From: Laurel G Larsen <laurel@berkeley.edu>
Sent: Tuesday, September 10, 2024 8:58 AM
To: disb@deltacouncil.ca.gov

Subject: Expert elicitation workshop on dimensions of uncertainty in CalSim3

Dear Delta Independent Science Board members,

On September 20, from 1-5 pm via Zoom, I will be holding a workshop targeting self-identified CalSim3 experts, which includes model users, data users, and people who consider themselves highly informed about the model because they have participated in critical reviews or have needed to learn about the model in detail for advocacy purposes. In the workshop, we will be conducting a detailed evaluation of the dimensions of uncertainty associated with the model's core assumptions and how that uncertainty might impact use of the model for multibenefit planning purposes (including DMDU).

Please accept the invite and register your attendance via the Google form linked below if you can participate. Provisional results will be presented at the Bay Delta Science Conference and will contribute to a manuscript on uncertainty in water system planning models.

ACTION ITEMS FOR THOSE INTERESTED IN PARTICIPATING

1. OPTIONAL (now): Review the list of assumptions that we will tentatively be evaluating below, and let us know if you have feedback on these or would really like to see us evaluate additional assumptions.
2. Register for the workshop on this Google form. Registration is free, but confirming via the link will ensure we have a finalized email list of participants. Feel free to share the invite and registration link with others.
3. Cheryl Schwab will follow up with registrants with a pre-workshop survey and consent form for participation in the research.
4. Read the correspondence (copied below) that was originally sent to targeted workshop participants for additional information about the study.

Thank you!

Tentative list of assumptions for evaluation:

Goal for evaluation: Assumptions should be evaluated with respect to the use of CalSim 3 for evaluation of multiple benefits and tradeoffs associated with potential climate and operational futures.

1. Monthly time steps are sufficient for both water supply reliability and water quality and ecological impacts analysis over multi-decadal time scales.
2. Each hydrologic year is functionally independent from all others. Hence, historical hydrologic years can be resampled in a different order. *(There is no meaningful serial correlation of annual input hydrology or CalSim results. In other words, the sequence of wet and dry years does not materially affect the outcomes of the model*.)
3. The historical hydrologic record represents sufficiently variable year types (wet/dry) and sequences of events within years (timing of droughts and floods) to serve as the basis for potential future hydrology through perturbation to match distributions of projected event magnitudes.
4. A fixed level of development, which includes land use and infrastructure, is assumed. Static land use is appropriate for representing demands for agriculture, and static demands are also appropriate for managed wetlands and urban land use. (*Cropping and land use practices cannot change from year to year*.)
5. Infrastructure/facility configuration and operating policies are static throughout the simulation.
6. Model results are reliable and credible for future period projection without a comprehensive calibration/validation of historical model performance. (*The static "level of development" framework in which CalSim is implemented and adjustments of historic hydroclimatic inputs to represent stationary conditions precludes consistent, structured, and comprehensive comparison to the observational record in a way that would support model corroboration (validation, calibration, establishing credibility, etc)*.)
7. A one-dimensional hydrodynamics model, DSM2, appropriately represents the distribution of salinity at regulatory control points in the Delta, and the results of DSM2 are appropriately represented in an artificial neural network (ANN) that relates operations and hydrology to Delta salinity conditions on a monthly timestep.

8. Demand units are the most appropriate scale at which to assume uniform agricultural practices and related water use.(*Demand units are assumed to represent homogeneous groups of water users that collectively capture dominant patterns in how water is demanded, allocated, and returned through the Sacramento-San Joaquin River system.*)
9. All demands (ag, urban, and refuge) are assumed to be met. Demands that cannot be met through surface deliveries are assumed to come from groundwater pumping. (*Aquifer shortages do not curtail groundwater pumping amounts. Water budget calculations within demand units do not reflect temporary conservation measures or reductions in allocations that may occur during times of shortage*.)
10. For Valley watersheds, field-scale runoff, root-zone soil moisture, and deep percolation are assumed to be independent of water allocations or sources of water that are dynamically simulated in CalSim 3.0, as the hydrology models are run prior to CalSim.
11. Closure terms are necessary for appropriate representation of system water balance and operations. (*Closure terms, applied to control points within the CalSim 3 domain with good historical records, correct errors in the estimates of rim inflows and valley-floor dynamic hydrology*.)
12. Select sub-monthly phenomena can be represented appropriately using daily scaling factors derived from historical flow data (weirs in Sacramento basin) or by applying sub-monthly accounting (pulse flows).
13. The growing season is assumed to be constant over the years and uniform across the Sacramento Valley.
14. Hydropower priorities and temperature management in operations are not sufficiently impactful at a monthly time step to be represented in the model.
15. Pre-1914 water rights are not comprehensively and explicitly represented across the CalSim domain except for when they are part of a settlement contract. Delta island demands are another exception – these demands are represented with high priority and are not subject to curtailments.
16. It is assumed that the rural population located outside public water agency service areas is self-supplied from groundwater. Rural demands are estimated from the rural population times an assumed use of 271 gallons per capita per day, based on the 2013 Water Plan Update.

17. All areas of the Central Valley not designated as agriculture, urban, or managed wetlands are assumed to be native vegetation for demand purposes. This includes open water, riparian vegetation, and grasslands.

Original email about the project (for reference):

Dear Colleagues,

As a complement to the COEQWAL project that aims to explore and document tradeoffs associated with alternative water futures for California, we will be conducting research to document the dimensions of uncertainty associated with the assumptions underlying the water planning model CalSim 3. Goals of the research are to enhance transparency and dialogue around the use of the model for water planning and highlight areas where high uncertainty, coupled with high sensitivity, point to priorities for future improvement of the model.

The assessment was inspired by similar studies in the discipline of postnormal science--science in support of high-stakes issues under conditions of high uncertainty (e.g., Boone et al. 2010). One of the tenets of postnormal science is that uncertainty is a given, so rather than focusing on revealing "truth," scientific analyses should be focused on "quality," as assessed by a diverse and extended community of peers.

We intend to conduct an expert elicitation workshop to evaluate the uncertainties associated with the assumptions of CalSim3 and their likely impacts for certain uses of the model. For workshop participants, we will be targeting both **users** (current/past modelers) of CalSim or **informed consumers** who have needed to familiarize themselves with the model for purposes of advocacy, critique, and/or use of model results. We do not expect participants to consider themselves "experts" in all or any aspects of CalSim3, but they should be generally familiar with the model and how it is used. The workshop will take place sometime in **Fall 2024.** Intended outputs will be a scientific paper, briefings to the agencies that use CalSim3, and communications on the COEQWAL website. We also plan to conduct a similar evaluation on the SacWAM model and potentially others.

Based on your known experience with CalSim, we hope you will be interested in learning more. If you agree, we will follow up with a formal recruitment email with additional information about your potential participation, a survey for possible workshop dates, and an opportunity for you to contribute feedback on who we plan

to engage with and the assumptions we intend to evaluate. **Please let us know by replying to this email if you are interested in receiving further communications about this project.**

Sincerely,

Laurel Larsen and Cheryl Schwab

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