Monitoring Multiple Harmful Algal Bloom Cyanotoxins Along the Lake Erie Shoreline

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Regional Science Consortium

Harmful Algal Blooms in Lake Erie

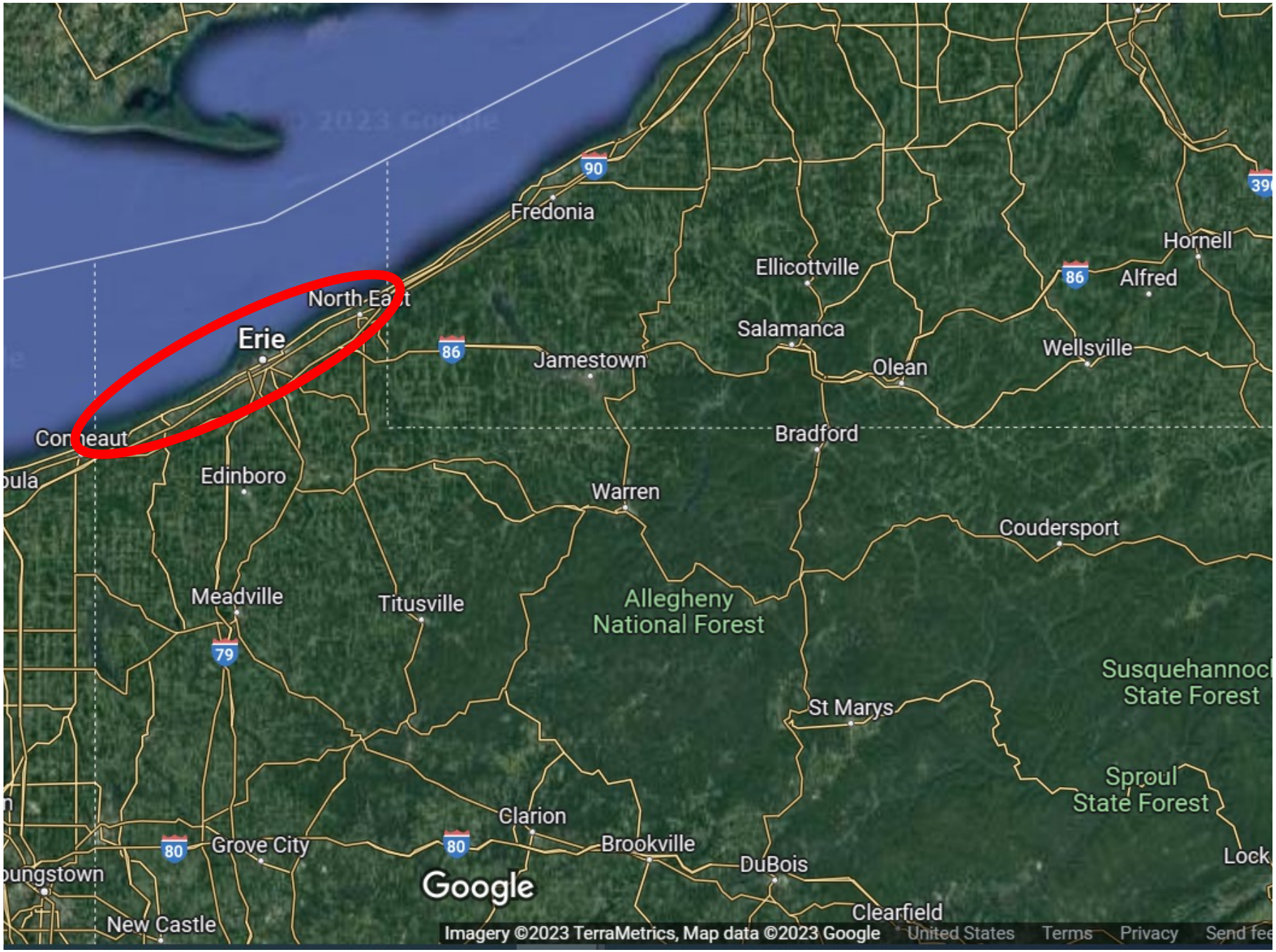
The RSC HABs Monitoring Program

Goals

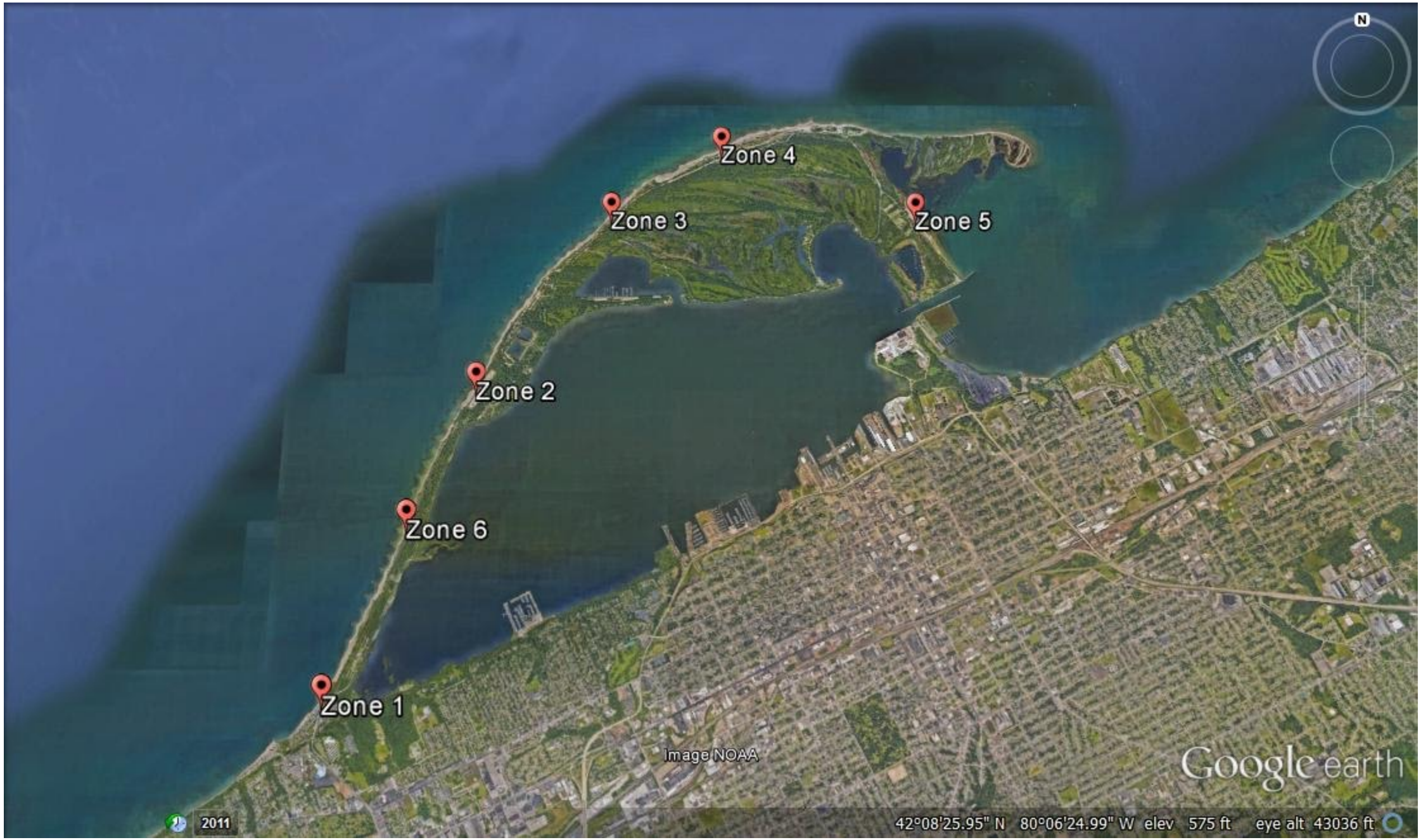
- Implement a long-term monitoring program for cyanotoxins
- Develop messaging for real-time results to the public
- Collaboration with Veterinarians to identify cyanotoxin poisoning in pets
- Create public education and awareness about HABs

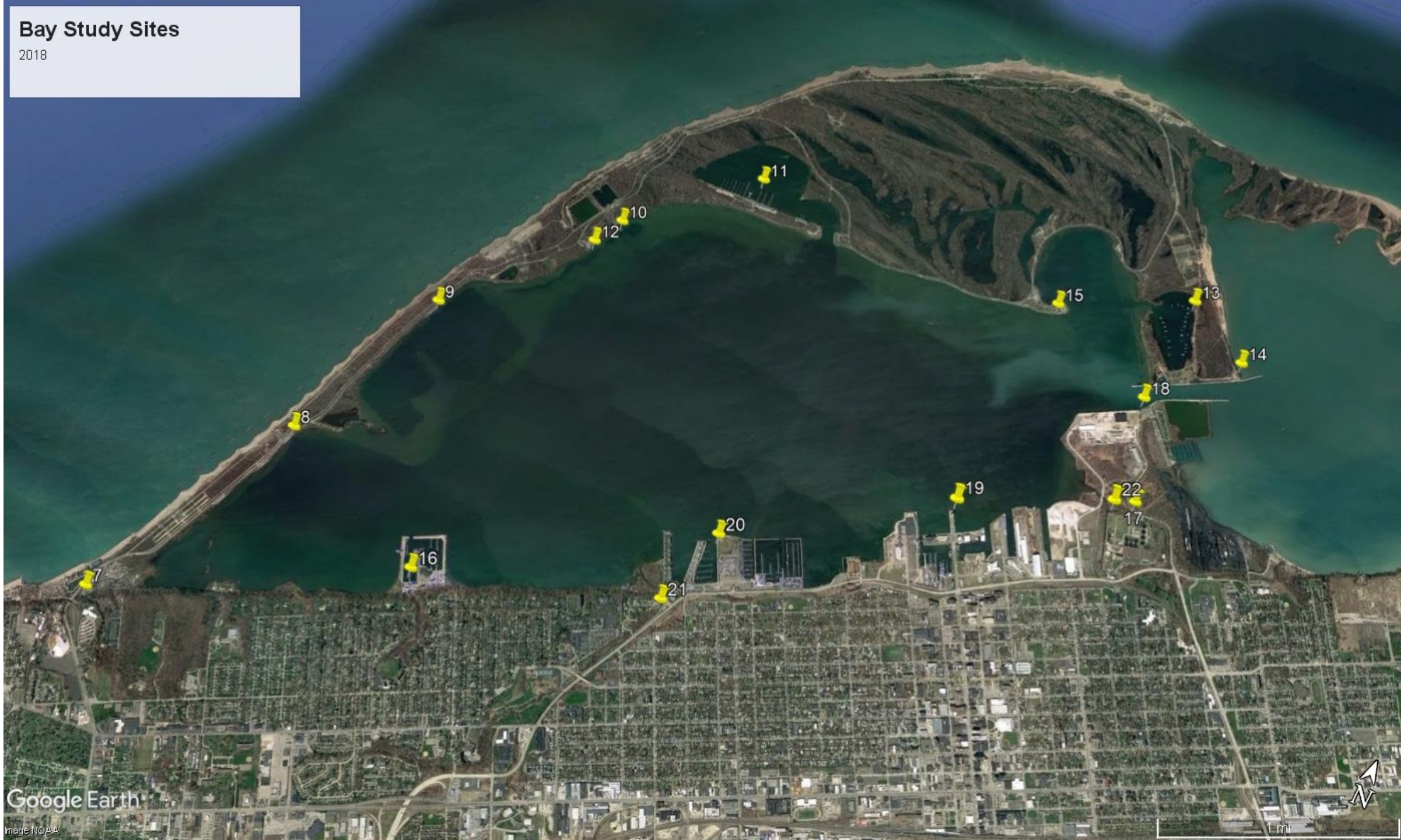
Sampling Methods and Sites

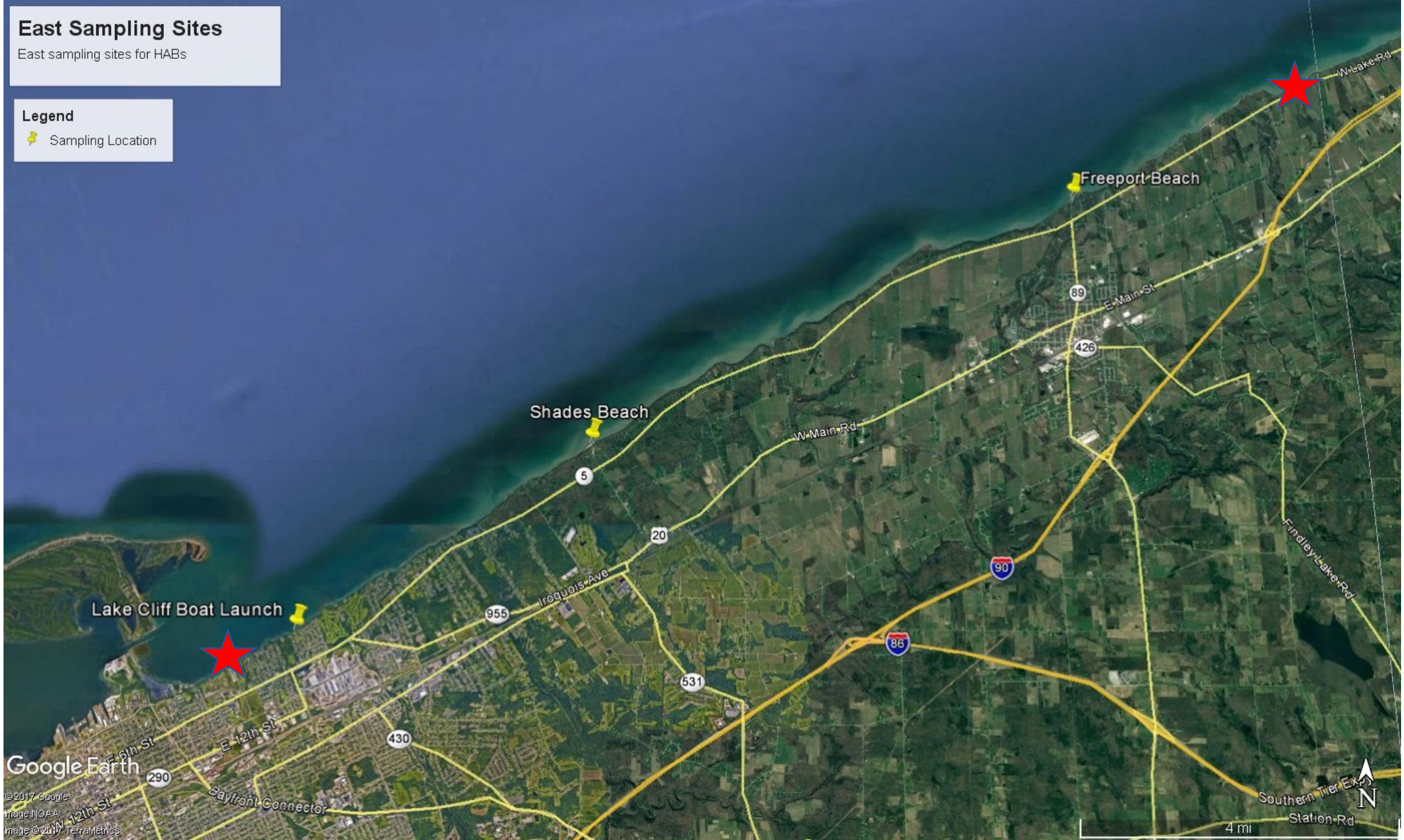
- Sampling initiated in 2014
- Samples collected weekly from May – October (20-22 weeks)
  - Sites accessed from shoreline
  - Samples approximately 1 meter below surface
- Currently 23 sampling sites - including PIB, PI Beaches, and PA Lake Erie coast
- 7 samples – including Erie Water Works and Northeast Drinking Water Authority
  - Lake Erie intakes
  - Eaton Reservoir
  - Smith Reservoir
  - Grahamville Reservoir


Fredonia
Ellicottville
Hornell
Alfred
North East
Erie
Salamanca
Wellsville
Jamestown
Olean
Bradford
Edinboro
Warren
Coudersport
Meadville
Titusville
Allegheny
National Forest
St Marys
Susquehannock
State Forest
Sproul
State Forest
Clarion
Grove City
Brookville
DuBois
Lock
New Castle
Clearfield
Google
Imagery ©2023 TerraMetrics, Map data ©2023 Google
United States
Terms
Privacy


West Sampling Sites
West sampling sites for HABs
Walnut Creek
Avonia Beach
Elk Creek
W Middle Rd
Middle Rd
W Ridge Rd
Main St
Lake St
Rice Ave
Walnut St
W Lake Rd
Bear Creek Rd
5
18
20
90
98
Legend
Sampling Location
N
Google Earth
©2017 Google
Image NOAA
Image © 2017 TerraMetrics


Zone 4
Zone 3
Zone 5
Zone 2
Zone 6
Zone 1
Image NOAA
Google earth
2011
42°08'25.95" N 80°06'24.99" W elev 575 ft eye alt 43036 ft


Bay Study Sites
2018
11
10
12
9
15
13
14
18
8
19
22
17
20
16
7
21
Google Earth
Image NOAA
1 mi


East Sampling Sites
East sampling sites for HABs
Legend
Sampling Location
Freeport Beach
Shades Beach
Lake Cliff Boat Launch
W Lake Rd
E Main St
W Main Rd
Findley Lake Rd
Iroquois Ave
E 9th St
E 12th St
N 12th St
Bayfront Connector
Southern Tier Expy
Station Rd
89
426
5
20
955
531
430
290
90
86
Google Earth
© 2017 Google
Image NOAA
Image © 2017 TerraMetrics
N
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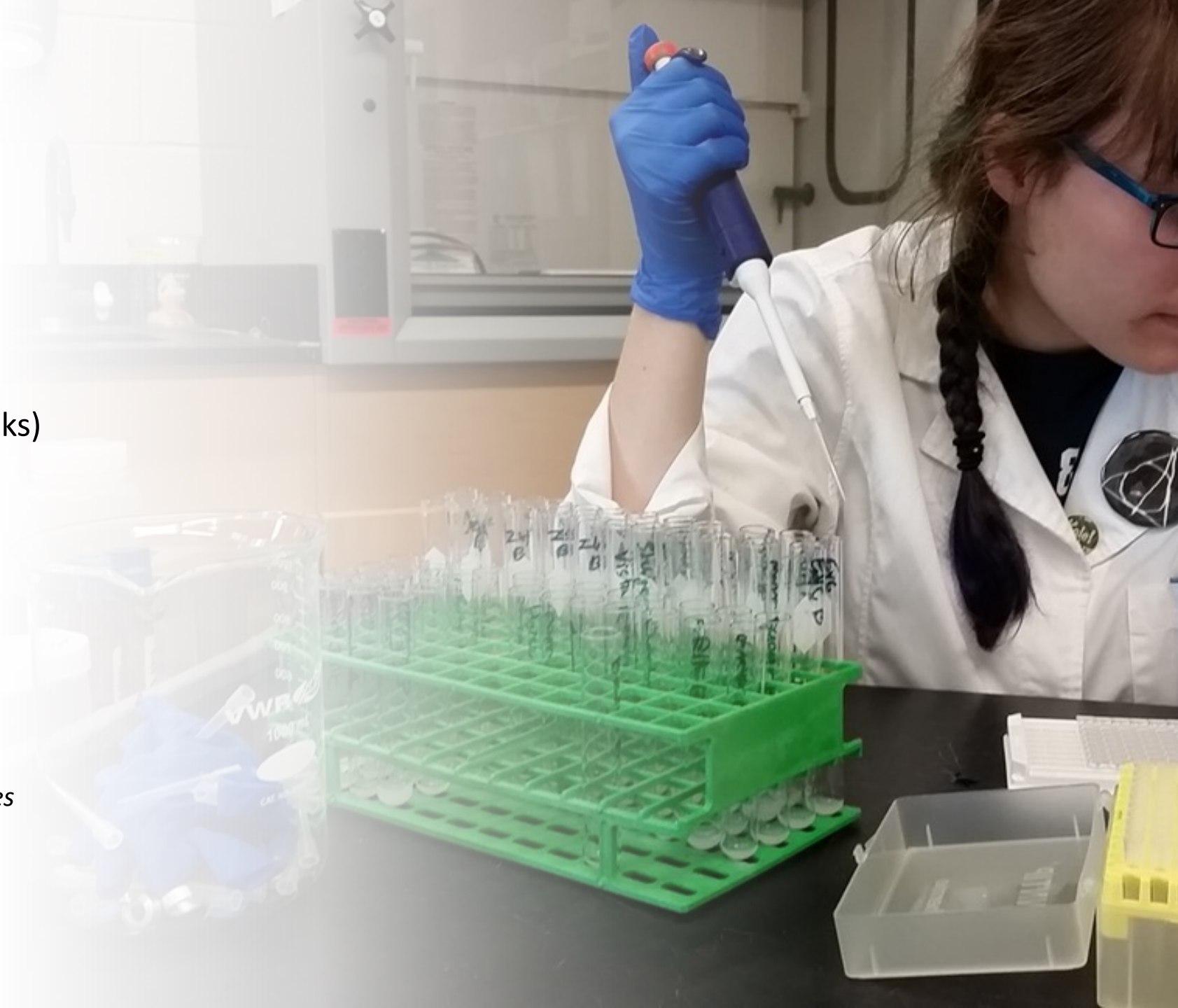
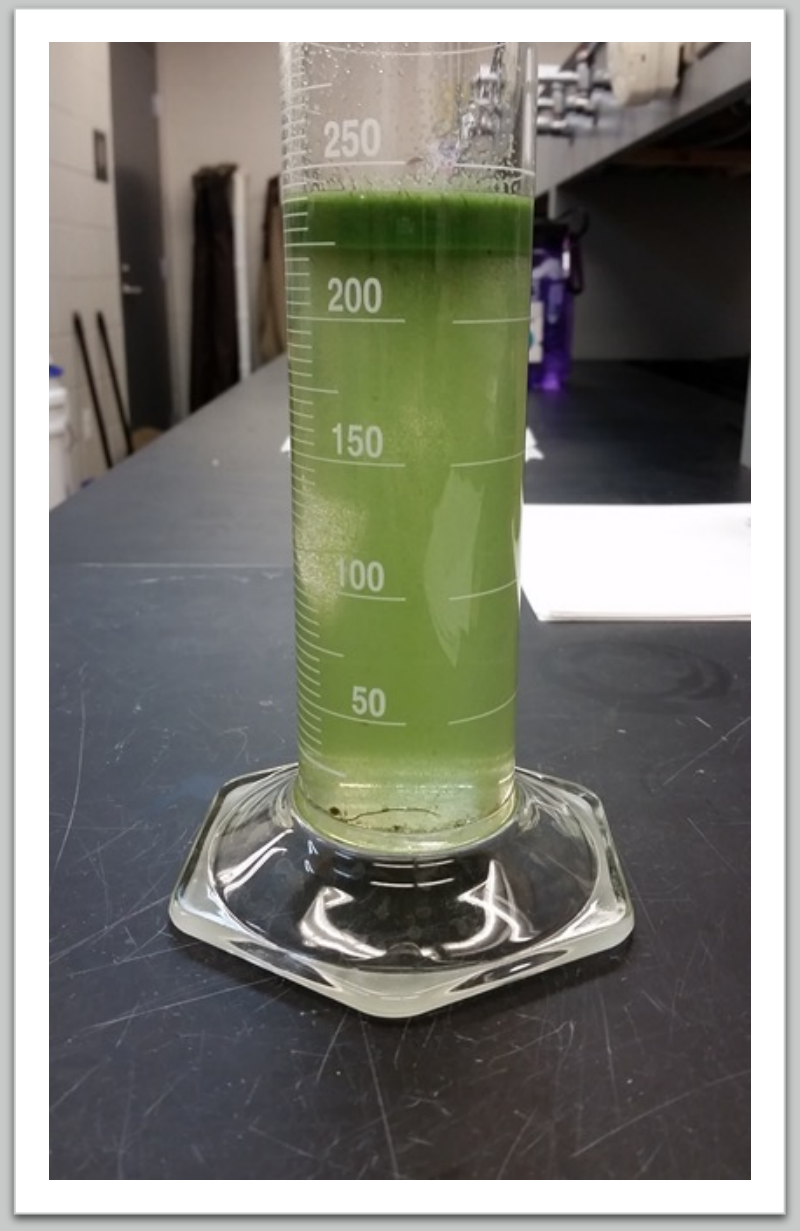
2022 Season Lab Analysis Summary

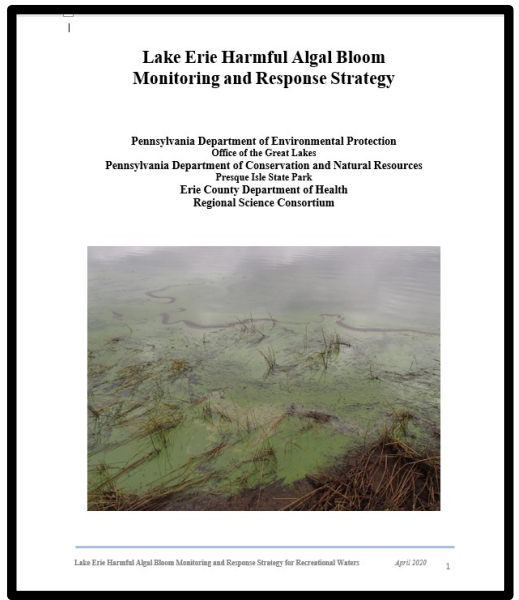
- May 12 – October 13, 2022 (21 weeks)
- Frequency
  - Microcystin – 1x/week
  - Anatoxin – 1x/ week
  - Saxitoxin – 1x/week
  - Cylindrospermopsin – 1x/ week
- ELISA Analysis
- Cyanotoxin analyses:
  - Total Analyzed – 4,200 samples (*includes duplicates*)





Advisory Thresholds

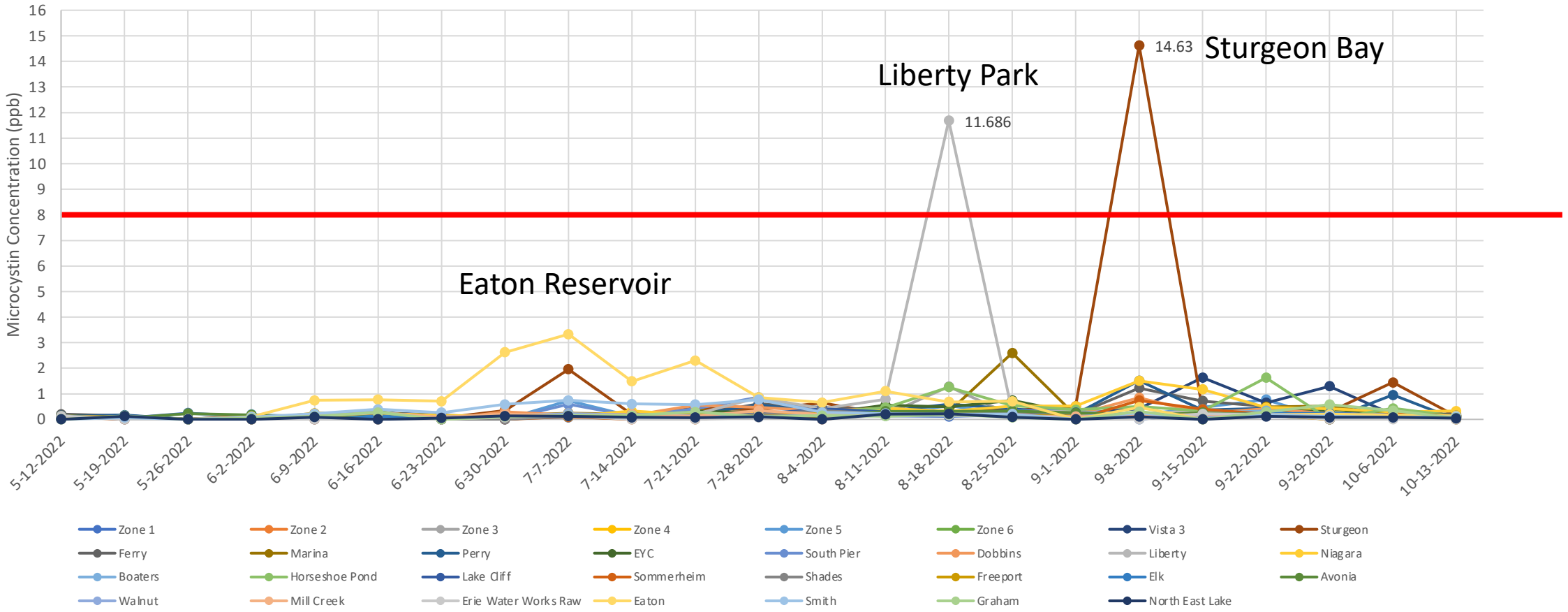
- Microcystin:
  - 0.2 ppb, drinking water threshold for dogs
  - 0.3 ppb, drinking water threshold for children under 6 y/o
  - 1.6 ppb, drinking water threshold for children over 6 y/o and adults
  - 8.0 ppb, recreational public health advisory
  - 20.0 ppb, recreational no contact advisory
- Anatoxin-a
  - 0.4 ppb, drinking water threshold for dogs (according to Oregon Health Authority)
  - 0.7 ppb, drinking water threshold for children under 5 y/o (according to Oregon Health Authority)
  - 3.0 ppb, drinking water threshold for children over 5 y/o and adults (according to Oregon Health Authority)
  - 80 ppb, recreational public health advisory
  - 300 ppb, recreational no contact advisory
- Saxitoxin:
  - 0.02 ppb, drinking water threshold for dogs
  - 0.3 ppb, drinking water threshold for children under 5 y/o
  - 1.6 ppb, drinking water threshold for children over 5 y/o and adults
  - 0.8 ppb, recreational public health advisory
  - 3.0 ppb, recreational no contact advisory
- Cylindrospermopsin:
  - 0.4 ppb, drinking water threshold for dogs
  - 0.7 ppb, drinking water threshold for children under 5 y/o
  - 3.0 ppb, drinking water threshold for children over 5 y/o and adults
  - 5.0 ppb, recreational public health advisory
  - 20 ppb, recreational no contact advisory


Lake Erie Harmful Algal Bloom
Monitoring and Response Strategy

Pennsylvania Department of Environmental Protection
Office of the Great Lakes
Pennsylvania Department of Conservation and Natural Resources
Presque Isle State Park
Erie County Department of Health
Regional Science Consortium

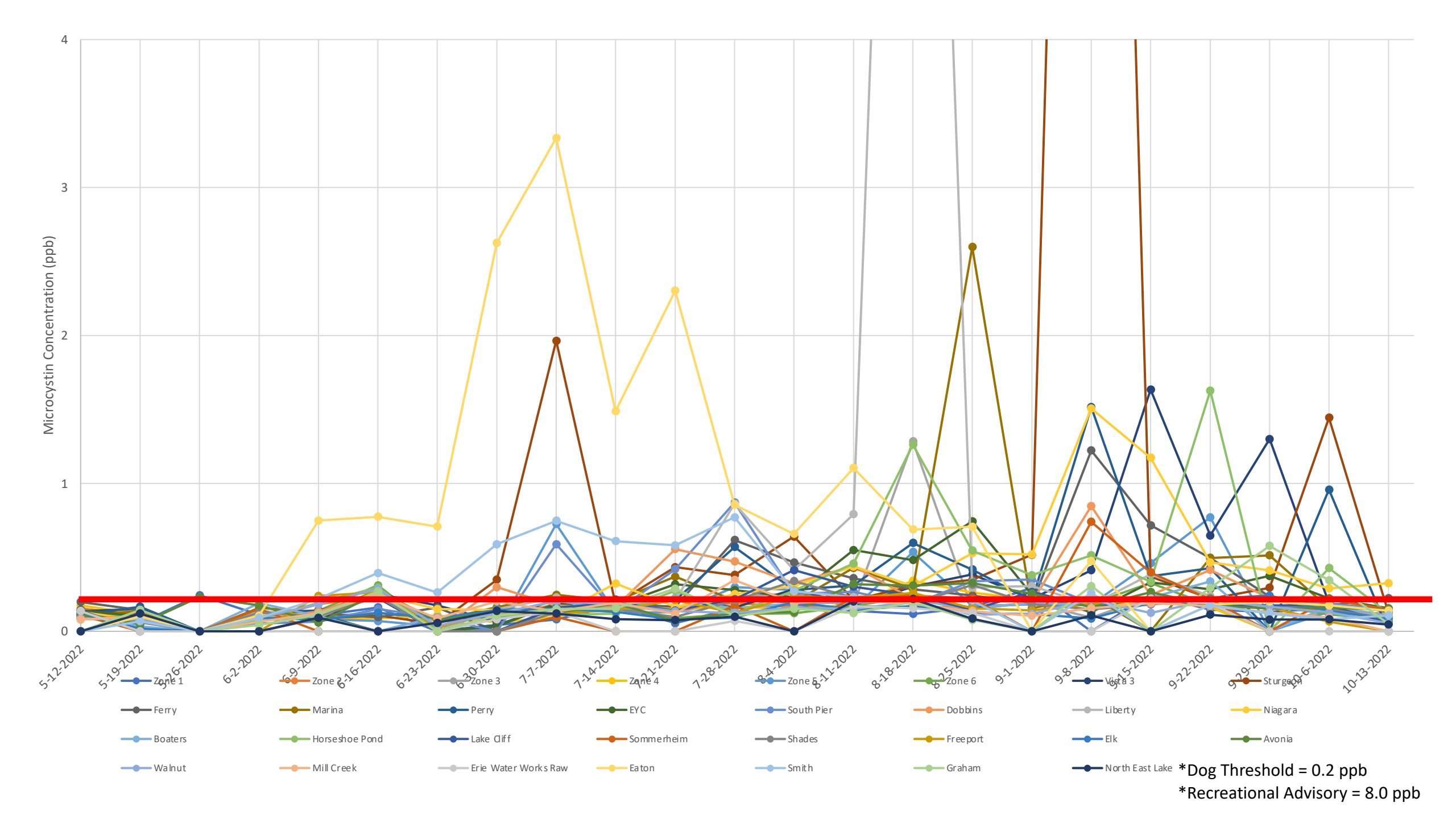
Lake Erie Harmful Algal Bloom Monitoring and Response Strategy for Recreational Waters April 2020 1

Microcystins – 2022

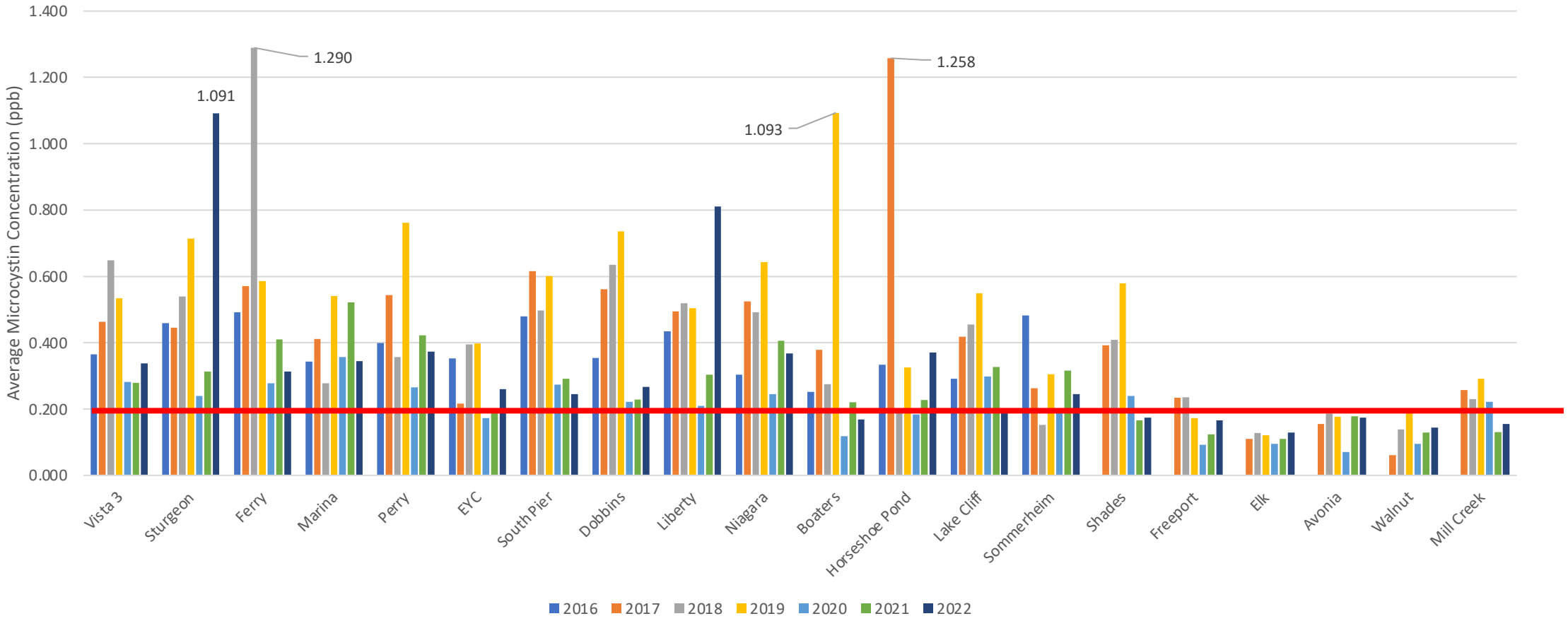


*Dog Threshold = 0.2 ppb

*Recreational Advisory = 8.0 ppb

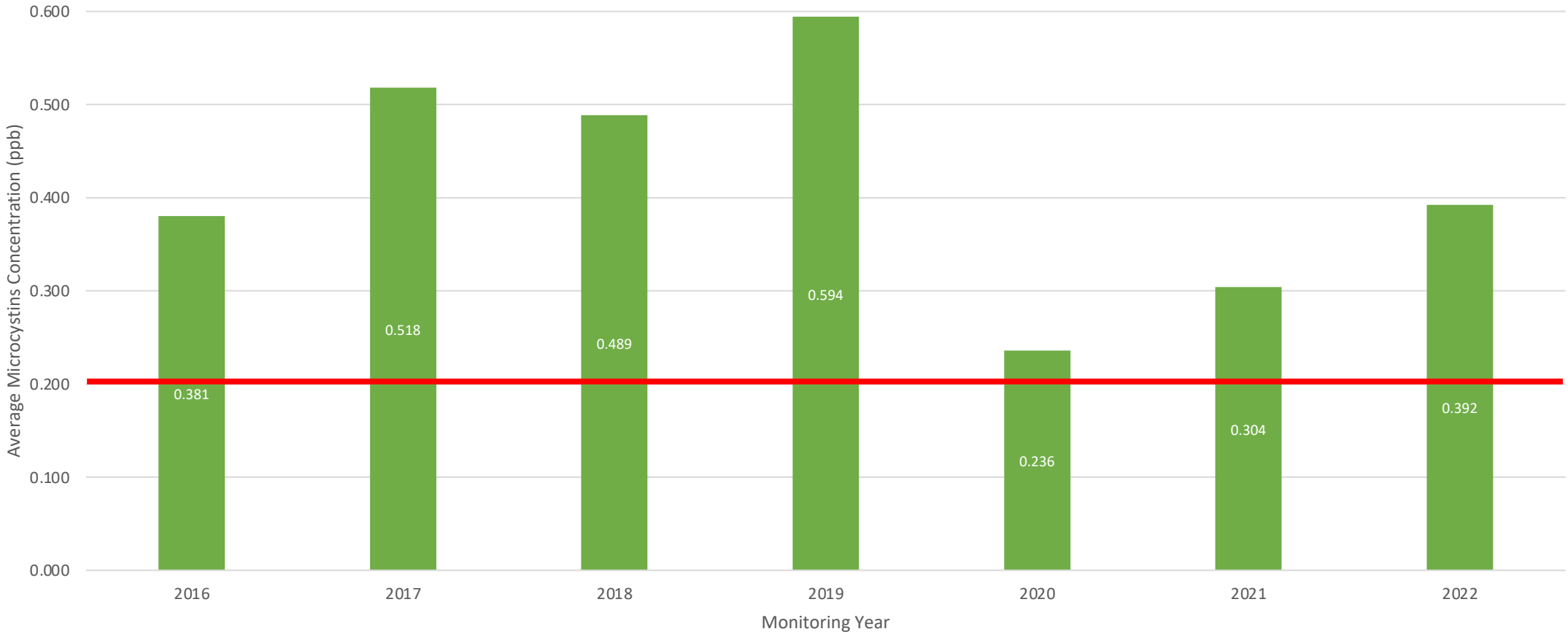

Microcystin Concentration (ppb)
4
3
2
1
0
5-12-2022
5-19-2022
5-26-2022
6-2-2022
6-9-2022
6-16-2022
6-23-2022
6-30-2022
7-7-2022
7-14-2022
7-21-2022
7-28-2022
8-4-2022
8-11-2022
8-18-2022
8-25-2022
9-1-2022
9-8-2022
9-15-2022
9-22-2022
9-29-2022
10-6-2022
10-13-2022
Zone 1
Zone 2
Zone 3
Zone 4
Zone 5
Zone 6
Vista 3
Sturgeon
Ferry
Marina
Perry
EYC
South Pier
Dobbins
Liberty
Niagara
Boaters
Horseshoe Pond
Lake Cliff
Sommerheim
Shades
Freeport
Elk
Avonia
Walnut
Mill Creek
Erie Water Works Raw
Eaton
Smith
Graham
North East Lake
*Dog Threshold = 0.2 ppb
*Recreational Advisory = 8.0 ppb

Microcystins Sampling Locations (2016-2022)



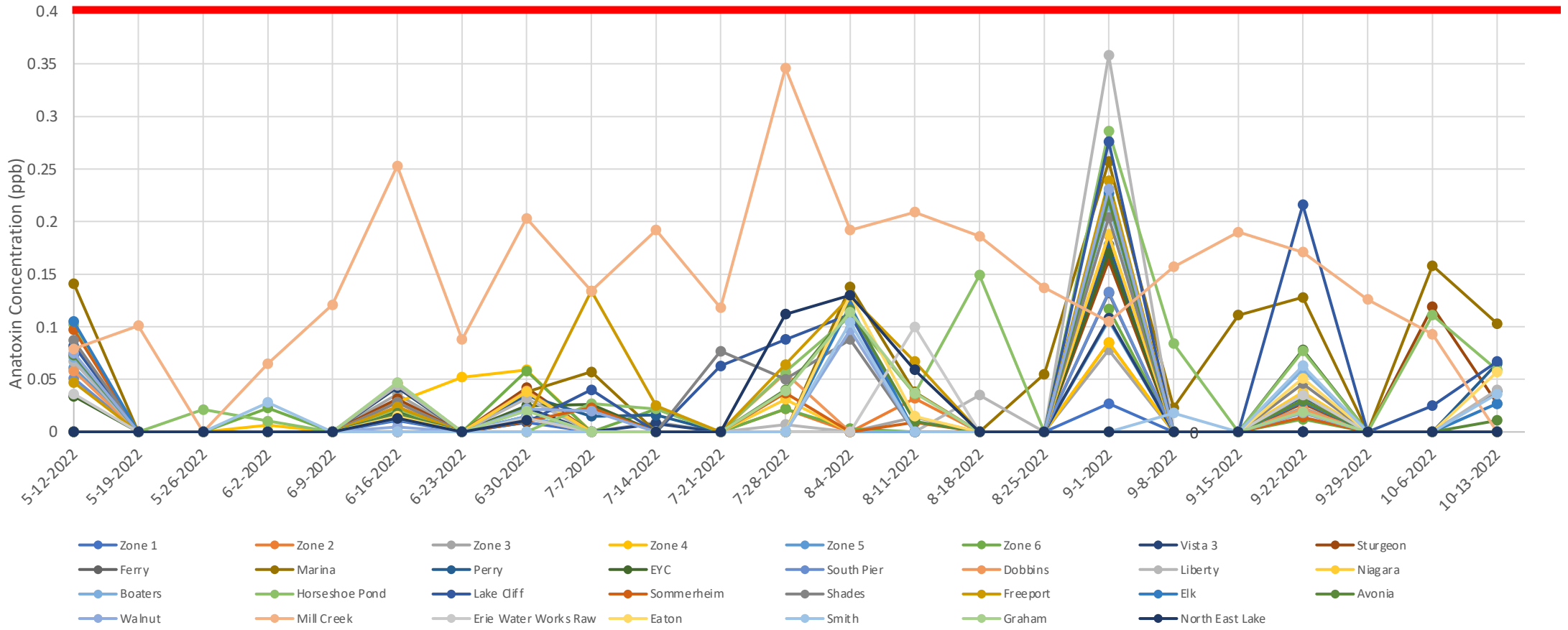
*Dog Threshold = 0.2 ppb
*Recreational Advisory = 8.0 ppb

Microcystins – Annual Average (2016 – 2022)



*Dog Threshold = 0.2 ppb
*Recreational Advisory = 8.0 ppb

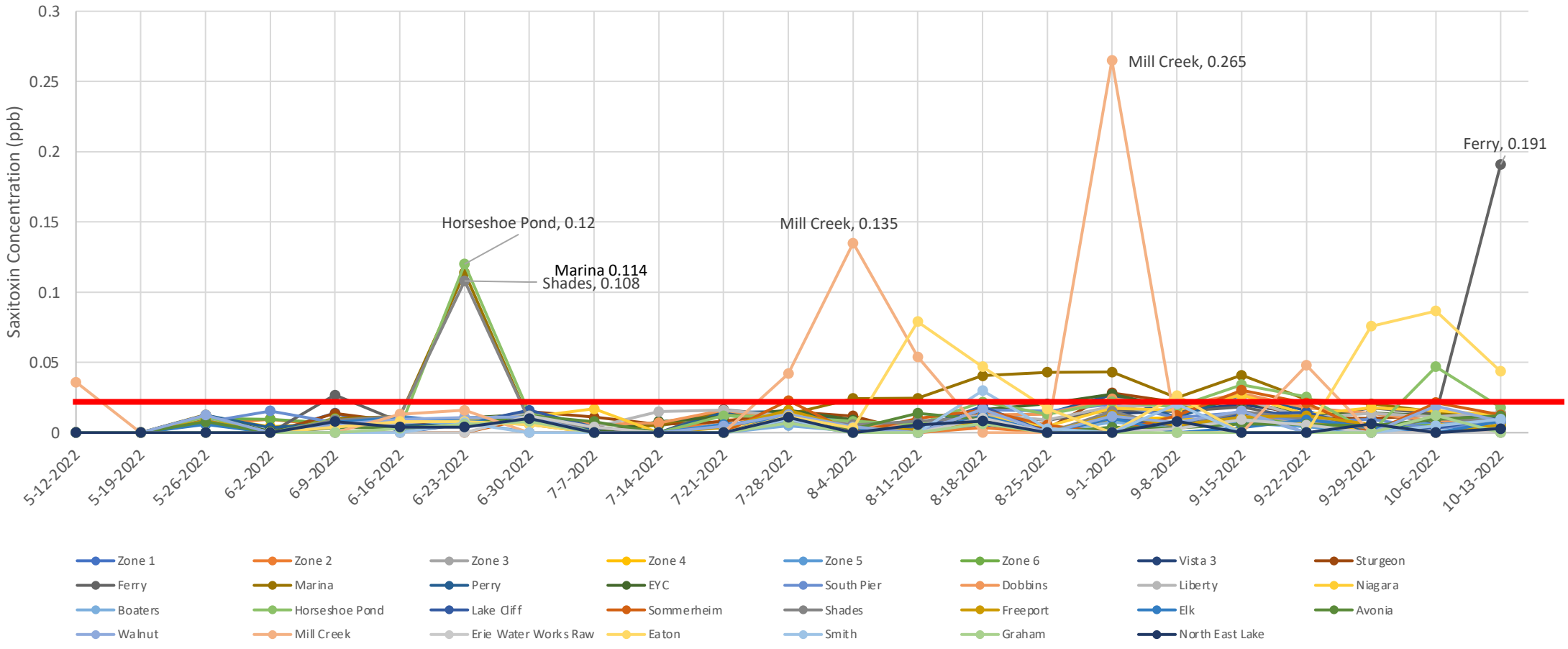
Anatoxin – 2022



*Dog Threshold = 0.4 ppb

*Recreational Advisory = 80 ppb

Saxitoxin – 2022



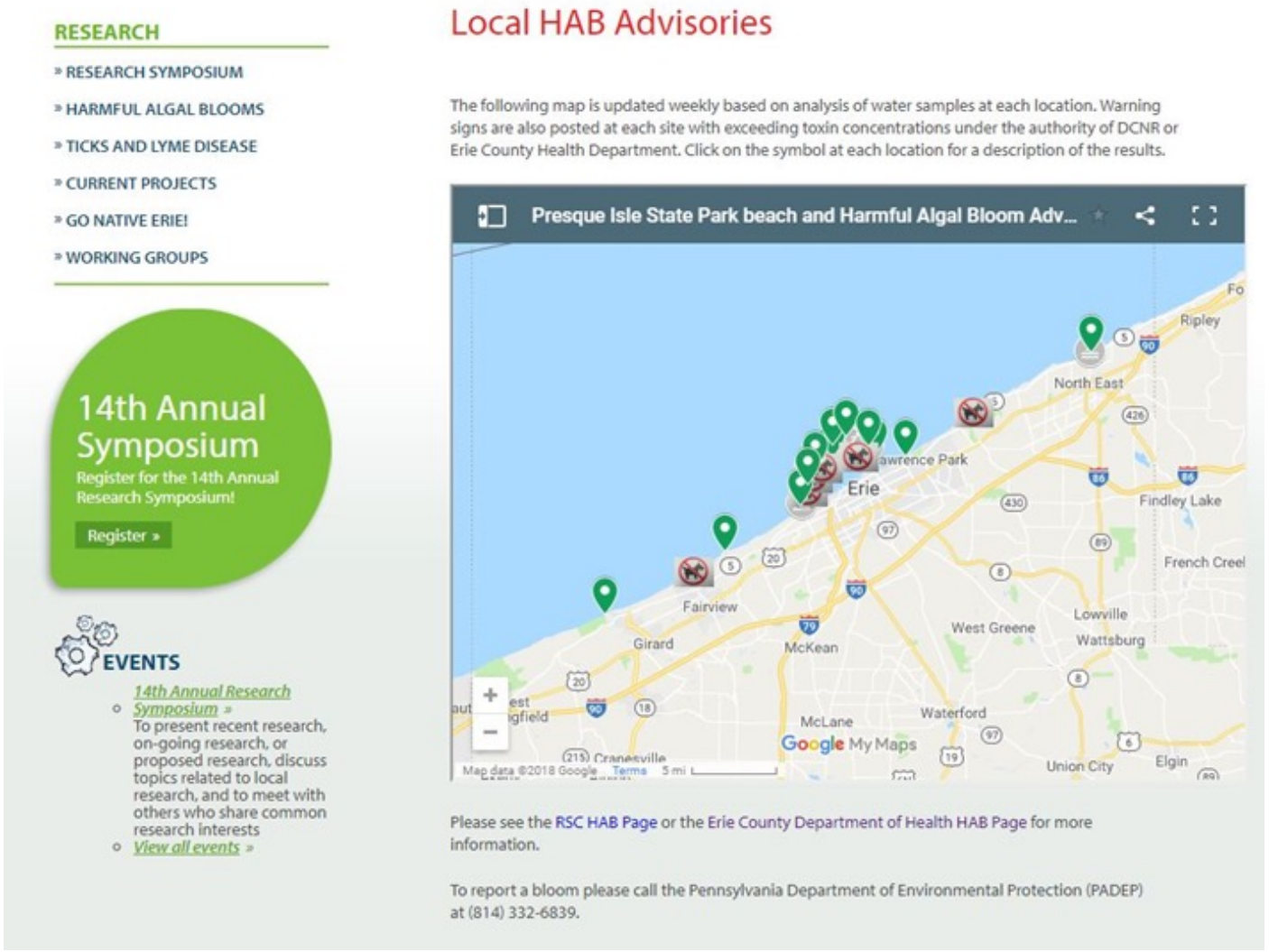
*Dog Threshold = 0.02 ppb

*Recreational Advisory = 0.8 ppb

Summary 2019-2022

Exceedances	Microcystin				Anatoxin-a				Saxitoxin				Cylindrospermopsin			
	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022	2019	2020	2021	2022
Dog Safety	147	72	197	245	1	0	1	0	1	3	8*	46*	0	0	0	0
Human Recreational Safety	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0

Signage at Sampling Locations



Real-Time Reporting

- Regional Science Consortium
  - https://www.regsciconsort.com/research/harmful-algal-blooms/local-hab-advisories/
- Erie County Department of Health
  - https://eriecountypa.gov/departments/health/what-we-do/beach-sampling-results/

Long Term Monitoring with Buoys

- Water Quality Buoys
  - Nearshore, Walnut Creek, Beach 2, Beach 6
  - Equipped with Blue-Green Algae (BGA) sensor
  - Transmits data in 20-minute increments AND logs data for the last several years
  - Live updates to Phone App and Website
- Predictive Model Development
  - U.S. Geological Survey
- Phone App**:**
  - ***LIVE Datacenter***
- Website:
  - ***www.PALakeErieBuoy.com***

HABs Education- The Interactive Wetland Model

HABs Education The Mobile HAB Lab

Education and Outreach

- RSC and Veterinarian Cyanotoxin Poisoning Monitoring Program
- HAB Spotter Citizen Science Program
- K-12 Education Lessons

Thank you

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