Nutrient Monitoring Council

Meeting Minutes
Thursday, Sept 14, 2023
9:00 a.m. – 11:30 a.m.
Via Zoom

Meeting Summary

Welcome and Introductions

Trevor Sample, Illinois Environmental Protection Agency
Trevor welcomed the group and read through the agenda. Joan asked everyone to put their name and affiliation in the chat.

USGS nutrient load update Summary

Jim Duncker, United States Geological Survey
Jim Duncker filled in for Kelly Warner to give us an update on USGS nutrient loads and research, highlighting five-year averages of nitrate and phosphorous for 2018-22. He emphasized the selection of the Illinois River Basin for the USGS Integrated Water Science (IWS) basins. He highlighted various USGS water science programs, including the Next Generation Water Observing System (NGWOS), Integrated Water Availability Assessments (IWAAs), and Integrated Water Prediction programs, which are providing the observations, understanding, predictions, and information delivery necessary for sound decision-making. He touched on the new technology for detecting harmful algal blooms and shared data on HAB occurrences at Starved Rock. He introduced FLAMe trips, which monitors a range of water quality parameters. The session also covered the exploration of historical HABs on the Illinois River through language processing of newspaper articles. Jim mentioned USGS' involvement in the NSF program, the NEON Challenge, which is an ecological forecasting competition. He explained more about the Integrated Water Availability Assessments and spoke about efforts to better define HABs, exploring new metrics and early warning indicators. Jim ended by talking about the national dynamic SPARROW modeling of surface water nutrient loads.

Which Experiments, Measurements and Analyses Should be Done to Quantify Causes of TP Load Increases in Illinois Rivers?

Greg McIsaac, University of Illinois
Greg reviewed changes in total phosphorous loads in the Illinois River Basin, looked at other Illinois Rivers like the Little Wabash and Kaskaskia, and lead discussion around possible causal factors and how to quantify their impacts on river phosphorous loads. He ended with some suggestions for research. He suggested an examination of statewide land cover to land use relationships to subwatershed P yields; an examination of monthly phosphorus loads to evaluate seasonal variation; an examination of trends in zooplankton, algae, and dissolved oxygen; an investigation of sediment to iron ratios; and lab, mesocosm, or incubation experiments to examine whether adding nitrate, chloride, or sulfate might change the phosphorus release from the sediment.

Illinois EPA Harmful Algal Bloom Program Update

Alex Terlep, Illinois Environmental Protection Agency
Alex shared IEPA's Harmful Algal Bloom monitoring and how to report a bloom. She highlighted some bloom events from this year and shared the sample results. Alex informed us about the IEPA's new Phycotech kits. Lastly, she shared the brand new HAB Dashboard and links to more information about

harmful algal blooms. She encouraged the council to report blooms throughout Illinois through the online form.

Illinois River Biological Station Monitoring on the Illinois Waterway

Sara Sawicki, Illinois Natural History Survey

Sara shared the various long term resource monitoring programs administered through the Illinois River Biological Station (IRBS), and include water quality, fish, and macroinvertebrate monitoring. She also discussed Multi Agency Monitoring, Long-Term Survey and Assessment of Large River Fishes, and invasive carp harvesting on the Illinois and Mississippi Rivers. She ended by mentioning a little about the Emiquon Preserve and sharing the extent of the IRBS's presence on the Illinois Waterways.

NMC Member Updates

Joan Cox announced that the annual Nutrient Loss Reduction Strategy Conference will be Thursday, January 25 in Springfield with the option to join virtually. Greg McIsaac announced his retirement as a member of the Nutrient Monitoring Council and was thanked for his service. Cindy Skrukrud announced that the Army Corps of Engineers has drafted a plan to remove nine dams from the Fox River, which should help to improve water quality. Trevor asked the group if they would like to return to in person meetings and encouraged anyone who has updates for the council to reach out to him.

Meeting Minutes

In attendance: Erin Bauer, Illinois State Water Survey; Amanda Christenson, University of Illinois Extension; Dan Christiansen, United States Geological Survey; Joan Cox, University of Illinois Extension; Rachel Curry, University of Illinois Extension; Dave D; Paul Davidson, University of Illinois; Chris Davis, Illinois Environmental Protection Agency; Jim Duncker, United States Geological Survey; Luis Garcia, United States Geological Survey; Nicole Haverback, University of Illinois Extension; Vlad Iordache, Illinois State Water Survey; Gary Johnson, United States Geological Survey; Shibu Kar, University of Illinois Extension; Laura Keefer, Illinois State Water Survey; Layne Knoche, Illinois Extension; Jim Lamer, Illinois Natural History Survey; Jong Lee, University of Illinois; Mila Marshall, Sierra Club; Greg McIsaac, University of Illinois; Brian Metzke, Illinois Department of Natural Resources; Shawn Meyer, Waterborne Environmental; Tom Minarik, Metropolitan Water Reclamation District of Greater Chicago; Raelynn Parmely, Illinois Farm Bureau; Colin Peake, United States Geological Survey; Amy Russell, United States Geological Survey; Trevor Sample, Illinois Environmental Protection Agency; Sara Sawicki, Illinois Natural History Survey; Lindsey Schafer, United States Geological Survey; Cindy Skrukrud, Fox River Watershed; Rachel Sortor, United States Geological Survey; Alex Terlep, Illinois Environmental Protection Agency; Judith Thomas, United States Geological Survey; Justin Vick, Metropolitan Water Reclamation District of Greater Chicago; Michael Woods, Illinois Department of Agriculture; Zhongjie Yu, University of Illinois.

Welcome and Introductions

Trevor Sample, Illinois Environmental Protection Agency

Trevor Sample with Illinois EPA began by welcoming everyone to the Nutrient Monitoring Council meeting. Joan acknowledged the Illinois Extension Team, Layne Knoche, Amanda Christenson, helping with minutes and technology.

USGS Nutrient Load Update

Jim Duncker, United States Geological Survey

Jim Duncker presented the 2018-22 five-year averages of nutrient loads from Illinois' major rivers relative to the 1980-96 baseline. The Illinois River measurements showed an 8% reduction in nitrate-

nitrogen, the Embarrass a 15% reduction, and the Vermilion a 25% reduction. The Kaskaskia showed a 118% increase in phosphorus, the little Wabash a 101% increase, and the Illinois river a 22% increase. See presentations for the full results. There was above average flow during the 2016-2020 period.

Jim explained the role of USGS Integrated Water Science (IWS) Basins and the contributions of various USGS water science programs to decision-making. He discussed the Next Generation Water Observing System (NGWOS), Integrated Water Availability Assessments (IWAAs), and Integrated Water Prediction programs, are providing the observations, understanding, predictions, and information delivery necessary for sound decision-making.

Jim discussed expansion of super gages in the Illinois River Basin and the introduction of new technology for HAB monitoring. Starved Rock is one of the primary test bed sites. Continuous monitoring and new technology are used in HAB monitoring and to improve the understanding of what triggers HABs and the production of toxins. Nutrients, suspended sediment, selected metals, *chlorophyll a,* and other indicators of bloom conditions, as well as cyanotoxins, taste and odor compounds are monitored. They are working to identify phytoplankton and periphyton in communities.

The 2022 harmful algal bloom preliminary data was presented, emphasizing the event at Starved Rock in 2021. At that event they noticed phycocyanin concentrations peaked at the upstream station near Seneca and then again with the transport of that bloom downstream near Starved Rock and further downstream towards Henry. 2-Methylisoborneal (MIB), Geosmin, and taste and order compounds were elevated during the event. Cyanobacteria were dominant during the visible HAB, and diatoms were dominant during non-HAB events. Widespread rainfall occurred and washed out that bloom. While they have seen similar conditions and been prepared to capture additional events, they have not seen any bloom events at Starved Rock in 2022 or 2023, which demonstrates that they do not fully understand the driving mechanisms of harmful algal blooms.

Jim also spoke about FLAMe trips. FLAMe stands for fast, limnological automated measurements. It is a float with a continuous flow-through water quality testing system that they can mount on a small boat. These flow through setups are measuring nutrients (N, P, C), major ions, dissolved CO2, methane, carbon isotopes, dissolved organic matter, chemical characterization, PFAS, pharmaceuticals, and algal community. They have run five of these FLAMe trips across different seasons and flow conditions to provide comprehensive water quality data on the large reaches between super gages, which helps fill gaps in information. Data analysis will be forthcoming.

As part of the NGWOS program, they are also looking at groundwater contributions of nutrients to streams from shallow groundwater. The two test beds are in Davis, Indiana near the Headwaters of the Kankakee River and near Quiver Creek, a small stream near Havana, Illinois. These sites are equipped with the equivalent instruments of a super gauge, except for in a groundwater setting. They are monitoring groundwater flow rates, flow directions, and groundwater quality in the zone close to the stream bed. Simultaneously, they are monitoring the Kankakee River and Quiver Creek using equivalent types of super gauges to be able to make comparisons of the ground and surface water datasets. Testing should reveal nutrient contributions coming from streams and groundwater.

Jim delved into the research on HABs in the Illinois River Basin including the use of newspaper articles to trace their history. He noted that with a large study area, this type of regional assessment can reveal information that was not documented through normal channels.

USGS is participating in a National Science Foundation (NSF) program, the NEON Challenge, or National Ecological Observatory Network Challenge. Many university groups are participating in efforts to forecast

HABs. The goal is to expand ongoing thirty-day chlorophyll fluorescence forecasting work. His USGS team in the Illinois River Basin is currently in first place. Jim shared data from the long-term database from by Kathi Jo Jankowski in the La Crosse office who is evaluating average winter chlorophyll concentrations in different habitats.

The HABs research community is aiming to define how harmful algal blooms and to develop or follow a standard approach when defining HABs. One of the approaches is to compile state level HAB guidelines and explore the use of routine and novel metrics for identification, and then explore early morning indicators. This is being applied at seven sites in the Illinois River Basin to demonstrate the application in rivers. There has been previous work on HABs in lake settings but very little work in at the river in settings. Thus, the narrowed focus to that riverine setting.

Jim showed some work from Sarah Stackpoole on the indicators for harmful algal blooms, demonstrating what is being sampled and analyzed in the labs for both recreational purposes and drinking water. Jenny Murphy and Noah Schmadel are investigating *chlorophyll-a* concentrations as a proxy for algal biomass and looking at how transport affects the growth of a bloom. He shared some of their data. Noah's work is quantifying effective mass and tributary inputs, as well as when and where growth is occurring.

The IWAAs are working with the Illinois State Water Survey and Daniel Abrams group to look at assessing the domestic water supply. They will use some new information from the national dynamic SPARROW modeling of surface water with total nitrogen and phosphorus to get a complete modeling suite based on regional information. Then, they will incorporate it into regional water availability assessments.

Discussion summary:

- Question (Greg McIsaac): At what water depth Does the FLAMe Project collect data?
- Answer (Jim Duncker): The intake is about 6 inches to a foot below the bottom of the vessel. It is a near surface sample and there are about 30 sites from between Chicago and Grafton that we stop and collect discreet samples following our typical USGS sampling protocol.
- Comment (Trevor Sample): He reiterated that at the beginning of the presentation the brown bars are the most recent data from 2018-22, and that we are seeing for the first time now. He is interested in what the overall statewide nitrate and phosphorus loads and stream flow yields are for the same period. He explained that the new data will not appear in the 2023 Biennial Report coming out in December since they just came out. We will have to see what statewide numbers look like once the team is able to refine them. Trevor thanked Jim for filling in for Kelly Warner, and for presenting on short notice.
- Question (Cindy Skrukrud): The Fox River Study Group is interested in the Fox River inputs of chlorophyll and algae to the Illinois River. She asked whether Noah was the contact to talk with about this.
- Answer (Jim Duncker): Yes, Noah or I can have a more detailed conversation on this.

Which Experiments, Measurements and Analyses Should be Done to Quantify Causes of TP Load Increases in Illinois Rivers?
Greg McIsaac, University of Illinois

Joan introduced Greg McIsaac, professor emeritus at the University of Illinois. Greg collaborated with Tim Hodson and others at the Illinois State Water Survey and the University of Illinois Ag and Biological Engineering to identify factors contributing to increased phosphorus loads in the Illinois River.

He posed the question about which experiments should be done to understand the causes of Total Phosphorous (TP) load increases, who would conduct them, and who would fund them. Greg presented data from the Annual Nutrient Loads at Illinois EPA Ambient Water Quality Monitoring Network Sites, Water Years 1976–2021 by Tim Hodson. These data were based upon the discrete sampling at the traditional sites, not the super gauges continuous monitoring dataset. Both discrete sampling and super gauge data sets showed an approximate 26% increase of phosphorus above baseline. The Little Wabash Rivers' total phosphorous load increased by over 100%. A significant difference was observed in the Kaskaskia River, jumping from 49% to over 100% increase in TP loads. Greg believes this might be due to the location of the super gauge at New Athens, which is 796 square miles further downstream than the sites used for discrete sampling (Venedy Station). The super gauge may be picking up more phosphorus from that additional drainage area.

Across most major rivers, except for the Green River, there has been an increase in the dissolved phosphorus (DP) to total phosphorus (TP) ratio. Potential contributors include:

- Conservation Practices: There is reason to believe adoption of conservation tillage practices, in which there is less incorporation of phosphorus fertilizer into the soil, may be a factor. Plot level data show higher levels of dissolved phosphorus and lower levels of suspended solids and PP in runoff.
- Drainage Tile: Expansion of tile drainage could also be a factor.
- CAFOs: Greg mentioned that in their paper they discussed concentrated animal feeding operations, in which there can be more concentrated applications of manure.

The study on was a collaboration between Greg, Tim Hudson, Momcilo Marcus at the Water Survey and Rabin Bhattarai, and Daniel Kim in the Ag and Bioengineering Department at U of I and was undertaken to identify locations and quantify factors contributing to increased phosphorus loads in the Illinois River at Valley City. Funding for this research was from Illinois Nutrient Research and Education Council and U.S. Geological Survey. He highlighted that Chicago and the upper part of the basin have the highest yields. The lower mainstem shifted from being a phosphorus sink to a source, accounting for 78% of the increased load at Valley City.

Some of the other changes noticed were that almost everywhere there was an increase in dissolved phosphorus, a reduction in particulate phosphorus, and reduced suspended solids. At some locations, mostly in the upper part of the basin, there was an increase in chloride concentrations that propagated down to Valley City. Greg shared a map showing the changes in TP yields from the 1989-96 period to the 2015-19 period. Results show:

- The TP load increase in the Illinois River at Valley City was 6 million pounds per year increased load and 78% of that increase came from the lower mainstem subwatershed.
- There were some other increases, such as in Kickapoo Creek, which is east of Bloomington where there has been a population increase. This seems to be more of an increase of impervious area because increased peak flows were correlated with increased particulate phosphorus.

- A suburban area by West Chicago and Warrenville is where there is another increase in TP, along with a marked increase in population and wastewater treatment loading.
- A large reduction occurred at Thorn Creek at Thornton where combined sewer overflows are now being diverted to the tunnel and reservoir system and subsequently treated as wastewater before being discharged into the river system.

Of these results, the big question now is how to explain why the lower mainstream shifted from being a phosphorus sink to being a source.

Greg presented data from 1989 to 2000 showing phosphorus yields were initially negative but later showed positive yields. This shift coincided with increases in DP, reduced nitrate, and increased chloride. While they did not investigate correlations with CAFOs, zebra mussels, or carp, He noted that the rise of zebra mussels and carp in the late 1990s might be linked to this shift.

Greg's graph indicated that when the TP load at Valley City exceeds 100% of incoming P loads, the lower mainstem becomes a phosphorus source. Greg's said a simple explanation could be that as more of the incoming phosphorus is in a dissolved form, it is less subject to deposition in that lower mainstem, which is extremely flat and is essentially a series of lakes. He then showed a graph which demonstrated a correlation was found between chloride concentrations and the DP to TP ratio upstream, while reminding us that the correlation does not prove a cause-and-effect relationship. A study in Chesapeake Bay also observed phosphorus release in sediments with chloride, but the reason remains unclear. A multi-national study highlighted chloride's negative impact on zooplankton, potentially leading to increased algal abundance and fluctuating dissolved oxygen levels. Greg's paper focused on annual loads, excluding continuous monitoring data.

Greg has done some analyses since then, and the data had two outlier periods in the daily average Ortho-P concentrations at Florence, just downstream of Valley City. The highest concentrations were measured in spring of 2015 after a lagoon failure at the Beardstown hog slaughterhouse. Also, high concentrations were measured after May 2023. When those two outlier periods are excluded, a plot of the daily average of Ortho-P concentration as a function of nitrate concentration shows that the highest concentrations of Ortho-P occur when there is a low concentration of nitrate. That typically occurs in the summertime when there is low flow and more anaerobic conditions in the sediment. That is where denitrification and low redox potential occurs in the sediments, which also promotes phosphorus release from sediments.

A 2000 textbook diagram depicted organic matter decomposition pathways, suggesting a mechanism connecting reduced nitrate and sediment phosphorus release. Greg referenced studies where nitrate added to lakes decreased phosphorus or phosphate release from sediments, hinting at potential experiments for the Illinois River. A thorough literature review may indicate whether similar experiments in the Illinois River are warranted.

Nitrate concentrations in Valley City and Florence have decreased since 2000, possibly due to efficiency in nitrogen fertilizer use by Illinois farmers. Average nitrogen fertilizer quantities applied to corn flattened out around 1990, with a small increase in recent years, based upon USDA surveys. Illinois has produced more corn per unit of nitrogen fertilizer, and less of it may be getting into the river. Nitrate-N load reductions are seen in many of the tributaries. He showed a chart of the twelve highest nitrate-yielding subwatersheds from 1989-95 with ten of twelve tributaries going to the Illinois River. When

comparing 1989-95 to 2015-19 nitrate-N yields, eleven of twelve subwatershed yields declined, except for the Sangamon at Fisher. These declines are not all related to changes in water yield. There are also several subwatersheds with increases in water yield and decreases in nitrate-N yield. Some subwatersheds had very small reductions in water yield and yet substantial reductions in nitrate yield. One of the surprising observations about the Illinois River nitrate is that it never goes to 0. It is always measured in the water column and not in the sediments. By comparison, in many of these tributaries during the summer low flows, there is very little to no nitrate measured in the water column.

Belgium lab incubations found high phosphorus to iron ratio linked to phosphorus releases during low sediment oxygen levels. Similar patterns might be observed in the Illinois River. Could we see a similar relationship between nitrate concentrations and TP concentrations at the Kaskaskia River at Carlyle downstream of the reservoir? This might happen in the summer when we deplete the nitrate supply. Then what happens with that released phosphorus? Does it just sit there or transform? Does it feed algae and/or does much of it get washed out once the flows increase? For the Little Wabash watershed, there is a 100% increase from the baseline period. The Little Wabash River at Effingham, which was not included in some of our earlier studies for the Nutrient Loss Reduction Strategy, had phosphorus yields averaging as high as 6 or 7 kg per hectare per year. This is similar in magnitude to the yields that are coming out of Chicago. These yields are almost all particulate phosphorus which suggests that it is more of a surface erosion or channel erosion issue. This is downstream of Effingham where there has not been much increase in population, but there has been a lot of increase in commercial development and impervious areas that are increasing peak flows. Seasonal nitrate and phosphorus load analyses are essential, especially considering the varied phosphorus types in different river sections.

In conclusion, the focus is on understanding phosphorus load changes in Illinois' rivers and determining causal factors. Greg proposed potential research areas ranked relative ease of accomplishing. These include:

1. Examine statewide land cover and its relationship to land use. Assess how these relationships impact river phosphorus loads.
2. Investigate the influence of factors such as livestock and tile drainage. Evaluate monthly phosphorus loads to determine seasonal shifts. Check for phosphorus release from sediments during summer and subsequent washout in fall and spring. Investigate the frequency of conditions that produce low dissolved oxygen in sediments. Determine if extended periods of low flow and elevated water temperatures are driving seasonal shifts.
3. Study trends in: Zooplankton, Algae, and dissolved oxygen. Consider any past measurements to identify shifts over time that might explain changes in phosphorus release or loads.
4. Investigate the ratios of sediment phosphorus to iron. Utilize past measurements if available.
5. Conduct experiments in labs, mesocosms, or incubations to examine the effects of adding nitrate, chloride, or sulfate on phosphorus release from sediments.

Discussion summary:

- Comment (Jim Duncker): I want to point out that the NGWOS program is working with Jim Lamer and Sara Sawicki at Illinois Natural History Survey (INHS) who are on this call. We are looking at the Long-Term Resource Monitoring (LTRM) datasets for trends in zooplankton, algae, and dissolved oxygen in the lower river. LTRM data goes back to 1980. I believe that Kathi Jo

Jankowski has been talking with Sara and others at the INHS. This work fits right in with the research directions Greg is proposing.

- Comment (Greg): Yes, it would. Is that trends research trying to connect with changes in phosphorus loads?
- Comment (Jim): It needs discussion, and I would like to connect them with you.
- Comment (Greg): Yes
- Comment (Rick Manner): For the last two items on the research list, should iron be added?
- Comment (Greg) Yes, that could be another treatment. These are things I believe could help us understand what is happening. Somebody else will need to do the work. Who will do it? I might like to be involved, but I do not have the background to lead that kind of a study.
- Comment (Joan): Sara Sawicki mentioned that she believes Kathi Jo is working on the total phosphorus total nitrogen analysis from the LTRM data.
- Comment (Sara): I do not know too much about what exactly she is analyzing because it is ongoing and is not finished. I believe Jim Dunker said that we have recently met with Jenny Murphy and Heather Krempa about HABs, so we are starting to collaborate more in terms of nutrients and algae.
- Comment (Joan): Sara will be giving an overview of the Illinois River Biological Station monitoring after our break today.
- Comment (Jim): I can help make those connections and start those conversations.
- Comment (Greg): I spent a little time looking at the long-term data. As Jim said, there are concentrations in different parts of the river reach. The challenge is how to connect that up to the river loads. That would be challenging, but interesting, work.
- Comment (Trevor): It looks like there are a lot of things going on around this. It is just matter of coalescing it and deciding what we want to study first. If any members know of available funding or have funding for a project that could be part of this, let us know. Greg and I will start talking with USGS folks first based on this discussion today. Please email Trevor or Greg if you have any ideas about the research, who could do it, and the funding. We first started this research effort with original Strategy and investigated loads. Now we are trying to get more sophisticated and figure out all the mechanisms that are causing this. We are fortunate to have the USGS NGWOS projects in the Illinois River Basin. We will continue to work on this and figure out the new research directions. Andrew Margenot's group is investigating stream bank erosion and we look forward to those results in another year or two. Thank you everyone for working on this issue. We will be in touch and keep trying to move this forward.
- Comment (Joan): Greg can be reached at gmcisaac@illinois.edu, and Trevor can be reached at Trevor.sample@illinois.gov.

Illinois EPA Harmful Algal Bloom Program Update
Alex Terlep, Illinois Environmental Protection Agency

Joan welcomed everyone back from break and introduced Alex. Alex Terlep is an environmental protection specialist with the IEPA's Bureau of Water, Surface Water Section. She coordinates the Illinois EPA's harmful algal bloom (HAB) program. Alex mentioned that she and her coworker, Erica Becker put together the presentation.

First, she gave some history of the HAB program. Illinois EPA has been monitoring waters for a very long time, but the HAB program is relatively new. At the beginning in 2013, they were only collecting microcystin samples and by 2021 they were also collecting cylindrospermopsin, anatoxin-a, and saxitoxin. The HAB program consists of two parts, routine monitoring, and event response. Routine monitoring sites are chosen at the beginning of the year, including public water supply intakes, lakes, streams, lake beaches, and some areas in Lake Michigan. Event response investigates suspected cyanobacteria blooms.

Routine monitoring sites are chosen due to the proximity to public water supply intakes. All samples in streams, rivers, or sites associated with the public water supply are tested for all four toxins. Routine monitoring also occurs in our lakes and beaches, at those sites they collect microcystin, cylindrospermopsin. Illinois EPA will also go to the water treatment plant and collect samples from the untreated and final treated water. If toxins are detected in the treated water or in public water supply, they will go back out and perform follow-up sampling, if necessary.

HAB event response investigates potential or suspected cyanobacteria blooms in publicly owned water bodies. Annually, they collect about 50 to 65 event response samples from water bodies throughout the state of Illinois, which includes some blooms being sampled five or six times during a year. Harmful Algal Blooms are reported in a variety of ways with some water body managers reporting directly to staff and some being discovered by staff during routine sampling. The preferred method for reporting, however, is the bloom report form located on the IEPA HAB website.

The Illinois EPA Bloom report form is easily accessible either on a computer, a tablet, or your phone. They request that the public fill it out with as much information as possible, including contact information, GPS coordinates, landscape and close-up photos, bloom description, color, odor, proximity to public access, timing, and comments. They also ask if they know of any human or animal illness, or deaths associated with the bloom. If the person selects yes, once the form is submitted, they are prompted to go fill out a human or animal illness report form with Illinois Department of Public Health. Once a form is received, IEPA reviews all the information and if the information is indicative of a bloom, they may go out and collect a sample.

Alex moved on to talk about a few of the blooms which they responded to this year. Giving one example for each reporting scenario. For all those blooms, samples were sent to the Illinois EPA lab in Springfield to be tested for all four toxins. The lab typically has a turnaround time of seven to fourteen business days. Once sample results are ready, they are relayed to regional staff, who then reach out directly to the water body managers. Alex shared a chart of toxin thresholds set forth by Illinois EPA and the World Health Organization. If any of the sample results exceed those guidance values, they recommend that contact should be avoided. IEPA recommends that if there is a visible bloom, people should use caution around the water body and stay out of the water. She shared a summary of what the sampling season has looked like so far this year as of August 31, mentioning that sampling season is not yet done. See presentations for detailed sampling data for the 2023 season.

In 2020, the IEPA received a multipurpose grant from US EPA that allowed them to purchase 75 kits from PhycoTech that provides species identification, enumeration, and an estimate of cyanobacteria biovolume. The kits were originally reserved only for bloom events but in 2023, they decided to use them at certain sites for routine monitoring as well. They have tried to use the collection kits throughout the state. She showed an example of what those Phycotech results look like. Information included is the

water body name, the site location, and a chart of cyanobacteria taxa detected. Results tell us the HAB's cell count, concentration, biovolume, and relative biovolume, of each taxon detected plus any relevant warnings.

Lastly, Alex spoke about the HAB dashboard, which is new this year. The purpose of the dashboard is to be useful for the public so they can find any information that they might need in relation to HABs. The dashboard includes links to important websites, such as the bloom reporting form, a summary of our HAB program at Illinois EPA, some frequently asked questions, IEPA contact information, and how to identify a bloom. The dashboard features a list of water bodies where blooms have been reported that includes detailed data of each bloom. The map is populated by data from the bloom report forms mentioned earlier in the presentation. When someone fills out that bloom report form, they are asked if this information may be shared and if yes, IEPA screens the information and allows it to display on the dashboard. They hope that this dashboard will help people feel more confident in reporting suspected blooms, identifying suspected blooms, and feel more connected with IEPA when a bloom occurs. Joan thanked Alex and opened the floor for questions and discussion.

Discussion summary:

- Question (Rick Manner): In terms of frequency of finding the various HABs, do you ever see the less common versions of HABs without microcystin being present? Do we trust results if the most common microcystin is non-detect, then the others most likely will also be non-detect.
- Answer (Alex): I cannot really say with certainty that you can trust that because we have seen a few cases where maybe just saxitoxins have been detected. We have seen a couple of times where just cylindrospermopsin has been detected, so I would probably say no. You cannot trust that just because microcystin has not been detected that the others will not be present.
- Question (Sara Sawicki): I saw in one of your pictures that somebody was using hydrolab. What kind of water quality do you collect?
- Answer (Alex): If we have a multiparameter meter available at the time of collection, we will usually collect pH, dissolved oxygen, and specific conditions like water and air temperature.
- Comment (Alex): If any of you are ever out in the field and you come across a bloom, please report it to IEPA. That is the only way that our dashboard is going to show blooms that are happening in the state of Illinois.

Illinois River Biological Station Monitoring on the Illinois Waterway

Sara Sawicki, Illinois Natural History Survey

Joan introduced Sara Sawicki at the Illinois Natural History Survey (INHS). Sara works at the Illinois River Biological Station (IRBS) in their long-term resource monitoring program. Sara began by sharing a little about the Illinois River Biological Station located in Havana, Illinois on the Illinois River. She spoke about the Long-Term River Monitoring (LTRM) program, which monitors six pools of the upper Mississippi River. The Illinois River Biological Station monitors the LaGrange reach, which is about 80 river miles between the lock and dams at Peoria and LaGrange, Illinois. They sample and analyze water quality, fish, and macro invertebrates and have been using standardized methods since 1993.

Sara shared that she looks at physical, chemical, and biological aspects of water, and she is the only one doing this year-round. The LTRM program started in 1988 but was not standardized until 1993. So far,

they have over 33,000 records of water quality in the LaGrange Reach. They monitor 11 fixed and 135 random sites that are in different strata, going into the main channel, side channels, tributaries, and backwaters. They monitor temperature, pH, turbidity and secchi, suspended solids, depth, dissolved oxygen, wave type, sediment type, snow and ice, and velocity in the backwaters and side channels. When monitoring nutrients and chemicals, they look at nitrogen, phosphorus, silica, chloride, ammonia, and nitrate-nitride. Until 2002 the chemical program monitored, calcium, iron, magnesium, potassium, sodium, manganese, and sulfur, but due to budget cuts these are no longer sampled. However, in 2020, they brought back sampling for chlorine. Biological monitoring includes sampling for phytoplankton, *chlorophyll a*, both fluorometric and spectrophotometric.

USGS publishes a status and trends report using LTRM data. Sara highlighted a 2022 water quality trends data table. She pointed out that in the main channel suspended solids and nitrogen have gone down, and phosphorus has gone up. All of this information and more can be found in the USGS Ecological Status and Trends of the Upper Mississippi and Illinois River report.

Sara moved on to talk about long term fish monitoring in the Illinois River. Kris and Levi monitor fish in summertime. Fish here have been monitored during three periods, between June 15 and October 31 since 1993. They have 54 fixed sites and 252 random sites that are stratified by habitat use. They perform fish netting and electrofishing with the goal of monitoring fish populations on the LaGrange Reach. They use a multi gear approach with hoop nets, fyke nets, mini fykes, and electro-fishing. They also sample water quality, monitoring temperature, turbidity, depth, dissolved oxygen, sediment type, and velocity. They also monitor for vegetation, woody debris, dams, or rip rap presence, anything that may affect fish.

The last component of LTRM at the station is macroinvertebrates. Manisha oversees this monitoring and between May and June, she goes samples using ponar and suction dredge. She monitors mayflies and contaminants, including PFAs, which started in spring of 2023. She compares data she collects to historical data from ponar sampling in 1991 to 2004. Manisha is the manager and coordinator for all 6 pools of LTRM macroinvertebrates. If you are curious about where to find any of the LTRM data, it is on the USGS.gov page.

IRBS also administers Multi Agency Monitoring (MAM). This grew out of LTRM after the lock closures starting in 2019 with the range from Lockport to Alton. Brandon and Andrew monitor silver and bighead carp from Lockport to Alton. The goal for them is invasive carp detection, fish response to the carp, and impacts of contracted commercial harvest. They have about 1,880 sites each year and they collect chlorophyll once a year. They use all the same methods as LTRM and fish monitoring. They also have pressure sensors for wave presence in 2018, 2020, and 2021. Jesse and Sam work on black carp detection, which came out of increased commercial fishermen catching black carp. They focus predominantly on the LaGrange reach with some work below the Melvin Price Lock and Dam and Horseshoe Lake.

IRBS also administers the Long-Term Survey and Assessment of Large River Fishes or LTEF, is done June to October and has been done using LTRM methods since 2016. Fixed sites have been monitored since 1959 and random sites were added in 2009. The monitoring area reaches from Southwest Chicago downstream to Alton, Illinois. It includes Pools 16-22, 25, and 26 on the Mississippi River, the Wabash River, and the Ohio River. Andrya and Jason, look at species ID, weights, lengths, occurrence of external lesions, parasites, and deformities. Jason manages all the LTEF data from the IRBS station. Data from

outside of their range is collected by the Great Rivers Field Station, Southern Illinois University in Carbondale, and Eastern Illinois University.

The Upper Illinois River invasive carp harvest is done out of Yorkville, which is a substation of the IRBS. They use contracted commercial fishermen to target invasive carp species to reduce invasion pressure at the electric barrier. Emily and Zack monitor upstream of the electric barrier for invasive carp presence. Over 12.7 million pounds of invasive carp have been harvested since 2010. They use contracted commercial fishermen who intensely target invasive carp species for removal. They determine population abundance to evaluate the effectiveness of harvest. They monitor the presence of invasive carp reproduction using larval light traps and they determine the frequency and rate of fish passage at lock and dam 14 and 15 using telemetered fish.

The Emiquon Preserve is located across the river from Havana. This site used to be farmland that was then reclaimed into a wetland. IRBS has two projects out there. Toby works on vegetation and electro-fishing and Katie uses the brand new WHOOSHH fish cannon.

Sara showed a map of the IRBS's presence on the Illinois Waterways, stating that they are always out there collecting samples. She said that she can speak for everyone when she says they are always open to collaboration. They can tell you where to find our data and explain what they do in detail if anyone ever needs it. She expressed a thank you to the UIUC, INHS, LTRM UMESC page, her fellow staff, IRBS website and Facebook page and the captains of the IRBS, April and Jim, who are here in this meeting today. Sara shared her email address ssawicki@illinois.edu.

Discussion Summary:

- Question (Gregory McIsaac): I was just wondering, you mentioned measuring dissolved oxygen. Is that measured at different depths, and is any of it measured in or near the sediments?
- Answer (Sara Sawicki): It is all subsurface, so it is 20 cm under the surface of the water. It is never really near the sediments.
- Question (Gregory McIsaac): One other question about sediment. You listed several nutrients that were measured. Is this measurement dissolved or total nutrients in the water column? It is not in sediment, correct?
- Answer (Sara): Yes, it is all 20 cm subsurface.

Member Updates

Joan started with an announcement. The Nutrient Loss Reduction Strategy Annual Conference is going to be held Thursday, January 25, 2024 and it will be a hybrid format. Streaming will be available on Webex and in person venue will be at the Illinois Department of Agriculture, John Block Auditorium in Springfield, Illinois. More details are coming out soon.

Greg McIsaac had an update. He is ready to retire from the Council and this will be his last meeting as a member, although he is happy to give a presentation or be part of future meetings. He thanked the Nutrient Monitoring Council members for all the interesting exchanges over the years. Members thanked Greg for his time serving on this council.

Cindy Skrukrud also had some exciting news for the Fox River Study Group. They have been working with the Army Corps and the IDNR for many years to remove dams from the Fox River. The Corps has now released a draft report that calls for removing 9 dams on the Fox River. She shared a link, with more

information about this. Cindy shared her email address, cskrukrud@gmail.com, if anyone wants to discuss. The wastewater facilities in the Fox River watershed have gotten their phosphorus discharges down to one milligram per liter and are set to get down to 0.5 mg/L by 2030. With the monitoring and modeling that they have done on the Fox River, they know that asking them to get their phosphorus discharges lower than 0.5 is going to be very expensive. The modeling work done in the Fox River shows that if these dams that do not serve their original purposes can be removed, then this will provide many benefits to Fox River habitat and water quality.

Trevor had a question for the group. Would anyone prefer moving these meetings back to in person or are we happy with the virtual format? He encouraged members to reach out if they have feedback or would like to present at future meetings. He emphasized that these meetings provide a good opportunity to not just focus on nutrients, but also to gather all the Illinois agencies and organizations interested in water quality monitoring and to share their activities.

Joan thanked everyone for coming and adjourned the meeting at 11:15 AM.

Proposed Experiments, Measurements, and Analyses Needed to Quantify Causes of Total Phosphorus Load Increases in Illinois Rivers

Suggested Research Priorities (In no particular order)

1. Statewide Landcover/Land Use Analysis

- Relationship to river P loads
- Estimate influence of factors: livestock, tile drainage, land slope, impervious area, etc.

2. Monthly P Load Analysis

- Determine any seasonal shifts in P loads
- Examine summer P release from sediments and P washout in fall/spring
- Investigate frequency of low DO in sediments
- Assess impact of extended low flow periods and elevated water temperatures on seasonal shifts

3. Low Dissolved Oxygen (DO) Conditions

- Investigate frequency of conditions producing low DO in sediment
- Consider factors like extended periods of low flow and high water temperatures

4. Biological Trend Analysis

- Study trends in zooplankton, algae, and DO
- Utilize past measurements if available

5. Sediment Analysis

- Investigate sediment P:Fe ratios
- Use past measurements if available

6. Lab, Mesocosm, Incubation Experiments

- Examine the effects of NO3, Cl-, SO4, Fe on P release from sediments

Key Questions

- Who will conduct the research?
- Who will fund it?

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