By Howard Markus and Steve Heiskary

What's That Green Stuff?

Algae can be vital to a lake's ecosystem or toxic to wildlife.

Algae are everywhere, in oceans, in freshwater lakes and rivers, on land, and even in the air we breathe. Sometimes called pond scum or seaweed, they are a natural part of any aquatic environment. Algae and fungi can live together in a form called lichens on rocks, walls, and trees.

Algae occur at the bottom of the food web, making them vital food sources for *zooplankton* (small invertebrates such as Daphnia). In turn, these invertebrates are eaten by fish and other aquatic animals.

Similar to all living plants, algae need nutrients—such as phosphorus and nitrogen—and light to photosynthesize and thrive. Different kinds of algae have distinct appearances and grow at different times of year. Indeed, color and season are helpful in identification. And if you know your algae, you'll know whether the

Blue-green algae

A thick, blue-white crust of algae covered this backwater of Dan Lake in Wright County. Blue-green algae can form at any time, but they are most common in mid- to late summer. They can form large algal mats that look like slicks of spilled paint.

Blue-green algae

This thick algal mat on Little Rock Lake in Benton County is bright green, but it's still a variety of blue-green algae. These blooms can smell bad and produce a foul taste in drinking water. Blue-green algae also contain toxins which cause liver and nervous system damage if ingested by humans and dogs.

TOP: MPCA STAFF PHOTO BY STEVE HEISKARY; BOTTOM: MPCA STAFF PHOTO

wq-s1-90

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Top: Periphyton, like these green algae, commonly attach to rocks along the shore of the Mississippi River. Middle: When chunks of filamentous algae detach from a lake's bottom, they are often blown to shore and can collect near docks. Bottom: Short-lived blooms of reddish algae occur occasionally on Minnesota lakes in spring.

green slimy stuff in the water is benign fish food or a toxic form that humans and animals should avoid.

Algae come in many shapes and sizes, ranging from microscopic plants (most algae fall into this category) to large ocean kelps, which can grow to 20 feet or more. They can consist of a single cell or colonial globes or large ribbons or almost any other plant shape imaginable. In water, algae can be free-floating *phytoplankton* or *periphyton* attached to substrates such as other plants, rocks, logs, or sediments. *Chara,* also called muskgrass, is widespread in Minnesota lakes. It has the appearance of a submerged rooted plant but is actually a multicellular green alga.

Seasonal Cycles. In lakes and rivers, different forms of algae grow in response to changes in water temperature, sunlight, and nutrients. In spring, following ice out, diatoms, a unicellular algae, often grow profusely in cool water, which contains silica and abundant nutrients accumulated during winter. They use silica to build their cell walls. Diatoms grow quite rapidly and often give the water a brownish hue.

Because they cannot regulate their buoyancy in water, diatoms rely on river currents or wind and wave action in lakes to keep them in the lighted zone, where sunlight penetrates shallow water. In the absence of wind, waves, or currents, diatoms settle to the bottom of the lake and die.

As the water warms, diatoms are outcompeted for nutrients and give way to green algae or yellow-brown algae, which grow faster in the warmer water. Some greens such as *Cladophora* may grow extensively on rocks and docks in some lakes and rivers, but most green and yellow-brown forms are uncommon in Minnesota waters.

Usually by early summer, diatoms, greens, and yellow-browns give way to blue-green algae, also known as *cyanobacteria.* As the latter name suggests, this type of algae is not a plant but a photosynthetic bacteria. It grows best with plentiful nutrients and warm temperatures—common conditions in many central and southern lakes.

The more nutrients and light available in a lake, the larger its concentration of blue-green algae. When algae growth is excessive, we often refer to it as an *algal bloom.* Landowners can minimize the amount of nutrients that enter our lakes. Shoreline buffers of natural vegetation and good lawn practices keep fertilizers, grass clippings, and leaves from washing off yards and eventually into lakes.

Toxic Algal Blooms. Some bloom-forming algae contain toxins, which can cause serious illness or even death in animals and humans. In marine (salt) waters, the most common bloom-forming toxic algae are *dinoflagellates.* These can cause "red tides," potentially resulting in fish die-offs and making seafood poisonous to eat. Minnesota lakes occasionally have dinoflagellate blooms, which give the water a reddish hue; however, these freshwater forms are not toxic.

In Minnesota the most common bloom-forming toxic algae are blue-green algae. Though they can bloom any time, blue-green algae typically produce blooms during mid- to late summer, when people and their pets are enjoying warm waters and sunlight.

Blue-green algal blooms can cause a variety of problems, from foul taste and odor in drinking water, to aesthetically unappealing algal mats, which look like slicks of brown or bluish paint blown by winds to shore. Most significantly, blue-green algae blooms contain powerful natural poisons. These toxins include *hepatotoxins* that cause liver injury and *neurotoxins* that act on the nervous system.

Contact with water containing these toxins has resulted in rashes, respiratory problems, and gastroenteritis in humans. Dogs, livestock, and wildlife are also highly susceptible to the toxins; it is not unusual to hear of animals getting sick or dying after drinking or swimming in water that contains blue-green algae.

As the cells in these blooms die off and decay, they consume oxygen, often drastically reducing dissolved oxygen levels, which can result in summer fish kills.

More Algae in Minnesota? In recent decades Minnesota has been having longer ice-free seasons, providing more time for algae to grow to greater densities.

More algae in lakes could reduce dissolved oxygen below the thermocline as they die and decompose. This could have a negative impact on some fish species such as lake trout and tullibee that live in the cool waters of deep lakes and require high oxygen levels.

Algae will continue to be an essential part of the food web in oceans, rivers, lakes, and all waters in between. Without algae, oceans and inland waters would not have fish. So the next time you see that "green stuff" in the water, remember that while it might look slimy, it is vital to aquatic life.

For more information and pictures of blue-green blooms, see http://tinyurl.com/bluegreenblooms.