Source Water Management and Mitigation Strategies in Ohio

Ruth Briland
February 5, 2020
Overview

• HAB response and program integration
• Monitoring tools and training
• Research efforts
• Case Studies (public drinking water systems, PWS)
  – Wilmington PWS: Alternative water sources
  – Akron PWS: Reservoir management and source water protection
  – Cadiz PWS: Tappan Lake Nutrient Reduction Initiative
  – Celina PWS: Treatment train wetlands
HAB Response and Program Integration

• PWS HAB Rules (OAC 3745-90) specify compliance monitoring and treatment techniques
  – HAB Treatment Optimization and HAB General Plan
• Drinking Water Beneficial Use Assessment
• Source Water Protection Plan
• 9-Element Plan and Section 319 Grants
Monitoring Tools and Training

• Water quality monitoring and analytical equipment
• HAB response and technical assistance
• Satellite imagery
• Phytoplankton identification and reservoir management workshops
  – Stone Lab, Lake Erie: Aug 2020
  – OTCO: June 2020
HAB Research Efforts

• Harmful Algal Bloom Research Initiative (HABRI, ODHE)
  https://ohioseagrant.osu.edu/research/collaborations/habs

  Algaecide selection and targeted application (Dr. Cutright, U Akron)
HAB Research Efforts

• Harmful Algal Bloom Research Initiative (HABRI, ODHE)
  – Efficacy of ultrasound/sonication (Dr. Weavers, OSU)
  – Algaecide selection and targeted application (Dr. Cutright, U Akron)

• Ohio Water Development Authority Grant
  – U. Akron and Akron PWS

• USGS Water Science Center
  – Microcystin-production and statistical modelling (Dr. Francy)

• USEPA Office of Groundwater and Drinking Water
  – Comprehensive Performance Evaluation (Tom Waters)
Cyanotoxins detected in both sources in 2017

Satellite imagery of Caesar Creek Lake in Warren and Clinton Counties, showing 2,806 Acres of Water and 36.3 Miles of Shoreline.

Two sources on different watersheds:
- Microcystins detected in Caesar Creek
- Cylindrospermopsin detected in upground reservoirs

Multiple source waters: Caesar Creek Lake and upground reservoirs

Ohio Environmental Protection Agency
Wilmington PWS – Caesar Creek Lake

Avoidance strategy (multiple intake depths, alternative sources)
Wilmington PWS – Caesar Creek Lake

Program integration and source water monitoring

- Source water assessment (OEPA-DSW)
- Recreation, beach sites (ODNR)
- Comprehensive performance evaluation (OEPA, USEPA-ORD)
- Source Water Protections Coordinator (PWS)
- HAB satellite imagery (NOAA)
Wilmington PWS – Upground Reservoirs

Model: Hydro Bioscience Quattro-DB
Marketed by: Sonic Solutions   Northampton, MA
Note: NSF 61 certified for use in drinking water source
Akron PWS – U. Akron (HABRI Grant)

- Algaecide selection and targeted field application
  - Bench-scale experiment with common copper and peroxide products to assess efficacy and determine dose
  - Field scale algaecide application with control area

Crafton 2018; Crafton et al. 2019
Akron PWS – U. Akron (OWDA, 319 Grant)

- Nutrient reduction with drinking water treatment residual (Al, PAC)
  - Bench-scale experiment to demonstrate PO4 uptake
  - Develop structure for passive flow and phosphorus removal in stream
Cadiz PWS – Tappan Lake
Cadiz PWS – Microcystins

Microcystins, mcyE

Microcystins (µg/L)  mcyE (GC/µL)  16S (GC/µL)

Ohio Environmental Protection Agency
Cadiz PWS - Tappan Lake Nutrient Reduction Initiative (TLNRI)

- Collaboration to reduce nutrients and mitigate HABs
- Alternative TMDL
Celina PWS – Grand Lake St Marys

Recommended Actions:
In-lake
• Lake treatment with alum
• Dredging sediments
• Site specific aeration

Watershed
• Wetland treatment trains
• Education and outreach
• Farm conservation planning
• Installation of conservation practices
Celina PWS – Grand Lake St Marys

Beach, recreation area

• Isolate beach embayment
• Dredge nutrient-rich sediment
• Aeration units
Western Lake Erie HABs

- Great Lakes Water Quality Agreement, Annex 4 – Phosphorus Loading Targets
- Ohio’s Domestic Action Plan - draft (https://lakeerie.ohio.gov/)
- H2Ohio Water Quality Plan (http://h2.ohio.gov/)
  - Phosphorus reduction best practices
  - Creation of wetlands

Questions?

HABs in Recreational Waters: [www.ohioalgaeinfo.com](http://www.ohioalgaeinfo.com)

HABs in Drinking Water: [https://epa.ohio.gov/ddaqw/HAB](https://epa.ohio.gov/ddaqw/HAB)

Ruth Briland
614-369-4045
[Ruth.Briland@epa.ohio.gov](mailto:Ruth.Briland@epa.ohio.gov)
Western Lake Erie HABs

- Great Lakes Water Quality Agreement, Annex 4 – Phosphorus Loading Targets

<table>
<thead>
<tr>
<th></th>
<th>Spring (Mar-July)</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Basin Cyanobacteria – Bloom biomass less than or equal to 2004 or 2012 9 years out of ten, and/or reduce risk of nearshore localized blooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maumee River</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus load</td>
<td>860 MT(^*)</td>
<td></td>
</tr>
<tr>
<td>Dissolved Reactive Phosphorus load</td>
<td>186 MT(^*)</td>
<td></td>
</tr>
<tr>
<td>Other Western Basin Tributaries and Thames River</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus load</td>
<td>40% reduction(^*)</td>
<td></td>
</tr>
<tr>
<td>Dissolved Reactive Phosphorus load</td>
<td>40% reduction(^*)</td>
<td></td>
</tr>
<tr>
<td>Central Basin Hypoxia – Aug – Sept Average Hypolimnetic Oxygen of 2 mg/L or more</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus load to Western and Central Basins, including Detroit River and atmospheric load</td>
<td>6000 MT(^**)</td>
<td></td>
</tr>
<tr>
<td>Eastern Basin Cladophora – insufficient information to establish target</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>