

March 5, 2019 meeting on Shasta Division elements of the 2019 ROConLTO BA Storage Management and Allocations Logic. Katrina Harrison; Peggy Manza, Jeff Reiker, Russ Callejo, David Mooney, Derek Hilts, Kaylee Allen, Howard Brown, Maria Rea, Garwin Yip; Evan Sawyer (phone Brooke Jacobs, Ken Kundari, Miles Daniels, Eric Danner). **Sarah Gallagher's notes.** Focus was mainly on allocation discussion and Katrina will be following up with written response to unanswered questions

Shasta Storage Management and Allocations Logic

4.7 Allocation and Forecasts:

Q: How are allocation decisions made? *The considerations are listed, but a description of how factors are considered in making those allocations is not described. We need a description to evaluate risk of temperature operations for the duration of the project. How do allocations considerations and decisions differ between north-of-Delta and south-of-Delta allocations?*

Peggy Manza walked through the current forecast process, which begins in Feb or March, integrating the entire system. For the PA tiers are not chosen until May.

Starting with Feb or March operations: Use hydrology from DWR and compare San Luis and Folsom (impaired) and Shasta and Oroville (Unimpaired). Look at delta requirements; salinity issues, Port Chicago data; and reduce outflow if necessary. Mid- month look at what has happened so far with inflow and weather, and then make an estimate for the rest of the month. In Feb and March they are in flood control, so no fish are not considered because normally meeting in stream requirements. Look at releases to maintain storage for flood control and safety. Remove Delta outflow from model, OMR and IE trigger, and export what we can. Depending on how full reservoirs are, decrease exports to state and ramp exports until San Luis is full. Any excess is outflow for the month. Because it is difficult on the pumps to switch back in forth, true up COA balance in the summer.

In April, export restrictions (D1641); use April 15- May 15 for a monthly average to estimate pulse flow period, inflows and releases are stabilized; flood control rule goes up and storage goes up until the end of May when have every reservoir full-the goal. Plug in state and fed flows, instream demand shows up; NOD and riparian users start taking water; and temps warm up. Accretion/depletion from tributaries are taken into consideration to Yuba. Wilkins Slough flow (minimum 5,000 cfs) not needed anymore but water export pipes put in that level. How much do we need to release to meet Wilkins from Shasta, if low, need more than 4,000 cfs; taking warmest water for future temperature control. No specific temperature control needed in April.

May is similar, meet increasing demand; crops planted, no rain; Wilkins slough more of an issue; Balance. As part of forecasting process, look at what state needs and COA. Exchange data with state.

Barb/Derek: are allocations considered in April and what exceedance hydrology is used? 90 and 50, and in extremely wet year, may do 25% if rain doesn't stop. Specific data for each of those forecasts. Accretions are weakest link (the black box). **Derek:** Suggested plotting historical records to see if accretions are changing. **Derek:** Adjusting allocations by a discrete amount could cause contractors to go to ground water, which causes other changes.

Allocation north of delta not done in March or April Sac settlement likely to get 100%, likely 100% to NOD; SOD allocation from San Luis reservoir. Fill San Luis and drain by Sept. How full we get is matter of the forecast. Different allocations based on how full, don't know til do the forecast. How much water is matter of how much is in there. Storage 1 plus deltaS-(exported in) minus export out. Start out with a % allocation, then go through monthly step process, if there is extra when look at EOS, then can allocate. Uncertainty in accretion/depletion makes allocations difficult.

June/July/Aug/Sept continue through the process; average operation making releases for temp control, export to support allocation; EOS sept storage targets; does not mean we don't stop at the end of Sept. Look at say, for example pulled water from trinity, didn't pull as much from Shasta, Folsom is low, doesn't look balance so will put water back to trinity and pulls Shasta down. **Maria-Where does temperature fit in? Peggy: During the hottest month, releases stay higher to reduce instream warming, 10-15 K depending on storage and year type.** Done every month through the summer (same as American). Look at storage in Sept, look at flow patterns to make adjustments to balance or not, consider redd dewatering.

Jeff: Not proposing to run temp models in Feb when res stratification is isothermal. Degree of uncertainty is too high ; output is not useful as a tool. Model is too uncertain and giving it a false. When is temperature model going to be run in PA? Propose in April (caveat not stratified, by May). **Barb, rule of thumb; May 1 storage is good predictor of temp. Are there things that can be done Feb-April, consideration to back off early season release to be in good May 1 storage shape?** Peggy, main priority is filling reservoir (north of delta) on May 31. If at minimum releases and reservoirs not full, minimal pumping. Have had to do that pump on and off to deal with that. **Jeff R.:** What do we do to manage for temp control? Minimum operation is base operation (certain pumping to San Luis within operation) at the end of the day after management system for requirements, is element of water that can be moves south or managed for temp (what do you do with it for spring forecast and what do you do with it afterwards). That last chunk of water. Look at balance for future years, addition movement out of delta held up by COA splits or additional carriage losses through the delta, does it make sense to move it south if tremendous losses, or better held up in storage? Is movement going to affect temperatures in those tiers? **Maria, more broadly looking at the system, deconstruct the system; Are there other things that could come into play, could you do other releases to bank more water at Shasta?** Don't want to come in too high at Sept

Know on May 1 storage based on rule of thumb in Two 2 and 3 storage. Reduce allocations to stay in a tier? Jeff:-proposes a system that will allow cvp and avoid jeopardy to the species. To the extent as there is discretion, we would do that while maintaining a tier that avoids jeopardy. Can Shasta operation be changed or not, what are affects, will cause jeopardy somewhere else? We propose continued existence of the species, if not in a take situation. Mooney; Process to getting to outputs; north of delta that are coming directly from Shasta-low releases projected, if you get heating issue, water gets past redds, then water than can be diverters that get water. Dual purpose. Time series that provided you can look at the function of flow rate and heating. **Maria:** Debate on relationship between agencies 6-8 K was the breakpoint to maintain solar heating. **Jeff:** AG service is 450 K in North of Delta (for the years); Folsom M&I 181-313K;

Derek, CVP incur a debt? Neither party in favor when there is a spill-debts are cancelled. A design debt building, look at leveraging, not intention of COA. Looking at that in drought years. **Jeff-**New coa agreement may have improved south of delta allocations.

Evan: Iterative forecasted adjustment; does any of that apply to meeting temperatures below Keswick and Shasta storage? (*did not capture answer to this*)

4.9.1.2 Spring Pulse Flows:

Q: How often will spring pulse flows occur, and at what duration, magnitude and volume? "Under the Core Water Operation, Reclamation would not release spring pulse flows unless the projected May 1 Shasta Reservoir storage is greater than 4 MAF. If Shasta Reservoir total storage on May 1 is projected to be greater than 4 MAF, Reclamation would make a Spring pulse release as long as the release would not

cause Reclamation to drop into a lower Tier of the Shasta summer temperature management or interfere with the ability to meet other anticipated demands on the reservoir. (pg. 4-27)" **Would similar/the same operational guidance for pulse flows on the American River (section 4.9.4.1) be applied to the Sacramento River?**

Q: What is meant by a "drop into a lower Tier of the Shasta summer temperature management or interfere with the ability to meet other anticipated demands on the reservoir"?

Q: What is the expected effect of the pulse flows [Section 5.6.3.2 (Spring Pulse Flows)] and what is the quantifiable benefit [Section 5.8.3.3.2 (Rearing to Out-migrating Juveniles)]?

Use rule of thumb after putting in forecasting and pulse flows in Feb, do it again in March and look again. April 1, do forecast again and verify with forecast and rule of thumb, can meet temps. .4 million is initial trigger, then rule of thumb. April will verify. **Katrina** is getting stats on how often this may trigger. Initial guess and drop on lower tier. Ensure releasing spring pulse would not cause issues on other demands- **Peggy** says EOS negative impact, and fall habitat flows.

4.9.1.4 Fall and Winter Refill and Redd Maintenance

Q: Please describe how Reclamation will determine fall flows, and the likelihood of winter-run and fall-run redd dewatering occurrence after October 31. (pg. 4-32) "Reclamation will minimize effects with a risk analysis of the remaining Winter-Run Chinook Salmon redds, the probability of sufficient cold water in a subsequent year, and conservative distribution and timing of subsequent Winter-Run Chinook Salmon redds. If maintaining flows puts the subsequent year class at a 10 percent or less risk, Reclamation will reduce releases to rebuild storage."

Q: How is putting a subsequent year class at 10% or less risk determined when maintaining flows? Please clarify as to what 10 percent means. This risk analysis conflicts with other statements in the BA including the (1) inability to determine cold water pool until April, and (2) that "end of September storage shows little ability to modify the tier in the subsequent year" (pg. 5-21).

Katrina: Current thought, at each point in proposed action be using forecasts in October (historical hydrology) end of season storages. Most of the time dropping flows in uncertain period, exceedance level defined in PA? Likely use 90% and 10% is egg mortality model? Katrina is providing a written description.

Takeaways

Maria: We need to look at the species as a whole, and Reclamation looks at system as a whole
Jeff: Ensure we have a viable project, but operate not to jeopardize species; critical to water users provide highest allocations early in the season-meet the commitment. Reclamation doesn't over commit because of cost to water users and fisheries. Maria emphasized using modern forecasting tools; use NOAA architecture and expertise for new tools and better forecast; Years of experience from reclamation but want bring new tools now, pushing envelop using most updated forecasting **Peggy** agreed and said she has greater confidence in runoff and forecasting than even 10 years ago. Maria emphasized not using historic averages to predict –more situation analysis.

Final question was about CVPIA and B2 water-FWS and legal sensitivity around it. Follow up discussion about why it's not in the PA.