Piseco Lake Conductivity Sweep

2018 Report

Prepared by
Lenny Croote, Conservation Technician
and
Caitlin Stewart, Conservation Educator

Hamilton County Soil and Water Conservation District
103 County View Drive, PO Box 166
Lake Pleasant NY 12108 518-548-3991
hcswcd@frontiernet.net www.hcswcd.com
Find us on Facebook and Vimeo

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

Introduction

Healthy water quality is essential to the integrity of Hamilton County. Henry David Thoreau wrote "A lake is the landscape's most beautiful and expressive feature. It is the earth's eye; looking into which the beholder measures the depth of his own nature. The fluvial trees next the shore are the slender eyelashes which fringe it, and the wooded hills and cliffs around are its overhanging brows." Surface waters, such as lakes, provide drinking water and recreational opportunities for humans. We enjoy lakes during the summer for paddling, boating, swimming, fishing, and water skiing, and during the winter for snowmobiling, ice fishing, skiing and snowshoeing. Lakes also provide habitat, breeding grounds, and food for aquatic organisms. A variety of plants, fish, birds, amphibians, reptiles, arthropods, and mammals make their home in these ecosystems. Lake water quality becomes degraded when pollutants are introduced, resulting in decreased dissolved oxygen, increased primary production, algal blooms, or degraded aesthetic beauty. Good water quality will help to continue to promote tourism throughout the county, provide local landowners enjoyment, and benefit the physical environment.

Conductivity is the ability of water to pass an electric current (Conductivity, 2006). The underlying geology of a lake designates the normal range of conductivity for that particular water body. Water temperature and the concentration of inorganic dissolved solids (IDS) influence conductivity. Examples of IDS include phosphate, nitrate, sodium, chloride, sulfate, bicarbonate, iron, calcium, magnesium, and potassium ions (Fedeler, 2004). These dissolved substances are necessary to help carry out the life processes of aquatic organisms, including the transportation of materials in and out of cells, the construction of new cells and the creation of energy (Water, 2010).

Scientists use conductivity measurements during water quality studies. Rain or snowmelt pick up ions from the land surface and deposit them in a lake, elevating conductivity. Ions may be directly discharged into a lake by a pipe or enter via runoff. Wastewater discharge with high salt levels, land clearing, fertilizers, and road salt contribute ions to lake ecosystems. A faulty sewage system near a lake will increase conductivity as chloride, phosphate, and nitrate enter the water body. IDS in high amounts act as pollutants, and cause elevated conductivity readings. Lakes polluted with IDS become useless for industrial and agricultural projects, and show declines in fish populations, as well as other aquatic plants and animals that cannot tolerate high levels of salt.

Site Description

Piseco Lake is located in the Town of Arietta, Hamilton County. The lake is in the Upper Hudson River watershed, with a watershed area of 38,023 ac and a surface area of 2,842 ac (Martin *et al.*, 2005). Maximum depth is 125 ft while mean depth is 58 ft. Lake volume is 164,836 ac/ft and shoreline length is 21.3 mi. The trophic state is classified as mesotrophic, indicating moderate water clarity, plant production, and nutrient levels. Piseco Lake falls under the class B fresh surface waters category rated by the New York State Department of Environmental Conservation, indicating that this lake may be used for wildlife, fish, and shellfish propagation and survival as well as secondary and primary contact recreation and fishing (New, 1993).

Methods

In 2009, 2010, 2011, 2012, 2015, 2016, 2017, and 2018, the Hamilton County Soil and Water Conservation District staff conducted a conductivity sweep of the shoreline of Piseco Lake. A YSI 650MDS data displayer and a YSI 6-series multiparameter water quality sonde were used to take lake water conductivity measurements. A motor boat, canoe, kayaks and walking were used to complete the shoreline sweep. A control measurement was taken for conductivity in the middle of the lake (designated as "Control" on Figure 1) with the sonde probe, and this reading was used as a comparison for conductivity readings taken along the shoreline. The shoreline sweep was completed as close to the shore as possible to prevent dilution found at deeper locations of the lake from impacting the study. An elevated reading is considered an increase of 25% from the control conductivity measurement. When an elevated reading was seen on the data displayer's screen, coordinates were recorded with a GPS, and then the District staff conducts a small investigating to attempt to locate the source.

Results and Conclusions

Tables 1 - 8 show the 2009, 2010, 2011, 2012, 2015, 2016, 2017 and 2018 conductivity measurements at the control site, and at sites where elevated conductivity readings occurred in Piseco Lake. Each year, sites are added or omitted to reflect the changing data. Refer to Figure 1 for a map of the site locations.

Elevated readings at sites 1-4 occurred at the same locations for both 2009 and 2010, with the addition of an elevated reading at site 5 in 2010. In 2011, elevated readings occurred at sites 1, 3, 4, and the newly noted site 6. The source of these elevated readings is inconclusive. Watersheds play a large role in the water quality parameters of a lake, including conductivity. Tributaries enter Piseco Lake at the locations of site 1, site 2, site 3 and site 4. These tributaries may pick up and carry inorganic dissolved solids (IDS) from their watersheds and deposit them into Piseco Lake, attributing to the elevated readings seen at these locations.

Site 3 showed readings that were 10 times greater than the control. Conductivity was measured at a few locations in the tributary that flows into site 3, and the measurements in this stream were 20 times greater than the control. The New York State Department of Transportation's salt storage facility may have contributed salts to the lake via runoff at site 3 in the past. In addition, runoff from Route 8 may contain ions that are transported into Piseco Lake at site 3. Studies have shown that road salt runoff contributes to elevated conductivity readings (Carthance). Finally, an old surface well was discovered adjacent to the stream. Conductivity sampling of the well water showed extremely high readings, indicating a pollution source at site 3.

The elevated reading at site 4 may be the result of the outlet of Oxbow Lake, as the conductivity levels of the lake were similar to the elevated measurement at this site.

The elevated reading seen at site 5 is inconclusive as no tributary was associated with this location.

The elevated reading seen at site 6 is inconclusive, as 2011 was the first year a spike was seen at this location.

In 2012, readings taken at sites 1-5 were comparable to previous years. The elevated reading seen at site 7 is inconclusive as 2015 was the first year a spike was noted. In 2015, sites 1, 3, 4, and 6 were similar to past data.

When Piseco Lake was surveyed in 2016, elevated readings where found at sites 1, 3, 4, and 6 that were slightly higher than in the past. This could be the result of low water levels due to the lack of precipitation.

In 2017, sites 1,_3,_4,and 6 were similar to readings from previous years. However, an elevated measurement was discovered at site 8.

In 2018, sites 1, 3, 4, and 5 had similar conductivity readings as in past years, but site 6 was about 3 times higher than previously recorded. There were multiple new sites including sites 9, 10, 11, 12, and 13.

Piseco Lake
Conductivity Sweep
Town of Arietta
County of Hamilton

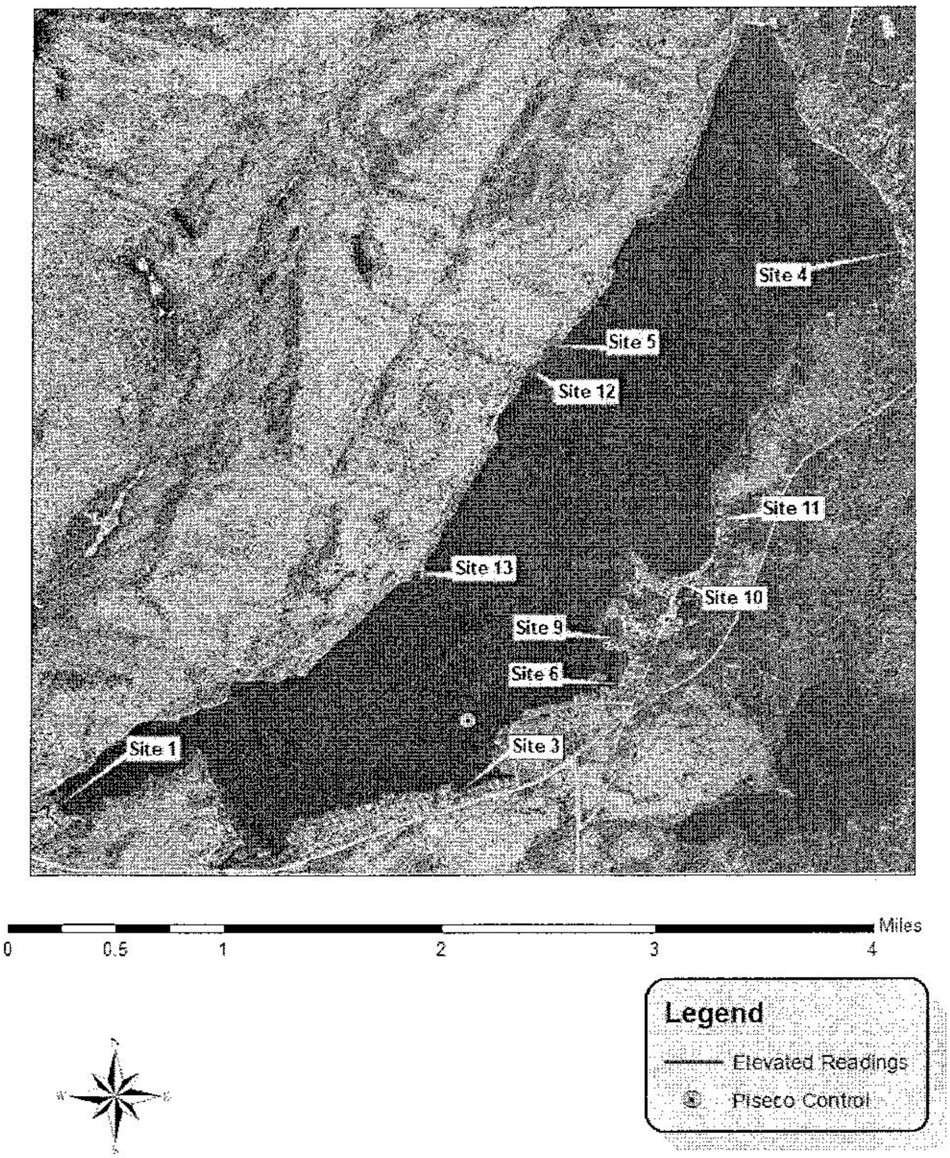

Figure 1. A map of the conductivity sweep of Piseco Lake.

Table 1. 2009 control and elevated conductivity measurements in Piseco Lake.	
Site	**Conductivity (ms/cm)**
Control	0.036
Site 1	0.056
Site 2	0.051
Site 3	0.356
Site 4	0.086

Table 2. 2010 control and elevated conductivity measurements in Piseco Lake.	
Site	**Conductivity (ms/cm)**
Control	.039
Site 1	.059
Site 2	.049
Site 3	.398
Site 4	.082
Site 5	.068

Table 3. 2011 control and elevated conductivity measurements in Piseco Lake.	
Site	**Conductivity (ms/cm)**
Control	.036
Site 1	.057
Site 3	.387
Site 4	.088
Site 6	.079

Table 4. 2012 control and elevated conductivity measurements in Piseco Lake.	
Site	**Conductivity (ms/cm)**
Control	.033
Site 1	.049
Site 2	.051
Site 3	.475
Site 4	.057
Site 5	.064

Table 5. 2015 control and elevated conductivity measurements in Piseco Lake.	
Site	**Conductivity (ms/cm)**
Control	.036
Site 1	.052
Site 3	.379
Site 4	.079
Site 6	.081
Site 7	.068

Table 6. 2016 control and elevated conductivity measurements in Piseco Lake.	
Site	**Conductivity (ms/cm)**
Control	.041
Site 1	.063
Site 3	.493
Site 4	.096
Site 6	.106

Table 7. 2017 control and elevated conductivity measurements in Piseco Lake.	
Site	**Conductivity (ms/cm)**
Control	.040
Site 1	.057
Site 3	.386
Site 4	.089
Site 6	..093
Site 8	.087

Table 8. 2018 control and elevated conductivity measurements in Piseco Lake.	
Site	**Conductivity (ms/cm)**
Control	.040
Site 1	.056
Site 3	.364
Site 4	.100
Site 5	.051
Site 6	.327
Site 9	.153
Site 10	.057
Site 11	.105
Site 12	.096
Site 13	.076

Abbreviations

ac	Acre
ac/ft	Acre per foot
ft	Foot
IDS	Inorganic dissolved solids
mi	Mile
ms/cm	Microsiemens per centimeter

References

Carthance Watershed Project. Retrieved November 12, 2010 from http://learn.bowdoin.edu/apps/hydrology/watersheds/book/export/html/941

Conductivity. 2006. Retrieved September 30, 2009, from the U.S. Environmental Protection Agency website: http://www.epa.gov/volunteer/stream/vms59.html

Fedeler, B. 2004. Teaching about conductivity. Retrieved September 30, 2009, from Water on the Web website: http://waterontheweb.org/curricula/bs/teacher/conduct/teaching.html

Martin, M., Ambrosino, C., Chaucer, A., Cook, D., Croote, L., Drew, I., Faville, M., Flanagan, L., Hanley, K., Mangle, E., McCarthy, K., Michasiow, C., Reynolds, J. & Stewart, C. 2005. The state of Hamilton County lakes a statistical analysis of water quality trends 1993-2003. 354 pp.

New York State Department of Environmental Conservation regulations. 1993. Chapter X division of water part 701: classifications-surface waters and groundwaters.

Water conductivity and total dissolved solids water quality sampling. Retrieved October 20, 2010, from ttp://txstreamteam.rivers.txstate.edu/Educators/Curriculum/content aragraph/0/text_files/file4/Curriculum%20lesson%205.pdf