

Welcome!

All the small Things . . .

with **BIG** Environmental Impacts

*We will begin at 6:30pm*

# Consent To Take Part in Research Study

## **Why is this study being done?**

This study is being done to understand and evaluate the effectiveness of an educational webinar series.

## **Why have I been asked to take part in this study?**

You are being asked to take part in this study in order to understand and evaluate the effectiveness of the Rutgers Earth Day at Home educational webinar series.

## **What will I be asked to do if I take part in this study?**

You will be asked to answer questions about the quality of the webinar, what you learned from the webinar, and what actions you expect to take at home based on the practices discussed during the webinar.

## **How will information about me be kept private or confidential?**

All efforts will be made to keep your personal information in your research record confidential, but total confidentiality cannot be guaranteed. The data will be collected and stored electronically and only the principal investigator and co-principal investigators will have the password.

## **What will happen to my information collected for this research after the study is over?**

The information collected about you for this research will not be used by or distributed to investigators for other research.

## **What will happen if I do not wish to take part in the study or if I later decide not to stay in the study?**

It is your choice whether to take part in the research. You may choose to take part, not to take part or you may change your mind and withdraw from the study at any time.

If you do not want to enter the study or decide to stop taking part, your relationship with the study staff will not change, and you may do so without penalty and without loss of benefits to which you are otherwise entitled. You may also withdraw your consent for the use of data already collected about you, but you must do this in writing to Amy Rowe at [rowe@njaes.rutgers.edu](mailto:rowe@njaes.rutgers.edu)

**Who can I contact if I have questions?** Amy Rowe, Agriculture and Natural Resources, 908-235-1168, [rowe@njaes.rutgers.edu](mailto:rowe@njaes.rutgers.edu)

If you have questions about your rights as a research subject, you can contact the Rutgers IRB Director at: Arts and Sciences IRB, 335 George St., Liberty Plaza Ste. 3200, New Brunswick, NJ 08901 (732) 235-2866 or the Rutgers Human Subjects Protection Program at (973) 972-1149, email us at [humansubjects@ored.rutgers.edu](mailto:humansubjects@ored.rutgers.edu) or write us at 65 Bergen St., Suite 507, Newark, NJ 07107.



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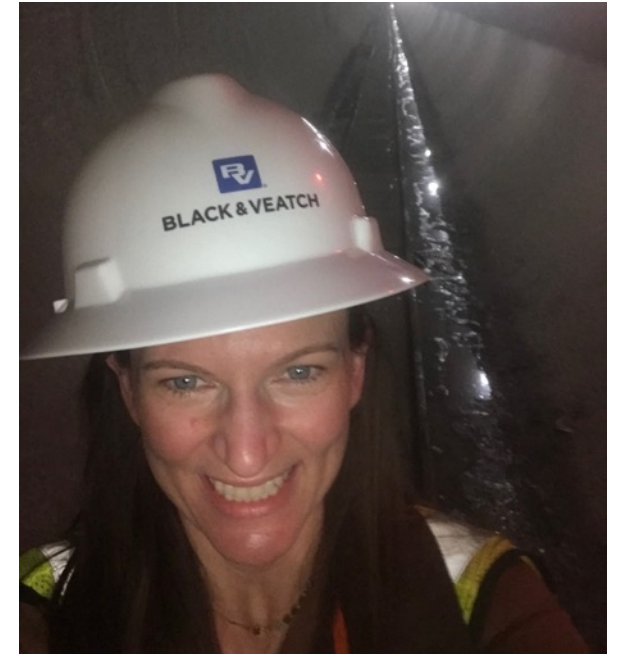
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**COOPERATIVE EXTENSION**  
*College of Agriculture, Forestry and Life Sciences*

# **HARMFUL ALGAL BLOOMS:** WHAT THEY ARE AND WHAT TO DO ABOUT THEM

Heather Bergerud Nix  
Upstate Regional Water Resources Agent



# Harmful Algal Blooms are fairly common

## NJ DEP: Stay out of Millstone River because of harmful algae blooms

**Mike Deak** MyCentralJersey.com

Published 5:15 a.m. ET Aug. 2, 2022



Lake Hopatcong, normally buzzing with swimmers and water skiers, is filled with blooms of cyanobacteria, fueled by heavy rains and hot, sunny days. Rick Loomis for The New York Times

Aug. 5, 2019

## Algae Bloom Fouls N.J.'s Largest Lake, Indicating Broader Crisis



By **Anne Barnard**



**ADVISORY**  
MODERATE HEALTH RISK  
**HARMFUL ALGAL BLOOM (HAB)**  
FLORACIONES DE ALGAS NOCIVAS

Always keep children and pets away from areas with blooms or scums.

OK  
Use Caution  
Advise Against



**TOXIC ALGAE BLOOMS RETURN TO NEW JERSEY LAKES**

Eric Scott | Published: July 21, 2022

**NEW JERSEY 101.5**

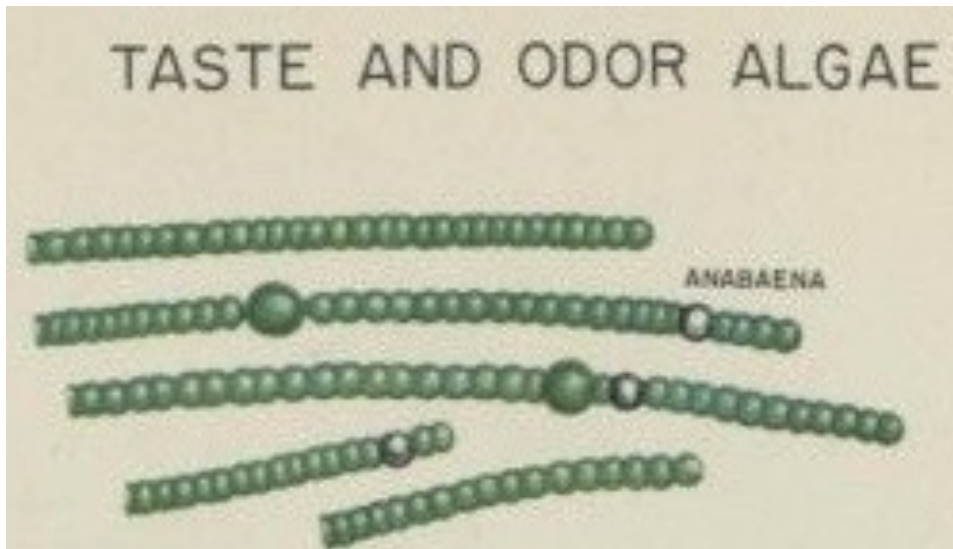
Kevin Biallas, NJDEP/Townsquare Media Illustration

- Physical use



Saluda Reedy Watershed Consortium

- Physical use
- Taste & Odor



Humans can detect extremely low levels of algae-produced compounds in drinking water

Geosmin  
2 to 10  
parts per **trillion**

## DEEP-DIVE

### When will the dirty water end?

For weeks, some residents' water has tasted and smelled of dirt. When will this issue end?



Author: Emily Correll (WLTX)  
Published: 12:37 PM EDT September 17, 2019  
Updated: 7:42 PM EDT September 17, 2019



- Physical use
- Taste & Odor
- Toxicity

BY JOHN MARKS

OCTOBER 07, 2021 12:56 PM

## The Herald



**An advisory on Lake Wylie warns to keep clear of detected toxins. Here's where.**





# CAUTION

## TOXIC ALGAE MAY BE PRESENT

Water may be unsafe for people and pets

### If blue-green algae is present:



**DO NOT** swim or recreate in areas with blue-green algae

**DO NOT** drink water

Keep all pets, livestock, and horses away from blue-green algae

Clean fish well and discard guts

Avoid areas with blue-green algae when boating



Call your doctor or veterinarian immediately if you or your animals have sudden or unexplained sickness or signs of poisoning

Report new algae blooms to: [hab.mt.gov](http://hab.mt.gov) or 1-888-849-2938

Sign posted by:

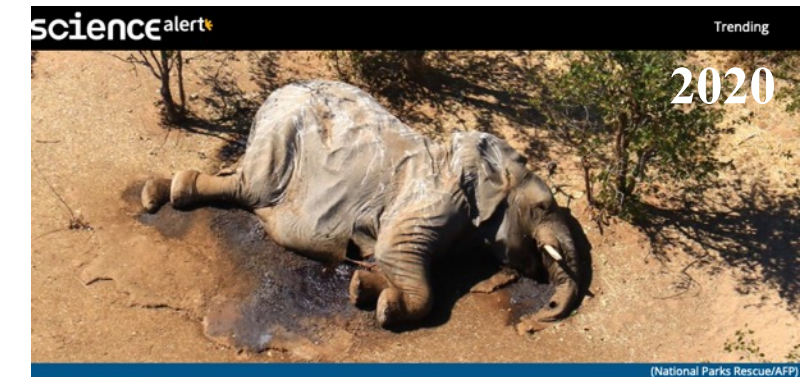
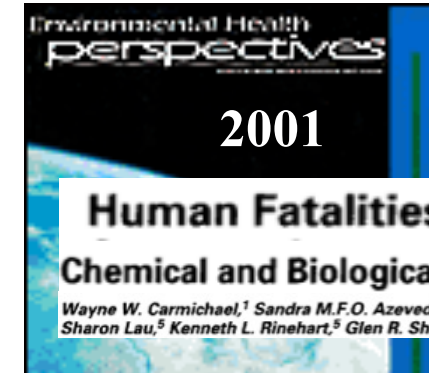


## Dog-Killing Blue-Green Algae Spreads Across U.S. Lakes, Ponds

August 27, 2019 By Robin Young and Serena McMahon



Melissa Martin's three dogs — Abby, Izzy and Harpo — all died earlier this month from toxic blue-green algae. Pictured are West Highland white terriers Abby and Izzy. (Courtesy of Melissa Martin)

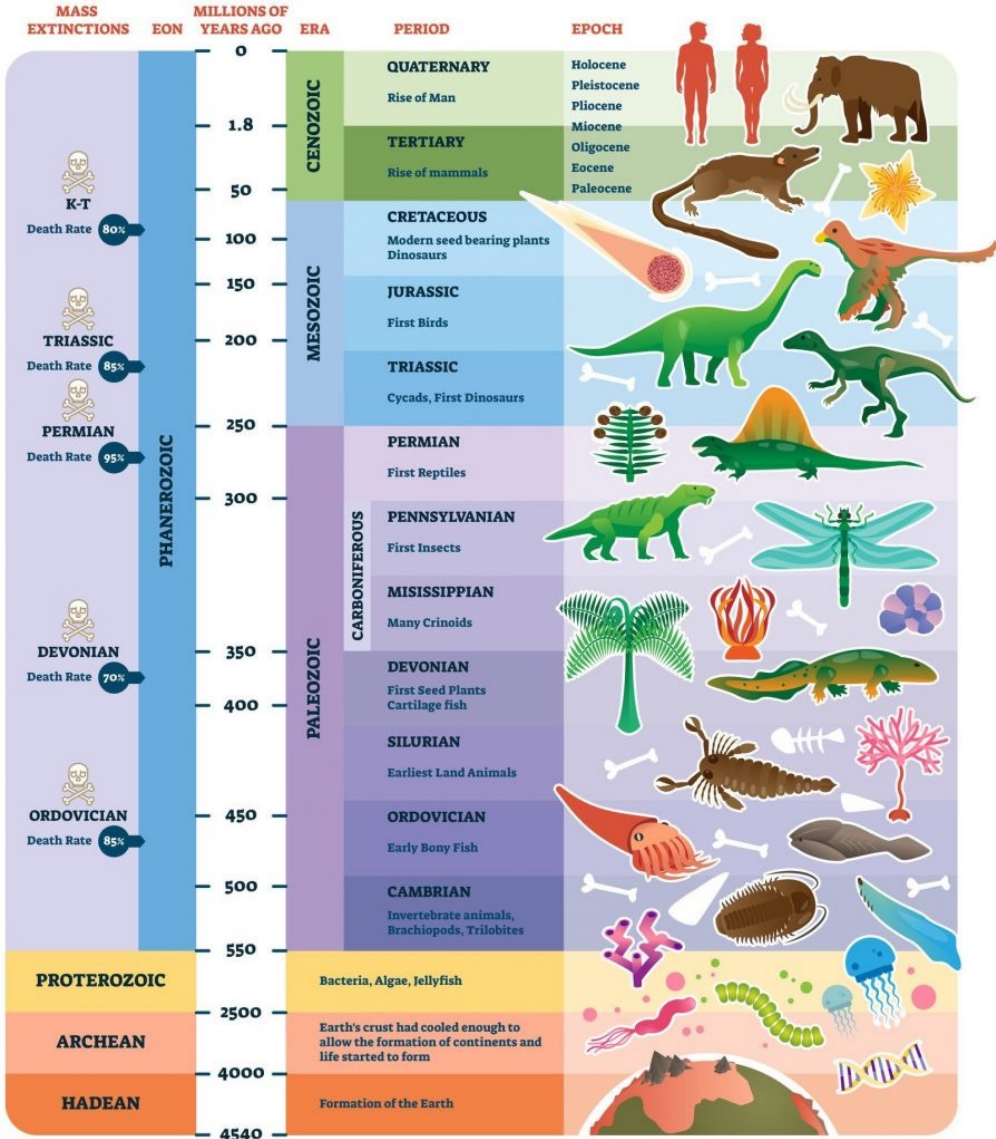


NATURE

## Mysterious Mass Elephant Die-Off in Botswana Was Caused by Cyanobacteria Poisoning

AFP 22 SEPTEMBER 2020

# Cyanobacteria formed 3.5 billion years ago

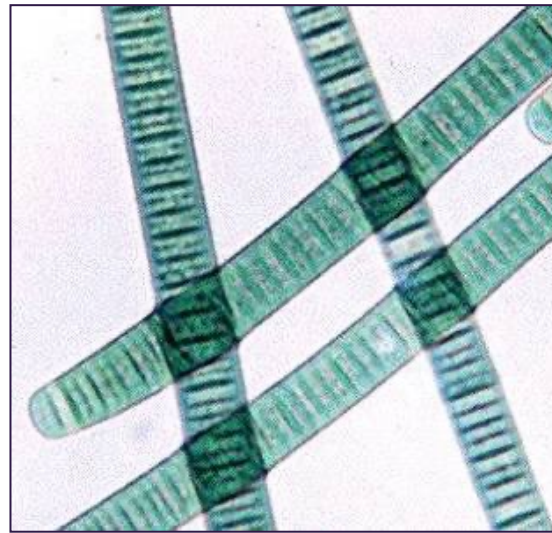


# There are many types of cyanobacteria

*Cylindrospermopsis*



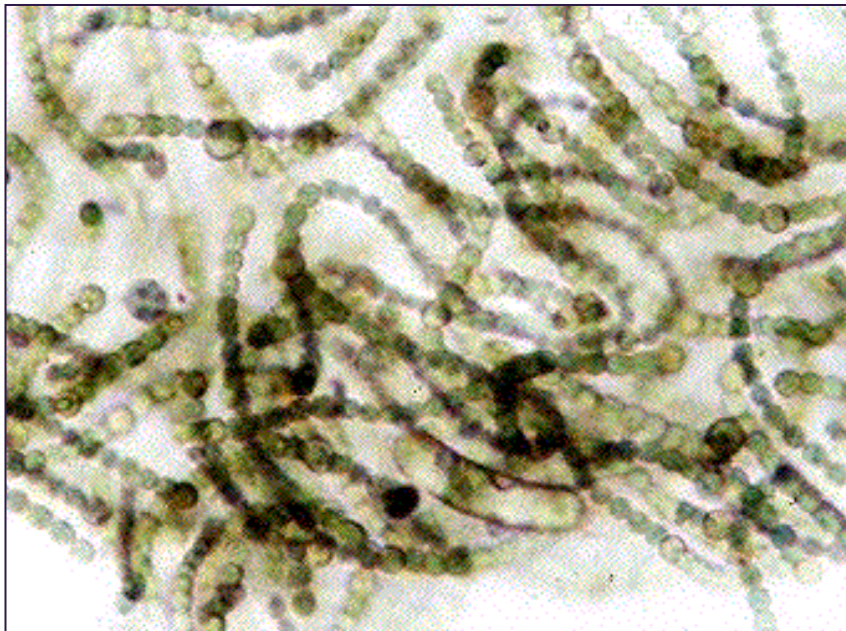
*Oscillatoria*



*Dolichospermum*



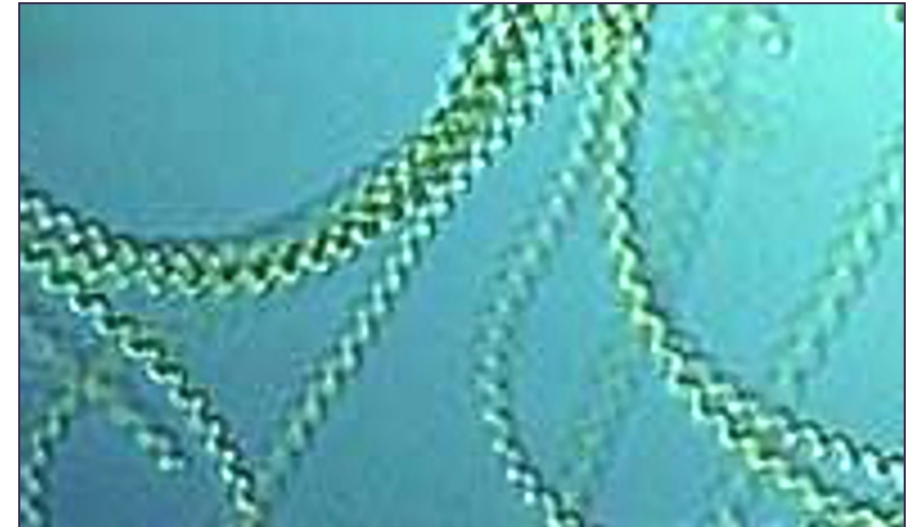
*Nostoc*



*Gymnodinium*



*Spirulina*



# Main factors that drive HABs



**Nutrients**  
(phosphorus and nitrogen)

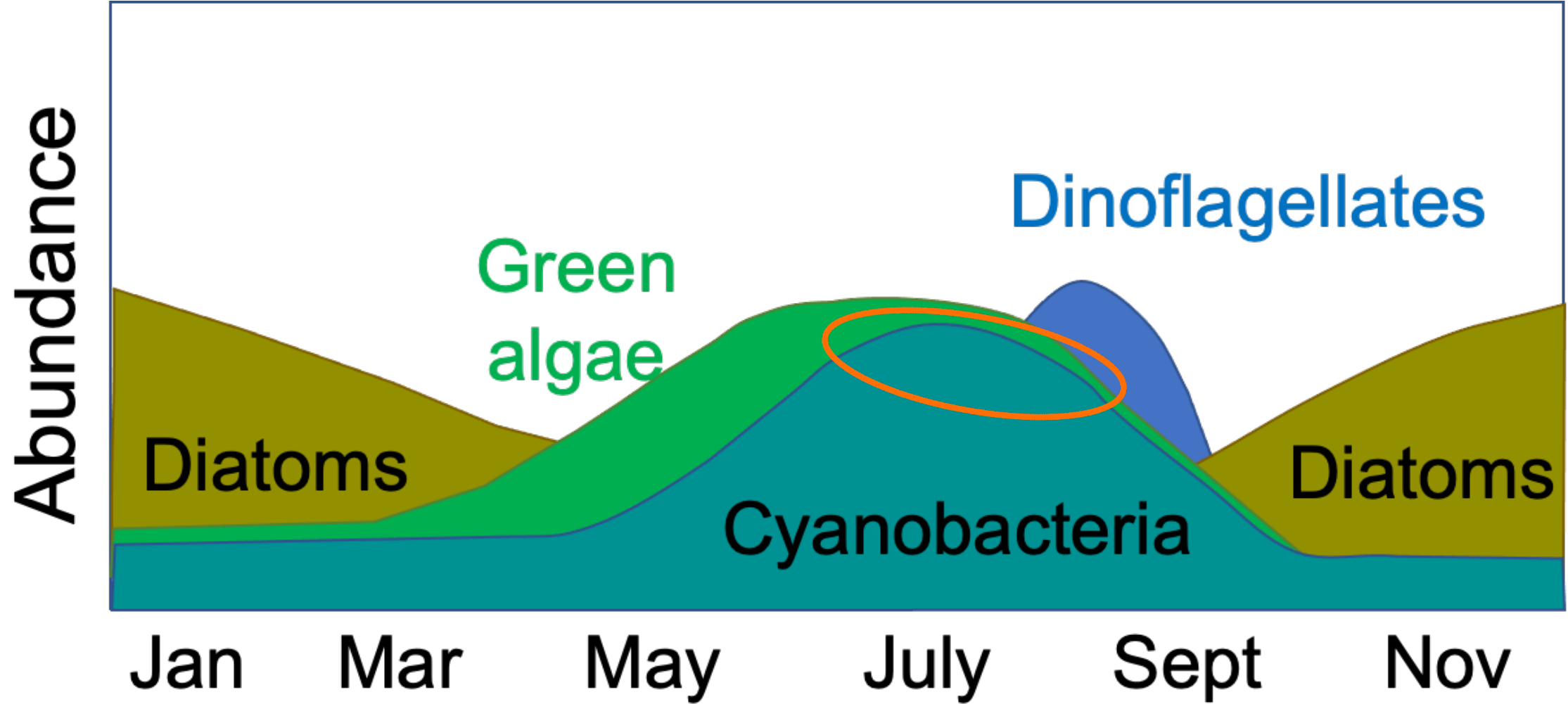


**Sunlight &  
Warm Temperatures**



**Stagnant Water**

# Cyanobacteria most abundant summer/fall



# Visual indicators



Katie Callahan



Emily Bores, SCDHEC

*Microcystis*



*Aphanizomenon*



Emily Bores, SCDHEC

*Dolichospermum*



Washington State Department of Ecology

# Blooms can have multiple species

*Dinoflagellate and Dolichospermum*



Emily Bores, SCDHEC

*Microcystis, Dolichosperma,  
Aphanizomenon*



Emily Bores, SCDHEC



# *Lyngbia* spp. look different

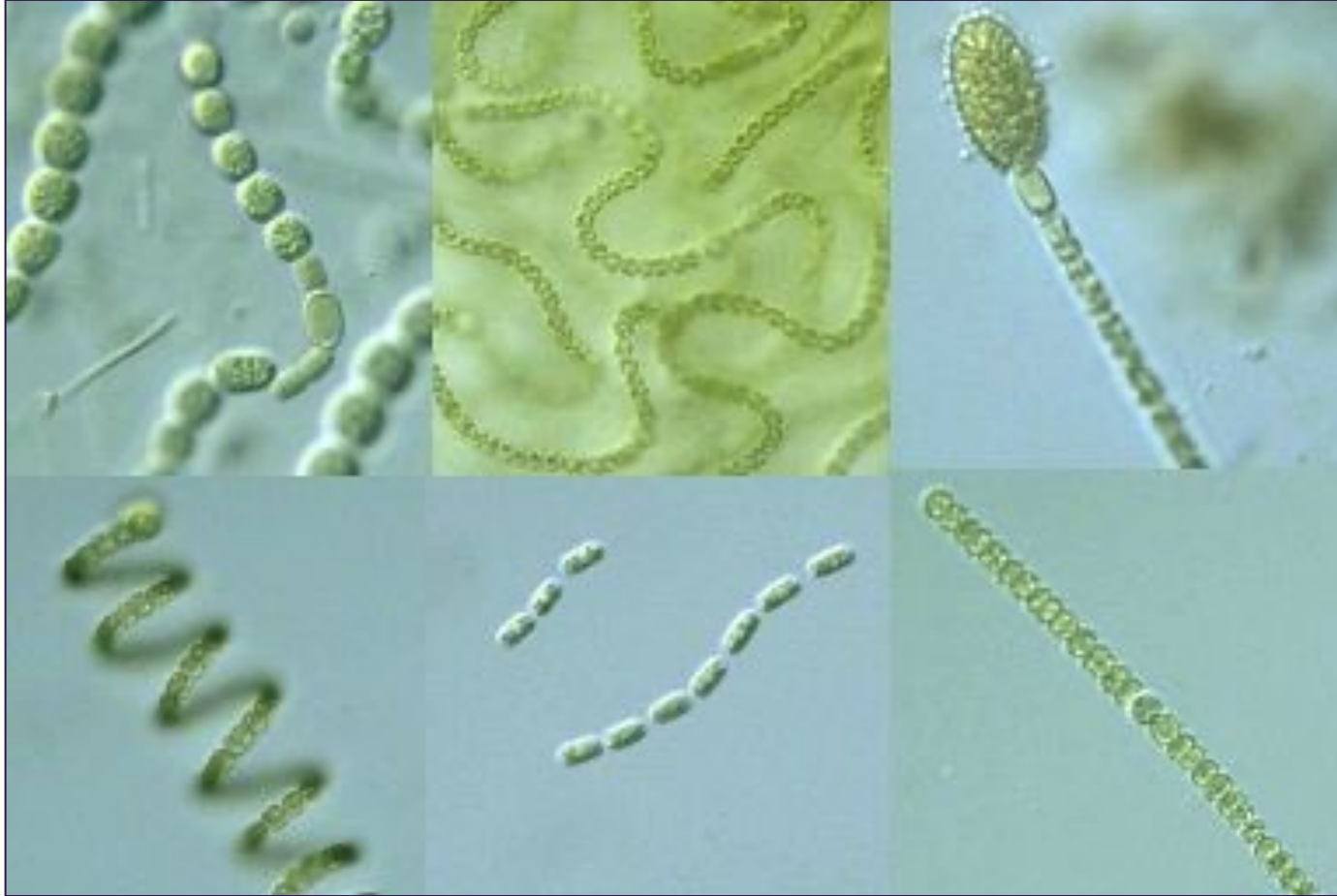


Emily Bores, SCDHEC



Sarah White, Clemson University

# How do you know if it's cyanobacteria?



Analyzing a sample is the only way to confirm identification.

# If publicly-accessible waterbody, report to NJDEP



STATE OF NEW JERSEY  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
**AVOID IT AND REPORT IT!**

<https://www.nj.gov/dep/hab/>

## Report a Suspected Harmful Algal Bloom (HAB)

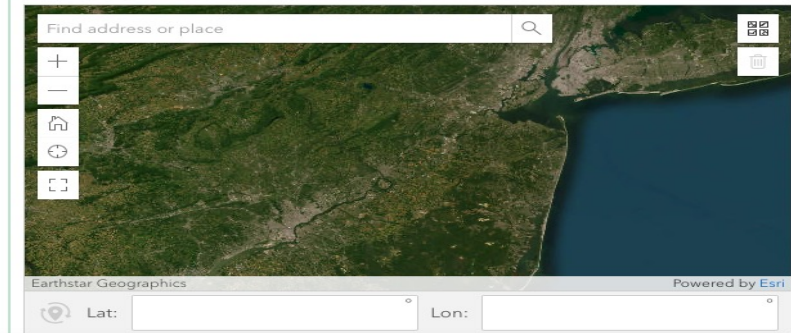


### HAB Report Details

\* = required

Date Bloom Observed:\*

Use the map below to locate the position of the HAB.\*



### AVOID IT AND REPORT IT.

Exposure to any HABs can cause adverse health effects in people and animals when water with blooms is touched, swallowed, or when airborne droplets are inhaled. **This is true regardless of toxin levels;** Some HABs produce toxins, while others do not. Exposure to blooms and toxins can cause symptoms such as diarrhea, nausea or vomiting; skin eye or throat irritation and allergic reactions or breathing difficulties. If you or your pets were exposed to HABs, rinse with clean fresh water as soon as possible.

Thank you for using the NJDEPHAB system to report a possible HAB.  
Please contact [njcyanoabs@dep.nj.gov](mailto:njcyanoabs@dep.nj.gov) with any questions.



## NJDEP Algal Bloom Sampling Status

### Samples By Date

- 6/13/2023, 12:17 PM Spruce Run Reservoir
- 6/13/2023, 10:41 AM Spruce Run Reservoir
- 6/13/2023, 10:16 AM Spruce Run Reservoir
- 6/13/2023, 9:38 AM Greenwood Lake
- 6/13/2023, 9:27 AM Greenwood Lake
- 6/13/2023, 9:13 AM Greenwood Lake
- 6/13/2023, 9:02 AM Greenwood Lake
- 6/13/2023, 8:23 AM pond
- 6/9/2023, 10:36 AM Manasquan Reservoir
- 6/8/2023, 10:59 AM Delaware Lake
- 6/6/2023, 10:09 AM Greenwood Lake
- 6/6/2023, 10:00 AM Greenwood Lake

*HAB Alerts are localized to the area where the monitoring occurred and do not apply to the entire waterbody, unless otherwise noted. Posted Alerts remain until a change in status is reported and confirmed. Use caution as conditions may change. "Avoid it, and Report it"*

### WATERBODY SELECTOR:

All Waterbodies

### HAB Alert Level Overall Distribution

Alert Level	Count
Watch	5
Advisory	15
HAB Not Present	53

### Links for more information:

- Bureau of Freshwater & Biological Monitoring
- HAB Website
- Advisory Guidance
- Response Strategy
- Outreach Materials
- Report a Suspected HAB

HAB Alert Level	Criteria	Recommendations
<b>HAB Not Present</b>	HAB reported and investigated. No HAB present.	None
<b>WATCH</b>	Suspected or confirmed HAB with potential for allergenic or irritative health effects	Public Bathing Beaches Open Waterbody Accessible: Use caution during primary contact (e.g. swimming) and secondary (e.g. non-contact boating) activities Do not ingest water (people/pets/livestock) Do not consume fish
<b>ADVISORY</b>	Confirmed HAB with moderate risk of adverse health effects and increased potential for toxins above public health thresholds	Public Bathing Beaches Closed Waterbody Remains Accessible: Avoid primary contact recreation Use caution for secondary contact recreation Do not ingest water (people/pets/livestock) Do not consume fish
<b>WARNING</b>	Confirmed HAB with high risk of adverse health effects due to high toxin levels	Public Bathing Beaches Closed Cautions as above May recommend against secondary contact recreation
<b>DANGER</b>	Confirmed HAB with very high risk of adverse health effects due to very high toxin levels	Public Bathing Beaches Closed Cautions as above. Possible closure of all or portions of waterbody and possible restrictions access to shoreline.

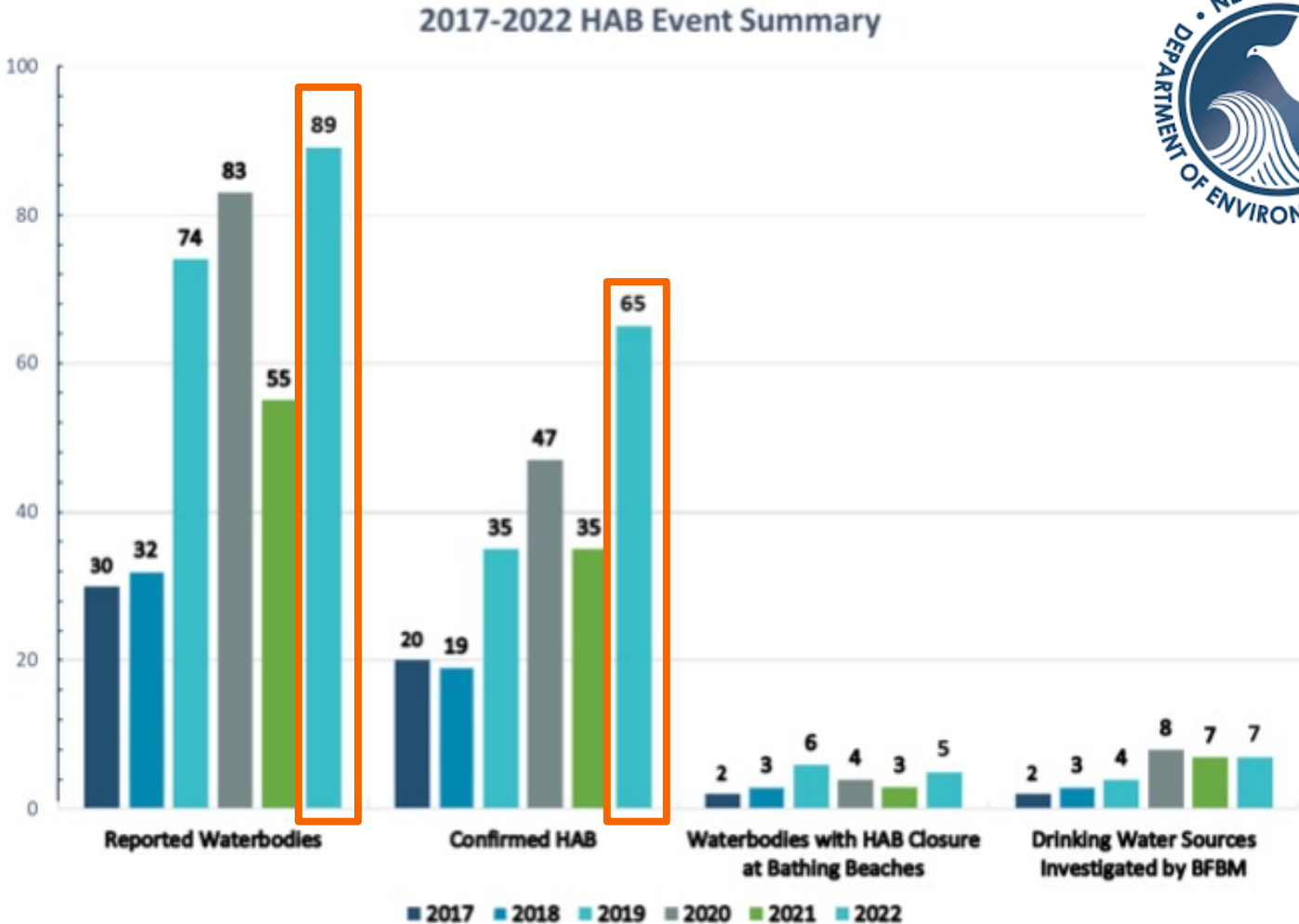
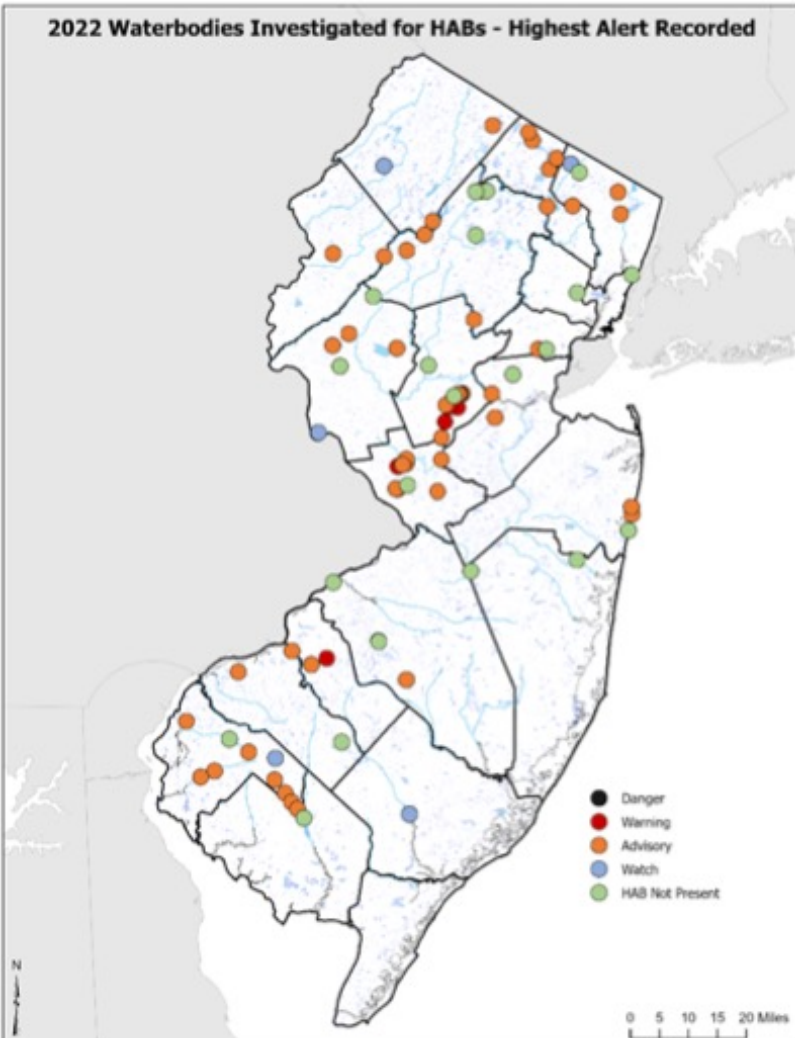
HAB Sampling Photo courtesy of Kevin Biallas, NJDEP

Dashboard has been reset for 2023.

Map reflects sampling results for suspected or confirmed HAB events reported to DEP; there may be other HABs occurring in NJ not shown here.

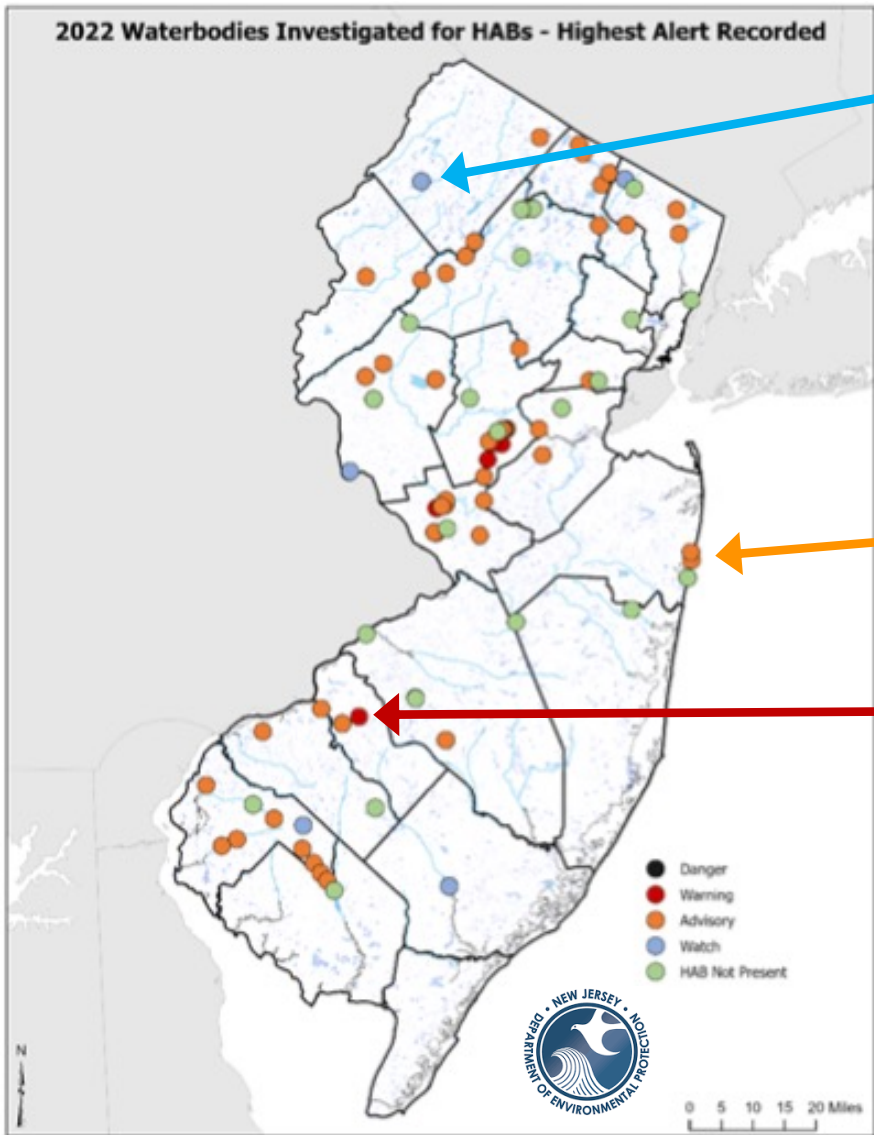
Dots at the same site are stacked by date with the current Alert on top. Use the WATERBODY SELECTOR on the top right to filter by waterbody.

# Summary of NJ HABs - 2022



Source: (NJ) HAB Summit 2023 – Victor Poretti (Bureau Chief, NJDEP Bureau of Freshwater and Biological Monitoring)  
<https://www.nj.gov/dep/hab/docs/2023-hab%20summit-presentations.pdf>

# NJ HAB Advisory Levels



WATERBODY:

## WATCH

HEALTH EFFECTS RISK  
HARMFUL ALGAL BLOOM (HAB)  
FLORACIONES DE ALGAS NOCIVAS

Always keep children and pets away from areas with blooms or scums.

				Ok Use Caution Advise Against

\*Public Bathing Beaches will be closed under the authority of NJDEP regulations, New Jersey State Sanitary Code Chapter 17 Public Recreational Bathing, N.J.A.C. 17:27.

WATERBODY:

## ADVISORY

MODERATE HEALTH RISK  
HARMFUL ALGAL BLOOM (HAB)  
FLORACIONES DE ALGAS NOCIVAS

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				Ok Use Caution Advise Against

\*Public Bathing Beaches will be closed under the authority of NJDEP regulations, New Jersey State Sanitary Code Chapter 17 Public Recreational Bathing, N.J.A.C. 17:27.

WATERBODY:

## WARNING

HIGH HEALTH RISK  
HARMFUL ALGAL BLOOM (HAB)  
FLORACIONES DE ALGAS NOCIVAS

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				Ok Use Caution Advise Against

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WATERBODY:

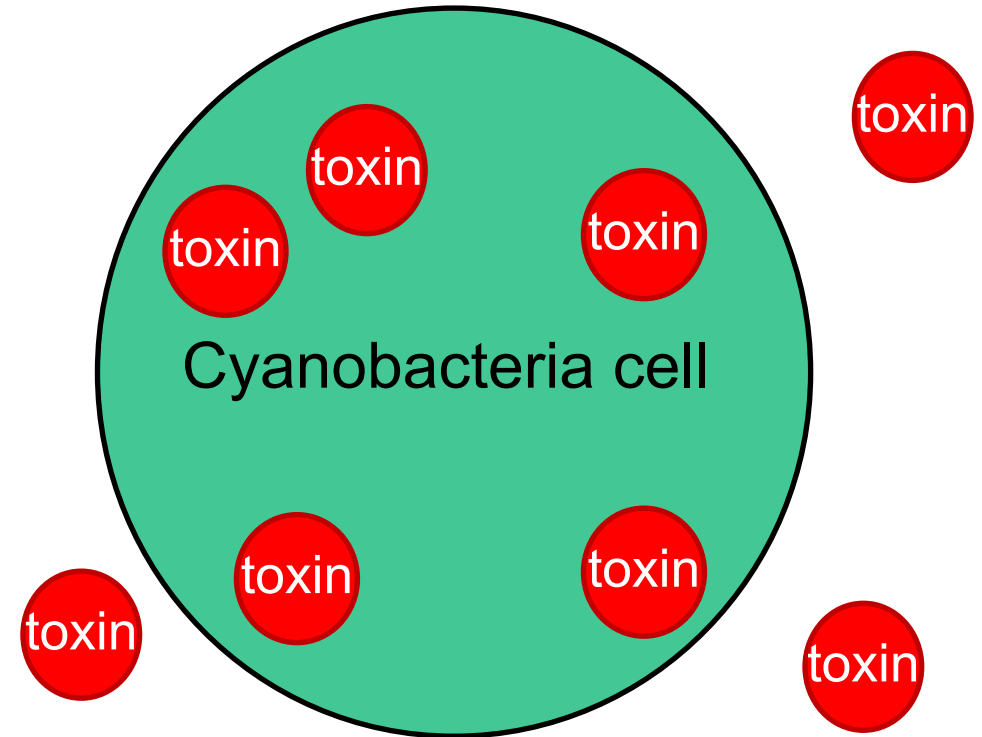
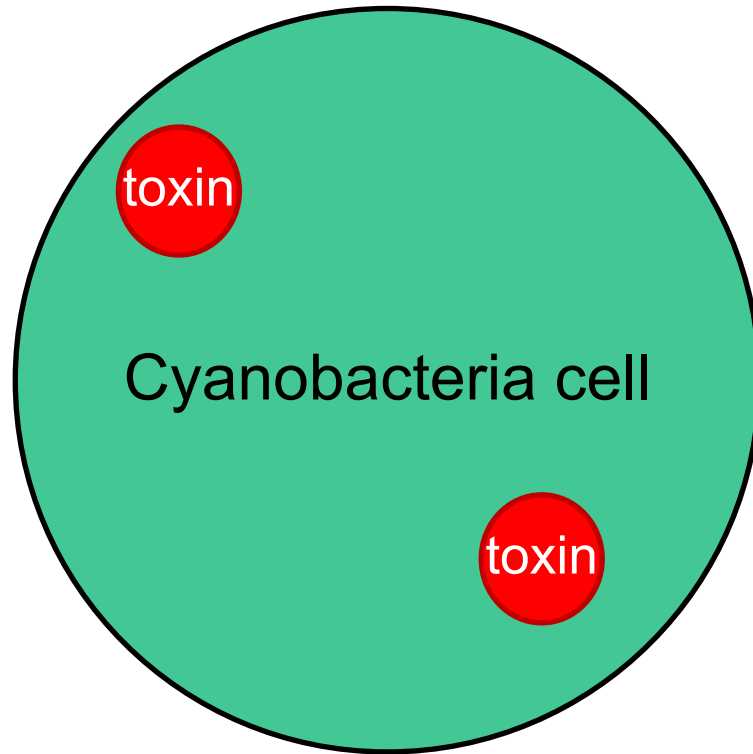
## DANGER

VERY HIGH HEALTH RISK  
HARMFUL ALGAL BLOOM (HAB)  
FLORACIONES DE ALGAS NOCIVAS

Always keep children and pets away from areas with blooms or scums.

				Ok Use Caution Advise Against

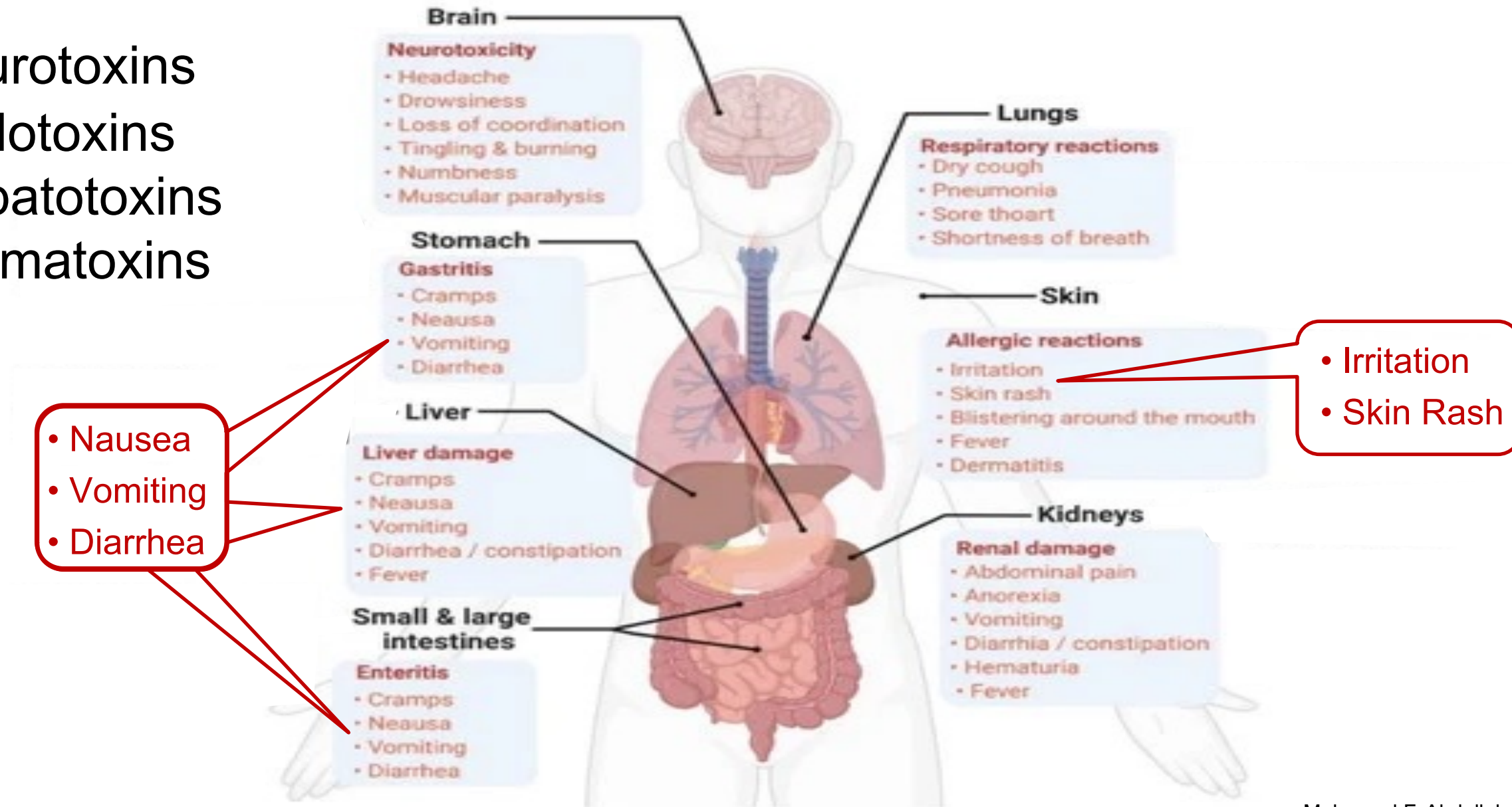
\*Public Bathing Beaches will be closed under the authority of NJDEP regulations, New Jersey State Sanitary Code Chapter 17 Public Recreational Bathing, N.J.A.C. 17:27.



We don't fully understand toxicity production or release

# Watch for symptoms in people, pets, livestock

- Neurotoxins
- Endotoxins
- Hepatotoxins
- Dermatoxins

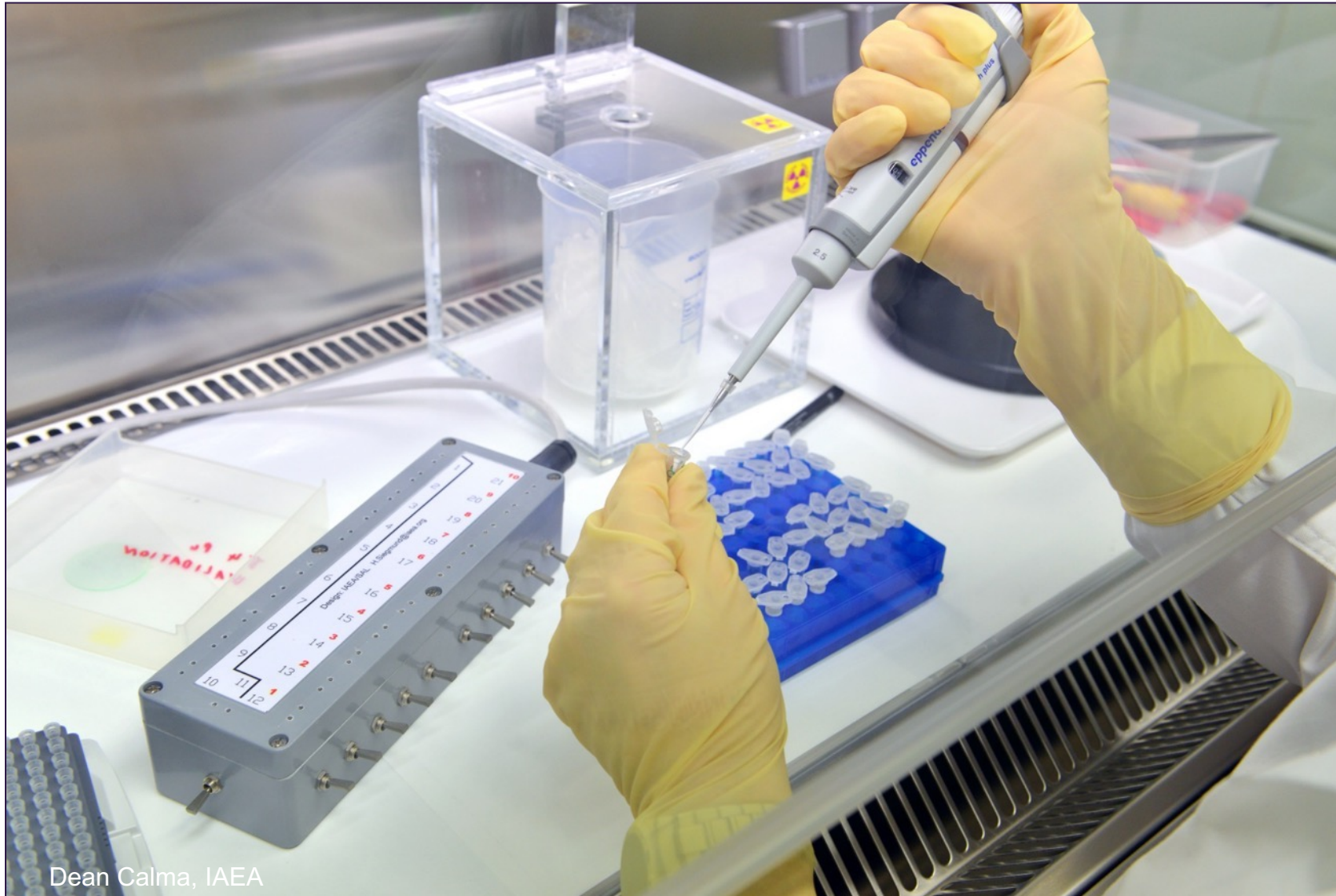




Drinking water health advisories are used as technical guidance

Cyanotoxin	Drinking Water Health Advisory (10-day)	
	Bottle-fed infants & pre-school children	School-age children & adults
Cylindrospermopsin	0.7 µg/L	3.0 µg/L
Microcystins	0.3 µg/L	1.6 µg/L





## Professional Labs (multiple cyanotoxins)

**RUTGERS**  
New Jersey Agricultural  
Experiment Station

**PLANT  
DIAGNOSTIC  
LABORATORY**



<https://njaes.rutgers.edu/services>

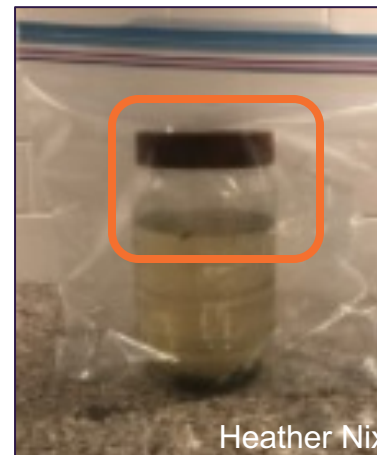


[https://www.clemson.edu/  
public/regulatory/plant-problem/](https://www.clemson.edu/public/regulatory/plant-problem/)



# Sampling Instructions

1. Wear gloves and wash your hands after sampling.
2. Fill clean, plastic bottle 90% full of algae/pond water. The empty space is important!
3. Fresher samples are better.



<https://hgic.clemson.edu/factsheet/submitting-an-algae-sample-for-identification/>



## SUBMITTING AN ALGAE SAMPLE FOR IDENTIFICATION

Factsheet | HGIC 1889 | Published: Oct 22, 2020

If there is an algae bloom in a pond you own or manage, it's crucial to know what type of algae is growing to determine an effective response. General types of algae can often be identified by **submitting pictures** to either your local County Agent or the **Clemson University Plant and Pest Diagnostic Clinic**. In some cases, including a suspected **cyanobacteria** bloom, you may need confirmation of the algae species from the Clinic. For confirmed identification, follow the directions below.

### Sample Collection:

1. Gloves are recommended.
2. Use a clean, plastic bottle that holds more than one cup. (Example: a rinsed, disposable drink container)
3. Fill the bottle 90% full with the algae and pond water. The empty space is important!
4. Place the plastic container with a sample inside a sealed, zip-top plastic bag.
5. Fresher samples are better for testing.  
Keep the sample from overheating and limit exposure to direct sunlight. It doesn't have to be on ice but avoid leaving it in your car for very long on a hot day.

### Sample packages should include:

1. a completed **Plant/Weed Identification Sampling Form**,
2. the sample, and
3. payment (\$20 if in-state)

### Sample packages can be:

- Shipped using USPS, FedEx, or UPS. Shipped samples can be received by the lab Tuesdays, Wednesdays, and Thursdays, except holidays.
- Coordinate with lab staff (864.646.2133) to leave the sample in the drop-box located at the rear loading dock in Pendleton, SC. This option is typically available Mondays through Fridays, except

# CyanoHAB identification: submit sample



4. Keep samples cool until (and during) shipment.



5. Sample, Form, and Payment (\$30 Out-of-State):

- CALL FIRST 864.646.2133
- Ship using USPS, FedEx, or UPS. Sample should arrive on a weekday, except holidays.

**CLEMSON UNIVERSITY** **PLANT AND PEST DIAGNOSTIC CLINIC**  
511 Westinghouse Road, Pendleton, SC 29670  
(864) 646-2133 ppcinc@clemson.edu www.clemson.edu/plantclinic  
(Lab Use Only) Revised 2/2018

**PLANT/WEED IDENTIFICATION**  Commercial  Residential

Name \_\_\_\_\_ Company Name \_\_\_\_\_  
LAST FIRST MI (IF APPLICABLE)

Mailing Address \_\_\_\_\_  
STREET CITY STATE ZIP

Phones ( \_\_\_\_\_ ) (HOME • WORK • CELL?) ( \_\_\_\_\_ ) (HOME • WORK • CELL?)

**EMAIL (reports are emailed – print clearly)** \_\_\_\_\_

Copy report to Clemson staff: \_\_\_\_\_ @clemson.edu \_\_\_\_\_ @clemson.edu

Sample Collection Site: \_\_\_\_\_  
(if different from above) Name/Company \_\_\_\_\_  
Address \_\_\_\_\_  
Phone \_\_\_\_\_ Email \_\_\_\_\_ County \_\_\_\_\_

<b>SELECT ONE:</b> <input type="checkbox"/> \$20.00 South Carolina collection site <input type="checkbox"/> \$30.00 out-of-state collection site	<b>BILLING ACCOUNT:</b> _____ If none, submit payment with sample material. Make checks payable to <b>Clemson University</b> .	<b>Check #</b> _____
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Submit **entire plant**, if possible, including roots, leaves, flowers, seeds, pods, berries, and any other identifying characteristics. Enclose plants or turfgrass in a sealed plastic bag. If submitting **mushrooms**, enclose in a **paper bag** only. **Mold** cannot be identified.

Turfgrass can be identified to genus (e.g. Bermuda, Centipede, Zoysia), but not to cultivar (e.g. Diamond, Palisades, Tif Dwarf, Zenith).

Questions marked with an asterisk (\*) are **required** in order to provide **control recommendations**. If this information is left blank, report will consist of identification only.

Suspected identification and/or comments: \_\_\_\_\_

\* Infested plant/crop/pond \_\_\_\_\_ Planting date \_\_\_\_\_

Field ID/Reference \_\_\_\_\_ (Optional, up to 20 characters. Examples: East Field, Irrigation Pond)

County where collected \_\_\_\_\_ Date collected \_\_\_\_\_

Degree of infestation  light  moderate  severe

Previous herbicides used for control  NONE  UNKNOWN

Product name \_\_\_\_\_ Rate \_\_\_\_\_ Date \_\_\_\_\_  
Product name \_\_\_\_\_ Rate \_\_\_\_\_ Date \_\_\_\_\_

\* Is livestock present, or will they be feeding on this crop?  Yes  No

\* If from a pond: Are fish present?  Yes  No

Do animals drink the water?  Yes  No

Is water used for plant/crop irrigation?  Yes  No

\* If yes, plants/crops irrigated \_\_\_\_\_

**Growth habit**  climbing/vine  low-growing  upright  floating  submerged

**Flowers** Season/month in bloom \_\_\_\_\_  
Flower color \_\_\_\_\_

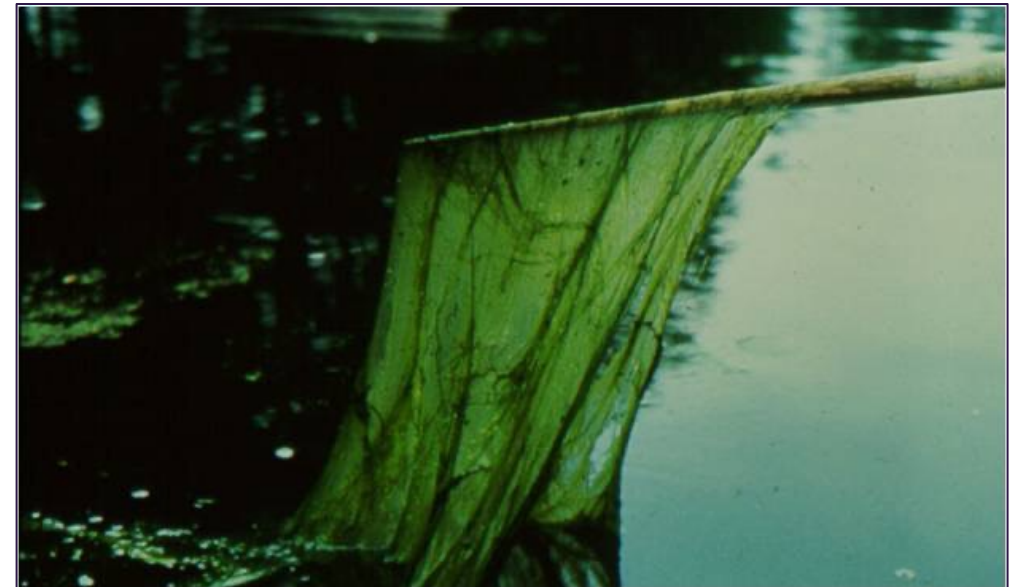
**Fruit/Seeds** Season/month seen \_\_\_\_\_  
Type of fruit/seeds \_\_\_\_\_

**Location of planting**  
 Field  
 Forest  
 Greenhouse  
 Landscape – commercial  
 Landscape – residential  
 Nursery  
 Orchard  
 Pasture  
 Pond  
 Vegetable/herb garden

# CyanoHAB identification: DIY stick test



AMoore, UK Centre for Ecology & Hydrology





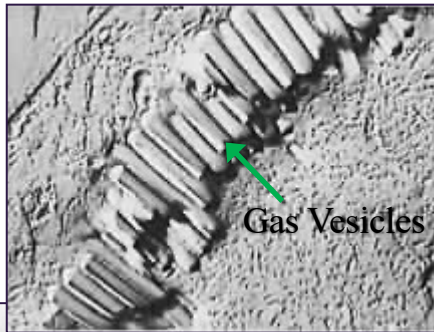
Collect sample  
in clear container



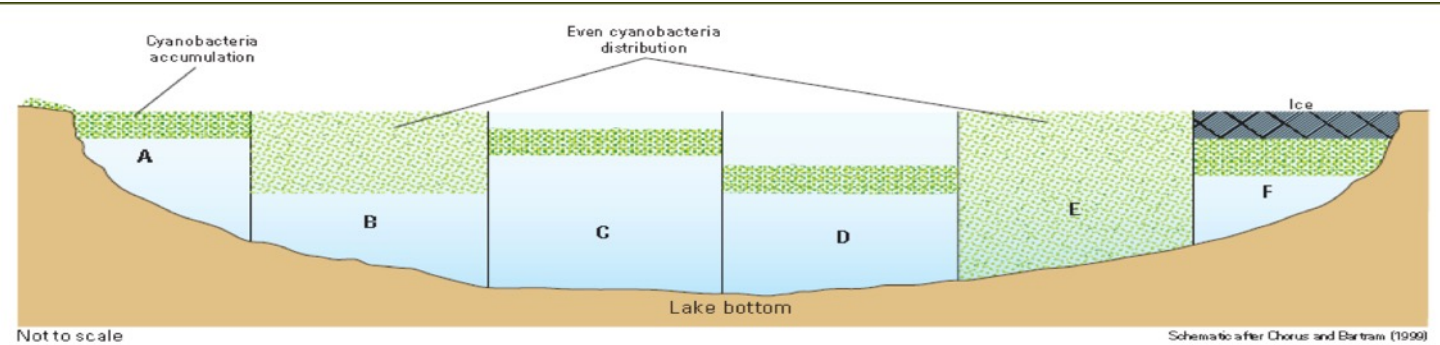
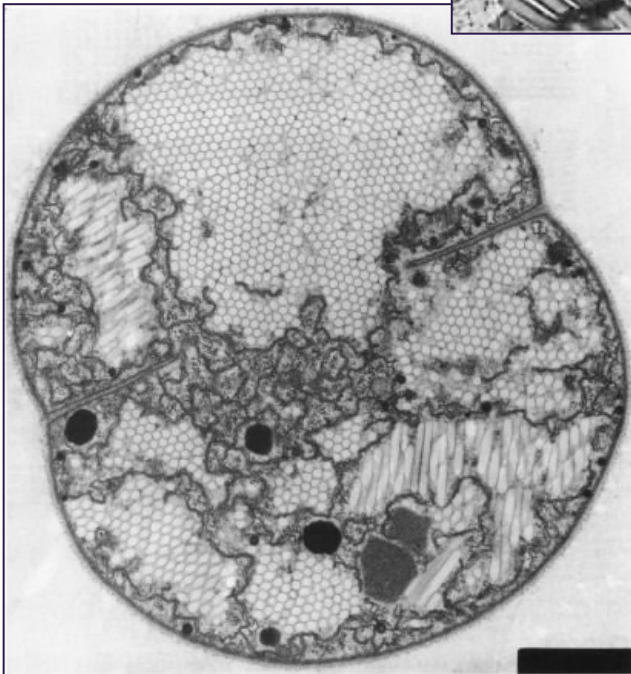
Let sample sit undisturbed  
in cool/dark location  
for up to 12 hours



If cells collected at surface  
= likely cyanobacteria



Some cyanobacteria have gas vesicles that allow them to control movement up/down in the water column



**EXPLANATION**

**Potential water column distributions of cyanobacteria**

- A** Shoreline, near-shore, and open water accumulations and scums
- B** Even distribution throughout the photic zone or epilimnion
- C** Specific depth in the photic zone
- D** Metalimnetic bloom (special case of C)
- E** Even distribution throughout the water column
- F** Under ice bloom

**Figure 6.** Potential water column distributions of cyanobacteria.

Sources: <http://lecturer.ukdw.ac.id/dhira/BacterialStructure/Inclusions.html>  
[http://www.bact.wisc.edu/Microtextbook/index.php?module=Book&func=displaychapter&chap\\_id=35&theme=printer](http://www.bact.wisc.edu/Microtextbook/index.php?module=Book&func=displaychapter&chap_id=35&theme=printer)



# Toxicity: DIY on-site test



Assume the bloom is toxic

Keep people, pets, and livestock out of the water



# Limit skin contact, ingestion, and inhalation



Wear waterproof gloves  
and wash hands

Avoid ingesting water  
or cyanobacteria



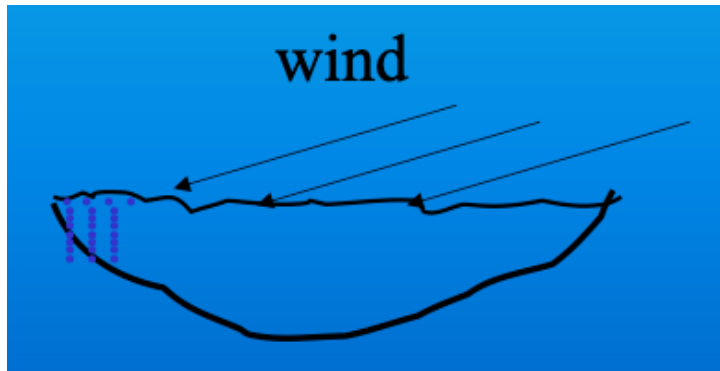
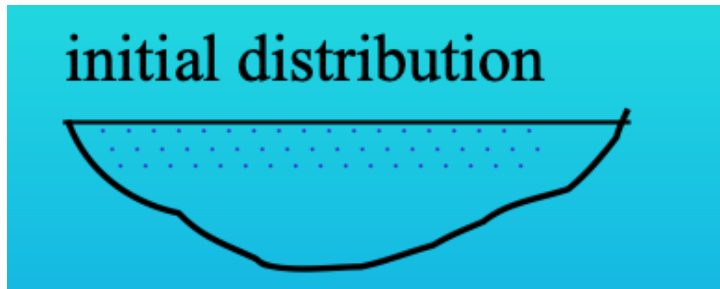
Avoid leaning over water

# Remove livestock

## Provide an alternate water supply



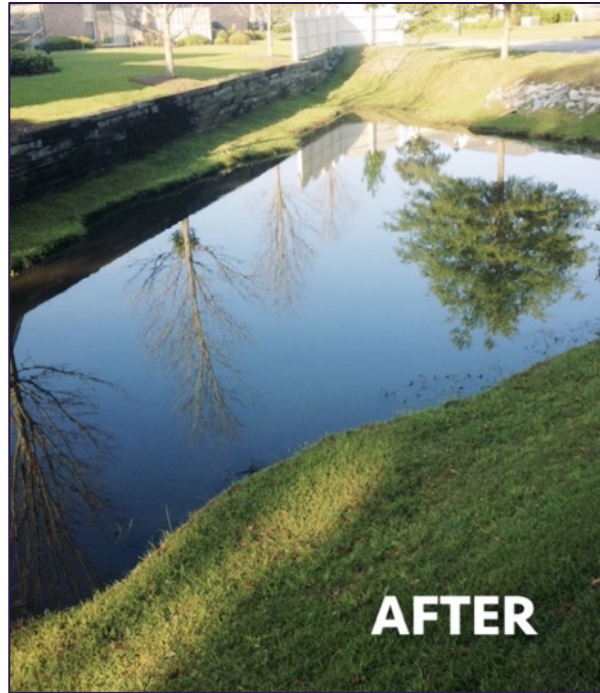
# Upwind side of pond



Katie Callahan, Clemson Extension

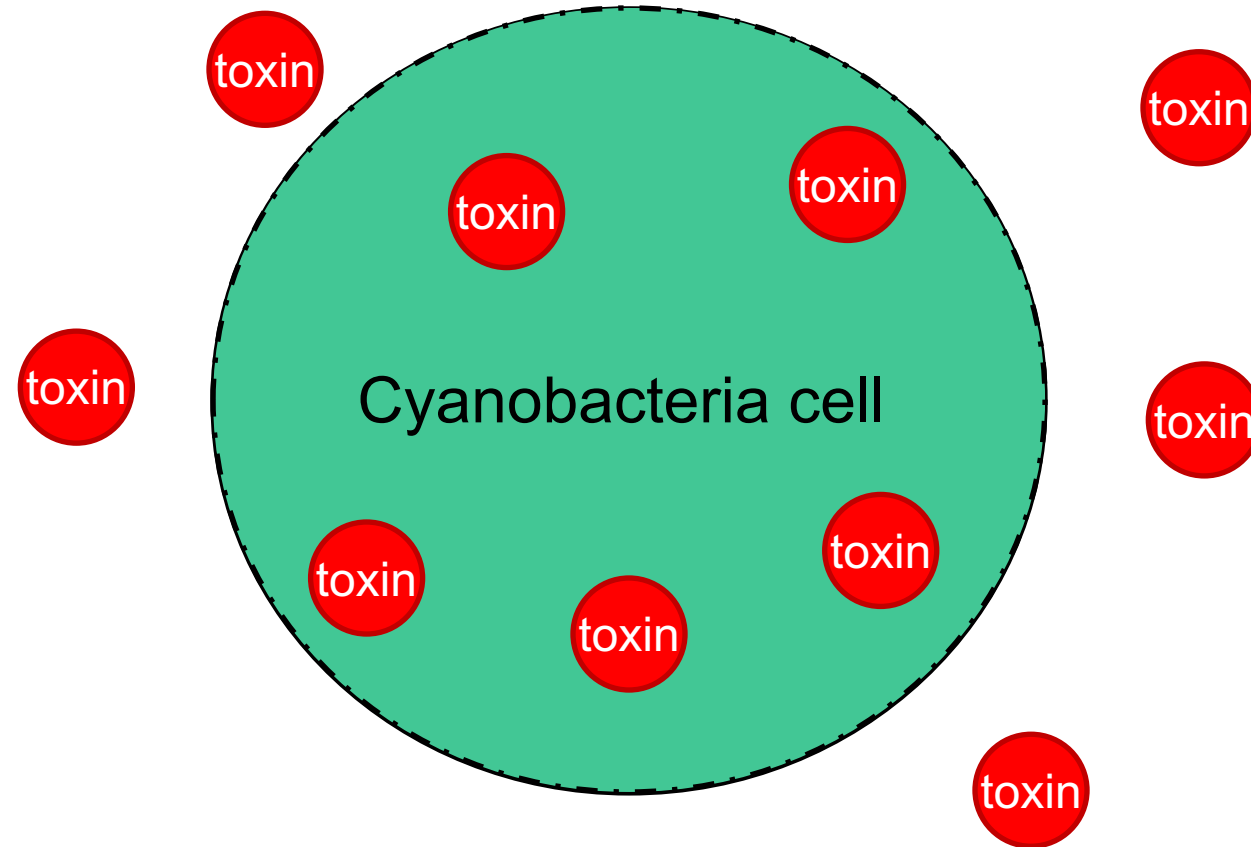
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## *In NJ, only certified pesticide applicators can apply aquatic herbicides!*



- Fact acting, but short-term results
- Water chemistry impacts pesticide toxicity
- Pesticides can lose effectiveness if used repeatedly

<https://pestmanagement.rutgers.edu/pat/certlicensreq/>

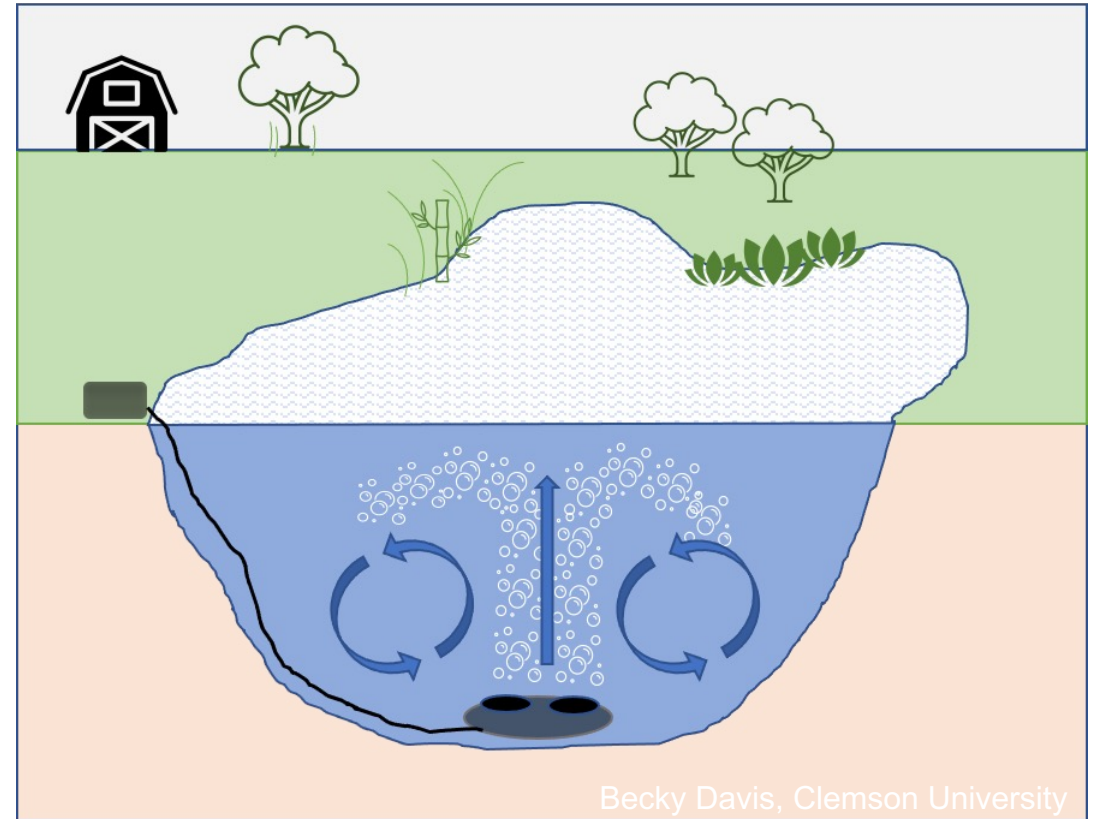


Toxins will be release, so will likely be present throughout waterbody

# When aquatic plants die – DO decreases



Dissolved oxygen will decrease



Aeration can help increase dissolved oxygen



# Now what?



**Take action to prevent future blooms!**

# Main factors that drive HABs



**Nutrients**  
(phosphorus and nitrogen)

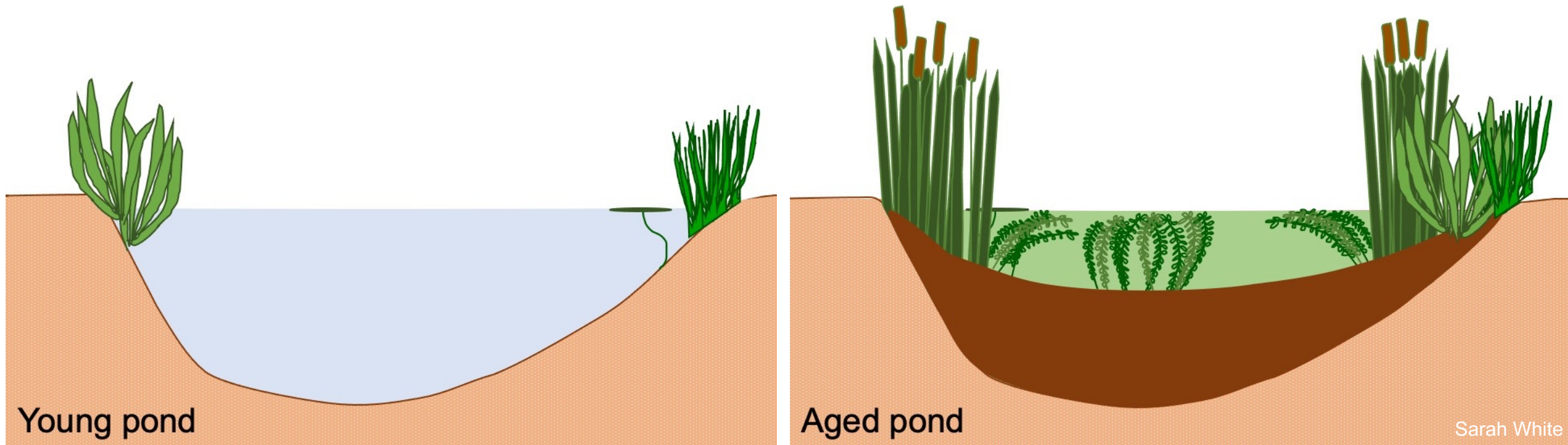


**Sunlight &  
Warm Temperatures**



**Stagnant Water**

Sediment (and nutrients) will accumulate in ponds over time



What happens on the land that drains into a waterway is critical to the waterbody's health.



*Credit: Greenville County Soil & Water Conservation District*

# Nutrients drive plant growth



*Credit: Joey Williamson*



*Credit: [www.pickrepo.com](http://www.pickrepo.com)*



*Credit: SC Resident*

## External Nutrient Sources:

1. Fertilizer
2. Sediment (Erosion)
3. Human Waste (Sanitary Sewer and Septic Tanks)
4. Animals (Pets, Livestock, Feral Hogs, Wildlife, Waterfowl)

## Fertilizer: use only what is needed

### Fertilizer Label

10	–	10	–	10
N		P		K
Nitrogen		Phosphorus		Potassium

Have your soil analyzed for fertilizer recommendations!



*Credit: Joey Williamson*

# Fertilizer: apply at the right time

Plant-specific



Credit: University of Minnesota Extension

Weather forecast

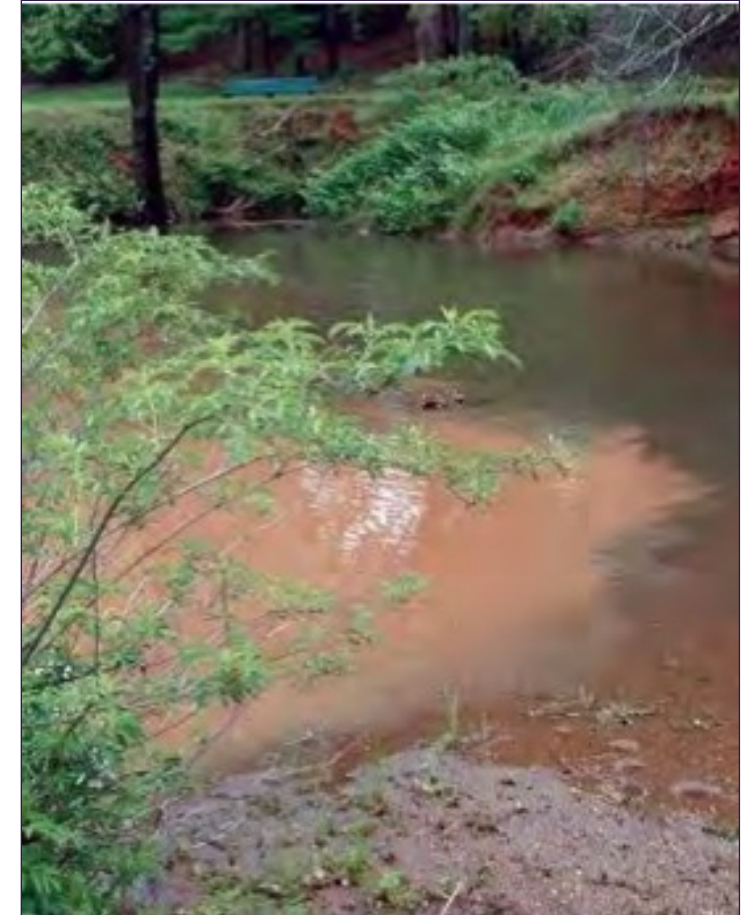


Credit: Craig Miller, KQED



# Sediment

- Damages aquatic habitat
- Clogs infrastructure
- Transports other contaminants



# Sediment carries phosphorus into streams



*Cahaba Riverkeeper*

# Prevent Erosion: exposed soil is easily eroded

**Water Rills = Soil Erosion**



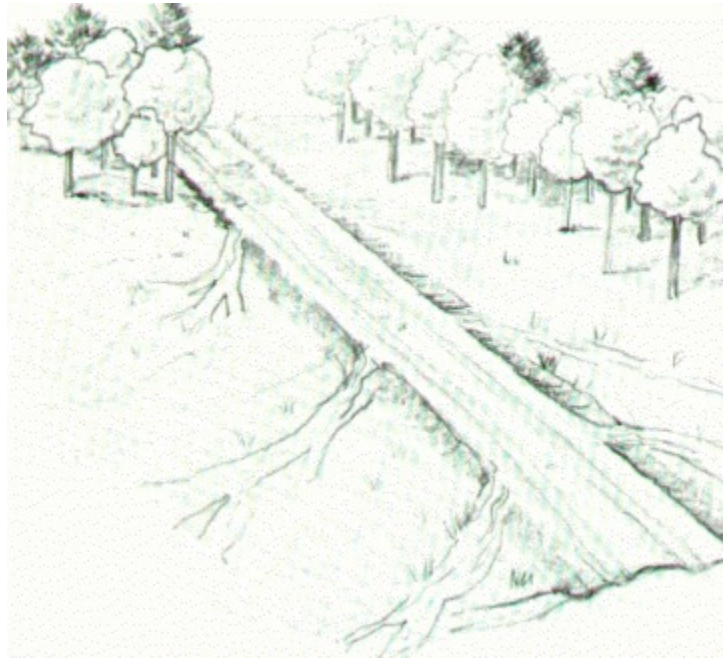
*Credit: Heather Nix*



*Credit: Google Maps*

# Prevent Erosion: Use forest road best management practices

Water Turnouts



*Credit: SC Forestry Commission*

Grass or Gravel Roads



*Credit: James Kochenderfer, Cornell Extension*

Culverts



*Credit: SC Forestry Commission*

# Prevent Erosion: Cover bare soil with plants or mulch



*Credit: S. Cory Tanner*

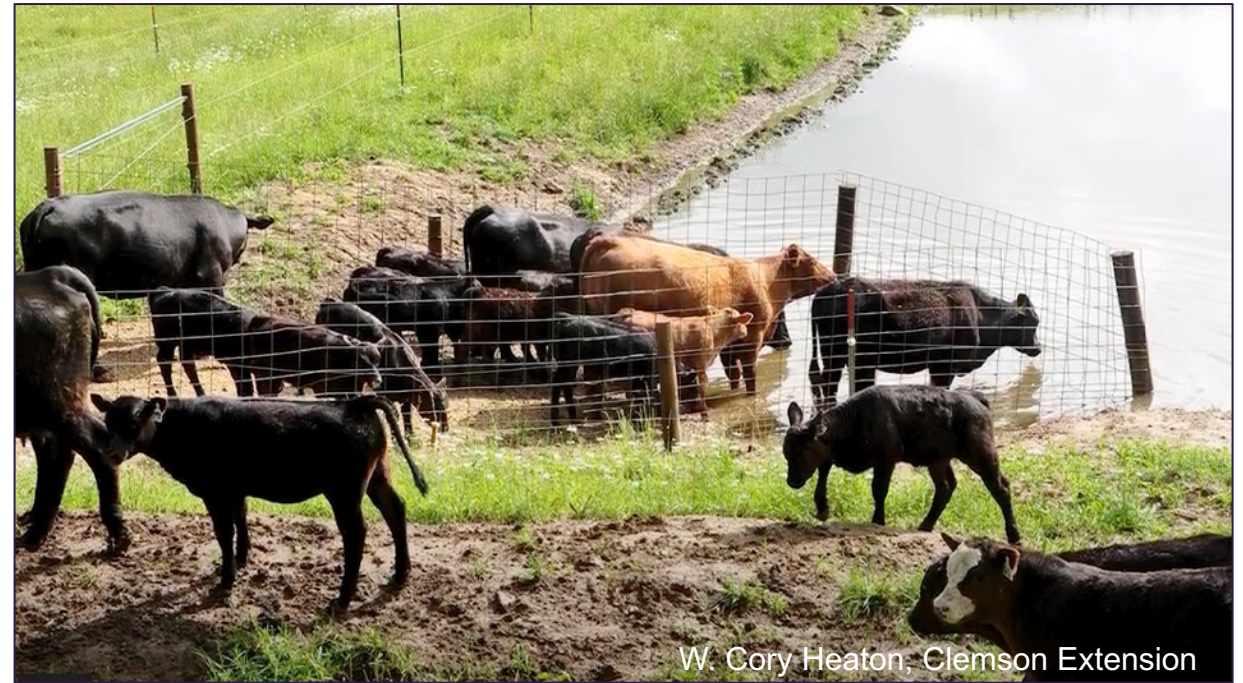


*Credit: [welcomewildlife.com](http://welcomewildlife.com)*

# Prevent erosion: limit livestock in waterways



Fence livestock  
out of waterways

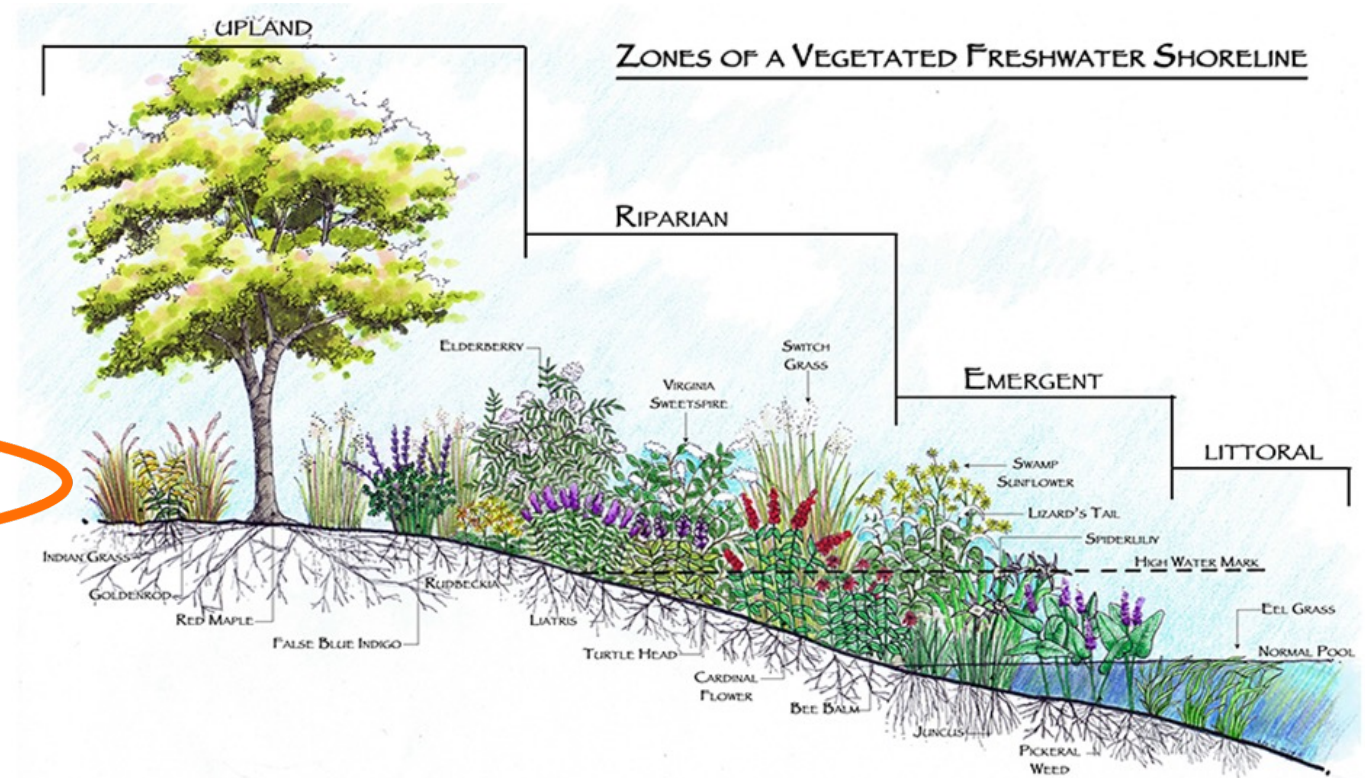


Reduce access to waterways

# Shoreline Buffer: vegetation can protect your pond



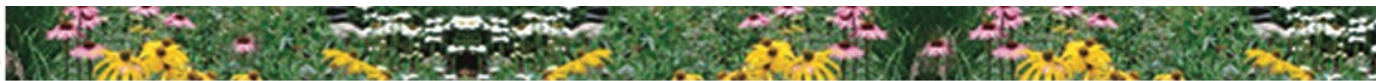
*Credit: Heather Nix*



*Credit: Renee Byrd*

# NJ-specific plant recommendations

© EPA



**Plants to help stop a HAB** Native trees, shrubs, woody and herbaceous plants, grasses, sedges, rushes and aquatic plants listed below. Many NJ nurseries now carry native plants (see links below). Plant in the spring after last frost to allow plants to get established but before soils dry out in summer's heat or plant in fall before first frost.

## TREES (tall to shorter)

### Shade Trees

- American Sycamore | 60-140'  
- Black Willow | 30-90'  
- Pin Oak | 70-90'   
- Swamp White Oak | 60-80'   
- River Birch | 40-80'   

- Red Maple | 60-90'  
- Silver Maple | 50-80'  
- Sweet Gum | 60-90'  
- Black Gum | 30-50'   
- Hackberry | 25-50'   
- Sweetbay Magnolia | 20-60', late Spr  

### Ornamental/Small Trees

- Shadbush/Serviceberry | 25-30', early Spr  
  - Ironwood, A. Hornbeam | 25-30'  
- ### Evergreens
- Eastern Red Cedar | 40-50'  
  - American Holly | 40-50', berries Fall-Win  

## SHRUBS (many flowering Spring-Summer and/or colorful Fall berries)

- Eastern Redbud | up to 40', early Spr 
- Pussy Willow | 6-20', Feb-Mar 
- Spicebush | 3-9', early Spr   
- Red-twig Dogwood | 6-10', late Spr  
- Silky Dogwood | 6-10', Jun-July   
- Blackhaw Viburnum | 12-15'  

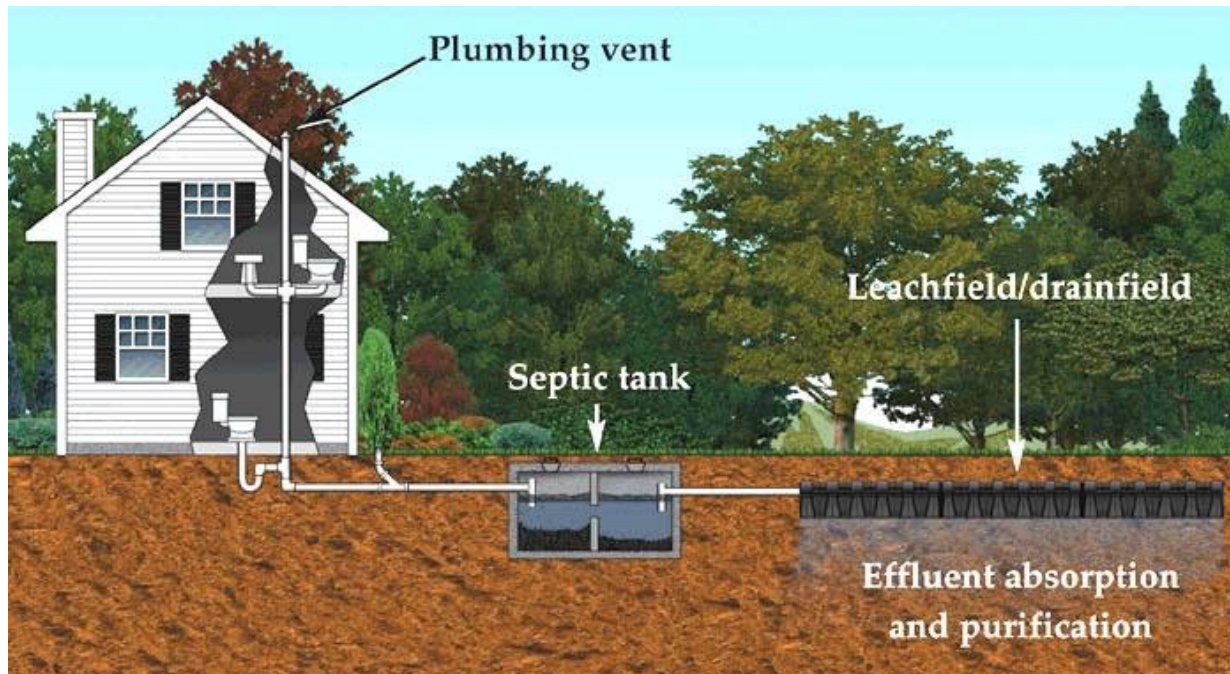
- Arrowwood Viburnum | 6-10'   
- Cranberrybush | 6-12'   
- Smooth Alder | 8-12', Mar, Apr  
- Red Chokeberry | 5-10', Spr   
- Elderberry | 4-12', late Spr   
- Buttonbush | 3-8', mid-summer  

- Highbush Blueberry | 6-12', July   
- Swamp Rose | to 7', Jun-July  
- Virginia Sweetspire | 3-6', late Spr  
- Fragrant Sumac | 2-4'  
(also "GroLow" variety for very compact form)  
- Winterberry Holly | 6-10', berries Winter  

<https://www.nj.gov/dep/hab/outreach-material.html>



## Be sure human waste is properly treated



*Credit: www.24hplans.com*

**Maintain and repair septic tanks**



*Credit: US Geological Survey*

**Report sewer leaks**

# Reduce impacts from animals

## Discourage waterfowl



**PLEASE... HOLD THE BREAD!**

*It's making us SICK!*

- High fiber foods, like bread, upset the simple digestive system of the Canada Goose.
- Fed geese stop migrating, and instead, stay and nest along our waterways.
- Their waste fouls our water, trails and shorelines, making park features unusable.

- By not feeding the geese and establishing a no-mow zone around waterways, we encourage them to keep to their natural migration pattern and protect our water quality.

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For more information, please visit [www.clemson.edu/carolinaclear](http://www.clemson.edu/carolinaclear).

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## Pick up after pets



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**BE PREPARED.  
ALWAYS BRING A BAG.**

## Keep livestock out of pond



*Credit: Heather Nix*

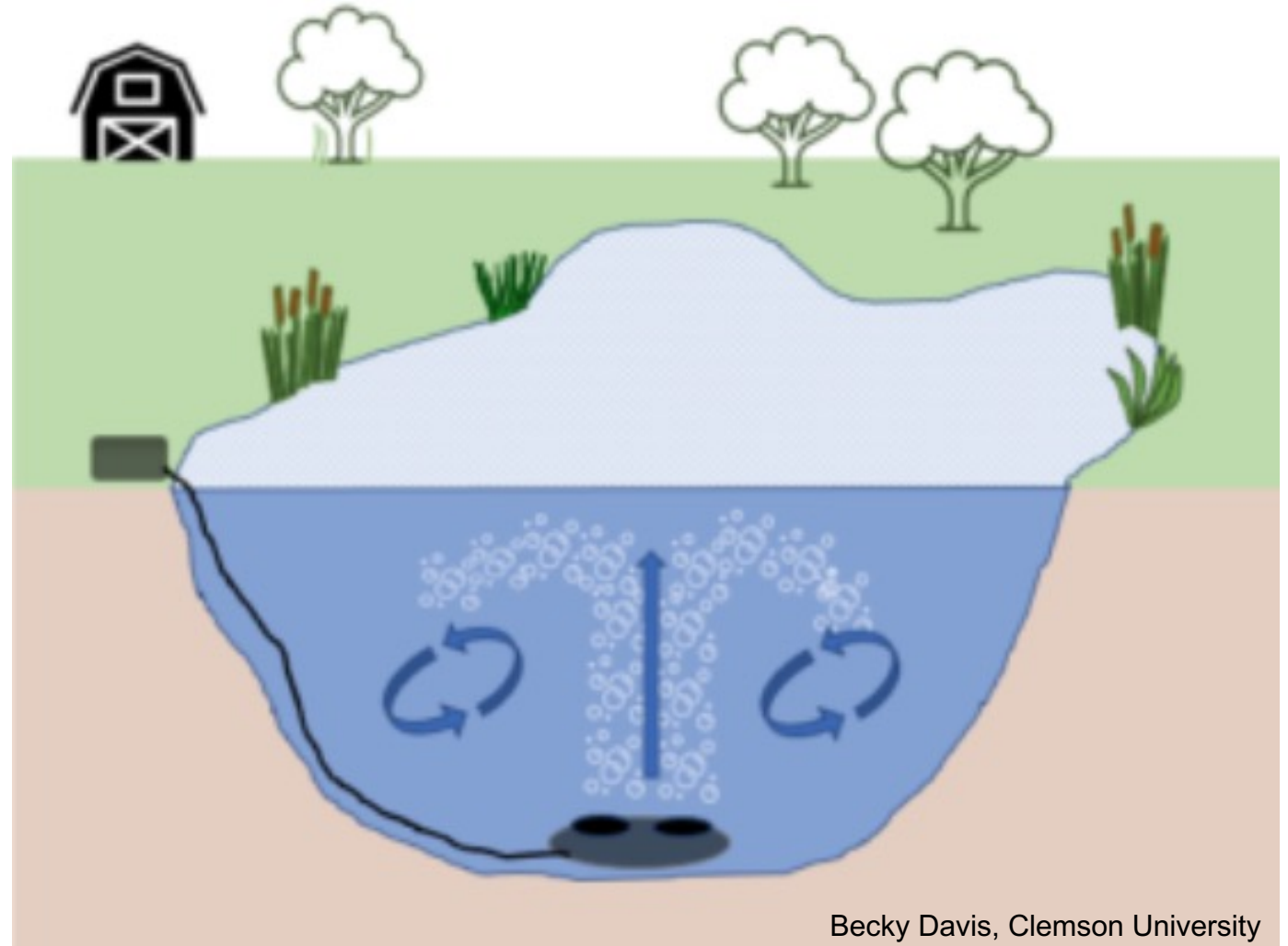
## Control feral hogs



*Credit: Missouri Department of Conservation*

# Aerate with a bottom diffuser

- Improves dissolved oxygen
- Helps microbial activities and reduce blooms
- Consider pond size, depth, shape and availability of power for a pond aeration system



# Reduce in-pond nutrients by removing sediment





<https://lgpress.clemson.edu/category/water/ponds/>





Clemson Cooperative Extension  
**Home & Garden Information Center**

<https://hgic.clemson.edu/category/ponds/>

**SUBMITTING AN ALGAE SAMPLE FOR IDENTIFICATION**

Factsheet | HGIC 1889 | Published: Oct 22, 2020 | Print

If there is an algae bloom in a pond you own or manage, it's crucial to know what type of algae is growing to determine an effective response. General types of algae can often be identified by **submitting pictures** to either your local County Agent or the **Clemson University Plant and Pest Diagnostic Clinic**. In some cases, including a suspected **cyanobacteria** bloom, you may need confirmation of the algae species from the Clinic. For confirmed identification, follow the directions below.

**Sample Collection:**

1. Gloves are recommended.
2. Use a clean, plastic bottle that holds more than one cup. (Example: a rinsed, disposable drink container)
3. Fill the bottle 90% full with the water from the bloom.
4. Place the plastic container with the water in a cooler or ice chest to keep it cool.

**CHEMICAL CONTROL OF AQUATIC WEEDS**

Factsheet | HGIC 1720 | Reviewed: Dec 8, 2015 | Print

Aquatic weeds in ponds or lakes can be controlled by physical removal, biological control, or herbicides. The method or combination of methods, used will depend on factors such as target weeds, non-target plants, and the uses of the water (fishing, swimming, livestock watering, and irrigation).

Physical removal can be accomplished manually or mechanically. It is time consuming, expensive, and normally used alone if other methods are not available. In some cases, a certain amount of physical removal, in combination with biological control and herbicides, may be necessary.

Biological control is the use of natural predators to control weeds. The major concern is application and no concern over damage to non-target plants. Irrigation with treated water can be very effective for controlling weeds. Submerged vascular aquatic weeds. Grass carp are usually used to control all vegetation in a pond, rather than selectively controlling certain vegetation. Replacement stocking of grass carp is necessary when fish are lost. A permit is required to stock grass carp, and only triploid fish can be legally used in SC. Tilapia are stocked in the



**Only certified pesticide applicators can apply aquatic herbicides in NJ!**

**CYANOBACTERIA: UNDERSTANDING BLUE-GREEN ALGAE'S IMPACT ON OUR SHARED WATERWAYS**

Factsheet | HGIC 1858 | Published: Aug 26, 2015 | Print

In August 2014, news outlets across the country reverberated with the shocking story that a large harmful algal bloom in Lake Erie had produced a dangerous toxin (microcystin) that threatened the drinking water supply for over 500,000 people in the Toledo, Ohio area (Zimmer, 2014). The occurrence of this type of algal bloom, called cyanobacteria or blue-green algae, is not an isolated event. Cyanobacteria have impacted much of our South Carolina surface waters and some water systems as well. With the frequency of these harmful algal blooms increasing across the nation, South Carolina residents can take action to prevent harmful algal blooms and protect our shared waterways.



Figure 1. Cyanobacteria blooms often have a telltale bright green color.

**What are cyanobacteria/blue-green algae?**

Cyanobacteria, sometimes referred to as blue-green algae, are a group of photosynthetic bacteria.

**BIOLOGICAL CONTROL OF AQUATIC WEEDS**

Factsheet | HGIC 1715 | Reviewed: Dec 5, 2015 | Print

Although many organisms feed on aquatic weeds, only herbivorous fish have proven both effective and relatively easy to obtain for aquatic weed control in South Carolina. Various herbaceous fish species, including Tilapia species, various strains of the common carp and grass carp have been recommended for aquatic weed control. Aquatic weed identification is still required for biological control since each fish species selectively controls certain weed species while having no preference for other plants.

**Tilapia**

Tilapia are tropical fish that resemble our native sunfish and can control certain aquatic vegetation. Two species of tilapia are recommended for aquatic weed control.

Blue tilapia feed entirely on algae (both planktonic and filamentous) but do not readily consume submerged vascular plants. Redbelly tilapia feed primarily on submerged vascular plants rather than algae, but most pond managers prefer triploid grass carp for control since grass carp offer multiple year control and are easier to manage. Because tilapia are tropical fish, they cannot survive normal winter water temperatures in most of South



Tilapia are recommended for aquatic weed control. W. Cory Heaton, ©2015, Clemson Extension



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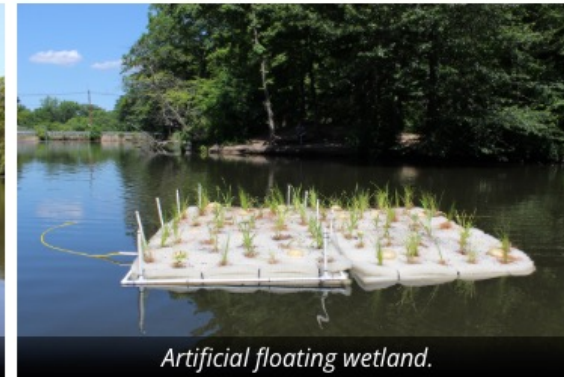
## Lake and Pond Management



*Blue-green algae.*



*Underwater aeration system.*



*Artificial floating wetland.*

<https://camden.njaes.rutgers.edu/enr/lake-pond-management/>

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**COOPERATIVE EXTENSION**  
*College of Agriculture, Forestry and Life Sciences*



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## Clemson Extension Water Resources:

<https://www.clemson.edu/extension/water/index.html>



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