Annual Report of Activities

Water Year 2015

Stanislaus Operations Group (SOG)

September 2015

Acronyms and Abbreviations

7DADM	Seven-Day-Average 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
ESA	Endangered Species Act
GDW	Stanislaus River at Goodwin Dam (CDEC gauge)
KF	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
RPN	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

Cover Photo: Stanislaus River at the Honolulu Bar Recreation Area. August 2015, 150 cfs.
Credit: Meiling Roddam

Table of Contents

Acronyms and Abbreviations i

Table of Contents ii

Chapter 1 – Introduction and Background 3

1.1 Introduction 3

1.2 Background 4

1.3 Membership 5

Chapter 2 – Summary of Actions and SOG Discussions 6

3.1 Monthly Discussion Topics 6

3.2 Other Discussion Topics 6

3.3 Implementation of RPA Actions in WY2015 6

3.3.1 RPA Action III.1.2 (Temperature Management) 6

3.3.2 RPA Action III.1.3 (Flow Management) 7

3.3.3 RPA Action Suite III.2 (Habitat Restoration) 10

Chapter 4 – Water Operations Summary 13

4.1 Action III.1.3 – Flow Management 13

4.2 Action III.1.2 Temperature Management 18

Chapter 5 – Summary of Selected Stanislaus Fish Monitoring Data 21

References 25

Appendix A: SOG advice on fall pulse flow
Appendix B: SOG advice on winter instability flows
Appendix C: SOG advice on spring pulse flow
Appendix D: Press release regarding spring pulse flow
Appendix E: Stanislaus Operations Plan submitted to SWRCB

Chapter 1 – Introduction and Background

1.1 Introduction

This report summarizes the activities and actions of the Stanislaus Operations Group (SOG) for most of WY 2015 (the report is due for review in September, before the water year is over) 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). The report is broken down into an introduction/background; summary of actions and SOG discussions; implementation of reasonable and prudent alternative (RPA) actions in WY2015; a water operations summary; and summary of selected Stanislaus fish monitoring data. Below is the list of RPA actions from the NMFS BiOp that establish the requirements related to Stanislaus operations (Table 1).

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

[1] The 2011 NMFS RPA adjustments 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

[2] Appendix 2-E is available at: *http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/appendix_2-rpa_supporting_documents_compiled.pdf*

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

1.2 Background

The Stanislaus River is a significant resource of considerable interest to fishery management agencies, the public, and the Bureau of Reclamation (Reclamation). The U.S. Fish and Wildlife Service (USFWS), NMFS, California Department of Fish and Wildlife (CDFW), and State Water Resource Control Board (SWRCB), are agencies with trust responsibilities for fishery and water resources in the Stanislaus River. Reclamation is responsible for operating the East Side Division, which includes New Melones Dam and its powerplant. Tri-Dam Project, a partnership between the Oakdale Irrigation District (OID) and the South San Joaquin Irrigation District (SSJID), owns and operates Donnells and Beardsley dams and reservoirs upstream of New Melones Reservoir and Tulloch Dam and Reservoir downstream of New Melones Reservoir. OID and SSJID own Goodwin Dam and Reservoir located downstream of Tulloch Dam. The East Side Division is operated to provide flood control, irrigation, power generation, general recreation, water quality, and fish and wildlife enhancement[3].

On June 4, 2009, NMFS issued its NMFS BiOp[4]. On April 7, 2011, NMFS issued adjustments[5] to the RPA of the NMFS BiOp (2011 NMFS RPA Adjustments). All references to page numbers in this document refer to the page numbers in the 2011 NMFS RPA adjustments, unless noted otherwise; all references to the NMFS BiOp should be considered to include the 2011 NMFS RPA Adjustments. The NMFS BiOp included the requirement that Reclamation create the Stanislaus Operations Group (SOG). The SOG is a technical team that provides advice to NMFS and to the Water Operations Management Team (WOMT) on issues related to fisheries and water resources on the Stanislaus River, per the decision-making procedures outlined on pages 8-9 of the 2011 NMFS RPA Adjustments.

[3] PL 78–534 and PL 87-874

[4] 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

[5] The 2011 NMFS RPA adjustments 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

The purpose of the SOG is "to gather and analyze information, and make recommendations, regarding adjustments to water operations within the range of flexibility prescribed in the implementation procedures"[6] 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. The SOG has no authority to make operational decisions, but rather provides advice to NMFS and WOMT. NMFS will consider advice from SOG when making a final determination as to whether or not a proposed operational action is consistent with the NMFS BiOp and ESA obligations.

1.3 Membership

The SOG consists of representatives from Reclamation, USFWS, NMFS, CDFW, CDWR, EPA, USACE, and the SWRCB. Other agencies may be added to the SOG provided existing agencies approve of the change in SOG membership.

[6] 2011 NMFS RPA Adjustments at p. 7.

Chapter 2 – Summary of Actions and SOG Discussions

The following agenda items were discussed at monthly SOG meetings from October 2014 through September 2015.

3.1 Monthly Discussion Topics

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

3.2 Other Discussion Topics

The following list of SOG discussion topics highlights some additional substantive issues reviewed by SOG over the past year.

- Fall Attraction Flows (September and October 2014 meetings) – see details in final advice provided in Appendix A.
- Winter Instability Flows (December 2014 and January 2015 meetings) – see details in final advice provided in Appendix B.
- Spring Pulse Flow – see details in several sets of advice provided in Appendix C, as well as the press release in Appendix D.

SOG members also participated, along with Stanislaus irrigation district and FISHBIO representatives, in a broader "Stanislaus Drought Operations Group (S-DOG)" in discussions regarding reservoir operations and temperature management on the Stanislaus River during the summer and fall. The final plan submitted to the SWRCB by Reclamation (in consultation with S-DOG) for Stanislaus operations through December 2015 is included in Appendix E.

3.3 Implementation of RPA Actions in WY2015

3.3.1 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.

The 56°F temperature criterion at OBB in the fall is intended to provide temperatures suitable for the migration and holding of CV steelhead. The NMFS BiOp notes that "This criterion

shall apply as of October 1 or as of initiation date of fall pulse flow as agreed to by NMFS." SOG expected that few CV steelhead would migrate into the Stanislaus River before the fall pulse flow. For October 2014, SOG advised that the fall temperature criterion of 56°F at Orange Blossom Bridge apply as of the second overall, and first of two high peaks, of the reshaped fall pulse flow, 10/24/14 (details on page A-4 of Appendix A).

Temperature criteria and water temperatures during WY 2015 are summarized in Figure 5 in Chapter 4.

3.3.2 RPA Action III.1.3 (Flow Management)

This RPA action requires Reclamation to operate releases from the East Side Division reservoirs according to the New Melones yeartype specific minimum flow schedules in Appendix 2-E of the NMFS BiOp.

Fall Pulse Flow

The fall attraction flow is one component of the daily flow schedule required in Appendix 2-E of the NMFS BiOp. As noted in the 2011 RPA Adjustments, 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."

SOG considered several reshaped flow schedules (Figure 1), all of which had the same volume (23,207 AF) and peak (1,250 cfs) as the Critical fall pulse in Appendix 2-E. Relative to the default schedule in Appendix 2-E, both the Alternative B and Alternative B-revised schedules (a) provided greater variability in flow in order to deter spawning until flows steady in the pulse tail, and (b) extended the pulse "tail" into November, which SOG expected would help to buffer water temperatures through mid-November. The Alternative B-revised schedule started earlier with a small flow peak, and ended a bit sooner – SOG advised this schedule based on a general consensus (at the 10/15/14 SOG meeting) that that the fall pulse flow should be implemented as soon as practicable given:

- cooler water temperatures,
- passage of hundreds of adult Chinook past the weir at Riverbank,
- initiation of Chinook salmon spawning in Goodwin Canyon, and
- the potential for an early-, rather than mid-November, removal of the fall barrier at the head of Old River.

Full details regarding the rationale for the shaping and timing of the fall pulse flow are provided in Appendix A, including a discussion of stakeholder input received at the Stanislaus River Forum on pages A-11 and A-12. The fall pulse flow implementation is also shown in Figure 4 in Chapter 4.

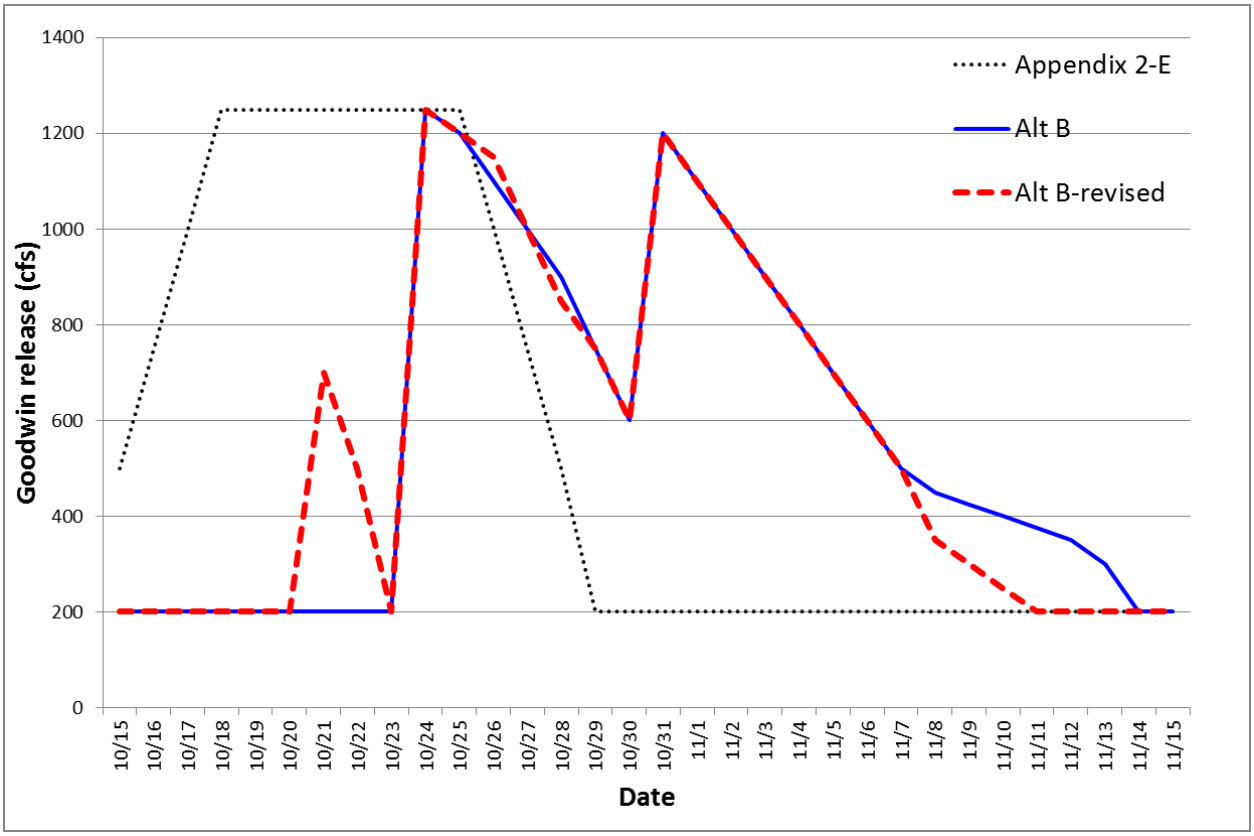

Figure 1. Selected Stanislaus fall pulse flow schedules considered by SOG for October-November 2014. SOG advised, and NMFS approved, implementation of the "Alt B-revised" pulse flow schedule.

Winter Instability Flows

Winter instability flows in January and February are another component of the daily flow schedule in Appendix 2-E of the NMFS BiOp required per Action III.1.3 of the Reasonable and Prudent Alternative (RPA). As noted in the 2011 RPA Amendments (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."

SOG advised a modified winter instability flow for implementation in both January and February that met the intent of the RPA action. For January and February 2014, SOG advised, and NMFS approved, that the winter instability flow (Critical yeartype): (a) be reshaped according to the "Alternative A" flow schedule described Figure 2 (without any change to the 793 AF volume), and (b) be shifted in time to coincide with a natural storm event. Full details are provided in Attachment 2 of Appendix B (beginning on page B-6).

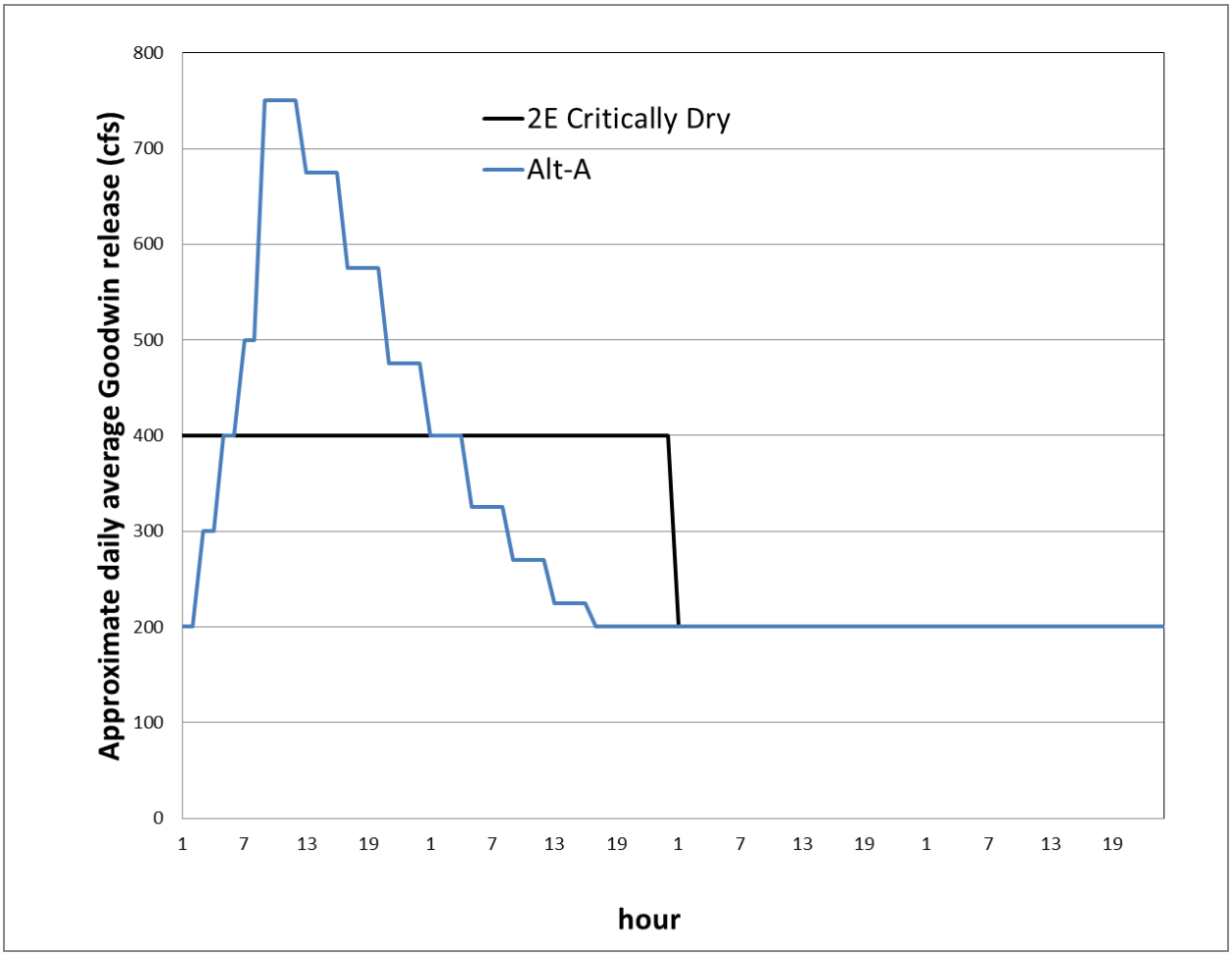

Figure 2: The default (2-E Critically Dry) and SOG-advised (Alt-A) winter instability flow shapes. Note that the horizontal "Hour" axis is not intended to imply any particular date since the advice was to implement the pulse, if possible, coincident with a natural storm event rather than on a specific calendar date.

The January winter instability flow was implemented in early January, in conjunction with New Melones releases for Vernalis salinity requirements, in order get multiple benefits from the released water and in consideration of low New Melones storage and no certain precipitation in the January weather forecast. In mid-February, given the severity of drought conditions, SOG advised and NMFS agreed that it was appropriate for the natural storm pulse in February 2015 to be considered in lieu of a controlled release to satisfy the February winter instability flow. Additionally, as SOG noted in its advice, the default shape and volume of the February winter instability flow was provided on 2/16 and 2/17 by releases for Vernalis salinity. Full details of this modified advice are provided on pages B1-B5 of Appendix B; the shape and timing of the final winter instability flows are also shown in Figure 4 in Chapter 4.

Spring Pulse Flow
In WY 2015, the spring pulse flow was initiated earlier than usual (in March rather than April) due to SOG concerns about warming water temperatures, and was completed in late April. Appendix C provides the correspondence (summarized below) leading up to the final, NMFS-approved SOG advice.

- On March 2, 2015, SOG provided advice to NMFS on the timing, magnitude, and duration of the spring pulse flow in Appendix 2-E of NMFS' Biological Opinion. (Appendix C, pages C-20 to C-26)
- On March 18, 2015, NMFS responded to the SOG advice, requesting that SOG revise or clarify its earlier advice, as appropriate, based on the status of the construction of the rock barrier at the Head of Old River (HORB). (Appendix C, page C-19)
- On March 19, 2015, SOG provided updated advice that advised initiation of the spring pulse flow on the Stanislaus River as soon as practicable while water temperature conditions were still conducive for steelhead smoltification and emigration. The SOG advice noted that SOG's concerns about water temperature effects, both for smoltification potential and migratory corridor conditions, far outweighed any concerns regarding possible routing of steelhead into Old River before the HORB was mostly completed on April 1. (Appendix C, pages C-2 to C-17)
- On March 19, 2015, NMFS concurred that the SOG advice met the objective of RPA Action III.1.3, and recommended that the pulse start one day earlier than assumed in the SOG advice. (Appendix C, pages C-1 to C-2)

Implementation of the second of two peaks in the reshaped spring pulse was delayed in order for concerns from Oakdale Irrigation District and the South San Joaquin Irrigation District to be resolved (see press release in Appendix D). The final spring pulse flow implementation is shown in Figure 4 in Chapter 4.

3.3.3 RPA Action Suite III.2 (Habitat Restoration)

The NMFS BiOp included a suite of four habitat restoration RPA actions[7] to improve habitat for spawning, rearing, and migrating Central Valley 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

A summary of completed (since 2009) and potential habitat restoration projects relevant for the objectives of RPA Actions III.2.1, III.2.2, and III.2.3 is provided in Table 2. SOG expects that

[7] 2011 NMFS RPA Adjustments at pages 53-55. The 2011 NMFS RPA Adjustments 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

RPA Action III.2.4, which calls for an evaluation of fish passage at New Melones, Tulloch, and Goodwin Dams, is being addressed by the Interagency Fish Passage Steering Committee.

Table 2: Completed (since 2009) and potential habitat restoration actions on the Stanislaus River relevant for the objectives of RPA Actions III.2.1, III.2.2, and III.2.3.

Recovery action	**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	3,333 cubic yards
Goodwin Canyon at float tube pool – 2012	2,000 cubic yards
Goodwin Canyon at cable crossing – 2015	5,333 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
COMPLETED floodplain & side-channel restoration (for improved rearing habitat, improved migratory habitat, improved connectivity to avoid stranding)	
Lancaster Road side-channel -- 2011	640 feet of side-channel and 2 acres of floodplain habitat
Side-channel improvement at Honolulu Bar to reduce stranding risk – 2012	
Floodplain at Honolulu Bar, including clearing on non-native vegetation and planting of native riparian vegetation – 2012	2.4 acres
POTENTIAL Projects	
Lover's Leap	*Anticipated gravel:* 8,000 cubic yards to be added to river; 80,000 cy available on perched floodplain for this and other projects.
Knights Ferry (upstream of covered bridge)	*Anticipated gravel:* 8,000 cubic yards
Knights Ferry (between covered bridge and Sonora Road Bridge)	*Anticipated habitat:* Up to 1 acre of side-channel and floodplain habitat.
Two Mile Bar	*Anticipated gravel:* 6,000 cubic yards; >20,000 cubic yards available on perched floodplain for this and other projects.
Horseshoe Recreation Area	*Anticipated gravel:* 6,000 cubic yards
Valley Oak Recreation Area	*Anticipated gravel:* 3,000 cubic yards

Buttonbush	*Anticipated habitat:* Up to 18 acres of side-channel and floodplain habitat and 2,800 feet of side-channel habitat.
Goodwin Canyon	*Anticipated gravel:* The 2009 NMFS BiOp requires 50,000 cubic yards by 2014 (extension has been granted; including the 2015 augmentation in Goodwin Canyon, total augmentation will be 18,666 cy), and 8,000 cubic yards per year thereafter. The 8,000 cubic yards /year rate was achieved in 2012 during the Honolulu Bar restoration work.

Chapter 4 – Water Operations Summary

This chapter briefly describes Stanislaus River operations for water year 2015, pertaining to RPA Actions III.1.2 and III.1.3. These actions are presented in reverse order for clarity.

4.1 Action III.1.3 – Flow Management

Figure 3 summarizes New Melones Reservoir operations from October 2014 through mid-September 2015.

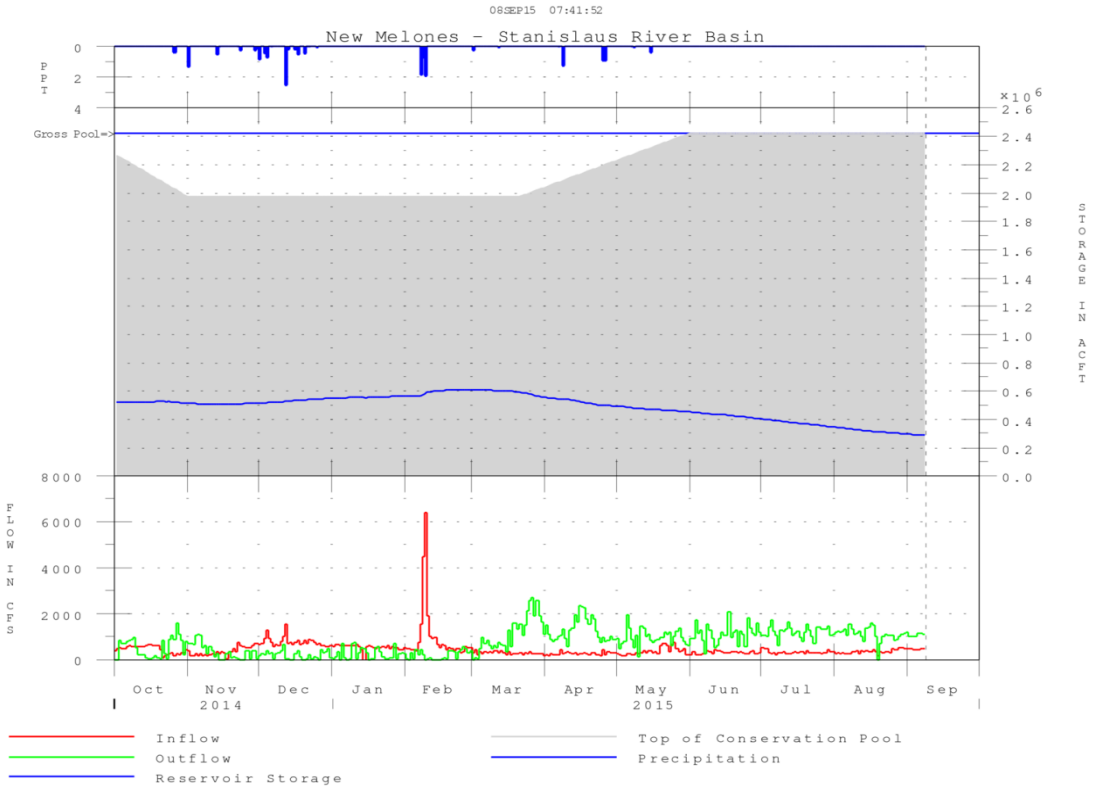

Figure 3 Summary of New Melones Reservoir Operations during the 2015 water year.

The 2015 water year classifications for determining Appendix 2-E minimum flows, based on the New Melones Index, were as follows in Table 3 (the New Melones Index is based on forecasted inflows and storage volume). Per agreement (SOG meeting notes from February 17, 2010), the New Melones Water Supply Parameter was calculated by using the Interim Plan of Operations (IPO) methodology.

Table 3: Water Year Classification by Month during WY 2015

Month	Water Year Classification
October	Critically Dry
November	Critically Dry
December	Critically Dry
January	Critically Dry
February	Critically Dry
March	Critically Dry
April	Critically Dry
May	Critically Dry
June	Critically Dry
July	Critically Dry
August	Critically Dry
September	Critically Dry

Stanislaus River Operations:
The October pulse was implemented according to the September SOG advice. During April and May, releases were governed by Appendix 2-E and drought operations plans[8]. In June and July, operations were governed by the Appendix 2-E schedule except for a brief period in June when flows were increased to meet the Temporary Urgency Change Petition Vernalis flow target. Appendix 2-E continued to be the controlling standard through late September 2015."

Goodwin Reservoir releases to the Stanislaus River are shown in Figure 4, including the primary reasons for those releases. Table 4 contains a summary of release changes from Goodwin Reservoir indicating the purpose of the operational change.

[8] http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/tucp/index.shtml

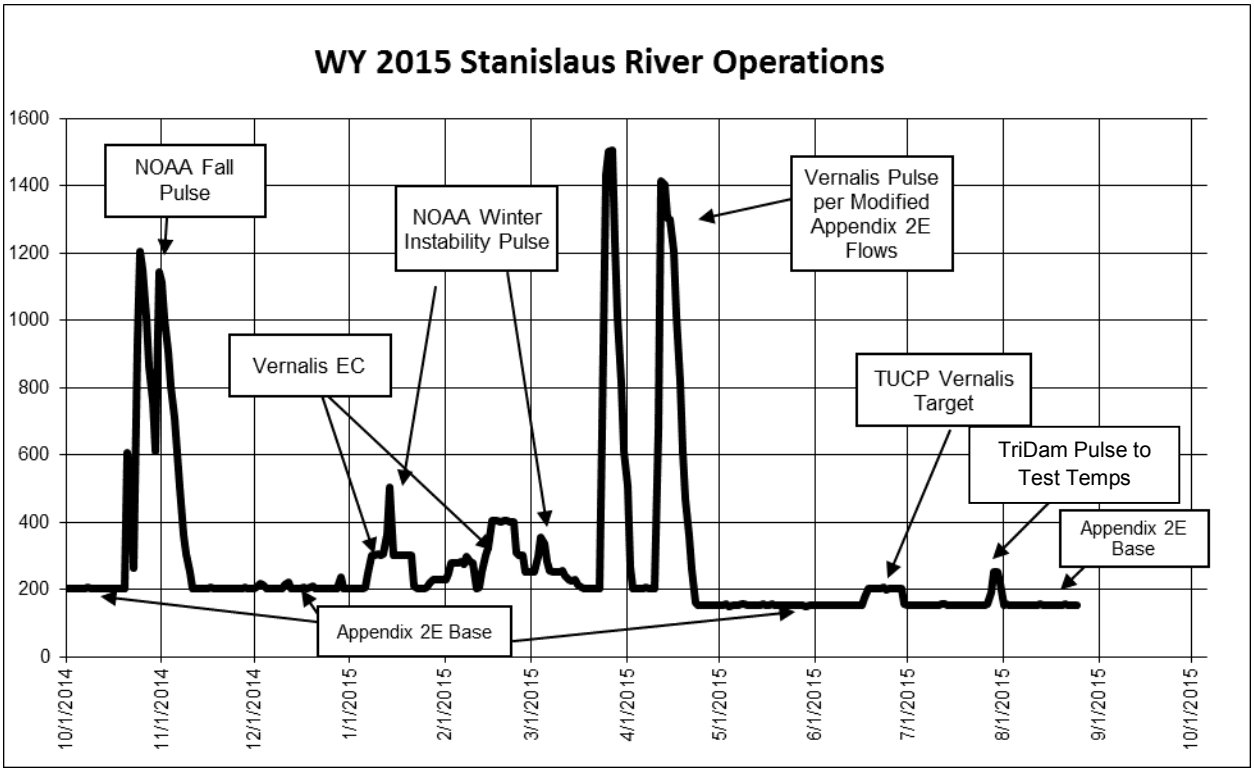

Figure 4: Summary of Stanislaus River releases at Goodwin Dam during WY 2015. Boxes identify the controlling requirements

Table 4: Release changes at Goodwin Dam during WY 2015

		NEW MELONES LAKE OPERATIONS - GOODWIN RELEASE LOG		
Date	**Time of Change**	**INC or DEC**	**Flow (cfs)**	**Comment/Reason**
1/7/2015	1300	INC	300	VNS Daily Salinity
1/13/2015	1800	INC	400	NOAA Winter instability pulse
	2000	INC	500	
	2200	INC	750	
1/14/2015	200	DEC	675	NOAA Winter instability pulse
	600	DEC	575	
	1000	DEC	475	
	1400	DEC	400	
	1800	DEC	325	
	2200	DEC	300	

Date	Time of Change	INC or DEC	Flow (cfs)	Comment/Reason
1/22/2015	0100	DEC	200	2E Min
1/27/2015	1300	INC	225	VNS EC
2/2/2015	1300	INC	275	VNS EC
2/11/2015	100	DEC	200	NOAA Minimums
2/13/2015	1300	INC	300	VNS EC
2/15/2015	1800	INC	400	VNS EC
2/24/2025	0100	DEC	300	VNS EC
2/27/2015	0100	DEC	250	VNS EC
3/3/2015	0100	DEC	200	VNS EC
3/2/2015			250	Cancel the prior release reduction. VNS EC
3/3/2015	1300	INC	350	VNS EC
3/5/2015	1500	DEC	300	VNS EC
3/6/2015	1500	DEC	250	VNS EC
3/12/2015	1300	DEC	225	VNS EC/Flow
3/16/2015	1300	DEC	200	NOAA Minimums
3/24/2015	0100	INC	800	NOAA Pulse #1
3/25/2015	0100	INC	1,500	NOAA Pulse #1
3/28/2015	0100	DEC	1,200	NOAA Pulse #1
3/29/2015	0100	DEC	1,000	NOAA Pulse #1

Date	Time of Change	INC or DEC	Flow (cfs)	Comment/Reason
3/30/2015	0100	DEC	800	NOAA Pulse #1
3/31/2015	0100	DEC	600	NOAA Pulse #1
4/1/2015	0100	DEC	500	NOAA Pulse #1
4/2/2015	0100	DEC	200	NOAA Pulse #1
4/11/2015	0100	INC	800	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/12/2015	0100	INC	1,500	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/13/2015	0100	DEC	1,400	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/14/2015	0100	DEC	1,300	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/16/2015	0100	DEC	1,200	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/17/2015	0100	DEC	1,000	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/18/2015	0100	DEC	800	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/19/2015	0100	DEC	600	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/20/2015	0100	DEC	450	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/21/2015	0100	DEC	350	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/22/2015	0100	DEC	250	NOAA Pulse #2
				(This pulse was delayed by negotiations)
4/23/2015	0100	DEC	150	NOAA Pulse #2
				(This pulse was delayed by negotiations)
6/17/2015	1300	INC	200	TUCP VNS Target
7/28/2015	1400	INC	200	OID/SSJID Water Released to River (above 150 base flow)
	1600	INC	250	

Date	Time of Change	INC or DEC	Flow (cfs)	Comment/Reason
7/31/2015	1300	DEC	200	
	1700	DEC	150	

4.2 Action III.1.2 Temperature Management

Figure 5 is a summary of temperature operations from October 2014 through August 2015. Temperature exceedances were reported to NMFS and the SOG.

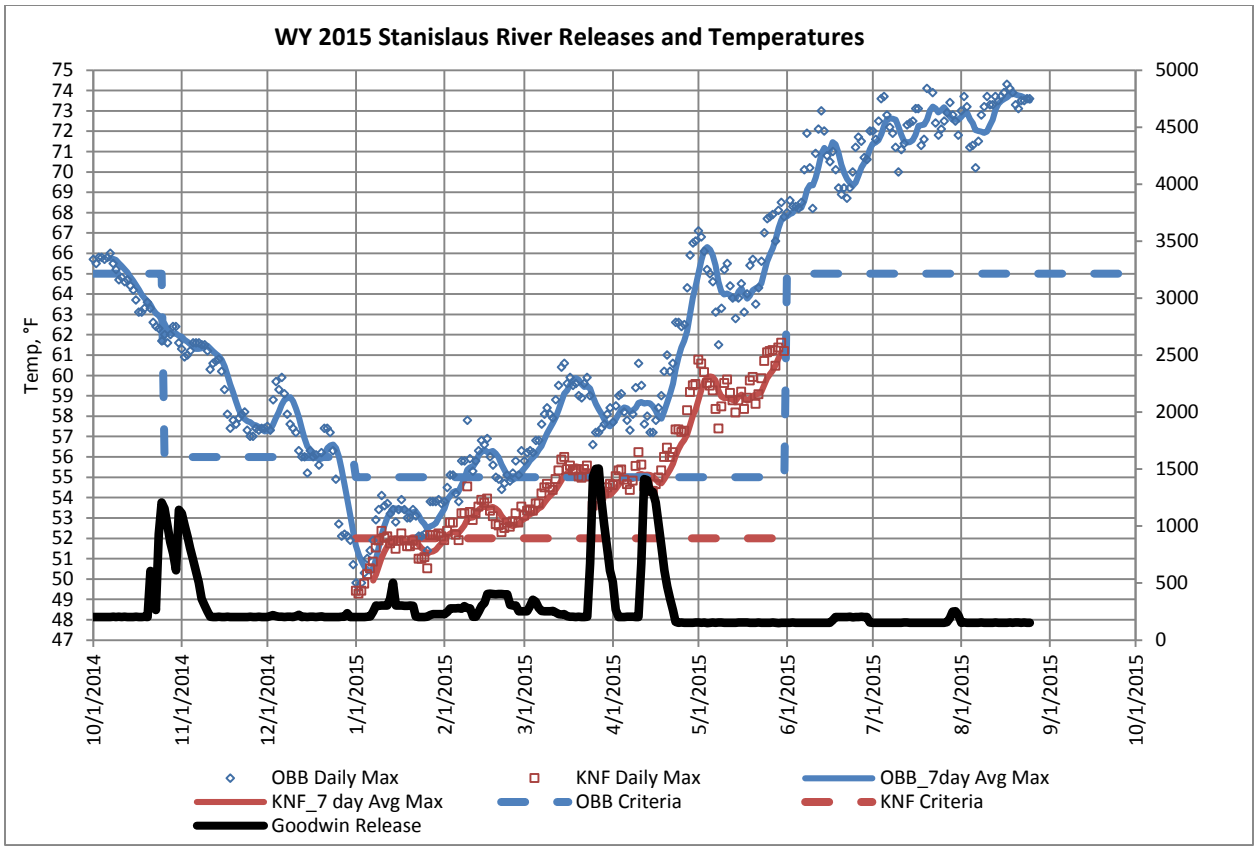

Figure 5: Summary of temperature and flow at Orange Blossom Bridge and Knights Ferry during WY 2015.

Summary of Water Year 2015 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, measured at both OBB and Knights Ferry are based on a 7-day average daily maximum temperature (7DADM). 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.

During WY 2015, because of extremely low reservoir level at New Melones due to the extended drought, the low-level outlet became available for use in late August. Reclamation's Regional Engineer advises that the low-level outlet only be used for its intended purpose (to make temporary base flow releases during times when the multipurpose tunnel has been dewatered for inspection and maintenance) when reservoir elevation exceeds 808.0 feet. This advice is in accordance with the both the Design Operating Criteria (DOC) and the Standing Operating Procedures (SOP) for New Melones Dam and Reservoir.

The NMFS RPA provides a temperature exception procedure which requires Reclamation to notify NMFS if the temperature requirement is expected to be exceeded based on a three-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 2015 (see Figure 5) were noted and discussed within SOG. Except for a short time in mid October and in spite of elevated flows for a fishery pulse, temperatures exceeded the OBB criterion in the fall. The Knights Ferry temperature criterion was exceeded from early February through June; the OBB temperature criterion was also exceeded from early February through September (Figure 9).

In response to drought conditions and the SWRCB's request, SOG members also participated, along with OID and FISHBIO, in discussions within a "Stanislaus Drought Operations Group (S-DOG)" (distinct group from SOG) regarding reservoir operations and temperature management on the Stanislaus River during the summer and fall. The final plan submitted to the SWRCB by Reclamation (in consultation with S-DOG) for Stanislaus operations through December 2015 is included in Appendix E. Highlights of the plan include:

- Temperature targets consistent with the exception procedures in RPA Action III.1.2 (E-1 to E-2)
- Flow & Reservoir Operations (E-2 to E-3)
- Key modeling assumptions (E-4 to E-5)
- Temperature modeling results provided by Oakdale Irrigation District (conducted by Avry Dotan, AD Consultants) which show that blending releases from the penstock intake at New Melones Dam with releases from the low-level outlet and/or drawdown releases from Tulloch Reservoir reduced water temperatures in the Stanislaus River below Goodwin Dam (see, for example, page E-21).

- Summaries of S-DOG discussions prior to submission of the final plan (E-27 to E-31)

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Chapter 5 – Summary of Selected Stanislaus Fish Monitoring Data

Monitoring data from the Stanislaus River are summarized below for both fall-run Chinook salmon and (when available) *O. mykiss*. The location of monitoring sites is shown in Figure 6.

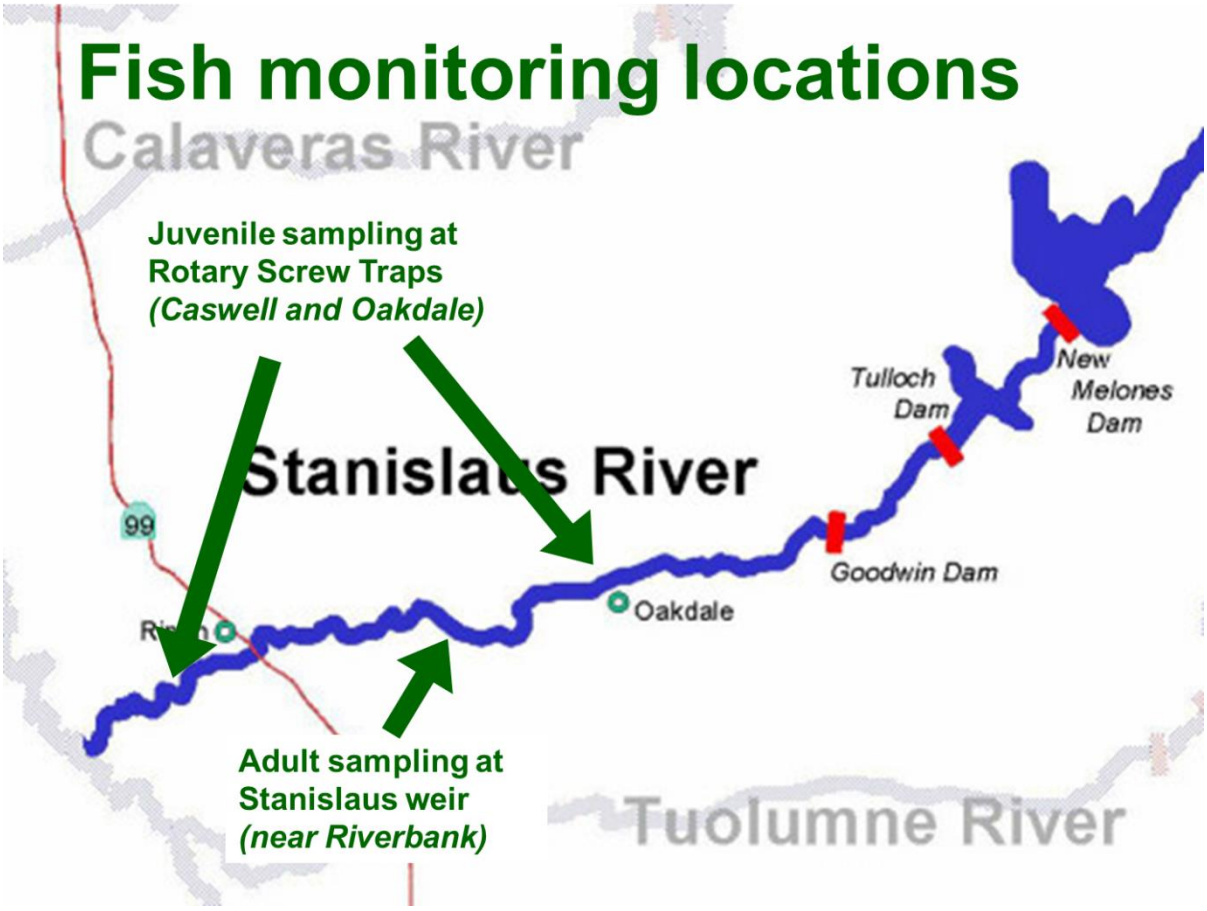

Figure 6: Location of fish monitoring efforts on the Stanislaus River.

U.S. Fish and Wildlife Service funds Cramer Fish Sciences to conduct rotary screw trap monitoring on the Stanislaus River at Caswell Memorial State Park (approximately river mile 9). During the 2015 juvenile outmigration season, the trap sampled 137 out of 170 days during the 12/18/14 to 6/5/15 sampling season. A total of 905 Chinook salmon were captured during the season. Daily Chinook salmon catch and lengths are reported in Figures 7 and 8.

A total of 2 *O. mykiss* (fork lengths of 38 mm and 222 mm) were captured during the first peak of the spring pulse flow at the end of March 2015.

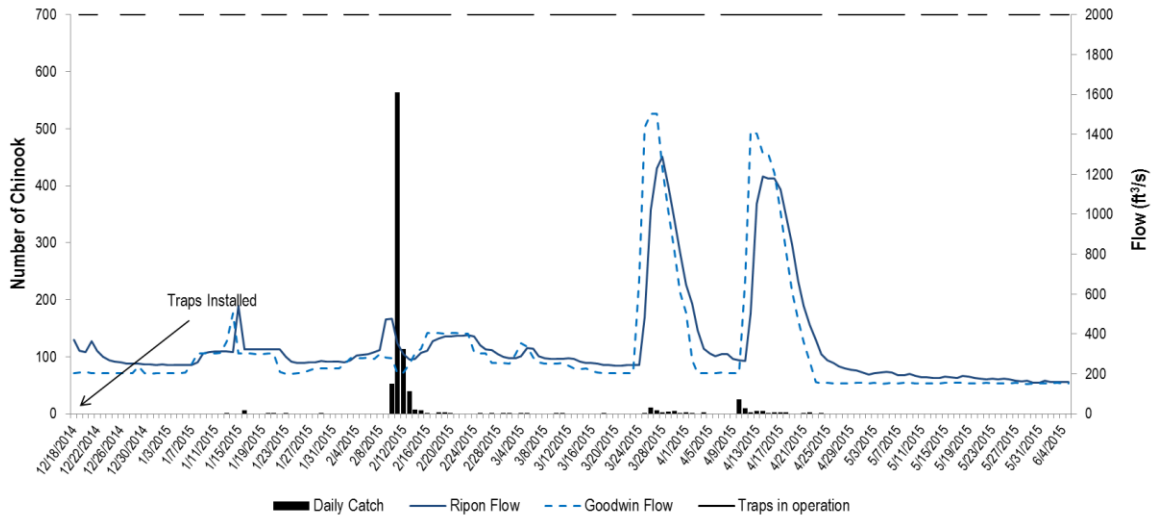

Figure 7: Daily catch of outmigrating juvenile Chinook salmon at Caswell and daily average flow (cfs) at Ripon (RIP) and Goodwin Dam (GDW) from 12/18/14 to 6/5/15. Figure courtesy of Cramer Fish Sciences.

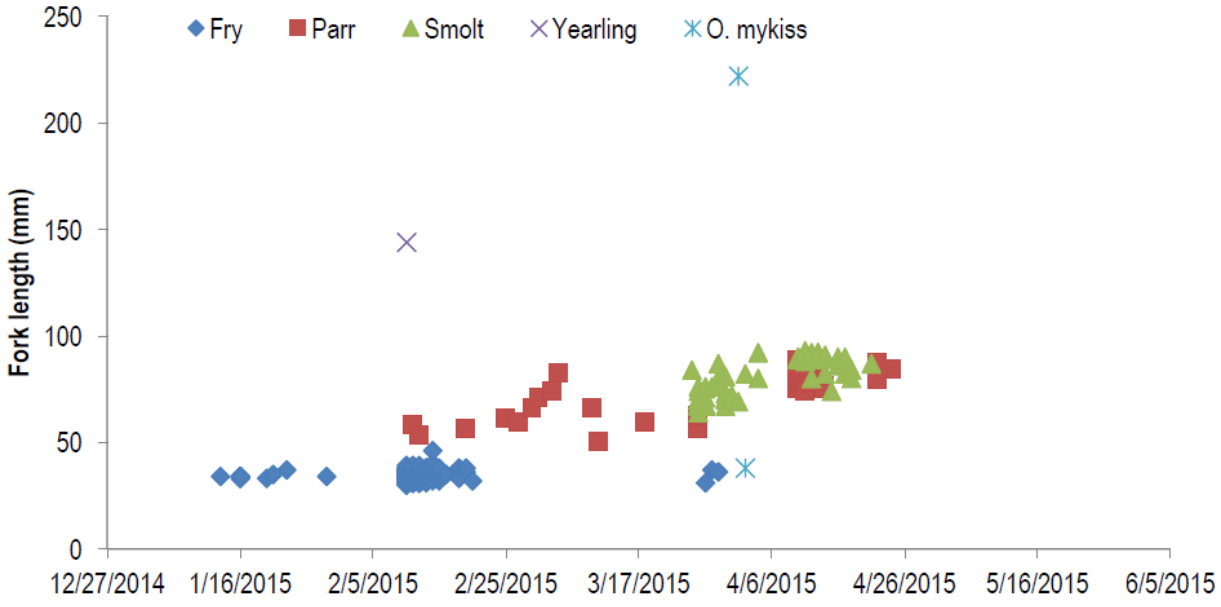

Figure 8: Length-frequency distribution of outmigrating juvenile Chinook salmon and outmigrating juvenile *O. mykiss* captured at Caswell from 12/18/14 to 6/5/15. Figure courtesy of Cramer Fish Sciences.

Oakdale and South San Joaquin Irrigation Districts and Tri-Dam Project fund Fishbio to conduct weir monitoring (for adult salmonids) near Riverbank and rotary screw trap monitoring (for

juvenile salmonids) near Oakdale. WY 2015 data from those monitoring sites is provided below in Figures 9-12.

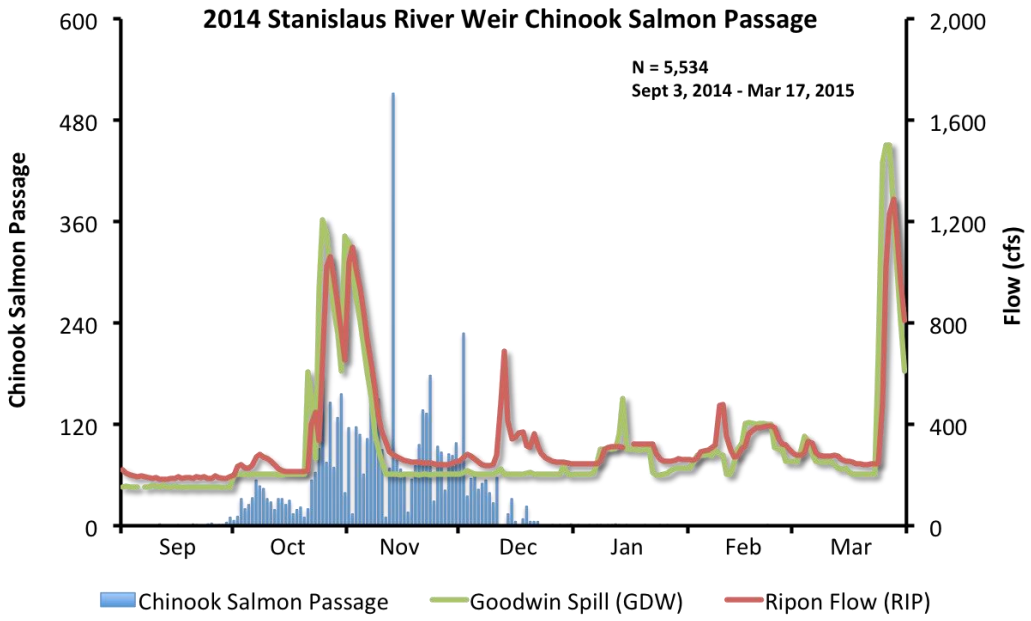

Figure 9: Daily upstream passage of adult Chinook salmon at the Stanislaus River Weir and flow at Goodwin Dam (GDW) and Ripon (RIP) from 9/3/14 to 3/17/15. Figure courtesy of FISHBIO.

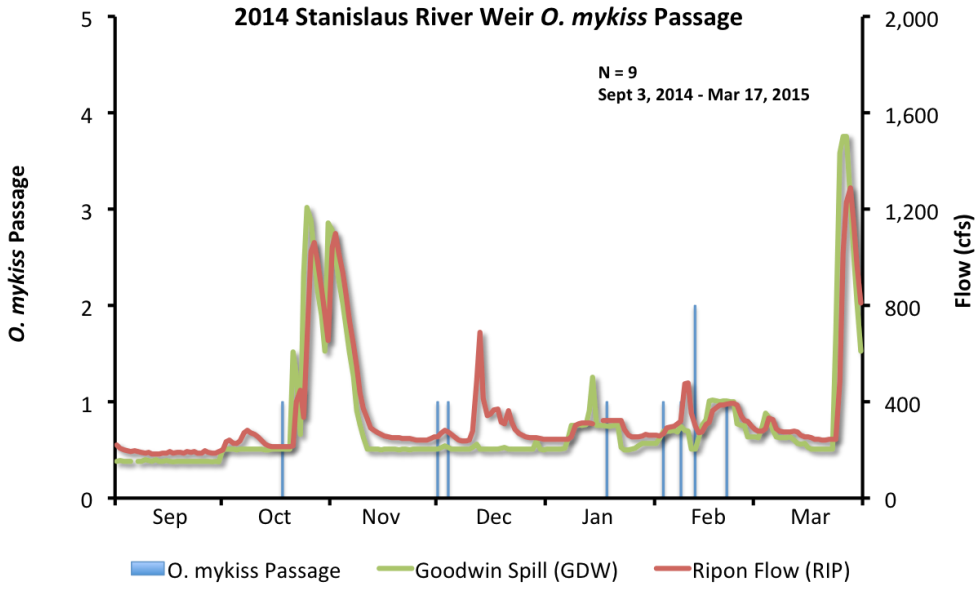

Figure 10: Daily Upstream passage of *O. mykiss* at the Stanislaus River Weir and flow at Goodwin Dam (GDW) and Ripon (RIP) from 9/3/14 to 3/17/15. Figure courtesy of FISHBIO.

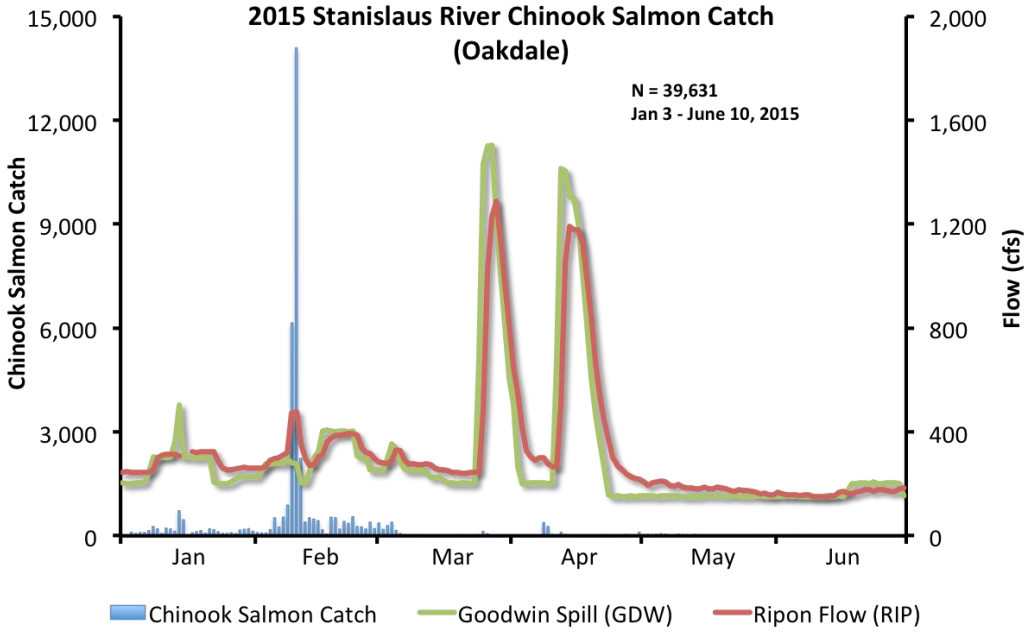

Figure 11: Daily catch of outmigrating juvenile Chinook salmon at the Stanislaus River rotary screw trap at Oakdale and flow at Goodwin Dam (GDW) and Ripon (RIP) from 1/3/15 to 6/10/15. Figure courtesy of FISHBIO.

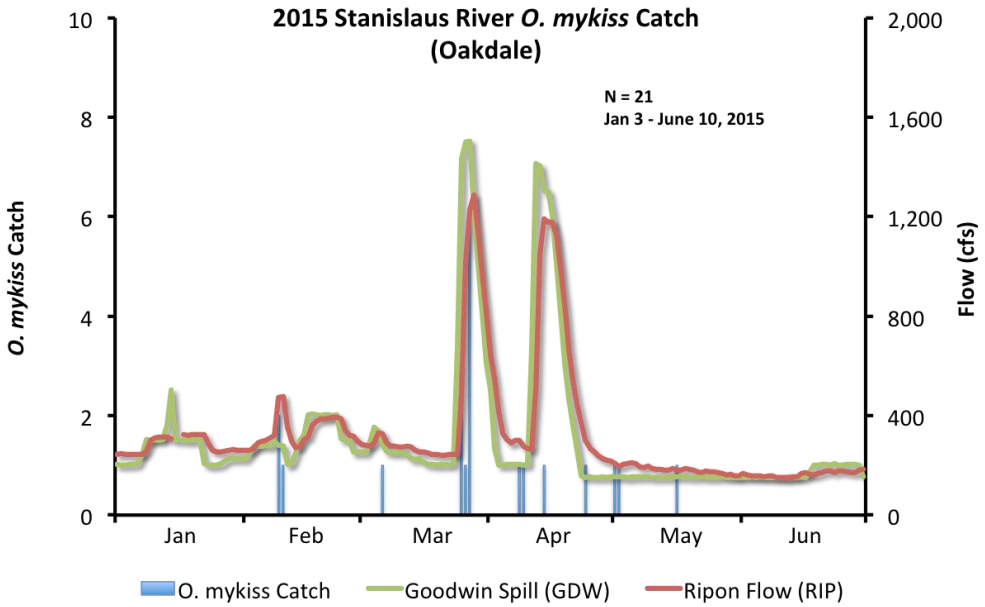

Figure 12: Daily catch of outmigrating juvenile *O. mykiss* at the Stanislaus River rotary screw trap at Oakdale and flow at Goodwin Dam (GDW) and Ripon (RIP) from 1/3/15 to 6/10/15. Figure courtesy of FISHBIO.

References

NMFS. 2009. *Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project. NMFS-Southwest Region. 844 pages plus appendices.*

NMFS. 2011. *Letter transmitting the 2009 Reasonable and Prudent Alternative with 2011 Amendments. April 7.*

Bragg, Carolyn <cbragg@usbr.gov>

Re: Revised SOG advice -- response requested by Friday (10/17) 9am

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Fri, Oct 17, 2014 at 8:49 AM
To: "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>
Cc: Barbara Byrne <barbara.byrne@noaa.gov>, Carolyn Bragg <cbragg@usbr.gov>, Patricia L Clinton <PClinton@usbr.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Tom,

On October 1, 2014, NMFS determined that the proposed change in the fall pulse flow schedule, as described in the September 26, 2014, SOG advice, was consistent with the implementation procedures of RPA Action III.1.3. At that time, NMFS requested that SOG report the specific timing of the fall pulse flow to NMFS and WOMT no later than October 31, 2014. NMFS also concurred with the advice to shift the initiation date for the fall temperature criterion at Orange Blossom Bridge to the date of the first pulse peak within the reshaped fall pulse flow and determined that the proposed initiation window for the fall temperature criterion was consistent with the implementation procedures of RPA Action III.1.2.

The October 16, 2014, SOG advice proposes a minor modification to the approved pulse reshaping and reports the specific timing of both the fall pulse flow (to be initiated on October 21, 2014) and the initiation of the fall temperature criterion (effective beginning on October 24, 2014) for implementation in 2014. NMFS determines that, for 2014, implementation of the fall attraction flow according to the "Alt B-revised" scheduled (Table 1 of the attached October 16, 2014, SOG advice) is 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 let Aaron Miller (DWR) know, and he can schedule a WOMT meeting. Thanks.

-Garwin-

Garwin Yip
U.S. Department of Commerce
NOAA's National Marine Fisheries Service
Water Operations and Delta Consultations Branch Supervisor
650 Capitol Mall, Suite 5-100
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Begin forwarded message:

> **From:** Barbara Byrne - NOAA Federal <barbara.byrne@noaa.gov>
> **To:** Garwin Yip - NOAA Federal <Garwin.Yip@noaa.gov>
> **Cc:** "Bragg, Carolyn" <CBragg@usbr.gov>, "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>, Patricia L Clinton <PClinton@usbr.gov>
> **Subject: Revised SOG advice -- response requested by Friday (10/17) 9am**

Garwin,

At its 10/15/14 meeting, the Stanislaus Operations Group (SOG) discussed the specific timing of the fall pulse flow within the flexible timing window advised in the 9/26/14 SOG advice (approved by NMFS on 10/1/14). Based on our discussion, SOG advises a minor modification to the approved pulse reshaping for 2014.

Attached is SOG advice which (a) advises a minor reshaping of the pulse flow within the already-approved flexible time window, based on discussion at the 10/14/14 SOG meeting, and (b) identifies specific timing for both the pulse flow and the initiation of the fall temperature criterion, as requested in the 10/1/14 NMFS approval of the 9/26/14 SOG advice.

SOG requests that NMFS concur with this advice regarding implementation of Stanislaus RPA actions during October and November of 2014. Because of the lead time needed for the scheduling of New Melones releases, *SOG requests a response, if possible, no later than 9am on Friday, 10/17. *

Please send your final decision to Tom Morstein-Marx, Reclamation, with a cc: to me; I'll forward your decision to the Stanislaus Operations Group for their information.

Regards,

Barb (on behalf of SOG)

--

*Barb Byrne**Biologist*

*NOAA Fisheries West Coast RegionU.S. Department of CommerceOffice: 916-930-5612*barbara.byrne <barbara.byrne@noaa.gov>
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*

2014.10.16_SOG flow & temp initiation advice_with attachments.pdf
548K

SOG ADVICE RE: IMPLEMENTATION OF THE STANISLAUS RPA ACTIONS DURING OCTOBER AND NOVEMBER
10/16/2014

Background
On 10/1/14, NMFS approved the 9/26/14 Stanislaus Operations Group (SOG) advice regarding implementation of Stanislaus actions in the Reasonable and Prudent Alternative (RPA) of the 2009 NMFS Biological Opinion (NMFS BiOp). Specifically, NMFS approved the reshaping of the fall pulse flow advised by SOG, as well as the flexible time window for implementation of the fall pulse flow and initiation data of the fall temperature criterion (see Attachment 1).

The regulatory background and stakeholder input regarding implementation of Stanislaus RPA actions during October and November 2014 are summarized in the 9/26/14 SOG advice (see Attachment 2). The considerations described in the 9/26/14 advice and the overall rationale for the reshaped pulse still apply; the current advice is provided in order to:

- request approval for a minor reshaping of the pulse flow within the already-approved flexible time window, based on discussion at the 10/14/14 SOG meeting, and
- identify specific timing for both the pulse flow and the initiation of the fall temperature criterion, as requested in the 10/1/14 NMFS approval.

SOG believes that the modified fall attraction flow schedule and initiation date for the fall temperature criterion at Orange Blossom Bridge are consistent with the intent of RPA actions III.1.3 and III.1.2.

SOG advice
SOG met on 10/15/14, reviewed recent conditions (Figure 1), and came to a general consensus that that the fall pulse flow should be implemented as soon as practicable given:

- cooler water temperatures,
- passage of hundreds of adult Chinook past the weir at Riverbank,
- initiation of Chinook salmon spawning in Goodwin Canyon, and
- the potential for an early-, rather than mid-November, removal of the fall barrier at the head of Old River.

Because of the lead time needed to schedule New Melones releases, assuming a change order was issued on Friday, 10/17/14, the pulse would not begin until Tuesday, 10/21/14, and the shaping in the 9/26/14 SOG advice would no longer accommodate the requested weekend rafting flows. The 9/26/14 SOG advice noted that SOG would work to accommodate the requested weekend flows "if not detrimental to expected fish benefits"; the reshaping advised in the current advice adjusts the pulse shaping such that the mid-week initiation of the pulse (which accommodates the current SOG consensus that "sooner is better" in terms of fishery benefits) doesn't preclude the fish-neutral accommodation of the higher weekend flows.

Flow
For 2014, SOG advises that the fall attraction flow (Critical yeartype) be implemented according to the "Alt B-revised" flow schedule described in Table 1 and Figure 2, in terms of both pulse shaping and specific pulse timing.

As does the previously advised "Alt B" schedule, the currently advised "Alt B-revised" schedule has the same volume (23,207 AF) and peak flow (1,250 cfs) as the Critical fall pulse in Appendix 2-E, and provides flow variability expected to deter spawning at the higher flows that won't be sustained through egg incubation and fry emergence. The technical team believes "Alt B-revised" schedule meets the intent of the RPA action, namely, improving instream conditions and providing an attraction cue for adult salmonids returning to spawn.

Temperature

For 2014, SOG advises that the fall temperature criterion of 56°F at Orange Blossom Bridge apply as 10/24/2014. The 9/26/14 SOG advice was "that the fall temperature criterion of 56°F at Orange Blossom Bridge apply as of the initiation of the first pulse peak within the reshaped fall pulse flow, which will be no later than 11/8/2014". The current advice implements the intent of that advice in the context of the "Alt B-revised" pulse flow, setting the initiation date of the fall temperature criterion to the first of the two highest pulse peaks (1,250 cfs on 10/24/14), rather than the first, but small, pulse peak (700 cfs on 10/21/14).

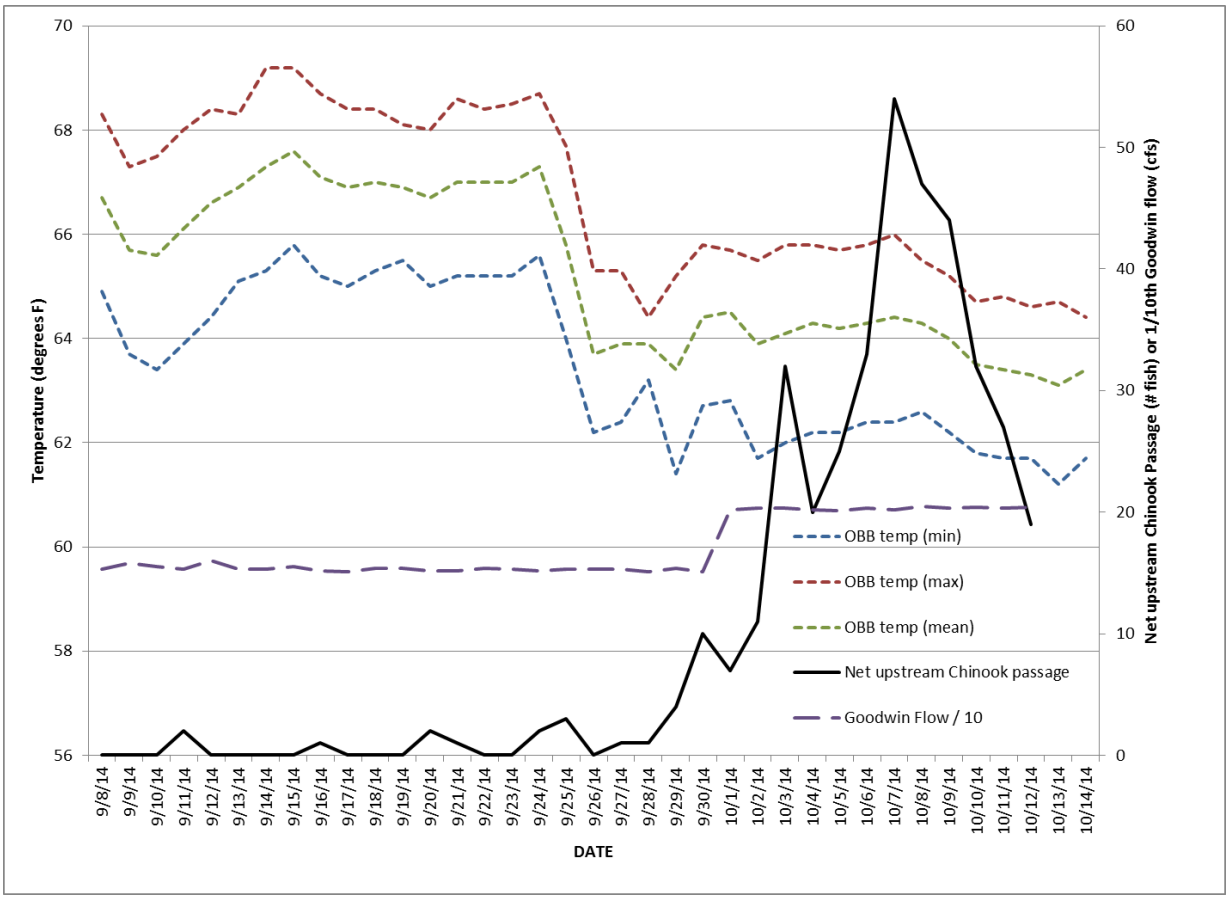

Figure 1. Recent conditions in the Stanislaus River. Data on water temperatures at Orange Blossom Bridge (OBB) and flows below Goodwin Dam are from CDEC. Net upstream Chinook passage data is from the 10/13/14 FISHBIO Stanislaus weir update.

Table 1. Selected Stanislaus fall pulse flow schedules considered by SOG for October-November 2014. The current SOG advice is that the "Alt B-revised" pulse be implemented according to the dates noted. The 9/26/14 SOG advice was that the "Alt B" pulse be implemented with some potential shift in timing. For all scenarios, the pulse volume was calculated against a base flow of 200 cfs.

Appendix 2-E
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	500	200	300	595	595
	10/16	750	200	550	1091	1686
	10/17	1000	200	800	1587	3273
	10/18	1250	200	1050	2083	5355
	10/19	1250	200	1050	2083	7438
	10/20	1250	200	1050	2083	9521
	10/21	1250	200	1050	2083	11603
	10/22	1250	200	1050	2083	13686
	10/23	1250	200	1050	2083	15769
	10/24	1250	200	1050	2083	17851
	10/25	1250	200	1050	2083	19934
	10/26	1000	200	800	1587	21521
	10/27	750	200	550	1091	22612
	10/28	500	200	300	595	23207
	10/29	200	200	0	0	23207
	10/30	200	200	0	0	23207
	10/31	200	200	0	0	23207
NOV	11/1	200	200	0	0	23207
	11/2	200	200	0	0	23207
	11/3	200	200	0	0	23207
	11/4	200	200	0	0	23207
	11/5	200	200	0	0	23207
	11/6	200	200	0	0	23207
	11/7	200	200	0	0	23207
	11/8	200	200	0	0	23207
	11/9	200	200	0	0	23207
	11/10	200	200	0	0	23207
	11/11	200	200	0	0	23207
	11/12	200	200	0	0	23207
	11/13	200	200	0	0	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

Alt B
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	200	200	0	0	0
	10/16	200	200	0	0	0
	10/17	200	200	0	0	0
	10/18	200	200	0	0	0
	10/19	200	200	0	0	0
	10/20	200	200	0	0	0
	10/21	200	200	0	0	0
	10/22	200	200	0	0	0
	10/23	200	200	0	0	0
	10/24	1250	200	1050	2083	2083
	10/25	1200	200	1000	1983	4066
	10/26	1100	200	900	1785	5851
	10/27	1000	200	800	1587	7438
	10/28	900	200	700	1388	8826
	10/29	750	200	550	1091	9917
	10/30	600	200	400	793	10711
	10/31	1200	200	1000	1983	12694
NOV	11/1	1100	200	900	1785	14479
	11/2	1000	200	800	1587	16066
	11/3	900	200	700	1388	17455
	11/4	800	200	600	1190	18645
	11/5	700	200	500	992	19636
	11/6	600	200	400	793	20430
	11/7	500	200	300	595	21025
	11/8	450	200	250	496	21521
	11/9	425	200	225	446	21967
	11/10	400	200	200	397	22364
	11/11	375	200	175	347	22711
	11/12	350	200	150	298	23008
	11/13	300	200	100	198	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

Alt B-revised
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	200	200	0	0	0
	10/16	200	200	0	0	0
	10/17	200	200	0	0	0
	10/18	200	200	0	0	0
	10/19	200	200	0	0	0
	10/20	200	200	0	0	0
	10/21	700	200	500	992	992
	10/22	500	200	300	595	1587
	10/23	200	200	0	0	1587
	10/24	1250	200	1050	2083	3669
	10/25	1200	200	1000	1983	5653
	10/26	1150	200	950	1884	7537
	10/27	1000	200	800	1587	9124
	10/28	850	200	650	1289	10413
	10/29	750	200	550	1091	11504
	10/30	600	200	400	793	12298
	10/31	1200	200	1000	1983	14281
NOV	11/1	1100	200	900	1785	16066
	11/2	1000	200	800	1587	17653
	11/3	900	200	700	1388	19041
	11/4	800	200	600	1190	20231
	11/5	700	200	500	992	21223
	11/6	600	200	400	793	22017
	11/7	500	200	300	595	22612
	11/8	350	200	150	298	22909
	11/9	300	200	100	198	23107
	11/10	250	200	50	99	23207
	11/11	200	200	0	0	23207
	11/12	200	200	0	0	23207
	11/13	200	200	0	0	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

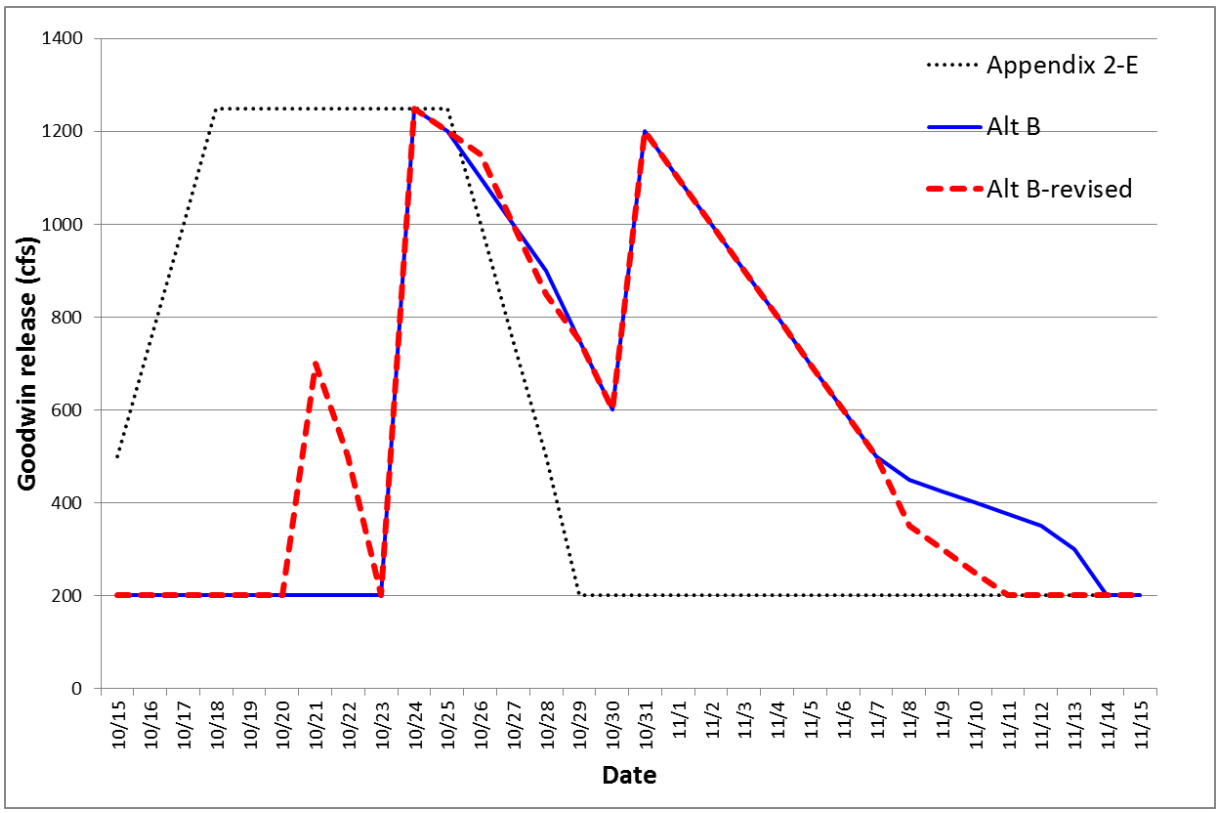

Figure 2. Selected Stanislaus fall pulse flow schedules considered by SOG for October-November 2014. The current SOG advice is that the "Alt B-revised" pulse be implemented according to the dates noted. The 9/26/14 SOG advice was that the "Alt B" pulse be implemented with some potential shift in timing.

Attachment 1

10/1/14 NMFS Approval of
9/26/14 SOG Advice

Bragg, Carolyn <cbragg@usbr.gov>

Re: SOG Oct-Nov 2014 NMFS BiOp proposed actions

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Wed, Oct 1, 2014 at 3:25 PM
To: Carolyn Bragg <cbragg@usbr.gov>
Cc: "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>, Patricia L Clinton <PClinton@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, "'Maria.rea@noaa.gov" <Maria.rea@noaa.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Carolyn,

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 2014, the fall attraction flow may be reshaped according to the attached SOG advice (specifically, the "Alt B" schedule in Table 1 of Attachment 1). 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 understands that because of uncertainty about temperature conditions in mid-late October, SOG advises that the advised pulse shaping be implemented within a flexible time window, with specific dates to be determined in early-mid October. Therefore, SOG advises that the approximately two-week duration pulse be implemented sometime within a five-week window between mid-October and mid-November such that the first peak is implemented between October 18, 2014, and November 8, 2014, and that flows return to the base 200 cfs no later than November 22, 2014. NMFS requests that SOG report back to NMFS and WOMT on the specific pulse schedule no later than October 31, 2014.

NMFS also concurs with the advice to shift the initiation date for the fall temperature criterion at Orange Blossom Bridge to the date of the first pulse peak within the reshaped fall pulse flow (per the SOG advice, to be implemented between October 18 and November 8, 2014) 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 let Aaron Miller

know, and he can schedule a WOMT meeting. Thanks.

-Garwin-

Garwin Yip
Water Operations and Delta Consultations Branch Chief
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---------- Forwarded message ----------
From: **Bragg, Carolyn** <cbragg@usbr.gov>
Date: Tue, Sep 30, 2014 at 9:46 AM
Subject: SOG Oct-Nov 2014 NMFS BiOp proposed actions
To: Garwin Yip - NOAA Federal <garwin.yip@noaa.gov>
Cc: THOMAS MORSTEIN-MARX <tmorsteinmarx@usbr.gov>, Barb Byrne <barbara.byrne@noaa.gov>, PATRICIA CLINTON <pclinton@usbr.gov>

Morning Garwin,

Stanislaus River talk: At its 9/17/2013 meeting, the Stanislaus Operations Group (SOG) discussed both the upcoming fall attraction flow schedule in Appendix 2-E of the NMFS Biological Opinion (BiOp) and the fall temperature criterion at Orange Blossom Bridge. Attached is SOG advice regarding (a) the reshaping of the fall attraction flow in Action III.1.2 and (b) the initiation date of the fall temperature criterion at Orange Blossom Bridge.

Let me (BOR) know if NMFS concurs with this approach regarding the implementation of Stanislaus RPA actions during October and November of 2014 when you can. Please send your thoughts and/or final decision to the people included in this email. Barb, or I, will forward on to SOG, SRF and the other interested stakeholders once decisions have been finalized.

Hope things are going well over there...

Attachment 2

9/26/14 SOG Advice

SOG ADVICE RE: IMPLEMENTATION OF THE STANISLAUS RPA ACTIONS DURING OCTOBER AND NOVEMBER
9.26.2014

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."

Input from stakeholders

On the August 20, 2014 Stanislaus River Forum (SRF) call, representatives from Oakdale Irrigation District (OID), South San Joaquin Irrigation District (SSJID), and Stockton East Water District (SEWD) expressed concerns about current and future storage in New Melones Reservoir. Given the water supply concerns, the districts made two specific suggestions regarding management of fall flows on the Stanislaus:

> (1) Rather than implement the 23,207 AF fall pulse flow required by the NMFS 2009 Biological Opinion on Long-term Operations of the CVP and SWP (2009 NMFS BiOp), implement flows in the 200-250 range during the fall. Could condition this action with a requirement that, if hydrology improves, the 23,207 TAF "foregone" could be used later, for example to augment the spring outmigration flow.
> (2) Ask the State Water Resources Control Board (Reclamation petition for a temporary urgency change petition) for a relaxation of the October Vernalis flow standard, which requires that average monthly flow at Vernalis for October be at least 1000 cfs.

Fishbio provided additional information in support of these requests on a special SRF call on 9/5/14.

[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

On both the 8/20/14 and 9/5/14 SRF calls, NMFS noted that the districts' first suggestion, while related to implementation of the 2009 NMFS BiOp, would require a change in the pulse flow volume, which is not a change within the authority of the Stanislaus Operations Group (SOG). The second suggestion is related to a state water quality standard, not to any requirement in the 2009 NMFS BiOp, and thus is not within the scope or authority of the SOG.

The All Outdoors (a rafting company) representative asked that, when discussing the shaping and timing of the fall pulse flow, the SOG consider the following preferred rafting conditions:

- Preferred rafting flows: 800-1200 cfs, high end of the range preferred. 600-800 cfs is do-able, but not desirable.
- Timing of rafting flows: 10am-4pm on weekends
- Location of rafting flows: Between Goodwin Dam and Knights Ferry

Below, SOG advises a modified fall attraction flow schedule and initiation date for the fall temperature criterion at Orange Blossom Bridge that we believe is consistent with the intent of RPA actions III.1.3 and III.1.2. In terms of stakeholder input, the proposed flow schedule does not adjust the volume of the pulse flow required in the NMFS BiOp, as that is not within SOG's authority, but does offer the potential (depending on final timing) to partially accommodate the preferred flows for rafters if not detrimental to expected fishery benefits.

<u>SOG advice</u>

Flow

For 2014, SOG advises that the fall attraction flow (Critical yeartype) be reshaped according to the "Alt B" flow schedule[3] described in Table 1 and Figure 1 of Attachment 1.

Pulse shaping:

At the 9/17/14 SOG meeting, SOG members reviewed the "Alt A" schedule and agreed with the shaping in general but agreed to modify the peaks slightly such that flows would increase a bit more quickly and decline a bit more slowly. That revision resulted in the "Alt B" schedule. Both reshaped flow schedules have the same volume (23,207 AF) as the Critical fall pulse in Appendix 2-E. Both the "Alt A" and "Alt B" schedules reshape the fall pulse volume into a two-peak release (the maximum daily releases in the alternatives reach 1200-1250 cfs; comparable to the peak sustained flow of 1250 in the default 2-E flow schedule) that provides flow variability expected to deter spawning at the higher flows that won't be sustained through egg incubation and fry emergence. The technical team believes both schedules meet the intent of the RPA action, namely, improving instream conditions and providing an attraction cue for adult salmonids returning to spawn.

<u>Note:</u> SOG's scope is limited to implementation of the Stanislaus actions in the NMFS BiOp, but SOG does consider other expected flows in the San Joaquin basin when providing advice on BiOp implementation. Because SOG was not certain whether releases from New Melones additional to the BiOp-required flows might be necessary to

[3] The timing of the pulse flow might not occur exactly as depicted in Table 1 and Figure 1 of Attachment 1; see the advice on pulse timing.

meet the Vernalis flow objective in D-1641, SOG shaped the flow volume required by the NMFS BiOp. If additional Stanislaus releases are necessary, SOG suggests that additional flow be released to augment or extend the advised "Alt B" flow in a manner such that (a) the resulting schedule maintains flow variability, i.e. that daily flow changes by at least 200 cfs per day (to provide flow variability expected to deter spawning), (b) October weekend flows do not exceed 1,200 cfs unless higher flows provide greater fishery benefits or are necessary to meet the Vernalis requirement (to keep flows within the preferred rafting conditions), and (c) additional flows be released between mid-October and mid-November.

Pulse timing:
At the 9/17/14 SOG meeting, SOG members agreed that delaying the initiation of the fall pulse was appropriate in fall 2014 due to expected warm water temperatures into mid-late October. By delaying the pulse until late October and sustaining the pulse tail through mid-November, SOG expects that the higher-than-base flows will help to buffer water temperatures during the seasonal transition to cooler air temperatures. However, because of uncertainty about temperature conditions in mid-late October, SOG advises that the advised pulse shaping be implemented within a flexible time window, with specific dates to be determined in early-mid October. SOG advises that the approximately two-week duration pulse be implemented sometime within a five-week window between mid-October and mid-November such that the first peak is implemented between 10/18/14 and 11/8/14 and that flows return to the base 200 cfs no later than 11/22/14. If not detrimental to expected fish benefits, SOG will implement the pulse so that the peak flows occur on weekends, in order to accommodate the flow preferences of rafting interests.

The full list of considerations discussed by SOG at the 9/1714 meeting is summarized in Table 2 of Attachment 1.

Temperature
For 2014, SOG advises that the fall temperature criterion of 56°F at Orange Blossom Bridge apply as of the initiation of the first pulse peak within the reshaped fall pulse flow, which will be no later than 11/8/2014. 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. The net upstream cumulative count of fall-run Chinook counted at the Stanislaus Weir from 9/5/2014 through 9/23/2014 is just 6 fish, and no CV steelhead have yet been observed this fall at the weir. These data provide no clear indication of "early migration" of salmonids into the watershed which might require temperature management to begin on October 1.

From 9/15/14 to 9/25/14, daily maximum temperatures measured at OBB[4] have ranged between 67.7°F and 69.2°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 9/25/2014 was 68.3°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.

[4] 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 attraction flow schedule advised by SOG for October-November 2014

Table 1. Stanislaus fall pulse flow schedules considered by SOG for October-November 2014. SOG advised that the "Alt B" pulse be implemented with some potential shift in timing. The pulse volume was calculated against a base flow of 200 cfs.

Appendix 2-E
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	500	200	300	595	595
	10/16	750	200	550	1091	1686
	10/17	1000	200	800	1587	3273
	10/18	1250	200	1050	2083	5355
	10/19	1250	200	1050	2083	7438
	10/20	1250	200	1050	2083	9521
	10/21	1250	200	1050	2083	11603
	10/22	1250	200	1050	2083	13686
	10/23	1250	200	1050	2083	15769
	10/24	1250	200	1050	2083	17851
	10/25	1250	200	1050	2083	19934
	10/26	1000	200	800	1587	21521
	10/27	750	200	550	1091	22612
	10/28	500	200	300	595	23207
	10/29	200	200	0	0	23207
	10/30	200	200	0	0	23207
	10/31	200	200	0	0	23207
NOV	11/1	200	200	0	0	23207
	11/2	200	200	0	0	23207
	11/3	200	200	0	0	23207
	11/4	200	200	0	0	23207
	11/5	200	200	0	0	23207
	11/6	200	200	0	0	23207
	11/7	200	200	0	0	23207
	11/8	200	200	0	0	23207
	11/9	200	200	0	0	23207
	11/10	200	200	0	0	23207
	11/11	200	200	0	0	23207
	11/12	200	200	0	0	23207
	11/13	200	200	0	0	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

Alt A
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	200	200	0	0	0
	10/16	200	200	0	0	0
	10/17	200	200	0	0	0
	10/18	200	200	0	0	0
	10/19	200	200	0	0	0
	10/20	200	200	0	0	0
	10/21	200	200	0	0	0
	10/22	200	200	0	0	0
	10/23	200	200	0	0	0
	10/24	500	200	300	595	595
	10/25	1000	200	800	1587	2182
	10/26	1200	200	1000	1983	4165
	10/27	1100	200	900	1785	5950
	10/28	900	200	700	1388	7339
	10/29	700	200	500	992	8331
	10/30	500	200	300	595	8926
	10/31	700	200	500	992	9917
NOV	11/1	1000	200	800	1587	11504
	11/2	1200	200	1000	1983	13488
	11/3	1100	200	900	1785	15273
	11/4	900	200	700	1388	16661
	11/5	700	200	500	992	17653
	11/6	700	200	500	992	18645
	11/7	700	200	500	992	19636
	11/8	600	200	400	793	20430
	11/9	600	200	400	793	21223
	11/10	600	200	400	793	22017
	11/11	600	200	400	793	22810
	11/12	400	200	200	397	23207
	11/13	200	200	0	0	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

Alt B
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	200	200	0	0	0
	10/16	200	200	0	0	0
	10/17	200	200	0	0	0
	10/18	200	200	0	0	0
	10/19	200	200	0	0	0
	10/20	200	200	0	0	0
	10/21	200	200	0	0	0
	10/22	200	200	0	0	0
	10/23	200	200	0	0	0
	10/24	1250	200	1050	2083	2083
	10/25	1200	200	1000	1983	4066
	10/26	1100	200	900	1785	5851
	10/27	1000	200	800	1587	7438
	10/28	900	200	700	1388	8826
	10/29	750	200	550	1091	9917
	10/30	600	200	400	793	10711
	10/31	1200	200	1000	1983	12694
NOV	11/1	1100	200	900	1785	14479
	11/2	1000	200	800	1587	16066
	11/3	900	200	700	1388	17455
	11/4	800	200	600	1190	18645
	11/5	700	200	500	992	19636
	11/6	600	200	400	793	20430
	11/7	500	200	300	595	21025
	11/8	450	200	250	496	21521
	11/9	425	200	225	446	21967
	11/10	400	200	200	397	22364
	11/11	375	200	175	347	22711
	11/12	350	200	150	298	23008
	11/13	300	200	100	198	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

- rafting target 800-1200 cfs
- salmon festival target <500 cfs

Figure 1. Stanislaus fall pulse flow schedules considered by SOG for October-November 2014. SOG advised that the "Alt B" pulse be implemented with some potential shift in timing.

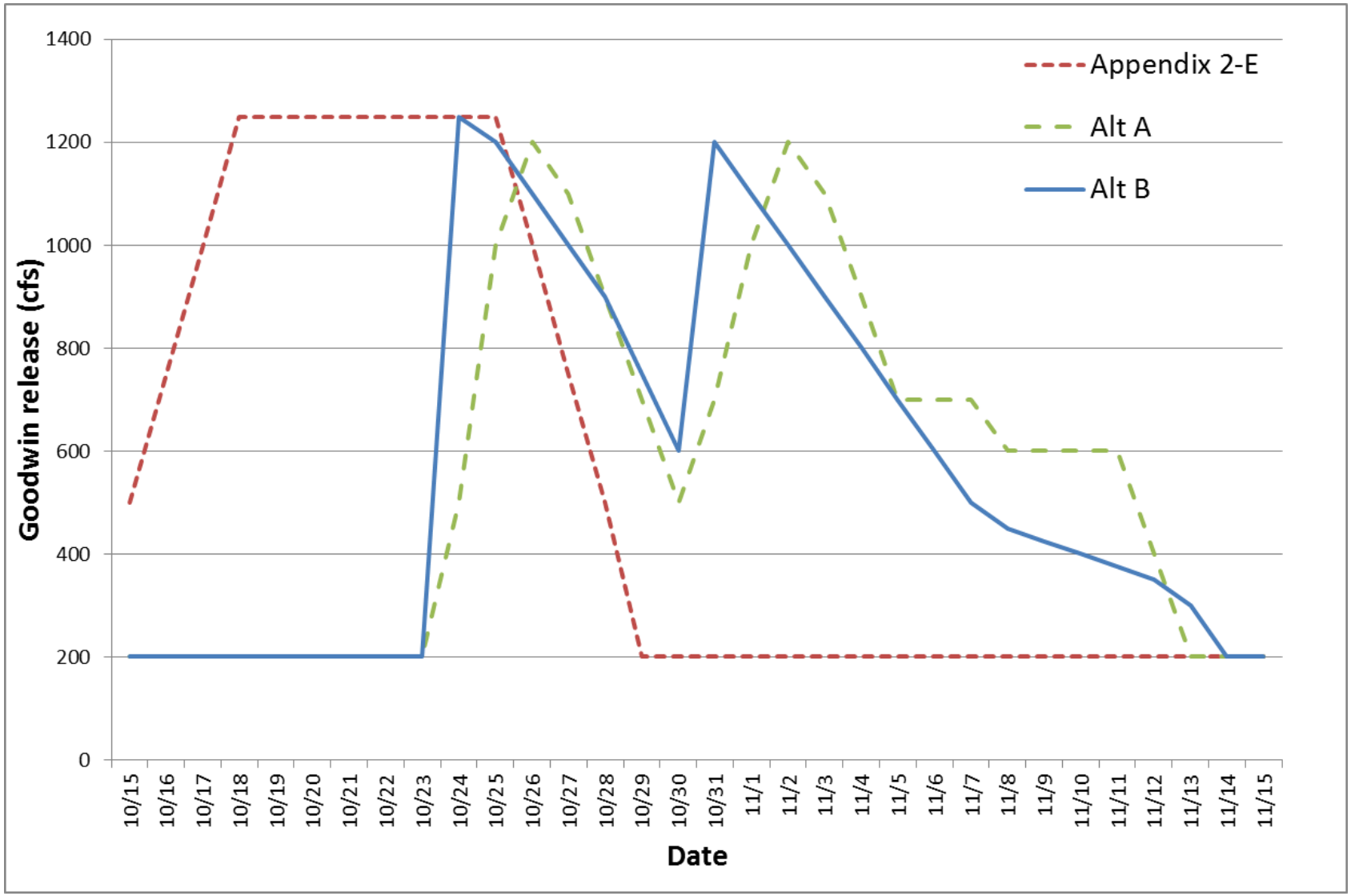

Table 2. Factors considered in the design of the SOG-advised fall pulse flow.

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. Ramping down to 500 cfs after peak flows allow the weir to be cleaned.
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, few redds are built before the 4th week of Oct, though in some years redd activity picks up in mid-October.
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.
Straying	Vernalis	Adult	Straying may be reduced when San Joaquin flows at Vernalis exceed 4,000 cfs.
Straying	delta	Adult	Straying may be reduced when the ratio of south delta exports to inflow () is no greater than 2:1.
Straying	Vernalis/ I street	Adult	Straying may be reduced when the ratio of Sacramento Inflow (I Street) to SJ Inflow (Vernalis) is no greater than 2:1.
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.
Stanislaus Salmon Festival	Knights Ferry	N/A	Flows <500 cfs are preferred for setup of the “Salmon Cam” at the festival.

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

Re: SOG advice re:winter instability flow

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Thu, Feb 26, 2015 at 9:47 PM
To: "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>
Cc: Michele Palmer <mpalmer@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Tom,

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."

Given the current context and severity of drought conditions, NMFS agrees that it is appropriate for the natural storm pulse in February 2015 to be considered in lieu of a controlled release to satisfy the February winter instability flow. Additionally, as SOG noted in its advice, the default shape and volume of the February winter instability flow was provided on 2/16 and 2/17 by releases for Vernalis salinity. NMFS determines that the February winter instability flows has been satisfied 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. Thanks.

-Garwin-

Garwin Yip
Water Operations and Delta Consultations Branch Chief
NOAA Fisheries West Coast Region
U.S. Department of Commerce
California Central Valley Area Office
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814
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NOAA FISHERIES
West Coast Region

---------- Forwarded message ----------
From: **Morstein-Marx, Thomas** <tmorsteinmarx@usbr.gov>
Date: Thu, Feb 26, 2015 at 12:08 PM
Subject: SOG advice re:winter instability flow
To: "Yip, Garwin" <Garwin.Yip@noaa.gov>
Cc: Michele Palmer <mpalmer@usbr.gov>, Barbara Byrne - NOAA Federal <barbara.byrne@noaa.gov>

Garwin,

At the February Stanislaus Operations Group (SOG) meeting, SOG members discussed the February winter instability flow in Appendix 2-E of the NMFS Biological Opinion (BiOp) and is providing advice (attached) regarding implementation of that flow element in WY 2015.

We request that NMFS concur with this advice. Please send your final decision to Tom Morstein-Marx, Reclamation, with a cc: to Michele Palmer; I'll forward your decision to the Stanislaus Operations Group for their information.

Regards,

SOG

2015.02.26_SOG advice re Feb 2015 WIF.pdf
401K

SOG ADVICE RE: FEBRUARY 2015 WINTER INSTABILITY FLOW
2.26.2015

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."

On 12/19/14, NMFS determined that the SOG-proposed changes in the shaping and timing of the January and February winter instability flows were consistent with the implementation procedures of RPA Action III.1.3 (See Attachment 2). The January winter instability flow was implemented in early January, in conjunction with New Melones releases for Vernalis salinity requirements, in order get multiple benefits from the released water and in consideration of low New Melones storage and no certain precipitation in the January weather forecast.

Below, SOG advises that the natural storm pulse in early February be considered to satisfy the February winter instability flow.

SOG advice

For February 2015, SOG advises that the natural storm pulse in early February be considered to satisfy the February winter instability flow (Critically Dry yeartype) in the Appendix 2-E flow schedule.

Rationale:

- Realized storm flow in-river at Orange Blossom Bridge was of a similar shape to the SOG-advised winter instability flow *[Attachment 1]*
- Realized storm flow in-river at Orange Blossom Bridge (1026 AF above a base flow of 200 cfs) exceeded the volume of the SOG-advised winter instability flow (796 AF above a base flow of 200 cfs) *[Attachment 1]*
- Concerns about storage in New Melones

In the current context of severe drought and serious concerns about storage in New Melones, SOG believes that the intended biological benefits have been largely satisfied by the natural storm pulse. SOG also notes that the 400 cfs flows on 2/16 and 2/17 (releases for Vernalis salinity) satisfy the "default" 2-E February winter instability flow in the Critical Appendix 2-E flow schedule.

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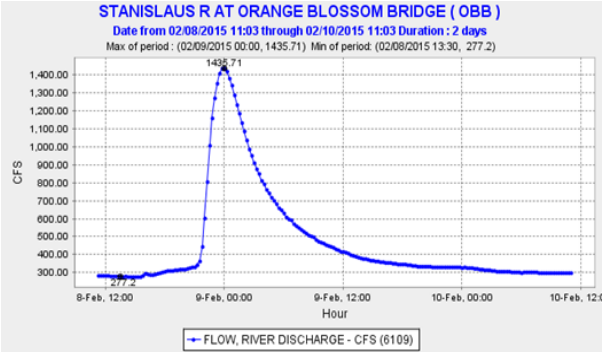
[1] The BiOp and all appendices are available online at: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocap.html

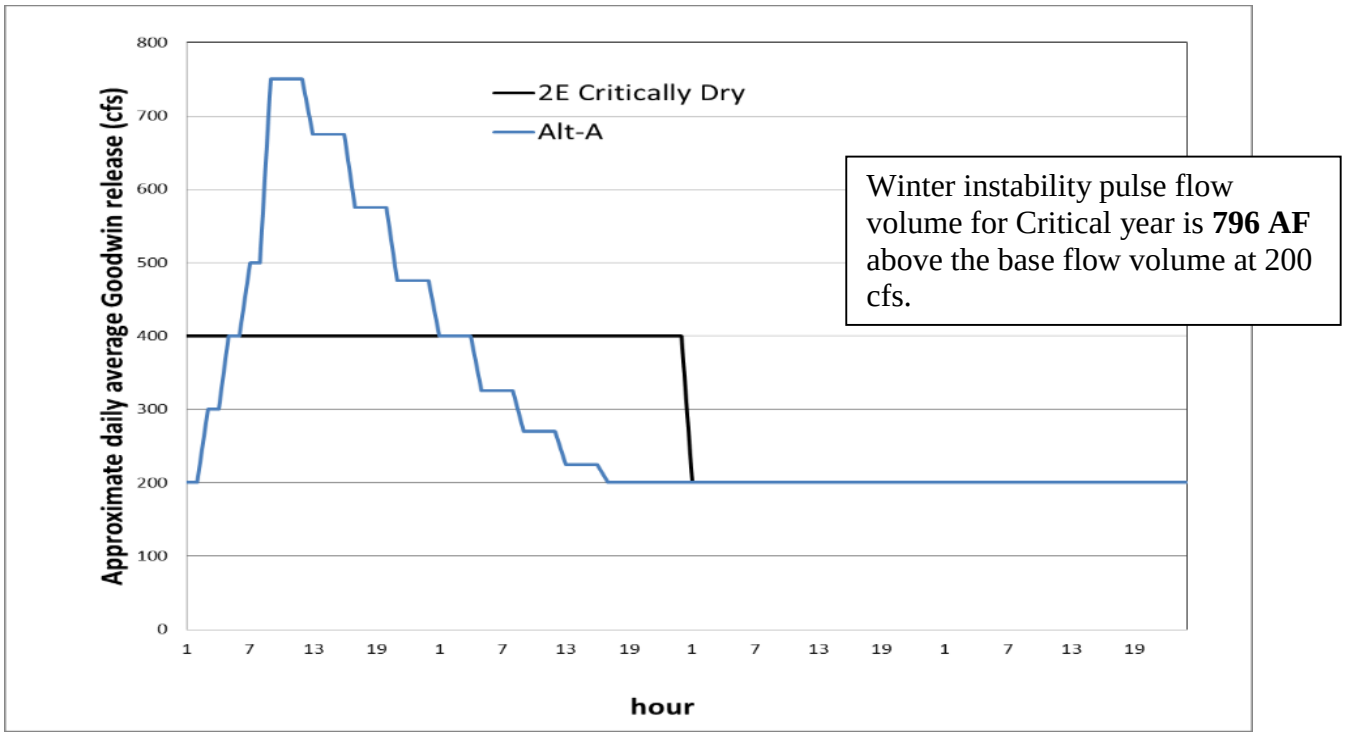
[2] Available online at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

ATTACHMENT 1

Comparison of February storm flow to
SOG-advised winter instability flow

2/8/15 to 2/9/15 measured flow at OBB compared to December SOG advice[3] (vertical scales do not match; horizontal scales approximately equivalent):





Date	Average daily flow at OBB	Flow above base flow of 200 cfs	AF above base flow
2/8/15	395	195	387
2/9/15	522	322	639
		Total	**1026**

[3] 2-E flow schedule refers to flow below Goodwin Dam, not at OBB. Observed flows at OBB during storm runoff are likely greater than observed flows below Goodwin Dam; in a controlled release flow, Goodwin Dam and OBB flows may be similar.

ATTACHMENT 2

NMFS determination regarding SOG-advised
Winter instability flows for January and February 2015

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

Fwd: January and February 2015 Pulse

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Fri, Dec 19, 2014 at 2:30 PM
To: "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>
Cc: Patricia L Clinton <PClinton@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, "womt@water.ca.gov" <womt@water.ca.gov>, EVasquez@usbr.gov

Tom--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 2015, 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, in the event of no rainfall, be initiated no later than the last day of the month in which it was scheduled per Appendix 2-E.

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. Thanks.

-Garwin-

Garwin Yip
Water Operations and Delta Consultations Branch Chief
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NOAA FISHERIES
West Coast Region

---------- Forwarded message ----------
From: **CLINTON, PATRICIA** <pclinton@usbr.gov>
Date: Thu, Dec 18, 2014 at 8:48 AM
Subject: January and February 2015 Pulse
To: Garwin Yip <Garwin.Yip@noaa.gov>
Cc: Elizabeth Vasquez <evasquez@usbr.gov>, Barb Byrne <barbara.byrne@noaa.gov>

Garwin,

At the December Stanislaus Operations Group (SOG) meeting, SOG members discussed the upcoming winter instability flows (one each in January and February) in Appendix 2-E of the NMFS Biological Opinion (BiOp).

Attached is the final SOG advice regarding a reshaping and shift in timing of the winter instability flows that we believe meets the intended objectives of the flow schedule specified in the BiOp per Action III.1.3.

We request that NMFS concur with this advice regarding Stanislaus operations during January and February of 2015. Please send your final decision to Tom Morstein-Marx, Reclamation, with a cc: to me; I'll forward your decision to the Stanislaus Operations Group for their information.

Regards,
Patti (on behalf of SOG)

--
Patti Clinton
Natural Resources Specialist
Bureau of Reclamation
Central California Area Office
7794 Folsom Dam Road
Folsom, California
916.989.7173

2014.12.17_SOG winter pulse advicep.pdf
99K

SOG ADVICE RE: IMPLEMENTATION OF THE STANISLAUS RPA ACTIONS DURING JANUARY & FEBRUARY 2015
12.17.2014

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 advice

Flow per RPA Action III.1.3

For January and February 2014, SOG advises that the winter instability flow (Critically Dry yeartype) (a) be reshaped according to the "Alt-A" flow schedule described in Table 1 and Figure 1, and (b) be 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).

a) RESHAPING: This alternate pulse shaping has the same volume (793 AF in addition to the 200 cfs base flow) as the Critically Dry 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 more slowly descending limb, is more typical of the flow pattern associated with storm events. Reshaping the subdaily flow pattern to increase the peak flow to 750 cfs for part of the first day of the pulse will inundate a greater portion of the Honolulu Bar restoration area and will likely allow at least partial inundation of the Lancaster Road restoration area. Short-term inundation of shallow water habitat can provide benefits to rearing salmonids such as: temporary spatial refuges from large predators, increased temperatures that may allow short-term increases in growth rate, and increased allochthonous input to the main channel. It was the opinion of SOG members familiar with those areas that, since the restoration at Honolulu Bar, there are minimal stranding concerns for juvenile salmonids for flow changes between 200 and 750 cfs.

[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

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

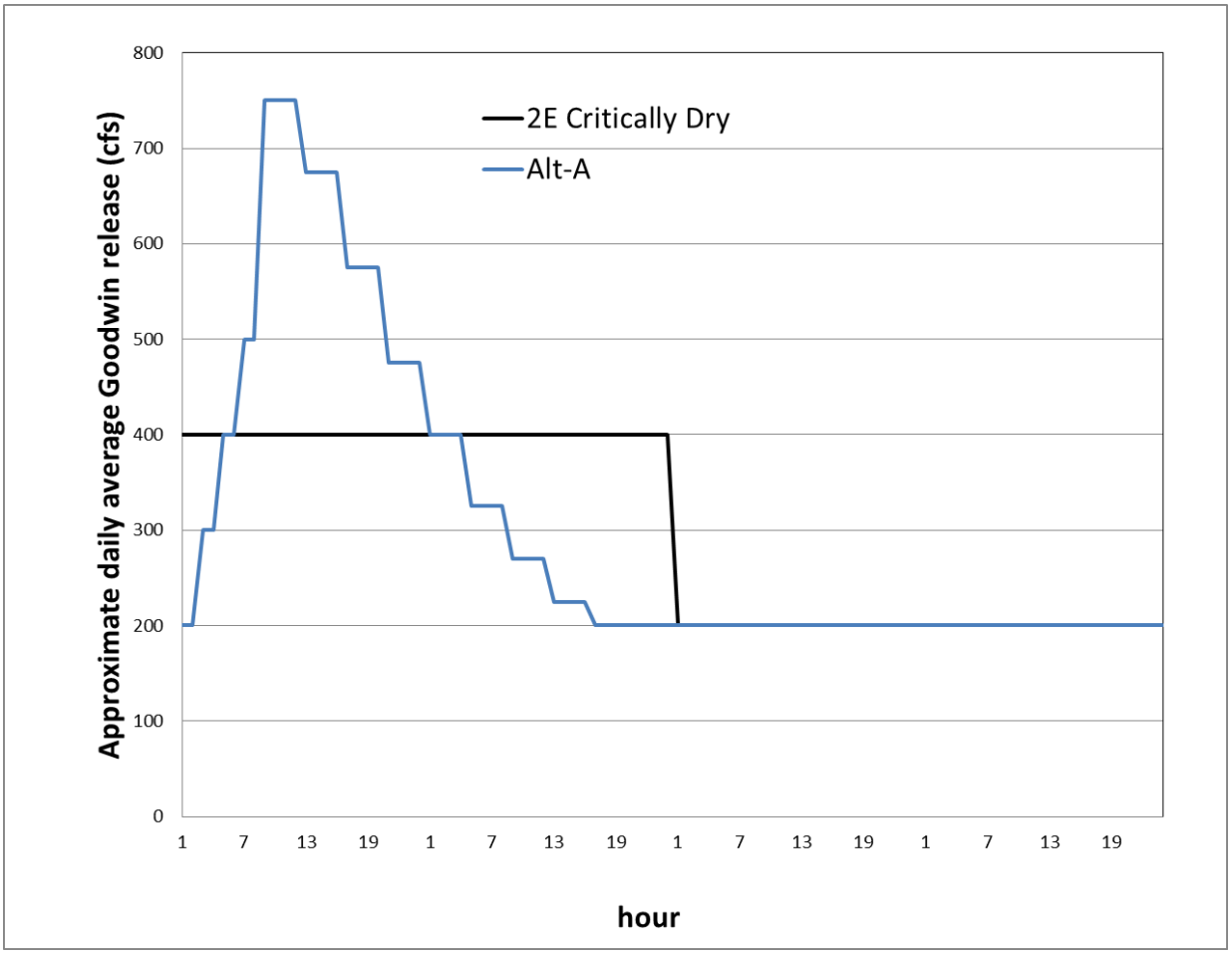
b) SHIFT IN TIME: According to the flow schedule in Appendix 2-E, the January and February winter instability flows are scheduled to begin on January 3rd and February 5th, respectively. Allowing the winter instability flow to be shifted in time to coincide with a natural storm event within each month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

If the January winter instability pulse hasn't been implemented by the January SOG meeting on 1/21/15, then SOG will schedule the pulse to be initiated no later than 1/31/15. If the February winter instability pulse hasn't been implemented by the February SOG meeting on 2/19/15, then SOG will schedule the pulse to be initiated no later than 2/28/15.

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..

Day	Time	Appendix 2E (Critically Dry)	Alt-A
1	1	400	200
1	2	400	200
1	3	400	**300**
1	4	400	300
1	5	400	**400**
1	6	400	400
1	7	400	**500**
1	8	400	500
1	9	400	**750**
1	10	400	750
1	11	400	750
1	12	400	750
1	13	400	**675**
1	14	400	675
1	15	400	675
1	16	400	675
1	17	400	**575**
1	18	400	575
1	19	400	575
1	20	400	575
1	21	400	**475**
1	22	400	475
1	23	400	475
1	0	400	475
2	1	400	**400**
2	2	400	400
2	3	400	400
2	4	400	400
2	5	400	**325**
2	6	400	325
2	7	400	325
2	8	400	325
2	9	400	**270**
2	10	400	270
2	11	400	270
2	12	400	270
2	13	400	**225**
2	14	400	225
2	15	400	225
2	16	400	225
2	17	400	**200**
2	18	400	200
2	19	400	200
2	20	400	200
2	21	400	200
2	22	400	200
2	23	400	200
2	0	400	200
avg hourly cfs:		400.0	399.6

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.



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

Re: Final SOG advice - 2-E flow schedule 2015

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Thu, Mar 19, 2015 at 11:19 PM
To: "Field, Randi C" <RField@usbr.gov>
Cc: Carolyn Bragg <cbragg@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>, lmao@usbr.gov, Michele Palmer <mpalmer@usbr.gov>

Randi,

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."

Attachment 1 of the attached file provides the correspondence leading up to the current revised SOG advice:

-- On March 2, 2015, SOG provided advice to NMFS on the timing, magnitude, and duration of the spring pulse flow in Appendix 2-E of NMFS' Biological Opinion.

-- On March 18, 2015, NMFS responded to the SOG advice, requesting that SOG revise or clarify its earlier advise, as appropriate, based on the status of the construction of the rock barrier at the Head of Old River (HORB; the HORB will be 90% complete by April 1, and 100% complete by April 8).

The attached SOG advice identifies the current and projected water temperatures in the Stanislaus and Vernalis rivers, and advises implementation of Alternative 1, that is, to initiate a spring pulse flow on the Stanislaus River as soon as practicable and following the shape and magnitude provided in Figure 1 and Table 1(which indicates the initiation of the pulse on Tuesday, March 24), while water temperature conditions are still conducive for steelhead smoltification and emigration. The SOG advice also acknowledges the status of the construction of the HORB, but stated that its concerns about water temperature effects, both for smoltification potential and migratory corridor conditions, far outweigh any concerns regarding possible routing of steelhead into Old River before the HORB is mostly completed on April 1.

NMFS concurs that the SOG advice, Alternative 1, 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…" In addition, as a result of the concerns regarding water temperatures, **NMFS recommends that Reclamation shift all of the dates associated with the spring pulse flow in Alternative 1 to one day earlier, so that the spring pulse flow is initiated on Monday, March 24**.

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. As this is a time critical issue, 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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---------- Forwarded message ----------
From: **Bragg, Carolyn** <cbragg@usbr.gov>
Date: Thu, Mar 19, 2015 at 5:11 PM
Subject: Final SOG advice - 2-E flow schedule 2015
To: Garwin Yip - NOAA Federal <garwin.yip@noaa.gov>
Cc: Thomas Morstein-Marx <tmorsteinmarx@usbr.gov>, Randi Field <rfield@usbr.gov>, Barb Byrne <barbara.byrne@noaa.gov>, Leeyan Mao <lmao@usbr.gov>, Michele Palmer <mpalmer@usbr.gov>

Hey Garwin,

At its 3/18/15 meeting, the Stanislaus Operations Group (SOG) again considered the shaping and timing of the spring pulse flow on the Stanislaus River per the Appendix 2-E flow schedule in the NMFS Biological Opinion. SOG explicitly considered the construction schedule for the rock barrier at the Head of Old River (HORB), and developed two alternative flow schedules, per your request, consistent with the intent of Action III.1.3 (see attached).

The conclusion from the updated SOG advice is excerpted below:

> **There was strong consensus that the Alternative 1 schedule, which starts the spring pulse during March, provides a better chance of successful steelhead outmigration than the Alternative 2 schedule.** SOG's

conclusion is based on the fact that current water temperatures on the Stanislaus River are already exceeding the threshold (57° F) considered suitable for steelhead smoltification, and are rising. Additionally, water temperatures in the mainstem San Joaquin are even warmer, and may soon be unsuitable for steelhead migration (>72° F; 2009 NMFS BiOp). **SOG's concerns about water temperature effects, both for smoltification potential and migratory corridor conditions, far outweigh any concerns regarding possible routing of steelhead into Old River before the HORB is mostly completed on April 1.**

SOG requests that NMFS concur with this advice. Please send your determination to Randi Field, Reclamation (acting for Tom Morstein-Marx), with a cc: to others included in this e-mail. I'll forward your decision to SOG for their information.

Much thanks and let me know if I can be of help - talk with you soon.

2015.03.19_SOG advice_spring pulse_FINAL.pdf
1131K

Stanislaus Operations Group Advice Re:
Alternative Stanislaus River Spring 2015 Outmigration Pulse flow
March 19, 2015

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."

On 3/2/15, the Stanislaus Operations Group (SOG) advised that, because of concerns about rising water temperatures, the WY 2015 spring pulse flow be implemented beginning in March (3/2/15 SOG advice included in Attachment 1). NMFS responded on 3/18/15 (see Attachment 1) with a request for SOG to review the advice in consideration of the construction schedule of the Head of Old River Barrier (HORB; 90% complete by April 1), and to develop two alternatives:

> **Alternative 1:** Objective focused on moving steelhead out of the Stanislaus and San Joaquin rivers before water temperatures become intolerable. This will likely include multiple peak flows, probably including at least one in March, as the [3/2/15] SOG advice provides. However, as mentioned above, the HORB will not be complete, so there will be risks associated with steelhead being entrained into Old River.
>
> **Alternative 2**: Objective focused on moving steelhead down the San Joaquin River after the HORB is complete. Travel time of the increased release from Goodwin Dam to Vernalis should be considered, so for example, if the travel time is 2 days, the pulse from Goodwin Dam could start on March 30 so that by the time it reaches the Head of Old River, the HORB will be closed.

SOG advice

SOG developed the two alternative flow schedules requested by NMFS; they are described in Figures 1-4 and Tables 1-2. Both alternatives have the same volume (30,842 AF, calculated against a base flow of 200 cfs in April and a 150 cfs base flow in May) as the spring outmigration pulse in the Critical yeartype schedule in Appendix 2-E. **There was strong consensus that the Alternative 1 schedule, which starts the spring pulse during March, provides a better chance of successful steelhead outmigration than the Alternative 2 schedule.** SOG's conclusion is based on the fact that current water temperatures on the

[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

Stanislaus River are already exceeding the threshold (57° F) considered suitable for steelhead smoltification, and are rising. Additionally, water temperatures in the mainstem San Joaquin are even warmer, and may soon be unsuitable for steelhead migration (>72° F; 2009 NMFS BiOp). **SOG's concerns about water temperature effects, both for smoltification potential and migratory corridor conditions, far outweigh any concerns regarding possible routing of steelhead into Old River before the HORB is mostly completed on April 1.**

SOG understands that the pulse flow may not be implemented exactly according to either alternative, but urges that implementation begin as soon as practicable.

Alternative 1 Flow Schedule Highlights:

- SOG **strongly prefers** the Alternative 1 schedule (Figure 1 and Table 1). Since unsuitable smoltification and migration conditions are expected to occur before mid-April this year (see Water Temperature Highlights), SOG considers it is very important to encourage steelhead migration to occur as soon as possible.
- The first peak is intended to spur outmigration of steelhead prior to water temperatures becoming unsuitable for smoltifcation and migration and to incrementally improve water temperatures on the Stanislaus and the San Joaquin rivers. Figures 5b and 6b show that water temperatures did decrease at both locations during the WY 2014 spring flow; SOG doesn't expect water temperatures to decrease as much in WY 2015 since the pulse flow will be considerably lower.
- The second, more attenuated peak, is also intended to spur continued outmigration of steelhead and to incrementally improve water temperatures on the Stanislaus and San Joaquin rivers.
- Additionally, the second peak is timed to provide improved migratory conditions on the mainstem San Joaquin River until the Tuolumne River pulse begins (expected April 19). Figure 2 and Table 2 show that the spring pulse flows on the mainstem will have three connected peaks – the first two from the Stanislaus River and the third from the Tuolumne River.
- Steelhead migrating out on the first peak will encounter an incomplete HORB and will have a higher likelihood of migrating through Old River, instead of the mainstem San Joaquin River. However, particularly at the low flows expected in WY 2015, steelhead survival may not be substantively different between routes (see Head of Old River Barrier Highlights).
- Steelhead migrating out on the second peak will encounter a HORB that is at least 90% complete (100% completion expected on 4/8/15), and most will likely remain in the mainstem San Joaquin River. Because all eight culverts in the HORB are expected to be open, some steelhead may still enter Old River even after 100% completion of the barrier.

Alternative 2 Flow Schedule H:

- SOG has provided an Alternative 2 schedule (Figure 1 and Table 1), as requested; however, SOG advises **against** selecting this alternative due to the increased probability that water temperatures will become unsuitable for smoltification and migration as the season progresses.
- Both peaks are intended to spur outmigration of steelhead and to potentially incrementally improve water temperatures on the Stanislaus and the San Joaquin rivers.

Figures 5b and 6b show that water temperatures did decrease at both locations during the WY 2014 spring flow; SOG doesn't expect water temperatures to decrease as much in WY 2015 since the pulse flow will be considerably lower.

- As in Alternative 1, the second peak is timed to provide improved migratory conditions on the mainstem San Joaquin River until the Tuolumne River pulse begins (expected April 19). Figure 3 and Table 3 show that, as in Alternative 1, the spring pulse flows on the mainstem will have three connected peaks – the first two from the Stanislaus River and the third from the Tuolumne River.
- Steelhead migrating out on the both peaks will encounter a HORB that is at least 90% complete (100% completion expected on 4/8/15), and most will likely remain in the mainstem San Joaquin River. Because all eight culverts in the HORB are expected to be open, some steelhead may still enter Old River even after 100% completion of the barrier.

<u>Water Temperature Highlights:</u>

- The 2009 NMFS BiOp water temperature criterion at Orange Blossom Bridge for steelhead smoltification is 57°F, measured as the seven day average of the daily maximum water temperature (7DADM).
- The 7DADM at Orange Blossom Bridge as of 3/18/15 was 59.8°F, and is rising quickly (Figure 4a). The 7DADM has increased by 4.3 Fahrenheit degrees since 3/1/15.
- Water temperatures at Orange Blossom Bridge have increased more quickly this year (Figure 4a) than in 2014 (Figure4b); the 7DADM exceeded 57°F in early March this year, while (on a sustained basis) not until early April in WY 2014. . As such, unsuitable smoltification conditions are already occurring this year at Orange Blossom Bridge. Conditions appropriate for smoltification are still expected to be present in cooler reaches upstream of Orange Blossom Bridge.
- The 2009 NMFS BiOp Old and Middle River flow RPA Action, Action IV.2.3, has an off-ramp when mean daily June water temperatures at Mossdale (very near Vernalis) exceed 72°Ffor seven days, since sustained water temperatures above 72°Fare considered unsuitable for salmonid migration.
- The mean daily water temperature at Vernalis as of 3/18/15 was 65.5°F and is rising quickly (Figure 5a). Mean daily water temperature has increased by 8 Fahrenheit degrees since 3/1/15.
- Water temperatures at Vernalis have increased more quickly this year (Figure 5a) than in 2014 (Figure 5b). Water temperature at Vernalis was in the low 60's by mid-March of 2014, but is in the mid- to high 60's this year, indicating that migration conditions will become unsuitable earlier this year.

<u>Head of Old River Barrier Highlights:</u>

- SOG acknowledges that steelhead arriving at the Head of Old River before April 1 have a greater risk of migrating through Old River (and later becoming entrained into the CVP or SWP export facilities) than those fish arriving at the Head of Old River after the HORB is 90% completed by April 1.
- However, based on recent acoustic tagging studies, and particularly in a year when lower than usual flows are expected at Vernalis, survival in the Old River route may not be substantively different than in the mainstem San Joaquin River route.

- Most importantly, given the current and expected trends in increasing water temperatures in WY 2015, SOG determined that delaying the pulses to coincide with the HORB being in place would cause detriments to steelhead outmigration. The probability that unsuitable smoltification and migration water temperatures will occur, or worsen, within the next few weeks far outweighs any potential benefits that may occur due to routing steelhead into the mainstem San Joaquin River by the HORB.

SOG recognizes that WY 2015 is a very challenging year on many fronts. **We encourage the implementation of the Alternative 1 pulse to provide a better chance of successful steelhead outmigration in 2015.**

Figure 1: Stanislaus spring outmigration pulse flow schedules considered by the SOG. SOG advises that the Alternative 1 schedule be implemented in WY 2015.

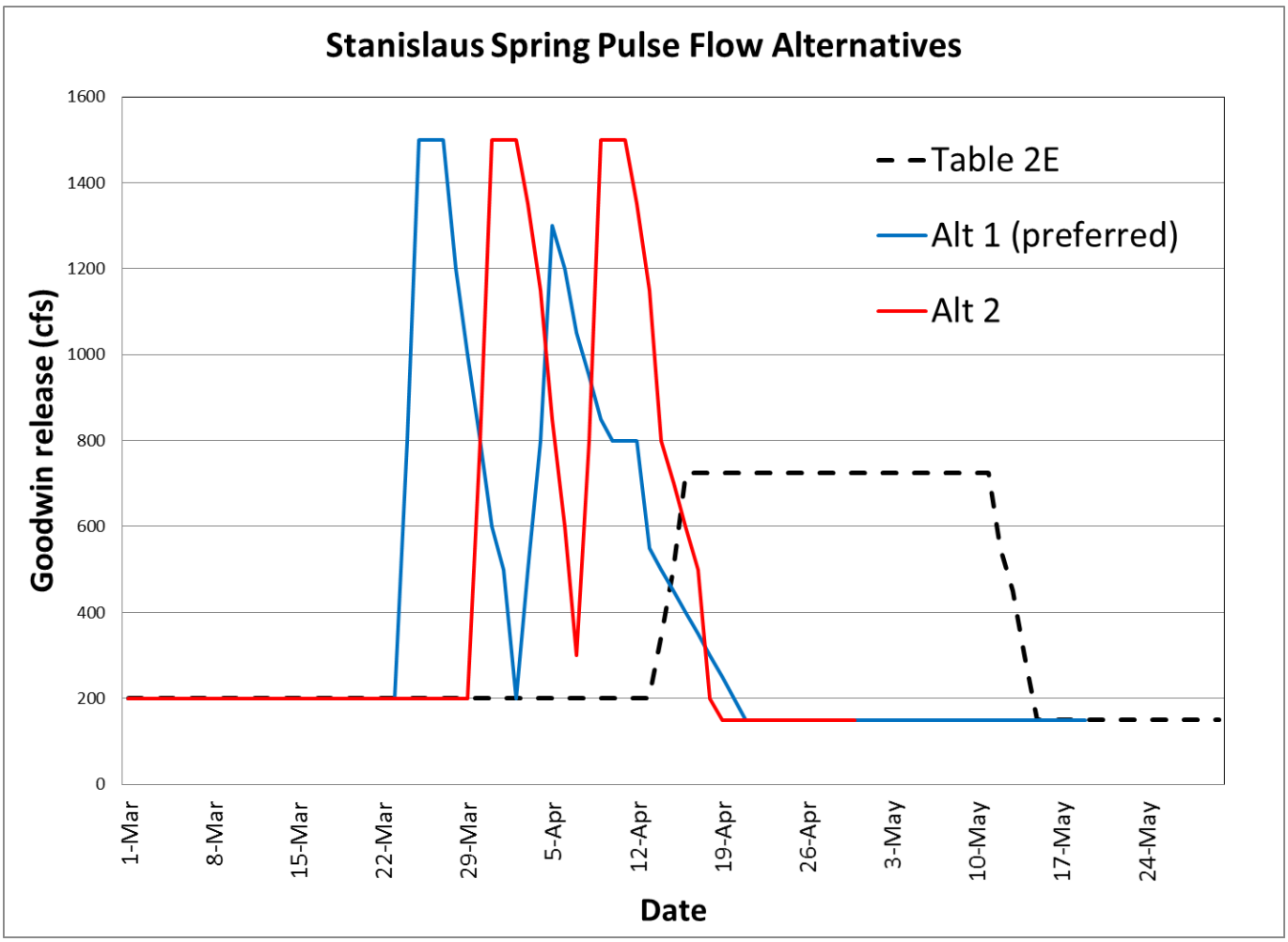


Table 1: Stanislaus spring outmigration pulse flow schedules considered by the SOG. SOG advises that the "Alternative 1" schedule be implemented in WY 2015. Pulse days are highlighted in yellow.

Day of week	Date	Table 2E Crit	Alt 1 (preferred)	Alt 2
W	3/18/2015	200	200	200
T	3/19/2015	200	200	200
F	3/20/2015	200	200	200
S	3/21/2015	200	200	200
S	3/22/2015	200	200	200
M	3/23/2015	200	200	200
T	3/24/2015	200	800	200
W	3/25/2015	200	1500	200
T	3/26/2015	200	1500	200
F	3/27/2015	200	1500	200
S	3/28/2015	200	1200	200
S	3/29/2015	200	1000	200
M	3/30/2015	200	800	800
T	3/31/2015	200	600	1500
W	4/1/2015	200	500	1500
T	4/2/2015	200	200	1500
F	4/3/2015	200	500	1350
S	4/4/2015	200	800	1150
S	4/5/2015	200	1300	850
M	4/6/2015	200	1200	600
T	4/7/2015	200	1050	300
W	4/8/2015	200	950	800
T	4/9/2015	200	850	1500
F	4/10/2015	200	800	1500
S	4/11/2015	200	800	1500
S	4/12/2015	200	800	1350
M	4/13/2015	200	550	1150
T	4/14/2015	200	500	800
W	4/15/2015	350	450	700
T	4/16/2015	500	400	600
F	4/17/2015	725	350	500
S	4/18/2015	725	300	200
S	4/19/2015	725	250	150
M	4/20/2015	725	200	150
T	4/21/2015	725	150	150
W	4/22/2015	725	150	150
T	4/23/2015	725	150	150
F	4/24/2015	725	150	150
S	4/25/2015	725	150	150
S	4/26/2015	725	150	150
M	4/27/2015	725	150	150
T	4/28/2015	725	150	150
W	4/29/2015	725	150	150
T	4/30/2015	725	150	150

Table 1 (continued):

Day of week	Date	Table 2E Crit	Alt 1 (preferred)	Alt 2
F	5/1/2015	725	150	150
S	5/2/2015	725	150	150
S	5/3/2015	725	150	150
M	5/4/2015	725	150	150
T	5/5/2015	725	150	150
W	5/6/2015	725	150	150
T	5/7/2015	725	150	150
F	5/8/2015	725	150	150
S	5/9/2015	725	150	150
S	5/10/2015	725	150	150
M	5/11/2015	725	150	150
T	5/12/2015	725	150	150
W	5/13/2015	550	150	150
T	5/14/2015	450	150	150
F	5/15/2015	300	150	150
S	5/16/2015	150	150	150
S	5/17/2015	150	150	150
M	5/18/2015	150	150	150
T	5/19/2015	150	150	150
W	5/20/2015	150	150	150
T	5/21/2015	150	150	150
F	5/22/2015	150	150	150
S	5/23/2015	150	150	150
S	5/24/2015	150	150	150
M	5/25/2015	150	150	150
T	5/26/2015	150	150	150
W	5/27/2015	150	150	150
T	5/28/2015	150	150	150
F	5/29/2015	150	150	150
S	5/30/2015	150	150	150
S	5/31/2015	150	150	150

Figure 2: Approximate flow schedules throughout the San Joaquin River basin, assuming the preferred "Alternative 1" flow schedule is implemented on the Stanislaus River. The estimated contributions from each source to Vernalis flows are estimates, and may not be implemented exactly as shown below. The estimated flow at Vernalis is the sum of flows from the Stanislaus River (lagged two days), the Tuolumne River (lagged two days), the Merced River (lagged three days), above the Merced River (lagged three days) and ungaged flows below the Merced River (not lagged).

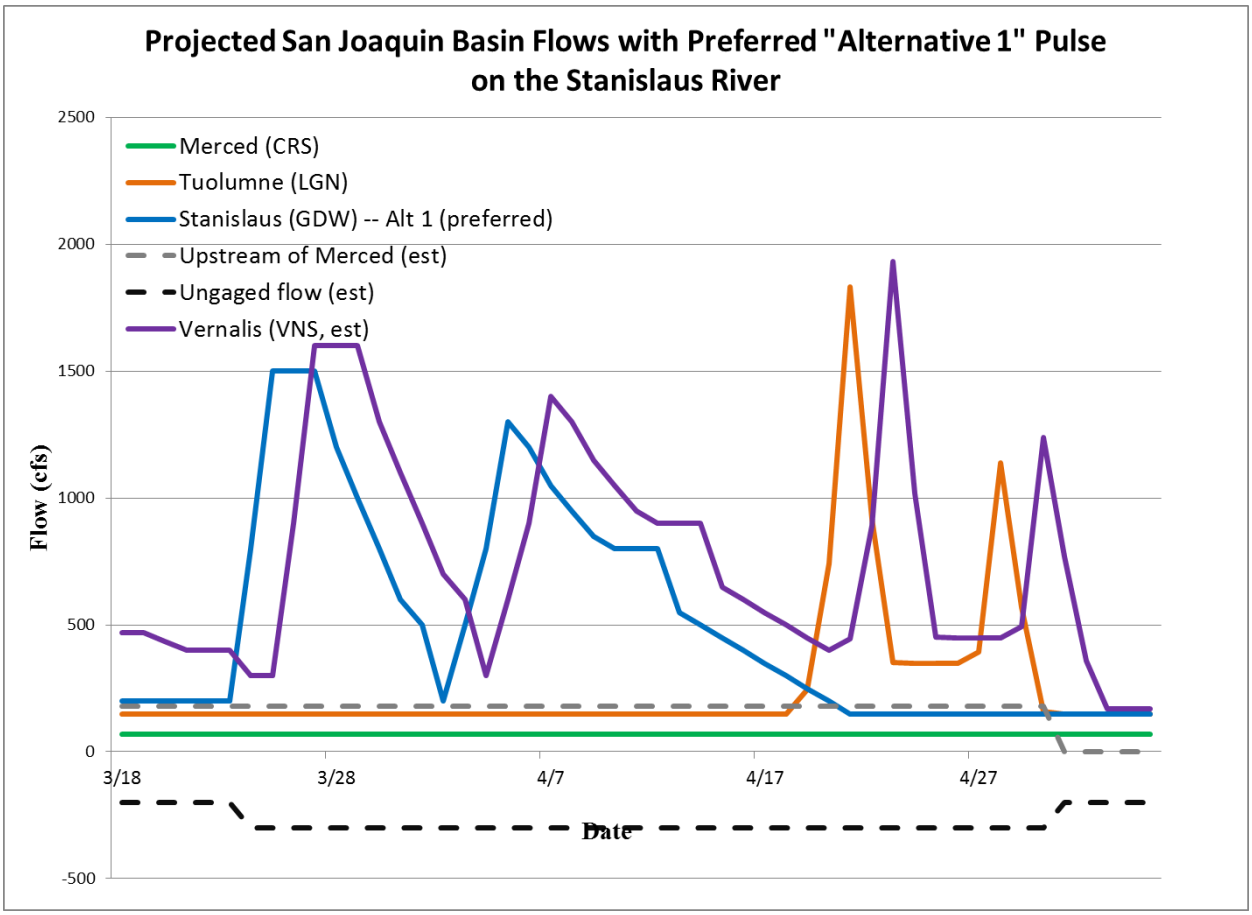


Table 2: Approximate flow schedules throughout the San Joaquin River basin, assuming the preferred "Alternative 1" flow schedule is implemented on the Stanislaus River. Pulse days are highlighted in yellow. The projected contributions from each source to Vernalis flows (in italics, after 3/17/15) are estimates, and may not be implemented exactly as shown below. The estimated flow at Vernalis is the sum of flows from the Stanislaus River (lagged two days), the Tuolumne River (lagged two days), the Merced River (lagged three days), above the Merced River (lagged three days) and ungaged flows below the Merced River (not lagged).

	3 dy lag to VNS	2 dy lag to VNS	2 dy lag to VNS	2 dy lag to VNS	0 day lag to VNS	
	Cressy (Merced)	Below La Grange Dam (Tuolumne)	Goodwin Dam (Stanislaus)	Estimate of flow from upstream of the Merced	Calculated as: VNS-CRS-LGN-GDW-(NEW-MST), with listed lags	Calculated as: CRS + LGN + GDW + (NEW-MST) + Ungaged Flow Estimate, with listed lags
Date	CRS	LGN	GDW (Alt 1)	NEW-MST	UNGAGED FLOW (calculated through 3/17, estimated thereafter)	VNS (calculated)
3/15/2015	108	169	227	173	*-144*	*510*
3/16/2015	105	170	212	179	*-155*	*517*
3/17/2015	104	170	205	189	*-178*	*501*
3/18/2015	*70*	*150*	*200*	*180*	*-200*	*469*
3/19/2015	*70*	*150*	*200*	*180*	*-200*	*469*
3/20/2015	*70*	*150*	*200*	*180*	*-200*	*434*
3/21/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/22/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/23/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/24/2015	*70*	*150*	*800*	*180*	*-300*	*300*
3/25/2015	*70*	*150*	*1500*	*180*	*-300*	*300*
3/26/2015	*70*	*150*	*1500*	*180*	*-300*	*900*
3/27/2015	*70*	*150*	*1500*	*180*	*-300*	*1600*
3/28/2015	*70*	*150*	*1200*	*180*	*-300*	*1600*
3/29/2015	*70*	*150*	*1000*	*180*	*-300*	*1600*
3/30/2015	*70*	*150*	*800*	*180*	*-300*	*1300*
3/31/2015	*70*	*150*	*600*	*180*	*-300*	*1100*
4/1/2015	*70*	*150*	*500*	*180*	*-300*	*900*
4/2/2015	*70*	*150*	*200*	*180*	*-300*	*700*
4/3/2015	*70*	*150*	*500*	*180*	*-300*	*600*
4/4/2015	*70*	*150*	*800*	*180*	*-300*	*300*
4/5/2015	*70*	*150*	*1300*	*180*	*-300*	*600*
4/6/2015	*70*	*150*	*1200*	*180*	*-300*	*900*
4/7/2015	*70*	*150*	*1050*	*180*	*-300*	*1400*
4/8/2015	*70*	*150*	*950*	*180*	*-300*	*1300*
4/9/2015	*70*	*150*	*850*	*180*	*-300*	*1150*
4/10/2015	*70*	*150*	*800*	*180*	*-300*	*1050*

Table 2 (continued):

	3 dy lag to VNS	2 dy lag to VNS	2 dy lag to VNS	2 dy lag to VNS	0 day lag to VNS	
	Cressy (Merced)	Below La Grange Dam (Tuolumne)	Goodwin Dam (Stanislaus)	Estimate of flow from upstream of the Merced	Calculated as: VNS-CRS-LGN-GDW-(NEW-MST), with listed lags	Calculated as: CRS + LGN + GDW + (NEW-MST) + Ungaged Flow Estimate, with listed lags
Date	**CRS**	**LGN**	**GDW (Alt 1)**	**NEW-MST**	**UNGAGED FLOW (calculated through 3/17, estimated thereafter)**	**VNS (calculated)**
4/11/2015	*70*	*150*	*800*	*180*	*-300*	*950*
4/12/2015	*70*	*150*	*800*	*180*	*-300*	*900*
4/13/2015	*70*	*150*	*550*	*180*	*-300*	*900*
4/14/2015	*70*	*150*	*500*	*180*	*-300*	*900*
4/15/2015	*70*	*150*	*450*	*180*	*-300*	*650*
4/16/2015	*70*	*150*	*400*	*180*	*-300*	*600*
4/17/2015	*70*	*150*	*350*	*180*	*-300*	*550*
4/18/2015	*70*	*150*	*300*	*180*	*-300*	*500*
4/19/2015	*70*	*244*	*250*	*180*	*-300*	*450*
4/20/2015	*70*	*740*	*200*	*180*	*-300*	*400*
4/21/2015	*70*	*1830*	*150*	*180*	*-300*	*444*
4/22/2015	*70*	*918*	*150*	*180*	*-300*	*890*
4/23/2015	*70*	*351*	*150*	*180*	*-300*	*1930*
4/24/2015	*70*	*350*	*150*	*180*	*-300*	*1018*
4/25/2015	*70*	*350*	*150*	*180*	*-300*	*451*
4/26/2015	*70*	*350*	*150*	*180*	*-300*	*450*
4/27/2015	*70*	*394*	*150*	*180*	*-300*	*450*
4/28/2015	*70*	*1138*	*150*	*180*	*-300*	*450*
4/29/2015	*70*	*568*	*150*	*180*	*-300*	*494*
4/30/2015	*70*	*157*	*150*	*180*	*-300*	*1238*
5/1/2015	*70*	*150*	*150*	*0*	*-200*	*768*
5/2/2015	*70*	*150*	*150*	*0*	*-200*	*357*
5/3/2015	*70*	*150*	*150*	*0*	*-200*	*170*
5/4/2015	*70*	*150*	*150*	*0*	*-200*	*170*
5/5/2015	*70*	*150*	*150*	*0*	*-200*	*170*

Figure 3: Approximate flow schedules throughout the San Joaquin River basin, assuming the not-preferred "Alternative 2" flow schedule is implemented on the Stanislaus River. The estimated contributions from each source to Vernalis flows are estimates, and may not be implemented exactly as shown below. The estimated flow at Vernalis is the sum of flows from the Stanislaus River (lagged two days), the Tuolumne River (lagged two days), the Merced River (lagged three days), above the Merced River (lagged three days) and ungaged flows below the Merced River (not lagged).

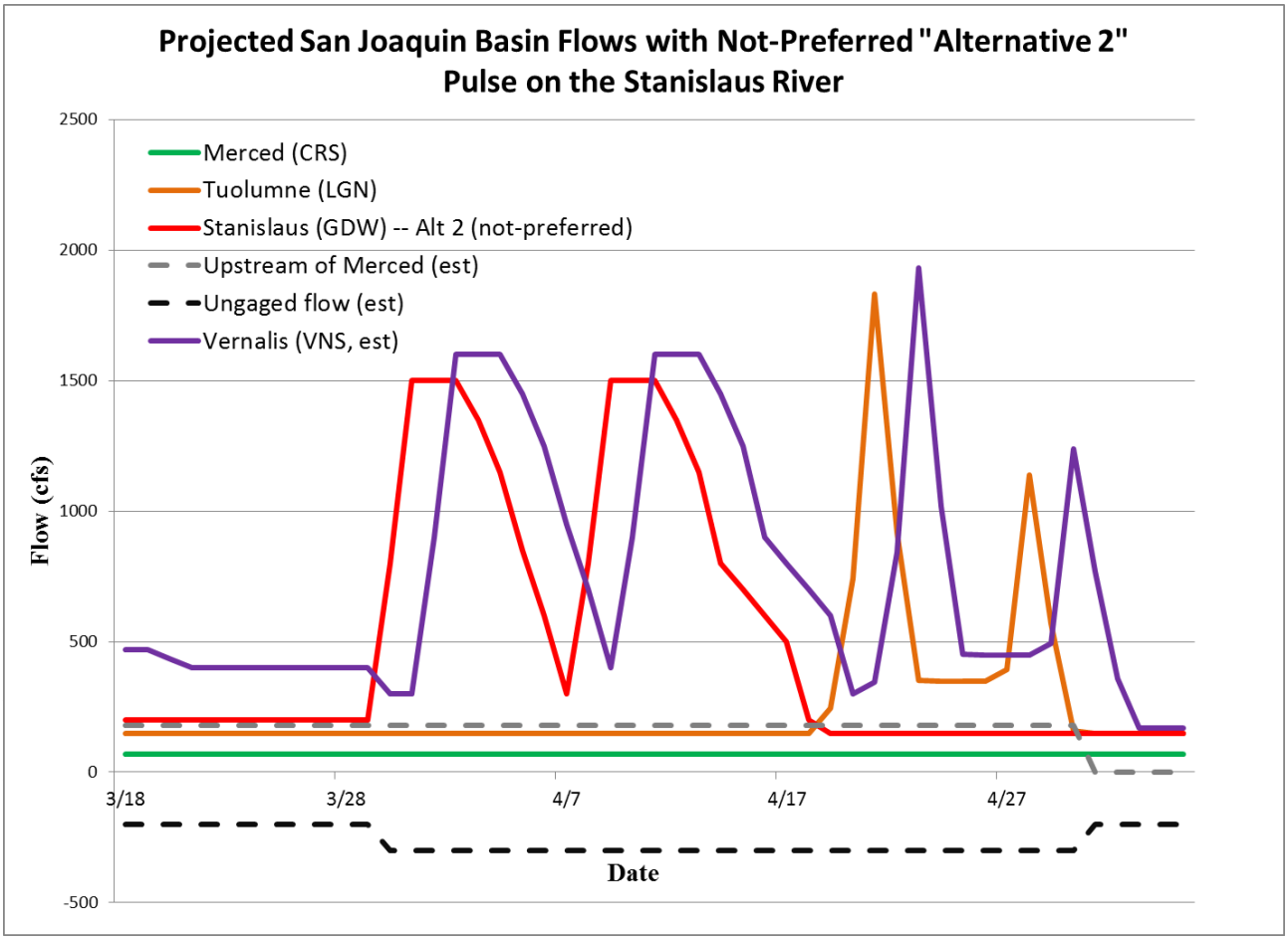


Table 3: Approximate flow schedules throughout the San Joaquin River basin, assuming the not-preferred "Alternative 2" flow schedule is implemented on the Stanislaus River. Pulse days are highlighted in yellow. The projected contributions from each source to Vernalis flows (in italics, after 3/17/15) are estimates, and may not be implemented exactly as shown below. The estimated flow at Vernalis is the sum of flows from the Stanislaus River (lagged two days), the Tuolumne River (lagged two days), the Merced River (lagged three days), above the Merced River (lagged three days) and ungaged flows below the Merced River (not lagged).

	3 dy lag to VNS	2 dy lag to VNS	2 dy lag to VNS	2 dy lag to VNS	0 day lag to VNS	
	Cressy (Merced)	Below La Grange Dam (Tuolumne)	Goodwin Dam (Stanislaus)	Estimate of flow from upstream of the Merced	Calculated as: VNS-CRS-LGN-GDW-(NEW-MST), with listed lags	Calculated as: CRS + LGN + GDW + (NEW-MST) + Ungaged Flow Estimate, with listed lags
Date	CRS	LGN	GDW (Alt 2)	NEW-MST	UNGAGED FLOW (calculated through 3/17, estimated thereafter)	VNS (calculated)
3/15/2015	108	169	227	173	*-144*	*510*
3/16/2015	105	170	212	179	*-155*	*517*
3/17/2015	104	170	205	189	*-178*	*501*
3/18/2015	*70*	*150*	*200*	*180*	*-200*	*469*
3/19/2015	*70*	*150*	*200*	*180*	*-200*	*469*
3/20/2015	*70*	*150*	*200*	*180*	*-200*	*434*
3/21/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/22/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/23/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/24/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/25/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/26/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/27/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/28/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/29/2015	*70*	*150*	*200*	*180*	*-200*	*400*
3/30/2015	*70*	*150*	*800*	*180*	*-300*	*300*
3/31/2015	*70*	*150*	*1500*	*180*	*-300*	*300*
4/1/2015	*70*	*150*	*1500*	*180*	*-300*	*900*
4/2/2015	*70*	*150*	*1500*	*180*	*-300*	*1600*
4/3/2015	*70*	*150*	*1350*	*180*	*-300*	*1600*
4/4/2015	*70*	*150*	*1150*	*180*	*-300*	*1600*
4/5/2015	*70*	*150*	*850*	*180*	*-300*	*1450*
4/6/2015	*70*	*150*	*600*	*180*	*-300*	*1250*
4/7/2015	*70*	*150*	*300*	*180*	*-300*	*950*
4/8/2015	*70*	*150*	*800*	*180*	*-300*	*700*
4/9/2015	*70*	*150*	*1500*	*180*	*-300*	*400*
4/10/2015	*70*	*150*	*1500*	*180*	*-300*	*900*

Table 3 (continued):

	3 dy lag to VNS	2 dy lag to VNS	2 dy lag to VNS	2 dy lag to VNS	0 day lag to VNS	
	Cressy (Merced)	Below La Grange Dam (Tuolumne)	Goodwin Dam (Stanislaus)	Estimate of flow from upstream of the Merced	Calculated as: VNS-CRS-LGN-GDW-(NEW-MST), with listed lags	Calculated as: CRS + LGN + GDW + (NEW-MST) + Ungaged Flow Estimate, with listed lags
Date	**CRS**	**LGN**	**GDW (Alt 2)**	**NEW-MST**	**UNGAGED FLOW (calculated through 3/17, estimated thereafter)**	**VNS (calculated)**
4/11/2015	*70*	*150*	*1500*	*180*	*-300*	*1600*
4/12/2015	*70*	*150*	*1350*	*180*	*-300*	*1600*
4/13/2015	*70*	*150*	*1150*	*180*	*-300*	*1600*
4/14/2015	*70*	*150*	*800*	*180*	*-300*	*1450*
4/15/2015	*70*	*150*	*700*	*180*	*-300*	*1250*
4/16/2015	*70*	*150*	*600*	*180*	*-300*	*900*
4/17/2015	*70*	*150*	*500*	*180*	*-300*	*800*
4/18/2015	*70*	*150*	*200*	*180*	*-300*	*700*
4/19/2015	*70*	*244*	*150*	*180*	*-300*	*600*
4/20/2015	*70*	*740*	*150*	*180*	*-300*	*300*
4/21/2015	*70*	*1830*	*150*	*180*	*-300*	*344*
4/22/2015	*70*	*918*	*150*	*180*	*-300*	*840*
4/23/2015	*70*	*351*	*150*	*180*	*-300*	*1930*
4/24/2015	*70*	*350*	*150*	*180*	*-300*	*1018*
4/25/2015	*70*	*350*	*150*	*180*	*-300*	*451*
4/26/2015	*70*	*350*	*150*	*180*	*-300*	*450*
4/27/2015	*70*	*394*	*150*	*180*	*-300*	*450*
4/28/2015	*70*	*1138*	*150*	*180*	*-300*	*450*
4/29/2015	*70*	*568*	*150*	*180*	*-300*	*494*
4/30/2015	*70*	*157*	*150*	*180*	*-300*	*1238*
5/1/2015	*70*	*150*	*150*	*0*	*-200*	*768*
5/2/2015	*70*	*150*	*150*	*0*	*-200*	*357*
5/3/2015	*70*	*150*	*150*	*0*	*-200*	*170*
5/4/2015	*70*	*150*	*150*	*0*	*-200*	*170*
5/5/2015	*70*	*150*	*150*	*0*	*-200*	*170*

Figure 4a: WY 2015 water temperatures (7 day average of daily maximum water temperature) and mean daily flows at Orange Blossom Bridge on the Stanislaus River. The dashed reference line is at 57°F; sustained water temperatures above this threshold indicate conditions unsuitable for steelhead smoltification.

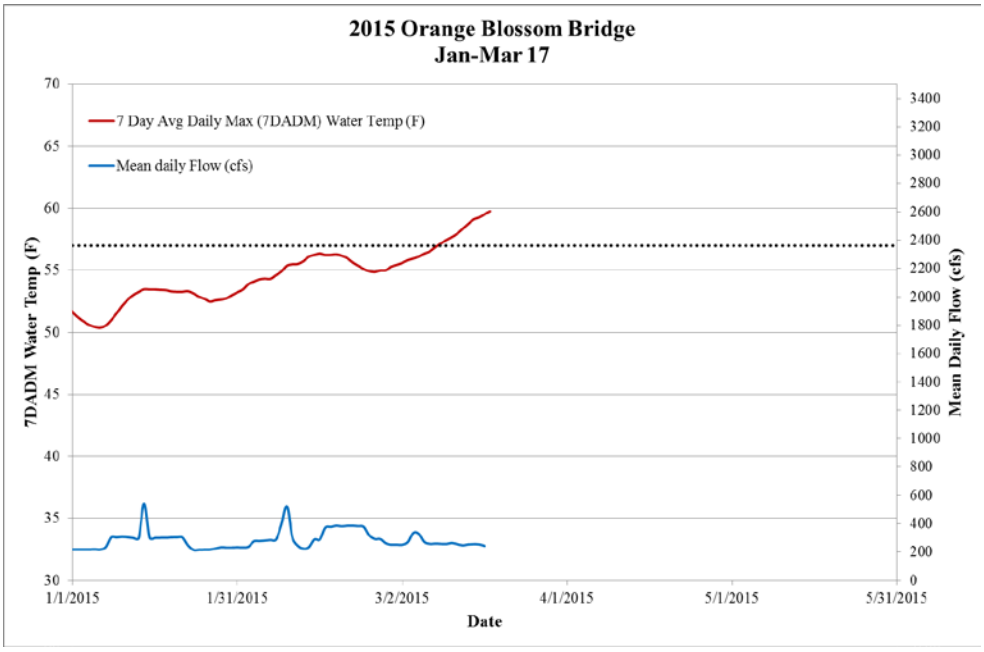


Figure 4b: WY 2014 water temperatures (7 day average of daily maximum water temperature) and mean daily flows at Orange Blossom Bridge on the Stanislaus River. The dashed reference line is at 57°F; sustained water temperatures above this threshold indicate conditions unsuitable for steelhead smoltification.

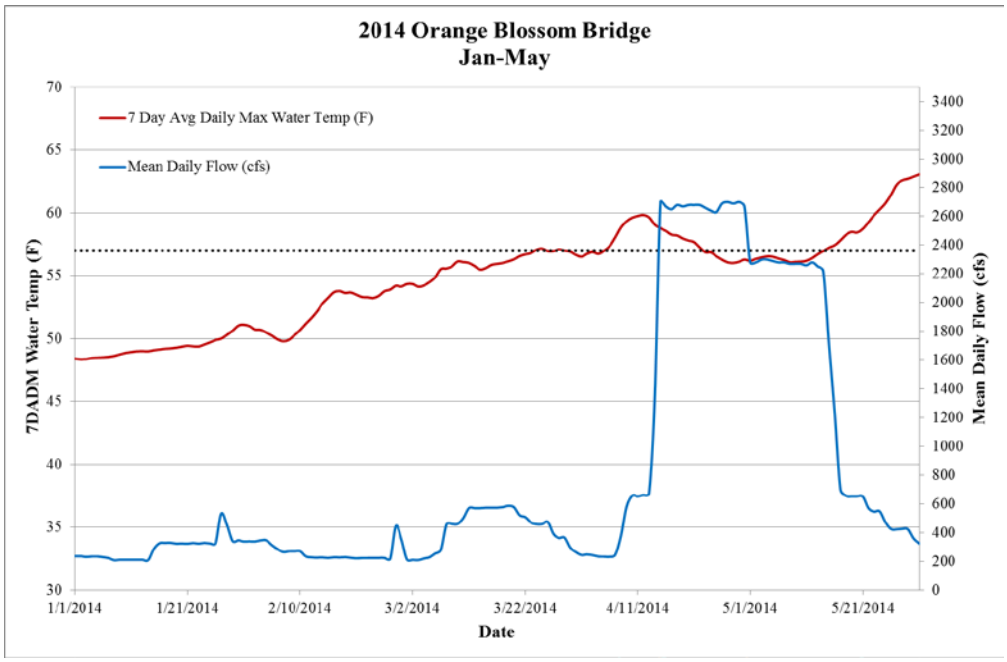


Figure 5a: WY 2015 daily water temperatures and mean daily flows at Vernalis, on the mainstem San Joaquin River. The dashed reference line is at 72°F; sustained water temperatures above this threshold indicate conditions unsuitable for salmonid outmigration.

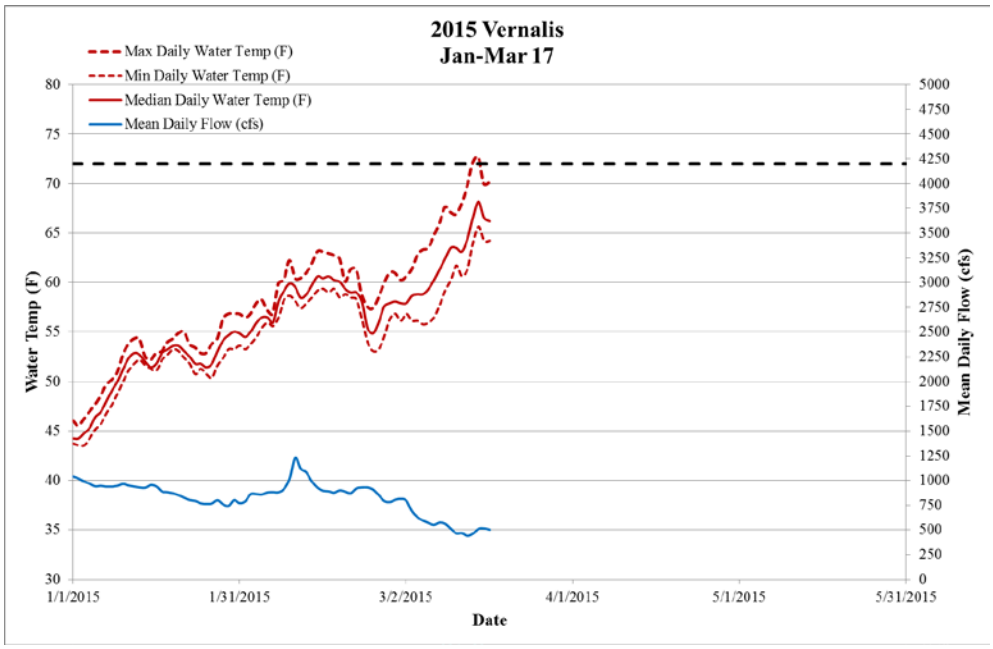
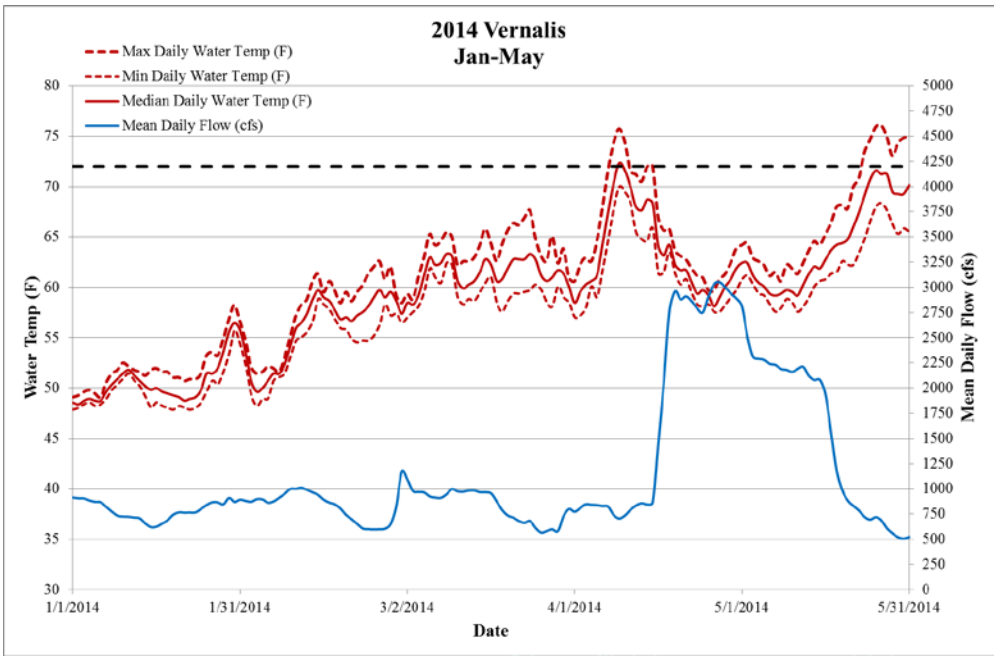


Figure 5b: WY 2014 daily water temperatures and mean daily flows at Vernalis, on the mainstem San Joaquin River. The dashed reference line is at 72°F; sustained water temperatures above this threshold indicate conditions unsuitable for salmonid outmigration.



Attachment 1

NMFS Response to 3/2/15 SOG advice

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

Re: SOG Advice Re: Alternative Stanislaus River Spring 2015 Outmigration Pulse Flow

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Wed, Mar 18, 2015 at 12:53 AM
To: "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>
Cc: Elizabeth G' 'Kiteck <EKiteck@usbr.gov>, David van Rijn <dvanrijn@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, Michele Palmer <mpalmer@usbr.gov>

Tom,

Thank you for the SOG advice. As SOG has indicated in its attached advice, there are many factors to consider this year with regard to the timing, magnitude, and duration of the Appendix 2E spring pulse flow and how it relates to various considerations, including storage in New Melones Reservoir, D-1641 requirements, San Joaquin River tributary pulse flows, status of the rock barrier at the Head of Old River, ongoing discussions regarding a proposed temporary urgency change petition for April through September, and current and projected water temperatures in the Stanislaus River and lower San Joaquin River.

I am taking this opportunity to request that the SOG considers its advise, and revises/clarifies it as appropriate, based on the status of the construction of the rock barrier at the Head of Old River (HORB). The HORB will be 90% complete by April 1, and 100% complete by April 8. Although SOG may have considered the status of HORB construction in providing its advice, that consideration is not evident. Therefore, 2 alternatives should be developed, based on the following:
-- Alternative 1: Objective focused on moving steelhead out of the Stanislaus and San Joaquin rivers before water temperatures become intolerable. This will likely include multiple peak flows, probably including at least one in March, as the current SOG advice provides. However, as mentioned above, the HORB will not be complete, so there will be risks associated with steelhead being entrained into Old River.
-- Alternative 2: Objective focused on moving steelhead down the San Joaquin River after the HORB is complete. Travel time of the increased release from Goodwin Dam to Vernalis should be considered, so for example, if the travel time is 2 days, the pulse from Goodwin Dam could start on March 30 so that by the time it reaches the Head of Old River, the HORB will be closed.

Please indicate SOG's preferred alternative, and provide data on current and projected water temperatures in the Stanislaus and San Joaquin rivers, so NMFS can evaluate the risks between warm water temperatures, and exposure from a less than complete HORB.

Based on the attached SOG advice, the first pulse was to occur "today" (March 17). If/Assuming SOG prefers alternative 1, above, time is of the essence, and therefore, NMFS appreciates a quick turnaround on the revised SOG advice. Thanks.

-Garwin-

Garwin Yip
Water Operations and Delta Consultations Branch Chief
NOAA Fisheries West Coast Region
U.S. Department of Commerce
California Central Valley Area Office
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814
Office: 916-930-3611
Cell: 916-716-6558
FAX: 916-930-3629
www.westcoast.fisheries.noaa.gov

NOAA FISHERIES
West Coast Region

---------- Forwarded message ----------
From: **Palmer, Michele** <mpalmer@usbr.gov>
Date: Mon, Mar 2, 2015 at 5:52 PM
Subject: SOG Advice Re: Alternative Stanislaus River Spring 2015 Outmigration Pulse Flow
To: Garwin Yip - NOAA Federal <garwin.yip@noaa.gov>
Cc: Thomas Morstein-Marx <tmorsteinmarx@usbr.gov>, Elizabeth Kiteck <ekiteck@usbr.gov>, David Van rijn <dvanrijn@usbr.gov>, Barbara Byrne - NOAA Federal <barbara.byrne@noaa.gov>

Garwin,

At its 2/18/2015 meeting, the Stanislaus Operations Group (SOG) discussed the upcoming spring outmigration pulse flow schedule specified in Appendix 2-E of the NMFS Biological Opinion (BiOp). Upon considering forecasted New Melones storage and CRITICAL water year type, SOG advises a modified spring outmigration pulse flow schedule consistent with the intent of Action III.1.3 (see attached).

SOG is aware that Stanislaus River operations related to NMFS BiOp implementation may need to be considered in the context of other drought planning efforts, including general concerns about New Melones storage. SOG encourages these conversations to happen sooner rather than later; as SOG's advice is to implement the spring pulse flow much earlier than usual, given concerns about water temperatures.

We request that NMFS concur with this advice. Please send your final determination to Tom Morstein-Marx, Reclamation, with a cc: to others included in this email; I'll forward your decision to SOG for their information.

Regards,

SOG

Michele Palmer
Reclamation
Bay-Delta Office
Fisheries Biologist
916-414-2414
mpalmer@usbr.gov

SOG Advice Alternative Spring 2015 Outmigration Pulse Flow_FINAL_20150302.pdf
366K

SOG ADVICE RE: ALTERNATIVE STANISLAUS RIVER SPRING 2015 OUTMIGRATION PULSE FLOW

Background:

Spring outmigration pulse flows in the Stanislaus River 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 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." (emphasis added).

SOG Advice:

Upon considering forecasted New Melones storage and CRITICAL water year type, SOG advises a modified spring outmigration pulse flow schedule consistent with the intent of Action III.1.3 as described below. For water year 2015, SOG advises that the spring outmigration pulse flow (Water Year: CRITICAL) be reshaped according to one of two alternative flow schedules (Alternative A or Alternative B) specified in Table 1 and Figure 1, dependent on current weather forecasts (Alternative A = warmer weather forecast; Alternative B = cooler weather forecast). Both of these alternate pulse flows have the same volume (30,842 AF, calculated against a base flow of 200 cfs in April and a 150 cfs base flow in May) as the spring outmigration pulse specified for a critically dry water year type in the Appendix 2-E schedule, and only differ in the flow release shape (i.e., three short duration pulses compared to a single duration pulse). The proposed flow schedule does not adjust the volume of the pulse flow required in the NMFS BiOp, as that is not within SOG's authority, but does offer the potential to optimize migration cues prior to water temperatures in the migratory corridor becoming too hot for smoltification under current drought and forecasted weather conditions. The implementation of a modified Appendix 2E scenario will be consistent with the intent of Action III.1.3, namely, it will provide a spring pulse flow that may cue anadromy and will maintain habitat quality within the migratory corridor.

Additional Information:

During the past two months, Stanislaus River water temperatures at Orange Blossom Bridge have been higher than normal (Figure 2). Based on previous studies that have documented earlier migration of juvenile salmonids exposed to extended periods of warmer temperatures, it is anticipated that early migration may occur in the Stanislaus River and pulse flows beginning in March will assist any early

[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

migrants. Additionally, if above normal water temperatures continue to persist, earlier pulse flows can provide migration opportunities under more suitable conditions.

The February 90% forecast[3] predicts that New Melones storage will be approximately 63 thousand acre feet (TAF) by the end of September (full capacity of New Melones is 2.4MAF). As such, there are concerns regarding possible thermal impacts to oversummering fish in the lower Stanislaus River, as well as to adults migrating into the system beginning in the fall.

The "three-peak" alternative pulse flow approach suggested by SOG provides for rain event shaping and also hedges the risk to outmigrating juveniles in spring 2015 by providing several outmigration opportunities.

Additional Concerns:

Based on information presented above, SOG encourages the project and fish agencies and Irrigation Districts to discuss planning for this spring and into the future water year.

In order to allow the fullest coordination of the San Joaquin River tributaries with the volume and timing that may be required for Vernalis flow requirements in D-1641, the Real Time Drought Operations Management Team will need to make decisions regarding spring pulse flows quickly, before water temperatures get too warm within the migratory corridor. A pulse flow released too late this spring will not provide any benefit to outmigrating anadromous salmonids if water temperatures are too warm to support smoltification.

The SOG welcomes the opportunity to revise this advice in the event that management outside the scope of the SOG (SWRCB requirements, Irrigation District water sales, etc.) result in changes to flow shape, volume, or timing.

[3] http://www.usbr.gov/mp/cvo/data/Feb90_2015.pdf

Table 1. SOG Proposed Alternative Stanislaus River Outmigration Pulse Flow Schedules for Spring 2015. Alternatives dependent on weather forecasts (Alternative A= warmer weather forecast; Alternative B= cooler weather forecast); actual implementation dates may be adjusted to coincide with rain events.

		Appendix 2E: Critically Dry Water Year	Alternative A (warmer)	Alternative B (cooler)
S	1-Mar	200	200	200
M	2-Mar	200	200	200
T	3-Mar	200	200	200
W	4-Mar	200	200	200
T	5-Mar	200	200	200
F	6-Mar	200	200	200
S	7-Mar	200	200	200
S	8-Mar	200	200	200
M	9-Mar	200	200	200
T	10-Mar	200	200	200
W	11-Mar	200	200	200
T	12-Mar	200	200	200
F	13-Mar	200	200	200
S	14-Mar	200	200	200
S	15-Mar	200	200	200
M	16-Mar	200	200	200
T	17-Mar	200	500	200
W	18-Mar	200	1000	450
T	19-Mar	200	850	1000
F	20-Mar	200	600	850
S	21-Mar	200	400	600
S	22-Mar	200	200	400
M	23-Mar	200	200	200
T	24-Mar	200	200	200
W	25-Mar	200	200	200
T	26-Mar	200	200	200
F	27-Mar	200	200	200
S	28-Mar	200	200	200

S	29-Mar	200	200	200
M	30-Mar	200	800	200
T	31-Mar	200	1500	600
W	1-Apr	200	1500	1200
T	2-Apr	200	1500	1000
F	3-Apr	200	1350	850
S	4-Apr	200	1200	700
S	5-Apr	200	1100	550
M	6-Apr	200	900	400
T	7-Apr	200	750	300
W	8-Apr	200	600	200
T	9-Apr	200	450	200
F	10-Apr	200	300	200
S	11-Apr	200	200	200
S	12-Apr	200	200	800
M	13-Apr	200	200	1500
T	14-Apr	200	200	1500
W	15-Apr	350	200	1500
T	16-Apr	500	600	1350
F	17-Apr	725	1200	1200
S	18-Apr	725	1000	1100
S	19-Apr	725	850	900
M	20-Apr	725	700	750
T	21-Apr	725	550	600
W	22-Apr	725	400	450
T	23-Apr	725	300	300
F	24-Apr	725	150	200
S	25-Apr	725	150	150
S	26-Apr	725	150	150
M	27-Apr	725	150	150
T	28-Apr	725	150	150
W	29-Apr	725	150	150
T	30-Apr	725	150	150

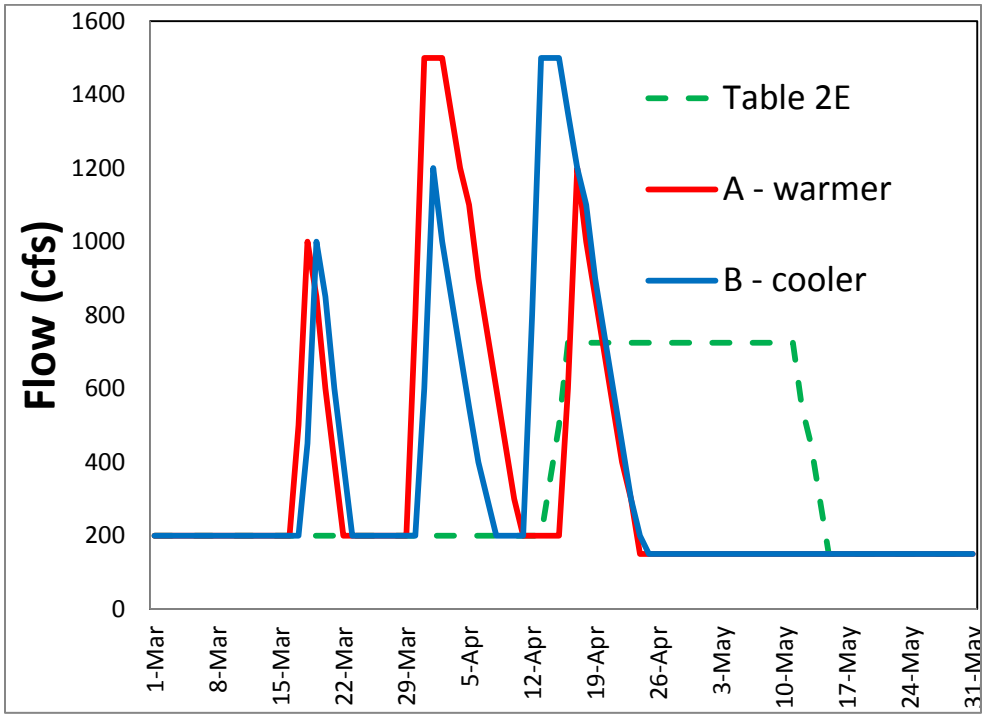


Figure 1. Alternative Stanislaus River Outmigration Pulse Flow Schedules for Spring 2015. Alternatives dependent on weather forecasts (Alternative A = warmer weather forecast; Alternative B = cooler weather forecast).

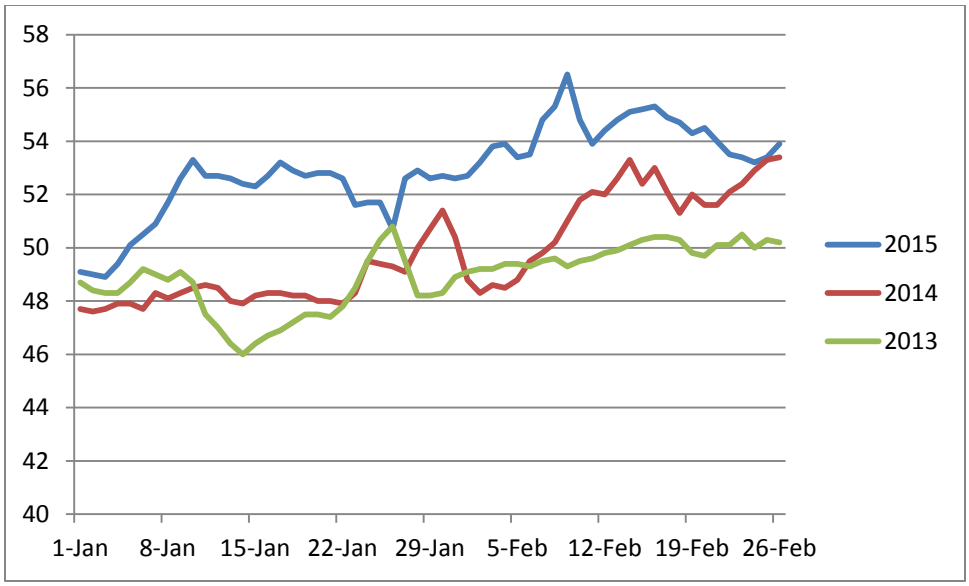


Figure 2. Water temperatures at the Orange Blossom Bridge gage for January and February 2013, 2014, and 2015. Source CDEC.

Reclamation, Oakdale Irrigation District and South San Joaquin Irrigation Districts Resolve New Melones Pulse Flow Concerns

Posted April 10th, 2015 by USBR

SACRAMENTO, Calif. ? The Bureau of Reclamation, in collaboration with federal and state fisheries agencies, the local water districts and the State Water Resources Control Board, met to talk through the issues related to pulse flows on the Stanislaus River for steelhead and Chinook salmon. The agreement will allow the required pulse flows to be accomplished as previously scheduled, while protecting water supplies in New Melones Lake for later this summer. With this agreement in place, Reclamation has scheduled the pulse flows from Goodwin Dam to begin Saturday morning, April 11, at 0100 a.m. Releases will be ramped up from 200 cubic feet per second (cfs) over several hours to 1,500 cfs and then ramped down on Tuesday morning at 0100 a.m. to 1,300 cfs.
In addition to the pulse flow release the Districts will work with Reclamation on increasing water conservation this year. The water the districts conserve this year will be available to the districts in the 2016 water year.

Lake Tulloch is expected to have normal operations through October 1, 2015. Lake drawdown after October 1 will depend on inflows into New Melones. Calaveras County Water District?s municipal supply from Lake Tulloch will not be interrupted.

Reclamation, the districts and the resource agencies will continue work cooperatively to manage operations at New Melones to meet fishery resource needs through the summer.

?I am very proud of the work we put into resolving the pulse flow concerns,? said David Murillo, Reclamation?s Mid-Pacific Regional Director. ?It shows what can be accomplished when people are willing to sit down, roll up their sleeves and work toward a common goal.?

# # #

Reclamation is the largest wholesale water supplier and the second largest producer of hydroelectric power in the United States, with operations and facilities in the 17 Western States. Its facilities also provide substantial flood control, recreation, and fish and wildlife benefits. Visit our website at www.usbr.gov and follow us on Twitter .
News Source : Reclamation, Oakdale Irrigation District and South San Joaquin Irrigation Districts Resolve New Melones Pulse Flow Concerns

U.S. Bureau of Reclamation
New Melones Operations
Stanislaus River Temperature Management
August 10 through December 31, 2015

Reclamation has been working closely with the State and Federal fishery agencies, and Oakdale Irrigation District and South San Joaquin Irrigation District (the districts), to plan operations for New Melones Lake and Tulloch Reservoir for the remainder of the calendar year.

The following summarizes the draft plan for temperature management, river releases and lake operations for review by the agencies and the State Water Resources Control Board. The attached documents provide supporting technical information.

NEW MELONES OPERATIONS PLAN – SUMMARY:

Temperature Targets

- Given the severe drought conditions and uncertainty about operations this year, the following temperature targets might not be achieved on the targeted timeframe, but real-time blending decisions will be guided by these general targets with the limited resources available. Current modeling and past performance also indicate that these target temperatures will be difficult to achieve.
- Through December 31, 2015, given the low storage concerns in the basin, temperature management will rely solely on blending operations (at New Melones and Tulloch), not on flow releases above the minimum instream flow requirements below Goodwin Dam per Appendix 2-E[1] ("Table 2e flows") of the 2009 NMFS Biological Opinion on Long-term Operations of the CVP and SWP[2] (2009 NMFS BiOp).
- Proposed temperature targets:
  - **August 1 to October 31: 7 DADM not to exceed 65°F at Goodwin Dam** (measured at USGS 11302000).
    - Although sustained water temperatures above 65°F are not suitable for juvenile rearing of Central Valley steelhead (*Oncorhynchus mykiss*), this target aims to provide suitable temperatures for oversummer rearing of

[1] See Appendix 2-E in: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/appendix_2-rpa_supporting_documents_compiled.pdf
[2] http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocap.html

juvenile *O. mykiss* within Goodwin Canyon.
    - Temperature model runs show lower temperatures may be achievable during October and operations will target decreasing temperatures during October, to the extent feasible, in order to transition to the cooler water temperatures suitable for salmonid spawning.

- **November 1 to November 25 7DADM not to exceed 60°F at Orange Blossom Bridge** (measured at CDEC station OBB)**.**
    - Shifting the target location downstream to Orange Blossom Bridge may focus cooler temperatures within much of the available spawning habitat for fall-run Chinook salmon (*O. tshawytscha*) and Central Valley steelhead (*O. mykiss*).
    - While 56°F would be more suitable for adult salmonid migration (whether holding or spawning), temperature modeling indicates that this lower threshold may not be feasible until after mid-November, when shorter days and cooler air temperatures cause water to cool as it moves downstream.

- **November 25-December 31: 7DADM not to exceed 56°F at Orange Blossom Bridge** (measured at CDEC station OBB).
    - Provides water temperatures suitable for spawning and incubation by fall-run Chinook salmon, adult migration and holding of Central Valley steelhead. Water temperatures in at this threshold are highly dependent on ambient conditions.

- Given current severe drought conditions, and reservoir storage concerns, NMFS has concurred that this proposed plan is consistent with the exception procedures under Action III.1.2[3] of the 2009 NMFS BiOp.

<u>Flows & Reservoir Operations:</u>

- Release to the Stanislaus River the Table 2e flows through December, but see conditions on fall pulse flow in the next bullet.
- For this year, the Table 2e Fall Pulse Flow (above the base flow of 150 cfs) will be achieved using water conserved by the Districts over the summer through aggressive water conservation efforts.
- Per the 2009 NMFS BiOp, the Stanislaus Operations Group may provide advice to NMFS and the Water Operations Management Team to adjust the

[3] See details of Action III.1.2 in the 2009 RPA with 2011 Amendments; page 47 of Enclosure 2 of the document posted at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf

shaping and timing of the default Table 2e fall pulse flow; any adjusted flow schedule must be approved by NMFS before implementation.

- Under the current conditions, it appears that the combination of Stanislaus River and other San Joaquin River tributary releases will not be sufficient to meet the October Vernalis Flow in Decision 1641. Reclamation will continue to monitor conditions and may submit a Temporary Urgency Change Petition (TUCP) to the SWRCB.
- The Districts will continue to take irrigation water through September 30
- The low-level outlet will be opened to 250 cfs once the New Melones Lake elevation lowers to 808'; releases through the low-level outlet may be adjusted slightly based on observed in-river water temperatures and starting date, but this flow rate generally is needed to ration the available volume of cold water through October.
- At about the time New Melones lowers to elevation 808', the Districts are prepared to draw up to 1,000 cfs per day from Tulloch reservoir (total volume not to exceed 30 TAF) to meet irrigation demand through September 2015 in coordination with New Melones operations and the release of Table 2e flows. Given the uncertain temperature effects of this phase of operations and the potential adverse effect to residents along Tulluch reservoir, Reclamation and the Districts will be closely monitoring conditions to verify that the Tulloch drawdown operation is having a measurable effect on lowering Goodwin release temperatures.
- Once the New Melones Lake elevation lowers to about 785', releases through the Penstock Intake will cease.
- The release of water from New Melones to support the Fall Pulse flow will begin with a blend of 25% from the Penstock Intake and 75% from low-level outlet; this blend may be adjusted based on observed in-river water temperatures and availability of the main outlet at New Melones.

Coordination

- Reclamation, in coordination with the Districts, fisheries agencies, and the Stanislaus Operations Group, will meet at least bi-weekly to access and potentially respond to changing conditions recognizing that the temperature targets described above may not be achieved on the targeted timeframe.
- Reclamation, in coordination with the fisheries agencies and the Districts, will also prepare and submitted to the State Water Resources Control Board a report in January 2016, which documents the effectiveness of the Stanislaus River operations this year in protecting the fishery resources given the limitations of the drought and the structural infrastructure.

HYDROLOGY UPDATE

Attachment 1 summarizes the most recent inflows to New Melones through July 20, 2015, and the projected hydrology through December 2015. This summary illustrates two significant differences from the storage projections prepared in April 2015 (Attachment 2). First, there has been better than forecasted inflows into New Melones over the spring and summer. The second, and most significant, change has been the Districts' conservation efforts which have totaled to approximately 80,000 acre-feet.

These factors have resulted in a new end-of-September storage of 259,000 acre-feet at New Melones. In April of this year the projected storage at New Melones was 147,000 acre-feet by the end of September.

KEY MODELING ASSUMPTIONS/REFINEMENTS

Use of the Low-Level Outlet

Attachment 3 summarizes the operation constraints for use of the low-level outlet at New Melones. Generally, the low-level outlet should not be operated until the lake level drops below elevation 808', and the low-level outlet should not be operated above 1,000 cfs to protect the access road and outlet facility.

Initial temperature modeling had assumed that the low-level outlet could be used for blending starting around July 15 at a rate of 250 cfs. This date was based on earlier estimates of New Melones lake levels this summer. Given that New Melones has more storage than previously projected, and given the operational constraints on the low-level outlet, use of the low-level outlet for blending is not possible until approximately August 23 (or until storage in New Melones is 302,000 acre-feet, see Attachment 4).

The Districts have conducted additional temperature modeling with the low-level outlet being used under these constraints. (See Attachment 5.) These runs showed two periods wherein water temperatures were elevated; late August/early September and during the pulse flow in later October.

Through coordination with the Districts and State and Federal fishery agency staffs, some potential modeling refinements were discussed (see meeting summaries in Attachment 6 and Attachment 7). Some specific refinements identified were:

- Use the shaping and timing of the WY 2015 fall pulse flow in future modeling runs (Attachment 8)
- Investigate if the October temperature increase could be reduced by changing the mix of release through the low-level and the Penstock Intake from 25%-75% to a

higher percentage from the low-level outlet.

To address the second bullet, above, the Districts also ran a model wherein 100% of the pulse flow came from the low-level outlet (Attachment 9). In this run, the October temperature increase dissipated with 100% of the release coming from the low-level outlet. This run was done without the constraint of 1,000 cfs for the low-level outlet. Through further investigation, it may be possible to achieve the improved water temperatures by blending 75% from the low-level and 25% from the Penstock Intake. With adequate lead time, this operation would likely avoid the 1,000 cfs limitation on the low-level outlet.

The August/September increase in temperature may possibly be addressed by withdrawing water from Tulloch, slightly before or at the time the low-level outlet is opened. Modeling suggests that withdrawing water from Tulloch at 500 cfs could result in 2-4 degrees improvement in river release temperature. Releasing water out of Tulloch would reduce the amount of warm water being released from New Melones at this time. Such an operation could address the temperature rise in late August early September and is being further evaluated.

Use of the Penstock Intake:

- The Flood Control and Irrigation (FC&I) Valve off the Penstock intake can no longer be used once New Melones Lake drops below about 785' (expected to occur in mid to late October). Reclamation is currently watching for vortex formation that could limit or even preclude use of the power plant. Should this occur, Reclamation will begin use of the FC&I Valve up to the point the lake drops below about 785'.

Additional Temperature Model Refinements and Temperature Targets

Attachment 10 contains a summary of additional analysis and conclusions about the water temperature modeling after looking more closely at the boundary conditions. The changes outlined in Attachment 10 have been made to the model and these modifications were applied to the additional modeling conducted to fully assess the suite of actions outlined above (Attachment 5).

OCTOBER PULSE FLOW

The use of the limited remaining stored water in New Melones for the October Pulse Flow raises significant factual and legal issues for Reclamation and the Districts. For this year, Reclamation and the Districts have agreed that Reclamation may release a portion of the water conserved by the Districts this summer for the fall pulse flow, and the

Districts will be compensated for the water released through a purchase agreement. Reclamation and the Districts are working on the final details of this agreement, and we will continue to plan (in coordination with the SOG) on these flows this fall.

Attachment 1

	Stanislaus River - 331,000 Acre-feet Unimpaired and 313,000 Inflow (DBS Forecast)																							
20-Jul-15	Upstream Stanislaus				Tulloch Operation						Goodwin Operation											New Melones		
	Stanislaus	Upstr	Upstr	NM	Tulloch	Tulloch	Tulloch	Tulloch	Tulloch	Tulloch	Goodwin	Goodwin	Info	Fish	Fish	WQ	Vernalis	DO	Minimum	Added/FC	River	NM	NM	NM
	Unimpaired	Storage	Regulation	Inflow	Local	Evap	Storage	Storage Trgt	Require	Release	OID/SSJID	CVP	2E (cfs)	Require	Req - CFS	Rel	Rel	Rel	River	Release	Release	Release	Net Evap	Storage
Beginning		161					61.742	61.742																520
Oct 2014	7	140	20	28	0.383	0.534	56.883	56.883	34.648	36.925	8.7			26.0	423	0.0	0.0	0.0	26.0		26.0	32.220	2.2	513
Nov	9	128	12	22	0.149	0.169	55.292	55.292	21.081	23.211	0.0			21.1	354			0.0	21.1		21.1	21.640	0.7	513
Dec	35	112	16	48	2.666	0.157	56.062	56.062	12.684	14.515	0.0			12.7	206			0.0	12.7		12.7	12.776	0.7	547
Jan 2015	13	92	20	32	3.043	0.115	56.475	56.475	16.058	18.456	0.0			16.1	261			0.0	16.1		16.1	15.943	0.5	563
Feb	91	113	-21	55	6.193	0.177	57.347	57.347	17.159	16.893	0.0			17.2	309			0.0	17.2		17.2	11.746	0.8	606
Mar	38	126	-13	19	3.927	0.345	57.358	57.358	69.189	72.631	40.7		200	28.5	464	0.0	0.0	0.0	28.5		28.5	69.062	1.6	553
Apr - 1	15	131	-5	8	0.138	0.190	55.682	55.682	34.179	34.120	19.9		200	14.3	514	0.0	0.0	0.0	14.3		14.3	32.496	0.9	528
Apr - 2	22	141	-10	9	0.244	0.317	61.236	61.236	38.133	38.764	23.7		709	14.4	454	0.0	0.0	0.0	14.4		14.4	44.391	1.3	491
May - 1	25	157	-16	8	0.071	0.305	63.398	63.398	26.418	26.773	21.9		677	4.5	153	0.0	0.0	0.0	4.5		4.5	29.175	1.2	469
May - 2	32	174	-17	15	0.210	0.428	63.980	63.980	29.271	29.221	24.4		150	4.8	152	0.0	0.0	0.0	4.8		4.8	30.071	1.6	453
Jun	30	185	-12	19	0.123	1.016	66.107	66.107	64.344	64.344	54.0		150	10.3	173	0.0	0.0	0.0	10.3		10.3	67.364	3.5	401
Jul	10	174	12	22	0.400	0.930	66.000	66.000	74.925	74.925	65.7		150	9.2	150	0.0	0.0	0.0	9.2		9.2	75.348	3.0	344
Aug	3	159	14	17	0.400	0.950	65.000	65.000	72.225	72.225	63.0		150	9.2	150	0.0	0.0	0.0	9.2		9.2	71.775	3.0	286
Sep	1	144	16	17	0.400	0.700	62.000	62.000	44.925	44.925	36.0		150	8.9	150	0.0	0.0	0.0	8.9		8.9	42.225	1.8	259
Oct	2	135	9	11	0.400	0.500	57.000	57.000	35.479	35.479	0.0		577	35.5	577	0.0	0.0	0.0	35.5		35.5	30.579	1.1	238
Nov	2	127	8	10	0.400	0.200	55.000	55.000	11.900	11.900	0.0		200	11.9	200	0.0	0.0	0.0	11.9		11.9	9.700	0.5	238
Dec	2	118	9	11	1.000	0.200	56.000	56.000	12.300	12.300	0.0		200	12.3	200	0.0	0.0	0.0	12.3		12.3	12.500	0.2	236
	Approx			Approx							Approx			Approx		Approx	Approx	Approx	Approx	Approx	Approx		Approx	
WY 2015	331			319		NMI =	720				358			197		0	0	0	197	0	197		23	
April - Sept	138			115		Formula =	412							76		0	0	0	76	0	76	1,000 acre-feet unless noted		

Actual releases for water quality included in fishery releases

Attachment #2

District Forecast of Operations – Dated 4-8-2015 – Based on DWR 4/1 Forecast of UF

8-Apr-15																
					Stanislaus River - 268,000 Acre-feet Unimpaired and 284,000 Inflow (Upper Forecast)									**All values in 1,000 acre-feet unless otherwise noted**		
	Stanislaus Unimpaired	Upstr Storage	Upstr Regulation	NM Inflow	Goodwin OID/SSJID	Info 2E (cfs)	Fish Require	Fish Req - CFS	WQ Rel	Vernalis Rel	DO Rel	Minimum River	NM Net Evap	NM Storage	Target/FC Release	River Release
Beginning		161												520		
Oct 2014	7	140	20	28	8.7		26	423	0	0	0	26.0	2	513		26
Nov	9	128	12	22	0.0		21	354			0	21.1	1	513		21
Dec	35	112	16	48	0.0		13	206			0	12.7	1	547		13
Jan 2015	13	92	20	32	0.0		16	261			0	16.1	1	563		16
Feb	91	113	-21	55	0.0		17	309			0	17.2	1	606		17
Mar	38	126	-13	19	40.7	200	29	464	0	0	0	28.5	2	553		29
Apr - 1	16	132	-6	10	30.0	200	22	784	0	0	0	21.8	1	510		22
Apr - 2	17	139	-7	10	33.0	709	6	200	0	0	0	6.3	1	480		6
May - 1	18	147	-8	10	34.0	677	4	150	0	0	0	4.5	1	450		4
May - 2	16	153	-6	10	35.0	150	5	150	0	0	0	4.8	1	419		5
Jun	7	150	3	10	78.0	150	9	150	0	0	0	8.9	2	340		9
Jul	1	141	9	10	78.0	150	9	150	0	0	0	9.2	2	261		9
Aug	0	130	11	11	70.0	150	9	150	0	0	0	9.2	2	190		9
Sep	0	120	10	10	42.5	150	9	150	0	0	0	8.9	2	147		9
Oct				2	0	577	35	577	0	0	0	35.5	1	113		35
Nov				2	0	200	12	200	0	0	0	11.9	1	102		12
Dec				2	0	200	12	200	0	0	0	12.3	1	91		12
	Approx			Approx	Approx		Approx		Approx	Approx	Approx	Approx	Approx			Approx
WY 2015	268			284	450		195		0	0	0	195	19			195
April - Sept	75			81	401		74					74	Formula = 392 + 58 Conservation Account			

Actual releases for water quality included in fishery releases

Attachment 3

From: Tim O"Laughlin
To: Ryan Stager
Subject: FW: New Melones and Tulloch Temperature Profiles
Date: Friday, July 24, 2015 8:55:40 AM
Attachments: Memo on LLO usage _Regional Engr 06_30_15.pdf

From: Kiteck, Elizabeth [mailto:ekiteck@usbr.gov]
Sent: Tuesday, July 14, 2015 12:16 PM
To: Tim O'Laughlin
Cc: Ronald E Milligan
Subject: Re: New Melones and Tulloch Temperature Profiles

I've attached the Memo from our Regional Engineer. The criteria for the low level outlet use is:

Begin use at elev. 808 and below.
Can be used in tandem with the FC&I valve between elevations 808 and 785
Below elev. 785 must use low level outlet
Max. capacity of low level outlet depends on head but safe to use without monitoring outlet for erosion to about 1000cfs. Anything higher than 1000 cfs we will have New Melones personnel checking regularly to make sure there's no damage to the outlet discharge channel.

Liz

On Tue, Jul 14, 2015 at 11:52 AM, Tim O'Laughlin <towater@olaughlinparis.com> wrote:
I have asked Avry to compare to current model profile. Also asked the time, cost and expense of changing profiles.
Any low level operation criteria you can share with me?
I still don't have your memo to SOG on the issue. Tks Tim

Sent from my iPhone

On Jul 14, 2015, at 12:31 PM, Kiteck, Elizabeth <ekiteck@usbr.gov> wrote:

> Hi Tim
>
> Here are 2 recent temperature profiles for New Melones. It may be good if Avry could use this information in his model.
>
> Thanks,
> Liz
> ---------- Forwarded message ----------
> From: **Giudice, Domenic@Wildlife** <Domenic.Giudice@wildlife.ca.gov>
> Date: Tue, Jul 14, 2015 at 9:58 AM
> Subject: New Melones and Tulloch Temperature Profiles
> To: "Barbara.Byrne@noaa.gov" <Barbara.Byrne@noaa.gov>, "Worth, Daniel@Waterboards" <Daniel.Worth@waterboards.ca.gov>, "White, Kristin" <knwhite@usbr.gov>, "Bragg, Carolyn" <cbragg@usbr.gov>, "Miller, Aaron@DWR" <Aaron.Miller@water.ca.gov>, "Chu, Andy@DWR"

<Andy.Chu@water.ca.gov>, "Carr, Chris@Waterboards" <Chris.Carr@waterboards.ca.gov>, "Hidalgo, Christina R SPK" <Christina.R.Hidalgo@usace.army.mil>, "Craig_Anderson@fws.gov" <Craig_Anderson@fws.gov>, "Yamanaka, Dan@DWR" <Dan.Yamanaka@water.ca.gov>, "Riddle, Diane@Waterboards" <Diane.Riddle@waterboards.ca.gov>, Donna Garcia <dcgarcia@usbr.gov>, "Linander, Duane@Wildlife" <Duane.Linander@wildlife.ca.gov>, "ekiteck@usbr.gov" <ekiteck@usbr.gov>, "Garwin.Yip@noaa.gov" <Garwin.Yip@noaa.gov>, "Edwards, James@DWR" <James.Edwards@water.ca.gov>, Jessica Andrieux <jandrieux@usbr.gov>, "jhannon@usbr.gov" <jhannon@usbr.gov>, John Hutchings <jhutchings@usbr.gov>, "John_Wikert@fws.gov" <John_Wikert@fws.gov>, Julie Zimmerman <julie_zimmerman@fws.gov>, "Kundargi, Kenneth@Wildlife" <Kenneth.Kundargi@wildlife.ca.gov>, "Lindsay, Larry@Waterboards" <Larry.Lindsay@waterboards.ca.gov>, Lee Mao <lmao@usbr.gov>, "Li-Ming.He@noaa.gov" <Li-Ming.He@noaa.gov>, "Mary (Catherine) Blackwell" <mblackwell@usbr.gov>, "Ford, John@DWR" <John.Ford2@water.ca.gov>, Monica Gutierrez <monica.gutierrez@noaa.gov>, "Brantley, Patricia@Wildlife" <Patricia.Brantley@wildlife.ca.gov>, "pfujitani@usbr.gov" <pfujitani@usbr.gov>, "rfield@usbr.gov" <rfield@usbr.gov>, "Reed, Ronda@noaa" <rhonda.reed@noaa.gov>, "Heyne, Tim@Wildlife" <Tim.Heyne@wildlife.ca.gov>, "Pettit, Tracy@DWR" <Tracy.Pettit@water.ca.gov>, "RMILLIGAN@usbr.gov" <RMILLIGAN@usbr.gov>, "dvanrijn@usbr.gov" <dvanrijn@usbr.gov>, Amanda Bahls <abahls@usbr.gov>, "Palmer, Michele@usbr.gov" <mpalmer@usbr.gov>

Here are the two most recent profiles for New Melones and Tulloch. Let me know if you have any questions.

Domenic Giudice
CA Dept. of Fish and Wildlife
Environmental Scientist
Domenic.giudice@wildlife.ca.gov
(209) 202-9484

Every Californian should conserve water. Find out how at:

SaveOurWater.com · Drought.CA.gov

<New Melones and Tulloch Temperature Profiles 5_20_15.xlsx>

<New Melones and Tulloch Temperature Profiles 6_4_15.xlsx>

United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

JUN 30 2015

IN REPLY REFER TO:
MP-200
PRJ-19.0

MEMORANDUM

To: Area Manager, Central California Area Office
Operations Manager, Central Valley Operations Office

From: Steven B. Melavic
Regional Engineer

Subject: New Melones Dam – Operations of Low-Level Outlets

Operations of the Low-Level Outlets (LLO) at New Melones Dam should continue to be minimized. Typical operations have been limited to making temporary base flow releases from the LLO on the order of a few hundred cubic-feet-per-second during winters when the multipurpose tunnel has been dewatered for inspection and maintenance. During times of storage above Elevation 808, higher flows to make irrigation or flood type releases are not recommended due to system constraints and risks.

The reason for minimizing operations is the inability to readily shut off the water in the event of an emergency in the LLO system. Original design operating criteria received from the Army Corps of Engineers require the reservoir water surface to be at or below Elevation 808 prior to dewatering the LLO. Due to this requirement, the LLO pipes have never been inspected since original construction in 1979 because the reservoir has not been down to that elevation.

The facility should continue to be operated in accordance with the Standing Operating Procedures and design operating criteria.

cc: MP-100, MP-115 (JPhillips), MP-200 (SMelavic)
CC-600 (JEmami)
CVO (PFujitani, LKiteck, BMortimeyer)

Attachment #4

	DBS - July 23, 2015																					
	AF																					
	July	21,749	52,477	0	75,756	2,912				-184	75,756	52,388	0	643	74,738	942				9,368	65,699	75,068
	August	17,217	0	0	71,302	2,767				0	71,302	0	0	-996	71,314	984				9,346	62,964	72,310
	September	16,959	0	0	39,769	2,678				0	39,769	0	0	-2,999	42,054	714				9,045	36,008	45,053
		New Melones								Tulloch										Goodwin		
		Inflow	Power	Outlet	Total	Evap	Change	Storage	Elevation	Local	New Mel	Power	Outlet	Tul Stor Adj	Total Rel	Evap	Change	Storage	Stor Target	River	Canals	Total
		CFS	CFS	CFS	CFS	CFS	AF	AF	FT	CFS	CFS	CFS	CFS	CFS	CFS	CFS	AF	AF	AF	CFS	CFS	CFS
								401,300										66,107				
July	1	551	1,061		1,061	66	-1,142	400,158	834.00	-225	1,061	1,259			1,259	20	-879	65,228		152	1,122	1,274
	2	506	1,060		1,060	63	-1,224	398,934	834.00	227	1,060	1,249			1,249	19	38	65,266		151	1,112	1,263
	3	510	1,043		1,043	63	-1,182	397,752	834.00	-8	1,043	1,209			1,209	19	-383	64,883		153	1,073	1,226
	4	312	1,424		1,424	55	-2,315	395,437	833.00	-4	1,424	1,236			1,236	17	331	65,214		151	1,102	1,253
	5	282	1,748		1,748	64	-3,035	392,402	832.00	15	1,748	1,218			1,218	20	1,041	66,256		153	1,085	1,238
	6	292	1,243		1,243	44	-1,974	390,428	832.00	-1	1,243	1,134			1,134	14	186	66,442		153	1,003	1,156
	7	200	1,070		1,070	43	-1,811	388,618	831.00	-20	1,070	1,138			1,138	13	-200	66,242		153	1,007	1,160
	8	308	607		607	44	-680	387,937	831.00	-19	607	1,192			1,192	14	-1,226	65,016		153	1,060	1,213
	9	306	1,290		1,290	45	-2,041	385,896	831.00	-9	1,290	1,267			1,267	14	0	65,016		153	1,134	1,287
	10	340	1,234		1,234	32	-1,837	384,059	830.00	-4	1,234	1,245			1,245	10	-50	64,966		153	1,109	1,262
	11	279	1,321		1,321	21	-2,108	381,951	830.00	-14	1,321	1,239			1,239	6	123	65,089		152	1,108	1,260
	12	262	1,655		1,655	45	-2,852	379,099	829.00	3	1,655	1,246			1,246	14	789	65,879		155	1,113	1,268
	13	288	1,362		1,362	42	-2,214	376,885	828.00	8	1,362	1,174			1,174	13	363	66,242		155	1,045	1,200
	14	313	1,054		1,054	51	-1,571	375,314	828.00	-15	1,054	1,174			1,174	16	-300	65,942		153	1,046	1,199
	15	355	1,139		1,139	48	-1,650	373,664	828.00	-7	1,139	1,167			1,167	15	-99	65,843		152	1,040	1,192
	16	291	1,245		1,245	51	-1,993	371,670	827.00	14	1,245	1,136			1,136	16	212	66,055		151	1,011	1,162
	17	352	968		968	53	-1,327	370,344	827.00	-18	968	1,171			1,171	17	-472	65,583		152	1,045	1,197
	18	349	806		806	55	-1,016	369,328	827.00	-7	806	1,192			1,192	17	-813	64,770		152	1,067	1,219
	19	284	1,203		1,203	40	-1,902	367,426	826.00	-10	1,203	1,152			1,152	13	56	64,826		152	1,026	1,178
	20	385	1,571		1,571	45	-2,442	364,984	825.00	9	1,571	1,113			1,113	14	899	65,724		152	991	1,143
	21	306	1,310		1,310	45	-2,081	362,903	825.00	2	1,310	1,210			1,210	14	175	65,899		151	1,086	1,237
	22	294	1,043		1,043	48	-1,581	361,323	824.00	-10	1,043	1,291			1,291	16	-543	65,355		153	1,162	1,315
	23	400			1,304	45	-1,882	359,440	824.00	0	1,304			36	1,252	16	71	65,427		152	1,064	1,216
	24	400			1,304	45	-1,882	357,558	824.00	0	1,304			36	1,252	16	71	65,498		152	1,064	1,216
	25	400			1,304	45	-1,882	355,676	823.00	0	1,304			36	1,252	16	71	65,569		152	1,064	1,216
	26	400			1,304	45	-1,882	353,793	823.00	0	1,304			36	1,252	16	71	65,641		152	1,064	1,216
	27	400			1,304	45	-1,882	351,911	822.00	0	1,304			36	1,252	16	71	65,712		152	1,064	1,216
	28	400			1,304	45	-1,882	350,029	822.00	0	1,304			36	1,252	16	71	65,784		152	1,064	1,216
	29	400			1,304	45	-1,882	348,146	821.00	0	1,304			36	1,252	16	71	65,855		152	1,064	1,216
	30	400			1,304	45	-1,882	346,264	821.00	0	1,304			36	1,252	16	71	65,927		152	1,064	1,216
	31	400			1,304	45	-1,882	344,381	820.00	0	1,304			36	1,252	16	71	65,998	66,000	152	1,064	1,216
August	1	280			1,160	45	-1,834	342,548	820.00	0	1,160			-16.2	1,160	16	-32	65,966		152	1,024	1,176
	2	280			1,160	45	-1,834	340,714	819.00	0	1,160			-16.2	1,160	16	-32	65,934		152	1,024	1,176
	3	280			1,160	45	-1,834	338,880	819.00	0	1,160			-16.2	1,160	16	-32	65,902		152	1,024	1,176
	4	280			1,160	45	-1,834	337,046	818.00	0	1,160			-16.2	1,160	16	-32	65,869		152	1,024	1,176
	5	280			1,160	45	-1,834	335,212	818.00	0	1,160			-16.2	1,160	16	-32	65,837		152	1,024	1,176
	6	280			1,160	45	-1,834	333,378	817.00	0	1,160			-16.2	1,160	16	-32	65,805		152	1,024	1,176
	7	280			1,160	45	-1,834	331,544	817.00	0	1,160			-16.2	1,160	16	-32	65,773		152	1,024	1,176
	8	280			1,160	45	-1,834	329,710	816.00	0	1,160			-16.2	1,160	16	-32	65,741		152	1,024	1,176
	9	280			1,160	45	-1,834	327,876	816.00	0	1,160			-16.2	1,160	16	-32	65,709		152	1,024	1,176
	10	280			1,160	45	-1,834	326,042	815.00	0	1,160			-16.2	1,160	16	-32	65,677		152	1,024	1,176
	11	280			1,160	45	-1,834	324,208	815.00	0	1,160			-16.2	1,160	16	-32	65,644		152	1,024	1,176
	12	280			1,160	45	-1,834	322,374	814.00	0	1,160			-16.2	1,160	16	-32	65,612		152	1,024	1,176
	13	280			1,160	45	-1,834	320,540	813.00	0	1,160			-16.2	1,160	16	-32	65,580		152	1,024	1,176
	14	280			1,160	45	-1,834	318,706	813.00	0	1,160			-16.2	1,160	16	-32	65,548		152	1,024	1,176
	15	280			1,160	45	-1,834	316,872	812.00	0	1,160			-16.2	1,160	16	-32	65,516		152	1,024	1,176
	16	280			1,160	45	-1,834	315,038	812.00	0	1,160			-16.2	1,160	16	-32	65,484		152	1,024	1,176
	17	280			1,160	45	-1,834	313,204	811.00	0	1,160			-16.2	1,160	16	-32	65,452		152	1,024	1,176
	18	280			1,160	45	-1,834	311,370	811.00	0	1,160			-16.2	1,160	16	-32	65,420		152	1,024	1,176
	19	280			1,160	45	-1,834	309,537	810.00	0	1,160			-16.2	1,160	16	-32	65,387		152	1,024	1,176
	20	280			1,160	45	-1,834	307,703	810.00	0	1,160			-16.2	1,160	16	-32	65,355		152	1,024	1,176
	21	280			1,160	45	-1,834	305,869	809.00	0	1,160			-16.2	1,160	16	-32	65,323		152	1,024	1,176
	22	280			1,160	45	-1,834	304,035	809.00	0	1,160			-16.2	1,160	16	-32	65,291		152	1,024	1,176
	23	280			1,160	45	-1,834	302,201	808.00	0	1,160			-16.2	1,160	16	-32	65,259		152	1,024	1,176
	24	280			1,160	45	-1,834	300,367	808.00	0	1,160			-16.2	1,160	16	-32	65,227		152	1,024	1,176
	25	280			1,160	45	-1,834	298,533	807.00	0	1,160			-16.2	1,160	16	-32	65,195		152	1,024	1,176
	26	280			1,160	45	-1,834	296,699	807.00	0	1,160			-16.2	1,160	16	-32	65,162		152	1,024	1,176
	27	280			1,160	45	-1,834	294,865	806.00	0	1,160			-16.2	1,160	16	-32	65,130		152	1,024	1,176
	28	280			1,160	45	-1,834	293,031	806.00	0	1,160			-16.2	1,160	16	-32	65,098		152	1,024	1,176
	29	280			1,160	45	-1,834	291,197	805.00	0	1,160			-16.2	1,160	16	-32	65,066		152	1,024	1,176
	30	280			1,160	45	-1,834	289,363	805.00	0	1,160			-16.2	1,160	16	-32	65,034		152	1,024	1,176
	31	280			1,160	45	-1,834	287,529	804.00	0	1,160			-16.2	1,160	16	-32	65,002	65,000	152	1,024	1,176
September	1	285			978	45	-1,464	286,065	804.00	0	978			-50.4	1,017	12	-100	64,902		152	915	1,067
	2	285			933	45	-1,375	284,690	803.00	0	933			-50.4	972	12	-100	64,802		152	870	1,022
	3	285			938	45	-1,385	283,305	803.00	0	938			-50.4	977	12	-100	64,702		152	875	1,027
	4	285			861	45	-1,232	282,073	802.00	0	861			-50.4	900	12	-100	64,602		152	798	950
	5	285			799	45	-1,109	280,964	802.00	0	799			-50.4	838	12	-100	64,502		152	736	888
	6	285			788	45	-1,087	279,876	802.00	0	788			-50.4	827	12	-100	64,402		152	725	877
	7	285			790	45	-1,091	278,785	801.00	0	790			-50.4	829	12	-100	64,302		152	727	879
	8	285			814	45	-1,139	277,646	801.00	0	814			-50.4	853	12	-100	64,202		152	751	903
	9	285			810	45	-1,131	276,515	801.00	0	810			-50.4	849	12	-100	64,102		152	747	899
	10	285			896	45	-1,302	275,214	800.00	0	896			-50.4	935	12	-100	64,002		152	833	985
	11	285			907	45	-1,323	273,890	800.00	0	907			-50.4	946	12	-100	63,902		152	844	996
	12	285			929	45	-1,367	272,523	799.00	0	929			-50.4	968	12	-100	63,802		152	866	1,018
	13	285			893	45	-1,296	271,228	799.00	0	893			-50.4	932	12	-100	63,702		152	830	982
	14	285			814	45	-1,139	270,089	799.00	0	814			-50.4	853	12	-100	63,602		152	751	903
	15	285			712	45	-937	269,152	798.00	0	712			-50.4	751	12	-100	63,502		152	649	801
	16	285			612	45	-738	268,414	798.00	0	612			-50.4	651	12	-100	63,402		152	549	701
	17	285			625	45	-764	267,650	798.00	0	625			-50.4	664	12	-100	63,302		152	562	714
	18	285			630	45	-774	266,876	798.00	0	630			-50.4	669	12	-100	63,202		152	567	719
	19	285			722	45	-956	265,919	797.00	0	722			-50.4	761	12	-100	63,102		152	659	811
	20	285			788	45	-1,087	264,832	797.00	0	788			-50.4	827	12	-100	63,002		152	725	877
	21	285			752	45	-1,016	263,816	797.00	0	752			-50.4	791	12	-100	62,902		152	689	841
	22	285			764	45	-1,040	262,776	796.00	0	764			-50.4	803	12	-100	62,802		152	701	853
	23	285			558	45	-631	262,145	796.00	0	558			-50.4	597	12	-100	62,703		152	495	647
	24	285			404	45	-326	261,819	796.00	0	404			-50.4	443	12	-100	62,603		152	341	493
	25	285			391	45	-300	261,520	796.00	0	391			-50.4	430	12	-100	62,503		152	328	480
	26	285			326	45	-171	261,349	796.00	0	326			-50.4	365	12	-100	62,403		152	263	415
	27	285			321	45	-161	261,188	796.00	0	321			-50.4	360	12	-100	62,303		152	258	410
	28	285			163	45	152	261,340	796.00	0	163			-50.4	202	12	-100	62,203		152	100	252
	29	285			63	45	351	261,691	796.00	0	63			-50.4	102	12	-100	62,103		152	0	152
	30	285			63	45	351	262,041	796.00	0	63			-50.4	102	12	-100	62,003	62,000	152	0	152

Stanislaus Temperature Modeling
2015 Proposed Operations
Water Allocation Schedule – July 26, 2015

General:

The objective of this work is to assess, using the HEC-5Q Model, the expected temperature conditions at discrete points along the Stanislaus River, given the most recent projections of inflow to New Melones Reservoir, proposed instream flow requirements and various alternatives for OID/SSJID diversions from July 26, 2015 through the December 31, 2015.

Tasks:

1. True-up the system to July 26, 2015 by using actual hydrology and Met data for 2015.
2. Adjust boundary conditions, i.e., modified initial temperature inflow to New Melones and Tulloch to increase winter river temperatures and thus build the thermal structure in New Melones and Tulloch to match recent temperature profiles in these reservoirs (latest available are from May and June 2015).
3. Process the meteorological record for the 2011 - 2014 period and extrapolate beyond July 26 based on average data for those years.
4. Use projected New Melones Inflow, Irrigation Demand and River Release (including pulse flow) based on the tables below (Figure 1).
5. Disaggregate New Melones projected monthly inflow to daily based on average data for 2013-2014.
6. Assume New Melones low level outlet is opened to 250 cfs when New Melones hits elevation 808' (aka, Early Bypass). The low level outlet remains at 250 cfs until the commencement of the October Pulse flow.
7. At or slightly before New Melones hits 808' the Districts take up to 500 cfs per day from Tulloch to meet irrigation demand through September 15th and September 30th (2 cases).
8. Assume fall pulse flow per the table below.
9. For the fall pulse flow, the low level outlet will be set at 600 cfs.
10. Perform 4 simulations:
    - BASE1 – no Early Bypass power bypass (unless forced to because of minimum power pool at El. 785), no Tulloch drawdown.
    - Alt1 – same as base, except with Early Bypass.
    - Alt2 – Early Bypass with Tulloch drawdown through September 30.
    - Alt3 – Early Bypass with Tulloch drawdown through September 15.

11. Evaluate the three alternatives in terms of the temperature outflow from Goodwin Dam. Select the preferred alternative.
12. For the selected alternative, analyze the results in terms of the expected temperatures (maximum and 7DADM) at specified locations along the Stanislaus River from day 1 of the simulation to end-of-year 2015.
13. Generate plots showing maximum temperatures at specified locations for the Base and selected alternative. Show temperature targets set by the resource agencies as a reference (but not operate the system to try to meet those targets). Targets assumed to be as follows:
    - Below Goodwin – 65 F from July 26 through October 31.
    - At OBB – 60 F from November 1 through November 22.
    - At OBB – 56 F from November 23 through December 31.
14. Compile a short report with findings.
15. Provide Excel file with 7DADM results at specified locations.

System Operation - Projected Hydrology and Assumed Demands

Beginning	NM Inflow	Goodwin OID/SSJID	Goodwin To River
	TAF	TAF	CFS
1-Jul-15	22.0	65.7	150
1-Aug-15	17.0	63.0	150
1-Sep-15	17.0	36.0 (see below)	150
1-Oct-15	11.0	0.0	432.3 (see below)
1-Nov-15	10.0	0.0	350.0 (see below)
1-Dec-15	11.0	0.0	200

Goodwin OID/SSJID demand in September 2015 (Assuming linear reduction from 1000 cfs to eom)			Goodwin To River in October 2015 (including Pulse Flow based on Alt B-revised)			Goodwin To River in November 2015 (including Pulse Flow based on Alt B-revised)		
	CFS	AF		CFS	AF		CFS	AF
1-Sep-15	1000.0	1983	1-Oct-14	200	397	1-Nov-14	1100	2182
2-Sep-15	972.8	1929	2-Oct-14	200	397	2-Nov-14	1000	1983
3-Sep-15	945.5	1875	3-Oct-14	200	397	3-Nov-14	900	1785
4-Sep-15	918.3	1821	4-Oct-14	200	397	4-Nov-14	800	1587
5-Sep-15	891.0	1767	5-Oct-14	200	397	5-Nov-14	700	1388
6-Sep-15	863.8	1713	6-Oct-14	200	397	6-Nov-14	600	1190
7-Sep-15	836.6	1659	7-Oct-14	200	397	7-Nov-14	500	992
8-Sep-15	809.3	1605	8-Oct-14	200	397	8-Nov-14	350	694
9-Sep-15	782.1	1551	9-Oct-14	200	397	9-Nov-14	300	595
10-Sep-15	754.8	1497	10-Oct-14	200	397	10-Nov-14	250	496
11-Sep-15	727.6	1443	11-Oct-14	200	397	11-Nov-14	200	397
12-Sep-15	700.3	1389	12-Oct-14	200	397	12-Nov-14	200	397
13-Sep-15	673.1	1335	13-Oct-14	200	397	13-Nov-14	200	397
14-Sep-15	645.9	1281	14-Oct-14	200	397	14-Nov-14	200	397
15-Sep-15	618.6	1227	15-Oct-14	200	397	15-Nov-14	200	397
16-Sep-15	591.4	1173	16-Oct-14	200	397	16-Nov-14	200	397
17-Sep-15	564.1	1119	17-Oct-14	200	397	17-Nov-14	200	397
18-Sep-15	536.9	1065	18-Oct-14	200	397	18-Nov-14	200	397
19-Sep-15	509.7	1011	19-Oct-14	200	397	19-Nov-14	200	397
20-Sep-15	482.4	957	20-Oct-14	200	397	20-Nov-14	200	397
21-Sep-15	455.2	903	21-Oct-14	700	1388	21-Nov-14	200	397
22-Sep-15	427.9	849	22-Oct-14	500	992	22-Nov-14	200	397
23-Sep-15	400.7	795	23-Oct-14	200	397	23-Nov-14	200	397
24-Sep-15	373.4	741	24-Oct-14	1250	2479	24-Nov-14	200	397
25-Sep-15	346.2	687	25-Oct-14	1200	2380	25-Nov-14	200	397
26-Sep-15	319.0	633	26-Oct-14	1150	2281	26-Nov-14	200	397
27-Sep-15	291.7	579	27-Oct-14	1000	1983	27-Nov-14	200	397
28-Sep-15	264.5	525	28-Oct-14	850	1686	28-Nov-14	200	397
29-Sep-15	237.2	471	29-Oct-14	750	1488	29-Nov-14	200	397
30-Sep-15	210.0	417	30-Oct-14	600	1190	30-Nov-14	200	397
			31-Oct-14	1200	2380			
Avg	**605.0**		**Avg**	**432.3**		**Avg**	**350.0**	
Total		**36000**	**Total**		**26579**	**Total**		**20826**

Figure 1: New Melones Inflow, Diversion and Release Schedule

Modeling, Analysis and Findings

1. Model Validation

Model validation was conducted by simulating the operation of the Stanislaus River System with actual hydrological and meteorological data from January 1 through July 26, 2015 and then comparing simulated temperature downriver with observed. The first step was to define the boundary conditions, i.e., the initial temperature inflow to New Melones and Tulloch, so that the thermal structure in New Melones and Tulloch would match as close as possible the most recent temperature profiles taken for these reservoirs (latest available are from May and June 2015).

A comparison between the computed and observed temperature profiles in New Melones and Tulloch is shown in Figure 2 and Figure 3 below.

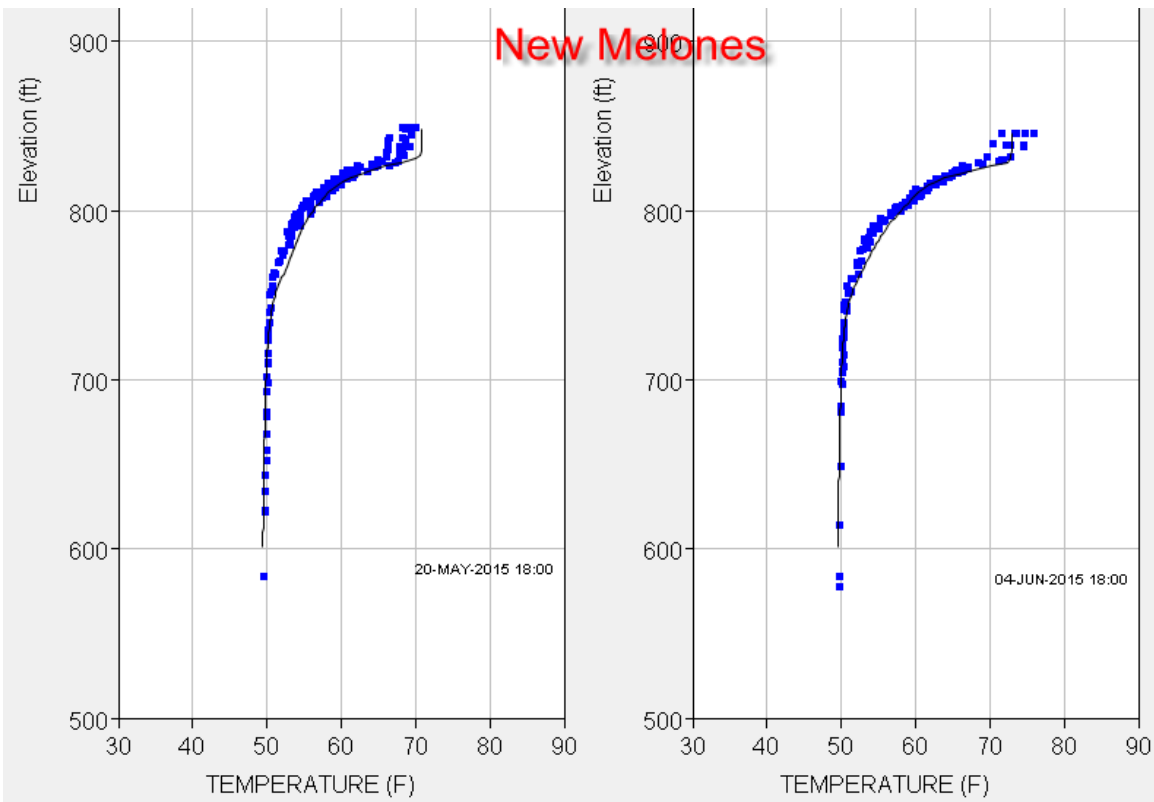


Figure 2: Temperature Profile in New Melones. Computed (line) vs. Observed (squares).

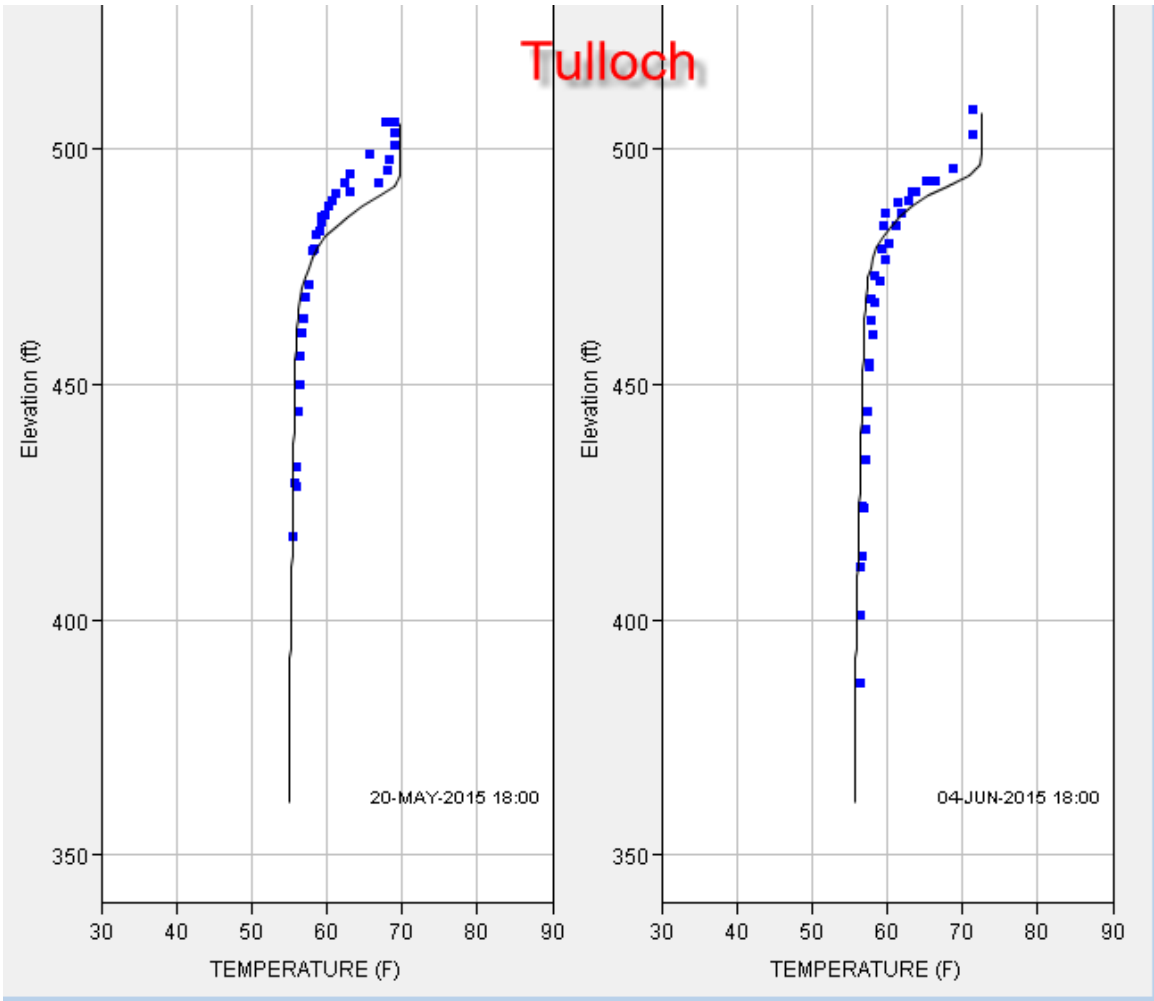


Figure 3: Temperature Profile in Tulloch. Computed (line) vs. Observed (squares).

Next step was to simulate actual diversion and release to the river from Goodwin Dam and compare the computed temperature response downriver with observed.

The results are shown in the following series of plots. The plots show the maximum and minimum daily temperature recorded by FishBio at three locations during the period March 1 to June 13, 2015 and the corresponding computed temperature on a 6-hour time step. Locations were: 1) Immediately below Goodwin Dam, 2) Knights Ferry and 3) Orange Blossom Bridge

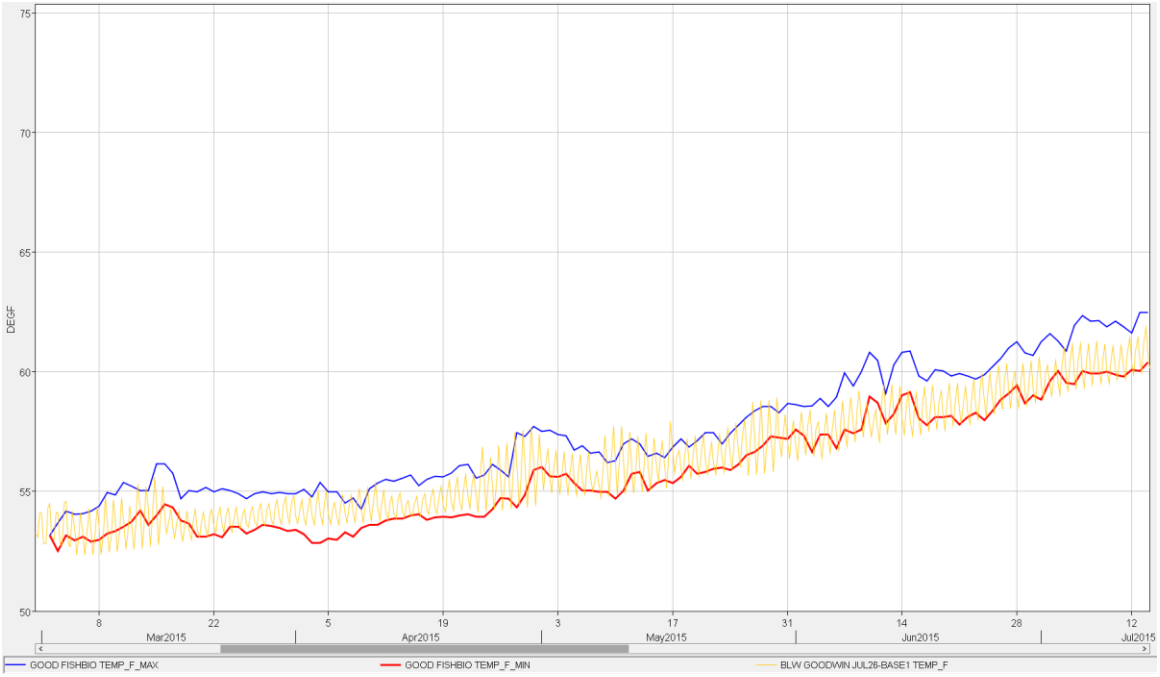


Figure 4: Computed (6-hour) vs. Observed Max and Min (daily) below Goodwin Dam

Figure 5: Computed (6-hour) vs. Observed Max and Min (daily) at Knights Ferry

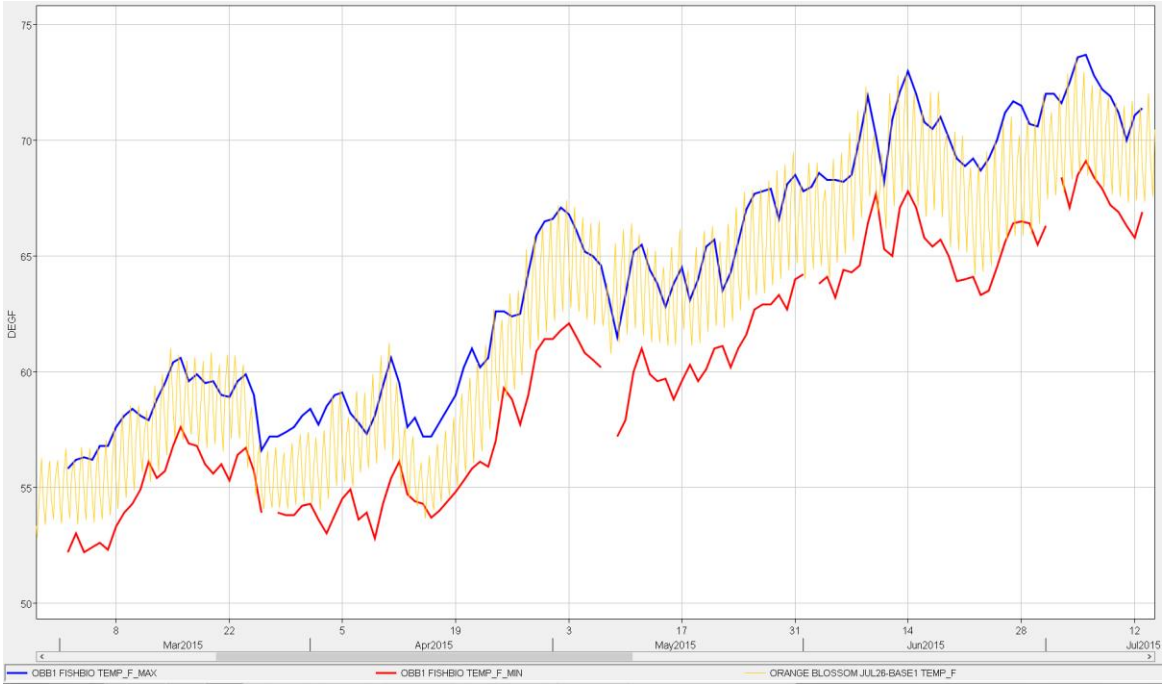


Figure 6: Computed (6-hour) vs. Observed Max and Min (daily) at Orange Blossom Bridge

2. Hydrological and Meteorological Data used for Simulation

The pattern of inflow to New Melones was based on average of the inflow data for 2013 and 2014 (both low runoff years) as shown in Figure 7. The volume of the inflow was scaled down to match the monthly estimates specified in Figure 1 above.

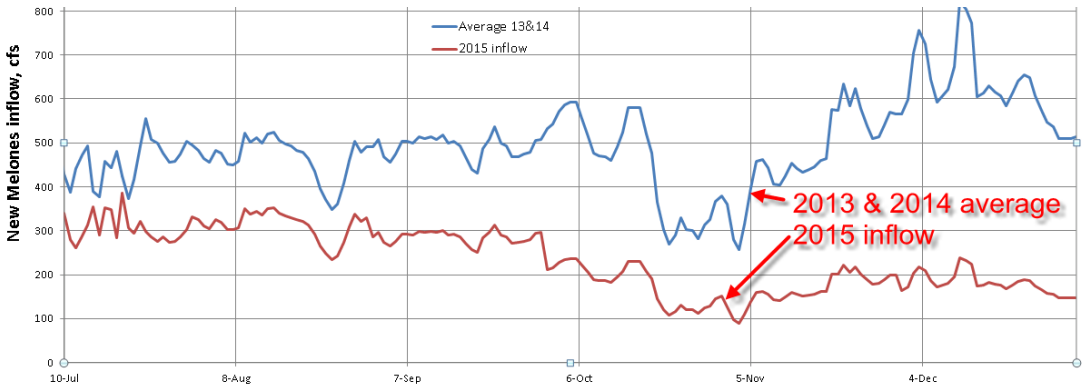


Figure 7: Pattering of New Melones Inflow based on Average of 2013 & 2014 Data

The meteorological data used (beyond July 16) was based on the average of the hourly data over the period 2011-2014.

The rational was based on reviewing the computed pool temperature (see Figure 8) using the past 5 years of meteorology. The review demonstrated the following:

1) The early part of 2015 was unusually warm
2) During the past 30 +/- days, computed water temperatures were typical of the previous four years, and
3) None of the previous years were unusually warm for August - December period.

Therefore the average condition seems appropriate going forward.

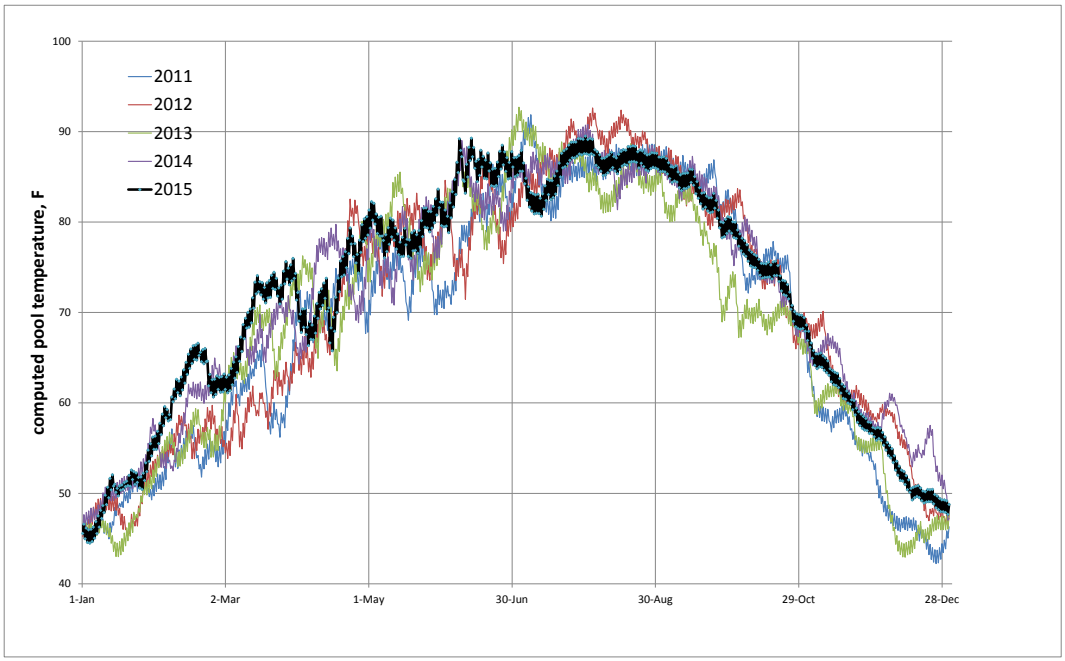


Figure 8: Computed Pool Temperature in the Past 5 Years

3. Simulation Cases

The HEC-5Q simulated 4 cases. All the cases assumed the same hydrology as specified in Figure 1 above, i.e., New Melones projected inflow, diversion to OID and SSJID and release from Goodwin Dam downriver. The difference between the cases had to do with the timing of the hydro bypass operation in New Melones and the extent of drawing down Tulloch to meet diversion demand as explained in the *Tasks* section above.

The following is a summary description of the various cases simulated:

Case Name	Description
BASE1	No Early Bypass power bypass (unless forced to because of minimum power pool at El. 785), no Tulloch drawdown
ALT1	same as BASE1, except with Early Bypass (when NM reaches El. 808)
ALT2	Early Bypass with Tulloch drawdown through September 30
ALT3	Early Bypass with Tulloch drawdown through September 15

Figure 9 – HEC-5Q Simulation Cases

4. Projected New Melones and Tulloch Storage

From the storage perspective, there is no difference in New Melones storage between the base cases (BASE1 and ALT1). However, this is not the case for the two operation cases for Tulloch drawdown (ALT2 and ALT3) since in those cases New Melones storage is maintained higher than the base cases which affects the thermal structure of New Melones, Tulloch and Goodwin temperature outflow.

Storage conditions in New Melones and Tulloch for the various cases are shown in Figure 10 and Figure 11. The figures show that Tulloch drawdown would most probably start around August 23 (triggered when New Melones reaches El. 808).

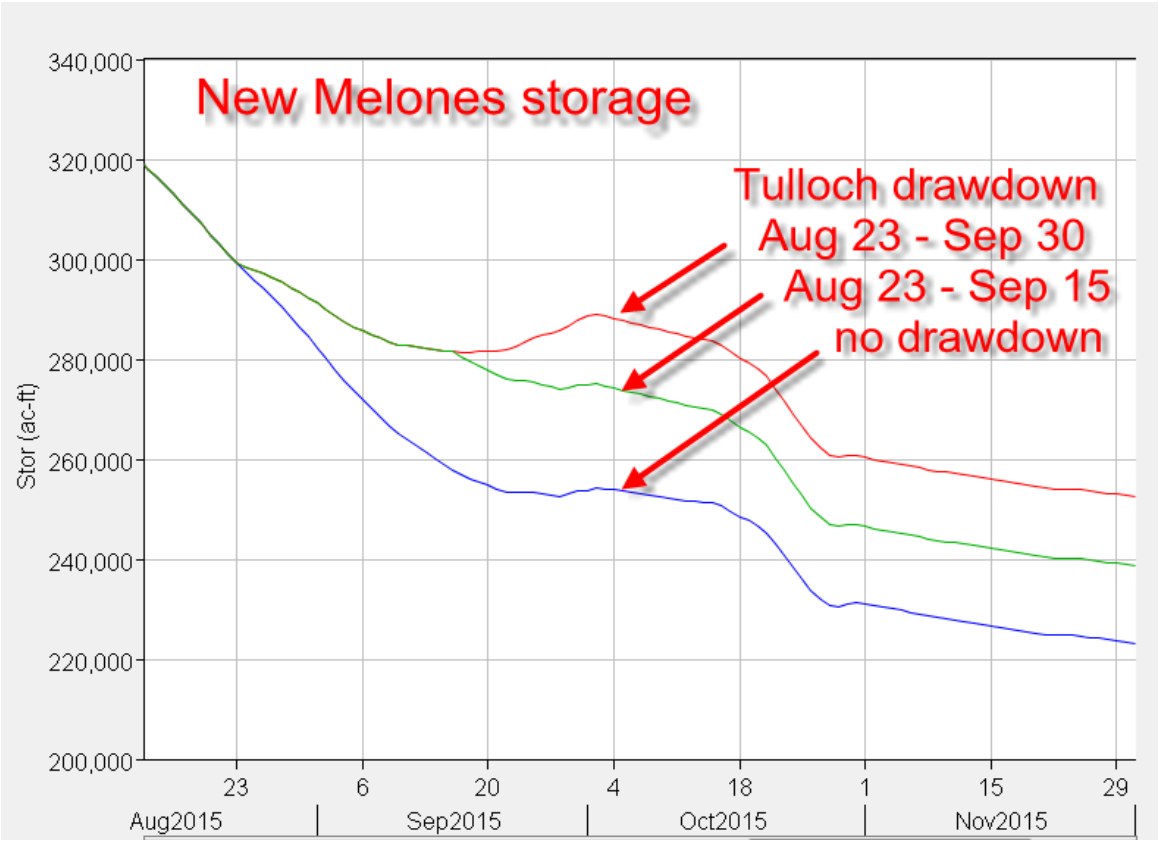


Figure 10 – New Melones Projected Storage

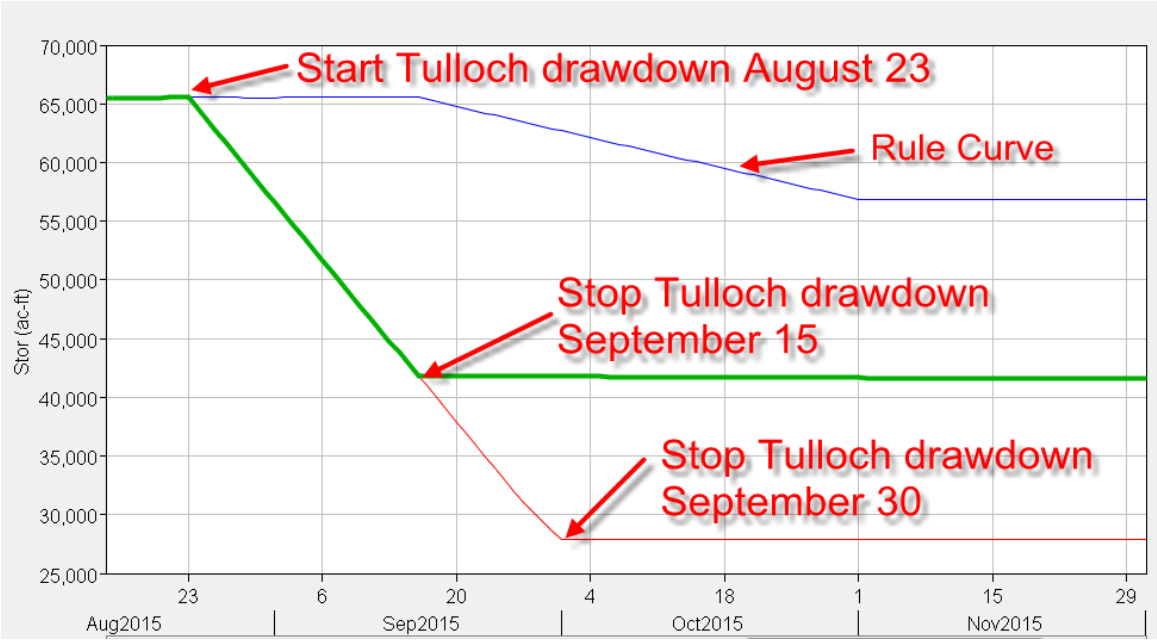


Figure 11 – Tulloch Projected Storage

5. Selected Tulloch's Drawdown Alternative

The computed temperature below Goodwin Dam for all the cases analyzed is shown in Figure 12. The figure shows that all the alternatives would provide an immediate temperature relief below Goodwin in comparison with the base case (BASE1).

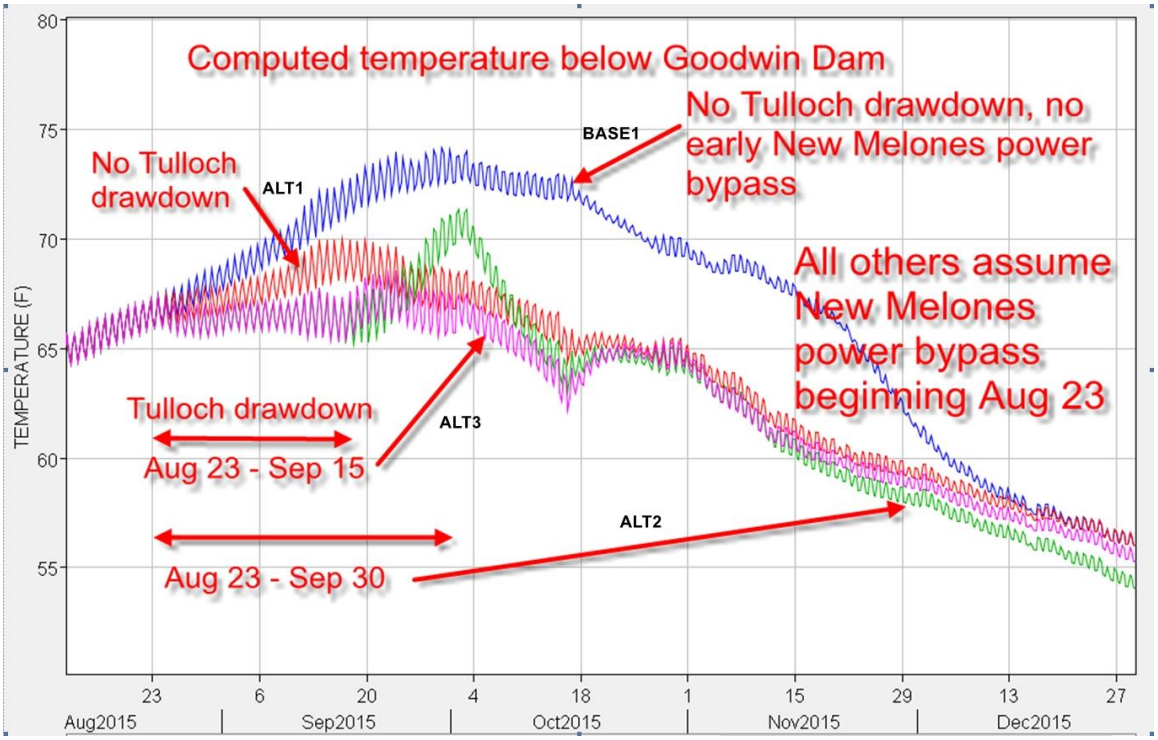


Figure 12: Goodwin Temperature Outflow for the Alternatives Considered

The figure also shows that the most significant factor for temperature relief is the power bypass at New Melones. Tulloch drawdown provides additional benefits but up to the point where the cold pool of water in Tulloch is depleted and the warm water epilimnion (the top-most layer) starts discharging from the reservoir through the Tulloch power intake (the centerline of the power intake is at El. 415). This situation creates a spike in temperature below Goodwin around the end of September as shown for ALT2 in the above figure.

In order to mitigate this spike, a new case, ALT3, was introduced whereby Tulloch drawdown was halted on September 15 and the irrigation demand for the rest of the month was supplied from New Melones. Figure 13 and Figure 14 below explain why ALT3 is preferred over ALT2:

While water temperature at the centerline of the power intake in Tulloch by September 15 is the same for both alternatives (around 64.5 DegF), it is about 5.5 DegF warmer for ALT2 by September 30. Note that the precipitous drop in temperature below Goodwin (Figure 12) past September 30 in ALT 2 is due to the fact that the water is now being pulled out of New Melones and not Tulloch.

The exact date when to stop the Tulloch drawdown is a "balancing act". However, for the purpose of this analysis this cutoff date and ALT 3, as such, were chosen as the preferred alternative.

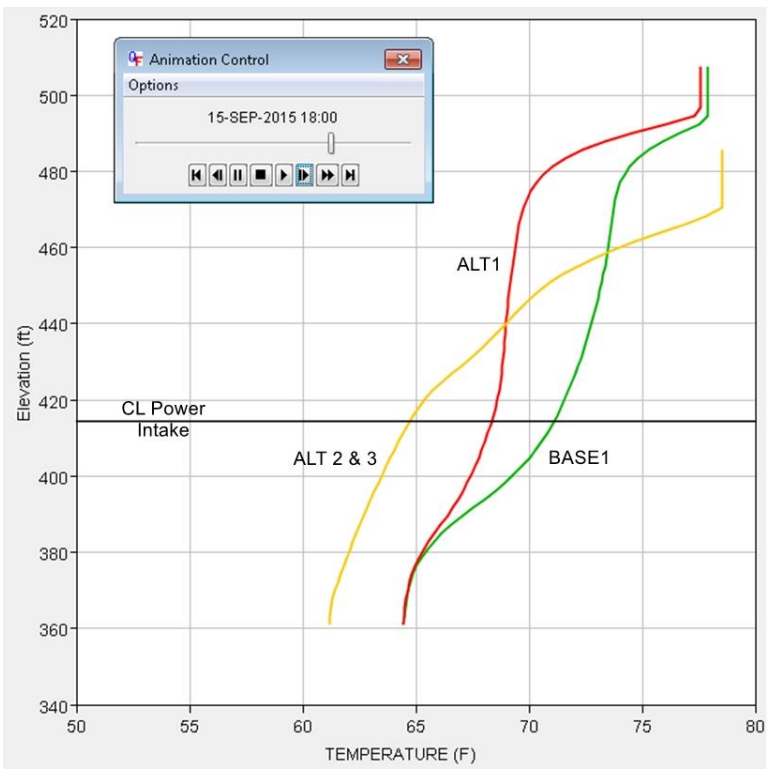


Figure 13: Tulloch Temperature Profile on September 15

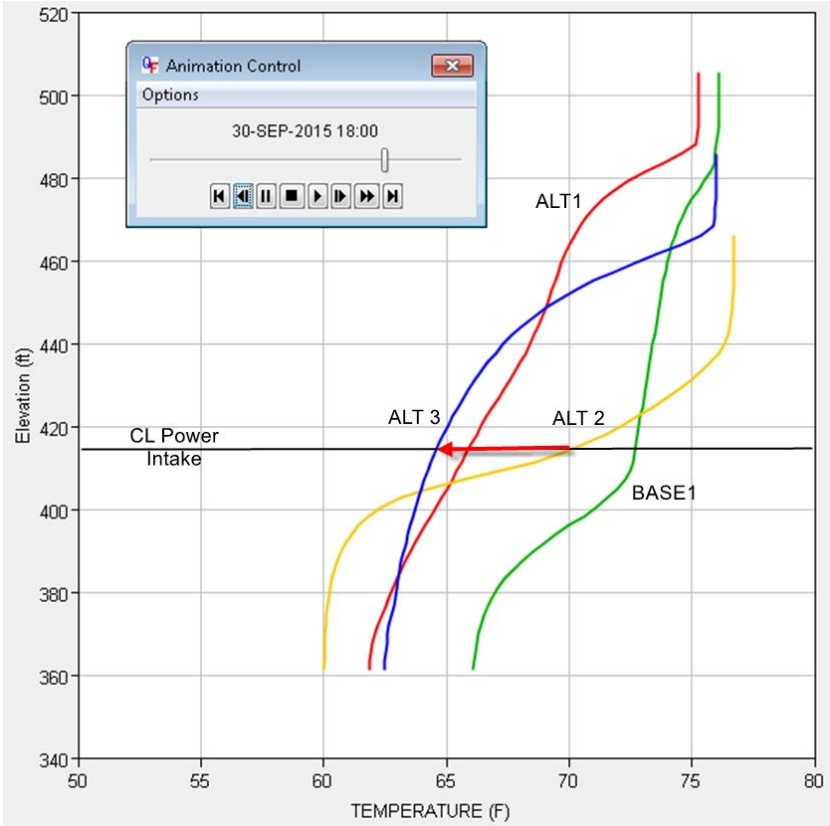


Figure 14: Tulloch Temperature Profile on September 30

6. Projected Downriver Temperature Response

The following figures show the results for the temperature response at six discrete points along the Stanislaus River:

1) **Below Goodwin Dam**
2) **Knights Ferry**
3) **Orange Blossom Bridge**
4) **Highway 120 Bridge (Oakdale)**
5) **Ripon Gage (Highway 99)**
6) **Above the confluence with the San Joaquin River**

The results are presented in two ways:

A. Graphical form (BASE1 and ALT3) - showing the daily maximum temperatures and the two temperature targets set by the Resource Agencies (for reference only). Note that the targets are relevant only for Below Goodwin Dam and Orange Blossom Bridge.

B. Excel File (attached) - showing the 7-Days Average of Daily Maximums (7DADM) for BASE1 and ALT3.

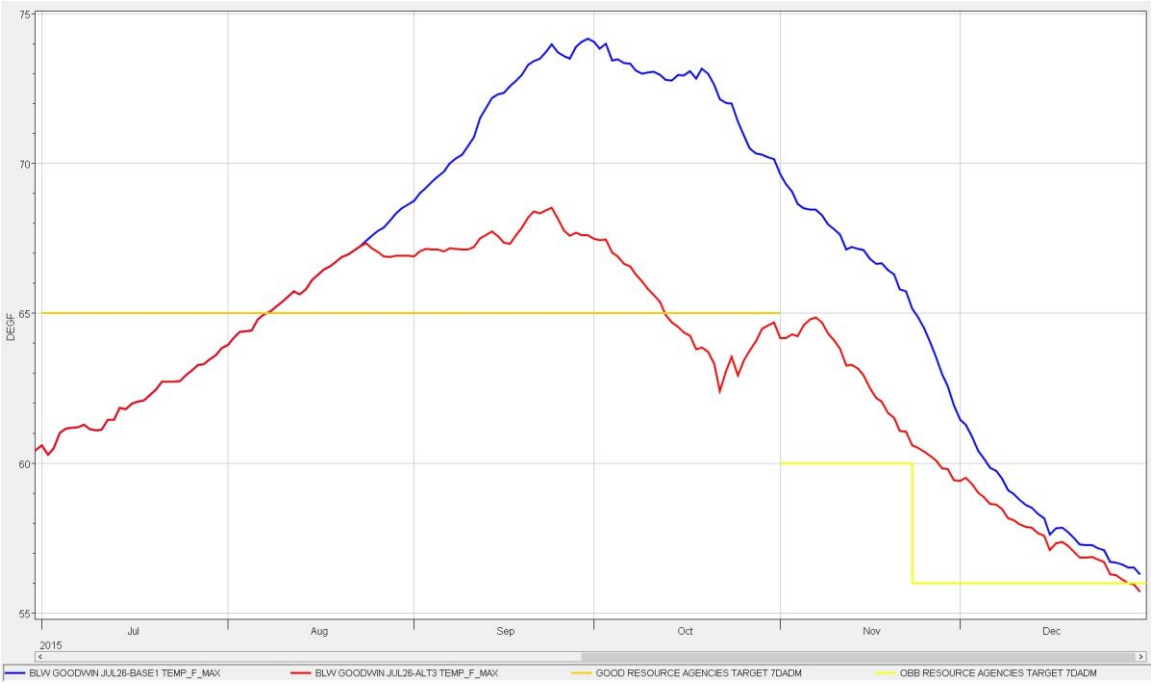


Figure 15 : Maximum Daily Temperatures below Goodwin Dam

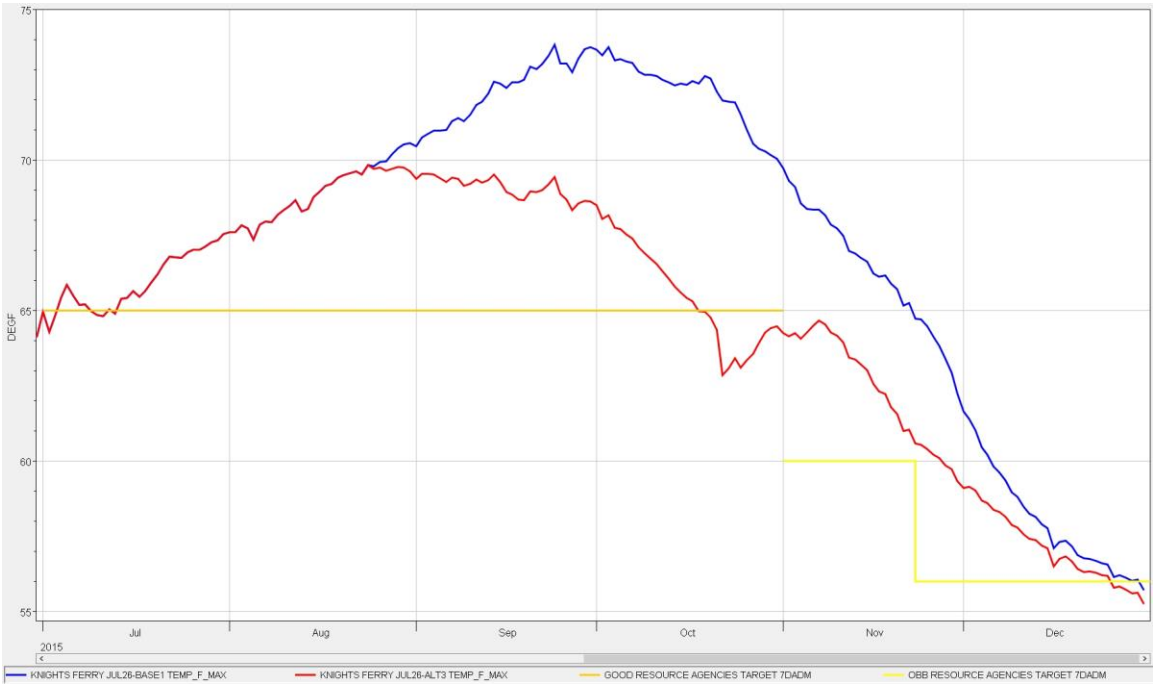


Figure 16 : Maximum Daily Temperatures at Knights Ferry

Figure 17 : Maximum Daily Temperatures at Orange Blossom Bridge

Figure 18 : Maximum Daily Temperatures below Highway 120 (Oakdale)

Figure 19 : Maximum Daily Temperatures at Ripon Gage (Highway 99)

Figure 20 : Maximum Daily Temperatures above the Confluence with the San Joaquin River

Attachment #6

Summary of 7/8/15 Stanislaus Temperature Management Planning call
3-4pm

Participants
Reclamation: Ron Milligan, Paul Fujitani, Liz Kiteck, Catherine Blackwell, Carolyn Bragg, Amanda Bahls, Kristin White
NMFS: Rhonda Reed (for first ½ hour), Barb Byrne
FWS: Julie Zimmerman, Craig Anderson
DFW: Dom Giudice, Tim Heyne, Pat Brantley
DWR: Mike Ford
SWRCB: Dan Worth
OID: Tim O'Laughlin, Dan Steiner
FISHBIO: Doug Demko, Andrea Fuller

Group primarily discussed the most recent temperature modeling report from Avry Dotan which modeled some scenarios using both New Melones outlets, as well as two scenarios that included a greater-than-usual drawdown of Tulloch. Was some brief discussion about operations to meet minimum instream flows through March. See highlights below.

New Melones outlet engineering limitations

- Based on a Corps memo, shared by Liz Kiteck, Reclamation will not use low-level outlet until reservoir elevation drops to 808 feet (300 TAF) -- expected mid- to late-August.
- Main New Melones outlet is expected to be available for blending releases from New Melones until the reservoir elevation drops below ~785 feet (~227 TAF), though staff will be literally watching the reservoir for any vortex formation once elevation drops below 808 feet and use of the main outlet will stop as soon as that is observed, even if elevation is >785 feet.
- The low level outlet CAN release more than 250 cfs (up to at least 1000 cfs), but the 250 cfs release level was chosen to ration out the low, cold, water in New Melones.

Tulloch ops

- Residents around Tulloch Lake have been informed by the districts that the drawdown of Tulloch is likely to begin September 1 (increasing Tulloch releases in September reduces temperatures downstream of Goodwin Dam).

Stanislaus Flows

- Tim O'Laughlin reported that it appears to them that the forecasted reservoir storage levels could meet the 2-E flow schedule in the NMFS BiOp through March 2016
- Tim reported that meeting the fall pulse flow might be conditional on an "OID release" that would be picked up by the CVP in the Delta for delivery to Westside Water District. Ron cautioned that some details would still need to be worked out.

- Tim O. suggested that the districts meet with Reclamation and NMFS in February 2016 to assess current and forecasted storage conditions and the ability of Reclamation to continue to meet the 2-E flows.

Temp modeling highlights

- Reclamation explained that the low level outlet could release more than 250 cfs, but that the 250 cfs was chosen to ration out the cold water in New Melones.
- Was some discussion of using higher low-level outlet releases to dampen late Aug-early September temperature peak; was noted that this might use up cold water by earlier in October and thus increase temps in early fall.
- Discussed reason(s) for temperature increase in fall (see temp figures and/or bottom panel of Figure 12 in most recent AD Consultants temperature modeling report) but this may merit further discussion; what I took from the discussion was that this mid-October increase in temp was related to increased releases during fall pulse flow and probably also depletion of the cold water pool but I'm not sure of the exact dynamics

Questions for Avry Dotan (who did the temperature modeling)

- At what elevation did the model assume that water could no longer be released from the main outlet at New Melones?
- Are the 1987 temperatures fairly representative of current conditions (Tim gave an initial answer that the 1987 temps were cooler than recent observed conditions); if not, is an alternate, more representative, set of meterorological data available that could be used in future model runs?
- What suggestions do you [Avry] have for buffering the temperature peak in late Aug/early September and smoothing temps in October-early November?

Next Steps

- Tim O'Laughlin will pass along questions to Avry and share answer with group, hopefully on Thursday, 7/9
- Tim will see when Avry is available for some potential additional model run(s)
- Reclamation will ask SWRCB for extension of July 10 deadline for the Stan Temp management plan (no new date decided on; will depend somewhat on Avry's availability)
- *Tentative:* group will meet again to discuss specific scenarios for new model runs

Attachment #7

Summary of 7/14/15 Stanislaus Temperature Management Planning call
9-10am

Participants
Reclamation: Liz Kiteck, Catherine Blackwell, Carolyn Bragg, Amanda Bahls, Michele Palmer
NMFS: Barb Byrne
FWS: Julie Zimmerman, Craig Anderson, J.D. Wikert
DFW: Dom Giudice, Pat Brantley, Duane Linander, Ken Kundargi
SWRCB: Dan Worth, Diane Riddle
FISHBIO: Jason Guignard, Andrea Fuller

Latest modeling from AD consulting (ADC-StanislausOps-July-13-2015.pdf)

- The modeled scenario compares a 250 cfs low-level outlet bypass throughout fall to a scenario in which all of the fall pulse flow is taken through the low-level outlet; both scenarios include 1000 cfs daily Tulloch drawdown during September.
- The scenario that bypasses the full pulse flow shows Goodwin temperatures <60 from mid-October onward; the 250 cfs bypass scenario shows Goodwin temperatures spiking into the mid-60's during the pulse flow.
- Group agreed that releasing a greater proportion of the fall pulse flow through the New Melones low-level outlet should be an element of the temperature management plan, as it avoids a spike in water temperatures from ~60°F to above 65°F when salmonids may be present in the Stanislaus in October.

Summary of modeling ideas/constraints
The group didn't discuss any specific new modeling scenarios, but identified some steps and ideas for future model runs (some reiterated from earlier discussions, some may already be included in modeling assumptions), summarized below:

Engineering constraints

- Assume can no longer use main outlet at New Melones once New Melones Reservoir reaches 790 feet/244 TAF (expected to occur in mid to late October). In actuality, staff will begin watching for vortex formation when the reservoir drops to 808 feet and outlet use will end once any vortex is seen – this might happen above or below 790 feet.
- Assume cannot begin to use low-level outlet at New Melones until New Melones Reservoir reaches 808 feet/300 TAF (expected to occur in mid to late August)
- Assume can release up to 1000 cfs through low-level outlet.
- Assume Tulloch drawdown begins September 1
- **Question for OID/SSJID:** Current modeling assumes that Tulloch drawdown occurs only during September. Could it extend into October? Is an extension dependent on total drawdown, e.g. a 1000 cfs daily drawdown can occur for only 30 days, but a 500 cfs daily drawdown could occur for 60 days?

Environmental inputs to model

Attachment #7

- Compare reservoir profiles (at New Melones and Tulluch) used in recent modeling to most recent reservoir profiles shared with districts by Reclamation (data collected by CDFW); if substantively different, consider re-running previously modeled scenarios using the most recent reservoir profile.
- Compare meteorological data (particularly air temperatures) used in recent modeling to observed air temps in 2015; if substantively different, consider re-running previously modeled scenarios using a set of meteorological data that better matches recent observed air temperatures. The group recognizes that picking a representative dataset for future temperatures is a guess.
- In future model runs, use the most recent reservoir profiles and a "representative" meteorological dataset.

Fall pulse flow input to model

- In future model runs, use the Fall 2014 pulse flow timing and shaping.
- The agreement to use this shaping/timing for modeling was NOT a commitment to implement that shaping and timing this fall (which would need to be approved by NMFS), but the 2014 shaping and timing was thought more likely than the default 2-E schedule.

Draft fall temperature targets

The current Stanislaus Temperature Management Plan filed with the SWRCB includes a target to not exceed 65°F, measured as the 7DADM, at Goodwin Dam, through October 31, 2015. The group discussed temperature targets throughout the fall, and developed the following straw proposal[1]:

> **October:** Current plan targets 7DADM not to exceed 65°F at Goodwin Dam through October 31, but temp model runs show lower temps may be achievable and group agreed that decreasing temps (as long as don't spike back up) desirable during October. No specific new October target.
> **Beginning November 1:** 7DADM not to exceed 60°F at Orange Blossom Bridge (discussion was to move target location downstream to provide more suitable habitat for spawning than we've provided for oversummer rearing by setting the target location at Goodwin Dam)
> **Mid-late November-December 31:** 7DADM not to exceed 56°F at Orange Blossom Bridge
> **Uncertainty:** Group agreed that the temperature management plan should include explicit recognition that the targets (especially the 56°F at OBB) might not be achieved on the targeted timeframe, but that blending decisions would be guided by these targets and tradeoffs would be discussed as conditions play out.
>
> Fall Temperature Criterion in 2009 Long-term Operations BiOp:
> **Beginning October 1 (or initiation of fall pulse flow) through December 31:** 7DADM not to exceed 56 degrees at Orange Blossom Bridge.
>
> In past years, SOG has advised, and NMFS has approved, the initiation of the fall temp

[1] Attached to the e-mail transmitting the meeting notes is document with some rough characterizations of the proposed targets compared to (a) modeled OBB temperatures in the ADC-StanislausOps-June-5-2015.pdf modeling report, and (b) actual WY 2014 water temperatures.

Attachment #7

criterion in mid-to-late October after the fall pulse flow begins; 7DADM temps have often not fallen to 56 until sometime in November or later (in mid-November, conditions begin to cool downstream) under the exception procedures. So, the proposed target temps and dates are not dissimilar to actual temperature trends in recent years.

Next Steps

- Byrne will share Fall 2014 pulse flow shaping with group
- Participants should discuss draft temperature targets within their organization and share any concerns with the group ASAP
- Reclamation will draft plan

Attachment #8

Bragg, Carolyn <cbragg@usbr.gov>

Re: Revised SOG advice -- response requested by Friday (10/17) 9am

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Fri, Oct 17, 2014 at 8:49 AM
To: "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>
Cc: Barbara Byrne <barbara.byrne@noaa.gov>, Carolyn Bragg <cbragg@usbr.gov>, Patricia L Clinton <PClinton@usbr.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Tom,

On October 1, 2014, NMFS determined that the proposed change in the fall pulse flow schedule, as described in the September 26, 2014, SOG advice, was consistent with the implementation procedures of RPA Action III.1.3. At that time, NMFS requested that SOG report the specific timing of the fall pulse flow to NMFS and WOMT no later than October 31, 2014. NMFS also concurred with the advice to shift the initiation date for the fall temperature criterion at Orange Blossom Bridge to the date of the first pulse peak within the reshaped fall pulse flow and determined that the proposed initiation window for the fall temperature criterion was consistent with the implementation procedures of RPA Action III.1.2.

The October 16, 2014, SOG advice proposes a minor modification to the approved pulse reshaping and reports the specific timing of both the fall pulse flow (to be initiated on October 21, 2014) and the initiation of the fall temperature criterion (effective beginning on October 24, 2014) for implementation in 2014. NMFS determines that, for 2014, implementation of the fall attraction flow according to the "Alt B-revised" scheduled (Table 1 of the attached October 16, 2014, SOG advice) is 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 let Aaron Miller (DWR) know, and he can schedule a WOMT meeting. Thanks.

-Garwin-

Garwin Yip
U.S. Department of Commerce
NOAA's National Marine Fisheries Service
Water Operations and Delta Consultations Branch Supervisor
650 Capitol Mall, Suite 5-100
Sacramento, CA. 95814
Office: 916-930-3611
Cell: 916-716-6558
FAX: 916-930-3629

Begin forwarded message:

> **From:** Barbara Byrne - NOAA Federal <barbara.byrne@noaa.gov>
> **To:** Garwin Yip - NOAA Federal <Garwin.Yip@noaa.gov>
> **Cc:** "Bragg, Carolyn" <CBragg@usbr.gov>, "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>, Patricia L Clinton <PClinton@usbr.gov>
> **Subject: Revised SOG advice -- response requested by Friday (10/17) 9am**

Garwin,

At its 10/15/14 meeting, the Stanislaus Operations Group (SOG) discussed the specific timing of the fall pulse flow within the flexible timing window advised in the 9/26/14 SOG advice (approved by NMFS on 10/1/14). Based on our discussion, SOG advises a minor modification to the approved pulse reshaping for 2014.

Attached is SOG advice which (a) advises a minor reshaping of the pulse flow within the already-approved flexible time window, based on discussion at the 10/14/14 SOG meeting, and (b) identifies specific timing for both the pulse flow and the initiation of the fall temperature criterion, as requested in the 10/1/14 NMFS approval of the 9/26/14 SOG advice.

SOG requests that NMFS concur with this advice regarding implementation of Stanislaus RPA actions during October and November of 2014. Because of the lead time needed for the scheduling of New Melones releases, *SOG requests a response, if possible, no later than 9am on Friday, 10/17. *

Please send your final decision to Tom Morstein-Marx, Reclamation, with a cc: to me; I'll forward your decision to the Stanislaus Operations Group for their information.

Regards,

Barb (on behalf of SOG)

--

*Barb Byrne**Biologist*

*NOAA Fisheries West Coast RegionU.S. Department of CommerceOffice: 916-930-5612*barbara.byrne <barbara.byrne@noaa.gov>
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Find us online

www.westcoast.fisheries.noaa.gov
*

2014.10.16_SOG flow & temp initiation advice_with attachments.pdf
548K

SOG ADVICE RE: IMPLEMENTATION OF THE STANISLAUS RPA ACTIONS DURING OCTOBER AND NOVEMBER
10/16/2014

Background
On 10/1/14, NMFS approved the 9/26/14 Stanislaus Operations Group (SOG) advice regarding implementation of Stanislaus actions in the Reasonable and Prudent Alternative (RPA) of the 2009 NMFS Biological Opinion (NMFS BiOp). Specifically, NMFS approved the reshaping of the fall pulse flow advised by SOG, as well as the flexible time window for implementation of the fall pulse flow and initiation data of the fall temperature criterion (see Attachment 1).

The regulatory background and stakeholder input regarding implementation of Stanislaus RPA actions during October and November 2014 are summarized in the 9/26/14 SOG advice (see Attachment 2). The considerations described in the 9/26/14 advice and the overall rationale for the reshaped pulse still apply; the current advice is provided in order to:

- request approval for a minor reshaping of the pulse flow within the already-approved flexible time window, based on discussion at the 10/14/14 SOG meeting, and
- identify specific timing for both the pulse flow and the initiation of the fall temperature criterion, as requested in the 10/1/14 NMFS approval.

SOG believes that the modified fall attraction flow schedule and initiation date for the fall temperature criterion at Orange Blossom Bridge are consistent with the intent of RPA actions III.1.3 and III.1.2.

SOG advice
SOG met on 10/15/14, reviewed recent conditions (Figure 1), and came to a general consensus that that the fall pulse flow should be implemented as soon as practicable given:

- cooler water temperatures,
- passage of hundreds of adult Chinook past the weir at Riverbank,
- initiation of Chinook salmon spawning in Goodwin Canyon, and
- the potential for an early-, rather than mid-November, removal of the fall barrier at the head of Old River.

Because of the lead time needed to schedule New Melones releases, assuming a change order was issued on Friday, 10/17/14, the pulse would not begin until Tuesday, 10/21/14, and the shaping in the 9/26/14 SOG advice would no longer accommodate the requested weekend rafting flows. The 9/26/14 SOG advice noted that SOG would work to accommodate the requested weekend flows "if not detrimental to expected fish benefits"; the reshaping advised in the current advice adjusts the pulse shaping such that the mid-week initiation of the pulse (which accommodates the current SOG consensus that "sooner is better" in terms of fishery benefits) doesn't preclude the fish-neutral accommodation of the higher weekend flows.

Flow
For 2014, SOG advises that the fall attraction flow (Critical yeartype) be implemented according to the "Alt B-revised" flow schedule described in Table 1 and Figure 2, in terms of both pulse shaping and specific pulse timing.

As does the previously advised "Alt B" schedule, the currently advised "Alt B-revised" schedule has the same volume (23,207 AF) and peak flow (1,250 cfs) as the Critical fall pulse in Appendix 2-E, and provides flow variability expected to deter spawning at the higher flows that won't be sustained through egg incubation and fry emergence. The technical team believes "Alt B-revised" schedule meets the intent of the RPA action, namely, improving instream conditions and providing an attraction cue for adult salmonids returning to spawn.

Temperature

For 2014, SOG advises that the fall temperature criterion of 56°F at Orange Blossom Bridge apply as 10/24/2014. The 9/26/14 SOG advice was "that the fall temperature criterion of 56°F at Orange Blossom Bridge apply as of the initiation of the first pulse peak within the reshaped fall pulse flow, which will be no later than 11/8/2014". The current advice implements the intent of that advice in the context of the "Alt B-revised" pulse flow, setting the initiation date of the fall temperature criterion to the first of the two highest pulse peaks (1,250 cfs on 10/24/14), rather than the first, but small, pulse peak (700 cfs on 10/21/14).

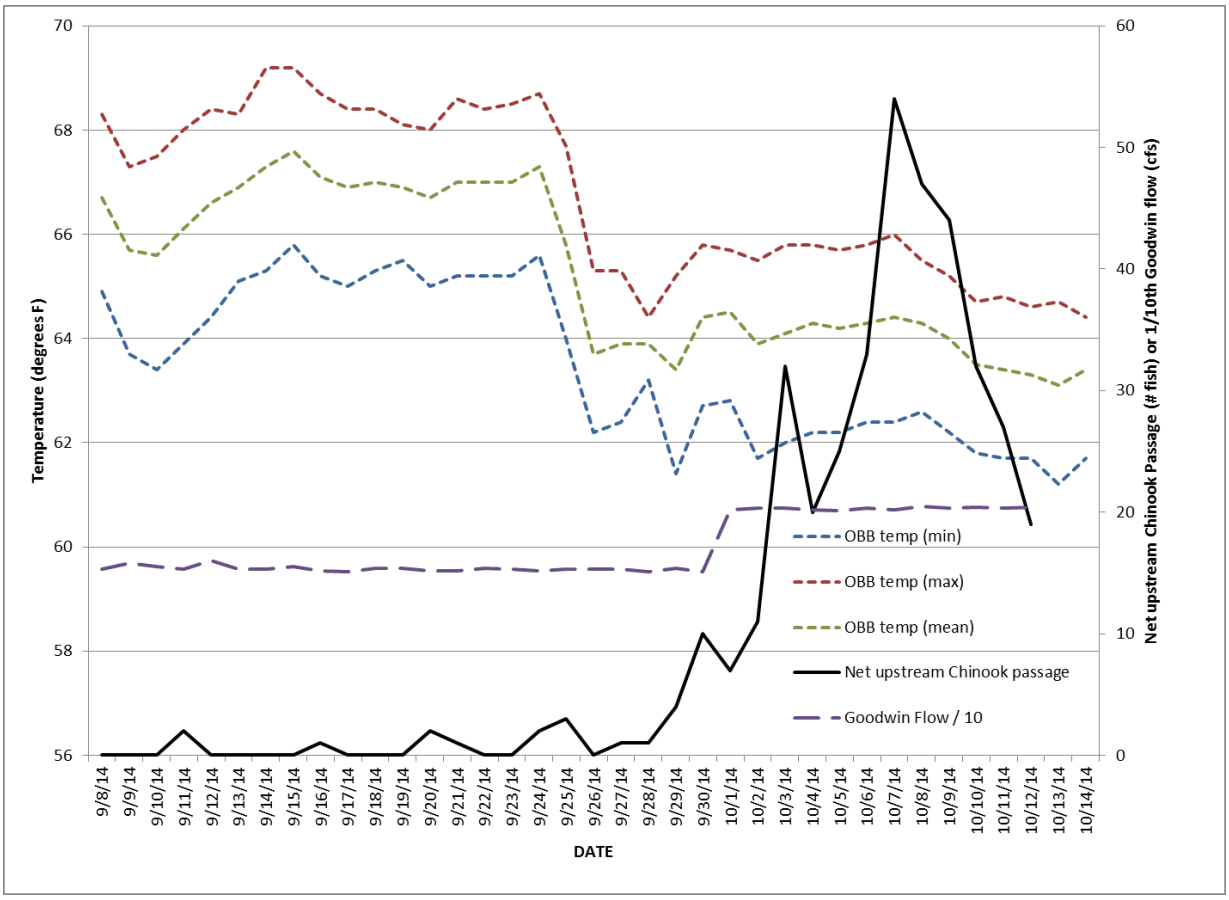

Figure 1. Recent conditions in the Stanislaus River. Data on water temperatures at Orange Blossom Bridge (OBB) and flows below Goodwin Dam are from CDEC. Net upstream Chinook passage data is from the 10/13/14 FISHBIO Stanislaus weir update.

Table 1. Selected Stanislaus fall pulse flow schedules considered by SOG for October-November 2014. The current SOG advice is that the "Alt B-revised" pulse be implemented according to the dates noted. The 9/26/14 SOG advice was that the "Alt B" pulse be implemented with some potential shift in timing. For all scenarios, the pulse volume was calculated against a base flow of 200 cfs.

Appendix 2-E
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	500	200	300	595	595
	10/16	750	200	550	1091	1686
	10/17	1000	200	800	1587	3273
	10/18	1250	200	1050	2083	5355
	10/19	1250	200	1050	2083	7438
	10/20	1250	200	1050	2083	9521
	10/21	1250	200	1050	2083	11603
	10/22	1250	200	1050	2083	13686
	10/23	1250	200	1050	2083	15769
	10/24	1250	200	1050	2083	17851
	10/25	1250	200	1050	2083	19934
	10/26	1000	200	800	1587	21521
	10/27	750	200	550	1091	22612
	10/28	500	200	300	595	23207
	10/29	200	200	0	0	23207
	10/30	200	200	0	0	23207
	10/31	200	200	0	0	23207
NOV	11/1	200	200	0	0	23207
	11/2	200	200	0	0	23207
	11/3	200	200	0	0	23207
	11/4	200	200	0	0	23207
	11/5	200	200	0	0	23207
	11/6	200	200	0	0	23207
	11/7	200	200	0	0	23207
	11/8	200	200	0	0	23207
	11/9	200	200	0	0	23207
	11/10	200	200	0	0	23207
	11/11	200	200	0	0	23207
	11/12	200	200	0	0	23207
	11/13	200	200	0	0	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

Alt B
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	200	200	0	0	0
	10/16	200	200	0	0	0
	10/17	200	200	0	0	0
	10/18	200	200	0	0	0
	10/19	200	200	0	0	0
	10/20	200	200	0	0	0
	10/21	200	200	0	0	0
	10/22	200	200	0	0	0
	10/23	200	200	0	0	0
	10/24	1250	200	1050	2083	2083
	10/25	1200	200	1000	1983	4066
	10/26	1100	200	900	1785	5851
	10/27	1000	200	800	1587	7438
	10/28	900	200	700	1388	8826
	10/29	750	200	550	1091	9917
	10/30	600	200	400	793	10711
	10/31	1200	200	1000	1983	12694
NOV	11/1	1100	200	900	1785	14479
	11/2	1000	200	800	1587	16066
	11/3	900	200	700	1388	17455
	11/4	800	200	600	1190	18645
	11/5	700	200	500	992	19636
	11/6	600	200	400	793	20430
	11/7	500	200	300	595	21025
	11/8	450	200	250	496	21521
	11/9	425	200	225	446	21967
	11/10	400	200	200	397	22364
	11/11	375	200	175	347	22711
	11/12	350	200	150	298	23008
	11/13	300	200	100	198	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

Alt B-revised
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	200	200	0	0	0
	10/16	200	200	0	0	0
	10/17	200	200	0	0	0
	10/18	200	200	0	0	0
	10/19	200	200	0	0	0
	10/20	200	200	0	0	0
	10/21	700	200	500	992	992
	10/22	500	200	300	595	1587
	10/23	200	200	0	0	1587
	10/24	1250	200	1050	2083	3669
	10/25	1200	200	1000	1983	5653
	10/26	1150	200	950	1884	7537
	10/27	1000	200	800	1587	9124
	10/28	850	200	650	1289	10413
	10/29	750	200	550	1091	11504
	10/30	600	200	400	793	12298
	10/31	1200	200	1000	1983	14281
NOV	11/1	1100	200	900	1785	16066
	11/2	1000	200	800	1587	17653
	11/3	900	200	700	1388	19041
	11/4	800	200	600	1190	20231
	11/5	700	200	500	992	21223
	11/6	600	200	400	793	22017
	11/7	500	200	300	595	22612
	11/8	350	200	150	298	22909
	11/9	300	200	100	198	23107
	11/10	250	200	50	99	23207
	11/11	200	200	0	0	23207
	11/12	200	200	0	0	23207
	11/13	200	200	0	0	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

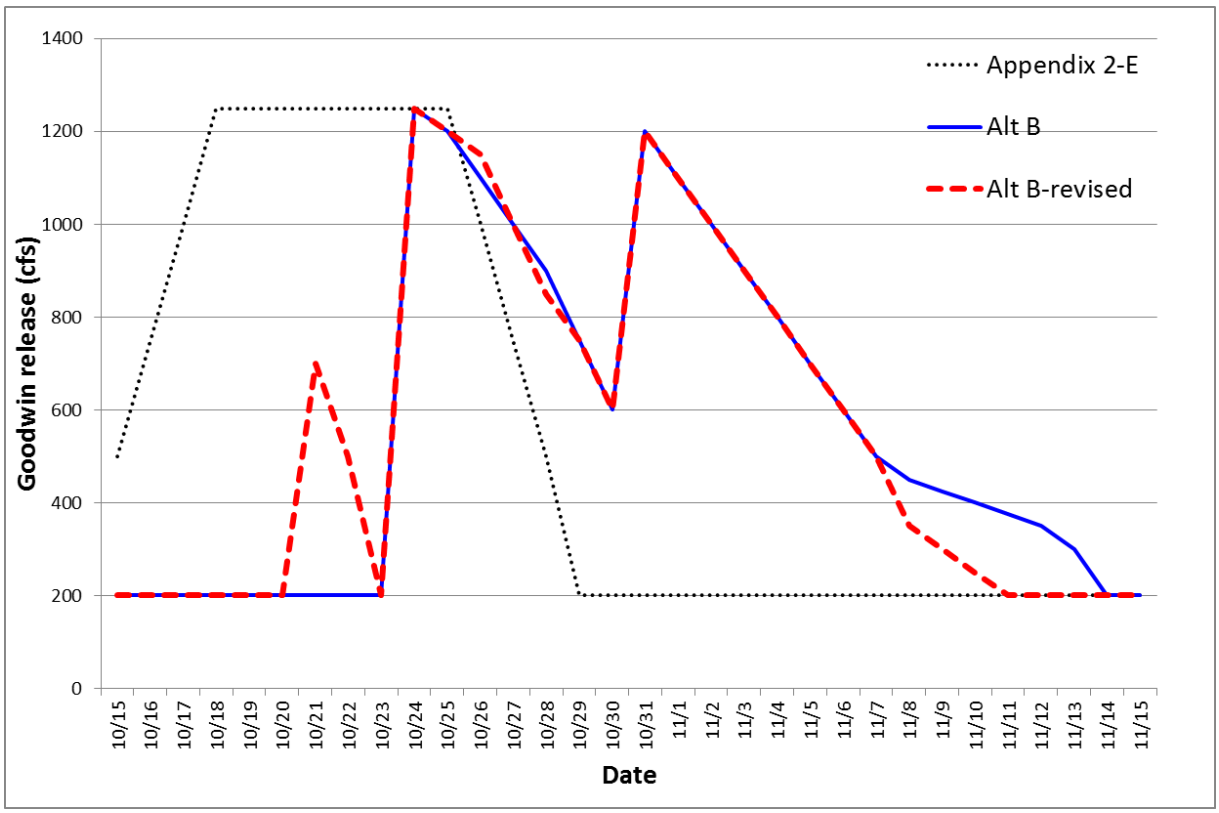

Figure 2. Selected Stanislaus fall pulse flow schedules considered by SOG for October-November 2014. The current SOG advice is that the "Alt B-revised" pulse be implemented according to the dates noted. The 9/26/14 SOG advice was that the "Alt B" pulse be implemented with some potential shift in timing.

Attachment 1

10/1/14 NMFS Approval of
9/26/14 SOG Advice

Bragg, Carolyn <cbragg@usbr.gov>

Re: SOG Oct-Nov 2014 NMFS BiOp proposed actions

1 message

Garwin Yip - NOAA Federal <garwin.yip@noaa.gov> Wed, Oct 1, 2014 at 3:25 PM
To: Carolyn Bragg <cbragg@usbr.gov>
Cc: "Morstein-Marx, Thomas" <TMorsteinMarx@usbr.gov>, Patricia L Clinton <PClinton@usbr.gov>, Barbara Byrne <Barbara.Byrne@noaa.gov>, "'Maria.rea@noaa.gov" <Maria.rea@noaa.gov>, "womt@water.ca.gov" <womt@water.ca.gov>

Carolyn,

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 2014, the fall attraction flow may be reshaped according to the attached SOG advice (specifically, the "Alt B" schedule in Table 1 of Attachment 1). 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 understands that because of uncertainty about temperature conditions in mid-late October, SOG advises that the advised pulse shaping be implemented within a flexible time window, with specific dates to be determined in early-mid October. Therefore, SOG advises that the approximately two-week duration pulse be implemented sometime within a five-week window between mid-October and mid-November such that the first peak is implemented between October 18, 2014, and November 8, 2014, and that flows return to the base 200 cfs no later than November 22, 2014. NMFS requests that SOG report back to NMFS and WOMT on the specific pulse schedule no later than October 31, 2014.

NMFS also concurs with the advice to shift the initiation date for the fall temperature criterion at Orange Blossom Bridge to the date of the first pulse peak within the reshaped fall pulse flow (per the SOG advice, to be implemented between October 18 and November 8, 2014) 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 let Aaron Miller

know, and he can schedule a WOMT meeting. Thanks.

-Garwin-

_____
Garwin Yip
Water Operations and Delta Consultations Branch Chief
NOAA Fisheries West Coast Region
U.S. Department of Commerce
California Central Valley Area Office
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814
Office: 916-930-3611
Cell: 916-716-6558
FAX: 916-930-3629
www.westcoast.fisheries.noaa.gov

---------- Forwarded message ----------
From: **Bragg, Carolyn** <cbragg@usbr.gov>
Date: Tue, Sep 30, 2014 at 9:46 AM
Subject: SOG Oct-Nov 2014 NMFS BiOp proposed actions
To: Garwin Yip - NOAA Federal <garwin.yip@noaa.gov>
Cc: THOMAS MORSTEIN-MARX <tmorsteinmarx@usbr.gov>, Barb Byrne <barbara.byrne@noaa.gov>, PATRICIA CLINTON <pclinton@usbr.gov>

Morning Garwin,

Stanislaus River talk: At its 9/17/2013 meeting, the Stanislaus Operations Group (SOG) discussed both the upcoming fall attraction flow schedule in Appendix 2-E of the NMFS Biological Opinion (BiOp) and the fall temperature criterion at Orange Blossom Bridge. Attached is SOG advice regarding (a) the reshaping of the fall attraction flow in Action III.1.2 and (b) the initiation date of the fall temperature criterion at Orange Blossom Bridge.

Let me (BOR) know if NMFS concurs with this approach regarding the implementation of Stanislaus RPA actions during October and November of 2014 when you can. Please send your thoughts and/or final decision to the people included in this email. Barb, or I, will forward on to SOG, SRF and the other interested stakeholders once decisions have been finalized.

Hope things are going well over there...

Attachment 2

9/26/14 SOG Advice

SOG ADVICE RE: IMPLEMENTATION OF THE STANISLAUS RPA ACTIONS DURING OCTOBER AND NOVEMBER
9.26.2014

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."

Input from stakeholders

On the August 20, 2014 Stanislaus River Forum (SRF) call, representatives from Oakdale Irrigation District (OID), South San Joaquin Irrigation District (SSJID), and Stockton East Water District (SEWD) expressed concerns about current and future storage in New Melones Reservoir. Given the water supply concerns, the districts made two specific suggestions regarding management of fall flows on the Stanislaus:

> (1) Rather than implement the 23,207 AF fall pulse flow required by the NMFS 2009 Biological Opinion on Long-term Operations of the CVP and SWP (2009 NMFS BiOp), implement flows in the 200-250 range during the fall. Could condition this action with a requirement that, if hydrology improves, the 23,207 TAF "foregone" could be used later, for example to augment the spring outmigration flow.
> (2) Ask the State Water Resources Control Board (Reclamation petition for a temporary urgency change petition) for a relaxation of the October Vernalis flow standard, which requires that average monthly flow at Vernalis for October be at least 1000 cfs.

Fishbio provided additional information in support of these requests on a special SRF call on 9/5/14.

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[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

On both the 8/20/14 and 9/5/14 SRF calls, NMFS noted that the districts' first suggestion, while related to implementation of the 2009 NMFS BiOp, would require a change in the pulse flow volume, which is not a change within the authority of the Stanislaus Operations Group (SOG). The second suggestion is related to a state water quality standard, not to any requirement in the 2009 NMFS BiOp, and thus is not within the scope or authority of the SOG.

The All Outdoors (a rafting company) representative asked that, when discussing the shaping and timing of the fall pulse flow, the SOG consider the following preferred rafting conditions:

- Preferred rafting flows: 800-1200 cfs, high end of the range preferred. 600-800 cfs is do-able, but not desirable.
- Timing of rafting flows: 10am-4pm on weekends
- Location of rafting flows: Between Goodwin Dam and Knights Ferry

Below, SOG advises a modified fall attraction flow schedule and initiation date for the fall temperature criterion at Orange Blossom Bridge that we believe is consistent with the intent of RPA actions III.1.3 and III.1.2. In terms of stakeholder input, the proposed flow schedule does not adjust the volume of the pulse flow required in the NMFS BiOp, as that is not within SOG's authority, but does offer the potential (depending on final timing) to partially accommodate the preferred flows for rafters if not detrimental to expected fishery benefits.

<u>SOG advice</u>

Flow

For 2014, SOG advises that the fall attraction flow (Critical yeartype) be reshaped according to the "Alt B" flow schedule[3] described in Table 1 and Figure 1 of Attachment 1.

Pulse shaping:

At the 9/17/14 SOG meeting, SOG members reviewed the "Alt A" schedule and agreed with the shaping in general but agreed to modify the peaks slightly such that flows would increase a bit more quickly and decline a bit more slowly. That revision resulted in the "Alt B" schedule. Both reshaped flow schedules have the same volume (23,207 AF) as the Critical fall pulse in Appendix 2-E. Both the "Alt A" and "Alt B" schedules reshape the fall pulse volume into a two-peak release (the maximum daily releases in the alternatives reach 1200-1250 cfs; comparable to the peak sustained flow of 1250 in the default 2-E flow schedule) that provides flow variability expected to deter spawning at the higher flows that won't be sustained through egg incubation and fry emergence. The technical team believes both schedules meet the intent of the RPA action, namely, improving instream conditions and providing an attraction cue for adult salmonids returning to spawn.

<u>Note:</u> SOG's scope is limited to implementation of the Stanislaus actions in the NMFS BiOp, but SOG does consider other expected flows in the San Joaquin basin when providing advice on BiOp implementation. Because SOG was not certain whether releases from New Melones additional to the BiOp-required flows might be necessary to

[3] The timing of the pulse flow might not occur exactly as depicted in Table 1 and Figure 1 of Attachment 1; see the advice on pulse timing.

meet the Vernalis flow objective in D-1641, SOG shaped the flow volume required by the NMFS BiOp. If additional Stanislaus releases are necessary, SOG suggests that additional flow be released to augment or extend the advised "Alt B" flow in a manner such that (a) the resulting schedule maintains flow variability, i.e. that daily flow changes by at least 200 cfs per day (to provide flow variability expected to deter spawning), (b) October weekend flows do not exceed 1,200 cfs unless higher flows provide greater fishery benefits or are necessary to meet the Vernalis requirement (to keep flows within the preferred rafting conditions), and (c) additional flows be released between mid-October and mid-November.

Pulse timing:
At the 9/17/14 SOG meeting, SOG members agreed that delaying the initiation of the fall pulse was appropriate in fall 2014 due to expected warm water temperatures into mid-late October. By delaying the pulse until late October and sustaining the pulse tail through mid-November, SOG expects that the higher-than-base flows will help to buffer water temperatures during the seasonal transition to cooler air temperatures. However, because of uncertainty about temperature conditions in mid-late October, SOG advises that the advised pulse shaping be implemented within a flexible time window, with specific dates to be determined in early-mid October. SOG advises that the approximately two-week duration pulse be implemented sometime within a five-week window between mid-October and mid-November such that the first peak is implemented between 10/18/14 and 11/8/14 and that flows return to the base 200 cfs no later than 11/22/14. If not detrimental to expected fish benefits, SOG will implement the pulse so that the peak flows occur on weekends, in order to accommodate the flow preferences of rafting interests.

The full list of considerations discussed by SOG at the 9/1714 meeting is summarized in Table 2 of Attachment 1.

Temperature
For 2014, SOG advises that the fall temperature criterion of 56°F at Orange Blossom Bridge apply as of the initiation of the first pulse peak within the reshaped fall pulse flow, which will be no later than 11/8/2014. 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. The net upstream cumulative count of fall-run Chinook counted at the Stanislaus Weir from 9/5/2014 through 9/23/2014 is just 6 fish, and no CV steelhead have yet been observed this fall at the weir. These data provide no clear indication of "early migration" of salmonids into the watershed which might require temperature management to begin on October 1.

From 9/15/14 to 9/25/14, daily maximum temperatures measured at OBB[4] have ranged between 67.7°F and 69.2°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 9/25/2014 was 68.3°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.

[4] 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 attraction flow schedule advised by SOG for October-November 2014

Table 1. Stanislaus fall pulse flow schedules considered by SOG for October-November 2014. SOG advised that the "Alt B" pulse be implemented with some potential shift in timing. The pulse volume was calculated against a base flow of 200 cfs.

Appendix 2-E
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	500	200	300	595	595
	10/16	750	200	550	1091	1686
	10/17	1000	200	800	1587	3273
	10/18	1250	200	1050	2083	5355
	10/19	1250	200	1050	2083	7438
	10/20	1250	200	1050	2083	9521
	10/21	1250	200	1050	2083	11603
	10/22	1250	200	1050	2083	13686
	10/23	1250	200	1050	2083	15769
	10/24	1250	200	1050	2083	17851
	10/25	1250	200	1050	2083	19934
	10/26	1000	200	800	1587	21521
	10/27	750	200	550	1091	22612
	10/28	500	200	300	595	23207
	10/29	200	200	0	0	23207
	10/30	200	200	0	0	23207
	10/31	200	200	0	0	23207
NOV	11/1	200	200	0	0	23207
	11/2	200	200	0	0	23207
	11/3	200	200	0	0	23207
	11/4	200	200	0	0	23207
	11/5	200	200	0	0	23207
	11/6	200	200	0	0	23207
	11/7	200	200	0	0	23207
	11/8	200	200	0	0	23207
	11/9	200	200	0	0	23207
	11/10	200	200	0	0	23207
	11/11	200	200	0	0	23207
	11/12	200	200	0	0	23207
	11/13	200	200	0	0	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

Alt A
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	200	200	0	0	0
	10/16	200	200	0	0	0
	10/17	200	200	0	0	0
	10/18	200	200	0	0	0
	10/19	200	200	0	0	0
	10/20	200	200	0	0	0
	10/21	200	200	0	0	0
	10/22	200	200	0	0	0
	10/23	200	200	0	0	0
	10/24	500	200	300	595	595
	10/25	1000	200	800	1587	2182
	10/26	1200	200	1000	1983	4165
	10/27	1100	200	900	1785	5950
	10/28	900	200	700	1388	7339
	10/29	700	200	500	992	8331
	10/30	500	200	300	595	8926
	10/31	700	200	500	992	9917
NOV	11/1	1000	200	800	1587	11504
	11/2	1200	200	1000	1983	13488
	11/3	1100	200	900	1785	15273
	11/4	900	200	700	1388	16661
	11/5	700	200	500	992	17653
	11/6	700	200	500	992	18645
	11/7	700	200	500	992	19636
	11/8	600	200	400	793	20430
	11/9	600	200	400	793	21223
	11/10	600	200	400	793	22017
	11/11	600	200	400	793	22810
	11/12	400	200	200	397	23207
	11/13	200	200	0	0	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

Alt B
Stanislaus River Minimum Fish Flow Schedule
Water Year Type: Critically Dry

		Daily				Cumulative
		Total CFS	Base CFS	Pulse CFS	Pulse AF	Pulse AF
OCT	10/15	200	200	0	0	0
	10/16	200	200	0	0	0
	10/17	200	200	0	0	0
	10/18	200	200	0	0	0
	10/19	200	200	0	0	0
	10/20	200	200	0	0	0
	10/21	200	200	0	0	0
	10/22	200	200	0	0	0
	10/23	200	200	0	0	0
	10/24	1250	200	1050	2083	2083
	10/25	1200	200	1000	1983	4066
	10/26	1100	200	900	1785	5851
	10/27	1000	200	800	1587	7438
	10/28	900	200	700	1388	8826
	10/29	750	200	550	1091	9917
	10/30	600	200	400	793	10711
	10/31	1200	200	1000	1983	12694
NOV	11/1	1100	200	900	1785	14479
	11/2	1000	200	800	1587	16066
	11/3	900	200	700	1388	17455
	11/4	800	200	600	1190	18645
	11/5	700	200	500	992	19636
	11/6	600	200	400	793	20430
	11/7	500	200	300	595	21025
	11/8	450	200	250	496	21521
	11/9	425	200	225	446	21967
	11/10	400	200	200	397	22364
	11/11	375	200	175	347	22711
	11/12	350	200	150	298	23008
	11/13	300	200	100	198	23207
	11/14	200	200	0	0	23207
	11/15	200	200	0	0	23207

- rafting target 800-1200 cfs
- salmon festival target <500 cfs

Figure 1. Stanislaus fall pulse flow schedules considered by SOG for October-November 2014. SOG advised that the "Alt B" pulse be implemented with some potential shift in timing.

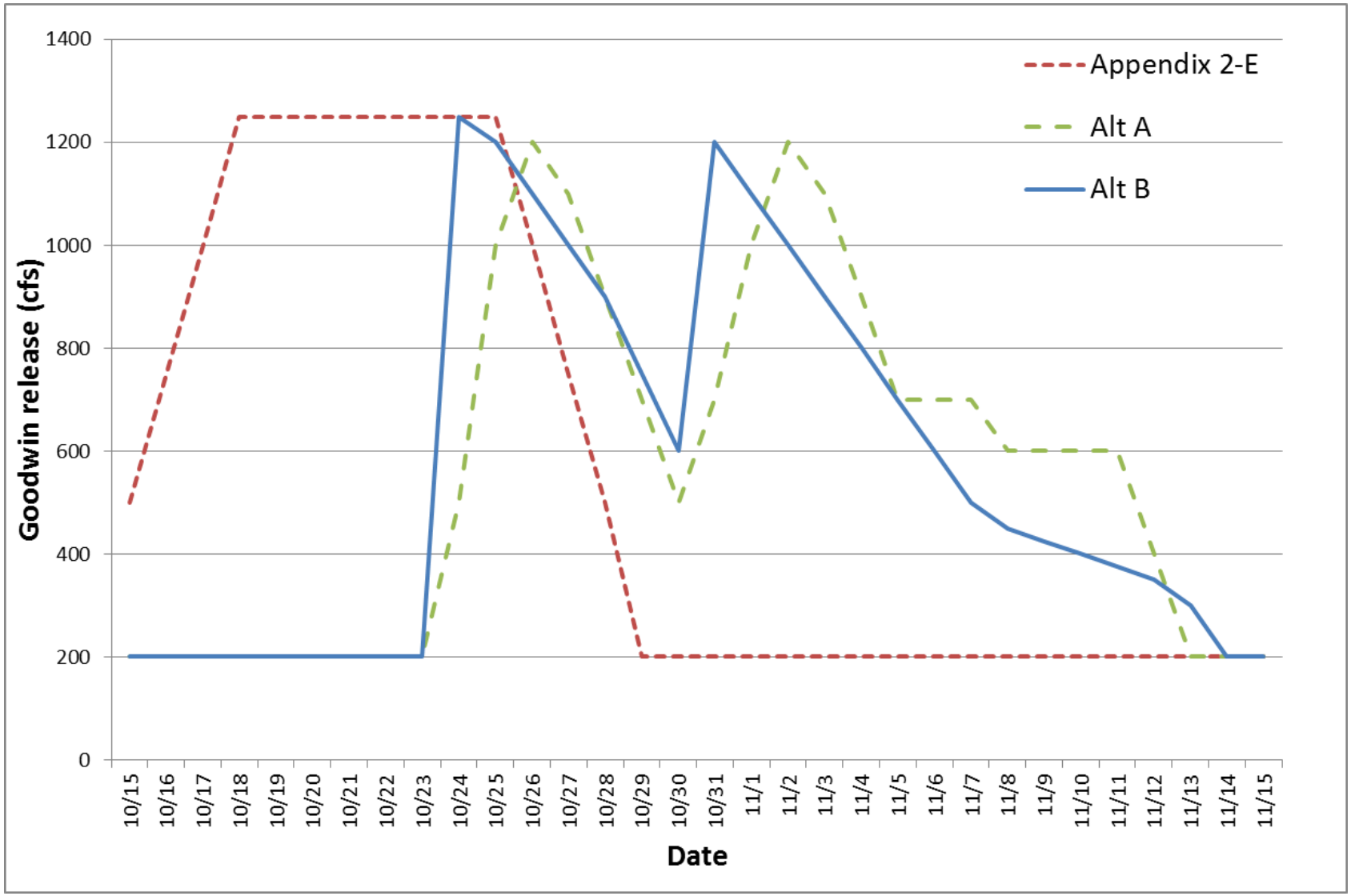


Table 2. Factors considered in the design of the SOG-advised fall pulse flow.

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. Ramping down to 500 cfs after peak flows allow the weir to be cleaned.
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, few redds are built before the 4th week of Oct, though in some years redd activity picks up in mid-October.
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.
Straying	Vernalis	Adult	Straying may be reduced when San Joaquin flows at Vernalis exceed 4,000 cfs.
Straying	delta	Adult	Straying may be reduced when the ratio of south delta exports to inflow () is no greater than 2:1.
Straying	Vernalis/ I street	Adult	Straying may be reduced when the ratio of Sacramento Inflow (I Street) to SJ Inflow (Vernalis) is no greater than 2:1.
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.
Stanislaus Salmon Festival	Knights Ferry	N/A	Flows <500 cfs are preferred for setup of the “Salmon Cam” at the festival.

Stanislaus Temperature Modeling
2015 Proposed Operations
Run: T1000-798
July 13, 2015

General:

This document presents results for additional analysis that we conducted recently. The analysis is based on the same assumptions used for the case T1000 as presented in the study report ADC-StanislausOps-June-5-2015.pdf with some operational changes, as explained below:

In the T1000 case, Tulloch was drawn down at a rate of 1000 af/day starting September 1 with the objective to reach approximately 35 TAF in Tulloch by end of September. Hydro bypass at a rate of 250 cfs started when New Melones reached El. 808. Then, the October pulse flow was split 1/3 to the low-level outlet and 2/3 to the hydro power intake.

Although the blending of releases from New Melones in the T1000 case reduced substantially the temperature conditions below Goodwin during the pulse flow period (with respect to the base case, BASE1, which assumed no hydro bypass at all), it still produced peak temperatures below Goodwin in excess of 65 Deg-F.

In order to reduce these temperatures further, a new case was developed where by the entire pulse flow bypassed the hydro power intake and was discharged through the low-level outlet. This case was named T1000-798 to denote that it was built upon the T1000 case but full bypass was implemented when New Melones elevation reached El. 798 corresponding to the pool level on October 15, the starting day of the pulse flow period.

Results

The effect of the T1000-798 case in comparison with the T1000 case is illustrated in the figure below.

The tables that follow show the resulting 7DADM temperatures at the key locations for the T1000-798 case.

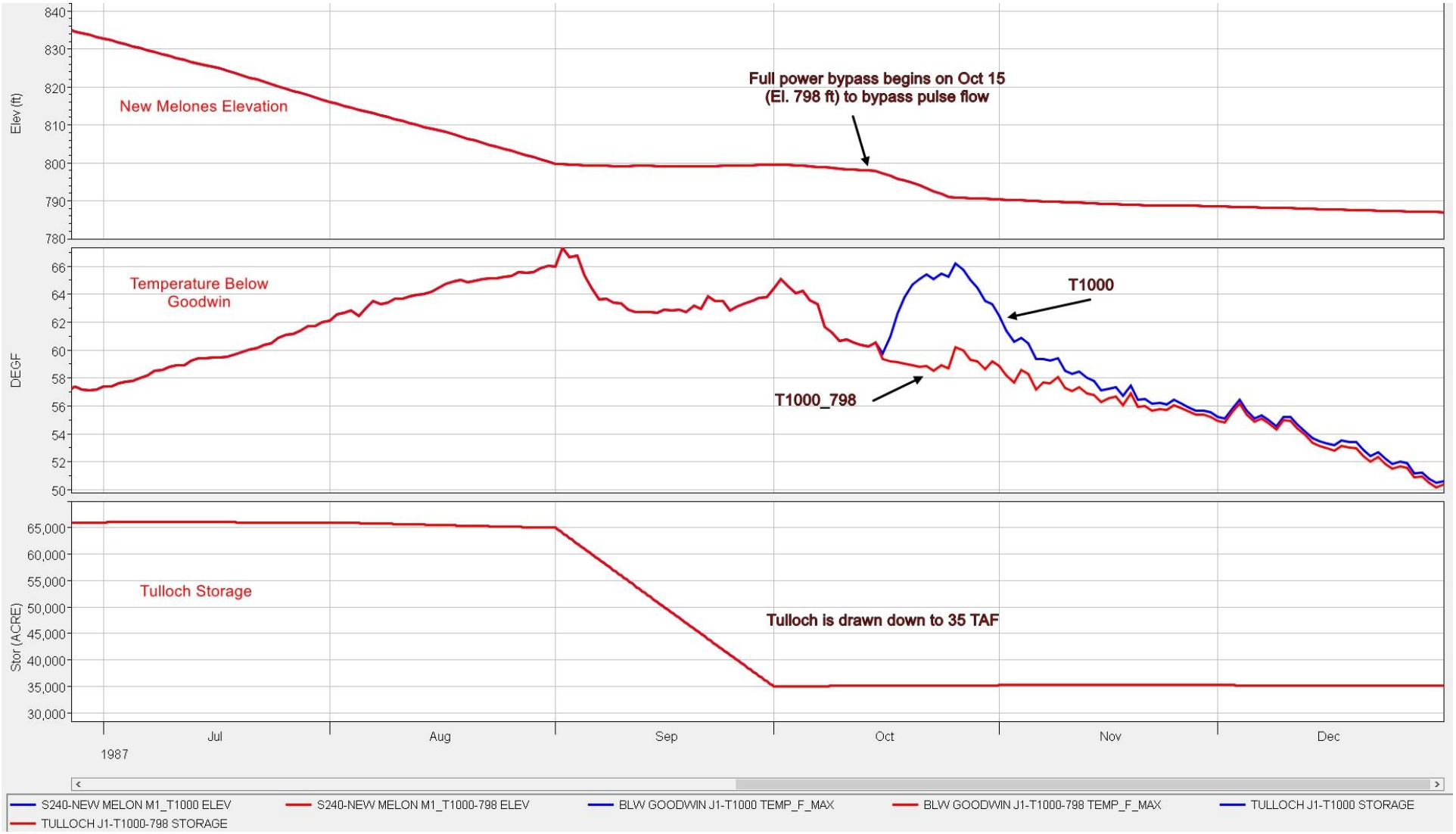


Figure 1 - Full bypass operation and resulting temperature below Goodwin during the pulse period

Table 1: Temperature Response – 7DADM
June-July, 2015

	BLW GOODWIN	KNIGHTS FERRY	ORANGE BLOSSOM	HYW 120 BRIDGE	RIPON GAGE	ABV SJR
	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798
	7DADM	7DADM	7DADM	7DADM	7DADM	7DADM
	DEGF	DEGF	DEGF	DEGF	DEGF	DEGF
1-Jun	55.3	58.6	64.8	66.3	71.2	71.6
2-Jun	55.3	58.9	65.3	66.8	71.9	72.3
3-Jun	55.3	59.4	66.2	67.6	72.8	73.1
4-Jun	55.2	59.5	66.5	68.1	73.2	73.6
5-Jun	55.1	59.6	66.7	68.5	73.6	73.9
6-Jun	55.1	59.8	67.1	68.9	74.0	74.3
7-Jun	55.1	59.9	67.5	69.3	74.4	74.7
8-Jun	55.2	60.1	67.7	69.6	74.8	75.1
9-Jun	55.3	60.1	67.8	69.8	74.8	75.2
10-Jun	55.3	60.1	67.7	69.8	74.8	75.1
11-Jun	55.5	60.3	68.1	70.0	75.0	75.3
12-Jun	55.6	60.6	68.5	70.4	75.5	75.8
13-Jun	55.8	60.8	68.8	70.8	75.8	76.1
14-Jun	55.8	60.9	68.9	70.9	75.9	76.1
15-Jun	55.9	60.8	68.8	70.8	75.7	75.9
16-Jun	55.9	60.8	68.7	70.8	75.6	75.8
17-Jun	55.9	60.7	68.5	70.6	75.5	75.6
18-Jun	56.0	60.7	68.4	70.5	75.4	75.6
19-Jun	56.0	60.6	68.3	70.3	75.3	75.4
20-Jun	56.0	60.4	67.9	70.0	74.9	75.1
21-Jun	56.1	60.4	67.7	69.7	74.7	74.9
22-Jun	56.2	60.5	67.7	69.6	74.7	74.9
23-Jun	56.4	60.6	67.9	69.7	74.8	75.0
24-Jun	56.5	60.9	68.2	70.0	75.1	75.4
25-Jun	56.6	61.2	68.6	70.4	75.6	75.9
26-Jun	56.8	61.4	69.0	70.9	76.2	76.4
27-Jun	56.9	61.7	69.6	71.5	76.8	77.1
28-Jun	57.0	62.0	69.9	72.0	77.5	77.7
29-Jun	57.1	62.1	70.2	72.4	78.0	78.3
30-Jun	57.2	62.2	70.4	72.7	78.3	78.6
1-Jul	57.2	62.2	70.4	72.7	78.5	78.8
2-Jul	57.3	62.2	70.2	72.6	78.4	78.7
3-Jul	57.4	62.0	69.9	72.3	78.0	78.3
4-Jul	57.5	62.0	69.7	71.9	77.6	78.0
5-Jul	57.6	62.0	69.6	71.7	77.3	77.7
6-Jul	57.7	62.1	69.5	71.5	77.1	77.4
7-Jul	57.9	62.2	69.6	71.5	77.0	77.3
8-Jul	58.1	62.3	69.7	71.6	76.9	77.2
9-Jul	58.2	62.6	69.9	71.7	76.9	77.2
10-Jul	58.4	62.8	70.2	72.0	77.1	77.4
11-Jul	58.6	63.0	70.5	72.2	77.3	77.5
12-Jul	58.7	63.2	70.7	72.5	77.4	77.6
13-Jul	58.9	63.5	71.1	72.8	77.7	77.9
14-Jul	59.0	63.6	71.2	73.0	77.8	78.0
15-Jul	59.2	63.8	71.4	73.3	78.1	78.3
16-Jul	59.3	63.8	71.5	73.4	78.3	78.4
17-Jul	59.4	63.8	71.4	73.4	78.3	78.5
18-Jul	59.5	63.8	71.4	73.4	78.3	78.5
19-Jul	59.6	63.8	71.2	73.2	78.1	78.3
20-Jul	59.6	63.7	70.9	72.9	77.9	78.1
21-Jul	59.8	63.7	70.7	72.7	77.7	77.9
22-Jul	59.9	63.6	70.4	72.3	77.3	77.5
23-Jul	60.0	63.6	70.2	72.0	76.9	77.1
24-Jul	60.2	63.7	70.2	71.9	76.7	77.0
25-Jul	60.4	63.8	70.3	71.8	76.6	76.8
26-Jul	60.6	64.0	70.3	71.8	76.5	76.7
27-Jul	60.8	64.1	70.4	71.8	76.5	76.7
28-Jul	61.0	64.3	70.6	71.9	76.5	76.7
29-Jul	61.2	64.5	70.7	72.1	76.5	76.7
30-Jul	61.4	64.7	70.9	72.2	76.6	76.8
31-Jul	61.6	64.9	71.1	72.4	76.7	76.9

Table 2: Temperature Response – 7DADM
August-September, 2015

	BLW GOODWIN	KNIGHTS FERRY	ORANGE BLOSSOM	HYW 120 BRIDGE	RIPON GAGE	ABV SJR
	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798
	7DADM	7DADM	7DADM	7DADM	7DADM	7DADM
	DEGF	DEGF	DEGF	DEGF	DEGF	DEGF
1-Aug	61.8	65.2	71.4	72.6	76.9	77.1
2-Aug	62.0	65.4	71.7	72.9	77.3	77.5
3-Aug	62.2	65.7	72.0	73.3	77.7	77.9
4-Aug	62.3	65.7	72.0	73.5	77.8	78.0
5-Aug	62.5	65.9	72.1	73.6	77.9	78.2
6-Aug	62.7	66.1	72.4	73.8	78.2	78.5
7-Aug	62.9	66.2	72.4	73.9	78.2	78.5
8-Aug	63.0	66.3	72.4	73.9	78.2	78.4
9-Aug	63.2	66.3	72.4	73.8	78.1	78.3
10-Aug	63.3	66.3	72.2	73.6	77.7	77.9
11-Aug	63.5	66.5	72.4	73.6	77.6	77.7
12-Aug	63.6	66.6	72.3	73.5	77.4	77.5
13-Aug	63.7	66.5	72.1	73.3	77.1	77.2
14-Aug	63.8	66.5	71.9	73.1	76.8	76.9
15-Aug	64.0	66.5	71.8	72.9	76.5	76.6
16-Aug	64.1	66.6	71.8	72.8	76.4	76.5
17-Aug	64.3	66.7	71.8	72.8	76.4	76.5
18-Aug	64.5	66.8	71.8	72.8	76.3	76.4
19-Aug	64.6	66.9	71.8	72.8	76.3	76.3
20-Aug	64.7	67.0	71.9	72.7	76.2	76.3
21-Aug	64.9	67.1	71.9	72.8	76.2	76.3
22-Aug	65.0	67.2	72.0	72.8	76.1	76.2
23-Aug	65.0	67.2	71.8	72.7	75.9	75.9
24-Aug	65.1	67.2	71.8	72.6	75.7	75.8
25-Aug	65.1	67.2	71.8	72.5	75.7	75.7
26-Aug	65.2	67.4	71.9	72.6	75.7	75.8
27-Aug	65.3	67.5	72.1	72.8	75.9	76.0
28-Aug	65.4	67.6	72.3	73.0	76.2	76.3
29-Aug	65.5	67.8	72.5	73.3	76.6	76.7
30-Aug	65.6	68.0	72.8	73.6	77.0	77.1
31-Aug	65.7	68.2	73.0	73.9	77.3	77.4
1-Sep	66.0	68.4	73.4	74.2	77.7	77.7
2-Sep	66.1	68.5	73.5	74.4	77.9	78.0
3-Sep	66.3	68.7	73.8	74.7	78.2	78.3
4-Sep	66.3	68.7	73.9	74.8	78.3	78.3
5-Sep	66.1	68.5	73.6	74.6	77.9	78.0
6-Sep	65.7	68.2	73.2	74.3	77.5	77.5
7-Sep	65.4	67.9	72.9	73.9	77.1	77.1
8-Sep	64.9	67.5	72.4	73.5	76.7	76.7
9-Sep	64.4	67.1	72.0	73.0	76.3	76.3
10-Sep	63.8	66.5	71.4	72.5	75.7	75.8
11-Sep	63.4	66.1	70.9	71.9	75.3	75.4
12-Sep	63.2	65.7	70.4	71.5	74.9	75.0
13-Sep	63.1	65.4	70.1	71.2	74.7	74.9
14-Sep	62.9	65.1	69.7	70.7	74.2	74.4
15-Sep	62.8	64.8	69.2	70.3	73.8	74.0
16-Sep	62.8	64.5	68.8	69.8	73.3	73.5
17-Sep	62.8	64.3	68.5	69.4	72.9	73.1
18-Sep	62.8	64.2	68.2	69.0	72.5	72.8
19-Sep	62.8	64.2	68.1	68.9	72.4	72.7
20-Sep	62.9	64.2	68.1	68.8	72.3	72.6
21-Sep	63.0	64.4	68.3	69.0	72.5	72.8
22-Sep	63.1	64.6	68.6	69.2	72.7	73.1
23-Sep	63.2	64.7	68.7	69.4	73.0	73.3
24-Sep	63.2	64.8	68.8	69.6	73.1	73.5
25-Sep	63.3	64.8	68.8	69.6	73.1	73.5
26-Sep	63.3	64.8	68.8	69.6	73.1	73.5
27-Sep	63.4	64.8	68.8	69.6	73.0	73.4
28-Sep	63.4	64.7	68.6	69.4	72.8	73.2
29-Sep	63.4	64.7	68.4	69.2	72.6	73.0
30-Sep	63.5	64.8	68.5	69.2	72.6	72.9

Table 3: Temperature Response – 7DADM
October-November, 2015

	BLW GOODWIN	KNIGHTS FERRY	ORANGE BLOSSOM	HYW 120 BRIDGE	RIPON GAGE	ABV SJR
	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798
	7DADM	7DADM	7DADM	7DADM	7DADM	7DADM
	DEGF	DEGF	DEGF	DEGF	DEGF	DEGF
1-Oct	63.9	64.8	68.5	69.2	72.6	73.0
2-Oct	64.1	65.0	68.6	69.2	72.8	73.1
3-Oct	64.2	65.1	68.6	69.2	72.8	73.2
4-Oct	64.3	65.2	68.7	69.3	72.9	73.3
5-Oct	64.2	65.3	68.8	69.3	73.1	73.5
6-Oct	64.2	65.2	68.7	69.3	73.1	73.6
7-Oct	63.8	65.0	68.3	69.0	72.8	73.3
8-Oct	63.2	64.7	68.0	68.6	72.4	73.0
9-Oct	62.7	64.2	67.5	68.1	71.9	72.5
10-Oct	62.2	63.8	67.0	67.6	71.4	72.1
11-Oct	61.7	63.2	66.4	67.0	70.8	71.5
12-Oct	61.2	62.7	65.7	66.4	70.1	70.9
13-Oct	60.8	62.2	65.0	65.6	69.4	70.2
14-Oct	60.6	61.8	64.6	65.1	68.9	69.7
15-Oct	60.4	61.4	63.9	64.4	68.2	69.2
16-Oct	60.1	61.0	63.3	63.8	67.5	68.5
17-Oct	59.9	60.6	62.6	63.1	66.6	67.7
18-Oct	59.7	60.3	62.0	62.4	65.7	66.7
19-Oct	59.5	60.0	61.5	61.8	64.8	65.7
20-Oct	59.3	59.7	60.9	61.2	63.8	64.7
21-Oct	59.0	59.4	60.3	60.6	62.9	63.7
22-Oct	58.9	59.2	59.9	60.1	62.0	62.7
23-Oct	58.9	59.1	59.8	60.0	61.4	61.9
24-Oct	58.8	59.0	59.7	59.8	61.1	61.4
25-Oct	59.0	59.1	59.7	59.8	60.9	61.1
26-Oct	59.1	59.2	59.9	59.8	60.8	61.0
27-Oct	59.2	59.3	60.0	60.0	60.9	61.0
28-Oct	59.3	59.3	60.2	60.1	61.0	61.0
29-Oct	59.3	59.4	60.3	60.2	61.1	61.0
30-Oct	59.3	59.4	60.5	60.3	61.2	61.2
31-Oct	59.3	59.4	60.6	60.4	61.3	61.2
1-Nov	59.1	59.3	60.5	60.2	61.1	61.0
2-Nov	58.7	59.0	60.2	59.9	60.8	60.6
3-Nov	58.6	58.8	60.0	59.7	60.6	60.4
4-Nov	58.5	58.7	59.8	59.5	60.3	60.1
5-Nov	58.3	58.5	59.5	59.2	59.9	59.8
6-Nov	58.1	58.2	59.1	58.8	59.5	59.3
7-Nov	57.9	58.0	58.8	58.4	59.0	58.9
8-Nov	57.9	57.9	58.7	58.2	58.8	58.6
9-Nov	57.8	57.7	58.5	57.9	58.5	58.2
10-Nov	57.6	57.4	58.1	57.6	58.0	57.7
11-Nov	57.5	57.2	57.8	57.2	57.6	57.3
12-Nov	57.4	57.2	57.8	57.1	57.4	57.1
13-Nov	57.3	57.1	57.6	56.9	57.1	56.7
14-Nov	57.1	56.8	57.2	56.5	56.6	56.3
15-Nov	56.9	56.6	56.9	56.1	56.1	55.8
16-Nov	56.8	56.5	56.8	55.9	55.8	55.5
17-Nov	56.7	56.4	56.5	55.7	55.5	55.1
18-Nov	56.6	56.3	56.4	55.5	55.2	54.8
19-Nov	56.5	56.1	56.1	55.3	54.9	54.4
20-Nov	56.3	55.9	55.9	55.0	54.6	54.1
21-Nov	56.3	55.8	55.8	54.9	54.3	53.9
22-Nov	56.1	55.7	55.6	54.7	54.1	53.6
23-Nov	56.0	55.6	55.5	54.5	53.8	53.3
24-Nov	56.0	55.6	55.5	54.5	53.7	53.2
25-Nov	55.9	55.5	55.3	54.3	53.4	52.9
26-Nov	55.8	55.4	55.2	54.2	53.3	52.8
27-Nov	55.7	55.3	55.1	54.1	53.1	52.5
28-Nov	55.7	55.3	55.1	54.0	53.0	52.4
29-Nov	55.6	55.2	55.0	53.9	52.9	52.3
30-Nov	55.5	55.1	54.9	53.8	52.7	52.1

Table 4: Temperature Response – 7DADM
December, 2015

	BLW GOODWIN	KNIGHTS FERRY	ORANGE BLOSSOM	HYW 120 BRIDGE	RIPON GAGE	ABV SJR
	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798	J1-T1000-798
	7DADM	7DADM	7DADM	7DADM	7DADM	7DADM
	DEGF	DEGF	DEGF	DEGF	DEGF	DEGF
1-Dec	55.3	54.9	54.6	53.6	52.4	51.8
2-Dec	55.3	54.8	54.6	53.5	52.3	51.7
3-Dec	55.4	54.9	54.7	53.6	52.5	51.8
4-Dec	55.4	54.9	54.7	53.7	52.6	51.8
5-Dec	55.3	54.8	54.6	53.7	52.6	51.9
6-Dec	55.3	54.8	54.6	53.7	52.7	52.0
7-Dec	55.2	54.7	54.7	53.8	52.9	52.2
8-Dec	55.2	54.7	54.7	53.8	53.0	52.3
9-Dec	55.1	54.6	54.6	53.8	53.1	52.3
10-Dec	54.9	54.5	54.5	53.7	53.0	52.3
11-Dec	54.8	54.4	54.4	53.6	53.0	52.3
12-Dec	54.6	54.3	54.3	53.5	52.8	52.2
13-Dec	54.4	54.0	53.9	53.2	52.5	51.9
14-Dec	54.2	53.8	53.6	52.8	52.1	51.5
15-Dec	54.0	53.6	53.4	52.5	51.8	51.2
16-Dec	53.6	53.3	53.0	52.1	51.3	50.7
17-Dec	53.4	53.1	52.6	51.8	50.8	50.3
18-Dec	53.2	52.8	52.4	51.4	50.4	49.8
19-Dec	53.1	52.7	52.3	51.2	50.1	49.6
20-Dec	52.9	52.6	52.1	51.1	49.9	49.3
21-Dec	52.8	52.4	52.0	50.9	49.6	49.1
22-Dec	52.7	52.3	51.9	50.8	49.5	48.9
23-Dec	52.5	52.2	51.8	50.7	49.4	48.7
24-Dec	52.3	52.0	51.5	50.4	49.1	48.4
25-Dec	52.1	51.8	51.3	50.2	48.9	48.2
26-Dec	51.9	51.5	51.1	49.9	48.6	47.9
27-Dec	51.7	51.3	50.8	49.7	48.3	47.5
28-Dec	51.5	51.1	50.6	49.5	48.1	47.3
29-Dec	51.3	50.9	50.3	49.2	47.7	47.0
30-Dec	51.0	50.7	50.0	48.9	47.4	46.6
31-Dec	50.9	50.5	49.8	48.7	47.1	46.4

Attachment 10

From:	Tim O"Laughlin
To:	Ryan Stager
Subject:	FW: Follow up
Date:	Friday, July 24, 2015 8:49:13 AM
Attachments:	HisVsBaseCase-Revised-July-2015.pdf

From: AVRY@aol.com [mailto:AVRY@aol.com]
Sent: Friday, July 17, 2015 4:52 PM
To: Tim O'Laughlin
Subject: Follow up

Confidential and Privileged Communication!

Hi Tim,
We did a very thorough check to understand why our computed temperatures are lower than observed (The discrepancies between computed and observed for below Goodwin and KF were much higher than those I sent you for OBB). The bottom line is that the boundary conditions (Jan 1) we used for temperatures in NM and Tulloch were too low. This was coupled with the fact that 1987 appears to be colder than 2015.
As such, we have adjusted the boundary conditions for 2015 and re-ran the base case. Summary of the assumptions and results are shown in the attached PowerPoint.
Note that for the Met data (from July 13 on), we are now using the average conditions from the previous 4 years (2011-2014).
My recommendations is that we use this approach for all future runs (note that we are erring now by about 1/2 of a degree on the conservative side).
Thanks,
Avry

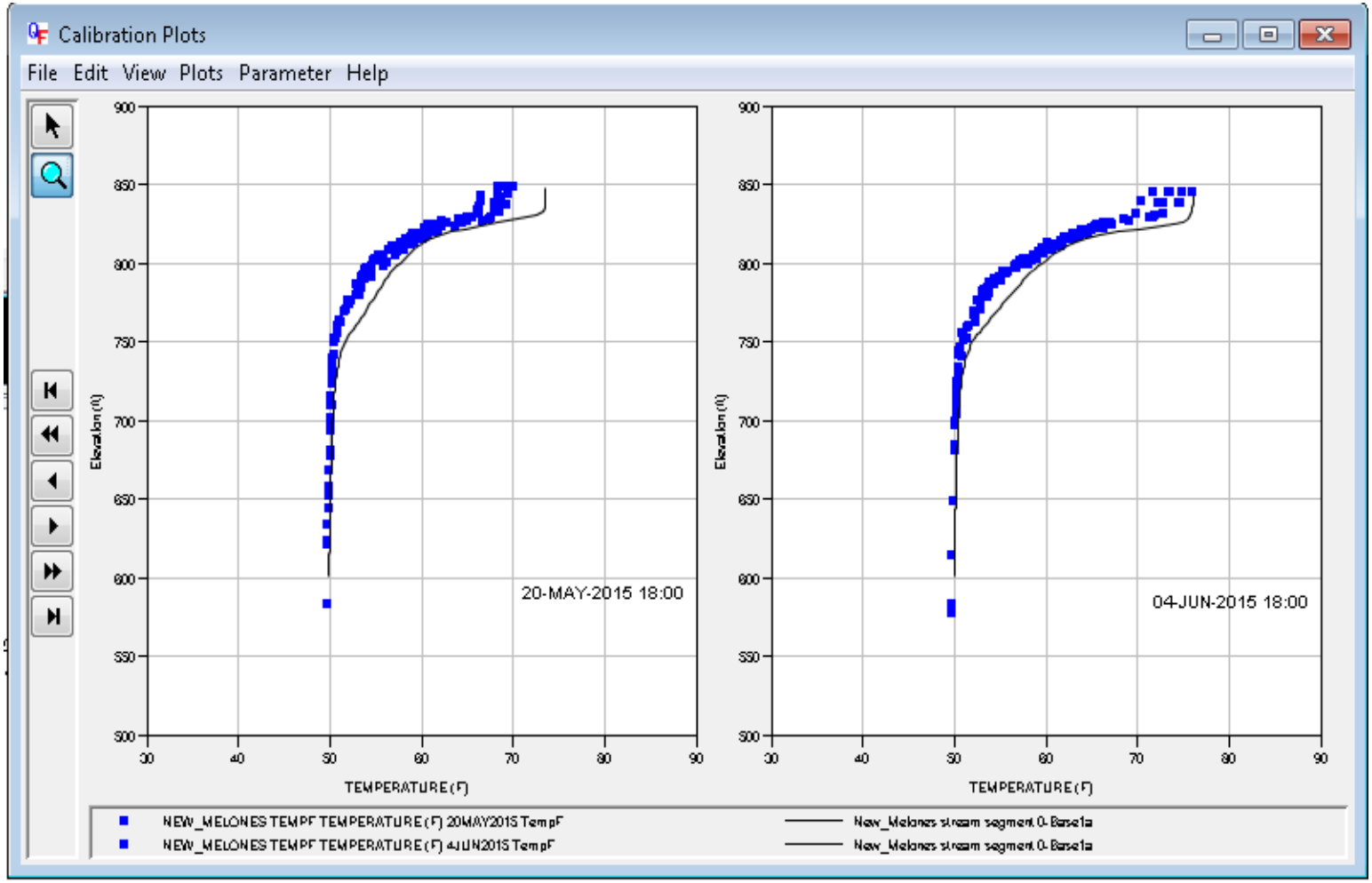
Stanislaus ReOp – July 2015 Analysis
Revised Base Case

Assumptions:

1. Flows updated to historical per June 1 analysis period.
2. Increased the initial temperature in New Melones and Tulloch by 2F and 3F respectively to increase winter river temperatures.
3. Processed the meteorological record for the 2011 - 2015 period. Extrapolation beyond July 14 based on average data for 2011-2014.
4. No Model heat exchange factors were modified.
5. Developed 2015 depletion above Ripon based on USGS Ripon data and Goodwin Dam outflow.

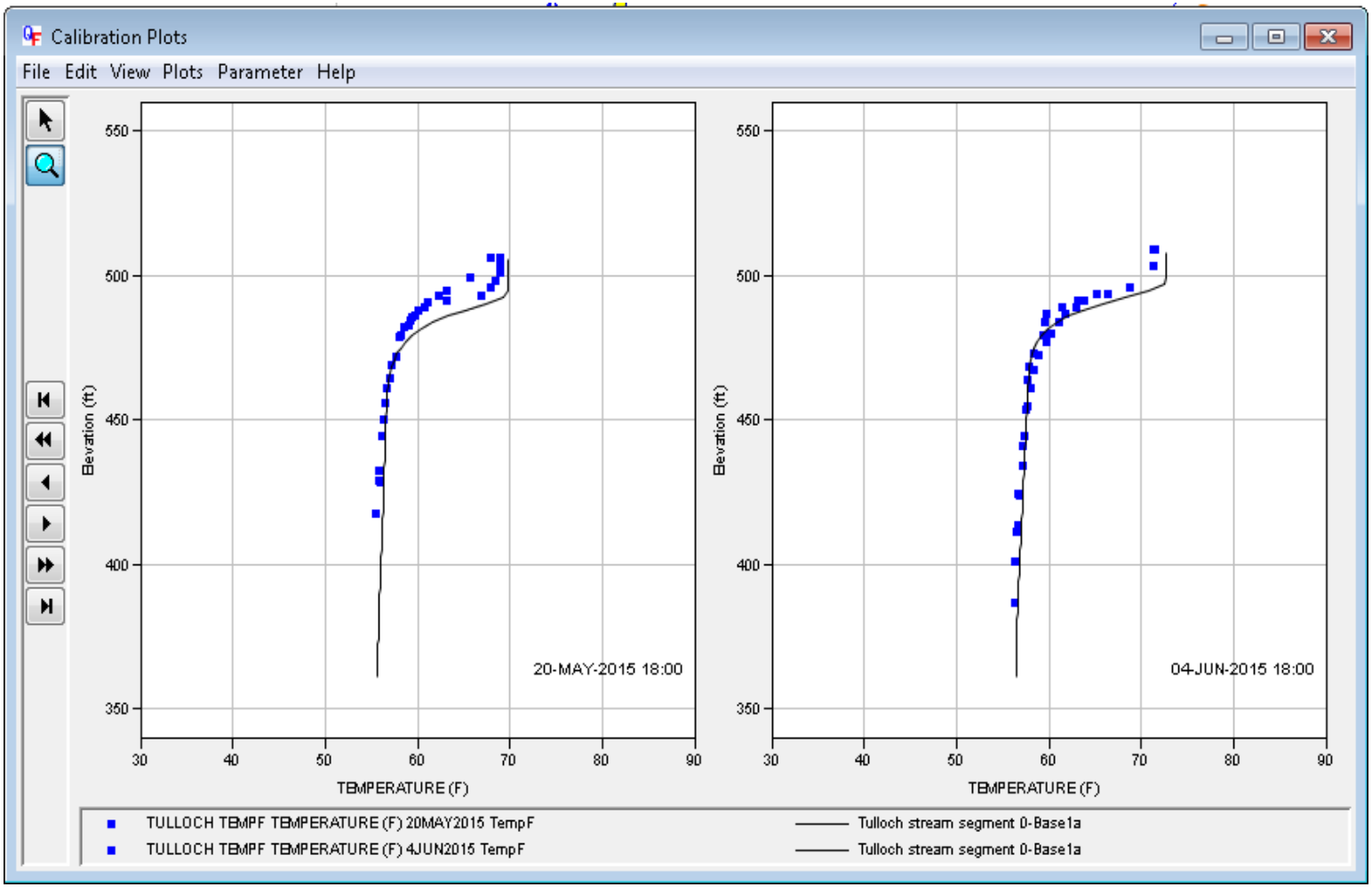
New Melones Temperature Profile

Computed (line) vs. Observed (Squares)

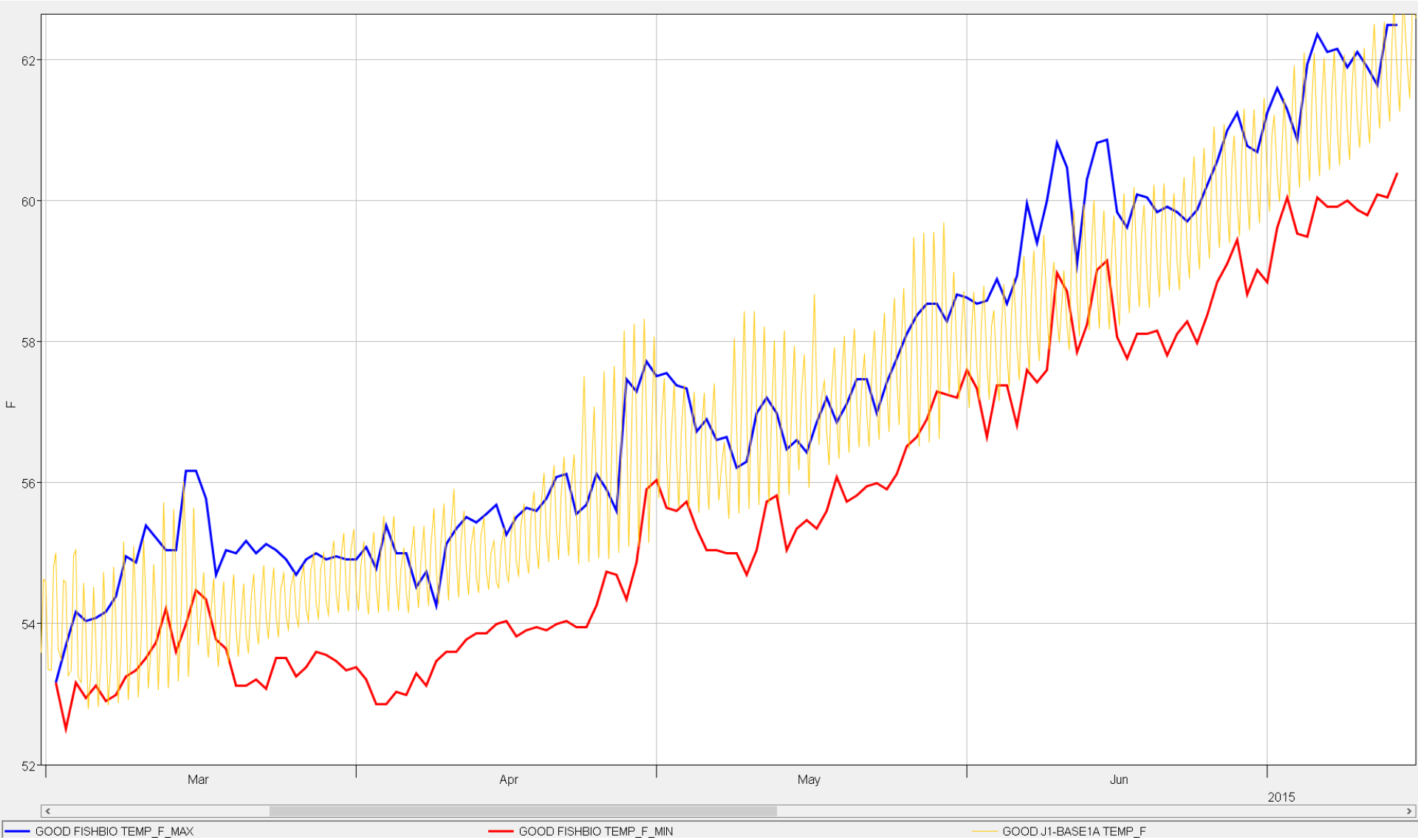


Tulloch Temperature Profile

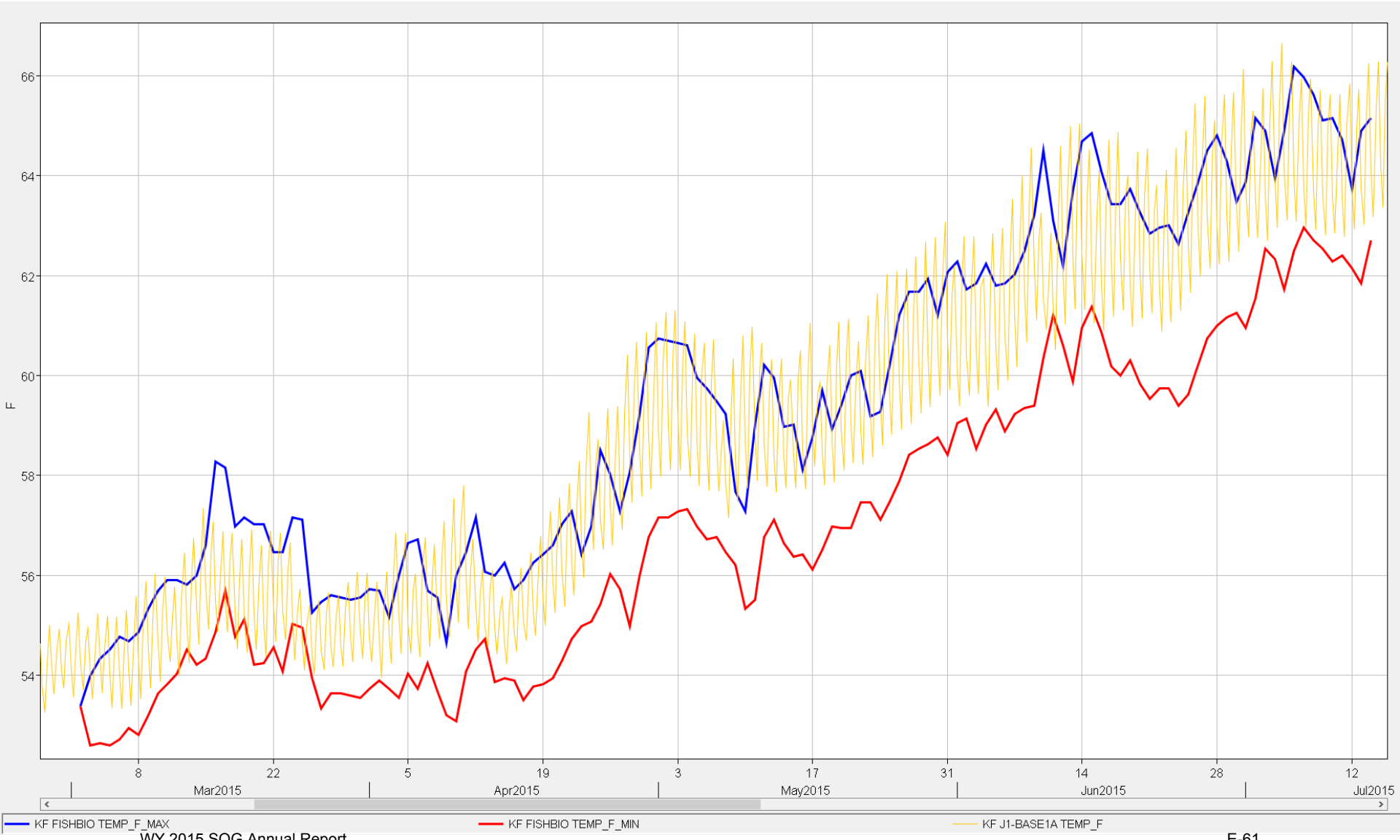
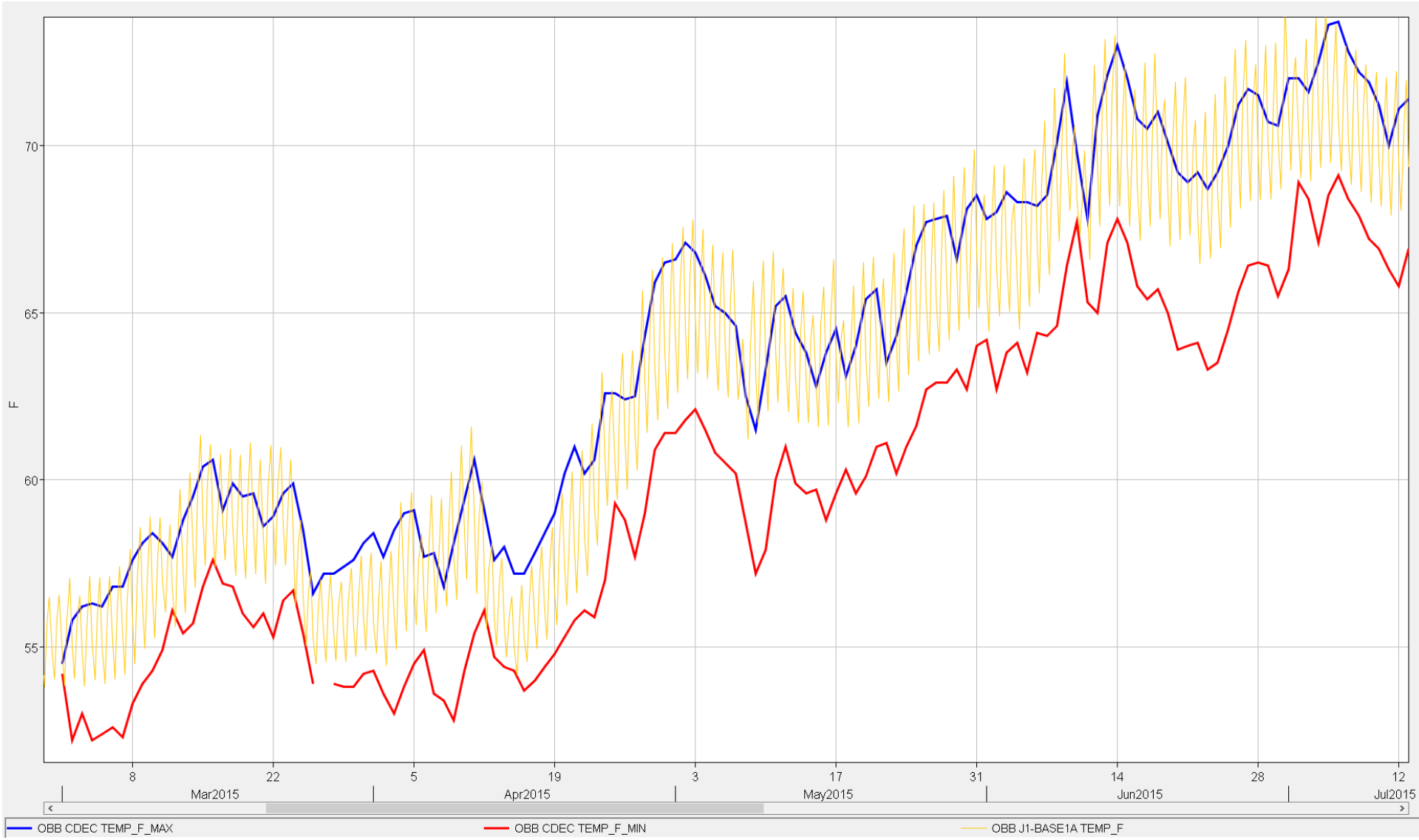
Computed (line) vs. Observed (Squares)



Goodwin
Daily Min, Max observed vs. Base Case (6-hour)



KF
Daily Min, Max observed vs. Base Case (6-hour)



OBB
Daily Min, Max observed vs. Base Case (6-hour)