

**Utah Lake Water Quality Study
Science Panel Meeting #3
Summary
February 8, 2019**

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 Steering Committee in general. A list of attendees can be found at the end of the document.

Upcoming Meeting/Call	When	Suggested Agenda Items
ULWQS Science Panel (Meeting #4)	<i>Monday, March 11, 9:00-5:00; Tuesday, March 12, 8:30-12:30</i>	○ Revised lines of evidence, uncertainty guidance ideas, data gaps ideas
ULWQS Science Panel (Meeting #5)	<i>Thursday, April 25, 9:00-5:00; Friday, April 26, 8:30-1:00</i>	○ Discuss framework, finalize conceptual models, progress on data analysis, final data gaps discussion, revisit U of U modeling
ULWQS Science Panel (Call #7)	<i>Tuesday, May 14 10:30-1:30 Mountain</i>	○ Progress – update on framework, development of full strategic plan ideas
ULWQS Science Panel (Call #8)	<i>Thursday, June 13 9:00 -12:00 Mountain</i>	○ Progress – data gaps updates, uncertainty ideas discussion, development of full strategic plan ideas
ULWQS Science Panel (Meeting #6)	<i>Wednesday, July 10, 9:00-5:00; Thursday, July 11, 9:00-5:00</i>	○ Final framework discussion, ideas on final strategic plan and presentation for SC

I. Action Items

Meeting Summaries	Who	Due Date	Date Completed
1. Share draft Meeting Summary	Facilitation Team	Feb. 21	Feb. 21
2. Review and share comments on summary	SP	Feb. 28	NA
3. Finalize summary and post to Dropbox	Facilitation Team	Mar. 1	Mar. 7
Data and Information Sharing	Who	Due Date	Date Completed
4. Schedule additional upcoming meetings and calls. Add exploratory research plan calls to the schedule	Facilitation Team, DWQ, Tetra Tech	Feb. 15	Feb. 15

5. Send out information on related upcoming meetings (see Note at end of Action Items)	DWQ/Facilitation Team	Feb. 21	Feb. 21
6. Share any papers (examples) or novel approaches regarding how to derive nutrient criteria (especially for shallow water lakes)	Science Panel	Mar. 6	
7. Share June Sucker presentations	Jereme Gaeta	Mar. 6	
8. Share approach for considering protection of downstream uses	DWQ	Mar. 6	
9. Determine changes in chlorophyll <i>a</i> analysis methodologies over time	DWQ	Mar. 6	
10. Determine phosphorus lab analysis methods and speciation	DWQ	Mar. 6	
11. Develop draft agenda for March 11-12 meeting	Facilitation Team, Tetra Tech, DWQ	Mar. 6	
12. Explore communication tools (e.g., Slack) and make proposal (check on security issues)	Facilitation Team, Tetra Tech, DWQ	Mar. 11	
Science Panel Technical Support	Who	Due Date	Date Completed
13. Share results of research prioritization break out session with SP for ranking of top priorities	Tetra Tech	Feb. 19	Feb. 19
14. Provide ranking of top priorities for research	SP	Feb. 22	
15. Refine conceptual models and share with SP for review and comment	Tetra Tech	Mar. 7	
16. Review and comment on revised conceptual model	SP	Mar. 11 and 12	
17. Develop comprehensive list of potential analyses and share draft analysis plan for SP review	Tetra Tech	Mar. 7	

NOTE: Utah Chapter of the American Fisheries Society and Lake Sucker Symposium (March 12-14, 2019) <https://utah.fisheries.org/annual-meeting-2019/> and Society of Freshwater Science (May 19-23, 2019) Salt Lake City, Utah <https://sfsannualmeeting.org/>)

II. Meeting Recording

A recording of the meeting (also available on the DWQ website in the near future) can be found at the following link: <http://resolv.adobeconnect.com/pvfs085ud1pg/>. Please use the video scroll bar along the bottom of the recording window to find the appropriate time in the webinar recording for the session you would like to watch. There are bookmarks in the 'Events Index' on the left side of the screen identifying each session.

III. Key Points of Discussion

Welcome and Agenda Review

Meeting Facilitator Paul De Morgan, RESOLVE, welcomed everyone to the meeting and introduced himself. He went over the list of individuals participating via teleconference and those present at the meeting, and reviewed the agenda items, materials and the ground rules.

Science Panel and Technical Consultant Introductions

Mr. De Morgan invited each of the members of the Science Panel to introduce themselves and to provide a short description of their technical expertise. Similarly, he asked for each of the Tetra Tech representatives to introduce themselves, describe their technical expertise, and their role on the Technical Consultant team.

Overview of the Tetra Tech Work Plan and How the Pieces Fit Together

Mike Paul, Tetra Tech, provided an overview of Tetra Tech's Work Plan. He presented a schematic that depicts how the various elements work together to complete the scope of work. He explained that the framework outlines how the information will be compiled, developed and integrated and draws from the other work elements including the literature review, conceptual model and data characterization. The focus of this meeting was the literature review, conceptual model, data characterization and exploratory research plan. The conceptual model illustrates important pathways and relationships and will be the communication tool. The data is compiled in Data explorer. Additional analyses and new data will be discussed. Exploratory research plan studies will begin in 2019. Tetra Tech will have a draft Exploratory Research Plan by early April, 2019.

In response to a question from Hans Paerl, University of North Carolina, on who will conduct the research, Erica Gaddis, DWQ, indicated the research will most likely be contracted out.

Proposed Interactions with the Science Panel

Mr. De Morgan explained that the Project Team is proposing most communications will come from the facilitation team regarding meeting preparations and follow-up as well as logistical information. For direct communication with Tetra Tech, panel members are asked to share with the group and not individually. The facilitation team and other Project Team members will look into specific software that might manage communication more efficiently than just email.

Initial Lines of Evidence and Literature Review (Work Plan Task 1)

Mike Paul gave a presentation on the use of multiple lines of evidence (e.g., reference, stressor-response, mechanistic, scientific literature) to derive nutrient criteria designed to protect beneficial uses. He explained that the literature review will be focused on approaches to developing nutrient criteria for shallow lake ecosystems like Utah Lake. The LimnoTech literature review was based on Utah Lake-related research.

Lines of Evidence

- Will Tetra Tech identify what EPA will approve and what they will not?
- What does the monitoring program look like to assess criteria?
 - Florida court rule struck down independent applicability
- How do you implement the construct of NNC in assessment?
 - Separate issues from the work of the Science Panel
- The Science Panel should consider frequency and duration of exceedance of the water quality criteria. How often can an ecosystem withstand a stressor before responding in an adverse way? Consider the tipping points and resilience of the ecosystem.

Literature Review

- Look for innovative statistical and other approaches to nutrient criteria development

Conceptual Model (Work Plan Task 2)

Mike Paul presented a couple of different draft conceptual models (pre-science panel input) using the CADDIS framework. He asked the science panel to review, edit, or add to the model to define system understanding based on existing knowledge and relationships.

Science Panel Discussion:

- James Martin, Mississippi State University: The conceptual model is geared toward protecting recreational, aquatic and agricultural beneficial uses not sources or loading for now. Need to add water management controls.
- Consider seasonality and timing (e.g., wastewater loading is year-round), might need an idea of major sources of loading to get at frequency and duration.
- Erica Gaddis, DWQ: How to handle different parts of the lake (i.e, Goshen Bay, Provo bay, marinas – wetlands, degree of exposure)? The conceptual model is for open water for now but may need additional models for the bays.
- Hans Paerl, University of North Carolina: Want to keep it simple but is missing internal cycling, such as denitrification and fixation. Bioavailable Nitrogen and Phosphorous are too complicated and may never be understood. The model is bottom up (grazing). It may need to be top down (carp removal).
- Theron Miller, WFWQC: Top down from benthos (midges).
- Mike Paul, Tetra Tech: Please add in food web.
- Ryan King, Baylor University: N and P cycles are fundamentally different. Should the cycles be broken out?
- James Martin, Mississippi State University: Implementation versus criteria development. Are they separate? Can we use bioavailable P? This is complicated by internal cycling.
- Mike Paul, Tetra Tech: Table what form to use for now and work on pathways.
- Hans Paerl, University of North Carolina: Need to be sensitive to the outcome of the Paleo studies.

- Erica Gaddis, DWQ: Add Agricultural Beneficial Use.

Break Out Groups

After the initial questions and discussion, the group split into two smaller groups to discuss the questions of whether the CADDIS is an appropriate framework? Is there another approach that would be more useful? What is missing from these approaches?

Group 1 Feedback:

- Decent framework but need to fill in
- Need water balance component
- Sediment – phosphorous equilibrium – how saturated?
- Need data and information on how sediment transport affects turbidity and P
- Consider influence of carp on the system (e.g., bioturbation and excretion)
- Consider chironomids influence on P?
- Separate N and P models
- Drinking water use? Is it an appropriate downstream 1C use for the Jordan River? An existing use?
- Wastewater Treatment Plant effluent precipitates and adds to turbidity

Group 2 Feedback:

- Missing from conceptual model
 - Impact of food web on nutrient cycling (e.g., grazing etc.)
 - Need Nitrogen cycling – detail is needed, how it fits into the model needs to be decided
 - Bioavailable versus measured
 - Sediment Oxygen Demand and fluxes: lake N and P box includes this but needs clarification
 - Need simpler model for communication
- Other topics:
 - Paleo techniques (e.g., pigment, diatoms)
 - Macrophytes: How much nutrients are stored in them?
 - Are salinity concentrations controlling cyanobacteria production?
 - Need a simple version to communicate to public. Perhaps two versions, one technical and one for public.

Data Review (Work Plan Task 3)

Mike Paul and Scott Daly, DWQ gave a presentation reviewing the existing data and analyses in the Data Explorer tool that was part of Phase 1 of the study. Scott noted DWQ is in the process of compiling data since 2016 and should be completed by the end of February, 2019.

Science Panel Discussion:

- Hans Paerl, University of North Carolina: Chlorophyll *a* analytical methods may not compare and can be a point of contention (e.g., fluorometric - HPLC vs. spectrophotometric). HPLC is consistently lower. DWQ will get more information from Toby Hooker, DWQ.
- James Martin, Mississippi State University: Need color data? Nick von Stackelberg may collect as part of the modeling efforts. Also, pigments can be part of the paleo work.
- Hans Paerl, University of North Carolina: Is there a long-term dataset for salinity? Yes, specific conductance and ionic composition. This could be relevant for climatic changes.

- Is there a water balance, retention study? See LaVere Merritt's study. Plan to update data from tributaries. WFWQC data will be in the database.

Analyses:

What additional analyses beyond the explorer tool?

What analyses might change research priorities?

- Jereme Gaeta, Utah State University: Carp removal and nutrients removed, N and P excretions, See DWR data.
- James Martin, Mississippi State University: Requesting a pared down dataset.
- Erica Gaddis, DWQ: Is there a list of additional analyses that was put together before that includes wind, turbidity and Harmful Algal Blooms?
- Jereme Gaeta, Utah State University: How are blooms classified? Can bloom and non-bloom data be linked to the data from sondes. NOAA images and microcystis. Can other data be classified as bloom and non-bloom? Look at Chlorophyll and phycocyanin data. Water surface area vs. elevation.
- Jim Harris, DWQ: The bottom sample represents 20 cm from the bottom. Use of a secchi depth or weighted measure to find the bottom. Follow an SOP.
- James Martin, Mississippi State University: Look at lake bed wet and drying with change in lake elevation and how water quality changes. See Water Rights – Eric Ellis to send – What percentage of lakebed is exposed, moist vs. dry?
- Scott Daly, DWQ: 2016 Lidar information could answer this and use of an old bathymetry dataset.

Exploratory Research Plan Ideas (Work Plan Task 3)

Review the plan outline

Discuss ideas, prioritize later in March

Brainstorm exploratory research ideas

Refer to handout

- Jereme Gaeta, Utah State University: SOP for data usage/data protection clause? Is there a requirement for metadata quality?
- Mike Paul, Tetra Tech: Will have a draft for next meeting to review.

Question 1

Group 1

- 1.2 and 1.4 - Photopigments and DNA can be implemented quickly, consistent set of cores, in 1st funding cycle, add calcium and iron.

Group 2

- 1.2 – Collect multiple cores and save for future research, need lead and cesium. The locations should correspond to longer long-term data sites. Dating can be expensive though. Also 1.1 For 1.4, Photopigments and DNA. The rest need more thought.

Question 2

Group 1

- 2.1 Candidate for Exploratory Research Plan.
- 2.3 Is somewhat ongoing with DWQ and WFWQC. Check for consistency among the programs.
- Remote sensing and HABS.
- 2.4 Sediment Transport Modeling. Need to collect data.
- Erica Gaddis, DWQ Suggests adding a recreation survey and look at cyanotoxins in crop water. Asked if there is research that can be developed and implemented right away?
- Comments on timing of exploratory research plan. To be discussed in later session.

Group 2

- Added 2.7 Nitrogen fixation.
- 2.4.2 – Collect more SOD data.
- Pilot methods for small mesocosms to conduct studies.

Question 3

- 3.2 Bioassays could be done in the short-term.

IV. Public Comment

No member of the public offered a public comment.

V. Meeting Participants (Name, Organization)**Members of the Science Panel:**

- Greg Carling, Brigham Young University
- Jereme Gaeta, 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
- Hans Paerl, University of North Carolina
- Janice Brahney, Utah State University (Adobe Connect)
- Soren Brothers, Utah State University (Adobe Connect)

Technical Consultant Staff:

- Michael Paul, Tetra Tech
- Andrea Plevan, Tetra Tech

Members of the Public:

- Eric Ellis, Co-Chair, Utah Lake Water Quality Study
- Jeff den Bleyker, Jacobs Engineering (Adobe Connect)
- Mark Illium, IM Flash Tehcnologies (Adobe Connect)
- Renn Lambert, LimnoTech (Adobe Connect)
- David Richards, Oreo Helix (Adobe Connect)

Utah Division of Water Quality Staff Present:

- Scott Daly, Utah Lake Project Coordinator

- Erica Gaddis, Co-Chair, Utah Lake Water Quality Study
- Jodi Gardberg, Watershed Protection Section Manager
- James Harris, Assistant Director
- Jeff Ostermiller, Nutrient Program Coordinator
- Nick von Stakelberg, Modeler

Facilitation Team:

- Paul De Morgan, RESOLVE