— BUREAU OF —
RECLAMATION

Sacramento River 2021 Spring Pulse Operations Plan

Central Valley Project, California

California-Great Basin Region

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In coordination with
California Department of Water Resources, U.S. Fish and Wildlife Service, National Marine Fisheries Service, University of California Santa Cruz, California Department of Fish and Wildlife, California State Water Resources Control Board, and Sacramento River Settlement Contractors

Shasta Dam (Photo credit: Reclamation)

Summary

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. 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. Based on the March 90% forecast, May 1 Shasta Reservoir storage is predicted to be 2.38 MAF. The current forecast indicates that none of the Study Plan's pulse flow scenarios are achievable this spring due to Shasta storage volume of less than 4 MAF.

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 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.

Through the Upper Sacramento Scheduling Team (USST), 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, State Water Resource Control Board, and the Sacramento River Settlement Contractors.

Method: Pulse Flow Operations Assessment

Through discussion with the USST, criteria for considering different pulse flow scenarios were developed. These are included in the Operations Assessment Table (Attachment A) to openly and transparently identify a preferred pulse flow scenario. This table describes a suite of variables including flow scenario releases, accretions, depletions, ramp down rates, estimated end of September total storage volume, total release volume, estimated volume difference from outlook, juvenile Chinook salmon travel time and survival estimates, and temperature dependent mortality (TDM) estimates (Attachment A).

Pulse flow scenarios are modeled using a simple mathematical model (Attachment A). The following outlines a description and how data are / will be collected for each tab:

- Summary inputs:
    - Description: Overview of spring pulse summary inputs including monthly 90% forecasts for Keswick releases (cfs), Shasta EOM storage (TAF), accretions (cfs), and depletions / diversions (cfs)

    - How data are / will be collected: Projections input manually by CVO from monthly forecast and/or data can be updated throughout season.
- Flow scenarios:
    - Description: More detailed statistics by month for each modeled spring pulse scenario including total volume of Keswick release (TAF), total Keswick increase over base (TAF), estimated June EOM Shasta storage (TAF), peak flow at Wilkins Slough (cfs), and the variables listed above
    - How data are / will be collected: Dependent on data from other tabs
- KES DailyFlows
    - Description: Daily Keswick flows from individual proposed pulse scenarios modeled in the WLK DailyFlows tab to produce a flow downstream of 11,000 cfs at Wilkins Slough.
    - How data are / will be collected: Dependent on monthly 90% forecast numbers as baseline and modeled Wilkins Slough flows
- KES Plot
    - Description: Plot of model scenarios created in KES DailyFlows tab
    - How data are / will be collected: Dependent on KES DailyFlows tab
- ClearCreek DailyFlows
    - Description: Daily Clear Creek flows including any projected pulse flows
    - How data are / will be collected: Based on release from Whiskeytown Dam
- ACC DailyFlows
    - Description: Monthly accretions values
    - How data are / will be collected: Dependent on monthly accretions as baseline
- DEP DailyFlows
    - Description: Monthly depletions values
    - How data are / will be collected: Dependent on monthly depletions as baseline
- WLK DailyFlows
    - Description: Individual proposed pulse scenarios to meet criteria set out in proposed pulse flow scenario table
    - How data are / will be collected: Dependent on cumulative impacts of Keswick daily flows, Clear Creek daily flows, accretions, and depletions
- WLK Plot
    - Description: Plot of model scenarios created in WLK DailyFlows tab
    - How data are / will be collected: Dependent on WLK DailyFlows tab
- Rampdown Rates
    - Description: Description of ramping rates for Keswick Dam
    - How data are / will be collected: NA (rates are static)
- Historical data
    - Description: May 1st Shasta storage (TAF) by year for February, March, and April 90% forecasts including net acc/dep used in historical forecast
    - How data are / will be collected: NA (reference point from previous years)

Pulse Flow Operation Plan

March Analyses 2021

The Upper Sacramento Scheduling Team proposes a set of pulse flow scenarios explored during winter 2021 to help determine what timing and shaping of the pulse flow would result in the most biological benefits. All scenarios have a pulse volume < 150 TAF, utilize 15% ramping rates, and achieve a pulse magnitude of 11,000 cfs at Wilkins Slough. Differing action periods and pulse durations for each proposed scenario are outlined in Table 1.

TABLE 1. Spring pulse flow scenario parameters proposed to guide future planning efforts.

Scenario #	Pulse Occurrence	Pulse Volume (TAF)	Ramping Rate	Pulse Magnitude (WLK)	Action Period	Duration
1	Single	-	15%	11,000 cfs	1 in April	2 days
2	Single	-	15%	11,000 cfs	1 in April	3 days
3	Single	-	15%	11,000 cfs	1 in April	4 days
4	Single	-	15%	11,000 cfs	1 in May	2 days
5	Single	-	15%	11,000 cfs	1 in May	3 days
6	Single	-	15%	11,000 cfs	1 in May	4 days
7	Multiple	-	15%	11,000 cfs	2 in April	2 days each
8	Multiple	-	15%	11,000 cfs	2 in April	3 days each
9	Multiple	-	15%	11,000 cfs	2 in April	4 days each
10	Multiple	-	15%	11,000 cfs	2 in May	2 days each
11	Multiple	-	15%	11,000 cfs	2 in May	3 days each
12	Multiple	-	15%	11,000 cfs	2 in May	4 days each
13	Multiple	-	15%	11,000 cfs	1 in April, 1 in May	2 days each
14	Multiple	-	15%	11,000 cfs	1 in April, 1 in May	3 days each
15	Multiple	-	15%	11,000 cfs	1 in April, 1 in May	4 days each

April Analyses 2021

- Re-evaluate a spring pulse flow action based on April 90% forecast
- CWP impact
- TDM modeling efforts
    - TDM forecast estimated difference from outlook for the 2021 season

May Analyses 2021

- Re-evaluate a spring pulse flow action based on May 90% forecast
- CWP impact
- TDM modeling efforts
    - TDM forecast estimated difference from outlook for the 2021 season

Attachments

Attachment A: Operations Assessment Table

Operations Assessment Table template for Baseline and a proposed spring pulse flow scenario (Scenario 1) for fisheries and non-fisheries variables.

Month	**Baseline – CVP 90% Forecast – Keswick flow (cfs)**	**Est. - A - (+)**	**Est. - D - (-)**	**Est. - WLK – Flow (cfs)**	**Scenario 1 – Keswick flow (cfs)**	**Est. – A – (+)**	**Est. – D – (-)**	**Est. – WLK – Flow (cfs)**
March								
April								
May								
June								
Comparison Metrics: Non-Fishery								
Total Vol Keswick Release (TAF)								
Tot Keswick Increase over Base (TAF)								
Est June EOM Shasta Storage (TAF)								
Peak Flow at Wilkins Slough (CFS)								
Comparison Metrics: Fishery								
Juvenile Chinook salmon survival								
Juvenile Chinook salmon travel time								
Temperature Dependent Mortality (TDM) estimates								

Attachment B: Study Plan

Attachment C: Fish Monitoring Plan