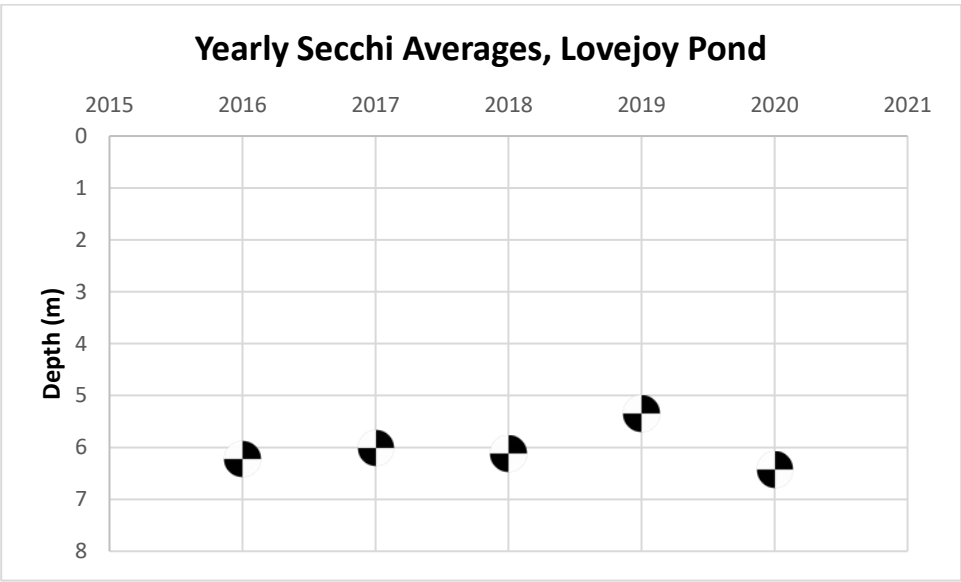
Overview

Lovejoy Pond is a 348-acre Pond in Fayette, Maine with a mean of depth 12 feet and a maximum depth of 22 feet. In 2020, 30MRWA monitored Lovejoy Pond once a month from May through September, for a total of 5 visits throughout the summer. On each visit we collected **water clarity** readings and **dissolved oxygen/temperature** profiles. Twice during the late summer, water samples were collected and tested for **phosphorus** concentrations. Sampling visits this summer were performed less frequently than a typical season due to constraints of the Covid-19 pandemic, but the focus remained to keep eyes on the water, collecting the quality data necessary for monitoring water quality trends.

Water Clarity

Secchi disk transparency (SDT) is an indicator of water clarity. To collect SDT data, a black and white disk is lowered in the water and a reading is taken at the depth at which it is no longer visible. Factors that affect transparency include algal growth, zooplankton, and suspended silt or sediment particles.

In 2020 the average reading was 6.4m (21.0 ft), the maximum: 7.02m (23.0 ft) and the minimum: 6.11m (20.0 ft). This is welcome news after a season with abnormally low clarity readings last year. The average clarity reading in 2019 was 5.35m. Lovejoy Pond has a maximum depth of around 7 meters, so clarity is extending to nearly the full depth of the pond.



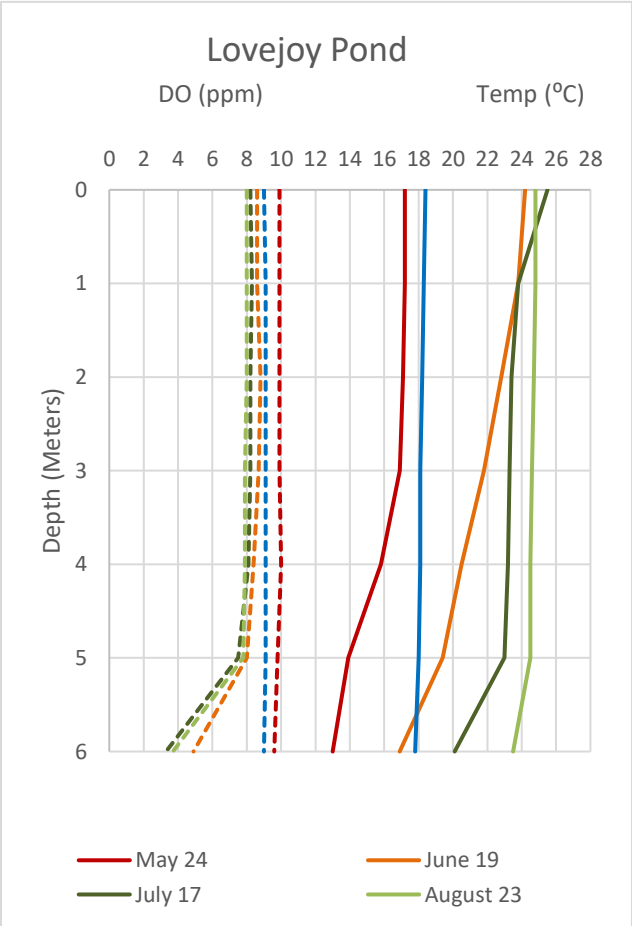
The 2020 figures are above (deeper than) the historical average of 5.5 meters, which includes limited (sporadic) data dating back to 1974.

Dissolved Oxygen

The primary reason we measure dissolved oxygen (DO) is to observe when anoxic (DO <2 ppm) conditions are present in the lake. Oxygen levels below 2 ppm (parts per million) indicate anoxic conditions, and can occur in the deepest waters of a lake or pond during the summer when the lake is thermally stratified. When anoxic conditions occur at or near the bottom sediments, it triggers a chemical reaction that releases phosphorus from the sediment, that was formerly bound to iron in the soil, back into the water column. This is referred to as "internal loading" as it differs from phosphorus that enters the lake from external sources in the form of runoff from the surrounding watershed. In 2020, sampling showed oxygen levels dropping substantially in the bottom meter from June through August, but never dropping below 3ppm. This is a good sign for lake health this summer on Lovejoy Pond.

Temperature

As you can see from the temperature profile graph here, Lovejoy Pond only vaguely forms separate temperature layers at the very bottom of the water column. This is common among shallower lakes and ponds, such as Lovejoy. Shallow ponds also tend to mix more readily, as a result of wind and weather patterns, which breaks down any stratification and facilitates oxygen movement into the deepest waters. We don't yet have enough historical information on Lovejoy Pond to form conclusions about long-term temperature trends. However, there is no doubt that a warming climate will lead to warmer lakes. One of the impacts of this will be greater algae growth.



Phosphorus

Phosphorus is an important parameter to measure in lakes and ponds as it is the nutrient that most influences the growth of algae. Phosphorus is found in soil, fertilizers, and animal waste among other sources, and enters lakes and streams during rain events that erode bare soils, and flow over the landscape transporting stormwater runoff into a water body. Our goal is to limit the phosphorus entering a water body, and thus limit algal growth. It only takes small increases of phosphorus in a lake to cause substantial increases in algal growth. Algal blooms are harmful to fish and other organisms because they use up the available oxygen in a lake, harming fish populations. Algal blooms also cause risks to human health and can decrease the economic, recreational, and aesthetic value of a lake and the properties around it.

It is important to note that extreme weather events associated with climate change typically produce higher volumes and velocity of stormwater runoff. This increases the likelihood that sediment and nutrients (primarily phosphorus) will be transported to lakes and cause substantial increases in the concentration of algae in lake water over a relatively short period of time.

Phosphorus samples were collected twice this summer, once in July and once in September. The phosphorus concentrations in Lovejoy Pond in 2020 were 11 ppb and 8 ppb (parts per billion). The average in 2019 was 8.75 ppb. The 11ppb reading observed in July is high compared to other recent readings on Lovejoy Pond, however, phosphorus can vary dramatically from year to year, so continued consistent monitoring is essential to understand Phosphorus trends in this pond.

Monitoring of Lovejoy in 2020

2020 was our fifth year of monitoring Lovejoy's water quality. We began monitoring in late May and continued through the end of September, once per month. This was an abbreviated monitoring schedule, but still produced a thorough sample of this summer's conditions to be included in the growing dataset of water quality parameters that we are monitoring. The last five years has seen the most frequent water monitoring in Lovejoy Pond's history in our effort to provide a greater understanding of the lake's dynamic processes. This effort will continue to develop a robust dataset that can help our community identify and address water quality concerns in Lovejoy Pond.

Near real-time data for Lovejoy's clarity (Secchi depth), dissolved oxygen, and temperature can be found online at http://30mileriver.org/programs/water-quality-monitoring/lovejoy-pond/, along with a link to historical data for the pond.

Threatened Status

Although the water quality is rated as average, Lovejoy Pond is listed on the DEP's 2019 NPS Priority Watershed List as "Threatened" due to sediment chemistry. Aluminum to iron and aluminum to phosphorus ratios within lake sediment can indicate whether or not a lake is more vulnerable to the release of iron-bound phosphorus in the bottom sediments, which can lead to internal phosphorus recycling. This detrimental process releases phosphorus from lake sediments, fueling algae growth and creating a destructive positive feedback loop. Sediment data collected in 2016 show that Lovejoy's aluminum to iron ratio meets the vulnerability threshold and the aluminum to phosphorus is close to meeting it; therefore, Lovejoy is considered "threatened". Simply put, this means that Lovejoy Pond is much more at risk of losing its good water quality than we once thought.

Need for Sustained, Longer-Term Monitoring

Based on the limited historical data, the Maine DEP rates the overall water quality of Lovejoy as average. It is important to note that although there are no red flags yet, we have only five years of complete, consistent data on clarity, dissolved oxygen, temperature, phosphorous and chlorophyll. According to Maine DEP water quality staff, we will need **ten years** of data at our current monitoring schedule before we will have enough information to identify any trends. Therefore, our **continual and consistent monitoring of Lovejoy is critically important** in order for us to identify trends in water quality over time.

The **annual cost of water quality monitoring of Lovejoy Pond is $3,500**. This includes staff time, lab fees, travel, and supplies over the six-month monitoring season. While some of the start-up cost of water quality monitoring of Lovejoy as well as other lakes in the 30 Mile River Watershed received funding from foundation grants, the **ongoing cost of water quality monitoring of Lovejoy must be supported by donors to 30 Mile, including the Lovejoy Pond Improvement Association.**