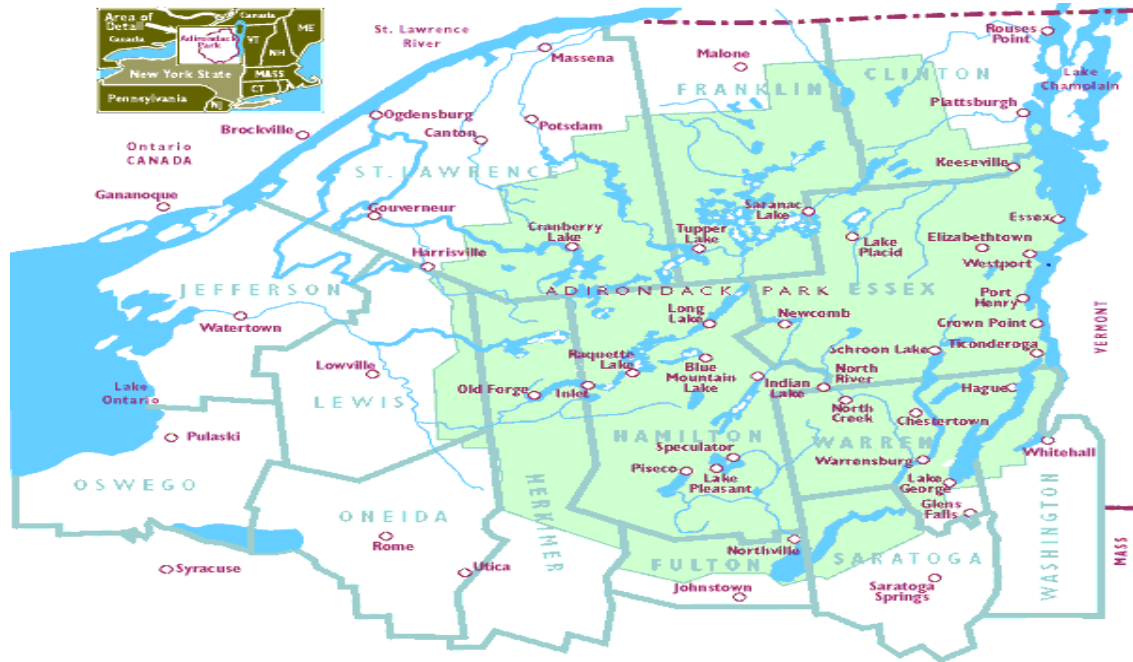


# Adirondack Lake Assessment Program 2010



**Thirteen Years in the program**

Cranberry Lake, Loon Lake, Oven Mountain Pond, Blue Mountain Lake, Silver Lake, Eagle Lake

**Twelve Years in the program**

Little Long Lake, Gull Pond, Stony Creek Ponds, Thirteenth Lake, Eli Pond

**Eleven Years in the program**

Austin Pond, Osgood Pond, Middle Saranac Lake, White Lake, Brandreth Lake, Trout Lake

**Ten Years in the program**

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

**Nine Years in the program**

Spitfire Lake, Upper St. Regis, Lower St. Regis, Garnet Lake, Lens Lake, Snowshoe Pond, Lake Ozonia, Long Pond, Lower Saranac Lake

**Eight Years in the program**

Raquette Lake, Lake Colby, Kiwassa Lake, Canada Lake

**Seven Years in the program**

Indian Lake, Schroon Lake, Lake Eaton, Chazy Lake, Big Moose Lake

**Six Years in the program**

Dug Mountain Pond, Seventh Lake, Abanakee Lake, Moss Lake, Mountain View Lake, Indian Lake, Tupper Lake

**Five Years in the program**

Sylvia Lake, Fern Lake

**Four Years in the program**

Adirondack Lake, Lower Chateaugay Lake, Upper Chateaugay Lake, Lake Easka, Lake Tekeni

**Three Years in the program**

Simon Pond

**Two Years in the program**

Amber Lake, Jordan Lake, Otter Pond, Rondaxe Lake

**One Year in the program**

Auger Lake, Lake Titus, Star Lake

Adirondack Lake  
***Assessment Program***

**Raquette Lake**

**Summer 2010**

*January 2011*

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## 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 year 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, 21<sup>st</sup> 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

Raquette Lake was sampled five times by a volunteer in 2010. Samples were collected on the following dates: 5/31/10, 6/27/10, 7/27/10, 8/14/10, and 9/03/10. Results for 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 ( $\mu\text{g/L}$ ) or its equivalent of parts per billion (ppb).

$$1 \text{ mg/L} = 1 \text{ ppm}; 1 \mu\text{g/L} = 1 \text{ ppb}; 1 \text{ ppm} = 1000 \text{ ppb}.$$

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 2010 Adirondack Lakes Assessment program, the acidity status of Raquette Lake is considered to be moderately threatened. The pH and calcium concentration for 2010 was satisfactory but the alkalinity and CSI values show us a lake that is moderately threatened by future acidic inputs.

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 2010 Adirondack Lakes Assessment Program, Raquette 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 Raquette Lake ranged from 6.52 to 6.71. The average pH was 6.62. Based solely on pH, Raquette Lake 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 microequivalents per liter ( $\mu\text{eq/L}$ ). 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 Raquette Lake ranged from 6.0 ppm to 9.2 ppm. The average alkalinity was 7.36 ppm. These values indicate moderate sensitivity to acidification.

### Calcium

Calcium is one of the buffering materials that occurs 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 in the upper waters of Raquette Lake was measured in 2010 and it ranged from 2.42 to 2.97 ppm. The average calcium concentration was found to be 2.81 ppm. This value shows us a lake that is considered not sensitive to further acidic inputs at this time.

### 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

The CSI value for the upper water of Raquette Lake was calculated and found to be 3.45. This value shows us a lake that is moderately vulnerable 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 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 Raquette Lake ranged from 7 ppb to 11 ppb. The average concentration was 9.2 ppb. This is indicative of late oligotrophic to early mesotrophic conditions.

### **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 Raquette Lake ranged from 1.72 ppb to 2.23 ppb. The average concentration was 1.96 ppb. This is indicative of late oligotrophic to early mesotrophic conditions.

### **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 are 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 Raquette Lake ranged from 4.75 meters to 6.00 meters. The average transparency was 5.35 meters. These values are indicative of late 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 Raquette Lake ranged from 0.21 to 0.29 ppm and the average was found to be 0.236 ppm.

### **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 in the upper waters of Raquette Lake was measured in 2010 and it ranged from 5.9 to 8.5 ppm. The average chloride concentration was found to be 7.32 ppm. This concentration is elevated for an Adirondack Lake and is 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  $\mu\text{ohms/cm}$ ) 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  $\mu\text{ohms/cm}$ , but may not be characterized by pollution inputs. Clean, clear-water lakes in our region typically have conductivities up to 30  $\mu\text{ohms/cm}$ , but values less than 50  $\mu\text{ohms/cm}$  are considered normal.

The conductivity in the upper waters of Raquette Lake ranged from 26.0  $\mu\text{ohms/cm}$  to 44.1  $\mu\text{ohms/cm}$ . The average conductivity was 33.8  $\mu\text{ohms/cm}$ .

## **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 Raquette Lake ranged from 32 Pt-Co to 57 Pt-Co. The average color was 42.8 Pt-Co.

## **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 Raquette Lake was measured in 2010 and it ranged from 0.060 to 0.080 ppm. The average aluminum concentration was found to be 0.066 ppm.

## **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 Raquette Lake for 2008 were measured and the results can be found graphed in Appendix A. The dissolved oxygen results show us a lake that has sufficient oxygen from top to bottom to be able to support warm and cold water fish.

## Summary

Raquette Lake was a moderately productive late oligotrophic to early mesotrophic lake during 2010. The acidity status of Raquette shows a come back from the acidic conditions in 2004. In 2010, the pH and alkalinity indicated Raquette Lake to be less vulnerable to acidification as in 2004. The dissolved oxygen results show us a lake that has sufficient oxygen from top to bottom to be able to support warm and cold water fish.

Eight years worth of data collection is enough in order to make predications on trends in water quality, or changes in water quality. We can also compare the data from 2003 to 2010. The pH, alkalinity, color, Secchi disk transparency, calcium, chloride, aluminum and nitrate levels were slightly higher in 2010 than in 2009. The conductivity, total phosphorous, and chlorophyll a values were lower in 2010 than in 2009.

The pH has increased over the last six years and the alkalinity has most of those years. The lake has rebounded as the acids in our Adirondack rain has diminished over the last decade. The total phosphorous levels in Raquette Lake have been very stable for the last six years and have actually decreased in the most recent years. This has led to stable algae growth, as shown by the very stable chlorophyll a levels during the last seven years. This has also led to stable transparency readings over the last seven years and even a small improvement in recent years.

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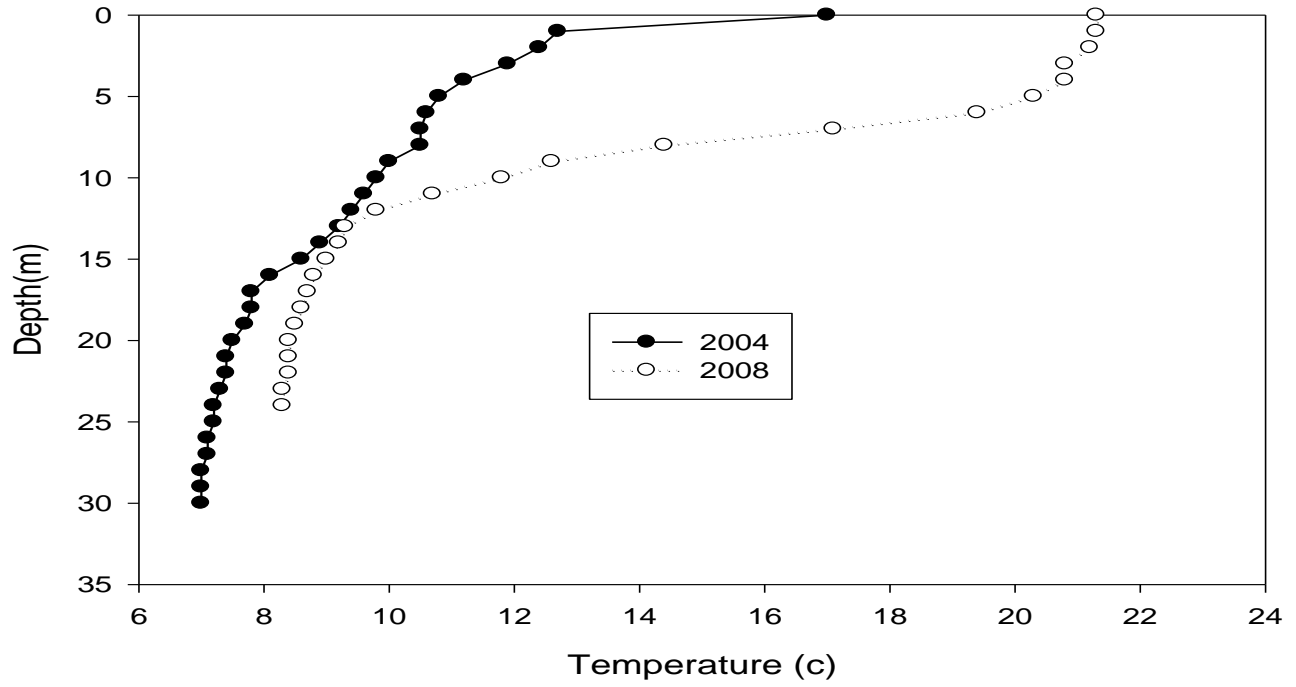
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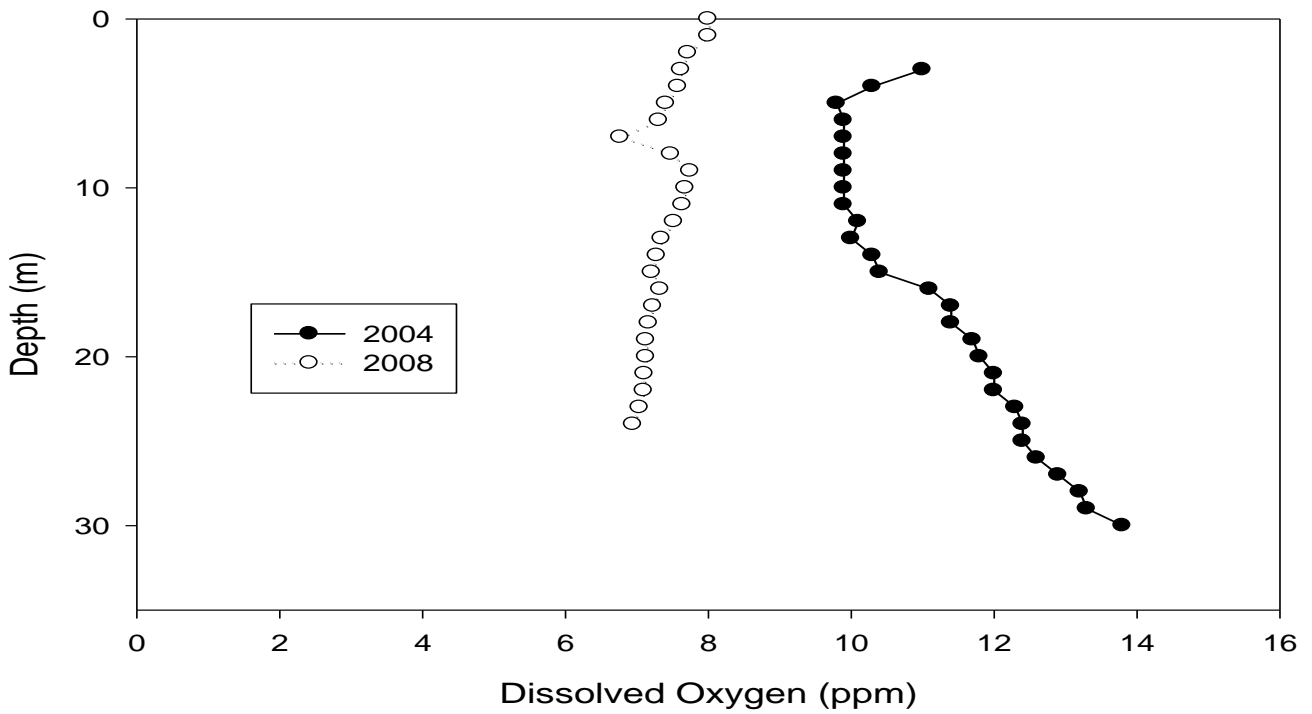
# **Appendix A**

## **Water Quality Data**

### Raquette Lake



### Raquette Lake



Source	Lake/Pond Name	Sampling Location	Sampling Date	pH (units)	Alkalinity (ppm)	Conductivity ( $\mu$ ohms/cm)	Color (Pt-Co)	Total P (ppm)	Chl a ( $\mu$ g/l)
Vol	Raquette Lake	Deephole	07/29/03	5.9500	6.0000	41.3000	24.0000	0.0130	1.8200
Vol	Raquette Lake	Deephole	8/25/2003	5.9200	2.0000	31.0000	22.0000	0.0120	2.9500
Vol	Raquette Lake	Deephole	9/26/2003	6.1200	2.0000	10.0000	10.0000	0.0090	1.6000
			Mean	5.9967	3.3333	27.4333	18.6667	0.0113	2.1233
			Std Dev	0.1079	2.3094	15.9519	7.5719	0.0021	0.7243
AWI	Raquette Lake	Epilimnion	5/13/2004	6.4500	6.0000	34.0000	75.0000	0.0140	2.3700
Vol	Raquette Lake	Deephole	6/23/2004	4.8200	1.0000	36.1000	23.0000	0.0160	1.2400
Vol	Raquette Lake	Deephole	7/24/2004	5.4700	2.0000	30.6000	29.0000	0.0150	2.2400
Vol	Raquette Lake	Deephole	8/17/2004	6.2600	2.0000	29.9000	27.0000	0.0120	1.7700
Vol	Raquette Lake	Deephole	9/6/2004	5.9400	2.0000	29.7000	30.0000	0.0210	5.0100
Vol	Raquette Lake	Deephole	10/9/2004	6.0600	4.2000	38.2000	17.0000	0.0070	1.0900
			Mean	5.8333	2.8667	33.0833	33.5000	0.0142	2.2867
			Std Dev	0.5973	1.8619	3.5740	20.8782	0.0046	1.4297
AWI	Raquette Lake	Hypolimnion	5/13/2004	6.2800	6.0000	32.0000	18.0000	0.0140	
Vol	Raquette Lake	Deephole	5/28/2005	6.3100	4.0000	32.9000	16.0000	0.0130	2.7000
Vol	Raquette Lake	Deephole	6/26/2005	6.3400	2.0000	38.0000	21.0000	0.0090	2.2800
Vol	Raquette Lake	Deephole	7/20/2005	6.2800	3.8000	22.0000	15.0000	0.0110	1.9000
Vol	Raquette Lake	Deephole	8/24/2005	6.1400	1.8000	20.3000	12.0000	0.0090	1.8800
Vol	Raquette Lake	Deephole	9/24/2005	6.3000	6.0000	19.4000	10.0000	0.0070	1.4600
			Mean	6.2740	3.5200	26.5200	14.8000	0.0098	2.0440
			Std Dev	0.0780	1.7123	8.4010	4.2071	0.0023	0.4676
Vol	Raquette Lake	Deephole	5/26/2006	6.5500	6.6000	51.6000	57.0000	0.0120	3.1700
Vol	Raquette Lake	Deephole	6/30/2006	6.2200	2.8000	34.6000	23.0000	0.0100	2.7800
Vol	Raquette Lake	Deephole	7/19/2006	6.2500	3.2000	32.2000	57.0000	0.0120	2.6700
Vol	Raquette Lake	Deephole	8/17/2006	6.1600	2.4000	31.8000	39.0000	0.0090	1.9700
Vol	Raquette Lake	Deephole	9/25/2006	6.1500	2.2000	33.1000	21.0000	0.0090	2.1300
			Mean	6.2660	3.4400	36.6600	39.4000	0.0104	2.5440
			Std Dev	0.1641	1.8078	8.4207	17.5157	0.0015	0.4910
Vol	Raquette Lake	Deephole	5/26/2007	6.4000	6.0000	32.3000	40.0000	0.0130	3.2200
Vol	Raquette Lake	Deephole	6/26/2007	6.1400	6.0000	29.8000	15.0000	0.0110	1.9800
Vol	Raquette Lake	Deephole	7/22/2007	6.4800	7.6000	31.9000	55.0000	0.0090	1.8700
Vol	Raquette Lake	Deephole	08/21/07	6.440	7.2	29.4	21	0.0080	
Vol	Raquette Lake	Deephole	09/04/07	6.520	8.2	39.2	12	0.0110	
			Mean	6.3960	7.0000	32.5200	28.6000	0.0104	2.3567
			Std Dev	0.1499	0.9798	3.9430	18.3385	0.0019	0.7497
AWI	Raquette Lake	Epilimnion	7/1/2008	6.6800	9.2000	36.9000	37.0000	0.0120	2.6700
Vol	Raquette Lake	Deephole	6/5/2008	6.4500	6.0000	35.0000	30.0000	0.0120	2.5200
Vol	Raquette Lake	Deephole	7/1/2008	6.6600	7.6000	36.8000	35.0000	0.0110	2.0200
Vol	Raquette Lake	Deephole	8/20/2008	6.3800	6.0000	23.2000	27.0000	0.0090	2.0100
Vol	Raquette Lake	Deephole	9/3/2008	6.2400	5.2000	15.2000	20.0000	0.0100	2.0800
Vol	Raquette Lake	Deephole	10/8/2008	6.2400	5.2000	35.1000	26.0000	0.0120	3.0700
			Mean	6.4417	6.5333	30.3667	29.1667	0.0110	2.3950
			Std Dev	0.1948	1.5731	9.0480	6.2423	0.0013	0.4324
AWI	Raquette Lake	Hypolimnion	7/1/2008	6.5800	7.6000	37.7000	25.0000	0.0130	x

Vol	Raquette Lake	Deephole	5/24/2009	6.4500	2.8000	40.1000	20.0000	0.0120	3.0700
Vol	Raquette Lake	Deephole	6/30/2009	6.3100	5.2000	34.1000	20.0000	0.0100	2.0200
Vol	Raquette Lake	Deephole	7/29/2009	6.4900	6.0000	52.7000	23.0000	0.0100	1.9900
Vol	Raquette Lake	Deephole	8/16/2009	6.3300	5.2000	28.2000	12.0000	0.0090	1.8700
Vol	Raquette Lake	Deephole	9/5/2009	6.5200	6.2000	45.1000	19.0000	0.0100	1.9800
			Mean	6.4200	5.0800	40.0400	18.8000	0.0102	2.1860
			Std Dev	0.0949	1.3535	9.5046	4.0866	0.0011	0.4974
Vol	Raquette Lake	Deephole	5/31/2010	6.5200	6.0000	44.1000	57.0000	0.0110	2.2300
Vol	Raquette Lake	Deephole	6/27/2010	6.7100	9.2000	30.1000	40.0000	0.0090	1.8100
Vol	Raquette Lake	Deephole	7/27/2010	6.6800	8.8000	37.8000	45.0000	0.0090	1.9700
Vol	Raquette Lake	Deephole	8/14/2010	6.6400	6.6000	26.0000	32.0000	0.0100	2.0700
Vol	Raquette Lake	Deephole	9/3/2010	6.5700	6.2000	30.8000	40.0000	0.0070	1.7200
			Mean	6.6240	7.3600	33.7600	42.8000	0.0092	1.9600
			Std Dev	0.0783	1.5192	7.1696	9.2033	0.0015	0.2032
Source	Lake/Pond Name	Sampling Location	Sampling Date	Secchi (meters)	Nitrate (ppm)	Calcium (ppm)	Chloride (ppm)	Aluminum (ppm)	CSI
Vol	Raquette Lake	Deephole	07/29/03	5.0000	0.0000				
Vol	Raquette Lake	Deephole	8/25/2003	4.7500	0.5000				
Vol	Raquette Lake	Deephole	9/26/2003	6.0000	0.6000				
			Mean	5.2500	0.3667				
			Std Dev	0.6614	0.3215				
AWI	Raquette Lake	Epilimnion	5/13/2004	5.0000	0.8000	2.5900	5.0000	0.0080	3.6600
Vol	Raquette Lake	Deephole	6/23/2004	4.5000	0.2000				
Vol	Raquette Lake	Deephole	7/24/2004	4.5000	0.1000				
Vol	Raquette Lake	Deephole	8/17/2004	5.5000	0.1000				
Vol	Raquette Lake	Deephole	9/6/2004	4.7500	0.1000				
Vol	Raquette Lake	Deephole	10/9/2004	4.0000	0.1000				
			Mean	4.7083	0.2333				
			Std Dev	0.5103	0.2805				
AWI	Raquette Lake	Hypolimnion	5/13/2004		0.7000	2.4700	5.0000	0.0210	3.8500
Vol	Raquette Lake	Deephole	5/28/2005	4.0000	0.2000				
Vol	Raquette Lake	Deephole	6/26/2005	5.2500	0.1000				
Vol	Raquette Lake	Deephole	7/20/2005	5.0000	0.3000				
Vol	Raquette Lake	Deephole	8/24/2005	5.2500	0.1000				
Vol	Raquette Lake	Deephole	9/24/2005	6.5000	0.0000				
			Mean	5.2000	0.1400				
			Std Dev	0.8909	0.1140				
Vol	Raquette Lake	Deephole	5/26/2006	4.750	0.1700				
Vol	Raquette Lake	Deephole	6/30/2006	4.750	0.0900				
Vol	Raquette Lake	Deephole	7/19/2006	4.7500	0.0800				
Vol	Raquette Lake	Deephole	8/17/2006	5.5000	0.0600				
Vol	Raquette Lake	Deephole	9/25/2006	nr	0.1300				
			Mean	4.9375	0.1060				
			Std Dev	0.3750	0.0439				

Source	Lake/Pond Name	Sampling Location	Sampling Date	Secchi (meters)	Nitrate (ppm)	Calcium (ppm)	Chloride (ppm)	Aluminum (ppm)	CSI
Vol	Raquette Lake	Deephole	5/26/2007	4.0000	0.5000				
Vol	Raquette Lake	Deephole	6/26/2007	5.0000	0.4000				
Vol	Raquette Lake	Deephole	7/22/2007	6.0000	0.5000				
Vol	Raquette Lake	Deephole	08/21/07	6.0000	0.3000				
Vol	Raquette Lake	Deephole	09/04/07	5.0000	0.2000				
			Mean	5.2000	0.3800				
			Std Dev	0.8367	0.1304				
AWI	Raquette Lake	Epilmnion	7/1/2008	4.6000	0.3000	2.7600	2.0000	0.0090	3.6000
Vol	Raquette Lake	Deephole	6/5/2008	4.7500	0.2000				
Vol	Raquette Lake	Deephole	7/1/2008	5.0000	0.3000				
Vol	Raquette Lake	Deephole	8/20/2008	5.0000	0.2000				
Vol	Raquette Lake	Deephole	9/3/2008	5.0000	0.4000				
Vol	Raquette Lake	Deephole	10/8/2008	4.5000	0.5000				
			Mean	4.8083	0.3167				
			Std Dev	0.2245	0.1169				
AWI	Raquette Lake	Hypolimnion	7/1/2008	x	0.1000	2.6100	4.0000	0.0090	
Vol	Raquette Lake	Deephole	5/24/2009	4.250	0.2000	2.2600	4.0000	0.0180	2.8000
Vol	Raquette Lake	Deephole	6/30/2009	5.000	0.2000				
Vol	Raquette Lake	Deephole	7/29/2009	5.000	0.2000				
Vol	Raquette Lake	Deephole	8/16/2009	5.2500	0.1000				
Vol	Raquette Lake	Deephole	9/5/2009	5.0000	0.2000				
			Mean	4.9000	0.1800				
			Std Dev	0.3791	0.0447				
Vol	Raquette Lake	Deephole	5/31/2010	4.7500	0.2500	2.8600	8.5000	0.0800	
Vol	Raquette Lake	Deephole	6/27/2010	5.7500	0.2900	2.9400	7.0000	0.0700	
Vol	Raquette Lake	Deephole	7/27/2010	5.2500	0.2200	2.8400	7.6000	0.0600	
Vol	Raquette Lake	Deephole	8/14/2010	5.0000	0.2100	2.4200	5.9000	0.0600	
Vol	Raquette Lake	Deephole	9/3/2010	6.0000	0.2100	2.9700	7.6000	0.0600	
			Mean	5.3500	0.2360	2.8060	7.3200	0.0660	
			Std Dev	0.5184	0.0344	0.2224	0.9576	0.0089	

