Long-Term Operation – Biological Assessment

Appendix AB-N – New Melones Stepped Release Plan

July 2024

Contents

Appendix N New Melones Stepped Release Plan

N.1 Introduction

The New Melones Stepped Release Plan addresses the volume of instream flows that can occur over a multi-year hydrology without affecting reservoir levels to the extent of depleting the water pool to cause the release of warm water.

N.2 Initial Alternatives Report

N.2.1 Management Questions

The United States Department of the Interior, Bureau of Reclamation's (Reclamation) management questions for the formulation of an alternative include:

- What is the relationship between releases and downstream water temperatures?
- What reservoir storage levels result in the release of warm water?
- Does the long-term instream release result in storage levels that would result in the release of warm water that would affect salmonid survival?
- What risks occur from operating to a 75% exceedance forecast early in the water year?
- What hydrograph shape optimizes Central Valley (CV) steelhead anadromy and survival? Is there a flow intensity threshold to cue migration?
- What is the optimal pulse flow timing by water year type to increase salmonid survival, increase life history diversity, and contribute to successful spawning in the adult population? What migratory phenotypes (i.e., fry, parr, smolts) are more likely to survive under different flow regimes?
- How do releases on the Stanislaus River affect the Water Quality Control Plan (WQCP) and exports?

N.2.2 Initial Analyses

N.2.3 Initial Findings

What is the relationship between releases and downstream water temperatures?

- Modeling is under development

What reservoir storage levels result in the release of warm water?

- Modeling is under development

Does the long-term instream release result in storage levels that would result in the release of warm water that would affect salmonid survival?

- Modeling is under development

What risks occur from operating to a 75% exceedance forecast early in the water year?

A sensitivity was run to analyze changes to New Melones operations if different forecast exceedances are used. The SRP uses the San Joaquin River Index to set flows and allocations. The forecasts are only different between February and April, so changes are limited. The 75% forecast is very similar to the final. February, when the forecast is most uncertain is when the forecast is likely to be different than the final water year type under the 75% forecast. Using the 90% forecast, which can reduce flows, results in consistently higher storage (since operations at New Melones are largely independent of storage, the additional storage can stay in the reservoir until evaporation or flood control increases reduce it).

What hydrograph shape optimizes steelhead anadromy and survival? Is there a flow intensity threshold to cue migration?

Spring pulse flows occurring during the steelhead outmigration period are designed to increase life history diversity by cuing anadromy and improving migratory habitat in the Stanislaus River, San Joaquin River, and southern Sacramento–San Joaquin Delta (Delta) (Appendix AB-C, *Species Spatial and Temporal Domains*; NMFS 2009). Spring pulses typically consist of multiple pulses that extend flow variability later into the season, allowing opportunities for broader salmonid outmigration timing. Higher flows cue outmigration and can reduce water temperature and inundate more shallow-water habitat. Maximum pulse flows are generally constrained to 1,500 cfs due to seepage concerns in agricultural lands adjacent to the Stanislaus River (Appendix AB-C).

What is the optimal pulse flow timing by water year type to increase salmonid survival, increase life history diversity, and contribute to successful spawning adult population? What migratory phenotypes (i.e., fry, parr, smolts) are more likely to survive under different flow regimes?

Each year, several pulse flows occur to benefit different life stages of CV steelhead and other salmonids, as specified by Action III.1.3 of the 2009 NMFS Biological Opinion. The 2011 RPA Amendment to Action III.1.3 specifies that pulse flow timing, magnitude, and duration may be adjusted based on water year type, with longer durations of pulses and higher intensities of peaks during wetter years, and other adjustments based on a variety of other considerations (Table 4). Maximum pulse flows are generally limited to 1,500 cfs and a duration of 10 days due to seepage concerns in agricultural lands adjacent to the Stanislaus River (Table 4).

Fall pulse flows usually occur in October through early November prior to peak spawning by adults, and timing may vary based on environmental conditions to achieve suitable habitat (DO and temperature) conditions for migration and holding. These multi-peak (3-4 peaks) flow pulses are designed to attract adult CV steelhead to the Stanislaus while deterring adults from spawning in areas that may be subsequently de-watered (NMFS 2009; Appendix AB-A, *Facilities Description*).

Winter instability flows usually occur between January and February (may occur in both months) and may be timed to coincide with winter storms, as well as with emergence of fall-run Chinook fry. These flows are shaped to simulate winter storms, with rapidly increasing flows followed by slowly descending flows. Higher flows may inundate shallow water habitat, leading to benefits for rearing juvenile salmonids that may take refuge from predators and receive potential growth benefits from increased terrestrial inputs (Appendix AB-B, *Water Operations and Ecosystem Analyses*).

Spring pulse flows usually occur between April and June. These multi-peak (3-6 peaks) flow pulses are designed to increase flow variability to allow for a broader range of salmonid outmigration timing, increasing life history diversity. These flows are intended to cue anadromy of steelhead and outmigration of smolts and improve migratory habitat downstream, as well as convey outmigrating salmonids (smolts) more rapidly. Pulse flows may also inundate shallow water habitat, leading to benefits for rearing salmonids that may take refuge from predators and receive potential growth benefits (Appendix AB-C).

Sturrock et al. (2020) found that greater flow volume and variability was associated with earlier outmigration, and thus a greater proportion of fish outmigrating as fry. Winter flows had a large impact on whether or not fry outmigrated downstream, with reduced winter flows leading to later salmon outmigration, composed of smaller numbers of larger fish, and ultimately leading to lower production. Annual abundances of emigrant per spawner were correlated with flow variability and mean rearing flows across all migratory phenotypes. In general, while fry and smolts were the more dominant phenotypes for outmigration, survival was higher for intermediate-sized (parr) fish outmigrating in the spring.

How do releases on the Stanislaus River affect WQCP and exports?

There are only small impacts to the WQCP and exports from the Stanislaus River Initial Alternatives.

N.2.4 Subsequent Consideration

N.3 Public Draft Environmental Impact Statement Scenarios

Under the National Environmental Policy Act, Reclamation compares action alternatives to a "no action" alternative. Under the Endangered Species Act, Reclamation's discretionary actions over an environmental baseline determine the effects on listed species. No single environmental baseline to evaluate the effects under the Endangered Species Act (ESA) or impacts under NEPA. ESA requires a comparison to the environmental baseline which is informed by ROR and Alt 1. NEPA requires a comparison to NA.

N.3.1 Run of River

[Placeholder]

N.3.2 No Action

[Placeholder]

N.3.3 Alternative 1 – WQCPs

[Placeholder]

N.3.4 Alternative 2 – Multi-Agency Consensus

[Placeholder]

N.3.5 Alternative 3 – Modified Natural Flow Hydrograph

[Placeholder]

N.3.6 Alternative 4 – Reservoir Flexibility

[Placeholder]

N.4 Performance Metrics

Performance metrics describe criteria that can be measured, estimated, or calculated relevant to informing trade-offs for alternative management actions.

N.4.1 Biological

Fisheries metrics consider direct observations and environmental surrogates including:

- **Water Temperature for Juveniles and Eggs**
    - The survival temperature threshold for juvenile steelhead is less than or equal to 68 degrees Fahrenheit (°F) from May 1 to October 31
    - The temperature threshold for steelhead egg incubation is less than or equal to 54°F from December 1 to May 31

The steelhead on the Stanislaus River generally move upstream to spawn between July and March; juvenile steelhead out-migrate between January and June (NMFS 2014). Reservoir releases combined with other environmental conditions will affect water temperature, dissolved oxygen level, and other habitat attributes that will influence the timing, condition and survival of eggs in the spawning redds. Decrease in flows generally results in warmer water temperatures in the winter; however, winter water temperatures are colder than adult migration temperature needs. The New Melones Stepped Release Plan promotes increased storage at New Melones Reservoir, which can help the development of a larger cold water pool. More cold water in the reservoir may help lower water temperatures downstream of Goodwin Dam, which would benefit steelhead in all life stages in the lower Stanislaus River.

The fisheries metrics address the volume of instream flows that can occur over a multi-year hydrology without affecting reservoir levels to the extent of depleting the cold water pool to cause the release of warm water.

N.4.2 Water Supply

Water supply metrics consider the multipurpose beneficial uses of New Melones including:

- Central Valley Project (CVP) water service contracts
- Senior water right holders (Oakdale Irrigation District and South San Joaquin Irrigation District)
- State Water Resources Control Board Water Right Decision 1641 (D-1641) standards and its dissolved oxygen requirement
- Flood conservation pool release

CalSim II would support the evaluation of water supply metrics.

N.4.3 NEPA Resources

Analysis of the range of alternatives as required by the National Environmental Policy Act is anticipated to describe changes in the multiple resources areas. Key resources are anticipated to include surface water supply, water quality, groundwater resources, aquatic resources, terrestrial biological resources, regional economics, land use and agricultural resources, cultural resources, socioeconomics, environmental justice, climate change, and power generation.

N.5 Methods Selection

Reclamation solicited input from the stakeholders and agencies for the knowledge base paper (Steelhead Juvenile Production Estimate). Reclamation identified the following datasets, literature, and models to help in evaluating the New Melones Stepped Release Plan.

N.5.1 Datasets

Several efforts to characterize historical and ongoing steelhead monitoring programs in the California Central Valley have been completed over the past two decades. A few years after the completion of the Central Valley Steelhead Monitoring Plan, a series of related monitoring projects, identified as the Central Valley Steelhead Monitoring Program, were initiated on the Sacramento River and its tributaries (Fortier et al. 2014). Appendix AB-G, *Specific Facility and Water Operations Deconstruction*, provides pertinent information for the datasets for steelhead.

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SacPAS: Central Valley Prediction & Assessment of Salmon provides a platform for data queries of juvenile steelhead salvage and loss. Available at http://www.cbr.washington.edu/sacramento/data/juv_salvage_loss.html.

Use CalFishTrack to understand juvenile steelhead routing and survival into the Delta. Available at https://oceanview.pfeg.noaa.gov/CalFishTrack/

N.5.2 Literature

The documents listed below were compiled from the 2019 BiOps, 2020 ITP, fact sheets produced for the February 2021 joint Delta Science Program – U.S. Bureau of Reclamation Steelhead Workshop, and a Google Scholar search.

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N.5.3 Models

Models support testing alternative operations and predicting environmental responses. The following models were available to Reclamation and relevant to addressing management questions:

N.5.3.1 Water Operations

CalSim II is a generalized reservoir-river basin simulation model that allows for specification and achievement of user-specified allocation targets, or goals (Draper et al. 2004). CalSim II represents the best available planning model for CVP and State Water Project (SWP) system operations and has been used in previous system-wide evaluations of CVP and SWP operations (Bureau of Reclamation 2015). Reclamation and the California Department of Water Resources are advancing CalSim 3, but the model was not ready for these purposes.

N.5.3.2 Water Temperature

HEC-5Q is a reservoir routing and temperature model. Over the past 15 years, various temperature models were developed to simulate temperature conditions on the rivers affected by CVP and SWP operations (e.g., Sacramento River Water Quality Model [SRWQM], San Joaquin River HEC-5Q model) (Bureau of Reclamation 2008). Recently, these models were compiled and updated into a single modeling package referred to here as the HEC-5Q model. Further updates were performed under the long-term operation (LTO) EIS modeling that included improved meteorological data and subsequent validation of the Sacramento and Stanislaus River models, implementation of the Folsom Temperature Control Devices and low-level outlet, implementation of the Trinity auxiliary outlet, improved temperature targeting for Shasta and Folsom Dams, as well as improved documentation and streamlining of the models and improved integration with the CalSim II model (Bureau of Reclamation 2015). A summary of previous model calibration and validation details can be found at the following link: DWR-1084 RMA 2003 SRWQM.pdf (ca.gov). Reclamation is developing an updated water temperature modeling platform, but the model is not yet available for broad use.

N.6 Lines of Evidence

Analysis of the LTO relies on multiple lines of evidence from datasets, literature, and models.

Lines of Evidence section is currently under development and will be provided for the Public Draft Environmental Impact Statement).

N.7 Uncertainty

Future studies of high value that may benefit from special studies include estimating the juvenile production of steelhead in the Stanislaus River to evaluate the effect flow and temperature operations has on this populations. The special study considering this is:

Steelhead JPE and OMR Management

N.8 References

Literature referenced for Stanislaus SRP are listed in Section 3 above. Additional references cited or used for informational material in the document are included below.

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