



CYANOBACTERIA THRESHOLDS: RECREATIONAL ADVISORIES AND/OR WATER QUALITY CRITERIA

Blue Green Algae Task Force Meeting

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Division of Environmental Assessment and Restoration
Florida Department of Environmental Protection
July 29, 2020**

State	Recreational Water Guidance/Action Levels
California	Microcystin: 0.8 µg/L; Anatoxin-a: 90 µg/L; Cylindrospermopsin: 4 µg/L
Connecticut	-Visual Rank Category 1: Visible Material is not likely cyanobacteria or water is generally clear. -Visual Rank Category 2: Cyanobacteria present in low numbers. -Visual Rank Category 3: Cyanobacteria present in high numbers.
Illinois	Microcystin-LR concentration results approach or exceed 10 µg/L
Indiana	Level 1: very low/no risk < 4 µg/L microcystin-LR Level 2: low to moderate risk 4 to 20 µg/L microcystin-LR Level 3: serious risk > 20 µg/L microcystin-LR Warning Level: Cylindrospermopsin: 5 ppb
Iowa	Microcystin ≥ 20 µg/L
Kansas	Health advisory: >4 µg/L to <20 µg/L for microcystin or > 20,000 cell/mL to <100,000 cell/mL cyanobacteria cell counts Health Warning: > 20 µg/L or > 100,000 cell/mL cyanobacterial cell counts and visible scum present
Kentucky (Louisville District)	Advisory: >20,000 cells/mL of cyanobacteria cell counts; Caution: > 100,000 cells/mL of cyanobacteria cell counts
Massachusetts	14 µg/L for microcystin-LR and ≥ 70,000 cells/mL for cyanobacteria cell counts
Nebraska	Microcystin ≥ 20 µg/L
New Hampshire	>50% of cell counts from toxigenic cyanobacteria
North Carolina	Visible discoloration of the water or a surface scum may be considered for microcystin testing
Ohio	Microcystin-LR: PHA: 6 µg/L; NCA: 20 µg/L; Anatoxin-a: PHA: 80 µg/L; NCA: 300 µg/L Saxitoxin: PHA: 0.8 µg/L; NCA: 3 µg/L; Cylindrospermopsin: PHA: 5 µg/L; NCA: 20 µg/L
Oklahoma	100,000 cell/mL of cyanobacteria cell counts and > 20µg/L for microcystin
Oregon	Option 1: Visible scum and cell count or toxicity Option 2: Toxigenic species >100,000 cells/mL Option 3: Microcystis or Planktothrix > 40,000 cells/mL Option 4: Microcystin : 10 µg/L ; Anatoxin-a: 20 µg/L; Cylindrospermopsin: 6µg/L; Saxitoxin: 100 µg/L
Rhode Island	Visible cyanobacteria scum or mat and/or cyanobacteria cell count > 70,000 cells/mL and/or ≥14 µg/L of microcystin-LR
Texas	> 100,000 cell/mL of cyanobacteria cell counts and >20µg/L microcystin
Vermont	4,000 cells/mL cyanobacteria cell counts or ≥ 6µg/L microcystin-LR and the visible presence of cyanobacterial scum Anatoxin-a ≥ 10 µg/L
Virginia	Microcystin provisional action level: 6µg/L
Washington	Microcystin-LR: 6 µg/L; Anatoxin-a: 1 µg/L; Cylindrospermopsin: 4.5 µg/L; Saxitoxin: 75 µg/L
Wisconsin	> 100,000 cells/mL or scum layer <i>Slide Courtesy of Lesley D'Aniglada, EPA OST</i>



EPA RECOMMENDED CYANOTOXIN CRITERIA/ADVISORY THRESHOLDS

Table 6-1.

Recreational Criteria or Swimming Advisory Recommendations for Microcystins and Cylindrospermopsin

Application of Recommended Values	Microcystins			Cylindrospermopsin		
	Magnitude (µg/L)	Duration	Frequency	Magnitude (µg/L)	Duration	Frequency
Recreational Water Quality Criteria	8	1 in 10-day assessment period across a recreational season	More than 3 excursions in a recreational season, not to be exceeded in more than one year	15	1 in 10-day assessment period across a recreational season	More than 3 excursions in a recreational season, not to be exceeded in more than one year
Swimming Advisory		One day	Not to be exceeded		One day	Not to be exceeded



BASIS FOR EPA RECOMMENDED CYANOTOXIN CRITERIA/ADVISORY THRESHOLDS

31.8 kg

$0.05 \mu\text{g}/\text{kg}/\text{day} \times 0.21 \text{ L}/\text{day} = 8 \mu\text{g}/\text{L}$ microcystins

31.8 kg

$0.1 \mu\text{g}/\text{kg}/\text{day} \times 0.21 \text{ L}/\text{day} = 15 \mu\text{g}/\text{L}$ cyclindrospermopsin

- Assumes 100% of child's exposure (ages 6 – 10) comes from incidental ingestion during swimming
- DEP has received a petition requesting that we adopt EPA's 2016 draft thresholds instead of EPA's 2019 final recommended thresholds
- 2016 draft document applied a Relative Source Contribution (RSC) factor of 0.8 and an incidental ingestion estimate of 0.33 L/day, yielding draft values of 4 $\mu\text{g}/\text{L}$ microcystins and 8 $\mu\text{g}/\text{L}$ cyclindrospermopsin



BASIS FOR EPA RECOMMENDED CYANOTOXIN CRITERIA/ADVISORY THRESHOLDS

- The Reference Dose (RfD) for microcystins was derived from a 1999 drinking water study with 11-week-old male rats (0, 50, 150 $\mu\text{g}/\text{kg}/\text{day}$ **MC-LR**) where LOAEL was 50 $\mu\text{g}/\text{kg}/\text{day}$
 - Uncertainty factor of 1,000 applied
- The Reference Dose (RfD) for Cylindrospermopsin was derived from a 2002 gavage study with male mice for 11 weeks (0, 30, 60, 120, 240 $\mu\text{g}/\text{kg}/\text{day}$ **Cylindrospermopsin**) where LOAEL was 60 $\mu\text{g}/\text{kg}/\text{day}$
 - Uncertainty factor of 300 applied



CURRENT STATE OF FLORIDA PRACTICE

DOH reviews DEP Algal Bloom Dashboard daily to determine what waters need advisories

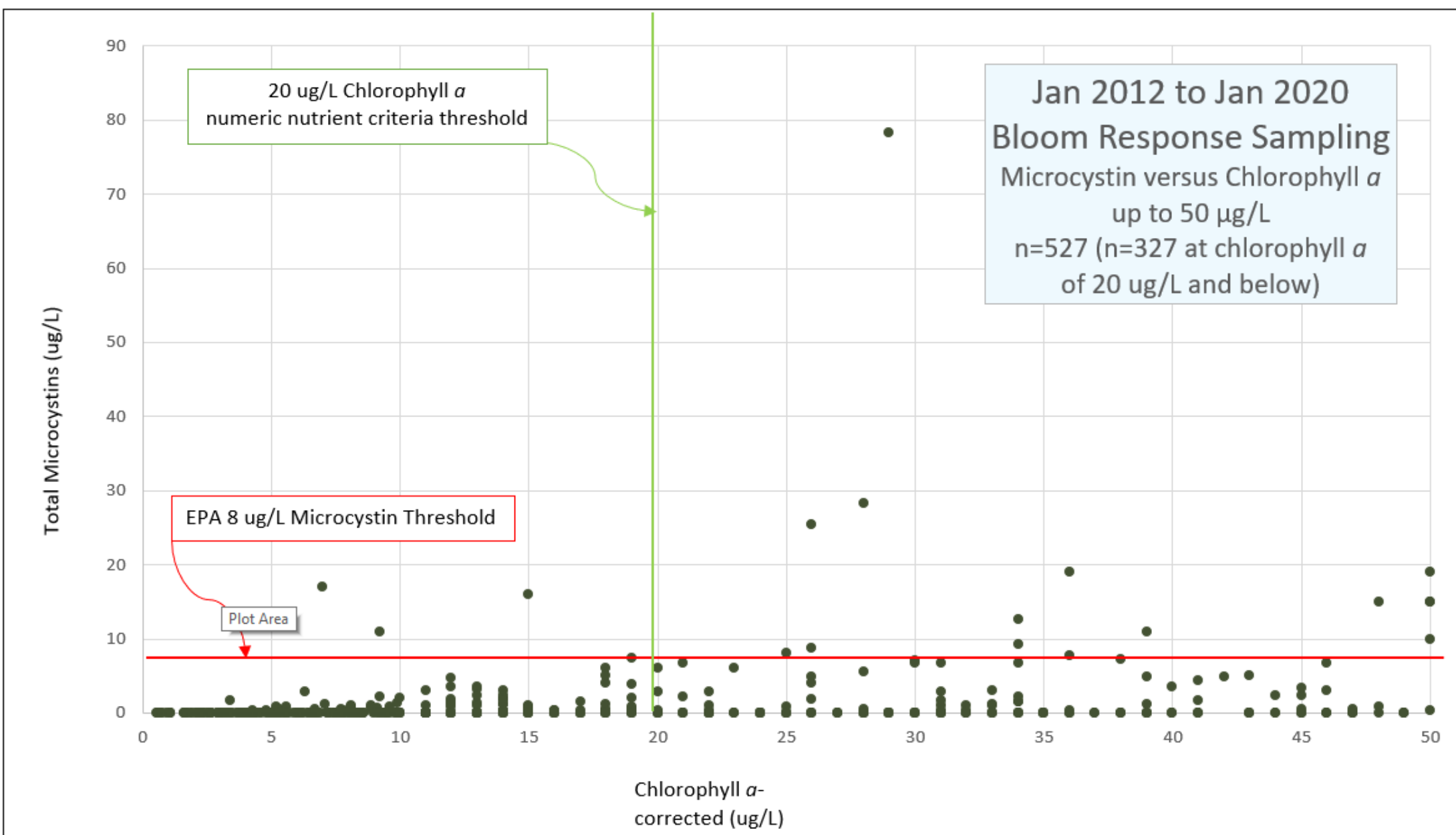
- **Caution advisory if cyanobacteria bloom present**
- **Alert advisory if cyanotoxins are present**
 - **Any detectable cyanotoxin**
- **DEP performs repeat sampling at sites with detectable toxin levels until toxins are no longer detected**
- **Alerts are removed once cyanobacteria bloom or toxins are no longer present per DEP HAB Dashboard**



PRECAUTIONARY PRINCIPLE

Visual presence of bloom used as threshold instead of numeric toxin value because:

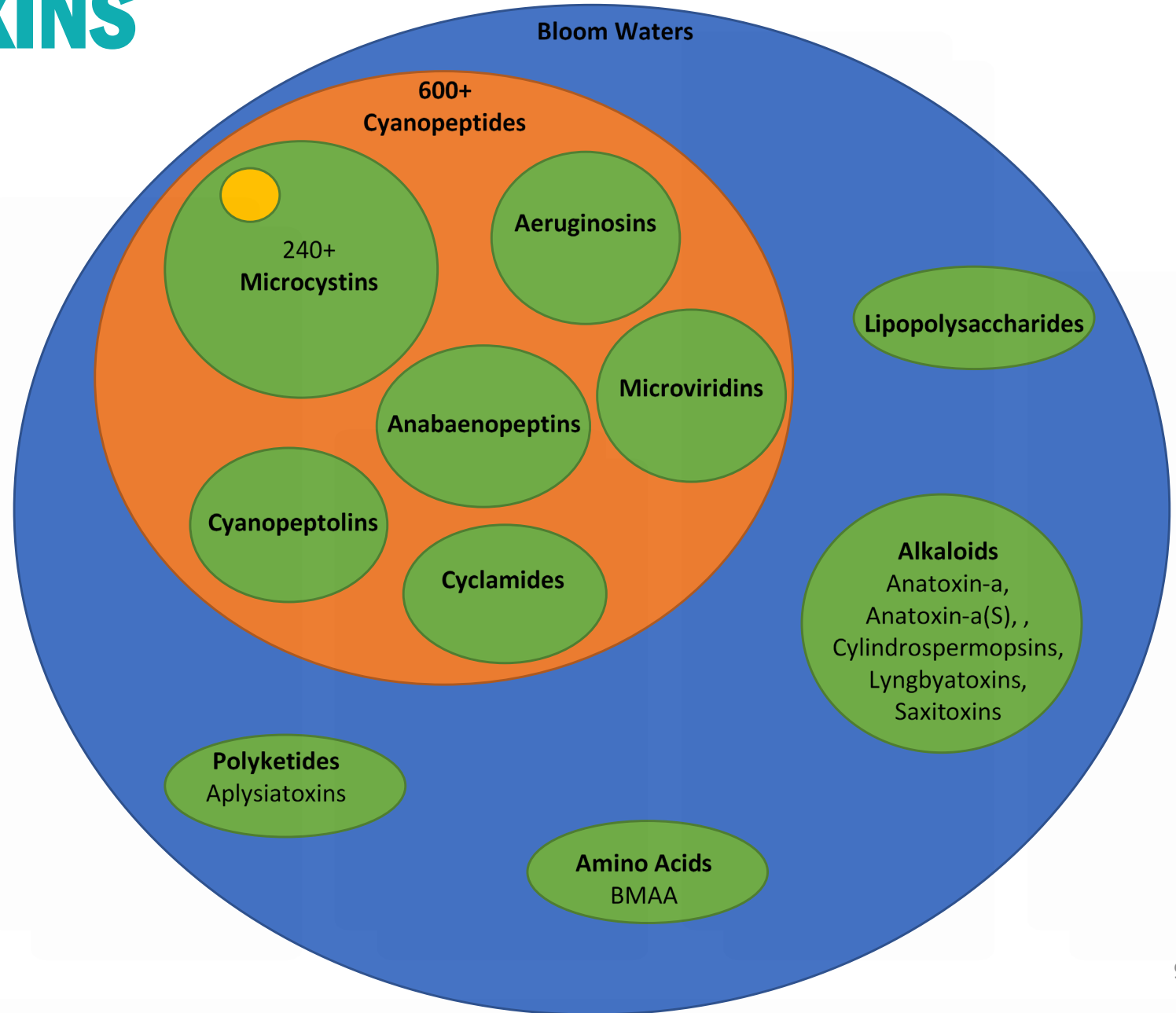
- **Lag time between sample collection and dissemination of results**
- **High spatial and temporal variability in algal cell and toxin concentrations**
- **Uncertainties as it relates to EPA's derivation of cyanotoxin thresholds**
- **Very low incidence of toxins in waters without visible bloom present**
- **Allows the public to make decisions about recreating in a water at the time of use**
- **Application of EPA's recommended criteria would not cause any additional waters in Florida to be listed as impaired**



- Florida monitoring data strongly suggest that cyanotoxin concentrations in waters with chlorophyll *a* values less than the state's maximum chlorophyll *a* criterion of 20 ppb are rarely (< 1% of the time) in excess of EPA's recommended threshold for microcystin.



CYANOTOXINS





CYANOTOXIN EXPOSURE

- **The state of Florida currently monitors surface waters for cyanotoxins when blooms are detected and as part of routine monitoring efforts by the South Florida Water Management District (Lake Okeechobee) and the St. Johns River Water Management District (St. Johns River and associated lakes)**
- **Cyanotoxins are not regularly monitored in fish tissues, sediments, or air, but they have been detected in all three media**
- **EPA's recommended recreational criteria/thresholds assume 100% of exposure is through incidental ingestion of water during recreational activities and all cyanotoxin congeners are of equal or lesser toxicity than MC-LR and Cylindrospermopsin**
- **There are few commercially available cyanotoxin analytical standards compared to the overall number of known toxins**
- **More realistic estimates of cyanotoxin risk to people, pets, livestock, and wildlife would require additional monitoring and research**

A lush green forest scene with a large tree overhanging a body of water. The water reflects the surrounding greenery and the large tree. The word "QUESTIONS?" is overlaid in white text in the center of the image.

QUESTIONS?

Florida Department of Health

Blue Green Algae Response



Division of Disease Control and Health Protection

Bureau of Environmental Health

Florida Blue Green Algae Task Force

7/29/2020

Cyanotoxins and Health



Kendra F. Goff, PhD, DABT, CPM, CEHP
Chief & State Toxicologist
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Email: HealthHABInfo@flhealth.gov



What is the Department's Role?

“To Protect, Promote and Improve the health of all people in Florida”

- Evaluation of Human Health Effects
- Surveillance of Human Illness
- Education of Health Care Professionals
- Outreach to the Public



Challenges to Evaluating Health Impacts

- Limited understanding of exposure dose from some exposure pathways
- Symptoms not specific to harmful algal bloom (HAB) exposures
- No Food and Drug Administration approved clinical laboratory tests for exposure
- Many health care professionals need more education to identify HAB-related illnesses
- Migration of people in and out of affected areas
- Scarcity of air monitoring data
- Expense and time of conducting long-term, human health studies



Florida Department of Health (DOH) Appropriation 2019-2020

- Appropriated \$650,000 for fiscal year 2019-2020
- Research Priorities
 - Prevention: Focus on prevention of impacts from exposure to HAB toxins
 - Treatment: Focus on improved treatment of impacts from exposure to HAB toxins
 - Health Disparities: Contribute to reduction of impacts from exposure to HAB toxins resulting from health disparities due to race, ethnicity, or income
 - Screening: Improve screening accuracy, detect high-risk subgroups, and/or improve implementation of screening program to increase early detection or prevention of HAB-related illness



DOH Funded Health Research: FY 19-20

Florida Atlantic University

\$269,285

- Assess toxin exposure of a group exposed to HABs
 - Sample blood, urine, and nasal cavity
 - Complete health survey; collect data for site, exposure frequency, duration of potential HAB exposures
 - Review self-reported symptoms to evaluate exposure and potential dose
- Refine methods in urine for detection of microcystin toxin
- Perform environmental sampling (surface water and air) before and during exposure



DOH Funded Health Research: FY 19-20

University of Miami

\$189,955

- Assess toxin exposure of a representative group of people exposed to HABs
 - Sample blood, urine, and lung function
 - Complete health survey
 - Look for visitors, residents, and those working around water
- Test air filtration systems' ability to filter HAB toxins



DOH Funded Health Research: FY 19-20

University of Florida

\$130,332

- Link electronic health record data to identify potential hotspots of human diseases associated with cyanobacterial toxins
- Provide environmental sampling with the St. Johns River Water Management District and Florida Lake Watch Network
- Analyze environmental samples for cyanotoxins



DOH Funded Health Research: FY 19-20

Florida Gulf Coast University \$60,428

- Provide environmental sampling in support of CDC community exposure study including design and statistical analysis of data collected
- Isolate cyanobacteria species from the bloom that have no information on toxicity to better understand potential human impacts

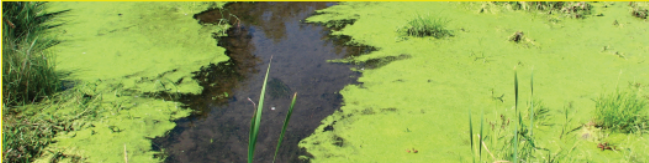


Cyanobacteria/Blue-Green Signage






CAUTION



Blue Green Algae may be in these waters.

THERE MAY BE TOXINS.



Use caution if you see algae at this time:


-  You should not swim at this location.
-  Avoid getting water in your eyes, nose or mouth.
-  You should not eat shellfish from this location.
-  Rinse fish fillets with tap or bottled water. Throw out guts. Cook fish well.
-  You should keep pets and livestock away from the waters in this location.




HEALTH ALERT


Blue Green Algae are in these waters.

STAY SAFE FROM TOXINS.

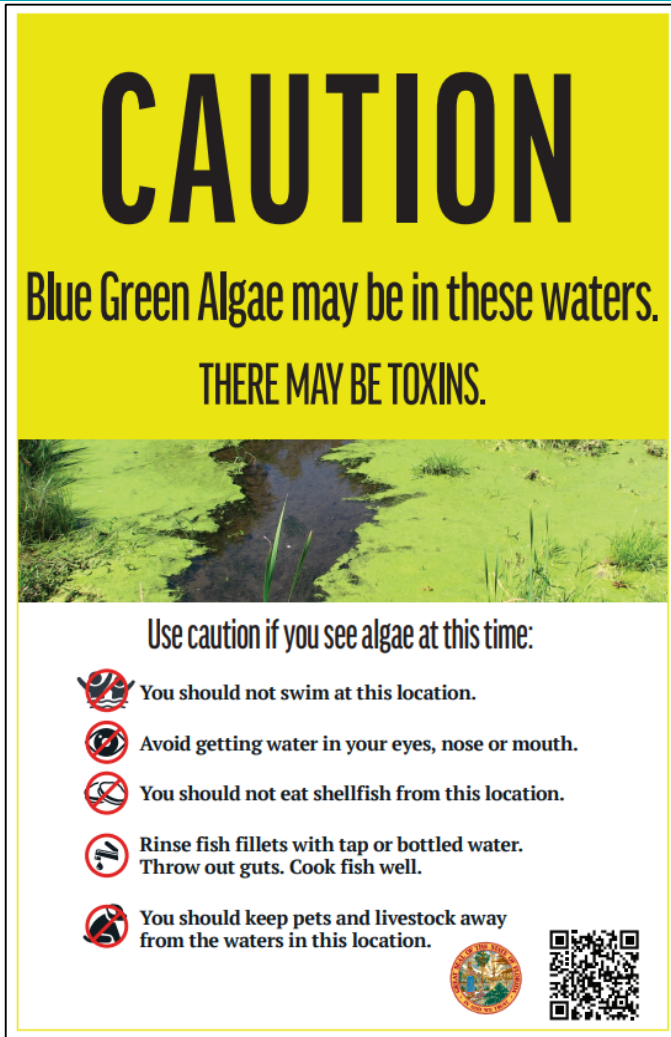


During this health alert:

-  Do not swim at this location.
-  Do not get this water in your eyes, nose or mouth.
-  Do not eat shellfish from this location.
-  Rinse fish fillets with tap or bottled water. Throw out guts. Cook fish well.
-  Keep pets and livestock away from these waters.



Cyanobacteria/Blue-Green **Caution** Sign



“If you see algae, stay out of the water”

- Placed at beginning of season
- Removed at the end
- Placed where public may contact HABs
- Locations chosen with local partners
- Consistent statewide approach
- Real-time
- Posted at publicly accessible points where blooms are present
- Not reliant on toxin results
- Easy to understand, clear message



Cyanobacteria/Blue-Green **Health Alert** Sign

HEALTH ALERT
Blue Green Algae are in these waters.
STAY SAFE FROM TOXINS.

During this health alert:

- Do not swim at this location.
- Do not get this water in your eyes, nose or mouth.
- Do not eat shellfish from this location.
- Rinse fish fillets with tap or bottled water. Throw out guts. Cook fish well.
- Keep pets and livestock away from these waters.

- Data driven
 - Local decision whether to use or not
- Uses laboratory-certified data
 - Trigger is the presence of toxins
 - Absence of toxin triggers removal of the signs
- More messaging available
 - Local County Health Department (CHD) website alert
 - Press release
 - **Health Alert** signage



Questions?



Kendra F. Goff, PhD, DABT, CPM, CEHP
Chief & State Toxicologist
Bureau of Environmental Health
Florida Department of Health
Email: HealthHABInfo@flhealth.gov





BLUE-GREEN ALGAE TASK FORCE Notification Process



SUMMARY OF TASK FORCE RECOMMENDATION

- **The task force recommended a communications plan relating to potential health impacts associated with exposure to algae and/or algal toxins that:**
 - **Is transparent**
 - **Is consistent**
 - **Is comprehensive**
 - **Takes into account diverse population in Florida**
 - **Informs the public**



EDUCATIONAL SIGNAGE

- Overall goal to increase awareness about blue-green algae blooms and their effects
- Designed to be permanent fixtures
- Can be installed at common public access points



DRAFT

PROTECTING TOGETHER

Florida's waterways allow visitors to experience the beauty and nature of this state. We are committed to ensuring that all Floridians can enjoy clean and abundant water.

BLUE-GREEN ALGAE BLOOMS

When you are on the water, be mindful of the many different types of animals and plants that you are likely to encounter. Florida is home to large number of species, many of which generally go unnoticed. Algae, for example, are an important part of Florida's aquatic ecosystems, but they can sometimes reach nuisance concentrations.



Individuals should avoid areas where algal blooms are present.



Algal blooms may make the water appear discolored.



Some algae produce toxins, which can cause irritation of the skin, eyes, nose and throat.



Humans and pets should not drink or swim in water where algae blooms are present.

KNOW BEFORE YOU GO.

Visit ProtectingFloridaTogether.gov to see if an algal bloom has been observed or to report an algal bloom. Explore the website to learn more about water quality throughout Florida, where you may find volunteer opportunities, and what we are doing to protect and restore our waters.



Waiting on QR Code: 2.5x2.5"

Waiting on Spanish QR Code: 2.5x2.5"

DRAFT



BLUE-GREEN ALGAE BLOOMS

When you are on the water, be mindful of the many different types of animals and plants that you are likely to encounter. Florida is home to large number of species, many of which generally go unnoticed. Algae, for example, are an important part of Florida's aquatic ecosystems, but they can sometimes reach nuisance concentrations.



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Florida HEALTH

2.5x2.5"

QR Code:
2.5x2.5"



ADVISORY SIGNAGE

- Overall goal to inform visitors that toxic blue-green algae have been identified
- Not a permanent fixture
- Placed at common public access points near where blue-green algae blooms and toxins have been identified



DRAFT

RECREATIONAL ADVISORY

 **A blue-green algae bloom was observed in this waterbody and algal toxins were present.**



Do not swim, wade or walk near algae or scum in the water.



Do not let pets or livestock swim or go near algae or scum in the water or shore.



Rinse fish fillets with tap or bottled water. Throw out guts.



Do not drink or use water for cooking.



Do not eat shellfish.

THIS AREA WILL CONTINUE TO BE MONITORED.

Visit ProtectingFloridaTogether.gov to view the most up-to-date information. Explore the website to learn more about water quality throughout Florida, where you may find volunteer opportunities, and what we are doing to protect and restore our waters.



Waiting on QR Code: 1.7x1.7"

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