Utah Lake Water Quality Study
Science Panel Call #15
Call Summary
September 15, 2020

This document includes a list of future meetings, action items, and a brief summary of the discussions. Please review the action item list for tasks assigned to you and/or the Science Panel in general. A list of attendees can be found at the end of the document.

Upcoming Meeting/Call	When & Where	Suggested Agenda Items
• SP Call #16	TBD; Zoom	○ Update on and discussion of Steering Committee Management Goals ○ Update on first-round research projects ○ Continued development of Analysis Report ○ Update on TSSD mesocosm project ○ EFDC and WASP Scope of Work development

I. Action Items

Meeting Summaries	Who	Due Date	Date Completed
1. Share draft meeting summary	Facilitation Team	Sept. 23	Sept. 23
2. Review and share comments on summary	Science Panel	Sept. 30	
3. Finalize summary and post to Dropbox	Facilitation Team	Oct. 2	
Assessment of Models	**Who**	**Due Date**	**Date Completed**
4. Develop final draft Model Limitations Memo for SP review	DWQ	Sept. 28	
5. Share final draft Model Limitations memo and initiate prioritization task	Facilitation Team	Sept. 28	
6. Review draft Model Limitations memo and complete prioritization	Science Panel	Oct. 5	
7. Develop draft model scope of work for Science Panel Review	DWQ	TBD. Late Oct./early Nov.	

Atmospheric Deposition	**Who**	**Due Date**	**Date Completed**
8. Develop a structure or naming structure to the research plan	Theron Miller	Sept. 30	
9. Provide questions/comments on WFWQC SAP as appropriate	Science Panel	TBD	
Updates on Other ULWQS Elements	**Who**	**Due Date**	**Date Completed**
10. Develop potential list of scientists to bid on Littoral Sediment and P-Binding RFPs	Science Panel	Sept. 22	
11. Review draft Analysis Report and Utah Lake Data Explorer and provide comments	Science Panel	Sept. 30	
12. Release final P-Binding RFP	UDWQ	TBD (*SC approved*)	
13. Coordinate and schedule call with the independent members of the Science Panel to evaluate Littoral Sediment proposals	Scott Daly	Oct. 9	

II. Decisions/Approvals

This section provides an overview of decisions made by the Science Panel during the call; related key discussion points can be found below in the document. In this call, no formal decisions were made.

III. Meeting Recording

Recordings of the meeting (also available on the DWQ website in the near future) can be found at the following link. https://www.youtube.com/watch?v=O6010mR7o2I

IV. Key Discussion Points

EFDC and WASP Model Findings

- Nick von Stackelberg, DWQ, provided an overview of the EFDC model framework including important parameters and inputs for model construction, current performance of the model relative to observed conditions, and recommendations for future model refinements.
- Juhn-Yuan Su, University of Utah, presented an overview of the final WASP model deliverable to DWQ and summarized significant components of the model inputs, modifications made in response to Science Panel comments following the March meeting, sensitivity of important parameters, structural limitations, and current model performance.

- Science Panel discussion raised a question of appropriateness of the phytoplankton groups included in the WASP model, specifically Synechococcus, with their ability to adequately represent toxin production from non-nitrogen fixers as a whole.

Assessment of Models – Identification of Model Limitations

Presentations:

- Nick von Stackelberg gave an overview of the session and described the process for including the results of this session into a future model scope of work for a contractor to support the Science Panel in running the model.
- Dr. James Martin, Science Panel, led a presentation and discussion to identify and describe additional limitations related to model structure and performance. Dr. Martin gave an overview of the limitations discussed at the March 2020 Science Panel meeting, described additional limitations identified during review of the draft April 2020 model report, and described how existing information, ongoing studies, and future study may inform them.

Chat Box Exchanges:

- The following comments were provided in the chat box by the public and model development team during the presentation and associated Science Panel discussion:
  - Renn Lambert (question for Juhn Yuan Su): Are you running a parallelized version of WASP? If so, how many cores are you using for the run? It looks like it was run on a server?
    - Juhn Yuan Su: I did not run the Utah Lake WASP under the parallelized version as I seem to NOT be able to run the Linux Version of WASP. (I have run the Utah Lake WASP through the university (*through the university's CHPC windows server.)
  - David Richards comment: Retention time is a critical question
  - Juhn Yuan Su comment: The pH and alkalinity issues were observed with the Jordan River WASP back in WASP Version 8.1 when incorporating benthic/macro algae, which Versions 8.2 and above seem to NOT exhibit such issues. On the other hand, the Utah Lake WASP seems to exhibit issues with pH and alkalinity (likely due to wetting/drying mechanisms, but could be other factors), yielding pH values of nearly 14 and alkalinity of over 10^20 mg/L as CaCO3."
  - Juhn Yuan Su comment: Has there been literature review conducted over the cyano toxin production for other systems (e.g., other lakes) and model applications that one can potentially reference for the Utah Lake exercise? I am thinking that there may be previous research over this work.
  - Juhn Yuan Su comment: To Dr. Martin's discussion of the overprediction of TP observed with the Utah Lake WASP: For the overprediction of TP, I have attempted looking into the mass balance of TP for reviewing such performance by the Utah Lake WASP, which such analyses seem to suggest that the sediment diagenesis inputs, atmospheric deposition data from Brahney (2019), and the losses of TP (e.g., adsorption of orthophosphate to water column solids, etc.) appear to exhibit significant effects upon the TP concentrations (some of such provided in the model sensitivity analyses plots in Appendix A of the model calibration report). Meanwhile, I have attempted altering the model inflows (e.g., data sources, TP vs. DP speciation, etc.) for the Water Year 2009-2013 run as well to see if such modifications help with the overprediction of TP. Such modifications seem to help simulate lower TP concentrations by the Utah Lake WASP as

compared to the measured data, but such overprediction appears to still be observed. Hence, I do think that the performance of TP by the Utah Lake WASP can be revisited for reviewing the approximations, model inputs, etc. that further contribute to the overprediction of TP.

- Juhn Yuan Su comment: One approach that I can think of regarding the incorporation of calcite vs. iron-bound phosphorus into WASP involves developing 2 solids classes, with 1 attempting to resemble calcite and 1 attempt to resemble iron, and specifying adsorption coefficients of orthophosphate to water column solids to each group followed by simulating solids transport (for attempting to address calcite scavenging) for such solids groups. I am not sure if one can add such modules into WASP for including calcite scavenging, along with calcite vs. iron bound phosphorus,, especially given that the source code of WASP is not provided.
- David Richards comment: Very good job on model development. Food-web models usually are not same as effects of biota on nutrient dynamics. Food webs typically address "what eats what", not how biota effect nutrients, e.g. chironomid larvae effects on P availability via tubes and oxygen levels. I would call it a FoodWeb/Nutrient Dynamics Model.
- David Richards (question for Juhn): Are you assuming no spatial autocorrelation (e.g. kriging not a good fit) for sediment digenesis?
    - Juhn Yuan Su: The spatial interpolation is applied for populating the inputs into the sediment diagenesis (e.g., initial POP sediment condition, prescribed SOD flux, benthic DIP and ammonia flux, etc.). I did not look into such spatial autocorrelation into the distinct interpolation techniques for the Utah Lake work, but I do suspect that such spatial autocorrelation seems likely for kriging (and hence may contribute to the performance of kriging as compared to natural neighbor, splining, IDW, etc.). I have reviewed and conducted analyses over the distinct spatial interpolation methods back during my M.S. studies at the University of Texas at Austin.
- David Richards (question for Juhn): Does phytoplankton maximum growth rate include grazing by zooplankton? Zooplankton grazing can increase phytoplankton growth rate.
    - Juhn Yuan Su: I did NOT include phytoplankton grazing by zooplankton due to the need of data for the Utah Lake WASP, including zooplankton population (one value per Utah Lake WASP) and grazibility per phytoplankton group. Such processes can be visited for seeing such effects upon phytoplankton performance by the Utah Lake WASP.
- David Richards (question for Nick): Why not incorporate variability from all evapo-transpiration models?
    - Nick von Stackelberg: I did not test the sensitivity of the EFDC model to the various ET formulas. My recommendation moving forward is to use the more recent, higher resolution inflow data to revisit the appropriateness of the Priestley-Taylor ET formulation to Utah Lake.
- David Richards comment to James: Retention time estimates are critical. It is likely that blooms will mostly be determined by retention time even at very low nutrient levels in the lake. Thanks!

<u>Atmospheric Deposition</u>

- Dr. Theron Miller provided an overview of changes made to version 4 of the Standard Operating Procedures in response to Science Panel comments received in May 2020. Dr. Miller showed a

document on the screen highlighting the difference between version 4 and version on the screen. Dr. Miller also discussed a scientific study of attenuation of SRP in Lake Tahoe, California (Jassby, 1994).

Public Involvement (Chat Box)

- David Richards following comment: would include terrestrial insect contribution as local AD. I wouldn't ignore them. Jassby et al. 1994 shows that terrestrial insects contribute to SRP on Lake Tahoe. I would consider Utah Lake aquatic insects such as chironomids as nutrient recycling in Utah Lake from sediments as larvae to water column via adult mortalities.

V. Participation

Members of the Science Panel:

- Janice Brahney, Utah State University
- Soren Brothers, Utah State University
- Greg Carling, Brigham Young University
- Mitch Hogsett, Forsgren Associates, Science Panel Chair
- Ryan King, Baylor University
- James Martin, Mississippi State University
- Theron Miller, Wasatch Front Water Quality Council
- Michael Mills, June Sucker Recovery Program
- Hans Paerl, University of North Carolina

Members of the Steering Committee:

- Eric Ellis, Co-Chair, Utah Lake Commission
- Erica Gaddis, Co-Chair, Utah Division of Water Quality
- Richard Mickelsen, Timpanogos Special Service District

Members of the Public:

- Byran Fuhrmann, SePRO
- Renn Lambert, Limnotech
- David Richards, Oreo Helix Ecological
- Junh-Yuan Su, University of Utah

Utah Division of Water Quality Staff:

- Scott Daly
- Jodi Gardberg
- Nick von Stackelberg

Tetra Tech

- Michael Paul
- Kateri Salk

Facilitation Team:

- Paul De Morgan, RESOLVE
- Dave Epstein, SWCA