

Blue-Green Algae Blooms in the Mohawk Watershed

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Background

Toxin-producing cyanobacteria -- a.k.a. blue-green algae (BGA) or harmful algal blooms (HABs) -- in lakes and streams can negatively impact public health and recreation. BGA blooms are a growing public safety concern throughout New York State, and so state agencies have developed a protocol for identifying and responding to them. NYS Office of Parks and Recreation (NYS Parks) currently addresses BGA blooms at bathing beaches and other waterbodies within State Park boundaries. The NYS Parks Environmental Management Bureau (EMB) in Albany, NY trains park managers and other staff on how to identify a bloom, how to report a sighting, and how to educate and protect the public.

We provide a case study of blue-green algae blooms in the Mohawk Watershed, including how they were identified and responded to by NYS Parks staff. Delta Lake State Park reported 2 BGA blooms in 2016. One of these blooms was reported in July at Turtle Pond, and the other bloom was reported in September at the Delta Lake bathing beach, causing a closure for 2 days until the water tested negative for toxins. The timely reactions of the park manager and the EMB staff kept the public from being exposed to the toxins that can be associated with bloom conditions.

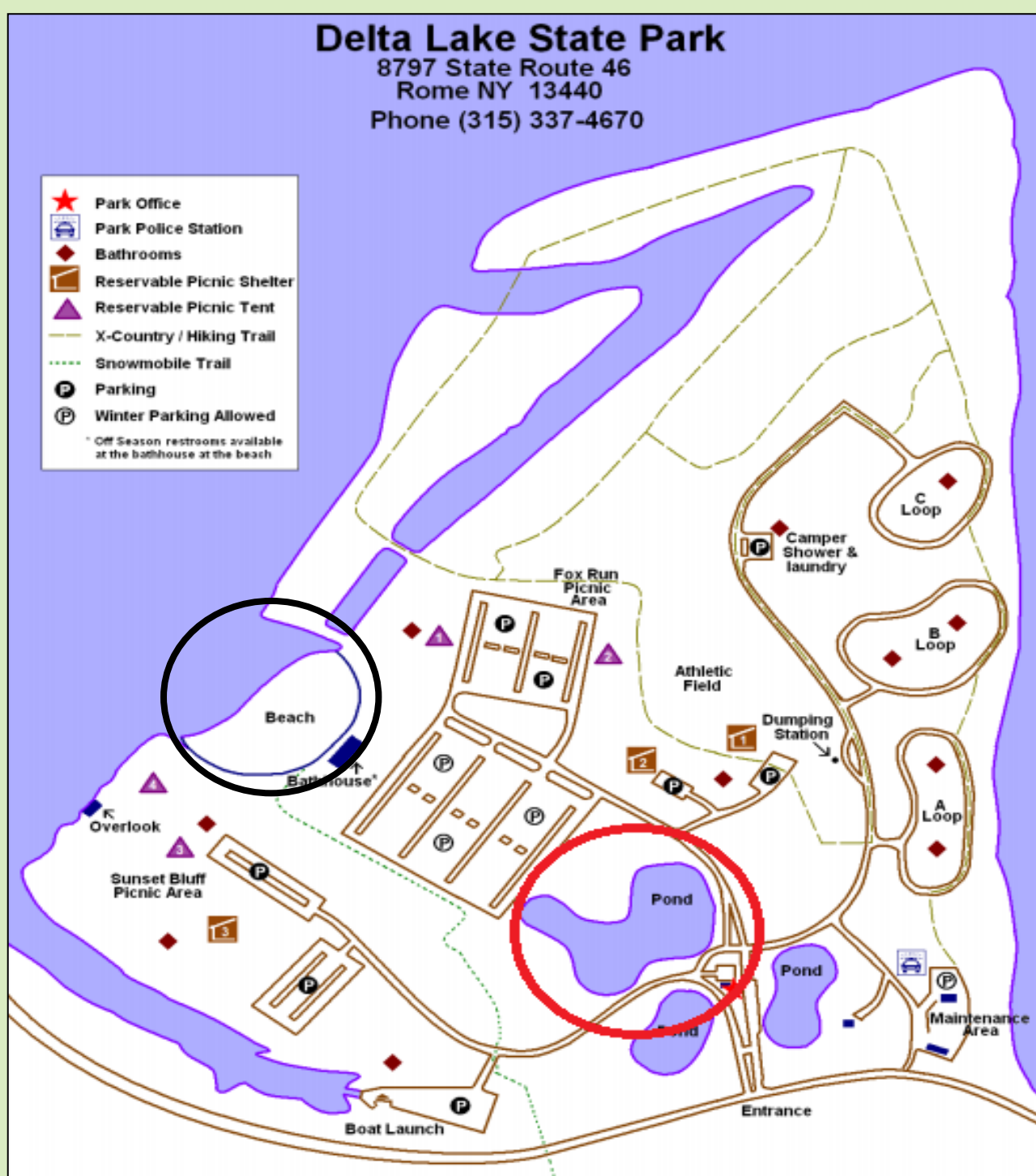
BGA causes & health impacts

Blue-green algae blooms have been found in a variety of conditions – in freshwater, estuarine and marine waters, and even under ice. Not all cyanobacteria produce toxins, and some genera, like *Anabaena*, *Aphanizomenon*, and *Microcystis*, are more associated with toxin production than others. Generally, toxin-producing genera of cyanobacteria tend to proliferate in warm weather, and prefer stagnant water with high levels of nitrogen and phosphorus. Toxins vary and can target different organs and systems, including the liver, skin, nervous system, kidney, and lymphoid tissue. Currently there is no affordable, rapid technology to identify the genera or toxins present in a bloom. There are, however, kits that use test strips to estimate specific toxin presence/absence.

Table 1: BGA bloom Health Effects		
Organism	Health Effects	
Fish, Aquatic Fauna	When large BGA blooms die, their biomass falls to the bottom of the waterbody to decompose. This can lead to a dramatic decrease in dissolved oxygen in the water column that can suffocate aquatic life and lead to large fish die-off events.	
Aquatic Plants	Cyanobacteria can regulate their buoyancy in the water column to maximize their access to light for photosynthesis. This phenomenon can result in large BGA blooms blocking the sunlight from habitats below and inhibiting photosynthesis in submerged aquatic plants.	
Humans	Can range from mild (skin rash) to severe (muscular paralysis) depending on the toxins present, the exposure pathway (see table below), and the organ systems affected.	
Pets	Dogs can have severe reactions to some algal toxins. They can swallow BGA when they lick their fur after swimming in affected waters. Toxins may result in vomiting and, in some cases, death.	

Table 2: Toxin Exposure Pathways		
Exposure Pathway	Recreational activity	Potential Exposure Level
Ingestion, inhalation	Submersed in water: swimming, wading, diving Splashing contact with water: water skiing, wake boarding, wind surfing, jet skiing	High
Inhalation, skin contact, ingestion	Boating on the water: canoeing, rowing, sailing, kayaking Motor boating Fish consumption**	Moderate
Skin contact	Catch-and-release fishing**	Low/none

Case Study: Delta Lake State Park



Location of Turtle Pond & Delta Lake swimming beach.



July 13, 2016 – Bloom persists in pond. Park manager continues to monitor location & extent.



July 11, 2016 – Streaks sighted in Turtle Pond. Park manager contacts NYS Parks EMB.



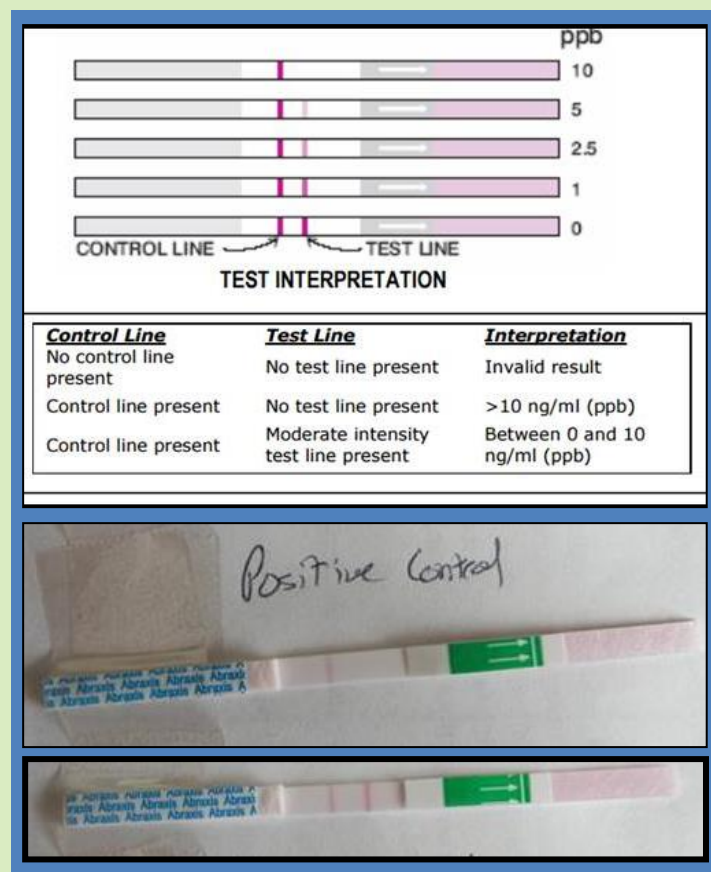
August 5, 2016 – Bloom persists in pond. The bloom disappears by late September.

A small bloom later appeared at the Delta Lake swimming area at the end of the summer. The park manager sent photos to EMB to confirm, closed the beach and posted public notice signs. 24 hours after the bloom disappeared, the swim area was tested for the toxin microcystin using a test kit manufactured by Abraxis (0-10ppb Microcystins, Recreational Water with QuikLyse™, approx. \$24/test). The test came back negative (<10 ppb limit by WHO), and the beach was reopened. Beach closure and reopening notifications were posted online by EMB.

****As more information becomes available, BGA toxin standards/risks, detection methods, and response protocols are subject to change.**



September 3, 2016 – Scum in Delta Lake, leading to beach closure @12:45pm.



September 4, 2016 – Toxin test strip negative.** Beach reopened Sept. 5, 2016.

How to ID

“Blue-green algae” is a misnomer. It is not technically algae, and it is not always blue-green. BGA refers to various species of cyanobacteria, which are bacteria that can photosynthesize and appear blue, green, brown, red and even purple. However, there are key signs to watch for. BGA blooms tend to have a “spilled paint” look, floating on the surface of the water as a foamy mat, in globules or often as a streaky film. BGA might stick to surfaces like boat paddles. Blooms tend to collect near the shore & grow in stagnant water. A BGA bloom may also have a musky odor.

If the substance is green and hairy, it is likely a true algae, such as *Cladophora* spp. If the substance is grainy, it could be a type of duckweed, like *Wolffia* spp. or *Lemna* spp., or even just clumps of floating pollen.

Other approaches may be used to verify BGA beyond naked-eye identification: specific toxin field test kits, microscopic examination, and laboratory assays (e.g. ELISA, LCMS).**



Tends to collect near shore or grow in still water.

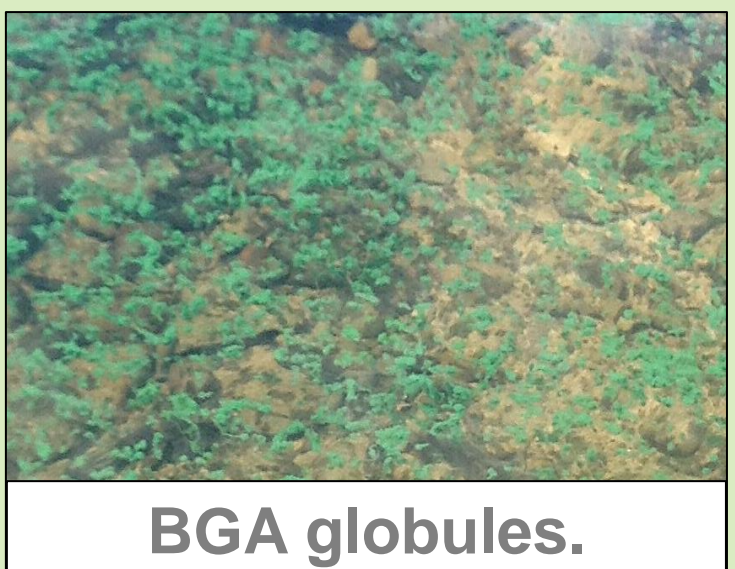


“Spilled paint” look, floating & often streaky.

What to do if you see a bloom**



Sticking to paddle.



BGA globules.

- Take photos (several & from different angles).
- Report to NYS Dept. of Environmental Conservation.
- People and pets must not swim in, touch or ingest the water. Eating fish caught in BGA-infested water is strongly discouraged.
- After bloom clears, wait. **Toxins may remain in water for 24 hours.** As dead BGA cells release their contents, toxin levels might be elevated at this time.

Noticing repeat blooms?

If you are a researcher or part of the local waterbody/watershed association, consider keeping an eye on potential causes of repeat BGA bloom events.

- Explore possible **nutrient inputs** (e.g. phosphorus, nitrogen) from the nearby watershed. Several activities may cause an increase in nutrient levels conducive to BGA blooms. Excess fertilizers from agriculture or residential areas may leach into the groundwater or wash into local waterbodies via stormwater. Old septic infrastructure can leak into groundwater.
- Consider changes within the **waterbody** itself. Shifts in the aquatic community (plants, fish, etc.) may help give clues to chemical or thermal changes in the water. Increased activities such as motorized boating may stir up bottom sediment, which may cause a spike in phosphorus levels. Lower water levels or slower/halted stream flows may lead to warmer waters, which are more conducive to BGA growth.

About EMB Water Quality Unit

The Water Quality unit in NY State Park’s Environmental Management Bureau (EMB) helps manage the lakes, streams and bathing beaches in State Parks. Duties include testing for nutrients and other indicators of water health, conducting aquatic plant surveys, coordinating beach water quality monitoring, and responding to incidents related to public and/or ecological health.

About the Park

Delta Lake State Park is located in Rome, NY. The Delta Lake beach area typically has water quality that is better than the standards set forth by the EPA for bathing beaches. Visitors can enjoy swimming and camping in the summer, cross-country ski trails in the winter, and nature trails and picnic areas year-round.

For more information: <https://parks.ny.gov/parks/66/>

Resources

NYS Department of Environmental Conservation – receives and keeps track of reports for BGA blooms and HABs throughout the state, helps confirm suspected BGA blooms. <http://www.dec.ny.gov/chemical/77118.html>
NYS Department of Health – sets public health guidelines regarding BGA, helps confirm suspected BGA blooms <https://www.health.ny.gov/environmental/water/drinking/bluegreenalgae/>
Stone D and Bress W. – Exposure pathways table adapted from 2006 paper “Addressing Public Health Risks for Cyanobacteria in Recreational Freshwaters: The Oregon and Vermont Framework.” Integr. Env. Assess. & Mngmt. 137-42.
US Env. Protection Agency – provides resources & guidance on BGA toxins.
World Health Organization – provides resources & guidance on BGA toxins.

Acknowledgments

- Photos by New York State OPRHP staff.
- Case study information based on correspondences between Karen Terbush and Joe Morisette.
- State Parks works closely with BGA experts at the NYS Dept. of Health and NYS Dept. of Environmental Conservation in confirming and reporting BGA blooms, developing protocols for the protection of park patrons and their pets, and public education and outreach.



NYS DOH
BGA factsheet



NYS DEC
HABs info

Further Information

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