

Upper Mississippi River Basin Association Water Quality Executive Committee and Water Quality Task Force Virtual Meeting

June 8-9, 2021

Highlights and Action Items Summary

Tuesday, June 8

Approval of the January 27, 2021 WQTF Draft Meeting Summary

The UMRBA Water Quality Task Force (WQTF) approved the January 27, 2021 draft highlights and action items summary pending an edit to Illinois EPA's Clean Water Act (CWA) update on page A-8.

UMRBA Meeting Review

January 26, 2021 WQTF Technical Session and May 6, 2021 Technical Session Follow-up

Before diving into the meeting review, Lauren Salvato announced that UMRBA has a new and updated website. She encouraged participants to explore the new features, and to be aware that UMRBA staff are still adding pages, resources, and content.

Salvato reflected that the goals of the January 26, 2021 WQTF Technical Session were to 1) consider the benefits and drawbacks of using Environmental Monitoring and Assessment Program Great Rivers Ecosystem initiative (EMAP-GRE) vs. Long Term Resource Monitoring (LTRM) methods for the Interstate Water Quality (WQ) Monitoring Plan, and 2) discuss the applicability of the total suspended solids (TSS) supplementary indicator for the Reaches 8-9 pilot. As a reminder, the EMAP-GRE method was selected for the UMR Interstate WQ Monitoring Plan for its focus on CWA-type assessments. The Reaches 0-3 pilot (northern pilot) utilized the EMAP-GRE method, while the Reaches 8-9 pilot (southern pilot) is also utilizing the EMAP-GRE method but has opted to use the LTRM approach for fish assemblage monitoring. Part of the reason for making the switch was that the transects in the EMAP-GRE method consist of 1-1,000 meter stretch. The Reaches 0-3 pilot field staff had to break halfway through the transect to keep fish healthy and for the crews to take a break if needed. Andy Bartels from Wisconsin DNR found that breaking up the transects into 4-250 meter transects did not greatly affect the index of biotic integrity (IBI) scores. The other aspect is that the LTRM method is widely adopted across other parts of the UMRB (see table below). Unless otherwise stated, the number of samples and agency represents annual sampling.

Reach	Number of Samples, Agency	Reach	Number of Samples, Agency
2		15	
3		16	15, Illinois NHS, 12, Iowa DNR
4	24, LTRM	17	12, Illinois NHS
5		18	15, Illinois NHS, 13, Iowa DNR
5A		19	27, Illinois NHS
6		20	12, Illinois NHS
7		21	12, Illinois NHS
8	12, LTRM	22	
9	6, Iowa DNR (alternate years)	24	
10	12, Iowa DNR	25	18, Illinois NHS
11	4, Iowa DNR (alternate years)	26	24, LTRM
12	4, LTRM	Chain of Rocks	21, Illinois NHS
13	12, LTRM	Kaskaskia Confl.	30 Illinois NHS
14		Cape G.	24, Missouri DOC

For total suspended solids (TSS), Salvato reminded participants that the analysis is supplementary to the dual assemblage fish and macroinvertebrate analysis associated with the aquatic life use assessment. TSS median values equate to a good, fair, or poor condition and serve as a tie breaker if the dual assemblage disagrees. The question that the Reaches 8-9 pilot considered was given the higher TSS values in Reaches 8-9, is the river automatically in “poor” condition, or do another set of thresholds make sense for the lower impounded UMR?

Following the meeting an initial set of research questions and needs were compiled:

EMAP GRE vs. LTRM

- 1) Can the LTRM design meet CWA needs?
- 2) Can we validate the use of the Great Rivers Fish Index (GRFIn) IBI for both EMAP-GRE and LTRM methods? Is the tool sensitive enough to respond to changes in condition?
- 3) What investigations can be made on the IBI rating categories?
- 4) Aggregate Illinois Natural History Survey data to compare the GRFIn scores with those produced with Reaches 8-9 pilot data.

TSS

- 1) Explore the needs for TSS thresholds in different areas of the UMR (e.g., lower impounded, Open River).

The goal of the follow-up WQTF call on May 6, 2021 was to 1) refine the research questions, and 2) discuss logistics e.g., timeline, availability of datasets, sources of funding. The WQTF agreed to a few next steps. For EMAP-GRE vs. LTRM to 1) seek outside input on research questions, and 2) recruit university interest in graduate students working on the research questions. For TSS, to determine if there is surplus in the Reaches 8-9 pilot budget, and if so, investigate the potential for TSS thresholds in the lower impounded and open river reaches.

Jim Fischer said that from a purely pragmatic standpoint, LTRM methods cover a wide range of the river. If there is a way to utilize the method, it makes sense. Karen Hagerty supports the use of the LTRM

methods. For TSS, she asked whether the Missouri River confluence reduction in sediment is being considered. Salvato replied that the analysis is not that far along, but they will keep that in mind.

Nutrient Reduction Strategy (NRS) Progress Tracking Workshops April 9 and 13, 2021

Salvato reviewed that the objectives of the workshop were to 1) strengthen regional collaboration among individuals and organizations involved in nutrient reduction strategy development, 2) exchange information regarding how the UMR states track nutrient reduction progress and associated challenges, and 3) identify priorities and actionable items for UMRBA and the states to pursue collaboratively. To enable detailed discussion, four topics were selected over two three-hour workshop sessions:

- 1) Measuring Nutrient Reduction from nonpoint source (NPS) BMP Implementation
- 2) Capturing Private Investment in BMPs
- 3) Monitoring Water Quality to Detect Changes in Nutrient Reduction
- 4) Incorporating New Datasets

The workshop itself was by invitation only. In addition to state agencies working on the NRS, other participants included university and extension staff, county conservationists, and federal partners from USEPA and NRCS. The next steps are to put a survey together for feedback from workshop participants, determine topics for future in-person meetings, and distribute a summary of the workshops.

Adam Schnieders thanked UMRBA staff for putting the meeting together. There was a good exchange of information and ideas. Since the workshops occurred, Iowa has had a spin off meeting with Minnesota. It was nice to relate to the other states on similar challenges faced with regard to nutrient reduction progress tracking. And the virtual meeting format was set up well to facilitate discussion. Chris Wieberg agreed and said that Missouri benefited from the workshop.

TSS in the Upper Mississippi River

Pam Anderson provided a high-level overview of the TSS impairments in the Upper Mississippi River (UMR). The UMR in Minnesota refers to the reaches near the headwaters of the Mississippi River, near Itasca State Park. Approximately 140 miles of river are exceeding the 15 mg/L TSS standard. The standard is for April to September and is a 10% exceedance.

When looking at the biological communities across the state, fish communities are in good shape even if they are located in the most impacted river systems. The macroinvertebrate tool is still in development for larger rivers. It will include criteria for use of Hester Dendys, and is based on Wisconsin's tool. Anderson said that PCA is finding that across in the state, in sediment laden rivers, increases in tolerant or very tolerant taxa are observed. However, it does not appear to be bringing the IBI score to an impairment threshold. While there is a TSS threshold, there is not necessarily a corresponding response in biological community. It may be that the impacts are not yet being observed. Anderson noted that PCA does not have a tool for mussels or plants. The TSS value is okay if it does not have a 1:1 relationship with the two biological assemblages that are collected.

In terms of sources of TSS, the permitted sources are not huge contributors. On the non-permitted side, sources include glacial lake deposits, which are highly erodible fine sediments. This is a major driver in this part of the state. Ditching is another source, in which instream erosion occurs and the stream channel moves. This area of the state does not have a lot of elevation gradient. And there is plenty of near stream

disturbance from pastured animals. These areas of the state were historically pine forest. In order to make meaningful reductions, the TMDL report identified priority areas both on the non-regulatory and regulatory side.

In response to a question from Shawn Giblin, Anderson replied that the lead for the report is either biologist Ben Lundeen or project manager Bonnie Finnerty. Giblin said that Wisconsin DNR is forming a group to look at TSS criteria in Wisconsin. In response to a question from Salvato, Giblin replied that this is a state-wide effort and the group will first look at large rivers.

Nutrients

State Updates

Minnesota – Anderson reviewed that Dave Wall is lead on NRS work for PCA. The agency is working on compiling guidance to integrate NRS into PCA's watershed work. Anderson said the goal is to be able to ensure that nutrient reduction at a national level is tied to local watershed plans and implementation. Minnesota PCA has partnered with the University of Minnesota to develop WQ trading documents specific to permitted facilities. The research involves modeling on how to optimize nitrogen and phosphorus reduction.

Another NRS related item is figuring out how to take counts of BMPs and average load reductions to track progress looking back in time as well as forecasting. The Agriculture BMP certification program is gaining a lot of interest. The story map highlights the work producers are doing: <https://mnag.maps.arcgis.com/apps/Shortlist/index.html?appid=f5f1c86e75cd48bf9a79b5eccb51d36e>. Schnieders read an article about Minnesota achieving record high acres enrolled for the Ag BMP certification program. What is the target and how many acres are enrolled? Kessler responded that she believes Minnesota has more than 750,000 acres and 1,050 producers. Governor Walz has set a goal of a million acres by the end of his term. Kessler added that Minnesota is working on pilot projects to catalyze WQ markets. One is in central Minnesota to develop carbon and nutrient credit markets. The state wants to capitalize on Ag BMP certification success and grow urban/farmer partnership opportunities. There is good momentum so far. Schnieders asked if as more producers participate in the certification program, are they sharing it with their neighboring farmers? Is there an opportunity for cities as well? In response, Kessler said that Minnesota worked with farm business management program data, and they independently found that an Ag BMP certified farms averaged significantly greater net profit than non certified farms for two consecutive years. That type of success and actual money that comes with these practices are going to accelerate the program even more. She believes that the two pilots will help get cities involved. If Minnesota had a credit bank, all of these practices could be ready for people who needed them. They don't always line up geographically and value on the credit, but we see that this presents a big opportunity going forward as well.

Illinois – Good announced that at the June 10, 2021 Nutrient Monitoring Council meeting, participants will discuss alternative options for the continuation of the USGS super gages. He reminded the WQTF that Illinois EPA funds eight super gages and the Metropolitan Water Reclamation District of Greater Chicago funds one gage near Joliet. The network was started in support of the NLRS to calculate loads leaving the state. The funding will run out at the end of November 2021, and Good believes a feasible option is to keep a few of the gages going. Chris Wieberg asked whether the Illinois River Basin (ILRB) NGWOS could pay for the super gages. Jim Duncker confirmed that two of the sites are within the Illinois River Basin. He could talk to USGS HQ about directing the funding towards the gages but is aware of potential funding constraints. Salvato asked whether the super gage and loading calculations are comparable. Good responded that the methods are within 7-8% of one another and Duncker confirmed that Dr. Tim Hodson from the Urbana USGS was the lead researcher. Robert Voss asked if

Illinois collects phosphorus grab samples. Good said the super gages provide phosphate results, every 2-4 hours. He added there were considerable issues with the phosphate analyte during the first couple years. USGS has played around with the method, and will be looking at new phosphorus analyzers with the ILRB NGWOS. The Illinois EPA ambient WQ sites do include total and dissolved phosphorus collection. Super gages are no doubt expensive but a hybridization may be the best option. Voss contributed that it would be beneficial to see flux and flow at high loading events, especially looking back 10 years and trending high flow events to watershed efforts.

Iowa – Schnieders said it is an exciting time for water. Cities, counties and states are trying to figure out what to do with American Rescue plan dollars. Some cities applied dollars to WWTP upgrades in a few instances, and some are including nutrient reduction technology. The Iowa legislative session recently concluded, and one thing of note was an increase in nutrient reduction strategy funding. The funding would be extended for 10 years and target roughly \$20 million towards conservation practices across the state. Schnieders said he hopes that RCPPs will continue to evolve in the state. He would like to better leverage resources and work with watershed coordinators on the source water protection funding from the Farm Bill.

The University of Iowa received funding from the Iowa Finance Authority to test out new technologies at smaller WWTPs, and take existing treatment plants and optimize nutrient reduction. This project is a USEPA priority. Schnieders reminded participants that Iowa is doing a lot of work with nutrient reduction and agriculture-urban partnerships. Four cities in Iowa have MOUs to make investments in the watershed.

Finally, Schnieders thanked the UMRB states for the letters of support provided in the USEPA farmer to farmer grant. Iowa received a grant for cover crop seed production in partnership with the Practical Farmers of Iowa. Schnieders hopes that seed production will double in fall 2021.

Wisconsin – Greg Searle said the next NRS implementation progress report will be complete in spring 2022. Wisconsin does not have plans to update the strategy itself at this time, but will instead focus on the improvement of tracking agriculture NPS. Wisconsin DNR established a watershed restoration team to implement TMDLs. DNR wants to standardize the tracking of implementation and is having conversations with organizations in the state to compare reduction in agriculture BMPs. Two nitrogen workgroups have been formed within DNR with the intent of examining DNR authorities to reduce nitrogen contamination and explore new legislation or initiatives to address nitrogen pollution.

The State's nutrient trends website has updated information on trends and loading for L&D 9. The gage was previously discontinued but is up and running again. The update can be found linked here: <https://wisconsin.dnr.shinyapps.io/riverwq/>

Shawn Giblin added that the one of the workgroups will talk about criteria and standards for nitrogen and the other will discuss nitrogen goals for the state. Giblin is developing a manuscript to look at UMR backwaters and potential endpoints for algal toxins. The research will hopefully wrap up in the fall, concluding a second year of data collection on backwater residence time. Another study is being conducted in Trempealeau County, linking to nitrate loading. In response to a question from Salvato, Giblin replied he is interested in presenting the work and will follow up on the progress.

Missouri – Wieberg said Missouri's nutrient lake criteria was developed in 2018. Litigation followed and Wieberg announced that the criteria were upheld and will continue to be implemented.

Missouri DNR is working on rule making and putting a total phosphorus (TP) reduction requirement on point sources (PS) within the state and applying effluent regulations. Wieberg is in the process of setting up stakeholder meetings and going through the rule making process. The domestic wastewater side will

not be as much of a challenge. Technology has proven itself to make the reductions feasible for point source phosphorus. The industrial side with meat and food processing, chemical manufacturing, etc. is going to be more challenging. Wieberg and staff are in the process of learning more about the feasibility of reductions. There are opportunities to trade within the watersheds of those facilities. The same facilities are subject to carbon emission credits under the Clean Air Act. Stakeholder engagement will be ongoing through the rest of the calendar year.

The HTF grant used to set up a WQ trading clearing house is coming to an end. The grant money was used to look at the soil and water conservation program and capture the average reduction of conservation practices across a few pilot HUC-8 watersheds. The technical papers are being wrapped up now. The next step would be to do the same work across all 64-HUC 8 watersheds in the state to have a total bank of credits to implement the lake nutrient criteria and facilitate new conservation practices on the ground.

Missouri is working on a revision of its NLRS, and talking to stakeholders during summer 2021 about the NPS side of the nutrient reduction strategy and setting a baseline to establish conservation goals and tracking mechanisms for aspects such as fertilizer that is bought, sold and applied in the state.

Wieberg described that the nutrient criteria rule includes screening thresholds for phosphorus (P), nitrogen (N), and chlorophyll-a (chl-a) and eutrophication factors. Coupled together, the water body qualifies for impairment. Recently, Missouri has been challenged by the amount of data available about eutrophication and its many forms e.g., state agency generated data and citizen complaints. USEPA Region 7 started mining those databases and believes that certain lakes should be impaired. USEPA Region 7 and Missouri DNR are currently deliberating on this matter. Wieberg said that if the agency wants to list the water bodies as impaired it will upset some of their stakeholder groups.

Good asked if Missouri has minimum data requirements on lake impairment for 303(d) listing. Voss replied that at least four samples must be collected of N, P and chl-a in between May and September. Some of the eutrophication factors pull in suspended sediment, a ratio of chl-a to TP, and Secchi depth to determine if lakes are light limited. And there is consideration of allowable exceedance frequencies in the last three years. In response to a question from Good, Voss said regarding data quantity, it is a mixed bag whether there is or is not enough data. Some of the data are fish kill information. Wieberg added that most of the controversy is on Lake of the Ozarks, a popular recreation site in the state. The fish kill recorded that was utilized by USEPA Region 7 encompassed 100 fish, and it was a citizen report that was not verified by any scientists. The actual number of fish killed is unknown, nor is the cause of death. In response to a question from Good, Wieberg clarified this is related to aquatic life use assessments. Voss added that another unusual aspect of Missouri's nutrient lake criteria is that with the eutrophication standards, if one is exceeded in one year, the water is listed as impaired. It is fairly strict when eutrophication factors happen. Any of the five eutrophication factors can be exceeded i.e., pH, fish kills, algal toxin or algal cell counts, limit limitations and fish community data.

Federal Updates

USEPA Region 5 – Micah Bennett reported that the national lake nutrient criteria recommendations will be finalized in summer 2021. There are a lot of priorities for the Biden-Harris Administration that are still being discussed and prioritized. USEPA recently finalized its cyanotoxin preparedness and response tool kit that includes resources for responding to cyanobacterial blooms. The tool kit can be accessed here:

<https://www.epa.gov/sites/production/files/2021-05/documents/cyanotoxins-preparedness-response-toolkit-2021.pdf>

Presentations

Soil Loss in the Corn Belt Region

Evan Thaler introduced his work with advisor Dr. Isaac Larsen to quantify rates and magnitude of historical soil loss in the Midwestern U.S. Soil erosion is an undervalued issue, effecting both the human side of food production, and impacts to waterways e.g., nitrogen in the Gulf Hypoxic Zone and excessive sediment delivery. Qualitatively, it is known that soil erosion is a big issue and widespread, but the magnitude of erosion is heavily debated.

The USDA puts out a National Resources Inventory (NRI) every five years. While it is a useful tool for conservation planning it does not provide insights on soil lost since cultivation began. The calculations in the NRI do not include tillage and gully erosion.

There are visible signs of erosion in light color pattern on hilltops and hillslopes, which are indicative of decreasing organic carbon. Thaler and Larsen developed a soil organic carbon index to map out A-horizon soil loss. Once the carbon indices are calculated, the imagery can be classified into different soil horizons. Thresholds are applied to high resolution satellite imagery and then final calculations are made for fields with no-A-horizon. This method was repeated across 28 sites in the Corn Belt region, but a method was needed to scale up estimates to the entire region. Thaler developed a relationship between B-horizon soil exposure and landscape curvature. The data were used because found that A-horizon loss disproportionately occurs on convex hillslopes.

The results were that 35% of the Corn Belt no longer has any A-horizon soil, an estimate far greater than USDA's estimate. The most A-horizon soil losses occur at Iowa/Missouri border and driftless areas of WI. A-horizon losses translate to decreases in crop yields. Estimates include 6% decrease annually, amounting to about \$2.8 billion in annual losses. The areas identified A-horizon loss, and does not capture where A-horizon has thinned. This also impacts crop yield.

Thaler believes the erosion driven on convex hilltops is from tillage. A way to estimate the erosion rate can be done using the thickness of soil in a prairie compared to an agricultural field. Using the land transfer records to determine the cultivation timeline, Thaler used the following equation: erosion rate = thickness loss divided by the cultivation time. Scaling this equation up to twenty plus sites, Thaler estimated a median erosion rate of 1.9 mm/year. If you compare historical erosion rates (Thaler and Larsen) with current erosion rates (USDA NRI), the modern erosion rates exceed the historical rate in 68% of the counties.

On a global scale, the Corn Belt erosion rate is in the 99th percentile and comparable to the steepest mountain ranges like the Himalayas. Thaler believes the eroded soil may be accumulated in local depressions, but may be exported to water bodies during larger storm events.

Good asked Thaler to explain his comment on the USDA not including tillage in national erosion estimates. Good knows that USDA will do field inspections and assign categories based on whether a field has crop residue. How is tillage not being considered? Thaler replied that USDA applies a coefficient and looks at tillage in the way that it effects water erosion. It does not consider the mechanical removal of soil. On hilltops, the USDA is saying the drainage is essentially zero and not active on those parts of the landscape. Good commented that another interesting point Thaler put forth was that 35% of the A-horizon has been lost but the NRI says 0% has been lost. Thaler added that the NRI classifies erosion in four phases and phrase four is the complete loss of the A-horizon. Jim Fischer asked whether the hilltops are experiencing more erosion due to wind than water. Thaler replied that the soil is being moved by the plow and soil progressively moves down the slope.

Schnieders said that Iowa actively tracks conservation practices such as cover crops and no-till that change the landscape. Is there evidence that shows erosion rates may be slowing in the last 20 years? Between the Dust Bowl and present day? Thaler is not sure what soil erosion rates look like in the last 40 years. Conservation practices started in the later 1960s and 70s. One way to measure that is taking cesium cores in the soil, which reached peak deposition in the mid 1960s in prairie landscapes and conducting a mass balance equation with the farm field across the road.

Salvato asked the WQ committees if they are aware of RCPPs or other programmatic decisions made in the areas experiencing great soil loss. Schnieders said that Iowa has utilized LiDAR to map practices. In the southern hills of Iowa, a lot of practices such as terraces and no till have been implemented. From the management standpoint, Iowa has been able to use tools like the Agricultural Conservation Planning Framework from USDA ARS to locate where practices can go relative to what has already been implemented. The tool has been able to save time in figuring out what is possible. The information provided in Thaler and Larsen's research is definitely useful and adds to the weight of evidence to continue with landscape changes. Wieberg said over the last five fiscal years, Missouri has cost shared \$8-10 million annually on conservation practices in the northern part of the state where there are a lot of agronomic crops. There is a lot of money put into conservation practices annually and there are still challenges associated with losing productive land to erosion. More resources are necessary and research like this helps to bring that to light.

Hydraulic Connectivity for Sediment and Nutrient Sequestration in UMR Floodplains

Chuck Theiling reflected on the study question of what it would take to create 500-year flood protection for the UMRS. He was asked to take a watershed approach to think about protecting communities from flooding impacts.

The health and function of the floodplain has been compromised by development. There is opportunity is to restore floodplain connection using existing infrastructure and nature-based technology to sequester nutrients from the surface water, ultimately reducing runoff to the Gulf of Mexico.

The tools Theiling conceptually modeled for nutrient reduction were floating treatment wetlands and algal turf scrubbers (ATF). Floating treatment wetlands, as the name implies, include a cluster of plants that float on the water's surface. The plants have a concentrated wetland effect that grow a biofilm and support processes like nitrogen uptake and denitrification. They can also provide habitat and operate in areas that natural wetlands do not, e.g., they are less sensitive to TSS and discharge. ATF are mats of native algae that reduce pollutants in waterbodies. Biomass can then be utilized as a fertilizer or turned into a biofuel. The cost of biofuel, however, has not been made cheap enough to compete with oil. Land availability is another constraint.

Theiling's conceptual model for hydroponic nutrient abatement included individually understanding nutrient reduction from wetlands, open ditches, floating islands, ATF raceways, and a combination of the options for two sites Fabius River and Marion County. He modeled the existing conditions, pre-settlement and "pump-off" scenario, in which drainage operations are stopped or reduced and groundwater seeps into wetlands. The main take away is that hydroponic enhancements are effective at nutrient reduction.

Theiling concluded that nutrient trading has a lot of potential to simultaneously improve economic and environmental outcomes. The levee districts in the lower impounded areas of the UMRS are in the best location to generate credits from nutrient reduction.

Bennett asked Theiling to discuss the denitrification rates used for the models. Do you expect the outcomes to be affected by their high variability? Theiling replied the rates are simplistic. He hoped to integrate the values into a habitat evaluation procedures model.

CWA Program Updates

State Updates

Missouri – Wieberg said Missouri is working on the 2022 impaired waters list, but is currently resolving aspects of the 2020 list with USEPA Region 7.

For TMDLs, DNR has been working on revisions over the last few years to ensure that the TMDLs are implementable based on new data and information. Some TMDLs have been approved while others have hit road blocks on the modeling. USEPA Region 7 has had some challenges in the way they run Missouri DNR models.

Minnesota – Kessler said the 2020 impaired waters list was approved by USEPA Region 5 in April 2021. An ongoing point of contention is that tribes in Minnesota have asked that water bodies be listed as impaired for wild rice be included, however, PCA is prohibited by the state legislature to list wild rice impairments, which is in direct conflict with the CWA. USEPA is taking action on its own and has put out upwards of 30 waters in amendment to PCA's impaired waters list on public notice. These waters would include portions of the UMR impaired based on the sulfate standard for wild rice. These areas of the UMR are directly below the drainage area of WWTPs in the Twin Cities Metro Area, which means the ramifications could be more restrictive sulfate permit limits for upwards of 800 WWTPs. Kessler is unsure when the process will end. PCA will need new permit limits for a lot of stakeholders. While that is in progress, PCA has begun working on the 2022 list. In response to a question from Salvato, Kessler said the current sulfate standard was adopted in the late 1970s. She believes the 10 mg/L standard is right for a large majority of the state, but other parts of the state need site specific standards.

Watershed restoration and protection strategies (WRAPs) consider impaired waters and waters that are trending towards impairment. WRAPs are required for 80 major watersheds, and 66 are completed. Each WRAP includes TMDLs, and close to 1,700 TMDLs have been approved in the last 17 years.

Kessler shared a recently approved TMDL on the Shell Rock River, located 12 miles upstream of the Iowa border. The river is a drainage point for city of Albert Lea, the third largest discharger in the state. PCA has been fighting with the city for a decade about eutrophication standards and whether the city needs a limit. The center of the dispute was around data quantity and modeling calibration. PCA argued that the modeling and data collection supported their perspective, and eventually everyone agreed on a technically sound process. Anderson added when the WQ Task Force last met, PCA was submitting Lake Pepin TMDL and it has since been approved by USEPA Region 5.

Wisconsin – Shupryt said Wisconsin's 2020 integrated report was approved and the proposed 2022 list is going out for public comment in July 2021. New components of the report include reporting the number of impaired waters covered by a TMDL and breaking those impaired waters up that are in sub restoration plans.

Some of the listings removed were for mercury fish consumption advisories. That was related to changes in methodology and available data. For TMDLs in the UMRB, DNR is in its second year of monitoring the Fox River and Des Plaines flows into Rock River and eventually the UMR. The TMDL is related to TP and TSS. There may be plans to add monitoring, as some spring runoff monitoring was missed in 2020 due to COVID-19.

Wisconsin DNR is in the early stages of implementation of the Wisconsin River TMDL for TP and TSS. The TMDL covers 20% of the state by land area. The endpoints are to protect downstream reservoirs, and hopefully benefits will be seen by all downstream, including the UMR. Searle added that DNR wants to have a higher success of implementing TMDLs. The agency is using a prioritization framework and the NRS and looking at different parts of the state. The Sugar River TMDL in SW Wisconsin is an example. Prior to development of the TMDL, DNR wants to work with local stakeholders to determine what are the best chances of implementation and success. Searle added he hopes this leads to more success in restoration.

Illinois – Good said Illinois submitted its 2018 report in ATTAINS and it is fully approved. In past discussions, Illinois has had partial approval dating back to 2008, and 10 years later it has been resolved. Illinois will start the 2020/2022 combined report next, with the hope of meeting the April 1, 2022 deadline.

Iowa – Kendall said Iowa received approval for its 2020 list in May 2021. DNR is getting ready to start the 2022 list, and is hoping to meet the submission date. DNR is also working on a fish kill methodology update, and is looking to how neighboring states define the magnitude of a fish kill(s). Iowa has a long history of impairment based on a single fish kill.

Kendall said Iowa submits its data to ATTAINS and Region 7 states are leading the nation in submittals.

Tuesday, June 9

Illinois River Basin NGWOS Science Plan

Duncker described the Next Generation Water Observing System (NGWOS) as part of the USGS Integrated Water Science. The Illinois River Basin is the third basin selected by USGS. Resources are being brought to the Basin to address science questions and observe water quantity and quality issues in a high-density fashion, with a focus on HABs and nutrients. The data garnered from the NGWOS can be transferred to other areas of the Midwest.

Efforts are in year one of a 10-year commitment. During the first year, the major effort is to engage with stakeholders, identify basin priorities, and start purchasing equipment. Stakeholder engagement is valuable during this time.

Duncker review questions provided by UMRBA based on previous stakeholder meetings:

Upgrading three locations for continuous monitoring, where specifically those locations are on the Fox, Calumet and Illinois Rivers.

The three locations are 1) the Fox River at New Munster, WI, 2) the Grand Calumet River at Hammond, IN, and 3) the Illinois River at Starved Rock L&D, IL. The interest in adding continuous monitoring to these stations is to understand the nutrient loads coming into the State of Illinois. It is an easier lift for USGS to utilize existing gage stations where infrastructure and permitting are already in place. The Grand Calumet River is a tributary to the Chicago Waterway. The river is highly industrialized and borders underserved communities. USEPA has also been in the area for the last decade trying to restore portions of the river. The Illinois River at Starved Rock is a dividing point between the Upper and Lower Illinois River. There is a sharp change in slope below Starved Rock, and there have been existing water quality issues including HAB events at the location. Duncker said that the Illinois River is a wastewater dominated system, especially in times of low flow, which can lead to HAB events. There are many

unknowns associated with HAB research including what turns a nuisance bloom to a harmful bloom. In response to a question from Kessler, Duncker said the USGS NGWOS program is paying for the installation and maintenance of continuous monitoring.

Whether USGS is utilizing new technology components e.g., next generation fluorometers

Examples of new technology being deployed are multispectral cameras, continuous monitoring, and next generation fluorometers. Duncker hopes that USGS can contribute to a better understanding of HABs. This is partially supported by the proxies group within USGS. The group is interested in measuring fluorescence and correlations with parameters of interest. In response to a question from Salvato, Duncker replied that both grab samples and fluorometer will be utilized to measure the correlation with wastewater compounds.

For HABs, you mentioned plans to add 1) instrumentation at multiple fixed locations, 2) mobile rapid response instrumentation, and 3) intensive sampling. What will you do if you encounter a HAB?

USGS will have fixed and mobile sets of equipment for HAB events. While the fixed and super gages are upgraded for continuous monitoring, USGS can respond to HAB events in inland reservoirs or lakes with the mobile equipment. The cameras can see wavelengths beyond the human eye. Their use can potentially improve early detection of HAB events with better identification of algal communities, and the cameras can be linked to remote sensing data.

USGS hopes to encounter a HAB from the research standpoint. Duncker said that USGS has protocols in place to notify Illinois EPA and the Department of Health. Otherwise, response to HAB events is reactionary once the public records the bloom. The HABs work crew is set to monitor and sample HAB outbreaks intensively. The crew will be led by Dr. Tim Straub from Urbana-Champaign USGS office during summer 2021.

Water chemistry sampling, how much data do you need to establish a baseline? Where are the three strategic locations in FY 21?

The baseline data depends on the research questions. Asian carp migration and water quality was studied in 2015. USGS researchers found that the carp have not advanced past Joliet, or the Dresden Island pool. One theory is that the carp are not moving past the pool because of the water quality coming out of Chicago. Several sites were studied on the Des Plaines, Kankakee, and Illinois Rivers and over 639 constituents were sampled. Of the 639, 280 were detected at least once, and many were emerging contaminants. No one compound was deemed responsible for the stalling of carp migration. The effects of the constituents on biota are still being understood. The constituents could be part of HAB formation, and to begin answering that question, baseline data is needed.

Nicole Manasco said that Corps staff are in the field this morning at Starved Rock and they noticed blue green algae bloom at the marina. Manasco said staff grabbed a bottle to send in for analysis, and are currently filling out an Illinois EPA bloom report. If USGS are ready, there is an opportunity to study a bloom. Duncker thanked Manasco and will pass the message along to the USGS HABs team.

Giblin understands there is a growing body of literature linking emerging contaminants and HAB events. Are there specific compounds that have that linkage? Duncker said specific compounds have not yet been identified. Fischer said there is a lot of interest in macroinvertebrate abundance and emerging contaminants. Is macroinvertebrate sampling occurring with the NGWOS? Duncker replied USGS is collaborating with external research groups, and is interested in timing sampling with WQ monitoring. There is also an interest in fish communities. Duncker reiterated that NGWOS is truly about leveraging federal dollars and aligning external research efforts where possible. In response to a question from

Salvato, Duncker said the professors are Cory Suski at the University of Illinois and Reuben Keller at Loyola University Chicago. Duncker said the NGWOS is also working with colleagues at UMESC on the HABs work to look at historic LTRM data. It is nice to be able to pull in different expertise in USGS offices.

Fiscal Year (FY) 2022 (22) will be a big roll out of field deployment. Duncker will be speaking with the Illinois Nutrient Monitoring Council on June 10, 2021. The NGWOS wants to build upon the work that has been done in the Illinois River Basin for the last five years and the NGWOS study plan will be built upon partners' feedback.

Kessler said states are interested in ways to leverage existing monitoring networks. Minnesota PCA has asked the state legislature for bonding dollars to add continuous monitoring sites with mixed success. Kessler asked Duncker to elaborate on what makes the right combination of USGS partners, LGUs, states and funding for monitoring efforts. In areas where there are not relationships for continuous monitoring, what is missing? Duncker reiterated the value of personal relationships between scientists and managers. Agencies can go off on their own but continuous monitoring is expensive. The investment was made back in 2015 with Illinois EPA, USGS, and other entities to stand up gages.

NGWOS can come into the basin and work at the basin level, but there are real constraints at the national level. Duncker wants to bring USGS federal resources to the local issues and address priorities. USGS has to do it equitably and in a manner that answers Congressional mandates. Wallace asked how UMRBA can build relationships with the Water Mission area and strengthen them. She added that the President's Budget includes a big increase in the Water Mission area, and there may be an opportunity to discuss the support of mutual goals with FY 22 spending. Duncker encouraged UMRBA to communicate with the USGS Water Mission area. He added that when a basin was being selected in the Midcontinent region, letters of support from partners to select the Illinois River Basin went a long way. Wallace suggested two approaches to the WQEC: 1) have a call with USGS leadership and talk about priorities and questions, and 2) write a letter of support related to the FY 22 budget cycle. The letter can describe excitement of being engaged with the Illinois River Basin NGWOS and lay out some priorities in a higher-level way. Is the WQEC interested in the follow-up? Good, Kessler, and Wieberg agreed. Kessler emphasized that the needs of the ILRB NGWOS go beyond the basin. Kelly Warner said if UMRBA writes a letter to the Water Mission area, it would be informative for them to hear which aspects UMRBA is already supporting e.g., the Reaches 8-9 pilot and how new technology can be integrated or extrapolated.

The Impact of Drought on Arsenic Exposure in Private Wells

Melissa Lombard said the arsenic exposure study was conducted in partnership with the US Center for Disease Control and builds off previous work of Dr. Joe Ayotte and collaborators. The study's focus was on natural sources of arsenic in groundwater, not anthropogenic sources.

Arsenic has numerous impacts to human health. The USEPA has a public drinking water standard of 10 µg/L. Private wells are not regulated, and water quality testing falls on the responsibility of the homeowner.

The original model put forth by Dr. Ayotte and collaborators was based off 20,000 domestic well samples. The modeling aspect was brought in to be able to predict the entire country, especially areas that are not well sampled. The most significant model variables included geologic binary indicators, geochemical data, and hydrologic/meteorologic variables (e.g., precipitation and groundwater recharge).

In the new study, Lombard et al., 2021, Lombard took the original model and tweaked it to see how drought would affect the outputs from the model. Drought simulations reduce precipitation and

groundwater recharge values. However, if just precipitation decreases, arsenic increases, and if groundwater recharge decreases, arsenic decrease. Lombard and collaborators had to figure out based on different simulations what the ultimate result was for arsenic concentrations. Drought simulation #7 in Table 1 of Lombard et al., 2021 simulated a decrease in precipitation by 25% and decrease in recharge by 50%. This scenario was the most similar to the 2012 drought in the Midwest. Under average arsenic and climate conditions, 2.6 million people are potentially exposed to high arsenic. Using drought simulation #7, the number increases to 4.1 million people. For the UMRB states, the biggest increases in high arsenic in areas with domestic well use include south central Minnesota, north central and central Iowa, and roughly one third of the state of Illinois.

Lombard concluded that the model results suggest that the probability of exceeding 10 g/L in domestic wells increases during drought. During longer durations of drought, the probability of high arsenic tends to increase. She added that a limitation of the study is that this is a national study and local results may vary. Lombard hopes to ground truth the model predictions to verify or dispute the results, and work towards future scenario prediction.

Lombard mentioned other studies of interest to the WQ committees. She is involved in a USGS hydrologic drought prediction project FY 20-24 to predict hydrologic drought e.g., impacts to streamflow, groundwater, and reservoir. Right now, the group is focusing in on metrics to determine when hydrologic drought occurs. They are also interested in conditions leading up to a drought and what occurs when drought is lifted as well as impacts to society and wildlife. The project manager is currently in the process of reaching out to stakeholders, and UMRBA certainly seems like the right audience. USGS wants to know what resources and outputs to provide that are useful to stakeholders. Wallace said she will follow up on the drought prediction study. UMRBA and the states put together a report on the most impactful things to do related to resilience plan and there are a few key things related to drought identified in the report that were also identified in the drought prediction study. UMRBA would appreciate being a key stakeholder.

Salvato asked Iowa, Illinois, and Minnesota what their agency's role is in arsenic exceedances, understanding the Departments of Health likely have the main authority. Anderson said arsenic is naturally occurring in the Red River Basin and impaired waters are identified in the basin. Minnesota PCA does have some arsenic data across the state, but the Minnesota Department of Health has the authority on the drinking water component. Kendall replied that Iowa DNR does not have many impairments for arsenic, but the standard is for arsenic (III). The naturally occurring arsenic is concentrated in the northern region of the state. Kendall asked Lombard if the study looked at various species of arsenic. Lombard said the focus was on total arsenic. She is aware that arsenic (III) on the human health side usually includes collecting blood samples.

Administrative Items

Election of Officers

Salvato thanked Chris Wieberg, WQEC chair and Dan Kendall, WQTF chair for their leadership over the past two years. The next chairs are Katrina Kessler (WQEC) and John Hoke (WQTF).

Future Meetings

- The next WQTF meeting will be convened in person September 28-29, 2021 in Dubuque, Iowa.

Attendance

Gregg Good	Illinois Environmental Protection Agency
Daniel Kendall	Iowa Department of Natural Resources
Adam Schnieders	Iowa Department of Natural Resources
Pam Anderson	Minnesota Pollution Control Agency
Katrina Kessler	Minnesota Pollution Control Agency
Molly Sobotka	Missouri Department of Conservation
Robert Voss	Missouri Department of Natural Resources
Chris Wieberg	Missouri Department of Natural Resources
Jim Fischer	Wisconsin Department of Natural Resources
Shawn Giblin	Wisconsin Department of Natural Resources
Greg Searle	Wisconsin Department of Natural Resources
Mike Shupryt	Wisconsin Department of Natural Resources
Karen Hagerty	U.S. Army Corps of Engineers, Rock Island District
Leo Keller	U.S. Army Corps of Engineers, Rock Island District
Nicole Manasco	U.S. Army Corps of Engineers, Rock Island District
Chuck Theiling	U.S. Army Corps of Engineers, Mississippi Valley Division, Engineer Research and Development Center
Catherine Thomas	U.S. Army Corps of Engineers, Mississippi Valley Division, Engineer Research and Development Center
Eric Summa	U.S. Army Corps of Engineers, Jacksonville District
Micah Bennett	U.S. Environmental Protection Agency, Region 5
Tim Elkins	U.S. Environmental Protection Agency, Region 5
Kim Harris	U.S. Environmental Protection Agency, Region 5
Jason Daniels	U.S. Environmental Protection Agency, Region 7
Amy Shields	U.S. Environmental Protection Agency, Region 7
Aleshia Kenney	U.S. Fish and Wildlife Service, Iowa-Illinois Field Office
Jim Duncker	U.S. Geological Survey, Central Midwest Water Science Center
Kelly Warner	U.S. Geological Survey, Central Midwest Water Science Center
KathiJo Jankowski	U.S. Geological Survey, Upper Midwest Environmental Science Center
Melissa Lombard	U.S. Geological Survey, New England Water Science Center
Ingrid Gronstal	Iowa Environmental Council
Isaac Larsen	University of Massachusetts Amherst
Evan Thaler	University of Massachusetts Amherst
Lauren Salvato	Upper Mississippi River Basin Association
Kirsten Wallace	Upper Mississippi River Basin Association