BUREAU OF RECLAMATION

Sacramento River Temperature Task Group Notes

June 22, 2023

Members Attending

- USBR: John M. Hannon, Elizabeth G. Kiteck, Elissa Buttermore, Michele V. Pacheco, Lisa Elliot, Tom Patton
- USFWS: Bill Poytress, Craig Anderson, Matt Brown
- CDFW: Crystal Rigby, Erica Meyers, Tracy Grimes, Vanessa Guzman
- NMFS: Seth Naman, Stephen Maurano
- SWFSC: Cyril Michel, Eric Danner
- DWR: John Ford
- SWRCB: Craig Williams, Jeff Laird, Matthew Holland, Michael Macon
- SRSC: Anne Williams, Mike Deas
- WAPA: Michael Prowatzke
- Yurok Tribe: Christopher Laskodi

Topics/Actions

- Reclamation will send out June forecasts once they are finalized.
- Reclamation will follow up with USGS on gage issues.
- Reclamation will follow up on copper/ turbidity status.

Welcome, Agenda Review, and Purpose

Nahal Ipakchi, Kearns and West, welcomed all participants.

Purpose and Objective

The purpose of the 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."

TMP Update

Michael Macon, SWRCB, confirmed that the SWRCB conditionally approved the June 07, 2023 TMP as compliant with Order 90-5; the conditions include the requirement that a notice would be provided to the SWRCB if daily average temperatures were to exceed 56°F at Balls Ferry.

Hydrology, Operations, Forecasts, and Temperature Management

Reclamation presented the hydrology, operations, and temperature management updates. Northern Sierra Precipitation and Snowplots:

- Sac River 8 Station Precipitation Index is at 63.9 inches of precipitation, 123% of normal for this time of year.
- Likely to not see much more precipitation for the remainder of the year.
- Southern Sierra snow is slowly dwindling, and flood releases are starting to cut back. Operators are going into fill mode, trying to maximize storage in all of the reservoirs. Most reservoirs are full.
- Operations are looking good this season. 2023 has been a good year for snowpack and how well the temperatures have allowed operators to manage the fill without causing any major issues downstream.

Current Storage and Releases:

- Shasta: Shasta Reservoir storage is slowly starting to decrease. Projecting 3.3- 3.4 MAF of storage at the end of September.
- Keswick: Keswick release is currently 9,000 cfs with plans to increase to 9,500 cfs tonight (06/22/2023). A projected heat wave is anticipated later next week, so
- Reclamation will monitor data downstream to make sure flows at Wilkins Slough to remain at least 5,000 cfs. There could be another increase in Keswick flows up to 10,000 cfs early next week.
- Trinity: Storage continues to increase at Trinity Reservoir, recently crossing the 1.4 MAF mark and projected to be at 1.25 MAF end-of-September.
- Whiskeytown reservoir is full. Before the weekend of July 4th, storage will be brought to summertime maximum. Releases are at minimum levels.

Water Temperatures and Forecasted Releases:

- 8-14 Day Air temperature Outlook: Issued on June 15 and valid for the month of July. Equal chances of above or below normal temperatures. Projected temperatures for July, August, and September are above average temperatures.
- Sacramento River Mean Daily Temperatures: Water temperatures have been below average this season.
- Balls Ferry has been under 56 °F. CCR has been around 53.5 °F.
- Air temperatures are beginning to slowly increase. Air temperatures at Redding are

approaching 107 °F.

- TCD has one middle gate open at this time with chances of opening another middle gate next week to provide cooler releases down the system to counteract the heat wave projected to occur next week.
- Forecasted releases from Shasta are 10,000 cfs for July.

Trinity River Mean Daily Temperatures:

- USGS and Reclamation are working to get data for the Douglas City gage currently being buried under sediment. The temperature trend for the river below Lewiston is slowly increasing due to the heat wave.
- North Fork gage has also increased in water temperatures due to the warmer weather. Initiated diversions due to Whiskeytown's natural flow decreasing. Will continue to divert water to maintain water levels in Clear Creek and Whiskeytown storage levels high.
- The cool weather has helped keep Lewiston Lake from rapidly warming up.
- At Lewiston, temperatures have risen from 51 °F at the beginning of the month to mid-50's (55 °F). Have been informed by the Trinity River Hatchery that they are concerned with temperatures rising.]
- For the June forecast, Reclamation inserted a place holder for moderate diversions to help keep colder water moving through Lewiston; they estimated 30-40 TAF through Spring Creek and Carr for each of the three summer months to provide support for the Trinity River temperatures and will adjust diversions depending on the temperatures at Lewiston. Diversions from Trinity will help keep Whiskeytown Reservoir full.
- In addition, Trinity River releases for August and September are placeholders in case assistance is needed for the Klamath River (augmentation flows).

Profiles and Cold-Water Pool:

- Shasta Lake: the surface of Shasta Lake has cooled off, and there is good cold-water pool volume (i.e., volumes below 52 °F). The latest profile was used to make temperature model runs.
- Trinity Lake: Trinity has increased storage since the last meeting due to snow melt, though inflows are now under 2,000 cfs. The volumes of 52 °F water has increased and is above 2016 levels but below average for this time of year. 50 ° F and 48 °F volumes look good.
- Whiskeytown: Warming up on the surface, but overall cooler than other years.

Temperature Model Runs:

- Sacramento Temperature Model was run on 6/21/2023 and didn't show much change from previous run. Modeling still shows no side gate operation. Slightly increased at the end of September cold-water pool (1.58 MAF cold water pool volume) since the last model run, which may be due to the cooler temperatures in June. Have not seen any exceedances of

56 °F at the Balls Ferry gauge.

- Projections for Clear Creek (CCR): Improving but will revisit the temperature model at CCR moving forward for improved modeling.
- Projections for Trinity: Trinity operations look good in terms of what to expect. Good cold-water management this summer.

Questions from SRTTG participants included:

- Yurok Tribe asked how much water will be moved from Trinity Reservoir to Whiskeytown Reservoir. Reclamation also inquired whether this information is outside the 50% forecast.
    - Reclamation shared that in the forecast, diversions are set at 30-40 TAF for each of the three months. The volume will depend on Lewiston's reaction to the flows. Some water will have to be diverted for temperatures. Coincides with when flows on the Trinity are down low at 450 cfs. When the forecasts for June are finalized, they will be shared with the group. Reclamation will present the draft forecast later in the meeting.
- NMFS asked if Reclamation or USGS are planning on installing a new temperature logger at Douglas City for the time being so that data can be collected.
    - Reclamation shared that USGS has a backup gauge, but they need to review it and post it. If that is not available, it would be important to get a new temperature logger installed. USGS was waiting for the flows to go down before working on gage.
- USFWS asked if the model incorporated the increase in discharge in July to 10,000 cfs.
    - Reclamation confirmed that the model includes 10,000 cfs from July as well as the increased diversions.Questions and Comments

SWFSC presented on the Summary Document for Shasta/Keswick Operational Scenarios 06/19/2023:

SWFSC shared the following model run updates and planning methods for Shasta/Keswick scenarios. The results are like previous meetings with minimal changes. There is a low TDM based on the composite of redd distributions from 2016- 2022. The annual mean TDM is 2%. The difference between the two approaches is that predicted temperatures from Keswick compare HEC-5Q vs CE-QUAL-W2 models. At the beginning of the year the HEC-5Q is predictably warmer vs the end which is cooler. Both figures maintain below 12°C through November.

Fish Study Preliminary Results. Spring Pulse Flow 2023, Planning and Monitoring:

Cyril Michel, SWFSC, presented the preliminary results of the fish study on the Spring Pulse Flow efforts. The Upper Sacramento Scheduling Team (USST) met frequently Feb-April 2023 to draft a Sacramento Spring Pulse Operations Plan to present to the SRTTG and Shasta Planning Group (SPG). USST would receive regular updates from Reclamation on storage and runoff

forecasts, paying particular attention to whether Shasta would reach 4 MAF storage as of May 1, 2023, a soft requirement for pulse flows. USST estimated survival for several spring pulse flow scenarios to identify the most beneficial of the scenarios for salmon.

Initially NMFS presented 1-2 pulse flows: 6 scenarios with 1 pulse flow and 9 scenarios with 2 pulse flows. The following were the criteria considered among the scenarios:

- Duration lasted from 2, 3, or 4 days.
- The goal was to achieve 11,000 cfs at Wilkins Slough gauge.
- Varied when the pulse flows happened: April or May, or 1 in April and 1 in May. Single or multiple frequency.
- Volume: up to 150 TAF. 15% ramp down rates.
- Shasta May 1st storage: more than 4 MAF.

The following were the considerations and steps the USST used in their scenario planning and evaluation:

- Used rotary screw trapping data from the entire historic data set of fish passage at USFWS the Red Bluff Diversion Dam.
- Focused on the above normal or wet years that were more in line with the hydrological conditions seen this water year.
- Utilized survival flow thresholds from a published study that shows support for a drastic increase of survival at approximately 10,700-11,000 cfs as measured at Wilkins Slough. This study helped govern the design of each pulse flow to try to meet that higher survival threshold.
- Each scenario and flow outcomes were tested day-by-day for the Spring season. Each day the data were analyzed to identify the flow survival relationship. The model also identified a general number of fish passage. Base line flows per day were multiplied by the percentage of survival to obtain the approximate number of fish.
- Scenario M4 was the simulation that was best supported for highest level of fish survival, with 12% over baseline survival outcomes. This scenario was then proposed to the SRTTG. It has an 83.3 TAF estimated water cost.
    - M4 consisted of 2, 4-day long pulse flows with ramping down, both resulting in 11,000 cfs at Wilkins Slough. One pulse flow occurred in late April and one early May.
    - May 1st 50% exceedance Shasta storage was 4.1188 MAF.
- SRTTG voiced support for advancing M4 to the Shasta Planning Group. SPG supported the action with the caveat that it should be implanted to the point feasible given potential flood control/storage management operations.

Cyril outlined the steps taken to monitor the pulse flow:

- UC Santa Cruz and GCID deployed turbidity sensors to assess the impact of the pulse flows on water turbidity.
- USFWS-Red Bluff was poised to continue operation of rotary screw traps to the extent possible to assess any changes in daily number of migrating salmon.
- UC Santa Cruz (with financial support from Reclamation) was poised to acoustically tag juvenile salmon and release them weekly at Red Bluff to assess changes in outmigration survival because of pulse flows.
- Storage management became a necessity, so there was no drop in flows between the pulses for "control" treatment groups.
- Monitored the 5 release groups via real time tracking webpage.
- Preliminary results on survival:
    - Pre-pulse group had a higher survival rate.
    - The first two release groups during the pulse had relatively lower survival rates.
    - The last two release groups had comparable survival to the first.
- The survival rates are high compared to what has been seen in prior years.
- Some confounding variables were present and will require further analyses.
- Preliminary results on migration rate:
    - The pre-pulse release group showed slower migration rates to Sacramento.
    - The other 4 releases had faster migration rates to Sacramento along with the pulse flow.
    - Mean travel time was 8.5 days.
- Preliminary results on synchronicity with the tributaries:
    - Found that fish entered the Sacramento River from the tributaries during high flows.

Next Steps:

- Short-term:
    - Finalize acoustic telemetric results.
    - Collect and assess turbidity data.
    - Collect and assess rotary screw trap data.
- Long-term:
    - Develop better tools to assess how the use of stored water for pulse flows impacts

annual TDM.

- Develop strategy for implementing pulse flows in synchrony with fresh nets on spring-run Chinook creeks.

Questions from SRTTG participants included:

- USFWS asked how different the flow releases would have been if there had not been implementation of the pulse flow. Is there an estimate of how much water was required or how different it would have been from normal operations?
    - NMFS replied that it was shortly after the first pulse flow that it was realized that storage management had to start occurring. 1-2 days into the pulse flow we pivoted to storage management.
    - Reclamation stated that all the volume of the release would have been for storage management, but that timing was set differently for the study. In terms of the volume, all the volume had to be released for storage management. In terms of the volume, all the volume had to be released for storage management.
- USFWS asked if the data were helpful for turbidities. Can we get the operators at USGS or others to be funded properly to encourage cooperation?
    - NMFS replied that turbidity is notoriously more difficult to measure via river gauges. This is partly why NMFS added their own sensors this year and have not retrieved the sensors yet. These will be reviewed in the next week. At Redd Bluff, the sensors show that turbidity was high most of the Spring, which coincides with what was observed. Turbidity was mostly driven by snowmelt runoff, especially at Cottonwood Creek. It may be difficult to tease apart the effect of the managed pulse flow and turbidity outside the influence of the other creeks. More turbidity sensors would be valuable. There are no year-round turbidity sensors downstream of Red Bluff until you reach Sacramento.

River Fish Monitoring: 1) carcass surveys 2) Redd counts 3) stranding and dewatering surveys.

K&W presented Doug Killam's, CDFW, notes on River Fish Monitoring updates.

- The carcass counts remain low compared to average.
- As of yesterday, the crew observed a total of 60 winter-run Chinook salmon carcasses.
- The average through June 21st since 2003 is 396 carcasses.
- This year's counts are higher than 2011 and 2017 but still below average.
- The aerial redd counts remain similarly low, with only 5 redds observed to date over 5 weeks of surveys.
- Shallow redd observations are ongoing.

- As of 06/22/2023, only 1 redd was identified in shallow water.
- Pre-spawn mortality of female winter-run Chinook salmon is currently 2/22 females (9.2%). Expected to decrease as peak spawning activity occurs over the next few weeks.

Fish Distribution/Forecasts: 1) Estimated percentage of the population upstream of Red Bluff Diversion Dam for steelhead, winter-run, and spring-run Chinook salmon 2) Sampling at rotary screw traps at Red Bluff Diversion Dam 3) Steelhead update 4) Livingston Stone Hatchery

Bill Poytress, USFWS, presented on the most recent Fish Distributions/Forecasts. This is the time of year where no juvenile winter-run Chinook salmon have been seen passing for several weeks now. Anticipate seeing BY 2023 winter-run Chinook salmon at the end of July and into August. Seeing a decent number of fall-run Chinook salmon smolts. Turbidity is relatively high for this time of year --7-8 NTUs at times, when it is usually at 2 NTUs at this point. Few juvenile Oncorhynchus mykiss. 2-500 fish per day are passing through. I have seen the first of 1-3 peaks of larval sturgeon the last few days, and numbers are looking good. Capture is in the 50-100 range a day.

Livingston Stone Hatchery Update:

Bill Poytress, USFWS, provided Kaitlin Dunham's, USFWS, Livingston Stone National Fish Hatchery (LSNFH) winter-run Chinook salmon updates. The Keswick trap is being operated once a week. LSNFH is returning all males and retaining females at the target number of 180. Any fish that are returning to the river are being injected with thiamine. They have spawned 88 females from the Keswick trap and 12 females from Battle Creek as well. Anticipate meeting collection goals this year.

USFWS added that 250 fish have been injected with thiamine, primarily females.

Topics for Elevation to Shasta Planning Group:

- No topics to elevate to the Shasta Planning Group.

Adjourn