HORN POND

2022 SAMPLING HIGHLIGHTS

Station Deep

Wakefield, NH

Extension

Water quality data displayed in Tables 1 and 2 are surface water measurements with the exception of the dissolved oxygen data that are collected near the lake bottom. Summary statistics are provided for a single set of measurements collected on September 7, 2022.

Blue = Oligotrophic

Yellow = Mesotrophic

Red = Eutrophic

Gray = No Data

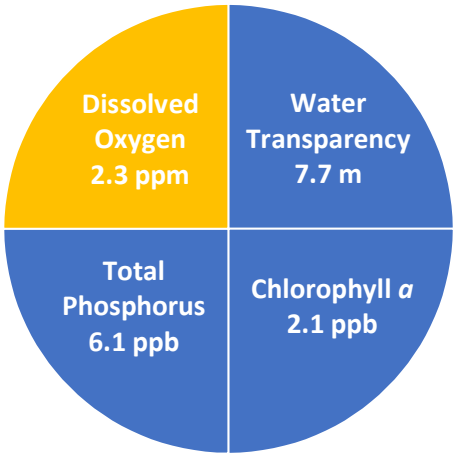


Figure 1. Horn Pond Water Quality (2022)

Table 1. 2022 Horn Pond Seasonal Averages and NH DES Aquatic Life Nutrient Criteria[1]

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	**7.7** meters (single value)	Oligotrophic
Chlorophyll *a* [1] (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	**2.1** ppb (single value)	Oligotrophic
Total Phosphorus [1] (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	**6.1** ppb (single value)	Oligotrophic
Dissolved Oxygen (ppm)	5.0 – 7.0	2.0 – 5.0	<2.0	**2.3** ppm (0.2 – 6.8) *	Mesotrophic

* Dissolved oxygen concentrations were measured between 8.0 and 9.5 meters, in the mid water layer, on September 7, 2022.

Table 2. 2022 Horn Pond Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Horn Pond Average (range)	Horn Pond Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	**9.1** color units (range: single value)	Uncolored
Alkalinity (ppm)	< 0.0 acidified	0.1 – 2.0 extremely vulnerable	2.1 – 10 moderately vulnerable	10.1 – 25.0 low vulnerability	> 25.0 not vulnerable	**10.1** ppm (range: single value)	Low vulnerability
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			**6.7** standard units (range: single value)	Optimal range for fish growth and reproduction
Specific Conductivity (*u*S/cm)	< 50 *u*S/cm Characteristic of minimally impacted NH lakes		50-100 *u*S/cm Lakes with some human influence	> 100 *u*S/cm Characteristic of lakes experiencing human disturbances		**85.6** *u*S/cm (range: single value)	Characteristic of lakes with some human influence

Strategies to stabilize and improve water quality

Implement Best Management Practices (BMPs) within the Horn Pond watershed to minimize the adverse impacts of polluted runoff and erosion into Horn Pond. Refer to "Landscaping at the Water's Edge: An Ecological Approach", "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home", and the Acton Wakefield Watershed Alliance webpages for more information on how to reduce nutrient loading caused by overland run-off. NH Lakes also provides a series of resources aimed at educating residents and protecting our lakes and ponds.

- https://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/homeowner-guide-stormwater.pdf
- https://awwatersheds.org/
- https://nhlakes.org/lakesmart-resource-library/

Figure 2. Horn Pond (2022 Seasonal Data)
Secchi Disk Transparency and Chlorophyll *a* Data

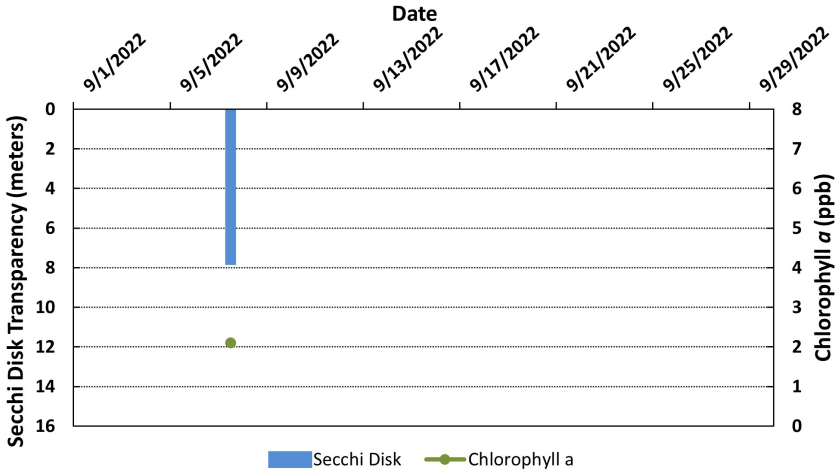


Figure 3. Horn Pond (2022 Seasonal Data)
Secchi Disk Transparency and Dissolved Color Data

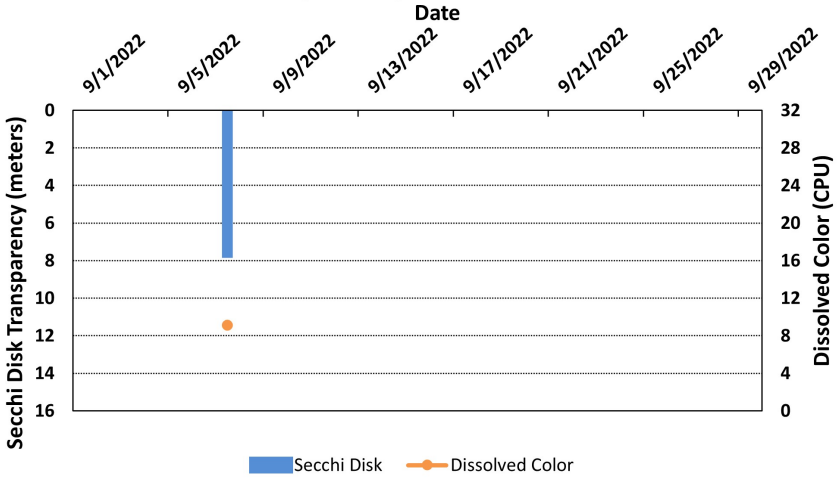


Figure 4. Horn Pond- Deep Site (2003-2022)
Long-term Secchi Disk Transparency and Chlorophyll *a* Data

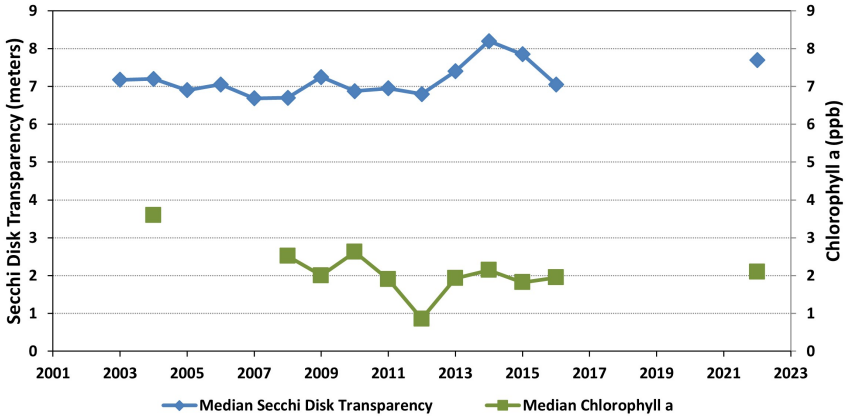
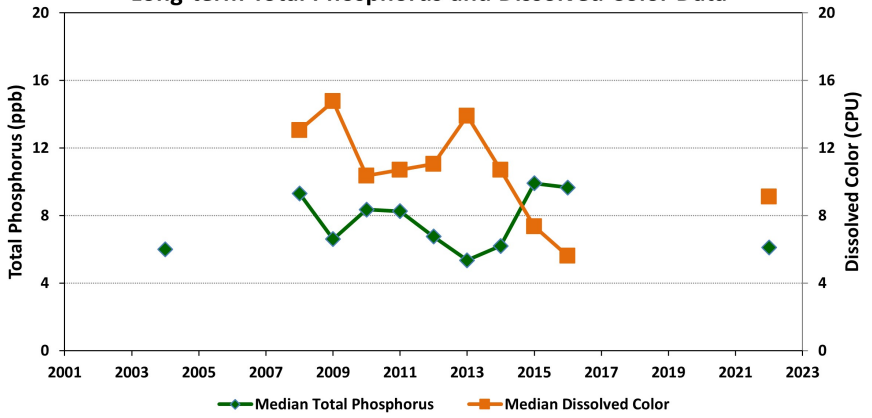


Figure 5. Horn Pond - Deep Site (2003-2022)
Long-term Total Phosphorus and Dissolved Color Data



Figures 2 and 3. Seasonal comparison of Horn Pond water transparency (Secchi Disk depth), chlorophyll *a* and dissolved color for 2022. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll *a* and/or color concentrations.

Figures 4 and 5. Annual median Horn Pond water transparency, chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 2004 and 2022, through the New Hampshire Lakes Lay Monitoring Program and the New Hampshire Department of Environmental Services**.** The long-term data provide insight into the water quality fluctuations, among years, that have been documented in Horn Pond.

Figure 6. Horn Pond - Site 1 Deep
Temperature Profiles (September 7, 2022)

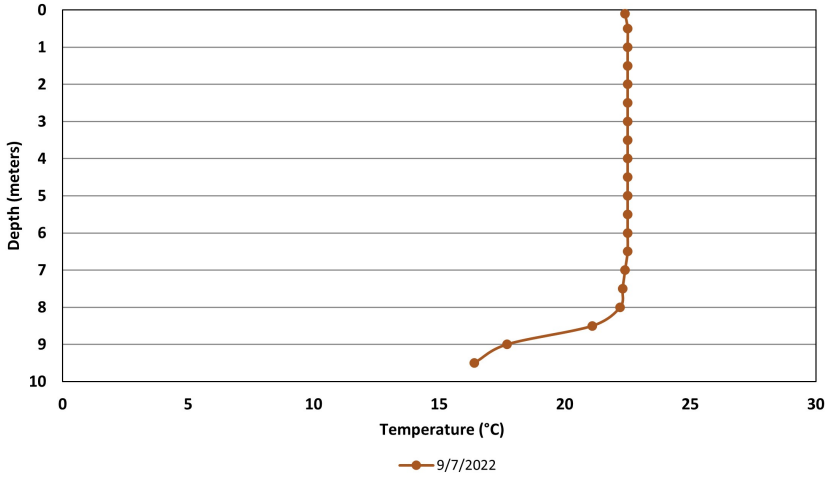


Figure 7. Horn Pond - Site 1 Deep
Dissolved Oxygen Profiles (September 7, 2022)

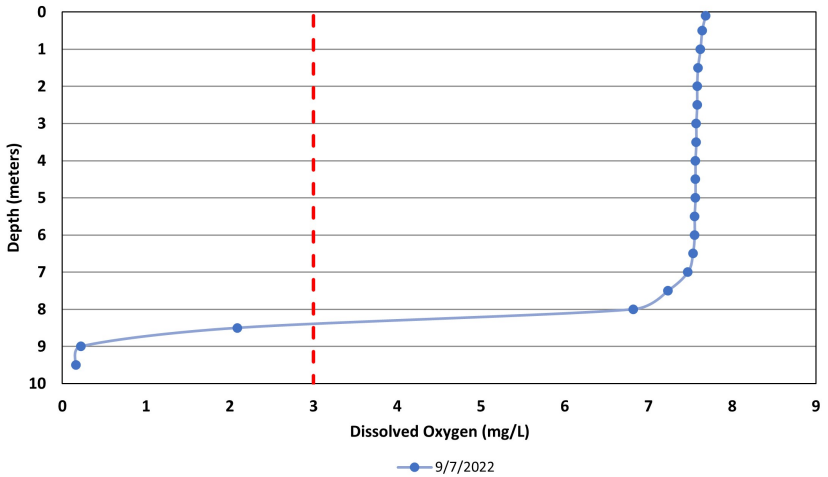


Figure 8. Horn Pond - Site 1 Deep
Specific Conductivity Profiles (September 7, 2022)

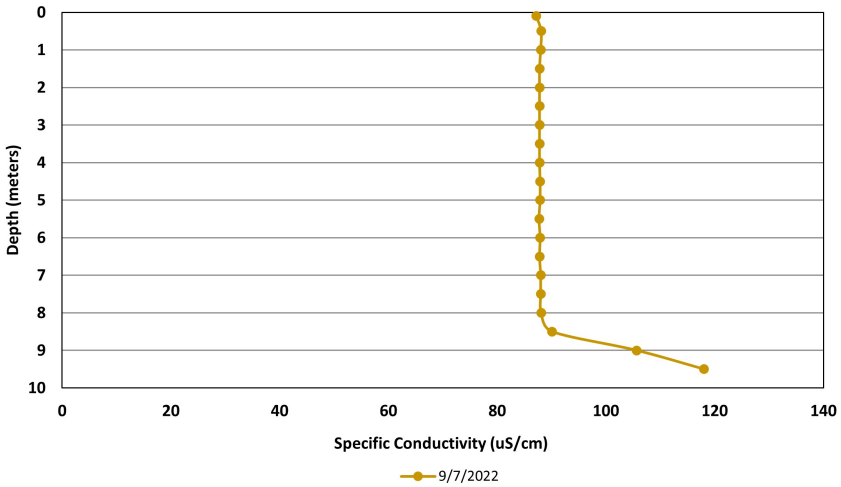
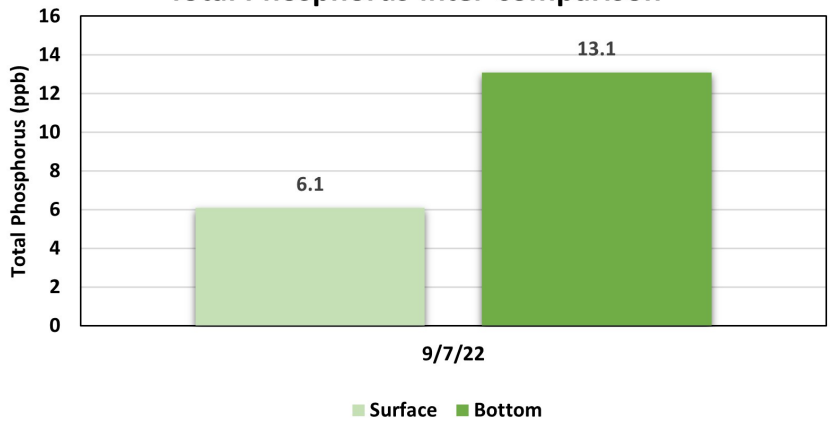


Figure 9. Horn Pond - Site 1 Deep
Total Phosphorus inter-comparison



Figures 6, 7 and 8. Temperature, dissolved oxygen and specific conductivity profiles displaying the water quality differences in 0.5-meter increments. The dashed vertical red line in Figure 7 displays the dissolved oxygen threshold for the successful growth and reproduction of warm-water fish such as bass and perch.

Figure 9. Total phosphorus comparison between the surface (epilimnion) and bottom water (hypolimnion) zones.

Table 3. Salmon Falls River Watershed Lakes (Acton ME and Wakefield NH)
(2022 water quality data collected between May 31 and September 26)

Lake	Average (range) Secchi Disk Transparency (meters)	Average (range) Total Phosphorus (ppb)	Average (range) Chlorophyll-*a* (ppb)	Average (range) Dissolved Oxygen (ppm)
Great East Lake	9.8 meters (range: 8.6 – 10.9)	4.3 ppb (range: 3.3 – 6.0)	1.4 ppb (range: 1.2 – 1.7)	7.0 ppm (range: 5.3 – 9.0)
Horn Pond	7.7 meters (single point)	6.1 ppb (single point)	2.1 ppb (single point)	2.3 ppm (0.2 – 6.8)
Lake Ivanhoe/Round Pond	4.4 meters (range: 4.0 – 5.8)	10.4 ppb (range: 9.1 – 11.9)	3.6 ppb (range: 1.9 – 5.2)	------
Lovell Lake	7.0 meters (range: 5.1 – 8.9)	8.5 ppb (range: 6.4 – 16.0)	2.4 ppb (range: 1.7 – 3.1)	0.9 ppm (range: 0.0 – 4.9)
Wilson Lake	Not assessed	Not assessed	Not assessed	Not assessed

- Water quality data are reported for a deep reference sampling location in each water body
- Dissolved oxygen measurements were taken late season and from the middle or bottom water layer
- ------ indicates the site is too shallow to form a bottom water layer

Data Interpretation: Overview of factors to consider when reviewing the Horn Pond data

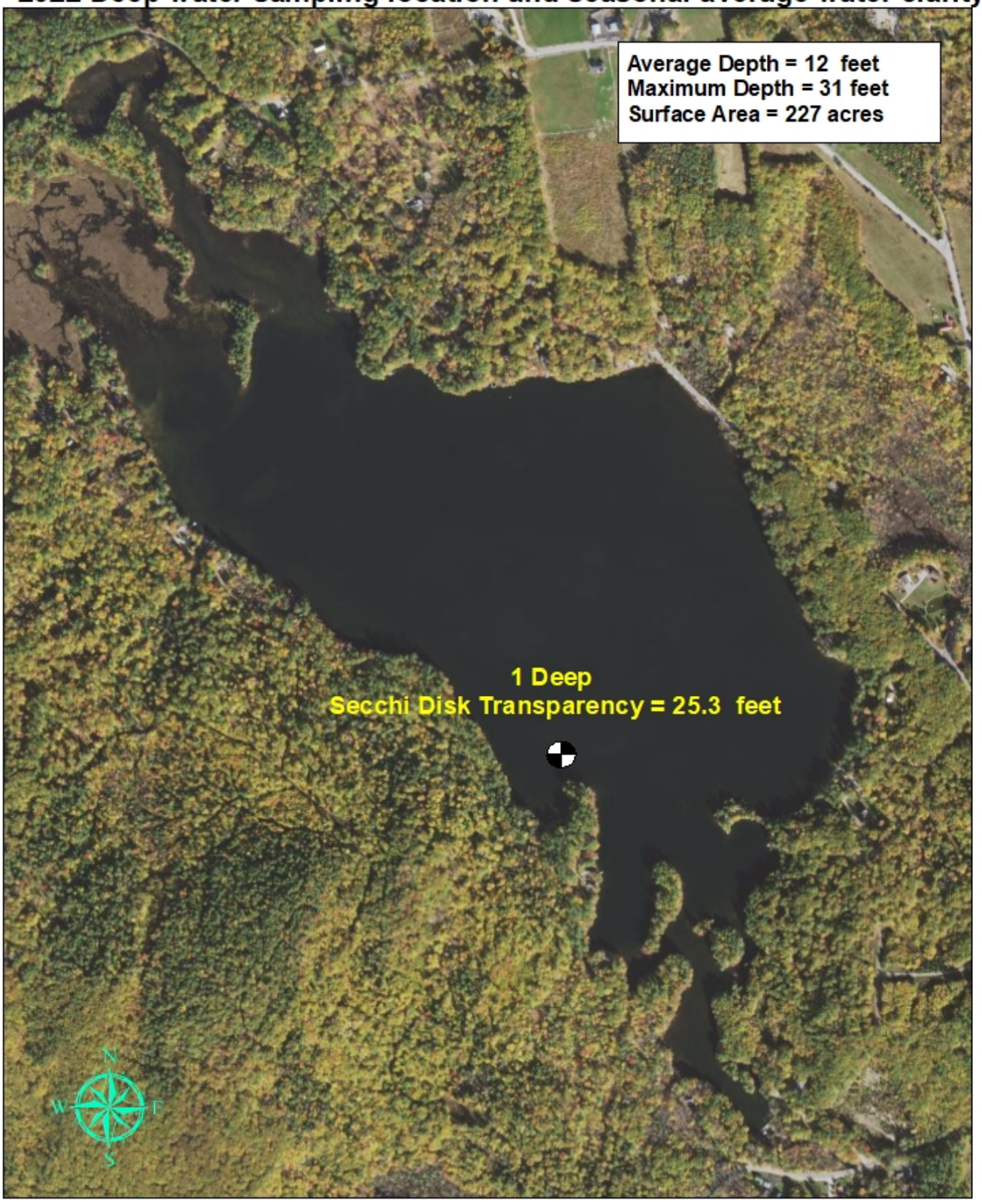
This highlight report provides a general overview of the current and historical conditions of Horn Pond. The report is intended to provide a simple assessment of the water quality trends. Should you have additional questions about interpreting your water quality results, we would be happy to discuss the data with you and/or any concerns you may have. In general, some factors that influence the current and long-term water quality results/trends for our New Hampshire lakes and ponds include:

- **Land-use Patterns** within the watershed (drainage basin) – Research indicates land use patterns have an impact on how much phosphorus (nutrient) is washing into our lakes. In general, more urbanized watersheds have a greater degree of phosphorus runoff than highly forested/vegetated drainage areas.
- **Weather Patterns** – Rainfall and temperature can influence water quality. Wet periods, and overland runoff, tend to be a time when elevated nutrients and other pollutants are transported into our lakes. Temperature can also influence water quality conditions since many aquatic plants and algae tend to respond to changing seasonal conditions. Unusually warm periods are sometimes tied to short-term algal and cyanobacteria blooms.
- **Best Management Practices (BMPs)** – The presence/absence of best management practices can have an interplay on water quality. BMPs are measures that are used to manage nutrients and other pollutants that could otherwise make their way into our lakes. Properties that employ BMPs, designed specifically to remove pollutants of concern (e.g. sediments and phosphorus), are less likely to contribute nutrients and other pollutants into our lakes.
- **Temperature (Thermal) Stratification** – Many lakes become thermally stratified during the summer months and may form three distinct thermal layers: upper water layer (epilimnion), middle lake layer (metalimnion) and bottom cold-water layer (hypolimnion). These thermal zones form a barrier to lake mixing, during the summer months, and can coincide with differences in dissolved oxygen and specific conductivity through the water column.
- **Internal Nutrient Loading** (nutrients that are introduced from the sediments along the lake bottom) – Some of our lakes experience significant internal nutrient loading. Such lakes generally tend to be well stratified and exhibit increasing deep water phosphorus concentrations, relative to surface levels.

Figure 10. Horn Pond

Acton, ME & Wakefield, NH

2022 Deep water sampling location and seasonal average water clarity



0 0.1 0.2 0.3 0.4 Miles

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

NH Extension