



Blue-Green Algae Monitoring 2021 Report

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Water Resources Management Division

Prepared by:

Paul Rideout
Environmental Scientist
Water Resources Management Division
Department of Environment and Climate Change
4th Floor, Confederation Building, West Block
PO Box 8700, St. John's NL A1B 4J6
Ph. No.: (709) 729 - 0351
Fax No.: (709) 729 - 0320
paulrideout@gov.nl.ca

Background

Cyanobacteria, commonly called 'blue-green algae', are microscopic, plant-like bacteria that occur naturally in many aquatic and terrestrial environments throughout the world. Individual organisms are not normally visible, but aquatic populations can increase rapidly when conditions are favorable, causing the bacteria to congregate in large masses or 'blooms' that are often, though not always, easily visible.

These blooms most commonly occur in summer or early fall, when surface waters are warmest, but they can also occur at other times during the year. In addition to water temperature, a key factor contributing to the growth of blue-green algae and the formation of a bloom is the amount of available nutrients such as phosphorus and nitrogen in the water.

Many species of blue-green algae can produce toxins that are potentially harmful to humans and animals. The most common blue-green algae toxins encountered and monitored in Canadian waters are microcystins. Health Canada has established guidelines for the cyanobacterial toxin 'microcystin-LR'. The guidelines are "believed to be protective of human health against exposure to other microcystins (total microcystins) that may also be present" (Health Canada, 2016).

Health Canada's '*Guidelines for Canadian Drinking Water Quality*' recommend that microcystin-LR not exceed **1.5 µg/L**.

The '*Guidelines for Canadian Recreational Water Quality*' recommend total cyanobacteria not exceed a density of **100,000 cells/mL** and total microcystins not exceed **20 µg/L** (expressed as microcystin-LR). Proposed new Recreational Water Quality Guidelines will lower acceptable total microcystin levels to 10 µg/L, cell density to 50,000 cells/mL. These proposed Guidelines will also establish limits on total cyanobacterial biovolume at 4.5 mm³/L and total chlorophyll a at 33 µg/L.

Summaries of blue-green algae monitoring in the province for the years 2007 to 2020, are available on the Department of Environment and Climate Change website at:

<https://www.mae.gov.nl.ca/waterres/quality/background/bgalgae.html>

Blue-Green Algae Occurrences in 2021

Miller's Pond

In late May 2021 a blue-green algae bloom was observed in Miller's Pond, Portugal Cove - St. Philip's. As in previous years, water samples were collected on a weekly schedule by Water Resources Management Division (WRMD) staff. Samples were taken from an area where the bloom was most intense and analyzed at the York-Durham Regional Environmental Laboratory in Pickering, Ontario.

Results showed microcystin levels to be less than detectable from the 5 samples collected as this bloom progressed. The highest cell densities from a sample collected on June 11, were measured at 150,000 cells/mL. The cell count exceeds the '*Guidelines for Canadian Recreational Water Quality*' (100,000 cells/mL) and indicates that the water was not safe for recreation at that time. Cell densities measured in samples collected on June 16 and June 23 were significantly below this limit and the bloom was no longer visible.

The cyanobacteria bloom that occurred in Miller's Pond in 2021 was, as in past years, a proliferation of cyanobacteria belonging to the *Anabaena* genus. A bloom of *Anabaena* has been observed and monitored in Miller's Pond each year since 2013.



Forest Pond

On June 18 WRMD staff were advised by a local resident that a fish kill had occurred in Forest Pond near Salmon Cove. The resident also reported bright green water in the pond and in waters downstream.

The location was inspected on June 19 and several dead and dying fish were observed along the shoreline of Forest Pond (figs. 1-4 below). Analyses of samples collected on June 19 confirmed that a bloom of *Anabaena* cyanobacteria was occurring. Regular sampling thereafter confirmed that the bloom was not producing detectable levels of microcystin.

In-situ measurements of water chemistry in Forest Pond during this bloom indicated that the water was super-saturated with oxygen and had a significantly elevated pH. Dissolved oxygen levels of 130% saturation and a pH as high as 9.51 were recorded.

The blue-green algae bloom in Forest Pond had dissipated by mid July and no other reports were received from the area.

Oxygen super-saturation and high pH are well known effects in bodies of water undergoing an intense bloom of algae or blue-green algae. Photosynthesis removes CO₂ from the water and releases oxygen, causing pH to rise and dissolved oxygen levels to increase. In a normal situation, there is a daily fluctuation in pH and dissolved oxygen. Both pH and oxygen levels rise slightly during daylight hours and fall again at night when photosynthesis ceases. During an intense bloom however, the respiration of plants and other organisms during the night does not reverse the effects of photosynthesis during the day. Oxygen levels and pH can remain elevated and continue to increase until the bloom starts to dissipate.

Because of uncertainties associated with the effects of this bloom and out of concern for public health, the Town of Salmon Cove closed public access to the beach at Salmon Cove Sands on June 22. The beach remained closed until June 30.

This was the first time in Newfoundland and Labrador that a fish kill in fresh water has been associated with a blue-green algae bloom. Sampling results indicated that the bloom was not producing microcystins and it is unlikely that the fish were killed by cyanobacteria toxins. As noted above, however, pH was very high for several days and the water was very cloudy with suspended blue-green algae cells. A combination of warm water, high pH and the impairment of respiration because of cyanobacteria cells clogging gills may have been the cause.

Samples were collected from Forest Pond on seven occasions during this bloom and analyzed for microcystins and for cell identification/enumeration. Cell counts ranged from 33,000 cells/mL on June 19 to a high of 660,000 cells/mL on June 22. Cell counts began to decrease in samples collected from June 24 and by July 7 had reached a level 64,000 cells/ mL, below the current '*Guidelines for Canadian Recreational Water Quality*'. A final sample collected on July 27 contained 1,500 cells/ mL.

Blue-Green Algae in Newfoundland and Labrador 2021



No other occurrences of cyanobacteria blooms were observed or reported in 2021.