

# HORN POND

## 2016 SAMPLING HIGHLIGHTS

### Station – 1 Deep

Acton, ME & Wakefield, NH



Blue = Oligotrophic

Yellow = Mesotrophic

Red = Eutrophic

Gray = No Data

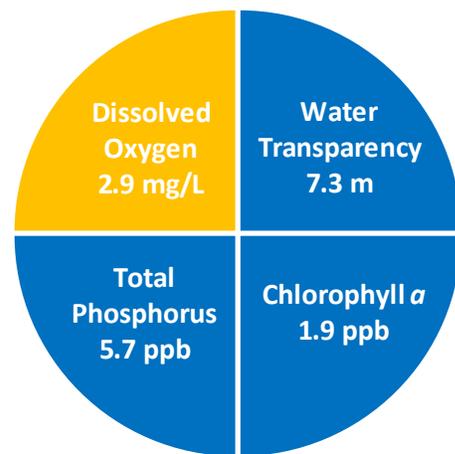


Figure 1. Horn Pond Water Quality (2016)

Station 1 Deep (Figure 7) was used as a reference point to represent the overall Horn 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 near the lake bottom.

Table 1. 2016 Horn Pond Seasonal Averages and NH DES Aquatic Life Nutrient Criteria<sup>1</sup>

Parameter	Oligotrophic	Mesotrophic	Eutrophic	Horn Pond Average (range)	Horn Pond Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	7.3 meters (6.2 – 8.8)	Oligotrophic
Chlorophyll a <sup>1</sup> (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	1.9 ppb (1.5 – 2.2)	Oligotrophic
Total Phosphorus <sup>1</sup> (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	5.7 ppb (4.3 – 7.6)	Oligotrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	2.9 mg/L (0.3 – 6.7)	Mesotrophic

\* Dissolved oxygen concentrations were measured between 6.5 and 9.0 meters, in the layer of rapidly decreasing temperatures, on August 8, 2016.

Table 2. 2016 Horn Pond Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Horn Pond Average (range)	Horn Pond Classification
	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored		
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	8.3 color units (range: 5.1 – 10.6)	Uncolored
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	10.6 mg/L (range: 9.3 – 13.1)	Low vulnerability
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			7.1 standard units (6.4 – 7.4)	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		89.5 uS/cm (range: 88.3 – 96.7)	Characteristic of lakes with some human influence

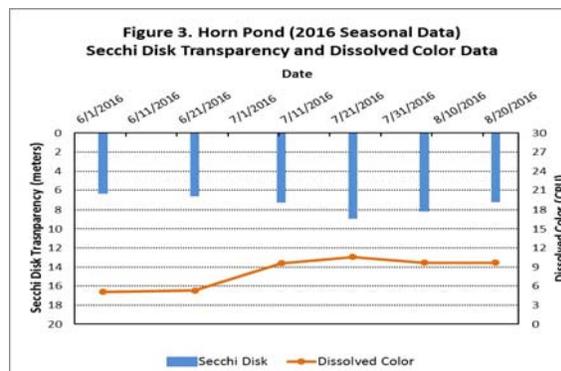
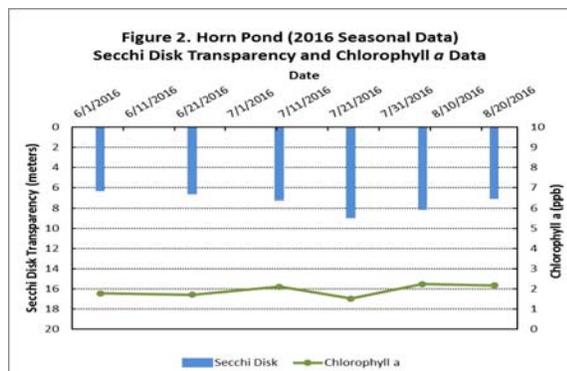


Figure 2 and 3. Seasonal Secchi disk transparency, chlorophyll a concentrations and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll a and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll a and/or color concentrations.

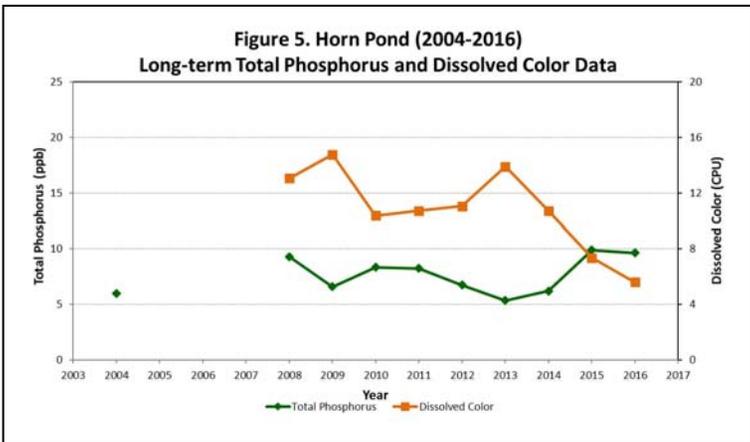
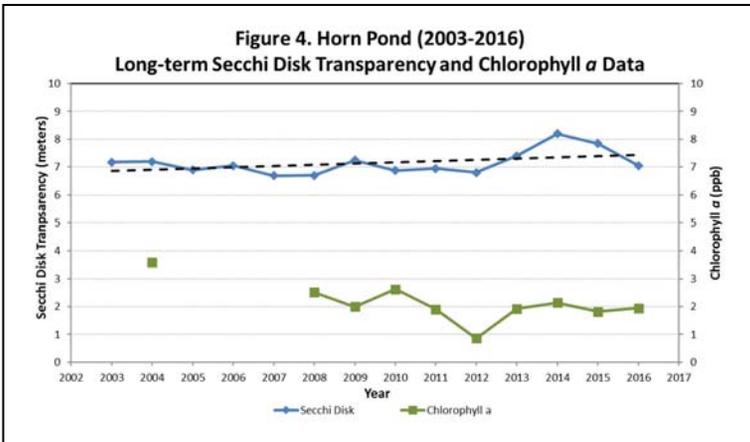
## LONG-TERM TRENDS

**WATER CLARITY:** The Horn Pond water clarity measurements, measured as Secchi Disk transparency, display a trend of increasing water clarity over the past fourteen years.

**CHLOROPHYLL:** The Horn Pond chlorophyll *a* concentrations, a measure of microscopic plant life within the lake have been collected over a span of nine consecutive sampling seasons. Due to the limited number of consecutive years sampled (less than ten) a trend analysis was not performed on the chlorophyll *a* data.

**TOTAL PHOSPHORUS:** The Horn Pond total phosphorus concentrations, the nutrient most responsible for microscopic plant growth, have been collected over a span of nine consecutive sampling seasons. Due to a limited number of consecutive years sampled (less than ten) a trend analysis was not performed on the total phosphorus data.

**COLOR:** Color is a result of naturally occurring “tea” color substances from the breakdown of soils and plant materials. Color data have been collected over a span of nine consecutive sampling seasons. Due to a limited number of years sampled (less than ten) a trend analysis was not performed on the color data.



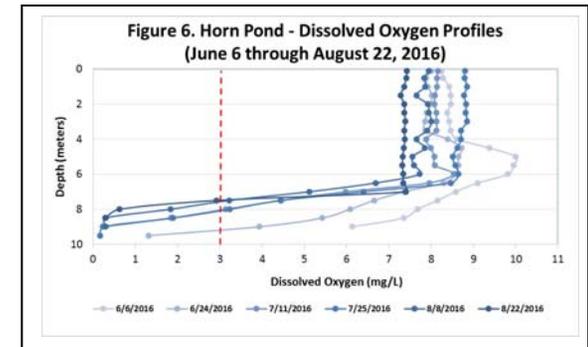
**Table 3. Salmon Falls Headwaters Seasonal Average Water Quality Inter-comparison (2016)**

Lake	Average Secchi Disk Transparency (meters)	Average Chlorophyll <i>a</i> (ppb)	Average Total Phosphorus (ppb)	Average Dissolved Oxygen (ppm)
Great East Lake	11.6	1.2	4.4	8.6
Wilson Lake	7.0	2.4	5.5	0.1
Lovell Lake	7.5	2.8	6.5	1.7
Horn Pond	7.3	1.9	5.7	2.9
Lake Ivanhoe	4.1	3.9	7.9	-----

- Water quality data are reported for a deep reference sampling location in each water body
- Dissolved oxygen measurements were collected during the summer months (late July through late August) and from the deepest water layer (metalimnion or hypolimnion) in each lake.
- ----- Indicates the site is too shallow to form a bottom water layer (metalimnion or hypolimnion).

Figures 4 and 5. Changes in the Horn Pond water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 2003 and 2016. **These data illustrate the relationship among plant growth, water color and water clarity. Total phosphorus data are also displayed and are oftentimes correlated with the amount of plant growth.** Trendlines are displayed when sufficient data are available.

Figure 6. Bi-weekly Horn Pond dissolved oxygen profiles collected between June 30 and August 22, 2016. The vertical red line indicates the oxygen concentration commonly considered the threshold for successful growth and reproduction of warm water fish such as bass and perch. *Notice the low oxygen concentrations near the lake bottom between July 11 and August 22, 2016.*



## Recommendations

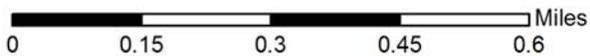
Implement Best Management Practices within the Horn Pond watershed to minimize the adverse impacts of polluted runoff and erosion on the lake. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions 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://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf)
- <http://soaknh.org/wp-content/uploads/2016/04/NH-Homeowner-Guide-2016.pdf>
- <http://awwatersheds.org/healthy-lakes/conservation-practices-for-homeowners/>

# Figure 7. Horn Pond

Acton, ME & Wakefield, NH

2016 Deep water sampling site and seasonal average water clarity



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



Extension

