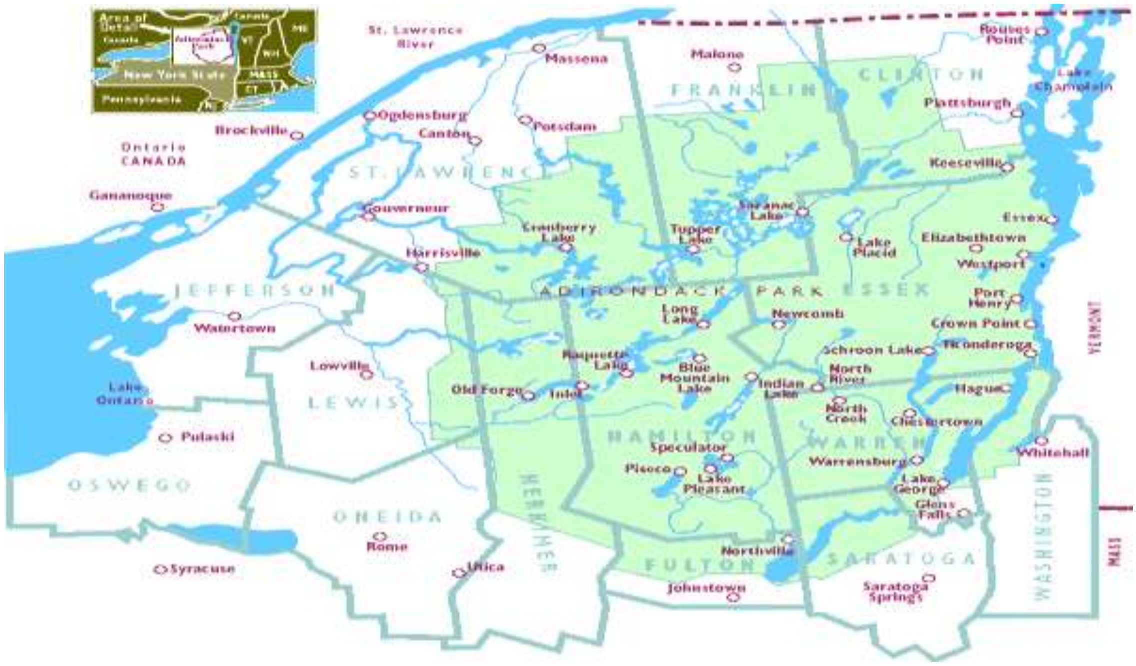
Adirondack Lake Assessment Program 2012



<u>**Fifteen Years in the program**</u>
Cranberry Lake, Loon Lake, Oven Mountain Pond, Blue Mountain Lake, Silver Lake, Eagle Lake
<u>**Fourteen Years in the program**</u>
Little Long Lake, Gull Pond, Stony Creek Ponds, Thirteenth Lake, Eli Pond
<u>**Thirteen Years in the program**</u>
Austin Pond, Osgood Pond, Middle Saranac Lake, White Lake, Brandreth Lake, Trout Lake
<u>**Twelve Years in the program**</u>
Hoel Pond, Tripp Lake, Sherman Lake, Wolf Lake, Twitchell Lake, Deer Lake, Arbutus Pond, Rich Lake, Catlin Lake, Pine Lake, Lake of the Pines, Pleasant Lake
<u>**Eleven Years in the program**</u>
Spitfire Lake, Upper St. Regis, Lower St. Regis, Garnet Lake, Lens Lake, Snowshoe Pond, Lake Ozonia, Long Pond, Lower Saranac Lake, Balfour Lake
<u>**Ten Years in the program**</u>
Raquette Lake, Lake Colby, Kiwassa Lake, Canada Lake
<u>**Nine Years in the program**</u>
Indian Lake, Big Moose Lake
<u>**Eight Years in the program**</u>
Dug Mountain Pond, Abanakee Lake, Moss Lake, Mountain View Lake, Indian Lake, Tupper Lake
<u>**Seven Years in the program**</u>
Sylvia Lake, Fern Lake, Hewitt Lake
<u>**Six Years in the program**</u>
Adirondack Lake, Lower Chateaugay Lake, Upper Chateaugay Lake, Lake Easka, Lake Tekeni
<u>**Five Years in the program**</u>
Simon Pond
<u>**Four Years in the program**</u>
Amber Lake, Jordan Lake, Otter Pond
<u>**Three Years in the program**</u>
Auger Lake, Lake Titus, Star Lake
<u>**Two Years in the program**</u>
Chapel Pond, Lake Durant, Upper Cascade Lake

Adirondack Lake Assessment Program

Sylvia Lake

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Author
Michael De Angelo

Project Participants
Michael De Angelo, Environmental Chemist, Aquatics Director of the AWI
Cory Laxson, Research Associate, AWI
Elizabeth Yerger, Laboratory and Field Technician, AWI

Prepared by:
The Adirondack Watershed Institute at Paul Smith's College
P.O. Box 265, Paul Smiths, NY 12970-0244
Phone: 518-327-6270; Fax: 518-327-6369; E-mail: mdeangelo@paulsmiths.edu

Program Management by:
Protect the Adirondacks! Inc.
P.O. Box 769
Lake George, NY 12845
Phone: 518-685-3088
E-mail: info@protectadks.org

Introduction

The Adirondack Lake Assessment Program is a volunteer monitoring program established by the Residents' Committee to Protect the Adirondacks (RCPA) and the Adirondack Watershed Institute (AWI). The program is now in its' fifteenth year. The program was established to help develop a current database of water quality in Adirondack lakes and ponds. There were 69 participating lakes in the program in year 2012.

Methodology

Each month participants (trained by AWI staff) measured transparency with a secchi disk and collected a 2-meter composite of lake water for chlorophyll-a analysis and a separate 2-meter composite for total phosphorus and other chemical analyses. The participants filtered the chlorophyll-a sample prior to storage. Both the chlorophyll-a filter and water chemistry samples were frozen for transport to the laboratory at Paul Smith's College.

In addition to the volunteer samples, AWI staff sampled water quality parameters in most of the participating lakes as time and weather allowed. In most instances, a 2-meter composite of lake water was collected for chlorophyll-a analysis. Samples were also collected at depths of 1.5 meters from the surface (epilimnion) and within 1.5 meters of the bottom (hypolimnion) for chemical analysis. Once collected, samples were stored in a cooler and transported to the laboratory at Paul Smith's College.

All samples were analyzed by AWI staff in the Paul Smith's College laboratory using the methods detailed in *Standard Methods for the Examination of Water and Wastewater, 21st edition* (Greenberg, *et al*, 2005). Volunteer samples were analyzed for pH, alkalinity, conductivity, color, nitrate, chlorophyll a and total phosphorus concentrations.

Results Summary

Sylvia Lake was sampled three times by a volunteer in 2012 at two locations. Samples were collected on the following dates at Station #1 Inlet and Station #2 Center: 6/30/12, 7/29/12 and 8/29/12. Results for 2012 are presented in Appendix A and will be discussed in the following sections. Results are presented as concentrations in milligrams per liter (mg/L) or its equivalent of parts per million (ppm) and micrograms per liter (μg/L) or its equivalent of parts per billion (ppb).

1 mg/L = 1 ppm; 1 μg/L = 1 ppb; 1 ppm = 1000 ppb.

Adirondack lakes are subject to the effects of acidic precipitation (i.e. snow, rain). A water body's susceptibility to acid producing ions is assessed by measuring pH, alkalinity, calcium concentrations, and the Calcite Saturation Index (CSI). These parameters define both the acidity of the water and its buffering capacity. Based on the results of the 2012 Adirondack Lake Assessment program, the acidity status of Sylvia Lake is considered to be satisfactory with no danger or possible future threat from further acidic inputs due to its' high alkalinity, high calcium level and high pH levels.

Limnologists, the scientists who study bodies of fresh water, classify lake health (trophic status) into three main categories: oligotrophic, mesotrophic, and eutrophic. The trophic status of a lake is determined by measuring the level of three basic water quality parameters: total phosphorus, chlorophyll-a, and secchi disk transparency. These parameters will be defined in the sections that follow. Oligotrophic lakes are characterized as having low levels of total phosphorus, and, as a consequence, low levels of chlorophyll-a and high transparencies. Eutrophic lakes have high levels of total phosphorus and chlorophyll-a, and, as a consequence, low transparencies. Mesotrophic lakes have moderate levels of all three of these water quality parameters. Based upon the results of the 2012 Adirondack Lake Assessment Program, Sylvia Lake is considered to be an oligotrophic water body.

pH

The pH level is a measure of acidity (concentration of hydrogen ions in water), reported in standard units on a logarithmic scale that ranges from 1 to 14. On the pH scale, 7 is neutral, lower values are more acidic, and higher numbers are more basic. In general, pH values between 6.0 and 8.0 are considered optimal for the maintenance of a healthy lake ecosystem. Many species of fish and amphibians have difficulty with growth and reproduction when pH levels fall below 5.5 standard units. Lake acidification status can be assessed from pH as follows:

pH less than 5.0	Critical or Impaired
pH between 5.0 and 6.0	Endangered or Threatened
pH greater than 6.0	Satisfactory or Acceptable

The pH in the upper waters of Sylvia Lake ranged from 7.87 to 8.17. The average pH for the lake center was 8.05 and for Inlet it was 7.98. Based solely on pH, Sylvia Lake's acidity levels should be considered satisfactory with no harm from further acidic inputs. The pH values for both stations were very similar.

Alkalinity

Alkalinity (acid neutralizing capacity) is a measure of the buffering capacity of water, and in lake ecosystems refers to the ability of a lake to absorb or withstand acidic inputs. In the northeast, most lakes have low alkalinities, which mean they are sensitive to the effects of acidic precipitation. This is a particular concern during the spring when large amounts of low pH snowmelt runs into lakes with little to no contact with the soil's natural buffering agents. Alkalinity is reported in milligrams per liter (mg/L) or microequivelents per liter (μeq/L). Typical summer concentrations of alkalinity in northeastern lakes are around 10 mg/l (200 μeq/L). Lake acidification status can be assessed from alkalinity as follows:

Alkalinity less than 0 mg/L	Acidified
Alkalinity between 0 and 2 mg/L	Extremely sensitive
Alkalinity between 2 and 10 mg/L	Moderately sensitive
Alkalinity between 10 and 25 mg/L	Low sensitivity
Alkalinity greater than 25 mg/L	Not sensitive

The alkalinity of the upper waters of Sylvia Lake ranged from 39.7 mg/L to 75.2 mg/L. The average alkalinity for the lake center was 61.4 mg/L, and for inlet it was 51.1 mg/L. These values indicate no sensitivity to acidification. The alkalinity for both stations was very similar but the inlet values were a little lower.

Calcium

Calcium is one of the buffering materials that occur naturally in the environment. However, it is often in short supply in Adirondack lakes and ponds, making these bodies of water susceptible to acidification by acid precipitation. Calcium concentrations provide information on the buffering capacity of that lake, and can assist in determining the timing and dosage for acid mitigation (liming) activities. Adirondack lakes containing less than 2.5 mg/L of calcium are considered to be sensitive to acidification.

The calcium in Sylvia Lake ranged from 19.5 mg/L to 26.3 mg/L. The average calcium concentration for the lake center was 23.7 mg/L and for the lake Inlet it was 23.8 mg/L. These values indicate no sensitivity due to further acidic inputs.

Calcite Saturation Index

The Calcite Saturation Index (CSI) is another method that is used to determine the sensitivity of a lake to acidification. High CSI values are indicative of increasing sensitivity to acidic inputs. CSI is calculated using the following formula:

$$CSI = -\log_{10} \frac{Ca}{40000} - \log_{10} \frac{Alk}{50000} - pH + 2$$

Where Ca = Calcium level of water sample in ppm or mg/L
Alk = Alkalinity of the water sample in ppm or mg/L
pH = pH of the water sample in standard units

Lake sensitivity to acidic inputs is assessed from CSI as follows:

CSI greater than 4	Very vulnerable to acidic inputs
CSI between 3 & 4	Moderately vulnerable to acidic inputs
CSI less than 3	Low vulnerability to acidic inputs

CSI values for Sylvia Lake were found to be 0.09 for the lake center and 0.24 for the lake inlet. This shows that Sylvia Lake has no vulnerability to further acidic inputs.

Total Phosphorus

Phosphorus is one of the three essential nutrients for life, and in northeastern lakes, it is often the controlling, or limiting, nutrient in lake productivity. Total phosphorus is a measure of all forms of phosphorus, both organic and inorganic. Total phosphorus concentrations are directly related to the trophic status (water quality conditions) of a lake. Excessive amounts of phosphorus can lead to algae blooms and a loss of dissolved oxygen within the lake. Surface water (epilimnion) concentrations of total phosphorus less than 0.010 mg/L are associated with oligotrophic (clean, clear water) conditions. Concentrations greater than 0.025 mg/L are associated with eutrophic (nutrient-rich) conditions.

The total phosphorus in the upper waters of Sylvia Lake ranged from 0.004 mg/L to 0.007 mg/L. The average for the lake center was 0.005 mg/L and for the lake inlet the average was 0.006 mg/L. These values are indicative of oligotrophic conditions for the lake center and oligotrophic for the inlet lake station.

Chlorophyll-a

Chlorophyll-a is the green pigment in plants used for photosynthesis, and measuring it provides information on the amount of algae (microscopic plants) in lakes. Chlorophyll-a concentrations are also used to classify a lakes trophic status. Concentrations less than 2 ug/L is associated with oligotrophic conditions and those greater than 8 ug/L are associated with eutrophic conditions.

The chlorophyll-a concentrations in the upper waters of Sylvia Lake ranged from 1.02 ug/L to 1.68 ug/L. The average concentration for the lake center was 1.36 ug/L and for the lake inlet it was 1.46 ug/L. These values are indicative of oligotrophic conditions for both lake stations.

Secchi Disk Transparency

Transparency is a measure of water clarity in lakes and ponds. It is determined by lowering a 20 cm black and white disk (Secchi) into a lake to the depth where it is no longer visible from the surface. This depth is then recorded in meters. Since algae are the main determinant of water clarity in non-stained, low turbidity (suspended silt) lakes, transparency is also used as an indicator of the trophic status of a body of water. Secchi disk transparencies greater than 4.6 meters (15.1 feet) are associated with oligotrophic conditions, while values less than 2 meters (6.6 feet) are associated with eutrophic conditions (DEC & FOLA, 1990).

Secchi disk transparency in Sylvia Lake ranged from 6.5 to 9.5 meters. The average for the lake center was 7.8 meters and for the lake inlet the average was 7.3 meters. These values are indicative of oligotrophic conditions for both lake stations.

Nitrate

Nitrogen is another essential nutrient for life. Nitrate is an inorganic form of nitrogen that is naturally occurring in the environment. It is also a component of atmospheric pollution. Nitrogen concentrations are usually less than 1 mg/L in most lakes. Elevated levels of nitrate concentration may be indicative of lake acidification or wastewater pollution.

Nitrate in Sylvia Lake ranged from 0.036 to 0.058 mg/L. The average nitrate in the upper waters was found to be 0.053 mg/L for the lake center and 0.051 mg/L for the lake inlet. These values are typical for an Adirondack lake.

Chloride

Chloride is an anion that occurs naturally in surface waters, though typically in low concentrations. Background concentrations of chloride in Adirondack Lakes are usually less than 1 mg/L. Chloride levels 10 mg/L and higher is usually indicative of pollution and, if sustained, can alter the distribution and abundance of aquatic plant and animal species. The primary sources of additional chloride in Adirondack lakes are road salt (from winter road de-icing) and wastewater (usually from faulty septic systems). The most salt impacted waters in the Adirondacks usually have chloride concentrations of 100 mg/L or less.

The chloride in the upper waters of Sylvia Lake ranged from 7.9 mg/L to 14.3 mg/L. The chloride concentration was 12.1 mg/L for the lake center and for the Inlet it was 12.8 mg/L. Both stations had similar elevated chloride levels which could be due to geology or road salt.

Conductivity

Conductivity is a measure of the ability of water to conduct electric current, and will increase as dissolved minerals build up within a body of water. As a result, conductivity is also an indirect measure of the number of ions in solution, mostly as inorganic substances. High conductivity values (greater than 50 µohms/cm) may be indicative of pollution by road salt runoff or faulty septic systems. Conductivities may be naturally high in water that drains from bogs or marshes. Eutrophic lakes often have conductivities near 100 µohms/cm, but may not be characterized by pollution inputs. Clean, clear-water lakes in our region typically have conductivities up to 30 µohms/cm, but values less than 50 µohms/cm are considered normal.

The conductivity in the upper waters of Sylvia Lake ranged from 132.7 µohms/cm to 208.0 µohms/cm. The average conductivity for the lake center was 180.9 µohms/cm, and for the inlet it was 182.2 µohms/cm. Both stations had similar elevated conductivity levels which could be due to geology or road salt.

Color

The color of water is affected by both dissolved materials (e.g., metallic ions, organic acids) and suspended materials (e.g., silt and plant pigments). Water samples are collected and compared to a set of standardized chloroplatinate solutions in order to assess the degree of coloration. The measurement of color is usually used in lake classification to describe the degree to which the water body is stained due to the accumulation of organic acids. The standard for drinking water color, as set by the United States Environmental Protection Agency (US EPA) using the platinum-cobalt method, is 15 Pt-Co. However, dystrophic lakes (heavily stained, often the color of tea) are common in this part of the country, and are usually found in areas with poorly drained soils and large amounts of coniferous vegetation (i.e., pines, spruce, hemlock). Dystrophic lakes usually have color values upwards of 75 Pt-Co.

Color can often be used as a possible index of organic acid content since higher amounts of total organic carbon (TOC) are usually found in colored waters. TOC is important because it can bond with aluminum in water, locking it up within the aquatic system and resulting in possible toxicity to fish (see Aluminum).

The color in the upper waters of Sylvia Lake ranged from 2 Pt-Co to 17 Pt-Co. The average color for the lake center was 9 Pt-Co and for the lake inlet it was 12.0 Pt-Co. Both stations had similar color levels.

Aluminum

Aluminum is one of the most abundant elements found within the earth's crust. Acidic runoff (from rainwater and snowmelt) can leach aluminum out of the soil as it flows into streams and lakes. If a lake is acidic enough, aluminum may also be leached from the sediment at the bottom of it. Low concentrations of aluminum can be toxic to aquatic fauna in acidified water bodies, depending on the type of aluminum available, the amount of dissolved organic carbon available to bond with the aluminum, and the pH of the water. Aluminum can form thick mucus that has been shown to cause gill destruction in aquatic fauna (i.e., fish, insects) and, in cases of prolonged exposure, can cause mortality in native fish populations (Potter, 1982). Aluminum concentrations are reported as mg/L of total dissolved aluminum.

The aluminum in the upper waters of Sylvia Lake ranged from 0.092 mg/L to 0.134 mg/L. The average aluminum for the lake center was 0.109 mg/L and for the lake inlet it was 0.101 mg/L. Both stations had similar aluminum levels and these values were very low for both lake stations.

Dissolved Oxygen

The dissolved oxygen in a lake is an extremely important parameter to measure. If dissolved oxygen decreases as we approach the bottom of a lake we know that there is a great amount of bacterial decay that is going on. This usually means that there is an abundance of nutrients, like phosphorous that have collected on the lake bottom. Oligotrophic lakes tend to have the same amount of dissolved oxygen from the surface waters to the lake bottom, thus showing very little bacterial decay. Eutrophic lakes tend to have so much decay that their bottom waters will have very little dissolved oxygen. Cold-water fish need 6.0 ppm dissolved oxygen to thrive and reproduce. Warm water fish need 4.0 ppm oxygen.

The dissolved oxygen profiles for 2007 and 2008 are included in the appendix for both the center deep hole and the inlet area. There was greater than 8 ppm dissolved oxygen at both locations and this value actually increased with depth. These values are excellent for cold water fish survival. A profile was not run in 2009 - 2012 due to the lack of a site visit.

Summary

Sylvia Lake was an unproductive oligotrophic lake at both stations during 2012. Based on the results of the 2007 – 2012 Adirondack Lake Assessment program, the acidity status of Sylvia Lake is considered to be satisfactory with no possible future threat from further acidic inputs due to its' high alkalinity, calcium and pH levels. Both stations showed similar results for all tests performed. The dissolved oxygen levels were excellent for cold water fish survival.

If we look at the yearly averages for total precipitation in the Adirondacks, the amount of precipitation last year was normal. We had a very dry spring and early summer followed by a very wet late summer and fall. During the previous year, 2011, we had record precipitation that was way above average. We had a very wet winter, spring and summer. Some of the changes to water quality on Simon Pond could have been weather related.

Graphs showing trends in Sylvia Lake over the last seven years are included in Appendix A. When comparing the results for 2006 – 2012, the pH, conductivity, color, nitrate, and calcium have stayed very steady due to the large amount of buffers found in the waters of Sylvia Lake. The total phosphorous and chlorophyll a are lower this past year due to lack of rain and runoff. This has led to less algal growth and increased Secchi disk transparency this past year.

This past summer was very dry which meant less runoff and thus less nutrients like total phosphorous and nitrate entering the waters of Sylvia Lake. This led to much less algal growth and much lower chlorophyll-a concentrations. This also meant that conductivity, nitrate, calcium and chloride concentrations were very stable. When comparing the lake center to the lake inlet station, we see oligotrophic conditions for the lake center station and the same oligotrophic conditions for the lake inlet station this past year. For 2012, the conditions for both stations were very similar. This is most likely due to less runoff from the surrounding watershed that is entering the lake through the inlet.

Literature Cited

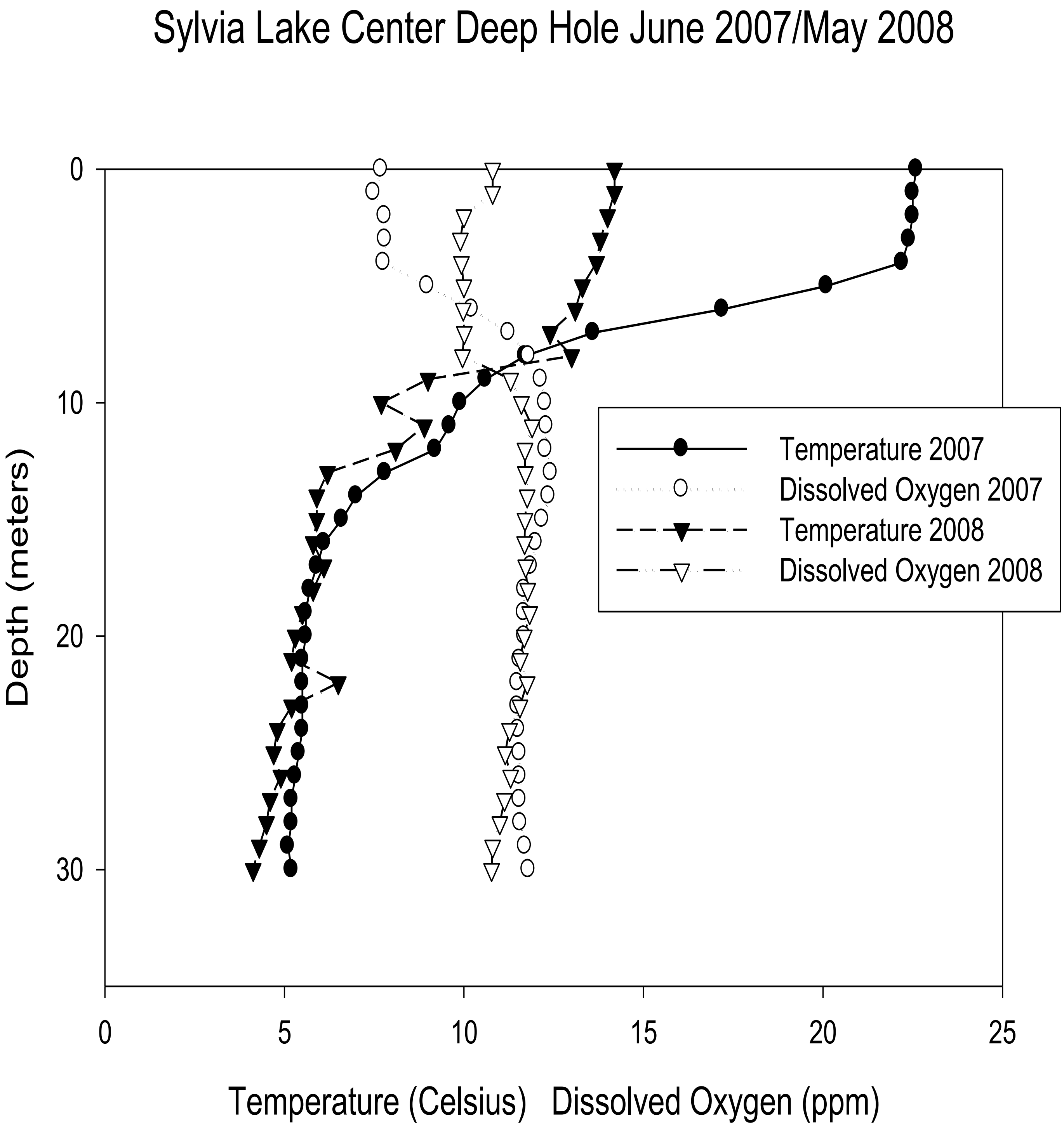
DEC & FOLA. (1990). Diet for a Small Lake: A New Yorker's Guide to Lake Management. New York State Department of Environmental Conservation & The Federation of Lake Associations, Inc.: Albany, New York.

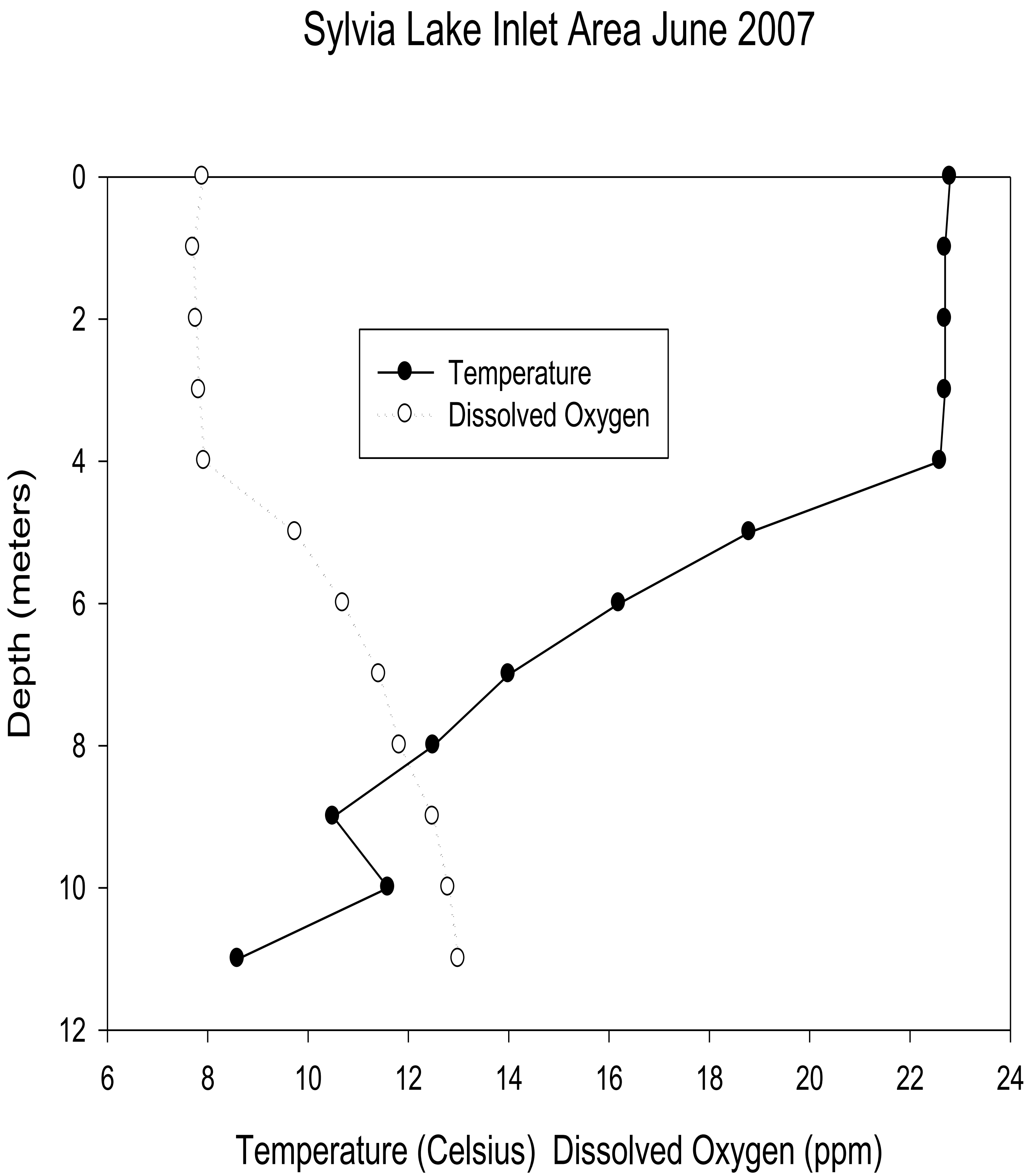
Greenberg, A.E., Eaton, A.D., and Leseri, L.A. (editors). (2005). Standard Methods for the Examination of Water and Wastewater, 21st Edition. American Public Health Association: Washington, D.C.

Potter, W. (1982). *The Effects of Air Pollution and Acid Rain on Fish, Wildlife and Their Habitats – Lakes*. Technical Report FWS/OBS – 80/50.4. United States Fish and Wildlife Service, Biological Services Program: Washington, D.C.

Appendix A

Water Quality Data


Sylvia Lake Center Deep Hole June 2007/May 2008
Depth (meters)
0
10
20
30
0
5
10
15
20
25
Temperature (Celsius) Dissolved Oxygen (ppm)
Temperature 2007
Dissolved Oxygen 2007
Temperature 2008
Dissolved Oxygen 2008


Sylvia Lake Inlet Area June 2007
Temperature
Dissolved Oxygen
Depth (meters)
0
2
4
6
8
10
12
6
8
10
12
14
16
18
20
22
24
Temperature (Celsius) Dissolved Oxygen (ppm)

Source	Lake Name	Location	Station	Date	pH	Alk mg/L	Cond µohms/cm	Color Pt-Co	TP mg/L
Vol	Sylvia Lake	Marsh		7/17/2006	7.69	102.4	210.0	23.0	0.008
Vol	Sylvia Lake	Marsh		8/18/2006	7.61	112.0	216.0	10.0	0.011
Vol	Sylvia Lake	Marsh		9/21/2006	7.58	84.4	174.7	17.0	0.009
				Mean	7.63	99.6	200.2	16.7	0.009
				Std Dev	0.06	14.0	22.3	6.5	0.002
Vol	Sylvia Lake	Center		7/24/2006	7.39	124.4	227.0	22.0	0.011
Vol	Sylvia Lake	Center		8/21/2006	7.88	120.4	200.0	10.0	0.008
Vol	Sylvia Lake	Center		9/21/2006	7.56	79.6	161.6	10.0	0.007
				Mean	7.61	108.1	196.2	14.0	0.009
				Std Dev	0.25	24.8	32.9	6.9	0.002
AWI	Sylvia Lake	Center	epi	6/21/2007	7.97	142.0	232.0	0.0	0.008
Vol	Sylvia Lake	Center	2	7/6/2007	7.87	134.6	194.6	19.0	0.011
Vol	Sylvia Lake	Center	2	8/4/2007	7.85	132.2	174.8	3.0	0.009
Vol	Sylvia Lake	Center	2	9/7/2007	7.77	124.8	196.0	0.0	0.011
				Mean	7.83	130.5	188.5	7.3	0.010
				Std Dev	0.05	5.1	11.9	10.2	0.001
AWI	Sylvia Lake	Center	hypo	6/21/2007	7.55	110.0	232.0	1.0	0.009
AWI	Sylvia Lake	Center	epi	5/26/2008	7.81	135.6	236.0	0.0	0.010
Vol	Sylvia Lake	Center	2	6/25/2008	8.13	140.2	215.0	28.0	0.006
Vol	Sylvia Lake	Center	2	8/5/2008	8.17	138.8	201.0	0.0	0.009
Vol	Sylvia Lake	Center	2	9/3/2008	8.21	140.4	154.0	2.0	0.010
				Mean	8.08	138.8	201.5	7.5	0.009
				Std Dev	0.18	2.2	34.8	13.7	0.002
AWI	Sylvia Lake	Center	hypo	5/26/2008	7.95	140.4	235.0	1.0	0.008
Vol	Sylvia Lake	Center	2	6/28/2009	7.95	144.0	169.6	14.0	0.005
Vol	Sylvia Lake	Center	2	7/30/2009	7.48	74.2	148.7	20.0	0.008
Vol	Sylvia Lake	Center	2	8/25/2009	7.72	125.2	118.5	11.0	0.011
				Mean	7.72	114.5	145.6	15.0	0.008
				Std Dev	0.24	36.1	25.7	4.6	0.003
Vol	Sylvia Lake	Center	2	7/8/2010	8.32	154.0	170.5	0.0	0.008
Vol	Sylvia Lake	Center	2	8/7/2010	8.12	138.0	199.9	14.0	0.011
Vol	Sylvia Lake	Center	2	9/1/2010	8.02	136.0	185.0	20.0	0.009
				Mean	8.15	142.7	185.1	11.3	0.009
				Std Dev	0.15	9.9	14.7	10.3	0.002
Vol	Sylvia Lake	Center	2	6/27/2011	7.60	97.2	192.6	11.0	0.010
Vol	Sylvia Lake	Center	2	7/22/2011	7.20	82.8	176.2	16.0	0.006
Vol	Sylvia Lake	Center	2	8/26/2011	7.40	90.0	190.0	47.0	0.010
				Mean	7.40	90.0	186.3	24.7	0.009
				Std Dev	0.20	7.2	8.8	19.5	0.002

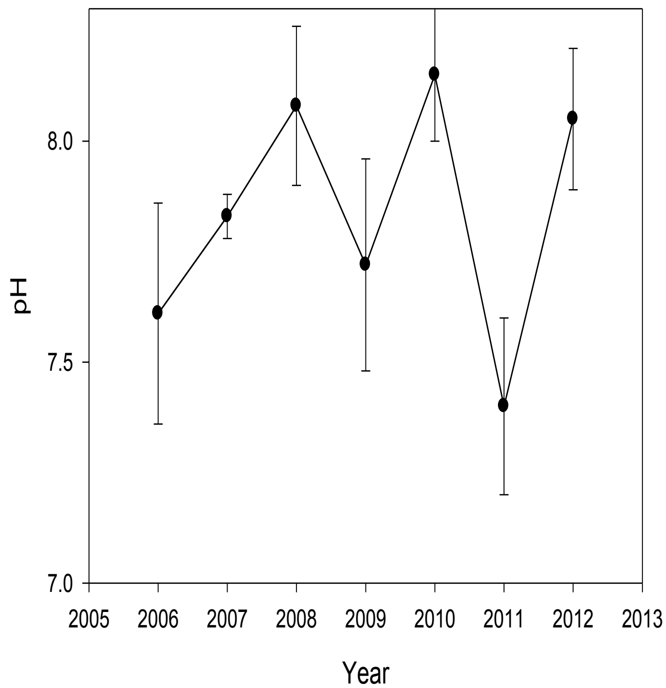
Source	Lake Name	Location	Station	Date	pH	Alk mg/L	Cond µohms/cm	Color Pt-Co	TP mg/L
Vol	Sylvia Lake	Center	2	6/30/2012	7.87	39.7	132.7	17.0	0.005
Vol	Sylvia Lake	Center	2	7/29/2012	8.17	75.2	208.0	8.0	0.007
Vol	Sylvia Lake	Center	2	8/29/2012	8.12	69.4	202.0	2.0	0.004
				Mean	8.05	61.4	180.9	9.0	0.005
				Std Dev	0.16	19.0	41.9	7.5	0.002
Vol	Sylvia Lake	Inlet	1	7/24/2006	7.88	113.2	211.0	10.0	0.013
Vol	Sylvia Lake	Inlet	1	8/21/2006	7.93	86.0	176.5	10.0	0.010
Vol	Sylvia Lake	Inlet	1	9/21/2006	7.98	103.6	208.0	10.0	0.007
				Mean	7.93	100.9	198.5	10.0	0.010
				Std Dev	0.05	13.8	19.1	0.0	0.003
AWI	Sylvia Lake	Inlet	epi	6/21/2007	7.70	137.0	232.0	0.0	0.008
Vol	Sylvia Lake	Inlet	1	7/6/2007	7.77	124.8	192.2	4.0	0.010
Vol	Sylvia Lake	Inlet	1	8/4/2007	7.74	122.8	130.4	21.0	0.008
Vol	Sylvia Lake	Inlet	1	9/7/2007	7.88	128.6	152.6	0.0	0.011
				Mean	7.80	125.4	158.4	8.3	0.010
				Std Dev	0.07	2.9	31.3	11.2	0.002
AWI	Sylvia Lake	Inlet	hypo	6/21/2007	7.72	139.0	232.0	1.0	0.008
Vol	Sylvia Lake	Inlet	1	6/25/2008	7.79	138.0	228.0	27.0	0.006
Vol	Sylvia Lake	Inlet	1	8/5/2008	8.44	146.0	176.0	0.0	0.012
Vol	Sylvia Lake	Inlet	1	9/3/2008	7.62	122.0	162.0	13.0	0.011
				Mean	7.95	135.3	188.7	13.3	0.010
				Std Dev	0.43	12.2	34.8	13.5	0.003
Vol	Sylvia Lake	Inlet	1	6/28/2009	7.63	118.8	222.0	25.0	0.008
Vol	Sylvia Lake	Inlet	1	7/30/2009	7.69	123.6	226.0	22.0	0.014
Vol	Sylvia Lake	Inlet	1	8/25/2009	7.66	122.8	193.3	17.0	0.012
				Mean	7.66	121.7	213.8	21.3	0.011
				Std Dev	0.03	2.6	17.8	4.0	0.003
Vol	Sylvia Lake	Inlet	1	7/8/2010	8.31	152.0	195.9	17.0	0.011
Vol	Sylvia Lake	Inlet	1	8/7/2010	8.14	139.0	190.6	28.0	0.013
Vol	Sylvia Lake	Inlet	1	9/1/2010	7.89	129.0	147.0	21.0	0.01
				Mean	8.11	140.0	177.8	22.0	0.011
				Std Dev	0.21	11.5	26.8	5.6	0.002

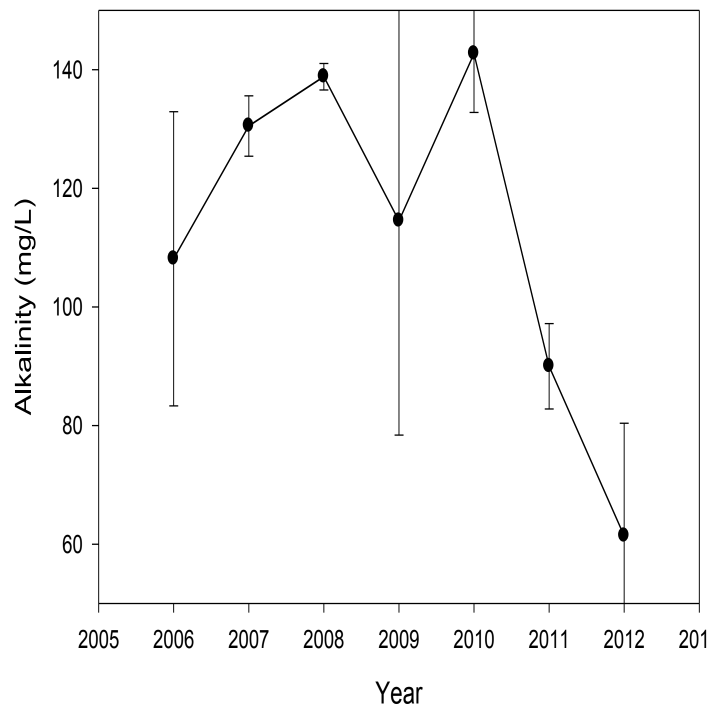
Source	Lake Name	Location	Station	Date	pH	Alk mg/L	Cond µohms/cm	Color Pt-Co	TP mg/L
Vol	Sylvia Lake	Inlet	1	6/27/2011	7.52	93.2	162.2	1.0	0.006
Vol	Sylvia Lake	Inlet	1	7/22/2011	7.66	88.4	187.0	33.0	0.011
Vol	Sylvia Lake	Inlet	1	8/26/2011	7.43	107.6	202.0	18.0	0.008
				Mean	7.54	96.4	183.7	17.3	0.008
				Std Dev	0.12	10.0	20.1	16.0	0.003
Vol	Sylvia Lake	Inlet	1	6/30/2012	8.02	51.3	196.7	12.0	0.005
Vol	Sylvia Lake	Inlet	1	7/29/2012	8.04	56.9	183.9	2.0	0.006
Vol	Sylvia Lake	Inlet	1	8/29/2012	7.89	45.1	166.0	22.0	0.006
				Mean	7.98	51.1	182.2	12.0	0.006
				Std Dev	0.08	5.9	15.4	10.0	0.001

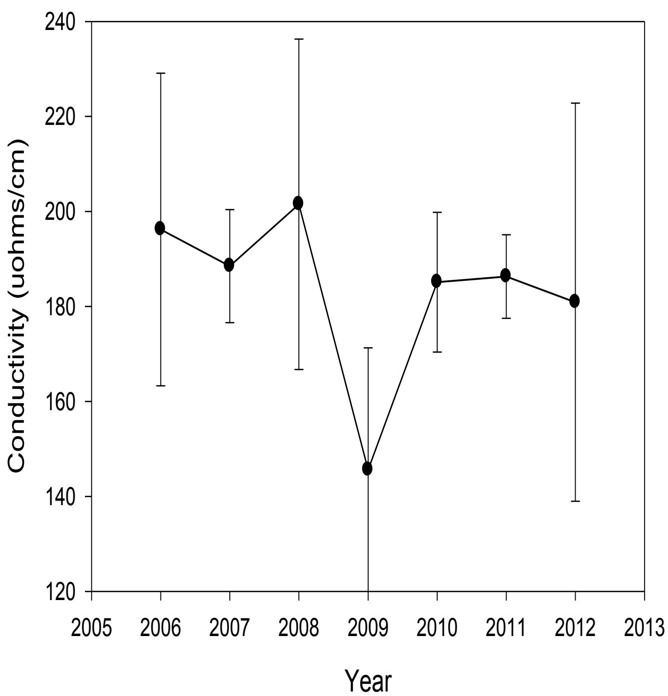
Location	Date	Secchi (meters)	Nitrate mg/L	Chloride mg/L	Calcium mg/L	Aluminum mg/L	Chl A µg/L
Marsh	7/17/2006	6.5	0.00	14.0			1.64
Marsh	8/18/2006	5.0	0.00	15.0			2.45
Marsh	9/21/2006	6.0	0.10	12.0			1.84
	Mean	5.8	0.03	13.7			1.98
	Std Dev	0.8	0.06	1.5			0.42
Center	7/24/2006	5.0	0.00	15.0			2.43
Center	8/21/2006	6.3	0.00	14.0			1.84
Center	9/21/2006	6.5	0.10	10.0			1.47
	Mean	5.9	0.03	13.0			1.91
	Std Dev	0.8	0.06	2.6			0.48
epi	6/21/2007	6.4	0.00	17.0		0.00	1.87
	7/6/2007	5.0	0.00				2.04
	8/4/2007	6.0	0.00				1.95
	9/7/2007	5.5	0.00				2.12
	Mean	5.5	0.00				2.04
	Std Dev	0.5	0.00				0.09
hypo	6/21/2007		0.10	20.0		0.00	
epi	5/26/2008	4.2	0.00	21.0	18.2	0.00	3.12
	6/25/2008	7.0	0.20				1.43
	8/5/2008	5.5	0.20				1.89
	9/3/2008	5.0	0.10				2.05
	Mean	5.4	0.13	21.0			2.12
	Std Dev	1.2	0.10				0.72
hypo	5/26/2008	x	0.00	21.0	18.6	0.00	x
Center	6/28/2009	7.5	0.10	11.0	19.1	0.00	1.21
Center	7/30/2009	6.0	0.60				1.82
Center	8/25/2009	5.0	0.00				2.23
	Mean	6.2	0.23				1.75
	Std Dev	1.3	0.32				0.51
Center	7/8/2010	5.5	0.24	14.9	26.9	0.00	1.72
Center	8/7/2010	4.5	0.20	14.4	23.9	0.00	2.96
Center	9/1/2010	5.0	0.20	15.0	25.0	0.00	1.98
	Mean	5.0	0.21	14.8	25.3	0.00	2.22
	Std Dev	0.5	0.02	0.3	1.5	0.00	0.65
Center	6/27/2011	6.5	0.209	14.0	20.6	0.016	1.44
Center	7/22/2011	5.5	0.147	15.6	18.3	0.010	1.78
Center	8/26/2011	4.5	0.168	14.6	20.0	0.023	2.81
	Mean	5.5	0.175	14.7	19.6	0.016	2.01
	Std Dev	1.0	0.032	0.8	1.2	0.007	0.71

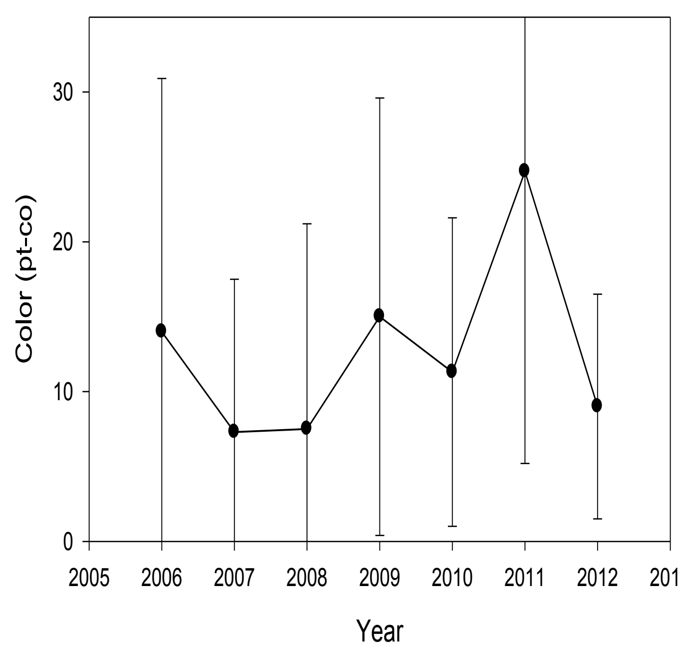
Location	Date	Secchi (meters)	Nitrate mg/L	Chloride mg/L	Calcium mg/L	Aluminum mg/L	Chl A µg/L
Center	6/30/2012	7.5	0.058	7.9	19.5	0.134	1.38
Center	7/29/2012	6.5	0.064	14.3	25.2	0.092	1.68
Center	8/29/2012	9.5	0.036	14.2	26.3	0.100	1.02
	Mean	7.8	0.053	12.1	23.7	0.109	1.36
	Std Dev	1.5	0.015	3.7	3.6	0.022	0.33
Inlet	7/24/2006	4.7	0.10	15.0			2.75
Inlet	8/21/2006	5.4	0.00	12.0			1.89
Inlet	9/21/2006	6.5	0.00	15.0			1.57
	Mean	5.5	0.03	14.0			2.07
	Std Dev	0.9	0.06	1.7			0.61
Inlet	6/21/2007	7.0	0.10	16.0		0.00	1.77
	7/6/2007	5.5	0.10				1.98
	8/4/2007	6.0	0.00				1.89
	9/7/2007	5.0	0.00				2.12
	Mean	5.5	0.03				2.00
	Std Dev	0.5	0.06				0.12
Inlet	6/21/2007		0.00	16.0			
Inlet	6/25/2008	7.0	0.20				1.75
	8/5/2008	4.3	0.10				3.07
	9/3/2008	4.5	0.10				2.57
	Mean	5.3	0.13				2.46
	Std Dev	1.5	0.06				0.67
Inlet	6/28/2009	6.0	0.00	17.0	17.4	0.00	1.87
	7/30/2009	4.5	0.00				2.67
	8/25/2009	4.8	1.00				2.25
	Mean	5.1	0.33				2.26
	Std Dev	0.8	0.58				0.40
Inlet	7/8/2010	4.5	0.240	13.8	26.9	0.03	3.01
	8/7/2010	4.0	0.170	12.0	24.0	0.03	4.04
	9/1/2010	5.0	0.189	12.6	22.3	0.07	1.98
	Mean	4.5	0.200	12.8	24.4	0.04	3.01
	Std Dev	0.5	0.036	0.9	2.3	0.02	1.03

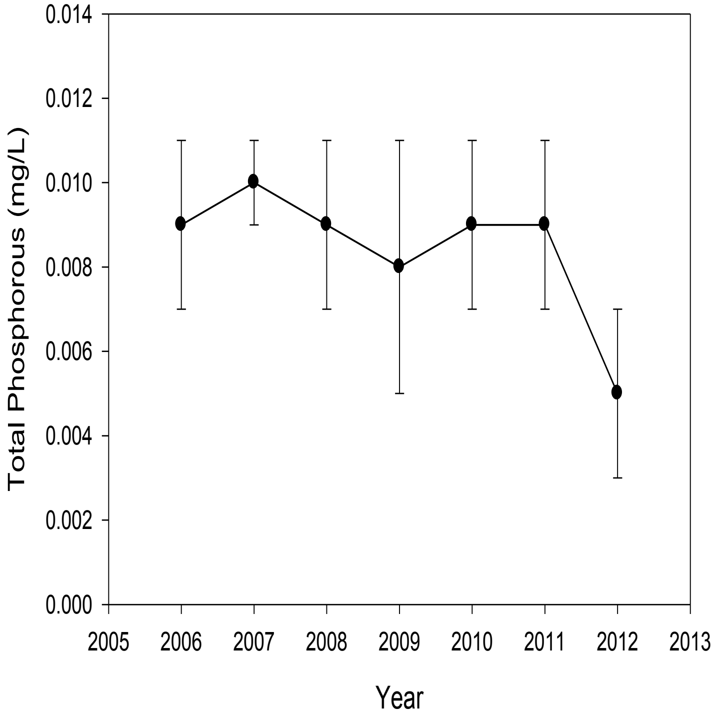
Location	Date	Secchi (meters)	Nitrate mg/L	Chloride mg/L	Calcium mg/L	Aluminum mg/L	Chl A µg/L
Inlet	6/27/2011	6.5	0.204	11.7	19.8	0.010	1.81
	7/22/2011	5.0	0.123	13.4	20.0	0.022	1.97
	8/26/2011	4.5	0.164	14.0	23.6	0.098	2.87
	Mean	5.3	0.164	13.0	21.1	0.043	2.22
	Std Dev	1.0	0.041	1.2	2.1	0.048	0.57
Inlet	6/30/2012	7.0	0.075	14.2	25.0	0.095	1.52
	7/29/2012	6.0	0.053	14.0	24.2	0.108	1.72
	8/29/2012	9.0	0.024	10.3	22.4	0.101	1.13
	Mean	7.3	0.051	12.8	23.8	0.101	1.46
	Std Dev	1.5	0.026	2.2	1.4	0.007	0.30

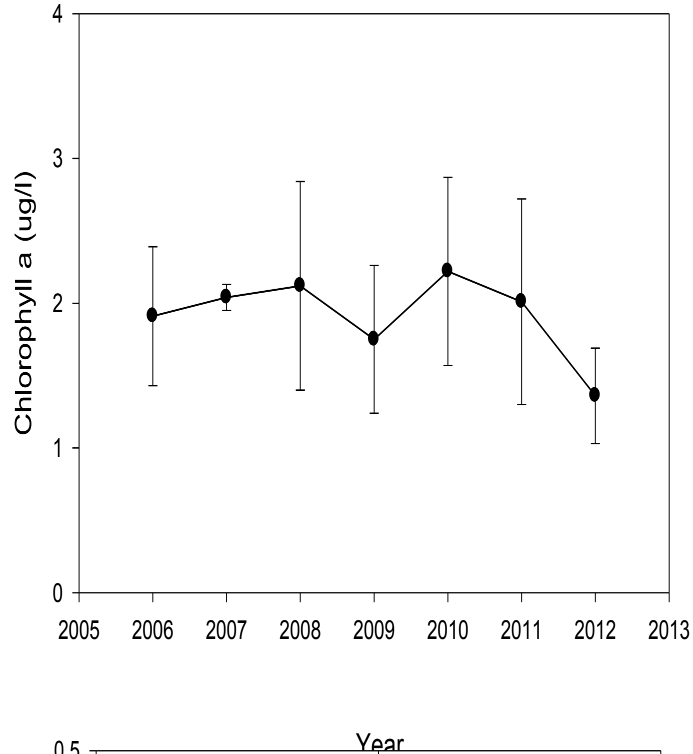

pH
7.0
7.5
8.0
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year

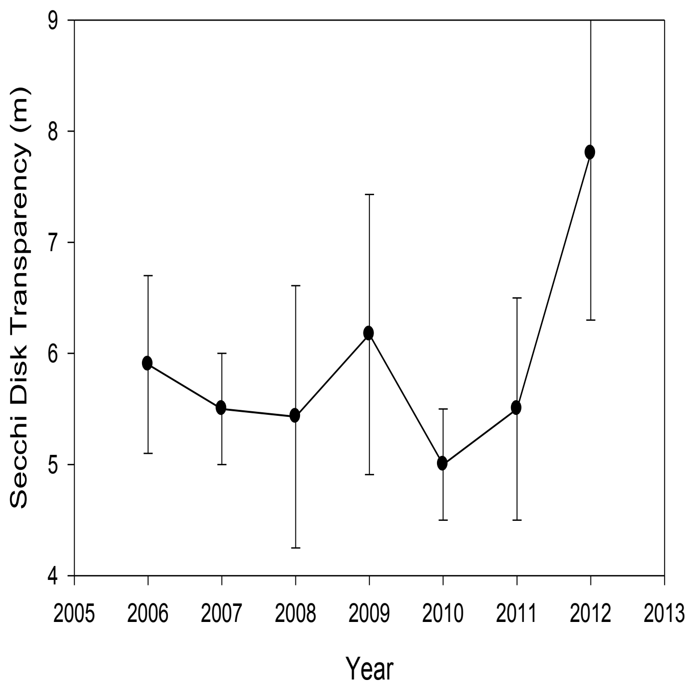

Alkalinity (mg/L)
60
80
100
120
140
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year

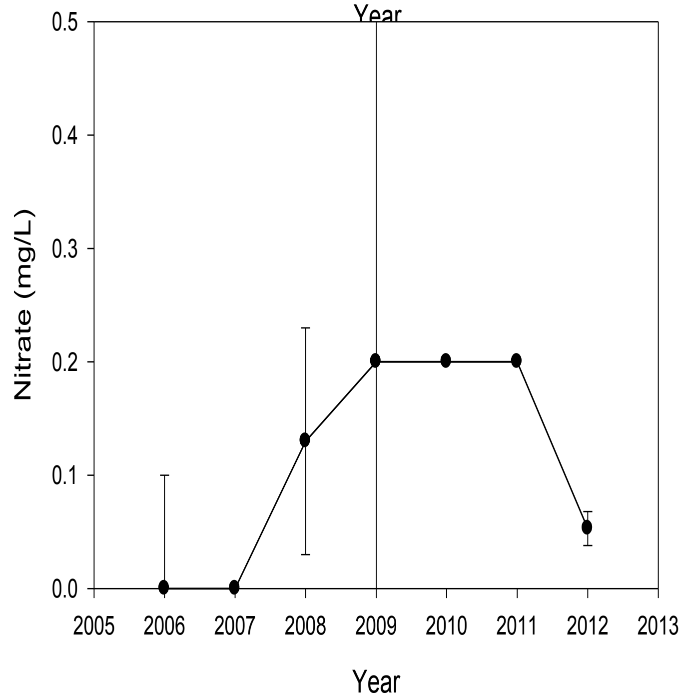

Conductivity (uohms/cm)
120
140
160
180
200
220
240
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year

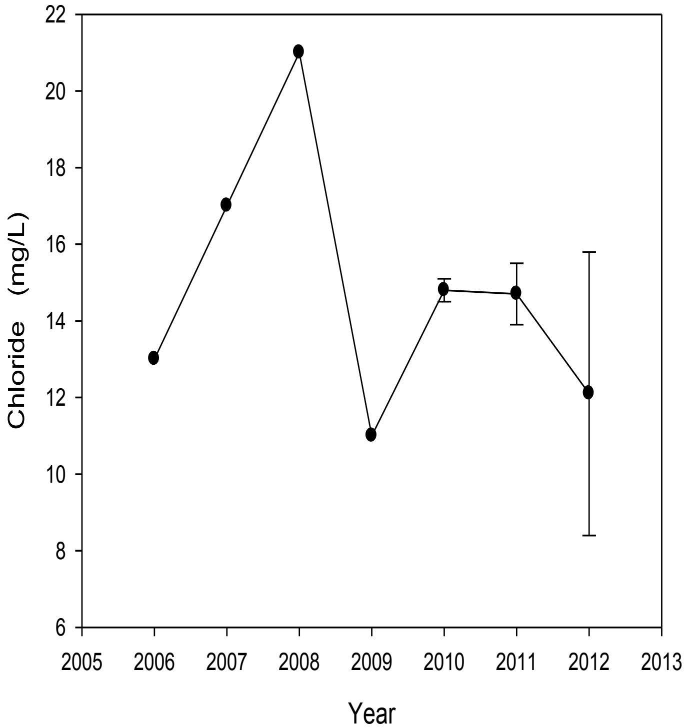

Color (pt-co)
0
10
20
30
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year

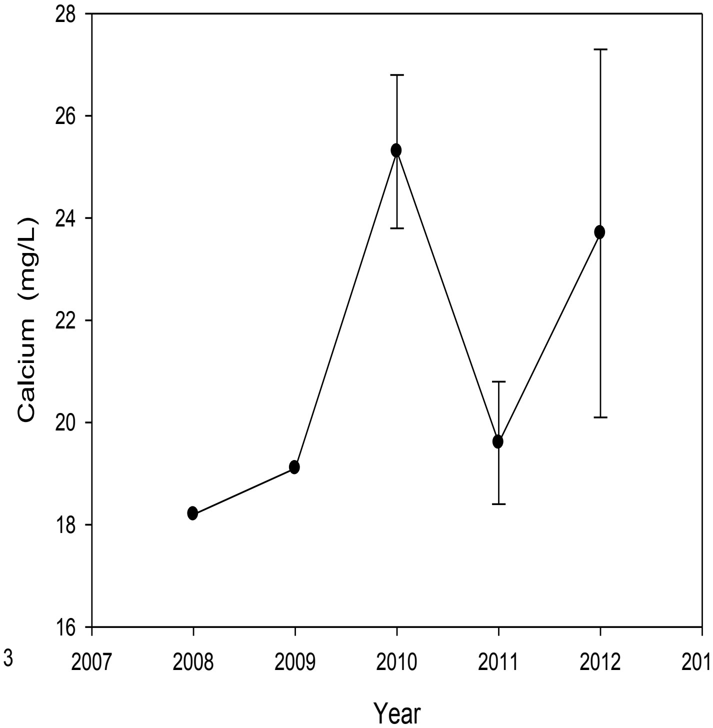

Total Phosphorous (mg/L)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
0.014
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year

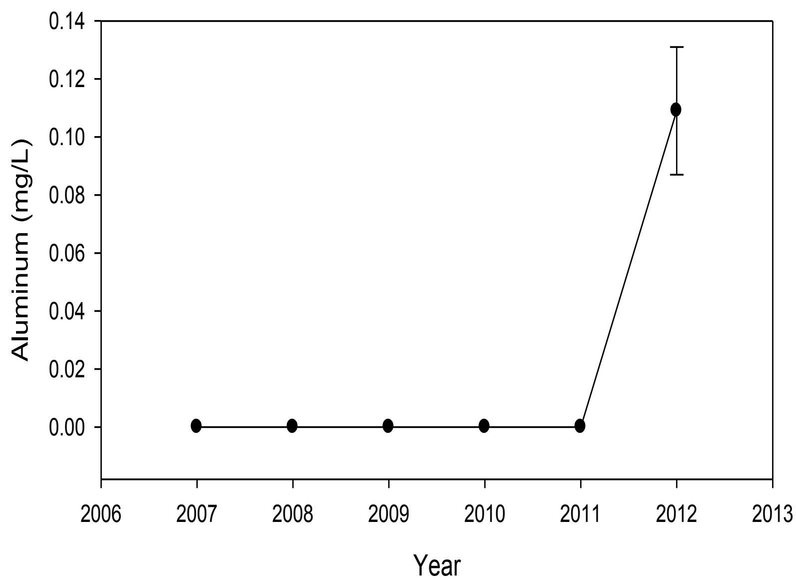

Chlorophyll a (ug/l)
0
1
2
3
4
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year


Secchi Disk Transparency (m)
4
5
6
7
8
9
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year


Nitrate (mg/L)
0.0
0.1
0.2
0.3
0.4
0.5
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year


Chloride (mg/L)
Year
22
20
18
16
14
12
10
8
6
2005
2006
2007
2008
2009
2010
2011
2012
2013


Calcium (mg/L)
Year
28
26
24
22
20
18
16
2007
2008
2009
2010
2011
2012
2013


Aluminum (mg/L)
Year
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
2006
2007
2008
2009
2010
2011
2012
2013