

**Upper Mississippi River Basin Association
Water Quality Task Force
Virtual Meeting**

January 27, 2021

**Agenda
with
Background
and
Supporting Materials**

UPPER MISSISSIPPI RIVER BASIN ASSOCIATION WATER QUALITY TASK FORCE VIRTUAL MEETING

January 27, 2021

Agenda

Connection Information

- Web, video conferencing, click on the following link:
<https://umrba.my.webex.com/umrba.my/j.php?MTID=m03cd40c6f711bc4bed58c9d25cfc3ae9>
- Dial-in number: (312) 535-8110
 - o Access code: 126 180 7380
 - o Passcode: 1234

Time	Attachment	Topic	Presenter
8:00 a.m.		Welcome and Introductions	<i>Dan Kendall, IADNR</i>
8:05	A1-10	Approval of the September 22, 2020 WQ Task Force Meeting Summary	<i>All</i>
8:10		UMRBA Meeting Review • UMRBA Board-WQEC October 27, 2020 Quarterly Meeting • WQEC Strategic Planning	<i>Kirsten Wallace, UMRBA</i>
8:25		Interstate WQ Monitoring • Reaches 8-9 Pilot Update	<i>Dan Kendall, IADNR</i>
8:35	B1-3	Nutrients • Reducing Legacy Nutrients with Wetlands and Wetlaculture™ • Defining a Nuisance Algal Bloom • State and Federal Updates	<i>Dr. Bill Mitsch, FGCU</i> <i>Mike Shupryt, WIDNR</i>
	B4-5	• Nutrient References	<i>All</i>
9:50		Break	
10:20		CWA Program Updates • 305(b) and 303(d) Consultation • TMDL Updates	<i>All</i>
10:45		UMRR Water Quality Status and Trends	<i>Dr. KathiJo Jankowski, USGS UMESC</i>
11:15	C1	TSS in the Upper Mississippi River	<i>Pam Anderson, MNPCA</i>
11:40		HABs in Hazard Mitigation Plans	<i>Lauren Salvato, UMRBA</i>

(Continued)

January 27, 2021 (Continued)

Time	Topic	Presenter
11:50	Reflection	<i>All</i>
11:55	Administrative Items • Future Meeting Schedule	<i>All</i>
12:00 noon	Adjourn for the day	

ATTACHMENT A

Draft Summary of the September 22, 2020

WQTF Virtual Meeting

(A-1 to A-10)

Upper Mississippi River Basin Association Water Quality Task Force Virtual Meeting

September 22, 2020

Draft Highlights and Action Items Summary

July 22, 2020 WQEC-WQTF Meeting Summary

The UMRBA Water Quality Task Force (WQTF) approved the July 22, 2020 draft highlights and action items summary pending an edit to Missouri's TMDL update on page A-7.

Interstate WQ Monitoring

Lauren Salvato announced that the Reaches 8-9 pilot will resume on October 1, 2020 with fixed site sampling. Iowa DNR will be sampling at L&Ds 17 and 19. Missouri DOC will sample at L&D 21. PFAS will not be collected until the USEPA Region 5 laboratory contamination issue has been resolved. Dan Kendall added that Iowa DNR staff are currently trying to track down acids to preserve field samples before early October 2020 sampling.

For the drinking water use assessment, PWS participation was lost for two of the three participating groups. One agreed to resume in November, but the Reaches 8-9 Planning Committee do not see the value of one set of data to determine the condition assessment of two reaches. Salvato said she is trying to determine PWS participation in the recent Unregulated Contaminant Monitoring Rule cycle and which parameters were collected. The data may be useable for the Reaches 8-9 pilot. Salvato said the Reaches 8-9 pilot should consider follow up discussions with the PWS that did not resume sampling, as it can help improve communications for future efforts. Alternatively, there is potential for state agency staff to collect samples at the PWS intake stations, to ensure consistency in the sampling methodologies. Illinois EPA applied for additional Section 106 funding to cover the first three months of the pilot. There is no update on whether the funding has been approved.

For interstate water quality monitoring more broadly, Salvato said she had discussions with Pam Anderson and Shawn Giblin about reopening discussions on TSS as a supplementary indicator and the crossover between EMAP-GRE and LTRM methods. The plan is to have a technical session before or after the regularly scheduled January WQTF meeting. Anderson said the TSS as a supplementary indicator piqued the interest of the technical staff in her section. Macroinvertebrates are a key consideration in Minnesota for TSS criteria.

Cyanotoxins

February 2020 USEPA Region 5, 7, and 8 HABs Workshop Proceedings

Steve Schaff reviewed the conference's purpose to address HABs in agricultural dominated landscapes. The workshop hosted 170 attendees from 17 states and 2 tribes. While the proceedings are still being finalized, Schaff discussed the short- and long-term opportunities for 1) prevention, control, and mitigation of HABs and 2) funding, coordination, and collaboration.

Prevention, Control, and Mitigation of HABs (Short-Term):

- Encourage coordination and collaboration among agricultural partners and waterbody managers
- Develop a network of experts on mitigation of HABs to improve the selection and implementation of in-lake management practices
- Proactively incorporate HABs into other existing programs and plans
- Compile and document stories of successful HABs mitigation practices.

Prevention, Control and Mitigation of HABs (Long-Term):

- Develop tools to facilitate the selection of appropriate best practices based on local conditions
- Develop tools to assist waterbody managers in managing legacy nutrients
- Enhance and improve monitoring and analytical programs for HABs

Funding, Coordination, and Collaboration (Short-Term):

- Develop HABs-related educational materials and tools to aid in building multi-sector partnerships
- Develop strategies for building organizational capacity for leveraging funding sources

Funding, Coordination, and Collaboration (Long-Term):

- Increase cross-regional collaboration to improve HABs management
- Highlight funding opportunities and enhance grant skills
- Develop HABs workshops and materials specific to Tribal communities
- Improve access to funding for HABs programs and enhance flexibilities in those programs

Research needs include:

- Conduct health assessments for additional cyanotoxins of concern
- Develop and test new technologies for mitigating HABs at a variety of cost-scales
- Assess the economic impacts of HABs at the local and regional level
- Develop and enhance new tools to be incorporated into monitoring programs

Next steps are to develop a USEPA Region 7 HABs work plan, benchmark efforts with other regions, continue work with state and tribal partners, and engage with USEPA headquarters (HQ) and other agencies. In response to a question from Salvato, Schaff said the request for application is a large, HAB research driven opportunity. There will be three grants awarded of approximately \$2 million each. A 25 percent cost share will be required. Kendall asked whether a future workshop will be held. Schaff replied that there is no workshop being planned now, but would guess that a workshop may occur every third year. USEPA HQ received good feedback from the workshop. USEPA HQ provided the funding, and planning was a significant undertaking. Schaff requested that participants provide feedback to their respective USEPA division director, and they will move the message up the chain. Albert Ettinger asked Schaff to clarify what he meant by HAB activities. Schaff replied HAB activities range from installing barley straw in the inlets of streams to mitigate blooms to treating a lake with an algaecide.

Cyanotoxins in Large Rivers Across the US

Dr. Jennifer Graham said that cyanotoxins are commonly detected across the nation in lakes, reservoirs, small streams, wetlands, and large rivers. There is not a comprehensive assessment of cyanotoxin occurrence in large rivers, so Graham and her team began a pilot study in 2017. The objectives were to describe cyanotoxin occurrence in inland and coastal rivers in the summer. Some of the inland rivers include the Mississippi River, Missouri River, and Ohio River. Overall, cyanobacteria, cyanotoxin synthetase genes, and cyanotoxins were present at low concentrations through the pilot study areas and across the nation. Algal biomass, and occurrence and abundance of cyanotoxin synthetase genes were highest in the Midwest region. Next steps include incorporating summer 2019 data and to look at patterns across the years of collection as well as characterizing the physicochemical environment associated with toxins to understand the conditions that increase occurrence of the toxins.

Salvato asked whether Graham is involved in the USGS integrated water basin selection for the Midwest, hoping that the WQTF can work with Graham if the Upper Illinois River basin is selected. For background, the USGS is evolving its water resources mission area and selecting at least 10 HUC-4 watersheds to intensively monitor to determine assessment and forecasting objectives for its major water science programs. Graham said she does not have a big role, but has been involved in the discussions for the Midwest selection as the focus is on HABs and nutrients. She will likely be involved moving forward.

Giblin remarked that the patterns reported in Graham's paper are similar to Wisconsin DNR's data, and the years sampled were high flow years. He asked whether sampling will occur in low flow years. Graham replied that she looked at stream flow and it became evident that her research team needed to look at site specific level. When they did that they were surprised to observe an increased abundance in cyanobacteria in higher flows rather than low flows. It seems that we may be seeing transport and runoff from rain fall events. That finding has spurred a lot of discussion to capture that aspect (high vs low flow years).

In response to a question from Kendall regarding classifying the larger rivers by impoundments versus run of the river, Graham replied that they did a high level analysis and ultimately selected impounded sites. Ettinger recalled HAB events on the Ohio River in 2015 and again in 2019, and that Graham's dataset captures the years in between. He asked if she has sampling plans for the Ohio River in future years. Graham replied that she has not yet received 2019 data and noted that the field sampling site was below the area of the HAB event. Her research team is discussing how to balance future studies for HABs research where you need to understand ambient conditions but cannot fully understand a HAB until one occurs. She added she would appreciate input on designing and informing research strategies. Ettinger suggested the Starved Rock pool on the Upper Illinois River.

Schaff reflected on some numbers recited at the February 2020 HABs workshop. In the Great Lakes, the Toledo HAB affected the water supply of half a million people. The 2015 Ohio River bloom affected the drinking water source of five million people. How is the risk factor in large rivers versus other types of systems being addressed? Graham's short answer is no, USGS is not doing risk analysis for large rivers.

Giblin said that the USGS site in Hastings, MN is an unusual site where the water is fairly turbid. He asked whether a site below Lake Pepin or in the backwater areas has been considered. Graham does not have any plans to add a site at this time, but USGS is in the process of scoping some HAB-related research that may focus in large rivers. If USGS moves in that direction, those sites would be in consideration.

Gregg Good mentioned that Illinois EPA conducted a one-year large river microcystin monitoring effort in 2017. Forty-eight samples were collected at 15 sites on the Upper Mississippi River, Wabash River, Illinois River, and Fox River. The only "hits" of microcystin were on the Fox and Wabash Rivers, below 1 µg/L. During the 2020 HAB event on the Illinois River, microcystin levels were as high as 138 µg/L, and a week later were at 1.5 µg/L. The area where the Starved Rock pool HABs consistently occur are in

the impounded areas of the river. There are also super gages on the Illinois River and continuous monitoring sites. Both gages garner great data in support of temperature and nutrient levels when a HAB occurs.

What is Happening in Missouri Reservoirs When No One is Looking?

Dr. Rebecca North said that toxic algal blooms are increasing, which may be due to changes in factors believed to regulate algal growth: light, temperature, nutrients, and grazing. Winters are getting shorter, impacting the dimictic nature of lakes, and one research question is whether cyanotoxin production is happening during the cold, winter months. North's laboratory has consistent data throughout the year on reservoirs and lakes in Missouri to attempt to answer this question. Data are collected by 1) engaging youth through the Reservoir Observing Student Scientists program and 2) through volunteers in the Lakes of Missouri Volunteer Program. Results from the 1,434 surface water microcystin samples collected between 2017 and 2019 indicate that microcystin was detected 38% of the time measured. North focused on two case studies in Bethel Lake and Stephens Lake. Chlorophyll-a (chl-a) is expected to be highest in the summer, but there were no differences between summer and non-summer in any of the study reservoirs. There is a weak, positive relationship between microcystin and chl-a, and a weak, negative relationship between cylindrospermopsin and chl-a.

Revisiting the factors believed to regulate algal growth, North said that no relationship was found between light attenuation coefficient and microcystin nor cylindrospermopsin. Similarly no relationship was found between surface water temperature and the two cyanotoxins. For nutrients, a weak positive relationship was found between total phosphorus and microcystin, and a weak negative relationship between total phosphorus and cylindrospermopsin. These results leave more question than answers, such as which water bodies are most at risk? Where are cyanotoxins coming from? What factors regulate their growth and/or toxin production? One of our current major challenges is to figure out how we can predict and mitigate blooms and toxin production and protect human health.

Good asked North whether she uses a standard definition of an algal bloom. In response, North said she is not aware of a good definition. She is currently a part of a global effort to define a bloom, and it has been challenging to agree upon. Good asked how the risk to volunteers collecting algal samples is managed. North said that because volunteers are monitoring the same location, ideally they are not targeting algal blooms. Volunteers are provided gloves and a PVC sampler so they do not have to touch the sample. They are trained one-on-one by her laboratory's coordinator. The other precautions include filtering samples in their homes, away from food and open containers.

Ettinger said that USEPA's draft numeric nutrient criteria is based on national data, some which North's conclusions seem to contradict. North replied she is looking solely at Missouri reservoir data, which is hard to scale up to national assumptions. She agrees the common assumptions that high temperature and nutrient loading in waters is a recipe for an algal bloom and potentially a toxin producing one. She added that her data are unpublished and preliminary and she is planning to do further statistical analyses.

In response to a question from Kendall, North replied in 2017 that her laboratory purchased a YSI probe that measures phycocyanin and are using an adapted protocol developed by Iowa State University. Her laboratory is conducting research projects with the probe, not their larger scale projects. Giblin observed that North did not share anatoxin data results, and North confirmed most of the samples are below detection for anatoxin and saxitoxin.

Salvato asked whether the spikes in microcystin in Stephens Lakes were driven by fall and spring turnover. North clarified that most of the reservoirs in the state are monomictic and have an anoxic hypolimnion, but yes she believes the spikes are related to mixing events.

Regional Research and Management Questions

Salvato reviewed some of the research and management challenges posed by the WQTF. She requested that participants add to any of the challenges and welcomed Graham's perspective of challenges shared or different at a national scale.

- The differences in toxin prevalence in the five states
- Public understanding of algal blooms
- Communication and outreach for local and state agencies
- Reporting and documenting algal blooms
- Predicting algal blooms on the UMR (especially the backwaters) as well as inland waters

Kendall added that Iowa tested its beaches for cylindrospermopsin in 2019. The laboratory results had 17 hits, barely above the detection level and nowhere near the recreation criteria. Iowa DNR staff struggle with which tests to run. They recently decided to drop cylindrospermopsin analysis and remain focused on microcystin. Public understanding of HABs is relatively limited in Iowa. The lakes are mainly shallow, and citizens do not want vegetation so they can fish. Iowa DNR staff do well with communication. The HAB response efforts are based on lakes. One challenge is the time for data turnaround, which inhibits putting out a warning if the results are above the recommended recreation criteria.

Giblin echoed Kendall's comments. Wisconsin DNR has not observed a lot of cylindrospermopsin detections, but has for anatoxin. The anatoxin levels are relatively high in backwater areas of the UMR. He would like to see anatoxin emphasized more in research.

Anderson said Minnesota PCA is limited on HAB tools, mainly due to funding reasons. For example, remote sensing or other tools can help improve the predictive capabilities of HAB events. Minnesota PCA has a decent system in place for reporting blooms by phone and online. In a state with a lot of water, people care infinitely more about lakes than they do rivers. Anderson added that the agency currently samples for anatoxin and cylindrospermopsin, but does not have the budget to ramp up and add additional sampling. The State of Michigan is starting to get hits for cylindrospermopsin, believed to be caused by warming waters.

John Hoke said that Missouri has a HABs manual for interagency collaboration. They have made it easier for citizens to report HABs. From the monitoring perspective, the Missouri Lakes volunteer program monitors about 140 lakes for the presence of micro and cylindrospermopsin. In general, the samples will yield detections but generally none are above the recreation criteria. Robert Voss added that the State Lake Assessment Project collects samples for all four algal toxins on the lakes monitored. Within Missouri DNR there is response sampling as well, as part of the fish tissue monitoring. Typically, the elevated toxins are observed in the HAB response sampling more than the general ambient monitoring.

Cyanotoxin Resources

Salvato pointed to B11-26 in the agenda packet, cyanotoxin resources. The first article is the Government Analyst Office study on the federal response to algal blooms. According to USEPA, the scope of work is still in development. Salvato can provide periodic updates on the work. The next is HR 414, an amendment to the Robert T. Stafford Disaster Relief and Emergency Assistance Act. There is language to include HABs as a biological/natural disaster. If passed, FEMA funding would be available to address HABs as a major disaster.

Sterner et al., 2020 was a paper mentioned on the July 30, 2020 USEPA Region 5 HABs call. The authors observed algal blooms in oligotrophic Lake Superior and found that a factor in their presence is the buildup of phytoplankton biomass.

Partnering to Mitigate HABs was an effort funded by the North Central Region Water Network. The report released in fall 2019 makes messaging recommendations related to HABs based on the subject or audience.

Federal Updates

USEPA Region 5 – Micah Bennett noted a few items of interest including Regional Applied Research Efforts (RARE) grants through the research and development office. Bennett and Ed Hammer are working with Mike McManus, Office of Research and Development (ORD), to look at the Indiana Department of Environmental Management's stream network monitoring with nutrient concentrations. The work includes utilizing all the monitoring networks a state may have to predict nutrient concentrations. The tool can be used for other constituents as well.

Researchers at ORD, Jorge Santo Domingo and Aabir Banerji are looking at how cyanobacterial communities form and their succession processes. The researchers are looking for collaborators and data.

USEPA is offering state multi-purpose grants. Illinois EPA applied, and Bennett will let Good share what was included in their application. Bennett noted that for the other Region 5 states, Ohio EPA is revising its recreation sampling to look at cyanotoxin co-occurrence at beach sites. Michigan Department of Health and Human Services is expanding its outreach and public engagement. It may be worth looking at the activities in Michigan. Wendy Drake continues to hold Region 5 triannual HAB conference calls. Drake and Bennett would appreciate any input or comments/questions. Good said that Illinois EPA's application was to scale up its HAB program. One aspect is additional monitoring, training staff from the seven regional offices on collecting algal samples, and recruiting other partners. Leo Keller at the Army Corps Rock Island District said he would help collect samples as well as Dr. Jim Lamer at the Illinois Natural History Survey. Engaging Illinois EPA and partners will help mobilize and respond to HAB events. The grant, if awarded, would also fund the purchase and distribution of algal bloom test kits.

Anderson previously mentioned Toledo, Ohio, and Bennett said the city is receiving a State Revolving Fund loan to upgrade filters specifically for cyanotoxins. The CyAn app continues to be developed into a web based application in addition to the smart phone app. USEPA HQ continues to publish a freshwater HABs newsletter. Bennett said in future updates, he would like to include more of ORD's HAB research updates. There is a lot going on and it would be good to stay in the loop.

USEPA Region 7 – Schaff said that USEPA has a small business innovative grants program administered by ORD. A grant was awarded to AQUA, a company that developed an economical floatable sensor, called an algae tracking buoy. It was developed to be easily deployed in less than an hour and light weight (approximately 15 pounds). The ongoing costs for using the buoy is subscribing to data management services. Seven water quality monitors are collected and phycocyanin every 15 minutes, uploaded to the cloud. With the subscription service, AQUA analyzes the data and provides a report. USEPA will deploy their test buoy as early as late fall 2020. USEPA Region 7 staff are building up their technical capacity and uploading its laboratory equipment. An ongoing USEPA RARE is a joint project with USEPA Region 8 to evaluate urban HABs. The cities in the project include Kansas City, Denver, and Cincinnati.

Office of Research and Development – Brenda Rashleigh shared the following updates:

- USEPA Safe and Sustainable Water Resources strategic research action plan was recently completed and can be found online at: <https://www.epa.gov/research/strategic-research-action-plans-2019-2022>
- USEPA and Oak Ridge Institute collaborators published a paper in *Toxins* titled “The Comparative Toxicity of 10 Microcystin Congeners Administered Orally to Mice: Clinical Effects and Organ Toxicity.” The paper can be found linked here: <https://pubmed.ncbi.nlm.nih.gov/32570788/>
- The Cyan webpage has FY 2019 project activities and update: <https://www.epa.gov/water-research/cyanobacteria-assessment-network-cyan>
- The Next Gen Fertilizer challenge is a partnership between USEPA and USDA to advance agricultural sustainability in the U.S. More information on the two challenges can be found on the webpage: <https://www.epa.gov/innovation/next-gen-fertilizer-challenges>

In response to a question from Salvato regarding state engagement for ORD’s HAB research priorities, Rashleigh replied the research cycle is every four years. Typically, ORD works with the ECOS state representatives but there is always more room for understanding state priorities.

State Updates

Salvato asked the WQTF how often they want to update the UMRBA HAB Response Resource manual. The WQTF agreed to update the manual every second year.

Missouri – Regarding HABs and nutrients, Missouri DNR conducts event type sampling. Notifications come in through a complaint line for Missouri DOC and Department of Health and Human Services, or the emergency response line. Missouri DNR staff responded to a number of complaints during summer 2020, and fortunately most have not been toxin producing blooms.

Minnesota – Anderson said Minnesota PCA added a generic email inbox for HAB reporting. It added increased presence with about 45 notifications or complaints. In 2020, Minnesota did not have any reported animal illnesses or deaths. Minnesota PCA also developed recreational guidance values and made those available on a webpage for local government units. Anderson said she needs to follow up with the health departments and see if the criteria were adopted. Overall, Minnesota PCA did little monitoring this year, including for HABs.

Wisconsin – Giblin said, overall, blooms did seem more intense this year because of lower flow. Chlorophyll-a was higher than average in the main channel of the UMR.

Mike Shupryt said that Wisconsin DNR is developing algal criteria as part of a package for phosphorus. DNR staff came up with 20 microgram/L of chl-a (moderate). The assessment is the number of days exceeding the threshold. He said if the WQTF is interested, he can request that the Wisconsin DNR staff lead can present. He added that the criteria also have a social science component. The WQTF agreed to a presentation on this effort.

Illinois – Good said Illinois EPA has a new staff person starting October 1, whose duties will include assisting with HAB program development. The addition will bring Illinois EPA up to full staff capacity. He reflected that HAB events over the past five years and a dog death in summer 2020 made Illinois EPA staff feel there is much to improve on. Predictive tools are one such tool that would help.

Iowa – Kendall said Iowa DNR adopted the new microcystin levels proposed by USEPA in 2019. Even with the adoption, beach advisories were reduced for the season. The drought in western Iowa helped in that regard. As far as responses to HABs, Iowa DNR does not get a lot of reports. Citizens are accustomed to the lakes turning green.

Ettinger asked why Kendall mentioned that the drought reduced the amount of HAB events. Kendall said he believed the inputs were reduced. The number of HAB events seems to increase if spring is wet. He added it is not to say that blooms don't occur past the primary recreation season, and Iowa DNR does not monitor for those. Lakes were green this year, but toxin production did not occur as frequently.

Action Items

- **The WQTF agreed to update the UMRBA HAB Resource Response Manual every other year. The next update is scheduled for winter 2021-2022.**

Clean Water Act (CWA) Program Updates

State Updates

Missouri – Hoke said Missouri DNR staff are awaiting management approval to release the response to commons on the Regulatory Impact Report (RIR) document. The RIR estimates the environmental and economic costs and benefits of the proposed rule. Hoke estimates the proposed rule will be published for public notice in early 2021.

Minnesota – Anderson said Minnesota PCA staff are working to upload 2020 data into the ATTAINS database. It has been challenging since the site was reconfigured. Her staff are also awaiting a decision from Governor Walz's office on how to proceed with the 2020 list, and if wild rice will be included.

TMDLs are completed in watershed segments. There are 41 ongoing TMDLs, and the only one that drains to the Mississippi River is the Shell Rock River. All of the other TMDLs are in the Red River basin.

More than half of the watershed plans are complete (55/80).

Wisconsin – Shupyr said there are ongoing TMDLs in different phases that affect the UMR. The Wisconsin River TMDL was recently approved. Wisconsin DNR staff analyzed total phosphorus trends and found they are decreasing, due to point source improvements. The Fox River and Des Plaines River TMDLs are both in the monitoring phases.

Illinois – Good said Illinois EPA will have the 2018 report submitted by October 2020. Agreement has been reached with USEPA Region 5 for partial approval on 2008, 2010, 2012, 2014 and 2016 reports. USEPA Headquarters is helping Illinois EPA populate the ATTAINS database. Good said the 2020 and 2022 reports may be combined, as they are delayed on the 2020 report.

Iowa – Kendall said Iowa DNR is still working on the 2020 303(d) list, and the 2018 list has been approved by USEPA Region 7. Kendall does not anticipate any changes on the Upper Mississippi River mainstem. One thing Iowa DNR staff are looking to change is not using data that does not occur in a particular segment. Historical impairments are based on upstream data but moving forward, only data that occurs within a segment will be used. He added this will be challenging on the UMR, as Iowa has different river segments than the other states it borders.

Regarding TMDLs, there is a state wide beach TMDL in place. However, the TMDL only applies to three beaches due to its data requirement.

Nutrients

State Updates

Missouri – Missouri DNR has completed the 2020 NLRS update. The comment period for the strategy update will be advertised soon.

Minnesota – Anderson said Minnesota’s five-year progress report will be released soon. Katrina Kessler confirmed it would be released on September 23, 2020 in conjunction with the state’s water report, focused on climate change. There is a strong link in the data to changes seen in precipitation and flow.

Anderson said Minnesota PCA had a feedlot general permit comment period that recently closed. The general permit includes restrictions on land application in the fall of manure and prohibits solid applications in late winter. The permit is getting a lot of attention. On September 1, 2020, restrictions are in place for nitrate application in the fall, in areas known to have groundwater vulnerabilities. Giblin requested that Anderson share a map of those areas.

Illinois– Good announced that Trevor Sample is taking over as Illinois’ Nutrient Monitoring Council committee chair.

Iowa – Schnieders provided a variety of nutrient related updates.

- The fall HTF meeting is upcoming on September 30-October 1, 2020.
- The Iowa Nutrient Research Council recently approved 11 research projects. The project information can be found at the following link: <https://www.cals.iastate.edu/inrc/projects>.
- In 2020, IIHR and Iowa DNR have installed 38 new sensors.
- Three RCPPs were awarded in Iowa in FY 19-20, representing millions of dollars put towards on the ground conservation practices.
- The Iowa Watershed Approach continues to work in the nine identified watersheds to reduce flood risk, improve water quality, and build resilience.
- The U.S. Economic Development Authority awarded a grant to Iowa Falls to invest in flood protection measures for its public water supply, wastewater treatment, and local businesses.
- The Water Quality Initiative (WQI) had open application periods for its highest levels of funding. As a reminder, SF 512 was passed by the Iowa legislature in 2018 to allocated \$282 million to WQI projects over the next 12 years.
- USEPA and NRCS continue to offer financial assistance for source water protection initiatives in Iowa.

Administrative Items

Future Meetings

- The next WQTF meeting will be convened virtually January 27, 2021.

Attendance

Gregg Good	Illinois Environmental Protection Agency
Amy Buckendahl	Iowa Department of Natural Resources
Katie Greenstein	Iowa Department of Natural Resources
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
Angela Falls	Missouri Department of Natural Resources
John Hoke	Missouri Department of Natural Resources
Erin Petty	Missouri Department of Natural Resources
Chris Wieberg	Missouri Department of Natural Resources
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
Micah Bennett	U.S. Environmental Protection Agency, Region 5
Ed Hammer	U.S. Environmental Protection Agency, Region 5
Mari Nord	U.S. Environmental Protection Agency, Region 5
Jason Daniels	U.S. Environmental Protection Agency, Region 7
Ann Lavaty	U.S. Environmental Protection Agency, Region 7
Venessa Madden	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
Brenda Rashleigh	U.S. Environmental Protection Agency, Office of Research and Development
Jennifer Graham	U.S. Geological Survey, New York Water Science Center
J.C. Nelson	U.S. Geological Survey, Upper Midwest Environmental Science Center
Kelly Warner	U.S. Geological Survey, Central Midwest Water Science Center
Albert Ettinger	Mississippi River Collaborative and Sierra Club
Rebecca North	University of Missouri
Lauren Salvato	Upper Mississippi River Basin Association
Kirsten Wallace	Upper Mississippi River Basin Association

ATTACHMENT B

Nutrients

- **Abstract: Sustainably Reducing Legacy Nutrients in Landscapes with Wetlands and Wetlaculture™** *(B-1 to B-3)*
- **Article: US Rivers are changing from blue to yellow and green, satellite images show (12/31/20)** *(B-4 to B-5)*

SUSTAINABLY REDUCING LEGACY NUTRIENTS IN LANDSCAPES WITH WETLANDS AND WETLACULTURE™

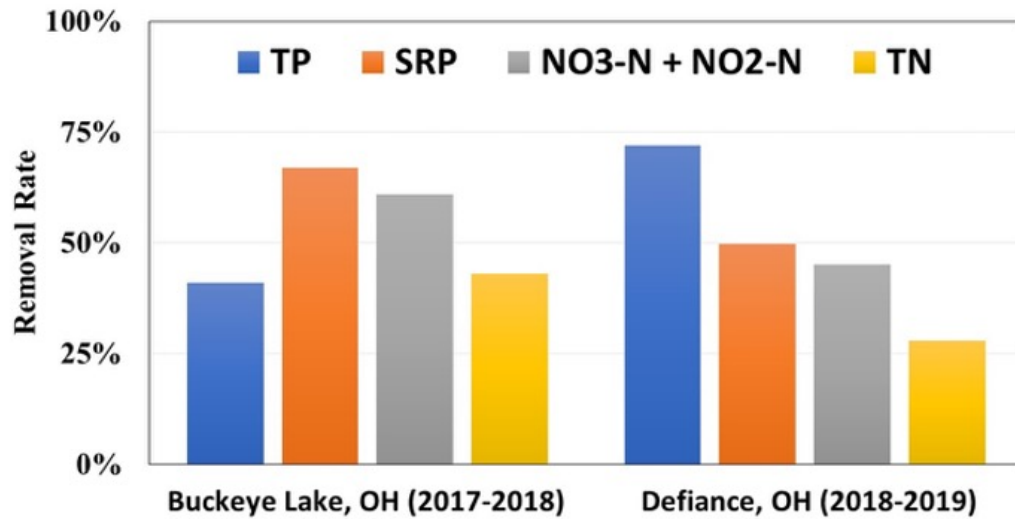
William J. Mitsch Ph.D.

Everglades Wetland Research Park, FGCU, Naples, FL; School of Environment and Natural Resources, The Ohio State University, Columbus; School of Geosciences, University of South Florida, Tampa, FL

Humans have caused both landscape change and climate change, leading to ecological calamities around the world in freshwater and coastal waters. Harmful algal blooms (HABs), more common and wicked because of excessive and non-stop fertilization and runoff from farms and urban areas, are accelerated by increased water temperatures. We have also changed our landscapes by draining wetlands that could help with nutrient retention and carbon sequestration. The world has lost 87% of its wetlands, with half of that loss occurring in the 20th century alone. Wetlands have been demonstrated to be effective nutrient sinks for long periods and at very large scale of 20,000 ha or more. One hundred thousand acres of treatment wetlands, both in the Florida Everglades and in the former Great Black Swamp adjacent to western Lake Erie have been recommended as sustainable solutions for harmful algal blooms in those regions. A nutrient recycling approach applicable to landscapes around the world called wetlaculture™ (wetlands + agriculture) could help solve downstream nutrient pollution problems while decreasing the amount of fertilizers added to landscapes. We have established in 2016 to 2018 field physical model replicated wetland mesocosm compounds, two in temperate Ohio and one in subtropical south Florida, for estimating the amount of time needed for wetlands to accumulate nutrients before flipping the land to agriculture. Published results show significant nutrient retention by the wetland mesocosms in Ohio. More recent studies have shown promising corn production when these nutrient-rich wetland are converted to commercial crops. In addition, our early business model suggests that farmers could make profits comparable to crops by receiving payment for ecosystem services (PES) coupled with public environmental impact bonds sold to investors.



Mesocosm compound planted with bulrush (*Schoenoplectus tabernaemontani*) at beginning of its fourth growing season at Buckeye Lake Ohio in spring 2020. Eight empty mesocosms in lower right and back have just been flipped from wetlands to drained conditions and corn planting. No external fertilizers are ever applied.

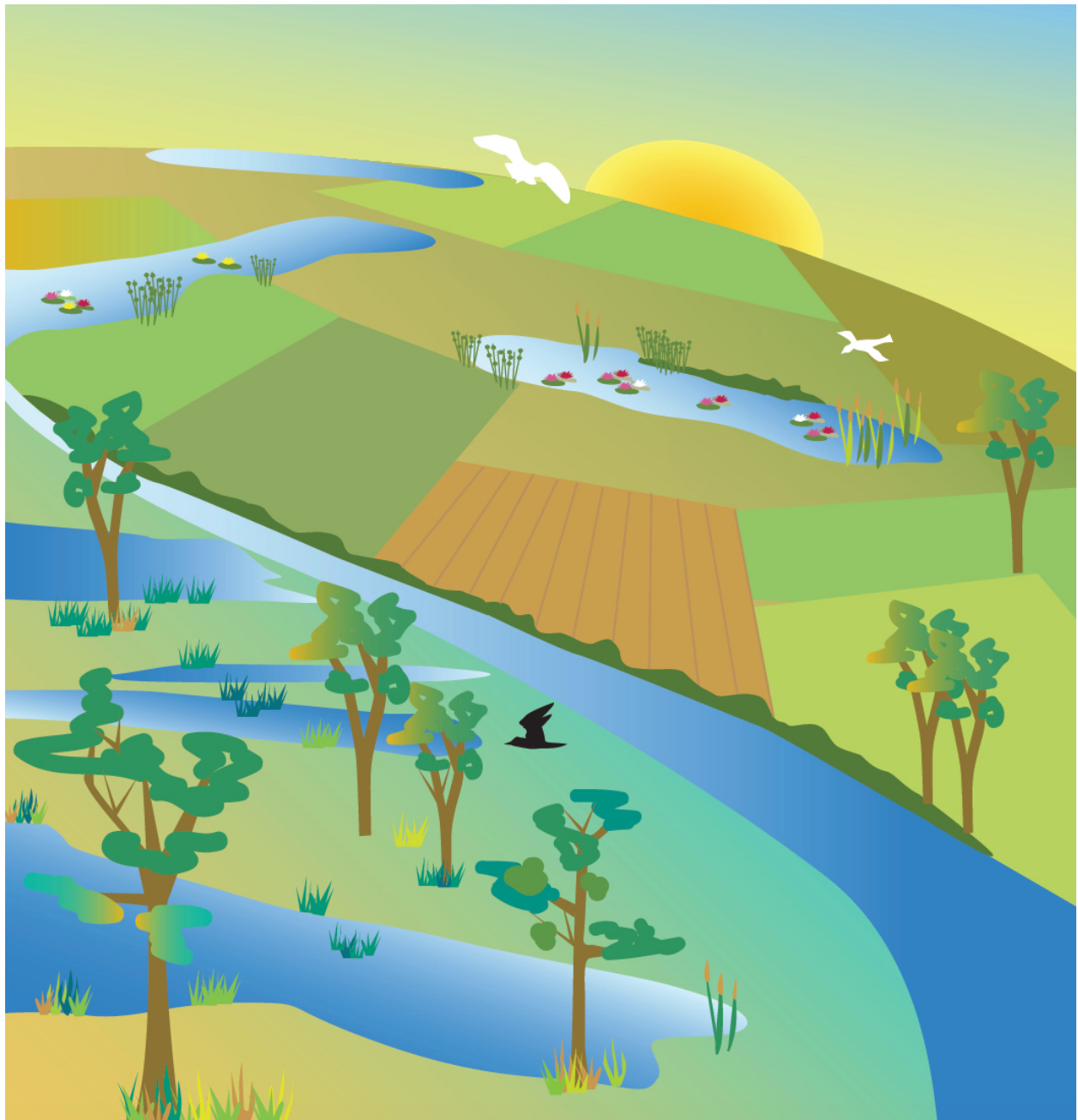


Nutrient Retention in Two Experimental Mesocosms

Two mesocosm experiments with results of first phase—small-tub wetlands are created with flooded soils, wetland plants, and application of known amount of water each week during the growing season



Corn biomass and production in late August 2020 in some of the eight mesocosms at Buckeye Lake flipped to corn in spring 2020



Sketch of potential diverse landscape pattern in wetlaculture™ treatment areas with rotating wetlands and agriculture fields

<https://www.livescience.com/us-rivers-changing-color.html>

Live Science December 30, 2020

US rivers are changing from blue to yellow and green, satellite images show

By Harry Baker - Staff Writer

Satellite images reveal color changes in rivers across America.



Parts of the Mississippi River have turned more blue-green over time, researchers have found. (Image: © Sergio Mendoza Hochmann via Getty Images)

A third of U.S. rivers have significantly changed color over the last 36 years, turning from blue to yellow and green, striking new images reveal.

Researchers analyzed 235,000 satellite images — taken over a 34-year period between 1984 and 2018 — from NASA and the U.S. Geological Survey (USGS) Landsat program. The changing hues can be viewed in an [interactive map](#).

More than half of those satellite images showed rivers with a dominant hue of yellow, while more than a third of images were mostly green. Just 8% of river pics were mostly blue.

"Most of the rivers are changing gradually and not noticeable to the human eye," lead author John Gardner, a postdoctoral researcher in the global hydrology lab at University of North Carolina, told Live Science. "But areas that are the fastest changing are more likely to be man-made."

Rivers can appear to be shades of blue, green, yellow or other colors depending on the amount of suspended sediment, algae, pollution or dissolved organic matter in the water. As a general rule, river water turns green as more algae blooms, or when the water carries less sediments. Rivers tend to turn yellow when they carry more sediment.

"Sediment and algae are both important, but too much or too little of either can be disruptive," Gardner said.

Assessing trends

In total, the researchers collected 16 million measurements over the 34-year period on the 67,000 miles (108,000 kilometers) of rivers in the U.S. that are more than 197 feet (60 meters) wide. This allowed them to track significant trends in color change over time.

More than half of the rivers, or 55%, varied in color over time, but with no clear trend over time. A third changed color in that time period, and only 12% had a constant color.

In the North and West, rivers tended to become greener, whereas the eastern regions of the U.S. had a trend toward yellow rivers. Larger waterways, such as the Ohio basin and Upper Mississippi basin, also moved to blue-green.

"Big trends to yellow or green can be worrying," Gardner said, but added that "it depends on the individual river."

Just as leaves turn red and gold in fall, rivers can also change color with the seasons, thanks to changes in rainfall, snowmelt and other factors that change a river's flow.

The satellite images did reveal hotspots where human influences, such as dams, reservoirs, agriculture and urban development, may be changing the color of some rivers.

But these changes aren't necessarily permanent.

"You could totally see these trends going back in the other direction," Gardner said, "especially if the change is occurring due to local mismanagement that is easily fixed."

Monitoring river health

Although river color can't give precise numbers for water quality or ecosystem health, it is a good proxy for both of these things. Thanks to satellite imaging it is also much easier for scientists to measure color than water quality.

"It is a very simple metric, which is integrating so many things," Gardner said. "But it can be used to identify areas that are changing really fast."

From there, scientists could figure out what's causing the change, he said.

More research is now needed to determine just how accurate river color is at determining ecosystem health and which changes are important to monitor.

The researchers' findings were published Dec. 6 in the journal [Geophysical Research Letters](#).

Originally published on Live Science.

ATTACHMENT C

Total Suspended Solids (TSS)

- **Fact Sheet: Upper Mississippi River TSS TMDL Fact Sheet (Minnesota PCA) *(C-1)***

Upper Mississippi River TSS TMDL fact sheet

- **The report**, known as a total maximum daily load (TMDL), is specific to Total Suspended Solids (TSS) in three reaches of the Upper Mississippi River that are on Minnesota's 2018 list of impaired waters: from the Swan River to the Willow River; the Willow River to the Pine River; and the Pine River to the Crow Wing River.

- **Past monitoring efforts** identified TSS, or specifically sediment, impairments within these reaches of the river. This TMDL is a follow up study stemming from the Upper Mississippi River Monitoring and Assessment Report.

- **The dominant source of sediment** within this TMDL study area is nonpoint sources, in particular bed and bank erosion of the finely grained, easily erodible Glacial Lake Aitkin/Upham clay deposits. Past ditching in peatlands has resulted in a significant amount of altered watercourses in the study area.

Consequences of altered watercourses can include channel instability characterized by bank erosion and riverbed alteration, and increasing the amount of water in downstream reaches. Land use conversions near the river channel also contribute sediment through greater soil erosion from physical trampling of the banks from livestock, less stabilization of the soil from shallow rooted plants, more areas of exposed soil, and more concentrated runoff. Watershed runoff and regulated wastewater and stormwater sources contribute a small fraction of the total sediment to this part of the Upper Mississippi River.

This TMDL report will help guide local, state, and federal partnerships to develop and implement strategies to minimize sediment impairments, including:

- Land conservation through easements and acquisition.
- Working with landowners to exclude livestock from direct access to riverbanks.
- Riparian buffers and filter strips along riverbanks.
- Stormwater best management practices.

Swan River to Willow River

Willow River to Pine River

Pine River to Crow Wing River

