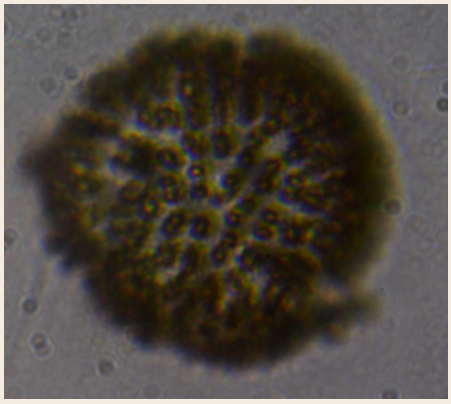
WORCESTER CYANOBACTERIA MONITORING COLLABORATIVE

Indian Lake - October 2021

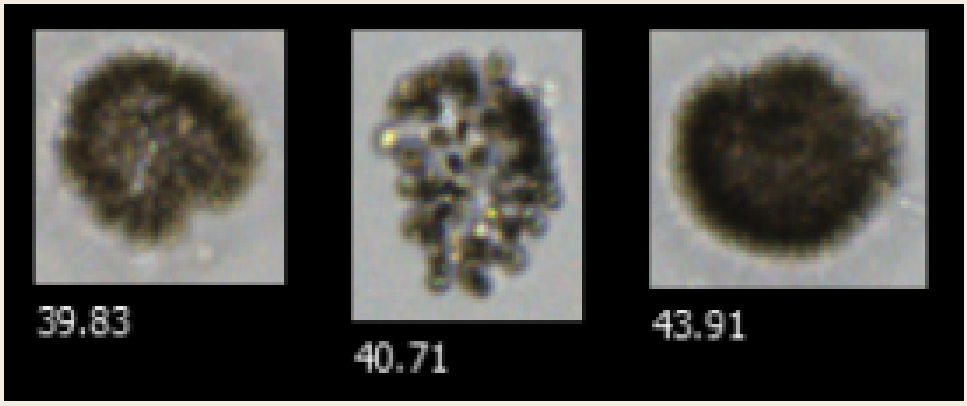
Sampling Conditions

October 16th was a calm, partly cloudy Saturday at 71.8℉. There was no rainfall the day before the sample was taken. The water was 65.8℉ and slightlyTurbid. Ducks, geese and insects were observed along the shoreline.

Microscopic Findings from the Plankton NET



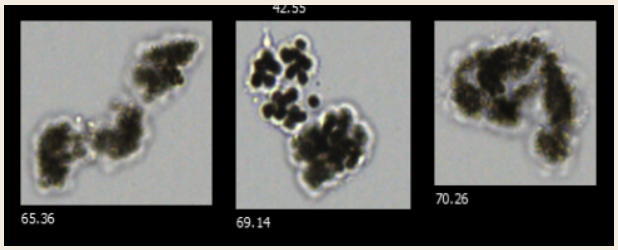
Woronichinia Cyanobacteria



FlowCam images of Woronichinia Cyanobacteria

FlowCam Findings from the GRAB Sample

The particle density at Indian Lake was 697 particles/ml in October, down from 12384 particles/ml in September, according to the FlowCam. The sample still contained cyanobacteria, including Microcystis, Doliscospermum, and Woronichinia, but in much lower density than the previous month. There were also many small particles and organic debris.



Microcystis Cyanobacteria

Fluorimetry Data from the Integrated Tube Sample

We used the fluorometer to find the amount of phycocyanin in the sample, which we can use as an indicator of cyanobacteria. In October, Indian Lake had undetectable levels of phycocyanin pigment, down from 119 Aus in September. A pond becomes at risk for a bloom when is at levels above 50 Au.

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Tabellaria Diatoms

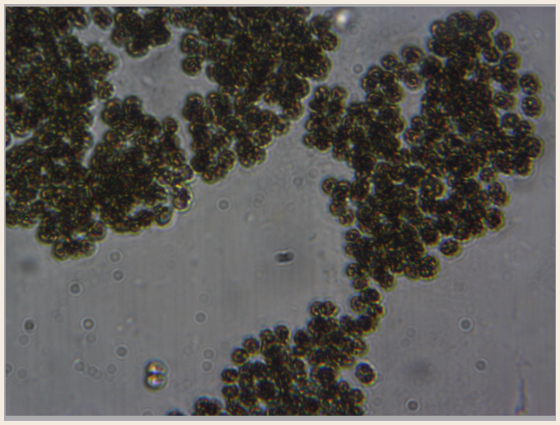
WORCESTER CYANOBACTERIA MONITORING COLLABORATIVE

Indian Lake - September 2021

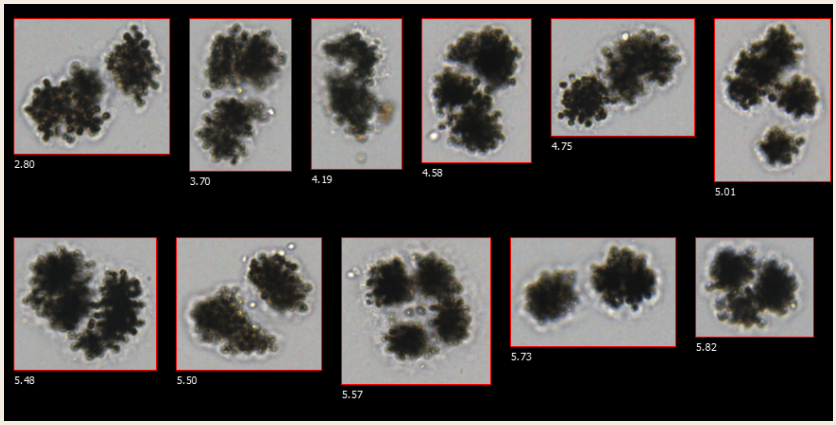
Sampling Conditions

September 25th was a calm, sunny Saturday at 68℉ with a light breeze. There were 2 inches of rainfall the day before the sample was taken. The water was 69.9℉ and Turbid. Ducks, insects and minnows were observed along the shoreline.

Microscopic Findings from the Plankton NET



Microcystis cyanobacteria



Flowcam Image of *Microcystis* cyanobacteria

FlowCam Findings from the GRAB Sample

The particle density at Indian Lake was 12384 particles/ml in September, according to the FlowCam, which was much higher than it was in August. Since that last sampling date, Indian Lake has experienced a cyanobacteria bloom, which ended the day that the September sample was collected. This sample contained a lower diversity than in August as well, containing about an equal density of the two cyanobacteria Microcystis and Aphanizomenon, in addition to a lot of organic debris.

Fluorimetry Data from the Integrated Tube Sample

We used the fluorometer to find the amount of phycocyanin in the sample, which we can use as an indicator of cyanobacteria. In September, Indian Lake had 126 Aus of phycocyanin pigment, which is relatively high compared to other lakes in the program, as well as the August level of 19Au. A pond becomes at risk for a bloom when it is at levels above 50 Au.

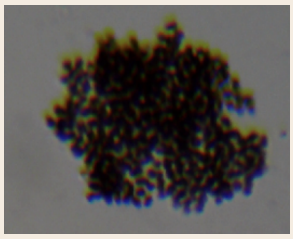
WORCESTER CYANOBACTERIA MONITORING COLLABORATIVE

Indian Lake - August 2021

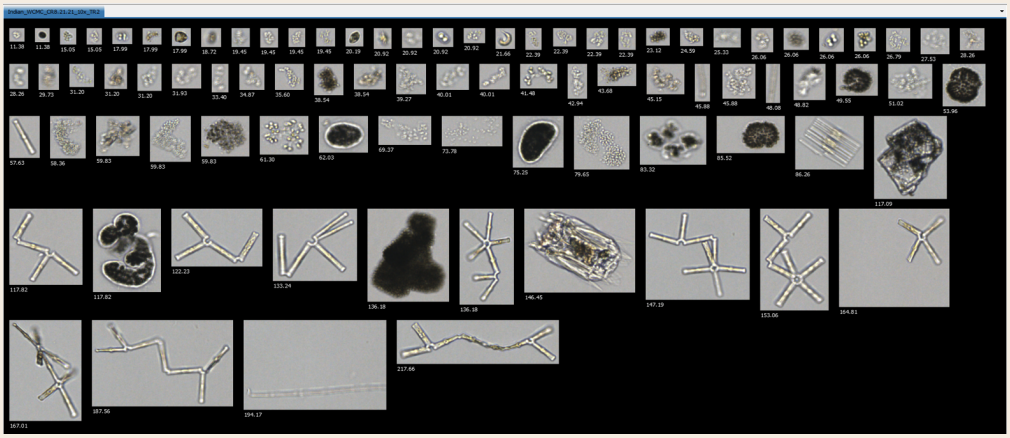
Sampling Conditions

August 21st was a partly cloudy Saturday at 80℉ with a light breeze. There was 1 inch of rainfall the day before the sample was taken, and 3 inches two days before the sample was taken.

Microscopic Findings from the Plankton NET



Microcystis cyanobacteria

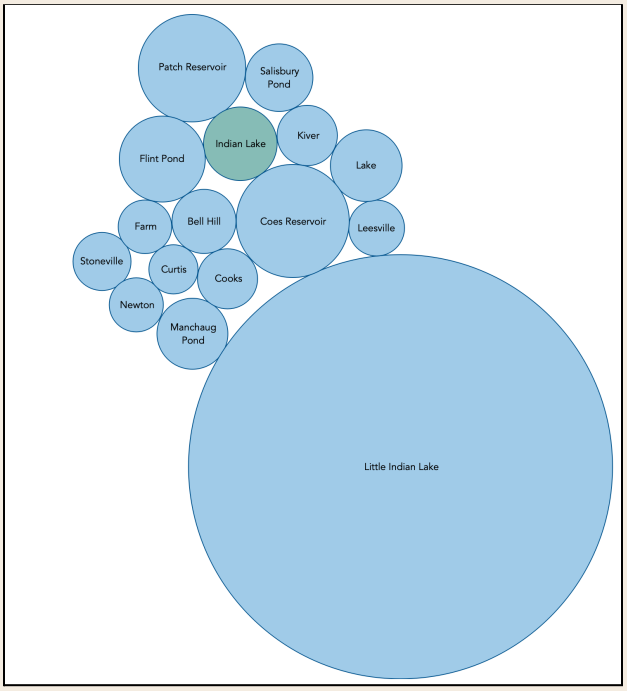


FlowCam Findings from the GRAB Sample

The particle density at Indian Lake was 347 particles/ml in August, according to the FlowCam, which was lower this month than it was in July. The sample contained a range of different organisms, including the diatom *Tabellaria*, as well as several genera of cyanobacteria including *Microcystis*, *Woronichinia*, *Aphanocapsa*, and *Snowella*. Absent from the sample were *Dolichospermum*, which were present in July. While cyanobacteria are a concern at Indian Lake, this data, along with the fluorometry data, do not suggest that it is at a dangerous level.

Fluorimetry Data from the Integrated Tube Sample

Using the fluorometer to find phycocyanin levels, the following graph represents the relative cyanobacteria pigment in each pond. Indian Lake rose from 10 Au in the month of July to 19 Au in the month of August. A pond becomes at risk for a bloom when it is at levels above 50 Au.



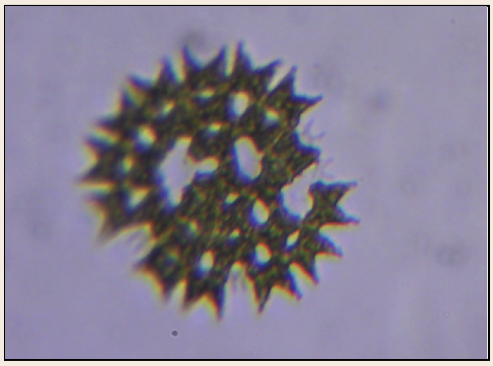
WORCESTER CYANOBACTERIA MONITORING COLLABORATIVE

Indian Lake - July 2021

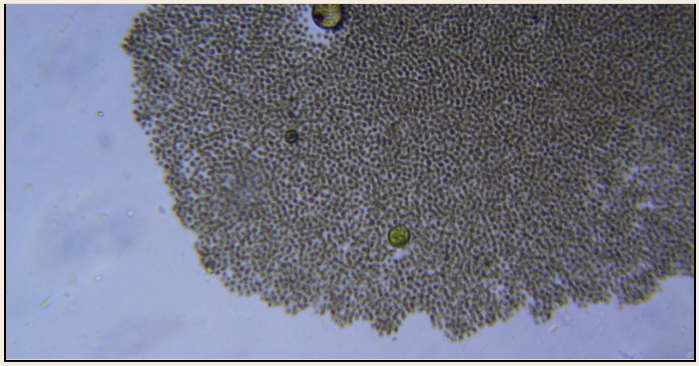
Sampling Conditions

July 17th was a partly cloudy Saturday at 73°F with no wind activity. The sample was taken at the dock where there were .4 inches of rainfall the day before. The water's surface temperature was 77°F and the water was calm with no wave activity. The water was slightly turbid with no odor, and no evidence of scums. A flock of geese was along the surface of the water, as well as squirrels and swallows which were observed along the shore.

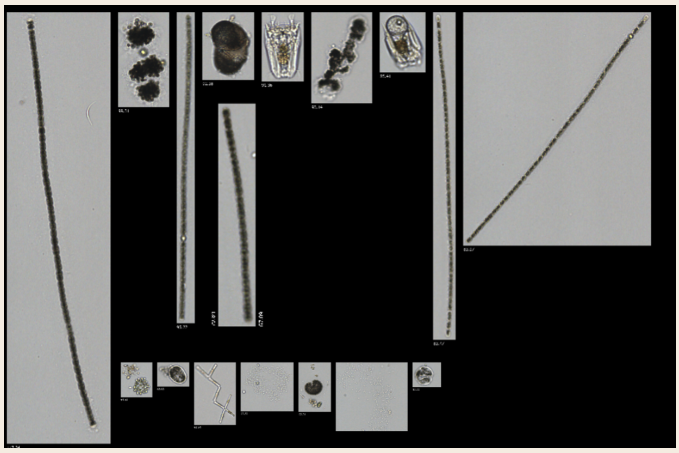
Microscopic Findings from the Plankton NET on July 17th



Pediastrum Simplex - 100x



Microcystis

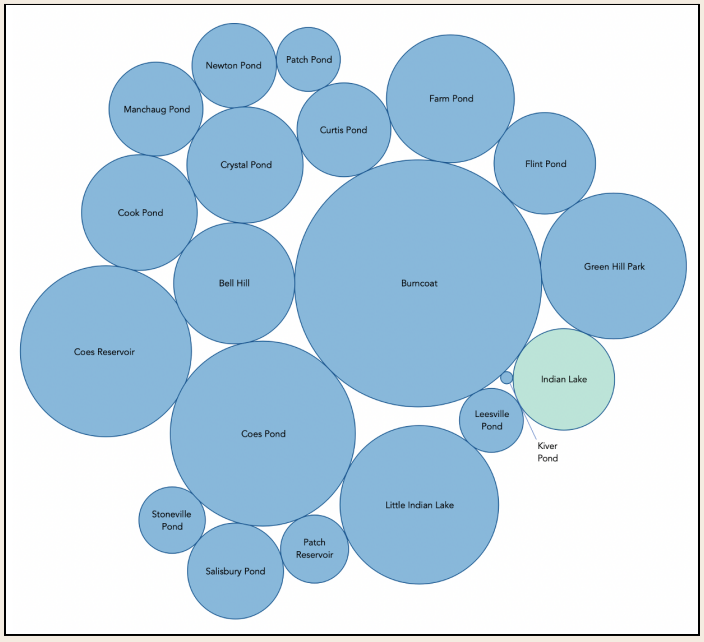


FlowCam Findings from the GRAB Sample

The FlowCam, an advanced microscopy technology, was run for all organisms in the water sample including green algae, golden algae, cyanobacteria, diatoms, and debris. The particle density at Indian Lake was 784 particles/ml in July, which is a decrease from 1,534 particles/ml in June. The figure provides a snapshot of some of the images that were seen by the camera at this lake.

Fluorimetry Data from the Integrated Tube Sample

Using the fluorometer to find phycocyanin levels, the following graph represents the relative cyanobacteria pigment in each pond. Indian Lake rose from an undetectable level in the month of June to about 10 Absorbance Units (Au) in the month of July. A pond becomes at risk for a bloom when levels rise above 50 Au.



WORCESTER CYANOBACTERIA MONITORING COLLABORATIVE

Indian Lake - June 2021

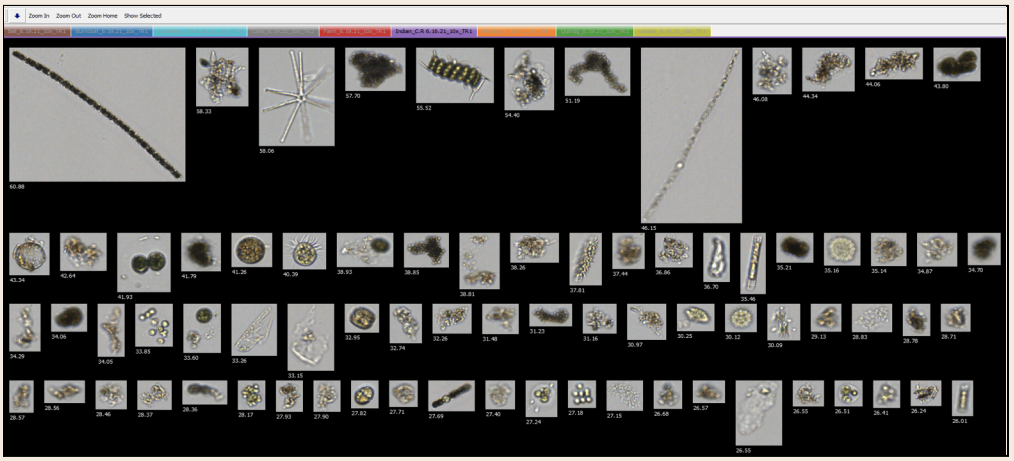
Sampling Conditions

June 19th was a mostly cloudy Saturday at 71°F with a light breeze from the southeast direction. There was about .25 inches of rain from the night before. Surface temperature was 73°F and the water had average wave activity. The water was clear with no odor, with pollen observed along the top. Turtles and a goose family were spotted along the shoreline.

Microscopic Findings from Plankton NET on June 19th

Trichrome - 100x

FlowCam Findings from GRAB Sample

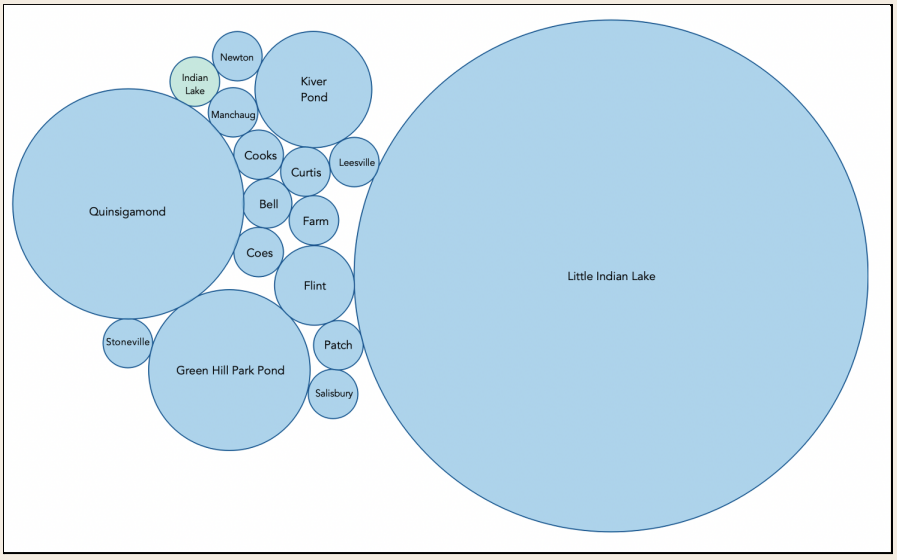


The FlowCam is advanced microscopy technology that uses a high speed camera to photograph individual cells as they pass through a thin flow cell. The computer's image recognition technology will then sort the cells based on parameters used to distinguish cyanobacteria from other organisms, and eventually count them. While we still have some work to do to train the computer to cell counts, we were able to do an initial scan on June's samples.

The particle density at Indian Lake was 1,534 particles/ml. Keep in mind that this number includes all organisms in the water sample, including green algae, golden algae, cyanobacteria, diatoms, and debris. Further work with the FlowCam will allow us to tease the groups apart, but for now, this figure can be used to help us understand how productive the water is. Here also is a snapshot of some of the images that were seen by the camera at this lake.

Fluorimetry Data from IT Tube

A spectrometer is a scientific instrument used to measure specific fluorescent components of a substance. Using this machine, we are able to measure the amounts of phycocyanin - a pigment specific to cyanobacteria - in a water sample. From these measurements we are able to determine the relative amounts of cyanobacteria in Worcester's waters. The graph provides the relative amounts of cyanobacteria found in the month of June. This month, only five water bodies presented with a distinguishable amount of cyanobacteria: Flint, Kiver, Quinsigamond, Green Hill, and Little Indian Lake. All other ponds, including Indian Lake, showed no distinguishable levels of phycocyanin.



WORCESTER CYANOBACTERIA MONITERING COLLABORATIVE

Indian Lake

May 2021

Indian Lake, which was once known as North Pond, is located in northern Worcester, Massachusetts along Grove Street, Holden Street, Shore Drive, and I-190. Along the shore are multiple parks such as Shore Park, Morgan Park, and Indian Lake Park, with a playground, tennis courts, beaches, YMCA, and many public access points. Indian Lake is one of Worcester's largest lakes at 190 acres. The mean and maximum depths are 8 and 15 feet respectively, and has been known to have reduced transparency. It is considered high risk for cyanobacteria blooms, and the City monitors it closely and treats it throughout the year to ensure the water meets all recreational standards. Indian Lake has been sampled by the WCMC in 2017, 2018, 2019, and now in 2021.

Sampling Conditions

May 22nd was a sunny, spring Saturday at 76°F with no wind. Indian Lake's sample was taken at a private dock on Holden Street where there was no rain in the past 48 hours. Surface temperature was 71°F and the water was calm with little wave activity. The water was slightly turbid with no odor, with pollen observed along the top. Ducks and other birds were spotted at the lake while samples were taken, as well as one motorboat in the water.

Microscopic Findings

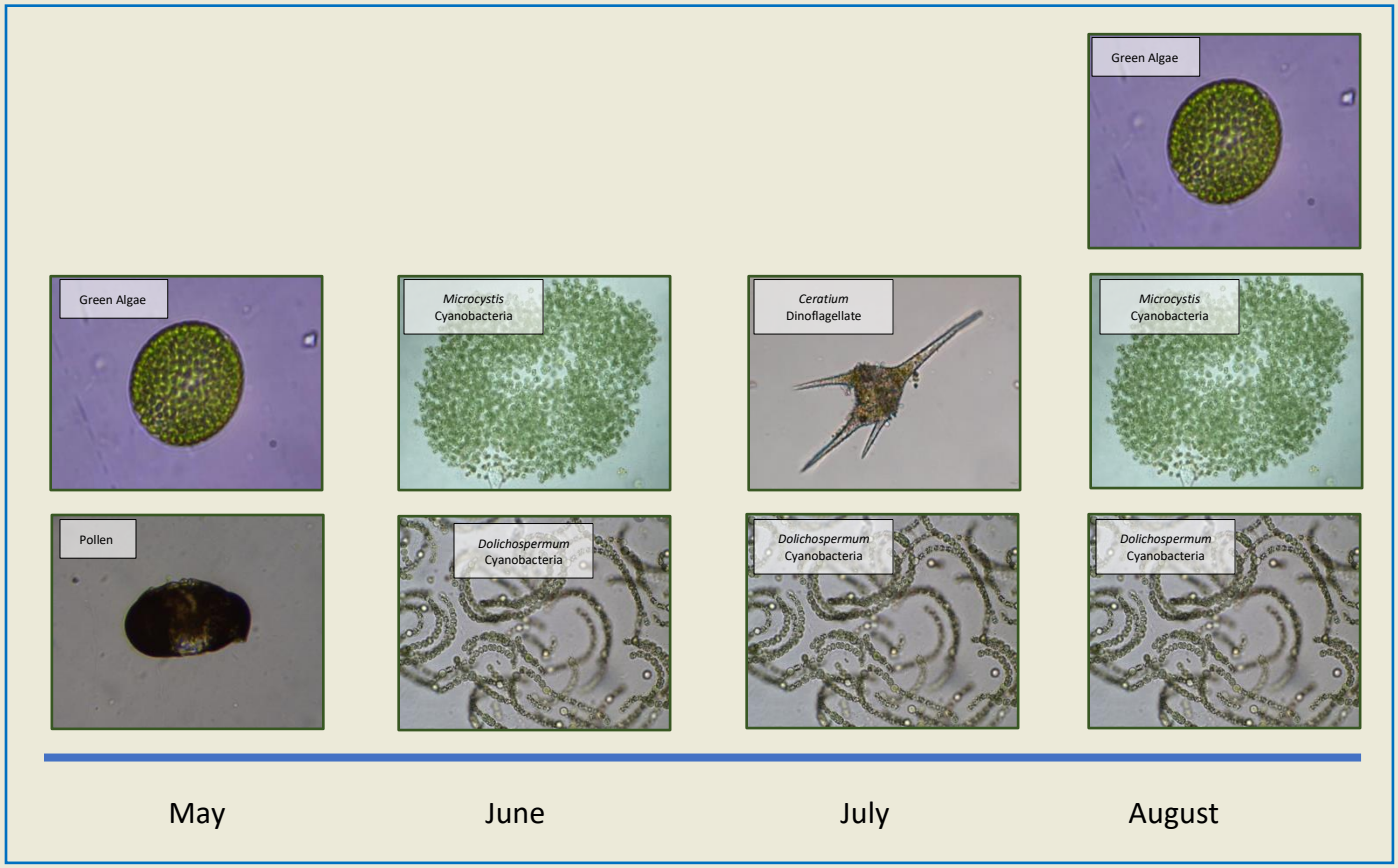
Dolichospermum, a cyanobacterium (400X)

Monthly Overview

This month, there were expected levels of cyanobacteria found in Indian Lake. Dolichospermum was found under the microscopes, an organism that has been found every year of sampling at Indian Lake, especially in the months of June and August. Using the data determined by the fluorometry, the number of cyanobacteria found was around the average amount for other lakes using the whole lake water sample. The number of larger, bloom forming cyanobacteria found was elevated over the other lakes and ponds around Worcester. Contracted cell counts by the city indicated that these levels were not high enough to be of concern at this time. The alum treatment in late May will be a significant driver in keeping cyanobacteria levels down, and next month's samples will tell us more information.

Past Years' Findings

The timeline below shows the organisms found in previous sampling years.



Thank you to Dana, Preston, Karen and all our volunteers!