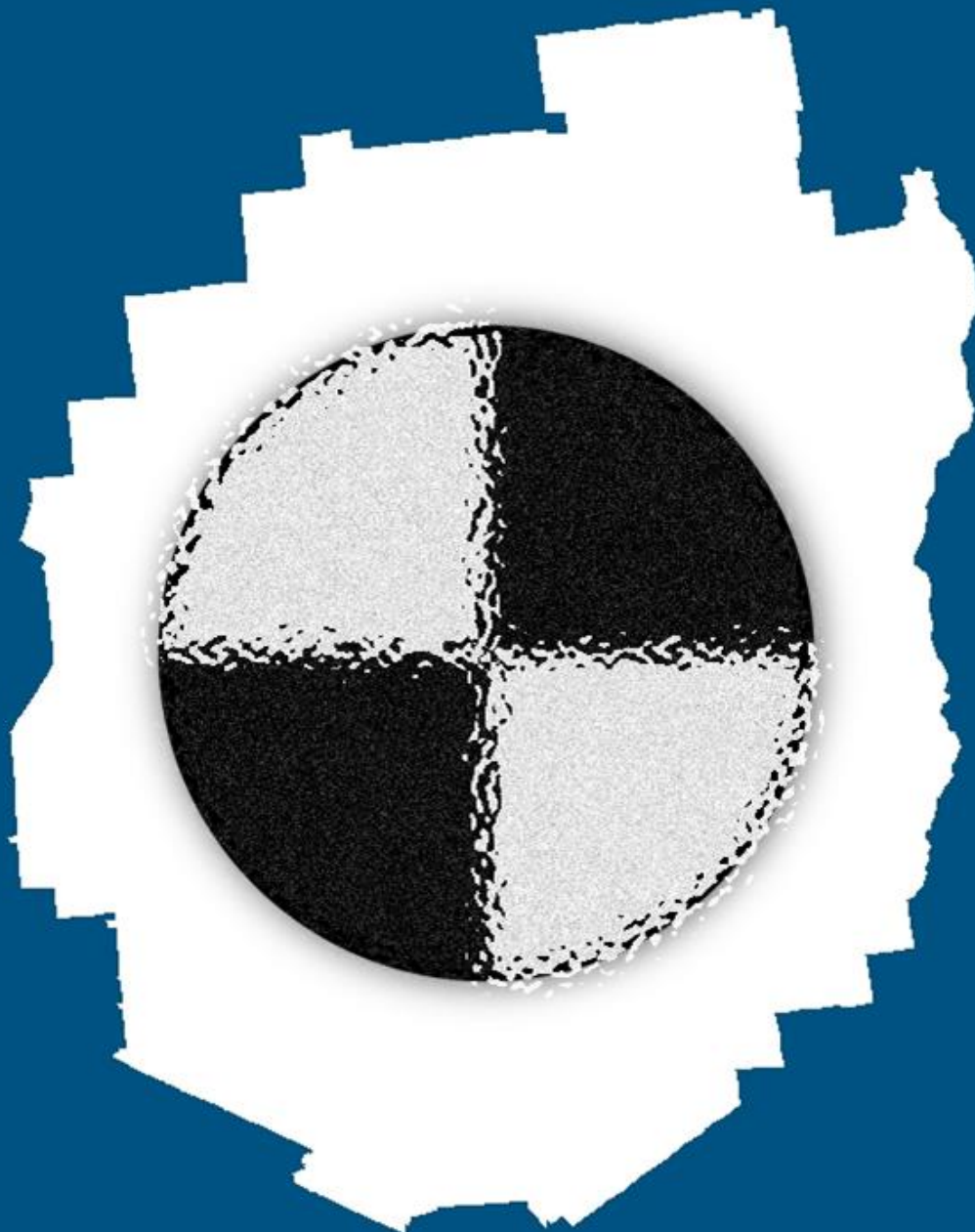


# Adirondack Lake Assessment Program

## 2016 Report

ALAP



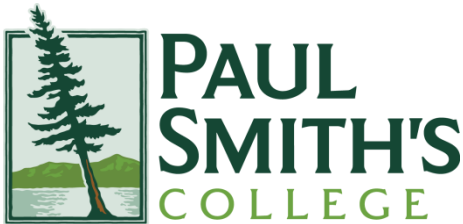
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# Acknowledgments

The Adirondack Lake Assessment Program (ALAP) is a collaboration between the Paul Smith's College Adirondack Watershed Institute ([www.adkwatershed.org](http://www.adkwatershed.org)) and Protect the Adirondacks ([www.protectadks.org](http://www.protectadks.org)). 2016 marked the 19<sup>th</sup> year of ALAP. The narrative and results presented in this report were produced by Corey Laxson, Elizabeth Yerger, Sean Regalado, and Daniel L Kelting. Laboratory work on samples received from ALAP volunteers was conducted by Elizabeth Yerger, Corey Laxson, Hunter Favreau, and Dan Kelting. Administrative support, volunteer coordination, and numerous program contributions were provided by Peter Bauer, Nancy Bernstein, Evelyn Greene, and Elizabeth Yerger.

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## Special thanks to our ALAP 2016 Volunteers

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# Table of Contents

<b>List of Figures.....</b>	<b>7</b>	Deer Lake .....	53
<b>List of Tables.....</b>	<b>7</b>	Eagle Lake.....	55
<b>How to Use This Report.....</b>	<b>8</b>	East Caroga Lake .....	57
<b>Overview of ALAP .....</b>	<b>9</b>	Eli Pond .....	59
<b>Methods.....</b>	<b>9</b>	Fern Lake.....	61
<b>Understanding and Interpreting ALAP Data ...</b>	<b>12</b>	Frank Pond .....	64
Transparency.....	12	Garnet Lake.....	66
Chlorophyll-a.....	12	Gull Pond.....	68
Phosphorus .....	13	Hoel Pond.....	70
Trophic State .....	14	Indian Lake - Franklin County.....	72
Color.....	16	Indian Lake - Hamilton County.....	74
pH.....	16	Kiawassa Lake .....	76
Alkalinity.....	17	Lake Abanakee .....	78
Sodium and Chloride.....	20	Lake Adirondack.....	80
Calcium.....	21	Lake Clear .....	82
Conductivity .....	22	Lake Colby .....	84
<b>Individual Lake Reports.....</b>	<b>24</b>	Lake Durant.....	86
Arbutus Lake .....	25	Lake Titus .....	88
Augur Lake .....	27	Lake of the Pines.....	90
Austin Pond.....	29	Lens Lake.....	92
Big Moose Lake .....	31	Little Long Lake .....	94
Blue Mountain Lake .....	33	Long Lake .....	96
Brandreth Lake.....	36	Long Pond .....	98
Butternut Pond .....	38	Loon Lake - Franklin County.....	100
Canada Lake .....	40	Loon Lake - Warren County .....	103
Catlin Lake.....	42	Lower Chateaugay Lake .....	105
Chapel Pond .....	44	Lower Saranac Lake.....	107
Chase’s Lake .....	46	Lower St. Regis Lake.....	109
Chazy Lake.....	48	Middle Saranac Lake .....	111
Cranberry Lake .....	51	Mink Pond .....	113
		Moss Lake.....	115
		Mountain View Lake .....	117

Osgood Pond .....	119
Paradox Lake .....	121
Pine Lake .....	124
Pleasant Lake .....	126
Raquette Lake .....	128
Rich Lake .....	130
Schroon Lake .....	132
Silver Lake .....	135
Simon Pond .....	137
Spitfire Lake .....	139
Star Lake.....	141
Stony Creek Pond.....	143
Thirteenth Lake .....	145
Tripp Pond.....	147
Trout Lake .....	149

Tupper Lake.....	151
Twitchell Lake.....	153
Upper Cascade Lake .....	155
Upper Chateaugay Lake .....	157
Upper St. Regis Lake.....	159
West Caroga Lake.....	161
White Lake .....	163
Wolf Lake .....	165

**Literature Cited .....** 167

<b>Appendix 1.</b> Analytical methods performed on ALAP samples at the AWI Environmental Research Lab. ....	169
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# List of Figures

Figure 1 Location of ALAP participants in 2015. .... 10

Figure 2. Frequency histograms of average 2016 ALAP values for transparency, total phosphorus, chlorophyll, and color. .... 17

Figure 3. Condition of the 2016 ALAP lakes in terms of trophic state, acidity, acid sensitivity, and road salt influence..... 18

Figure 4. Frequency histograms of average 2016 ALAP values for pH, alkalinity, chloride, sodium, calcium and conductivity..... 19

Figure 5. . Relationship between conductivity and the combination of sodium and chloride in ALAP lakes, 2011-2016. ( $P < 0.001$ ,  $r^2 = 0.86$ ,  $n = 1383$ )..... 23

# List of Tables

Table 1. 2016 ALAP Lakes organized by the number of years of program participation. .... 11

Table 2. Fixed boundary trophic status determination employed by the NYSDEC. .... 15

Table 3. Assessment of lake acidification based on pH ..... 16

Table 4. Acid neutralizing ability and acidification status assessment based on alkalinity concentration (mg/L as  $\text{CaCO}_3$ ). .... 20

Table 5. Assessment of road salt influence based on chloride concentration. .... 21

## How to Use This Report

Welcome to the 2016 ALAP Report! Last year we enacted a major change to the reporting format. Instead of issuing individual lake reports we designed a single report that encompasses all the information of the old style reports plus plenty of new material as well. We believe the move to a single report represents a substantial upgrade for the program for several reasons. First, a single report highlighting the water quality across the entire region will attract wider interest than dozens of lake specific reports; and it will be much more useful for academics, government agencies, non-profits, lake associations, and interested individuals. Secondly, ALAP participants will now have easy access to lake information from all of the participating lakes without having to search and download files from a website. Lastly, a single document greatly improves our reporting efficiency, allowing ALAP to be cost effective and affordable.

This report is designed to provide lake information to the informed lay person, scientific community, lake managers, and other interested individuals. As such, it is written in a way to provide something for everyone. New last year is a section titled *“Understanding and Interpreting ALAP Data”*. We hope this section will provide readers with greater appreciation for lake science as well as improved ability to interpret the data for their lake. The data for each participating lake has been reduced down to a 2-page description and can be found in the section titled *“Individual Lake Reports”*. Participating lakes that wish to have a full stand-alone report produced for them are encouraged to contact the corresponding author.

The data in this document are reported in metric units. Although this system has not been fully adopted in the United States, it is the standard system of measurement used by scientists and lake managers throughout the world. Information on converting the metric units of measurements used in this report to English units are readily available through internet searches. The amount of chemical elements dissolved in the lake samples are always described using metric concentration units. The most common ways to express chemical data are milligrams per liter (mg/L) and micrograms per liter ( $\mu\text{g/L}$ ). One milligram per liter is equal to one part analyte to one million parts water. One microgram per liter is equal to one part analyte to one billion parts water.



Image 1. Sunset on Middle Saranac Lake (photo courtesy of Brendan Wiltse).

## Overview of ALAP

The Adirondack Lake Assessment Program (ALAP) is a highly successful citizen science lake monitoring program that combines the enthusiasm of volunteers with the technology and expertise of scientists in the environmental field. Citizen science programs like ALAP are quickly becoming the 21<sup>st</sup> century model for handling large scale research and monitoring projects. These collaborations are mutually beneficial in that they address the scientific communities need for more researchers, and provide citizens with the benefit of knowing they helped advance the understanding of a cherished resource (Toerpe 2013). There are many citizen science lake monitoring programs across the country, the vast majority of which are administered at the state level. ALAP is the only program to focus on a specific region.



**Image 2.** Young citizen scientists from Camp Whippoorwill preparing to collect an ALAP sample from Augur Lake (photo courtesy of Nancy Gucker-Birdsall).

ALAP is a cooperative effort between Protect the Adirondacks (Protect) and the Adirondack Watershed Institute (AWI). The objectives of ALAP are to (1) develop a long term water quality database for Adirondack lakes and ponds

that can be used by multiple stakeholders, (2) document historical trends in their limnological condition, and (3) engender lake stewardship by providing opportunities for citizens to participate in scientific monitoring.

ALAP continues to be a highly successful program. Established in 1998 with 9 participating lakes, the program has grown to 75 participating lakes in 2015 and 68 Lakes in 2016. ALAP lakes are from all across the Adirondack Region (Figure 1 and Table 1). For many lakes the ALAP dataset represents the only available source of information on water quality.

## Methods

ALAP volunteers were trained in standard limnological sampling methods by AWI and PROTECT. Data was collected from the deepest location of the lake, 3 to 5 times during the summer months. During each sampling event volunteers observed the secchi transparency reading by lowering a standard 20 cm black and white secchi disk to a depth where it could no longer be seen. This process was repeated and the average secchi depth for that day was recorded. Surface water samples were collected using a 2-meter integrated tube sampler. The contents of the tube were poured into a 1 liter brown bottle and thoroughly mixed. A 250 mL aliquot of the integrated sample was collected for chemical analysis and a second 250 mL aliquot was filtered through a 0.45  $\mu\text{m}$  cellulose membrane filter for chlorophyll-a analysis. The filter was retrieved and wrapped in foil. The water sample and chlorophyll filter were frozen immediately after collection and delivered frozen to the AWI Environmental Research Lab, generally within a 10 day period.

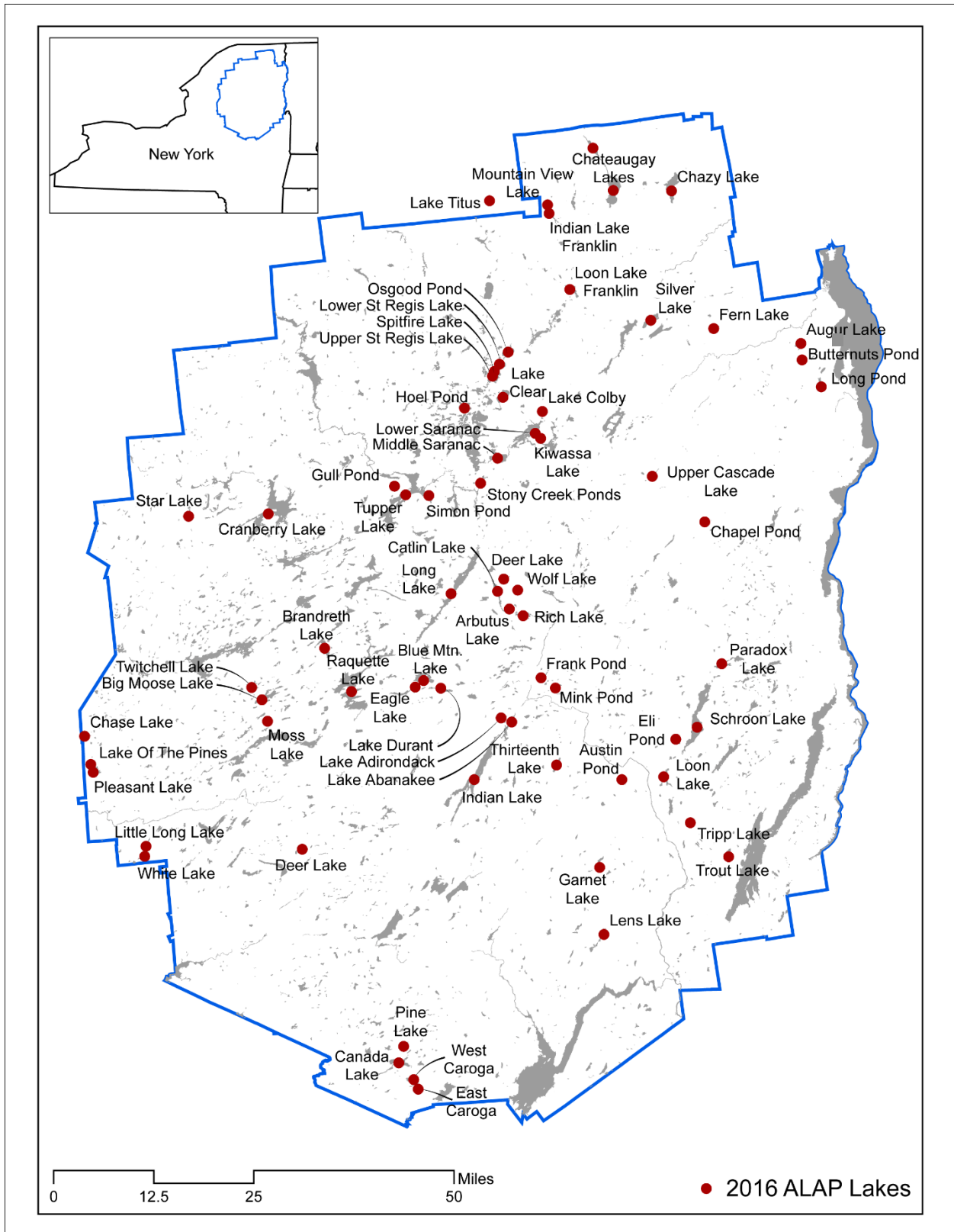


Figure 1 Location of ALAP participants in 2016.

Table 1. 2016 ALAP Lakes organized by the number of years of program participation.

Lake Name	Years	Lake Name	Years	Lake Name	Years
Blue Mt. Lake	19	Pine Lake	16	Lake Abanakee	11
Cranberry Lake	19	Long Pond	16	Chazy Lake	10
Eagle Lake	19	Pleasant Lake	16	Lake Adirondack	10
Loon Lake (FC)	19	Tripp Lake	16	Lower Chateaugay Lake	10
Silver Lake	19	Twitchell Lake	16	Upper Chateaugay Lake	10
Stony Creek Ponds	18	Wolf Lake	16	Chapel Pond	9
Brandreth Lake	18	Garnet Lake	15	Simon Pond	9
Eli Pond	18	Lens Lake	15	Upper Cascade Lake	8
Gull Pond	18	Lower Saranac Lake	15	Augur Lake	7
Little Long Lake	18	Lower St Regis Lake	15	Lake Titus	7
Thirteenth Lake	18	Upper St Regis Lake	15	Star Lake	7
Middle Saranac Lake	17	Spitfire Lake	15	Lake Clear	6
Osgood Pond	17	Canada Lake	14	Lake Durant	6
Austin Pond	17	Kiwassa Lake	14	Loon Lake (WC)	5
Trout Lake	17	Lake Colby	14	Schroon Lake	3
White Lake	17	Raquette Lake	14	Paradox Lake	3
Arbutus Lake	16	Tupper Lake	14	Butternut Pond	2
Catlin Lake	16	Indian Lake (HC)	13	Chases Lake	2
Deer Lake	16	Fern Lake	12	Frank Pond	2
Hoel Pond	16	Big Moose Lake	12	Mink Lake	2
Lake of the Pines	16	Mountain View Lake	12	Long Lake	1
Rich Lake	16	Indian Lake (FC)	12	West Caroga	1
		Moss Lake	12	East Caroga	1



Each sample was analyzed for laboratory pH, conductivity, total phosphorus, chlorophyll-a, and color. One sample from the season was analyzed for alkalinity, chloride, calcium and sodium at the AWI Environmental Research Lab following the analytical methods listed in Appendix 1. Results for the current year were tabulated and time series charts were constructed from the annual average value for each indicator. Trend analysis was conducted on lakes with five or more years of data using Kendall's non-parametric regression to test the hypothesis "there is no relationship between the indicator and time". Simple linear trend lines were fit to data with significant trends ( $P < 0.05$ ) and displayed on the corresponding chart.

## Understanding and Interpreting ALAP Data

### Transparency

Transparency is a simple and inexpensive measurement of water clarity and light penetration. It is measured by lowering a 20 cm black and white disk, called a secchi disk, through the water to the depth where it is no longer visible from the surface. The secchi disk was created by the Italian astronomer Pietro Angelo Secchi in the mid-19<sup>th</sup> century (Image 3).

Transparency is a great indicator of lake condition because it is influenced by many factors related to water quality and human perception. Secchi data is used most often to interpret the productivity of a lake. In general, lakes that have low productivity and low algal abundance have greater transparency. As algal productivity increases the transparency of the water body tends to decrease (see Trophic State). There are a number of other water quality issues that can

influence transparency depth such as turbidity (cloudiness of the water), suspended sediment, and dissolved chemicals. For example, the transparency of many lakes in the Adirondacks is influenced by the amount of colored dissolved organic material in the water (see Color).

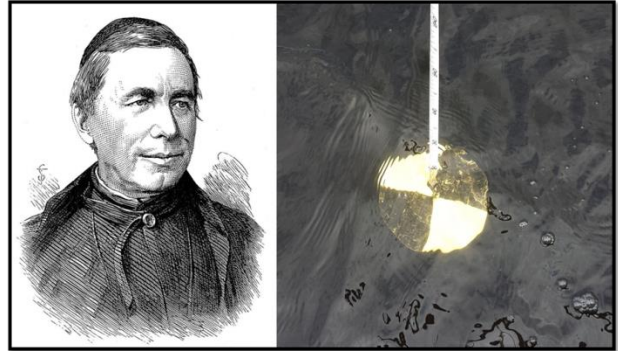


Image 3. Pietro Angelo Secchi (1818 - 1878) and the limnological tool named after him.

In 2016 average ALAP transparencies ranged from 1 meter to as high as 10 meters in depth. The majority of lakes (70%) had average transparency depths of 5.0 meters or less (Figure 2). Analysis of the historical data reveals that 87% of study lakes had no observable change over time and 13% had a decreasing trend in transparency (less transparent).

### Chlorophyll-a

Chlorophyll-a is the primary photosynthetic pigment found in all freshwater species of algae and cyanobacteria. Studying actual algal productivity in a lake is a difficult and expensive undertaking. A measurement of chlorophyll-a however is relatively simple and inexpensive, and provides a surrogate measure of algal productivity (Wetzel 2001). Chlorophyll-a is not a direct measure of algal biomass as the concentration of chlorophyll varies somewhat by species and environmental conditions. This said, increases in chlorophyll are generally associated with increased algal production, and the



concentration of chlorophyll is widely considered as the most direct measure of the trophic state of lakes. Algal biomass is affected by the interaction of nutrient availability, light, water temperature, and grazing so there can be considerable variation in chlorophyll concentrations throughout the year depending on which of these factors is limiting growth at a particular time. Typically, major changes in algal biomass (e.g. an algae bloom), and thus chlorophyll, are usually related to changes in the availability of phosphorus, nitrogen, silica or inorganic carbon (Wetzel 2001; Klemer 1990).



**Image 4. A chlorophyll filter clogged with algae. The sample was taken during a cyanobacteria bloom on Spitfire Lake in August, 2014.**

Chlorophyll-a is analyzed by filtering a known volume of lake water through a fine (0.45 $\mu$ m) cellulose-acetate filter, which captures the small photosynthetic organisms (Image 4). In the laboratory the filter is macerated and the chlorophyll- is extracted into acetone and is then analyzed with a spectrophotometer.

In 2016 average chlorophyll-a concentrations ranged from less than 1  $\mu$ g/L to as high as 11  $\mu$ g/L. The majority of lakes (76%) had values less than 4.0  $\mu$ g/L (Figure 2). Analysis of the historical data reveals that 79% of participating lakes

showed no statistical change in algal productivity over time and that 21% had a decreasing trend in chlorophyll-a concentration.

## Phosphorus

Phosphorus is of major importance to structure and metabolism of all organisms. However, it exists in relatively small amounts in freshwater systems compared to other essential nutrients such as carbon, hydrogen, oxygen, and sulfur. The addition of extra phosphorus to an aquatic system allows production to increase greatly because all other essential elements are typically available in excess. Thus phosphorus is typically the limiting nutrient in aquatic systems, and widely considered as the most important contributor to reduced water quality in lakes (Schindler 1977; S ndergaard et al. 2003). Natural weathering releases phosphorus from rocks and soils, and it also enters our watersheds in fertilizers, human and animal waste, and atmospheric deposition. Phosphorus exists in a number of forms in aquatic systems, including readily available dissolved phosphorus, and organically and inorganically bound phosphorus. Total phosphorus is a measurement of all of the forms of phosphorus combined and serves as an important indicator of overall trophic status of a lake. Generally speaking, lakes of low productivity (oligotrophic) have total phosphorus concentrations less than 10  $\mu$ g/L, while highly productive lakes (eutrophic) have total phosphorus concentrations greater than 20 $\mu$ g/L (NYSDEC Clean Lakes Assessment).

Total phosphorus is analyzed by digesting the lake water sample with a strong acid (sulfuric acid) and an oxidizing agent (ammonia persulfate). All of the numerous forms of phosphorus are converted to phosphate, which is then quantified with an automated spectrophotometer (Image 5)

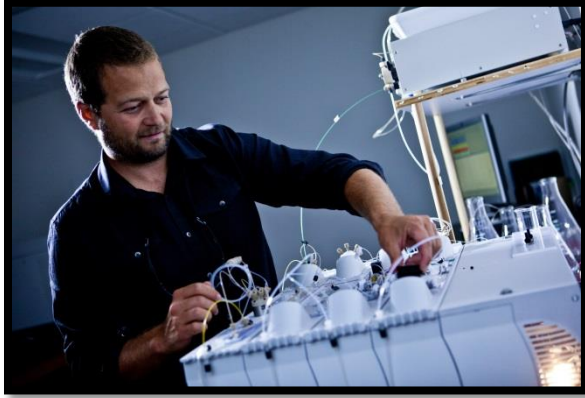


Image 5. Preparing the Lachat QC 8500 for chemical analysis of ALAP samples in the Environmental Research Lab of the AWI.

In 2016 the average total phosphorus concentrations ranged from below 5  $\mu\text{g/L}$  to as high as 26 $\mu\text{g/L}$ . The majority of lakes (71%) had average values less than 10  $\mu\text{g/L}$  (Figure 2). Analysis of the historical data reveals that 57% of participating lakes showed no statistical change in phosphorus concentration over time and that 41% exhibited a decreasing trend. Significant improvements were made to our phosphorus methodology in 2010. The method change may be partially responsible for the decreasing trend exhibited by some lakes.

## Trophic State

Trophic status is a term derived from the Greek word *trophi*, meaning food or nourishment, and is used by limnologists to explain the overall productivity of a lake. Lake productivity is naturally influenced by the rate of nutrient supply from the watershed, climatic condition, and lake and watershed morphology. Human activities and development within a watershed have the potential to increase the rate of nutrient supply into the lake and thereby accelerate lake productivity, a process known as cultural eutrophication.

Most Lakes in the Adirondacks can be assigned into one of three trophic classes; oligotrophic, mesotrophic, or eutrophic based on their overall level of biological productivity.

Oligotrophic - From the Greek words *oligo*, meaning few and *trophi*, meaning nourishment; oligotrophic lakes have low biological productivity due to relatively low nutrient content. As a result of low nutrients oligotrophic lakes have high transparency, low algal abundance, low organic matter in the sediments, sparse aquatic plant growth, and abundant dissolved oxygen throughout the water column the entire year. Oligotrophic lakes are most likely to support a cold water fishery (trout and salmon).

Eutrophic - From the Greek words *Eu*, meaning good. Eutrophic lakes have high biological productivity due to abundant levels of nutrients. As a result of high nutrient availability eutrophic lakes are typified by high algal productivity, low transparency, high organic matter in the sediments, and periods of anoxia in the bottom of the water column (the hypolimnion). Eutrophic lakes tend to support dense aquatic plant growth in the littoral zone. Eutrophic lakes are unlikely to support a viable cold water fishery

Mesotrophic - from the Greek words *Meso*, is an intermediate trophic classification on the continuum between oligotrophy and eutrophy.

Trophic status is typically determined by analyzing lake data on transparency, chlorophyll and total phosphorus and employing one of the two most commonly used classification approaches, the fixed boundary method or the trophic index method. The fixed boundary method uses predetermined ranges of transparency, total phosphorus, and chlorophyll to classify the lakes trophic status. A good example of a fixed boundary is the traditional

method employed by the NYS DEC that appears in Table 2 (NYSDEC Clean Lakes Assessment).

**Table 2. Fixed boundary trophic status determination employed by the NYSDEC.**

Parameter	Oligotrophic	Mesotrophic	Eutrophic
Transparency	>5	2-5	<2
Total Phosphorus	<10	10-20	>20
Chlorophyll-a	<2	2-8	>8

The most commonly used trophic state index is Carlson's TSI (Carlson 1977). This index uses algal biomass as determined by the three variables of transparency, total phosphorus, and chlorophyll as the basis for the trophic state classification. The range of the index is from approximately zero to 100, although technically there are no upper or lower bounds. Each major TSI division (10, 20, 30, etc.) represents a doubling in algal biomass. The Traditional trophic classification scheme can be overlaid on the index as follows:

TSI < 40 = oligotrophic, TSI 40-50 = mesotrophic, TSI > 50 = Eutrophic.

Regardless of the lakes trophic state, or the method used to classify it, it's important to remember that "trophic state" is just an organizing concept limnologists use to locate a particular waterbody on a continuum of productivity, thereby connecting the lake to previous information and knowledge from other lakes. An oligotrophic lake and its biota do not possess a distinct identity or wholeness that separates it from a mesotrophic lake. The physical variables of a lake system are dynamic and exist across a wide gradient and the biological components of a lake change continuously as well (Carlson and Simpson 1996).

Of the 68 lakes participating in 2016 we classified 70% as oligotrophic, 26% as mesotrophic, and 4% as eutrophic using the average of the three Carlson's TSI values (Figure 3).



**Image 6. Paddling on Blue Mountain Lake, a classic oligotrophic lake (photo courtesy of Brendan Wiltse).**

## Color

The observed color of a lake is an optical property that results from light being scattered upwards after selective absorption by water molecules as well as dissolved (metallic ions, organic acids) and suspended materials (silt, plant pigments). For example, alkaline lakes with high concentrations of calcium carbonate scatter light in the green and blue wavelength and thus appear turquoise in color. Lakes rich in dissolved organic matter and humic compounds absorb shorter wavelengths of light such as green and blue and scatter the longer wavelengths of red and yellow, thus these lakes appear to be brown in color (Image 7; Wetzel 2001). Analysis of color can provide us with information about the quantity of dissolved organic matter (DOM) in the water. However, caution should be taken when using color as a surrogate for DOM as color has been shown to behave differently than the total DOM pool in a lake, making it a crude predictor of DOM (Dillon and Molot 1997; Thurman 1985).



**Image 7.** Dissolved organic matter can make a lake appear different shades of brown due to its selective light absorption.

For objective quantification of apparent color water samples are compared to standards of platinum-cobalt solution (PtCo units) via spectrophotometry. “True color” is the color transmitted by a solution after the removal of

suspended material, “apparent color” is the color transmitted without any filtration.

In 2016 the average color values ranged from less than 10 to nearly 70 PtCo, with the majority of lakes (72%) falling between 10 and 30 PtCo units. (Figure 2). Analysis of the historical data reveals that 90% of participating lakes showed no statistical change in color over time and that 7% have exhibited an increasing trend.

## pH

In chemistry, pH is used to communicate the acidity or alkalinity of a solution. Technically pH is a surrogate measure of the concentration of hydrogen ions in water (acidity). Hydrogen ions are very active, and their interaction with other molecules determines the solubility and biological activity of gasses, nutrients, and heavy metals; thus pH is considered a master variable for its influence on chemical processes and aquatic life. pH exists on a logarithmic scale from 0-14, with 7 being neutral. pH values less than 7 indicate increasing acidity, whereas pH values greater than 7 indicate increasingly alkaline conditions. Because pH exists on a logarithmic scale a decrease in 1 pH unit represents a 10 fold increase in hydrogen ion activity.

**Table 3.** Assessment of lake acidification based on pH

Lake acidity	Status
pH less than 5	Acidic: Critically Impaired
pH 5.0 – 6.0	Acidic: Threatened
pH 6 – 6.5	Acidic: Acceptable
pH 6.5 – 7.5	Circumneutral: non-impacted
pH >7.5	Alkaline: non-impacted

Lakes can become acidified when they are influenced by organic acids from wetlands and bogs or when acidic precipitation falls on a poorly buffered watershed (Driscoll et al. 2003, Wetzel 2001). In the Adirondacks acidification status can



be assessed from pH values based on the guidelines outlined in Table 3.

In 2016 the average pH values ranged from 6.5 to 8.2. The majority of lakes (94%) fell in the circumneutral range between 6.5 and 7.5 (Figures 3 and 4). Analysis of the historical data reveals that 90% of participating lakes showed no statistical change in pH over time and that 10% have exhibited an increasing trend (less acidic).

### Alkalinity

Alkalinity (or acid neutralizing ability) is the capacity of water body to neutralize acids and thereby resist changes in pH. The alkalinity of a lake plays a major role in whether or not a lake is impacted by acid deposition.

Alkalinity is a function of the amount of calcium carbonate in the water which is derived mainly from the watershed.

Most Adirondack lakes exist on slowly weathering granitic bedrock that has a slow rate of calcium carbonate generation, and therefore lower acid neutralizing ability. The opposite is true for lakes that exist on bedrock derived from ancient ocean deposits, such as limestone or dolomite. Soil depth also plays a role in acid neutralizing capacity, with deeper soils offering more buffering ability than shallower soils. Alkalinity is quantified by analyzing the amount of dilute acid is required to lower the pH of a lake sample to 4.3 pH units, the point at which all of the carbonate and bicarbonate alkalinity is consumed. The acid neutralizing ability of a lake can be generally assessed following the parameters presented in Table 4.

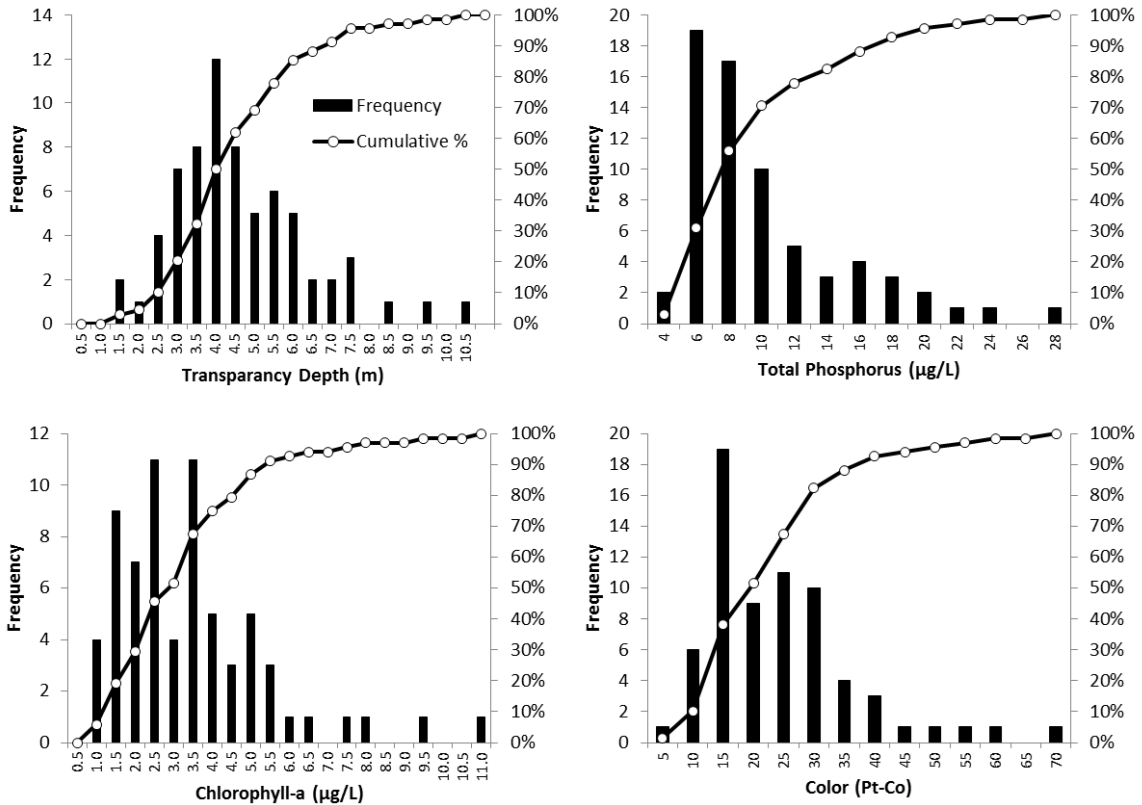


Figure 2. Frequency histograms of average 2016 ALAP values for transparency, total phosphorus, chlorophyll, and color.

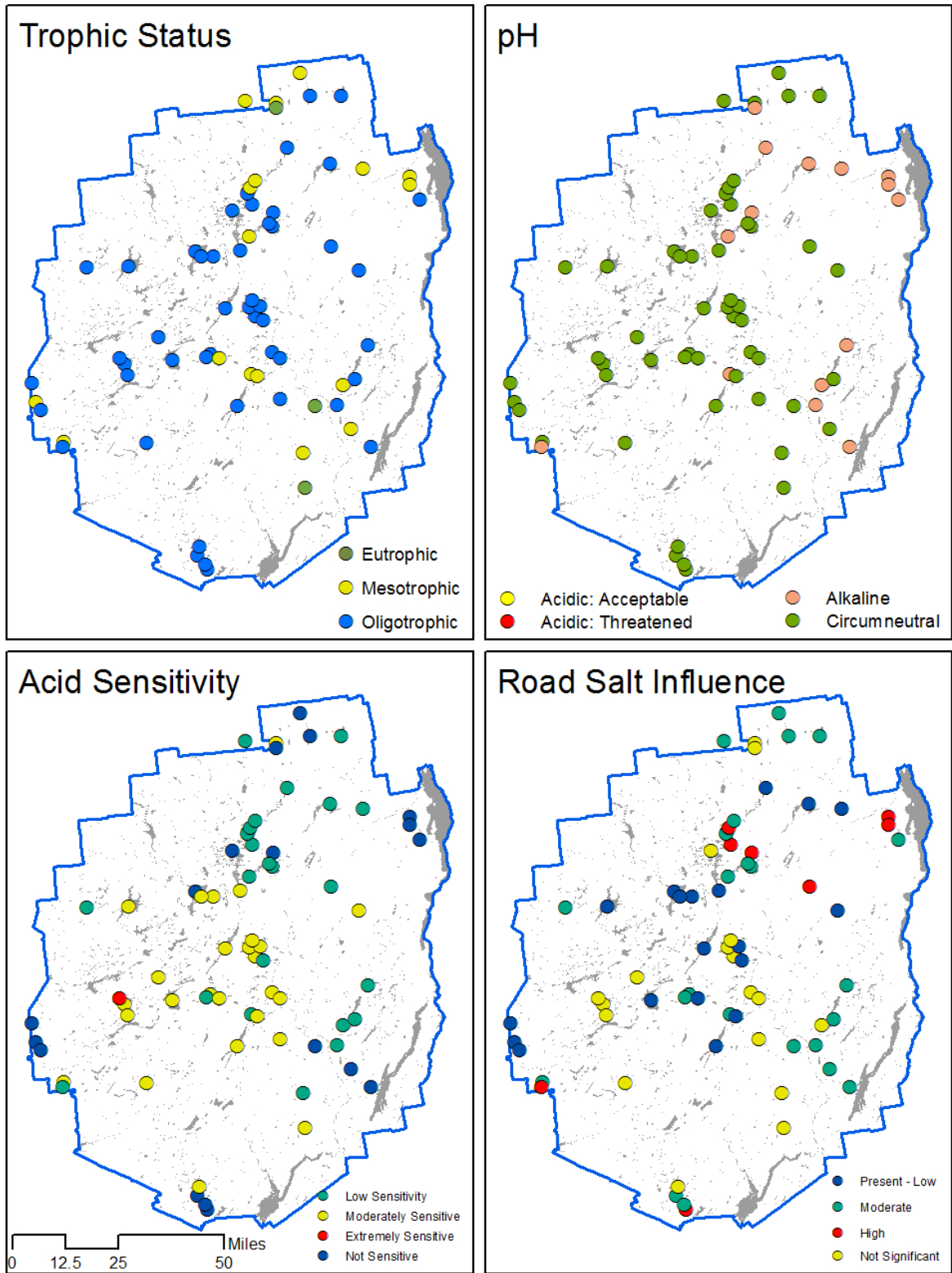


Figure 3. Condition of the 2016 ALAP lakes in terms of trophic state, acidity, acid sensitivity, and road salt influence.

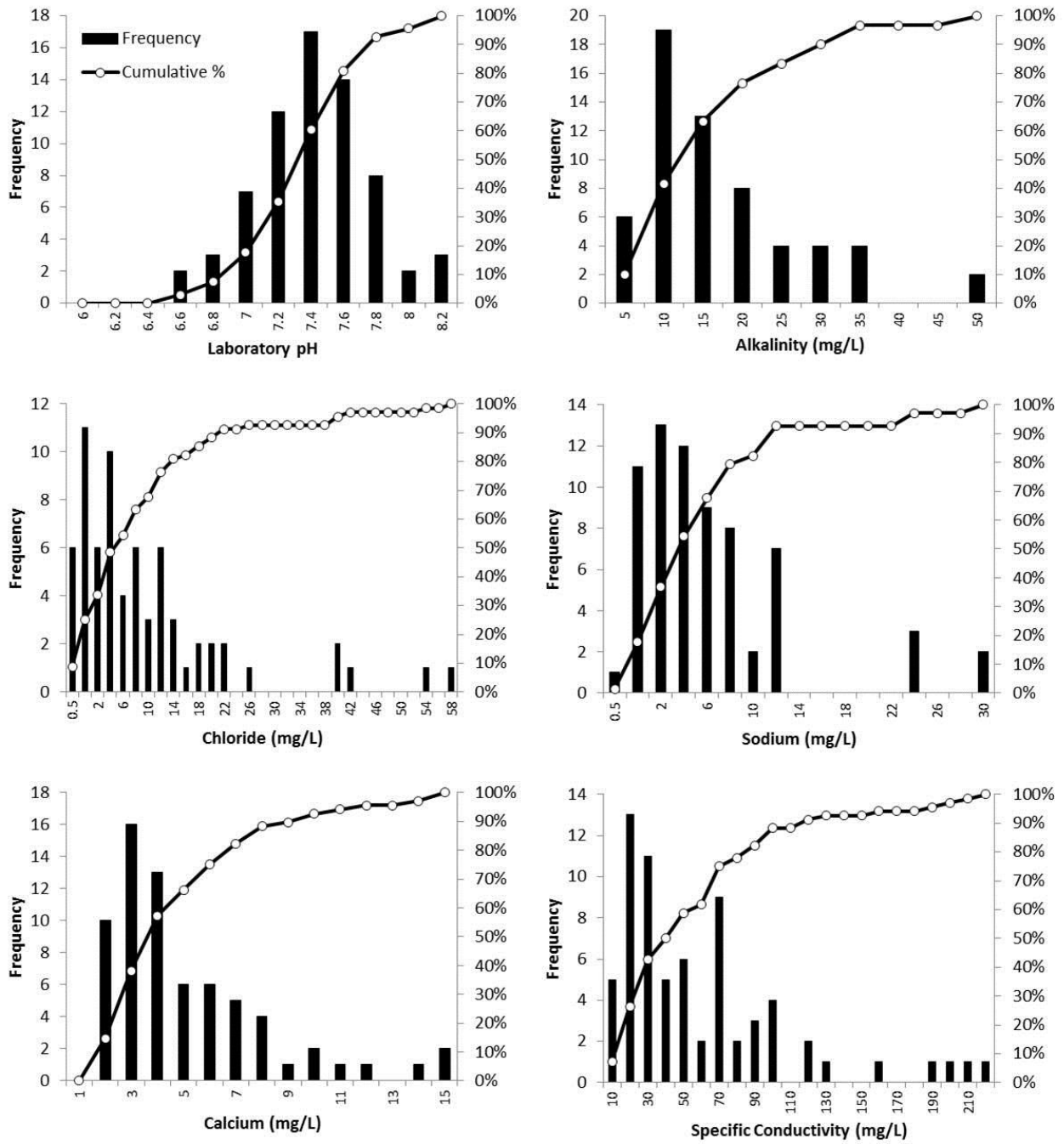


Figure 4. Frequency histograms of average 2016 ALAP values for pH, alkalinity, chloride, sodium, calcium and conductivity.

A wide range of buffering abilities exists across the Adirondack Region. We analyzed one alkalinity sample from each lake in the 2016 season. In 2016 the alkalinity values ranged from 2 mg/L to nearly 50 mg/L, with 38% of the lakes exhibiting some acid sensitivity (Figures 3 and 4). Analysis of the historical data reveals that 71% of participating lakes showed no statistical change in alkalinity over time and that 28% have exhibited a negative trend.

**Table 4. Acid neutralizing ability and acidification status assessment based on alkalinity concentration (mg/L as CaCO<sub>3</sub>).**

Alkalinity (mg/L)	Buffering Ability	Acidification status
< 0	none	acidified
0 - 2	low	extremely sensitive
2 - 10	moderate	moderately sensitive
10 - 25	adequate	low sensitivity
> 25	high	not sensitive

## Sodium and Chloride

Lakes in the Adirondack region have naturally low concentrations of chloride and sodium, with average background concentrations of 0.2 mg/L and 0.5 mg/L respectively (Kelting et al. 2012). However, wide spread use of road deicers (primarily sodium chloride) have significantly increased the concentration of these chemicals in the environment. Each year approximately 98,000 metric tons of road deicers are spread across state roads in the Adirondacks. (Kelting and Laxson 2014). Recent research by Kelting et al. (2012) highlighted that concentrations of sodium and chloride in Adirondack Lakes are directly proportional to the density of state roads within the watershed.

Road salt can have direct and indirect effects on aquatic ecosystems. It is clear that the direct impact of road deicers on organisms is not well

understood, and is highly variable across taxa. Based on laboratory studies the lethal concentration for most aquatic organisms is much higher than concentrations encountered in a lake environment. However, at times lethal concentrations can be encountered in near-road environments that receive direct run-off such as road side streams or vernal pools (reviewed by Findlay and Kelly 2011; Kelting and Laxson 2010).

Indirect effects to aquatic systems have also been documented. For example sodium actively displaces base cations (Ca, K, and Mg) as well as heavy metals from the soil, potentially elevating their concentration in surface waters. In some extreme cases excessive road salt pollution can interfere with lake stratification due to salts effect on water density (Bubeck et al. 1971; Kjensmo 1997). Sodium and chloride impart an undesirable taste to drinking water. The US EPA has guideline of 250 mg/L for chloride and 20 mg/L for sodium, but these are for drinking water only and are not enforceable standards.



**Image 8. Road Salt (NaCl) being loaded into the back of a plow truck (photo by Paul Sancya/AP).**

Although it is difficult to use sodium and chloride concentration to assess impact to the aquatic environment, the concentration of these chemicals serve as a reliable index for the level of hydrologic connectivity a lake has with salted roads in its watershed. We propose the



boundaries presented in Table 5 as a general guideline for gauging road salt influence on a lake.

**Table 5. Assessment of road salt influence based on chloride concentration.**

Chloride (mg/L)	Road Salt Influence
Less than 1.0	Not significant
1 - 5 mg/L	Present - Low
5 - 20	Moderate
20 - 50	High

Sodium and chloride are analyzed separately from each other in the laboratory using two automated methods. Chloride is measured by injecting the water sample through an ion chromatograph where the chloride is separated from other negatively charged ions by a selective resin and then quantified with a voltmeter. Sodium is analyzed with an atomic emission spectrophotometer. The water sample is introduced into a very hot argon plasma torch that excites the sodium ion into a higher energy state. When the ion relaxes it emits light in a characteristic wavelength, the intensity of which is proportional to the amount of sodium in the sample. Regular analysis of sodium and chloride was initiated by the AWI in 2010. Only a handful of lakes have chloride data that extends before 2010.

As expected, a wide range of salt concentrations existed across the region in 2016, driven primarily by the density of salted roads in the watershed. The average chloride concentration ranged from less than 0.5 mg/L to as high as 57 mg/L. Based on these concentrations alone we believe that roughly 75% of the participating lakes are influenced by road salt (Figures 3 and 4). Analysis of the limited historical data reveals that 90% of participating lakes showed no statistical change in chloride since year 2010, and that 8% have exhibited an increasing trend.



**Image 9. Direct road salt runoff coming off of NYS RT 30 during a thawing event in the spring of 2015. The chloride concentration of this melt water was approaching 5,000 mg/L which is ¼ the concentration of sea water.**

## Calcium

Calcium plays an important role in lake ecology because it is an essential element for the structure and physiology of all organisms. For example, calcium is needed for bones and teeth in vertebrates, exoskeletons and shells in invertebrates, and biochemical regulation in plants to name a few. The ultimate source of calcium in lakes is weathering of the bedrock, and to a lesser extent atmospheric deposition (dust). The majority of lakes in the Adirondacks have low concentrations of calcium, typically between 2 and 5 mg/L. The reason for the relatively low concentration is that the granite bedrock under the Adirondacks weathers slowly resulting in a low rate of calcium generation. There are however many lakes in the Adirondacks that reside on calcium rich bedrock resulting in much higher calcium concentrations, examples include Augur Lake (Ca = 15mg/L), Long Pond (Ca = 15 mg/L), and Lake Colby (Ca = 13mg/L).

Environmental stressors can affect the calcium concentration of lakes. Research on northeastern lakes has demonstrated that acid deposition has depleted calcium stores in soils leading to reduced calcium concentrations over time (Strock et al. 2014; Keller et al. 2001). The influence that road salting has on calcium concentrations is an emerging research area. Some municipalities utilize calcium chloride to deice roads, thereby increasing the calcium content of the watershed. When rock salt is used as a deicer the sodium can displace calcium in the soil, potentially leading to increase calcium concentrations in the ground and surface water. Kelting and Laxson (2014) observed that the combined concentration of calcium, magnesium and potassium in lakes with paved roads in the watershed was 62% greater than lakes with no paved roads.

Calcium concentration is a good indicator of the overall habitat suitability for the zebra mussel, a non-indigenous species from Eurasia that has been spreading through the world. Researchers have reported that the minimum calcium concentrations needed to support a viable zebra mussel population is in the range of 12-20 mg/L, lower than most, but not all lakes in the Adirondacks (Whittier et al. 2008).



**Image 10. Zebra mussel distribution in NYS (left) and an aggregation of zebra mussels growing attached to a native mussel (from USFWS).**

Calcium concentration is analyzed alongside sodium and other metals using an atomic emission spectrophotometer and has only been

analyzed regularly since 2010 (see Sodium and Chloride). In 2016 the average calcium concentrations values ranged from 1 mg/L to 15 mg/L. The majority of lakes (66%) have calcium concentrations less than 5 mg/L (Figure 4). We found three lakes with calcium concentrations within the minimum range needed to support a viable zebra mussel population (Augur Pond, Lake Colby, and Long Pond). Trend analysis was not performed on calcium concentrations in 2016.

## Conductivity

Conductivity is a measurement of the ability of a water sample to conduct electricity. Pure H<sub>2</sub>O is a poor conductor of electricity. The ability of water to conduct electricity increases as the concentration of dissolved ions in the water increases. Thus, conductivity is considered a strong indicator of the amount of dissolved ions in water. Typically the conductivity of a clean undeveloped lake in the Adirondacks is in the range of 10-25  $\mu$ S/cm. Elevated conductance may be indicative of road salt pollution, faulty septic systems or the influence of bogs and wetlands in the watershed. Conductivity is a very useful surrogate when the relationships between ion concentrations and conductivity are known. For example, conductivity can be used to estimate sodium and chloride concentrations in streams (Daley et al. 2009).

Conductivity is measured in the laboratory with a conductivity meter. The instrument applies an alternating electrical current to two electrodes immersed in the water sample and measures the resulting voltage. Electrical conductance is influenced by water temperature so all measurements are scaled to the conductance at 25° C, known as specific conductivity.

In 2016 the average conductance values ranged from 6 $\mu$ S/cm to 210  $\mu$ S/cm (Figure 4). We found

sodium and chloride concentration to be the main driver in lake conductance in the ALAP dataset, the combination of these two ions explained 86% of the variability in conductivity in 2015 (Figure 5;  $P < 0.001$ ,  $r^2 = 0.86$ ).

Analysis of the historical data reveals that 67% of participating lakes showed no statistical change in conductivity over time and that 34% exhibited a significant downward trend in conductivity.

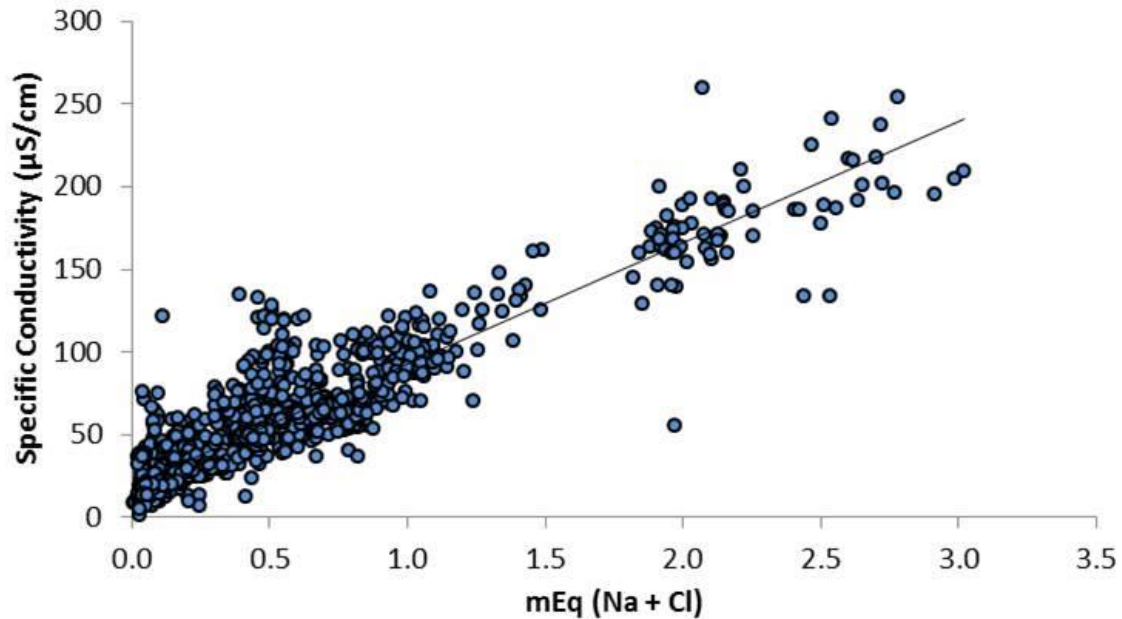
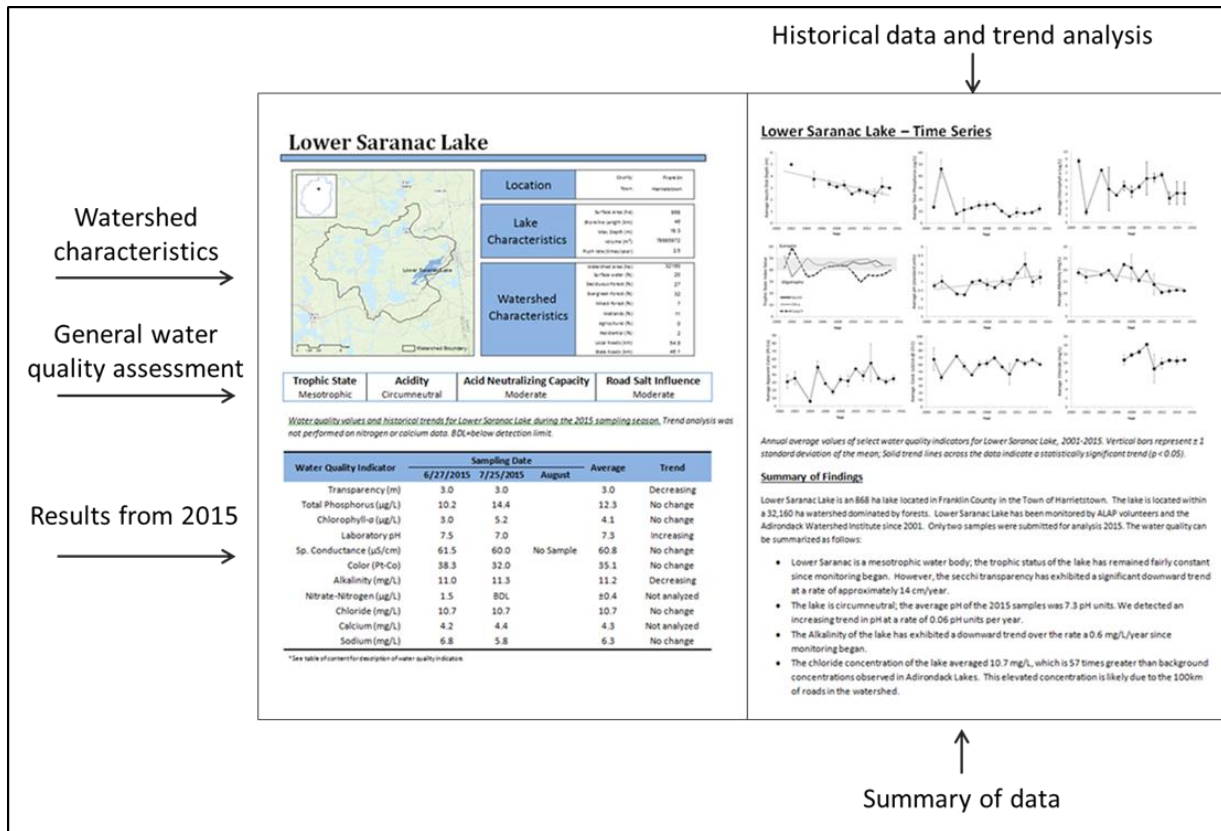


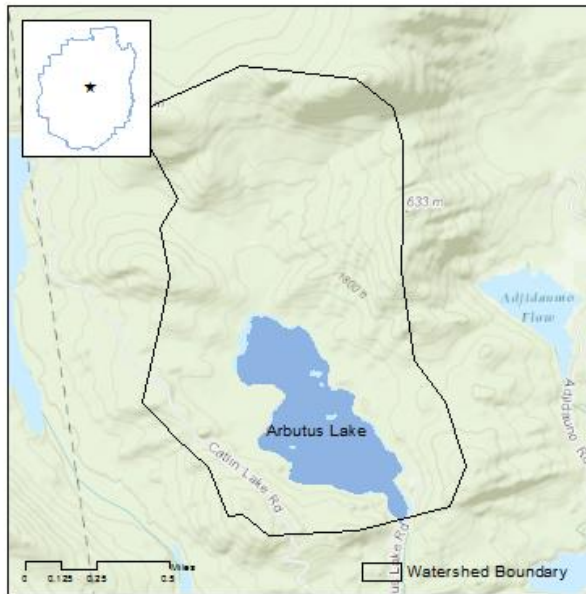
Figure 5. . Relationship between conductivity and the combination of sodium and chloride in ALAP lakes, 2011-2016. ( $P < 0.001$ ,  $r^2 = 0.86$ ,  $n = 1383$ ).

# Individual Lake Reports

The data and accompanying analysis provided in this report give insight into the water quality of the study lakes, more detailed limnological studies may be necessary to produce management recommendations or specific trend interpretations. Readers interested in additional information or accesses to the raw data are encouraged to contact the corresponding author. Each lake description includes lake and watershed characteristics, general water quality assessment, tabulated 2016 data, historical analysis and a brief summary. An example of the lake report format can be seen below.



# Arbutus Lake



<b>Location</b>	County:	Essex
	Town:	Newcomb

<b>Lake Characteristics</b>	Surface Area (ha):	48
	Shoreline Length (km):	5
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	1530320
	Flush rate (times/year):	1.8

<b>Watershed Characteristics</b>	Watershed Area (ha):	353
	Surface water (%):	14
	Deciduous Forest (%):	46
	Evergreen Forest (%):	14
	Mixed Forest (%):	16
	Wetlands (%):	9
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	0
	State Roads (km):	0

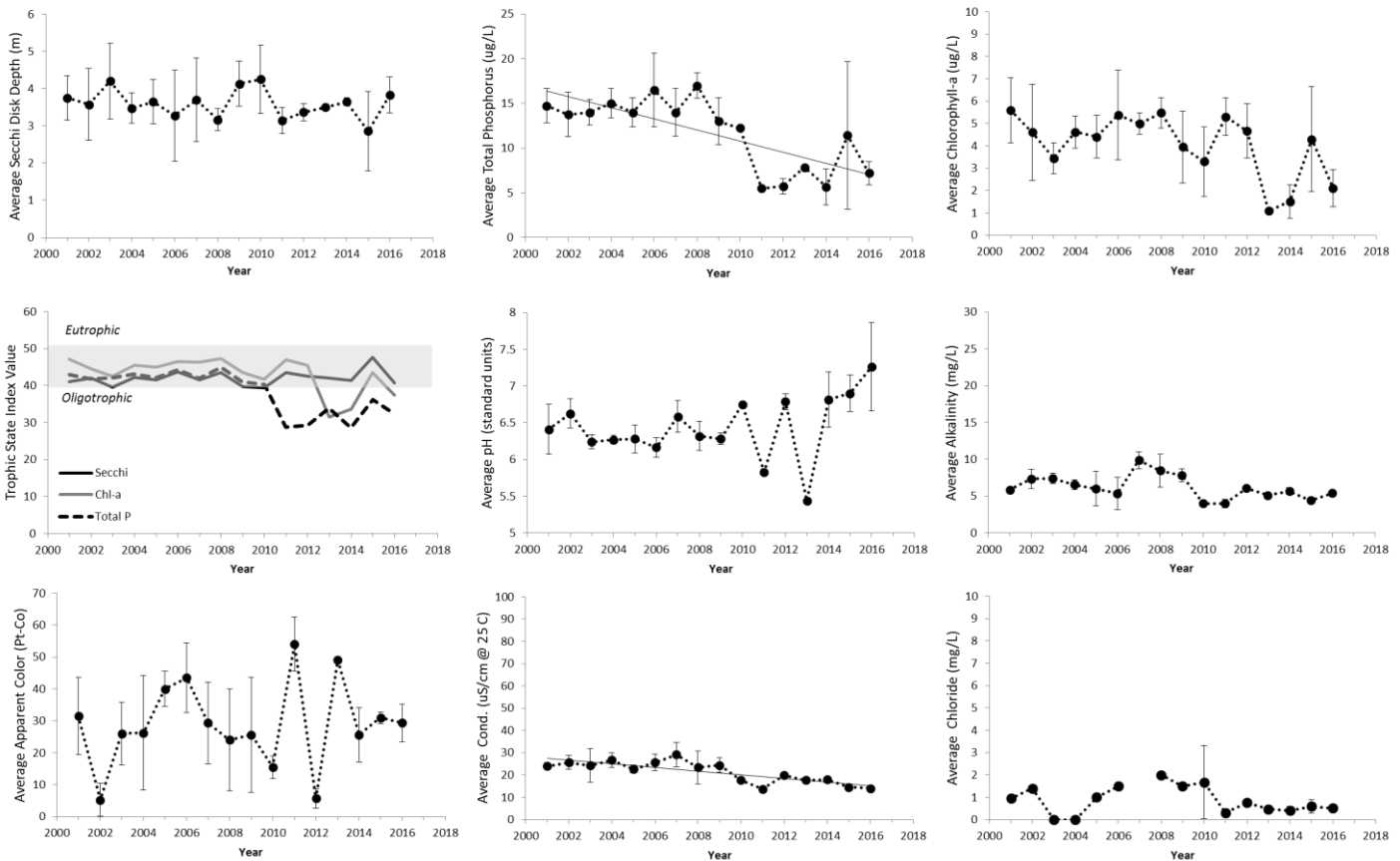
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Arbutus Lake during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/22/2016	7/20/2016	8/24/2016		
Transparency (m)	3.9	4.3	3.3	3.8	No change
Total Phosphorus (µg/L)	6.9	6.1	8.6	7.2	Decreasing
Chlorophyll- <i>a</i> (µg/L)	1.9	1.4	3.0	2.1	No change
Laboratory pH	7.9	7.1	6.8	7.3	No change
Sp. Conductance (µS/cm)	14.1	13.1	14.8	14.0	Decreasing
Color (Pt-Co)	22.7	34.3	31.1	29.3	No change
Alkalinity (mg/L)			5.4	5.4	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	0.5			0.5	No change
Calcium (mg/L)	2.1			2.1	Not analyzed
Sodium (mg/L)	0.9			0.9	No change

\*See table of content for description of water quality indicators

# Arbutus Lake – Time Series



Annual average values of select water quality indicators for Arbutus Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

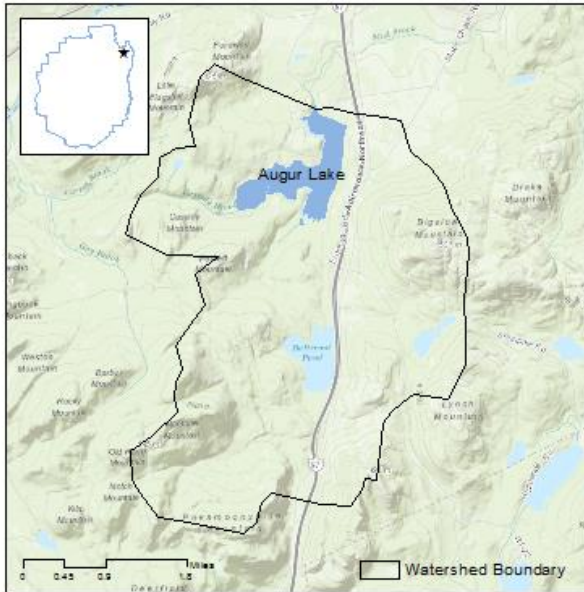
## Summary of Findings

Arbutus Lake is a 48 ha lake located in Essex County in the Town of Newcomb. The lake is located within a 353 ha watershed dominated by forests. Arbutus Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Arbutus Lake is best classified as an oligotrophic lake, bordering on mesotrophic. Secchi disk transparency and chlorophyll-a concentrations have remained relatively stable since 2001, and have exhibited no significant trend. Total phosphorus on the other hand, has exhibited a significant downward trend. Some of this decrease may be attributed to methodology upgrades in 2010.
- Samples from 2016 were found to be circumneutral in terms of their acidity with moderate sensitivity to acid deposition.
- Arbutus Lake serves as a good example of the inherently low concentrations of chloride and sodium found in watershed that lack maintained paved roads.



# Augur Lake



<b>Location</b>	County:	Essex
	Town:	Chesterfield
<b>Lake Characteristics</b>	Surface Area (ha):	146
	Shoreline Length (km):	10
	Max. Depth (m):	6.4
	Volume (m <sup>3</sup> ):	4242477
	Flush rate (times/year):	3.8
<b>Watershed Characteristics</b>	Watershed Area (ha):	3397
	Surface water (%):	7
	Deciduous Forest (%):	44
	Evergreen Forest (%):	13
	Mixed Forest (%):	21
	Wetlands (%):	3
	Agricultural (%):	1
	Residential (%):	7
Local Roads (km):	9.9	
State Roads (km):	25.4	

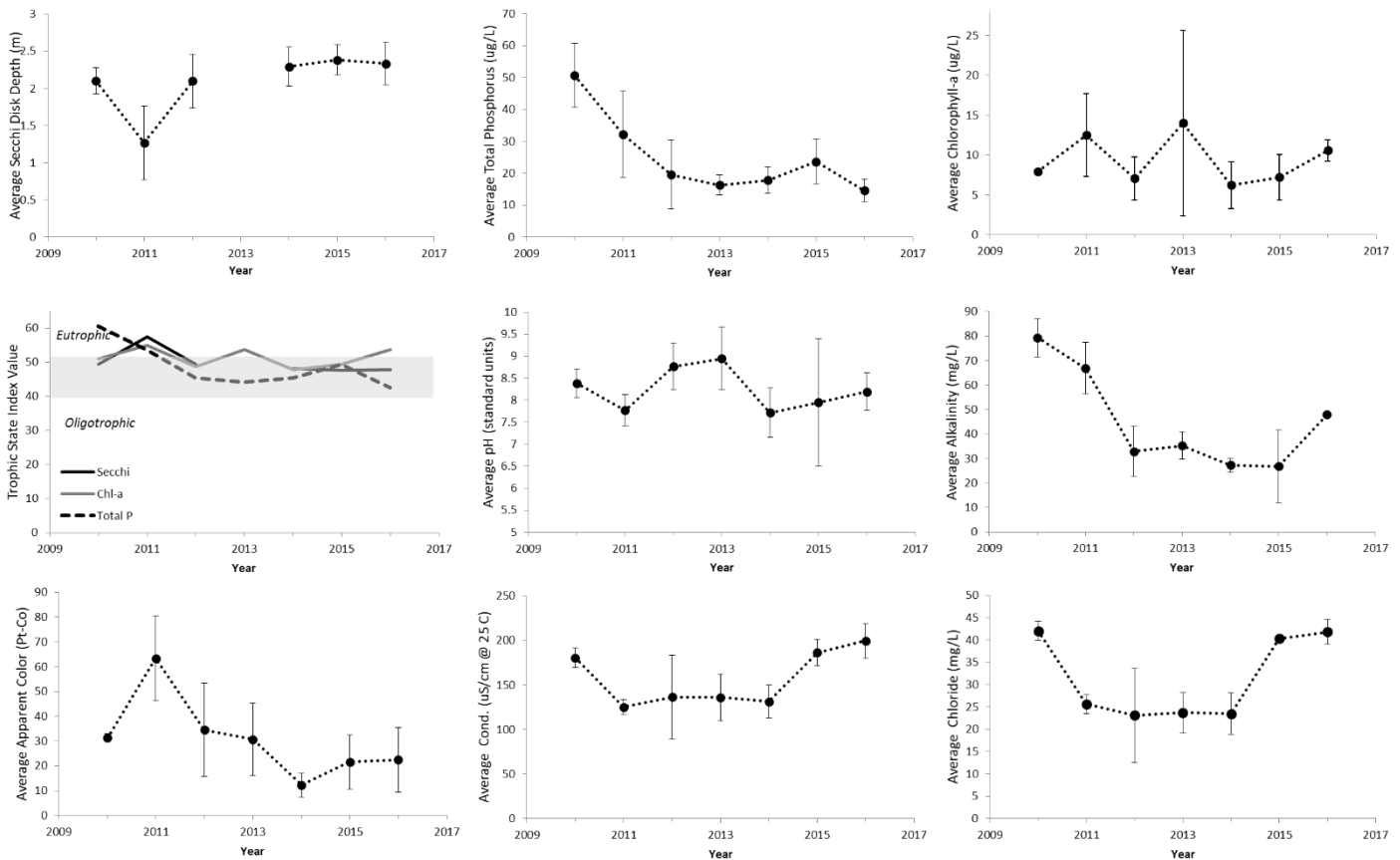
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Alkaline	<b>Acid Neutralizing Capacity</b> Well Buffered- Not Sensitive	<b>Road Salt Influence</b> High
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Water quality values and historical trends for Augur Lake during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	7/21/2016	8/26/2016	9/12/2016		
Transparency (m)	2.0	2.5	2.5	2.3	No change
Total Phosphorus (µg/L)	16.4	10.6	16.8	14.6	No change
Chlorophyll- <i>a</i> (µg/L)	9.1	11.0	11.6	10.6	No change
Laboratory pH	8.1	8.7	7.8	8.2	No change
Sp. Conductance (µS/cm)	212.0	177.3	210.0	199.8	No change
Color (Pt-Co)	34.3	8.6	24.6	22.5	No change
Alkalinity (mg/L)			47.9	47.9	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)			43.8	43.8	No change
Calcium (mg/L)			15.4	15.4	Not analyzed
Sodium (mg/L)			22.4	22.4	No change

\*See table of content for description of water quality indicators

# Augur Lake – Time Series



Annual average values of select water quality indicators for Augur Lake, 2010-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

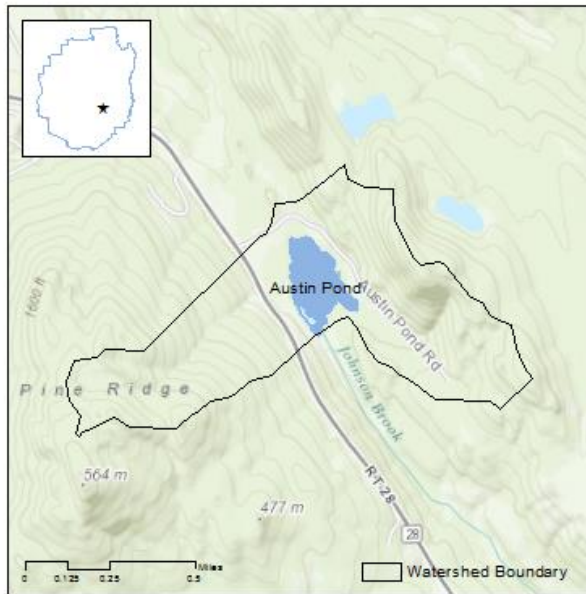
## Summary of Findings

Augur Lake is a 146 ha lake located in Essex County in the Town of Chesterfield. This lake is located within a 3,397 ha watershed dominated by forests. Augur Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2010.

- Augur Lake is best classified as a mesotrophic lake. Total phosphorus concentrations have fairly been similar over the past 5 years, and ranged between 15 and 25 µg/L.
- Augur Lake is one of the few alkaline water bodies in the ALAP data set with pH values typically greater than 8. The Alkalinity of the lake was 47.9 mg/L in 2016, greater than any of the other participating ALAP Lakes. The lake is well buffered and not sensitive to acid deposition.
- The 2016 sodium and chloride concentrations in Augur Lake are among the highest in the ALAP dataset and averaged 22.4 mg/L and 43.8 mg/L respectively, demonstrating that the lake's chemistry is highly influenced by the 35.4 km of salted roads in the watershed.
- Calcium concentrations in the lake averaged 15.4 mg/L, within the range needed to support a variable zebra mussel population.



# Austin Pond



<b>Location</b>	County:	Warren
	Town:	Johnsburg
<b>Lake Characteristics</b>	Surface Area (ha):	9
	Shoreline Length (km):	2
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	138289
	Flush rate (times/year):	4.9
<b>Watershed Characteristics</b>	Watershed Area (ha):	121
	Surface water (%):	10
	Deciduous Forest (%):	28
	Evergreen Forest (%):	18
	Mixed Forest (%):	37
	Wetlands (%):	4
	Agricultural (%):	0
	Residential (%):	6
	Local Roads (km):	0.9
State Roads (km):	0.5	

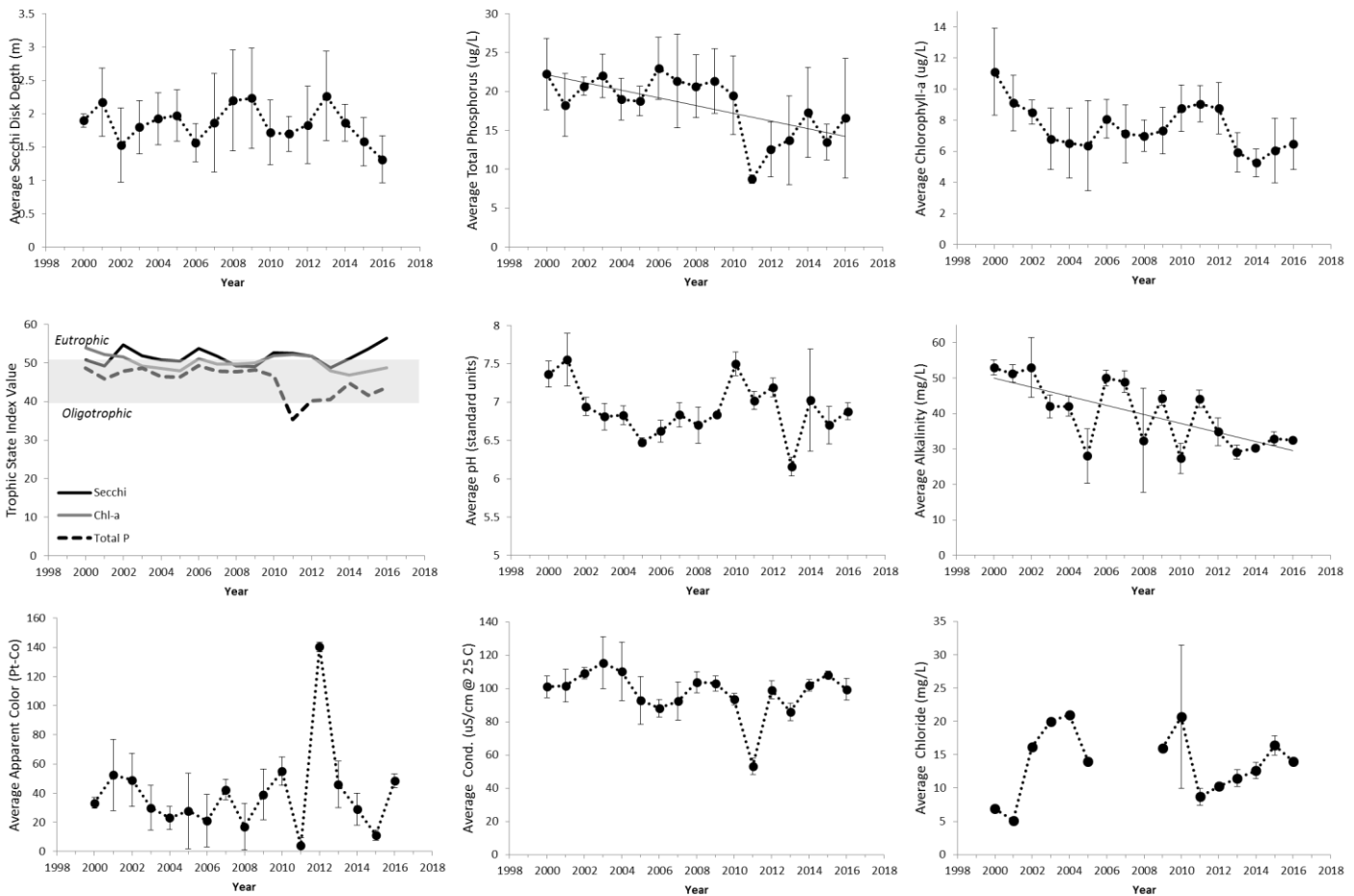
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Well buffered – not sensitive	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Austin Pond during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/17/2016	7/21/2016	8/23/2016		
Transparency (m)	1.7	1.3	1.0	1.3	No change
Total Phosphorus (µg/L)	25.1	14.6	10.0	16.6	Decreasing
Chlorophyll- <i>a</i> (µg/L)	7.1	7.7	4.6	6.5	No change
Laboratory pH	7.0	6.9	6.8	6.9	No change
Sp. Conductance (µS/cm)	106.3	93.2	98.8	99.4	No change
Color (Pt-Co)	47.6	53.6	43.9	48.4	No change
Alkalinity (mg/L)			32.5	32.5	Decreasing
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	14.0			14.0	No change
Calcium (mg/L)	11.2			11.2	Not analyzed
Sodium (mg/L)	8.4			8.4	No change

\*See table of content for description of water quality indicators

# Austin Pond – Time Series



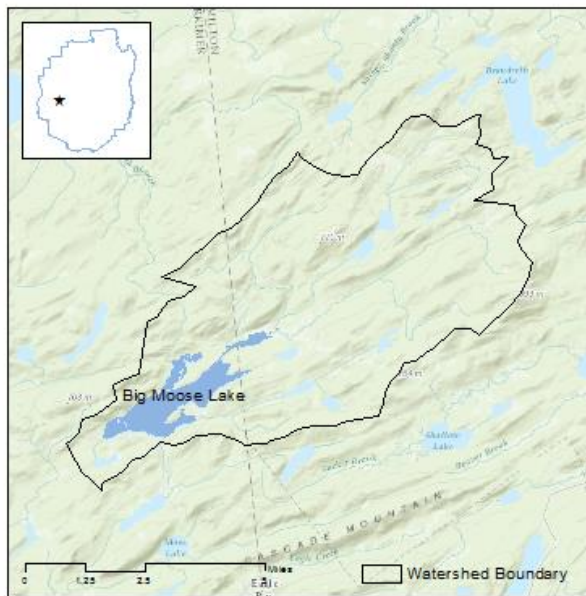
Annual average values of select water quality indicators for Austin Pond, 2000-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Austin Pond is an 8.6 ha lake located in Warren County in the Town of North Creek. The lake is located within a 120 ha watershed dominated by forests. Austin Pond has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2000.

- Austin pond is best classified as a mesotrophic lake. The transparency and chlorophyll-a concentration have been relatively stable over time. The total phosphorus concentration has exhibited a significant downward trend at a rate of approximately 0.5  $\mu\text{g/L/year}$ .
- The pond is circumneutral in terms of its acidity ( $\text{pH} = 6.9$ ) and well buffered against changes in pH. However, we did detect a slight, yet statistically significant downward trend in alkalinity at a rate of approximately 1.3  $\text{mg/L/year}$ .
- Sodium and chloride concentrations averaged 8.4  $\text{mg/L}$  and 14.0  $\text{mg/L}$  respectively in 2016, demonstrating that the chemistry of the pond is influenced by NYS Rt. 28. Chloride concentration in Austin Pond is greater than 80% of the participating ALAP lakes. Calcium concentration averaged 11.2  $\text{mg/L}$  in 2016 which is just below the suggested lower threshold required for a viable zebra mussel population.

# Big Moose Lake



<b>Location</b>	County: Herkimer Town: Webb
<b>Lake Characteristics</b>	Surface Area (ha): 499 Shoreline Length (km): 32 Max. Depth (m): 21.3 Volume (m <sup>3</sup> ): 38400000 Flush rate (times/year): 2
<b>Watershed Characteristics</b>	Watershed Area (ha): 9685 Surface water (%): 10 Deciduous Forest (%): 29 Evergreen Forest (%): 27 Mixed Forest (%): 8 Wetlands (%): 24 Agricultural (%): 0 Residential (%): 0 Local Roads (km): 9 State Roads (km): 0

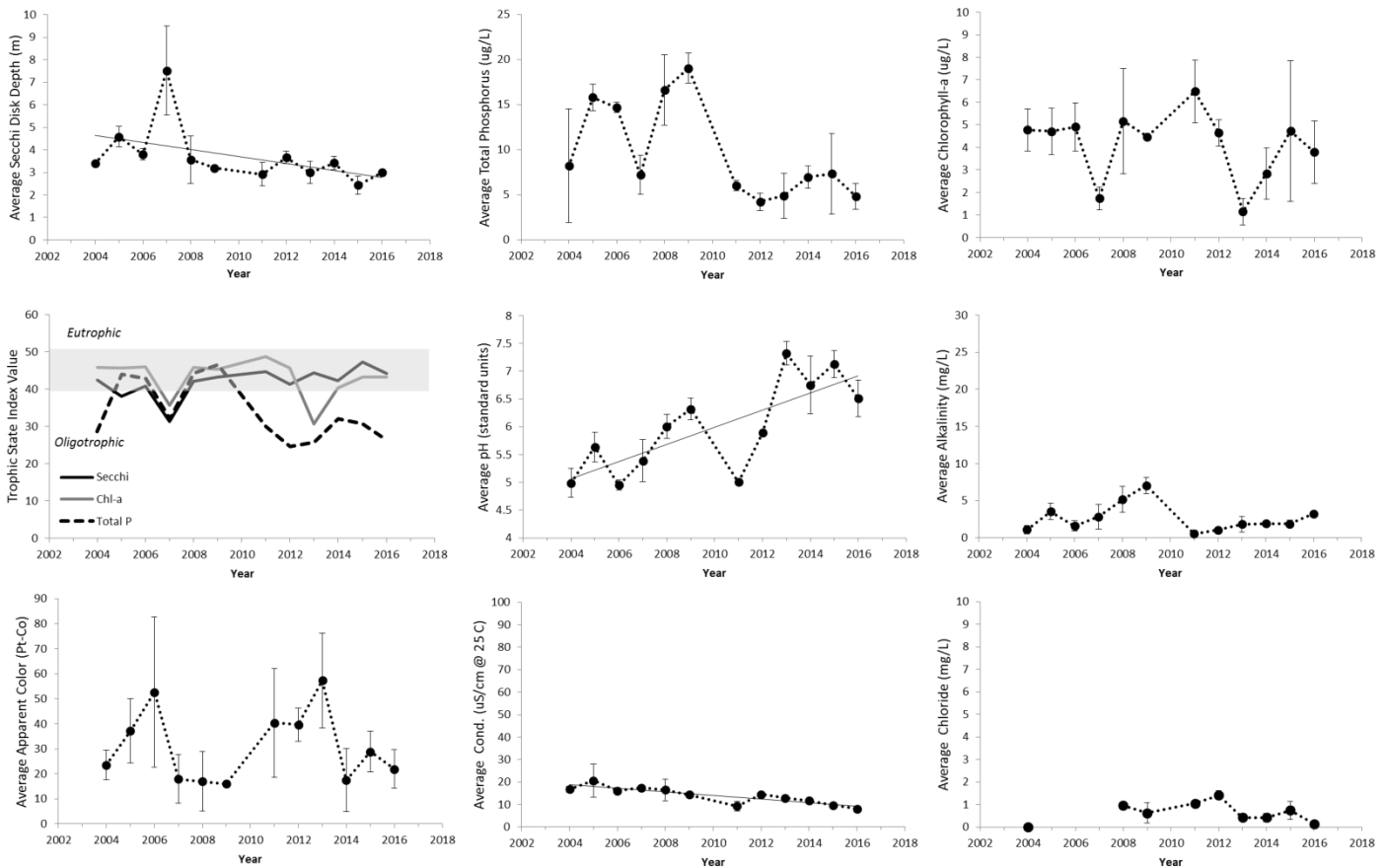
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Big Moose Lake during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/20/2016	7/20/2016	8/21/2016		
Transparency (m)	3.0	3.0	3.0	3.0	Decreasing
Total Phosphorus (µg/L)	4.3	6.5	3.7	4.8	No change
Chlorophyll- <i>a</i> (µg/L)	2.5	3.7	5.2	3.8	No change
Laboratory pH	6.4	6.9	6.3	6.5	Increasing
Sp. Conductance (µS/cm)	7.9	7.0	9.2	8.0	Decreasing
Color (Pt-Co)	13.3	24.6	27.9	21.9	No change
Alkalinity (mg/L)			3.3	3.3	No change
Nitrate-Nitrogen (µg/L)			6.7	6.7	Not analyzed
Chloride (mg/L)	0.1			0.1	No change
Calcium (mg/L)	1.3			1.3	Not analyzed
Sodium (mg/L)	0.7			0.7	No change

\*See table of content for description of water quality indicators

# Big Moose Lake – Time Series



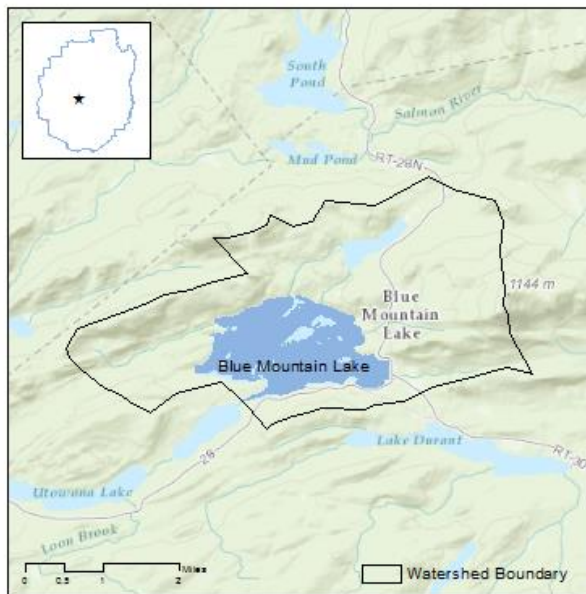
Annual average values of select water quality indicators for Big Moose Lake, 2004-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Big Moose Lake is a 499 ha lake located in Herkimer County in the Town of Webb. The lake is located within a 9,685 ha watershed dominated by forests. Big Moose Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2004.

- Big Moose Lake is best classified as a mesotrophic lake, although the trophic indicators have been highly variable over time. We detected a significant downward trend in transparency at a rate of approximately 15 cm/year.
- The acid neutralizing ability of Big Moose is low, with alkalinity values typically in the range 1 – 2 mg/L. Despite the low alkalinity, the pH of the lake has been significantly increasing since 2004. This trend is likely part of a regional decrease in acid the deposition rate.
- Sodium and chloride concentration in Big Moose were 0.7 and 0.1mg/L in 2016. These values are within the range expected for a lake lacking salted state roads in the watershed. We detected a slight but statistically significant downward trend in conductivity at a rate of 0.8  $\mu\text{S}/\text{cm}/\text{year}$ .

# Blue Mountain Lake



<b>Location</b>	County:	Hamilton
	Town:	Indian Lake
<b>Lake Characteristics</b>	Surface Area (ha):	500
	Shoreline Length (km):	25
	Max. Depth (m):	30.5
	Volume (m <sup>3</sup> ):	75723176
	Flush rate (times/year):	0.28
<b>Watershed Characteristics</b>	Watershed Area (ha):	2972
	Surface water (%):	21
	Deciduous Forest (%):	42
	Evergreen Forest (%):	16
	Mixed Forest (%):	11
	Wetlands (%):	6
	Agricultural (%):	0
	Residential (%):	3
	Local Roads (km):	4
State Roads (km):	9	

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Moderate
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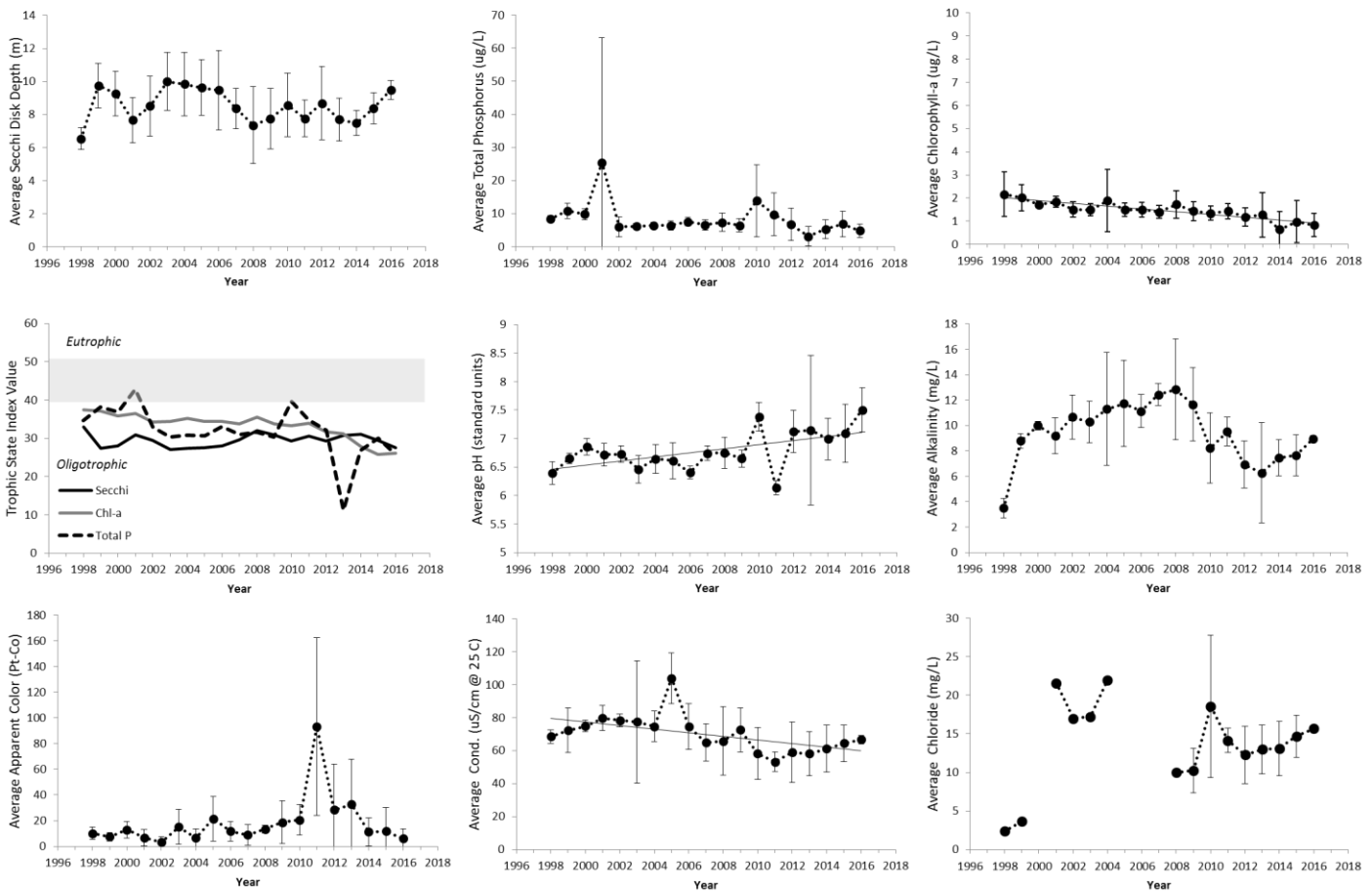
Water quality values and historical trends for Blue Mountain Lake during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit, ± = estimated value (< quantitation limit).

Water Quality Indicator	Sampling Date					Average	Trend
	5/26	6/28	7/24	8/23	9/21		
<i>Town Bay</i>							
Transparency (m)	Visible on Bottom						Not Analyzed
Total Phosphorus (µg/L)	8.3	6.3	5.0	3.4	3.6	5.3	No Change
Chlorophyll- <i>a</i> (µg/L)	0.6	0.9	1.1	0.8	1.6	1.0	Decreasing
Laboratory pH	7.2	7.8	7.3	7.3	8.3	7.6	Increasing
Sp. Conductance (µS/cm)	67.4	68.1	59.2	64.4	66.6	65.1	Decreasing
Color (Pt-Co)	BDL	0.8	11.8	11.8	5.3	±5.5	No Change
Alkalinity (mg/L)	9.2					9.2	No Change
Nitrate-Nitrogen (µg/L)	31.5					31.5	Not analyzed
Chloride (mg/L)	15.5					15.5	No Change
Calcium (mg/L)	3.3					3.3	Not analyzed
Sodium (mg/L)	9.8					9.8	No Change

\*See table of content for description of water quality indicators

Water Quality Indicator	Sampling Date					Average
	5/26	6/28	7/24	8/23	9/21	
<i>East Bay</i>						
Transparency (m)	8.8	10.1	8.8	9.4	9.4	9.3
Total Phosphorus (µg/L)	4.5	4.1	5.0	3.7	3.4	4.1
Chlorophyll- <i>a</i> (µg/L)	BDL	BDL	0.8	1.2	0.6	±0.6
Laboratory pH	7.2	7.7	7.2	7.3	7.7	7.4
Sp. Conductance (µS/cm)	67.1	69.9	67.6	63.9	67.3	67.2
Color (Pt-Co)	BDL	0.8	11.8	15.0	2.1	±4.9
Alkalinity (mg/L)	9.1					9.1
Nitrate-Nitrogen (µg/L)	29.3					29.3
Chloride (mg/L)	15.6					15.6
Calcium (mg/L)	3.3					3.3
Sodium (mg/L)	9.5					9.5
<i>West Bay</i>						
Transparency (m)	8.7	10.1	9.8	9.4	10.4	9.7
Total Phosphorus (µg/L)	4.8	4.7	5.4	3.1	3.2	4.2
Chlorophyll- <i>a</i> (µg/L)	0.6	1.1	0.7	1.2	1.9	1.1
Laboratory pH	7.3	7.8	7.2	7.5	8.4	7.6
Sp. Conductance (µS/cm)	66.7	69.4	65.9	64.1	67.5	66.7
Color (Pt-Co)	BDL	0.8	11.8	8.6	2.1	±3.6
Alkalinity (mg/L)	8.7					8.7
Nitrate-Nitrogen (µg/L)	30.5					30.5
Chloride (mg/L)	15.4					15.4
Calcium (mg/L)	3.3					3.3
Sodium (mg/L)	9.6					9.6
<i>Halsch Bay</i>						
Transparency (m)			Visible on Bottom			
Total Phosphorus (µg/L)	10.5	6.8	4.9	2.4	3.2	5.6
Chlorophyll- <i>a</i> (µg/L)	BDL	BDL	BDL	1.6	0.9	±0.6
Laboratory pH	7.3	7.7	6.8	7.7	7.3	7.4
Sp. Conductance (µS/cm)	68.7	69.4	68.1	64.0	66.9	67.4
Color (Pt-Co)	19.6	BDL	18.2	8.6	8.6	±10.5
Alkalinity (mg/L)	9.0					9.0
Nitrate-Nitrogen (µg/L)	31.6					31.6
Chloride (mg/L)	15.7					15.7
Calcium (mg/L)	3.3					3.3
Sodium (mg/L)	9.6					9.6

# Blue Mountain Lake – Time Series



Lake wide annual average values of select water quality indicators for Blue Mountain Lake, 1998-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

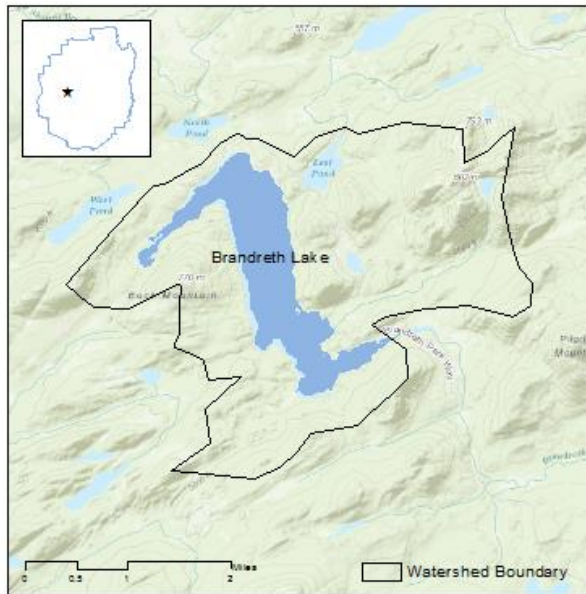
## Summary of Findings

Blue Mountain Lake is a 500 ha lake located in Hamilton County in the Town of Indian Lake. The lake is located within a 2,972 ha watershed dominated by forests. Blue Mountain Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1998.

- Blue Mountain Lake is an oligotrophic lake. The average transparency was greater than 98.5% of participating ALAP lakes in 2016. No statistical trend was detected in transparency or total phosphorus. The chlorophyll-a concentration has exhibited a slight yet significant downward trend at a rate of approximately 0.06  $\mu\text{g/L/year}$ .
- The samples from 2016 were found to be circumneutral in terms of their acidity ( $\text{pH} = 7.5$ ), and trending up from a low of 6.4 in 1998. The water is moderately sensitive to acid deposition.
- Sodium and chloride concentrations averaged 10.0 mg/L and 15.7 mg/L respectively, indicating that the chemistry of the lake is influenced by salted roads in the watershed. Chloride concentration is greater than 82% of participating ALAP lakes and is approximately 79 times higher than background concentration.



# Brandreth Lake



<b>Location</b>	County:	Hamilton
	Town:	Long Lake

<b>Lake Characteristics</b>	Surface Area (ha):	362
	Shoreline Length (km):	18
	Max. Depth (m):	54
	Volume (m <sup>3</sup> ):	90379940
	Flush rate (times/year):	0.18

<b>Watershed Characteristics</b>	Watershed Area (ha):	2298
	Surface water (%):	19
	Deciduous Forest (%):	44
	Evergreen Forest (%):	7
	Mixed Forest (%):	16
	Wetlands (%):	13
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	0
	State Roads (km):	0

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Low	<b>Road Salt Influence</b> Not Significant
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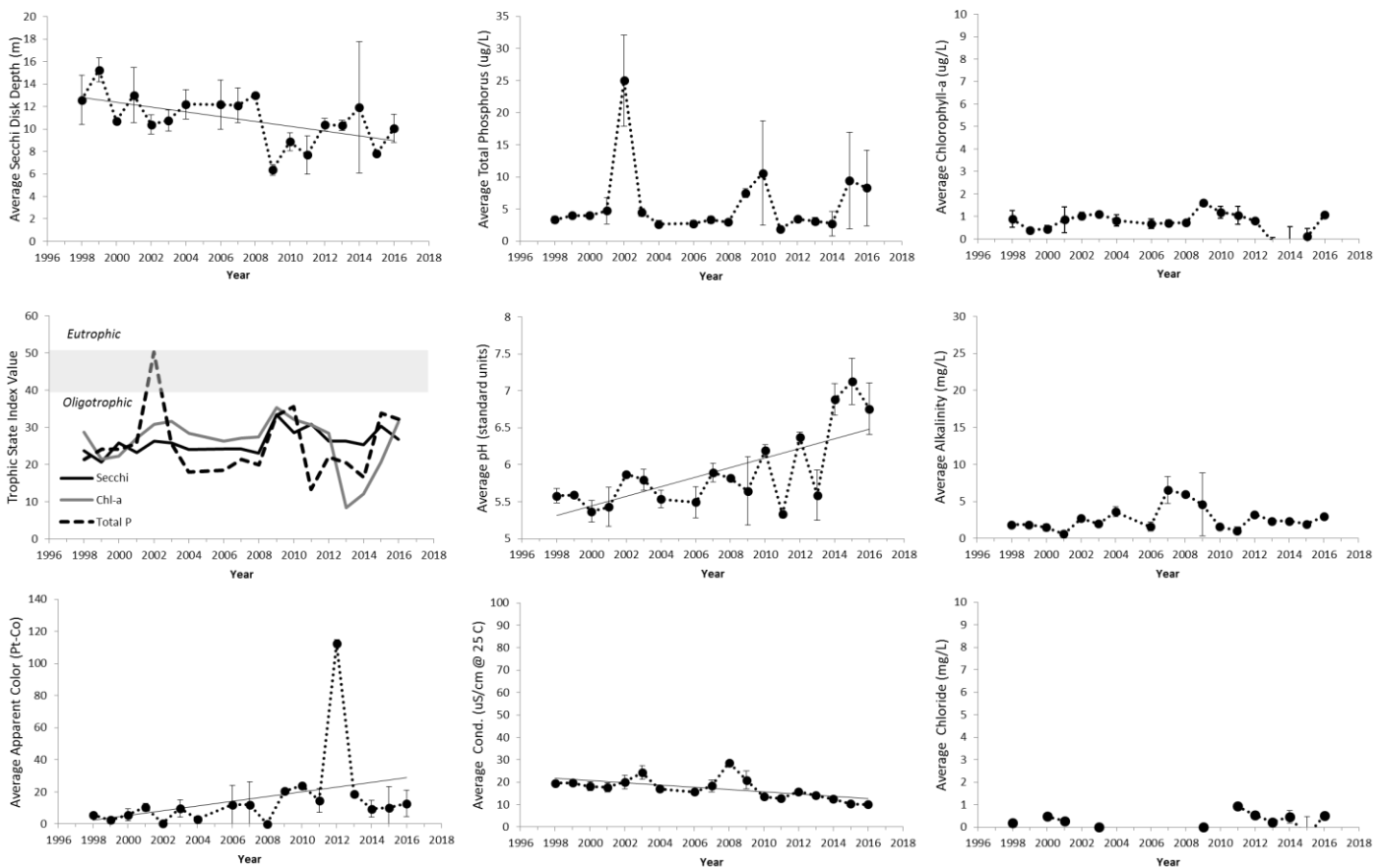
Water quality values and historical trends for Brandreth Lake during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	7/21/2016	8/27/2016	9/25/2016		
Transparency (m)	8.9	9.9	11.4	10.1	Decreasing
Total Phosphorus (µg/L)	3.7	14.9	6.3	8.3	No change
Chlorophyll- <i>a</i> (µg/L)	1.1	1.1	1.1	1.1	No change
Laboratory pH	7.1	6.6	6.5	6.8	Increasing
Sp. Conductance (µS/cm)	9.0	10.2	11.0	10.1	Decreasing
Color (Pt-Co)	5.3	11.8	21.4	12.8	Increasing
Alkalinity (mg/L)		3.0		3.0	No change
Nitrate-Nitrogen (µg/L)		119.0		119.0	Not analyzed
Chloride (mg/L)		0.5		0.5	No change
Calcium (mg/L)		1.3		1.3	Not analyzed
Sodium (mg/L)		0.6		0.6	No change

\*See table of content for description of water quality indicators



# Brandreth Lake – Time Series



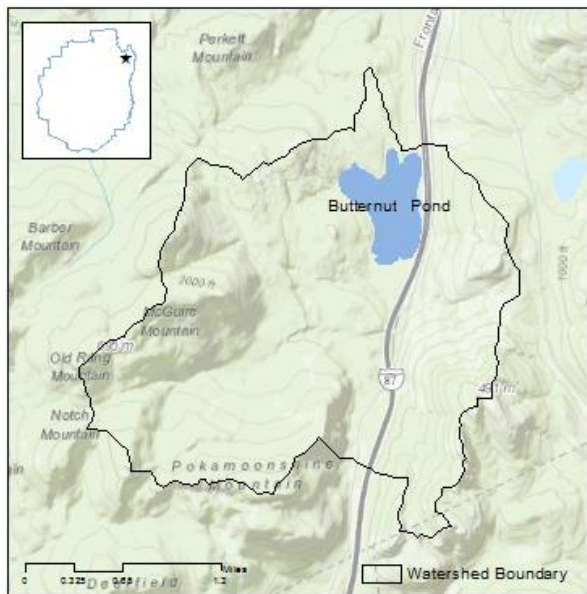
Annual average values of select water quality indicators for Brandreth Lake, 1998-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Brandreth Lake is a 362 ha lake located in Hamilton County in the Town of Long Lake. The lake is located within a 2,298 ha watershed dominated by forests. Brandreth Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1998.

- Brandreth Lake is an oligotrophic lake with low concentrations of phosphorus and chlorophyll-a. The transparency of the lake averaged 10 meters in 2016, and was the most transparent lake in the ALAP dataset. We detected a slight yet significant decrease in the transparency of the lake at a rate of approximately 21 cm/year. This trend may be related to the increase observed in color, as greater color tends to result in lower transparencies.
- The acid neutralizing ability of Brandreth Lake is low, with alkalinity values typically  $\leq 2$  mg/L. Despite the low alkalinity, the pH of the lake has been significantly increasing since 1998. This trend is likely part of a regional decrease in acid deposition rate.
- Sodium and chloride concentration in the lake were 0.6 and 0.5 mg/L in 2016. These values are within the range expected for a lake lacking salted state roads in the watershed.

# Butternut Pond



<b>Location</b>	County:	Essex
	Town:	Chesterfield
<b>Lake Characteristics</b>	Surface Area (ha):	66
	Shoreline Length (km):	4
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	-
<b>Watershed Characteristics</b>	Flush rate (times/year):	-
	Watershed Area (ha):	1347
	Surface water (%):	5
	Deciduous Forest (%):	45
	Evergreen Forest (%):	12
	Mixed Forest (%):	24
	Wetlands (%):	4
	Agricultural (%):	0
	Residential (%):	6
	Local Roads (km):	0
State Roads (km):	10.8	

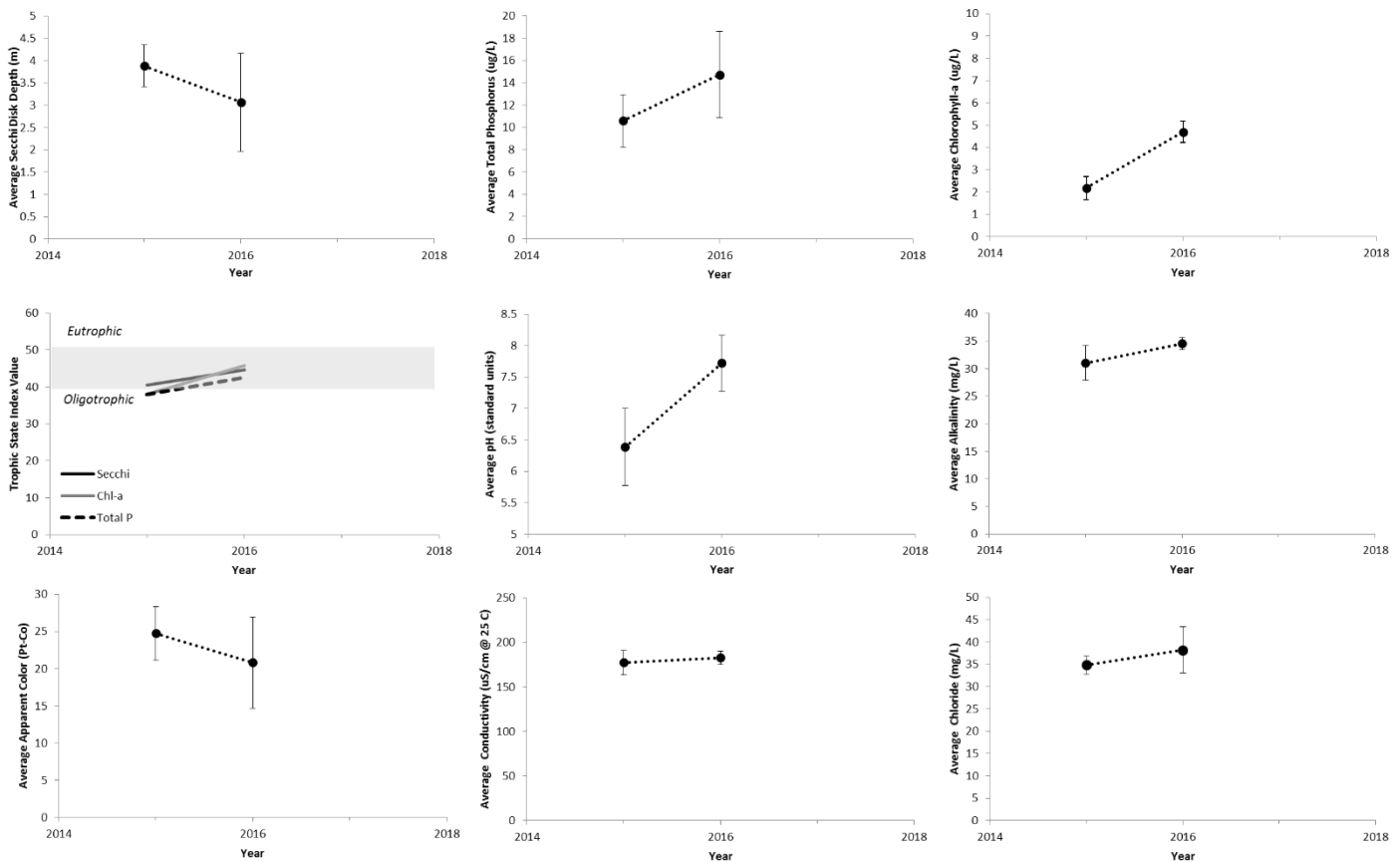
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Alkaline	<b>Acid Neutralizing Capacity</b> Well buffered – not sensitive	<b>Road Salt Influence</b> High
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Water quality values and historical trends for Butternut Pond during the 2016 sampling season. Trend analysis will be performed after five years of consecutive data collection. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/15/2016	7/13/2016	8/17/2016		
Transparency (m)	3.6	3.8	1.8	3.1	Not analyzed
Total Phosphorus (µg/L)	18.8	11.1	14.3	14.7	
Chlorophyll- <i>a</i> (µg/L)	5.2	4.3	4.5	4.7	
Laboratory pH	8.0	7.2	8.0	7.7	
Sp. Conductance (µS/cm)	174.7	188.7	184.8	182.7	
Color (Pt-Co)	16.4	18.2	27.9	20.8	
Alkalinity (mg/L)			35.0	35.0	
Nitrate-Nitrogen (µg/L)			BDL	BDL	
Chloride (mg/L)			42.6	42.6	
Calcium (mg/L)			10.2	10.2	
Sodium (mg/L)			24.2	24.2	

\*See table of content for description of water quality indicators

# Butternut Pond- Time Series



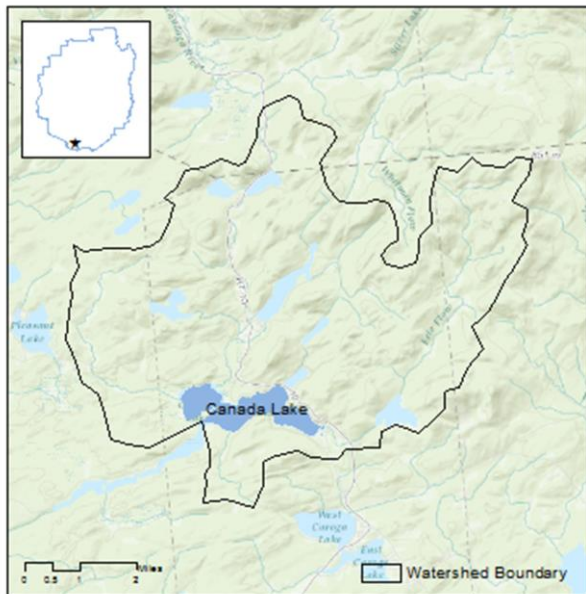
Annual average values of select water quality indicators for Butternut Pond 2015-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Butternut Pond is a 66 ha pond located in Essex County in the Town of Chesterfield. The pond is located within a 1,347 ha watershed dominated by forests. This is Butternut Ponds second year in ALAP. Trend analysis will be performed on water quality indicators after five years of data have been collected.

- Total phosphorus, transparency, and chlorophyll-a values all indicate that Butternut Pond is a mesotrophic waterbody.
- The pH of the 2016 samples were alkaline, averaging 7.7 pH units. The pond is well buffered from acid deposition. The alkalinity of the pond was 34.5 mg/L as  $\text{CaCO}_3$ , which is greater than 97% of participating lakes.
- The 2016 sodium and chloride concentrations in Butternut Pond are greater than 97% of the participating ALAP lakes, 23.6 mg/L and 38.2 mg/L respectively. The high concentration of salt demonstrates that the lake's chemistry is influenced by the 10.8 km of US Rt 87.
- Calcium concentrations in the lake were 10.9 mg/L, slightly below the suggested threshold for a viable zebra mussel population.

# Canada Lake



<b>Location</b>	County:	Fulton
	Town:	Caroga

<b>Lake Characteristics</b>	Surface Area (ha):	294
	Shoreline Length (km):	14
	Max. Depth (m):	45.7
	Volume (m <sup>3</sup> ):	
	Flush rate (times/year):	

<b>Watershed Characteristics</b>	Watershed Area (ha):	9040
	Surface water (%):	8
	Deciduous Forest (%):	52
	Evergreen Forest (%):	5
	Mixed Forest (%):	12
	Wetlands (%):	19
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	16.5
State Roads (km):	18.7	

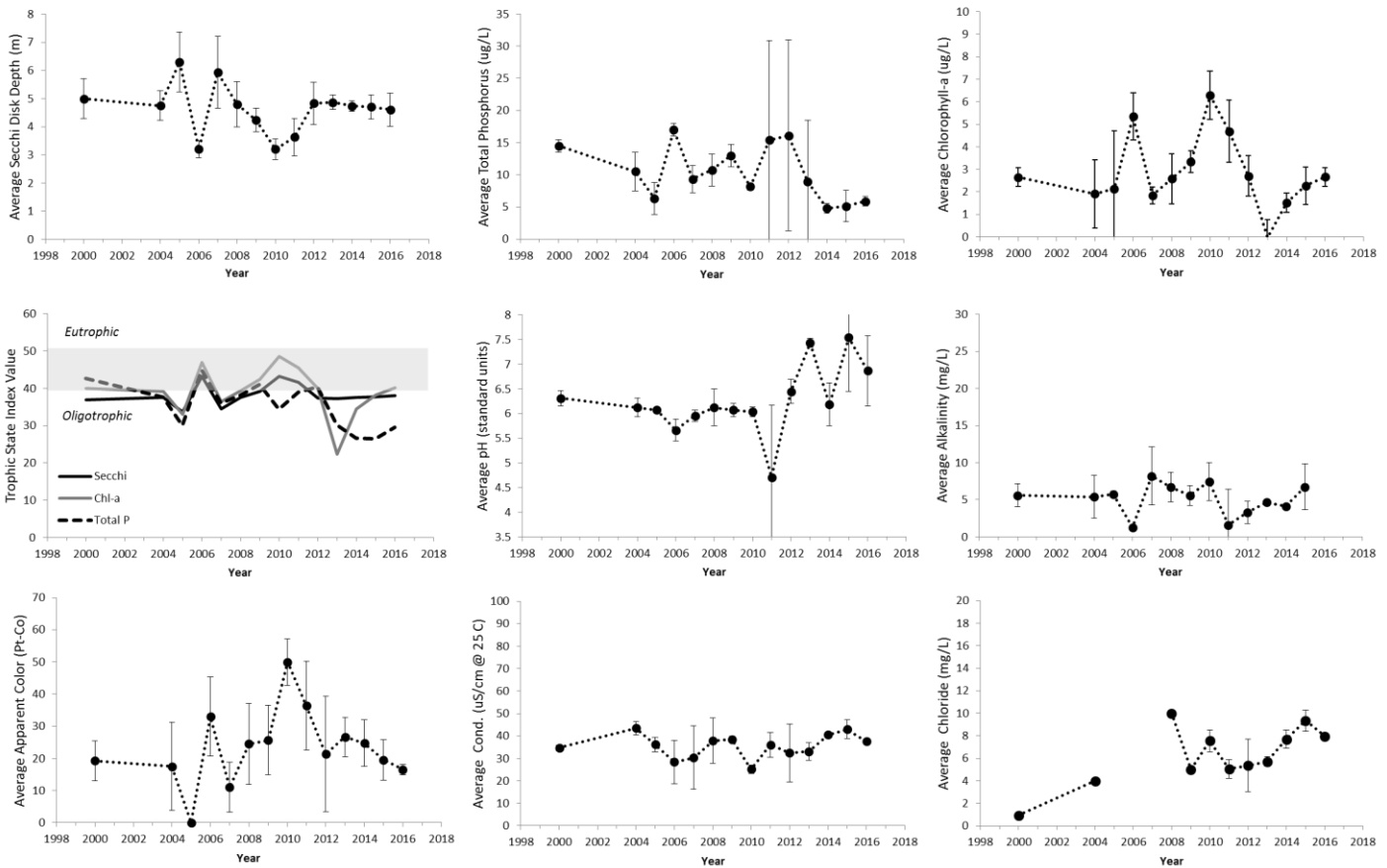
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> No 2016 Data	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Canada Lake during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/19/2016	7/20/2016	8/24/2016		
Transparency (m)	4.0	4.7	5.2	4.6	No change
Total Phosphorus (µg/L)	6.6	5.1	5.9	5.9	No change
Chlorophyll- <i>a</i> (µg/L)	2.7	2.2	3.1	2.7	No change
Laboratory pH	7.4	6.1	7.2	6.9	No change
Sp. Conductance (µS/cm)	37.3	37.0	38.4	37.6	No change
Color (Pt-Co)	16.4	15.0	18.2	16.5	No change
Alkalinity (mg/L)					No change
Nitrate-Nitrogen (µg/L)	85.9			85.9	Not analyzed
Chloride (mg/L)	8.0			8.0	No change
Calcium (mg/L)	2.2			2.2	Not analyzed
Sodium (mg/L)	5.9			5.9	No change

\*See table of content for description of water quality indicators

# Canada Lake – Time Series



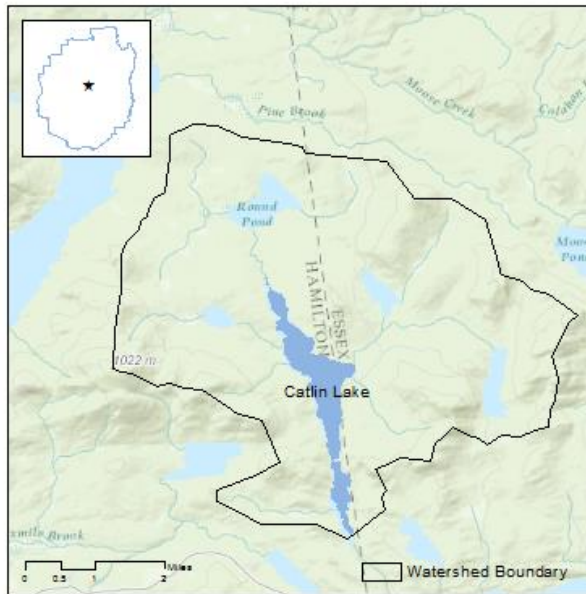
Annual average values of select water quality indicators for Canada Lake, 2000-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Canada Lake is a 294 ha lake located in Fulton County in the Town of Caroga. This lake is located within a 9,040 ha watershed dominated by forests. Canada Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1999.

- Canada Lake is an oligotrophic lake. We did not detect a significant trend in any of the trophic indicators. Secchi transparency averaged 4.6 meters in 2016, which is greater than 69% of the participating ALAP lakes.
- Water samples from 2016 were found to be circumneutral in terms of their acidity, with an average pH of 6.9. We are unable to report alkalinity for 2016 due to a laboratory error. The alkalinity of the samples averaged 6.7 mg/L in 2015, suggesting that the lake has moderate sensitivity to acid deposition.
- Sodium and chloride concentrations in 2016 were 5.9 and 8.0 mg/L respectively, suggesting that the chemistry of the lake is influenced by the 35.2 km of roads in the watershed. Chloride concentration of Canada Lake is greater than 63% of participating lakes.

# Catlin Lake



<b>Location</b>	County:	Hamilton
	Town:	Long Lake
<b>Lake Characteristics</b>	Surface Area (ha):	261
	Shoreline Length (km):	16
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	19303122
	Flush rate (times/year):	2.5
<b>Watershed Characteristics</b>	Watershed Area (ha):	6390
	Surface water (%):	9
	Deciduous Forest (%):	57
	Evergreen Forest (%):	13
	Mixed Forest (%):	7
	Wetlands (%):	13
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	0
State Roads (km):	0	

<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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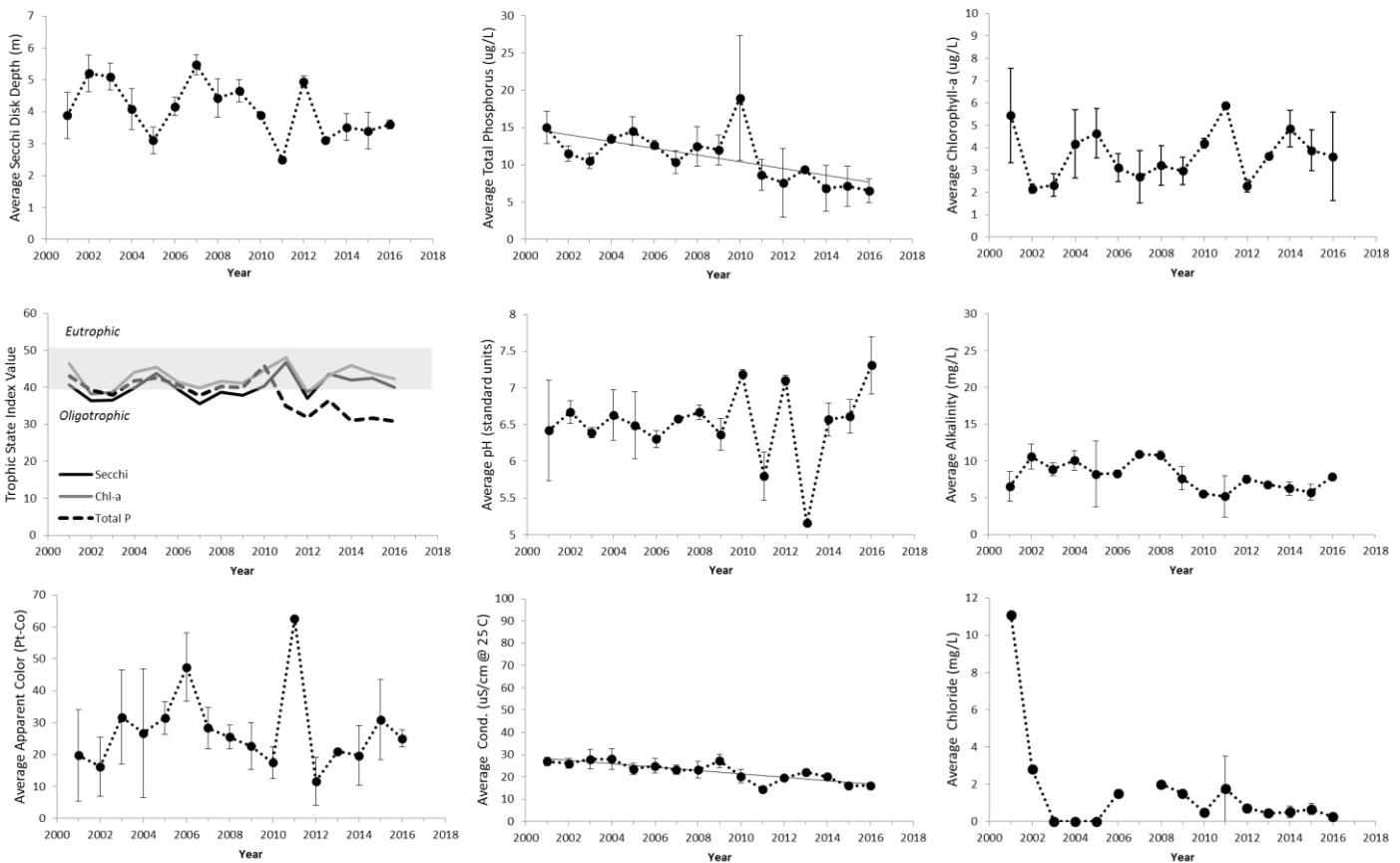
Water quality values and historical trends for Catlin Lake during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/24/2016	7/21/2016	8/24/2016		
Transparency (m)	3.9	2.9	4.1	3.6	No change
Total Phosphorus (µg/L)	5.0	8.1	6.5	6.5	Decreasing
Chlorophyll- <i>a</i> (µg/L)	2.0	5.8	3.0	3.6	No change
Laboratory pH	7.8	7.2	7.0	7.3	No change
Sp. Conductance (µS/cm)	15.4	15.9	17.3	16.2	Decreasing
Color (Pt-Co)	22.7	27.9	24.6	25.1	No change
Alkalinity (mg/L)			7.9	7.9	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	0.3			0.3	No change
Calcium (mg/L)	2.4			2.4	Not analyzed
Sodium (mg/L)	0.9			0.9	No change

\*See table of content for description of water quality indicators



# Catlin Lake – Time Series



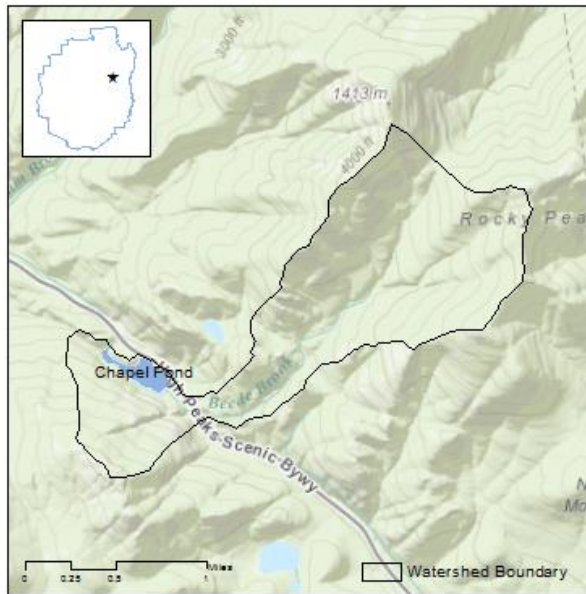
Annual average values of select water quality indicators for Catlin Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Catlin Lake is a 261 ha lake located in Hamilton County in the Town of Long Lake. The lake is located within a 6,390 ha watershed dominated by forests. Catlin Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Catlin Lake is a mesotrophic lake. Secchi disk transparency and chlorophyll values have been variable over time and exhibited no statistical trend. Average total phosphorous concentration has exhibited a significant downward trend over the 16 years of ALAP participation, with an annual decrease at the rate of 0.45 µg/L.
- Catlin Lake is a circumneutral water body in terms of its acidity, with moderate sensitivity to acid deposition.
- The sodium and chloride concentrations averaged 0.9 mg/L and 0.3 mg/L, respectively, and are within the range expected for a lake that lacks salted state roads in the watershed. Elevated chloride levels in 2001 occurred before major methodological improvements were made in our ability to quantify chloride, These values are almost certainly an error.

# Chapel Pond



<b>Location</b>	County:	Essex
	Town:	Keene

<b>Lake Characteristics</b>	Surface Area (ha):	8
	Shoreline Length (km):	2
	Max. Depth (m):	23.8
	Volume (m <sup>3</sup> ):	685476
	Flush rate (times/year):	4.1

<b>Watershed Characteristics</b>	Watershed Area (ha):	449
	Surface water (%):	2
	Deciduous Forest (%):	11
	Evergreen Forest (%):	51
	Mixed Forest (%):	33
	Wetlands (%):	1
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	0
	State Roads (km):	0.6

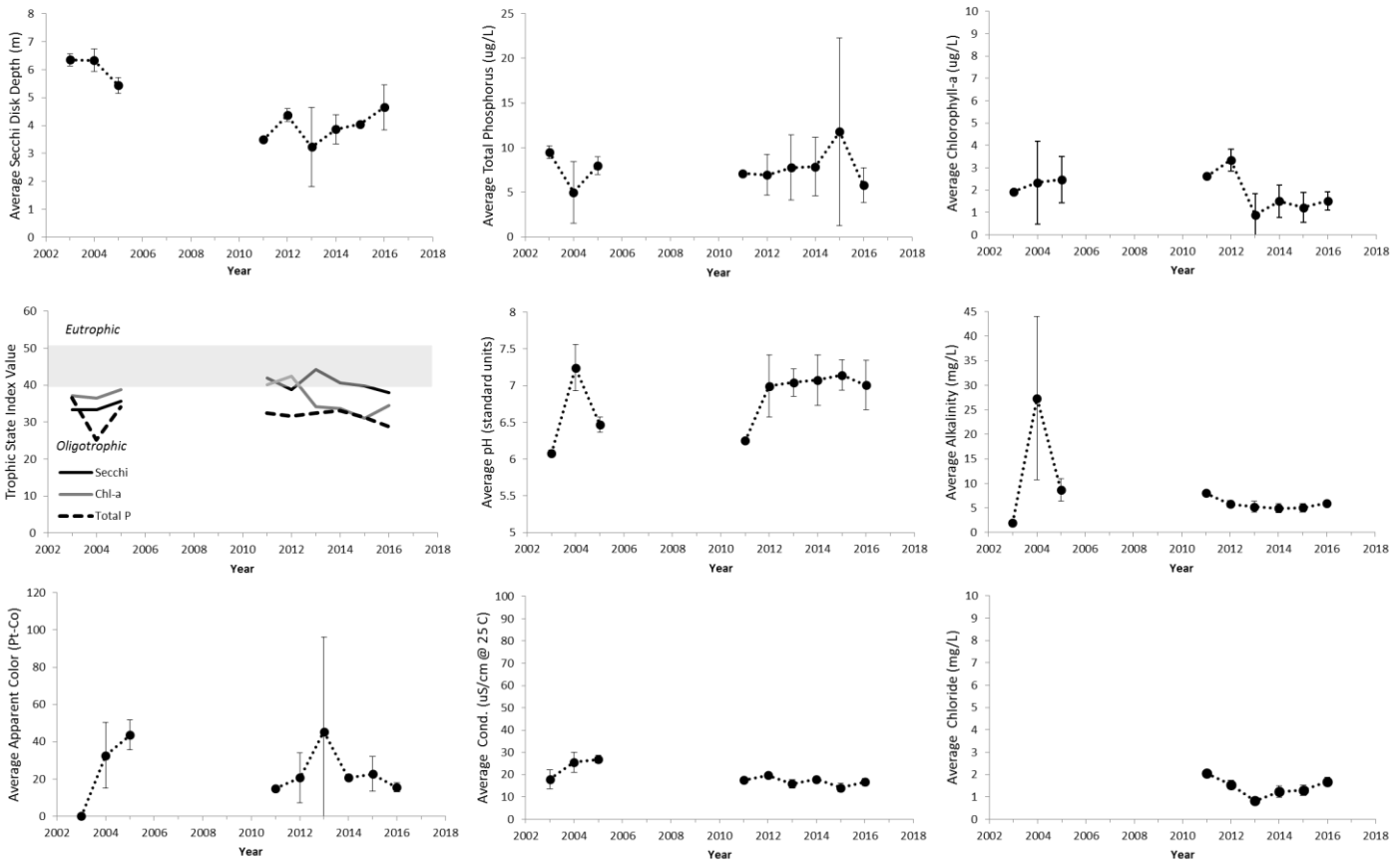
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present - Low
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Water quality values and historical trends for Chapel Pond during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/16/2016	7/13/2016	9/4/2016		
Transparency (m)	3.9	5.5	4.7	4.7	No change
Total Phosphorus (µg/L)	6.5	3.6	7.3	5.8	No change
Chlorophyll- <i>a</i> (µg/L)	1.6	1.1	1.9	1.5	No change
Laboratory pH	6.6	7.3	7.1	7.0	No change
Sp. Conductance (µS/cm)	17.4	14.9	18.0	16.8	No change
Color (Pt-Co)	13.3	15.0	18.2	15.5	No change
Alkalinity (mg/L)	5.7			5.7	No change
Nitrate-Nitrogen (µg/L)	58.3			58.3	Not analyzed
Chloride (mg/L)	1.8			1.8	No change
Calcium (mg/L)	1.8			1.8	Not analyzed
Sodium (mg/L)	1.4			1.4	No change

\*See table of content for description of water quality indicators

# Chapel Pond – Time Series



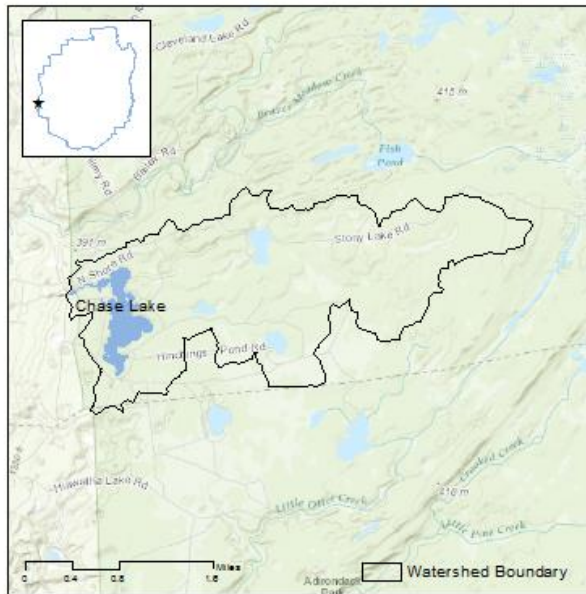
Annual average values of select water quality indicators for Chapel Pond, 2003-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Chapel Pond is an 8 ha lake located in Essex County in the Town of Keene. The lake is located within a highly sloped 449 ha watershed dominated by forests. Chapel Pond has been monitored by ALAP volunteers and the Adirondack Watershed Institute from 2003 to 2005 and 2011 to 2016.

- Chapel Pond is an oligotrophic water body. The transparency, total phosphorus, and chlorophyll concentrations of Chapel Pond have been highly variable over the period of ALAP participation. For example, average annual transparency values have ranged from 3.9 to 6.4 meters, and total phosphorus concentrations have ranged from 4.9 to 12  $\mu\text{g/L}$ . Despite the range of data observed over the 9 years of monitoring, no statistical positive or negative trend was detected in any of the three trophic indicators. Inter-annual variability in the trophic indicator values is likely related to the high turnover rate of the pond, which has been estimated to flush over four times per year.
- The pond is circumneutral in terms of its acidity, with moderate sensitivity to acid deposition.
- The sodium and chloride concentration in Chapel Pond was 1.4 mg/L and 1.8 mg/L respectively, suggesting that road salt influence is present in the pond, but it is fairly low.

# Chase's Lake



<b>Location</b>	County:	Lewis
	Town:	Watson

<b>Lake Characteristics</b>	Surface Area (ha):	47
	Shoreline Length (km):	7
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	-
	Flush rate (times/year):	-

<b>Watershed Characteristics</b>	Watershed Area (ha):	1041
	Surface water (%):	7
	Deciduous Forest (%):	13
	Evergreen Forest (%):	46
	Mixed Forest (%):	4
	Wetlands (%):	14
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	5.5
	State Roads (km):	0

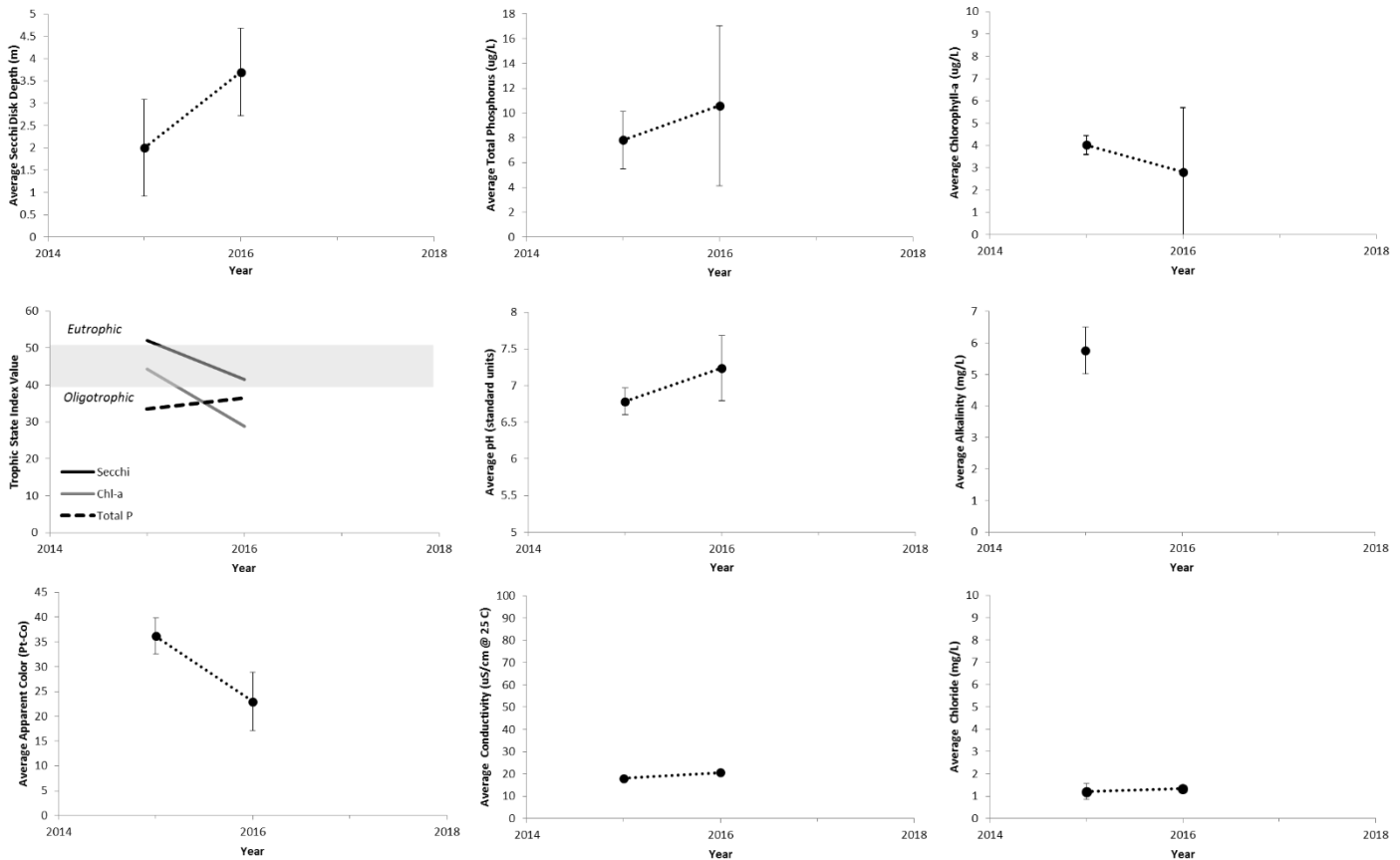
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> No 2016 Data	<b>Road Salt Influence</b> Present - low
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Water quality values and historical trends for Chase's Lake during the 2016 sampling season. Trend analysis will be performed after five years of data have been analyzed. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/19/2016	7/17/2016	8/24/2016		
Transparency (m)	4.0	4.5	2.6	3.7	Not analyzed
Total Phosphorus (µg/L)	17.9	8.2	5.7	10.6	
Chlorophyll- <i>a</i> (µg/L)	2.6	BDL	5.8	2.8	
Laboratory pH	7.1	7.7	6.9	7.2	
Sp. Conductance (µS/cm)	21.3	19.7	20.9	20.6	
Color (Pt-Co)	16.4	24.6	27.9	23.0	
Alkalinity (mg/L)					
Nitrate-Nitrogen (µg/L)	BDL			BDL	
Chloride (mg/L)	1.2			1.2	
Calcium (mg/L)	2.5			2.5	
Sodium (mg/L)	1.5			1.5	

\*See table of content for description of water quality indicators

## Chases Lake -- Time Series



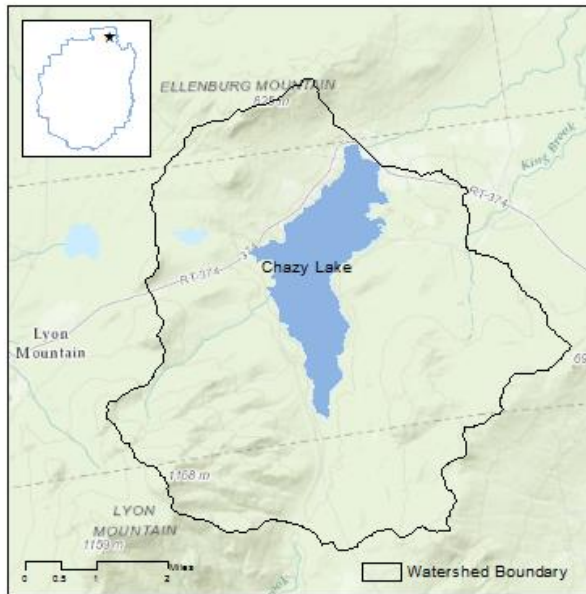
Annual average values of select water quality indicators for Chase's Pond 2015-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Chases lake is a 47 ha pond located in Lewis County in the Town of Watson. The pond is located within a 1,041 ha watershed dominated by forests. This is Chases Ponds second year in ALAP. Trend analysis will be performed on water quality indicators after five years of data have been collected.

- Currently we have very little information on morphometry of the pond.
- The lake is best classified as oligotrophic using the data from 2016.
- The samples analyzed in 2016 were circumneutral in terms of their pH, with an average pH value of 7.2. The alkalinity cannot be reported for 2016 due to a laboratory error. In 2015 the alkalinity was 6.8, indicating that the pond has moderate sensitivity to acid deposition.
- Sodium and chloride concentration averaged 1.5 and 1.2 mg/L respectively. These values are slightly higher than background values in the Adirondack region, suggesting that road salt influence is present, but low.

# Chazy Lake



<b>Location</b>	County:	Clinton
	Town:	Dannemora
<b>Lake Characteristics</b>	Surface Area (ha):	740
	Shoreline Length (km):	20
	Max. Depth (m):	21.9
	Volume (m <sup>3</sup> ):	65399532
	Flush rate (times/year):	0.33
<b>Watershed Characteristics</b>	Watershed Area (ha):	6896
	Surface water (%):	11
	Deciduous Forest (%):	61
	Evergreen Forest (%):	16
	Mixed Forest (%):	4
	Wetlands (%):	2
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	16.4
State Roads (km):	8.3	

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Chazy Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

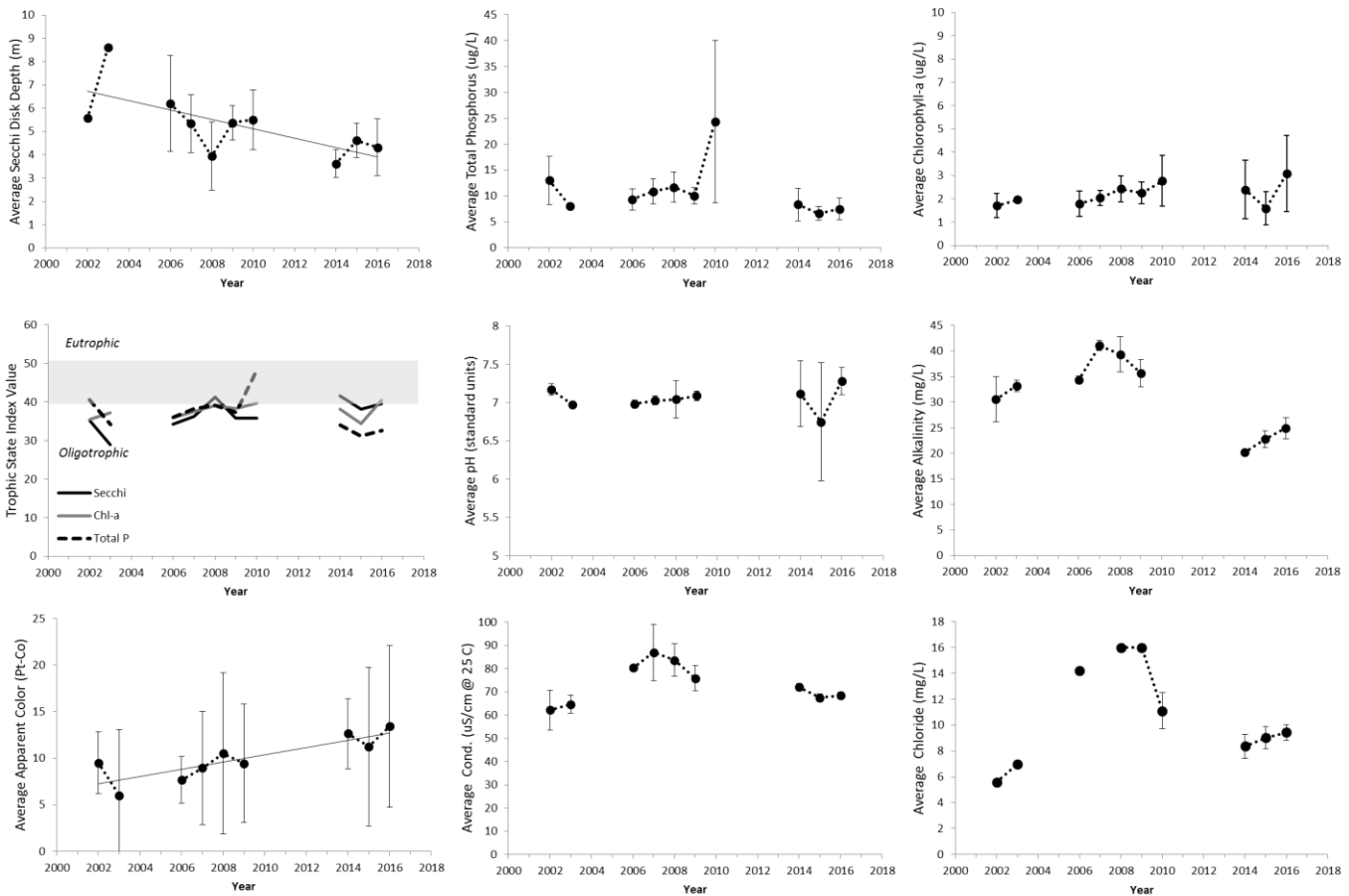
Water Quality Indicator	Sampling Date			Average	Trend
	6/22/2016	7/19/2016	8/17/2016		
<i>Eagle Point</i>					
Transparency (m)	4.4	4.4	4.2	4.3	Decreasing
Total Phosphorus (µg/L)	6.9	6.0	5.8	6.2	No change
Chlorophyll- <i>a</i> (µg/L)	2.4	1.5	5.3	3.0	No change
Laboratory pH	7.1	7.5	7.4	7.3	No change
Sp. Conductance (µS/cm)	68.0	70.7	67.6	68.8	No change
Color (Pt-Co)	7.1	8.6	24.6	13.4	Increasing
Alkalinity (mg/L)			23.3	23.3	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)			10.1	10.1	No change
Calcium (mg/L)			6.1	6.1	Not analyzed
Sodium (mg/L)			5.7	5.7	No change



Water Quality Indicator	Sampling Date			Average
	6/22/2016	7/19/2016	8/17/2016	
<i>Halfway Point</i>				
Transparency (m)	6.2	5.2	4.6	5.4
Total Phosphorus (µg/L)	8.9	4.6	10.3	7.9
Chlorophyll- <i>a</i> (µg/L)	1.6	1.7	3.9	2.4
Laboratory pH	7.1	7.4	7.5	7.3
Sp. Conductance (µS/cm)	67.1	69.2	67.7	68.0
Color (Pt-Co)	10.2	8.6	15.0	11.2
Alkalinity (mg/L)			24.2	24.2
Nitrate-Nitrogen (µg/L)			BDL	BDL
Chloride (mg/L)			10.4	10.4
Calcium (mg/L)			6.2	6.2
Sodium (mg/L)			5.9	5.9
<i>South Inlet</i>				
Transparency (m)	VOB	3.3	2.2	2.7
Total Phosphorus (µg/L)	9.0	5.7	10.2	8.3
Chlorophyll- <i>a</i> (µg/L)	2.7	2.7	6.0	3.8
Laboratory pH	7.1	7.1	7.4	7.2
Sp. Conductance (µS/cm)	66.1	70.6	68.2	68.3
Color (Pt-Co)	7.1	8.6	31.1	15.6
Alkalinity (mg/L)			27.3	27.3
Nitrate-Nitrogen (µg/L)			BDL	BDL
Chloride (mg/L)			9.1	9.1
Calcium (mg/L)			6.5	6.5
Sodium (mg/L)			5.6	5.6

\*See table of content for description of water quality indicators

# Chazy Lake – Time Series



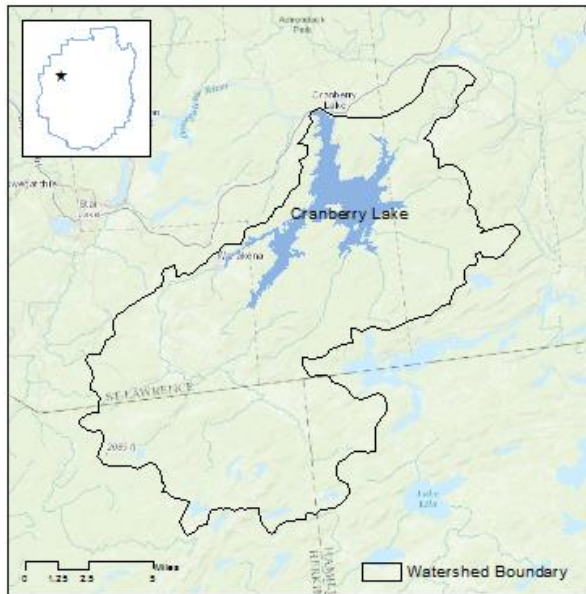
Lake wide annual average values of select water quality indicators for Chazy Lake, 2002-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Chazy Lake is a 740 ha lake located in Clinton County in the Town of Dannemora. The lake is located within a 6,896 ha watershed dominated by forests. Chazy Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute off and on since 2002.

- Chazy Lake is an oligotrophic lake. No statistical trend was detected in total phosphorus or chlorophyll-a concentration. Transparency has exhibited a decreasing trend at a rate of 20 cm/year. Some of the change in transparency may be related to the observed increase in color, which has exhibited a significant increase at a rate of 0.4 Pt-Co/year.
- Water samples analyzed in 2016 were circumneutral in terms of their acidity, with a lake wide average of 7.2. The alkalinity of the water averaged 24.9 mg/L indicating that the lake is adequately buffered and not sensitive to acid deposition.
- Sodium and chloride concentrations averaged 5.6 and 9.4 mg/L respectively, indicating that the chemistry of the lake is influenced by the 25 km of roads in the watershed. The chloride concentration of Chazy is greater than 68% of participating ALAP lakes.

# Cranberry Lake



<b>Location</b>	County:	St Lawrence
	Town:	Clifton

<b>Lake Characteristics</b>	Surface Area (ha):	2750
	Shoreline Length (km):	128
	Max. Depth (m):	11.8
	Volume (m <sup>3</sup> ):	52200000
	Flush rate (times/year):	4.35

<b>Watershed Characteristics</b>	Watershed Area (ha):	37478
	Surface water (%):	10
	Deciduous Forest (%):	60
	Evergreen Forest (%):	8
	Mixed Forest (%):	3
	Wetlands (%):	18
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	17
State Roads (km):	1.3	

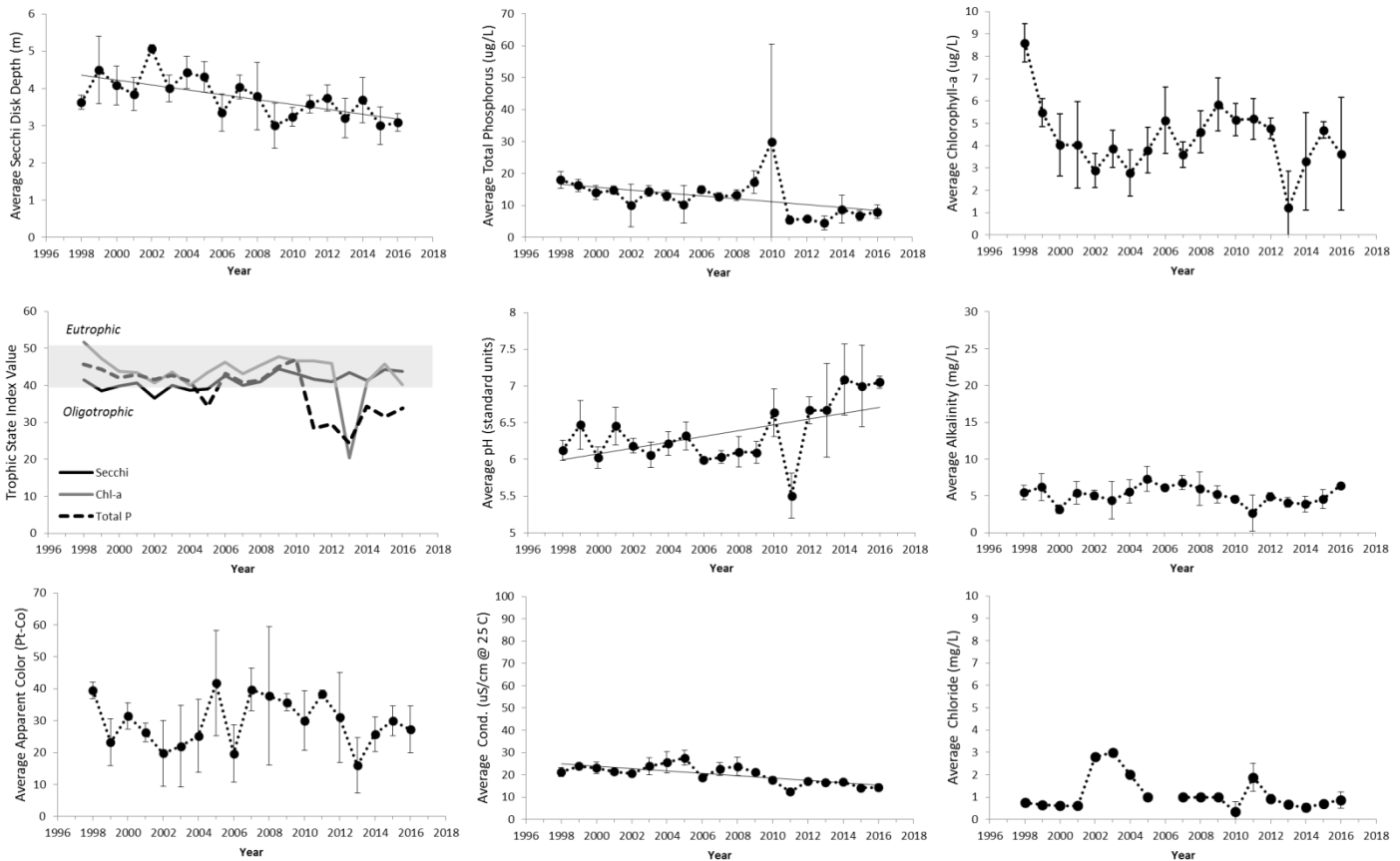
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Cranberry Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/17/2016	7/14/2016	8/17/2016		
Transparency (m)	3.0	2.9	3.4	3.1	Decreasing
Total Phosphorus (µg/L)	10.1	5.9	7.9	8.0	Decreasing
Chlorophyll- <i>a</i> (µg/L)	0.7	5.2	5.0	3.6	No change
Laboratory pH	7.0	7.0	7.1	7.1	Increasing
Sp. Conductance (µS/cm)	14.8	12.6	15.7	14.4	Decreasing
Color (Pt-Co)	19.6	27.9	34.3	27.2	No change
Alkalinity (mg/L)			6.4	6.4	No change
Nitrate-Nitrogen (µg/L)			1.4	1.4	Not analyzed
Chloride (mg/L)			1.3	1.3	No change
Calcium (mg/L)			1.7	1.7	Not analyzed
Sodium (mg/L)			0.9	0.9	No change

\*See table of content for description of water quality indicators

# Cranberry Lake – Time Series



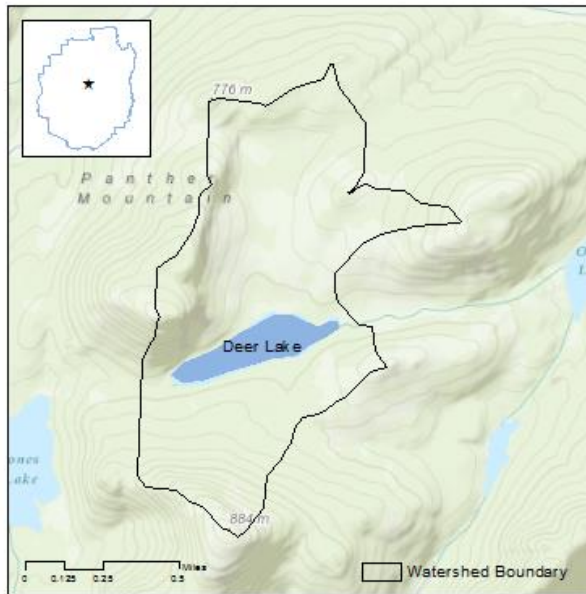
Annual average values of select water quality indicators for Cranberry Lake, 1998-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Cranberry Lake is a 2,750 ha lake located in St. Lawrence County in the Town of Clifton. The lake is located within a 34,478 ha watershed dominated by forests. Cranberry Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1998.

- Cranberry Lake is a mesotrophic lake. The transparency of the lake has exhibited a slight, yet significant downward trend at a rate of 6 cm/year. Total phosphorus is also trending down, at a rate of approximately 0.45 µg/L/year. Chlorophyll concentrations has been variable over the length of the study and have shown no significant positive or negative trend.
- The samples analyzed in 2016 were circumneutral in terms of their pH, with an average pH value of 7.1. The alkalinity of the 2016 sample was 6.4 mg/L, indicating that the pond has moderate sensitivity to acid deposition.
- The sodium and chloride concentration of Cranberry was 0.9 and 1.3 mg/L respectively, indicating that the lake is not significantly influenced by road salt.

# Deer Lake



<b>Location</b>	County:	Hamilton
	Town:	Morehouse

<b>Lake Characteristics</b>	Surface Area (ha):	13
	Shoreline Length (km):	2
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	720060
	Flush rate (times/year):	5.6

<b>Watershed Characteristics</b>	Watershed Area (ha):	203
	Surface water (%):	9
	Deciduous Forest (%):	63
	Evergreen Forest (%):	3
	Mixed Forest (%):	5
	Wetlands (%):	17
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	0
	State Roads (km):	0

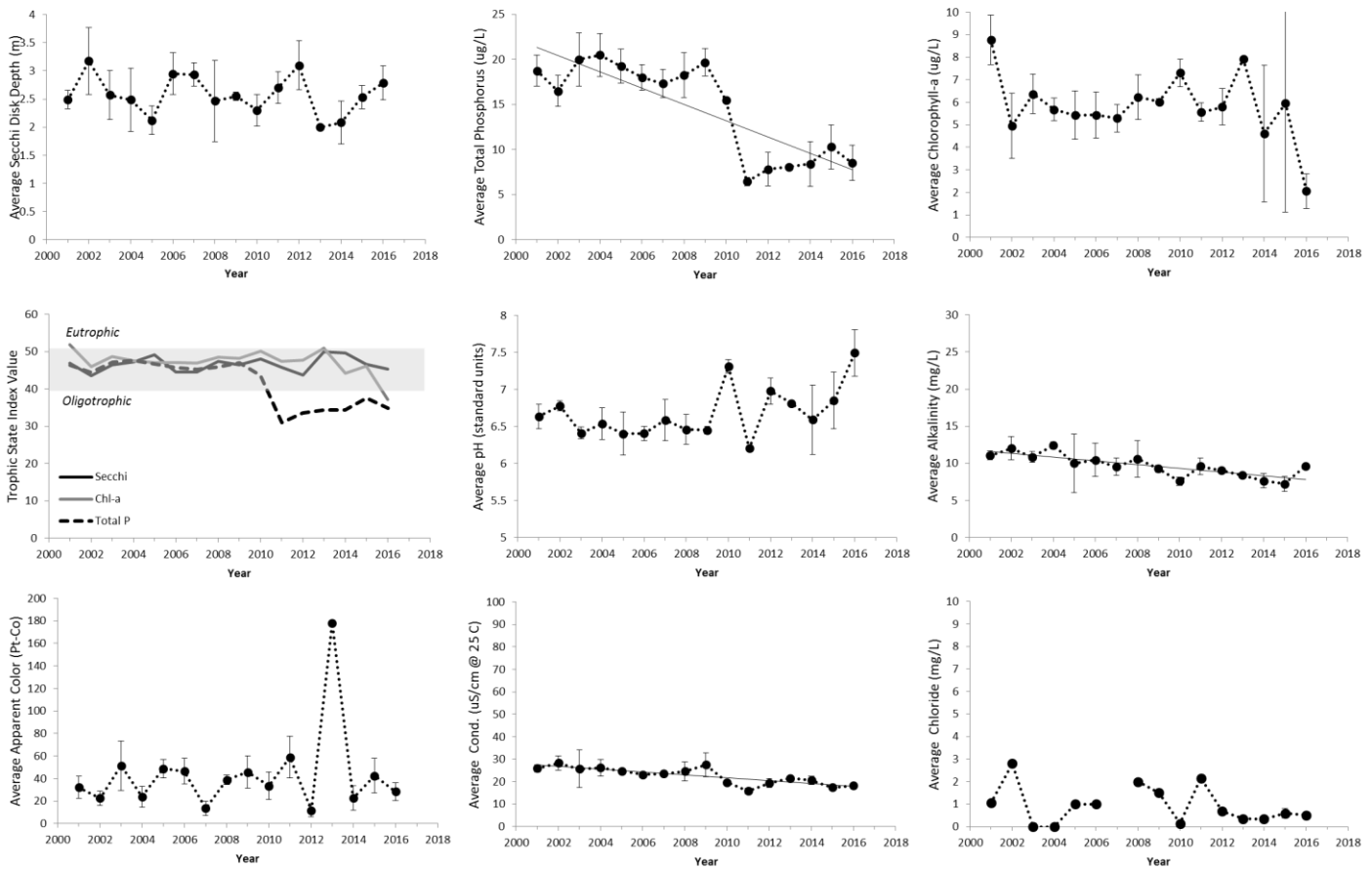
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Deer Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit. VOB=Secchi disk was visible on the bottom of the lake.

Water Quality Indicator	Sampling Date			Average	Trend
	6/23/2016	7/21/2016	8/24/2016		
Transparency (m)	2.6	VOB	3.0	2.8	No change
Total Phosphorus (µg/L)	10.7	7.9	6.9	8.5	Decreasing
Chlorophyll- <i>a</i> (µg/L)	2.5	1.2	2.5	2.1	No change
Laboratory pH	7.7	7.7	7.1	7.5	No change
Sp. Conductance (µS/cm)	17.5	17.9	19.5	18.3	Decreasing
Color (Pt-Co)	19.6	34.3	31.1	28.3	No change
Alkalinity (mg/L)			9.6	9.6	Decreasing
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	0.5			0.5	No change
Calcium (mg/L)	2.7			2.7	Not analyzed
Sodium (mg/L)	1.2			1.2	No change

\*See table of content for description of water quality indicators

# Deer Lake – Time Series



Annual average values of select water quality indicators for Deer Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

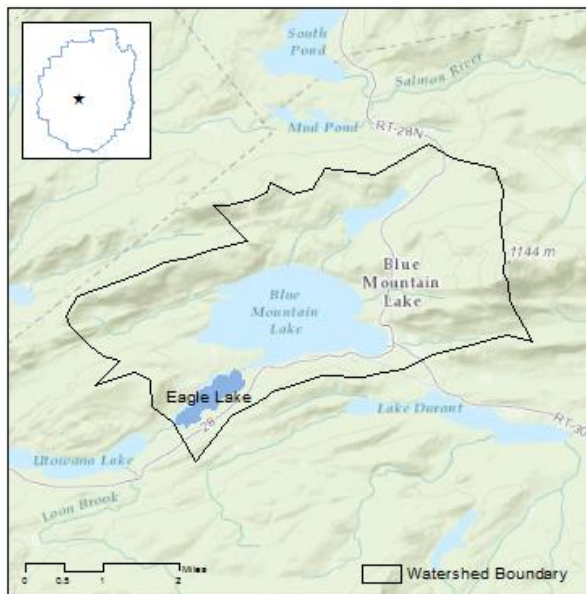
## Summary of Findings

Deer Lake is a 38 ha lake located in Essex County in the Town of Newcomb. The lake is located within a 550 ha watershed dominated by forests. Deer Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Deer Lake is mesotrophic lake bordering on oligotrophic. Secchi disk transparency has remained relatively constant over the 15 years of monitoring with no significant trend detected in the data. Chlorophyll –a concentration, a surrogate for algal productivity, has been variable over time but also exhibited no statistical trend. Total phosphorus showed a significant downward trend at a rate of 0.9  $\mu\text{g/L}$  per year.
- The pH of the 2016 water samples averaged 7.5, indicating that the lake is circumneutral. The alkalinity of the 2016 sample was 9.6 mg/L indicating moderate sensitivity to acid deposition. Alkalinity exhibited a statistically significant downward trend at a rate of 0.3mg/L per year.
- Sodium and chloride concentrations averaged 1.2 and 0.5 mg/L respectively, which is in the range expected for a watershed lacking salted roads.



# Eagle Lake



<b>Location</b>	County:	Hamilton
	Town:	Indian Lake
<b>Lake Characteristics</b>	Surface Area (ha):	64
	Shoreline Length (km):	4
	Max. Depth (m):	9.4
	Volume (m <sup>3</sup> ):	3169395
	Flush rate (times/year):	7.7
<b>Watershed Characteristics</b>	Watershed Area (ha):	3290
	Surface water (%):	21
	Deciduous Forest (%):	42
	Evergreen Forest (%):	15
	Mixed Forest (%):	10
	Wetlands (%):	7
	Agricultural (%):	0
	Residential (%):	4
	Local Roads (km):	4
State Roads (km):	11	

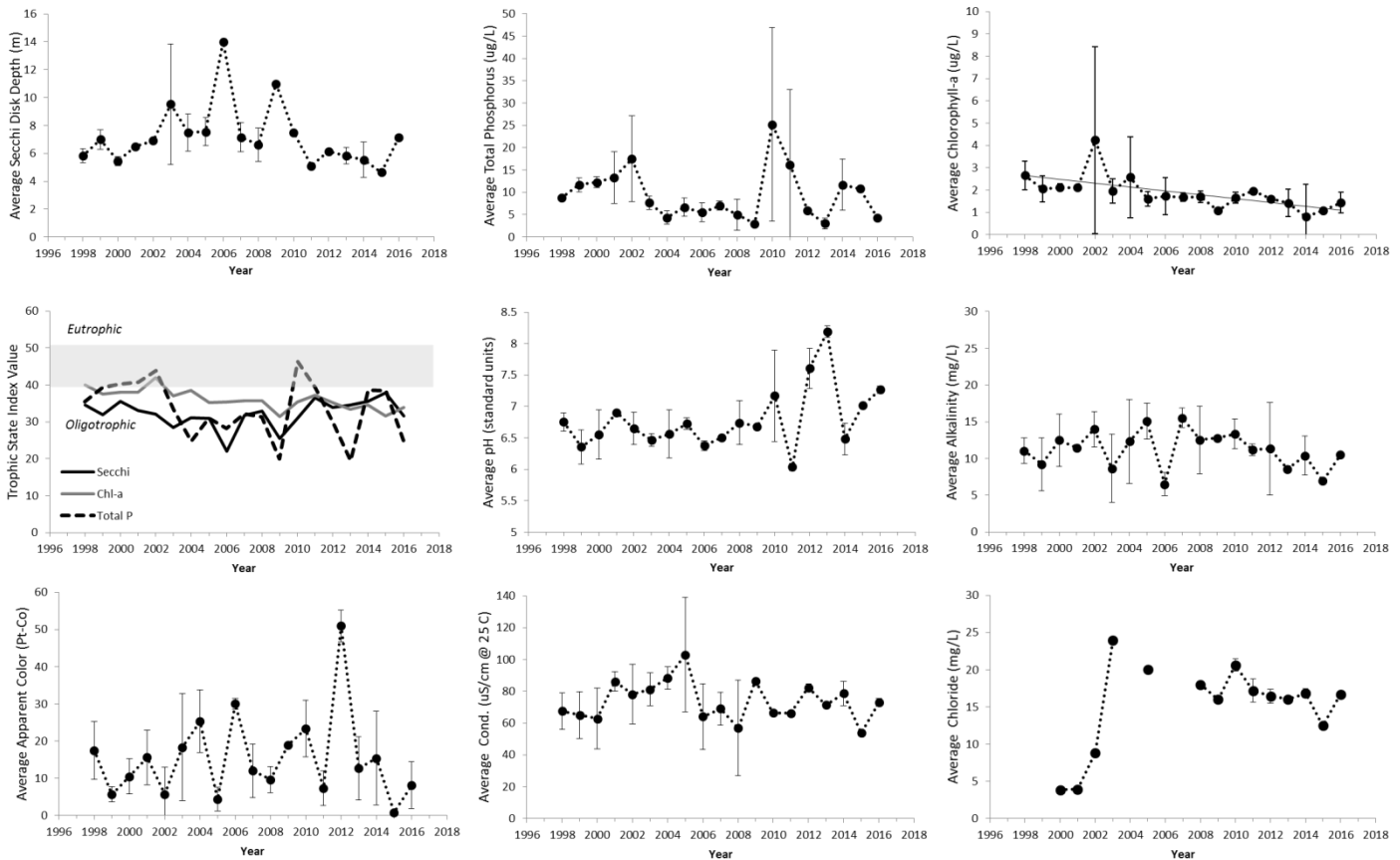
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Eagle Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/24/2016	7/25/2016	8/29/2016		
Transparency (m)	7.0	7.1	7.4	7.2	No change
Total Phosphorus (µg/L)	4.1	4.5	4.2	4.2	No change
Chlorophyll- <i>a</i> (µg/L)	1.1	1.3	1.9	1.4	Decreasing
Laboratory pH	7.3	7.2	7.3	7.3	No change
Sp. Conductance (µS/cm)	74.5	74.2	70.2	73.0	No change
Color (Pt-Co)	0.8	11.8	11.8	8.1	No change
Alkalinity (mg/L)			10.5	10.5	No change
Nitrate-Nitrogen (µg/L)			1.5	1.5	Not analyzed
Chloride (mg/L)	16.7			16.7	No change
Calcium (mg/L)			3.8	3.8	Not analyzed
Sodium (mg/L)			10.0	10.0	No change

\*See table of content for description of water quality indicators

# Eagle Lake – Time Series



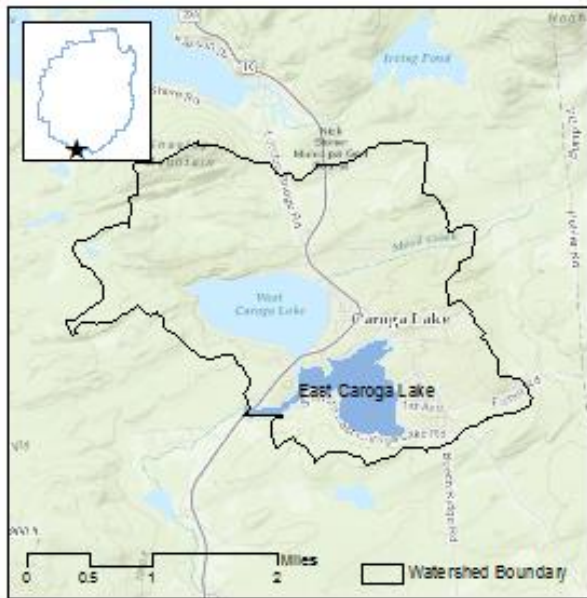
Annual average values of select water quality indicators for Eagle Lake, 1998-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Eagle Lake is a 64 ha lake located in Hamilton County in the Town of Indian Lake. The lake is located within a 3,289 ha watershed dominated by forests. Eagle Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1998.

- Eagle Lake is an oligotrophic lake. Chlorophyll-a has exhibited a slight downward trend at a rate of approximately  $0.08 \mu\text{g/L/year}$ . Total phosphorus and transparency have been variable over time, and exhibited no positive or negative trend.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was  $10.5 \text{ mg/L}$ , indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were  $10.0$  and  $16.7 \text{ mg/L}$  respectively, indicating that the chemistry of the lake is influenced by the  $15 \text{ km}$  of roads in the watershed. Chloride concentration of Eagle Lake was greater than 85% of participating lakes.

# East Caroga Lake



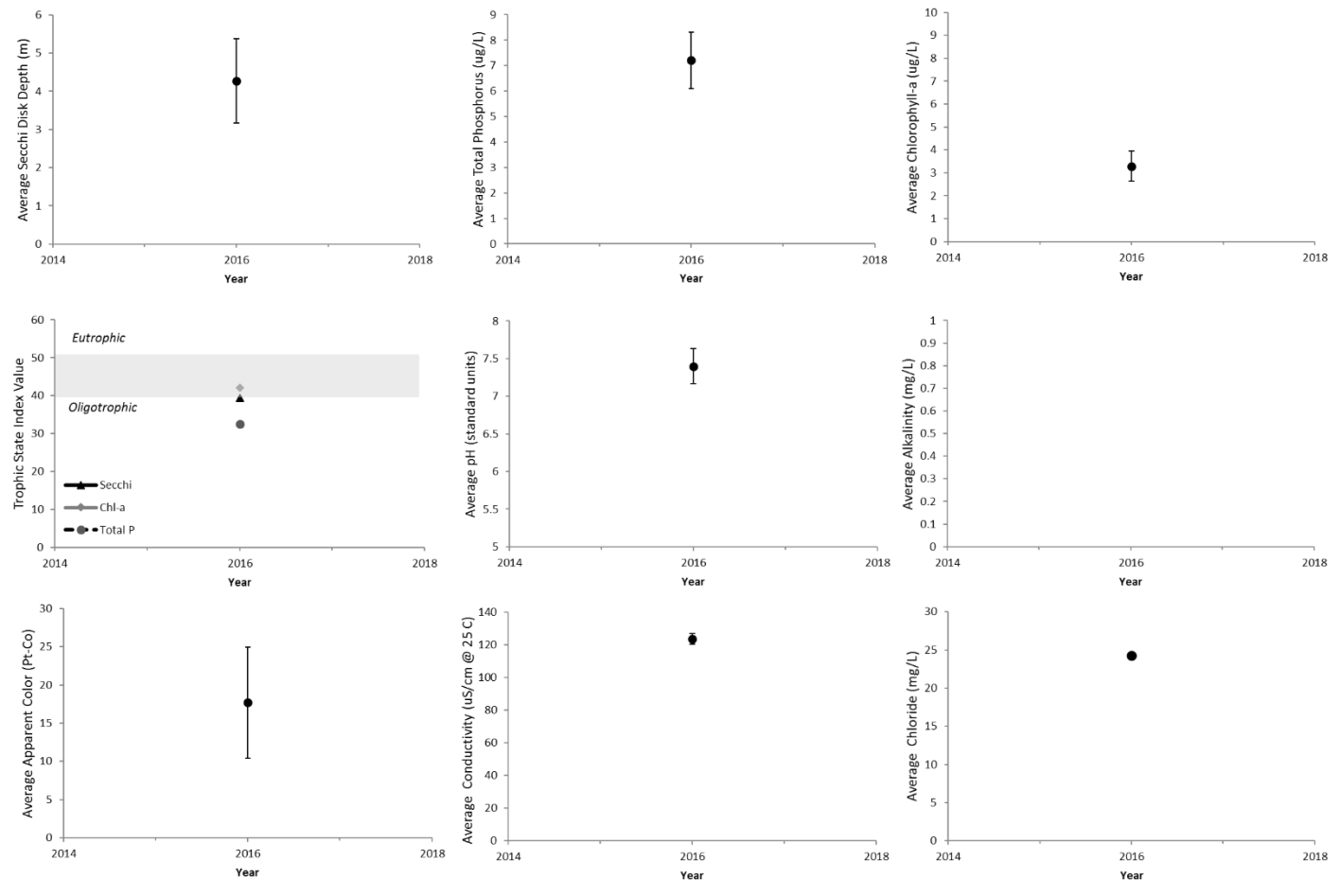
<b>Location</b>	County: Fulton Town: Caroga Lake
<b>Lake Characteristics</b>	Surface Area (ha): 94 Shoreline Length (km): 8 Max. Depth (m): 12.4 Volume (m <sup>3</sup> ): 3176316 Flush rate (times/year): 0.71
<b>Watershed Characteristics</b>	Watershed Area (ha): 1490 Surfacewater (%): 6 Deciduous Forest (%): 30 Evergreen Forest (%): 10 Mixed Forest (%): 9 Wetlands (%): 20 Agricultural (%): 0 Residential (%): 8 Local Roads (km): 21 State Roads (km): 6.6

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> No 2016 Data	<b>Road Salt Influence</b> High
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Water quality values for East Caroga Lake during the 2016 sampling season. Trend analysis will be performed after five years of consecutive data collection. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/20/2016	7/19/2016	8/23/2016		
Transparency (m)	4.2	3.2	5.4	4.3	Not Analyzed-5 years of data needed
Total Phosphorus (µg/L)	8.5	6.3	6.8	7.2	
Chlorophyll- <i>a</i> (µg/L)	3.1	2.8	4.0	3.3	
Laboratory pH	7.3	7.2	7.7	7.4	
Sp. Conductance (µS/cm)	124.0	126.9	120.2	123.7	
Color (Pt-Co)	10.2	18.2	24.6	17.7	
Alkalinity (mg/L)					
Nitrate-Nitrogen (µg/L)	BDL			BDL	
Chloride (mg/L)	24.3			24.3	
Calcium (mg/L)	8.9			8.9	
Sodium (mg/L)	15.1			15.1	

# East Caroga Lake- Time Series



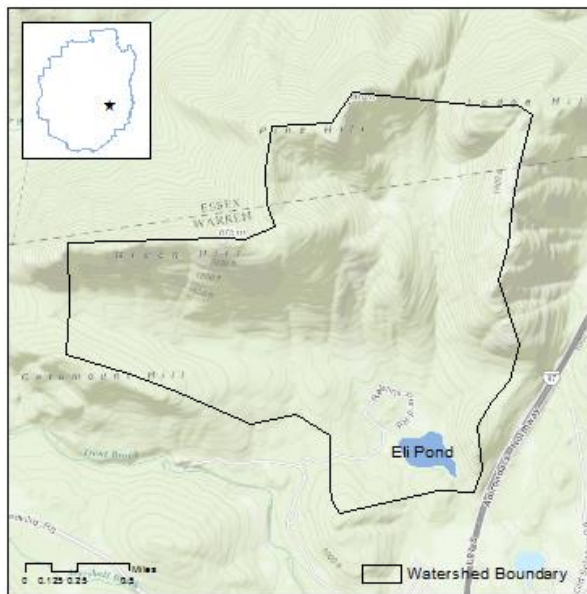
Annual average values of select water quality indicators for East Caroga Lake, 2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

East Caroga Lake is a 94 ha lake located in Fulton County in the Town of Caroga. The lake is located within a 1,490 ha watershed dominated by forests. This is the first year of participation for East Caroga

- East Caroga is an oligotrophic lake on the border of mesotrophic.
- The lake is circumneutral in terms of its pH, and averaged 7.4 pH units in 2016.
- Unfortunately, we cannot report alkalinity values this year due to a laboratory error. Alkalinity will be assessed in 2017.
- Sodium and chloride values for the lake were 15.1 and 24.3 mg/L in 2016, indicating that the chemistry of the lake is highly influenced by road salt. Chloride concentration in East Caroga is greater than 94% of the participating lakes and approximately 120 times higher than unimpacted lakes in the Adirondacks.

# Eli Pond



<b>Location</b>	County:	Warren
	Town:	Chester
<b>Lake Characteristics</b>	Surface Area (ha):	9
	Shoreline Length (km):	1
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	159105
	Flush rate (times/year):	28
<b>Watershed Characteristics</b>	Watershed Area (ha):	714
	Surface water (%):	2
	Deciduous Forest (%):	68
	Evergreen Forest (%):	17
	Mixed Forest (%):	11
	Wetlands (%):	2
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	0
State Roads (km):	0	

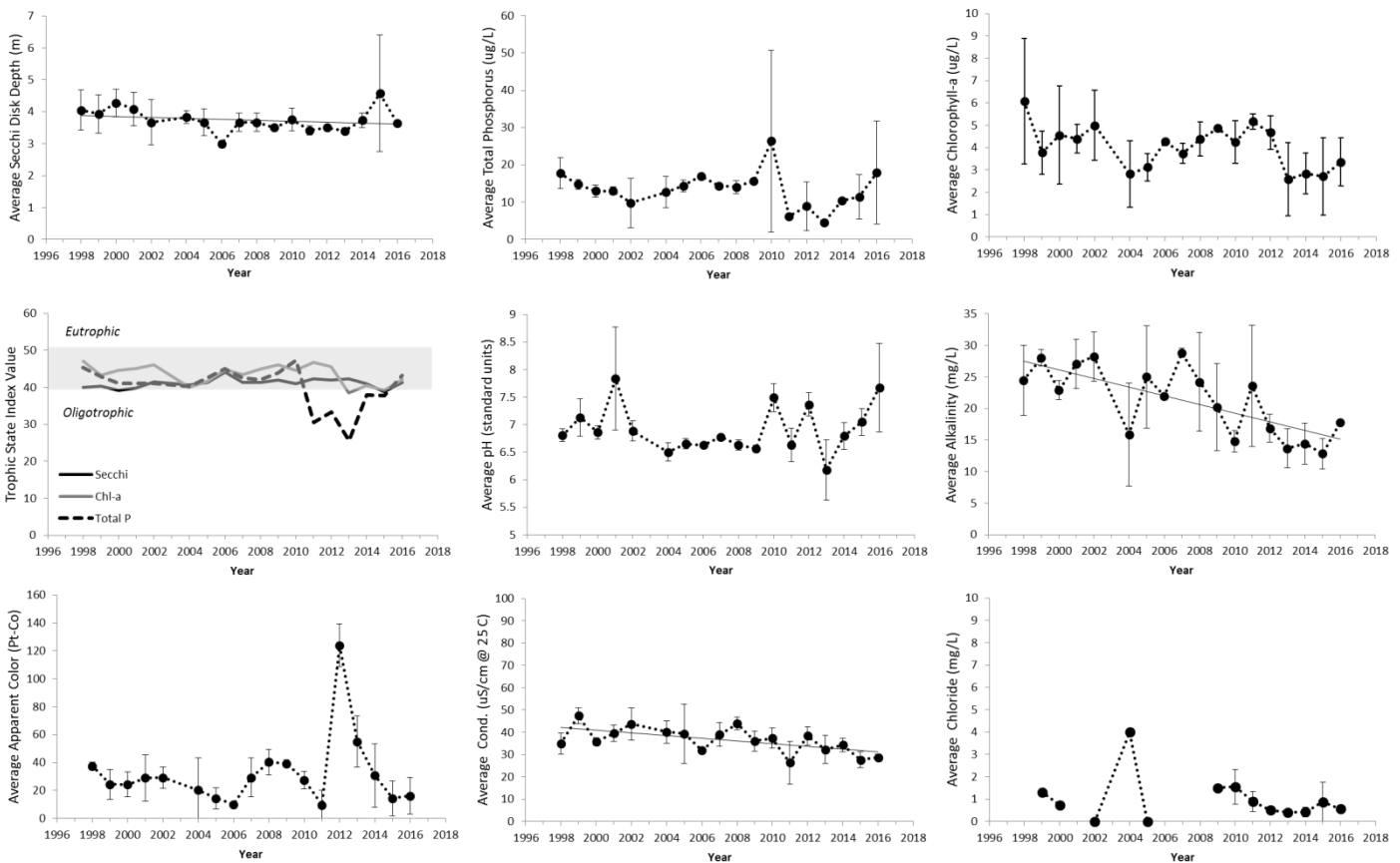
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Alkaline	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Eli Pond during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	5/28/2016	6/25/2016	7/23/2016		
Transparency (m)	3.7	3.7	3.6	3.6	Decreasing
Total Phosphorus (µg/L)	9.2	33.8	10.8	17.9	No change
Chlorophyll- <i>a</i> (µg/L)	2.5	3.0	4.6	3.4	No change
Laboratory pH	6.9	7.7	8.5	7.7	No change
Sp. Conductance (µS/cm)	27.3	29.2	29.8	28.8	Decreasing
Color (Pt-Co)	10.2	7.1	31.1	16.1	No change
Alkalinity (mg/L)			17.8	17.8	Decreasing
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)		0.6		0.6	No change
Calcium (mg/L)		4.8		4.8	Not analyzed
Sodium (mg/L)		1.3		1.3	No change

\*See table of content for description of water quality indicators

# Eli Pond – Time Series



Annual average values of select water quality indicators for Eli Pond, 1998-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

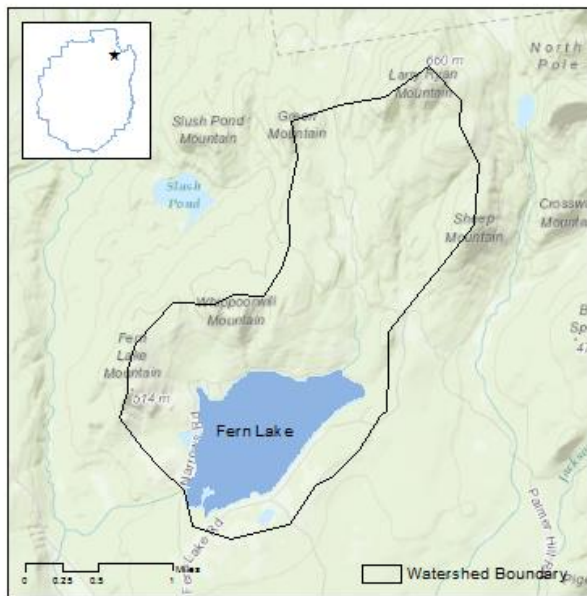
## Summary of Findings

Eli Pond is a 9 ha lake located in Warren County in the Town of Chester. The lake is located within a 714 ha watershed dominated by forests. Eli Pond has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1998.

- Eli Pond is a mesotrophic lake. Transparency has typically ranged between 3 and 5 meters. This year we detected a very slight, yet statistically significant downward trend in transparency. Chlorophyll-a and total phosphorus has been variable, and have exhibited no positive or negative trend.
- The water samples analyzed in 2016 were found to be circumneutral to alkaline in terms of their acidity, with an average pH value of 7.7 units. The alkalinity was 17.8 mg/L, indicating low sensitivity to acid deposition. We did detect a decreasing trend in alkalinity at a rate of 0.7 mg/L. There is considerable variability in alkalinity; this is likely related to the flushing rate of the pond, which is estimated at 20 times per year on average.
- Sodium and chloride concentration averaged 1.3 and 0.6 mg/L respectively, these values are within the range we would expect for a lake that lacks salted roads in the watershed.



# Fern Lake



<b>Location</b>	County:	Clinton
	Town:	Black Brook
<b>Lake Characteristics</b>	Surface Area (ha):	169
	Shoreline Length (km):	7
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	3887513
	Flush rate (times/year):	1.9
<b>Watershed Characteristics</b>	Watershed Area (ha):	1014
	Surface water (%):	17
	Deciduous Forest (%):	59
	Evergreen Forest (%):	8
	Mixed Forest (%):	10
	Wetlands (%):	3
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	4.3
State Roads (km):	0	

<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Present - Low
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Water quality values and historical trends for Fern Lake during the 2016 sampling season. Trend analysis was not

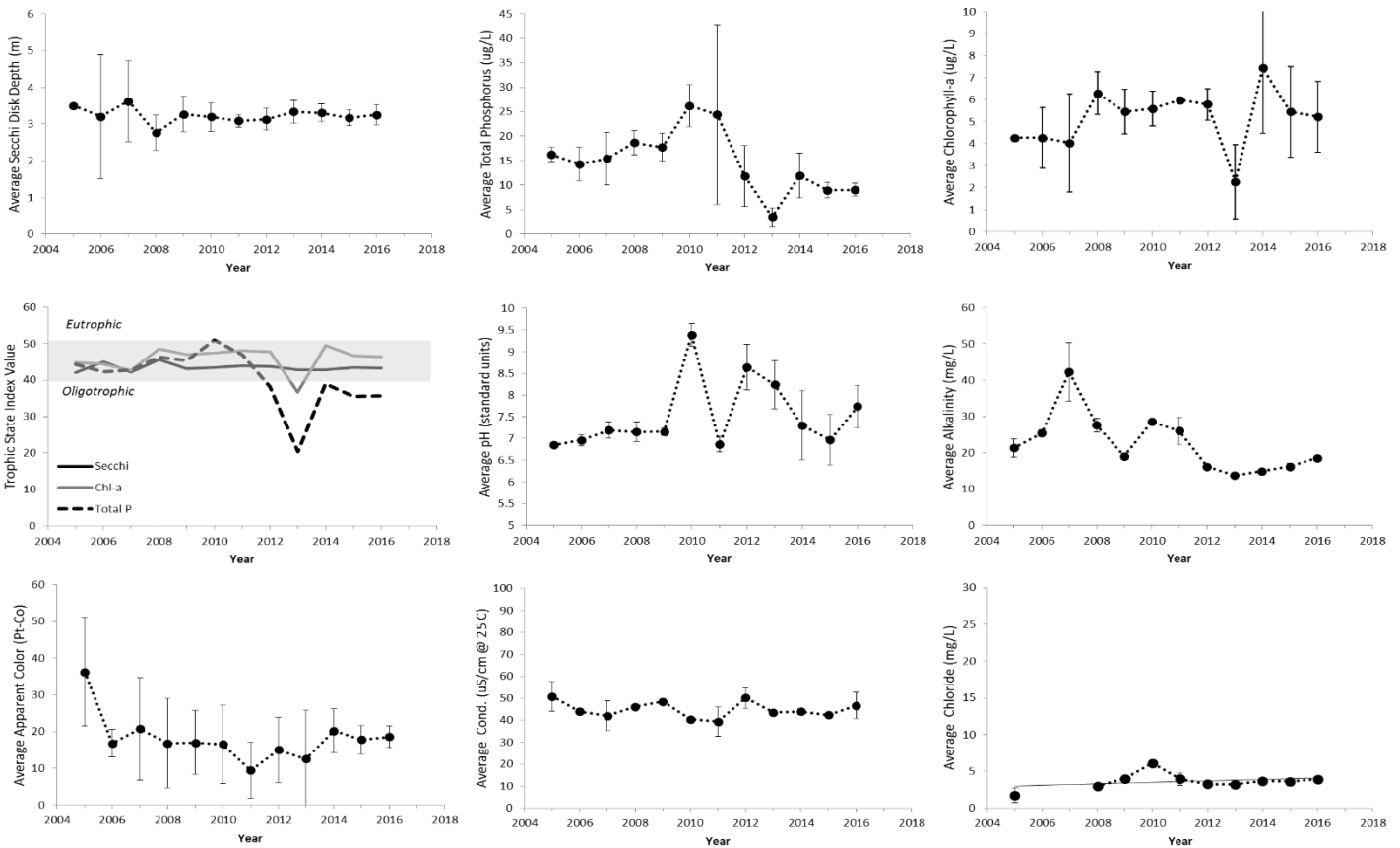
Water Quality Indicator	Sampling Date			Average	Trend
	7/21/2016	8/26/2016	9/19/2016		
	<i>Deep Hole</i>				
Transparency (m)	3.5	3.5	3.8	3.6	No change
Total Phosphorus (µg/L)	8.8	10.4	7.4	8.9	No change
Chlorophyll- <i>a</i> (µg/L)	7.5	3.3	3.3	4.7	No change
Laboratory pH	7.2	7.6	8.4	7.7	No change
Sp. Conductance (µS/cm)	44.4	48.9	43.8	45.7	No change
Color (Pt-Co)	18.2	15.0	18.2	17.1	No change
Alkalinity (mg/L)		18.9		18.9	No change
Nitrate-Nitrogen (µg/L)		BDL		BDL	Not analyzed
Chloride (mg/L)		4.0		4.0	Increasing
Calcium (mg/L)		5.2		5.2	Not analyzed
Sodium (mg/L)		3.0		3.0	No change

performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average
	7/21/2016	8/26/2016	9/19/2016	
<i>Beach</i>				
Transparency (m)	3.0	3.0	3.3	3.1
Total Phosphorus (µg/L)	9.7	9.4	7.0	8.7
Chlorophyll- <i>a</i> (µg/L)	4.8	6.0	4.4	5.0
Laboratory pH	7.5	7.9	7.5	7.7
Sp. Conductance (µS/cm)	43.5	46.4	43.3	44.4
Color (Pt-Co)	15.0	15.0	21.4	17.1
Alkalinity (mg/L)		18.5		18.5
Nitrate-Nitrogen (µg/L)		BDL		BDL
Chloride (mg/L)		4.0		4.0
Calcium (mg/L)		4.5		4.5
Sodium (mg/L)		2.6		2.6
<i>Marsh</i>				
Transparency (m)	3.0	3.0	3.3	3.1
Total Phosphorus (µg/L)	10.6	10.0	7.9	9.5
Chlorophyll- <i>a</i> (µg/L)	6.1	7.4	4.4	6.0
Laboratory pH	7.3	7.6	8.7	7.8
Sp. Conductance (µS/cm)	44.4	61.9	43.1	49.8
Color (Pt-Co)	21.4	21.4	21.4	21.4
Alkalinity (mg/L)		18.3		18.3
Nitrate-Nitrogen (µg/L)		BDL		BDL
Chloride (mg/L)		3.9		3.9
Calcium (mg/L)		4.8		4.8
Sodium (mg/L)		2.7		2.7

\*See table of content for description of water quality indicators

# Fern Lake – Time Series



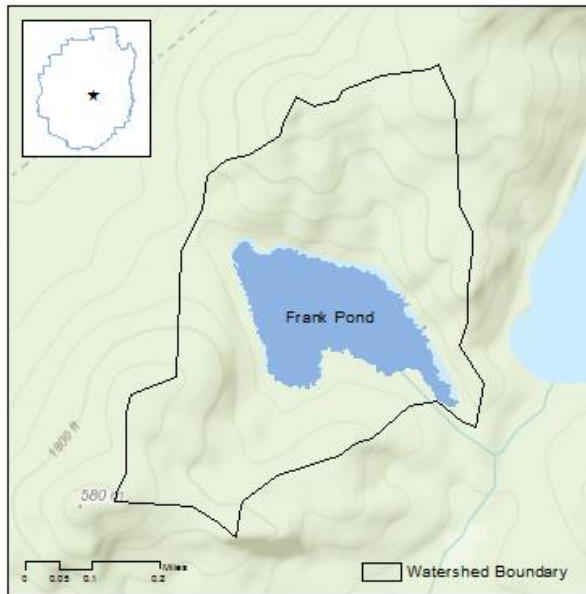
Lake wide annual average values of select water quality indicators for Fern Lake, 2005-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Fern Lake is a 169 ha lake located in Clinton County in the Town of Black Brook. The lake is located within a 1,014 ha watershed dominated by forests. Fern Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2005.

- Fern Lake is a mesotrophic lake. Transparency has been fairly stable since monitoring began, and has ranged between 3 and 5 meters. Chlorophyll-a and total phosphorus have been variable, and have exhibited no positive or negative trend.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 18.5 mg/L, indicating low sensitivity to acid deposition.
- Sodium and chloride concentration averaged 2.8 and 4.0 mg/L respectively, these values indicate that the lake is influenced by road salt, but the influence is relatively low. We detected a slight, yet statistically significant increase in chloride concentration at a rate of approximately 0.1 mg/L/year.

# Frank Pond



<b>Location</b>	County:	Essex
	Town:	Minerva

<b>Lake Characteristics</b>	Surface Area (ha):	10
	Shoreline Length (km):	2
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	-
	Flush rate (times/year):	-

<b>Watershed Characteristics</b>	Watershed Area (ha):	61
	Surface water (%):	22
	Deciduous Forest (%):	70
	Evergreen Forest (%):	0
	Mixed Forest (%):	6
	Wetlands (%):	3
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	0
	State Roads (km):	0

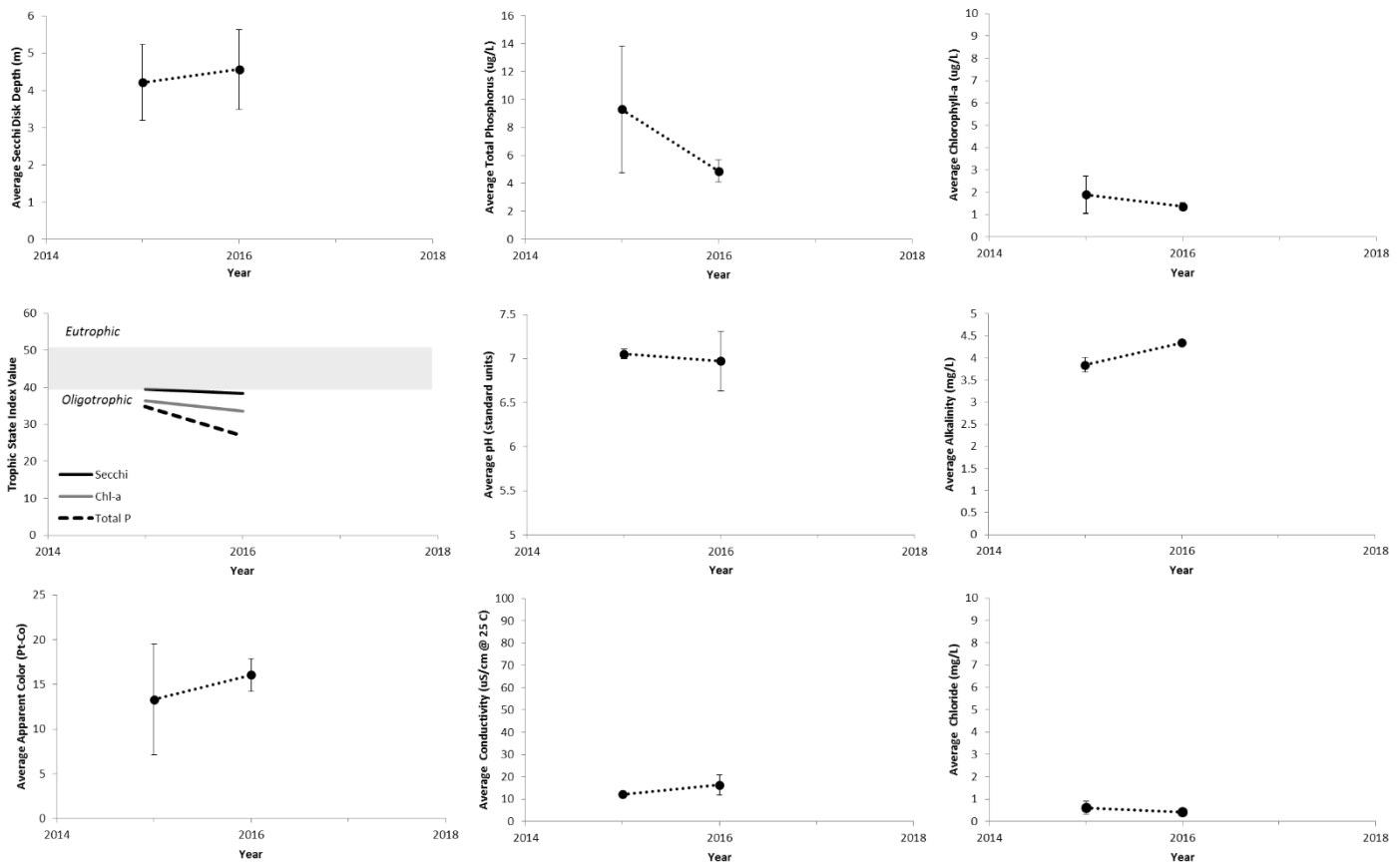
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Frank Pond during the 2016 sampling season. Trend analysis will be performed after five years of data collection. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	7/6/2016	8/5/2016	9/7/2016		
Transparency (m)	3.5	4.6	5.7	4.6	Not analyzed – 5 years of data needed
Total Phosphorus (µg/L)	4.0	5.3	5.4	4.9	
Chlorophyll- <i>a</i> (µg/L)	1.2	1.5	1.4	1.4	
Laboratory pH	7.3	6.9	6.7	7.0	
Sp. Conductance (µS/cm)	14.1	21.5	13.5	16.4	
Color (Pt-Co)	15.0	18.2	15.0	16.1	
Alkalinity (mg/L)		4.4		4.4	
Nitrate-Nitrogen (µg/L)		BDL		BDL	
Chloride (mg/L)		0.4		0.4	
Calcium (mg/L)		1.7		1.7	
Sodium (mg/L)		0.7		0.7	

\*See table of content for description of water quality indicators

## Frank Pond- Time Series



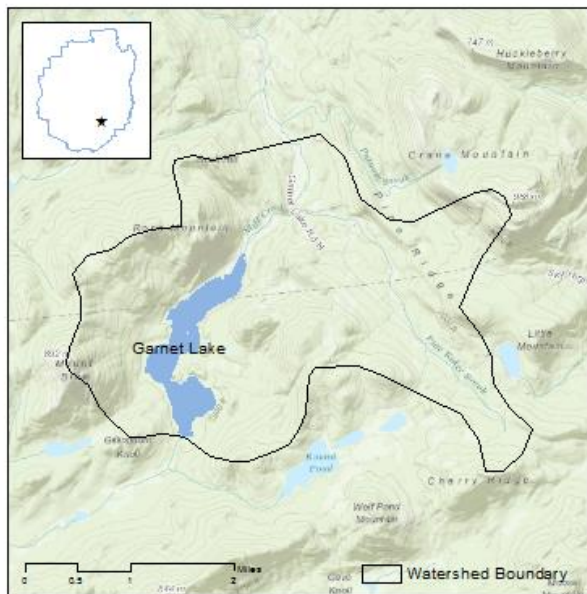
Annual average values of select water quality indicators for Frank Pond, 2015-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Frank Pond is a 10 ha pond located in Essex County in the Town of Minerva. The pond is located within a 61 ha watershed dominated by forests. This is Frank Ponds second year in ALAP. Trend analysis will be performed on water quality indicators after five years of data collection.

- Currently little data exists on the morphometry of the pond.
- Frank Pond is best classified as an oligotrophic pond.
- The pH of the water samples received in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 4.4 mg/L, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration averaged 0.7 mg/L and 0.4 mg/L respectively. These values are within the range we would expect for a pond with no salted roads in the watershed.

# Garnet Lake



<b>Location</b>	County:	Warren
	Town:	Thurman

<b>Lake Characteristics</b>	Surface Area (ha):	133
	Shoreline Length (km):	10
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	4250058
	Flush rate (times/year):	3.8

<b>Watershed Characteristics</b>	Watershed Area (ha):	2261
	Surface water (%):	6
	Deciduous Forest (%):	48
	Evergreen Forest (%):	25
	Mixed Forest (%):	15
	Wetlands (%):	5
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	10.1
	State Roads (km):	0

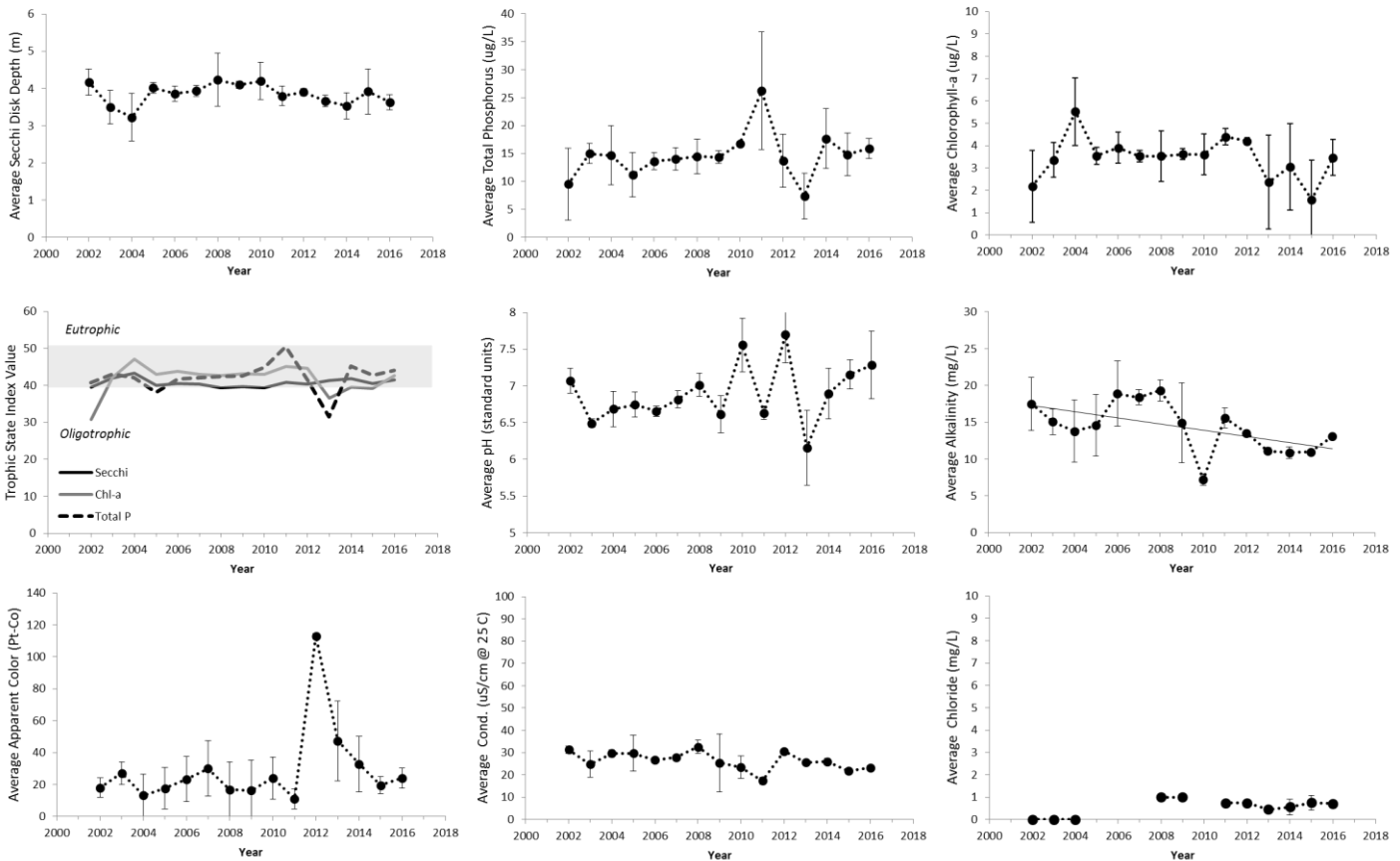
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Garnet Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/18/2016	7/20/2016	8/20/2016		
Transparency (m)	3.5	3.9	3.6	3.6	No change
Total Phosphorus (µg/L)	17.6	14.0	16.1	15.9	No change
Chlorophyll- <i>a</i> (µg/L)	2.5	4.0	3.8	3.5	No change
Laboratory pH	6.8	7.7	7.4	7.3	No change
Sp. Conductance (µS/cm)	24.2	22.8	22.5	23.2	No change
Color (Pt-Co)	19.6	21.4	31.1	24.0	No change
Alkalinity (mg/L)			13.1	13.1	Decreasing
Nitrate-Nitrogen (µg/L)	5.1			5.1	Not analyzed
Chloride (mg/L)	0.6			0.6	No change
Calcium (mg/L)	3.1			3.1	Not analyzed
Sodium (mg/L)	0.9			0.9	No change

\*See table of content for description of water quality indicators

# Garnet Lake – Time Series



Annual average values of select water quality indicators for Garnet Lake, 2002-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

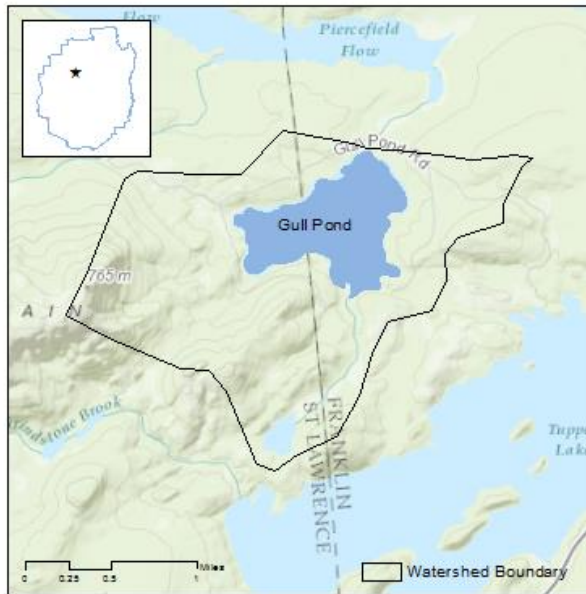
## Summary of Findings

Garnet Lake is a 133 ha lake located in Warren County in the Town of Johnsbury. The lake is located within a 2,121 ha watershed dominated by forests. Garnet Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2002.

- Garnet Lake is a mesotrophic lake. Transparency has been fairly stable since monitoring began, ranging between 3 and 4 meters. Chlorophyll-a and total phosphorus have been variable, and have exhibited no positive or negative trend.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 13.1 mg/L, indicating low sensitivity to acid deposition. We did detect a decreasing trend in alkalinity at a rate of 0.4 mg/L.
- Sodium and chloride concentration averaged 0.9 mg/L and 0.6 mg/L respectively, these values are within the range we would expect for a lake that lacks salted state roads in the watershed.



# Gull Pond



<b>Location</b>	County:	Franklin
	Town:	Tupper Lake

<b>Lake Characteristics</b>	Surface Area (ha):	117
	Shoreline Length (km):	6
	Max. Depth (m):	23.2
	Volume (m <sup>3</sup> ):	11975150
	Flush rate (times/year):	0.4

<b>Watershed Characteristics</b>	Watershed Area (ha):	738
	Surface water (%):	18
	Deciduous Forest (%):	73
	Evergreen Forest (%):	2
	Mixed Forest (%):	0
	Wetlands (%):	5
	Agricultural (%):	0
	Residential (%):	2
	Local Roads (km):	0
	State Roads (km):	0

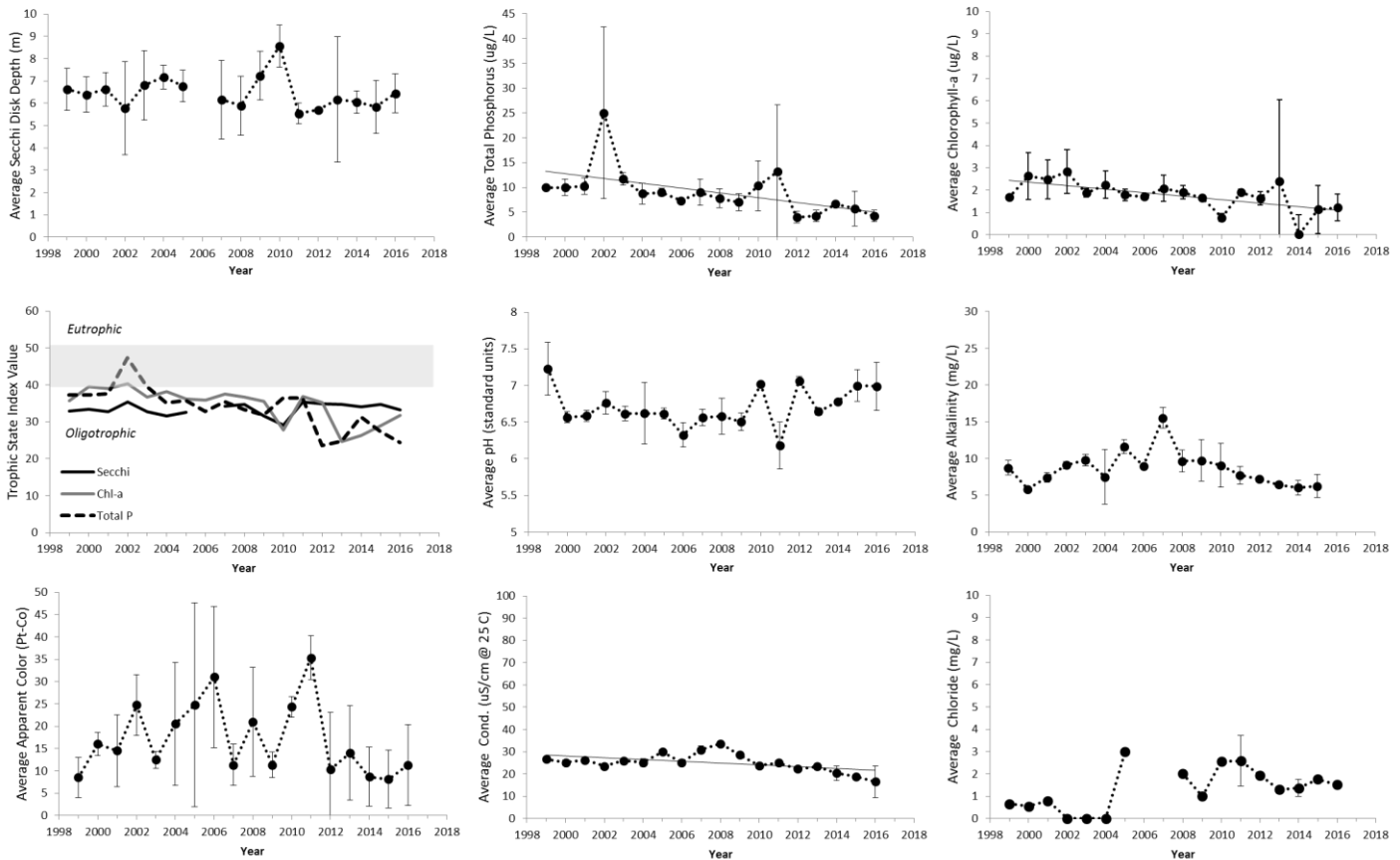
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> No 2016 Data	<b>Road Salt Influence</b> No Roads
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Water quality values and historical trends for Gull Pond during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/23/2016	7/15/2016	8/27/2016		
Transparency (m)	6.2	5.8	7.4	6.4	No change
Total Phosphorus (µg/L)	5.4	4.1	3.1	4.2	Decreasing
Chlorophyll- <i>a</i> (µg/L)	0.7	1.9	1.1	1.2	Decreasing
Laboratory pH	6.9	6.7	7.4	7.0	No change
Sp. Conductance (µS/cm)	18.9	8.5	22.1	16.5	Decreasing
Color (Pt-Co)	4.0	21.4	8.6	11.3	No change
Alkalinity (mg/L)					No change
Nitrate-Nitrogen (µg/L)			11.4	11.4	Not analyzed
Chloride (mg/L)	1.5			1.5	No change
Calcium (mg/L)	2.2			2.2	Not analyzed
Sodium (mg/L)	1.5			1.5	No change

\*See table of content for description of water quality indicators

# Gull Pond – Time Series



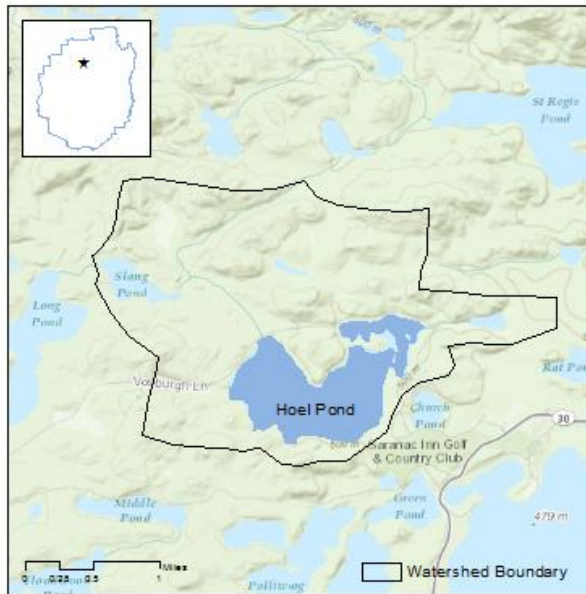
Annual average values of select water quality indicators for Gull Pond, 1999-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Gull Pond is a 117 ha lake located in Franklin County in the Town of Tupper Lake. This 117 ha lake is located within a 737 ha watershed dominated by forests. Gull Pond has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1999.

- Gull Pond is an oligotrophic waterbody. Transparency has been relatively stable since monitoring began. Chlorophyll-a has exhibited a slight yet significant downward trend at a rate of approximately  $0.08 \mu\text{g/L/year}$ . Total phosphorus has also exhibited a decreasing trend at a rate of approximately  $0.5 \mu\text{g/L/year}$ .
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. We are unable to report alkalinity for 2016 due to a laboratory error. The alkalinity averaged  $6.3 \text{ mg/L}$  in 2015, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were both found to be  $1.5 \text{ mg/L}$ . These values are slightly higher than we would expect for a watershed that lacks salted roads.

# Hoel Pond



<b>Location</b>	County:	Franklin
	Town:	Santa Clara
<b>Lake Characteristics</b>	Surface Area (ha):	185
	Shoreline Length (km):	10
	Max. Depth (m):	24.2
	Volume (m <sup>3</sup> ):	14777670
	Flush rate (times/year):	0.3
<b>Watershed Characteristics</b>	Watershed Area (ha):	1174
	Surface water (%):	23
	Deciduous Forest (%):	46
	Evergreen Forest (%):	15
	Mixed Forest (%):	3
	Wetlands (%):	12
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	0
	State Roads (km):	0

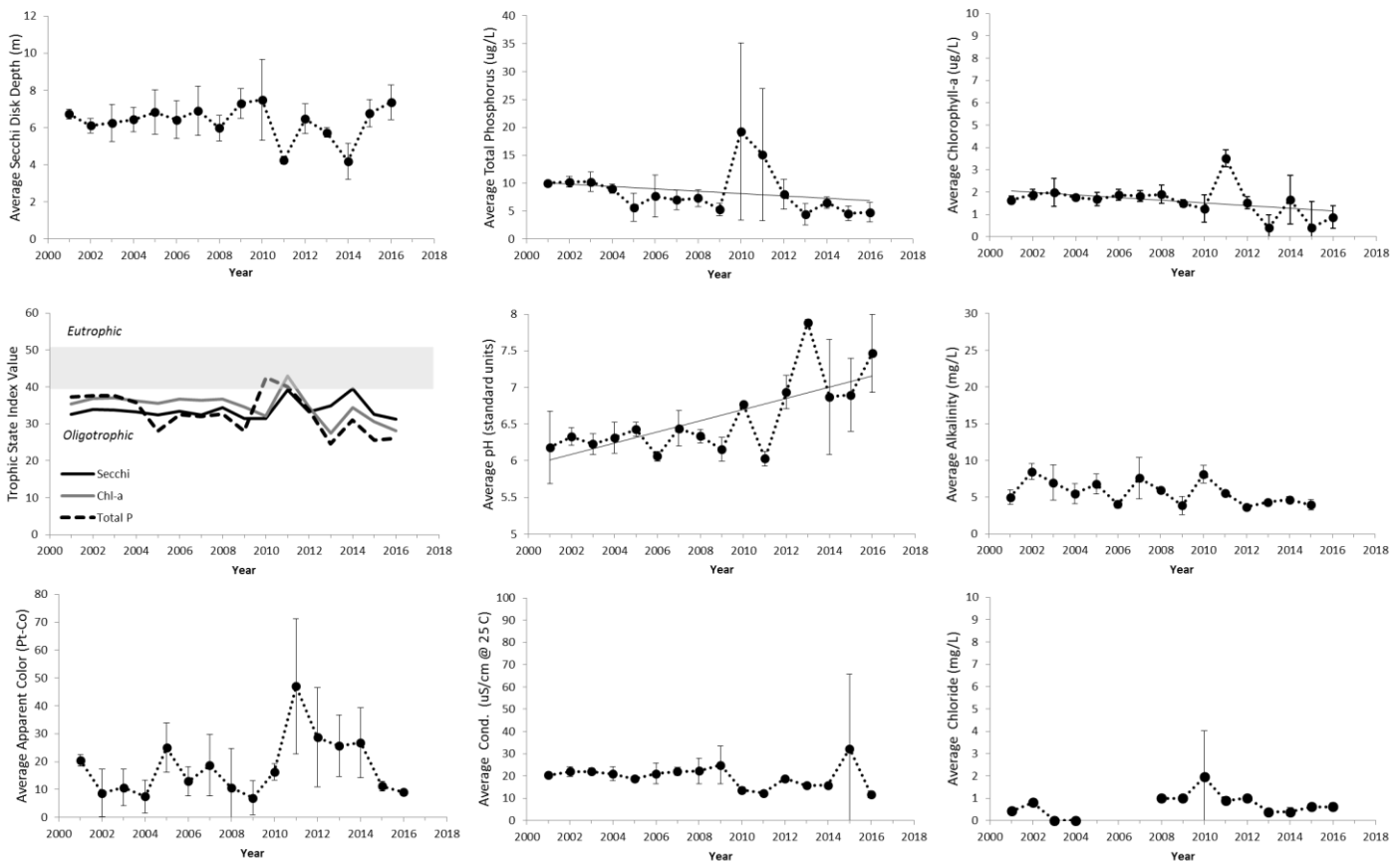
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> No 2016 Data	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Hoel Pond during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/23/2016	7/20/2016	8/20/2016		
Transparency (m)	6.7	7.0	8.4	7.4	No change
Total Phosphorus (µg/L)	6.5	4.8	3.1	4.8	Decreasing
Chlorophyll- <i>a</i> (µg/L)	0.9	0.4	1.4	0.9	Decreasing
Laboratory pH	7.0	8.1	7.3	7.5	Increasing
Sp. Conductance (µS/cm)	11.4	10.5	13.3	11.7	No change
Color (Pt-Co)	10.2	8.6	8.6	9.1	No change
Alkalinity (mg/L)					No change
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	0.5			0.5	No change
Calcium (mg/L)	1.8			1.8	Not analyzed
Sodium (mg/L)	0.8			0.8	No change

\*See table of content for description of water quality indicators

# Hoel Pond – Time Series



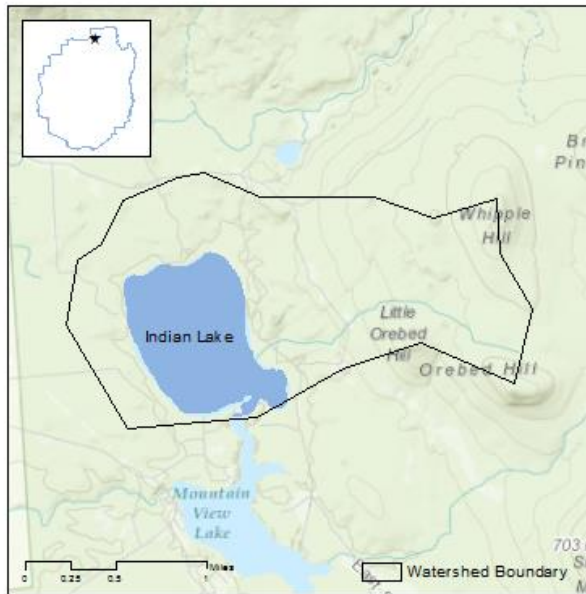
Annual average values of select water quality indicators for Hoel Pond, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Hoel Pond is a 185 ha lake located in Franklin County in the Town of Santa Clara. The lake is located within a 1,174 ha watershed dominated by forests. Hoel Pond has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Hoel Pond is an oligotrophic lake. Transparency has been relatively stable, and is greater than 96% of participating lakes. Chlorophyll-a and total phosphorus have both exhibited a slight yet statistically significant downward trend at a rate of 0.07 and 0.21  $\mu\text{g/L/year}$  respectively.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The pH of the water has exhibited a significant increasing trend at a rate of approximately 0.07 pH units/year. We are unable to report alkalinity for 2016 due to a laboratory error. The alkalinity averaged 4.0 mg/L in 2015, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 0.8 and 0.5 mg/L respectively. These values are within the range we would expect for a pond with no salted roads in the watershed.

# Indian Lake- Franklin County



<b>Location</b>	County:	Franklin
	Town:	Bellmont

<b>Lake Characteristics</b>	Surface Area (ha):	134
	Shoreline Length (km):	5
	Max. Depth (m):	4.9
	Volume (m <sup>3</sup> ):	3769281
	Flush rate (times/year):	1.2

<b>Watershed Characteristics</b>	Watershed Area (ha):	651
	Surface water (%):	21
	Deciduous Forest (%):	54
	Evergreen Forest (%):	16
	Mixed Forest (%):	2
	Wetlands (%):	5
	Agricultural (%):	0
	Residential (%):	2
	Local Roads (km):	1.5
	State Roads (km):	0

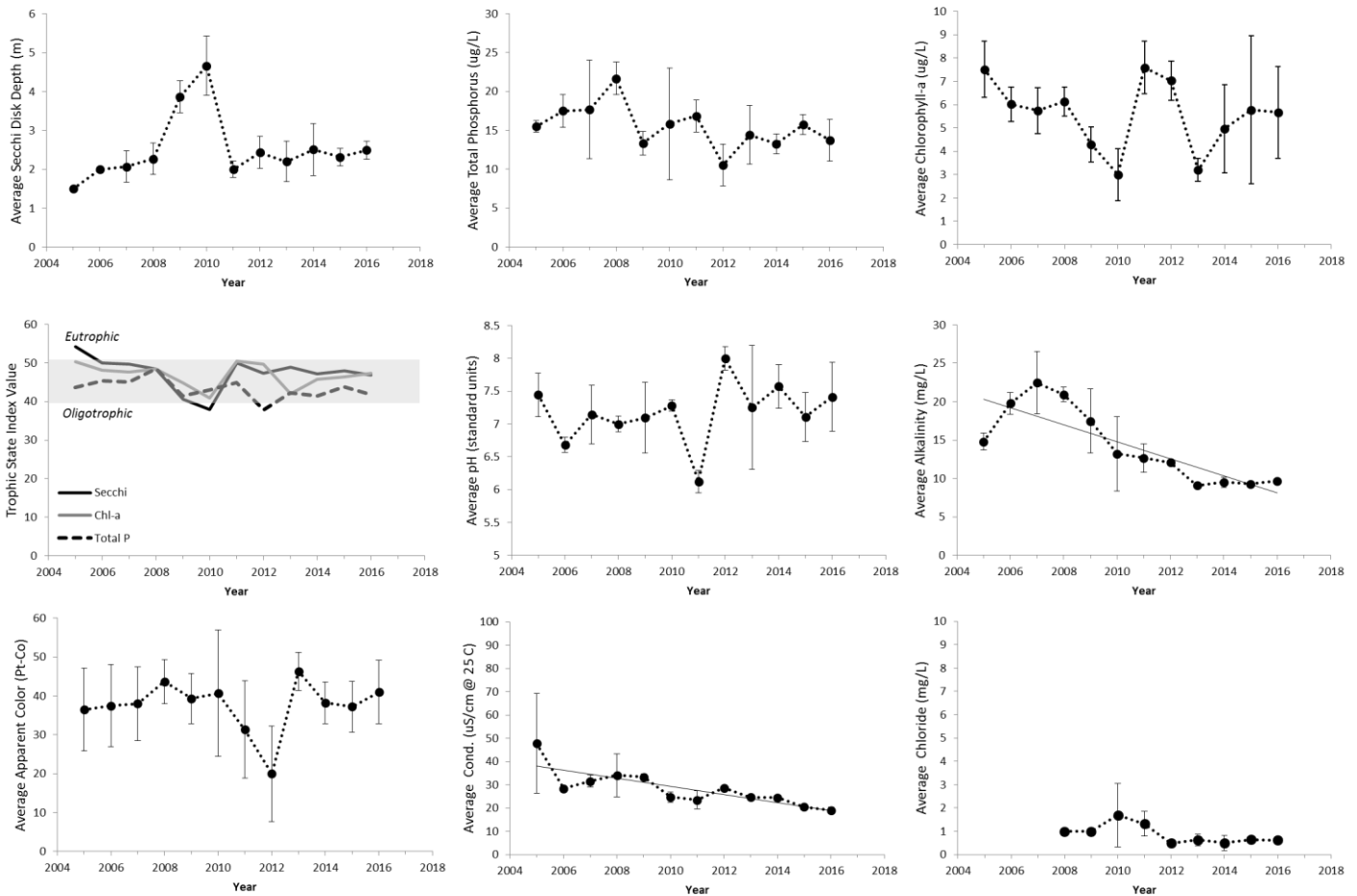
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Indian Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/17/2016	7/20/2016	8/22/2016		
Transparency (m)	2.3	2.7	2.5	2.5	No change
Total Phosphorus (µg/L)	15.6	10.6	15.0	13.7	No change
Chlorophyll- <i>a</i> (µg/L)	4.6	4.5	7.9	5.7	No change
Laboratory pH	6.8	7.9	7.5	7.4	No change
Sp. Conductance (µS/cm)	18.0	18.4	20.6	19.0	Decreasing
Color (Pt-Co)	35.1	37.5	50.4	41.0	No change
Alkalinity (mg/L)			9.7	9.7	Decreasing
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)			0.7	0.7	No change
Calcium (mg/L)			2.7	2.7	Not analyzed
Sodium (mg/L)			0.9	0.9	No change

\*See table of content for description of water quality indicators

# Indian Lake Franklin County – Time Series



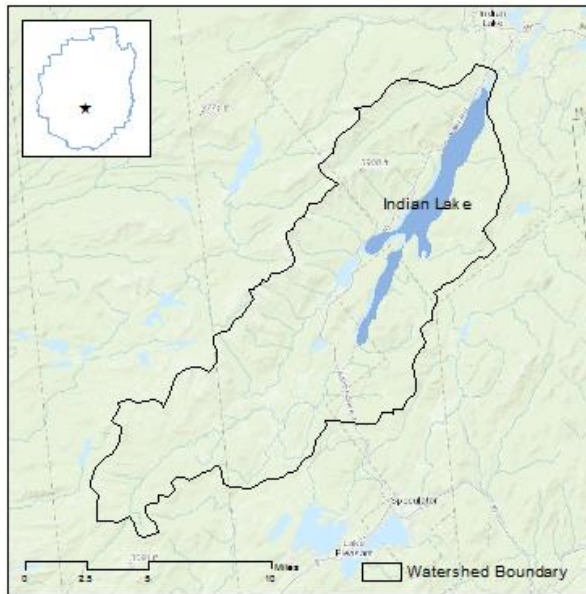
Annual average values of select water quality indicators for Indian Lake, 2005-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Indian Lake is a 134 ha lake located in Franklin County in the Town of Bellmont. The lake is located within a 651 ha watershed dominated by forests. Indian Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2005.

- Indian Lake (Franklin County) is a mesotrophic lake. Transparency, total phosphorus, and chlorophyll-a have all been variable, and have not exhibited any significant positive or negative trends since monitoring began in 2005.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 9.7 mg/L, indicating moderate sensitivity to acid deposition. We detected a significant downward trend in alkalinity at a rate of approximately 1.1 mg/L/year.
- Sodium and chloride concentration were 0.9 and 0.7 mg/L respectively, these values are within the range we would expect for a pond with few salted roads in the watershed.

# Indian Lake- Hamilton County



<b>Location</b>	County:	Hamilton
	Town:	Indian Lake

<b>Lake Characteristics</b>	Surface Area (ha):	2155
	Shoreline Length (km):	51
	Max. Depth (m):	25.9
	Volume (m <sup>3</sup> ):	210069990
	Flush rate (times/year):	1.11

<b>Watershed Characteristics</b>	Watershed Area (ha):	33838
	Surface water (%):	7
	Deciduous Forest (%):	63
	Evergreen Forest (%):	12
	Mixed Forest (%):	5
	Wetlands (%):	10
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	10.3
State Roads (km):	28.7	

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present - Low
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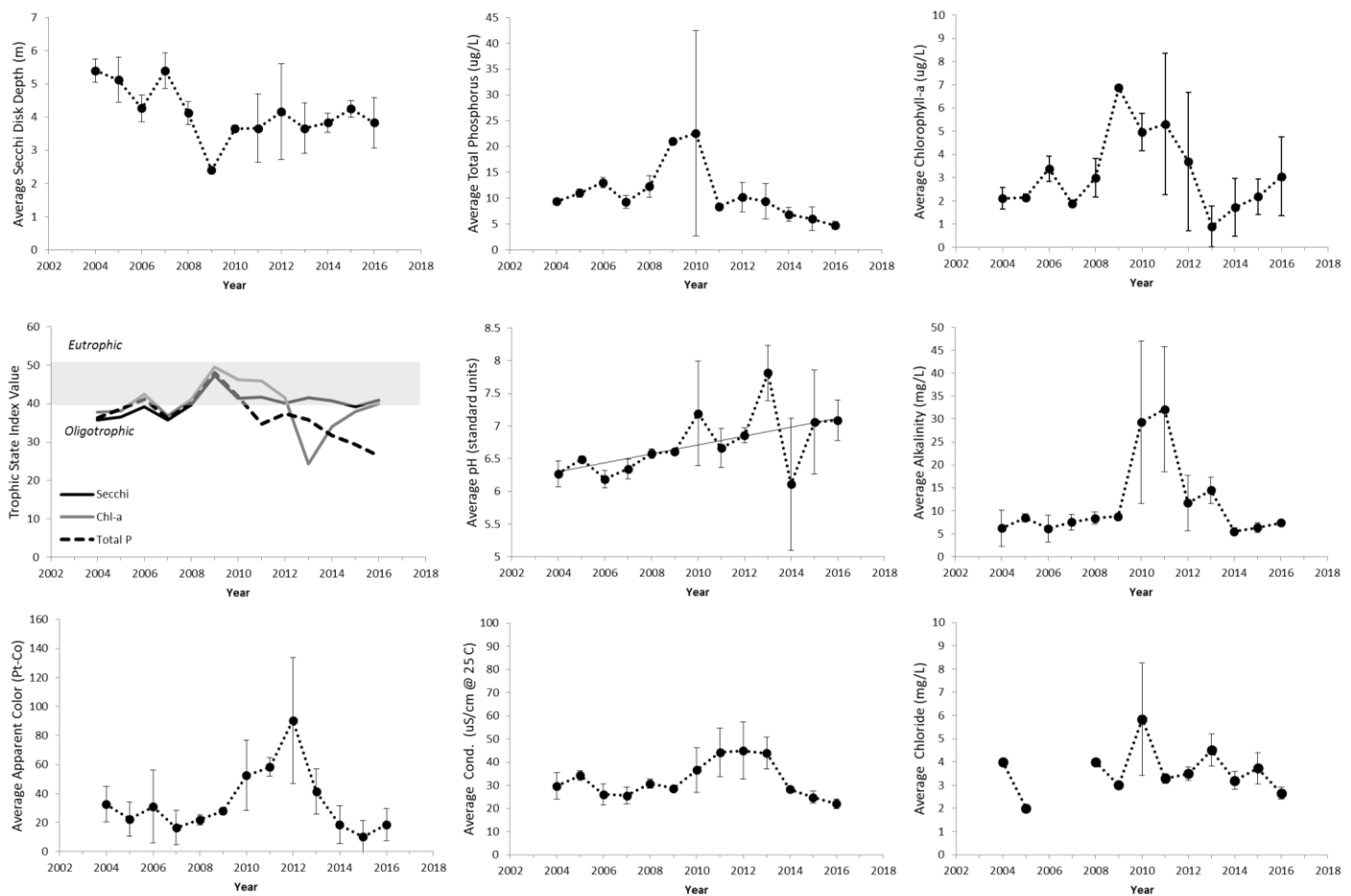
Water quality values and historical trends for Indian Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	7/3/2016	8/14/2016	9/4/2016		
Transparency (m)	3.0	4.5	4.0	3.8	No change
Total Phosphorus (µg/L)	5.3	5.0	3.9	4.7	No change
Chlorophyll- <i>a</i> (µg/L)	3.9	4.2	1.1	3.1	No change
Laboratory pH	7.3	7.2	6.7	7.1	Increasing
Sp. Conductance (µS/cm)	19.7	23.6	22.8	22.0	No change
Color (Pt-Co)	10.2	31.1	15.0	18.8	No change
Alkalinity (mg/L)		7.4		7.4	No change
Nitrate-Nitrogen (µg/L)		BDL		BDL	Not analyzed
Chloride (mg/L)		2.8		2.8	No change
Calcium (mg/L)		2.0		2.0	Not analyzed
Sodium (mg/L)		2.2		2.2	No change

\*See table of content for description of water quality indicators



# Indian Lake Hamilton County – Time Series



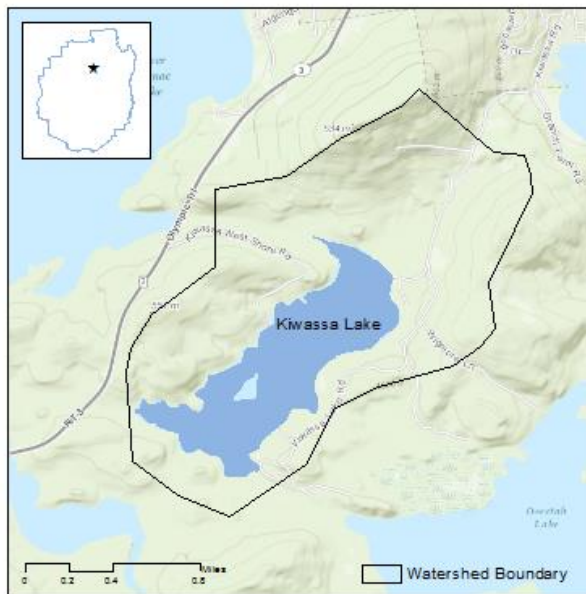
Annual average values of select water quality indicators for Indian Lake, 2004-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Indian Lake is a 2,155 ha lake located in Hamilton County in the Town of Indian Lake. The lake is located within a 33,838 ha watershed dominated by forests. Indian Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2004.

- Indian Lake is best classified as an oligotrophic lake based on its total phosphorus concentration. However, the transparency of the lake and its chlorophyll concentration are more indicative of a mesotrophic lake. The trophic indicators have been variable over time, and have exhibited no significant trends.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The pH of the water has exhibited an increasing trend at a rate of approximately 0.07 pH units/year. The alkalinity in 2016 was 7.4 mg/L, indicating that the lake has moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 2.2 and 2.8 mg/L respectively, indicating that the chemistry of the lake is influenced by the 39 km of roads in the watershed, but the influence is relatively low.

# Kiwassa Lake



<b>Location</b>	County:	Franklin
	Town:	Harrietstown
<b>Lake Characteristics</b>	Surface Area (ha):	114
	Shoreline Length (km):	8
	Max. Depth (m):	13.7
	Volume (m <sup>3</sup> ):	7307748
	Flush rate (times/year):	0.1
<b>Watershed Characteristics</b>	Watershed Area (ha):	549
	Surface water (%):	22
	Deciduous Forest (%):	37
	Evergreen Forest (%):	16
	Mixed Forest (%):	15
	Wetlands (%):	6
	Agricultural (%):	0
	Residential (%):	2
	Local Roads (km):	3.4
State Roads (km):	0.5	

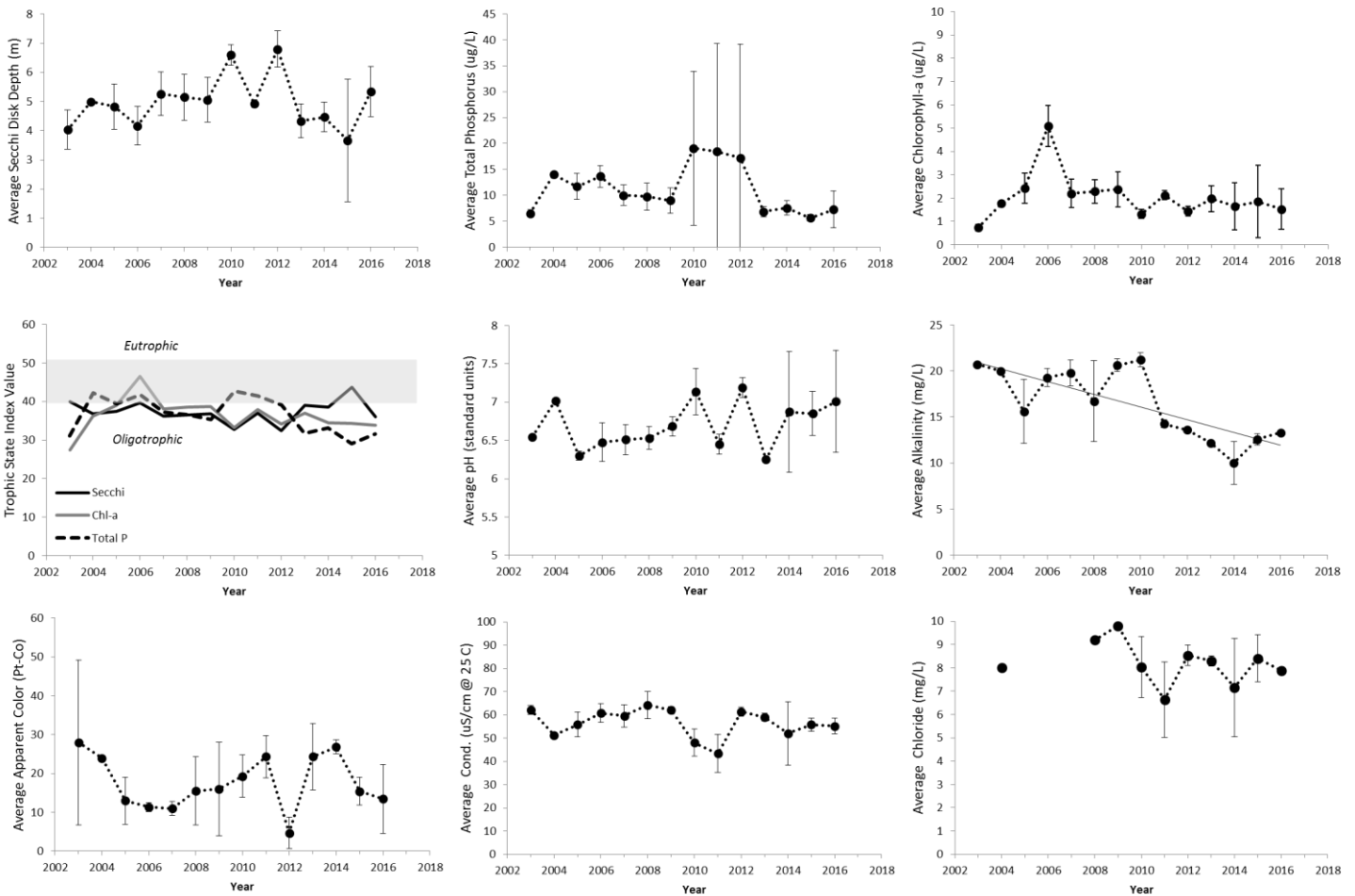
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Kiwassa Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/28/2016	7/20/2016	8/31/2016		
Transparency (m)	5.5	6.1	4.4	5.3	No change
Total Phosphorus (µg/L)	4.7	11.3	5.8	7.2	No change
Chlorophyll- <i>a</i> (µg/L)	1.1	1.0	2.5	1.5	No change
Laboratory pH	7.6	6.3	7.2	7.0	No change
Sp. Conductance (µS/cm)	57.5	56.6	51.3	55.1	No change
Color (Pt-Co)	4.0	21.4	15.0	13.5	No change
Alkalinity (mg/L)			13.3	13.3	Decreasing
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	7.9			7.9	No change
Calcium (mg/L)	4.7			4.7	Not analyzed
Sodium (mg/L)	5.3			5.3	No change

\*See table of content for description of water quality indicators

# Kiwiassa Lake – Time Series



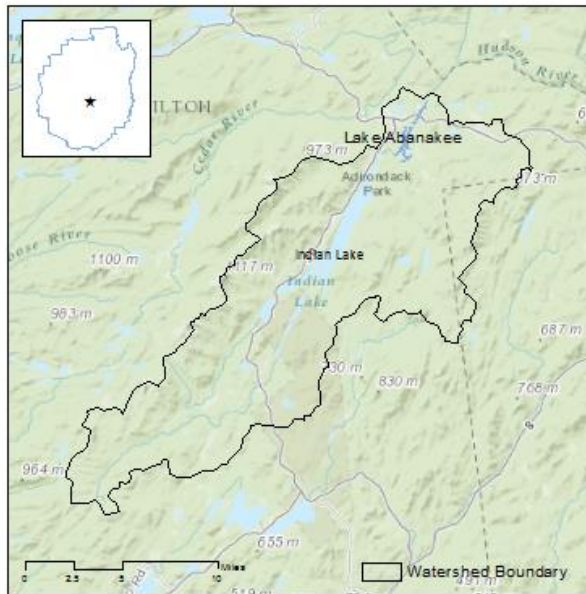
Annual average values of select water quality indicators for Kiwiassa Lake, 2003-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Kiwiassa Lake is a 114 ha lake located in Franklin County in the Town of Harrietstown. The lake is located within a 549 ha watershed dominated by forests. Kiwiassa Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2004.

- Kiwiassa Lake is an oligotrophic water body. Historically the trophic status of the lake has fluctuated around the oligo-mesotrophic boundary. Transparency, total phosphorus, and chlorophyll-a have not exhibited any significant positive or negative trends since monitoring began in 2003.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 13.3 mg/L, indicating low sensitivity to acid deposition. We detected a significant downward trend in alkalinity at a rate of approximately 0.7 mg/L/year.
- Sodium and chloride concentration averaged 5.3 and 7.9 mg/L respectively, indicating moderate influence from road salting.

# Lake Abanakee



<b>Location</b>	County:	Hamilton
	Town:	Indian Lake
<b>Lake Characteristics</b>	Surface Area (ha):	208
	Shoreline Length (km):	30
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	15391566.83
	Flush rate (times/year):	22.1
<b>Watershed Characteristics</b>	Watershed Area (ha):	49953
	Surface water (%):	6
	Deciduous Forest (%):	56
	Evergreen Forest (%):	16
	Mixed Forest (%):	6
	Wetlands (%):	12
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	53.7
State Roads (km):	43.6	

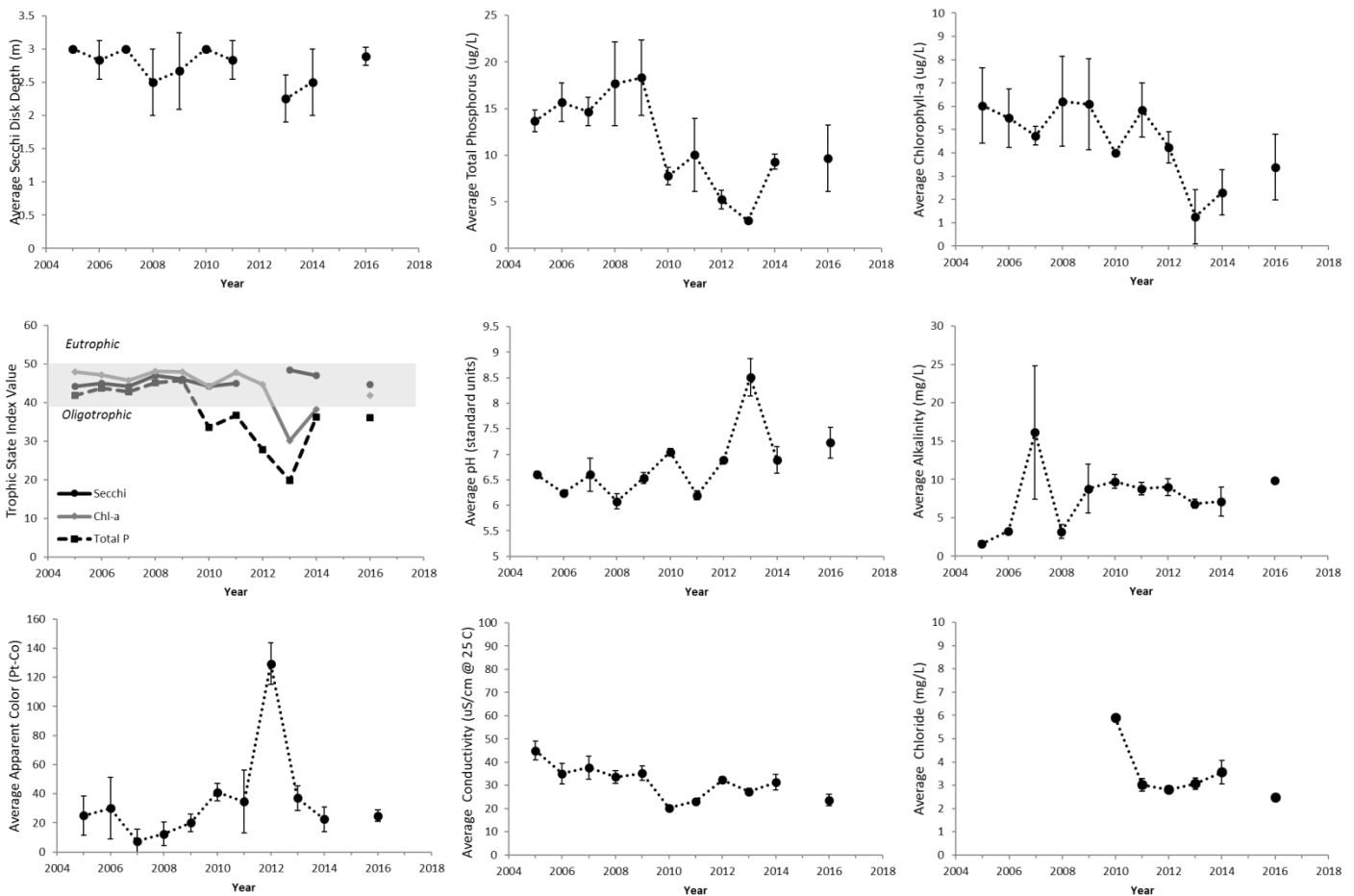
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present - Low
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Water quality values and historical trends for Lake Abanakee during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/23/2016	7/22/2016	8/19/2016		
Transparency (m)	2.9	2.7	3.0	2.9	No change
Total Phosphorus (µg/L)	13.2	9.8	6.1	9.7	No change
Chlorophyll- <i>a</i> (µg/L)	2.0	4.9	3.3	3.4	No change
Laboratory pH	7.6	7.2	7.0	7.2	No change
Sp. Conductance (µS/cm)	22.7	21.8	26.6	23.7	No change
Color (Pt-Co)	28.9	24.6	21.1	24.9	No change
Alkalinity (mg/L)			9.9	9.9	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	2.5			2.5	No change
Calcium (mg/L)	2.3			2.3	Not analyzed
Sodium (mg/L)	2.4			2.4	No change

\*See table of content for description of water quality indicators

# Lake Abanakee – Time Series

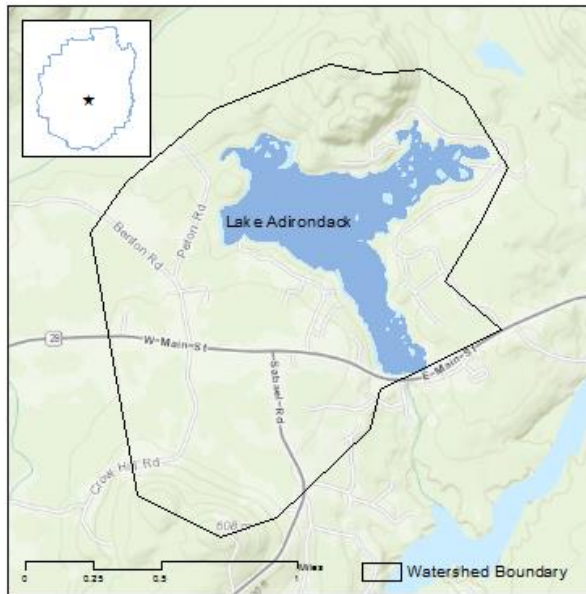


Annual average values of select water quality indicators for Lake Abanakee 2005-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

- Lake Abanakee is a mesotrophic lake. The trophic indicators (transparency, total phosphorus, and chlorophyll-a) have been variable over time, this variability is likely related to the high flushing rate of the pond, which we estimate to be 22 times per year. The trophic indicators have not exhibited any positive or negative trends.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 10 mg/L, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 2.4 and 2.5 mg/L respectively, indicating that road salt influence is present, but relatively low.

# Lake Adirondack



<b>Location</b>	County:	Hamilton
	Town:	Indian Lake
<b>Lake Characteristics</b>	Surface Area (ha):	78
	Shoreline Length (km):	10
	Max. Depth (m):	5.8
	Volume (m <sup>3</sup> ):	1772330
	Flush rate (times/year):	1.9
<b>Watershed Characteristics</b>	Watershed Area (ha):	469
	Surface water (%):	19
	Deciduous Forest (%):	11
	Evergreen Forest (%):	12
	Mixed Forest (%):	4
	Wetlands (%):	39
	Agricultural (%):	1
	Residential (%):	13
	Local Roads (km):	6.6
	State Roads (km):	2.6

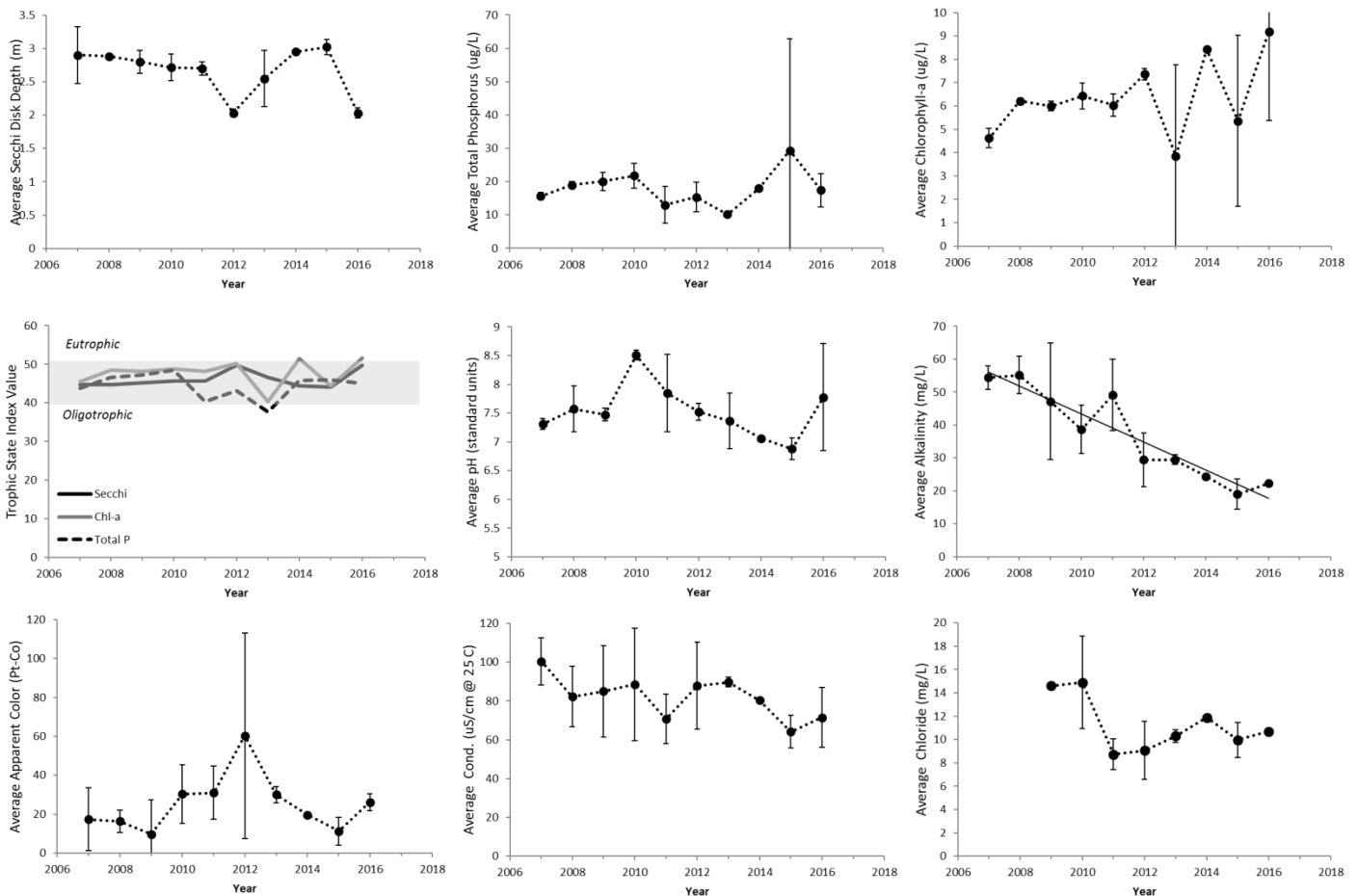
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Lake Adirondack during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/4/2016	7/17/2016	8/21/2016		
Transparency (m)	2.0	2.1	2.0	2.0	No change
Total Phosphorus (µg/L)	22.9	16.2	13.2	17.4	No change
Chlorophyll- <i>a</i> (µg/L)	12.3	4.9	10.3	9.2	No change
Laboratory pH	6.9	8.8	7.7	7.8	No change
Sp. Conductance (µS/cm)	84.3	75.8	54.3	71.5	No change
Color (Pt-Co)	22.7	31.1	24.6	26.1	No change
Alkalinity (mg/L)			22.3	22.3	Decreasing
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	10.7			10.7	No change
Calcium (mg/L)	9.5			9.5	Not analyzed
Sodium (mg/L)	6.6			6.6	No change

\*See table of content for description of water quality indicators

# Lake Adirondack – Time Series



Annual average values of select water quality indicators for Lake Adirondack, 2007-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Lake Adirondack is a 78 ha lake located in Hamilton County in the Town of Indian Lake. The lake is located within a 469 ha watershed dominated by forests. Lake Adirondack has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2007.

- Lake Adirondack is a mesotrophic lake. The lake has fluctuated within the mesotrophic range since monitoring began. Transparency, total phosphorus, and chlorophyll-a have not exhibited any significant positive or negative trends.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 22.3 mg/L, indicating low sensitivity to acid deposition. We detected a significant downward trend in alkalinity at a rate of approximately 4.3 mg/L/year.
- Sodium and chloride concentration were 6.6 and 10.7 mg/L respectively, indicating that the chemistry of the lake is influenced by the 9.2 km of roads in the watershed.



# Lake Clear



<b>Location</b>	County:	Franklin
	Town:	Harrietstown
<b>Lake Characteristics</b>	Surface Area (ha):	395
	Shoreline Length (km):	11
	Max. Depth (m):	8.5
	Volume (m <sup>3</sup> ):	34482898
	Flush rate (times/year):	0.35
<b>Watershed Characteristics</b>	Watershed Area (ha):	1952
	Surface water (%):	22
	Deciduous Forest (%):	37
	Evergreen Forest (%):	23
	Mixed Forest (%):	4
	Wetlands (%):	8
	Agricultural (%):	0
	Residential (%):	3
	Local Roads (km):	0.8
State Roads (km):	5.5	

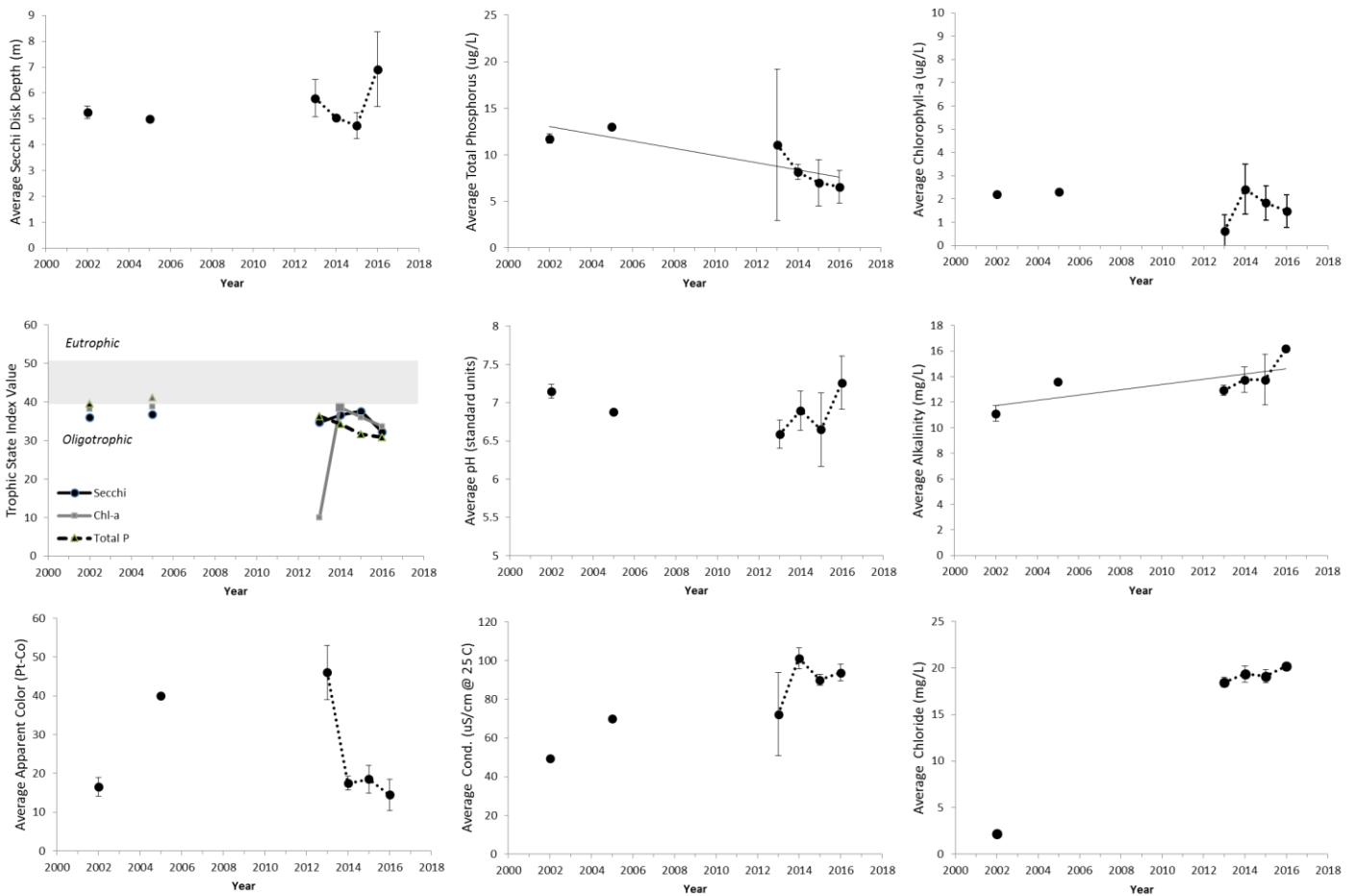
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Lake Clear during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/24/2016	7/17/2016	8/24/2016		
Transparency (m)	7.8	7.8	5.3	6.9	No change
Total Phosphorus (µg/L)	5.8	8.6	5.3	6.6	Decreasing
Chlorophyll- <i>a</i> (µg/L)	0.8	1.4	2.2	1.5	No change
Laboratory pH	7.6	7.2	6.9	7.3	No change
Sp. Conductance (µS/cm)	94.2	98.0	89.2	93.8	No change
Color (Pt-Co)	10.2	15.0	18.2	14.5	No change
Alkalinity (mg/L)			16.2	16.2	Increasing
Nitrate-Nitrogen (µg/L)			2.2	2.2	Not analyzed
Chloride (mg/L)			20.2	20.2	No change
Calcium (mg/L)			5.3	5.3	Not analyzed
Sodium (mg/L)			10.7	10.7	No change

\*See table of content for description of water quality indicators

# Lake Clear – Time Series



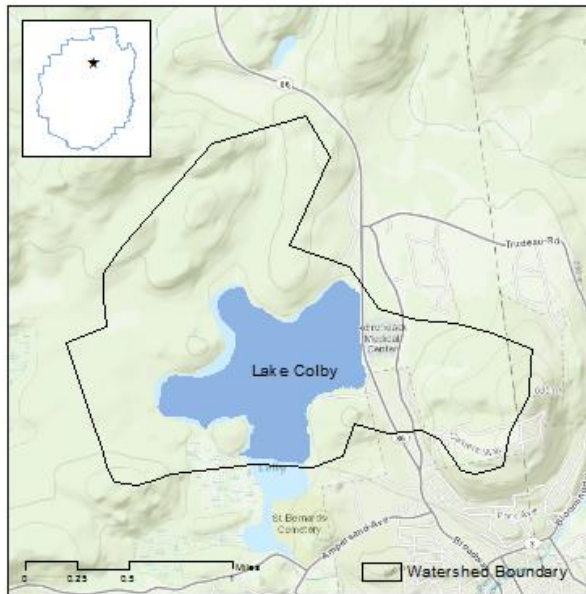
Annual average values of select water quality indicators for Lake Clear, 2002-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Lake Clear is a 395 ha lake located in Franklin County in the Town of Harrietstown. The lake is located within a 1,952 ha watershed dominated by forests. ALAP monitoring of Lake Clear began in 2002, again in 2005 and most recently 2013-present.

- Lake Clear is an oligotrophic lake. Transparency and chlorophyll-a have not exhibited any significant positive or negative trends since monitoring began in 2002. Total phosphorus has exhibited a statistically significant downward trend at a rate of 0.4  $\mu\text{g/L}$  per year.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 16.2 mg/L, indicating low sensitivity to acid deposition.
- Sodium and chloride concentration were 10.7 and 20.2 mg/L respectively, indicating that the chemistry of the lake is influenced by the 6.3 km of roads in the watershed. The chloride concentration of Lake Clear is greater than 88% of participating ALAP lakes, and approximately 100 times greater than unimpacted lakes in the Adirondacks (no salted roads in the watershed).

# Lake Colby



<b>Location</b>	County:	Franklin
	Town:	Harriestown

<b>Lake Characteristics</b>	Surface Area (ha):	119
	Shoreline Length (km):	6
	Max. Depth (m):	14.3
	Volume (m <sup>3</sup> ):	7873831
	Flush rate (times/year):	0.7

<b>Watershed Characteristics</b>	Watershed Area (ha):	577
	Surface water (%):	22
	Deciduous Forest (%):	25
	Evergreen Forest (%):	25
	Mixed Forest (%):	3
	Wetlands (%):	20
	Agricultural (%):	0
	Residential (%):	5
	Local Roads (km):	1.4
	State Roads (km):	1.2

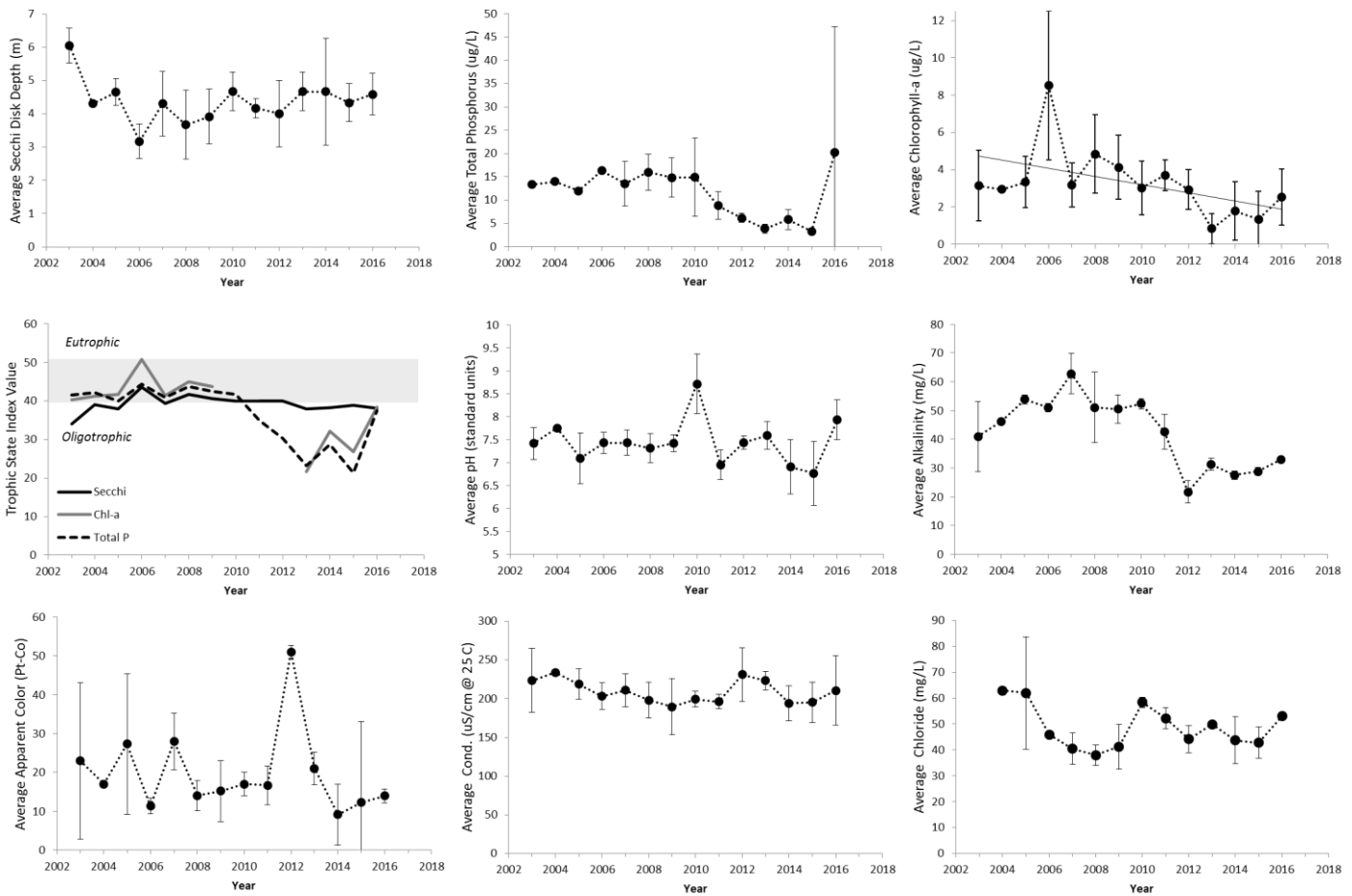
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Alkaline	<b>Acid Neutralizing Capacity</b> Well buffered – not sensitive	<b>Road Salt Influence</b> High
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Water quality values and historical trends for Lake Colby during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	7/24/2016	8/17/2016	9/5/2016		
Transparency (m)	4.5	4.0	5.3	4.6	No change
Total Phosphorus (µg/L)	3.6	5.6	51.4	20.2	No change
Chlorophyll- <i>a</i> (µg/L)	1.1	2.5	4.0	2.5	Decreasing
Laboratory pH	8.3	8.1	7.4	7.9	No change
Sp. Conductance (µS/cm)	164.7	213.0	254.0	210.6	No change
Color (Pt-Co)	15.0	15.0	11.8	13.9	No change
Alkalinity (mg/L)			33.0	33.0	No change
Nitrate-Nitrogen (µg/L)			64.3	64.3	Not analyzed
Chloride (mg/L)			53.0	53.0	No change
Calcium (mg/L)			13.1	13.1	Not analyzed
Sodium (mg/L)			29.5	29.5	No change

\*See table of content for description of water quality indicators

# Lake Colby – Time Series



Annual average values of select water quality indicators for Lake Colby, 2003-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Lake Colby is a 119 ha lake located in Franklin County in the Town of Harrietstown. The lake is located within a 577 ha watershed dominated by forests, but with significant residential and commercial development in the eastern portion of the watershed. Lake Colby has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2003.

- Lake Colby is an oligotrophic lake, bordering on mesotrophic. Chlorophyll-a concentrations have exhibited a significant negative trend since 2003 at a rate of  $0.2 \mu\text{g/L/year}$ . The total phosphorus concentration in the August sample was unusually high at  $51 \mu\text{g/L}$ . This sample was analyzed twice, with a 1.3% residual difference between the duplicates.
- Water samples received in 2016 were alkaline in terms of their acidity. The alkalinity was  $33.0 \text{ mg/L}$ , indicating the lake is not sensitive to acid deposition. The calcium concentration was  $13.1 \text{ mg/L}$ , putting the lake within the lower end of the suitability range for zebra mussels.
- Sodium and chloride concentration were  $29.5$  and  $53.0 \text{ mg/L}$  respectively, indicating that the chemistry of the lake is heavily influenced by the  $2.6 \text{ km}$  of roads in the watershed. The sodium concentration of Lake Colby was the second highest in the 2016 ALAP data set, and 265 times greater than background concentration for Adirondack lakes.

# Lake Durant



<b>Location</b>	County: Hamilton Town: Indian Lake
<b>Lake Characteristics</b>	Surface Area (ha): 142 Shoreline Length (km): 17 Max. Depth (m): 6.1 Volume (m <sup>3</sup> ): - Flush rate (times/year): -
<b>Watershed Characteristics</b>	Watershed Area (ha): 6044 Surface water (%): 5 Deciduous Forest (%): 41 Evergreen Forest (%): 20 Mixed Forest (%): 7 Wetlands (%): 25 Agricultural (%): 0 Residential (%): 1 Local Roads (km): 1 State Roads (km): 3.8

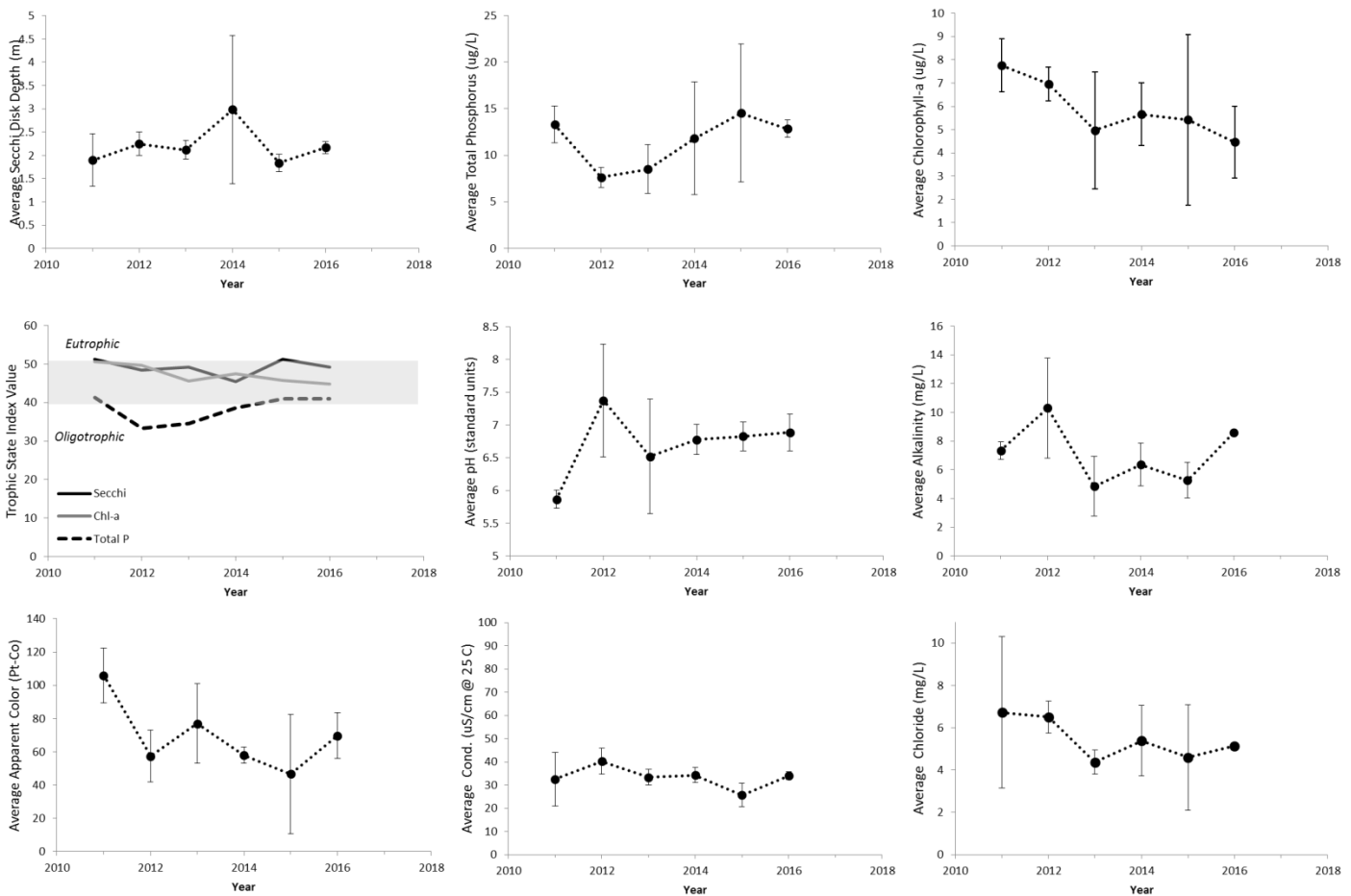
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present - Low
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Water quality values and historical trends for Lake Durant during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit. VOB=Secchi disc was visible on the bottom of the lake.

Water Quality Indicator	Sampling Date			Average	Trend
	6/20/2016	7/19/2016	8/22/2016		
Transparency (m)	2.0	2.2	VOB	2.1	No change
Total Phosphorus (µg/L)	12.8	13.8	11.9	12.8	No change
Chlorophyll- <i>a</i> (µg/L)	2.8	4.8	5.8	4.5	No change
Laboratory pH	6.8	7.2	6.7	6.9	No change
Sp. Conductance (µS/cm)	32.1	35.4	34.4	34.0	No change
Color (Pt-Co)	53.9	79.3	76.1	69.8	No change
Alkalinity (mg/L)			8.6	8.6	No change
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	5.1			5.1	No change
Calcium (mg/L)	2.5			2.5	Not analyzed
Sodium (mg/L)	3.9			3.9	No change

\*See table of content for description of water quality indicators

# Lake Durant – Time Series



Annual average values of select water quality indicators for Lake Durant, 2011-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

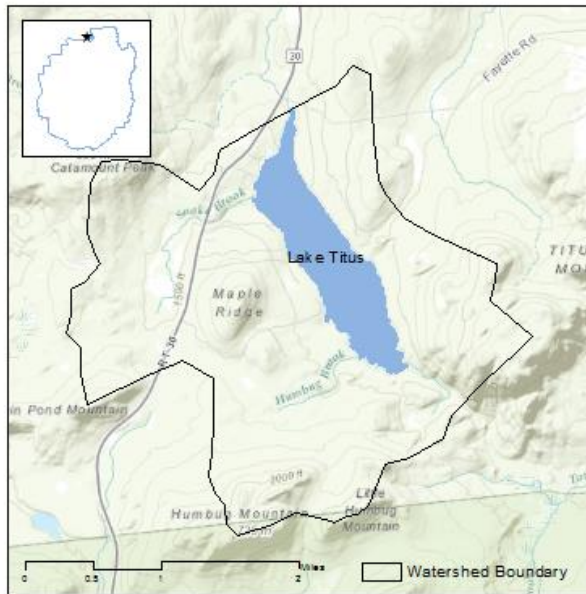
## Summary of Findings

Lake Durant is a 142 ha lake located in Hamilton County in the Town of Indian Lake. The lake is located within a 6,044 ha watershed dominated by forests. Lake Durant has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2011.

- Lake Durant is a mesotrophic lake. The lake has fluctuated around the mesotrophic range since monitoring began. Transparency, total phosphorus, and chlorophyll-a have not exhibited any significant positive or negative trends.
- The transparency of the lake is relatively low. The low transparency is likely related to the color of the water, which averaged 69.8 Pt-co units in 2016. Elevated color is indicative of high amounts of dissolved organic material and rapid light attenuation.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 8.6 mg/L, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration averaged 3.9 and 5.1 mg/L respectively, indicating that the chemistry of the lake is slightly influenced by the 3.8 km of roads in the watershed.



# Lake Titus



<b>Location</b>	County:	Franklin
	Town:	Malone
<b>Lake Characteristics</b>	Surface Area (ha):	177
	Shoreline Length (km):	8
	Max. Depth (m):	9.1
	Volume (m <sup>3</sup> ):	8837690
	Flush rate (times/year):	1.2
<b>Watershed Characteristics</b>	Watershed Area (ha):	1658
	Surface water (%):	12
	Deciduous Forest (%):	64
	Evergreen Forest (%):	9
	Mixed Forest (%):	3
	Wetlands (%):	8
	Agricultural (%):	1
	Residential (%):	3
	Local Roads (km):	0
State Roads (km):	0	

<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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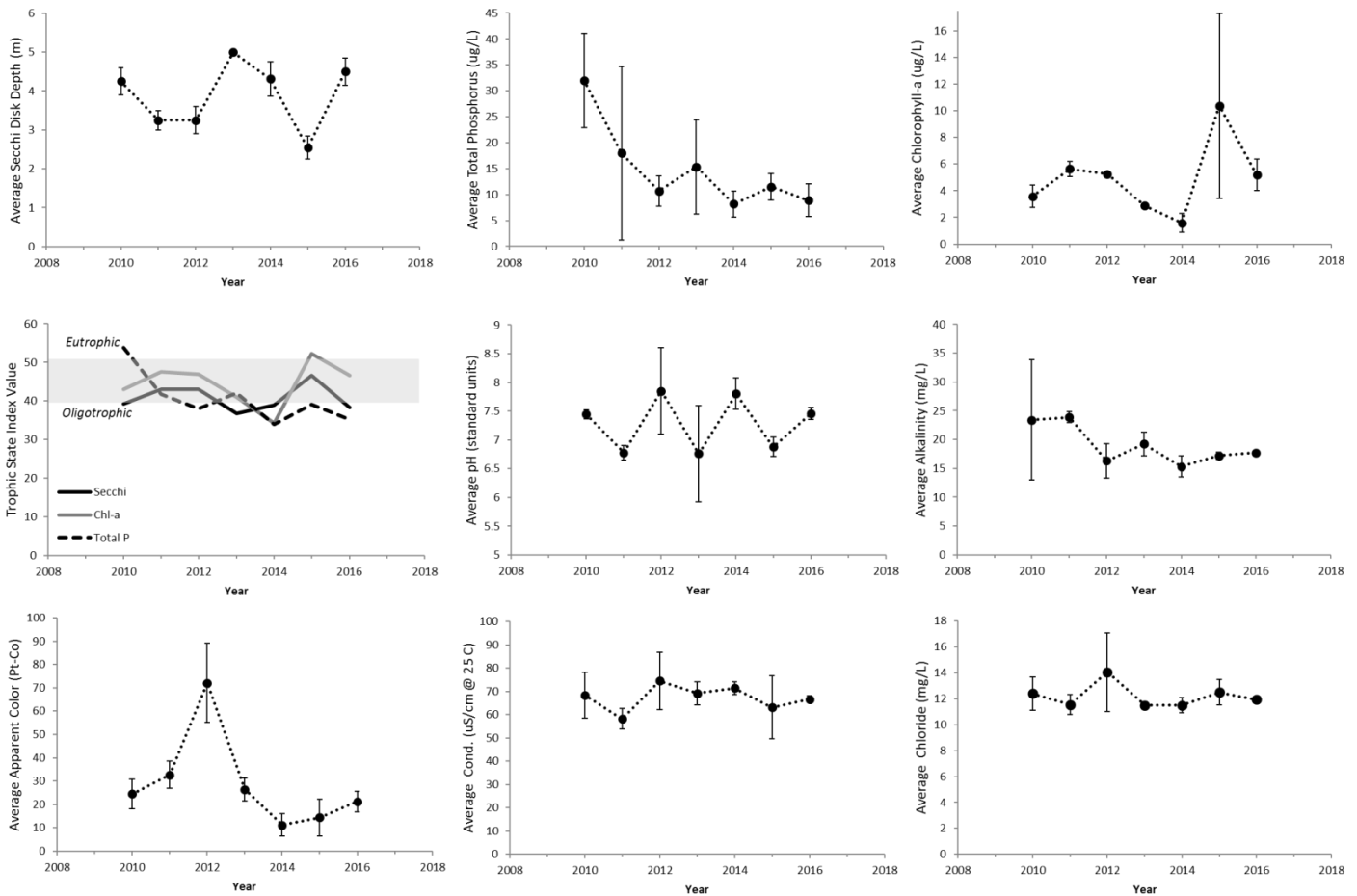
Water quality values and historical trends for Lake Titus during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	July	8/3/2016	9/3/2016		
Transparency (m)	Sample not received	4.8	4.3	4.5	No change
Total Phosphorus (µg/L)		6.7	11.1	8.9	No change
Chlorophyll-a (µg/L)		4.4	6.0	5.2	No change
Laboratory pH		7.4	7.5	7.5	No change
Sp. Conductance (µS/cm)		67.7	65.6	66.7	No change
Color (Pt-Co)		24.4	18.2	21.3	No change
Alkalinity (mg/L)			17.7	17.7	No change
Nitrate-Nitrogen (µg/L)			2.1	2.1	Not analyzed
Chloride (mg/L)			11.9	11.9	No change
Calcium (mg/L)			5.2	5.2	Not analyzed
Sodium (mg/L)		7.4	7.4	No change	

\*See table of content for description of water quality indicators



# Lake Titus – Time Series



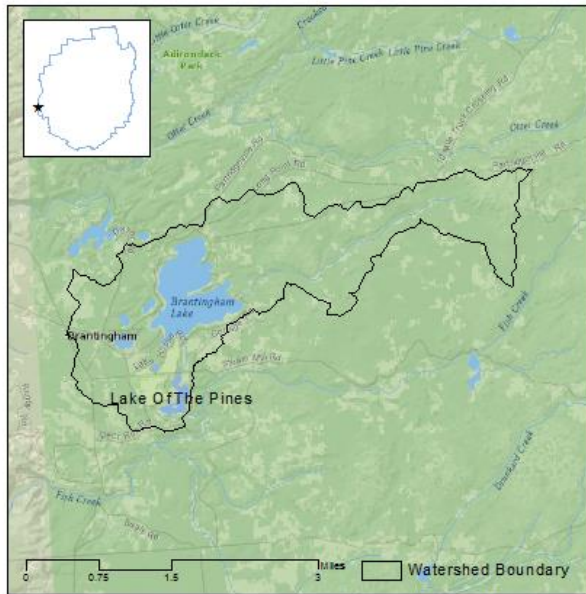
Annual average values of select water quality indicators for Lake Titus, 2010-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Lake Titus is a 177 ha lake located in Franklin County in the Town of Malone. The lake is located within a 1,658 ha watershed dominated by forests. Lake Titus has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2010.

- Lake Titus is a mesotrophic lake. The lake has fluctuated within the mesotrophic range since monitoring began. Transparency, total phosphorus, and chlorophyll-a have been variable, and not exhibited any significant positive or negative trends.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 17.7 mg/L, indicating low sensitivity to acid deposition.
- Sodium and chloride concentration were 7.4 and 11.9 mg/L respectively, indicating that the chemistry of the lake is influenced by the 3.8 km of roads in the watershed.

# Lake of the Pines



<b>Location</b>	County:	lewis
	Town:	Greig
<b>Lake Characteristics</b>	Surface Area (ha):	3
	Shoreline Length (km):	1
	Max. Depth (m):	
	Volume (m <sup>3</sup> ):	
	Flush rate (times/year):	
<b>Watershed Characteristics</b>	Watershed Area (ha):	1315
	Surface water (%):	12
	Deciduous Forest (%):	34
	Evergreen Forest (%):	21
	Mixed Forest (%):	3
	Wetlands (%):	1
	Agricultural (%):	2
	Residential (%):	0
	Local Roads (km):	16
	State Roads (km):	0

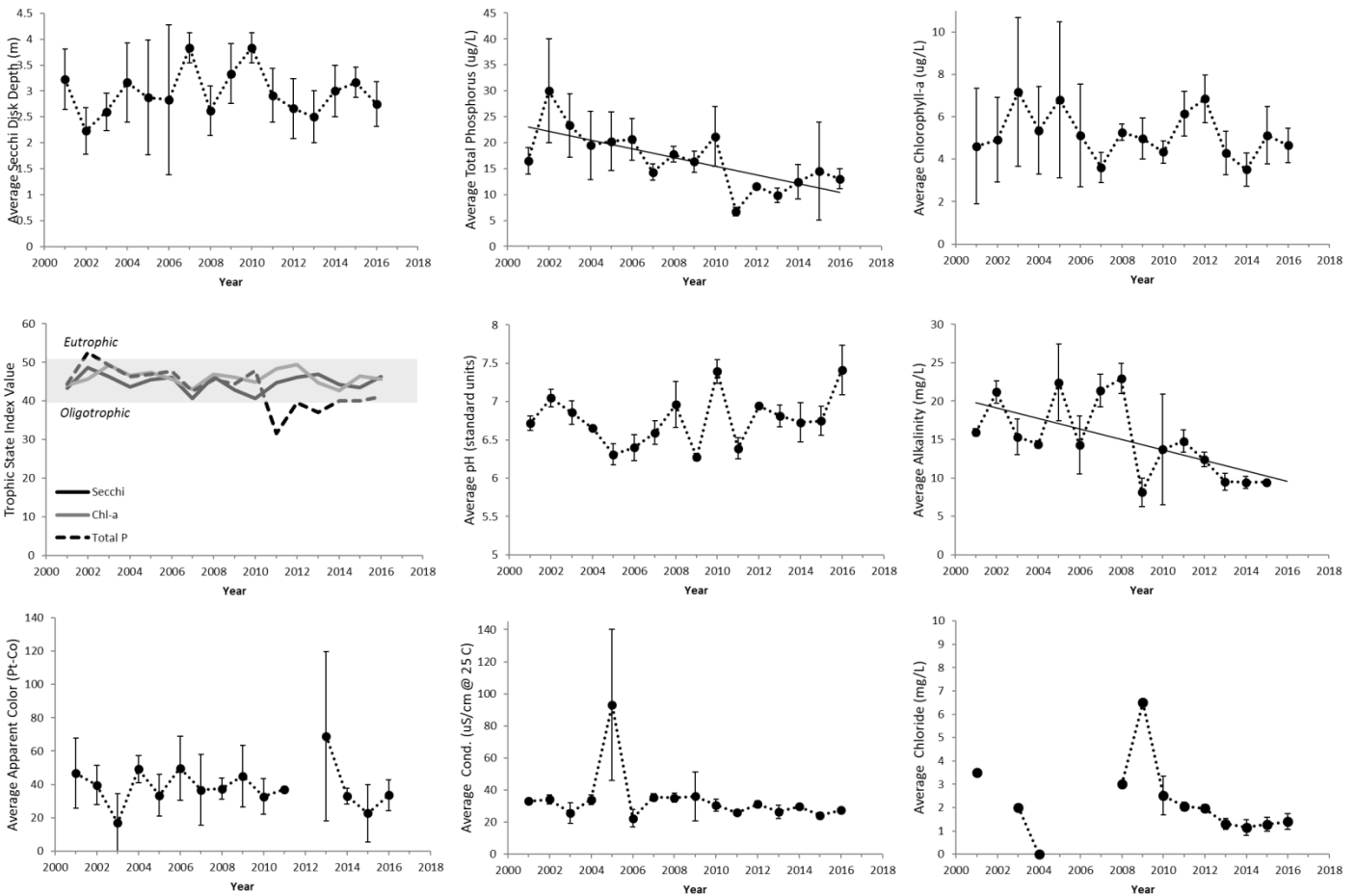
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> No 2016 Data	<b>Road Salt Influence</b> Present - low
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Water quality values and historical trends for Lake of the Pines during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/17/2016	7/20/2016	8/19/2016		
Transparency (m)	3.0	2.3	3.0	2.8	No change
Total Phosphorus (µg/L)	14.1	14.2	10.8	13.0	Decreasing
Chlorophyll-a (µg/L)	4.1	5.6	4.3	4.7	No change
Laboratory pH	7.1	7.7	7.4	7.4	No change
Sp. Conductance (µS/cm)	27.0	27.3	27.9	27.4	No change
Color (Pt-Co)	25.8	43.9	31.1	33.6	No change
Alkalinity (mg/L)					Decreasing
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	1.2			1.2	No change
Calcium (mg/L)	3.4			3.4	Not analyzed
Sodium (mg/L)	1.7			1.7	No change

\*See table of content for description of water quality indicators

# Lake of the Pines – Time Series



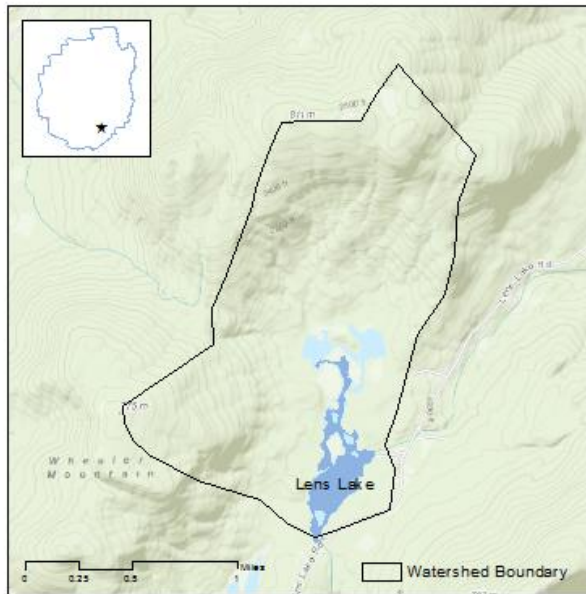
Annual average values of select water quality indicators for Lake of the Pines, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Lake of the Pines is a 3 ha lake located in Lewis County in the Town of Greig. The lake is located within a 1,315 ha watershed dominated by forests. Lake of the Pines has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Lake of the Pines is a mesotrophic lake. The trophic indicators of the lake have been fairly stable over time with the exception of total phosphorus, which has exhibited a significant downward trend at a rate of approximately 0.8  $\mu\text{g/L/year}$ .
- Water samples from 2016 were found to be circumneutral in terms of their acidity. We are unable to report alkalinity for 2016 due to a laboratory error. The alkalinity of the lake averaged 7.6 mg/L in 2015, indicating that the lake has moderate sensitivity to acid deposition. Alkalinity exhibited a statistically significant downward trend at a rate of 0.7 mg/L.
- Sodium and chloride concentrations were 1.7 and 1.2 mg/L respectively. These concentrations suggest that the chemistry of the lake is influenced by the 16 km of roads in the watershed, but the influence is relatively low.

# Lens Lake



<b>Location</b>	County:	Warren
	Town:	Stony Creek
<b>Lake Characteristics</b>	Surface Area (ha):	22
	Shoreline Length (km):	6
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	201874
	Flush rate (times/year):	17.3
<b>Watershed Characteristics</b>	Watershed Area (ha):	514
	Surface water (%):	7
	Deciduous Forest (%):	64
	Evergreen Forest (%):	8
	Mixed Forest (%):	10
	Wetlands (%):	12
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	0.2
State Roads (km):	0	

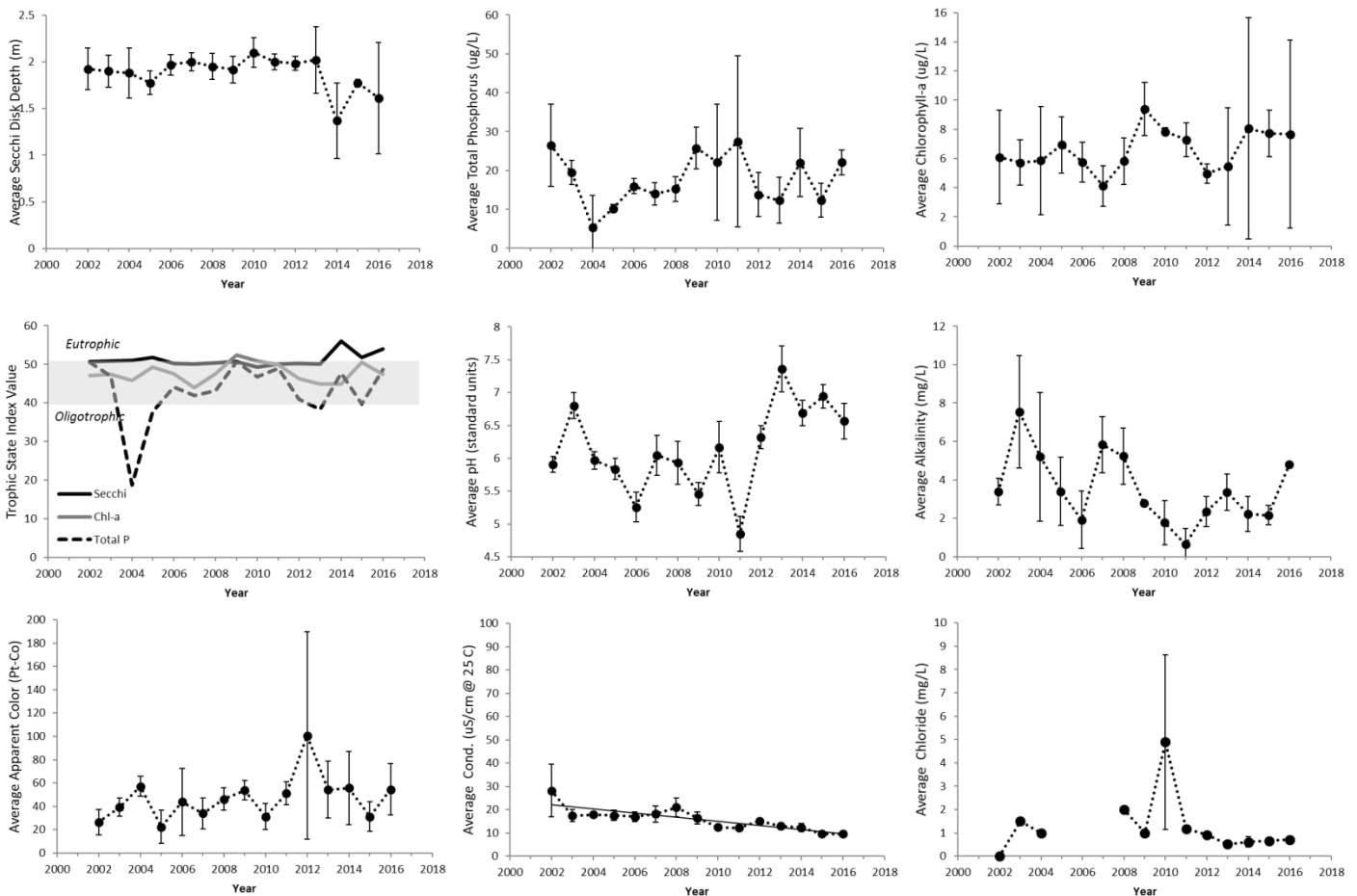
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Lens Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit. VOB=Secchi disk is visible on the bottom of the lake.

Water Quality Indicator	Sampling Date					Average	Trend
	5/19	6/15	7/23	8/14	September		
Transparency (m)	2.2	2.0	0.9	1.4		1.6	No change
Total Phosphorus (µg/L)	23.5	20.1	25.9	18.9		22.1	No change
Chlorophyll- <i>a</i> (µg/L)	2.0	3.0	9.8	15.8		7.7	No change
Laboratory pH	6.6	6.9	6.3	6.4		6.6	No change
Sp. Cond. (µS/cm)	8.8	8.9	10.2	10.5	No Sample	9.6	Decreasing
Color (Pt-Co)	25.8	78.8	60.0	53.6		54.5	No change
Alkalinity (mg/L)				4.8		4.8	No change
Nitrate-Nitrogen (µg/L)	3.9					3.9	Not analyzed
Chloride (mg/L)	0.7					0.7	No change
Calcium (mg/L)	1.0					1.0	Not analyzed
Sodium (mg/L)	0.7					0.7	No change

\*See table of content for description of water quality indicators

# Lens Lake – Time Series



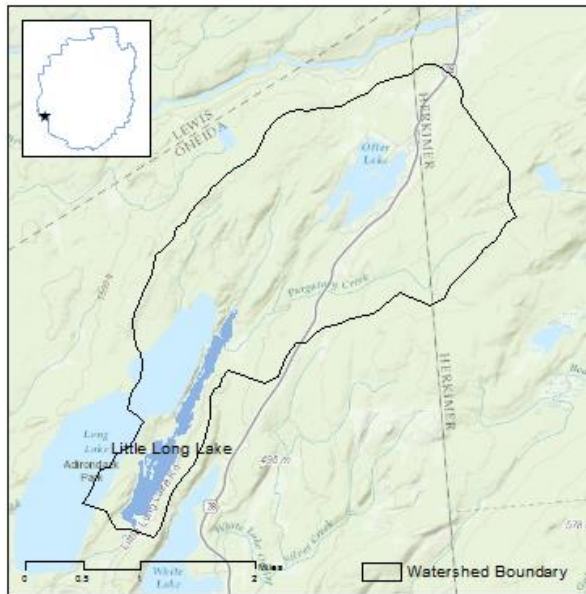
Annual average values of select water quality indicators for Lens Lake, 2002-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Lens Lake is a 22 ha lake located in Warren County in the Town of Stony Creek. The lake is located within a 514 ha watershed dominated by forests. Lens Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2002.

- Lens Lake is a mesotrophic lake. Transparency, total phosphorus, and chlorophyll-a have not exhibited any significant positive or negative trends since monitoring began in 2002. In this case, transparency is not a good indicator of trophic state due to the shallow depth of the lake.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 4.8 mg/L, indicating that the lake is sensitive to acid deposition.
- Sodium and chloride concentration were 0.7 and 0.7 mg/L respectively, these values are within the range we would expect for a lake that lacks salted roads in the watershed.

# Little Long Lake



<b>Location</b>	County:	Oneida
	Town:	Forestport
<b>Lake Characteristics</b>	Surface Area (ha):	64
	Shoreline Length (km):	11
	Max. Depth (m):	10.7
	Volume (m <sup>3</sup> ):	1600000
	Flush rate (times/year):	9.1
<b>Watershed Characteristics</b>	Watershed Area (ha):	1637
	Surface water (%):	8
	Deciduous Forest (%):	64
	Evergreen Forest (%):	3
	Mixed Forest (%):	1
	Wetlands (%):	14
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	6.3
State Roads (km):	4.5	

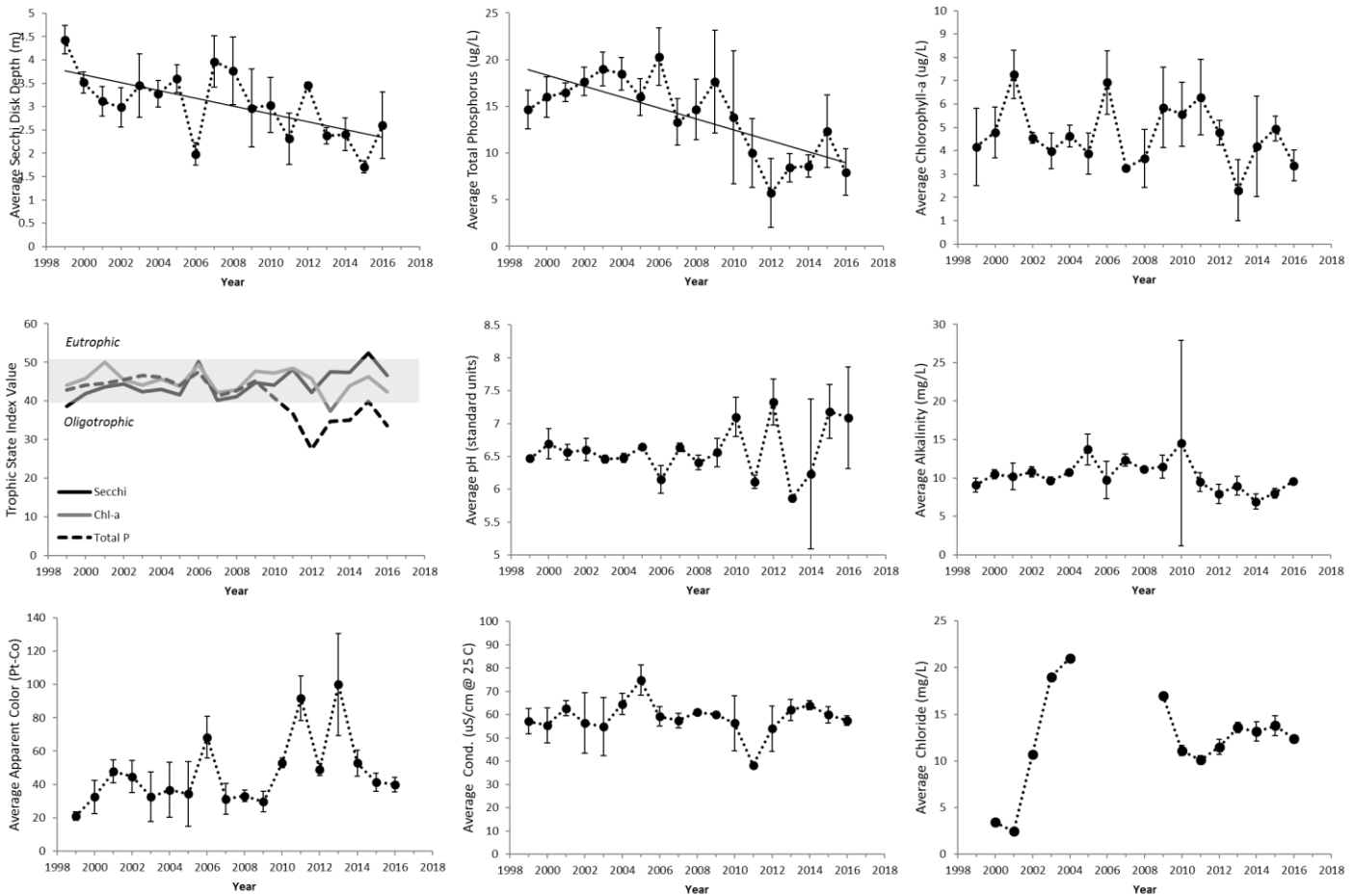
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Little Long Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/20/2016	7/21/2016	8/26/2016		
Transparency (m)	2.8	1.8	3.2	2.6	Decreasing
Total Phosphorus (µg/L)	10.5	7.9	5.5	8.0	Decreasing
Chlorophyll-a (µg/L)	2.7	3.3	4.0	3.4	No change
Laboratory pH	6.4	7.9	7.0	7.1	No change
Sp. Conductance (µS/cm)	59.8	55.9	56.7	57.5	No change
Color (Pt-Co)	35.1	40.7	43.9	39.9	No change
Alkalinity (mg/L)			9.6	9.6	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	12.4			12.4	No change
Calcium (mg/L)	3.5			3.5	Not analyzed
Sodium (mg/L)	7.5			7.5	No change

\*See table of content for description of water quality indicators

# Little Long Lake – Time Series



Annual average values of select water quality indicators for Little Long Lake, 1999-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

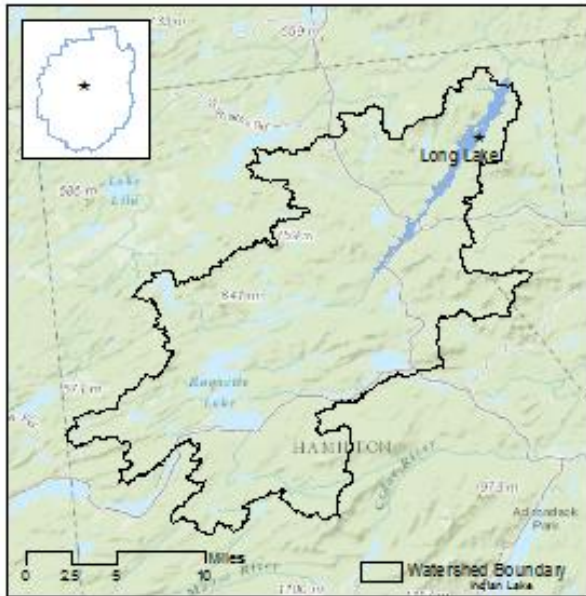
## Summary of Findings

Little Long Lake is a 64 ha lake located in Oneida County in the Town of Forestport. The lake is located within a 1,637 ha watershed dominated by forests. Little Long Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1999.

- Little Long Lake is a mesotrophic lake. Transparency depth has exhibited a significant downward trend at a rate of approximately 8 cm/year. Total phosphorus concentrations have also been trending down at a rate of approximately 0.59  $\mu\text{g/L/year}$ .
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 9.6 mg/L, indicating that the lake is moderately sensitive to acid deposition.
- Sodium and chloride concentration were 7.5 and 12.4 mg/L respectively, indicating that the chemistry of the lake is influenced by the 11 km of roads in the watershed. The chloride concentration in Little Long Lake is greater than 76% of participating ALAP lakes.



# Long Lake



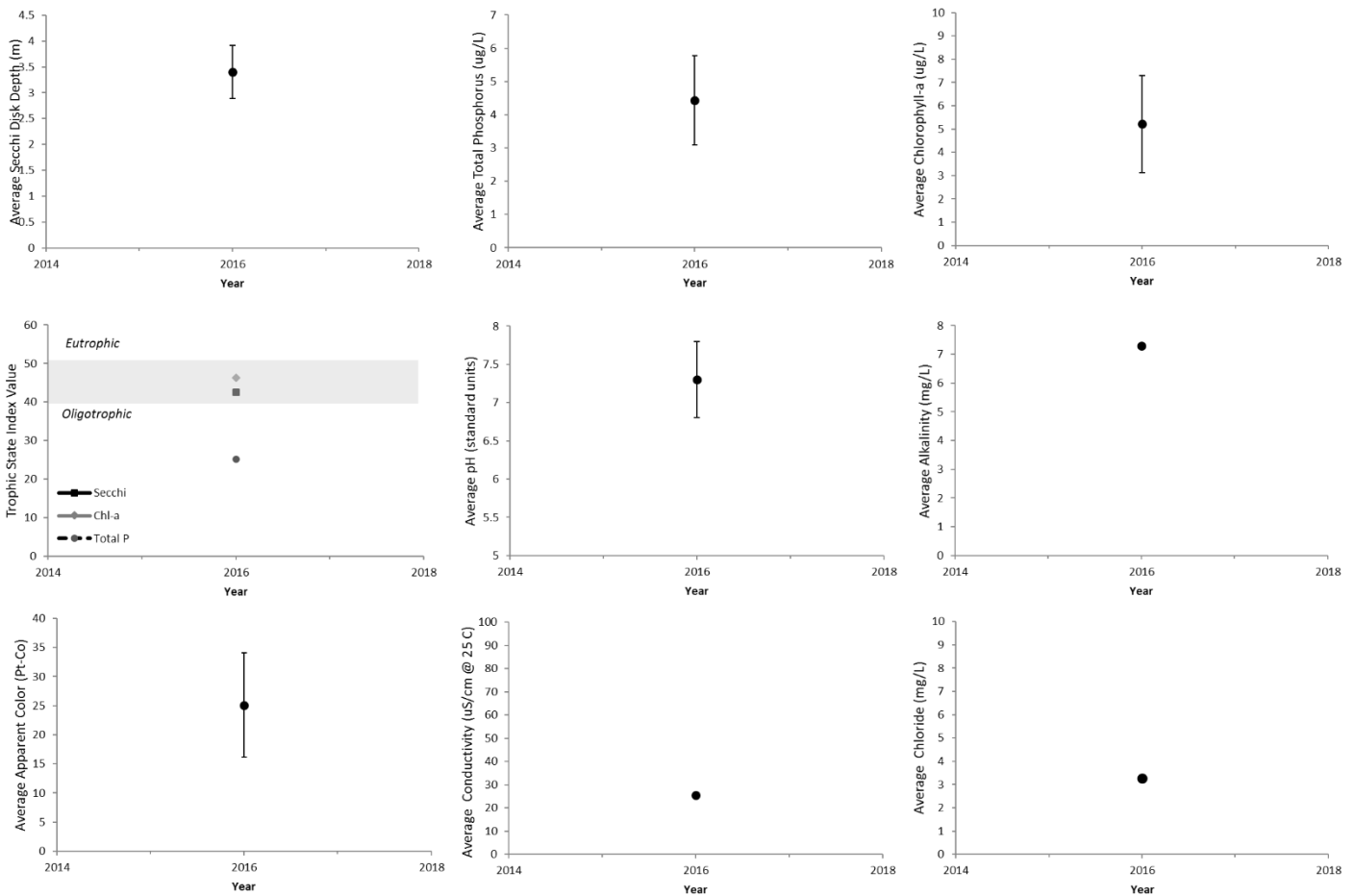
<b>Location</b>	County:	Hamilton
	Town:	Long Lake
<b>Lake Characteristics</b>	Surface Area (ha):	1685
	Shoreline Length (km):	78
	Max. Depth (m):	13.7
	Volume (m <sup>3</sup> ):	65403234
	Flush rate (times/year):	10
<b>Watershed Characteristics</b>	Watershed Area (ha):	76376
	Surface water (%):	2
	Deciduous Forest (%):	41
	Breagreen Forest (%):	19
	Mixed Forest (%):	8
	Wetlands (%):	17
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	62
State Roads (km):	60	

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present - Low
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Water quality values for Long Lake during the 2016 sampling season. Trend analysis will be performed after five years of consecutive data collection. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/22/2016	7/16/2016	8/24/2016		
Transparency (m)	3.2	3.0	4.0	3.4	Not Analyzed – 5 years of data needed
Total Phosphorus (µg/L)	4.1	5.9	3.3	4.4	
Chlorophyll- <i>a</i> (µg/L)	4.2	7.6	3.8	5.2	
Laboratory pH	7.8	7.2	6.9	7.3	
Sp. Conductance (µS/cm)	24.9	25.1	26.4	25.5	
Color (Pt-Co)	16.4	34.3	24.6	25.1	
Alkalinity (mg/L)			7.3	7.3	
Nitrate-Nitrogen (µg/L)			BDL	BDL	
Chloride (mg/L)	3.3			3.3	
Calcium (mg/L)	2.3			2.3	
Sodium (mg/L)	3.0			3.0	

# Long Lake- Time Series



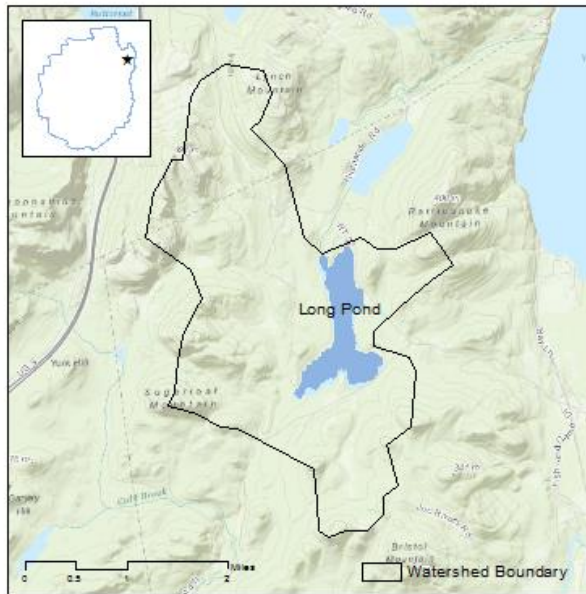
Annual average values of select water quality indicators for Long Lake, 2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Long Lake is a 1,685 ha lake located in Hamilton County in the Town of Long Lake. The lake is located within a 76,376 ha watershed dominated by forests. This is Long Lake first year in the Adirondack Lake Assessment Program. Trend analysis will be conducted after five years of data have been collected.

- Long Lake is classified as an oligotrophic lake based on chlorophyll-a concentration, and a mesotrophic lake based on transparency depth and total phosphorus concentration.
- Water samples submitted in 2016 were circumneutral in terms of their acidity; the alkalinity was 7.3 mg/L, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 3.0 and 3.3 mg/L respectively, indicating that the chemistry of the lake is influenced by the 122 km of roads in the watershed, but the influence is rather low.

# Long Pond



<b>Location</b>	County:	Essex
	Town:	Willsboro
<b>Lake Characteristics</b>	Surface Area (ha):	120
	Shoreline Length (km):	8
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	2767201
	Flush rate (times/year):	3.7
<b>Watershed Characteristics</b>	Watershed Area (ha):	1757
	Surface water (%):	7
	Deciduous Forest (%):	24
	Evergreen Forest (%):	29
	Mixed Forest (%):	30
	Wetlands (%):	4
	Agricultural (%):	0
	Residential (%):	3
	Local Roads (km):	4.2
State Roads (km):	4.2	

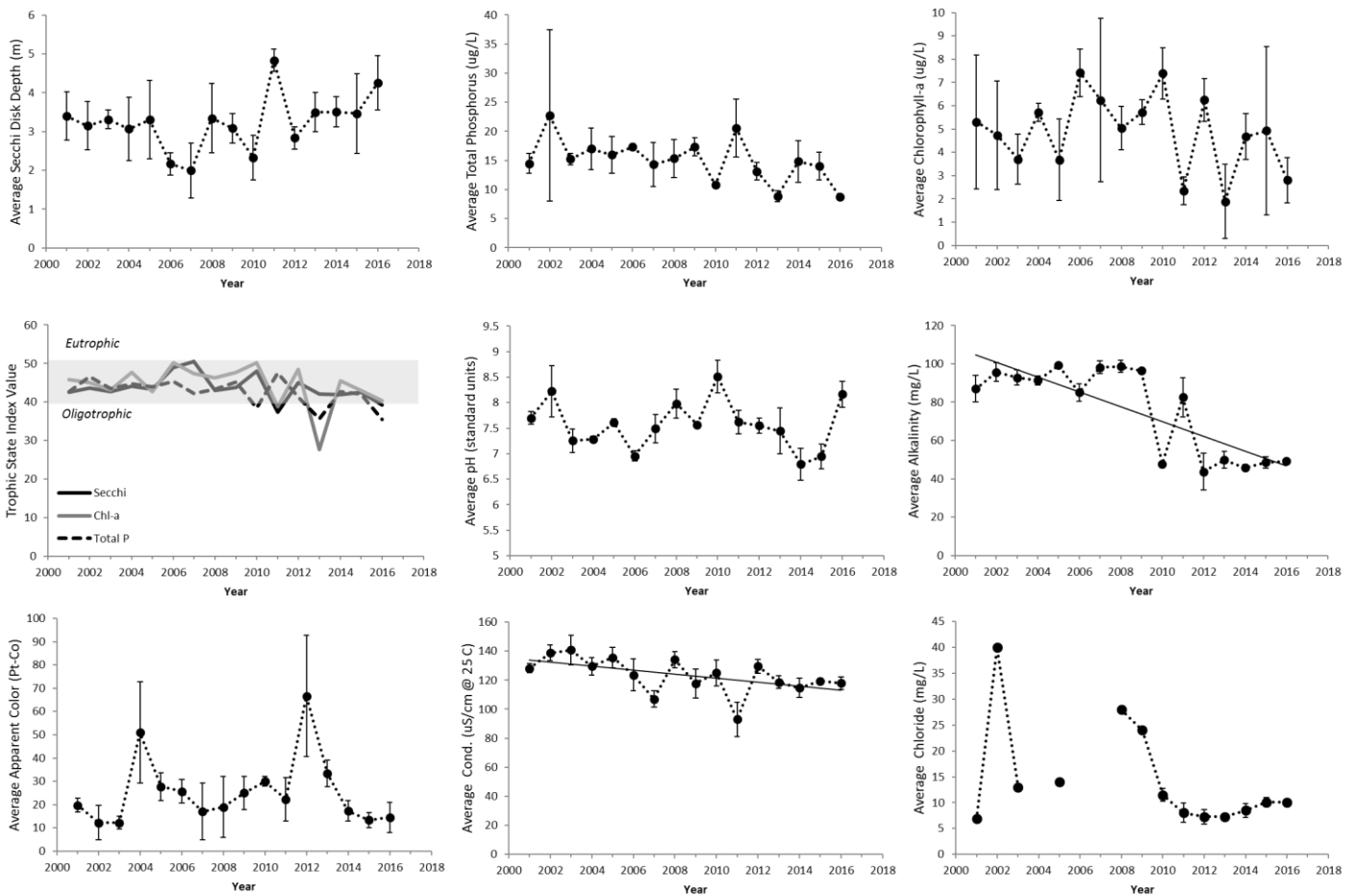
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Alkaline	<b>Acid Neutralizing Capacity</b> Well buffered – not sensitive	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Long Pond during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/24/2016	7/24/2016	8/20/2016		
Transparency (m)	4.3	5.0	3.6	4.3	No change
Total Phosphorus (µg/L)	8.9	8.4	9.0	8.8	No change
Chlorophyll- <i>a</i> (µg/L)	2.4	2.1	3.9	2.8	No change
Laboratory pH	8.4	8.1	7.9	8.2	No change
Sp. Conductance (µS/cm)	121.8	119.0	113.2	118.0	Decreasing
Color (Pt-Co)	7.1	18.2	18.2	14.5	No change
Alkalinity (mg/L)			49.3	49.3	Decreasing
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	10.1			10.1	No change
Calcium (mg/L)	15.0			15.0	Not analyzed
Sodium (mg/L)	7.8			7.8	No change

\*See table of content for description of water quality indicators

# Long Pond – Time Series



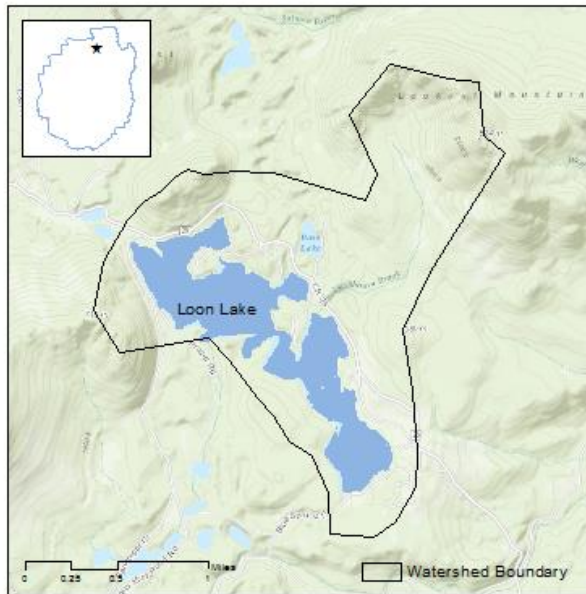
Annual average values of select water quality indicators for Long Pond, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Long Pond is a 120 ha lake located in Essex County in the Town of Willsboro. The lake is located within a 1,757 ha watershed dominated by forests. Long Pond has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Long Pond is a mesotrophic lake. Transparency, total phosphorus, and chlorophyll-a have not exhibited any significant positive or negative trends since monitoring began in 2001.
- The water samples analyzed in 2016 were found to be alkaline in terms of their acidity. The alkalinity was 49.3 mg/L, indicating that the lake is not sensitive to acid deposition. The alkalinity of the pond is greater than any of the other participating ALAP lakes. We detected a significant downward trend in alkalinity at a rate of approximately 3.9 mg/L/year.
- Sodium and chloride concentration were 7.8 and 10.1 mg/L respectively; these values indicate that the chemistry of the lake is influenced by salted roads in the watershed. Calcium concentration averaged 15.0 mg/L in 2016, greater than any of the other participating ALAP lakes. The concentration of calcium is within the minimum range needed to support a viable zebra mussel population.

# Loon Lake- Franklin County



<b>Location</b>	County:	Franklin
	Town:	Franklin
<b>Lake Characteristics</b>	Surface Area (ha):	144
	Shoreline Length (km):	13
	Max. Depth (m):	16.5
	Volume (m <sup>3</sup> ):	7399735
	Flush rate (times/year):	0.7
<b>Watershed Characteristics</b>	Watershed Area (ha):	692
	Surface water (%):	23
	Deciduous Forest (%):	49
	Evergreen Forest (%):	12
	Mixed Forest (%):	1
	Wetlands (%):	6
	Agricultural (%):	1
	Residential (%):	4
	Local Roads (km):	6.7
State Roads (km):	0	

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Present - Low
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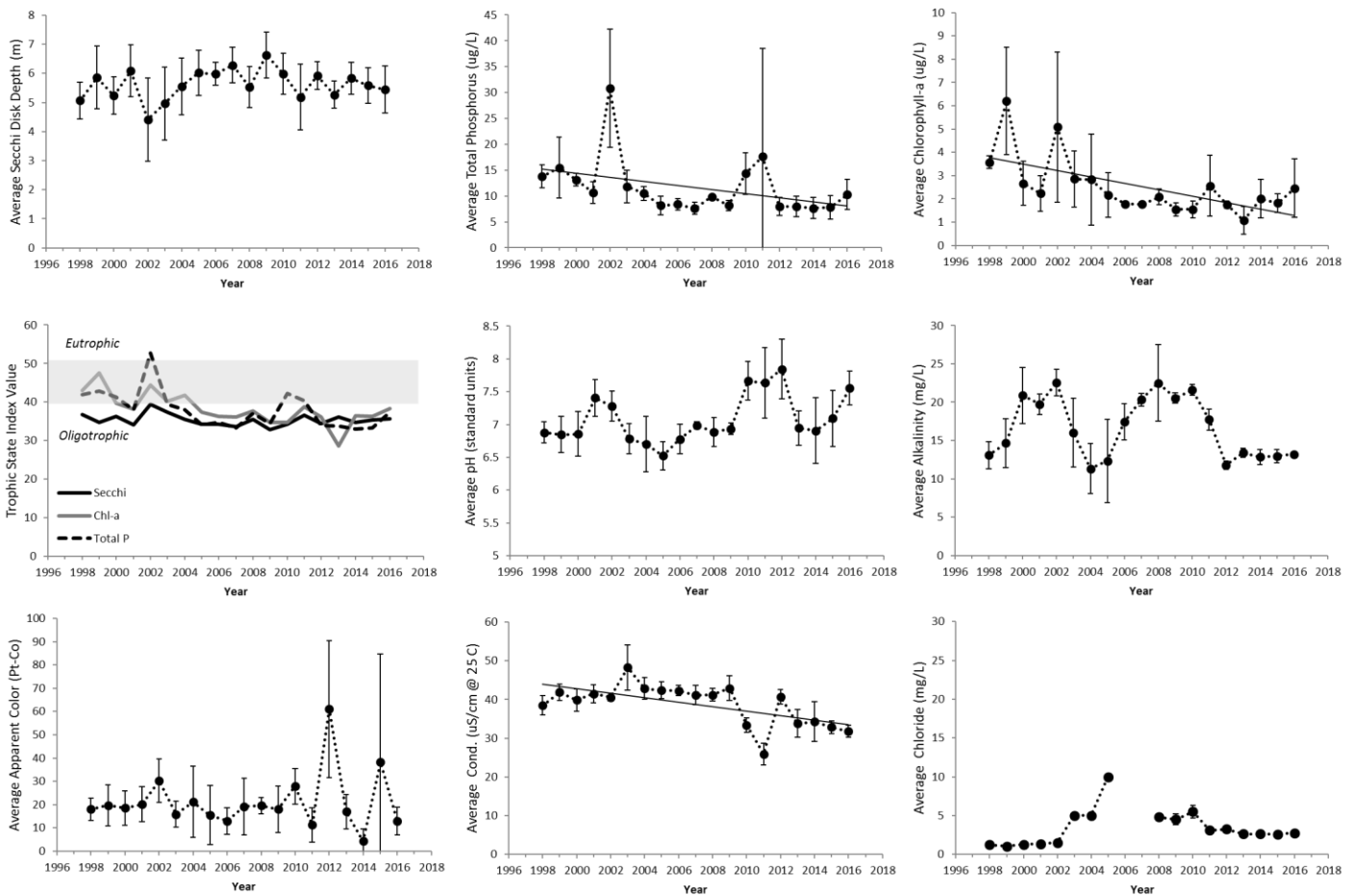
Water quality values and historical trends for Loon Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	North Basin			Average	Trend
	Sampling Date				
	6/11/2016	7/27/2016	9/3/2016		
Transparency (m)	4.8	5.8	6.2	5.6	No change
Total Phosphorus (µg/L)	9.7	7.7	12.3	9.9	Decreasing
Chlorophyll- <i>a</i> (µg/L)	2.8	1.2	2.0	2.0	Decreasing
Laboratory pH	7.3	7.8	7.9	7.6	No change
Sp. Conductance (µS/cm)	31.9	33.3	33.4	32.9	Decreasing
Color (Pt-Co)	4.0	15.0	18.2	12.4	No change
Alkalinity (mg/L)	13.4			13.4	No change
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	3.0			3.0	No change
Calcium (mg/L)	3.3			3.3	Not analyzed
Sodium (mg/L)	2.0			2.0	No change

South Basin				
Water Quality Indicator	Sampling Date			Average
	6/11/2016	7/27/2016	9/3/2016	
Transparency (m)	4.3	6.4	5.3	5.3
Total Phosphorus (µg/L)	15.1	9.1	7.7	10.6
Chlorophyll- <i>a</i> (µg/L)	4.2	1.1	3.5	2.9
Laboratory pH	7.3	7.7	7.5	7.5
Sp. Conductance (µS/cm)	30.0	29.8	32.3	30.7
Color (Pt-Co)	7.1	18.2	15.0	13.4
Alkalinity (mg/L)	13.0			13.0
Nitrate-Nitrogen (µg/L)	BDL			BDL
Chloride (mg/L)	2.6			2.6
Calcium (mg/L)	3.1			3.1
Sodium (mg/L)	1.8			1.8

\*See table of content for description of water quality indicators

# Loon Lake Franklin County– Time Series



Annual average values of select water quality indicators for Loon Lake, 1998-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

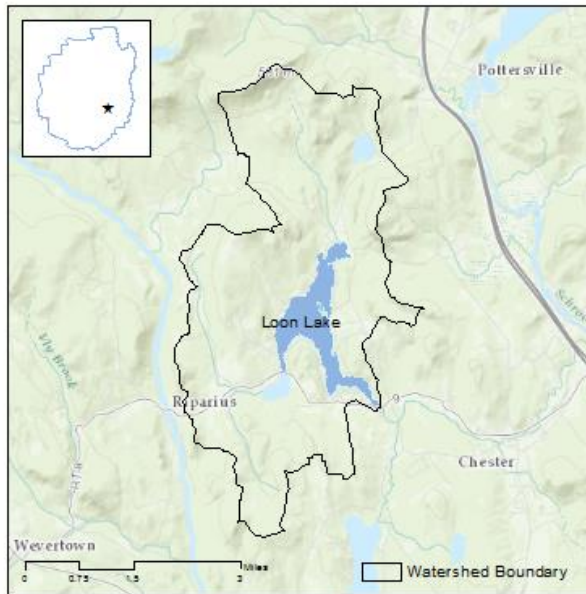
## Summary of Findings

Loon Lake is a 144 ha lake located in Franklin County in the Town of Franklin. The lake is located within a 692 ha watershed dominated by forests. Loon Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1998.

- Loon Lake is an oligotrophic lake. The transparency has been relatively stable over the past 19 years. However, the total phosphorus and chlorophyll-a concentrations have exhibited a significant downward trend at a rate of approximately 0.4 and 0.1  $\mu\text{g/L}/\text{year}$  respectively.
- Water samples from 2016 were found to be circumneutral in terms of their acidity. The alkalinity of the lake was 13.2 mg/L, indicating that the lake has low sensitivity to acid deposition.
- Sodium and chloride concentrations were 1.9 and 2.8 mg/L respectively. These concentrations suggest that the chemistry of the lake is influenced by the 6.7 km of roads in the watershed, but that influence is relatively low.



# Loon Lake- Warren County



<b>Location</b>	County:	Warren
	Town:	Chester

<b>Lake Characteristics</b>	Surface Area (ha):	212
	Shoreline Length (km):	20
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	-
	Flush rate (times/year):	-

<b>Watershed Characteristics</b>	Watershed Area (ha):	3363
	Surface water (%):	9
	Deciduous Forest (%):	18
	Evergreen Forest (%):	35
	Mixed Forest (%):	24
	Wetlands (%):	10
	Agricultural (%):	0
	Residential (%):	6
	Local Roads (km):	22
	State Roads (km):	10.6

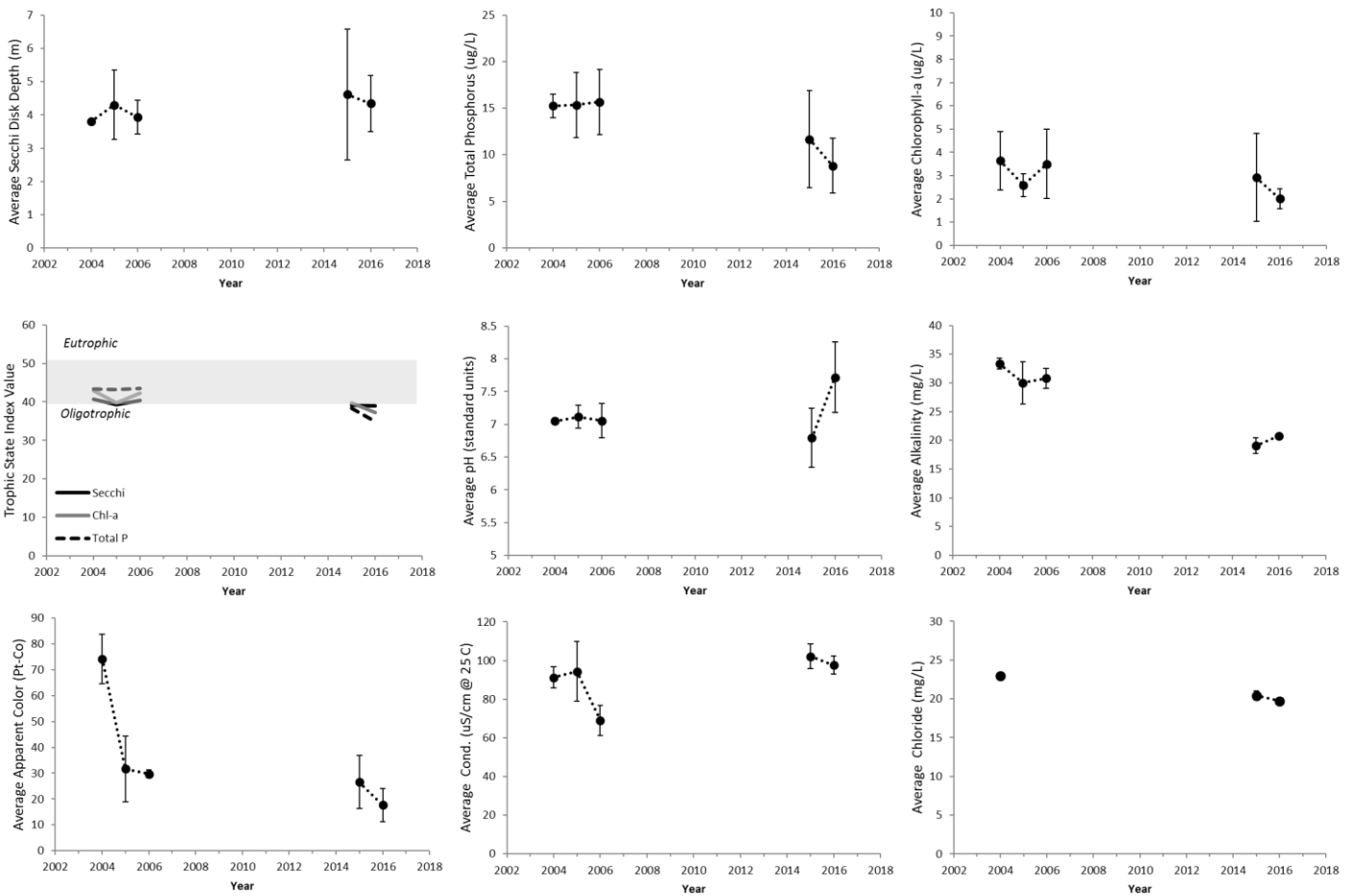
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Alkaline	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> High
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Water quality values and historical trends for Loon Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/25/2016	7/13/2016	8/24/2016		
Transparency (m)	5.3	4.2	3.6	4.4	No change
Total Phosphorus (µg/L)	11.4	9.4	5.6	8.8	No change
Chlorophyll- <i>a</i> (µg/L)	2.5	1.9	1.6	2.0	No change
Laboratory pH	7.4	8.3	7.4	7.7	No change
Sp. Conductance (µS/cm)	102.3	93.0	97.6	97.6	No change
Color (Pt-Co)	10.2	21.4	21.4	17.7	No change
Alkalinity (mg/L)			20.8	20.8	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	19.7			19.7	No change
Calcium (mg/L)	7.1			7.1	Not analyzed
Sodium (mg/L)	11.6			11.6	No change

\*See table of content for description of water quality indicators

# Loon Lake Warren County – Time Series



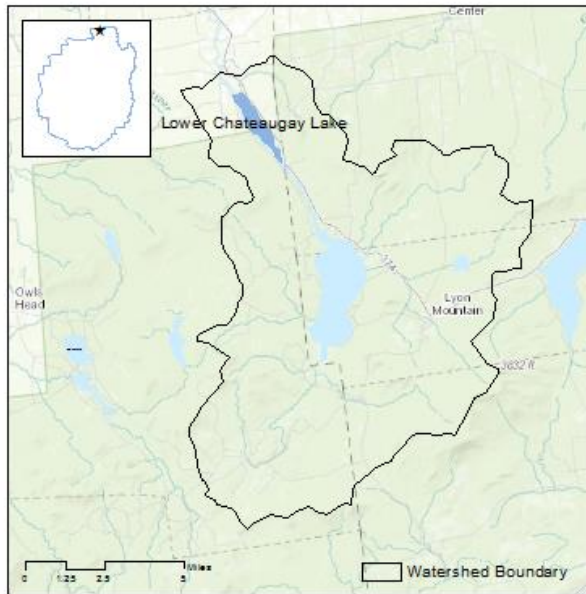
Annual average values of select water quality indicators for Loon Lake, 2004-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Loon Lake is a 212 ha lake located in Warren County in the Town of Chester. The lake is located within a 3,363 ha watershed dominated by forests. Loon Lake began participation in ALAP in 2004-2006, and again in 2015. Trend analysis will be performed on the data after five consecutive years of collection.

- Loon Lake is an oligotrophic water body. The average transparency depth, as well as total phosphorus and chlorophyll-concentrations, are similar to the values observed in the early 2000's.
- Water sample from 2016 were found to be alkaline in terms of their acidity. The alkalinity was 20.8 mg/L, indicating that the lake has low sensitivity to acid deposition. The alkalinity is greater than 77% of participating ALAP Lakes.
- Sodium and chloride concentrations were 11.6 and 19.7 mg/L respectively in 2016, indicating that the chemistry of the lake is highly influenced by the 32.6 km of roads in the watershed. The chloride concentration of Loon Lake is greater than 88% of participating lakes.

# Lower Chateaugay Lake



<b>Location</b>	County:	Franklin
	Town:	Bellmont

<b>Lake Characteristics</b>	Surface Area (ha):	234
	Shoreline Length (km):	10
	Max. Depth (m):	7.8
	Volume (m <sup>3</sup> ):	8410944
	Flush rate (times/year):	18.67

<b>Watershed Characteristics</b>	Watershed Area (ha):	28000
	Surface water (%):	8
	Deciduous Forest (%):	54
	Evergreen Forest (%):	17
	Mixed Forest (%):	8
	Wetlands (%):	9
	Agricultural (%):	0
	Residential (%):	2
	Local Roads (km):	73.8
	State Roads (km):	20.3

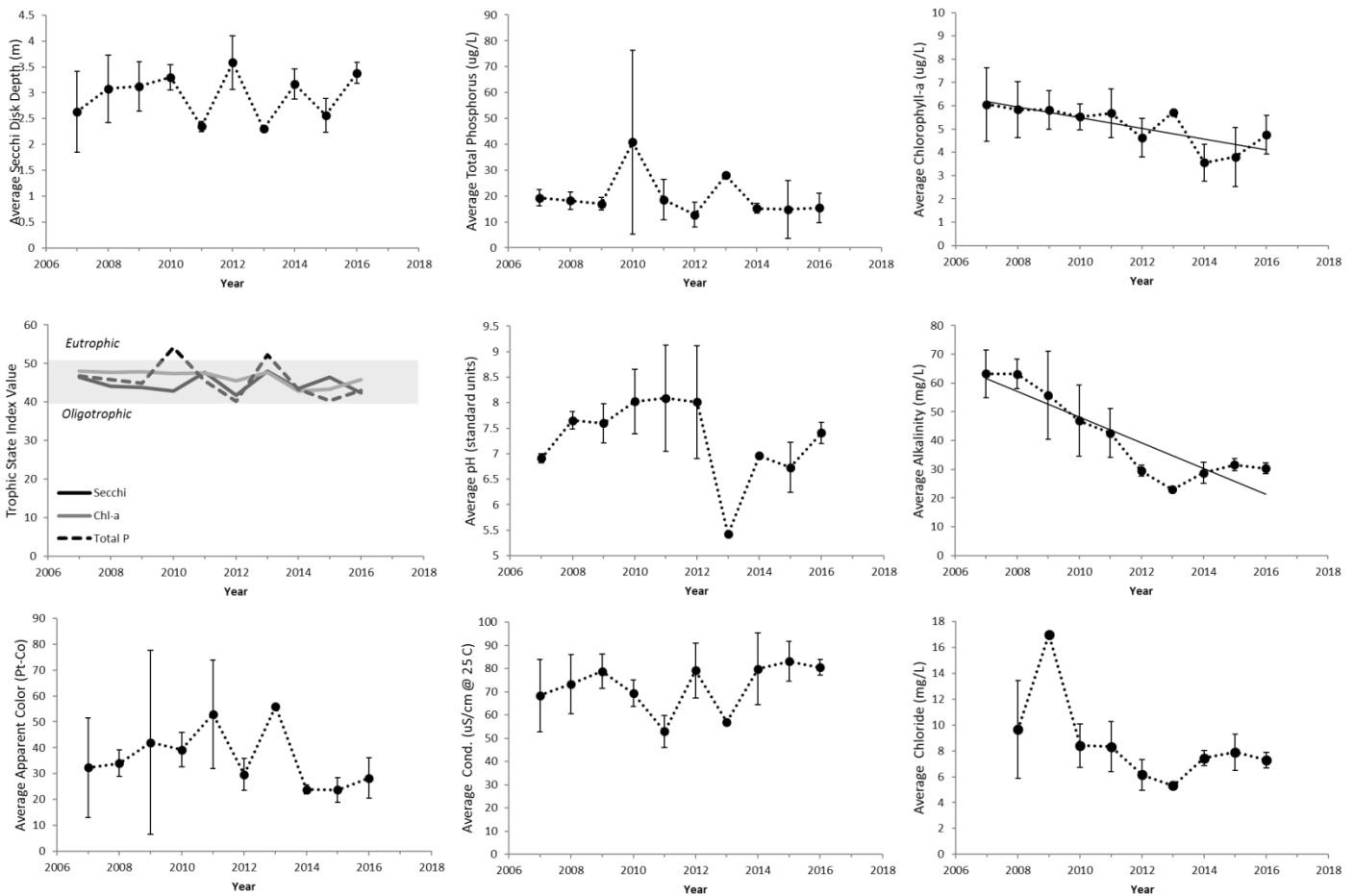
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Well buffered – not sensitive	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Lower Chateaugay Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/19/2016	7/17/2016	8/14/2016		
Transparency (m)	3.6	3.2	3.4	3.4	No change
Total Phosphorus (µg/L)	21.9	13.5	10.8	15.4	No change
Chlorophyll- <i>a</i> (µg/L)	5.0	5.4	3.8	4.8	Decreasing
Laboratory pH	7.4	7.2	7.6	7.4	No change
Sp. Conductance (µS/cm)	77.1	80.7	83.7	80.5	No change
Color (Pt-Co)	19.6	34.3	31.1	28.3	No change
Alkalinity (mg/L)	31.7			31.7	Decreasing
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	6.7			6.7	No change
Calcium (mg/L)	7.7			7.7	Not analyzed
Sodium (mg/L)	4.6			4.6	No change

\*See table of content for description of water quality indicators

# Lower Chateaugay Lake – Time Series



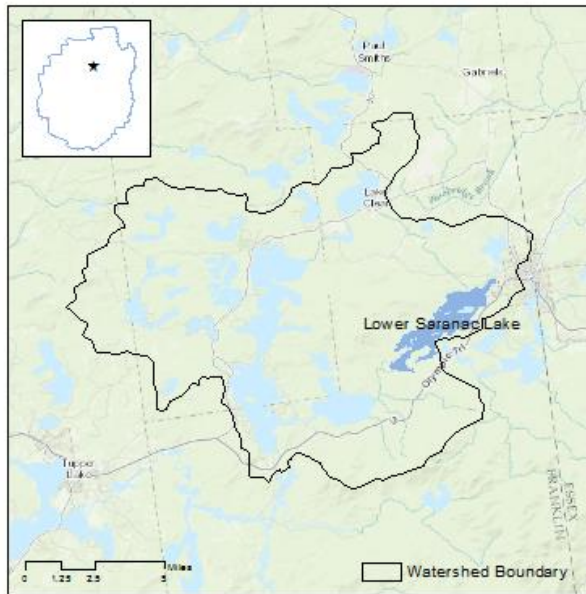
Annual average values of select water quality indicators for Lower Chateaugay Lake, 2007-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Lower Chateaugay Lake is a 234 ha lake located in Franklin County in the Town of Belmont. The lake is located within a 26,000 ha watershed dominated by forests. Lower Chateaugay Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2007.

- Lower Chateaugay is a mesotrophic lake; the trophic status has been fairly stable over the ten years of monitoring. Transparency depth and total phosphorus concentration have not exhibited a positive or negative trend since 2007. Chlorophyll-a concentration has been trending down at a rate of approximately 0.2  $\mu\text{g/L/year}$ .
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity of the lake was 31.7 mg/L, indicating that the lake is not sensitive to acid deposition. The alkalinity of Lower Chateaugay is greater than 90% of participating ALAP lakes. However, a statistically significant downward trend was detected at a rate of 4.5 mg/L/year.
- Sodium and chloride concentrations of the lake were 4.6 and 6.7 mg/L respectively. These values indicate that the chemistry of the lake is influenced by the 94km of roads in the watershed.
- Calcium concentrations averaged 7.7 mg/L in 2016. These values are below the minimum zebra mussel threshold values suggested by researchers.

# Lower Saranac Lake



<b>Location</b>	County: Franklin Town: Harrietstown
<b>Lake Characteristics</b>	Surface Area (ha): 868 Shoreline Length (km): 46 Max. Depth (m): 18.3 Volume (m <sup>3</sup> ): 78985872 Flush rate (times/year): 2.5
<b>Watershed Characteristics</b>	Watershed Area (ha): 32160 Surface water (%): 20 Deciduous Forest (%): 27 Evergreen Forest (%): 32 Mixed Forest (%): 7 Wetlands (%): 11 Agricultural (%): 0 Residential (%): 2 Local Roads (km): 54.9 State Roads (km): 46.1

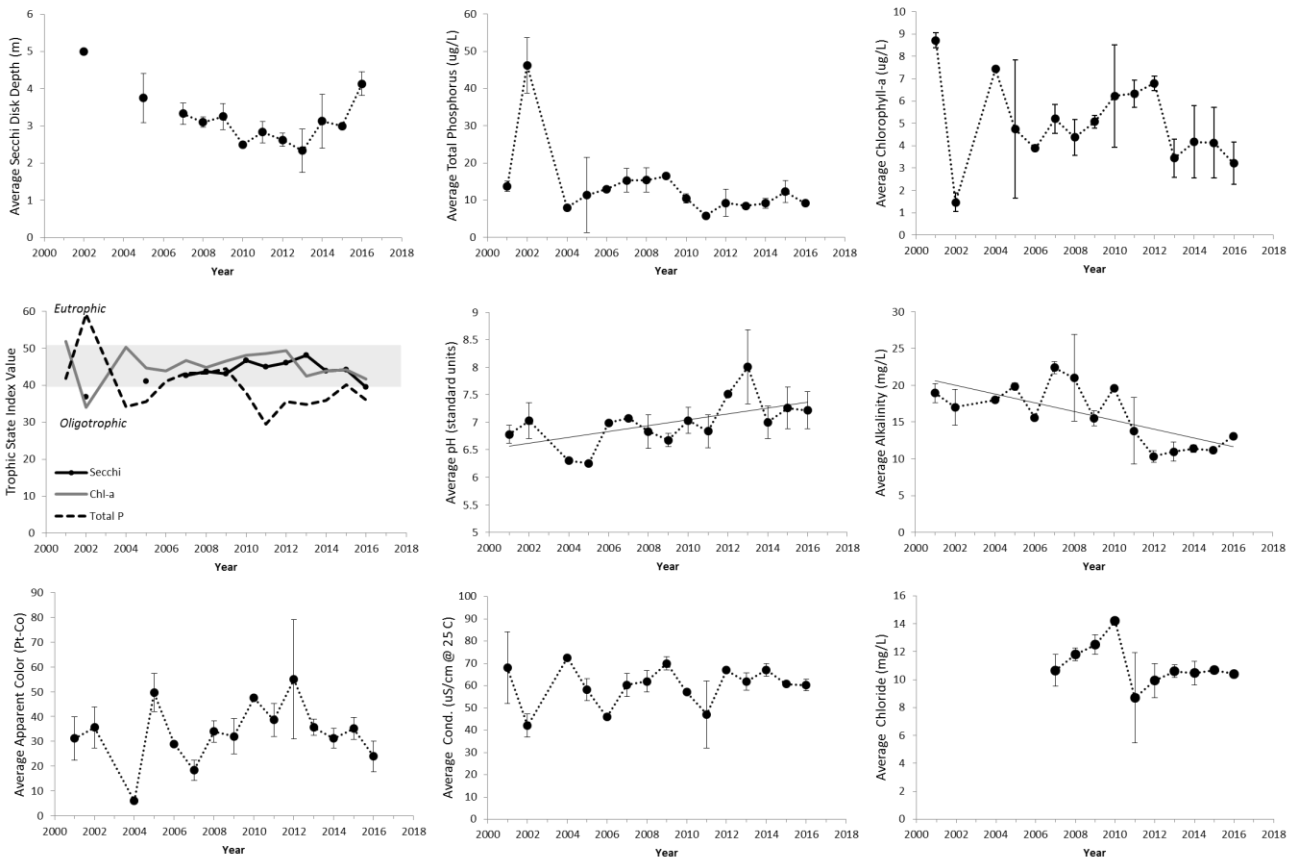
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Lower Saranac Lake during the 2016 sampling season. Trend analysis was not performed on nitrogen or calcium data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/21/2016	7/21/2016	9/23/2016		
Transparency (m)	3.9	4.0	4.5	4.1	No change
Total Phosphorus (µg/L)	9.9	8.6	9.1	9.2	No change
Chlorophyll- <i>a</i> (µg/L)	3.3	2.2	4.1	3.2	No change
Laboratory pH	7.2	6.9	7.6	7.2	Increasing
Sp. Conductance (µS/cm)	59.4	63.3	58.1	60.3	No change
Color (Pt-Co)	19.6	31.1	21.4	24.0	No change
Alkalinity (mg/L)			13.1	13.1	Decreasing
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	10.4			10.4	No change
Calcium (mg/L)	4.5			4.5	Not analyzed
Sodium (mg/L)	8.0			8.0	No change

\*See table of content for description of water quality indicators

# Lower Saranac Lake – Time Series



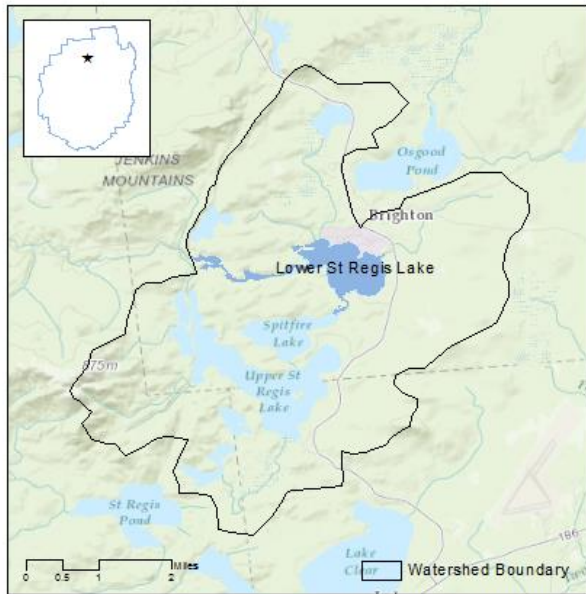
Annual average values of select water quality indicators for Lower Saranac Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Lower Saranac Lake is an 868 ha lake located in Franklin County in the Town of Harrietstown. The lake is located within a 32,160 ha watershed dominated by forests. Lower Saranac Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Lower Saranac is a mesotrophic water body. The trophic status of the lake typically fluctuates around the oligotrophic mesotrophic boundary.
- The lake is circumneutral; the average pH of the 2016 samples was 7.2 pH units. We detected an increasing trend in pH at a rate of 0.05 pH units per year.
- The alkalinity of the lake was 13.1 mg/L in 2016, indicating moderate acid neutralizing capacity. Alkalinity has exhibited a downward trend at a rate of 0.6 mg/L/year since monitoring began.
- The chloride concentration of the lake averaged 10.4 mg/L, which is 57 times greater than background concentrations observed in Adirondack Lakes. This elevated concentration is likely due to the 100km of roads in the watershed.

# Lower St. Regis Lake



<b>Location</b>	County:	Franklin
	Town:	Brighton

<b>Lake Characteristics</b>	Surface Area (ha):	185
	Shoreline Length (km):	18
	Max. Depth (m):	11.6
	Volume (m <sup>3</sup> ):	7606124
	Flush rate (times/year):	3.7

<b>Watershed Characteristics</b>	Watershed Area (ha):	5363
	Surface water (%):	17
	Deciduous Forest (%):	35
	Evergreen Forest (%):	28
	Mixed Forest (%):	3
	Wetlands (%):	13
	Agricultural (%):	0
	Residential (%):	3
	Local Roads (km):	10
	State Roads (km):	13.4

<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> High
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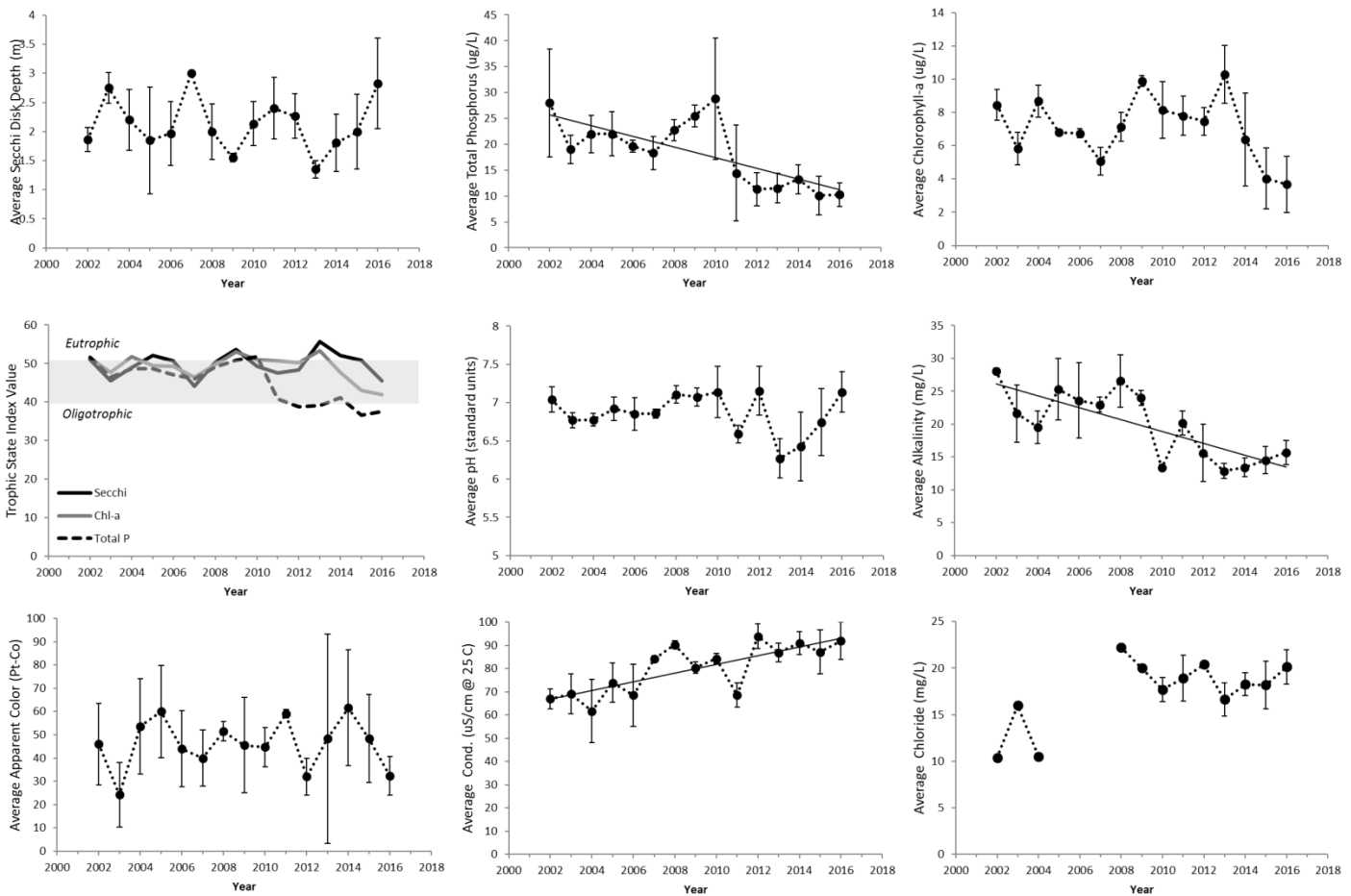
Water quality values and historical trends for Lower St. Regis Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/7/2016	7/11/2016	8/3/2016		
Transparency (m)	2.0	2.4	3.1	2.5	No Change
Total Phosphorus (µg/L)	14.7	10.5	8.5	11.2	Decreasing
Chlorophyll- <i>a</i> (µg/L)	3.2	4.4	5.7	4.4	No change
Laboratory pH	7.0	7.2	7.3	7.2	No change
Sp. Conductance (µS/cm)	89.5	92.6	93.9	92.0	Increasing
Color (Pt-Co)	32.0	38.3	15.0	28.4	No change
Alkalinity (mg/L)	14.1	14.6	16.3	15.0	Decreasing
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	18.8	19.4	20.2	19.4	No change
Calcium (mg/L)			5.4	5.4	Not analyzed
Sodium (mg/L)			12.7	12.7	No change

\*See table of content for description of water quality indicators



# Lower St. Regis Lake – Time Series



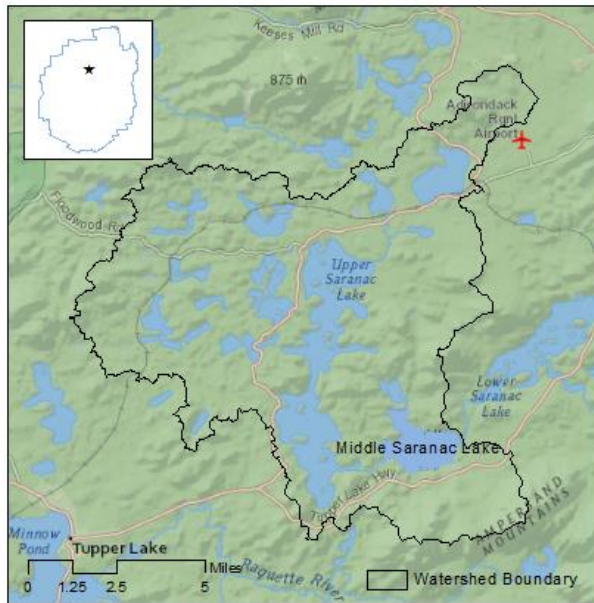
Annual average values of select water quality indicators for Lower St. Regis Lake, 2002-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Lower St Regis Lake is a 185 ha lake located in Franklin County in the Town of Brighton. The lake is located within a 5,363 ha watershed dominated by forests. Lower St Regis Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2002.

- Lower St. Regis Lake is a mesotrophic lake. The transparency depth and chlororphyll-a concentration have not exhibited any significant trends since 2002. However, the total phosphorus concentration has exhibited a significant downward trend at a rate of approximately  $1.0 \mu\text{g/L/year}$ .
- Water samples analyzed from 2016 were circumneutral in terms of their acidity. The alkalinity averaged  $15.0 \text{ mg/L}$  indicating low sensitivity to acid deposition. The alkalinity has exhibited a significant downward trend at a rate of approximately  $0.9 \text{ mg/L/year}$ .
- Sodium and chloride concentration were  $12.7$  and  $19.4 \text{ mg/L}$  respectively, indicating that the chemistry of the lake is highly influenced by the  $23 \text{ km}$  of roads in the watershed. The chloride concentration of the lake is greater than 88% of participating ALAP lakes.

# Middle Saranac Lake



<b>Location</b>	County:	Franklin
	Town:	Harrietstown
<b>Lake Characteristics</b>	Surface Area (ha):	572
	Shoreline Length (km):	18
	Max. Depth (m):	
	Volume (m <sup>3</sup> ):	
<b>Watershed Characteristics</b>	Flush rate (times/year):	
	Watershed Area (ha):	24007
	Surface water (%):	22
	Deciduous Forest (%):	28
	Evergreen Forest (%):	30
	Mixed Forest (%):	6
	Wetlands (%):	10
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	30
	State Roads (km):	34

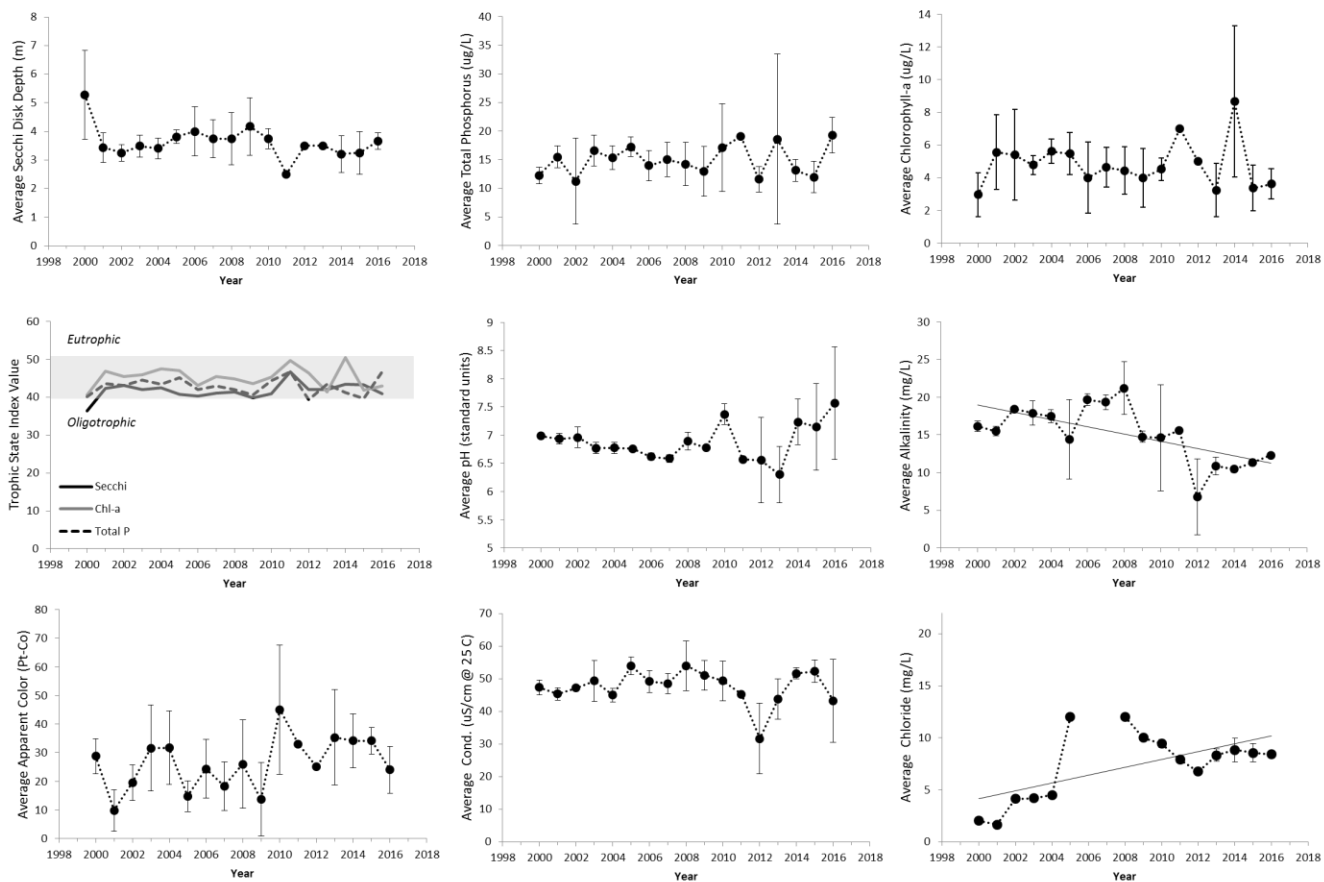
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Middle Saranac Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/19/2016	7/12/2016	8/15/2016		
Transparency (m)	3.5	4.0	3.5	3.7	No change
Total Phosphorus (µg/L)	18.0	22.8	17.0	19.3	No change
Chlorophyll- <i>a</i> (µg/L)	2.6	4.0	4.3	3.6	No change
Laboratory pH	6.8	7.2	8.7	7.6	No change
Sp. Conductance (µS/cm)	50.9	50.4	28.6	43.3	No change
Color (Pt-Co)	25.8	31.1	15.0	24.0	No change
Alkalinity (mg/L)	12.3			12.3	Decreasing
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	8.4			8.4	Increasing
Calcium (mg/L)	3.9			3.9	Not analyzed
Sodium (mg/L)	5.0			5.0	No change

\*See table of content for description of water quality indicators

# Middle Saranac Lake – Time Series



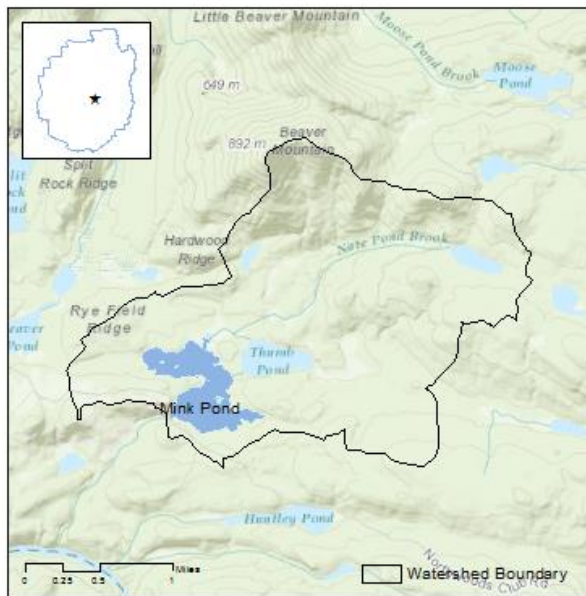
Annual average values of select water quality indicators for Middle Saranac Lake, 2000-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Middle Saranac Lake is a 572 ha lake located in Franklin County in the Town of Harrietstown. The lake is located within a 24,000 ha watershed dominated by forests. Middle Saranac Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2000.

- Middle Saranac Lake is a stable mesotrophic lake. The transparency depths as well as the total phosphorus and chlorophyll concentrations have not exhibited any significant trend since 2000.
- Water samples analyzed from 2016 were circumneutral in terms of their acidity. The alkalinity was 12.3 mg/L indicating low sensitivity to acid deposition. The alkalinity has exhibited a significant down ward trend at a rate of approximately 0.5 mg/L/year.
- Sodium and chloride concentration were 5.0 and 8.4 mg/L respectively, indicating that the chemistry of the lake is influenced by the 64 km of roads in the watershed. Chloride concentration has exhibited a significant trend since 2000, increasing at a rate of approximately 0.4 mg/L/year. This trend is driven largely by low concentrations observed 2000-2004. Our methodology for analyzing chloride greatly improved in 2010 and chloride values have been fairly similar since then.

# Mink Pond



<b>Location</b>	County:	Essex
	Town:	Minerva
<b>Lake Characteristics</b>	Surface Area (ha):	56
	Shoreline Length (km):	9
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	-
	Flush rate (times/year):	-
<b>Watershed Characteristics</b>	Watershed Area (ha):	1024
	Surface water (%):	10
	Deciduous Forest (%):	54
	Evergreen Forest (%):	18
	Mixed Forest (%):	16
	Wetlands (%):	2
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	0
State Roads (km):	0	

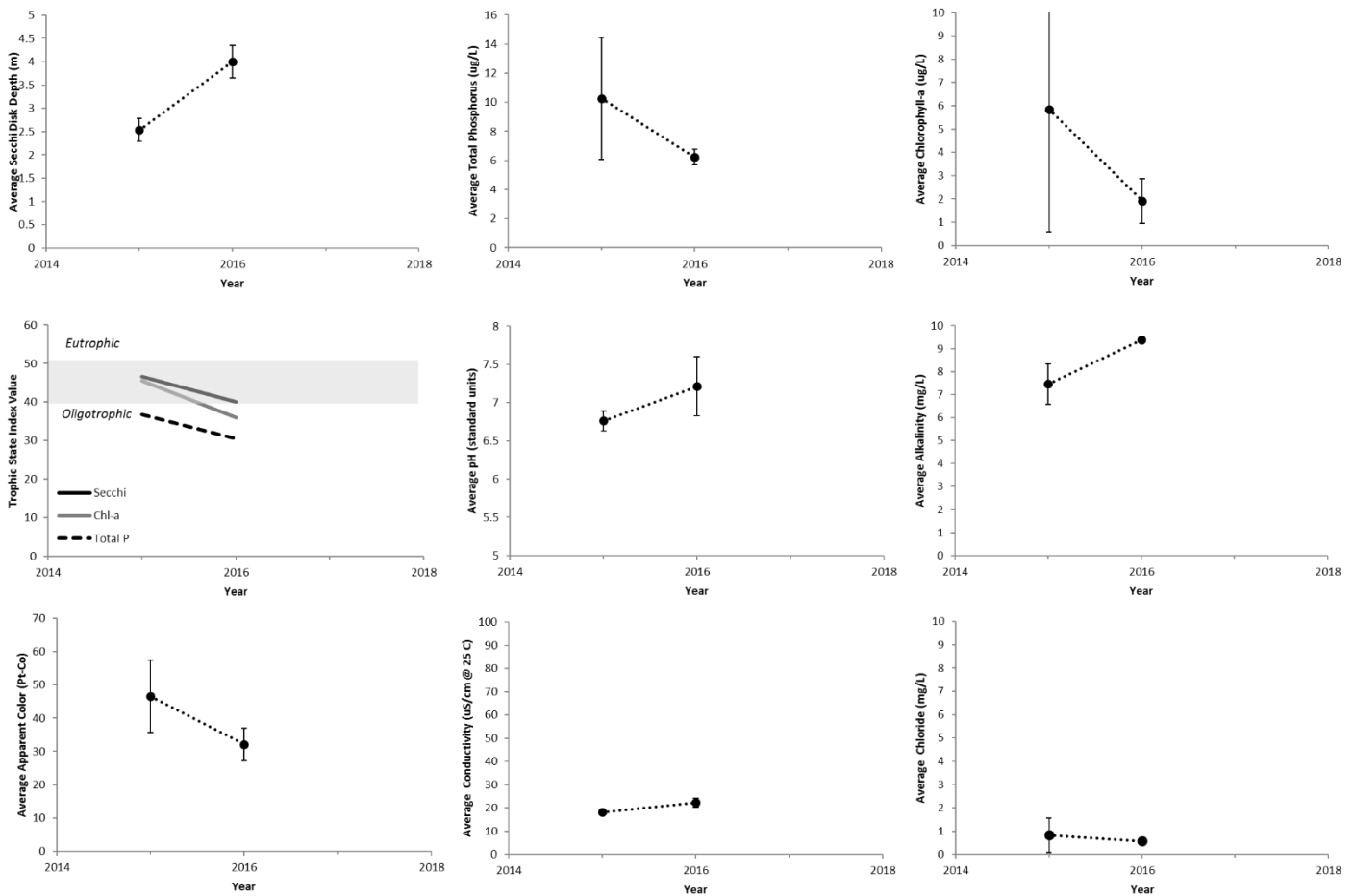
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Mink Pond during the 2016 sampling season. Trend analysis will be performed after five years of consecutive data collection. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	7/6/2016	8/5/2016	9/7/2016		
Transparency (m)	3.6	4.2	4.3	4.0	Not analyzed
Total Phosphorus (µg/L)	5.7	6.2	6.8	6.2	
Chlorophyll-a (µg/L)	2.0	0.9	2.8	1.9	
Laboratory pH	7.7	7.0	7.0	7.2	
Sp. Conductance (µS/cm)	24.3	20.7	21.7	22.2	
Color (Pt-Co)	27.9	31.1	37.5	32.1	
Alkalinity (mg/L)		9.4		9.4	
Nitrate-Nitrogen (µg/L)		BDL		BDL	
Chloride (mg/L)		0.6		0.6	
Calcium (mg/L)		3.1		3.1	
Sodium (mg/L)		0.8		0.8	

\*See table of content for description of water quality indicators

# Mink Pond – Time Series



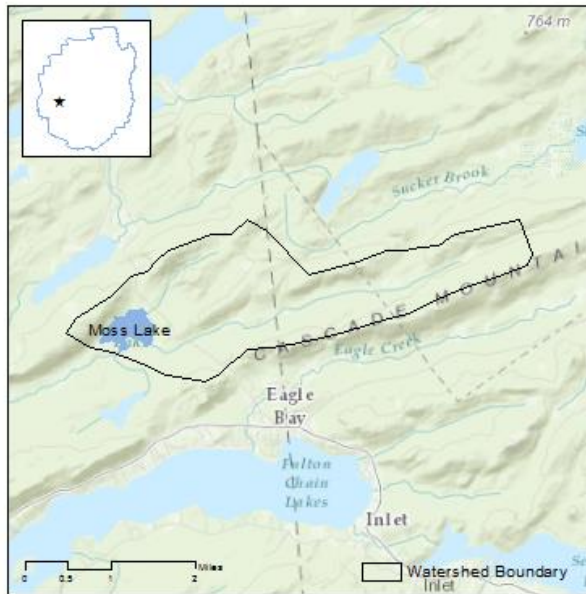
Annual average values of select water quality indicators for Moss Lake, 2005-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Mink Pond is a 56 ha pond located in Essex County in the Town of Minerva. The pond is located within a 1,024 ha watershed dominated by forests. This is Mink Ponds first year in ALAP. Trend analysis will be performed on water quality indicators after five years of data collection.

- Currently little data exists on the morphology of the pond.
- Mink Pond is best classified as an oligotrophic waterbody, bordering on mesotrophic
- The pH of the water samples received in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 9.4 mg/L, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 0.8 and 0.6 mg/L respectively; these values are within the range we would expect for a pond with no salted roads in the watershed.

# Moss Lake



<b>Location</b>	County:	Herkimer
	Town:	Webb
<b>Lake Characteristics</b>	Surface Area (ha):	49
	Shoreline Length (km):	4
	Max. Depth (m):	15.2
	Volume (m <sup>3</sup> ):	2597578
	Flush rate (times/year):	1.6
<b>Watershed Characteristics</b>	Watershed Area (ha):	1312
	Surface water (%):	9
	Deciduous Forest (%):	37
	Evergreen Forest (%):	4
	Mixed Forest (%):	9
	Wetlands (%):	38
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	2.7
State Roads (km):	0	

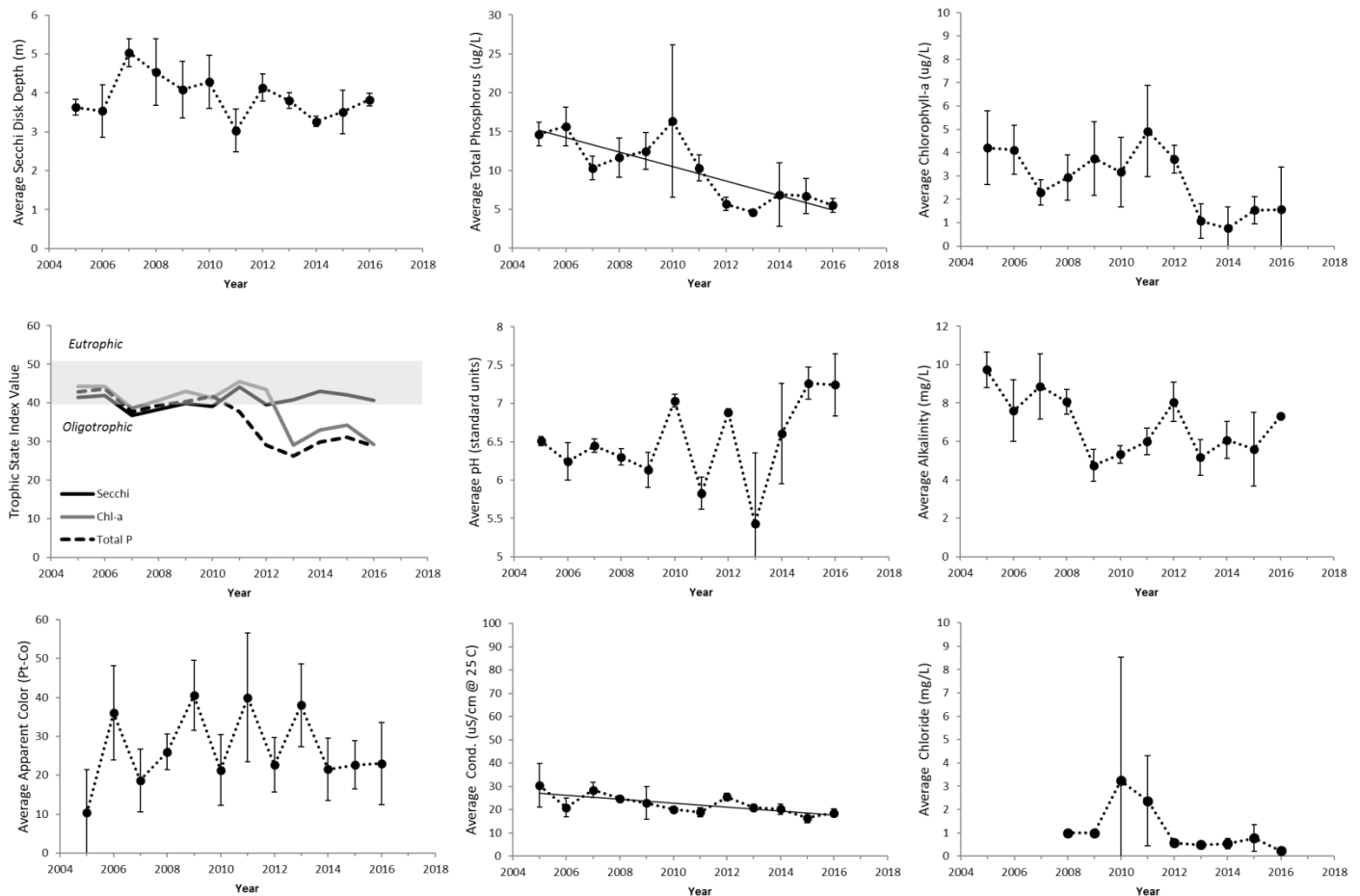
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Moss Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/23/2016	7/19/2016	8/24/2016		
Transparency (m)	3.9	3.9	3.6	3.8	No change
Total Phosphorus (µg/L)	6.5	5.4	4.7	5.5	Decreasing
Chlorophyll- <i>a</i> (µg/L)	0.9	0.2	3.6	1.6	No change
Laboratory pH	7.7	7.1	6.9	7.2	No change
Sp. Conductance (µS/cm)	17.3	20.4	17.9	18.5	Decreasing
Color (Pt-Co)	13.3	21.4	34.3	23.0	No change
Alkalinity (mg/L)			7.3	7.3	No change
Nitrate-Nitrogen (µg/L)			20.2	20.2	Not analyzed
Chloride (mg/L)	0.2			0.2	No change
Calcium (mg/L)	2.4			2.4	Not analyzed
Sodium (mg/L)	1.3			1.3	No change

\*See table of content for description of water quality indicators

# Moss Lake – Time Series



Annual average values of select water quality indicators for Moss Lake, 2005-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

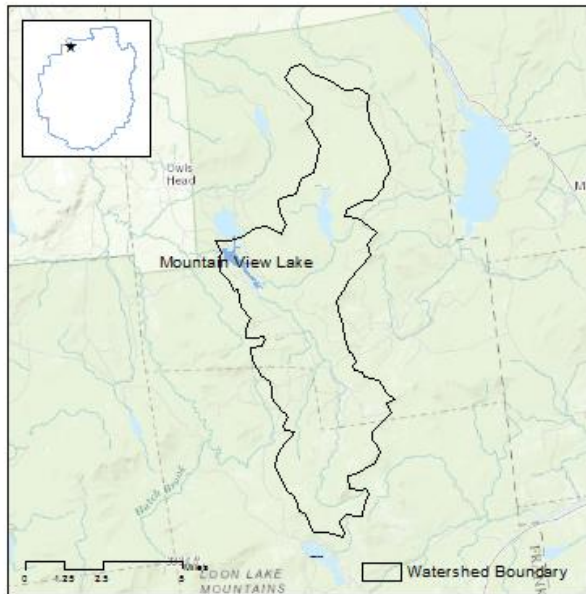
## Summary of Findings

Moss Lake is a 49 ha lake located in Herkimer County in the Town of Webb. The lake is located within a 1,312 ha watershed dominated by forests. Moss Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2005.

- Moss Lake is classified as oligotrophic based on phosphorus and chlorophyll concentrations. However, the secchi transparency is more indicative of a mesotrophic lake. A disparity of this nature is typically the result of elevated dissolved organic material or non-algal turbidity; since the watershed of Moss Lake is composed of 38% wetland, it is likely the former. Total phosphorus has exhibited a significant downward trend at a rate of approximately 0.9  $\mu\text{g/L/year}$ . Secchi transparency and chlorophyll-a have been variable, and exhibited no significant trend.
- The water sample analyzed in 2016 was found to be circumneutral in terms of its acidity. The alkalinity was 7.3 mg/L, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 1.3 and 0.2 mg/L, these values are within the range expected for lake with few roads in the watershed.



# Mountain View Lake



<b>Location</b>	County:	St Lawrence
	Town:	Hopkinton
<b>Lake Characteristics</b>	Surface Area (ha):	95
	Shoreline Length (km):	12
	Max. Depth (m):	2.7
	Volume (m <sup>3</sup> ):	542542
	Flush rate (times/year):	135.4
<b>Watershed Characteristics</b>	Watershed Area (ha):	11448
	Surface water (%):	5
	Deciduous Forest (%):	60
	Evergreen Forest (%):	12
	Mixed Forest (%):	2
	Wetlands (%):	16
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	12.8
State Roads (km):	0	

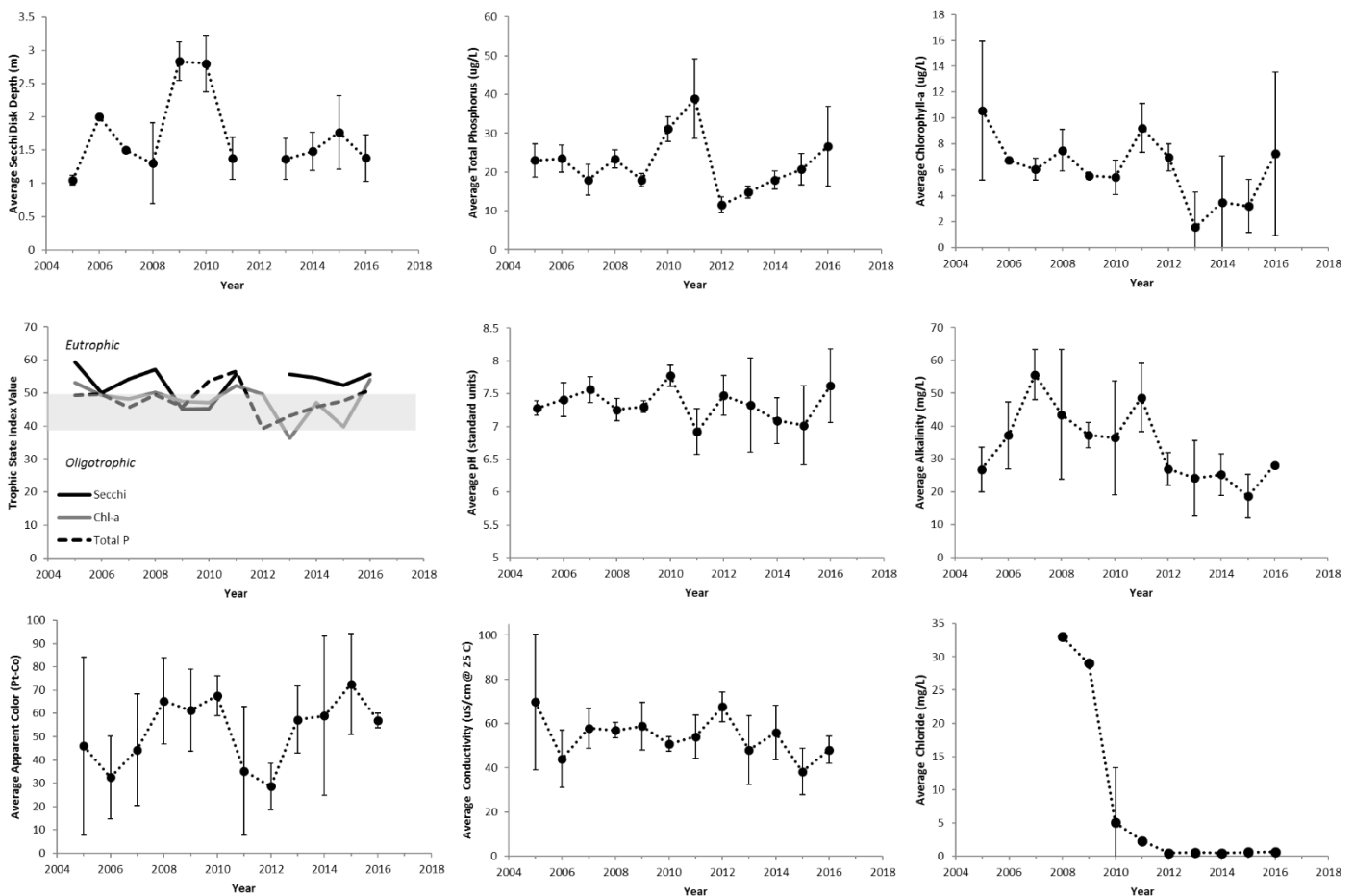
<b>Trophic State</b> Eutrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Well buffered- not sensitivity	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Mountain View Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/17/2016	7/20/2016	8/22/2016		
Transparency (m)	1.3	1.8	1.1	1.4	No change
Total Phosphorus (µg/L)	38.5	20.1	21.4	26.7	No change
Chlorophyll- <i>a</i> (µg/L)	11.2	0.0	10.6	7.2	No change
Laboratory pH	7.1	8.2	7.6	7.6	No change
Sp. Conductance (µS/cm)	41.1	50.8	52.4	48.1	No change
Color (Pt-Co)	53.9	60.2	56.8	57.0	No change
Alkalinity (mg/L)			28.1	28.1	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)			0.8	0.8	No change
Calcium (mg/L)			6.9	6.9	Not analyzed
Sodium (mg/L)			1.4	1.4	Decreasing

\*See table of content for description of water quality indicators

# Mountain View Lake – Time Series



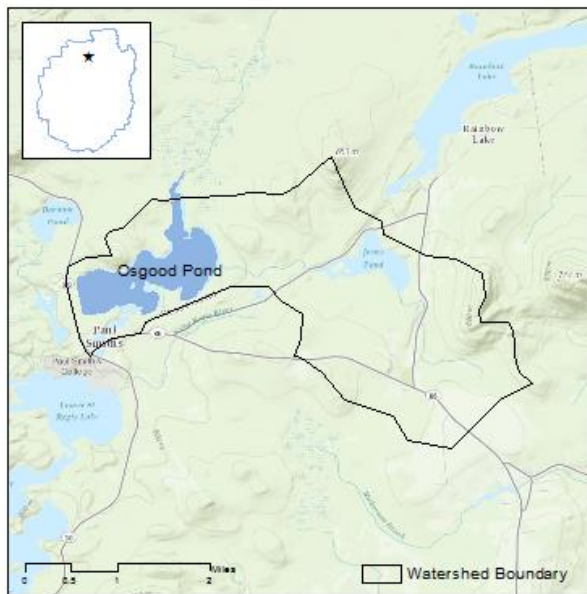
Annual average values of select water quality indicators for Mountain View Lake, 2005-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Mountain View Lake is a 95 ha lake located in Franklin County in the Town of Bellmont. The lake is located within a 11,448 ha watershed dominated by forests. Mountain View Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2005.

- Mountain View Lake is best classified as a eutrophic lake. Water quality indicators of the lake are highly variable within years and across years. This variability is probably related to the high flushing rate, estimated to be 135 times/year. The lake is highly colored, and as a result the transparency is relatively low. The color of the water averaged 57.0 Pt-Co units, greater than 98% of the participating ALAP lakes.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 28.1 mg/L, indicating low sensitivity to acid deposition.
- Sodium and chloride concentration were 1.4 and 0.8 mg/L respectively, indicating that the chemistry of the lake is not significantly influenced by road salt. Elevated chloride concentrations detected in 2008-2009 are almost certainly in error. Significant modification were made in our analytical method for chloride in 2011, since that time the chloride concentration has been relatively stable around 0.8 mg/l.

# Osgood Pond



<b>Location</b>	County:	Franklin
	Town:	Brighton

<b>Lake Characteristics</b>	Surface Area (ha):	108
	Shoreline Length (km):	12
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	8277728
	Flush rate (times/year):	1.4

<b>Watershed Characteristics</b>	Watershed Area (ha):	1871
	Surface water (%):	15
	Deciduous Forest (%):	22
	Evergreen Forest (%):	43
	Mixed Forest (%):	2
	Wetlands (%):	10
	Agricultural (%):	2
	Residential (%):	4
	Local Roads (km):	8.9
	State Roads (km):	4.7

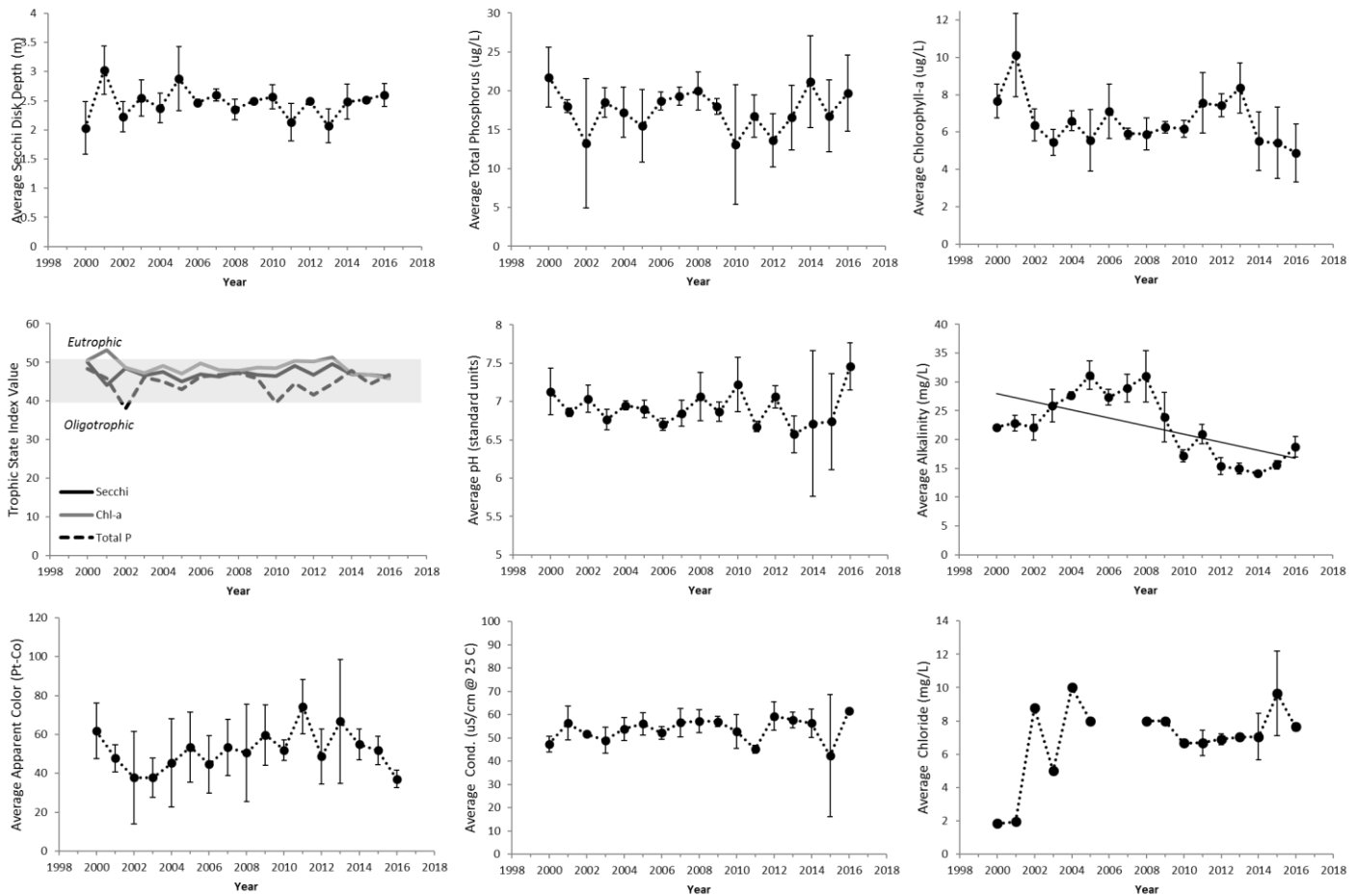
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Osgood Pond during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/10/2016	7/5/2016	8/9/2016		
Transparency (m)	2.4	2.6	2.8	2.6	No change
Total Phosphorus (µg/L)	25.0	18.8	15.3	19.7	No change
Chlorophyll- <i>a</i> (µg/L)	5.3	3.2	6.2	4.9	No change
Laboratory pH	7.2	7.8	7.4	7.5	No change
Sp. Conductance (µS/cm)	62.4	61.9	60.8	61.7	No change
Color (Pt-Co)	32.0	38.3	40.7	37.0	No change
Alkalinity (mg/L)	17.5			17.5	Decreasing
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	7.8			7.8	No change
Calcium (mg/L)	5.1			5.1	No change
Sodium (mg/L)	4.2			4.2	No change

\*See table of content for description of water quality indicators

# Osgood Pond – Time Series



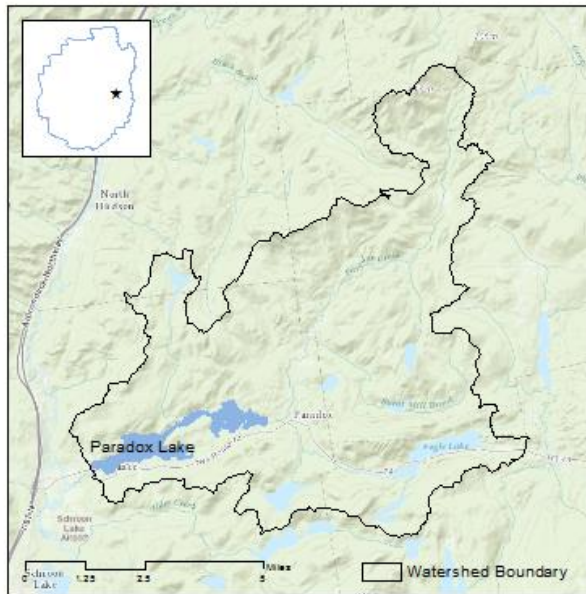
Annual average values of select water quality indicators for Osgood Pond, 2000-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Osgood Pond is a 108 ha lake located in Franklin County in the Town of Brighton. The lake is located within a 1,871 ha watershed dominated by forests. Osgood Pond has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2000.

- Osgood Pond is a mesotrophic lake; the trophic status has been fairly stable over the 17 years of monitoring. Transparency depth, chlorophyll-a, and total phosphorus concentration have not exhibited a positive or negative trends.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity, averaging 7.5 pH units. The alkalinity of the lake was 17.5 mg/L, indicating that the lake has low sensitivity to acid deposition. The alkalinity of Osgood Pond has exhibited a downward trend at a rate of approximately 0.7 mg/L/year.
- Sodium and chloride concentrations of the lake were 4.2 and 7.8 mg/L respectively. These values indicate that the chemistry of the lake is moderately influenced by the 13.6 km of roads in the watershed. Low chloride concentrations recorded in 2000 and 2001 are likely an error. Chloride methodology was greatly improved in 2010.

# Paradox Lake



<b>Location</b>	County:	Essex
	Town:	Schroon
<b>Lake Characteristics</b>	Surface Area (ha):	377
	Shoreline Length (km):	23
	Max. Depth (m):	18.5
	Volume (m <sup>3</sup> ):	28745000
	Flush rate (times/year):	0.4
<b>Watershed Characteristics</b>	Watershed Area (ha):	11978
	Surface water (%):	8
	Deciduous Forest (%):	21
	Evergreen Forest (%):	42
	Mixed Forest (%):	20
	Wetlands (%):	7
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	34
State Roads (km):	16.4	

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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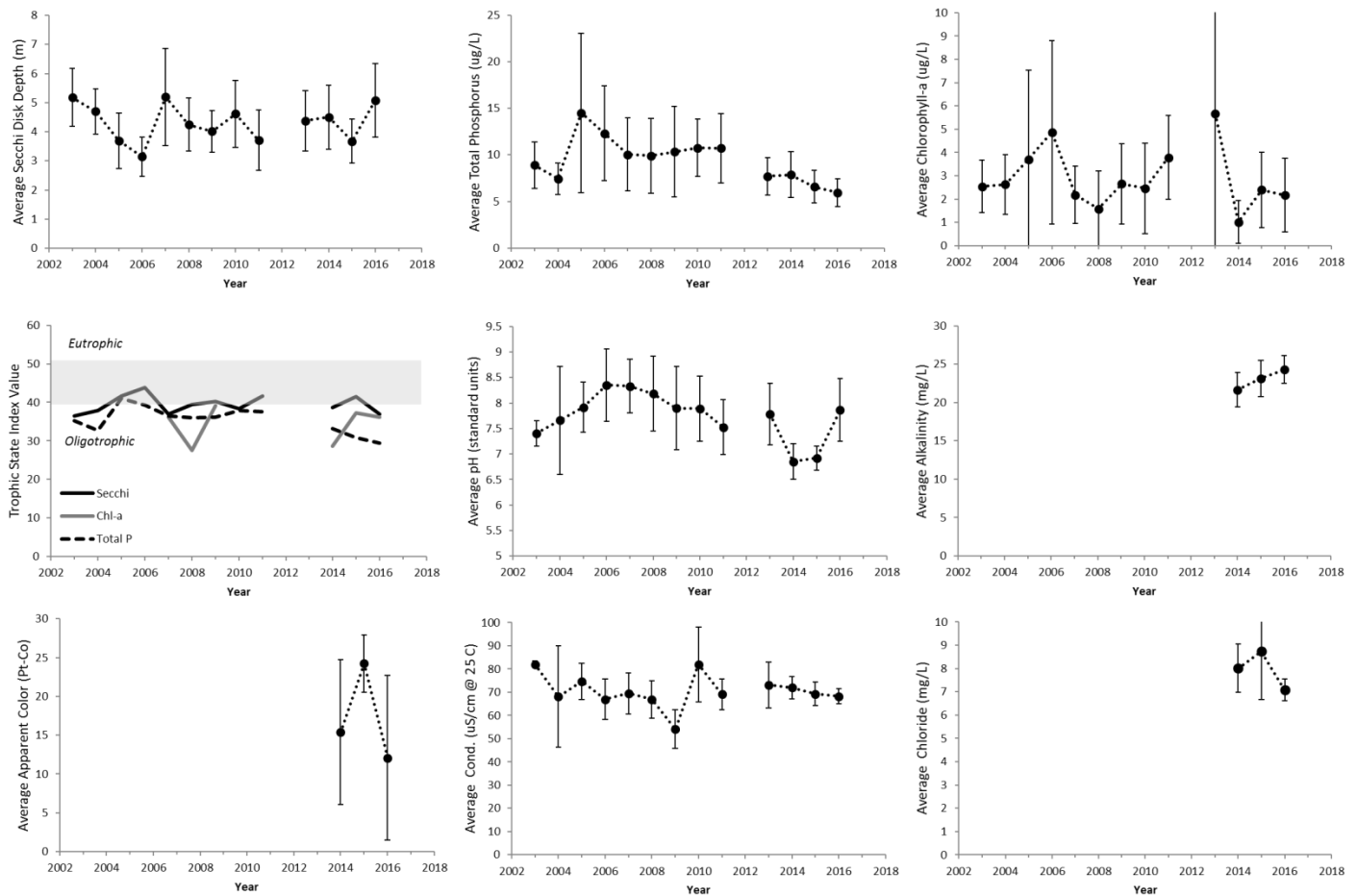
Water quality values and historical trends for Paradox Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date					Average	Trend
	5/21	6/25	7/22	8/23	9/17		
	<i>Upper Basin</i>						
Transparency (m)	4.0	4.0	4.5	4.5	3.5	4.1	No change
Total Phosphorus (µg/L)	6.6	5.3	6.3	8.2	8.2	6.9	No change
Chlorophyll- <i>a</i> (µg/L)	2.0	2.7	2.0	3.1	6.1	3.1	No change
Laboratory pH	6.9	7.6	7.9	8.4	7.6	7.7	No change
Sp. Cond. (µS/cm)	62.7	71.5	67.7	68.8	73.8	68.9	No change
Color (Pt-Co)	13.3	16.4	24.6	18.2	11.8	16.9	No change
Alkalinity (mg/L)			25.6			25.6	No change
Nitrate-Nitrogen (µg/L)	BDL					BDL	Not analyzed
Chloride (mg/L)	6.8					6.8	No change
Calcium (mg/L)	7.0					7.0	Not analyzed
Sodium (mg/L)	4.6					4.6	No change

Water Quality Indicator	Sampling Date					Average
	5/28	6/26	7/21	8/24	9/19	
	<i>Lower Basin</i>					
Transparency (m)	6.0	4.4	6.9	6.1	6.9	6.0
Total Phosphorus (µg/L)	6.6	5.4	4.2	4.5	4.2	5.0
Chlorophyll- <i>a</i> (µg/L)	1.9	0.7	0.6	1.7	1.1	1.2
Laboratory pH	7.1	8.0	9.0	8.3	7.9	8.0
Sp. Cond. (µS/cm)	65.4	68.6	65.6	68.0	70.5	67.6
Color (Pt-Co)	7.1	7.1	18.2	18.2	BDL	±7.3
Alkalinity (mg/L)			23.0			23.0
Nitrate-Nitrogen (µg/L)	BDL					BDL
Chloride (mg/L)	7.3					7.3
Calcium (mg/L)	6.9					6.9
Sodium (mg/L)	5.1					5.1

\*See table of content for description of water quality indicators

# Paradox Lake– Time Series



Lake wide annual average values of select water quality indicators for Paradox Lake, 2003-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ). Data from 2003-2013 from CSLAP, Data from 2014-present from ALAP.

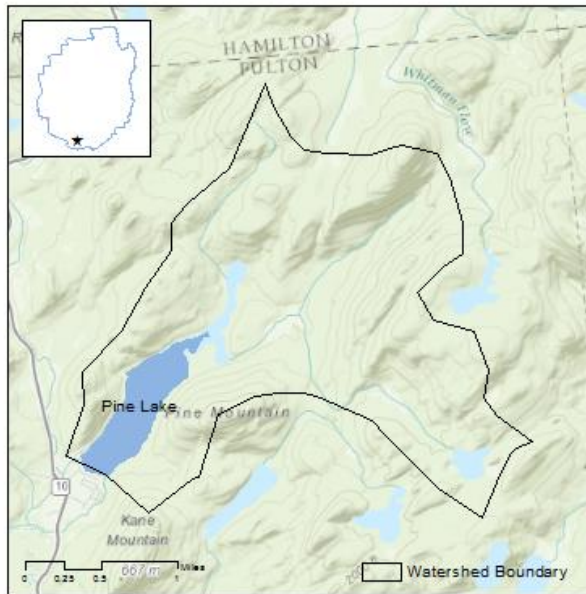
## Summary of Findings

Paradox Lake is a 377 ha lake located in Essex County in the Town of Schroon. The lake is located within an 11,978 ha watershed dominated by forests. This is the third year Paradox Lake is participating in ALAP, having been enrolled in CSLAP since 2003.

- Paradox Lake is an oligotrophic Lake. Transparency, total phosphorus, and chlorophyll-a have not exhibited any significant trends since monitoring began 1998.
- Water samples from 2016 were found to be circumneutral in terms of their acidity. Alkalinity averaged 24.3 mg/L, indicating that the lake is well buffered, and not sensitive to acid deposition.
- Sodium and chloride concentration averaged 4.9 and 7.0 mg/L in 2016, indicating the chemistry of the lake is influenced by the 50 km of roads in the watershed.
- Calcium concentration averaged 6.9 mg/l in 2016, greater than 82% of participating lakes.



# Pine Lake



<b>Location</b>	County:	Fulton
	Town:	Caroga
<b>Lake Characteristics</b>	Surface Area (ha):	67
	Shoreline Length (km):	5
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	2490981
	Flush rate (times/year):	3.5
<b>Watershed Characteristics</b>	Watershed Area (ha):	1129
	Surface water (%):	8
	Deciduous Forest (%):	49
	Evergreen Forest (%):	5
	Mixed Forest (%):	15
	Wetlands (%):	21
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	0.8
State Roads (km):	0	

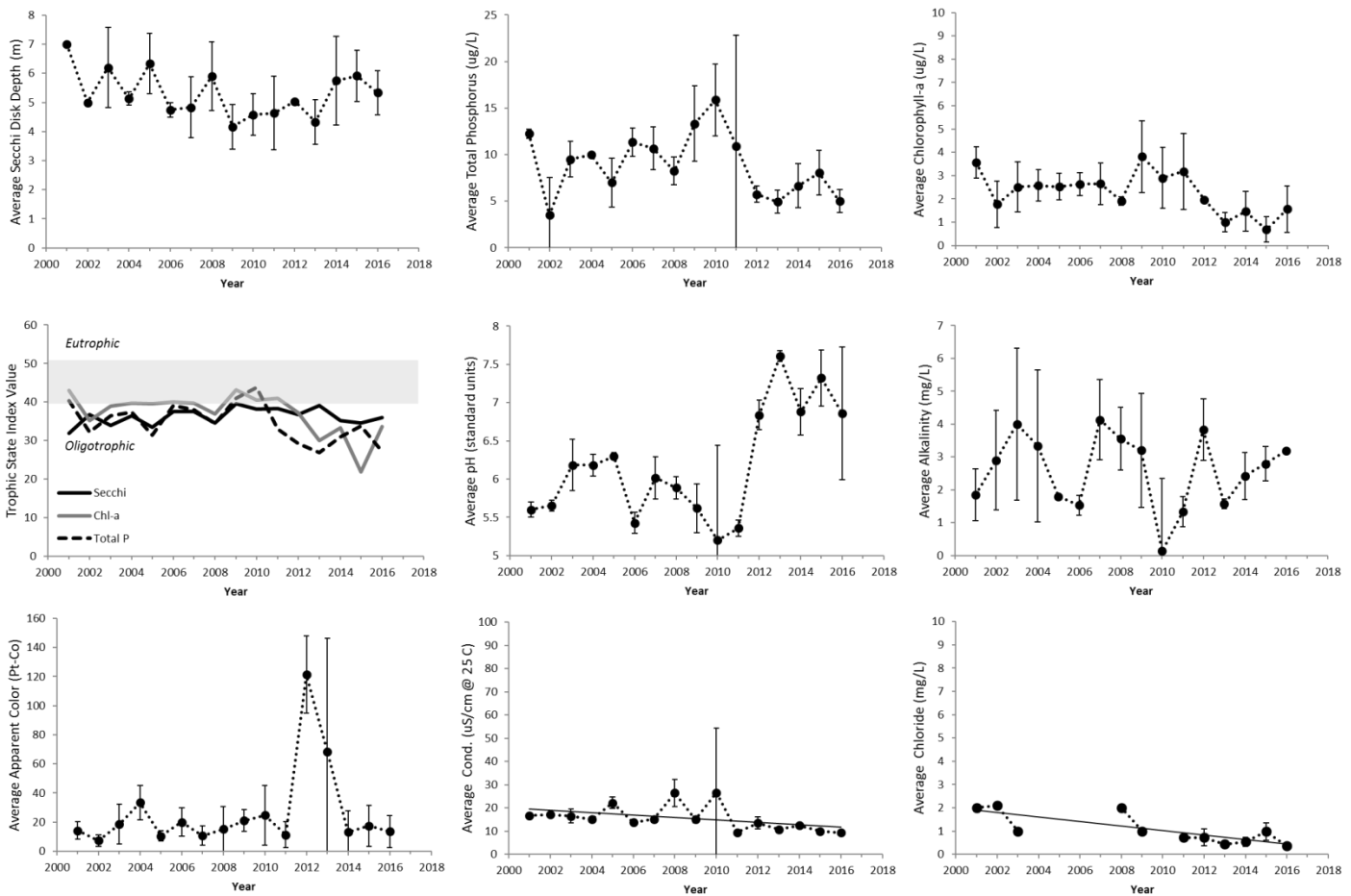
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Pine Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/21/2016	7/20/2016	8/24/2016		
Transparency (m)	4.5	6.0	5.5	5.3	No change
Total Phosphorus (µg/L)	6.4	4.3	4.4	5.0	No change
Chlorophyll-a (µg/L)	2.7	0.8	1.2	1.6	No change
Laboratory pH	7.9	6.3	6.4	6.9	No change
Sp. Conductance (µS/cm)	9.0	9.7	9.3	9.3	Decreasing
Color (Pt-Co)	0.8	21.4	18.2	13.5	No change
Alkalinity (mg/L)			3.2	3.2	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	0.4			0.4	Decreasing
Calcium (mg/L)	1.0			1.0	Not analyzed
Sodium (mg/L)	0.8			0.8	No change

\*See table of content for description of water quality indicators

# Pine Lake – Time Series



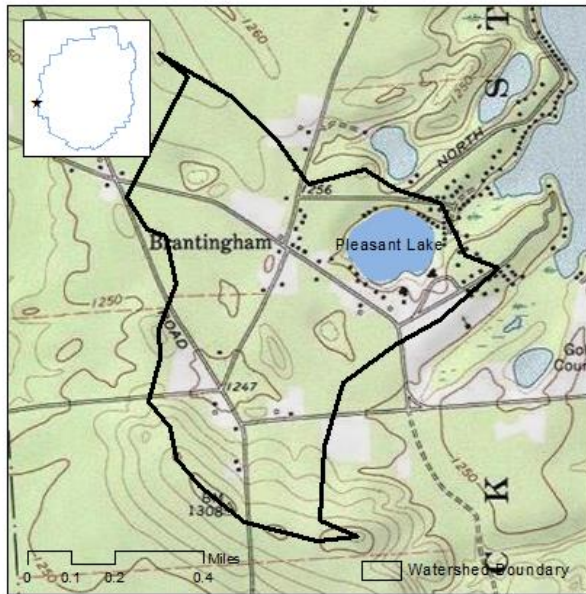
Annual average values of select water quality indicators for Pine Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Pine Lake is a 67 ha lake located in Fulton County in the Town of Caroga. The lake is located within a 1,129 ha watershed dominated by forests. Pine Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Pine Lake is an oligotrophic Lake. Transparency, total phosphorus, and chlorophyll-a have not exhibited any significant trends since monitoring began 2001. The secchi transparency of Pine Lake was greater than 70% of participating lakes.
- Water samples from 2016 were found to be circumneutral in terms of their acidity. Alkalinity was 3.2 mg/L, indicating that the lake has moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 0.8 and 0.4 mg/L in 2016, indicating the chemistry of the lake is not significantly influenced by road salt, in fact, chloride concentration has been trending down since 2001.

# Pleasant Lake



<b>Location</b>	County:	Lewis
	Town:	Greig

<b>Lake Characteristics</b>	Surface Area (ha):	6
	Shoreline Length (km):	1
	Max. Depth (m):	10.4
	Volume (m <sup>3</sup> ):	264475
	Flush rate (times/year):	0.9

<b>Watershed Characteristics</b>	Watershed Area (ha):	117
	Surface water (%):	6
	Deciduous Forest (%):	8
	Evergreen Forest (%):	59
	Mixed Forest (%):	3
	Wetlands (%):	3
	Agricultural (%):	0
	Residential (%):	3
	Local Roads (km):	4.3
	State Roads (km):	0

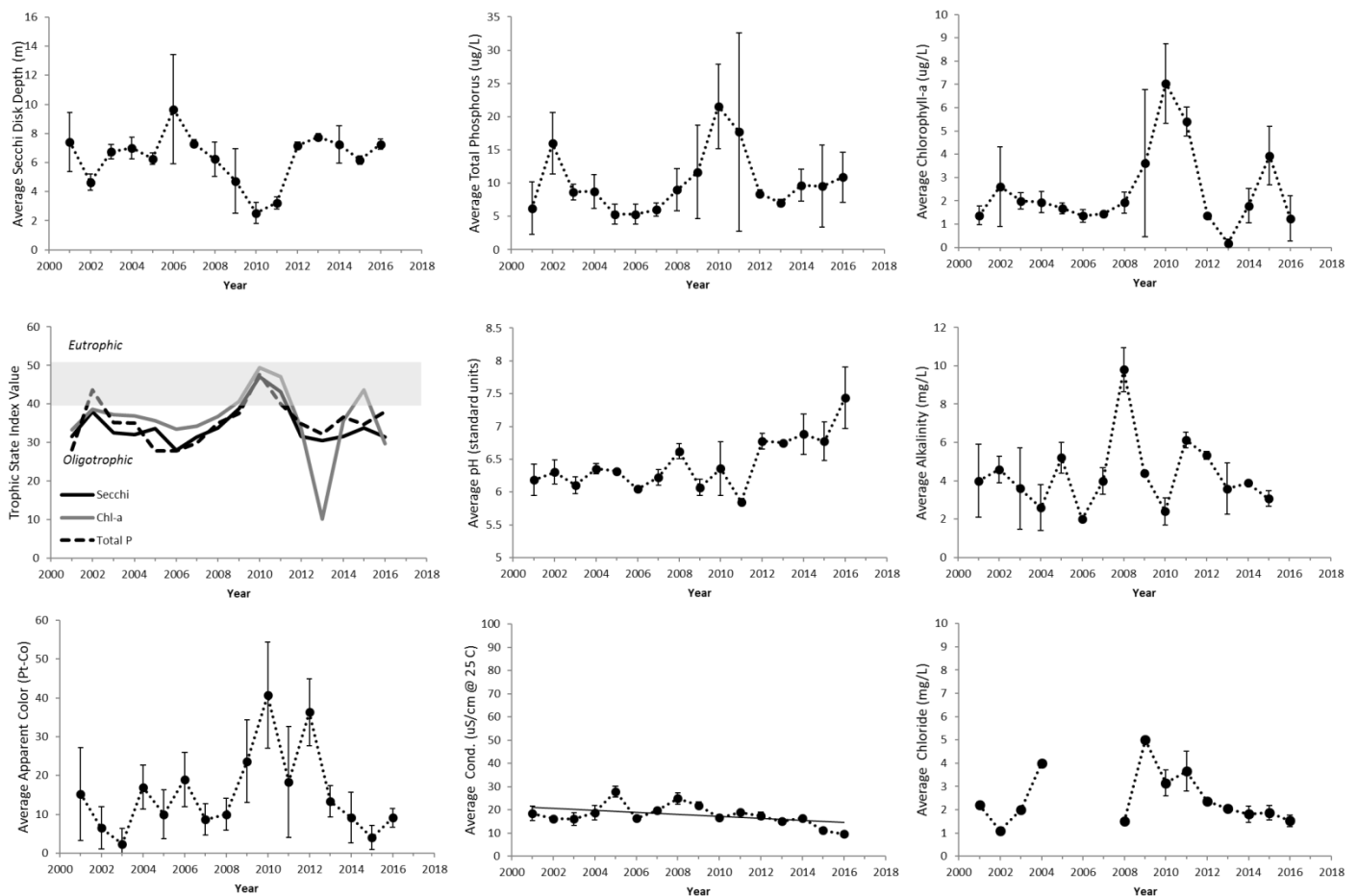
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> No 2016 Data	<b>Road Salt Influence</b> Present - Low
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Water quality values and historical trends for Pleasant Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/22/2016	7/19/2016	8/19/2016		
Transparency (m)		7.5	7.0	7.3	No change
Total Phosphorus (µg/L)	15.2	9.3	8.2	10.9	No change
Chlorophyll- <i>a</i> (µg/L)	0.3	1.2	2.2	1.2	No change
Laboratory pH	7.0	7.9	7.4	7.4	No change
Sp. Conductance (µS/cm)	9.3	8.7	10.9	9.6	Decreasing
Color (Pt-Co)	7.1	8.6	11.8	9.1	No change
Alkalinity (mg/L)					No change
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	1.4			1.4	No change
Calcium (mg/L)	1.2			1.2	Not analyzed
Sodium (mg/L)	1.1			1.1	No change

\*See table of content for description of water quality indicators

# Pleasant Lake – Time Series



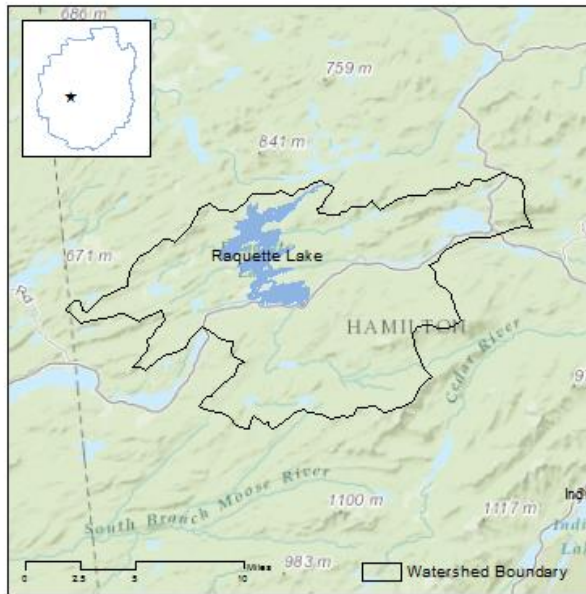
Annual average values of select water quality indicators for Pleasant Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Pleasant Lake is a 6 ha lake located in Lewis County in the Town of Greig. The lake is located within a 108 ha watershed dominated by forests. Pleasant Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1999.

- Pleasant Lake is an oligotrophic lake. Trophic indicators have been variably since 2001 and have exhibited no positive or negative trend.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity, averaging 7.4 pH units. We are unable to report alkalinity for 2016 due to a laboratory error. The alkalinity averaged 3.1 mg/L in 2015, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 1.1 and 1.4 mg/L respectively, indicating that the chemistry of the lake is influenced by the 4.3km of roads in the watershed, but the influence is relatively low.

# Raquette Lake



<b>Location</b>	County:	Hamilton
	Town:	Long Lake

<b>Lake Characteristics</b>	Surface Area (ha):	2183
	Shoreline Length (km):	78
	Max. Depth (m):	29
	Volume (m <sup>3</sup> ):	285759848
	Flush rate (times/year):	0.91

<b>Watershed Characteristics</b>	Watershed Area (ha):	33147
	Surface water (%):	12
	Deciduous Forest (%):	32
	Evergreen Forest (%):	20
	Mixed Forest (%):	7
	Wetlands (%):	26
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	26.8
	State Roads (km):	31.1

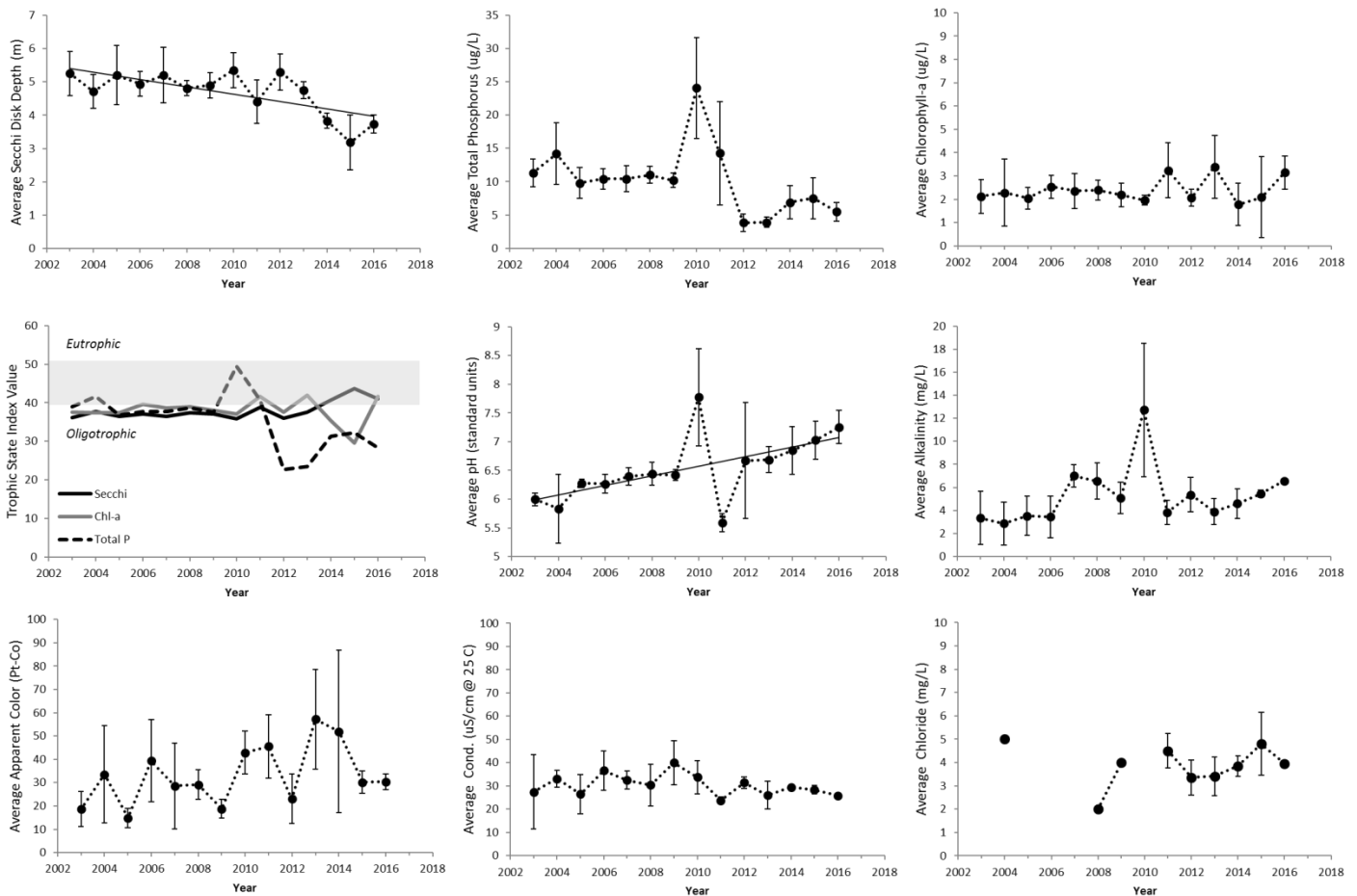
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present- low
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Water quality values and historical trends for Raquette Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/24/2016	7/19/2016	8/22/2016		
Transparency (m)	4.0	3.5	3.7	3.7	Decreasing
Total Phosphorus (µg/L)	5.8	6.7	3.9	5.5	No change
Chlorophyll- <i>a</i> (µg/L)	2.3	3.6	3.5	3.1	No change
Laboratory pH	7.6	7.2	7.0	7.3	Increasing
Sp. Conductance (µS/cm)	25.5	25.7	26.2	25.8	No change
Color (Pt-Co)	28.9	34.3	27.9	30.4	No change
Alkalinity (mg/L)			6.6	6.6	No change
Nitrate-Nitrogen (µg/L)			6.4	6.4	Not analyzed
Chloride (mg/L)	4.0			4.0	No change
Calcium (mg/L)	2.2			2.2	Not analyzed
Sodium (mg/L)	3.1			3.1	No change

\*See table of content for description of water quality indicators

# Raquette Lake – Time Series



Annual average values of select water quality indicators for Raquette Lake, 2003-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Raquette Lake is a 2,183 ha lake located in Hamilton County in the Town of Long Lake. The lake is located within a 33,147 ha watershed dominated by forests. Raquette Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2003.

- The trophic state of Raquette Lake is classified as oligotrophic based on total phosphorus. However, the transparency depth and chlorophyll-a concentration are more indicative of a mesotrophic state. The trophic status of the lake is typically near the oligotrophic-mesotrophic boundary. We detected a downward trend in transparency at a rate of approximately 11 cm per year.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity, averaging 7.3 pH units. The pH of the lake has exhibited a slight increasing trend at a rate of approximately 0.08 pH units/year. The alkalinity of the lake was 6.6 mg/L, indicating that the lake has moderate sensitivity to acid deposition.
- Sodium and chloride concentrations of the lake were 3.1 and 4.0 mg/L respectively. These values indicate that the chemistry of the lake is moderately influenced by the 68 km of roads in the watershed.



# Rich Lake



Location	County:	Essex
	Town:	Newcomb

Lake Characteristics	Surface Area (ha):	154
	Shoreline Length (km):	11
	Max. Depth (m):	19.8
	Volume (m <sup>3</sup> ):	12860840
	Flush rate (times/year):	10

Watershed Characteristics	Watershed Area (ha):	16883
	Surface water (%):	6
	Deciduous Forest (%):	56
	Evergreen Forest (%):	18
	Mixed Forest (%):	7
	Wetlands (%):	11
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	0.8
	State Roads (km):	17

Trophic State	Acidity	Acid Neutralizing Capacity	Road Salt Influence
Oligotrophic	Circumneutral	Adequate – Low sensitivity	Present - Low

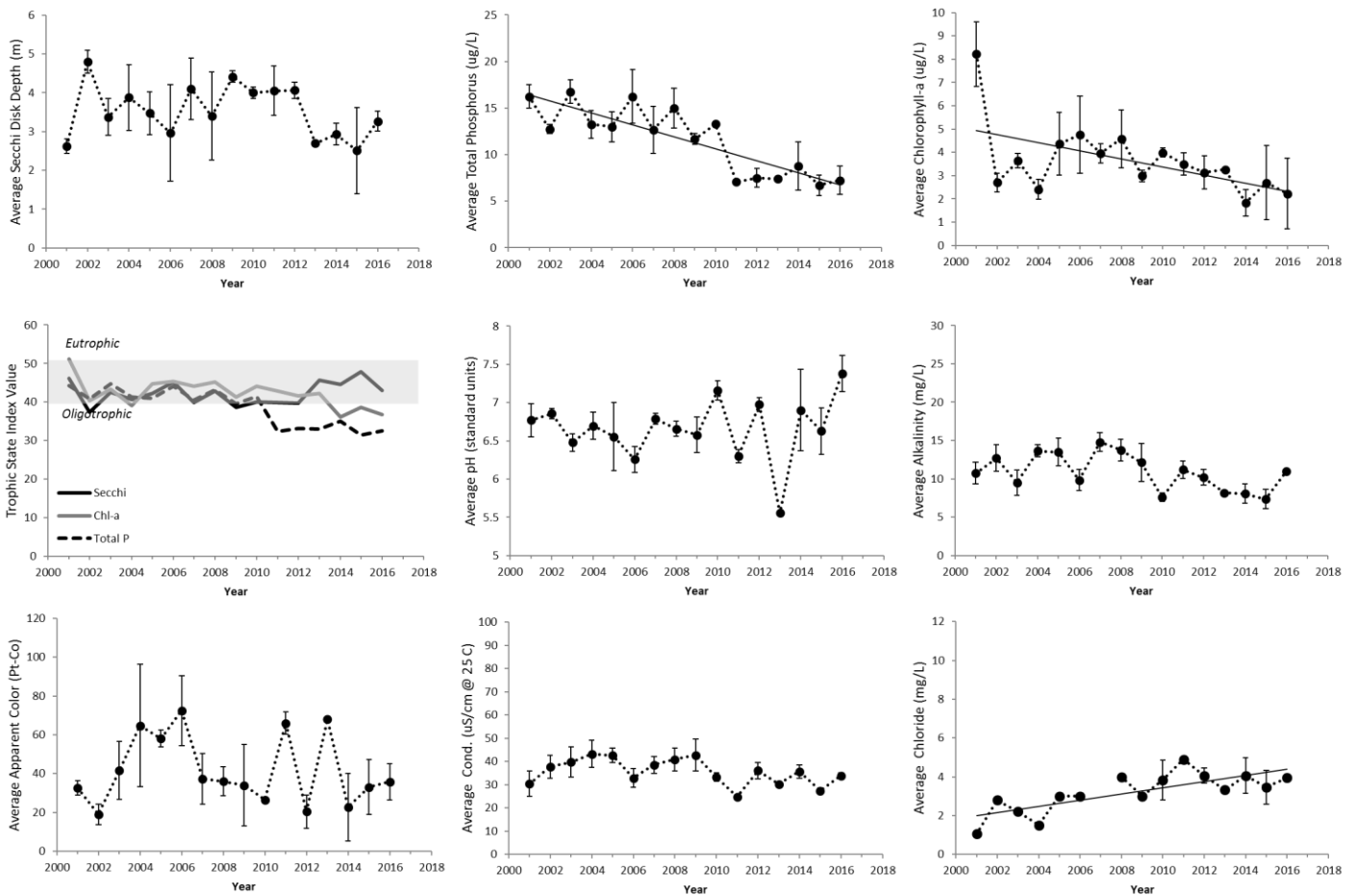
Water quality values and historical trends for Rich Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/24/2016	7/23/2016	8/24/2016		
Transparency (m)	3.6	3.1	3.2	3.3	No change
Total Phosphorus (µg/L)	5.6	8.5	7.7	7.3	Decreasing
Chlorophyll- <i>a</i> (µg/L)	1.9	0.9	3.9	2.2	Decreasing
Laboratory pH	7.4	7.6	7.1	7.4	No change
Sp. Conductance (µS/cm)	32.4	34.4	34.7	33.8	No change
Color (Pt-Co)	25.8	43.9	37.5	35.7	No change
Alkalinity (mg/L)			11.0	11.0	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	4.0			4.0	Increasing
Calcium (mg/L)	3.4			3.4	Not analyzed
Sodium (mg/L)	3.9			3.9	No change

\*See table of content for description of water quality indicators



# Rich Lake – Time Series



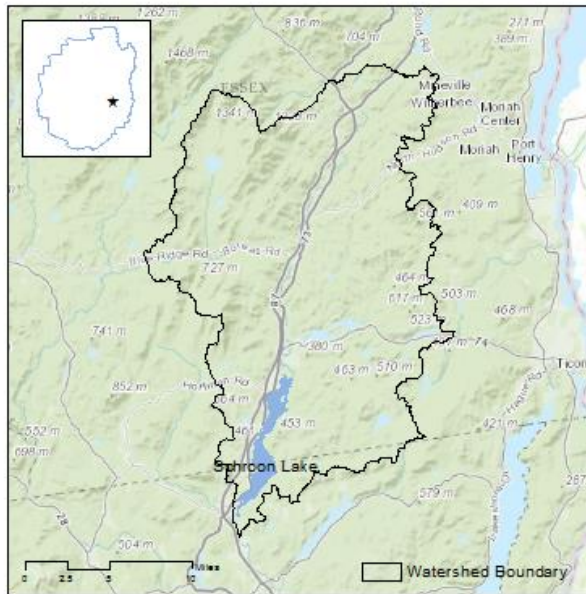
Annual average values of select water quality indicators for Rich Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Rich Lake is a 154 ha lake located in Essex County in the Town of Newcomb. The lake is located within a 16,883 ha watershed dominated by forests. Rich Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1999.

- Rich Lake is an oligotrophic lake, bordering on mesotrophic. Total phosphorus has exhibited a significant downward trend at a rate of approximately 0.65  $\mu\text{g/L/year}$ . Chlorophyll-a has also demonstrated a significant downward trend at a rate of 0.2  $\mu\text{g/L/year}$
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 11.0 mg/L, indicating adequate acid neutralizing capacity and relatively low sensitivity to acid deposition.
- Sodium and chloride concentration were 3.9 and 4.0 mg/L respectively, indicating that the chemistry of the lake is influenced by the 18 km of roads in the watershed, but that influence is relatively low. We detected an increasing trend in chloride concentration at a rate of approximately 0.2 mg/L/year.

# Schroon Lake



<b>Location</b>	County:	Warren
	Town:	Horicon
<b>Lake Characteristics</b>	Surface Area (ha):	1722
	Shoreline Length (km):	53
	Max. Depth (m):	46.4
	Volume (m <sup>3</sup> ):	276623312
	Flush rate (times/year):	2.5
<b>Watershed Characteristics</b>	Watershed Area (ha):	81866
	Surface water (%):	5
	Deciduous Forest (%):	30
	Evergreen Forest (%):	37
	Mixed Forest (%):	17
	Wetlands (%):	8
	Agricultural (%):	0
	Residential (%):	2
	Local Roads (km):	167.8
State Roads (km):	160.7	

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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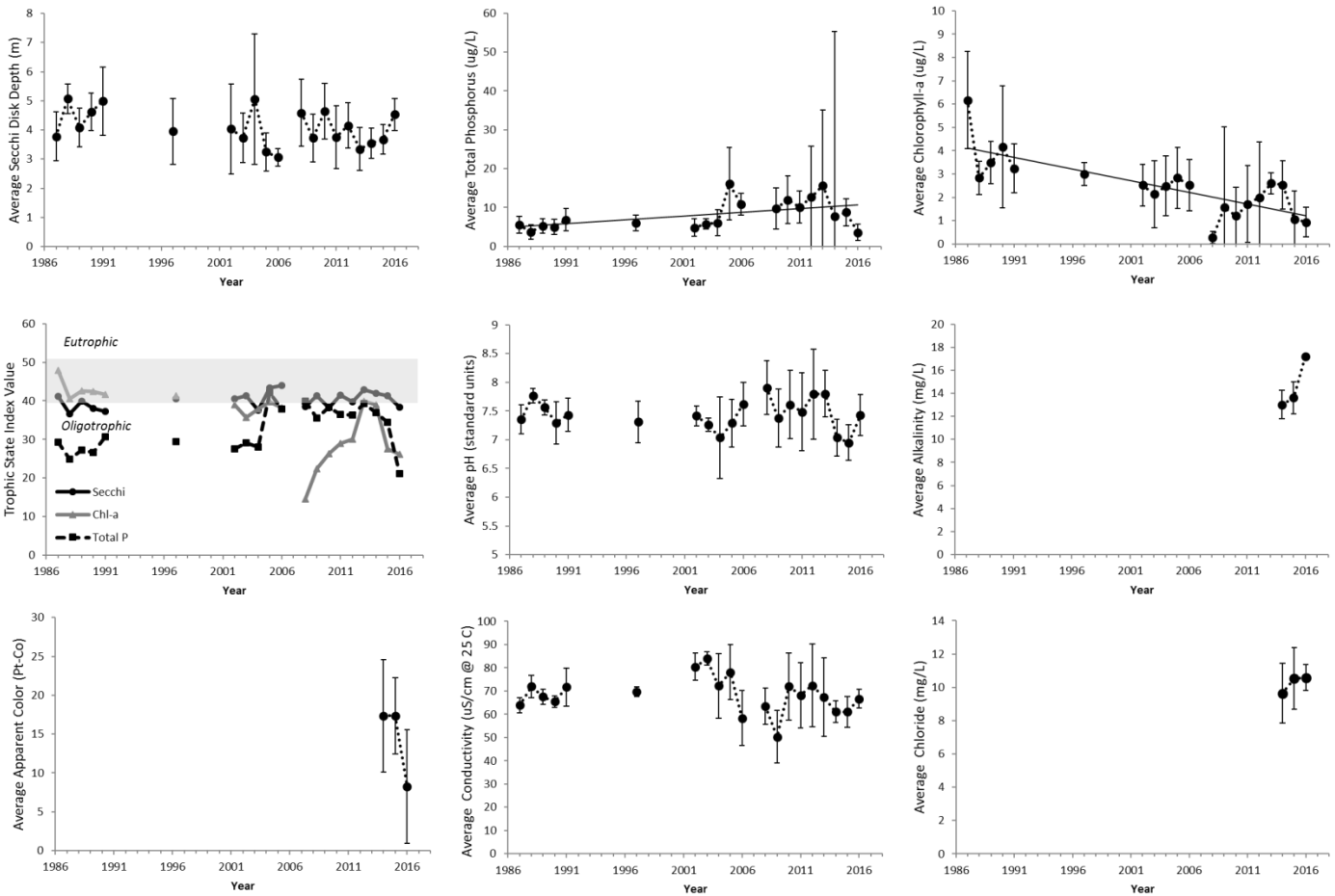
Water quality values and historical trends for Schroon Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date					Average	Trend
	5/27	6/23	7/13	Aug.	9/20		
<i>North Basin</i>							
Transparency (m)	4.4	4.4	5.4		3.9	4.5	No change
Total Phosphorus (µg/L)	9.0	2.8	3.4		3.7	4.7	Increasing
Chlorophyll- <i>a</i> (µg/L)	BDL	0.9	1.5		0.5	0.7	Decreasing
Laboratory pH	6.7	7.6	7.2		7.4	7.2	No change
Sp. Cond. (µS/cm)	62.5	64.6	70.9	No Sample	69.3	66.8	No change
Color (Pt-Co)	4.0	7.1	8.6		2.1	5.4	No change
Alkalinity (mg/L)					17.1	17.1	No change
Nitrate-Nitrogen (µg/L)					2.6	2.6	Not analyzed
Chloride (mg/L)			11.9			11.9	No change
Calcium (mg/L)		5.3				5.3	Not analyzed
Sodium (mg/L)		7.0				7.0	No change

Water Quality Indicator	Sampling Date					Average
	5/27	6/23	7/13	8/24	9/20	
	<i>South Basin</i>					
Transparency (m)	4.5	4.1	5.0	5.3	4.0	4.6
Total Phosphorus (µg/L)	3.9	2.5	3.0	1.9	2.3	2.7
Chlorophyll- <i>a</i> (µg/L)	0.3	1.1	1.1	2.1	0.8	1.1
Laboratory pH	7.8	7.6	7.4	7.3	7.9	7.6
Sp. Cond. (µS/cm)	62.0	62.8	67.0	67.4	73.3	66.5
Color (Pt-Co)	4.0	7.1	24.6	15.0	2.1	10.6
Alkalinity (mg/L)				17.3		17.3
Nitrate-Nitrogen (µg/L)				BDL		BDL
Chloride (mg/L)			11.0			11.0
Calcium (mg/L)		5.0				5.0
Sodium (mg/L)		6.9				6.9

\*See table of content for description of water quality indicators

# Schroon Lake– Time Series



Lake wide annual average values of select water quality indicators for Schroon Lake, 1985-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ). Data from 1987-2013 form CSLAP, data from 2014-present from ALAP.

## Summary of Findings

Schroon Lake is a 1,722 ha lake located within an 81,866 ha watershed dominated by forests. This is the third year Schroon Lake is participating in ALAP, having been enrolled in CSLAP periodically since 1987.

- Schroon Lake is an oligotrophic Lake. Total phosphorus has exhibited an increasing trend at a rate of approximately 0.2  $\mu\text{g/L/year}$ . Chlorophyll-a concentration has exhibited a slight downward trend at a rate of approximately 0.1  $\mu\text{g/L/year}$ .
- Water samples from 2016 were found to be circumneutral in terms of their acidity. Alkalinity averaged 17.2 mg/L, indicating that the lake is well buffered, and not sensitive to acid deposition.
- Sodium and chloride concentration averaged 7.0 and 11.5 mg/L in 2016, indicating the chemistry of the lake is influenced by the 329 km of roads in the watershed. The chloride concentration of Schroon greater than 76% of the lakes participating in ALAP.

# Silver Lake



<b>Location</b>	County:	Clinton
	Town:	Black Brook
<b>Lake Characteristics</b>	Surface Area (ha):	324
	Shoreline Length (km):	11
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	25613064
	Flush rate (times/year):	0.3
<b>Watershed Characteristics</b>	Watershed Area (ha):	1245
	Surface water (%):	28
	Deciduous Forest (%):	44
	Evergreen Forest (%):	14
	Mixed Forest (%):	9
	Wetlands (%):	3
	Agricultural (%):	0
	Residential (%):	3
	Local Roads (km):	5.5
State Roads (km):	0	

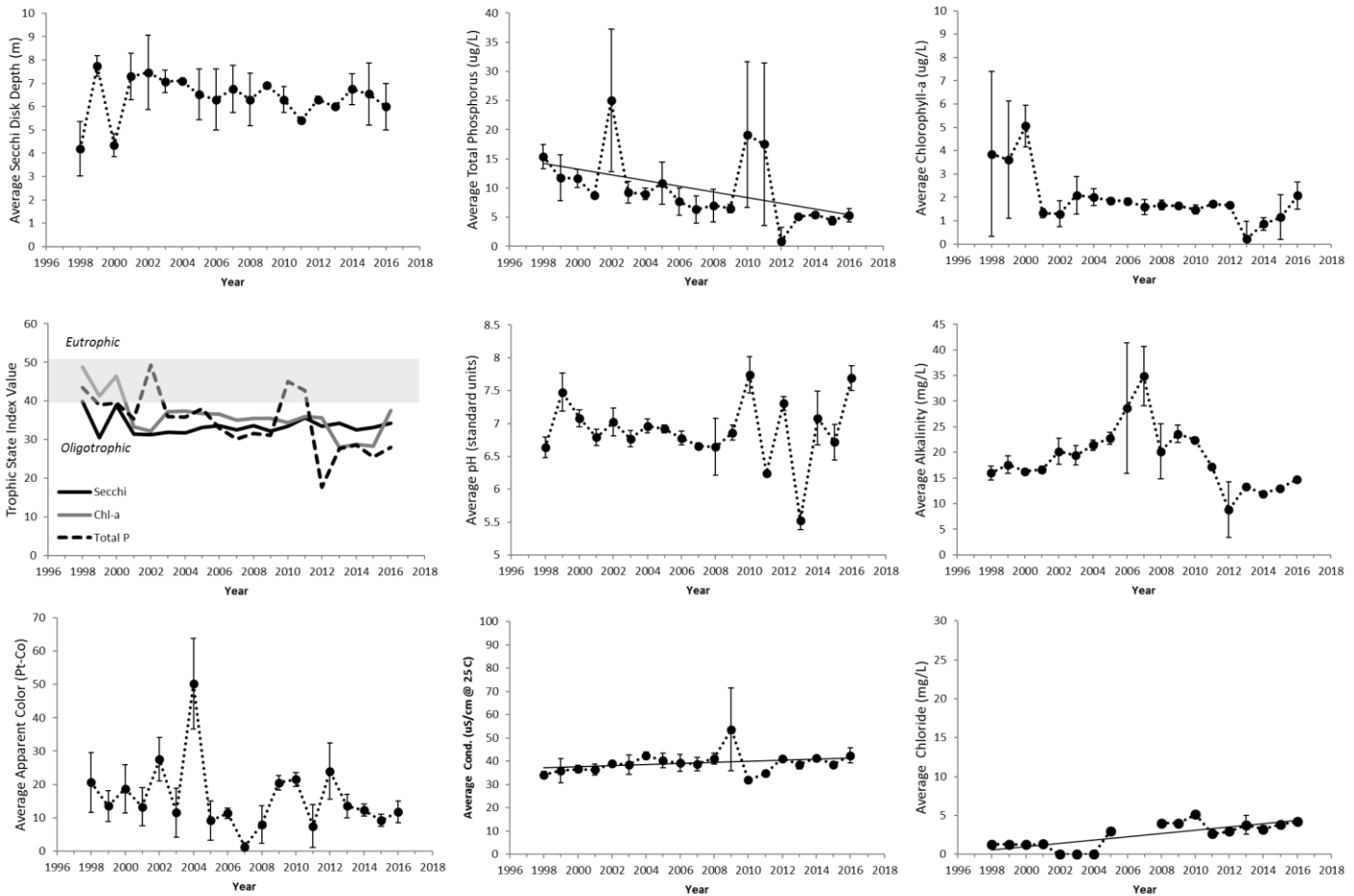
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Present- low
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Water quality values and historical trends for Silver Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/22/2016	7/12/2016	8/23/2016		
Transparency (m)	6.0	7.0	5.0	6.0	No change
Total Phosphorus (µg/L)	4.2	6.5	5.3	5.3	Decreasing
Chlorophyll- <i>a</i> (µg/L)	1.9	1.6	2.7	2.1	No change
Laboratory pH	7.7	7.8	7.5	7.7	No change
Sp. Conductance (µS/cm)	45.6	42.7	39.1	42.5	Increasing
Color (Pt-Co)	15.0	8.6	11.8	11.8	No change
Alkalinity (mg/L)			14.7	14.7	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)			4.1	4.1	Increasing
Calcium (mg/L)			4.2	4.2	Not analyzed
Sodium (mg/L)			2.6	2.6	No change

\*See table of content for description of water quality indicators

# Silver Lake – Time Series



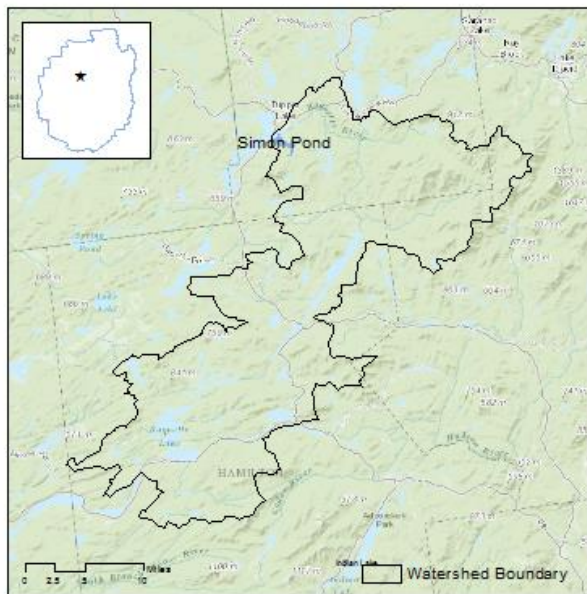
Annual average values of select water quality indicators for Silver Lake, 1998-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Silver Lake is a 324 ha lake located in Clinton County in the Town of Black Brook. The lake is located within a 1,245 ha watershed dominated by forests. Silver Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1998.

- Silver Lake is an oligotrophic Lake. Total phosphorus has exhibited a downward trend at a rate of approximately 0.5  $\mu\text{g/L/year}$ . Chlorophyll-a and transparency have not exhibited any statistically significant trends.
- Water samples from 2016 were found to be circumneutral in terms of their acidity. Alkalinity was 14.7 mg/L, indicating that the lake is not sensitive to acid deposition.
- Sodium and chloride concentration were 2.6 and 4.1 mg/L in 2016, indicating the chemistry of the lake is influenced by the 5.5 km of roads in the watershed, but the influence is relatively low. We detected an increase in chloride concentration since 1998 at a rate of 0.2 mg/L/year.

# Simon Pond



<b>Location</b>	County:	Franklin
	Town:	Tupper Lake
<b>Lake Characteristics</b>	Surface Area (ha):	287
	Shoreline Length (km):	16
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	15534637
	Flush rate (times/year):	53.6
<b>Watershed Characteristics</b>	Watershed Area (ha):	132235
	Surface water (%):	8
	Deciduous Forest (%):	40
	Evergreen Forest (%):	27
	Mixed Forest (%):	9
	Wetlands (%):	14
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	76.4
State Roads (km):	71.3	

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present - Low
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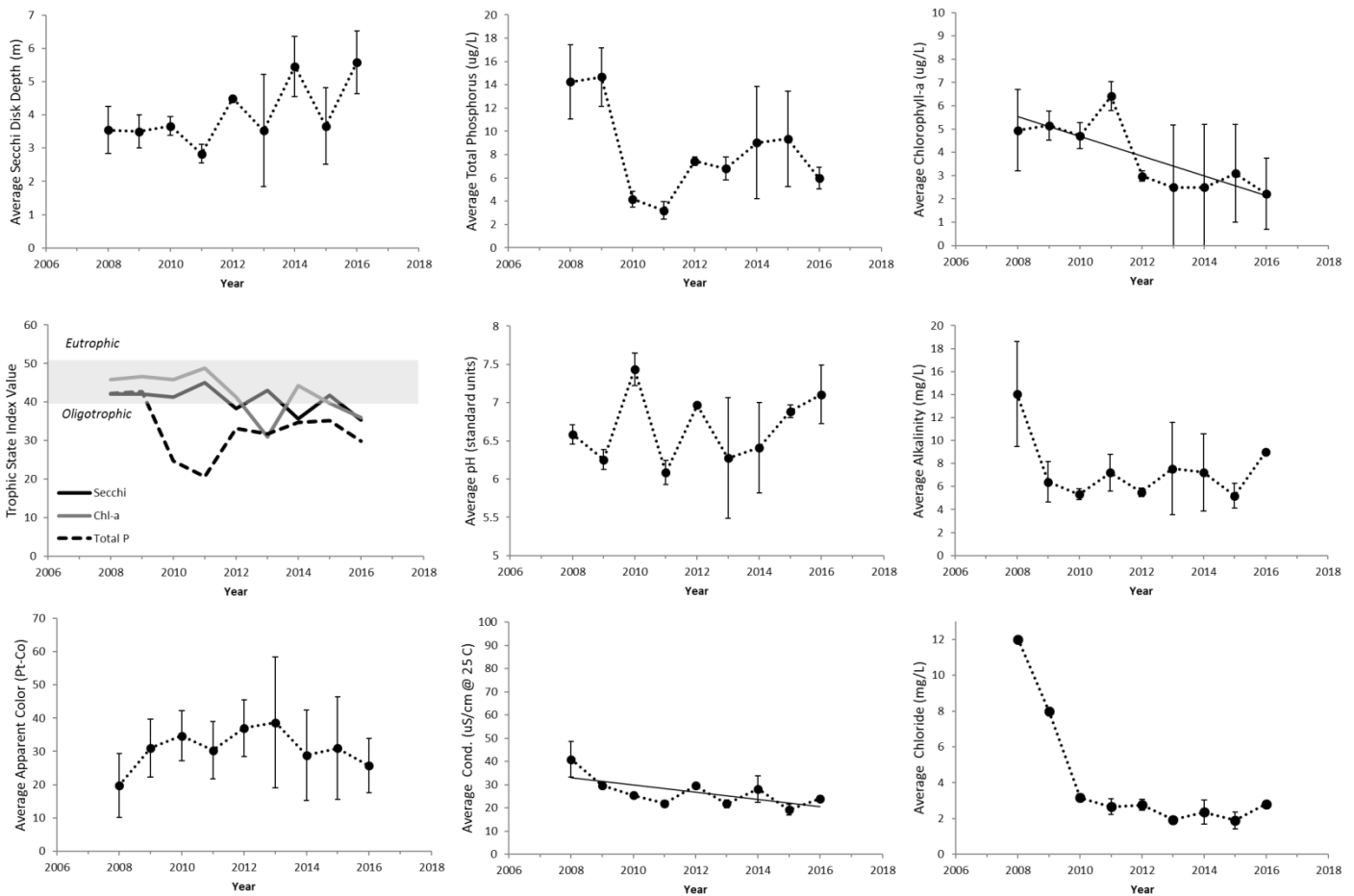
Water quality values and historical trends for Simon Pond during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/26/2016	7/13/2016	8/24/2016		
Transparency (m)	6.3	4.5	6.0	5.6	No change
Total Phosphorus (µg/L)	6.8	6.1	5.0	6.0	No change
Chlorophyll- <i>a</i> (µg/L)	0.6	3.6	2.5	2.2	Decreasing
Laboratory pH	7.0	6.8	7.5	7.1	No change
Sp. Conductance (µS/cm)	22.7	24.2	25.2	24.0	Decreasing
Color (Pt-Co)	34.3	18.2	24.6	25.7	No change
Alkalinity (mg/L)			9.0	9.0	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)			2.8	2.8	No change
Calcium (mg/L)			2.7	2.7	Not analyzed
Sodium (mg/L)			2.1	2.1	No change

\*See table of content for description of water quality indicators



# Simon Pond – Time Series



Annual average values of select water quality indicators for Simon Pond, 2008-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Simon Pond is a 287 ha lake located in Franklin County in the Town of Tupper Lake. The lake is located within a 132,235 ha watershed dominated by forests. Simon Pond has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2008.

- Simon Pond is an oligotrophic lake. Trophic indicators and water quality variables have been highly variable. This variability is likely related to flushing rate, which is estimated to be 54 times per year.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity, averaging 7.1 pH units. The alkalinity of the lake was 9.0 mg/L, indicating that the lake has moderate sensitivity to acid deposition.
- Sodium and chloride concentrations of the lake were 2.1 and 2.8 mg/L respectively. These values indicate that the chemistry of the lake is influenced by the 147 km of roads in the watershed, but that influence is relatively low.

# Spitfire Lake



<b>Location</b>	County:	Franklin
	Town:	Brighton

<b>Lake Characteristics</b>	Surface Area (ha):	109
	Shoreline Length (km):	7
	Max. Depth (m):	9.4
	Volume (m <sup>3</sup> ):	5036554
	Flush rate (times/year):	2.7

<b>Watershed Characteristics</b>	Watershed Area (ha):	2800
	Surface water (%):	22
	Deciduous Forest (%):	43
	Evergreen Forest (%):	18
	Mixed Forest (%):	4
	Wetlands (%):	12
	Agricultural (%):	0
	Residential (%):	2
	Local Roads (km):	1
	State Roads (km):	4.3

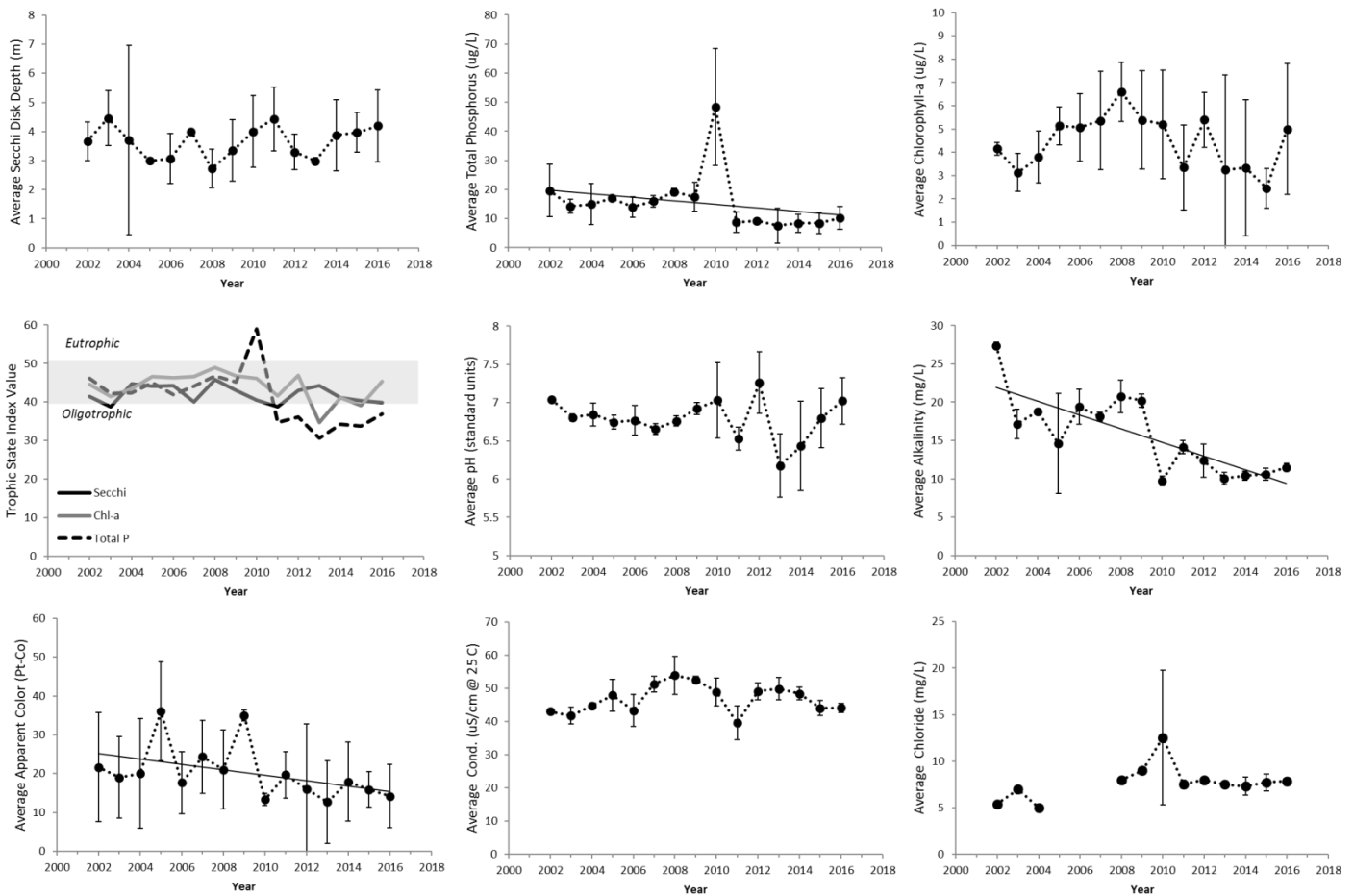
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Spitfire Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/7/2016	7/11/2016	8/3/2016		
Transparency (m)	3.1	5.1	5.6	4.6	No change
Total Phosphorus (µg/L)	8.8	9.6	6.7	8.4	Decreasing
Chlorophyll- <i>a</i> (µg/L)	4.0	5.0	2.9	4.0	No change
Laboratory pH	7.2	7.2	6.9	7.1	No change
Sp. Conductance (µS/cm)	43.7	45.3	44.4	44.5	No change
Color (Pt-Co)	7.1	13.3	5.3	8.6	Decreasing
Alkalinity (mg/L)			11.8	11.8	Decreasing
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)			8.1	8.1	No change
Calcium (mg/L)			3.3	3.3	Not analyzed
Sodium (mg/L)			5.2	5.2	No change

\*See table of content for description of water quality indicators

# Spitfire Lake– Time Series



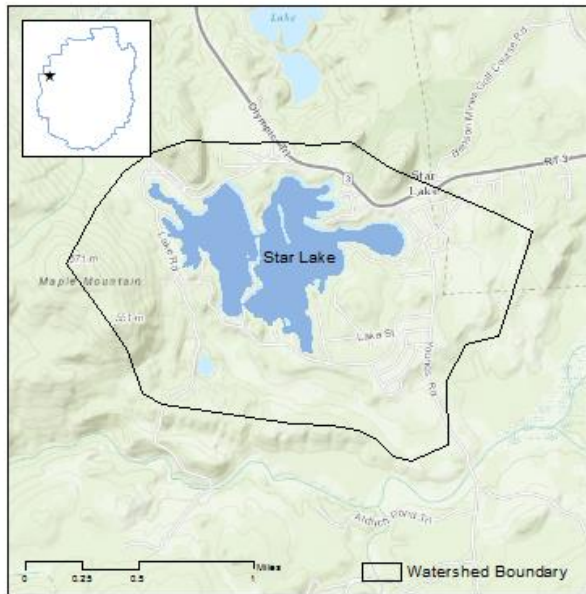
Annual average values of select water quality indicators for Spitfire Lake, 2002-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Spitfire Lake is a 109 ha lake located in Franklin County in the Town of Brighton. The lake is located within a 2,800 ha watershed dominated by forests. Spitfire Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2002.

- Spitfire Lake is a mesotrophic lake. Transparency and chlorophyll-a have been variable over time, and have not exhibited any significant trends. However, average transparency has been steadily increasing over the past four years. Total phosphorous has exhibited a downward trend at a rate of 0.6  $\mu\text{g/L/year}$ .
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 11.8 mg/L, indicating moderate sensitivity to acid deposition. We detected a significant downward trend in alkalinity at a rate of approximately 0.9 mg/L/year.
- Sodium and chloride concentration were 5.2 and 8.1 mg/L respectively, indicating that the chemistry of the lake is influenced by the 5.3 km of roads in the watershed.

# Star Lake



<b>Location</b>	County:	St Lawrence
	Town:	Fine
<b>Lake Characteristics</b>	Surface Area (ha):	83
	Shoreline Length (km):	11
	Max. Depth (m):	19.8
	Volume (m <sup>3</sup> ):	5288762
	Flush rate (times/year):	0.4
<b>Watershed Characteristics</b>	Watershed Area (ha):	509
	Surface water (%):	20
	Deciduous Forest (%):	61
	Evergreen Forest (%):	2
	Mixed Forest (%):	2
	Wetlands (%):	3
	Agricultural (%):	2
	Residential (%):	9
	Local Roads (km):	12.2
State Roads (km):	1.3	

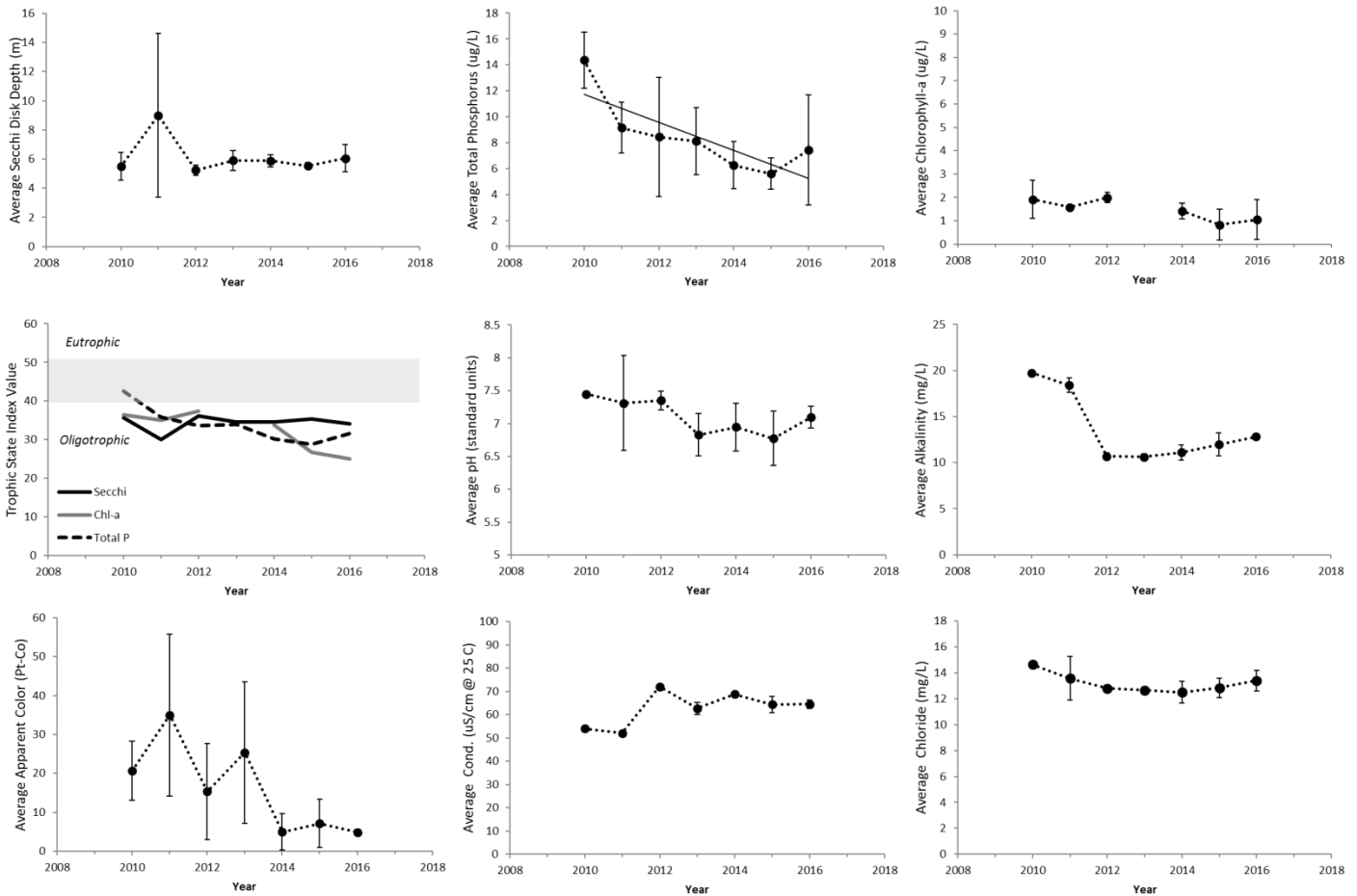
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Star Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/21/2016	7/14/2016	8/18/2016		
Transparency (m)	6.7	5.0	6.5	6.1	No change
Total Phosphorus (µg/L)	12.3	5.1	4.9	7.4	Decreasing
Chlorophyll- <i>a</i> (µg/L)	0.1	1.3	1.7	1.0	No change
Laboratory pH	6.9	7.2	7.2	7.1	No change
Sp. Conductance (µS/cm)	64.8	66.1	62.6	64.5	No change
Color (Pt-Co)	4.0	5.3	5.3	4.9	No change
Alkalinity (mg/L)			12.8	12.8	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)			14.3	14.3	No change
Calcium (mg/L)			4.0	4.0	Not analyzed
Sodium (mg/L)			8.2	8.2	No change

\*See table of content for description of water quality indicators

# Star Lake – Time Series



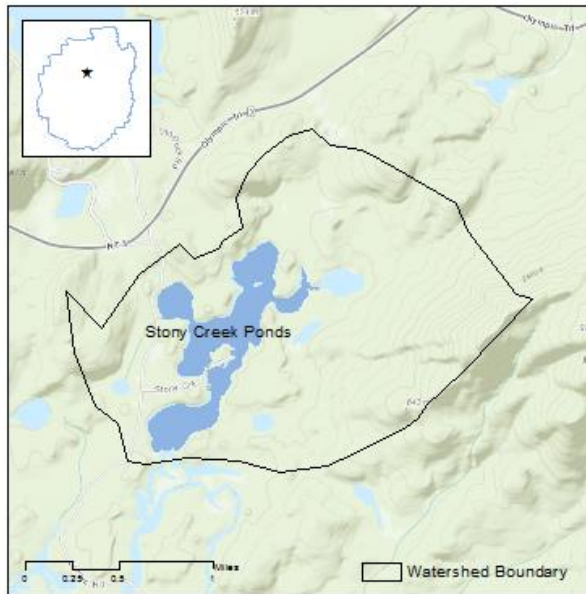
Annual average values of select water quality indicators for Star Lake, 2010-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Star Lake is an 83 ha lake located in St. Lawrence County in the Town of Fine. The lake is located within a 509 ha watershed dominated by forests. Star Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2010.

- Star Lake is an oligotrophic lake. Transparency and chlorophyll-a values have been stable over time. However, total phosphorus concentrations have exhibited a significant downward trend at a rate of approximately 1.1  $\mu\text{g/L/year}$ .
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 12.8 mg/L, indicating low sensitivity to acid deposition.
- Sodium and chloride concentration were 8.2 and 14.3 mg/L respectively, indicating that the chemistry of the lake is influenced by the 13.5 km of roads in the watershed. Chloride concentration of Star Lake is greater than 80% of participating ALAP lakes, and 71 times higher than the median value for unimpacted lakes (no roads in the watershed).

# Stony Creek Pond



<b>Location</b>	County:	Franklin
	Town:	Harriestown

<b>Lake Characteristics</b>	Surface Area (ha):	76
	Shoreline Length (km):	9
	Max. Depth (m):	12.5
	Volume (m <sup>3</sup> ):	2825129
	Flush rate (times/year):	1.5

<b>Watershed Characteristics</b>	Watershed Area (ha):	710
	Surface water (%):	13
	Deciduous Forest (%):	26
	Evergreen Forest (%):	38
	Mixed Forest (%):	10
	Wetlands (%):	12
	Agricultural (%):	0
	Residential (%):	1
	Local Roads (km):	1.8
	State Roads (km):	0

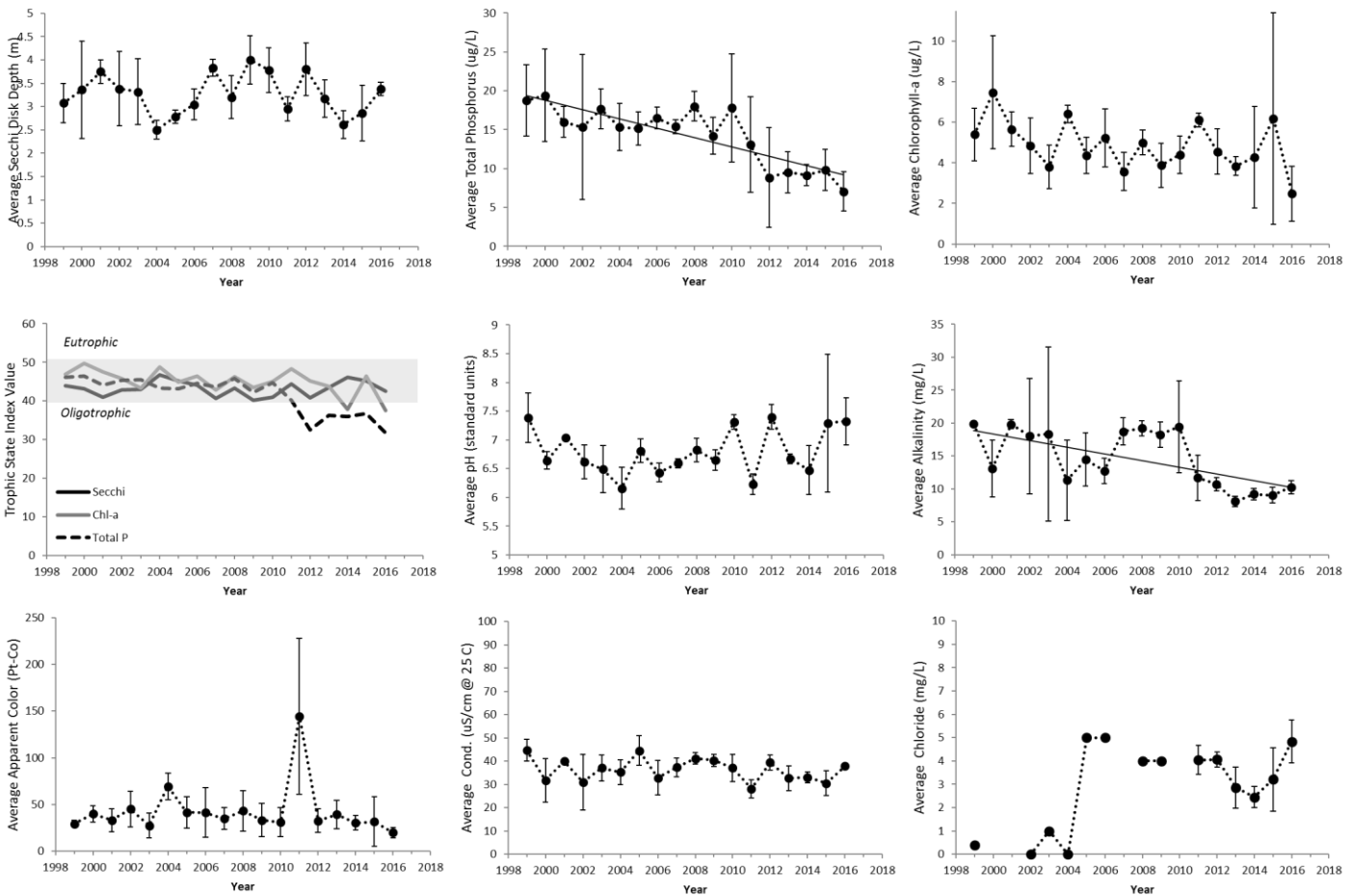
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present - Low
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Water quality values and historical trends for Stony Creek Pond during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date					Average	Trend
	5/7	6/1	7/1	8/2	9/2		
Transparency (m)	3.2	3.4	3.4	3.3	3.6	3.4	No change
Total Phosphorus (µg/L)	7.5	5.5	5.6	11.3	5.4	7.0	Decreasing
Chlorophyll- <i>a</i> (µg/L)	2.8	4.4	1.0	2.8	1.5	2.4	No change
Laboratory pH	6.8	7.0	7.8	7.5	7.5	7.3	No change
Sp. Cond. (µS/cm)	37.9	38.1	38.1	37.7	37.8	37.9	No change
Color (Pt-Co)	19.6	10.2	22.7	24.6	21.4	19.7	No change
Alkalinity (mg/L)	9.6					9.6	Decreasing
Nitrate-Nitrogen (µg/L)	93.7					93.7	Not analyzed
Chloride (mg/L)	5.8					5.8	No change
Calcium (mg/L)	3.8					3.8	Not analyzed
Sodium (mg/L)	2.5					2.5	No change

\*See table of content for description of water quality indicators

# Stony Creek Pond – Time Series



Annual average values of select water quality indicators for Stony Creek Pond, 1999-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

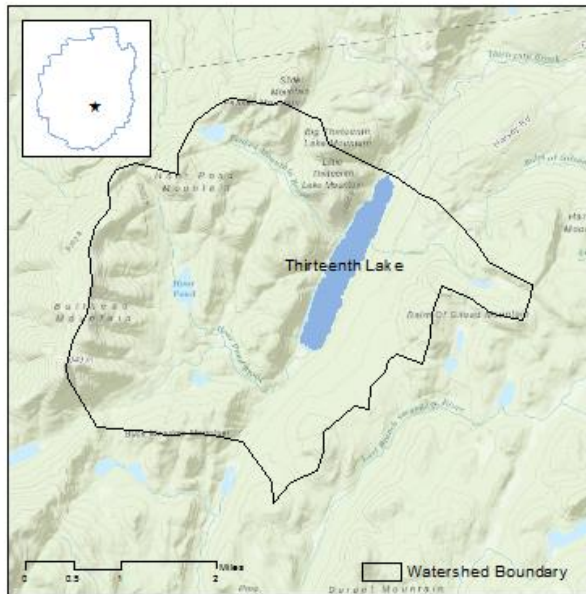
## Summary of Findings

Stony Creek Ponds is a 76 ha lake located in Franklin County in the Town of Harrietstown. The lake is located within a 710 ha watershed dominated by forests. Stony Creek Ponds has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1999.

- Stony Creek Pond is a mesotrophic lake on the border of oligotrophic. Transparency depth and chlorophyll concentration have been variable over time, and have not exhibited any positive or negative trend. Total phosphorus concentration has exhibited a significant downward trend at a rate of approximately 0.6  $\mu\text{g/L/year}$ .
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 9.6 mg/L, indicating moderate sensitivity to acid deposition. Alkalinity has exhibited a significant downward trend at a rate of 0.5 mg/L/year.
- Sodium and chloride concentration were 2.5 and 5.8 mg/L respectively, indicating that the chemistry of the lake is influenced by the 1.8 km of roads in the watershed, but the influence is relatively low.



# Thirteenth Lake



<b>Location</b>	County:	Warren
	Town:	Johnsburg

<b>Lake Characteristics</b>	Surface Area (ha):	128
	Shoreline Length (km):	7
	Max. Depth (m):	14.9
	Volume (m <sup>3</sup> ):	7961958
	Flush rate (times/year):	2.3

<b>Watershed Characteristics</b>	Watershed Area (ha):	2915
	Surface water (%):	8
	Deciduous Forest (%):	62
	Evergreen Forest (%):	12
	Mixed Forest (%):	19
	Wetlands (%):	1
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	5.1
State Roads (km):	0	

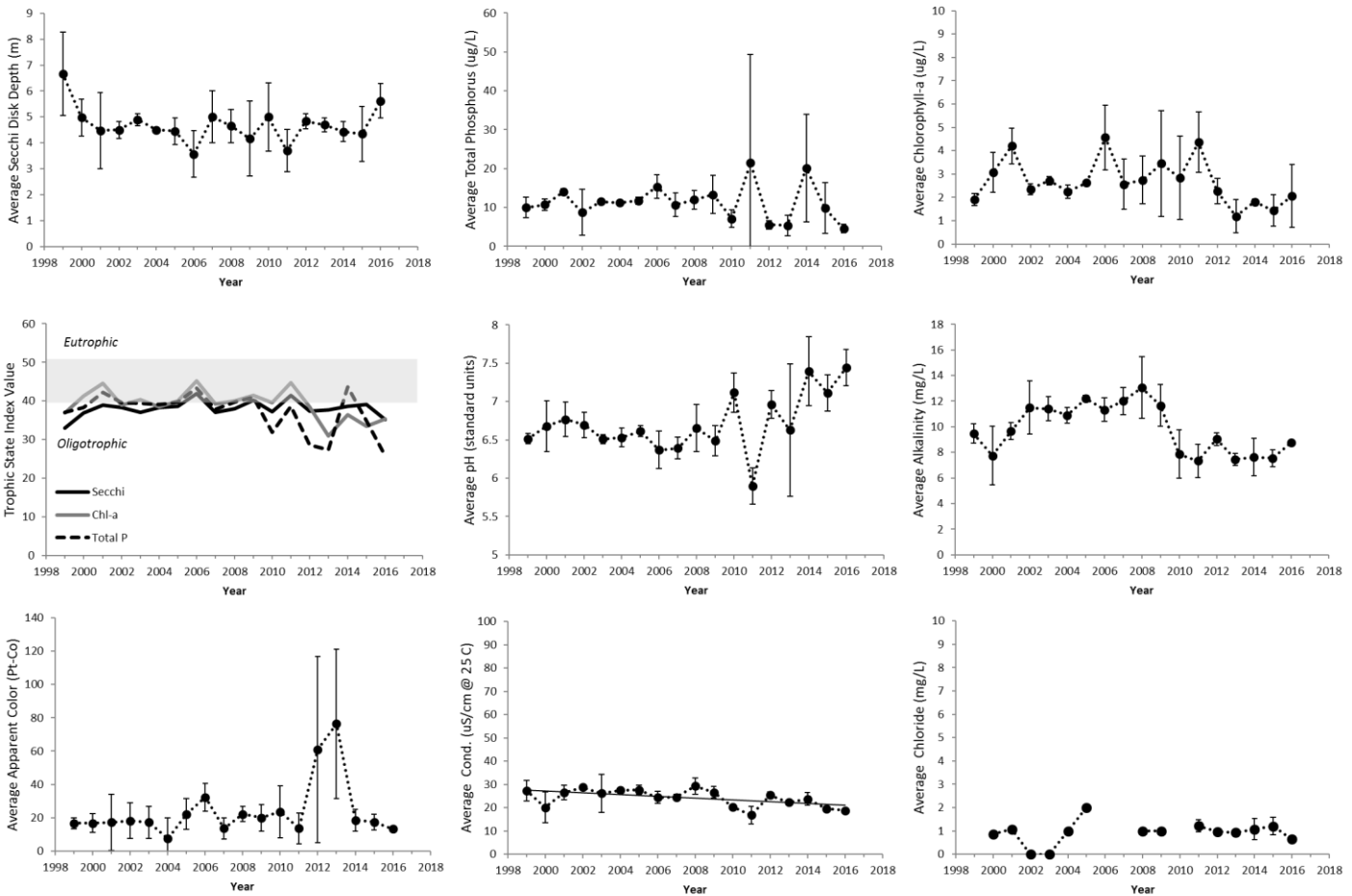
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Thirteenth Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/25/2016	7/23/2016	8/23/2016		
Transparency (m)	6.0	6.0	4.9	5.6	No change
Total Phosphorus (µg/L)	5.8	3.7	4.2	4.6	No change
Chlorophyll- <i>a</i> (µg/L)	2.7	0.5	3.0	2.1	No change
Laboratory pH	7.7	7.4	7.2	7.4	No change
Sp. Conductance (µS/cm)	18.2	19.0	19.1	18.8	Decreasing
Color (Pt-Co)	13.3	15.0	11.8	13.4	No change
Alkalinity (mg/L)			8.8	8.8	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	0.6			0.6	No change
Calcium (mg/L)	2.4			2.4	Not analyzed
Sodium (mg/L)	1.1			1.1	No change

\*See table of content for description of water quality indicators

# Thirteenth Lake – Time Series



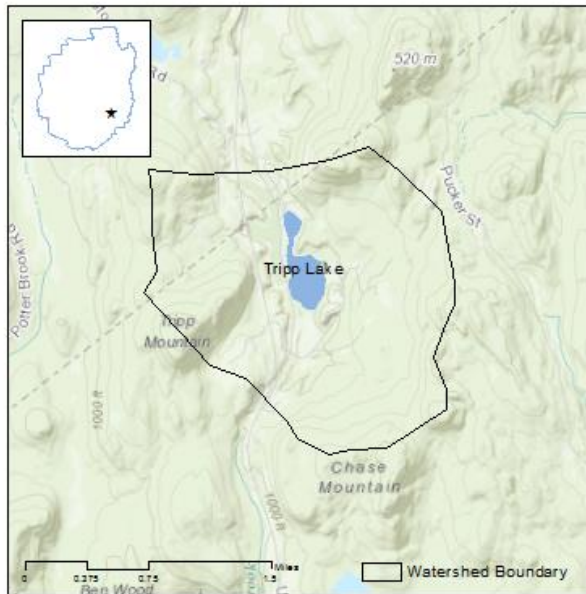
Annual average values of select water quality indicators for Thirteenth Lake, 1999-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Thirteenth Lake is a 128 ha lake located in Warren County in the Town of Johnsbury. This lake is located within a 2,915 ha watershed dominated by forests. Thirteenth Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1999.

- Thirteenth Lake is an oligotrophic lake. The trophic indicators (transparency, total phosphorus, and chlorophyll) have been fairly stable over time, and have not exhibited any significant trends.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 8.8 mg/L, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 1.1 and 0.6 mg/L respectively, indicating that the chemistry of the lake is not significantly influenced by the 5.1 km of roads in the watershed.

# Tripp Pond



<b>Location</b>	County:	Warren
	Town:	Warrensburg
<b>Lake Characteristics</b>	Surface Area (ha):	19
	Shoreline Length (km):	3
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	623980
	Flush rate (times/year):	8
<b>Watershed Characteristics</b>	Watershed Area (ha):	668
	Surface water (%):	3
	Deciduous Forest (%):	15
	Evergreen Forest (%):	36
	Mixed Forest (%):	28
	Wetlands (%):	5
	Agricultural (%):	2
	Residential (%):	10
	Local Roads (km):	5.6
State Roads (km):	2.3	

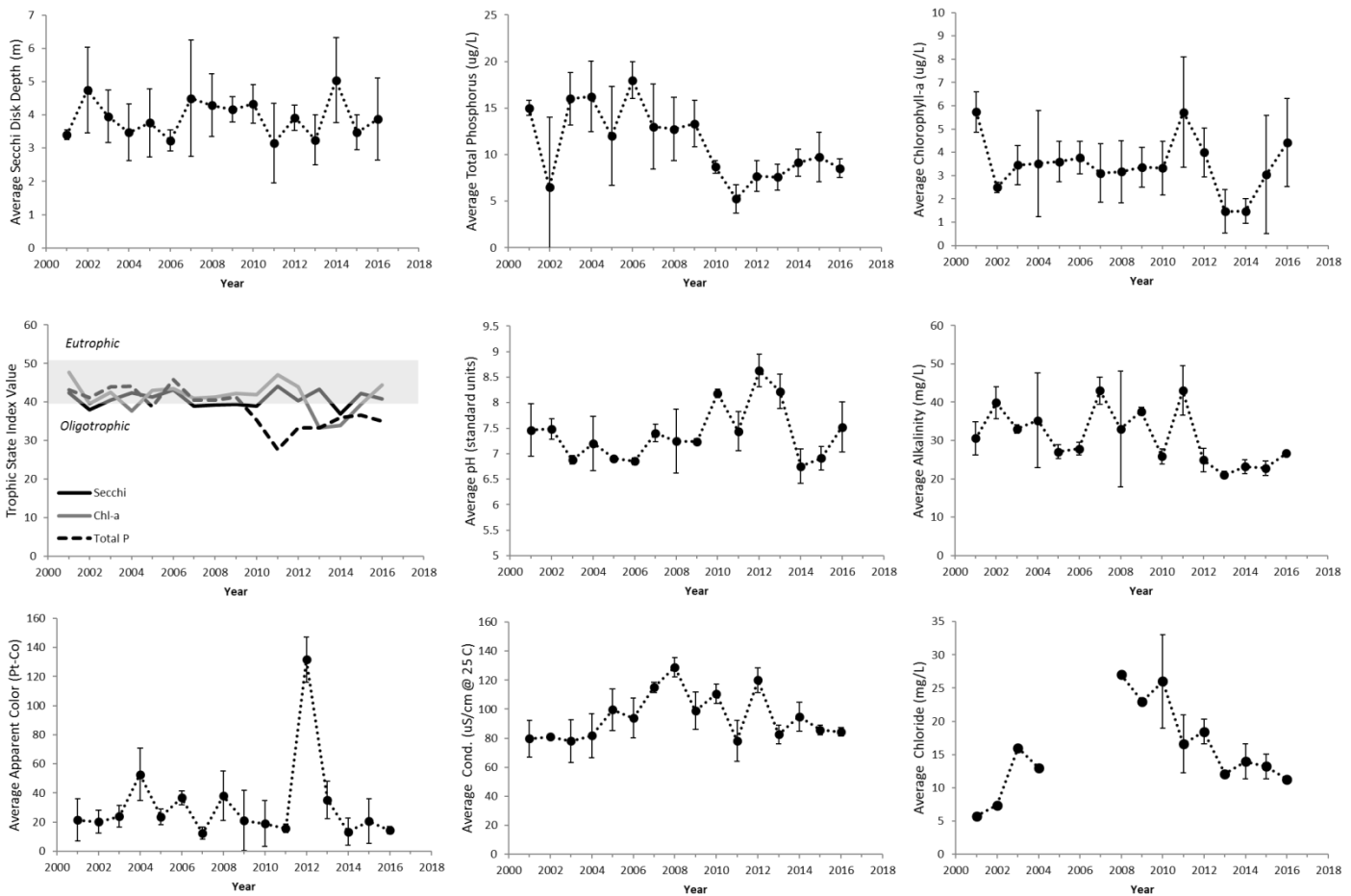
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Tripp Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit. VOB=secchi disk was visible on the bottom of the lake

Water Quality Indicator	Sampling Date			Average	Trend
	6/19/2016	7/17/2016	8/20/2016		
Transparency (m)	3.0	VOB	4.8	3.9	No change
Total Phosphorus (µg/L)	9.2	9.1	7.4	8.5	No change
Chlorophyll-a (µg/L)	6.0	4.9	2.3	4.4	No change
Laboratory pH	7.0	8.0	7.6	7.5	No change
Sp. Conductance (µS/cm)	86.2	80.9	85.9	84.3	No change
Color (Pt-Co)	16.4	15.0	11.8	14.4	No change
Alkalinity (mg/L)			26.7	26.7	No change
Nitrate-Nitrogen (µg/L)	BDL			BDL	Not analyzed
Chloride (mg/L)	11.3			11.3	No change
Calcium (mg/L)	7.9			7.9	Not analyzed
Sodium (mg/L)	7.2			7.2	No change

\*See table of content for description of water quality indicators

# Tripp Lake – Time Series



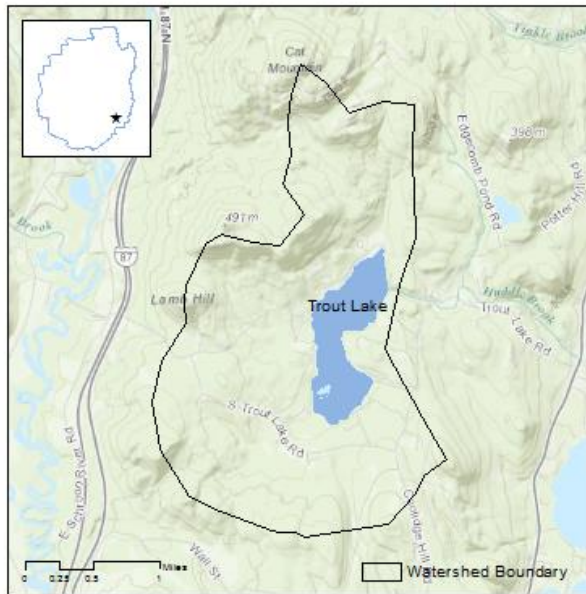
Annual average values of select water quality indicators for Tripp Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Tripp Pond is a 19 ha lake located in Warren County in the Town of Warrensburg. The lake is located within a 668 ha watershed dominated by forests. Tripp Pond has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 1999.

- Tripp Pond is a mesotrophic lake. Transparency depth has been fairly stable over time, total phosphorus and chlorophyll-a concentrations have been more variable. None of the trophic indicators have exhibited any significant trends.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 26.7 mg/L, that the pond is well buffered and has low sensitivity to acid deposition.
- Sodium and chloride concentration were 7.2 and 11.3 mg/L respectively, indicating that the chemistry of the lake is influenced by the 8 km of roads in the watershed. For example, the chloride concentration of Tripp is 56 times greater than the median concentration for unimpacted lakes (no roads in the watershed).

# Trout Lake



<b>Location</b>	County:	Warren
	Town:	Bolton
<b>Lake Characteristics</b>	Surface Area (ha):	103
	Shoreline Length (km):	7
	Max. Depth (m):	22.9
	Volume (m <sup>3</sup> ):	6646143
	Flush rate (times/year):	0.9
<b>Watershed Characteristics</b>	Watershed Area (ha):	1211
	Surface water (%):	9
	Deciduous Forest (%):	31
	Evergreen Forest (%):	33
	Mixed Forest (%):	15
	Wetlands (%):	5
	Agricultural (%):	0
	Residential (%):	5
	Local Roads (km):	9.3
State Roads (km):	0	

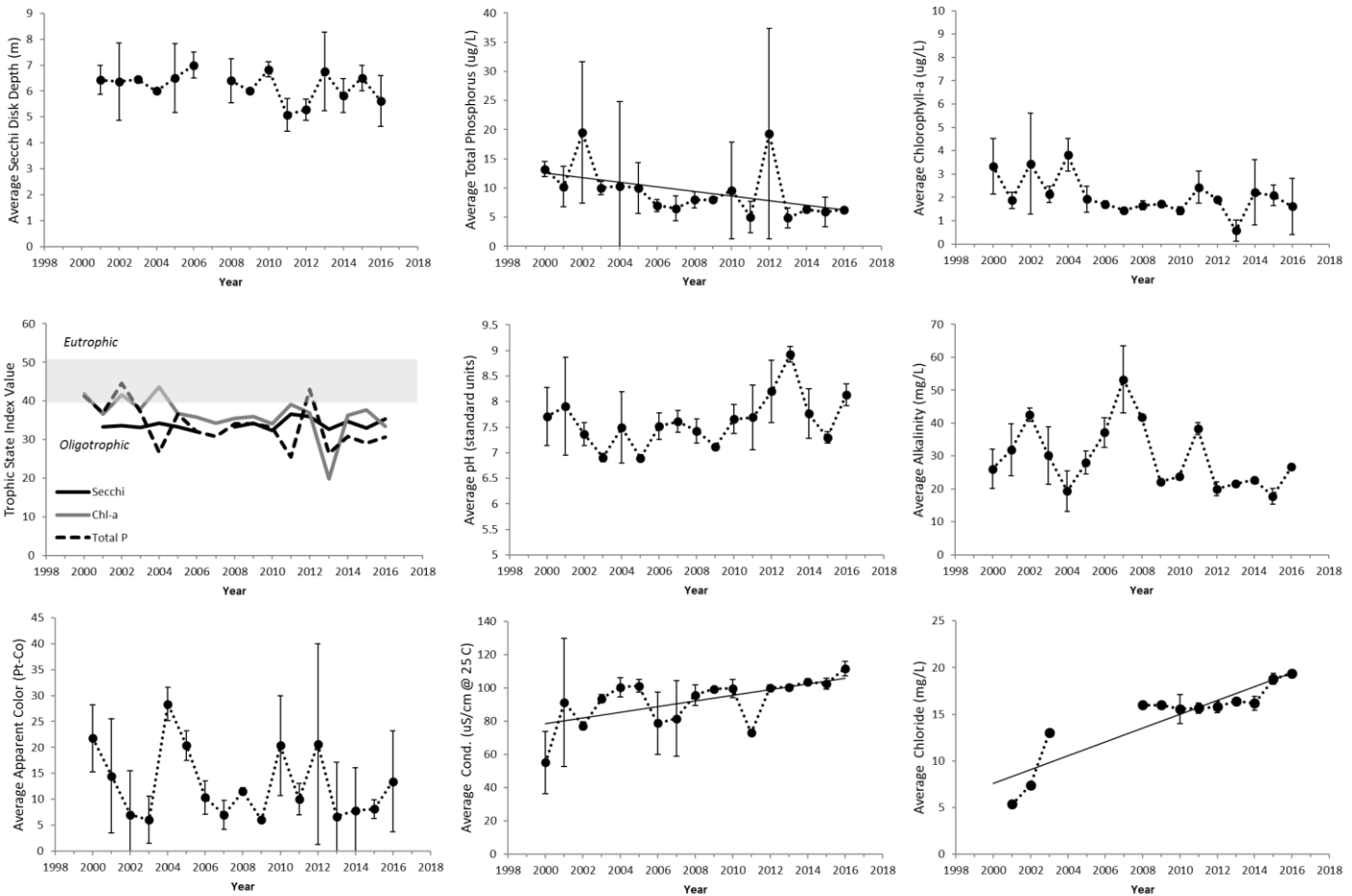
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Alkaline	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Trout Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/22/2016	7/7/2016	8/22/2016		
Transparency (m)	6.8	5.1	5.1	5.6	No change
Total Phosphorus (µg/L)	6.1	6.7	6.0	6.3	Decreasing
Chlorophyll- <i>a</i> (µg/L)	0.7	1.1	3.0	1.6	No change
Laboratory pH	7.9	8.3	8.2	8.1	No change
Sp. Conductance (µS/cm)	115.2	113.1	106.9	111.7	Increasing
Color (Pt-Co)	7.1	8.6	24.6	13.4	No change
Alkalinity (mg/L)		26.7		26.7	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	19.4			19.4	Increasing
Calcium (mg/L)	9.4			9.4	Not analyzed
Sodium (mg/L)	11.8			11.8	No change

\*See table of content for description of water quality indicators

# Trout Lake – Time Series



Annual average values of select water quality indicators for Trout Lake, 2000-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

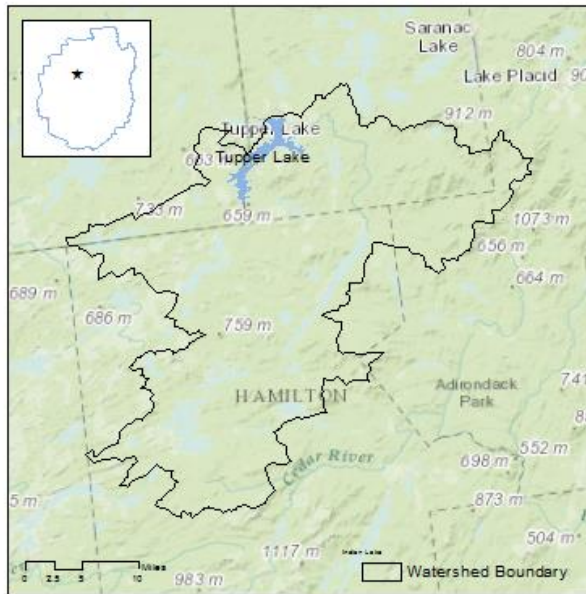
## Summary of Findings

Trout Lake is a 103 ha lake located in Warren County in the Town of Bolton. The lake is located within a 1,211 ha watershed dominated by forests. Trout Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2000.

- Trout Lake is an oligotrophic lake with relatively stable transparency. Trout Lake has greater transparency than 85% of ALAP Lakes. Total phosphorus concentration has exhibited a significant downward trend at a rate of approximately  $0.4 \mu\text{g/L/year}$ .
- The water samples analyzed in 2016 were found to be alkaline in terms of their acidity. The alkalinity was  $26.7 \text{ mg/L}$ , indicating that the lake is well buffered and has low sensitivity to acid deposition.
- Sodium and chloride concentration were  $11.8$  and  $19.4 \text{ mg/L}$  respectively, indicating that the chemistry of the lake is moderately influenced by the  $9.3 \text{ km}$  of roads in the watershed. The chloride concentration of Trout Lake is greater than 88% of participating ALAP Lakes, and is trending up at a rate of  $0.7 \text{ mg/L/year}$ . The trend is largely driven by relatively low chloride concentrations in 2001-2003.



# Tupper Lake



<b>Location</b>	County: Franklin Town: Tupper Lake
<b>Lake Characteristics</b>	Surface Area (ha): 2447 Shoreline Length (km): 118 Max. Depth (m): 25.9 Volume (m <sup>3</sup> ): 299680602 Flush rate (times/year): 1
<b>Watershed Characteristics</b>	Watershed Area (ha): 178856 Surface water (%): 10 Deciduous Forest (%): 44 Evergreen Forest (%): 23 Mixed Forest (%): 7 Wetlands (%): 14 Agricultural (%): 0 Residential (%): 1 Local Roads (km): 131.2 State Roads (km): 108.4

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present - Low
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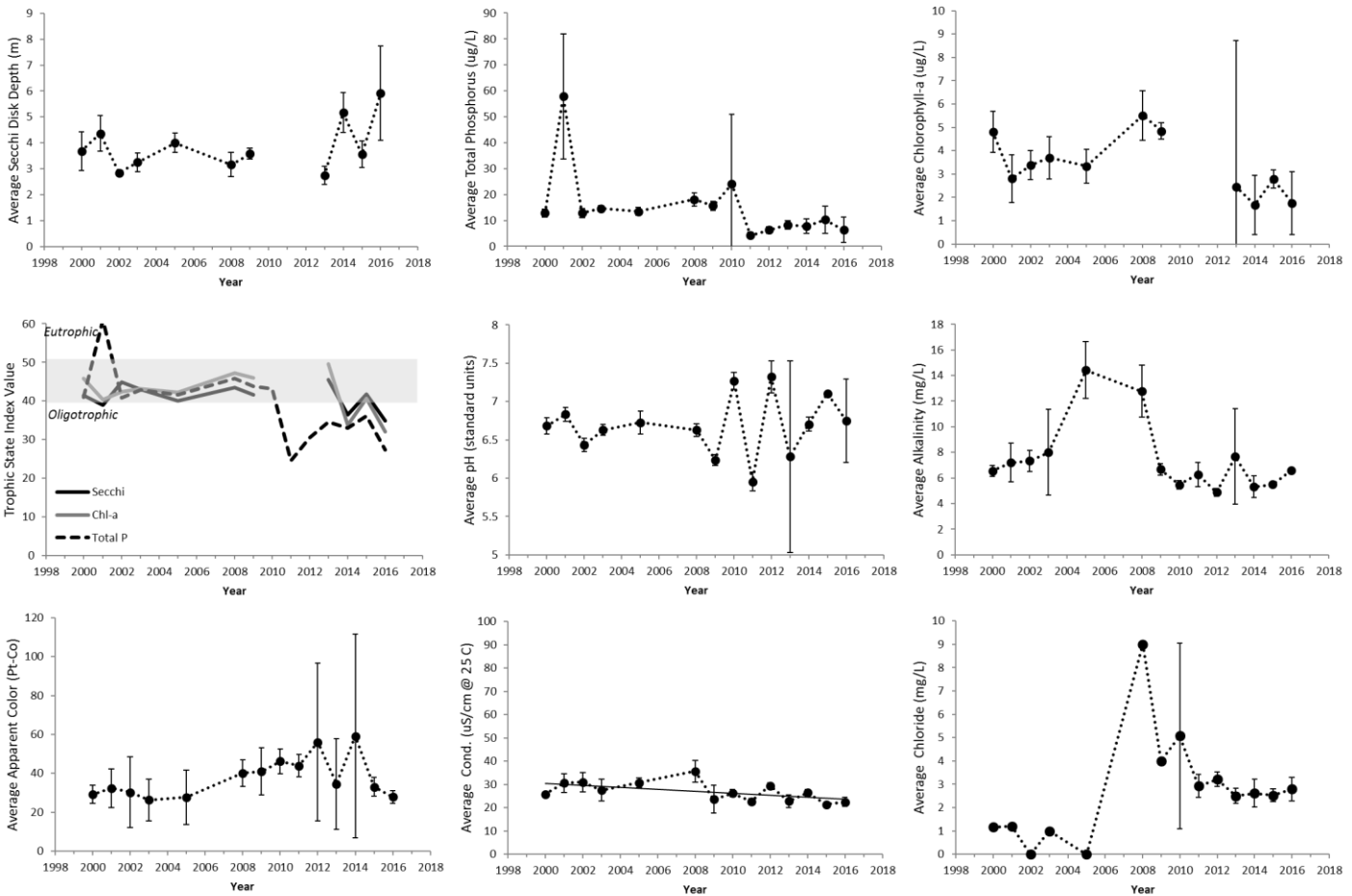
Water quality values and historical trends for Tupper Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/28/2016	7/13/2016	8/24/2016		
Transparency (m)	5.0	4.8	8.0	5.9	No change
Total Phosphorus (µg/L)	11.7	5.2	2.1	6.3	No change
Chlorophyll- <i>a</i> (µg/L)	0.2	2.2	2.8	1.8	No change
Laboratory pH	6.6	6.3	7.4	6.8	No change
Sp. Conductance (µS/cm)	23.1	24.0	20.3	22.5	Decreasing
Color (Pt-Co)	27.9	31.1	24.6	27.9	No change
Alkalinity (mg/L)			6.6	6.6	No change
Nitrate-Nitrogen (µg/L)			14.2	14.2	Not analyzed
Chloride (mg/L)			2.4	2.4	No change
Calcium (mg/L)			2.2	2.2	Not analyzed
Sodium (mg/L)			1.7	1.7	No change

\*See table of content for description of water quality indicators



# Tupper Lake – Time Series



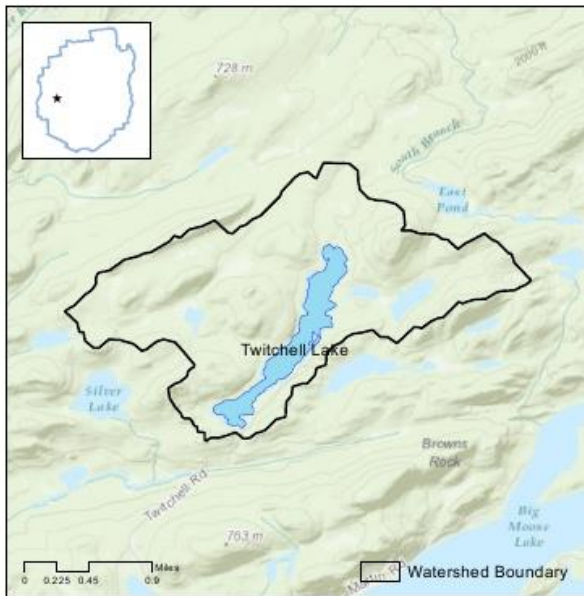
Annual average values of select water quality indicators for Tupper Lake, 2000-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Tupper Lake is a 2,132 ha lake located in Franklin County in the Town of Tupper Lake. The lake is located within a 178,856 ha watershed dominated by forests. Tupper Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2000.

- Tupper Lake is an oligotrophic lake. Trophic indicators have been highly variable over time, and did not exhibit any positive or negative trends in the 2016 analysis. Some of the historical variability may be related to shifting sampling locations, there are several locations listed that have been sampled in the past.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 6.6 mg/L, indicating moderate sensitivity to acid deposition.
- Sodium and chloride concentration were 1.7 and 2.4 mg/L respectively, indicating that the chemistry of the lake is influenced by the 140 km of roads in the watershed, but the influence is relatively low.

# Twitchell Lake



<b>Location</b>	County:	Herkimer
	Town:	Webb
<b>Lake Characteristics</b>	Surface Area (ha):	58
	Shoreline Length (km):	7
	Max. Depth (m):	10.4
	Volume (m <sup>3</sup> ):	1822596
	Flush rate (times/year):	3.1
<b>Watershed Characteristics</b>	Watershed Area (ha):	757
	Surface water (%):	12
	Deciduous Forest (%):	54
	Evergreen Forest (%):	16
	Mixed Forest (%):	8
	Wetlands (%):	7
	Agricultural (%):	0
	Commercial (%):	0
	Local Roads (km):	0.3
State Roads (km):	0	

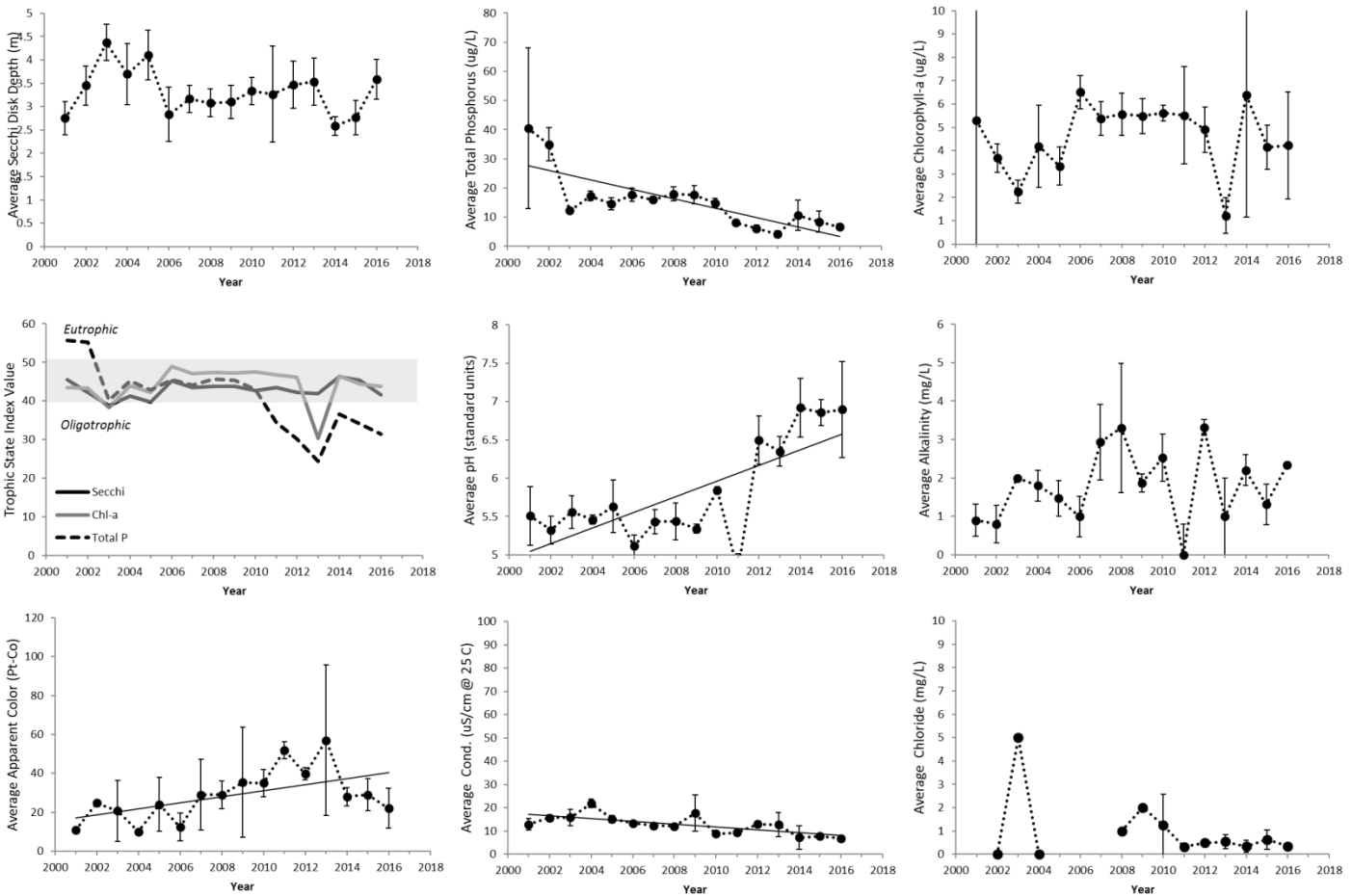
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Low	<b>Road Salt Influence</b> Not Significant
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Water quality values and historical trends for Twitchell Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/18/2016	7/17/2016	8/20/2016		
Transparency (m)	3.6	4.0	3.2	3.6	No change
Total Phosphorus (µg/L)	7.8	6.7	5.6	6.7	Decreasing
Chlorophyll- <i>a</i> (µg/L)	3.3	2.5	6.8	4.2	No change
Laboratory pH	7.4	7.1	6.2	6.9	Increasing
Sp. Conductance (µS/cm)	5.5	7.8	7.3	6.8	Decreasing
Color (Pt-Co)	10.2	27.9	27.9	22.0	Increasing
Alkalinity (mg/L)			2.3	2.3	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	0.4			0.4	No change
Calcium (mg/L)	1.0			1.0	Not analyzed
Sodium (mg/L)	0.4			0.4	No change

\*See table of content for description of water quality indicators

# Twitchell Lake – Time Series



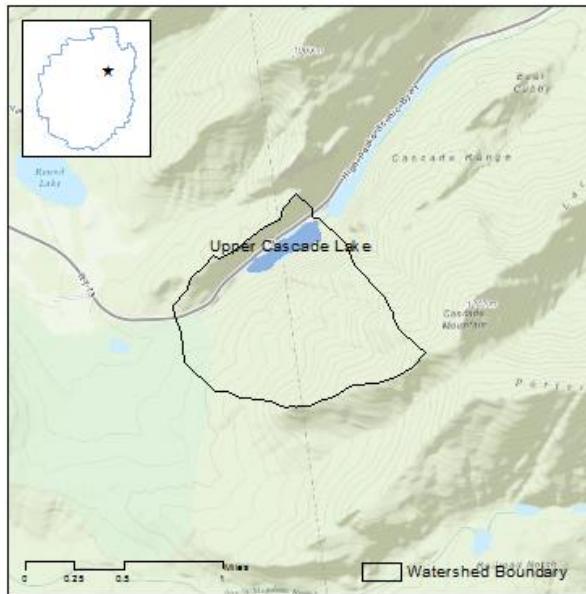
Annual average values of select water quality indicators for Twitchell Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Twitchell Lake is a 58 ha lake located in Herkimer County in the Town of Webb. The lake is located within a 757 ha watershed dominated by forests. Twitchell Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Twitchell Lake is a mesotrophic lake. The transparency depth has been relatively stable between 3 and 4 meters, with no significant trend detected. Total phosphorus concentration has exhibited a significant downward trend at a rate of approximately  $1.6 \mu\text{g/L/year}$ . This downward trend is largely driven by unusually high phosphorus concentrations 2001-2002.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. pH values have been substantially higher in recent years and have displayed a statistically significant increasing trend at a rate of 0.1 pH units/ year. The alkalinity was 2.3 mg/L, indicating that the lake is still highly sensitive to acid deposition.
- Sodium and chloride concentration were 0.4 and 0.4 mg/L respectively. These values are within the range we would expect for a watershed lacking salted state roads.

# Upper Cascade Lake



<b>Location</b>	County:	Essex
	Town:	Keene
<b>Lake Characteristics</b>	Surface Area (ha):	9
	Shoreline Length (km):	2
	Max. Depth (m):	19.2
	Volume (m <sup>3</sup> ):	1144425
	Flush rate (times/year):	1.5
<b>Watershed Characteristics</b>	Watershed Area (ha):	213
	Surface water (%):	5
	Deciduous Forest (%):	43
	Evergreen Forest (%):	19
	Mixed Forest (%):	27
	Wetlands (%):	0
	Agricultural (%):	0
	Residential (%):	6
	Local Roads (km):	0
State Roads (km):	1.4	

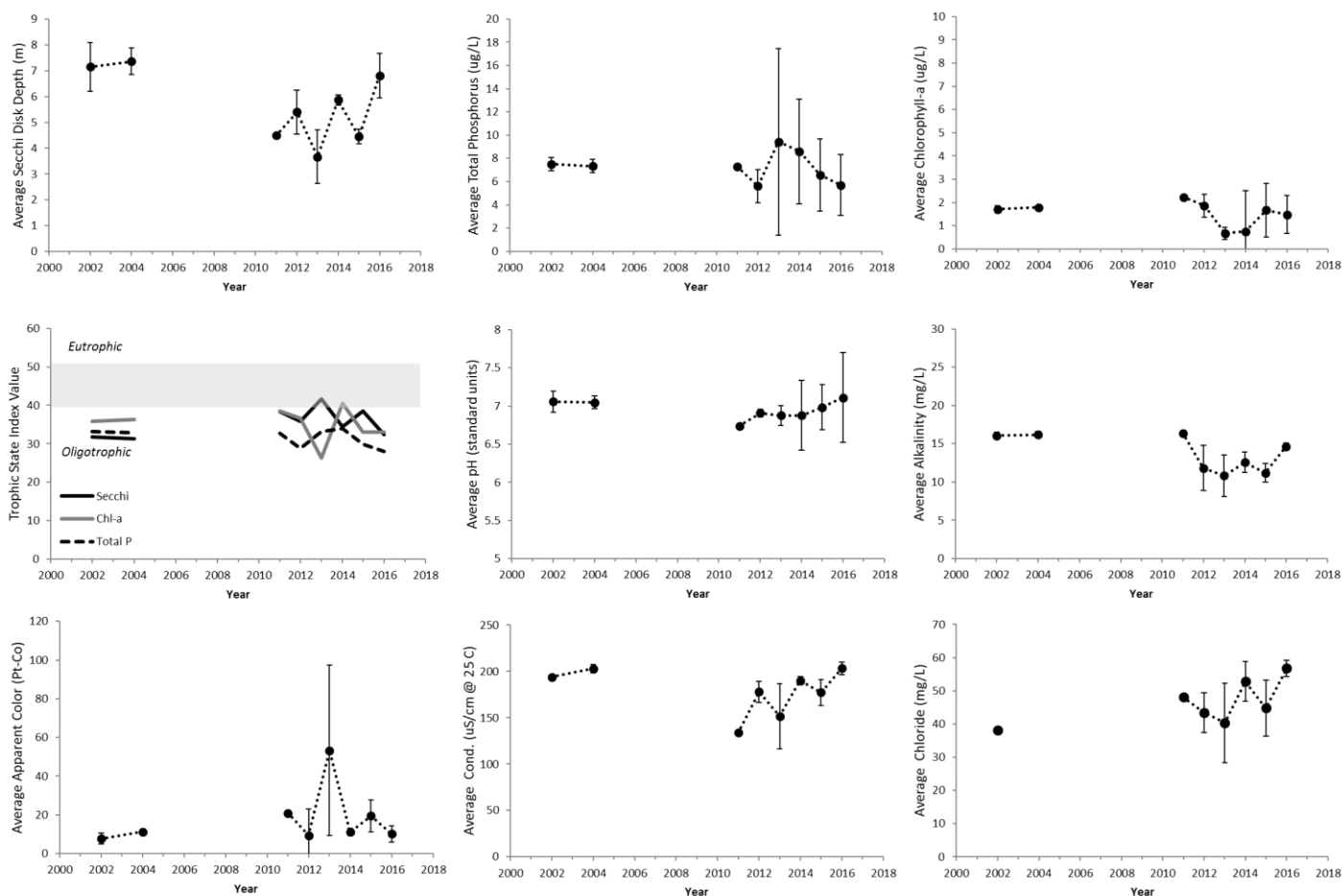
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> High
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Water quality values and historical trends for Upper Cascade Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/6/2016	7/14/2016	9/4/2016		
Transparency (m)	5.9	7.1	7.5	6.8	No change
Total Phosphorus (µg/L)	8.0	2.9	6.3	5.7	No change
Chlorophyll- <i>a</i> (µg/L)	1.7	0.6	2.2	1.5	No change
Laboratory pH	6.5	7.1	7.7	7.1	No change
Sp. Conductance (µS/cm)	195.9	209.0	205.0	203.3	No change
Color (Pt-Co)	7.1	8.6	15.0	10.2	No change
Alkalinity (mg/L)	14.7			14.7	No change
Nitrate-Nitrogen (µg/L)	90.1			90.1	Not analyzed
Chloride (mg/L)	53.9	58.0	58.4	56.8	No change
Calcium (mg/L)	6.6			6.6	Not analyzed
Sodium (mg/L)	28.7			28.7	No change

\*See table of content for description of water quality indicators

# Upper Cascade Lake – Time Series



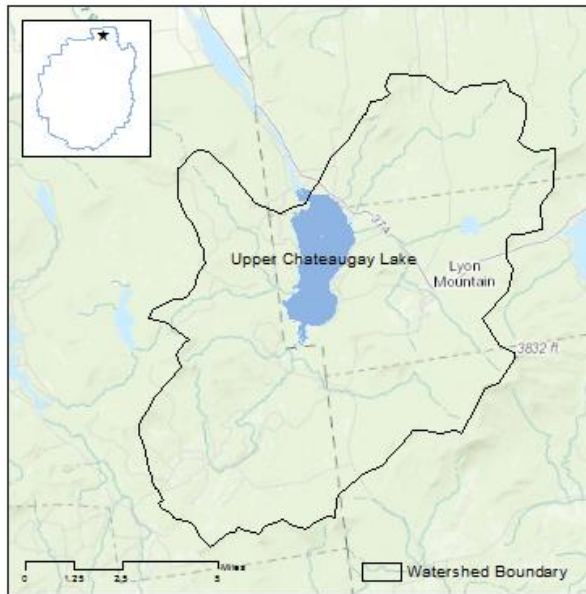
Annual average values of select water quality indicators for Upper Cascade Lake, 2002-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Upper Cascade Lake is a 9 ha lake located in Essex County in the Town of Keene. The lake is located within a 213 ha watershed dominated by forests. Upper Cascade Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute during the years of 2002, 2003 and 2011 - 2015.

- Upper Cascade Lake is an oligotrophic lake. Trophic indicators have not exhibited any significant positive or negative trends.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 14.7 mg/L, indicating low sensitivity to acid deposition.
- Sodium and chloride concentration were 28.7 and 56.8 mg/L respectively, indicating that the chemistry of the lake is highly influenced by the 1.4 km of NYS Rt 73. The chloride concentration is 284 times greater than the median concentration of unimpacted lakes (watersheds with no roads). The concentrations of these chemicals in Upper Cascade are greater than any of the other lakes in the program.

# Upper Chateaugay Lake



<b>Location</b>	County:	Clinton
	Town:	Dannemora
<b>Lake Characteristics</b>	Surface Area (ha):	1038
	Shoreline Length (km):	29
	Max. Depth (m):	21.9
	Volume (m <sup>3</sup> ):	105632868
	Flush rate (times/year):	1
<b>Watershed Characteristics</b>	Watershed Area (ha):	20856
	Surface water (%):	6
	Deciduous Forest (%):	52
	Evergreen Forest (%):	18
	Mixed Forest (%):	9
	Wetlands (%):	10
	Agricultural (%):	1
	Residential (%):	2
	Local Roads (km):	50.2
State Roads (km):	10.3	

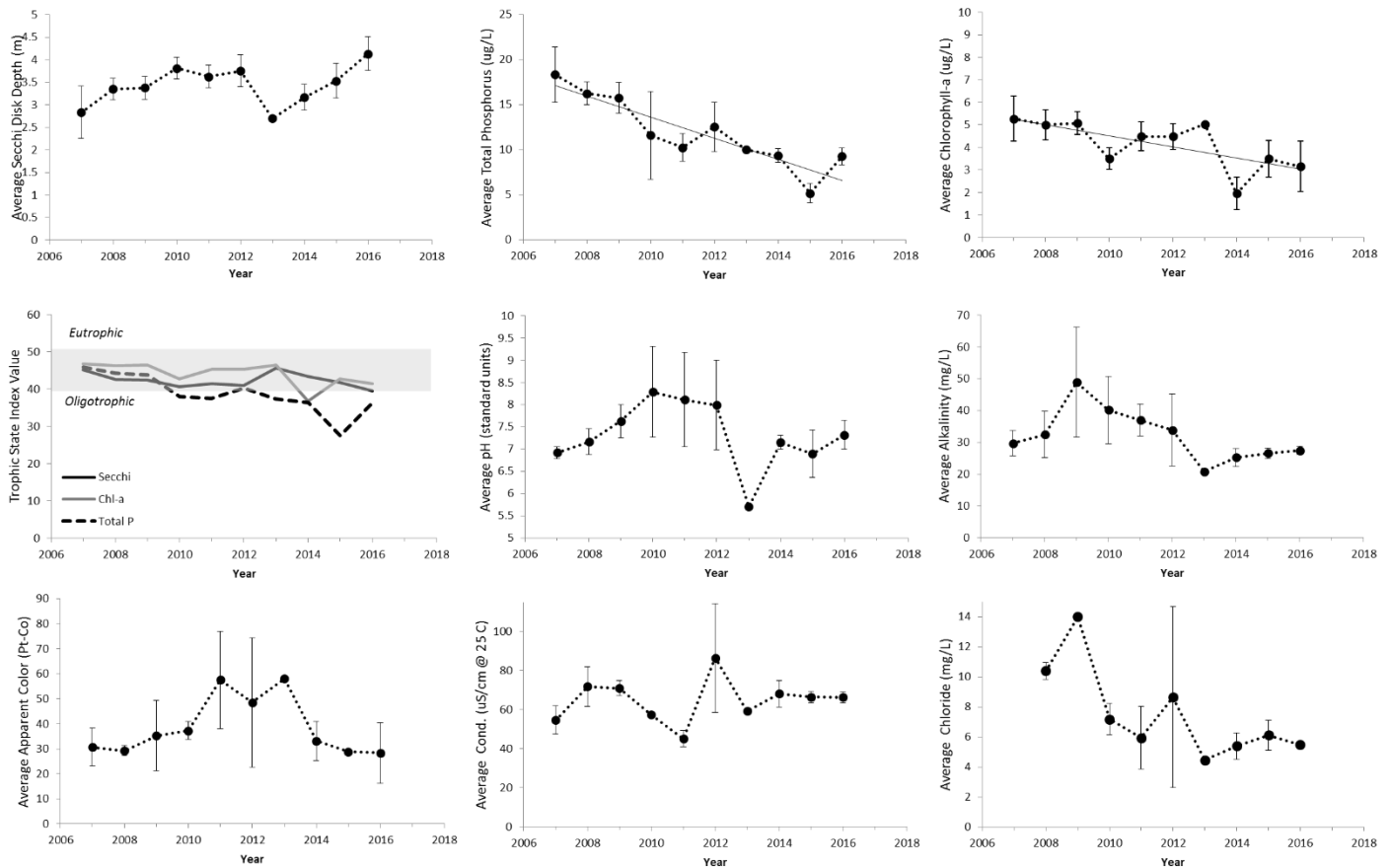
<b>Trophic State</b> Mesotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Well buffered – not sensitive	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Upper Chateaugay Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/19/2016	7/17/2016	8/14/2016		
Transparency (m)	3.8	4.2	4.5	4.1	No change
Total Phosphorus (µg/L)	9.9	8.2	9.6	9.3	Decreasing
Chlorophyll- <i>a</i> (µg/L)	4.4	2.4	2.6	3.1	Decreasing
Laboratory pH	7.3	7.0	7.7	7.3	No change
Sp. Conductance (µS/cm)	63.2	68.2	67.8	66.4	No change
Color (Pt-Co)	16.4	40.7	27.9	28.3	No change
Alkalinity (mg/L)	26.5			26.5	No change
Nitrate-Nitrogen (µg/L)	1.9			1.9	Not analyzed
Chloride (mg/L)	5.4			5.4	No change
Calcium (mg/L)	6.6			6.6	Not analyzed
Sodium (mg/L)	3.6			3.6	No change

\*See table of content for description of water quality indicators

# Upper Chateaugay Lake – Time Series



Annual average values of select water quality indicators for Upper Chateaugay Lake, 2007-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

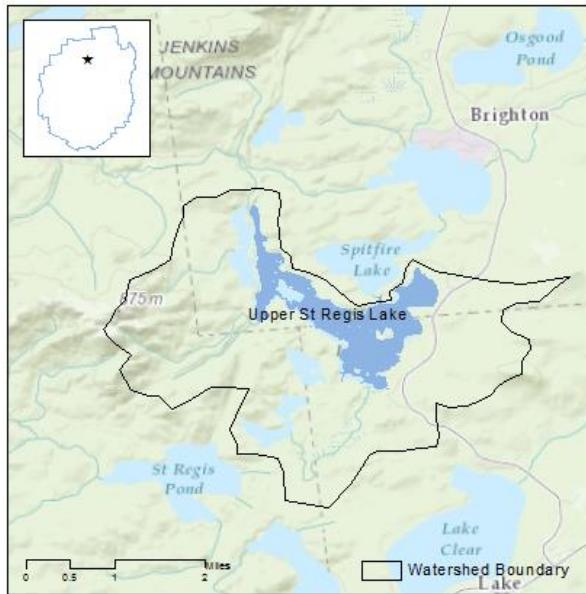
## Summary of Findings

Upper Chateaugay Lake is a 1,038 ha lake located in Clinton County in the Town of Dannemora. The lake is located within a 20,856 ha watershed dominated by forests. Upper Chateaugay Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2007.

- Upper Chateaugay is a mesotrophic Lake on the border of oligotrophic. Transparency depth has typically ranged between 2.5 and 3.5 meters. The transparency averaged 4.1 meters in 2016, the highest average on record. Both total phosphorus and chlorophyll-a concentrations have exhibited a significant downward trend at a rate of 1.2 and 0.2 µg/L/year respectively.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 26.5 mg/L, indicating that the lake is not sensitive to acid deposition.
- Sodium and chloride concentration were 3.6 and 5.4 mg/L respectively, indicating that the chemistry of the lake is moderately influenced by the 61km of roads in the watershed.
- Calcium concentration of Upper Chateaugay is greater than 82% of participating lakes, but below the concentrations researchers believe is needed for a viable zebra mussel population (12-20 mg/L).



# Upper St. Regis Lake



<b>Location</b>	County:	Franklin
	Town:	Harrietstown
<b>Lake Characteristics</b>	Surface Area (ha):	287
	Shoreline Length (km):	22
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	20400000
	Flush rate (times/year):	0.6
<b>Watershed Characteristics</b>	Watershed Area (ha):	2313
	Surface water (%):	21
	Deciduous Forest (%):	52
	Evergreen Forest (%):	14
	Mixed Forest (%):	4
	Wetlands (%):	10
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	1
State Roads (km):	3.5	

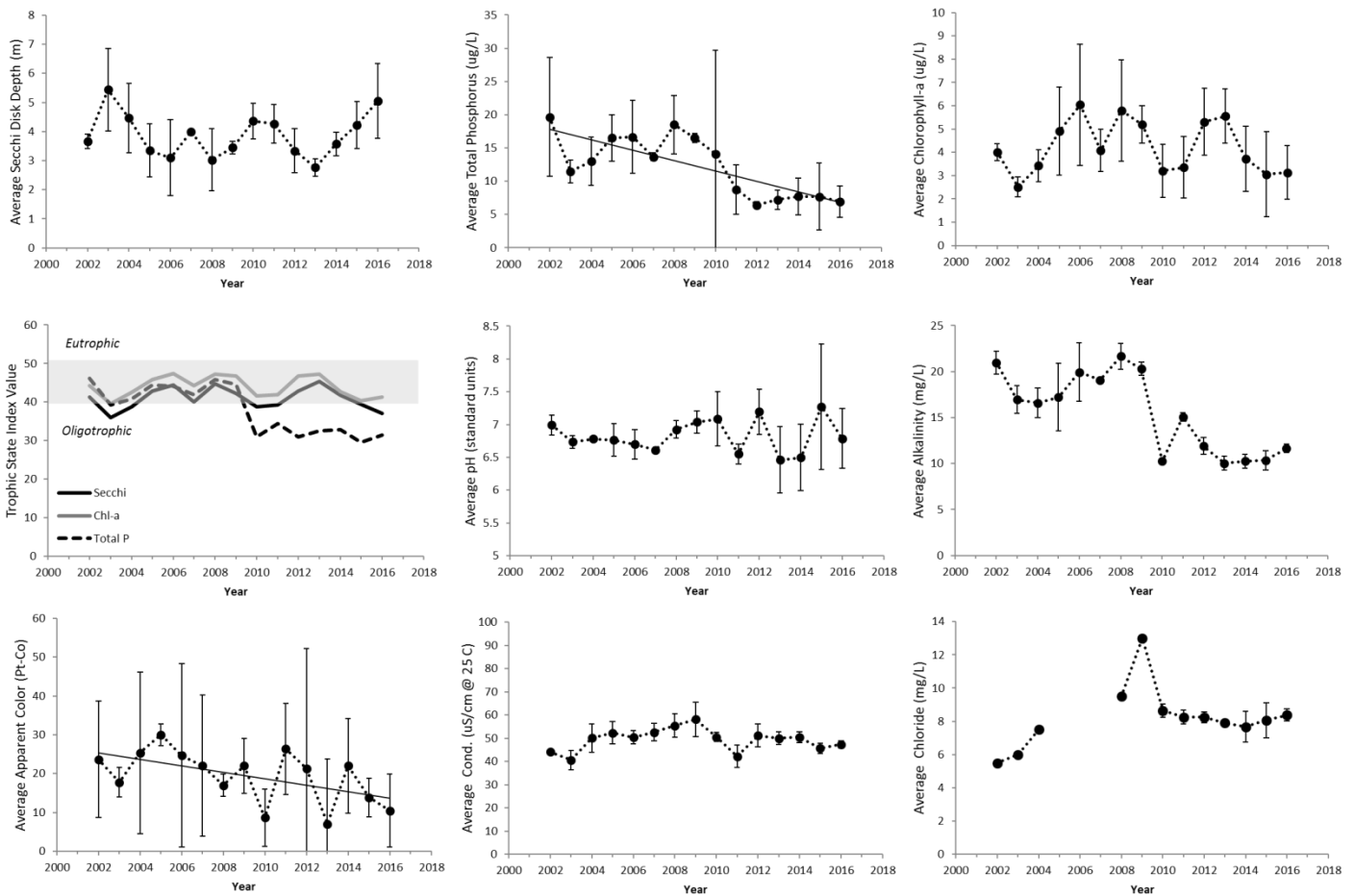
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> Moderate
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Water quality values and historical trends for Upper St. Regis Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/7/2016	7/11/2016	8/3/2016		
Transparency (m)	3.1	5.6	6.1	4.9	No change
Total Phosphorus (µg/L)	10.8	5.0	6.4	7.4	Decreasing
Chlorophyll-a (µg/L)	3.2	1.8	2.5	2.5	No change
Laboratory pH	7.2	6.5	6.6	6.8	No change
Sp. Conductance (µS/cm)	44.8	49.1	48.2	47.4	No change
Color (Pt-Co)	16.4	10.2	BDL	6.5	Decreasing
Alkalinity (mg/L)			11.9	11.9	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)			8.8	8.8	No change
Calcium (mg/L)			3.5	3.5	Not analyzed
Sodium (mg/L)			5.8	5.8	No change

\*See table of content for description of water quality indicators

# Upper St. Regis Lake– Time Series



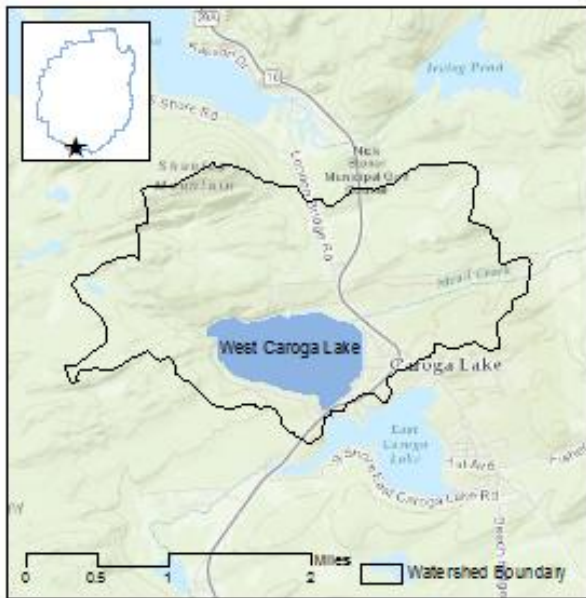
Annual average values of select water quality indicators for Upper St. Regis Lake, 2002-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Upper St. Regis Lake is a 287 ha lake located in Franklin County in the Town of Brighton. The lake is located within a 2313 ha watershed dominated by forests. Upper St. Regis Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2002.

- Upper St. Regis Lake is an oligotrophic lake, bordering on mesotrophic. The transparency depth and chlorophyll-a concentrations have not exhibited any significant trend since 2002. The total phosphorus concentration has exhibited a significant downward trend at a rate of approximately 0.8  $\mu\text{g/L/year}$ .
- Water samples analyzed from 2016 were circumneutral in terms of their acidity. The alkalinity was 11.9 mg/L indicating low sensitivity to acid deposition.
- Sodium and chloride concentration were 5.8 and 8.8 mg/L respectively, indicating that the chemistry of the lake is influenced by the 4.5 km of roads in the watershed.

# West Caroga Lake



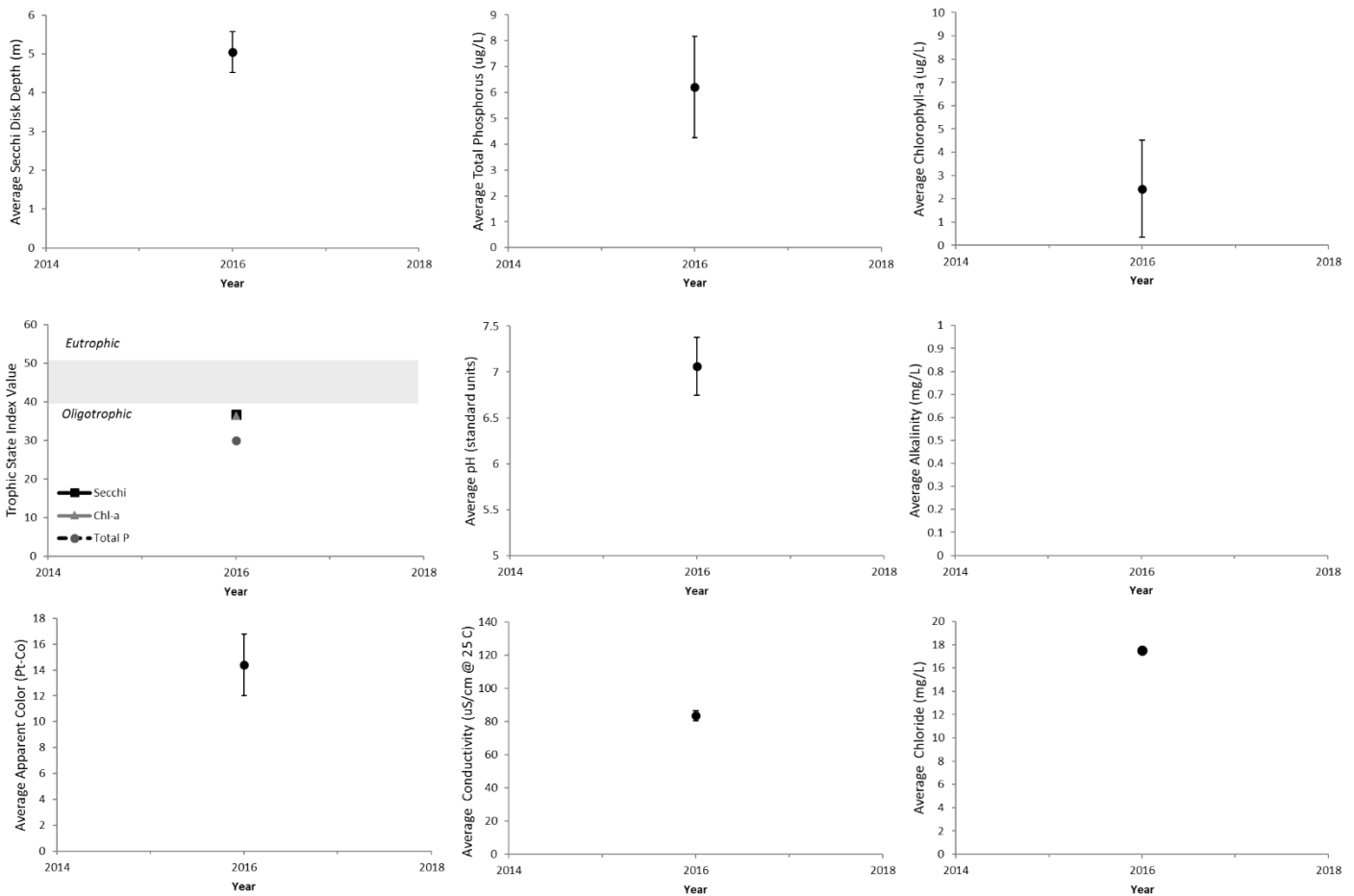
<b>Location</b>	County: Fulton Town: Caroga Lake
<b>Lake Characteristics</b>	Surface Area (ha): 129 Shoreline Length (km): 5 Max. Depth (m): 21.3 Volume (m <sup>3</sup> ): 11537900 Flush rate (times/year): 0.71
<b>Watershed Characteristics</b>	Watershed Area (ha): 1019 Surfacewater (%): 13 Deciduous Forest (%): 34 Evergreen Forest (%): 9 Mixed Forest (%): 10 Wetlands (%): 22 Agricultural (%): 0 Residential (%): 5 Local Roads (km): 11 State Roads (km): 3.9

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> No 2016 Data	<b>Road Salt Influence</b> Moderate
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Water quality values for West Caroga Lake during the 2016 sampling season. Trend analysis will be performed after five years of consecutive data collection. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/20/2016	7/19/2016	8/23/2016		
Transparency (m)	4.6	5.6	5.0	5.1	Not Analyzed
Total Phosphorus (µg/L)	8.5	5.0	5.2	6.2	
Chlorophyll- <i>a</i> (µg/L)	1.9	0.6	4.7	2.4	
Laboratory pH	7.2	6.7	7.3	7.1	
Sp. Conductance (µS/cm)	84.8	85.7	80.0	83.5	
Color (Pt-Co)	16.4	15.0	11.8	14.4	
Alkalinity (mg/L)					
Nitrate-Nitrogen (µg/L)	BDL			BDL	
Chloride (mg/L)	17.5			17.5	
Calcium (mg/L)	5.2			5.2	
Sodium (mg/L)	11.3			11.3	

# West Caroga Lake- Time Series



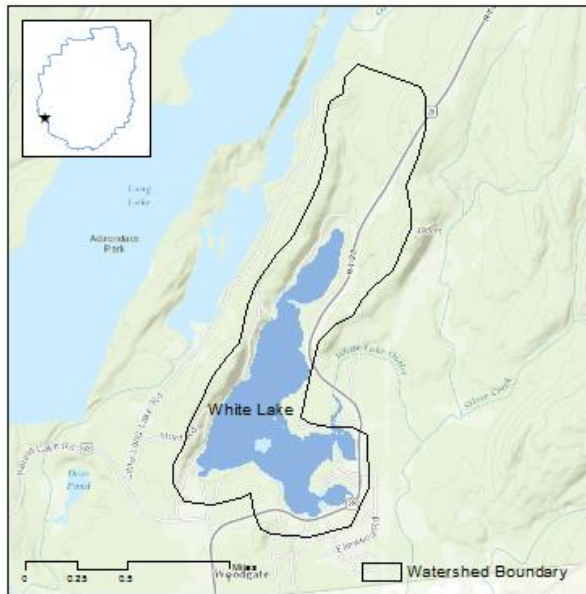
Annual average values of select water quality indicators for West Caroga Lake, 2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

West Caroga Lake is a 129 ha lake located in Fulton County in the Town of Caroga. The lake is located within a 1,019 ha watershed dominated by forests. This is the first year of participation for West Caroga

- West Caroga is an oligotrophic lake. The transparency is relatively high, and greater than 70% of participating ALAP lakes.
- The lake is circumneutral in terms of its pH, and averaged 7.1pH units in 2016.
- Unfortunately, we cannot report alkalinity values this year due to a laboratory error. Alkalinity will be assessed in 2017.
- Sodium and chloride values for the lake were 11.3 and 17.5 mg/L in 2016, indicating that the chemistry of the lake is highly influenced by road salt. Chloride concentration in West Caroga is greater than 85% of the participating lakes and approximately 88 times higher than unimpacted lakes in the Adirondacks.

# White Lake



<b>Location</b>	County:	Oneida
	Town:	Forestport
<b>Lake Characteristics</b>	Surface Area (ha):	97
	Shoreline Length (km):	10
	Max. Depth (m):	22.9
	Volume (m <sup>3</sup> ):	6912525
	Flush rate (times/year):	0.4
<b>Watershed Characteristics</b>	Watershed Area (ha):	329
	Surface water (%):	30
	Deciduous Forest (%):	38
	Evergreen Forest (%):	7
	Mixed Forest (%):	2
	Wetlands (%):	11
	Agricultural (%):	1
	Residential (%):	2
	Local Roads (km):	1.7
State Roads (km):	3.6	

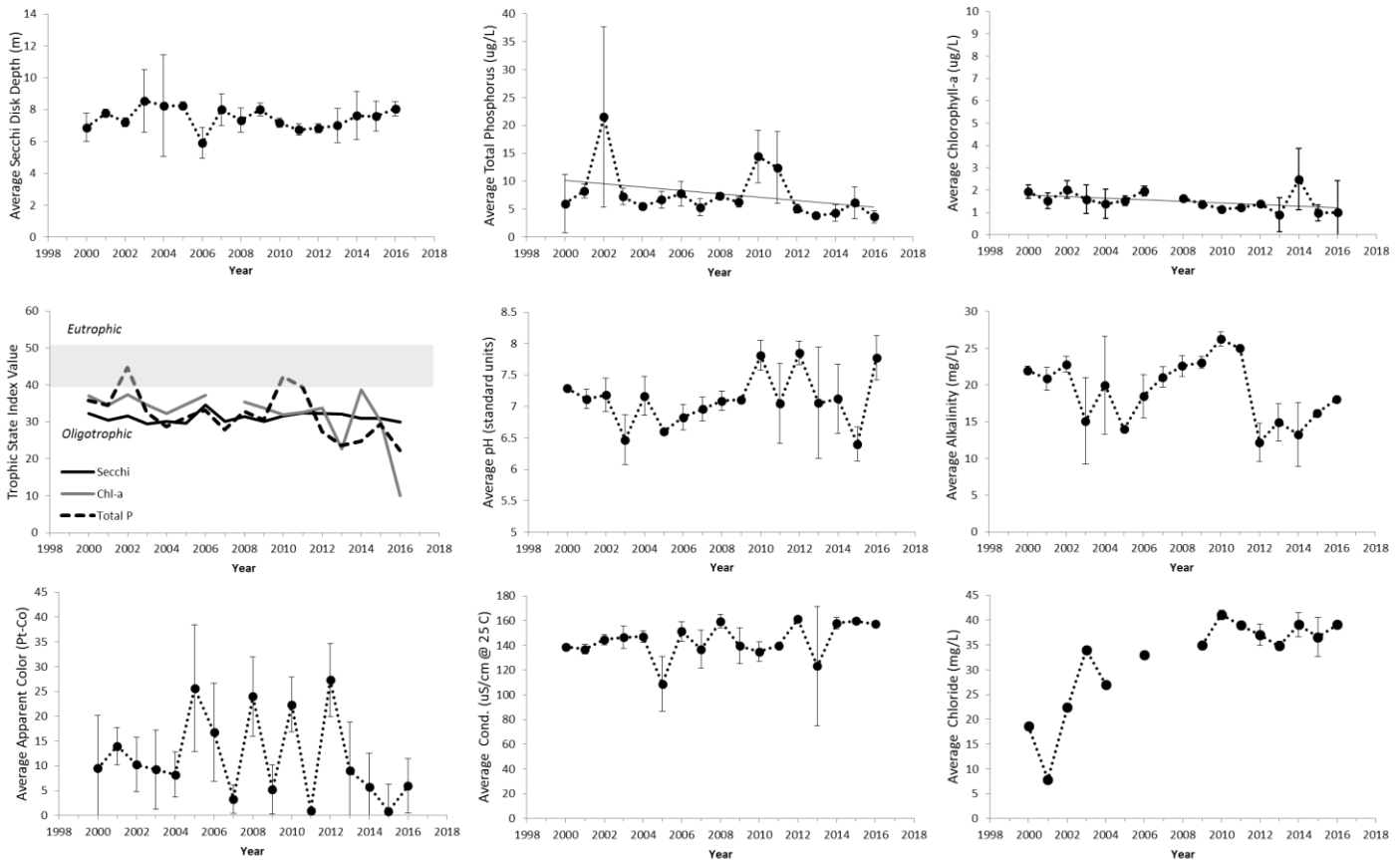
<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Adequate – low sensitivity	<b>Road Salt Influence</b> High
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Water quality values and historical trends for White Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/17/2016	7/16/2016	8/15/2016		
Transparency (m)	8.5	8.0	7.7	8.1	No change
Total Phosphorus (µg/L)	4.8	3.5	2.6	3.6	Decreasing
Chlorophyll- <i>a</i> (µg/L)	0.4	BDL	2.6	±1.0	Decreasing
Laboratory pH	7.6	8.2	7.5	7.8	No change
Sp. Conductance (µS/cm)	158.5	158.9	154.3	157.2	No change
Color (Pt-Co)	0.8	5.3	11.8	6.0	No change
Alkalinity (mg/L)			18.1	18.1	No change
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	39.1			39.1	No change
Calcium (mg/L)	7.5			7.5	Not analyzed
Sodium (mg/L)	22.9			22.9	No change

\*See table of content for description of water quality indicators

# White Lake – Time Series



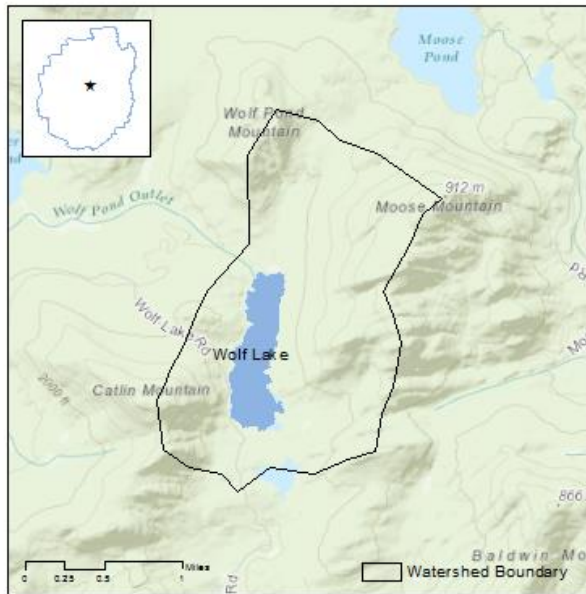
Annual average values of select water quality indicators for White Lake, 2000-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

White Lake is a 97 ha lake located in Oneida County in the Town of Forestport. The lake is located within a 329 ha watershed dominated by forests. White Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2000.

- White Lake is an oligotrophic lake. The lake is highly transparent; the average transparency in 2016 was greater than 97% of ALAP participants. Chlorophyll-a and total phosphorus concentration have exhibited a slight, yet significant downward trend at a rate of approximately 0.04 and 0.3  $\mu\text{g/L/year}$  respectively.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 18.1 mg/L, indicating that the lake is well buffered and has low sensitivity to acid deposition.
- Sodium and chloride concentration were 22.9 and 39.1 mg/L respectively. These values indicate that the lake is highly influenced by the 5.3 km of roads in the watershed. Chloride concentration of White lake is greater than 96% of participating lakes, and nearly 200 times greater than chloride concentration in lakes without paved roads.

# Wolf Lake



<b>Location</b>	County:	Essex
	Town:	Newcomb

<b>Lake Characteristics</b>	Surface Area (ha):	59
	Shoreline Length (km):	5
	Max. Depth (m):	-
	Volume (m <sup>3</sup> ):	3389892
	Flush rate (times/year):	1.5

<b>Watershed Characteristics</b>	Watershed Area (ha):	673
	Surface water (%):	10
	Deciduous Forest (%):	67
	Evergreen Forest (%):	10
	Mixed Forest (%):	10
	Wetlands (%):	3
	Agricultural (%):	0
	Residential (%):	0
	Local Roads (km):	0
	State Roads (km):	0

<b>Trophic State</b> Oligotrophic	<b>Acidity</b> Circumneutral	<b>Acid Neutralizing Capacity</b> Moderate	<b>Road Salt Influence</b> Present - low
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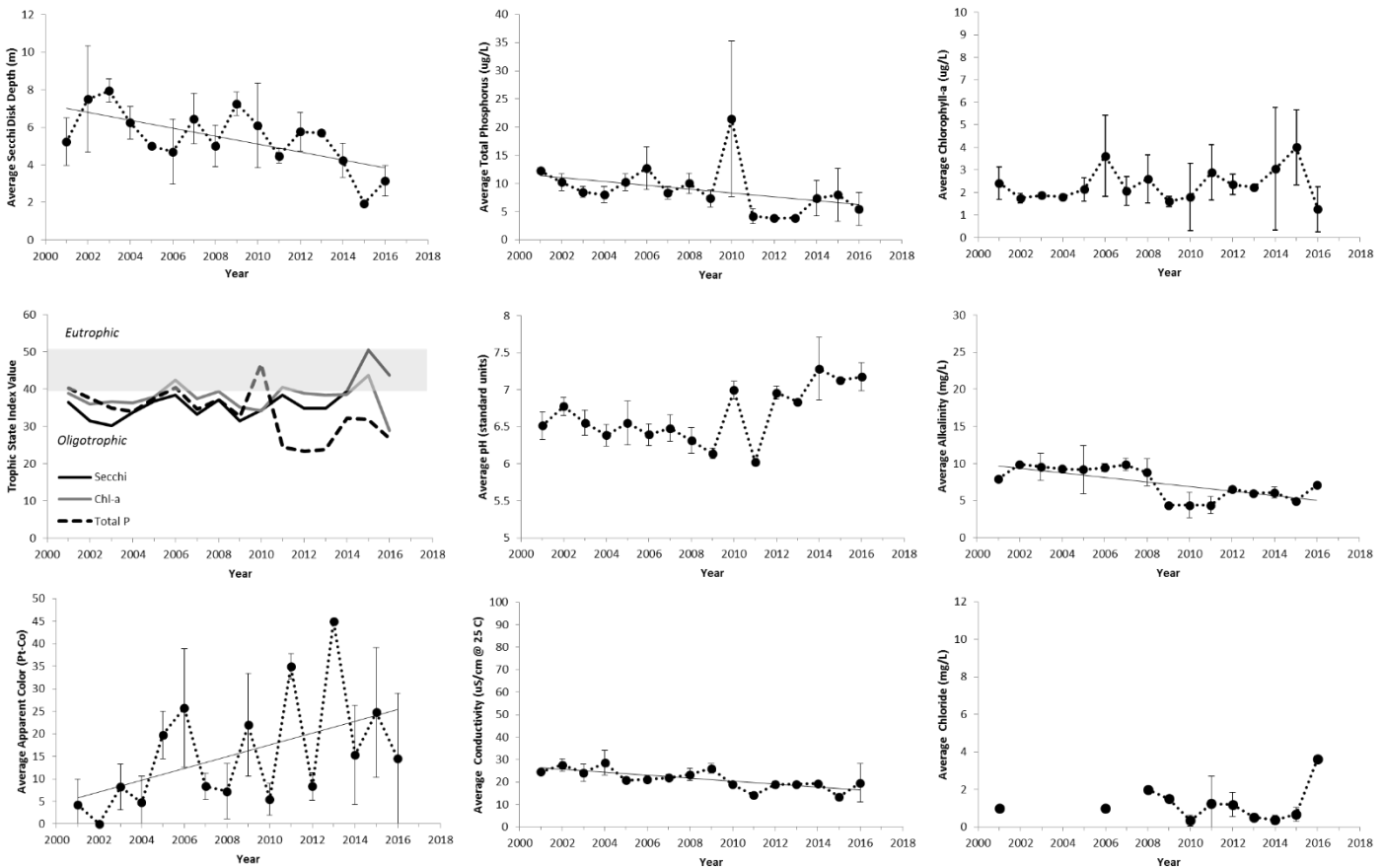
Water quality values and historical trends for Wolf Lake during the 2016 sampling season. Trend analysis was not performed on calcium or nitrogen data. BDL=below detection limit.

Water Quality Indicator	Sampling Date			Average	Trend
	6/24/2016	7/20/2016	8/24/2016		
Transparency (m)	4.0	3.1	2.4	3.2	Decreasing
Total Phosphorus (µg/L)	8.1	6.0	2.2	5.5	Decreasing
Chlorophyll- <i>a</i> (µg/L)	2.2	0.2	1.4	1.3	No change
Laboratory pH	7.2	7.3	7.0	7.2	No change
Sp. Conductance (µS/cm)	29.4	14.2	15.3	19.6	Decreasing
Color (Pt-Co)	4.0	31.1	8.6	14.5	Increasing
Alkalinity (mg/L)			7.1	7.1	Decreasing
Nitrate-Nitrogen (µg/L)			BDL	BDL	Not analyzed
Chloride (mg/L)	3.6			3.6	No change
Calcium (mg/L)	3.1			3.1	Not analyzed
Sodium (mg/L)	2.3			2.3	No change

\*See table of content for description of water quality indicators



# Wolf Lake – Time Series



Annual average values of select water quality indicators for Wolf Lake, 2001-2016. Vertical bars represent  $\pm 1$  standard deviation of the mean; Solid trend lines across the data indicate a statistically significant trend ( $p < 0.05$ ).

## Summary of Findings

Wolf Lake is a 59ha lake located in Essex County in the Town of Newcomb. The lake is located within a 673 ha watershed dominated by forests. Wolf Lake has been monitored by ALAP volunteers and the Adirondack Watershed Institute since 2001.

- Wolf Lake is best classified as an oligotrophic lake. Transparency depth has exhibited a significant downward trend at a rate of approximately 34 cm/year. It's possible that some of this trend could be explained by an increasing trend in color (at a rate of 1.3Pt-Co/year), a surrogate measure of dissolved organic material. Dissolved organic material rapidly attenuates light, resulting in decreased transparency.
- The water samples analyzed in 2016 were found to be circumneutral in terms of their acidity. The alkalinity was 7.1 mg/L, indicating that the lake is moderately sensitive to acid deposition. Alkalinity has exhibited a slight, yet significant downward trend at a rate of approximately 0.3 mg/L/year.
- Sodium and chloride concentration were 2.3 and 3.6 mg/L respectively. There are no salted roads in the Wolf Lake watershed and chloride concentrations are typically well below 1 mg/L. We believe the chloride sample was contaminated, and does not represent an actual increase in lake concentration

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## Appendix 1. Analytical methods performed on ALAP samples at the AWI Environmental Research Lab.

Analyte	Method Description	Reference
Lab pH	Mettler Toledo standard pH electrode	APHA
Conductivity	Conductivity at 25° C via Mettler Toledo conductivity cell	APHA 2510 B
Apparent Color	Single wavelength method with PtCO standards	APHA 2120 C
Chlorophyll-a	Trichromatic method uncorrected for phaeophyton	APHA 10200 H
Total Phosphorus	Acid-persulfate digestion, automated ascorbic acid reduction	APHA 4500-P H
Nitrate + Nitrite	Automated cadmium reduction	APHA 4500-NO <sub>3</sub> I
Alkalinity	Automated methyl orange method	EPA 301.2
Chloride	Automated ion chromatography	EPA 300.0
Calcium and Sodium	Inductively coupled plasma optical emission spectroscopy	EPA 200.7