

Pocasset Lake

WATER QUALITY REPORT

2021



30 Mile River Watershed Association

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2021 Pocasset Lake Water Quality Report

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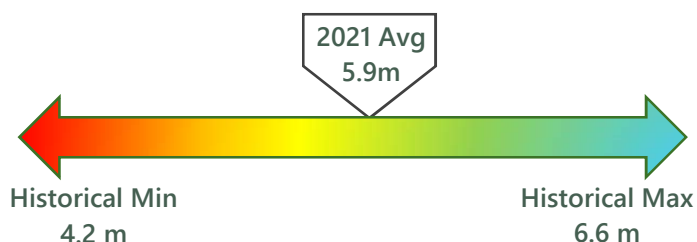
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2021 Water Quality Summary¹

Monitoring on Pocasset Lake occurred on 10 dates between May and October 2021 by Whitney Baker of 30 Mile River Watershed Association (30 Mile) and volunteers from the Pocasset Lake Association (PLA).

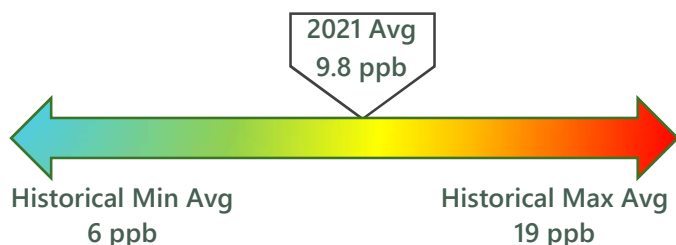
Water clarity readings in 2021 ranged from 4.58 meters (August 12th) to 6.55 meters (July 29th) with an annual average of 5.9 meters. 13 readings were collected in 2021 in total.

Water Clarity (m)	
2021 Water Clarity Average	5.9
Historical SDT Average	5.7
Maine Lakes SDT Average	4.8



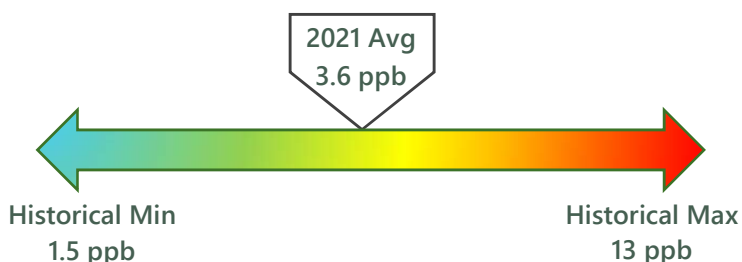
Five (5) samples were collected and analyzed for **Total Phosphorus**. Laboratory results ranged from 8 ppb (parts per billion) to 15 ppb with an annual average of 9.8 ppb.

Total Phosphorus (ppb)	
2021 TP Average	9.8
Historical TP Average	9.4
Maine Lakes TP Average	12.0



Chlorophyll was measured five (5) times in 2021. Results ranged from 3 ppb to 5 ppb with an annual average of 3.6 ppb.

Chlorophyll-a (ppb)	
2021 Chl-a Average	3.6
2021 Peak Chl-a	5.0
Historical Chl-a Average	3.3
Maine Lakes Chl-a Average	5.4



Ten (10) **Dissolved Oxygen (DO)** and Temperature profiles were collected in 2021. Anoxia (DO <2 ppm) was not documented in the lake in 2021. Low DO (DO <5 ppm) was documented in only the bottom meter of the lake between late June and late August.

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

Pocasset Lake is located in the town of Wayne in Kennebec County, Maine and has a direct watershed area of approximately 4 square miles. Its indirect, upstream watershed is very large (53 square miles) and includes the upstream drainages of Pickerel Pond, Lovejoy Pond, Echo Lake, Taylor Pond, Minnehonk Lake, David Pond, Parker Pond, Flying Pond, and several other smaller ponds and tributaries flowing into each of the above. Pocasset Lake drains to a single outlet located at the south end of the lake that flows south to Androscoggin Lake in Wayne.

Pocasset Lake is quite shallow with a maximum depth of just over 6 m (20 ft), an average depth of 4m (13 ft), and a surface area covering approximately 600 acres. Pocasset Lake does not have a public boat launch.

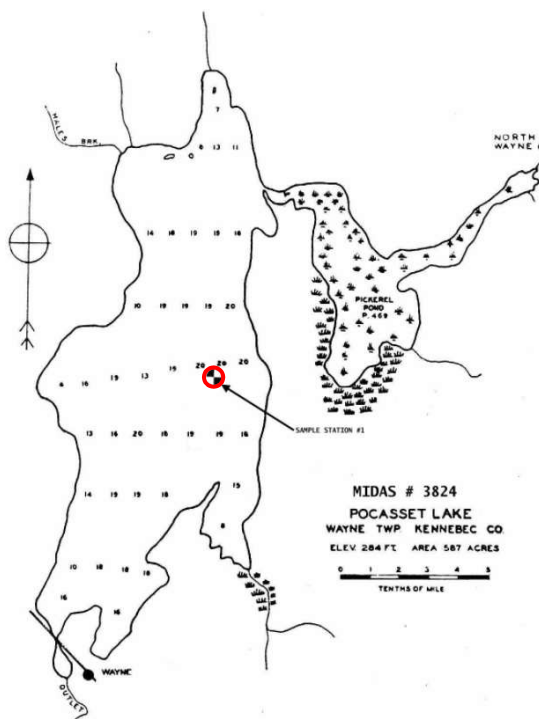


Figure 1. Pocasset Lake Monitoring Station, Maine DEP.

Water Quality Monitoring in 2021

Water quality monitoring on Pocasset Lake takes place at the deepest spot in the lake (Maine DEP Station 1), also known as the “deep spot”, located off the eastern shore near Richardson’s Beach. Station 1 is just over 6 meters (20 ft) deep (Figure 1). Monitoring in 2021 was completed by Whitney Baker of 30 Mile River Watershed Association (30 Mile) and volunteers from the Pocasset Lake Association (PLA). A special thanks to the 2021 volunteers, Jeremy Smith and Deb Duplisea.



2021 water quality volunteers, Jeremy Smith (left) and Deb Duplisea (right).

Water quality data was collected on 10 dates between May and October. Parameters include Secchi disk transparency, dissolved oxygen and temperature, phosphorus, chlorophyll, 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	5.9
Historical SDT Average	5.7
Maine Lakes SDT Average	4.8

Water clarity readings in 2021 ranged from 4.58 meters (August 12th) to 6.55 meters (July 29th) with an annual average of 5.9 meters. 13 total readings were collected over 10 monitoring days in 2021 (Figure 2).

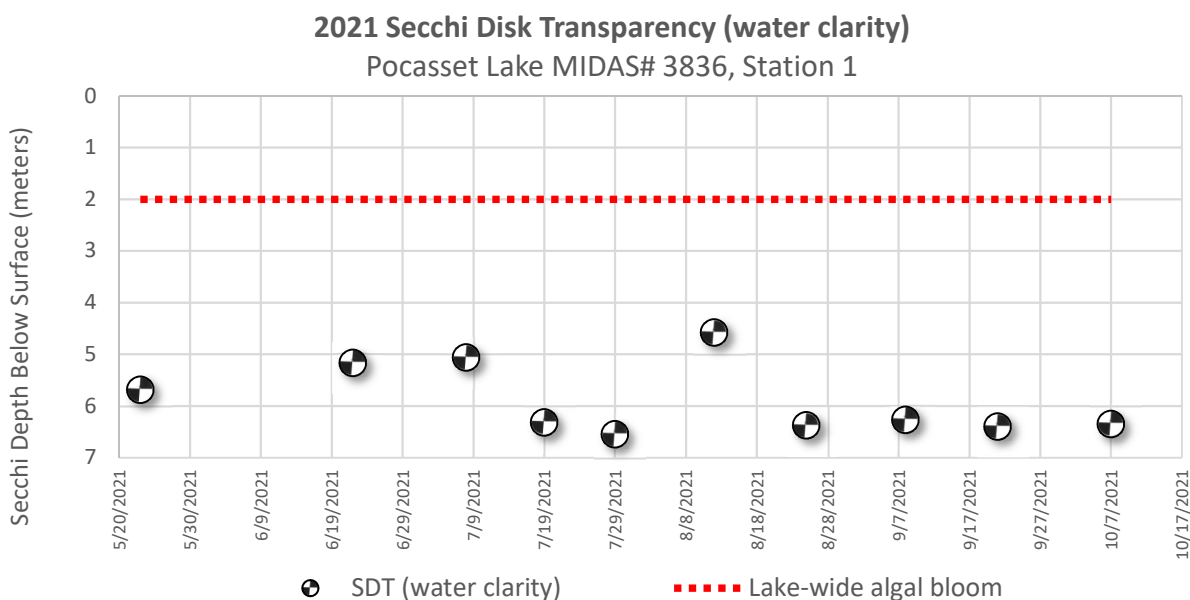


Figure 2. 2021 Secchi Disk Transparency (water clarity), Station 1

SDT data has been collected during 39 years throughout the historical monitoring period spanning the past 45 years. SDT readings in Pocasset Lake have ranged from 4.2 m (1976) to 6.6 m (2021²) with an average annual reading of 5.7 m (Figure 3). It is important to note that water clarity readings in Pocasset Lake can sometimes be physically restricted by the depth of the lake. Occasionally, the Secchi disk will touch the bottom of the lake while still visible.

² The deepest SDT reading on the monitoring record was collected in 2021 and is attributed to a slightly deeper monitoring location found by the monitoring team that year.

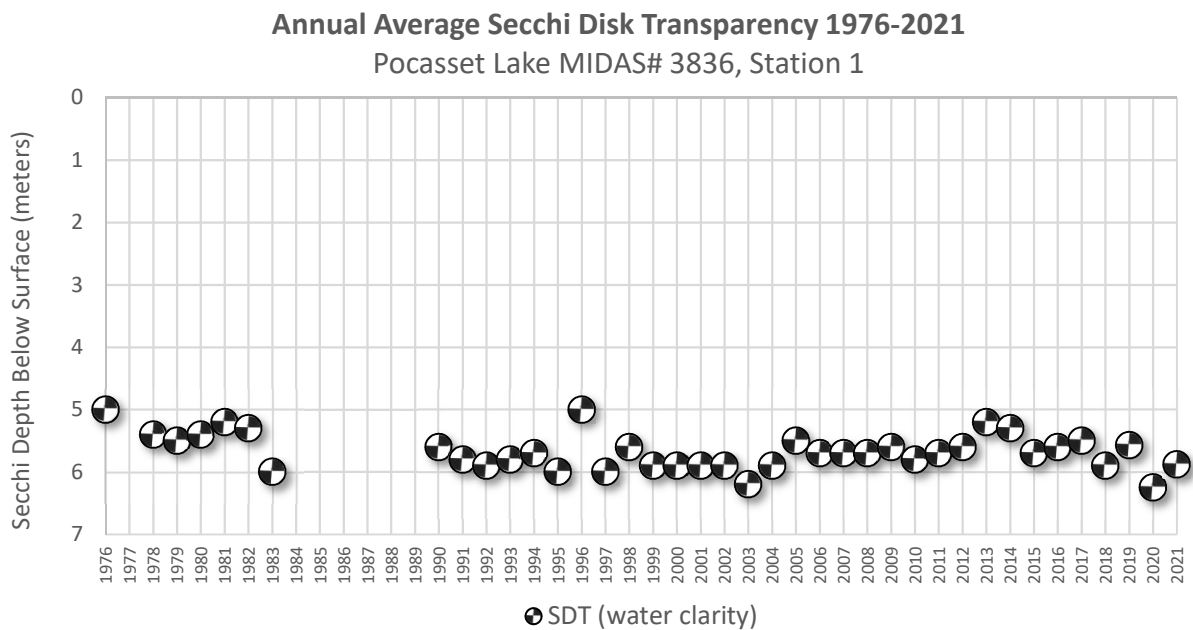


Figure 3. Historical Secchi Disk Transparency (water clarity), Station 1, 1976-2021

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 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 the lake is important to understanding changes between the years and through a single season, and is particular concerning for lakes that may be more vulnerable for internal phosphorus loading due to unique sediment chemistries.³

As lake water is warmed during the summer, deep lakes will thermally stratify to 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. Shallow lakes may experience brief or periodic occurrences of thermal stratification throughout the open water season, but most often shallow lakes are homothermous, with consistent temperature and dissolved oxygen levels from the lake surface to the lake bottom. Pocasset Lake is considered a homothermous lake, which is typical of lakes of similar depth as wind

³Some lakes in Maine may be more vulnerable than others 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.

events can facilitate water mixing and easily disrupt thermal stratification. However, low levels of DO were documented in recent years with DO <5 ppm in '16, '17, '18, '19, and '21. DO <2 ppm (anoxia) was documented in 2019. Continued and consistent monitoring will provide greater understanding of DO trends in Pocasset Lake.

In 2021, DO <5 ppm was documented in five of the ten total profiles collected, in water 6m and deeper. DO <2 ppm (anoxia) was not documented in 2021 (Figure 4).

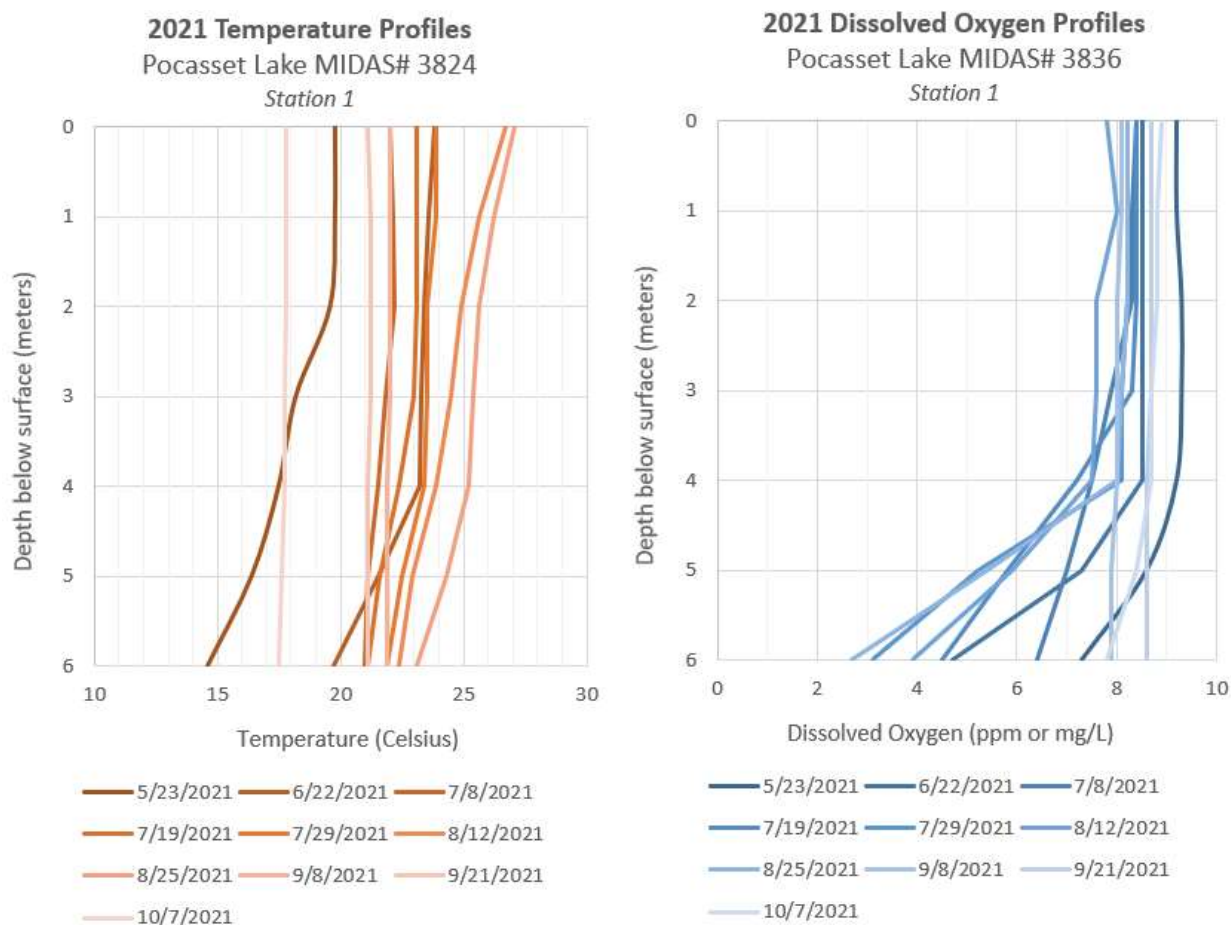


Figure 4. 2021 Dissolved Oxygen and Temperature Profiles, Station 1

Water surface temperatures through the monitoring season ranged from 21.1 C (70 F) to 27.1 C (81 F) with an average surface water temperature of 23.7 C (75 F) between June and September. Continued collection of bi-weekly DO and temperature profiles will identify trends and changes occurring in Pocasset Lake in order to better understand variations in thermal stratification and the extent and severity of the low DO and anoxia throughout the monitoring season.

Total Phosphorus (TP)

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.

Five (5) samples were collected from the surface of Pocasset Lake in 2021 using an integrated core sampler (referred to as “epilimnetic core samples”) and analyzed for Total Phosphorus (TP). Samples were collected monthly between June and October. Laboratory results for epilimnetic core samples collected in 2021 ranged from 8 ppb to 15 ppb with an annual average of 9.8 ppb.

Generally speaking, in-lake phosphorus concentrations (epilimnetic samples) less than 10-12 ppb are ideal. Lakes with in-lake phosphorus concentrations of 13 ppb or more are able to sustain algal blooms, and blooms become frequent as in-lake average concentrations approach 20 ppb. TP data has been collected from Pocasset lake during only 14 years since 1976. Historically, the annual average in-lake phosphorus concentration in Pocasset Lake ranges from 6 ppb (2001) to 19 ppb (2017) with a historical average of 9.4 ppb (Figure 5).

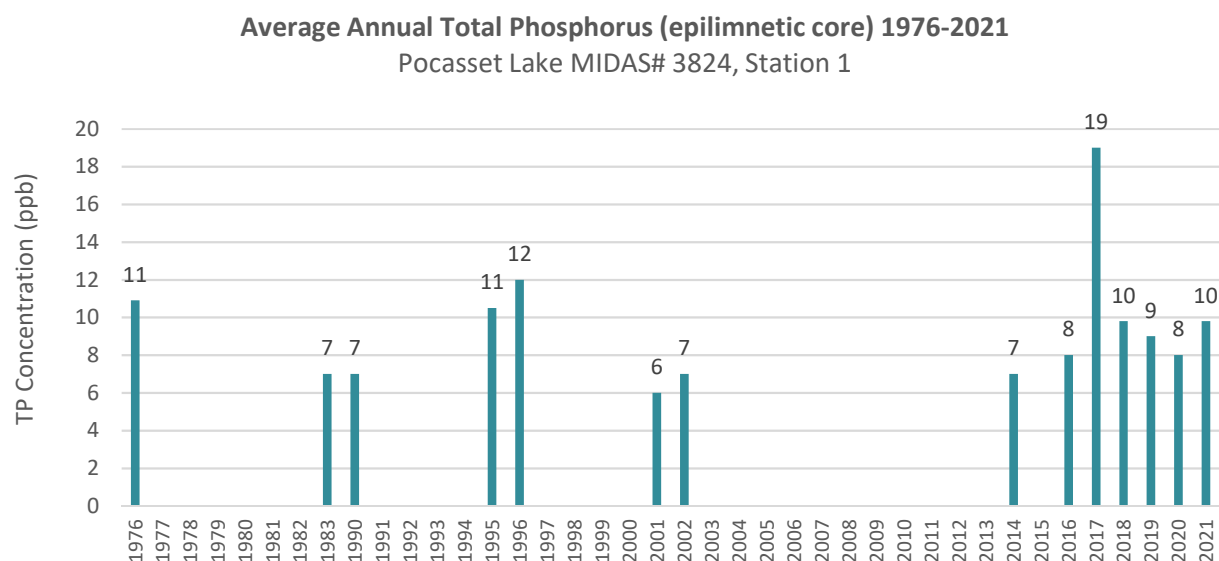


Figure 5. Annual Average Total Phosphorus data (epilimnetic core samples) collected 1976-2021, Station 1.

Chlorophyll (Chl-a)

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.

Chl-a (ppb)	
2021 Chl-a Average	3.6
2021 Peak Chl-a	5.0
Historical Chl-a Average	3.3
Maine Lakes Chl-a Average	5.4

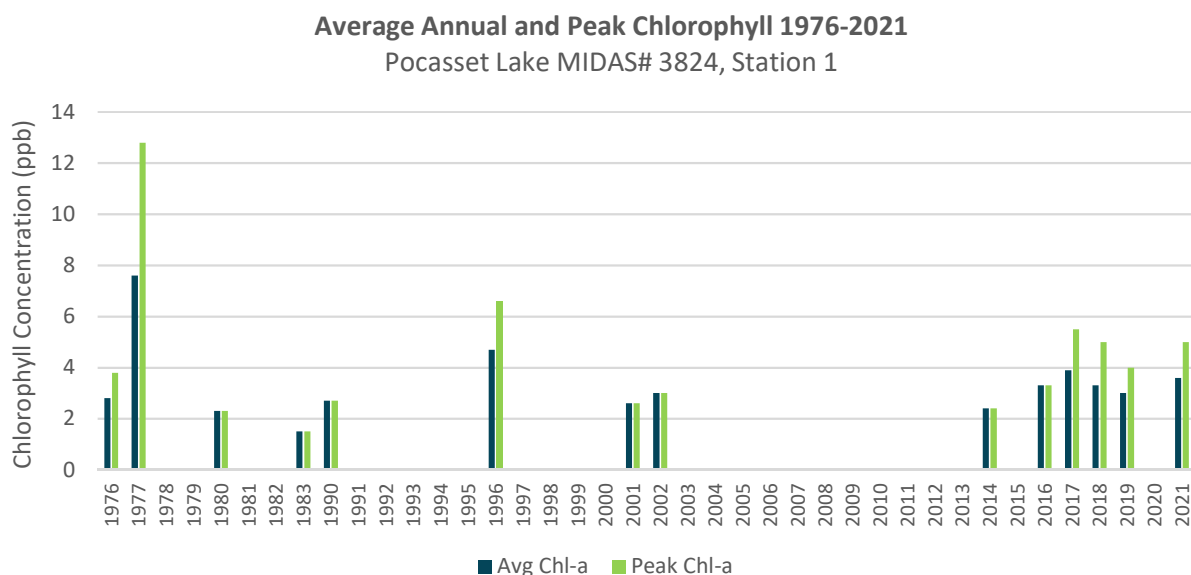


Figure 6. Annual average and peak chlorophyll-a, station 1, 1976-2021

Chlorophyll was measured five (5) times in 2021. Results ranged from 3 ppb to 5 ppb, with a 2021 annual average of 3.6 ppb. Historical monitoring data collected during 14 years between 1976-2021 ranged from 1.5 ppb (1983) to 12.8 ppb (1977) with a historical annual average of 3.3 ppb (Figure 6).

Discussion

2021 was 30 Mile's sixth year of monitoring Pocasset Lake. 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 for water quality. 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 Pocasset Lake.

Near real-time data for Pocasset Lake's clarity (Secchi depth), and dissolved oxygen and temperature profiles can be found online at <https://30mileriver.org/pocasset-lake/>, 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 better document changes and trends over time.
2. Develop a **LakeSmart team** on Pocasset Lake, providing education to shorefront property owners about polluted stormwater runoff, phosphorus, and the affects that watershed development can have on lake water quality.
3. Conduct a **watershed survey** of the Pocasset Lake watershed. A previous watershed survey was conducted about 20 years ago in 2002, and Maine DEP recommends watershed surveys be updated every 5-10 years.