Benefits of Citizen Science in Ohio; Tales from the CLAM Program

Dana Oleskiewicz

Citizen Lake Awareness and Monitoring

Sponsored by Ohio Lake Management Society

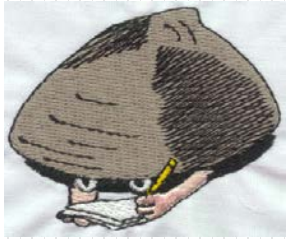
Citizen Scientists

- Enhanced datasets
- Reliable and engaged
- Baseline and long-term
- Local and immediate
- Leads to Action

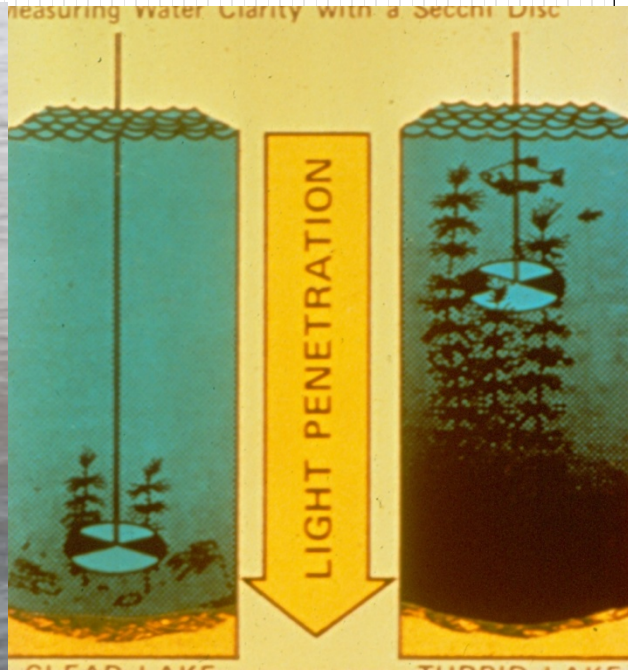
Portage Lakes CLAM Training, 2010.

Photo by Lew Stamp: LewStampPhotography.com

Collecting data since 1991……

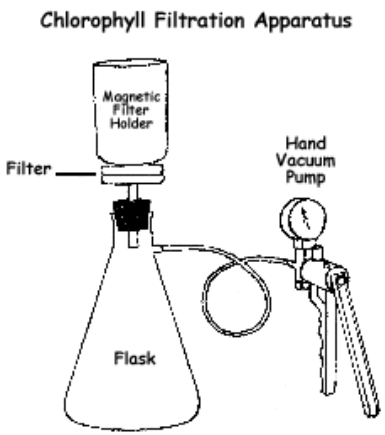


Citizen Lake Awareness and Monitoring



CLAM Parameters in QDC Program

- Transparency
- Water temperature
- Water color
- Quality and lake use



- Temp. / DO profiles
- Total nutrients
- Total suspended solids
- Chlorophyll *a*

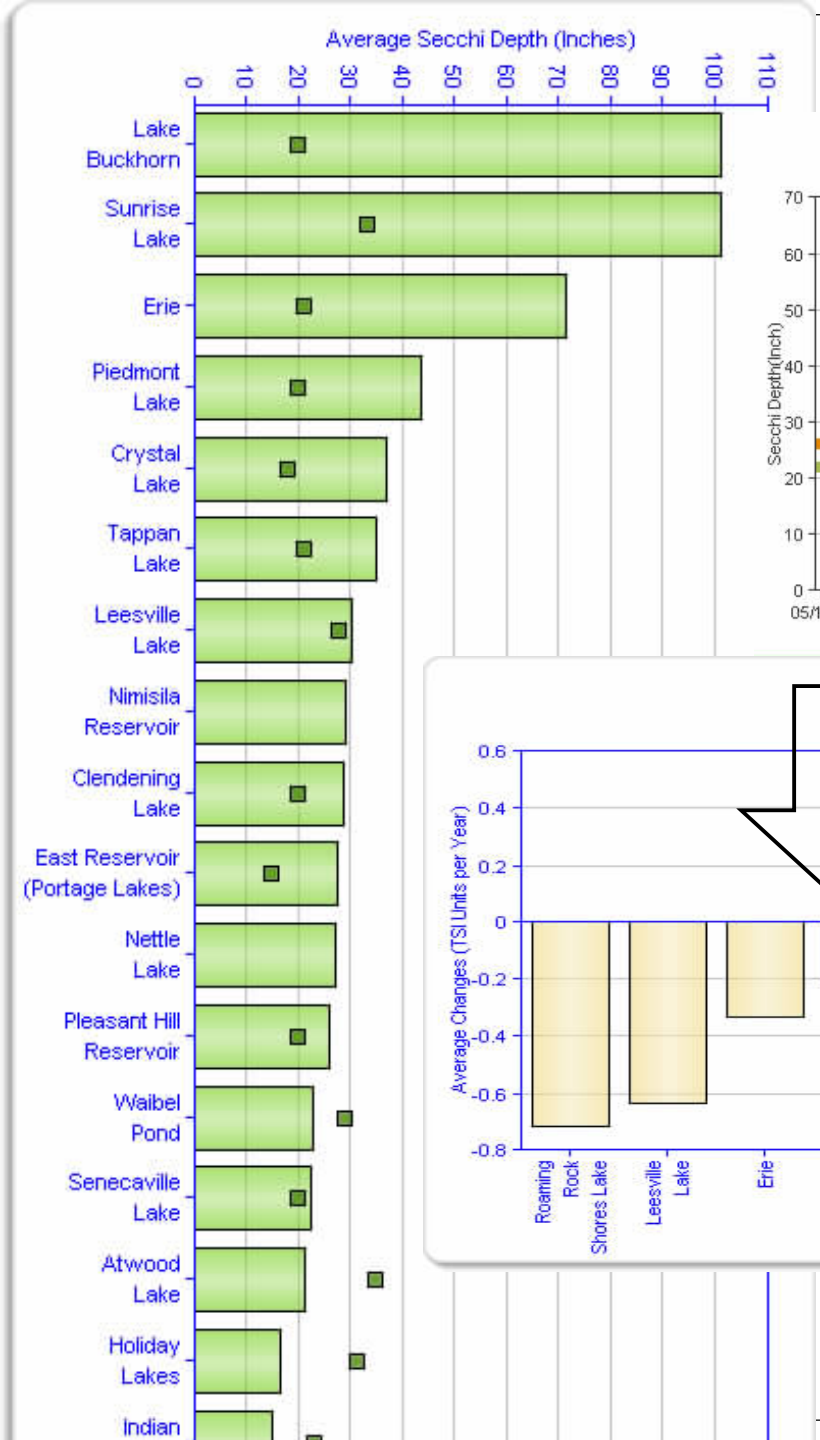
www.eyesonthewater.org/olms

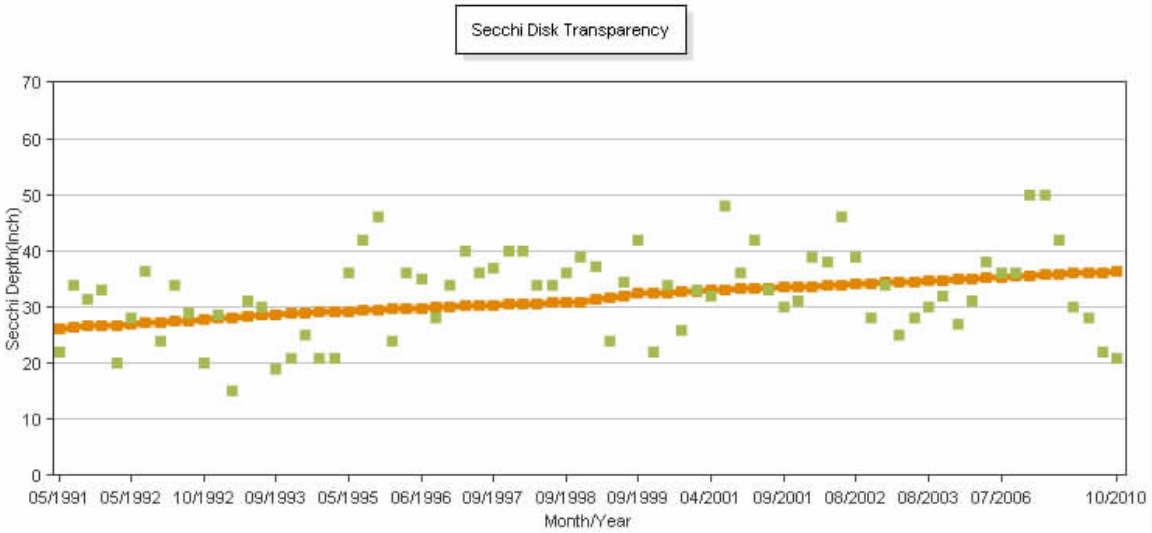
Ohio Lake Management Society

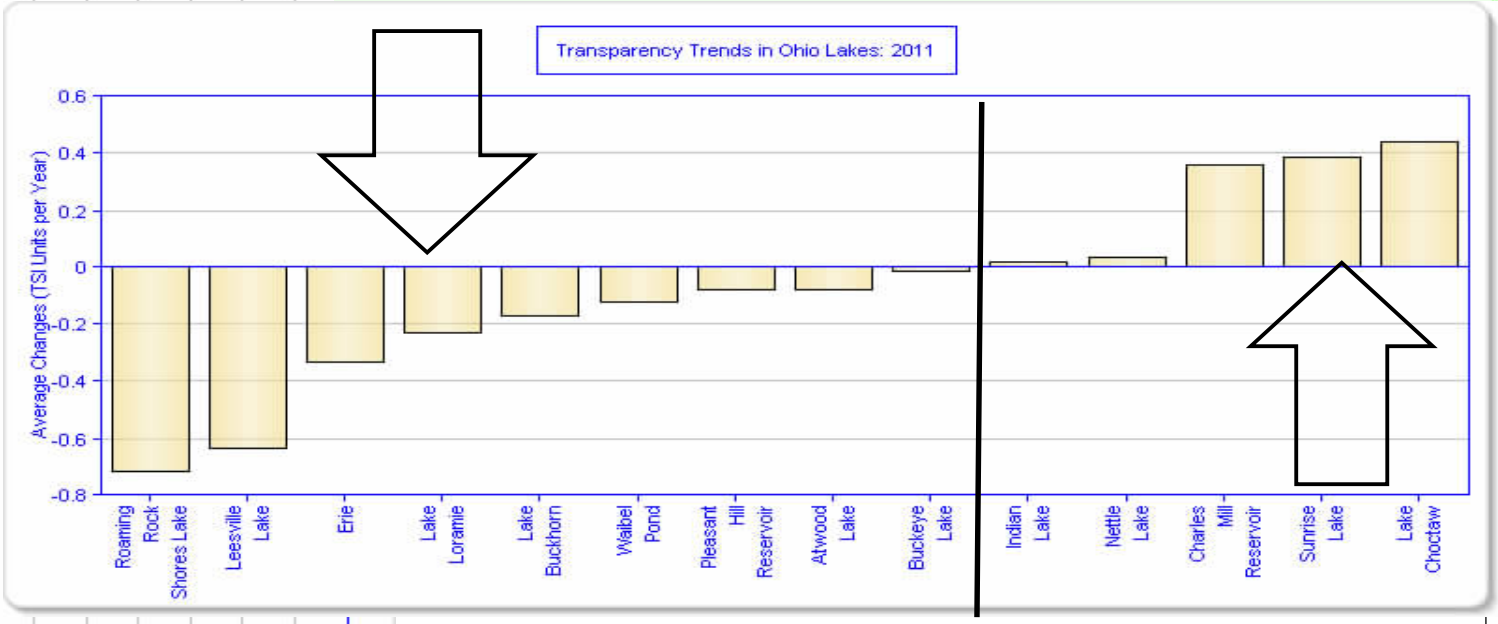
11 November 2010

Lake Summary Charles Mill Reservoir ID: 210

YEAR	SITE	Volunteer	Samples	SECCHI Avg	SECCHI Min	SECCHI Max	Water Depth (FT)	Water Color	Water Temp.
1995									
	0	Marion Zaugg	5	15.20	11	20	7.20	6.20	79.80
	1	Roger Clay	1	20.00	20	20	6.50	5.00	79.00
	10	Jim and Bev Pelc	10	8.00	6	12	3.75	3.30	74.60
	11	Larry Giannetto	3	13.67	11	16	23.37	6.33	74.67
	2	Robert Ledvina	3	23.33	18	26	12.93	5.00	74.00
	3	Robert Ledvina	3	25.33	16	30	9.77	3.33	73.33
	4	Dick and Marlene Groff	10	11.80	8	17	6.00	7.00	70.80
	5	Dick and Marlene Groff	10	12.80	10	19	6.55	7.20	70.40
	6	Nelson Shogren	8	10.63	5	15	5.36	4.88	70.50
	7	Nelson Shogren	8	9.38	4	12	4.27	4.50	74.63
	8	Jim and Bev Pelc	10	9.10	6	12	5.45	3.20	74.10
	9	Jim and Bev Pelc	10	9.20	6	12	4.05	3.40	74.20
	Averages for 1995		81	11.75	10.08	17.58	6.37	4.89	73.41
1996									
	10	Jim and Bev Pelc	8	6.75	6	8	3.63	4.38	79.13


Average Secchi Depth (Inches)
0
10
20
30
40
50
60
70
80
90
100
110
Lake Buckhorn
Sunrise Lake
Erie
Piedmont Lake
Crystal Lake
Tappan Lake
Leesville Lake
Nimisila Reservoir
Clendening Lake
East Reservoir (Portage Lakes)
Nettle Lake
Pleasant Hill Reservoir
Waibel Pond
Senecaville Lake
Atwood Lake
Holiday Lakes
Indian


Secchi Disk Transparency
Secchi Depth(Inch)
0
10
20
30
40
50
60
70
05/1991
05/1992
10/1992
09/1993
05/1995
06/1996
09/1997
09/1998
09/1999
04/2001
09/2001
08/2002
08/2003
07/2006
10/2010
Month/Year


Transparency Trends in Ohio Lakes: 2011
Average Changes (TSI Units per Year)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
Roaming Rock Shores Lake
Leesville Lake
Erie
Lake Loramie
Lake Buckhorn
Waibel Pond
Pleasant Hill Reservoir
Atwood Lake
Buckeye Lake
Indian Lake
Nettle Lake
Charles Mill Reservoir
Sunrise Lake
Lake Choctaw

Citizen Lake Awareness and Monitoring

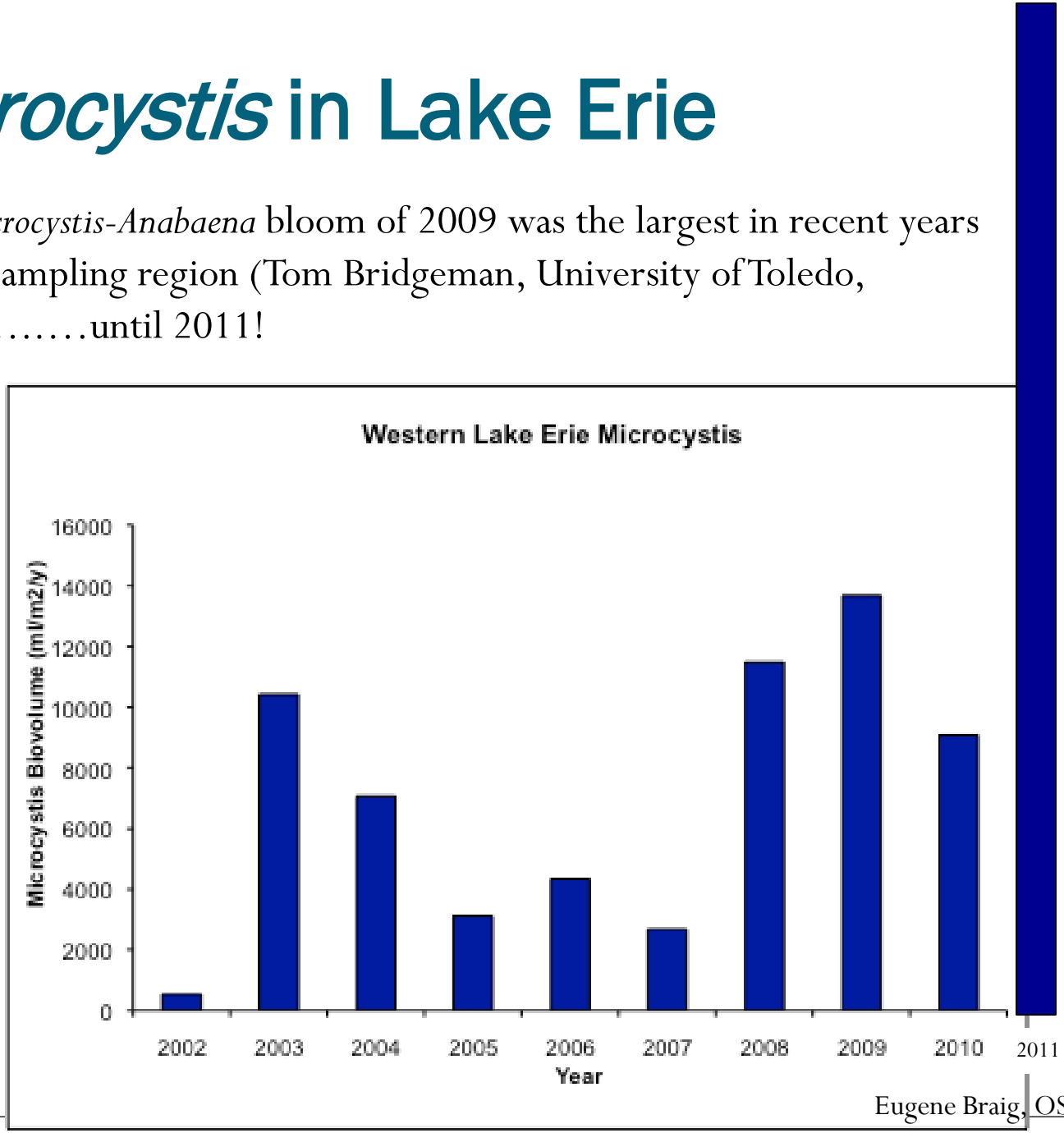
- Data for last 25 years
- 156 lakes total since start
- 825 citizens in database
- Approx. 200 citizens collected data
- 38 active lakes in 2015
- Currently approx. 123 active volunteers
- 6 volunteers with 20+ years
- Transparency since 1991, added parameters 2009

- Then….HABs hit….

Grand Lake St. Marys, 2010

Microcystis in Lake Erie

The *Microcystis-Anabaena* bloom of 2009 was the largest in recent years in our sampling region (Tom Bridgeman, University of Toledo, 2012)……..until 2011!



Eugene Braig, OSU Extension

Harmful Algal Blooms in Ohio

- 2009 high microcystin in Grand Lake St. Marys
- 2009 OEPA - Cyanotoxin monitoring
- 2010 ODH - 41 human illnesses, 5 dog deaths
- 2011 response strategy - ODH, ODNR, and OEPA

Citizen Lake Awareness Monitoring

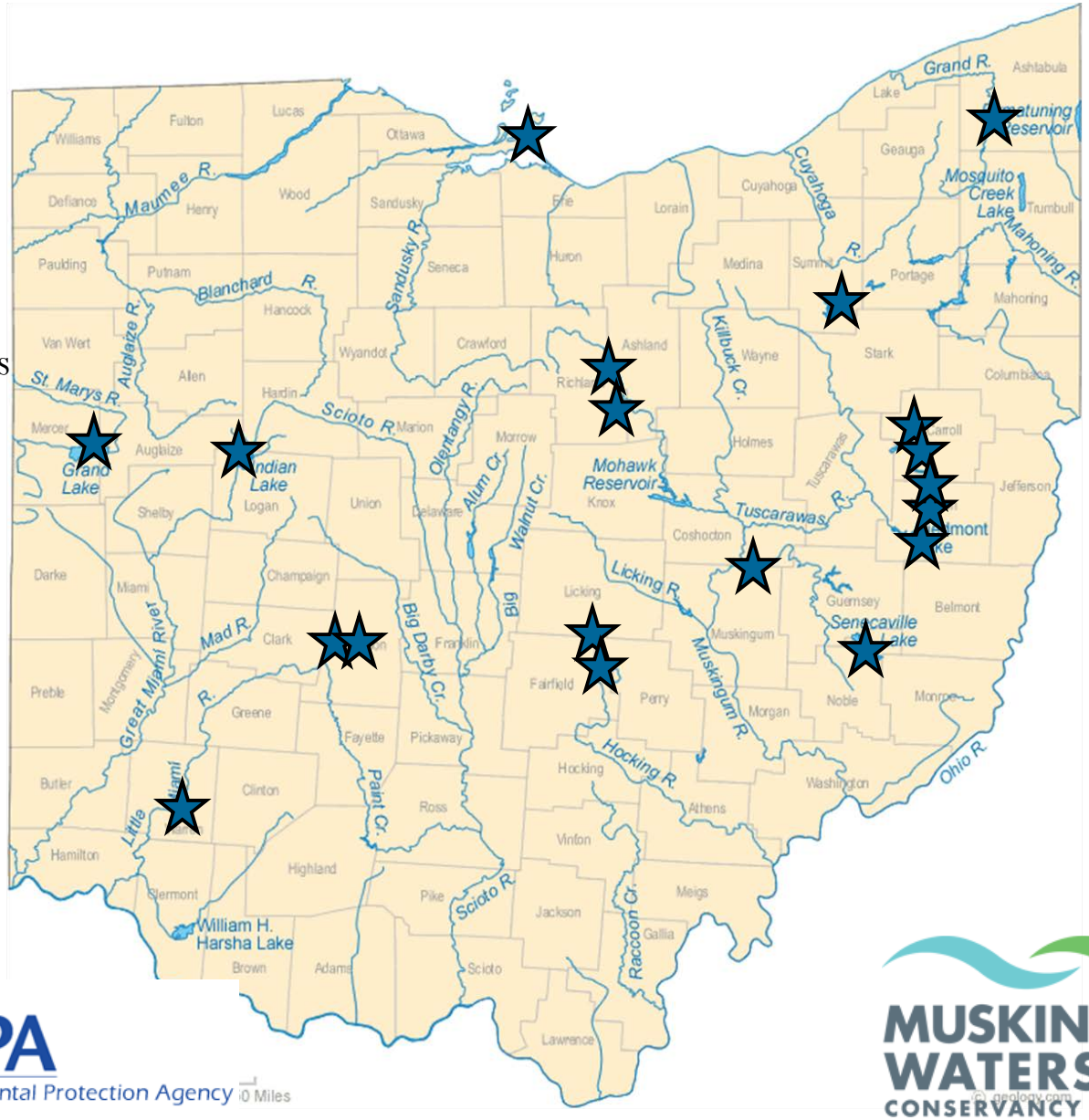
- 2011-2016 MWCD lakes being watched
- 2013 expanded watch in Ohio with OEEF project

Raymond, H., Merchant-Masonbrink, L, and Shaskus, M. (2012). *Ohio's Experience with HABs*. LakeLine, NALMS publication, vol.32: no.3, pgs. 26-30

HABs – 19 Lakes in 2013

OEEF

Buckeye Lake
Choctaw Lake
Lake Erie
Grand Lake St. Mary's
Indian Lake
Portage Lakes
Lake Roaming Rock
Sunrise Lake
Lake Sylvan
Waibel Pond



MWCD

Atwood
Charles Mill
Clendening
Leesville
Piedmont
Pleasant Hill
Seneca
Tappan
Wills Creek

OhioEPA
Ohio Environmental Protection Agency

MUSKINGUM WATERSHED CONSERVANCY DISTRICT

HAB Monitoring Protocol

Robert David and Jim Swihart, Choctaw Lake, Aug 2013

- Modified from OEPA methods
- Equipment bag, 6-7 mailing boxes
- Site selection, beaches, contact areas
- Composite, along a shoreline transect
- Twice per month, Jul - Aug - Sep
- Mail to BSA Environmental Services
- Toxin data weekly
- Phytoplankton data monthly
- 2014 - added 'hot spots'

Quality Assurance / Quality Control

Site	Time	Date Sampled	Date Analyzed	Microcystin (µg/L)
Sippo - Driven	10:05	7/26/2011	8/10/2011	0.381
Sippo - Driven	10:07	7/26/2011	8/10/2011	0.838
Sippo - Driven	10:09	7/26/2011	8/10/2011	0.451
			average:	**0.557**
Sippo - Mailed	10:05	7/26/2011	8/10/2011	0.399
Sippo - Mailed	10:07	7/26/2011	8/10/2011	0.603
Sippo - Mailed	10:09	7/26/2011	8/10/2011	0.612
			average:	**0.538**
Sippo - Driven	10:05	8/1/2011	8/10/2011	0.295
Sippo - Driven	10:10	8/1/2011	8/10/2011	0.240
Sippo - Driven	10:15	8/1/2011	8/10/2011	0.380
			average:	**0.305**
Sippo - Mailed	10:05	8/1/2011	8/10/2011	0.307
Sippo - Mailed	10:10	8/1/2011	8/10/2011	0.483
Sippo - Mailed	10:15	8/1/2011	8/10/2011	0.442
			average:	**0.410**
Sippo - Driven	10:45	8/2/2011	8/10/2011	2.015
Sippo - Driven	10:50	8/2/2011	8/10/2011	1.961
Sippo - Driven	10:55	8/2/2011	8/10/2011	2.290
			average:	**2.089**
Sippo - Mailed	10:45	8/2/2011	8/10/2011	2.328
Sippo - Mailed	10:50	8/2/2011	8/10/2011	2.120
Sippo - Mailed	10:55	8/2/2011	8/10/2011	2.892
			average:	**2.447**

Robert David and Betty Lyle Kaser ,
Indian Lake, Aug 2013

Cyanobacteria Bloom Densities

4,000 - 10,000 cells/mL	**=**	**Minor Bloom**
10,000 - 100,000 cells/mL	**=**	**Moderate Bloom**
>100,000 cells/mL	**=**	**Severe Bloom**

http://epa.ohio.gov/HABAlgae.aspx

Cyanotoxin Genera

2011

Density (cells/mL)	Piedmont 7/10/2011 12:15	Piedmont 7/26/2011 17:30	Piedmont 8/8/2011 17:15	Piedmont 8/22/2011 17:00	Piedmont 9/12/2011 17:23	Piedmont 9/28/2011 17:15
Anabaena	1198	5113		13223	4584	1693
Anabaenopsis		617	15163	1410	1146	741
Aphanizomenon						
Cylindrospermopsis	20406	92035	27328	258297	310309	159386
Microcystis						
Oscillatoria		2292		1322		
Planktothrix						
TOTAL CYANOS	**95,269**	**100,057**	**42,491**	**275,840**	**319,390**	**168,484**

2012

Density (cells/mL)	Piedmont 7/10/2012 17:05	Piedmont 7/24/2012 17:00	Piedmont 8/12/2012 15:15	Piedmont 8/27/2012 17:00	Piedmont 9/10/2012 17:05	Piedmont 9/17/2012 17:20
Anabaena	1176	2709	20		4991	2042
Anabaenopsis	72	998	327	2597	381	2625
Aphanizomenon	864	668	472		8556	18959
Cylindrospermopsis	83152	205340	154718	62641	93223	45307
Microcystis						
Oscillatoria						110
Planktothrix						
TOTAL CYANOS	**240,635**	**447,875**	**380,118**	**260,800**	**649,339**	**451,750**

Microcystin Cyanobacteria

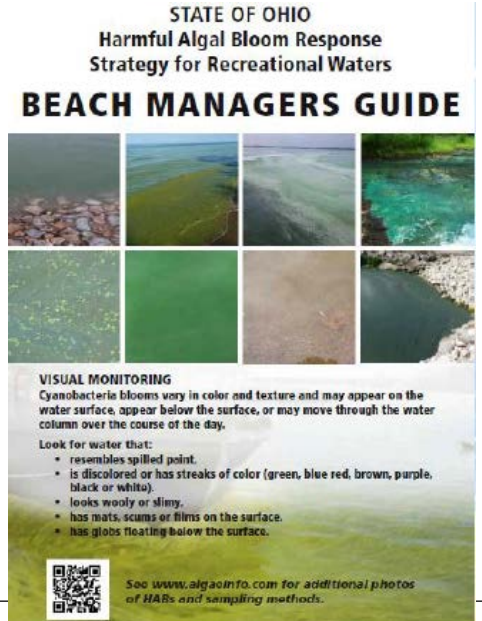
Cylindrospermopsin Cyanobacteria

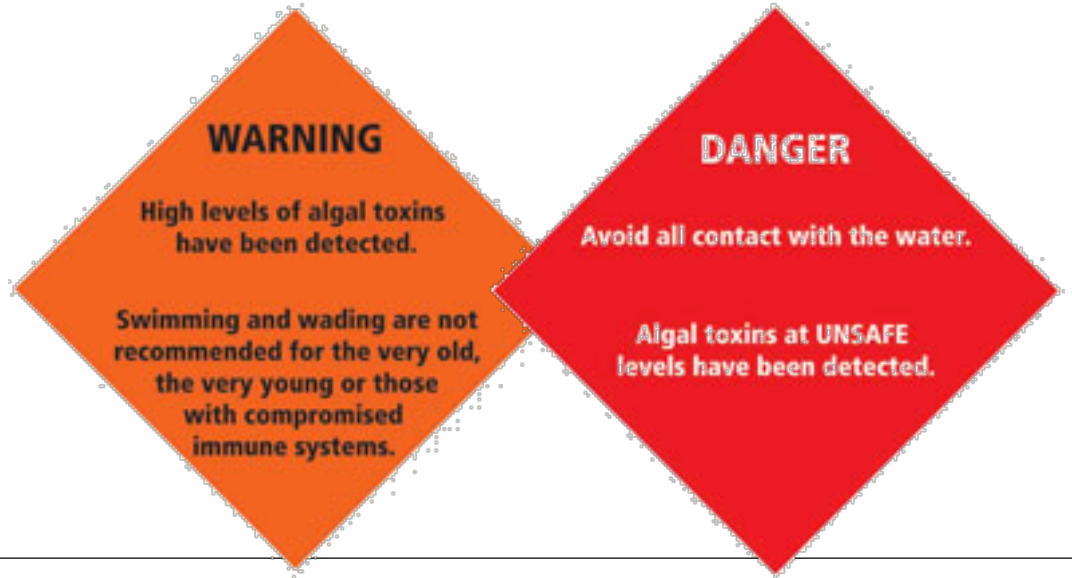
Cyanotoxin Thresholds

http://epa.ohio.gov/HABAlgae.aspx

Threshold (ug/L)	Microcystin	Cylindrospermopsin
Algae Bloom Advisory	identified	identified
Recreational Public Health Advisory	6	5
Recreational No Contact Advisory	20*	20*
Drinking Water - Do Not Drink	1	1
Drinking Water - Do Not Use	20	20

*Concentration levels, along with confirmed illness or death.





Microcystin Results

- 75% of samples = limited detection
- 5 lakes with values
- < 6 ug/L threshold
- 2011 with more 'hits'
- Tappan Lake with greatest frequency and highest value

Lake	Time	Date Sampled	Microcystin (ug/L)
Charles Mill	17:45	8/24/2011	0.225
Charles Mill	14:00	7/9/2012	0.19
Leesville	11:15	7/5/2011	0.239
Leesville	10:45	9/6/2011	0.203
Pleasant Hill	14:00	7/5/2011	0.153
Pleasant Hill	14:30	7/5/2011	0.149
Pleasant Hill	13:39	7/25/2011	0.220
Pleasant Hill	14:32	8/9/2011	0.253
Pleasant Hill	13:40	8/29/2011	0.749
Pleasant Hill	11:30	9/27/2011	0.216
Tappan	14:32	7/5/2011	0.692
Tappan	14:51	7/5/2011	0.526
Tappan	14:40	7/19/2011	0.813
Tappan	10:53	8/2/2011	0.170
Tappan	10:28	8/29/2011	0.540
Tappan	11:50	9/12/2011	0.512
Tappan	14:00	9/27/2011	0.991
Tappan	10:05	7/17/2012	0.56
Tappan	14:30	7/29/2012	1.45
Tappan	16:04	8/7/2012	0.18
Tappan	10:25	8/21/2012	0.90
Tappan	10:30	9/3/2012	0.91
Tappan	15:05	9/24/2012	0.32
Wills Creek	14:00	8/28/2011	0.349
Wills Creek	14:00	7/22/2012	0.18
Wills Creek	16:00	8/5/2012	0.15

Cylindrospermopsin Results

Lake	Time	Date Sampled*	Cylindrospermopsin (ug/L)	Comments
Atwood	11:42	7/2/2012	<0.10	Concentration below limit of quantification
Atwood	9:45	10/4/2012	ND	Concentration below limit of detection
Charles Mill	14:00	7/9/2012	ND	Concentration below limit of detection
Clendening	17:50	7/10/2012	ND	Concentration below limit of detection
Leesville	10:45	7/10/2012	ND	Concentration below limit of detection
Piedmont	17:05	7/10/2012	<0.10	Concentration below limit of quantification
Piedmont	17:00	7/24/2012	ND	Concentration below limit of detection
Piedmont	15:15	8/12/2012	0.12	< 5 ug/L threshold
Piedmont	17:00	8/28/2012	0.65	< 5 ug/L threshold
Piedmont	15:05	9/10/2012	1.21	< 5 ug/L threshold
Piedmont	17:20	9/17/2012	1.14	< 5 ug/L threshold
Pleasant Hill	14:49	7/8/2012	ND	Concentration below limit of detection
Seneca	13:45	7/10/2012	ND	Concentration below limit of detection
Tappan	10:05	7/17/2012	ND	Concentration below limit of detection
Tappan	16:04	8/7/2012	<0.10	Concentration below limit of quantification
Wills Creek	19:00	7/1/2012	<0.10	Concentration below limit of quantification
Wills Creek	14:00	7/22/2012	ND	Concentration below limit of detection

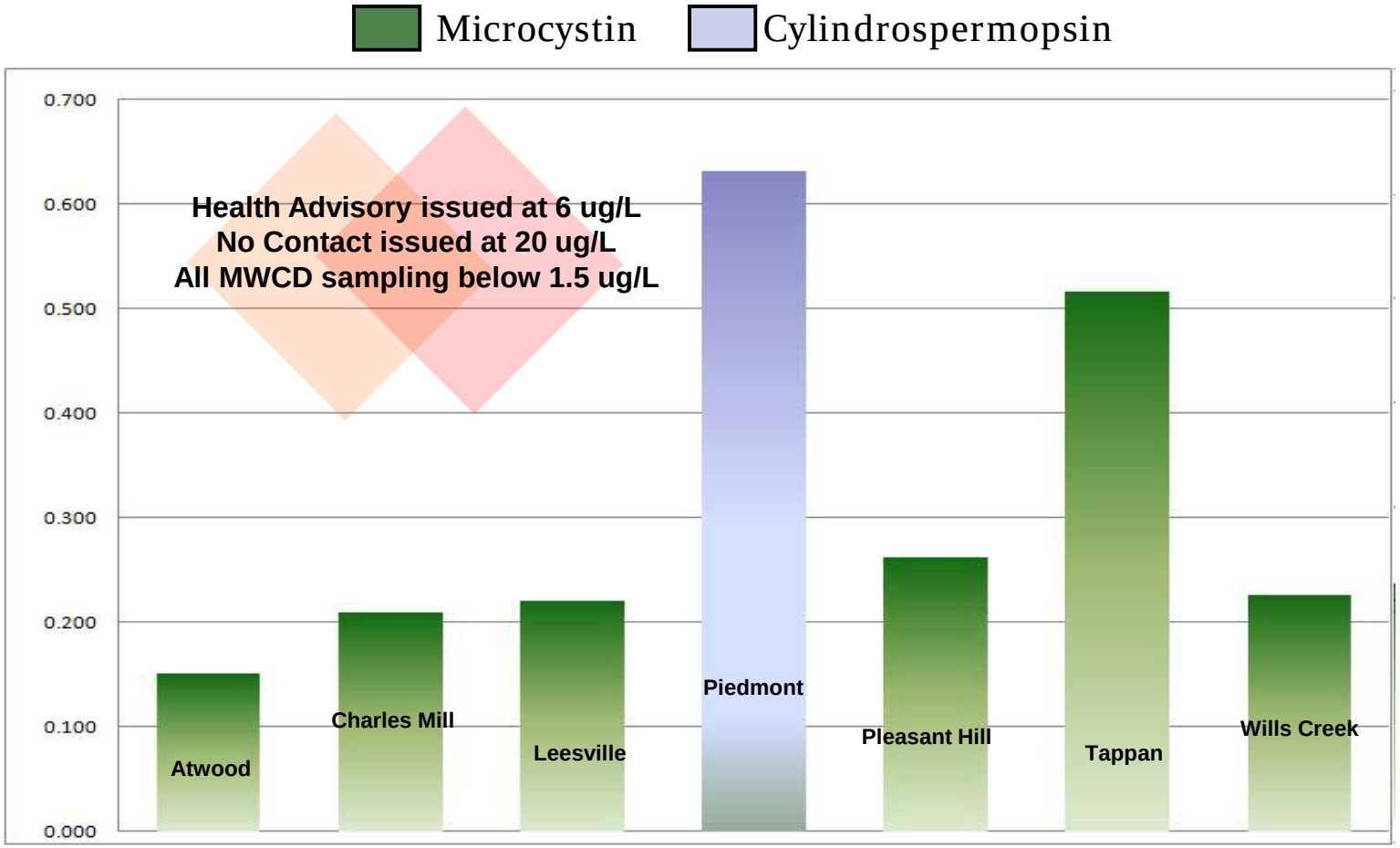
*Not all samples shown. Except Piedmont Lake, all samples were below limit to detect or quantify.

Microcystin Concentrations ug/L OEEF Lakes - 2013

- 27% of samples = limited detection
- 50% above .15 ug/L but < 6 ug/L
- 23% above 6 ug/L representing 4 lakes
- 12% above 'no contact' threshold of 20 ug/L

Site	Date Sampled	Microcystin (µg/L)
Choctaw Lake	9/17/2013	6.563
Choctaw Lake	7/15/2013	7.95
Choctaw Lake	8/12/2013	10.002
Buckeye Lake	7/8/2013	11.18
Choctaw Lake	8/27/2013	12.562
Grand Lake St. Mary's	7/29/2013	12.833
Choctaw Lake – QAQC	8/27/2013	13.844
Grand Lake St. Mary's	7/1/2013	25.954
Grand Lake St. Mary's	8/26/2013	31.739
Grand Lake St. Mary's	7/15/2013	34.180
Indian Lake	7/29/2013	38.1531
Grand Lake St. Mary's – QAQC	8/15/2013	42.407
Grand lake St. Mary's	9/9/2013	50.896
Buckeye Lake	8/18/2013	68.736
Buckeye Lake – QAQC	9/9/2013	106.41
Buckeye Lake	9/9/2013	107.14

Average Toxin Concentration (2011 - 2013) ug/L



- Average concentration from 2011 to 2013.
- Only samples with a measurement above .15 ug/L are included.
- Clendening and Seneca lakes did not measure above .15 ug/L.

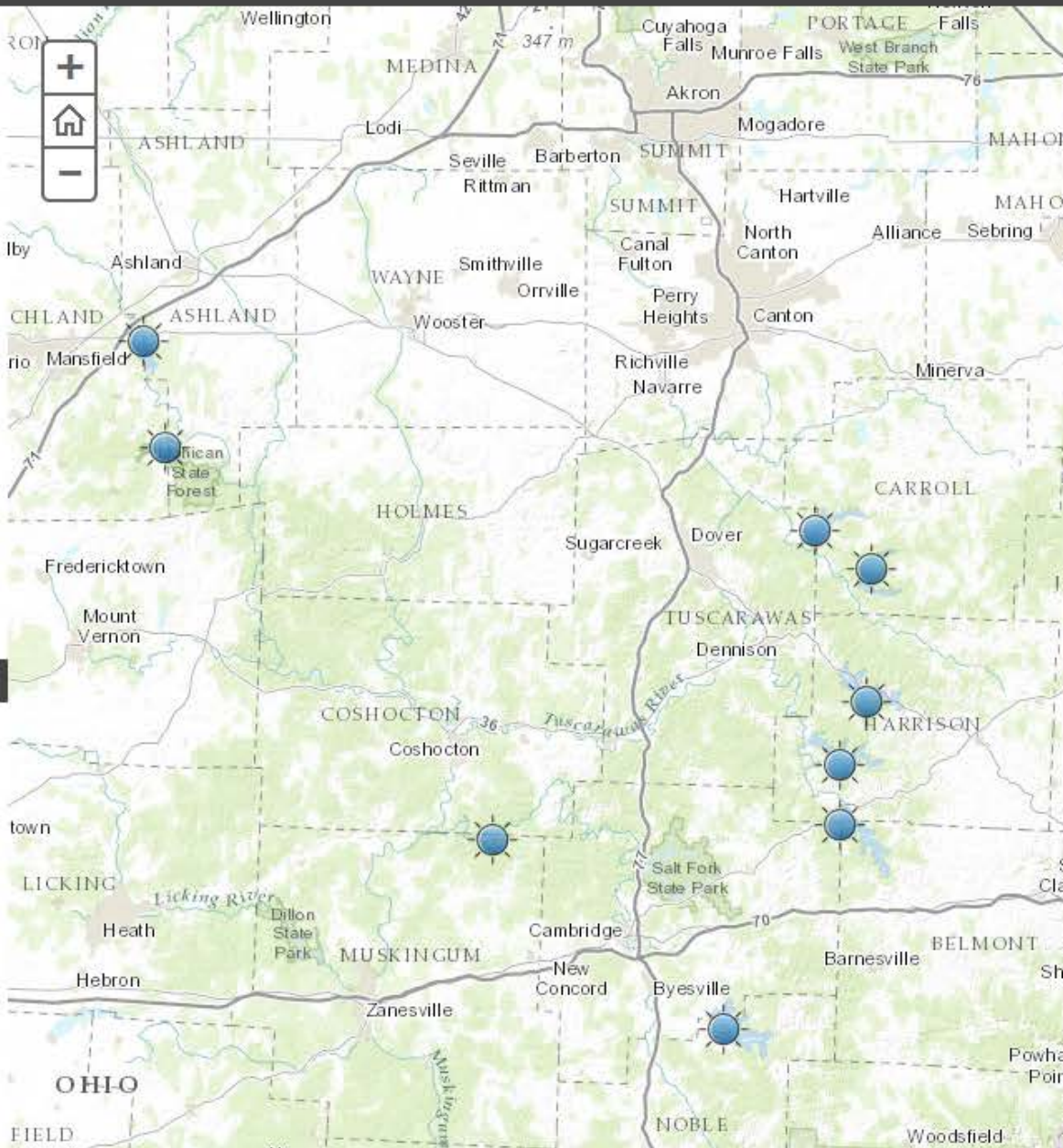
Monitoring for a Harmful Algal Bloom at Muskingum Watershed Lakes

Most recent HAB TOX results from BSA Environmental Services

MWCD Lakes are sampled every 2 weeks July - September by Citizen Lake Awareness and Monitoring (CLAM) volunteers through Ohio Lake Management Society (OLMS) and a grant awarded by MWCD The samples are sent to a certified lab (BSA Environmental Service, Inc) to be analyzed. All seasonal results are available by contacting OLMS at 330-466-5631 as only most recent results are displayed on the map.

Levels of advisory were developed following the Ohio EPA public health thresholds.

Map Compiled by
Skyler Dewey, MWCD



LEGEND

HAB Advisory- Most Current Results

- No Recreational Public Health Advisory
- Recreational Public Health Advisory
- Recreational No Contact Advisory

MUSKINGUM WATERSHED CONSERVANCY DISTRICT

Partnerships and Stewardship

- Nonprofit, public, and private working together
  - Combined resources, strengths magnified
  - Increase legitimate improvements with various decision makers
  - Better ability for long-term effort
- Longevity of effort leads to action
- Action (and only action) will protect our water and us!

www.eyesonthewater.com/olms

www.olms.org

Dana Oleskiewicz

330-466-5631

oleskiewicz@windstream.net

*Special thank you to Linda Merchant-Masonbrink with Ohio EPA and Dr. Eugene Braig with Ohio State University for contributions to this presentation.