

PINE RIVER POND

2014 SAMPLING HIGHLIGHTS

Station – 1 Deep

Wakefield, NH



Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

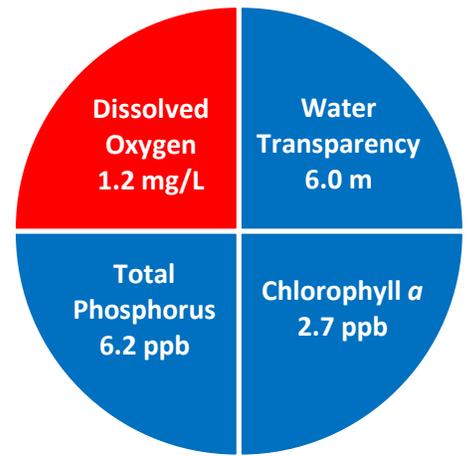


Figure 1. Pine River Pond Water Quality (2014)

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 unless indicated otherwise.

Table 1. 2014 Pine River Pond Seasonal Averages and NH DES Trophic Level Classification Criteria

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Pine River Pond Average (range)	Pine River Pond Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	6.0 meters (5.4 – 6.8)	Oligotrophic
Chlorophyll <i>a</i> (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	2.7 ppb (2.3 – 3.7)	Oligotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	6.2 ppb (5.2 – 7.0)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	1.4 mg/L (1.1 – 3.3)	Eutrophic

* Dissolved oxygen concentrations were measured between 10.5 and 16.5 meters, in the bottom waters, on September 9, 2014.

Table 2. 2014 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	18.7 color units (16.7 – 19.6)	Slightly 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	7.3 mg/L (6.5 – 7.8)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			6.9 standard units (range: 6.6 – 7.0)	Optimal range for fish growth and reproduction
Specific Conductivity (uS/cm)	< 50 uS/cm Characteristic of minimally impacted NH lakes		50-100 uS/cm Lakes with some human influence	> 100 uS/cm Characteristic of lakes experiencing human disturbances		50.2 uS/cm (range: 48.8 – 50.9)	Lakes with some human influence

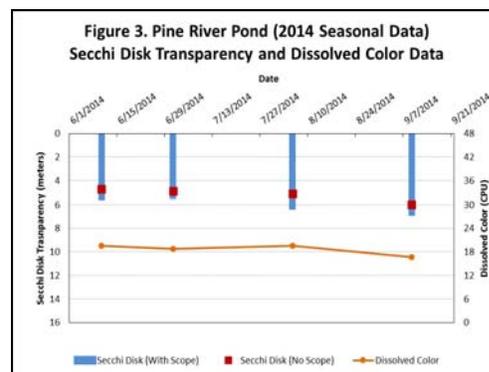
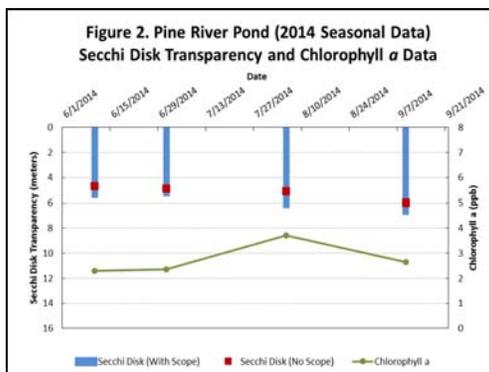


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in 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 over the past twenty-seven years of water quality monitoring (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, display a trend of increasing concentrations over the past twenty-eight years of water quality monitoring (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 over the past twenty-eight years of water quality monitoring (Figure 5).

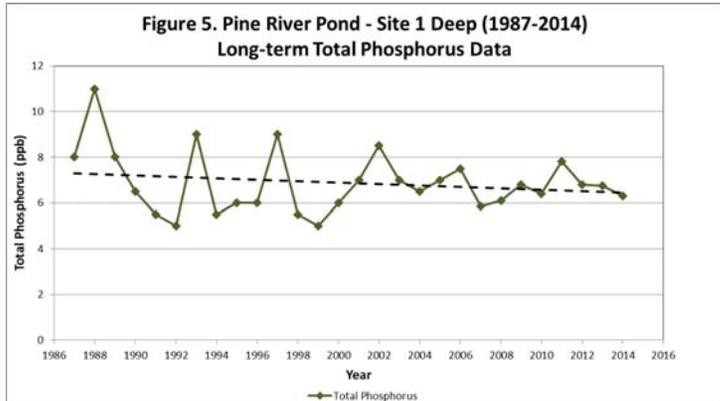
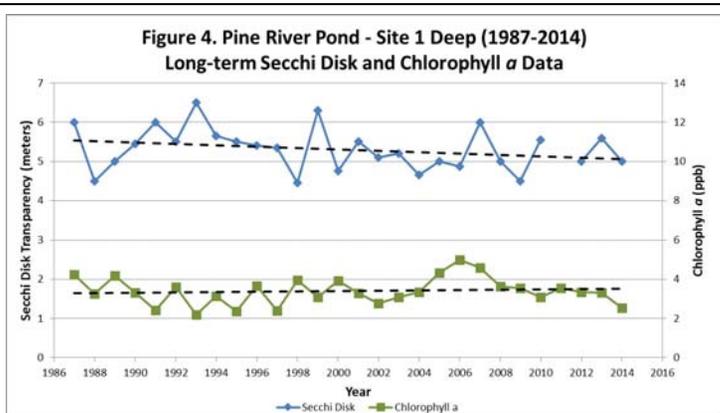
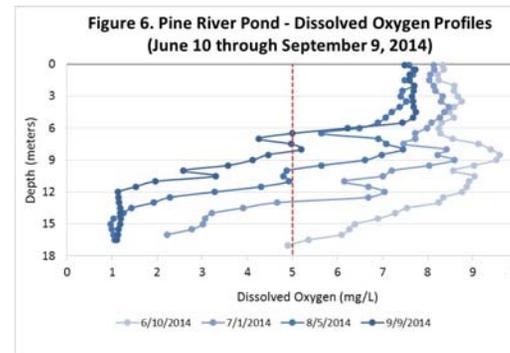


Table 3. Pine River Pond Steam Inlet Seasonal Average Water Quality Inter-Site Comparison (2014)

Lake	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	5.9 ppb (single value)	79.3 $\mu\text{S}/\text{cm}$ (single value)	9.6 mg/L (single value)	6.9 units (single value)
Meadow Brook	14.1 ppb (10.7 – 21.2)	60.5 $\mu\text{S}/\text{cm}$ (53.0 – 64.7)	8.1 mg/L (7.3 – 9.5)	6.6 units (6.4 – 6.8)
Young Brook	14.4 ppb (11.1 – 16.3)	84.6 $\mu\text{S}/\text{cm}$ (76.4 – 93.4)	9.4 mg/L (8.5 – 10.0)	6.6 units (6.3 – 6.8)

Figures 4 and 5. Changes in the Pine River Pond water clarity (Secchi Disk depth), chlorophyll *a* and total phosphorus concentrations measured between 1987 and 2014. **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.**

Figure 6. Monthly Pine River Pond dissolved oxygen profiles collected between June 10 and September 9, 2014. 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 decreasing dissolved oxygen concentrations near the lakebottom between June and September.*



Recommendations

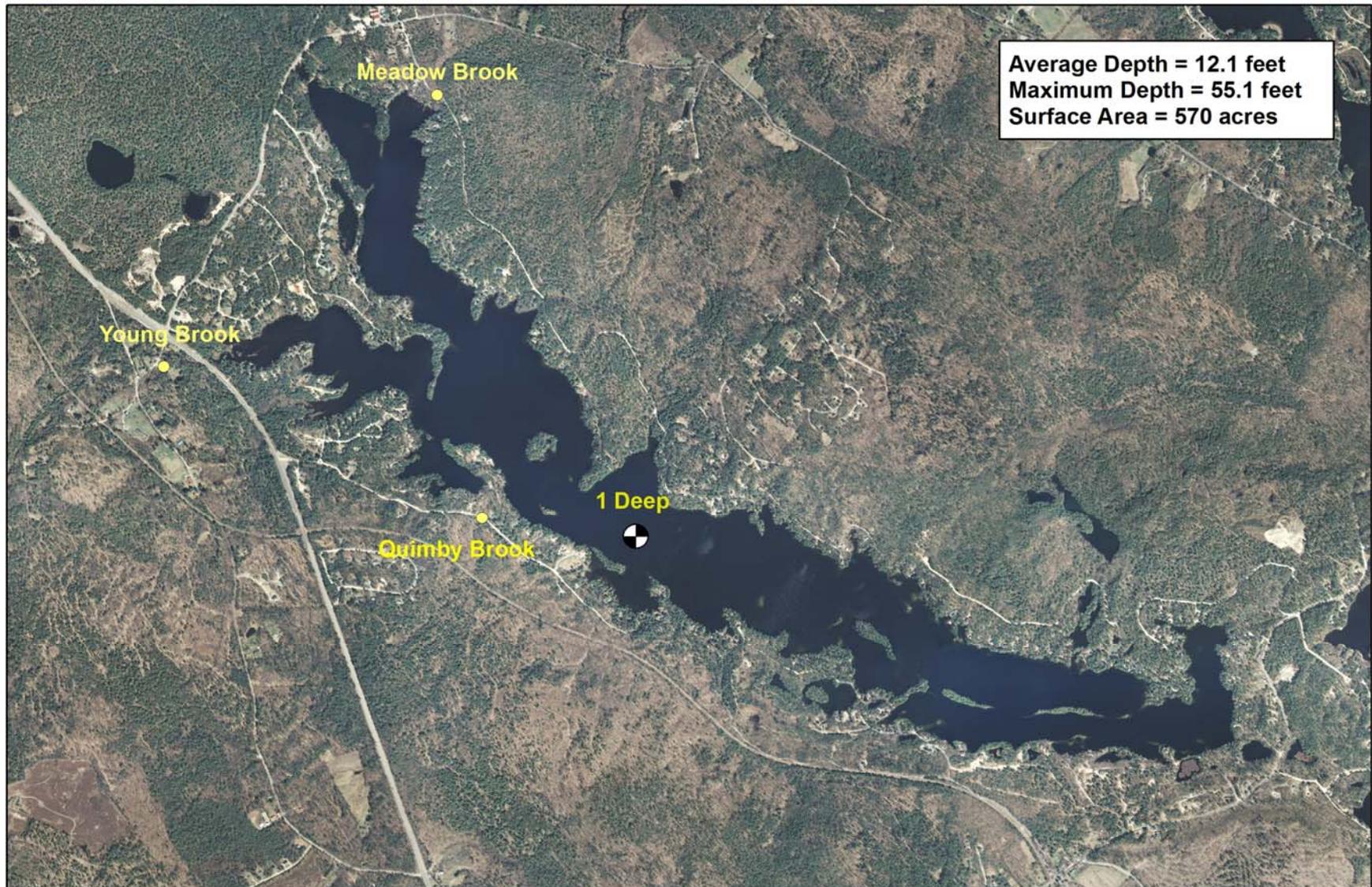
Implement Best Management Practices within the Pine River Pond watershed to minimize the adverse impacts of polluted runoff and erosion into the lake. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself Stormwater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

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

Figure 7. Pine River Pond

Wakefield, NH

2014 deep water and tributary sampling stations



Aerial Orthophoto Source: NH GRANIT
Site locations GPSed by the UNH Center of Freshwater Biology



University of New Hampshire
Cooperative Extension

