Buckeye Lake for Tomorrow Research Paper

Introduction

Earlier this semester we participated in two trips to collect water samples from Buckeye Lake to test for water quality parameters, including *E. coli* and microcystin in the water. Here, we provide a report of the results of these collection trips and subsequent water testing.

Research Methods

Secchi Depth

We dropped a black and white disk into the water and measured when we could no longer see it, and then we measured how deep it was with a ruler. Then, we did it again, but this time dropped it all the way down and then measured with a ruler when we could see the black and white disk again as we were pulling it up. We then averaged these two numbers.

Phosphate Levels, Nitrate Levels, E-Coli Levels, and Microcystin Levels
We tested phosphate, nitrate, E-Coli, and Microcystin levels by collecting a sample of the lake water in a plastic beaker and clearing it out three times before collecting our final sample to pour into sample bottles to be sent off for testing. Testing for phosphate and nitrate is important because if there is too much of it it can be harmful to aquatic life as well as too much of these can cause algae blooms. Testing for E-Coli is important because it shows the extent of or if there are feces in the water. Lastly testing the Microcystin levels is important because if found they can be dangerous to the aquatic life and people in the water.

Phosphate and Nitrate – We used test strips to test for nitrate and phosphate when available.

E Coli- We tested E Coli by using Neogene Petri films for rapid detection. We dropped 1ML of water with a pipette from each location and switched our pipettes to ensure there was no cross contamination. They set in the incubator for approximately 24 hours to grow cultures if there was any E Coli detectable.

Microcystin – Water samples were frozen and shipped to the OSU Stone Laboratory. Water samples were processed to test for microcystin using an ELISA test for microcystins in the Chaffin lab. Results are reported in ppb or µg/L.

Water Conductivity, Dissolved Oxygen Levels (at surface and at bottom), Water Temperature (at surface and at bottom), and Ph Levels (at surface and at bottom)
We recorded dissolved oxygen levels, water temperature, pH, and water conductivity by placing a YSI multiparameter probe into the water. After holding it in the water for some time to get an

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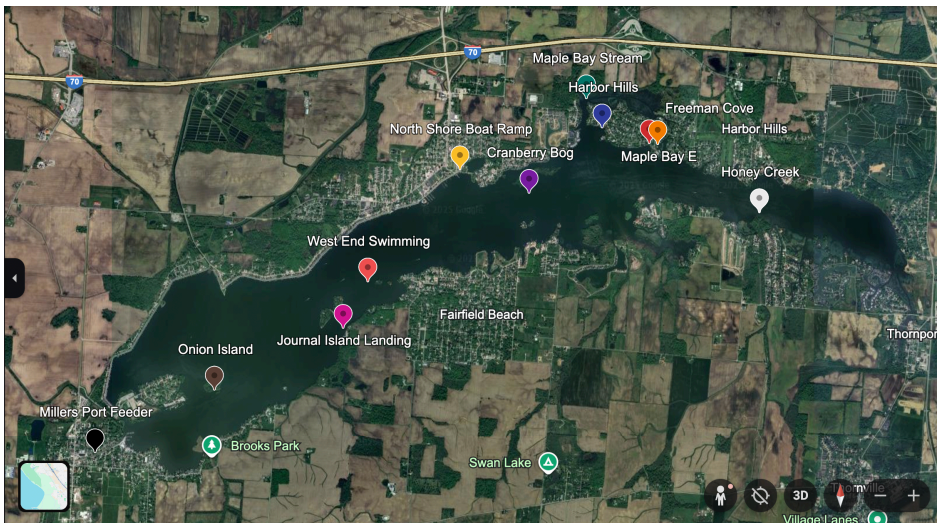
accurate estimate of the water contents, we were able to find an accurate value for the levels of oxygen, conductivity, pH, and the general temperature of the area of Buckeye Lake being tested. Dissolved oxygen levels can be important to record because marine life requires oxygen to survive. When oxygen levels in water are low, the chances of fish and other organisms surviving in those waters decrease. This can also be said for water temperature, and certain organisms cannot survive unless the water is within a certain temperature threshold. Keeping tabs on this information helps with monitoring the wellbeing of life underwater.

Sampling Localities



Map with all locations we tested. Each location is labeled with a different color to make it easier to identify. The Secchi depths, water temperature, and microsystin levels are shown at each location below.

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Results

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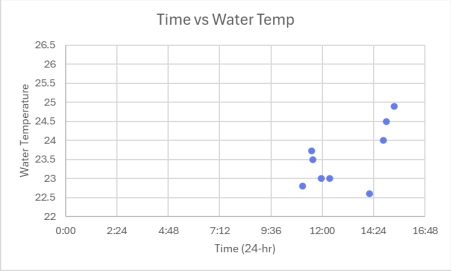
Secchi depth

Sample Loction	Secchi Depth (in cm)
Freeman Cove	20
Maple Bay Stream	20
Honey Creek	22
Cranberry Bog	22.5
Journal Island Landi	22.5
Onion Island	23
Harbor Hills	25
West End Swimming	25
Millersport Feeder	32.5
Maple Bay E	35

This table shows the Secchi depth/water clarity for each location seen on the table above. The Secchi depth is recorded in centimeters on the right of the table above.

Water temperature

Location	Water temperature at 1m
freeman cove	20
maple bay str	22.5
honey creek	25
cranberry bog	20
journal island	35
onion island	22
harbor hills	32.5
west end swir	23
millersport fe	22.5
maple bay e	25



This table shows the relationship between the location and water temperature at 1m. The temperature is recorded in Celsius and it goes down by chronological order. The graph shows as the day goes on, the water temperature increases.

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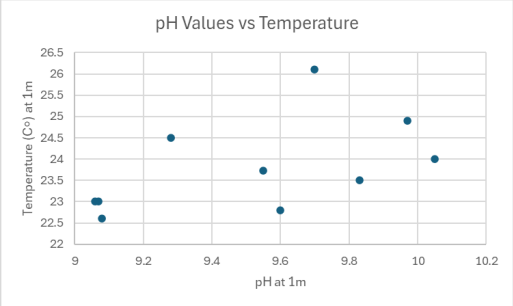
This table shows the relationship between mircocsytin and water depth at different locations

Location	Water Depth(m)	Mircocytin
Freemman cove	1	3.5
Maplebay street	4.6	6
Honey creek	2	0.5
Cranberry Bog	1	1.9
Journal Island	1	2.9
onion island	0.8	0.3
habor hills	0.8	4.8
westand swir	1.1	5.2
millersport fe	0.9	3.7
maplebay e	0.9	4.4



This graph shows there is no correlation between the pH and temperature.

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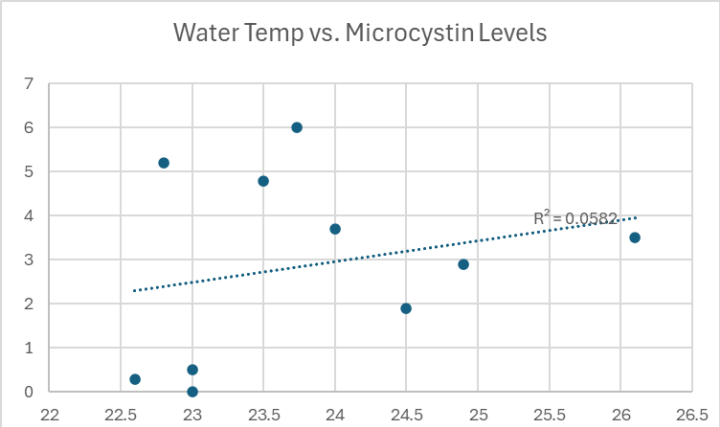
Please see this resource to think about pH.
https://www.epa.gov/system/files/documents/2021-07/parameter-factsheet_ph.pdf



This graph of water temperature (x) and Microcystin levels (y) indicates a moderately positive relationship between the two. Though you cannot use this as a sure way to measure, it could give you a basic sense of what the relationship would look like. This relationship occurs because microcystin thrives better in warmer temperatures. Because our temperatures are on a small scale, it may be harder to see the full correlation between these two factors.

Water Temp vs. Conductivity

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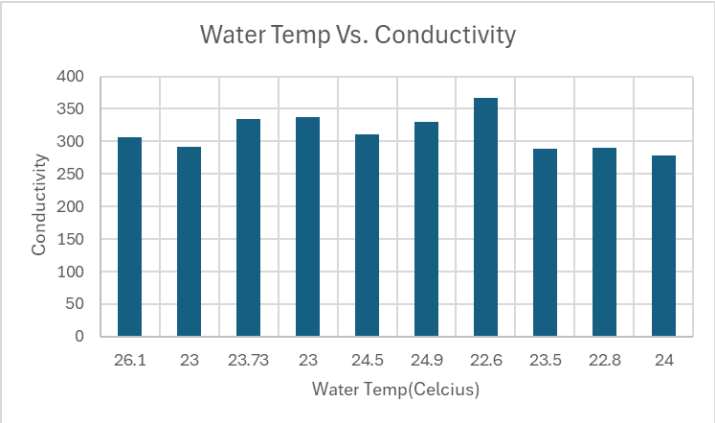

This graph shows the relationship between Water temperature and Conductivity, which measures how easily electricity can move through water and depends on the amount of dissolved salts. This can change depending on temperature: the warmer the water is, the more salts tend to be present, as evaporation occurs at a faster rate, taking the water but leaving the salts. This graph shows a narrow range of temperatures, making the conductivity relatively even as the temperature remains around a constant of 23.81.

E. Coli.

Test results showed no significant E. coli growth on test platelets. However, we recommend testing again in the spring, as these samples were perhaps stored too long before testing, due to issues with procuring the test kits.

Interpretations

To help put the different data sets into context with one another, we have data from Lake Erie provided to us by Stone Lab, as well as the data collected in Buckeye Lake by our peers on September 26, 2025, and October 4, 2025. When looking at the Stone Lab data, we focused on a similar time frame to when our data was collected. For both Buckeye Lake and Lake Erie, the data sets on Secchi Depth and Microcystin can be compared to see if the levels match or are higher than expected. Secchi Depth typically ranged from .2m to .35m in Buckeye Lake. However, when viewing Lake Erie's typical Secchi Depth

The range of good saturation for the dissolved oxygen of a lake is approximately 80-120%. The dissolved oxygen at 1 meter is drastically low in Millersport Feeder compared to other areas in Buckeye Lake with the percentage being 47.70%. Another low dissolved oxygen percentage is 66.90% in Cranberry Bog. Cranberry Bog and Millersport Feeder would benefit

from having an aeration system. The highest percentage of dissolved oxygen at 1 meter is 163.17% at West End Swimming.

Microcystin is a toxin produced from blue-green algae, or cyanobacteria. This toxin makes the water harmful to humans who use the lake for various recreational activities, such as swimming. The microcystin levels obtained from Buckeye Lake are getting dangerously high with the highest in some areas. In Harbor Hills the microcystin level obtained on September 26, 2025, were 6 µg/L. Another area with high microcystin is Journal Island Landing which is at 5.2 µg/L gathered on October 4, 2025. The U.S. Environmental Protection Agency (EPA) states that keeping the microcystin levels at or below 8 µg/L will protect public health. There are many ways to manage the microcystin levels, such as preventing anthropogenic nutrients from entering the waterbodies, placing signs and examples of blooms to ensure people are careful of where they choose to swim, and using water treatments on lower levels.

Summary: We learned about the eutrophication of lakes, rivers, and other bodies of water, and the dangers that an oversaturation of nutrients can have on marine ecosystems. For example, the Secchi depth at Buckeye Lake compared to the Secchi depth at Stone Lab was drastically different. It was much more difficult to see the Secchi disk underwater at Buckeye Lake, which we learned was the result of runoff from farms and other forms of nutrient pollution, which led to the growth of harmful algae blooms. We were also able to see through the aerators that were placed underwater that there were solutions to these problems that could produce satisfying results over time. In areas with aerators, dissolved oxygen levels were at a record high throughout our visit. All in all, the experience helped us understand the importance of maintaining a healthy marine environment. People who lived nearby shared their experiences with the lake and how eutrophication has affected their health and well-being. With this knowledge, we will be able to make informed decisions that can lead to the conservation and restoration of these hydro systems.

Commented [LJ10]: This summary section is looking good Katie, Joseph, Jaden, Karina. As you finish up, please add a section on the microcystin. Some of the localities are getting close to dangerous level. https://www.epa.gov/newsreleases/epa-issues-recommendations-recreational-water-quality-criteria-and-swimming-advisories

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