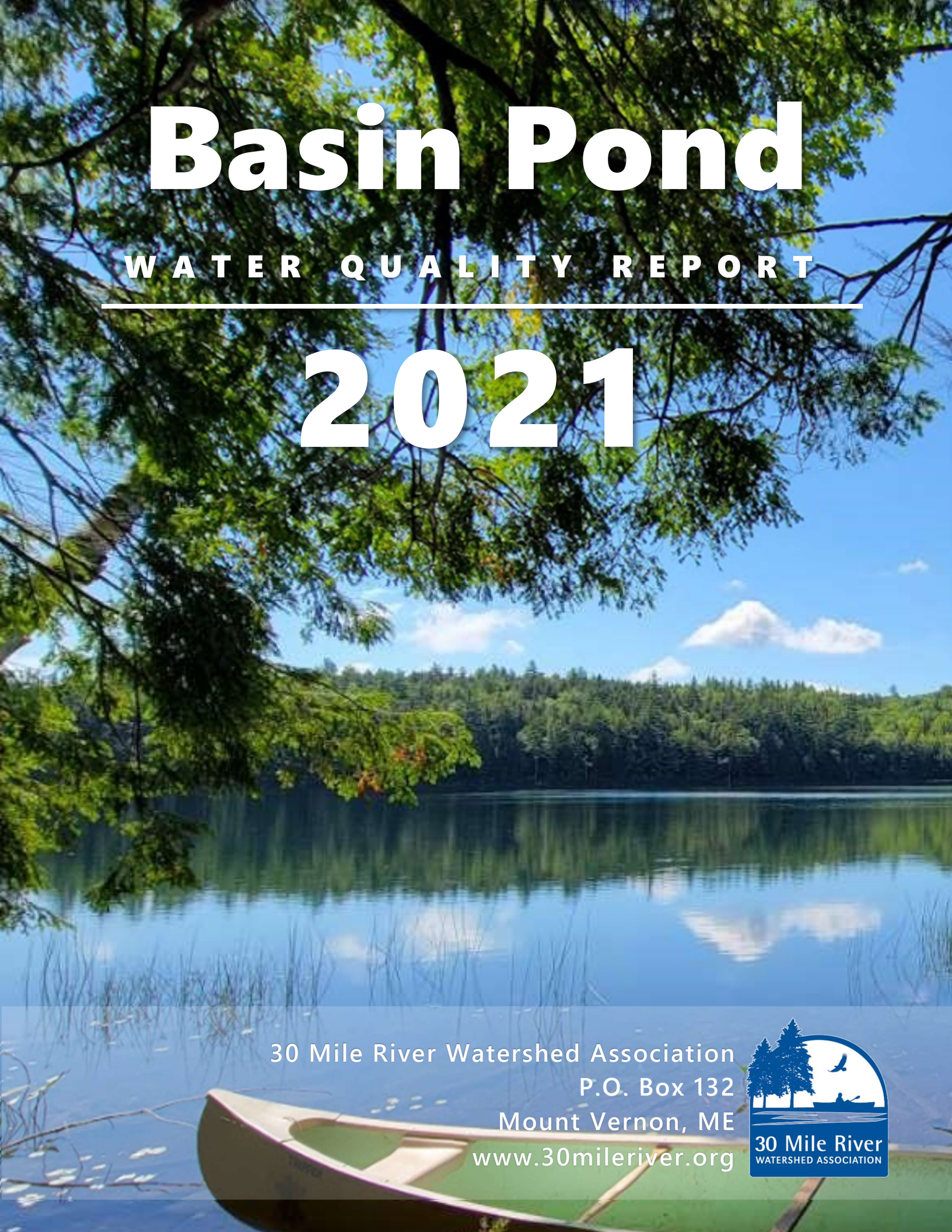

Basin Pond

WATER QUALITY REPORT

2021

30 Mile River Watershed Association
P.O. Box 132
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30 Mile River
WATERSHED ASSOCIATION

2021 Basin Pond Water Quality Report

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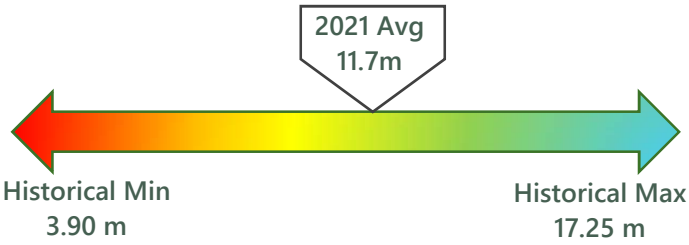
Monitoring on Basin Pond occurred on 10 dates between May and September 2021 by Whitney Baker of 30 Mile River Watershed Association (30 Mile) and local volunteers.

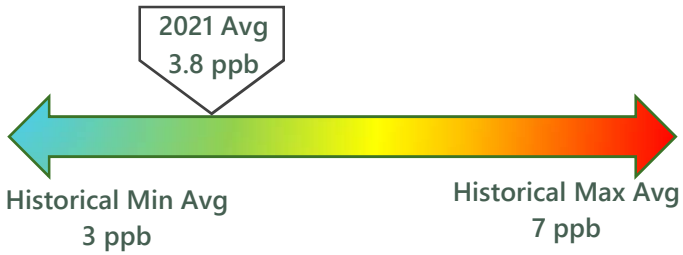
Water clarity readings in 2021 ranged from 8.92 meters (September 21st) to 12.59 meters (August 24th) with an annual average of 10.95 meters. 12 readings were collected in 2021 in total.

Water Clarity (m)	
2021 Water Clarity Average	11.0
Historical SDT Average	11.7
Maine Lakes SDT Average	4.8



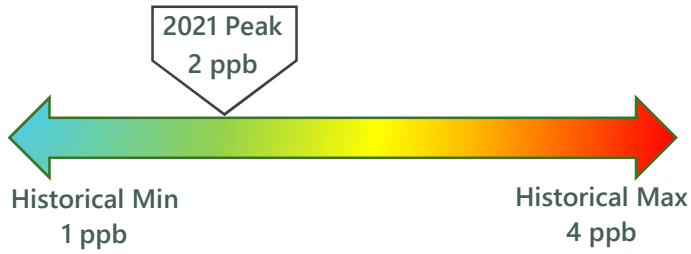
Five (5) samples were collected and analyzed for **Total Phosphorus**. Laboratory results ranged from 3 ppb (parts per billion) to 4 ppb with an average of 3.8 ppb.

Total Phosphorus (ppb)	
2021 TP Average	3.8
Historical TP Average	5
Maine Lakes TP Average	12



Chlorophyll was measured five (5) times in 2021. Results ranged from 1 ppb to 2 ppb with an annual average of 1.2 ppb.

Chlorophyll-a (ppb)	
2021 Chl-a Average	1.2
2021 Peak Chl-a	2.0
Historical Chl-a Average	1.5
Maine Lakes Chl-a Average	5.4



Ten **Dissolved Oxygen (DO)** profiles were collected in 2021. Anoxia (DO <2 ppm) was first encountered in deep waters at a depth of 29 meters in early July and increased slightly over the course of the summer to include waters 25 meters and deeper in September. Oxygen loss is typical in the summer months in the deepest areas of the lake. The extent of anoxia seen in 2021 was similar to patterns seen throughout Basin Pond's historical monitoring period.

[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

Basin Pond is located in the town of Fayette in Kennebec County, Maine and has a total watershed area of 94 acres. Basin Pond is spring fed and has a single outlet, located on the southwestern shoreline, that flows north to David Pond.

Basin Pond is deep for its size with a maximum depth of 32 m (106 ft) and an average depth of just 13 m (42 ft). The lake has a surface area covering approximately 30 acres and can be accessed via a public launch located on the eastern shoreline, just a short hike from the end of Basin Road in Fayette.

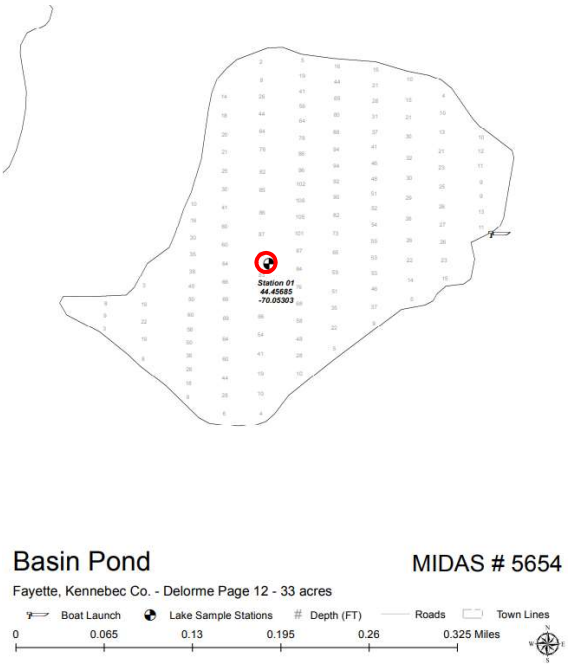


Figure 1. Basin Pond Monitoring Station, Maine DEP.

Water Quality Monitoring in 2021

Water quality monitoring on Basin Pond takes place at the deepest spot in the lake (Maine DEP Station 1), also known as the "deep spot", located roughly in the center of this small pond. Station 1 is 32 meters (106 ft) deep (Figure 1). Monitoring in 2021 was completed by Whitney Baker of 30 Mile River Watershed Association (30 Mile) and 30 Mile volunteers. A special thanks to the 2021 volunteers:

2021 water quality volunteer, Bill Young, paddles to the Basin Pond monitoring station.

Bill Young
Deb Cayer
Dianna McLaughlin
Gerry Tinguely

Water quality data was collected on 10 dates between May and September. 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	11.0
Historical SDT Average	11.7
Maine Lakes SDT Average	4.8

Water clarity readings in 2021 ranged from 8.92 meters (September 21st) to 12.59 meters (August 24th) with an annual average of 10.59 meters. 12 total readings were collected over 10 monitoring days in 2021 (Figure 2).

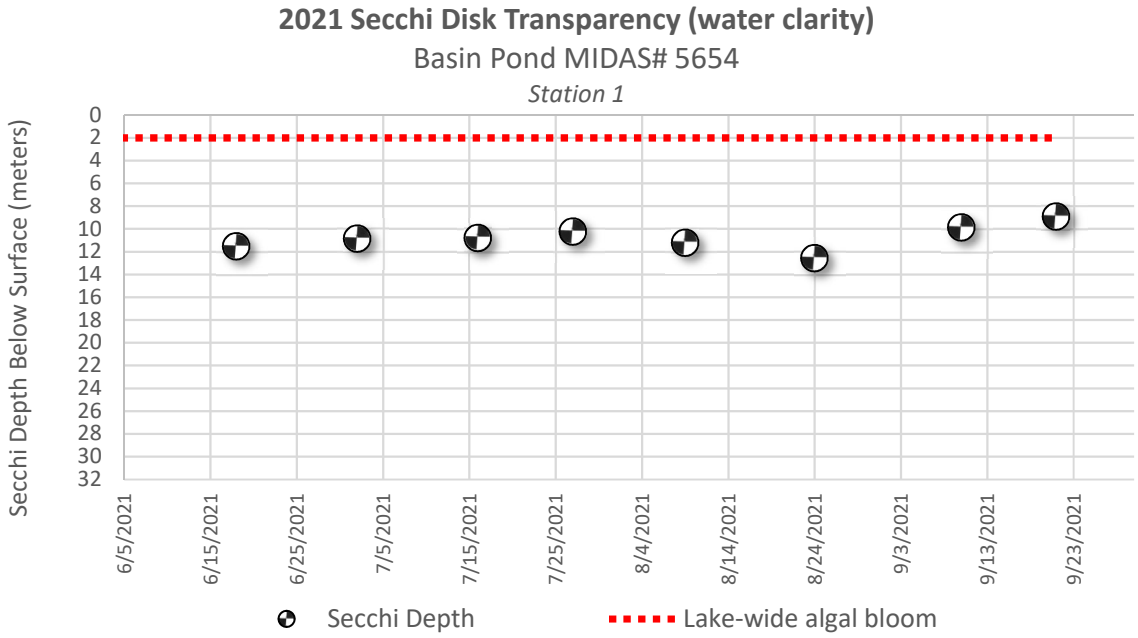


Figure 2. 2021 Secchi Disk Transparency, Station 1

SDT data has been collected on Basin Pond during 23 years starting in 1984. Hisotrically, SDT readings have ranged from 3.9 m (2018) to 17.3 m (2019) with a historical average of 11.7 m. (Figure 3).

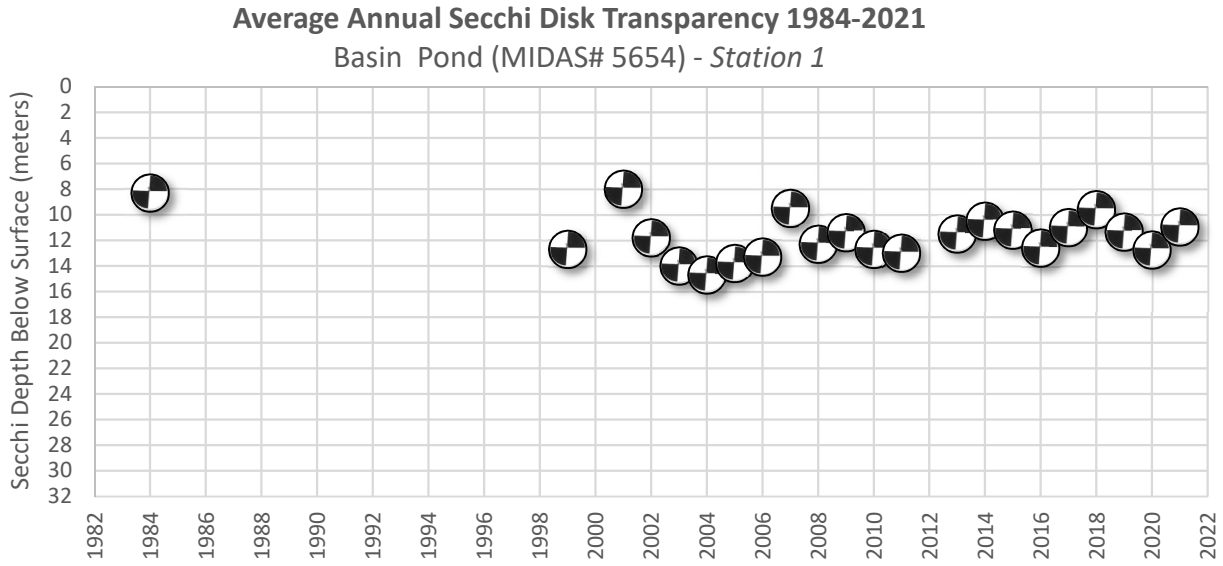


Figure 3. Historical Secchi Disk Transparency, Station 1, 1984-2021

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 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 the lake becomes 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 Basin Pond is important to understanding changes between years and throughout a single season, and is particular concerning for lakes that may be more vulnerable for internal phosphorus loading due to unique sediment chemistries.[2]

In Basin Pond, oxygen loss in the deepest waters occurs in July through September, and is not uncommon in lakes as deep as Basin Pond. The extent of anoxia documented in the pond has remained consistent throughout the historical monitoring period starting in 1984.

[2]Some 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.

Ten (10) DO and Temperature profiles were collected in 2021. Anoxia (DO <2 ppm) was first encountered in deep waters at a depth of 29 meters in early July and increased slightly over the course of the summer to include waters 25 meters and deeper in September. Oxygen loss is typical in the summer months and is confined to the deepest area of the lake, a typical pattern seen throughout Basin Pond's historical monitoring period.

With summertime oxygen depletion isolated to only the bottom 3-5 meters, Basin Pond is well suited to support cold-water fish species that rely on deep, cold-water refuge with an adequate oxygen supply during warm summer months. Basin Pond supports a principal fishery of brook trout and splake[3], both stocked annually by Maine Department of Inland Fisheries & Wildlife until 2019.[4]

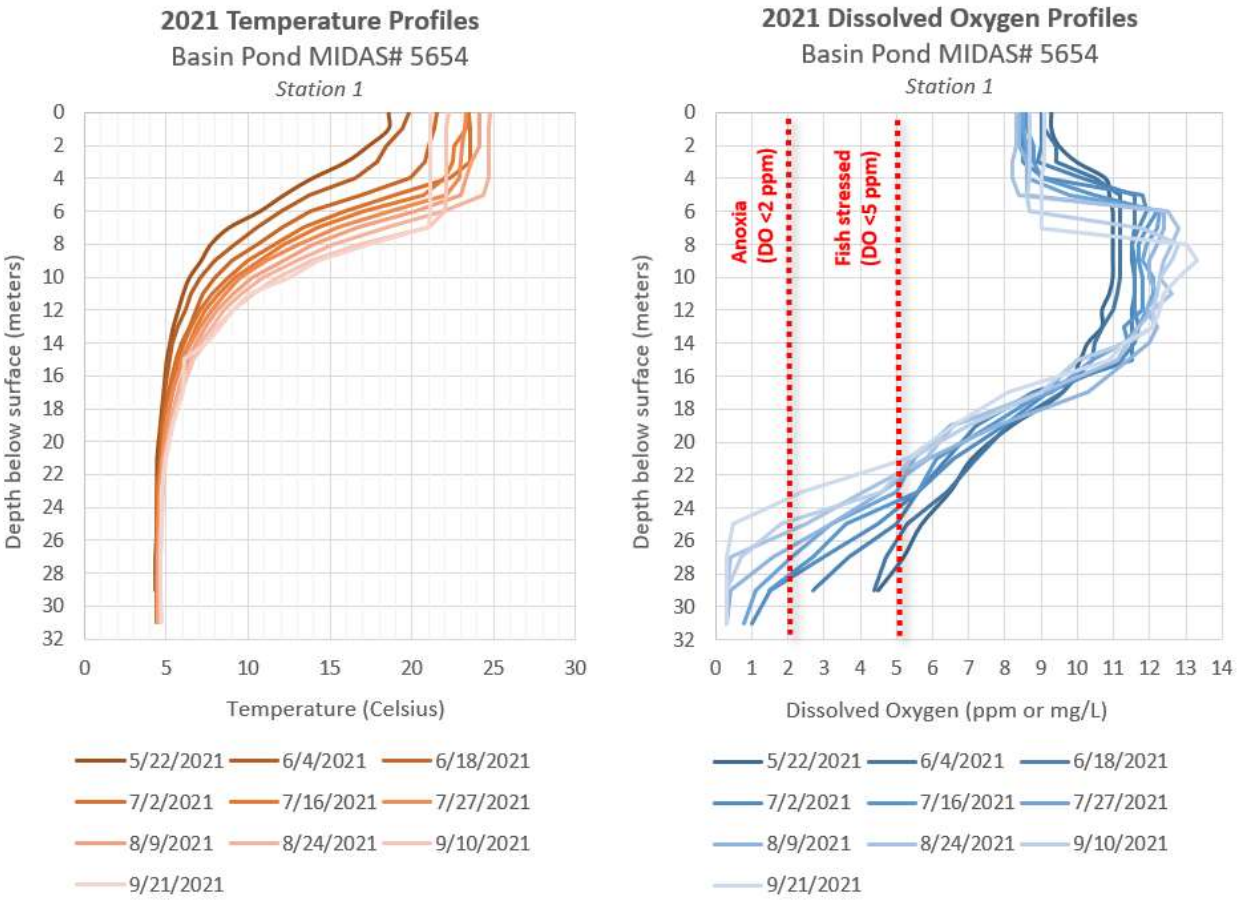


Figure 4. 2021 Dissolved Oxygen and Temperature Profiles, Station 1

[3] Maine Department of Inland Fisheries & Wildlife. Lake Survey Maps – Basin Pond. Accessed online: https://www.maine.gov/ifw/docs/lake-survey-maps/kennebec/basin_pond.pdf.

[4] Maine Department of Inland Fisheries & Wildlife. Annual Fish Stocking Reports. Accessed online: https://www.maine.gov/ifw/fishing-boating/fishing/fishing-resources/fish-stocking-report.html. Link doesn't work

Water surface temperatures through the monitoring season ranged from 19.8 C (68 F) to 24.8 C (77 F) with an average surface water temperature of 22.6 C (73 F) between June and September. Continued annual collection of bi-weekly DO and temperature profiles will identify trends and changes occurring in Basin Pond over time and will document variations in thermal stratification and the extent and severity of anoxic zones throughout the monitoring season

Total Phosphorus

Total Phosphorus (ppb)	
2021 TP Average	3.8
Historical TP Average	5
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.

Nine (9) samples were collected by 30 Mile staff this year and analyzed for Total Phosphorus (TP). Samples were collected monthly between May and September. Five (5) of the phosphorus samples were collected from the surface of the pond using an integrated core sampler and are referred to as "epilimnetic core samples". Laboratory results for epilimnetic core samples collected in 2021 ranged from 3 ppb to 4 ppb with an annual average of 3.8 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 able to sustain algal blooms, and blooms become frequent as in-lake average concentrations approach 20 ppb.

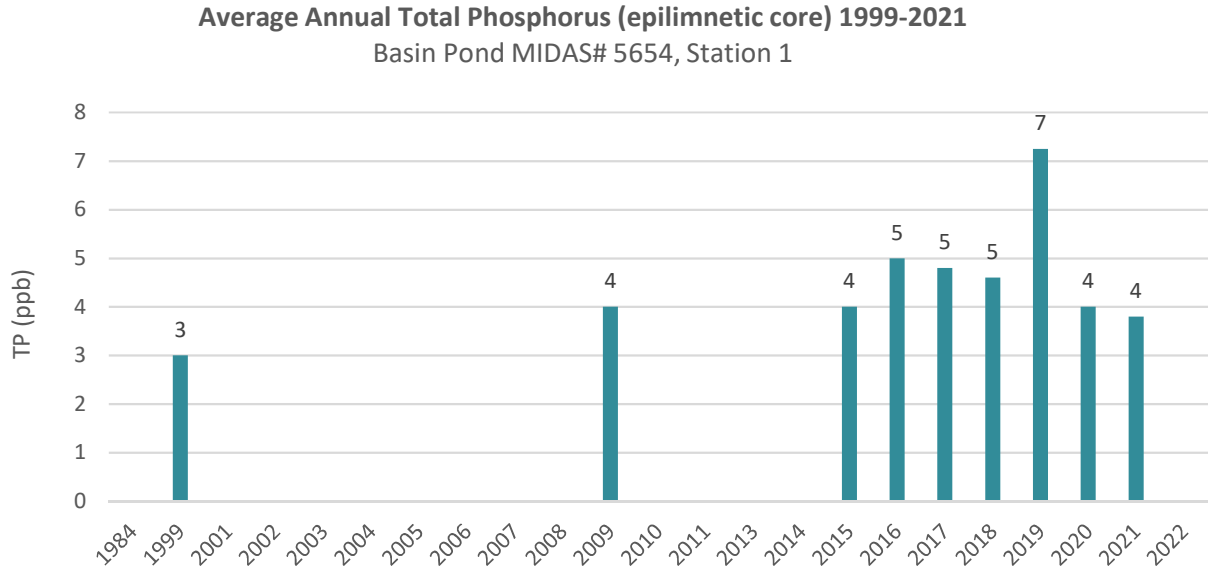


Figure 5. Annual Average Total Phosphorus data (epilimnetic core samples) collected 1999-2021, Station 1.

Historically, the annual average in-lake phosphorus concentration in Basin Pond is very low, ranging from 3 ppb to 7 ppb with a historical average of 5 ppb (Figure 5).

In 2021, four (4) samples were collected from the bottom of Basin 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, and help us determine if there is active phosphorus release from bottom sediments exposed to anoxic conditions. Laboratory results for bottom grab samples collected in 2021 ranged from 14 ppb to 30 ppb with an annual average of 21 ppb.

Historically, bottom grab samples were collected during 7 years since 2009. The historical annual average bottom grab TP concentration ranges from 12 ppb (2015) to 28 ppb (2019) with a historical average of 20 ppb.

Chlorophyll (Chl-a)

Chl-a (ppb)	
2021 Chl-a Average	1.2
2021 Peak Chl-a	2.0
Historical Chl-a Average	1.5
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 1 ppb to 2 ppb, with a 2021 average of 1.2 ppb. Historical monitoring data collected during eight years between 1999-2021 ranged from 1 ppb to 4 ppb with a historical annual average of 1.5 ppb (Figure 6).

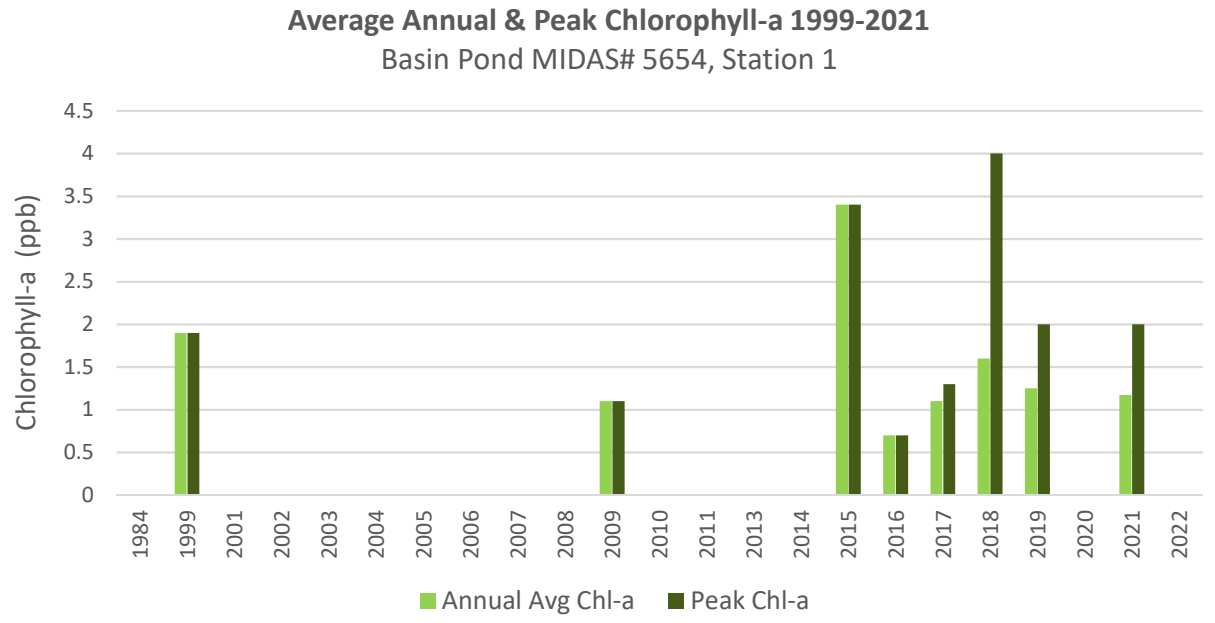


Figure 6. Annual average and peak chlorophyll-a, station 1, 1999-2021

Discussion

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

Though one of the smaller ponds in the 30 Mile River watershed at just 27 acres in size, Basin Pond is the second deepest waterbody in the entire 30-Mile chain of lakes. This unique kettle-hole pond has exceptional water quality and ranks 8th on the list of Maine's clearest lakes and ponds (2017 data).

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 Basin Pond.

Near real-time data for Basin Pond's clarity (Secchi depth), and dissolved oxygen and temperature profiles can be found online at https://30mileriver.org/basin-pond/, along with a link to the historical dataset and depth map.

Next Step

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.