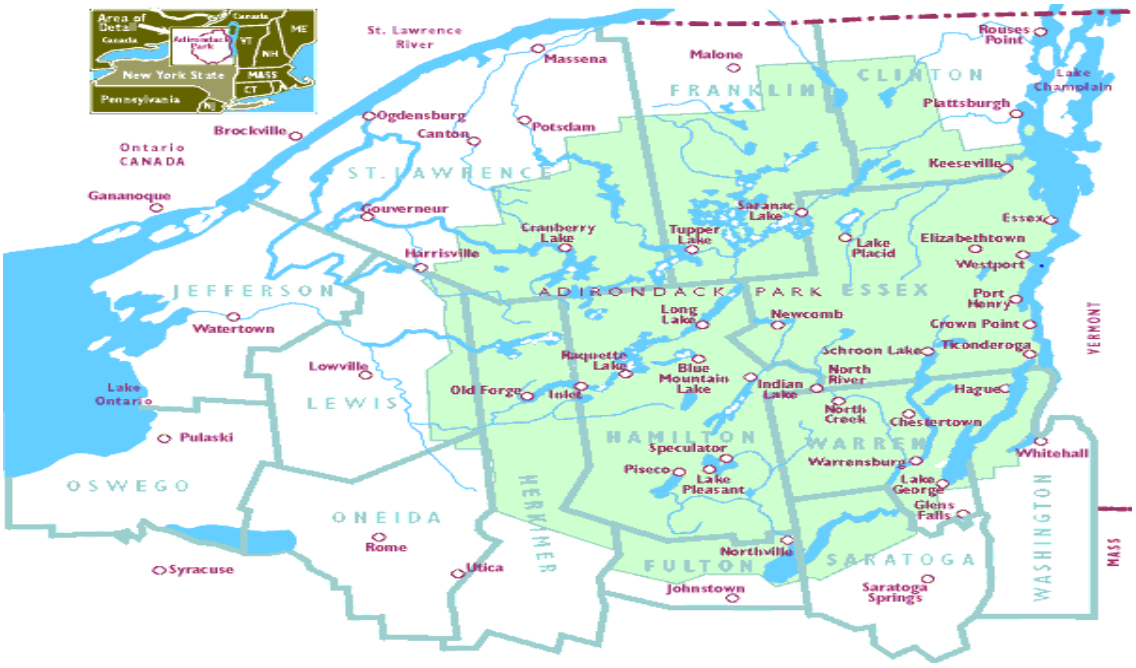
Adirondack Lake Assessment Program
2010



<u>Thirteen Years in the program</u>
Cranberry Lake, Loon Lake, Oven Mountain Pond, Blue Mountain Lake, Silver Lake, Eagle Lake
<u>Twelve Years in the program</u>
Little Long Lake, Gull Pond, Stony Creek Ponds, Thirteenth Lake, Eli Pond
<u>Eleven Years in the program</u>
Austin Pond, Osgood Pond, Middle Saranac Lake, White Lake, Brandreth Lake, Trout Lake
<u>Ten Years in the program</u>
Hoel Pond, Great Sacandaga Lake, 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>Nine 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
<u>Eight Years in the program</u>
Raquette Lake, Lake Colby, Kiwassa Lake, Canada Lake
<u>Seven Years in the program</u>
Indian Lake, Schroon Lake, Lake Eaton, Chazy Lake, Big Moose Lake
<u>Six Years in the program</u>
Dug Mountain Pond, Seventh Lake, Abanakee Lake, Moss Lake, Mountain View Lake, Indian Lake, Tupper Lake
<u>Five Years in the program</u>
Sylvia Lake, Fern Lake
<u>Four Years in the program</u>
Adirondack Lake, Lower Chateaugay Lake, Upper Chateaugay Lake, Lake Easka, Lake Tekeni
<u>Three Years in the program</u>
Simon Pond
<u>Two Years in the program</u>
Amber Lake, Jordan Lake, Otter Pond, Rondaxe Lake
<u>One Year in the program</u>
Auger Lake, Lake Titus, Star Lake

Adirondack Lake

Assessment Program

Chazy Lake

Summer 2010

January 2011

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 244, 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 1180
Saranac Lake, NY 12983
E-mail: ALAP@protectadks.org

© The Adirondack Watershed Institute 2011

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' thirteenth year. The program was established to help develop a current database of water quality in Adirondack lakes and ponds. There were 70 participating lakes in the program in 2010.

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. Samples taken by AWI staff were analyzed for the same parameters, as well as for calcium, chloride, and aluminum concentrations.

Results Summary

Chazy Lake was sampled five times by volunteers at three locations in 2010. Samples were collected on the following dates: 5/08/10, 6/11/10, 7/08/10, 8/07/10 and 9/01/10. Results for year 2010 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 waterbody'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 year 2010 Adirondack Lakes Assessment program, the acidity status of Chazy Lake is considered not threatened at this time. The pH values are satisfactory, the CSI value indicates low vulnerability

to acidic inputs, the alkalinity values indicate no sensitivity to acidification and the calcium levels are currently high enough to help buffer the lake as well.

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 year 2010 Adirondack Lakes Assessment Program, Chazy Lake is considered to be a late oligotrophic to early mesotrophic 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 Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 7.08, 7.06 and 7.08 respectively. Based solely on pH, Chazy Lake's acidity levels should be considered satisfactory.

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 ppm	Acidified
Alkalinity between 0 and 2 ppm	Extremely sensitive
Alkalinity between 2 and 10 ppm	Moderately sensitive
Alkalinity between 10 and 25 ppm	Low sensitivity
Alkalinity greater than 25 ppm	Not sensitive

The alkalinity of the upper waters of Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 34.9, 34.1 and 34.7 ppm respectively. These values indicate no sensitivity to acidification.

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 ppm of calcium are considered to be sensitive to acidification.

The calcium of the upper waters of Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 7.59, 7.56 and 7.54 ppm respectively. This suggests that Chazy Lake may currently not be sensitive to acidification.

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 Chazy Lake were found to be 1.78 in the sample taken the upper waters, and 1.86 in the bottom sample in 2010. The other two stations had very similar results. These values classify Chazy Lake as having low vulnerability to 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 10 ppb are associated with oligotrophic (clean, clear water) conditions. Concentrations greater than 25 ppb are associated with eutrophic (nutrient-rich) conditions.

The total phosphorus in the upper waters of Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 9.2, 11.8 and 13.0 ppb respectively. These values are indicative of late oligotrophic to early mesotrophic conditions in the upper waters.

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 ppb are associated with oligotrophic conditions and those greater than 8 ppb are associated with eutrophic conditions.

The chlorophyll-a concentrations in the upper waters of Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 2.13, 2.84 and 3.35 ppb respectively. These values are indicative of late oligotrophic to early mesotrophic conditions in the upper waters.

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 Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 5.5, VOB (visible on bottom) and VOB (visible on bottom) meters respectively. These values are indicative of oligotrophic conditions.

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 ppm in most lakes. Elevated levels of nitrate concentration may be indicative of lake acidification or wastewater pollution.

The nitrate in the upper waters of Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 0.164, 0.116 and 0.122 ppm respectively.

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 ppm. Chloride levels 10 ppm 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 ppm or less.

The chloride of the upper waters of Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 10.68, 11.66 and 10.94 ppm respectively. These levels are elevated for a typical Adirondack Lake and are most likely due to road salt contamination.

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 Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 69.2, 72.4 and 72.2 μohms/cm respectively.

Color

The color of water is affected by both dissolved (e.g., metallic ions, organic acids) and suspended (e.g., silt and plant pigments) materials. 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 Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 12.2, 13.4 and 12.4 Pt-Co respectively.

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 Chazy Lake for Halfway Point, Seine Bay and South Inlet averaged 0.080, 0.036, and 0.108 ppm respectively.

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 and temperature profiles for Chazy Lake for 2002 - 2009 are presented in Appendix A. The dissolved oxygen remained quite constant from the surface to the bottom in Chazy Lake. There was a small decrease in dissolved oxygen in 2008 at a depth of about 12 meters. The oxygen level is sufficient for cold-water fish survival as well as sufficient for warm water fish survival.

Summary

Chazy Lake was a lake with low productivity in 2010 and as such it can be classified as a late oligotrophic to early mesotrophic lake during 2010. Based on the results of the year 2010 Adirondack Lakes Assessment program, the acidity status of Chazy Lake is considered not threatened at this time. The pH values are satisfactory, the CSI values indicate low vulnerability and the alkalinity values indicate no sensitivity to acidification. The calcium concentrations for Chazy Lake currently indicate no sensitivity to acidification. There was a small decrease in dissolved oxygen in 2008 at a depth of about 12 meters. The oxygen level is sufficient for cold-water fish survival as well as sufficient for warm water fish survival.

Seven years worth of data, over a nine year time period, is sufficient data to report significant trends or changes in water quality for Chazy Lake. The data does point out one area of concern. Over the last nine years Chazy Lake's chloride and conductivity levels have rose dramatically. The conductivity level has grown by about 40 % while the chloride level has more than tripled in concentration. This upward trend did not continue in 2010. This could be due to the very wet summer of 2010 that could have helped flush some of the chloride, due to road salt, through the system. These results still suggest that there is a road salt problem for Chazy Lake. The lake is receiving large additional quantities of road salt and this should be looked at more closely as this could mean that other materials are running into the lake as well.

The data between all three stations was very similar in 2010. The conductivity, chloride and color of Seine Bay samples were still a little higher than the other two stations. This would suggest that more road salt or some other pollutant is entering the lake near that location. This should be investigated further in 2010.

Another point of concern is since 2003 the total phosphorous level has increased every year except 2009. This has led to more algae growth as seen by the increase in chlorophyll-a concentration except 2009. This increase in algal growth has led to a steadily falling Secchi disk transparency every year since 2003 except 2009. The total phosphorous and chlorophyll-a concentrations are higher for Seine Bay and South Inlet over Halfway Point. This again could show excessive runoff to the lake and should be investigated further.

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

Source	Lake/Pond Name	Sampling Location	Sampling Date	pH (units)	Alkalinity (ppm)	Conductivity (μohms/cm)	Color (Pt-Co)	Total P (ppm)	Chl a (μg/l)
AWI	Chazy Lake	Epilimnion	6/29/2002	7.0900	28.6000	65.6000	5.0000	0.0110	2.1500
Vol	Chazy Lake	Deephole	6/29/2002	7.2400	28.9000	65.8000	10.0000	0.0110	2.1700
Vol	Chazy Lake	Deephole	7/31/2002	7.1200	27.6000	49.4000	13.0000	0.0200	1.2900
Vol	Chazy Lake	Deephole	8/31/2002	7.2300	37.2000	67.7000	10.0000	0.0100	1.2300
			Mean	7.1700	30.5750	62.1250	9.5000	0.0130	1.7100
			Std Dev	0.0762	4.4515	8.5360	3.3166	0.0047	0.5203
AWI	Chazy Lake	Hypolimnion	6/29/2002	7.0900	30.2000	68.9000	9.0000	0.0130	
AWI	Chazy Lake	Epilimnion	6/12/2003	6.9600	34.0000	62.0000	11.0000	0.0080	1.9400
Vol	Chazy Lake	Deephole	6/12/2003	6.9900	32.4000	67.4000	1.0000	0.0080	1.9800
			Mean	6.9750	33.2000	64.7000	6.0000	0.0080	1.9600
			Std Dev	0.0212	1.1314	3.8184	7.0711	0.0000	0.0283
AWI	Chazy Lake	Hypolimnion	6/12/2003	6.9600	34.0000	66.0000	10.0000	0.0090	1.9400
Vol	Chazy Lake	Deephole	8/31/2006	7.0400	35.2000	79.3000	5.0000	0.0070	1.1600
Vol	Chazy Lake	Deephole	10/2/2006	6.9400	33.8000	80.8000	10.0000	0.0100	2.1300
AWI	Chazy Lake	Epilimion	10/2/2006	6.9700	34.0000	80.9000	8.0000	0.0110	2.0800
			Mean	6.9833	34.3333	80.3333	7.6667	0.0093	1.7900
			Std Dev	0.0513	0.7572	0.8963	2.5166	0.0021	0.5462
AWI	Chazy Lake	Hypolimion	10/2/2006	6.5200	32.7000	77.1000	33.0000	0.0190	
Vol	Chazy Lake	Halfway Pt	6/15/2007	6.9800	40.8000	67.6000	13.0000	0.0080	1.6800
Vol	Chazy Lake	Halfway Pt	7/16/2007	7.1400	42.6000	96.6000	2.0000	0.0080	1.8800
Vol	Chazy Lake	Halfway Pt	8/15/2007	7.0400	41.2000	83.2000	11.0000	0.0100	1.9800
Vol	Chazy Lake	Halfway Pt	9/10/2007	7.0900	42.2000	115.3000	3.0000	0.0110	2.1700
Vol	Chazy Lake	Halfway Pt	10/5/2007	7.1400	42.6000	108.5000	14.0000	0.0070	1.5400
			Mean	7.0900	42.0000	102.3333	9.3333	0.0093	1.8967
			Std Dev	0.0500	0.7211	16.9152	5.6862	0.0021	0.3232
Vol	Chazy Lake	Seine Bay	6/15/2007	6.9900	40.8000	79.2000	17.0000	0.0150	2.8800
Vol	Chazy Lake	Seine Bay	7/16/2007	6.9700	40.6000	79.6000	11.0000	0.0140	2.3400
Vol	Chazy Lake	Seine Bay	8/15/2007	7.0400	41.2000	84.6000	9.0000	0.0090	2.0900
Vol	Chazy Lake	Seine Bay	9/10/2007	7.0300	41.2000	84.9000	3.0000	0.0110	2.2700
Vol	Chazy Lake	Seine Bay	10/5/2007	6.9300	38.8000	91.8000	7.0000	0.0130	1.8800
			Mean	7.0000	40.4000	87.1000	6.3333	0.0110	2.0800
			Std Dev	0.0608	1.3856	4.0731	3.0551	0.0020	0.1952
Vol	Chazy Lake	South Inlet	6/15/2007	7.0600	41.4000	83.1000	19.0000	0.0150	1.7800
Vol	Chazy Lake	South Inlet	7/16/2007	7.0500	41.4000	80.9000	3.0000	0.0110	1.9800
Vol	Chazy Lake	South Inlet	8/15/2007	7.0100	41.2000	80.0000	17.0000	0.0110	2.0200
Vol	Chazy Lake	South Inlet	9/10/2007	6.9900	40.2000	86.0000	2.0000	0.0100	2.2200
Vol	Chazy Lake	South Inlet	10/5/2007	6.9800	40.2000	82.5000	3.0000	0.0100	1.9200
			Mean	6.9933	40.5333	82.8333	7.3333	0.0103	2.0533
			Std Dev	0.0153	0.5774	3.0139	8.3865	0.0006	0.1528
AWI	Chazy Lake	Epilimnion	5/27/2008	7.3800	42.4000	98.5000	8.0000	0.0130	2.7800
Vol	Chazy Lake	Halfway Pt	5/27/2008	7.3300	42.4000	97.5000	12.0000	0.0120	2.7200
Vol	Chazy Lake	Halfway Pt	6/27/2008	6.8600	40.5000	78.9000	2.0000	0.0140	3.2100
Vol	Chazy Lake	Halfway Pt	7/27/2008	6.6100	32.6000	81.9000	1.0000	0.0080	1.6200
Vol	Chazy Lake	Halfway Pt	8/26/2008	6.9600	41.4000	81.9000	9.0000	0.0100	2.0400
Vol	Chazy Lake	Halfway Pt	9/24/2008	7.0600	41.6000	82.6000	12.0000	0.0080	1.6400
			Mean	7.0333	40.1500	86.8833	7.3333	0.0108	2.3350
			Std Dev	0.2910	3.7660	8.7110	4.8028	0.0026	0.6623
AWI	Chazy Lake	Hypolimnion	5/27/2008	7.4100	42.6000	82.6000	14.0000	0.0150	x
Vol	Chazy Lake	Seine Bay	5/27/2008	7.4400	42.6000	83.0000	11.0000	0.0150	2.5500

Vol	Chazy Lake	Seine Bay	6/27/2008	6.8500	35.3000	84.1000	13.0000	0.0160	2.9800
Vol	Chazy Lake	Seine Bay	7/27/2008	6.7900	34.6000	81.0000	2.0000	0.0120	2.7700
Vol	Chazy Lake	Seine Bay	8/26/2008	7.1400	41.2000	85.7000	7.0000	0.0090	1.9500
Vol	Chazy Lake	Seine Bay	9/24/2008	7.0600	41.0000	86.3000	28.0000	0.0090	2.0200
			Mean	7.0560	38.9400	84.0200	12.2000	0.0122	2.4540
			Std Dev	0.2587	3.7024	2.1324	9.7826	0.0033	0.4550
Vol	Chazy Lake	South Inlet	5/27/2008	7.3200	41.4000	78.0000	12.0000	0.0140	2.8800
Vol	Chazy Lake	South Inlet	6/27/2008	6.8500	35.8000	75.2000	1.0000	0.0170	3.1800
Vol	Chazy Lake	South Inlet	7/27/2008	6.7700	34.6000	71.5000	3.0000	0.0120	2.7700
Vol	Chazy Lake	South Inlet	8/26/2008	7.0400	41.4000	82.9000	18.0000	0.0090	1.8800
Vol	Chazy Lake	South Inlet	9/24/2008	7.2100	41.2000	88.3000	29.0000	0.0090	1.8600
			Mean	7.0380	38.8800	79.1800	12.6000	0.0122	2.5140
			Std Dev	0.2325	3.3870	6.5808	11.4586	0.0034	0.6068

Source	Lake/Pond Name	Sampling Location	Sampling Date	pH (units)	Alkalinity (ppm)	Conductivity (mohms/cm)	Color (Pt-Co)	Total P (ppm)	Chl a (mg/l)
AWI	Chazy Lake	Epilimnion	7/6/2009	7.1600	38.3000	77.9000	6.0000	0.0090	2.0700
Vol	Chazy Lake	Halfway Pt	5/9/2009	7.1200	36.8000	77.5000	5.0000	0.0080	1.7200
Vol	Chazy Lake	Halfway Pt	6/8/2009	7.0800	34.2000	77.7000	1.0000	0.0100	1.9400
Vol	Chazy Lake	Halfway Pt	7/6/2009	7.1400	37.4000	77.3000	4.0000	0.0090	1.9600
Vol	Chazy Lake	Halfway Pt	8/7/2009	7.1000	36.9000	80.1000	8.0000	0.0100	1.9600
Vol	Chazy Lake	Halfway Pt	9/3/2009	7.0500	32.8000	62.2000	6.0000	0.0070	1.5500
			Mean	7.1083	36.0667	75.4500	5.0000	0.0088	1.8667
			Std Dev	0.0402	2.1049	6.5708	2.3664	0.0012	0.1928
AWI	Chazy Lake	Hypolimnion	7/6/2009	6.7700	19.8000	78.2000	14.0000	0.0100	x
Vol	Chazy Lake	Epilimnion	7/6/2009	7.1200	36.4000	79.7000	19.0000	0.0090	2.1800
Vol	Chazy Lake	Seine Bay	5/9/2009	7.0600	34.0000	81.1000	1.0000	0.0080	1.7400
Vol	Chazy Lake	Seine Bay	6/8/2009	6.9800	31.2000	79.2000	14.0000	0.0120	2.9200
Vol	Chazy Lake	Seine Bay	7/6/2009	7.0600	34.4000	78.6000	24.0000	0.0100	2.5600
Vol	Chazy Lake	Seine Bay	8/7/2009	7.1500	38.6000	65.5000	12.0000	0.0110	2.3200
Vol	Chazy Lake	Seine Bay	9/3/2009	7.2000	39.6000	83.1000	8.0000	0.0120	3.0400
			Mean	7.0740	34.9200	76.8200	14.0000	0.0103	2.4600
			Std Dev	0.0654	2.7698	6.3951	8.6313	0.0016	0.4846
Vol	Chazy Lake	South Inlet	7/6/2009	7.0200	33.8000	72.0000	15.0000	0.0120	2.8900
Vol	Chazy Lake	South Inlet	5/9/2009	7.0900	34.8000	71.3000	4.0000	0.0090	1.8400
Vol	Chazy Lake	South Inlet	6/8/2009	7.1700	39.2000	78.7000	6.0000	0.0100	1.9600
Vol	Chazy Lake	South Inlet	7/6/2009	6.9900	31.4000	70.2000	17.0000	0.0120	2.7200
Vol	Chazy Lake	South Inlet	8/7/2009	7.1300	38.6000	74.6000	10.0000	0.0120	2.3700
Vol	Chazy Lake	South Inlet	9/3/2009	7.0200	34.0000	78.7000	10.0000	0.0110	2.7800
			Mean	7.0800	35.5600	73.3600	10.4000	0.0110	2.4267
			Std Dev	0.0748	3.2967	3.3960	5.5946	0.0013	0.4451

Source	Lake/Pond Name	Sampling Location	Sampling Date	pH (units)	Alkalinity (ppm)	Conductivity (mohms/cm)	Color (Pt-Co)	Total P (ppm)	Chl a (mg/l)
Vol	Chazy Lake	Halfway Pt	5/8/2010	6.9200	32.2000	66.0000	15.0000	0.0130	3.5200
Vol	Chazy Lake	Halfway Pt	6/11/2010	7.0500	33.6000	71.0000	13.0000	0.0110	2.8800
Vol	Chazy Lake	Halfway Pt	7/8/2010	7.0900	35.2000	70.0000	17.0000	0.0060	1.0400
Vol	Chazy Lake	Halfway Pt	8/7/2010	7.1500	36.6000	70.0000	7.0000	0.0090	1.8400
Vol	Chazy Lake	Halfway Pt	9/1/2010	7.1800	37.0000	69.0000	9.0000	0.0070	1.3700
			Mean	7.0780	34.9200	69.2000	12.2000	0.0092	2.1300
			Std Dev	0.1018	2.0229	1.9235	4.1473	0.0029	1.0422
Vol	Chazy Lake	Seine Bay	5/8/2010	6.9800	32.4000	73.0000	17.0000	0.0160	4.4800
Vol	Chazy Lake	Seine Bay	6/11/2010	7.0600	33.2000	73.0000	12.0000	0.0110	3.0400
Vol	Chazy Lake	Seine Bay	7/8/2010	7.0800	34.6000	71.0000	11.0000	0.0090	1.7700

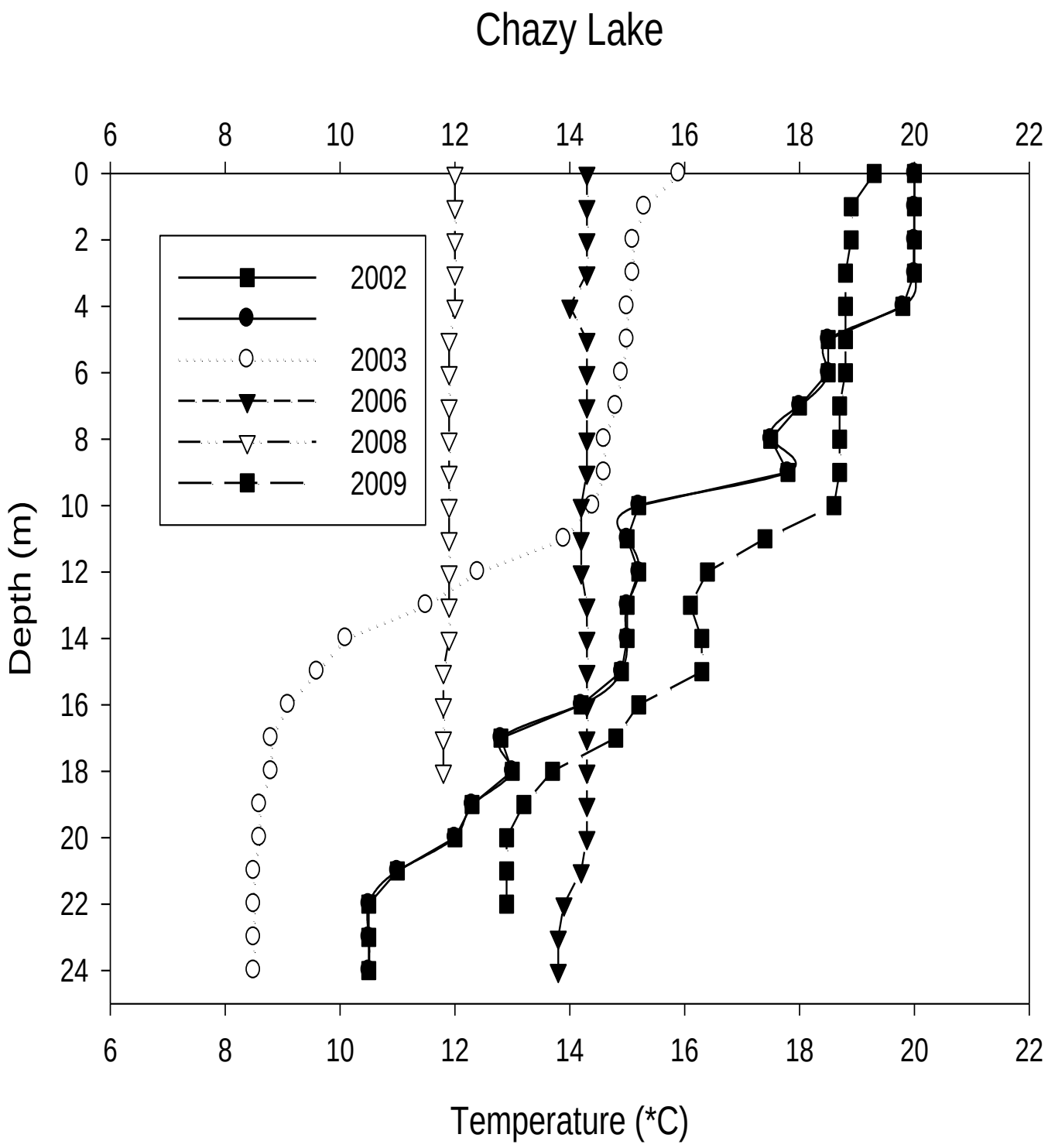
Vol	Chazy Lake	Seine Bay	8/7/2010	7.0500	34.2000	70.0000	13.0000	0.0120	2.7700
Vol	Chazy Lake	Seine Bay	9/1/2010	7.1100	36.2000	75.0000	14.0000	0.0110	2.1400
			Mean	7.0560	34.1200	72.4000	13.4000	0.0118	2.8400
			Std Dev	0.0483	1.4464	1.9494	2.3022	0.0026	1.0452
Vol	Chazy Lake	South Inlet	5/8/2010	6.9800	32.6000	72.0000	13.0000	0.0150	4.2900
Vol	Chazy Lake	South Inlet	6/11/2010	7.0700	33.8000	75.0000	5.0000	0.0130	3.1100
Vol	Chazy Lake	South Inlet	7/8/2010	7.0900	34.2000	73.0000	16.0000	0.0090	1.8100
Vol	Chazy Lake	South Inlet	8/7/2010	7.1200	36.5000	68.0000	16.0000	0.0150	4.2800
Vol	Chazy Lake	South Inlet	9/1/2010	7.1200	36.6000	73.0000	12.0000	0.0130	3.2500
			Mean	7.0760	34.7400	72.2000	12.4000	0.0130	3.3480
			Std Dev	0.0577	1.7544	2.5884	4.5056	0.0024	1.0232

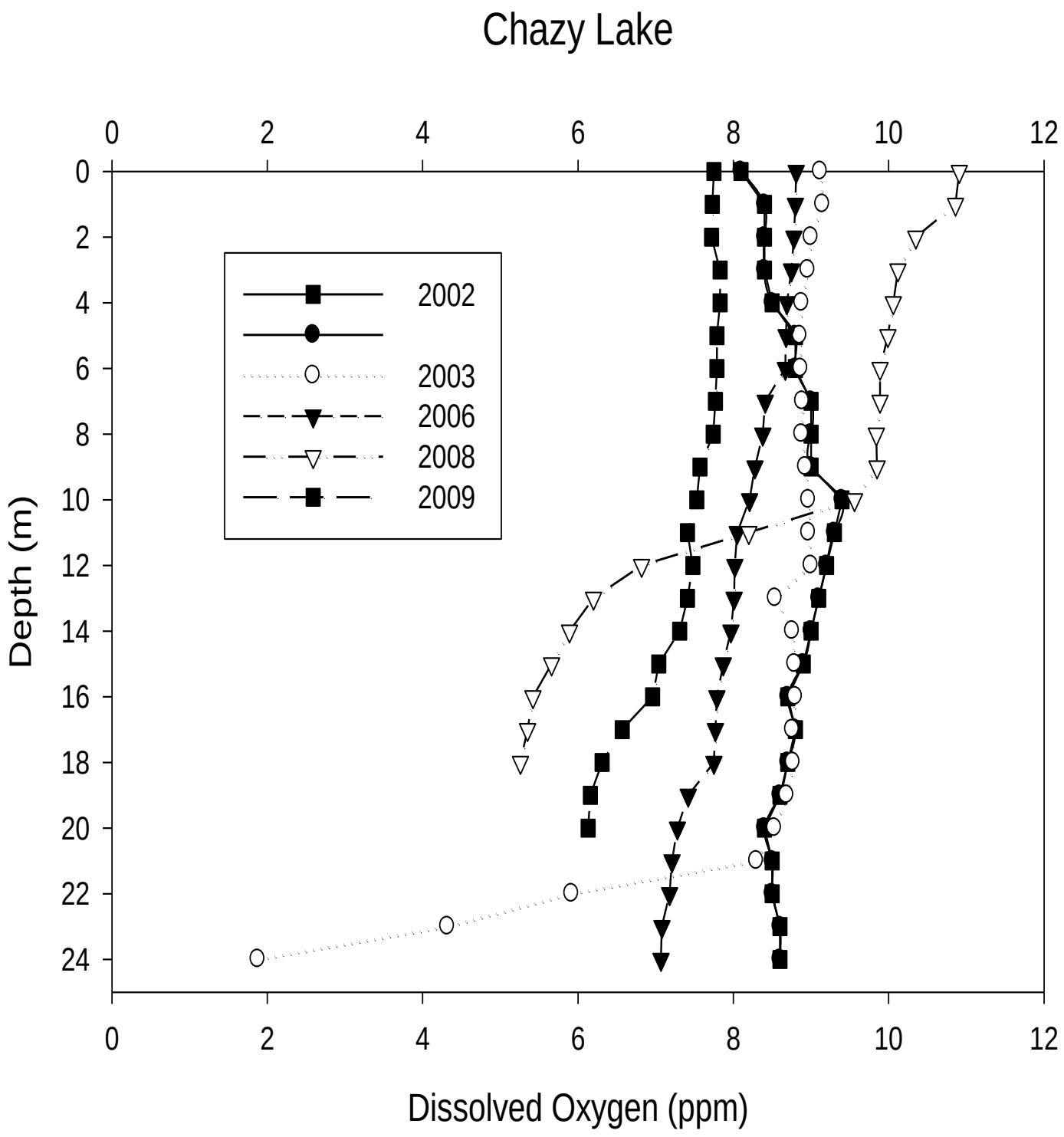
Source	Lake/Pond Name	Sampling Location	Sampling Date	Secchi (meters)	Nitrate (ppm)	Calcium (ppm)	Chloride (ppm)	Aluminum (ppm)	CSI
AWI	Chazy Lake	Epilimnion	6/29/2002	5.6000	0.2000	7.4700	5.6000	0.0080	1.8800
Vol	Chazy Lake	Deephole	6/29/2002	5.5000	0.3000				
Vol	Chazy Lake	Deephole	7/31/2002	5.7000	0.0000				
Vol	Chazy Lake	Deephole	8/31/2002	5.5000	0.0000				
			Mean	5.5750	0.1250				
			Std Dev	0.0957	0.1500				
AWI	Chazy Lake	Hypolimnion	6/29/2002		0.2000	7.6800	6.1000	0.0020	1.8500
AWI	Chazy Lake	Epilimnion	6/12/2003	8.6000	0.5000	8.1400	7.0000	0.0000	
Vol	Chazy Lake	Deephole	6/12/2003	8.6000	0.5000				
			Mean	8.6000	0.5000				
			Std Dev	0.0000	0.0000				
AWI	Chazy Lake	Hypolimnion	6/12/2003	8.6000	0.5000	8.2100	7.0000	0.0010	
Vol	Chazy Lake	Deephole	8/31/2006	8.5700	0.0300				
Vol	Chazy Lake	Deephole	10/2/2006	5.0000	0.0500				
AWI	Chazy Lake	Epilimion	10/2/2006	5.0000	0.0200	8.2200	14.2000	0.0000	
			Mean	6.1900	0.0333				
			Std Dev	2.0611	0.0153				
AWI	Chazy Lake	Hypolimion	10/2/2006		0.1200	8.0600	14.2000	0.0040	
Vol	Chazy Lake	Halfway Pt	6/15/2007	6.0000	0.2000				
Vol	Chazy Lake	Halfway Pt	7/16/2007	6.0000	0.1000				
Vol	Chazy Lake	Halfway Pt	8/15/2007	5.5000	0.2000				
Vol	Chazy Lake	Halfway Pt	9/10/2007	5.0000	0.0000				
Vol	Chazy Lake	Halfway Pt	10/5/2007	6.5000	0.1000				
			Mean	5.6667	0.1000				
			Std Dev	0.7638	0.1000				
Vol	Chazy Lake	Seine Bay	6/15/2007	3.0000	0.1000				
Vol	Chazy Lake	Seine Bay	7/16/2007	2.0 vob	0.0000				
Vol	Chazy Lake	Seine Bay	8/15/2007	3.5 vob	0.1000				
Vol	Chazy Lake	Seine Bay	9/10/2007	2.7 vob	0.1000				
Vol	Chazy Lake	Seine Bay	10/5/2007	2.1 vob	0.1000				
			Mean	#DIV/0!	0.1000				
			Std Dev	#DIV/0!	0.0000				
Vol	Chazy Lake	South Inlet	6/15/2007	1.7500	0.1000				
Vol	Chazy Lake	South Inlet	7/16/2007	3.0 vob	0.1000				
Vol	Chazy Lake	South Inlet	8/15/2007	1.5 vob	0.1000				
Vol	Chazy Lake	South Inlet	9/10/2007	2.1 vob	0.1000				
Vol	Chazy Lake	South Inlet	10/5/2007	2.1 vob	0.1000				
			Mean	#DIV/0!	0.1000				

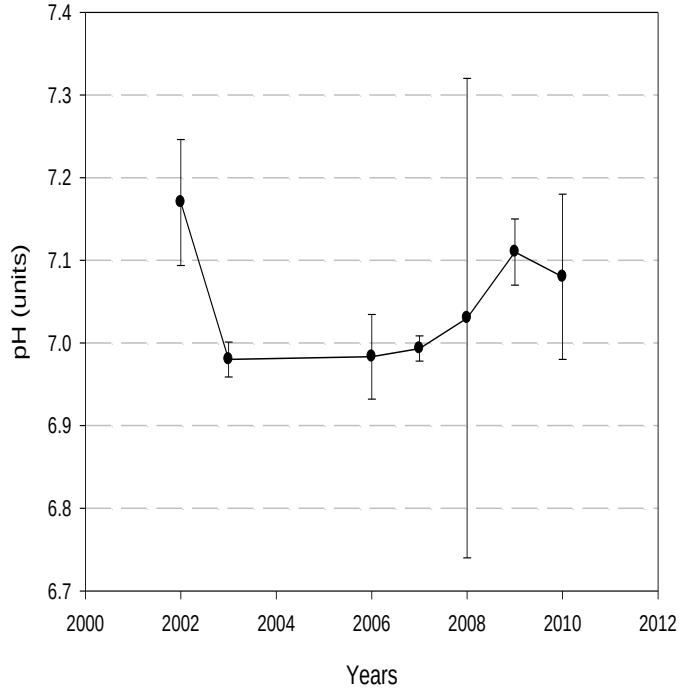
			Std Dev	#DIV/0!	0.0000				
AWI	Chazy Lake	Epilimnion	5/27/2008	3.9000	0.1000	7.1500	16.0000	0.0000	1.4000
Vol	Chazy Lake	Halfway Pt	5/27/2008	4.0000	0.1000				
Vol	Chazy Lake	Halfway Pt	6/27/2008	4.0000	0.1000				
Vol	Chazy Lake	Halfway Pt	7/27/2008	6.0000	0.1000				
Vol	Chazy Lake	Halfway Pt	8/26/2008	5.0000	0.1000				
Vol	Chazy Lake	Halfway Pt	9/24/2008	6.0000	0.1000				
			Mean	4.8167	0.1000				
			Std Dev	1.0008	0.0000				
AWI	Chazy Lake	Hypolimnion	5/27/2008	x	0.1000	7.1500	16.0000	0.0000	1.4000
Vol	Chazy Lake	Seine Bay	5/27/2008	2.5000	0.1000				
Vol	Chazy Lake	Seine Bay	6/27/2008	2.0000	0.1000				
Vol	Chazy Lake	Seine Bay	7/27/2008	3 VOB	0.1000				
Vol	Chazy Lake	Seine Bay	8/26/2008	3 VOB	0.1000				
Vol	Chazy Lake	Seine Bay	9/24/2008	3 VOB	0.1000				
			Mean	2.2500	0.1000				
			Std Dev	0.3536	0.0000				
Vol	Chazy Lake	South Inlet	5/27/2008	4.0000	0.1000				
Vol	Chazy Lake	South Inlet	6/27/2008	2.0000	0.1000				
Vol	Chazy Lake	South Inlet	7/27/2008	2 VOB	0.1000				
Vol	Chazy Lake	South Inlet	8/26/2008	2 VOB	0.1000				
Vol	Chazy Lake	South Inlet	9/24/2008	3 VOB	0.1000				
			Mean	3.0000	0.1000				
			Std Dev	1.4142	0.0000				

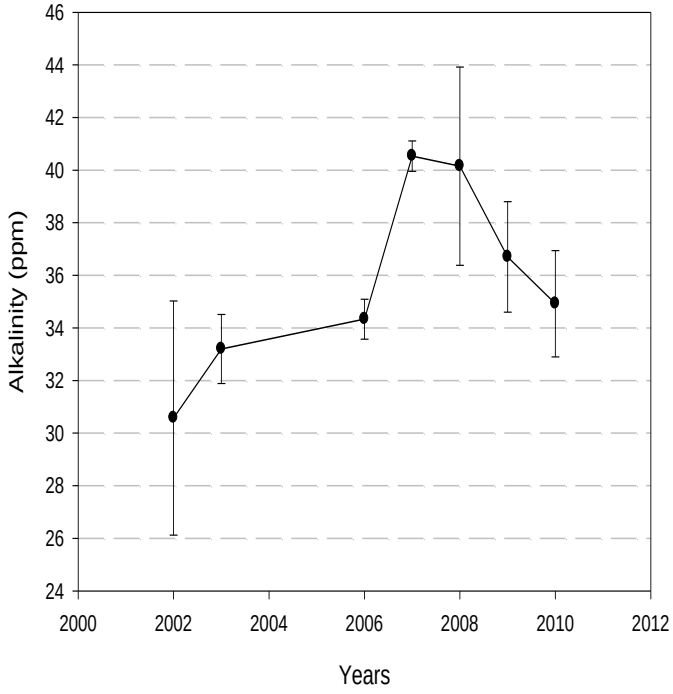
Source	Lake/Pond Name	Sampling Location	Sampling Date	Secchi (meters)	Nitrate (ppm)	Calcium (ppm)	Chloride (ppm)	Aluminum (ppm)	CSI
AWI	Chazy Lake	Epilimnion	7/6/2009	5.0000	0.0000	7.2200	16.0000	0.0100	
Vol	Chazy Lake	Halfway Pt	5/9/2009	6.0000	0.1000				
Vol	Chazy Lake	Halfway Pt	6/8/2009	5.0000	0.1000				
Vol	Chazy Lake	Halfway Pt	7/6/2009	5.0000	0.0000				
Vol	Chazy Lake	Halfway Pt	8/7/2009	5.0000	0.1000				
Vol	Chazy Lake	Halfway Pt	9/3/2009	7.0000	0.1000				
			Mean	5.5000	0.0667				
			Std Dev	0.8367	0.0516				
AWI	Chazy Lake	Hypolimnion	7/6/2009	x	0.1000	6.5700	16.0000	0.0100	
Vol	Chazy Lake	Epilimnion	7/6/2009	5.0000	0.2000	7.0900	16.0000	0.0090	
Vol	Chazy Lake	Seine Bay	5/9/2009	VOB	0.1000				
Vol	Chazy Lake	Seine Bay	6/8/2009	VOB	0.0000				
Vol	Chazy Lake	Seine Bay	7/6/2009	5.0000	0.2000				
Vol	Chazy Lake	Seine Bay	8/7/2009	VOB	0.1000				
Vol	Chazy Lake	Seine Bay	9/3/2009	VOB	0.1000				
			Mean	5.0000	0.1167				
			Std Dev	0.0000	0.0753				
Vol	Chazy Lake	South Inlet	7/6/2009	VOB	0.1000	6.8100	16.0000	0.0090	
Vol	Chazy Lake	South Inlet	5/9/2009	VOB	0.0000				
Vol	Chazy Lake	South Inlet	6/8/2009	VOB	0.0000				
Vol	Chazy Lake	South Inlet	7/6/2009	VOB	0.1000				
Vol	Chazy Lake	South Inlet	8/7/2009	VOB	0.1000				
Vol	Chazy Lake	South Inlet	9/3/2009	VOB	0.1000				
			Mean	#DIV/0!	0.0667				
			Std Dev	#DIV/0!	0.0516				

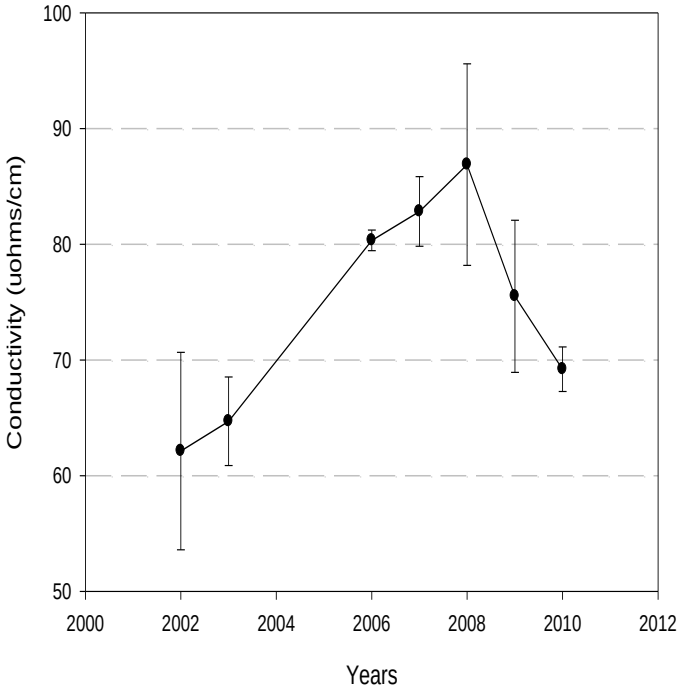
Source	Lake/Pond Name	Sampling Location	Sampling Date	Secchi (meters)	Nitrate (ppm)	Calcium (ppm)	Chloride (ppm)	Aluminum (ppm)	CSI
Vol	Chazy Lake	Halfway Pt	5/8/2010	4.0000	0.2000	7.3100	7.8000	0.0300	
Vol	Chazy Lake	Halfway Pt	6/11/2010	4.5000	0.1800	7.5200	12.8000	0.0500	
Vol	Chazy Lake	Halfway Pt	7/8/2010	7.0000	0.1800	7.4800	12.0000	0.0700	
Vol	Chazy Lake	Halfway Pt	8/7/2010	5.5000	0.1300	7.8500	10.8000	0.1900	
Vol	Chazy Lake	Halfway Pt	9/1/2010	6.5000	0.1300	7.8100	10.0000	0.0600	
			Mean	5.5000	0.1640	7.5940	10.6800	0.0800	
			Std Dev	1.2748	0.0321	0.2298	1.9370	0.0632	
Vol	Chazy Lake	Seine Bay	5/8/2010	VOB	0.1100	7.3400	12.3000	0.0500	
Vol	Chazy Lake	Seine Bay	6/11/2010	VOB	0.1200	7.3800	12.2000	0.0200	
Vol	Chazy Lake	Seine Bay	7/8/2010	VOB	0.1100	7.6900	11.8000	0.0400	
Vol	Chazy Lake	Seine Bay	8/7/2010	VOB	0.1200	7.6100	9.7000	0.0300	
Vol	Chazy Lake	Seine Bay	9/1/2010	VOB	0.1200	7.8000	12.3000	0.0400	
			Mean	#DIV/0!	0.1160	7.5640	11.6600	0.0360	
			Std Dev	#DIV/0!	0.0055	0.1986	1.1149	0.0114	
Vol	Chazy Lake	South Inlet	5/8/2010	VOB	0.1300	7.0900	10.3000	0.0600	
Vol	Chazy Lake	South Inlet	6/11/2010	VOB	0.1100	7.3700	11.8000	0.0500	
Vol	Chazy Lake	South Inlet	7/8/2010	VOB	0.1300	7.4700	11.0000	0.1600	
Vol	Chazy Lake	South Inlet	8/7/2010	VOB	0.1200	7.9700	9.9000	0.1200	
Vol	Chazy Lake	South Inlet	9/1/2010	VOB	0.1200	7.8100	11.7000	0.1500	
			Mean	#DIV/0!	0.1220	7.5420	10.9400	0.1080	
			Std Dev	#DIV/0!	0.0084	0.3515	0.8385	0.0507	

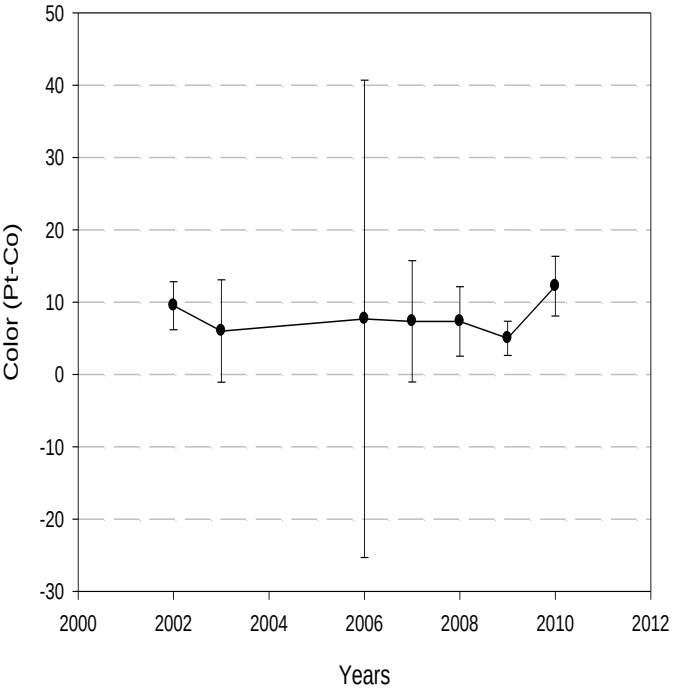

Chazy Lake
6
8
10
12
14
16
18
20
22
0
2
4
6
8
10
12
14
16
18
20
22
24
Depth (m)
2002
2003
2006
2008
2009
Temperature (*C)

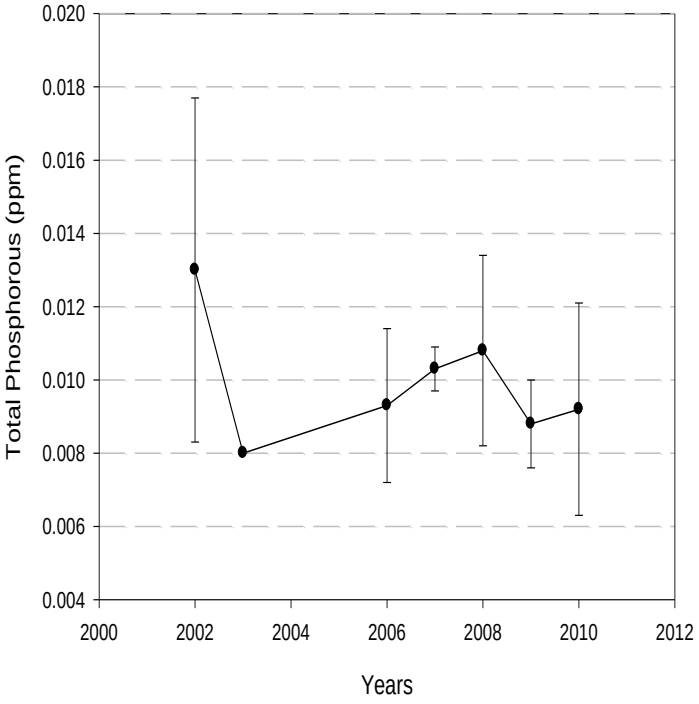

Chazy Lake
0
2
4
6
8
10
12
Depth (m)
2002
2003
2006
2008
2009
Dissolved Oxygen (ppm)

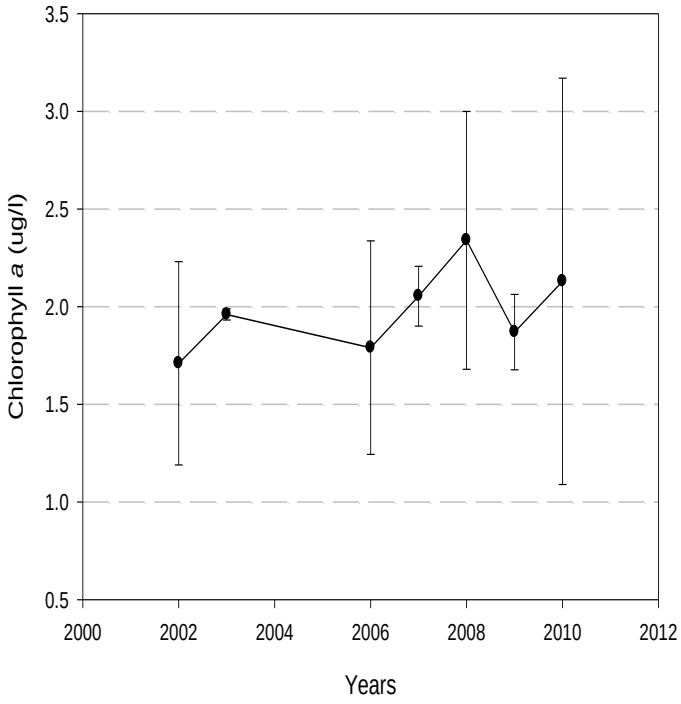

pH (units)
7.4
7.3
7.2
7.1
7.0
6.9
6.8
6.7
2000
2002
2004
2006
2008
2010
2012
Years

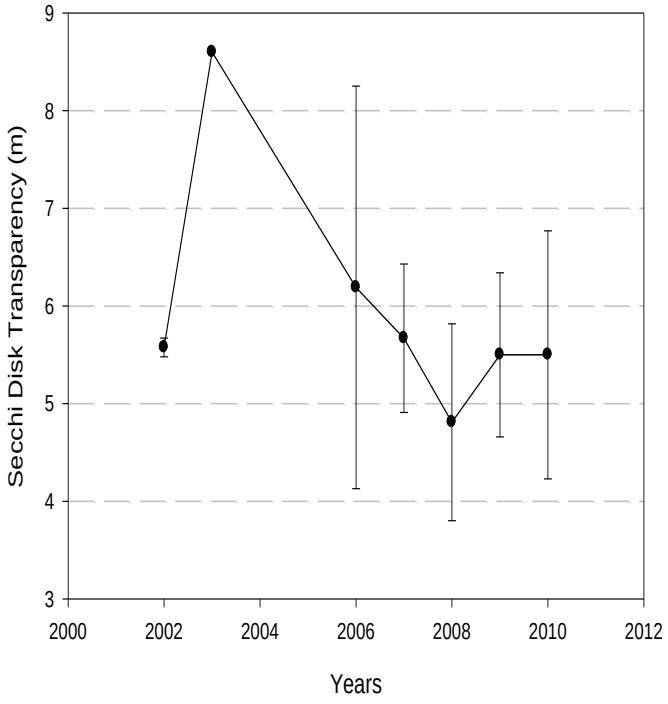

Alkalinity (ppm)
46
44
42
40
38
36
34
32
30
28
26
24
2000
2002
2004
2006
2008
2010
2012
Years

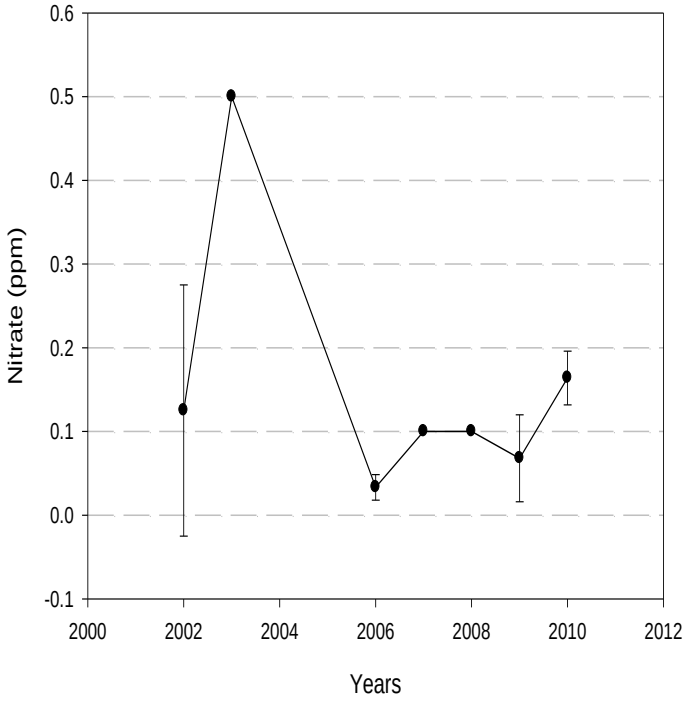

Conductivity (uohms/cm)
100
90
80
70
60
50
2000
2002
2004
2006
2008
2010
2012
Years

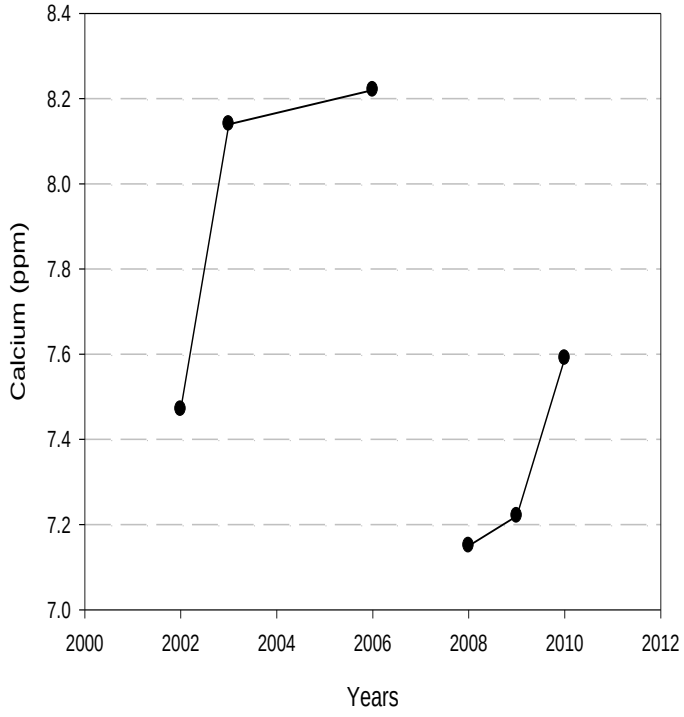

Color (Pt-Co)
50
40
30
20
10
0
-10
-20
-30
2000
2002
2004
2006
2008
2010
2012
Years

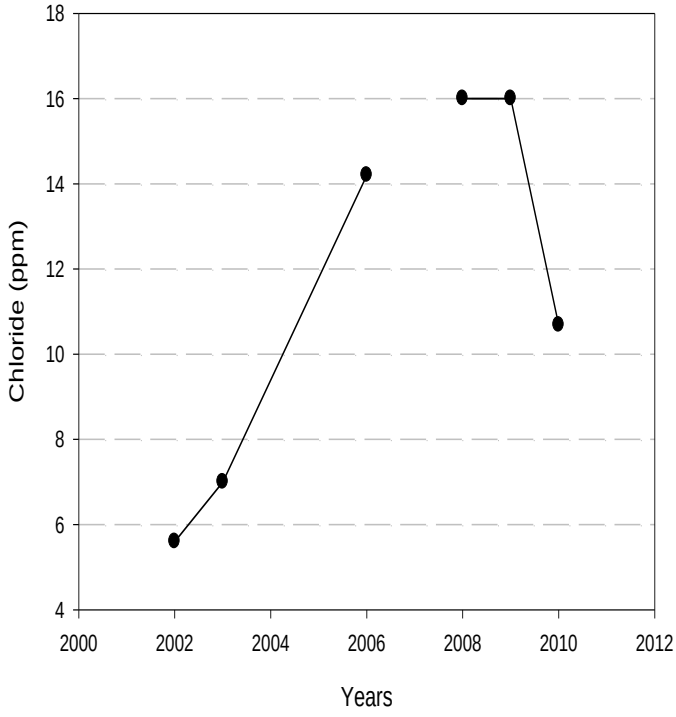

Total Phosphorous (ppm)
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
2000
2002
2004
2006
2008
2010
2012
Years

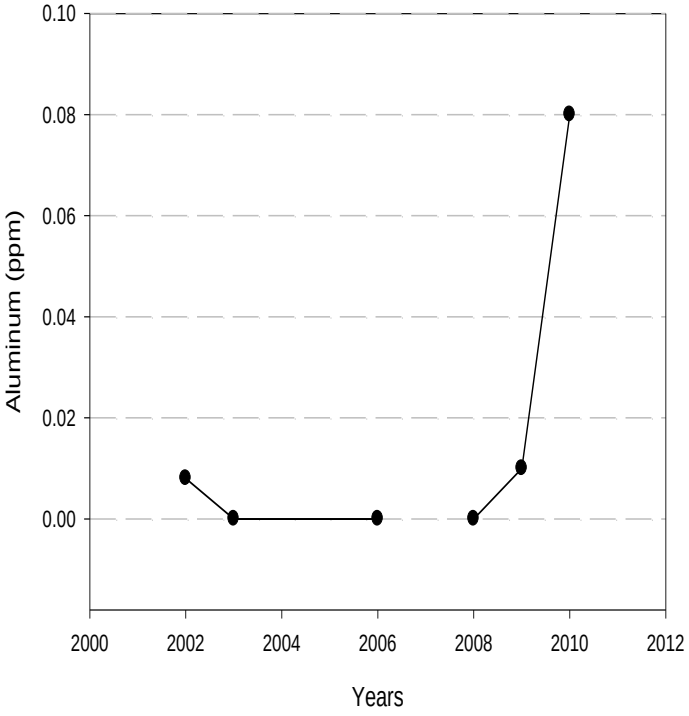

Chlorophyll a (ug/l)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
2000
2002
2004
2006
2008
2010
2012
Years


Secchi Disk Transparency (m)
9
8
7
6
5
4
3
2000
2002
2004
2006
2008
2010
2012
Years


Nitrate (ppm)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
2000
2002
2004
2006
2008
2010
2012
Years


Calcium (ppm)
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0
2000
2002
2004
2006
2008
2010
2012
Years


Chloride (ppm)
18
16
14
12
10
8
6
4
2000
2002
2004
2006
2008
2010
2012
Years


Aluminum (ppm)
0.10
0.08
0.06
0.04
0.02
0.00
2000
2002
2004
2006
2008
2010
2012
Years