# WAKONDAH POND

## 2021 SAMPLING HIGHLIGHTS

## Station – Deep

### Moultonborough, NH

Station Deep (Figure 7) was used as a reference point to represent the overall Wakondah 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.

**Blue** = Excellent = Oligotrophic

**Yellow** = Fair = Mesotrophic

**Red** = Poor = Eutrophic

**Gray** = No Data

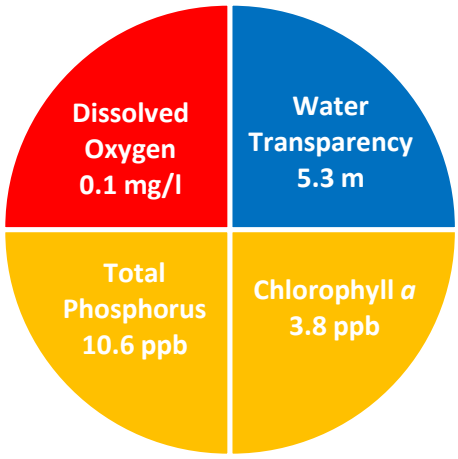



**Figure 1. Wakondah Pond Water Quality (2021)**

**Table 1. 2021 Wakondah Pond Seasonal Averages and NH DES Aquatic Life Nutrient Criteria[1]**

| Parameter | Oligotrophic "Excellent" | Mesotrophic "Fair" | Eutrophic "Poor" | Wakondah Pond Average (range) | Wakondah Pond Classification |
|---|---|---|---|---|---|
| Water Clarity (meters) | 4.0 – 7.0 | 2.5 - 4.0 | < 2.5 | **5.3** meters (4.4 – 6.5) | Oligotrophic |
| Chlorophyll *a* [1] (ppb) | < 3.3 | > 3.3 – 5.0 | > 5.0 – 11.0 | **3.8** ppb (2.7 – 5.4) | Mesotrophic |
| Total Phosphorus [1] (ppb) | < 8.0 | > 8.0 – 12.0 | > 12.0 – 28.0 | **10.6** ppb (9.4 – 11.6) | Mesotrophic |
| Dissolved Oxygen (mg/L) | 5.0 – 7.0 | 2.0 – 5.0 | < 2.0 | **0.1 mg/l (0.0 – 0.2)** | Eutrophic |

* Dissolved oxygen concentrations were measured on July 12, 2021 between 7.5 and 12.0 meters, in the bottom waters.

**Table 2. 2021 Wakondah Pond Seasonal Average Accessory Water Quality Measurements**

| Parameter | Assessment Criteria | | | | | Wakondah Pond Average (range) | Wakondah Pond Classification |
|---|---|---|---|---|---|---|---|
| Color (color units) | < 10 uncolored | 10 – 20 slightly colored | 20 – 40 lightly tea colored | 40 – 80 tea colored | > 80 highly colored | **21.1** color units (range: 17.2 – 24.9) | Lightly 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 | **14.7** mg/L (range: 13.4 – 15.9) | 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: 6.5 – 6.9) | 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 | | 86.0 uS/cm (range: 82.9 – 89.4) | Lakes with some human influence |

**Figure 2. Wakondah Pond - Site 1 Deep (2020 Seasonal Data) Secchi Disk Transparency and Chlorophyll *a* Data**

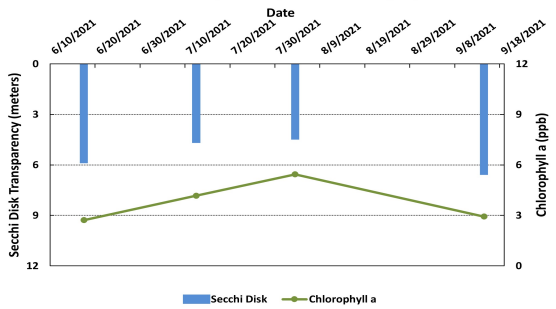



**Figure 3. Wakondah Pond - Site 1 Deep (2020 Seasonal Data) Secchi Disk Transparency and Dissolved Color Data**

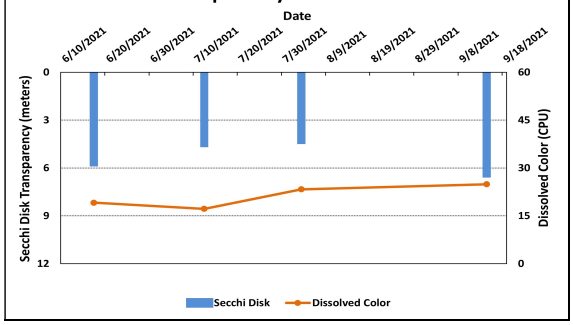
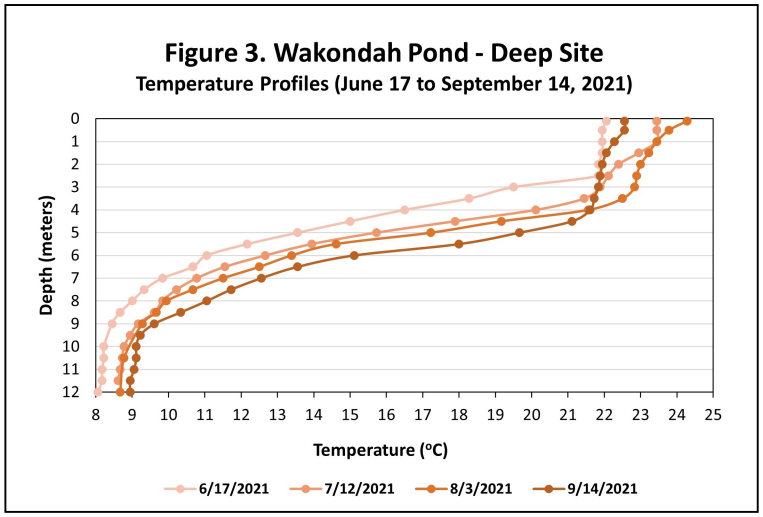
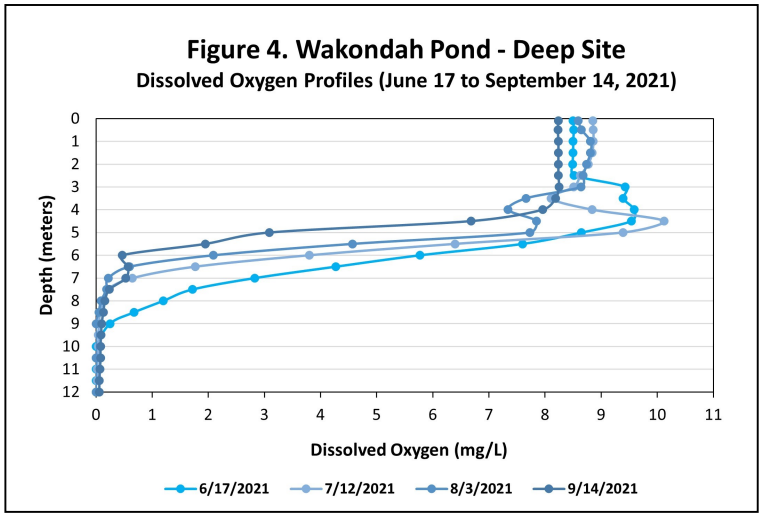



Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll *a* changes and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in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

# WAKONDAH POND – Pertinent Observations (2021)

**Wakondah Pond was sampled monthly, between June 17 and September 14, 2021, to provide supplemental data in support of a Lake Kanasatka Watershed Management Planning effort.** The following graphs depict water quality differences between the surface and deeper waters and suggest Wakondah Pond may be susceptible to internal nutrient loading; when nutients (particularly the nutrient phosphorus) is "released" from the bottom sediments and becomes available for microscopic plant "algal" and cyanobacteria growth.



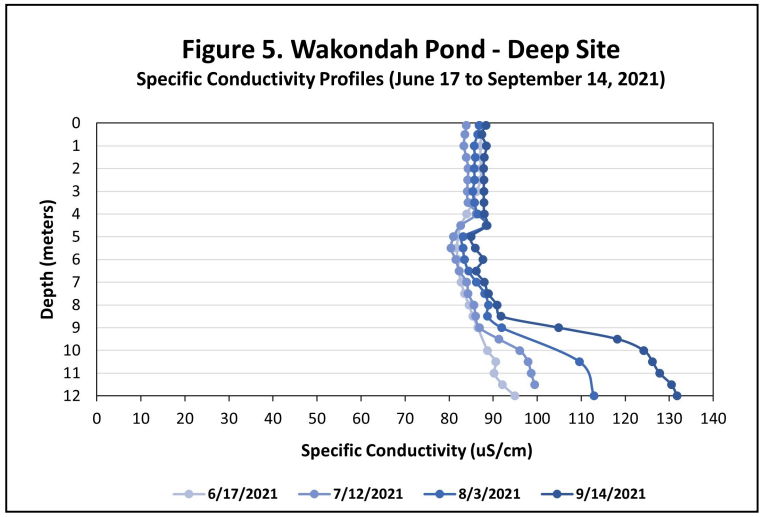



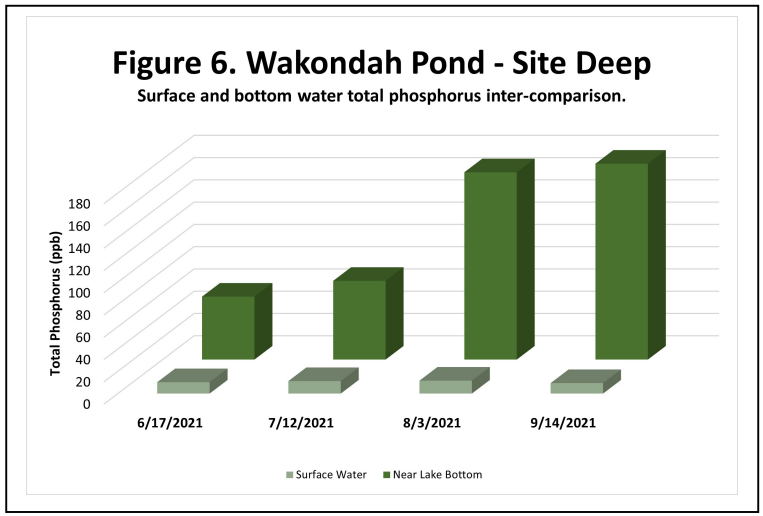

Figures 3. Temperature changes are evident from the surface to the lake bottom during the summer months. Wakondah Pond partitions into three thermal (temperature zones: an upper warm water zone, a middle layer of rapidly decreasing temperature, and a bottom water layer of relatively uniform cold water. These zones persist through the summer months and prevent the water from circulating freely from the surface to the lake bottom.

Figure 4. Dissolved oxygen changes are evident from the surface to the lake bottom during the summer months. Stagnating bottom waters became devoid of oxygen as early as July 12 and the lack of deep water oxygen persisted through the final sampling date on September 14. The lack of deep water oxygen is suboptimal for the successful growth and reproduction of coldwater fish. Thus, Wakondah Pond is best suited as a warm water fishery.

Figure 5. Specific Conductivity (a measure of dissolved salts in the water column) varied slightly slightly in the surface waters among sampling dates. However, deep water specific conductivity was more variable among dates and deep water conductivity increased each successive month.

Figure 6. Monthly Wakondah Pond surface water and bottom water total phosphorus inter-comparison. Notice the difference between the surface water and bottom water total phosphorus concentrations. The elevated deep water total phosphorus concentrations may be associated with the phenomenon known as internal nutrient loading, that is typically associated with low dissolved oxygen and elevated specific conductivity concentrations near the lake bottom.




## Recommendations

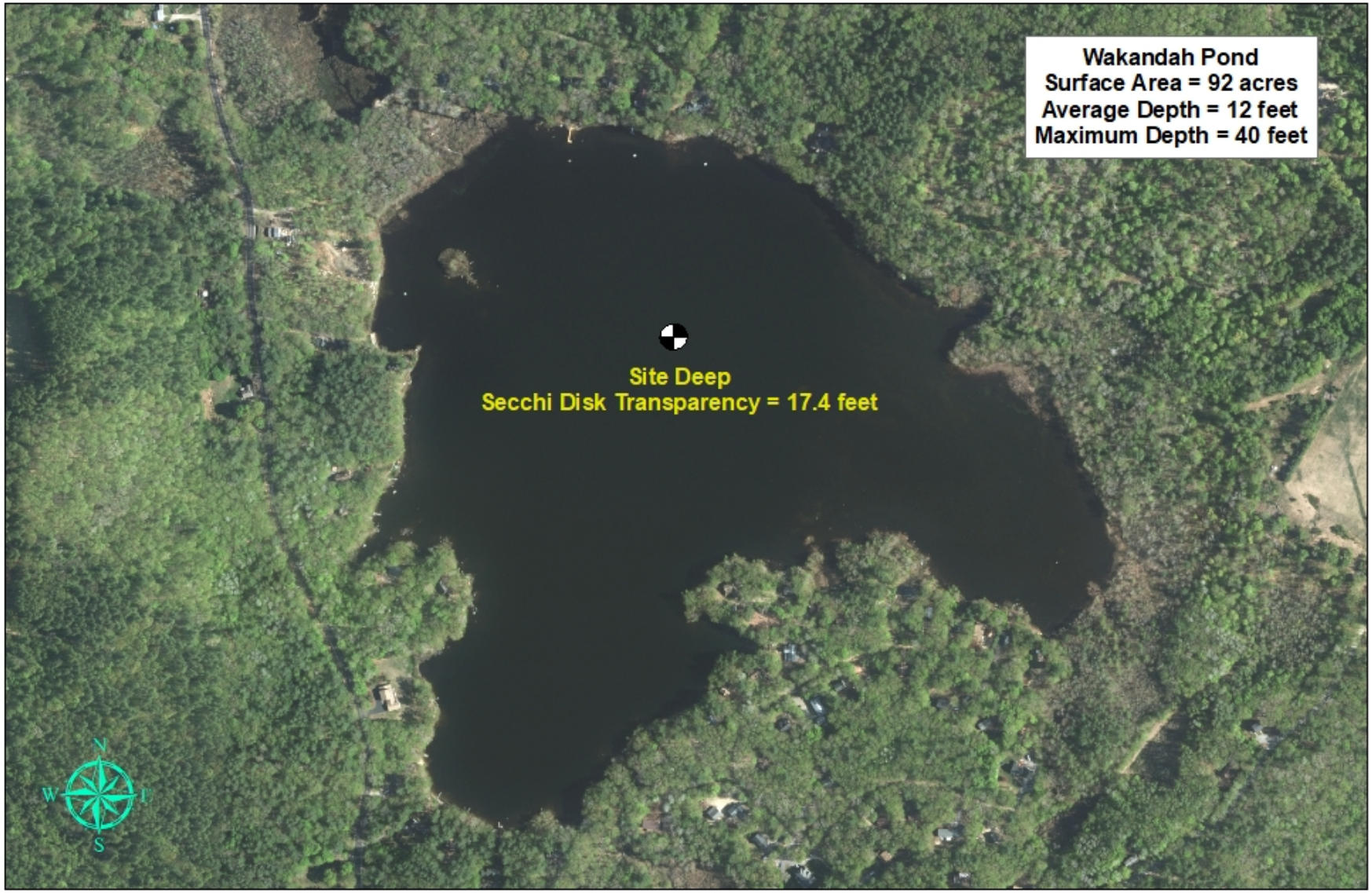
Implement Best Management Practices within the Wakondah Pond watershed to minimize the adverse impacts of polluted runoff and erosion into Wakondah Pond. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off.

- https://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- https://www.des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf

# Figure 7. Wakondah Pond

**Moultonborough, NH**

**2021 Deep water sampling sites and seasonal average water transaprency.**




0 0.1 0.2 0.3 0.4 Miles

Aerial Orthophoto Source: NH GRANIT
GPS Coordinates collected by the UNH Center for Freshwater Biology