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**From:** Eric Danner - NOAA Federal <eric.danner@noaa.gov>  
**Sent:** Friday, December 7, 2018 10:23 AM  
**To:** Miles Daniels - NOAA Affiliate  
**Subject:** Re: Shasta temp modeling effort

I think it is a good idea.

On Fri, Dec 7, 2018 at 9:53 AM Miles Daniels - NOAA Affiliate <[miles.daniels@noaa.gov](mailto:miles.daniels@noaa.gov)> wrote:  
Hi Eric,

I passed on some information to Sara Gallagher about Mike Deas' modeling efforts below. She is wondering if we can do a call sometime to explain more about this with Maria, Garwin, and her. What do you think?

-Miles

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

**From:** Sarah Gallagher - NOAA Federal <[sarah.gallagher@noaa.gov](mailto:sarah.gallagher@noaa.gov)>  
**Date:** Fri, Dec 7, 2018 at 9:47 AM  
**Subject:** Re: Shasta temp modeling effort  
**To:** Miles Daniels - NOAA Affiliate <[miles.daniels@noaa.gov](mailto:miles.daniels@noaa.gov)>

Miles, Thank you for the thoughtful reply. This is very helpful for my understanding of the model.

I didn't give you much time to respond before I needed to give my update earlier this week, but I knew that I had enough information to give at least a brief overview. My update was part of a larger discussion with Maria and Garwin in preparation for ROC LTO.

After our discussion, we thought it would be best to have a call/webex meeting with you and Eric to get an overview on efforts for the CVTemp models, and the Dea's model. You both have a great way of explaining and simplifying your technical work, and I think it would be most effective to hear directly from you. The audience would be Maria, Garwin, and me, and possibly another person or two involved in Shasta ops.

Would this be something you could do? And if so, about how long would you need so I can work on getting something scheduled?

Thanks so much, Sarah

On Thu, Dec 6, 2018 at 4:28 PM Miles Daniels - NOAA Affiliate <[miles.daniels@noaa.gov](mailto:miles.daniels@noaa.gov)> wrote:  
Hi Sarah,

Sorry for the slow reply. Yes, happy to provide some initial feedback. As you mentioned, the model is still being developed and so I'll have to wait to have a more detailed look at the model before giving any final opinions. Thus far, I have really only seen slides. I'm hoping there will be more details in any report put out.

Overall, I think the modeling efforts are making good steps to better understanding how the temperature dynamics of Shasta and Keswick Reservoir operate. A few main points from the work are outlined below.

1) Having a physical model of Keswick Reservoir is an improvement. The error statistics shown for this portion of the model indicate it operates well (often < 1 Deg F for Keswick discharge temperature). However, thermal dynamics of Keswick Reservoir are much simpler compared to Shasta Reservoir.

2) The improved geometric representation of Shasta Reservoir (i.e. finer spatial resolution) built from USGS topographic maps is an improvement. However, to date, it seems that there has not been any error analysis to evaluate how much the finer resolution geometry improves the modeling. As with most models, there is a trade-off between resolution and computational efficiency.

3) The representation of the TCD on Shasta using three point/line sinks compared to one for each gate elevation seems like a logical step to better represent flow and temperature dynamics through the TCD gates. However, as mentioned in the calls, assuming equal flow through each point sink for a given elevation, might not be the most valid assumption. Assessing this choice of this component of model structure will also need to be evaluated more in my opinion.

5) Using the adapted blending algorithm (original from USGS) to portion flow through the TCD when more than one elevation is being accessed needs more clarification. For example, if flow between two TCD elevations are independent of the number of shutters open at each gate (I'm not saying this is the case, but this is unclear at this point), this may cause some problems for how the model used to assess historic and forecasted TCD operation.

Let me know if you would like further clarification on any of these items.

Good luck with the update,  
Miles

On Mon, Dec 3, 2018 at 2:39 PM Sarah Gallagher - NOAA Federal <[sarah.gallagher@noaa.gov](mailto:sarah.gallagher@noaa.gov)> wrote:  
Hi Miles,

I work with Garwin Yip in the Water Ops Division at the CVO, and have been participating in the Upper Sac Technical Modeling Group calls over the last year. I have been asked to give an update on the status of the Shasta temperature model and was hoping to get some feedback from you.

I have a decent understanding of the model's purpose (information going into it, some of its limitations, and the current status) but I don't have enough technical expertise to know what limitations it may have or how well it will perform when finished.

Are you supportive of the model or have any thoughts what works or doesn't that you could share me? Maybe the answer to this until the model is actually complete.

Thanks for any insights you can provide. I am available by phone too if that works better for you.

**Sarah Gallagher | Fish Biologist**

*NOAA Fisheries | West Coast Region*

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