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 produce toxins
- Diverse communities of many types of algae
Trophic Impacts

- Algae are a crucial part of lake food webs
- Blooms can disrupt them
Acronym time: HABs

**H**: Harmful

**A**: Algal (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
• Gas vacuoles (moderate buoyancy)
• Fix nitrogen
Annie, Fannie & Mike

**Anabaena**
- Fix Nitrogen
- Produces anatoxin (nerve toxin) and others

**Aphanizomenon**

**Microcystis**
- Adjust buoyancy
- Produces microcystin (liver toxin)
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.
Algae need Nutrients and Light to Thrive

- Lakes that have higher nutrients (are eutrophic) are more likely to have HABs
- However, present in low nutrient waterbodies too (Finger Lakes, Lake Placid)
- Causes & toxicity not fully understood
Three Main Toxins

**Microcystins** (liver toxin)
- Impacts liver
- Most common toxin in New York

**Anatoxins** (nerve toxin)
- Impacts nerves
- Potentially fatal to dogs

**Lipopolysaccharides** (endotoxins)
- Skin irritants and allergens
- Produced by most cyanobacteria

**Others** (Cylindrospermopsin, Saxitoxins, BMAA, etc.)
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
Toxins analysis

- Can’t be done just visually
- Expensive and time consuming
- Not standardized nationally
- In NY, mostly SUNY labs
- Sample collection is warranted
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
• Bright green (or bluegreen, white-ish, or purple)
Not just NY!
Figure 2-2. State-reported HAB Advisories by EPA Region, January 1 to August 12, 2016
The NY DEC HABs Program

Surveillance/sampling

- DEC MOUs with SUNY ESF and Stony Brook researchers for lab analysis
- Sampling mostly by trained volunteers, DEC staff
- Drinking water and beaches are the jurisdiction of DOH & Parks
The DEC HABs Program

Bloom Criteria

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

Education

• Maintain website with HABs primer, FAQs, photo gallery and more
• Publish articles in DEC publications, respond to press inquiries, lake association newsletters, etc.
• Public presentations and training workshops
The DEC HABs Program

General Outreach

• Website with weekly notifications, map, and past archive data
• Weekly *MakingWaves*, Facebook, Twitter updates
• Summary results in DEC reports
• NEW! Brochure and Program Guide

Bloom Email Outreach

• Email lists of agency and regional staff, lake association contacts
• Notifications sent with date, bloom status, photos, raw data for most blooms
• Sent as quickly as possible after receipt (sometimes there is a lag)
Interpret and communicate results

Public & CSLAP reports

Agency reports

Lab reports

DEC HABs Program Role
Credible Report

Suspicious Bloom

Collect a sample for analysis

BG Chl.a < 25 µg/L or non-cyanobacteria majority

Not a bloom

BG Chl.a > 25 µg/L and/or cyanobacteria majority; Microcystin <10 µg/L (open water) / 20 µg/L (shoreline)

Confirmed Bloom

Confirmed Bloom + Microcystin > 10 µg/L (open water) / 20 µg/L (shoreline)

Confirmed with High Toxins Bloom
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)
### HABS in New York 2012-2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Suspicious</th>
<th>Confirmed</th>
<th>High Toxins</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>20</td>
<td>29</td>
<td>9</td>
<td>58</td>
</tr>
<tr>
<td>2013</td>
<td>17</td>
<td>37</td>
<td>22</td>
<td>76</td>
</tr>
<tr>
<td>2014</td>
<td>19</td>
<td>51</td>
<td>23</td>
<td>93</td>
</tr>
<tr>
<td>2015</td>
<td>40</td>
<td>62</td>
<td>35</td>
<td>137</td>
</tr>
<tr>
<td>2016</td>
<td>41</td>
<td>95</td>
<td>38</td>
<td>174</td>
</tr>
<tr>
<td>12-16</td>
<td>75</td>
<td>133</td>
<td>77</td>
<td>285</td>
</tr>
</tbody>
</table>
Roles of Regional Staff - Vary by region

- Coordinators serve as HABs info source for the region
- Receive email notifications by county (DOW and Fisheries Mgr)
- Inform regional executive staff of blooms; prioritize response for high profile waterbodies
### Who are the regional coordinators?

<table>
<thead>
<tr>
<th>Region</th>
<th>DOW HABs Coordinators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alyssa Carroll, David Lengyel</td>
</tr>
<tr>
<td>2</td>
<td>Suzanne Rowlett</td>
</tr>
<tr>
<td>3</td>
<td>Natalie Browne</td>
</tr>
<tr>
<td>4</td>
<td>Carrie Buetow</td>
</tr>
<tr>
<td>5</td>
<td>Fred Dunlap &amp; Andy Luce</td>
</tr>
<tr>
<td>6</td>
<td>Chris Fidler &amp; Brian Boyer</td>
</tr>
<tr>
<td>7</td>
<td>Scott Cook</td>
</tr>
<tr>
<td>8</td>
<td>Pradeep Jangbari</td>
</tr>
<tr>
<td>9</td>
<td>Jim Lehnen</td>
</tr>
</tbody>
</table>
What can you do?

• Report blooms to DEC using HABsInfo@dec.ny.gov or 518-402-8179
• Sign up for MakingWaves to get updates
• Encourage lake communities to develop clean water plans
In Conclusion

• There’s a lot that we don’t know about HABs
  ▪ How to get rid of them
  ▪ How to predict them
  ▪ How much they impact human and animal health
Thank You!

• Rebecca Gorney, Ph.D.
• Division of Water, Lake Monitoring and Assessment Section
  rebecca.gorney@dec.ny.gov
• 518-402-8258
Climate Change & Blooms

The rise of harmful cyanobacteria blooms: The potential roles of eutrophication and climate change

J.M. O’Neil\textsuperscript{a,*}, T.W. Davis\textsuperscript{b}, M.A. Burford\textsuperscript{b}, C.J. Gobler\textsuperscript{c}

While the interactive effects of future eutrophication and climate change on harmful cyanobacterial blooms are complex, much of the current knowledge suggests these processes are likely to enhance the magnitude and frequency of these events.

Blooms Like It Hot

Hans W. Paerl\textsuperscript{1} and Jef Huisman\textsuperscript{2}

A link exists between global warming and the worldwide proliferation of harmful cyanobacterial blooms.
Forest Pest Update
Mark Whitmore, Dept. of Natural Resources, Cornell University
Emerald Ash Borer
Agrilus planipennis
1-Year Life Cycle

- **June/July**: Oviposition
- **Summer/Fall**: Larval growth
- **May/June**: Adult Emergence
- **Winter**: Pre-pupae
- **Early spring**: Pupation
- **Ovary maturation**: 1-Year
Woodpecker foraging
Signs & Symptoms

Canopy thinning
EAB Death Curve

EAB-Induced Ash Mortality in the Upper Huron River Watershed, SE Michigan

Exponential Increase in Ash Mortality (> 4 inch dbh)

Solid line: direct measurements
Dotted line: inferred from dendrochronology data confirming EAB-induced ash mortality from 1994 - 2004

Dan Herms, Ohio State University, 2012.
Restore Ash on Landscape

• The 3 point plan

1. Establish Biological Controls
2. Identify and incorporate resistance
3. Conserve the ash genome
Conserve ash genome

• Collect seed
  – Federal, regional, and state programs underway

• Preserve magnificent individuals
  – Systemic insecticides

• Watch for survivors!!!
When do I cut my woodlot?

• Know where EAB is
  – DEC website
  – Know signs and symptoms. Woodpecker foraging!!!

• Determine management goals
  – Forestry isn’t what you take out but what is left

• Plan ahead – hire a forester
  – Know the market – Will buyers take infested trees?
  – Will ash removal damage residual trees?
  – Line up a logger
Homeowners

• **Insecticides work**
  – Emamectin benzoate injections recommended
  – Much less costly to remove a live tree

• **Know where EAB is**
  – Plan to treat trees when symptomatic trees are 5 miles away

• **Plan ahead – line up your contractor**
  – Arborists will be busy, might need months lead time
What we can do to save New York’s Hemlocks from the Hemlock Woolly Adelgid

Mark Whitmore
Dept. of Natural Resources
Cornell University
mcw42@cornell.edu