January 2005 Water Fact Sheet 2005-5

IOWA'S WATER
Ambient Monitoring Program

Cyanobacteria in Iowa Waters

Introduction

Cyanobacteria or blue-green algae have recently grabbed headlines in a number of Midwestern states, including Iowa. While not a new phenomenon, scientists are just beginning to understand the relationship between cyanobacteria life cycles and their potential health impacts. The Iowa Department of Natural Resources (IDNR) and Iowa State University have jointly conducted monitoring for cyanobacteria and other phytoplankton density over the last five years. In addition, the toxin levels produced by cyanobacteria were monitored beginning in the summer of 2003, and results showed low levels statewide. Despite these low levels, there was cause for concern, as numerous reports had indicated high cyanotoxin levels in surrounding states. Therefore in 2004, the IDNR began its first intensive investigation into the occurrence of cyanotoxins in Iowa lakes, through research at Carter Lake in western Iowa. In the previous Iowa State University/IDNR studies, the cyanotoxin levels at Carter Lake, while not unusually high, were the highest recorded in any lake monitored in Iowa.

Silver Lake in Delaware County exhibits green water, characteristic of water bodies experiencing chronically high cyanobacteria concentrations.

What are Cyanobacteria?

Cyanobacteria are a common form of algae often referred to as "pond scum." They grow in water bodies when the water is warm and enriched with nutrients such as phosphorus or nitrogen. If environmental conditions are just right, these cyanobacteria can grow very quickly and form a "bloom" or scum layer on the surface of the water. In Iowa, cyanobacteria blooms usually show up in June and may last through October. These blooms persist for several months due to the numerous species of cyanobacteria that may be present. These different species each thrive under varying conditions, and therefore differing species will dominate throughout the summer and fall months.

Cyanobacteria samples are often taken with a tow net at the same time as phytoplankton and zooplankton samples.

Health Effects

Some species of cyanobacteria have the ability to produce cyanotoxins, but do not produce them all of the time. The triggers for cyanobacteria to release these toxins are not completely understood, but when exposed to water containing these toxins, some people may develop allergic reactions. Symptoms may include skin rash, hives, and itchy eyes and throat. If cyanobacteria are ingested, it is possible for more severe illness to occur. A physician should be consulted if someone ingests these algae and experiences stomach cramps, vomiting, diarrhea, fever, headache, and/or severe muscle or joint pain.

Children are especially susceptible to illness if they ingest cyanotoxins. This is a result of children usually spending more time in the water and not truly understanding the health risks. As a result, they may drink the water because they are thirsty or swallow it accidentally while swimming. Additionally, children have less relative body weight than adults and a smaller quantity of toxin may trigger an adverse response in their liver or central nervous system.

Animals are not necessarily more sensitive to cyanotoxins than humans. However, many animals enjoy being in the water and are not particularly concerned with a green scum layer floating on the water. They may drink the water and thereby consume large quantities of cyanobacteria as well. If the cyanobacteria are producing toxins at the time of ingestion, they can become very ill and even die.

The Iowa Department of Natural Resources has not received any information that people eating fish have become ill due to cyanotoxins. It has been documented that certain algal toxins have been shown to accumulate in the tissues of fish and shellfish, particularly in the viscera (liver, kidney, etc.). The World Health Organization has advised that people choosing to eat fish from waters where cyanobacteria blooms exist should eat them in moderation and avoid eating the liver and kidney where accumulation of toxins may be greatest.

The Carter Lake Example

During the summer of 2004, a number of indicators, ranging from swimmers complaining of rashes to observations of characteristic green water, pointed out the possibility of a cyanobacterial bloom in Carter Lake, near Council Bluffs in western Iowa. Initial testing in July revealed slightly elevated levels of cyanotoxins in the water. In August, the Iowa DNR and Nebraska Department of Environmental Quality began jointly testing water samples weekly from six locations in Carter Lake (Figure 1). To date,

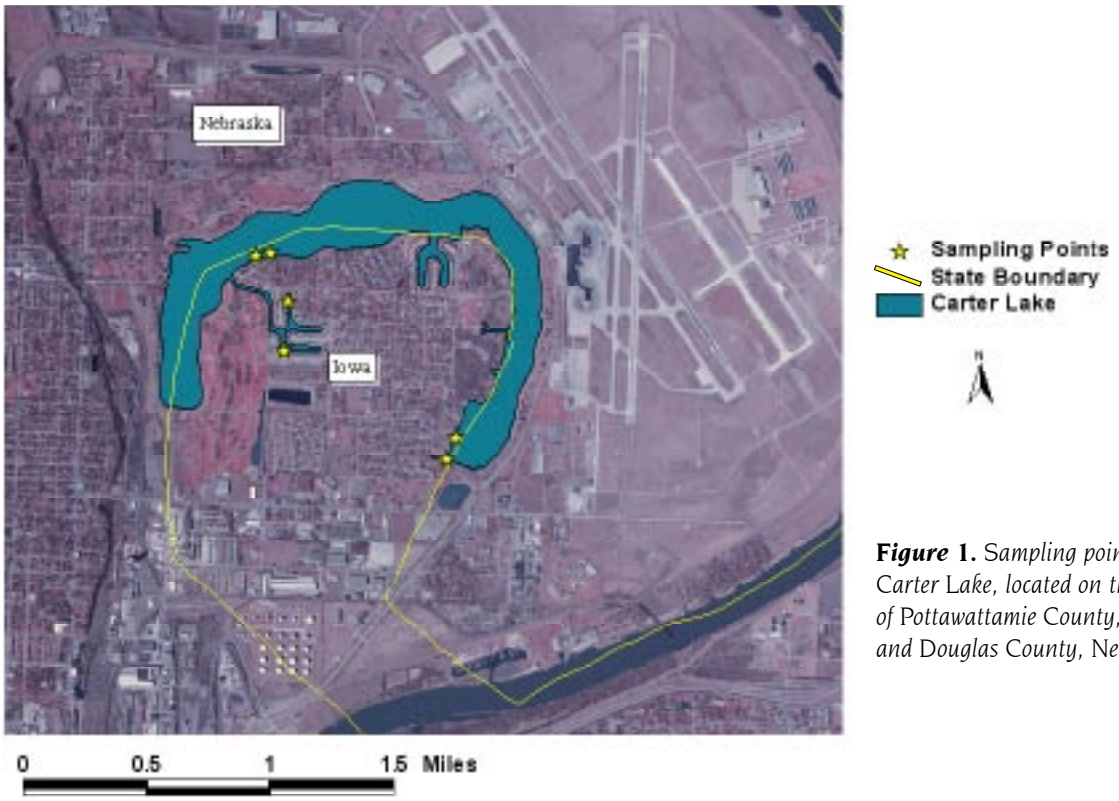

***Figure* 1.** *Sampling points from Carter Lake, located on the border of Pottawattamie County, Iowa and Douglas County, Nebraska.*

testing has revealed high levels of cyanobacteria and toxins (microcystin) in the water from all six sampling points throughout Carter Lake.

Carter Lake is located on the Iowa – Nebraska state line. Because of this and Nebraska's experience monitoring cyanobacteria, the established water quality standard for Nebraska (15 parts per billion) was used in determining risk to public health. Water samples collected violated this 15 ppb standard 51% of the time between August and December 2004. Weekly sampling of Carter Lake will resume in the spring of 2005.

Remediation

Once cyanobacteria appear in a lake or pond, there are no quick and easy steps toward remediation. Simply reducing the amount of nutrients entering lakes and ponds will not immediately cause reductions in cyanobacteria blooms. It will take a long time to reduce the nutrient concentrations in the water. Furthermore, lake sediments may act as a nutrient reservoir to be used as a source of food by cyanobacteria.

In Iowa, agencies such as the Iowa Department of Natural Resources, Iowa Department of Agriculture and Land Stewardship, and Natural Resources Conservation Service are working with communities and landowners around the state to reduce stormwater runoff and to encourage agricultural practices that reduce soil erosion and nutrient runoff while maintaining high crop yields. On the local level, landowners and interested citizens can help minimize the problems associated with algal blooms

Animals usually do not discriminate against water contaminated with cyanobacteria.

working together with partners in their watershed to reduce inputs of nutrients that reach nearby lakes, streams, and ponds. Numerous best management practices can be promoted within individual neighborhoods and communities that can help improve water quality, including:

- Only using fertilizers where truly needed.
- Preventing yard debris (i.e., leaves, grass clippings, etc.) from washing into storm drains, as many storm drain systems empty directly into water bodies.
- Supporting local ordinances that require silt curtains for residential and commercial construction sites.
- Planting and maintaining vegetative buffer strips along land bordering water bodies.
- Allowing native plant species to grow along shorelines of water bodies, as they are much more effective at filtering runoff than the typical grass species found on most residential lawns.

Acknowledgements

Basic information regarding cyanobacteria, their health effects, and steps toward remediation courtesy of the Wisconsin Department of Natural Resources. The Iowa DNR would like to acknowledge the contributions of partners and colleagues from many organizations. Researchers from the Nebraska Departments of Environmental Quality and Health and Human Services have provided a great deal of help with sample collection and analysis of Carter Lake samples. Staff with the Wisconsin Department of Natural Resources has provided guidance in the development of a cyanobacterial monitoring program. The Wisconsin State Laboratory of Hygiene has provided technical assistance and analyzed many samples. Iowa State University's Limnology Laboratory has analyzed and continues to analyze Iowa lakes for cyanotoxins which may send up more red flags at other lakes in the future. The dedication, hard work, and vision of the Water Monitoring Section staff is also greatly appreciated.

Photos on pages 1 & 4 courtesy of University of Northern Iowa – Environmental Programs. Photo on page 2 by Iowa DNR.

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Iowa Water Monitoring Program Web Site – wqm.igsb.uiowa.edu

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