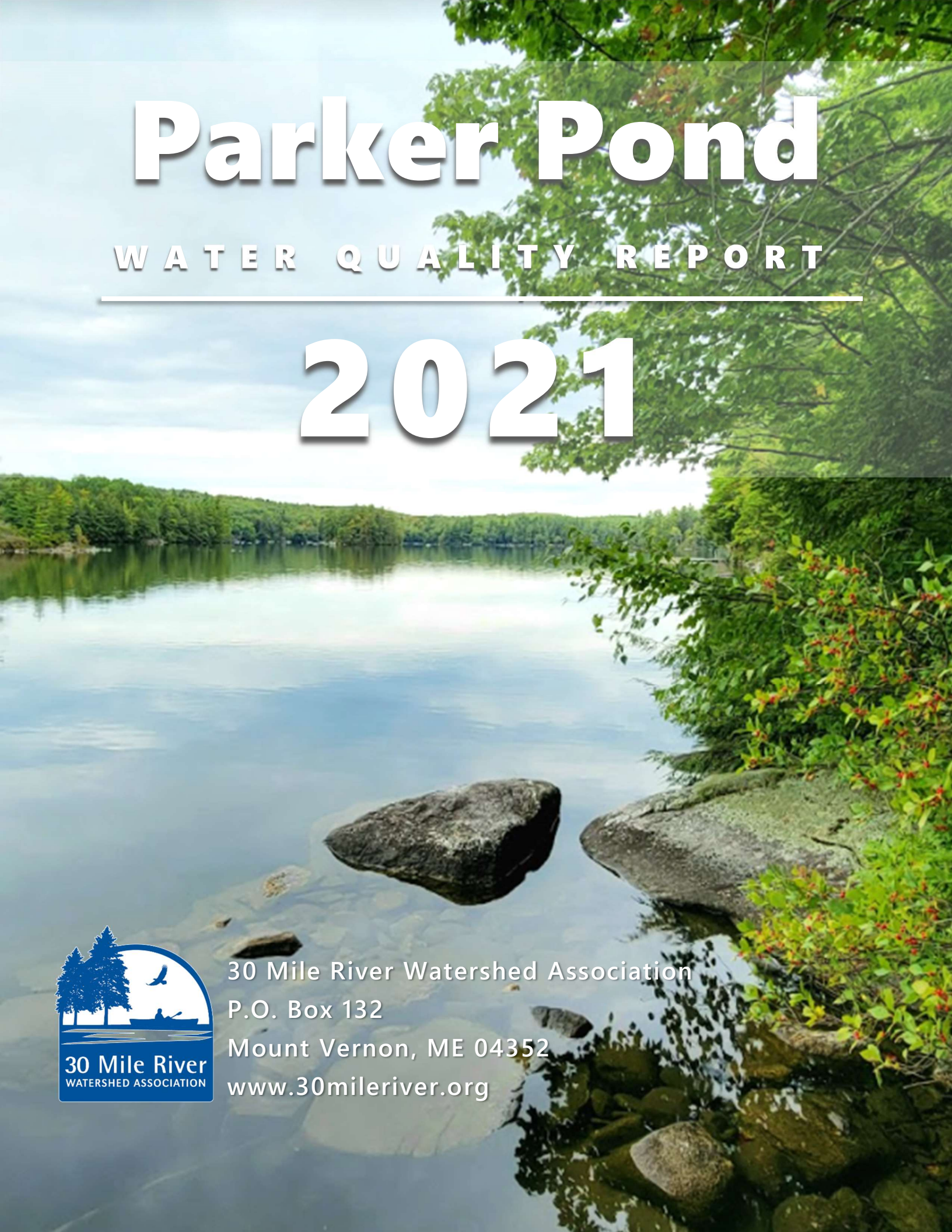
Parker Pond

WATER QUALITY REPORT

2021



30 Mile River Watershed Association
P.O. Box 132
Mount Vernon, ME 04352
www.30mileriver.org

2021 Parker Pond Water Quality Report

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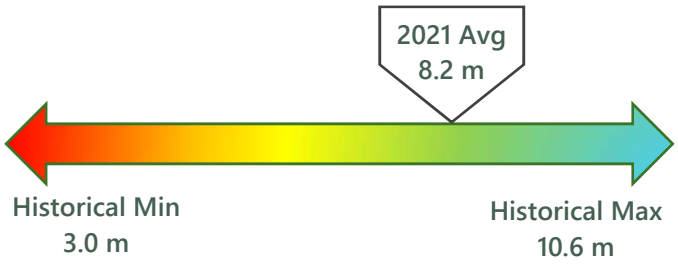
2021 Water Quality Summary[1]

Monitoring on Parker Pond occurred on 11 dates between May and September 2021 by Whitney Baker of the 30 Mile River Watershed Association (30 Mile) and volunteers from the Parker Pond Association (PPA).

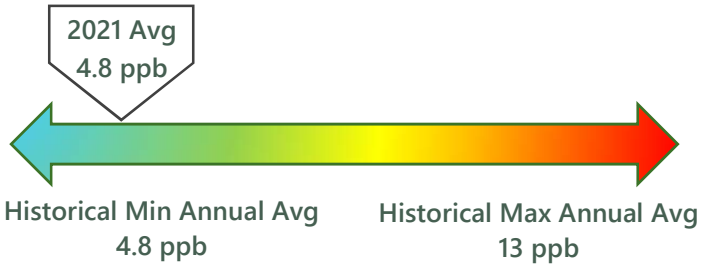
Water clarity readings in 2021 ranged from 7.10 meters (September 28th) to 9.35 meters (July 23rd) with an annual average of 8.22 meters. 14 total readings were collected in 2021.

Water Clarity (m)	
2021 Water Clarity Average	8.2
Historical SDT Average	7.4
Maine Lakes SDT Average	4.8



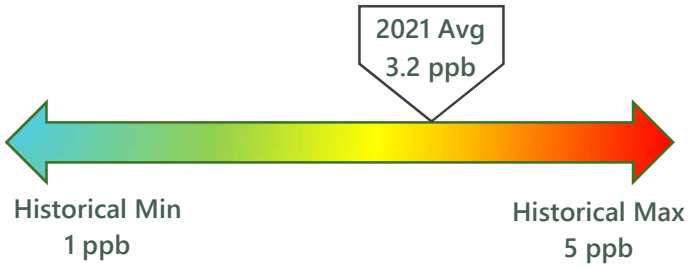
Five (5) samples were collected and analyzed for **Total Phosphorus**. Laboratory results ranged from 4 ppb (parts per billion) to 6 ppb with an average of 4.8 ppb.

Total Phosphorus (ppb)	
2021 TP Average	4.8
Historical TP Average	7
Maine Lakes TP Average	12



Chlorophyll was also measured five (5) times in 2021. Results ranged from 2 ppb to 5 ppb with an annual average of 3.2 ppb.

Chlorophyll-a (ppb)	
2021 Chl-a Average	3.2
2021 Peak Chl-a	5.0
Historical Chl-a Average	2.6
Maine Lakes Chl-a Average	5.4



Ten (10) **Dissolved Oxygen (DO)** profiles were collected in 2021. Anoxia (DO <2 ppm) was first encountered in deep waters at a depth of 13 meters in late August and this zone of anoxia grew slightly to include waters 11 meters and deeper by the end of September. This pattern of oxygen loss is typical of Parker Pond in late August and September.

[1] Scale bars illustrate the range of data collected for each parameter over the historical monitoring record for general comparison with the 2021 monitoring results. The blue end represents the historical minimum (best), and the red end represents the historical maximum (worst) of all monitoring data collected.

Overview

Parker Pond is located in the towns of Mount Vernon, Fayette, Vienna, and Chesterville, located in the upper west branch of the 30 Mile River watershed. Parker Pond has a watershed drainage area of approximately 13 square miles, which includes the indirect, upstream drainages (6 sq. mi.) of Tilton, Basin, David, and Whittier Ponds. Parker Pond has a single outlet located on the southeastern shore that flows south to Taylor Pond and Echo Lake in Mount Vernon.

Parker Pond is moderately deep with a maximum depth of 20 m (65 ft) and an average depth of 8 m (27 ft). The pond has a relatively large surface area covering over 1,500 acres (2.4 sq. mi.) and can be accessed via a public boat launch located on the north end of the lake on Tower Road in Vienna.

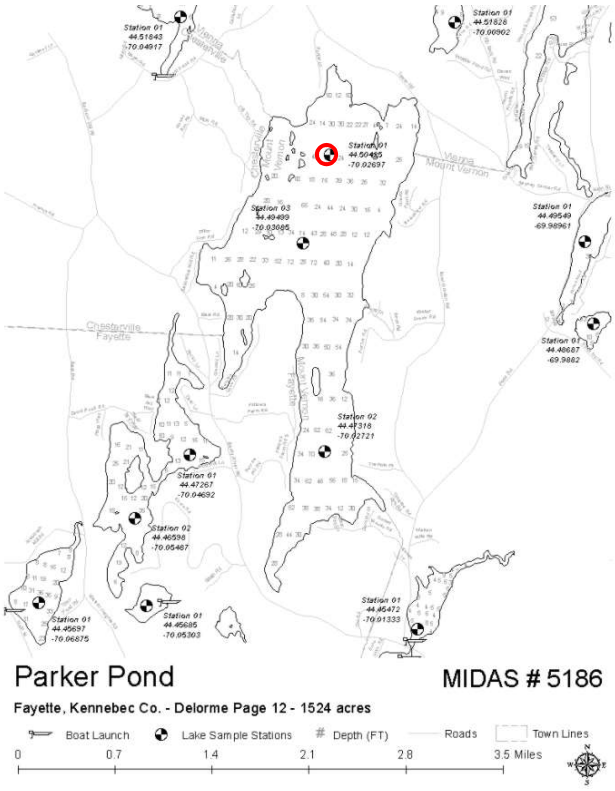


Figure 1. Parker Pond Monitoring Stations, Maine DEP.

Water Quality Monitoring in 2021

Water quality monitoring on Parker Pond takes place at the deepest spot in the lake (Maine DEP Station 1), located in the north end of the lake (Figure 1). Monitoring in 2021 was completed by Whitney Baker of the 30 Mile River Watershed Association (30 Mile) and volunteers from the Parker Pond Association (PPA). A special thanks to the 2021 volunteers:

Bob Weimont & Maggie Chadwick
Sue Knorr

Parker Pond Monitoring in 2021.

In 2021, water quality monitors collected data on 11 dates between June and September. Parameters collected include Secchi disk transparency, dissolved oxygen and temperature, phosphorus, chlorophyll-A, and advanced chemistry parameters (pH, Alkalinity, Color, and Conductivity).

Secchi Disk Transparency (Water Clarity)

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

Water Clarity (m)	
2021 Water Clarity Average	8.2
Historical SDT Average	7.4
Maine Lakes SDT Average	4.8

Water clarity readings in 2021 ranged from 7.10 meters (September 28th) to 9.35 meters (July 23rd) with an annual average of 8.2 meters. 14 total readings were collected over 10 monitoring days in 2021 (Figure 2).

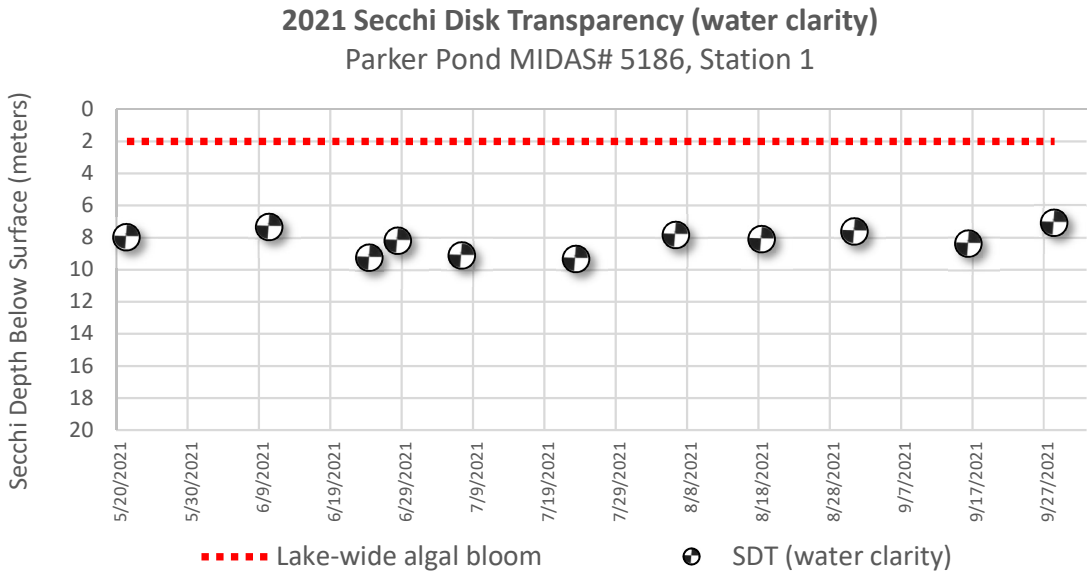


Figure 2. 2021 Secchi disk transparency (water clarity) data, Station 1.

Historically, SDT data was collected on Parker Pond during 39 of the past 45 years. Readings ranged from 3.0 m (1989) to 7.3 m (1995) with an average annual reading of 7.4 m (Fugure 3).

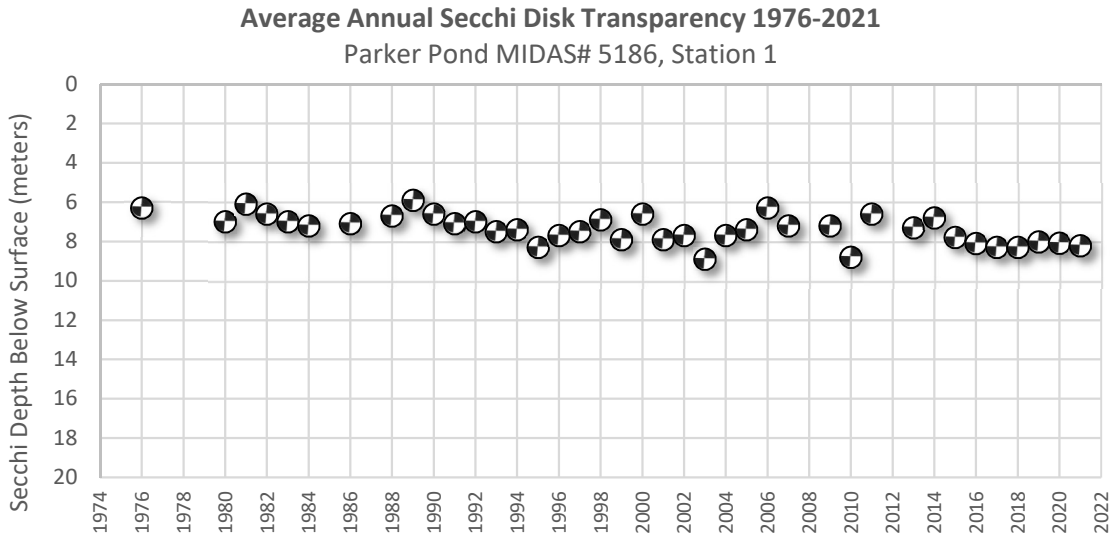


Figure 3. Historical Secchi disk transparency (water clarity) data 1976-2021, Station 1.

Dissolved Oxygen and Temperature

Dissolved oxygen (DO) is a critical indicator of the health of the lake system. DO is produced through photosynthesis, consumed during respiration and decomposition, and is influenced by wind, wave action, weather events, and lake productivity. A good supply of oxygen is essential for fish and other aquatic species, with most fish species requiring a DO concentration of 5 ppm (parts per million) or more. As lake water is warmed during the summer, deep lakes will form three distinct temperature layers. There is a warm layer at the surface (epilimnion), a thin transitional layer (metalimnion), and a deep cold layer (hypolimnion) that becomes isolated from the surface and oxygen resupply.

As lakes become more biologically productive in the summer, oxygen can decline as decomposition occurs in deep areas of the lake. Loss of oxygen may indicate a stressed and changing ecosystem. Understanding the pattern and extent of oxygen loss in deep areas of Parker Pond is particularly important because the lake is more vulnerable for internal phosphorus loading due to its unique sediment chemistry.[2]

In Parker Pond, oxygen loss in the deepest waters occurs in August and September. The extent of anoxia documented in the pond has remained relatively consistent throughout the historical monitoring period with the first DO profile collected in 1983.

[2] Parker Pond appears on Maine DEP's list of "Threatened Lakes" on the NPS Priority Watersheds List (https://www.maine.gov/dep/land/watershed/nps_priority_list/NPS%20Priority%20List%20-%20Lakes20.pdf) due to its sediment chemistry. Sediment results suggest that the lake is more vulnerable to internal phosphorus loading, a phenomenon that can occur when deep waters become anoxic (DO loss <2 ppm) resulting in phosphorus release from the bottom sediments exposed to anoxic waters.

Ten (10) DO and temperature profiles were collected in 2021 (Figure 4). Anoxia (DO <2 ppm) was first encountered in deep waters at a depth of 13 meters in August and grew to include waters 11 meters and deeper by the end of September. Oxygen loss is typical in the summer months in the deepest areas of the lake, a typical pattern seen throughout Parker Pond's historical monitoring period. The shallowest documented depth of anoxia in Parker Pond is 9 meters and was documented in September of 2009 and 2013.

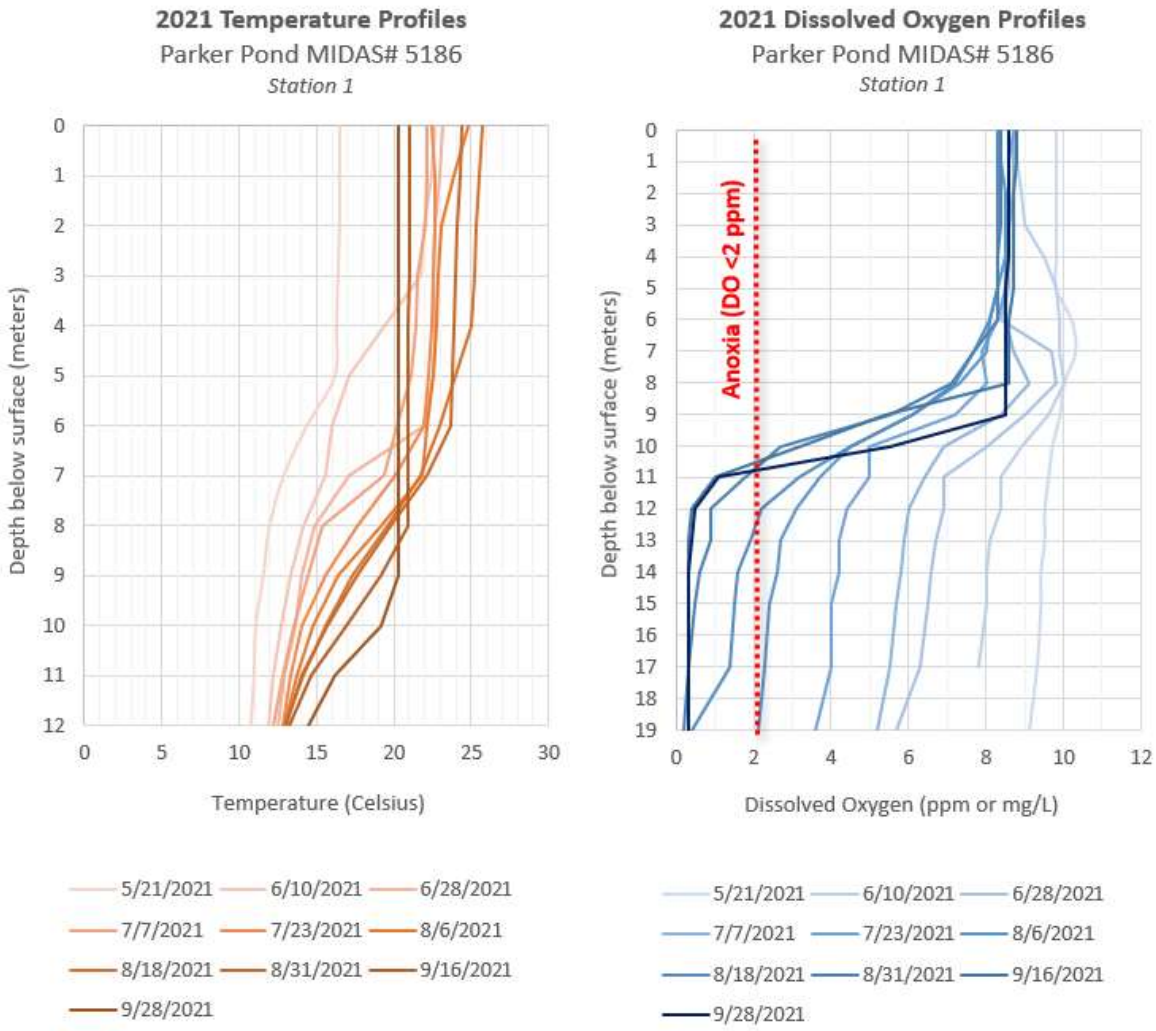


Figure 4. 2021 dissolved oxygen and temperature profiles, Station 1.

DO levels <5 ppm were documented in every profile collected in 2021 starting in late July through September in waters 10m and deeper. Water surface temperatures ranged from 20.3 C (69 F) to 25.7 C (78 F) with an average surface water temperature of 23.0 C (73 F). Continued collection of bi-weekly DO and temperature profiles will identify trends and changes occurring in Parker Pond in order to better understand variations in stratification and the area of seasonal anoxia in deep waters.

Total Phosphorus (TP)

Total Phosphorus (ppb)	
2021 TP Average	5
Historical TP Average	7
Maine Lakes TP Average	12

Phosphorus is the nutrient that most influences the growth of algae in lakes. Because its natural occurrence in lakes is very small, phosphorus "limits" the growth of algae in lake ecosystems. Small increases in phosphorus in lake water can cause substantial increases in algal growth, hindering lake health as well as the economic, recreational, and aesthetic value of the lake. Tracking in-lake phosphorus levels over time is another way of monitoring change in lake water quality trends.

Seven (7) samples were collected by 30 Mile staff this year and analyzed for Total Phosphorus (TP). Samples were collected monthly between June and September. Five (5) of these were collected from the top layer of the pond using an integrated core sampler and are referred to as "epilimentic core samples". Laboratory results for epilimnetic core samples collected in 2021 ranged from 4 ppb (parts per billion) to 6 ppb with an average of 4.8 ppb.

Generally speaking, in-lake phosphorus concentrations (epilimnetic core samples) less than 10-12 ppb are ideal. Lakes with in-lake phosphorus concentrations of 13 ppb or more are known to sustain algal blooms, and blooms become frequent as in-lake average concentrations approach 20 ppb. Historically, annual average in-lake phosphorus concentration in Parker Pond has ranged from 5 ppb (2021, 2017, 2016, 2005, and 1988) to 13 ppb (1986) with a historical average of 7 ppb (Figure 5).

Two (2) samples were collected from the bottom of Parker Pond using a Kemmerer grab sampler; this type of sample is known as a "bottom grab". Bottom grabs are collected when anoxia is encountered anywhere in the dissolved oxygen profile to determine if there is active phosphorus release from bottom sediments exposed to anoxic conditions. TP laboratory results for the two bottom grabs collected in 2021 were 14 ppb (August 31st) and 24 ppb (September 28th) with an annual average of 19 ppb. Internal P loading from bottom sediments did occur this summer during periods of anoxia, but it was not well documented through the collection of just two bottom grab samples in 2021 indicating elevated P concentrations at one location (deep spot) of the lake at this time.

Historically, bottom grab phosphorus samples have been collected during 21 years starting in 1981. Average annual bottom phosphorus concentrations have ranged from 7 ppb (1983) to 21 ppb (1997 and 2017) with 2021 documenting the third highest average on the historical record.

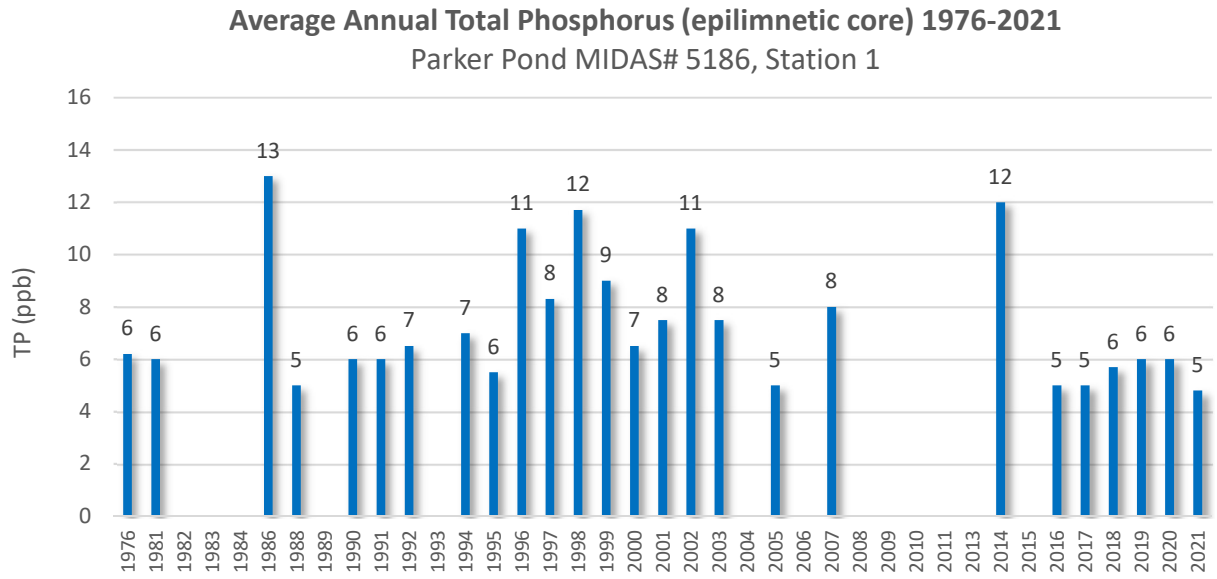


Figure 5. Annual average phosphorus concentration (epilimnetic core) 1976-2021, Station 1.

Chlorophyll (Chl-a)

Chl-a (ppb)	
2021 Chl-a Average	3.2
2021 Peak Chl-a	5.0
Historical Chl-a Average	2.6
Maine Lakes Chl-a Average	5.4

Chlorophyll is found in plants, including algae, and is used to convert sunlight into energy. Measuring the concentration of Chlorophyll in lake water helps us estimate the algae population in the lake. Chlorophyll was measured five (5) times in 2021.

Results ranged from 2 ppb (August 6th and 31st) to 5 ppb (September 28th) with an annual average of 3.2 ppb. Historical monitoring data collected between 1976-2021 has ranged from 1 ppb to 5 ppb with a historical annual average of 2.6 ppb (Figure 6).

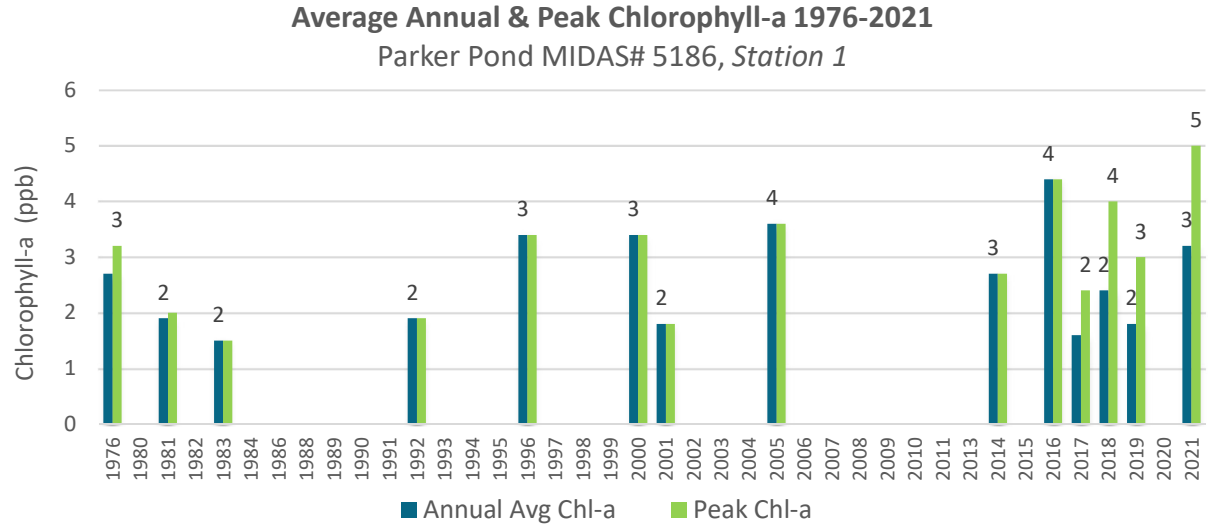


Figure 6. Average annual and peak chlorophyll concentration 1976-2021, Station 1.

Discussion

2021 was 30 Mile's sixth year of monitoring Parker Pond. Historical data presented in this report includes all monitoring data collected through 2018, submitted by volunteer monitors, 30 Mile staff, and state agencies, that has undergone a thorough QA/QC process at Maine DEP. 2019, 2020, and 2021 data included in this report is data collected by 30 Mile only, and annual averages will be updated in next year's water quality report if Maine DEP has published the full dataset by the time of the report.

Five years of consecutive data collection for any given parameter will provide the baseline condition of the Pond. 10 years of consecutive data collection is needed to meet the minimum data thresholds for determining trends over time. 30 Mile's monitoring program 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 Pond's clarity (Secchi depth), and dissolved oxygen and temperature profiles can be found online at https://30mileriver.org/parker-pond/, along with a link to the historical dataset and depth map.

Next Steps

1. Continue bi-weekly baseline monitoring between May and October each year to monitor seasonal and annual variability across all parameters and document changes and trends over time.

2. Continue to deliver and expand LakeSmart programming on Parker Pond, providing education to shorefront property owners about polluted stormwater runoff, phosphorus, and the affects that watershed development can have on lake water quality.