

HORN POND

2014 SAMPLING HIGHLIGHTS

Station – 1 Deep

Acton, ME & Wakefield, NH



Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

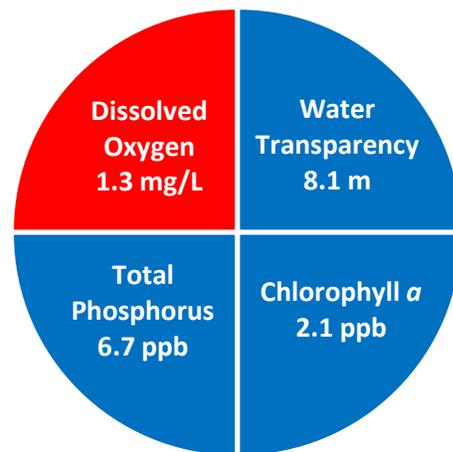


Figure 1. Horn Pond Water Quality (2014)

Station 1 Deep (Figure 7) was used as a reference point to represent the overall Horn Pond water quality.

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

| Parameter | Oligotrophic "Excellent" | Mesotrophic "Fair" | Eutrophic "Poor" | Horn Pond Average (range) | Horn Pond Classification |
|-------------------------|--------------------------|--------------------|------------------|---------------------------|--------------------------|
| Water Clarity (meters) | 4.0 – 7.0 | 2.5 - 4.0 | < 2.5 | 8.1 meters (7.0 – 8.9) | Oligotrophic |
| Chlorophyll a (ppb) | < 3.3 | > 3.3 – 5.0 | > 5.0 – 11.0 | 2.1 ppb (1.4 – 2.9) | Oligotrophic |
| Total Phosphorus (ppb) | < 8.0 | > 8.0 – 12.0 | > 12.0 – 28.0 | 6.7 ppb (5.5 – 8.2) | Oligotrophic |
| Dissolved Oxygen (mg/L) | 5.0 – 7.0 | 2.0 – 5.0 | <2.0 | 1.3 mg/L (1.1 – 1.5) | Eutrophic |

* Dissolved oxygen concentrations were measured between 8.0 and 9.5 meters, in the bottom waters, on September 8, 2014.

Table 2. 2014 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 | 11.3 color units (range: 8.9 – 14.3) | 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 | 9.9 mg/L (range: 9.4 – 10.2) | 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 (6.2 – 7.1) | 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 | | 72.3 uS/cm (range: 71.0 – 75.3) | Characteristic of lakes with some human influence |

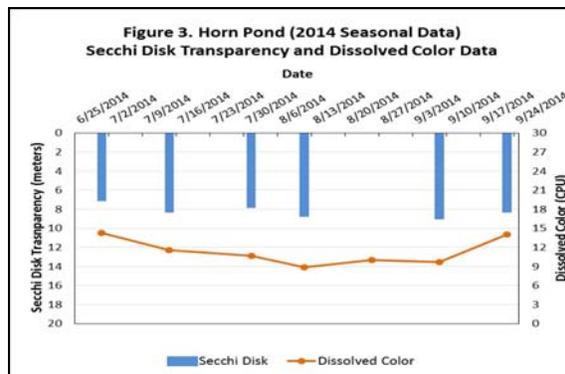
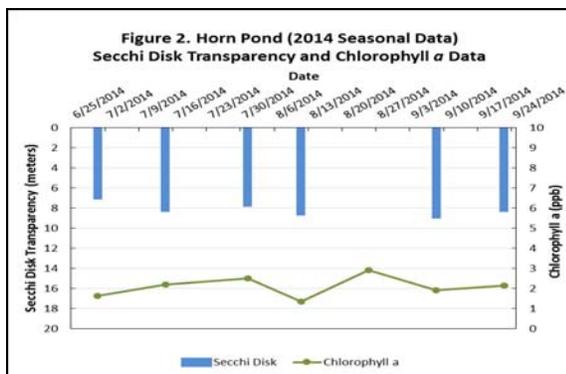


Figure 2 and 3. Seasonal Secchi disk transparency, chlorophyll a changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll a and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll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

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 twelve years.

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

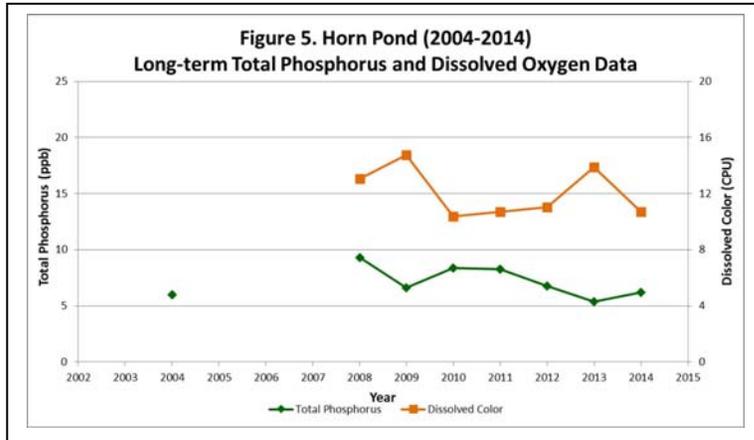
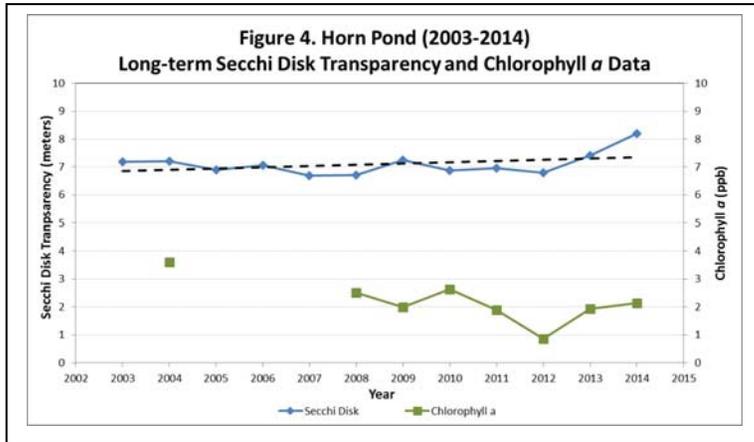


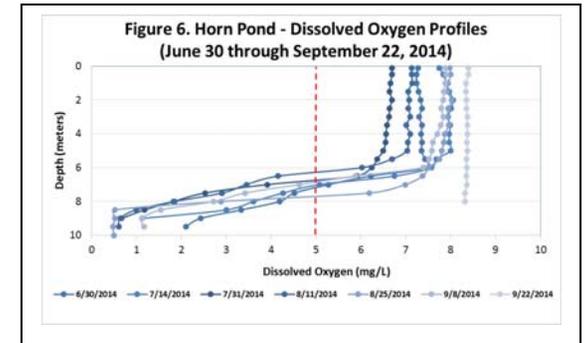
Table 3. Salmon Falls Headwaters Seasonal Average Water Quality Inter-comparison (2014)

| Lake | Average Secchi Disk Transparency (meters) | Average Chlorophyll <i>a</i> (ppb) | Average Total Phosphorus (ppb) | Average Dissolved Oxygen (ppm) |
|-----------------|---|------------------------------------|--------------------------------|--------------------------------|
| Great East Lake | 10.5 | 1.1 | 6.2 | 4.6 |
| Wilson Lake | 7.5 | 2.1 | 6.5 | 1.2 |
| Lovell Lake | 7.8 | 2.7 | 7.1 | 1.6 |
| Horn Pond | 8.1 | 2.1 | 6.7 | 1.3 |
| Lake Ivanhoe | 4.2 | 6.0 | 9.0 | ----- |

- Water quality data are reported for a deep reference sampling location in each water body
- Dissolved oxygen measurements were taken late season (early-mid September) and from the bottom water layer (hypolimnion).
- ----- Indicates the site is too shallow to form a bottom water layer (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 2014. **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 September 22, 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 low oxygen concentrations near the lake bottom between June 30 and September 8.*



Recommendations

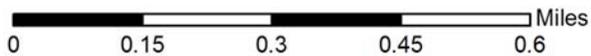
Implement Best Management Practices within the Horn Pond watershed to minimize the adverse impacts of polluted runoff and erosion into the lake. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself Stormwater 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. Horn Pond

Acton, ME & Wakefield, NH

2014 Deep water sampling site and seasonal average water clarity



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



University of New Hampshire
Cooperative Extension

