Annual Report of Activities
Water Year 2018

Stanislaus Operations Group (SOG)
November 2018

Cover Photo: *Goodwin Dam releasing ~1,800 cfs on December 4, 2017.*
Credit: *NMFS*

Acronyms and Abbreviations

Term	Definition
7DADM	Seven-Day-Average of the Daily Maximum Temperature
BiOp	Biological Opinion
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CDEC	California Data Exchange Center
CDFW	California Department of Fish & Wildlife
CWT	Coded Wire Tag
CDWR	California Department of Water Resources
D-1422	Water Rights Decision 1422
ESA	Endangered Species Act
GDW	Stanislaus River at Goodwin Dam (CDEC gauge)
KF or KFS	Knights Ferry
NMFS	National Marine Fisheries Service
OBB	Stanislaus River at Orange Blossom Bridge (CDEC gauge)
OID	Oakdale Irrigation District
Reclamation	U.S. Bureau of Reclamation
RPA	Reasonable and Prudent Alternative
RIP	Stanislaus River at Ripon (CDEC gauge for dissolved oxygen)
SOG	Stanislaus Operations Group
SSJID	South San Joaquin Irrigation District
SWP	State Water Project
SWRCB	State Water Resources Control Board
TUCP	Temporary Urgency Change Petition
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish & Wildlife Service
WOMT	Water Operations Management Team
WY	Water Year

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CHAPTER 1 INTRODUCTION AND BACKGROUND

1.1 Introduction

This report summarizes the activities and actions of the Stanislaus Operations Group (SOG) for Water Year (WY) 2018[1] in compliance with the NOAA's National Marine Fisheries Service (NMFS) 2009 Biological Opinion and Conference Opinion on the Long Term Operations of the Central Valley Project (CVP) and State Water Project (SWP; NMFS BiOp). Table 1-1 lists the Reasonable and Prudent Alternative (RPA) actions from the NMFS BiOp that establish the requirements related to Stanislaus operations.

Table 1-1. NMFS BiOp Reasonable and Prudent Alternative (RPA) actions, description, and page references in the 2009 BiOp with 2011 amendments[2] related to Stanislaus operations.

ACTION ID	Page #	RPA Action Name
Section 11.2.1.2	9	Research and Adaptive Management (Annual Review)
Section 11.2.1.3	10	Monitoring and Reporting: (e) Adult escapement and juvenile monitoring for steelhead on the Stanislaus River.
Action III.1.1	7-9, 47	Establish Stanislaus Operational Group (SOG) for Real-Time Operational Decision-Making.
Action III.1.2	47-48	Provide Cold Water Releases to Maintain Suitable Steelhead Temperatures.
Action III.1.3	49-53, Appendix 2-E[3]	Operate the East Side Division Dams to Meet the Minimum Flows, as Measured at Goodwin Dam.
Action III.2.1	53-54	Increase and Improve Quality of Spawning Habitat with addition of 50,000 Cubic Yards of Gravel by 2014 and with a Minimum Addition of 8,000 Cubic Yards per Year for the Duration of the Project Actions.
Action III.2.2	54	Conduct Floodplain Restoration and Inundation in Winter or Spring to Inundate Steelhead Juvenile Rearing Habitat on One- to Three-Year Schedule.
Action III.2.3	54-55	Restore Freshwater Migratory Habitat for Juvenile Steelhead by Implementing Projects to Increase Floodplain Connectivity and to Reduce Predation Risk During Migration.
Action III.2.4	55	Evaluate Fish Passage at New Melones, Tulloch, and Goodwin Dams.

[1] WY 2018 started on 10/1/17 and ended on 9/30/18.
[2] The 2011 NMFS RPA Amendments are available online here.
[3] Appendix 2-E is provided in the "Appendix 2 Supporting Document for the RPA" file, available at here

1.2 Background

The Stanislaus River is of considerable interest to fishery management agencies, the public, and the U.S. Bureau of Reclamation (Reclamation). The agencies with trust responsibilities for fishery and water resources in the Stanislaus River include the U.S. Fish and Wildlife Service (USFWS), NMFS, California Department of Fish and Wildlife (CDFW), and State Water Resources Control Board (SWRCB). 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[4]. A partnership between the Oakdale Irrigation District and the South San Joaquin Irrigation District (collectively, the Districts), known as the Tri Dam Project, owns and operates 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.

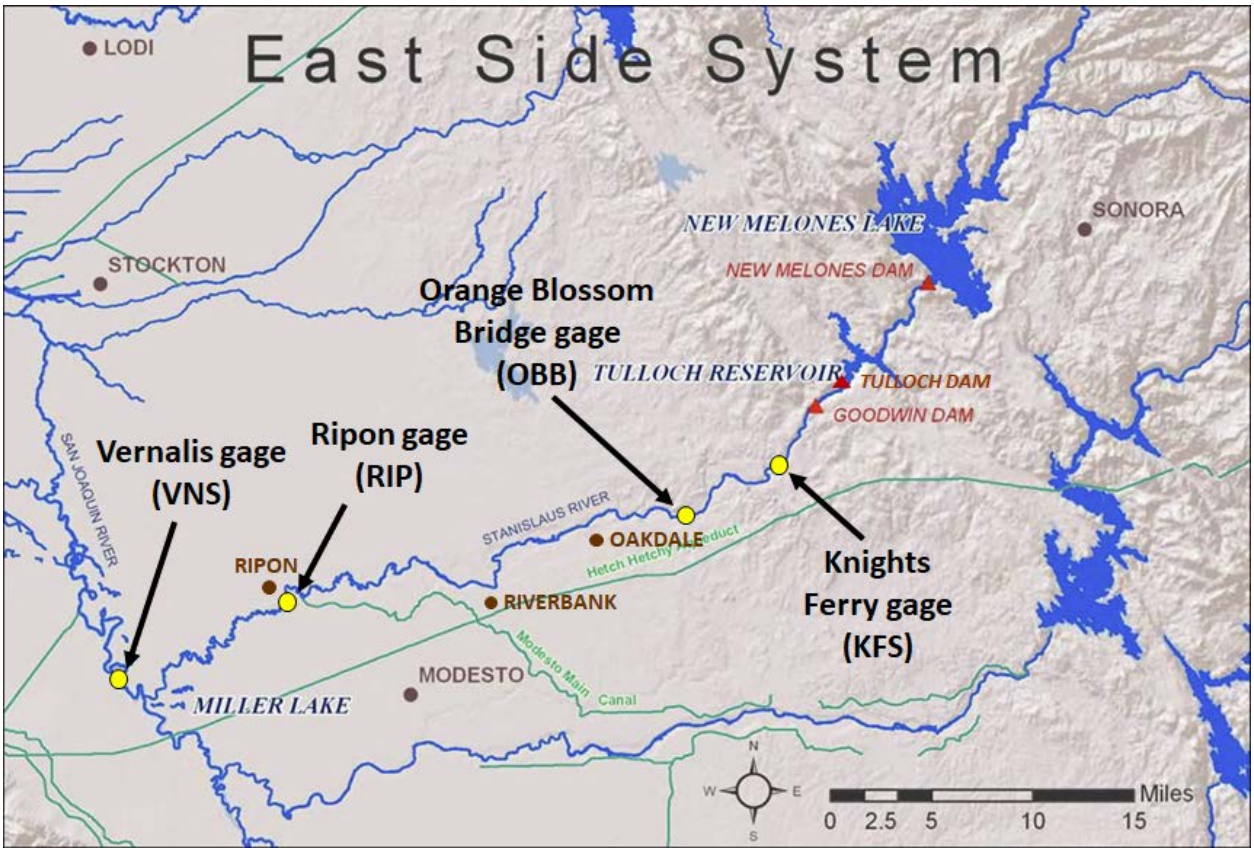


Figure 1-1. Map of key locations in or near the Stanislaus River watershed. Modified from Figure 2-10 of Reclamation's 2008 Biological Assessment.

[4] PL 78–534 and PL 87-874

On June 4, 2009, NMFS issued its NMFS BiOp[5]. On April 7, 2011, NMFS issued amendments[6] to the RPA of the NMFS BiOp. Unless noted otherwise, references to page numbers in this document refer to page numbers in the 2011 NMFS RPA Amendments. References to the NMFS BiOp should be considered to include the 2011 NMFS RPA Amendments. The NMFS BiOp required that Reclamation create the SOG, a technical team providing advice to NMFS and the Water Operations Management Team (WOMT) on issues related to the Stanislaus River fishery and water resources (2011 NMFS RPA Amendments, *pp. 8-9*).

The SOG mission is "to gather and analyze information, and make recommendations, regarding adjustments to water operations within the range of flexibility prescribed in the implementation procedures"[7] for the Stanislaus River and for the operation of the East Side Division as a unit of the overall CVP, which is consistent with all relevant laws, regulations, and standards, including the NMFS BiOp. Reclamation maintains its authority and responsibility for operations of the East Side Division complex. SOG provides operational advice to NMFS and WOMT but has no authority in operational decisions. NMFS considers advice from SOG when making a final determination as to whether or not a proposed operational action is consistent with obligations to the NMFS BiOp and Endangered Species Act.

1.3 Membership

SOG member agencies during WY 2018 included:

- Reclamation
- USFWS
- NMFS
- CDFW
- California Department of Water Resources (CDWR)
- SWRCB

[5] The NMFS BiOp is available online at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/nmfs_biological_and_conference_opinion_on_the_long-term_operations_of_the_cvp_and_swp.pdf

[6] The 2011 NMFS RPA Amendments are available online at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

[7] 2011 NMFS RPA Amendments at p. 7.

CHAPTER 2 SUMMARY OF ACTIONS AND SOG DISCUSSIONS

SOG met monthly during WY 2018 and discussed a standard set of agenda items (described in Section 2.1) and occasional special topics (described in Section 2.2).

2.1 Monthly Discussion Topics

- Water operations at Goodwin Dam;
- Water quality [temperatures at Orange Blossom Bridge (OBB) and Knights Ferry (KF), occasionally dissolved oxygen (DO) at Ripon];
- Stanislaus RPA Actions (2011 NMFS RPA Amendments at pages 46-55);
- Stanislaus River Forum update;
- Fish monitoring; and
- Restoration.

2.2 Other Discussion Topics

2.2.1 Advice on implementation of the pulse flows in Action III.1.3

- Fall Attraction Flows – see summary in Section 2.3 and details in the full SOG advice provided in Appendix A.
- Winter Instability Flows – see summary in Section 2.3 and details in the full SOG advice provided in Appendix B.
- Spring Pulse Flow – see summary in Section 2.3 and details in the full SOG advice provided in Appendix C.

2.2.2 Storage Management and Flood Control Releases

The 2018 water year began with New Melones storage at 250% of the 15-year average. Because the storage was so high, the New Melones reservoir was projected to approach encroachment in mid-October. After discussions and coordination in SOG, Reclamation increased flows starting October 22, 2017, for both the fall pulse flow and storage management for New Melones. As soon as the fall pulse flow ended, increased releases were necessary for New Melones storage management. Reclamation coordinated flows for storage management with fishery agencies in SOG; specifically, to provide variable releases to deter spawning in locations inundated only during the highest flows. Flows were increased up to 2,400 cfs and ramping down to 1,600 cfs the next day. These storage management pulses continue through January of 2018.

2.2.3 Springtime release of District water

In December 2016, Congress passed the Water Infrastructure Improvements for the Nation (WIIN) Act[8]. Subtitle J of the WIIN Act relates to California water issues and specifies certain operational changes to the way CVP and SWP water management occurs under the 2008 USFWS and 2009 NMFS BiOps on long-term operations of the CVP and SWP. In May 2018, CVP and SWP utilized Section 4001 to adopt a 1:1 inflow to export ratio (I:E ratio) for the export of the additional increment of water reaching Vernalis that was released by Reclamation on the Stanislaus River and provided by the Districts (Oakdale Irrigation District and South San Joaquin Irrigation District). The Districts' water released on the Stanislaus River was above and beyond the minimum instream flow requirements required by Action III.1.3 of the NMFS BiOp. This WIIN Act flexibility resulted in increased springtime flows on the Stanislaus River and approximately 50 TAF of additional Delta exports.

SOG was aware of the potential release of the Districts' water since early spring, but did not provide any formal SOG advice on the shaping of the release of the Districts' water in WY 2018, deferring to Reclamation and NMFS to coordinate on WIIN Act implementation.

2.2.4 Review of 2017 LOBO Independent Review Panel report

The most recent Long-term Operations Biological Opinions (LOBO) Biennial Science Review was held December 4-7, 2017, in Sacramento, California. As explained on the webpage[9] for the 2017 Science Review,

> "The U.S. Bureau of Reclamation (Reclamation), National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) use this Biennial Science Review to evaluate the prior years' water operations and regulatory actions prescribed by their respective Reasonable and Prudent Alternative (RPA) actions, with the goal of developing lessons learned, incorporating new science, and making appropriate, scientifically justified adjustments to the implementation of the RPA actions to inform water operations in future years. The Independent Review Panel's (IRP) findings and recommendations provide objective feedback to agency staff to inform rapid decision-making.
>
> In April 2016, the U.S. Bureau of Reclamation (Reclamation) and NMFS agreed to temporarily modify the RPA science review frequency from annual to biennial between 2016 through 2020. The biennial review is expected to address a system-wide operational overview, resulting in comprehensive assessments that are relevant and valuable to all of the agencies involved. After this period, Reclamation and NMFS will evaluate whether to make this change permanent or consider additional changes."

[8] https://www.congress.gov/bill/114th-congress/senate-bill/612/text. The "California Water" provisions are in Subtitle J, starting at Section 4001 (the "Enrolled Bill" version has a hotlinked table of contents).
[9] Review materials and the Independent Review Panel report from the 2017 Science Review are available at: http://deltacouncil.ca.gov/events/2017-long-term-operations-biological-opinions-lobo-biennial-science-review

The charge to the panel included a review of Stanislaus River operations under the NMFS BiOp. SOG reviewed the 2017 LOBO Independent Review Panel report, and Appendix D summarizes the report's comments regarding Stanislaus operations as well as feedback from SOG members.

2.3 Implementation of RPA Actions in WY2018

2.3.1 RPA Action III.1.2 - Temperature Management

This RPA action requires Reclamation to manage the cold water supply within New Melones Reservoir and make cold water releases from New Melones Reservoir to provide suitable temperatures for California Central Valley (CV) steelhead (*Oncorhynchus mykiss*) rearing, spawning, egg incubation, smoltification, and adult migration in the Stanislaus River downstream of Goodwin Dam.

- **October 6 to December 31: 7-day average of the daily maximum (7DADM) not to exceed 56°F at Orange Blossom Bridge (OBB;** measured at CDEC station OBB). The 56°F temperature criterion at OBB in the fall is intended to provide temperatures suitable for adult CV steelhead migration and holding. The NMFS BiOp states, "This criterion shall apply as of October 1 or as of initiation date of fall pulse flow as agreed to by NMFS." Per SOG advice, approved by NMFS on September 29, 2017, Reclamation implemented the "Alternative A" fall pulse flow schedule for WY 2018 with an associated initiation date of the fall temperature criterion of October 6, 2017 (see details in Appendix A).
- **January 1 to May 31: 7DADM not to exceed 55°F at OBB** (measured at CDEC station OBB) **or 52°F at Knights Ferry (KF;** estimated[10]**).** The 55°F temperature criterion at OBB is for steelhead spawning and incubation. The 52°F criterion at KF is for steelhead smoltification.
- **June 1 to September 30: 7DADM not to exceed 65°F at OBB** (measured at CDEC station OBB). The 65°F temperature criterion at OBB is for steelhead juvenile rearing.

Temperature criteria and water temperatures during WY 2018 are summarized in Section 3.3 and Figures 3-3 and 3-4; exceedances are summarized in Section 3.4.

2.3.2 RPA Action III.1.3 - Flow Management

This RPA action requires Reclamation to provide minimum instream flows in the Stanislaus River according to the New Melones yeartype specific minimum flow schedules in Appendix 2-E of the NMFS BiOp.

[10] During WY 2018, the daily maximum water temperature at Knights Ferry was estimated using a new equation based on two gage stations: estKFmax = (0.293 x OBBmax) + (0.708 x USGSmax) The "estKFmax" term refers to the estimated daily maximum water temperature at Knights Ferry, the "OBBmax" term refers to the measured daily maximum water temperature reported at the OBB gage on CDEC (gage near Orange Blossom Bridge and the town of Oakdale – downstream of Knights Ferry); the "USGSmax" term refers to the measured daily maximum water temperature reported at USGS gage 11302000 (gage in Goodwin Canyon – upstream of Knights Ferry). See details in Appendix E.

2.3.2.1 Fall Pulse Flow

The fall attraction flow is one component of the daily flow schedule required. As stated in the 2011 NMFS RPA Amendments, the fall attraction flow is intended "…to improve in-stream conditions sufficiently to attract CV steelhead to the Stanislaus River." The RPA action further notes that "…based upon the advice of SOG and concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

At the September 2017 SOG meeting, SOG members reviewed some draft flow schedules and agreed to advise a four-peak alternative, "Alternative A", to the default 2-E flow schedule for 2017 (Figure 2-1). The SOG-advised alternative reshaped the fall pulse volume [using the Wet fall pulse flow volume (27,174 AF) in Appendix 2-E] into a four-peak release that provided flow variability expected to deter spawning at the higher flows that would not be sustained through egg incubation and fry emergence. The maximum daily release in the alternative was 1,375 cfs, comparable to the peak flow of 1,500 in the default 2-E flow schedule.

Because reported water temperatures in the Stanislaus River in mid-September 2017 were cooler than usual (daily maximum temperatures usually less than 60°F, but still above the 56°F criterion for CV steelhead migration and holding), SOG advised starting the fall pulse flow in early October and having some smaller peaks in mid-October. SOG expected that the higher-than-base flows would help to buffer water temperatures during the seasonal transition to cooler air temperature. Scheduled flows in the advised alternative were down to base flows in early November before peak spawning was expected to occur. SOG believed the alternative flow schedule met the intent of the RPA action, namely, improving instream conditions and providing an attraction cue for adult salmonids returning to spawn.

NMFS approved the Fall Pulse Advice on September 29, 2017. The full rationale for the shaping and timing of the fall pulse flow is provided in Appendix A. Actual fall pulse flow implementation is shown in Figure 3-2 in Chapter 3.

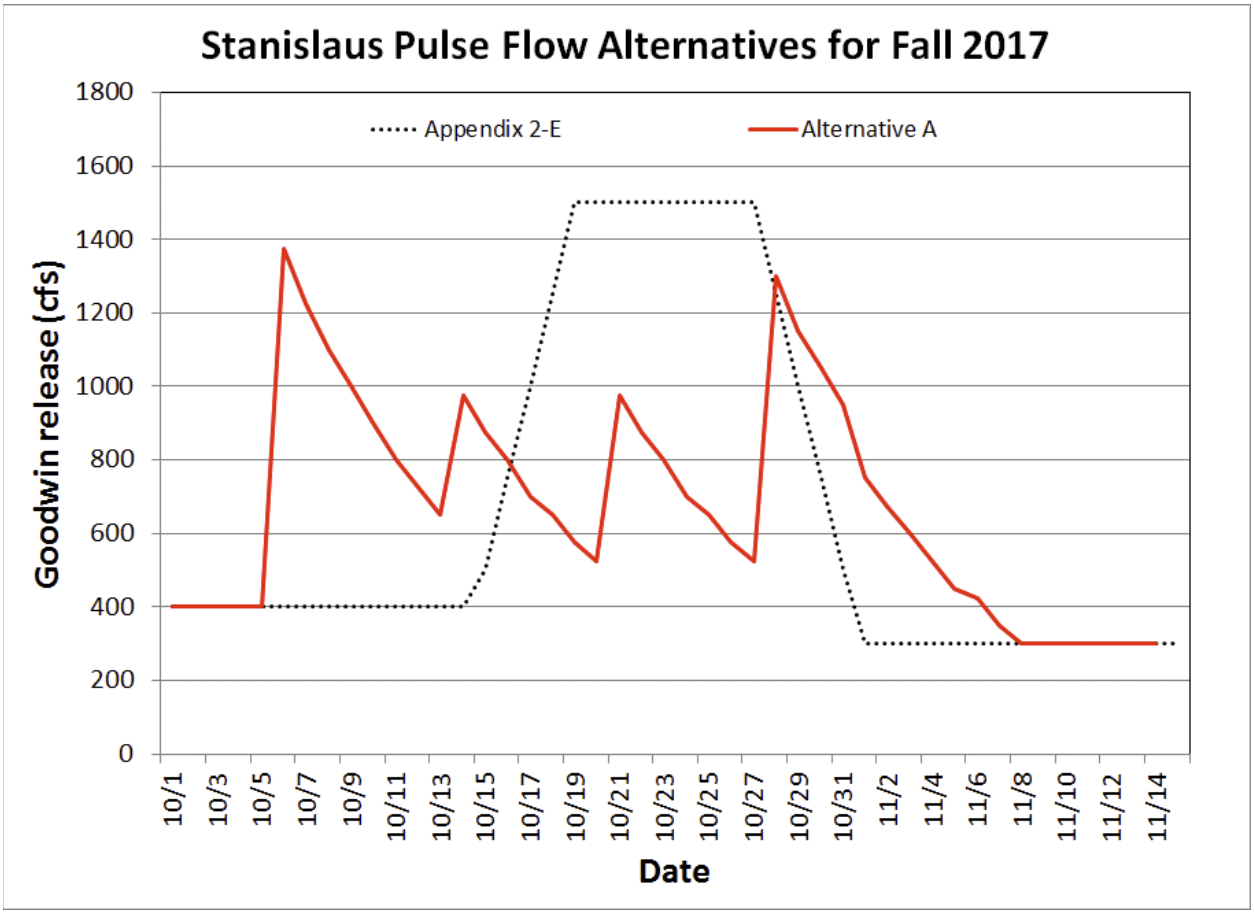


Figure 2-1. Stanislaus fall pulse flow schedules (Wet yeartype) considered by SOG for October - November 2017. SOG advised, and NMFS approved, implementation of the "Alternative A" pulse flow schedule.

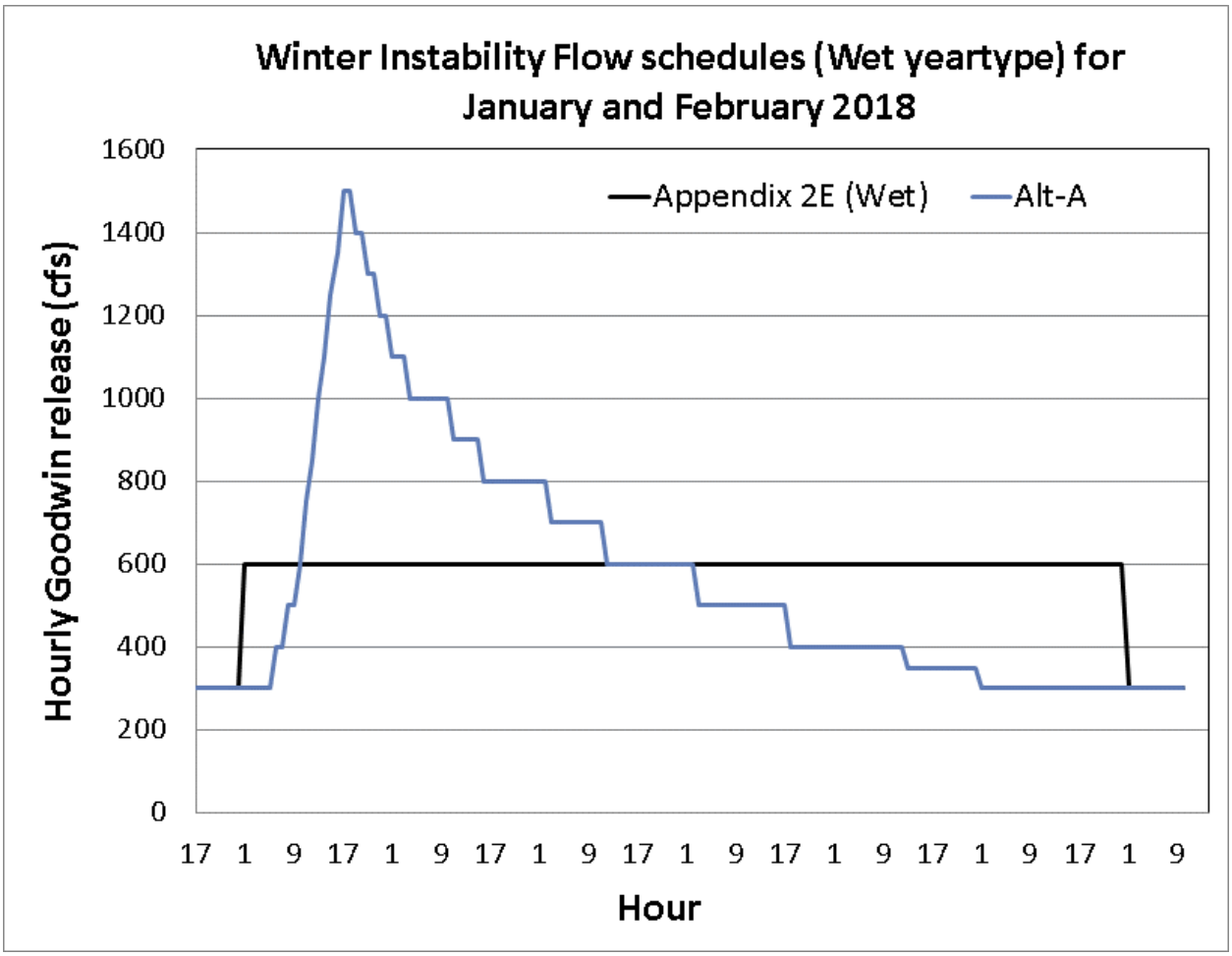
2.3.2.2 Winter Instability Flows

Winter instability flows in January and February are another component of the daily flow schedule in Appendix 2-E required per Action III.1.3 of the 2011 NMFS RPA Amendments. The winter instability flows are intended "…to simulate natural variability in the winter hydrograph and to enhance access to varied rearing habitats" (2011 NMFS RPA Amendments page 50). The RPA further states (page 50) that "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

For January and February 2018, SOG advised, and NMFS approved, that the winter instability flows be reshaped to mimic a natural storm pulse (including a higher peak) and be moved to coincide with a natural storm event (or scheduled to be initiated by the end of each calendar month if no rainfall event occurs). The alternative pulse shaping (Figure 2-2) had the same volume (3,570 AF in addition to the 300 cfs base flow) and

approximate duration as the Wet yeartype[11] winter instability pulse in Appendix 2-E. Full details are provided in Appendix B.

SOG noted in its advice that reservoir management releases in January or February might be sufficient to satisfy the winter instability flows and that was indeed the case. Both the January and February winter instability flows were satisfied by reservoir management releases from New Melones Reservoir. During much of January, the releases for storage management were released as pulses (see Goodwin releases in Figure 3-2 in Chapter 3), rather than as a steady flow, to try to deter fall-run Chinook and steelhead spawning at the highest flows that were not expected to be sustained through fry emergence.



[11] In December 2017, when SOG provided advice on implementation of the winter instability flows, the Stanislaus yeartype was Wet. Based on the January forecast and updated New Melones Index, available in mid-January, the Stanislaus yeartype changed from Wet to Below Normal. The Stanislaus yeartype remained Below Normal based on the February forecast. Because reservoir management releases had already satisfied the Wet yeartype winter instability flow requirement for January, and continued reservoir management releases were expected to satisfy the Wet yeartype winter instability flow requirement for February, SOG did not provide revised advice in January 2018 to reshape the winter instability flow schedule according to the Below Normal volume in Appendix 2-E.

Figure 2-2. Stanislaus winter instability flow schedules (Wet yeartype) considered by SOG for January and February 2018. SOG advised, and NMFS approved, implementation of the "Alternative A" pulse flow schedule, though reservoir management releases from New Melones Reservoir.

2.3.2.3 Spring Pulse Flow

The spring pulse flows identified in Action III.1.3 are intended to serve multiple purposes. Spring pulse flows provide outmigration flow cues to enhance likelihood of anadromy and help with conveyance and maintenance of downstream migratory habitat quality. The 2011 NMFS RPA Amendments further note (page 50) that "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

In WY 2018, as part of the advice on the spring pulse flow, SOG proposed a water accounting framework to determine the water volume required by Appendix 2-E if an updated inflow forecast causes a change in the Stanislaus yeartype. Because the yeartype is generally updated mid-month based on the snow surveys completed early in the month, the framework calculates the total required instream flow volume based on the default flow schedule in Appendix 2-E from the 16th of Month A to the 15th of Month B, based on the yeartype determined by the Month A forecast. NMFS agreed with the proposed methodology for WY 2018 and future water years.

The volumes of total required minimum instream flows (not just the pulse volume) in the Appendix 2-E schedule for mid-March through June of WY 2018 are provided in Table 2-1.

Table 2-1. The volumes of total required minimum instream flows (not just the pulse volume) in the Appendix 2-E schedule for mid-March through June of WY 2018

Date range	Stanislaus yeartype (Month of forecast)	Total water volume in default schedule in Appendix 2-E (acre-feet)
3/16/18-4/15/18	Below Normal (March)	50,182
4/16/18-5/15/18	Above Normal (April)	94,413
5/16/18-6/15/18	Above Normal (May)	71,008
6/15/18-6/30/18	Above Normal (June)	23,008
	Total:	238,612

In WY 2018, SOG ultimately advised[12] that the spring pulse flow be reshaped according to the flow schedule described in Alternative A (See Figure 2-3; full details in Appendix C). The Alternative A schedule has the same total volume (238,612 AF, including base flows) for the March 16 to June 30 period as the default Appendix 2-E schedule based on the water year types provided in Table 2-1. SOG believed that reshaping meets the intent of the RPA action by providing a spring pulse flow that may cue anadromy and improve migratory habitat in both the Stanislaus River and in the mainstem San Joaquin River and southern Delta. In the Stanislaus River, higher flows are expected to reduce water temperature and inundate some shallow water habitat that 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) are expected to convey outmigrating salmonids more rapidly along their migratory pathway, which may improve outmigration success.

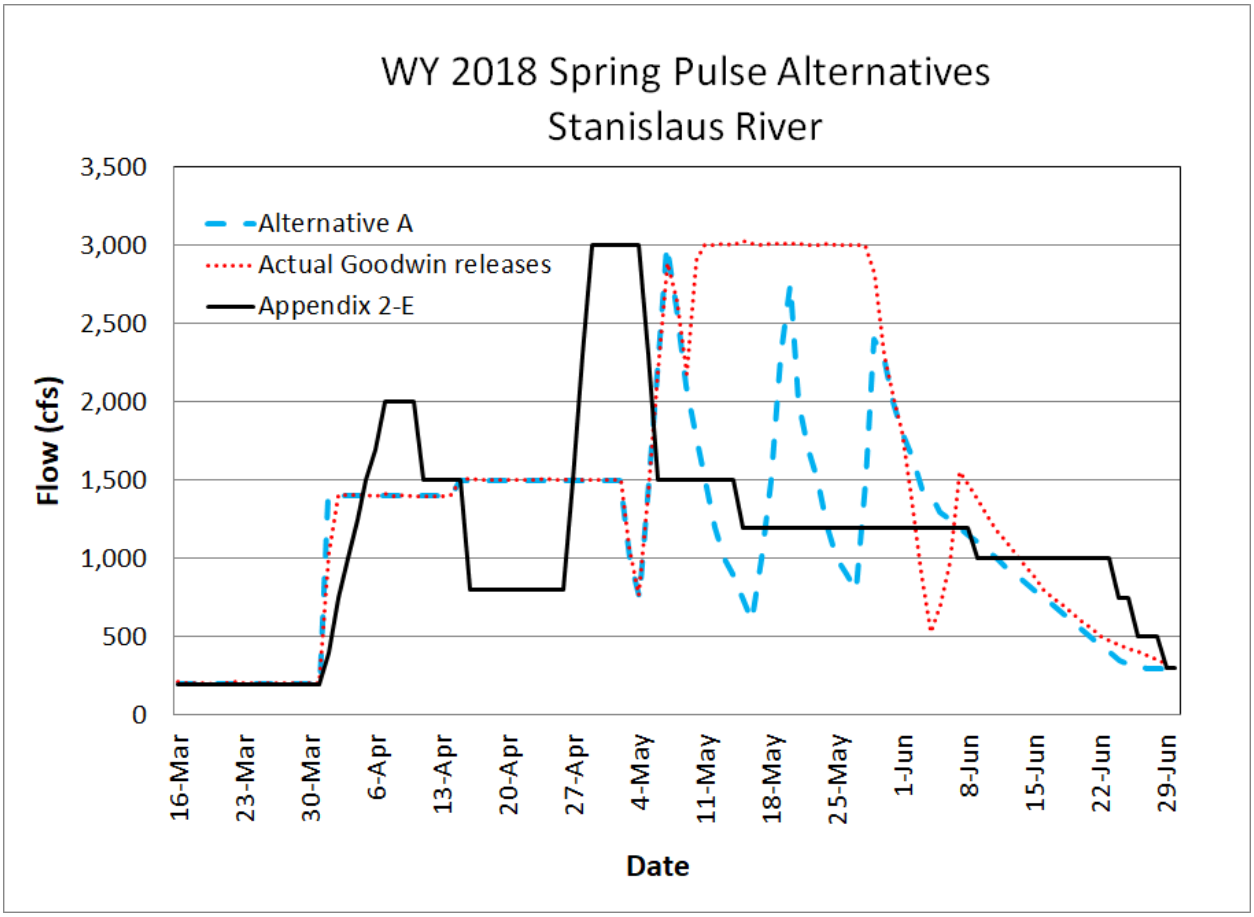


Figure 2-3. Final Spring pulse flow schedules considered by SOG, and actual releases from Goodwin Dam. SOG advised and NMFS approved the "Alternative A" shaping.

[12] Because of changing circumstances during the spring pulse flow period, SOG provided advice in several phases. Appendix C compiles all elements of the interim and final advice.

Actual flows during the spring pulse did not match the SOG shaping due to the release of District water during May (described above in section *2.2.3 Springtime release of District water*; see Figure 2-3). Because the District water was additional to the minimum flows required per the NMFS BiOp and related to implementation of the WIIN Act, SOG did not provide any formal SOG advice on the shaping of the District release, deferring to Reclamation and NMFS to coordinate on WIIN Act implementation.

2.3.3 RPA Action Suite III.2 - Habitat Restoration

The NMFS BiOp includes a suite of four habitat restoration RPA actions[13] to improve habitat for spawning, rearing, and migrating CV steelhead:

- **RPA Action III.2.1** -- Gravel augmentation
- **RPA Action III.2.2** -- Conduct Floodplain Restoration and Inundation Flows
- **RPA Action III.2.3** -- Restore Freshwater Migratory Habitat for Juvenile Steelhead by Implementing Projects to Increase Floodplain Connectivity and to Reduce Predation Risk During Migration
- **RPA Action III.2.4** -- Evaluate Fish Passage at New Melones, Tulloch, and Goodwin Dams

Habitat restoration on the Stanislaus River pursuant to the NMFS BiOp (2009-present) has been implemented primarily with funding through the Central Valley Project Improvement Act (CVPIA). Two programs under the CVPIA have provided funding. The Gravel Program [3406 (b)(13)] has provided semi-regular gravel augmentation predominantly in Goodwin Canyon. The Anadromous Fish Restoration Program [3406(b)(1)] has implemented larger floodplain/side-channel projects usually with associated gravel augmentation. Currently, SOG is completely reliant on these programs to fund restoration, though no clear mechanism exists to link CVPIA decision making to RPA requirements. The limited success this approach has achieved in accomplishing RPA Action III.2.1 is described in Table 2-2.

A summary of projects completed (since 2009) and potential habitat restoration projects relevant for meeting the objectives in the suite of RPA actions associated with habitat restoration can be found in Table 2-3.

SOG is relying on the Interagency Fish Passage Steering Committee to meet the requirement of RPA Action III.2.4, which calls for an evaluation of fish passage at New Melones, Tulloch, and Goodwin dams.

[13] 2011 NMFS RPA Amendments at pages 53-55. The 2011 NMFS RPA Amendments are available online at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

Table 2-2. Gravel augmentation annual averages (cubic yards) over different time periods

Time Period	Average Cubic Yards of Gravel Added Annually	Annual Target in Cubic Yards	Percent of Target Achieved
Pre-BiOp (1994-2008)	3,647	N/A	N/A
BiOp catch-up (2009-2014)	1,995	8,333*	24%
BiOp maintenance (2015-2017)	2,515	8,000**	32%

*The 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 has granted an extension.

**The 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 2-3. Completed (since 2009) and potential habitat restoration projects on the Stanislaus River relevant for the objectives of RPA Actions III.2.1, III.2.2, and III.2.3

Project	Project extent
COMPLETED gravel augmentation projects (for spawning habitat at all locations; some gravel placed at the cable crossing in Goodwin Canyon intended for mobilization and downstream placement by river flows)	
Goodwin Canyon at cable crossing – 2011	2,941 cubic yards
Goodwin Canyon at float tube pool – 2012	1,765 cubic yards
Goodwin Canyon at cable crossing – 2015	4,706 cubic yards
Main channel and floodplain bench at Honolulu Bar – 2012	8,000 cubic yards total used for spawning riffles in main channel and 0.7 acre floodplain bench
Buttonbush – 2017	2,838 cubic yards
Rodden Road – 2018	1,250 cubic yards
COMPLETED floodplain and side-channel restoration projects (for improved rearing habitat, improved migratory habitat, improved connectivity to avoid stranding)	
Lancaster Road side-channel -- 2011	640 linear feet of side-channel and 2 acres of floodplain habitat
Side-channel at Honolulu Bar – 2012	Improvement of existing side-channel to reduce stranding risk
Floodplain at Honolulu Bar – 2012	2.4 acres
Buttonbush – 2017	4.4 acres of side-channel and floodplain habitat and 2,400 linear feet of side-channel habitat.
Rodden Road – 2018	4.9 acres of habitat
POTENTIAL Projects	
Two Mile Bar	*Anticipated gravel:* 6,000 cubic yards. *Anticipated habitat:* TBD
Kerr Park Restoration	*Anticipated gravel and habitat:* TBD
Migratory Corridor Rehabilitation	*Anticipated gravel and habitat:* TBD
Goodwin Canyon	*Anticipated gravel:* 8,000 cubic yards/year is required under the 2009 NMFS BiOp. No CVPIA-funded gravel augmentation on the Stanislaus is anticipated for WY 2019.

CHAPTER 3 WATER OPERATIONS SUMMARY

This chapter describes Stanislaus River operations for WY 2018, pertaining to RPA Actions III.1.2 and III.1.3. These actions are presented in reverse order for clarity.

3.1 Action III.1.3 – Flow Management

Figure 3-1 summarizes New Melones Reservoir operations during WY 2018, including information on local precipitation, inflow and outflow from the reservoir, and reservoir storage throughout the year in comparison to the top of the conservation pool.

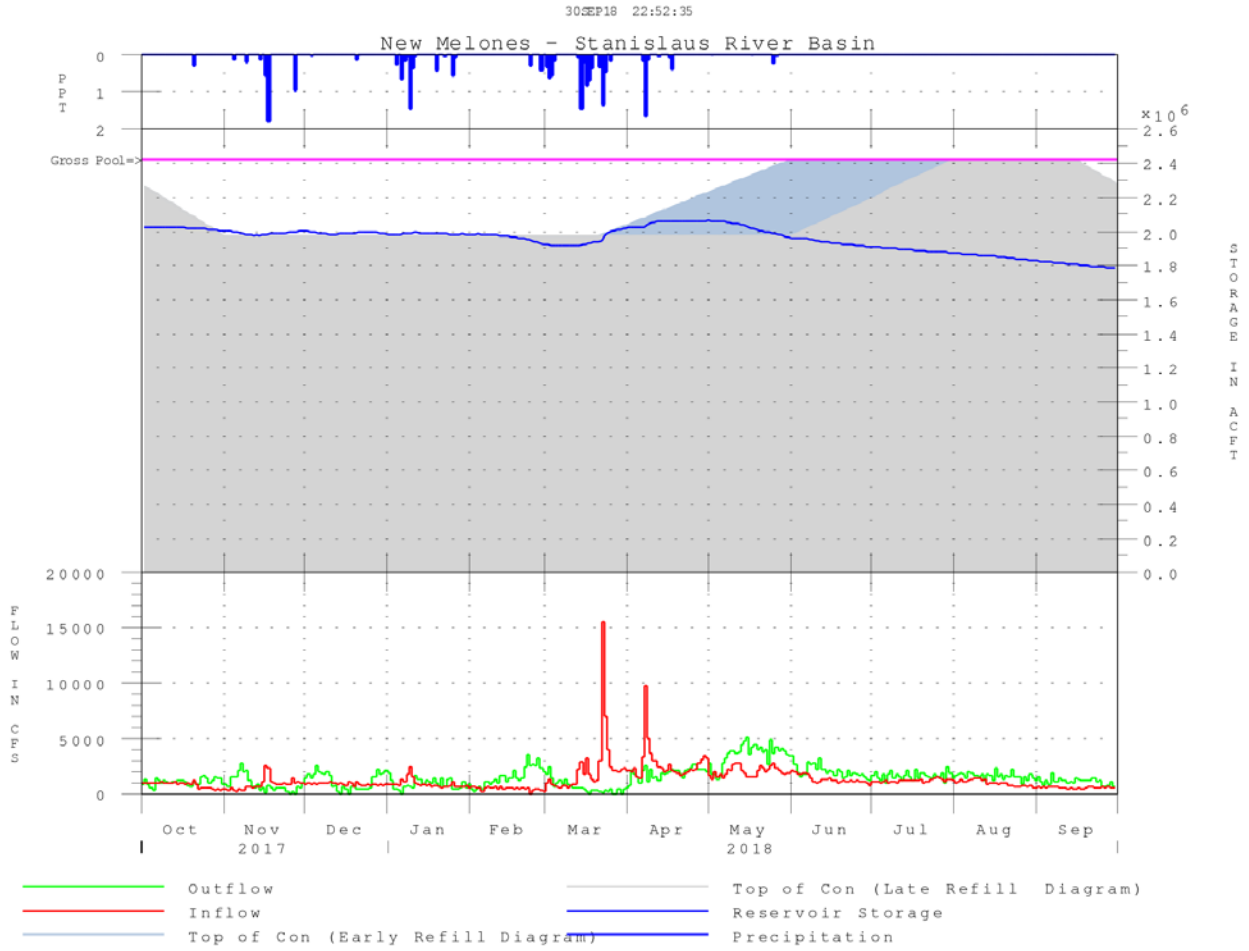


Figure 3-1. Summary of New Melones Reservoir Operations during WY 2018.

The WY 2018 classifications for determining Appendix 2-E minimum flows, based on the New Melones Index, are provided in Table 3-1 (the New Melones Index is the sum of end-of-February storage and forecasted inflows for March through September). Per agreement (SOG meeting notes from February 17, 2010), the New Melones Index was calculated by using the Interim Plan of Operations methodology which uses the 90% exceedance forecast for any forecasted elements of the index[14].

Table 3-1. Water Year Classification by Month during WY 2018.

Month of Forecast	Water Year Classification
October	Wet
November	Wet
December	Wet
January	Below Normal
February	Below Normal
March	Below Normal
April	Above Normal
May	Above Normal
June	Above Normal
July	Above Normal
August	Above Normal
September	Above Normal

3.2 Stanislaus River Operations

The WY 2018 began with New Melones storage at 2,023,891 AF. The fall pulse flow started on October 6, 2017, and ended on November 4, 2017. Storage in New Melones in mid-October was still high and Reclamation increased flows starting October 22, 2017, for both the fall pulse flow and storage management for New Melones in order to get down to the required storage for the beginning of the flood season. As soon as the fall pulse flow ended, increased releases were still necessary for New Melones storage management. Reclamation coordinated these increased flows with the fish agencies. These storage management pulses continued through January of 2018.

[14] For more information on this methodology, see Appendix C of the WY 2010 SOG Annual Report, available at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Stanislaus%20Operations%20Group/2010_sog_annual_report.pdf

In February, releases were increased up to 2,300 cfs for the Vernalis Flow Objective in the SWRCB's Bay-Delta Water Quality Control Plan. Starting on April 1, 2018, the spring pulse flow per Action III.1.3 of the NMFS BiOp began with an increase in flows to 1,400 cfs. By April 15, flows increased to 1,500 cfs. Appendix 2-E flows, as reshaped per SOG advice (see details in Appendix C and Figure 2-3) continued through June with peaks between 2,400 cfs and 3,000 cfs. During the second half of May, releases increased to 3,000 cfs (above the minimum flows in the reshaped spring pulse flow schedule) pursuant to the "Agreement for Release of Water by and Among the Oakdale Irrigation District, the South San Joaquin Irrigation District, the San Luis Delta Mendota, and the California Department of Water Resources." The Districts' release continued through May 31, 2018, for a total release of approximately 59 TAF of District water.

Goodwin Reservoir releases to the Stanislaus River are shown in Figure 3-2, including the primary reasons for those releases.

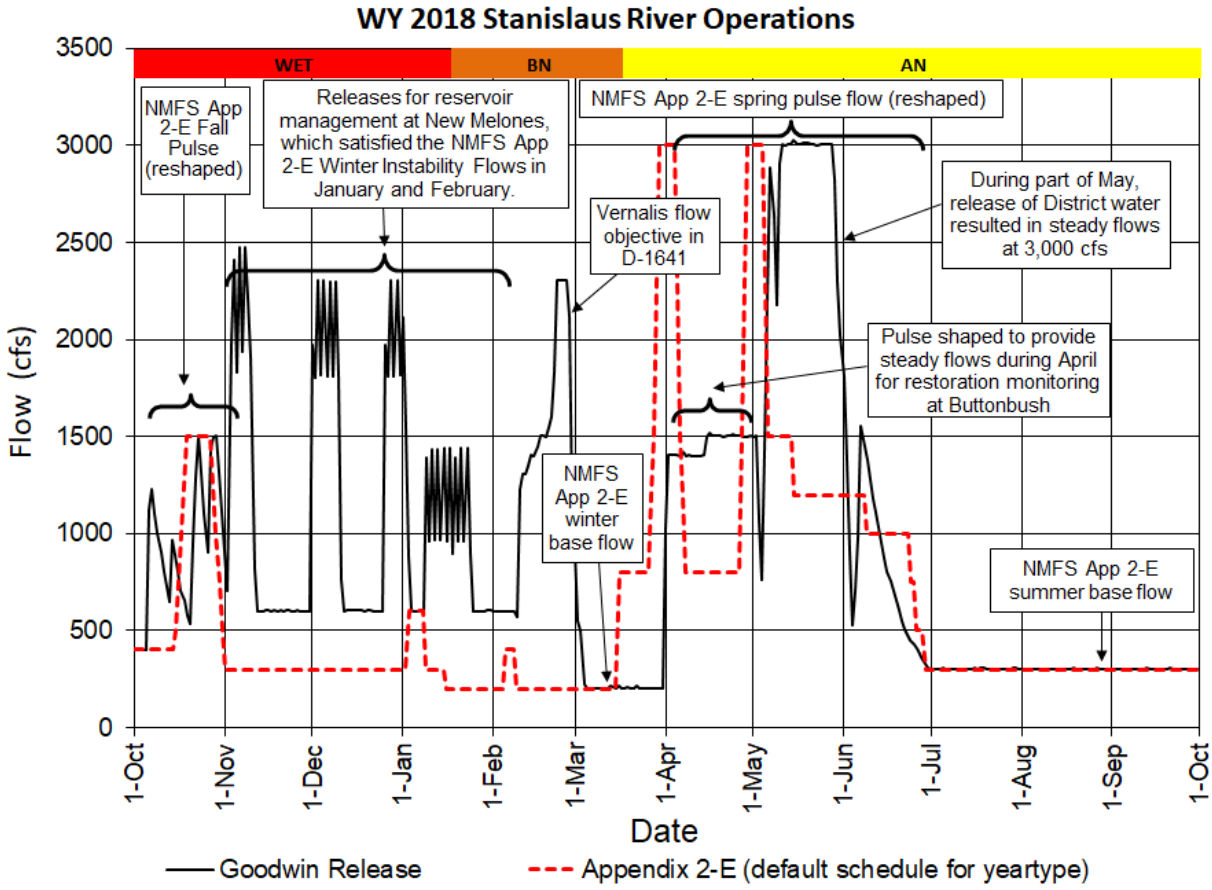


Figure 3-2. Summary of Stanislaus River releases at Goodwin Dam during WY 2018. Boxes identify the controlling requirements, the band at the top indicates the changes in yeartype (based on the New Melones Index) throughout the year from Wet, to Below Normal (BN), to Above Normal (AN).

3.3 Action III.1.2 - Temperature Management

Figure 3-3 is a summary of temperature operations from October 2017 through September 2018. Figure 3-4 is the same summary with average air temperature at Modesto, California added to the graph[15].

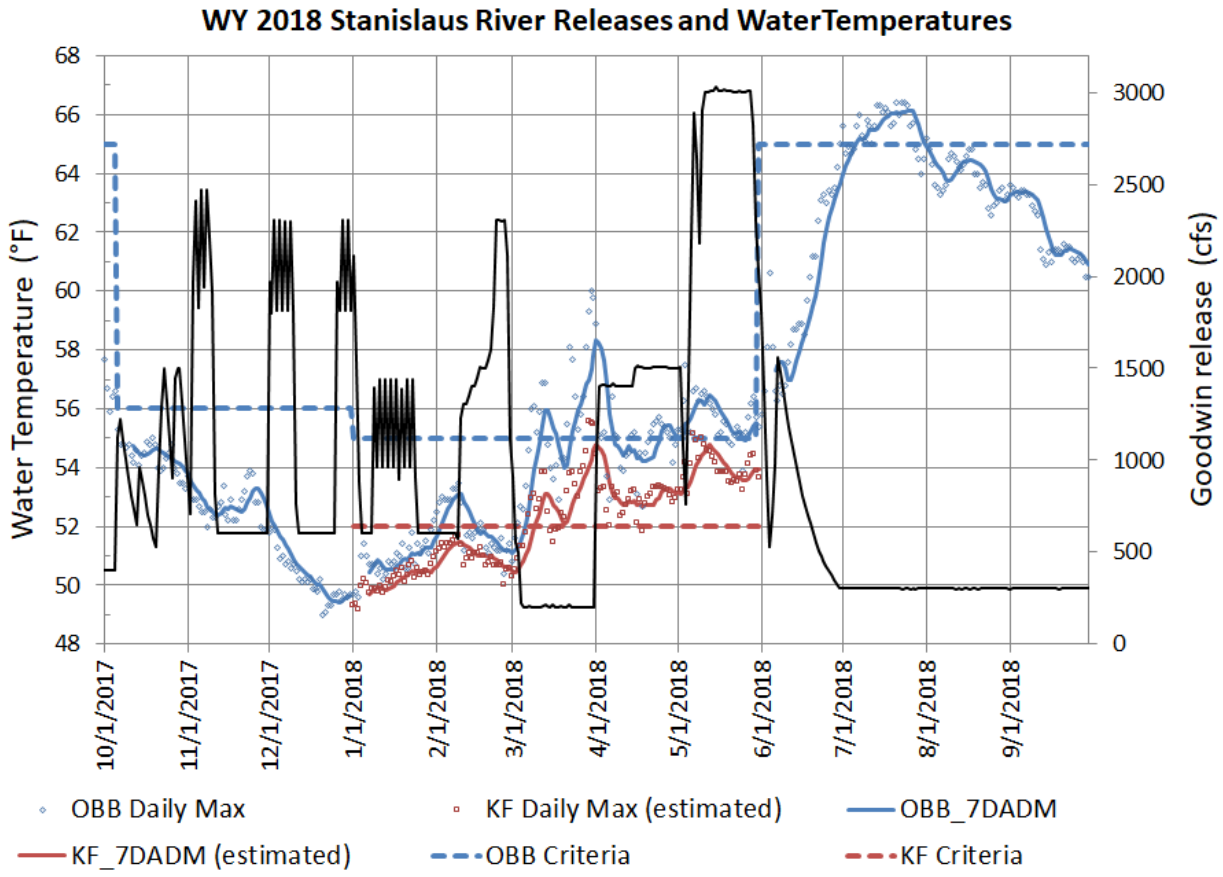


Figure 3-3. Summary of releases at Goodwin Dam and water temperatures at Orange Blossom Bridge (OBB; measured) and Knights Ferry (KF; estimated) during WY 2018. The 7DADM targets are per Action III.1.2 in the NMFS BiOp. Goodwin Dam release data from CDEC station "GDW." Orange Blossom Bridge temperatures from CDEC station "OBB."

[15] The summary with air temperature was plotted on a separate graph since the increased range of the temperature axis made the Orange Blossom Bridge and Knights Ferry water temperature data more difficult to distinguish.

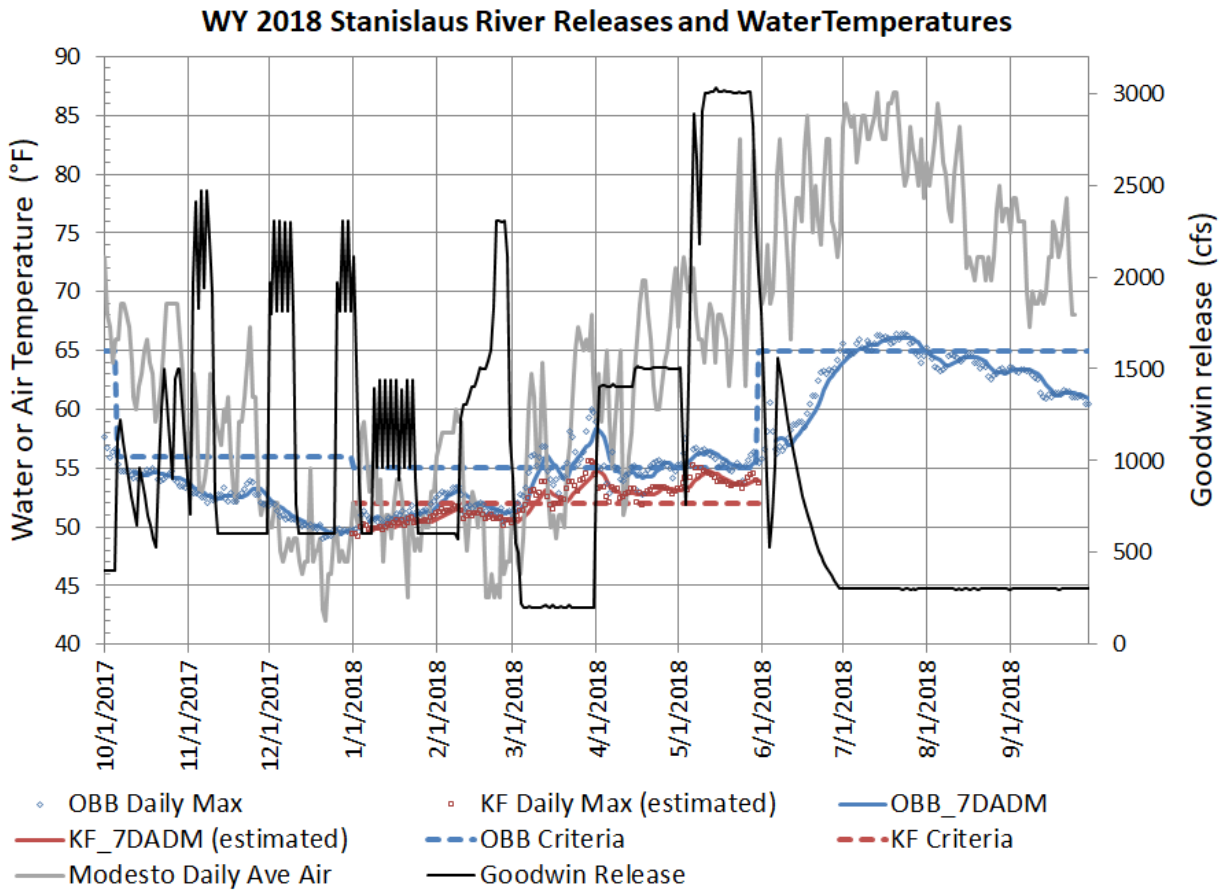


Figure 3-4. Summary of releases at Goodwin Dam, water temperatures at Orange Blossom Bridge (OBB; measured) and Knights Ferry (KF: estimated), and average daily air temperature at Modesto, California during WY 2018. The 7DADM targets are per Action III.1.2 in the NMFS BiOp. Goodwin Dam release data from CDEC station "GDW." Orange Blossom Bridge temperatures from CDEC station "OBB." Average daily air temperature at Modesto from KMOD station at www.wunderground.com.

3.4 Summary of Water Year 2018 NMFS BiOp RPA Action III.1.2 Exceptions

RPA Action III.1.2 describes suitable temperatures for CV steelhead life stages on the Stanislaus River. The temperature criteria at both OBB and Knights Ferry are based on a 7DADM metric. Stanislaus River temperatures are influenced by the upstream reservoir systems at Goodwin Dam, Tulloch Dam, and New Melones Dam (additional reservoir systems further upstream are assumed to have minimal effect on water temperature due to the large size of New Melones Reservoir). No temperature control devices or other physical structures are available to manage for temperature blending at these facilities except for a low-level outlet at New Melones that can only be used when the water surface elevation is below 808.0 feet. The outlet controls at both New Melones Dam and Tulloch Dam typically draw the coolest water available in those reservoirs. In the series of reservoirs (New Melones, Tulloch, and Goodwin), downstream temperature can be somewhat influenced with increased flows from Goodwin Dam. However, there are operational limitations to utilizing additional water due to conflicts with Reclamation's obligations served by New Melones Reservoir storage and the desire to preserve cold water for fishery purposes later in the year.

RPA Action III.1.2 provides a temperature exception procedure, which requires Reclamation to notify NMFS if the temperature requirement is expected to be exceeded, based on a 3-day average daily maximum. Reclamation is also required to provide an evaluation of the conditions and identify conflicts with Reclamation's nondiscretionary requirements. The temperature exceptions in WY 2018 (see exceedances in Figure 3-3) were noted and discussed within SOG. Temperatures exceeded the OBB criterion for much of the spring and for most of July, for a total of 80 days. Exceedances of the OBB 7DADM ranged from 0.1°F to 3.3°F, with an average of 0.9°F. Estimated temperatures also exceeded the Knights Ferry criterion for much of the spring, for a total of 83 days. Exceedances of the Knights Ferry 7DADM ranged from 0.1°F to 2.8°F, with an average of 1.4°F.

CHAPTER 4 SUMMARY OF SELECTED STANISLAUS FISH MONITORING DATA

Monitoring data from the Stanislaus River are summarized below for both fall-run Chinook salmon (*O. tshawytscha*) and CV steelhead (*O. mykiss)* (when data are present). The location of monitoring sites is shown in Figure 4-1.

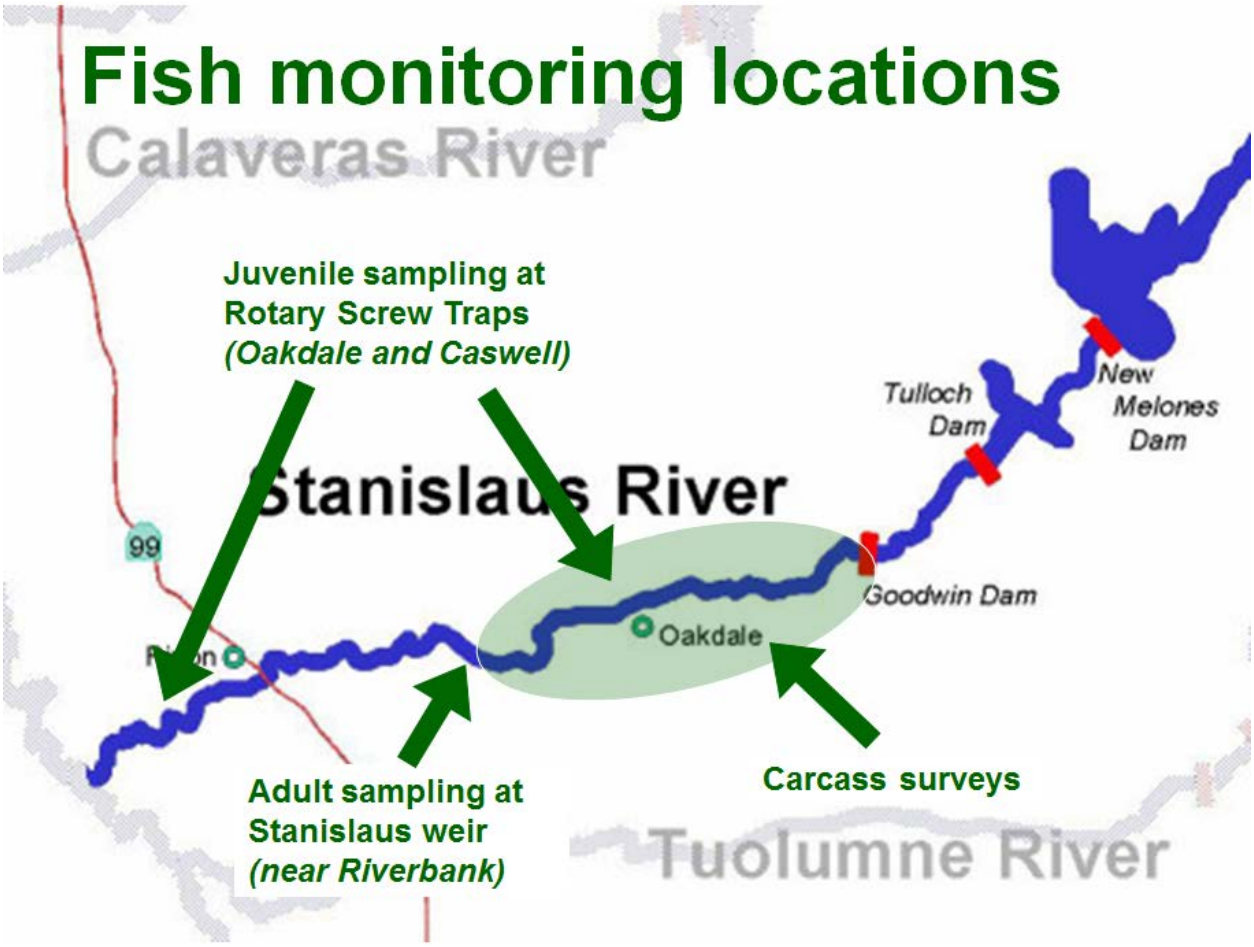


Figure 4-1. Location of fish monitoring efforts on the Stanislaus River

4.1 CDFW Carcass Survey

The CDFW began conducting fall-run Chinook carcass and redd surveys the week of October 2, 2017 and completed surveys in early January. Through the final week of the survey, the week of January 1, 2018, CDFW observed 2,002 redds on the Stanislaus River (compared to 598 on the Tuolumne River and 1,622 on the Merced River). Some survey reaches on the Stanislaus River in some weeks could not be surveyed due to high flows or staffing limitations. The preliminary Stanislaus River escapement estimate for brood year 2017 fall-run Chinook salmon based on the CDFW carcass survey (reported in the April 9, 2018 GrandTab) was 5,655 fish (compared to 1,096 fish on the Tuolumne River and 5,152 fish on the Merced River; the Merced River total combines 1,961 fish taken for the Merced River Hatchery and 3,191 fish estimated in-river adult returns).

4.2 Stanislaus Weir

The Districts' and Tri-Dam Project fund FISHBIO to conduct adult weir monitoring near Riverbank, California (approximately river mile 31) and juvenile rotary screw trap monitoring near Oakdale, California (approximately river mile 40). Monitoring at the weir near Riverbank (for upstream passage of adult salmonids) began for the season on September 16, 2017. In anticipation of continuous high flows expected through the end of December and potentially into January and February, FISHBIO discontinued monitoring and removed the weir on December 22, 2017. The cumulative net upstream passage through December 22, 2017 was 8,447 Chinook (30% were adipose fin-clipped, indicating a hatchery origin) and 11 *O. mykiss* (55% were adipose fin-clipped, indicating a hatchery origin, and five of the 11 *O. mykiss* were greater than 16 inches). The figures below were provided by FISHBIO in their final December 29, 2017 Stanislaus Weir Update.

Figures 4-2 and 4-3 show daily net upstream passage of Chinook salmon and *O. mykiss* over the sampling period. The Chinook salmon returns observed since the weir sampling began in 2003 are summarized in Table 4-1.

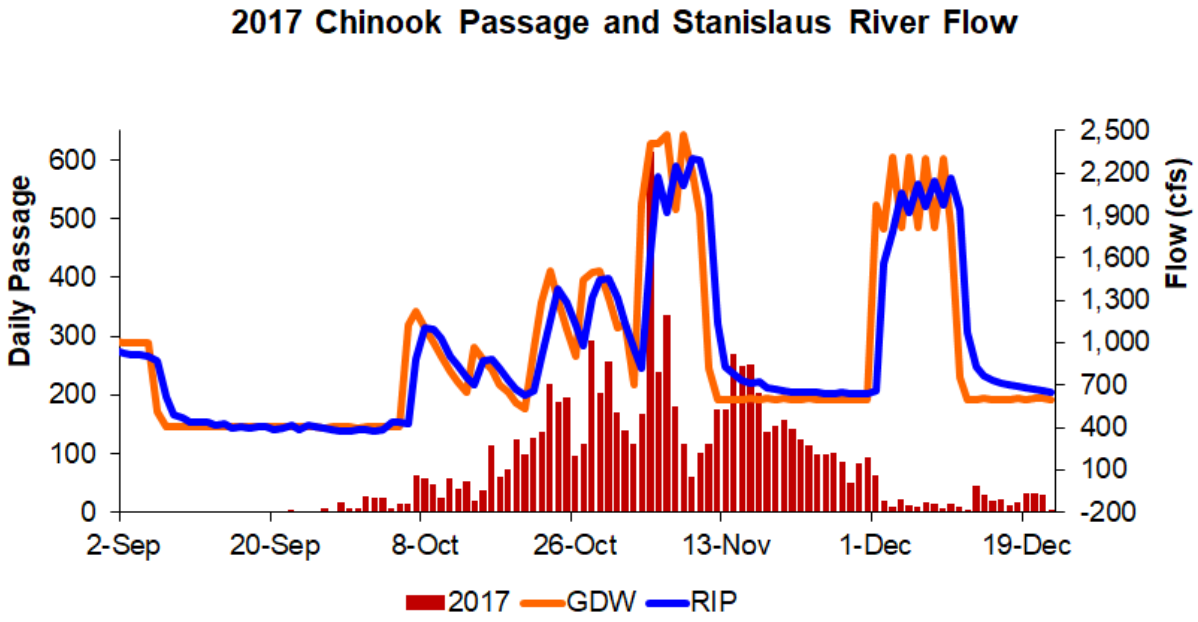


Figure 4-2. Daily upstream passage of adult Chinook salmon at the Stanislaus River Weir and flow at Goodwin Dam (GDW) and Ripon (RIP) from September 16, 2017 to December 22, 2017. Figure provided by FISHBIO in their December 29, 2017 Stanislaus weir update.

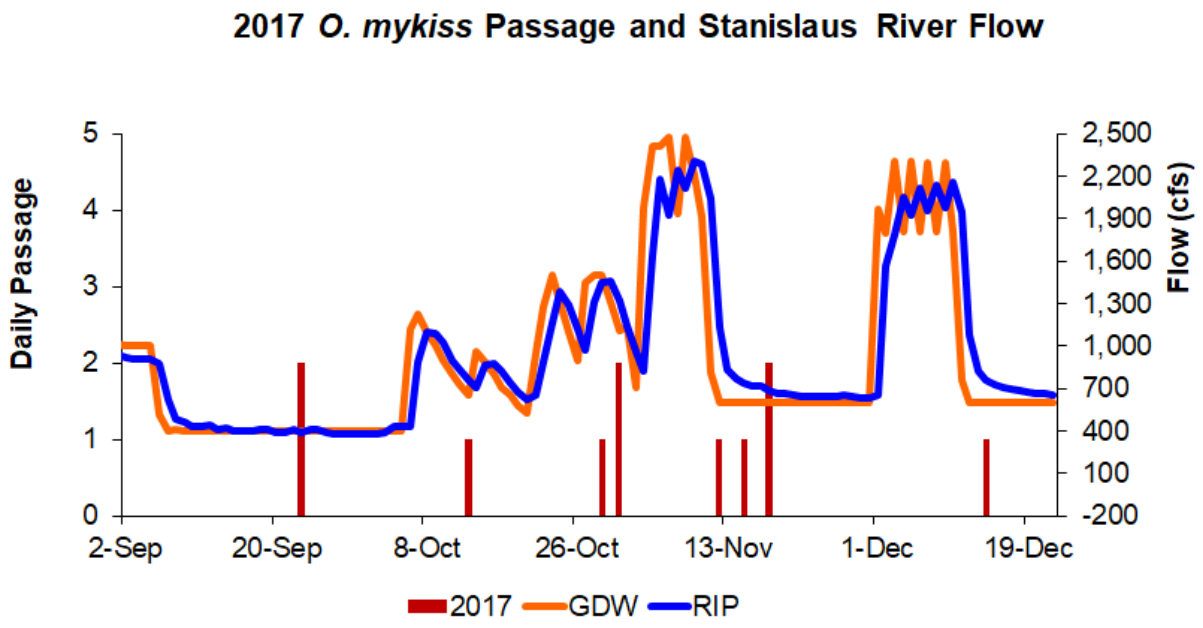


Figure 4-3. Daily upstream passage of O. mykiss at the Stanislaus River Weir and flow at Goodwin Dam (GDW) and Ripon (RIP) from September 16, 2017 to December 22, 2017. Figure based on data provided by FISHBIO in their December 29, 2017 Stanislaus weir update.

Table 4-1: Cumulative net upstream passage of Chinook salmon at the Stanislaus weir near Riverbank (~ river mile 31) since the weir was first installed in 2003. Data courtesy of FISHBIO.

Brood Year	Monitoring Start date	Net Passage (Start date to 12/22)	Seasonal Total
2017	9/15/2017	8498	8,498
2016	9/8/2016	14301	14,399
2015	9/15/2015	12407	12,707
2014	9/5/2014	5508	5,527
2013	9/3/2013	5412	5,452
2012	9/11/2012	7116	7,248
2011	11/8/2011	748	776
2010	9/7/2010	1352	1,364
2009	9/9/2009	1255	1,303
2008	9/9/2008	886	928
2007	9/22/2007	434	439
2006	9/8/2006	2976	3,074
2005	9/8/2005	4124	4,124
2004	9/10/2004	4440	4,448
2003	9/5/2003	4789	4,848

4.3 Rotary Screw Traps near Oakdale and Caswell

Rotary screw trap monitoring of outmigrating juvenile salmonids began at Oakdale (~river mile 40, monitoring conducted by FISHBIO) and at Caswell (~ river mile 9, monitoring funded by USFWS and conducted by the Pacific States Marine Fisheries Commission) in early January. Sampling at Caswell ended on May 25, 2018 with a cumulative seasonal catch of 3,516 non-adipose fin-clipped juvenile Chinook salmon, zero adipose fin-clipped juvenile Chinook salmon and zero juvenile O. mykiss. Sampling at Oakdale ended on June 29, 2018. Daily Chinook catch at these sampling locations is summarized in Figures 4-4 and 4-5; Figure 4-6 plots individual fork lengths of juvenile Chinook salmon captured at the Caswell location over time.

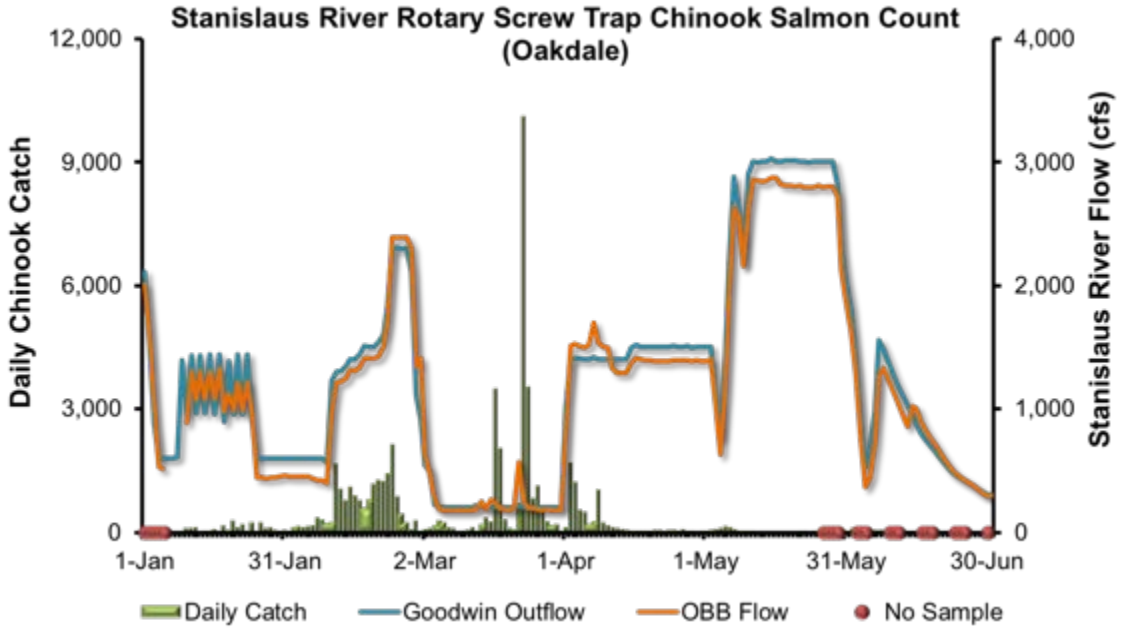


Figure 4-4. Daily catch of outmigrating juvenile Chinook salmon at the Stanislaus River rotary screw trap at Oakdale and flow at Goodwin Dam (GDW) and Orange Blossom Bridge (OBB) for January to June 2018. Figure provided by FISHBIO in their 7/2/18 San Joaquin Basin Update.

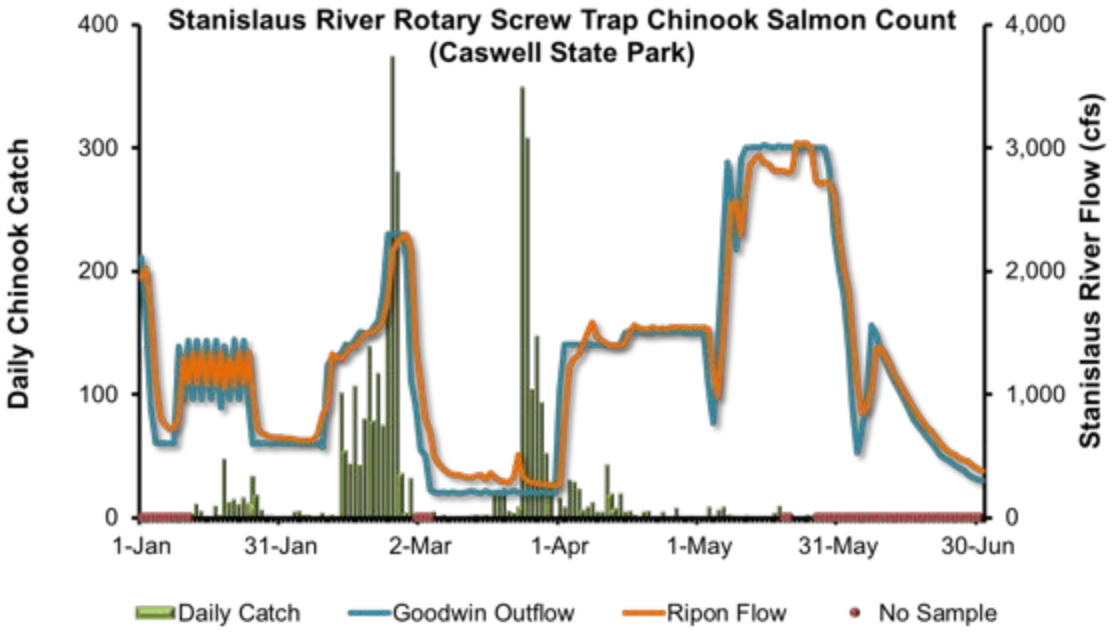


Figure 4-5. Daily catch of outmigrating juvenile Chinook salmon at Caswell and daily average flow (cfs) at Goodwin Dam (GDW) and Ripon (RIP) for January to June 2018. Figure provided by FISHBIO in their July 2, 2018 San Joaquin Basin Update.

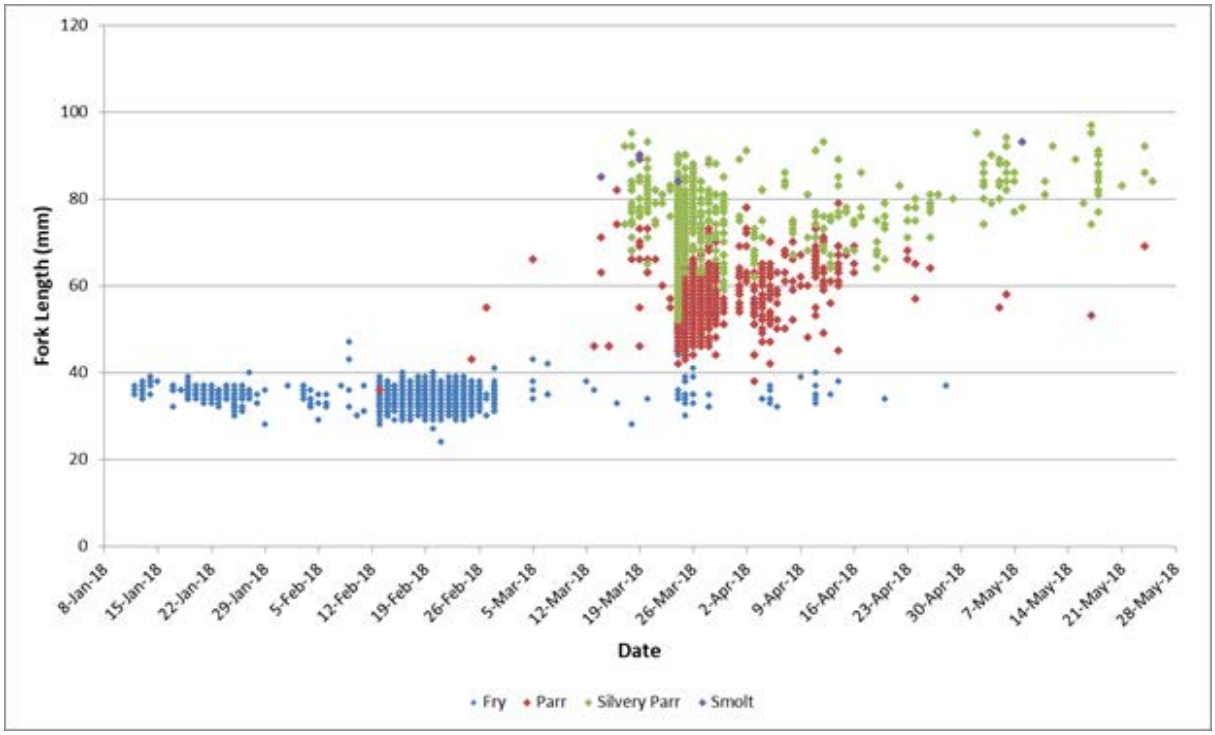


Figure 4-6. Fork length (in mm) and lifestage (fry, parr, silvery parr, or smolt) of outmigrating juvenile Chinook salmon captured at the Caswell rotary screw trap for January to June 2018. Figure provided by Pacific States Marine Fisheries Commission. This summary of data is provisional and subject to change.

CHAPTER 5 REFERENCES

National Marine Fisheries Service (NMFS). 2009. Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project. NMFS-Southwest Region, Long Beach, California. 844 pages plus appendices. http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocap.html

NMFS. 2011. Letter transmitting the 2009 Reasonable and Prudent Alternative with 2011 Amendments. NMFS Southwest Region, Long Beach, California. April 7. http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocap.html

Appendix A — SOG advice on fall pulse flow

Barbara Byrne - NOAA Federal <barbara.byrne@noaa.gov>

NMFS determination re: SOG Advice - Fall Pulse Flow and Temperature

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Fri, Sep 29, 2017 at 4:29 PM
To: rcallejo@usbr.gov
Cc: Jeffrey Rieker <jrieker@usbr.gov>, "Washburn, Thuy T" <TWashburn@usbr.gov>, Jessica Andrieux <jandrieux@usbr.gov>, Elizabeth G' 'Kiteck <EKiteck@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, bhubbard@usbr.gov, DREW LESSARD <dlessard@usbr.gov>, Lee Mao <lmao@usbr.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Russ,

As you know, Action III.1.3 (page 49 of the 2011 RPA Amendments to the NMFS Biological Opinion) provides for the adaptive management of the flow schedule in Appendix 2-E of the NMFS Biological Opinion. Specifically, "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action." (page 50 of the 2011 RPA Amendments to the NMFS Biological Opinion).

NMFS agrees that for 2017, the fall pulse flow may be reshaped according to the "Alternative A" schedule in Attachment 1 of the attached SOG advice. NMFS determines that the proposed change in the fall pulse flow schedule is consistent with the implementation procedures of RPA Action III.1.3.

NMFS also concurs with the advice to shift the initiation date for the fall temperature criterion at Orange Blossom Bridge to October 6, 2017, the date of the first peak within the reshaped fall pulse flow, and determines that the proposed initiation window for the fall temperature criterion is consistent with the implementation procedures of RPA Action III.1.2.

WOMT--In the interest of following the process provided in NMFS' Opinion section 11.2.1.1, this e-mail is to inform WOMT of NMFS' determination, and to provide WOMT with an opportunity to discuss the proposal. If anyone wants to discuss the SOG advice or NMFS determination, please initiate a WOMT meeting as soon as possible. Thanks.

-Garwin-

Garwin Yip
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NOAA FISHERIES West Coast Region

---------- Forwarded message ----------
From: **Callejo, Russell** <rcallejo@usbr.gov>
Date: Fri, Sep 29, 2017 at 4:09 PM
Subject: SOG Advice - Fall Pulse Flow and Temperature
To: garwin.yip@noaa.gov
Cc: Jeffrey Rieker <jrieker@usbr.gov>, Thuy Washburn <twashburn@usbr.gov>, Jessica Andrieux <jandrieux@usbr.gov>, ELIZABETH KITECK <ekiteck@usbr.gov>, Barbara Byrne - NOAA Federal <barbara.byrne@noaa.gov>, "Hubbard, Bradley C" <BHubbard@usbr.gov>, "Lessard, Drew" <dlessard@usbr.gov>, "Mao, Leeyan" <lmao@usbr.gov>

Hi Garwin,

The Stanislaus Operations Group (SOG) met on September 20, 2017, and discussed both the upcoming fall pulse flow schedule in Appendix 2-E of the NMFS Biological Opinion (per Action III.1.3) and the fall temperature criterion at Orange Blossom Bridge (per Action III.1.2). Attached is the SOG advice for implementing these RPA actions during October and November of 2017.

As a summary, SOG advises reshaping the fall pulse flow (Wet year type) into a series of four peaks starting in early October. SOG also advises that the 56°F fall temperature criterion at Orange Blossom Bridge apply beginning October 6, 2017, the first peak of the reshaped fall pulse flow.

Reclamation requests concurrence from NMFS on the reshaped fall pulse flow and the initiation date of the fall temperature criterion.

Please contact me with any questions.

Thanks,
Russ

Russell Callejo
Chief, Water Resources Branch
Bureau of Reclamation
Central California Area Office
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Folsom, CA 95630
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2017.09.29_SOG fall pulse flow & temp initiation advice_FINAL.pdf
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SOG ADVICE RE: IMPLEMENTATION OF THE STANISLAUS RPA ACTIONS DURING OCTOBER AND NOVEMBER 2017

September 29, 2017

Background

Flow

The fall attraction flow is one component of the daily flow schedule in Appendix 2-E of the NMFS BiOp[1] required per Action III.1.3 of the Reasonable and Prudent Alternative (RPA). As noted in the 2011 RPA Amendments[2] (p. 50), the fall attraction flow is intended "…to improve in-stream conditions sufficiently to attract Central Valley (CV) steelhead to the Stanislaus River." The RPA further notes (p. 50) that "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

Temperature

The 56°F fall temperature criterion at Orange Blossom Bridge (OBB) required per Action III.1.2 of the RPA is intended to provide temperatures suitable for the migration and holding of adult CV steelhead. The BiOp notes (p. 47 of the 2011 RPA Amendments) that "This criterion shall apply as of October 1 or as of initiation date of fall pulse flow as agreed to by NMFS."

Below, SOG advises a reshaped fall pulse flow schedule that we believe is consistent with the intent of RPA actions III.1.3.

SOG advice

Flow

For 2017, SOG advises that the fall pulse flow (Wet yeartype) be reshaped according to the "Alternative A" flow schedule described in Table 1 and Figure 1 of Attachment 1.

> *Pulse shaping:*
> At the 9/20/17 SOG meeting, SOG members reviewed some draft flow schedules and agreed to advise a four-peak alternative, "Alternative A", to the default 2-E flow schedule for 2017. The reshaped flow schedule has the same volume (27,174 AF) as the Wet fall pulse in Appendix 2-E. The SOG-advised alternative reshapes the fall pulse volume into a four-peak release that provides flow variability expected to deter spawning at the higher flows that will not be sustained through egg incubation and fry emergence. The maximum daily release in the alternative is 1,375 cfs, comparable to the peak flow of 1,500 in the default 2-E flow schedule. The technical team believes the alternative flow

[1] Available online at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/nmfs_biological_and_conference_opinion_on_the_long-term_operations_of_the_cvp_and_swp.pdf

[2] Available online at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

schedule meets the intent of the RPA action, namely, improving instream conditions and providing an attraction cue for adult salmonids returning to spawn.

Pulse timing:
One function of the fall pulse flow is to help buffer water temperatures to provide conditions suitable for the migration and holding of adult salmonids. Because reported water temperatures in the Stanislaus River in mid-September 2017 were cooler than usual for this time of year, with daily maximum temperatures usually less than 60°F, SOG was comfortable starting the fall pulse flow in early October and having some smaller peaks in mid-October. As in past years, the reshaped fall pulse flow extends into November; SOG expects that the higher-than-base flows will help to buffer water temperatures during the seasonal transition to cooler air temperature. Scheduled flows in the advised alternative are down to base flows in early November, before peak spawning is expected to occur.

The full list of considerations discussed by SOG at the 9/20/17 meeting is summarized in Table 2 of Attachment 1.

Temperature

For 2017, SOG advises that the fall temperature criterion of 56°F at Orange Blossom Bridge (OBB) apply beginning October 6, 2017, the first peak of the reshaped "Alternative A" fall pulse flow. SOG expects that few CV steelhead will migrate into the Stanislaus before the fall pulse flow, and has no evidence this year to suggest otherwise. For the period 9/16/17 through 9/26/17, two *Oncorhynchus mykiss* have been reported as passing upstream at the Stanislaus Weir near Riverbank. Neither fish was greater than 16 inches (*O. mykiss* larger than 16 inches are more likely to be sea-running steelhead rather than resident trout); one of the two had a clipped adipose fin, indicating a hatchery origin. The net upstream cumulative count of fall-run Chinook over the same period was 24 fish. These data provide no clear indication of "early migration" of salmonids into the watershed that might require temperature management to begin on October 1.

From 9/15/17 to 9/28/17, daily maximum temperatures measured at OBB[3] have ranged between 56.9°F and 58.9°F. The 7 day average of the daily maximum temperature (7DADM, the type of temperature criterion applied under Action III.1.2) at OBB as of 9/28/2017 was 57.6°F. Because of progressively shorter day length and cooler night temperatures, SOG expects that water temperatures will start falling even before the pulse flow begins.

[3] See links to monthly summaries of water quality for "STANISLAUS R AT ORANGE BLOSSOM BRIDGE" at: *http://cdec.water.ca.gov/wquality/*

ATTACHMENT 1

Stanislaus fall pulse flow schedule advised by SOG for October-November 2017

Table 1. Stanislaus fall pulse flow schedules considered by SOG for October-November 2017. SOG advises that the "Alternative A" pulse be implemented rather than the Appendix 2-E schedule.

		Appendix 2-E						
		Stanislaus River Minimum Fish Flow Schedule						
		Water Year Type: Wet						
		Daily					Cumulative	
		Total CFS	Total AF	Base CFS	Pulse CFS	Pulse AF	Pulse AF	Total AF
OCT	10/1	400	793	400	0	0	0	793
	10/2	400	793	400	0	0	0	1587
	10/3	400	793	400	0	0	0	2380
	10/4	400	793	400	0	0	0	3174
	10/5	400	793	400	0	0	0	3967
	10/6	400	793	400	0	0	0	4760
	10/7	400	793	400	0	0	0	5554
	10/8	400	793	400	0	0	0	6347
	10/9	400	793	400	0	0	0	7140
	10/10	400	793	400	0	0	0	7934
	10/11	400	793	400	0	0	0	8727
	10/12	400	793	400	0	0	0	9521
	10/13	400	793	400	0	0	0	10314
	10/14	400	793	400	0	0	0	11107
	10/15	500	992	400	100	198	198	12099
	10/16	750	1488	400	350	694	893	13587
	10/17	1000	1983	400	600	1190	2083	15570
	10/18	1250	2479	400	850	1686	3769	18050
	10/19	1500	2975	400	1100	2182	5950	21025
	10/20	1500	2975	400	1100	2182	8132	24000
	10/21	1500	2975	400	1100	2182	10314	26975
	10/22	1500	2975	400	1100	2182	12496	29950
	10/23	1500	2975	400	1100	2182	14678	32926
	10/24	1500	2975	400	1100	2182	16860	35901
	10/25	1500	2975	400	1100	2182	19041	38876
	10/26	1500	2975	400	1100	2182	21223	41851
	10/27	1500	2975	400	1100	2182	23405	44826
	10/28	1250	2479	400	850	1686	25091	47306
	10/29	1000	1983	400	600	1190	26281	49289
	10/30	750	1488	400	350	694	26975	50777
	10/31	500	992	400	100	198	27174	51769
NOV	11/1	300	595	300	0	0	27174	52364
	11/2	300	595	300	0	0	27174	52959
	11/3	300	595	300	0	0	27174	53554
	11/4	300	595	300	0	0	27174	54149
	11/5	300	595	300	0	0	27174	54744
	11/6	300	595	300	0	0	27174	55339
	11/7	300	595	300	0	0	27174	55934
	11/8	300	595	300	0	0	27174	56529
	11/9	300	595	300	0	0	27174	57124
	11/10	300	595	300	0	0	27174	57719
	11/11	300	595	300	0	0	27174	58314
	11/12	300	595	300	0	0	27174	58909
	11/13	300	595	300	0	0	27174	59504
	11/14	300	595	300	0	0	27174	60099
	11/15	300	595	300	0	0	27174	60694

		Alternative A		
		tanislaus River Minimum Fish Flow Schedu		
		Water Year Type: Wet		
		Daily		Cumulative
		Total CFS	Total AF	Total AF
OCT	10/1	400	793	793
	10/2	400	793	1587
	10/3	400	793	2380
	10/4	400	793	3174
	10/5	400	793	3967
	10/6	1375	2727	6694
	10/7	1225	2430	9124
	10/8	1100	2182	11306
	10/9	1000	1983	13289
	10/10	900	1785	15074
	10/11	800	1587	16661
	10/12	725	1438	18099
	10/13	650	1289	19388
	10/14	975	1934	21322
	10/15	875	1736	23058
	10/16	800	1587	24645
	10/17	700	1388	26033
	10/18	650	1289	27322
	10/19	575	1140	28463
	10/20	525	1041	29504
	10/21	975	1934	31438
	10/22	875	1736	33174
	10/23	800	1587	34760
	10/24	700	1388	36149
	10/25	650	1289	37438
	10/26	575	1140	38579
	10/27	525	1041	39620
	10/28	1300	2579	42198
	10/29	1150	2281	44479
	10/30	1050	2083	46562
	10/31	950	1884	48446
NOV	11/1	750	1488	49934
	11/2	675	1339	51273
	11/3	600	1190	52463
	11/4	525	1041	53504
	11/5	450	893	54397
	11/6	425	843	55240
	11/7	350	694	55934
	11/8	300	595	56529
	11/9	300	595	57124
	11/10	300	595	57719
	11/11	300	595	58314
	11/12	300	595	58909
	11/13	300	595	59504
	11/14	300	595	60099
	11/15	300	595	60694

Figure 1. Stanislaus fall pulse flow schedules considered by SOG for October-November 2017. SOG advised that the "Alternative A" pulse be implemented rather than the Appendix 2-E schedule.

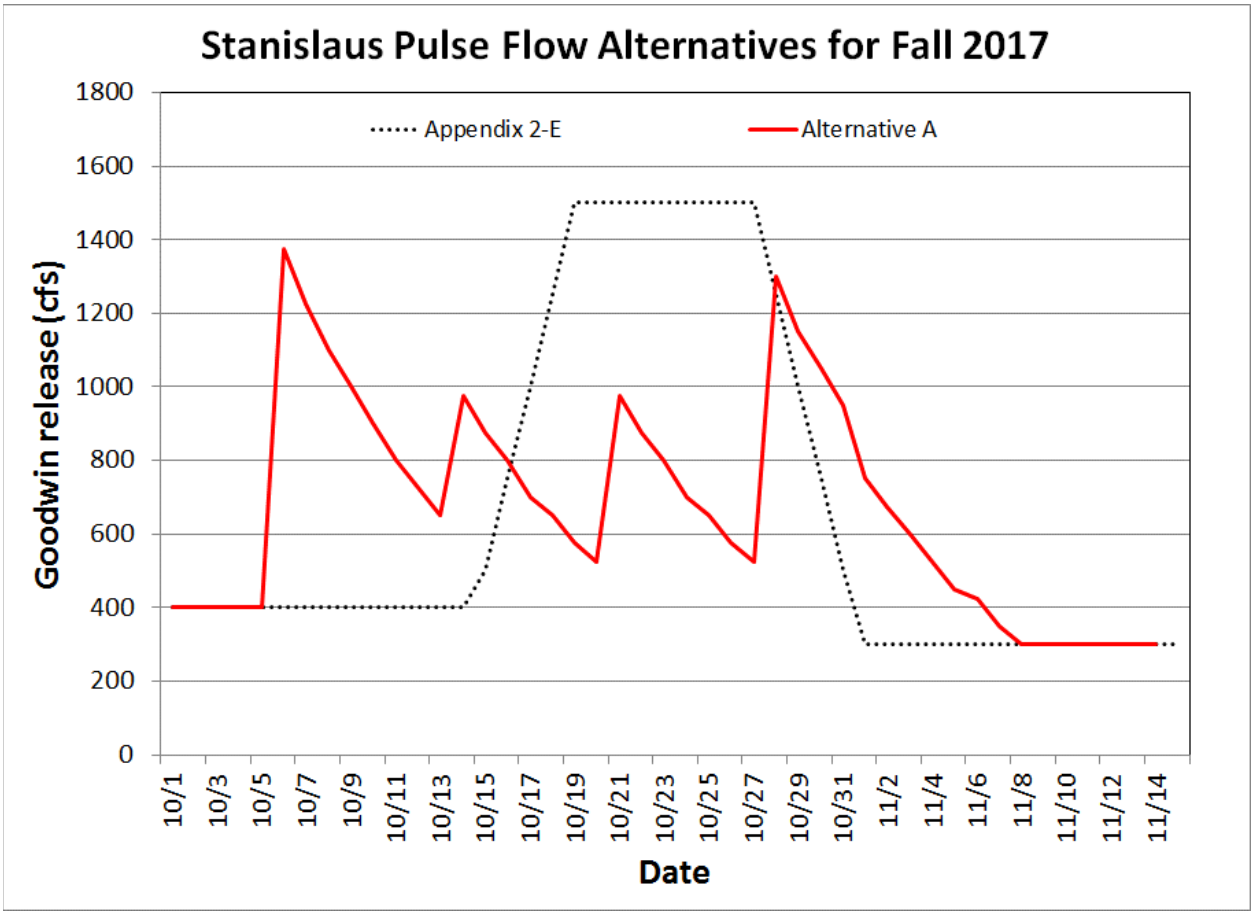

Table 2. Factors considered in the design of the SOG-advised fall pulse flow.

Driver	Location	Lifestage	Notes
Agriculture	lower trib	N/A	The NMFS Appendix 2-E flow schedule does, in some months in some yeartypes, require flows above 1500 cfs. Because of seepage concerns, NMFS limited the duration of those flows to no more than 10 consecutive days. When the default Appendix 2-E flow schedule for a pulse event does not exceed 1500 cfs, NMFS will not require that a reshaped flow exceed 1500 cfs.
D.O.	Vernalis	Adult	The combined pulse should, ideally, provide sufficient flow to achieve a D.O. of at least 7ppm in the deepwater ship channel.
Migration Window	Vernalis	Adult	Provide temperature/D.O. suitable for upmigration for at least several weeks.
Monitoring	Riverbank	N/A	Weir operation is impacted when flows exceed 1500 cfs, or last for more than a few days at 1500 cfs.
Redd Scour/Stranding	Trib/ spawning area	redd/eggs/fry	The main pulse should occur before a significant number of the season's redds are created. Historically, peak spawning occurs mid-November.
Redd Stranding	Trib/spawning area	redd/eggs/fry	The pulse should avoid sustained flows that would encourage redd construction in areas that will be dewatered during post-attraction-pulse flows.
Temperature	Vernalis	Adult	Pulse should be late enough to provide cool enough temperatures for upmigrants through the San Joaquin to avoid egg mortality within migrating adults.
Temperature	Trib/spawning area	Adult	Pulse should be shaped and timed to provide and maintain instream temperatures sufficient to avoid egg mortality for returning adults.
Preferred rafting flows	Goodwin Canyon to Knights Ferry	N/A	Preferred flows for rafting are 800-1200 cfs between 10am and 4pm on weekend days during October.

Appendix B — SOG advice on winter instability flows

Barbara Byrne - NOAA Federal <barbara.byrne@noaa.gov>

NMFS determination Re: SOG Advice - Winter Instability Flows

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Mon, Jan 8, 2018 at 2:05 PM
To: Russell Callejo <rcallejo@usbr.gov>
Cc: Jeffrey Rieker <jrieker@usbr.gov>, Elizabeth G' 'Kiteck <EKiteck@usbr.gov>, "Washburn, Thuy T" <TWashburn@usbr.gov>, DREW LESSARD <dlessard@usbr.gov>, Lee Mao <lmao@usbr.gov>, Bradley Hubbard <bhubbard@usbr.gov>, Jessica Andrieux <jandrieux@usbr.gov>, sperrin@usbr.gov, Barbara Byrne <Barbara.Byrne@noaa.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Russ--As you know, Action III.1.3 (page 49 of the 2011 RPA Amendments to the NMFS Biological Opinion) provides for the adaptive management of the flow schedule in Appendix 2-E of the NMFS Biological Opinion. Specifically, "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action." (page 50 of the 2011 RPA Amendments to the NMFS Biological Opinion)

NMFS agrees that for January and February 2018, the winter instability flows may be (1) reshaped according to the attached SOG advice (specifically, the "Alt-A" column in Table 1 and shape in Figure 1), and (2) shifted in timing to coincide with a natural storm event or scheduled to be initiated by the end of each calendar month if no rainfall event occurs. Until each winter instability flow is implemented, Goodwin releases must not be less than the minimum base flow in the Appendix 2-E schedule for January and February (300 cfs for the Wet yeartype, 200 cfs for all other yeartypes).

NMFS determines that the proposed changes in the shaping and timing of the January and February winter instability flows are consistent with the implementation procedures of RPA Action III.1.3.

WOMT--In the interest of following the process provided in NMFS' Opinion section 11.2.1.1, this e-mail is to inform WOMT of NMFS' determination, and to provide WOMT with an opportunity to discuss the proposal. If anyone wants to discuss the SOG advice or NMFS determination, please initiate a WOMT meeting or bring it up during tomorrow afternoon's WOMT call. Thanks.

-Garwin-

Garwin Yip
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NOAA FISHERIES West Coast Region

---------- Forwarded message ----------
From: **Callejo, Russell** <rcallejo@usbr.gov>
Date: Fri, Jan 5, 2018 at 6:07 PM
Subject: SOG Advice - Winter Instability Flows
To: Garwin Yip - NOAA Federal <garwin.yip@noaa.gov>
Cc: Jeffrey Rieker <jrieker@usbr.gov>, ELIZABETH KITECK <ekiteck@usbr.gov>, Thuy Washburn <twashburn@usbr.gov>, "Lessard, Drew" <dlessard@usbr.gov>, "Mao, Leeyan" <lmao@usbr.gov>, "Hubbard, Bradley C" <BHubbard@usbr.gov>, Jessica Andrieux <jandrieux@usbr.gov>, "Perrin, Sarah" <sperrin@usbr.gov>, Barbara Byrne - NOAA Federal <barbara.byrne@noaa.gov>

Hi Garwin,

Attached is the Stanislaus Operations Group (SOG) advice for implementing winter instability flows in January and February 2018. As a summary, SOG advises to reshape the winter instability flow to simulate a storm pulse, and shift its timing to coincide with a natural storm event (if applicable).

Reclamation requests concurrence from NMFS on both reshaping and timing flexibility regarding winter instability flows in January and February 2018.

Please contact me with any questions.

Thanks,
Russ

Russell Callejo
Chief, Water Resources Branch
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2018.01.05_SOG winter pulse advice_FINAL.pdf
133K

SOG ADVICE RE: IMPLEMENTATION OF THE STANISLAUS RPA ACTIONS DURING JANUARY & FEBRUARY 2018
1/5/2018

Background

Winter instability flows in January and February are a component of the daily flow schedule in Appendix 2-E of the NMFS BiOp[1] required per Action III.1.3 of the Reasonable and Prudent Alternative (RPA). As noted in the 2011 RPA Amendments[2] (p. 50), the winter instability flows are intended "…to simulate natural variability in the winter hydrograph and to enhance access to varied rearing habitats." The RPA further notes (p. 50) that "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

Below, SOG advises a modified winter instability flow for implementation in both January and February that we believe is consistent with the intent of the RPA action.

SOG notes that reservoir management releases in January or February may be sufficient to satisfy the winter instability flows, for example if releases for reservoir management remain at or above 600 cfs. In the event that reservoir management releases beyond the Appendix 2-E volume are needed, SOG encourages that, to the extent possible and within the ramping rates in the NMFS BiOp, those releases to be shaped to mimic a storm hydrograph similar to the shaping shown in Figure 1 (i.e. to have a rapidly ascending limb and a slowly declining limb).

SOG advice

Flow per RPA Action III.1.3

For January and February 2018, SOG advises that the winter instability flow (Wet yeartype) be (a) reshaped according to the Alt-A flow schedule described in Table 1 and Figure 1, and (b) shifted in time to coincide with a natural storm event or scheduled to be initiated by the end of each calendar month if no rainfall event occurs. SOG would prefer the January winter instability flow to be implemented in mid to late January.

a) RESHAPING: The Alt-A pulse shaping has the same volume (3,570 AF in addition to the 300 cfs base flow) as the Wet yeartype winter instability pulse in Appendix 2-E but has been reshaped to include a higher peak flow. The technical team believes it meets the intent of the RPA action, namely, it provides variability in the winter hydrograph by simulating a small storm pulse. The shape of the Alt-A pulse, with its more rapidly rising limb and slowly descending limb, is characteristic of the flow pattern associated with storm events. Reshaping the subdaily flow pattern to increase the peak flow to 1,500 cfs for the early portion of the pulse will inundate a greater portion of the Honolulu Bar,

[1] The BiOp and all appendices are available online at: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocap.html

[2] Available online at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

Lancaster Road, and Buttonbush restoration areas. 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 allochthonous input to the main channel. The duration of the Alt-A pulse is similar to the six-day duration of the Wet yeartype winter instability flow schedule in Appendix 2-E.

If the yeartype based on the New Melones water supply parameter changes in February (the first month in which an official forecast is available; information usually available mid-month) before the February WIF is implemented, SOG will provide new advice on how to reshape the water volume of the winter instability flow for that new yeartype.

b) SHIFT IN TIME: According to the flow schedule in Appendix 2-E, the January and February winter instability flows are scheduled to begin on January 3rd and February 5th, respectively. Shifting the winter instability flow in time to coincide with a natural storm event (if applicable) each month is expected to better capture the characteristics of a natural hydrograph as the runoff, turbidity, meteorological conditions, etc. associated with a storm event will co-occur with the pulse of regulated flow.

Flow variability could cue outmigration for juvenile California Central Valley steelhead (*Oncorhynchus mykiss)* throughout January, but few fall-run Chinook fry will have emerged in early January. SOG would prefer the January winter instability flow to be implemented in mid to late January, when more fall-run Chinook fry will have emerged from redds and available to be redistributed by the flow.

Reclamation will monitor the forecasted precipitation and will solicit SOG input on scheduling the January winter instability pulse. If the pulse has not been scheduled by January 17, then SOG will discuss scheduling at the January 17 SOG meeting to ensure a pulse is initiated no later than January 31.

Reclamation will also monitor the forecasted precipitation in February and will solicit SOG input on scheduling the February winter instability pulse. If the pulse has not been scheduled by February 21, then SOG will discuss scheduling at the February 21 SOG meeting to ensure a pulse is initiated no later than February 28.

Table 1 Winter instability flow shape advised by SOG (Alt-A, highlighted in yellow), in comparison to the pulse as described in Appendix 2-E. Average hourly flow (in cfs) shown at the top is based on flows for Days 1-6, which is the default pulse period in Appendix 2-E.

		Appendix 2E (Wet)	Alt-A
Average Hourly CFS		600	600
Day	Time	Appendix 2E (Wet)	Alt-A
0	17	300	300
0	18	300	300
0	19	300	300
0	20	300	300
0	21	300	300
0	22	300	300
0	23	300	300
0	24	300	300
1	1	600	300
1	2	600	300
1	3	600	300
1	4	600	300
1	5	600	300
1	6	600	400
1	7	600	400
1	8	600	500
1	9	600	500
1	10	600	600
1	11	600	750
1	12	600	850
1	13	600	1000
1	14	600	1100
1	15	600	1250
1	16	600	1350
1	17	600	1500
1	18	600	1500
1	19	600	1400
1	20	600	1400
1	21	600	1300
1	22	600	1300
1	23	600	1200
1	24	600	1200

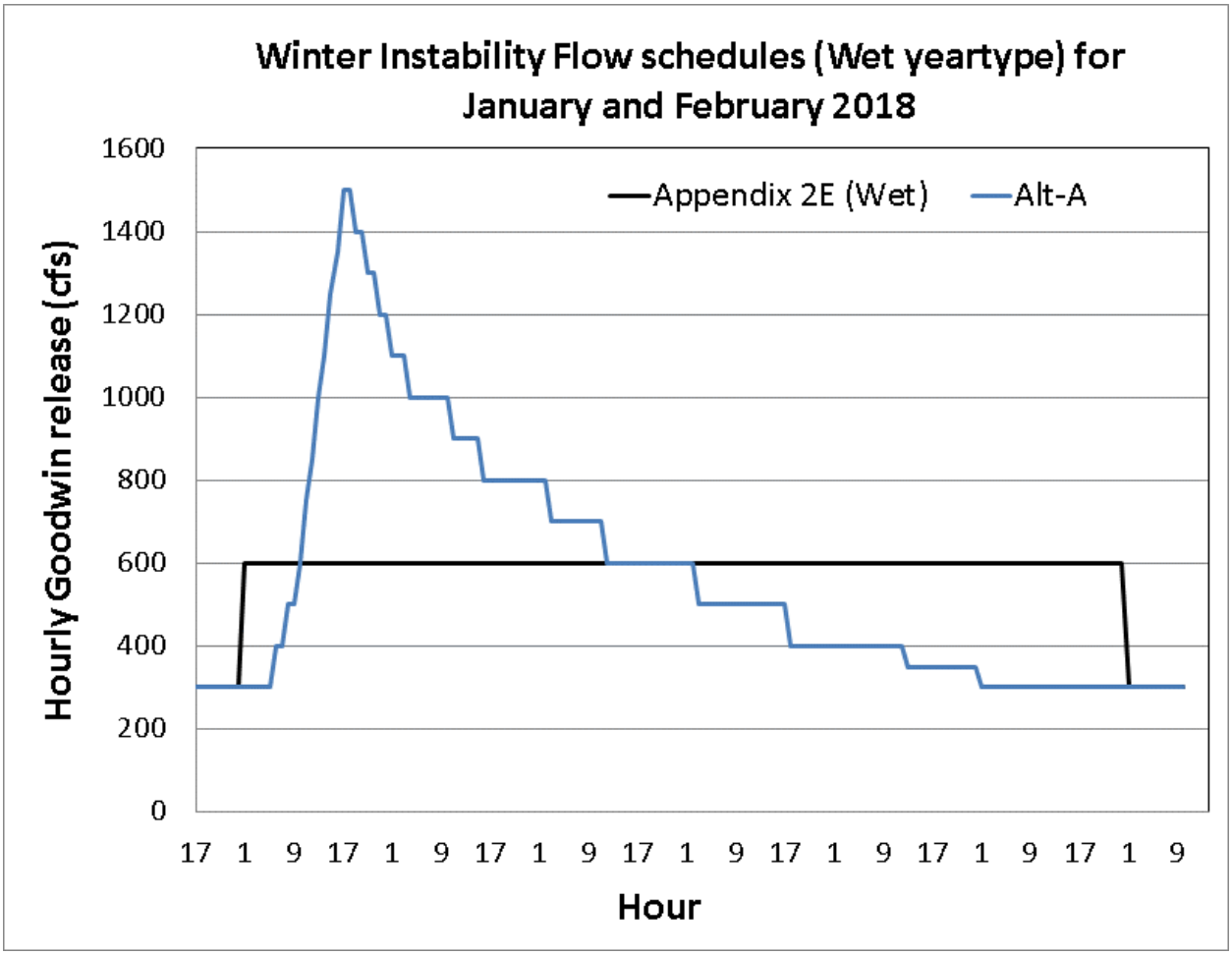
Day	Time	Appendix 2E (Wet)	Alt-A
2	1	600	1100
2	2	600	1100
2	3	600	1100
2	4	600	1000
2	5	600	1000
2	6	600	1000
2	7	600	1000
2	8	600	1000
2	9	600	1000
2	10	600	1000
2	11	600	900
2	12	600	900
2	13	600	900
2	14	600	900
2	15	600	900
2	16	600	800
2	17	600	800
2	18	600	800
2	19	600	800
2	20	600	800
2	21	600	800
2	22	600	800
2	23	600	800
2	24	600	800
3	1	600	800
3	2	600	800
3	3	600	700
3	4	600	700
3	5	600	700
3	6	600	700
3	7	600	700
3	8	600	700
3	9	600	700
3	10	600	700
3	11	600	700
3	12	600	600

Day	Time	Appendix 2E (Wet)	Alt-A
3	13	600	600
3	14	600	600
3	15	600	600
3	16	600	600
3	17	600	600
3	18	600	600
3	19	600	600
3	20	600	600
3	21	600	600
3	22	600	600
3	23	600	600
3	24	600	600
4	1	600	600
4	2	600	600
4	3	600	500
4	4	600	500
4	5	600	500
4	6	600	500
4	7	600	500
4	8	600	500
4	9	600	500
4	10	600	500
4	11	600	500
4	12	600	500
4	13	600	500
4	14	600	500
4	15	600	500
4	16	600	500
4	17	600	500
4	18	600	400
4	19	600	400
4	20	600	400
4	21	600	400
4	22	600	400
4	23	600	400
4	24	600	400

Day	Time	Appendix 2E (Wet)	Alt-A
5	1	600	400
5	2	600	400
5	3	600	400
5	4	600	400
5	5	600	400
5	6	600	400
5	7	600	400
5	8	600	400
5	9	600	400
5	10	600	400
5	11	600	400
5	12	600	400
5	13	600	350
5	14	600	350
5	15	600	350
5	16	600	350
5	17	600	350
5	18	600	350
5	19	600	350
5	20	600	350
5	21	600	350
5	22	600	350
5	23	600	350
5	24	600	350
6	1	600	300
6	2	600	300
6	3	600	300
6	4	600	300
6	5	600	300
6	6	600	300
6	7	600	300
6	8	600	300
6	9	600	300
6	10	600	300
6	11	600	300
6	12	600	300

Day	Time	Appendix 2E (Wet)	Alt-A
6	13	600	300
6	14	600	300
6	15	600	300
6	16	600	300
6	17	600	300
6	18	600	300
6	19	600	300
6	20	600	300
6	21	600	300
6	22	600	300
6	23	600	300
6	24	600	300
7	1	300	300
7	2	300	300
7	3	300	300
7	4	300	300
7	5	300	300
7	6	300	300
7	7	300	300
7	8	300	300
7	9	300	300
7	10	300	300

Figure 1: Plot of winter instability flow shapes from Table 1. Note that the horizontal "Hour" axis is not intended to imply any particular date since the advice is to implement the pulse, if possible, coincident with a natural storm event rather than on a specific calendar date.



Appendix C — SOG advice on spring pulse flow

NMFS determination: SOG Advice - WY 2018 Spring Pulse Flows

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Wed, Apr 25, 2018 at 2:50 PM
To: Russell Callejo <rcallejo@usbr.gov>
Cc: Jeffrey Rieker <jrieker@usbr.gov>, Elizabeth G' 'Kiteck <EKiteck@usbr.gov>, "Washburn, Thuy T" <TWashburn@usbr.gov>, Drew Lessard <dlessard@usbr.gov>, Lee Mao <lmao@usbr.gov>, Brad Hubbard <bhubbard@usbr.gov>, Jessica Andrieux <jandrieux@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, "Oliver (Towns) Burgess" <oburgess@usbr.gov>, Michael Hendrick <mhendrick@usbr.gov>, Elissa Buttermore <ebuttermore@usbr.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Russ,

As you know, Action III.1.3 (pages 49-50 of the 2011 RPA Amendments to the NMFS Biological Opinion) provides for the adaptive management of the flow schedule in Appendix 2-E of the NMFS Biological Opinion. Specifically, "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

The first element of the final SOG advice is an update of the water volume accounting based on the April forecast. In the March 28, 2018, response regarding the interim SOG advice, I indicated NMFS' agreement with the proposed water accounting methodology in WY 2018 and future water years, and this update is consistent with that approved methodology.

The second element of the final SOG advice is a proposed reshaping of the remainder of the spring outmigration pulse flow schedule. NMFS concurs that the "Alternative A" flow schedule described in Section II of the attached SOG advice meets the objective of RPA Action III.1.3 "…to incorporate habitat maintaining geomorphic flows in a flow pattern that will provide migratory cues to smolts and facilitate out-migrant smolt movement…" and may be implemented in lieu of the daily flow schedule in Appendix 2-E.

WOMT--In the interest of following the process provided in NMFS' Opinion section 11.2.1.1, this e-mail is to inform WOMT of NMFS' determination, and to provide WOMT with an opportunity to discuss the proposal. If anyone wants to discuss the SOG advice or NMFS determination, please convene a WOMT meeting.

Thanks.

-Garwin-

Garwin Yip
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NOAA FISHERIES West Coast Region

---------- Forwarded message ----------
From: **Callejo, Russell** <rcallejo@usbr.gov>
Date: Tue, Apr 24, 2018 at 3:49 PM
Subject: SOG Advice - WY 2018 Spring Pulse Flows
To: Garwin Yip - NOAA Federal <garwin.yip@noaa.gov>
Cc: Jeffrey Rieker <jrieker@usbr.gov>, ELIZABETH KITECK <ekiteck@usbr.gov>, Thuy Washburn <twashburn@usbr.gov>, "Lessard, Drew" <dlessard@usbr.gov>, "Mao, Leeyan" <lmao@usbr.gov>, "Hubbard, Bradley C" <BHubbard@usbr.gov>, Jessica Andrieux <jandrieux@usbr.gov>, Barbara Byrne - NOAA Federal <barbara.byrne@noaa.gov>, Kristin White <knwhite@usbr.gov>, Mike Hendrick <mhendrick@usbr.gov>, "Burgess, Oliver (Towns)" <oburgess@usbr.gov>, "Buttermore, Elissa" <ebuttermore@usbr.gov>

Hi Garwin,

Please find attached final Stanislaus Operations Group (SOG) advice for implementing the remainder of the water year 2018 spring pulse flow. Recall that NMFS approved interim SOG advice for April 2018 flows on March 28 and April 13.

This final SOG advice includes two elements:

1. An update of the water volume accounting to account for the year-type change based on the April forecast.
2. SOG advice for the remainder of a modified spring outmigration pulse flow schedule that we believe is consistent with the intent of the RPA action.

Reclamation is requesting NMFS's concurrence that the SOG-advised "Alternative A" schedule may be implemented in lieu of the daily flow schedule in Appendix 2-E.

Please contact me if you have any questions.

Thanks,
Russ

Russell Callejo
Chief, Water Resources Branch
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2018.04.24_SOG advice_spring pulse_FINAL.pdf
842K

Stanislaus Operations Group Advice Re:
WY 2018 Stanislaus River Spring Pulse flow
April 24, 2018

Background

Spring outmigration pulse flows are one component of the daily flow schedule in Appendix 2-E of the NMFS BiOp[1] required per Action III.1.3 of the Reasonable and Prudent Alternative (RPA). As noted in the 2011 BiOp Amendments[2], spring pulse flows are intended to provide "outmigration flow cues to enhance likelihood of anadromy" and "late spring flows for conveyance and maintenance of downstream migratory habitat quality". The 2011 BiOp Amendments further note (p. 50) that "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

Previously, NMFS approved interim SOG advice for early April 2018 (Attachment 2) and a revision to that interim advice (Attachment 3).

The current SOG advice includes two elements:

I. An update of the water volume accounting to account for the yeartype change based on the April forecast.
II. SOG advice for the remainder of a modified spring outmigration pulse flow schedule that we believe is consistent with the intent of the RPA action.

SOG Advice

I. Water Volume Accounting

Background: SOG proposed in the interim SOG advice, and NMFS approved (Attachment 2), a water accounting framework to determine the water volume required by Appendix 2-E. Because the yeartype is generally updated mid-month based on the snow surveys completed early in the month, the framework calculates the total required instream flow volume for the spring pulse flow period based on the default flow schedule in Appendix 2-E from the 16th of Month A to the 15th of Month B, based on the yeartype determined by the Month A forecast.

WY 2018 accounting, updated based on the April forecast: During WY 2018, the Stanislaus yeartype, based on the New Melones Index, shifted from Wet to Below Normal in mid-January based on the January forecast, and remained Below Normal based on the February and March forecasts. The Stanislaus yeartype shifted to Above Normal based on the April forecast. The total required instream flow volume pursuant to Action III.1.3 for the March 16-June 30 period is detailed below:

[1] The BiOp and all appendices are available online at:
http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocap.html

[2] Available online at:
http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

Date range	Stanislaus yeartype (Month of forecast)	Total water volume in default schedule in Appendix 2-E (acre-feet)
3/16/18-4/15/18	Below Normal (March)	50,182
4/16/18-5/15/18	Above Normal (April)	94,413
5/16/18-6/15/18	Above Normal* (May)	71,008
6/15/18-6/30/18	Above Normal* (June)	23,008
	Total:	238,612

** If the Stanislaus yeartype changes from Above Normal based on the May or June forecasts, SOG will recalculate the volume requirement and advise a revised flow schedule.*

II. SOG advice

For 2018, SOG advises that the spring outmigration pulse flow be reshaped according to the flow schedule described in Alternative A (See Attachment 1). The Alternative A flows through April 30 have already been approved by NMFS based on the interim advice (see Attachments 2 and 3) and are included here in order to provide a complete overview of the WY 2018 spring pulse flow.

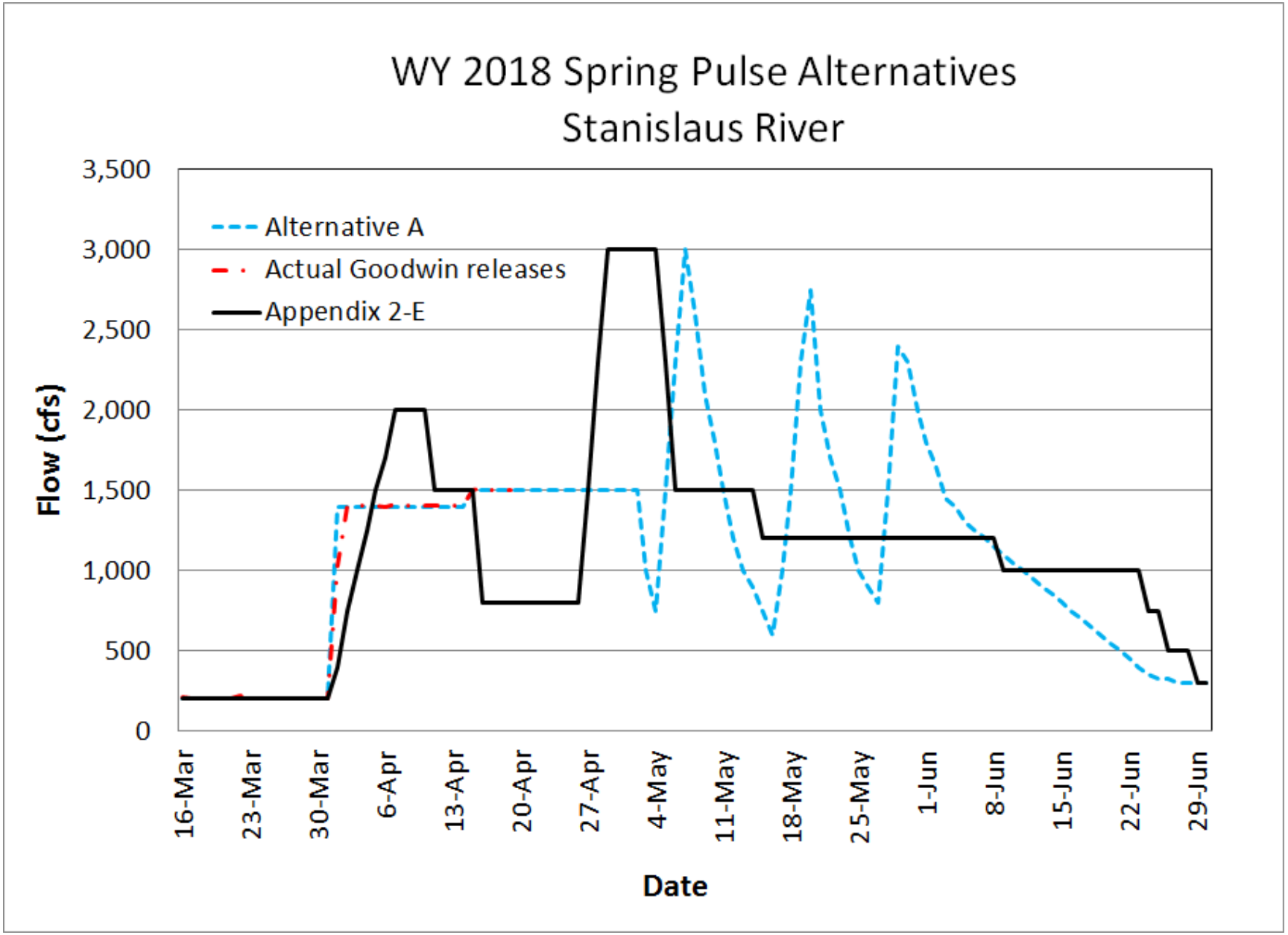
The Alternative A schedule has the same total volume (238,615 AF, including base flows) for the March 16-June 30 period as the default Appendix 2-E schedule, as described in Section I of this advice. The technical team believes that reshaping meets the intent of the RPA action by providing a spring pulse flow that may cue anadromy and improve migratory habitat in both the Stanislaus River and in the mainstem San Joaquin River and southern delta. In the Stanislaus River, higher flows are expected to reduce 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) are expected to convey outmigrating salmonids more rapidly along their migratory pathway, which may improve outmigration success.

Some key features of the Alternative A pulse include:

- **Two two-week periods at steady flows** during April to inundate floodplain benches at the Buttonbush restoration area in support of restoration monitoring work at that location.
- Reshaping the few larger pulses identified in Appendix 2-E into **pulses that extend flow variability to later in the season** to provide opportunities for a broader range of salmonid outmigration timing. Increased flows are intended to cue outmigration and improve migratory habitat downstream.
- The **time frame** of the Alt-A pulse (comparable to that of the default 2-E schedule) is expected to provide some inundation of shallow-water habitat and temperature buffering from April through early June; the extent of such benefits will vary with flow throughout the spring pulse period.
- Other considerations for in-basin interests:
    - The limited time at flows >1,500 cfs is intended to address agricultural seepage concerns.

Attachment 1

Stanislaus spring outmigration flow schedule advised by SOG for March 16-June 30, 2018


WY 2018 Spring Pulse Alternatives
Stanislaus River
Alternative A
Actual Goodwin releases
Appendix 2-E
Flow (cfs)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
16-Mar
23-Mar
30-Mar
6-Apr
13-Apr
20-Apr
27-Apr
4-May
11-May
18-May
25-May
1-Jun
8-Jun
15-Jun
22-Jun
29-Jun
Date

Date	Appendix 2-E (cfs)	Alternative A (SOG-advised) (cfs)
3/16/2013	200	200
3/17/2013	200	200
3/18/2013	200	200
3/19/2013	200	200
3/20/2013	200	200
3/21/2013	200	200
3/22/2013	200	200
3/23/2013	200	200
3/24/2013	200	200
3/25/2013	200	200
3/26/2013	200	200
3/27/2013	200	200
3/28/2013	200	200
3/29/2013	200	200
3/30/2013	200	200
3/31/2013	200	200
4/1/2013	400	1400
4/2/2013	750	1400
4/3/2013	1000	1400
4/4/2013	1250	1400
4/5/2013	1500	1400
4/6/2013	1700	1400
4/7/2013	2000	1400
4/8/2013	2000	1400
4/9/2013	2000	1400
4/10/2013	2000	1400
4/11/2013	1500	1400
4/12/2013	1500	1400
4/13/2013	1500	1400
4/14/2013	1500	1400
4/15/2013	1500	1500
4/16/2013	800	1500
4/17/2013	800	1500
4/18/2013	800	1500
4/19/2013	800	1500
4/20/2013	800	1500
4/21/2013	800	1500
4/22/2013	800	1500
4/23/2013	800	1500
4/24/2013	800	1500
4/25/2013	800	1500
4/26/2013	800	1500
4/27/2013	1500	1500
4/28/2013	2300	1500
4/29/2013	3000	1500
4/30/2013	3000	1500
5/1/2013	3000	1500
5/2/2013	3000	1500
5/3/2013	3000	1000
5/4/2013	3000	750
5/5/2013	2300	1500
5/6/2013	1500	2300
5/7/2013	1500	3000

Date	Appendix 2-E (cfs)	Alternative A (SOG-advised) (cfs)
5/8/2013	1500	2600
5/9/2013	1500	2100
5/10/2013	1500	1800
5/11/2013	1500	1500
5/12/2013	1500	1200
5/13/2013	1500	1000
5/14/2013	1500	900
5/15/2013	1200	750
5/16/2013	1200	600
5/17/2013	1200	1000
5/18/2013	1200	1500
5/19/2013	1200	2300
5/20/2013	1200	2750
5/21/2013	1200	2000
5/22/2013	1200	1700
5/23/2013	1200	1500
5/24/2013	1200	1200
5/25/2013	1200	1000
5/26/2013	1200	900
5/27/2013	1200	800
5/28/2013	1200	1500
5/29/2013	1200	2400
5/30/2013	1200	2300
5/31/2013	1200	2000
6/1/2013	1200	1800
6/2/2013	1200	1650
6/3/2013	1200	1450
6/4/2013	1200	1400
6/5/2013	1200	1300
6/6/2013	1200	1250
6/7/2013	1200	1200
6/8/2013	1200	1150
6/9/2013	1000	1100
6/10/2013	1000	1050
6/11/2013	1000	1000
6/12/2013	1000	950
6/13/2013	1000	900
6/14/2013	1000	850
6/15/2013	1000	800
6/16/2013	1000	750
6/17/2013	1000	700
6/18/2013	1000	650
6/19/2013	1000	600
6/20/2013	1000	550
6/21/2013	1000	500
6/22/2013	1000	450
6/23/2013	1000	400
6/24/2013	750	350
6/25/2013	750	325
6/26/2013	500	325
6/27/2013	500	300
6/28/2013	500	300
6/29/2013	300	300
6/30/2013	300	300
Average cfs (3/16-6/30)	1,124	1,124
Total acre-feet (3/16-6/30)	238,612	238,612

Attachment 2

Interim SOG advice for early April 2018

NMFS determination: WY 2018 spring pulse flow -- Interim SOG advise

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Wed, Mar 28, 2018 at 8:51 AM
To: "Washburn, Thuy T" <TWashburn@usbr.gov>
Cc: Elizabeth G' 'Kiteck <EKiteck@usbr.gov>, Jeffrey Rieker <jrieker@usbr.gov>, Drew Lessard <dlessard@usbr.gov>, Lee Mao <lmao@usbr.gov>, Russell Callejo <rcallejo@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, Kristin White <knwhite@usbr.gov>, Michael Hendrick <mhendrick@usbr.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Thuy,

As you know, Action III.1.3 (pages 49-50 of the 2011 RPA Amendments to the NMFS Biological Opinion) provides for the adaptive management of the flow schedule in Appendix 2-E of the NMFS Biological Opinion. Specifically, "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

NMFS determinations on the two elements in the March 28, interim SOG advice are provided below.

I. Water Volume Accounting for WY 2018: The water accounting framework described in Section I of the SOG advice is a reasonable and practicable method for defining instream flow requirements when an updated inflow forecast causes a change in yeartype. NMFS agrees with this methodology for WY 2018 and for future water years.

II. Interim advice for the first phase of the spring pulse flow schedule: NMFS concurs that the interim flow schedule described in Section II of the SOG advice [specifically, that the first phase of the spring outmigration pulse flow be reshaped to provide two weeks (April 1 to April 14) at 1,400 cfs and 5 days (April 15-April 19) at 2,100 cfs] meets the objective of RPA Action III.1.3 "…to incorporate habitat maintaining geomorphic flows in a flow pattern that will provide migratory cues to smolts and facilitate out-migrant smolt movement…" for the April 1-19 period, and expects SOG advice on the remainder of the spring pulse flow schedule no later than April 16, 2018 (with adequate time for NMFS to issue a determination on the SOG advice and Reclamation to issue a change order for implementation on April 20, 2018).

WOMT--In the interest of following the process provided in NMFS' Opinion section 11.2.1.1, this e-mail is to inform WOMT of NMFS' determination, and to provide WOMT with an opportunity to discuss the proposal. If anyone wants to discuss the SOG advice or NMFS determination, please convene a WOMT meeting.

Thanks.

-Garwin-

Garwin Yip
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NOAA FISHERIES West Coast Region

---------- Forwarded message ----------
From: **WASHBURN, THUY** <twashburn@usbr.gov>
Date: Wed, Mar 28, 2018 at 7:51 AM
Subject: WY 2018 spring pulse flow -- Interim SOG advise
To: "Yip, Garwin" <Garwin.Yip@noaa.gov>
Cc: "Kiteck, Elizabeth G" <EKiteck@usbr.gov>, Jeff Reiker <jrieker@usbr.gov>, "Lessard, Drew" <dlessard@usbr.gov>, LEEYAN MAO <lmao@usbr.gov>, "Callejo, Russell" <rcallejo@usbr.gov>

Attached is the Interim Stanislaus Operations Group (SOG) advise for implementing the first phase of the WY 2018 spring pulse flow. As a summary, SOG advise includes two elements:

1. SOG's method for water volume accounting for WY2018.
2. Interim SOG advice for the first phase (April 1 to April 19) of a modified spring outmigration pulse flow schedule that SOG believes is consistent with the intent of RPA Action III.1.3

By mid April, SOG will advise for the full spring outmigration pulse schedule. If you have any questions, please contact me.

Thuy Washburn

2018.03.27_SOG advice_spring pulse_INTERIM_FINAL.pdf
82K

Interim Stanislaus Operations Group Advice Re:
2018 Stanislaus River Spring Pulse flow
March 27, 2018

Background

Spring outmigration pulse flows are one component of the daily flow schedule in Appendix 2-E of the NMFS BiOp[1] required per Action III.1.3 of the Reasonable and Prudent Alternative (RPA). As noted in the 2011 BiOp Amendments[2], spring pulse flows are intended to provide "outmigration flow cues to enhance likelihood of anadromy" and "late spring flows for conveyance and maintenance of downstream migratory habitat quality". The 2011 BiOp Amendments further note (p. 50) that "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

This interim SOG advice for spring 2018 includes two elements:

I. Description of water volume accounting during the spring pulse flow for WY 2018.
II. SOG advice for the first phase of a modified spring outmigration pulse flow schedule that we believe is consistent with the intent of the RPA action.

SOG will provide advice on the full outmigration pulse flow schedule in mid-April.

I. Water Volume Accounting

Background: In Water Year 2017, in response to changes in yeartype during the spring pulse flow period, SOG developed and NMFS approved a water accounting framework to determine the water volume required by Appendix 2-E[3]. Because the yeartype is generally updated mid-month based on the snow surveys completed early in the month, the framework calculates the total required instream flow volume for the spring pulse flow period based on the default flow schedule in Appendix 2-E from the 16th of Month A to the 15th of Month B, based on the yeartype determined by the Month A forecast.

WY 2018: During WY 2018, the Stanislaus yeartype, based on the New Melones Index, changed from Wet to Below Normal based on the January forecast, and has remained Below Normal based on the February and March forecasts. SOG will calculate the total required instream flow volume for the March 16-June 30 period based on the water accounting framework adopted in WY 2017, as detailed below:

[1] The BiOp and all appendices are available online at:
http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocap.html
[2] Available online at:
http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf
[3] See pages C-1 and C-4 of Appendix C of the 2017 SOG Annual Report, available at:
http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Stanislaus%20Operations%20Group/2017_sog_annual_report.pdf

Date range	Stanislaus yeartype (Month of forecast)	Total water volume in default schedule in Appendix 2-E (acre-feet)
3/16/18-4/15/18	Below Normal (March)	50,182
4/16/18-5/15/18	Below Normal (April*)	92,231
5/16/18-6/15/18	Below Normal (May*)	46,909
6/15/18-6/30/18	Below Normal (June*)	7,438
	Total:	196,760

** If the Stanislaus yeartype changes from Below Normal during the spring pulse period, SOG will recalculate the volume requirement and advise a revised flow schedule.*

II. Interim SOG advice

For 2018, SOG advises that the first phase of the spring outmigration pulse flow be reshaped to provide two weeks (April 1 to April 14) at 1,400 cfs and 5 days (April 15-April 19) at 2,100 cfs (Table 1).

The volume of the reshaped first phase (66 TAF over the March 16 to April 19 period) is comparable to the volume of the default schedule in Appendix 2-E for the same period (63 TAF). SOG will design the full spring outmigration pulse schedule such that the volume of the reshaped flow over the entire spring pulse flow period does not exceed the volume of the default schedule in Appendix 2-E, as determined by the method described in Section I.

The technical team believes that reshaping meets the intent of the RPA action by providing a spring pulse flow that may cue anadromy and improve migratory habitat in both the Stanislaus River and in the mainstem San Joaquin River and southern delta. In the Stanislaus River, higher flows are expected to reduce 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) are expected to convey outmigrating salmonids more rapidly along their migratory pathway, which may improve outmigration success.

The steady flows during the first phase of the spring pulse flow are designed to inundate the lower and higher floodplain benches at the Buttonbush restoration area in support of restoration monitoring work at that location.

Table 1: First phase of the spring outmigration pulse flow on the Stanislaus River advised by SOG for WY 2018. The flows represent scheduled releases at Goodwin Dam and volumes are reported in acre-feet (AF).

Date	Appendix 2-E (cfs)	Interim SOG advice (cfs)
3/16/2018	200	200
3/17/2018	200	200
3/18/2018	200	200
3/19/2018	200	200
3/20/2018	200	200
3/21/2018	200	200
3/22/2018	200	200
3/23/2018	200	200
3/24/2018	200	200
3/25/2018	200	200
3/26/2018	200	200
3/27/2018	200	200
3/28/2018	200	200
3/29/2018	200	200
3/30/2018	200	200
3/31/2018	200	200
4/1/2018	400	1,400
4/2/2018	750	1,400
4/3/2018	1,000	1,400
4/4/2018	1,250	1,400
4/5/2018	1,500	1,400
4/6/2018	1,700	1,400
4/7/2018	2,000	1,400
4/8/2018	2,000	1,400
4/9/2018	2,000	1,400
4/10/2018	2,000	1,400
4/11/2018	1,500	1,400
4/12/2018	1,500	1,400
4/13/2018	1,500	1,400
4/14/2018	1,500	1,400
4/15/2018	1,500	2,100
4/16/2018	1,500	2,100
4/17/2018	1,500	2,100
4/18/2018	1,500	2,100
4/19/2018	2,000	2,100
Average cfs (3/16-4/19)	909	951
Total AF (3/16-4/19)	63074	66050
Total AF (3/16-4/15)	50182	49388

Attachment 3

Revised interim SOG advice for early April 2018

Re: [EXTERNAL] NMFS determination: WY 2018 spring pulse flow -- Interim SOG advise

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Fri, Apr 13, 2018 at 9:46 AM
To: "Washburn, Thuy T" <TWashburn@usbr.gov>
Cc: Elizabeth G' 'Kiteck <EKiteck@usbr.gov>, Jeffrey Rieker <jrieker@usbr.gov>, Drew Lessard <dlessard@usbr.gov>, Lee Mao <lmao@usbr.gov>, Russell Callejo <rcallejo@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, Kristin White <knwhite@usbr.gov>, Michael Hendrick <mhendrick@usbr.gov>, "womt@water.ca.gov" <womt@water.ca.gov>, "Ford, John@DWR" <John.Ford2@water.ca.gov>

Thuy,

NMFS understands that Reclamation has concerns about sustained flows over 1,500 cfs for two weeks, and one reason SOG provided only interim advice with just five days over 1,500 cfs was to work out those concerns for the second half of April.

Reclamation's e-mail to WOMT describes a compromise worked out by a subset of SOG members that provides steady flow for two weeks (which supports the study needs at the Buttonbush restoration area), but at a reduced flow rate of 1,500 cfs (which is not ideal for the study needs, but minimally suitable). This flow schedule through the end of April partially satisfies the requirement for the remainder of the spring pulse schedule by April 16, 2018.

NMFS understands that the Stanislaus yeartype changed this week and that SOG will be meeting again next Wednesday, April 19th to discuss the shaping of the volume under the new Above Normal yeartype. NMFS concurs with the proposed 1,500 cfs flows for April 15-30, and expects a more detailed rationale be included in the SOG advice on the remainder of the spring pulse flow schedule. That advice should be issued no later than April 24, 2018 (with adequate time for NMFS to issue a determination on the SOG advice and Reclamation to issue a change order for implementation on May 1, 2018).

WOMT (Mike, please make sure this goes to WOMT)--In the interest of following the process provided in NMFS' Opinion section 11.2.1.1, this e-mail is to inform WOMT of NMFS' determination, and to provide WOMT with an opportunity to discuss the proposal. If anyone wants to discuss the SOG advice or NMFS determination, please convene a WOMT meeting.

Thanks.

-Garwin-

Garwin Yip
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NOAA FISHERIES West Coast Region

---------- Forwarded message ----------
From: **WASHBURN, THUY** <twashburn@usbr.gov>
Date: Thu, Apr 12, 2018 at 9:38 AM
Subject: Re: [EXTERNAL] NMFS determination: WY 2018 spring pulse flow -- Interim SOG advise
To: Garwin Yip - NOAA Federal <garwin.yip@noaa.gov>
Cc: Elizabeth G' 'Kiteck <EKiteck@usbr.gov>, Jeffrey Rieker <jrieker@usbr.gov>, Drew Lessard <dlessard@usbr.gov>, Lee Mao <lmao@usbr.gov>, Russell Callejo <rcallejo@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, Kristin White <knwhite@usbr.gov>, Michael Hendrick <mhendrick@usbr.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Garwin,

As you know, Action III.1.3 (pages 49-50 of the 2011 RPA Amendments to the NMFS Biological Opinion) provides for the adaptive management of the flow schedule in Appendix 2-E of the NMFS Biological Opinion. Specifically, "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

NMFS determinations on the two elements in the March 28, interim SOG advice are provided below.

I. Water Volume Accounting for WY 2018: The water accounting framework described in Section I of the SOG advice is a reasonable and practicable method for defining instream flow requirements when an updated inflow forecast causes a change in yeartype. NMFS agrees with this methodology for WY 2018 and for future water years.

II. Interim advice for the first phase of the spring pulse flow schedule: NMFS concurs that the interim flow schedule described in Section II of the SOG advice [specifically, that the first phase of the spring outmigration pulse flow be reshaped to provide two weeks (April 1 to April 14) at 1,400 cfs and 5 days (April 15-April 19) at 2,100 cfs] meets the objective of RPA Action III.1.3 "…to incorporate habitat maintaining geomorphic flows in a flow pattern that will provide migratory cues to smolts and facilitate out-migrant smolt movement…" for the April 1-19 period, and expects SOG advice on the remainder of the spring pulse flow schedule no later than April 16, 2018 (with adequate time for NMFS to issue a determination on the SOG advice and Reclamation to issue a change order for implementation on April 20, 2018).

SOG's current advice is for flows released into the river from Goodwin Dam at a rate of 2,100 cfs to 2,400 cfs from April 15 to April 30 for the post-project monitoring at the Buttonbush project. Reclamation strongly does not support releases over 1.500 cfs for a sustained period of time (over 5 days) when we are operating outside of flood control due to damage, mainly seepage, and measurable flooding (above 3000 cfs) that takes place to lands along the Stanislaus River.

There was a conference call yesterday on April 11, 2018, with NOAA Fisheries West Coast Region and U.S. Fish & Wildlife Service. U.S. Fish & Wildlife Service suggest a flow of 1,500 cfs from April 15 to the 30. This constant schedule flow is in favor for the post-project monitoring at the Buttonbush project. Reclamation can support this propose flow schedule.

Thuy

On Wed, Mar 28, 2018 at 8:51 AM, Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> wrote:

Thuy,

As you know, Action III.1.3 (pages 49-50 of the 2011 RPA Amendments to the NMFS Biological Opinion) provides for the adaptive management of the flow schedule in Appendix 2-E of the NMFS Biological Opinion. Specifically, "…based upon the advice of SOG and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action."

NMFS determinations on the two elements in the March 28, interim SOG advice are provided below.

I. Water Volume Accounting for WY 2018: The water accounting framework described in Section I of the SOG advice is a reasonable and practicable method for defining instream flow requirements when an updated inflow forecast causes a change in yeartype. NMFS agrees with this methodology for WY 2018 and for future water years.

II. Interim advice for the first phase of the spring pulse flow schedule: NMFS concurs that the interim flow schedule described in Section II of the SOG advice [specifically, that the first phase of the spring outmigration pulse flow be reshaped to provide two weeks (April 1 to April 14) at 1,400 cfs and 5 days (April 15-April 19) at 2,100 cfs] meets the objective of RPA Action III.1.3 "…to incorporate habitat maintaining geomorphic flows in a flow pattern that will provide migratory cues to smolts and facilitate out-migrant smolt movement…" for the April 1-19 period, and expects SOG advice on the remainder of the spring pulse flow schedule no later than April 16, 2018 (with adequate time for NMFS to issue a determination on the SOG advice and Reclamation to issue a change order for implementation on April 20, 2018).

WOMT--In the interest of following the process provided in NMFS' Opinion section 11.2.1.1, this e-mail is to inform WOMT of NMFS' determination, and to provide WOMT with an opportunity to discuss the proposal. If anyone wants to discuss the SOG advice or NMFS determination, please convene a WOMT meeting.

Thanks.

-Garwin-

Garwin Yip
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NOAA FISHERIES West Coast Region

---------- Forwarded message ----------
From: **WASHBURN, THUY** <twashburn@usbr.gov>
Date: Wed, Mar 28, 2018 at 7:51 AM

Subject: WY 2018 spring pulse flow -- Interim SOG advise
To: "Yip, Garwin" <Garwin.Yip@noaa.gov>
Cc: "Kiteck, Elizabeth G" <EKiteck@usbr.gov>, Jeff Reiker <jrieker@usbr.gov>, "Lessard, Drew" <dlessard@usbr.gov>, LEEYAN MAO <lmao@usbr.gov>, "Callejo, Russell" <rcallejo@usbr.gov>

Attached is the Interim Stanislaus Operations Group (SOG) advise for implementing the first phase of the WY 2018 spring pulse flow. As a summary, SOG advise includes two elements:

1. SOG's method for water volume accounting for WY2018.
2. Interim SOG advice for the first phase (April 1 to April 19) of a modified spring outmigration pulse flow schedule that SOG believes is consistent with the intent of RPA Action III.1.3

By mid April, SOG will advise for the full spring outmigration pulse schedule. If you have any questions, please contact me.

Thuy Washburn

Appendix D — Review of 2017 LOBO Independent Review Panel report

2017 Long-term Operations Biological Opinions (LOBO) Science Review

The U.S. Bureau of Reclamation (Reclamation), National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (USFWS) use the Science Review to evaluate the prior years' water operations and regulatory actions. The goal of the review is to develop lessons learned, incorporate new science, and make appropriate, scientifically justified adjustments to the implementation of the RPA actions to inform water operations in future years. The Independent Review Panel's (IRP) findings and recommendations provide objective feedback and addresses a system-wide operational overview. Below is a summary of comments from the IRP on Stanislaus River operations (usually presented as direct quotes from the IRP report) and associated feedback from participants in SOG (provided in bullets beneath each IRP report comment). Individual elements of feedback may not represent a consensus view of all SOG participants. Some recommendations from the IRP (for example, development of new tools or management actions) fall outside the scope of SOG. SOG participants offered feedback on these recommendations but implementation would need to occur in a venue other than the SOG technical team, for example, the reinitiation effort or some other planning process. .

All materials associated with the 2017 LOBO Science Review, including the IRP report, are available at: http://deltacouncil.ca.gov/events/2017-long-term-operations-biological-opinions-lobo-biennial-science-review

General

- *IRP report, page 6:* "The Stanislaus Operations Group (SOG) appears to be functioning with a high level of coordination among the agencies and reflects a positive approach to adaptive management."
- *IRP report, page 35:* "…the IRP was unable to find a focused attempt to summarize how experiences of the operators or the fish were synthesized in any way."
    - Interest in having the IRP elaborate on this suggestion. Specific suggestions on how to synthesize this type of information or examples where this has happened would be helpful.
    - While not summarized for the 2017 Science Review, the annual SOG reports do capture various lessons learned from each year's implementation of the 2009 NMFS BiOp. Agreement that additional, multi-year synthesis has value.

Water Constraints and Temperature Challenges

- IRP recognized challenges based on over-allocation of water and limited temperature management (*IRP* report, pages 3 and 16).
    - SOG acknowledges the challenges in meeting multiple demands on the Stanislaus River.

    - The November 2016 report[16] that came out of the Stanislaus River Scientific Evaluation Process (SEP)[17] --*Conservation Planning Foundation for Restoring Chinook Salmon (Oncorhynchus tshawytscha) and O. mykiss in the Stanislaus River* -- offers some useful metrics for both biological (e.g. productivity) and environmental (e.g. supporting short-term and long-term inundated rearing habitats) objectives.
- *IRP report, page 34:* "There are a number of important constraints on the effective management of temperature in the Stanislaus. One key constraint is the existing infrastructure. For example, New Melones Dam has limited temperature control capability due to low-level outlets that can only be used when reservoir depths are below 808 feet. The existence of the submerged relict structure of the original [Old] Melones Dam impedes the flow of cold water to the low-level outlets in New Melones."
    - Strategies could be developed to mitigate these issues. One example could be coordinating with the U.S. military to perform underwater demolition training and remove the old dam.
- *IRP report, page 34:* "If meeting temperature criteria is indeed a requirement of the RPA action, SOG should consider how current infrastructure may be modified to provide the cold water needed to meet the criteria. The addition of a more flexible temperature control system at New Melones would likely be beneficial for meeting temperature targets with the least amount of water, though the capital costs are high and the infrastructure may be impractical to install or operate."
    - Action III.1.3, which sets temperature criteria for the Stanislaus River, does include an exception procedure in recognition of various constraints in the watershed.
    - The expense of constructing and installing a potential temperature control device and/or demolition of Old Melones Dam versus the value in habitat restoration of a similar financial magnitude could be investigated. The Science Integration Team (SIT) model used in the Central Valley Project Improvement Act (CVPIA) process could help with such an evaluation once reasonable cost estimates were available.
- *IRP report, page 34:* "From a biological perspective, temperature criteria were established in the Stanislaus to benefit steelhead. However, the steelhead population in the Stanislaus may be too small to effectively evaluate the consequences of exceeding current temperature criteria. Furthermore, it is not clear if the current temperature criteria are protective of the remaining fall-run Chinook in the system. Although fall-run Chinook are not targeted by RPA actions, a summary of available data indicates that temperature requirements for Chinook and steelhead differ (Carter 2005) and managing temperature for one may have unintended negative consequences for the other."

[16] The SEP group briefed the SWRCB about the report at a 2/23/17 meeting; the associated presentation is available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/022317_seppres.pdf

[17] While unrelated to implementation of the 2009 NMFS BiOp, the SEP effort was inspired by the management challenges in the Stanislaus River watershed and some of the findings from that effort are included in some feedback elements for the IRP's information.

- As the IRP notes, the NMFS RPA actions in the Stanislaus River target steelhead because steelhead are ESA-listed while fall-run Chinook salmon are not; however, SOG does acknowledge and discuss interspecies trade-offs.

Gravel Augmentation RPA Implementation Challenges

- *IRP report, pages17 and 36:* "The RPA action requiring the addition of 50,000 yd^3 of gravel by 2014, and 8,000 yd^3 annually thereafter, has been stalled by lack of funding, land access, and other issues."
  - Table 2-2 of this annual report details progress to date on gravel augmentation targets.
  - Seeking funding and land access is outside the scope of SOG. These obstacles to restoration could be addressed in the reinitiation process or other planning effort with a commitment and plan to seek the resources necessary to meet gravel augmentation timelines and targets.

Monitoring and Evaluation of Management Actions

- *IRP report, page 33:* IRP suggested experimenting with shape and timing of pulse flows to refine understanding of how alternatives affect migration.
  - Some SOG members expressed interest in considering some more active experimentation (and/or improved synthesis) in fall pulse flow reshaping if could be accommodated under the existing BiOp. In fall 2018, based on coordination with other tributaries in the San Joaquin River, the same fall pulse flow (in both volume and timing) was released on both the Stanislaus River and Tuolumne River, to provide an opportunity to compare adult returns under identical pulse flows.
  - Modifying RPA actions is outside the scope of SOG. Modifications to the Stanislaus River flow requirements that include some explicit allowance for "experiments" in flow shaping beyond the limits of the current RPA actions could be addressed in the reinitiation effort or other planning process.
  - The IRP focuses on migration objectives but both the fall and spring pulse flows provide benefits that are not limited to migration. For example, pulse flows can provide temperature buffering, inundation of shallow water habitat (which may provide predator refuge, increased food production, thermal diversity), and support geomorphic functions such as sediment movement, support of riparian vegetation, etc.).
- *IRP report, page 16*: "Despite the strong qualitative logic model linking biological processes to the design of flow pulses, quantitative analysis to demonstrate that the pulse flows are indeed achieving the intended biological outcomes seems lacking. … In addition, it is not clear if, or how, the shape of the [fall] pulse impacts the timing of fish arriving in the basin. Field observations could be examined to investigate the effectiveness of spring pulses in achieving their outcomes of reducing temperatures, inundating shallow habitats, and flushing smolts out of the river and through the Delta. Such an analysis would be beneficial both for shaping pulses and for prioritizing areas for restoration actions."
  - General agreement that this would be a worthwhile effort, though likely complicated by actions in the Tuolumne and Merced rivers as well as Delta

hydrology and operations.

- *IRP report, page 11:* "Expecting immediate positive population responses to RPA actions in any given year would be overly optimistic, but evaluating impacts to individual life stages is possible through the use of field observations and numerical models."
    - These types of life-stage-specific investigations are being conducted at some restoration sites on the Stanislaus River (e.g., at Buttonbush).
    - 2D models are available to quantify various types of habitat, and restoration partners on the Stanislaus River are designing floodplain and side channel projects in which the habitat benefits are clearly predicted for various anticipated flows.
    - Some SOG participants expressed concerns about using population-level responses as a metric to determine success of implementing a single or small subset of RPA actions, since it is the entire set of RPA actions that is necessary to avoid jeopardy to the ESA-listed species.
    - Targeted studies should consider results in the full context of other stressors and conditions in the system. For example, if increased spawning activity is not observed following injection of gravel, one should not necessarily conclude that adding the gravel is not important. Fish may not be spawning on new gravel because of another stressor (e.g., water pollution or water temperature) making that location unsuitable or because low escapement means that spawning habitat is not limiting in that particular year.
- *IRP report, page 11:* "However, the benefits of these projects in producing food resources for salmon could be enumerated through documentation of increases in primary and secondary productivity using benthic macroinvertebrate surveys. While increased productivity is only one benefit of the gravel augmentation, the data could be used in bioenergetics models to demonstrate how the gravel projects contribute to growth and survival, and how much more gravel is needed to support a viable population."
    - SOG members agree that adding benthic macroinvertebrate surveys would provide us with a metric to evaluate spawning gravel augmentation within the water year.
    - There is some support within SOG for further analysis and development of new modeling tools, though that analysis and development is not within the scope of SOG.
    - Some concern was expressed about how to assign responsibility and acquire funding to support research studies.

<u>Communication Needs</u>

- The IRP recognized (*page 12*) a "need for communicating lessons learned in all water years."
    - There is general agreement within SOG that it would be useful to compile a lessons learned summary that articulates areas of success, failure, and challenges. This has been completed for the RPA actions, but not specifically to address challenges of every water year. We may consider including this type of information in the annual reports or in a new type of synthesis document.
    - The IRP indicated an interest in learning more about moderate water years. SOG experiences minimal conflict in meeting RPA action objectives during "normal"

years, but experiences and major challenges while coping with flood and drought conditions. SOG values suggestions on how to cope during these more extreme years.

- *IRP report, page 35:* "First, a synthesis of lessons learned would be an important exercise for operators and managers. Such a synthesis should summarize the hydrologic year at a weekly to monthly time scale, outline operational decisions in response to data and associated releases, examine measures of how operations and extreme conditions impacted fish, and identify what additional information and/or alternative actions would be needed in a future event."
    - The SOG annual reports include some of this synthesis information (particularly in terms of fine-scale hydrologic data) already.
    - It would likely be of value to develop an operator's manual (possibly for each watershed with CVP or SWP reservoirs) that documented issues and possible solutions associated with project operations and fisheries, especially in extremely dry or wet years.

<u>Planning and Developing Objectives</u>

- The IRP provided perspective on climate change impacts to long-term operations. *IRP report, page 13:* "…forecasted components of the New Melones Index (Index) will be more uncertain, and the Index thresholds for water yeartype may require adjustment as a result."
    - The Southern Sierras have higher peak elevations than other Central Valley watersheds and despite their southern location are expected to be at least moderately resilient to climate change.
    - Modeling could be used to assess whether and how the frequency distribution of year types will change under various climate change scenarios.

- *IRP report, page 13:* "Agencies are encouraged to create and test various climate oscillation and climate change scenarios as a means of anticipating new conditions that historical records might not predict."
    - Agreement that this would be useful information, particularly in the context of long-term planning. Less relevant to the typical scope and scale of SOG activities.

- *IRP report, page 14*: "These actions follow a general assumption that gravel augmentation mitigates against the loss of access to upstream salmonid spawning habitat. However, the gravel volumes that have been put in place so far on the Stanislaus are only a fraction of that which was initially prescribed, and it is not clear that the RPA prescriptions are adequate to produce desired ecological outcomes."
    - SOG participants believe (to varying degrees: from "desperately need" to "somewhat beneficial") that a sediment budget for the Stanislaus River would be beneficial.
    - Before a sediment budget can be developed, we need to refine our vision for the river. We should hone the design of the river by conducting more mapping, modeling, and bathymetry.

        - 2-D modeling has been completed for downstream of Knights Ferry, but modeling is still needed for Knight Ferry to Goodwin Canyon.
    - The Stanislaus River is designated as a floodway. It has been very difficult to deposit material and acquire permitting. The U.S. Army Corps of Engineers (USACE) has very rigorous process for Stanislaus River gravel projects to satisfy new Clean Water Act section 408 permit requirements. We need to coordinate with USACE when developing a river-wide design in a way that will make the 408 permit process more efficient.
    - A sediment budget should assess the ability for each reach to move sediment, as well the capacity for the existing habitat to absorb additional gravel input (thus informing section 408 permits). Gravel provides additional benefits beyond spawning and egg incubation habitat, such as: providing thermal refugia through hyporheic flow, creating habitat for aquatic macroinvertebrates favored by salmonids, and breaking up long stretches of glide habitat favored by predators.
    - Would be useful to explicitly compare benefits of gravel augmentation to other types of efforts (e.g. side channel restoration or projects to improve water temperatures). The CVPIA's SIT model is one potential tool for this evaluation.
    - Some SOG participants have attempted to acquire CVPIA funding to develop a sediment budget, but were not successful.
- *IRP report, page 18:* "Other RPA actions also lack measurable, time bound objectives (e.g., floodplain restoration, predation management) that link to biologically-relevant outcomes. Effects of RPA actions can be measured in a variety of ways (e.g., primary and secondary production, diversity, etc.), but ultimately habitat rehabilitation projects need to demonstrate meaningful connections to the viability of targeted salmonid populations. What proportional contribution to new spawning habitat is expected from 50,000 yd^3 of gravel, if that could be achieved? How many redds can that area support? Similarly, are small side channel projects at an adequate scale to produce a biological response, or are landscape-scale projects needed to provide adequate habitat for protecting fish during dry and/or wet years? Will predators consume most or all of the expected increased production of salmonids from the floodplain and gravel projects?"
    - The SEP Group[18] developed quantitative metrics in the *Conservation Planning Foundation for Restoring Chinook Salmon (Oncorhynchus tshawytscha) and O. mykiss in the Stanislaus River* November 2016 Report.
    - It will be important to coordinate with other river basins as a monitoring plan is developed for the Stanislaus River. Metrics need to be standardized in a way that allows resource managers to assess and compare fish populations and river conditions (e.g., water quality) across the Central Valley.
        - Currently a sediment budget and monitoring plan are being developed for the Sacramento River.
- *IRP report, page 12:* "A certain water temperature is not the only defining characteristic of suitable habitat for salmonids. As such, individual actions alone, such as meeting temperature targets or adding gravel, do not necessary [sic] reflect creation of suitable

[18] The SEP group's metrics are referenced as examples of quantitative objectives developed for the Stanislaus River watershed but are not directly applicable to the Stanislaus River RPA actions in the 2009 NMFS BiOp, which were (in concert with all other actions in the RPA) designed to avoid jeopardy.

habitats."
    - SOG participants acknowledge the IRP's consternation that "many reports and presenters used the term habitat to mean the number of river miles maintained at a given target temperature range."
- *IRP report, page 11:* "It was encouraging to note the continuing effort to link physical criteria in RPA actions to biological responses, but there continues to be substantial capacity for improvement in this area."
    - SOG participants acknowledge that the IRP's interest in moving from proxy requirements such as flow and temperature to biological criteria that would potentially provide more flexibility and more certain biological responses.
- *IRP report, page 17:* "Identifying where sites fall along a range of wild to intensively-modified will help managers prioritize conservation of the least impacted systems and identify for which systems maintaining or restoring historical species levels and compositions is not feasible."
    - A geospatial tool would be valuable for communication and decision support. SOG experiences high membership turnover. A geospatial database could help get new members up-to-speed because it would be easier to visualize, communicate, and interpret management actions and monitoring data on a map. Key features could include compliance and fish monitoring locations, side channel and gravel augmentation project sites, predation/salmonid mortality hotspots, and other threats. It would also be helpful to include a feature that allows users to adjust the river stage to visualize and quantify how restoration sites and floodplains would be inundated under different water operation scenarios.

    - SacPAS provides real-time analytics for the Stanislaus River.
        - All years graphs for
            - Stanislaus River - temperature, flow, discharge, river stage, and conductivity
            - New Melones and Goodwin Dam hydrology
            - http://www.cbr.washington.edu/sacramento/data/river_allyears.html
        - Real-time Stanislaus River temperature exceedances http://www.cbr.washington.edu/sacramento/data/tc_stanislaus_RPAIII.1.2.html

Appendix E — Method used to estimate daily maximum water temperature at Knights Ferry

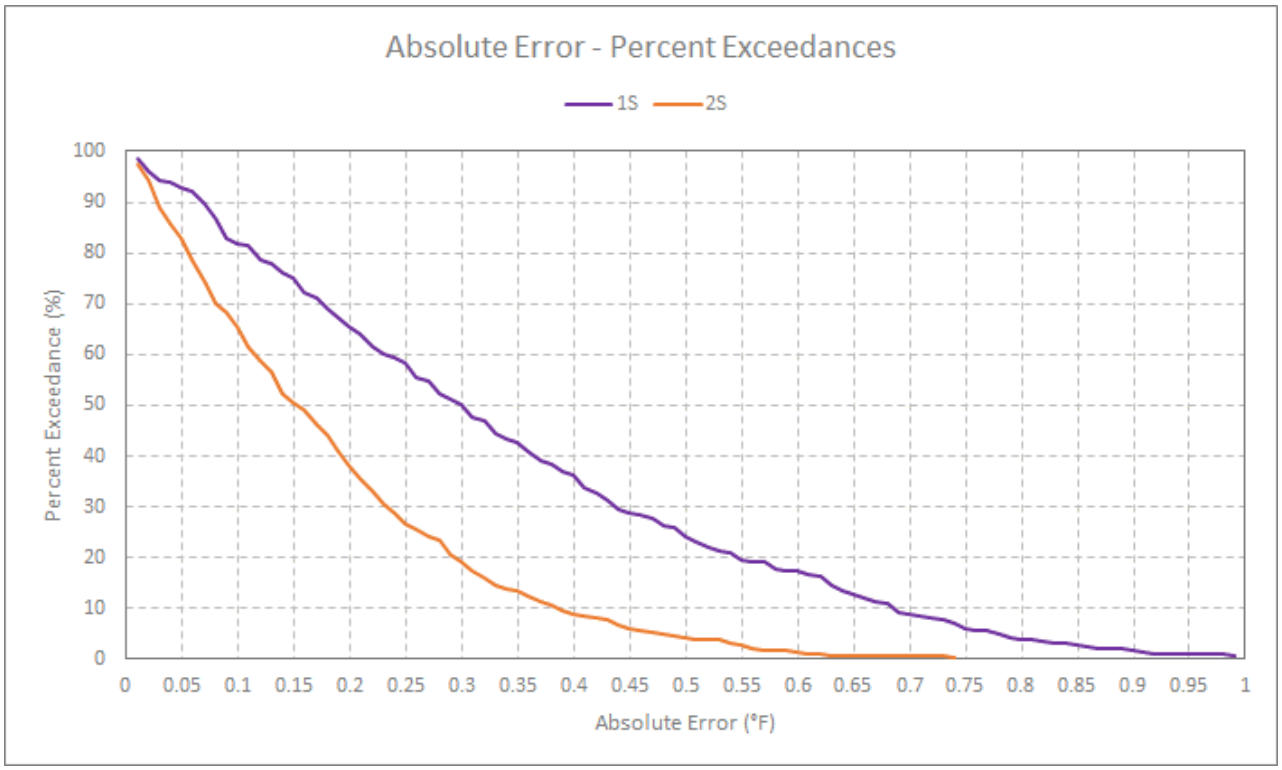
In WY 2018, Reclamation updated the method used to estimate daily maximum water temperature at Knights Ferry to monitor compliance with the Knights Ferry temperature criterion in effect per Action III.1.2 from January 1 through May 31 of each water year. In previous years, Reclamation used a "1-station model" (based on data from the Orange Blossom Bridge gage) with a different equation used for each month. The current method uses a "2-station model" (based on data from the Orange Blossom Bridge gage and USGS gage 11302000), with the same equation used throughout the January through May period.

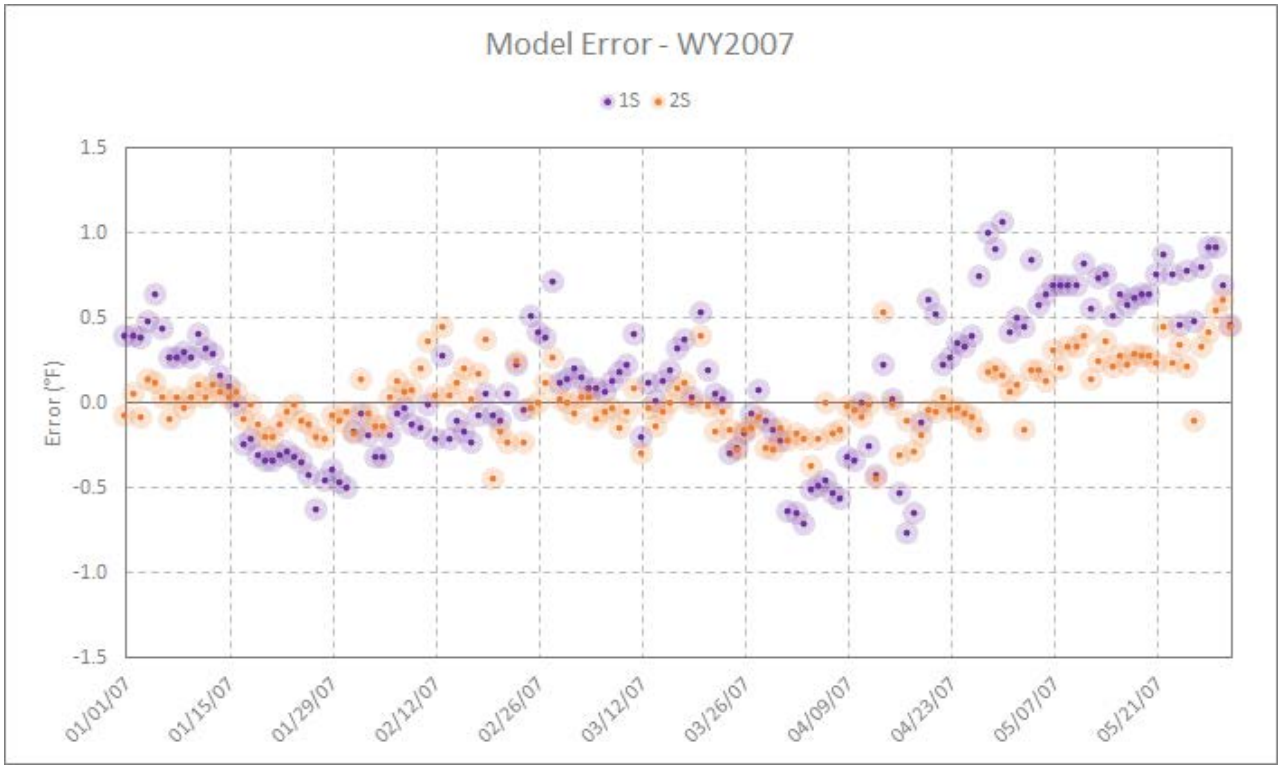
A brief overview of the two methods is provided below.

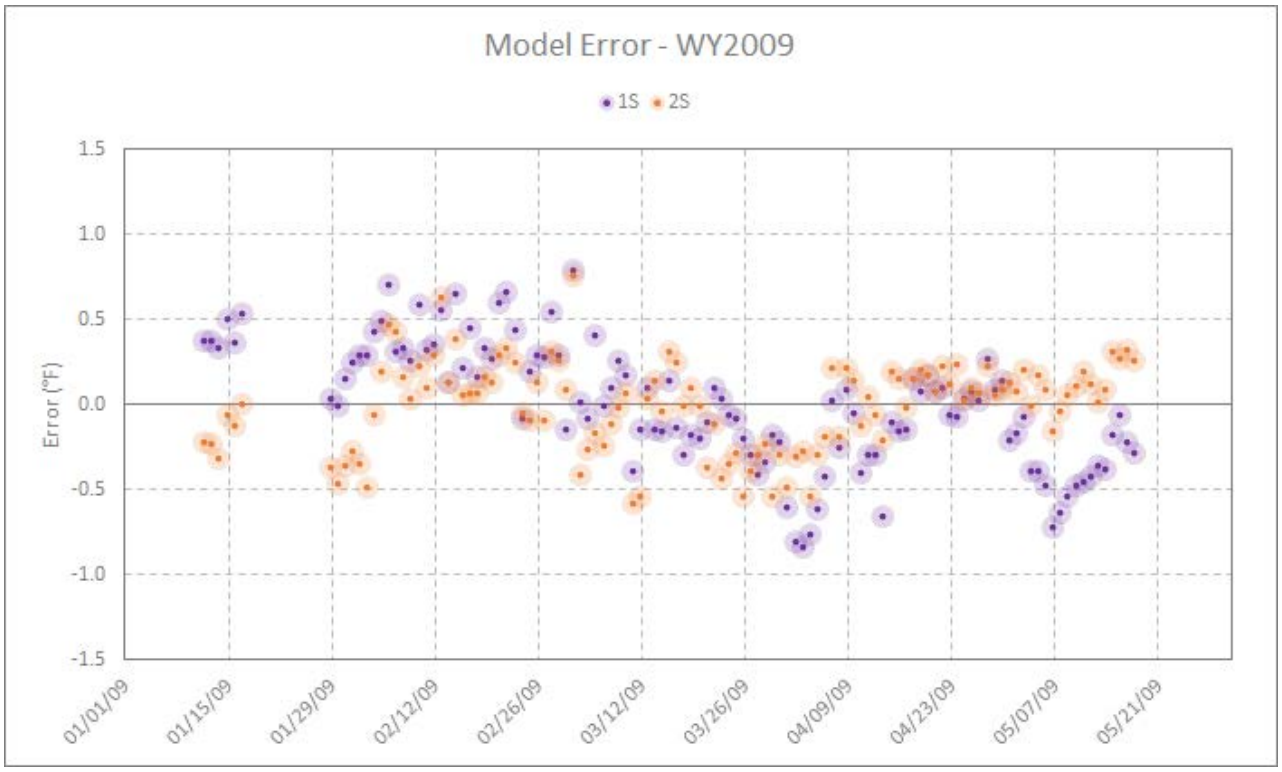
Data Sources: Daily maximum water temperature data was available from all three gages listed below for January through May of 2007 and 2009 (data from the KFS gage near Knights Ferry was the limiting factor). Some days in January and May of 2009 had missing data from at least one of the gages (see days without data points in the "Model Error – WY 2009" chart).

- OBB (gage at Orange Blossom Bridge): https://cdec.water.ca.gov/cgi-progs/staMeta?station_id=OBB
- USGS 11302000 (gage upstream of Knights Ferry in Goodwin Canyon): https://waterdata.usgs.gov/ca/nwis/inventory/?site_no=11302000
- KFS (gage near Knights Ferry at Sonora Road Bridge): http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=KFS

KFS Model	Algorithm	r^2	MAE (°F)	Notes
1S (1-Station)	*Varies by month:* Jan: estKFSmax = 0.685*OBBmax+15.3 Feb: estKFSmax = 0.658*OBBmax+16.5 Mar: estKFmax = 0.597*OBBmax+19.8 Apr: estKFSmax = 0.558*OBBmax+22.4 May: estKFSmax = 0.603*OBBmax+20.3	0.96	0.34	Original 1-station models used prior to WY 2018
2S (2-Station)	*Applied January through May:* estKFSmax = (0.293*OBBmax) + (0.708*USGSmax)	0.99	0.18	New 2-station model used during WY 2018


Absolute Error - Percent Exceedances
1S
2S
Percent Exceedance (%)
100
90
80
70
60
50
40
30
20
10
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
Absolute Error (°F)


Model Error - WY2007
1S
2S
Error (°F)
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
01/01/07
01/15/07
01/29/07
02/12/07
02/26/07
03/12/07
03/26/07
04/09/07
04/23/07
05/07/07
05/21/07


Model Error - WY2009
1S
2S
Error (°F)
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
01/01/09
01/15/09
01/29/09
02/12/09
02/26/09
03/12/09
03/26/09
04/09/09
04/23/09
05/07/09
05/21/09