



# Lake Hopatcong Cyanobacterial Harmful Algal Bloom (HAB)

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Bureau of Freshwater & Biological Monitoring (BFBM)  
Division of Water Monitoring & Standards  
Department of Environmental Protection

*Lake Hopatcong Commission Meeting  
Hopatcong High School  
July 8, 2019*

# Overview

- Cyanobacterial Harmful Algal Blooms (HABs)
- HAB Recreational Response Strategy - 2017
- HAB Outreach & Website
- Lake Hopatcong 2019 HAB Response
  - HAB reports, field monitoring & aircraft flights
  - Advisories & beach closures
  - Current status



# What are Cyanobacterial HABs?

- Cyanobacteria
- Blooms
- Cyanobacterial HABs (CyanoHABs)
  - Can produce cyanotoxins
  - Blooms not producing toxins can also have adverse impacts
  - Blooms not producing toxins at one time can subsequently produce toxins



# What are the Risks?

## **Humans:**

Adverse effects can include: Flu-like symptoms, rash, allergic reactions, or more serious liver, kidney or nervous system impacts.

## **Animals:**

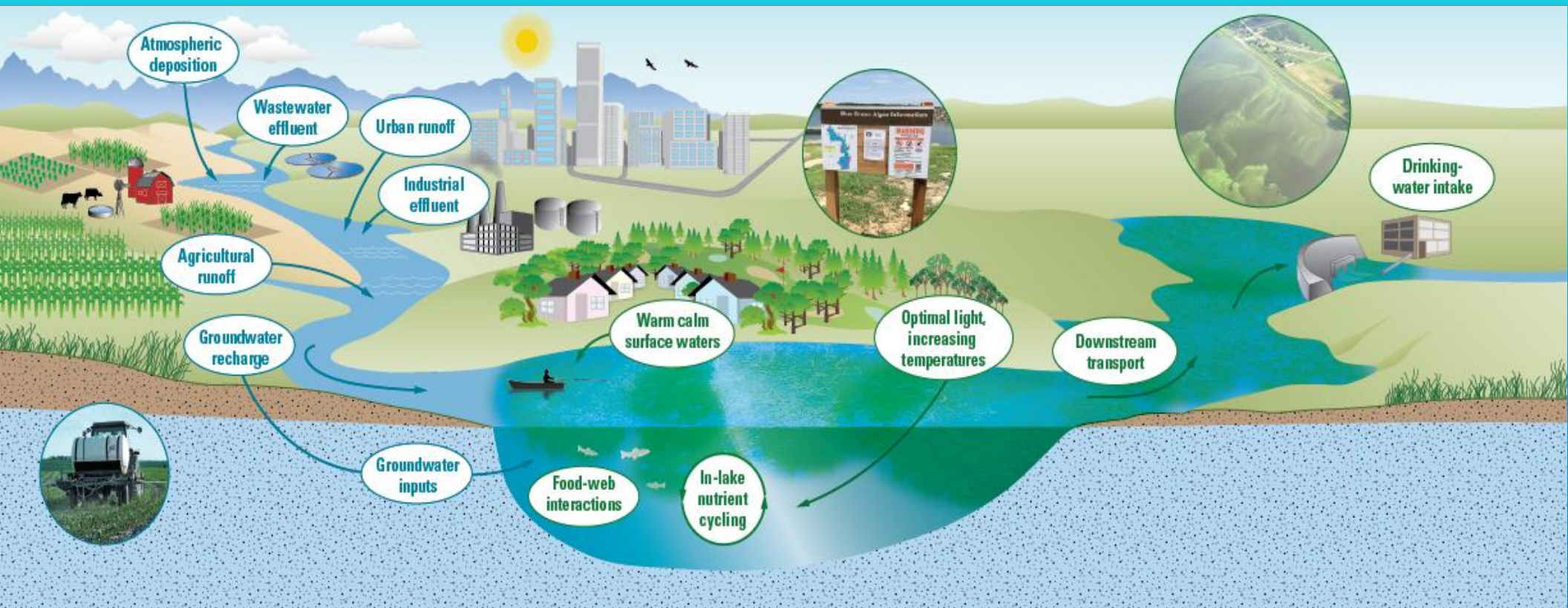
Effects on wildlife, pets, and livestock can include sickness and death.



# Background

## What Causes Algal Blooms?

Many environmental factors influence the occurrence of algal blooms. In general, an algal bloom indicates an ecosystem imbalance.



# **Need For State Capacity Building & Preparedness for Freshwater Cyanobacterial HABs**

- Increasing global incidence & concern
- Primary concerns – recreational & drinking water exposure
- High profile blooms (e.g., Toledo, Ohio River, & Lake Okeechobee)
- Impacts - human & animal health, ecosystem & economic
- Need for NJ to develop HAB lab testing, monitoring & response strategy (2016 Interagency Workgroup)

# Cyanobacterial Harmful Algal Blooms (HABs)

## Freshwater Recreational Response Strategy

- BACKGROUND
- RECREATIONAL THRESHOLDS
- HAB MONITORING & RESPONSE
- ADVISORIES
- RESEARCH
- OUTREACH & COMMUNICATION



NJ Department of Environmental Protection  
Division of Water Monitoring and Standards  
Bureau of Freshwater & Biological Monitoring

### Cyanobacterial Harmful Algal Bloom (HABs) Freshwater Recreational Response Strategy



Revision 1.0  
June 2018

<https://www.nj.gov/dep/wms/bfbm/CyanoHABhome.html>



# Cyanobacterial Harmful Algal Blooms (HABs) Freshwater Recreational Response Strategy and Guidance

## PURPOSE

- Provide unified statewide approach for responding to HABs in freshwater recreational waters and sources of drinking water.
- Identify programs and define actions for appropriate response.
  - Coordinated by DEP Bureau of Freshwater & Biological Monitoring





# HAB Reporting

NJDEP Hotline:

**Environmental Emergency?**  
**1-877-WARN-DEP**  
1-877-927-6337

**Environmental Non-Emergency?**

Try our new  
WARN NJDEP  
mobile app



HAB Button – NJDEP Homepage

<https://www.state.nj.us/dep/index.html>

General HAB Website

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

BFBM HAB Page

<https://www.state.nj.us/dep/wms//bfbm/CyanoHABHome.html>

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**Cyanobacterial Harmful Algal Blooms (CyanoHABs)**

[Return to the full HABs Home Page.](#)

[Report a HAB](#)

[CyanoHAB Photos](#)

**Cyanobacteria**

Also known as blue-green algae, but are not true algae. Naturally present in lakes and streams in low numbers. Can form dense blooms under suitable environmental conditions - sunlight, high nutrients, warm temperatures and calm water.

**Cyanobacterial Harmful Algal Blooms (CyanoHABs) Blooms:**

Can discolor the water or produce floating mats or "scums" on surface. Dissolved oxygen rises when algae or cyanobacteria are in the growth state and respiring, and



# HAB RESPONSE

**Bathing beach or youth camp** - DEP/BFBM directs sampling and analysis. DEP notifies local HD and State DOH.

**Parks waterbody or drinking water source –**

DEP/BFBM directs sampling and analysis. Notifies Parks or Division of Water Supply and Geosciences.

**If other public or private water body** - DEP notifies & coordinates with appropriate local government agency

**Note:** licensed bathing beaches are under NJDOH regulation. New Jersey State Sanitary Code Chapter IX Public Recreational Bathing N.J.A.C. 8:26

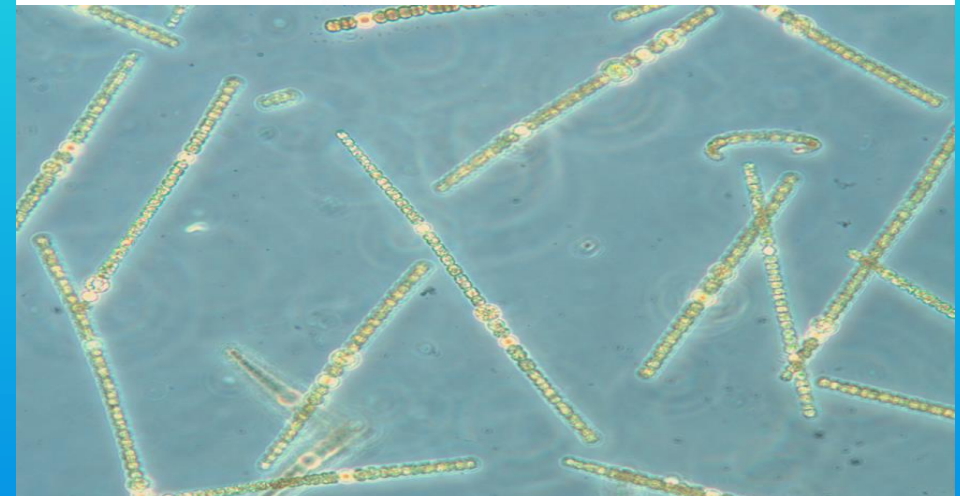
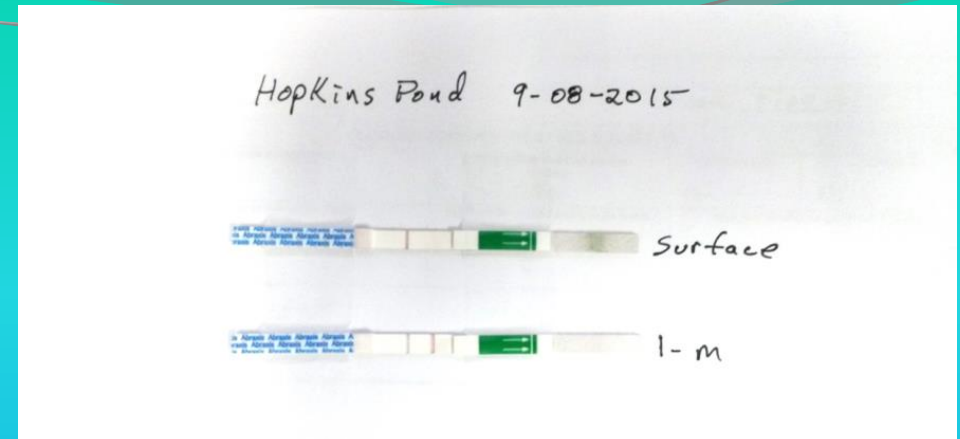


Hopatcong State Park 7/1/2019



# HAB MONITORING AND RESPONSE

- Field screening and visual surveillance (strip test, phycocyanin)
- Lab - species ID and cell counts
- Toxin lab analysis - ELISA
  - CAAS - Cyanotoxin Automated Assay System



# Thresholds Used For Advisories and Beach Closures

## HUMAN HEALTH RECREATIONAL THRESHOLDS

Developed by DEP Division of Science and Research

Cell counts > 20,000 cells/ ml

Or toxins;

- Microcystins:  $\geq 3 \mu\text{g/L}$
- Cylindrospermopsin:  $\geq 8 \mu\text{g/L}$
- Anatoxin-a:  $\geq 27 \mu\text{g/L}$

EPA's "Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin" released May 2019 - will be assessed by DEP. (Anatoxin not included)



# HARMFUL ALGAL BLOOM ADVISORIES

WATERBODY: <http://www.nj.gov/dep/wms/HABS.html> 

**WARNING**


**SUSPECTED  
HARMFUL ALGAE BLOOM (HAB)  
PRESENT**

**WARNING - Avoid Contact or Ingestion (Humans and Animals)**

*A Harmful Algal Bloom is suspected which can be harmful to humans and animals.  
People, pets, and livestock should avoid contact and drinking the water.  
Avoid swimming, wading, and watersports.  
Fish caught in this waterbody should not be eaten.*

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WATERBODY: [www.nj.gov/dep/wms/HABS.html](http://www.nj.gov/dep/wms/HABS.html) 

**DANGER**

**HARMFUL ALGAE BLOOM (HAB) PRESENT**  
*HIGH RISK-NO Contact or Ingestion (Humans and Animals)*

**A confirmed Harmful Algal Bloom is present with levels  
quantified at or above the NJ Health Advisory Guidance.**

*Do not drink or have contact with the water including, but not limited to, swimming, wading and watersports.  
Fish caught in this waterbody should not be eaten.  
Pets and livestock should not contact or drink the water.*

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# CyanoHABs Website

<https://www.state.nj.us/dep/wms/bfbm/CyanoHABHome.html>

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### Cyanobacterial Harmful Algal Blooms (CyanoHABs)

[Return to the main HABs Home Page.](#)

[Report a HAB](#)

[CyanoHAB Photos](#)




Photo Credit: NJDEP

#### Cyanobacteria

Also known as blue-green algae, but are not true algae. Naturally present in lakes and streams in low numbers. Can form dense blooms under suitable environmental conditions - sunlight, high nutrients, warm temperatures and calm water

#### Cyanobacterial Harmful Algal Blooms (CyanoHABs) Blooms:

Can discolor the water or produce floating mats or "scums" on surface. Dissolved oxygen rises when algae or cyanobacteria are in the growth state and respiring, and decreases when algae continue to respire at night. During significant blooms, extreme depletion of oxygen may be detrimental to fish and other aquatic organisms.

#### Cyanotoxins

- Cyanobacteria can produce toxins that are dangerous for humans, pets, livestock and wildlife.
- The toxins produced by the cyanobacteria are referred to as cyanotoxins.
- Cyanotoxins can be produced by a wide variety cyanobacteria.


#### Most common toxin producing taxa

- Microcystis and Anabaena.
- Degree of toxicity varies with species and concentrations.
- **Microcystis**: resemble a greenish, thick, paint-like (sometimes granular) material that accumulates along shores. Scums that dry on the shores of lakes may contain high concentrations of microcystin for several months, allowing toxins to dissolve in the water even when the cells are no longer alive or after a recently collapsed bloom.
- **Anabaena**: slimy blooms on the surface. Anabaena blooms may develop quickly and also resemble green or blue-green paint. Some species also form colonies, which are seen as large dark dots in water samples.

#### Most common cyanotoxins

Based on the surveys that have been carried out to date in U.S. waters, the most commonly identified cyanotoxins are [microcystins](#), [cylindrospermopsins](#), [anatoxins](#) and saxitoxins. Additional information on CyanoHABs, including other states' activities, is available on the [EPA CyanoHABs website](#).

Information on how NJ handles cyanobacterial harmful algal blooms can be found in the [Cyanobacterial Harmful Algal Blooms \(HABs\) Response Strategy document](#).



NJ HAB Response Strategy Document



# Lake Hopatcong HAB - 2019

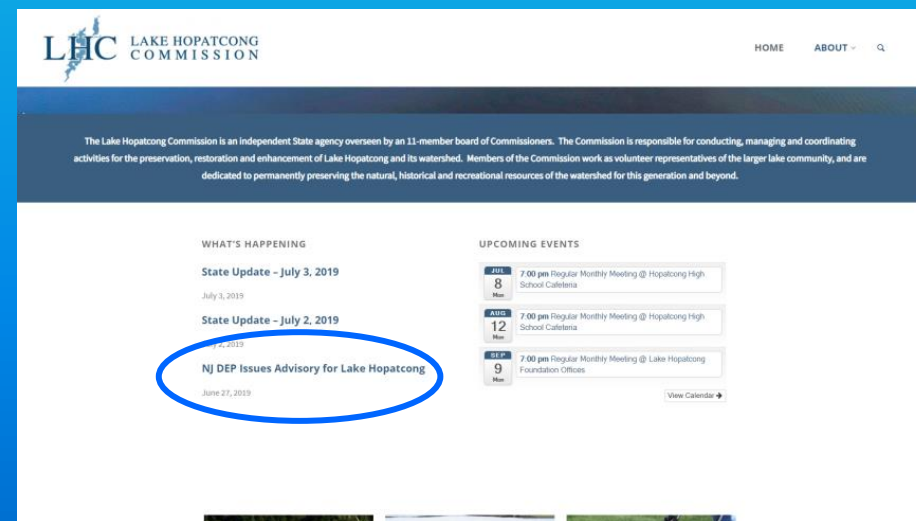


# Chronology of Events

- 6/18/19 – Initial report -Byram Bay area (Pebble Bay Beach and Sand Harbor Beach)
  - BFBM initiated response and coordinated with local health departments
- 6/20/19 - Additional reports in Byram Bay Area
  - Lake Hopatcong Commission informed local municipalities of advisory; advisories posted on Commission web and Facebook pages



Byram Bay Area 6/20/19





# Chronology of Events (cont)

6/20/19 - 6/26/2019

- Numerous reports of suspected HABs
- BFBM performed sampling and lab analysis at targeted beaches
- Targeted beaches closed as result of lab testing



6/26/19

- Flight reconnaissance commenced
- Advisory recommended to close all beaches due to extent of HAB



# Chronology of Events (cont)

6/27/19 – present

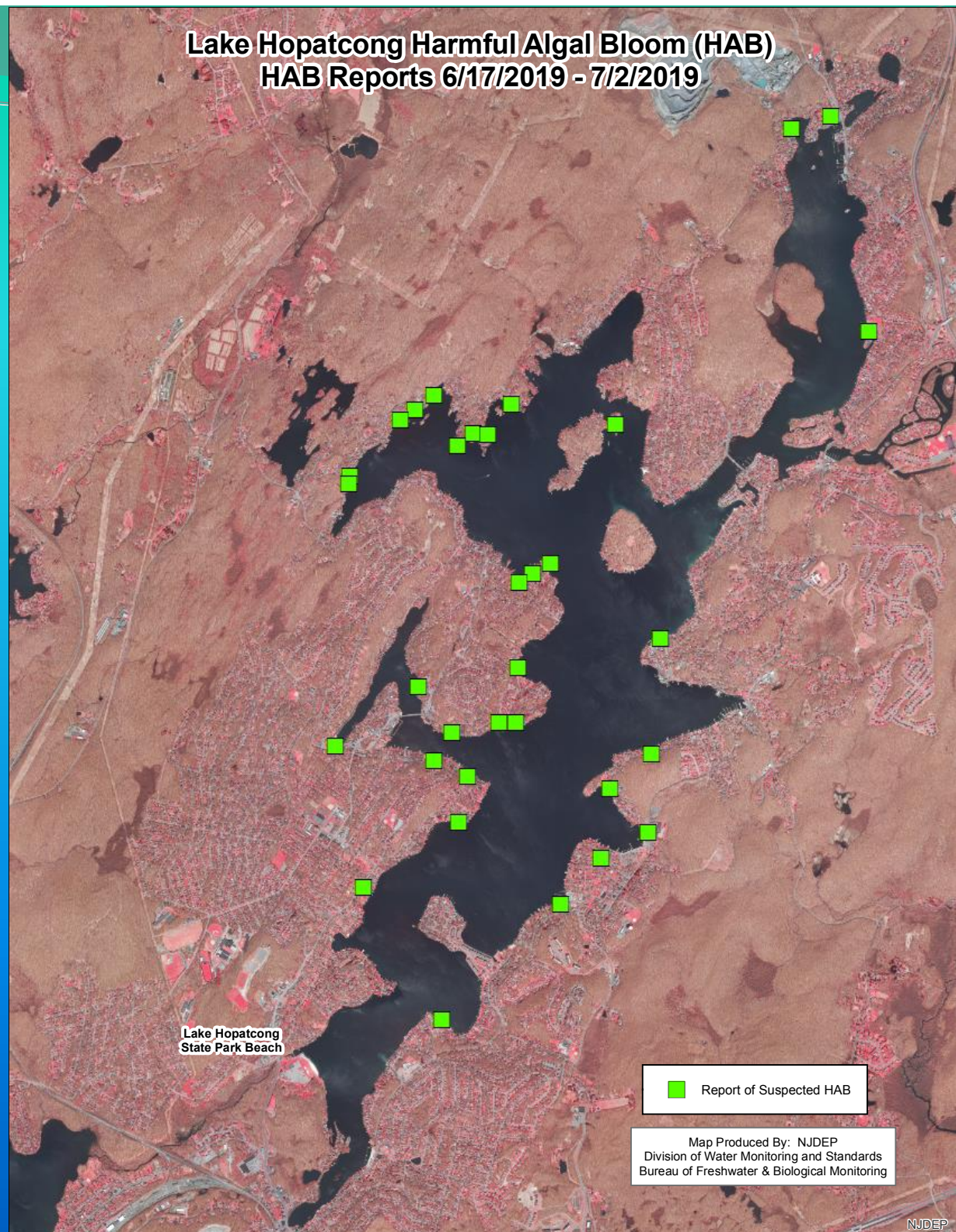
- DEP **Press Releases** (6/27, 7/3) with advisory for entire lake

*“DEP is recommending that local health authorities close all public swimming beaches along the lake due to the widespread nature of the bloom...**avoid all contact with water from Lake Hopatcong until further notice. People also should not eat fish caught in the lake or allow pets to come in contact with lake water or drink the water.**”*

- DEP continues **aircraft surveillance** (6/28, 6/30, 7/2, 7/5), **sampling** (6/28, 7/1, 7/2, 7/5), and **analysis**



# Lake Hopatcong 2019 HAB Reports (6/17-7/2/19)



# DEP Use of Advanced Technology for HABs

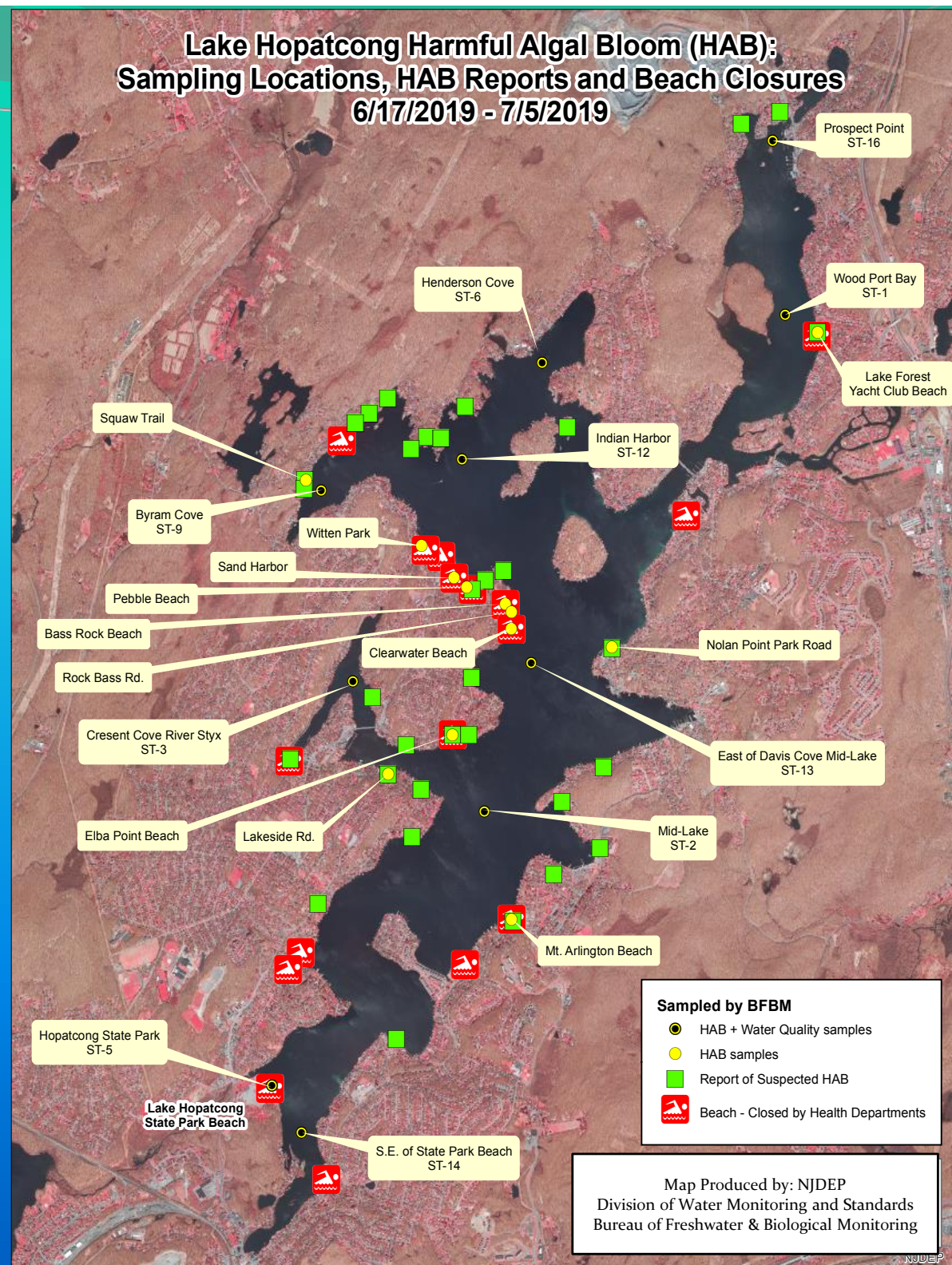
- Hand-held Phycocyanin Meters (e.g. Aquaflor)
- Aircraft Remote Sensing
  - Fixed Wing Phycocyanin sensor
- Continuous monitoring buoys (DEP and USGS)
  - Temperature, Specific Conductance, Dissolved Oxygen, pH, Turbidity, and Phycocyanin
  - Readings every 5 min
  - Hourly data will be available:  
<http://njdep.rutgers.edu/continuous/>



Photo courtesy of YSI



# Sampling Locations, HAB Reports and Beach Closures



# Bathing Beach Cell Count Results

## Collected as of 7/2/2019

Site name	Station# (where applicable)	Cyanobacteria Counts cells/mL*						
		Date Sampled						
<b>Bathing Beach Sites</b>		6/18/2019	6/21/2019	6/26/2019	6/27/2019	6/28/2019	7/1/2019	7/2/2019
Pebble Beach		57,000					95,000	16,850
Sand Harbor		51,375					9,250	27,800
Clearwater Beach			8,750				21,000	13,000
Bass Rock Beach			35,812				33,030	53,450
Lake Forest Yacht Club Beach				9,750			115,000	4,400
Elba Point Beach				37,125			18,500	29,090
Mt. Arlington Beach					179,000		12,750	14,125
Hopatcong State Park	ST-5					24,250	7,750	0
SE. of State Park Beach	ST-14					34,000		21,100
		*NJ Health Advisory Guidance Levels Cell Count ≥ 20,000 cells/ml;						
			Indicates > than advisory levels					



# Other Lake Site Results as of 7/3/2019

Site name	Station# (where applicable)	Cyanobacteria Counts cells/mL*							
		Date Sampled							
Other Lake Sites		6/18/2019	6/21/2019	6/26/2019	6/27/2019	6/28/2019	7/1/2019	7/2/2019	7/5/2019
Nolan Point Park Road		12,500					12,500	11,900	
Rock Bass Rd.			9,750						
Squaw Trail			11,875						
Lakeside Rd.			10,281						
Witten Park					14,500				
Wood Port Bay	ST-1					34,000		8,000	Pending
Mid-Lake**	ST-2					36,000		65,750	Pending
Crescent Cove River Styx	ST-3					34,500		2,000	Pending
Henderson Cove	ST-6					28,280		19,000	Pending
Byram Cove	ST-9					10,250		28,000	Pending
Indian Harbor	ST-12					22,000		39,750	Pending
East of Davis Cove Mid-Lake	ST-13					18,500		19,000	Pending
Prospect Point	ST-16							5,150	
** Collected from surface 0.5, 1.0 and 2.0 meters. Highest results listed (1 meter)		*NJ Health Advisory Guidance Levels Cell Count $\geq$ 20,000 cells/ml; Microcystins $\geq$ 3 $\mu$ g/L							
						Indicates > than advisory levels			

# Microcystin Results for All Samples Collected as of 7/5/2019

- 48 Samples Collected at 22 Sites (beaches & other waters)
- All results below Health Advisory Level ( $\geq 3$  ug/L)
- Measurable Levels in 31 samples:  $< 0.15 - 1.35$  ug/L
- 17 Results Below Reporting Level



# Actions

- Continued response and reporting according to the HAB Strategy
- Continued field monitoring and lab analyses until results below NJ Health Advisory Guidance levels (for beaches – 2 consecutive samples below thresholds required to open)
- Continued flight monitoring of the lake
- Water quality continuous monitoring buoys to understand and predict blooms

# Thanks to DWMS & DSR Personnel

- *DWMS*

- **Bureau of Freshwater & Biological Monitoring**

- Vic Poretti, Dean Bryson, Tom Miller, Johannus Franken, Brian Taylor, John Abatemarco, Briana Morgan, Briana King, Jenna Krug, Dari Logan

- **Bureau of Marine Water Monitoring**

- Bob Schuster, Rodney Sloan, Carrie Lloyd

- **Director's Office**

- Bruce Friedman, Alena Baldwin-Brown, Paul Morton

- **Bureau of Environmental Analysis, Restoration & Standards**

- Sheri Shifren, Emmalee Carr

- *DSR* – Rob Newby



# Thanks to our Partners:

- DEP Division of Parks and Forestry
- DEP Division of Fish and Wildlife
- NJ Department of Health
- Sussex County Health Department
- Mt. Arlington Health Department
- Roxbury Health Department
- Jefferson Twp. Health Department
- Mt. Olive Health Department
- Lake Hopatcong Commission
- Lake Hopatcong Foundation
- Princeton Hydro
- United States Geological Survey

# Contact Information

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Monitoring

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BFBM Website -

<https://www.state.nj.us/dep/wms//bfbm>

HAB website – <https://www.nj.gov/dep/HAB>

