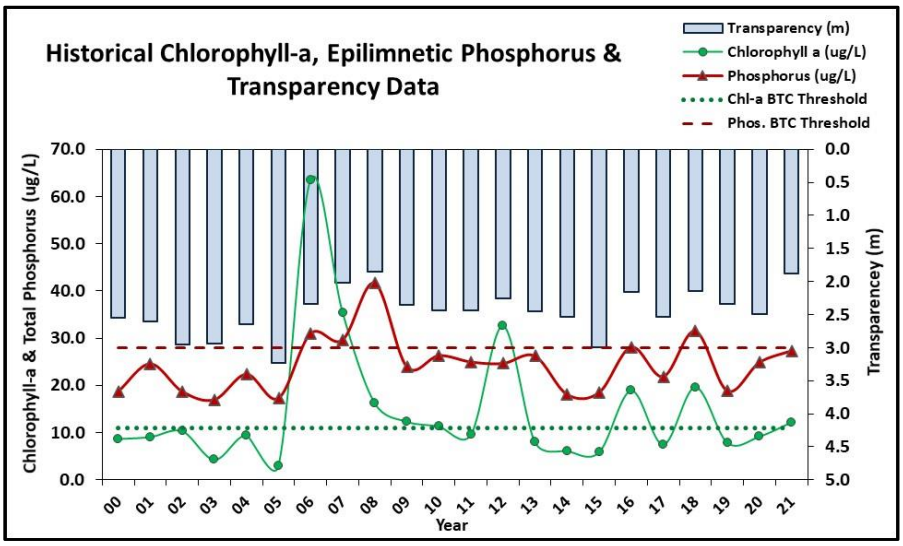
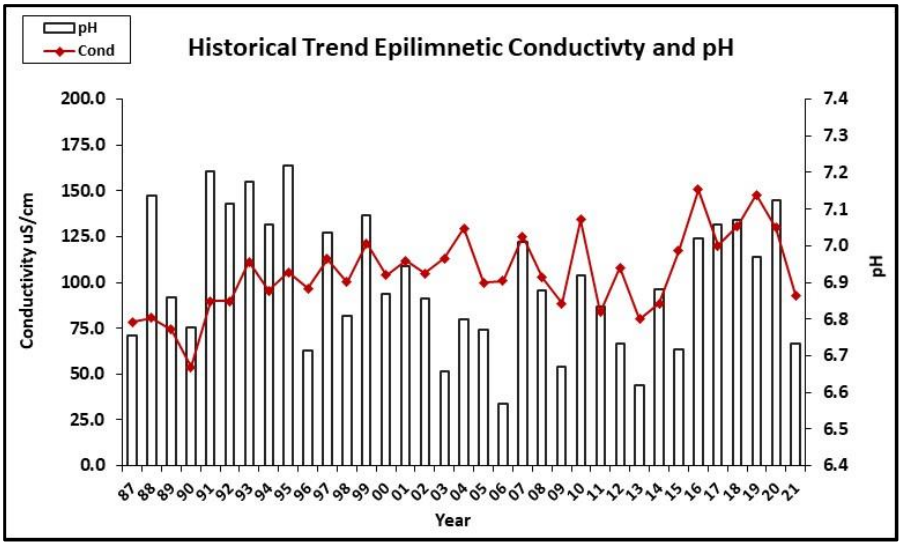
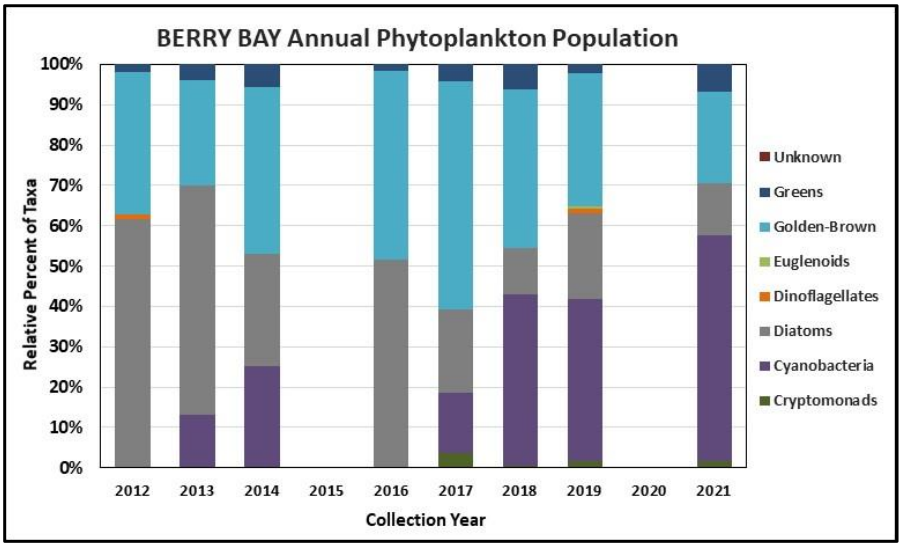
HOW TO READ YOUR VLAP REPORT

WATER QUALITY TREND ANALYSIS: Understanding how lake water quality has changed over time can identify potential problems and help guide watershed management activities. Statistical analyses are conducted on various parameters where ten or more consecutive years of data are available. Specifically, linear regression analyses are utilized to determine if the annual mean value of a parameter has changed significantly, increased or decreased, over time. A parameter has significantly changed if the significance value is less than 0.05, meaning there is 95% confidence that the values have increased or decreased. If there is not a significant change, then we look at the coefficient of variation to determine how stable or variable are the data. The graphics depict the average annual value for chlorophyll-a, transparency, and Epilimnetic total phosphorus, pH and conductivity. A significant increase in chlorophyll-a, total phosphorus and conductivity means that data are degrading or worsening over time; while a significant decrease means the data are improving over time. The opposite holds true for pH and transparency; a significant increase means the data are improving, while a significant decrease means the data are degrading or worsening. Total phosphorus and chlorophyll data are compared with the threshold associated with the lake's best trophic classification (BTC). Values above the thresholds are generally considered poor, while values below the thresholds are considered good (see page 1 for parameter thresholds).



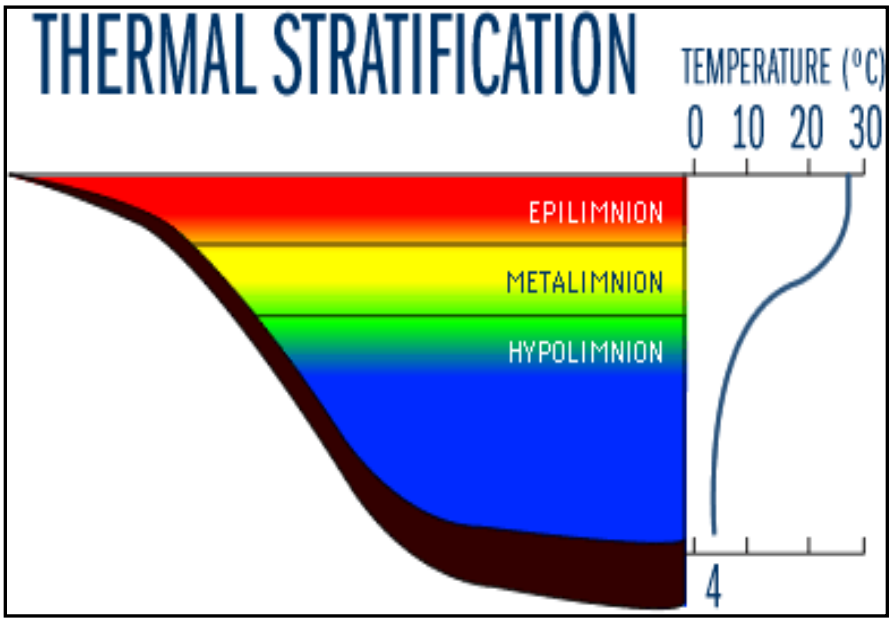


PHYTOPLANKTON: Microscopic plants, or algae, form the basis of the lake's food chain. They need sunlight and nutrients to grow and are typically found in the warmer Epilimnetic and Metalimnetic waters. The type of phytoplankton present in a lake can be used as an indicator of general lake quality and shifts in the dominant algal population over time can be an early warning to shifts in the aquatic ecosystem. Diatoms and golden-brown algae are typically found in the spring and fall, while green algae and cyanobacteria are more common in mid to late summer. An abundance or shift to cyanobacteria dominance over time may indicate excessive phosphorus or that the lake ecology is out of balance. Diatoms and golden-brown algae are typical of NH's less productive lakes. ***Note: Phytoplankton graphics are not included in all lake reports.***



HOW TO READ YOUR VLAP REPORT

DISSOLVED OXYGEN AND TEMPERATURE PROFILE: Depicts the amount of oxygen dissolved in water at various temperatures from the lake's surface to bottom. Dissolved oxygen (DO) in lake water is used by all forms of aquatic life and can help to assess the "health" of the lake ecosystem. NH's lakes typically mix twice annually; spring and fall. Spring turnover of lake water occurs after ice out as warmer air temperatures heat up surface waters. Eventually, the lake becomes thermally stratified with a layer of warm surface water overlying layers of dense cold water. Eventually three distinct layers form called the Epilimnion, Metalimnion, and Hypolimnion, and waters in these layers do not mix freely during summer months. Layers can be determined by looking at the DO/Temperature profile and graphic. Typically, DO is greater in the epilimnion due to wind and wave action mixing atmospheric oxygen into surface waters, as well as algal growth producing oxygen as a by-product of photosynthesis. As you move into the Metalimnion and Hypolimnion, DO can decrease to low levels as these layers do not get re-oxygenated and microbial activity utilizes DO to break down organic matter in bottom sediments. When fall arrives and colder air temperatures cool surface waters, fall turnover occurs, mixing the thermal layers until they are a uniform temperature and DO levels recover at deeper depths. Understanding DO and temperature patterns is important to lake management. These patterns reflect and influence lake productivity, physical properties, phosphorus cycling, and fish and aquatic animal populations. ***Note: Dissolved oxygen and temperature profiles are not included in all lake reports.***



OBSERVATIONS AND RECOMMENDATIONS SECTION

Chlorophyll-a: A photosynthetic pigment found in plants, including algae, and measured to estimate amount of algal growth in a lake system. Elevated chl-a levels indicate excessive algal growth typically caused by too many nutrients (phosphorus).

Conductivity/Chloride: Conductivity measures the ability of water to carry an electrical current. It is determined by the number of ions and minerals present. Chloride ion is naturally occurring in seawater, but less so in freshwaters. NH's soft water has naturally low conductivity and chloride values. Elevated conductivity and chloride may indicate pollution from such sources as road salting, septic systems, wastewater treatment plants, or agriculture runoff.

Color: A visual measure of the color of water. This color is generally caused by decaying organic matter or by naturally occurring metals in the soils, such as iron and manganese. A highly colored lake generally has extensive wetlands along the shore or within the watershed, and often a mucky bottom, conditions often associated with eutrophic waters.

E. coli: *E. coli* is a natural component of the large intestines of humans and other warm-blooded animals. *E. coli* is used as an indicator organism for bacteriological monitoring because it is easily cultured and its presence in the water in defined amounts indicates that fecal matter MAY be present.

Total Phosphorus: Total phosphorus is a measure of all the phosphorus forms present in the water, including both inorganic and organic forms. In freshwater, it is the limiting nutrient that determines the amount of algal growth that can occur. Too much phosphorus can lead to excessive algal and cyanobacteria populations.

Transparency: Transparency, a measure of water clarity, is affected by the amount of algae, color, and particulate matter within a lake. It is measured using a 20 cm black and white Secchi disk.

Turbidity: Turbidity in the water is caused by suspended matter (such as clay, silt, and algae) that cause light to be scattered and absorbed, not transmitted in straight lines through water.

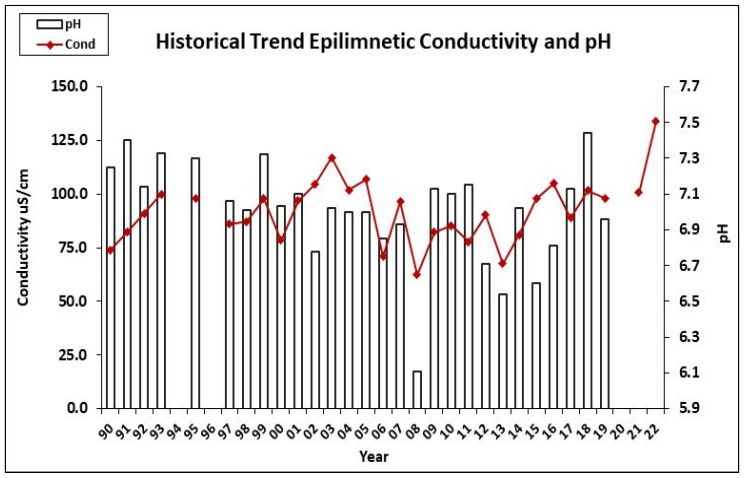
pH: pH is a measure of the hydrogen ions in the water or, in general terms, the acidity. New Hampshire lakes historically have slightly acidic pH levels due to acid rain and granite bedrock lacking in minerals that counteract inputs of the acid rain. Lake pH is important to the survival and reproduction of fish and other aquatic life.

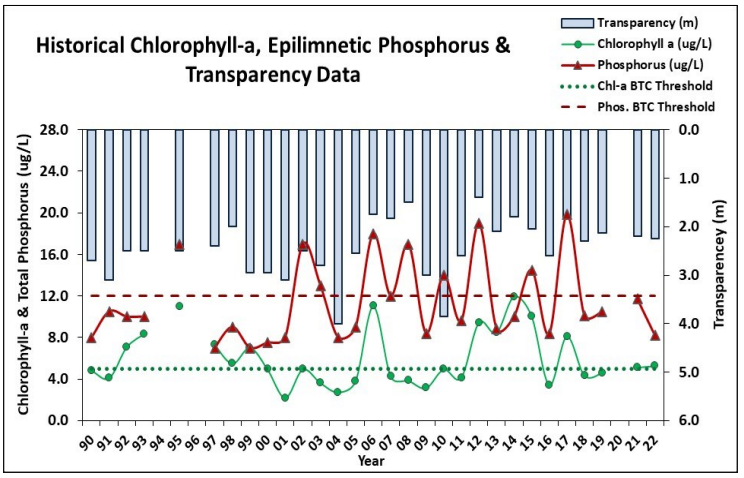
Volunteer Lake Assessment Program Individual Lake Reports
South (Upper) Mountain Lake, Haverhill
2022 Data Summary

Recommended Actions: Great job sampling in 2022! Lake water quality was generally representative of mesotrophic, or average, conditions. Epilimnetic nutrient (phosphorus) levels and algal growth (chlorophyll) remained within the thresholds for mesotrophic lakes however have fluctuated above the thresholds historically. Increase monitoring frequency to once per month, typically June, July, and August, to better assess monthly and annual variations in water quality over time. Water clarity (transparency) remains below average and may be a result of water color becoming darker, or more tea colored, over time due to the increased frequency and intensity of storm events and flushing of systems rich in dissolved organic acids. Continue monitoring water color to better evaluate the relationship with water clarity. Consider development of a watershed management plan to help identify and quantify pollutant sources and loading to the lakes, and make recommendations on ways to reduce nutrient loads. For more information contact the NHDES Watershed Assistance Section. Encourage lake front property owners to be certified LakeSmart through NH LAKES' lake-friendly living program. Keep up the good work!

Historical Water Quality Trend Analysis

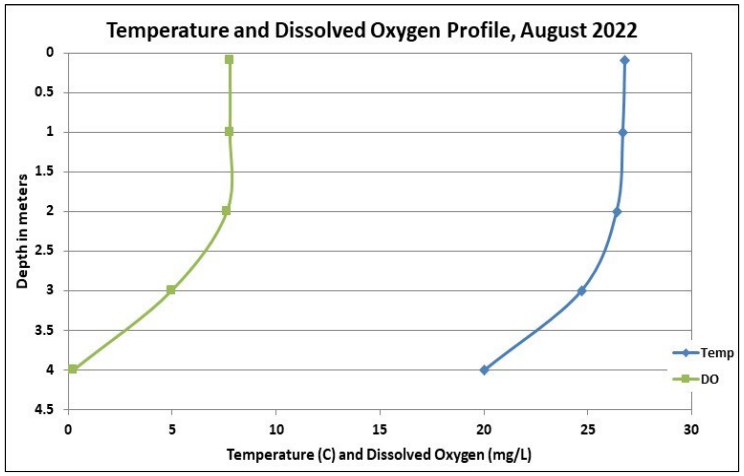
Parameter	Trend	Parameter	Trend
Conductivity	Stable	**Chlorophyll-a**	Stable
pH (epilimnion)	Stable	**Transparency**	Stable
		Phosphorus (epilimnion)	Stable

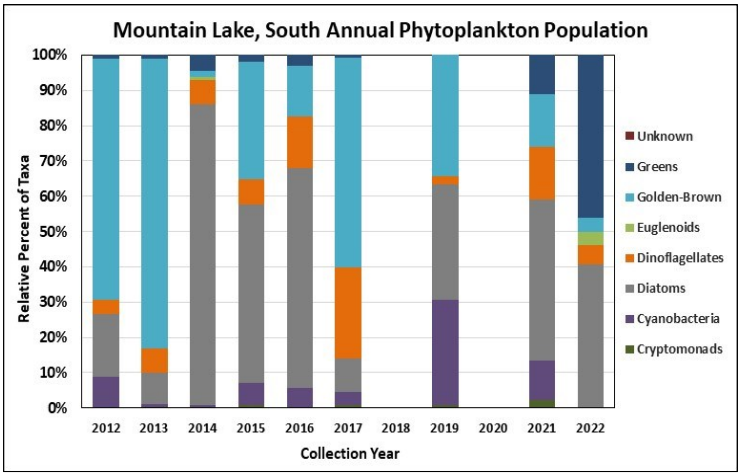




Dissolved Oxygen and Phytoplankton

(Note: Information may not be collected annually)





Volunteer Lake Assessment Program Individual Lake Reports
South (upper) Mountain Lake, Haverhill
2022 Data Summary

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

- **Chlorophyll-a:** Chlorophyll level was within a low range in August, was slightly greater than the state median, and was approximately equal to the threshold for mesotrophic lakes. Historical trend analysis indicates stable, yet variable, chlorophyll levels since monitoring began.
- **Conductivity/Chloride:** Epilimnetic (upper water layer), Hypolimnetic (lower water layer), Cove, Monteau Inlet, and Outlet conductivity levels remained slightly elevated and greater than the state median. Epilimnetic, Cove and Outlet chloride levels were slightly greater than the state median, yet much less than the state chronic chloride standard. Historical trend analysis indicates relatively stable epilimnetic conductivity levels since monitoring began.
- **Color:** Apparent color measured in the epilimnion indicates the water was lightly tea colored, or light brown, in August.
- **E. coli:** Beach E. coli level was very low and much less than the state standard for public beaches.
- **Total Phosphorus:** Epilimnetic phosphorus level was within a low range, 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. Hypolimnetic, Cove, Monteau Inlet, and Outlet phosphorus levels were within a low range for those stations.
- **Transparency:** Transparency measured without the viewscope (NVS) was below average (worse) in August, remained stable with 2021, and was lower (worse) than the state median. Historical trend analysis indicates stable, yet variable, NVS transparency since monitoring began. Viewscope (VS) transparency was slightly higher (better) than NVS transparency and was within an average range.
- **Turbidity:** Epilimnetic, Hypolimnetic, Cove, and Outlet turbidity levels were within a low to average range for those stations. Monteau Inlet turbidity level was slightly elevated.
- **pH:** Epilimnetic pH data were invalided for 2021 and 2022 due to a laboratory instrument error and we apologize for the inconvenience. Hypolimnetic, Cove, Monteau Inlet, and Outlet pH levels were within the desirable range 6.5-8.0 units.

Station Name	Table 1. 2022 Average Water Quality Data for UPPER MOUNTAIN LAKE - HAVERHILL										
	Alk. (mg/L)	Chlor-a (ug/L)	Chloride (mg/L)	Color (pcu)	Cond. (us/cm)	E. coli (mpn/100 mL)	Total P (ug/L)	Trans. (m)		Turb. (ntu)	pH
								NVS	VS		
Epilimnion	18.2	5.28	23	40	134.1		8	2.25	2.75	1.26	
Hypolimnion					133.2		8			1.25	7.22
Beach						3					
Cove			24		133.7		8			1.11	7.29
Monteau Inlet					142.0		11			1.99	7.53
Outlet			23		135.1		9			1.19	7.33

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.

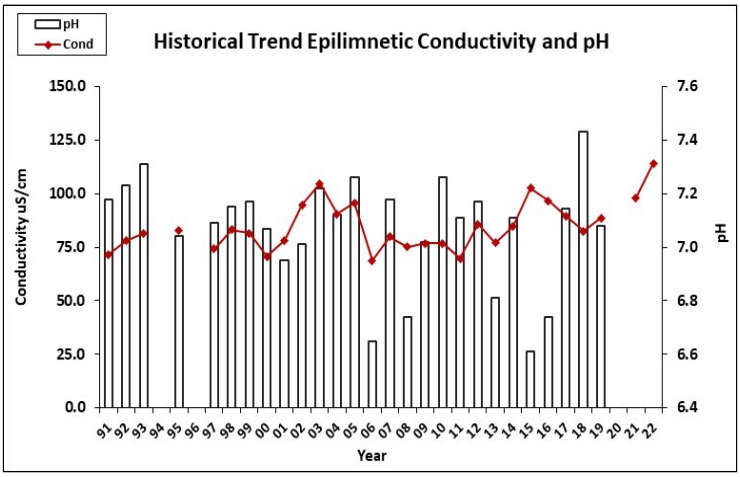
Chloride: > 230 mg/L (chronic) **Turbidity:** > 10 NTU above natural
E. coli: > 88 cts/100 mL (beach)
E. coli: > 406 cts/100 mL (surface waters)
pH: between 6.5-8.0 (unless naturally occurring)

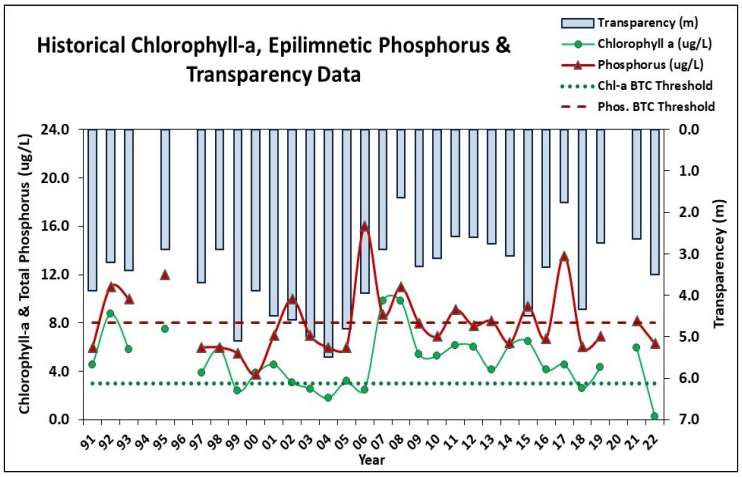
Volunteer Lake Assessment Program Individual Lake Reports
North (Lower) Mountain Lake, Haverhill
2022 Data Summary

Recommended Actions: Great job sampling in 2022! In contrast with record summer rainfall in 2021, drought conditions in 2022 resulted in lower nutrient (phosphorus) levels and lower levels of algal growth (chlorophyll) which led to improved lake clarity (transparency). This highlights the importance of managing stormwater runoff within the watershed due to the increased intensity of significant storm events. Consider development of a watershed management plan to help identify and quantify pollutant sources and loading to the lakes, and help make recommendations on ways to reduce nutrient loads. For more information contact the NHDES Watershed Assistance Section. Encourage lake front property owners to be certified LakeSmart through NH LAKES' lake-friendly living program. Increase monitoring frequency to once per month, typically June, July and August, to better assess monthly and annual variations in water quality over time. Keep up the good work!

Historical Water Quality Trend Analysis

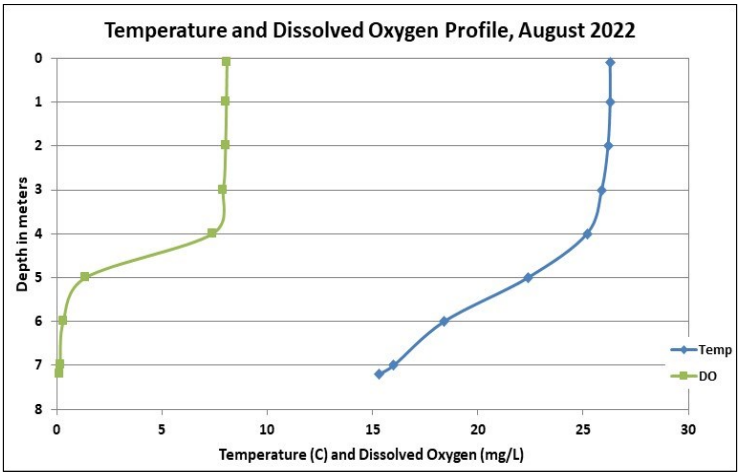
Parameter	Trend	Parameter	Trend
Conductivity	Worsening	**Chlorophyll-a**	Stable
pH (epilimnion)	Stable	**Transparency**	Worsening
		Phosphorus (epilimnion)	Stable

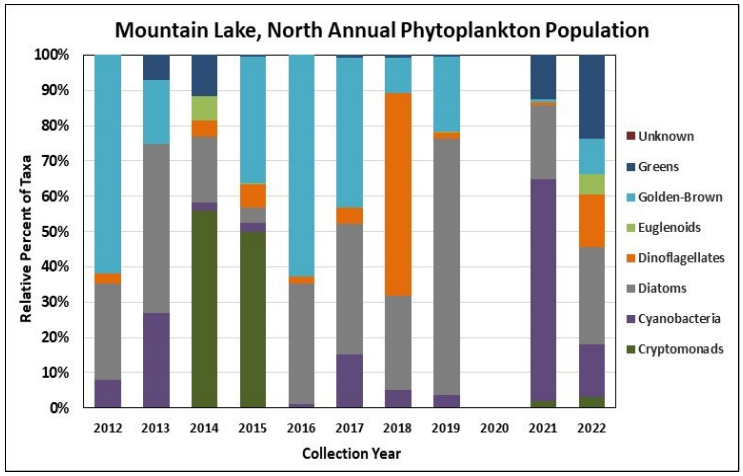




Dissolved Oxygen and Phytoplankton

(Note: Information may not be collected annually)





Volunteer Lake Assessment Program Individual Lake Reports
North (Lower) Mountain Lake, Haverhill
2022 Data Summary

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

- **Chlorophyll-a:** Chlorophyll level was very low in August, decreased greatly from 2021, was much less than the state median and the threshold for oligotrophic lakes, and was the lowest measured since monitoring began. Historical trend analysis indicates stable, yet variable, chlorophyll levels since monitoring began.
- **Conductivity/Chloride:** Epilimnetic (upper water layer), Hypolimnetic (lower water layer) and Outlet conductivity levels remained slightly elevated and greater than the state median. Epilimnetic chloride level was greater than the state median yet much less than the state chronic chloride standard. Historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity levels since monitoring began.
- **Color:** Apparent color measured in the epilimnion indicates the water was lightly tea colored, or light brown, in August.
- **E. coli:** Beach E. coli level was very low and much less than the state standard for public beaches.
- **Total Phosphorus:** Epilimnetic, Hypolimnetic and Outlet phosphorus levels were within a low range. Epilimnetic phosphorus level decreased from 2021 and was less than the state median and the threshold for oligotrophic lakes. Historical trend analysis indicates stable, yet variable, epilimnetic phosphorus levels since monitoring began.
- **Transparency:** Transparency measured without the viewscope (NVS) was high (good) in August likely due to low levels of algal growth. NVS transparency increased (improved) from 2021 and was slightly higher (better) than the state median. Historical trend analysis indicates significantly decreasing (worsening) NVS transparency since monitoring began. Viewscope (VS) transparency was much higher (better) than NVS transparency and a better measure of actual conditions.
- **Turbidity:** Epilimnetic, Hypolimnetic and Outlet turbidity levels were within a low range for those stations.
- **pH:** Epilimnetic pH data was invalidated for 2021 and 2022 due to a laboratory instrument error and we apologize for this inconvenience. Hypolimnetic and Outlet pH levels were within the desirable range 6.5-8.0 units.

Station Name	Table 1. 2022 Average Water Quality Data for LOWER MOUNTAIN LAKE - HAVERHILL										
	Alk. (mg/L)	Chlor-a (ug/L)	Chloride (mg/L)	Color (pcu)	Cond. (us/cm)	E. coli (mpn/100 mL)	Total P (ug/L)	Trans. (m)		Turb. (ntu)	pH
								NVS	VS		
Epilimnion	14	0.25	19	30	114.1		6	3.50	4.22	0.89	
Hypolimnion					116.3		7			0.86	7.08
Beach						9					
Outlet					113.2		8			0.74	7.32

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)