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**From:** Miles Daniels - NOAA Affiliate <miles.daniels@noaa.gov>  
**Sent:** Thursday, April 4, 2019 10:37 AM  
**To:** Evan Sawyer - NOAA Affiliate; Eric Danner - NOAA Federal  
**Cc:** Cathy Marcinkevage - NOAA Federal; Garwin Yip; Howard Brown; Barbara Byrne - NOAA Federal  
**Subject:** Re: Physical drivers  
**Attachments:** Shasta\_Release\_Storage\_Summary\_WYT.png

Hi Evan,

Responses to your questions below, but please let us know if you want to talk more.

Q1: I would describe these figures as the distribution of differences between the PA and the COS stratified by month and WYT.

Q2: This question could be answered in a few different ways, but at its core, the increased Shasta storage is coming from the reduction in Shasta releases. It difficult to infer this relationship in the boxplot figures we had sent out as they are not showing the temporal relationship between Shasta storage and Shasta release. For example, if we looked at a time series (attached) we can see how the reduction in release correlates exactly to an increase in storage. In this plot annual releases are converted to units of TAF so that can be compared directly with changes in annual Shasta storage in TAF, with release on the left Y-axis and storage on the right Y-axis for differences between the PA and COS. The question of how releases are able to be reduced might be better suited for USBR, however, I think you are correct in assuming a portion of this can be attributed relaxation of the Fall X2 requirement.

-Miles

On Tue, Apr 2, 2019 at 3:52 PM Eric Danner - NOAA Federal <[eric.danner@noaa.gov](mailto:eric.danner@noaa.gov)> wrote:

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

**From:** Evan Sawyer - NOAA Federal <[evan.sawyer@noaa.gov](mailto:evan.sawyer@noaa.gov)>  
**Date:** Tue, Apr 2, 2019 at 3:49 PM  
**Subject:** Re: Physical drivers  
**To:** Eric Danner - NOAA Federal <[eric.danner@noaa.gov](mailto:eric.danner@noaa.gov)>  
**Cc:** Cathy Marcinkevage - NOAA Federal <[Cathy.Marcinkevage@noaa.gov](mailto:Cathy.Marcinkevage@noaa.gov)>, Garwin Yip - NOAA Federal <[Garwin.Yip@noaa.gov](mailto:Garwin.Yip@noaa.gov)>, Howard Brown - NOAA Federal <[howard.brown@noaa.gov](mailto:howard.brown@noaa.gov)>, Barbara Byrne - NOAA Federal <[barbara.byrne@noaa.gov](mailto:barbara.byrne@noaa.gov)>

Hey Eric,

Thanks for this. I have a couple of interpretations and questions:

- How would I describe these figures? Is it average difference (COS v PA) in Shasta storage (or Y-axis variable) by month and WYT over the course of the 82 year CalSim II record.

- Where does the increased Shasta storage come from? Shasta storage (page 2) shows an increased average storage Jan - May (maybe even all year) for BN, D and C years, as well as large storage increases Sept - Dec of W and AN years. But Keswick flows (page 4) only shows a decreases in flow (which I'm assuming as a surrogate for Shasta releases) in September and November of W and AN years. Is all the storage benefit "built" by reduced flows in September and November of W and AN years? Asked another way, for the COS what drives the high releases in September and November of W and AN years? I've heard the decreased September and November flows are attributed to Reclamation not implementing a fall X2 but I don't know? If that's the case though, recent discussions between FWS and Reclamation regarding adding back in a Fall X2 or an alternative could be problematic because it would "use" this water because it could potentially wipe out the Shasta storage benefit.

Thoughts on questions/interpretations?

Thanks,

Evan

On Tue, Apr 2, 2019 at 2:12 PM Eric Danner - NOAA Federal <[eric.danner@noaa.gov](mailto:eric.danner@noaa.gov)> wrote:

Hi Cathy and Evan.

Attached are updated plots and data that also include Shasta storage and Keswick release volume for the PA and COS.

Eric

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