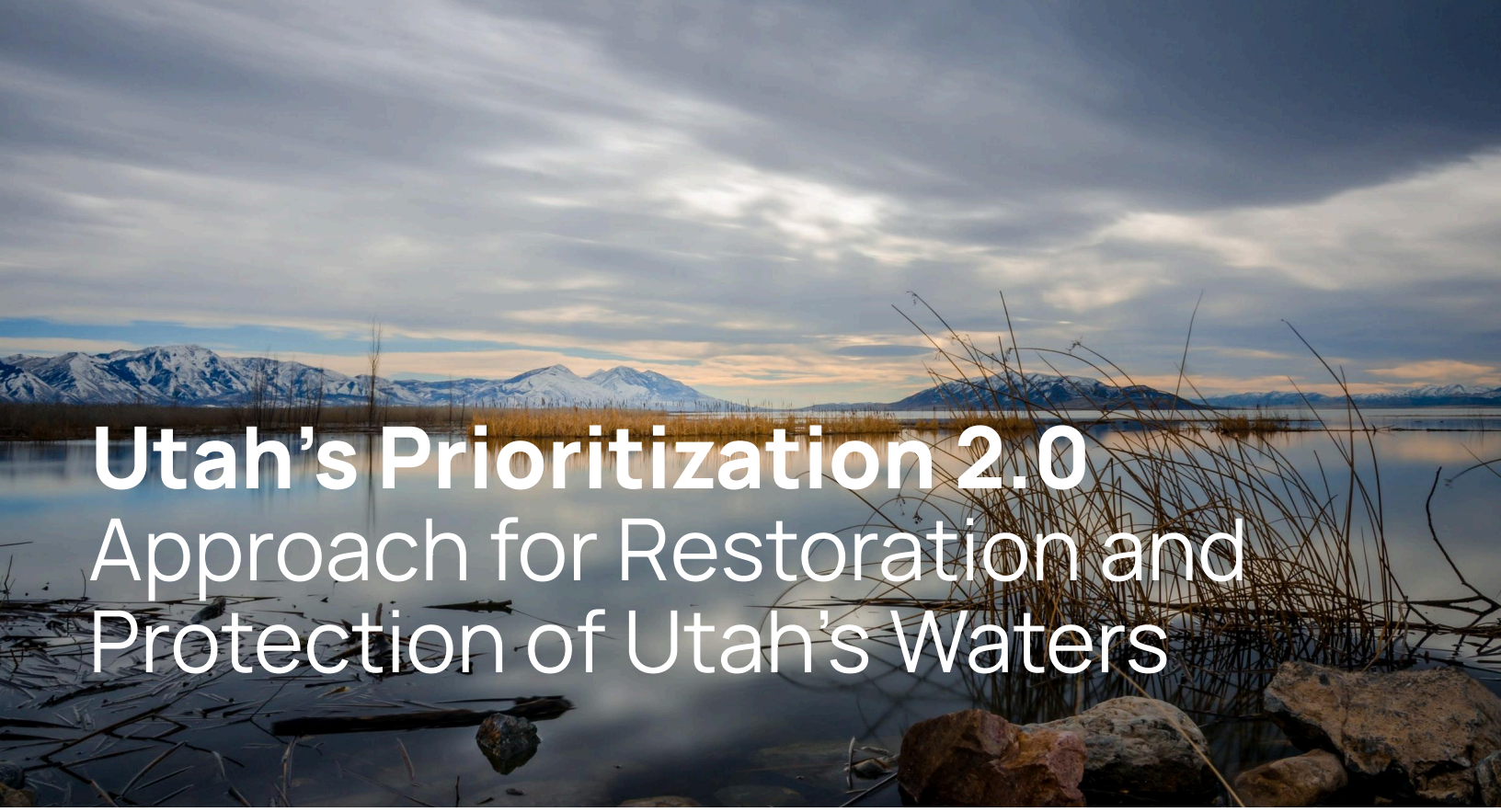

Utah's Prioritization 2.0 Approach for Restoration and Protection of Utah's Waters

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UTAH DEPARTMENT *of* ENVIRONMENTAL QUALITY
WATER QUALITY

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Executive Summary

The Utah Division of Water Quality's (DWQ) mission is to safeguard and improve Utah's water quality through balanced regulation. DWQ's primary goal is to protect Utah's water quality for drinking water, recreation, aquatic wildlife, agricultural, and Great Salt Lake beneficial uses.

DWQ regularly monitors and assesses the state's waters through its sampling efforts and partnerships with other agencies and organizations. The biennial Utah Integrated Report (IR) summarizes the assessment of the quality of the surface waters in the state and identifies waterbodies that are not supporting their beneficial uses. Waterbodies that do not meet one or more of their beneficial uses are classified as impaired in the IR and placed on the Clean Water Act (CWA) 303(d) list of impaired waters. A Total Maximum Daily Load (TMDL) water quality study is required for all waterbodies on the 303(d) impaired waterbodies list. TMDLs are restoration plans that establish scientifically based goals to limit the sources of pollutants in a waterbody. A TMDL is a quantification of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards and beneficial uses. Because of the intense level of study required to complete a TMDL, DWQ is not able to develop TMDLs for every water listed on the 303(d) list all at once. Determining the order of TMDLs to develop requires prioritization to address the most pressing water quality challenges first.

In 2013, the United States Environmental Protection Agency (EPA) launched a long-term vision and goals effort for the CWA 303(d) program that allowed states to prioritize the 303(d) list of impaired waterbodies for TMDL development. EPA's Vision 1.0 afforded states the ability to be strategic and focus limited resources on priority waters for more efficient and effective management, with the hope of expeditious achievement of water quality improvements. As a result, in 2016, DWQ developed Utah's first prioritization of impaired waters on the 303(d) list for TMDL development. Utah's Prioritization focused on waterbodies with water quality impairments that posed the greatest risk to human health. From 2013 to 2023, DWQ completed multiple pathogen TMDLs addressing *E. coli* in drinking water and recreational use waters. Implementation of those *E. coli* TMDLs is underway thanks to the numerous stakeholders who are essential to the effort.

The next iteration of the prioritization process is underway. EPA launched Vision 2.0 for the CWA Section 303(d) program, which includes goals related to planning and prioritization, restoration, protection, data and analysis, and partnerships. It also asks States to consider focus areas including environmental justice, climate change, tribal water quality and program development and program capacity building.

For this iteration, DWQ is taking the opportunity to use DWQ's Prioritization 2.0 as a ten-year road map for water quality restoration and protection planning in the state. In addition to TMDLs, other complementary planning tools can be used to achieve water quality restoration and protection goals. DWQ strongly believes that long-term water quality restoration and protection planning will help facilitate robust and efficient monitoring, more effective partnerships, watershed group development, strategic implementation and clarity in protecting and restoring Utah's waters.

In this document, DWQ outlines the approach to Prioritization 2.0 and the results including lists of Utah's watersheds for restoration and protection planning over the next ten years. The approach to the prioritization effort was guided by the use of two tools: the Environmental Protection Agency's (EPA's) Recovery Potential Screening (RPS) tool; and a widely distributed stakeholder survey on the uses and threats to water quality in Utah. The lists of watersheds for future water quality restoration and protection planning were reviewed and refined after input from staff within the Utah Department of Environmental Quality; state, federal, and local agencies; stakeholders; and the general public.

Prioritization Background

2016 Prioritization

The CWA Section 303(d), requires the development of a TMDL for all waterbodies that are listed as impaired on the 303(d) list. Listings occur when waterbodies do not meet water quality standards and beneficial uses. Recognizing that all TMDLs cannot be completed at once due to limited technical and financial resources, and that certain risks may be greater than others, the EPA launched a long-term vision and goals for the CWA 303(d) program that allowed states to prioritize the 303(d) list of impaired waterbodies for TMDL development. EPA's Vision 1.0 afforded states the ability to be strategic and focus limited resources on priority waters for more efficient and effective management and provided

states with the flexibility to use other planning tools in addition to TMDLs to restore and protect water quality.

As a result, in 2016, DWQ completed the first prioritization of impaired waters on the 303(d) list for TMDL development. Utah's Prioritization focused on waterbodies that had the potential to impact public health, primarily pathogen impairments in waterbodies with drinking water and recreational beneficial uses. From 2013 to 2023, Utah's Prioritization commitments were met through *E. coli* TMDLs for the North Fork Virgin River, Fremont River, Spring Creek (Heber), and the Jordan River watershed (14 sub-watersheds), as well as a temperature TMDL for Nine Mile Creek. Best management practices to reduce the sources of pollutants are recommended in those TMDLs and are currently being implemented. Utah Lake and Great Salt Lake remain high-priority waterbodies for DWQ but were removed from the list of waterbodies for TMDL development and instead addressed through water quality standards development.

2024 Prioritization

The next iteration of the prioritization process began in 2023. EPA launched Vision 2.0 for the CWA Section 303(d) program, which includes goals related to planning and prioritization, restoration, protection, data and analysis, and partnerships. It also asks states to consider focus areas that include environmental justice, climate change, tribal water quality and program development, and program capacity building.

For this iteration, DWQ took the opportunity to use Prioritization 2.0 as a ten-year road map for water quality restoration and protection planning in the State. Other types of plans in addition to TMDLs can be used to achieve water quality restoration and protection goals. In this document, DWQ outlines the approach to Prioritization 2.0. It explains the types of restoration and protection plans that DWQ will employ and the two tools used to guide the prioritization of waterbodies for water quality restoration or protection plans: the Environmental Protection Agency's (EPA) Recovery Potential Screening (RPS) tool, and a widely distributed stakeholder survey on the uses and threats to water quality in Utah.

Types of Restoration and Protection Plans

Water quality restoration and protection plans identify and address water quality problems from sources of pollution. The planning process is a series of steps to

characterize existing conditions; identify and prioritize problems; define management objectives; develop protection or remediation strategies; and implement and adapt selected actions as necessary (EPA, 2008). The ultimate success is when the impaired waterbody is restored to a condition in which it meets water quality standards and supports its drinking water, recreation, aquatic life and agricultural beneficial uses. Watershed groups and stakeholders are essential to the successful implementation of the plans. Depending on the watershed, DWQ has a variety of planning tools to choose from, including TMDLs, Nine-element Watershed Plans, Protection Plans, and the state Nonpoint Source Management Plan. This section defines each plan and its application.

Total Maximum Daily Load

The CWA requires states to establish and maintain water quality standards designed to protect, restore, and preserve water quality in the state. These standards consist of numeric and narrative criteria for protecting beneficial uses (i.e., drinking water, recreation, aquatic life, agriculture, and the Great Salt Lake). When a lake, river or stream fails to meet water quality standards, Section 303(d) of the CWA directs the state to place the waterbody on a list of impaired waters (the CWA 303(d) list) and prepare a plan to restore water quality called a Total Maximum Daily Load study (TMDL).

A TMDL study determines the amount of an identified pollutant (i.e., the load or concentration) that a waterbody can receive and still support its beneficial uses and meet state water quality standards. Once the location and magnitude of water quality standard exceedances are identified, and all potential point and nonpoint sources are characterized, controls are implemented to reduce pollutant loading until the waterbody is brought back into compliance with water quality standards. Point sources (direct discharges) are assigned wasteload allocations, which are incorporated into Utah Pollution Discharge Elimination System (UPDES) permits. Nonpoint sources (diffuse sources) are assigned a load allocation and addressed through voluntary, incentive-based grant programs with DWQ and other partner agencies. DWQ includes a project implementation plan with every TMDL that outlines the process and milestones to achieve the restoration targets. Upon completion of the TMDL, it is submitted to the Utah Water Quality Board and the EPA for final approval. To date, DWQ has completed 55 TMDLs.

Nine-Element Watershed Plans

Nine-element watershed plans are restoration plans that are an effective way for DWQ and stakeholders to collaborate on identifying pollutant sources and potential solutions to water quality impairments. DWQ uses standalone Nine-element watershed plans rather than TMDLs in areas with nonpoint source pollution and no point source discharges. EPA requires a nine-element watershed plan to receive federal CWA 319 grants for watershed projects. DWQ follows EPA's guidance (EPA, 2013) on the development of watershed plans that include the following nine elements:

1. Identify causes and sources of pollution.
2. Estimate pollutant loading into the watershed and the expected load reductions.
3. Describe management measures that will achieve load reductions and targeted critical areas.
4. Estimate the amount of technical and financial assistance and the relevant authorities needed to implement the plan.
5. Develop an information and education component.
6. Develop a project schedule.
7. Describe the interim, measurable milestones.
8. Identify indicators to measure progress.
9. Develop a monitoring component.

To date, DWQ and its partners have completed roughly 40 Nine-element watershed plans.

Nonpoint Source Management Plan

Utah's Nonpoint Source Management Program is focused on improving water quality through a voluntary, incentive-based approach. Unlike point sources of pollution such as industrial waste or wastewater treatment plant effluent that are regulated through a permit, nonpoint source pollution refers to the contamination of water from a wide range of diffuse sources across a landscape. Individually, small contributions of pollution from things like fertilizer running off an agricultural field or sediment mobilized by road runoff do not cause problems, but the accumulation of pollution from multiple sources, particularly at the watershed scale, can lead to significant water quality degradation that affects streams, lakes, reservoirs, and wetlands. The most common pollutants in Utah are nutrients, pathogens (bacteria and viruses), metals, sediment, and salts. Nonpoint source pollution can also manifest in other ways such as increased water temperature as a result of riparian vegetation removal along streams or periods of low dissolved oxygen and

harmful algal blooms as a result of nutrient enrichment. In many cases, the presence of nonpoint source pollution reflects degradation at the watershed scale, and it is the leading cause of water quality impairment in Utah's water bodies. The production of nonpoint source pollution is highly dependent upon the major land uses of a particular watershed. Some common land uses that produce nonpoint source pollution include agricultural activities; runoff from paved surfaces; mining and timber operations; recreational activities; poorly functioning onsite septic systems; construction runoff; stream/riparian habitat degradation; and natural sources.

The approach a state takes to reduce nonpoint sources of pollution is guided by the Nonpoint Source Management Plan. The Nonpoint Source Management Plan is required by the EPA for a state to receive federal funding to reduce nonpoint sources of pollution (i.e., 319 funding). The plan is updated every five years and is scheduled to be updated in 2024. DWQ aims to integrate the results of both the Stakeholder Survey and Recovery Potential Screening Tool analyses into the Nonpoint Source Management Plan. Key elements will include:

- Developing priority geographic areas to target project funding that addresses the greatest needs of the watersheds as informed by the stakeholder survey, Recovery Potential Screening Tool analysis, and other analyses and stakeholder input
- Promotion of best management practices to reduce nonpoint source pollution
- Targeting outreach and education to raise awareness about nonpoint source pollution
- Technical assistance to help local watershed groups or stakeholders assess their watersheds and develop watershed plans
- Partnering with agencies and non-governmental organizations to improve collaborative efforts to reduce nonpoint source pollution

Protection Plans

While most plans focus on the restoration of impaired waters, there are many good reasons to protect healthy waters and watersheds from future degradation. Examples of waterbodies that could benefit from a protection plan include:

- Waters and watersheds that support a drinking water supply
- Healthy segments in watersheds with impaired segments
- Healthy waters near areas of rapid land-use changes
- Healthy waters that are at-risk

In many cases, protection tends to be less costly than restoration and can help prevent future threats or lessen the impact of natural disasters. Protection plans are designed to maintain water quality and protect high-quality waters. The planning process for protection plans is similar to restoration plans and includes the following key steps:

- Build partnerships;
- Characterize the watershed;
- Finalize goals and identify solutions;
- Design an implementation program;
- Implement the plan; and
- Measure progress.

To date, DWQ is working with one watershed group in northern Utah to develop a protection plan for Summit Creek in Smithfield, Utah.

Utah's Prioritization Approach Tools

DWQ's approach to the prioritization effort was guided by the use of two tools: the Environmental Protection Agency's (EPA's) Recovery Potential Screening (RPS) tool; and a widely distributed stakeholder survey on the uses and threats to water quality in Utah. The survey provided valuable insight into the opinions of Utah citizens on water quality uses and threats. Survey results were considered in conjunction with the results of the RPS tool to help select the appropriate type of water quality restoration and protection plans for Utah's waterbodies. The following sections provide background information on each of the prioritization approach tools.

Recovery Potential Screening (RPS) Tool

The EPA developed the RPS tool to assist states in determining differences in watersheds that may impact their relative likelihood of being protected, successfully restored, or managed in more beneficial ways. The tool is a flexible, user-driven app that allows users to compare watersheds more quickly and efficiently while setting priorities for investing in restoration activities. The RPS tool analyzes watersheds at the 12-digit Hydrologic Unit Code level (HUC12), which equates to watersheds ranging from 10,000-40,000 acres in size. The tool employs a screening approach that identifies a group of watersheds to be compared and a specific purpose for comparison. Users select appropriate indicators in three categories (ecological, stressor, and social), and the tool calculates index values for

the watersheds. Users can vary the analysis iteratively and apply the results to support strategic planning and prioritization. Several states have used the tool to help prioritize waterbodies for study and best management practice implementation. Utah attempted to use the RPS tool in the 2016 Prioritization process, but insufficient data at that time made it difficult to produce meaningful results. Since then, the RPS Tool has been refined and updated to allow for better state-level results.

For Prioritization 2.0, DWQ used the RPS screening tool to evaluate a suite of scenarios to identify opportunities and challenges for restoring the water quality of impaired waters and protecting high-quality watersheds on statewide and river basin scales. DWQ formulated 19 scenarios focusing on the drinking water, recreation, aquatic life and agricultural beneficial uses of surface waters, environment justice concerns, tribal considerations, and protection of high-quality watersheds. These scenarios aimed to refine the prioritization of watersheds for restoration planning (TMDL or Nine-Element Watershed Plans) and identify those most likely to recover through best management practice (BMP) implementation. Scenarios included considerations of nutrient impairment in agricultural areas, harmful algal blooms in recreational waters, temperature impacts exacerbated by climate change, impacts on species of conservation concern, and socio-economic factors like underserved or disadvantaged communities and tribal lands. The complete list of scenarios is outlined in Appendix B.

DWQ ran the scenarios for each of the state's 11 major hydrologic river basins: Southeast Colorado River, Uintah, West Colorado River, Kanab/Virgin, Bear River, Weber River, Utah Lake, Jordan River, West Desert, Sevier River, Cedar/Beaver. DWQ took a basin approach instead of a statewide one because the RPS tool produces more meaningful results at a finer resolution, and each basin has distinct water quantity and quality characteristics. Criteria were defined for each scenario to guide the selection of watersheds included in each scenario.

The RPS screening tool includes a wide range of indicators that can be used to characterize a watershed or scenario. Each RPS screening iteration must incorporate at least one indicator from the ecological, stressor, and social categories. Categories can be further broken down into sub-categories that look at specific things, like the number of road crossings or the percent impervious cover in a watershed. Indicators were selected to reflect critical watershed characteristics related to each scenario using best professional judgment (Appendix B). In most cases, the state-level Preliminary Healthy Watersheds Assessment (PHWA) Watershed Health Index was used as the ecological indicator, as it is a comprehensive indicator that considers a suite of watershed characteristics that support high ecological health in the watershed. This indicator provided consistency in the ecological evaluation across all scenarios and allowed for a focus on stressors and

impairments. Stressor indicators include potential sources of pollutants that are likely to degrade watershed conditions. Reported impairments are included in that category. Social indicators are non-environmental factors that may favor water quality restoration efforts.

DWQ selected specific sets of indicators for each scenario. The selection was guided by the necessity to encompass various watershed elements and characteristics crucial for assessment. Using diverse indicators linked to the potential for protection and restoration offers multiple perspectives, aiding in gauging relative differences in watershed condition and their implications for management strategies. While it is not mandatory to include indicators from every sub-category, there was an emphasis on selecting indicators across different sub-categories within each major category to ensure a comprehensive evaluation.

Iterative runs were conducted for each scenario to ensure consistent results among indicators. Each scenario produced a list of ecological index, stressor index, social index, and Recovery Potential Index (RPI) scores for the subset of watersheds, which were plotted on a biplot of the ecological index and stressor index. The median score of the ecological index and stressor index demarcated quadrants on the plot, and these quadrants were used to guide the placement of watersheds into one of four categories:

1. Potential for protection planning (high ecological, low stressor)
2. Potential for restoration planning with a TMDL or Nine-Element Watershed Plan (high ecological, high stressor)
3. Less critical or more data needed (low ecological, low stressor)
4. Areas under significant stress (low ecological, high stressor)

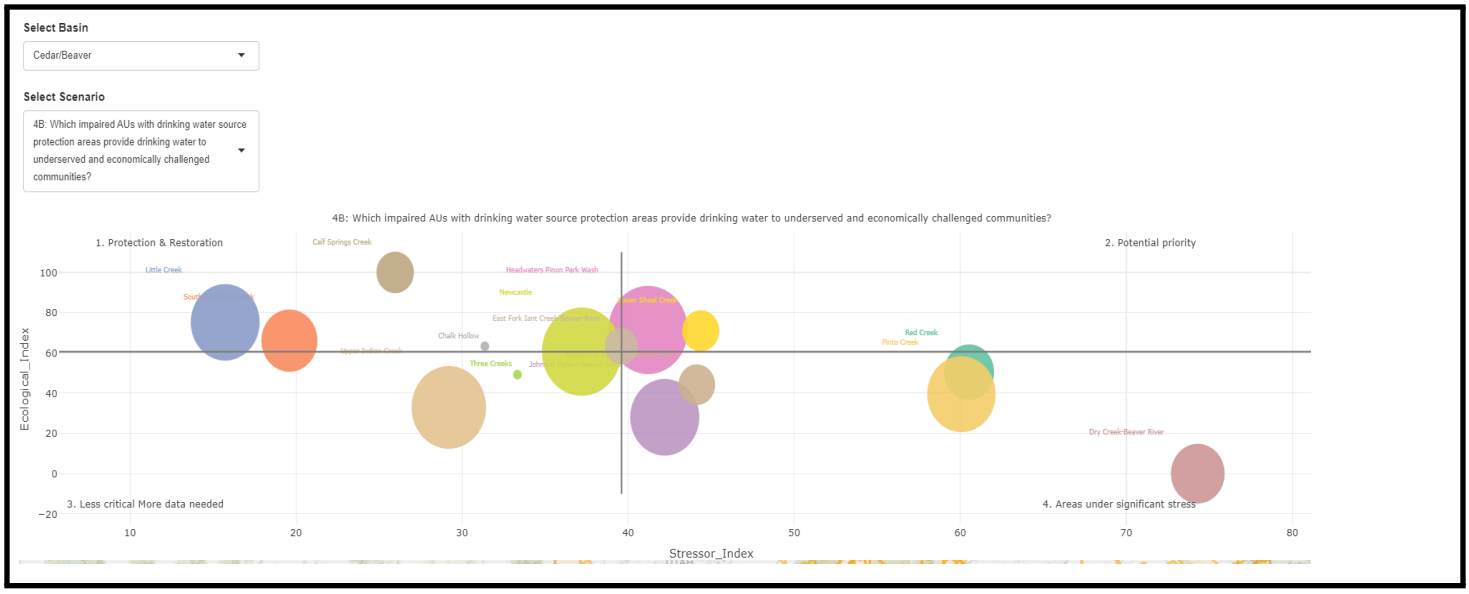


Figure 1: Example bubble plot from Utah RPS Tool Shiny app showing basin, scenario, and resulting watersheds. Bubble size corresponds to the social index score.

A challenge arose from differences between the geographic unit of organization used by the RPS tool and Utah's statewide Assessment Units (AUs) used for the water quality assessment in the IR. The RPS tool relies on the Hydrologic Unit Code (HUC) system for delineating geographical units that overlap with but do not consistently align with Utah AUs. Geographic Information Systems (GIS) analysis matched AUs with the corresponding HUC12s before using the RPS tool. In some cases, there were many AUs within a HUC12, and in other cases, an AU encompassed many HUC12s. These conversions were documented so DWQ's state Basin Coordinators could translate the results of the RPS tool for the AUs in each basin.

Using the RPS plots, additional basin information, and best professional judgment, DWQ's Basin Coordinators assigned selected watersheds into four planning categories:

- TMDL (Permitted point source discharges present in AU)
- Nine Element Watershed Plan (No point sources present in AU only nonpoint sources)
- Nonpoint source priority geographic area (approved TMDL and/or watershed plan already in place in AU)
- Protection plan (high ecological health, low stressor)

Additional considerations for selecting waterbodies for water quality restoration and protection plans by DWQ's Basin Coordinators included:

- Is there an existing TMDL in the AU? If so, for what pollutants?
- Have any of the recommendations of the TMDL Implementation Plans been executed?
- Is there an existing watershed plan in place for the AU?
- Are there any permitted point sources in the AU?
- Is the impairment a high priority for stakeholders?

Best professional judgment from the Basin Coordinators was necessary to conduct the initial selection of waterbodies for water quality restoration and protection plans based on the RPS Tool results. The Basin Coordinators have local knowledge of water quality issues and the experience and expertise to advise on what is economically and technically feasible in terms of water quality restoration and protection.

A map of the RPS tool scenario results and planning categories can be found on the DWQ's Watershed Protection Section webpage.

Stakeholder Survey

Utah State University (USU) conducted a comprehensive water quality survey in 2023 and 2024 on behalf of DWQ. The survey was distributed statewide to stakeholders by email, with 504 responses collected from October 2, 2023, through January 31, 2024. The Utah Department of Environmental Quality's Public Information Office and USU distributed the survey to a diverse group of stakeholders, including state agency partners, members of the regulated community, and citizens. The analysis of this survey informs stakeholder priorities by basin, provides context about how Utahns are using water across the state, and answers fundamental research questions about how communities shape their perceptions and opinions about water quality.

Participants were presented with a set of 20 questions (complete list of questions in Appendix A):

- Eight questions designed to assess the values and perspectives on the uses, benefits, and threats to Utah's surface waters;
- Five questions about personal activities and knowledge related to Utah waterbodies; and
- Seven demographic questions

The survey received 504 responses, representing all major basins and rural (farming and not farming), suburban, and urban areas. This survey resulted in an 18% increase in respondents relative to the previous statewide water quality survey conducted by DWQ in 2015 as part of the prioritization. In response to feedback from respondents of the 2015 survey, this survey incorporated additional efforts to increase participation, transparency, and quality of information. In 2015, some respondents expressed concern about the use of rank-order scoring for prioritizing beneficial uses, indicating that all uses are important (domestic, recreational, wildlife, and agricultural) and should receive equal consideration in prioritization. The 2024 survey used a Likert scale to ensure equal consideration across questions about the uses, benefits, and threats to Utah's waterbodies. In 2015, respondents also expressed concern about the representation of respondent land-use interests (e.g. farming, urban), and in response, DWQ increased its outreach efforts to reflect a proportionate representation of population distribution across rural and urban areas (20.5% rural, 79.5% urban and suburban, Fig. 2) in this survey.

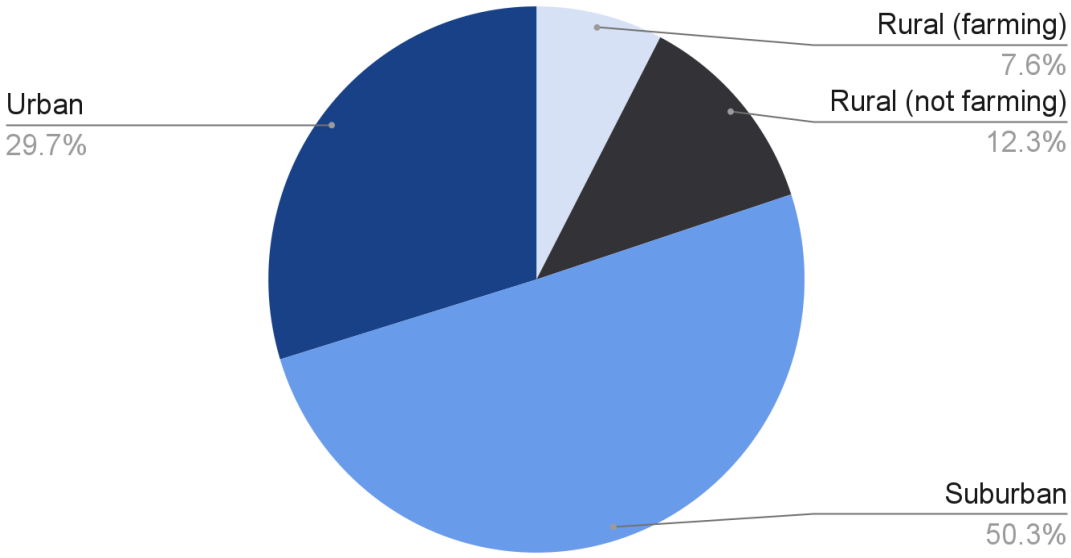


Figure 2: Distribution of survey respondents by place of residence.

On average, clean sources of drinking water were perceived as the most important beneficial use for Utahns across all areas of residence (rural-farming, rural-not farming, suburban, and urban). Water that supports fish and wildlife habitat was also perceived as an important use, ranking second to clean sources of drinking water statewide, though water for agricultural uses was the second most important use for respondents from rural-farming areas. Respondents were primarily concerned with how water quality affects human health and aquatic ecosystems and less concerned with how water quality impacts recreational and agricultural uses of water, except among rural farming respondents who expressed significant concern regarding the impact of water quality on agricultural uses.

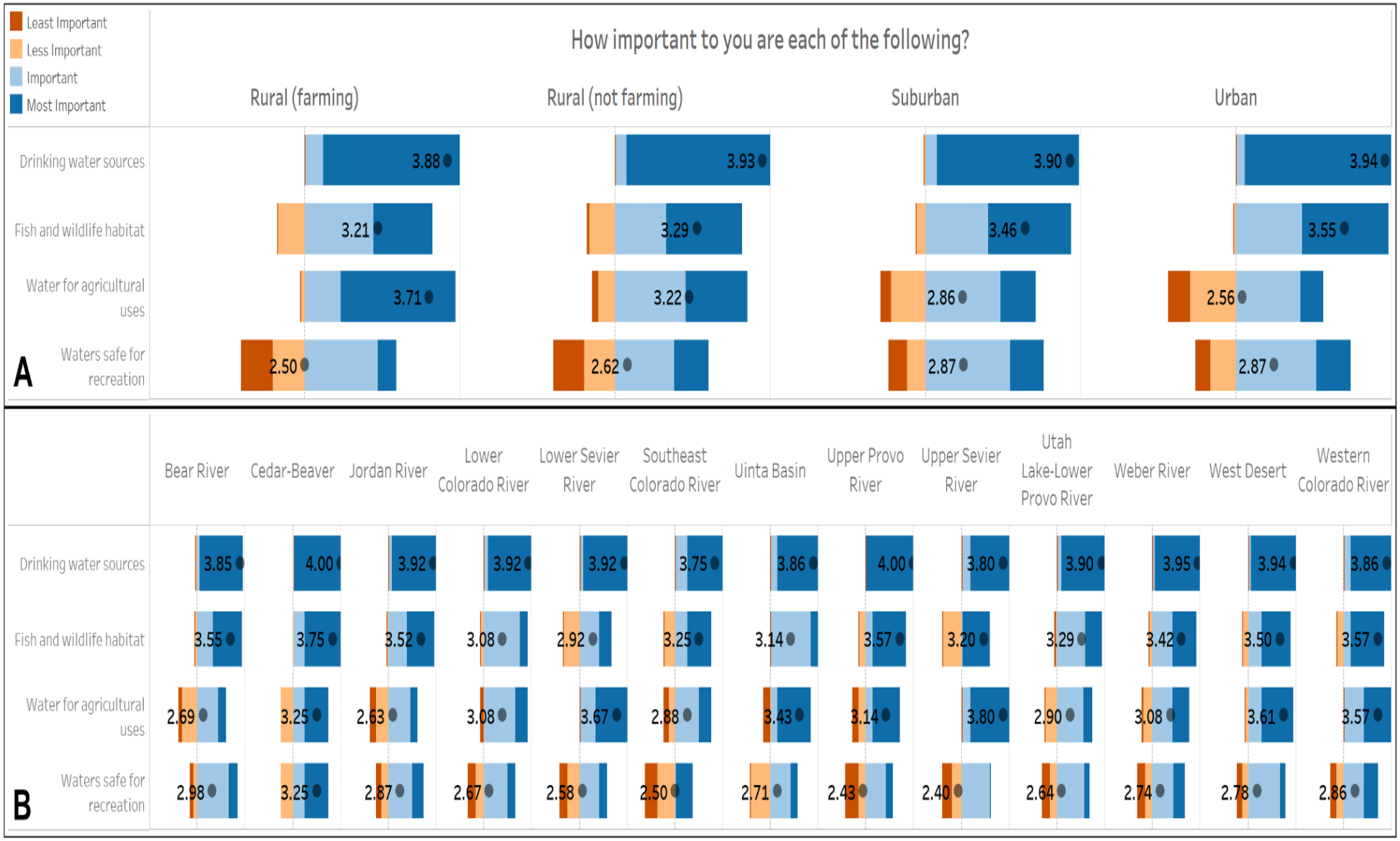


Figure 3: Results from survey questions asking Utahns, "How important are each of the following?" broken down by A) respondents area of residence and B) basin (n=503)

Survey results are presented in Appendix A as statewide aggregates and broken down by basin and area of residence to present priorities from specific watersheds. The results were incorporated in future basin planning and prioritization efforts and the selection of waterbodies for water quality restoration and protection planning.

Long-term Priority Waters for DWQ

The Great Salt Lake and Utah Lake remain high priority waterbodies for DWQ to address. However, both waterbodies are being addressed through different programs including water quality standards and assessment development designed to protect the beneficial uses of those lakes.

Great Salt Lake

The Great Salt Lake (GSL) is an important resource both regionally and hemispherically, most notably as an important habitat for migratory birds and waterfowl. In addition to providing critical water and wetland habitat, the lake provides significant lake-effect snow that supports local watersheds and Utah's skiing industry. Other economic benefits of the lake include international tourism, a globally important source of minerals including magnesium and other industrial salts, and brine shrimp cysts which provide an important food source for aquaculture. Recent climate trends and increasing growth have resulted in decreased water levels in GSL, with the lowest lake levels in recorded history in fall 2022.

Concern over declining lake levels, increasing salinity, exposed lakebed and dust, and their impact on the lake's vital functions, has resulted in several initiatives to get more water to GSL. These include the creation of the Great Salt Lake Watershed Enhancement Trust, the establishment of mechanisms to increase instream flows, water shepherding, and the creation of a GSL Commission to oversee the coordination of these efforts and state agency management of GSL. In addition, the Utah Division of Water Resources, in conjunction with the Bureau of Reclamation, is overseeing a multi-year GSL Basin Integrated Plan (GSLBIP) to assess and forecast water supply and provide tools and management strategies for managing the GSL watershed and lake levels.

DWQ is revising its GSL Water Quality Strategy by integrating the recent developments and concerns of declining lake levels and increasing salinity as well as strategies developed by the GSL Commissioner's office and the Division of Water Resources GSLBIP effort. For instance, DWQ is contributing to evaluating stormwater effects on water

delivery to GSL and working with Utah State University and the Division of Wildlife Resources to create a functional flow framework, both of which will be components in the GSLBIP. In addition, DWQ continues to work with partners on the Salinity Advisory Committee assisting the Division of Forestry Fire and State Lands in their management of the Union Pacific Railroad causeway, which has proven to be a critical tool in balancing salinity between the South and North Arms of GSL. Lastly, based on recent legislative directives, DWQ will be evaluating operator certifications of new mineral extraction activities on GSL.

Utah Lake

Utah Lake is a large (380 km^2) shallow freshwater lake, located near Provo, Utah, that experiences impairments to its recreational and aquatic life uses due to nutrient pollution and resulting harmful algal blooms. The lake's watershed is characterized by decades-long, extensive urban and agricultural land uses that have contributed to the eutrophication of the lake. According to Kem C. Gardner Policy Institute, the surrounding watershed is expected to double in population between 2015 and 2065, adding 650,000 people, the largest numerical population increase in the state of Utah. This growth is expected to contribute to additional stress on the lake. However, public interest in protecting and improving Utah Lake has increased in recent years, resulting in several active interest groups, the creation of the Utah Lake Authority, and legislative action to fund important water quality and ecosystem restoration projects.

DWQ initiated the Utah Lake Water Quality Study (ULWQS) in 2015 to address nutrient-related beneficial use impairments in the lake. The ULWQS is a three-phased study with two primary goals: 1) establish scientifically defensible, in-lake nitrogen and phosphorus water quality criteria protective of the recreational, aquatic life, agricultural, and downstream designated beneficial uses; and 2) develop an actionable stakeholder-supported water quality implementation plan that will result in practical and feasible on-the-ground management practices to achieve measurable water quality improvements.

The ULWQS is guided by an interest-based Steering Committee and a disciplinary-based Science Panel that are responsible for developing numeric nutrient criteria recommendations. This process has resulted in significant accomplishments to date, including the completion of the ULWQS Strategic Research Plan and the development of in-lake and watershed water quality models. The results of these efforts are currently being synthesized to create the technical basis for the nutrient criteria recommendations, with final recommendations expected in 2024-2025.

DWQ initiated the development of a water quality implementation plan in 2024. The implementation plan will be written under the EPA Nine-element watershed planning guidance; address all elements of the ULWQS Implementation Framework; and develop relevant programmatic guidance (e.g., Integrated Report 303(d)/305(b) assessment

methods, UPDES permitting guidelines, etc.) to support the adoption of numeric criteria by the Utah Water Quality Board and EPA. The target completion date for the implementation plan is December 2025.

EPA's Vision 2.0 Themes

EPA's Vision 2.0 memo encourages states to consider four themes or focus areas in conjunction with implementing existing CWA 303(d) programs (EPA, 2022). EPA's themes are listed below, followed by a bulleted list of how DWQ has addressed the themes in the past or will address them in future water quality assessment, planning, restoration, and protection work.

1. Environmental Justice (EJ): Consider environmental justice in assessment, listing, and TMDLs to address disproportionately high and adverse environmental, water quality, climate-related, and other relevant impacts on underserved communities.

   DWQ has:
   - Considered EJ communities for ranking criteria in awarding nonpoint source funding as part of its 2023 and 2024 nonpoint source project proposals.
   - Developed EJ-related scenarios for the RPS tool and prioritized resulting waterbodies for water quality restoration and protection planning.

2. Climate Change: Strategically consider how to account for the impacts of climate change or address climate resiliency or vulnerability in water quality assessment, impaired waters listing, and the development of TMDLs and other plans consistent with water quality standards.

   DWQ has:
   - Developed climate-change-related scenarios for the RPS tool and prioritized resulting waterbodies for water quality restoration and protection planning.
   - Considered and discussed the impacts of climate change in the Nine-mile Temperature TMDL.

   DWQ will:
   - Consider developing more concentration-based TMDLs instead of load-based ones so that water quality standards will still be met even with decreased precipitation and streamflow.
   - Incorporate climate change considerations in TMDL development by evaluating critical conditions for stream flow, loading, and water quality parameters as part of the analysis of loading capacity, and adjust implementation approaches to reflect future climate and watershed conditions (EPA, 2023).

- Utilize climate variability and change models and online mapping tools in future TMDLs and watershed plans to include information on how those waters and their beneficial uses may be impacted by increased temperatures and reduced stream flows.
- Incorporate future climate scenarios into mechanistic modeling for determining load allocations.
- Co-lead the multi-agency Functional Flow Framework Development Project that considers human and ecological factors affecting watershed health and function.

3. Tribal Water Quality and Program Development: Help interested tribes administer the CWA 303(d) program, assess waters, and plan for restoration and protection of tribal waters, ensure meaningful consultation opportunities, and otherwise enable tribes to engage with EPA on CWA 303(d) program activities relevant to their interests.

   DWQ has and will:
   - Include tribes in CWA programs by sharing assessment results for waters that overlap tribal boundaries.
   - Share the Integrated Report with tribal contacts.
   - In 2023, provided nonpoint source grant funding to Trout Unlimited/Ute Indian Tribe of the Uintah and Ouray Reservation in northeastern Utah to develop a watershed plan for Willow Creek.
   - Through WIIN Act 106 funding, collaborating with the Navajo Nation and Ute Mountain Ute tribes to develop a Lower San Juan River watershed plan on federal, state, and tribal lands in southeastern Utah and northeastern Arizona.

4. Program Capacity Building: Expand and build upon the activities and materials developed to improve understanding of CWA 303(d) program foundations, familiarity with tools and various approaches to regular tasks and complex circumstances, and ability to accomplish statutory responsibilities and Vision Goals more efficiently and effectively.

   DWQ has:
   - Developed R-based tools to streamline the assessment process using water quality data from the EPA Water Quality Portal, including an R-based data summary and mapping tool that allows for more efficient secondary reviews of the assessment results.
   - Updated the IR program website to include a user-friendly interactive map that displays assessment units, assessment status, impaired parameters, completed TMDLs, and staff contacts.
   - Updated the nonpoint source program website to include clear information about the goals and objectives of the program. The nonpoint source application process has been streamlined through the use of Google Forms.
   - Developed a database to improve high-frequency water quality data availability to DWQ and its partners.

DWQ will:

- Continue to develop TMDL templates and automated data analysis tools to streamline the TMDL process, making it more efficient and reproducible.
- Continue to conduct outreach on CWA programs through participation in water-related stakeholder meetings throughout the state.
- Add success stories to the Watershed Protection Section website to share information with the public about approved TMDLs and subsequent water quality improvement projects.
- Continue to coordinate with other DWQ sections (e.g., Water Quality Standards and Technical Services, Monitoring, Data and Information, Engineering, and Permitting) to ensure efficiency and transparency in ongoing and planned watershed restoration planning and implementation.
- Develop ongoing mechanistic modeling tools and skills. DWQ hosted the 2023 Association of Clean Water Administrators (ACWA) Modeling Workshop in Salt Lake City, with two model-specific training tracks and a nutrient modeling track.

Other Prioritization Considerations

In addition to the RPS tool results, stakeholder survey responses, and best professional judgment on which waterbodies should be prioritized for restoration and protection planning, DWQ will consider other elements when selecting priority waters.

Data Availability

Comprehensive TMDLs and watershed plans require robust datasets that capture spatial and temporal trends. IR water quality assessment methods for beneficial use support determinations are based on a limited number of data points that are not sufficient for TMDL development. Impaired waters lacking a dataset sufficient for study will be identified and targeted for additional monitoring to better characterize when and where exceedances are measured.

Watershed Groups

There are many active watershed groups in Utah. Areas with watershed groups in place tend to see more project work/implementation of best management practices than areas without stakeholder support for those improvements. Watershed groups help identify

potential project areas, assist with financial support for that work, and support project effectiveness monitoring.

TMDL Revisions

Many of the TMDLs for Utah's waterbodies were written years ago, with several over 20 years old. In some instances, those documents no longer accurately characterize current watershed conditions, land-use practices and management, population growth and development, hydromodification, and UPDES permits and discharges.. TMDL revisions were included as part of this Prioritization 2.0 process based on input from DWQ's permitting, engineering, and compliance sections.

Flexibility

DWQ appreciates the flexibility that EPA's Vision 2.0 allows. DWQ's prioritization approach sets the general road map for protection and restoration planning over the next 10 years. Selecting priority waters for TMDL development every two years allows the necessary flexibility to respond to new impairments, public health risks, cooperative funding opportunities, and changes in resources.

Public Engagement

Public engagement in CWA Section 303(d) work has always been a priority for DWQ and will continue to be a priority in the future. Local support and feedback, understanding of water quality issues, and meaningful engagement make Utah's implementation of the CWA programs much more effective. DWQ works to thoroughly document the steps of the watershed planning process to ensure transparency in which waters are monitored, what the assessment results are, how TMDLs are developed, what is included in implementation plans, and the timelines for all of the work.

DWQ will continue to engage with the public in the following ways:

- Participation in watershed groups statewide including
    - Local watershed councils and stakeholder groups
    - State Watershed Council
    - Conservation district meetings

    - Watershed Restoration Initiative (WRI) meetings
    - County and city council meetings
    - Utah Water Quality Board meetings
    - Bear River Commission
    - Jordan River Commission
    - Great Salt Lake Advisory Council
    - Utah Lake Authority
- Presenting water quality information at annual symposiums and workshops
    - Salt Lake Watershed Symposium
    - Utah Lake Symposium
    - Utah Water Users Workshop
    - Water Environment Association of Utah Conference
    - Weber River Confluence Symposium
    - Great Salt Lake Issues Forum
    - Uintah Basin Water Summit
- Promoting public comment periods for the IR and TMDLs
- Participation in watershed days and community water quality outreach events
- Participation in federal, state and local agencies

DWQ conducted an outreach campaign on the initial list of waterbodies selected for water quality restoration and protection plans. The outreach campaign gathered input from stakeholders in each basin, governmental agencies, non-governmental organizations, the regulated community, and staff within the Utah Department of Environmental Quality. DWQ contacted and presented the Prioritization Process to the following watershed groups:

- Moab Area Watershed Partnership
- Jordan River Technical Advisory Committee
- Weber River Partnership Board
- Public Lands and Policy Coordinating Office' Resource Development Coordinating Committee
- Provo River Watershed Council

Plans to Pursue

DWQ will pursue the following TMDLs over the next two years (2024-2026):

Basin	Assessment Unit Name	Assessment Unit ID	Impaired Parameters
Jordan River	Bingham Creek	UT16020204-023_00	E. coli, Total Dissolved Solids
Jordan River	Butterfield Creek	UT16020204-024_02	E. coli, Total Dissolved Solids
Jordan River	City Creek-1	UT16020204-009_00	E. coli
Southeast Colorado	Mill Creek1-Moab	UT14030005-005_00	E. coli
Southeast Colorado	Pack Creek	UT14030005-011_00	E. coli
Southeast Colorado	Castle Creek-1	UT14030005-009_00	E. coli

DWQ has committed to revising the existing TMDL for Deer Creek Reservoir (UT-L-16020203-001_00) during the 2026-2028 cycle to address the dissolved oxygen, temperature, phosphorus and harmful algal bloom impairments. Initial work on this effort has begun, with stakeholder engagement, water quality monitoring, and model selection and development underway.

DWQ will continue to coordinate with stakeholders to develop Nine Element Watershed plans where there is interest and need. The following plans are currently in progress:

Waterbody	Assessment Unit	Assessment Unit ID	Impairments	New or Revision
Emigration Creek	Emigration Creek Emigration Creek Lower	UT16020204-012_ UT16020204-033	E. coli	Revision
Salina Creek	Salina Creek-1 Salina Creek-2	UT16030003-003 UT16030003-006	Dissolved oxygen, E. coli, pH, temperature	New
Utah Lake	Utah Lake and Provo Bay portion of Utah Lake	UT-L-16020201-004_01 UT-L-16020201-004_02	E. coli, ammonia, PCBs in fish tissue, pH, TDS, total phosphorus, eutrophication, harmful algal blooms	New

DWQ will pursue the following Protection Plan over the next two years (2024-2026):

Waterbody	Assessment Unit	Assessment Unit ID	Impairments (2024 IR)
Summit Creek (Cache Valley)	Summit Creek Upper	UT16010202-011_00	None
	Summit Creek Lower	UT16010202-005_00	None

References

U.S. Environmental Protection Agency. (May 2013). A Quick Guide to Developing Watershed Plans to Restore and Protect our Waters.

U.S. Environmental Protection Agency. (2023). Draft Document. Climate Change Considerations When Prioritizing, Developing, and Implementing TMDLs.

U.S. Environmental Protection Agency. (March 2008). Handbook for Developing Watershed Plans to Restore and Protect Our Waters.

U.S. Environmental Protection Agency. (September 2022). Memorandum: 2022-2032 Vision for the Clean Water Act Section 303(d) Program.

Appendix A: Stakeholder Survey & Results

Survey Questionnaire

1) How important to you are each of the following?

	Most Important (4)	Important (3)	Less Important (2)	Least Important (1)
Clean sources of drinking water (1)	O	O	O	O
Waters safe for recreation (e.g. swimming, boating) (2)	O	O	O	O
Water that supports fish & wildlife habitat (3)	O	O	O	O
Water for agricultural uses (4)	O	O	O	O

2) How concerned are you about the impact of Utah's water quality on these categories:

	Extremely concerned (5)	Very concerned (4)	Moderately concerned (3)	Slightly concerned (2)	Not concerned (1)
Human health (1)	O	O	O	O	O
Aquatic ecosystems & wildlife (3)	O	O	O	O	O
Agriculture (4)	O	O	O	O	O
Recreation (5)	O	O	O	O	O

3) How would you rate the local water quality of lakes, rivers, streams, and reservoirs in your area? (i.e. in your city or county)

O Excellent (5)

O Good (4)

O Average (3)

O Poor (2)

O Very poor (1)

4) How would you rate statewide water quality of Utah's lakes, rivers, streams, and reservoirs?

- O Excellent (5)
- O Good (4)
- O Average (3)
- O Poor (2)
- O Very poor (1)

5) Compared to 10 years ago, how would you rate Utah's water quality in rivers, streams, lakes, and reservoirs?

	Better (4)	About the same (3)	Worse (2)	I don't know (6)
Water used for agriculture (2)	O	O	O	O
Clean sources of drinking water (5)	O	O	O	O
Water that supports fish & wildlife habitat (3)	O	O	O	O
Waters safe for recreation (e.g. swimming, boating) (4)	O	O	O	O

6) How often have water quality issues limited your ability to use water for the following purposes?

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
Recreation (1)	O	O	O	O	O
Agriculture (2)	O	O	O	O	O
Drinking water (3)	O	O	O	O	O

7) What is your level of concern about these sources of pollution and their threat to water quality in your city or county?

	Very high (5)	High (4)	Moderate (3)	Low (2)	None (1)
Cropland runoff (1)	O	O	O	O	O
Livestock access to waterbodies (2)	O	O	O	O	O
Feedlot runoff (3)	O	O	O	O	O
Urban and residential runoff (4)	O	O	O	O	O
Construction runoff (5)	O	O	O	O	O
Erosion and sedimentation (6)	O	O	O	O	O
Industrial and chemical pollution (7)	O	O	O	O	O
Sewage treatment plant discharge (8)	O	O	O	O	O
Onsite septic systems (9)	O	O	O	O	O
Pet waste, human waste from recreation, trash/litter (11)	O	O	O	O	O

Loss of natural areas (12)	O	O	O	O	O
Abandoned mine drainage (13)	O	O	O	O	O
Natural disasters (e.g. floods, droughts, and wildfires) (14)	O	O	O	O	O

8) Are there any lakes, rivers, streams, or reservoirs near your home that you are concerned about where conditions could be improved with restoration?

O No (1)

O Yes (list all waterbodies you're concerned about) (2)

_____

8.1) In the waterbody or waterbodies that you indicated in the previous question, which of the following water quality issues are you concerned about? (Check all that apply)

☐ Litter, debris, and/or trash in the water (1)

☐ Dead fish (2)

☐ Invasive species (E.g. quagga mussels, non-native fish, Russian olive) (8)

☐ Algae blooms or aquatic weeds (E.g. pond scum, duckweed, water looks like 'pea soup') (3)

☐ Murky, muddy, or cloudy water (4)

- [ ] Smell/odor from water (5)
- [ ] Bacteria & pathogens (E.g. giardia, E. coli) (6)
- [ ] Pesticides or fertilizers (7)
- [ ] Salt/salinity affecting irrigated plants (9)
- [ ] Heavy metals & toxic compounds (E.g. mercury, arsenic, lead, PFAS) (10)
- [ ] Water temperature (11)
- [ ] Excess nutrients and/or low dissolved oxygen (12)

9) How often do you visit rivers, streams, or lakes for recreational activities such as swimming, fishing, or kayaking?

- O Most days during the recreational season (5)
- O At least once a week (4)
- O Once a month (3)
- O Once or twice a year (2)
- O Never (1)

10) How would you rate your level of knowledge about water quality issues facing your area?

- O Very high (5)
- O High (4)
- O Average (3)
- O Low (2)
- O Very low (1)

11) Select all activities you have participated in during the last two years:

- ☐ Volunteer water quality monitoring (1)
- ☐ Lake, river, stream, or watershed protection groups (2)
- ☐ County, municipal, township, or tribal commission meetings (3)
- ☐ Lake, river, or stream clean-up day (4)
- ☐ Other (please specify) (5)

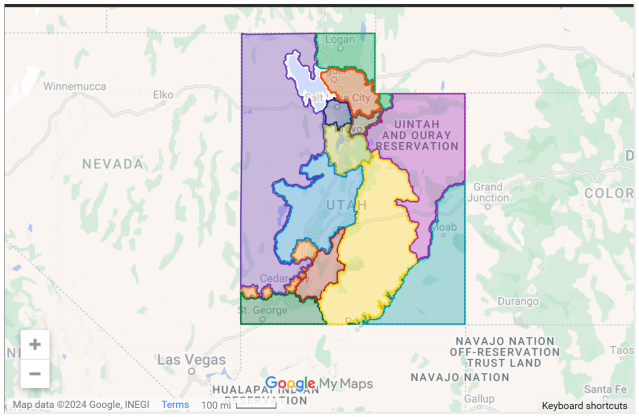
12) In the last year, did you see, hear, or read information about water quality in your area?

- O Yes (1)
- O No (2)

13) Where do you get information about water quality in Utah? (Select all that apply)

- [ ] Web search (2)
- [ ] Local news outlets (newspapers, TV, radio) (3)
- [ ] National newspapers (4)
- [ ] Social media outlets (5)
- [ ] Other (17) _____

14) Which watershed basin do you live in? Use the map to find the name of your basin.



- O Bear River (1)
- O Cedar-Beaver (2)
- O Jordan River (3)
- O Lower Colorado River (4)
- O Lower Sevier River (5)
- O Southeast Colorado River (6)
- O Uinta Basin (7)
- O Upper Provo River (8)

O Upper Sevier River (9)

O Utah Lake-Lower Provo River (10)

O Weber River (11)

O West Desert (12)

O Western Colorado River (13)

15) What best describes your place of residence?

O Urban (1)

O Suburban (2)

O Rural (not farming) (3)

O Rural (farming) (4)

All information that you provide below is optional and completely anonymous and helps us to identify patterns and potential disparities in how Utahns experience and value water quality. This information will help us tailor communication, educational opportunities, and community programs to specific demographic segments and address any disparities or specific concerns most effectively.

16) What is your current age?

O 18-24 (1)

O 25-34 (2)

O 35-44 (3)

O 45-54 (4)

O 55-64 (5)

O 65-94 (6)

O 95 or older (7)

17) What is the highest level of school you have completed?

O Some formal schooling (1)

O High school/GED (2)

O Some college (3)

O 2-year degree, vocational, or technical training (4)

O 4-year degree (5)

O Graduate/professional degree (6)

18) How do you describe yourself?

O Male (1)

O Female (2)

O Non-binary (3)

O Prefer not to say (4)

O Other (5) _____

Please answer BOTH of the following questions about ethnicity and race (for this questionnaire, Hispanic or Latino origins are not races.)

19) What is your race? (Select all that apply)

O American Indian or Alaska Native (1)

O Asian (2)

O Black or African American (3)

O Native Hawaiian or Pacific Islander (4)

O White (5)

20) What is your ethnicity?

O Hispanic or Latino (1)

O Not Hispanic or Latino (2)

Graphics of survey results

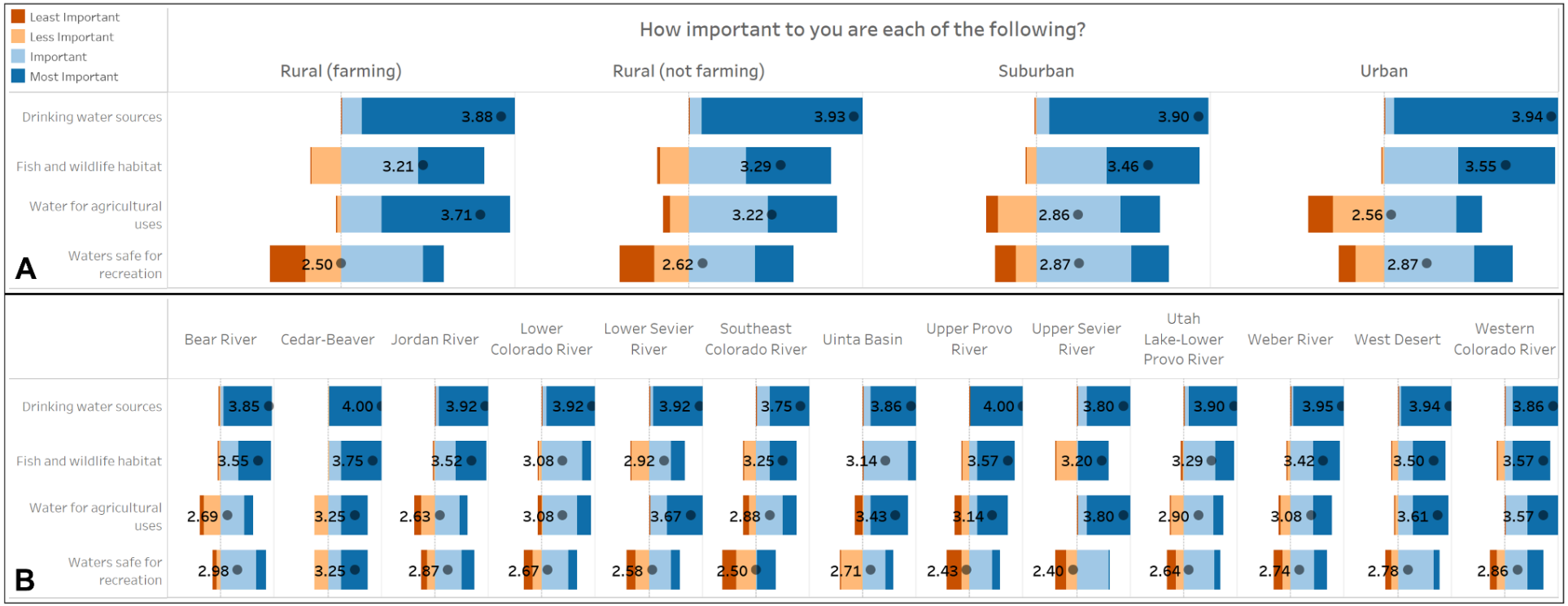


Figure A1. Results from a survey question asking Utahns, "How important to you are each of the following?" broken down by A) participants' area of residence and B) basin (n = 503).

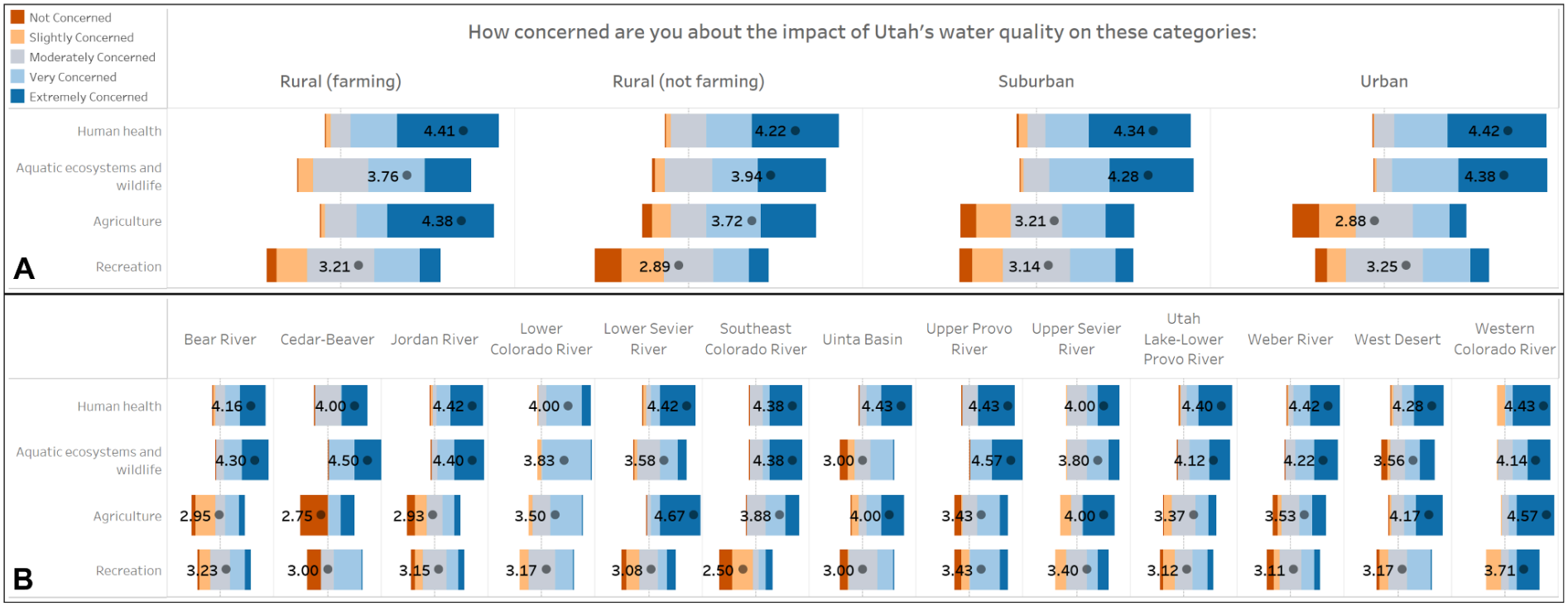
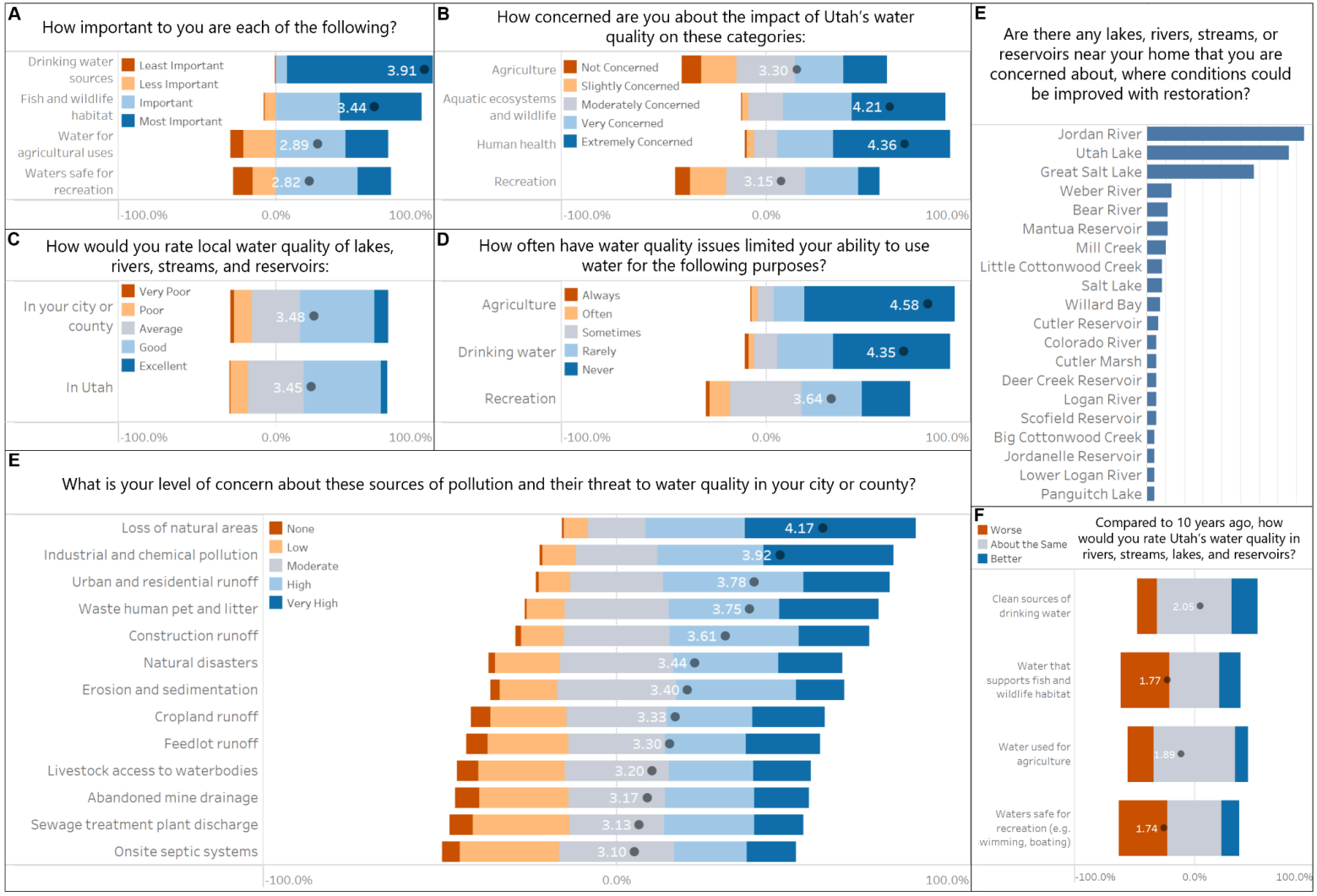


Figure A2. Results from a survey question asking Utahns, "How concerned are you about the impact of Utah's water quality on these categories?" broken down by A) participants' area of residence and B) basin (n = 499).


A
How important to you are each of the following?
Drinking water sources
Fish and wildlife habitat
Water for agricultural uses
Waters safe for recreation
Least Important
Less Important
Important
Most Important
3.91
3.44
2.89
2.82
-100.0%
0.0%
100.0%
B
How concerned are you about the impact of Utah's water quality on these categories:
Agriculture
Aquatic ecosystems and wildlife
Human health
Recreation
Not Concerned
Slightly Concerned
Moderately Concerned
Very Concerned
Extremely Concerned
3.30
4.21
4.36
3.15
-100.0%
0.0%
100.0%
C
How would you rate local water quality of lakes, rivers, streams, and reservoirs:
In your city or county
In Utah
Very Poor
Poor
Average
Good
Excellent
3.48
3.45
-100.0%
0.0%
100.0%
D
How often have water quality issues limited your ability to use water for the following purposes?
Agriculture
Drinking water
Recreation
Always
Often
Sometimes
Rarely
Never
4.58
4.35
3.64
-100.0%
0.0%
100.0%
E
Are there any lakes, rivers, streams, or reservoirs near your home that you are concerned about, where conditions could be improved with restoration?
Jordan River
Utah Lake
Great Salt Lake
Weber River
Bear River
Mantua Reservoir
Mill Creek
Little Cottonwood Creek
Salt Lake
Willard Bay
Cutler Reservoir
Colorado River
Cutler Marsh
Deer Creek Reservoir
Logan River
Scofield Reservoir
Big Cottonwood Creek
Jordanelle Reservoir
Lower Logan River
Panguitch Lake
E
What is your level of concern about these sources of pollution and their threat to water quality in your city or county?
Loss of natural areas
Industrial and chemical pollution
Urban and residential runoff
Waste human pet and litter
Construction runoff
Natural disasters
Erosion and sedimentation
Cropland runoff
Feedlot runoff
Livestock access to waterbodies
Abandoned mine drainage
Sewage treatment plant discharge
Onsite septic systems
None
Low
Moderate
High
Very High
4.17
3.92
3.78
3.75
3.61
3.44
3.40
3.33
3.30
3.20
3.17
3.13
3.10
-100.0%
0.0%
100.0%
F
Compared to 10 years ago, how would you rate Utah's water quality in rivers, streams, lakes, and reservoirs?
Worse
About the Same
Better
Clean sources of drinking water
Water that supports fish and wildlife habitat
Water used for agriculture
Waters safe for recreation (e.g. wimming, boating)
2.05
1.77
1.89
1.74
-100.0%
0.0%
100.0%

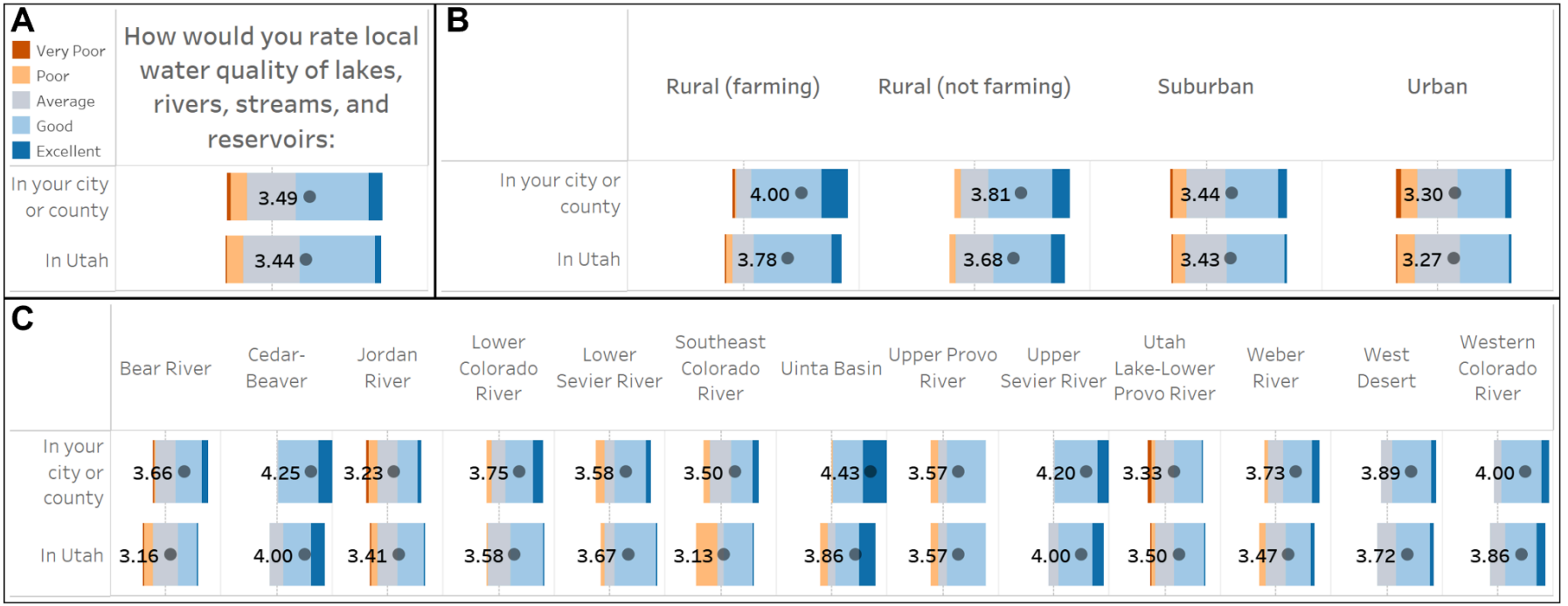


Figure A3. Results from a survey question asking Utahns, "How would you rate local water quality of lakes, rivers, streams, and reservoirs in: your area (i.e. in your city or county) and in Utah (statewide)?" broken down by A) statewide average, B) participants' area of residence, and C) basin (n = 502).

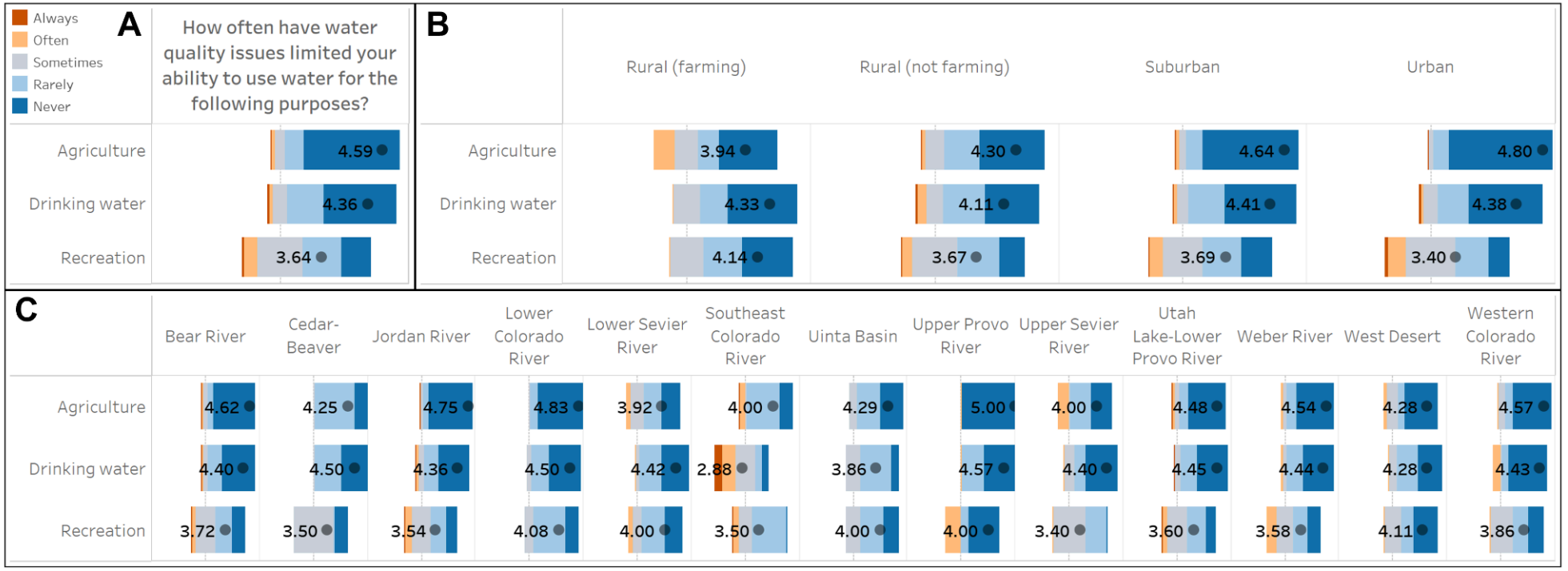


Figure A4. Results from a survey question asking Utahns, "How often have water quality issues limited your ability to use water for the following purposes?" broken down by A) statewide average, B) participants' area of residence, and C) basin (n = 479).

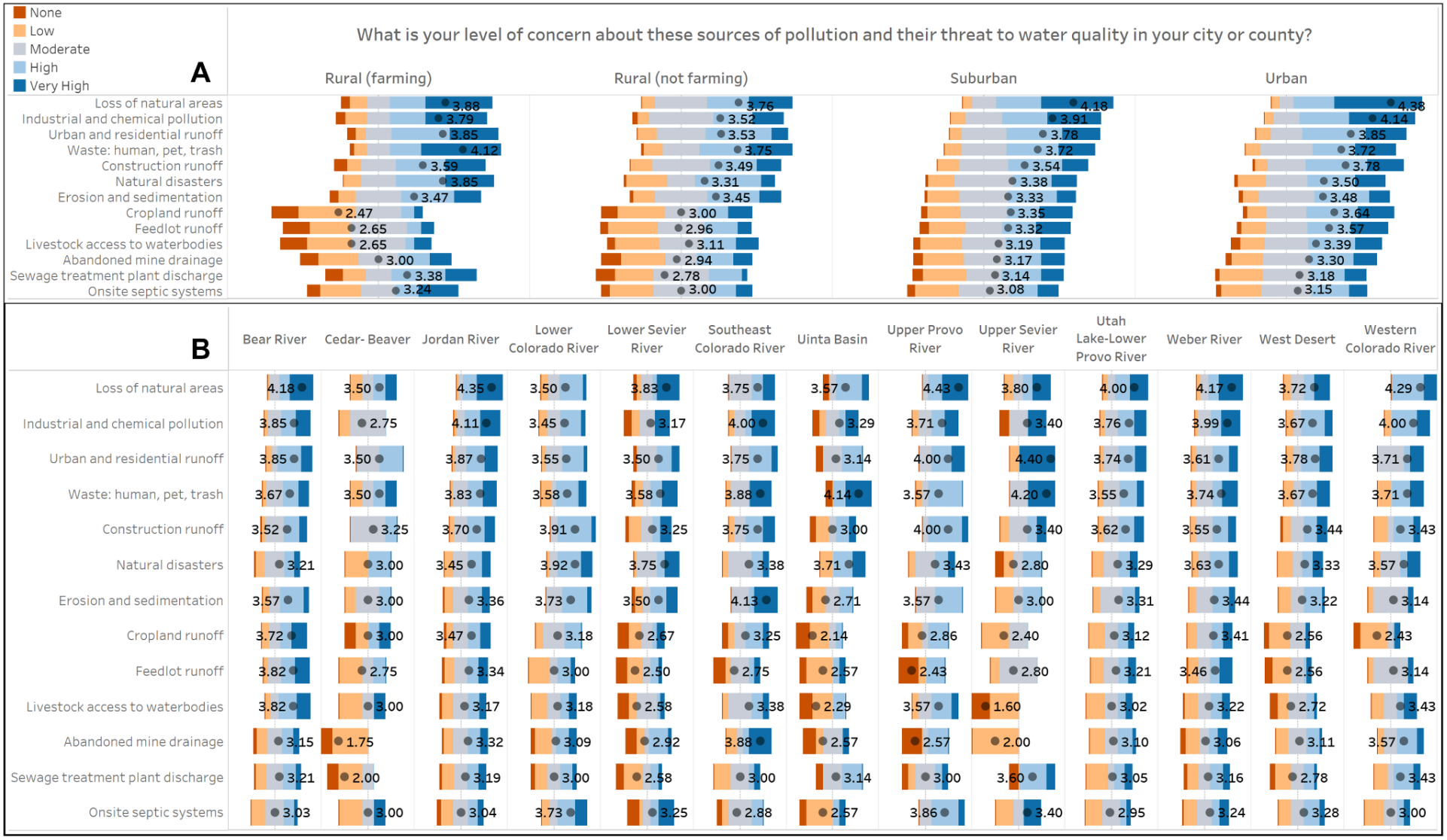


Figure A5. Results from a survey question asking Utahns, "What is your level of concern about these sources of pollution and their threat to water quality in your city or county?" broken down by A) participants' area of residence and B) basin (n = 475).

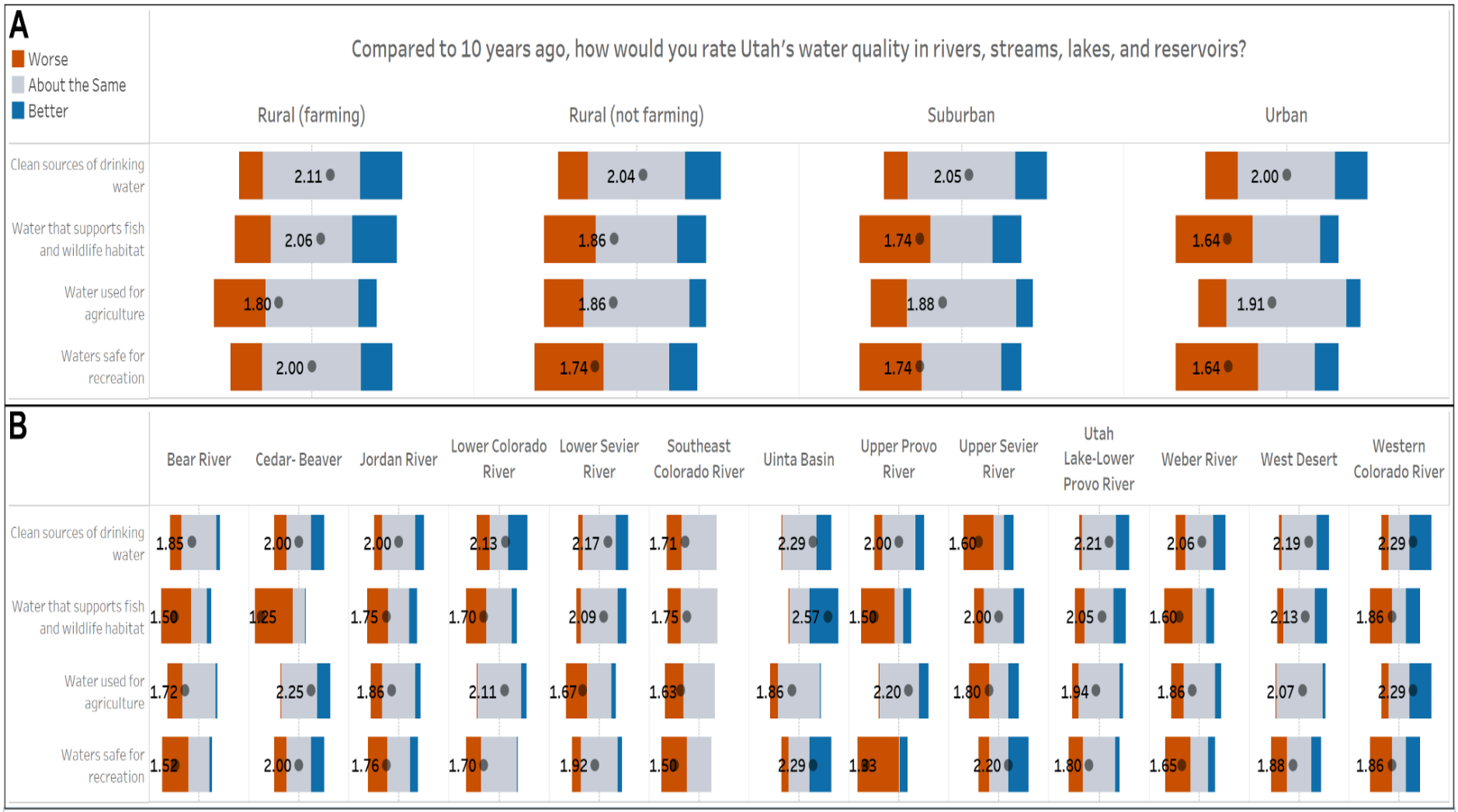


Figure A6. Results from a survey question asking Utahns, "Compared to 10 years ago, how would you rate Utah's water quality in rivers, streams, lakes, and reservoirs?" broken down by A) participants' area of residence and B) basin (n = 498).

Appendix B: Recovery Potential Screening Tool Objectives, Scenarios, and Indicators

The following table includes a summary of the water quality objectives, scenarios associated with those objectives, watershed selection criteria, and Ecological, Stressor, and Social Indicators used in the RPS tool to screen Utah watersheds for protection and restoration.

Objective	Scenario	Watershed Selection Criteria	Ecological Indicators	Stressor Indicators	Social Indicators
1. What pollutants pose the greatest risk to human health?	1A. What nutrient-impaired AUs with agricultural land uses and increased population growth are within drinking water source protection areas?	Nutrient impairment	PHWA Watershed Health Index, State	• Nutrient Impaired Waters Count in HUC12 • % Agriculture in HUC12 • % Urban in HUC12 • Livestock Density in HUC12 • Population Density in HUC12 • Manure Nitrogen Application in HUC12 • Synthetic Fertilizer Nitrogen Application in HUC12 • Manure Phosphorus Application in HUC12 • Synthetic Fertilizer Phosphorus Application in HUC12 • % Urban Change in HUC12 (2001-19) • % Projected Change in Developed Cover in HUC12, SSP5 Scenario	• % Drinking Water Source Protection Area in HUC12, Surface • % Drinking Water Source Protection Area in HUC12, Ground • Drinking Water Surface Intake Count in HUC12 • Drinking Water Groundwater Intake Count in HUC12 • Drinking Water Population Served in HUC12 • Nutrient Nonpoint Source Pollution Control Project Presence in HUC12
	1B. What nutrient-impaired AUs with significant agricultural land uses are within drinking water source protection areas?	Nutrient impairment	PHWA Watershed Health Index, State	• Nutrient Impaired Waters Count in HUC12 • Soil Erodibility, Mean in HUC12 • % Agriculture in HUC12 • Manure Nitrogen Application in HUC12 • Synthetic Fertilizer Nitrogen Application in HUC12 • Manure Phosphorus Application in HUC12 • Synthetic Fertilizer Phosphorus Application in HUC12 • Livestock Density in HUC12 • % Agriculture Change in HUC12 (2001-19) • % High Runoff Potential Soils in HUC12 • % Moderately High Runoff Potential Soils in HUC12	• % Drinking Water Source Protection Area in HUC12, Surface • % Drinking Water Source Protection Area in HUC12, Ground • Drinking Water Surface Intake Count in HUC12 • Drinking Water Groundwater Intake Count in HUC12 • Drinking Water Population Served in HUC12 • Nutrient Nonpoint Source Pollution Control Project Presence in HUC12

Objective	Scenario	Watershed Selection Criteria	Ecological Indicators	Stressor Indicators	Social Indicators
	1C. What primary contact recreational use lakes/reservoirs are impaired as a result of Harmful Algal Blooms (advisories) and *E. coli?*	Beneficial Use Class 2A & 2B *E. coli* impairment HAB in 2022	PHWA Watershed Health Index, State	• % Nonbuffered Agriculture in HUC12 • % Pasture on > 10% Slope in HUC12 • Livestock Density in HUC12 • % Urban in Hydro-Connected Zone in HUC12 • % Agriculture in Hydro-Connected Zone in HUC12 • Manure Nitrogen Application in HUC12 • Synthetic Fertilizer Nitrogen Application in HUC12 • Manure Phosphorus Application in HUC12 • Synthetic Fertilizer Phosphorus Application in HUC12 • Septic System Count in HUC12 • % High Runoff Potential Soils in HUC12 • Nutrient Impaired Waters Count in HUC12 • Pathogen Impaired Waters Count in HUC12	• % Protected Land in HUC12 • Nutrient Nonpoint Source Pollution Control Project Presence in HUC12 • 303d Vision Priority in HUC12 • Freshwater Fishing Demand in HUC12 • Pathogen Nonpoint Source Pollution Control Project Presence in HUC12 • Demand in HUC12
	1D. What primary contact recreational use lakes/reservoirs are *E. coli* impaired?	Beneficial Use Class 2A & 2B *E. coli* impairment HAB in 2022	PHWA Watershed Health Index, State	• % Nonbuffered Agriculture in HUC12 • % Pasture on > 10% Slope in HUC12 • Livestock Density in HUC12 • % Urban in Hydro-Connected Zone in HUC12 • % Agriculture in Hydro-Connected Zone in HUC12 • Manure Nitrogen Application in HUC12 • Manure Phosphorus Application in HUC12 • Septic System Count in HUC12 • % High Runoff Potential Soils in HUC12 • Pathogen Impaired Waters Count in HUC12	• % Protected Land in HUC12 • Area of State Parks in HUC12 • Area of National Parks in HUC12 • Utah National Priority List Site Count in HUC12 • Pathogen Nonpoint Source Pollution Control Project Presence in HUC12
	1E. What HUC12 watersheds contain impaired waters within high-density areas and high-use areas (i.e., may affect a large number of people)?	All impairments	PHWA Watershed Health Index, State	• Population Density in HUC12 • % Urban in HUC12 • % Developed, High Intensity in HUC12 • % Developed, Medium Intensity in HUC12 • Stormwater Discharges in HUC12 • High Priority Stormwater Outfalls in HUC12 • % Developed, Low Intensity in HUC12 • PHWA Land Use Vulnerability Sub-Index, State	• Drinking Water Surface Intake Count in HUC12 • Drinking Water Population Served in HUC12 • Area of State Parks in HUC12 • Area of National Parks in HUC12 • Presence of National Wild and Scenic Rivers in HUC12 • Freshwater Fishing Demand in HUC12
2. Which waterbodies are most vulnerable to climate change impacts?	2A. Which temperature-impaired AUs have experienced the greatest decrease in precipitation amount?	Temperature impairment	PHWA Watershed Health Index, State	• % Projected Change in Annual Precipitation in HUC12, Inverse • % Projected Change in Summer Precipitation in HUC12, Inverse • % Projected Change in Annual Runoff in HUC12, Inverse • % Projected Change in Spring Runoff in HUC12, Inverse • % Projected Decrease in March Snow Water Equivalence in HUC12	• Nonpoint Source Pollution Control Project Count in HUC12 • 303d Vision Priority in HUC12 • % Protected Land in HUC12

Objective	Scenario	Watershed Selection Criteria	Ecological Indicators	Stressor Indicators	Social Indicators
	2B. Which impaired temperature AUs are most vulnerable to forecasted increases in temperature due to climate change?	Temperature impairment	PHWA Watershed Health Index, State	• Projected Change in Annual Temperature in HUC12 • Projected Change in Summer Temperature in HUC12 • % Projected Change in Annual Evaporative Deficit in HUC12 • PHWA Watershed Vulnerability Index, State	• Nonpoint Source Pollution Control Project Count in HUC12 • 303d Vision Priority in HUC12 • % Protected Land in HUC12 •
	2C. Which impaired AUs with permitted point sources are predicted to have a decrease in stream flow due to drought?	All impairments UPDES > 1	PHWA Watershed Health Index, State	• NPDES Permit Count in HUC12 • % Projected Change in Annual Precipitation in HUC12, Inverse • % Projected Change in Summer Precipitation in HUC12, Inverse • % Projected Change in Annual Runoff in HUC12, Inverse • % Projected Change in Spring Runoff in HUC12, Inverse • % Projected Decrease in March Snow Water Equivalence in HUC12 • % Projected Change in Annual Evaporative Deficit in HUC12	• Nonpoint Source Pollution Control Project Count in HUC12 • 303d Vision Priority in HUC12 • % Protected Land in HUC12 •
	2D. Which impaired watersheds with impaired waters supporting species of greatest conservation need are at risk of greatest temperature change from climate change?	All impairments SGCN > 1	PHWA Watershed Health Index, State	• Projected Change in Annual Temperature in HUC12 • Projected Change in Summer Temperature in HUC12 • PHWA Watershed Vulnerability Index, State • Impaired Waters Count in HUC12	• Nonpoint Source Pollution Control Project Count in HUC12 • 303d Vision Priority in HUC12 • % Protected Land in HUC12
3. What pollutants pose the greatest risk to aquatic life uses?	3A. Which aquatic life impairments are in areas with Species of Greatest Conservation Need (SGCN)?	Aquatic life impairments 3A-3E SGCN > 1	PHWA Watershed Health Index, State	• Impaired Waters Count in HUC12 • PHWA Watershed Vulnerability Index, State	• Nonpoint Source Pollution Control Project Count in HUC12 • 303d Vision Priority in HUC12 • % Protected Land in HUC12
4. Environmental Justice	4A. What recreational use and fish consumption impaired AUs are within underserved and economically challenged communities?		PHWA Watershed Health Index, State	• Pathogen Impaired Waters Count in HUC12 • Metals Impaired Waters Count in HUC12 • Livestock Density in HUC12 • NPDES Permit Count in HUC12	• Freshwater Fishing Demand in HUC12 • % Low-Income Population in HUC12 • % Minority Population in HUC12 • % Less Than High School Educated Population in HUC12 • % Vulnerable Age Group Population in HUC12

Objective	Scenario	Watershed Selection Criteria	Ecological Indicators	Stressor Indicators	Social Indicators
	4B. Which drinking water source protection areas provide drinking water to underserved and economically challenged communities?	Recreation impairment (2A-2B) (no fish advisory data)	PHWA Watershed Health Index, State	• PHWA Watershed Vulnerability Index, State • PHWA Water Use Vulnerability Sub-Index, State • Impaired Waters Count in HUC12	• % Drinking Water Source Protection Area in HUC12, Surface • % Drinking Water Source Protection Area in HUC12, Ground • % Low-Income Population in HUC12 • % Minority Population in HUC12 • % Less Than High School Educated Population in HUC12 • % Vulnerable Age Group Population in HUC12
5. Tribal Considerations	5A. Which impaired AUs overlap tribal lands?		PHWA Watershed Health Index, State	• PHWA Watershed Vulnerability Index, State	• Neutral Variable, Social Category
	5B. Which impaired AUs are drinking water sources for tribal nations?		PHWA Watershed Health Index, State	• PHWA Watershed Vulnerability Index, State	• % Drinking Water Source Protection Area in HUC12, Surface • % Drinking Water Source Protection Area in HUC12, Ground
6. Watershed Protection	6A. What high-quality watersheds support aquatic SGCNs?	No impairments, SGCN > 1	PHWA Watershed Health Index, State	• PHWA Watershed Vulnerability Index, State	• Neutral Variable, Social Category
	6B. What high-quality watersheds support aquatic SGCNs and drinking water sources?	No impairments, SGCN > 1, HUC12 in DW-groundwater and/or DW-surface water protection zones	PHWA Watershed Health Index, State	• PHWA Watershed Vulnerability Index, State	• % Drinking Water Source Protection Area in HUC12, Surface • % Drinking Water Source Protection Area in HUC12, Ground
	6C. What high-quality HUC12s with SGCNs are at risk of experiencing the greatest increase in temperature and/or reduction in precipitation?	No impairments, SGCN > 1	PHWA Watershed Health Index, State	• Projected Change in Annual Temperature in HUC12 • Projected Change in Summer Temperature in HUC12 • % Projected Change in Annual Precipitation in HUC12, Inverse • % Projected Change in Summer Precipitation in HUC12, Inverse	• % Drinking Water Source Protection Area in HUC12, Surface • % Drinking Water Source Protection Area in HUC12, Ground
	6D. Which HUC12 watersheds are	No impairments, SGCN > 1	PHWA Watershed	• % Urban Change in HUC12 (2001-19) • % Projected Change in Developed Cover in HUC12,	• % Drinking Water Source Protection Area in HUC12, Surface

Objective	Scenario	Watershed Selection Criteria	Ecological Indicators	Stressor Indicators	Social Indicators
	experiencing high development pressure that might negatively impact waterbodies that are currently supporting their beneficial uses?		Health Index, State	SSP5 Scenario • PHWA Watershed Vulnerability Index, State	• % Drinking Water Source Protection Area in HUC12, Ground
7. Agricultural waters	7A. Which waterbodies impaired for total dissolved solids (TDS) have high agricultural water demand?	TDS impairments	PHWA Watershed Health Index, State	• Agricultural Water Demand	• Neutral Variable