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From: **Deirdre Des Jardins** <ddj@cah2oresearch.com>
Date: Tue, May 7, 2024 at 12:14 PM

Subject: Re: DYK: Limitations of CALSIM model in representing reservoir operations with climate change?

To: Henderson, Jeff@DeltaCouncil <Jeff.Henderson@deltacouncil.ca.gov>
Cc: Pearson, Jessica@DeltaCouncil <Jessica.Pearson@deltacouncil.ca.gov>, Mullin, Erin@DeltaCouncil <Erin.Mullin@deltacouncil.ca.gov>, Dante Nomellini, Sr. <ngmplcs@pacbell.net>, Dante Nomellini, Jr. <dantejr@pacbell.net>, Brett Baker <brettgbaker@gmail.com>, Herrick, John @aol.com <jherrlaw@aol.com>

Thanks so much for this response, Jeff.

I also had a question about how equity and public interest / public trust considerations were evaluated in the Delta Adapts recommendation on modifying water quality standards, which was presented at the March Delta Stewardship Council meeting:

The next strategy is to review and consider modifying water quality standards to develop climate informed objectives for agricultural uses, fishing, recreational, tribal, and other human beneficial uses of water. The lead for this would be the State Water Resources Control Board.

The Delta Adapts Vulnerability Study Equity Technical Memorandum refers to the Water Supply Technical Memorandum for drought impacts. That memorandum states on p 6-5:

The potential impact of climate change on DWR's ability to meet these water quality standards and agreements requires further investigation. If substantial changes were made to the infrastructure and regulatory requirements, salinity could penetrate deeper into the Delta during summer and fall months, especially in drier years, and impact in-Delta water users' ability to divert water.

This assessment does not quantify potential vulnerability of in-Delta water users since modeling uses current regulatory requirements. Modeling up to two feet of sea level rise also projects that in-Delta regulatory requirements can be maintained in most year types.

In the Water Supply Reliability focus group I tried to ensure that there were proper considerations of equity issues and the public interest /public trust. Delta water agencies were also advocating for adequate Delta water quality for Delta agricultural uses. We did recommend that needed studies of more conservative reservoir operations for drought be done (see attached summary from Meeting #2.) While modifying water quality standards was discussed, most focus group members were not in favor of it as a strategy. From the summary of Meeting #2:

Modify Regulations:

- In general, most focus group members were not in favor of this adaptation strategy

- Modify Water Quality Standards in the Delta to Preserve Reservoir Water
    - Discussion:
        - ♣ Reducing water quality in the Delta is kind of going away from the historical system; we don't want to lose the fact that there is an inherent mismatch; don't think we should change regulations before figuring what we are going to do with less water to meet current regulations
        - ♣ Part of Delta Reform Act Water code 85023; framework of power – frame of reference to a single interest (moral values of our legislature) Delta is not being managed this way
        - ♣ Water code section 106 also says: "It is hereby declared to be the established policy of this State that the use of water for domestic purposes is the highest use of water and that the next highest use is for irrigation." Bottom line, the uses of limited supply must be balanced; Some challenges are not related to exports, some are from upstream diverters
        - ♣ Balancing needs to meet existing standards and rights THEN increasing exports
        - ♣ Changing standards in this way may not be possible
        - ♣ Projects were built to protect water quality in the Delta, multiple benefits as conditions of approval
        - ♣ On[ce] reducing exports to a safe minimum has been done, but we have to do more beyond that. We can't rely on reducing exports
- Modify Water Quality Standards in the Delta to Increase the Use of Reservoir Water Supplies
    - Example potential actions:
        - ♣ More restrictive water quality standards to protect, restore, and enhance the Delta Ecosystem that has taken a disproportionate impact due to less advocacy and for ag use
    - Discussion:
        - ♣ Require adequate carryover storage for multiple dry years

Clearly something happened when the focus group recommendations were synthesized. I'm wondering how a strategy that was not favored by most Water Supply Reliability focus group members ended up getting carried forward to the draft recommendations? And why the strategy wasn't brought back to the focus group for further discussion / input?

Thanks

On Mon, May 6, 2024 at 12:32 PM Henderson, Jeff@DeltaCouncil <Jeff.Henderson@deltacouncil.ca.gov> wrote:

Deirdre,

My apologies for our delayed response to your question.

We are aware of the limitations you highlighted in the CalSim model. The model weights you referenced in your email, or *Table 4.12 Water Use Priorities*, are an outgrowth of reservoir management policy decisions made by the Department of Water Resources, and they are outside of the Council's ability to adjust. However, we do recognize the need to address this. Strategy WSR-4 of Delta Adapts includes a priority action for improving water supply and demand forecasting models. We don't call out CalSim specifically because the strategy is directed to all reservoir operators, and not all reservoir operators use CalSim.

It's our intent, once the Delta Adapts Adaptation Strategy document is completed, to turn our focus to the data gaps and adaptation needs therein. We look forward to working with you and other stakeholders on this and the other areas identified through this process.

Thanks for your inquiry.

Jeff Henderson (He/Him/His)

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From: Deirdre Des Jardins <ddj@cah2oresearch.com>
Sent: Wednesday, March 6, 2024 1:30 PM
To: Henderson, Jeff@DeltaCouncil <Jeff.Henderson@deltacouncil.ca.gov>; Ross, Harriet@DeltaCouncil <Harriet.Ross@deltacouncil.ca.gov>
Cc: Madueno, Virginia@DeltaCouncil <Virginia.Madueno@deltacouncil.ca.gov>

Subject: DYK: Limitations of CALSIM model in representing reservoir operations with climate change?

Dear Jeff and Harriet,

I'm writing to you because of your facilitation of the Delta Adapts Water Supply Reliability focus group.

The Delta Stewardship Council didn't explain the limitations of the CALSIM model in representing reservoir operations with climate change in the focus group meetings, and I wanted to inquire if you understand those limitations.

In 2010, DWR's chief modeler, Francis Chung made a presentation to the California Water and Environmental Modeling Forum on the BDCP modeling, in which he commented:

The relative frequency of dead storage conditions in upstream reservoirs indicate that significantly modified operations will be required with climate changed conditions." Chung made the following recommendations:

Recommendations

- We recommend that DWR develop a reoperation strategy for the CVP and SWP that includes modified operations scenarios to mitigate the effects of dead storage during climate change conditions prior to release of any studies (either these or BDCP) that include climate change.
- We recommend that economic modeling and results be completed and included with prepared information.

See https://cah2oresearch.com/2021/05/10/dwr-chief-engineer-warned-of-climate-change-draining-northern-california-reservoirs/

The issue has never been addressed, although California Water Research has championed it for over a decade.

It's buried fairly deep in the CALSIM model, but this is the problem.

The CALSIM II model weights prioritize meeting SWP and CVP export deliveries over meeting reservoir carryover storage targets, and as a result the need for increasing outflow to repel salinity the Delta drains the reservoirs to dead pool. This was discovered in the first climate change studies by DWR (See attached excerpt from 2006), and DWR's modelers confirmed on cross-examination in the WaterFix hearing in 2016 hat the prioritization was the same. My understanding is that the model weights in CALSIM III have not changed.

Table 4.12. CalSim-II Water use Prioritization

First Priority	Prior right water users, minimum in-stream flow requirements, WQCP requirements
Second Priority	SWP Table A contractors, CVP contractors
Third Priority	Reservoir storage for the next year (carryover)
Fourth Priority	SWP Article 21 deliveries

In 2006, DWR's modelers wrote:

While CVP and SWP contractor deliveries take precedence over next year's storage, a balance between the two is struck in the allocation decision. During the winter and spring, the SWP and CVP decide how much of contractor demand can be met for the year based on available storage and forecasted runoff. Part of the allocation decision is to ensure that enough water is left in storage at the end of the year in case of impending drought. Once the allocation decision is made though, deliveries to meet that allocation take priority over maintaining the storage carryover target.

Given this simple explanation of prioritization, there are two types of shortages in CalSim-II. One is an acceptable, though not desirable, result of making water allocations based on imperfect forecasts. In wetter years, the SWP and CVP sometimes allocate more south-of-Delta (SOD) deliveries than can be delivered through the pumps due to various export constraints. For the base and four climate change scenarios, this type of shortage is infrequent and, compared to total annual deliveries, insignificant. This type of shortage is also implicitly included in the delivery analysis; if it's not delivered, we don't count it.

The other type of shortage is usually unacceptable. This is when the first priority obligations – prior right contracts, minimum in-stream flow requirements, Delta requirements – are not met. The only way for this shortage to occur in CalSim-II is for one or more North-of-Delta reservoirs to be drawn down to dead storage. At this point, the model has lost control of meeting the watershed's most basic needs not to mention the lawful obligations of the CVP and SWP. Such a simulation is broken. The lower priority metrics are questionable: Could the shortage of high priority water uses be avoided at the expense of lower priority uses through some simple changes in operating rules? And the results of a broken simulation can not be confidently compared to an unbroken simulation.

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"We aren't just failing to address the growing climate crisis to come; we're unprepared even for the impacts already here—in part because they keep surprising us with their intensity and in part because we can't seem to fathom our genuine vulnerability." – David Wallace Wells
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