



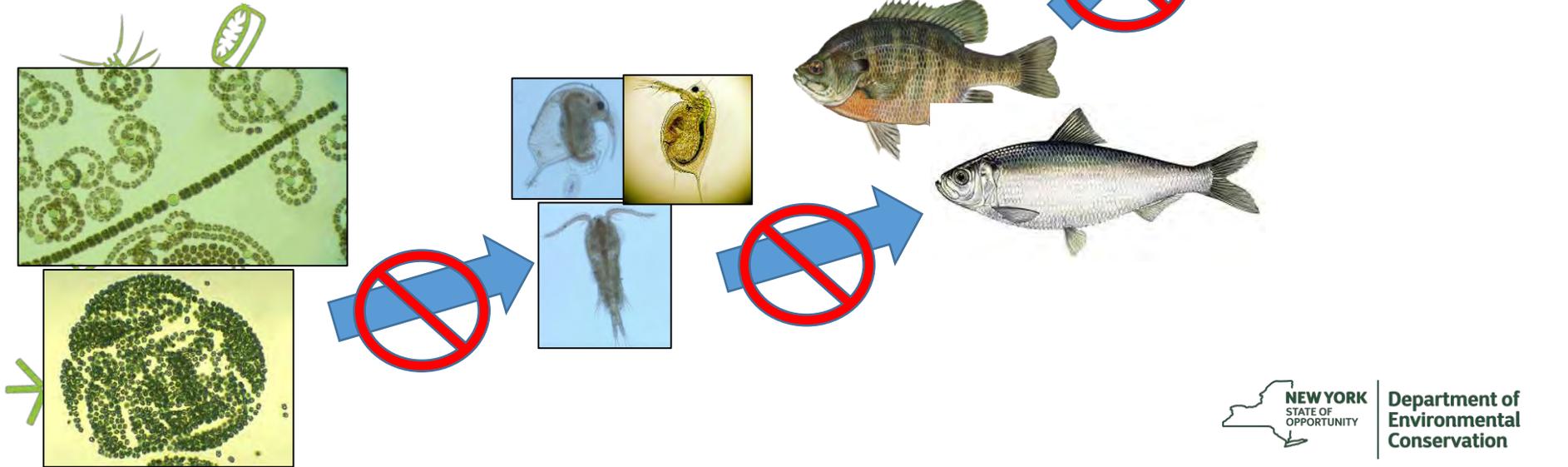
# Normally, NOT HARMFUL



- 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)



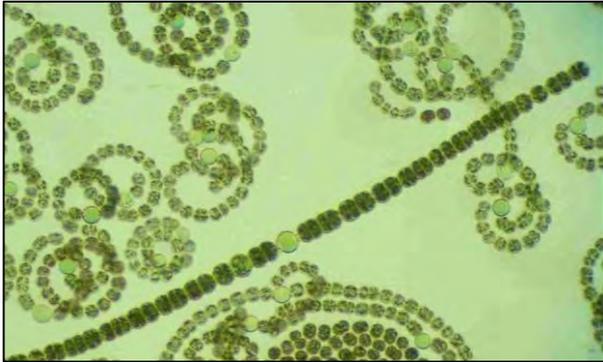
# Cyanobacteria – Blue-green Algae – HABs

- 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*

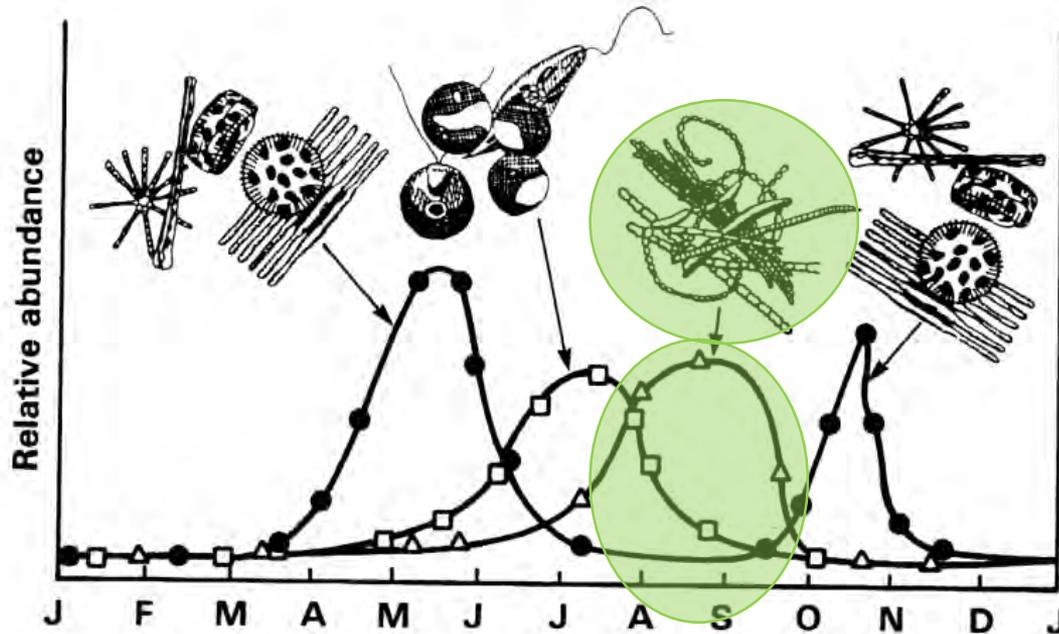


*Microcystis*



- 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

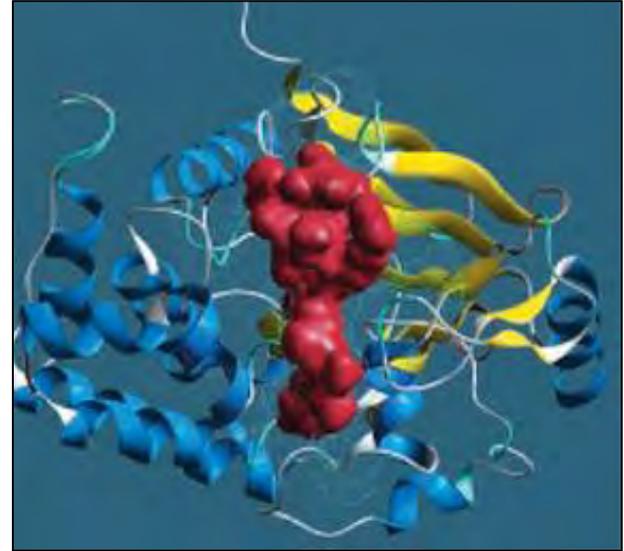
## Anatoxins (nerve toxin)

- Impacts nerves
- Potentially fatal to dogs

## Lipopolysacharides (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

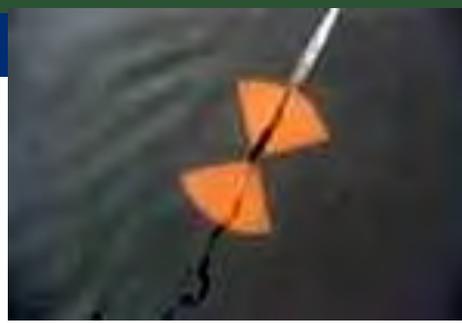
- Can't be done just visually
- Expensive and time consuming
- Not standardized nationally
- In NY, mostly SUNY labs
- Sample collection is warranted



# 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)



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# Not just NY!



Tai Hu, China



Lake Mead, AZ

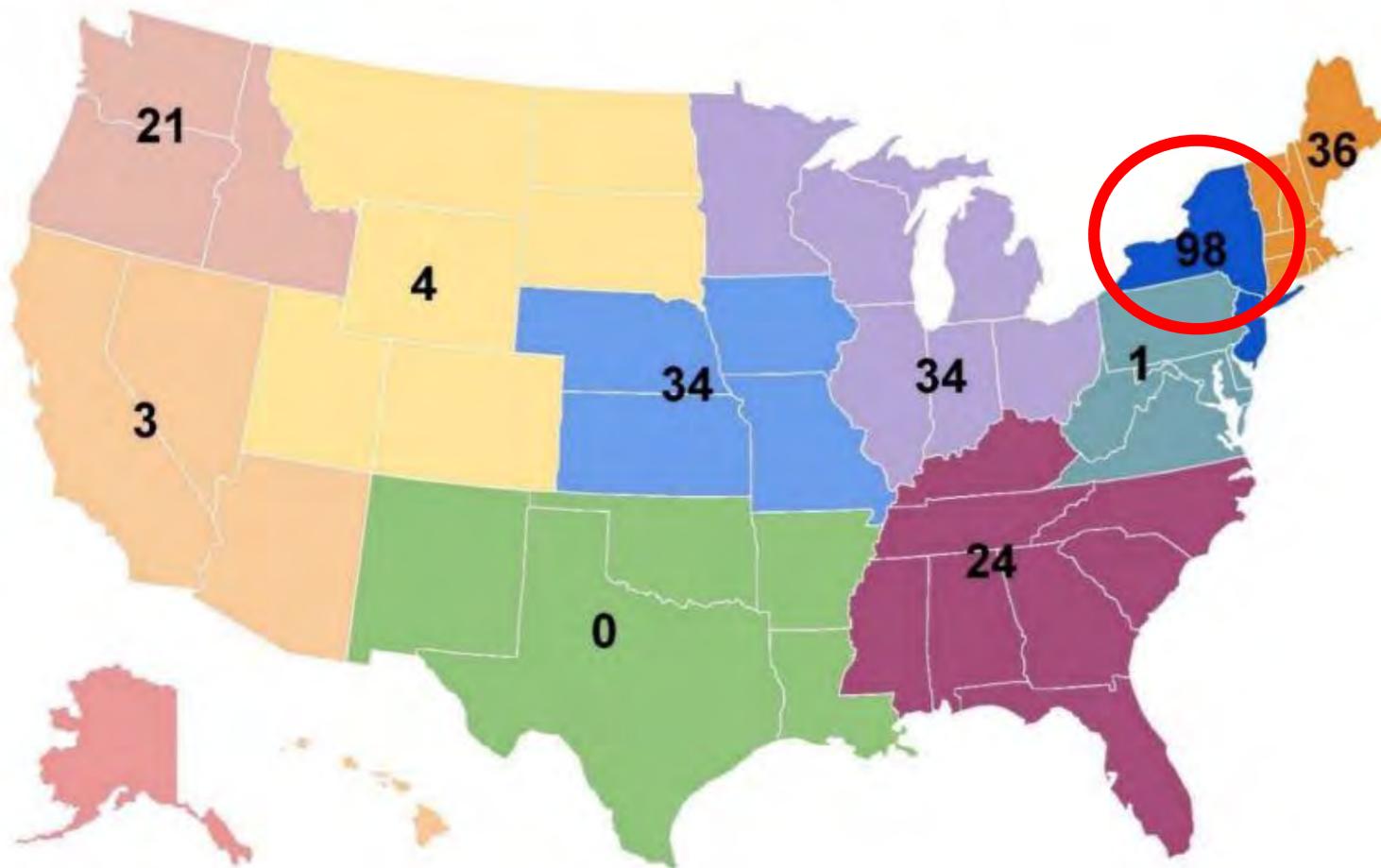
Hoover Dam



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**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

## Diet for a Small Lake



Prepared by the New York State Federation of Lake Associations, Inc.  
in cooperation with the New York State Department of Environmental Conservation



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## HARMFUL ALGAL BLOOMS (HABS) PROGRAM GUIDE



# The DEC HABs Program

## General Outreach

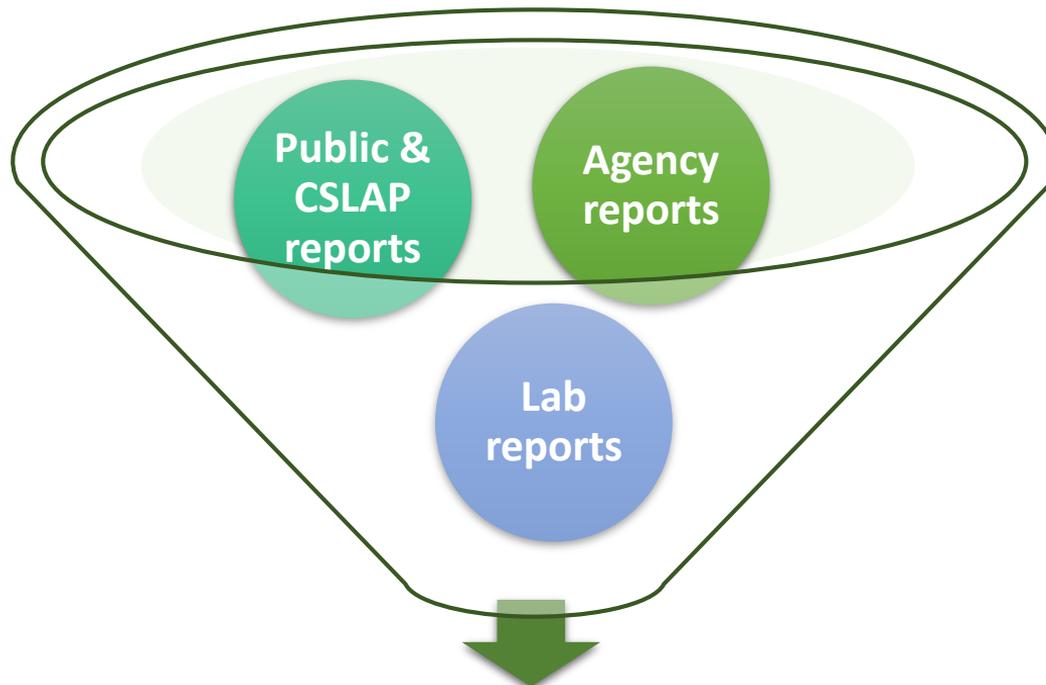
- Website with weekly notifications, map, and past archive data
- Weekly *MakingWaves*, Facebook, Twitter updates
- Summary results in DEC reports
- **NEW!** Brochure and Program Guide

## Bloom Email Outreach

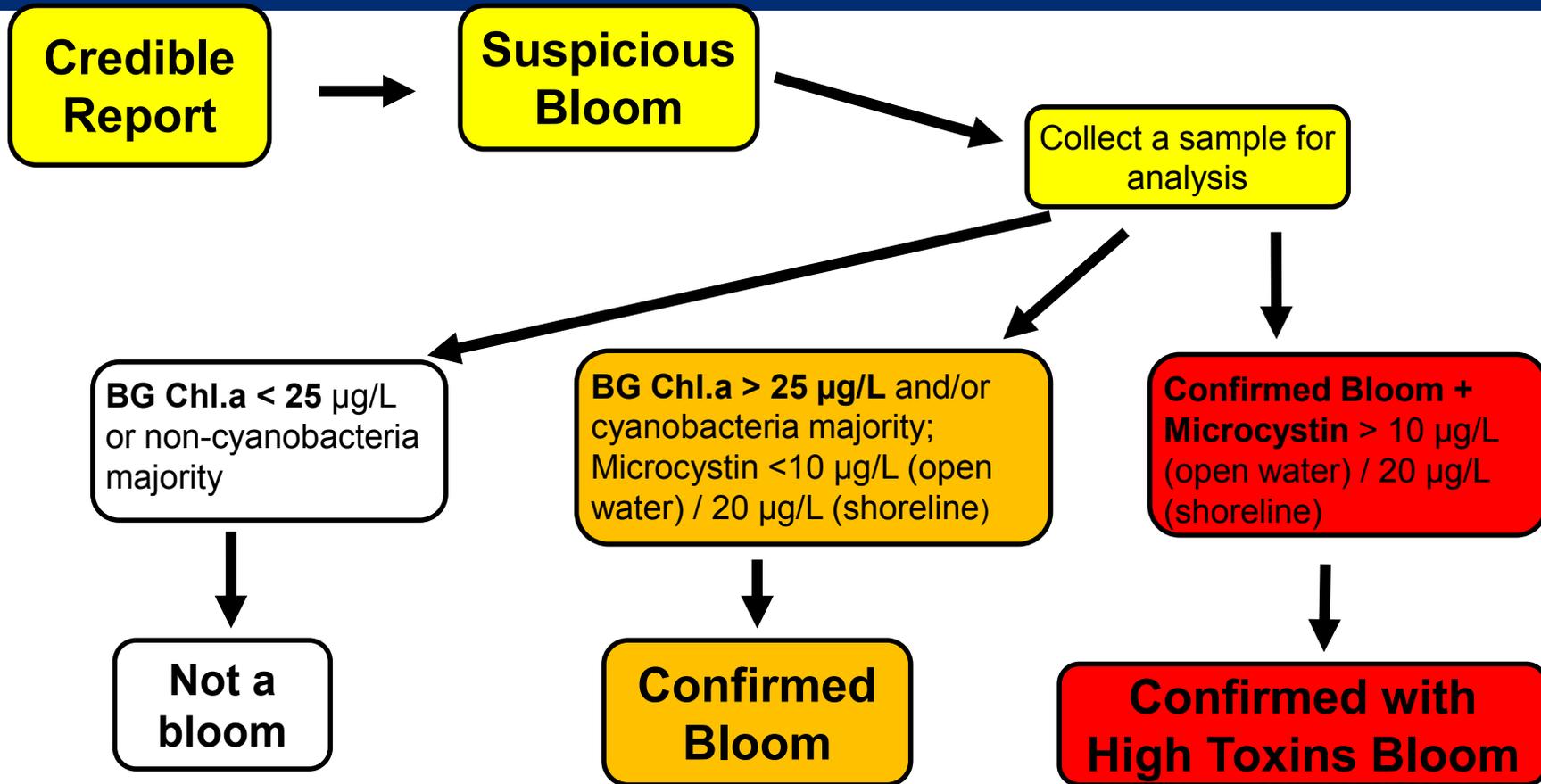
- Email lists of agency and regional staff, lake association contacts
- Notifications sent with date, bloom status, photos, raw data for most blooms
- Sent as quickly as possible after receipt (sometimes there is a lag)



# DEC HABs Program Role



**Interpret and  
communicate results**

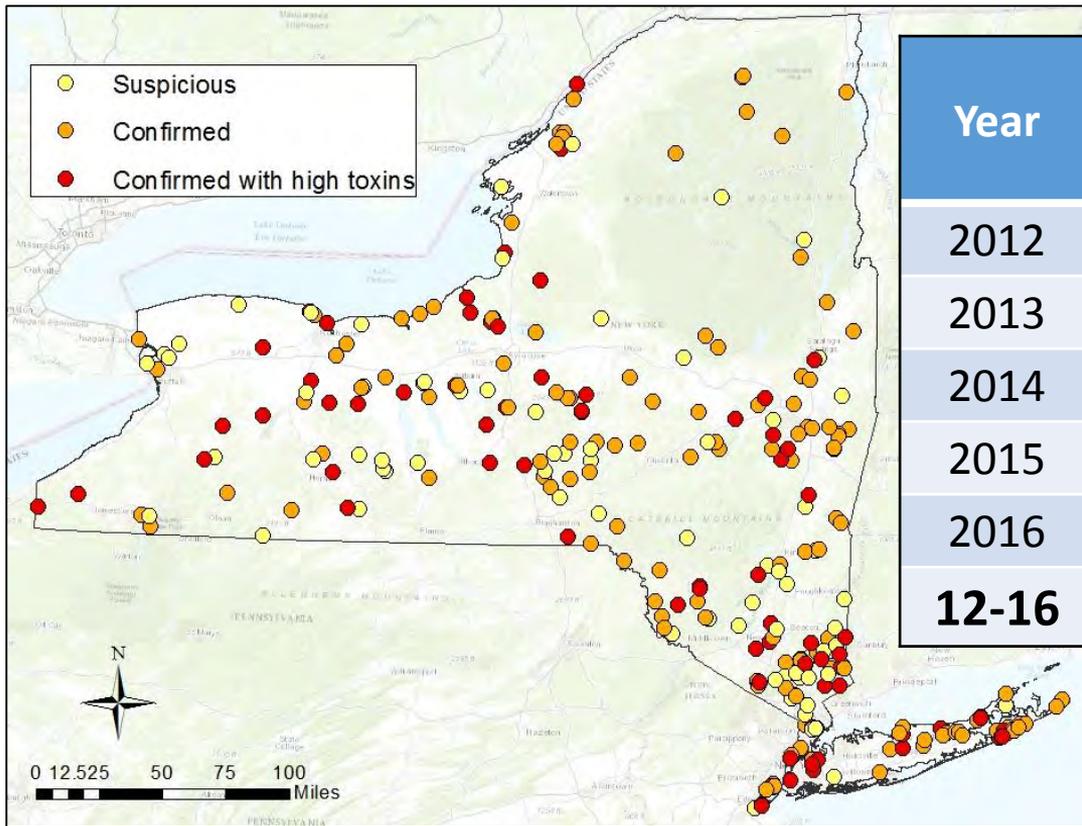


## ***For all blooms.....***

- **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



| 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        |
| <b>12-16</b> | <b>75</b>  | <b>133</b> | <b>77</b>   | <b>285</b> |

# 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?

| <b>Region</b> | <b>DOW HABs Coordinators</b>  |
|---------------|-------------------------------|
| <b>1</b>      | Alyssa Carroll, David Lengyel |
| <b>2</b>      | Suzanne Rowlett               |
| <b>3</b>      | Natalie Browne                |
| <b>4</b>      | Carrie Buetow                 |
| <b>5</b>      | Fred Dunlap & Andy Luce       |
| <b>6</b>      | Chris Fidler & Brian Boyer    |
| <b>7</b>      | Scott Cook                    |
| <b>8</b>      | Pradeep Jangbari              |
| <b>9</b>      | Jim Lehnen                    |



## What can you do?



- Report blooms to DEC using [HABsInfo@dec.ny.gov](mailto: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 <sup>a,\*</sup>, T.W. Davis <sup>b</sup>, M.A. Burford <sup>b</sup>, C.J. Gobler <sup>c</sup>

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<sup>1</sup> and Jef Huisman<sup>2</sup>

A link exists between global warming and the worldwide proliferation of harmful cyanobacterial blooms.



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# Forest Pest Update

Mark Whitmore, Dept. of Natural Resources, Cornell University



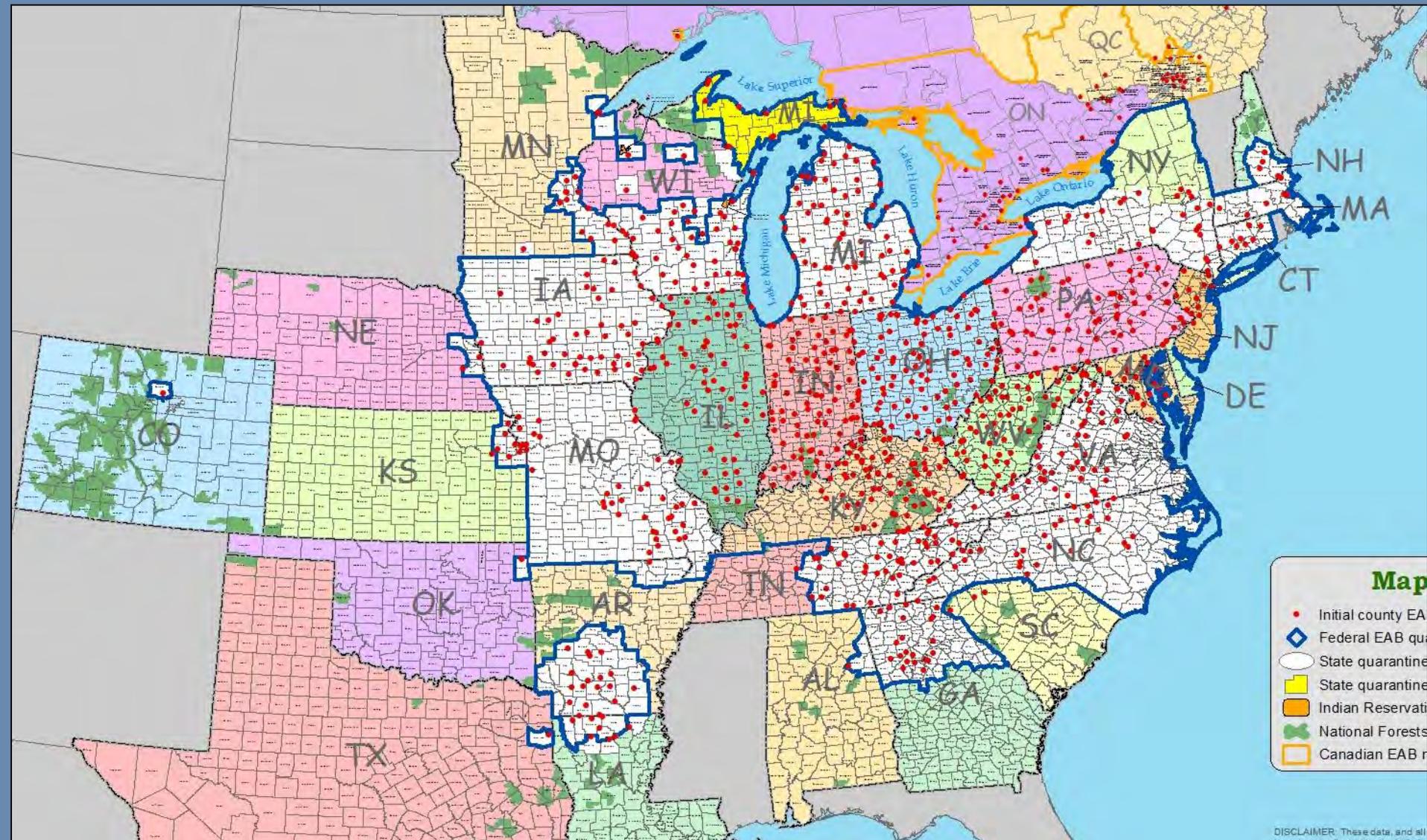
Cornell University



A close-up photograph of a tree trunk showing extensive damage from Emerald Ash Borer. The bark is heavily textured with numerous small, irregular holes and deep, winding tunnels. The color of the bark is a mix of light tan, brown, and grey, indicating the progression of the infestation. The text is overlaid in the center of the image.

**Emerald Ash Borer**  
*Agrilus planipennis*

# September 2017





June/July  
Oviposition



Summer/Fall  
Larval growth



May/June  
Adult Emergence  
Ovary maturation

# 1-Year Life Cycle

Winter  
Pre-pupae



Early spring  
Pupation



# Woodpecker foraging







# Signs & Symptoms

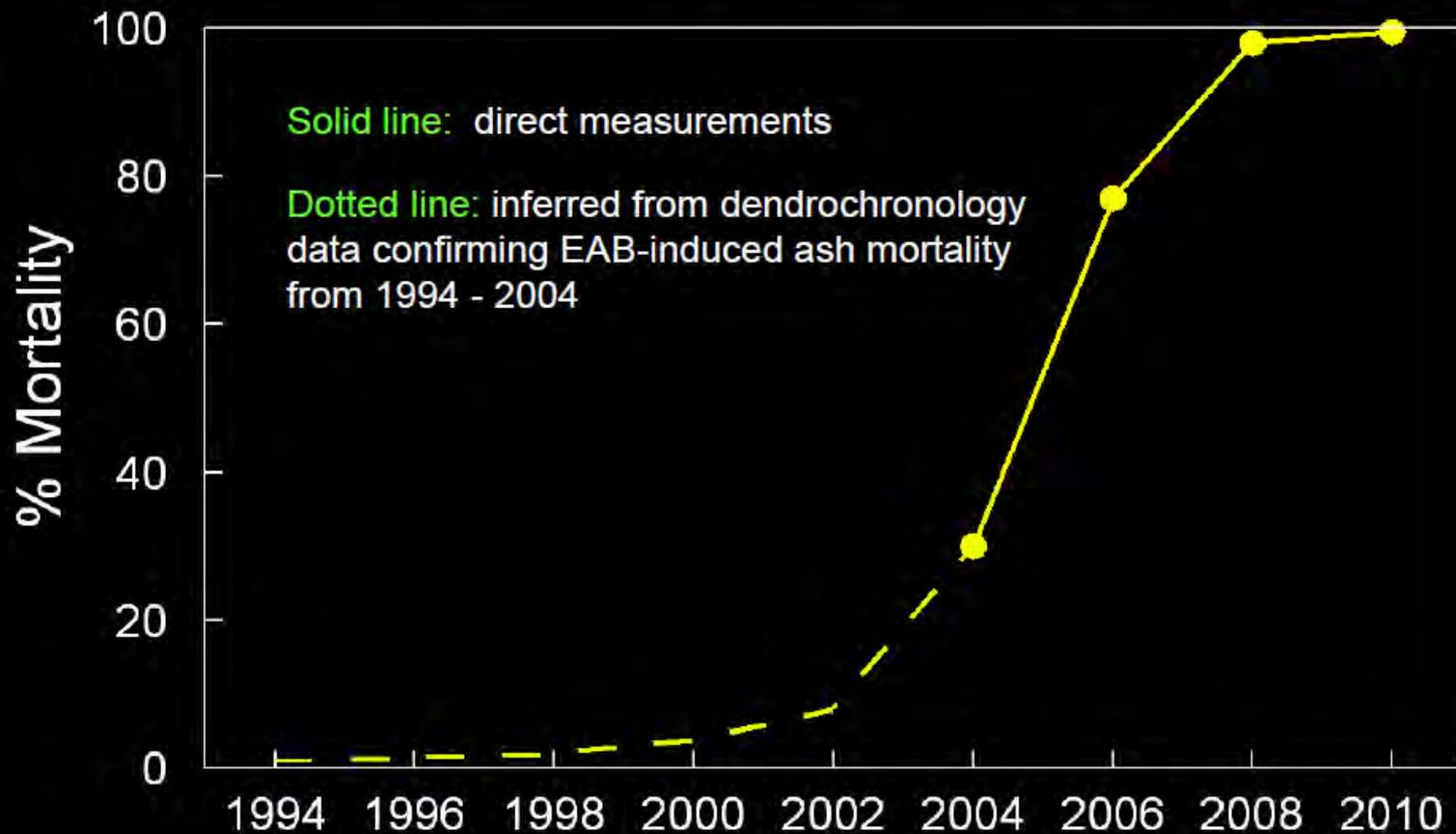
Canopy  
thinning

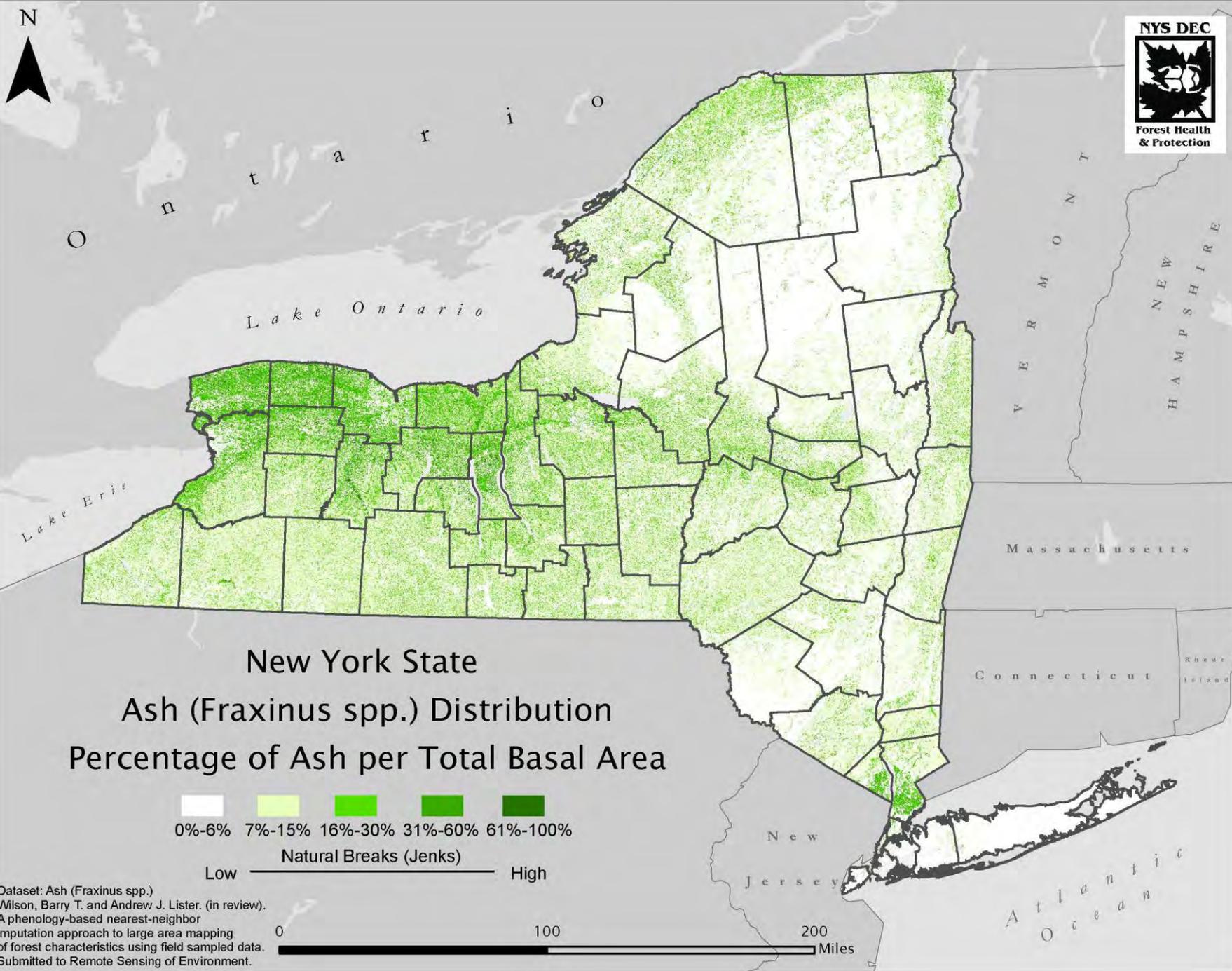


# EAB Death Curve

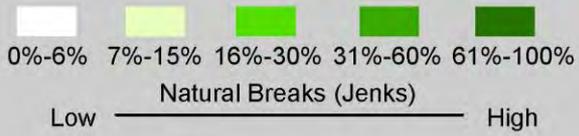
## EAB-Induced Ash Mortality in the Upper Huron River Watershed, SE Michigan

Exponential Increase in Ash Mortality (> 4 inch dbh)

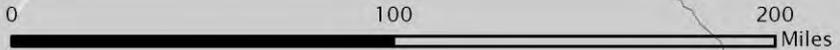




# New York State Ash (*Fraxinus* spp.) Distribution Percentage of Ash per Total Basal Area



Dataset: Ash (*Fraxinus* spp.)  
 Wilson, Barry T. and Andrew J. Lister. (in review).  
 A phenology-based nearest-neighbor  
 imputation approach to large area mapping  
 of forest characteristics using field sampled data.  
 Submitted to Remote Sensing of Environment.

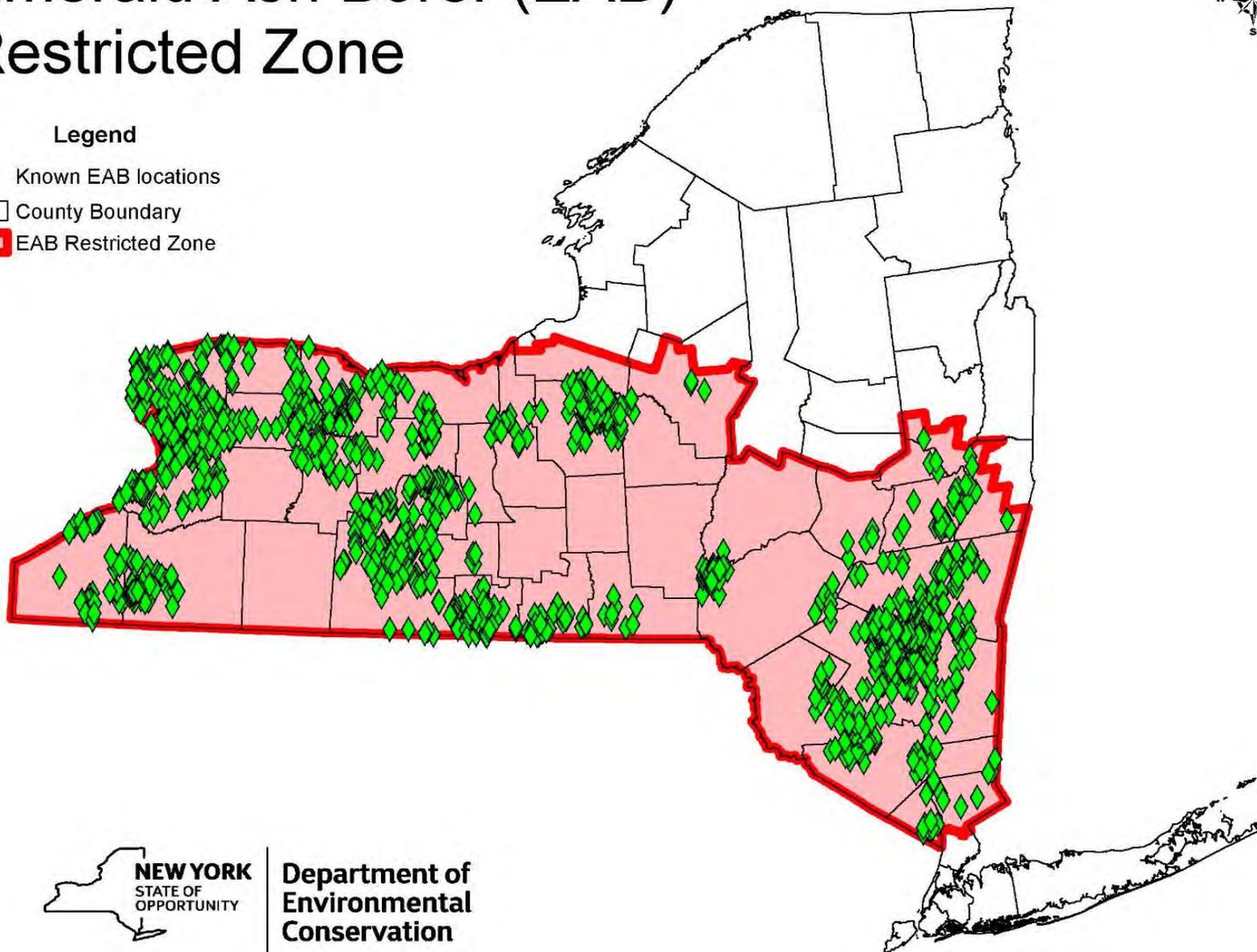


# Emerald Ash Borer (EAB) Restricted Zone



## Legend

-  Known EAB locations
-  County Boundary
-  EAB Restricted Zone



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Created May 2017

Bureau of Invasive Species & Ecosystem Health

# 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](mailto:mcw42@cornell.edu)



Cornell University





Photo  
Mike  
Belleme