Appendix B - Sacramento River 2023 Spring Pulse Operations Plan

April 12, 2023

Background

As part of the Action for the Long term Operation of the Central Valley Project and State Water Project, Reclamation expects to release spring pulse flows of up to 150 thousand acre-feet (TAF) in coordination with the Upper Sacramento Scheduling Team when the projected total May 1 Shasta Reservoir storage indicates a likelihood of sufficient cold water to support summer cold water pool management, and the pulse does not interfere with the ability to meet performance objectives or other anticipated operations of the reservoir. The purpose of the pulse flow is to improve survival rates of outmigrating juvenile Spring-run Chinook Salmon smolts though the Sacramento River.

Reclamation has been coordinating with U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Wildlife, California Department of Water Resources, Sacramento River Settlement Contractors, Yurok Tribe, Hoopa Valley Tribe, Western Area Power Administration, and the State Water Resource Control Board. During winter 2021, the Upper Sacramento Scheduling Team met 12 times and the Upper Sacramento Scheduling Team Spring Flows Planning subgroup met 7 times to develop a Pulse Flow Study Plan. The Study Plan included the information necessary for considering a seasonal pulse flow and a Fish Monitoring Plan (See Attachment for more information). Following the Guidance Document for the Upper Sacramento River Spring Pulse Flow & Upper Sacramento River Scheduling Team, each year a Pulse Flow Operation Plan will be developed based on the Study Plan and Fish Monitoring Plan and presented in March and April to the Sacramento River Temperature Task Group in support of the Proposed Action.

Forecasted and Current Conditions

Reclamation anticipates that a projected May 1 storage greater than 4 million acre feet (MAF) provides sufficient cold water pool management for Tier 1 and may release the spring pulse if it does not impact the ability to meet project objectives. Following the Guidance Document for the Upper Sacramento River Spring Pulse Flow & Upper Sacramento River Scheduling Team, Reclamation could also determine, in coordination with the Upper Sacramento scheduling team, that while the reservoir is less than 4 MAF, there is sufficient water to do a pulse of up to 150 TAF. Based on the March 90% forecast, total May 1 Shasta Reservoir storage is predicted to be 3.868 MAF. However, based on the March 50% forecast, total May 1 Shasta Reservoir storage is predicted to be 4.188 MAF. To date in 2023, actual conditions have more closely followed the 50% forecasts, and the

forthcoming April 90% forecast is currently expected to project a total May 1 Shasta Reservoir storage greater than 4.0 MAF. Currently Shasta storage exceeds 4 MAF. The pulse flow releases are not anticipated to bring end of May Shasta storage below 4 MAF.

CVP actual operations do not follow any forecasted operation or outlook; actual operations are based on real-time conditions. CVP operational forecasts or outlooks represent general system-wide dynamics and do not necessarily address specific watershed/tributary details. CVP releases or export values represent monthly averages. CVP Operations are updated monthly as new hydrology information is made available December through May.

Chinook Salmon Benefits and Action Effectiveness

Optimal timing for implementation of a managed pulse release from Keswick Reservoir to improve outmigration survival of Spring-run Chinook Salmon smolts was discussed during the USST meetings. Late April and early May are likely to have most benefits for survival in most years. Factors considered to determine optimal timing were peak period of water diversions to benefit areas further downstream and smolt timing of Delta entry. Smolts are expected to have disproportionately large contribution to the returning adult population; however, they also typically experience the worse outmigration conditions due to their later outmigration timing. Spring-run juveniles from Mill and Deer Creeks also migrate later than Spring-run juveniles observed in the rotary screw traps at Red Bluff Diversion Dam.

Juvenile chinook salmon will be acoustically tagged as described in the Study Plan. Initial real-time results for this year's Pulse Flow Study as well as previous years are posted to: CalFishTrack (noaa.gov). Final results will be posted to: Central Valley Enhanced Acoustic Tagging Project (noaa.gov). The effectiveness of this action will also be reported in the Shasta Winter Storage Rebuilding and Spring Pulse Flow Seasonal Report.

Pulse Flow Scenarios

The Upper Sacramento Scheduling Team proposes a set of pulse flow scenarios. All scenarios (with the exception of the no action alternative) have a pulse volume < 150 TAF, utilize 15% ramping rates, and achieve a pulse magnitude of 11,000 cfs at Wilkins Slough. It is anticipated that these pulse flows will occur in April and May. Additional constraints that were considered were ACID dam needs and power impacts. All scenarios have forecasted end of May Shasta storage greater than 4.0 MAF based on the March 50% forecast. A beginning of May Shasta storage of 2.8 MAF is associated with Tier 1 year (2020 ROD Long-term Operations of CVP and SWP). A Tier 1 year is the best temperature management category in which it is suggested that 53.5 degrees F at CCR can be maintained from May 15 to October 31.

Potential pulse flow scenarios for consideration are described in Figure 1 and Tables 1. On April 11, 2023, Upper Sacramento Scheduling Team, representatives reviewed the scenarios described in survival_per_scenario_20230405.pdf and recommended scenario M4. M4 was slightly revised on April 12th to shift the peaks of the pulse volume to occur

over the weekday to avoid potential power impacts associated with weekend power generation (see survival_per_scenario_20230412.pdf). The modelled juvenile Chinook salmon survival for the revised M4 was about 2 percent lower than the M4 April 5th version. However, M4 continues to have the greatest survival benefits. In addition to improved juvenile Chinook salmon survival, the pulse flow release will also help with reservoir filling management (i.e., Shasta Reservoir is expected to fill to capacity this summer).

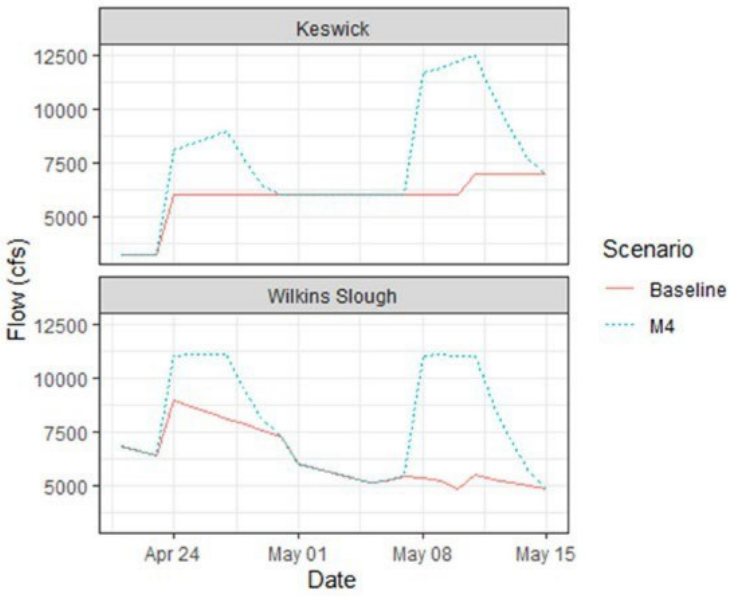

Figure 1. Potential pulse flow scenarios for the Keswick and Wilkins Slough from April to May 2023.

Figure 1 is two line graphs that model scenario M4 against the baseline flow for Keswick and Wilkins Slough. Both graphs show peak flow from April 24, 2023 – May 1 and May 8 – May 15, 2023.

Table 1. Potential Pulse Flow Scenarios

Scenario	Estimated Volume/Storage Cost (TAF)	Estimated Max Keswick Flow (cfs)	Estimated Difference in Migration Survival (all years)	Estimated Difference in Migration Survival (above normal years)
S1	58	12,200	1.06	1.04
S2	61	12,900	1.06	1.03
S3	60	11,900	1.06	1.05
M1	107	13,800	1.12	1.04
M2	100	14,000	1.12	1.04
M3	118	13,700	1.12	1.06
M4	83	12,500	1.11	1.13
M5	94	12,900	1.11	1.11