



VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS

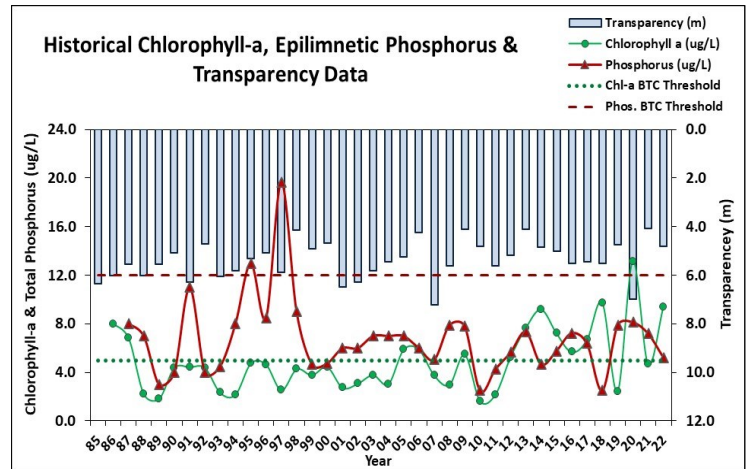
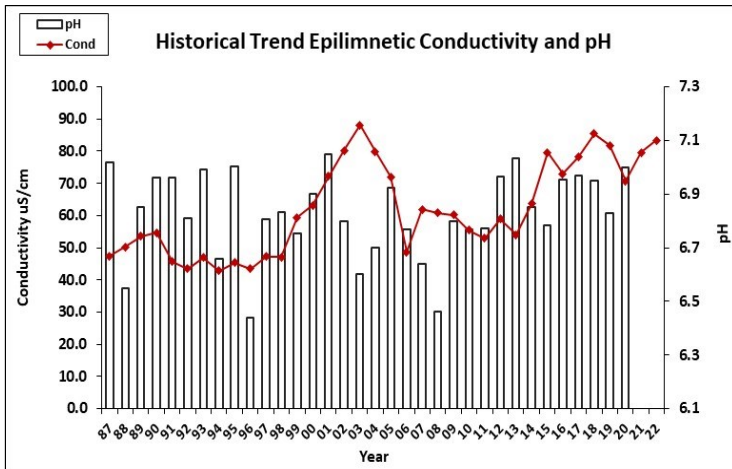
LAKE WINONA, NEW HAMPTON

2022 DATA SUMMARY

RECOMMENDED ACTIONS: Great job sampling in 2022! Algal growth (chlorophyll-a) has significantly increased in the lake, particularly since 2012 when levels have generally remained above the threshold for mesotrophic lakes. In contrast with record summer rainfall amounts in 2021 that helped to flush nutrients out of the system, drought conditions in 2022 likely resulted in nutrients being retained in the lake and in the elevated algal growth in August. Due to the history of cyanobacteria surface scums, keep an eye on the lake for any unusual signs of algal/cyanobacteria growth and [report to NHDES' Harmful Algal Bloom Program](#). Phosphorus levels have significantly increased in the Hypolimnion suggesting an organic layer on the lake bottom that depletes dissolved oxygen resulting in release of phosphorus bound in lake sediments. This phosphorus is readily available for uptake by algae/cyanobacteria and highlights the importance of minimizing stormwater runoff, erosion, sedimentation and deposition of organic material to the lake from the surrounding watershed. Encourage shoreline property owners to maintain a good vegetative buffer to help reduce stormwater runoff to the lake and minimize shoreline erosion from wave action. NHDES' [NH Homeowner's Guide to Stormwater Management](#) and UNH Cooperative Extension's [Landscaping at the Water's Edge](#) are good resources. Lake conductivity levels have increased and likely being driven by road salt usage on local roadways particularly in the sub-watersheds of Hawkins Pond Inlet and Chutes Cove. Encourage local winter maintenance companies to obtain [Green SnowPro Certification](#) to help address increasing conductivity/chloride levels. Keep up the great work!

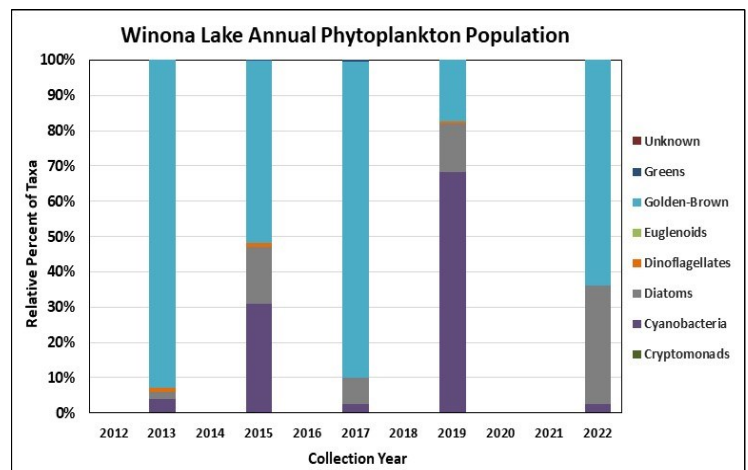
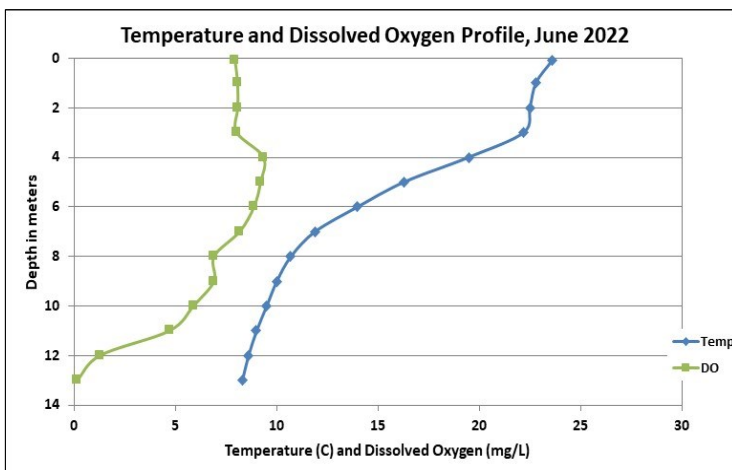
HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Parameter	Trend
Conductivity	Worsening	Chlorophyll-a	Worsening
pH (epilimnion)	Stable	Transparency	Stable
		Phosphorus (epilimnion)	Stable



DISSOLVED OXYGEN AND PHYTOPLANKTON

(Note: Information may not be collected annually)





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OBSERVATIONS (Refer to Table 1 and Historical Deep Spot Data Graphics)

- ◆ **CHLOROPHYLL-A:** Chlorophyll level was within a low range in June and increased to an elevated level in August indicative of an algal/cyanobacteria bloom. Average chlorophyll level increased sharply from 2021 and was greater than the state median and the threshold for mesotrophic lakes. Historical trend analysis indicates significantly increasing (worsening) chlorophyll levels since monitoring began.
- ◆ **CONDUCTIVITY/CHLORIDE:** Epilimnetic (upper water layer), Metalimnetic (middle water layer), Hypolimnetic (lower water layer), Heights Brook Inlet, North Inlet, and Outlet conductivity and chloride levels were slightly greater than the state medians, yet not above a level of concern. However, historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity levels since monitoring began. York Brook conductivity and chloride levels were very low and less than the state medians. Chutes Cove and Hawkins Pond Inlet conductivity and chloride levels were elevated and much greater than the state medians, however chloride levels did not exceed the state chronic chloride standard.
- ◆ **COLOR:** Apparent color measured in the epilimnion indicates the water was clear with little to no tea, or brown, coloring.
- ◆ **E. COLI:** Chutes cove, Heights Brook Inlet, North Inlet, Outlet, and York Brook E. coli levels were within a low range and less than the state standard of 406 cts/100 mL for surface waters. Hawkins Pond Inlet E. coli levels approached the state standard in June but did not exceed it and E. coli levels decreased to a lower range in August.
- ◆ **TOTAL PHOSPHORUS:** Epilimnetic phosphorus level was within a low range in June and decreased in August. Average epilimnetic phosphorus level decreased from 2021 and was less than the state median and the threshold for mesotrophic lakes. Historical trend analysis indicates stable, yet variable, epilimnetic phosphorus levels since monitoring began. Metalimnetic phosphorus level was slightly elevated in June and increased in August when algal growth was elevated. Hypolimnetic phosphorus level was low in June and increased to an elevated level in August likely due to release of phosphorus from bottom sediments under anoxic (no dissolved oxygen) conditions. Chutes Cove and Hawkins Pond Inlet phosphorus levels were elevated in June following a storm event and during low flow conditions, and the turbidity of the samples was also slightly elevated. Heights Brook Inlet phosphorus level was slightly elevated. North Inlet, Outlet and York Brook phosphorus level were within a low range.
- ◆ **TRANSPARENCY:** Transparency measured with (VS) and without (NVS) the viewscope was slightly below average (worse) in June and then increased (improved) to an average/above average range in August. Average NVS transparency increased (improved) from 2021 and was higher (better) than the state median. Historical trend analysis indicates relatively stable NVS transparency since monitoring began.
- ◆ **TURBIDITY:** Epilimnetic and Metalimnetic turbidity levels fluctuated within a low to average range for those stations. Hypolimnetic turbidity level was slightly elevated in August likely due formation and accumulation of organic compounds under anoxic conditions. Chutes Cove and Hawkins Pond Inlet turbidity levels were slightly elevated in June following a storm event and during low flow conditions. Heights Brook Inlet, North Inlet, Outlet, and York Brook turbidity levels were within a low range.
- ◆ **PH:** Epilimnetic pH data were invalidated due to a laboratory instrument error and we apologize for the inconvenience. Metalimnetic, Chutes Cove, Hawkins Pond Inlet, North Inlet, Outlet, and York Brook pH levels were within the desirable range 6.5-8.0 units. Hypolimnetic and Heights Brook Inlet pH levels were slightly acidic. Historical trend analysis indicates relatively stable epilimnetic pH levels since monitoring began.

Station Name	Table 1. 2022 Average Water Quality Data for LAKE WINONA - CENTER HARBOR										
	Alk. (mg/L)	Chlor-a (ug/L)	Chloride (mg/L)	Color (pcu)	Cond. (us/cm)	E. coli (mpn/100mL)	Total P (ug/L)	Trans. (m)		Turb. (ntu)	pH
								NVS	VS		
Epilimnion	7.1	9.40	18	15	83.4		5	4.80	5.75	0.38	
Metalimnion					79.8		14			0.90	6.78
Hypolimnion					81.7		13			1.34	6.33
Chutes Cove			63		196.0	43	60			1.62	6.58
Hawkins Pond Inlet			35		152.5	243	21			2.18	6.90
Heights Brook Inlet			14		57.2	17	16			0.74	6.12
North Inlet			24		85.9	23	11			0.73	7.11
Outlet			19		83.6	19	8			0.41	6.92
York Brook			3		26.4	1	8			0.08	6.66

NH Median Values

Median values generated from historic lake monitoring data.

Alkalinity: 4.5 mg/L **Chlorophyll-a:** 4.39 ug/L
Conductivity: 42.3 uS/cm **Chloride:** 5 mg/L
Total Phosphorus: 11 ug/L **Transparency:** 3.3 m
pH: 6.6

NH Water Quality Standards

Numeric criteria for specific parameters. Water quality violation if thresholds exceeded.

Chloride: > 230 mg/L (chronic) **Turbidity:** > 10 NTU above natural
E. coli: > 88 cts/100 mL (beach)
E. coli: > 406 cts/100 mL (surface waters)
pH: between 6.5-8.0 (unless naturally occurring)