2025 Cyanobacteria Monitoring Report

Government of Newfoundland & Labrador
Department of Environment, Conservation & Climate Change
Water Resources Management Division

Newfoundland Labrador

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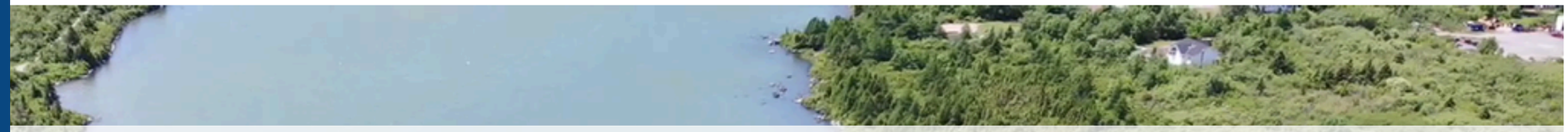
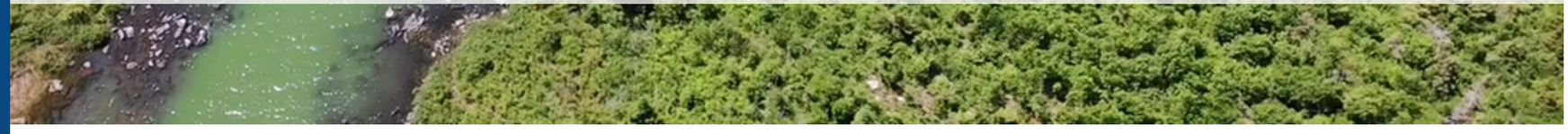


Cyanobacteria, or blue-green algae, are algae-like bacteria that naturally occur in many aquatic and terrestrial environments around the world. Cyanobacteria are considered one of the most ancient life forms on earth. Individual organisms are not visible to the human eye. Certain conditions can cause cyanobacteria populations to increase rapidly, and can result in dense accumulations of cells, commonly known as blooms. Cyanobacteria blooms can be easily observed and are often a distinct blue-green colour.

In temperate zones, blooms are most common in the summer and early fall, when surface waters are warmest. 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.

Cyanobacteria can quickly dominate a waterscape and outcompete other key species. Some species of cyanobacteria can produce toxins, or cyanotoxins, which are harmful or potentially lethal to humans and animals. The most common cyanotoxins in Canadian waters are microcystins, a family of toxins that includes over 250 known variants. Health Canada has established separate guidelines for drinking and recreational waters regarding cyanobacterial cell counts and total microcystins. Total microcystins include toxins dissolved in the water as well as those contained within the cell of the cyanobacteria. These guidelines are used to help support cyanobacteria management in Newfoundland and Labrador. There are other toxins produced by cyanobacteria; unfortunately, testing for these toxins is not widely available.

The *Guidelines for Canadian Recreational Water Quality* states that total cyanobacteria cells should not exceed a density of 50,000 cells/mL and total microcystins do not exceed 10 µg/L for recreational waters involving primary contact recreation (swimming or other activities with direct exposure to water). Cyanobacteria and their toxins are a major concern for drinking water in Canada; however, in Newfoundland and Labrador no blooms have been reported in drinking water supplies. Health Canada's *Guidelines for Canadian Drinking Water Quality* states that the seasonal maximum acceptable concentration of total microcystin is 1.5 µg/L.



2025 Overview

For the first time, in 2024 there were confirmed algal blooms in Newfoundland and Labrador outside of the Avalon Peninsula. In 2025, blooms outside of the Avalon were confirmed again; however, the majority of bloom activity occurred in the province's most densely populated region: the Avalon Peninsula.

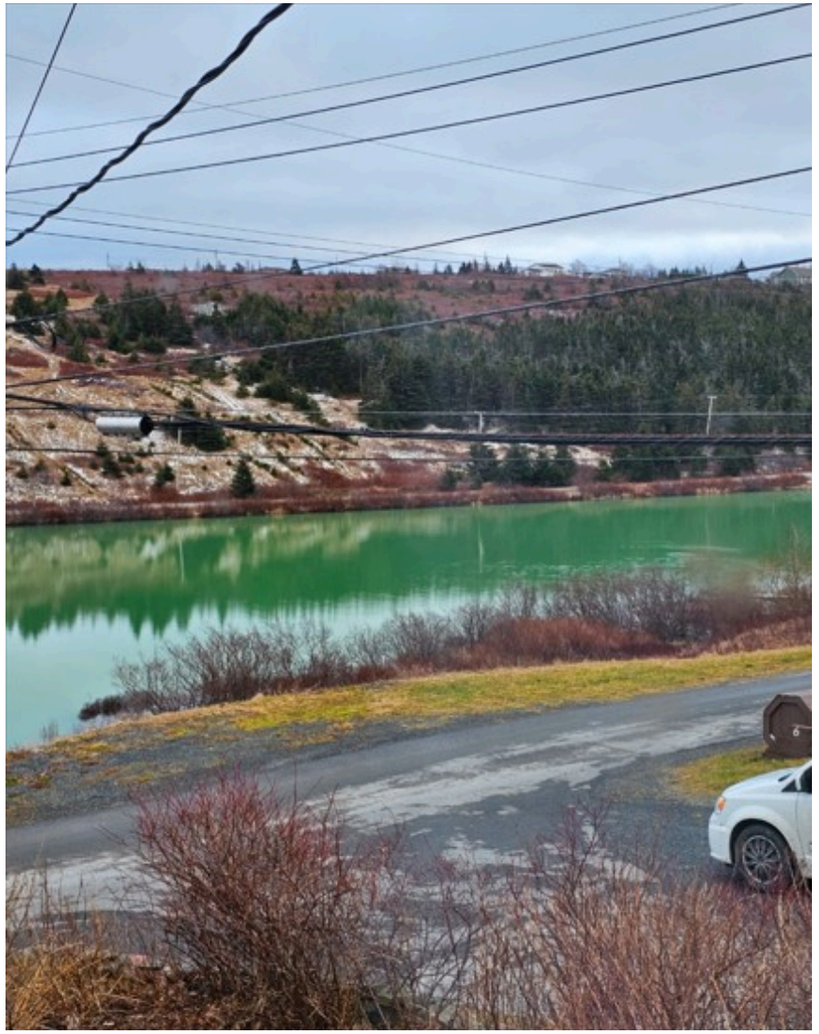
In 2025, Water Resources Management Division (WRMD) conducted algae sampling at eight waterbodies across the province. In May, the real time data collection buoy was deployed in Forest Pond; however, site visits, quality assurance, and quality control protocols were restricted due to forest fire activity in the area. There was relatively little algal activity in Forest Pond in 2025.

Samples were collected from Hunts Gully, Paddy's Pond, Pasadena Beach, Howley Beach, and Clarkes Beach in response to visual reports from staff or the public. Additional samples were taken from Great Pond, Torbay and Healey's Pond to determine baseline conditions.

2025 Bloom Images

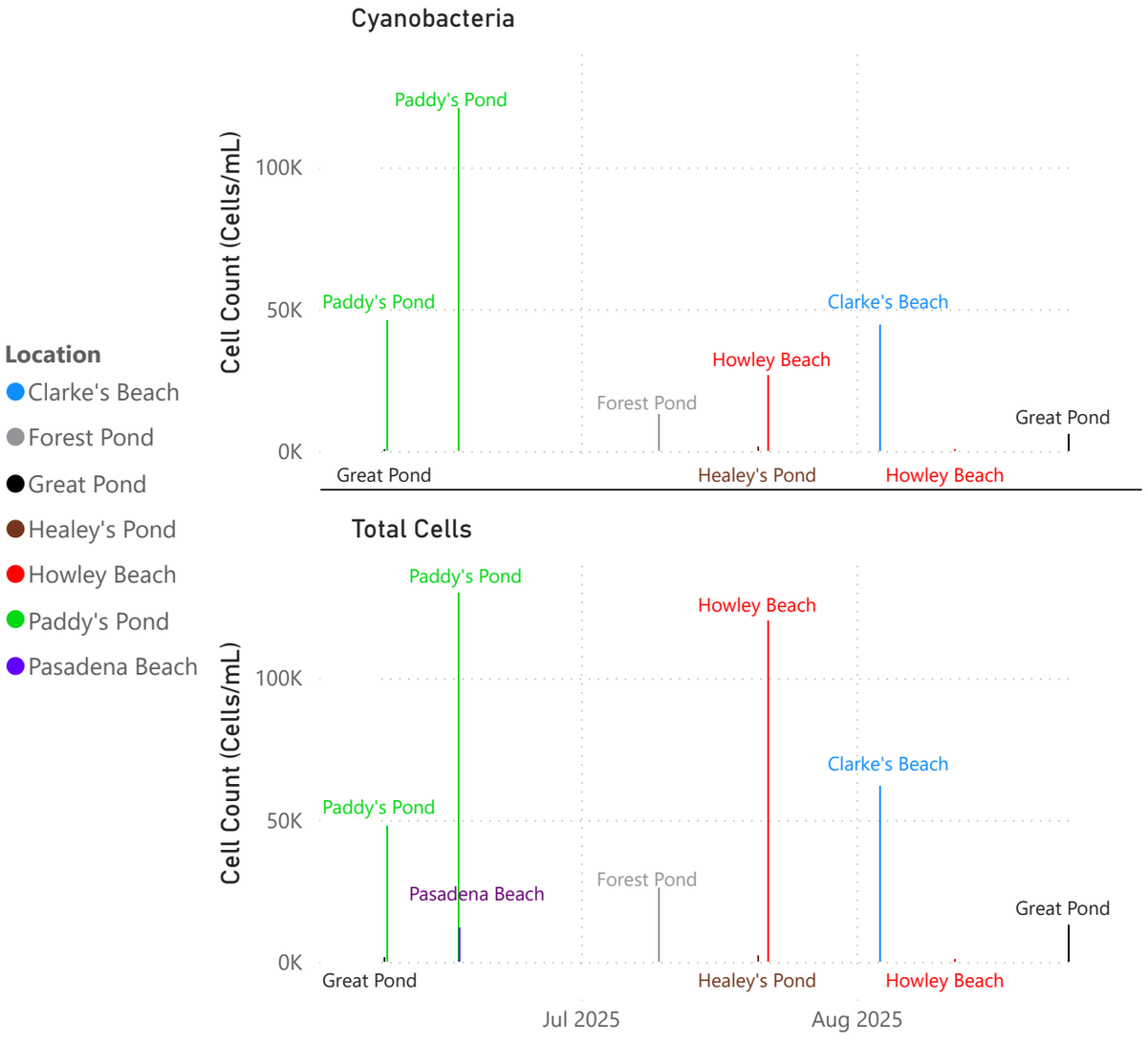
In January 2025, WRMD was notified of the first confirmed winter bloom in the history of the province, occurring in Hunts Gully, Bryant's Cove. Images taken during peak bloom appeared intense however, the bloom had mostly dissipated by the time WRMD was deployed to the site. The most intense bloom of the year, confirmed through laboratory analysis occurred in Paddy's Pond. Initial reports of this bloom were received in early June, and samples were collected on the 9th and 17th.

Hunts Gully, Bryant's Cove - January 2025



Paddy's Pond- June 2025

Grab Samples



Date	Location	Cyanobacteria (cells/mL)	Total (cells/mL)	Microcystins (µg/L)
1/22/2025	Hunts Gully		120	<0.15
6/9/2025	Great Pond	560	1400	<0.15
6/9/2025	Paddy's Pond	46120	48000	<0.15
6/17/2025	Paddy's Pond	120750	130000	<0.15
6/17/2025	Pasadena Beach		12000	<0.15
7/10/2025	Forest Pond	13000	26000	<0.15
7/21/2025	Healey's Pond	1590	2000	<0.15
7/22/2025	Howley Beach	26600	120000	<0.15
8/4/2025	Clarke's Beach	44460	62000	<0.15
8/12/2025	Howley Beach	478	830	<0.15
8/25/2025	Great Pond	5900	13000	<0.15

*The Method Detection Limit (minimum detectable concentration) for microcystin analysis is 0.15(µg/L).

Waters were tested for microcystins, the most common toxin produced by cyanobacteria. Results can be found in the table above. No samples returned values above the analysis method detection limit of 0.15 µg/L, which is well below Health Canada's Guidelines for Canadian Recreational Water Quality for microcystins (10 µg/L). Cell counts were also tested at each site (see above), and Cyanobacteria and total cell counts are plotted to the left. Total cell counts include cyanobacteria cells as well as beneficial algae like green algae and diatoms.

The most intense bloom occurred in Paddy's Pond; however, Hunts Gully was not sampled during peak cyanobacteria activity. Health Canada's Guidelines for Canadian Recreational Water Quality for total cyanobacterial Cells is 50,000 cells/mL. This guideline can be used as an indicator to determine when the waterbody is at an elevated risk of cyanotoxins. During one sampling event, the cyanobacteria cell count at Paddy's Pond was more than double the guideline. The major risk associated with such a bloom is the potential for toxin production, which was ruled out through direct microcystin (toxin) testing as well as eDNA testing (see page 4). Nonetheless, caution should be taken when blooms are present due to the possibility of skin rashes, gastrointestinal upset, or other complications.

eDNA

To help determine the risk associated with a bloom, eDNA (environmental DNA) was used to better understand the characteristics of blooms. eDNA is genetic material shed by organisms (e.g. cyanobacteria) into the environment. Laboratories can test for specific genes to determine the presence or absence of cyanobacteria and if the genes required to produce toxins are present. 2025 eDNA results are tabulated below:

Collection Date	Location	Total Cyanobacteria (gc/mL)	Microcystin/Nodularin (gc/mL)	Clindrospermopsin (gc/mL)	Saxitoxin (gc/mL)	Anatoxin (gc/mL)	Guanotoxin (gc/mL)
Monday, January 20, 2025	Hunts Gully	12000	< 45	< 45	< 45	< 45	< 45
Monday, June 09, 2025	Paddy's Pond	33000	< 45	< 45	< 45	< 45	< 45
Thursday, July 10, 2025	Forest Pond	11000	< 45	< 45	< 45	< 45	< 45
Monday, July 21, 2025	Healey's Pond	580	< 45	< 45	< 45	< 45	< 45
Tuesday, July 22, 2025	Howley Beach	78000	< 45	< 45	< 45	< 45	< 45
Monday, August 04, 2025	Clarke's Beach	25000	< 45	< 45	< 45	< 45	< 45

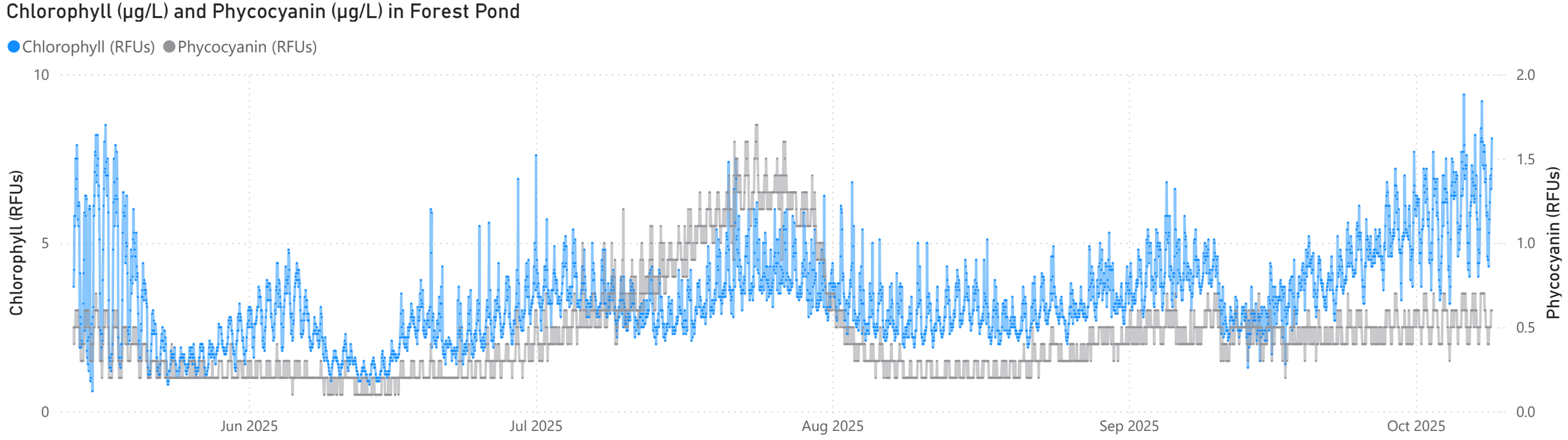
*All results are in gc/mL, or gene copies per milliliter.
**The Method Detection Limit (minimum detectable concentration) is 45 gc/mL

Results of 20,000 gc/mL or more indicate an elevated presence of cyanobacteria. When a toxin producing gene is detected in conjunction with moderate levels of cyanobacteria genes (20,000 gc/mL), the health risk is elevated. If the total cyanobacteria gene copies exceeds 1,000,000 gc/mL and a toxin producing gene is present the risk to human health is significant. The moderate total cyanobacteria gene copies threshold (20,000 gc/mL) was surpassed at both Paddy's Pond and Howley Beach; however, no toxin producing genes were detected so there was little to no risk to human health from cyanobacteria toxins. Cyanobacteria can still cause health-related symptoms including skin rashes, gastrointestinal upset, or other complications even when no toxins are present.

Chlorophyll & Phycocyanin

WRMD has monitored Forest Pond, a 1.5 km lake bordering the towns of Victoria and Salmon Cove, with a Real-Time Data Collection Buoy since 2023 during the ice-free months (approximately May to November). This site was selected due to Forest Pond's proximity and history of blooms. In May, an EXO^2 with temperature, turbidity, dissolved oxygen, specific conductivity, and sensors measuring the concentration of Chlorophyll and Phycocyanin pigments was installed on the data collection buoy with near real-time capacity. The EXO^2 stopped reporting in October.

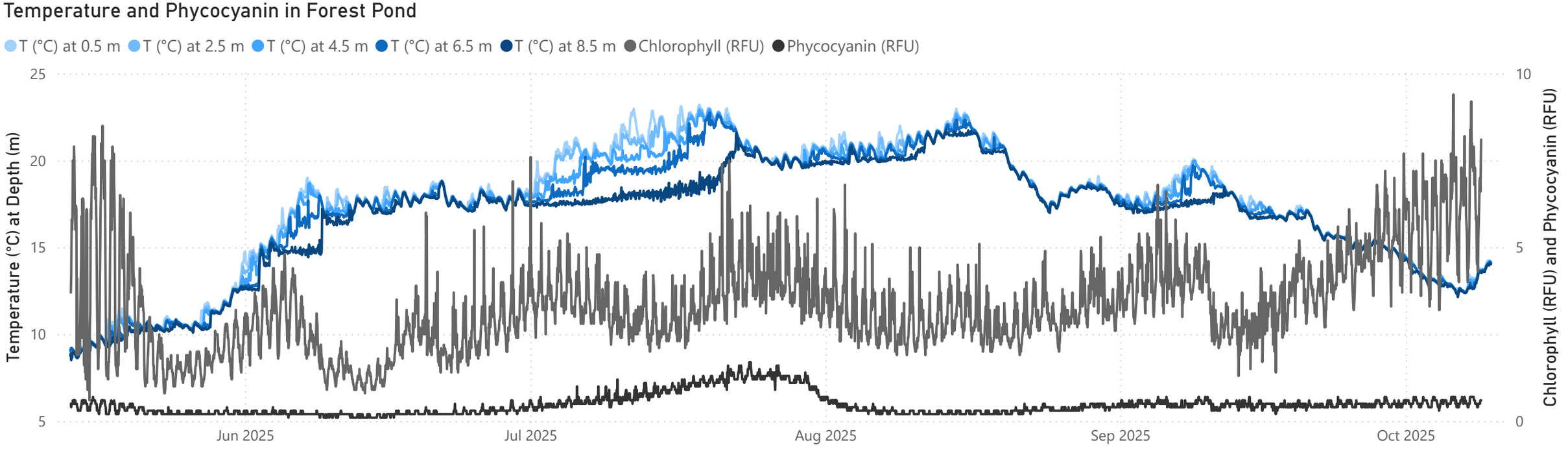
In 2023 there was a small bloom, and 2024 experienced pre-bloom conditions; however, the cyanobacteria levels did not reach bloom-like conditions. In 2025 cyanobacteria activity dropped further. This season was initially dominated by chlorophyll; however, from early July to the end of July, phycocyanin became more abundant, possibly reflecting a change in algae composition. EXO^2 uses the EXO Total Algae PC Smart Sensor optical sensor to detect pigments in photosynthesizing cells (algae and cyanobacteria cells). Chlorophyll A is found in all photosynthesizing cells including green algae and cyanobacteria. Phycocyanin is predominately found in cyanobacteria cells. A grab sample taken July 10th indicated a 50/50 split of cyanobacteria to algae cells at this time. The predominate cyanobacteria species at this time was *dolichospermum*.



Temperature

Many species of cyanobacteria thrive in warm waters, which is why cyanobacteria blooms are often associated with warm summers. 2025 results from Forest Pond indicate the maximum temperature occurred July 19th, 2025, and maximum phycocyanin levels occurred July 24, 2025, five days after the maximum temperature. The temperature sensor was located approximately half a meter below the lake surface, where waters reached a maximum temperature of 23.17°C.

In addition to the temperature sensor on the sonde, a temperature string with sensors located at 0.5m, 2.5m, 4.5m, 6.5m, and 8.5m was deployed; the results can be seen below. The chlorophyll levels were highest in the spring and fall when water temperatures were cooler. During the summer months, higher temperatures and reduced mixing occurred. Modelling showed a weak negative relationship between stratification and chlorophyll levels. The most intense period of stratification occurred at the start of July, lasting for approximately 20 days. The average temperature difference throughout the deployment was 0.79 °C and during this period of stratification, the difference in temperature between the surface and lake bed reached 5.02°C. Phycocyanin concentration also rose during this time, reaching a maximum of 1.70 (RFU).

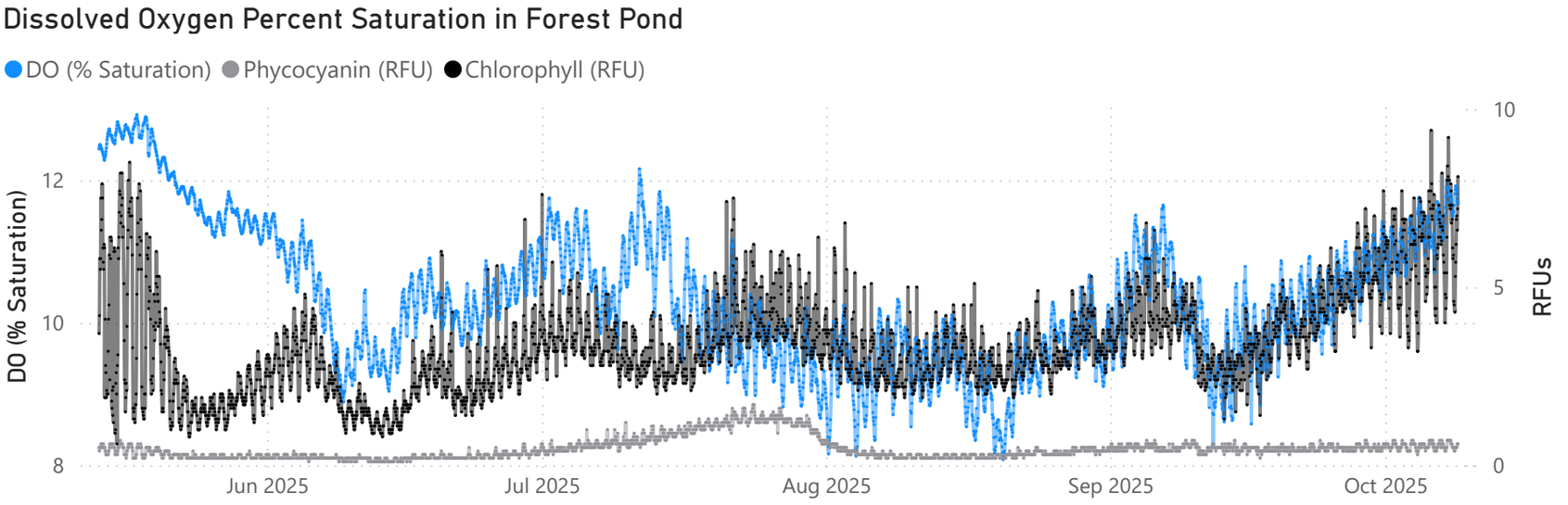


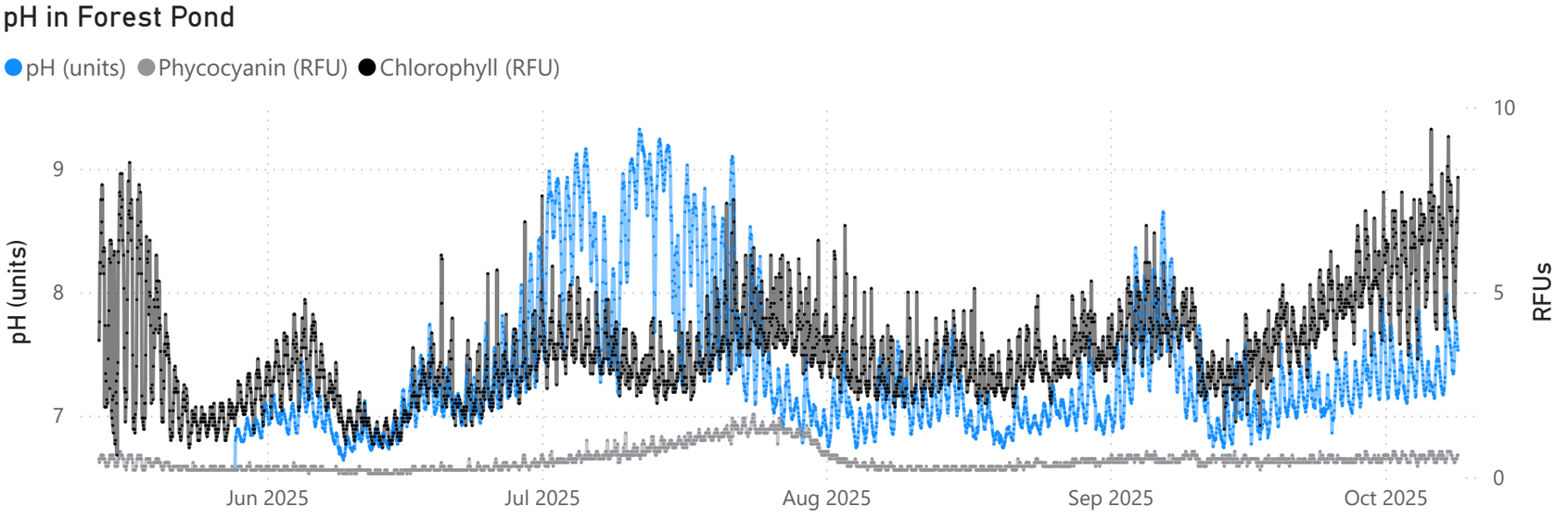
Dissolved Oxygen & pH

When organisms, like cyanobacteria, photosynthesize (convert light energy into sugars), they produce oxygen from carbon dioxide. During a bloom, cyanobacteria can drastically increase dissolved oxygen (DO). As seen in the graph to the left, DO concentrations rise and fall, often mirroring the concentration of chlorophyll.

As blooms die off, it can also cause the DO to drop, which can result in fish kills or other negative impacts for the waterbody. During this deployment, DO did not fall below the Canadian Council of Ministers of the Environment (CCME) minimum guidelines for other life stages (6.5 mg/L). However, at times it was below the minimum guidelines for early life stages (9.5 mg/L), which is common during warmer summer months.

pH is influenced by the concentration of carbon dioxide in water. Photosynthesis decreases carbon dioxide, thus increasing the pH of the water. pH surpassed 9 pH units in early July. CCME's freshwater guidelines for pH recommend a minimum pH of 6.5 and maximum pH of 9 for protection of aquatic life. At the peak of the bloom, the pH briefly exceeded CCME's guidelines for the maximum long term concentration of pH.





Key Findings & Contact

In 2024 Newfoundland and Labrador confirmed the first cyanobacteria blooms outside of the Avalon Peninsula. In 2025 a small bloom consisting primarily of green algae was detected near the west coast of Newfoundland; however, most of the cyanobacteria activity occurred on the Avalon Peninsula. In 2025 Newfoundland and Labrador confirmed its first winter bloom.

Chlorophyll is often used as an indicator of harmful algal blooms, like cyanobacteria; however, it also an important indicator of beneficial algae like green algae and diatoms. The concentration of chlorophyll in Forest Pond was highest in the spring and fall. Modelling indicated a weak negative relationship between stratification and chlorophyll. This could be explained by decreased mixing from stratification which may cause beneficial algae to settle on the lakebed.

Health Canada's Guidelines for Recreational Water's Cell Count was exceeded at Paddy's Pond. At this time, no toxins were found and eDNA testing confirmed that the species present were unable to produce them. In 2025 the risk to recreational waterbodies was low because only non-toxin producing species were present and the risk to drinking water was low because no blooms were observed near drinking water intakes.

While it may be encouraging to see the risk of cyanobacteria toxins was low in 2025, it is important not to predict toxin levels in future blooms. Other jurisdictions have seen significant increases in toxin production over the last decade.

Suspected blooms within Newfoundland and Labrador can be reported to:
Government of Newfoundland & Labrador
Department of Environment, Conservation & Climate Change
Water Resources Management Division
water@gov.nl.ca