Town of Arietta Conductivity Sweep of Piseco Lake and Oxbow Lake

2020 Report

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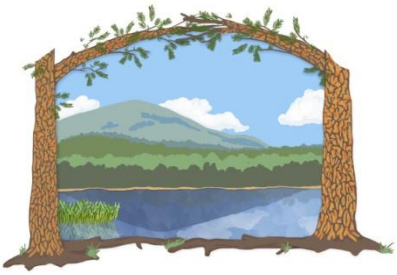

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"Working to manage and promote the wise use of natural resources in Hamilton County since 1965."

INTRODUCTION

The purpose of this report is to provide the Town of Arietta residents an update of the water quality monitoring efforts on Piseco Lake and Oxbow Lake. In addition to the traditional limnological water sampling done on these two lakes by the Hamilton County Soil and Water Conservation District (District), the Town of Arietta contracts with the District to conduct a conductivity sweep along the shoreline of each lake where specific conductance is measured. Specific conductance is the temperature corrected analysis of conductivity. This additional sampling allows us to pinpoint nearshore locations that could be impacted from non-point sources of pollution. The following report will provide a brief background of conductivity as a water quality parameter, historical conductivity measurements, and data from the 2020 monitoring season.

Conductivity measures the ability of water to pass an electrical current and is used to estimate the presence or amount of charged ions in the water. Pure water is a poor conductor of electricity and as such has very low conductivity readings and a low concentration of dissolved ions. As concentrations of dissolved ions (sodium, chloride, phosphate, nitrates) increases so does the conductivity of the water. In the Adirondacks, undeveloped and least impacted lakes typically have conductivity readings in the range of 10 to 25 uS/cm (Laxson et. Al). According to the "State of Hamilton County Lakes: A 25-year perspective," chloride concentration can explain 86% of the variation on conductivity.

Conductivity alone is not a measure of water pollution, however, nearshore changes in conductivity can indicate important changes in the watershed as runoff often picks up and discharges dissolved ions directly into surface waters.

METHODS

District technicians traversed the shoreline of Piseco Lake and Oxbow lake via motorboat and kayak, often getting out and walking along the shoreline to collect data. A YSI Pro30 conductivity sonde and a YSI 6-series multiparameter water sonde were used to measure specific conductivity at select locations around the lake. For the purposes of this report, a spike in conductivity is considered anything higher than 25% of the control. The control measurement is taken in the first meter of water at the deepest part of the lake using a YSI multiparameter sonde. When an elevated measurement was observed, coordinates were recorded with a GPS and staff conducted a small investigation to determine the source of influence.

OXBOW LAKE

BACKGROUND

The District has been collecting limnological data on Oxbow Lake since the inception of the lake monitoring program in 1993. Figure 1 shows the increasing trend in specific conductivity over the past 8 years.

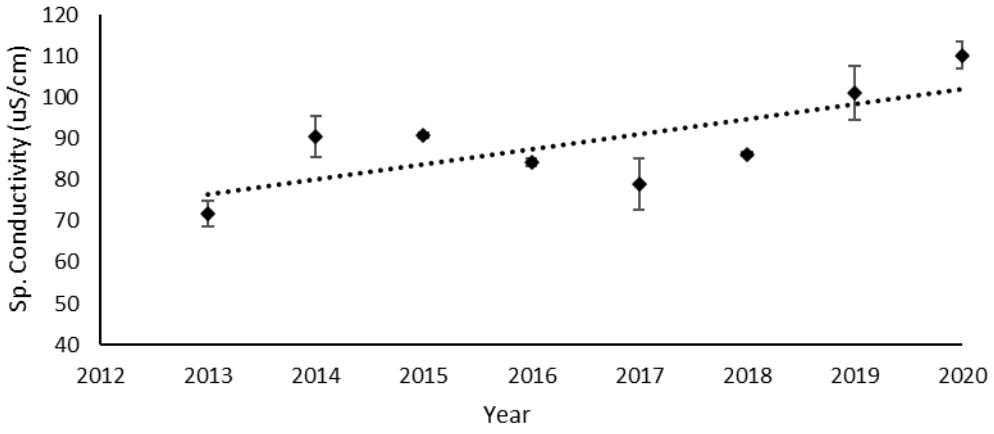

Figure 1. A time series of Specific Conductivity measurements on Oxbow Lake show a significant increasing trend. (P-value .039) Error bars represent 1 standard deviation of the mean.

Increasing conductivity measurements coincide with increasing sodium and chloride concentrations, as seen in Figure 2.

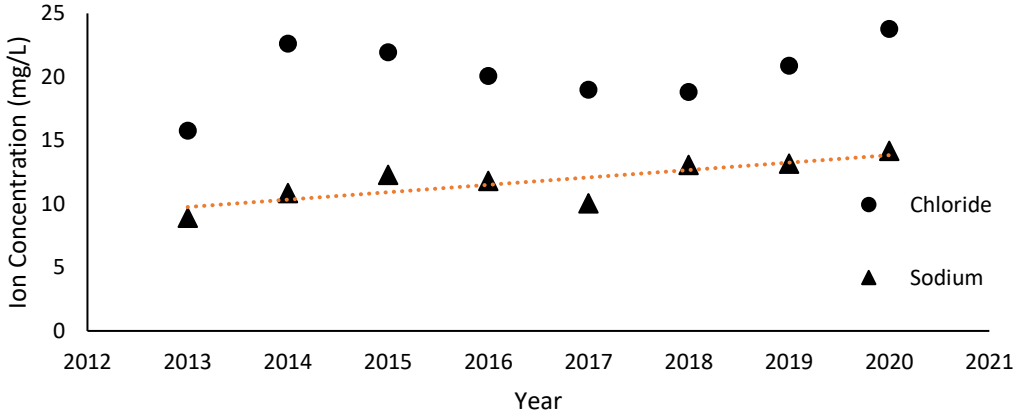

Figure 2. A time series depicting Sodium and Chloride concentrations on Oxbow Lake. Sodium concentrations show a significant increasing trend (p-value .0145)

CONDUCTIVITY SWEEP RESULTS

2020 was the first year the District performed a conductivity sweep along the shores of Oxbow Lake (July 9, 2020). Specific conductance measured between 108 uS/cm and 114.5 uS/cm, with the control (deep water site) measuring **110.2 uS/cm**. Although we did not detect any spikes in conductivity, the data collected in 2020 can serve as important baseline data on the lake. Future consecutive years of data collection will allow us to easily detect future spikes that could be related to pollutants entering the lake.

PISECO LAKE

BACKGROUND

The District has been collecting limnological data on Piseco Lake since the inception of the water monitoring program in 1993. The District has been collecting supplementary shoreline conductivity data intermittently since 2009. Figure 3 shows a time series of specific conductivity data from the past 8 years. No significant trend exists within this data, although we have seen a slight increase of specific conductivity over the years. This increase coordinates with the sodium and chloride data shown in Figure 4.

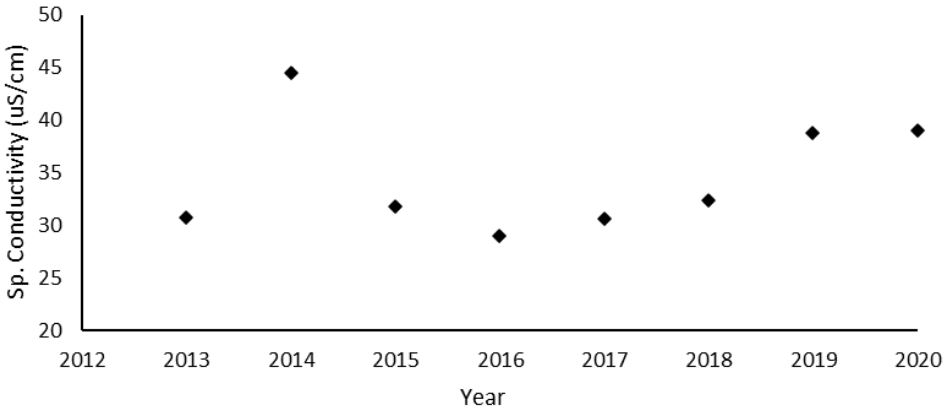

Figure 3. A time series depicting specific conductivity on Piseco Lake. No trend was detected.

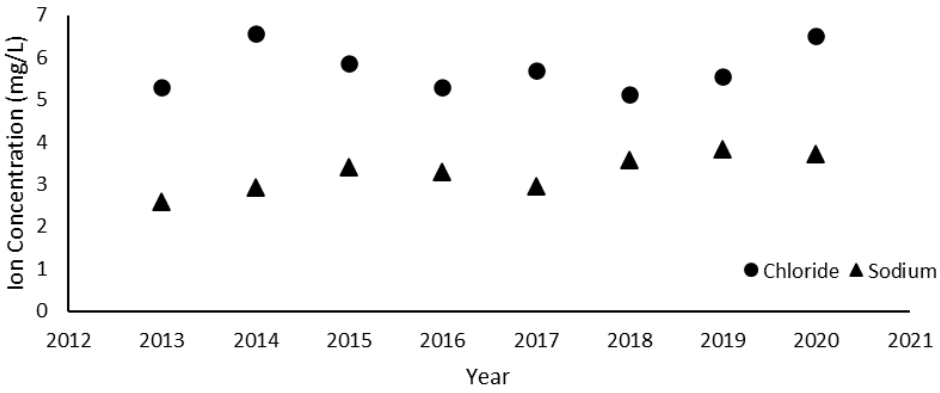

Figure 4. Time series of Sodium and Chloride concentrations on Piseco Lake.

Conductivity Sweep Results

Data was collected along the shoreline of Piseco Lake this year during the first and second week of July. The following table and map show the year and location of where a spike was detected.

Table 1. Historical data showing Site location and year in which a conductivity spike was noted. The control specific conductivity measurement is also included for reference.

	2009	2010	2011	2012	2015	2016	2017	2018	2020
Control (uS/cm)	36	35	31	33	42	41	40	40	38
Site 1	X	X	X	X	X	X	X	X	X
Site 2	X	X		X					
Site 3	X	X	X	X	X	X	X	X	X
Site 4	X	X	X	X	X	X	X	X	X
Site 5		X		X				X	
Site 6			X		X	X	X	X	X
Site 7					X				
Site 8							X		X
Site 9								X	
Site 10								X	
Site 11								X	
Site 12								X	
Site 13								X	
Site 14									X
Site 15									X

Piseco Lake site location descriptions

Site 1: Evergreen Inlet
Site 2: Shoreline between Outlet Road and Point road.
Site 3: Sheepshead Bay
Site 4: Tributary from Oxbow Lake
Site 5: Old Piseco Road
Site 6: Shore in front of Sleepy Hollow trailer park
Site 7: Piseco Outlet
Site 8: Small tributary – Knox Road
Site 9: Bonnie Brae
Site 10: South side Higgins Bay
Site 11: North side of Higgins Bay
Site 12: Old Piseco Road
Site 13: Old Piseco Road
Site 14: Confluence of Cold Stream and Mill Stream
Site 15: Small tributary on South Shore Road (by boat launch)

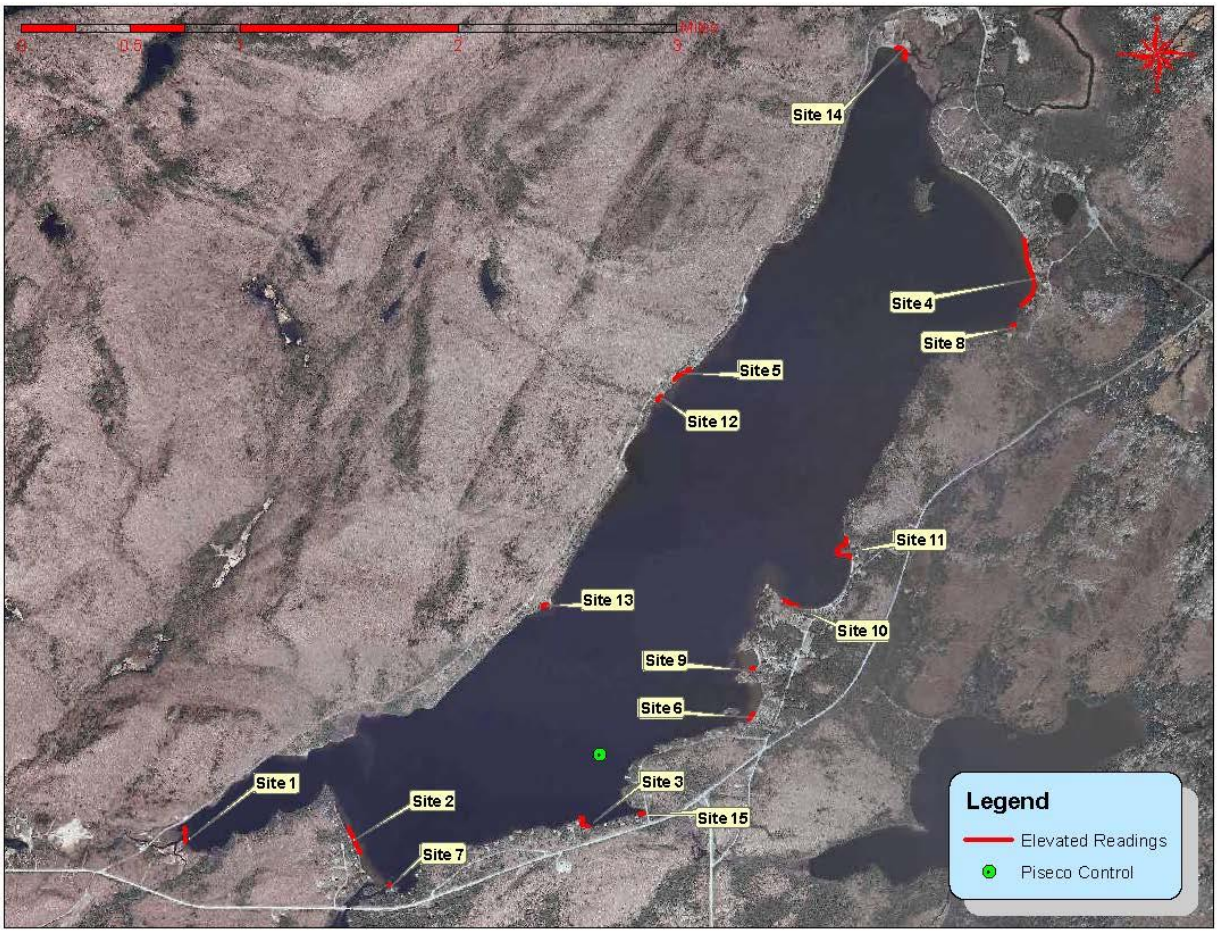

Figure 5. A map of Piseco Lake depicting all locations where a spike in conductivity was detected since 2009.

2020 Conductivity Spikes

Various locations along the shoreline of Piseco Lake were noted to have elevated conductivity readings. The chart below identifies those specific sites and offers an explanation if possible, to explain the presence of a spike. It is important to remember that although the conductivity measurements are higher in these locations, without a complete analysis, it is impossible to deduce the exact cause of the spike.

Location	Sp. Conductivity (uS/cm)	Explanation
Site 1: Evergreen Outlet	116	Nutrient rich water from Evergreen Lake and surrounding watershed enter the lake here, causing a noticeable spike in conductivity.
Site 3: Sheepshead Bay	<1000	The small tributary that enters the lake at this location has been contaminated with road salt

		from a closely located NYS DOT salt shed. Conductivity readings are likely higher this year than in the past due to drought-like conditions this summer, resulting in the small tributary being fed by contaminated ground water.
Site 4: Oxbow Lake Outlet	73	The water entering Piseco Lake from the area of Oxbow Lake Outlet consistently reads at a higher conductivity which is a product of the chloride-laden waters of Oxbow Lake and the surrounding watershed.
Site 6: Shoreline in front of Sleepy Hallow	215	There appears to be seepage of unknown origin in this location. Conductivity readings were very high in front of the beach. Further investigation is needed to ascertain the source.
Site 8: Small tributary by Knox Road	160	This small tributary crosses NYS Route 8, so it is likely that road salt is influencing the conductivity at this site.
Site 14: Confluence of Mill Stream and Cold stream	52	The small spike in conductivity at this location is most likely due to nutrients entering the lake via the Cold Stream watershed.
Site 15: Small tributary by boat launch on South Shore Road	941	This small tributary crosses and is located very close to NYS Route 8, and appears to run through a wetland. It is likely the elevated conductivity can be a result of road salt contamination.

CONCLUSIONS

Overall, the findings from the 2020 conductivity sweep were neither unusual nor unexpected. Spikes were detected primarily at tributaries where the discharged water picked up dissolved ions along its way into the lake.

This fluctuation in specific conductance can remind us that land use / watershed type matter. While conductivity is significantly higher in watersheds with state roads (Oxbow Lake, Evergreen Lake), conductivity could also be impacted by logging operations, extensive shoreline development, or flooding events exposing bare stream and riverbanks.

With wise land use and proper septic system maintenance, we can all work together to ensure the integrity of our lakes remains stable.

REFERENCES

Laxson, C., Croote, L., Stewart, C., Regalado, S., and Ketling, D. (2109). The State of Hamilton County Lakes: A 25 Year Perspective, 1993 – 2017. New York: Paul Smith's College Adirondack Watershed Institute.