UPPER DANFORTH POND

2024 SAMPLING HIGHLIGHTS

Station North

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 water quality data are reported for the Upper Danforth Pond survey conducted on July 29, 2024.

Blue = Excellent = Oligotrophic

Light Green = Fair = Mesotrophic

Dark Green = Poor = Eutrophic

Gray = No Data

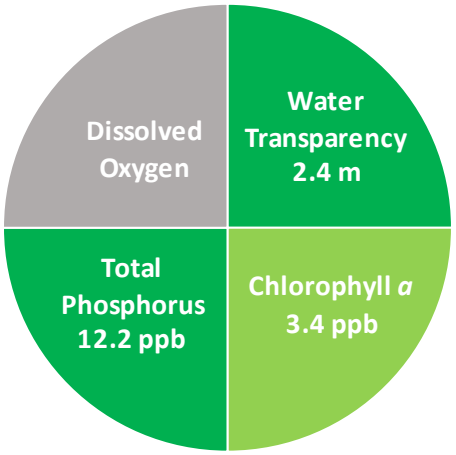


Figure 1. Upper Danforth Pond Water Quality (2024)

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

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Upper Danforth Pond Average (range)	Upper Danforth Pond Classification
Water Clarity (meters)	> 4.0 – 7.0	2.5 - 4.0	< 2.5	**2.4** meters (single value)	**Eutrophic**
Chlorophyll *a* [1] (ppb)	< 3.3	3.3 – 5.0	> 5.0 – 11.0	**3.4** ppb (single value)	**Mesotrophic**
Total Phosphorus [1] (ppb)	< 8.0	8.0 – 12.0	> 12.0 – 28.0	**12.2** ppb (single value)	**Eutrophic**
Dissolved Oxygen (ppm)	> 5.0 – 7.0	2.0 – 5.0	< 2.0	Not Assessed *	Not Assessed

* Upper Danforth Pond does not develop a deep-water layer that is the basis for the dissolved oxygen classification criteria.

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

Parameter	Assessment Criteria					Upper Danforth Pond Average (range)	Upper Danforth Pond Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	**43.7** color units (single value)	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	**10.0** ppm (single value)	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 (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		**58.4** *u*S/cm (single value)	Characteristic of lakes with some human influence

Strategies to stabilize and improve water quality

Implement Best Management Practices (BMPs) within the Upper Danforth Pond watershed to minimize the adverse impacts of polluted runoff and erosion into Upper 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. Upper Danforth Pond - Site North (2024 Seasonal Data)
Secchi Disk Transparency and Chlorophyll *a* Data

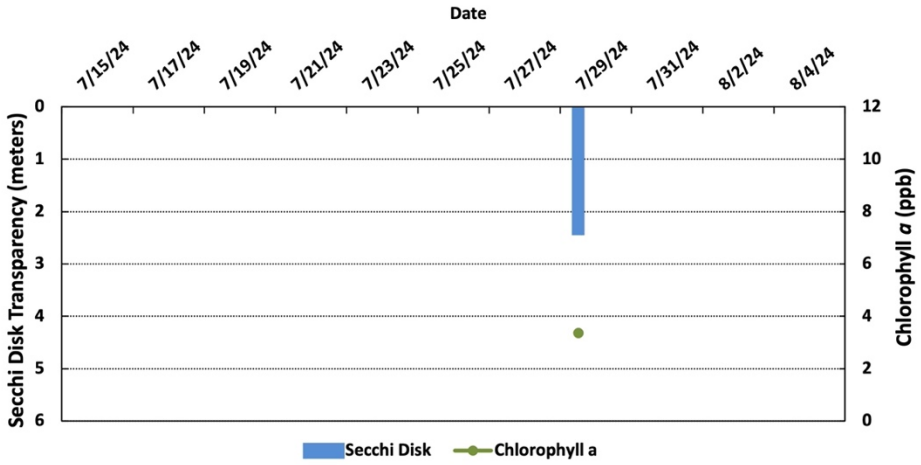


Figure 3. Upper Danforth Pond - Site North (2024 Seasonal Data)
Secchi Disk Transparency and Dissolved Color Data

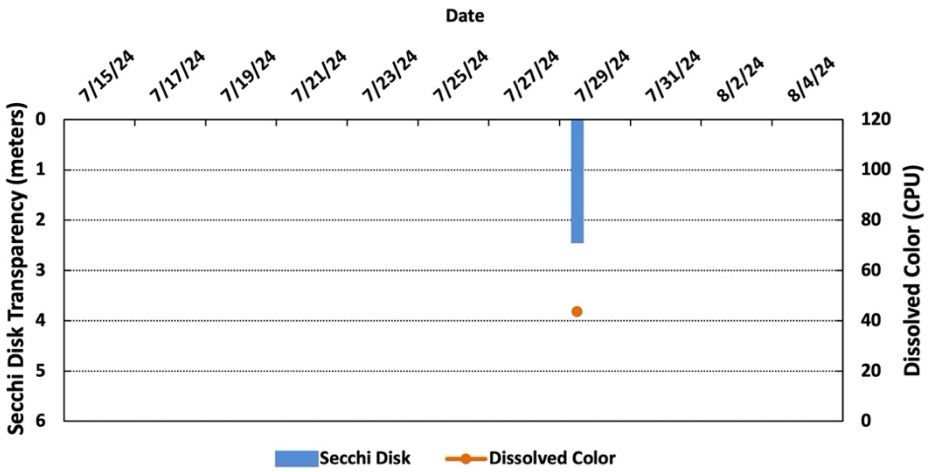


Figure 4. Upper Danforth Pond - North Site (1994-2024)
Long-term Secchi Disk Transparency and Chlorophyll *a* Data

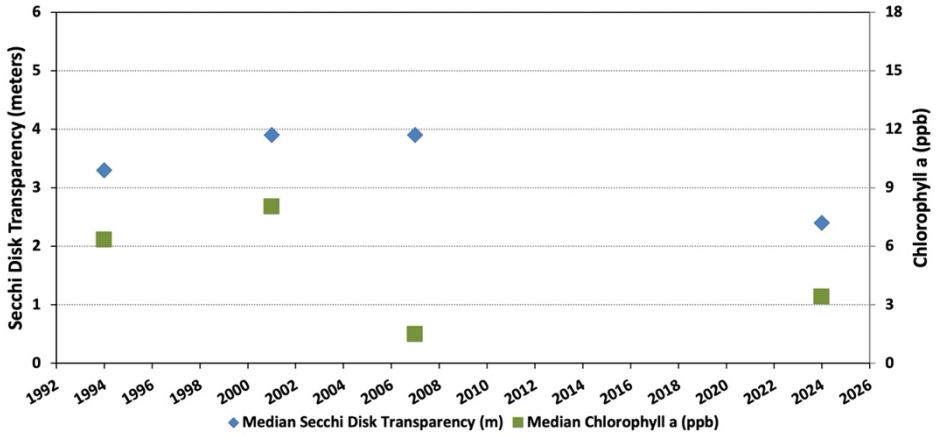
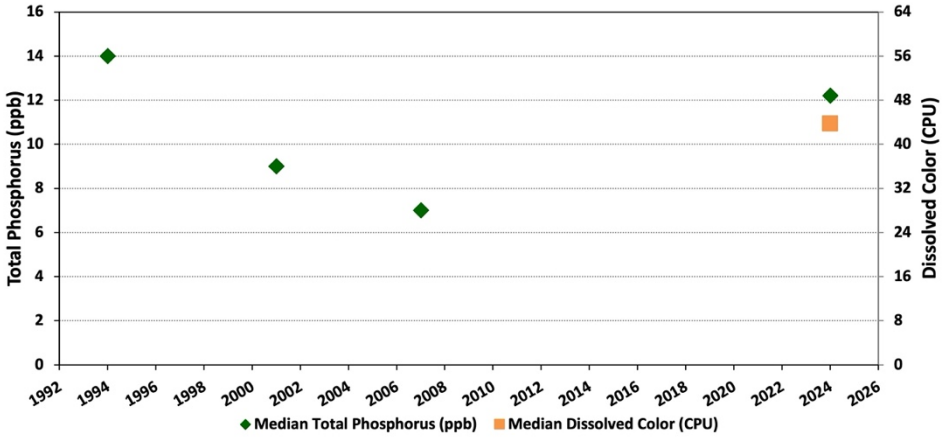


Figure 5. Upper Danforth Pond - North Site (1994-2024)
Long-term Total Phosphorus and Dissolved Color Data



Figures 2 and 3. Seasonal comparison of Upper 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 Upper Danforth Pond water transparency, chlorophyll *a*, dissolved color, and total phosphorus concentrations measured between 1994 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 Upper Danforth Pond.

Figure 6. Upper Danforth Pond - Site North
Temperature Profiles (July 29, 2024)

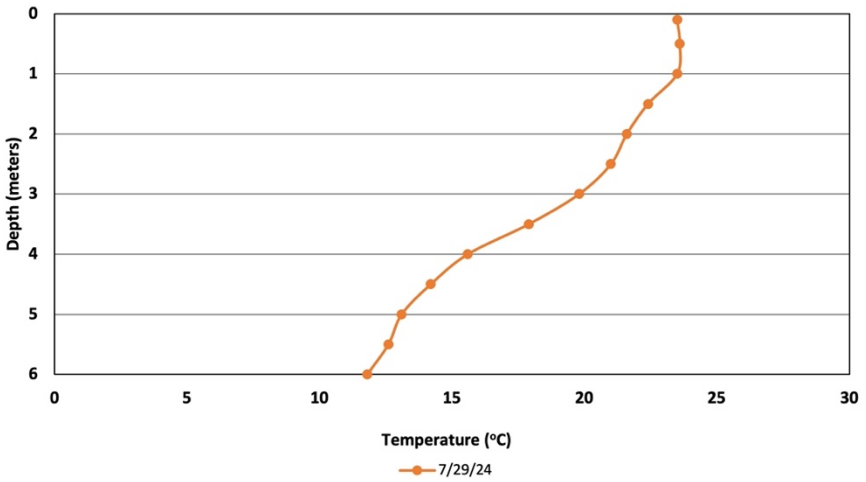


Figure 7. Upper Danforth Pond - Site North
Dissolved Oxygen Profiles (July 29, 2024)

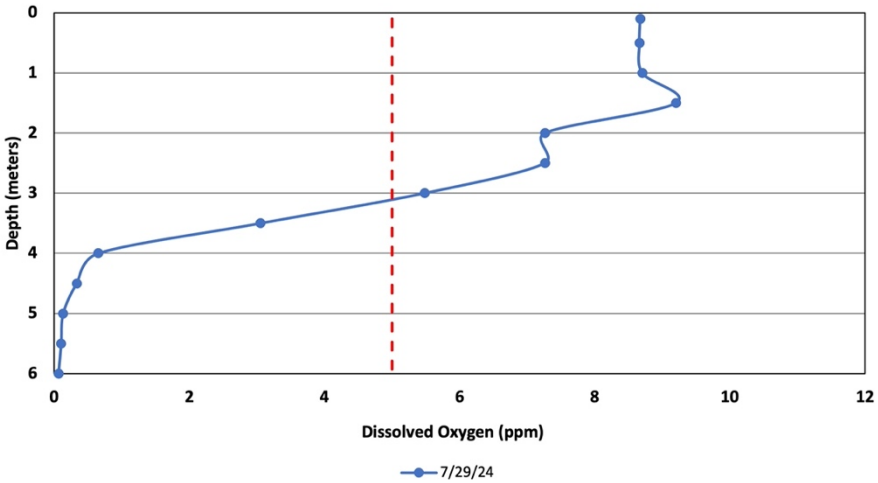


Figure 8. Upper Danforth Pond - Site North
Total Phosphorus inter-comparison

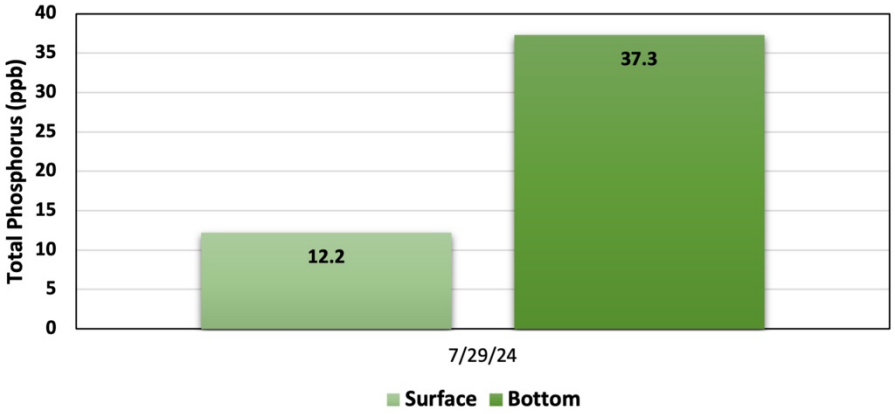
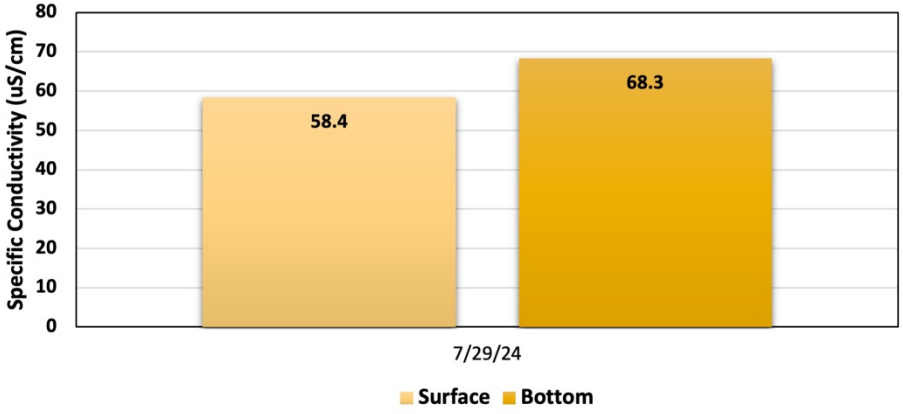


Figure 9. Upper Danforth Pond - Site North
Specific Conductivity inter-comparison



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.

Table 3. Upper Danforth Pond water quality inter-comparison by site
(July 29, 2024, Data reported for the Upper Danforth Pond sampling sites: North and South)

Sampling Site and Thermal Zone	Secchi Disk Transparency (meters)	Chlorophyll a (ppb)	Total Phosphorus (ppb)	Specific Conductivity (uS/cm)	Total Alkalinity @ pH 5.2 (ppm)	pH (standard units)
North Surface Composite (epilimnion)	**2.4 m**	**3.4 ppb**	**12.2 ppb**	**58.4 *uS*/cm**	**10.0 ppm**	**7.3 std units**
South Surface Composite (epilimnion)	**2.8 m**	**4.2 ppb**	**10.3 ppb**	**60.3 *uS*/cm**	**10.4 ppm**	**7.3 std units**
North Surface Zone (epilimnion)	N/A	N/A	**11.6 ppb**	**81.9 *uS*/cm**	**9.6 ppm**	**7.3 std units**
South Surface Zone (epilimnion)	N/A	N/A	**10.1 ppb**	**75.7 *uS*/cm**	**9.6 ppm**	**7.4 std units**
North Mid- Lake Zone (metalimnion)	N/A	N/A	**16.4 ppb**	**59.5 *u*S/cm**	**11.2 ppm**	**6.9 std units**
South Mid- Lake Zone (metalimnion)	N/A	N/A	**14.9 ppb**	**68.2 *u*S/cm**	**14.6 ppm**	**6.9 std units**
North Deep-water Zone (hypolimnion)	N/A	N/A	**37.3 ppb**	**68.3 *u*S/cm**	**16.2 ppm**	**6.7 std units**
South Deep-water Zone (hypolimnion)	N/A	N/A	Not Assessed	Not Assessed	Not Assessed	Not Assessed

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

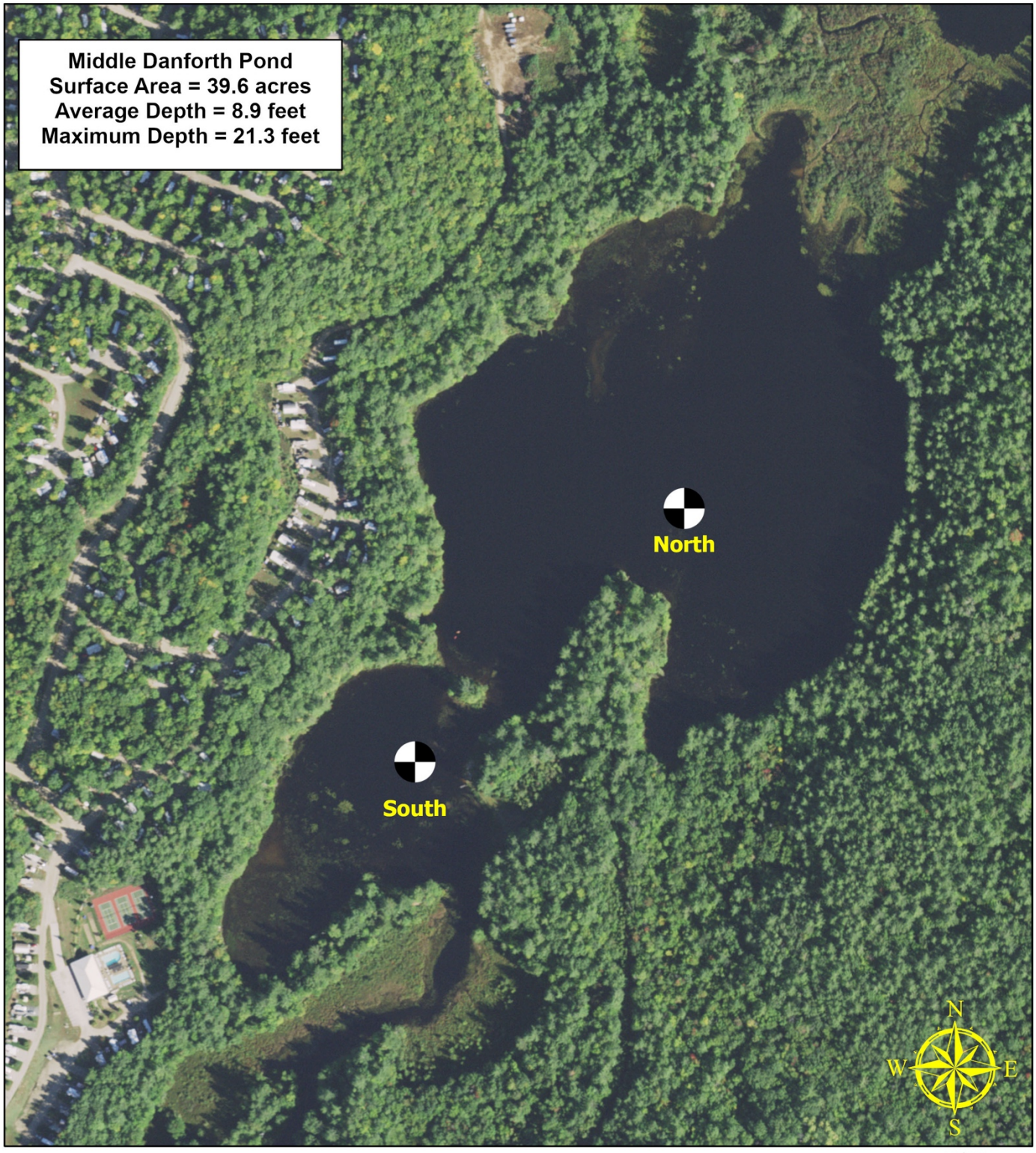
Data Interpretation: Overview of factors to consider when reviewing the Upper Danforth Pond data

This highlight report provides a general overview of the current and historical conditions of Upper 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. Upper Danforth Pond

Freedom, NH
2024 deep sampling location



Aerial Orthophoto Source: NH Granit, 2021 National Agriculture Imagery Program
GPS Coordinates collected by the UNH Center for Freshwater Biology

NH Extension

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