Collection and Analysis of Dissolved Oxygen and Specific Conductance Data in Fort Eddy Pond, on NHTI Campus

Teagan Zarakotas, Tracey Lesser

Department of Natural Sciences

NHTI Concord's Community College

Background

Fort Eddy Pond is a freshwater pond located in Concord, New Hampshire. It has a maximum depth of 15 feet deep and a width of 10 acres (Figure 2.). It is surrounded by NHTI – Concord's Community College and one major highway. Its main use is for fishing and other water activities.

Figure 1. Highway I-393 right next to Fort Eddy Pond

According to a similar study on Mirror Lake in New Hampshire, low dissolved oxygen (DO) and high conductivity are caused by salt runoffs from nearby highways [2] (Figure 1.). High conductivity causes harm by inhibiting the growth and reproduction of living organisms and having an impact on oxygen levels [1]. Additionally, having an ice cover suppresses oxygen from entering the pond either through absorption or photosynthesis (Figure 3.). This data will reveal the approximate levels of DO and conductivity to determine the well-being of the pond.

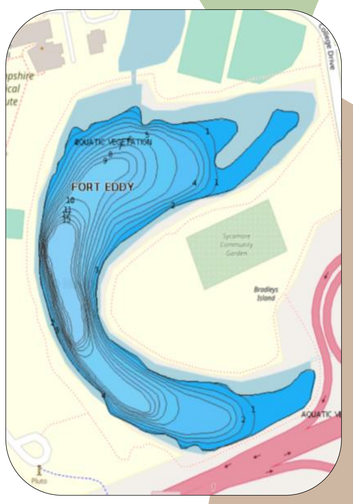

Figure 2. Fort Eddy pond

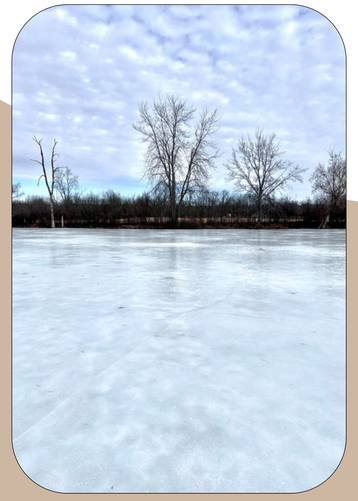

Figure 3. Ice cover over Fort Eddy pond

Technique

Samples of pond water were collected from January 31 to March 3, every Monday and Thursday (Figure 5.), and were analyzed using Winkler titration. The percentage of dissolved oxygen was collected using an Optical Dissolved Oxygen Sensor (Figure 4.), ion content was measured in µS/cm by using a Vernier Conductivity Probe CON- BTA, and the temperature was recorded in °C using a Vernier temperature probe.

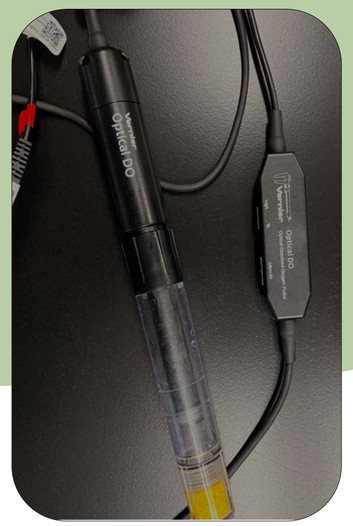

Figure 4. Optical Dissolved Oxygen Sensor

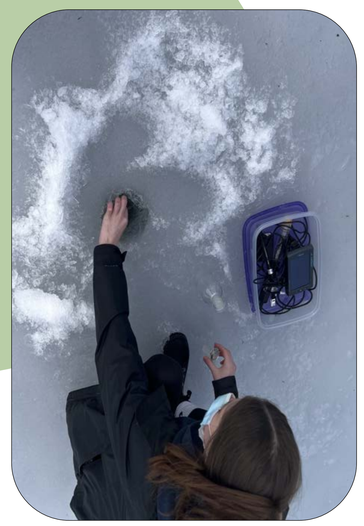

Figure 5. Collecting water samples

Results

There were little to no changes in water temperature with temperatures between –0.6 °C to 0.8 °C due to the cover of ice making it stable and at a maximum cold. After the ice cover melted during the last week of March temperature rose to 5 °C (Figure 7.). As for conductivity, the data's average was around 300 µS/cm with a slight decline and one outlier (Figure 9.). The percentage of dissolved oxygen started off at around 60% and increased throughout the month of March (Figure 8.).

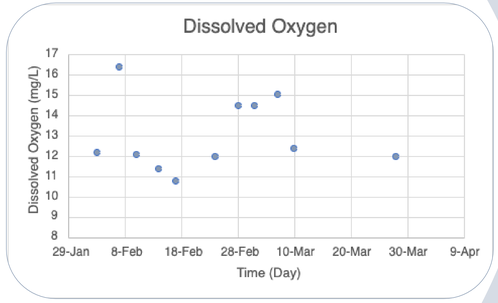

Figure 6. Dissolved Oxygen levels each day

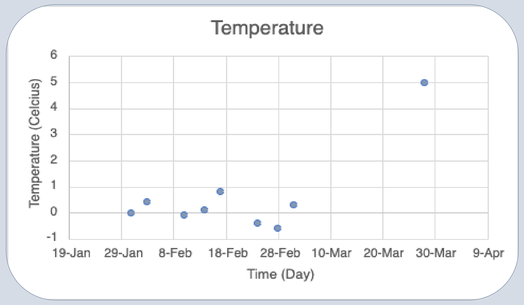

Figure 7. Temperature levels each day

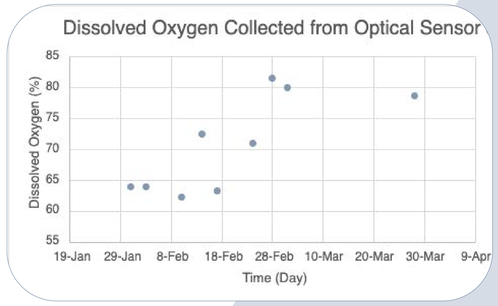

Figure 8. Percent of Dissolved oxygen levels each day

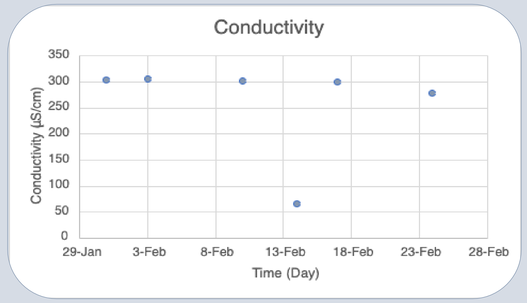

Figure 9. Conductivity levels each day

Conclusion

Conductivity levels were within the normal range of 200-1000 µS/cm and show no signs of threats from nearby road salts (Figure 9.). Levels of the percentage of dissolved oxygen didn't quite meet the standard (80-120%) during the earlier weeks but increased towards the beginning of March (Figure 8.). The low percentage of dissolved oxygen could be a result of aquatic plants and organisms using up the oxygen without the pond being able to regenerate the oxygen during the ice-on period [3]. However, the amount of oxygen in mg/L were well over the normal levels of 6.5-8 mg/L (Figure 6). According to the literature, winter and spring have higher amounts of dissolved oxygen than summer and fall due to colder water being able to hold more dissolved oxygen [4]. To continue this study, obtaining data after the ice-on period will allow for useful knowledge to ensure levels are stabilizing after the spring season.

Acknowledgment

Special thanks to Tracey Lesser and Beth Wilkes for providing assistance and feedback throughout my project. Karel Pluhar for helping with the chemistry knowledge. NHTI – Concord's Community College for providing the space and materials in order to make this study possible.

References

[1] Hinsdale, J., 2018. *How Road Salt Harms the Environment.* [online] State of the Planet. Available at: <https://news.climate.columbia.edu/2018/12/11/road-salt-harms-environment/> [Accessed 6 April 2022].

[2]Likens, G., & Buso, D. (2009). Salinization of Mirror Lake by Road Salt. Water, Air, Soil Pollution, 205(4), 205-214.

[3]Obertegger, U., Obrador, B. and Flaim, G., 2017. Dissolved oxygen dynamics under ice: Three winters of high-frequency data from Lake Tovel, Italy. *Water Resources Research*, [online] 53(8), pp.7234-7246. Available at: <https://agupubs.onlinelibrary.wiley.com/doi/10.1002/2017WR020599> [Accessed 12 April 2022].

[4]Usgs.gov. 2018. *Dissolved Oxygen and Water | U.S. Geological Survey.* [online] Available at: <https://www.usgs.gov/special-topics/water-science-school/science/dissolved-oxygen-and-water> [Accessed 12 April 2022].