Hamilton County Soil and Water Conservation District
2019 Water Quality Monitoring Program

Hamilton County
Soil & Water
Conservation District

Working to manage and promote the wise use of natural resources in Hamilton County since 1965.

Introduction

With great foresight, elected officials recognized the need to protect Hamilton County's vital water resources, and the Board of Supervisors contracted with the Hamilton County Soil and Water Conservation District (District) in 1993 to conduct a comprehensive lake monitoring program. Hamilton County's residents, economy, and ecosystem depend on clean water for drinking, recreation, and flourishing flora and fauna. Decades of consistent lake data collection is essential to the effective analysis of long term trends. Tax payer dollars are saved when a water quality problem is detected and remediated in its early stages.

From June through September, District staff monitor 21 lakes once a month at their deepest point. A YSI multi-probe is lowered at 1 meter increments to the bottom of each lake, collecting pH, conductivity, temperature, turbidity, and dissolved oxygen data. Transparency is measured with a secchi disk. Water samples are collected from the top meter and analyzed for alkalinity, aluminum, calcium, chloride, chlorophyll a, nitrate + nitrite, total phosphorus, and sodium. Dissolved organic carbon (DOC) was added in the 2019 sampling season.

The introduction to this report will offer a brief explanation of each water quality indicator and assessment criteria, adapted from The State of Hamilton County Lakes: A 25 -Year Perspective (Laxson et al., 2019).

The District's Lake Monitoring Program would not be possible without funding from the New York State Environmental Protection Fund, and the Finger Lakes – Lake Ontario Watershed Protection Alliance.

The District is grateful for the steadfast support of the Hamilton County Board of Supervisors, Hamilton County Water Quality Coordinating Committee, the District's Board of Directors, and Paul Smith's College Adirondack Watershed Institute and ALS Environmental - Rochester. We appreciate the hard work and dedication from the numerous individuals and agencies who have contributed to this program, including Candace Ambrosino, Alexandra Bielli, Abigail Bobbette, Alex Chaucer, Del Cook, Leonard Croote, Bryan Decker, Ian Drew, Margery Faville, Hunter Favreau, Laura Flanagan, Kevin Hanley, Dan Kelting, Corey Laxson, Elizabeth Mangle, Kevin McCarthy, Casey Michasiow, Jaime Parslow, Janice Reynolds, Sean Regalado, Caitlin Stewart, Marjorie Remias, Collin Weaver, Elizabeth Yerger, the Adirondack Park Invasive Plant Program, Paul Smith's College Adirondack Watershed Institute, the New York State Department of Environmental Conservation, and the residents of Hamilton County.

Understanding Water Quality Parameters

Trophic Status is the measurement of overall lake productivity and is determined by quantifying the following parameters:

- **Transparency:** The measurement of water clarity and light penetration.
- **Chlorophyll-a:** Chlorophyll-a is a photosynthetic pigment that is found in all freshwater algae and cyanobacteria. Measuring chlorophyll-a allows us to quantify the algal productivity of a lake.
- **Total phosphorus:** An essential, but limiting nutrient in freshwater systems. The addition of extra phosphorus in a lake allows for an increase in production.

Of the 21 lakes monitored, 15 of the study lakes (70%) are classified as mesotrophic, with the remaining lakes classified as oligotrophic.

Table 1. Fixed boundary trophic status determination method used by the NYS Department of Environmental Conservation

Parameter	Oligotrophic	Mesotrophic	Eutrophic
Transparency (m)	>5	2-5	<2
Total phosphorus (µg/L)	<10	10-20	>20
Chlorophyll-a (µg/L)	<2	2-8	>8

Nitrate + Nitrite (NOx): An essential element that can be a limiting factor in lake productivity. A limiting factor is the environmental factor that is of predominant importance in restricting the size of a population. An increase in NOx can indicate human impacts such as wastewater discharge or agricultural runoff.

Calcium is an essential element that plays an important role in lake ecology and many organisms require its presence for the growth of important features such as exoskeleton and shell development. For example, invasive zebra mussels need a range of 12 – 20 mg/L of calcium to support a population.

Aluminum is the most abundant metal in the earth's crust, with high numbers being potentially toxic. The District monitors only total aluminum, limiting the ability to interpret biological impacts.

Assessing Acid Rain Impacts & Acidity

pH is measured to assess the acidity of our freshwater resources.

Table 2. Assessment of Lake Acidification based on pH

Lake Acidity	Assessment
pH < 5.0	Acidic: critically impaired
pH 5.0 – 6.0	Acidic: threatened
pH 6.0 – 6.5	Acidic: acceptable
pH 6.5 – 7.5	Circumneutral: non-impacted
pH > 7.5	Alkaline: non-impacted

Alkalinity is the measurement of a lake's acid neutralizing capability, and is a function of the amount of calcium carbonate in the water.

Table 3. Assessment of sensitivity to acid deposition

Alkalinity (mg/L)	Acid Neutralizing Ability	Acidification Status
0	None	Acidified
0-2	Low	Extremely sensitive
2-10	Moderate	Moderately sensitive
10-25	Adequate	Low sensitivity
>25	High	Not sensitive

Results from the 2019 monitoring season revealed that 10 of the study lakes (48%) were moderately sensitive to the effects of acid rain, 8 study lakes (38%) showed low sensitivity to acid rain, and only 3 study lakes (14%) were classified as being extremely sensitive.

Understanding Road Salt Impacts

Sodium and Chloride have naturally low concentrations in the region; therefore an increase in these concentrations is indicative of road salt application influencing the chemistry of our lakes.

Specific Conductivity is the measurement of how well water can conduct electricity. Pure water is a poor conductor of electricity; therefore an increase in conductivity represents an increase in dissolved ions in the water, and can be indicative of road salt contamination, faulty septic systems or other human impacts.

Table 4. Assessment of road salt influence based on chloride concentrations

Chloride (mg/L)	Road Salt Influence
Less than 1.0	Not significant
1 – 5	Present – low
5 – 20	Moderate
20 – 50	High

During the 2019 monitoring season, we have found that 13 of 21 study lakes are moderately influence by road salt application, with Oxbow Lake's water chemistry showing significant influence of road salt. Of all the study lakes, the 2 lakes with no significant road salt influence were Fawn Lake and Morehouse Lake, which are located in watersheds that lack highways.

Understanding Lake Profile Data

Thermal Stratification is determined by analyzing the lake's profile data. A lake is said to be thermally stratified when it has 3 distinct layers: the epilimnion (top), metalimnion (middle), and hypolimnion (bottom). An area of sharp thermal change (thermocline) exists in the metalimnion which prevents mixing between the top and bottom waters. Isothermal (uniform temperature throughout the water column) conditions can exist during the summer months in some of our more shallow lakes, allowing oxygen and nutrients to fully mix throughout the column.

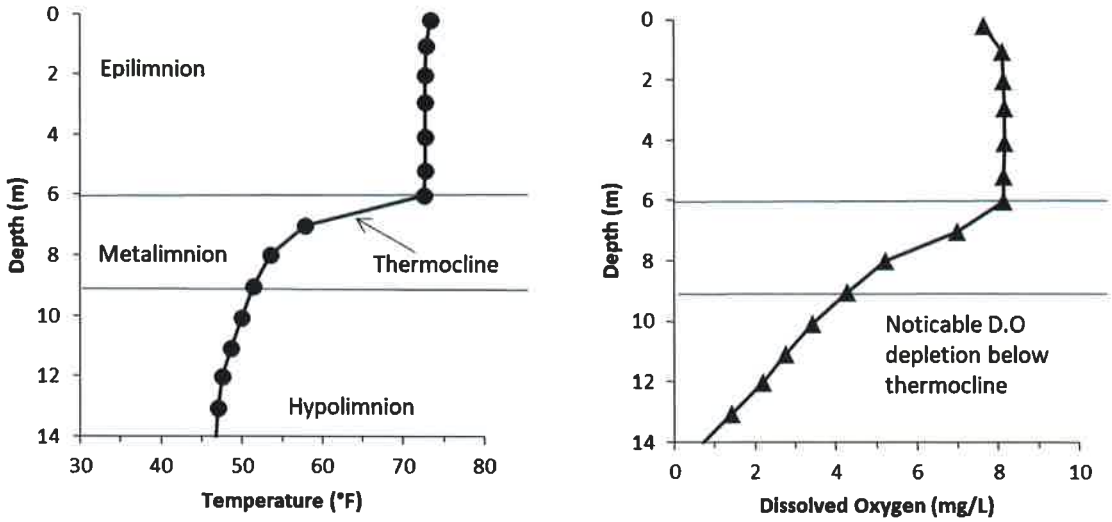


Figure 1. Temperature and dissolved oxygen profile from Lake Eaton (August 2019) showing thermal stratification and dissolved oxygen characteristics

Dissolved Oxygen is essential for healthy freshwater ecosystems. The primary source of oxygen in the water comes from the atmosphere, thus, when a lake is thermally stratified, oxygen cannot be replenished to the bottom waters until turnover occurs. In some cases, significant oxygen depletion occurs, which can result in negative environmental impacts.

Table 5. Dissolved oxygen thresholds for hypoxic and anoxic conditions

Hypoxic Conditions	Anoxic Conditions
Dissolved oxygen < 2.0 mg/L	Dissolved oxygen < 0.5mg/L

Understanding Aquatic Invasive Species

Aquatic Invasive Species (AIS) are introduced beyond the borders of their historic range, reproduce rapidly, and displace native species. Most come from Europe or Asia, and without the ecological checks and balances found on their home turf, cause economic, ecologic, and / or societal harm in our lakes. Three AIS have been confirmed in Hamilton County lakes. Eurasian watermilfoil and variable-leaf milfoil are invasive plants that fill in fish habitat, ensnare motors and fishing lures, interfere with swimming and boating, and devalue shoreline property. Spiny waterflea is an invasive crustacean that eats native zooplankton (an important food source for fish), fouls fishing gear, and prevents fish from being landed.

Out of the 21 monitored lakes in Hamilton County, 11 lakes (52%) have at least one known aquatic invasive species present, with 4 of those lakes hosting spiny waterflea and the other 7 lakes are hosting Eurasian watermilfoil, variable-leaf milfoil, or both.

References

Laxson, C., Croote, L., Stewart, C., Regalado, S., and D. Kelting. (2019). *The State of Hamilton County Lakes: A 25-year Perspective, 1993 – 2017*. New York: Paul Smith's College Adirondack Watershed Institute. Retrieved February 24, 2020 from www.hcswcd.com.

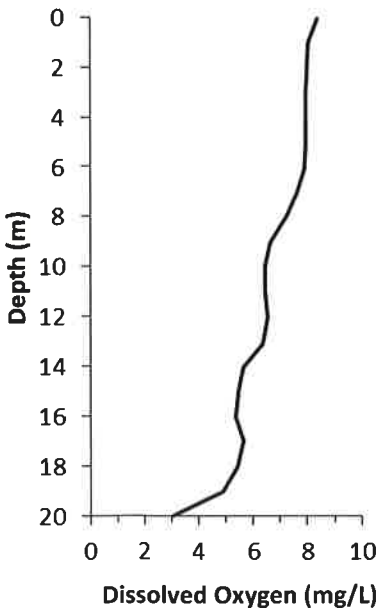
Blue Mountain Lake

Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Oligotrophic	Circumneutral	Moderate sensitivity	Moderate	No known AIS

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	5.1	8.2	6.1	7.1	6.6	No trend
Chlorophyll-a (µg/L)	3.0	1.1	1.2	1.8	1.8	No trend
Total Phosphorus (µg/L)	5.0	5.0	5.0	5.0	5.0	Decreasing
Nitrate + Nitrite (µg/L)	7.9	2.0	2.0	2.0	3.5	No trend
Alkalinity (mg/L $CaCo_3$)	5.6	5.6	6.4	7.0	6.2	Increasing
Lab pH	6.8	6.8	7.0	7.4	7.0	No trend
Sp. Conductance (µs/cm)	89.4	93.4	98.3	99.7	95.2	No trend
Chloride(mg/L)	20.2	20.2	21.2	22.4	21.0	No trend
Sodium (mg/L)	11.9	13.0	13.7	13.9	13.1	No trend
Calcium (mg/L)	3.2	3.2	3.5	3.4	3.3	No trend
Aluminum (µg/L)	40.0	40.0	100.0	100.0	70.0	Increasing

Lake Profile – August 2019



Analysis of the 2019 lake profile data shows:

- Blue Mountain Lake was thermally stratified throughout the sampling season.
- Blue Mountain Lake did not experience any hypoxic or anoxic conditions and remained well oxygenated throughout the sampling season.

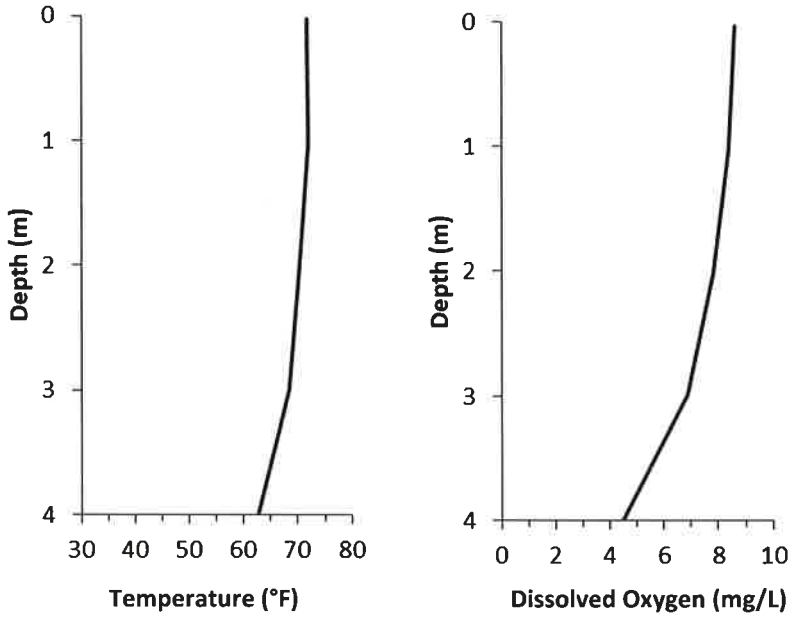
Fifth Lake

Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Low sensitivity	Moderate	Eurasian watermilfoil, variable-leaf milfoil

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	3.6	2.9	3.8	4.1	3.6	Decreasing
Chlorophyll-a (µg/L)	2.4	3.2	3.0	2.7	2.9	No trend
Total Phosphorus (µg/L)	5.0	4.9	6.9	14.3	7.8	Decreasing
Nitrate + Nitrite (µg/L)	111.0	62.2	5.6	34.3	53.3	No trend
Alkalinity (mg/L $CaCo_3$)	10.0	12.4	15.2	15.0	13.2	No trend
Lab pH	6.8	7.0	7.0	6.9	6.9	Increasing
Sp. Conductance (µs/cm)	77.0	96.7	120.3	101.0	98.8	No trend
Chloride(mg/L)	13.2	17.0	21.0	18.2	17.4	No trend
Sodium (mg/L)	8.2	11.6	13.3	11.2	11.1	No trend
Calcium (mg/L)	4.7	5.7	7.1	5.8	5.8	No trend
Aluminum (µg/L)	50.0	30.0	100.0	20.0	50.0	No trend

Lake Profile – August 2019



Analysis of the 2019 lake profile data shows:

- Fifth Lake was thermally stratified, but was approaching isothermal conditions in September.
- Fifth Lake was found to have adequate oxygen for most of the sampling season, with hypoxic conditions being observed in September in the bottom meter of water.

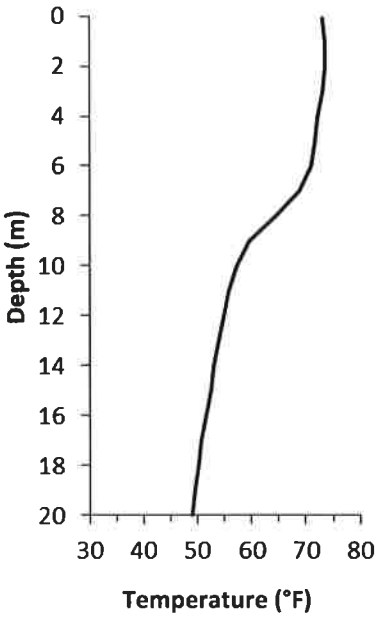
Fourth Lake

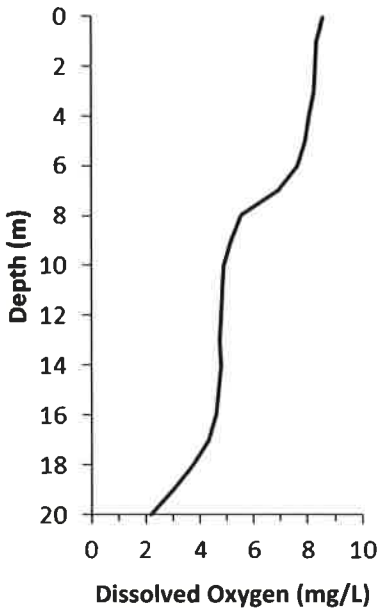
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Low sensitivity	Moderate	Eurasian watermilfoil (eradicated), variable-leaf milfoil

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	5.3	4.6	4.8	5.7	5.1	Decreasing
Chlorophyll-a (µg/L)	2.0	2.4	3.2	2.8	2.6	No trend
Total Phosphorus (µg/L)	4.4	5.0	5.4	6.1	5.2	Decreasing
Nitrate + Nitrite (µg/L)	136.0	70.2	34.5	27.2	67.0	Decreasing
Alkalinity (mg/L $CaCo_3$)	9.6	9.6	10.8	12.0	10.5	Increasing
Lab pH	6.9	7.0	7.2	7.2	7.1	No trend
Sp. Conductance (µs/cm)	70.5	71.0	78.6	79.7	75.0	No trend
Chloride(mg/L)	11.2	11.3	11.8	12.6	11.7	No trend
Sodium (mg/L)	7.0	8.0	8.0	7.9	7.7	No trend
Calcium (mg/L)	4.7	4.6	5.0	5.0	4.8	No trend
Aluminum (µg/L)	40.0	40.0	20.0	30.0	32.5	Increasing

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Fourth Lake remained thermally stratified throughout the sampling season.
- Hypoxic conditions (dissolved oxygen below 2.0 mg/L) noted during September in the hypolimnion.

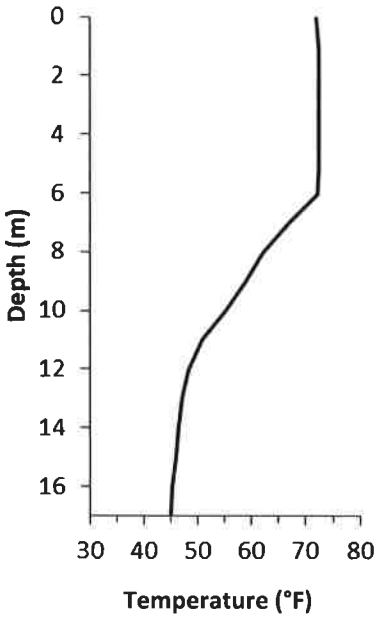
Indian Lake

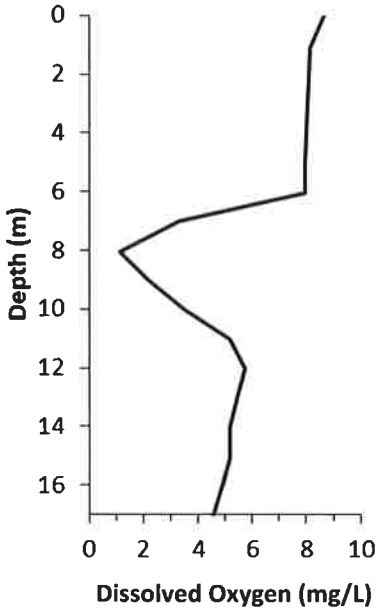
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Moderate sensitivity	Low	Spiny waterflea

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	2.9	3.8	4.0	3.6	3.6	Decreasing
Chlorophyll-a (µg/L)	2.9	3.1	3.4	3.3	3.2	No trend
Total Phosphorus (µg/L)	4.1	5.0	5.4	6.0	5.1	Decreasing
Nitrate + Nitrite (µg/L)	102.0	51.2	2.0	8.4	40.9	Decreasing
Alkalinity (mg/L $CaCo_3$)	2.4	2.4	3.6	4.0	3.1	No trend
Lab pH	6.6	6.7	6.9	7.7	7.0	No trend
Sp. Conductance (µs/cm)	23.5	25.6	27.8	31.1	27.0	No trend
Chloride(mg/L)	3.0	3.4	4.1	3.9	3.6	No trend
Sodium (mg/L)	2.3	2.7	2.9	2.8	2.7	No trend
Calcium (mg/L)	1.6	1.6	1.8	2.0	1.8	No trend
Aluminum (µg/L)	80.0	60.0	30.0	30.0	50.0	Increasing

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Indian Lake was thermally stratified throughout the sampling season.
- Significant oxygen depletion was noted during September, with hypoxic (dissolved oxygen below 2.0 mg/L) and anoxic (dissolved oxygen below 0.5 mg/L) conditions encountered.
- A negative heterograde was noted in the August dissolved oxygen profile at 8 meters, likely caused by a concentration of zooplankton or the decomposition of organic matter.

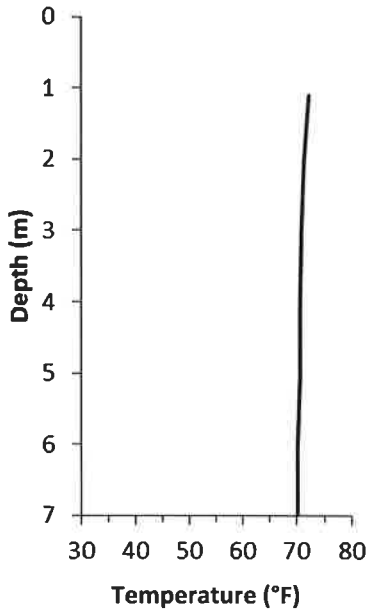
Lake Abanakee

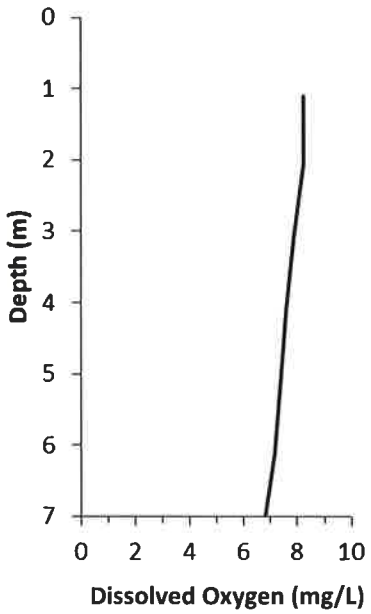
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Moderate sensitivity	Low	No known AIS

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	3.0	2.4	3.6	3.5	3.1	Decreasing
Chlorophyll-a (µg/L)	2.3	3.6	2.9	2.8	2.9	No trend
Total Phosphorus (µg/L)	5.2	6.4	5.9	4.4	5.5	Decreasing
Nitrate + Nitrite (µg/L)	78.4	55.7	5.0	3.3	35.6	No trend
Alkalinity (mg/L $CaCo_3$)	5.2	3.6	5.6	6.5	5.2	Increasing
Lab pH	6.6	6.6	6.7	7.2	6.8	Decreasing
Sp. Conductance (µs/cm)	29.0	27.2	33.4	36.7	31.6	No trend
Chloride(mg/L)	3.5	3.4	4.0	4.6	3.9	No trend
Sodium (mg/L)	2.6	2.7	3.2	3.3	3.0	No trend
Calcium (mg/L)	2.4	1.9	2.5	2.8	2.4	Decreasing
Aluminum (µg/L)	80.0	60.0	30.0	20.0	47.5	Increasing

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Lake Abanakee remained relatively isothermal throughout the sampling season, allowing oxygen to freely mix though the water column.

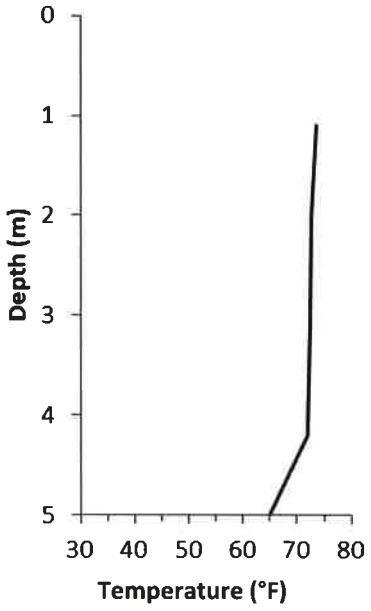
Lake Adirondack

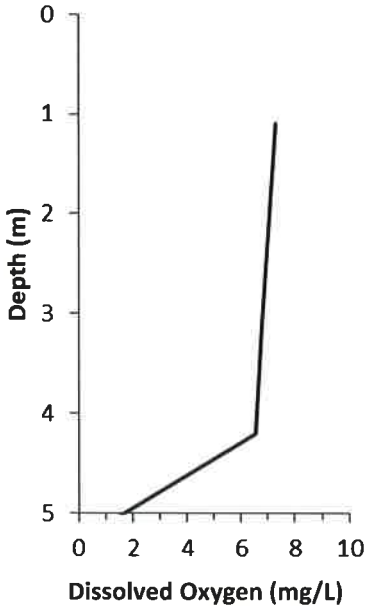
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Low sensitivity	Moderate	No known AIS

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	1.5	1.8	2.4	2.1	2.0	Decreasing
Chlorophyll-a (µg/L)	7.0	4.8	5.2	6.3	5.8	No trend
Total Phosphorus (µg/L)	11.6	10.2	10.0	7.8	9.9	No trend
Nitrate + Nitrite (µg/L)	2.0	2.0	2.0	2.0	2.0	No trend
Alkalinity (mg/L $CaCo_3$)	24.4	28.4	28.0	30.0	27.7	No trend
Lab pH	7.0	6.9	8.3	7.2	7.3	No trend
Sp. Conductance (µs/cm)	99.9	107.2	108.6	112.3	107.0	No trend
Chloride(mg/L)	12.5	12.9	13.7	14.5	13.4	No trend
Sodium (mg/L)	7.2	8.0	8.5	8.5	8.1	No trend
Calcium (mg/L)	9.9	10.3	10.7	10.5	10.4	No trend
Aluminum (µg/L)	20.0	100.0	100.0	20.0	60.0	No trend

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- The bottom waters of Lake Adirondack experienced significant oxygen depletion during the months of June, July, and August.
- Oxygen was redistributed through the water column in September when isothermal conditions occurred.

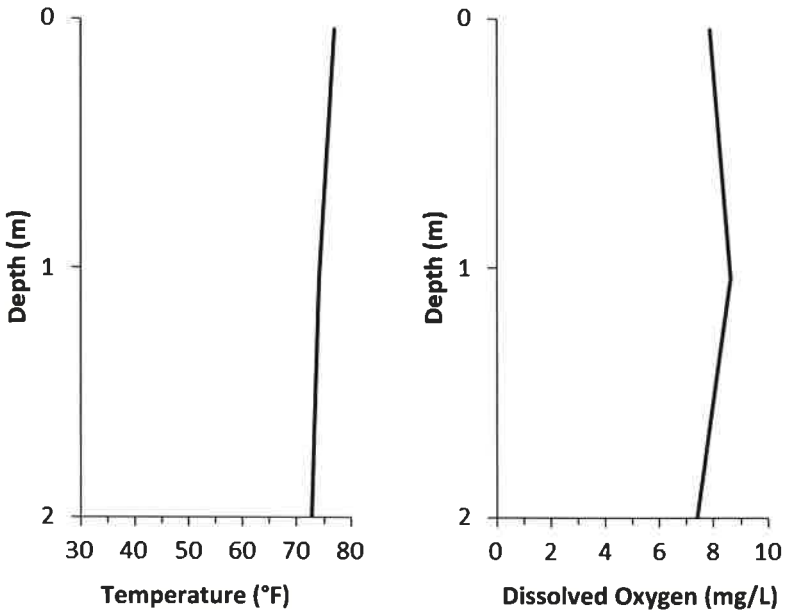
Lake Algonquin

Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Low sensitivity	Moderate	Eurasian watermilfoil

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	2.5	1.9	2.2	2.9	2.4	Decreasing
Chlorophyll-a (µg/L)	1.3	4.0	5.9	3.3	3.6	Increasing
Total Phosphorus (µg/L)	6.9	10.5	11.6	5.3	8.6	No trend
Nitrate + Nitrite (µg/L)	41.1	20.8	3.4	14.0	19.8	No trend
Alkalinity (mg/L $CaCo_3$)	8.4	14.4	15.2	17.0	13.8	No trend
Lab pH	7.0	7.2	7.7	7.0	7.2	No trend
Sp. Conductance (µs/cm)	47.7	78.4	81.3	68.0	68.9	No trend
Chloride(mg/L)	6.5	11.5	10.3	8.0	9.1	No trend
Sodium (mg/L)	4.4	7.5	7.1	5.5	6.1	No trend
Calcium (mg/L)	3.7	5.6	6.3	5.4	5.3	No trend
Aluminum (µg/L)	80.0	50.0	50.0	50.0	57.5	No trend

Lake Profile – August 2019



Analysis of the 2019 lake profile data shows:

- Lake Algonquin remained relatively isothermal throughout the sampling season, allowing oxygen to freely mix though the water column.

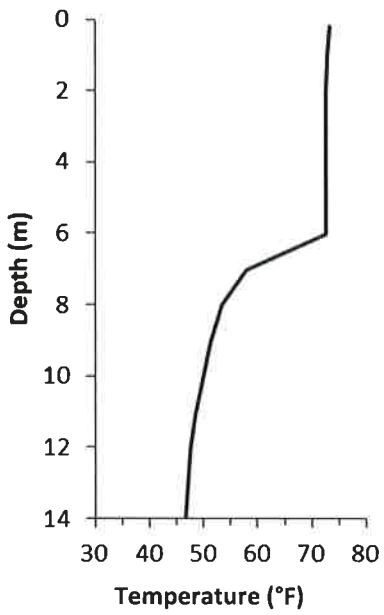
Lake Eaton

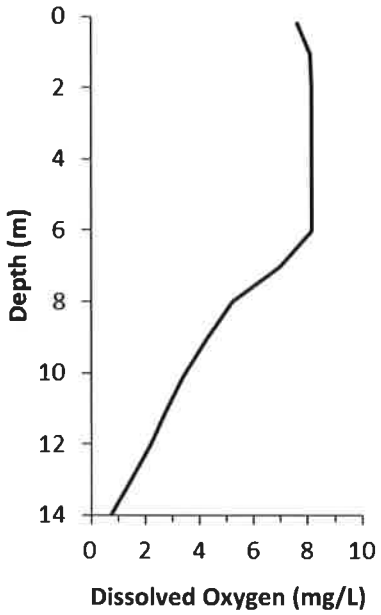
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Oligotrophic	Circumneutral	Moderate sensitivity	Moderate	No known AIS

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	3.6	5.1	5.3	5.1	4.7	Decreasing
Chlorophyll-a (µg/L)	1.9	1.3	1.8	2.4	1.8	No trend
Total Phosphorus (µg/L)	5.0	5.0	5.0	5.0	5.0	Decreasing
Nitrate + Nitrite (µg/L)	37.5	2.0	2.0	2.0	10.9	No trend
Alkalinity (mg/L $CaCo_3$)	4.4	3.6	4.4	5.5	4.5	Increasing
Lab pH	6.8	7.0	7.4	7.0	7.1	Increasing
Sp. Conductance (µs/cm)	65.5	66.8	73.1	74.7	70.0	No trend
Chloride(mg/L)	13.4	13.9	14.9	15.2	14.4	No trend
Sodium (mg/L)	8.3	9.0	9.5	9.7	9.1	No trend
Calcium (mg/L)	2.7	2.6	2.8	2.8	2.7	No trend
Aluminum (µg/L)	30.0	30.0	100.0	100.0	65.0	Increasing

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Lake Eaton was thermally stratified for the duration of the 2019 monitoring season.
- Hypoxic (dissolved oxygen below 2.0 mg/L) and anoxic (dissolved oxygen below 0.5 mg/L) conditions were encountered in the hypolimnion during August and September.

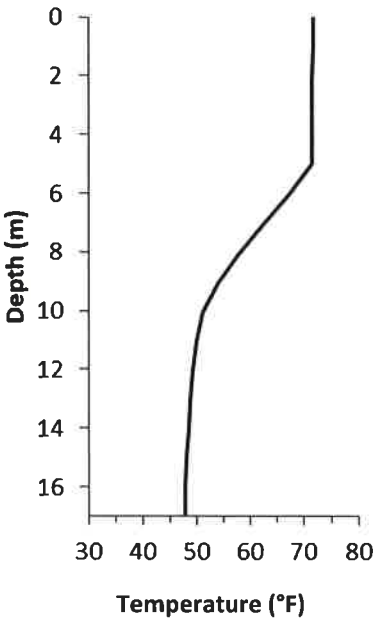
Lake Pleasant

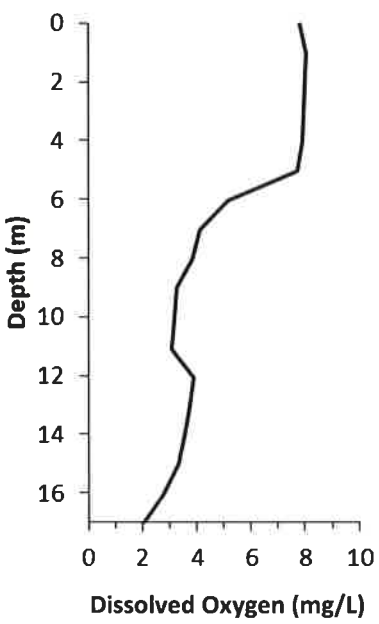
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Low sensitivity	Moderate	Spiny waterflea

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	2.8	3.0	3.8	4.0	3.4	Decreasing
Chlorophyll-a (µg/L)	3.1	2.6	2.4	2.9	2.8	No trend
Total Phosphorus (µg/L)	4.7	5.0	5.8	4.2	4.9	Decreasing
Nitrate + Nitrite (µg/L)	31.2	2.0	2.0	2.0	9.3	Decreasing
Alkalinity (mg/L $CaCo_3$)	8.8	8.4	9.2	9.0	8.9	Increasing
Lab pH	6.8	6.9	7.3	7.1	7.0	No trend
Sp. Conductance (µs/cm)	63.1	64.2	69.5	72.8	67.4	No trend
Chloride(mg/L)	10.9	10.8	11.5	12.6	11.5	No trend
Sodium (mg/L)	6.3	6.8	7.4	7.3	7.0	No trend
Calcium (mg/L)	3.7	3.7	4.0	3.9	3.8	No trend
Aluminum (µg/L)	30.0	30.0	100.0	100.0	65.0	No trend

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Lake Pleasant was thermally stratified during the July, August and September sampling days. Profile data shows that the lake was isothermal in June.
- During the months of August and September, Lake Pleasant experienced significant oxygen depletion below the thermocline, with the bottom waters developing hypoxic (dissolved oxygen below 2.0 mg/L) conditions in August and anoxic (D.O. below 0.5 mg/L) in September.

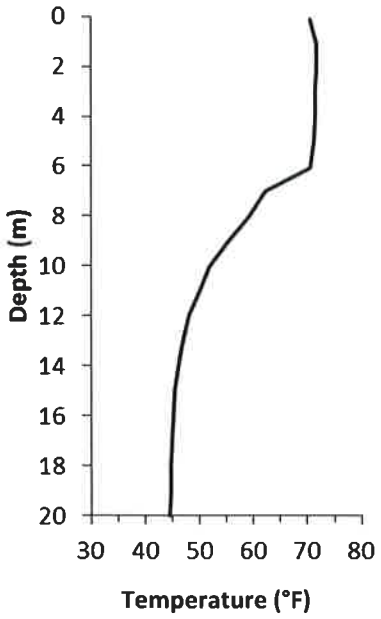
Limekiln Lake

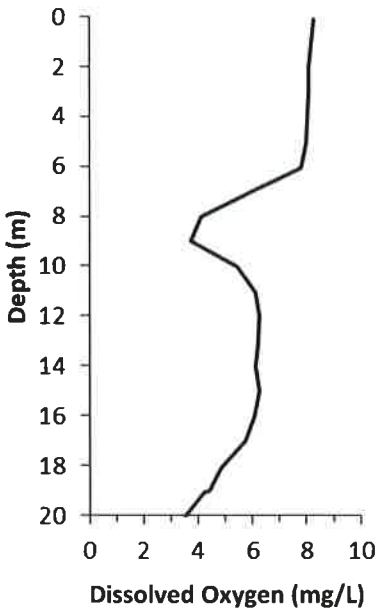
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Extreme Sensitivity	Low	No known AIS

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	6.1	5.5	6.5	6.3	6.1	Decreasing
Chlorophyll-a (µg/L)	0.8	1.0	2.2	1.4	1.3	No trend
Total Phosphorus (µg/L)	5.0	5.0	5.0	5.0	5.0	Decreasing
Nitrate + Nitrite (µg/L)	89.1	49.1	21.0	10.1	42.3	No trend
Alkalinity (mg/L $CaCo_3$)	2.0	2.0	2.0	3.0	2.3	Increasing
Lab pH	6.6	6.4	6.7	6.4	6.5	No trend
Sp. Conductance (µs/cm)	15.9	15.2	19.2	20.6	17.7	No trend
Chloride(mg/L)	1.6	1.7	2.3	2.1	1.9	No trend
Sodium (mg/L)	1.1	1.3	1.4	1.3	1.3	No trend
Calcium (mg/L)	1.5	1.5	1.7	1.6	1.6	Decreasing
Aluminum (µg/L)	100.0	90.0	40.0	20.0	62.5	No trend

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Limekiln Lake was thermally stratified during the sampling season.
- Limekiln Lake experienced depleted oxygen in the bottom waters during the month of August, and hypoxic (dissolved oxygen below 2.0 mg/L) conditions were encountered during September.
- A negative heterograde was noted in the August dissolved oxygen profile at 8 meters, likely caused by a concentration of zooplankton or the decomposition of organic matter.

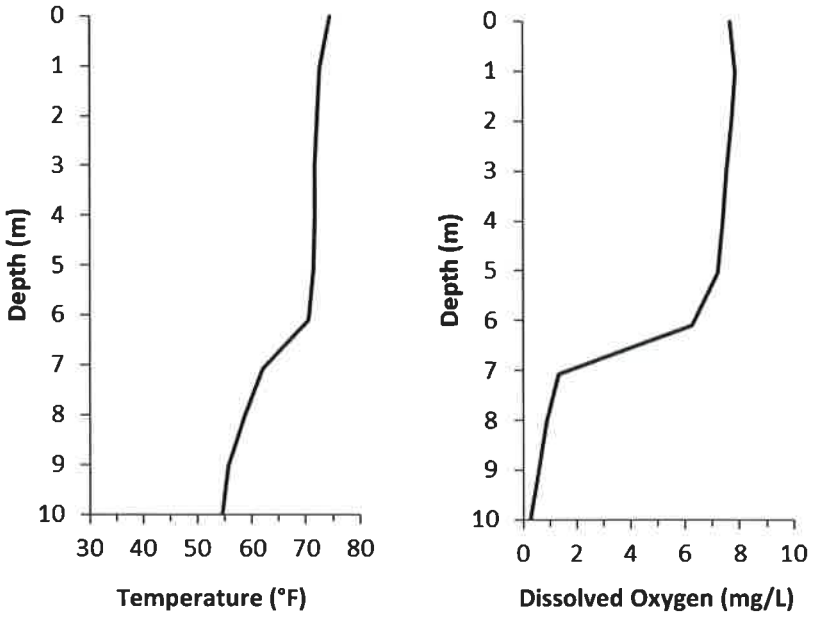
Long Lake

Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Moderate Sensitivity	Low	Variable-leaf milfoil

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	3.5	3.4	2.4	3.3	3.1	Decreasing
Chlorophyll-a (µg/L)	3.2	3.3	4.2	4.0	3.7	No trend
Total Phosphorus (µg/L)	5.0	5.0	6.4	4.2	5.2	Decreasing
Nitrate + Nitrite (µg/L)	63.0	11.4	1.5	16.1	23.0	No trend
Alkalinity (mg/L $CaCo_3$)	2.8	2.4	3.2	5.0	3.4	Increasing
Lab pH	6.4	6.5	7.1	6.6	6.7	No trend
Sp. Conductance (µs/cm)	28.2	29.2	34.2	36.1	31.9	No trend
Chloride (mg/L)	3.8	4.3	4.5	4.8	4.4	No trend
Sodium (mg/L)	2.8	3.3	3.6	3.5	3.3	No trend
Calcium (mg/L)	2.0	2.0	2.4	2.3	2.2	No trend
Aluminum (µg/L)	100.0	70.0	30.0	30.0	57.5	No trend

Lake Profile – August 2019



Analysis of the 2019 lake profile data shows:

- Long Lake was thermally stratified during the months of June, July, and August, becoming isothermal in September.
- Significant depletion of oxygen was noted during July, with conditions becoming hypoxic (dissolved oxygen below 2.0 mg/L) in August.

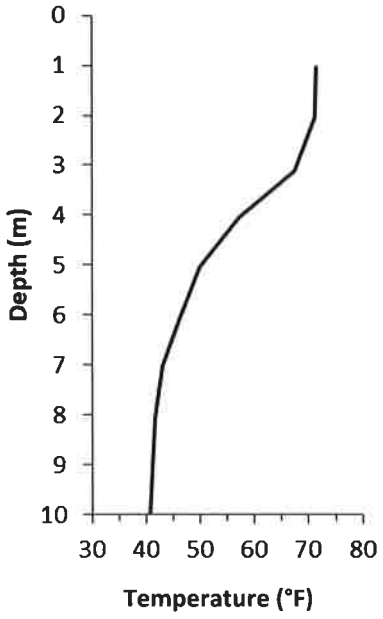
Morehouse Lake

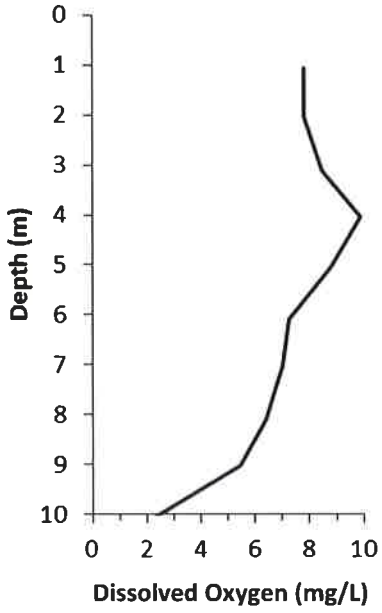
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Oligotrophic	Circumneutral	Extreme sensitivity	Not significant	No known AIS

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	2.2	2.9	3.0	3.0	2.7	Decreasing
Chlorophyll-a (µg/L)	2.7	2.2	1.8	2.0	2.2	No trend
Total Phosphorus (µg/L)	4.9	5.6	7.5	5.1	5.8	Decreasing
Nitrate + Nitrite (µg/L)	12.8	6.0	9.3	7.3	8.9	Decreasing
Alkalinity (mg/L $CaCo_3$)	2.0	2.0	2.0	2.0	2.0	Increasing
Lab pH	6.0	6.4	6.7	6.2	6.3	Increasing
Sp. Conductance (µs/cm)	7.4	8.6	10.0	10.8	9.2	No trend
Chloride (mg/L)	2.0	2.0	0.9	2.0	1.7	No trend
Sodium (mg/L)	0.4	0.5	0.5	0.5	0.5	No trend
Calcium (mg/L)	0.8	0.9	0.9	1.0	0.9	Decreasing
Aluminum (µg/L)	190.0	190.0	130.0	140.0	162.5	No trend

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Morehouse Lake was thermally stratified for the duration of the sampling season.
- Hypoxic (dissolved oxygen below 2.0 mg/L) conditions were noted during September in the bottom meter of water.
- A positive heterograde was noted in the August dissolved oxygen profile at 4 meters, likely caused by an algal plate at the thermocline.

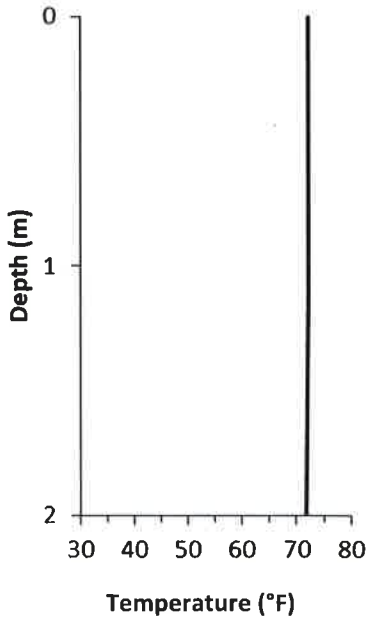
Oxbow Lake

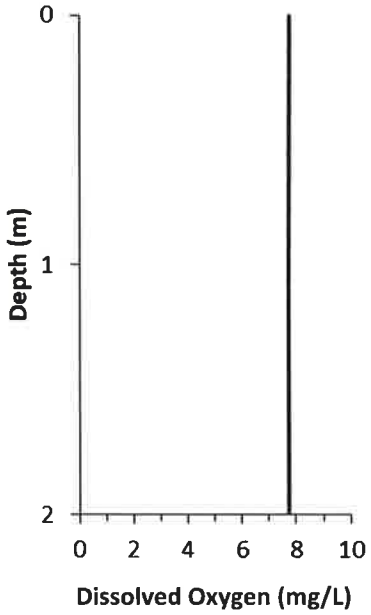
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Moderate sensitivity	High	No know AIS

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	2.6	2.3	2.4	3.1	2.6	Decreasing
Chlorophyll-a (µg/L)	3.6	6.8	3.5	4.6	4.6	Increasing
Total Phosphorus (µg/L)	9.6	12.8	10.4	10.6	10.9	No trend
Nitrate, Nitrite (mg/L)	2.0	2.0	1.6	2.2	2.0	Decreasing
Alkalinity (mg/L $CaCo_3$)	7.6	8.4	9.2	10.0	8.8	Increasing
Lab pH	6.8	6.9	6.7	6.8	6.8	No trend
Sp. Conductance (µs/cm)	89.2	93.8	104.0	105.8	98.2	No trend
Chloride(mg/L)	19.3	19.6	21.4	23.2	20.9	No trend
Sodium (mg/L)	11.7	13.0	13.9	14.1	13.2	No trend
Calcium (mg/L)	3.1	3.4	3.6	3.7	3.5	No trend
Aluminum (µg/L)	40.0	30.0	100.0	100.0	67.5	No trend

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Oxbow Lake experienced isothermal condition throughout the sampling season, thus, the lake remained well oxygenated.

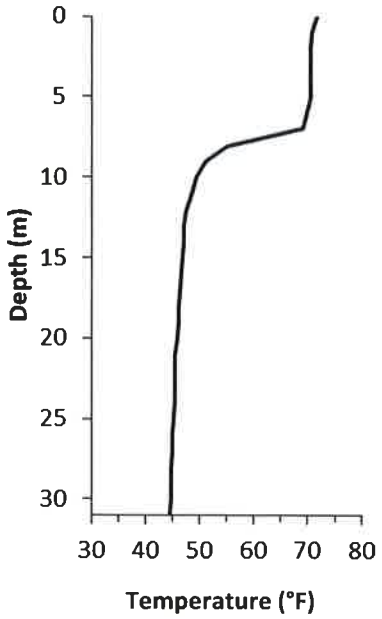
Piseco Lake

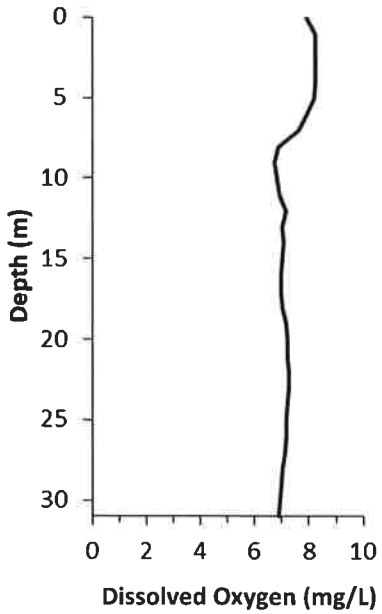
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Moderate sensitivity	Moderate	Spiny waterflea

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	3.4	3.3	3.5	3.6	3.4	Decreasing
Chlorophyll-a (µg/L)	2.6	2.9	3.1	3.1	2.9	No trend
Total Phosphorus (µg/L)	6.0	5.6	5.4	3.7	5.2	Decreasing
Nitrate + Nitrite (µg/L)	70.4	2.0	2.0	4.6	19.8	Decreasing
Alkalinity (mg/L $CaCo_3$)	4.4	4.0	5.2	5.0	4.7	Increasing
Lab pH	6.4	6.8	6.8	6.9	6.7	No trend
Sp. Conductance (µs/cm)	33.2	35.7	39.2	40.9	37.3	No trend
Chloride (mg/L)	5.0	5.3	5.8	6.1	5.6	No trend
Sodium (mg/L)	3.4	3.8	4.1	4.0	3.8	No trend
Calcium (mg/L)	2.1	2.2	2.4	2.3	2.3	Increasing
Aluminum (µg/L)	70.0	50.0	30.0	30.0	45.0	No trend

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Piseco Lake was thermally stratified throughout the sampling season.
- Piseco Lake stayed well oxygenated throughout the sampling period with no significant oxygen depletion detected.

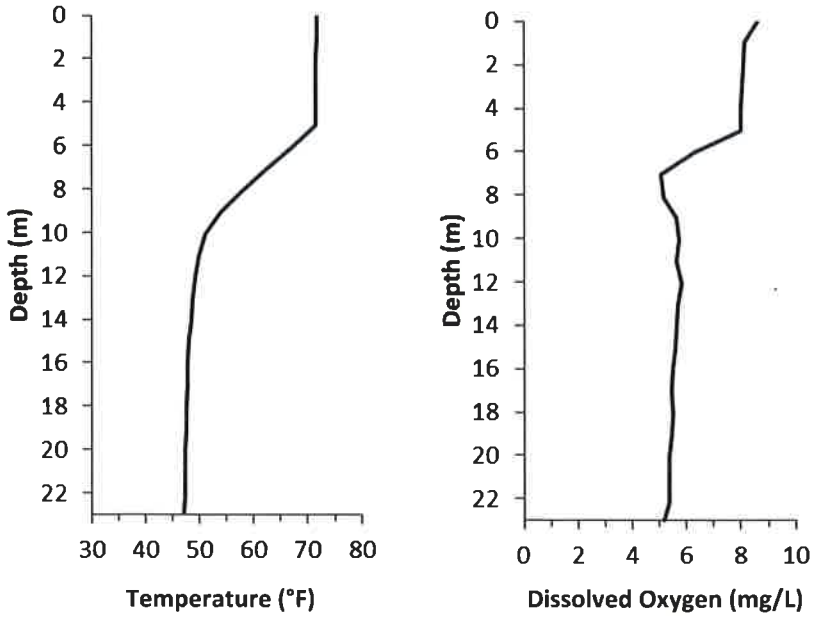
Raquette Lake

Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Moderate sensitivity	Low	Variable-leaf milfoil

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	3.7	3.3	4.5	3.9	3.8	Decreasing
Chlorophyll-a (µg/L)	1.8	2.2	2.7	2.7	2.4	No trend
Total Phosphorus (µg/L)	4.1	3.9	6.0	4.8	4.7	Decreasing
Nitrate + Nitrite (µg/L)	77.0	34.6	16.8	2.0	32.6	No trend
Alkalinity (mg/L $CaCo_3$)	2.8	2.8	2.4	4.0	3.0	Increasing
Lab pH	6.4	6.6	6.6	6.7	6.6	No trend
Sp. Conductance (µs/cm)	31.0	33.3	35.6	37.3	34.3	No trend
Chloride (mg/L)	4.6	5.0	5.1	5.4	5.0	No trend
Sodium (mg/L)	3.3	3.6	3.9	5.8	4.2	No trend
Calcium (mg/L)	2.0	2.0	2.2	2.1	2.1	Increasing
Aluminum (µg/L)	90.0	80.0	50.0	40.0	65.0	No trend

Lake Profile – August 2019



Analysis of the 2019 lake profile data shows:

- Raquette Lake was thermally stratified throughout the sampling season.
- Raquette Lake remained well oxygenated throughout the sampling season with no hypoxic or anoxic waters encountered.
- A negative heterograde was noted in the August dissolved oxygen profile at 7 meters, likely caused by a concentration of zooplankton or the decomposition of organic matter.

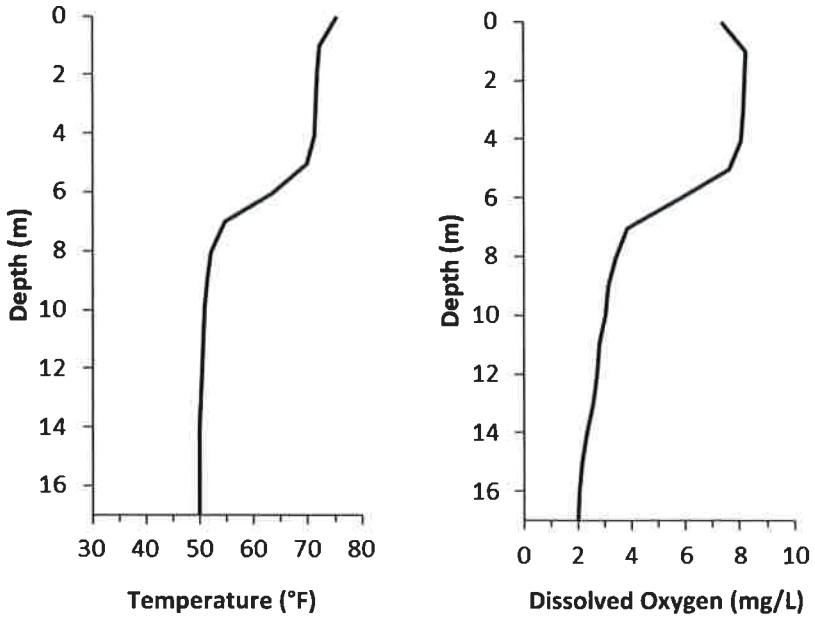
Sacandaga Lake

Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Moderate sensitivity	Moderate	Spiny waterflea

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	3.5	3.5	5.8	4.5	4.3	Decreasing
Chlorophyll-a (µg/L)	2.4	2.7	1.9	4.1	2.7	No trend
Total Phosphorus (µg/L)	4.8	4.6	6.2	4.0	4.9	Decreasing
Nitrate + Nitrite (µg/L)	43.7	2.0	2.0	2.0	12.4	Decreasing
Alkalinity (mg/L $CaCo_3$)	8.8	8.8	9.2	10.0	9.2	Increasing
Lab pH	6.8	6.9	6.8	6.9	6.8	No trend
Sp. Conductance (µs/cm)	52.0	55.1	59.5	61.1	56.9	No trend
Chloride (mg/L)	7.9	8.2	8.3	9.0	8.4	No trend
Sodium (mg/L)	4.7	5.3	5.6	5.6	5.3	No trend
Calcium (mg/L)	3.7	3.7	4.0	3.9	3.8	Decreasing
Aluminum (µg/L)	30.0	20.0	100.0	100.0	62.5	No trend

Lake Profile – August 2019



Analysis of the 2019 lake profile data shows:

- Sacandaga Lake was thermally stratified throughout the sampling season.
- Sacandaga Lake experienced significant oxygen depletion below the thermocline with hypoxic (dissolved oxygen below 2.0 mg/L) and anoxic (dissolved oxygen below 0.5 mg/L) conditions encountered during the months of August and September.

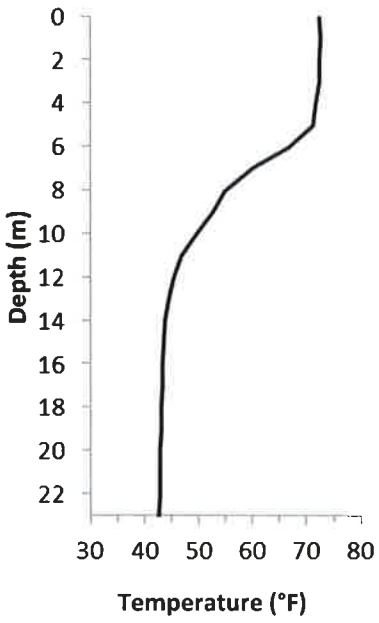
Seventh Lake

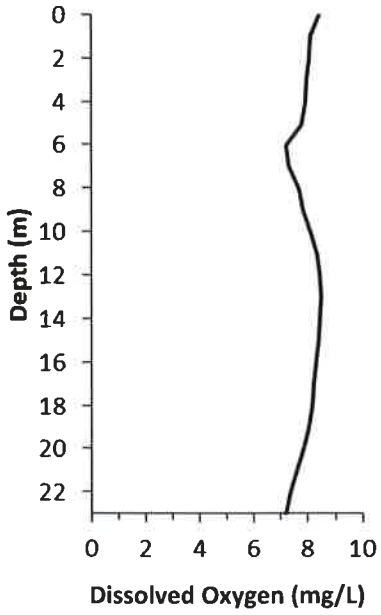
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Oligotrophic	Circumneutral	Low sensitivity	Moderate	Eurasian watermilfoil, variable-leaf milfoil

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	4.3	4.2	5.1	5.8	4.8	Decreasing
Chlorophyll-a (µg/L)	1.4	1.3	1.8	1.4	1.5	No trend
Total Phosphorus (µg/L)	5.0	19.3	4.7	5.0	8.5	Decreasing
Nitrate + Nitrite (µg/L)	106.0	88.2	71.7	65.2	82.8	Decreasing
Alkalinity (mg/L $CaCo_3$)	7.6	8.0	8.8	10.0	8.6	Increasing
Lab pH	6.8	6.9	7.0	7.1	6.9	No trend
Sp. Conductance (µs/cm)	66.3	67.5	74.0	76.1	71.0	No trend
Chloride (mg/L)	10.9	10.9	11.6	12.4	11.5	No trend
Sodium (mg/L)	7.6	8.0	8.1	8.2	8.0	No trend
Calcium (mg/L)	4.4	4.1	4.6	4.5	4.4	No trend
Aluminum (µg/L)	60.0	70.0	50.0	50.0	57.5	Increasing

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Seventh Lake was thermally stratified throughout the sampling season.
- Seventh Lake was well oxygenated throughout the sampling season, and experienced no significant oxygen depletion.

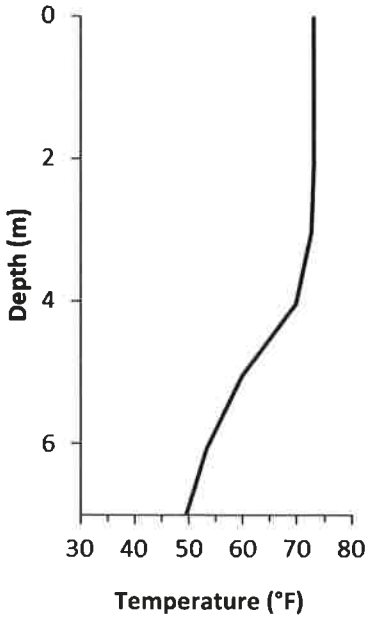
Sixth Lake

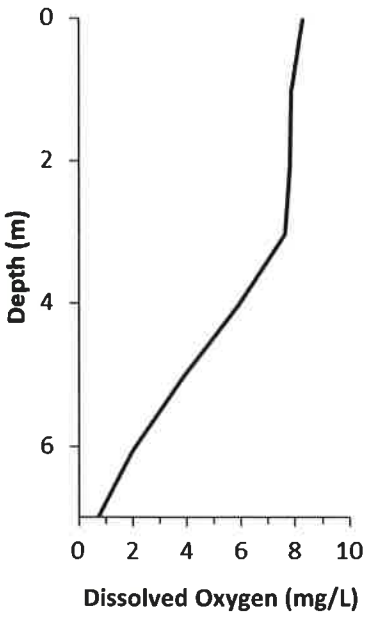
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Low sensitivity	Moderate	Eurasian watermilfoil, variable-leaf milfoil

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	3.6	3.5	4.8	4.1	4.0	Decreasing
Chlorophyll-a (µg/L)	1.3	1.8	2.2	1.9	1.8	No trend
Total Phosphorus (µg/L)	5.0	5.0	5.0	4.5	4.9	Decreasing
Nitrate + Nitrite (µg/L)	121.0	69.2	36.9	34.2	65.3	No trend
Alkalinity (mg/L $CaCo_3$)	11.6	9.6	10.4	11.0	10.7	Increasing
Lab pH	6.8	6.9	7.0	7.2	7.0	No trend
Sp. Conductance (µs/cm)	69.1	73.3	81.5	83.9	77.0	No trend
Chloride (mg/L)	11.5	12.1	12.9	14.7	12.8	No trend
Sodium (mg/L)	7.0	8.2	9.0	9.1	8.3	No trend
Calcium (mg/L)	4.1	4.4	4.9	4.9	4.6	No trend
Aluminum (µg/L)	70.0	40.0	20.0	30.0	40.0	Increasing

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Sixth Lake was thermally stratified for the duration of the sampling season.
- Sixth Lake experienced significant oxygen depletion during the sampling season, with hypoxic (dissolved oxygen below 2.0 mg/L) and anoxic (dissolved oxygen below 0.5 mg/L) conditions occurring in the bottom waters during the July, August, and September trips.

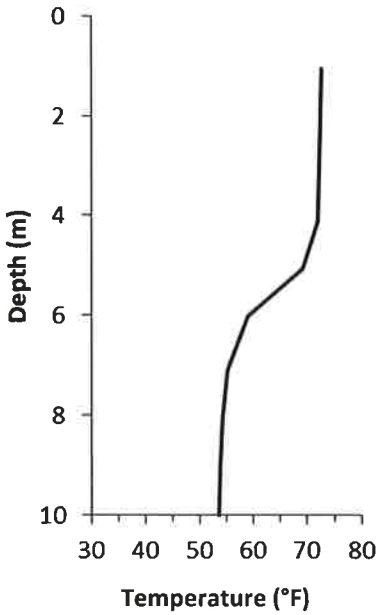
Spy Lake

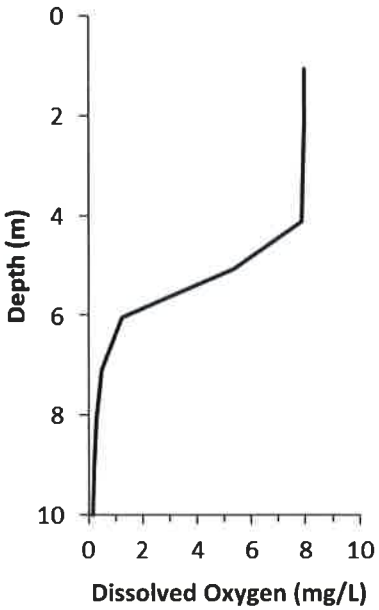
Trophic Status	Acidity	Acidity Assessment	Road Salt Influence	Presence of AIS
Mesotrophic	Circumneutral	Moderate sensitivity	Moderate	No known AIS

2019 Data

Water Quality Indicator	June	July	Aug.	Sept.	Avg.	Trend 1993-2017
Transparency (m)	1.9	4.1	3.5	3.5	3.2	No trend
Chlorophyll-a (µg/L)	6.9	1.5	3.0	2.2	3.4	No trend
Total Phosphorus (µg/L)	5.5	4.1	4.8	4.1	4.6	Decreasing
Nitrate + Nitrite (µg/L)	2.0	2.0	3.0	2.0	2.3	No trend
Alkalinity (mg/L $CaCo_3$)	3.2	2.4	3.6	4.5	3.4	Increasing
Lab pH	6.7	6.7	6.9	7.0	6.8	Increasing
Sp. Conductance (µs/cm)	68.1	70.9	77.7	78.4	73.8	No trend
Chloride (mg/L)	16.0	16.4	17.1	18.0	16.9	No trend
Sodium (mg/L)	9.5	10.2	11.1	11.1	10.5	No trend
Calcium (mg/L)	2.1	2.1	2.2	2.2	2.2	No trend
Aluminum (µg/L)	60.0	40.0	100.0	100.0	75.0	No trend

Lake Profile – August 2019





Analysis of the 2019 lake profile data shows:

- Spy Lake was thermally stratified for the duration of the sampling season.
- Spy Lake experienced significant oxygen depletion during the sampling season, with hypoxic (dissolved oxygen below 2.0 mg/L) and anoxic (dissolved oxygen below 0.5 mg/L) conditions occurring in the bottom waters during the July, August, and September trips.