GUIDANCE DOCUMENT
LTO 015
Sacramento River Fall and Winter Flow Refill and Redd Maintenance and Rice Decomposition Smoothing
LTO Implementation

May 21, 2020

I. PURPOSE

This document provides coordinated implementation guidance on the Sacramento River's Fall and Winter Flow Refill and Redd Maintenance and Rice Decomposition Smoothing pursuant to 4.10.1.3 of the U.S. Bureau of Reclamation's (Reclamation) Proposed Action and NOAA's National Marine Fisheries Service's (NMFS) Biological Opinion and Incidental Take Statement (ITS). The scope of guidance includes the deliverables, schedule, and processes of the Upper Sacramento Scheduling Team (USST) and other teams to implement these operational activities. The primary deliverables are USST flows schedules related to the fall and winter flow refill and redd maintenance and rice decomposition smoothly activities. A fall flow schedule will describe an operation scenario, developed by the USST and Reclamation to coordinate implementation of fall and winter operations.

II. REQUIREMENTS

This section provides the applicable verbatim language for the Spring Pulse Flow action from the Reclamation PA and NMFS 2019 BiOp. No text was identified from the USFWS 2019 BiOp.

PROPOSED ACTION:

4.10.1.3 *Summary of PA Items to Improve Shasta Storage*

As described in the sections below, the PA includes several operational components, that are intended to contribute to increased spring Shasta storage levels as compared to recent years. These include (1) Fall and Winter Refill and Redd Maintenance, which sets minimum late fall and winter flows, including modification of rice decomposition operations compared to the Current Operations Scenario (COS); (2) modified fall outflow requirements compared to the COS; (3) flexibility in export operations (especially in April and May) compared to the COS; and (4) December 2018 changes to COA (which are also included in COS). These operations, as well as real-time operations, are expected to result in increased end of September carryover storage, which Reclamation expects to benefit the following May 1 storage in years without flood control releases.

4.10.1.5 *Fall and Winter Refill and Redd Maintenance*

Reclamation proposes to rebuild storage and cold water pool for the subsequent year. Maintaining releases to keep late spawning Winter-Run Chinook Salmon redds underwater may drawdown storage necessary for temperature management in a subsequent year. Reclamation will minimize effects with a risk analysis of the remaining Winter-Run Chinook Salmon redds, the probability of sufficient cold water in a subsequent year, and a conservative distribution and timing of subsequent Winter-Run Chinook Salmon redds. If the combined productivity of the remaining redds plus a conservative scenario for the following year is less than the productivity

of maintaining, Reclamation will reduce releases to rebuild storage. Real-time fish monitoring data, operational conditions, and modeling will be shared through SRTTG. Reclamation anticipates NMFS will provide technical assistance through the SRTTG.

The conservative scenario for the following year would include a 75% (dry) hydrology; 75% (warm) climate; a median distribution for the timing of redds, and the ability to remain within Tier 3 or higher (colder) tiers.

If, based on the above analysis, Reclamation determines reduced releases are needed to rebuild storage, targets for winter base flows (December 1 through the end of February) from Keswick would be set in October based on Shasta Reservoir end-of-September storage. These targets would be set based on end-of-September storage and the current hydrology, after accounting for winter-run redd stranding. Base flows would be set based on historic performance to accomplish improved refill capabilities for Shasta Reservoir to build cold water pool for the following year. Table 4-10 shows the initial schedule for Keswick Releases based on Shasta Reservoir storage condition; these would be refined through future modeling efforts as part of the seasonal operations planning.

Table 4-10. Keswick Dam Release Schedule for EOS Storage

Keswick Release	Shasta EOS Storage
3,250 cfs	≤ 2.2 MAF
4,000 cfs	≤ 2.8 MAF
4,500 cfs	≤ 3.2 MAF
5,000 cfs	> 3.2MAF

High storage years are not necessarily correlated with a following wetter fall and winter. As a result, Reclamation will manage the real time releases based on conditions observed. In scenarios were higher storage exist at the end of September but the fall hydrology is dry (generally defined as below 90% exceedance of historical hydrology), Reclamation will coordinate with appropriate agencies, including NMFS and CDFW at a minimum, to reduce flows below those described in the table, if possible.

This approach to selecting fall, winter, and spring minimum flows allows Reclamation to build and conserve storage for supporting cold water management and summer demands. Due to the effort to build storage, this often results in flood control releases well over the minimum flows, typically in the December through May periods. The low flow in the fall and winter period directly increases the likelihood and magnitude of the flood control releases in the winter and spring months.

4.10.1.5.2 Conservation Measures

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• Rice Decomposition Smoothing: Following the emergence of Winter-Run Chinook Salmon and prior to the majority of Fall-Run Chinook Salmon spawning, upstream Sacramento Valley CVP contractors and the Sacramento River Settlement Contractors propose to work to synchronize their diversions to lower peak rice decomposition demand. With lower late October and early November flows, Fall-Run Chinook Salmon are less likely to spawn in shallow areas that would be subject to dewatering during winter base flows. Early reductions (late October–early November) would balance the potential for dewatering late spawning Winter-Run Chinook Salmon redds and early Fall-Run Chinook Salmon dewatering.

4.12.5 Drought and Dry Year Actions

Within 18 months of executing the Record of Decision, Reclamation shall coordinate with DWR to develop a voluntary toolkit to be exercised at the discretion of Reclamation, DWR, other agencies, participating water users, and/or others for the operation of Shasta Reservoir during critical hydrologic year types. The toolkit shall include, at a minimum: measures at the Livingston-Stone National Fish Hatchery; the potential for translocation of fish; and facility improvements to reduce the adverse effects of critical and dry years on listed species. Drought and dry year planning will include the measures under Shasta Cold Water Pool Management Dry Years, Drought Years, and Successive Dry Years.

In Tier 3 and Tier 4 years, Reclamation shall meet and confer with USFWS, NMFS, DWR, CDFW, and Sacramento River Settlement Contractors on voluntary measures to be considered if drought conditions continue into the following year, including measures that may be beyond Reclamation and DWR's discretion. If dry conditions continue, Reclamation will regularly meet with this group (and potentially other agencies and organizations) to evaluate current hydrologic conditions and the potential for continued dry conditions that may necessitate the need for development of a drought contingency plan (that may include actions from the toolkit) for the water year.

The Sacramento River Settlement Contractors approved A Resolution Regarding Salmon Recovery Projects in the Sacramento River Watershed, Actions Related to Shasta Reservoir Annual Operations, and Engagement in the Ongoing Collaborative Sacramento River Science Partnership Effort. Pursuant to the resolution, during drier water years with operational conditions as described in the Tier 3 and Tier 4 scenarios, the SRS Contractors will meet and confer with Reclamation, NMFS, and other agencies as appropriate to determine if there is any role for the SRS Contractors in connection with Reclamation's operational decision-making for Shasta Reservoir annual operations in those years. This determination will include consideration of what actions are feasible, consistent with the terms of the SRS Contracts. In addition to the 25% reduction during Shasta Critical Years as set forth in the SRS Contracts, the types of actions that may be considered include, but are not necessarily limited to: (1) the scheduling of spring diversions by the SRS Contractors; (2) voluntary, compensated water transfers by the SRS Contractors subject to Reclamation approval; and (3) delayed SRS Contractor diversion for rice straw decomposition during the fall months. Any mutually agreeable proposed actions resulting from these meet and confer discussions must be consistent with the terms of the SRS Contracts and may also be subject to other regulatory approvals.

NMFS ITS:

13.3.1.2 Take Anticipated from Flow Management

Changes in flow can be a stressor in the upper Sacramento River and create benefits. Flow reductions can cause juvenile stranding and redd dewatering while also preserving cold water for use at specific times of the year. Flow increases and pulse flows can benefit juvenile and smolt outmigration. Ramping rates are intended to reduce the magnitude of adverse effects associated with changes in flow. Specifically, decreased flows as a result of fall and winter refill of the Shasta Dam pool will lead to changes in water flow. Reduction in flow will reasonably be expected to result in take of listed species due to stranding, a loss of floodplain inundation, redd dewatering, and side-channel connectivity for Sacramento River winter-run Chinook salmon and CV spring-run Chinook salmon.

The flow regime of a water body is defined by its flow magnitude, timing, duration, frequency, and rate of change. Effects described in the Opinion describe how fish can be injured or killed from certain changes in river flow. Because of the causal relationship of flow magnitude, timing, duration, frequency, and rate of change to survival within and between life stages, flow can be used as an ecological surrogate for the amount or extent of take for salmonids.

The proposed action is reasonably expected to result in the take of juvenile listed salmonids through stranding or desiccated redds throughout the upper Sacramento River from Keswick Dam to Red Bluff Diversion Dam.

Take of Sacramento River winter-run Chinook salmon from changes in flow during the temperature management season is reasonably expected to result in egg mortality from the dewatering of one percent of redds.

Take of CV spring-run Chinook salmon resulting from flow changes from summer releases down to 3,250 cfs is reasonably expected to result in egg mortality from the dewatering of up to three percent of redds.

The anticipated level of take will be exceeded if flow decreases occur at a rate greater than the ramping rates described in the proposed action with the exception of flood control and emergency conditions.

NMFS Essential Fish Habitat Conservation Recommendation *to address the Thermal Refugia and Spawning Habitat Habitat Areas of Particular Concern (Page 17):* To address Chinook salmon EFH effects related to the Fall and Winter Refill and Redd Maintenance action component Reclamation should establish a process through the SRTTG to consider real-time operations to manage flow and reservoir releases in the Upper Sacramento River that dissuade fall-run Chinook salmon spawning in high flow channel margins as a way to reduce the potential for redd dewatering.

Reclamation response: Reclamation will work with the SRTTG to manage flows in the Sacramento River to reduce the potential for redd dewatering. During fall of 2019 Reclamation released variable flows in October, as recommended by fishery agencies, to meet water supply needs and discourage spawning in shallow areas. These types of operations have been used

previously in the Stanislaus and American rivers. Monitoring showed that there was likely some spawning discouraged, although there were some spawning that occurred during the higher flow pulses that were at risk of dewatering as the flows receded. The variable operations produced pulses of juvenile Chinook salmon emigrating past Red Bluff Diversion Dam, but there was not consensus on whether this earlier emigration is desirable. Collaboration will continue to refine these types of operations when practicable to provide suitable conditions for salmonids while meeting water supply needs.

III. DELIVERABLES

Deliverables resulting from this effort follow the coordination described in Appendix C of the Proposed Action required to implement and report on these activities.

- Draft Fall and Winter refill and redd maintenance flow schedule
- Final Fall and Winter refill and redd maintenance flow schedule
- Annual Report on Shasta Storage Rebuilding and Spring Pulse (Appendix C, Exhibit G.b.) and Annual Summary of Water Supply and Fish Operations (Appendix C, Exhibit G.c).

IV. PROCESS

A. Upper Sacramento Scheduling Team (USST)

The Upper Sacramento Scheduling Team will include agency (CDFW, DWR, NMFS, Reclamation, USFWS) and stakeholder (Sacramento Central Valley Project Contractor and Sacramento River Settlement Contractors) technical staff with direct interest in potential redd maintenance scenarios and associated monitoring.. Technical staff may include members with expertise in operations and/or fish science.

The USST will propose a Fall redd maintenance flow schedule based on August and September forecast, biological conditions and estimates of redd dewatering.

B. Timeline

Reclamation will provide the anticipated Fall and Winter flow schedule as part of the monthly 90% forecast through CVO website, SRTTG and WOMT throughout the summer. In these forecasts, Reclamation will identify end of September Shasta reservoir storage and Keswick releases for the Fall based on the initial schedule in Table 4-10. The 50% and 90% forecasts for the new water year, which uses generic hydrology and are highly uncertain, are completed in October. Additionally, fish monitoring information and predictions of redd dewatering and stranding will be shared in August through October as inputs to these processes.

In August and September, the USST will review an initial rice decomposition operation schedule with the Sacramento Valley CVP Contractors and SRSC and propose modifications in the draft fall and winter refill and redd maintenance flow schedule. Modification may include the timing, rate of change, magnitude, and duration of releases to reduce flow effects to winter-run, spring-run, and fall-run Chinook salmon and achieve the Keswick releases in Table 4-10. The USST proposed schedule should reduce salmonid redd dewatering, provide necessary releases for rice decomposition, and Keswick releases identified in Table 4-10.

In mid-September, the USST will present a draft fall and winter refill and redd maintenance flow schedule to Reclamation. Reclamation will share the draft schedule with the SRTTG at its September meeting, and anticipates interagency technical assistance through the SRTTG related to the USST proposed Fall redd maintenance flow schedule. The USST will consider SRTTG input and may modify the proposed flow schedule and provide to Reclamation in late September.

If the USST's proposed redd maintenance and rice decomposition flow schedule suggest higher releases for late spawning Winter-Run Chinook Salmon redd protection is necessary into late October, then an assessment of whether these releases may affect storage necessary for temperature management in a subsequent year will occur. Reclamation will complete this additional assessment, as necessary, and present it to the USST. The assessment will evaluate the cumulative productivity of two scenarios. First, a scenario quantifying the productivity of the remaining Winter-Run Chinook Salmon redds and the following years productivity based on a 75% (dry) hydrology; 75% (warm) climate; a median distribution for the timing of redds, and the ability to remain within Tier 3 or higher (colder) tiers. Second, a scenario quantifying the reduced productivity from the remaining Winter-run Chinook salmon redds due to the lower release, and the following years productivity based on the estimated increased storage and a 75% (dry) hydrology; 75% (warm) climate; a median distribution for the timing of redds, and the ability to remain within Tier 3 or higher (colder) tiers.

If the combined productivity of the remaining redds plus a conservative scenario for the following year (scenario #1) is less than the combined productivity of reduced survival in dewatered redds plus a conservative scenario for the following year including increased storage (scenario #2), then greater redd dewatering in October potentially has a lesser impact to WCS than the potential refill to benefit a subsequent cohort. In this case, the USST will modify the redd maintenance and rice decomposition flow schedule to consider possible lower releases in October, which may potentially cause greater winter-run redd dewatering, and provide a final flow schedule to Reclamation. Winter-run redd dewatering must remain less than the 1% dewatering limited in the ITS. Based on the USST's recommended flow schedule and potential discussion at WOMT, Reclamation will make a final determination.

Reclamation will reduce releases to rebuild storage using the USST final redd maintenance and rice decomposition flow schedule. Reclamation will manage the real time releases based on conditions observed. Following the emergence of Winter-Run Chinook Salmon and prior to the majority of Fall-Run Chinook Salmon spawning, Reclamation and upstream Sacramento Valley CVP contractors and the Sacramento River Settlement Contractors will work to synchronize release and diversions to operate to the USST's final fall and winter refill and redd maintenance flow schedule. Reclamation will coordinate with appropriate agencies, including NMFS and CDFW at a minimum, to monitor fish effects. Monitoring will report estimates of redd dewatering and stranding.

Reporting will be included in the "Annual Report on Shasta Storage Rebuilding and Spring Pulse (Appendix C, Exhibit G.b.)" and "Annual Summary of Water Supply and Fish Operations (Appendix C, Exhibit G.c)". It will include information about fall and winter releases, fishery

monitoring information, and potential storage improvements under the different forecasts based on the USST flow schedules.

C. Change Orders

Changes to Keswick releases for these actions require at least 48 hours prior notice to any desired releases. Change orders pursuant to the rice decomposition action will be e-mailed to the USST.

D. Water Operations Management Team

In September and October, as the USST provides their input on the potential redd maintenance and rice decomposition flow schedules being considered for the flow schedule, Reclamation will communicate this information to WOMT.

E. Updates to Guidance Document

In addition, it is expected that as this guidance is being implemented there will be necessary revisions to the document to provide further clarification and refinement. Reclamation and DWR, with technical assistance from the USFWS, NMFS, and CDFW, commit to reviewing this implementation guidance following each water year, at a minimum, to identify and incorporate any necessary revisions.