

**Utah Lake Water Quality Study
Science Panel Call #19
Call Summary
December 14, 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
<ul style="list-style-type: none"> • SP Call #20 	TBD; Zoom	<ul style="list-style-type: none"> ○ Bioassay Report; Analysis Report; CNP mass balance; internal loading; model prioritization, model RFP development.

I. Action Items

Meeting Summaries	Who	Due Date	Date Completed
1. Share draft meeting summary	Facilitation Team	Jan. 4	Jan. 5
2. Review and share comments on summary	Science Panel	Jan. 11	
3. Finalize summary and post to Dropbox	Facilitation Team	Jan. 12	Jan. 12
C, N, and P Mass Balance Development	Who	Due Date	Date Completed
4. Provide input and/or feedback on literature review and data compilation	Science Panel	Jan. 8	
5. Share conceptual models	Tetra Tech	Jan. 15	
6. Continue to develop the Sedflux model	Tetra Tech	TBD	
7. Continue with analysis of hydrologic and nutrient budgets for the mass-balance	Tetra Tech	TBD	
Draft Analysis Report	Who	Due Date	Date Completed
8. Provide residual plots	Tetra Tech	Feb. 1	
9. Determine conditional predictive relationship between covariates and phytoplankton w/o nutrients	Tetra Tech	Feb. 1	

10. Run model with zero-inflated negative binomial distribution and examine fit compared to linear model	Tetra Tech	Feb. 1	
11. Explore options for temporal aggregation and antecedent condition predictors	Tetra Tech	Feb. 1	
EFDC and WASP Model Development	Who	Due Date	Date Completed
12. Develop RFP for further model development	DWQ	Jan. 15	
Bioassay Research Study	Who	Due Date	Date Completed
13. Share draft report	BYU Team	Jan. 15	

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.

1. Approved Model Gaps and Limitations Summary Memo (unanimously) as final. The memo may be utilized by the modeling contractor to be hired to finalize development of the Utah Lake model.

III. Meeting Recording

A recording 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=zxwzTJJDZei&feature=youtu.be>

IV. Key Discussion Points

Utah Lake Management Goals

- Dr. Erica Gaddis, DWQ/Steering Committee co-chair, provided an update on the Management Goals developed by the Steering Committee with help from the Science Panel. Dr. Gaddis explained that the Steering Committee was extremely grateful for the extensive and quality work of the Science Panel. She noted the Steering Committee held two calls to discuss the document and to finalize it so it could be shared with the Utah Lake Commission in early December.
- Dr. Gaddis explained that there was some debate within the Steering Committee related to the use of cyanobacteria as a measure in the table. This debate was incorporated into the executive summary of the Management Goals document. While some members of the Steering Committee felt it was important to include measures of cyanobacteria (cell counts, biovolume) in the study to be able to track changes in cyanobacteria (and due to the connection between cyanobacteria and nutrients), other members of the Steering Committee feel that the data analysis should only focus on chlorophyll a. Both of these opinions are reflected in the

document that was approved by the Steering Committee and shared with the Utah Lake Commission.

- The document was reviewed by the Utah Lake Commission in their December 10 meeting and Dr. Gaddis made a presentation. The Utah Lake Commission approved the document.
- Dr. Gaddis flagged for the Science Panel that it could be helpful for them to think about the time it will take for the lake to recover and whether there are things that could be done to try to accelerate the recovery.
- Eric Ellis, Steering Committee co-chair, added that the Utah Lake Commission is interested in evaluating a range of scenarios to develop several potential solutions for improving water quality conditions.

C, N, P Mass Balance Development

- Dr. Kateri Salk, Tetra Tech, presented an overview of the C, N, and P research project literature review including the process for conducting the review, a summary of the documents identified during the review, and a summary of the data acquired. Dr. Salk also discussed the application of the ULWQS Uncertainty Guidance to the literature and data acquired through the review.
- Dr. Salk presented the initial progress on updating the conceptual models and developing the SedFlux model based on the data acquired from the literature review.
- Science Panel members provided comments:
 - Need to ensure that N and P models are consistent with the conceptual models developed earlier in the process.
 - Where does the balance between N fixation and denitrification come into this? There is a need to add denitrification N-fixation to the model.
 - Modeling doesn't include redox; modifications will be needed to include those processes.
 - For uptake rates, will they come from literature values?
 - Dr. Salk indicated that Tetra Tech will make estimates based on information from the literature – the estimates can be made by using uptake rates from the literature and standing stocks measured for Utah Lake]
 - SedFlux and WASP are similar models and will have similar output. The results of each will be complimentary and will serve as multiple lines of evidence to inform confidence in the outcomes.
 - Modeling “end of pipe” discharges, may not account for wetland assimilation between the treatment plants and the lake?
 - Scott Daly indicated that DWQ will look at assimilation and will use annual total loading
 - WFWQC has monthly data.
 - Flow duration curves will be used to look at loading.
 - Is the quality of existing data good enough to implement a paired watershed approach to evaluate unmonitored watersheds?
 - Dr. Salk noted she had not yet evaluated the data for this analysis, but indicated that data availability and quality could affect uncertainty of the results for some unmonitored catchments. (e.g., on the west side of the lake). She indicated that the report will document data quality and availability once the analysis is completed.

- Dr. Mike Brett presented preliminary mass balance calculations. The approach he has taken is simplified (one box) and can be used for scenarios. The WASP model (more complicated with many boxes) and Mass Balance models will be checks on one another and should have similar results; however, the inputs need to be compatible and the efforts need to be coordinated.
 - A monthly non-steady state model could be a next step and compared to WASP output.
 - Next steps: Update assumptions for external inputs and update the memo. Define the future scenarios to test. Including one water residence time, neglecting month to month variation. Can adjust to monthly.

Draft Analysis Report

- Dr. Salk provided an update to the Science Panel on the draft Analysis Report. She explained that in order to better understand the variability in cell counts and biovolume, an analysis of covariates was conducted. Science Panel members made several comments including requests for modifications to the analysis:
 - Include residual plots to look at TN.
 - Run model without TN.
 - Look at the relationship between output of bioassays and models.
 - Analyze nutrient conditions to seasonally to determine relationships for when nutrient concentrations are relatively lower ($\frac{2}{3}$ of the year) and when concentrations are relatively higher ones ($\frac{1}{3}$ of the year).
 - Follow up on antecedent conditions.
- Dr. Salk clarified several details related to some of the comments on the data.
 - Only samples that have a direct match between nutrient data and phytoplankton in open waters are included in the analysis.
 - Scum samples/marina samples are not included in analysis because they do not have corresponding nutrient concentrations.
 - Cyanotoxin collection in open waters was added to the routine monitoring just recently.
 - The analysis differentiates marina and open water data and relationships.
 - Used hypothesized predictors based on science panel input.

EFDC and WASP Model Development

- Scott Daly, DWQ, presented an overview of the Utah Lake model development gaps memo and solicited feedback and reactions from the Science Panel. He asked the Science Panel whether they approved of finalizing the memo. In response, the Science Panel approved the document unanimously. Mr. Daly explained that DWQ will continue to develop the Utah Lake Model Development Scope of Work and related Request for Proposals. DWQ will engage Dr. James Martin, Science Panel member, in reviewing the Scope of Work and hope to release it in early 2021.

Public Involvement

David Richards: Did I notice that DWQ is considering an RFP for food web models?

Science Panel response: Food web models are outside the scope of the EFDC/WASP framework which is the focus of the memo.

V. Participation**Members of the Science Panel:**

- Janice Brahney, Utah State University
- Michael Brett, University of Washington
- Soren Brothers, Utah State 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
- Jay Olsen, Utah Department of Agriculture and Food

Members of the Public:

- Jeff DenBleyker, Jacobs
- LaVere Merritt
- David Richards, Oreo Helix Ecological
- John Wolfe, Limnotech

Utah Division of Water Quality Staff:

- Scott Daly
- Jodi Gardberg
- Nick von Stackelberg

Technical Consultants to ULWQS Science Panel:

- Michael Paul, Tetra Tech
- Kateri Salk, Tetra Tech

Facilitation Team:

- Dave Epstein, SWCA