



Department of
Environmental
Conservation

2018 NYACD Training

Division of Water, Bureau of Water Assessment
and Management

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2018

Goals for today

- What are HABs? What causes them?
- How to Identify
- How does DEC handle HABs?
- What is NYS doing about HAB?

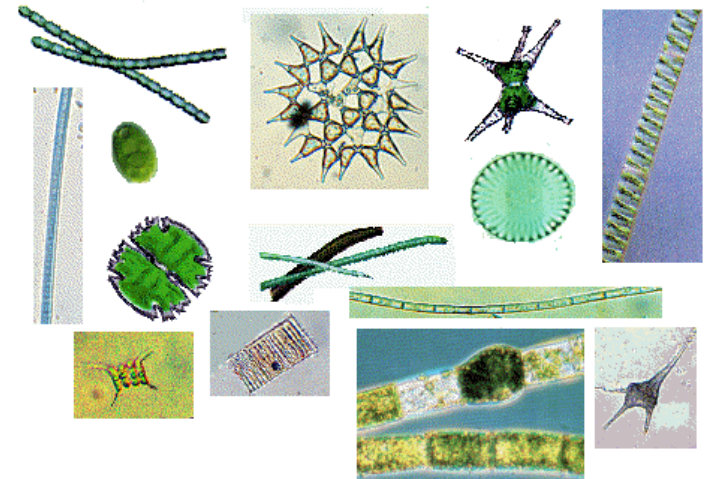
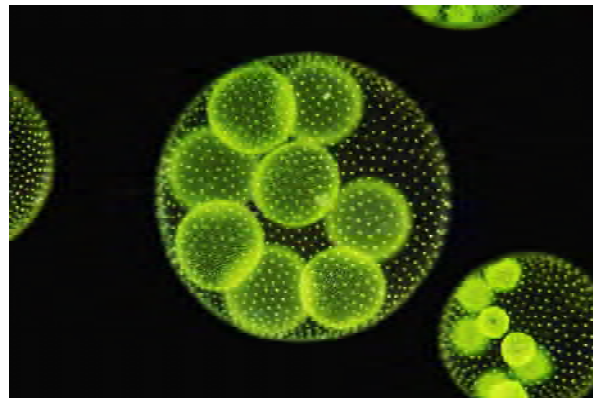


What are Harmful Algal Blooms?

Introduction

What are Algae?

- Single-celled plants
- Possess chlorophyll
- Conduct photosynthesis.



Normally, NOT HARMFUL



- Algae are present in all lakes and oceans
- Most kinds do not cause any harm
- Diverse communities of many types of algae

Acronym time: HABs

H: Harmful (toxins, economic aesthetics, ecological)

A: Algal (freshwater HABs refer to cyanobacteria, not truly algae)

B: Blooms (proliferation of cells, dense concentrations)



Cyanobacteria – Blue-green Algae – HABs

- Highly specialized and competitive
 - Some regulate buoyancy
 - Some fix nitrogen
- Best in high temps, high light, high nutrients
- Causes not fully understood, hard to predict



Seasonal Changes in Algae

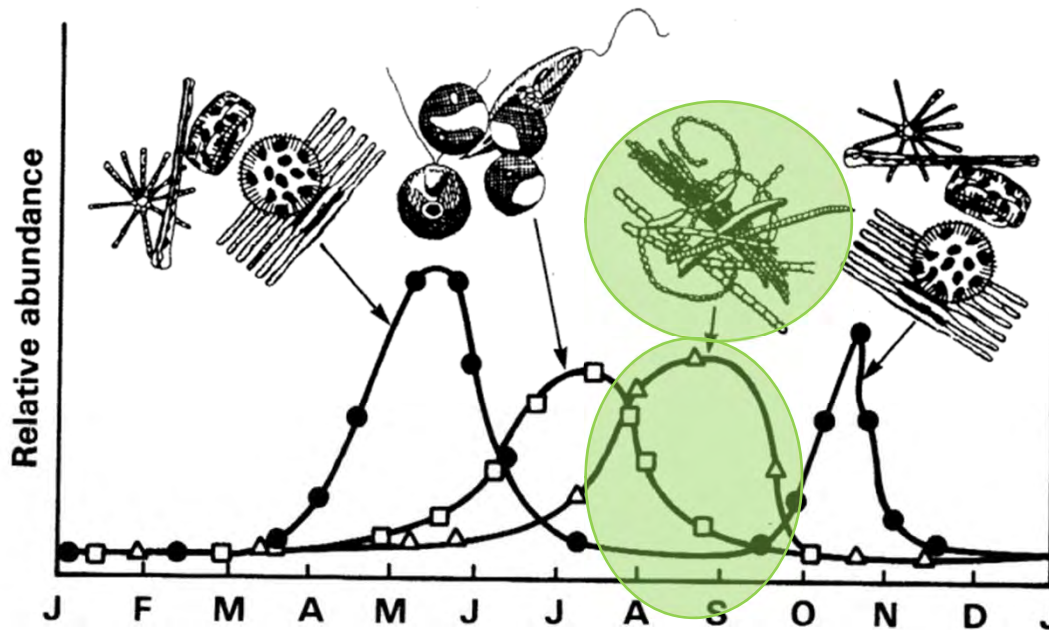


Figure 5. Seasonal Succession of Phytoplankton (Olem and Flock, 1990)

Diatoms tend to dominate in spring and fall, with greens and blue-greens dominant during summer, but many variations are possible.

HABs need Nutrients and Light to Thrive

- Lakes that have higher nutrients are more likely to have HABs
- HABs are present in low nutrient waterbodies too (Finger Lakes, Lake Placid)
- Causes not fully understood
 - Some low P systems bloom, some high P systems don't bloom
 - Interannual variability within lakes



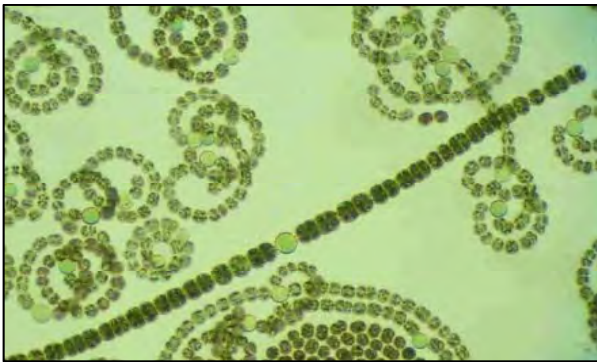
Wild Cards Affecting HABs

1. Climate change
2. Trophic interactions
 - increased nutrient recycling
 - selective feeding by **dreissenid mussels**
3. Emerging contaminants



Common types of Cyanobacteria

Dolichospermum



- Fixes Nitrogen
- Produces anatoxin (nerve toxin) and others

Aphanizomenon



Microcystis



- Adjusts buoyancy
- Produces microcystin (liver toxin)

Cyanotoxins

Microcystins (liver toxins)

- Most common toxin in New York

Anatoxins (nerve toxins)

- Potentially fatal to dogs

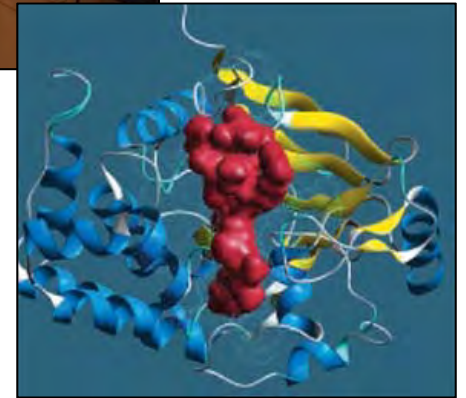
Lipopolysaccharides (endotoxins)

- Skin irritants and allergens
- Produced by most cyanobacteria

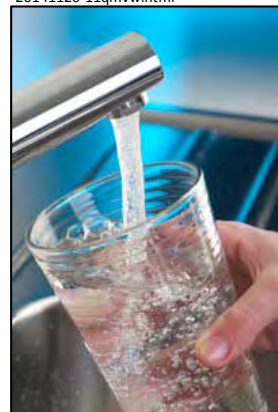
Other Toxins (Cylindrospermopsin, Saxitoxin, BMAA, etc.)

No visual cues that toxins are present

Sample collection is warranted



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!

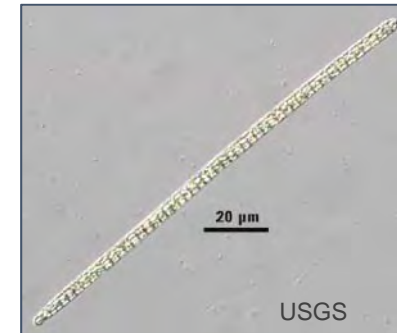


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Exposure Potential

Ingestion, inhalation and/or direct contact:

- Cyanobacteria cells
 - Associated compounds (LPS, Phycocyanin, other?)
- Secondary metabolites i.e. cyanotoxins
 - Microcystins: hepatotoxin
 - Anatoxin-A: neurotoxin
 - Cylindrospermopsin: hepatotoxin
- Secondary infection



Planktothrix (Oscillatoria)



Aphanizomenon



Microcystis colonies

***Whether toxins are present or not, there is still a concern for health effects.**



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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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HABs & Dogs

- Dog deaths have occurred, including in NYS
- Greater chance of ingestion of BGA impacted water mats or shoreline scum
- Cyanobacteria stick to fur and are ingested during grooming



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If You are Exposed

- Rinse off yourself, children, and animals with clean water if exposed to blooms or surface scums, or water that is noticeably discolored.
- Stop using the water and consider medical attention if people or animals have symptoms

Symptoms include diarrhea, nausea or vomiting; skin, eye or throat irritation; and allergic reactions or breathing difficulties.

Avoid blooms in surface waters because blue-green algae can cause health effects in people and animals.



Know it.

It might be a blue-green algae bloom if you see:

- Strongly colored water.
- Paint-like appearance.
- Floating mats or scums.



Avoid it.

Always stay away from blooms in surface waters:

- Don't swim, fish, boat, or wade in areas with blooms.
- Don't eat fish caught from areas with blooms.

If you're **not** on a public water supply:

Never drink, prepare food, or wash in untreated surface water. If you must drink, prepare food, cook, or wash in surface water, even if you treat it, also consider not using it for anything other than washing. If you are on a public water supply: Public water supplies are disinfected and monitored for harmful algal blooms.



Report it.

Report blooms to: HABsInfo@dec.ny.gov, your local health department (health.ny.gov/EnvironmentalContacts), or harmfulalgae@health.ny.gov

Report bloom-related symptoms to: Your local health department or harmfulalgae@health.ny.gov

Consider visiting a health care provider if you, your family, or your animals are experiencing symptoms that might be related to blue-green algae exposure.

Learn more health.ny.gov/harmfulalgae

HABsInfo@dec.ny.gov, your local health department (health.ny.gov/EnvironmentalContacts), or harmfulalgae@health.ny.gov

- Please report symptoms to your local health department or harmfulalgae@health.ny.gov

More Information

NYS Department of Health
www.health.ny.gov/harmfulalgae

NYS Department of Environmental Conservation
www.dec.ny.gov/chemical/77118.html

US Centers for Disease Control and Prevention
www.cdc.gov/nceh/hsb/hab/default.htm

US Environmental Protection Agency
www2.epa.gov/nutrient-policy-data/cyanohabs



Blue-green Algae and Health



Know it.



Avoid it.



Report it.

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HABs roles and responsibilities

NYS DEC

- Implement Clean Water Act (CWA)
- Responsible for ambient waters (i.e. lakes and streams)
- 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



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HABs and Health

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Harmful Blue-green Algae Blooms

- [Blue-green Algae and Health bookmark](#) (PDF, 276KB, 2 pp.), [Blue-green Algae and Health brochure](#) is available in Portable Document Format (PDF, 533KB, 2 pp.)

Blue-green algae are microscopic organisms that can form dense blooms in surface waters. People and animals should avoid blooms because blue-green algae can cause health effects.

Know It	Avoid It	Report It
<p>It might be a blue-green algae bloom in surface water if you see:</p> <ul style="list-style-type: none"> • Strongly colored water (blue-green, green, yellow, white, brown, purple, or red). • Paint-like appearance. • Floating mats or scums. 	<p>Always stay away from blooms in surface waters.</p> <ul style="list-style-type: none"> • Don't swim, fish, boat, or wade in areas with blooms. • Don't eat fish caught from areas with blooms. <p>If you are not on a public water supply and are using surface water:</p> <ul style="list-style-type: none"> • Bloom or no bloom, never drink, prepare food, cook, or make ice with untreated surface water. • During a bloom, don't drink, prepare food, cook, or make ice with surface water, even if you treat the water yourself. Also, consider not using it for showering, bathing, or washing. <p>If you are on public water:</p>	<ul style="list-style-type: none"> • Report blooms to: the NYS Department of Environmental Conservation, your local health department, or harmfulalgae@health.ny.gov • Report blue-green algae related symptoms to: your local health department or harmfulalgae@health.ny.gov • Consider visiting a healthcare provider if you, your family, or your animals are experiencing symptoms related to blue-green algae exposure. Symptoms include diarrhea, nausea, or vomiting; skin, eye, or throat irritation; and allergic reactions or breathing difficulties.



Health department email:
harmfulalgae@health.ny.gov

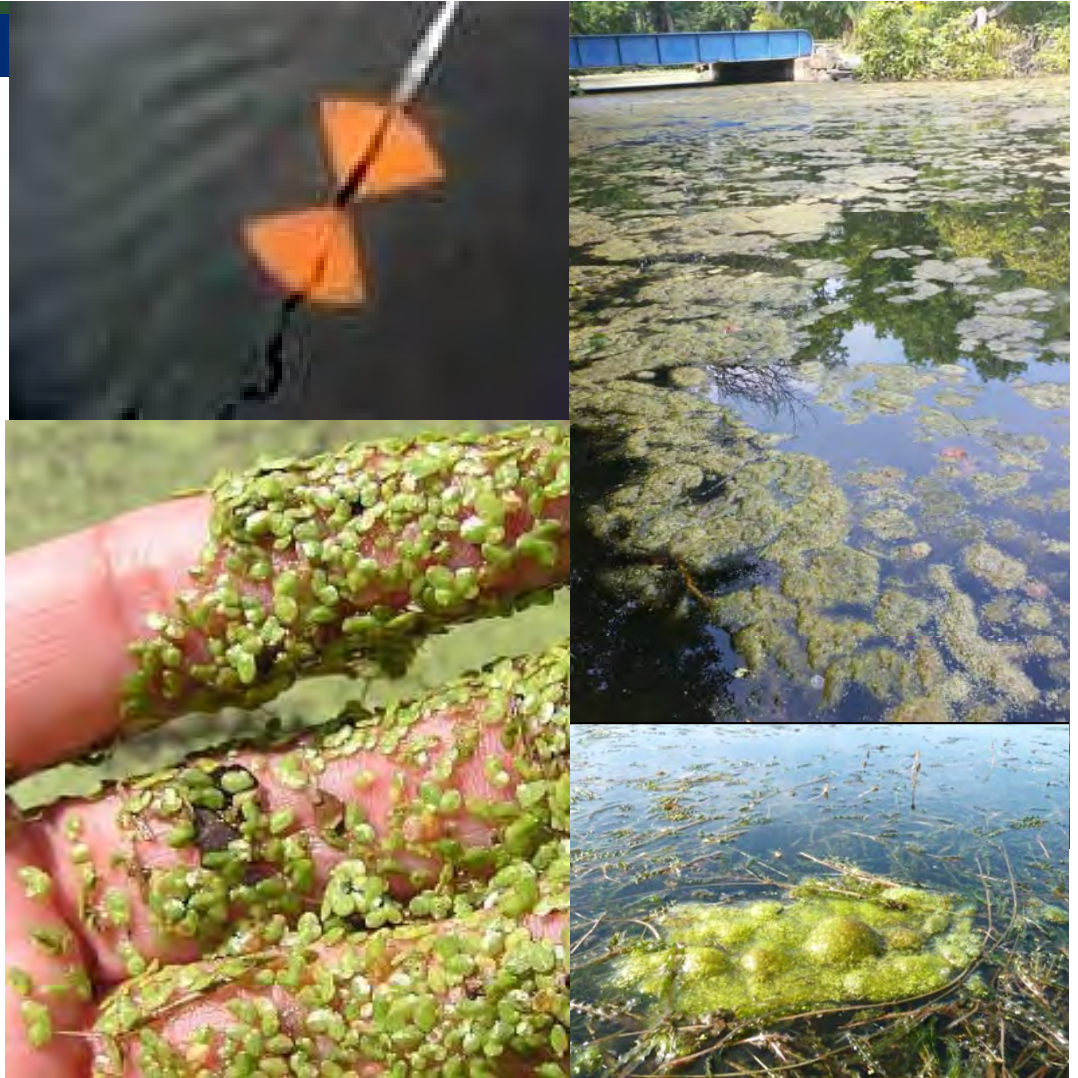
County health departments
https://www.health.ny.gov/prevention/prevention_agenda/contact_list.htm



Recognizing HABs

NOT HABs

- Filamentous algae
- Floating plants (watermeal and duckweed)
- Discolored water
- Blooms of other types of algae

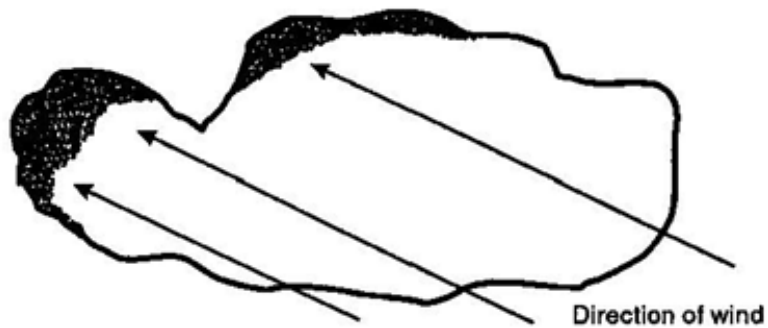
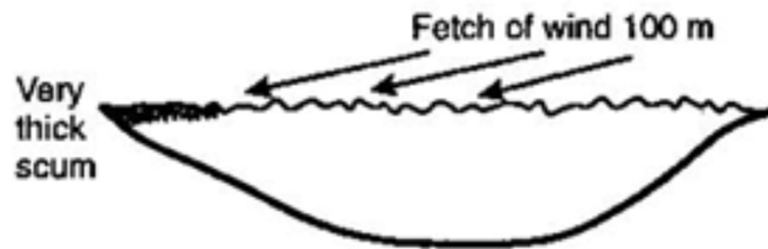


Recognizing HABs

PROBABLY HABs

- Floating on surface of the water
- Streaks, clumps, pea soup or spilled paint appearance
- Often bright green (or bluegreen, white-ish, or purple)





Be careful of wind concentrated scums!



Hamilton Reservoir, Platte River Power Authority, Fort Collins, CO



Batesville, MI



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Not just NY!

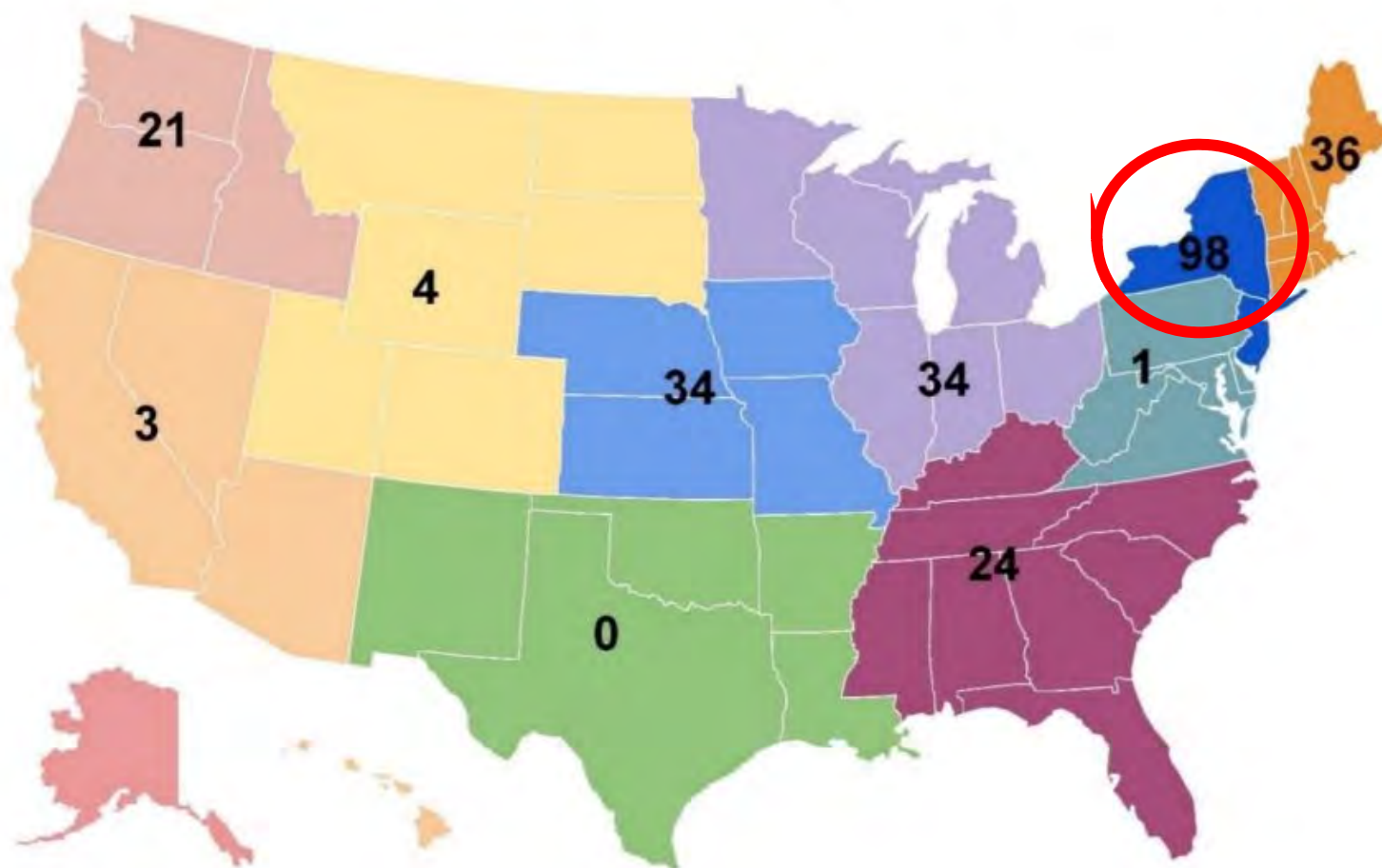


Tai Hu, China



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Figure 2-2. State-reported HAB Advisories by EPA Region, January 1 to August 12, 2016



NYS HABs Programs

What do we do?



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The DEC HABs Program

Surveillance/sampling



- DEC coordinates several HABs and lake monitoring programs (DEC lake monitoring, CSLAP, NYC Parks, Suffolk County, individual lakes); >400 lakes/year!
- Sampling conducted mostly by trained volunteers, DEC staff
- Drinking water and most regulated swimming areas (beaches) are the jurisdiction of DOH & State Parks

The DEC HABs Program

Bloom Status

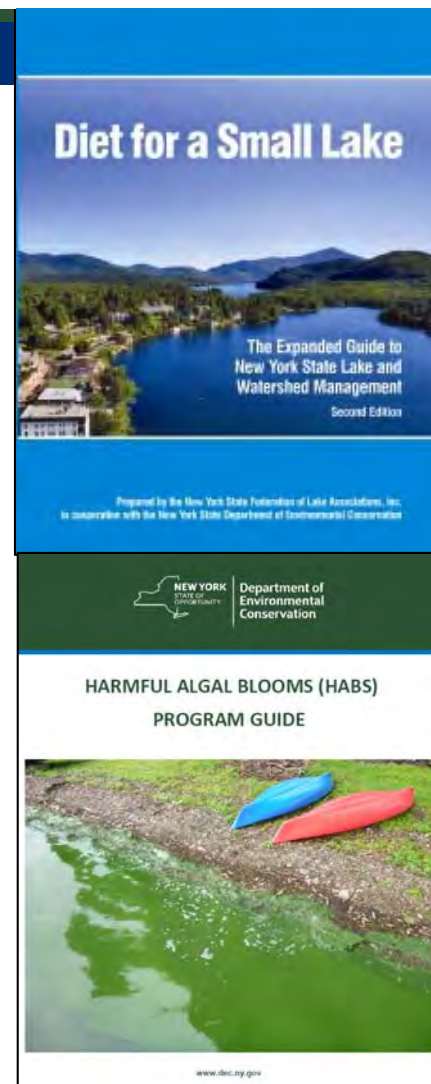
- Determine bloom status (**Suspicious**, **Confirmed**, or **Confirmed with High Toxins**) based on surveillance (visual evidence) and sampling data

Education

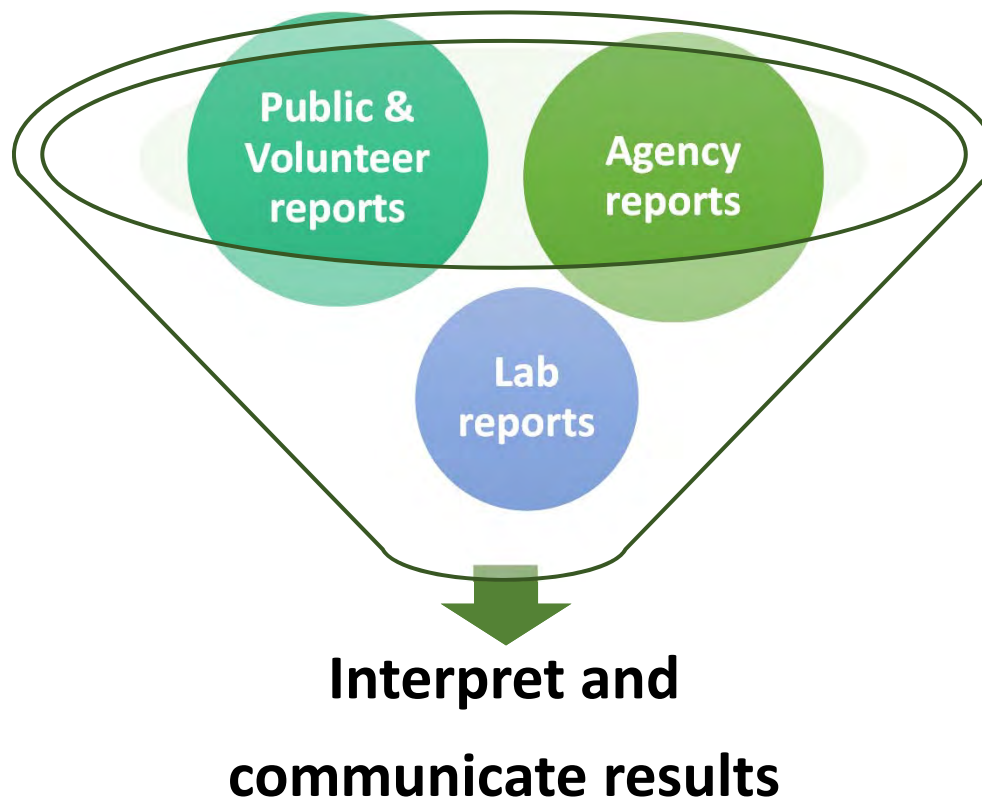
- Maintain website with HABs primer, FAQs, photo gallery and more (on.ny.gov/hab)
- Publish articles in DEC publications, respond to press inquiries, lake association newsletters, etc.
- Public presentations and training workshops

Outreach

- Daily notifications sent via email to agency and county staff
- Weekly updates to website (map), social media, etc.



DEC HABs Program Role



Initial Bloom Report

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Is the observer a professional or trained citizen?

No (lay person)

Yes

Has a regulated beach been closed?

Yes

Does DEC HABs Program staff determine descriptions/photos appear to be a likely cyanobacteria bloom?

No

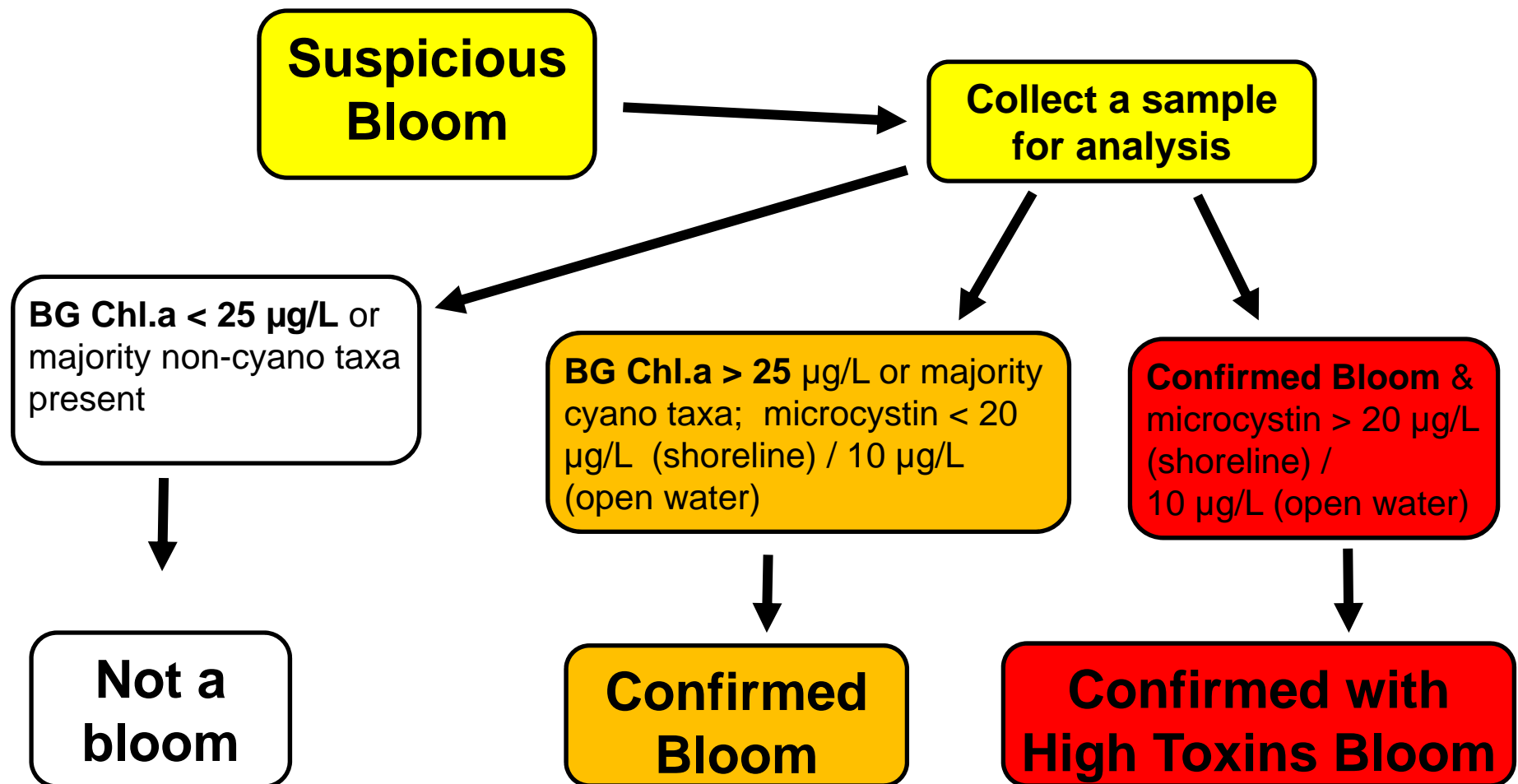
Yes

Not a bloom

Suspicious Bloom



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For all blooms....

- **Avoid exposure.** Keep children and pets away from scums or discolored water
- Seek immediate medical assistance for symptoms consistent with exposure
- Report any symptoms to local/state Health Department
- Report additional and on-going blooms to DEC through digital photos, suspicious bloom form, or email drop box (HABsInfo@dec.ny.gov)

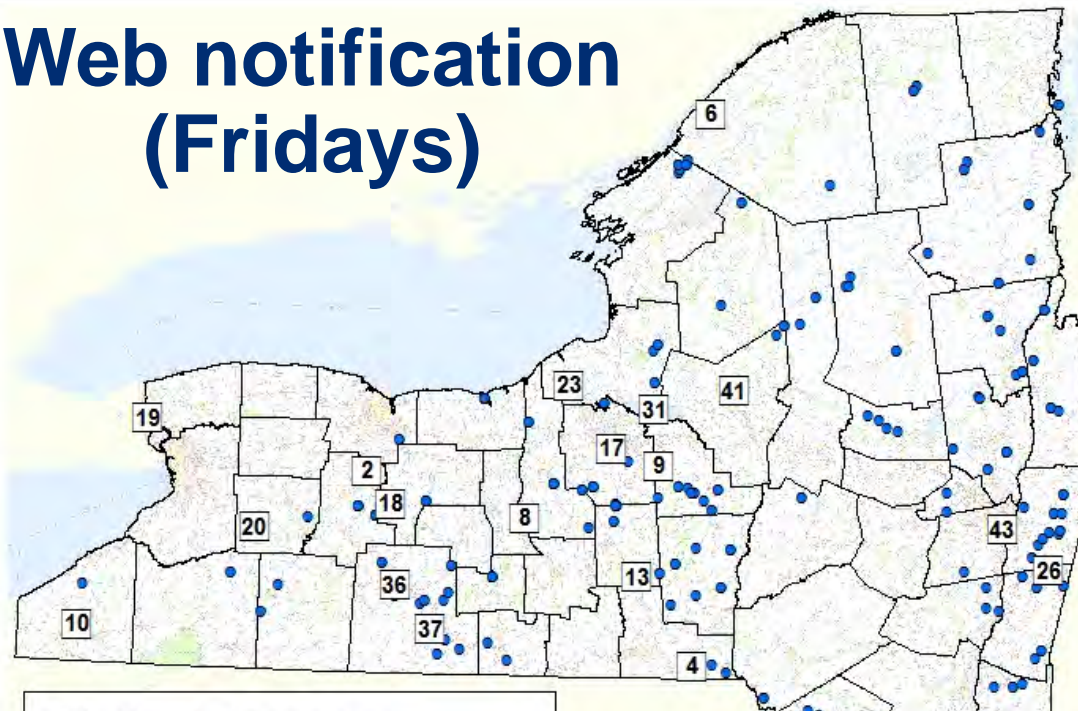
The Difficulty of HABs



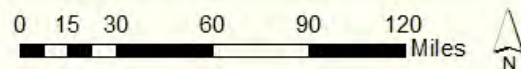
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Web notification (Fridays)

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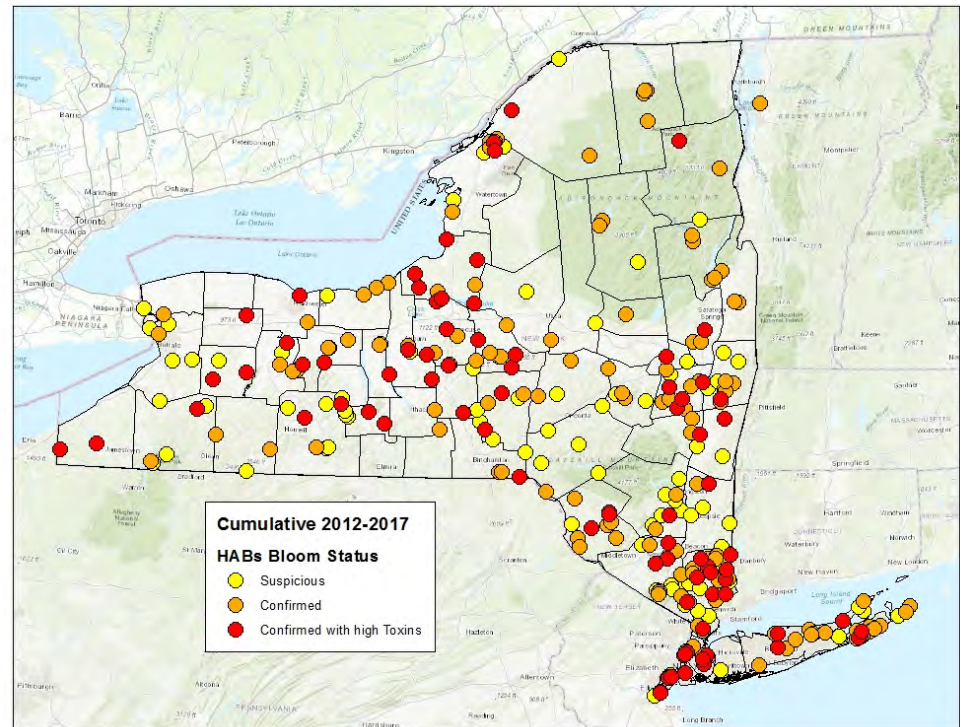
- Current HABs Locations
- 2018 DEC Lakes Monitoring Program

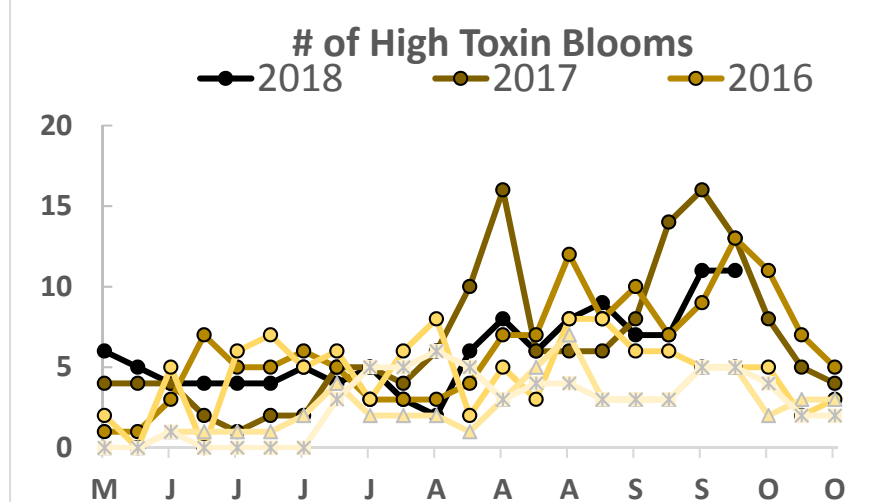
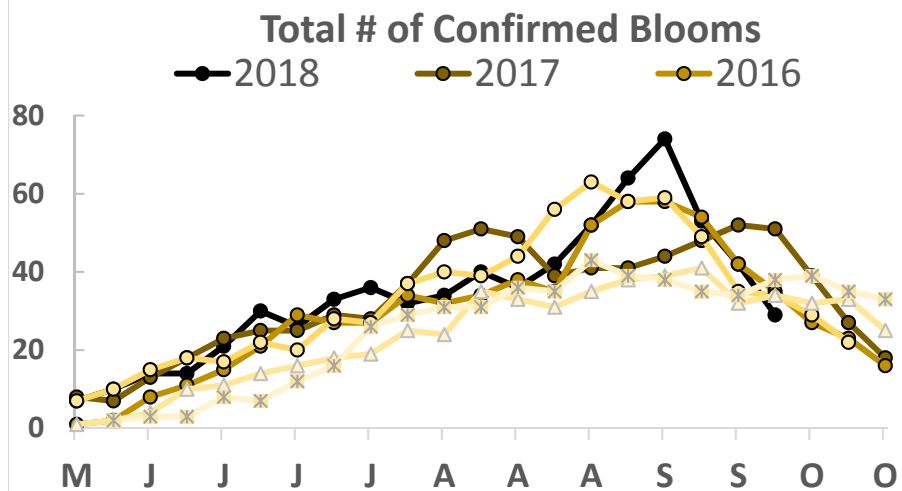
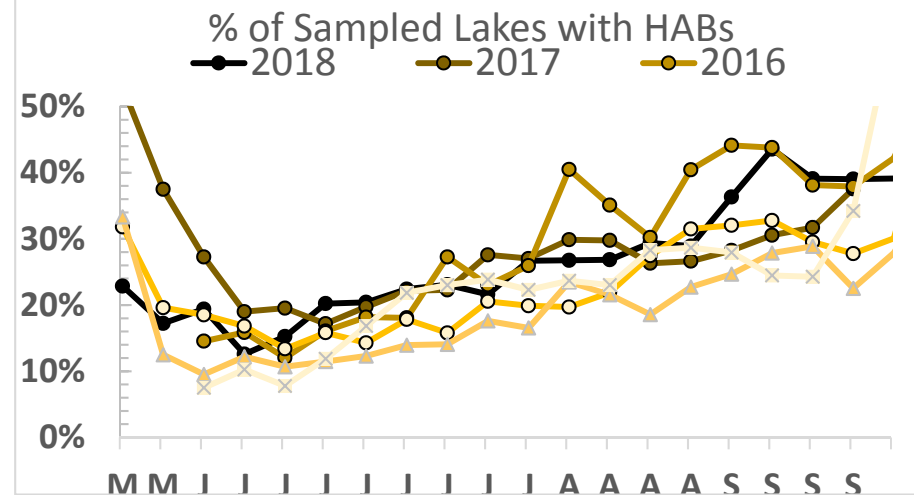
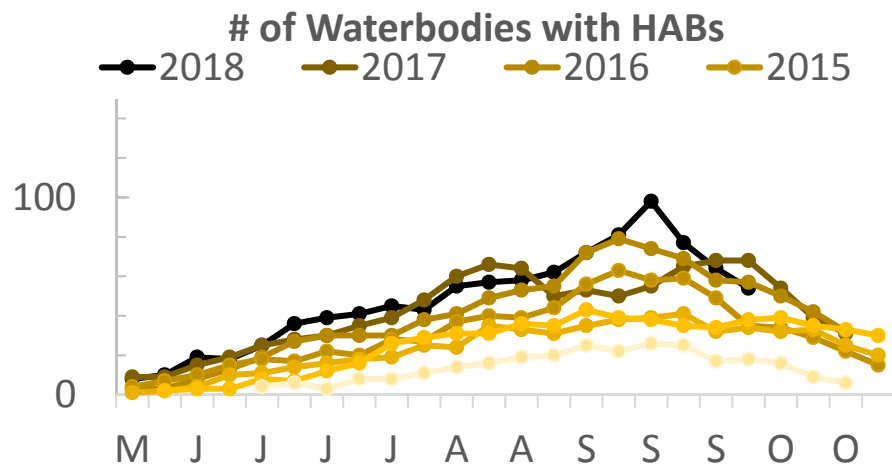


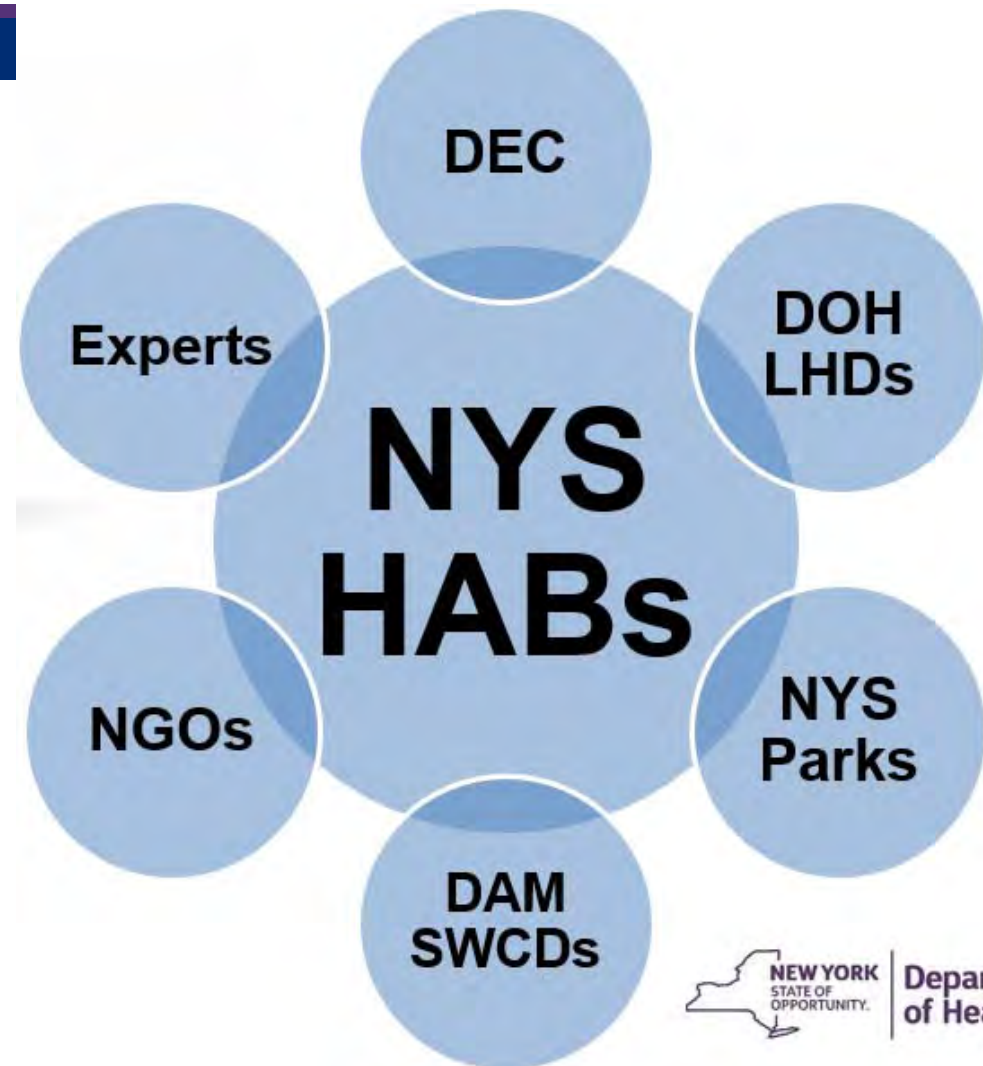
Map #	Waterbody Name	County	Status	Extent of bloom	Date	Type of Sample	Change in Status
1	Allegheny Reservoir	Chautauqua	Confirmed	Large localized	10/7	Lab sample	Updated listing
2	Beaver Lake	Orange	Confirmed	Small localized	10/7	Lab sample	Updated listing
3	Browns Pond	Orange	Suspicious	Widespread/ lakewide	10/3	Visual report	No change
4	Burden Lake	Rensselaer	Confirmed	Small localized	9/29	Lab sample	No change

HABS in New York 2012-2017

Year	Suspicious	Confirmed	High Toxins	Total
2012	20	29	9	58
2013	17	37	22	76
2014	19	51	23	93
2015	40	62	35	137
2016	41	95	38	174
2017	45	84	36	165
12-17	75	133	77	340

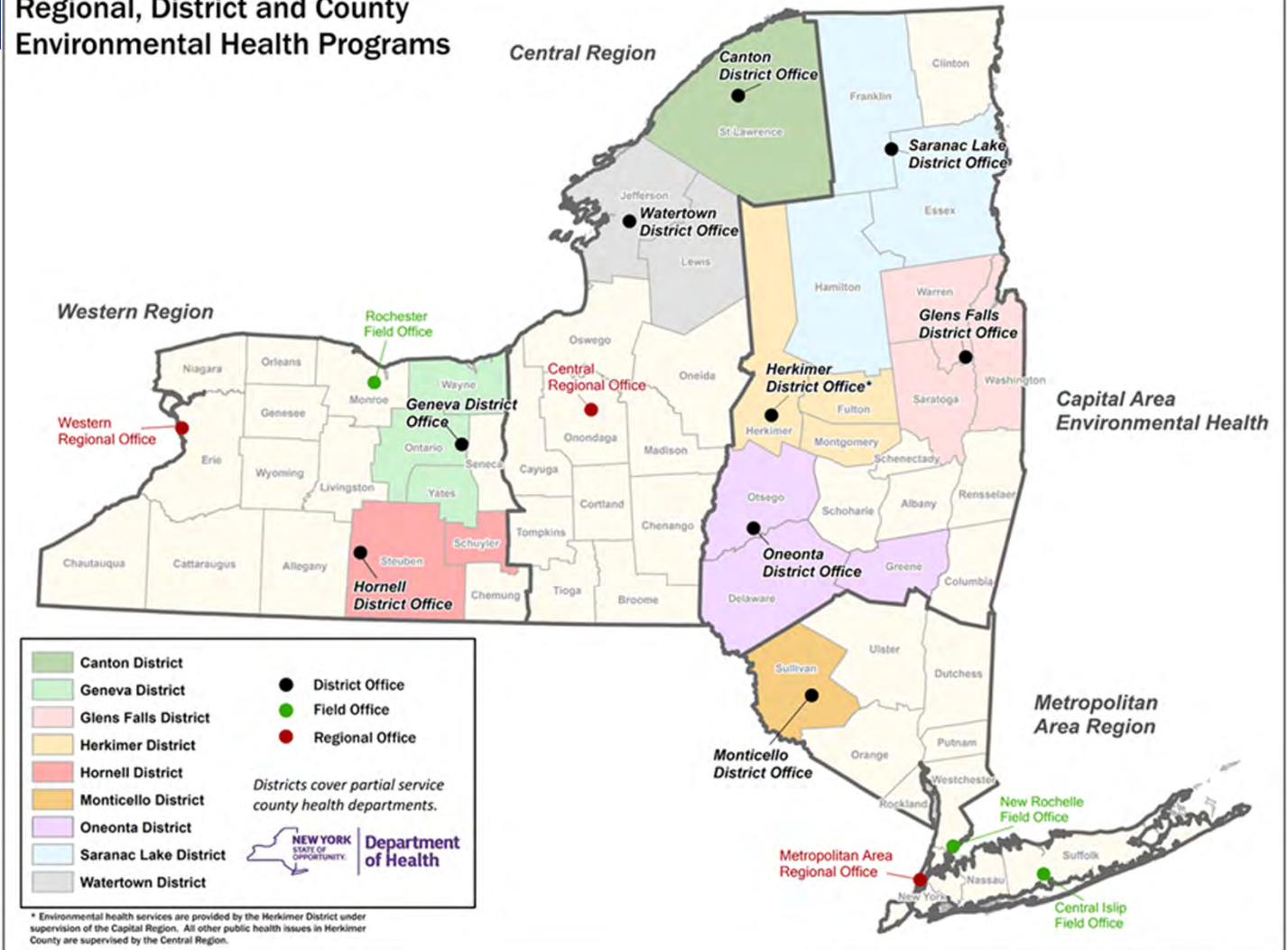






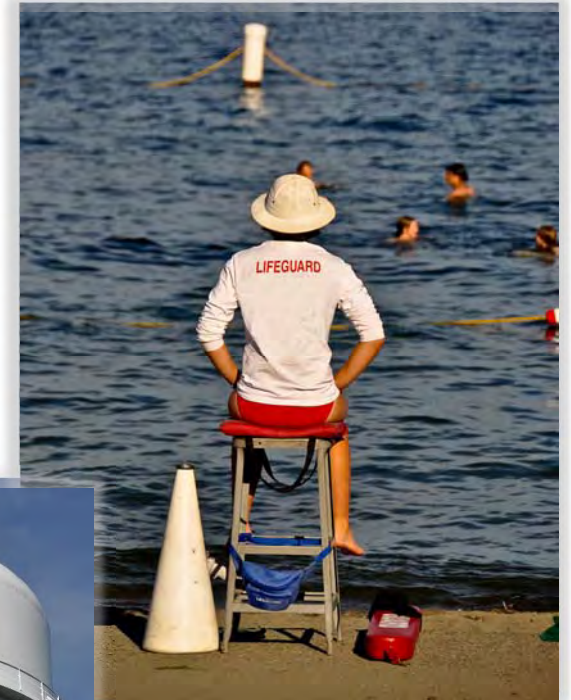
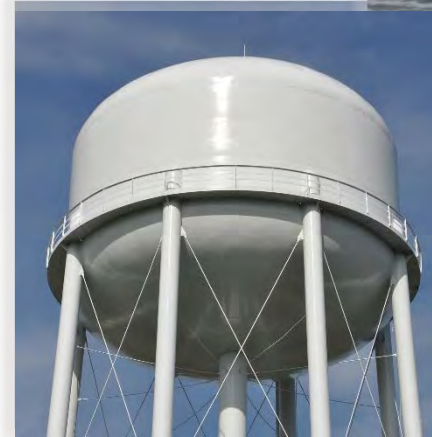
NYS DOH EH Field Structure

Regional, District and County Environmental Health Programs

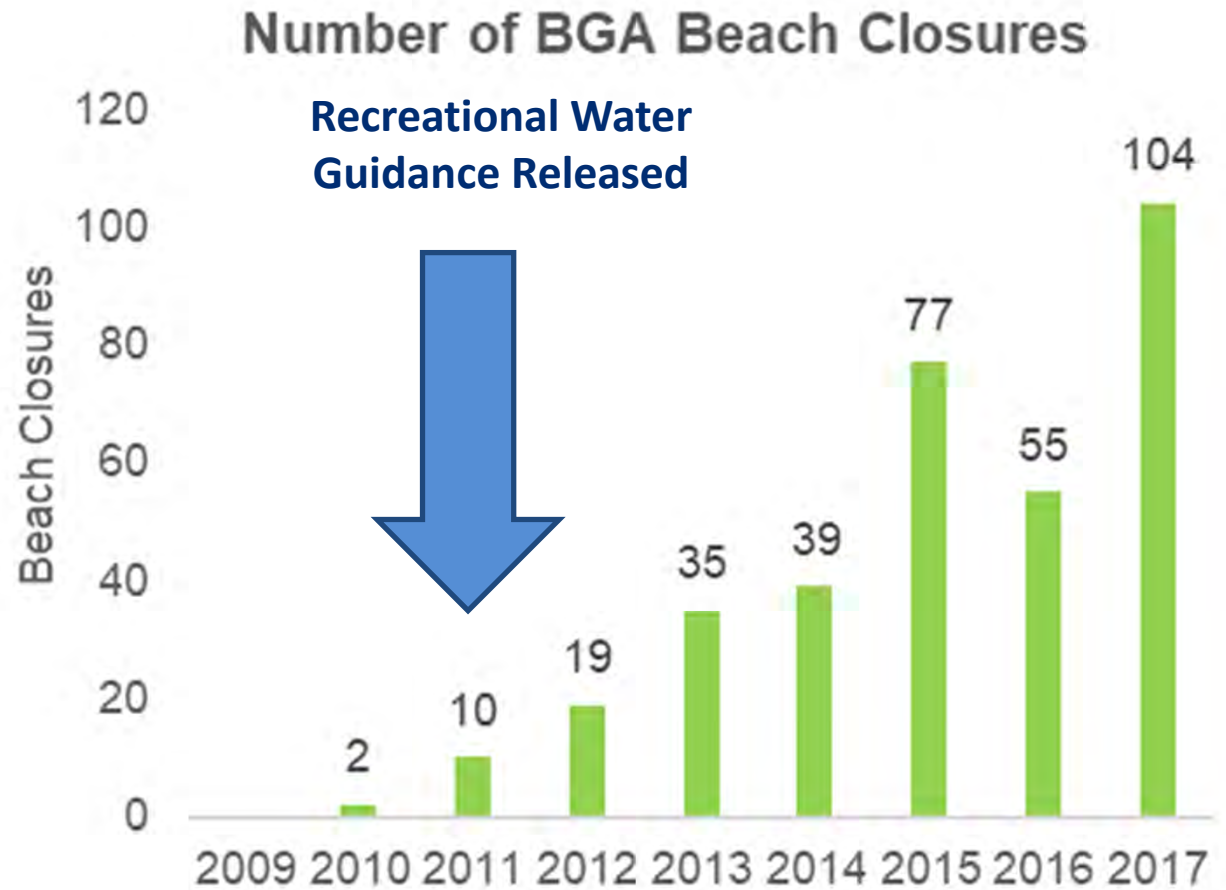


HABs and NYS Regulated Facilities

- **Public Beaches:** 1,400 regulated beaches
- **Public Drinking Water:** 312 surface source water public water systems
 - These serve another 426 public water systems



NYS BGA Impact at Beaches



NYSDOH Protocol:

Visual Evidence of Bloom = Beach Closures & Advisories

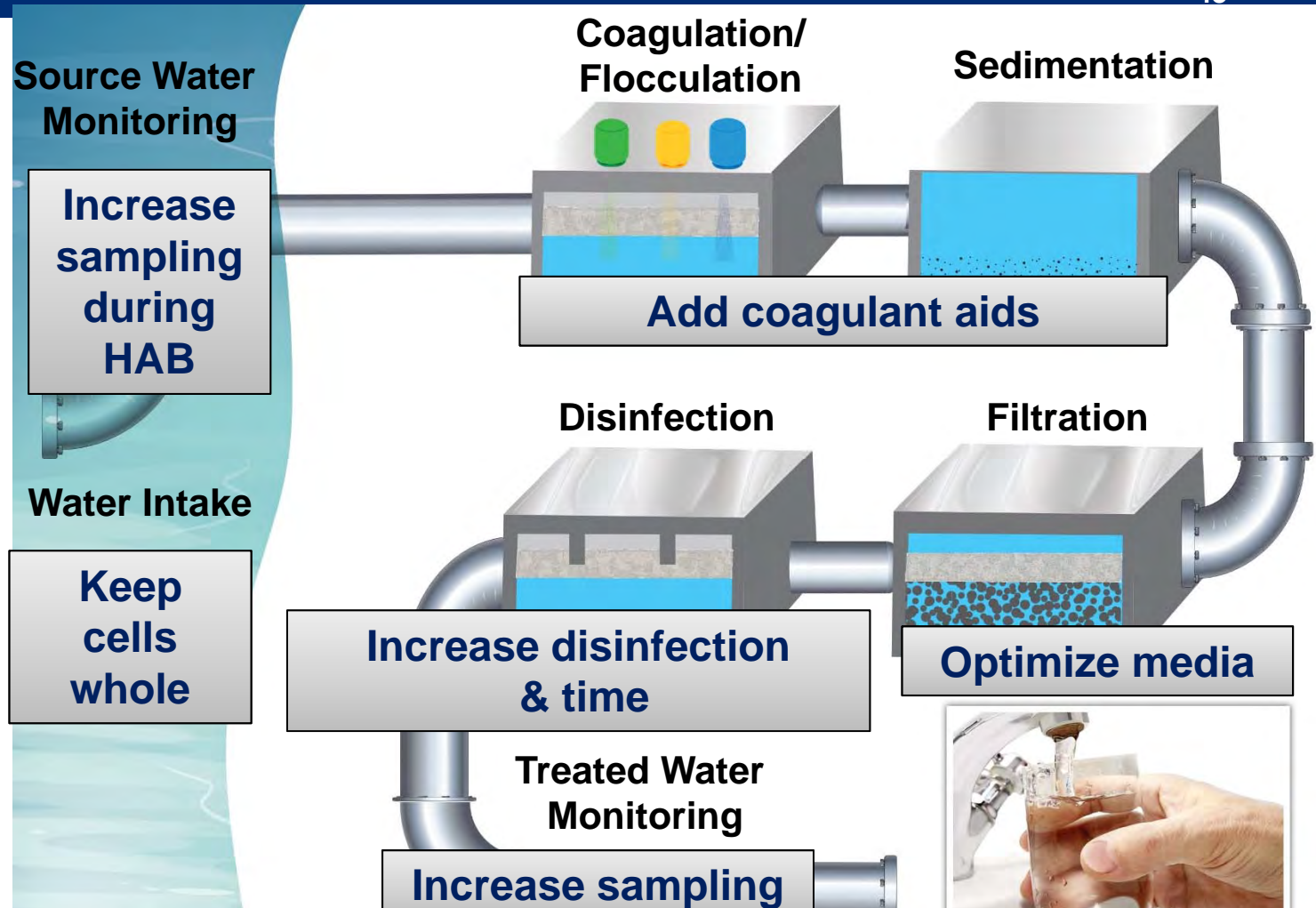
- Toxin monitoring is NOT the primary public health intervention
- Lack of bloom for a day AND analysis for microcystins required to reopen beaches
 - Method: EPA 546
 - Criteria: EPA, 2017 draft $< 4\mu\text{g/l}$



Visual Based Response: Why?

- Symptoms possible with or without toxins
- Sampling and analysis takes time
- Not all toxins analyzed
- Blooms are dynamic:
 - Spatial, temporal & toxin gene expression
- Not practical to sample all waters at all times

Drinking Water Treatment

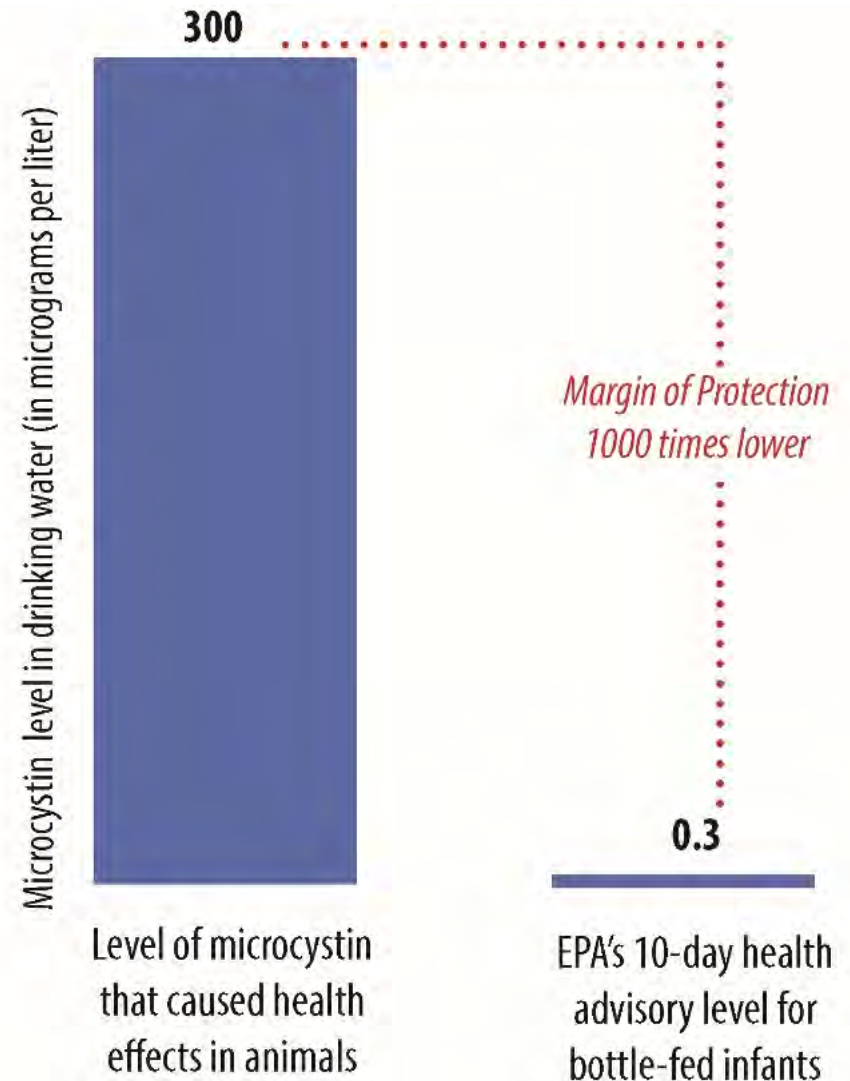


Public Drinking Water Response

- Triggered by evidence that HABs could be in source water near intake.
- Sample source and treated water
- Optimize treatment and reduce levels
- Notify public if US EPA Health Advisory Level for microcystins in small children is exceeded ($0.3 \mu\text{g/l}$)

US EPA Drinking Water Health Advisory

- Addresses exposure to unregulated contaminants
- Build in a large margin of protection between observed health effects and level
- An exceedance used to take actions to reduce exposure because the margin of protection is reduced



Examples of Situations Triggering Response

- Potentially HAB-related outbreak/illness
- Algaecide treatment
- Visual blooms near intake
- Noted change in raw water quality
- Widespread HAB in lake
- HAB concentrated near intake
- Shallow intake near a lesser HAB
- A taste and odor event
- Public confidence

2017 Summary

- 22 public water supplies sampled
- 594 samples analyzed
- 0 detects of microcystin over EPA Health Advisory in treated drinking water

Illness Surveillance

Reports of recreational and drinking water illness

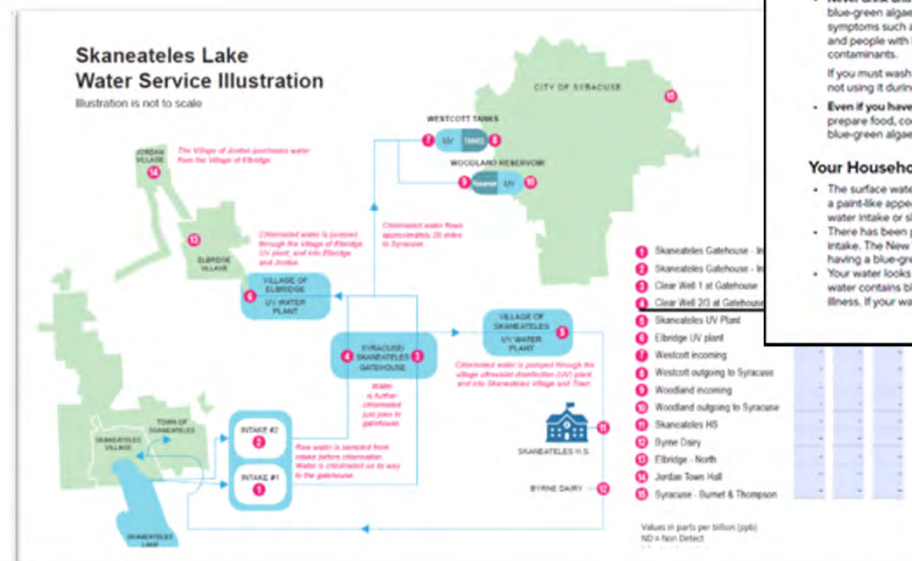
- Reports from recreational exposures
- No reported drinking water illness
- Reports of illness coincide with blooms and media attention
- Reports from open regulated beaches rare
- The numbers of reports are relatively small with potential reporting bias
- HAB Illness likely under reported

Federal partners

- CDC NORS Reporting
- HABISS grant, 2009 (MMWR 2014)
- CDC/CSTE Fellowships 2014, 2017 (MMWR 2017)
- OHHABS

Outreach: How and Who

- Websites
- Notification templates
- Social media
- Workshops
- Public drinking water customers
- Regulated facilities
- People with surface water intakes



CENTER FOR ENVIRONMENTAL HEALTH



Harmful Blue-green Algae Blooms: Understanding the Risks of Piping Surface Water into Your Home

This fact sheet provides information and advice for people who are not able to connect their homes to a public water supply or to a drilled well for their drinking water and are using a surface water source such as a lake, river, stream or spring for their household water. It is important to understand the risk of illness associated with using surface water that could contain harmful blue-green algae and their toxins, as well as bacteria, parasites and viruses.

About Harmful Blue-green Algae and Health Effects

Harmful blue-green algae blooms have been occurring in surface waters throughout New York State. Contact with water with blue-green algae and their toxins can cause health effects. Symptoms include diarrhea, nausea or vomiting, skin, eye or throat irritation, and allergic reactions or breathing difficulties. Animal illnesses and deaths also have occurred when animals consumed large amounts of accumulated algal scum from along shorelines or when animals groomed blue-green algal scums from their fur.

Recommendations for People with Private Surface Water Intakes

- **Never drink untreated surface water, bloom or no bloom.** Untreated surface water might contain blue-green algae and their toxins. It can also contain other bacteria, parasites or viruses that can cause symptoms such as diarrhea, nausea and vomiting. Young children, pregnant women, older adults and people with health issues are at higher risk from symptoms associated with these drinking water contaminants.
- If you must wash dishes with untreated surface water, rinse with bottled water. You may also consider not using it during a bloom for showering, bathing or washing, especially if your water looks cloudy.
- **Even if you have an in-home treatment system, use bottled water during a bloom.** Don't drink, prepare food, cook or make ice with surface water during a bloom. Boiling the water will not remove blue-green algae or their toxins.

Your Household Water Could Contain Blue-green Algae and Toxins if:

- The surface water is strongly colored (blue-green, green, yellow, white, brown, purple or red) or has a paint-like appearance, or you see floating mats or scums on the water, especially near your surface water intake or shore well.
- There has been public notification of blue-green algae blooms or beach closures near your water intake. The New York State Department of Environmental Conservation (DEC) also lists waterbodies as having a blue-green algae bloom at www.dec.ny.gov/chemical/83310.html.
- Your water looks cloudy coming out of the tap or water pressure changes. This could indicate that your water contains blue-green algae and their toxins as well as bacteria, parasites or viruses that can cause illness. If your water is treated, it could indicate that your system needs service.

High Profile Events

- Finished DW detection Owasco Lake, October 2016
- Detections in raw water of unfiltered DW supply for Syracuse. Skaneateles Lake, 2017 & 2018
- HABs in all 11 lakes in 2017
- Finished DW detection, Canandaigua Lake, October 2018



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High Profile Events (continued)

- Wallkill River: HABs detected over 30 miles in small river during drought conditions in 2016
- Illness reporting
- Beach closures continue to rise
- Record 98 waterbodies with HABs on 9/14/18



Combatting HABs in NYS

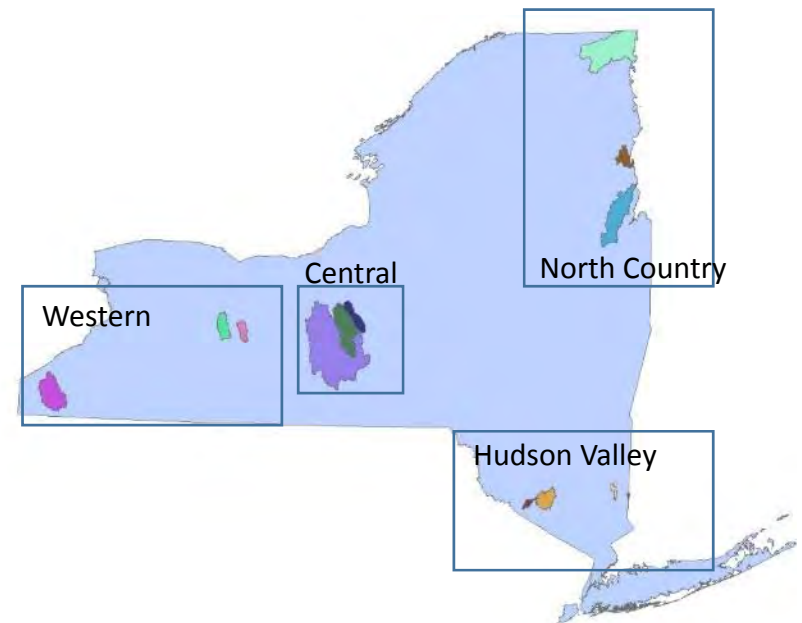
Late 2017: Governor Cuomo announced a 4-point initiative

1. Selection of priority lakes
2. Regional HABs summits
3. Completion of Action Plans
4. Implementation of treatment and monitoring



Selection of Priority Lakes

- There are 16,000 lakes in NYS, so a difficult task
- Wide variety of types, locations, sizes and vulnerabilities
- All Priority Lakes are water supplies or critical tourism drivers
 - **Western Group:** Conesus; Honeoye; Chautauqu Lakes
 - **Central Group:** Owasco; Skaneateles; Cayuga Lakes
 - **North Country Group:** Parts of Lake Champlain Lake George
 - **Greater Hudson Valley Group:** Lake Carmel; Palmer Lake; Putnam Lake; Monhagen Brook watershed (five reservoirs)



HABs Summits

Open to the Public

12 lakes divided into 4 regions

Took place in Feb/March 2018

Presentations and discussions on:

- Sources of nutrients
- Nutrient Reduction Strategies
- Algal ecology
- HABs treatment
- Other



National and Local Expertise at HABs Summits

Experts from:

- Michigan, North Carolina, Ohio & Vermont
- SUNY ESF & Stony Brook, Cornell
- Jefferson Project on Lake George
- Soil & Water Conservation Committees
- Agriculture, Industry
- State, County, Town officials

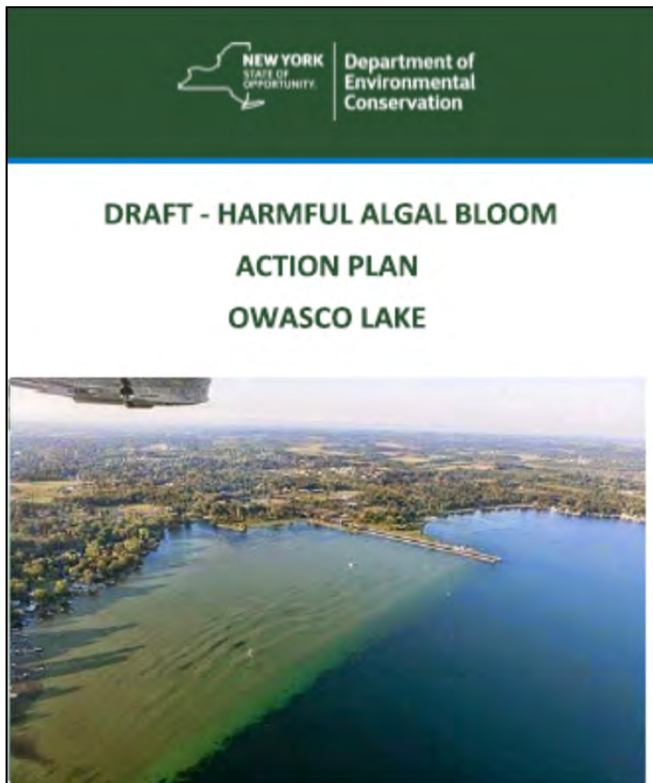


HABs Summits Take Home Messages



- “Its complicated”
- Long Haul
- Improvement is possible
- Control both nitrogen *and* phosphorus
- Expand collaborative partnerships and research

HABs Action Plans



- 12 plans, one for each priority waterbody
- Summary of lake, water quality and HABs history
- Waterbody and statewide analysis of HAB triggers
- Lake and watershed implementation projects to address HABs

HAB Action Plans

Prepared by OBG (consultants) with input from experts, State officials and Lake-specific steering committees.

<https://www.dec.ny.gov/chemical/113733.html>

Sections:

- Lake Background
- Designated Uses
- User and Stakeholder Groups
- Monitoring Efforts
- Water Quality Conditions
- Summary of HABs in the Lake
- Waterbody Assessment
- Conditions Triggering HABs
- Sources of Pollutants
- Lake Management / Water Quality Goals
- Summary of Management Actions to Date
- **Proposed HABs Actions**

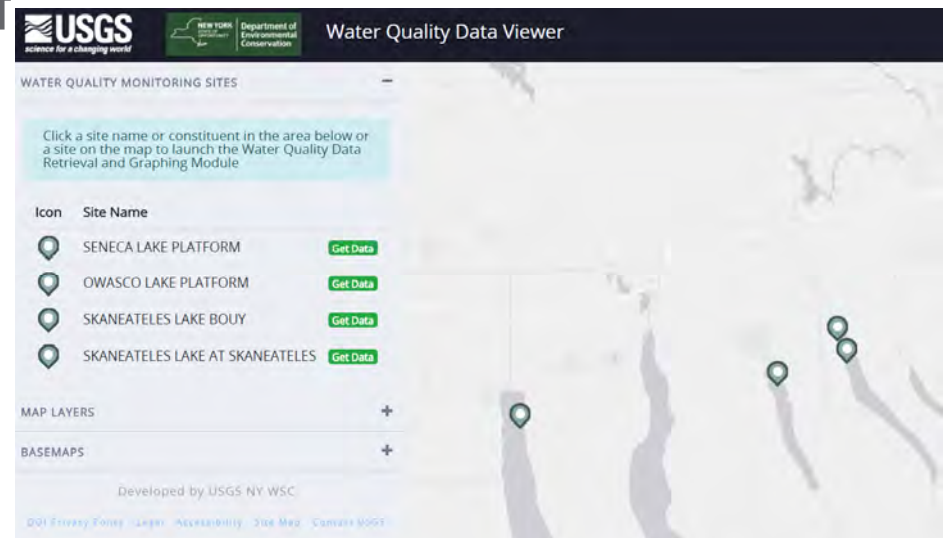


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HABs Advanced Monitoring Pilot

DEC and USGS piloting use of advanced monitoring platforms

- Innovative HAB sensors
- Meteorological stations
- Real time reporting
- Public facing webpage:
<https://ny.water.usgs.gov/maps/habs/>



HABs Mitigation Pilots



Evaluation of innovative HABs mitigation actions

- Nutrient inactivants
- Hydrogen peroxide
- Ultrasonic devices

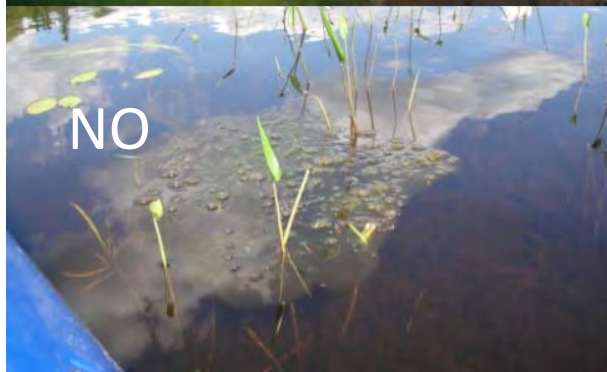
DEC and contractor choosing candidate sites and technologies; initiating environmental review



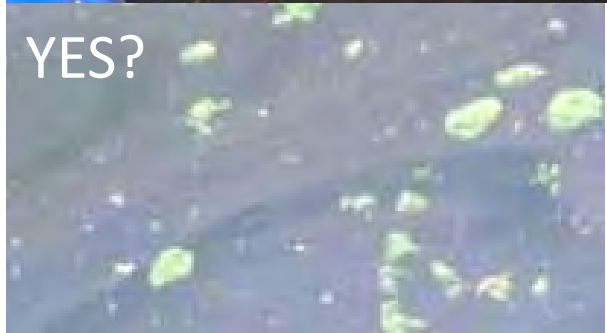
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YES



NO



YES?



NO



YES



NO



YES



MAYBE?



NO

So you have a cyanobacteria bloom...

You step out to survey your beach; you come across this.....

What should you do?

Let the right people know!

- If possible, send digital photos to HABsInfo@dec.ny.gov or call 518-402-8179
- If any health effects, let local health department know



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WARNING

**Avoid Harmful
Blue-green Algae Blooms**
while swimming, fishing and boating



Keep kids and pets away from areas with blooms or scum.
Swim, fish and boat in areas with no blooms or scum.

Contact can make people and animals sick.

If contact occurs, rinse with clean water.
If symptoms occur, contact a medical provider.



Blooms can look like streaks, spilled paint, pea soup, floating clumps or dots.

Learn more: www.health.ny.gov/HarmfulAlgae and on.ny.gov/hab

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Thank You/Questions

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