Upper Mississippi River Basin Association
Water Quality Task Force Virtual Meeting

September 28-29, 2021

Highlights and Action Items Summary

Tuesday, September 28

Approval of the WQEC-WQTF Draft June 8-9, 2021 Meeting Summary

The UMRBA Water Quality Task Force (WQTF) approved the June 8-9, 2021 draft highlights and action items summary pending an edit to page A-4 on the quantity of super gages funded by Illinois EPA and the Metropolitan Water Reclamation District of Greater Chicago.

UMRBA WQ Task Force Updates

How Clean is the River? Report

Erin Petty provided an update on the *How Clean is the River?* Report. The analysis was conducted using the EGRET R package to generate flow-normalized trends. Data collected were from Illinois EPA, Minnesota PCA, Wisconsin DNR, and the UMRR program, with flow gauge information from USGS and USACE from 1989 to 2018. Sixteen total sites were selected on the UMR (spanning Pool 4 to the Open River) and the La Grange reach of the Illinois Waterway. The initial findings are as follows:

- Total nitrogen (TN) and nitrate + nitrite were generally increasing
- Sulfate and chloride were generally increasing
- Conductivity was generally increasing
- Dissolved oxygen (DO) was generally increasing
- Chlorophyll-a (chl-a) was generally decreasing from Pool 4 to 13 and increasing below Pool 13
- Total phosphorus (TP) and ammonia were generally decreasing
- Zinc, aluminum, and copper were generally decreasing
- Total suspended solids (TSS) and temperature (water) were generally decreasing
- pH is generally decreasing

Next steps include writing the report and finalizing maps and graphics to communicate the results. Petty clarified that the temperature variable was for water in response to a question from Shawn Giblin. Aabir Banerji asked about confounding factors in chl-a versus turbidity. Are there ways to tease the two apart? Do we have separate turbidity measures that could be corrected for the signal for chl-a? Robert Voss replied that rivers respond differently based on the size of the photic zone. Voss would not suggest a trend analysis as the appropriate way to analyze Banerji's questions. A lot more data and a smaller scale

would be a better analysis. Generally, if there are nutrient and chl-a increases on the river, but a decrease in sediment or turbidity, then that could mean that sediment is dropping out but nutrients are available for the chl-a response. Lee Ganske asked if a review process is planned between release of results and the public rollout. Voss noted that the R code and data are available on the Google Drive, but staff can share widely for review. WQTF members agreed to conduct a review.

Reaches 8-9 Pilot

Dan Kendall provided an update on the Reaches 8-9 pilot project. As a reminder, UMRBA, Missouri, Illinois, and Iowa agencies and laboratories are sampling 109 river miles from the Iowa River confluence to L&D 21 (near Quincy, Illinois).

Fixed site sampling is completed. Probabilistic summer sampling is complete for water chemistry and macroinvertebrates. Some fish sampling remains, specifically the collection of black bass for the fish consumption use assessment. There were challenges in collecting bass within the required size parameters. Laboratory analyses for water chemistry by Missouri DNR are still ongoing. Analyses for PFAS by USEPA Region 5 and cyanotoxin analysis by Iowa DNR are complete. Much of the remaining work for the pilot includes field data entry and laboratory data entry.

Kendall detailed problems and solutions encountered along the way for the Reaches 8-9 pilot.

- COVID-19 shifted the originally scheduled sampling period from December 2019-December 2020 to October 2020-September 2021.

- The public water suppliers (PWS) that were voluntarily participating in the drinking water use assessment stopped participating in March 2020. Some of the reasons were challenges collecting the monthly volume of samples requested after staff capacity was reduced. The planning committee adjusted and incorporated drinking water parameters with fixed site sampling.

- PFAS sampling was temporarily suspended due to laboratory contamination issues. Sampling resumed in January 2021 after USEPA Region 5 adjusted sampling protocols to combat the contamination issue.

- Samples were lost by FedEx in January 2021 and have not been recovered.

- Five of the 34 Hester Dendy sampling sets were lost after deployment. Reasons are currently unknown.

- The contractor who was going to identify the macroinvertebrates was no longer available, and the planning committee quickly worked to find alternatives. Rhithron will be the new contractor. They identified the macroinvertebrates collected for the Reaches 0-3 pilot.

John Olson (retired Iowa DNR) is the contractor to draft the condition assessment report. Gregg Good suggested asking Olson why we chose to use skin-on filets in the original plan. The current discussion is whether to analyze the fish tissue with skin-on or skin-off. While the recommendation of skin-on is in the field operations manual, the states use skin-off, so it would be helpful to know why that decision was made.

Harmful Algal Blooms (HAB)s

State and Federal Updates

Minnesota – Ganske said the hot dry summer in Minnesota coupled with drought led to many blooms and hotline calls. Ganske said Minnesota PCA has not dealt with suspected illness. There was one dog death near the Minnesota and Iowa border on Lake Okamanpeedan/Tuttle. Additional investigation revealed the death was not related to harmful algal blooms (HABs), although the media reported on the story ahead of the agency. There was no microcystin detection (detect) in samples collected at the lake.

Substantial algal bloom activity occurred in Lake Pepin for the first time in several years. In response to a question from Kendall about toxin levels from the summer season, Ganske replied that Minnesota PCA does little toxin monitoring so he is unaware of how many detections occurred.

Illinois– Alexandrea Terlep said Illinois EPA has had a busy HAB season. Illinois EPA staff collected around 50 samples in response to suspected HAB events. Around 250 samples were analyzed from recreational waters, and 21 of those samples had results over 20 parts pers billion (ppb). This is in line with previous years. The highest value recorded was approximately 4,300 ppb microcystin on Lake Louise in Lake County in July 2021.

Illinois EPA staff have collected 180 cylindrospermopsin samples in recreational waters and no results were above the USEPA criteria of 15 µg/L. Similarly, there were no hits for raw and finished tap water that was sampled and analyzed. Illinois EPA is now able to analyze samples for anatoxin and saxitoxin. Sixty-five samples were taken from recreational waters for anatoxin, returning only one detection at 0.16 ppb. Only one hit from 80 drinking water samples (both raw and finished water) was found. Sixty-five samples in recreational waters were collected for saxitoxin. About 25 percent or 17 samples had detections, with the highest concentration of 0.3 ppb. Terlep said staff have observed that if saxitoxin is found in raw water, saxitoxin is also detected in finished water in low concentrations.

Terlep reviewed the bloom that occurred on the Illinois River at Starved Rock State Park. In mid-June the Army Corps of Engineers (Corps) noticed a suspected bloom at the Starved Rock L&D. On June 10, Illinois EPA staff collected samples. Of the four toxins analyzed (i.e., microcystin, cylindrospermopsin, anatoxin, and saxitoxin), microcystin was the only toxin detected at 95 ppb. Illinois EPA proceeded to issue a warning to the public. About a week later, USGS and Illinois EPA staff went back to Starved Rock for follow-up sampling. The bloom was still observed, and results for microcystin were 250 ppb. Two of the three samples USGS collected and analyzed were above the recreational criteria of 8 ppb or 8 µg/L. Thankfully, subsequent rain events dissipated the bloom at Starved Rock. On June 30, a final sample was collected and there was no evidence of a toxic bloom.

There is a bloom currently in Campus Lake at Southern Illinois University Carbondale (SIUC). It is a long-lasting bloom that has been in effect since July 2021 and has closed the lake to recreation. The agency used the opportunity for species identification samples in July and in mid-September. Both sets of samples showed that microcystin was the predominant species. The July sample had results of over 30 ppb microcystin. The water looked green. The August bloom had an extremely high pH of 10.2 and the water looked bright green. Surprisingly, the microcystin concentration was just above 8 ppb. The recent September 23 sampling event is still being analyzed. The bloom is less noticeable, and the pH level dropped. SIUC contracted with a consulting firm for a solution, and aerators are currently deployed in the lake.

One case of suspected dog illness occurred near Rochester shortly after the July 4th Holiday weekend. A citizen called stating that her four large dogs experienced partial paralysis after swimming in small ponds. Illinois EPA staff talked to the veterinarian that treated the dogs and confirmed that they showed

symptoms consistent with algal poisoning. The dogs were washed with a dog dish soap and treated with an anti-inflammatory. As far as Terlep is aware, the dogs made a complete recovery.

Staff were able to visit the ponds the same day as the call due to the close proximity to Springfield, Illinois. The water did not have any visual signs of a bloom. Samples collected for microcystin and cylindrospermopsin came back as non-detections (non-detect). Terlep did not observe anything under the microscope either. It is unclear what caused the dog illness, but from the prompt sampling, it was not likely caused by algal toxins.

A dog death occurred an hour after swimming in Valley Lake in northern Illinois. Illinois EPA staff received a call from a veterinarian. The lake was experiencing a bloom at the time of the dog's death. Lake County staff collected samples for all four toxins one day later. There were signs of a bloom but all four toxins were non-detects. It is not conclusive that toxins were not present, but because a necropsy or tests were not conducted, it is impossible to know the cause of death.

Illinois EPA has had issues with the Abraxis test strips. For a bloom that occurred on the Fox River, the test kit results were 10 ppb. The laboratory sample results were 140 ppb. Follow up sampling with the kit resulted in a non-detect while the laboratory result was 12.3 ppb. Terlep said she is unsure whether the kits can be trusted or whether the batch of kits was bad. She sent a new set of kits to northern Illinois and will have staff compare the new and old kits. Terlep said she would like to know if others are experiencing the same issue. In response to a question from Albert Ettinger, Good replied that a HAB summary report will be put together at the end of 2021.

In response to a question from Giblin about a funding source to run necropsies following dog deaths, Good replied that Illinois EPA does not have any funding. A dog death that occurred a few years ago was an older dog. The University of Illinois veterinary medicine program did a courtesy autopsy and found heat stroke was the cause of death. The dog's symptoms seemed consistent with algal toxins poisoning, but there was no proof. Necropsies can range from a few hundred to thousands of dollars depending on the reason. Gina LaLiberte noted that water intoxication has similar symptoms to algal toxin poisoning, and unless veterinarians are checking for ion levels, the ailment can be misdiagnosed. A dog playing fetch in the water for hours takes in too much water. A veterinarian will also present more than one probable cause of death, but algal toxin poisoning usually gets the blame because the pet owner is not in control of that.

Iowa – Kendall said that Iowa primarily monitors at state park beaches. During the 2020 season, Iowa DNR changed its recreational criteria to USEPA's recommended 8 µg/L of microcystin. During the 2021 season, there were 24 advisories. While this was more advisories than last summer, it was overall a below average year (the average is 31 advisories). DNR staff expected the number of advisories to increase once switching from 20 µg/L to 8 µg/L. A lot of lakes turned green, but toxin production (once analyzed) was low.

Iowa DNR laboratory analyzed samples of a suspected bloom on the UMR mainstem on July 27, 2021 and follow-up samples on August 10, 2021. This was a collaborative effort between the Corps and Illinois EPA (as mentioned by Terlep). The laboratory also analyzed samples for the Reaches 8-9 pilot. Kendall skimmed the results and noted the highest value was 3 or 4 µg/L for microcystin. Generally, the values were higher than he expected.

Wisconsin – LaLiberte said there has been improved HAB awareness and reporting in Wisconsin. For the past few years, DNR has maintained an email address the public can use to report events. In 2021, staff received about 170 reports. This included lakes for which there were multiple reports, and 40 instances of reports misidentified as toxin blooms (e.g., filamentous algae). LaLiberte and staff are working on updates to both the website and online reporting before next year's bloom season.

There were about six cases that were jointly investigated with the Wisconsin Department of Health Services via the HAB surveillance program. One of those cases was a dog death, however, the dog had underlying health conditions and the death may not have been related to cyanotoxin poisoning.

A few minor blooms occurred on Lake Superior. This was good from the public health standpoint, but not from the research standpoint because USGS staff were focused on studying blooms in Lake Superior during summer 2021.

LaLiberte reviewed that Wisconsin DNR does not have a coordinated statewide monitoring effort. Staff are working on incorporating HABs into its monitoring strategy for the next five-year cycle.

Missouri – John Hoke said that Missouri DNR had 27 reports of HABs through either the emergency response hotline or DNR's online reporting form. Nineteen were confirmed as being a cyano-bloom either through photo or field test confirmation, including three drinking water supply impacts. This has caught the attention of the drinking water branch and watershed protection program. The two programs have collaborated on source water protection measures. There have been no animal illness reports. Voss added that the University of Missouri does batch analysis of algal toxin samples on lakes, but DNR has not yet seen the 2021 sampling summary.

USEPA Office of Water - Dr. Lesley D'Anglada provided an update on USEPA Office of Water's (OW) work. The first, published in July 2021, is the final technical support document for implementing USEPA's recommend recreational ambient water quality criteria for microcystins and cylindrospermopsin. The second is the recommended nutrient criteria for lakes and reservoirs. This was released in August 2021 for total phosphorus and total nitrogen to protect the following use assessments: aquatic life, recreation, and drinking water supplies. USEPA developed a statistical model that can be used with local data to develop nutrient criteria.

USEPA updated its application (app) for sanitary surveys for marine and fresh waters. The app helps identify potential pollution sources as well as monitor and share data on the potential for HABs. The survey includes a place to report a HAB bloom, including various observations and photos. The app also geolocates sites to connect to weather service information.

The Unregulated Contaminant Monitoring Rule (UCMR 4) was conducted from 2018 to 2021. More than 85,000 cyanotoxin samples were collected from 6,000 public water supply systems. Around one percent had detections in finished water for the four toxins. The data are used to inform future public health interventions to protect drinking water supplies.

The upcoming 2022 National Aquatic Resource Survey monitoring will include microcystin and cylindrospermopsin monitoring. USEPA is working to provide additional real-time reporting tools with the BloomWatch app if blooms are encountered in the field.

The Cyanotoxins Preparedness and Response Toolkit, published in March 2021, is an online interactive tool with resources for drinking water systems and water managers to prepare before a bloom event occurs. The interactive PDF also allows for an assessment after the bloom occurs. If a government unit or other entity does not have a cyanotoxin management plan, this tool can be a good starting point.

CyanoHAB story map was published in August 2021. The story map compiles incidents in freshwater reports across the nation and illustrates where HABs occurred over time since 2015.

USEPA conducted workshops and webinars in 2021. The USEPA HAB regional workshops summary report is for outcomes of the nine HAB workshops that occurred between 2015 and 2019. The USEPA Freshwater HABs newsletter for both fresh water and marine environments is now available.

OW is currently working on risk assessments for saxitoxins and nodularins. D'Anglada hopes the assessments will be ready for review at the end of 2021. They will be used to determine if there is adequate data for health advisories for drinking and recreational waters. Systematic reviews are also being conducted for microcystin, cylindrospermopsin, anatoxin-a, saxitoxins, and nodularin in fish and irrigation water.

USEPA and NOAA have developed separate, but coordinated, draft HABs and Hypoxia Event of National Significance policies for freshwaters (EPA) and marine/coastal waters (NOAA) in the U.S., as directed by the 2017 Harmful Algal Blooms, Hypoxia, Research and Control Act (HABHRCA). Once the Office of Management and Budget finishes reviewing USEPA's draft policy, it will then be released for public comment.

Nicole Manasco says the Corps is wrestling with occupational exposure to microcystin. The literature indicates it may be building overtime in our bodies and the Corps Districts do not know how to share the information responsibly with the workforce. Does USEPA have any guidance? In response, D'Anglada said that exposure to cyanotoxins is inhalation of aerosols. The issue is with available data, and there is not a lot of toxicity data for respiratory exposure. USEPA has asked the Office of Research and Development for more data to be able to provide guidance.

In response to a question about whether USEPA will ask states to adopt its nutrient lakes criteria, D'Anglada said that USEPA would like states to adopt its criteria for the protection of public health. USEPA is providing technical support and will host webinars to answer questions, and the agency may suggest other actions in the future.

USEPA Office Research and Development – Dr. Scot Hagerthey said his role with USEPA is as a coordinator for the Safe and Sustainable Waters Resources Research Program as well as the HAB and nutrient portfolios. Hagerthey overviewed the current research and what is planned for the immediate future.

The Safe and Sustainable Waters Resources Research Program's goal is to provide science and innovative technology needed to maintain public drinking water systems and protect biological, physical, and chemical integrity of the water. The Strategic Research Action Plan (STRAP) guides research for each focal area. The third iteration of STRAP will end in FY 2022. By the end of September 2022, the majority of HABs projects will wrap up and many final reports will be circulated from the third STRAP. The fourth STRAP will be in effect FY 2023 to 2026.

Hagerthey reminded participants that at the September 2020 WQTF meeting, Brenda Rashleigh detailed the ongoing HAB research. That included health effects on toxicity to humans and biota, specifically for microcystin congeners. The research pertained to toxicity studies for anatoxin-a and exposure to aerosols in waterbodies. The project is starting up again after experiencing delays due to COVID-19. Another area of research focus is on source and drinking water treatment and developing tools for treating and managing HABs in drinking water. The final focus area is related to HABs ecology to characterize bloom-impacted environments. The CyanNetwork, a collaboration with USEPA, NASA, NOAA, and USGS is used to identify HABs across the contiguous U.S. using satellite sensors. The sensors currently capture blooms in large water bodies. In 2021, ORD released the web application, and now the CyanNetwork is available as both an Android and web application. Historical data from the satellite data collection was used to produce status and trends of blooms for 2,000 lakes in USEPA's report on the environment. The data show long term trends and the number of blooms that occurred, broken down by

the magnitude, duration, and extent of the events. The report is a synopsis of the national picture of HABs, but it can be broken down to small scales (e.g., individual states) for further analysis.

Hagerthey said that for the four years, the planning process is underway. Research action plans and projects related to HABs are developed in close partnership with the OW, ECOS, ERAS, and tribal partners. Hagerthey and colleagues have compiled information on key problems to address with research and how best to deliver tools and resources. The planning process is in early development. Over the next two to six months, staff will work on specific research projects and further refine the research that will be conducted. The Biden-Harris Administration's priorities will be incorporated: climate changes and HABs from an environmental justice standpoint.

Research will look at two main issues for HABs: 1) human and ecological health effects and toxicity, and 2) the management of surface waters used for irrigation and drinking water. Common priorities identified so far include: 1) in-vito and vitro studies on toxicity of HABs to humans, aquatic life, and life dependent on aquatic life that can support health advisories; 2) advancing methods to detect and collect microcystin, cylindrospermopsin, anatoxin-a, saxitoxin and nodularins; 3) emphasizing research on benthic HABs; and 4) how to evaluate the efficacy of intervention processes to remove toxins from drinking water systems. USEPA is downsizing the amount of research on the ecology of HABs and shifting toward forecasting HABs. The intent is not to have a tool, but to build science to move in that direction. If states and other entities collect data on HABs, they can coordinate with USEPA staff such as Dr. D'Anglada. The data are important to understand and validate models and approaches.

The Safe and Sustainable Waters Resources Research Program website is continuously updated, and Hagerthey encouraged participants to check the site to stay abreast of reports and other content. Dr. Amy Shields asked if regional staff could coordinate with Hagerthey on participating in the planning process. Hagerthey replied that a regional representative will be on each coordination team and those people will be identified soon.

NOAA – Dr. Tony Marshak provided a written update on the work of the Interagency Working Group on the Harmful Algal Bloom and Hypoxia Research and Control Act (IWG-HABHRCA). The IWG is a Congressionally-mandated group that is tasked with coordinating and convening Federal agencies and their stakeholders to discuss HAB and hypoxia events to develop action plans, reports, and assessments to monitor, address, limit, mitigate, and assist communities with their own resilience to HAB and hypoxia events in U.S. coastal and inland waters. In 2021, the IWG completed the 2020 Great Lakes Report to Congress. The report can be accessed with the following link: https://cdn.coastalscience.noaa.gov/page-attachments/research/FINAL_HABHRCA_GreatLakes_ProgressReport_November_2020.pdf.
In October 2021, the IWG-HABHRCA Coordinated Planning Document will be finalized. The document includes information on:

- IWG summary of activities and deliverables, including highlights of past successful coordinated activities and planned efforts
- Member agency roles and responsibilities and priority areas for enhanced Federal agency coordination, research, and response to HABs and hypoxia (including HHENS)
- Future IWG coordination strategies for continued and improved efficiencies over 2021 to 2026

Additional involvement of the IWG and outreach activities are as follows:

- Working with the National HAB Committee to update the 2005 HARRNESS (Harmful Algal Research and Response: A National Environmental Science Strategy) Report

- Participation in the three-part webinar series hosted by USEPA, NOAA, and the Sitka Tribe of Alaska on Managing HABs in Tribal Waters

- Convening of the April 2021 Interagency HAB Preparedness and Response Workshop

- Interagency participation in the May 2021 US Army Corps of Engineers HAB Research and Development Workshop

- Continued development of parallel NOAA and EPA HHENS policies for public comment in the Federal Register later this year.

Cyanotoxin Mixture Models

Dr. Vicki Christensen provided background on Voyageurs National Park for participants to understand relevance to waters of the Upper Mississippi River Basin. Voyageurs is downstream from many wilderness areas (i.e., Boundary Waters Canoe Area, Quetico Provincial Park, and Superior National Forest) and receives water inflow from pristine areas. A waterbody of concern at the Park is Kabetogama Lake. The lake acts like a backwater area. Water levels are manipulated to improve water quality with rule curves to simulate a more natural regime. Parts of the shoreline have granite outcrops and others have lower lying areas with soils high in nutrients and mineral rich, containing higher pH and specific conductance.

Algal blooms have been observed since at least 1975 (coinciding with the Park's establishment), but they were likely present before then. Some of the blooms produce multiple toxins, which raises it as a human health issue. Christensen and her co-authors collected over 120 environmental samples including water chemistry, phytoplankton identification and enumeration, toxins, and molecular assays. Molecular assays show which cyanobacteria are capable of producing a toxin. Ultimately, the conditions must be right for toxin production.

The study sought to answer two questions: 1) which variables best predict toxins and exposure risk?, and 2) is a cyanotoxin mixture model better than a microcystin-only model? The USEPA Virtual Beach software was used to run a comprehensive microcystin model and a comprehensive mixture model. The study looked at over 60 parameters at least theoretically related to cyanobacteria. Some variables lagged, e.g., total phosphorus (TP) concentration four days before a bloom may have been more relevant. One site, Sullivan Bay, had more hits of microcystin in 2016 and more with saxitoxin in 2017. Christensen reiterated the importance of collecting data over multiple years and multiple toxins.

The first comprehensive microcystin model had one false positive and one false negative. A false positive means a beach was closed unnecessarily, and a false negative means a beach was not closed when toxin levels were elevated. This is a greater public health concern. The comprehensive mixture model had many of the same parameters and matched observed and simulated conditions well. The model had a false positive, but had no false negatives.

In summary, neurotoxins are good predictors of overall risk. The toxins do not peak at the same time as microcystin and may be present without visible blooms. Water temperature, specific conductance, TP water level, wind direction, and toxin genes were all correlated to toxin occurrence. A three-toxin mixture (i.e., comprehensive mixture model) appeared to be the better model, as it produced no false negatives.

Ganske asked if the model is still used for other applications and if it the input is intensive. Christensen said quite a few people use this for bacteria, namely *E. coli* or fecal coliform at beaches. This study is the

first use of the model for a mixture of cyanotoxins, which makes this model unique. Regarding sampling intensity, the harder part is setting up the model.

Environmental Factors Controlling Phytoplankton Dynamics

Giblin displayed a photo of the visual presence of algal mats and green water at L&D 4 in the middle 2000s during low flow years. The purpose was to detail how conditions on the river change related to discharge. The year 2021 was categorized as a medium discharge, although *Microcystis* and *Aphanizomenon* blooms occurred on the mainstem.

In the paper Giblin and Gerrish, 2020, the authors developed regression tree models to predict specific phytoplankton biovolumes. Each oval is a predicted biovolume of phytoplankton under different conditions, e.g., high TP and low N. The result would produce the volume of phytoplankton in comparison to low discharge conditions.

The dataset used for the regression tree analysis was from the Upper Mississippi River Long Term Resource Monitoring. The seven total sites, collected in 2009 and 2011, spanned main channel and backwaters in Pool 8 collected in 2009 and 2011. These two years offered a good mix of a high (2011) and low (2009) discharge and provided a full range of water quality conditions found along the river. Flow differences also led to significant nutrient differences: *Microcystis, Aphanizomenon,* and *Dolichospermum (anabaena)* were dominant in 2009 while *Pseudanabaena* and *Planktothrix* were dominant in 2011.

River managers should know the associated risk factors. Giblin and Gerrish produced overarching regression tree models that attempt to characterize that for river managers. The highest risks tended to be during low nitrogen and high phosphorus conditions at roughly 16 times the biovolume. Microcystin, for example, tends to be more dominant during high phosphorus and when temperatures are warm.

In a separate study, Giblin collected data in 2019 in Pools 5 and 8 to capture a combination of high and low nitrogen and phosphorus concentration across paired sites. He used a structural equation model and produced a table to address conflicting hypotheses on the drivers of cyanotoxin blooms. The model tested each driver and Giblin found that cyanotoxin and cyanobacteria problems were associated with the following conditions:

- High total phosphorus
- Low dissolved inorganic nitrogen
- High water temperature
- Low water velocity (flushing)
- High turbidity
- Low macrophyte cover
- Shallow water depth

Giblin displayed an aerial image at Trempealeau National Wildlife, which has opaque waters relative to the mainstem. The refuge is leveed off from the river and locked into a turbid, cyanobacteria-dominated state. Refuge managers have not been able to do drawdowns because of the high discharge in the mainstem, and, as a result, the aquatic bird habitat has diminished. TP has built up over time and

turbidity (caused by cyanobacteria) is beyond the level of allowing for any submersed vegetation to persist. Managers are looking at how to improve conditions within the refuge by reconnecting it to the main channel to flush the refuge water with cleaner, less opaque waters.

Ettinger recalled that the levees were intended to keep the refuge isolated from silt from barge traffic and to keep carp out. He asked if Giblin had a view of the relative advantages and disadvantages of the levees. Giblin said reconnecting the refuge to the mainstem needs to be well thought out, but in his opinion the positives of reconnection outweigh the negatives. TSS values are low in Pool 6. USFWS has its own priorities that it is considering. Ettinger asked if Giblin's research is applicable in areas further south on the UMR (e.g., Swan Lake near IWW confluence). Giblin is confident that the same drivers would apply downstream but has not conducted a separate analysis.

Water Quality Monitoring Plans

Missouri - Hoke shared that Missouri is working on its next five-year water quality monitoring strategy. Missouri's ambient stream monitoring program is run in conjunction with USGS and provides the foundation for 305(b) and 303(d) assessments. Not only are CWA assessments informed, but the data meets the needs of permittees. Now the state is at crossroads and finding greater needs for data to understand Missouri's nutrient loading leaving the Missouri and Upper Mississippi River Basins. Hoke hopes to hear from the other states about their monitoring strategy development.

Iowa – Kendall said Iowa DNR's current monitoring strategy runs from 2016 to 2021. The strategy spans multiple agency programs, but also sets up the agency for additional monitoring if new sources of funding arise. For example, a few years ago, a Congressional representative had additional money and Iowa DNR was prepared to utilize the funding to monitor additional lakes and streams. The next five-year strategy will be drafted soon. Developing the strategy is a big undertaking but shows the breadth of monitoring and where data gaps exist, especially related to criteria. Hoke agreed that the biggest data gap for Missouri is also for nutrients.

USEPA Region 7 – Steve Schaff said USEPA Region 7's monitoring strategy is also being updated. He believes Region 7 is the only region that develops a strategy. The purpose is to keep all the programs coordinated and ensure that monitoring support needs are met. The Biden-Harris Administration has clear priorities that are being incorporated into the monitoring strategy. The first is environmental justice and how to not bear a disproportionate burden on communities. Schaff said that the region has been monitoring urban streams and lakes for fish tissue to establish credibility as monitoring partners. A report will be compiled to guide where monitoring is going next in terms of whether the existing monitoring network should continue, and how the data are used and analyzed. Schaff hopes the data will guide the environmental justice component of the strategy. Climate change is another priority of the Biden-Harris Administration. Additional continuous monitoring for states and tribes are being proposed. Region 7 is working to get the data analyzed and in a useable format. Ettinger noted recent literature about HABs releasing methane and suggested this is an opportunity to learn more about the effects of climate change. Schaff replied he will look into this further. Big river monitoring is an interest of Region 7. All four states within Region 7 noted that there was a gap in big river data.

The Government Accountability Office did a recent audit of USEPA's HAB program and noted that there is not an established monitoring network or protocols. Region 7 has done some work with urban HABs at a smaller scale. Schaff recently conducted field verification of the satellite data produced for the CyanNetwork to see how predicted data line up with field observations.

There is also an effort underway by Region 7 to develop a biological condition gradient (BCG) for the primary ecoregions. Region 7 states identified a data gap of biology and habitat assessments. The agency is not likely to expand on the assessment until the BCG is complete.

Hoke and Kendall reiterated the importance of big river monitoring. The UMRBA Interstate WQ Monitoring is an example of the organization's interest to conduct routine monitoring. The Reaches 8-9 pilot is helping states figure out how to work together to coordinate logistics and resources, as did the previous Reaches 0-3 pilot.

Good asked if the Region 7 monitoring strategy is its own initiative or if USEPA headquarters has made the request. Schaff said he believe Region 7 is only one with a strategy, and it is specific to Region 7's goals and objectives. In response to a question from Good about Region 7 staff available for monitoring, Schaff said the region has a Field Services Branch. The Branch is tasked with additional monitoring in the case of a TMDL needing more information. This ensures the data are collected as needed to support program work of the Region 7 states or NPDES permitting.

CWA Program Updates

State Updates

Missouri – Hoke said for the 2020 303(d) list, 481 waters were approved for listing, 44 water were approved for delisting, and 40 waters were not listed due to lack of data. Missouri DNR and USEPA Region 7 have been going back and forth, and a decision was made in early September 2021. Fourteen of the 40 lakes had data age issues, 17 lakes had mistakes made by Missouri DNR, and the remaining nine lakes had data collected by USEPA. DNR is working on the 2022 assessments in order to meet next year's deadline for the 50th anniversary of the CWA.

For TMDLs, the branch has been working on *E. coli* for swimming impairments as well as metals. Staff are modeling a reasonable potential analysis using BATHTUB. The model looks at a watershed level and whether permitted facilities are driving the impairment.

Minnesota – Ganske said the 2020 list has been partially approved by USEPA. The 33 sulfate listings that USEPA added on Minnesota's behalf are not approved, including two segments of the Mississippi River and a floodplain lake near Prairie Island. The 2022 list will be released in November 2021. There will be more PFAS listings, including some lakes outside of the Twin Cities Metro Area.

Lake Pepin Excess Nutrients TMDL was approved on May 19, 2021. The TMDL is several decades in the making. The first impairment listing was in 2002. Some of the major reductions mentioned in the TMDL include the following:

- Twenty percent reduction in the Mississippi River at Ford Dam (L&D 1, Minneapolis)
- Fifty percent reduction in the Minnesota River
- Twenty percent reduction in the St. Croix River (previous TMDL)
- Fifty percent reduction in the Cannon River (previous TMDL)
- Twenty percent reduction in other tributaries
- Seventy percent reduction from previously permitted loads for WWTPs
- Fifty percent reduction of resuspension in Pool 2

Other plans approved in 2021 were the following:

- Shell Rock River Watershed Restoration and Protection Strategy (WRAPs) and TMDLs
- Kettle and Upper St. Croix River WRAPs and TMDLs
- Des Moines River Basin WRAPs and TMDLs
- Lac Qui Parle River WRAPS and TMDLs
- Lake Winona (Alexandria) Excess Nutrients TMDL
- Sauk River Chain of Lakes Excess Nutrients TMDL

Wisconsin – Mike Shupryt said the 303(d) list is out for 2022 is out for public comment and closes in early October 2021. Most listings are degraded biological communities from TSS and TP. The 2022 assessment proposes to delist a few waterbodies, and for the first time there are the same amount of TSS listings as delistings.

For TMDLs, the two-year monitoring effort for the Fox River and Des Plaines River TSS TMDL is wrapping up. There is the possibility of another TMDL in the southwest part of the state, draining into the Illinois River.

Illinois – Good said Illinois EPA received full approval of the 2018 report. Staff are working on a combined 2020 and 2022 report, which will include four years' worth of data. Good said Illinois EPA staff sent a new methodology document to USEPA Region 5 a few weeks ago and are awaiting feedback.

Some of the major changes to the methodology are to chronic standards, and not fully using fish consumption advisories. It usually takes two years of data to make or remove an advisory. Now, the agency is proposing to use any new data available to impair waters, no matter the time frame. Additionally, Illinois EPA will not identify potential sources of impairments. There were challenges identifying a cause, but staff will still list potential causes of non-attainment.

Another change in the upcoming 2020/2022 combined report is the use of continuous monitoring data from USGS super gages for 12 stream segments. The stream segments will be assessed for attainment or non-attainment for aquatic life use using the pH, DO and temperature data. Good said it has been challenging to use the continuous monitoring data because standards differ across super gages, the DO standard has early life stage and normal stage criteria, and there is instantaneous, 7-day, and 30-day components to the standards. Finally, Illinois EPA has staff capacity to use R for auto generate assessment and aesthetic quality use assessment. Good hopes this will streamline assessments moving forward.

Iowa – Kendall said the 2020 list was submitted, and staff are currently working on the 2022 list. Prior to starting 2022 assessments, Iowa DNR had initial meetings with USEPA Region 7 to adjust the agency's methodology related to bacteria. The original methodology included a single sample maximum on rivers and calculating the "greater than 10 percent rule" for violations in a three-year time period. The proposed change is to move to violations in a single year. However, 10 collections are required, and there is not enough data, as staff are only able to sample up to eight times in a single year. Iowa DNR and Region 7 are trying to figure out solutions. Kendall said staff will soon be able to run their auto calculator on the 2022 list, and then move towards writing the assessment. His hope is that the assessment will be finished efficiently since most of the process is automated.

Iowa DNR recently underwent some programmatic changes. TMDLs moved to the WQ Monitoring and Assessment section, which now includes water monitoring, 303(d), and wasteload. NPDES permitting is still in a different section.

Wednesday, September 29

Nutrients

The Best Places to Tackle U.S. Farm Nitrogen Pollution

Dr. Eric Roy described the purpose of his research. Accounting for environmental losses of nitrogen (N) in cropland systems is challenging because of the multiple pathways that exist. However, there is compelling evidence that N balance can serve as a proxy for N losses to the environment, including nitrous oxide emissions and nitrate leaching. The use of N balances in policy is limited in the U.S. but has had more widespread use in Europe. Previous research has focused on calculating N balances at different scales in the U.S. but knowledge on the underlying factors that contribute to surplus N use is lacking.

The purpose of the study was to assess N balances with agronomic, environmental, social, demographic, and economic factors. Data were focused at the county level for 2011 to 2013. Roy and his team used the International Plant Nutrition Institute Use Information System (NuGIS) and Census of Agricultural data. The data are outdated, but the approach could be used as new data come online. The Fertilizer Institute is now operating NuGIS, and data for 2017 will soon be available.

Using the county level mean N flows for 2011-2013, Roy et al. created three metrics: 1) total surplus N, 2) excessive N input, and 3) potential for improvement of N balance. For the first criterion, total surplus N for roughly 1,000 counties were screened and about 36 percent had more than 1,000 metric tons/year. Criterion two, excessive input, is defined as more N going onto croplands then is required for high yields. About 25 percent of counties are where N input seems excessive based on those definitions. The third criterion, potential for improvement, is the most interdisciplinary metric. Roy and his team created a hierarchical random effects model. They were particularly interested in counties with higher N surplus then the model predicted. That was for 25 percent of the counties. The three scores were added together to identify hot spots of opportunities. Twenty hotspots account for 63 percent of surplus N but only 24 percent of cropland area across the U.S. Hot spots could be the focus of future research to better understand the links between N balance and N losses to the environment.

The analysis also included differing excess N input for different crop types, or typologies. Using a model, Roy and his team, looked at relationships between increasing N input and increasing N harvesting in crops and where the relationship starts to breakdown. The national breakpoint is 175 kg N per hectare per year or roughly 156 lbs per acre per year. The analysis was repeated for each typology, and each has a different breakpoint.

The third criterion required a statistical model to predict N balance at the county level. Factors included operating expenses, population, precipitation, soils, and more. A positive correlation was found for N balance with operating expenses, population density, precipitation, and the following typologies: corn and soybean, wheat and soybean, hay, corn and soybean, and other crops. Negative correlations with N balance include climate change belief and policy support, soil fertility based on county-level properties, and participation in USDA programs (e.g., conservation programs). The areas where is N balance is much higher than the model predicted could be “low hanging fruit” in terms of making improvements in N management.

Roy shared his concluding thoughts that the study can serve as a useful tool to guide N management policy and programs. The results themselves are not just important, but the use of the N balance to look for opportunities on the landscape to improve WQ.

Ettinger noticed the hot spot in Wyoming and asked what is grown there. Roy replied that it is fertilizer use for wheat and alfalfa groups. NuGIS tries to account for fertilizer bought in one county and used in another, but that is not always successful. However, there is a cluster in Wyoming that supports the designation as a hot spot. Roy replied that it was an inherent assumption that crops were fixed, in response to a question from Ettinger.

Bennett noticed that urban counties had high rates of N inputs and asked what could be driving the pattern. Furthermore, how would this affect the recommendations and results of your study? Roy wants to dig deeper into the result. NuGIS does not account for biosolids, so there are no different inputs. Urban counties have less agriculture, but high N inputs would still show as high as they are modeled on a per acre basis. In response to a question from Bennett about whether the data include lawn fertilization, Roy replied that the dataset differentiates between farm and non-farm fertilizer. Ettinger asked if one farm in Cook County is using too much nitrogen, would it be considered be a hot spot. Roy said it would score high for the second criterion but not necessarily for the first criterion.

Ganske asked how Roy would describe the weakest links in the dataset or where he would have liked to have better data. Roy said with an analysis like this there are inherently a lot of assumptions e.g., fixed N amount for each crop, when in reality it can vary, or fixed manure content for an animal. It is always challenging when you zoom in on a particular spot, but the study serves to broadly categorize the criteria. Roy suggested if working in Minnesota, he would plug in Minnesota specific parameters.

Constructed Wetlands are Best Protection for Agricultural Runoff into Waterways

Dr. Amy Hansen said that "best" in her presentation title *Constructed Wetlands are Best Protection for Agricultural Runoff into Waterways* means the most cost effective at simultaneously reducing nitrogen (N) and sediment loads. The paper Hansen et al., 2021 was written in collaboration of many authors and institutions, in which they linked three watershed-scale models together to evaluate portfolios of BMPs across watersheds. The NSF grant included observatory funding source to collect field data and develop models for the Minnesota River Basin.

Some of the conclusions from observational data collection point to the need to understand how near channel and in channel processes work within a watershed. 1) hydrology is the primary driver of pollutant export, 2) near channel sediment sources (bluff and bank erosion) are significant storage of sediment and sources of releases during high stream flows, and 3) wetlands and lakes are significant locations of nitrate removal and reduce peak stream flows. Hansen and her co-authors linked three watershed models together because near channel and in channel process are not included in watershed (SWAT) models in conservation management. And, wetlands and lakes are aggregated at a sub basin scale, meaning there is less resolution for size and placement of the waterbodies.

Hansen et al. developed the AgRiver modeling framework. They still used SWAT to represent what occurs on the landscape. They exported hydrology and sediment information to a river network model to capture near channel sediment (called MOSM). Hydrology and nitrate data was exported into Nitrate Network model to capture processes like denitrification as function of nitrate concentrations.

The team created candidate landscapes or entire watersheds with a portfolio of field management and near channel management actions e.g., cover crops, fertilizer management, wetlands, ravines, bluff and bank stabilization. The landscape could take hundreds of actions and each landscape was averaged over a 10

year period to determine which landscapes were optimal for reduction nitrate, suspended sediments in a cost effective manner.

The modeling framework was applied to the Le Sueur River Basin in southern Minnesota and is located within the hot spot area three in Dr. Roy's presentation. The basin was chosen due to its high suspended sediment, N, and P loads. Eighty percent of the basin is used for row crop agriculture and is extensively tile drained. For reference, the policy targets determined by the Minnesota PCA are 65 percent reduction in sediment and 45 percent reduction in N. Spending across all stakeholder groups (landowners, state, federal, and local entities) in the basin from 2004-2017 was $4.3 million per year. These numbers can serve as reference points for the scale of change being considered.

Hansen and her team found that with a typical agency budget of $500,000 per year, management targets for N and sediment are allocated to a variety of practices. If the view is broadened to all agencies working within the basin and their combined budgets, you start to see wetlands emerge as being the management choice. Hansen added that the analysis is not concluding that other practices are not effective. Ravine, cover crop, bank stabilization, and others are all good practices and are effective at sediment and N reduction, but not as cost effective as wetlands at the watershed level.

The study next evaluated the placement of wetlands and whether there is spatial dependency of N and sediment reduction results. Hansen et al. looked at clusters of wetlands that meet load reduction targets. For field management, there was no strong spatial dependency i.e., their effectiveness is not strongly dependent on their location. In contrast, for fluvial wetlands (or flow through wetlands), there are few locations that stand out where wetlands should be placed. These are highly spatially dependent within the watershed and river network.

In conclusion, wetlands appear to be the most cost effective, but the cost of wetlands is high (e.g., routine dredging). Wetland performance is highly spatially dependent. Both conclusions point to a need of coordination and collaboration across a watershed. Hansen noted the limitation that the results may not be transferrable to other watersheds. The Le Sueur is a typical Midwest watershed, so she expects N results to be similar, but not necessarily for sediment. Furthermore, there are other variables that can be evaluated.

There is follow up research being conducted to look more broadly at the Upper Mississippi River Basin. The work is a collaboration with USDA, the University of Kansas, University of Missouri, Texas A&M, and The Nature Conservancy. The team will be improving model representation of near channel processes in SWAT models, adding fish population responses as endpoint, and creating a decision analysis tool to support stakeholder decision making. A second research project Hansen is involved with is seeking to understand whether the placement and configuration of a wetland average nitrate concentration or minimize nitrate load at the outlet. There is potential synergy to target one over the other.

Giblin asked how Hansen modeled residence time of wetlands. He asked if the number was generic, because if so, performance of nitrate and sediment removal would be variable. Hansen replied that within the published model, the residence time was based on the size of the wetlands. Because SWAT was used as the base model, the wetlands were aggregated to maintain volume and surface area, then she and co-authors used flow exceedance probabilities going back 40 years to estimate residence time of a wetland based on what flow conditions would be.

In response to a question from Ettinger whether cost effectiveness is based on the total cost to the operator or the total societal cost, Hansen replied total cost. The analysis did not break out who was paying. For example, with wetlands, the paper tracked lost revenue from taking land out of production, averaged over a ten-year period. The cost would be felt annually by the landowner, but an agency cost was also

included e.g., dredging and maintenance. Ettinger asked if stakeholders would need to transfer money to aggregate costs in practice so that the operator would install a wetland. Hansen replied that the question is outside of her expertise, and she is unsure how much money would pass hands. Hansen has observed that near channel environments may be optimal areas for wetlands are not being farmed anyway.

Ganske asked about transferability of the work to other watersheds. The Le Sueur has particularly active bluff and bank erosion. Is that a significant factor in this model? Hansen agreed that bank and bluff erosion is worse. However, there is a significant amount of incision and erosion throughout region. Hansen would not expect near channel sediment to be as dominant as over-field erosion in other watersheds. Publications show near-channel sediment sources could account up to 50 percent of its sources.

Karen Hagerty recalled that other studies show that legacy sediments are a primary course of with channel sediment. Did Hansen's study evaluate this? Hansen said the analysis is coarse in the analysis of the mobilization of bed sediment. It prompted her research team to incorporate an annual analysis of sediment load. Hoke noted his appreciation for the study because states often make decisions how best to spend limited funds. Heather Golden appreciated Hansen's presentation and cited her previous research looking at wetlands in the uplands and how they affect nitrate across the UMRB. Golden would like to incorporate cost analyses in future research. The article can be accessed via the following link: https://iopscience.iop.org/article/10.1088/2515-7629/ac2125/pdf

State and Federal Updates

Minnesota – Ganske reminded participants that Minnesota's State Nutrient Reduction Strategy report was published in August 2020. Over the next few years, Dave Wall will lead the effort to update the strategy, with a focus on water storage and multiple benefits. Key groups include renters, crop advisors, and food consumers.

The public notice for the Albert Lea wastewater treatment facility permit reissuance ends on October 4, 2021. The facility discharges to the Shell Rock River, and the permit includes phosphorus limitations. The 2021 drought year provided the opportunity to evaluate wastewater phosphorus limits as it relates to DO impairments in the Lower Minnesota River Basin.

Ganske reiterated that a lot of the nutrient reduction work is tied back to major watershed monitoring, assessment, and strategy development approach. Minnesota PCA organizes information around nutrient reduction needs and practices around the major watersheds and evaluates processes to see how projects align or do not align with downstream goals.

Illinois– Good said the third Illinois Nutrient Loss Reduction Strategy was released on September 16, 2021. Some highlights of the report include the contributions of the agricultural community. Approximately $27 million has been spent on non-federal or state cost share and $6.9 million on agriculture research. The point source (PS) community has implemented a lot of capital improvement projects. While there is a lot of activity going on in the state, nutrient levels are not being reduced. The baseline for nitrogen and phosphorus is from 1980 to 1996. The recent calculations indicated that between 2015 and 2019, nitrate-nitrogen increased 13 percent and phosphorus increased 35 percent, primarily driven by high discharge.

Illinois EPA secured additional funding to keep its eight USGS super gages running. Leftover USGS funds cover the gages until 2022, and Illinois EPA funding continues the gages until 2024. The gage at the lower Illinois River basin is being funded by the USGS NGWOS program and includes monitoring for phosphate. The other seven sites are funded by Illinois EPA until 2024 for nitrate and turbidity but

the parameters DO, pH, specific conductivity, and temperature were removed to reduce costs of operating.

Section 106 grants awarded in 2020 and 2021 were used to monitor downstream of the PS to determine "risk of eutrophication" and whether the PS is contributing. Illinois EPA evaluates as DO, pH, and chlorophyll data and if it appears there is a risk for eutrophication, then a Nutrient Assessment and Reduction Plan is added to the PS's NPDES permit. Illinois IEPA contracted with the Illinois State Water Survey to conduct the work for 16 sites.

Iowa – Adam Schnieders said Iowa has a new dashboard for reporting nutrient progress: https://nrstracking.cals.iastate.edu/tracking-iowa-nutrient-reduction-strategy. The dashboard can be used as a communication tool to the public and allows for the NRS authors to update the dashboard with new data as it is available. Schnieders appreciated the cross collaboration as Minnesota and other states served as resources for Iowa's dashboard.

The WWTP optimization efforts continue. The project includes looking at the existing design capacity to activated sludge treatment, which can lend itself to achieve nutrient reduction and energy savings by creating anoxic conditions within treatment process. The association of Iowa wastewater treatment operators and Iowa State University are partners. USEPA has also been a partner. The agency funded a six-week training for operators for Region 7 states.

Iowa continues to develop agriculture-urban partnerships to allow for cities to invest in watersheds. MOUs have been set up with Cedar Rapids, Ames, and Storm Lake, and an MOU is in progress for the City of Muscatine.

Iowa DNR and the Practical Farmers of Iowa received a USEPA farmer to farmer grant to develop cover crop seeds for public lands. Schnieders is happy that WWTP are being built and operated. The effort is a result of policies put in place in the state in 2015.

Finally, Schnieders says Iowa is awaiting more direction on the process to receive Bipartisan Infrastructure Law. He is excited to have more resources available for WQ. DNR staff are also trying to figure out how cities and counties will invest American Rescue Plan Act dollars. Schnieders would like to hear how other states are planning to utilize the funding.

Ettinger asked if Iowa is looking to adapt USEPA nutrient lake criteria, which was in part based off Iowa data. Schnieders replied that Iowa DNR is planning to set up a process to review the criteria, as they did with cyanotoxins. The scientific review will take place over the next year.

Wisconsin – Shupryt reviewed that in Wisconsin's latest update to its nutrient reduction strategy, the trends are similar: decrease in TSS and increase in nitrogen. There are Wisconsin DNR groups looking at tackling the nitrogen issues. There is a Pre-criteria group, which is tasked with assessing the state's readiness to pursue nitrogen criteria. Staff are looking at monitoring data to see if we are in position to start the process. A concurrent group is looking at regulatory procedures for voluntary or regulatory efforts down the road. The state is making a concerted effort to address nitrogen leaving the state.

Missouri – Hoke described Missouri's nutrient focused projects. Contractor Barr Engineering helped Missouri DNR quantify nutrient reductions from agriculture BMPs (e.g., cover crops, grassed waterways, ponds, and control basins) at a HUC-8 scale, using a control design. Missouri DNR will also use the information to guide a WQ trading framework.

NLRS revisions were originally published in 2014. In the current revision, DNR would like to develop PS and nonpoint source (NPS) baselines. The original strategy proposed total phosphorus effluent limits

for PS. The proposed rulemaking for WWTPs is for major permitted facilities that output more than 1 million gallons per day (MGD) for domestic and 1 MGD or 80 percent reduction of TP loading over the most recent five year set of data for industrial facilities. Hoke said that TP limitations work, as evidenced the improved WQ from permit limitations of 0.5 mg/L in the southwest part of state. Hoke believes a statewide effort will further improve WQ.

Now that Missouri is past court challenges for its lake criteria, DNR staff have moved on to full implementation of TMDLs. Hoke said his staff are looking at the watershed level to understand what reductions may be necessary for impairments that do not have a PS.

Schnieders asked if the P and N limits are a technology-based approach. Hoke confirmed the P limits are technology based, but DNR has not looked at nitrogen yet. Nitrogen is being addressed in some parts of the stat with TMDLs e.g., James River Basin. Regionalization could help improve WQ for WWTP. Hoke said the state is also excited about ARPA funding to help with those upgrades. Schnieders suggested a merged technology approach. It is more affordable in the long-term for WWTP to redesign for N and P simultaneously, especially for ammonia. Hoke agreed and appreciated the suggestion.

USEPA Region 5 – Bennett said at the regional level, the Region 5 states are involved in a project related to lake nutrient criteria to help predict dissolved organic carbon (DOC) across Midwest lakes. DOC is an input for several models, and the projects wants to improve how to define and select representative DOC values (as there is typically limited data).

Nationally, USEPA OW is working on a nutrient memo to highlight priorities.

Sydney Weiss shared updates on nutrient optimization training at WWTPs. Region 5 has solidified funding for optimization trainings. So far trainings have been held in Wisconsin in November 2020 focused on small mechanical plants, in Ohio in April 2021, in the Red River in June 2021, and Illinois in August 2021. Around 100 to 300 folks joined each session. Next steps are to bring remaining sates and tribes similar trainings, pending interest and funding. More information can be found at the following link: https://www.epa.gov/sites/default/files/2021-06/documents/blenker-sherry_potw_may_2021.pdf

Weiss said there has been general success from the workshops. The optimization is relatively low cost to the operator, and mostly experimental to look at changing existing practices to improve outputs. Schnieders endorsed the operator trainings and said the workshops were formatted and exceeded expectations. He encouraged others to take the opportunity. Weiss asked for input on what would be helpful to states following the workshops, such as how to build off of and improve upon the training. Schnieders said Iowa is looking to build off the momentum and expand the training with the state. DNR staff are reaching out to operators to ask them to engage with regulators, which can be a culture change. WWTP may default to following permit guidelines, but DNR wants to encourage them to thinking differently about treatment.

Chloride Technical Workgroup

Weiss introduced the Chloride Technical Management Workgroup (CTMW), which was formed to help states address their challenges meeting chloride related water quality requirements. Weiss framed the issue with chloride. It is a persistent pollutant, used ubiquitously, and perceptions and habits increase its use. For example, people drive during snowstorms and expect to see bare streets to feel safe commuting. States have different programs and limited resources. They also have different approaches and ways of permitting, which makes the problems hard to tackle. The challenge we face is how to share the strengths of each program to enhance solutions at the state and local level.

The workgroup brings together a variety of agencies and organizations to pool resources and share info, innovate, hold each other accountable, as well as leverage skills and experience to help each other. CTMW looks at different ways to address the issue with metrics, subgroups, partnering with academics, and holding brainstorm sessions. The group is looking to expand at the state or tribal level, and to bridge the gap from state and federal level to communities.

One current initiative is the Chloride Reduction Resources Clearinghouse. The mockup, housed by USEPA Region 5, would serve as a single source of chloride information with links to information and tools. An example of a tool is the Smart Salting Tool created by Minnesota PCA. The tool looks at ways to reduce salt use, and could be further expanded to water softeners, industrial, and agriculture practices. Weiss encouraged participants to contact her if they are interested in getting involved with the workgroup at weiss.sydney@epa.gov.

Ettinger commented that chloride standards have not been reviewed since 1989. Tim Elkins replied that USEPA HQ are working to update 304(a) criteria, and the workgroup Weiss co-leads is a creative approach to work on other chloride related issues. Good asked why chlorides are increasing everywhere. In response, Weiss said ultimately chloride is persistent in the environment. She reflected on the last salt symposium in which participants discussed salt application outpacing urbanization rates, lawsuits are on an upward trend, which translates to increased application to avoid liability. Additionally, as water softeners age, they become less efficient and use more salt. There has also been expansion in the use of lake houses, not historically used in winter. Other factors include climate change, more extreme weather events, and temperature flux. The State of New Hampshire provided an example of COVID-19 leading to less travel and a reduced use of road salt.

Hazardous Spills Strategic Planning

Mark Ellis coordinates the UMR Hazardous Spills group and works with USEPA Region 5 to develop the Inland Sensitivity Analysis for spill response planning. He provided an overview of the strategic planning process for the Hazardous Spills group. The group developed goals and objectives, including notification updates that could benefit the WQTF. The group maintains an email listserv used to notify members of spill events. This listserv could be used by the WQTF to spread word about HAB events, or model one the Task Force could set up for its own purposes. This may be one way to alert water intake operators about HAB events or other water quality concerns. Ellis said this offers a segue into the discussion topic to follow about HAB events and the challenges of alerting the public.

HAB Notification at Recreational Sites

Gregg Good shared the timeline of the UMR Pool 13 HAB event that occurred during summer 2021. In late July 2021, Corps staff were in the field near Savanna, Illinois in upper Pool 13. Staff noticed green water, obtained a sample, and results were 2.98 µg/L for microcystin and non-detection from cylindrospermopsin. On August 10, 2021, the water in Pool 13 was still green. The sample results were 14.1 µg/L for microcystin. Good said that in Illinois there is typically a county health department or lake association that can make notifications and place signs. At Starved Rock for example, there is a joint press release through Illinois EPA and the Illinois Department of Public health. In the Pool 13 example, Good was not aware of a local entity to contact or notify. Terlep noticed there is public sandbar called Santa Fe Beach located just upstream of where the detection occurred. How do you notify the recreators? Good did not think an Illinois EPA news release would reach the right audience. In the future when detections occur, where are the local recreation sites, who are the right people to contact, and how can we get a hold of them? The UMRBA HAB manual includes a communication list of state, federal agencies, public water suppliers, etc. There is not a comprehensive list of sites up and down the river. The Corps

has a document as well with select contacts and site information found via the following link: https://www.mvr.usace.army.mil/Missions/Recreation/Mississippi-River-Project/Recreation/.

Leo Keller recalled previous conversations with John Sullivan (retired Wisconsin DNR), who asked how to keep people safe and who was monitoring the river for HABs. While recreating Sullivan noticed many potentially toxic blooms in backwater areas and on the mainstem. Keller said in the case of the Pool 13 bloom, a HAB was noticed coincidentally, a sample collected, but now what? Who is going to take action, how do we keep the public safe, and who is responsible? The Corps has some campgrounds to post notifications, but that is the extent for the Corps. If it is not otherwise connected to WQ work of the Corps, then staff are limited unless already doing field work in the area.

Good said the notification of HABs via listserv that Ellis mentioned was a good idea. Ellis said checking email is a limitation, e.g., an event reported on Saturday afternoon and email isn't checked until Monday morning. Ellis suggested this group generate a list of publicly known recreation sites and build on the informal sites overtime. Furthermore, how widespread is the knowledge of the reporting tools? Good doubted that awareness is widespread, and liked Ellis' suggestion of building the list.

Good asked other states if their agency or sister agency has contact information for the river. Giblin said the recreation is so widespread, and there are numerous informal sites in a particular pool. In Wisconsin a lot of notification goes to the local health counties. LaLiberte said it is essential to reach out to the local public health agencies before there is an incident. However, many are very small and have a limited capacity to respond. She has seen cases for inland lakes in which DNR sends a report over, and the agency does have a response plan in place. Wisconsin DNR and the Department of Public Health Services offers support for social media messaging, templates for guidance, and closure signage.

Kendall said for Iowa a list of local sites would come from the county conservation board. Iowa's protocol is to post signage, but not to close beaches. For county or city beaches, posting notices falls into local jurisdiction. DNR works with the localities but cannot post DNR signage. Ellis asked who has the authority to keep river users out of an area. For oil spills, Ellis said the group relies on law enforcement. Good echoed that Illinois EPA also leaves postings to localities. Like with a fish consumption advisory, you can provide information but cannot prevent someone from consuming fish.

Kendall asked who will continue to sample when a bloom is found. It worked out that the Corps was out in the field to take a sample. Good mentioned that no follow up sampling was conducted after the August 10, 2021, sampling event. It is near impossible for Illinois EPA staff to conduct follow up sampling. That is why Illinois EPA has opted to build partnerships up and down the river, and to provide training and sample bottles to entities. Kendall said similarly for Iowa DNR, the Des Moines office staff would have trouble getting to river. The Bellevue field station could help, but an event may not be in close proximity.

Ganske said similarly to Wisconsin, Minnesota finds it challenging to target particular recreation areas. He said that the air quality index is monitored daily by Minnesota PCA, and the information has been utilized by media and other entities. Is there anything between site-specific monitoring advisories and general education that could forecast heightened risk or concern, and hope that over time it becomes something that gets updated daily so media and others could pick up the information? On the note of state programs and public information, Manasco suggested HAB education in boating classes to target people using the waterways. Then educators could point to resources within the state to check water conditions. Good suggested the Illinois DNR annual fishing resources as a way to reach recreators. The annual report also publishes fish advisories, and HAB information could be included. Manasco also suggested a weather service-like notification system that when a phone is in a specific area, they will receive a message through the national broadcast system.

Manasco asked if there is any way to get a survey out for field staff for each organization in the field. She understands the schedule will change, but there should be a way out figure out who is available to collect samples. We can work together as a comprehensive team.

The WQTF and participants agreed that next steps are to compile a list of recreation sites along the river, including the contact information of the local jurisdiction.

Administrative Items

Hoke welcomed topic ideas for future WQTF meetings. Giblin suggested an emerging contaminants presentation. He will forward USGS staff Steve Corsi's contact information and recommended tying Corsi's research with a staff person from USEPA's Office of Research and Development. That way the presentations can contain both research and regulatory components.

Hoke congratulated Good on retirement and thanked him for his contributions to the WQTF. Good said the WQTF has been fantastic to work with and thanked the group for collaboration. Good will return to Illinois EPA as a contractor in winter 2022 for a 75-day assignment.

Future Meetings

- The next WQTF meeting will be convened virtually January 25-26, 2022.

Attendance

Anna Belyaeva	Illinois Environmental Protection Agency
Gregg Good	Illinois Environmental Protection Agency
Tara Norris	Illinois Environmental Protection Agency
Alexandrea Terlep	Illinois Environmental Protection Agency
Daniel Kendall	Iowa Department of Natural Resources
Adam Schnieders	Iowa Department of Natural Resources
Lee Ganske	Minnesota Pollution Control Agency
John Hoke	Missouri Department of Natural Resources
Erin Petty	Missouri Department of Natural Resources
Robert Voss	Missouri Department of Natural Resources
Coreen Fallat	Wisconsin Department of Agricultural, Trade and Consumer Protection
Shawn Giblin	Wisconsin Department of Natural Resources
Gina LaLiberte	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
Aabir Banerji	U.S. Environmental Protection Agency, Office of Research and Development
Micah Bennett	U.S. Environmental Protection Agency, Region 5
Glenn Curtis	U.S. Environmental Protection Agency, Region 7
Lesley D'Anglada	U.S. Environmental Protection Agency, Office of Science and Technology
Peg Donnelly	U.S. Environmental Protection Agency, Region 5
Wendy Drake	U.S. Environmental Protection Agency, Region 5
Heather Golden	U.S. Environmental Protection Agency, Office of Research and Development
Scot Hagerthey	U.S. Environmental Protection Agency, Office of Research and Development
Ann Lavaty	U.S. Environmental Protection Agency, Region 7
Megan Maskimowicz	U.S. Environmental Protection Agency, Region 7
Tanya Nix	U.S. Environmental Protection Agency, Region 7
Chelsea Paxson	U.S. Environmental Protection Agency, Region 7
Steve Schaff	U.S. Environmental Protection Agency, Region 7
Amy Shields	U.S. Environmental Protection Agency, Region 7
Sydney Weiss	U.S. Environmental Protection Agency, Region 5
Aleshia Kenney	U.S. Fish and Wildlife Service, Iowa-Illinois Field Office
Vicki Christensen	U.S. Geological Survey, Upper Midwest Water Science Center
Jim Duncker	U.S. Geological Survey, Central Midwest Water Science Center
Kelly Warner	U.S. Geological Survey, Central Midwest Water Science Center
Jeff Houser	U.S. Geological Survey, Upper Midwest Environmental Science Center
KathiJo Jankowski	U.S. Geological Survey, Upper Midwest Environmental Science Center
Ingrid Gronstal	Iowa Environmental Council
Albert Ettinger	Mississippi River Collaborative
Doug Daigle	Lower Mississippi River Sub-Basin Committee
Jennifer Terry	Des Moines Water Works
Meghan Arpino	Stone Environmental
Jacob Mitchell	Stone Environmental
Amy Hansen	University of Kansas
Eric Roy	University of Vermont
Mark Ellis	Upper Mississippi River Basin Association
Kirsten Wallace	Upper Mississippi River Basin Association