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Environmental  
Conservation

# Harmful Algal Blooms: What are they and what do we do about them?

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Bureau of Water Assessment and Management

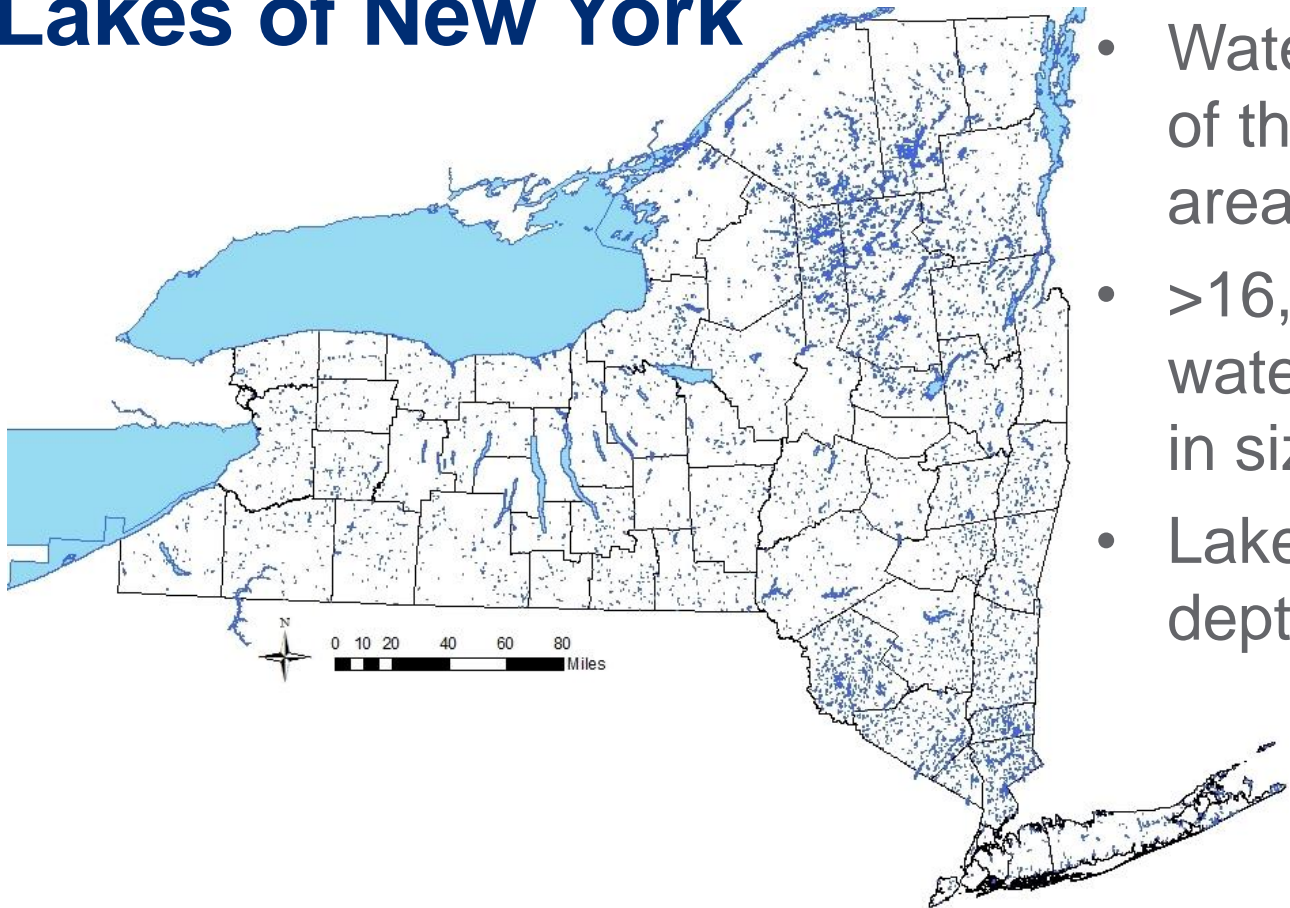
Plant Camp September 15, 2022

# Outline

- What are HABs?
- How to ID
- NYS HABs Program
- What can be done?

# What are HABs?

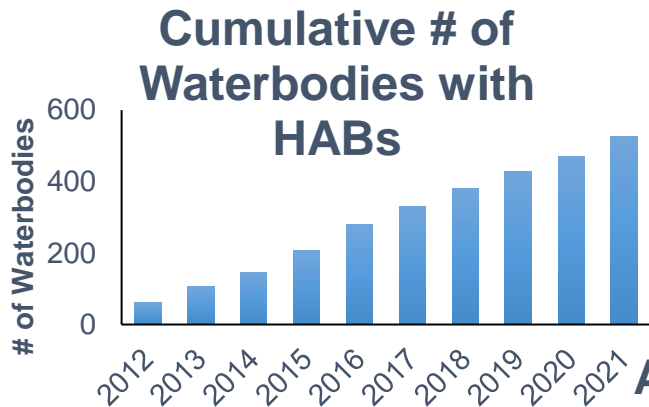
# Lakes of New York



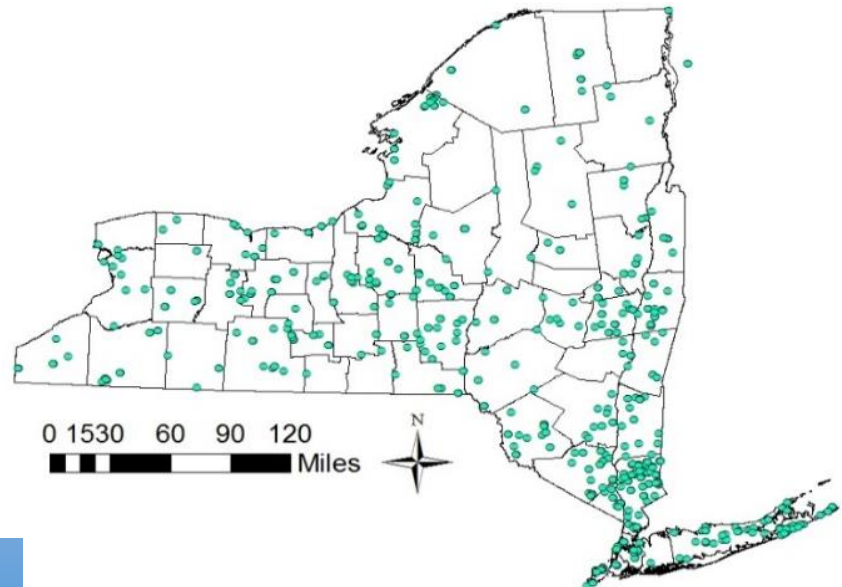
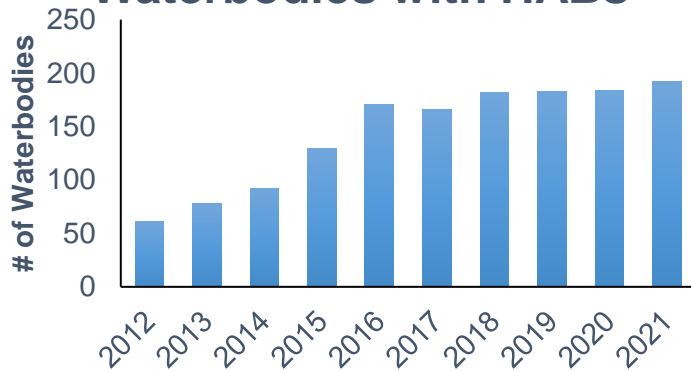
- Water covers over 10% of the state surface area!
- >16,000 distinct ponded waters over ~0.1 acre in size
- Lakes vary in size, depth, trophic status



# Statewide Distribution of HABs



**Annual # of Waterbodies with HABs**



# What are Harmful Algal Blooms (HABs)?

**H: Harmful** (toxins, other harmful compounds, economic, aesthetics, ecological)

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

**B: Bloom** (proliferation of cells, dense concentrations)



# Cyanobacteria = Blue-green Algae = HABs

**Know it,  
Avoid it,  
Report it**

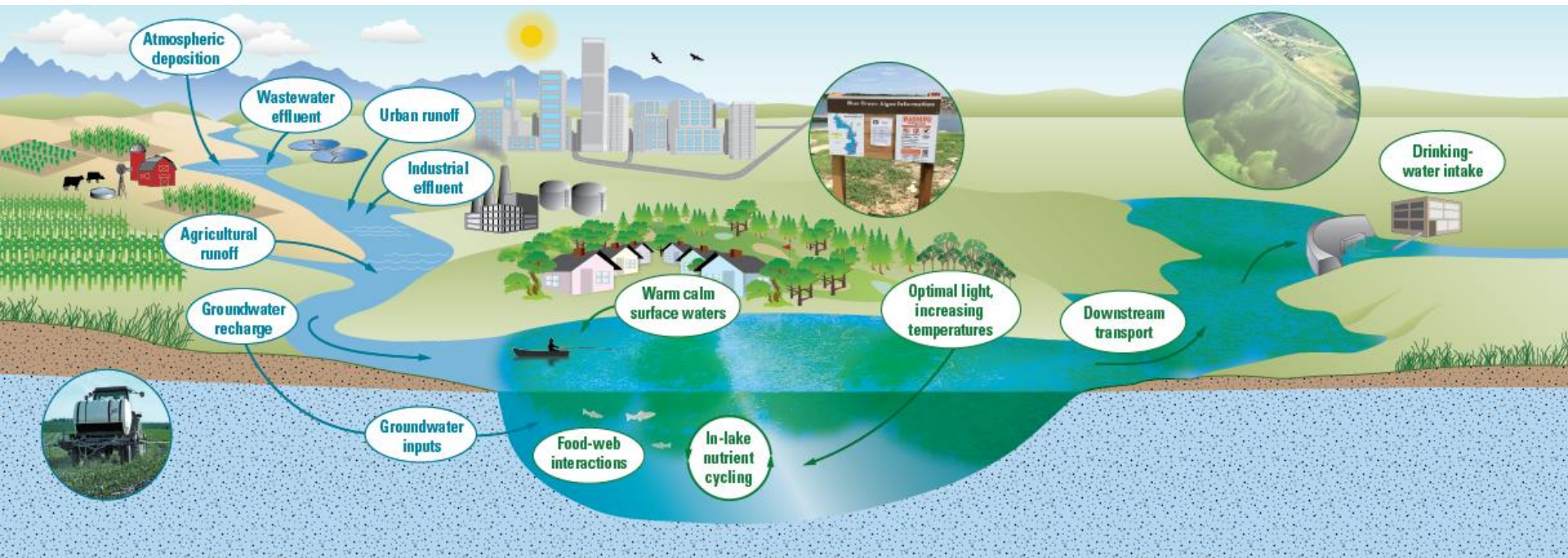


- Highly specialized and competitive ancient microscopic bacteria
- May produce toxins, pose health risk
- Hard to predict
- Difficult to remove





# What causes HABs?





# HABs need Nutrients and Light to Thrive

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

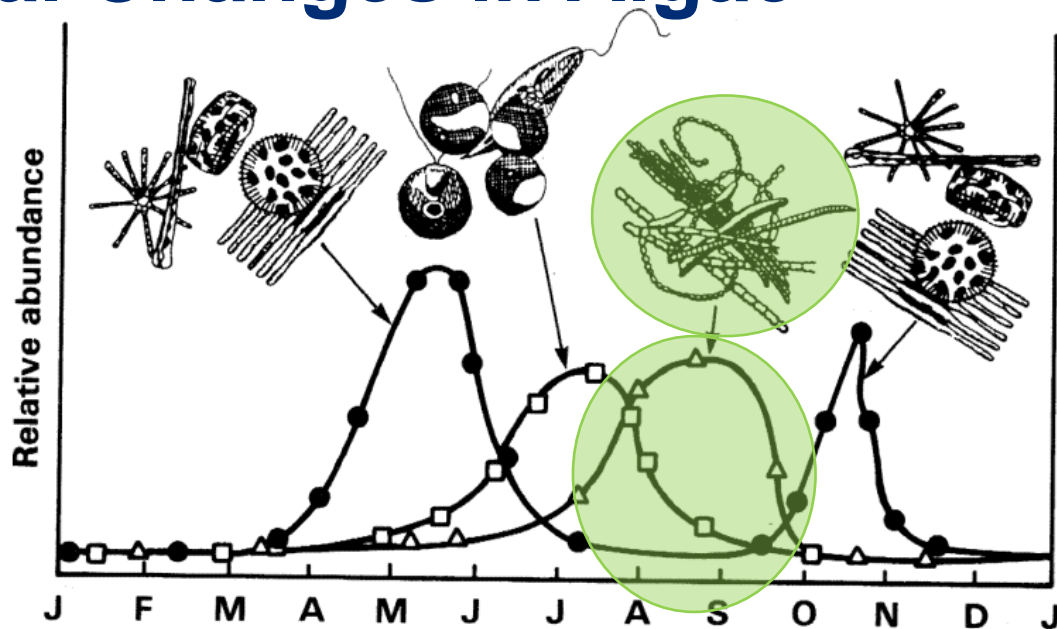


# Wild Cards Affecting HABs

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



# 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.

# Common types of Cyanobacteria

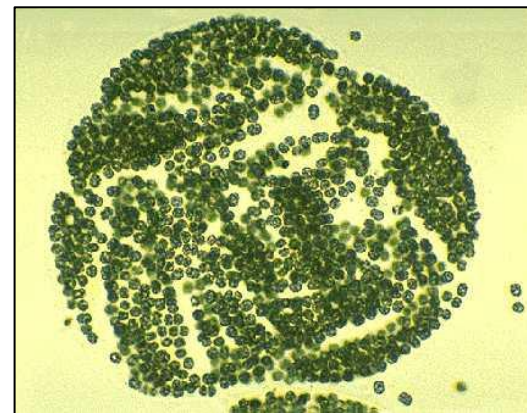
*Dolichospermum*



*Aphanizomenon*



*Microcystis*



- Can produce anatoxin (nerve toxin) and other toxins

- Adjusts buoyancy
- Can produce microcystin (liver toxin)

# Cyanotoxins

## Microcystins (liver toxins)

- Most common toxin in New York

## Anatoxins (nerve toxins)

- Potentially fatal to dogs

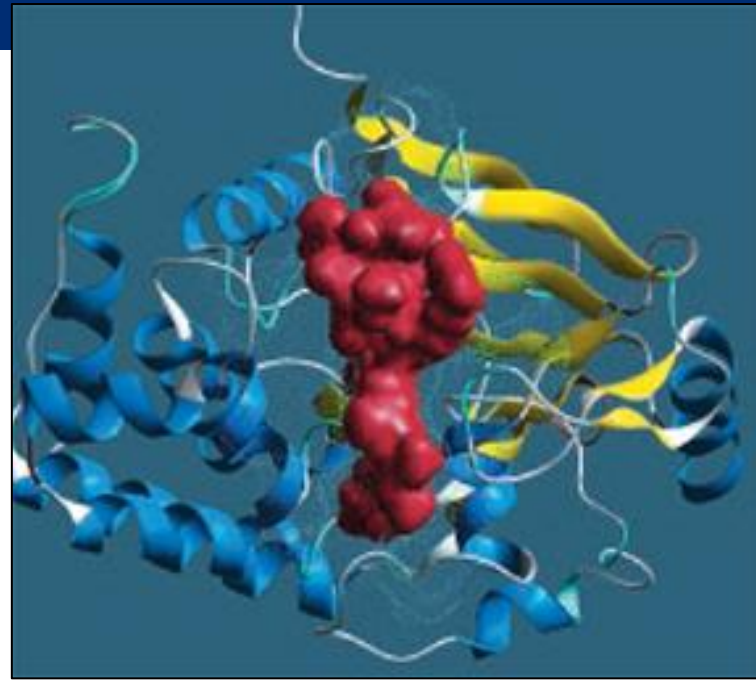
## Lipopolysaccharides (endotoxins)

- Skin irritants and allergens
- Produced by most cyanobacteria

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

No visual cues that toxins are present

Toxin production not well understood





# 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

## Potential Symptoms:

- Allergic reaction
- Skin, eye, or throat irritation
- Diarrhea
- Nausea
- Vomiting
- Respiratory difficulties

Consider visiting a healthcare provider if you, your family, or your animals experience symptoms related to HABs.

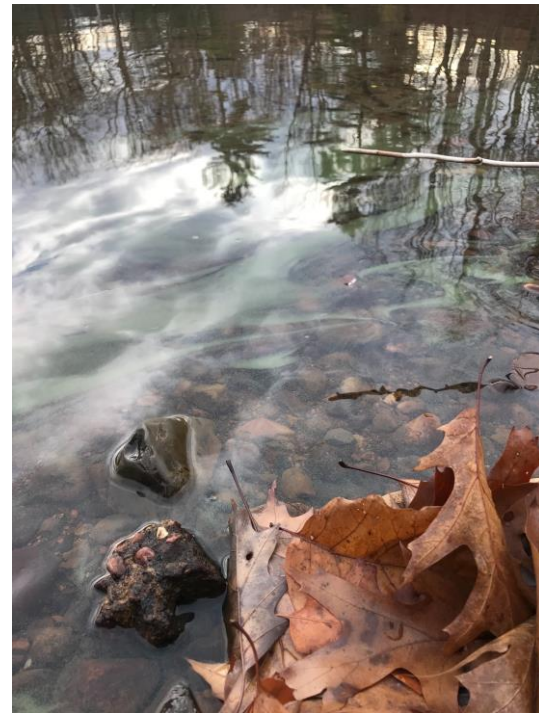
For more information:  
[www.health.ny.gov/HarmfulAlgae](http://www.health.ny.gov/HarmfulAlgae)





# 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
- **Know it, Avoid it, Report it!**



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# To HAB or not to HAB?

## HAB ID 101

# NOT HABs



**Filamentous = wet cloth, hair**

**Duckweed/watermeal = very small plants**

**Pollen = In Spring, very yellow, breaks apart**



**Whiting Events**



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## Filamentous green algae

Common types:  
*Cladophora*  
*Mougeotia*  
*Spirogyra*





# Spirogyra – bright green “cloud”, under the surface



Examples of *Spirogyra* green algae blooms.

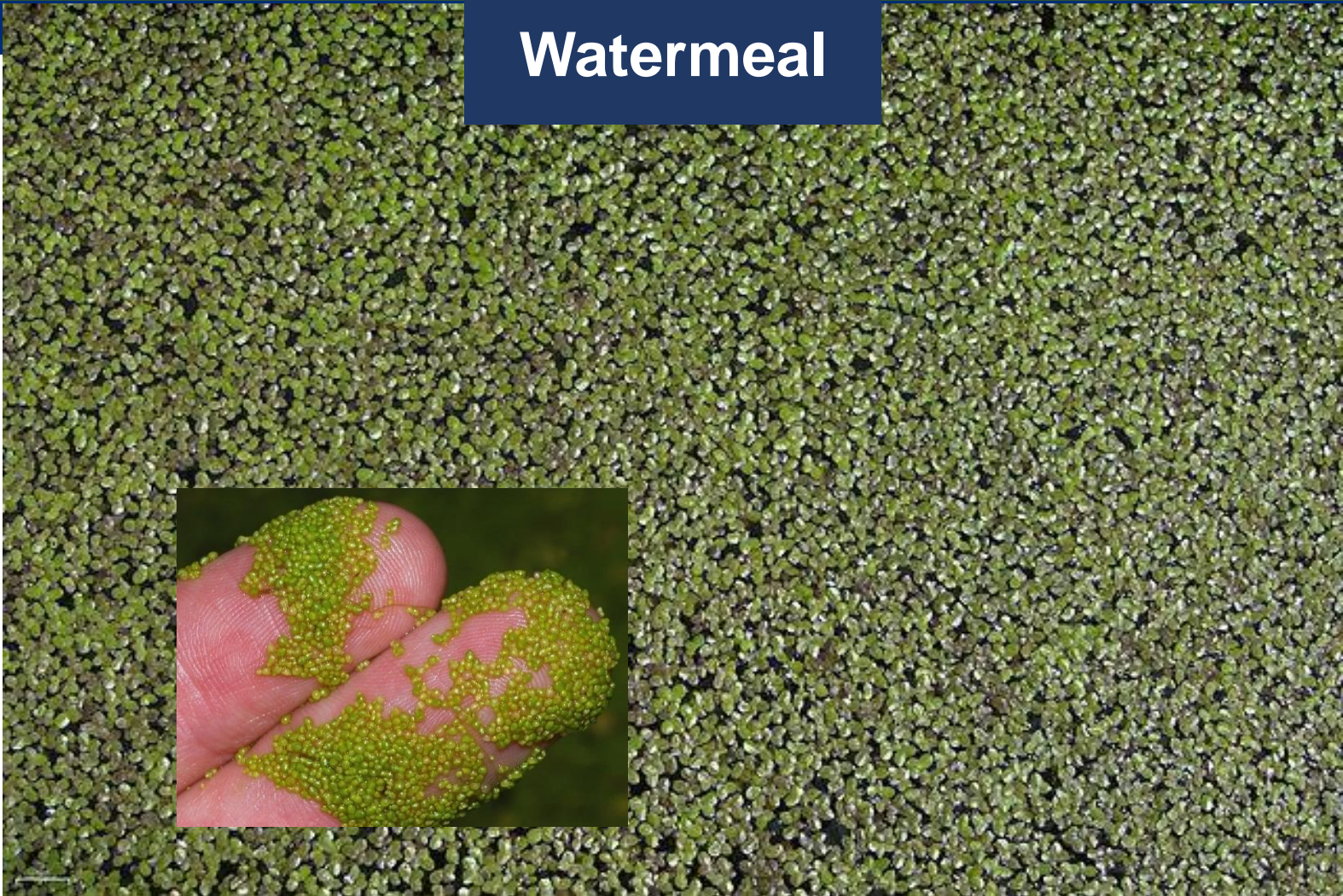


# Duckweed



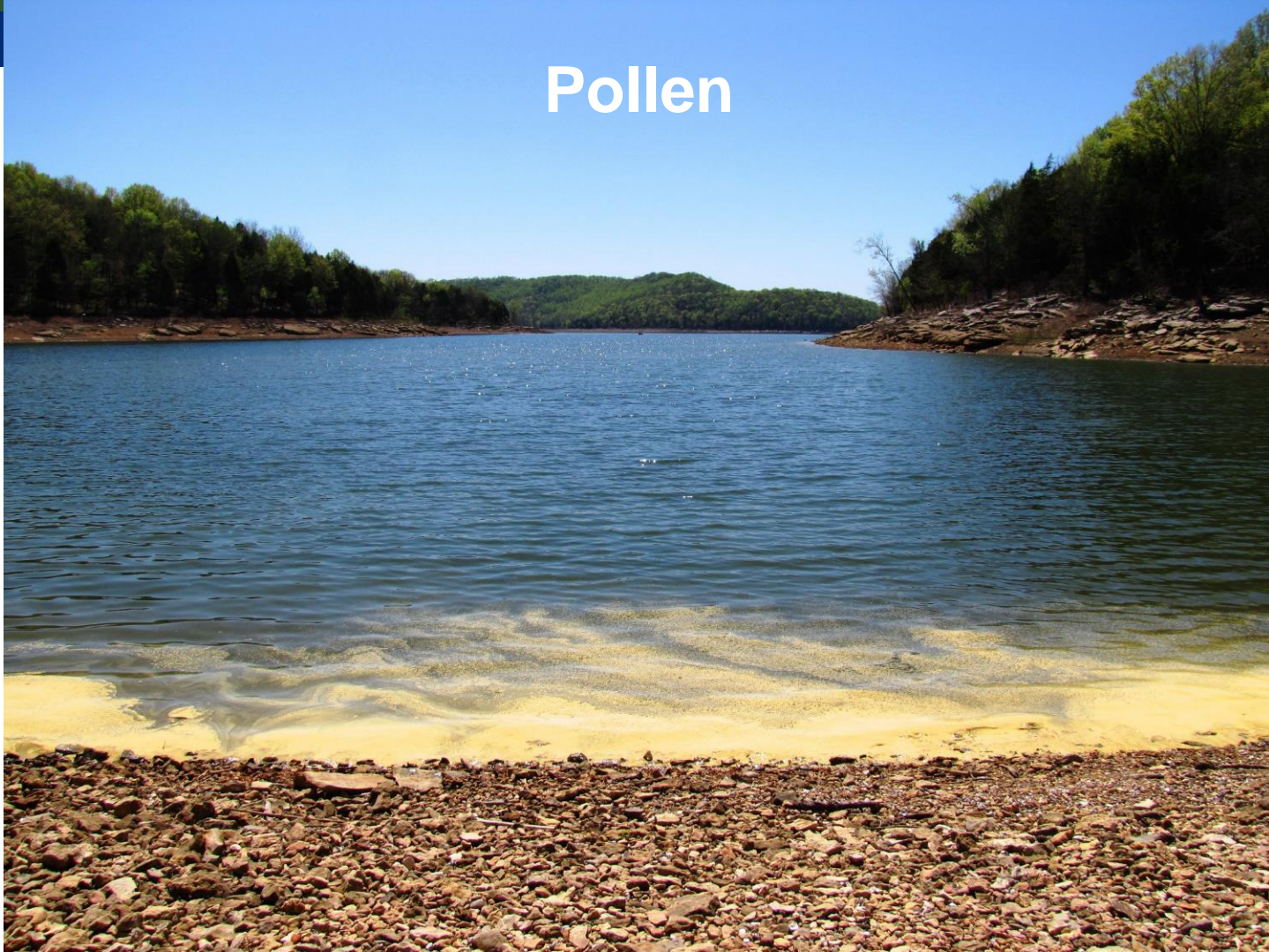


# Watermeal





# Pollen





## Pollen

- Bright yellow in color (which is not typical of HABs)
- Breaks up easily
- Most common in spring/early summer





# Whiting Event

- Lightening or whiting of water color
- Fine particles of calcium carbonate



# HABs

# Likely to be HABs

- Oily, shiny, sheeny
- Pea soup appearance
- Surface scums, foamy
- Spilled paint on the surface
- Discolored (green or blue green) streaks
- Floating clumps or globs
- Other





# Oily, shiny, sheeny



# Pea Soup, Scum, Foamy





# Paint, scum, foamy



# Paint, scum, foamy





# Surface or mixed in water column



# Surface or water column





# Accumulates on shorelines, docks or coves

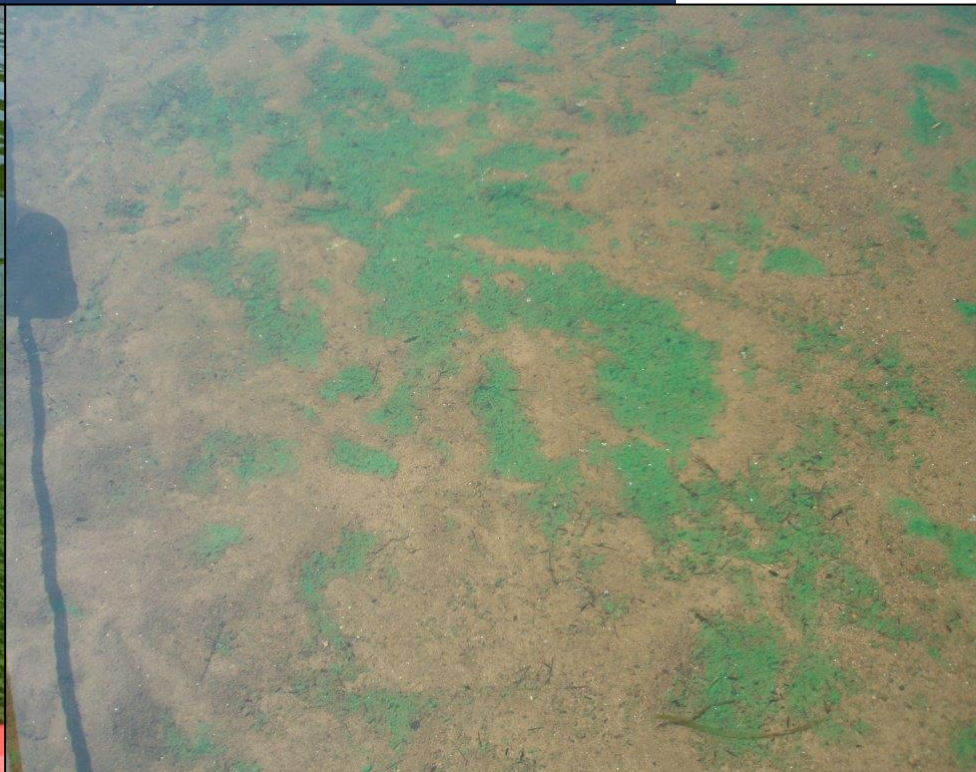


# Accumulates on shorelines, docks or coves





# Streaks, clumps, globs



# Streaks, clumps, globs





# Other



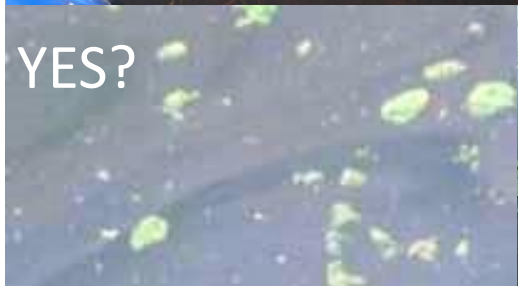
Photo Credit: Istvan Szabo



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# Test your skills



# More on how to ID HABs

Several resources available:

- DEC Reporting Guide:  
[www.dec.ny.gov/docs/water\\_pdf/habsreportingguide.pdf](http://www.dec.ny.gov/docs/water_pdf/habsreportingguide.pdf)
- DEC Harmful Algal Bloom (HAB) Identification Tips and Tricks: [https://www.youtube.com/watch?v=8nL\\_s77FV-o](https://www.youtube.com/watch?v=8nL_s77FV-o)
- HealthVermont: How to identify cyanobacteria:  
<https://www.youtube.com/watch?v=ea0EHw5suDs>



# NYS HABs Program

What do we do?

# The NYS HABs Program



- Interagency collaborative effort (DEC, OPRHP, DOH)
- Reports of HABs go to DEC or DOH
- DEC coordinates extensive monitoring; >400 lakes/year & hosts notifications on DEC map
- Health concerns & drinking water treatment overseen by local operators and DOH
- Regulated swimming areas (beaches) have a protective response protocol based on visual observations



# NYS DOH HABs Beach Closure Guidance

- Closure based on visual determinations
- Reopened after being clear of HAB for 24 hours and microcystins are  $< 4.0 \mu\text{g/L}$
- >800 beaches statewide



**BEACH CLOSED**

**Harmful Blue-green Algae Blooms**

**No Swimming or Wading**

**Contact can make people and animals sick.**

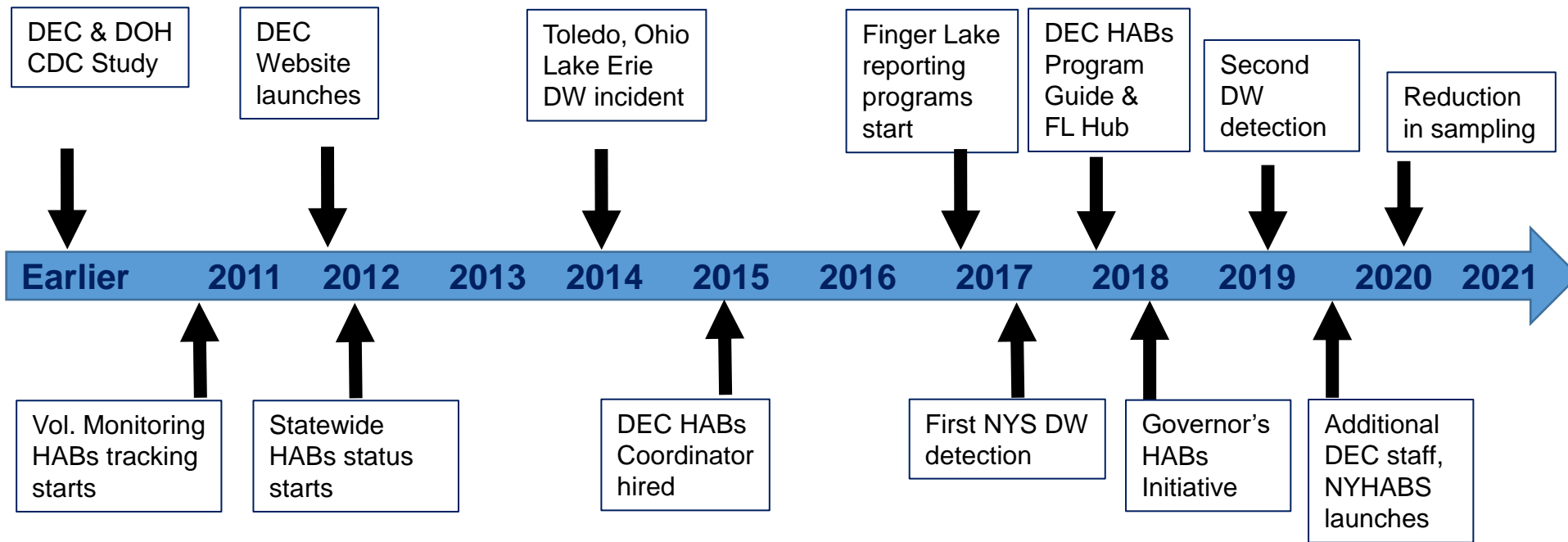
If contact occurs, rinse with clean water.  
If symptoms occur, contact a medical provider.



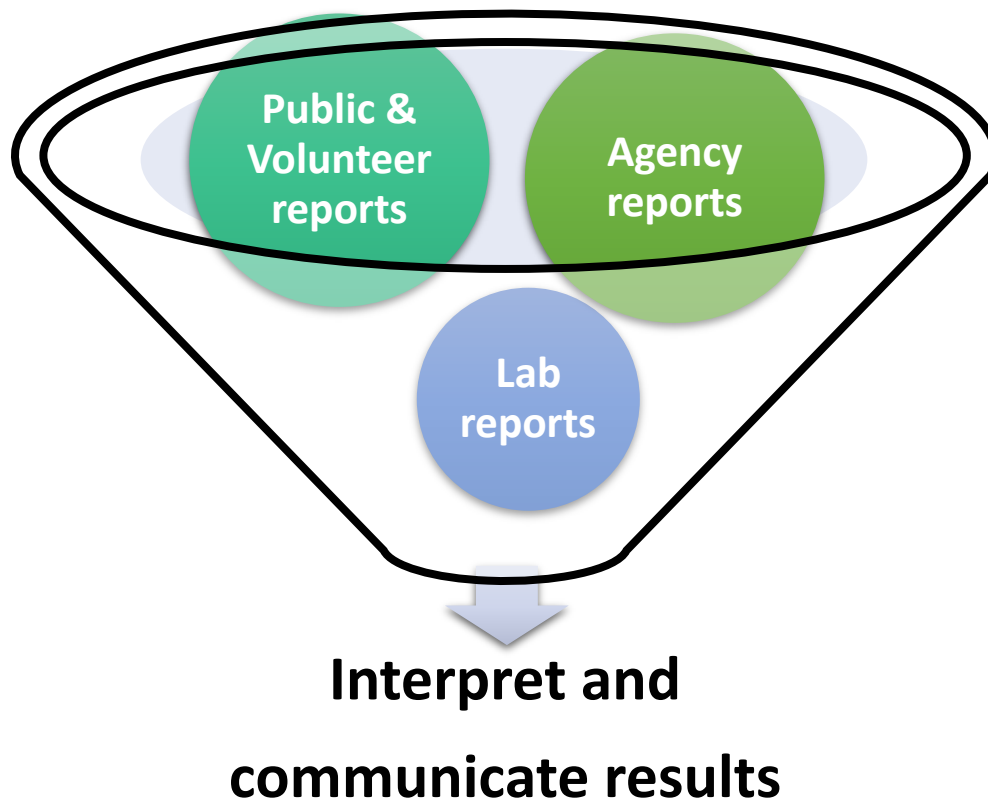
If you see blooms or scum outside the beach, don't swim, fish or boat in those areas. Keep kids and pets away.

Learn more: [www.health.ny.gov/HarmfulAlgae](http://www.health.ny.gov/HarmfulAlgae) and [on.ny.gov/hab](http://on.ny.gov/hab)

# Timeline of NYS HABs Program



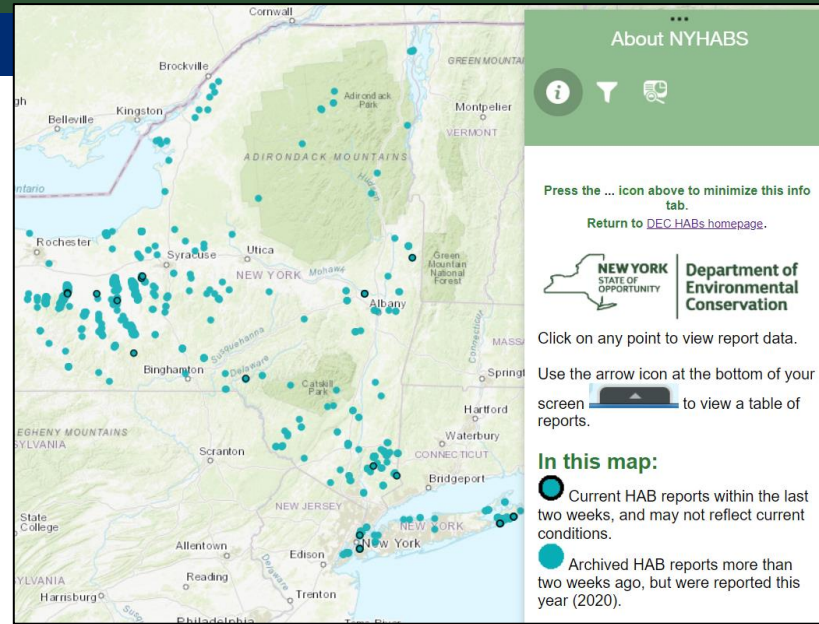
# DEC HABs Program Role



# The NY HABs System (NYHABS)

- Esri ArcGIS Online interactive map of HAB reports, updated daily\*
- Reports include status, extent, reported by, exact location, photos
- Current reports on map for 2 weeks
- After 2 weeks, reports are Archived
- User can filter by lake or county and export reports as pdf


[on.ny.gov/nyhabs](https://on.ny.gov/nyhabs)



About NYHABS


Press the ... icon above to minimize this info tab.

[Return to DEC HABs homepage.](#)



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STATE OF OPPORTUNITY

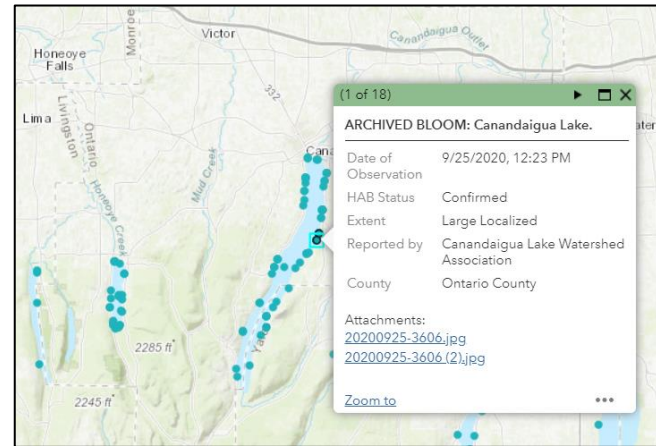
**Department of Environmental Conservation**

Click on any point to view report data.

Use the arrow icon at the bottom of your screen  to view a table of reports.

**In this map:**

-  Current HAB reports within the last two weeks, and may not reflect current conditions.
-  Archived HAB reports more than two weeks ago, but were reported this year (2020).




(1 of 18)

**ARCHIVED BLOOM: Canandaigua Lake.**

Date of Observation	9/25/2020, 12:23 PM
HAB Status	Confirmed
Extent	Large Localized
Reported by	Canandaigua Lake Watershed Association
County	Ontario County

Attachments:  
[20200925-3606.jpg](#)  
[20200925-3606 \(2\).jpg](#)

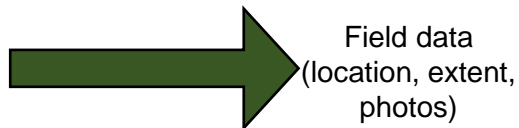
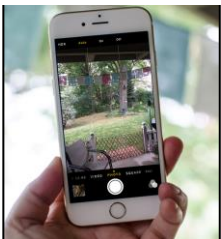
[Zoom to](#) 



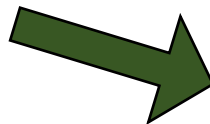
# Streamlined Reporting Tools



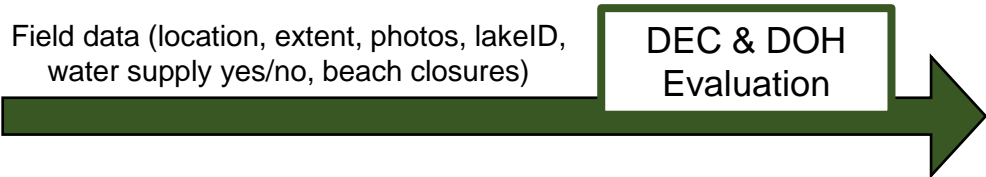
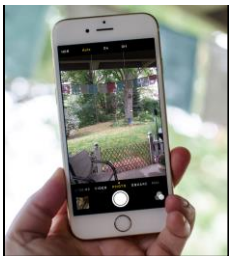
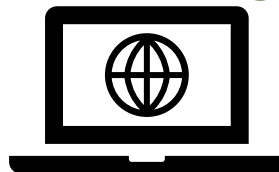
- Survey123: ESRI ArcGIS Online fillable forms
- Works on any platform (desktop, mobile, tablets)
- Fill out anywhere, but ideally in the field for exact location
- Attach photos to bloom report (required)
- Trained User HABs Form: **[on.ny.gov/habproform](https://on.ny.gov/habproform)**
- Public HABs Form: **[on.ny.gov/habform](https://on.ny.gov/habform)**



Field data  
(location, extent,  
photos)



**NYHABS**



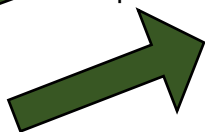
Field data (location, extent, photos, lakeID,  
water supply yes/no, beach closures)



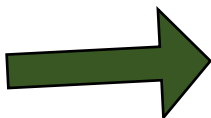
Samples



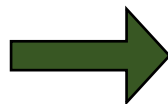
Sample ID



Lab Analysis



Results



# What can be done?



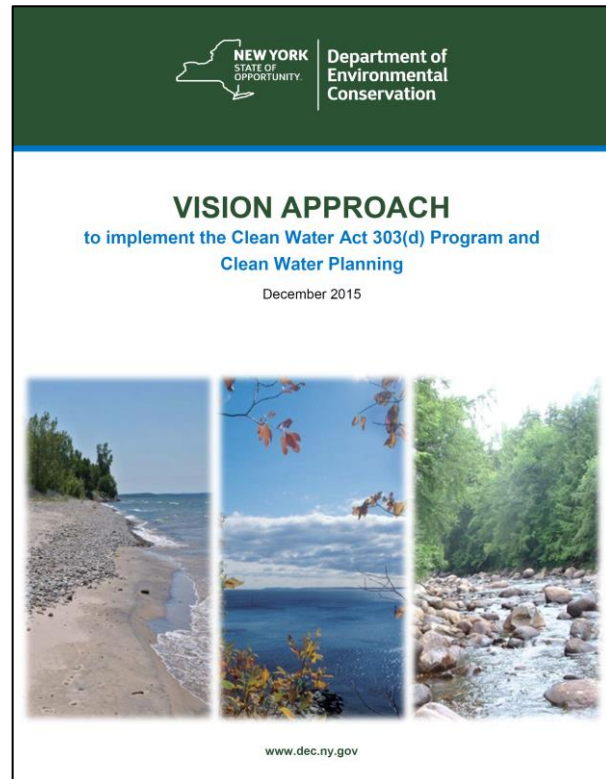
# There is no silver bullet

- DEC monitors for HABs parameters in our surface water programs
- DEC & DOH conduct outreach, provide guidance, close beaches, and post notifications on NYHABS
- Once a bloom is going, difficult to resolve, likely to return
- We can't control climate change or precipitation
- We can control water quality (nutrient inputs) & in lake processes



# Clean Water Plans

- Watershed-based approach that outlines a strategy to improve water quality
- Total Maximum Daily Load (TMDLs), 9E Plans
- These plans document the:
  - Pollutant sources and loads
  - Allowable pollutant level
  - Actions to improve water quality



# In Lake Mitigation Options

- Algaecides
- Aeration/Oxygenation
- Dredging
- Ultrasonic devices
- Nutrient Inactivants



# DOW Research Partners on HABs

Several applications and partnerships

- Academic institutions

*FLI, Syracuse, Cornell, SUNYs*

- Government agencies

*USGS, USACE, EPA*

- Private entities, lake managers and communities

*Targeted projects and/or enhanced monitoring*



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# Thank you

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DOH: [harmfulalgae@health.ny.gov](mailto:harmfulalgae@health.ny.gov)

