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Cyanobacteria: Understanding Blue-Green Algae's Impact on Our Shared Waterways

Guinn Garrett Wallover, Water Resources Agent, Clemson Extension

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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.

What are cyanobacteria/blue-green algae?

Cyanobacteria, sometimes referred to as blue-green algae, share characteristics with both algae and bacteria. Cyanobacteria are closely related to true bacteria, but perform photosynthesis like algae to gain or fix energy, and in turn, produce oxygen. Cyanobacteria are among the oldest organisms on earth and occur in diverse habitats, including both soil and water. In water, cyanobacteria are naturally present in small numbers in slow-moving fresh or brackish water bodies. However, when waterways become enriched with nutrients, naturally or due to human-related activities, this is called ***eutrophication***. This increased concentration of nitrates and phosphates can lead to rapid and explosive growth of ***cyanobacteria***. This rapid growth is called a bloom. Cyanobacteria blooms will typically occur on the surface of a waterbody and vary in color, often looking bright green to blue-green, and may be dense enough to resemble paint on the water's surface (*see Figure 1*).

Figure 1. Cyanobacteria blooms often have a telltale bright bluish or green coloration, giving them the name "blue-green algae". Dense blooms may resemble what looks like paint on the water's surface, as seen in the photo on the right. Photos courtesy Hillary Repik.

All algal blooms have the potential to negatively affect the health of a waterway through the depletion of available oxygen in water for aquatic and marine life. Low dissolved oxygen levels can lead to fish kills; when this condition persists, the result is "dead zones," where oxygen in water is so low that aquatic life is suffocated and very little life exists.

Cyanobacteria blooms have been labeled "harmful algal blooms" because they can release toxins into waterways as cyanobacteria cells die and breakdown. Of the 2,000 species of cyanobacteria that have been identified, more than forty of these have the potential to release toxins, called cyanotoxins, into the environment (Percival et al., 2014).

- These cyanotoxins can impact human and animal nervous systems and liver, irritate skin, cause gastrointestinal issues and contribute to the development of tumors.
- Human and animal exposure to cyanotoxins can occur through accidental ingestion, direct contact or inhalation.
- Documented cases of cyanotoxin poisonings and illness in animals and humans date back to the mid-1800s, with the frequency of occurrence increasing (Carmichael, 2001).
- The increased incidence of harmful algal blooms not only impacts human and animal health, but can also impact recreation, access to clean drinking water as seen in Toledo, Ohio, fishing and shellfishing, our economy, and ultimately our quality of life (CAST, 2014).

Why are cyanobacteria blooms happening in South Carolina?

Cyanobacteria blooms may occur under low flow, warm temperature, adequate light and sufficient nutrient conditions. Our community can play a significant role in introducing nutrients to our ponds, lakes, streams, and rivers. If not managed, nutrients carried in runoff from residential and agricultural activities can be transported to the nearest waterway, contributing to cyanobacteria growth. Runoff from landscaping and lawn care activities may have been the cause of eutrophication in a series of South Carolina coastal stormwater ponds that resulted in over 200 harmful algal blooms between 2001-2005, with cyanobacteria being the most abundant species present in the ponds studied (Lewitus et al., 2008).

Blooms like these are not limited to our South Carolina stormwater ponds, and can occur on agricultural ponds,

Figure 2. Nutrients in runoff contributed to a cyanobacteria bloom in a community stormwater pond. This pond ultimately drained to a nearby tidal creek. How could this bloom have impacted the surrounding community and downstream creek? What actions could this community have taken to help prevent the bloom from occurring? Photo courtesy Sara Pachota.

in rivers and streams, reservoirs, and elsewhere. Farmers have lost valuable livestock to harmful algal blooms in agricultural ponds (Hanie et al., 2014).

To understand why harmful algal blooms are occurring and to be better prepared to manage and prevent future occurrences, individuals should be proactive by reporting blooms, as well as taking action to manage runoff from your yard, farm or pond.

In case of a bloom, what should I do?

- While chemical treatments are available to help control the presence of cyanobacteria following a bloom, these treatments may not reduce the overall level of toxin that has been released in the water (Greenfield et al., 2014). **If you think a harmful algal bloom has occurred in your pond system or nearby waterway, contact the South Carolina Department of Health and Environmental Control and South Carolina Algal Ecology Laboratory as soon as possible.**
- Avoid contact with water and do not swim, boat or fish in the area. Use caution when walking along shorelines. Keep an eye on all pets and livestock and prevent them from drinking or accessing the water.

- It is important to avoid exposure to harmful algal blooms. If you have been exposed to water where a bloom has occurred, shower or bathe as soon as possible and contact your healthcare professional. Symptoms of initial exposure can appear flu or allergy-like.

- If a bloom occurs in your stormwater pond, you should also alert your homeowners association and/or neighborhood. In general, because stormwater ponds are used to help treat stormwater runoff, it is a good rule of thumb to implement a "No Swimming" policy in your pond at all times.

How can I prevent cyanobacteria blooms from occurring?

We can all play a part in minimizing nutrient runoff to our waterways and the occurrence of cyanobacteria and other harmful algal blooms. Whether in your yard or at your farm, consider the following tips in your nutrient management plan:

- Be sure to properly dispose of pet waste in your yard or on the sidewalk. Bag and trash waste for pickup or consider installing a pet waste digester.

- If you own livestock, limit access to waterways by using exclusion fencing. Install a pump system to move water from your pond to water troughs.

- Whether you're a home gardener or farmer, it's important to be mindful of your fertilizer applications. Have a soil test performed and follow directions for application. Store fertilizers properly, keeping under cover and sealed. When possible, maintain a no-fertilizer zone along shorelines, to decrease the likelihood that fertilizers will be transported with runoff to the nearest waterbody.

- If you own a septic tank system, have your system inspected and pumped if needed every three to five years. Be mindful of what you put down the drain, limiting solids and kitchen fats and grease.

- If you live along a waterway, establish a buffer of native plants, trees and grasses to help reduce, slow and filter runoff before it reaches the water. To achieve maximum benefits, try to maintain as wide a buffer as possible. Use the Clemson publication, Life at the Water's Edge, for assistance in designing, planting and maintaining your buffer (Life at the Water's Edge, by Dr. Lin Roth, 2004).

- If you have turfgrass in your yard, be mindful of grass clippings. For proper disposal, leave clippings in place to return beneficial nitrogen back to the lawn. You can also try composting clippings in your yard or through your community pick-up service. Don't blow clippings into the waterway, street, ditch or storm drain. Visit the Home and Garden Information Center website for more tips on lawn and garden maintenance.

- If you own a stormwater pond, keep up with regular inspection and maintenance to identify issues before they become a serious problem. Use Carolina Clear's website to access inspection and maintenance forms and other pond management resources to assist you in maintaining a healthy and functioning pond system.

- Share this information with family, friends and your local community. Help prevent cyanobacteria and other harmful algal blooms by discussing ways each yard owner can manage nutrients in runoff. Through our joined community effort, we can make a difference in protecting waterways for today and future generations of South Carolinians.

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