NYS Harmful Algae Blooms

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• Introduction to Harmful Algae Blooms
• HABs in New York State
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• Mitigation Options

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
• Best in high temps, high light, high nutrients
• Causes not fully understood
• Hard to predict
Seasonal Changes in Algae

Lakes that have higher nutrients (are eutrophic) are more likely to have HABs. However, present in low nutrient waterbodies too (Finger Lakes, Lake Placid). Climate change, mussels, development all play a role.

Common types of Cyanobacteria

- *Dolichospermum*
  - Fixes nitrogen
  - Produces anatoxin ("VFDF", nerve toxin) and others

- *Aphanizomenon*
  - Adjusts buoyancy
  - Produces microcystin (liver toxin)

- *Microcystis*

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, and more)

No visual cues that toxins are present. Sample collection is warranted.
What's Changing?

• Climate change, precipitation patterns?
• Farming practices?
• Population (human, animal) dynamics?
• Invasive species? →
• Land use changes? ↓
• Aging infrastructure? ↓

Not just NY!
**NY statewide approach to HABs**

- Collaborative effort between DEC and DOH
- Goal: Track, document, protect the public and communicate about HABs
- “Avoid contact” is our mantra
- #, duration, and intensity of blooms seems to be increasing
- Toxic blooms in large low nutrient lakes

**The DEC HABs Program**

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

**2018 NY HABs Partnerships**

- CSLAP: >150 lakes; 8x/summer
- LCI: ~100 lakes; 1-4x/summer
- Enhanced volunteer HABs monitoring: >10 lakes; weekly
- ESF and Stony Brook researchers: >20 lakes; weekly
- VT DEC, USACE, NYC Parks, NYC DEP and others: >30 lakes; variable frequency
- Regulated swimming areas; >1400 locations; daily inspection

**What is measured by the labs?**

- FluoroProbe Chlorophyll – Measures chlorophyll (total, blue green, diatoms, green algae)
- Microscopy – Quick scan, check for most common taxa
- Toxins – ELISA for Microcystins; LC-MSMS for Anatoxin-a, Cylindrospermopsin, BMAA
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

NYS Microcystin Advisory Thresholds

- <0.3 µg/L: Finished drinking water sample: Do Not Drink Advisory
- <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
- >10 µg/L: Open water ambient water; DEC Confirmed with High Toxins Bloom
- >20 µg/L: Shoreline water ambient water sample; DEC Confirmed with High Toxins Bloom

HABS in New York 2012-2018

<table>
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<tr>
<th>Year</th>
<th>Suspicious</th>
<th>Confirmed</th>
<th>High Toxins</th>
<th>Total</th>
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<td>57</td>
<td>83</td>
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<td>122</td>
<td>171</td>
<td>101</td>
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</tbody>
</table>

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)
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

High Profile Events (continued)

- Wallkill River: HABs detected over 30 miles in small river during drought conditions in 2016
- Continuing illness reported
- 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; Chautauqua 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

- “It’s complicated”
- Long Haul
- Improvement is possible
- Control both nitrogen and phosphorus
- Expand collaborative partnerships and research

HABs Advanced Monitoring Pilot

DEC and USGS piloting use of advanced monitoring platforms
- Innovative HAB sensors
- Meteorological stations
- Real-time reporting

Webpage: [https://ny.water.usgs.gov/maps/habs/](https://ny.water.usgs.gov/maps/habs/)

In Lake Treatment Options

HABs Mitigation Pilots

Evaluation of innovative HABs mitigation actions
- Nutrient inactivants
- Hydrogen peroxide
- Ultrasonic devices

Fieldwork completed
Environmental review under way

[http://aquatechnex.com](http://aquatechnex.com)
Thank You

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2018 News

• April: Environmental Lab Approval Program (ELAP) developed for Microcystin by ELISA method
• Expanded sampling in rivers and streams
• 1,397 Open water samples through CSLAP
• 1,166 shoreline HAB samples
• 1,175 Reports (visual surveillance)
• 57 New Waterbodies
• HABsiest Counties: Suffolk (24); NYC (15), Putnam(13),

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.
Funding options

Governor Cuomo has made available nearly $60 million in implementation funding this year to begin projects. Sources include:

• Water Quality Improvement Project Program
• Wastewater Infrastructure Engineering Planning Grant
• Clean Water Infrastructure Act (CWIA) Septic Program
• Green Innovation Grant Program

Mitigation Pilot - Overview

Initiated in summer 2018 on 5 waterbodies

Piloted strategies:
• Hydrogen Peroxide – 3 waterbodies
• Ultrasonic Device – 1 waterbody

Evaluated strategies:
• Nutrient Inactivants – 2 waterbodies

Mitigation Pilot – Future Outcomes

How effective were these strategies in deterring HABs or lessening their impact?

What additional work is needed to assess these and other innovative strategies?