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STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

Prevalence and Thresholds for Cyanotoxins in New York.

Division of Water, Bureau of Water Assessment and Management

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May 3, 2019 NYSFOLA Conference

Ways to define a bloom

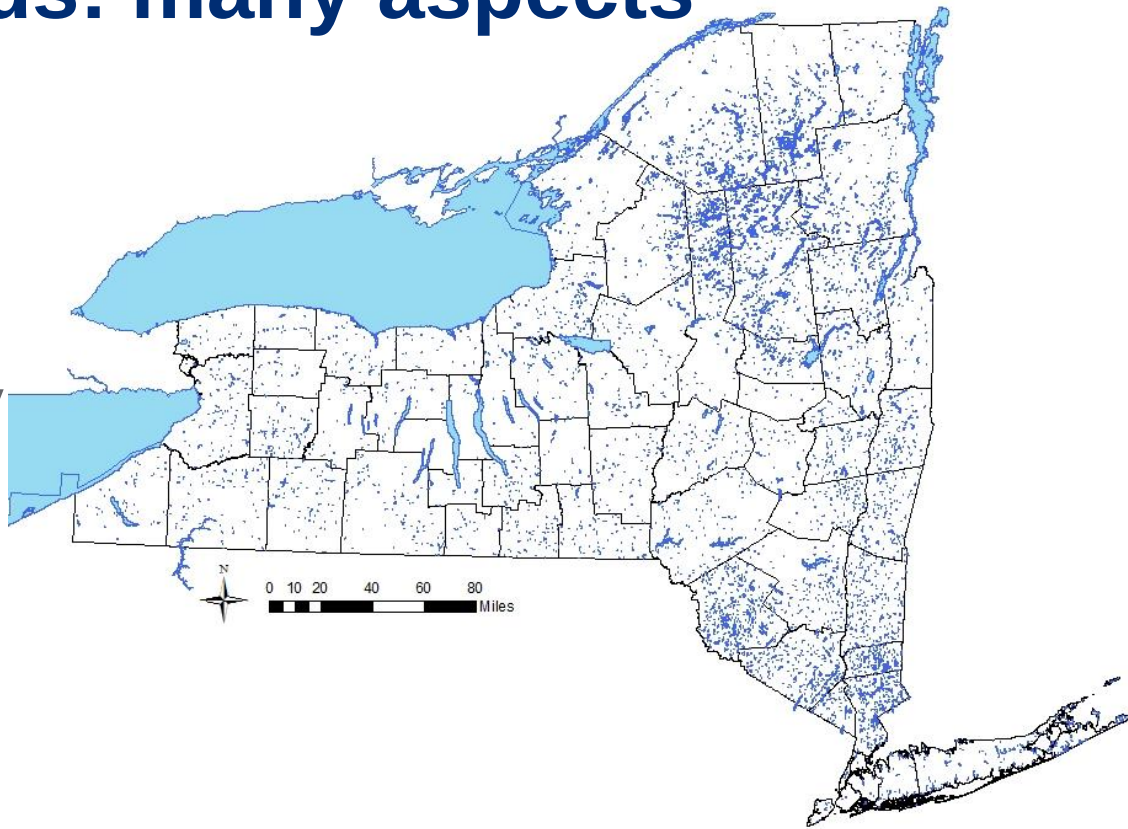
- Chlorophyll
- Pigments
- Cell counts
  - Cells/mL
  - Biovolume
- Visual (presence/absence)
- Toxin concentrations (which toxins)
- Genetic potential for toxin production
- Temporal/Spatial aspects

How does NYS define a bloom?

- If surface scums are visually apparent, there is the potential for toxins and other harmful compounds to be present; contact should be avoided
- Visual scums are satisfactory criteria for beach closure and bloom notification procedures to occur

Monitoring methods: many aspects

- Where to sample
- Quantity of samples
- Turn around time
- Public health
- Environmental Laboratory Approval Program (ELAP)
- Accuracy
- Cost
- Which toxins



NYS Surveillance and Monitoring

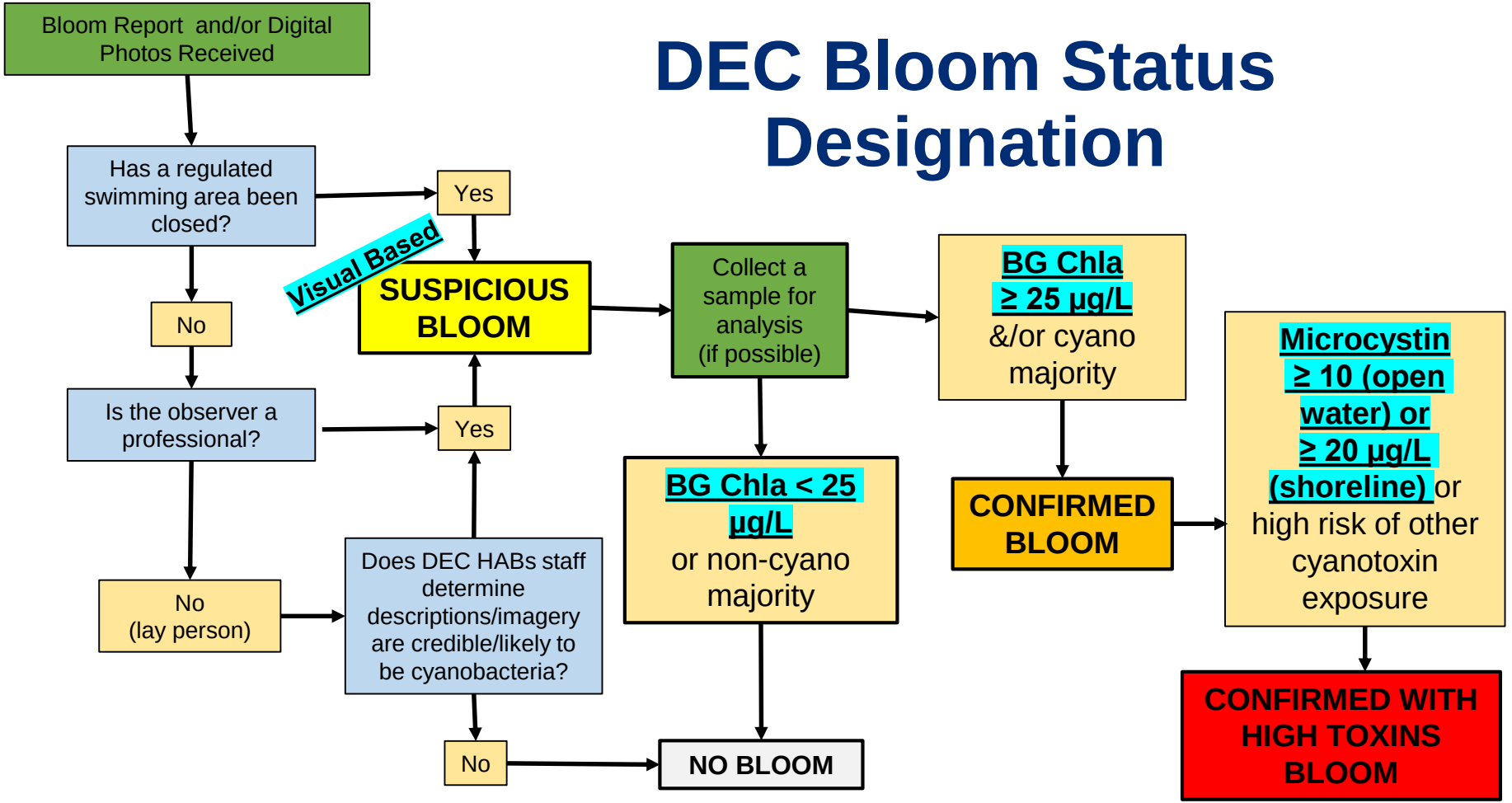
Category	Visual		Sampling		
	Public	Trained	Microscopy	Pigment	Toxins
Description	Digital images or comparison to image gallery	Beach manager or trained volunteer	Microscopic scan of dominant taxa	Unextracted or extracted chl.a; FluoroProbe	ELAP ELISA Total Microcystins
Implication	DEC Suspicious Bloom	Beach closure and/or DEC Suspicious Bloom	With quantitative evidence bloom; DEC Confirmed Bloom	DEC Confirmed Bloom	DEC Confirmed with High Toxins Bloom; Do not Drink advisory for DW
Decision Trigger	DEC QA	Beach operator review	Cyanobacteria ID	FP BG chla > 25; or total chl > 50 or other quant evidence	MC > 20 µg/L shoreline (> 10 µg/L open water; >0.3 µg/L DW)
Timing	Immediate	Immediate	1-2 days	1-2 days	2-10 days
Accuracy	Low to mod	Mod to high	High	Mod to high	Mod to high
Cost	None	None	Low to mod	Mod	High
Expertise / Availability	N/A	2 hour training at minimum	Some labs	Some labs	Few labs

What is measured by the labs?

- **Fluoroprobe Chlorophyll** – Measures chlorophyll (total, blue green, diatoms, green algae)
- **Microscopy** – Quick scan, check for most common taxa
- **Total microcystins**– ELISA (ELAP certified)
- **Other toxins** - Anatoxin-a, Cylindrospermopsin, BMAA, microcystin congeners

Bbe moldaenke Fluroroprobe

DEC Bloom Status Designation



NYS Microcystin Advisory Thresholds

USEPA Method 546 (ELISA) at a NY ELAP Certified Lab

>20 µg/L: Shoreline water ambient water sample; DEC Confirmed with High Toxins Bloom

>10 µg/L: Open water ambient water; DEC Confirmed with High Toxins Bloom

<4 µg/L: Regulated swimming area can re-open; shoreline ambient water sample from a facility that has been clear of HAB for at least 24 hours

>0.3 µg/L: Finished drinking water sample: Do Not Drink health advisory

NYS HABs roles and responsibilities

NYS DEC

- Implement Clean Water Act (CWA)
- Responsible for monitoring and assessment of ambient waters (i.e. lakes and streams), some beaches
- Source water protection
- Identify and implement water quality improvement needs

NYS DOH

- Implement Safe Drinking Water Act (SDWA)
- Responsible for regulated beaches, drinking water & illness surveillance
- Source water protection
- Identify drinking water problems & solutions

Routes of exposure to toxins

1. Consumption: incidental swallowing, drinking water
2. Inhalation: aerosols created during household use or recreation
3. Dermal: skin contact during swimming

Any health effects should be reported to your local health department!

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Blue-green Algae & Health

Potential Symptoms

- Allergic or irritative skin, eye, ear, throat reaction
- Diarrhea
- Nausea
- Jaundice
- Vomiting
- Respiratory difficulties
- Neurological

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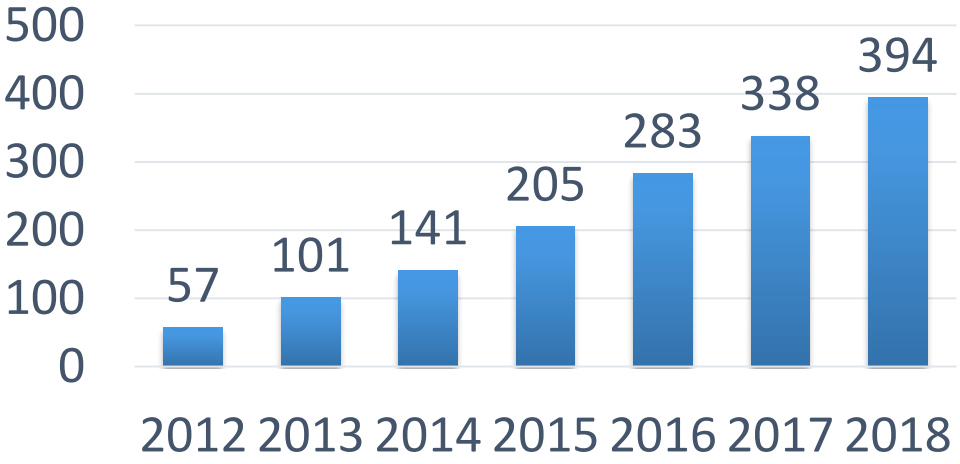
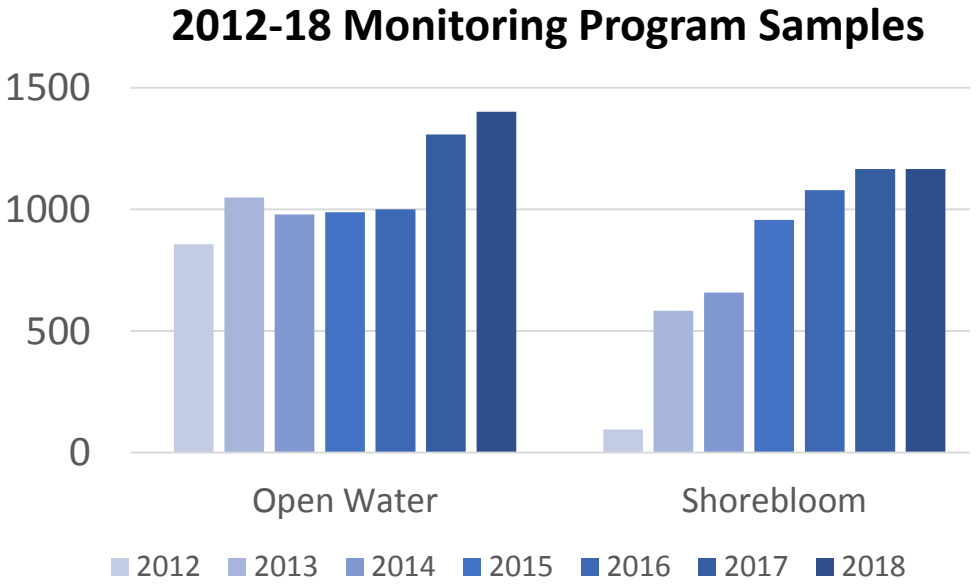
What is ELISA?

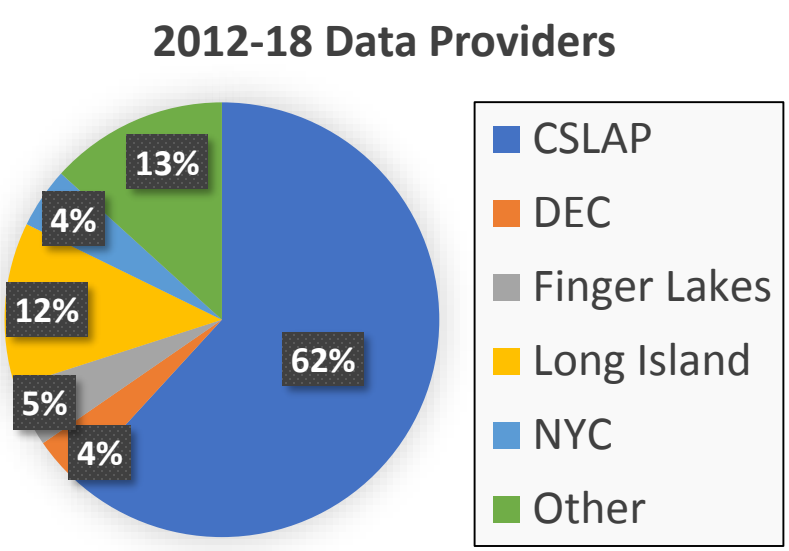
- Enzyme-linked immunosorbent assay (ELISA) is a plate-based assay technique designed for detecting and quantifying substances such as peptides, proteins, antibodies and hormones.
- Detection is assessing the enzyme activity via incubation with a substrate to produce a measurable product.
- The detection strategy depends on a highly specific antibody-antigen interaction.

Cumulative # of Waterbodies with HABs



DEC Lakes Monitoring – Large Dataset





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Are the FP status thresholds effective?

	>4 µg/L MC		>20 µg/L MC	
	n	%	n	%
Open water Samples (n = 7,586)	46	<1	22	<1
BG Chl <25 (No Bloom)	21	<1	5	<1
BG Chl >25 (Confirmed)	25	1	17	<1
Shoreline Samples (n = 5,709)	615	18	470	13
BG Chl <25 (No Bloom)	13	<1	3	<1
BG Chl >25 (Confirmed)	602	36	467	25

- Microcystin >4 µg/L rarely occurs when BG chl is below Confirmed Bloom Threshold (25 µg/L)
- We are not missing toxic blooms

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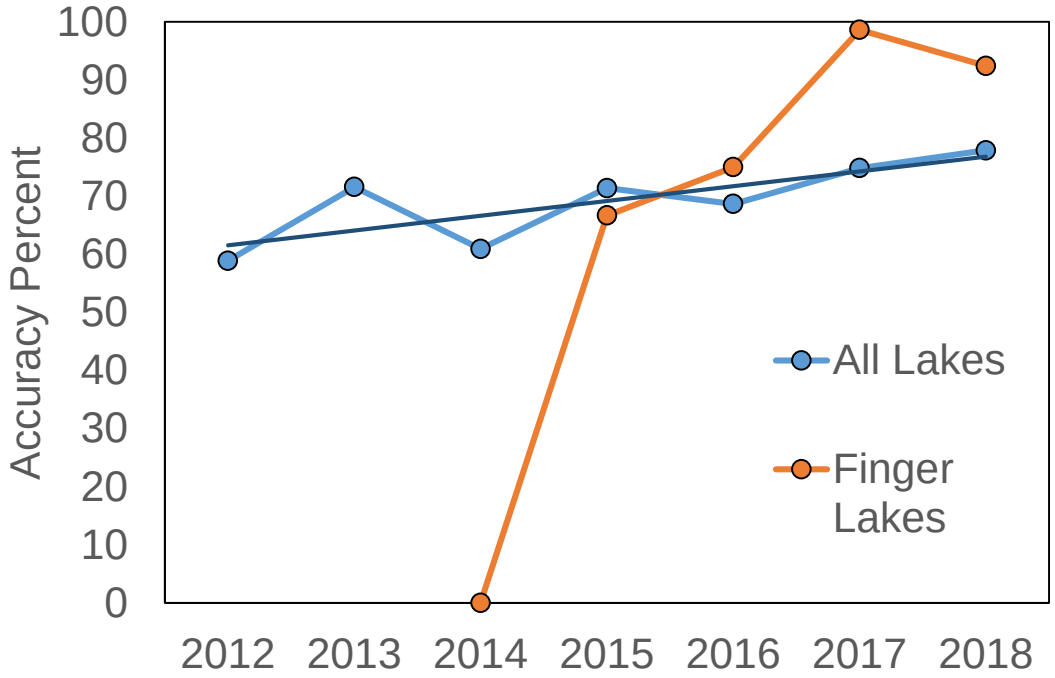
Toxin Prevalence

Toxin	Thresholds	Prevalence (any detection)
Microcystins	Various	SB: 25% OW: 8%
Anatoxin-a + variants	None	5%
Cylindrospermopsin	None	Not detected
beta-Methylamino-L-alanine (BMAA)	None	Not detected

How effective are visual observations



- If there is no visual indication of a bloom, there is a low likelihood of encountering toxins at a level to cause health concerns. **Know it, Avoid it, Report it** works!
- CSLAP and other trained investigators are very good at identifying HABs. You are our best stewards

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Visual Based Response: Why?

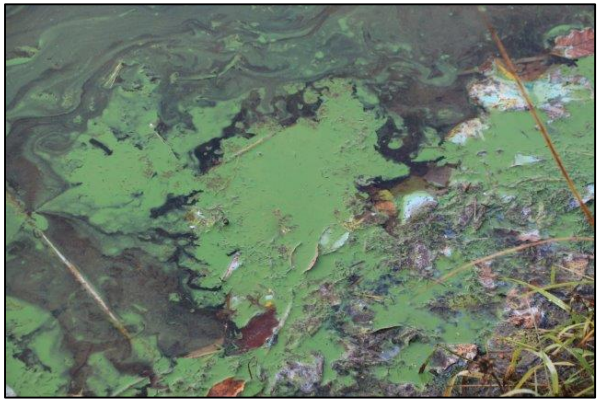
- Symptoms possible with or without toxins
- Sampling and analysis takes time
- Not all toxins analyzed
- Blooms are dynamic, heterogeneous
- Not practical to sample all waters at all times

DEC HABs business model

- We’ve been defining a bloom a certain way since 2012
- Data supports that our efforts are effective, accurate & protective
- There is a continued increase in blooms and desire to sample them.
- How can we take the next steps?

Next steps: Answer questions through evaluating the data

- Research!
- Why are some blooms toxic?
- Can we predict blooms?
- Can we fix/mitigate/reduce blooms?

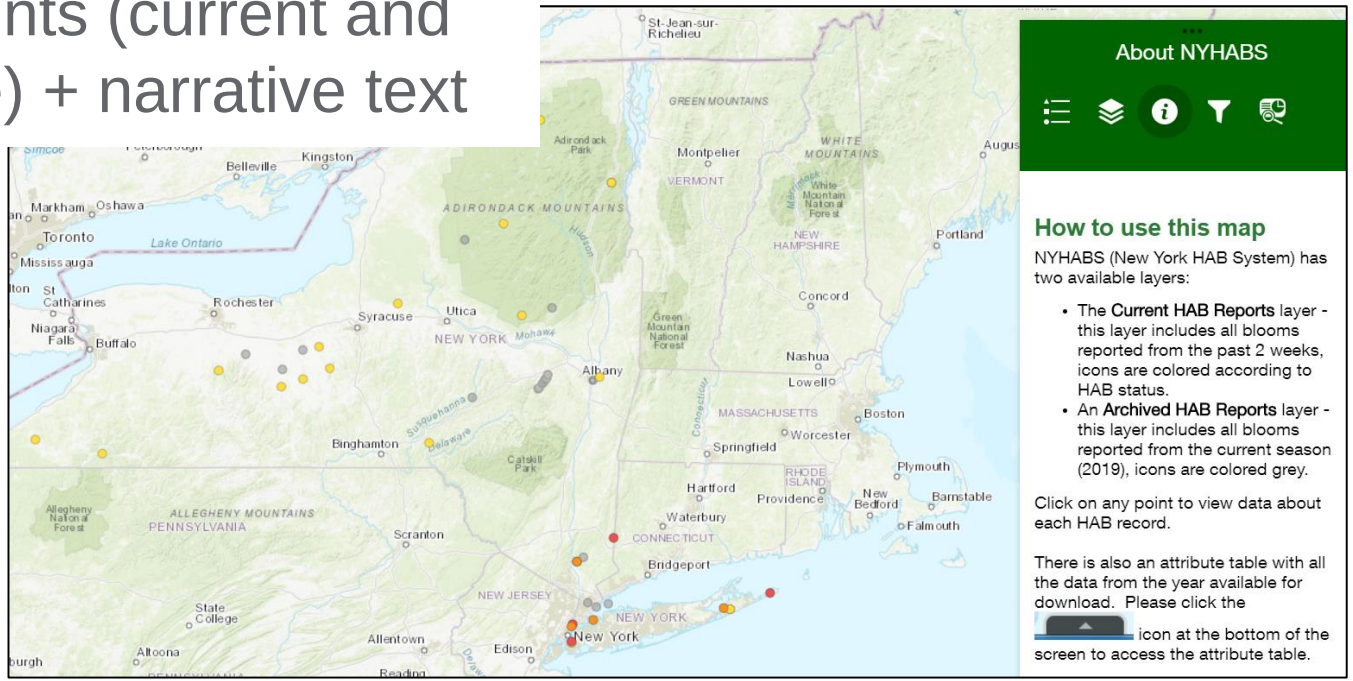


Updates regarding Notifications

- New and Improved reporting system using ArcGIS Online
- Mobile-ready Suspicious Algal Bloom Report Form for reporting
- Works on any platform (desktop, mobile, tablets)
- Streamlined DEC quality control of HAB reports and lab data
- Rapidly disseminate results internally to other state agencies

Introducing…..NYHABS

Weekly updated interactive map with sampling points (current and year-long archive) + narrative text



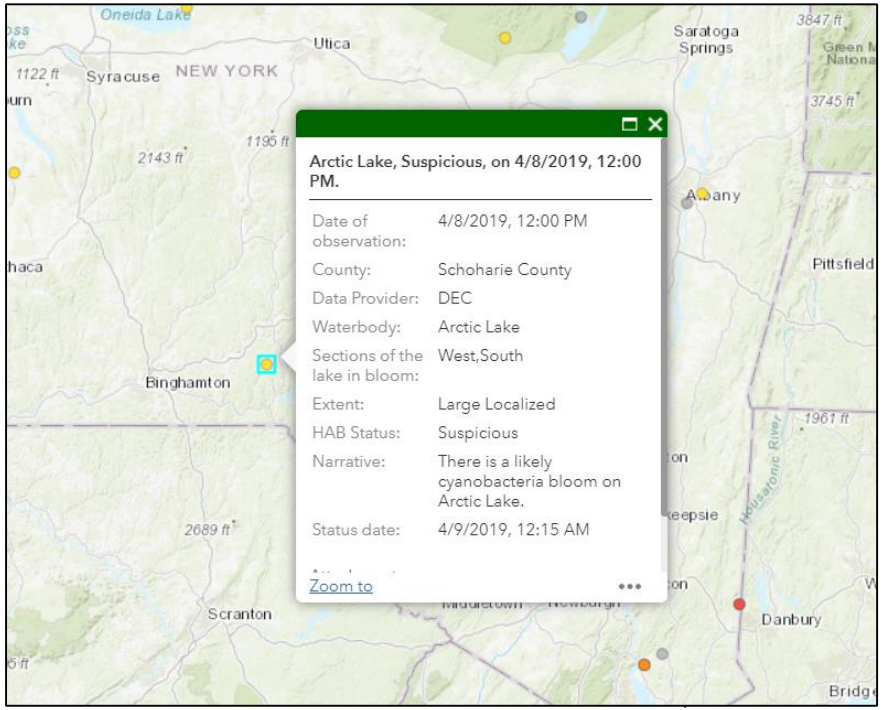
More info on HABs Updates: Webinar

- Demonstration of how to view and use NYHABS

Thursday, May 16

10-11:30 am

- Watch your email for more information on how to log-in



Thank You/Questions

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