MIDDLE DANFORTH POND

2024 SAMPLING HIGHLIGHTS

Station Deep

Freedom, 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 bi-weekly samples collected between May 21 and October 8, 2024.

Blue = Excellent = Oligotrophic

Light Green = Fair = Mesotrophic

Dark Green = Poor = Eutrophic

Gray = No Data

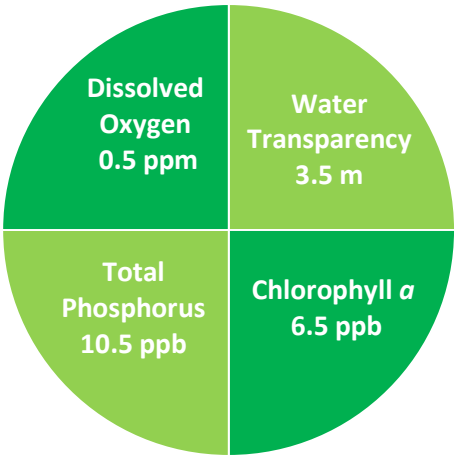


Figure 1. Middle Danforth Pond Water Quality (2024)

Table 1. 2024 Middle Danforth Pond Seasonal Averages and NH DES Aquatic Life Nutrient Criteria[1]

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Middle Danforth Pond Average (range)	Middle Danforth Pond Classification
Water Clarity (meters)	> 4.0 – 7.0	2.5 - 4.0	< 2.5	**3.5** meters (2.5 – 4.1)	Mesotrophic
Chlorophyll *a* [1] (ppb)	< 3.3	3.3 – 5.0	> 5.0 – 11.0	**6.5** ppb (1.8 – 17.1)	Eutrophic
Total Phosphorus [1] (ppb)	< 8.0	8.0 – 12.0	> 12.0 – 28.0	**10.5** ppb (7.7 – 15.1)	Mesotrophic
Dissolved Oxygen (ppm)	> 5.0 – 7.0	2.0 – 5.0	< 2.0	**0.5** ppm (0.1 – 2.4) *	Eutrophic

* Dissolved oxygen concentrations were measured between 4.0 and 9.5 meters, in the middle and bottom water layers, on September 12, 2024.

Table 2. 2024 Middle Danforth Pond Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Middle Danforth Pond Average (range)	Middle Danforth Pond Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	**42.2** color units (range: 23.6 – 70.2)	Tea colored
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	**9.7** ppm (range: 8.5 – 11.2)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			**7.3** standard units (range: 7.2 – 7.4)	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		**56.7** *u*S/cm (range: 45.0 – 66.8)	Characteristic of lakes with some human influence

Strategies to stabilize and improve water quality

Implement Best Management Practices (BMPs) within the Middle Danforth Pond watershed to minimize the adverse impacts of polluted runoff and erosion into Middle Danforth 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 Green Mountain Conservation Group BMP page 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 through the LakeSmart program.

Figure 2. Middle Danforth Pond (2024 Seasonal Data)
Secchi Disk Transparency and Chlorophyll *a* Data

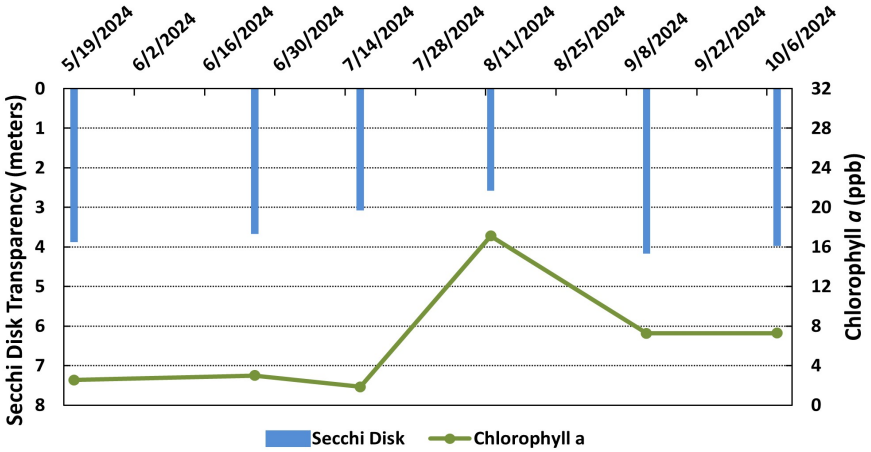


Figure 3. Middle Danforth Pond (2024 Seasonal Data)
Secchi Disk Transparency and Dissolved Color Data

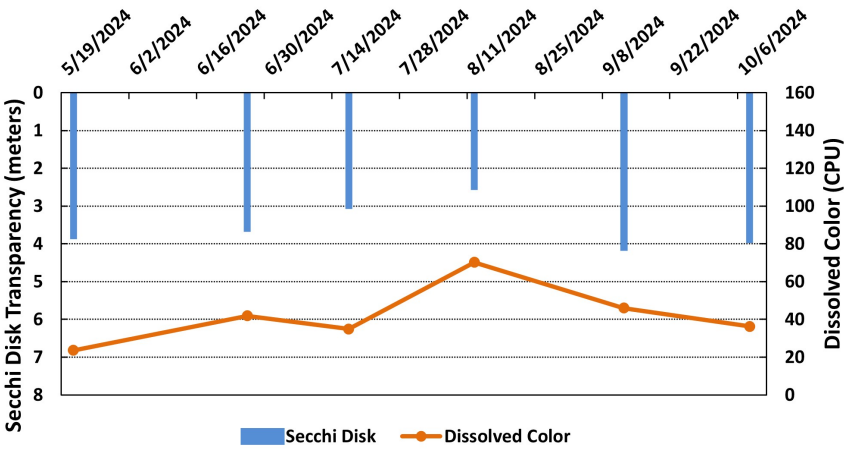


Figure 4. Middle Danforth Pond - Deep Site (1983-2024)
Long-term Secchi Disk Transparency and Chlorophyll *a* Data

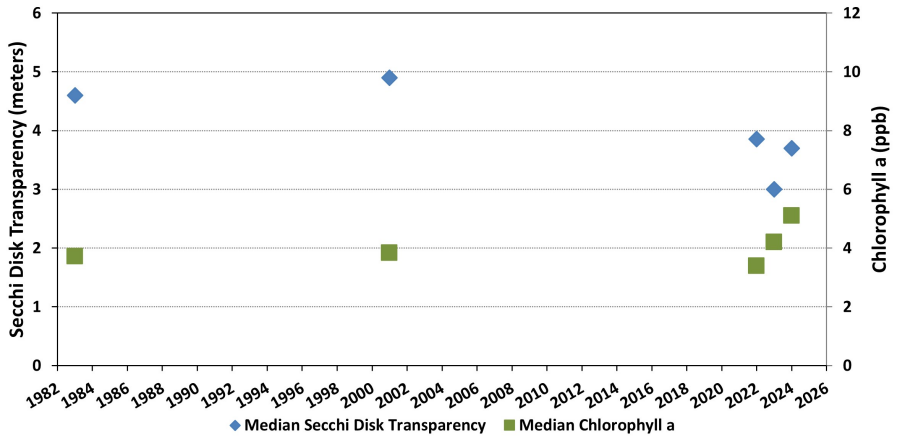
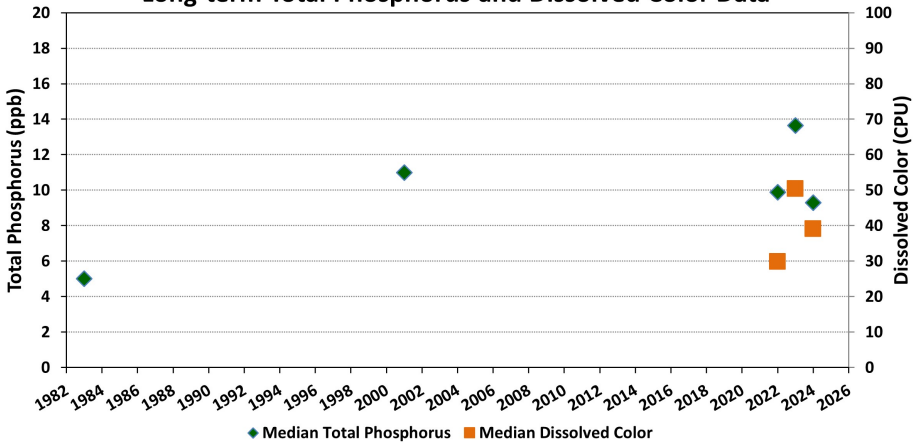


Figure 5. Middle Danforth Pond - Deep Site (1983-2024)
Long-term Total Phosphorus and Dissolved Color Data



Figures 2 and 3. Seasonal comparison of Middle Danforth Pond water transparency (Secchi Disk depth), chlorophyll *a,* and dissolved color for 2024. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll *a* and/or color concentrations.

Figures 4 and 5. Annual median Middle Danforth Pond water transparency, chlorophyll *a*, dissolved color, and total phosphorus concentrations measured between 1983 and 2024, 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 Middle Danforth Pond.

Figure 6. Middle Danforth Pond - Site Deep
Temperature Profiles (May 21 through October 8, 2024)

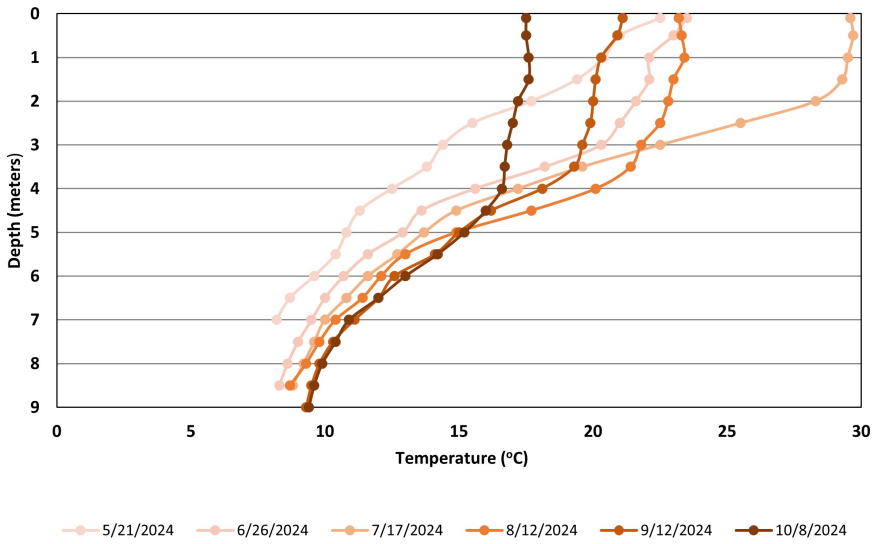


Figure 7. Middle Danforth Pond - Site Deep
Dissolved Oxygen Profiles (May 21 through October 8, 2024)

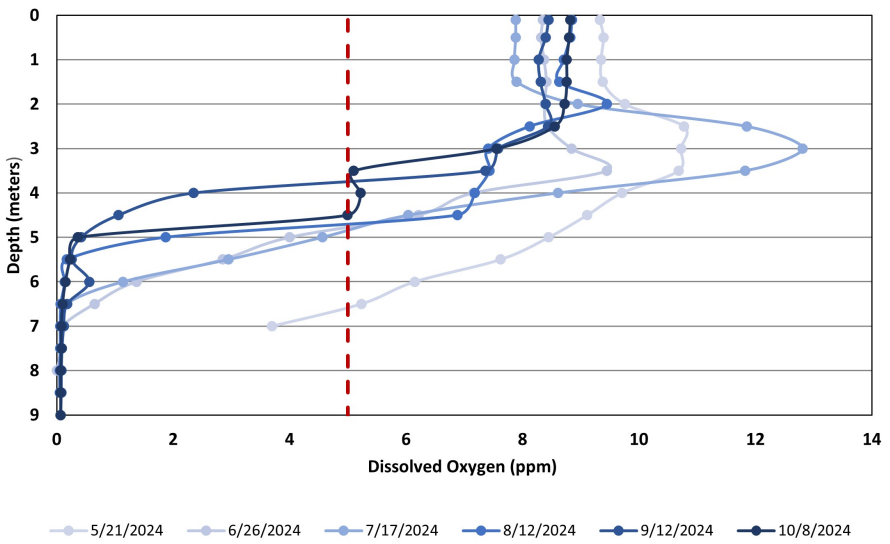


Figure 8. Middle Danforth Pond - Site Deep
Specific Conductivity inter-comparison

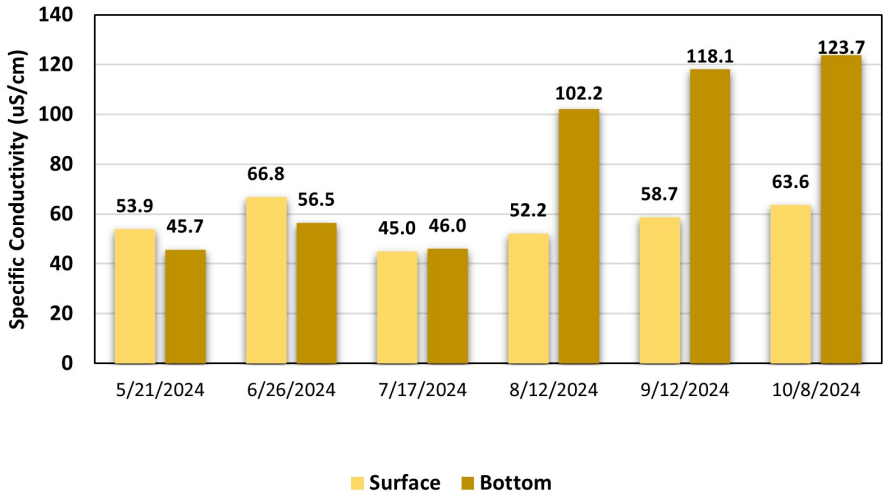
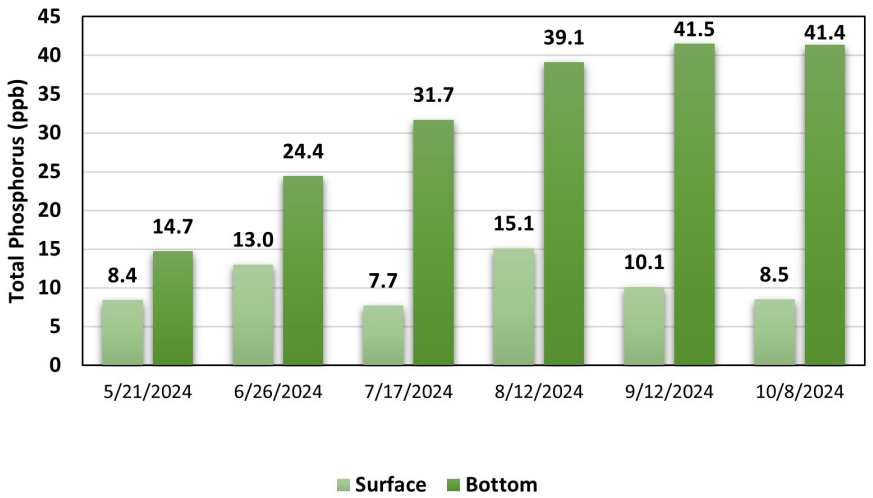


Figure 9. Middle Danforth Pond - Site Deep
Total Phosphorus inter-comparison



Figures 6 and 7. Temperature and dissolved oxygen profiles display the water quality differences in 0.5-meter increments. Notice the decreasing dissolved oxygen concentrations, near the lake bottom, through the season. The dashed vertical red line in Figure 7 displays the dissolved oxygen threshold for the successful growth and reproduction of cold-water fish such as trout and salmon.

Figures 8 and 9. Total phosphorus and specific conductivity comparison between the surface (epilimnion) and bottom water (hypolimnion) zones. Notice the increasing bottom water total phosphorus and specific conductivity concentrations, relative to surface water concentrations, later in the season.

Table 3. Middle Danforth Pond Water Quality Summary by Thermal Zone
(2024 Data: bi-weekly sampling between May 21 and October 8)

Thermal Zone	Average (range) Total Phosphorus (ppb)	Average (range) Specific Conductivity (uS/cm)	Average (range) Total Alkalinity @ pH 5.2 (ppm)	Average (range) pH (standard units)
Surface composite (epilimnion)	10.5 ppb (range: 7.7 – 15.1)	56.7 *u*S/cm (range: 45.0 – 66.8)	9.7 ppm (range: 8.5 – 11.2)	7.3 std units (range: 7.2 – 7.4)
Surface zone (epilimnion)	9.3 ppb (range: 7.4 – 13.1)	80.0 *u*S/cm (range: 46.2 – 129.6)	9.6 ppm (range: 8.4 – 11.0)	7.2 std units (range: 7.1 – 7.4)
Mid-lake zone (metalimnion)	14.2 ppb (range: 8.7 – 18.1)	59.9 *u*S/cm (range: 49.1 – 68.9)	9.6 ppm (range: 7.9 – 11.5)	6.8 std units (range: 6.6 – 7.0)
Deep water zone (hypolimnion)	32.1 ppb (range: 14.7 – 41.5)	82.0 *u*S/cm (range: 45.7 – 123.7)	25.8 ppm (range: 7.2 – 50.4)	6.9 std units (range: 6.7 – 7.1)

- Water quality summary statistics are reported for Middle Danforth Pond. Summary data are included for each of the three thermal zones, as well as the epilimnetic surface composite samples.

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

This highlight report provides a general overview of the current and historical conditions of Middle Danforth 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 (Figures 6, 7 and 9).
- **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, from May through September/October (Figure 8). Lakes that exhibit internal nutrient loading may also exhibit increasing deep water specific conductivity concentrations (a measure of dissolved materials) through the summer months (Figure 9).

Figure 10. Middle Danforth Pond

Freedom, NH
2024 deep sampling location

Aerial Orthophoto Source: NH Granit, 2018 National Agriculture Imagery Program
GPS Coordinates collected by the UNH Center for Freshwater Biology

NH Extension

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