



Welcome to *The Current*, the North Central Region Water Network's Speed Networking Webinar Series

Harmful Algal Blooms: 2PM CT

1. Submit your questions for presenters via the chat box. The chat box is accessible via the purple collaborate panel in the lower right corner of the webinar screen.
2. There will be a dedicated Q & A session following the last presentation.
3. A phone-in option can be accessed by opening the Session menu in the upper left area of the webinar screen and selecting "Use your phone for audio".

This session will be recorded and available at northcentralwater.org and learn.extension.org.



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northcentralwater.org



Today's Presenters:

- **Emily Kinzinger**, Graduate Research Assistant, MU Limnology Lab, University of Missouri
- **Melissa Miller**, Associate Director, Iowa Water Center, Iowa State University

Follow @northcentralh2o and #TheCurrent on Twitter for live tweets!





Emily Kinzinger



Emily is an M.S. student working with Dr. Rebecca North at the University of Missouri Limnology Lab. Her research focuses on an assessment of the year-round presence and severity of cyanobacterial blooms and their associated toxins. Emily received her B.S. in Environmental Science from Southeast Missouri State University. She was previously employed as an Environmental Scientist, where she prepared technical analyses in the context of the National Environmental Policy Act (NEPA)



Reservoir Observer Student Scientists: Year-round Harmful Algal Bloom Monitoring

July 8, 2020

Emily Kinzinger¹, Daniel Downing², Rebecca L. North¹

⁽¹⁾ School of Natural Resources, University of Missouri, Columbia, MO

⁽²⁾ University of Missouri Extension, Columbia, MO



Outline

- What are Harmful Algal Blooms (HABs)?
- Reservoir Observer Student Scientists (ROSS) Program
- Research questions
- Data
 - Chlorophyll a does not vary by season
 - Microcystin concentrations higher in summer
 - Cylindrospermopsin concentrations do not differ by season
 - No relationship between toxins and chlorophyll a
 - No relationship between toxins



Background: Eutrophication

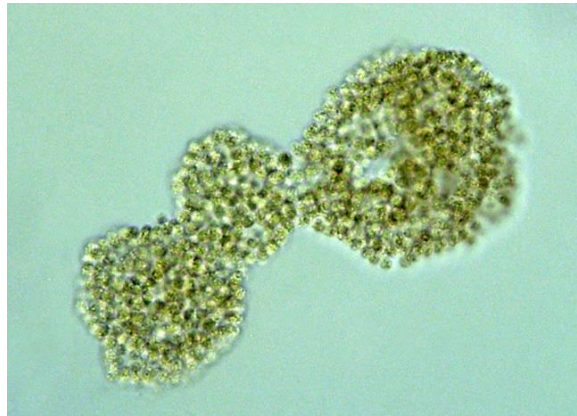
- Excessive nutrient inputs to surface waters is a global water quality issue
- Anthropogenic nutrient inputs
- Increased N and P can result in:
 - Excessive algal growth
 - Increased turbidity
 - Depletion of subsurface oxygen
 - Fish kills
 - Economic losses exceed \$2.2 billion annually in US¹
 - Shift in species composition



¹Dodds et al., 2009

Background: Harmful Cyanobacterial Blooms

- Dense, green, mucilaginous scums
- Taste and odor problems
- Shade subsurface vegetation
- Potentially toxic



Background: Algal toxins

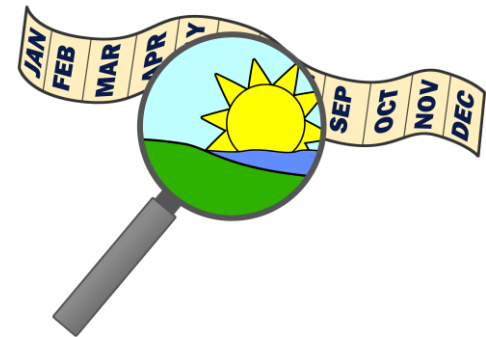
- ~75% of blooms are dominated by species that have the capability to produce toxins²
- Microcystin and cylindrospermopsin
- Liver and dermal toxins
- Exposure harmful to humans and animals
- Acute and chronic impacts
- Potential catalysts of cyanotoxin production
 - Light
 - Nutrients
 - Water temperature

²Blahova et al., 2008



Background

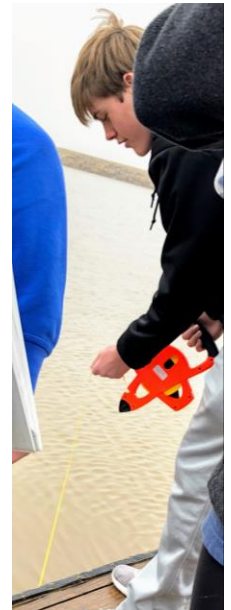
- Blooms like it hot, so most monitoring takes place during summer months
- Shoulder (spring, fall) and winter seasons understudied, but research indicates that blooms in the winter can produce toxins³
- Understanding what is happening year-round is important for management of lakes and reservoirs



³Wejnerowski et al., 2018

What is ROSS?

- Novel water quality monitoring program that works with high school students to teach them about HABs and collect year-round water samples
- MU Limnology Lab teaches students about limnology
- Hands-on water sampling and processing training
- Samples preserved and then analyzed at MU



ROSS Implementation

Lake	School	City	Date Started	# Students Trained
Bethel Lake	Rock Bridge HS	Columbia, MO	Fall 2017	75
Cheney Reservoir	Maize HS	Maize, KS	Jan 2019	140
Lake Sakatah	W-E-M HS	Waterville, MN	Fall 2019	60
Black Hawk Lake	East Sac Co. HS	Lake View, IA	Fall 2019	25



ROSS Student Success

Cheney Reservoir Student Presentations/Achievements:

- **2020 NSF KS EPSCoR MAPS Presentation** – *PBL², All Hands on Deck to #RehabHABs: A Place-Based, Project-Based Learning Project*
- **2019 Great Plains Limnology Conference:** Best Undergraduate Presentation award
- **2019 Samsung *Solve for Tomorrow* Semi-Finalists:** 2019 State of Kansas “Be the Vision” recipients
- **2018 Lexus EcoChallenge Semi-Finalists (\$10,000 Winners)**
<http://www.kten.com/story/39942431/maize-high-school-students-work-to-improve-kansas-drinking-water-win-scholarships>
- Traveled to other high schools to teach FFA groups about harmful algal blooms



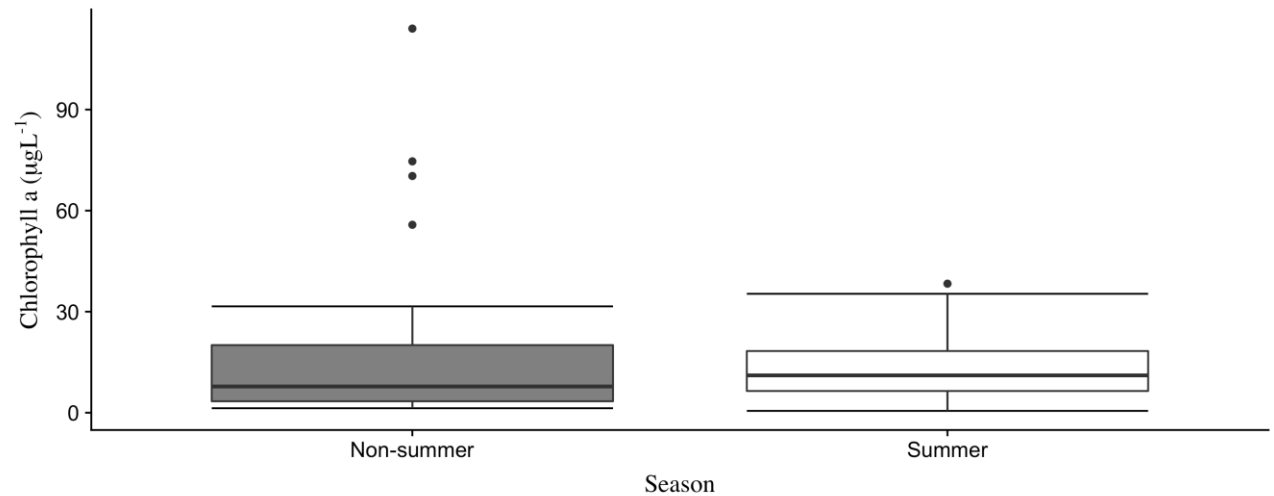
Research Questions

- Are hot moments in cyanotoxin production happening in the cold?
- How does the presence and concentration of cyanotoxins relate to physical and chemical environmental drivers?
- Are cyanotoxins correlated with chlorophyll a (proxy for algal biomass)?

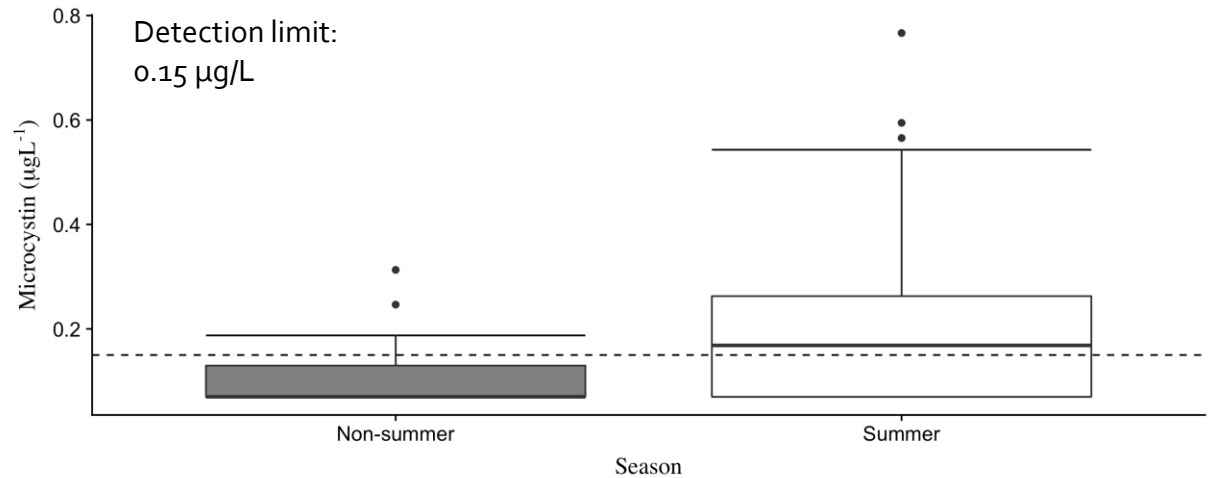
Lab Analyses and Data

- Samples analyzed for:
 - Total Nitrogen
 - Total Phosphorus
 - Chlorophyll a
 - Microcystin
 - Cylindrospermopsin
 - Total Suspended Solids
- Note: data only available for Bethel Lake and Cheney Reservoir – delay in analysis due to Covid-19 lab shutdown
- Samples divided based on summer/non-summer
 - Summer = stable stratification
 - Non-summer = lake mixing (neither lake gets ice cover in winter)

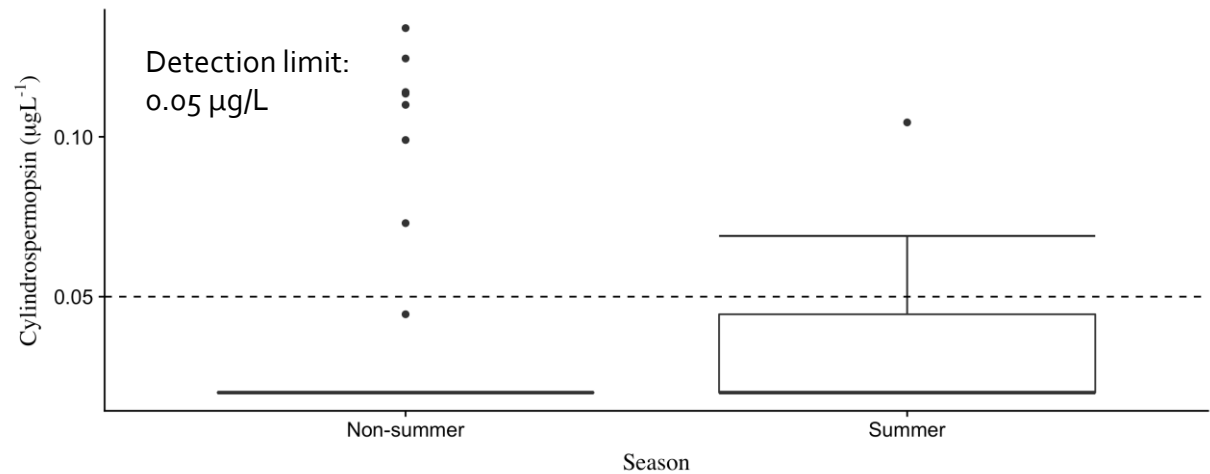
Chlorophyll a
does not
differ by
season



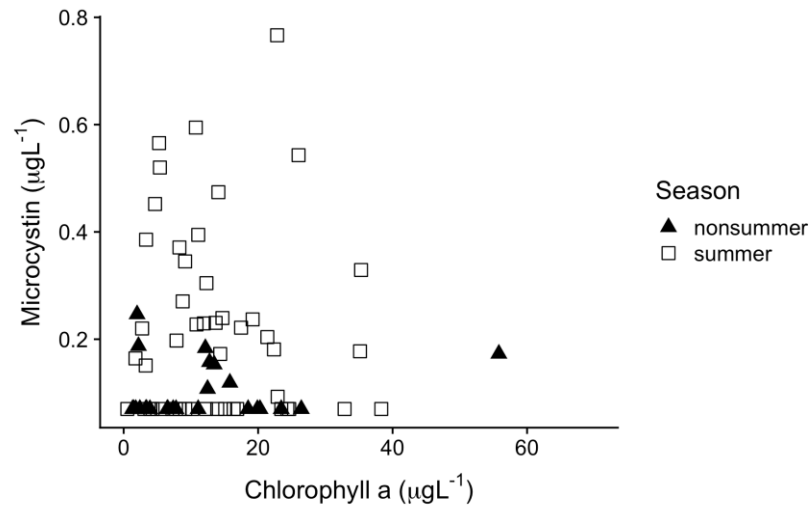
Microcystin higher
in summer
($p = 0.001$)



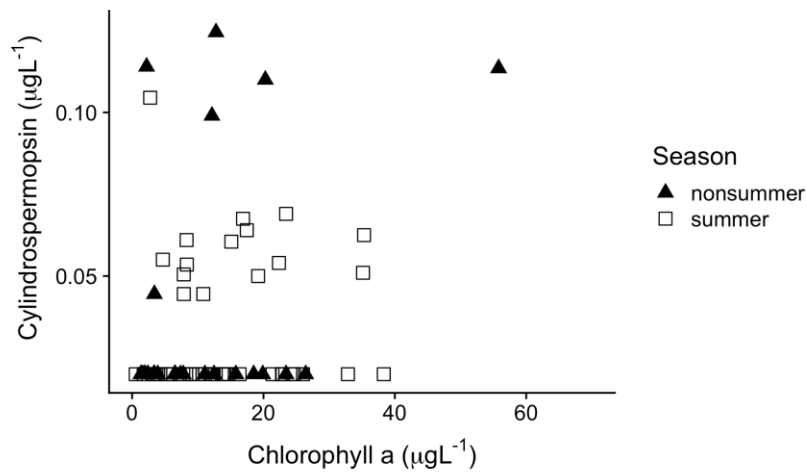
Cylindrospermopsin
does not vary by
seasons



No
relationship
between
toxins and
chlorophyll a

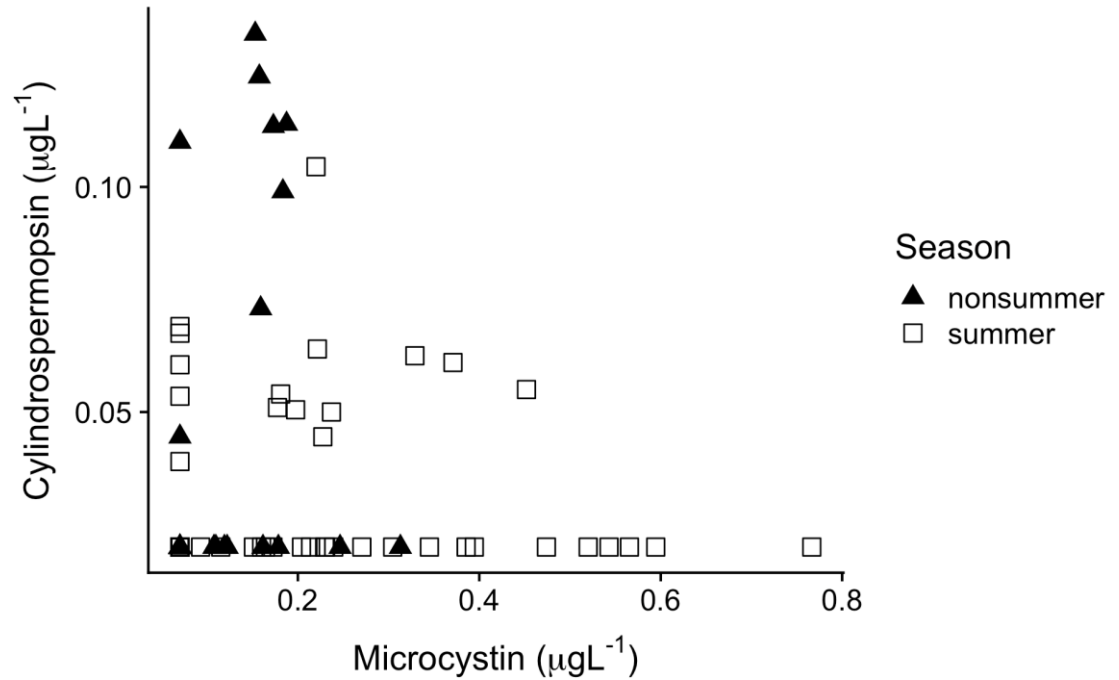


Detection
limit: $0.15 \mu\text{g/L}$

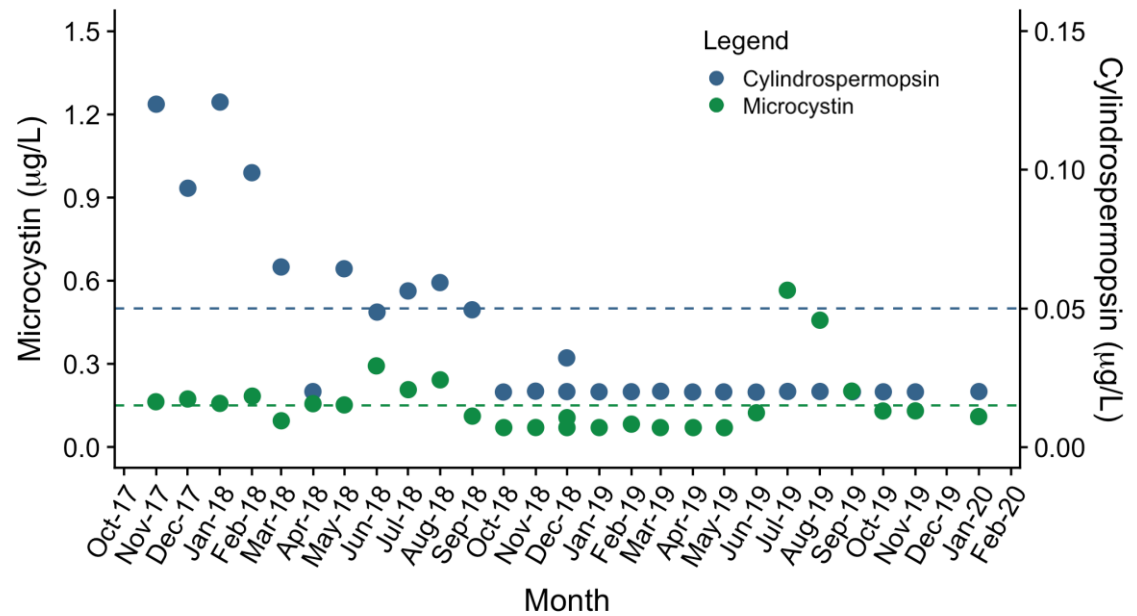


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No relationship
between
Cylindrospermopsin
and Microcystin



Variability in year-to-year toxin concentration in Bethel Lake



Conclusions

- Chlorophyll a is not always higher in the summer
- Microcystin concentrations were higher in the summer, but no difference between seasonal concentrations for cylindrospermopsin
- No relationship between toxins and chlorophyll a
- Toxins can be present in the winter, so it is important to monitor lakes year-round
- ROSS Program invaluable in collecting year-round water quality data

Next Steps

- MU Limnology Lab is continuing ROSS project
- Still recruiting interested high schools if willing to participate this school year
- Please let us know if you have any leads!
 - Contact: Dr. Rebecca North, northr@missouri.edu





Melissa Miller



Melissa Miller is the associate director at the Iowa Water Center, the state's Water Resources Research Institute. In this role, she forges relationships across the state and region to advance and elevate Center initiatives that address the water research needs of Iowa. Melissa's work typically centers around building team capacity for interdisciplinary research, outreach, and education projects, with special emphasis on internal and external communication and strategy. Melissa has been with the Iowa Water Center since 2012. She holds a BS in community and public health and MS in community development with a focus in natural resource management, both from Iowa State University. Melissa lives on a farm in the South Fork of the Iowa River watershed in central Iowa with her husband and three daughters.



Partnering to Develop Research, Outreach, and Education Resources to Mitigate Harmful Algal Blooms in the North Central Region

Melissa Miller, Associate Director

Iowa Water Center

The Current webinar

July 8, 2020



IOWA WATER CENTER



@IowaWaterCenter



@melmil321

Phase One – White Paper



**Partnering to Mitigate Harmful Algal Blooms
in the North Central Region of the United States**



A UNIVERSITY-LED PARTNERSHIP BETWEEN EXTENSION AND WATER RESOURCES RESEARCH INSTITUTES

August 2019



IOWA WATER CENTER



@IowaWaterCenter



@melmil321

Recommendations

- Five key areas
 - General HABs Knowledge
 - Identifying, monitoring, and treating HABs
 - Human health and HABs
 - Animal health and HABs
 - Landscape nutrient management practices and HABs

General Public

Engaged Citizen

Water
Professional



Future research needs

- New methods for treating HABs in lakes
- Long-term human health effects from HAB exposure
- Effects of HABs on aquatic organisms
- Effects of HABs on agricultural practices
- Effects of HABs on fisheries
- Developing models to predict HAB formation
- Warning systems to protect public health from HABs

Extension product recommendations

CONSERVATION AND AGRICULTURAL PROFESSIONAL AUDIENCES FOR HAB MESSAGING:

PRIMARY AUDIENCES:

- Extension professionals and WRRRI faculty and staff to inform their Extension and outreach programming, respectively.

SECONDARY AUDIENCES:

- Certified crop advisors
- Soil and water conservation district staff
- Agricultural and environmental engineers
- Consultants
- Private technical service providers
- Agricultural retailers and organization representatives
- Local watershed group staff
- Farmers and ranchers
- NGO staff
- Municipal and county staff
- County conservation boards
- Community development professionals
- Private sector planners
- Public and private utility staff
- Secondary science and agriculture educators
- Citizen scientists



Products to Develop

Research-based messages for building awareness and facilitating action developed by the HABs project team will have utility for a broad range of audiences (listed in the sidebar on this page).

The Products team developed an inventory of existing HAB outreach materials available in the North Central Region, crowdsourced product needs from the HABs team and North Central One Water Action Forum participants and identified successful outreach tools used in Extension programming. Based on these assessments, the team recommends developing the following products for use in Extension and outreach programming for the primary audience. These products will be used by the primary audience to conduct outreach in peer-to-peer and professional development opportunities with other members of the primary audience and for programming specific to members of the secondary audience.

PRIMARY AUDIENCE OUTREACH PRODUCTS:

- 1 **Social media toolkit with content, photos, and graphics.**
- 2 **Regional webinar series for sharing HAB research and resources.**
- 3 **Bank of pre-written articles available for states to include in existing newsletters, blogs, and other communication channels.**
- 4 **A series of factsheets that can be customized with state-level branding.**
- 5 **HAB poster template.**
- 6 **In-person workshops in tandem with regional events on specific state of the science HAB-related topics.**
- 7 **HAB resource webpage with regional resources, research, and tools.**
- 8 **HAB videos for staff to use in educational programming, web-based, and social media outreach that use existing videos where applicable and filling gaps where needed.**
- 9 **Media Toolkit for educators.**

As a follow-on project to this report, a team will further refine and prioritize this list for regional development.



Phase Two – Product Development

- “The Written Word”
- Video Shorts
- Research Symposium
- Webinar Series
- Resource Webpage



“The Written Word”

Main Objective: Develop common messaging resources for North Central Region Extension and WRRl educators to use in HABs education and campaigns.

- Fact Sheets (both styled and plain-text)
- Mid-length narrative texts
- Social media-ready statement bank
- Collection of real-life “snapshot” examples (please send yours!)



Video Shorts

Main Objective: Develop and/or curate 5-10 minute video shorts of researchers/technicians in the field or lab to educate on principles of identifying, monitoring, and treating HABs to use in online university classes.

- Collect pre-existing video shorts
- Call for north central state university or agency researchers to film new videos
- Promote via existing networks, use to build research symposium and webinar series



Research Symposium

Main Objective: Hold a virtual research symposium in December 2020 that connects regional HABs researchers and fosters relationships for additional projects.

- Introduce WRRI and WRRI-adjacent researchers to their peers from different states within the region working on similar topics
- Identify gaps/research needs in HABs (this could be developed into a review paper or a series of papers, e.g. special edition of UCOWR journal)
- Develop teams working on major, multi-state research efforts that incorporate Extension and Outreach
- Identify potential funding resources (including discussing with funding agencies prior to symposium to draw interest)



Webinar Series

Main Objective: Launch a webinar series that highlights regional research supported by or complementary to WRRRI/Extension activities, beginning with HABs.

- Identify common threads in WRRRI funded research and other regional water issues
- In continuation of research symposium, highlight research being conducted and connect researchers within the region



Resource Webpage

Main Objective: House all project related resources in one location for easy access.

- One webpage, likely on the North Central Region Water Network website, that houses ready-to-use text, videos, and links to other resources



Opportunities to Participate

- Technical reviewer for “Written Word” text
- Provide real-life “snapshot” stories of HABs impacts in your state
- Record or facilitate recording of video shorts
- Serve on research symposium planning committee; virtually attend symposium
- Suggest themes/topics for future webinars
- Contribute “other resources” for link on resource webpage



- Find the white paper at northcentralwater.org
- Contact Melissa Miller to participate:
millers@iastate.edu





Question and Answer Session

We will draw initial questions and comments from those submitted via the chat box during the presentations.

Today's Speakers

Emily Kinzinger – eky5f@mail.missouri.edu

Melissa Miller – millerm@iastate.edu





Thank you for participating in today's *The Current*!

Visit our website, northcentralwater.org, to access the recording and our webinar archive!

The North Central Region Water Network is launching a #What4water Twitter campaign to increase awareness about what extension professionals and partners are doing for water around the region. We invite you to join in and let us feature your important work!

To participate, just send the following to Grace Hershberg at hershberg@wisc.edu **by July 20th.**

- A 1-sentence description of a program, resource, or action you do (professionally) for water and 1 sentence about why you think it matters.
- A photo of yourself, preferably doing something with or around water
- The Twitter handles for you and the organization you are affiliated with, if applicable

