements will be addressed in a separate Operations Plan). The Final Operations Plan (January 2021 Flows) incorporates feedback from the Stanislaus Watershed Team (SWT) who convened November 18, 2020 and December 16, 2020 to discuss a WY 2021 WIF Draft Operations Plan.

Background

WIFs in January and February are a component of the daily flow schedule in the SRP proposed in Reclamation's October 2019 Biological Assessment (2019 BA), evaluated in NMFS's October 2019 Biological Opinion (2019 BiOp), and implemented per the February 2020 Record of Decision. 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."

Below, Reclamation summarizes the operations plan for implementation of the WIFs in January of WY 2021.

Water Volume Accounting

For January 2021, Reclamation plans to implement a WIF that is: (a) reshaped according to the "Alternative" flow schedule for the water year type in effect (critical), described in Table 1 and Figures 1, and (b) shifted in time to coincide with timing of installation of the Caswell Rotary Screw Trap (RST) by Pacific States Marine Fisheries Commission (Pacific States).

The alternative flow schedules have the same volumes as the default SRP schedule for the Critical water year type (793 AF) but have been reshaped to include higher peak flows and variability. The SWT reviewed and provided feedback on an initial flow alternative to provide variability in the

winter hydrograph by simulating a small storm pulse. A second alternative was developed that incorporated correct ramping rates, resulting in fewer and more attenuated peaks.

Reshaping

The shape of each "Alternative" flow schedule, with its more rapidly rising limb and more slowly descending limb, is more typical of the flow pattern associated with storm events. Reshaping the sub-daily flow pattern to increase the peak flow to over 700 cfs for part of 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 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, as the runoff, turbidity, meteorological conditions, etc. associated with a natural storm event co-occur with the pulse of regulated flow. With this approach if no storm event occurred by the end of the third week of the month, Reclamation would schedule the WIF to be initiated by the end of the month.

For WY 2021, however, the timing of the January WIF will be shifted to coincide with needed installation of Caswell RST by Pacific States. RST installation will take approximately two days and the WIF is currently scheduled to occur between January 7 and January 9, 2021. The minimum ideal flow for RST installation is 350 cfs.

An initial Alternative (Alt-Critical 1) was developed with support of the SWT that included a Day 1 peak of 1,000 cfs followed by a second peak of 600 cfs. On day 2, a peak of 800 cfs was proposed for the morning hours followed by a 700 cfs peaks a few hours later.

A second Alternative (Alt-Critical 2) was developed by Reclamation to better adhere to specified ramping rate requirements. Alt-Critical 2 includes an initial peak of 750 cfs on Day 1 and a 550 cfs peak on Day 2 (Figure 1). Reclamation met with National Marine Fisheries Service and United States Fish and Wildlife Service to discuss this new proposed schedule and both agencies agreed that Alt-Critical 2 was the most adequate to implement given ramping rate restrictions.

Reclamation intends to implement Alt-Critical 2.

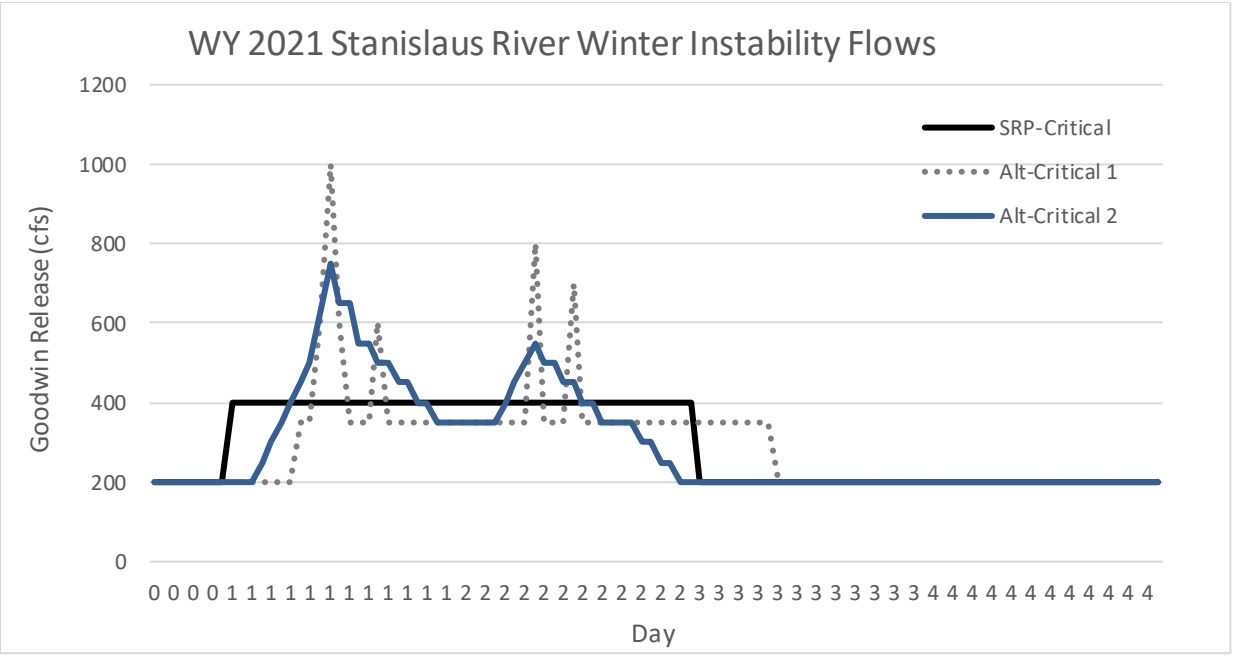

Figure 1. Hourly flows in the default SRP and proposed Alternative schedules for a Critical water year type.

Table 1. Hourly Flow Schedule for the SRP and Alternative Critical

Day	Hour	SRP Critical	Alt-Critical 1	Alt-Critical 2
0	17	200	200	200
0	18	200	200	200
0	19	200	200	200
0	20	200	200	200
0	21	200	200	200
0	22	200	200	200
0	23	200	200	200
0	24	200	200	200
1	1	400	200	200
1	2	400	200	200
1	3	400	200	200
1	4	400	200	250
1	5	400	200	300
1	6	400	200	350
1	7	400	200	400
1	8	400	350	450
1	9	400	350	500
1	10	400	600	625
1	11	400	1000	750
1	12	400	600	650
1	13	400	350	650
1	14	400	350	550
1	15	400	350	550
1	16	400	600	500
1	17	400	350	500
1	18	400	350	450
1	19	400	350	450
1	20	400	350	400
1	21	400	350	400
1	22	400	350	350
1	23	400	350	350
1	24	400	350	350
2	1	400	350	350
2	2	400	350	350
2	3	400	350	350
2	4	400	350	350
2	5	400	350	400
2	6	400	350	450
2	7	400	350	500
2	8	400	800	550
2	9	400	350	500
2	10	400	350	500
2	11	400	350	450
2	12	400	700	450
2	13	400	350	400
2	14	400	350	400
2	15	400	350	350
2	16	400	350	350
2	17	400	350	350
2	18	400	350	350
2	19	400	350	300
2	20	400	350	300
2	21	400	350	250
2	22	400	350	250
2	23	400	350	200
2	24	400	350	200
3	1	200	350	200
3	2	200	350	200
3	3	200	350	200
3	4	200	350	200
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3	6	200	350	200
3	7	200	350	200
3	8	200	350	200
3	9	200	200	200
3	10	200	200	200
3	11	200	200	200
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3	15	200	200	200
3	16	200	200	200
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3	19	200	200	200
3	20	200	200	200
3	21	200	200	200
3	22	200	200	200
3	23	200	200	200
3	24	200	200	200
4	1	200	200	200
4	2	200	200	200
4	3	200	200	200
4	4	200	200	200
4	5	200	200	200
4	6	200	200	200
4	7	200	200	200
4	8	200	200	200
4	9	200	200	200
4	10	200	200	200
4	11	200	200	200
4	12	200	200	200
4	13	200	200	200
4	14	200	200	200
4	15	200	200	200
4	16	200	200	200
4	17	200	200	200
4	18	200	200	200
4	19	200	200	200
4	20	200	200	200
4	21	200	200	200
4	22	200	200	200
4	23	200	200	200
4	24	200	200	200

Appendix D. February Winter Instability Flows Operations Plan

BUREAU OF RECLAMATION

Stanislaus Stepped Release Plan, Water Year 2021 Winter Instability Flows Final Operations Plan (February 2021 Flows)

February 10, 2021

This Stanislaus Stepped Release Plan (SRP) – Water Year (WY) 2021 Operations Plan (February 2021 Flows) details Reclamation's plan for operating the Stanislaus River to meet WY 2021 winter instability flow (WIF) requirements for February 2021 (January 2021 WIF requirements were addressed in a separate Operations Plan). The Final Operations Plan for February 2021 flows incorporates feedback from the Stanislaus Watershed Team (SWT) who convened January 20, 2021 to discuss a WY 2021 WIF Draft Operations Plan.

Background

WIFs in January and February are a component of the daily flow schedule in the SRP proposed in Reclamation's October 2019 Proposed Action (2019 PA), evaluated in NMFS's October 2019 Biological Opinion (2019 BiOp), and implemented per the February 2020 Record of Decision (ROD). As noted in the 2019 PA (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 PA 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."

On December 16, 2020, SWT advised a modified January 2021 WIF consistent with the intent of the February 2020 ROD. The January 2021 WIF was revised by Reclamation (with input from NMFS and USFWS) in a January 5, 2021, Operations Plan to better adhere to specified ramping rate requirements. The SWT decided to wait until its monthly meeting in January 2021 to advise an alternative flow schedule for February 2021. On January 7 and 8, 2021, Reclamation implemented a January 2021 WIF with peaks of 750 cfs on the first day and 550 cfs on the second day.

Below, Reclamation summarizes the Operations Plan for implementation of the February 2021 WIF.

Water Volume Accounting

Reclamation plans to implement a February 2021 WIF that is: (a) reshaped according to the "Alternative" flow schedule for the water year type in effect (critical), described in Table 1 and Figure 1, and (b) shifted in time to (i) the second half of February, and (ii) coincide with the timing

of a storm event, if possible, but with implementation to be completed no later than the last week of the month.

The alternative flow schedule has the same pulse volume as the default SRP schedule for the Critical water year type (793 acre-feet [AF], not including the base flow of 200 cfs) but has been reshaped to provide higher peak flows and variability.

Reshaping

The SWT reviewed and provided feedback on the flow alternative (Alternative 1) during its January meeting (January 21, 2021). The Alternative schedule was shaped to provide variability in the winter hydrograph by simulating a small storm-like pulse. The shape of the Alternative 1 flow schedule, with its more rapidly rising limb and more slowly descending limb, is more typical of the flow pattern associated with storm events. Reshaping the sub-daily flow pattern to increase the peak flow to 950 cfs the first day of the pulse is intended to provide enhanced mobilization of juvenile fall-run Chinook in February, and 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 February WIFs are scheduled to begin February 5th. 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, as the runoff, turbidity, meteorological conditions, etc. associated with a natural storm event co-occur with the pulse of regulated flow. For February 2021, SWT recommended that the February WIF be implemented in the second half of February, when more fall-run Chinook fry will have emerged from redds. If no storm event occurs by the end of the third week of February, Reclamation would schedule the WIF to be initiated before the end of the month.

Reclamation intends to implement Alternative 1 for the February 2021 WIF.

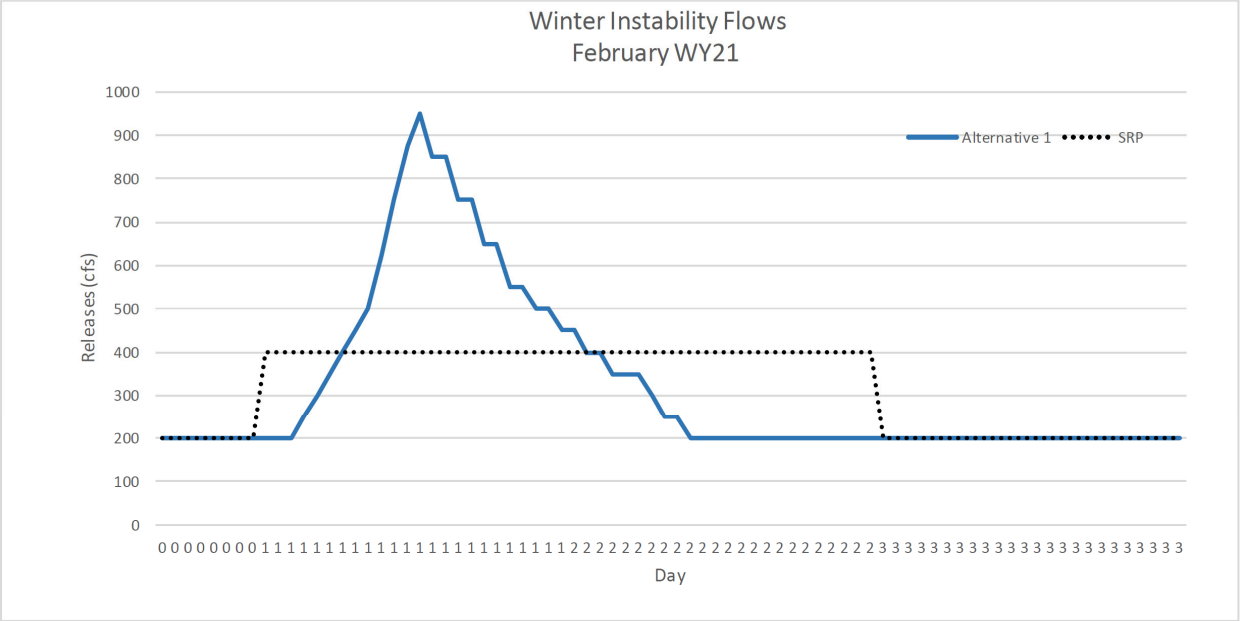

Figure 1. Figure showing daily flows from October 1 to December 31 in both the default SRP-Dry schedule and Alternative 1 schedule.

Table 1. Hourly Flow Schedule for the SRP and Alternative Critical

Day	Hour	SRP Critical	Alt-Critical 1
0	17	200	200
0	18	200	200
0	19	200	200
0	20	200	200
0	21	200	200
0	22	200	200
0	23	200	200
0	24	200	200
1	1	250	200
1	2	300	200
1	3	350	200
1	4	400	250
1	5	400	300
1	6	400	350
1	7	400	400
1	8	400	450
1	9	400	500
1	10	400	625
1	11	400	750
1	12	400	875

Day	Hour	SRP Critical	Alt-Critical 1
1	13	400	950
1	14	400	850
1	15	400	850
1	16	400	750
1	17	400	750
1	18	400	650
1	19	400	650
1	20	400	550
1	21	400	550
1	22	400	500
1	23	400	500
1	24	400	450
2	1	400	450
2	2	400	400
2	3	400	400
2	4	400	350
2	5	400	350
2	6	400	350
2	7	400	300
2	8	400	250
2	9	400	250
2	10	400	200
2	11	400	200
2	12	400	200
2	13	400	200
2	14	400	200
2	15	400	200
2	16	400	200
2	17	400	200
2	18	400	200
2	19	400	200
2	20	400	200
2	21	400	200
2	22	400	200
2	23	350	200
2	24	350	200
3	1	350	200
3	2	300	200
3	3	300	200
3	4	250	200
3	5	250	200
3	6	200	200

Day	Hour	SRP Critical	Alt-Critical 1
3	7	200	200
3	8	200	200
3	9	200	200
3	10	200	200
3	11	200	200
3	12	200	200
3	13	200	200
3	14	200	200
3	15	200	200
3	16	200	200
3	17	200	200
3	18	200	200
3	19	200	200
3	20	200	200
3	21	200	200
3	22	200	200
3	23	200	200
3	24	200	200

Appendix E. Spring Pulse Flows Operations Plans

BUREAU OF RECLAMATION

Stanislaus Stepped Release Plan – Water Year 2021 Spring Pulse Flows
Final Operations Plan (January 2021 Flows)

April 7, 2021

This Stanislaus Stepped Release Plan (SRP) – Water Year (WY) 2021 Final Operations Plan (January 2021 Flows) details Reclamation's plan for operating the Stanislaus River to meet WY 2021 winter instability flow (WIF) requirements for January 2021 (February 2021 WIF requirements will be addressed in a separate Operations Plan). The Final Operations Plan (January 2021 Flows) incorporates feedback from the Stanislaus Watershed Team (SWT) who convened November 18, 2020 and December 16, 2020 to discuss a WY 2021 WIF Draft Operations Plan.

Background

WIFs in January and February are a component of the daily flow schedule in the SRP proposed in Reclamation's October 2019 Biological Assessment (2019 BA), evaluated in NMFS's October 2019 Biological Opinion (2019 BiOp), and implemented per the February 2020 Record of Decision. 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."

Below, Reclamation summarizes the operations plan for implementation of the WIFs in January of WY 2021.

Water Volume Accounting

For January 2021, Reclamation plans to implement a WIF that is: (a) reshaped according to the "Alternative" flow schedule for the water year type in effect (critical), described in Table 1 and Figures 1, and (b) shifted in time to coincide with timing of installation of the Caswell Rotary Screw Trap (RST) by Pacific States Marine Fisheries Commission (Pacific States).

The alternative flow schedules have the same volumes as the default SRP schedule for the Critical water year type (793 AF) but have been reshaped to include higher peak flows and variability. The SWT reviewed and provided feedback on an initial flow alternative to provide variability in the

winter hydrograph by simulating a small storm pulse. A second alternative was developed that incorporated correct ramping rates, resulting in fewer and more attenuated peaks.

Reshaping

The shape of each "Alternative" flow schedule, with its more rapidly rising limb and more slowly descending limb, is more typical of the flow pattern associated with storm events. Reshaping the sub-daily flow pattern to increase the peak flow to over 700 cfs for part of 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 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, as the runoff, turbidity, meteorological conditions, etc. associated with a natural storm event co-occur with the pulse of regulated flow. With this approach if no storm event occurred by the end of the third week of the month, Reclamation would schedule the WIF to be initiated by the end of the month.

For WY 2021, however, the timing of the January WIF will be shifted to coincide with needed installation of Caswell RST by Pacific States. RST installation will take approximately two days and the WIF is currently scheduled to occur between January 7 and January 9, 2021. The minimum ideal flow for RST installation is 350 cfs.

An initial Alternative (Alt-Critical 1) was developed with support of the SWT that included a Day 1 peak of 1,000 cfs followed by a second peak of 600 cfs. On day 2, a peak of 800 cfs was proposed for the morning hours followed by a 700 cfs peaks a few hours later.

A second Alternative (Alt-Critical 2) was developed by Reclamation to better adhere to specified ramping rate requirements. Alt-Critical 2 includes an initial peak of 750 cfs on Day 1 and a 550 cfs peak on Day 2 (Figure 1). Reclamation met with National Marine Fisheries Service and United States Fish and Wildlife Service to discuss this new proposed schedule and both agencies agreed that Alt-Critical 2 was the most adequate to implement given ramping rate restrictions.

Reclamation intends to implement Alt-Critical 2.

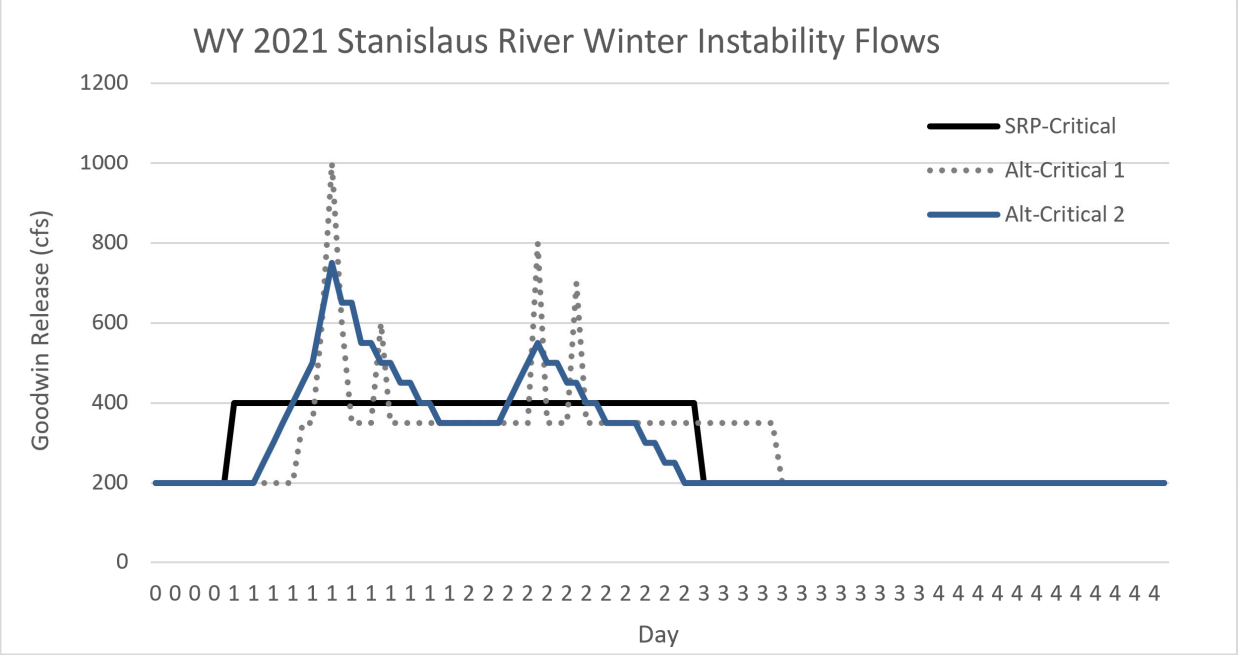

Figure 1. Hourly flows in the default SRP and proposed Alternative schedules for a Critical water year type.

Table 1. Hourly Flow Schedule for the SRP and Alternative Critical

Day	Hour	SRP Critical	Alt-Critical 1	Alt-Critical 2
0	17	200	200	200
0	18	200	200	200
0	19	200	200	200
0	20	200	200	200
0	21	200	200	200
0	22	200	200	200
0	23	200	200	200
0	24	200	200	200
1	1	400	200	200
1	2	400	200	200
1	3	400	200	200
1	4	400	200	250
1	5	400	200	300
1	6	400	200	350
1	7	400	200	400
1	8	400	350	450
1	9	400	350	500

Day	Hour	SRP Critical	Alt-Critical 1	Alt-Critical 2
1	10	400	600	625
1	11	400	1000	750
1	12	400	600	650
1	13	400	350	650
1	14	400	350	550
1	15	400	350	550
1	16	400	600	500
1	17	400	350	500
1	18	400	350	450
1	19	400	350	450
1	20	400	350	400
1	21	400	350	400
1	22	400	350	350
1	23	400	350	350
1	24	400	350	350
2	1	400	350	350
2	2	400	350	350
2	3	400	350	350
2	4	400	350	350
2	5	400	350	400
2	6	400	350	450
2	7	400	350	500
2	8	400	800	550
2	9	400	350	500
2	10	400	350	500
2	11	400	350	450
2	12	400	700	450
2	13	400	350	400
2	14	400	350	400
2	15	400	350	350
2	16	400	350	350
2	17	400	350	350
2	18	400	350	350
2	19	400	350	300
2	20	400	350	300
2	21	400	350	250
2	22	400	350	250
2	23	400	350	200

Day	Hour	SRP Critical	Alt-Critical 1	Alt-Critical 2
2	24	400	350	200
3	1	200	350	200
3	2	200	350	200
3	3	200	350	200
3	4	200	350	200
3	5	200	350	200
3	6	200	350	200
3	7	200	350	200
3	8	200	350	200
3	9	200	200	200
3	10	200	200	200
3	11	200	200	200
3	12	200	200	200
3	13	200	200	200
3	14	200	200	200
3	15	200	200	200
3	16	200	200	200
3	17	200	200	200
3	18	200	200	200
3	19	200	200	200
3	20	200	200	200
3	21	200	200	200
3	22	200	200	200
3	23	200	200	200
3	24	200	200	200
4	1	200	200	200
4	2	200	200	200
4	3	200	200	200
4	4	200	200	200
4	5	200	200	200
4	6	200	200	200
4	7	200	200	200
4	8	200	200	200
4	9	200	200	200
4	10	200	200	200
4	11	200	200	200
4	12	200	200	200
4	13	200	200	200

Day	Hour	SRP Critical	Alt-Critical 1	Alt-Critical 2
4	14	200	200	200
4	15	200	200	200
4	16	200	200	200
4	17	200	200	200
4	18	200	200	200
4	19	200	200	200
4	20	200	200	200
4	21	200	200	200
4	22	200	200	200
4	23	200	200	200
4	24	200	200	200