American Water Works Association

A Water Utility Manager's Guide to Cyanotoxins

Presented by: Keith Cartnick, United Water

EPA Stakeholder Meeting

Arlington, VA

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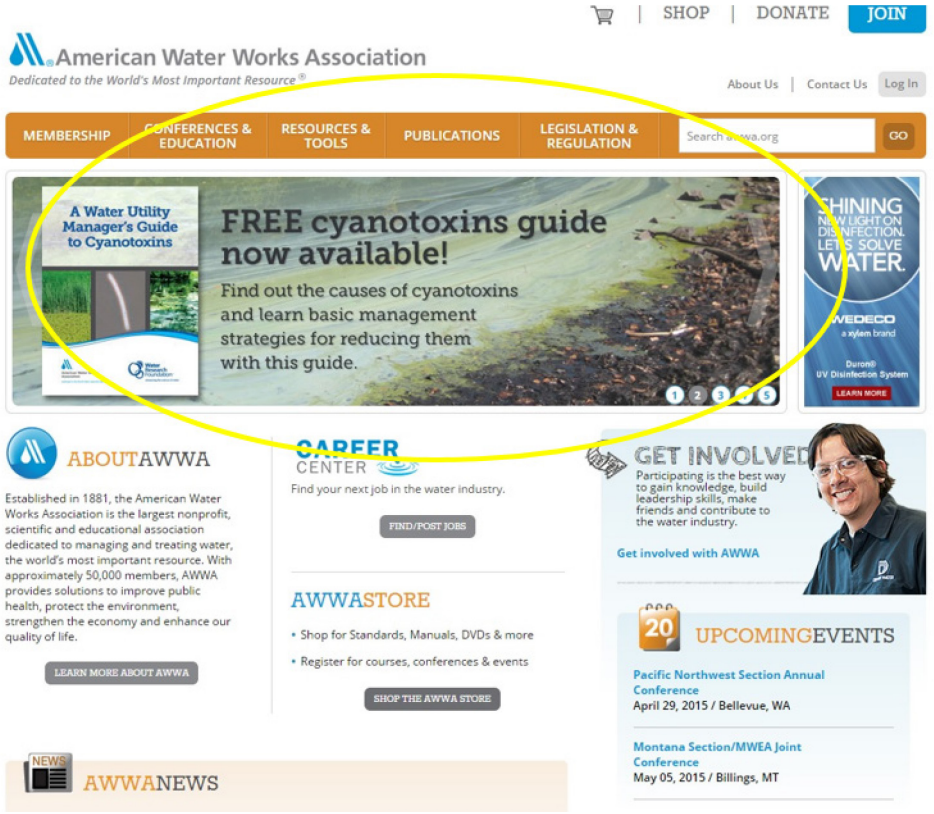
Manager's Guide Available

The background information in this presentation comes from A Water Utility Manager's Guide to Cyanotoxins, available for free at www.awwa.org and www.waterrf.org



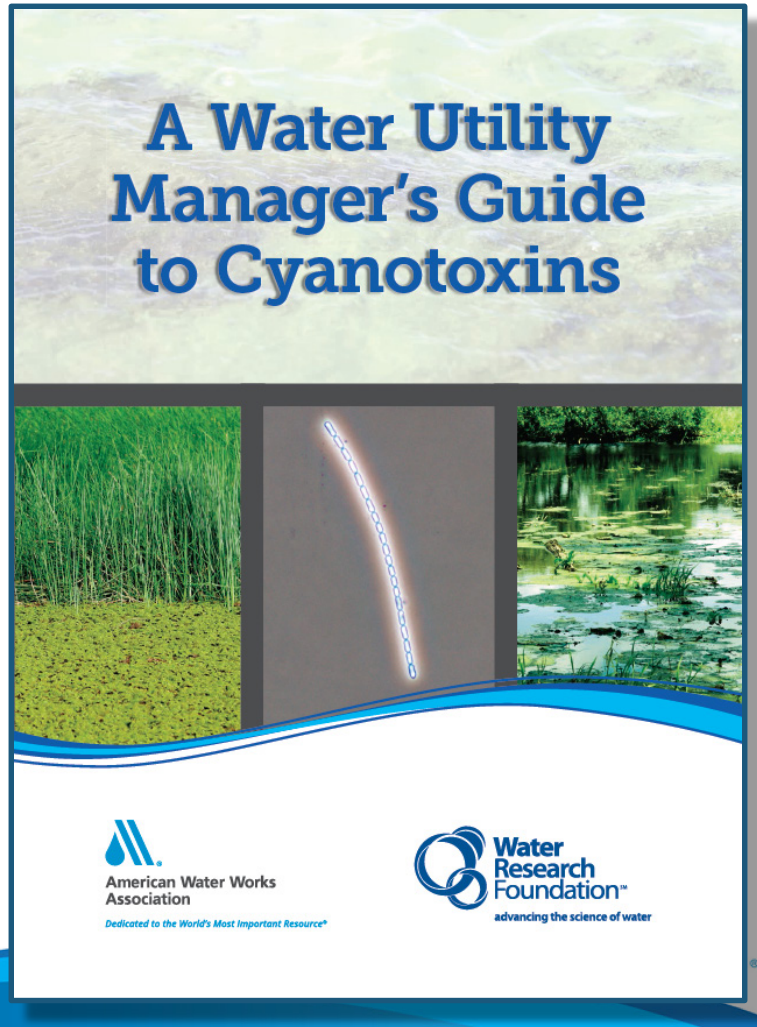
Opening Thoughts

- We need to learn more about cyanobacteria and cyanotoxins
- Utility managers must integrate managing cyanotoxins into existing utility practice
  - Source water protection and water supply strategies,
  - Treatment protocols,
  - Communication plans, and
  - Emergency response strategies

Cyanotoxins are an important concern, hence AWWA and WaterRF developing the Manager's Guide.

Utility Manager's Guide

1. What are cyanotoxins?
2. When might cyanotoxins be a concern for a water system?
3. How are cyanotoxins detected?
4. What can a water system do to respond?
5. Where are there knowledge gaps?



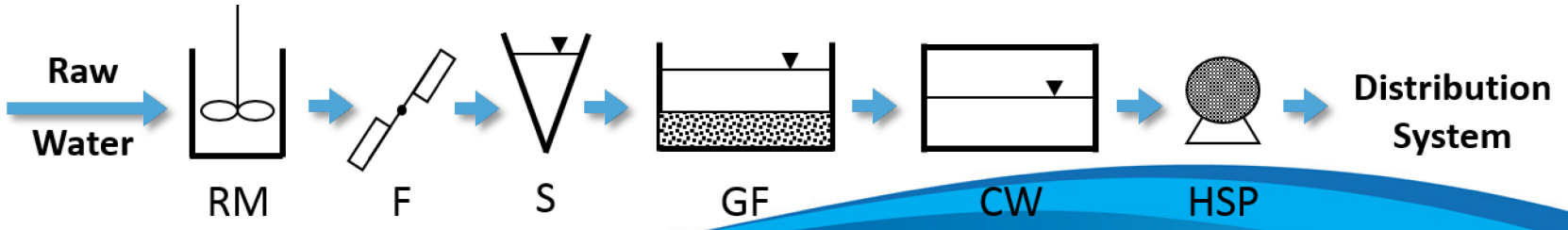
Addressing Multiple Objectives

- Systems must simultaneously manage and address a number of issues:
  - Provide an adequate supply of potable water
  - Remove / disinfect microbes
  - Control formation of disinfection byproducts
  - Prevent/ achieve removal of taste and odor causing compounds
  - Maintain corrosion control
  - Maintain reliable treatment under a wide range of conditions

Managing cyanotoxins effectively requires identifying recognition and response strategies that do not create unintended consequences.

Managing Algae & Cyanobacteria and Controlling Toxins

- Understand water supply hydrology and ecology
- Controlling algae and cyanobacteria in water supply (passive and active management)
- Managing withdrawal
- Pretreatment options
- Treatment objectives and unit processes
- Monitoring and management protocols



United Water's Approach

Addressing Cyanobacteria Growth in New Jersey

United Water has developed a plan to address concerns about cyanobacteria growth and related compounds in Lambertville Reservoir, a water supply in central New Jersey. The purpose of the Monitoring, Management and Treatment (MMT) Plan is to reduce the likelihood and magnitude of cyanobacteria blooms and related taste and odor compounds and toxins, and to effectively treat the water should a bloom occur. The MMT Plan has three key components:

Blue-green *Aphanizomenon sp.* on Klamath River

1. *Monitoring* Collect site-specific data in the reservoir to assess and respond to conditions in a more effective manner.
2. *Management* Implement both in-lake and watershed-based measures to improve the overall water quality of the reservoir.
3. *Treatment* Develop a proactive treatment strategy for the reservoir and implement additional control measures at the water treatment facility to remove algae toxins from the drinking water.

United Water also performed a bathymetric assessment of the reservoir bottom (surveyed the submarine terrain features), prepared a hydrologic determination of how much water is entering and leaving the reservoir, and developed a process for detecting and mitigating levels of nutrients that encourage algae growth, particularly phosphorus.

The improved treatment strategy includes using water quality data to determine when to treat for algae, rather than adhering to a fixed schedule for treatments. United Water adopted the use of liquid chelated copper-based algaecides in the reservoir, which provides a more uniform dose, are more persistent, and appear to be more effective than copper sulfate crystals against the cyanobacteria in the Lambertville Reservoir.

Finally, United Water upgraded its water treatment facility by installing a powdered activated carbon (PAC) system as a backup for MIB/geosmin and algal toxin control, and upgraded the plant's filters to accommodate the additional solids load from the PAC. (Cartnick 2014).

Supply/WTP Specific Prioritization

- Cyanobacteria are one phylum among ten algae phyla important to water systems
- There are at least eight groups of cyanotoxins associated with twelve different genera of cyanobacteria warranting additional research
- Cylindrospermopsins, anatoxins and saxitoxins are also observed in surface waters

Microcystins are believed to be the most commonly observed cyanotoxins in the U.S. .

EPA HAB Website

Sources:

2010. Algae Source to Treatment Manual of Water Supply Practices M57.

2008. Scientific Assessment of Freshwater Harmful Algal Blooms. Interagency Working Group on Harmful Algal Blooms, Hypoxia, and Human Health of the Joint Subcommittee on Ocean Science and Technology. Washington, DC.

Fit for Purpose Monitoring

- Monitoring and response strategies will be system-specific
- Indicators are an important tool
  - More frequent monitoring
  - Serve multiple purposes
- Monitoring location, timing, and frequency must balance competing objectives
  - Practical within utility staffing and operating constraints
  - Provide actionable information

What might result from a trigger?

- Increased monitoring
- Monitoring of additional parameters
- Increasing coordination with other water suppliers
- Modification of withdrawal
- Modification of treatment

Analytical Methods

- Monitoring and response strategies rely on the accuracy, precision, and robustness of the available methods
- Method selection must balance
  - Time to result
  - Ease of sample collection and handling
  - Analytical accuracy
- Critical decisions must be based on sound data
  - Confirmation samples
  - More accurate methods

Understanding Your Goals

- There are a number of drinking water advisory levels for cyanotoxins.
- Levels of concern vary with
  - Individual cyanotoxins and individual cyanotoxin congeners
  - Short-term or long-term exposure scenario
  - Population age demographic
  - Form of exposure (drinking, recreational, etc.)

State/Agency	Threshold Microcystin - LR (µg/L)	Threshold Anatoxin-a (µg/L)	Threshold Cylindrosper-mopsin (µg/L)	Threshold Saxitoxin (µg/L)
Ohio	1	20	1	0.2
Oregon	1	3	1	3
Minnesota	0.04*			
Quebec	1.5	3.7		
Health Canada	1.5			
WHO	1			

* The Minnesota level for microcystin is intended to be protective of a short-term exposure for bottle-fed infants.

NOTE: Health Canada and WHO data include information from other sources that was not provided through the ASDWA survey.

Take Self Assessment Now

Step 1: How prepared is my system for potential cyanotoxin events?

Asking the following questions can give a water utility a better idea of whether the utility should be preparing itself for possible cyanotoxin problems. This brief assessment considers three categories: 1) source water monitoring; 2) source water quality; and 3) cyanobacteria present during the treatment process. This tool is applicable only for water utilities using water from surface water bodies.

	High Concern	Medium Concern	Low Concern	Very Low Concern
Source Water Monitoring				
Does the utility have a source water monitoring program in place?	Doesn't monitor source water before treatment	Conducts some tests on source water (e.g., turbidity, total organic carbon) as it enters treatment plant	Monitors source water monthly (e.g., chlorophyll *a*, algae counts) at different depths and locations	Has a comprehensive source water monitoring program, sampling at least weekly at different depths, locations
Does the source water quality monitoring program evaluate changes to the water over the year?	No	No	Yes, tracks monthly water quality trends (e.g., to help determine which source(s) to use)	Yes, tracks trends at least weekly of all monitored parameters
Does the utility track changes by comparing water quality data from year to year?	No	No	Yes, seasonal or annual averages are tracked and compared	Yes, charts are created with monthly data for at least the last five years
Source Water Quality and Aesthetics				
Does the source water have algae growth?	Yes, there are blooms and copper sulfate is added regularly	Yes, but treatment adjustments are not necessary in response	Minor algae growth, but no visually obvious blooms	Very minimal, if any, growth

QUESTIONS?

Follow-up questions after this event may be directed to:

Adam T. Carpenter
Regulatory Analyst
Email: acarpenter@awwa.org
Direct: (202) 326-6126