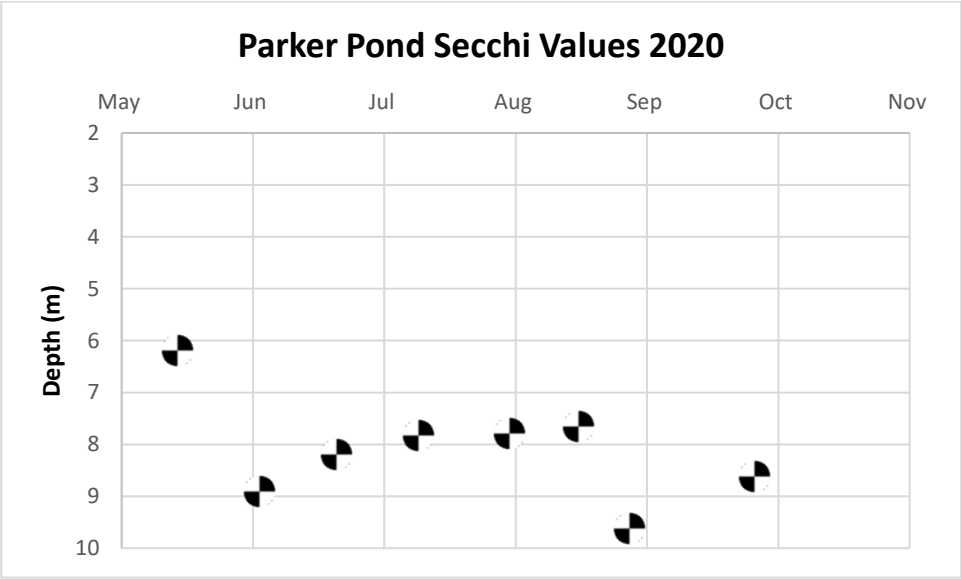
Overview

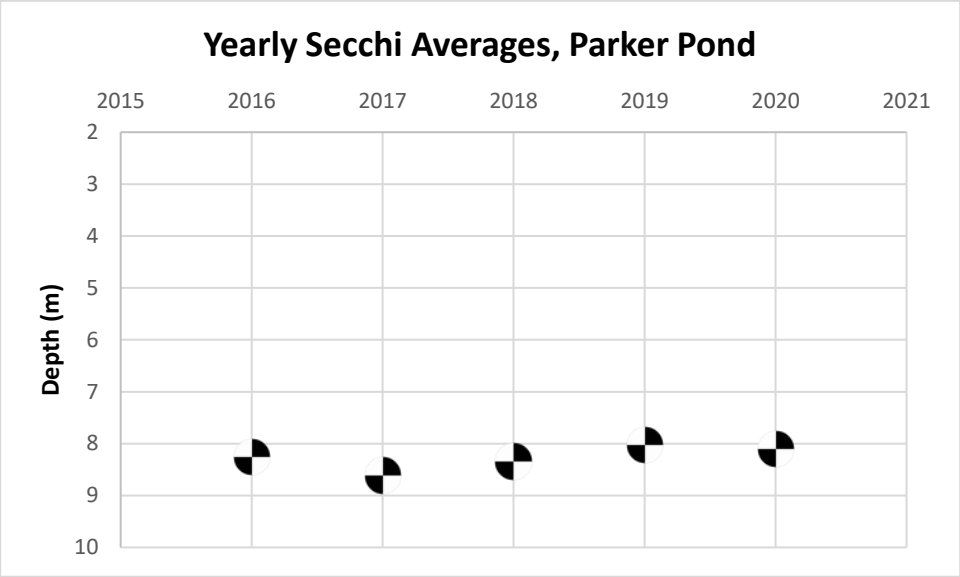
Parker Pond is a 1,551-acre pond in Mount Vernon and Vienna, Maine with a mean depth of 27 feet and a maximum depth of 76 feet. In 2020, 30MRWA monitored Parker Pond nearly twice a month from May through September, for a total of 8 visits throughout the summer. On each visit we collected **water clarity** 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 trends within the 30 Mile Watershed.

Water Clarity

Secchi disk transparency (SDT) is an indicator of water clarity. A black and white disk is lowered in the water and the reading is taken at the depth at which it is no longer visible.



In 2020 the average reading was 8.1 m (26.6 ft), the maximum: 9.62 m (31.6 ft) and the minimum: 6.19 m (20.3 ft). The maximum depth of the lake is 23 m. These figures are a good indicator as they are consistent with the Secchi readings we have seen over the past four years of monitoring. One trend that is of concern, and should continue to be monitored, is the decrease in clarity that occurs at the end of the monitoring season in September and October. This decrease in clarity has occurred all five years that 30MRWA has been monitoring the pond, and is likely occurring as a result of increased growth of phytoplankton or algae in the water during this time of year.

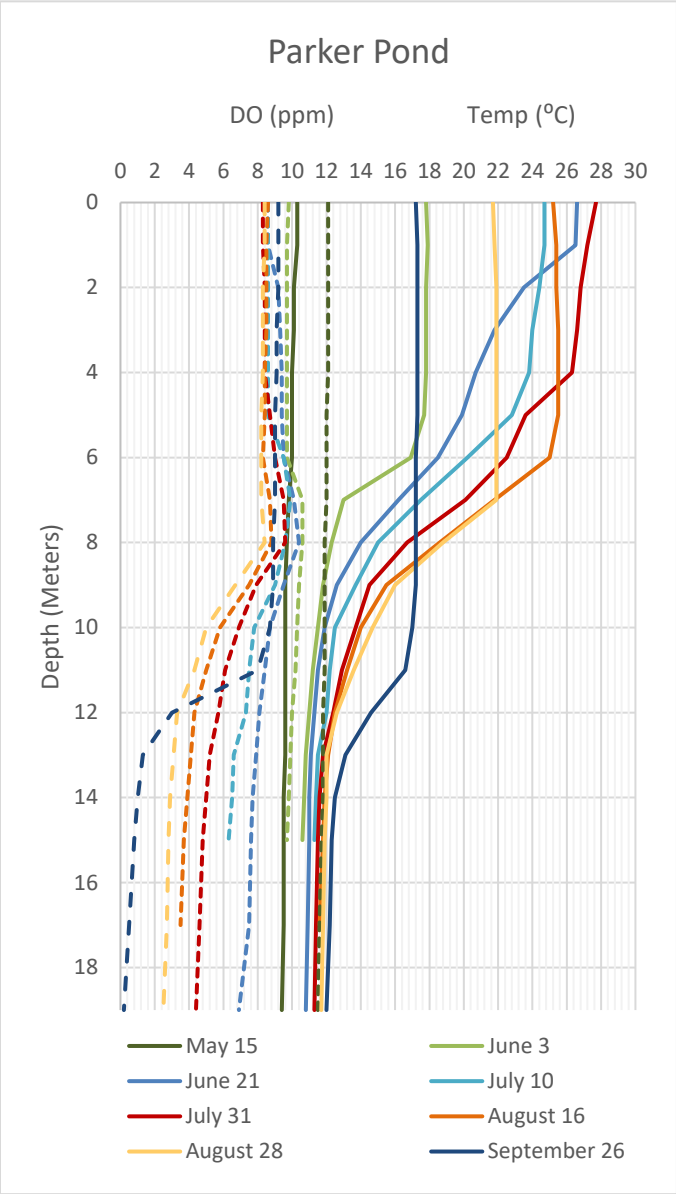


Parker's average Secchi depth shows very little variation from year to year, but readings throughout the summer show significant variation from month to months. These seasonal trends are being monitored closely to better understand the natural processes within Parker Pond.

Dissolved Oxygen and Temperature

As lake water is warmed during the summer months, many of Maine's lakes form three distinct temperature layers. There is a warm layer at the surface (epilimnion), a thin transitional layer (thermocline), and a deep cold layer (hypolimnion). As the graphs below demonstrate, Parker is a deep pond that forms distinct layers with warm water near the surface and colder water beneath. Water temperature and dissolved oxygen are generally measured together as the amount of oxygen that can dissolve into water changes with temperature. During the height of the summer, the water temperature 15m below the surface was over 25°F colder than surface water. This gradient of temperatures traps the movement of water and oxygen between layers. Decomposition of organic materials on the bottom of the lake consumes the oxygen supply in the hypolimnion. When oxygen levels are depleted

and fall below 2 ppm (parts per million) at the bottom of the lake, it is considered "anoxic" and there is a greater likelihood that iron-bound phosphorus stored in bottom sediments will be released back into the lake.



When anoxic conditions occur at the bottom of a lake, it triggers a chemical reaction that releases phosphorus, that was formerly bound to iron in the lake sediment, back into the water column. This is referred to as "internal loading" as it differs from phosphorus that enters the lake in the from external sources in the form of stormwater runoff from the surrounding watershed. (See more on phosphorus below). In 2020, oxygen levels at the pond bottom dipped below 2 ppm only in September. In 2019, anoxia was observed in August, September, and October in Parker Pond. This period of anoxia is similar to other years prior to 2019. A unique element to the Parker Pond profile is how deep the oxygenated layer goes during the last reading in the fall, before dropping quickly within a meter to nearly zero oxygen present. This is occurring as the top layer is cooling, and demonstrates how the stratification of layers restricts the movement of oxygen between layers. This pattern has occurred during the last measurement of each season we monitored, and would warrant continuing monitoring efforts longer into the fall to observe when these layers mix.

Phosphorus

Phosphorus is the nutrient that most influences the growth of algae in lakes, so it is an important parameter to measure. The lower the phosphorus the better. Even small increases in phosphorus in a lake can 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. 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.

The phosphorus concentrations in the two samples collected in 2020 were 5 ppb (parts per billion) and 7 ppm. The average phosphorus level in Parker Pond in 2019 was 5.8 ppb (sampled five times). These observations come in below Parker's historical average of 7.6 ppb, and are consistent with recent readings on Parker Pond in previous years. The lowest phosphorus reading on Parker in 2019 was 5 ppb and the highest was 7 ppb.

Monitoring of Parker in 2020

2020 was our fifth year of monitoring Parker's water quality. We began monitoring in late May and continued through the end of September, every two weeks. A big "Thank You" to **Deb Cayer**, a volunteer water quality monitor, for her support and time monitoring on Parker, David, and Basin ponds this summer. With her help, we were able to maintain more frequent monitoring visits to these ponds and create a more complete picture of the changes that occur throughout the season. The last five years have seen the most frequent water monitoring in Parker Pond's history in order 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 Parker Pond.

Near real-time data for Parker's clarity (Secchi depth), dissolved oxygen and temperature can be found online at http://30mileriver.org/programs/water-quality-monitoring/parker-pond/ along with a link to historical data that includes the many other parameters including phosphorus, chlorophyll, pH, alkalinity, color, and conductivity.

Need for Sustained, Longer-Term Monitoring

Based on this and the historical data, the Maine DEP rates the overall water quality of Parker as above average. It is important to note that although there are no red flags yet, we have

only four years of complete, consistent data on clarity, dissolved oxygen, temperature, phosphorus 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 Parker is critical**ly **important** in order for us to identify negative trends in water quality.

The **annual cost of water quality monitoring of Parker 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 Parker as well as other lakes in the 30 Mile River Watershed received from funding from foundation grants, the **ongoing cost of water quality monitoring of Parker must be supported by donors to 30 Mile including the Parker Pond Association.**