

WORCESTER CYANOBACTERIA MONITORING COLLABORATIVE

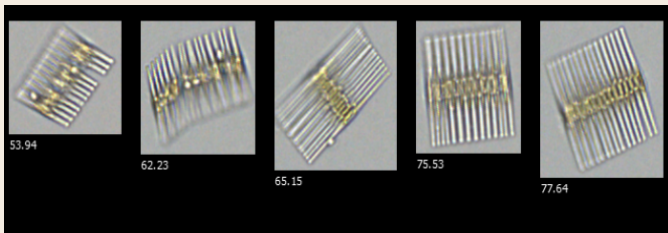
Coes Reservoir - October 2021

Sampling Conditions

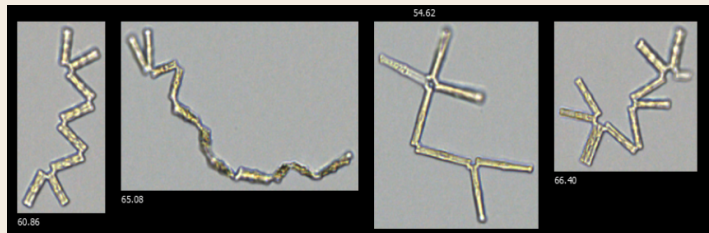
October 16th was a sunny, breezy Saturday at 68°F. The water was 66.4°F and slightly turbid. There was no rainfall the day before the sample was taken. Goose droppings were observed on the beach.

FlowCam Findings from the GRAB Sample

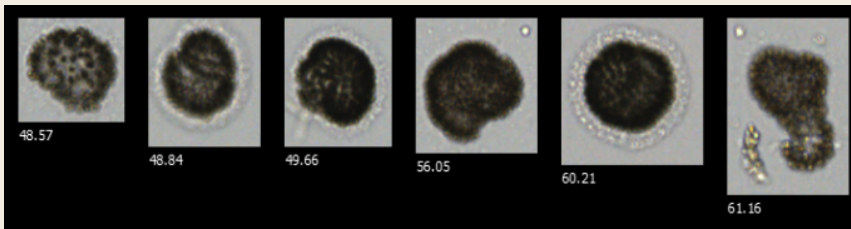
The particle density at Coes Reservoir was 238 particles/ml in October, according to the FlowCam, which was lower than what was observed in September. The sample was again dominated by diatoms, such as *Asterionella*, *Fragilaria*, and small circular diatoms. There were only a few images of cyanobacteria, including *Woronichinia*. The diversity this month was therefore similar to last month's, however, the density of cells was much lower.



Tabellaria Diatoms



Fragilaria Diatoms



Woronichinia 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, Coes Reservoir had undetectable levels of phycocyanin pigment, similar as it had in September. A pond becomes at risk for a bloom when it is at levels above 50 Au.

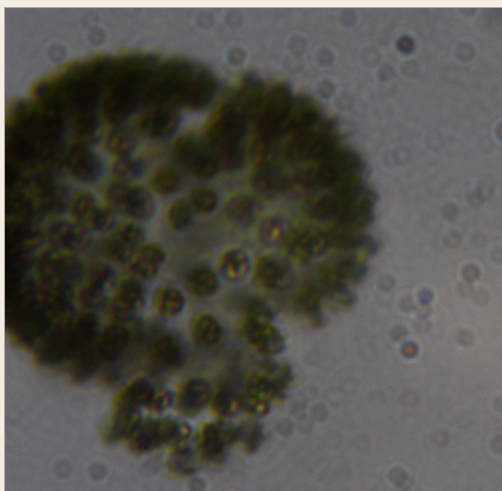
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Coes Reservoir - September 2021

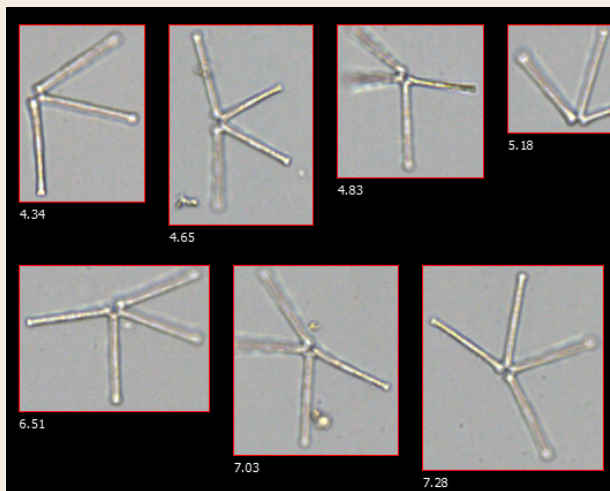
Sampling Conditions

September 25th was a Sunny Saturday at 66°F with a light breeze. The water was 72.4°F and slightly turbid. There were .34 inches of rainfall the day before the sample was taken. Five swans were observed on the pond.

Microscopic Findings from the Plankton NET



Woronichinia Cyanobacteria



Flowcam Images of Asterionella Diatoms

FlowCam Findings from the GRAB Sample

The particle density at Coes Reservoir was 3793 particles/ml in September, according to the FlowCam, which was more than what was observed in August. The sample was dominated by diatoms, such as Asterionella, Fragilaria, and small circular diatoms. There were only a few images of cyanobacteria, including Woronichinia. Since the last sampling event, there was a copper sulfate treatment performed at the lake, which may be responsible for the reduced density of cyanobacteria.



Circular Diatoms

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, Coes Reservoir had undetectable levels of phycocyanin pigment. This is down from the much higher level of 46 Aus in August. A pond becomes at risk for a bloom when it is at levels above 50 Au.

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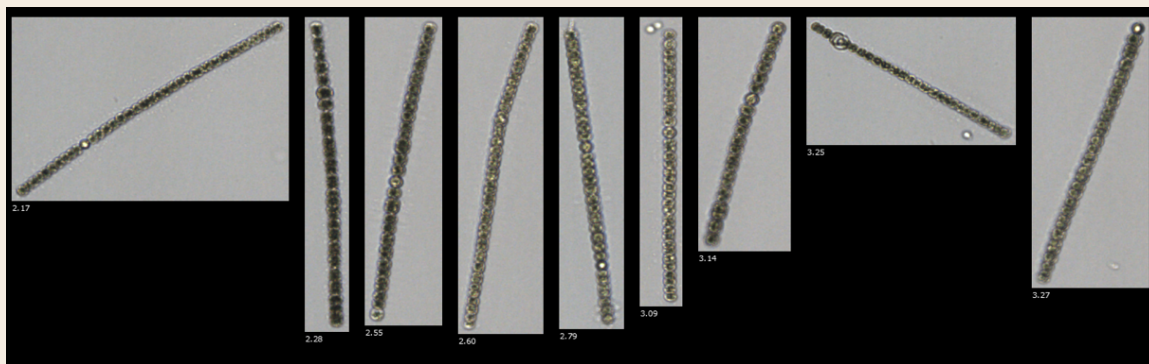
Coes Reservoir - August 2021

Sampling Conditions

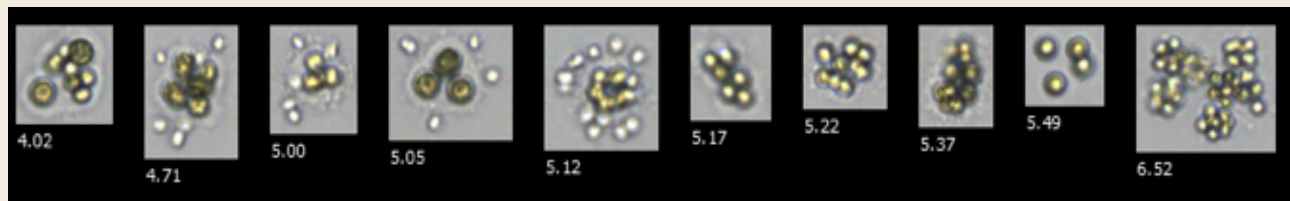
August 21st was a partly cloudy Saturday at 82°F with a light breeze. There were .2 inches of rainfall the day before the sample was taken, and 3 inches two days before the sample was taken.

FlowCam Findings from the GRAB Sample

The particle density at Coes Reservoir was 631 particles/ml in August, according to the FlowCam, which was less than what was observed in July. The sample was dominated by the cyanobacteria *Dolichospermum*, as well as some green algae from the genera of *Oocystis* and *Sphaerocystis*. Follow-up samples are now being taken at Coes Reservoir to determine if there is a threat of a cyanobacteria bloom.



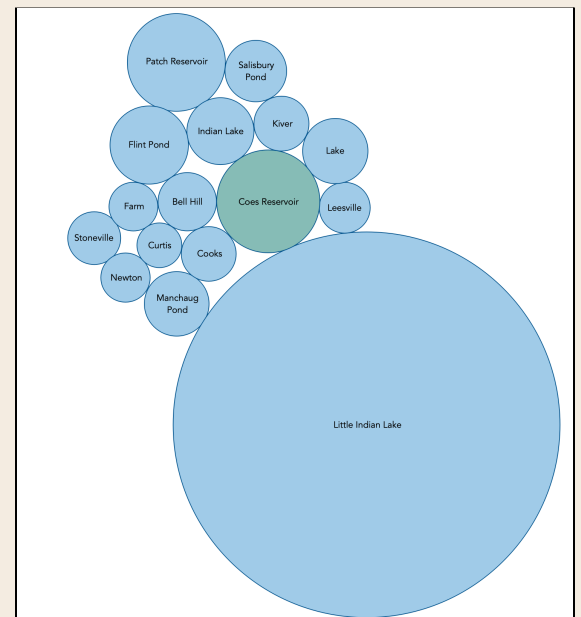
Dolichospermum Cyanobacteria



Oocystis/Sphaerocystis green algae

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. Coes Reservoir rose from 30 Au in the month of July to 46 Au in the month of August. A pond becomes at risk for a bloom when it is at levels above 50 Au.



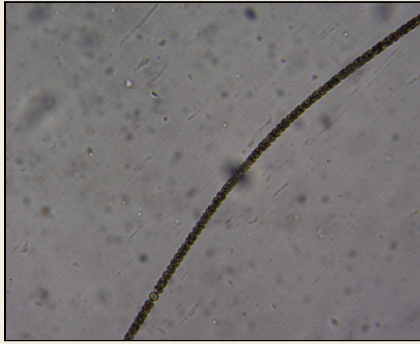
WORCESTER CYANOBACTERIA MONITORING COLLABORATIVE

Coes Reservoir - July 2021

Sampling Conditions

July 17th was a partly cloudy Saturday at 73°F with a light breeze. Coes Reservoir's sample was taken at Binienda Beach where there were .4 inches of rainfall the day before. The temperature at the water's surface was 78.9 °F and the water was still with little wave activity. The water was slightly turbid with no odor or evidence of scums.

Microscopic Findings from the Plankton NET on July 17th



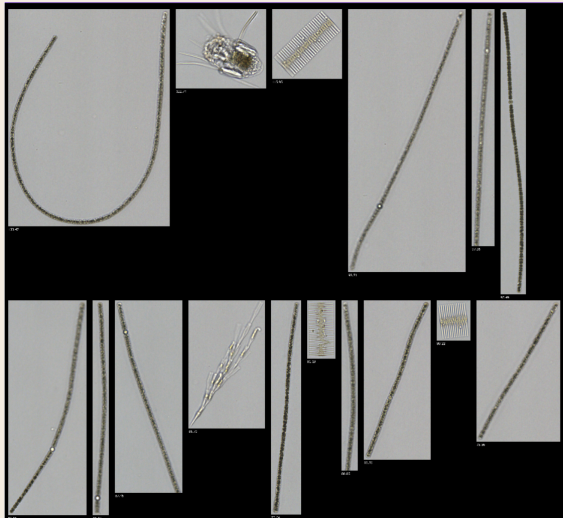
Dolichospermum - 100x



Dolichospermum - 100x



Tabellaria - 100x

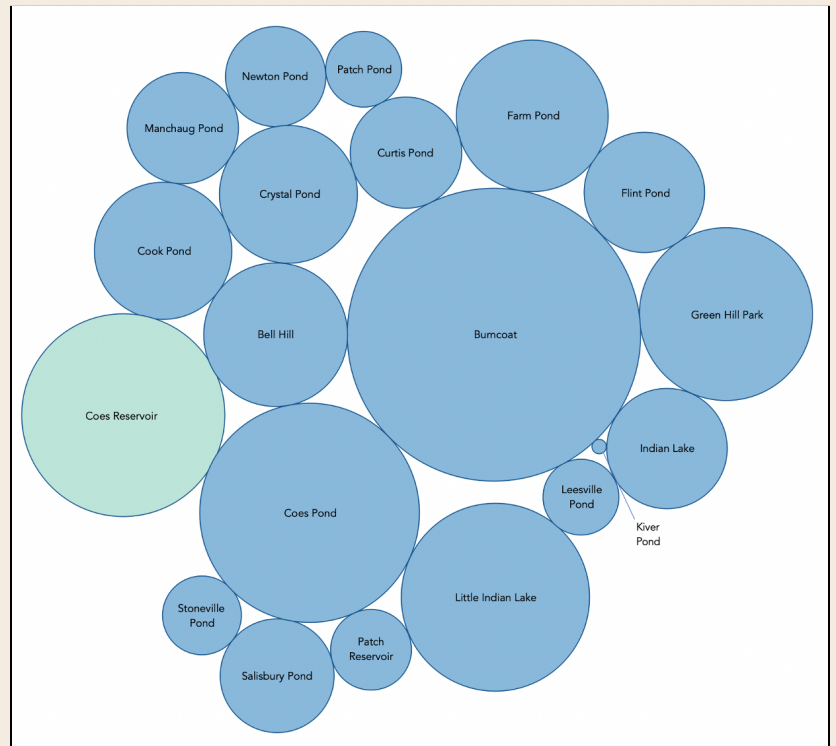


FlowCam Findings from the GRAB Sample

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 Coes Reservoir was 1202 particles/ml in June, and increased to 1891 particles/ml in July. 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. Coes Reservoir rose from an undetectable level in the month of June to about 30 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

Coes Reservoir - June 2021

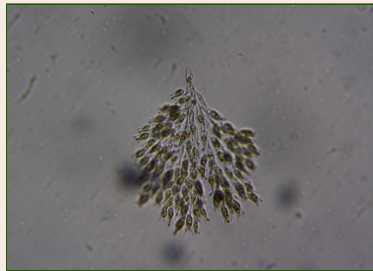
Sampling Conditions

June 19th was a partly cloudy Saturday at 75°F with no wind. Coes Reservoir's sample was taken at the shore on the beach where there was no rain in the past 48 hours. The surface temperature was 73.8°F and the water was calm with little wave activity. The water was slightly turbid with no odor or evidence of scums. Milfoil fragments were observed along the top of the water, as well as geese droppings and feathers on the shore.

Microscopic Findings from Plankton NET on June 19th



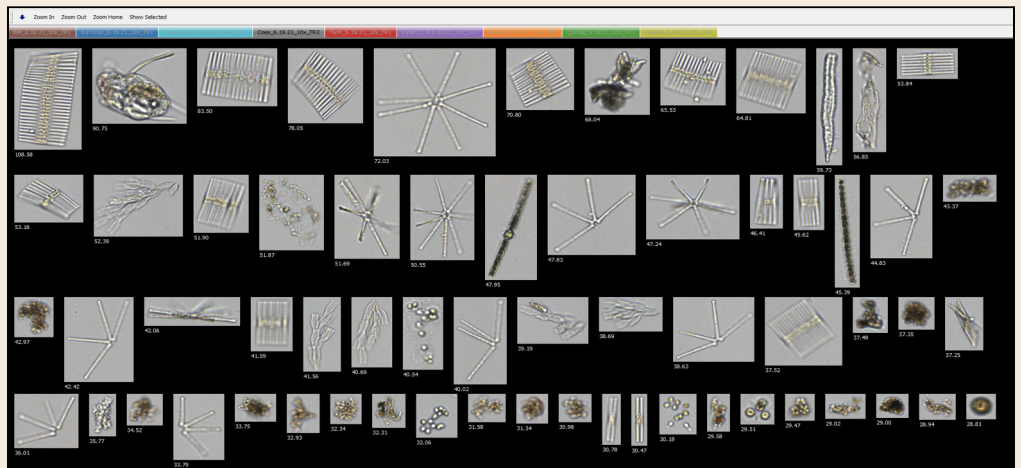
Trichome - 100x



Dinobryon - 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.

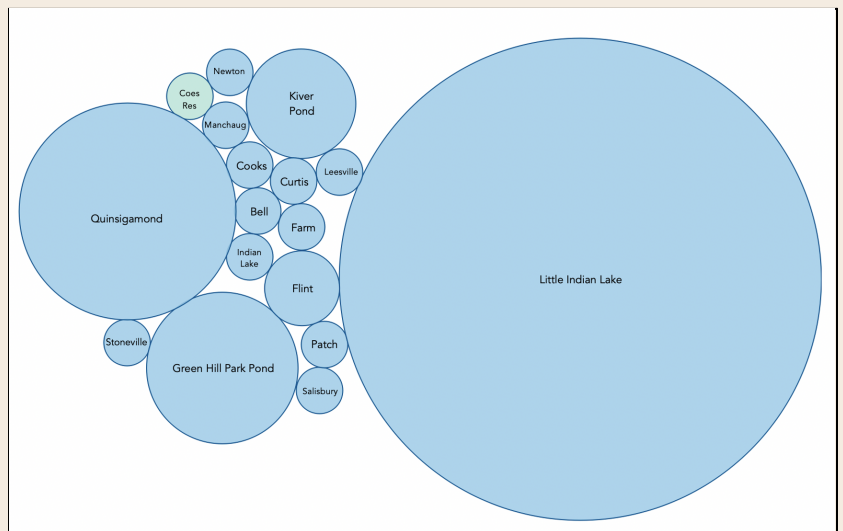


The particle density at Coes Reservoir was

1,202 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 Coes Reservoir, showed no distinguishable levels of phycocyanin.



WORCESTER CYANOBACTERIA MONITORING COLLABORATIVE

Coes Reservoir

May 2021

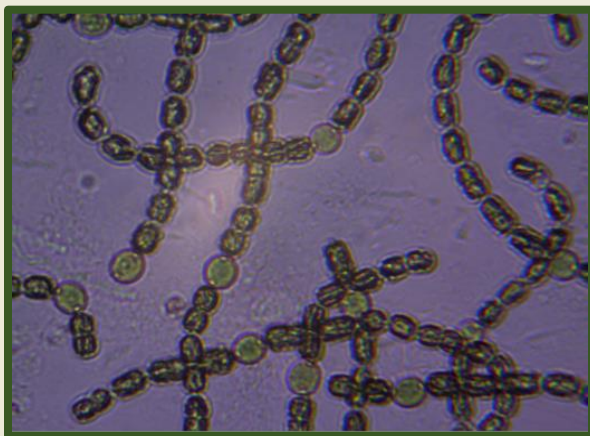
Coes Reservoir is located on Mill Street at the end of Tatnuck Brook on the western side of the City and is one of Worcester's most popular waterbodies. At the reservoir is a public beach, a new playground, some walking trails, and many public access points. The area surrounding Coes Pond includes several significant historical attributes such as the former Coes Knife property built in the late 1800's. The reservoir is 90 acres and shallow, 14 feet at its deepest point. It has many stormwater outfalls that empty into the brook and reservoir itself, meaning that it receives a lot of nutrient inputs. Coes Reservoir is managed for invasive plant growth and Harmful Algal Blooms (HABs) by the City of Worcester, and has been monitored by the WCMC in 2017, 2018, 2019, and now in 2021.



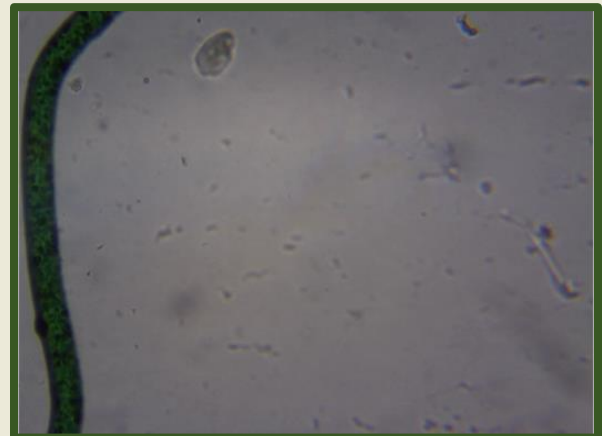
Sampling Conditions

May 22nd was a sunny, spring Saturday at 75°F with no wind. Coes Reservoir's sample was taken at the shore on the beach where there was no rain in the past 48 hours. The surface water temperature was 70°F and the water was calm with little wave activity. The water was clear with no odor or evidence of scums. Pollen was observed along the top of the water. Ducks and geese remained in the area, as well as water chestnut seen in the north end of the reservoir.

Microscopic Findings



Dolichospermum
cyanobacteria (400x)



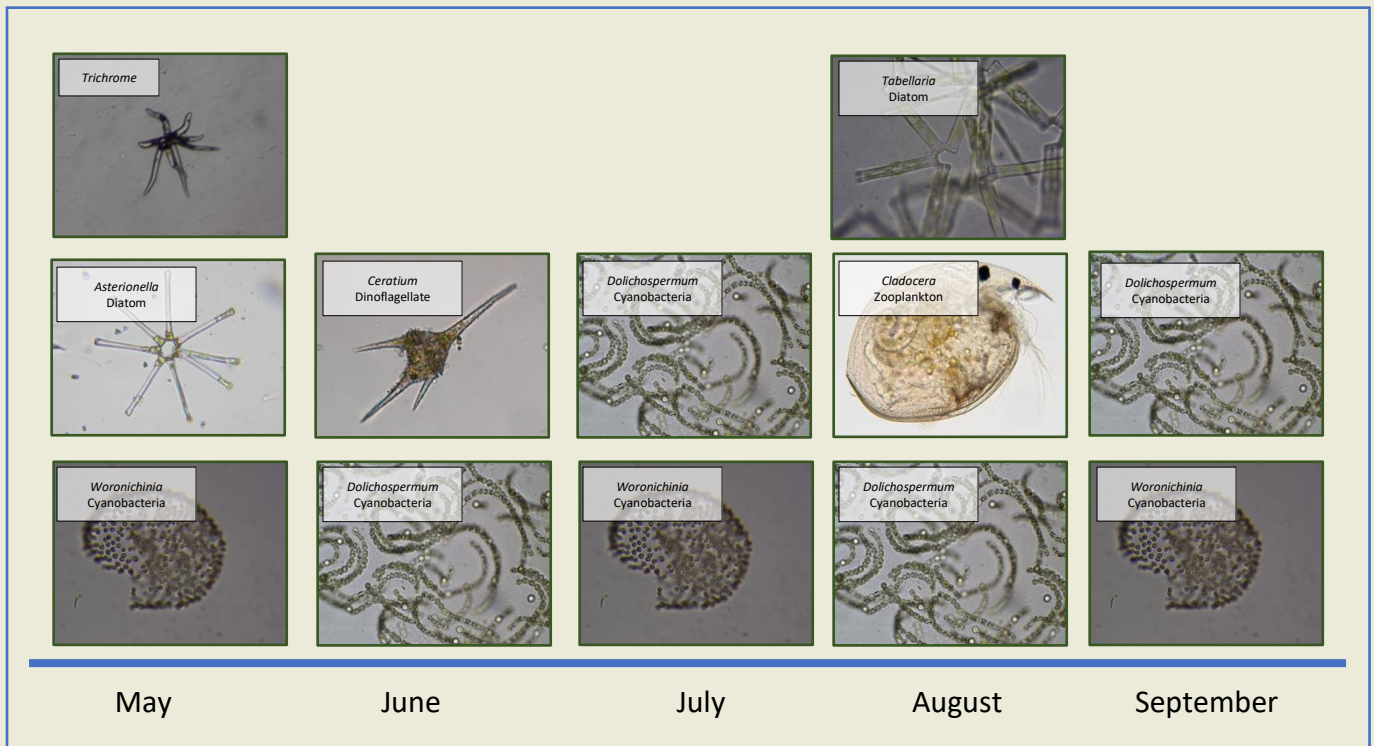
Unidentified (100x)

Monthly Overview

Underneath the microscopes, a small colony of Dolichospermum cyanobacteria was found by volunteers, as well as what we believe to be a green algae. These are commonly seen in Coes Reservoir, based on past years' timeline shown below. Since the sample was taken, the City has contracted a microscopic cell count, and levels of cyanobacteria have been determined to be low, and not a threat to humans or pets.

Past Year's Findings

The timeline below shows the organisms that have been found in Coes Reservoir in past years.



Thank you to Pat and all other volunteers!