

Utah Lake Water Quality Study (ULWQS)
Steering Committee
May 26, 12:00 PM to 3:00 PM
Virtual Meeting
Meeting Summary

ATTENDANCE:

Steering Committee Members and Alternates: David Barlow, Scott Bird, Gary Calder, Chris Cline, Eric Ellis, Erica Gaddis, Juan Garrido, Heidi Hoven, Christopher Keleher, Rich Mickelsen, Dave Norman, Jay Olsen, Cory Pierce, Mike Rau, Dennis Shiozawa, Jesse Stewart, Neal Winterton, and Gerard Yates

Science Panel Members: Mitch Hogsett

Members of the Public: Jeff DenBleyker, Tina Laidlaw, and Renn Lambert

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

Technical Consultants and Guest Speakers: Representative Brady Brammer and Kateri Salk

Facilitation Team: Heather Bergman and Samuel Wallace

ACTION ITEMS

Who	Action Item	Due Date	Date Completed
Kateri Salk	Follow up with Jay Olsen to address comments about removing the odor and taste assessment endpoints from the agricultural uses section of the Numeric Nutrient Criteria Framework.	June 2	
	Incorporate the feedback from the Steering Committee and provide a revised Numeric Nutrient Criteria Framework to the Committee.	June 9	
Heather Bergman and Samuel Wallace	Resend the Numeric Nutrient Criteria Framework to the Steering Committee.	May 26	May 26
	Provide a Google Form to accompany the revised Numeric Nutrient Criteria Framework that asks for final approval from Steering Committee members.	June 9	
	Send a Doodle to the Steering Committee to schedule the next meeting in August or September.	June 2	
Steering Committee Members	Provide feedback and comments on the Numeric Nutrient Criteria Framework to Kateri Salk.	June 2	

Who	Action Item	Due Date	Date Completed
Samuel Wallace	Create a Google Folder with all the Science Panel studies and add it to the Ideaflip.	June 9	

DECISIONS AND APPROVALS

No formal decisions or approvals were made at this meeting.

GROUND RULES AND PROCESS COMMITMENTS OVERVIEW

Heather Bergman, Peak Facilitation Group, gave an overview of the Steering Committee ground rules and process commitments. The ground rules and process commitments of the Steering Committee are listed below.

- The Steering Committee process commitments are:
 - Seek to learn and understand each other's perspective
 - Encourage respectful, candid, and constructive discussions
 - Seek to resolve differences and reach consensus
 - As appropriate, discuss topics together rather than in isolation
 - Make every effort to avoid surprises
- The Steering Committee ground rules are:
 - Focus on the task at hand
 - Have one person speaking at a time
 - Allow for a balance of speaking time by providing succinct statements and questions
 - Listen with respect

UTAH LAKE LEGISLATIVE AND POLICY UPDATES

Erica Gaddis, DWQ, provided an update on legislation and policy relevant to the ULWQS. Her comments are summarized below.

- The state legislature is working on the Utah Lake Authority Bill. The Bill would create a new legal authority for Utah Lake. Eleven workgroups are working with Representative Brady Brammer to refine the Bill. Erica Gaddis, DWQ, has joined many of the workgroups to make sure the work of the ULWQS Steering Committee and Science Panel is recognized in any new structure, funding, and planning effort.
- One of the workgroups has brought up the need for more cross-county comprehensive planning. Cross-county comprehensive planning could tie in well with the next phase of the ULWQS focused on scenario modeling and implementation planning. Eric Ellis, Utah Lake Commission, and Erica Gaddis are working to identify opportunities for alignment between county planning and the Steering Committee implementation planning.
- There is a lot of interest and work going into the Utah Lake Restoration proposal. The Utah Lake Restoration proposal involves developing the Utah Lake bed for 300,000 people in exchange for cleaning up water quality and improving habitat. The Utah Division of Forestry, Fire, and State Lands is reviewing the proposal. The DWQ does not have formal approval authority for the project except for the 401 water quality certification, which is part of the 404 permit. The Utah Lake Restoration Project managers plan to apply for the 404 permit this summer and complete their analysis in the next year and a half. They asked for the ULWQS draft model, data, and science as they intend to use the information from the ULWQS in their analysis. The state legislature funded \$10 million to provide a loan for the Utah Lake Restoration Project.
- The Utah Lake Commission is helping to connect Lake Restoration Solutions, Inc., the Utah Lake Restoration Project managers, with stakeholders in preparation for a formal

engagement with the US Army Corps of Engineers. Lake Restoration Solutions have been mapping the Utah Lake bed, and they should complete that effort in four to six weeks. They are assessing the soil content of the lake bed to a depth of 75 feet in case they proceed with a dredging plan.

- The state legislature funded harmful algal blooms (HABs) treatments. The funding is going through the Division of Forestry, Fire, and State Lands. DWQ is working with the Utah Department of Natural Resources (DNR) to monitor the treatments and develop a more comprehensive analysis of the effects and unintended consequences of the treatments. The funding will be for new targeted treatments and to develop a strategic treatment plan for managing algal blooms while the ULWQS Steering Committee and Science Panel work on nutrient reduction issues.
- There will be a new Utah Lake general permit that will go out for comment on June 1, with the plan for it to go into effect on July 1. The permit is for anyone adding things to Utah Lake to treat algae, such as chemicals, bacteria, and harvesting approaches with associated discharges. The permit will have reporting and notification requirements to help monitoring crews collect data.

UTAH LAKE AUTHORITY BILL UPDATE

Representative Brady Brammer provided an update on the Utah Lake Authority Bill. His comments are summarized below.

- The Utah County Caucus in the Utah House of Representatives has a strong interest in Utah Lake. They view it as a huge state asset with unfulfilled potential. The state legislature is getting serious about addressing Utah Lake.
- The state legislature allocated \$10 million for Utah Lake, including \$4.4 million for the Walkara Way, \$2.7 million for marina improvement, \$1 million for invasive species, and \$1 million for algal bloom remediation. The state legislature also allocated \$10 million as a loan for the Utah Lake Restoration proposal.
- Although there are many interests in Utah Lake, the Utah Lake Commission is the only organization with a charge over it. The Utah Lake Commission does not have the authority, funding, and resources to take many actions unless they pursue legislative allocations for funding. Relying on legislative allocations makes it difficult to pursue long-term projects. They also do not have the authority to tax or bond. The Utah Lake Authority Bill intends to establish the Utah Lake Authority with the appropriate level of authority, funding, and resources to act in Utah Lake.
- The Utah Lake Authority will have limitations on its authority and its ability to tax. The Bill is also not meant to be prescriptive on what the Utah Lake Authority will do; the Authority will take information and make its own decisions. However, the Utah Lake Authority will follow larger principles, including water quality remediation, protection of existing water rights, promotion of wildlife interests, and maximization of recreation and economic potential of Utah Lake. The legislation will focus on promoting these interests.
- The Utah Lake Authority should not get in the way of the ULWQS or get ahead of it. The ULWQS is important, but it needs to go to an organization that can do something about it. The Utah Lake Authority is meant to be the organization that can take the ULWQS and act upon it.

Clarifying Questions

Steering Committee members asked several clarifying questions about the Utah Lake legislative and policy updates. Questions are indicated in italics with corresponding answers in plain text.

If the ULWQS does not produce a clear pathway on how to improve Utah Lake, what will be the direction for the Utah Lake Authority?

- The Utah Lake Authority will follow the principles laid out in the Bill. Decision-makers receive inconclusive studies regularly, and they still have to make decisions. Decision-makers want data to help them make a clear decision, but if the ULWQS is not clear, there will still be some information for the Utah Lake Authority to work from.
- Studies are not binding for decision-makers. The study may not be conclusive, but the expectation is that it will provide some direction, given the number of experts involved.
- The goal of the ULWQS is to come back to policy-makers with clear scenario analyses that daylight where there are uncertainties to help assist with decision-making.

The ULWQS has taken a science-based approach to its analyses and decision-making processes. How does the Utah Lake Restoration Project incorporate relevant information and data for science-based decision-making? What information are the Utah Lake Restoration Project managers committed to providing?

- The Utah Lake Authority Bill sets up the Utah Lake Authority to be agnostic towards the Utah Lake Restoration Project. If the Utah Lake Restoration Project moves forward, the project managers will interact with the Utah Lake Authority. If the Utah Lake Restoration Project does not move forward, the Utah Lake Authority will still have a problem to solve. The Bill is meant to establish the Utah Lake Authority to manage Utah Lake with or without the Utah Lake Restoration Project.
- The Utah Lake Restoration Project managers will need to submit scientific documents for the project. They will be working with expert consultants that will gather the needed data to support their proposal. Many agencies, including the Division of Forest, Fire, and State Lands, the Utah Lake Commission, and the US Army Corps of Engineers, will vet and approve the proposal.

Will protection of hemispherically important bird areas be considered at the forefront of a Utah Lake Authority decision-making process?

The Utah Lake Authority Bill includes opportunities for input from the Utah Division of Wildlife Resources to consider wildlife interests. There is no desire to impact wildlife negatively. The policy decisions will be left to the Utah Lake Authority Board, and they will need to be wise and keep in mind the wildlife impact.

Steering Committee Discussion

Steering Committee members discussed the Utah Lake legislative and policy updates. Their comments are summarized below.

- There is a concern that the Utah Lake Restoration Project analysis will be piecemeal. With many agencies with different purviews and perspectives evaluating the proposal, they may not be able to adequately evaluate the proposal, given the complexities of Utah Lake. One challenge with evaluating the Utah Lake Restoration Project is defining a satisfactory methodology for evaluating the proposal. The Utah Lake Commission has discussed this challenge, and they intend to make this review as thorough as possible. The Utah Lake Commission is trying to make sure the Utah Lake Restoration Project managers interact with relevant entities to gather feedback on how the project will impact sensitive species. They are also looking into phasing the project at smaller scales to better understand how the project will impact the Lake so that they can adjust the project as needed.
- DWQ has not seen a lot of the scientific analyses in the Utah Lake Restoration Proposal. Three years ago, the Utah Lake Restoration Project managers indicated they had conducted

analyses and developed models, but it was all proprietary. They recently asked for the ULWQS models and analyses. The ULWQS work will potentially serve as the foundational science for their application.

- The ULWQS Steering Committee and Science Panel have been productive, so there may be an opportunity to use the ULWQS structure as a model for other groups.
- Peer-reviewed and science-based evidence should be used for the decision processes for the Utah Lake Authority, specifically concerning the Utah Lake Restoration Project. Utah Lake has hemispherically important bird areas, and plans moving forward could directly impact these hemispherically important bird areas.
- Forming a technical group of people to help evaluate the Utah Lake Restoration proposal is one approach to avoid a piecemeal evaluation process.
- Given the other projects and efforts on Utah Lake, there is an urgency to complete the ULWQS at the risk of becoming less relevant over time.

STEERING COMMITTEE HARMFUL ALGAL BLOOM UPDATE

Following the last Steering Committee meeting on March 25, several Steering Committee members stayed after the meeting to discuss harmful algal blooms. Heather Bergman, Peak Facilitation Group, provided an update on the post-meeting discussion. Her comments are summarized below.

- At the March 25 Steering Committee meeting, invited panelists talked about harmful algal blooms. Following the panelists' presentations, Steering Committee members were asked whether they were comfortable collecting cell count data. Some members said yes, and some members said no. Steering Committee members who said they were not comfortable collecting cell count data stayed after the meeting to further discuss their concerns.
- The concerns that Steering Committee members identified included:
 - Some epidemiological studies the Environmental Protection Agency (EPA) relies on in their guidelines are based on correlative rather than causal relationships between exposure to cyanobacteria and health effects.
 - Some Steering Committee members expressed concern about basing a health advisory on correlative data.
 - Others noted that epidemiological studies are always correlative, which is why EPA uses a "weight of evidence" approach in the guidelines.
- At the end of the post-meeting discussion, the participants reached the agreement that:
 - Cell counts are useful measures to have, in addition to data on chlorophyll-a and biovolume. The Steering Committee and Science Panel should use all these data types to assess progress toward management goals. The speciation of cell counts and toxin measurements should also be used.
 - Agreeing to collect cell count data and using them to explore options in different future scenarios does not equate to an agreement that there is a pre-established threshold or target that should be attained.
- Future discussions on specific cell count thresholds for advisory warnings are better suited for the DWQ and Utah Department of Health's Water Quality Health Advisory Panel. Additionally, future Steering Committee scenario discussions regarding potential targets or thresholds should consider achievability for each scenario in addition to other factors identified by the Steering Committee.
- Before the meeting, Steering Committee members provided their questions on harmful algal blooms to the panelists. Following the meeting, Samuel Wallace provided the questions to the panelists, who provided written responses. Samuel Wallace distributed a single Harmful Algal Blooms Question and Answer document with all the panelists' responses to the Steering Committee questions on Friday, May 21.

Clarifying Questions

Steering Committee members asked several clarifying questions about the harmful algal bloom post-meeting discussion. Questions are indicated in italics with corresponding answers in plain text.

What is meant by "achievability" in the context of potential targets or thresholds?

The goal of the ULWQS is to set criteria and then work to achieve that criteria. The criteria still need to be determined. Evaluating cost, feasibility, and attainability is part of the next phase of the ULWQS.

Is "achievability" related to whether a solution is affordable?

- There are two parts to achievability: attainability and feasibility. The Science Panel Paleo Study will show the best attainable conditions for Utah Lake. Ultimately, the goal of the ULWQS is not to bring Utah Lake to its pre-settlement condition or to bring it to the condition of other lakes, like Lake Tahoe. The goal is to find numeric criteria that are protective of all uses in Utah Lake and then, based on that criteria, analyze the feasibility of meeting those targets.
- Part of determining attainability will involve surveying the general public to assess their tolerance for water quality in Utah Lake. The Steering Committee can see whether the survey results align with the feasibility analysis of the ULWQS. If they align, the Steering Committee can use that information when they conduct the final assessment to identify criteria values that meet all needs.

In response to question 2C in the Harmful Algal Blooms Question and Answer document, it discusses the timeframe for restoring Utah Lake. On what basis is the ULWQS evaluating the timeframe for restoring Utah Lake?

This question is the type of question that should be asked during the scenario modeling and implementation phase of the ULWQS. Steering Committee members should understand the steady-state condition for Utah Lake under different hypotheticals *and* how quickly it will take Utah Lake to reach that condition.

Would management strategies beyond the treatment facilities be considered in the scenario modeling?

- The Steering Committee can take that approach to scenario modeling. The Steering Committee decided at the beginning of the ULWQS that they would make assumptions on some factors, like water management, climate change, and carp management, to be included in the scenarios. The goal in scenario modeling was to focus on where the Steering Committee could make a difference.
- The Steering Committee could identify nutrient criteria within a range based on fish, water management, and climate assumptions. The Steering Committee could then ask the Science Panel to provide quantitative or narrative answers on how the other factors may support or interfere with the Steering Committee's approach to nutrient reduction.

As the ULWQS enters the scenario planning and implementation phase, is the plan to ask the Science Panel to provide creative solutions for nutrient reduction in Utah Lake?

The Steering Committee should ask these questions. If the question is whether the Steering Committee can ask the Science Panel to model different types of fish management strategies and how that impacts nutrient levels, that level of modeling may not be feasible in the ULWQS. The level of detail required in that request would likely go beyond the budget and timeline of the

ULWQS. However, the Science Panel should provide a comprehensive recommendation beyond numeric nutrient criteria to help resolve algal bloom issues in Utah Lake.

Steering Committee Discussion

Steering Committee members discussed the harmful algal bloom post-meeting discussion. Their comments are summarized below.

- Meeting participants provided clarification on the March 25 discussion. In the discussion, meeting participants discussed the statistical corrections in the table from the Pilotto 1997 Study. The harmful algal bloom panelists also discussed a study conducted on Lake Taihu where researchers identified that removing 30% of nutrients resulted in improvements of the lake condition.
- In response to question 2A in the Harmful Algal Bloom Question and Answer document, the answer discusses how nutrients impact algal growth. The Steering Committee should take a more holistic approach, looking at other factors beyond nutrients that impact algal growth. Similarly, in response to question 3B(ii), the answer mentions how climate impacts algal growth and toxin production. The Steering Committee should ask questions about the other factors impacting algal growth, how the Steering Committee can deal with them, and whether it is possible to do so. Many of these comments can be framed up in the scenario modeling and implementation phase of the ULWQS.
- The Harmful Algal Bloom Question and Answer document is meant to convey the panelists' specific and discrete answers to the Steering Committees' specific and discrete questions. The document is not intended to be a comprehensive summary of the issue. Samuel Wallace and Heather Bergman can document the Steering Committee member's comments on the Harmful Algal Bloom Question and Answer document for future discussions during the scenario modeling and implementation phase of the ULWQS.
- The Steering Committee should evaluate the cost of any recommendations. DWQ is in a tough position. The state legislature requires that any recommended numeric nutrient criteria come with a detailed assessment of cost; at the same time, the EPA says that any standard based on cost is not approvable by their standards. The science needs to justify that any Steering Committee recommendation is supportive and protective of the uses in Utah Lake. The Steering Committee can evaluate a range of scientifically justifiable outcomes using policy and management factors to develop an implementation plan that is comprehensive, feasible, and supported by the science, independent of costs.
- Under the Clean Water Act, if a standard is determined to not be feasible, it is possible to go down the "G factors," which would involve providing variances and conducting a use attainability analysis based on socio-economic impacts of achieving proposed criteria. EPA's preference is for the regulatory body to pick a number first and then conduct feasibility analyses, but the Steering Committee will be conducting both analyses in parallel. Conducting the analyses in parallel will help the Steering Committee provide a comprehensive recommendation that will ultimately result in water quality improvements.
- As the Steering Committee discusses scenario modeling and implementation, they should better define words like "feasibility."

NUMERIC NUTRIENT CRITERIA FRAMEWORK DOCUMENT IDEAFLIP OVERVIEW

Samuel Wallace, Peak Facilitation Group, provided an overview of how the Numeric Nutrient Criteria Framework document fits into the ULWQS process using the ULWQS Ideaflip. His comments are summarized below.

- The lead-up to the Numeric Nutrient Criteria Framework has involved several steps. The first draft of the Numeric Nutrient Criteria Framework began with a literature review to

consider different approaches for developing numeric nutrient criteria for Utah Lake. The first draft also involved developing conceptual models for nutrient cycling in Utah lake and the Uncertainty Guidance that outlines how to communicate and manage uncertainties.

- The draft Numeric Nutrient Criteria Framework led to a data gap analysis, ultimately informing the ULWQS Strategic Research Plan. The Steering Committee then developed management goals. The literature review, conceptual models, Uncertainty Guidance, data gap analysis, Strategic Research Plan, and management goals are all part of the final Numeric Nutrient Framework.
- Following the finalization of the Numeric Nutrient Criteria Framework, the next step in the ULWQS process is to develop the Numeric Nutrient Criteria recommendation and begin scenario modeling and implementation planning.

NUMERIC NUTRIENT CRITERIA FRAMEWORK PRESENTATION

Kateri Salk, Tetra Tech, provided an overview of the Numeric Nutrient Criteria Framework document. Her presentation is summarized below.

Numeric Nutrient Criteria Framework Updates

Steering Committee members, DWQ staff, and EPA staff all provided feedback on the first draft of the Numeric Nutrient Criteria Framework. Tetra Tech staff incorporated all the comments and the associated responses into a Comment-Response document, which was distributed to Steering Committee members before the meeting. Tetra Tech also added the management goals table and a pathway to criteria section to the updated version of the Numeric Nutrient Criteria Framework.

Numeric Nutrient Criteria Framework – Section 1: Overview and Background

- The overview section of the Framework describes Utah Lake's beneficial use impairments and the establishment of the ULWQS. It also outlines the process to develop the Numeric Nutrient Criteria Framework, which involved conducting a literature review, developing the conceptual model, developing the Uncertainty Guidance, characterizing existing data, and analyzing data gaps.
- The next section of the Framework document outlines the results of the literature review. The literature review identified three approaches for developing the numeric nutrient criteria: reference-based approach, stressor-response analysis, and scientific literature.
 - There are three types of **reference-based approaches**. The first involves selecting a reference case based on the highest water quality conditions documented through direct observation. The second type of reference-based approach involves looking at what the system looked like before human intervention through paleolimnological reconstruction. The third involves running mechanistic modeling to show how a lake functioned with little human impact.
 - Another approach involves conducting a **stressor-response analysis**. There are two types of stressor-response analysis: empirical methods and mechanistic modeling. Empirical methods involve taking data and running statistics to identify relationships between a stressor and response variable. Another type of stressor-response analysis is mechanistic modeling, which involves running specific scenarios under different nutrient conditions. As a side note, the same mechanistic model can be used to develop a reference condition for the reference-based approach or evaluate the Lake in reduced nutrient conditions for the stressor-response analysis.
 - The third approach is reviewing existing **scientific literature**.
- Each of these approaches combined makes up multiple lines of evidence that can help identify a range for total nitrogen and total phosphorus values for the final criteria.

- The next section of the Framework contains the conceptual model. The conceptual model shows the ecological mechanistic pathways that connect the designated uses, assessment endpoints, nutrient sources, and modifying factors.
- The next section of the Framework goes over the data characterization, Uncertainty Guidance, and Strategic Research Plan and how each element feeds in the numeric nutrient criteria development process. This section covers the identification of data gaps, proposed studies to fill gaps, and the uncertainty guidance approach.

Numeric Nutrient Criteria Framework – Section 2: Approach for Utah Lake Numeric Criteria Development

- Tetra Tech heavily edited Section 2 of the Framework based on the Steering Committee's work on the Management Goals table. The section begins by defining the terms "management goals," "assessment endpoints," "measures," and "targets."
 - **Management goals** are statements about desired conditions and are related to designated uses but can be broader.
 - **Assessment endpoints** express what is to be protected and connect management goals to ecological causal pathways.
 - **Measures** are attributes of assessment endpoints used to assess and quantify progress.
 - **Targets** are the numeric threshold of the measures (i.e., the specific value as expressed by the measure).
- The following section of the Framework outlines the specific management goals, assessment endpoints, measures, and targets for each designated use (recreation, aquatic life, agriculture, and downstream). This section includes a copy-and-pasted version of the Steering Committee's management goals table. The text in the section should reflect the table.
- The next section outlines how the different approaches from the literature review (reference-based, stressor-response, and scientific literature) will be used to derive specific targets. For the reference-based approach, there will be two lines of evidence: the paleolimnological reconstruction of past conditions and the application of the mechanistic model to define a reference condition with little or no human intervention. The stressor-response approach will involve running the mechanistic model for specific scenarios and conducting empirical analyses on collected data. Lastly, existing scientific literature will be used to help derive targets.
- The Framework outlines how to combine multiple lines of evidence to link nutrient concentrations with the protection of designated uses. Combining lines of evidence involves using the uncertainty guidelines to interpret endpoints in the context of uncertainty. It also involves assessing the probability of exceedance given variability. The results of this step is a range of values compared across each line of evidence to identify where there is overlap in the value ranges and where there are specific sensitive uses.

Numeric Nutrient Criteria Framework – Stressor-Response Analysis

- The Framework contains a table that lays out the relationship between the assessment endpoint, stressor, and response. For each assessment endpoint, there is an associated response variable, and for each response variable, there is an associated stressor. The stressor-response analysis aims to identify a threshold value for the stressor, beyond which target response conditions exceed desired conditions.
- The table also indicates whether data is available for the stressor-response analyses and whether the response variable is an output of the mechanistic model. The Science Panel and

technical consultants will conduct empirical analyses *and* run a mechanistic model to identify the relationship between stressors and response variables. For some response variables, the Science Panel will either conduct empirical analyses *or* run the mechanistic model.

- The next step in the stressor-response analysis is to take the stressors and connect them to a nutrient value, beyond which the stressor will exceed desired values. This step in the analysis allows researchers to identify the nutrient target ranges beyond which stressors will exceed desired values, leading to undesired responses.
- The use of variables in the stressor-response analysis does not mean they will create specific nutrient targets. The use of the variables is not a commitment to their quality in terms of their statistical relationship and eventual use.

Numeric Nutrient Criteria Framework – Section 3: Pathway to Criteria

- The last section of the Framework displays the pathway to criteria diagram, which is consistent with the Ideaflip diagram.
- The Science Panel will oversee the reference analyses, stressor-response analyses, and scientific literature to recommend protective ranges for total nitrogen and total phosphorus in the context of uncertainty. The Science Panel and Steering Committee will be working in concert throughout the process.
- The Steering Committee will then develop the numeric nutrient criteria recommendation and send it to the Utah Lake Commission, DWQ, and Water Quality Board.
- The Water Quality Standards workgroup will be consulted on an ongoing basis to ensure compliance with regulatory requirements.
- Pursuant to legislation, costs and legislative review requirements will be evaluated and communicated, which will involve discussions around feasibility.
- DWQ and the Water Quality Standards workgroup will manage regulatory requirements and send the criteria to EPA for approval.

Clarifying Questions

Steering Committee members asked several clarifying questions about the Numeric Nutrient Criteria Framework. Questions are indicated in italics with corresponding answers in plain text.

Will the mechanistic model or empirical analyses include a food web model or multivariate models?

- The Framework document is agnostic on which specific model to use. The mechanistic model the Science Panel has been using is the EFDC/WASP model. They are continuing to improve the model.
- The Science Panel intends to use the result of empirical analyses in multivariate models. The Science Panel will provide direction on which of several modeling options to use.

What are the Clean Water Act requirements for the Utah Lake reference conditions?

DWQ is obligated to protect any existing uses from 1975. This requirement does not mean that DWQ is legally obligated to restore Utah Lake to the 1975 conditions or pre-settlement times. They only have to protect the *uses* that existed in 1975 and the ones currently in place. Since 1975, the designated recreation use of Utah Lake changed from low-frequency recreation use to high-frequency recreation use, so the regulation is more protective today than it was in 1975. The Paleo Study will give boundary conditions for what is attainable, but it does not mean there is a requirement to restore the Lake to those conditions.

There are nuisance thresholds for recreation use that will be based on a survey. The survey seems subjective. How will the survey be conducted, and will the Steering Committee have the opportunity to review the survey?

DWQ is drafting a request for proposals (RFP) to hire a consultant to develop the survey. The Governor's Office of Outdoor Recreation will help review the RFP and proposal. The Steering Committee will have the opportunity to weigh in on how the questions in the survey are framed. There is some subjectivity to the survey results, but the results are in the management/policy/decision-making category that will be factored into the ULWQS analysis. The Steering Committee will be discussing the recreation survey at future meetings.

The agricultural section discusses color and odor as assessment endpoints. Livestock has a different threshold for what they consider bad tastes and odors compared to people. How will the Steering Committee determine taste and odor thresholds for agricultural use?

The agricultural use section was left vague because specific values for protecting crops and stock watering is not as well developed as values for protecting human health. It would be necessary to review relevant literature to determine a threshold. The target sources are listed as "to be determined" in the management goals table. If the literature review comes up with relevant information, it can be incorporated into future empirical analyses.

When there are endpoints that are not clearly defined, like odor, is it possible to assume that whatever is protective for recreation would be protective for agricultural use?

- This question refers to the concept of most sensitive use. Researchers still need to determine what is the most sensitive use. Once researchers have identified the most sensitive use, the Steering Committee members can make some assumptions about the protectiveness of the criteria.
- This assessment is an opportunity to harness the Uncertainty Guidance. If there is an assessment endpoint that is more well defined and one that is less well defined, the Uncertainty Guidance provides information on how to weigh those lines of evidence.

Regarding downstream uses, is there a current designated use of the Jordan River for drinking water? If water comes out of Utah Lake, which does not have drinking water as a designated use, and goes into a water body with a designated use for drinking water, what are the responsibilities of the Steering Committee towards water quality, and how does that impact the management of Utah Lake?

- The Jordan Valley Water Conservancy District has water rights for drinking water on the Jordan River. They are not interested in giving up the drinking water designation in the future. The water quality standard will have to protect downstream uses, including drinking water in the Jordan River.
- EPA does not have a clear target for cyanotoxins in source water. Erica Gaddis asked the EPA if it is okay to assume that protecting recreation use upstream will protect drinking water use downstream. If not, the EPA will need to provide a number for source water protection.

Based on conversations outside the Steering Committee meetings, there seem to be differing perspectives on the use of drinking water from the Jordan River and Utah Lake. How will DWQ work with the Utah Lake Authority to make sure there is a consensus around drinking water?

- In a meeting, Jordan Valley Water Conservancy District indicated they might be interested in treating water from the Jordan River and Utah Lake directly. Although the Jordan Valley Water Conservancy District indicated they are interested in drinking water from Utah Lake, there is no current protected designated use for drinking water in Utah Lake.

- With respect to the ULWQS, the Utah Lake Authority would replace the Utah Lake Commission as the approving authority for the Study. DWQ would like to see DWQ or the Department of Environmental Quality represented in the Utah Lake Authority Board, and they continue to discuss that possibility with Representative Brammer. More information on those discussions will be forthcoming.

Is the Steering Committee trying to manage water quality in Utah Lake for downstream uses, including agriculture? Is the Steering Committee focusing on managing Utah Lake or focusing on managing the Jordan River and where the water might end up?

- The primary focus of the ULWQS is Utah Lake. As part of the criteria setting effort, the Steering Committee will need to demonstrate the standard protects downstream uses of the Jordan River. Given the other uses in the Jordan River, this should not be a problematic task from a recreational perspective because Utah Lake has a more sensitive recreation use designation than the Jordan River. The aquatic life uses are the same. The only difference is that there is a drinking water use designation on the Jordan River, so the water quality standards in Utah Lake will need to be protective of that designated use.
- The Steering Committee does not need to address other sources to the Jordan River as part of the Study.

There is a narrative aspect of the water quality standards in addition to the numeric criteria. The narrative describes the desired aesthetic quality of Utah Lake, such as smell and look, which is intended to be a part of the beneficial use. How does the narrative aspect of the water quality standard fit into the discussions?

- The impaired listing for Utah Lake is based on the narrative criteria. The ULWQS is trying to move from narrative criteria to more science-based, numeric criteria so that DWQ will not have to rely on narrative criteria to assess Utah Lake.
- Any numeric criterion tied to odor would likely come from existing literature. Generally, odor is not the low-hanging fruit when translating a narrative criterion to a numeric criterion.

Steering Committee Polling

Steering Committee members were polled on whether they were ready to approve the Numeric Nutrient Criteria Framework. The results of the poll are indicated below.

Are you ready to approve the Numeric Nutrient Criteria Framework?

<i>Response</i>	<i>Number of Responses</i>	<i>Percentage of Responses</i>
Yes, I'm ready to approve the Framework as is.	7	58%
Yes, I'm ready to approve the Framework with edits.	3	25%
No, I'm not ready to approve it because I need more time to review it.	2	17%
No, I'm not ready to approve it because it needs a lot more work.	0	0%

Steering Committee Comments

Steering Committee members commented on any edits they would like to see in the Numeric Nutrient Criteria Framework. Their comments are summarized below.

- The odor and taste assessment endpoints should be removed from the section on agricultural uses assessment endpoints, measures, and targets. Kateri Salk will follow up with Jay Olsen to address comments about removing the odor and taste assessment endpoints from the agricultural uses section.

Next Steps for the Numeric Nutrient Criteria Framework

- Some Steering Committee members requested more time to review the Framework in the poll. Heather Bergman and Samuel Wallace will resend the Numeric Nutrient Criteria Framework to the Steering Committee. The Steering Committee members will have until Wednesday, June 2, to provide final feedback on the Numeric Nutrient Criteria Framework.
- Kateri Salk will incorporate the feedback from the Steering Committee and provide a revised Numeric Nutrient Criteria Framework to the Committee by Wednesday, June 9. Heather Bergman and Samuel Wallace will provide a Google Form to accompany the revised Numeric Nutrient Criteria Framework that asks for final approval of the Framework.

SCIENCE PANEL UPDATE

Mitch Hogsett, Forsgren Associates and ULWQS Science Panel Chair, provided an update on the Science Panel. His presentation is summarized below.

- The Steering Committee developed four high-level charge questions to inform the work of the Science Panel:
 - What was the historical condition of Utah Lake, and how has it changed?
 - What is the current state of Utah Lake with respect to nutrients and ecology?
 - What additional information is needed to develop nutrient criteria?
 - Is there an improved stable state that can be reached under current water and fishery management?
- In response to these questions, the Science Panel began to conduct several studies.
- The Science Panel completed the **Sediment-Water Nutrient Interactions Study**. This study uncovered information on what nutrients were coming from the sediments, how much nutrient was coming from the sediments, the potential lake recovery time, and the sediment oxygen demand. Researchers looked at the nutrient concentrations coming from the sediment under different conditions: aerobic, anaerobic, and high pH. They found a reduction in soluble reactive phosphorus (SRP) in the main Lake, which means that the sediments are removing SRP from the water column. However, for total dissolved phosphorus (TDP), researchers found that the sediments were releasing TDP, which has led to questions and additional research around identifying phosphorus compounds.
- Dr. Zach Aanderud from Brigham Young University (BYU) conducted the **Bioassay Study**. This study looks at the algal communities in the Lake, identifies where they are, and how they react to varying levels of nitrogen and phosphorus concentrations. The study involves monitoring cubitainers with diluted lake water to see how algal communities respond. The final report is completed and under final review. Some of the findings from the study included identifying how phytoplankton communities in Utah Lake change over time and the potential for cyanobacteria to fix nitrogen in Provo Bay if nitrogen becomes limiting.
- Dr. Kateri Salk, Tetra Tech, is conducting the **Carbon, Nitrogen, and Phosphorus (CNP) Budget Study**. This study involves developing a mass balance for nutrient loads leaving and entering the Lake. Dr. Salk has broken the Utah Lake Watershed into sub-watersheds to look at different loading rates and developed a model that reflects the Science Panel's current understanding of how nutrients enter and leave Utah Lake. This study is underway.
- Dr. Josh LeMonte, BYU, is conducting the **Phosphorus-Binding (P-Binding) Study**. The P-Binding Study is meant to identify how phosphorus molecules interact with other

molecules (e.g., calcium) once they are in Utah Lake, considering that previous mass balances have not accounted for around 90% of the phosphorus in Utah Lake. The study will also identify the bioavailability of phosphorus in Utah Lake. Dr. LeMonte is starting the study this summer.

- Dr. Janice Brahney, Utah State University, and Dr. Soren Brothers, Utah State University, are conducting the **Paleoecology Study**. They are taking freeze cores to identify how the conditions of Utah Lake have changed over time. They are currently analyzing the data, with a target completion date of January 2022.
- The Science Panel will be overseeing the **Littoral Sediment Study**. The elevation of Utah Lake changes throughout the year, which means that the shorelines are repeatedly wetted and dried. The wetting and drying of sediment have impacts on nutrient cycling. The Littoral Sediment Study will uncover how the wetting and drying of sediments affect nutrient cycling. DWQ is finalizing an agreement with the primary investigator, and the target completion date for the study is February 2022.
- The Wasatch Front Water Quality Council is overseeing the **Atmospheric Deposition Study**. This study will provide estimates of the wet and dry deposition from the atmosphere to the surface of Utah Lake. The Science Panel will review the results of that study soon.
- The Timpanogos Special Service District (TSSD) is conducting the **Lake Mesocosms Study**. This study involves installing mesocosms (i.e., big cages) in Utah Lake to study the role of different organisms in Utah Lake and how they interact. The TSSD is developing its research plan.
- The last study is the **Utah Lake Watershed Model Study**. This study aims to take the Utah Lake Watershed models developed by researchers at the University of Utah and synthesize information from the Science Panel Studies to improve the model. This model will be used to analyze scenarios to help inform decisions. DWQ and Science Panel members are currently reviewing proposals for this study.
- The next step for the Science Panel will be to develop a **Progress Report** for the Steering Committee. The Progress Report will assess available information and data to answer the charge questions and identify remaining knowledge gaps.

Clarifying Questions

Steering Committee members asked several clarifying questions about the Science Panel update. Questions are indicated in italics with corresponding answers in plain text.

Is there any opportunity for the Science Panel to use the research results and detailed mapping efforts from the Utah Lake Restoration Project?

It depends on whether the Utah Lake Restoration Project managers are willing to share their results. The Utah Lake Restoration Project study is to understand the soil content to a depth of 75 feet, not develop an updated bathymetric map. Their report should be public at some point because their proposal will be part of the public record. However, their data will involve hundreds of terabytes, so their summary data rather than raw data will likely be more useful for the ULWQS.

Is there one place where the Steering Committee members can access the studies?

Not yet. Samuel Wallace will create a Google Folder with all the Science Panel studies and add the link to the Ideaflix. DWQ staff is also working on adding all the studies to the ULWQS website.

For the studies on carp removal, are researchers studying the impacts of carp removal on lake clarity and how long carp removal can be maintained?

- Several factors, such as high wind events, stir up sediment in addition to carp. No one expects that Utah Lake will be clear even if all the carp were removed.
- The Utah Lake June Sucker Program spends \$400,000 a year on carp removal. According to the scientific literature, the Program achieved its carp removal goals, which has allowed macrophytes to reestablish in Utah Lake. Rooted aquatic plants provide cover for June Sucker to hide from predators and complete their life cycle. The plants also help stabilize sediments from disturbances, like high wind events. The plants also can inhibit algal growth through allelopathic means. Nutrients and changing lake elevations also impact the ability of rooted aquatic plants to grow.
- The June Sucker Program reached and exceeded its goal of reducing carp biomass by 75%. The challenge is now to maintain the population and control the recruitment of carp into the system. The June Sucker Program will need to make intentional efforts to maintain carp populations.

Has the June Sucker Program seen a higher number of younger-sized carp classes, and how are they addressing that if so?

A Utah State University professor has developed a recruitment model for carp. According to the model, there will be a good pulse of young carp in the system as a compensatory response. The models show the June Sucker Program has not picked up those younger carp in their gear yet, but they are reaching the size where the gear will pick them up. The June Sucker Program is looking at research to manage young carp. Some potential solutions include poison bait and genetic approaches. The June Sucker Program will continue to focus on controlling larger carp, which are the bigger ecological problem.

NEXT STEPS

- Before the meeting, Steering Committee members received a poll asking if they were comfortable meeting in person at their next meeting. Of 22 respondents, 18 said yes, and four said it depends. Some concerns about meeting in person include having family members who are not yet vaccinated and having the flexibility to revisit virtual meetings if COVID conditions worsen. The State of Utah will be ending all mask and social distancing mandates in public buildings, so DWQ cannot require anyone to wear masks or social distance during a Steering Committee meeting. However, the next Steering Committee meeting could have a hybrid option so that people can participate in person and virtually.
- The next Steering Committee will be held virtually and in person. Samuel Wallace and Heather Bergman will send a Doodle to the Steering Committee to schedule the next meeting in August or September.
- The Utah Lake Authority workgroups are aware of the ULWQS. It may be helpful to provide those involved with the Utah lake Authority with more documentation and information on the ULWQS. DWQ staff will continue to provide documentation on the ULWQS webpage so that relevant parties have access to information on the charge questions and charters.