Upper Mississippi River Basin Association

Water Quality Task Force Meeting

February 1, 2024

Agenda

with
Background
and
Supporting Materials

UPPER MISSISSIPPI RIVER BASIN ASSOCIATION
WATER QUALITY TASK FORCE MEETING

February 1, 2024

Meeting Agenda

Connection Information

- Web, video conferencing, click on the following link:
  - https://umrba.my.webex.com/umrba.my/j.php?MTID=m9c5a9ce89c3feddc192d7e754a923c6c
- Dial-in number: (312) 535-8110
  - Access code: 2559 658 5567
  - Passcode: 1234

Thursday, February 1

Time	Attachment	Topic	Presenter
8:30 a.m.		Welcome and Introductions	*Kim Laing, MNPCA*
8:35	A1-A16	Approval of the September 20-21, 2023 WQTF Draft Meeting Summary	*All*
8:40	B1-B2	UMRBA Updates • *How Clean is the River?* Report • Gulf Hypoxia Program • UMR Interstate Water Quality Monitoring – Fixed Site Implementation • Potential UMR Recreation Survey	*Lauren Salvato, UMRBA*
9:00		Emerging Contaminants • Burrowing Mayfly Status and Trends	*Shawn Giblin, WIDNR*
9:30	C1-C5	Mississippi River Water Quality Survey	*Erin Niehoff, UMN*
10:00		Break	
10:15		Upper Mississippi River Monitoring • Summer 2024 Monitoring Plans	*David Pratt, USEPA, Kim Laing, MNPCA, and Dr. Luke Loke, USGS*
10:35		Toxic Cyanobacteria/Harmful Algal Blooms • 2023 Beach Monitoring: Analyzing Multiple Cyanotoxins (Anatoxin, Saxitoxin, Microcystin)	*Dan Kendall, IADNR*

(Continued)

11:00	Shared Water Quality Assessments for the Upper Mississippi River	*All*
11:25	Administrative Items • Future Meeting Schedule	*All*
11:30 a.m.	Adjourn	

ATTACHMENT A

September 20-21, 2023 WQTF Draft Meeting Summary

(A-1 to A-16)

Upper Mississippi River Basin Association
Water Quality Task Force Meeting

September 20-21, 2023
Draft Highlights and Action Items Summary

Approval of the WQEC-WQTF June 13-14, 2023 Meeting Summary

The UMRBA Water Quality Task Force (WQTF) approved the June 13-14, 2023 draft highlights and action items summary.

UMRBA Updates

UMR Interstate Water Quality Monitoring in 2025-2026

Lauren Salvato said the WQTF is planning to implement the fixed site network, a portion of the UMR Interstate Water Quality Monitoring Plan, from October 2025 to September 2026. This would include all five states as well as Metropolitan Council (a regional government in Minnesota) to sample a suite of parameters at 12 fixed sites from L&D 2 to Thebes, Illinois. The five states are coordinating multiple funding sources to be able to implement the fixed site network monitoring. The WQTF met earlier on June 13 for a working session and used that time to refine its list of parameters and discuss analytical laboratory options.

UMR Interstate Water Quality Monitoring Plan Updates

UMRBA staff met with USEPA Office of Research and Development (ORD) and USGS staff regarding updates to the UMR Interstate Water Quality Monitoring Plan. Specifically, the question is about implications for merging the drinking water use assessment with the fixed site monitoring network. As a reminder, sampling for the drinking water use assessment was challenging because of the voluntary participation with public water suppliers. If fixed site monitoring and drinking water use assessment were merged, then drinking water focused parameters would be collected at fixed sites instead of relying on PWS to collect samples at their intake points. Given that the results from intakes are averaged out to the CWA reach level, the data collection would be closer to how it was originally laid out in the monitoring plan.

The research question then becomes "If you cannot obtain a grab surface water sample directly from a PWS intake, how close to a given intake (x,y, and z dimensions) does a sample collected need to be to represent that given intake." USGS staff have suggested that we could conduct a flow-weighted sampling project and analyze intakes relative to tributary location. They suggest that tributary inputs are more substantial than the distance between a fixed site and an intake. Salvato said her impression is that this would be a costly effort, but the analysis would be robust in informing the distribution of fixed sites in the monitoring plan.

Salvato views the options as:

1) Merge the fixed site network and drinking water use assessment and ensure there is a fixed site in each of the CWA reaches that there are PWS intakes (i.e., we would likely be adding a few

additional fixed sites, all of which are currently part of Illinois EPA's ambient monitoring network)

2) Proceed with the recommendation of flow-weighted composite sampling

3) Do nothing and leave the plan as it is

4) Consider alternate options

Generally, the participants agreed with the logic of option number one. Salvato asked Dr. Danelle Larson to present an alternate option during this meeting for the WQTF's consideration.

UMRBA Multi-Benefit Conservation Practice Workshop

UMRBA received a USEPA Office of Wetlands, Oceans, and Watersheds grant to convene partners across the basin to discuss how to further accelerate the adoption of conservation practices with multiple benefits. The first workshop occurred in St. Louis, Missouri in November 2022 and the second is planned for October 3-4, 2023 in St. Paul, Minnesota. The theme of this workshop is leverage points of change. Identifying leverage points for the Upper Mississippi River Basin requires a whole system evaluation of the root causes that, when addressed, can increase the implementation of conservation practices with multiple benefits. UMRBA and the workshop participants will work together to plan strategic efforts to address root causes: policy, financial, technical, leadership, and partnership. Examples of leverage points include improved and coordinated technical assistance, innovative and streamlined funding mechanisms, peer to peer networks, and new partnerships/collaborations.

How Clean is the River? Report

Salvato said that UMRBA staff have developed a communications and dissemination plan for the How Clean is the River? Report. That includes a press release, an email to Congressional representatives, an email to UMRBA's water quality partners, and a list of organizations to receive the notification of the report publication. The distribution of the communication materials is anticipated to occur in winter 2023, but there is not an official release date yet. UMRBA staff presented at the Missouri Water Protection Forum on August 9 and offered presentations for the other member states.

Water Quality Task Force Roles and Responsibilities

During the WQEC-WQTF June meeting, the following priorities were stated:

1) Nutrients, specifically nitrogen loading reductions

2) PFAS

3) TSS and sedimentation management

4) Aluminum water quality standards

5) UMR Interstate Water Quality Monitoring implementation

6) Data management for monitoring data

7) Communication to the public about the monitoring plan, such as groups like the Missouri Water Protection Forum

8) Shared WQ assessments and standards

9) Recreation uses across the UMR

10) Developing resolutions for contaminants of emerging concern (CECs) and nitrogen

Salvato suggested that for the purposes of the discussion that number one can be eliminated because interstate nutrient priorities will be funded through Gulf Hypoxia Program dollars and coordinated through a different group of the five states. Number five can also be eliminated because planning is currently underway for fixed site monitoring implementation. Salvato said a goal of the discussion today is to discuss each state agency's top two to three priorities for the next two fiscal years. This will translate into a workplan that is proposed to the WQEC during its upcoming joint meeting October 24 with the UMRBA Board. The states shared their topic priorities as follows, with colors utilized to indicate more than one vote for a particular topic:

Minnesota	Missouri	Wisconsin	Illinois	Iowa
10	10	10	10	8
8	3	3	6	6
2	9	9	2	2

Number 2 (PFAS) and 10 (CEC and nutrient resolutions) were voted as the top priorities. However, it was less clear how to prioritize number two (PFAS) or number three (TSS and sedimentation) beyond monitoring. The WQTF decided to eliminate those priorities and settled on the following priorities:

- Developing resolutions for CECs and nitrogen (number 10)
- Data management for monitoring data (number six)
- Shared WQ assessments and standards (number eight)
- Recreation uses across the UMR (number nine)

Potential UMR Recreation Survey

When the WQTF considered updates to the Provisional Assessment, chl-a values were identified for an update. The values were derived from a 2005 Minnesota Lake Water Quality Assessment report. The WQTF discussed designing a recreation survey that would derive chl-a values reflective of a large river floodplain. Furthermore, the survey could also provide insights on how recreation uses change longitudinally.

UMRBA staff met with USEPA Great Lakes Toxicology and Ecology Division Laboratory staff about potential ways to assist with this effort. However, they asked for more information on our goals and objectives before making any recommendations. The questions were:

- What are the goals of a UMRBA recreation survey?
- What are the research questions?
- What data do we want to collect?
- Over what time and spatial extent do we want data collected?
- Who do we want to engage in a recreation survey?

The UMRCC fish tech section is interested in developing a creel survey for select pools in the UMR. The fish tech section will be asking the UMRCC Executive Board for funding at its October 2023 meeting. UMRBA staff met with current chair Travis Moore of Missouri DOC and discussed potential overlap between the two projects. It is unclear yet if these two efforts can be merged, so UMRBA staff seek input on next steps.

Giblin asked if the water quality tech section was asked to provide questions for the creel survey. Kendall replied that the plan is to develop the survey questions during the upcoming fall meeting. Travis Moore wants to keep the survey short to 10 questions with each tech section providing two questions. Kendall said UMRCC wants to survey the full UMR but may have to narrow it to a few pools. The other component is geofencing data to see how long people are staying on the river. That will be purchased from a company that collects that type of data. If we could obtain chl-a data from satellite imagery, it can be linked to the geofencing data. Giblin views the effort from UMRBA and UMRCC as different. It would be more expensive but more powerful to have recreation criteria based on excess algal growth. A UMRBA effort can tie the science to social aspects of when users are disgusted by recreation conditions. In response to a question from Voss, Giblin said that this could be done with Secchi readings. Voss suggested where people originate (e.g., zip code) is important if river users travel to recreate. Voss suggested that to reach users in the southern portion of the UMR, we will have to get creative with components like social media and on-site engagement.

Salvato asked and participants confirmed that UMRBA staff will stay apprised of UMRCC's progress, and a UMR recreation survey effort can continue to be developed by the UMRBA WQTF.

Upper Mississippi River Restoration Long Term Resource Monitoring

Interpolation Techniques for Water Quality Data

Dr. Danelle Larson reflected on the robust data set collected under Upper Mississippi River Restoration's Long Term Resource Monitoring (LTRM) program in UMR Pools 4, 8, 13, 26, Open River, and the La Grange Pool on the Illinois River. Even with its robust dataset, missing data is a common occurrence for various reasons like dodging unsafe conditions, faulty equipment, forgotten samples, lost samples, or sampling reductions due to costs. Some options to address the missing data are 1) recoding (e.g., adding a 0), 2) listwise deletion (e.g., removal of incomplete data), 3) inputting with a mean or median, and 4) interpolation, or estimates of the missing values using known values within the dataset. Even within

interpolation there are many techniques such as inverse-distance weighted, kriging, regression tree, random forests, and polynomial regression. Comparing the techniques, random forests was found to be the top performer at 93% prediction accuracy for water velocity. Larson suggested trying a few techniques to determine the best fit for your dataset. All of the roadmap and data analysis scripts are provided in Larson et al., 2023.

Larson shared applications for the interpolation technique. Larson and collaborators ran a complex multi-variate analysis and showed five different ecosystem states from one, considered a clear water state, to five, an incredibly turbid state. In the last six years, the analysis showed that UMR Pool 13 shifted from blue status quo state to green turbid state. It may be an early indicator of a pool suffering from sedimentation issues. Another application is taking point data and making it into continuous spatial data to better see patterns of change. Larson displayed an example of a map with a color gradient based on the density of plants.

Larson referenced the questions asked by the WQTF in updating the UMR Interstate Water Quality plan. The first was about inferring water quality at PWS takes. If we cannot obtain a water sample directly from a PWS intake, how close should a sample be taken to represent the intake? Either new data or existing data for three different areas are needed: 1) the intake itself, 2) random points around the intake, and 3) distance (space and time) from the intake. The other question was about inferring water quality conditions at the tributaries and how they contribute to pollutants in the main stem. Larson is working during 2024 through LTRM on how turbidity and herbicides can limit aquatic plant growth. She and collaborators will interpolate data above and below the tributary to see what is happening at the mouth.

Voss observed that the LTRM data has many sites in a pool, whereas the UMR Interstate Monitoring program has one fixed site per CWA reach, which could be hundreds of miles apart. That may be too big of a gap to fill. Voss asked Larson how the accuracy of prediction was determined? Larson said that it involved iterations of removing data and comparing the actual versus predicted. One could complete a single iteration, but she and collaborators opted for five to be rigorous. Given the interest of PWS in parameters like alkalinity, taste and odor issues, this may likely mean a new data collection effort. Voss also observed that Larson's analysis was for nitrogen, phosphorus and velocity, which have a high degree of correlation. The accuracy could vary across organics and metals. Larson clarified that some of the interpolation methods can take advantage of correlation of other water quality variables to help make the best prediction. And the existing or new data does not have to be collected at the same time. You can include any data from hundreds of meters away from a sample taken six months ago. The model will tell you the point at which it is inappropriate and recommend data from a particular time frame.

Kendall asked Larson about a possible application for state agency sampling programs to plan for a more limited sampling program. With increasing costs of monitoring and stagnant budgets, it could be helpful to plan sampling events around particular flow regimes and still make accurate interpretations of water quality. Can a sampling program be built around interpolation? Larson said that it would be a great application. The state agency could over-collect data for two years and then reduce the number of sites in a particular area.

In response to a question from Salvato about the skills needed to run the model, Larson said the model is easy to run but harder to interpret. She can assist if the WQTF would like. Salvato asked about next steps, and Sparks agreed to review the scripts to see what is involved in the analysis.

Cyanotoxins/Harmful Algal Blooms

State and Federal Updates

Missouri – Voss noted that the number of HAB reports submitted to DNR during 2023 was fewer than 30. Missouri DNR does some response-based sampling, and the University of Missouri collects four non-response-based samples per year. They are frozen and batched. Results are reported well after the season is over. Over the last few years, the results have shown an uptick in anatoxin, with averages up to 0.5-1 µg/L.

Missouri DNR made improvements to its HAB response form. Now pictures can be selected from a drop-down menu of what the HAB looks like. Pictures from the response form user can be submitted too. Based on the diagnosis of the pictures and talking to the individual, DNR may choose to sample, especially if the waterbody is public and there is a potential recreation concern. When conducting response sampling, DRN will analyze all four toxins and do cell counts. In response to a question from Giblin about who follows up on the report, Voss said it depends on whether the lake is owned by a public or private entity.

In southern Missouri there is excessive water meal, and many people confuse it for a HAB. There was a large HAB with a fish kill on the Lake of the Ozarks. It was the result of a combination of dry and hot weather with a low pulse of DO right next to the dam. The fish kill in the cove perpetuated (as dead fish consume more oxygen) until rain came.

Iowa – Kendall said that Iowa had a lower year of HAB events. He was expecting more with the heat. Observed through the state park beach monitoring program, two sites had persistent blooms until the end of the sampling. This was likely drought driven. Of the rest of the 40 sites, there were three that had an event. Compared to the 2022 season, there were 9-12 events with microcystin over 8 µg/L.

Iowa DNR used Section 106 funds to add saxitoxin and anatoxin monitoring to the beach monitoring program. For anatoxin, out of 40 sites, 23 had detections. Three of those sites had detections over 1 µg/L. WHO numbers will be used until there is a standard in Iowa. During the fall and winter, Kendall will dig into the data further to see if any co-occurrences are present. Out of the 40 sites, 19 had detections of saxitoxin but the maximum was 0.17 µg/L. Moving forward anatoxin will stay in the monitoring program but saxitoxin is less of a concern. Kendall hopes that USEPA will have recreation numbers in the near future. Micah Bennett suggested asking about the status of anatoxin and saxitoxin standards development during Mike Paul's presentation on September 21. In response to a question from Salvato about the impetus of monitoring for anatoxin and saxitoxin, Kendall said that Iowa was not sure what to expect but knew that microcystin and anatoxin seem to be more prevalent in the Upper Midwest. The beach monitoring program no longer collects cylindrospermopsin. Samples are still expensive even when run in-house and every plate maximizes analyses.

Iowa DNR recently purchased an autoanalyzer for the beach monitoring program and that has increased analysis efficiency. Samples collected are organized by the end of the day on Friday of the same week. Samples are expensive even when Iowa DNR runs algal toxin samples in-house. Voss noted the expense of sampling 80 lakes four times a year. For all four toxins, the cost is $40,000, and that is a low cost option as samples are frozen and batch analyzed at the end of the season.

Illinois – Ryan Sparks said as of 2021 Illinois EPA collects all four toxins in stream (i.e., anatoxin, saxitoxin, microcystin, and cylindrospermopsin). The HAB monitoring program consists of both routine and response-based monitoring. Overall, the HAB season was average except for a cylindrospermopsin detection in exceedance of USEPA's 15 µg/L. The value was 21.4 µg/L in Lake County, just east of the Fox River. The highlights of the season are as follows:

- Microcystin was detected in 24% of the 248 samples analyzed. The highest detected value was 335 µg/L.

- Cylindrospermopsin was detected in 3% of the 248 samples analyzed. The highest detected value was 21.4 µg/L.

- Anatoxin-a was detected in 0.6% of the 175 samples analyzed. The highest detected value was 1.04 µg/L.

- Saxitoxin was detected in 16% of the 175 samples analyzed. The highest detected value was 0.87 µg/L.

Salvato asked how Illinois EPA determines whether to add a PhycoTech kit at a particular site? Sparks responded that the kits have been added to routine sites and where blooms have previously occurred. Illinois EPA has observed cyanobacteria in routine samples, even with no evidence of a bloom. For example, at the UMR site near New Boston, the PhycoTech results were a total algal concentration of 58000 cells/mL and a four percent Anabaena concentration of 2500 cells/mL. In response to a question from Salvato, Kendall said the PhycoTech kits are roughly $250 per sample. Sparks said he would follow up with Kendall whether a PhycoTech kit was used on the response-based event for the high cylindrospermopsin event.

Wisconsin - Gina LaLiberte said Wisconsin has been tracking HABs for a while now. There is a public email to report HABs that is utilized mostly by public health officials, regional based Wisconsin DNR staff, and the public. There have been about the same number of reports as 2022. Of the 147 bloom reports, 61% were confirmed cyanobacteria blooms, most of them planktonic. About 15 reports were for floating benthic mats in the northern part of the state. A handful of small and short-lived blooms occurred on the Lake Superior shoreline. A report came in today (on September 20) from field staff observing a bloom in the inner harbor area of Duluth and Superior. It appears to be aphanizomenon. Blooms in the inner harbor area are influenced by the St. Louis River. Wisconsin DNR looks at satellite data for detected blooms in larger water bodies. Many of the blooms have been occurring in shallow, nutrient rich impoundments of northwest and central Wisconsin. Severe drought conditions in the state have contributed to this. Finally, some of the reports were about filamentous green algae and reports that turned out to be pollen. This likely occurred from very warm January 2023 temperatures and intermittent thawing events in mid to late winter.

Giblin said on the UMR, more intense blooms were observed in the main channel with lower water and discharge levels. Anatoxin numbers are the highest analyzed in the state thus far. In the Trempealeau National Wildlife Refuge there will be a habitat project to help flush the system and alleviate the bloom potential.

Minnesota – Laing reminded participants that Minnesota does not routinely monitor HABs but responds to dog deaths and human illnesses through the state and local health departments. The drought occurring in 2023 resulted in a lot of calls about bloom reports. Minnesota PCA is using Bloom Watch and has noticed an increase in the use of the application. Giblin shared that the low flows on the UMR have not been experienced since before 2010.

US Environmental Protection Agency Region 5 - Bennett said the triannual regional HABs call is scheduled for October 19. Region 7 states have been invited to join Region 5 states.

US Army Corps of Engineers – Mike Skrabacz said he is new with the St. Louis District water quality team. He asked whether anyone has heard of the harmful algal bloom explorer tool, a remote sensing platform that utilizes satellite data to detect blooms. It is a newer tool in partnership with NASA and USGS. Skrabacz is unsure if the tool is similar or different from USEPA's CyAN application that uses cell counts in satellite imagery. Ettinger asked for a link to the tool and how to find the data. Skrabacz said the tool is currently limited to internal government use. Right now, the district has not had a good opportunity to test the tool because the HAB season has been minimal to compare the data of satellite imagery and data from field measurements. LaLiberte said that CyAN has a limitation on pixel size. What is being used for this particular tool? Skrabacz said he is not familiar with the technical aspects of the tool, but the tool came out of formation of the Harmful Algal Bloom Hypoxia Research and Control interagency workgroup.

Nutrients

Conclusions from 10 Years of Phosphorus Rules in Wisconsin

Matt Claucherty works on phosphorus permitting for Wisconsin DNR and reviewed the conference put together by the University of Wisconsin Milwaukee Center for Water Policy on successes and challenges of Wisconsin's numeric phosphorus standards. Following public outcry about excessive nutrients in Wisconsin waters, the state adopted numeric phosphorus standards in 2010. The standards were developed by evaluating a suite of environmental response indicators and determining break point analyses at which biota begin to struggle from elevated phosphorus.

The numbers Wisconsin adopted were as follows:

- Rivers 100 µg/L
- Streams 75 µg/L
- Reservoirs
    - Not stratified 40 µg/L
    - Stratified 30 µg/L
- Inland lakes range from 15-30 µg/L
- Great Lakes
    - Lake Michigan 7 µg/L
    - Lake Superior 5 µg/L

In Wisconsin there are 750 wastewater dischargers that were evaluated for reasonable potential. Of the 750, 200 were unaffected by the numeric standards, 360 entities needed to reduce discharges between 0.04 mg/L and 0.3 mg/L, and 190 entities needed to reduce discharges to between 0.3 and 1.0mg/L. Claucherty explained that for limits between 0.3 and 1 mg/L, chemical and biological treatment, or a combination of those will reduce discharger limits. For limits below 0.3 mg/L, tertiary treatment is necessary following chemical and/or biological treatment. Wisconsin has had regulatory flexibility as to not double or triple sewer rates. Wisconsin DNR also adopted a third-party water quality trading house and adaptive management program — all focused on nonpoint source offsets. Almost 200 facilities are still on a variance and are classified as being in economically challenged communities. Nearly 100 additional facilities are meeting their discharge limit. About 50 have undertaken the filtration upgrade, and there are 54 water quality trades active in Wisconsin.

For watersheds with nutrient impairments, Wisconsin DNR developed SNAP plus to define edge of field loading values. This has allowed a TMDL to be defined in more understandable terms, e.g., a subwatershed, that should reduce phosphorus loading down to 1.2 lbs P/acre/year.

The conference's outcomes were to shift the focus on rulemaking to nonpoint source pollution in the form of targeted performance standards for cropland. Other aspects of the conference included discussion on voluntary adoption of nonpoint sources reduction practices.

Voss asked what tertiary filtration entails. Claucherty said wastewater is pushed through a multi-tiered filter. The process is the highest level of treatment, somewhat like reverse osmosis, and is quite expensive to install. Kendall observed that Wisconsin has 50 locations on the tertiary treatment. Is there a signal in the water quality data? Claucherty said much of the noise associated with nonpoint source pollution will overshadow a water quality signal. The City of La Crosse plans to install tertiary treatment and Claucherty will look for any signals for changes in water quality. Wisconsin DNR has some long-term monitoring sites. The results have shown that total phosphorus between 2010 and 2020 is trending downward but that could be a lot of noise between dry and wet years.

In response to a question from Salvato about what the next 10 years look like for Wisconsin, Claucherty said there is talk of nitrogen standards, but they would not come immediately. Getting facilities off variances so they can find a final compliance strategy and complete the full legal requirements is a focus of the wastewater program. Claucherty hopes to see more engagement in water quality trading over requests for variances. Ettinger asked about the entity organizing Wisconsin's water quality trading program. Claucherty said a wastewater facility will hire a consultant to look at opportunities upstream with farmers. The consultant will quantify the current pollutant load and propose conditions and if it all checks out with modeling, then DNR will review and approve the project and the reduction associated with the project. It is largely driven by the permittee.

Voss asked about legal requirements of having best management practices installed for a certain amount of time. Claucherty said that statutory requirement is supported by a binding, written agreement. The deal between a city and producer must be formalized and enforceable. There are also annual reporting requirements for the wastewater permits, including annual practice inspection. Water quality trading is viewed as a long-term compliance solution and practices need to be installed for 10-20 years. Zach Leibowitz asked how close the landowner's property needs to be from the facility and whether they must be in the same watershed? Claucherty said DNR says the landowner should be upstream in the same watershed. Wisconsin DNR has been pushed to have some flexibility and be able to also go downstream within a HUC 12 watershed. Leibowitz asked if there are additional benefits for

nitrogen for some of these trades or is the idea that practices installed are addressing both TP and total nitrogen (TN)? Claucherty said DNR just concluded a monitoring requirement for its TN permits. There will be more data available in the future.

Gulf Hypoxia Program Sub-Basin Committee Work Plan

Salvato shared UMRBA's workplan submitted to USEPA. The states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin have directed UMRBA to convene and facilitate its Hypoxia Task Force Sub-Basin Committee for the Upper Mississippi River Basin. Through the project period, and with the available funding, the states have determined that their shared priorities for the Committee are to create an UMR Nutrient Reduction Strategy, an interstate system for continuous learning (also known as adaptive management), and an interstate communications strategy. UMRBA will participate in the Hypoxia Task Force and integrate the Sub-Basin Committee's actions into other interstate water planning. Salvato said UMRBA is awaiting the agreement to sign with the grants office and will keep the WQTF posted on when the work begins.

Chloride

Upper Limits for Road Salt Pollution in Lakes

Dr. Chris Solomon said the goal of the model he and collaborators produced was to get a sense of where chloride trends are headed and where they might level off. In their model, all water from a watershed flows to a lake via a single flow path and out. The salt applied in the watershed can be calculated by multiplying watershed area by road density and salt application rate. Salt lost from the watershed can be calculated by multiplying runoff by salt concentration in the watershed by phi, a way to capture how effective a unit of runoff is at moving salt out of the watershed into the lake. All of this factors into the equilibrium salt concentration in a lake.

Select model simplifications and assumptions were as follows:

- The lake is well mixed on an annual scale
- Direct precipitation on or evaporation from lake are equal and negligible
- Ignores the distinction between surface water and groundwater

Solomon observed a huge range of equilibrium salt conditions based on road density near the lake and salt application rates. For example, if you are in a suburban area, you can expect chloride to equilibrate at 100 mg/L. This can also be mapped spatially on lakes that are 2.5-acres and larger. The highest concentrations are in the Upper Midwest, Great Lakes states and New England. There are plenty of areas to be worried about and at the same time many lakes in the warmer parts of the US that can be maintained at equilibriums lower than USEPA's chloride standards. Solomon plotted the number of lakes by state that may exceed the 120 mg/L or higher or 230 mg/L (chronic exposure) or higher chloride criteria. For example, in Illinois 23% of lakes are predicted to be 120 mg/L or higher.

Solomon views a shortcoming of the model that it is focused on long-term conditions. The episodic conditions that occur following spring melt are important. Next, it is unclear whether the 230 mg/L (chronic exposure) threshold is truly protective enough. In softer water, organisms may have more

sensitivities to chloride at lower levels. Data from Arnott et al., 2020 document impacts to zooplankton survival and reproduction can occur as low as 5-40 mg/L. On the other hand, stabilizing chloride trends in some areas of the US is possible through the prioritization of best management practices. State and federal governments can help county governments with incentives in place for upgrading equipment.

In response to a question from Salvato about the data on road salt application rates, Solomon said that a USGS model was utilized based on one square kilometer grid cells and it is inferred from salt purchases, road density, and snowfall rates. Giblin asked if the road density metric accounts for all impervious surfaces such as parking lots and private driveways. Solomon replied that the underlying data set is from the US Department of Transportation. He believes that residential driveways would not be included. Voss asked about the assumption for lake turnover. At a certain salt content, the density does not change, and the lake would not turn over and mix. Solomon said a waterbody would have to be significantly denser and instances of that happening are rare, at least that are documented. Solomon suggested that the places to worry about the most are waterbodies close to high densities of roads and smaller watersheds with an overapplication of salt.

Mike Paul asked about using the model to intercept the flow path of sodium chloride and potential options for capturing it. Is anyone doing that or thinking about other deicing compounds e.g., acetate? Solomon is not aware of research in that area. The model behaves conservatively, assuming some amount of chloride retention in watersheds. Alternative deicers are in use, but Solomon is not an expert on that topic. Ettinger suggested that Solomon connect with Steve McKracken in DuPage County, Illinois. McKracken has done a lot of work on reducing road salt usage and considering alternatives to road salt.

Cyanotoxins/Harmful Algal Blooms

Priorities for FY 2024

Dr. Mike Paul said he is new to USEPA and is serving as the national HAB lead. In response the inspector general reports with similar timing on coordination and collaboration within USEPA and across agencies, USEPA has recently stood up the National HAB program to improve intra-agency HAB coordination across the Office of Science and Technology, Office of Groundwater and Drinking Water, Office of Wetlands, Oceans, and Watersheds, Office of Wastewater Management, ORD and the 10 USEPA regions. The leads for the regions UMRBA works with are USEPA Region 5's Micah Bennett and Region 7's Steve Schaff.

The USEPA National HAB program website houses tools and information on how to prevent, monitor, forecast, control, and respond to blooms. In the short term, or next year, Paul said that USEPA will work on the following:

- Continued interagency cooperation
- National HAB program (NHP) and steering committee establishment
- Workplan development
- Website migration and upgrade
- Program gaps analysis and prioritization report

- National HAB response plan
- Long-term monitoring and forecasting plan
- Integration planning with nutrient criteria program

Paul described the NHP's longer term goals:

- Updating advisories and ambient criteria
- Expanding/improving methods
- Improved data communication tools
- Improve advisory reporting/tracking
- Improved satellite monitoring

Giblin asked if there is a timeline for saxitoxin and anatoxin criteria development, adding that anatoxin is far more widespread in the Upper Midwest than was previously thought. Paul said that experiments are ongoing but there is no hard timeline. It will likely be more than a year out. Salvato observed that the anticipated gap analysis and prioritization report would be very helpful to the UMRB states. Will there be funding to help states fill those gaps? Paul said that advocacy would be needed in Congress. NOAA receives substantial funding for the Great Lakes and coastal programs. USEPA does not receive funding for HABs and would like to be able to provide resources to state and tribal partners. Voss observed that the CyAN application is not geared towards state agencies who need to look across the state to understand trends in HAB occurrence and frequency. If Missouri DNR is conducting response-based sampling, Voss cannot look at CyAN imagery based on the data of field sampling. USEPA has asked states to use the data in CWA assessments, but Missouri DNR is hesitant because there is not a way to confirm a HAB occurred. Voss said better correlate satellite imagery with field data can be improved. Paul suggested approaching the CyAN team as they can help train state agency staff on accessing the satellite imagery. Anne Rea said she would initiate an email to the CyAN team to ask if they can assist with trends analysis. Laliberte asked for a daily or weekly compilation of trends within CyAN. Wisconsin DNR's limitation is not having a specialist to download satellite imagery and analyze those for cyanobacterial levels. Voss said he can review the imagery but there are many different sized lakes in Missouri. Parsing out the data and communicating findings to stakeholders is challenging. Paul understands the challenge and is unsure that a stakeholder can be convinced of the accuracy of satellite imagery. In response to a question from Ettinger about whether CyAN is solely focused on lakes, Paul said that existing satellite imagery is focused on lake systems. The next generation of satellites will have better resolution for larger rivers. USEPA does have a monitoring program in rivers and streams as well as a research program on benthic HABs.

Dr. Anne Rea from USEPA's Office of Research and Development (ORD) detailed ongoing HAB research being conducted by ORD scientists. Jingrang Lu is working on cyanotoxin encoding genes to enable short term predictions of cyanotoxin production, which can help guide HAB prediction and mitigation. Lu is also using qPCR for phytoplankton quantification to assess eutrophication in freshwater rivers.

Amalia Handler is developing a color-coded risk probability assessment to indicate which lakes in the US are at higher risk for toxic blooms.

Robert Sabo is the staff contact for the national watershed nutrient inventories, which can help identify elevated levels of agricultural nitrogen surplus and point source nitrogen loads. These inventories will be available as the Nutrient Explorer tool with an anticipated release date during FY 2024.

Heather Golden is evaluating wetland restoration in the UMRB and the potential for nitrate loading reduction. Restoring approximately 8,000 square kilometers will reduce mean annual nitrate loads by 12 percent, which is dependent on several factors — e.g., distance to the river basin outlet.

Naomi Detenbeck is the lead contact for the Upper Solider Creek, Kansas demonstration project. The project is optimizing a suite of decision support tools to assess BMP effectiveness in mixed land-use watersheds under multiple climate change scenarios.

Jana Compton, Region 7, is leading the project awarded through the Regional ORD Applied Research (ROAR) program. The project proposal involves establishing a monitoring framework to quantify benefits of soil health practices for groundwater nitrate mitigation. The soil results will be shared with growers to provide a cost-effective and environmentally friendly avenue to safe drinking water for many small and rural communities.

Ettinger asked if there are any current initiatives to evaluate chloride causing phosphorus resuspension. In Illinois, phosphorus is increasing even as other inputs seem to be decreasing. That has led to theories on chloride in water causing resurfacing and resuspension of phosphorus. Rea is aware of research on legacy nutrients but will have to ask about chloride specifically. Ettinger added another research topic of interest is aerosolization of HABs. Salvato asked how the other research projects Rea discussed were proposed outside of the Region 7 project that came out of ROAR. Rea said these projects are new as of FY 2023. The priorities are driven by ORD, the state and tribes. The state priorities include regional priorities. Rea also works with Katie Flahive, the co-chair of the Hypoxia Task Force Coordinating Committee. There is plenty of room to have broader conversations to make sure the work is more tailored towards user needs at the state and broader UMRB level.

Clean Water Act

303(d) and *305(b) Lists, and TMDLs*

Wisconsin – Giblin said Wisconsin DNR is on track to submit its 2024 assessments by April 1, 2024. The biggest change this year is the proposed addition of excess algal growth in reaches one, three, four, five, and six. The public comment period is anticipated in November 2023.

There is a TMDL on the Upper Mississippi and Illinois Rivers for total phosphorus and total suspended solids. The Lake Pepin TMDL will be submitted in 2023. Wisconsin DNR staff are working on vision 2.0 priorities, which include a framework and prioritization process.

Iowa – Kendall said Iowa DNR is also on track for the April 1, 2024 deadline. Just recently, Iowa made external data requests from state agencies bordering Iowa and from tribal nations. The data will be compiled and run through the assessment calculator. The assessment report itself is significantly

trimmed down with redundancies removed. Iowa DNR is aiming for a public comment period in late February 2024.

Illinois – Sparks said Illinois EPA is on track for the 2024 assessment. The last cycle resulted in more listings because of how fish contaminants are made, by the full waterbody as opposed to segments or portions. There are no active TMDLs on the UMR currently. In 2025, the intensive basin survey will include the upper Illinois and the UMR north central and central south basin. In 2026, the remainder of the UMR will be surveyed. In response to a question from Ettinger about using the dissolved oxygen data collected by USGS on the Illinois River, Sparks said he assumes the data would be included but the TMDL staff will be best suited to answer the question. Ettinger said there have been several cyanobacterial warnings on the Illinois River and those should be taken into account if there is a waterbody impairment. Sparks said Illinois has recreation thresholds in place but nothing that has been established for assessments. In response to a question from Salvato about what is involved in intensive basin surveys, Sparks said three rounds of water samples are taken based off historical impairments, fish kills, or anything that can signal an impairment. There are habitat and macroinvertebrate assessments as well. Illinois DNR is a partner to collect fish data. For the assessment portion, Illinois EPA has fish and macroinvertebrate indices of biotic integrity to get a full picture of the basin's health.

Missouri – Voss said it is not likely Missouri DNR will make the April 2024 deadline. There is a delay with finalizing the 2022 list with USEPA Region 7. The 2024 listing methodology document must be approved by the commission. Missouri DNR is currently in the data solicitation phase. Voss asked if anyone else has issues with getting a response from the data solicitation request. Staff have to reach out to stakeholders directly to ask for the data. Voss does not anticipate any changes to the UMR. Another ongoing effort with Region 7 is determining how to assess chloride and metals contamination.

Minnesota – Laing shared the exciting news that Minnesota PCA has fully implemented the watershed approach in the state. All 80 watersheds have been surveyed through monitoring, assessment, TMDL, and watershed restoration and protection strategies. Cumulatively that is nearly 2,000 TMDLs and Minnesota PCA is about halfway through monitoring assessment of the next cycle. Laing said everything is on track for 2024 assessment and there is nothing UMR-specific to report.

UMRBA CWA Research Questions Brainstorm

During the June WQEC-WQTF, UMRBA staff proposed compiling a list of CWA focused research questions, and the WQEC and WQTF agreed it was a worthwhile effort. Salvato shared a preliminary draft and asked what research priorities the WQTF has spanning UMRBA's five water quality focal areas: monitoring, nutrients, emerging contaminants, chloride, and HABs. What existing resources can be a good example for research ideas? What process should be used for prioritizing research questions moving forward?

Giblin said CECs and benthic invertebrates are his priority. More resources are needed to evaluate the linkages between the two. Bennett said climate change impacts on biology are of great interest. Region 5 can potentially support research via field sampling or gap analysis of existing data. Schaff said Region 7 has more capacity now to provide field and analytical support. Region 7 is getting a new big river boat and recently hired staff with macroinvertebrate expertise. Kendall suggested a potential route is the USEPA Science to Achieve Results (STAR) grants program that targets research partnerships with universities.

Statistical Survey Tools for Monitoring

Garrett Stillings with USEPA Headquarters said he and collaborators have been focused on probabilistic survey tools to aid partners in building probabilistic monitoring programs. Stillings helps implement the National Aquatic Resource Surveys, a probabilistic survey design consisting of approximately 1,000 randomly chosen sites along the nation's coastal areas, wetlands, streams, rivers, and lakes. Data are evaluated based on a condition class across biological, physical, and chemical indicators and human health indicators.

Stillings demonstrated the survey design tool (v 1.1.0). First you need a shapefile of resources and target population. Stillings used a UMRB shapefile with points representing the stream mile. You can customize aspects like having 100 base sites and 20 replacement sites. The distribution of sites can be exported into a shapefile. Voss asked Stillings if an organization can afford to sample only 30 sites, is it worth doing a probabilistic design with that small of a sample size? How can they be sure it is representative of the watershed? Stillings said it is hard to know the answer until you get the results. If you are sampling and your stressor is 95% good and 5% poor, you will have good confidence in your results even with a low sampling size. A simulator can be used to predict the margin of error. For example, if there are two condition classes and they're split evenly, our margin of error is approximately 8%. You can add more sites and see that the margin of error is down to 6%. Was the 2% worth the extra 50 sampling sites? That would be up to your program. Adding additional strata and categories of sampling will alter the margin of error.

Stillings next demonstrated the population estimate calculation tool, an R Shiny application that uses a web browser interface to allow users to upload data, select variables from input dataset, run analyses, and save the output without having to know how to program in R. Plots of categorical estimates can also be made by results e.g., conductivity. This information can then be uploaded into ATTAINS.

In response to a question from Salvato on the audience of the tools, Stillings replied that mainly states utilize the tools for their monitoring programs. Salvato asked of the WQTF who is already using the survey design tools or are you planning to use them? Kendall said Iowa DNR's biological program does probabilistic surveys but does not use this application. He wants to use the program to see how additional data can be collected. Stillings said the tool uses shapefiles of lines and polygons. Even if you wanted to look at one lake, you can upload a polygon of the lake. Laing said Minnesota does probabilistic surveys and PCA recently designed its own. Laing sees the tools being useful. Voss said the sister agency Missouri DOC does their own probabilistic survey design which includes fish, invertebrates, and water quality. Voss suggested the biggest hangup is the cost associated with a probabilistic survey design versus a targeted survey design. Missouri has a long list of targeted site needs that outweighs what a probabilistic site could do. Missouri has site-specific issues like historic mining that could vastly weigh the probabilistic survey if you have poor sites. It is a resource limitation among other complicating factors that prevent us from doing wide scale probabilistic sampling in Missouri. Giblin said Wisconsin is generating probabilistic work in-house. He can see utility in using this is for smaller surveys. Sparks said Illinois does not utilize either tool. He is not aware of probabilistic sampling beyond NARS. Sites in Illinois EPA's ambient monitoring are based off the location of public water supplier intakes in lakes. The stream sites are based on point source pollution and fish kills. Stillings said the tools can be used for assessment decisions based on probability results. If support is needed for the tools, please feel free to reach out.

Administrative Items

Future Meeting Schedule

The next WQTF virtual meeting is scheduled for February 1, 2024.

Participants

Ryan Sparks	Illinois Environmental Protection Agency
Dan Kendall	Iowa Department of Natural Resources
Kim Laing	Minnesota Pollution Control Agency
Mike Kruse	Missouri Department of Natural Resources
Robert Voss	Missouri Department of Natural Resources
Micah Bennett	U.S. Environmental Protection Agency, Region 5
Ed Hammer	U.S. Environmental Protection Agency, Region 5
Anthony Civiello	U.S. Environmental Protection Agency, Region 7
Zachary Leibowitz	U.S. Environmental Protection Agency, Region 7
David Pratt	U.S. Environmental Protection Agency, Region 7
Steve Schaff	U.S. Environmental Protection Agency, Region 7
Jared Schmalstieg	U.S. Environmental Protection Agency, Region 7
Amy Shields	U.S. Environmental Protection Agency, Region 7
Katie Flahive	U.S. Environmental Protection Agency, Office of Water
Garrett Stillings	U.S. Environmental Protection Agency, Office of Water
Anne Rea	U.S. Environmental Protection Agency, Office of Research and Development
Michael Paul	U.S. Environmental Protection Agency, Office of Science and Technology
Lauren Salvato	Upper Mississippi River Basin Association
Coreen Fallat	Wisconsin Department of Agriculture, Trade, and Consumer Protection
Matt Claucherty	Wisconsin Department of Natural Resources
Shawn Giblin	Wisconsin Department of Natural Resources
Gina Laliberte	Wisconsin Department of Natural Resources
Adrian Stocks	Wisconsin Department of Natural Resources
Mike Skrabacz	U.S. Army Corps of Engineers, St. Louis District
Gary Johnson	U.S. Geological Survey, Central Midwest Water Science Center
Danelle Larson	U.S. Geological Survey, Upper Midwest Environmental Science Center
Albert Ettinger	Mississippi River Collaborative
Chris Solomon	The Cary Institute
Caroline Pufalt	Sierra Club
Sandy Loftus	Sierra Club

ATTACHMENT B

How Clean is the River? **Report Press Release**

(B-1 to B-2)

PRESS RELEASE

January 9, 2024

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Wisconsin Department of Natural Resources, Katie Grant, dnrpress@wisconsin.gov

UMRBA Presents Water Quality Trends and Recommends Management Actions for the Upper Mississippi River System

The Upper Mississippi River Basin Association (UMRBA) – the Governors' interstate water quality entity – found water quality on the Upper Mississippi River System has improved greatly since the 1970s. Significant investments from the public sector and private interests have reduced nonpoint source and point source pollution. However, much work remains to preserve water quality gains and address unresolved and emerging issues.

Specifically, in light of the results, UMRBA calls upon its member states and partners in various levels of government and the conservation, agriculture, and transportation sectors to engage collaboratively in support of actions that will maintain positive trends, address negative trends, and support data collection efforts that will fill important information gaps.

"Understanding and improving water quality of the Upper Mississippi River System (including the Illinois River) is vital to the prosperity and sustainability of human communities and economies within the watershed. Collecting, compiling, and analyzing water quality data is essential to understanding and making informed management decisions for improving the river's water quality," says Dru Buntin, Missouri Department of Natural Resources Director.

UMRBA's second collaborative assessment of water quality on the Upper Mississippi River System, the "How Clean is the River?" report, measures trends between 1989 and 2018 and found the following notable trends and information gaps:

Notable Positive Trends

- Dissolved oxygen concentrations have increased throughout the Upper Mississippi River System

Notable Negative Trends

- Concentrations of chloride and sulfate have increased throughout the Upper Mississippi River System

Important Data Gaps

- Water quality monitoring frequency, sampling methods, and laboratory analytical methods are not consistent across the Upper Mississippi River System

- Total suspended solids have decreased significantly throughout the Upper Mississippi River System
- Total phosphorus concentrations have decreased in the Upper Mississippi River above Pool 13 (near Bellevue, Iowa)
- Total and inorganic nitrogen have decreased in the La Grange Pool of the Illinois River
- Lead has decreased in the Upper Mississippi River Pool 4 (near Red Wing, Minnesota)
- Total nitrogen appears to be increasing above Pool 13 (near Bellevue, Iowa), however the trend has low confidence
- Total phosphorus is increasing in Upper Mississippi River Pool 15 (near Rock Island, Illinois)
- Lead has increased in the Upper Mississippi River Pools 15 (near Rock Island, Illinois) and 17 (near New Boston, Illinois), but levels area below the chronic aquatic life use threshold
- Metals data and emerging contaminants data is not collected sufficiently for analyzing trends
- Important data gaps continue to reduce our ability to effectively identify problems and target management actions to protect water quality

This report is possible through aggregating existing datasets on the Upper Mississippi River System. There is a need for more comprehensive and long-term data collection.

"The Upper Mississippi River Interstate Water Quality Monitoring Plan is a holistic and collaborative approach among multiple levels of government to comprehensively monitor the Upper Mississippi River. This coordinated monitoring and data sharing approach will ensure pollutants – including contaminants of emerging concern - are properly assessed, while also enabling the Association and its member states to advance our environmental justice and climate change efforts," says Kirsten Wallace, Executive Director.

UMRBA fosters cooperative action and leadership as the Upper Mississippi River Basin's interstate water quality entity, serving the five states of the Upper Mississippi River System – Illinois, Iowa, Minnesota, Missouri, and Wisconsin. UMRBA strives to promote the states' mutual interests and convenes a Water Quality Executive Committee and a Water Quality Task Force to improve water quality monitoring and assessment and to enhance consistencies in the states' water quality programs in the context of the Mississippi River.

The full report, including maps of trends in all 19 parameters, is available here: https://umrba.org/how-clean-river-2023.

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ATTACHMENT C

Mississippi River Water Quality Survey
Frequently Asked Questions

– University of Minnesota *(C-1 to C-5)*

Project Overview

Thanks for participating in our research to investigate the value of clean water on the Mississippi River! Funded by the EPA, this project will inform how agencies and other entities prioritize resources and build capacity for river communities to improve environmental outcomes and advocate for more equitable and resilient futures. Our research team from the University of Minnesota, University of Washington, and Michigan State University are excited to work with you on deploying chatbots throughout the entire Mississippi River corridor. For this project, we're using chatbots to engage people in conversation via text message. A small sign with a phone number and a "hook question" will be posted at a public access site along the river. When river-users text the number, they will be prompted to answer questions about their basic demographics, values, uses, and perceptions of the Mississippi River. Survey data will be automatically sorted and easily accessible to partners.

Below are some frequently asked questions and instructions for sign installation. Please contact Erin Niehoff (ern@umn.edu) with any other questions you might have!

Chatbot FAQ

What is a chatbot? How do chatbot surveys work?

For this project, a chatbot is a computer software program that will send and receive text messages as a way of interacting with people at sites along the Mississippi River. Chatbots will use artificial intelligence to guide participants through a series of questions about the river, read their responses, and process and store the data collected. The “conversation” continues through a set of predefined questions, or until the visitor chooses not to respond. Engaging with a chatbot does not require special equipment or other apps to participate. Users simply text their response to the “hook question” to start the survey.

What questions will the chatbot ask?

The general questions programmed into the chatbot survey are:

Sign text

Hey, Mississippi River Visitors! Take a picture of the River and text it to XXX XXX XXXX. Responses are voluntary and will help inform management of the Mississippi River. For questions about this study, contact XXX or XX@XX.com.

1. Hook question: Take a picture of the river…(can make this more context-specific)

<bot responds with "Thanks! I'd like to ask you a few more questions. You can stop responding at any time.">

2. What is one word you would use to describe the Mississippi River?
3. What is your primary purpose for visiting this site today?
4. On a scale of 1-10, rate the water quality in the Mississippi River, 1 being poor, 10 being excellent.
5. On a scale of 1-10, how would you characterize the suitability of water quality in the Mississippi River for recreational fishing? 1 being poor and 10 being excellent.
6. On a scale of 1-10 how would you characterize the suitability of water quality in the Mississippi River for swimming? 1 being poor and 10 being excellent.
7. On a scale of 1-10, how comfortable would you be eating fish harvested from the River?
8. From your perspective, is the water quality in the Mississippi River improving, declining, or staying the same?
9. What do you perceive to be the biggest threats to water quality in the Mississippi River?
10. **<optional partner contributed question>**
11. **<optional partner contributed question>**
12. What is the five digit zip code of your primary residence?
13. May we contact you again? Your input will inform how agencies manage the River. You can opt out at any time.

What will the sign say? How big is it?

The sign can be displayed digitally or be printed on a 12”x18” aluminum sign.

Does the chatbot require cell service to work?

No. Users can initiate a conversation with the chatbot without cell service. Once the phone is back in range, the chatbot will pick up the conversation right where the user left off.

How do I access the data?

Our mobile technologies team will deploy and maintain the chatbot software, manage data storage, and organize and process the data to share with our partners. We can share raw data (with no identifying information) and help with data summaries and analysis.

How will the data be used?

Data collected from chatbots will inform how agencies and other entities prioritize resources and build capacity for river communities to improve environmental outcomes and advocate for more equitable and resilient futures. This data will be included in our larger project to better understand how people engage with and value the Mississippi River. No identifying information will be used in our public research products.

How will the data be stored and protected?

The respondents' phone numbers will be accessible as they are providing answers via text messages. None of the survey questions will ask for personally identifiable information. Phone numbers will be replaced with unique and anonymous identifiers (a cryptographic hash). This method of removing the personally identifiable information will allow data analysis to be performed on anonymized information. Unique and anonymous identifiers will be used to key survey response data. All data analysis will be performed on anonymized data. A separate table will link the anonymous identifier to the phone numbers of the respondents.

All electronic data will be stored on a private server operated by University of Washington or a private virtual server hosted on the Google cloud-computing platform. All raw data sources will be documented by Readmes containing a description about how the data were obtained, instructions for accessing the raw data, and a description of all modifications made to the raw data source. The indirect identifiers (phone numbers) will be kept on a secure server that is only accessible by the researchers. All other non-identifying data, including volunteer's answers to survey questions will also be kept on a secure server that is only accessible to the research team.

Where should I install the sign?

The sign must be an area with public access via land-based road or trail that has a clear view of the River. The site does not necessarily have to have water access, and could be located on a bluff or overlook with views of the River. After installation, send us the GPS coordinates of the sign location.

Can you help with maintenance and installation?

Yes, we can send a t-post and all installation materials with the sign. We can also help on site within proximity of the Twin Cities.

What do I do if a sign gets vandalized or stolen?

Contact Erin Niehoff (ern@umn.edu) to request a replacement sign at no cost.

How long should I leave the sign out?

As long as possible! Chatbots are easy to install and maintain, and we'd love to work with you to collect as much data as possible over a long period of time.

Can I request another sign for a different location?

Yes. Contact us to set up any new questions you would like included and we can send you another sign to install. You can also keep the same questions and order more signs—the more the merrier!