

PINE RIVER POND

2019 SAMPLING HIGHLIGHTS

Station – 1 Deep

Wakefield, NH



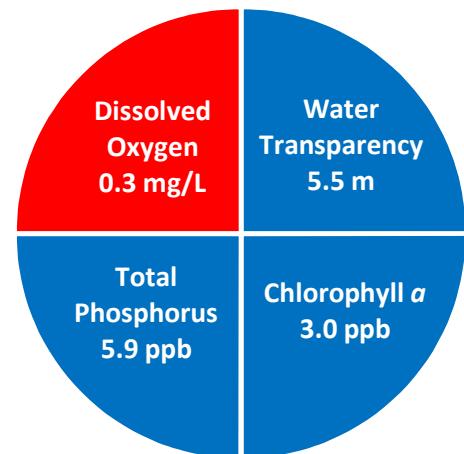
Extension

Blue = Oligotrophic

Yellow = Mesotrophic

Red = Eutrophic

Gray = No Data



Station 1 Deep (Figure 7) was used as a reference point to represent the overall Pine River Pond water quality. Water quality data displayed in Tables 1 and 2 are surface water measurements with the exception of the dissolved oxygen data that were collected in the cold bottom water layer.

Figure 1. Pine River Pond Water Quality (2019)

Table 1. 2019 Pine River Pond Seasonal Averages and NH DES Aquatic Life Nutrient Criteria¹

Parameter	Oligotrophic	Mesotrophic	Eutrophic	Pine River Pond Average (range)	Pine River Pond Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	5.5 meters (4.8 – 6.0)	Oligotrophic
Chlorophyll a ¹ (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	3.0 ppb (2.7 – 3.3)	Oligotrophic
Total Phosphorus ¹ (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	5.9 ppb (4.9 – 6.5)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	0.3 mg/L (0.0 – 1.6) *	Eutrophic

* Dissolved oxygen concentrations were measured between 11.0 and 16.0 meters, in the bottom water layer, on September 9, 2019.

Table 2. 2019 Pine River Pond Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Pine River Pond Average (range)	Pine River Pond Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	15.8 color units (range: 10.2 – 18.5)	Slightly tea colored
Alkalinity (mg/L)	< 0.0 acidified	0.1 – 2.0 extremely vulnerable	2.1 – 10 moderately vulnerable	10.1 – 25.0 low vulnerability	> 25.0 not vulnerable	6.6 mg/L (range: 6.1 – 7.1)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction					7.1 standard units (range: 7.0 – 7.1)	Optimal range for fish growth and reproduction
Specific Conductivity (µS/cm)	< 50 µS/cm Characteristic of minimally impacted NH lakes		50-100 µS/cm Lakes with some human influence	> 100 µS/cm Characteristic of lakes experiencing human disturbances		55.6 µS/cm (range: 51.4 – 60.9)	Lakes with some human influence

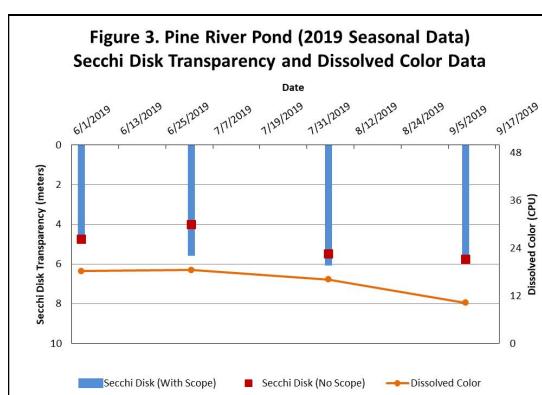
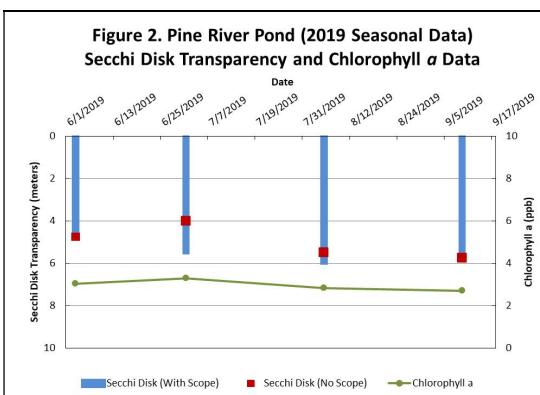


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll a concentrations and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll a and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll a and/or color concentrations. Secchi Disk transparency data are reported for measurements collected with and without a viewing scope.

LONG-TERM TRENDS

WATER CLARITY: The Pine River Pond water clarity data, measured as Secchi Disk transparency, display a trend of decreasing water clarity from 1987 to 2019 (Figure 4). The long-term water clarity trend is based on the Secchi Disk transparency measurements that have been collected without a view scope.

CHLOROPHYLL: The Pine River Pond chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, have oscillated among years while the long-term trend from 1987 to 2019 is stable (Figure 4).

TOTAL PHOSPHORUS: The Pine River Pond total phosphorus concentrations, the nutrient most responsible for microscopic plant growth, display a trend of decreasing nutrient concentrations from 1987 to 2019 (Figure 5).

Figure 4. Pine River Pond - Site 1 Deep (1987-2019)
Long-term Secchi Disk and Chlorophyll *a* Data

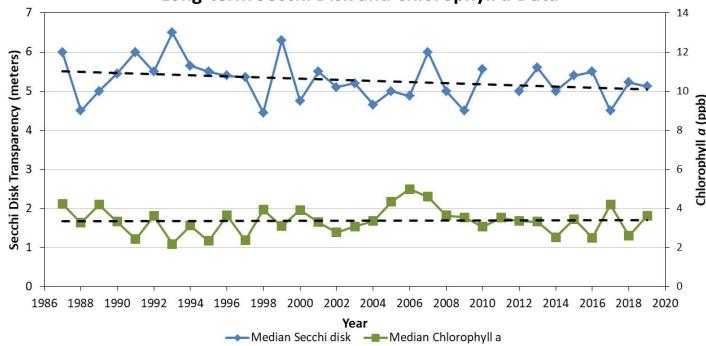
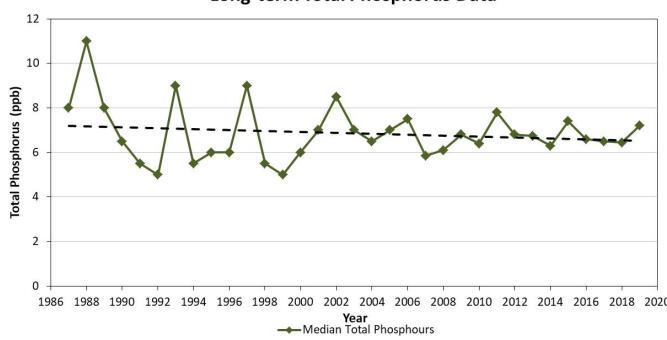


Table 3. Pine River Pond Stream Inlet Seasonal Average Water Quality Inter-Site Comparison (2019)

Stream Inlet	Average (range) Total Phosphorus (ppb)	Average (range) Specific Conductivity ($\mu\text{S}/\text{cm}$)	Average (range) Alkalinity (mg/L)	Average (range) pH (standard units)
Quimby Brook	6.6 ppb (6.2 – 7.0)	188.8 $\mu\text{S}/\text{cm}$ (183.9 – 193.8)	7.5 mg/L (7.0 – 8.0)	7.1 units (7.1 – 7.1)
Meadow Brook	13.8 ppb (10.2 – 15.3)	59.2 $\mu\text{S}/\text{cm}$ (48.9 – 72.1)	7.0 mg/L (4.6 – 9.8)	6.9 units (6.7 – 7.1)
Young Brook	10.5 ppb (7.9 – 13.8)	96.4 $\mu\text{S}/\text{cm}$ (56.7 – 143.1)	8.2 mg/L (5.7 – 10.3)	6.8 units (6.7 – 6.9)

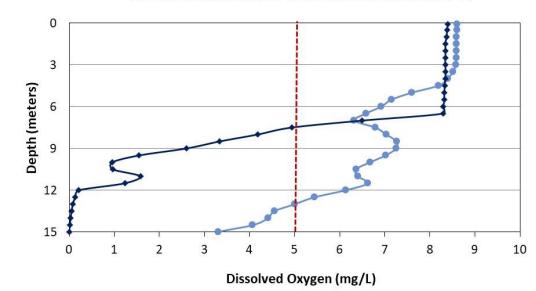
Figure 5. Pine River Pond - Site 1 Deep (1987-2019)
Long-term Total Phosphorus Data



Figures 4 and 5. Changes in the Pine River Pond water clarity (Secchi Disk transparency), chlorophyll *a* and total phosphorus concentrations measured between 1987 and 2019. These data illustrate the relationship between plant growth and water clarity. Total phosphorus data are also displayed and are oftentimes correlated with the amount of plant growth. Long-term trends are based on the analysis of annual median values.

Figure 6. Pine River Pond dissolved oxygen profile collected on July 1 and September 9, 2019. The vertical red line indicates the oxygen concentration commonly considered the threshold for successful growth and reproduction of cold water fish such as trout and salmon. Notice the lower late season dissolved oxygen concentrations near the lake bottom.

Figure 6. Pine River Pond - Site 1 Deep
Dissolved Oxygen Profiles (July 1 and September 9, 2019)

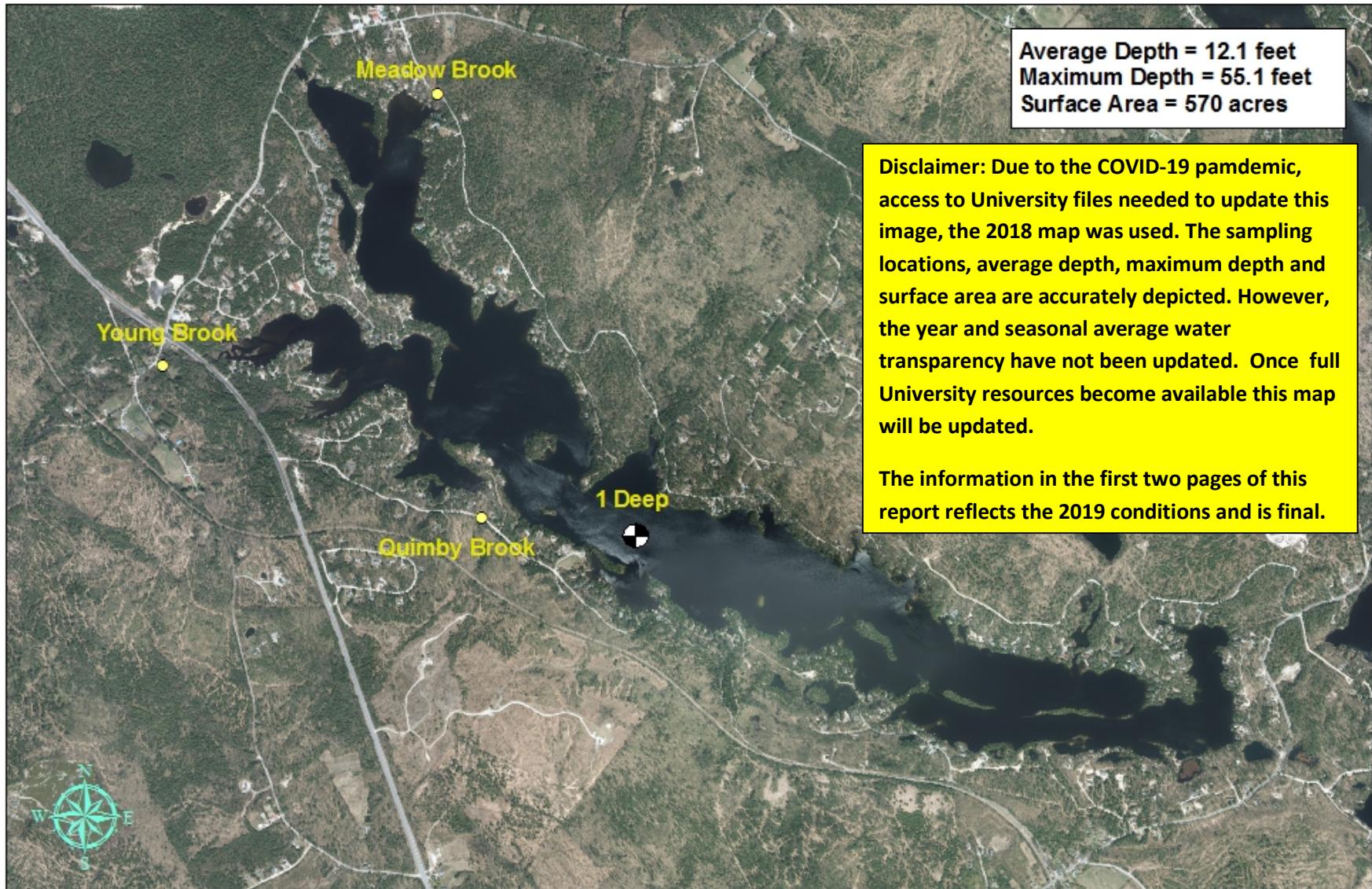


Recommendations

Implement Best Management Practices within the Pine River Pond watershed to minimize the adverse impacts of polluted runoff and erosion to the lake. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home” for more information on how to reduce nutrient loading caused by overland run-off. The Acton Wakefield Watersheds Alliance also offers technical assistance to help design and implement erosion control projects that protect and improve the water quality.

- https://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- <https://www.des.nh.gov/organization/commissioner/pip/publications/wd-11-11.pdf>
- <https://awwatersheds.org/healthy-lakes/conservation-practices-for-homeowners/>

Figure 7. Pine River Pond
Wakefield, NH
2018 deep water and tributary sampling stations



0 0.5 1 1.5
Miles

Aerial Orthophoto Source: NH GRANIT
Site location GPS coordinates collected by the UNH Center for Freshwater Biology



Extension

