

**Utah Lake Water Quality Study
Science Panel Meeting #5
Summary
September 30, 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 #6)	December 10-11, 2019	<ul style="list-style-type: none"> ○ Progress – update on framework, development of full strategic plan ideas

I. Action Items

Meeting Summary	Who	Due Date	Completed
Post meeting materials and presentations to Dropbox [link]	Facilitation Team	October 4	
Share initial version of action items	Facilitation Team	October 4	
Share draft meeting summary	Facilitation Team	October 4	
Review and share comments on summary	Science Panel	October 11	
Finalize meeting summary/post to Dropbox	Facilitation Team	October 14	

Near-Term Research Projects	Who	Due Date	Completed
1. Share initial results of the Sediment Equilibrium study with the SP	Drs. Goel and Carling	TBD	
2. Respond to Research Team as to whether SOD measurements should be made this fall and provide guidance on how to proceed with the pH 7 experiment	Science Panel	TBD	
3. Review initial findings of the Bioassay Study depicted in PowerPoint and provide feedback to Research Team	Science Panel	10/10/19	
4. Follow-up with Hans, Ryan, and others to seek input on interpretation of results	Dr. Aanderud	TBD	

5. Provide study update with initial findings at December meeting	Dr. Brahney	12/11/19	
Tetra Tech Work Plan Elements	Who	Due Date	Completed
6. Identify who can provide carp/fisheries information (Kevin Landom/Tim Walsworth?) in place of Jereme Gaeta	Scott Daly	10/1/19	10/1/19
7. Track down information from the Gaeta July presentation (carp population estimate data and macrophyte data)	Scott Daly	10/17/19	
8. Provide input on how nutrient regime should be characterized/quantified	Science Panel	10/10/19	
9. Share Uusitalo et al. (2015) paper on uncertainty	Mike Paul	9/30/19	9/30/19
Atmospheric Deposition of Nutrients to Utah Lak	Who	Due Date	Completed
10. Share updated Brahney white paper with the Science Panel	Dr. Brahney	10/1/19	10/1/19
11. Draft and share a recommendation with the Science Panel	Dr. Brett	10/4/19	
12. Review proposals for third party review and provide questions/comments/concerns to Mitch	Dr. Hogsett	10/1/19	10/1/19
13. Ask the third-party review candidates about their experience with P, dust, and aerosols	Dr. Hogsett	10/11/19	
14. Provide updates following conversations with candidates	Dr. Hogsett	10/18/19	
Mass Balance	Who	Due Date	Completed
15. Incorporate content from EPA manual on estimating stormwater inputs into draft methodology	Scott Daly	10/16/19	
16. Share draft Mass-Balance methodology	Dr. Brett and Scott Daly	10/18/19	

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/p8gx09qyuemf/>. Please note there were some challenges associated with the recording and only the second half of the call was successfully recorded. 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. *Please note, due to technical difficulties, the recording does not begin until about an hour into the call (during the Progress Update and Discussion on Tetra Tech Work Elements session provided by Mike Paul).*

III. Key Points of Discussion

Welcome and Agenda Review

Dave Epstein, SWCA, welcomed everyone to the call and listed the Science Panel members, project team members, and other participants (see Section V. below). Mr. Epstein also provided an overview of the meeting agenda, materials, and ground rules.

Updates on Near-Term Research Work Plan Projects

Mr. Epstein provided a brief overview of the Smartsheet action items worksheet being used by the project team to consolidate and track action items generated by the Science Panel. In addition, he reviewed the action times related the near-term research projects coming out of the July 10-11 Science Panel meeting.

Utah Lake-sediment water nutrient interactions – Ramesh Goel and Greg Carling

Dr. Ramesh Goel, University of Utah, briefly summarized the initial experimental observations for the pH and anaerobic experiments conducted so far. During the neutral pH experiment they observed that pH increased rapidly from the desired of 7 to 8.6. This increase appeared to be due to the buffering capacity of the relatively higher pH of the sediments. Dr. Ryan King and Dr. Soren Brothers, Science Panel members, recommended maintaining pH in a range that is more realistic and representative of ambient lake conditions. Dr. Hans Paerl, Science Panel member, requested measuring N-fixation rate using the acetylene reduction technique. Dr. Goel is developing the method for N fixation, but this is currently out of the scope of this project.

Bioassay to investigate nutrient limitation of Utah Lake – Zach Aanderud

Mr. Epstein provided an overview of the related action items from the July meeting. All items were completed following the meeting.

Dr. Zach Aanderud, Brigham Young University, introduced graduate students Gabby Watts and Erin Jones who are leading the bioassay experiment. Dr. Aanderud showed some photos of the initial bioassay harvest and presented some slides demonstrating the associated results. The harvests conducted in July and August represented a range of conditions including active blooms in Provo Bay with relatively less growth at the east and west lake locations. The next round of harvests will include a nutrient dilution experiment to determine the effect the effect lower than ambient concentrations have

on growth. Additionally, grazers will be added back into a subset of sample to determine their effect on productivity. Dr. Paerl requested they not adding more bicarbonate to avoid precipitation of metals and metal limitation. Dr. Aanderud stated that the research team will begin measuring nitrogen fixation rates in the lake.

Paleolimnology and paleoecology of Utah Lake – Janice Brahney and Soren Brothers

Dr. Janice Brahney, Utah State University and a Science Panel member, indicated that her team has collected the additional cores in the northern portion of the lake and north of Provo Bay. Dr. Brahney indicated that they are now receiving initial results from a variety of analyses with diatom results expected in the next 6 weeks. Their initial results show a good capture of cesium for core dating, however, capture of lead 210 was not as good because of the lack of lead released in the environment throughout the entire time period. She said they will share results when they have a complete dataset and could present an update at the December Science Panel meeting.

Progress Update and Discussion on Tetra Tech Work Elements

Nutrient Criteria Framework Development

Dr. Mike Paul, Tetra Tech, provided a summary of the draft nutrient criteria framework developed by Tetra Tech and discussed how it fits within the Science Panel Charge. He overviewed the lines of evidence included in the draft Framework document and discussed the potential application of each. Combining the lines of evidence into a single endpoint is difficult and will likely require a combination of quantitative evaluation and best professional judgment.

Conceptual Models

Dr. Paul went over the conceptual models narratives which were sent to the Science Panel earlier this summer. Comments from several members were incorporated into the current narrative. The models were also edited to show which components are addressed in the EFDC and WASP mechanistic models. The narratives will be finalized with these updates in the near future.

Data Characterization analysis plan results

Dr. Paul also went over the data characterization and analysis plan and provided an update of the eight main areas presented at the July 10-11 Science Panel meeting.

- Carp excretion. Estimates of carp excretion were updated to include estimates for nitrogen cycling. The estimates can be improved by acquiring the most recent carp density estimates from Dr. Jereme Gaeta's lab;
- High frequency buoy data descriptive stats were adjusted to look at the same date range for all locations to address comments received at the July 10-11 meeting;
- Phytoplankton temporal and spatial trends analyses were cleaned up to fix issues identified previously. More work needs to be done to determine if proximity of POTWs is related to presence and abundances of HAB taxa;
- Tetra Tech will use the Lake Analyzer R package to calculate a variety of stratification metrics including Schmidt stability;
- Analysis of light extinction is still ongoing, pending PAR data. Dr. Paerl suggested relating light extinction data to abundance of motile phytoplankton taxa to determine if motile taxa have a competitive advantage over non-motile taxa during high light extinction conditions;

- The Utah Lake Data Explorer (ULDE) is being updated to make the requested adjustments suggested at the July meeting and also to add many of the analyses included in this task. Tetra Tech will also be working to automate the ULDE to continuously update the underlying data.

Uncertainty Guidance

Dr. Paul described Science Panel comments on the Uncertainty Guidance and the edits made in response. He also provided an example of how evidence may be evaluated for abundance, quality, and agreement to determine the level of confidence for any one line of evidence. Additional discussion is needed to determine how to operationalize the guidance document to apply to the ULWQS.

Strategic Research Plan Development

The Strategic Research Plan (SRP) will include studies identified by the Panel as necessary to reduce uncertainties associated with answering the Charge Questions and defining criteria for the lake. Dr. Paul highlighted the charge questions, based on his interpretation of previous Science Panel conversation, that have limited evidence and could be improved with research. In addition, Dr. Paul listed potential research needs to support nutrient criteria development for the lake including the role of carp, macrophytes, and influence of different stable states.

Atmospheric Deposition of Nutrients to Utah Lake

Paul De Morgan, RESOLVE, provided an overview of the agenda items related to atmospheric deposition.

Estimating total and bioavailable nutrient loading to Utah Lake from the atmosphere

Dr. Brahney discussed the revisions made to the white paper in response to comments from the Science Panel including the inclusion of additional data for regional and local deposition, the bioavailable fractions of N and P, sampling protocol recommendations, and the application of a boot strap method to develop a distribution of loading estimates. The next version of the white paper, including these enhancements, is complete and will be shared with the Science Panel soon.

WFWQC proposal to measure atmospheric deposition

Dr. Theron Miller, WFWQC and Science Panel member, made changes to the sampling plan in response to Science Panel comments but is waiting for input from the pending third-party reviewer to finalize the plan. One specific change he noted was the addition of a mesh screen to exclude insects. Dr. Miller is also working to quantify nutrient concentrations associated with the different insets observed in the samplers to back-correct previous samples to adjust values. Dr. Miller is also planning to install a sampler in the middle of the lake. It was noted that two science panel members shared additional comments on the latest version of the sampling plan with Dr. Miller via email.

Update on initiative to engage external expert for review of atmospheric deposition products

Dr. Mitch Hogsett, Science Panel Chair, provided an update on the effort to procure an independent external expert to review various atmospheric deposition products. Two proposals were received from scientists with atmospheric deposition expertise. Dr. Hogsett explained that the current thought is to hire both individuals to utilize their unique expertise. Dr. Brahney commented that neither applicant has experience specifically related to aerosol or dust. Dr. Paerl questioned if they have experience with atmospheric deposition of phosphorus and recommended that Dr. Hogsett discuss this issue with the applicants. It was also recommended that he ask about how the applicants will address the need for experience with aerosols and dust. Dr. Hogsett requested that Science Panel members share any other comments with him in the next day.

Dr. Hogsett explained that the next step following procurement is to define explicitly what the experts will be asked to do. The review tasks will be defined and shared with the Science Panel for review and comment.

Utah Lake Mass Balance Analysis Update

Mr. Epstein reviewed the July 10-11 meeting action items to provide context for the mass balance task. This task came out of a discussion between Dr. LaVere Merritt, professor emeritus BYU, and the Science Panel. Dr. Brett and Scott Daly, DWQ, have drafted a methodology for updating the Utah Lake mass balance. The analysis will include newly collected flow and concentration data. The analysis will also test whether nutrients are attenuated between WWTP discharge locations and where the loads enter the lake. Newly collected high-frequency flow data will also be analyzed to characterize storm conditions and use paired concentration data to determine stormwater loading. Dr. Brett also explained that a GIS analysis is nearly complete that will determine the number and size of unmonitored tributaries around the lake. A paired watershed methodology will be used to assign flow and concentration data to similar, nearby watersheds.

Dr. Brett will finalize the mass balance approach memo and share it with the Science Panel for comment.

Review Ongoing and New Action Items

Mr. Epstein briefly discussed some of the outstanding action items, mostly from the July 10 and 11 meeting. He also discussed the use of SmartSheet as a tool to track action items from the July meeting and moving forward.

IV. Public Comment

Dan Potts commented that wetting and drying of the lake bed can aerate sediments and improve their fertility. Aquaculture operations purposefully dry ponds to increase nutrients available from the sediments. For Utah Lake he expects that algal blooms are more common during full lake conditions that follow a low lake level. Mr. Potts also commented that carp excretion rates may vary over the winter due to carp hibernation and the resulting decrease in feeding. Mr. Potts suggested that the Science Panel should also consider that June sucker will replace carp over the coming decades and excretion rates of nutrients may change. He also stated that Kevin Landom with Utah State University would be a great resource to provide fish expertise to the Science Panel.

David Richards: A critical question is: How does setting and meeting specific nutrient standards affect/improve DWQ designated beneficial biological use for Utah Lake? How will we know if numeric values are doing any good given the intellectual and monetary efforts put into developing specific values? To this end, we are developing a multimetric index of biological integrity (MIBI) for Utah Lake that will be invaluable in monitoring changes in ecological health of the lake. MIBI has several dozen easily measured metrics ranging from phytoplankton, zooplankton, fish, and macrophyte diversity, composition, and inter-relationships. Some metrics including as an example, zooplankton grazing potential, are based on widely accepted European lake biological indices. We are populating metrics with available data and literature values, which will be used as baseline index values to measure future changes. Will share with Science Panel later this year or early next.

Also, the Utah Lake/Jordan River drainage has an until recently undocumented, but well-established invader knocking at the back door of Utah Lake that has the potential to affect its ecology perhaps equal to or greater than carp effects.

V. Participation

Meeting Participants (Name, Organization)

Members of the Science Panel:

- Janice Brahney, Utah State University
- Mike Brett, University of Washington
- 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
- Hans Paerl, University of North Carolina

Technical Consultant Staff:

- Michael Paul, Tetra Tech
- Jen Stamp, Tetra Tech

Members of the Steering Committee:

- Eric Ellis, Co-Chair, Utah Lake Commission
- Erica Gaddis, Co-Chair, Utah Division of Water Quality

Members of the Public:

- Zach Aanderud, Brigham Young University
- Ramesh Goel, University of Utah
- Mark Illum, IM Flash
- Renn Lambert, LimnoTech
- Dan Potts, member of the public
- David Richards, Oreo Helix Consulting
- Juhn-Yuan Su, University of Utah

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
- David O'bryant, Utah Lake Water Quality Study Intern

Facilitation Team:

- Paul De Morgan, RESOLVE
- Dave Epstein, SWCA

