Utah Lake Water Quality Study (ULWQS)
Steering Committee
November 29, 1:00 PM to 4:00 PM
Virtual Meeting
Meeting Summary - FINAL

ATTENDANCE:
Steering Committee Members and Alternates by Seat (Quorom Reached):

- Utah Lake Commission: Eric Ellis (primary), Sam Braegger (alternate)
- Water quality: John Mackey (primary)
- Recreation, fishing, and sovereign lands: Ben Stireman (alternate)
- Agriculture/water rights/water users: Jesse Stewart (primary)
- Agriculture: Jay Olsen (primary)
- Public health: Craig Bostock (primary)
- Conservation and environment: Heidi Hoven (primary)
- Water management of Utah Lake: Gerard Yates (primary), Mike Rau (alternate)
- Publicly owned treatment works: Rich Mickelsen (primary), David Barlow (alternate)
- Municipal: Gary Calder (primary), Cory Pierce (alternate)
- Municipal: Brad Stapley (primary)
- Municipal: Dave Norman (alternate)

Science Panel Members: Mitch Hogsett, Theron Miller, and Hans Paerl

Members of the Public: David Richards and Soren Simonsen

Utah Division of Water Quality (DWQ) staff: Scott Daly, Jodi Gardberg,

Technical Consultants: Kevin Kratt, Kateri Salk, and Michelle Schmidt

Facilitation Team: Heather Bergman and Samuel Wallace

ACTION ITEMS

Who	Action Item	Due Date	Date Completed
Tetra Tech Modeling Team	Work with Scott Daly to determine what evapotranspiration model the Utah Division of Water Rights uses.	Dec. 15	
Scott Daly and Eric Ellis	Determine how to best recognize the contributions of the resigning Science Panel members.	Dec. 15	
Scott Daly, Eric Ellis, and John Mackey	Reach out to the new Science Panel members to formally invite them to join the Science Panel.	Dec. 15	Dec. 7

DECISIONS AND APPROVALS
The ULWQS Steering Committee approved recommending Dr. Thad Scott and Mr. Tim Wool to join the ULWQS Science Panel as independent Science Panel members and Dr. Zach Aanderud to join as an ex officio member.

ULWQS WATERSHED AND IN-LAKE MODEL UPDATE

Michelle Schmidt, Tetra Tech, provided an update on the two models being developed for Utah Lake. Her update is summarized below.

Watershed Model Update Overview

- Tetra Tech is the technical consultant tasked to develop a watershed and in-lake model for the ULWQS.
- The first step in developing the Utah Lake watershed model was to review different models and select one that best fits the goals of the ULWQS. Tetra Tech evaluated 11 different modeling platforms based on criteria (e.g., usability, open source code, etc.) that the Science Panel helped develop. After the comprehensive review, Tetra Tech ranked the models based on how well they satisfied the identified criteria. The top-rated modeling platform was the Hydrologic Simulation Program – Fortran (HSPF).
- After selecting the modeling platform, the next steps to develop the watershed model were to:
    - Gather data
    - Build the model
    - Calibrate the model
- Once the model team completes the model, the ULWQS Steering Committee can use it to assess current conditions and project what may happen to Utah Lake under future scenarios.
- Tetra Tech wrote a Quality Assurance Project Plan (QAPP) for the watershed model development process. The QAPP outlines quality objectives for measured and modeled data and the framework for how the model will support the ULWQS goals and objectives. It also identifies the process for collecting and acquiring data to build and calibrate the model. The QAPP specifies quality assurance/quality control activities to assess model performance. The QAPP went through several iterations before being approved by DWQ.
- The geographic extent of the watershed model includes several major streams, such as the Provo River, Spanish Fork, and American Fork, and several major reservoirs, including Deer Creek Reservoir, Jordanelle Reservoir, and Mona Reservoir. There is a lot of data on Deer Creek Reservoir, so the modeling team is using that as the boundary for the watershed model.
- The modeling team divided the watershed into drainages. The modeling team first broke the watershed into 84 HUC12 sub-basins. They then used several factors (e.g., where data was present, drainage boundaries used by the Utah Department of Environmental Quality, etc.) to categorize the HUC12 sub-basins into 26 unique drainages.

Watershed Model Data Sources

- The next step in model development involved identifying hydrologic response units (HRUs). HRUs are discrete areas with unique characteristics affecting water infiltration and quality. The modeling team identified the HRUs using factors like climate, geology, topography, and land use/cover, all of which affect water infiltration and quality.
- The modeling team used a variety of different datasets to characterize the landscape in the watershed.
    - The modeling team used the 2016 US Geological Survey National Land Cover Database (NLCD) to characterize land use/cover. They used several other databases to further refine land cover characteristics, such as the specific type of crop cover or impervious surfaces (e.g., roads, buildings, etc.). The modeling team also accounted

for wildfires in the watershed that occurred after 2016, which would not have been captured in the NLCD.
    - They used the US Department of Agriculture's Soil Survey Geographic Database (SSURGO) to characterize soil conditions. They categorized soil groups by whether they had high or low infiltration rates. They also used the US Geological Survey 10-meter digital elevation model to characterize slope.
    - An important aspect when modeling hydrology is irrigation from agricultural lands. The modeling team referenced evapotranspiration data from the Utah Climate Center to model evapotranspiration rates in agricultural fields. They also used crop coefficients to estimate water demand for different crop types. They then calculated irrigation demand by subtracting precipitation values from the overall crop water demand.
    - Another important aspect when modeling hydrology is the movement of water for irrigation. There are major and minor diversions in the watershed and imports from Strawberry Reservoir. The modeling team worked with various entities to obtain data on stream withdrawals, including Central Utah Water Conservancy District, Provo River Water Users Association, Utah Division of Water Rights, and annual distribution system reports.
    - The modeling team collected annual precipitation and storm event data to model weather patterns. They captured spatial variability by establishing 13 different weather zones. Each zone has a one-hour time series for the weather.
    - The modeling team inventoried discharge monitoring report data and monthly operating reports from municipal and industrial sources and fisheries to model permitted point source discharges. They incorporated this data into the model.

Watershed Model Calibration

- After the built the model, the modeling team calibrated it.
    - The modeling team used the Snow Data Assimilation System (SNODAS) program to extract snow data from stations. They compared the SNODAS data to the model outputs on predicted snow depth and snowmelt timing. They found the model outputs closely matched SNODAS data.
    - The modeling team also used evapotranspiration data to calibrate the model. The modeling team used the Simplified Surface Energy Balance (SSEBop) tool to generate evapotranspiration patterns. SSEBop is based on remotely sensed data, and it is also an estimate. The team compared the simulated seasonal evapotranspiration patterns from the model with the SSEBop outputs. They found that the model has a higher evapotranspiration rate in the summer than SSEBop. This pattern may occur because SSEBop may not capture irrigation occurring during the summer, which adds additional water supplies for evapotranspiration.
    - The modeling team also calibrated the model using streamflow data from gauges across the watershed. They plotted total flows, seasonal/monthly flows, and high/low flow distributions based on the streamflow gauge data. They used statistical metrics, like Nash Sutcliffe efficiency (NSE) coefficients, to assess the fit between existing and simulated data. The goal is to obtain as good a fit as possible between the modeling outputs and streamflow data. The modeling team prioritized the model having a better fit will larger tributaries than smaller ones. Overall, the model is doing well at modeling larger tributaries and less well for smaller ones.

Watershed Model Applications

- The watershed model ultimately can help the Steering Committee and Science Panel understand how water and nutrients are transported to the lake by surface and subsurface pathways and how variables, like soil, slope, and weather, impact the movement of water and nutrients. It will also quantify nutrient load contributions by sector/source. The model will allow Steering Committee members to simulate reductions in point and nonpoint source loads. The Steering Committee can also use the model to evaluate alternative future conditions (i.e., how water quality will change under future climate and land use conditions) and management scenarios (i.e., how changes in management will impact lake conditions).
- The watershed model is not currently designed to evaluate other pollutants beyond nutrients (e.g., bacteria, metals, etc.). It also cannot simulate specific urban or agricultural best management practices. Lastly, it cannot identify certain pollution issues (e.g., locations of failing septic systems).

Modeling Next Steps

- The next step for the watershed model is to continue calibrating it with sediment and water quality data. The modeling team is also writing a watershed modeling report.
- Tetra Tech is also working on calibrating the in-lake model. The ULWQS Science Panel is working to identify a value to represent atmospheric deposition loading. Once the modeling team receives that value, they can calibrate the in-lake model. Once the in-lake model is complete, the Science Panel and Steering Committee can use it to conduct stressor-response scenarios and support numeric nutrient criteria development.

Steering Committee Clarifying Questions

Steering Committee members asked clarifying questions about the watershed model update. Their questions are indicated below in italics, with the corresponding responses in plain text.

The geographic extent of the watershed model goes up to Deer Creek Reservoir, but the modeling team included point source data from a fish hatchery upstream from Deer Creek Reservoir. How does the modeling team incorporate upstream data if the geographic boundary of the model is Deer Creek Reservoir?

The watershed model simulates the entire Utah Lake basin. However, the modeling team is relying on the water quality and flow records from Deer Creek Reservoir because there is a lot of existing data. The model generates outputs for the areas upstream from Deer Creek Reservoir, but the modeling team is not using upstream data to calibrate the model.

If the modeling team is not using data upstream of Deer Creek Reservoir to calibrate the model, would that impact how accurately the watershed model simulates conditions upstream from the reservoir?

For the purposes of the ULWQS, the outflow data from Deer Creek Reservoir is adequate to simulate the nutrients coming from the Heber Valley. If partners are interested in learning how land uses impact water quality and quantity upstream from Deer Creek Reservoir, additional work would be needed to calibrate the model for that purpose. However, the work Tetra Tech is doing now will partially build the model for potential updates in the future.

In the future, could the model be updated to assess areas upstream from Jordanelle Reservoir?

Yes, the model team has compiled the data upstream of Jordanelle Reservoir. Someone would need to refine the model to run scenarios in that area.

How did the modeling team decide to use SSEBop to set the baseline for calibrating evapotranspiration patterns? There are many evapotranspiration models.
SSEBop is a graded product that incorporates different variables, like radiation and dew point temperature, to generate evapotranspiration rates. SSEBop simulates actual evapotranspiration, while the HSPF watershed model simulates potential evapotranspiration (i.e., the evapotranspiration rate under an unlimited supply of moisture).

Did the modeling team check what evapotranspiration model the Utah Division of Water Rights uses to model evapotranspiration?
The modeling team will check with Scott Daly to determine what evapotranspiration model the Utah Division of Water Rights uses.

Will it be detrimental that the model cannot simulate the impacts of urban and agricultural best management practices?
Some models can simulate best management practices for specific projects (i.e., what happens if a best management practice is applied to a specific farm). The HSPF model will not be able to simulate a specific project. Instead, the HSPF model takes a higher-level approach and can show where the largest contributors of nutrients are in each hydrologic response unit. The model will help identify key areas to tackle for implementation. It will be up to the Steering Committee to identify specific processes and projects.

Does the model simulate groundwater?
The HSPF model simulates surface flows and shallow groundwater flows.

Is there a sediment standard for the State of Utah?
There is no sediment standard for the State of Utah.

Why does the watershed model account for sediments if no sediment standard exists?
Not all parameters have an associated standard. The modeling team simulates sediments because sediments play an important role in transporting nutrients. The modeling team needs to accurately represent sediment movement to accurately represent nutrient transport. Although sediment is not an endpoint in and of itself, it is an important factor in capturing the mechanism of nutrient transport.

Public Audience Clarifying Questions
Members of the public asked clarifying questions about the watershed model update. Their questions are indicated below in italics, with the corresponding responses in plain text.

Will the watershed model handle the internal cycling of nutrients in Utah Lake?
The watershed model will simulate nutrients leading up to their entrance into Utah Lake. The in-lake model will account for nutrients once they enter Utah Lake.

The watershed model did not include effluent from Timpanogos Special Service District's (TSSD) wastewater treatment plant. Why is this dataset not included?
There are two wastewater treatment plants with direct discharges into Utah Lake. The TSSD and Orem wastewater treatment plants are the two facilities with direct discharges. The effluent from those wastewater treatment plants is accounted for in the in-lake model.

How transparent is the HSPF code for third parties to evaluate?
The HSPF code is accessible. The US Environmental Protection Agency (EPA) has tested and approved the model.

PRELIMINARY POINT SOURCE COST ESTIMATE UPDATE
John Mackey, DWQ, provided an update on ongoing work to estimate the cost of upgrading wastewater treatment plants. His update is summarized below.

- DWQ and the publicly owned treatment works (POTWs) around Utah Lake have been working on estimating the costs of upgrading treatment plants under three management scenarios for nutrient control. They conducted this work on behalf of the Steering Committee as requested in the Implementation Framework.
- Wasatch Front Water Quality Council (WFWQC), which includes all the POTWs, used standard cost estimating software to assess each treatment plant. The plants modeled include Salem City, TSSD, Springville City, Provo City, Spanish Fork City, and Payson City wastewater treatment plants.
- WFWQC and DWQ estimated the cost of upgrading treatment plants under four scenarios.
    - WFWQC and DWQ identified the cost of upgrading the plants under the baseline condition. POTWs are currently upgrading their facilities to limit effluent to one mg/l of total phosphorus. Since plants are already under construction, this situation represents the baseline condition. The baseline condition (current upgrades) cost is $774 million. The $774 million value represents the total value of WWTP assets once construction is complete in 2025.
    - Future scenario one is the cost of adding membrane filters to treatment plants to limit effluent to less than one part per million (PPM) of total phosphorus. The cost of scenario one is an additional $431.7 million above the baseline.
    - Future scenario two is the cost of expanding biological nutrient removal for phosphorus and nitrogen control. The biological nutrient removal would reduce total nitrogen concentrations to six to eight PPM and total phosphorus concentrations to 0.1 to 0.3 mg/l. The cost estimate for each scenario builds off previous scenarios, so the total cost of scenario two (membrane filters + biological nutrient removal) is $566.2 million.
    - Future scenario three is the cost of adding reverse osmosis technology to the WWTPs. Reverse osmosis equipment represents the limits of technology for reducing nutrients. It also brings the water quality to drinking water standards. The cost estimate for scenario three (membrane filters + biological nutrient removal + reverse osmosis technology) is $698 million.
- WFWQC calculated the cost breakdown for each of the seven facilities modeled. They also calculated the cost of upgrades assuming a 20-year loan period at a 5% interest rate. Under these loan conditions, the estimated total cost for the baseline condition is $1.262 billion, and the estimated total cost for scenario three (membrane filters + nutrient removal + reverse osmosis technology) is $1.071 billion on top of the baseline condition.
- The ULWQS Steering Committee has not yet identified nutrient standards, so the cost estimates are preliminary and high-level. These costs are a factor to consider once the ULWQS Steering Committee begins discussing implementation planning. The Steering Committee will also be asked to consider other mechanisms for reducing nutrient inputs.

Steering Committee Clarifying Questions
Steering Committee members asked clarifying questions about the watershed model update. Their questions are indicated below in italics, with the corresponding responses in plain text.

Does the analysis estimate the increase in cost by household?
The analysis estimated the increase in household costs for scenario one (membrane filters only). The result indicated an increase of approximately $15 per unit/month.

Will getting water quality conditions up to reuse standards create a problem downstream for the Great Salt Lake?
Adding membrane filters to WWTPs will put the water quality into the reuse range by DWQ's reuse standards. Whether reaching that standard impacts the Great Salt Lake depends on how the water is used. This question is important to consider during implementation planning and is also something the Utah State Legislature is discussing. The discussions focus on the potential to reuse water and aquifer storage and recovery.

Is it possible to generate diminishing return curves for each scenario to identify at what point it becomes more cost-effective to reuse water than deliver it to Utah Lake?

- It is cheaper to reduce phosphorus concentrations when the concentrations are high. As phosphorus concentrations decrease, it becomes more expensive to reduce concentrations by smaller amounts. It is possible to create graphs to represent this trend.
- It will depend on how stakeholders value the different water uses when determining whether it is more cost-effective to reuse water rather than deliver it to Utah Lake. It is difficult to compare the value of water going downstream to the Great Salt Lake versus the value of reusing the water. Steering Committee members and the Utah State Legislature will have to consider the water's value if the effluent ever comes into reuse standards.

Is the cost estimate report available and accessible to the public?
WFWQC needs to be credited with the work. They have produced a final report with all the information on cost model outputs, scenarios, and processes. The plan is to circulate the report to Steering Committee members at a future date.

Will similar cost estimates be generated for best management practices for other sectors (e.g., stormwater)?
The qualified answer is yes. It will be important for the ULWQS Steering Committee to understand the cost of all potential management actions. The plan is to generate these cost estimates for all potential management considerations (e.g., nonpoint sources, stormwater, etc.).

Steering Committee Comments
Steering Committee members provided comments on the preliminary point source cost estimate update. Their comments are summarized below.

- Whether water can be reused will also depend on downstream water rights.

Public Audience Comments
Members of the public commented on the preliminary point source cost estimate update. Their comments are summarized below.

- Bringing the effluent into reuse standards will result in doubling or tripling user rates, and the effluent will no longer reach Utah Lake. This dynamic would result in no net benefit to Utah lake.

SCIENCE PANEL MEMBER STATUS OVERVIEW
Samuel Wallace, Peak Facilitation Group, presented an overview of the current Science Panel membership status. His update is summarized below.

- Three Science Panel members have resigned: James Martin, Ryan King, and Soren Brothers. Their resignations created a gap in expertise in aquatic ecology/criteria development, water quality modeling, and shallow lake limnology. The primary expertise of the remaining Science Panel members is:
    - Two members with expertise in limnology
    - Four members with expertise in biogeochemistry
    - One member with expertise in fisheries management
- During today's meeting, the Steering Committee will discuss and identify three new Science Panel members to replace the resigned members. The Science Panel was charged with six tasks.
    1. Guide development of a scientifically defensible approach for developing site-specific nutrient criteria
    2. Recommend scientific studies based on the scope outlined by the Steering Committee
    3. Guide study efforts during implementation by providing advice to principal investigators and study contractors
    4. Review, interpret, and provide comments on study results
    5. Provide an independent, scientific peer review process on relevant Utah Lake studies and research reports
    6. Recommend science-based site-specific nutrient criteria to ensure long-term protection of Utah Lake's designated uses to the Steering Committee
- The Science Panel is currently in the middle of task 3, so Steering Committee members should consider which Science Panel nominees can best help the Science Panel with its remaining tasks.
- According to the Science Panel operating procedures, the Science Panel is composed of five independent and five ex officio members. Independent members provide independent and objective recommendations to the Steering Committee. Ex officio members provide local context, share professional experience and expertise, and advise on relevant experience with Utah and Utah Lake.
- According to the Science Panel operating procedures, the Science Panel members are expected to be "independent" and "objective." "Independent" means that these individuals are not financially connected to any individuals or organizations represented on the Steering Committee and will not bid on ULWQS work. "Objective" means members will approach all data and findings with an open mind and eliminate personal biases.
- As outlined in the Science Panel operating procedures, the process for selecting new Science Panel members is as follows:
    - Science Panel members will provide input on how to fill openings.
    - Steering Committee members will nominate new members using Science Panel input.
    - Steering Committee co-chairs (Eric Ellis and John Mackey) retain authority for replacing members based on the Steering Committee's nominations/ recommendations.
- The Science Panel members received a survey to provide their input on the missing areas of expertise needed to accomplish their remaining tasks. They also recommended individuals who could fill those gaps in expertise. The Science Panel members identified the following expertise as missing from the Science Panel:
    - Water quality modeling (7 members identified)
    - Water quality criteria development (6 members identified)
    - Wetland science (4 members identified)

    - Nutrient criteria implementation (2 members identified)
    - Toxicology (2 members identified)
    - Biogeochemistry (2 members identified)
    - Policy and planning (1 member identified)
    - Phycology (1 member identified)
    - Nutrient cycling (1 member identified)
    - Limnology (1 member identified)
    - Hydrodynamic modeling/hydrology (1 member identified)
    - Aquatic ecology (1 member identified)
    - Economics (0 members identified)
    - Fisheries management (0 members identified)
- Science Panel members also provided the following comments on the areas of expertise missing from the Science Panel:
    - "The departure of James Martin and Ryan King from the Science Panel has resulted in a loss of expertise in modeling and water quality criteria development. New Science Panel members should fill these gaps in expertise."
    - "A modeling expert can help provide guidance, clarification, and interpretation of results. They will also be able to help implement the calcite scavenging model add-on."
    - "The model results will inform the decision on nutrient criteria, so it is important to have a modeling expert weigh in."
    - "An expert in criteria development and standards implementation will be critical as these are the next steps in the ULWQS process."
    - "Additional help with phycology and toxicology would be useful."
- Science Panel members, in total, recommended 13 people to join the Science Panel. Steering Committee members received a report with the Science Panel's input and recommendations. Steering Committee members also received a form to formally nominate individuals to join the Science Panel. In total, Steering Committee members nominated seven people:
    - Dr. Zach Aanderud, Brigham Young University
    - Dr. Ben Abbott, Brigham Young University
    - Dr. Walter Dodds, Kansas State University
    - Dr. Ramesh Goel, University of Utah
    - Dr. David Richards, OreoHelix Ecological
    - Dr. Thad Scott, Baylor University
    - Mr. Tim Wool, Unaffiliated (retired USEPA)

Steering Committee Clarifying Questions

Steering Committee members asked clarifying questions about the Science Panel membership update. Their questions are indicated below in italics, with the corresponding responses in plain text.

The information provided on the areas of expertise remaining on the Science Panel does not align with past information on their areas of expertise. Why is this the case?

The information provided on the expertise of the remaining Science Panel members shows the remaining Science Panel members' primary area of expertise. All Science Panel members also have secondary areas of expertise, which were not accounted for in that update.

With the resignation of three Science Panel members, it was stated that the Science Panel has a gap in shallow lake limnology expertise. Yet, there are remaining Science Panel members with expertise in limnology. Does the Science Panel have a gap in shallow lake limnology?
Limnology as a field is broad. One of the resigning Science Panel members was an expert in shallow lake limnology. Although some of the remaining Science Panel members have expertise in limnology, it does not necessarily mean they have expertise in shallow lake limnology. Science Panel members may not have identified limnology as a need for the Science Panel, knowing that some remaining members have related expertise. The Science Panel did not identify shallow lake liminology as a missing area of expertise.

Steering Committee Discussion
Steering Committee members discussed how to recognize the three resigning Science Panel members for their contribution to Utah Lake. Their comments are summarized below.

- A letter from the ULWQS Steering Committee recognizing the resigning members for their contributions would be a nice gesture. Other potential options could be to provide those members with a plaque to acknowledge their service. Scott Daly and Eric Ellis will determine how to best recognize the contributions of the resigning Science Panel members.

Steering Committee Polling Question
Steering Committee members were polled on whether they agreed with the Science Panel's input, which identified the priority areas of expertise currently needed on the Science Panel: water quality modeling, water quality criteria development, and wetland science. The results of the polling are indicated below.

Polling Question: The Science Panel identified that the priority areas of expertise currently needed on the Science Panel are water quality modeling, water quality criteria development, and wetland science. Do you agree with this list?

Response	*Number of Responses*	*Percentage of Responses*
Yes, I agree with the list	9	75%
No, I do not agree with the list	1	8%
I am unsure	2	17%

Steering Committee Comments
The Steering Committee member that did not agree with the list commented that they did not want the results of this poll to limit who Steering Committee members could consider when selecting new Science Panel members. The poll's purpose is not to limit the decision by Steering Committee members on who should join the Science Panel; it is only meant to provide additional insight into how Steering Committee members are thinking. In their discussion, Steering Committee members can select whomever they would like to join the Science Panel.

OVERVIEW OF NOMINEES AND QUALIFICATIONS
Before the meeting, Steering Committee members received an overview of nominees based on information provided by the nominating Steering Committee member. Scott Daly, DWQ, gave a brief overview of the nominees and their qualifications based on the information provided by the nominating Steering Committee member. His overview is summarized below.

- Dr. Zach Aanderud was nominated by Steering Committee member Eric Ellis. Dr. Aanderud is at Brigham Young University (BYU) and has expertise in phycology and harmful algal blooms. He has an extensive list of publications related to his primary expertise. He recently

provided an updated curriculum vitae (CV), so the CV Steering Committee members received before the meeting may not be the most up-to-date version. Dr. Aanderud conducted a bioassay study for the ULWQS, which is now complete. Because the study is complete, no conflicts of interest were identified in his nomination, which means he does not have financial connections to DWQ, Steering Committee members, or other interests in Utah Lake.

- Dr. Ben Abbott was nominated by Steering Committee member Heidi Hoven. Dr. Abbott is at BYU, and his primary discipline is aquatic ecology. His secondary disciplines include biogeochemistry, hydrodynamic modeling/hydrology, limnology, nutrient cycling, water quality criteria development, water quality modeling, wetland science, policy and planning, and ecosystem ecology. He has worked on studies related to the application of watershed models, stream ecology, and source identification. Dr. Abbot has a potential conflict of interest through a Watershed Restoration Initiative grant awarded by the Utah Department of Natural Resources. The grant is not currently active.
- Dr. Walter Dodds was nominated by Steering Committee member John Mackey. Dr. Walter Dodds is at Kansas State University. He has worked on criteria development for several watersheds across the country, including Flathead Lake in Montana and the South Florida Water Management District. He has secondary expertise in nutrient cycling, as demonstrated by the publications identified in his CV. He does not have any conflicts of interest identified.
- Dr. Ramesh Goel was nominated by Steering Committee members Rich Mickelsen and Heidi Hoven. His primary discipline is nutrient cycling. He has secondary expertise in biogeochemistry, wetland science, aquatic ecology, and water quality modeling. He also worked on a study commissioned by the ULWQS Science Panel to assess and model nutrient interactions in the water column; the contract is no longer active. He does not have any conflicts of interest identified.
- Dr. David Richards was nominated by Steering Committee member Rich Mickelsen. Dr. Richards has his own company OreoHelix Consulting. He has worked on a range of studies with Utah Lake and has empirically analyzed data to monitor Utah Lake. He has produced many reports on Utah Lake. His primary discipline is aquatic ecology, with secondary expertise in toxicology, water quality criteria development, bioassessment development, food web modeling, and benthic invertebrate, phytoplankton, zooplankton, and fish ecology. Identified conflicts of interest include his current contract with the WFWQC to conduct ecological research in the Utah Lake-Jordan River-Farmington Bay ecosystems. He also serves on several Utah DWQ technical committees, including nutrient total maximum daily load criteria development committees. He is also being considered as a board member for the Utah Lake Audubon Society.
- Dr. Thad Scott was nominated by Steering Committee members John Mackey and Heidi Hoven. His primary discipline is limnology. He has studied the relationship between harmful algal blooms, nutrient cycling, and toxicology and applied that knowledge to criteria development. He has served on a similar science panel for developing nutrient criteria in Arkansas and Oklahoma. His other disciplines include aquatic ecology, biogeochemistry, and policy and planning. He does not have any conflicts of interest identified.
- Mr. Tim Wool was nominated by Steering Committee member John Mackey. He is unaffiliated but previously worked for the EPA. His primary area of expertise is water quality modeling. Since 1995, he has been the primary developer for the WASP model, which the Science Panel uses for the UWLQS in-lake model. He modified the code and incorporated new sciences into the model, and he has also provided input to Tetra Tech to

refine the WASP model to make it useful for the ULWQS. His other disciplines are hydrodynamic modeling/hydrology, nutrient cycling, and water quality criteria development. He helped develop the model for Lake Okeechobee for that criteria development process. He does not have any conflicts of interest identified.

- All nominees were contacted before the Steering Committee meeting and confirmed their willingness to participate.

CLOSED MEETING SESSION

Steering Committee members voted to enter into a closed meeting session to discuss the Science Panel nominees. The following Steering Committee members participated in the discussion for their respective interests:

- Eric Ellis – Utah Lake Commission (primary)
- John Mackey – water quality (primary)
- Ben Stireman – recreation, fishing, and sovereign lands (alternate)
- Jesse Stewart – agriculture/water rights/water users (primary)
- Jay Olsen – agriculture (primary)
- Craig Bostock – public health (primary)
- Heidi Hoven – conservation and environment (primary)
- Gerard Yates – water management of Utah Lake (primary)
- Rich Mickelsen – publicly owned treatment works (primary)
- Gary Calder – municipal (primary)
- Brad Stapley – municipal (primary)
- Dave Norman – municipal (alternate)

CLOSED MEETING SESSION OUTCOMES

Steering Committee members selected Tim Wool and Thad Scott to join the Science Panel as independent members and Zach Aanderud to join as an ex officio member. Steering Committee members were polled to indicate their support for this slate of candidates. The results of the polling exercise are indicated below.

Polling Question: Do you agree to advance Thad Scott and Tim Wool (independent) and Zach Aanderud (ex officio) as nominees to join the ULWQS Science Panel?

Response	*Number of Responses*	*Percentage of Responses*
Yes, I agree with this slate of candidates.	12	100%
No, I do not agree with this slate of candidates.	0	0%

NEXT STEPS

Scott Daly, Eric Ellis, and John Mackey will reach out to the new Science Panel members to formally invite them to join the Science Panel.