sediment-bound iron and becomes available for algal uptake. This internal loading of phosphorus can accelerate lake degradation

Are Algae Good for Your Lake?
Algae are critical to the life of our lakes. They:
- are the base of the food chain
- convert nutrients to organic matter
- oxygenate the water

Fish production in lakes varies directly with the amount of algae the lake produces. If there were no algae there would be no fish. However, problems arise in lakes when the balance between the plants and animals (zooplankton or fish) is upset. The introduction of pollutants and nutrients can result in excessive algal growth.

How Can I Protect My Lake?
- Try to maintain a natural shoreline to increase nutrient uptake by plants and reduce erosion and nutrients leaching into the lake
- Use low phosphorus detergents and soaps
- Avoid fertilizing your lawn
- Do not wash cars, shampoo or soap in the lake
- Pump out your septic tank every 3-6 years
- Take a closer look at your lake!
- Be a Lake Partner Volunteer!

An example of natural shoreline

Additional Information You May Want to Read!
- Ontario's Lake Partner Program (brochure)
- Ontario's Lake Partner Program (brief)
- Seven Hints on Protecting Your Lake

If you have any questions, please contact the Lake Partner Program Hotline at 1-800-470-8322 or email lakepartner@ene.gov.on.ca.

[Please note: Images for this Factsheet are from many sources. We acknowledge the following web-pages: www.micrsocopy-uk.org.ok, protist.i.hosei.ac.jp/PDB/Images, www.indiana.edu/~diatom/diatom.html, and www.bioimages.org.uk.]

Green Facts

What are Algae?

Blue-green algae at Rice Lake

In freshwater lakes, algae are tiny aquatic plants containing chlorophyll and are usually green in colour. They make their food in the form of starches or oils by using the energy of sunlight and nutrients from the water. They grow in many forms. Some species are microscopic single cells; others can grow as mass aggregates of cells or in strands. They can even resemble higher plants.

All plants require nutrients and sunlight for growth. The depth of sunlight penetration limits the depth to which plants can grow. A black and white Secchi disc (a round, flat, sinkable disc) is used to measure the water clarity. Algae can affect water clarity. It is usually the amount of available nutrients (in particular nitrogen and phosphorus) that will limit algal growth in a lake.

Types of Algae
Several thousand species of algae live in Ontario's waters. Algae are extremely diverse in form, colour, habit and habitat. We have broken them down into four general groups:

(i) Blue-Green algae (Cyanophyceae)
(ii) Green algae (Chlorophyceae)
(iii) Diatoms (Bacillariophyceae)
(iv) Pigmented flagellates (Dinophyceae, Cryptophyceae, Chrysophyceae, Euglenophyceae)

(i) Blue-Green Algae- are unicellular, colonial or filamentous. Some forms are gelatinous masses of various shapes floating in the water. When a "bloom" of blue-greens develops, the algae sometimes drift into bays or along beaches where they decompose. Soluble phycobiliprotein pigments can be released when cells break, giving the water a bluish or pinkish colour. They have a pleasant grassy odour while healthy, but this may change to an unpleasant musty smell or to a rather revolting foul odour upon disintegration and decomposition. Poisonings of animals and waterfowl have been attributed to the ingestion of lethal doses of toxic blue-greens accumulating along the shores of lakes. There are three common types of blue-greens that appear to be primarily responsible for most of these incidents: Anabaena, Microcystis and Aphanizomenon.

The blue-green alga Gleotrichea

Ontario

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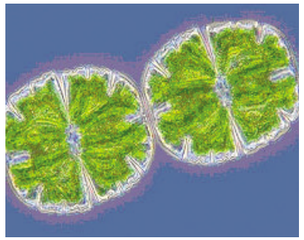
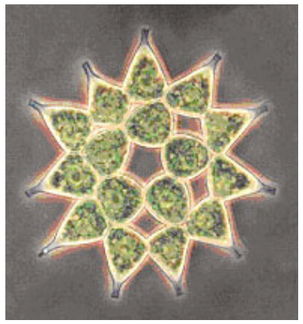
(ii) Green Algae- are primarily of two types. One is attached and the other is free-floating. Filamentous greens (or attached algae) range from several millimetres to a metre in length. In many cases they are not found as isolated filaments but develop into large colonies of floating or attached mats. A few have been given common names such as pond silk, green felt, frog-spawn algae and stoneworts. These may produce a slime that can interfere with some industrial uses of water. They may also benefit the lake, along with other algae, to help purify the water and maintain a favourable oxygen level. Some examples of filamentous green algae are Spirogyra, Mougeotia and Cladophora. These can also be responsible for causing odours in water and filter clogging. Free-floating green algae are important in the aquatic food chain and help to maintain oxygen levels. Some examples of free-floating algae are Chlorella, Pediastrum, and the desmids.



A Desmid: a free-floating green alga



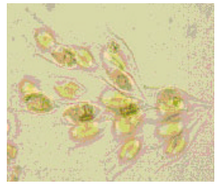
Green alga - Pediastrum

(iii) Diatoms- are algae commonly found in both fresh and salt waters. A feature that helps distinguish them from other algae is the silicon wall that encloses them. These silicon walls are often marked with intricate patterns. Diatoms are the main food source for many aquatic microscopic animals. This is the group of algae most likely to cause filter-clogging problems. The rigid silica walls of diatoms are not subject to decomposition. Some diatoms produce tastes and odours in the water. When taste and odour are a problem in less eutrophic northern lakes, diatoms may be the cause. Some commonly found diatoms are Asterionella, Fragilaria, and Cyclotella.

Diatom -Asterionella

Diatom- Cyclotella

(iv) Flagellated Algae- All flagellated algae possess one or more flagella per cell. A flagellum is a whip-like appendage that acts as a propeller. These algae can sometimes produce strong tastes and odours when present in water supplies. For example, Synura, a yellow, colonial flagellated alga can impart a perceptible cucumber odour to raw water even when present in low numbers. Some commonly found flagellates are Synura, Dinobryon and Euglena



Chrysophyte- Dinobryon, a flagellated alga

Factors that Affect Algal Growth

There are a number of environmental factors that influence algal growth. The major factors that determine the type and amount of algae in your lake are:

- the amount of light that penetrates the water (determined by the intensity of sunlight, the amount of suspended material and water colour)
- the concentration of nutrients in the water
- water temperature
- the physical removal of algae by sinking or flushing through an outflow
- grazing on the algal populations by microscopic animals and fish
- parasitism by bacteria, fungi and
- competition from aquatic plants for nutrients and sunlight

The Overgrowth of Algae

Unfortunately, nutrient enrichment of water bodies, a process known as eutrophication, is enhanced by our activities. Nutrient sources include farm runoff, detergent wastes, sewage discharges, septic tank seepage, fertilizer runoff from lawns and gardens. All of these sources fertilize the water and can result in increased algal growth

Excessive growth of one or more species of algae is termed a "bloom". Blooms of algae can destroy the appearance of water, result in unpleasant tastes or odours, reduce clarity, and colour the lake a vivid green, brown or yellow.

Filamentous and colonial algae are especially troublesome. They can mass together and form scums or mats on the lake surface. These mats can drift and clog water intakes, foul beaches and ruin many recreational opportunities. They may also provide habitat for bacteria. Shoreline areas in front of cottages can become unsightly and uninviting. Peeling paint and staining on boats and docks are partially the result of algae growth. Some species actually produce acids that may chemically corrode submersed metal pipes and concrete. Death and sickness to animals have been attributed to certain algae, mostly blue-green bloom-forming species.

The Connection to Oxygen Depletion

The amount of oxygen in the water is an important indicator of overall lake health. Oxygen plays an important role in determining the type of organisms that will live in a lake. Some species, such as trout, need consistently high oxygen levels to survive.

Excessive algal growth can lead to oxygen depletion in lakes

Algae produce oxygen as a byproduct of photosynthesis but also take in oxygen for respiration. Respiration occurs all the time, but photosynthesis occurs only when sunlight is available.

Consequently, a lake that has a large population of algae can experience a great fluctuation in dissolved oxygen concentration during a 24-hour period. Extreme oxygen fluctuations place great stress on fish and other creatures in the lake.

When algae die, they provide food for decomposers (bacteria, fungi, and other organisms living in or on the lake sediment). They need oxygen to break down organic matter. In this way oxygen is steadily consumed. Several chemical reactions occur within the lake sediments when dissolved oxygen concentrations reach less than one part per million. Phosphorus, often the most essential plant nutrient in our lakes, is released from its association with