

BCC INFORMAL REGULAR SESSION

DATE: Monday, May 4, 2015

<u>NAME</u>	<u>TITLE</u>	<u>AFFILIATION</u>	<u>PHONE/EMAIL ADDRESS</u>
1. <u>John McManus</u>	<u>Administrator</u>	<u>Clermont SWCD</u>	<u>_____</u>
2. <u>_____</u>	<u>_____</u>	<u>_____</u>	<u>_____</u>
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A person wearing a blue long-sleeved shirt is holding a clear glass filled with a thick, green, opaque liquid. The background shows a large, light-colored cylindrical industrial tank with a blue door and windows, situated outdoors. The overall scene suggests a water sampling or testing activity.

Harmful Algal Blooms (HABS)

Toxins in Local Lake 3,000 percent higher than normal level,

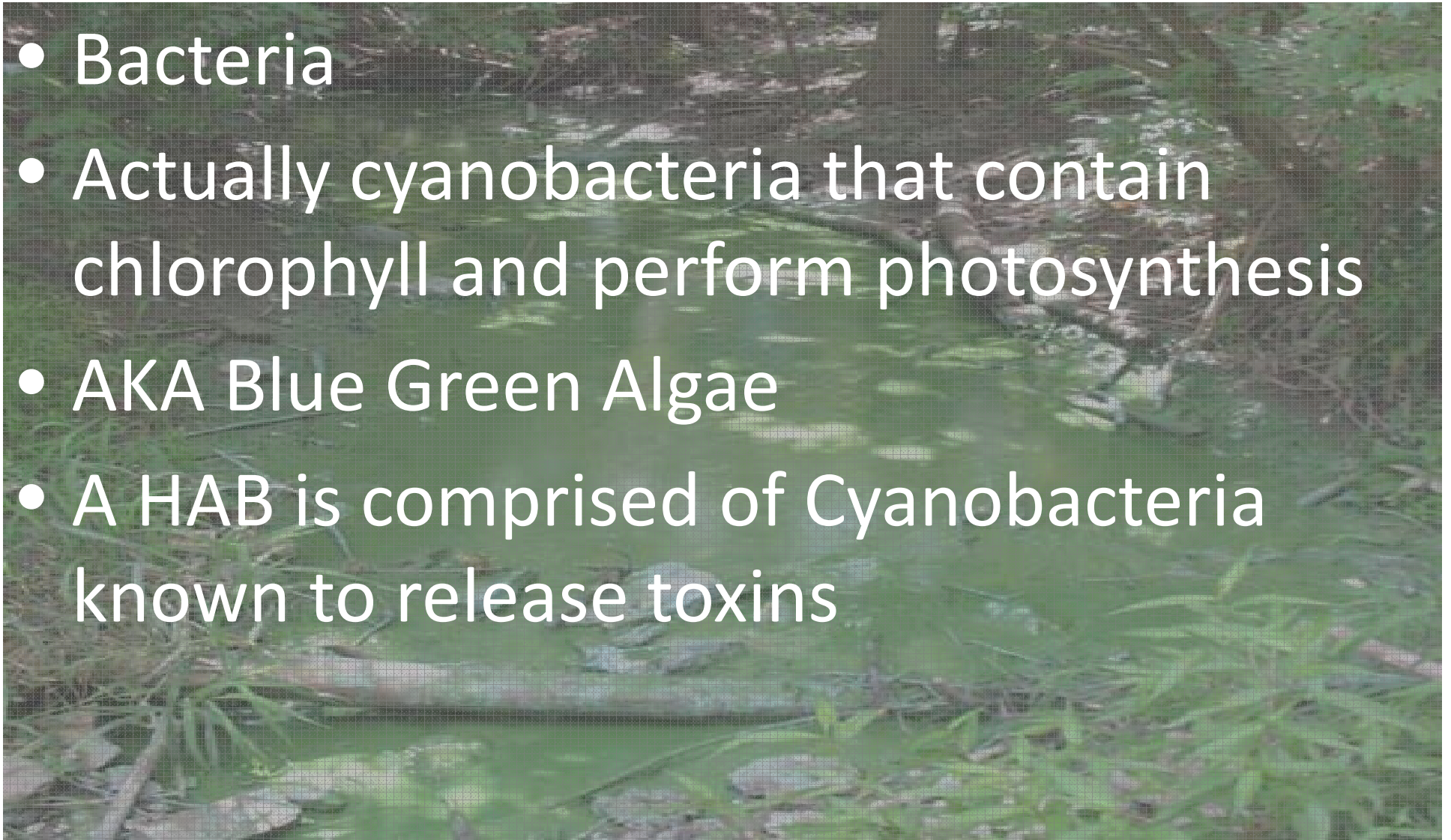
Fox19, 6/25/2014

Algae Toxins Prompts Toledo to Ban Its Drinking Water

npr, 8/3/2014

Terminology

- Bacteria
- Actually cyanobacteria that contain chlorophyll and perform photosynthesis
- AKA Blue Green Algae
- A HAB is comprised of Cyanobacteria known to release toxins



Toxins cause human and animal illnesses

Species	Dermatoxin (Irritant)	Hepatotoxin (Liver)	Neurotoxin (Nervous)	Taste/Odor Compound
<i>Aphanacapsa spp.</i>		microcystins		
<i>Microcystis spp.</i>		microcystins, nodularin	anatoxins	
<i>Snowella spp.</i>		microcystins		
<i>Synechococcus spp.</i>		microcystins		MIB, geosmin
<i>Woronichinia spp.</i>		microcystins		
<i>Lyngbya spp.</i>	lyngbyatoxins		saxitoxins	MIB
<i>Oscillatoria spp.</i>	aplysiatoxins	microcystins	anatoxins, saxitoxins	MIB, geosmin
<i>Planktothrix agardhii</i>	aplysiatoxins	microcystins	saxitoxins	MIB, geosmin
<i>Pseudoanabaena spp.</i>				MIB, geosmin
<i>Anabaena spp.</i>		microcystins, cylindrospermopsin	anatoxins, saxitoxins	MIB, geosmin
<i>Anabaenopsis elenkii</i>		microcystins		
<i>Aphanizomenon spp.</i>		microcystins, cylindrospermopsin	anatoxins, saxitoxins	geosmin
<i>Cylindrospermopsis raciborskii</i>		cylindrospermopsin	saxitoxins	
<i>Nodularia spp.</i>		microcystins, nodularin		

HAB Warning Signage

ODNR & OEPA

sample toxins and cyanobacteria.

Post signs as needed

Have fun on the water, but know that blue-green algae are in many Ohio lakes. Their toxins may be, too.

Be Alert! Avoid water that:

- looks like spilled paint
- has surface scums, mats or films
- is discolored or has colored streaks
- has green globs floating below the surface



Avoid swallowing lake water.

For more information, visit ohioalgaefinfo.com or call 1-866-644-6224.



WARNING

High levels of algal toxins have been detected.

Swimming and wading are not recommended for the very old, the very young or those with compromised immune systems.

Recreational Public Health Advisory

Microcystin > 6 ppb

DANGER

Avoid all contact with the water.

Algal toxins at UNSAFE levels have been detected.

No Contact Advisory

Microcystin > 20 ppb
Human illness or pet death



Widespread Impacts

- **Recreation:**
 - Beach closures
 - Pet deaths
- **Economic Impacts**
 - GLSM, \$40,000,000
- **Drinking water**

Harsha Lake – HAB History

- 2009 Grand Lake St. Marys
- HABs first samples/microcystin first detected in 2012
 - peak 4.5 ppb at main beach
- First advisory in 2013
 - peak microcystin 88 ppb

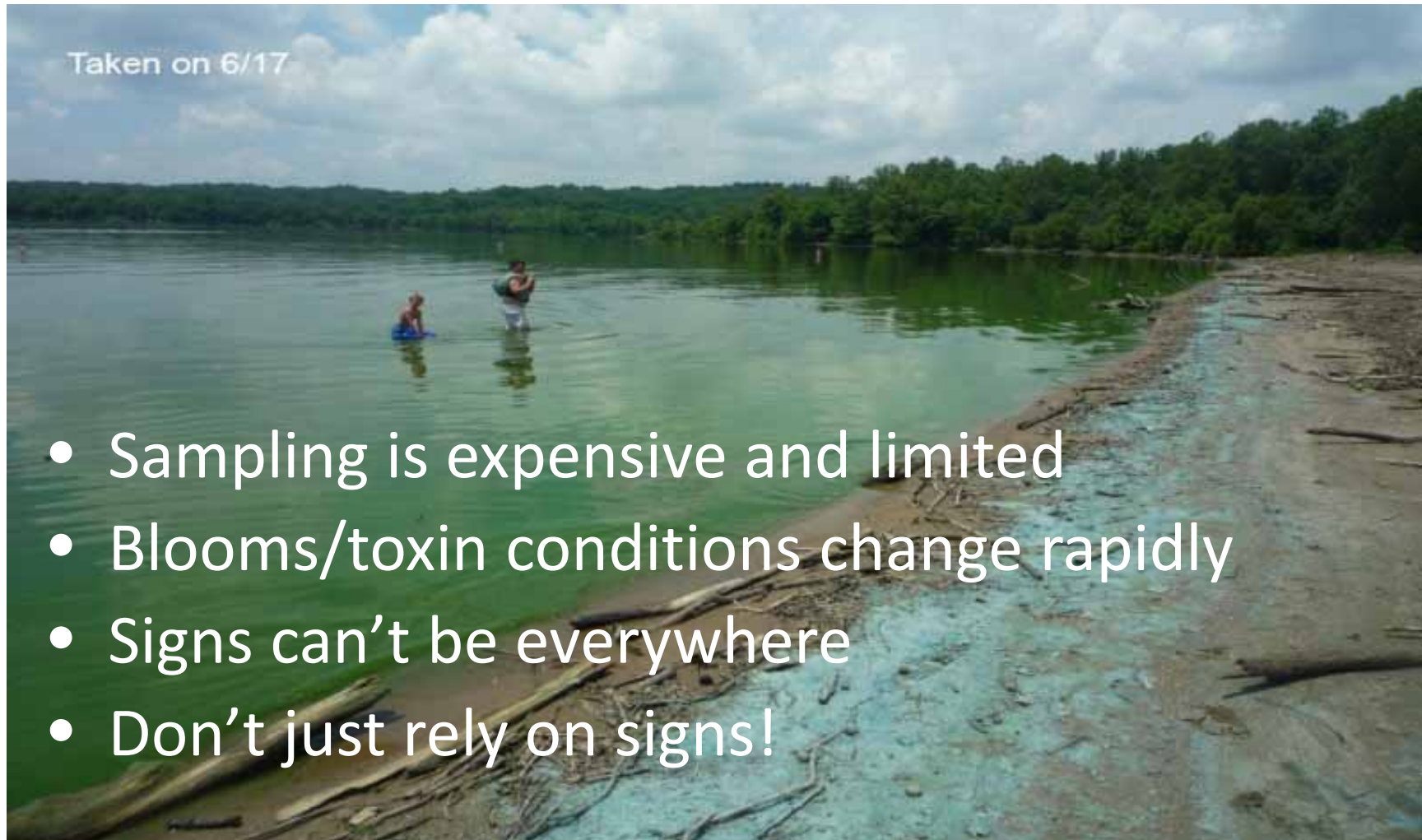


Starting to Impact Recreational Use

- 2014 – peak of 190 ppb
 - Regional swim meet moved
- 7/14/2015 – National Rowing Championships



When in Doubt Stay Out!



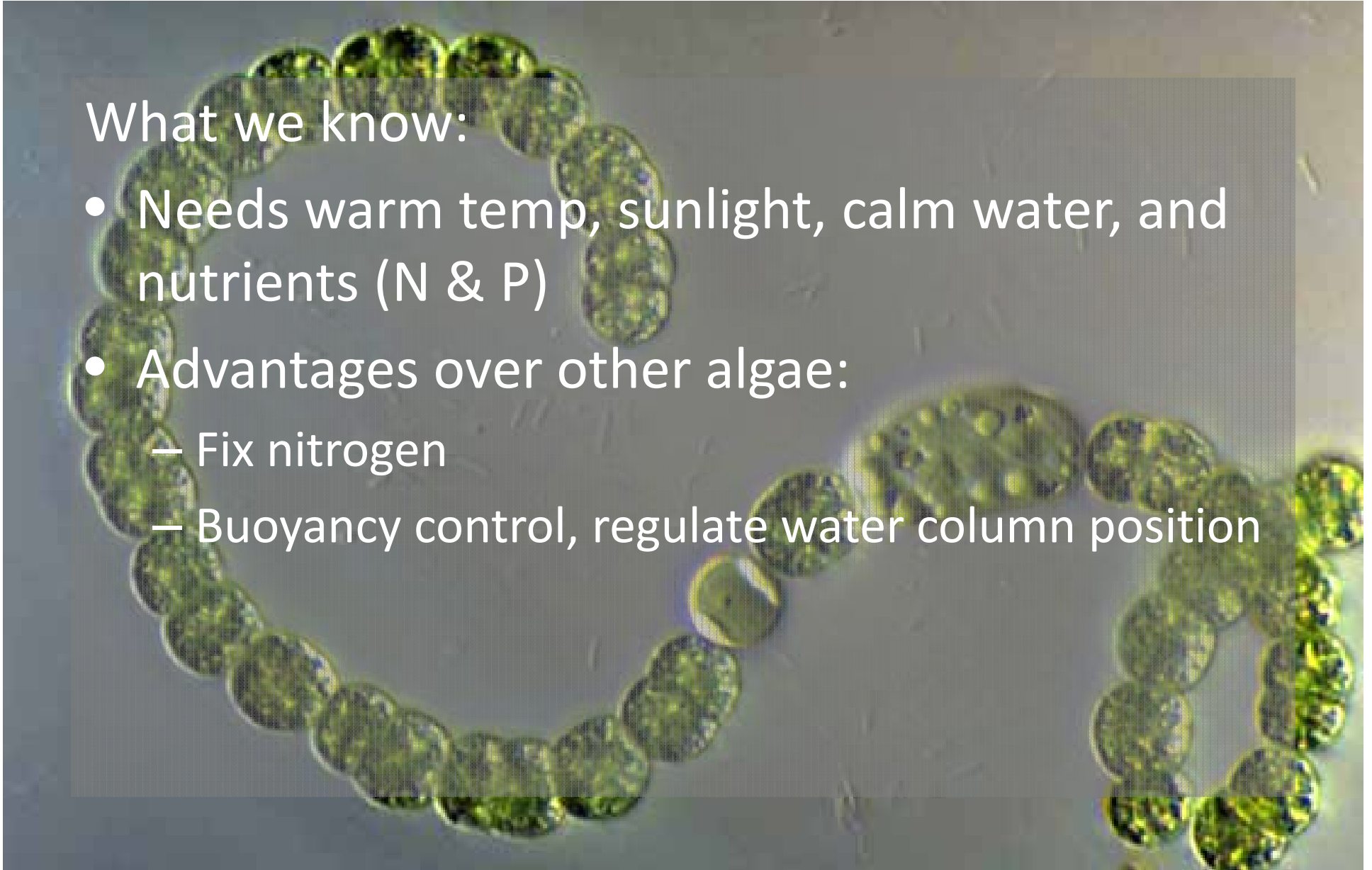
- Sampling is expensive and limited
- Blooms/toxin conditions change rapidly
- Signs can't be everywhere
- Don't just rely on signs!

Campground Beach, Harsha Lake

Why are we seeing this problem now?

What we know:

- Needs warm temp, sunlight, calm water, and nutrients (N & P)
- Advantages over other algae:
 - Fix nitrogen
 - Buoyancy control, regulate water column position





Theories:

- Fertilizer, farming practices
- changes in weather and extreme weather patterns (droughts, storms, temperature)

They are here to stay: akinetes (resting cells) over winter in lake and grow when conditions are favorable again

Make Them Go Away

Short term vs. long term

- Reservoir treatment on smaller scales
 - Copper sulfate
 - Alum or Ferric
 - Reservoir mixing, aeration, dredging
- Not cost effective on large reservoirs
- Prevention: source water protection



East Fork Watershed Cooperative From Source to Tap

- Federal Partners



- State Partners

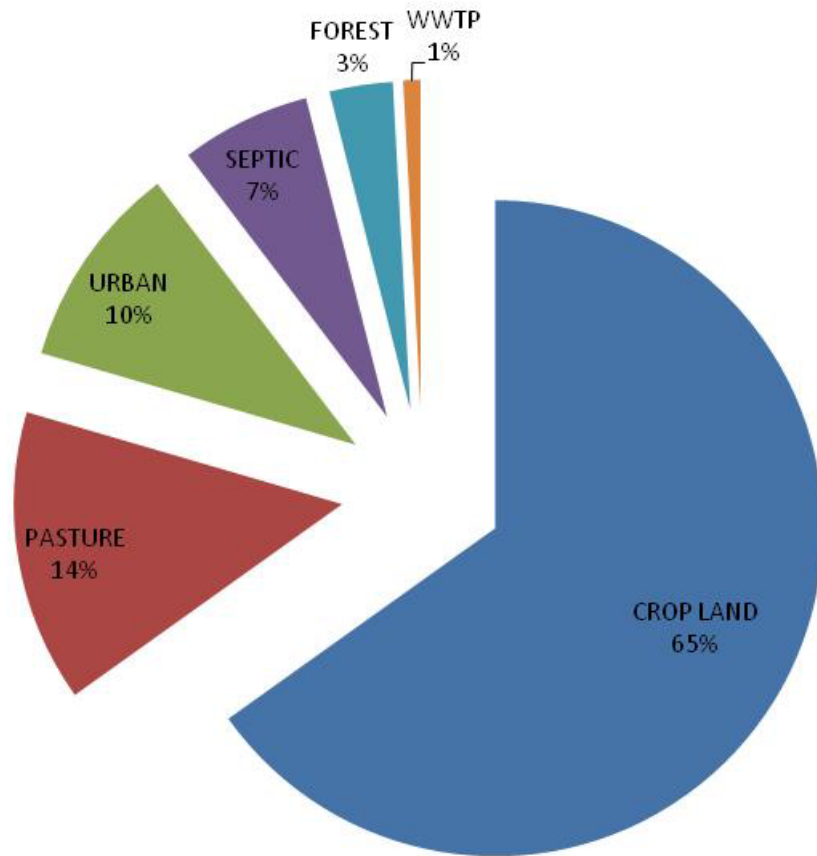


- Local Partners

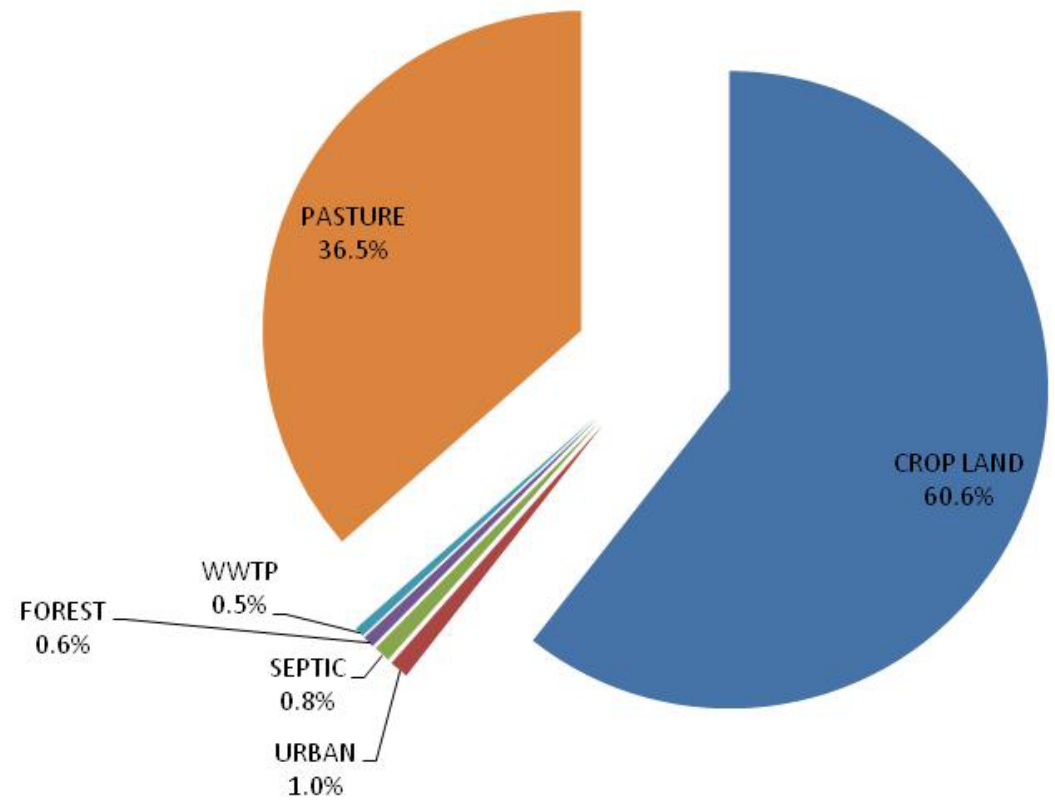


Annual Nutrient Load Distribution to Harsha Lake

Nitrogen



Phosphorus



Source: U.S. EPA Office of Research & Development

Reducing Agricultural Nutrient Runoff

- Do BMPs work?
- Are enough nutrients removed to improve WQ?
- Conservation Innovation Grant (CIG)
- Regional Conservation Partnership Program (RCPP)
 - \$427,905



Linking Watershed to the Lake

- Modeling watershed and lake
 - Determine feasibility of reducing blooms with sourcewater protection
 - Identifying best locations for BMPs

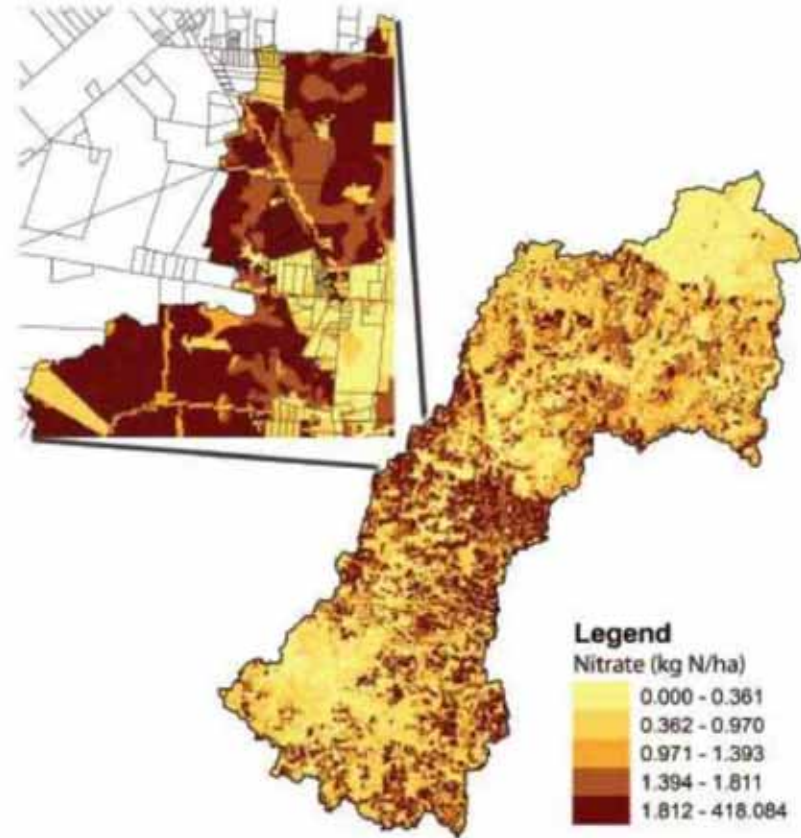


Fig. 10. (Color) SWAT model output visualized by HRU using alternative land-use layer

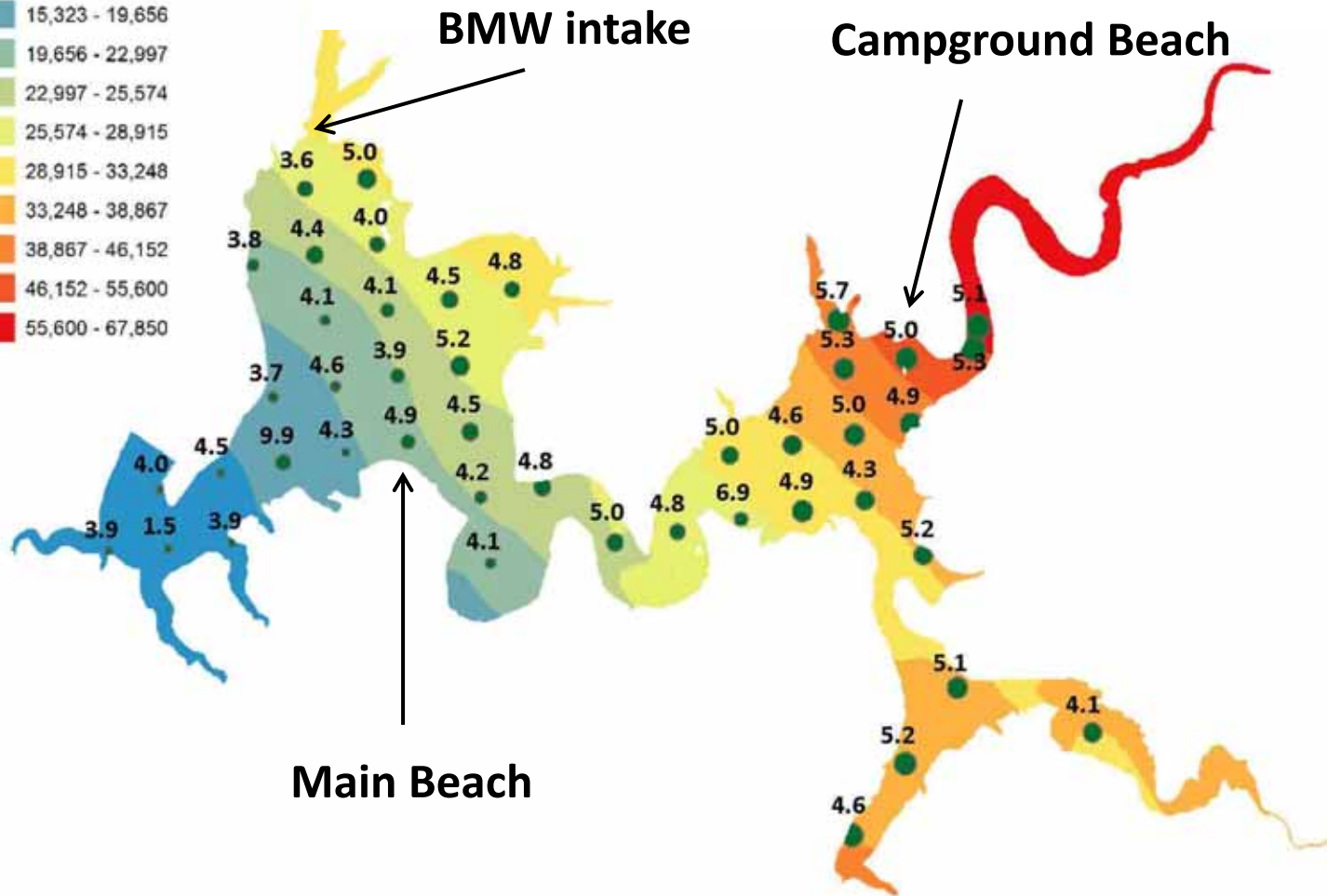
Lake Research

An aerial photograph taken from the perspective of someone inside an aircraft, looking out a window. The view shows a large body of water, likely a lake, with a significant portion of it covered in a bright green, turbid bloom. The water transitions from a clear blue to a deep green and then to a bright, almost white-green at the edges of the bloom. The aircraft's wing and part of the fuselage are visible in the foreground, framing the view of the lake. The sky is a pale blue, and some land with green vegetation is visible in the distance.

- Bloom monitoring
 - Less expensive and rapid assessment of blooms
 - Early HAB detection
 - Remote sensing via NOAA satellites and UC aircraft

Remote Sensing Project

BGA-PC (cells/mL)
Prediction Map



HAB History at BMW Plant

- Seasonal Taste & Odor (T&O) Issues since commissioning in 1995, suspected MIB and Geosmin
- Established CLSA and GC/MS testing capability
- MIB and Geosmin detected
- Conventional surface water treatment plant
- Original design using PAC not effective for complete removal of MIB and Geosmin
- GAC caps added to filters in 1999
- Caps effectively removed MIB & Geosmin
- Caps removed and GAC contactors constructed in 2012, concurrent with first microcystin detection

Best Available Treatment Technologies

Removal of Intact Cells

- Coagulation/Sedimentation
- Rapid Sand Filtration
- Slow Sand Filtration
- Membrane Processes
- Dissolved Air Flotation



Best Available Treatment Technologies

Removal of Extracellular Toxins

- Powdered Activated Carbon
- Granular Activated Carbon
- Biological Filtration
- Membrane Processes
- Oxidation (destroys toxin)

Technologies Currently Available at BMW

- Combined coagulation, sedimentation and filtration for algal cell removal
- GAC for removal of all extracellular toxins
- Potassium Permanganate (Oxidant)
- Chlorine (Oxidant)
- Multiple Level Intake Structure



Oxidant Inactivation Limitations

	Anatoxin-a	Cylindrospermopsin	Microcystin	Saxitoxin
Chlorine	Not Effective	Effective (at low PH)	Effective	Somewhat Effective
Chloramine	Not Effective	Not Effective	Not Effective	Inadequate Information
Chlorine Dioxide	Not Effective	Not Effective	Not Effective	Inadequate Information
Potassium Permanganate	Effective	Inadequate Information	Effective	Not Effective
Ozone	Effective	Effective	Effective	Not Effective
UV/Advanced Oxidation	Effective	Effective	Not Effective	Inadequate Information

Other Considerations

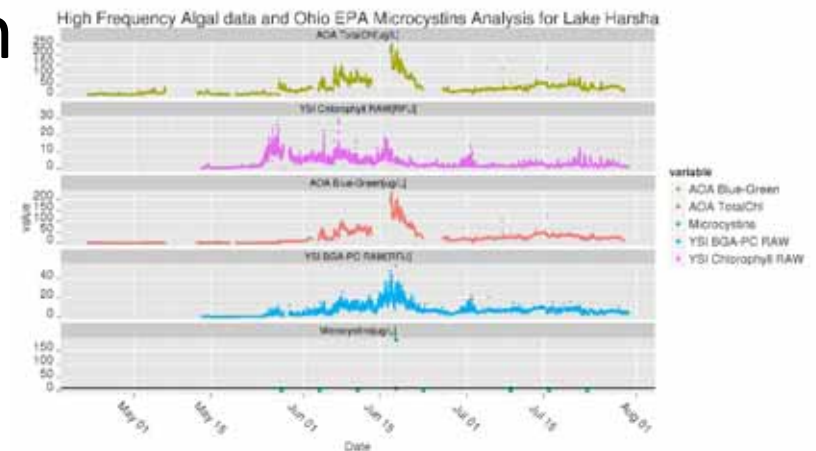
- Increase production at Groundwater Plants
- Interconnections with GCWW, Tate Monroe, and Western Water
- Water Use Restrictions

Current Testing Capabilities

- In House – Abraxis Testing
 - Pros: We Control Testing and Results
 - Cons: Time Demanding on Staff and Relatively Costly
- Contract Labs
 - Pros: Minimal Time from Staff
 - Cons: Delay in Results & Expensive for Numerous Samples

Research

- Joint Effort with USEPA
- Cluster Effort with Confluence that Involves Clermont County, USEPA, OEPA, USGS, GCWW, UC, and Army Corp.
- In House Testing/Research



QUESTIONS?