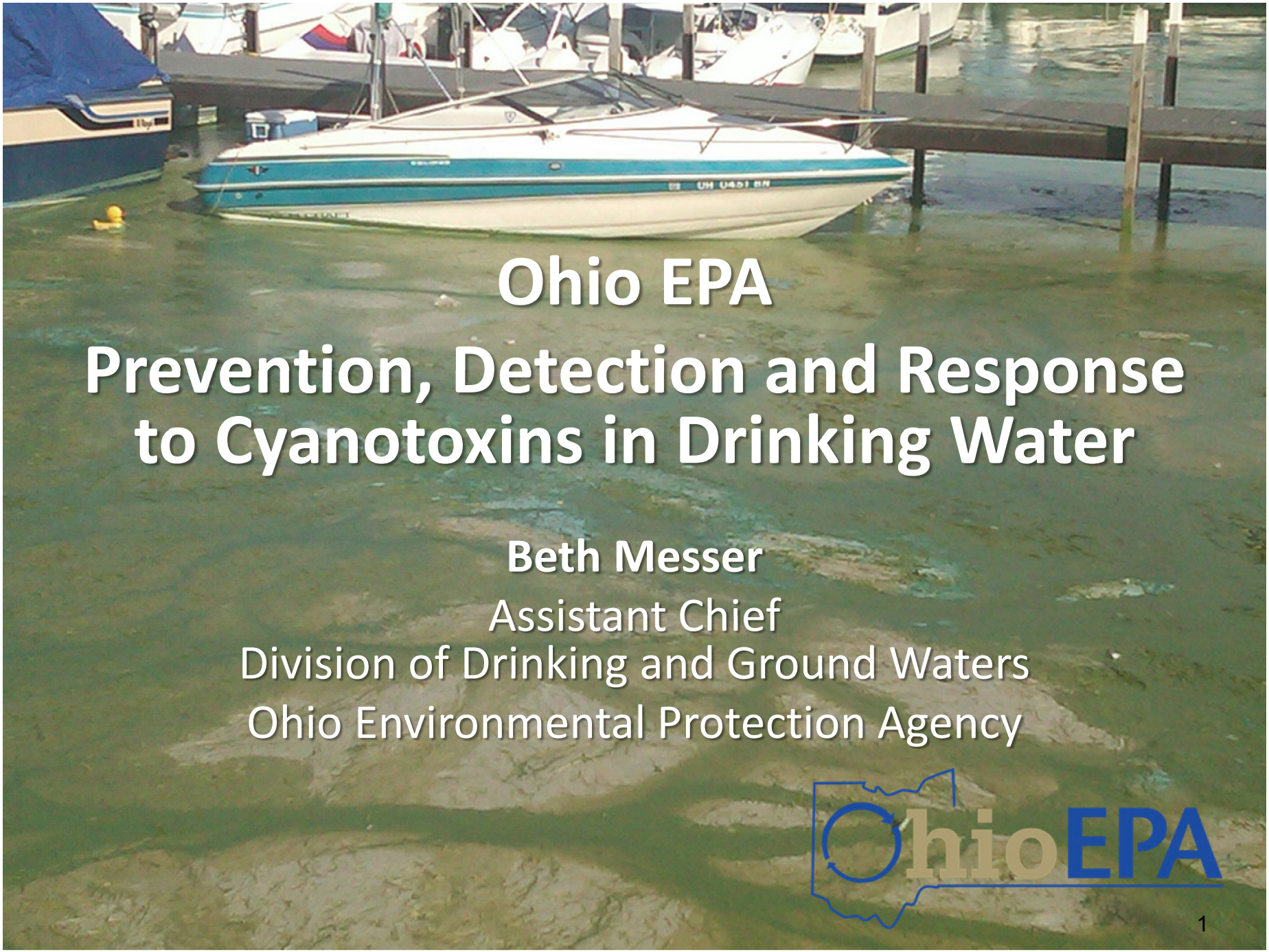

Ohio EPA

Prevention, Detection and Response to Cyanotoxins in Drinking Water

Beth Messer

Assistant Chief

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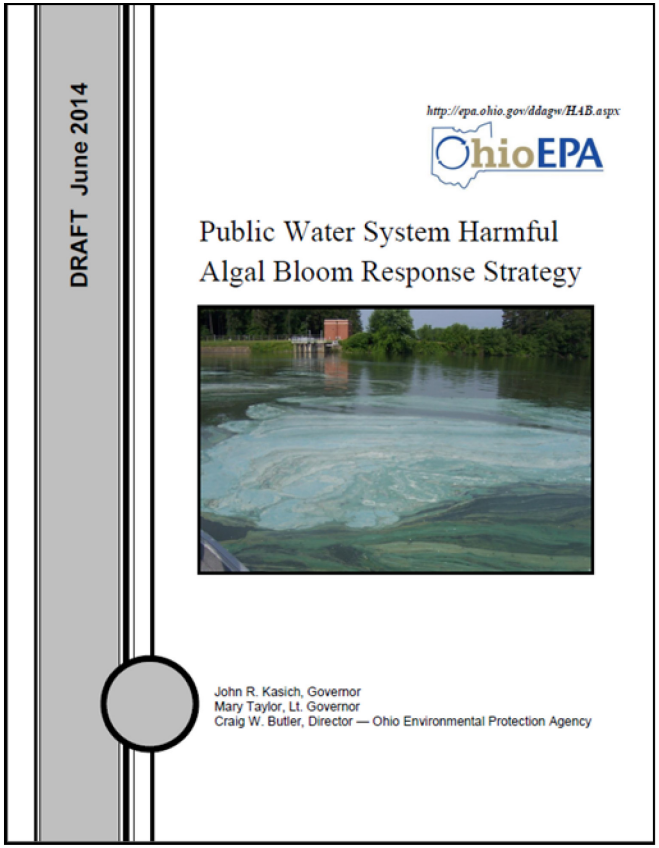
Ohio Environmental Protection Agency

Ohio Harmful Algal Bloom Response

- **Ohio EPA began Sampling for Cyanotoxins at Public Water Systems in 2010**
- **Collaborated with Ohio Department of Health and Ohio Department of Natural Resources to Develop State of Ohio HAB Response Strategy**
  - Developed in 2011, reviewed and revised annually
    - Sampling Frequency and Procedures,
    - Cyanotoxin Advisory Levels for:
      - Microcystins (total)
      - Cylindrospermopsin
      - Saxitoxins (total), and
      - Anatoxin-a
    - Public Notice Templates, and
    - HAB-related Contingency Planning Recommendations
  - **http://www.epa.ohio.gov/portals/28/documents/HAB/PWS-HAB-response.pdf**
  - Will revise based on U.S.EPA national health advisory guidance and lessons learned in 2014



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Cyanotoxin Sampling

- **Ohio EPA Sampling is Primarily Incident-Response Based**
- **Factors Considered:**
  - **Source Water Quality**: Phytoplankton, Phycocyanin, Chlorophyll-a, pH, Geosmin or MIB taste and odors
  - **Operational Issues:** Decreased filter run times and filter clogging, Increased chlorine demand
  - **Satellite & NASA Flight Data:** Remotely monitor bloom based on presence of pigments unique to cyanobacteria
  - **Algaecide Application:** At a minimum, sample following Ohio EPA pesticide permit requirements
- **Ohio EPA Encourages PWSs with a History of Persistent HABs to Voluntarily Monitor**
- **Sampling at Lake Erie Islands and Marblehead routinely in lieu of triggered – perhaps others in 2015**
- **Inland Lake Ambient Monitoring (Partner with Clean Water Act program)**

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Sampling Frequency & Analytical Method

- **Sampling Frequency:**
  - Weekly until toxins are <½ Ohio threshold for two consecutive weeks and bloom has dissipated.
  - If raw water microcystin concentrations are >5 ug/L, increase sampling and analysis to 3 times/week.
  - Finished water detections trigger repeat sampling & analysis within 24 hours. Ongoing sampling may include distribution sampling.
  - Need to reevaluate based on U.S. EPA H.A. Guidelines.

- **Analytical Method:** Ohio EPA utilizes the ELISA method for total microcystins (MC-ADDA), saxitoxin, and cylindrospermopsin and LC-MS/MS for anatoxin-a

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Public Water System Sampling Summary

- Ohio EPA has collected approximately 2,000 cyanotoxin samples at 56 water systems (almost 1/2 of all Ohio surface water supplies).
- Public water systems have voluntarily submitted results to Ohio EPA for over 1,000 cyanotoxin samples.
- Cyanotoxins detected in MAJORITY of source waters sampled.
- Five water systems had finished water detections >0.3 ug/L
- Two water systems exceeded 1.6 ug/L

Public Notice is recommended if a health advisory level is exceeded, however, Director also has authority to issue public notice.

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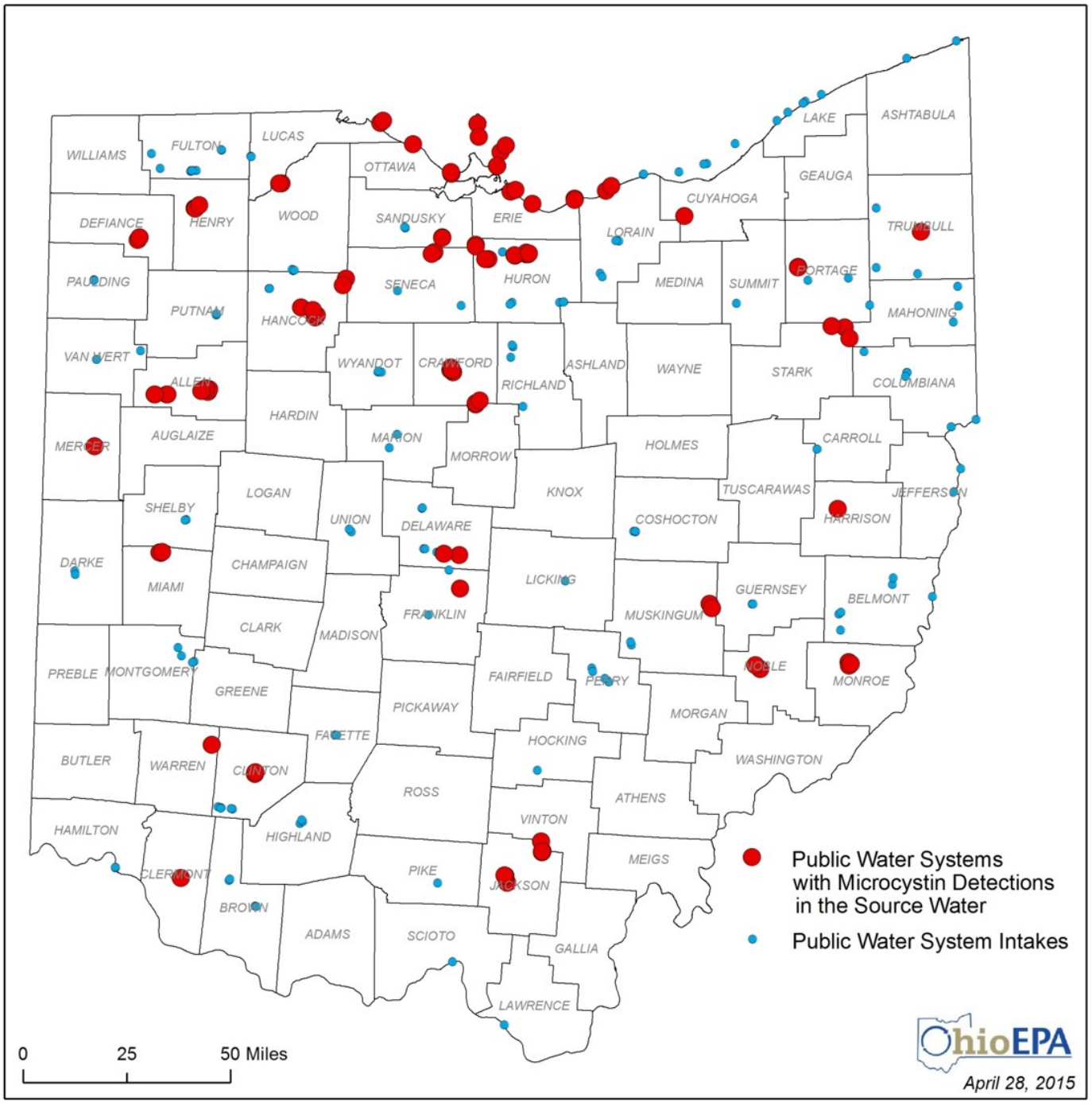
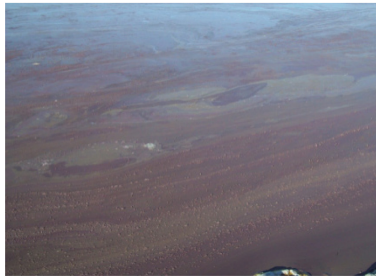
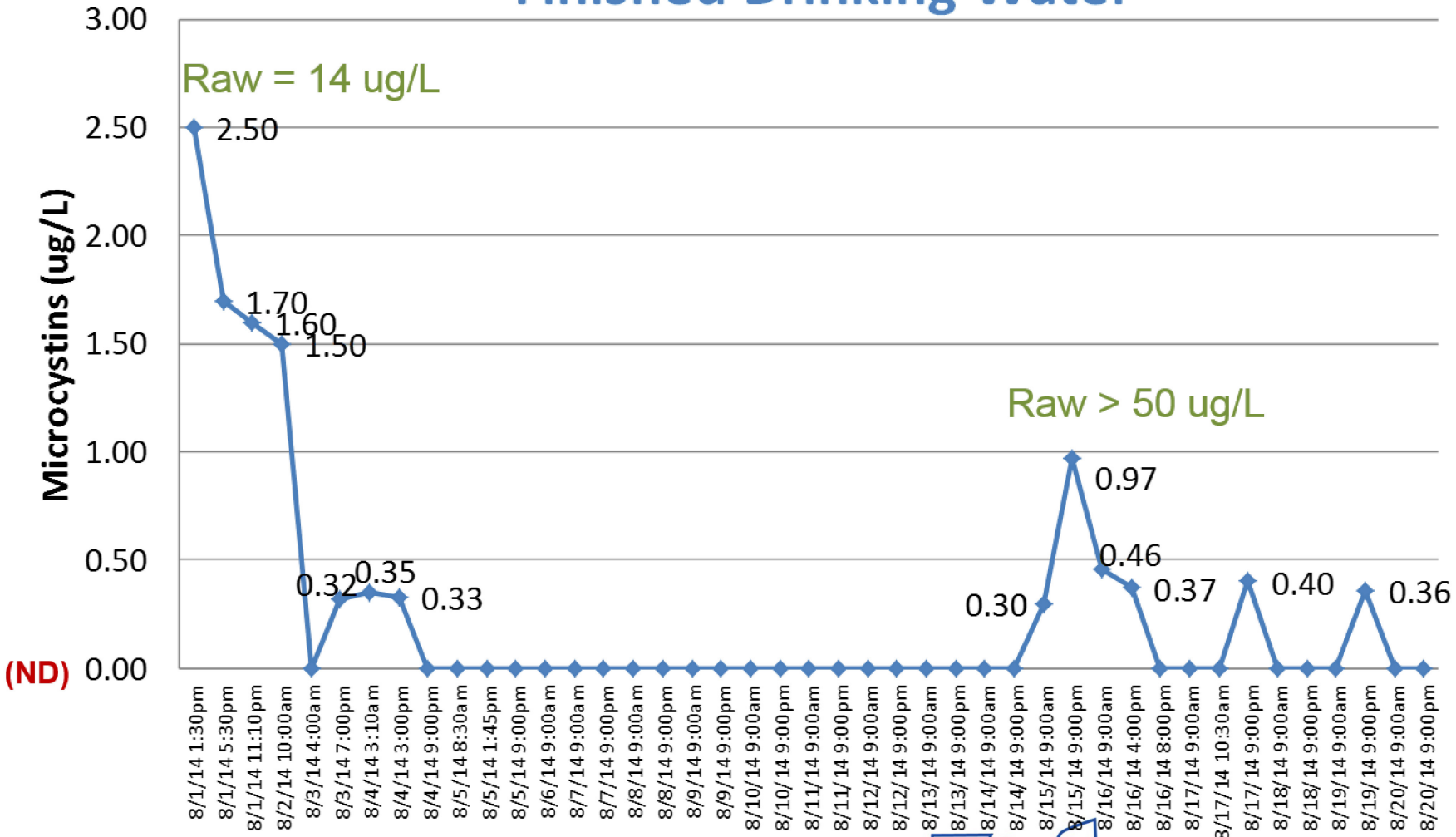
Public Water Systems with Cyanotoxin Detections in their Source Water





Microcystins Concentrations in Toledo's Finished Drinking Water



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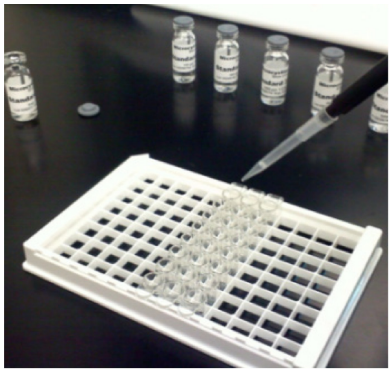
ND= Not Detected (Concentration <0.25)

Data Source: Toledo PWS

Microcystins Testing - ELISA

- **Ohio EPA uses the Enzyme-Linked ImmunoSorbent Assay (ELISA) Microcystin-ADDA Method**
  - Measures Total Microcystins
    - (all congeners, based on ADDA)
  - Certified by USEPA (ETV Program)
  - Moderately sensitive (RL: 0.30ug/L)
  - Suitable for raw & finished water
  - Quick (four hours), useful for operational adjustments
  - Relatively inexpensive
  - Does not require high end equipment or expertise to run (can be used in water system lab)
  - Does not provide concentrations of specific Microcystin congeners
  - Is an indirect measure of toxin



Microcystin-ADDA ELISA SOP

- Helps ensure consistent sample handling, preparation, and application of analytical method.
  - Finished water samples and treatment train samples that are subjected to an oxidant must be quenched upon collection.
- Labs must demonstrate they can achieve an acceptable level of precision and accuracy.
- Ohio EPA conducts site visits at labs preforming analysis.
- Considering Ohio EPA confirming finished water detections triggering an advisory

Analytical Method Comparison & Microcystin Congener Evaluation

- 11 Sites/22 Samples: 4 Up-ground Reservoirs, 2 In-stream Reservoirs, 2 Lake Erie locations, 2 Canal-feeder Lakes, and 1 River Source.
- Variety of Cyanobacteria Genera Represented
- Each Sample Analyzed Using 5 Separate Analytical Methods
- MC-LR was not the most common congener
- Confirmed ELISA results

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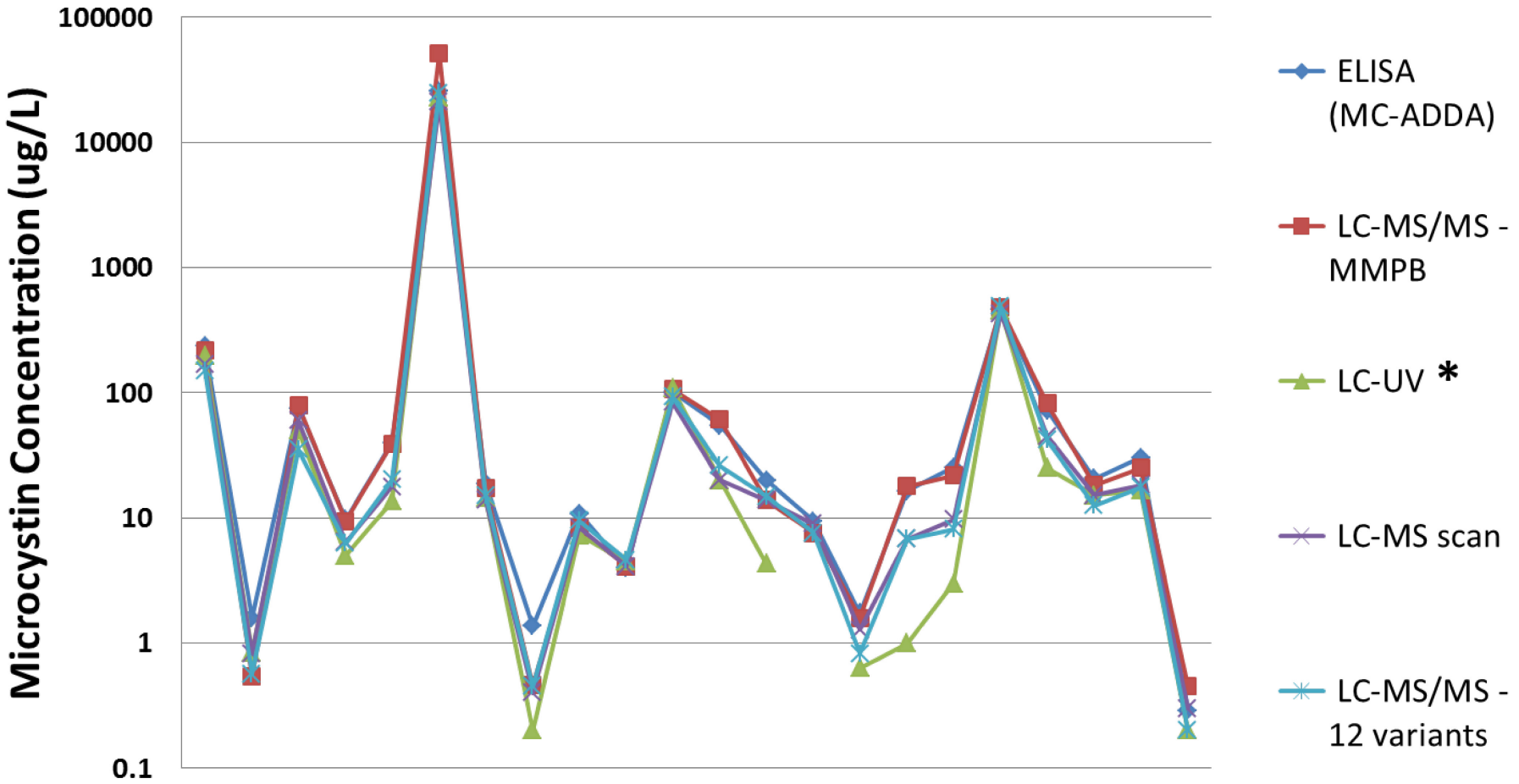
Results of Method Comparison



* LC-UV data presented does not include false-positives that were eliminated from total (Based on lack of confirmation with LC-MS methods). Sample # 14 was non-detect using LC-UV.

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HAB Response Strategy Revisions

- Incorporate USEPA Health Advisory Guidance
- Determine Analytical Method and sampling and analytical protocols
- Apply 10 Health Advisory as “not to exceed”
- Initiating an advisory
  - Confirmation analysis and sampling
  - Allowing for treatment adjustments

HAB Response Strategy Revisions

- Removing an advisory
  - Defining the number and time between samples
  - Entry point or distribution
- Cyclical advisory level detections
- Messaging
  - Revising Public Notices
  - Clarifying Exposure pathways

Ohio EPA Preparation

- Hosting Multi-Agency Tabletop Exercises to Better Prepare for any Future Advisories.
- Expanding the early warning network.
- Requiring HAB Contingency Plans for Susceptible Public Water Systems.
- Collaborating with University and Federal Researchers on Treatment Technologies, Analysis Methods, Remote Sensing, Bloom Dynamics, and other Applied Sciences.
- Assisting with Revisions to Ohio AWWA Cyanotoxin Treatment White Paper.
- Participating in State and National HAB Workgroups.
- Assisting other States.

Technical Assistance, Training & Outreach

- Responded to over 700 requests for information related to HABs at public water systems
- Gave over 30 presentations on HAB impacts to water systems
- Present at the 2-day OSU Stone Lab HAB Workshop (since 2010)
- 5 Targeted meetings with PWSs in 2014
- Additional Meetings in 2015
- Targeted Outreach to Susceptible Systems

Algae ID and HAB Workshops Offered by OSU & Ohio EPA

- Held at Stone Lab Campus on Gibralter Island
- Geared to Water Supplies and Lake Managers
- August

http://stonelab.osu.edu/courses/noncredit/87/

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HAB Funding

- $1 million in grants to surface water public water systems to enhance their monitoring capacity for cyanotoxins and harmful algal blooms.
- $50 million in 0% interest rate loans to surface water public water systems for enhanced water treatment infrastructure components as well as back-up water sources.
- $100 million in 0% interest rate loans for equipment and facilities that reduce the levels of phosphorus and other nutrients.
- $1.25 million in grants for farmers to plant cover crops or install controlled drainage devices.
- OBOR $2 million in grants for applied research on harmful algal blooms.

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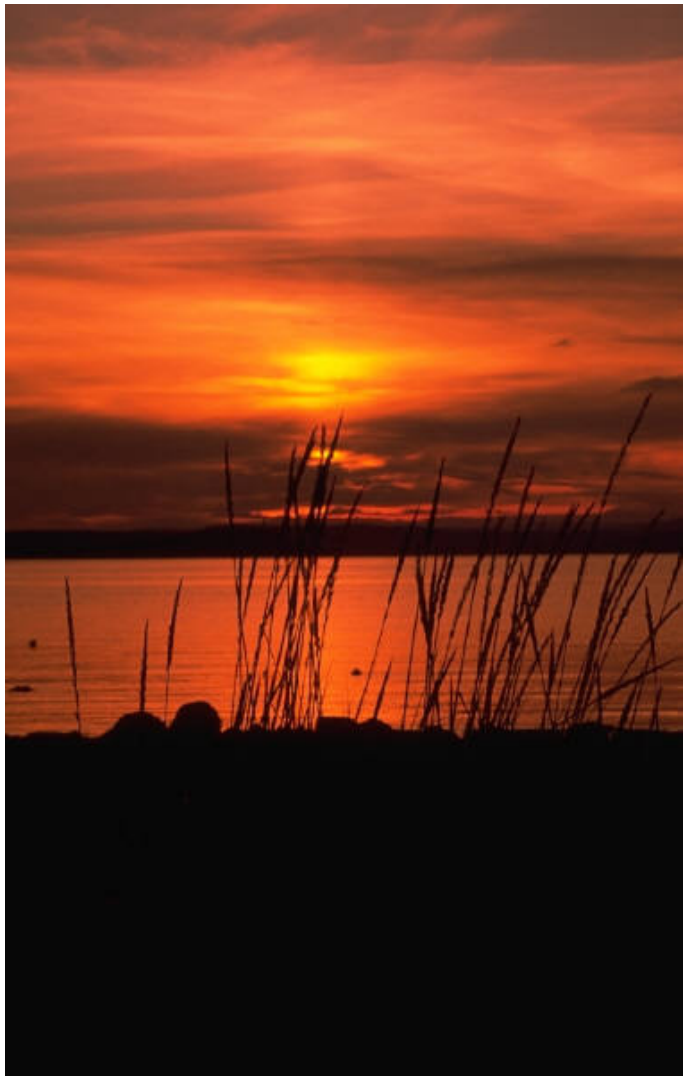
Thank You!

http://www.epa.ohio.gov/ddagw/HAB.aspx



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