Sacramento River Temperature Task Group (SRTTG) Meeting
April 28, 2022, | 1:00 PM – 2:45 PM
Meeting Summary

Participants

Anne Williams, SRSC
Bill Poytress, USFWS
Chris Laskodi, Yurok Tribe
Claudia Bucheli, SWRCB
Crystal Rigby, CDFW
Craig Williams, SWRCB
Doug Killam, CDFW
Donald Bader, Reclamation
Diane Riddle, SWRCB
Erica Meyers, CDFW
Eric Danner, SWFSC
Gabe Singer, CDFW
James Earley, USFWS
Jeffrey Onsted, DWR
Jeff Laird, SWRCB
Jo Anna Beck, Reclamation
John Ford, DWR
John Hannon, Reclamation
Jonathan Williams, CDFW
Kevin Reece, DWR
Kristin White, Reclamation
Kristal Davis-Fadtke, CDFW
Lauren McNabb, CDFW
Lewis Bair, SRSC
Liz Kiteck, Reclamation
Mary Suppiger, Reclamation
Matt Brown, USFWS
Miles Daniels, SWFSC
Michael Harris, CDFW
Michael Macon, SWRCB
Michael Wright, Reclamation
Mike Deas, SRSC
Mike Prowatzke, WAPA
Sheena Holley, CDFW
Stephen Maurano, NMFS
Taylor Lipscomb, SWRCB
Thad Bettner, SRSC
Tom Patton, Reclamation
Vanessa Kollmar, CDFW

Facilitation Team

Julie Leimbach, Kearns & West
Mia Schiappi, Kearns & West

Key Discussion Topics with
Summary of Recommendations and Outcomes

1. Welcome, Agenda Review, and Purpose

Julie Leimbach, Kearns & West, welcomed all participants and suggested re-sequencing of the agenda items in order to hear from Miles Daniels, SWFSC, on the model results before he needs to leave the meeting at 1:50 pm. The group had no concerns with re-sequencing the main agenda items as follows:

1. Model Assumptions
2. Technical Input on Final TMP
3. Hydrologic Conditions

2. Purpose and Objective

The purpose of the Sacramento River Temperature Task Group (SRTTG) is to "share operational information monthly and improve technical dialogue on the implementation of the temperature management plan." Reclamation provides "a draft temperature management plan to the SRTTG in April for its review and comment, consistent with

WRO 90-5."[1]

3. Action Items Tracking

Action Items 4/28/22

1. **Eric Danner, SWFSC**
   a) Will clarify the model results that Reclamation's model run is compared and add a note to the slide that provides that information.
   b) Delete or caveat End of Storage (EOS) number
   c) Consider if or how to update the graphic on redd distribution to more clearly communicate the information
2. **Miles Daniels/James Gilbert, SWFSC**
   a) If the SWFSC wants Miles Daniels' slide ("TDM estimate sensitivity to redd distribution assumption") included, please write introductory sentences about the slide for inclusion in the Final TMP.
   b) Ask SWFSC team if they want to include James Gilbert's slide ("Revisiting 2021 Forecasts: How much do inflow forecasts and redd distributions affect TDM predictions assuming actual 2021 operations?) or an updated version of it in the Final TMP. See slide sent in chat during SRTTG meeting and emailed on 4/29/22.
3. **Kearns & West –** Update Model Assumptions Table
4. **Kearns & West /SRTTG** – Consider future agenda item: error bounds of models

Prior Action Items

Julie Leimbach, Kearns & West, reviewed action items from the previous meeting on April 14, 2022:

1. KW to circulate the populated modeling assumptions table to SRTTG. Reclamation and SWFSC to review and confirm information. SRSC to populate their column.
   - Complete.
2. SWFSC to confirm where any of their current assumptions vary from those used in March modeling.
   - Complete.
3. Reclamation to share full modeling runs with SRTTG. SWFSC to graph Reclamation results alongside their own in their regular format for easier comparison.
   - Complete.
4. Reclamation and SWRCB create profile results in a graphical format.
   - Complete.
5. Suzanne will relay back to that the SRTTG supports using the 2021 redd distribution as the distribution input for the TDM modeling.
   - Complete.

4. Model Assumptions

Miles Daniels, SWFSC, reviewed the SWFSC model parameters and assumptions outlined in the Modeling Assumptions Table. See Modeling Assumptions Table for all details. Some key points include:

[1] Shasta Coldwater Pool Management Guidance Document

- SWFSC used the upper band of the 90th percentile confidence interval, so it is closer to the 95% percentile of the historical data used to calculate the regression relationship for water temperature. This means that 95% of the years fell below that temperature. SRSC is making a conservative high estimate of temperatures based on cold water pool storage in Shasta Reservoir. This implies that the actual temperatures in the Sacramento River are going to be below the modeled temperature.
- The SRSC model is different from SWFSC model because it attempts to find the mean temperature rather than the 95th percentile temperature.
- SWFSC used the April 99% exceedance level and captured the additional April inflow and increased storage at Shasta Reservoir from recent precipitation.

John Hannon, Reclamation, discussed the Reclamation model assumptions and parameters. Key points included:

- The most current model uses a Tcrit of 11.98°C for the stage dependent model.
- Reclamation used a regression from September 15, 2021, reservoir storage versus the water temperatures during that period.

Mike Deas, modeler for Sacramento River Settlement Contractors, reported that the SRSC had not run their model and had nothing to report.

Discussion of Model Assumptions

Update on Redd Distribution Assumptions

At the request of the Shasta Planning Group for two redd distribution inputs, the SRTTG held an ad-hoc meeting on 4/26 to provide technical input. The group did not come to a consensus on which years to use but there was support to use 2021 and an aggregate of 2016 to 2021. *[Post-meeting correction: The SRTTG members did converge around support for using the redd distributions of 2021 and an aggregate of 2016 – 2021. However, they did not come to agreement on the methodology for aggregating the multiple years.]*

- Reclamation reported that the Shasta Planning Group agreed that using 2021 and an aggregate of 2016 - 2021 would provide appropriate bounds.
- Reclamation used the 2021 and aggregate of 2016-2021 as redd distribution as input for the Draft Temperature Management Plan (TMP) and the April 25, 2022 HEC-5Q model run.
- SWFSC confirmed that for its April 27 model run, they used the same 2021 and aggregate of 2016-2021 years for redd distribution as Reclamation. SWFSC noted that they did not run a 56 °F temperature target scenario.

Update on Tcrit

The group also discussed the different Tcrit numbers between the Reclamation model and the SWFSC model.

- Reclamation cited *Targeting river operations to the critical thermal window of fish incubation: Model and case study on Sacramento River winter-run Chinook salmon*[2], Table 3 as its source for their Tcrit model assumption 11.82 °C.

[2] Anderson, J. J., Beer, W. N., Israel, J.A., & Greene, S. (2022). Targeting river operations to the critical thermal window of fish incubation: Model and case study on Sacramento River winter-run Chinook salmon. *River Research and Applications,* 1–11.https://doi.org/10.1002/rra.3965.

- Reclamation reported that there is a significant difference in the model results when the models are run with either a Tcrit of 11.82 °C or 11.98 °C.

5. Technical Input for Final TMP

Final TMP: Sacramento River Temperature Strategy
Reclamation introduced this agenda item by sharing a section of the Final Temperature Management Plan titled, Sacramento River Temperature Strategy. To see the draft document, see the SRTTG packet. The Sacramento River Temperature Strategy includes the Keswick Reservoir release schedule, temperature targets and locations, description of SRTTG discussion of tradeoffs between managing to temperature targets of 54.5°F and 56 °F temperature targets, a table of estimated water temperatures at key locations as predicted by the April 25, 2022, HEC-5Q model run, and fish and water performance metrics.

Model Results
Reclamation and SWFSC ran the 54.5°F scenario through their models and reported the results for SRTTG consideration. SRSC did not have model results to share.

Please refer to the packet for the model runs and assumptions.

SWFSC Model Results
Miles Daniels, SWFSC, reviewed the SWFSC model results (see meeting packet). Key points included:

- Assumptions
    a. Updated 4/26/2022 Shasta Reservoir temperature profile.
    b. Updated Reclamation provided outflow and the Spring Creek Pumping Plant contributions.
    c. Redd distribution
        - 2021 redd distribution – 52% TDM
        - 2016 to 2021 aggregate redd distribution – 58% TDM
- Results
    a. TDM estimates
        - Scenario 1 April 27, 2022 - 54.5°F Target - 52%
- Interpretation
    a. SWFSC believes the 54.5 °F scenario changed from 42% TDM on 4/14/22 to 52% TDM on 4/26/22 due to the reduction in coldwater pool at 50°F.
    b. It is also possible that the 2015 meteorology used on 4/14/22 did not have the warm temperatures that were experienced over the last two weeks.
    c. The hydrology inputs for the 4/14/22 run did not include the recent precipitation in April.
    d. The time series figure depicts the Keswick discharge temperature and the Sacramento discharge temperature. Based on the current model run, the target temperatures are closer to the target of 54.5°F.
    e. End of Season (EOS) Storage
        - SWFSC noted they have more confidence in Reclamation's EOS storage figure rather than the one included at the top of their model results. They are considering the options to exclude the figure from their model results or use Reclamation's EOS figure. Reclamation requested that SWFSC either delete or caveat the EOS figure in the model results.

Miles Daniels, SWFSC, presented new graphs of TDM estimated sensitivity to redd distribution assumption

- SWFSC developed two slides to demonstrate TDM variability associated with 0°F perturbation plotting the mean annual TDM against he ranked mean annual TDM.

- Assumptions
    a. All years from 1996 to 2021
    b. For each year they ran TDM estimates using 1999 water temperature but changed every redd year. 1999 had the lowest mean annual TDM and 2015 had the highest TDM.
    c. The TDM model parameters used are constant.
- Interpretation
    a. In years when there was a low TDM, regardless of redd distribution, water temperatures were maintained very well and there were a lot of resources. As resources become limited the model is more sensitive to redd distribution.
    b. There is more sensitivity in the model when there is a variation of 1°F either higher or lower.

Reclamation Model Results

John Hannon, Reclamation, reviewed model outputs for Reclamation's 4/25 model run with 54.5 °F temperature target. Key points include:

- Assumptions
    a. Assumes 90% exceedance and 25% future meteorology.
    b. Assumes April operations forecast
- Results
    a. EOS storage - 1.14 million-acre feet.
    b. Reservoir storage will drop below 935 feet in elevation in June.
- Interpretation
    a. Reclamation believes there will be a more of a stair step decrease in temperature than what is currently depicted in model results.

Discussion

The SRTTG members discussed their interpretation of the model results.

- NMFS commented that there is a chance that the 2022 redd distribution will be similar to 2021, which the models reflect. However, if the redd distribution is further downstream than 2021, there will be signals and it will be important to manage temperatures based on those signals. It would be unfortunate for TDM if there is significant downstream spawning, but it would be indicative of a broader trend in life history and diversity.
- SWFSC and SRSC disagree about the need to describe and importance of the level of uncertainty in the TDM model to improving decision-makers management of the system.
    a. SRSC commented that the decision makers need to know about the factors and the range of uncertainty in the TDM model results. When evaluating the hypothetical TDM model runs against actual mortality in the temperature season, many factors affect model accuracy. Some of these major factors include uncertainty around meteorology and operations.
    b. SWFSC stated that the TDM model predictions have proven to be very accurate. Yet the TDM model has received quite a bit of scrutiny about its accuracy and levels of uncertainty. SWFSC suggested that if we are going to discuss sources and levels of uncertainty, that SRTTG discuss uncertainty in the context of defining model error bands.
    c. Reclamation reminded SRTTG that models are not calibrated for the current low flow releases in the Sacramento River which means it will be hard to use past performance as a predictor for this year. Reclamation tries to use conservative estimates, but outcomes are dependent on meteorology and TCD operations.
- NMFS asked what gates Reclamation is planning to pull at the beginning of June which allow the temperature to decrease to 47°F.

a. Reclamation responded that the model is indicating pulling the pressure release gates (i.e. lower gates) in the beginning of June, which decreases the release temperature to 47°F. The move to the lower gates is based on the elevation of Shasta Reservoir. When the reservoir's elevation drops below 935 feet the model no longer utilizes the middle gates and moves to the lower gates. Moving to the lower gates would likely result in a period of blending of temperature layers in the reservoir that would allow Reclamation to release cooler temperatures to the river.

Technical Input for the Final TMP

Reclamation requested technical input from SRTTG to inform the Final Temperature Management Plan (TMP). This technical input will inform policy recommendations by the Shasta Planning Group. Individual SRTTG members provided the following technical input for the TMP:

- SRTTG confirmed that Reclamation should include the SWFSC graph, which includes the 54.5°F TDM scenario in the TMP.
    a. USFWS commented that it is important to recognize that both Reclamation and SWFSC forecasts will be outdated come June and July.
    b. Reclamation recognizes that the information will become outdated and there is language in the TMP referring to how the continued discussion at SRTTG and the Shasta Planning Group will help modify the plan as necessary throughout the season.
    c. Reclamation asked SWFSC to delete or caveat the end of September storage number in the slide summarizing their model run.
- USFWS suggested that Reclamation include a SWFSC graphic in the Final TMP. The graphic is from James Gilbert's slide deck and shows that TDM estimates changed over time in 2021.
- NMFS asked if Reclamation plans to include language in the Final TMP regarding Livingston Stone National Fish Hatchery mitigation support.
    a. Reclamation plans to include language that describes support for the hatchery including using a 20 °F chiller this year. If Shasta Reservoir is extremely warm, and the river is cooler, Reclamation may also pull water directly out of the Sacramento River into the hatcheries.

5. Hydrology and Operations Update

Tom Patton, Reclamation, provided a brief update on current hydrology and operations. Please see meeting handouts for more details. Highlights include:

Storage

- Shasta Reservoir storage has minimally increased due to new precipitation in April.
- Current storage at Shasta Reservoir is 1,794-thousand-acre feet (TAF).
- Current storage at Trinity Reservoir is 771 TAF.

Operations

- Releases from Keswick Dam on the Sacramento River are 3,250 cfs.
- There are no changes to flow out of Keswick Dam and very few changes to diversions.
- Reclamation will attempt to minimize diversions in November to increase 2023 storage in Shasta Reservoir.

Trinity River

- Reclamation included Trinity diversions in the volume estimates for Spring Creek for October.
- The Trinity Reservoir temperature profile is trending downwards and is of concern when compared to 2021.