

**Utah Lake Water Quality Study
Science Panel Meeting #4
Summary
March 11-12, 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 #5)	<i>Thursday, April 25, 9:00-5:00; Friday, April 26, 8:30-1:00</i>	○ Discuss framework, finalize conceptual models, review RFPs, discuss progress on data analysis, further discuss uncertainty guidance, 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	Completed
1. Post background materials and presentations to Dropbox [link]	Facilitation Team	March 13	March 13
2. Share initial version of action items	Facilitation Team	March 14	March 14
3. Share draft meeting summary	Facilitation Team	March 21	March 21
4. Review and share comments on summary	Science Panel	March 28	
5. Finalize meeting summary/post to Dropbox	Facilitation Team	March 29	
WFWQC Research	Who	Due Date	Completed
6. Share WFWQC research plan and key questions for the SP	Theron Miller	March 22	

7. SP to provide input/feedback on key questions re: WFWQC research plan	Science Panel	March 29	
8. Discuss deposition sampling methodology/protocol (Janice to share sampling protocol)	Janice Brahney and Theron Miller	March 29	
University of Utah Model Development	Who	Due Date	Completed
9. Draft response to U of U memo related to modeling sediment transport and the influence on water quality in EFDC/WASP	James Martin	March 14	Mar. 14
10. Send additional comments on the U of U modeling memo to Mitch and Scott	Science Panel	March 22	
11. Confirm the relationship between the ULWQS and the U of U modeling effort	Co-chairs	March 29	
12. Organize session with U of U modelers for the April 25-26 SP meeting	Scott Daly and Mitch Hogsett	April 18	
Uncertainty Guidance Paper	Who	Due Date	Completed
13. Provide papers on uncertainty in paleo analysis	Janice Brahney	March 22	
14. Provide papers on uncertainty	Mike Brett and James Martin	March 22	
15. Provide input on the draft uncertainty guidance paper	Science Panel	March 22	
16. Provide updated uncertainty guidance paper	Tetra Tech	April 18	
Science Panel Technical Support	Who	Due Date	Completed
17. Provide input (additions, omissions, etc.) on the draft Tetra Tech Analysis Plan	Science Panel	March 22	
18. Provide input on the various approaches to developing nutrient criteria (presented by Tetra Tech as part of the literature review)	Science Panel	March 22	
19. Share final literature review on approaches to developing nutrient criteria	Tetra Tech	March 29	

20. Update the Utah Lake Conceptual Models	Tetra Tech	TBD	
21. Review and comment on revised conceptual model	Science Panel	TBD	
22. Develop a literature review of estimates of atmospheric deposition, use DWQ's initial efforts on the subject as a starting point	Tetra Tech	TBD	
Research RFP Development	Who	Due Date	Completed
23. Further develop research RFPs and send out for SP review	Tetra Tech	March 22	
24. Review and share comments on RFPs	Science Panel	March 29	
25. Finalize RFPs and release for responses	DWQ	April 21	
26. Initiate RFP response review process with Independent Science Panel members	DWQ	May 19	
DWQ Data Collection	Who	Due Date	Completed
27. Send out the 2019 DWQ sampling plan for SP review	Scott Daly	March 22	
28. Share comments on DWQ sampling plan	Science Panel	March 29	
29. Work with phosphorus lab to lower P detection limit	DWQ	TBD	
Miscellaneous	Who	Due Date	Completed
30. Provide abstract for Scott Collins' paper	Zach Aanderud	TBD	
Science Panel April Meeting	Who	Due Date	Completed
31. Develop draft agenda for April 25-26 meeting	Facilitation Team, Tetra Tech, DWQ	April 18	

Monday, March 11, 2019 9:00 a.m. to 5:00 p.m.

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/pvp2oeo8lop2/>. 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

Paul De Morgan, RESOLVE, welcomed everyone to the meeting and asked the group to introduce themselves (see participant list below). He went over the list of individuals participating via teleconference, and reviewed the agenda items, materials, and meeting ground rules.

Conceptual Model

Mike Paul, Tetra Tech, presented three conceptual models depicting Utah Lake and the connection to the lake’s assessment endpoints. Mr. Paul highlighted the updates made building on comments from ULWQS SP Meeting #3. Science Panel members provided further questions and comments on the models, and several potential modifications to the figures were discussed. Some of the comments specifically related to the distinction between primary production from imported (from outside the lake) vs. regenerated (recycled from in-lake sources) nutrients. Mr. Paul suggested the Science Panel provide any additional comments to the technical team as the models are further updated.

Utah Lake Research Presentations

A series of four presentations on current Utah Lake research activities were made to help the Science Panel in the planning of future research needs related to the ULWQS. Each presentation lasted roughly 20 minutes and included another 10 minutes for questions, comments, and discussion. Copies of the presentation have been uploaded to the Science Panel Dropbox folder.

Mike Mills, June Sucker Recovery Program: Mr. Mills presented on the history of the June Sucker Recovery Program (JSRP) and the current research activities associated with the program. Mr. Mills described habitat restoration projects to restore spawning and rearing habitat associated with tributaries to Utah Lake. Additionally, he described the carp removal program. Mr. Mills noted that thus far JSRP has not undertaken projects specifically aimed at addressing Utah Lake water quality issues.

Theron Miller, Wasatch Front Water Quality Council: Mr. Miller presented an overview of data collection activities undertaken by the Wasatch Front Water Quality Council (WFWQC). Mr. Miller brought up the question of whether sampling methods should be focused on regional or local inputs to Utah Lake and solicited input from the Science Panel. The group discussed sample collection methods, and supported sharing the WFWQC research plan and sample collection methodologies for review and comment.

Greg Carling, Brigham Young University: Dr. Carling presented the results of research his lab has conducted related to nutrients contained in Utah Lake sediments and sediment pore water. Dr. Carling discussed the role that certain elements (Fe, Si, Ca) play in binding to phosphorus, which can influence phosphorus burial or recycling.

Zach Aanderud, Brigham Young University: Dr. Aanderud and two of his students (Erin Fleming and Scott Collins) presented on their Utah Lake research that focuses on the community of cyanobacteria within

the lake. The researches discussed how the abundance of different taxa of cyanobacteria changes over time and space within the lake during the growing season.

Literature Review Update

Andrea Plevan, Tetra Tech, presented on the literature review on different approaches that have been taken to identify nutrient criteria for water bodies. Ms. Plevan described a series of different approaches that have been used elsewhere and solicited input from the Science Panel or which approach(es) could be applicable to Utah Lake. Ms. Plevan asked that members of the Science Panel send any additional input via email after the meeting.

Uncertainty Guidance Development

Mike Paul gave a presentation on uncertainty associated with scientific information and how the Science Panel may choose to handle uncertainty in framing the results of research to be conducted as part of the ULWQS. Mr. Paul referenced approaches that have been used elsewhere including the approach taken by the Intergovernmental Panel on Climate Change (IPCC).

Utah Lake Nutrient Data Analysis

Mike Brett, University of Washington, presented calculations he made using monitoring data provided to him by LaVere Merritt. Dr. Brett pointed out that the results of his calculations were dramatically different from the claims made by Dr. Merritt. Dr. Brett also suggested that his calculations seemed to be consistent with other data that has been provided to the Science Panel from other sources such as UDWQ.

RFP Development

Andrea Plevan described the approach Tetra Tech took to identify top priorities for research on Utah Lake in the upcoming 2019 field season. She indicated 5 of the 10 Science Panel members participated in ranking the various research topics for short-term prioritization. Ms. Plevan presented the list of the top 6 research topics (from the ranking exercise) for reaction from the Science Panel. The Science Panel commented that within the 6 topics, two subsets of research questions could be packaged into two RFPs. In addition, the group identified an additional research topic to be addressed in a third RFP.

The three RFPs to be developed included:

A set related to analysis of the historic condition (paleo record) of Utah Lake via sediment cores:

- Historical P, N, and Si concentrations in sediment cores (SP charge 1.2)
- What does the diatom community and macrophyte community in the paleo record tell us about the historical trophic state and nutrient regime of the lake? (SP charge 1.1.i, ii, iii)
- What do photopigments and DNA in the paleo record tell us about the historical water quality, trophic state, and nutrient regime of the lake? (SP charge 1.4)

A set related to sediment nutrient dynamics:

- What are the current sediment equilibrium P concentrations throughout the lake? What effect will reducing inputs have on water column concentrations? If so, what is the expected lag time for lake recovery after nutrient inputs have been reduced? (SP charge 2.4.i)

- What is the role of calcite “scavenging” in the P cycle? (SP charge 2.3.v)
- What is the sediment oxygen demand of, and nutrient release from, sediments in Utah Lake under current conditions? (SP charge 2.4.ii)

And one related to in-lake primary production and HABs:

- Which nutrients are actually controlling primary production and HABs and when? (SP charge 2.3.ii)

Public Involvement

Dan Potts: I want to provide a quick snapshot of carp in Utah Lake. Carp growth used to be stunted and only grow to 4 lbs as there was not much food. There was reproductive failure in every 2 out of 5 years due to cannibalism. Early efforts for the June Sucker program were focused on carp and now there is less competition and carp are now 8 lbs, due to less competition for food. Expect that there will be a huge explosion of YoY common carp offspring this year. Actually, the main driver of everything in the lake is wind and not carp resuspending sediments, except for when they’re spawning. The claim from the program is that they have removed tons of carp; however, the biomass may be the same as it was.

David Richards: One comment on one of the important metrics; DWQs focus is protecting recreation and aquatic life. Provo bay appears to be a hotspot for sediment nutrient concentrations, which is also the hotspot for midges, fish, and wildlife so we have to think about how we are going to protect these uses.

Juhn-Yuan Su (Adobe Connect): Such stoichiometric ratios (N:P) are applied for phytoplankton and benthic/macro algae. For instance, in WASP, the user can specify stoichiometric ratios for nitrogen-to-carbon, phosphorus-to-carbon, chlorophyll-a-to-carbon, etc.

Juhn-Yuan Su (Adobe Connect): Meanwhile, for modeling applications, such ratios come into play for nutrient recycling (e.g., phytoplankton respiration to organic N vs. respiration to organic P, phytoplankton death to PON vs. death to POP, etc.).

Juhn-Yuan Su (Adobe Connect): Is this sampling event a SEPARATE event from the one documented in Hogsett et al. (2019), which Dr. Hogsett, Dr. Goel, and Hanyan Li have analyzed sediment core samples for phosphorus content (similar speciation as shown in the graph that displays distinct forms of phosphorus in sediment)?

Juhn-Yuan Su (Adobe Connect): I think that it may be interesting to compare the sediment-phosphorus speciations among the event conducted by Dr. Carling against the results by Dr. Goel's group over Utah Lake.

Day 2: Tuesday, March 12, 8:30 a.m. to 12:30 p.m.

I. Key Points of Discussion – March 12

A recording of the audio portion of the meeting (also available on the DWQ website in the near future) can be found at the following link: <http://resolv.adobeconnect.com/p3sopqy9zzkp/>.

Welcome and Agenda Review

Dave Epstein, SWCA, welcomed the group to the second day and reviewed the meeting agenda.

RFP Development (cont.)

Andrea Plevan informed the Science Panel that they would be breaking up into three groups to assist with development of separate RFPs (paleo; sediment-nutrient; primary production) to avoid potential conflicts of interests due to the potential for certain Science Panel members to submit proposals for some of the RFPs (Science Panel members were assigned RFPs for research areas that they would not be planning on responding to as contractors). Each of the groups worked to develop the level of detail needed to solicit proposal responses from potential contractors that align with the Science Panel's needed research. Following the individual group breakouts, each group reported back with an overview of the additional content/specificity added to each RFP. Scott Daly, UDWQ, went over the proposed timeline for soliciting responses to the RFPs and negotiating with contractors to commence research activities.

Analysis Plan Update

Mike Paul went over the various analyses that Tetra Tech is planning on undertaking in the coming months to support the Science Panel's goals and objectives. Mr. Paul provided detail on how each analysis would be completed and what information will be provided to the Science Panel and the ULWQS. Mr. Paul solicited input from the Science Panel on the utility of the work plan and suggested that they submit feedback via email following the meeting.

UDWQ Sampling Plan

Scott Daly, UDWQ, went over the 2019 UDWQ sampling plan for Utah Lake. Mr. Daly went over the sampling methods, sampling locations, and analytical laboratory methods associated with the UDWQ data collection efforts. Members of the Science Panel asked several questions about laboratory analytical methods and the implications for precision as it affects the ULWQS. Mr. Daly suggested that UDWQ would be putting the finishing touches on the 2019 sampling plan and would send it out for review and feedback from the Science Panel.

University of Utah Model Development

Mitch Hogsett went over the memo that the Science Panel received from the University of Utah (U of U) modeling team in response to a previous memo sent by the Science Panel asking questions about the model. Some discussion ensued among members of the Science Panel related to specific aspects of the model and Mr. Hogsett suggested that all additional questions and comments should be forwarded to him in advance of the April 25-26 Science Panel meeting where the Science Panel will have the opportunity to engage directly with the U of U modeling team.

IV. Public Comment

Dan Potts: When Lake Bonneville drained the cutthroat trout separated out into 4 "races," one of which has disappeared (the strain that was found in UT Lake). The trout could survive in UL as the lake does not absorb as much heat as people think. The Utah Lake sculpin has been lost. The shift in wind is important in the ecology of the lake as it builds big waves.

David Richards: Science Panel is an awesome group doing a great job. The WASP model is bottom-centric with no top-down influence. There are tons of species of plankton in the lake and other organisms and it could be in accurate.

Juhn-Yuan Su (Adobe Connect): For ice cover, Landsat imagery is currently employed for approximating ice cover over Utah Lake, but the spatial resolution appears generally coarse. Methods and sources that exhibit finer spatial resolution for approximating ice cover are currently being investigated.

Juhn-Yuan Su (Adobe Connect): The model inputs for ice cover in WASP appear generally simplistic. The user specifies a time-series for ice cover fraction that is applied to the ENTIRE system (Utah Lake), which one then specifies a multiplier for each segment/node that is constant throughout the entire model simulation period.

Juhn-Yuan Su (Adobe Connect): I do exhibit a similar question that is raised regarding the form of dissolved phosphorus as the measured WQ data from AWQMS seem to NOT state the form of dissolved phosphorus that is measured (e.g., dissolved inorganic P, dissolved organic P, etc.). The measured WQ data only indicates whether the measured phosphorus is dissolved or total phosphorus.

Juhn-Yuan Su (Adobe Connect): Have you compared the measured flows for sites WITHOUT a pressure transducer against those WITH a pressure transducer? I think that it will be interesting to assess the significance of the pressure transducer toward measuring flow.

Juhn-Yuan Su (Adobe Connect): The last statement states that WASP WILL simulate sediment transport for Utah Lake for "comparing the effects upon inorganic solid concentrations for the Utah Lake Model calibration".

II. Participation – March 11 and 12

Meeting Participants (Name, Organization) – March 11

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
- Andrea Plevan, Tetra Tech

Members of the Public:

- Eric Ellis, Co-Chair, Utah Lake Water Quality Study
- E. Gabrielsen (Adobe Connect)
- Ramesh Goel, University of Utah
- Sarah Hanners, University of Utah (Adobe Connect)
- Mark Illium, IM Flash Tehcnologies (Adobe Connect)
- Tina Laidlaw, EPA (Adobe Connect)
- Renn Lambert, LimnoTech (Adobe Connect)
- Dan Levy (Adobe Connect)
- Hanyan Li, University of Utah
- Mike Mills, June Sucker Recovery Program
- Dan Potts, Salt Lake Fish and Game Association
- David Richards, Oreo Helix

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

Facilitation Team:

- Paul De Morgan, RESOLVE
- Dave Epstein, SWCA

Meeting Participants (Name, Organization) – March 12

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 (Adobe Connect)
- Mitch Hogsett, Forsgren Associates, Science Panel Chair
- Ryan King, Baylor University
- James Martin, Mississippi State University
- Theron Miller, Wasatch Front Water Quality Council

Technical Consultant Staff:

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

Members of the Public:

- Eric Ellis, Co-Chair, Utah Lake Water Quality Study
- Hanyan Li, University of Utah (Adobe Connect)
- Mike Mills, June Sucker Recovery Program
- Dan Potts, Salt Lake Fish and Game Association
- Juhn Yuan Su, University of Utah (Adobe Connect)

- David Richards, Oreo Helix

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