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**From:** Cathy Marcinkevage - NOAA Federal <cathy.marcinkevage@noaa.gov>  
**Sent:** Sunday, March 31, 2019 11:22 PM  
**To:** Derek\_Hilts@fws.gov; Evan Sawyer - NOAA Affiliate; Garwin Yip  
**Subject:** Fwd: [EXTERNAL] Shasta and Upper Sac Modeling Questions

These were revisions of questions that Maria posed re: Shasta operations modeling. I asked Rec for answers, which are below.

----- Forwarded message -----

**From:** Harrison, Katrina <[kharrison@usbr.gov](mailto:kharrison@usbr.gov)>  
**Date:** Fri, Mar 29, 2019 at 4:54 PM  
**Subject:** Re: [EXTERNAL] Shasta and Upper Sac Modeling Questions  
**To:** Cathy Marcinkevage - NOAA Federal <[cathy.marcinkevage@noaa.gov](mailto:cathy.marcinkevage@noaa.gov)>, Barbara Byrne - NOAA Federal <[Barbara.byrne@noaa.gov](mailto:Barbara.byrne@noaa.gov)>  
**Cc:** Callejo, Russell <[rcallejo@usbr.gov](mailto:rcallejo@usbr.gov)>, Howard Brown <[howard.brown@noaa.gov](mailto:howard.brown@noaa.gov)>

Hi Cathy -

1. Please clarify whether the modeling (HEC-5Q, presumably) attempted to meet summer temperature thresholds as monthly averages or as daily averages. Additionally, please clarify how Reclamation and the SRTTG intends to operate to meet summer temperature thresholds (as monthly averages, as daily averages, instantaneous minimums, etc.).

The ROC on LTO HEC-5Q modeling included TCD shutter operations to attempt to meet monthly average temperature thresholds. We did this because CalSim is a monthly model. As you know, we did a subsequent analysis looking at meeting it daily for a few specific years and presented that to you on March 12. In the proposed action, Reclamation and the SRTTG intend to meet summer temperature thresholds as daily averages, as it says in the proposed action: "In years when Reclamation determines that cold water pool is sufficient (e.g., more than 2.8 MAF of cold water pool in Shasta Reservoir at the beginning of May or modeling suggests that a daily average temperature of 53.5°F at CCR can be maintained from May 15 to October 31), Reclamation proposes to operate to a **daily average temperature** of 53.5°F at the CCR gaging station to minimize temperature dependent mortality." etc.

2. Please explain how/why the actual frequency of Tier 1 years, Tier 2 years, Tier 3 years and Tier 4 years may differ from what the PA modeling implies (considering CalSim's "perfect foresight"). Please clarify how hydrologic forecasts will be used in implementing the tiers (including what probability of exceedance will be used). Please also clarify how meteorological forecasts will be used in implementing the tiers (including what probability of exceedance will be used).

In real life, we would expect similar frequencies of Tier 1, 2, 3, and 4 years for summer temperature management because they are based on May 1 cold water pool or storage and summer temperature management would be implemented based on the actual May 1 cold water pool, after May 1. Reclamation would use the same % forecast we are using for all the operational planning and allocations, generally 90%, to predict what tier we will be in for planning purposes in the spring. But, keep in mind, once we get to implementing, we will know the actual May 1 cold water pool and storage.

3. Please indicate whether the forecast of 4.0 for Shasta storage on May 1 will be based on a previous month's forecast. If so, which month, and at what level of confidence (e.g., 90% exceedance)? Is there any "real-time" weather or runoff forecast information from NOAA being considered?

For implementation of spring pulse flows, if the projected May 1 Shasta Reservoir storage is greater than 4 MAF, Reclamation would consider a spring pulse. Reclamation would use the same % forecast we are using for all the operational planning, generally 90%, to predict May 1 storage and whether or not to do a spring pulse. In the revised BA we added a decision tree - we would use the February 90% exceedance forecast to predict May 1 storage to determine whether we would consider releasing a March spring pulse. March 90% exceedance to determine whether we could release an April spring pulse. Etc. The frequency of spring pulse flows on the Sacramento River would be lower in real life than predicted under the modeling, because spring pulses would be released in the spring, based on forecasted May 1 storage. "Real-time" weather or runoff forecast information from NOAA is considered as part of the runoff forecast.

4. Please provide justification for the use of May 1st for the 4.0 Shasta storage prediction level. This seems very early in season for storage prediction, and could have the effect of minimizing the relationship between storage and cold water. June 1 or July 1 are also relevant to evaluate.

Reclamation is intending to avoid releasing spring pulse flows that are needed for cold water pool management in the summer, as our assumption is that temperature dependent egg mortality is a critical factor for Winter-run Chinook salmon, and so spring-pulse flows for other species are lower priority than Winter-run Chinook salmon temperature dependent egg mortality. Therefore, we are intending to only release Spring pulse flows if we are in decent cold water pool conditions in Shasta Reservoir. As shown by Figure 4-2 in the BA, at a May 1 Shasta storage of 4.0 MAF, we expect to be able to meet 53 degrees F at CCR from May to October based on our rule of thumb.

5. The current RPA allows for flexible locations of temperature compliance from Clear Creek to Jelly's Ferry. What does the COS temperature modeling output assume about these choices and flexibilities?

The COS temperature modeling uses the SRTTG temperature shutter approach which is the same approach that was used for the LTO EIS and other Reclamation studies. The COS temperature modeling assumptions account for these choices and flexibilities. As stated in the 2015 LTO EIS (link below), "This modeling approach does not dynamically change the compliance location that in reality changes throughout the year based on the SRTTG recommendations. While the temperature release targets would not change using for the year with this modeling logic, the logic recognizes that those temperature release targets will not be possible to meet in each year due to changes in Shasta Lake storage and meteorological conditions. If modeled Shasta Lake releases are

lower than the temperature target, then it could be considered that the compliance location was moved downstream. In addition, if Shasta Lake releases are higher than the temperature target, the it could be considered that the compliance location was moved upstream. ” Please refer to 6B.C.11 of the 2015 LTO EIS for further detail.

[https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc\\_ID=23711](https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc_ID=23711)

On Wed, Mar 27, 2019 at 9:41 PM Cathy Marcinkevage - NOAA Federal <[cathy.marcinkevage@noaa.gov](mailto:cathy.marcinkevage@noaa.gov)> wrote:

Katrina --

Could we get answers to the following questions? Some may have been covered in meetings with Jacobs/Reclamation, but we wanted to get some written explanation to better clarify our understanding.

Thanks -  
Cathy

1. Please clarify whether the modeling (HEC-5Q, presumably) attempted to meet summer temperature thresholds as monthly averages or as daily averages. Additionally, please clarify how Reclamation and the SRTTG intends to operate to meet summer temperature thresholds (as monthly averages, as daily averages, instantaneous minimums, etc.).
2. Please explain how/why the actual frequency of Tier 1 years, Tier 2 years, Tier 3 years and Tier 4 years may differ from what the PA modeling implies (considering CalSim's "perfect foresight"). Please clarify how hydrologic forecasts will be used in implementing the tiers (including what probability of exceedance will be used). Please also clarify how meteorological forecasts will be used in implementing the tiers (including what probability of exceedance will be used).
3. Please indicate whether the forecast of 4.0 for Shasta storage on May 1 will be based on a previous month's forecast. If so, which month, and at what level of confidence (e.g., 90% exceedance)? Is there any "real-time" weather or runoff forecast information from NOAA being considered?
4. Please provide justification for the use of May 1st for the 4.0 Shasta storage prediction level. This seems very early in season for storage prediction, and could have the effect of minimizing the relationship between storage and cold water. June 1 or July 1 are also relevant to evaluate.
5. The current RPA allows for flexible locations of temperature compliance from Clear Creek to Jelly's Ferry. What does the COS temperature modeling output assume about these choices and flexibilities?

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