The Adirondack Long-Term Monitoring Lakes:

A Compendium of Site Descriptions, Recent Chemistry and Selected Research Information

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The Adirondack Long-Term Monitoring Lakes: A Compendium of Site Descriptions, Recent Chemistry and Selected Research Information

Second Edition

Prepared for:

The New York State Energy Research and Development Authority
Albany, NY

Gregory Lampman
Program Manager

Diane Bertok
Project Manager

Prepared by:

Adirondack Lakes Survey Corporation
Ray Brook, NY

Karen Roy
New York State Department of Environmental Conservation
Division of Air Resources
Ray Brook, NY

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Karen Roy, Kevin Civerolo, and Margaret LaFarr.

Staff with the United States Environmental Protection Agency:
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Contents

Abstract

The Adirondack Lakes Survey Corporation (ALSC) and the New York State Department of Environmental Conservation (DEC) compiled a compendium of site descriptions, recent lake chemistry, and selected research information of the 52 Adirondack Long-Term Monitoring (ALTM) waters. This compilation is distributed free to the public via the web at www.nyserda.ny.gov/About/Publications/Research-and-Development-Technical-Reports/Environmental-Research-and-Development-Technical Reports in Adobe PDF format. For each of the 52 lakes sampled, descriptions of the geomorphology, recent chemistry, historical and recent aquatic biota and fish survey results, intensive studies and research programs, and watershed and land cover use overviews are provided in an easy-to-use desk reference format. The work is organized by watershed and supplemented with maps and tables that complete the overview for each ALTM water. This work was designed to offer the public, researchers, and policy makers an easy reference to the current research and chemistry at the diverse sites represented by the ALTM across the Adirondack Park.

Introduction

This report is a compilation of selected attributes and information that describe the 52 ALTM lakes. The attributes and level of detail are calculated to orient the user to each monitoring site and acquaint the user with the research activity within each watershed. The report is intended for general audiences with a working knowledge of acid rain effects. More technical readers may use the report to compare and contrast ALTM sites and cross reference selected intensive research efforts conducted over the past two decades.

Since the onset of ALTM monitoring, many chemical trend analyses have been conducted and published that refer to the ALTM waters. These analyses are listed on the Common References page. The reader will find additional references specific to each site at the end of each narrative.

The ALTM Past and Present

The ALTM program was initiated by C.T. Driscoll (Syracuse University) and others to evaluate monthly chemistry of Adirondack lakes. The initial 17 lakes were selected from the Regionalization of the Integrated Lake Watershed Acidification study (Driscoll and van Dreason 1993). Shortly thereafter, an intensive chemical and biological survey of nearly 1,500 lakes within the Adirondack Park was undertaken by the ALSC and others. This survey was conducted from 1984 through 1987. At the completion of a comprehensive interpretive analyses of the ALSC survey (Baker et al. 1990), the ALTM was expanded to 52 lakes to provide a better representation of lakes across the region. Monthly sampling of the 52 lakes began in June 1992. In addition, weekly spring melt sampling was discontinued at those sites where it occurred in 2014.

Since the publication of the first compendium, the sampling regimen of the ALSC has been revised. In 2013, after review by our ALTM cooperators, it was decided a reduction in the sampling frequency of some lakes could occur without a major impact on data and trend analysis. The new sampling schedule went into effect in 2014. Table 1.2 outlines the revised sampling frequency for each pond within the ALTM program. Since the first compendium, the National Atmospheric Deposition Program (NADP) and DEC consolidated their wet deposition monitoring networks.

Lake Identification Numbers

The DEC developed an eight character code to uniquely identify all ponded waters within the State. Ponded waters include lakes, reservoirs, ponds, or other non-flowing waterbodies (Swart and Bloomfield 1985). The first two numbers of the code represent the New York State Biological Survey Volume code, the next four digits define the pond number, and the last two place holders are character qualifiers. New York State has a total of 16 Biological Survey Volume codes, each defines a unique drainage area, six of which are located in the Adirondack ecological zone. The codes applicable to the Adirondacks are found in Table S.1.

Table S.1 Biological Survey Volume Codes (BSV) in the Adirondacks

BSV	Drainage
02	Lake Champlain
03	St. Lawrence
04	Oswegatchie-Black
05	Upper Hudson
06	Raquette
07	Mohawk-Hudson

Figure S.2 shows the location of the 52 ALTM waters and the six major drainage basins of the Adirondack Park that correspond to the Biological Survey codes and the first two digits of the pond identification numbers. For interpretive purposes, within the Adirondack region, the St. Lawrence (03) and Raquette (06) are often combined as one (i.e., St. Lawrence-Raquette) due to the relatively small areal contribution of the St. Lawrence (Baker et al. 1990). Figure S.5 identifies the classification criteria applied to the original ALS lakes.

Maps and Tables

Watershed maps are derived from the National Elevation Dataset (NED) 1/3 arc-second digital product, 10 meter accuracy, developed by the U.S. Geological Survey. Datasets and additional information about the NED were retrieved January 18, 2017 from http://nationalmap.gov/elevation.html. The horizontal datum is NAD83. Bathymetric maps, unless otherwise indicated, are produced from field work conducted during the 1984–1987 ALTM survey. The maps in Figures S.2 through S.4 are provided to be used in conjunction with each chapter as reference. Chemistry and fish netting/stocking information are from the digital records maintained by the ALSC.

Table S.2 Revised Sampling Frequency of ALTM Lakes

ALSC ALTM ID	Site Name	Sampling Frequency	ALSC ALTM ID	Site Name	Sampling Frequency
050684	ARBUTUS LAKE	Monthly	040186	LOON HOLLOW POND	Seasonal*
050707	AVALANCHE LAKE	Seasonal*	040887	LOST POND	Annual**
040905	BARNES LAKE	Annual**	020265	MARCY DAM POND	Seasonal*
020059	BIG HOPE POND	Monthly	040707	MIDDLE BRANCH LAKE	Seasonal*
040752	BIG MOOSE LAKE	Monthly	020143	MIDDLE POND	Annual**
040874	BROOK TROUT LAKE	Monthly	040704	MIDDLE SETTLEMENT LAKE	Seasonal*
030255	BLACK POND STREAM	Seasonal*	040746	MOSS LAKE	Monthly
040748	BUBB LAKE	Seasonal*	050577	NATE POND	Annual**
040748	BUBB LAKE STREAM	Seasonal*	041007	NORTH LAKE	Monthly
050669	CARRY POND	Annual**	070729	OTTER LAKE	Seasonal*
040747	CASCADE LAKE	Seasonal*	070728	OTTER LAKE STREAM	Seasonal*
040747A	CASCADE LAKE STREAM	Seasonal*	020233	OWEN POND	Annual**
050458	CLEAR POND	Seasonal*	060329	QUEER LAKE	Seasonal*
050706	LAKE COLDEN	Seasonal*	060315A	RAQUETTE LAKE RESERVOIR	Monthly
040777	CONSTABLE POND	Monthly	040739	LAKE RONDAXE	Monthly
040777	CONSTABLE POND STREAM	Monthly	060313	SAGAMORE LAKE	Monthly
040750	DART LAKE	Seasonal*	020197	SOCHIA POND	Annual**
020138	EAST COPPERAS POND	Seasonal*	041004	SOUTH LAKE	Monthly
070859	G LAKE	Seasonal*	040754	SQUASH POND	Monthly
030171	GRASS POND (3)	Annual**	040754	SQUASH POND STREAM	Monthly
040706	GRASS POND (4)	Monthly	040850	SQUAW LAKE	Monthly
020264	HEART LAKE	Monthly	020188	SUNDAY POND	Annual**
040852	INDIAN LAKE	Monthly	040753	WEST POND	Monthly
050259	JOCKEYBUSH LAKE	Monthly	040753	WEST POND STREAM	Monthly
030172	LITTLE CLEAR POND	Monthly	050215	WILLIS LAKE	Annual**
020126	LITTLE ECHO POND	Monthly	040210	WILLYS LAKE	Monthly
020058	LITTLE HOPE POND	Annual**	040750A	WINDFALL POND	Annual**
060182	LITTLE SIMON POND	Annual**	040750A	WINDFALL POND STREAM	Annual**
040826	LIMEKILN LAKE	Seasonal*	040576	WOODS LAKE	Monthly
050649	LONG POND	Annual**			

*Seasonal = Sampled in February, April, May, July, September, and November

**Annual = Sampled in July or August

Chemistry data for the lakes and streams discussed within the compendium and their metadata, fisheries data, and bathymetric maps, may be found at www.adirondacklakessurvey.org. Check the website frequently as historic data products are brought online on a continual basis.

New in this Edition

Lake chemistry tables were brought to 2013, the last year all the original ALTM sites were sampled on a monthly basis. Time series plots were brought current through 2014. The number of data points at each pond in 2014 will reflect the new sampling regimen. Where paired sites are referenced, both the lake and stream sites lake chemistry summary data is presented with the exception of Black Pond as sampling at the lake site ceased in mid-2006. Coordinates are now presented for both the approximate centroid of each pond and the actual sampling location. Sampling locations tend to be at or near the outlet of a pond, unless it is sampled from watercraft or helicopter. In the later instances the sample point is at or near the deepest section of the waterbody. A photo of each pond is now included to give the reader a general picture of the pond characteristics and the surrounding vegetation and landform. In a few instances additional pictures were included to add contextual information where one photo was not sufficient. Fish stocking tables were corrected and revised to reflect our records from 1980–2013.

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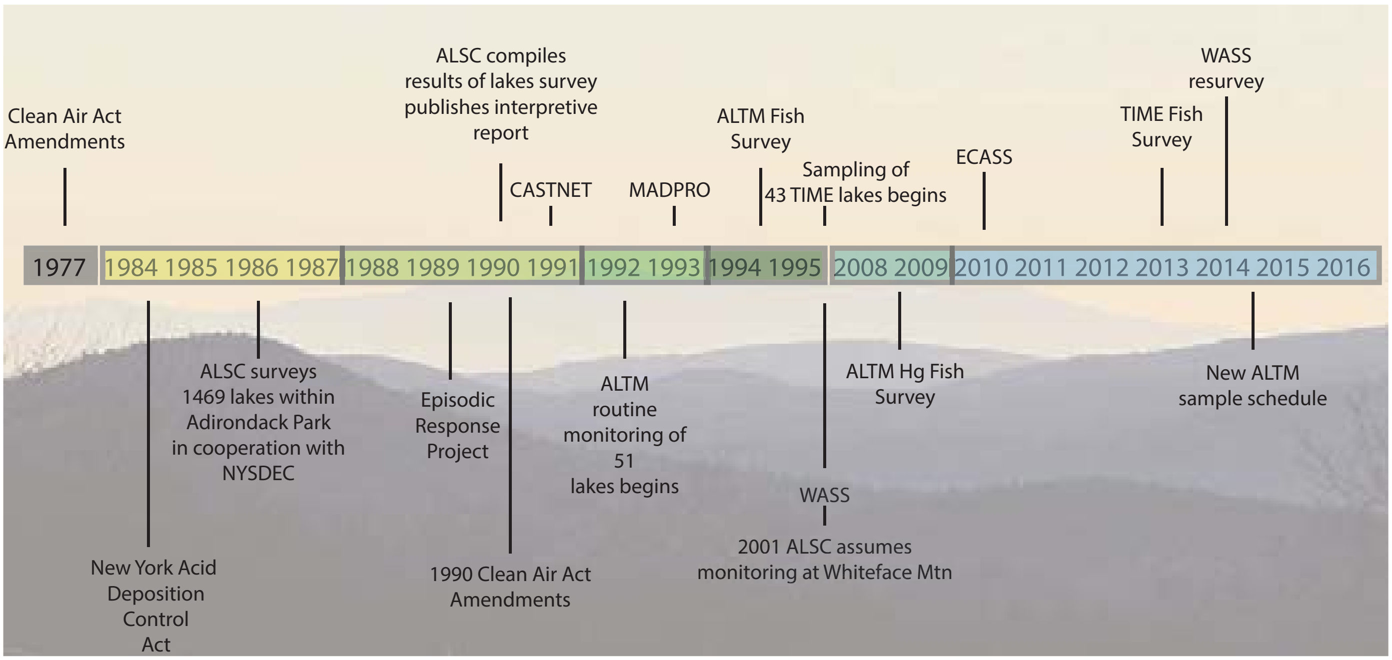
Figure S.1 ALTM Timeline



Modifications to Lake Monitoring Program 2010–2016

Since the first ALTM Compendium, a number of events and findings continue to influence modifications to lake monitoring.

The following events occurred during 2010–2016.

In 1998, New York State identifies 143 lakes in the Adirondack Mountain Forest Preserve as acid-impaired lakes (www.dec.ny.gov/docs/water_pdf/tmdlacidlkadir.pdf.) The 2010 Acid Impaired Lakes in the Adirondack Park 303(d) list includes 128 Adirondack lakes. Eight are ALTM lakes: Brook Trout Lake (040874), Constable Pond (040777), East Copperas Pond (020138), Grass Pond (040706), Middle Branch Lake (040707), Middle Settlement Lake (040704), Squash Pond (040754), and West Pond (040753). Models use two target thresholds of acid-neutralizing capacity (ANC; 11 and 20 ueq/L) to estimate recovery timeframes.

In 2010, wild (offspring) brook trout appear in the West Canada Lake Wilderness Area at Brook Trout Lake (040874). During 2005–2008, researchers at RPI's Darrin Freshwater Institute (DFWI) and DEC begin stocking adult heritage-strain brook trout, after determining this fishless lake shows improvement in chemistry trends. This is a special study of an EPA-sponsored Adirondacks Effects and Assessment Program (AEAP) to monitor for anticipated biological changes. With support from NYSERDA, the DFWI posts the complete AEAP chemical and biological data on 30 lakes and ponds including Brook Trout Lake during 2004–2012 (http://www.rpi.edu/dept/DFWI/research/aeap/aeap_chem_biota_database.html).

In 2011, NYSERDA's EMEP program publishes a comprehensive report on climate change in New York State (nyserda.ny.gov NYSERDA Final Report 11-18). The Synthesis Report expects impacts to terrestrial and aquatic ecosystems, including "Lakes, streams, inland wetlands, and associated aquatic species will be highly vulnerable to changes in the timing, supply and intensity of rainfall and snowmelt, groundwater recharge, and duration of ice cover. Increasing water temperatures will negatively affect brook trout and other native coldwater fish."

In 2012, NYSERDA's EMEP report "Assessment of Long-Term Monitoring of Nitrogen, Sulfur, and Mercury Deposition and Environmental effects in New York State" finds greater efficiencies and identifies gaps and redundancies in ecosystem components responding to environmental changes and policies. EMEP updates its research program plan for the Ecological Effects of Deposition of Sulfur, Nitrogen and Mercury in 2013 (Plan) (www.nyserda.ny.gov/All-Programs/Programs/Environmental-Research/Research-Planning). The Plan supports significant enhancements to acid deposition monitoring in New York State at three Adirondack Mountain sites – Piseco Lake, Wanakena Ranger School, and Paul Smith's College (www.dec.ny.gov/chemical/8406.html). At the same time, the EPA and DEC phase in a pilot monitoring program to support and evaluate the proposed secondary national ambient air quality standards (NAAQS, www.epa.gov/ttnnaaqs/standards/no2so2sec/cr_fr.html). Concurrently, specialized nitrogen measurements begin at Huntington Wildlife Forest, Whiteface Mountain, and Nick's Lake.

The 2013 EPA Progress Report (www.epa.gov/airmarkt/progress/surfacewater.html) finds continued improvement at regional LTM sites over 1990–2012. Critical loads exceedances for nitrogen and sulfur deposition in the eastern U.S. show many Adirondack lake sites improving since 2000–2002.

Budget reduction necessities in 2013 require NYSERDA, the DEC, and EPA to reevaluate the level of support for the ALTM lakes sampling. A detailed review by stakeholders covering the relative value of data types, frequencies, and locations modifies the lakes sampling to a combination of monthly, seasonal and annual sampling efforts starting in January 2014 (Table S.2 Revised Sampling Frequency of ALTM Lakes).

In May 2014, sampling at Marcy Dam Pond is discontinued after damage to the impoundment by Tropical Storm Irene in August 2011 and the decision by DEC is made to not reconstruct the dam.

During 2014, several long-term monitoring and research efforts support an update to the Total Maximum Daily Loads (TMDLs) for acidified waterbodies in the Adirondack Mountain Forest Preserve (www.dec.ny.gov/chemical/31290.html) and critical loads for sulfur and nitrogen for acid sensitive resources in the Adirondack Mountain region (Summary Report 14-11 and Report 14-24; https://www.nyserda.ny.gov/About/Publications/Research-and-Development-Technical-Reports/Environmental-Research-and-Development-Technical-Reports). Several ALTM lake long-term chemistry records appear in both efforts.

On October 19-23, 2015, the ninth International Conference on Acid Deposition gathered in Rochester, NY with a focus on "Successes Achieved and the Challenges Ahead." Over 100 presentations and nearly 200 posters illustrating current conditions around the world stimulated discussion about the extent of environmental degradation and the tremendous progress especially in Europe and North America over recent decades. Adirondack Park data are widely used. The National Atmospheric Deposition Program (http://nadp.slh.wisc.edu) hosted the proceedings. More than 30 papers from this conference appear in a special issue of Atmospheric Environment (https://www.sciencedirect.com/journal/atmospheric-environment/vol/146/suppl/C).

In January 2016, total phosphorus (TP) and chlorophyll-a (Chl a) collections and analyses resume at all 51 ALTM lake sites. TP and Chl a analyses are initiated in October 2008 through December 2013. Measurements will help identify potential signals in lake primary productivity and nutrient status.

In May 2018, the EPA Progress Report update through 2016 shows continued surface water chemistry improvements across all LTM regions including the Adirondack Mountains (www3.epa.gov/airmarkets/progress/reports/ecosystem_response_ecosystems.html#figure2).

A first compendium of Adirondack TIME (Temporally Integrated Monitoring of Ecosystems) lakes is completed in August 2018. Similar in purpose to this ALTM Compendium, but modelled after the EPA "Lake Site Assessments U.S. EPA TIME-New England Lakes" by Sarah Nelson et al. 2013, it will align the data summaries and descriptions with the New England TIME Compendium. Featuring 43 individual Adirondack lake descriptions, selected findings, and an overview of how the EPA TIME program relates to the ongoing LTM program in the Adirondacks, this second compendium will complement newly available data spanning over two decades since the early 1990s through 2014. The last Adirondack TIME lake collections in October 2016 coincide with the TIME portion of EPA's EMAP efforts, leaving the LTM portion the only component that is expected to continue.

We encourage users to search the links provided that contain additional data and findings.

Site Maps

Figure S.2 ALTM Lake and Drainage Basin Locations

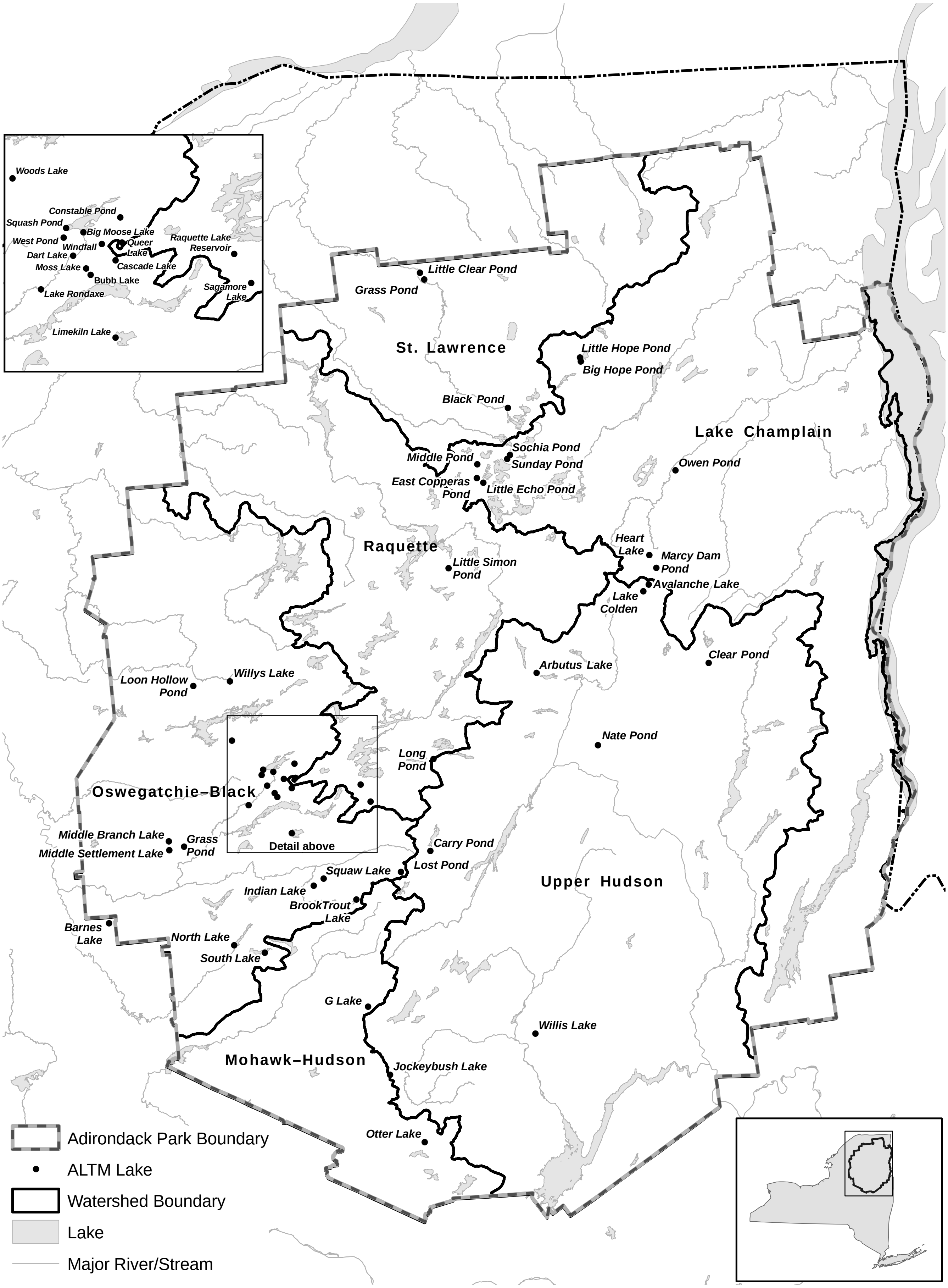


Figure S.3 ALTM Lakes by Sampling Period

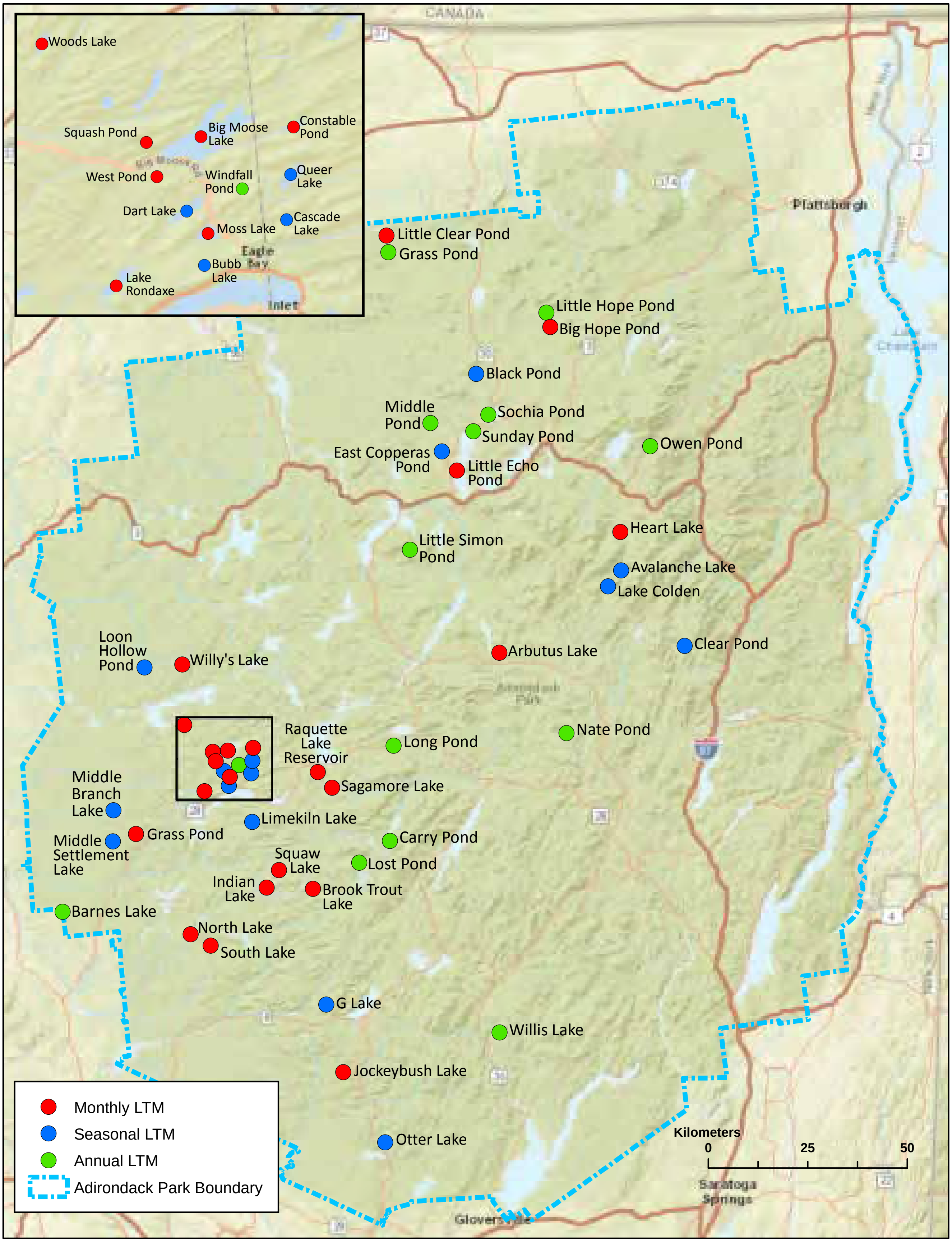


Figure S.4 NADP and CASTNET Sites

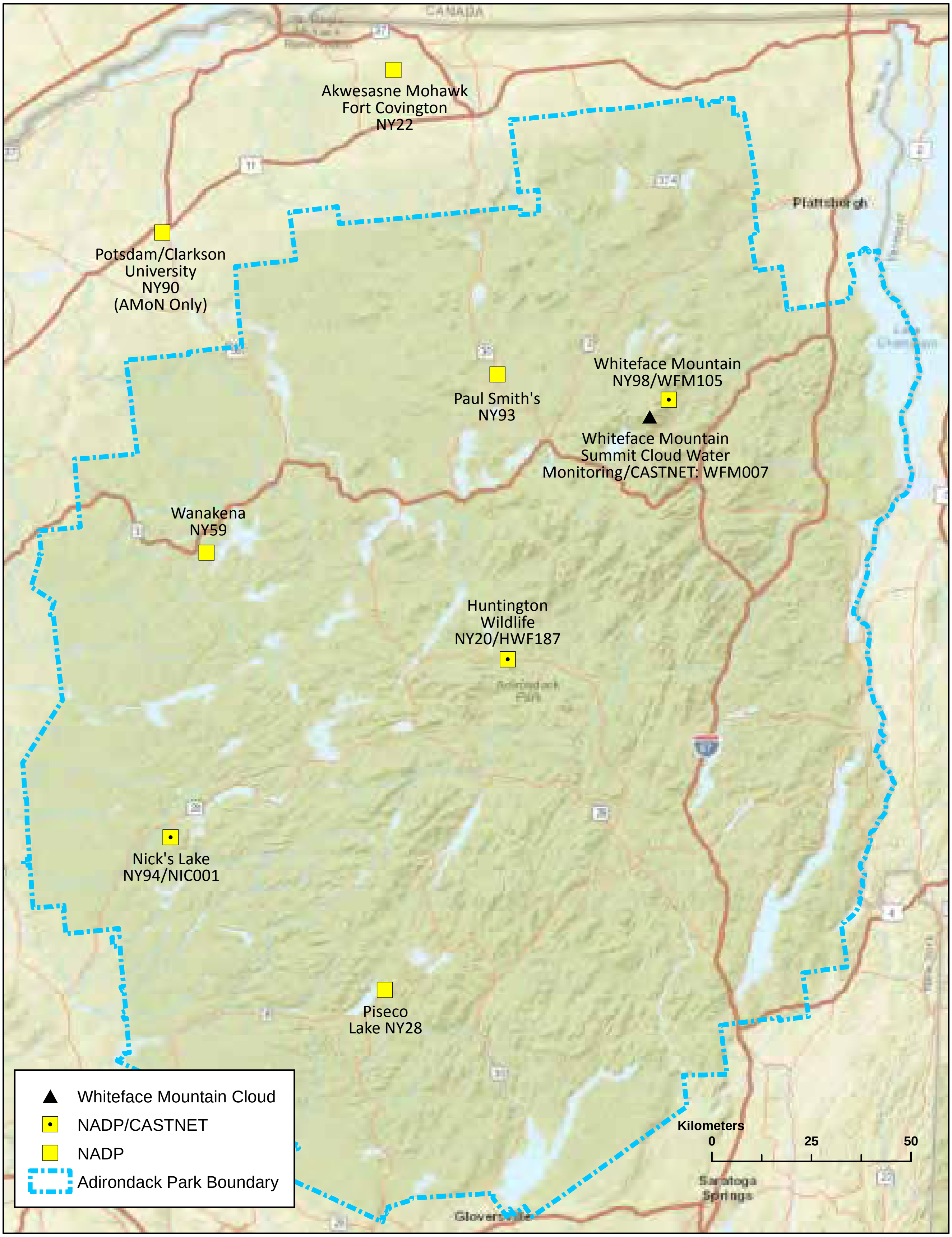
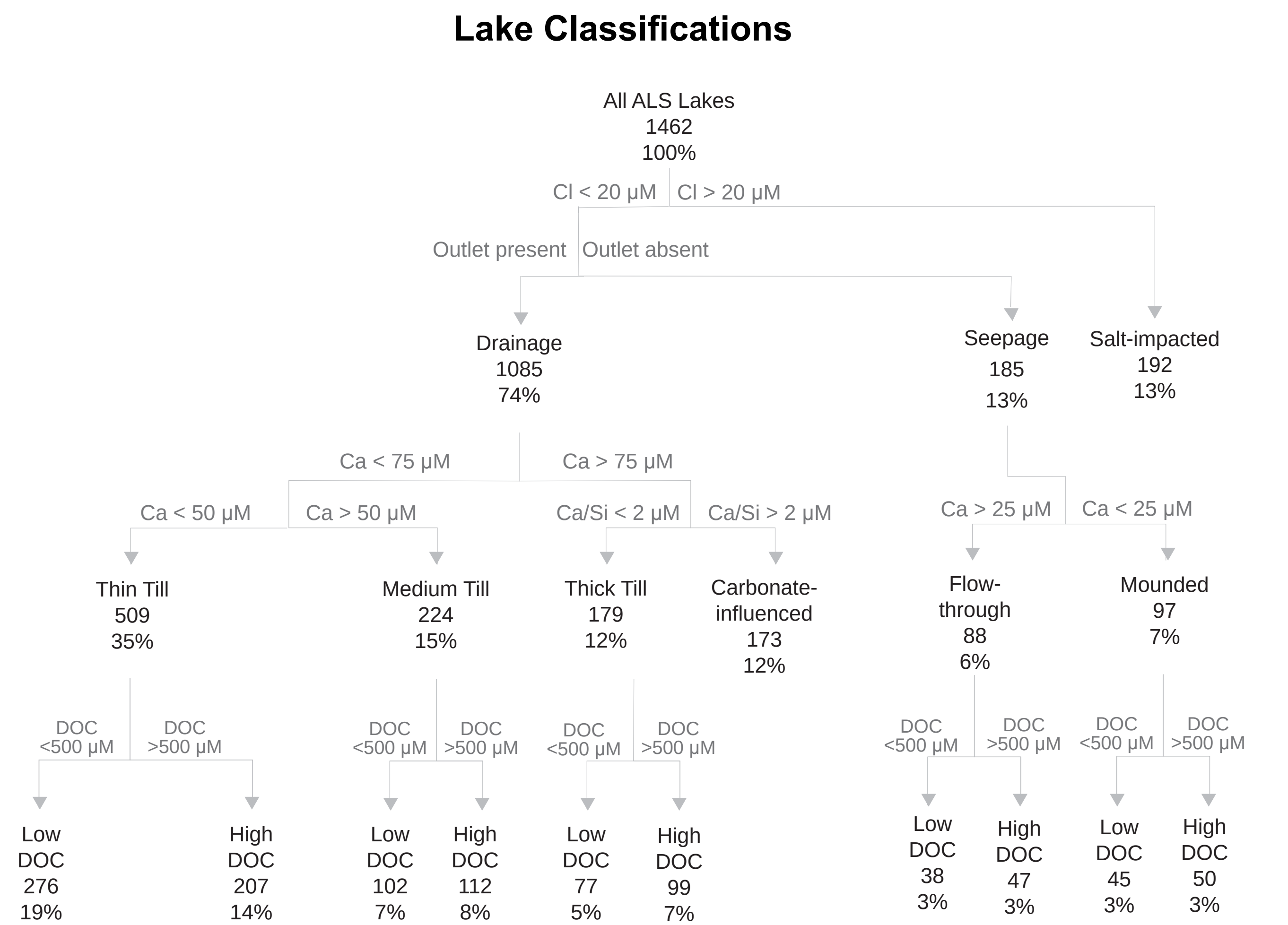


Figure S.5 Flow Chart of the Sequence in which Classification Criteria were Applied to the Original ALS Lakes

Each entry shows the total number of lakes in that class and the percentage of the total that class represents. Seven lakes were not classified as they did not meet quality assurance criteria. Lakes with missing parameters were not sub-classified.

From: Newton and Driscoll, "Classification of ALSC lakes", in Baker et al. 1990 Adirondack Lakes Survey: An Interpretive Analysis of Fish Communities and Water Chemistry. 1984-87. Adirondack Lakes Survey Corporation, Ray Brook, NY (www.adirondacklakessurvey.org/charts/classflow.htm).



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Glossary of Terms

$\mu eq\ L^{-1}$	microequivalent per liter
$\mu g\ kg^{-1}$	microgram per kilogram
$\mu g\ m^{-2}$	microgram per square meter
$\mu mol\ L^{-1}$-C	micromole carbon per liter
$\mu mol\ L^{-1}$	micromole per liter
$\mu S\ cm^{-1}$	microsiemens per centimeter
ACLP	Adirondack Cooperative Loon Project
AEAP	Adirondack Effects Assessment Program
AERP	Adirondack Episodic Response Project
AIREQPH	air equilibrated pH
ALIM or AL_IM	inorganically complexed aluminum
ALOM or AL_OM	organically complexed aluminum
ALS	Adirondack Lakes Survey (1980s)
ALSC	Adirondack Lakes Survey Corporation
ALTD	total dissolved aluminum
ALTM	Adirondack Long Term Monitoring Program
AL_TM	total complexed aluminum
AMMP	Adirondack Manipulation and Modeling Project
ANC	Acid Neutralizing Capacity
APA	Adirondack Park Agency
C_A	summed concentration of acid anions
Ca^{2+}	calcium ion
CASTNET	Clean Air Status and Trends Network
C_B	summed concentration of base cations
Chl a or CHLORA	Chlorophyll a
Cl^-	chloride ion
DDRP	Direct/Delayed Response Project
DEC	New York State Department of Environmental Conservation
DIC	Dissolved Inorgranic Carbon
DOC	Dissolved Organic Carbon
DOH	New York State Department of Health
ELS	Eastern Lakes Survey
EMAP	Environmental Monitoring and Assessment Program
EPA	Environmental Protection Agency (U.S.)
eq	equivalent
eq $ha^{-1}\ yr^{-1}$	equivalent per hectare per year
eq L^{-1}	equivalent per liter
ERP	Episodic Response Project
EPA	United States Environmental Protection Agency
F^-	flouride ion
g	grams
GIS	Geographic Information System
H^+	hydrogen ion
ha	hectare

Hg	elemental mercury
ILWAS	Integrated Lake-Watershed Acidification Study
K^+	potassium ion
kg	kilogram
km	kilometer
LABPH	laboratory pH
LAMP	Lakes Acidification Mitigation Project
LTD	lower than detectable
LTM	Long Term Monitoring Program
m	meter
MDN	Mercury Deposition Network
$MeHg^+$	methyl mercury
mg L^{-1}	milligrams per liter
mg L^{-1}-C	milligrams per liter as carbon
mg m^{-3}	milligrams per cubic meter
Mg^{2+}	magnesium ion
mm	millimeter
NA	not available
Na^+	sodium ion
NAD 83	North American Datum of 1983
NADP	National Atmospheric Deposition Program
NAPAP	National Acid Precipitation Assessment Program
NBMR	North Branch Moose River Project
NH_4^+	ammonium ion
NO_3^-	nitrate ion
NOAA	National Oceanic and Atmospheric Administration
NSA	Natural Spawning Adequate
NTN	National Trends Network
NYSERDA	New York State Energy Research and Development Authority
pH	negative logarithm of hydrogen ion concentration
PIRLA	Paleoliminological Investigation of Recent Lake Acidification Study
Pt Co	platinum cobalt
RILWAS	Regional Integrated Lake-Watershed Acidification Study
SCONDUCT	specific conductivity
SiO_2	silica
SO_2	sulfur dioxide
SO_4^{2-}	sulfate ion
SUNY-ESF	State University of New York College of Environmental Sciences and Forestry
TIME	Temporally Integrated Monitoring of Ecosystems
TP or TOTALP	Total phosphorus
TRUECOLOR	color defined on the platinum cobalt scale
USGS	United States Geological Survey

Little Hope Pond 020058
EPA ID: 020058O

ALSC Staff Photo 2015

Lake: Little Hope Pond lies in the Lake Champlain watershed at 517 m. The 2.8 ha headwater lake is within a group of kettle hole ponds near the Saranac River. In 1984, the ALS found a single inlet on the western shore and an outlet (ALSC 1985). In September 2008, ALSC field crew verified an outlet draining under Kushaqua Road into Big Hope Pond (020059) (Figure 1.1). Little Hope Pond reaches a maximum depth of 6.2 m (20.3 ft) (Figure 1.2).

Little Hope Pond is classified as a medium-till chain drainage lake, with high dissolved organic carbon (>500 µmol L^{-1}-C). The lake is considered to be moderately sensitive to acidification. The ALTM program began monitoring the lake in June 1992. Sampling frequency at this pond was modified to annual in 2014.

Lake chemistry: Little Hope Pond was sampled during the ALS on July 18, 1984 finding: Lab pH 5.00, ANC -27.7 µeq L^{-1}, SO_4^{2-} 105.77 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 108.79 µeq L^{-1}, Mg^{2+} 41.97 µeq L^{-1}, DOC 1098.98 µmol L^{-1}-C (ALSC 1985). Table 1.1 summarizes recent water chemistry. Major analytes through 2013 are shown in Table 1.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 1.3 including intermittent weekly spring melt data collected in the 1990s (shown in red).

Figure 1.1 Catchment

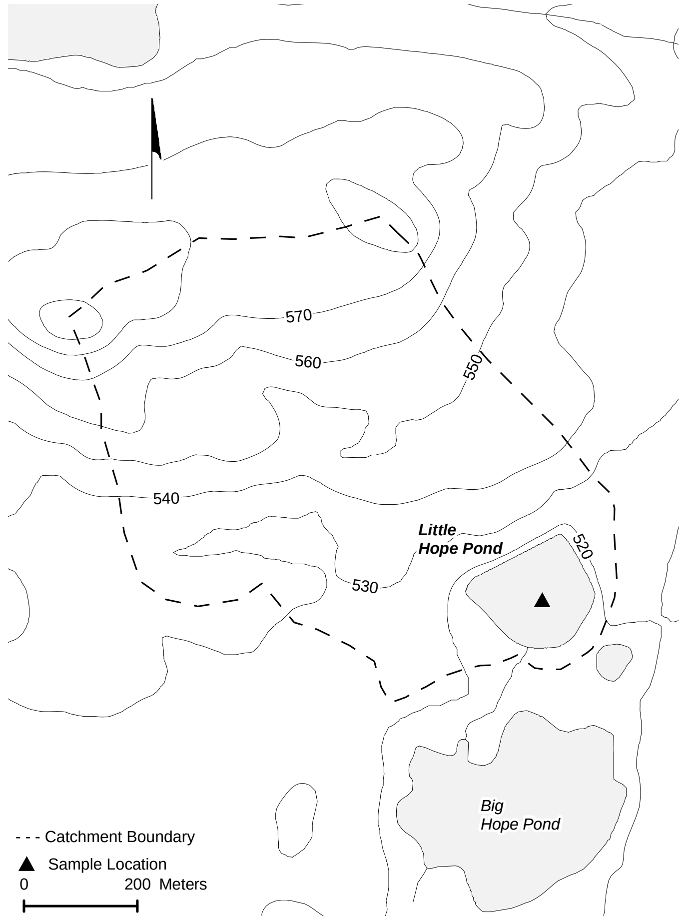
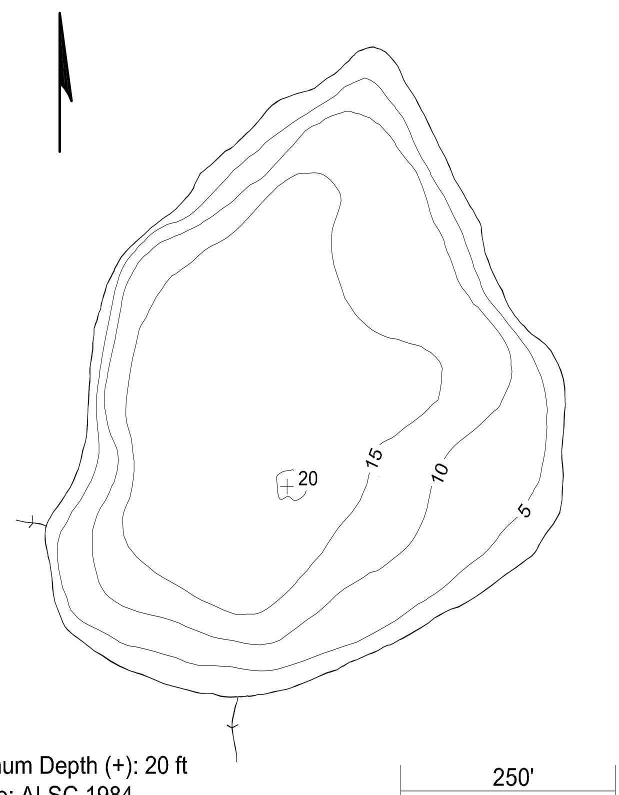


Figure 1.2 Bathymetry



Maximum Depth (+): 20 ft
Source: ALSC 1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.51709	-74.12604	44° 31′ 01.5″ N	074° 07′ 33.7″ W
Lake centroid	44.51708	-74.12605	44° 31′ 01.5″ N	074° 07′ 33.8″ W

Table 1.1 Lake Chemistry

020058			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	67.87	109.51	86.94	17.38	63.85	45.84	26.25	69.44	43.52	μeq L^{-1}
NO_3^-	-0.40	10.00	2.68	0.00	7.74	1.30	0.00	7.49	1.93	μeq L^{-1}
Cl^-	7.62	20.03	11.73	7.69	10.40	9.13	5.27	11.58	8.25	μeq L^{-1}
F^-	3.37	4.37	3.86	1.39	4.64	3.64	3.18	3.84	3.48	μeq L^{-1}
ANC	7.16	38.21	22.30	23.49	79.22	55.15	40.86	70.23	57.21	μeq L^{-1}
DIC	59.11	257.26	122.94	43.29	203.14	123.39	48.47	188.89	113.63	μmol L^{-1}-C
DOC	757.63	1205.88	1013.41	282.32	983.00	821.82	733.33	1199.95	964.17	μmol L^{-1}-C
SiO_2	10.49	112.84	61.04	21.14	110.84	81.03	72.26	112.33	92.73	μmol L^{-1}
Ca^{2+}	66.87	136.24	101.80	33.93	150.71	93.76	79.75	111.96	95.45	μeq L^{-1}
Mg^{2+}	30.45	55.13	42.17	13.17	46.04	38.54	33.86	47.57	40.22	μeq L^{-1}
Na^+	19.57	36.10	26.32	12.18	30.88	25.69	23.72	35.03	27.25	μeq L^{-1}
K^+	7.93	14.58	10.21	3.33	7.16	5.77	4.10	8.39	6.67	μeq L^{-1}
NH_4^+	-0.22	7.48	2.82	-1.05	5.54	1.44	-0.56	3.88	1.42	μeq L^{-1}
AL_TD	2.30	9.82	7.83	2.08	8.75	6.30	4.88	10.01	7.00	μmol L^{-1}
AL_TM	2.65	8.71	5.93	2.15	4.23	3.21	2.53	4.63	3.61	μmol L^{-1}
AL_OM	0.82	6.37	4.71	1.96	3.30	2.86	2.54	4.59	3.33	μmol L^{-1}
AL_IM	0.00	3.04	1.31	0.02	1.56	0.35	0.00	0.82	0.28	μmol L^{-1}
LABPH	4.90	5.74	5.28	5.56	6.36	5.92	5.64	6.23	5.96	
AIREQPH	4.96	6.04	5.46	6.21	6.86	6.45	6.03	6.77	6.36	
TRUECOLOR	80	140	112	45	180	139	80	160	122	Pt Co
SCONDUCT	18.02	27.57	21.65	8.54	20.87	17.26	15.53	21.97	18.15	μS cm^{-1}
TOTALP	na	na	na	3.85	13.83	7.63	6.97	11.62	9.49	μg L^1
CHLORA	na	na	na	1.05	14.67	7.34	5.32	25.02	11.19	μg L^1

Table 1.2 Lake Characteristics

Parameter	Value
Elevation	517 m
Maximum depth	6.2 m
Mean depth	3.5 m
Volume	10.0 x 10^4 m^3
Surface area	2.8 ha
Watershed area	53.6 ha
Watershed ratio	0.05
Hydraulic retention time (year)	0.29
Watershed	Lake Champlain
County, Town	Franklin, Franklin
USGS Quadrangle	Debar Mountain
Land use classification	Debar Mountain Wild Forest

Aquatic biota: On May 22, 1984, a dip-net survey by the ALS identified the following Insecta: Ephemeroptera Leptophlebiidae and Ephemerellidae; Odonata Corduliidae; and Diptera Chironomidae and Unspecified. No macrophyte data are available (ALSC 1985). On July 18, 1984, a thermocline was detected between 2.0 and 2.5 m (ALSC 1985).

Fisheries: The DEC stocked the pond with brook trout from 1938 to 1976. After the pond was reclaimed with rotenone in 2000, stocking resumed (ALSC 2003). In addition to the ALS fisheries survey on May 11, 1984, the ALSC netted the lake on May 15, 1995 and October 15, 2009 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 1.3 and 1.4 for fish stocking and netting histories.

Intensive studies: McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed. Little Hope Pond was one of 36 ALTM lakes evaluated by Momen and Zehr during 1994 examining lake-water chemistry and terrestrial characteristics with the existing watershed classifications (Momen and Zehr 1998). Ito and others (2005) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000.

Figure 1.3 Chemistry Time Series

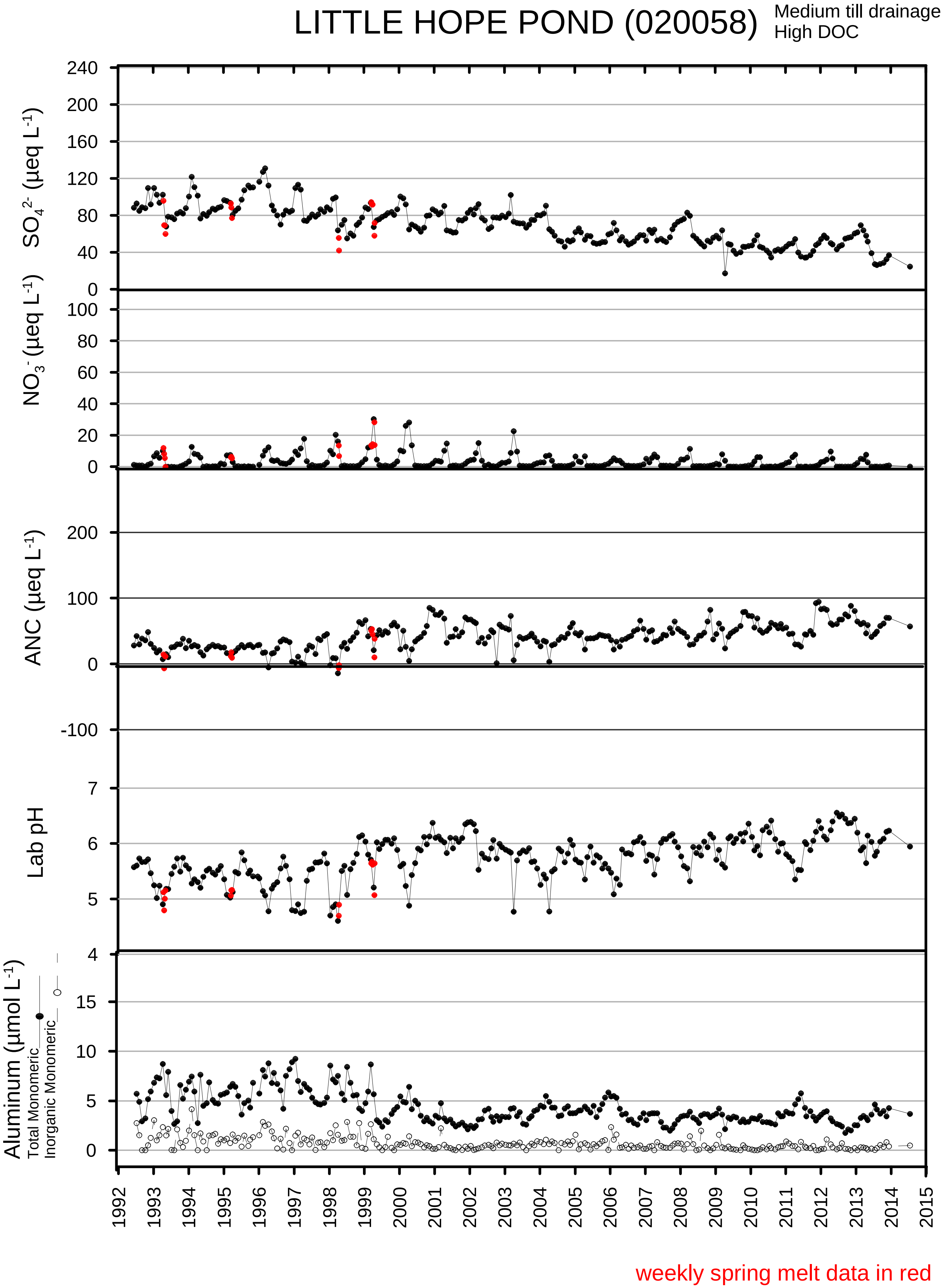


Table 1.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
2001	Brook trout	140	20
2002	Brook trout	150	13
2003	Brook trout	120	14
2004	Brook trout	140	13
2005	Brook trout	150	20
2006	Brook trout	150	15
2007	Brook trout	150	23
2008	Brook trout	150	16
2009	Brook trout	150	15
2010	Brook trout	150	19
2011	Brook trout	140	18
2012	Brook trout	140	13
2013	Brook trout	150	14
2014	Brook trout	150	15

Table 1.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-1984	Pumpkinseed	3	65	70	15	3
May-1984	Golden shiner	10	87	118	114	17
May-1984	Brown bullhead	10	94	120	132	85
May-1984	N. redbelly dace	1	-	-	-	1
May-1995	Golden shiner	31	71	188	420	265
May-1995	N. redbelly dace	18	62	110	110	18
May-1995	White sucker	24	192	355	5312	24
May-1995	Brown bullhead	46	75	175	938	54
May-1995	Pumpkinseed	21	53	85	111	21
Oct-2009	Brook trout	7	215	287	913	7
Oct-2009	Golden shiner	12	78	125	101	12

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date Jamuary 1, 2013; elevation 498 m) located 13 km southwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Little Hope Pond lies on charnockite, granitic and quartz syenite gneiss bedrock and is overlain by kame deposits (APA 2001). The highest elevation in the watershed is 580 m. The maximum relief is 63 m. In 1984, the ALS found the shoal water substrate comprised of 75% organic and 25% muck/silt (ALSC 1985).

Land cover/use: In 1984, half of the watershed was covered in deciduous-conifer mixed forest, 40% coniferous forest, and 10% shrub/sapling mix. The immediate shoreline was characterized as 60% wetland, 25% deciduous conifer mixed forest, and 15% shrub sapling mix. A bog fringe borders the pond (ALSC 1985). Total wetland area is 6.34 ha or 12% of the watershed. The predominant wetland type is forested needle-leaf evergreen (APA 2001). Little Hope Pond and its watershed are located entirely within the Debar Mountain Wild Forest (NYSDEC 2017). A road runs along the southeastern shore of the pond.

Watershed disturbance: The 1916 fire protection source data reveal 100% of the watershed as virgin and second growth green timber with no slash. The watershed was unaffected by the November 1950 blowdown and 1995 microburst storms (APA 2001). The watershed experienced heavy to extreme damage from the January 1998 ice storm (NYSDEC 1998).

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Big Hope Pond 020059
EPA ID: 020059O EMAP ID: NY012L

ALSC Staff Photo 2015

Lake: Big Hope Pond lies in the Lake Champlain watershed at 517 m. The 8.9 ha pond is within a group of kettle-hole ponds near the Saranac River and receives drainage from Little Hope Pond (020058). In 1984, the ALS found an inlet with negligible flow, as well as an outlet. In September 2008, ALSC field crew found an inlet from Little Hope Pond and an outlet to the southwest (Figure 2.1) previously indicated as an inlet during the 1984 ALS (Figure 2.2). The lake reaches a maximum depth of 11.6 m (38.1 ft).

Big Hope Pond is classified as a medium-till drainage lake with high dissolved organic carbon (>500 µmol L^{-1}-C). The lake is considered to be moderately sensitive to acidification. The ALTM program began monthly monitoring in June 1992, which has continued on this schedule.

Lake chemistry: Big Hope Pond was sampled near its deepest point during the ALS on July 18, 1984 finding: Lab pH 5.74, ANC 26.2 µeq L^{-1}, SO_4^{2-} 108.47 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 100.31 µeq L^{-1}, Mg^{2+} 42.79 µeq L^{-1}, DOC 582.79 µmol L^{-1}-C (ALSC 1985). Table 2.1 summarizes recent ALTM chemistry collected by boat near its deepest point. Major analytes through 2013 are shown in Table 2.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 2.3.

Aquatic biota: On May 23, 1984, a dip-net survey by the ALS collected the following Insecta: Odonata Coenagriidae, Libellulidae and Aeshnidae; and Trichoptera Limnephilidae. No macrophytes were recorded during a survey on May 22, 1984 (ALSC 1985). On July 18, 1984, a thermocline was detected

Figure 2.1 Catchment

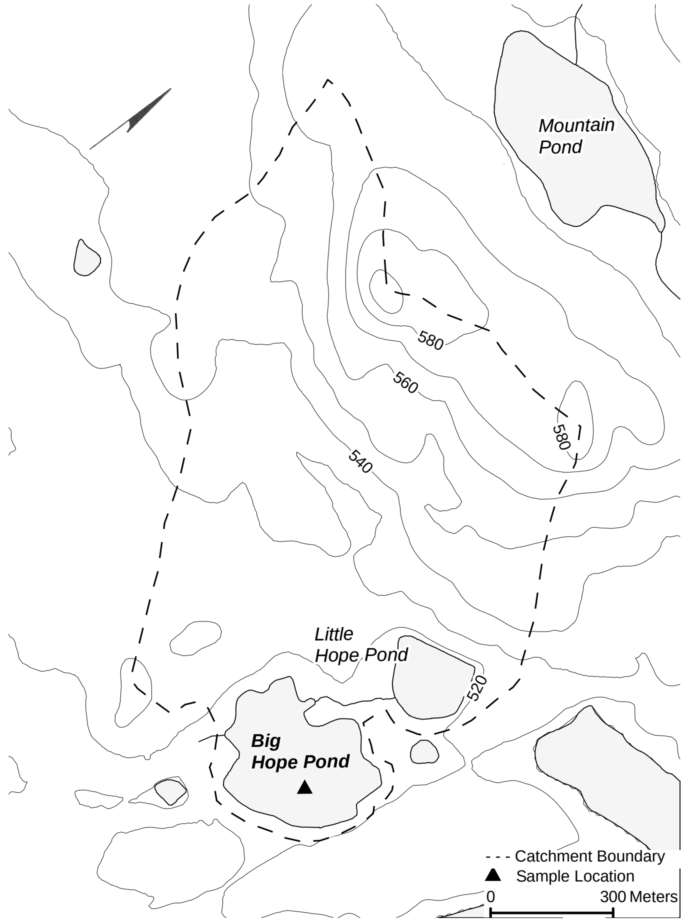
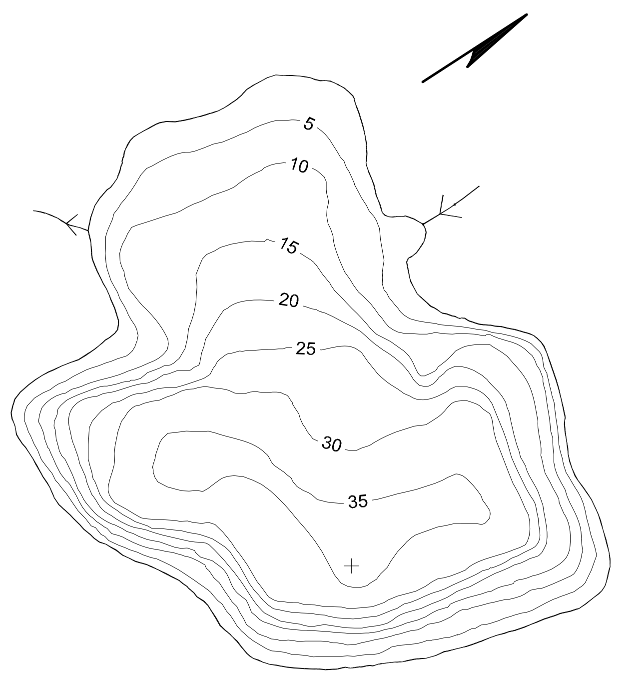


Figure 2.2 Bathymetry



Maximum Depth (+): 38 ft
Source: ALSC 1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.51360	-74.12673	44° 30′ 48.9″ N	074° 07′ 36.2″ W
Lake centroid	44.51360	-74.12673	44° 30′ 48.9″ N	074° 07′ 36.2″ W

Table 2.1 Lake Chemistry

020059			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	72.66	118.26	89.34	45.01	62.85	52.68	24.35	57.1	40.64	µeq L^{-1}
NO_3^-	-0.40	8.71	2.42	0.00	5.58	1.17	0	5.79	2.05	µeq L^{-1}
Cl^-	30.18	49.64	41.32	21.37	28.37	25.79	18.91	29.35	23.92	µeq L^{-1}
F^-	2.58	3.68	3.16	2.79	3.76	3.33	2.51	3.44	3.13	µeq L^{-1}
ANC	18.13	39.80	29.14	52.61	71.78	61.36	52.91	78.23	67.17	µeq L^{-1}
DIC	14.99	160.68	70.77	49.95	145.70	97.85	45.8	155.68	101.68	µmol L^{-1}-C
DOC	570.80	836.89	637.51	586.87	745.64	679.22	581.48	825.52	708.08	µmol L^{-1}-C
SiO_2	3.83	36.61	20.44	16.66	53.59	35.49	24.57	53.43	40.68	µmol L^{-1}
Ca^{2+}	77.35	135.24	96.98	87.83	146.71	102.57	84.72	105.22	94.57	µeq L^{-1}
Mg^{2+}	34.56	59.25	43.54	37.85	47.29	43.56	37.3	46.18	41.53	µeq L^{-1}
Na^+	36.10	56.98	45.27	30.88	39.35	36.27	33.58	45.11	37.11	µeq L^{-1}
K^+	8.70	16.11	10.96	5.63	7.42	6.65	5.62	7.75	6.63	µeq L^{-1}
NH_4^+	-1.00	5.60	2.92	-0.94	3.10	0.56	-0.47	3.52	0.97	µeq L^{-1}
AL_TD	2.48	5.00	4.29	1.96	5.63	3.75	2.2	5.09	3.73	µmol L^{-1}
AL_TM	0.78	10.44	3.55	1.93	2.63	2.25	1.82	2.67	2.23	µmol L^{-1}
AL_OM	0.65	7.53	2.30	1.82	2.52	2.15	1.87	2.63	2.21	µmol L^{-1}
AL_IM	0.00	3.17	1.29	0.00	0.70	0.13	0	0.42	0.07	µmol L^{-1}
LABPH	5.53	6.23	5.87	5.89	6.67	6.21	6.14	6.61	6.36	
AIREQPH	5.90	6.43	6.15	6.58	6.82	6.71	6.49	6.87	6.75	
TRUECOLOR	30	60	45	70	90.00	79	50	90	65	Pt Co
SCONDUCT	20.81	28.51	23.25	18.69	21.77	20.07	17.07	22.79	19.49	µS cm^{-1}
TOTALP	na	na	na	4.35	7.74	6.27	4.35	9.51	6.97	µg L^{1}
CHLORA	na	na	na	1.37	9.95	5.80	1.08	26.45	8.44	µg L^{1}

Table 2.2 Lake Characteristics

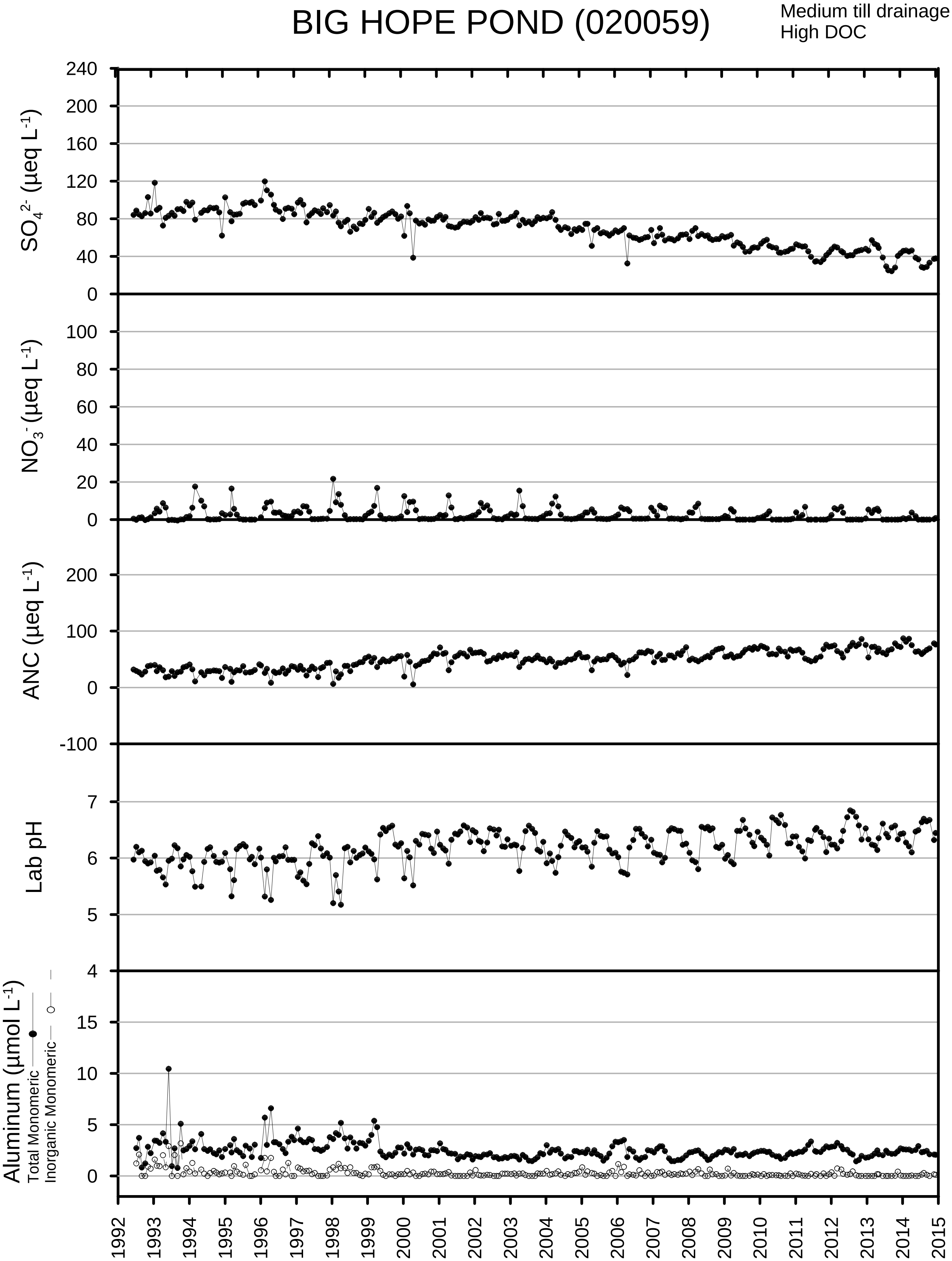
Parameter	Value
Elevation	517 m
Maximum depth	11.5 m
Mean depth	5.8 m
Volume	51.6 x 10^4 m^3
Surface area	8.9 ha
Watershed area	119.2 ha
Watershed ratio	0.07
Hydraulic retention time (year)	0.68
Watershed	Lake Champlain
County, Town	Franklin, Franklin
USGS Quadrangle	Debar Mountain
Land use classification	Debar Mountain Wild Forest

between 4.0 and 6.0 m (ALSC 1985). During July 1984, the DEC Biota Project survey found: chlorophyll a at 4.7 µg L^{-1}; total phosphorus of 22 µg L^{-1}; and a Secchi depth of 2.5 m. The phytoplankton community was dominated by Merismopedia tenuissima. Keratella taurocephala was the dominant rotifer and Diaptomus minutus was the dominant crustacean zooplankton (Sutherland 1989).

Fisheries: The DEC managed Big Hope Pond for brook trout from 1937 to 1965. In addition to the ALS fisheries survey on May 22, 1984, the ALSC netted the lake on May 17, 1994 and November 12, 2008 (Roy et al. 2015, Baldigo et al. 2016). The pond was reclaimed with rotenone in 2000 and stocked with brook trout (ALSC 2003). Refer to Tables 2.3 and 2.4 for fish stocking and netting histories.

Intensive studies: Big Hope Pond was surveyed in 1984 as part of the DEC Biota Project (Sutherland 1989). Big Hope Pond was sampled by the EPA's Environmental Monitoring and Assessment Program (EMAP) in 1991, 1995, and 1997. Since 1999, the lake is sampled annually by the ALSC as part of the Temporally Integrated Monitoring of Ecosystems (TIME) project (Stoddard et al. 2003). This is a TIME/ALTM crossover lake (Civerolo et al. 2011) with uninterrupted summer annual sampling under the TIME program through 2016. McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Figure 2.3 Chemistry Time Series



Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date January 1, 2013; elevation 498 m) located 13 km southwest of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The bedrock underlying Big Hope Pond and its watershed is charnockite, granitic, and quarti syenite gneiss. The rock is overlain by kame deposits (APA 2001). The highest elevation in the watershed is 580 m. The maximum relief is 63 m. In 1984, the ALS found the shoal water substrate to be comprised of 50% boulder/gravel, 30% organic, and 20% muck/silt (ALSC 1985).

Table 2.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1981	Splake	1100	8
1982	Splake	1080	24
1983	Splake	1200	36
1984	Splake	1200	18
1985	Splake	200	16
1986	Splake	140	10
1987	Splake	130	8
1988	Splake	200	13
1989	Splake	260	21
1990	Brown trout	350	65
1991	Brown trout	330	41
1992	Brown trout	400	65
1993	Brown trout	380	34
1994	Brown trout	380	36
1995	Brown trout	350	40
1996	Brown trout	340	34
1997	Brown trout	380	49
1998	Brown trout	380	33
1999	Brown trout	290	39
2000	Brown trout	380	95
2001	Rainbow trout	400	60
2001	Brook trout	1500	28
2002	Brook trout	1100	23
2003	Brook trout	1100	9
2004	Brook trout	1100	50
2005	Brook trout	1100	35
2006	Brook trout	1210	69
2007	Brook trout	1100	21
2008	Brook trout	1100	15
2009	Brook trout	1100	16
2010	Brook trout	500	23
2011	Brook trout	600	8
2012	Brook trout	1100	31
2013	Brook trout	1700	39
2014	Brook trout	700	12

Table 2.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-1984	Brook trout	1	215	215	95	1
May-1984	Lake trout	1	600	600	2000	1
May-1984	Splake	18	182	263	1895	18
May-1984	Golden shiner	10	95	112	117	27
May-1984	White sucker	11	187	392	1835	62
May-1984	Brown bullhead	10	100	255	705	25
May-1984	Pumpkinseed	12	60	90	69	12
May-1994	Brown trout	28	196	350	4720	28
May-1994	Golden shiner	38	74	146	373	350
May-1994	N. redbelly dace	3	61	100	17	3
May-1994	White sucker	30	118	363	4411	368
May-1994	Brown bullhead	29	75	164	450	66
May-1994	Pumpkinseed	13	52	85	33	13
May-1994	Common shiner	1	145	145	31	1
Nov-2008	Brook trout	25	110	331	2462	25
Nov-2008	Golden shiner	29	84	150	236	30

Land cover/use: In 1984, 80% of the watershed was covered in coniferous forest, while the remaining 20% contained deciduous-coniferous mixed forest. The immediate shoreline characteristics were comprised of 80% wetland, 10% coniferous forest, and 10% shrub-sapling mixed vegetation (ALSC 1985). Total wetland area is 13.7 ha and comprises 21% of the watershed. The predominant wetland type is classified as forested needle-leaved evergreen (Roy et al. 1996). The lake and its watershed occur within the Debar Mountain Wild Forest (NYSDEC 2017). A road runs along the western shore and an old railroad grade runs along the eastern shore.

Watershed disturbance: The 1916 fire protection map shows a majority of the watershed as virgin and second growth green timber with no slash with a very small portion to the north as logged for softwoods only. The watershed was unaffected by the November 1950 blow down and July 1995 microburst storms (APA 2001). The watershed experienced heavy to extreme damage from the January 1998 ice storm (NYSDEC 1998).

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Little Echo Pond 020126

EPA ID: 1A1-107E

ALSC Staff Photo 2000

Lake: Little Echo Pond lies in the Lake Champlain watershed at 482 m. This 0.8 ha lake is the smallest in the ALTM program. It has no inlets or outlets (Figure 3.1) and is one of seven seepage lakes in the ALTM program. The lake reaches a maximum depth of 4.6 m (15.1 ft) (Figure 3.2).

Little Echo Pond is classified as a mounded seepage lake with high dissolved organic carbon (>500 µmol L^{-1}-C). The lake is considered sensitive to acidification. This is one of the original ALTM lakes monitored on a monthly basis since June 1982. It continues to be sampled on this schedule.

Lake chemistry: Little Echo Pond was not surveyed by the ALS, but was sampled as part of the ELS (1A1-107) on October 12, 1984 finding: Lab pH 4.18, ANC -63.2 µeq L^{-1}, SO_4^{2-} 67.9 µeq L^{-1}, NO_3^- 1.1 µeq L^{-1}, Ca^{2+} 36.6 µeq L^{-1}, Mg^{2+} 13.8 µeq L^{-1}, DOC 1188.90 µmol L^{-1}-C (Kanciruk et al. 1986). Table 3.1 summarizes recent ALTM chemistry. Major analytes through 2013 are shown in Table 3.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 3.3 with intermittent spring melt data collected in the 1990s shown in red.

Aquatic biota: On October 12, 1984, the ELS I classified the lake as mixed (i.e., the difference between surface and bottom temperatures less than 4ºC). Secchi depth was 0.6 m and total phosphorus was 11.1 µg L^{-1} (Kanciruk et al. 1986).

Fisheries: The DEC stocked the pond with brook trout in the early 1970s (ALSC 2003). Little Echo Pond was not surveyed during the ALS in 1984 through 1987. The ALSC netted the pond on May 28, 1998 and June 29, 2009. No fish were caught in either survey (Roy et al. 2015, Baldigo et al. 2016).

Figure 3.1 Catchment

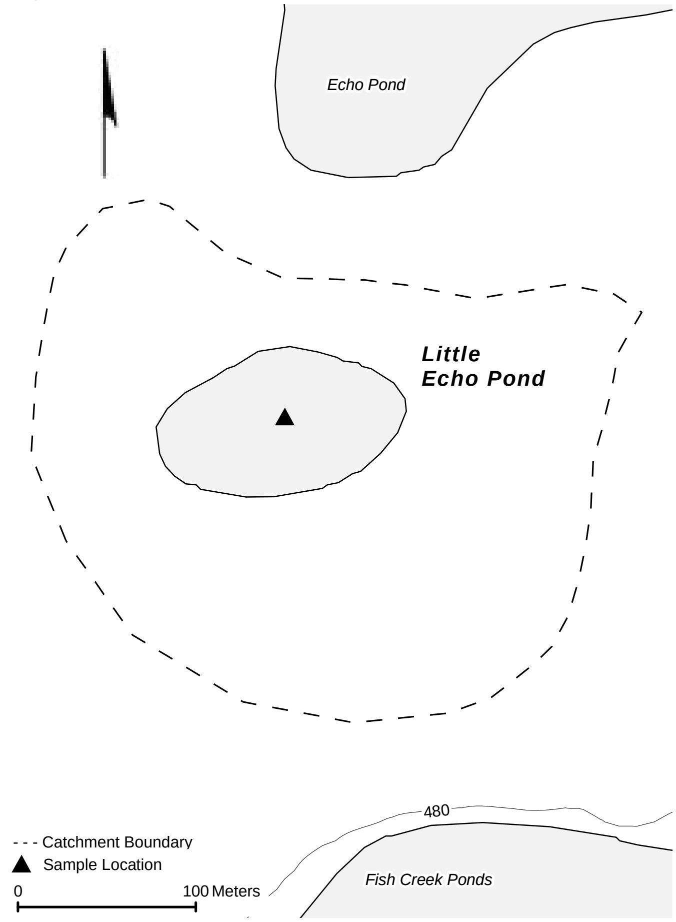
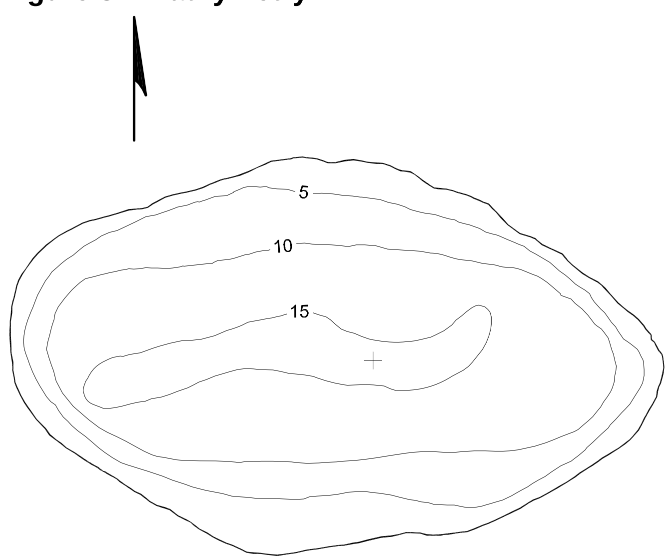


Figure 3.2 Bathymetry



Maximum Depth (+): 15 ft
Source: NYSDEC, ALSC Rev. c.1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.30576	-74.35721	44° 18′ 20.7″ N	074° 21′ 25.9″ W
Lake centroid	44.30576	-74.35721	44° 18′ 20.7″ N	074° 21′ 25.9″ W

Table 3.1 Lake Chemistry

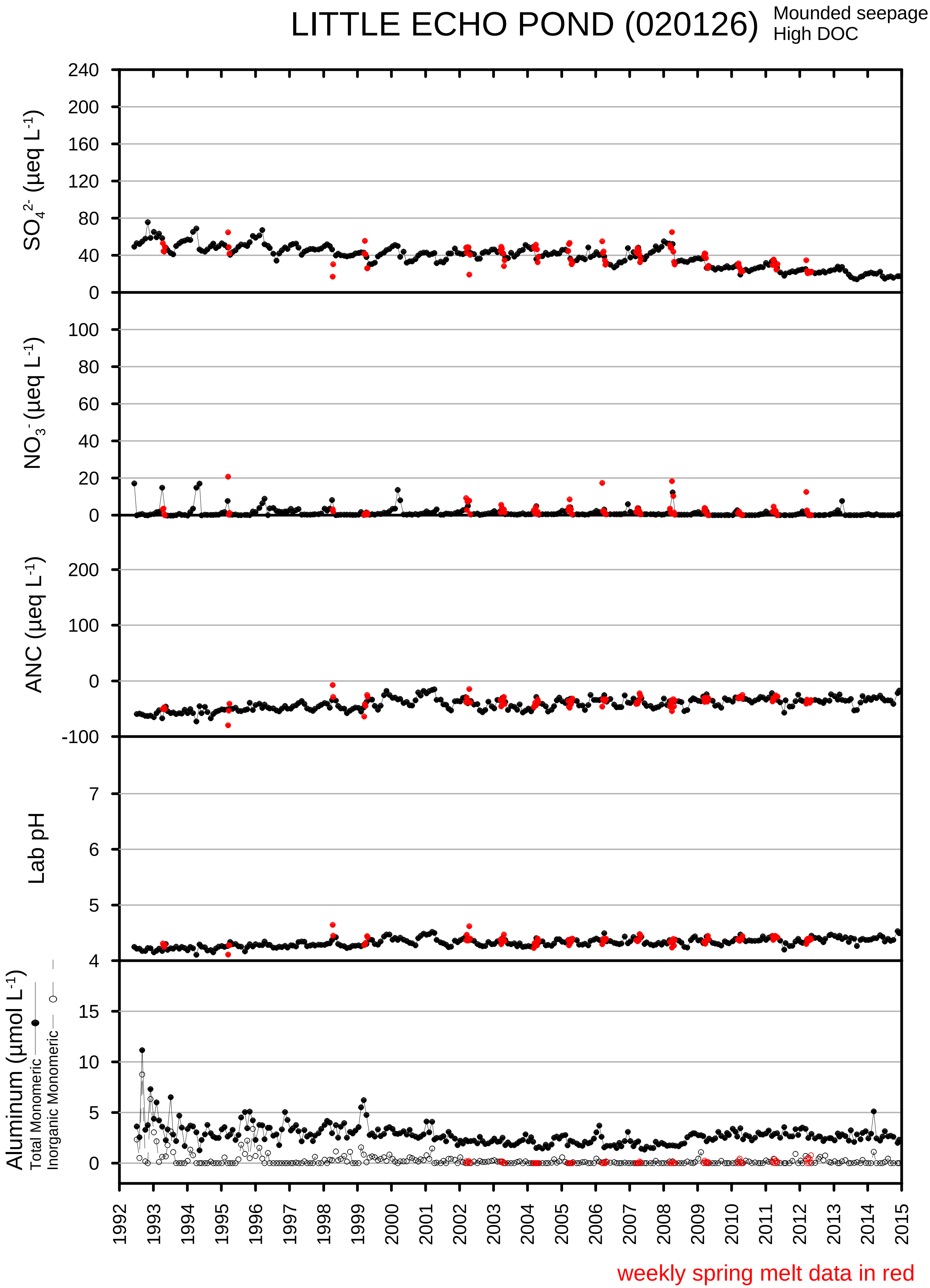
020126			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	40.81	65.17	53.06	24.53	36.81	29.03	13.96	27.97	20.51	µeq L^{-1}
NO_3^-	-0.24	14.84	1.57	0.00	1.98	0.47	0	7.65	1.11	µeq L^{-1}
Cl^-	6.77	14.67	9.14	8.73	13.45	10.66	10.28	15.09	12.43	µeq L^{-1}
F^-	0.32	1.21	0.93	0.58	1.14	0.82	0.85	1.23	1.08	µeq L^{-1}
ANC	-67.19	-46.41	-57.20	-48.09	-24.11	-35.83	-53.11	-24.4	-35.89	µeq L^{-1}
DIC	57.45	198.15	125.58	51.62	287.23	162.31	73.73	246.1	143.02	µmol L^{-1} -C
DOC	843.97	1431.09	1217.97	949.04	1570.48	1338.83	1168.46	1643.5	1408.62	µmol L^{-1} -C
SiO_2	-0.67	20.80	5.58	1.74	26.99	14.49	3.16	26.54	15.22	µmol L^{-1}
Ca^{2+}	19.46	44.91	30.86	20.70	50.40	30.45	12.67	33.82	26.34	µeq L^{-1}
Mg^{2+}	17.28	27.16	22.29	21.03	31.74	26.71	18.73	27.38	23.23	µeq L^{-1}
Na^+	3.91	11.31	7.29	8.26	10.87	9.60	10.29	13.69	11.87	µeq L^{-1}
K^+	1.79	8.18	5.56	2.24	5.63	4.06	4.01	6.29	5.21	µeq L^{-1}
NH_4^+	-0.33	6.43	1.87	-0.67	14.80	5.01	-0.3	18.89	5.94	µeq L^{-1}
AL_TD	1.74	3.08	2.33	1.37	3.48	2.58	0.94	3.72	2.77	µmol L^{-1}
AL_TM	1.68	6.50	3.77	2.15	3.09	2.62	2.08	3.25	2.68	µmol L^{-1}
AL_OM	1.33	4.97	2.95	1.67	3.47	2.60	2.07	3.38	2.66	µmol L^{-1}
AL_IM	0.00	3.13	1.05	0.00	1.07	0.15	0	0.31	0.09	µmol L^{-1}
LABPH	4.15	4.30	4.21	4.27	4.43	4.33	4.26	4.45	4.38	
AIREQPH	4.12	4.29	4.21	4.26	4.51	4.37	4.28	4.52	4.4	
TRUECOLOR	110	200	154	180	400	305	200	440	287	Pt Co
SCONDUCT	24.54	33.95	29.23	19.09	27.17	24.72	20.56	25.63	23.3	µS cm^{-1}
TOTALP	na	na	na	7.10	21.50	13.60	2.81	21.04	11.94	µg L^{1}
CHLORA	na	na	na	6.70	48.12	18.07	5.18	55.31	21.03	µg L^{1}

Table 3.2 Lake Characteristics

Parameter	Value
Elevation	482 m
Maximum depth	4.6 m
Mean depth	2.9 m
Volume	2.3×10^4 m^3
Surface area	0.8 ha
Watershed area	1.0 ha
Watershed ratio	1.0
Hydraulic retention time (year)	NA
Watershed	Lake Champlain
County, Town	Franklin, Santa Clara
USGS Quadrangle	Upper Saranac Lake
Land use classification	Fish Creek Intensive Use Area

Intensive studies: Diatom stratigraphies were developed from sediment cores in the late 1980s (Charles et al. 1990). Little Echo Pond was studied under RILWAS in 1985 (Driscoll and Newton 1985). Historical rates of mercury deposition were analyzed using sediment cores from 1982 to 1983 (Lorey and Driscoll 1999) and again in 1998 (Raynal et al. 2004). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). Bukaveckas and Robbins-Forbes (2000) characterized the attenuation of photosynthetic radiation in relation to lake chemistry in this lake as part of a regional survey. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. Saunders and others (2000) conducted enclosure experiments in this lake during the summers of 1990 and 1991 to examine nutrient and grazer regulation of phytoplankton.

Figure 3.3 Chemistry Time Series



Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date January 1, 2013; elevation 498 m) located 17 km northeast of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The bedrock underlying Little Echo Pond and its 1 ha watershed is metanorthosite and anorthositic gneiss. Surficial geology source data show rock overlain by lascustrine quartz sand (APA 2001). The watershed is relatively flat with no detectable change in relief from the topographical source data. The lake lies in a group of other kettle-hole type ponds in the area.

Land cover/use: The watershed is primarily forested. The predominant terrestrial vegetation is conifer bog with mixed woods (Charles et al. 1990). Little Echo Pond and its watershed occur within the Fish Creek Intensive Use Area. The pond lies within the DEC Fish Creek Campground (NYSDEC 1995). A foot trail connects the shoreline to a snowmobile trail on the western side of the pond.

Watershed disturbance: The 1916 fire protection source data reveal 100% of the watershed as virgin and second growth green timber with no slash. The watershed was unaffected by the November 1950 blowdown and July 1995 microburst storms (APA 2001). The watershed experienced light damage from the January 1998 ice storm (NYSDEC 1998).

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East Copperas Pond 020138
EPA ID: 020138O

ALSC Staff Photo 2015

Lake: East Copperas Pond lies in the Lake Champlain watershed at 480 m. This 3.6 ha drainage lake has no apparent inlets. Its outlet flows 50 m downstream into Copperas Pond, Fish Creek Ponds, and Upper Saranac Lake (Figure 4.1). The lake lies in a group of other kettle-hole ponds in the area. The lake has a maximum depth of 6.4 m (21.0 ft) (Figure 4.2). Field notes from 1984 indicate a fixed wooden fish barrier dam present on the outlet (ALSC 1985). By 2000, the barrier dam had completely deteriorated.

East Copperas Pond is classified as a thin-till drainage lake with high dissolved organic carbon (>500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. Sampling frequency at this pond was modified to seasonal in 2014.

Lake chemistry: The ALS sampled East Copperas Pond near its deepest point on July 19, 1984 finding: Lab pH 4.50, ANC -28.9 µeq L^{-1}, SO_4^{2-} 52.47 µeq L^{-1}, NO_3 - LTD, Ca^{2+} 32.44 µeq L^{-1}, Mg^{2+} 9.05 µeq L^{-1}, DOC 732.65 µmol L^{-1}-C (ALSC 1985). Table 4.1 summarizes recent ALTM chemistry taken at the outlet. Major analytes through 2013 are shown in Table 4.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 4.3 (weekly spring melt data in red).

Aquatic biota: On May 16, 1984, a dip-net survey by the ALS identified the following Insecta: Odonata Corduliidae and Trichoptera Limnephilidae. No aquatic macrophyte data are available. A thermocline was detected between 2.0 and 3.5 m on July 19, 1984 (ALSC 1985).

Figure 4.1. Catchment

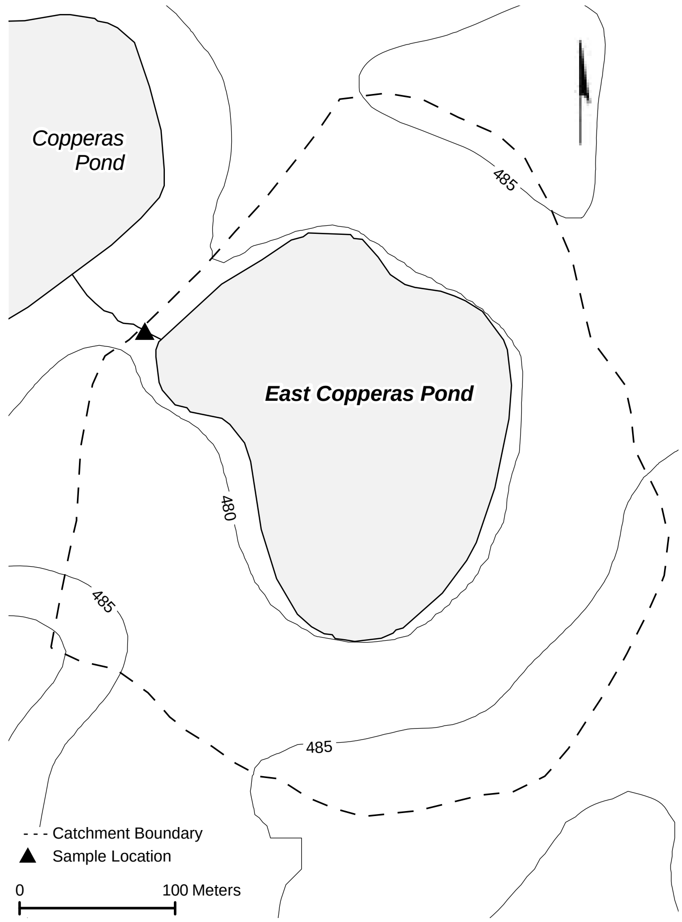
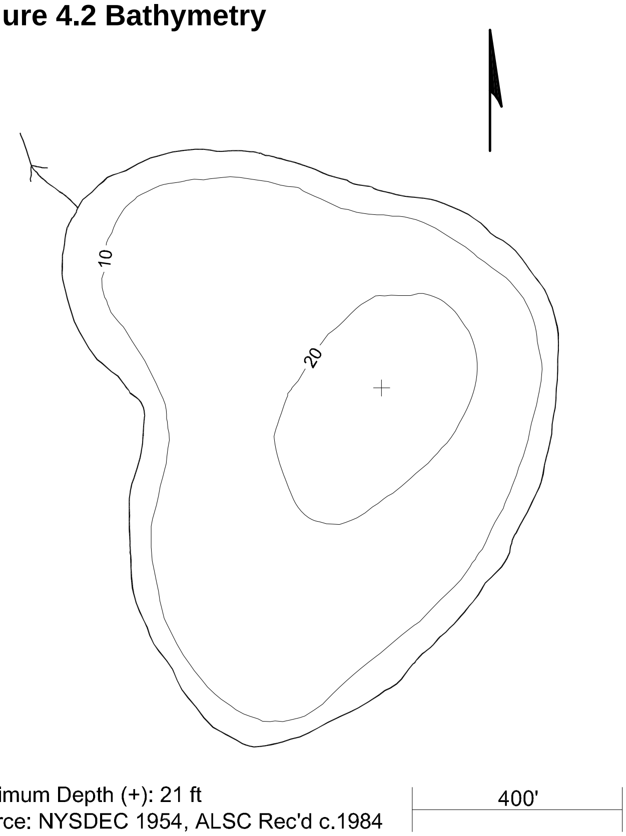


Figure 4.2 Bathymetry



Maximum Depth (+): 21 ft
Source: NYSDEC 1954, ALSC Rec'd c.1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.31377	-74.37322	44° 18′ 49.6″ N	074° 22′ 23.6″ W
Lake centroid	44.31316	-74.37155	44° 18′ 47.4″ N	074° 22′ 17.6″ W

Table 4.1 Lake Chemistry

020138 Parameter	1993 Min	1993 Max	1993 Avg	2009 Min	2009 Max	2009 Avg	2013 Min	2013 Max	2013 Avg	Units
SO_4^{2-}	28.52	53.51	42.61	23.35	33.27	26.80	14.36	22.66	17.8	µeq L^{-1}
NO_3^-	-0.40	10.32	2.43	0.00	5.96	0.99	0	3	0.71	µeq L^{-1}
Cl^-	4.80	18.62	8.27	4.30	17.17	6.45	3.37	7.72	5.46	µeq L^{-1}
F^-	0.63	1.21	0.93	0.55	1.56	0.93	0.54	1.26	1.05	µeq L^{-1}
ANC	-36.14	-2.71	-23.31	-49.79	4.03	-16.73	-22.46	-2.82	-14.91	µeq L^{-1}
DIC	21.65	206.47	91.58	17.48	210.07	122.27	55.56	230.37	120.01	µmol L^{-1}-C
DOC	455.49	1102.06	800.35	838.39	1218.29	968.09	818.01	1080.37	909.33	µmol L^{-1}-C
SiO_2	-1.17	49.76	17.99	1.70	29.77	17.58	2.43	25.44	11.12	µmol L^{-1}
Ca^{2+}	20.96	61.38	34.97	24.61	44.41	30.71	19.81	32.27	25.49	µeq L^{-1}
Mg^{2+}	6.58	15.63	11.59	9.25	11.40	10.13	8.42	11.46	9.58	µeq L^{-1}
Na^+	3.04	16.96	6.74	4.78	14.79	6.21	4.36	7.24	5.81	µeq L^{-1}
K^+	1.02	17.14	9.34	6.51	9.21	7.94	6.41	9.4	7.58	µeq L^{-1}
NH_4^+	0.28	29.16	6.18	-0.22	32.06	12.48	0.23	15.32	5.19	µeq L^{-1}
AL_TD	0.59	3.82	1.80	1.52	3.26	2.28	1.66	2.66	1.92	µmol L^{-1}
AL_TM	1.93	5.23	3.60	2.20	3.33	2.60	1.85	2.78	2.37	µmol L^{-1}
AL_OM	0.63	5.03	2.39	2.03	2.89	2.42	1.54	2.51	2.14	µmol L^{-1}
AL_IM	0.00	4.60	1.40	0.00	0.78	0.21	0	0.54	0.25	µmol L^{-1}
LABPH	4.37	4.96	4.52	4.21	4.83	4.53	4.43	4.74	4.59	
AIREQPH	4.40	5.02	4.54	4.30	4.90	4.58	4.55	4.87	4.65	
TRUECOLOR	45	120	76	120.00	180	155	80	160	111	Pt Co
SCONDUCT	10.35	24.29	18.90	15.46	24.85	18.10	13.55	17.27	15.17	µS cm^{-1}
TOTALP	na	na	na	10.63	51.51	33.02	2.66	30.79	18.45	µg L^{1}
CHLORA	na	na	na	4.50	144.67	29.60	2.94	402.48	48.02	µg L^{1}

Table 4.2 Lake Characteristics

Parameter	Value
Elevation	480 m
Maximum depth	6.4 m
Mean depth	4.1 m
Volume	14.8 x 10^4 m^3
Surface area	3.6 ha
Watershed area	13.0 ha
Watershed ratio	0.28
Hydraulic retention time (year)	1.78
Watershed	Lake Champlain
County, Town	Franklin, Santa Clara
USGS Quadrangle	Upper Saranac Lake
Land use classification	Saranac Lake Wild Forest

Fisheries: The DEC stocked brook trout and rainbow trout annually from 1959 to 1964 and limed the lake annually from 1959 to 1962. They treated the lake with rotenone in July 1964 and began stocking brook trout in 1965. In 1986, the stocking was discontinued (ALSC 2003). In addition to the ALS fisheries survey on July 19, 1984, the ALSC netted the lake on May 27, 1998 and June 17, 2009 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 4.3 and 4.4 for recent fish stocking and netting histories.

Intensive studies: East Copperas Pond was one of 31 small, unproductive Adirondack regional lakes studied for aquatic vegetation relationships with environmental factors (Jackson and Charles 1988). It was one of 36 ALTM lakes evaluated by Momen and Zehr (1998) during 1994 examining lake-water chemistry and terrestrial characteristics with the existing watershed classifications. Bukaveckas and Robbins-Forbes (2000) characterized the attenuation of photosynthetic radiation in relation to lake chemistry in this lake as part of a regional survey. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. In 2003, this lake watershed was part of a 36 lake-watershed regional survey of foliar nitrogen gradients in the Adirondack Park (McNeil et al. 2007).

Figure 4.3 Chemistry Time Series

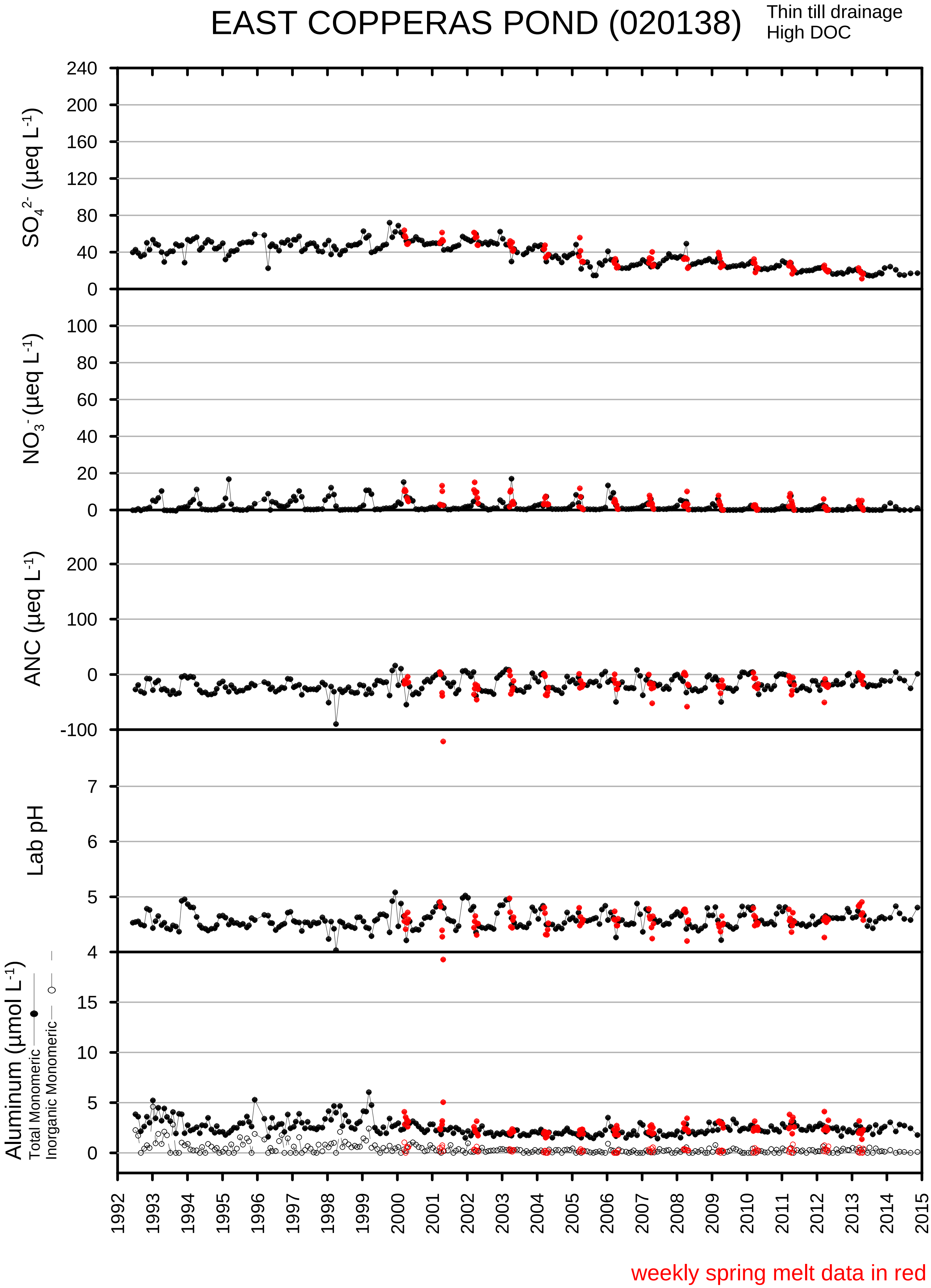


Table 4.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	420	6
1981	Brook trout	360	8
1982	Brook trout	400	3
1983	Brook trout	400	15
1984	Brook trout	296	3
1985	Brook trout	440	10

Table 4.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-1984	Central mudminnow	4	76	105	26	4
May-1998	Central mudminnow	30	87	115	301	53
Jun-2009	Central mudminnow	17	81	100	128	17

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date January 1, 2013; elevation 498 m) located 17 km northeast of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: East Copperas Pond is underlain by metanorthosite and anorthositic gneiss that is overlain by outwash sand and gravel (APA 2001). The watershed is relatively flat with a maximum relief of 6.0 m. In 1984, the ALS characterized the shoal water substrate as 80% muck/silt and 20% organic (ALSC 1985).

Land cover/use: In 1984, the ALS described the watershed as 80% coniferous forest and 20% deciduous-coniferous mixed forest. Coniferous forest predominates the immediate shoreline. A fringe of bog shrub-scrub abuts the shoreline near the outlet (ALSC 1985). The pond and watershed are in the Saranac Lake Wild Forest (NYSDEC 2016). There is no development in the watershed.

Watershed disturbance: The 1916 fire protection source data reveal 100% of the watershed as virgin and second growth green timber with no slash. The watershed was unaffected by the November 1950 blowdown and July 1995 microburst storms (APA 2001). The watershed experienced light damage from the January 1998 ice storm (NYSDEC 1998).

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Middle Pond 020143

EPA ID: 1A1-029O

ALSC Staff Photo 2015

Lake: Middle Pond lies within the Lake Champlain watershed at 483 m. Two inlets flow into the 24.3 ha headwater lake from the north (Figure 5.2). The outlet is a relatively wide marshy channel flowing into Floodwood Pond. Middle Pond reaches a maximum depth of 3.3 m (10.8 ft) (Figure 5.2).

Middle Pond is classified as a carbonate influenced drainage pond. The lake is not considered sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014.

Lake chemistry: Middle Pond was sampled near its deepest point during the ALS on July 27, 1984 finding: Lab pH 6.61, ANC 86.5 µeq L^{-1}, SO_4^{2-} 149.49 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 167.67 µeq L^{-1}, Mg^{2+} 50.20 µeq L^{-1}, DOC 507.86 µmol L^{-1}-C (ALSC 1985). Table 5.1 summarizes recent ALTM chemistry taken at the outlet. Major analytes through 2013 are shown in Table 5.1. Plots through 2014 appear in Figure 5.3 with spring melt data shown in red.

Aquatic biota: On May 16, 1984, a dip-net survey by the ALS identified the following Insecta: Odonata Libellulidae, Corduliidae, and Coenagriidae; Trichoptera Limnephilidae; Ephemeroptera Leptophlebiidae and Siphlonuridae; Coleoptera Gyrinidae; and Diptera Unspecified. Crustacea Isopoda Unspecified were also found. No macrophyte data available (ALSC 1985). The lake was isothermal on July 27, 1984 (ALSC 1985).

Figure 5.1 Catchment

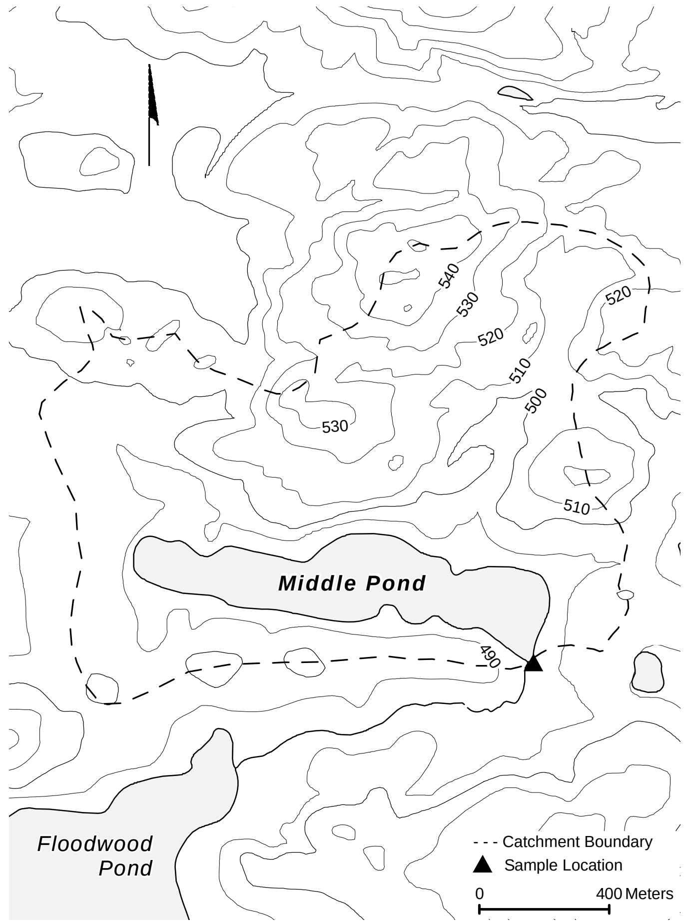
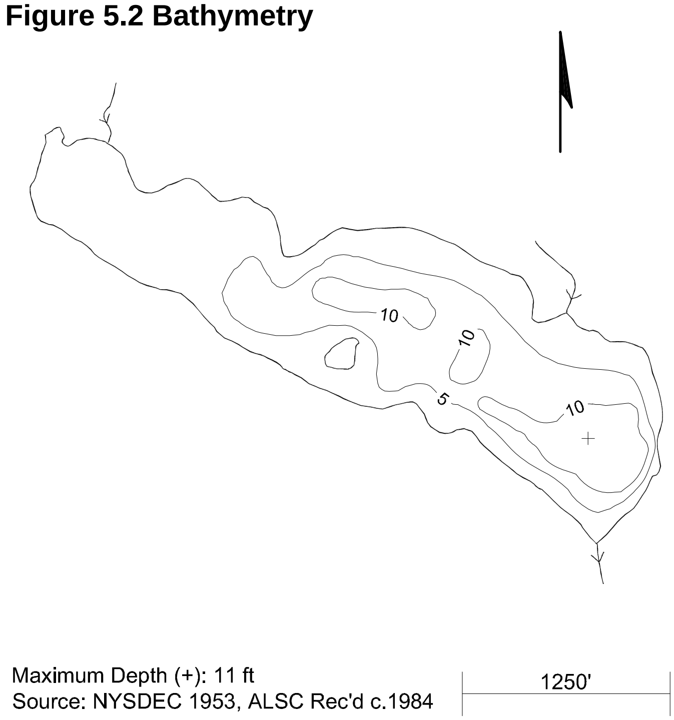


Figure 5.2 Bathymetry



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.33728	-74.37198	44° 20’ 14.2” N	074° 22’ 19.10” W
Lake centroid	44.33956	-74.37750	44° 20’ 22.4” N	074° 22’ 39.0” W

Table 5.1 Lake Chemistry

020143			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	89.73	140.74	110.95	70.45	88.67	77.00	49.94	83.43	64.36	µeq L^{-1}
NO_3^-	-0.24	14.97	5.00	0.00	11.98	2.70	0	15.61	3.66	µeq L^{-1}
Cl^-	10.72	16.92	13.23	8.19	15.39	12.09	9.78	17.65	13.55	µeq L^{-1}
F^-	1.63	2.11	1.82	1.60	2.22	1.90	1.63	2.36	1.85	µeq L^{-1}
ANC	71.43	155.51	102.57	81.83	134.83	106.48	67.03	171.65	116.91	µeq L^{-1}
DIC	81.59	477.89	214.59	99.91	379.65	191.79	143.29	489.43	229.95	µmol L^{-1}-C
DOC	346.68	698.77	495.09	338.69	485.60	421.45	338.17	569.95	466.97	µmol L^{-1}-C
SiO_2	48.93	160.27	76.64	21.68	124.16	57.33	39.62	124.53	71.86	µmol L^{-1}
Ca^{2+}	126.25	208.59	158.44	116.77	193.12	136.67	104.37	147.8	129.88	µeq L^{-1}
Mg^{2+}	35.38	56.78	47.80	32.92	47.62	41.95	29.7	48.57	39.31	µeq L^{-1}
Na^+	31.32	49.15	36.97	30.45	42.63	38.23	33.36	44.25	39.91	µeq L^{-1}
K^+	2.81	12.79	8.91	3.47	8.44	6.49	4.64	8.94	6.64	µeq L^{-1}
NH_4^+	-0.78	17.35	4.42	-1.09	10.87	2.06	-0.2	9.84	2.29	µeq L^{-1}
AL_TD	-0.30	5.04	2.42	0.46	4.37	1.96	0.6	4.08	2.21	µmol L^{-1}
AL_TM	0.63	4.93	2.71	1.45	2.48	1.89	1.31	2.51	1.83	µmol L^{-1}
AL_OM	0.11	2.89	1.29	1.41	2.45	1.88	1.27	2.29	1.76	µmol L^{-1}
AL_IM	0.04	3.43	1.42	0.00	1.04	0.11	0	0.22	0.09	µmol L^{-1}
LABPH	5.77	6.85	6.33	6.05	6.92	6.42	5.86	6.9	6.36	
AIREQPH	6.73	7.80	6.99	6.93	7.27	7.09	6.84	7.36	7.16	
TRUECOLOR	35	55	45	40	55	44	30	60	44	Pt Co
SCONDUCT	23.29	33.78	27.41	21.58	28.36	24.08	20.77	30.5	24.15	µS cm^{-1}
TOTALP	na	na	na	2.63	13.88	7.08	1.17	20.20	7.22	µg L^1
CHLORA	na	na	na	1.40	11.64	5.62	1.96	24.94	7.03	µg L^1

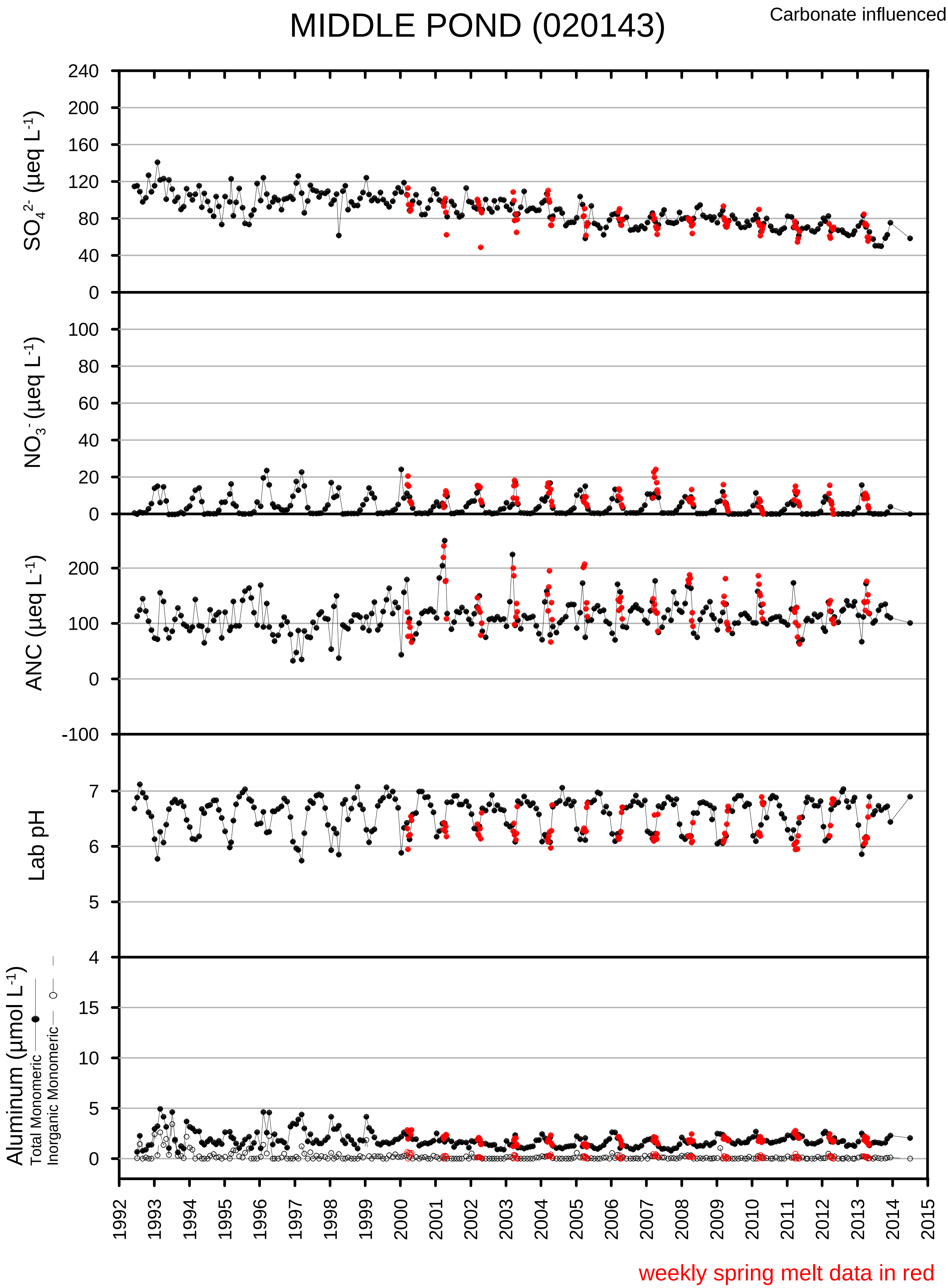
Table 5.2 Lake Characteristics

Parameter	Value
Elevation	483 m
Maximum depth	3.3 m
Mean depth	1.5 m
Volume	36.9 x 10^4 m^3
Surface area	24.3 ha
Watershed area	187.1 ha
Watershed ratio	0.13
Hydraulic retention time (year)	0.31
Watershed	Lake Champlain
County, Town	Franklin, Santa Clara
USGS Quadrangle	Upper Saranac Lake
Land use classification	Saranac Lakes Wild Forest

Fisheries: Middle Pond was stocked with brown trout in 1895 (ALSC 1985). In addition to the ALS fisheries survey on May 16, 1984, the ALSC netted the lake on May 27, 1998 and September 10, 2009 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 5.3 for recent netting history.

Intensive studies: Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Sullivan and others (1996) evaluated landscape changes with sediment records. Bukaveckas and Robbins-Forbes (2000) characterized the attenuation of photosynthetic radiation in relation to lake chemistry in this lake as part of a regional survey. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. Middle Pond was one of 25 Adirondack lakes studied by the Mercury Response Project to evaluate mercury in fish. The lake was originally sampled on September 17, 1992, and resurveyed on August 22, 2005 (Dittman and Driscoll 2009). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Figure 5.3 Chemistry Time Series



Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date January 1, 2013; elevation 498 m) located 15 km northeast of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Middle Pond and its watershed lie on metanorthosite and anorthositic gneiss. Surficial outwash sand and gravel overlay 45% of the watershed, and 55% is overlain by till (APA 2001). The highest elevation in the watershed is 550 m. The maximum relief is 67 m. In 1984, the ALS found the shoal water substrate comprised of 90% sand/gravel/rubble and 10% organic matter (ALSC 1985).

Land cover/use: In 1984, coniferous forest covered 50% of the watershed, while the remaining cover was 40% deciduous forest and 10% deciduous-coniferous mixed forest. The immediate shoreline vegetation was a mix of 40% deciduous forest, 40% deciduous-conifer forest, 15% sand gravel beach/rock ledge, and 5% shrub saplings. Bog shrub-scrub fringe appears along half of the shoreline near the northwestern inlet (ALSC 1985). Middle Pond and its watershed are in the Saranac Lakes Wild Forest (NYSDEC 2016). A campsite is located on the north shore of the lake and Floodwood Road runs along the lake's north shore. There are two separate foot trails that provide access to the pond. One trail on the eastern shoreline is a carry that meets the pond north of the outlet. The secondary foot trail skirts the western shoreline and extends to several other ponds in the area.

Watershed disturbance: The 1916 fire protection source data reveal 100% of the watershed as virgin and second growth green timber with no slash. The watershed was unaffected by the November 1950 blowdown and July 1995 microburst storms (APA 2001). The watershed experienced light damage from the January 1998 ice storm (NYSDEC 1998).

Table 5.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-1984	Northern pike	9	403	552	6220	9
May-1984	Golden shiner	10	78	174	261	32
May-1984	Brown bullhead	10	279	342	5205	49
May-1984	Pumpkinseed	7	145	202	890	7
May-1984	Largemouth bass	1	480	480	1800	1
May-1984	Yellow perch	10	149	209	629	44
May-1998	Northern pike	15	388	621	12071	15
May-1998	Golden shiner	24	87	191	384	54
May-1998	Fallfish	1	211	211	104	1
May-1998	Brown bullhead	27	135	390	8188	82
May-1998	Pumpkinseed	15	135	211	1993	15
May-1998	Largemouth bass	3	327	479	3210	3
May-1998	Yellow perch	24	76	281	2041	83
Sep-2009	Northern pike	15	337	590	7964	15
Sep-2009	Golden shiner	25	82	185	427	25
Sep-2009	Creek chub	3	88	97	23	3
Sep-2009	Brown bullhead	35	171	351	10476	35
Sep-2009	Pumpkinseed	25	105	210	2007	25
Sep-2009	Largemouth bass	1	489	-	2041	1
Sep-2009	Yellow perch	37	86	264	2187	37

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McNeil, B. E., Read, J. M., and Driscoll, C. T. 2007. Foliar Nitrogen Responses to Elevated Atmospheric Nitrogen Deposition in Nine Temperate Forest Canopy Species. Environmental Science & Technology 41: 5191-5197.

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183: 231-248.

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Sunday Pond 020188
EPA ID: 020188E

ALSC Staff Photo 2015

Lake: Sunday Pond lies in the Lake Champlain watershed at 495 m. The pond is located within 700 m of the shoreline of Upper Saranac Lake and has no inlets or outlets (Figure 6.1). It reaches a maximum depth of 11 m (36.1 ft) (Figure 6.2).

Sunday Pond is classified as a mounded seepage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). The pond is considered sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014.

Lake chemistry: The ALS sampled the lake on July 19, 1984 finding: Lab pH 5.69, ANC 11.1 µeq L^{-1}, SO_4^{2-} 70.37 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 43.91 µeq L^{-1}, Mg^{2+} 36.21 µeq L^{-1}, DOC 333.02 µmol L^{-1}-C (ALSC 1985). Table 6.1 summarizes recent ALTM chemistry. Major analytes through 2013 are shown in Table 6.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 6.3 including spring melt data shown in red.

Aquatic biota: On October 10, 1984, emergent aquatic plants occupied 1% of the surface and submergents occupied 1% of the lake bottom. Species identified were: Nuphar spp. and Eriocaulon spp. On October 12, 1984, a dip net survey found the following Insecta; Odonata Libellulidae, Corduliidae and Aeshnidae; Trichoptera Phryganeidae; Hemiptera Notonectidae; and Megaloptera Sialidae. On July 19, 1984, a thermocline was detected between 4.0 and 6.0 m (ALSC 1985).

Figure 6.1 Catchment

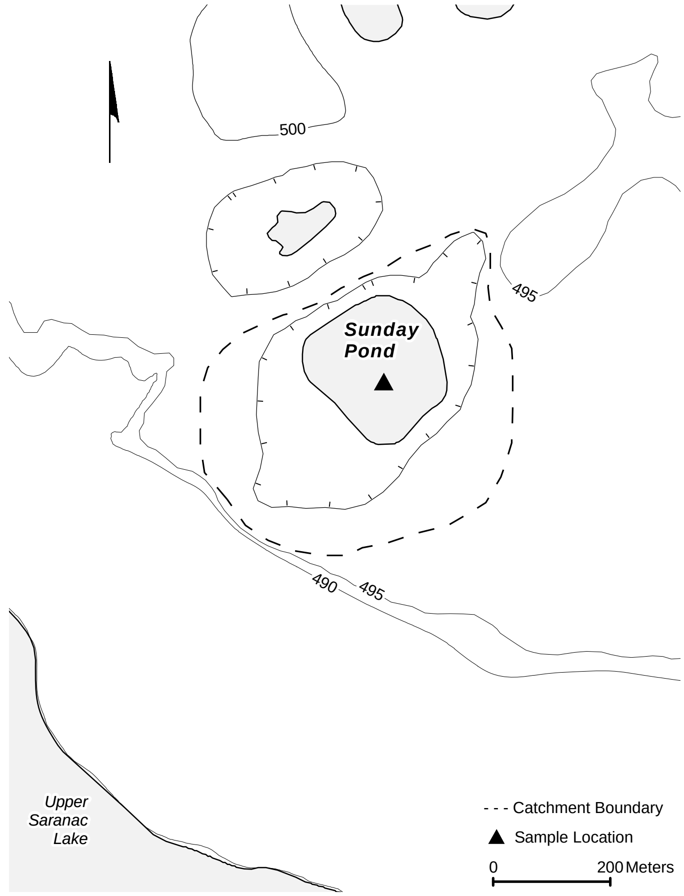
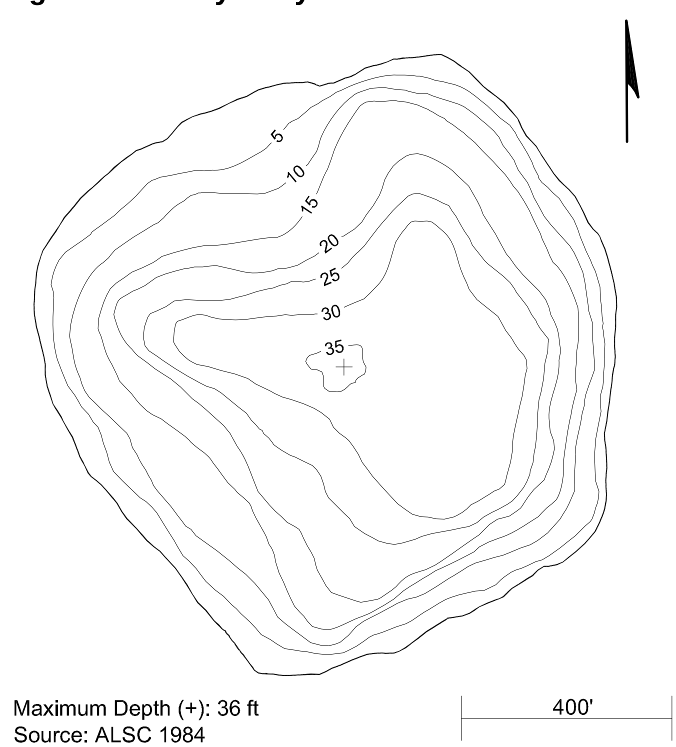


Figure 6.2 Bathymetry



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.34609	-74.30065	44° 20' 45.9" N	074° 18' 02.3" W
Lake centroid	44.34609	-74.30065	44° 20' 45.9" N	074° 18' 02.3" W

Table 6.1 Lake Chemistry

020188			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	52.47	84.11	62.06	36.95	47.65	42.35	31.06	38.58	34.72	µeq L^{-1}
NO_3^-	-0.24	30.32	5.33	0.00	2.76	0.39	0	2.23	0.45	µeq L^{-1}
Cl^-	3.95	10.44	5.74	4.52	5.99	4.92	3.33	5.55	4.52	µeq L^{-1}
F^-	0.58	1.00	0.71	0.00	1.24	0.73	0.49	0.88	0.71	µeq L^{-1}
ANC	-22.94	6.74	-3.15	-9.33	1.44	-2.18	-2.47	6	1.14	µeq L^{-1}
DIC	-0.83	124.88	60.78	15.82	132.38	49.90	7	104.11	44.41	µmol L^{-1}-C
DOC	163.68	338.19	242.83	91.75	179.87	127.13	165.06	212.08	182.88	µmol L^{-1}-C
SiO_2	-2.16	5.99	1.58	-3.16	1.37	-0.03	0.06	3.07	1.23	µmol L^{-1}
Ca^{2+}	23.95	53.90	39.67	21.96	34.43	25.22	16.39	25.2	21.27	µeq L^{-1}
Mg^{2+}	19.75	29.62	24.21	12.43	13.99	13.37	10.39	13.03	11.64	µeq L^{-1}
Na^+	1.74	7.83	3.26	2.17	3.48	2.80	2.15	3.58	2.89	µeq L^{-1}
K^+	1.28	9.98	7.05	5.37	6.28	5.84	5.39	6.88	6.02	µeq L^{-1}
NH_4^+	-0.33	7.82	2.86	-1.28	2.55	0.04	-0.49	3.6	0.87	µeq L^{-1}
AL_TD	-0.30	2.30	0.41	0.11	0.52	0.29	0.11	0.41	0.25	µmol L^{-1}
AL_TM	0.37	2.34	1.29	1.26	1.84	1.61	1	1.62	1.28	µmol L^{-1}
AL_OM	-0.01	0.74	0.39	1.33	1.93	1.59	0.93	1.7	1.25	µmol L^{-1}
AL_IM	0.26	1.89	0.90	0.00	0.30	0.08	0	0.29	0.08	µmol L^{-1}
LABPH	4.52	5.42	5.07	5.02	5.26	5.14	5.24	5.57	5.33	
AIREQPH	4.53	5.82	5.14	5.09	5.28	5.21	5.22	5.63	5.38	
TRUECOLOR	0	15	9	10	15	13	5	15	8	Pt Co
SCONDUCT	10.61	25.44	13.25	8.48	10.65	9.58	7.38	9.3	7.99	µS cm^{-1}
TOTALP	na	na	na	4.94	19.52	7.70	0.57	10.10	6.81	µg L^1
CHLORA	na	na	na	0.92	31.80	6.96	1.07	32.44	6.86	µg L^1

Table 6.2 Lake Characteristics

Parameter	Value
Elevation	495 m
Maximum depth	11 m
Mean depth	5.4 m
Volume	21.9 x 10^4 m^3
Surface area	4 ha
Watershed area	21.5 ha
Watershed ratio	0.18
Hydraulic retention time (year)	NA
Watershed	Lake Champlain
County, Town	Franklin, Santa Clara
USGS Quadrangle	Upper Saranac Lake
Land use classification	Saranac Lakes Wild Forest

Fisheries: The DEC initially stocked the lake with brook trout in 1929. The lake was limed each year from 1959–1962, and again in 1970 and 1976. The lake was treated with rotenone in 1964 (ALSC 1985). In addition to the ALS fisheries survey on October 11, 1984, the DEC provided netting data from 1998 through 2000 and ALSC netted the pond on September 9, 2010 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 6.3 and 6.4 for recent fish stocking and netting histories.

Intensive studies: Sunday Pond is one of 36 ALTM lakes evaluated by Momen and Zehr (1998) during 1994 examining lake-water chemistry and terrestrial characteristics with the existing watershed classifications. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. Bukaveckas and Robbins-Forbes (2000) characterized the attenuation of photosynthetic radiation in relation to lake chemistry in this lake as part of a regional survey.

Figure 6.3 Chemistry Time Series

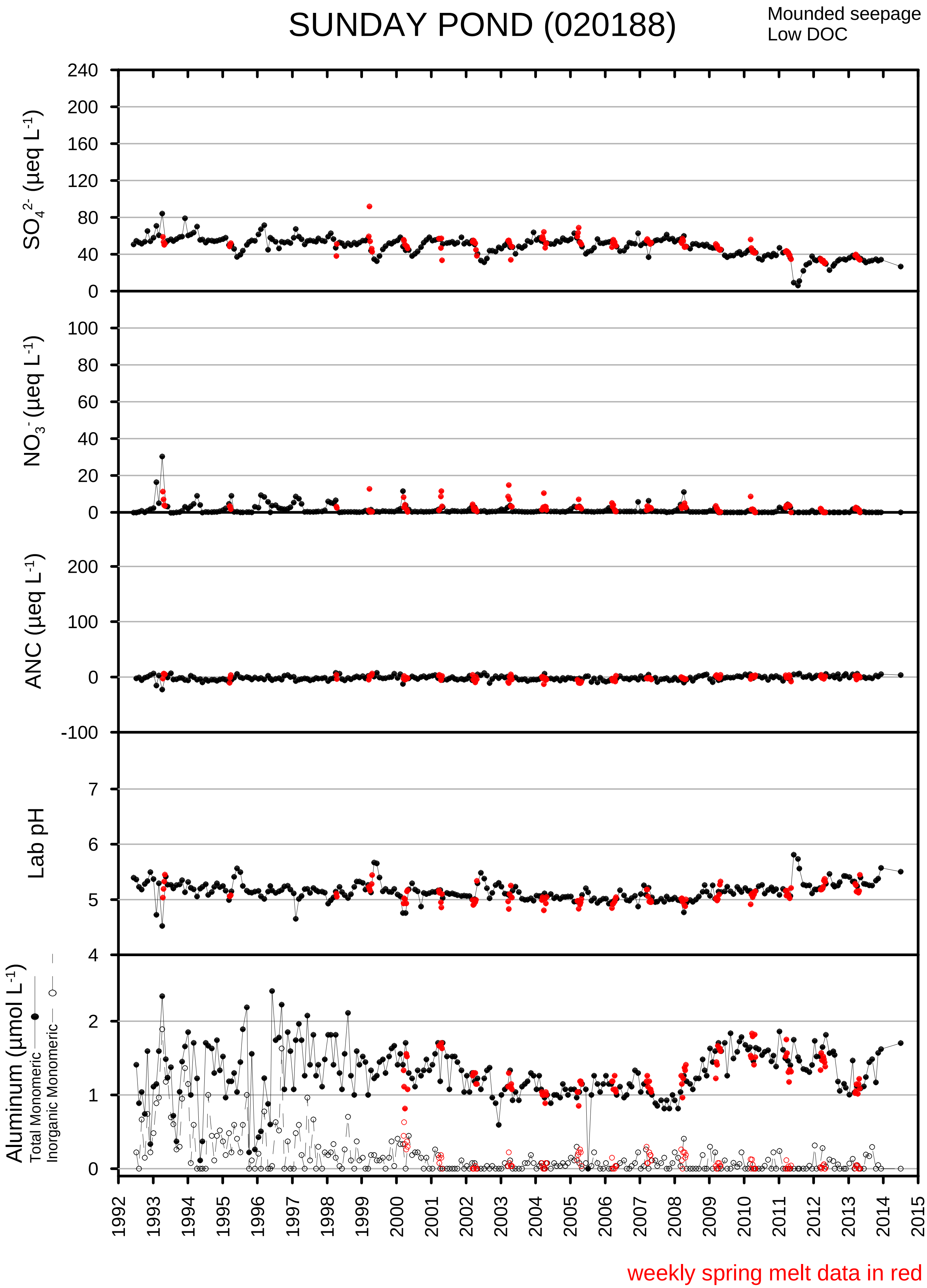


Table 6.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	735	10
1981	Brook trout	630	6
1982	Brook trout	500	20
1984	Brook trout	668	31
1985	Brook trout	770	12
1986	Brook trout	700	22
1987	Brook trout	700	4
1988	Brook trout	700	6
1989	Brook trout	770	11
1990	Brook trout	760	8
1991	Brook trout	700	7
1992	Brook trout	700	9
1993	Brook trout	700	7
1994	Brook trout	550	10
1995	Brook trout	350	3
1996	Brook trout	700	9
1997	Brook trout	700	7
1998	Brook trout	720	7
1999	Brook trout	700	5
2000	Brook trout	700	8
2001	Brook trout	700	12
2002	Brook trout	700	12
2003	Brook trout	700	5
2004	Brook trout	500	7
2005	Brook trout	500	7
2006	Brook trout	550	9
2007	Brook trout	500	8
2008	Brook trout	500	6
2009	Brook trout	500	7
2010	Brook trout	250	6
2011	Brook trout	300	8
2012	Brook trout	127	2
2014	Brook trout	300	3

Table 6.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Oct-1984	Brook trout	17	210	393	5040	17
Oct-1984	Lake trout	1	558	558	1300	1
Jul-1998	Brook trout	22	251	354	-	22
May-1999	Brook trout	20	185	294	-	20
Jun-2000	Brook trout	17	238	340	-	17
Sep-2010	Brook trout	14	200	296	1854	14

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date January 1, 2013; elevation 498 m) located 11 km northeast of the lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Sunday Pond and its watershed lie on metanorthosite and anorthositic gneiss. The watershed is primarily overlain by outwash sand and gravel with areas of swamp deposits comprised of muck/silt/sand (APA 2001). The watershed is relatively flat and rises to a maximum elevation of 495 m. In 1984, the ALS found the shoal water substrate comprised of 90% sand/gravel and 10% muck/silt (ALSC 1985).

Land cover/use: In 1984, deciduous forest covered 90% of the watershed and deciduous-coniferous mixed forest the remainder. The immediate shoreline was 95% deciduous-conifer mix and 5% coniferous forest (ALSC 1985). The pond and its watershed are located within the Saranac Lakes Wild Forest (NYSDEC 2016). There are two seasonal dirt roads on either side of the pond. The road on the western side leads to a sand pit, while the road on the east leads to a sandy hand launch access on the northern shore.

Watershed disturbance: The 1916 fire protection data reveal 100% of the watershed as virgin and second growth green timber with no slash. The watershed was unaffected by the November 1950 blowdown and July 1995 microburst storms (APA 2001). The watershed experienced light damage from the January 1998 ice storm (NYSDEC 1998).

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Sochia Pond 020197
EPA ID: 020197E

ALSC Staff Photo 2000

Lake: Sochia Pond lies in the Lake Champlain watershed at 495 m. This small 1.6 ha kettle hole lake has no inlets or outlets (Figure 7.1) with a bog fringe (ALSC 1985). The lake has a maximum depth of 5.5 m (18.0 ft) (Figure 7.2).

Sochia Pond is classified as a mounded seepage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). It is considered sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014.

Lake chemistry: Sochia Pond was sampled by the ALS on July 26, 1984 finding: Lab pH 4.63, ANC -21.1 µeq L^{-1}, SO_4^{2-} 53.92 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 22.96 µeq L^{-1}, Mg^{2+} 7.41 µeq L^{-1}, DOC 174.84 µmol L^{-1}-C (ALSC 1985). Table 7.1 summarizes recent ALTM chemistry. Major analytes through 2013 are shown in Table 7.1, plotted results through 2014 appear in Figure 7.3.

Aquatic biota: On May 10, 1984, a dip net survey by the ALS identified the following Insecta: Odonata Libellulidae, Lestidae, and Coenagriidae; Trichoptera Phryganeidae and Polycentropodidae; Hemiptera Notonectidae and Nepidae; Megaloptera Sialidae; Coleoptera Dytiscidae and Gyrinidae; and Diptera Culicidae. No macrophyte data were available (ALSC 1985).

Figure 7.1 Catchment

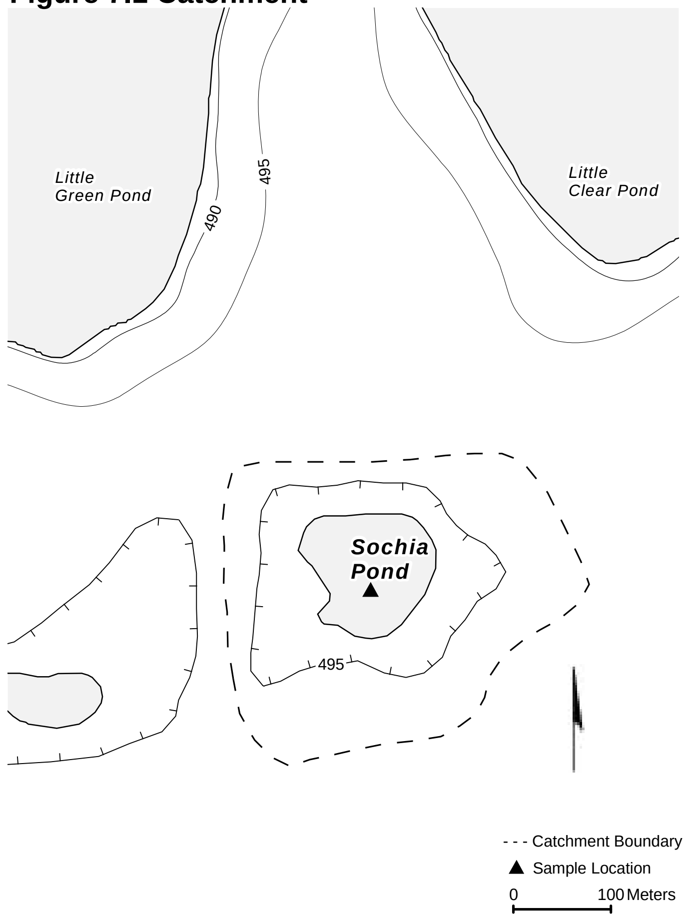
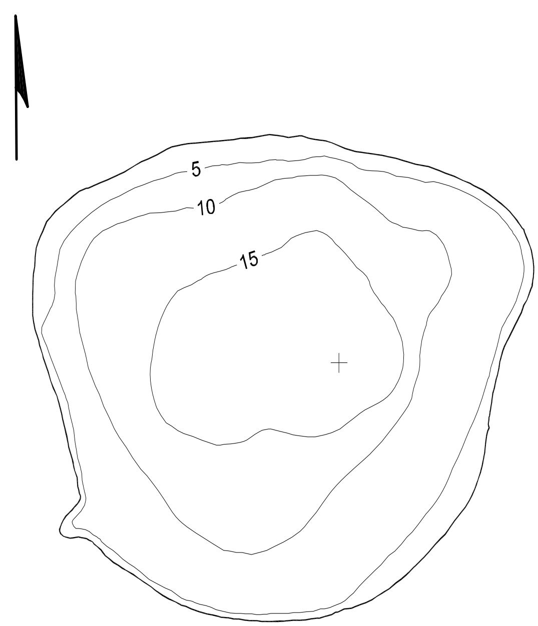


Figure 7.2 Bathymetry



Maximum Depth (+): 18 ft
Source: ALSC 1984
200'

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.ss	DDD MM SS.ss
Sample site	44.35282	-74.29424	44° 21’ 10.20” N	074° 17’ 39.30” W
Lake centroid	44.35282	-74.29424	44° 21’ 10.20” N	074° 17’ 39.30’’ W

Table 7.1 Lake Chemistry

020197			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	38.31	56.01	49.59	21.96	28.46	24.93	16.9	30.06	21.29	µeq L^{-1}
NO_3^-	-0.24	12.42	2.49	0.00	5.14	1.19	0	3.93	1.36	µeq L^{-1}
Cl^-	1.41	8.18	4.44	2.86	7.91	5.58	3.5	6.4	4.82	µeq L^{-1}
F^-	0.16	0.68	0.51	0.31	0.79	0.56	0	0.79	0.49	µeq L^{-1}
ANC	-35.43	-5.83	-27.53	-11.42	6.51	-4.75	-13.15	-2.25	-6.9	µeq L^{-1}
DIC	22.48	228.12	90.06	34.13	302.22	101.94	34	202.53	94.16	µmol L^{-1}-C
DOC	214.13	359.00	293.09	332.27	428.02	368.72	358.44	472.43	420.36	µmol L^{-1}-C
SiO_2	-5.99	5.99	0.94	-0.33	3.16	1.54	1.55	4.28	2.65	µmol L^{-1}
Ca^{2+}	11.98	33.93	18.71	10.98	20.46	14.07	9.81	17.4	13.51	µeq L^{-1}
Mg^{2+}	6.58	12.34	9.12	6.50	7.51	7.09	6.12	8.63	7.18	µeq L^{-1}
Na^+	1.74	5.65	3.44	3.04	4.78	3.84	2.83	4.6	3.77	µeq L^{-1}
K^+	1.02	7.16	3.47	0.65	3.84	2.72	1.85	3.82	2.86	µeq L^{-1}
NH_4^+	-0.44	11.03	3.43	-1.00	20.62	5.51	-0.84	9.64	3.98	µeq L^{-1}
AL_TD	-0.07	2.45	0.59	0.18	0.67	0.49	0.36	0.75	0.52	µmol L^{-1}
AL_TM	0.44	3.60	1.74	1.41	1.78	1.63	1.12	1.8	1.52	µmol L^{-1}
AL_OM	-0.18	1.52	0.58	1.48	1.96	1.72	1.13	1.85	1.51	µmol L^{-1}
AL_IM	0.00	3.11	1.16	0.00	0.11	0.02	0	0.16	0.04	µmol L^{-1}
LABPH	4.39	4.65	4.50	4.70	5.21	4.80	4.71	4.97	4.85	
AIREQPH	4.42	4.80	4.51	4.71	5.39	4.87	4.72	5.06	4.89	
TRUECOLOR	5	20	13	20	45	32	20	35	30	Pt Co
SCONDUCT	14.12	22.63	17.14	8.87	11.31	10.53	8.02	12.1	9.7	µS cm^{-1}
TOTALP	na	na	na	4.94	17.22	8.06	4.06	9.41	6.69	µg L^{1}
CHLORA	na	na	na	1.85	7.08	3.99	2.03	9.28	4.57	µg L^{1}

Table 7.2 Lake Characteristics

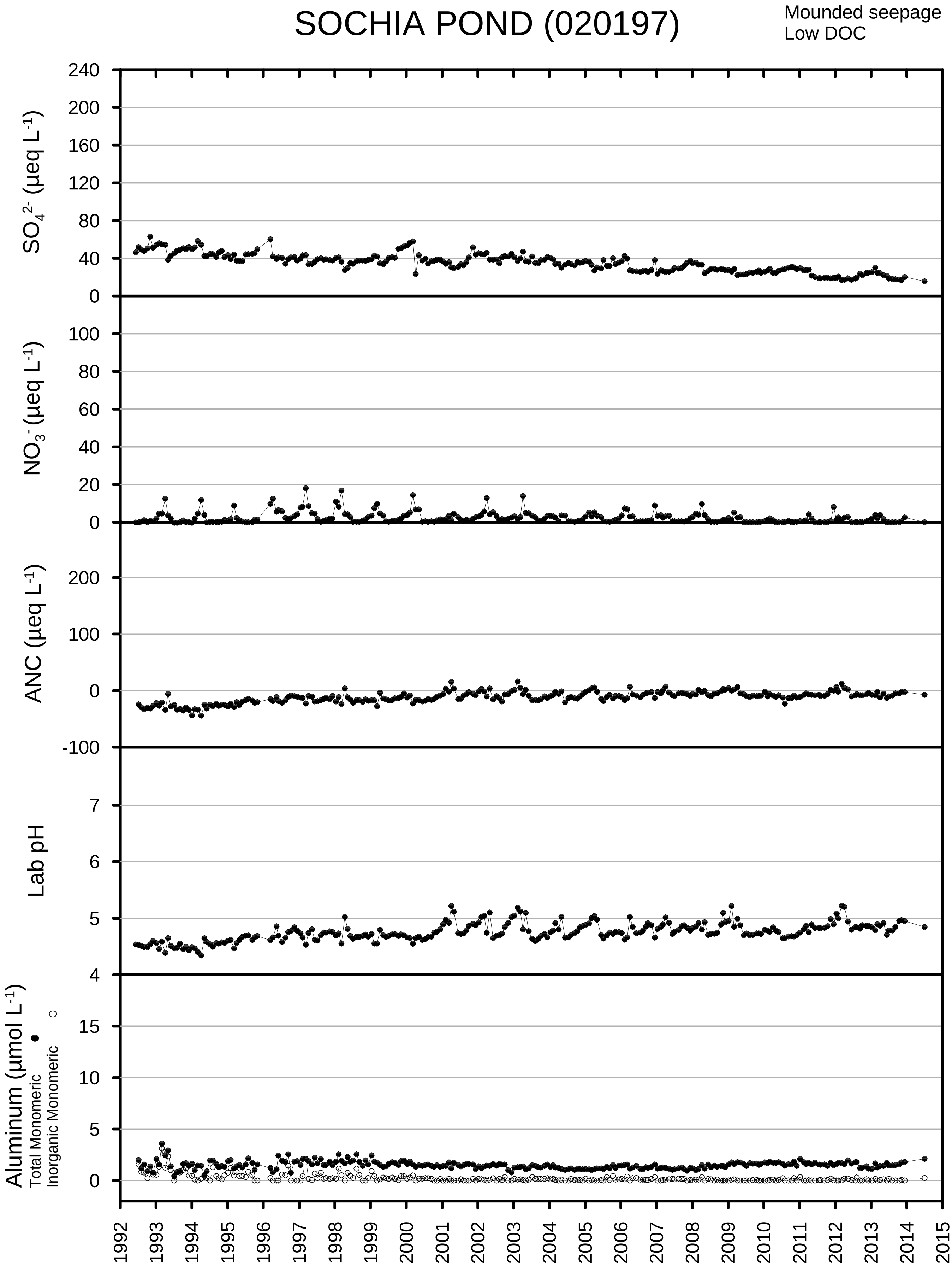
Parameter	**Value**
Elevation	495 m
Maximum depth	5.5 m
Mean depth	3.1 m
Volume	5.0 x 10^4 m^3
Surface area	1.6 ha
Watershed area	9.6 ha
Watershed ratio	0.17
Hydraulic retention time (year)	NA
Watershed	Lake Champlain
County, Town	Franklin, Santa Clara
USGS Quadrangle	Upper Saranac Lake
Land use classification	Saranac Lakes Wild Forest

Fisheries: The DEC stocked the pond with brook trout from 1942 to 1974 (ALSC 1985). In addition to the ALS fisheries survey on May 11, 1984, the ALSC surveyed the lake on May 23, 1995 and June 24, 2009. No fish were caught in any of the surveys.

Intensive studies: Sochia Pond is one of 36 ALTM lakes evaluated by Momen and Zehr (1998). During 1994, lake water chemistry and terrestrial characteristics with the existing watershed classifications were examined (Momen and Zehr 1998, Ito et al. 2006). Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000.

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date January 1, 2013; elevation 498 m) located 11 km northeast of the lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Figure 7.3 Chemistry Time Series



Watershed: The pond and its watershed are underlain by anorthositic gneiss and is overlain by deposited outwash sand and gravel (APA 2001). The watershed has a maximum elevation of 495 m that is the same elevation as the pond, so there is no detectible relief to the watershed. In 1984, the ALS found the shoal water substrate comprised of 90% muck/silt and 10% organic (ALSC 1985).

Land cover/use: In 1984, coniferous forest covered 50% of the watershed, while 45% was deciduous-coniferous mixed forest and 5% wetland. The immediate shoreline was predominately wetland vegetation (ALSC 1985). The pond and its watershed are located within the Saranac Lakes Wild Forest (NYSDEC 2016). There is an unmarked foot trail on the southeastern side of the pond.

Watershed disturbance: The 1916 fire protection source data reveal 100% of the watershed as virgin and second growth green timber with no slash. The watershed was unaffected by the November 1950 blow down and July 1995 microburst storms (APA 2001). The watershed experienced light damage from the January 1998 ice storm (NYSDEC 1998).

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Owen Pond 020233

EPA ID: 1A2-028O

ALSC Staff Photo 2015

Lake: Owen Pond lies in the Lake Champlain watershed at 514 m. This 7.6 ha lake lies on a shelf on the northwestern slopes of Stewart Mt. and Kilburn Mt. in the Sentinel Range. One inlet drains the combined outlets of Winch Pond, Marsh Pond, and Copperas Pond. A secondary inlet drains from Kilburn Mountain (Figure 8.1). Remnants of an old log dam or weir appear approximately 50 m downstream from the free flowing outlet. The lake outlet drains to the West Branch of the Ausable River. Owen Pond reaches a maximum depth of 9.4 m (30.8 ft) (Figure 8.2).

Owen Pond is classified as a thick-till lake with low dissolved organic carbon (<500 µmol L-1-C). The lake is not considered sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014.

Lake chemistry: Owen Pond was sampled near its deepest point during the ALS on July 24, 1984 finding: Lab pH 6.91, ANC 108.5 µeq L^{-1}, SO_4^{2-} 163.85 µeq L^{-1}, NO_3^- 2.43 µeq L^{-1}, Ca^{2+} 222.57 µeq L^{-1}, Mg^{2+} 55.96 µeq L^{-1}, DOC 399.63 µmol L^{-1}-C (ALSC 1985). Table 8.1 summarizes recent ALTM water chemistry taken at the outlet. Major analytes through 2013 are shown in Table 8.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 8.3 including weekly spring melt data shown in red.

Figure 8.1 Catchment

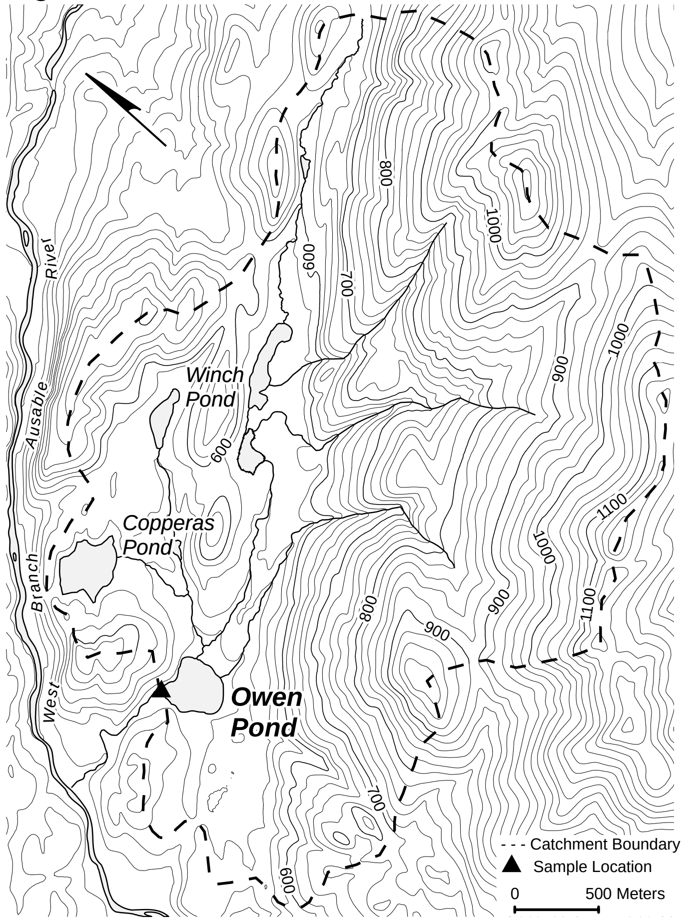


Figure 8.2 Bathymetry

Maximum Depth (+): 31 ft
Source: NYSDEC, ALSC Rev. 1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.32327	-73.90304	44° 19’ 23.8” N	073° 54’ 10.9” W
Lake centroid	44.32198	-73.90117	44° 19’ 19.1” N	073° 54’ 04.2” W

Table 8.1 Lake Chemistry

020233			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	121.38	178.01	152.09	71.91	117.81	91.93	56.16	94.55	74.21	μeq L^{-1}
NO_3^-	6.82	38.93	19.22	5.84	43.41	23.64	4.36	51.14	24.42	μeq L^{-1}
Cl^-	7.62	12.97	10.62	6.56	13.44	9.74	4.78	11.42	8.66	μeq L^{-1}
F^-	0.95	1.37	1.14	1.13	2.03	1.34	1.04	1.52	1.26	μeq L^{-1}
ANC	56.44	175.35	109.15	57.67	154.63	119.54	76.55	175.96	127.68	μeq L^{-1}
DIC	81.59	309.71	161.66	93.25	242.27	163.05	118.02	261.9	182.69	μmol L^{-1}-C
DOC	263.01	509.61	390.60	277.24	550.74	431.30	284.75	750.63	439.38	μmol L^{-1}-C
SiO_2	68.40	184.07	132.51	108.85	176.26	135.67	114.42	154.75	132.02	μmol L^{-1}
Ca^{2+}	115.28	265.48	202.69	143.72	209.09	172.54	124.59	193.76	162.68	μeq L^{-1}
Mg^{2+}	38.68	83.11	59.86	37.85	65.83	50.18	34.99	63.18	48.56	μeq L^{-1}
Na^+	23.49	43.50	34.00	26.97	43.50	35.10	25.96	40.74	35.9	μeq L^{-1}
K^+	3.33	6.91	5.16	3.33	4.95	4.10	3.04	4.91	4.1	μeq L^{-1}
NH_4^+	-0.44	4.32	2.39	-0.26	3.52	1.17	-0.04	3.15	1.07	μeq L^{-1}
AL_TD	2.59	6.71	4.26	1.82	7.15	4.86	2.37	9.73	5.05	μmol L^{-1}
AL_TM	0.76	3.12	1.98	1.86	3.11	2.35	1.55	4.49	2.36	μmol L^{-1}
AL_OM	0.67	2.91	1.49	1.56	2.89	2.19	1.58	3.67	2.13	μmol L^{-1}
AL_IM	0.00	1.28	0.54	0.00	0.41	0.18	0	0.82	0.25	μmol L^{-1}
LABPH	6.36	6.89	6.57	6.41	6.99	6.64	6.4	6.98	6.66	
AIREQPH	6.71	7.30	7.04	6.79	7.40	7.11	6.92	7.43	7.18	
TRUECOLOR	20	45	28	20	60	37	15	60	31	Pt Co
SCONDUCT	26.55	41.91	33.69	24.54	36.82	29.19	21.72	35.5	28.51	μS cm^{-1}
TOTALP	na	na	na	1.63	8.12	4.16	1.32	21.57	6.05	μg L^1
CHLORA	na	na	na	0.21	2.49	1.16	0.19	2.95	1.11	μg L^1

Table 8.2 Lake Characteristics

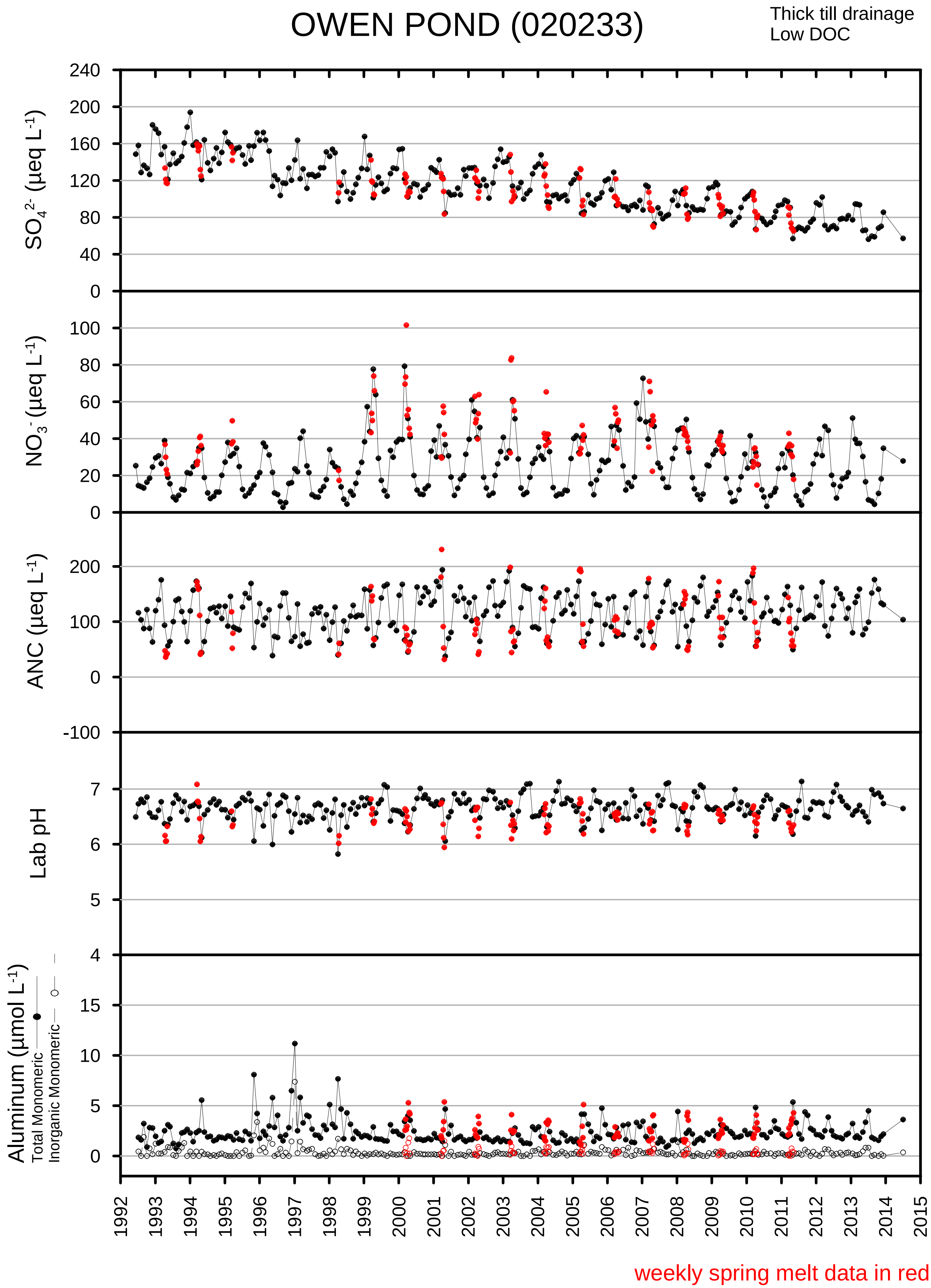
Parameter	Value
Elevation	514 m
Maximum depth	9.4 m
Mean depth	3.7 m
Volume	28.4 x 10^4 m^3
Surface area	7.6 ha
Watershed area	1159 ha
Watershed ratio	0.006
Hydraulic retention time (year)	0.03
Watershed	Lake Champlain
County, Town	Essex, North Elba
USGS Quadrangle	Lake Placid
Land use classification	Sentinel Range Wilderness

Aquatic biota: On September 13, 1984, the ALS aquatic plant survey found submergent plants covered 60% of the lake bottom. Floating and emergent aquatic plants occupied 8% and 2% of the lake surface, respectively. Species identified were: Sparganium spp., Potamogeton spp., Eriocaulon spp., Pontederia spp., Juncus spp., Nuphar spp., and Utricularia spp. A dip-net survey on the same date found: Demospong Haplosclerina Spongillidae, Crustacea Decapoda Astacidae; and the following Insecta: Ephemeroptera Heptageniidae, Odonata Coenagriidae, and Gomphidae (ALSC 1985). On July 24, 1984, a thermocline was detected between 2.0 and 4.0 m (ALSC 1985).

Fisheries: The DEC stocked rainbow trout from 1931–1949. In September 1952, the DEC reclaimed the lake with rotenone. In October 1952, they began annual stocking of brook trout until 1989. Brown trout have been stocked annually since 1990. In addition to the ALS fisheries survey on September 13, 1984, the ALSC netted the lake on May 24, 1994 and September 25, 2008 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 8.3 and 8.4 for recent fish stocking and netting histories.

Intensive studies: Owen Pond was a study watershed for the Adirondack/Catskill comparison during 1992–2001 (Burns et al. 2005, Burns et al. 2006). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in the watershed.

Figure 8.3 Chemistry Time Series



Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY98 Whiteface Mountain (start date July 3, 1984; elevation 610 m) located 9.0 km north of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Table 8.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	945	11
1981	Brook trout	810	19
1982	Brook trout	900	7
1983	Brook trout	900	6
1984	Brook trout	666	6
1985	Brook trout	990	8
1986	Brook trout	900	4
1987	Rainbow trout	800	98
1987	Brook trout	900	5
1988	Brook trout	900	4
1989	Brook trout	1980	34
1990	Brown trout	900	34
1991	Brown trout	900	28
1992	Brown trout	900	24
1993	Brown trout	900	25
1994	Brown trout	900	19
1995	Brown trout	900	32
1996	Brown trout	900	36
1997	Brown trout	900	25
1998	Brown trout	430	39
1999	Brown trout	330	30
2000	Brown trout	430	35
2001	Brown trout	400	43
2002	Brown trout	400	35
2003	Brown trout	370	32
2004	Brown trout	360	35
2005	Brown trout	370	26
2006	Brown trout	380	37
2007	Brown trout	380	38
2008	Brown trout	360	32
2009	Brown trout	380	33
2012	Brown trout	400	35
2013	Brown trout	330	33
2014	Brown trout	392	39

Table 8.4 Netting History

Date Month-Year	Species	Number	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1984	Brown trout	5	249	550	3580	5
Sep-1984	Brook trout	3	194	202	185	3
Sep-1984	Creek chub	20	89	117	-	31
Sep-1984	Pearl dace	2	62	76	-	2
Sep-1984	White sucker	16	100	349	2249	16
Sep-1984	Pumpkinseed	2	62	111	33	2
May-1994	Brown trout	4	310	357	1424	4
May-1994	Brook trout	8	144	293	1086	8
May-1994	N. redbelly dace	4	50	65	6	5
May-1994	Fathead minnow	1	65	65	3	1
May-1994	Blacknose dace	25	55	70	27	28
May-1994	Creek chub	34	60	128	187	34
May-1994	White sucker	28	165	418	4901	74
May-1994	Pumpkinseed	12	61	128	190	12
May-1994	Common shiner	3	91	97	21	3
Sep-2008	Brown trout	3	358	510	2602	3
Sep-2008	Brook trout	1	211	-	96	1
Sep-2008	Golden shiner	11	87	107	89	11
Sep-2008	Common shiner	25	43	105	193	119
Sep-2008	Creek chub	24	59	115	192	24
Sep-2008	White sucker	26	89	494	3803	35
Sep-2008	Pumpkinseed	3	60	66	10	3

Watershed: Owen Pond lies on predominantly metanorthosite and anorthositic gneiss (66%) and interlayered gabbroic or noritic metanorthosite (17%) bedrock. Till overlays 65% of the watershed while 35% of the watershed has exposed bedrock (APA 2001). Two-thirds of the watershed is above 600 m. About 20% of the watershed is above 900 m and 10% above 1000 m. The maximum elevation is 1183 m on the peak of Kilburn Mountain within the Sentinel Range. The maximum relief is 669 m. In 1984, the ALS found the shoal water substrate comprised of 40% rubble, 40% muck/silt, and 20% organic (ALSC 1985).

Land cover/use: In 1984, a deciduous-coniferous mixed forest covered 97% of the watershed while shrub sampling made up the remaining 3%. The immediate shoreline was 85% deciduous-coniferous forest and 15% shrub saplings (ALSC 1985). Owen Pond and its watershed occur entirely within the Sentinel Range Wilderness (NYSDEC 2017). A popular hiking trail skirts the north shoreline of the pond. There is a primitive campsite on the northeastern shoreline of the pond.

Watershed disturbance: The 1916 fire protection source data reveal a mix of virgin and second growth green timber with wide areas of logging for softwoods only. There is a small area to the north of the watershed where logging occurred for both soft and hardwoods. The November 1950 blowdown storm impacted two very small areas north of Winch Pond, but otherwise did not affect the watershed. The July 1995 microburst storm also did not affect the watershed (APA 2001). The watershed experienced heavy damage from the January 1998 ice storm (NYSDEC 1998).

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Heart Lake 020264
EPA ID: 1A1-102O

ALSC Staff Photo 2000

Lake: Heart Lake lies in the Lake Champlain watershed at 661 m. It has no permanent inlets, but intermittent inlet streams occur (Figure 9.1). The 10.7 ha lake has a maximum depth of 16.8 m (55.1 ft) (Figure 9.2). In 1985, the ALS observed an active beaver dam at the outlet. The beaver dam is no longer present. The outlet flows into a tributary of the West Branch of the Ausable River.

Heart Lake is a medium-till drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered moderately sensitive to acidification. This is one of the original ALS waters and has been monitored on a monthly basis since June 1982. This pond continues to be sampled on a monthly basis.

Lake chemistry: The ALS sampled Heart Lake near its deepest point on July 8, 1985 finding: Lab pH 6.59, ANC 29.5 µeq L^{-1}, SO_4^{2-} 94.52 µeq L^{-1}, NO_3^- 0.49 µeq L^{-1}, Ca^{2+} 102.30 µeq L^{-1}, Mg^{2+} 21.39 µeq L^{-1}, DOC 224.79 µmol L^{-1}-C (ALSC 1986). Table 9.1 summarizes recent ALTM chemistry taken at the outlet. Major analytes through 2013 are shown in Table 9.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 9.3 with weekly spring melt data shown in red.

Aquatic biota: On July 8, 1985, submergent aquatic plants occupied 1% of the lake bottom. Emergent aquatic plants occupied 1% of the lakes surface and consisted of Eriocaulon spp. in flowering stage. On May 6, 1985, a dip-net survey by the ALS found the following Insecta: Ephemeroptera Leptophlebiidae, Heptageniidae, and Ephemerellidae; Odonata Macromiidae and Coenagriidae; Trichoptera

Figure 9.1 Catchment

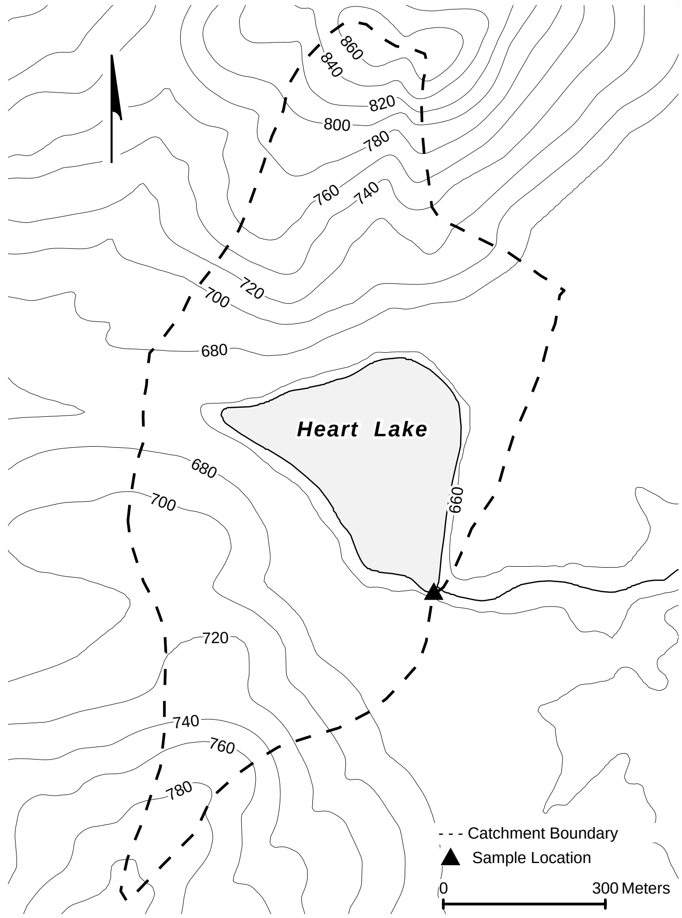
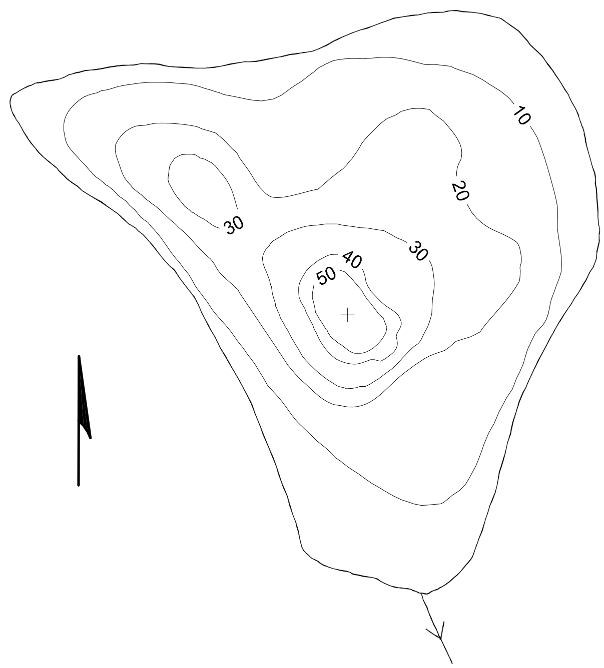


Figure 9.2 Bathymetry



Maximum Depth (+): 55 ft
Source: Indiana University, ALSC Rev. 1985

600'

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.18050	-73.96726	44° 10’ 49.8” N	073° 58’ 02.2” W
Lake centroid	44.18291	-73.96893	44° 10’ 58.5” N	073° 58’ 08.1” W

Table 9.1 Lake Chemistry

020264			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	81.61	117.42	93.05	56.64	75.16	62.58	37.15	54.22	46.27	μeq L^{-1}
NO_3^-	-0.40	22.56	5.54	0.00	18.92	4.12	0.00	17.16	4.91	μeq L^{-1}
Cl^-	6.21	9.87	7.80	6.10	7.77	6.80	5.00	12.53	6.9	μeq L^{-1}
F^-	0.84	1.26	0.99	0.72	1.23	1.02	0.56	1.26	0.94	μeq L^{-1}
ANC	17.65	56.44	37.70	35.29	54.20	46.00	44.04	141.74	60.76	μeq L^{-1}
DIC	44.96	148.20	80.13	59.11	132.38	88.21	69.65	426.29	132.16	μmol L^{-1}-C
DOC	158.60	325.03	220.30	158.27	218.91	189.35	191.18	259.07	223.74	μmol L^{-1}-C
SiO_2	21.64	59.91	36.57	15.20	67.24	40.45	37.98	106.77	52.64	μmol L^{-1}
Ca^{2+}	75.35	145.72	108.21	81.34	99.31	86.56	68.19	102.87	79.67	μeq L^{-1}
Mg^{2+}	18.93	30.45	23.31	16.46	22.22	19.34	16.19	31.6	19.4	μeq L^{-1}
Na^+	17.83	28.27	21.17	18.70	23.92	20.97	20.93	35.44	23.52	μeq L^{-1}
K^+	1.53	4.09	2.34	1.28	2.05	1.71	1.46	4.07	2.1	μeq L^{-1}
NH_4^+	0.28	3.55	1.07	-0.78	2.33	0.61	-0.17	5.5	1.09	μeq L^{-1}
AL_TD	0.07	3.37	1.28	0.33	2.67	1.21	0.27	3.01	1.43	μmol L^{-1}
AL_TM	0.16	2.02	0.79	1.30	1.96	1.63	1.15	1.84	1.44	μmol L^{-1}
AL_OM	-1.78	1.80	0.45	1.48	1.96	1.66	1.21	1.84	1.47	μmol L^{-1}
AL_IM	0.00	0.89	0.36	0.00	0.33	0.06	0.00	0.08	0.02	μmol L^{-1}
LABPH	5.85	6.69	6.31	6.01	6.59	6.33	6.16	6.6	6.35	
AIREQPH	6.51	6.91	6.69	6.62	6.90	6.76	6.67	7.25	6.82	
TRUECOLOR	5	15	10	15	20	16	5	25	13	Pt Co
SCONDUCT	16.91	23.06	18.76	14.23	17.91	15.26	12.42	22.86	15.11	μS cm^{-1}
TOTALP	na	na	na	2.20	5.60	3.58	2.23	9.43	5.40	μg L^1
CHLORA	na	na	na	0.43	2.85	1.37	0.77	13.39	4.70	μg L^1

Table 9.2 Lake Characteristics

Parameter	Value
Elevation	661 m
Maximum depth	16.8 m
Mean depth	5.1 m
Volume	54.5 x 10^4 m^3
Surface area	10.7 ha
Watershed area	69.3 ha
Watershed ratio	0.15
Hydraulic retention time (year)	1.03
Watershed	Lake Champlain
County, Town	Essex, North Elba
USGS Quadrangle	Keene Valley
Land use classification	Private - Resource Management

Unspecified; Diptera Chironomidae; and Hemiptera Gerridae. Also found were Gastropod Mesogastropoda Viviparidae and Demosponge Haplosclerina Spongillidae. The thermocline on July 8, 1985 was between 5.0 and 6.0 m (ALSC 1986).

Fisheries: Heart Lake is privately owned and reported to have been an excellent trout water prior to 1945 (Bath 2003). It has no history of stocking. In addition to the ALS fisheries survey on May 7, 1985, the ALSC netted the lake on May 26, 2004 and October 13, 2011 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 9.3 for a recent fish netting history.

Intensive studies: Heart Lake was studied during RILWAS in 1985 (Driscoll and Newton 1985). Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Heart Lake was part of a three lake study along with Lake Arnold and Upper Wallface Pond demonstrating paleoecological techniques to reconstruct long-term changes in lake chemistry, trophic state, watershed vegetation and soils in the High Peaks region (Whitehead et al. 1989). During the 1986 and 1987 snowmelts, Schaefer and Driscoll (1993) evaluated episodic acidification at the outlet. Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995).

Figure 9.3 Chemistry Time Series

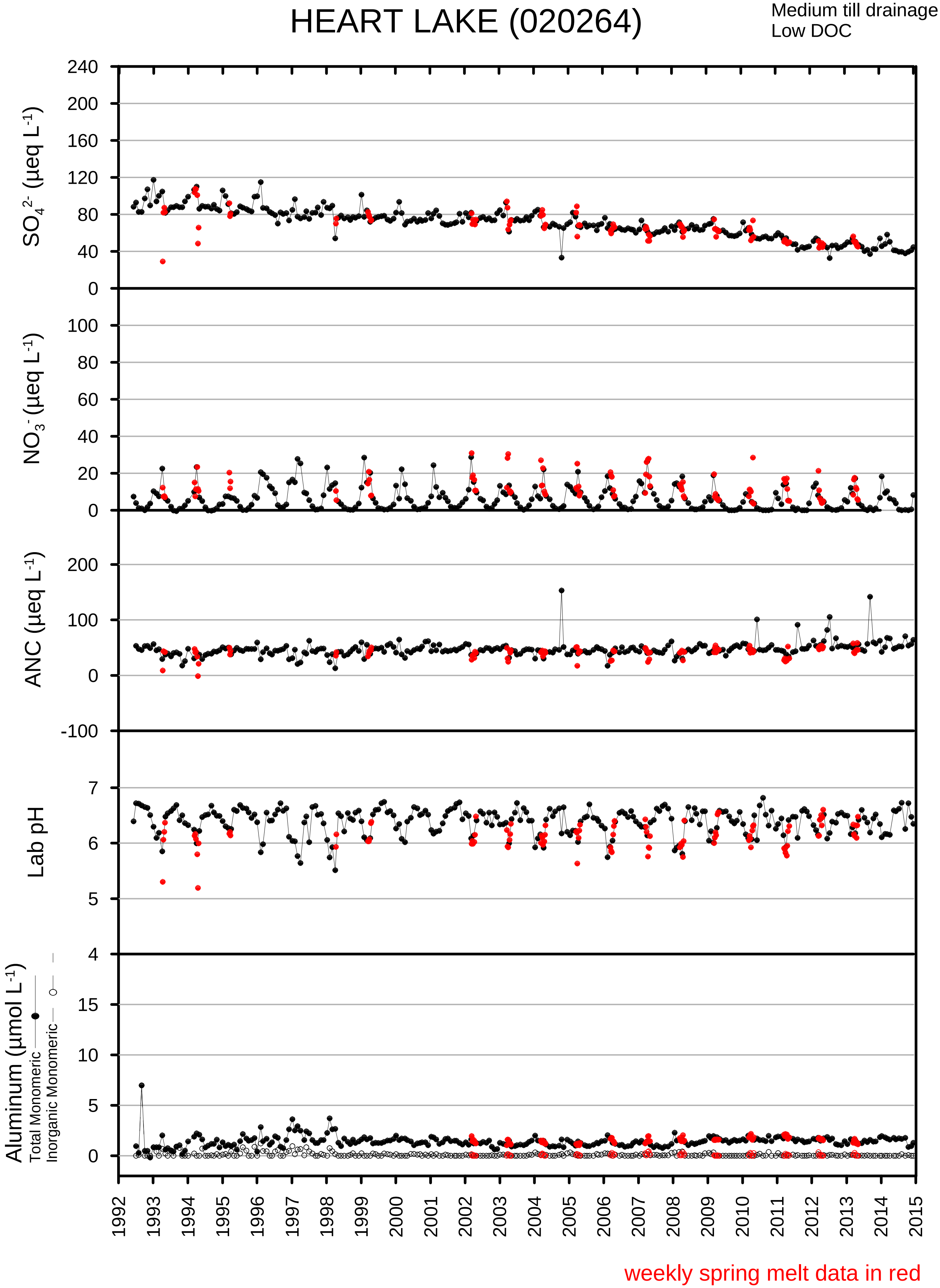


Table 9.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-1985	Brook trout	17	205	340	2930	17
May-1985	Lake chub	13	113	155	308	13
May-1985	White sucker	29	185	350	5954	66
May-1985	Brown bullhead	25	115	192	1043	48
May-2004	Brook trout	12	95	360	2934	12
May-2004	Lake chub	2	109	116	12	2
May-2004	Golden shiner	26	83	116	260	63
May-2004	White sucker	16	200	518	14238	16
May-2004	Brown bullhead	26	100	287	1736	40
May-2004	Smallmouth bass	1	540	540	2900	1
Oct-2011	Brook trout	16	150	396	3413	16
Oct-2011	Lake chub	9	54	127	93	9
Oct-2011	Golden shiner	7	88	112	57	7
Oct-2011	White sucker	18	230	506	5398	18
Oct-2011	Brown bullhead	25	191	312	4472	71

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY98 Whiteface Mountain (start date July 8, 1984; elevation 610 m) located 25 km north of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The bedrock underlying this moderately high elevation watershed is primarily metanorthosite and anorthositic gneiss. This type of bedrock is known to be hard and dense metamorphic rock that resists weathering and erosion. Deposited glacial till, a mixture of clay, silt, sand, and stone occur near and around the base of mountains where hardwoods and mixed conifer sites dominate (NYSDEC 1999). Eighty-seven percent of the watershed is overlain by till, 12.7% lascustrine delta sand and gravel, and less than 1% exposed bedrock. The highest point in the watershed is Mt. Jo at 877 m. The maximum relief in this watershed is 216 m. In 1985, the ALS characterized the shoal water substrate as 70% sand, 15% boulder/rubble, and 15% organic (ALSC 1986).

Land cover/use: In 1985, the ALS described the watershed as: 75% deciduous forest; 15% coniferous forest; and 10% developed. The immediate shoreline was 80% deciduous-coniferous mixed forest, 15% coniferous forest, and 5% developed (ALSC 1986). Heart Lake and its watershed are in private ownership in Resource Management under the APA Land Use and Development Plan (APA 2001) and are bordered by the High Peaks Wilderness Area (HPWA) (NYSDEC 1999). Hiking trails circle the lake. The Adirondack Mountain Club has a lodge, campground, developed beach area, and numerous lean-tos along the shoreline.

Watershed disturbance: During the nineteenth century, the Adirondack region supported a logging industry that denuded vast areas that were subject to wildfire. During the summer and fall of 1903, nearly 243,000 hectares of land burned in the Adirondacks, including areas of the HPWA. Piles of dry logging slash, an extended drought, and unseasonably high winds contributed to frequent major fires. In 1908 and 1909, an additional 121,406 hectares burned throughout the park. Lumbering practices were reformed to reduce fire risk and the State implemented extra measures of fire prevention and detection (NYSDEC 1999). The 1916 fire protection source data show nearly 95% of the Heart Lake watershed as waste and denuded with no slash. There is a very small area of burned with some slash to the eastern side of the pond. The watershed was not impacted by the November 1950 or July 1995 microburst storms (APA 2001). The watershed experienced light damage from the January 1998 ice storm (NYSDEC 1998).

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Marcy Dam Pond 020265
EPA ID: 020265O

ALSC Staff Photo 2008 Marcy dam prior to hurricane.

Lake: Marcy Dam Pond lies in the Lake Champlain watershed at 720 m. This 1.2 ha impoundment has a major inlet forming Marcy Brook and several unnamed streams (Figure 10.1). The outlet flows over a 7.0 m wooden dam of recent origin that replaced a dam installed at the turn of the century to control water for the logging industry (NYSDEC 1999). The lake reaches a maximum depth of 2.4 m (7.9 ft) (Figure 10.2).

Marcy Dam Pond was classified as a thin-till drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake was considered sensitive to acidification. The impoundment at Marcy Dam Pond was significantly damaged during Tropical Storm Irene in August 2011. In 2013, the DEC decided to dismantle the structure starting in August 2014. The decision to remove it was based on several factors including: dam safety, cost, ecological considerations, and its Wilderness classification under the Adirondack Park State Land Master Plan. Because the removal of the dam will change Marcy Dam Pond from a lake to a stream system, the site was discontinued as an ALTM chemistry monitoring site in June 2014. Its monthly chemistry record which began in June 1992 (ALSC Pond No. 020265) will be maintained along with the other ALTM lakes.

Lake chemistry: Marcy Dam Pond was sampled near its deepest point during the ALS on July 9, 1985 finding: Lab pH 5.46, ANC -3.1 µeq L^{-1}, SO_4^{2-} 107.01 µeq L^{-1}, NO_3^- 2.59 µeq L^{-1}, Ca^{2+} 86.83 µeq L^{-1}, Mg^{2+}

Figure 10.1 Catchment

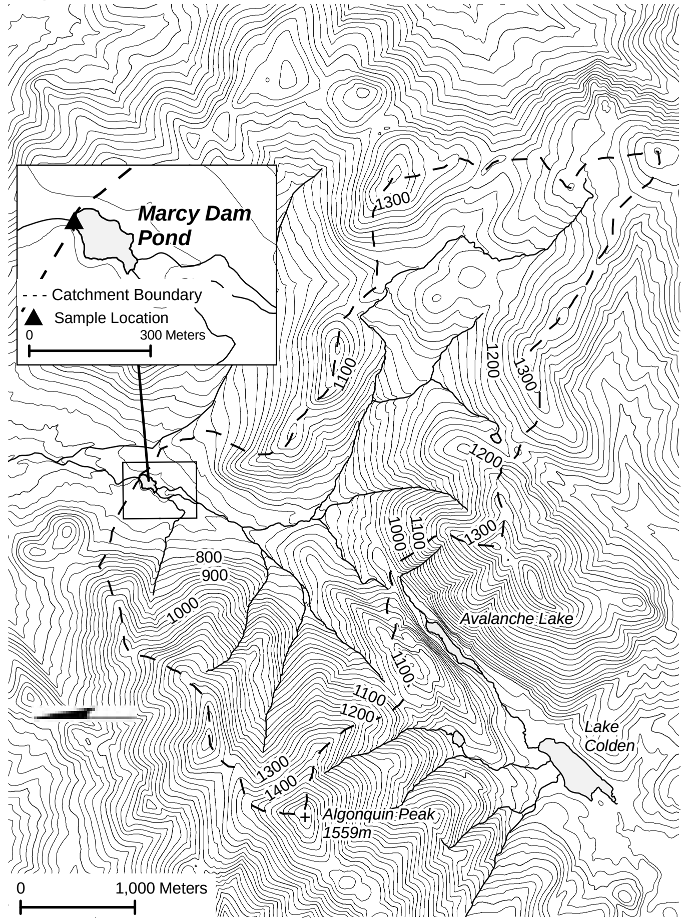
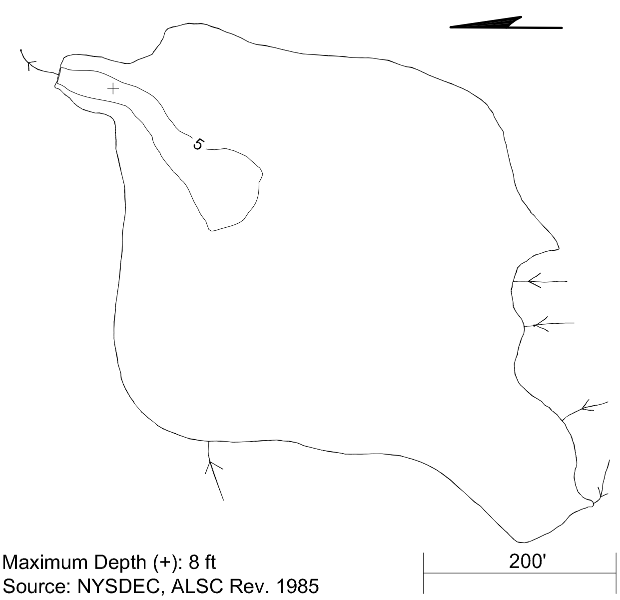


Figure 10.2 Bathymetry



Maximum Depth (+): 8 ft
Source: NYSDEC, ALSC Rev. 1985

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.15886	-73.95140	44° 09' 31.9" N	073° 57' 05.0" W
Lake centroid	44.15803	-73.95180	44° 09' 28.9" N	073° 57' 06.5" W

Table 10.1 Lake Chemistry

020265			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	59.96	119.72	95.32	52.96	78.11	63.85	41.90	68.36	52.25	µeq L^{-1}
NO_3^-	2.89	41.94	16.97	3.91	33.18	14.73	4.40	29.99	14.3	µeq L^{-1}
Cl^-	3.67	9.87	7.10	2.73	8.65	5.58	3.51	8.26	6	µeq L^{-1}
F^-	0.47	1.05	0.73	0.71	1.01	0.85	0.34	1.23	0.82	µeq L^{-1}
ANC	-8.99	58.40	17.80	10.16	64.87	29.36	15.60	47.86	30.75	µeq L^{-1}
DIC	7.49	158.19	56.48	25.81	115.73	57.29	29.68	118.54	64.58	µmol L^{-1}-C
DOC	147.86	446.75	270.13	182.75	369.99	265.90	197.29	359.90	281.97	µmol L^{-1}-C
SiO_2	53.42	165.26	120.50	72.56	150.45	121.12	80.86	136.12	114.99	µmol L^{-1}
Ca^{2+}	36.43	132.74	90.74	51.40	109.29	73.18	48.83	85.51	65.47	µeq L^{-1}
Mg^{2+}	9.05	33.74	21.94	10.70	32.09	19.17	11.84	26.07	18.12	µeq L^{-1}
Na^+	10.44	42.63	24.14	15.66	38.28	24.58	19.04	33.27	26	µeq L^{-1}
K^+	0.51	3.07	1.81	0.26	1.53	1.01	0.79	1.67	1.25	µeq L^{-1}
NH_4^+	-0.67	2.61	0.44	-1.41	2.29	0.04	-0.43	1.32	0.51	µeq L^{-1}
AL_TD	5.56	18.75	11.50	5.41	11.82	8.29	4.53	11.16	7.71	µmol L^{-1}
AL_TM	2.46	22.30	7.71	2.30	6.93	3.99	2.31	5.48	3.86	µmol L^{-1}
AL_OM	1.90	6.08	3.53	2.00	4.82	3.05	2.15	4.19	3.16	µmol L^{-1}
AL_IM	0.52	17.81	4.18	0.02	3.04	0.94	0.16	1.39	0.7	µmol L^{-1}
LABPH	4.95	6.27	5.39	5.36	6.49	5.89	5.76	6.37	6.04	
AIREQPH	4.98	6.88	5.38	5.34	7.04	5.98	5.83	6.8	6.22	
TRUECOLOR	15	25	19	15	30	25	10	25	18	Pt Co
SCONDUCT	14.86	23.36	19.14	12.05	21.13	15.35	10.66	18.2	14.23	µS cm^{-1}
TOTALP	na	na	na	1.29	4.59	2.56	2.18	8.44	3.84	µg L^{1}
CHLORA	na	na	na	0.05	0.43	0.25	0.03	0.32	0.18	µg L^{1}

Table 10.2 Lake Characteristics

Parameter	Value
Elevation	720 m
Maximum depth	2.4 m
Mean depth	0.7 m
Volume	0.8 x 10^4 m^3
Surface area	1.2 ha
Watershed area	1177.2 ha
Watershed ratio	0.001
Hydraulic retention time (year)	.0009
Watershed	Lake Champlain
County, Town	Essex, North Elba
USGS Quadrangle	Keene Valley
Land use classification	High Peaks Wilderness

21.39 µeq L^{-1}, DOC 274.74 µmol L^{-1}-C (ALSC 1986). Table 10.1 summarizes recent ALTM water chemistry taken at the outlet. Major analytes through 2013 are shown in Table 10.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 10.3.

Aquatic biota: On July 9, 1985, the ALS aquatic plant survey found Sparganium spp. covering 1% of the lake bottom. A dip-net survey on May 13, 1985, identified the following Insecta: Odonata Aeshnidae, Hemiptera Corixidae, Notonectidae, and Gerridae; Megaloptera Sialidae; and Coleoptera Gyrinidae. Also found was Mollusca Pelecypod Unspecified (ALSC 1986).

Fisheries: The DEC began stocking brook trout in Marcy Dam Pond in 1955 (ALSC 1986). In addition to the ALS fisheries survey on May 14, 1985, the ALSC netted the lake on May 25, 2004 and May 10, 2012 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 10.3 and 10.4 for recent fish stocking and netting histories.

Intensive studies: The DOH conducted a limnological survey of Marcy Dam Pond in August 1975 (Wood 1978). Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000.

Figure 10.3 Chemistry Time Series

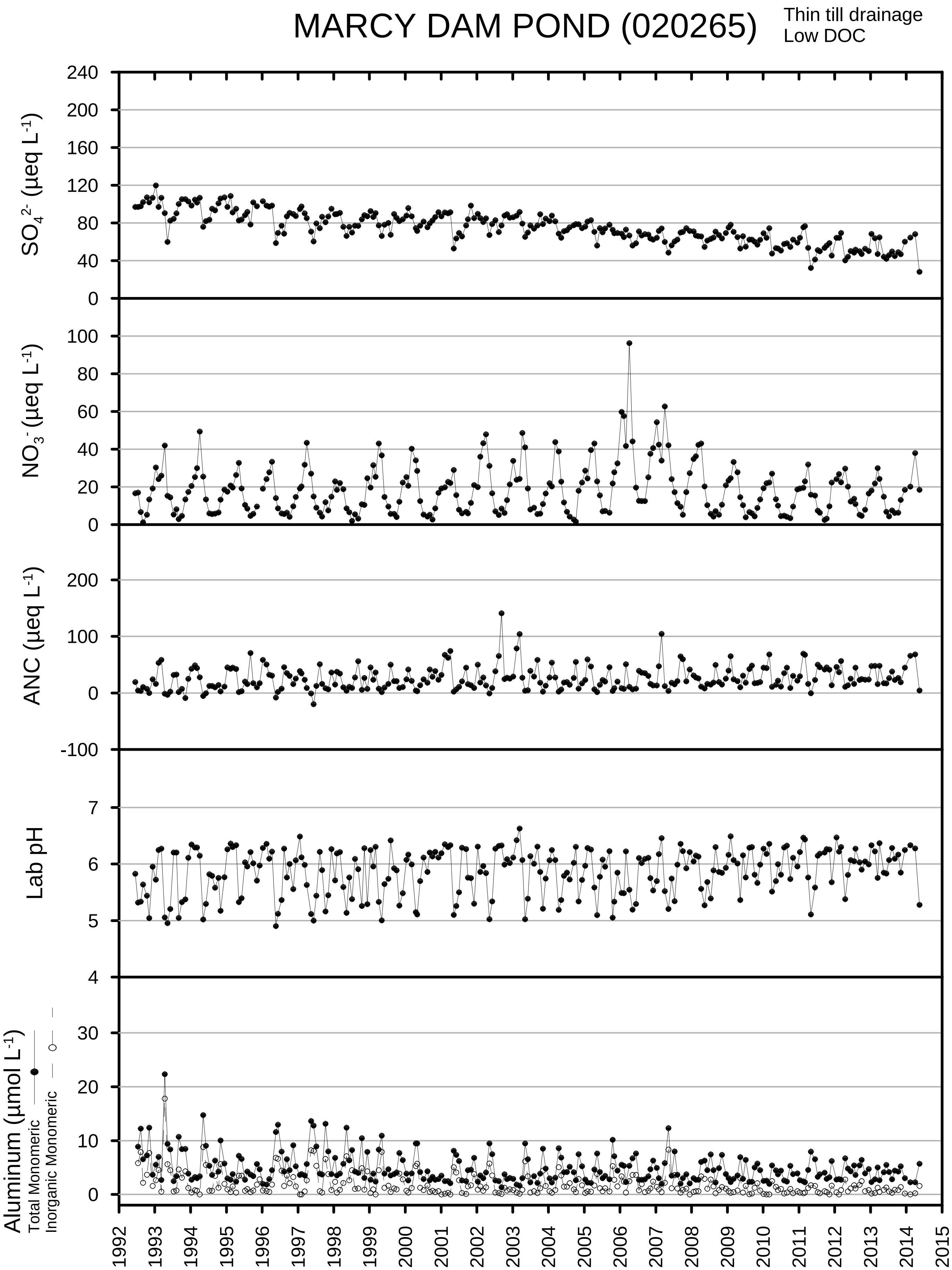


Table 10.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	315	4
1981	Brook trout	270	6
1982	Brook trout	300	2
1983	Brook trout	300	11
1984	Brook trout	222	2
1985	Brook trout	330	8
1986	Brook trout	300	1
1987	Brook trout	300	3
1988	Brook trout	300	1
1989	Brook trout	330	3
1990	Brook trout	330	1
1991	Brook trout	300	3
1992	Brook trout	300	4
1993	Brook trout	300	3
1994	Brook trout	240	4
1995	Brook trout	280	7
1996	Brook trout	300	3
1997	Brook trout	320	7
1998	Brook trout	320	5
1999	Brook trout	250	3
2000	Brook trout	250	3
2002	Brook trout	250	5
2003	Brook trout	250	2
2004	Brook trout	250	4

Table 10.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-1985	Brook trout	54	100	265	4123	54
Jun-2001	Brook trout	39	87	320	2993	39
Oct-2012	Brook trout	12	122	283	646	12

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY98 Whiteface Mountain (start date July 3, 1984; elevation 610 m) located 27 km north of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The bedrock underlying this high-elevation watershed is primarily metanorthosite and anorthositic gneiss. Glacial till, a mixture of clay, silt, sand, and stone are common near and around the base of mountains where hardwoods and mixed conifer sites dominate (NYSDEC 1999). Till covers 80% of the watershed while exposed bedrock accounts for the remaining surface area. The highest elevation in the watershed is the summit of Algonquin Mountain at 1560 m. The maximum relief is 840 m. In 1984, the ALS found the shoal water substrate comprised of 80% sand/gravel, 15% organic and 5% muck/silt (ALSC 1986).

Land cover/use: In 1985, deciduous/coniferous mixed forest covered approximately 85% of the watershed while the remaining 15% was shrub/sapling vegetation. Vegetation bordering the immediate shoreline was primarily deciduous-conifer forest with 12% shrub sapling vegetation and 3% open grassy areas (ALSC 1986). Marcy Dam Pond and its watershed occur entirely within the High Peaks Wilderness Area (HWPA). Nearly 140,000 recreational visitors used the area in 1998. Thirty campsites, four lean-tos and a ranger outpost are located within the watershed. The dam at Marcy Pond is one of four functioning and maintained dams in the HPWA (NYSDEC 1999).

Watershed disturbance: In the nineteenth century, the area supported a logging industry that denuded vast areas of the watershed and left it prone to wildfires. During the summer and fall of 1903, nearly 243,000 hectares of land burned in the Adirondacks, including areas of the HPWA. Contributing to the fire storms were dry logging slash, an extended drought, and unseasonably high winds. Fire storms raged again in 1908 and 1909, burning an additional 121,406 hectares throughout the park. Lumbering practices were reformed to reduce fire risk and the State took extra measures of fire prevention and detection (NYSDEC 1999).

The 1916 fire protection source data reveal 70% of the Marcy Dam Pond watershed as logged for both soft and hardwoods, 25% as virgin and second growth with no slash, while the remaining 5% was burned over. The November 1950 blowdown had less than 1% impact on the watershed. The watershed was not affected by the July 1995 microburst storm (APA 2001). The watershed experienced light damage from the January 1998 ice storm (NYSDEC 1998). In May 2014, sampling at Marcy Dam Pond was discontinued after damage to the impoundment by Tropical Storm Irene in August 2011 and the decision by the DEC to not reconstruct the dam.

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Grass Pond 030171
EPA ID: 030171E

ALSC Staff Photo 2015

Lake: Grass Pond lies in the St. Lawrence River watershed at 381 m. This 1.6 ha water has no inlets or outlets (Figure 11.1). It is one of seven seepage lakes monitored in the ALTM program. The pond is due south of Little Clear Pond (030172), another ALTM seepage lake. Both lakes are in proximity to Long Pond, separated by an esker. Grass Pond reaches a maximum depth of 7.0 m (23.0 ft) (Figure 11.2).

Grass Pond is classified as a mounded seepage lake, with high dissolved organic carbon (>500 μmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014.

Lake Chemistry: The ALS sampled Grass Pond near its deepest point on July 18, 1984 finding: Lab pH 4.48, ANC 7.1 μeq L^{-1}, SO_4^{2-} 49.55 μeq L^{-1}, NO_3^- LTD, Ca^{2+} 21.46 μeq L^{-1}, Mg^{2+} 10.70 μeq L^{-1}, DOC 549.49 μmol L^{-1}-C (ALSC 1985). Table 11.1 summarizes recent ALTM water chemistry. Major analytes through 2013 are shown in Table 11.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 11.3.

Figure 11.1 Catchment

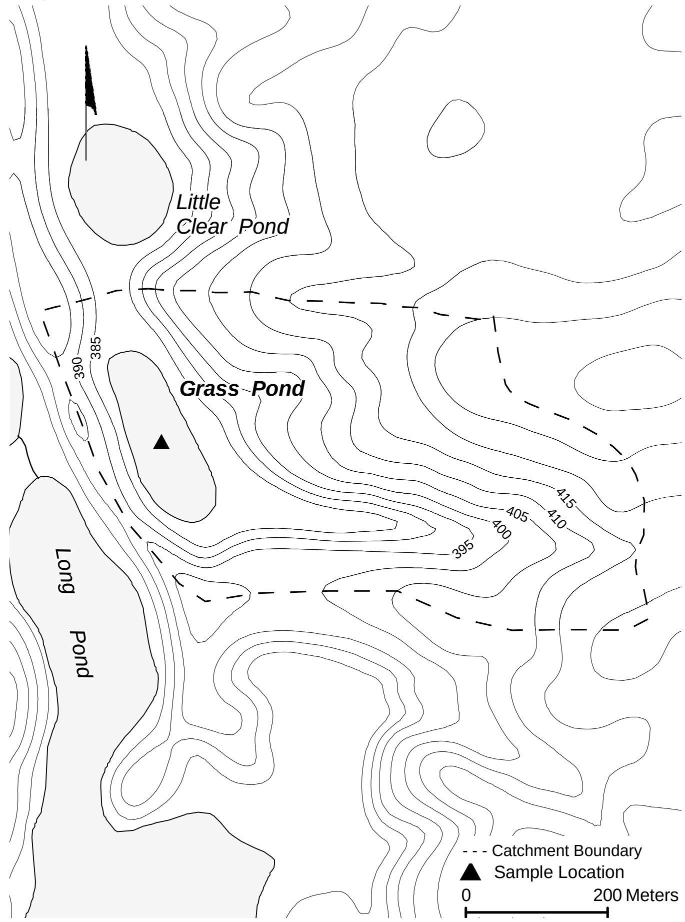
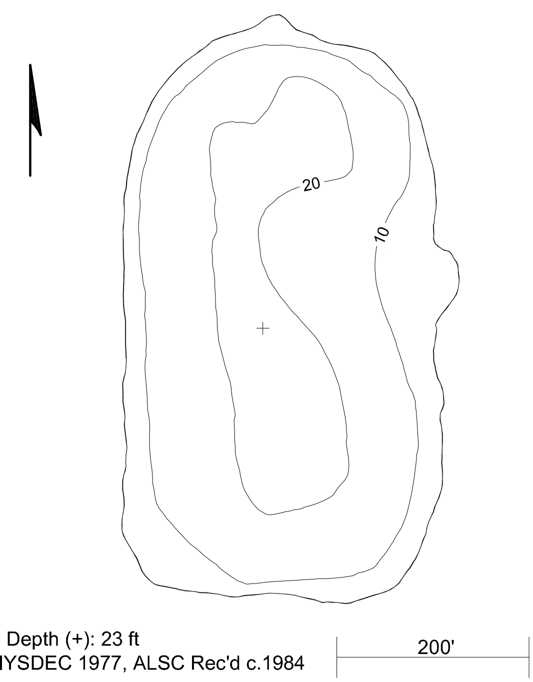


Figure 11.2 Bathymetry



Maximum Depth (+): 23 ft
Source: NYSDEC 1977, ALSC Rec'd c.1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.65698	-74.49562	44° 39′ 25.1″ N	074° 29′ 44.2″ W
Lake centroid	44.65698	-74.49562	44° 39′ 25.1″ N	074° 29′ 44.2″ W

Table 11.1 Lake Chemistry

030171			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	36.44	50.59	43.13	18.43	30.39	21.30	12.23	19.85	16.3	µeq L^{-1}
NO_3^-	-0.40	8.71	2.35	0.00	10.67	1.56	0.00	5.57	1.36	µeq L^{-1}
Cl^-	5.08	15.80	7.36	4.81	8.53	5.85	4.39	6.68	5.17	µeq L^{-1}
F^-	0.79	1.26	1.04	0.71	1.27	1.02	0.92	1.25	1.08	µeq L^{-1}
ANC	-43.91	-1.82	-28.80	-22.36	7.29	-11.09	-22.49	-5.91	-13.8	µeq L^{-1}
DIC	30.80	223.13	74.65	27.47	220.63	118.87	45.64	167.06	93.02	µmol L^{-1}-C
DOC	515.35	706.51	594.15	660.92	815.99	755.21	723.11	857.31	783.74	µmol L^{-1}-C
SiO_2	-4.99	13.48	4.88	1.06	11.65	7.10	3.34	9.88	6.85	µmol L^{-1}
Ca^{2+}	18.96	35.93	25.91	18.86	37.43	25.03	17.83	27.89	22.38	µeq L^{-1}
Mg^{2+}	10.70	14.81	12.89	10.66	12.56	11.41	10.06	12.49	11.15	µeq L^{-1}
Na^+	2.61	10.87	4.75	3.48	6.52	4.37	3.93	5.82	4.62	µeq L^{-1}
K^+	5.88	11.25	8.48	5.86	7.67	6.65	5.75	7.13	6.37	µeq L^{-1}
NH_4^+	0.00	7.76	1.90	-1.16	19.40	6.70	-0.46	4.91	1.59	µeq L^{-1}
AL_TD	0.44	1.30	0.77	0.63	1.74	1.06	0.41	1.71	0.96	µmol L^{-1}
AL_TM	0.04	2.75	1.97	1.78	2.33	2.10	1.53	2.26	1.94	µmol L^{-1}
AL_OM	0.55	2.63	1.46	1.37	2.26	1.97	1.54	2.14	1.93	µmol L^{-1}
AL_IM	0.00	1.34	0.75	0.00	0.41	0.14	0.00	0.28	0.05	µmol L^{-1}
LABPH	4.32	5.06	4.48	4.50	4.85	4.62	4.42	4.71	4.6	
AIREQPH	4.37	5.07	4.50	4.56	4.95	4.68	4.54	4.76	4.67	
TRUECOLOR	40	70	53	45	140	95	60	90	78	Pt Co
SCONDUCT	10.90	23.50	18.53	13.38	18.60	15.12	12.55	15.25	13.73	µS cm^{-1}
TOTALP	na	na	na	12.57	30.55	17.61	9.16	18.53	14.44	µg L^1
CHLORA	na	na	na	4.74	57.64	13.68	4.32	88.31	20.58	µg L^1

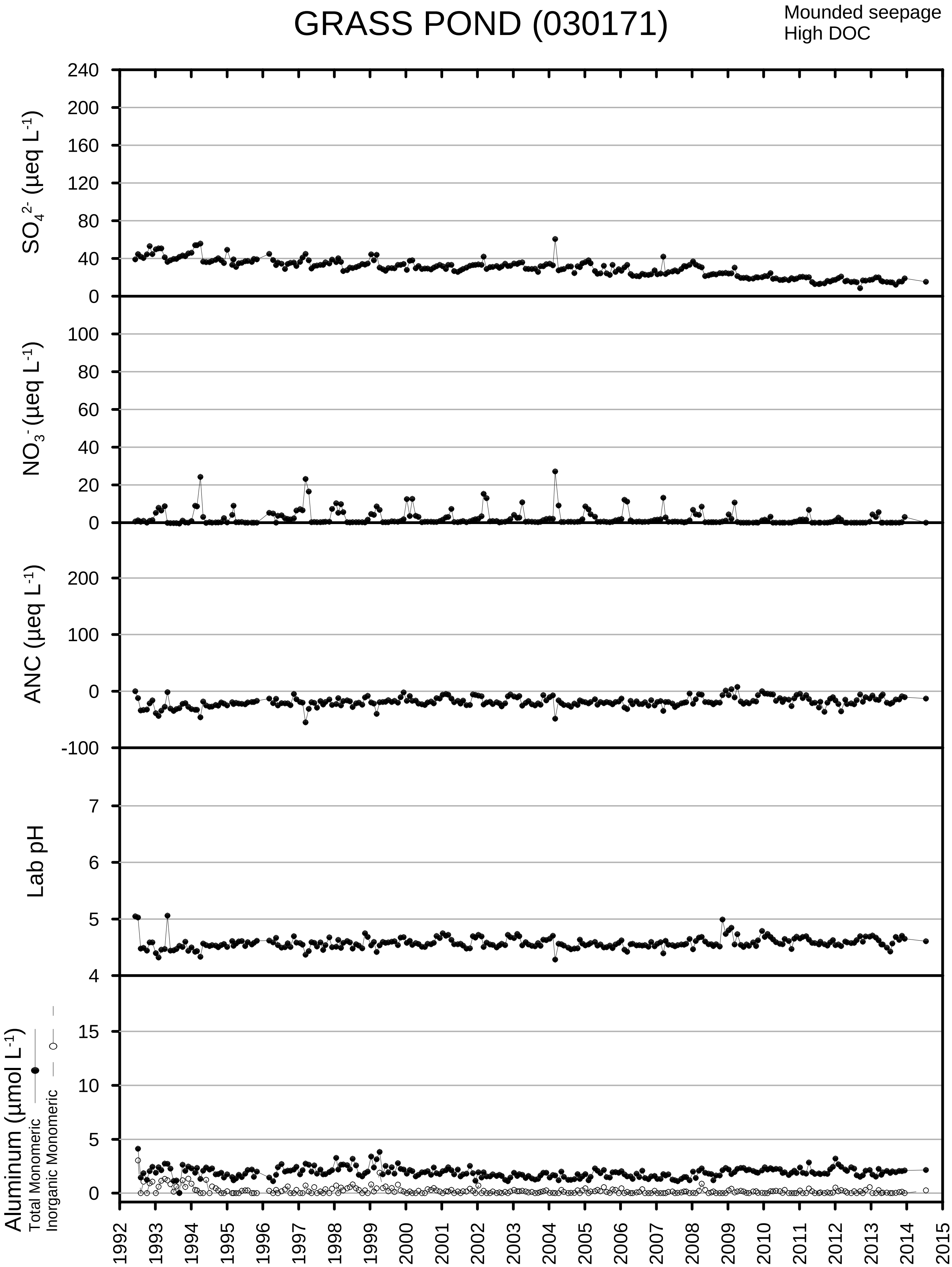
Table 11.2 Lake Characteristics

Parameter	Value
Elevation	381 m
Maximum depth	7.0 m
Mean depth	4.2 m
Volume	6.8×10^4 m^3
Surface area	1.6 ha
Watershed area	29.5 ha
Watershed ratio	0.05
Hydraulic retention time (year)	NA
Watershed	St. Lawrence
County, Town	Franklin, Waverly
USGS Quadrangle	Santa Clara
Land use classification	Debar Mountain Wild Forest

Aquatic biota: On October 10, 1984, a dip-net survey by the ALS identified the following Insecta: Odonata Corduliidae; Hemiptera Notonectidae; Coleoptera Dytiscidae; and Diptera Unspecified. No macrophytes were observed during a survey on October 9, 1984 (ALSC 1985). On July 18, 1984, a thermocline was detected between 3.0 and 4.0 m (ALSC 1985).

Fisheries: The DEC stocked Grass Pond with brook trout from 1957–1963 and rainbow trout in 1962–1963, after which stocking was discontinued (ALSC 1985). In addition to the ALS fisheries survey on October 9, 1984, the ALSC netted the lake on June 15, 1998 and October 1, 2008 (Roy et al. 2015, Baldigo et al. 2016). No fish were captured in any of these surveys.

Figure 11.3 Chemistry Time Series



Intensive studies: Grass Pond is one of 36 ALTM lakes evaluated by Momen and Zehr (1998) during 1994 examining lake-water chemistry and terrestrial characteristics with the existing watershed classifications. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. In 2003, this lake watershed was part of a 36 lake-watershed regional survey of foliar nitrogen gradients in the Adirondack Park (McNeil et al. 2007).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date January 1, 2013; elevation 498 m) located 32 km southeast of the lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Grass Pond and 32% of its watershed is underlain by interlayered amphibolite and granitic, charnockitic, syenitic gneiss. The remaining 68% is underlain by biotite and/or hornblende granite gneiss overlain by gravel and sand deposits (APA 2001). The highest elevation in the watershed is 425 m. The watershed has a maximum relief of 44 m. In 1984, the ALS found the shoal water substrate comprised of 90% muck/silt and 10% organic (ALSC 1985).

Land cover/use: In 1984, deciduous forest covered 95% of the watershed, and the remaining 5% was deciduous-conifer mixed forest. The immediate shoreline characteristics consisted of 99% coniferous forest and the entire pond was surrounded by a floating bog mat consisting primarily of sphagnum, leather leaf, and wild cranberry (ALSC 1985). Total wetland area is 2.29 ha and comprises 8% of the watershed. The predominant wetland type is classified as scrub/shrub needle-leaf deciduous and scrub/shrub needle-leaf evergreen (APA 2001). Detailed wetland mapping data are available from the NYS Adirondack Park Agency (Halasz et al. 2000, Karasin et al. 2002). The pond is located in the Debar Mountain Wild Forest (NYSDEC 2017) and has no designated trails or development.

Watershed disturbance: The 1916 fire protection source data show the watershed containing a mix of agricultural, open grasslands, portions of virgin and second growth, and burned over areas. The watershed was not affected by the November 1950 blowdown or July 1995 microburst storms (APA 2001). The watershed experienced heavy damage from the January 1998 ice storm (NYSDEC 1998).

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Little Clear Pond 030172
EPA ID: 030172E

ALSC Staff Photo 2015

Lake: Little Clear Pond lies in the St. Lawrence River watershed at 381 m. This 1.9 ha lake has no inlets or outlets (Figure 12.1). It is one of seven seepage lakes monitored in the ALTM program. It is located due north of Grass Pond (030171), another ALTM seepage lake. Little Clear Pond is bounded by an esker on about 75% of its shoreline. A break in the esker on the north shore evidences underground seepage to a forested wetland area north of the pond. The lake has a maximum depth of 14 m (45.9 ft) (Figure 12.2).

Little Clear Pond is classified as a mounded seepage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the pond in June 1992. This pond continues to be sampled monthly.

Lake chemistry: The ALS sampled Little Clear Pond on July 18, 1984 finding: Lab pH 4.97, ANC -5.0 µeq L^{-1}, SO_4^{2-} 42.06 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 36.43 µeq L^{-1}, Mg^{2+} 13.17 µeq L^{-1}, DOC 491.21 µmol L^{-1}-C (ALSC 1985). Little Clear Pond is not included in the ALTM overall water chemistry trend analyses due to liming. Table 12.1 summarizes recent ALTM chemistry. Major analytes through 2013 are shown in Table 12.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 12.3.

Figure 12.1 Catchment

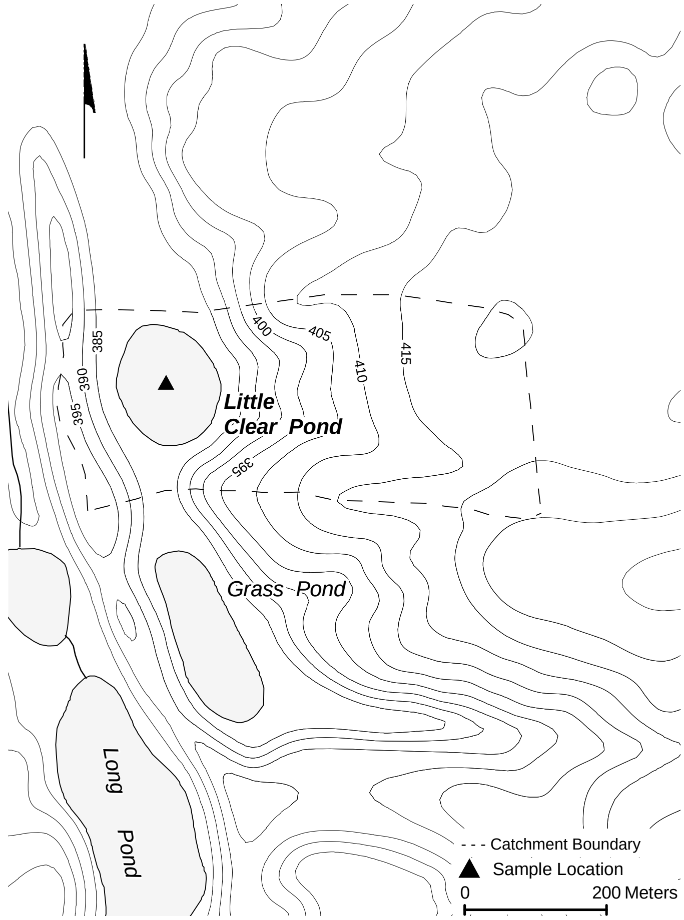
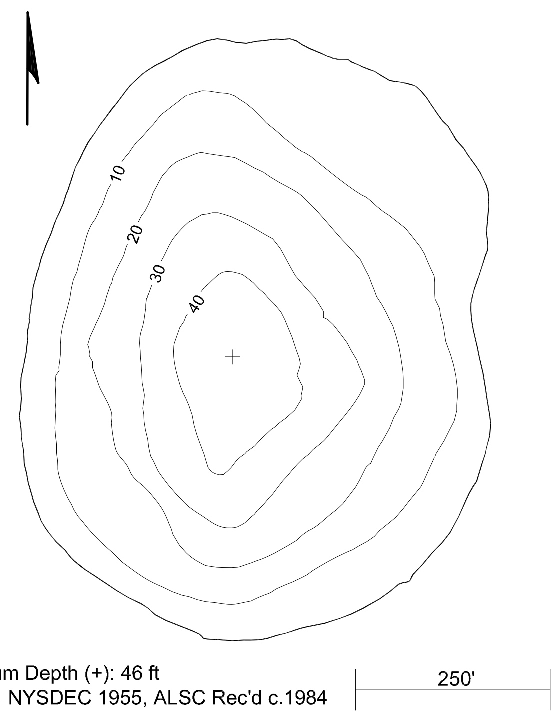


Figure 12.2 Bathymetry



Maximum Depth (+): 46 ft
Source: NYSDEC 1955, ALSC Rec'd c.1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	44.66022	-74.49632	44° 39′ 36.8″ N	074° 29′ 46.8″ W
Lake centroid	44.66022	-74.49632	44° 39′ 36.8″ N	074° 29′ 46.8″ W

Table 12.1. Lake Chemistry

030172			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	36.64	49.76	44.75	17.34	25.48	21.38	8.82	16.94	12.39	μeq L^{-1}
NO_3^-	-0.40	15.48	2.24	0.00	1.62	0.25	0.00	7.40	1.14	μeq L^{-1}
Cl^-	4.51	7.33	6.18	3.50	7.70	4.94	4.00	6.39	4.88	μeq L^{-1}
F^-	0.84	1.16	1.01	0.67	1.46	1.00	0.55	1.16	0.83	μeq L^{-1}
ANC	-30.18	44.17	3.11	58.58	127.11	80.89	39.93	90.00	62.54	μeq L^{-1}
DIC	15.82	372.15	158.67	54.95	407.95	191.63	38.46	324.28	162.55	μmol L^{-1}-C
DOC	458.74	648.40	549.43	499.45	646.90	571.57	537.33	650.45	594.82	μmol L^{-1}-C
SiO_2	-1.17	13.48	6.12	1.83	14.98	6.26	0.89	9.39	3.38	μmol L^{-1}
Ca^{2+}	20.96	53.40	39.55	61.65	143.22	86.81	50.94	87.37	65.48	μeq L^{-1}
Mg^{2+}	13.17	18.10	14.54	32.09	41.97	36.75	22.68	33.47	27.22	μeq L^{-1}
Na^+	2.17	5.22	3.77	3.04	4.78	3.83	3.88	4.60	4.24	μeq L^{-1}
K^+	7.67	16.37	10.32	7.93	11.25	9.41	7.12	10.99	9.33	μeq L^{-1}
NH_4^+	-0.11	32.76	11.03	-1.39	28.77	7.12	-0.41	17.52	7.68	μeq L^{-1}
AL_TD	0.33	3.04	0.94	0.31	1.11	0.62	0.37	1.27	0.68	μmol L^{-1}
AL_TM	0.42	3.37	1.84	1.45	1.82	1.63	1.30	1.91	1.48	μmol L^{-1}
AL_OM	0.36	3.69	1.50	1.37	1.86	1.60	1.35	1.89	1.57	μmol L^{-1}
AL_IM	0.00	1.40	0.53	0.00	0.19	0.07	0.00	0.08	0.01	μmol L^{-1}
LABPH	4.51	5.57	4.97	6.01	6.82	6.22	5.81	6.63	6.12	
AIREQPH	4.50	6.62	5.04	6.69	7.28	6.96	6.50	7.07	6.73	
TRUECOLOR	30	60	40	40	70	50	40	60	48	Pt Co
SCONDUCT	11.22	17.53	13.76	11.67	19.80	14.72	9.15	16.45	12.12	μS cm^{-1}
TOTALP	na	na	na	7.62	36.39	18.30	5.40	21.25	12.18	μg L^1
CHLORA	na	na	na	2.56	54.39	13.44	3.46	151.02	22.08	μg L^1

Table 12.2 Lake Characteristics

Parameter	Value
Elevation	381 m
Maximum depth	14.0 m
Mean depth	5.5 m
Volume	10.2 x 10^4 m^3
Surface area	1.9 ha
Watershed area	17.99 ha
Watershed ratio	0.11
Hydraulic retention time (year)	NA
Watershed	St. Lawrence
County, Town	Franklin, Waverly
USGS Quadrangle	Santa Clara
Land use classification	Debar Mountain Wild Forest, Rural Use

Aquatic biota: A dip-net survey by the ALS on October 10, 1984, identified the following Insecta: Odonata Corduliidae and Hemiptera Notonectidae. On that date an aquatic plant survey found 1% of the lake surface was comprised of Nuphar spp (ALSC 1985). On July 18, 1984, a thermocline was detected between 2.0 and 4.0 m (ALSC 1985).

Fisheries: Little Clear Pond has a history of stocking beginning in 1885 with brook trout and salmon. From 1892–1899 several species were stocked, including: lake trout, brown trout, rainbow trout, brook trout, Atlantic salmon, and lake whitefish. Annual stocking of brook trout started in 1940 (ALSC 1985). The lake was limed in 1962 and 1996 (ALSC 2003). Figure 12.3 shows responses to the 1996 liming. In addition to the ALS fisheries survey on October 9, 1984, the ALSC netted the lake on May 23, 1994 and October 9, 2008 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 12.3 and 12.4 for recent fish stocking and netting histories.

Figure 12.3 Chemistry Time Series

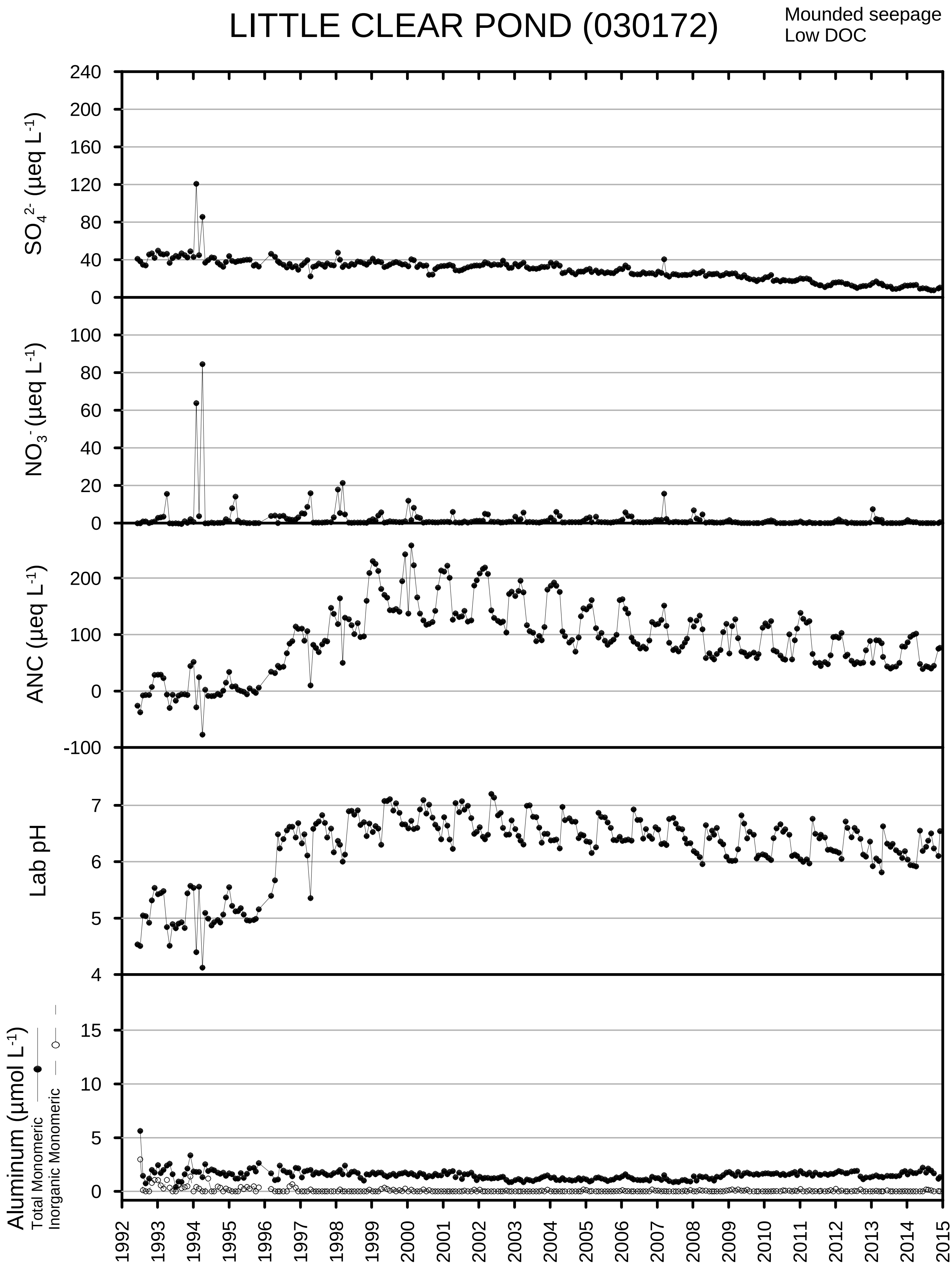


Table 12.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	400	41
1981	Brook trout	330	38
1982	Brook trout	375	48
1983	Brook trout	345	57
1984	Brook trout	325	51
1985	Brook trout	300	50
1986	Brook trout	740	95
1988	Brook trout	310	44
1989	Brook trout	330	79
1990	Brook trout	220	3
1991	Brook trout	200	2
1992	Brook trout	200	2
1993	Brook trout	200	4
1994	Brook trout	160	2
1995	Brook trout	190	4
1996	Brook trout	200	2
1997	Brook trout	250	2
1998	Brook trout	210	5
1999	Brook trout	200	4
2000	Brook trout	200	3
2001	Brook trout	200	10
2002	Brook trout	200	4
2003	Brook trout	200	2
2004	Brook trout	200	6
2005	Brook trout	200	6
2006	Brook trout	220	8
2007	Brook trout	200	4
2008	Brook trout	200	3
2009	Brook trout	200	3
2010	Brook trout	250	11
2011	Brook trout	100	1
2012	Brook trout	200	6
2013	Brook trout	200	3
2014	Brook trout	200	3

Table 12.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Oct-1984	Brook trout	9	228	292	1820	9
Oct-1984	Brown bullhead	37	78	235	-	37
May-1994	Brook trout	3	105	130	21	3
May-1994	Northern pike	1	490	490	858	1
May-1994	Brown bullhead	30	61	240	164	80
Oct-2008	Brook trout	7	95	133	113	7
Oct-2008	Brown bullhead	27	104	237	2232	64

Intensive studies: Little Clear Pond was one of 36 ALTM lakes evaluated by Momen and Zehr (1998) during 1994 examining lake-water chemistry and terrestrial characteristics with the existing watershed classifications. Bukaveckas and Robbins-Forbes (2000) characterized the attenuation of photosynthetic radiation in relation to lake chemistry in this lake as part of a regional survey. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date January 1, 2013; elevation 498 m) located 32 km southeast of the lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The bedrock underlying this watershed is 52% biotite and/or hornblende granitic gneiss and 48% interlayed amphibolite and granitic, charnockitic, syenitic gneiss. The rock is overlain by gravel and sand deposits (APA 2001). The highest elevation in the watershed is 420 m. The watershed is relatively flat with a maximum relief of 39 m. The pond is within a small grouping of other kettle-hole type ponds near the St. Regis River. In 1984, the ALS found the shoal water substrate of Little Clear Pond comprised of 80% muck/silt and 20% organic (ALSC 1985).

Land cover/use: In 1984, the ALS found watershed cover as 95% deciduous forest and 5% deciduous-coniferous mixed forest. The immediate shoreline consisted of 70% deciduous/coniferous mixed forest, 20% deciduous and 10% coniferous forest (ALSC 1985). A small portion of needle-leaved evergreen forested wetland is located on the northern end of the watershed, indicating the potential direction of seepage flow, but no wetlands border the shoreline. Detailed wetlands maps for the watershed are available (Halasz et al. 2000, Karasin et al. 2002). The pond is divided between public Debar Mountain Wild Forest, and private land with a rural use designation (NYSDEC 2017). A private jeep trail leads to a campsite on the pond from the northwest.

Watershed disturbance: The 1916 fire map shows the watershed containing a mix of agricultural, open grasslands, portions of virgin and second growth, and burned-over areas. The watershed was not affected by the November 1950 blowdown or July 1995 microburst storms (APA 2001). The watershed experienced heavy damage from the January 1998 ice storm (NYSDEC 1998).

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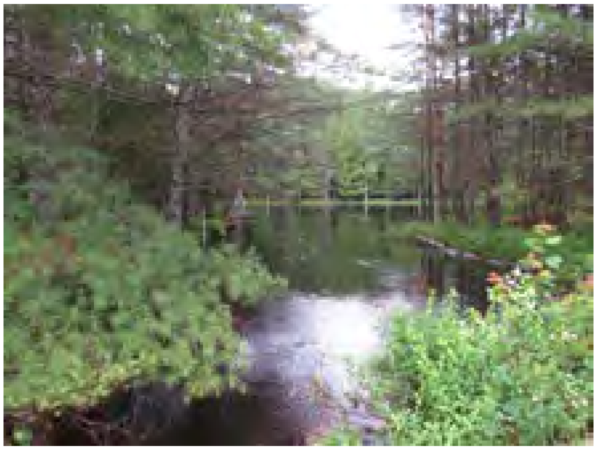
Black Pond 030256 and Black Pond Stream 030255

EPA ID: 1A1-071O and 1A1-071S



ALSC Staff Photo 2015 Looking from 030255 toward 030256.

Lake: Black Pond lies in the St. Lawrence River watershed at 495 m. The 29 ha lake has one inlet from Long Pond to the north. An esker runs along the western shore of both Long and Black Ponds. A kettle hole embayment with a depth of over 9.0 m forms the eastern section of Black Pond. The main lake reaches a maximum depth of 13.7 m (44.9 ft) (Figure 13.2). The lake outlet becomes a broad sandy flow identified as Black Pond Stream (030255) to a fish barrier/weir continuing to flow into an impounded portion of the St. Regis River (Figure 13.1).

Black Pond is a thick-till chain drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). It is considered insensitive to acidification. Black Pond Stream (030255, Station 1) is one of the 17 original ALTM sites, monitored monthly since June 1982. This roadside site is 0.3 km downstream from the lake. The ALTM program collected monthly samples at the main lake (030256, Station 1) from June 1993 until December 2006. Sampling was discontinued at this location when it was determined that the chemistry was statistically similar to the chemistry at Black Pond Stream (Cirmo et al. 2007). Sampling frequency at Black Pond Stream was modified to seasonal in 2014.

Lake chemistry: The ALS surveyed the lake on July 17, 1985 finding: Lab pH 7.44, ANC 206.4 µeq L^{-1}, SO_4^{-2} 129.29 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 210.59 µeq L^{-1}, Mg^{2+} 97.92 µeq L^{-1}, DOC 291.40 µmol L^{-1}-C (ALSC 1986). Table 13.1 summarizes recent ALTM water chemistry collected at

Figure 13.1 Catchment

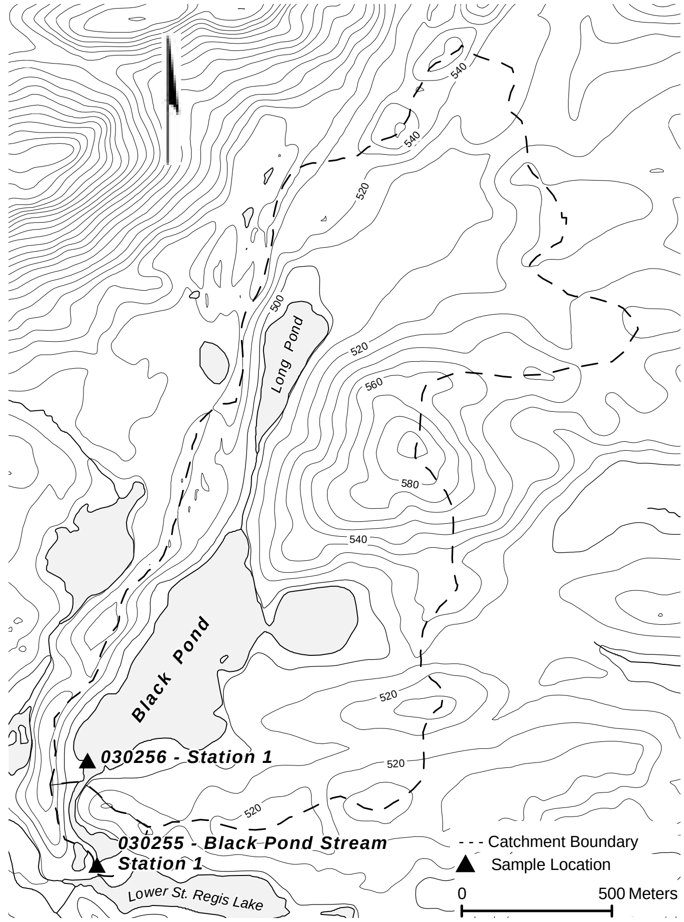
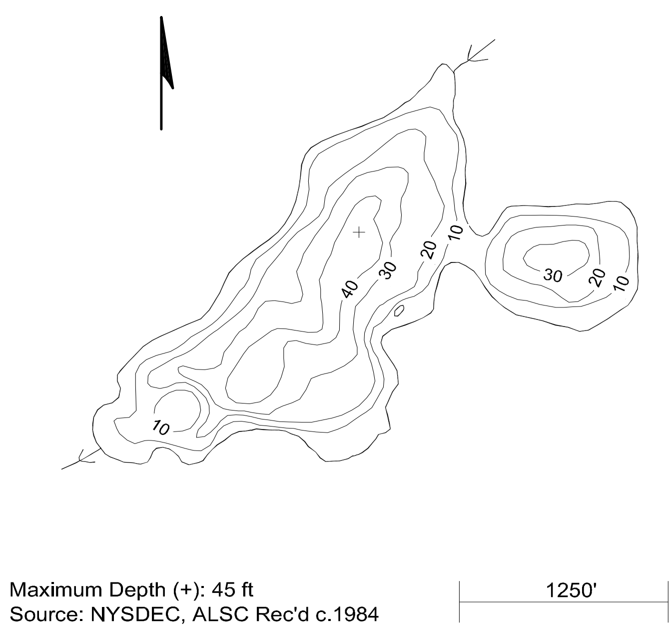


Figure 13.2 Bathymetry



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site - Stream	44.43219	-74.29813	44° 25′ 55.9″ N	074° 17′ 53.3″ W
Lake centroid	44.43218	-74.29814	44° 25′ 55.9″ N	074° 17′ 53.3″ W

Table 13.1 Lake/Stream Chemistry (Station 1)

030255			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	99.73	132.00	118.12	69.35	91.38	77.90	62.63	84.77	71.84	µeq L^{-1}
NO_3^-	-0.40	24.68	8.40	0.00	21.73	5.90	0.00	17.60	5.09	µeq L^{-1}
Cl^-	7.90	12.41	9.61	7.28	9.87	8.52	6.59	9.24	7.77	µeq L^{-1}
F^-	2.11	3.00	2.38	2.34	3.23	2.66	2.15	2.63	2.42	µeq L^{-1}
ANC	182.98	230.14	202.64	172.33	255.84	215.12	178.74	282.41	225	µeq L^{-1}
DIC	211.47	407.95	294.59	224.79	385.48	296.76	211.88	370.25	299.74	µmol L^{-1}-C
DOC	255.85	382.39	311.94	251.64	342.68	294.89	228.59	521.08	339.61	µmol L^{-1}-C
SiO_2	100.69	183.74	145.11	100.19	170.26	143.65	94.45	158.09	129.77	µmol L^{-1}
Ca^{2+}	173.16	255.50	210.05	170.74	263.49	188.92	158.93	216.86	182.51	µeq L^{-1}
Mg^{2+}	83.11	108.62	96.96	80.64	97.40	89.26	72.44	106.63	87.03	µeq L^{-1}
Na^+	40.02	53.50	44.66	38.44	50.02	44.29	40.93	51.07	45.85	µeq L^{-1}
K^+	7.93	14.58	9.48	7.42	9.46	8.30	7.35	10.27	8.89	µeq L^{-1}
NH_4^+	-0.67	9.87	2.25	-1.16	5.10	1.01	-0.76	6.84	1.52	µeq L^{-1}
AL_TD	0.22	1.48	0.75	0.07	1.45	0.73	0.29	1.40	0.66	µmol L^{-1}
AL_TM	0.49	14.01	2.16	1.33	1.78	1.59	1.16	1.67	1.4	µmol L^{-1}
AL_OM	0.07	4.25	0.92	1.22	1.74	1.55	1.22	1.71	1.43	µmol L^{-1}
AL_IM	0.00	13.94	1.63	0.00	0.44	0.08	0.00	0.14	0.03	µmol L^{-1}
LABPH	6.53	7.32	6.86	6.51	7.24	6.82	6.67	7.31	6.94	
AIREQPH	7.35	7.58	7.45	7.31	7.58	7.50	7.31	7.63	7.48	
TRUECOLOR	20	70	29	30	45	37	25	55	35	Pt Co
SCONDUCT	33.54	39.76	36.47	32.11	37.60	34.40	29.02	40.4	34.92	µS cm^{-1}
TOTALP	na	na	na	4.07	25.48	8.88	4.13	12.08	7.95	µg L^{1}
CHLORA	na	na	na	0.54	24.77	5.41	2.30	22.47	8.30	µg L^{1}

Table 13.2 Lake Characteristics

Parameter	Value
Elevation	495 m
Maximum depth	13.7 m
Mean depth	6.2 m
Volume	180.5 x 10^4 m^3
Surface area	29.0 ha
Watershed area	237.9 ha
Watershed ratio	0.12
Hydraulic retention time (year)	0.66
Watershed	St. Lawrence
County, Town	Franklin, Brighton
USGS Quadrangle	St. Regis Mtn.
Land use classification	Private - Resource Management

Black Pond Stream. Major analytes through 2013 are shown in Table 13.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 13.3. Black Pond (030256) chemistry data is not shown in Table 13.1 or Figure 13.3 as sampling was discontinued in 2006.

Aquatic biota: In 1985, the ALS conducted two aquatic plant surveys in the lake. On July 17, 1985, submergent plants occupied 10% of the lake bottom while floating vegetation covered 5% of the surface. Species identified were: Eriocaulon spp., Sphagnum spp., Nuphar spp. and Nymphaea spp. On October 10, 1985, submergent vegetation occupied 2% of the bottom. Emergent and floating plants each occupied 1% of the surface area. Plants included: Sparganium spp., Potamogeton spp., Eriocaulon spp., Pontederia spp. and Nymphaea spp.

On October 10, 1985, a dip-net survey found the following Insecta: Ephemeroptera Heptageniidae, Odonata Aeshnidae and Coenagriidae, Trichoptera Phryganeidae and Polycentropodidae, Diptera Chironomidae and Culicidae, Hemiptera Gerridae, and Megaloptera Sialidae. Also found were: Arachnoid Hydracarina Unspecified,

Figure 13.3 Chemistry Time Series

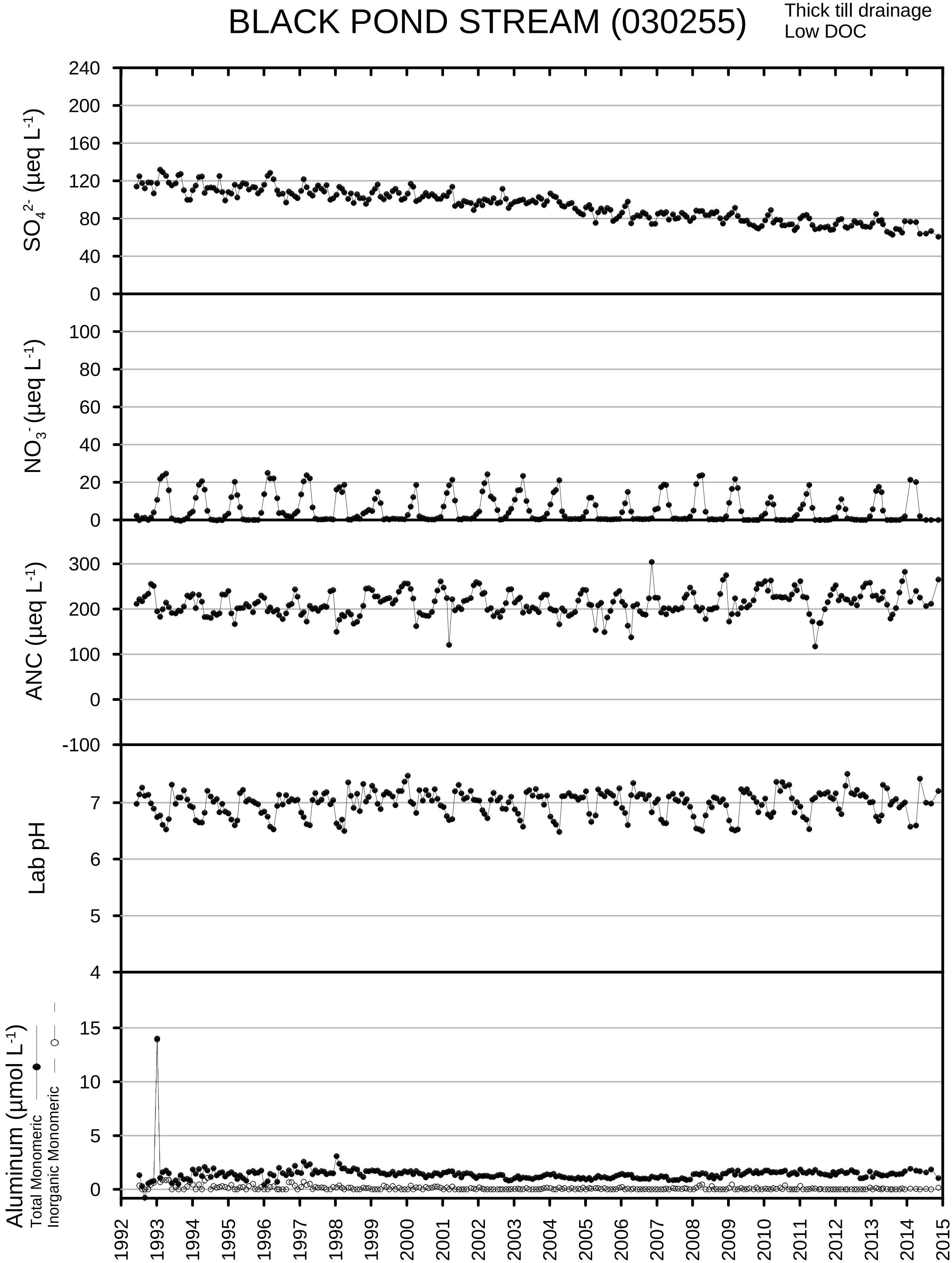


Table 13.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1998	Brook trout	4500	65
1999	Brook trout	2600	13
2001	Brook trout	2485	14
2002	Brook trout	2924	27
2006	Brook trout	2300	35

Table 13.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Oct-1985	Brook trout	50	83	356	6013	63
Oct-1985	Golden shiner	6	78	101	41	6
Oct-1985	Yellow perch	25	100	144	456	44
Jul-1998	Brook trout	79	158	279	-	79
Oct-2010	Brook trout	76	87	448	-	76
Oct-2010	Golden shiner	2	81	84	9	2
Oct-2010	Creek chub	27	88	152	391	27

Pelecypod Veneroida Sphaeriidae, Demospong Haplosclerina Spongillidae, and the following Crustacea: Isopoda Unspecified, Amphipoda Unspecified, and Decapoda Unspecified. On July 17, 1985, ALS field crews detected a thermocline between 3.0 and 4.0 m. (ALSC 1986).

Fisheries: The DEC stocked the lake with brook trout from 1958 to 1960, and from 1964 to 1971. Splake were stocked in 1961 and 1962. Rainbow trout were stocked in 1975. Rotenone treatments occurred in 1957, 1963, 1967, 1970, (ALSC 1986) and 1997. In addition to the ALS fisheries survey on October 10, 1985, the ALSC netted the lake on July 15, 1998 and again on October 25, 2010 in conjunction with DEC (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 13.3 and 13.4 for recent fish stocking and netting histories.

Intensive studies: Black Pond Stream was studied as part of RILWAS in 1985 (Driscoll and Newton 1985). Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). During 1986 and 1987 snowmelt, Schaefer and Driscoll (1993) evaluated episodic acidification at Black Pond Stream. Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY93 Paul Smiths (start date January 1, 2013; elevation 498 m) located 4.0 km east of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Black Pond Stream watershed is underlain by metanorthosite and anorthositic gneiss. Approximately 80% of the watershed is overlain with kame deposits of gravel and/or sand and till comprises the remaining 20%. The highest point in the watershed is an unnamed hill that rises to an elevation of 593 m east of Long Pond. The maximum relief is 98 m. In 1985, the ALS described the shoal water substrate around the lake as 35% boulder/rubble, 55% sand and gravel, 5% muck/silt, and 5% organic (ALSC 1986).

Land cover/use: In 1985, the ALS characterized the Black Pond watershed as 75% deciduous-coniferous mixed forest, 10% deciduous forest and 15% shrub-sapling vegetation. The immediate shoreline was characterized as 50% deciduous-coniferous forest, 25% deciduous forest, 10% coniferous forest, and 15% scrub-sapling vegetation (ALSC 1986). Wetlands occupy 5.1% of the watershed or 12.2 ha. Forested needle-leaf evergreen covers 9.1 ha while scrub-shrub broad leaf evergreen covers 3.1 ha. The outlet flow from the main lake of Black Pond (030256, Station 1) to the weir at Black Pond Stream (030255, Station 1) is edged with a scrub-shrub wetland fringe (APA 2001, Karasin et al. 2002).

The Black Pond Stream watershed lies within private land owned by Paul Smith's college and managed through the Adirondack Park Visitor Interpretive Center (VIC). Retrieved January 20, 2017 from: http://www.adirondackvic.org/. The area receives moderate recreational use. A trail follows most of the lake shore. A foot bridge exists at the constriction of the eastern bay. Two lean-to structures are located on the shoreline and are available for rent from the VIC. Motorized watercraft are prohibited on the lake. The lake and watershed are classified as Resource Management under the Adirondack Park Agency State Land Master Plan.

Watershed disturbance: The 1916 fire protection source data show the majority of the Black Pond watershed was severely burned over, while a smaller section on the east indicates virgin and second growth with no slash. The watershed was not affected by the November 1950 blowdown or the July 1995 microburst storms (APA 2001). The watershed experienced light damage from the January 1998 ice storm (NYSDEC 1998).

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Loon Hollow Pond 040186

EPA ID: 040186O

ALSC Staff Photo 2015

Lake: Loon Hollow Pond lies in the Oswegatchie-Black watershed at 605 m. A single inlet drains a deciduous forest wetland in the northeast (Figure 14.1). This 5.7 ha headwater lake drains to a series of wetlands and small ponds to the southwest, which flows north to the Middle Branch of the Oswegatchie River. In 1985, an active beaver dam was present at the outlet (ALSC 1986). This lake reaches a maximum depth of 11.6 m (38.1 ft) (Figure 14.2).

Loon Hollow Pond is classified as a thin-till drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to seasonal starting in 2014. This lake is accessed by helicopter.

Lake chemistry: Loon Hollow Pond was sampled during the ALS on July 25, 1985 finding: Lab pH 4.61, ANC -22.0 µeq L^{-1}, SO_4^{2-} 101.39 µeq L^{-1}, NO_3^- 3.56 µeq L^{-1}, Ca^{2+} 38.92 µeq L^{-1}, Mg^{2+} 11.52 µeq L^{-1}, DOC 308.05 µmol L^{-1}-C (ALSC 1986). Table 14.1 summarizes recent ALTM chemistry including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes through 2013 are shown in Table 14.1. Plots through 2014 appear in Figure 14.3.

Aquatic biota: On June 17, 1985, the ALS found emergent aquatic plants occupied 1% of the lake surface, including: Sphagnum spp.; Eriocaulon spp.; Dulichium spp.; Carex spp; and Nymphaea spp. On June 17, 1985, a dip-net survey identified: Insecta: Odonata Libellulidae and Coenagriidae; Trichoptera Unspecified and Polycentropodidae; Diptera

Figure 14.1 Catchment

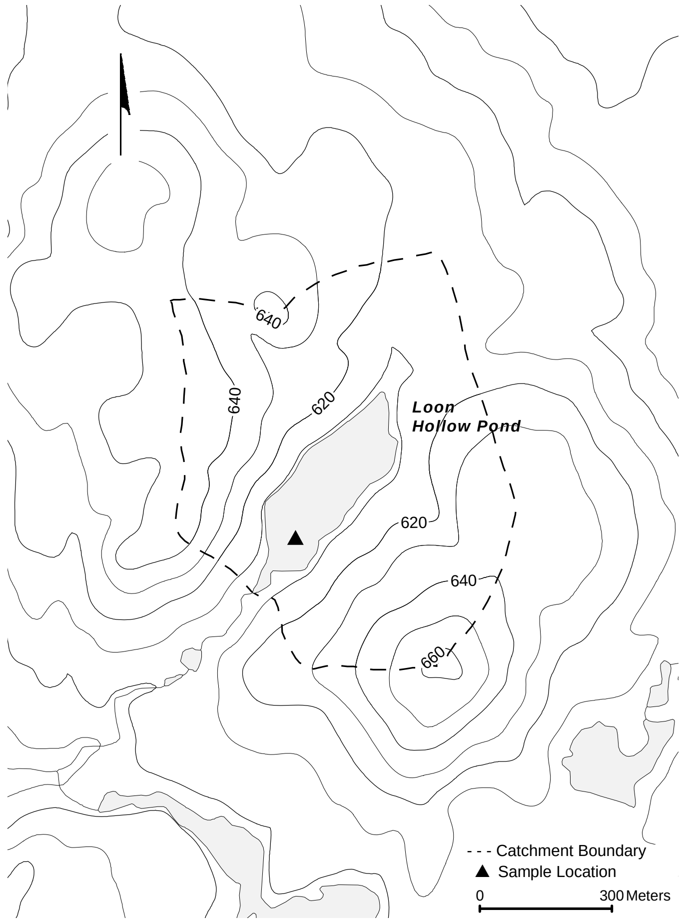
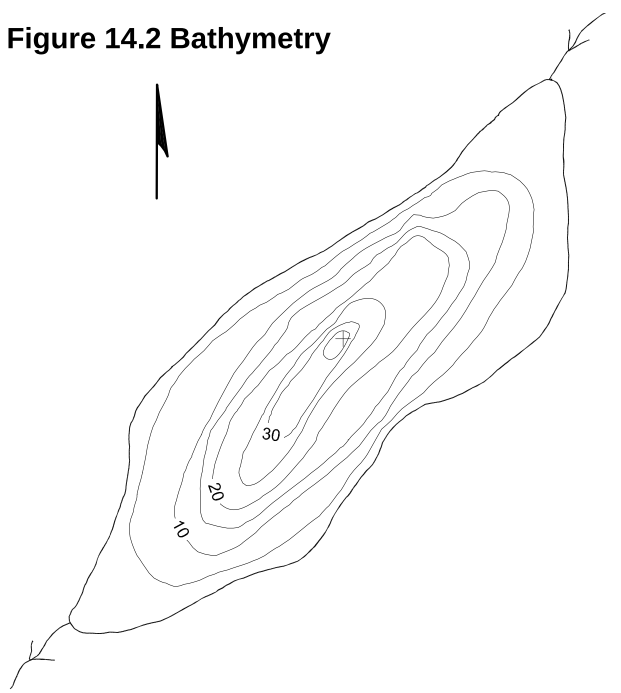


Figure 14.2 Bathymetry



Maximum Depth (+): 38 ft
Source: NYSDEC, ALSC Rev. 1985

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Helo sample site	43.96360	-75.04253	43° 57' 49.0" N	075° 02' 33.1" W
Lake centroid	43.96362	-75.04246	43° 57' 49.0" N	075° 02' 32.8" W

Table 14.1 Lake

040186			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	67.04	120.13	99.47	50.93	64.58	56.62	38.82	53.51	47.02	μeq L^{-1}
NO_3^-	4.60	44.84	17.89	0.00	16.88	6.60	0.41	20.11	9.09	μeq L^{-1}
Cl^-	6.21	13.54	8.34	4.90	6.99	5.83	6.49	9.69	8.12	μeq L^{-1}
F^-	1.26	2.16	1.81	1.25	1.84	1.55	1.23	2.23	1.60	μeq L^{-1}
ANC	-59.16	-13.17	-29.08	-25.72	-0.08	-9.90	-22.16	-2.40	-7.66	μeq L^{-1}
DIC	19.98	122.39	52.87	27.93	137.37	58.37	25.48	123.47	56.08	μmol L^{-1}-C
DOC	236.28	617.26	401.19	333.95	550.90	448.15	333.18	597.16	429.99	μmol L^{-1}-C
SiO_2	11.82	65.91	39.86	4.61	46.77	27.49	11.94	46.70	30.93	μmol L^{-1}
Ca^{2+}	26.95	41.42	33.44	18.46	24.88	22.43	15.60	23.22	20.15	μeq L^{-1}
Mg^{2+}	9.87	18.10	12.41	6.58	9.05	8.00	6.78	8.91	7.95	μeq L^{-1}
Na^+	10.00	17.40	13.74	10.44	15.66	13.01	14.96	18.37	16.88	μeq L^{-1}
K^+	4.60	11.51	5.88	2.33	4.86	3.41	2.35	5.11	3.66	μeq L^{-1}
NH_4^+	0.39	3.71	2.32	-0.59	3.05	1.19	0.11	4.88	2.04	μeq L^{-1}
AL_TD	13.27	26.65	21.37	11.93	22.50	17.22	9.26	19.71	14.38	μmol L^{-1}
AL_TM	12.26	23.07	18.48	5.93	12.16	9.39	4.54	11.65	8.33	μmol L^{-1}
AL_OM	1.31	7.60	4.06	2.40	6.26	3.90	2.68	6.26	4.20	μmol L^{-1}
AL_IM	10.24	18.77	14.42	3.53	8.26	5.49	1.57	7.36	4.13	μmol L^{-1}
LABPH	4.25	4.69	4.47	4.50	4.89	4.70	4.61	5.01	4.81	
AIREQPH	4.23	4.64	4.46	4.50	4.85	4.67	4.56	5.04	4.80	
TRUECOLOR	10	50	29	20	60	40	20	60	33	Pt Co
SCONDUCT	19.24	37.38	26.45	13.34	22.95	17.04	10.77	19.32	14.77	μS cm^{-1}
TOTALP	na	na	na	0.23	5.15	2.29	1.32	6.20	2.42	μg L^1
CHLORA	na	na	na	2.62	11.25	4.26	1.14	7.39	3.05	μg L^1

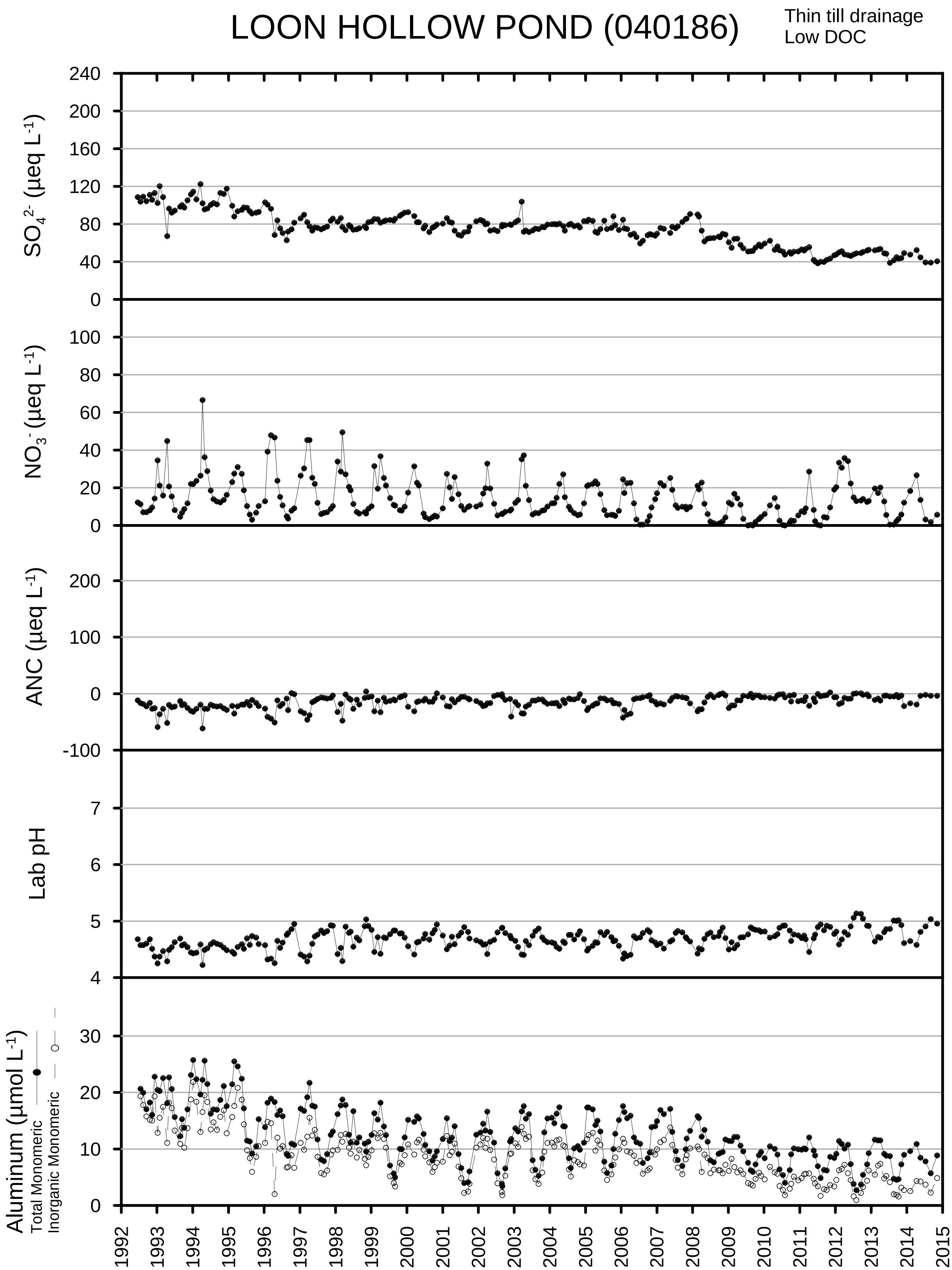
Table 14.2 Lake Characteristics

Parameter	Value
Elevation	605 m
Maximum depth	11.6 m
Mean depth	3.4 m
Volume	19.1 x 10^4 m^3
Surface area	5.7 ha
Watershed area	55.2 ha
Watershed ratio	0.10
Hydraulic retention time (year)	0.46
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Stillwater
Land use classification	Five Ponds Wilderness Area, Resource Management

Chironomidae and Culicidae; Hemiptera Corixidae and Notonectidae; and Coleoptera Dytiscidae and Gyrinidae. Also found were Oligochaeta Unspecified. On July 25, 1984, the ALS found the lake thermally stratified between 2.0 and 4.0 m (ALSC 1986). In 2003, the average value of chlorophyll a was 1.02 μg L^{-1} (Momen et al. 2006).

Fisheries: Brook trout were stocked by the DEC annually during 1932 to 1937. In addition to the ALS fisheries survey on June 17, 1985 (ALSC 1986), the ALSC netted the lake on May 28, 2002 and May 23, 2011 (Roy et al. 2015, Baldigo et al. 2016). No fish were captured in any of the surveys.

Figure 14.3 Chemistry Time Series



Intensive studies: The aquatic biota of this lake has been studied by the AEAP beginning in 1994 (Momen et al. 2006). Loon Hollow Pond was one of 36 ALTM lakes evaluated by Momen and Zehr's (1998) 1994 examination of lake-water chemistry and terrestrial characteristics with existing watershed classifications. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. In 2003, this lake watershed was part of a 36 lake-watershed regional survey of foliar nitrogen gradients in the Adirondack Park (McNeil et al. 2007).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY59 Wanakena (start date January 2, 2013) located 24 km northeast of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Loon Hollow Pond and its watershed are underlain by biotite and/or hornblende granite gneiss with low to no ANC (Roy et al. 1997). The watershed is entirely composed of basal till. The highest elevation in the watershed is 665 m. The maximum relief is 60 m. In 1985, the ALS found shoal water substrate comprised of 94% muck/silt/organic and 6% bedrock/boulder (ALSC 1986).

Land cover/use: In 1985, 98% of the watershed was covered in deciduous-coniferous mixed forest (ALSC 1986). Wetland area is 8.6 ha and comprises 15.5% of the watershed (Roy et al. 1996). The lake is bounded by a broad-leaf deciduous scrub/shrub dominant emergent marsh with evidence of a beaver wetland fringe. Leather leaf and sphagnum are found on 10% of this shoreline fringe (ALSC 1986).

The pond and watershed are primarily located on private land in Resource Management as designated by the Adirondack Park Agency State Land Master Plan. The southwestern tip and part of the watershed lie in the Five Ponds Wilderness Area (NYSDEC 1994).

Watershed disturbance: The 1916 fire protection data show 90.3% of the watershed logged for softwood with considerable slash. The November 1950 storm caused 50 to 100% blowdown over the entire watershed. The watershed was not disturbed by the July 1995 microburst storm (ALSC 2003) or the January 1998 ice storm (NYSDEC 1998).

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Willys Lake 040210
EPA ID: 040210O EMAP ID: NY789L

ALSC Staff Photo 2015

Lake: Willys Lake lies in the Oswegatchie-Black watershed at 632 m. The 24.3 ha headwater lake drains north to the Middle Branch Oswegatchie River (Figure 15.1). The lake has two inlets and has a maximum depth of 13.7 m (44.9 ft) (Figure 15.2). In 1984, an active beaver dam was present at the outlet.

Willys Lake is classified as a thin-till drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. This lake is accessed by helicopter and continues to be sampled monthly.

Lake chemistry: Willys Lake was sampled near its deepest point during the ALS on July 30, 1984 finding: Lab pH 4.74, ANC -11.0 µeq L^{-1}, SO_4^{2-} 128.04 µeq L^{-1}, NO_3^- 4.53 µeq L^{-1}, Ca^{2+} 66.37 µeq L^{-1}, Mg^{2+} 17.28 µeq L^{-1}, DOC 141.54 µmol L^{-1}-C (ALSC 1985). Table 15.1 summarizes recent ALTM major analytes including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 15.3.

Aquatic biota: On June 6, 1984, an ALSC dip-net survey found the following Insecta: Odonata Coenagriidae; Trichoptera Phryganeidae; Diptera Unspecified; Coleoptera Dytiscidae and Gyrinidae. No macrophyte data were available. The lake was thermally stratified between 6.0 and 7.0 m on July 30, 1984 (ALSC 1985). The AEAP reported an average value of chlorophyll a of 1.27 µg L^{-1} in 2003 (Momen et al. 2006).

Figure 15.1 Catchment

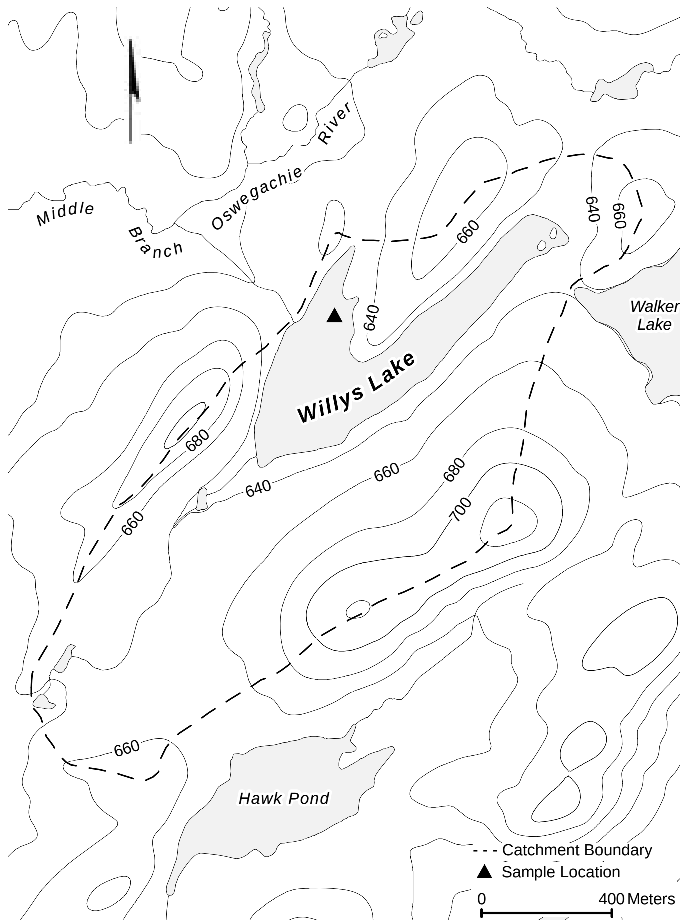
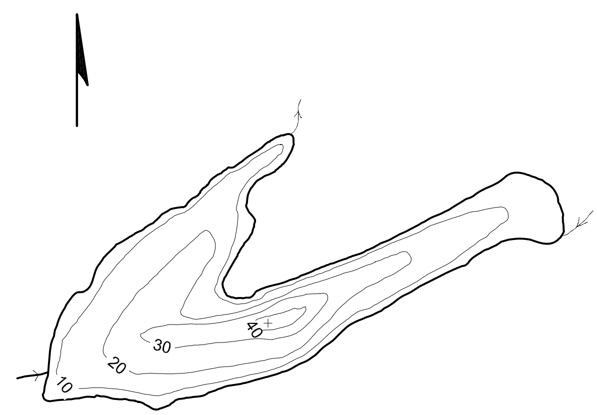


Figure 15.2 Bathymetry



Maximum Depth (+): 45 ft
Source: NYSDEC, ALSC Rev. 1984

1500'

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.ss	DDD MM SS.ss
Helo sample site	43.97078	-74.95740	43° 58’ 14.79” N	074° 57’ 26.63” W
Lake centroid	43.96821	-74.95708	43° 58’ 05.54” N	074° 57’ 25.49” W

Table 15.1 Lake Chemistry

040210			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	114.30	142.20	124.42	58.33	77.20	65.97	46.45	58.78	52.44	µeq L^{-1}
NO_3^-	16.71	68.54	30.37	3.24	19.75	10.07	6.58	24.12	15.09	µeq L^{-1}
Cl^-	6.77	10.15	8.16	5.01	7.39	6.27	5.14	7.26	6.26	µeq L^{-1}
F^-	3.05	4.16	3.57	2.26	2.58	2.44	2.42	2.92	2.73	µeq L^{-1}
ANC	-45.61	-8.69	-18.45	-21.12	7.06	-1.75	-5.97	9.24	0.00	µeq L^{-1}
DIC	19.98	104.07	45.10	27.47	155.69	66.00	19.24	93.40	46.53	µmol L^{-1}-C
DOC	91.91	376.65	190.16	285.40	449.00	327.87	250.24	316.20	279.24	µmol L^{-1}-C
SiO_2	33.95	57.58	49.29	9.10	40.94	25.49	17.09	37.04	26.49	µmol L^{-1}
Ca^{2+}	46.41	92.82	64.79	35.93	43.42	39.79	33.02	39.97	36.09	µeq L^{-1}
Mg^{2+}	14.81	19.75	16.25	9.05	11.52	10.69	9.07	11.13	10.39	µeq L^{-1}
Na^+	10.44	17.40	15.33	14.35	17.40	15.42	16.52	18.07	17.40	µeq L^{-1}
K^+	5.12	9.21	6.78	5.12	7.02	6.26	4.54	6.16	5.26	µeq L^{-1}
NH_4^+	0.50	5.65	2.35	-0.01	5.04	2.81	-0.08	5.20	1.89	µeq L^{-1}
AL_TD	11.53	23.79	18.49	6.18	14.75	10.07	4.20	9.69	7.06	µmol L^{-1}
AL_TM	10.67	19.79	16.22	3.33	7.56	5.07	2.33	6.69	4.23	µmol L^{-1}
AL_OM	0.39	8.12	2.44	2.15	3.78	2.63	2.05	3.48	2.32	µmol L^{-1}
AL_IM	7.41	17.62	13.78	1.03	4.52	2.44	0.24	3.20	1.91	µmol L^{-1}
LABPH	4.35	4.89	4.65	4.62	5.22	4.92	4.88	5.42	5.10	
AIREQPH	4.33	4.84	4.62	4.63	5.24	4.92	4.87	5.49	5.11	
TRUECOLOR	5	25	12	20	35	30	10	25	16	Pt Co
SCONDUCT	21.84	36.45	26.71	13.24	21.28	16.16	10.84	16.97	13.47	µS cm^{-1}
TOTALP	na	na	na	0.16	3.66	2.38	1.21	7.06	3.41	µg L^1
CHLORA	na	na	na	1.37	4.03	2.78	1.04	6.64	2.84	µg L^1

Table 15.2 Lake Characteristics

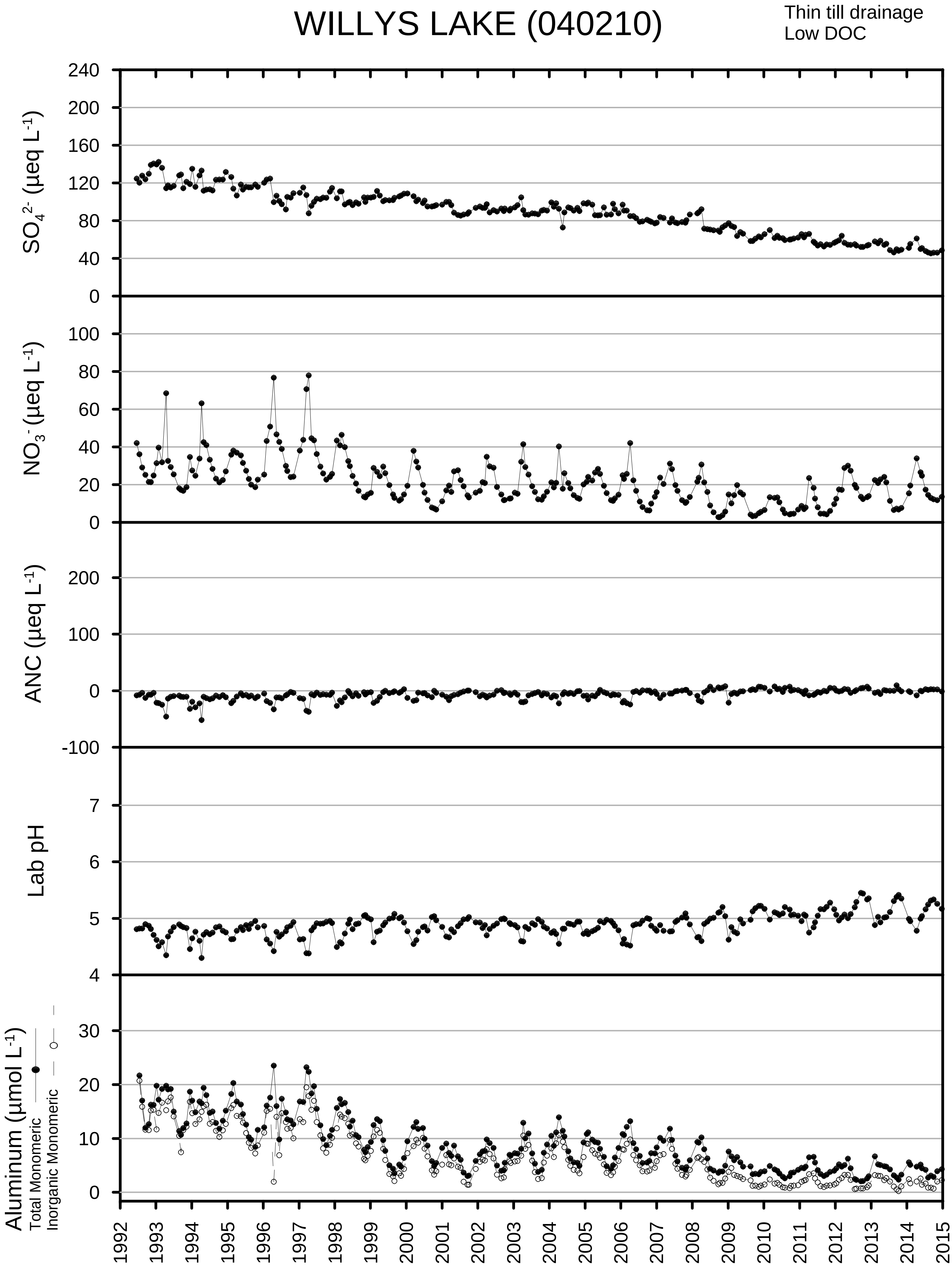
Parameter	Value
Elevation	632 m
Maximum depth	13.7 m
Mean depth	4.9 m
Volume	118.8 x 10^4 m^3
Surface area	24.3 ha
Watershed area	158.2 ha
Watershed ratio	0.15
Hydraulic retention time (year)	1.0
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Beaver River
Land use classification	Five Ponds Wilderness Area

Fisheries: The DEC stocked the lake with brook trout from 1929 to 1934. In addition to the ALS fisheries survey on June 6, 1984, the ALSC netted the lake on May 28, 2002 and on May 7, 2012 (Roy et al. 2015, Baldigo et al. 2016). No fish were captured in any of the surveys.

Intensive studies: Chen and others studied Willys Lake as an example of a mature forested watershed using the biogeochemical model PnET-BGC (Chen and Driscoll 2004, Chen et al. 2004). The AEAP has studied this lake beginning in 1994 (Momen et al. 2006). The lake was part of the EPA’s EMAP in 1994 and 1997. Since 1999, the lake is sampled annually by the ALSC as part of the TIME project (Stoddard et al. 2003). This is a crossover water TIME/ALTM (Civerolo et al. 2011) with uninterrupted annual summer sampling under the TIME program through 2016.

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Figure 15.3 Chemistry Time Series



Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY59 Wanakena (start date January 2, 2013) located 20 km north of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Willys Lake and its watershed are underlain by biotite and/or hornblende granite gneiss with low to no ANC. The entire watershed is comprised of basal till (Roy et al. 1997). To the southeast, the watershed rises to a maximum of 738 m. The maximum relief is 106 m. In 1984, the ALS found the shoal water substrate comprised of 70% boulder and sand, 20% muck/silt and 10% organic (ALSC 1985).

Land cover/use: In 1984, a deciduous-coniferous mixed-forest covered 90% of the watershed and coniferous forest 10% (ALSC 1985). Total wetland area was 11.9 ha and comprised 7.5% of the watershed (Roy et al. 1996). About 25% of the lake shoreline is fringed with an emergent marsh wetland. Scrub/shrub deciduous and evergreen wetland areas are found in the upstream sections. A forested wetland area lies in the lower section of the southeastern tributary. Willys Lake and watershed are entirely within the Five Ponds Wilderness Area (NYSDEC 1994). There is no developed trail access.

Watershed disturbance: The 1916 fire protection source data show 81.4% of the watershed as green timber with no slash and 6.1% of the watershed as logged for softwood. The November 1950 storm caused 50 to 100% blowdown throughout this watershed. A July 1995 microburst storm damaged 0-30% of the tree crowns throughout the watershed (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Woods Lake 040576
EPA ID: 040576O

ALSC Staff Photo 2015

Lake: Woods Lake lies in the Oswegatchie-Black watershed at 605 m. This headwater lake receives drainage from two major tributary streams (Figure 16.1). One inlet drains a large beaver pond and wetlands, while the second inlet is free flowing (Cirmo and Driscoll 1996). An earthen barrier dam with a spillway defines the outlet that, in the late 1980s, contained a diversion fish trap to monitor the movement of brook trout out of the lake. A deactivated USGS gage house and weir are present at the outlet (Driscoll et al. 1996). Woods Lake drains 3.0 km to the south where it meets Twitchell Creek and eventually the Stillwater Reservoir. The lake reaches a maximum depth of 10.1 m (33.1 ft) (Figure 16.2).

Woods Lake is classified as a thin-till drainage lake with low dissolved organic carbon (<500 μmol L^{-1}-C) and is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June of 1992. This lake is accessed by helicopter and continues to be sampled on a monthly basis.

Lake chemistry: The lake was not sampled during the ALS (1984–1987) nor by the EPA during the ELS. Woods Lake is not included in the ALTM water chemistry trend analyses due to past liming activities. Table 16.1 summarizes recent ALTM major analytes chemistry through 2013 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 16.3.

Aquatic biota: In May, July, and October 1984, two crustaceans were found: the copepods, calanoid Diaptomus minutus and cyclopoid Mesocyclops edax. Also present was

Figure 16.1 Catchment

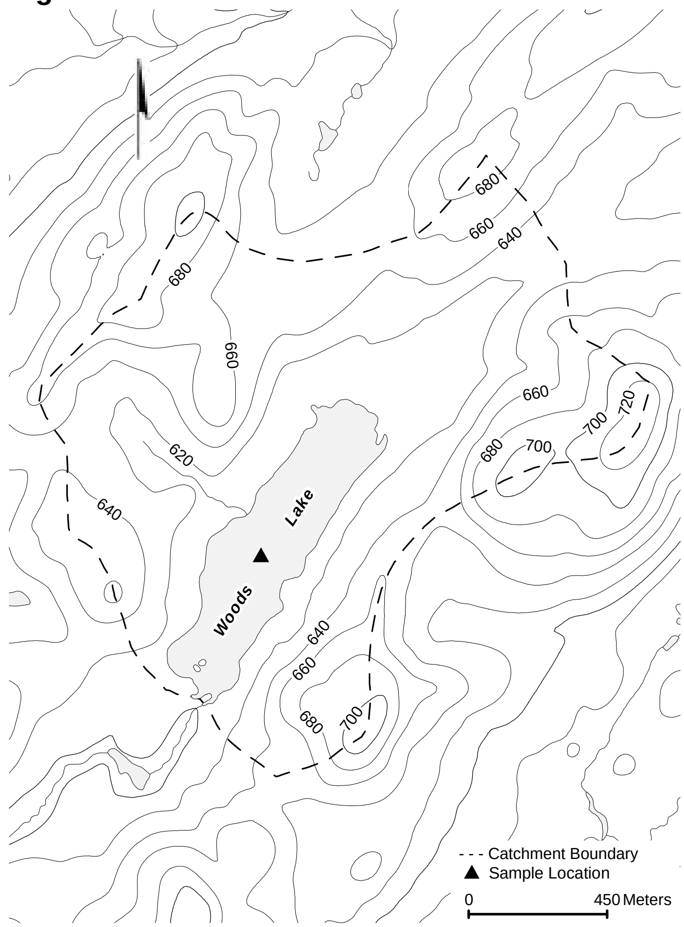
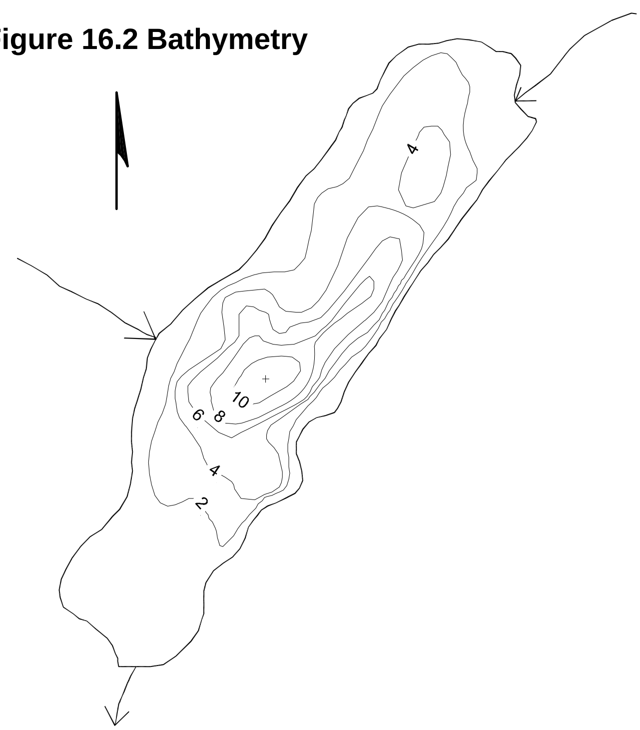


Figure 16.2 Bathymetry



Maximum Depth (+): *11 m
Source: Cornell Univ., ALSC Rev. 2010
* Note: Depths in meters

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.86566	-74.95512	43° 51′ 56.4″ N	074° 57′ 18.4′′ W
Helo sample site	43.87008	-74.95268	43° 52′ 12.3″ N	074° 57′ 09.7″ W
Lake centroid	43.87008	-74.95268	43° 52′ 12.3″ N	074° 57′ 09.7″ W

Table 16.1 Lake Chemistry

040576			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	103.89	178.01	120.17	57.43	81.34	64.61	46.49	61.51	53.51	μeq L^{-1}
NO_3^-	1.10	58.38	17.01	0.05	48.69	14.62	1.37	45.87	16.76	μeq L^{-1}
Cl^-	5.92	8.74	7.03	5.04	7.57	6.17	5.03	7.67	6.47	μeq L^{-1}
F^-	1.53	1.84	1.72	1.38	1.78	1.56	1.37	1.94	1.61	μeq L^{-1}
ANC	8.65	37.77	27.12	5.56	40.13	26.33	19.86	39.99	32.42	μeq L^{-1}
DIC	44.96	189.82	87.56	31.64	165.68	77.61	38.62	156.20	84.76	μmol L^{-1}-C
DOC	279.24	429.77	321.74	299.22	391.55	338.85	316.39	429.08	372.04	μmol L^{-1}-C
SiO_2	38.45	111.84	59.24	20.12	66.41	37.37	8.66	60.82	29.78	μmol L^{-1}
Ca^{2+}	108.29	201.61	137.61	71.36	117.27	89.98	71.13	99.10	86.24	μeq L^{-1}
Mg^{2+}	18.10	21.39	20.23	12.34	18.93	15.92	14.16	22.00	16.58	μeq L^{-1}
Na^+	13.92	20.44	16.67	11.31	18.27	15.23	15.83	19.37	17.56	μeq L^{-1}
K^+	5.12	8.70	5.95	2.05	4.86	3.79	3.19	5.56	4.50	μeq L^{-1}
NH_4^+	-0.39	2.33	1.09	-0.07	2.22	1.08	0.53	4.19	2.16	μeq L^{-1}
AL_TD	1.89	11.60	5.44	1.31	10.34	4.88	1.24	8.89	3.93	μmol L^{-1}
AL_TM	1.00	8.38	3.43	1.66	9.41	3.06	1.43	5.02	2.39	μmol L^{-1}
AL_OM	0.71	4.86	2.17	1.74	3.34	2.27	1.45	4.27	2.15	μmol L^{-1}
AL_IM	0.00	5.11	1.48	0.00	6.30	0.84	0.00	1.00	0.27	μmol L^{-1}
LABPH	5.22	6.38	5.89	5.15	6.35	5.69	5.50	6.38	5.96	
AIREQPH	5.49	6.69	6.15	5.30	6.63	5.91	5.77	6.69	6.34	
TRUECOLOR	15	30	20	25	40	29	20	35	23	Pt Co
SCONDUCT	19.98	29.07	22.10	14.55	22.59	16.14	13.36	18.8	15.75	μS cm^{-1}
TOTALP	na	na	na	0.89	4.54	2.99	1.73	7.77	3.76	μg L^1
CHLORA	na	na	na	0.51	4.17	1.99	0.38	2.58	1.53	μg L^1

Table 16.2 Lake Characteristics

Parameter	Value
Elevation	605 m
Maximum depth	10.1 m
Mean depth	3.5 m
Volume	80.9 x 10^4 m^3
Surface area	24.7 ha
Watershed area	208.7 ha
Watershed ratio	0.12
Hydraulic retention times (year)	0.51
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Big Moose
Land use classification	Private - Resource Management and Independence River Wild Forest

the cladoceran Bosmina longirostris. Dominant rotifers found were: Karatella taurocephala, Karatella hiemalis, Polyarthra spp. and Synchaeta spp. The macroinvertebrate community was dominated by Dipterans, Oligochaetes, and Ephemeropterans that together comprised 68% of the community, while Amphipods, Hydracarinae, and Odonates accounted for 15% of the community (Heinemann et al. 1985).

Bukavecas and Shaw (1998) found phosphorus as the limiting nutrient and chlorophyll a averaging 1.27 μg L^{-1} in July 1990 and 1991.

Fisheries: The DEC stocked brook trout in the lake intermittently during 1958 to 1977. Due to poor success, the lake was classified as “chemically unsuitable” for brook trout and stocking was abandoned in 1977 (Heinemann et al. 1985). The lake was limed in 1984, 1985, and 1989 as part of a larger project to evaluate the effects of experimental watershed liming. The ALSC conducted fisheries surveys on May 27, 1997 and May 19, 2009 (Roy et al. 2015, Baldigo et al 2016). Refer to Table 16.3 for recent netting history.

Figure 16.3 Chemistry Time Series

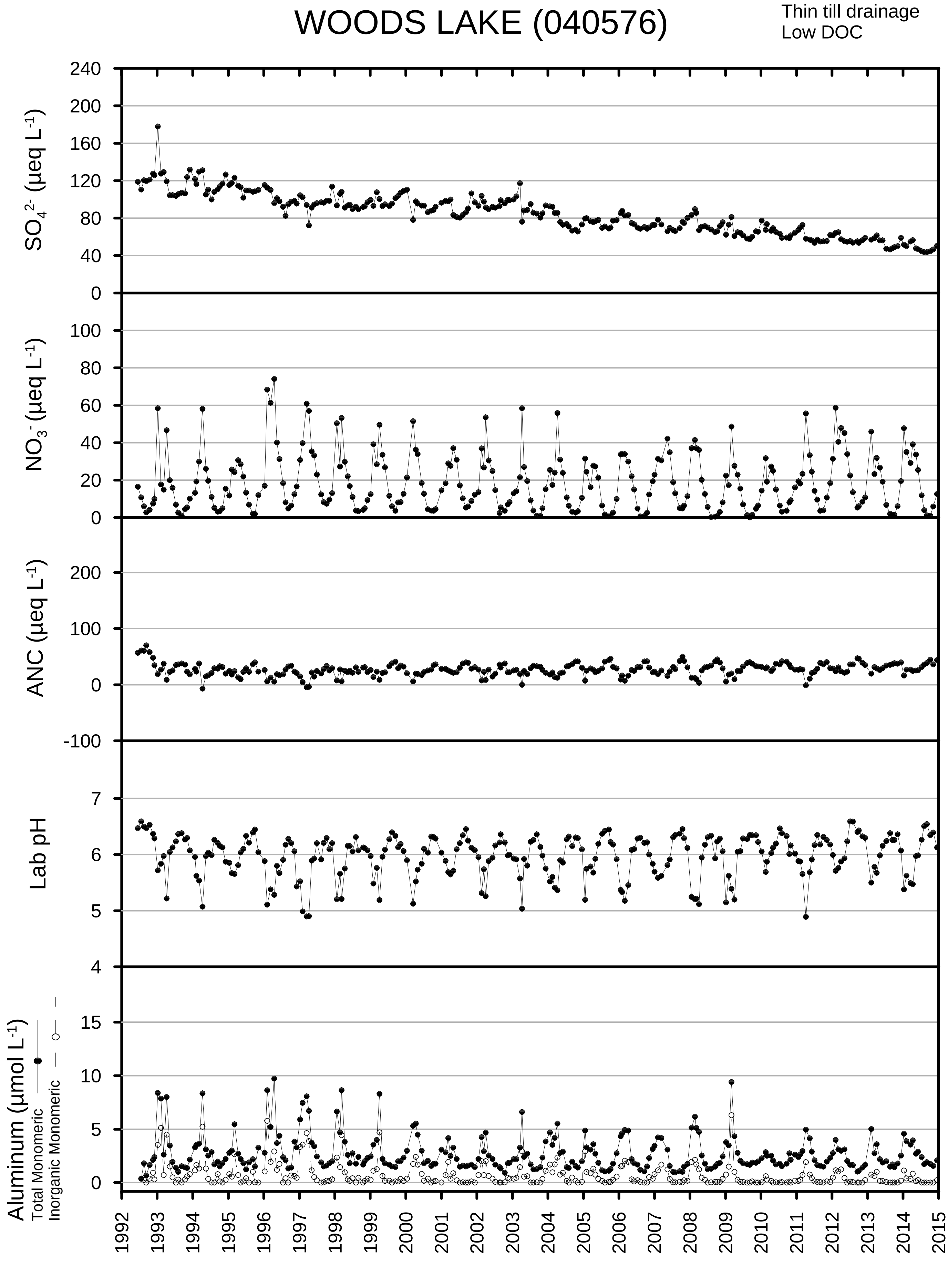


Table 16.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-1997	Brook trout	24	75	465	11250	-
May-2009	Brook trout	22	190	398	5406	23
May-2009	Golden shiners	25	79	135	196	259
May-2009	Creek chub	3	95	225	175	3

Intensive studies: Woods Lake was considered the most sensitive of three lakes studied by Schofield and others (1985) from 1977 to 1981 under the Integrated Lake-Watershed Acidification Study (ILWAS). Researchers evaluated acidification and aluminum mobilization processes and developed detailed soil and bedrock maps for each lake (Schofield et al. 1985). Phase II of ILWAS was a hydrologic analysis of Woods and Panther Lakes conducted from January 1980 through December 1981 (Peters and Murdoch 1985). Woods Lake was part of the Lake Acidification Mitigation Project (LAMP), which also included Little Simon Pond (060182) and Cranberry Pond to assess the chemical and biological effects of liming on lake ecosystems. LAMP model calibrations were made from detailed geologic, hydrologic, bathymetric, baseline biota, and chemistry data collected in the survey (Heinemann et al. 1985). Roberts and Boylen (1989) evaluated the effects of liming on the algal community of this lake. Watershed and lake liming studies occurred from 1985 to 1990 as part of the Experimental Watershed Liming Study (Driscoll et al. 1996). A phytoplankton and zooplankton experiment was conducted in 1990 (Bukaveckas and Shaw 1998). Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Landscape characteristics and disturbance history have been evaluated within this watershed (Sullivan et al.1999). Woods Lake was one of 20 Adirondack lakes studied to evaluate regional trends in chrysophyte-inferred lake water pH (Cumming et al. 1994, Smol et al. 1998). Several planktonic community investigations have been performed at Woods Lake (Bukaveckas 1989, Bukaveckas and Shaw 1997, Heinemann et al. 1985). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Soils: Schofield and others (1985) evaluated acidification and aluminum mobilization processes and developed detailed soil and bedrock maps for the study areas.

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick’s Lake (start date November 3, 2015; elevation 525 m) located 21 km south of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Woods Lake and its watershed are underlain by charnockite, mangerite, pyroxene-quartz syenite gneiss with low to no ANC (Roy et al. 1997). Till overlies 80% of the watershed and bedrock makes up the remainder. A mantle of eolian silt overlies the till in part of the watershed (Peters and Murdoch 1985). Rock outcrops and shallow (< 0.5 m) soils appear above 640 m elevation. Basal till defines the remaining area around the lake (Roy et al. 1997). The maximum elevation in the watershed is 735 m and the maximum relief is 130 m.

Land cover/use: The watershed is primarily forested with hardwoods: maples 48.0%; beech-birch 41.3% and conifers 10.7% (Heinemann et al. 1985). Total wetland area is 11.8 ha and comprises 5.6% of the watershed. The predominant wetland vegetation types are scrub/shrub, broad-leaf deciduous and needle leaf evergreen. Pockets of emergent marsh appear near the shoreline and forested needle-leaf evergreen near the outlet (Roy et al. 1996). The southern half of the lake is in Resource Management. There is one seasonal camp on the shoreline. Logging occurred in the southwestern part of the watershed in the last decade. The northern half of the lake is NYS public land in the Independence River Wild Forest (NYSDEC 1986).

Watershed disturbance: The 1916 fire protection source data show 41.9% as burned over, 25% as green timber, 15.4% as logged for softwoods only and the remaining 9.9% as being logged for both soft and hardwoods. The November 1950 storm severely damaged 100% of the watershed with 50-100% blow down. A July 1995 microburst storm caused moderate damage to 21.5% of the watershed with a 30-60% change in tree crowns. The remainder of the watershed incurred little-to-no damage with 0-30% change in tree crowns (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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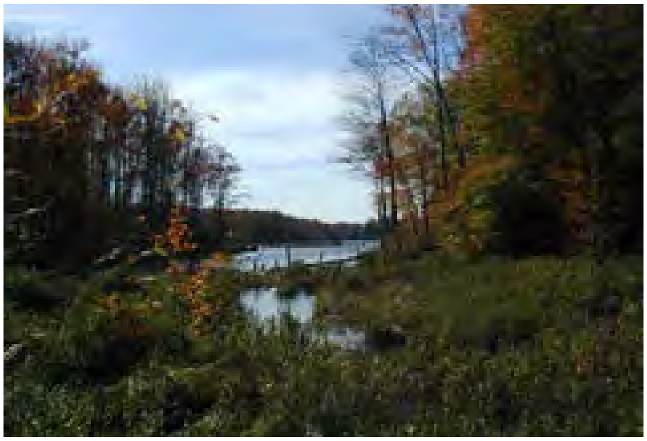
Middle Settlement Lake 040704

EPA ID: 040704O



ALSC Staff Photo 2015

Lake: Middle Settlement Lake lies in the Oswegatchie-Black watershed at 526 m. The 15.8 ha headwater lake has one inlet (Figure 17.1). The lake outlet flows to Middle Branch Creek, a tributary to Pine Creek. In 1984, an active beaver dam was present at the outlet (ALSC 1985). The lake reaches a maximum depth of 11 m (36.1 ft) (Figure 17.2).

Middle Settlement Lake is classified as a thin-till drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. The lake is accessed by helicopter. Sampling frequency at this pond was reduced from monthly to seasonal in 2014.

Lake chemistry: Middle Settlement Lake was sampled near its deepest point during the ALS on August 14, 1984 finding: Lab pH 4.96, ANC -7.6 µeq L^{-1}, SO_4^{2-} 104.1 µeq L^{-1}, NO_3^- 0.49 µeq L^{-1}, Ca^{2+} 47.91 µeq L^{-1}, Mg^{2+} 15.63 µeq L^{-1}, DOC 174.84 µmol L^{-1}-C (ALSC 1985). Table 17.1 summarizes recent ALTM chemistry. Major analytes through 2013 are shown in Table 17.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 17.3.

Aquatic biota: On September 18, 1984, submergent vegetation occupied 10% of the lake bottom. Emergent and floating vegetation occupied 5% and 1% of the lake surface, respectively. Species identified included: Carex spp., Nymphaea spp. and Utricularia spp. A dip net survey on that date found the following Insecta: Odonata, Hemiptera, Trichoptera, and Coleoptera (ALSC 1985).

Figure 17.1 Catchment

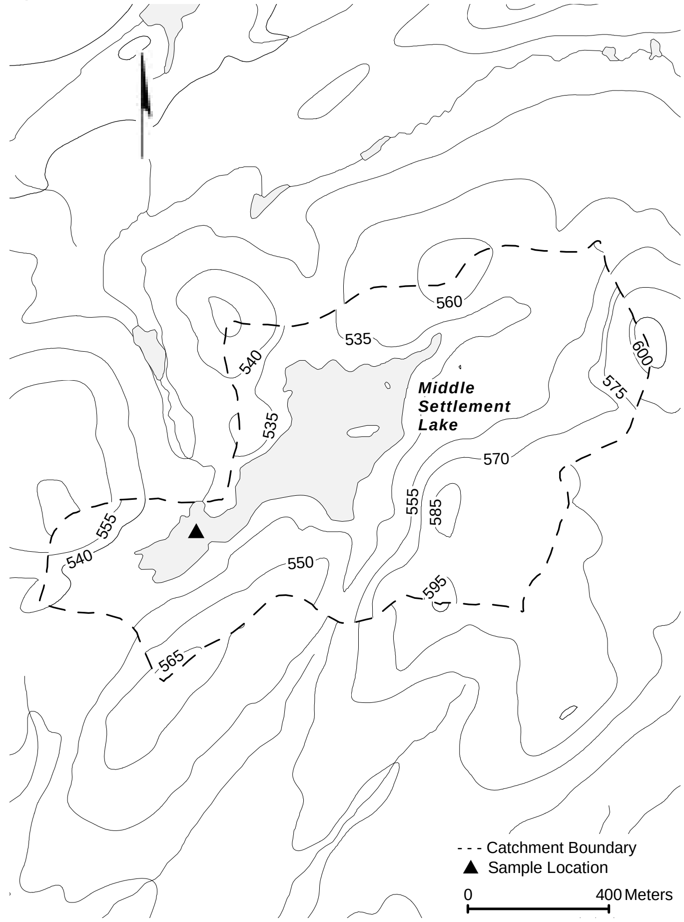
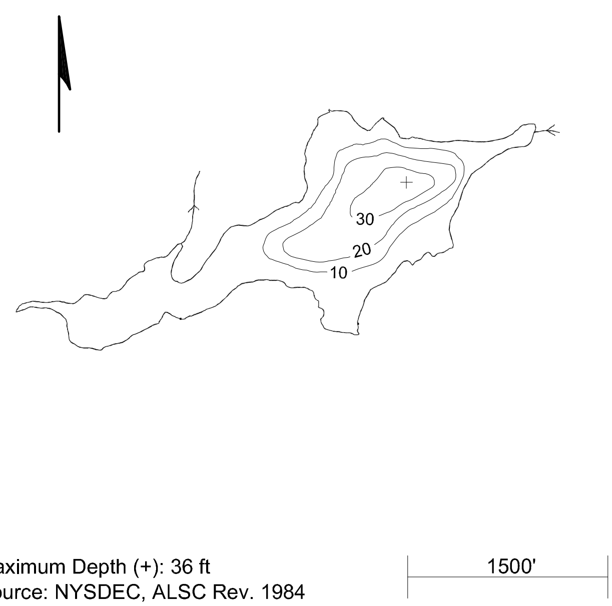


Figure 17.2 Bathymetry



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.68348	-75.10116	43° 41′ 00.5″ N	075° 06′ 04.2″ W
Helo sample site	43.68281	-75.10143	43° 40′ 58.1″ N	075° 06′ 05.1″ W
Lake centroid	43.68474	-75.09776	43° 41′ 05.1″ N	075° 05′ 51.9″ W

Table 17.1 Lake Chemistry

040704			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	62.67	101.19	92.94	53.47	68.24	59.57	40.67	55.79	48.76	µeq L^{-1}
NO_3^-	-0.31	19.03	7.11	0.00	9.33	3.72	0.00	11.98	3.70	µeq L^{-1}
Cl^-	4.23	9.59	6.98	3.35	7.93	6.03	3.59	8.85	6.44	µeq L^{-1}
F^-	1.89	3.32	2.75	2.23	3.08	2.58	2.27	2.95	2.60	µeq L^{-1}
ANC	-15.72	23.86	3.76	12.92	28.14	19.90	6.54	25.92	17.42	µeq L^{-1}
DIC	19.15	220.63	82.91	33.30	250.60	101.10	44.28	194.75	88.22	µmol L^{-1}-C
DOC	151.53	473.89	225.20	206.64	371.69	273.44	243.48	396.45	324.33	µmol L^{-1}-C
SiO_2	12.48	62.41	39.86	12.65	93.87	44.40	12.40	65.81	36.46	µmol L^{-1}
Ca^{2+}	28.94	56.39	50.15	39.92	55.89	45.28	29.87	42.30	37.25	µeq L^{-1}
Mg^{2+}	9.87	23.04	17.76	13.17	17.28	15.40	11.20	15.20	13.57	µeq L^{-1}
Na^+	11.74	26.97	23.13	21.31	26.78	24.85	22.84	28.30	26.61	µeq L^{-1}
K^+	3.58	6.39	5.12	3.13	5.88	4.78	3.42	5.56	4.61	µeq L^{-1}
NH_4^+	0.83	12.86	6.26	-0.12	11.31	4.43	-0.28	10.31	3.02	µeq L^{-1}
AL_TD	2.93	11.45	7.08	1.20	9.71	5.20	1.52	9.75	5.49	µmol L^{-1}
AL_TM	2.33	10.49	5.69	1.52	4.19	2.55	1.54	5.47	3.02	µmol L^{-1}
AL_OM	0.37	2.85	1.59	1.39	2.63	2.06	1.50	3.29	2.25	µmol L^{-1}
AL_IM	0.85	7.71	4.09	0.00	2.15	0.49	0.00	2.60	0.80	µmol L^{-1}
LABPH	4.67	5.71	5.12	5.34	6.08	5.69	5.24	6.22	5.61	
AIREQPH	4.67	5.92	5.18	5.91	6.40	6.11	5.46	6.44	5.87	
TRUECOLOR	5	25	15	20	35	25	15	30	23	Pt Co
SCONDUCT	15.56	20.78	17.35	12.02	15.19	12.99	10.08	14.8	11.98	µS cm^{-1}
TOTALP	na	na	na	1.59	5.38	3.30	2.96	11.91	5.22	µg L^{1}
CHLORA	na	na	na	0.73	1.93	1.26	0.28	4.04	1.56	µg L^{1}

Table 17.2 Lake Characteristics

Parameter	Value
Elevation	526 m
Maximum depth	11.0 m
Mean depth	3.4 m
Volume	54.5 x 10^4 m^3
Surface area	15.8 ha
Watershed area	114.3 ha
Watershed ratio	0.14
Hydraulic retention time (year)	0.63
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Thendara
Land use classification	Ha-De-Ron-Dah Wilderness

In August 1975, the DOH found total phosphorus at 54.0 mg m^{-3} and total chlorophyll a at 4.17 µg L^{-1} (Wood 1978). In 2003, the average value of chlorophyll a was 1.49 µg L^{-1} (Momen et al. 2006). On August 14, 1984, the lake was thermally stratified between 6.0 and 8.0 m (ALSC 1985).

Fisheries: The earliest records show stocking of brook trout in 1929. During the 1950s, the DEC stocked the lake three times with brown trout. Annual stocking of brook trout continued from 1960–1984 (ALSC 1985). Brook trout continue to be stocked annually. In addition to the ALS fisheries survey on September1984, the ALSC netted the lake on June 18, 2004 and September 13, 2012 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 17.3 and 17.4 for recent fish stocking and netting histories.

Figure 17.3 Chemistry Time Series

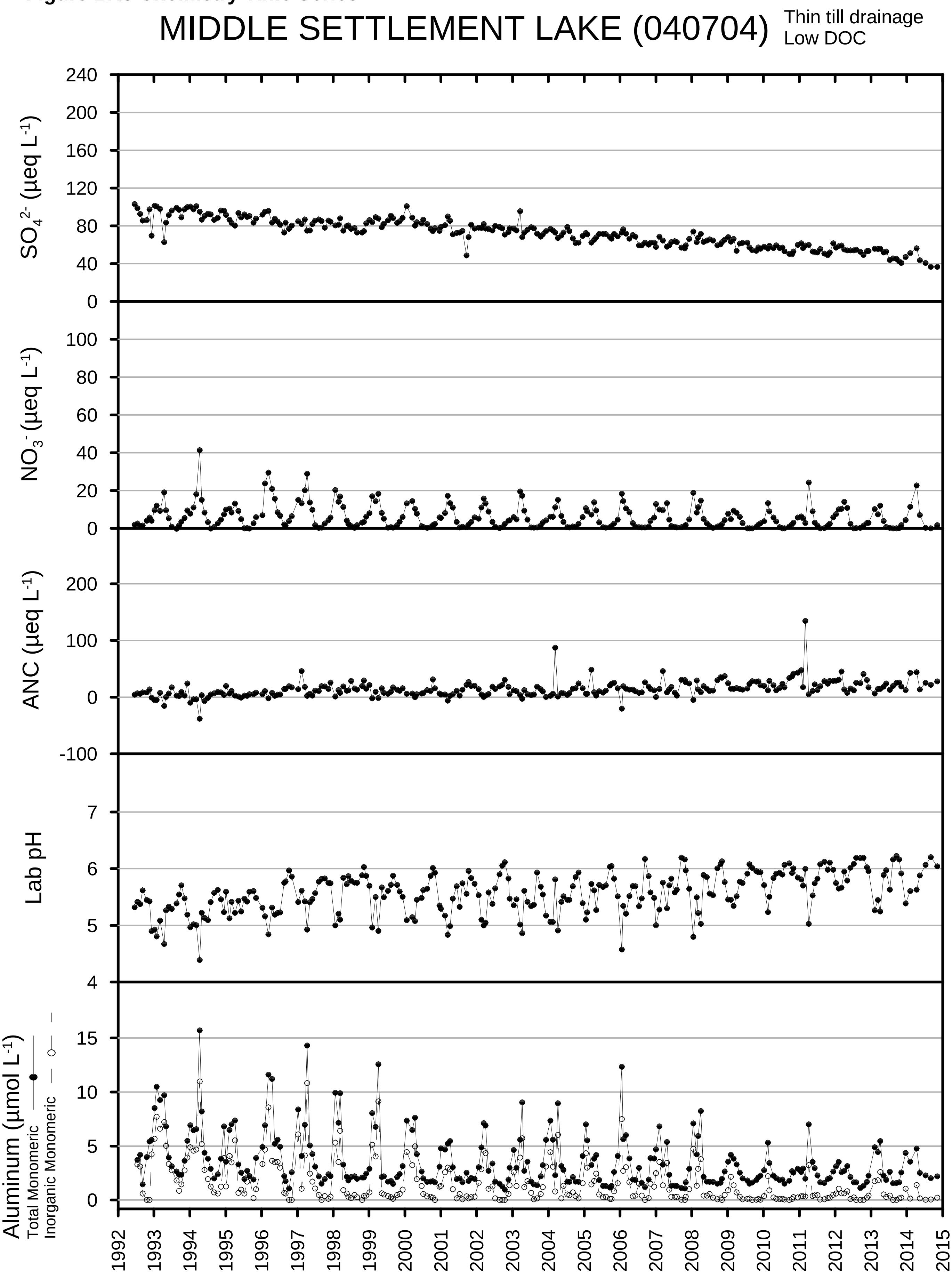


Table 17.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	285	7
1981	Brook trout	540	17
1982	Brook trout	600	5
1983	Brook trout	600	22
1984	Brook trout	444	10
1985	Brook trout	660	15
1986	Brook trout	600	7
1987	Brook trout	600	5
1988	Brook trout	600	7
1989	Brook trout	660	7
1990	Brook trout	600	26
1991	Brook trout	600	9
1992	Brook trout	600	14
1993	Brook trout	600	21
1994	Brook trout	470	16
1995	Brook trout	560	31
1996	Brook trout	600	11
1997	Brook trout	630	12
1998	Brook trout	630	8
1999	Brook trout	600	9
2000	Brook trout	600	8
2001	Brook trout	530	9
2002	Brook trout	600	15
2003	Brook trout	600	15
2004	Brook trout	600	15
2005	Brook trout	600	15
2006	Brook trout	660	11
2007	Brook trout	600	9
2008	Brook trout	600	12
2009	Brook trout	600	9
2011	Brook trout	600	10
2012	Brook trout	400	5
2013	Brook trout	500	6
2014	Brook trout	600	9

Table 17.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1984	Brook trout	6	295	445	5450	6
Sep-1984	Central mudminnow	13	72	98	98	18
Jun-2003	Brook trout	19	190	494	4181	19
Jun-2003	Central mudminnow	1	94	94	7	1
Sep-2012	Brook trout	8	103	435	4278	8
Sep-2012	Central mudminnow	7	53	102	49	7
Sep-2012	Golden shiner	9	78	145	95	9

Intensive studies: The DOH conducted a limnological survey of Middle Settlement Lake in August 1975 (Wood 1978). This lake has been studied as part of the AEAP beginning in 1994 (Momen et al. 2006). Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. In 2003, this lake watershed was part of a 36 lake-watershed regional survey of foliar nitrogen gradients in the Adirondack Park (McNeil et al. 2007).

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 9.0 km east of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Middle Settlement Lake and its entire watershed lie on biotite and hornblende granite gneiss with little to no ANC capacity (Roy et al. 1997). Till overlays 100% of the watershed and is comprised primarily of shallow soils. A small percentage of hydric soils are found in the area around the lake (APA 2001). The highest elevation in the watershed is 605 m. The watershed has a maximum relief of 79 m. In 1984, the ALS found the shoal water substrate comprised of 45% muck/silt, 30% rock/boulder/rubble, and 25% sand/gravel (ALSC 1985).

Land cover/use: A deciduous-coniferous mixed forest covers 95% of the watershed with the remaining cover shrub-sapling and wetland. In 1984, a deciduous-coniferous mixed forest bordered 70% of the lake shoreline, while the remaining edge cover was 30% wetland/shrub-sapling (ALSC 1985). Total wetland area was 2.5 ha and comprised 2.2% of the watershed. The predominant wetland type is forested needle-leaf evergreen and is primarily found in the low-lying areas northeast of the lake (Roy et al. 1996).

The lake and watershed are in the Ha-De-Ron-Dah Wilderness (NYSDEC 1995). A trail follows the entire northwestern shore. A lean-to and several primitive campsites are on the shoreline.

Watershed disturbance: The 1916 fire protection data show 92.2% of the watershed as burned over. A November 1950 storm moderately impacted the watershed causing 50 to 100% blowdown in 17.1% of the watershed and 25 to 50% blowdown in 15.3% of the watershed. A microburst storm in July 1995 also caused forest damage with 100% of the watershed incurring 0 to 30% change in tree crowns (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Grass Pond 040706

EPA ID: 1A3-048O

ALSC Staff Photo 2015

Lake: Grass Pond lies in the Oswegatchie-Black watershed at 549 m. This 5.3 ha headwater lake receives drainage from several tributaries (Ito et al. 2006) (Figure 18.1). The outlet flows into Cedar Pond. In 1984, an active beaver dam was present at the outlet (ALSC 1985). The lake reaches a maximum depth of 5.2 m (17.1 ft) (Figure 18.2).

Grass Pond is classified as a medium-till drainage lake with low dissolved organic carbon (<500 μmol L^{-1}-C). The lake is considered moderately sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. This lake is accessed by helicopter and is sampled monthly.

Lake chemistry: Grass Pond was sampled during the ALS on August 13, 1984 finding: Lab pH 6.03, ANC 50.3 μeq L^{-1}, SO_4^{2-} 122.01 μeq L^{-1}, NO_3^- 3.07 μeq L^{-1}, Ca^{2+} 112.28 μeq L^{-1}, Mg^{2+} 37.85 μeq L^{-1}, DOC 407.95 μmol L^{-1}-C (ALSC 1985). Table 18.1 summarizes recent ALTM chemistry. Major analytes through 2013 are shown in Table 18.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 18.3.

Aquatic biota: On September 17, 1984, submergent plants occupied 70% of the lake bottom. Emergent and floating vegetation occupied 10% and 30% of the surface, respectively. Plants identified were: Sphagnum spp., Potamogeton spp., Dulichium spp., Carex spp., Juncus spp., Nuphar spp., Nymphaea spp., and Utricularia spp. On the same date, a dip net survey found the following Insecta: Odonata Unspecified, Hemiptera Unspecified, and Coleoptera Unspecified (ALSC 1985).

Figure 18.1 Catchment

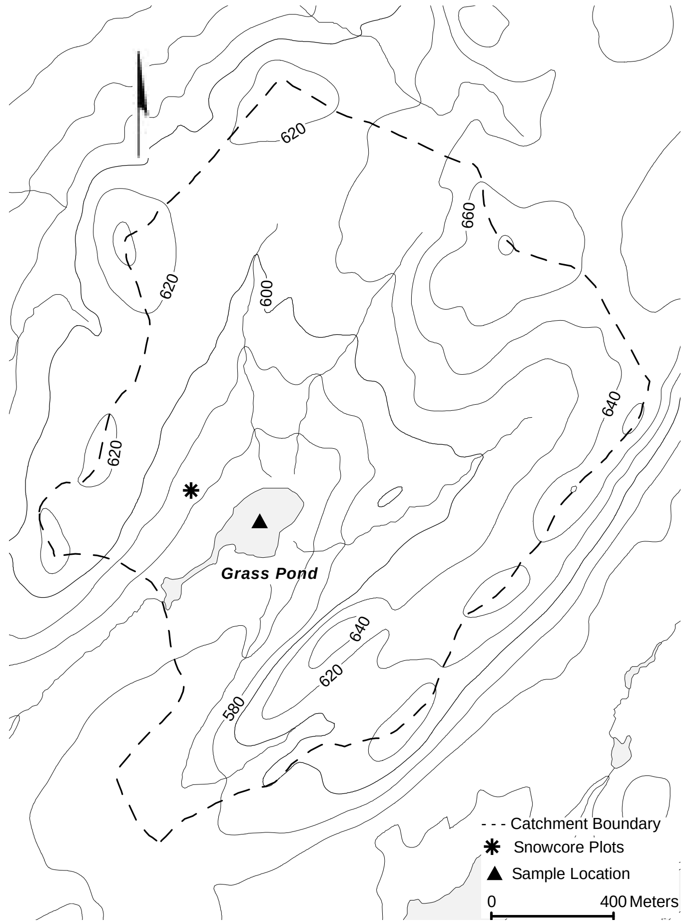
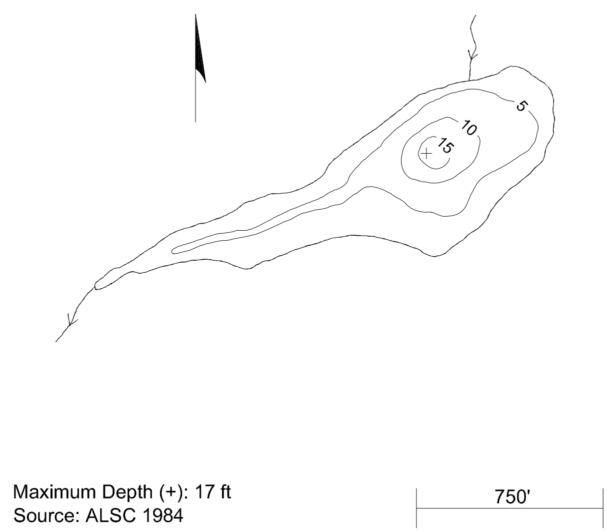


Figure 18.2 Bathymetry



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.ss	DDD MM SS.ss
Grab sample site	43.69066	-75.06462	43° 41' 26.40" N	075° 03' 52.60" W
Helo sample site	43.69300	-75.06084	43° 41' 34.80" N	075° 03' 39.02" W
Lake centroid	43.69269	-75.06127	43° 41' 33.68" N	075° 03' 40.58" W

Table 18.1 Lake Chemistry

040706			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	76.20	127.00	106.15	70.60	98.84	79.02	70.60	82.00	64.06	µeq L^{-1}
NO_3^-	1.31	54.35	26.30	0.00	39.06	16.92	0.00	60.47	22.98	µeq L^{-1}
Cl^-	5.08	11.56	7.87	5.32	8.56	6.85	5.32	10.52	7.24	µeq L^{-1}
F^-	3.63	5.58	4.72	4.01	5.26	4.55	4.01	5.23	4.31	µeq L^{-1}
ANC	-15.98	96.39	23.81	-12.37	70.05	30.18	-12.37	72.72	26.35	µeq L^{-1}
DIC	21.65	238.94	92.00	37.47	159.02	81.67	37.47	247.68	102.16	µmol L^{-1}-C
DOC	182.58	413.53	331.16	231.78	420.50	328.36	231.78	514.25	375.30	µmol L^{-1}-C
SiO_2	63.08	196.39	99.33	82.72	176.75	105.93	82.72	140.16	90.25	µmol L^{-1}
Ca^{2+}	57.89	152.20	87.91	43.91	109.29	73.28	43.91	93.34	59.95	µeq L^{-1}
Mg^{2+}	16.46	43.61	30.58	11.52	39.50	24.17	11.52	31.17	20.17	µeq L^{-1}
Na^+	15.22	61.33	36.72	18.70	51.76	34.98	18.70	46.04	33.05	µeq L^{-1}
K^+	5.63	14.32	8.61	2.30	11.00	6.16	2.30	10.89	6.52	µeq L^{-1}
NH_4^+	0.39	7.48	2.04	-0.11	2.99	0.94	-0.11	3.07	0.92	µeq L^{-1}
AL_TD	3.93	25.42	11.94	0.21	20.98	8.96	0.21	24.31	11.70	µmol L^{-1}
AL_TM	1.59	19.31	7.93	2.08	10.45	4.54	2.08	17.09	6.77	µmol L^{-1}
AL_OM	1.31	5.86	3.12	1.70	4.19	2.78	1.70	6.58	3.62	µmol L^{-1}
AL_IM	0.00	14.63	4.92	0.23	6.60	1.76	0.23	12.50	3.18	µmol L^{-1}
LABPH	4.67	6.31	5.29	4.82	6.47	5.48	4.62	4.82	5.23	
AIREQPH	4.66	7.15	5.32	4.81	7.11	5.52	4.59	4.81	5.25	
TRUECOLOR	15	40	23	25	35	28	25	40	26	Pt Co
SCONDUCT	18.46	30.10	23.09	16.48	25.40	18.98	16.48	25.14	18.59	µS cm^{-1}
TOTALP	na	na	na	0.96	12.39	3.85	3.06	18.21	6.66	µg L^1
CHLORA	na	na	na	0.24	2.16	1.18	0.27	4.37	1.86	µg L^1

Table 18.2 Lake Characteristics

Parameter	Value
Elevation	549 m
Maximum depth	5.2 m
Mean depth	1.5 m
Volume	7.8 x 10^4 m^3
Surface area	5.3 ha
Watershed area	272 ha
Watershed ratio	0.02
Hydraulic retention time (year)	0.04
Watershed	Oswegatchie/ Black
County, Town	Herkimer, Webb
USGS Quadrangle	Thendara
Land use classification	Ha-De-Ron-Dah Wilderness

The ALS found the lake thermally stratified between 4.0 and 6.0 m on August 13, 1984 (ALSC 1985). In 2003, the average value of chlorophyll a was 1.17 µg L^{-1} (Momen et al. 2006).

Fisheries: Grass Pond does not have a history of fish stocking (ALSC 1985). It is reported to have had Natural Spawning Adequate (NSA) trout status up to 1980 (Bath 2003). In addition to the ALS fisheries survey on September 18, 1984, the ALSC netted the lake on May 18, 1999 and October 17, 2010 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 18.3 for recent netting history.

Intensive studies: Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Landscape characteristics and disturbance history have been evaluated within this watershed (Sullivan et al. 1999). This lake was studied by the AEAP beginning in 1994 (Momen et al. 2006). During 1999 and 2000 mass-balance studies at three ALTM lakes (Grass, Constable, and G) included the installation of snow core plots in these watersheds (Figure 18.1). Inlets were sampled monthly by the ALSC from August 1998 to 2001 during ice free periods, along with monthly snow core sampling from 1999 to 2013 in the watershed of the pond. Grass Pond and Constable Pond were studied intensively for nitrogen solute sources and sinks in 1999 through 2000 (Ito et al. 2006).

Figure 18.3 Chemistry Time Series

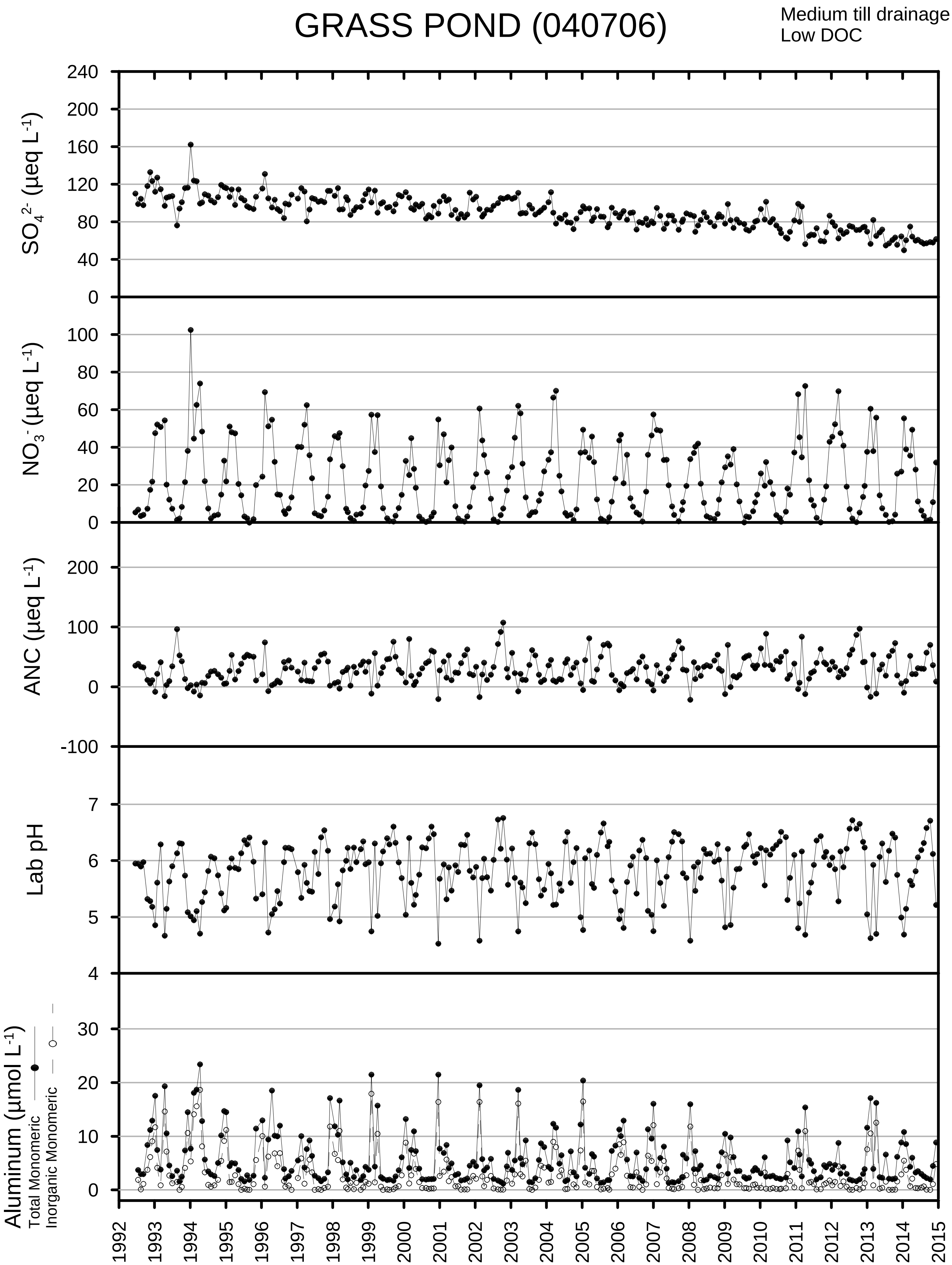


Table 18.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1984	Brook trout	18	108	290	1520	18
Sep-1984	Central mudminnow	1	81	81	7	1
Sep-1984	Common shiner	2	155	158	110	2
Sep-1984	Creek chub	9	166	191	-	9
Sep-1984	White sucker	26	165	321	-	62
May-1999	Brook trout	13	94	315	1279	13
May-1999	Central mudminnow	3	50	60	5	3
May-1999	Common shiner	23	82	94	167	32
May-1999	N. redbelly dace	25	58	75	68	59
May-1999	Creek chub	14	61	133	101	14
May-1999	White sucker	31	125	346	2649	56
Oct-2010	Central mudminnow	5	50	189	22	5
Oct-2010	Common shiner	25	124	173	955	64
Oct-2010	Creek chub	9	90	192	433	9
Oct-2010	White sucker	30	90	480	5350	49

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b). Ito and others (2006) conducted a study of surficial geology and soils in the Grass Pond and Constable Pond (040777) watersheds. This involved the development of four soils pits and five seismic lines to determine extent of till deposits within the Grass Pond watershed.

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 6.0 km east of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Grass Pond and its watershed lie on biotite and/or hornblende granite gneiss with low to no ANC (Roy et al. 1997). Till comprises 45% of the watershed and the remainder of the watershed (above 580 m) is exposed bedrock (APA 2001). The highest elevation in the watershed is 684 m. The watershed has a maximum relief of 135 m. In 1984, the ALS characterized the shoal water substrate as 70% muck/silt/organic and 30% boulders (ALSC 1985).

Land cover/use: In 1984, 85% of the watershed was covered in deciduous-coniferous mixed forest and 5% was covered in shrub-sampling vegetation (ALSC 1985). Wetland area covers approximately 14.7 ha comprising 5.4% of the watershed. The predominant wetland types are forested needle-leaf evergreen and forested broad-leaf deciduous occupying 2.2% and 1.6% of the watershed, respectively (NYSDEC 1995). The lake and its watershed occur totally within the Ha-De-Ron-Dah Wilderness of the NYS Forest Preserve. There is a small foot trail that leads to the shoreline from the south.

Watershed disturbance: The 1916 fire protection source data show nearly 60% of the watershed as burned over. This area was primarily found in the south. The remaining area is shown as 40% waste and denuded lands. In the 1950 November storm, 14% of the watershed was 50 to 100% blowdown. The July 1995 microburst storm caused 0 to 30% change in tree crowns in 99% of the watershed and 60 to 100% change in 1% of the watershed (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Middle Branch Lake 040707

EPA ID: 040707O

ALSC Staff Photo 2015

Lake: Middle Branch Lake lies in the Oswegatchie-Black watershed at 496 m. This 17 ha headwater lake has many seepage areas on the shoreline fringe. An inlet stream enters near the outlet on the southern end of the watershed (Figure 19.1). The irregularly shaped lake has a single elongated deep basin with a maximum depth of 5.2 m (17.1 ft) (Figure 19.2).

Middle Branch Lake is classified as a thin-till drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992 and is accessed by helicopter. Sampling frequency was modified to seasonal in 2014.

Lake chemistry: Middle Branch Lake was sampled near its deepest point by ALS on August 14, 1984 finding: Lab pH 6.87, ANC 18.4 µeq L^{-1}, SO_4^{2-} 104.1 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 98.31 µeq L^{-1}, Mg^{2+} 37.85 µeq L^{-1}, DOC 324.70 µmol L^{-1}-C (ALSC 1985). Table 19.1 summarizes recent ALTM chemistry collected at the outlet. Major analytes through 2013 are shown in Table 19.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 19.3.

Aquatic biota: On September 19, 1984, the ALS found submergent vegetation covered 5% of the lake bottom. No species were identified. A dip net survey on that date found the following Insecta: Odonata Macromiidae, Ephemeroptera Heptageniidae, and Diptera Chironomidae. Also found were: Oligochae Unspecified and Crustacea Amphipoda Unspecified.

Figure 19.1 Catchment

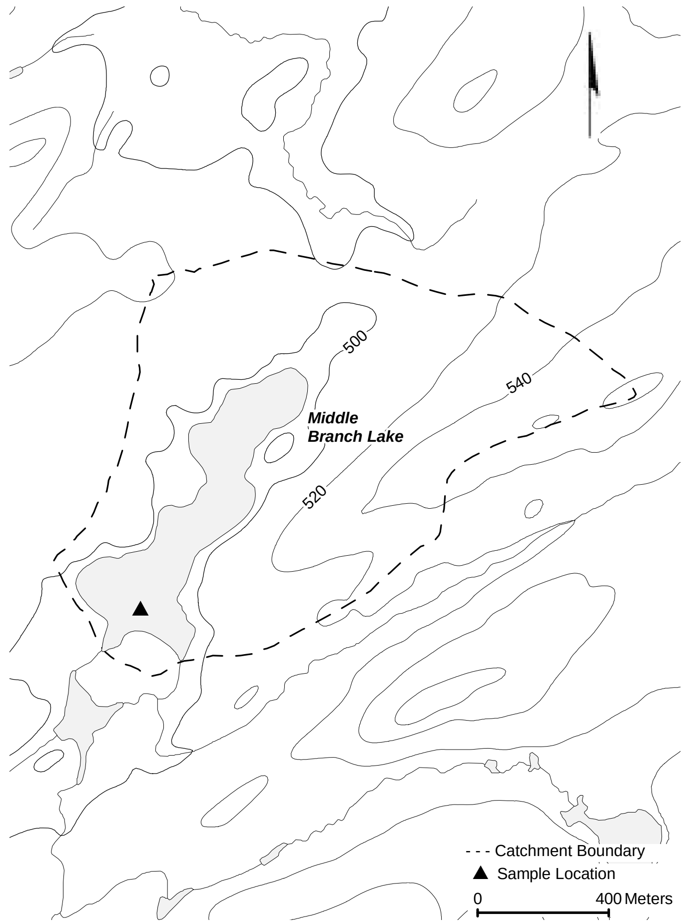
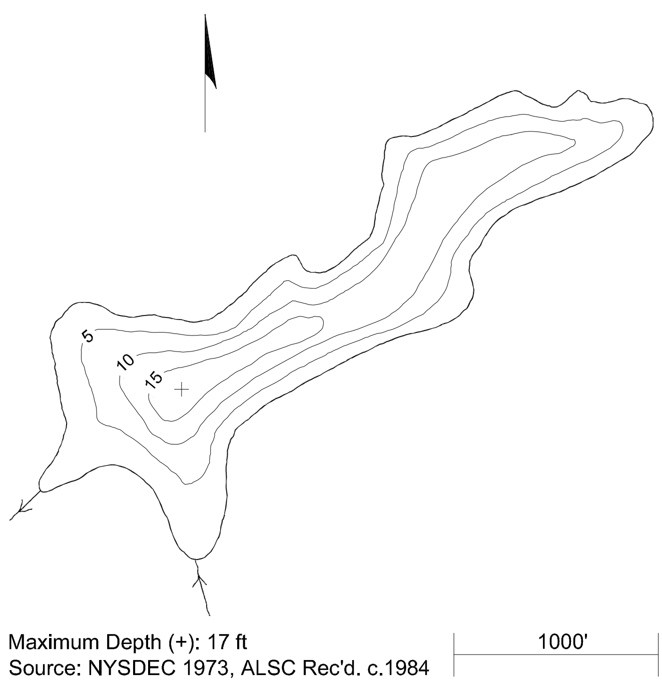


Figure 19.2 Bathymetry



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.69815	-75.10160	43° 41′ 53.4″ N	075° 06′ 05.7″ W
Helo sample site	43.69912	-75.10087	43° 41′ 56.8″ N	075° 06′ 03.1″ W
Lake centroid	43.69973	-75.10061	43° 41′ 59.0″ N	075° 06′ 02.2″ W

Table 19.1 Lake Chemistry

040707			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	86.19	104.72	95.47	60.73	80.28	68.91	53.20	66.30	60.34	µeq L^{-1}
NO_3^-	-0.27	20.48	9.67	0.00	11.66	4.20	0.00	8.88	3.55	µeq L^{-1}
Cl^-	6.49	9.59	8.05	6.00	8.12	6.88	5.81	9.01	7.33	µeq L^{-1}
F^-	3.63	5.16	4.40	3.51	4.98	4.23	3.91	4.93	4.47	µeq L^{-1}
ANC	25.39	62.63	42.72	18.81	69.32	52.81	55.97	80.24	67.74	µeq L^{-1}
DIC	44.13	209.81	108.91	59.94	240.61	112.61	69.82	303.75	128.69	µmol L^{-1} -C
DOC	285.73	380.31	328.18	293.56	434.36	379.65	290.78	422.73	378.24	µmol L^{-1} -C
SiO_2	66.57	108.68	85.14	74.64	112.01	91.68	89.45	118.40	99.01	µmol L^{-1}
Ca^{2+}	76.35	103.30	93.36	62.88	88.00	81.59	73.83	92.99	82.68	µeq L^{-1}
Mg^{2+}	27.98	41.14	33.89	19.75	33.65	29.73	27.57	34.70	30.87	µeq L^{-1}
Na^+	27.84	38.71	33.77	24.36	38.71	35.12	35.18	40.91	38.52	µeq L^{-1}
K^+	0.51	9.98	7.51	4.60	7.93	6.84	6.20	8.95	7.89	µeq L^{-1}
NH_4^+	-0.44	4.32	1.79	-0.86	3.22	0.80	-0.26	5.42	1.30	µeq L^{-1}
AL_TD	0.59	7.15	4.10	1.59	9.45	4.02	0.70	6.10	3.21	µmol L^{-1}
AL_TM	0.40	5.08	2.53	1.68	4.93	2.52	1.61	3.18	2.18	µmol L^{-1}
AL_OM	0.47	3.15	2.03	1.54	3.45	2.19	1.50	2.86	2.04	µmol L^{-1}
AL_IM	0.00	2.26	0.89	0.00	1.48	0.35	0.00	0.68	0.17	µmol L^{-1}
LABPH	5.64	6.60	6.02	5.35	6.69	6.04	5.95	6.80	6.35	
AIREQPH	6.14	6.93	6.46	5.58	6.90	6.42	6.73	7.02	6.88	
TRUECOLOR	20	35	28	25.00	50	39	20	40	33	Pt Co
SCONDUCT	19.50	21.39	20.36	16.08	20.12	18.07	16.33	20.67	18.6	µS cm^{-1}
TOTALP	na	na	na	1.31	14.99	4.65	3.28	13.28	5.70	µg L^{1}
CHLORA	na	na	na	1.02	6.51	3.29	1.51	7.75	4.28	µg L^{1}

Table 19.2 Lake Characteristics

Parameter	Value
Elevation	496 m
Maximum depth	5.2 m
Mean depth	2.1 m
Volume	36.3 x 10^4 m^3
Surface area	17.0 ha
Watershed area	129.6 ha
Watershed ratio	0.13
Hydraulic retention time (year)	0.37
Watershed	Oswegatchie/ Black
County, Town	Herkimer, Webb
USGS Quadrangle	Thendara
Land use classification	Ha-De-Ron-Dah Wilderness

The ALS found the lake isothermal on August 14, 1984 (ALSC 1985). The AEAP reported an average value of chlorophyll a of 3.40 µg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: The earliest record shows brook trout stocking in 1931 (ALSC 1985). In addition to the ALS fisheries survey on September 19, 1984, the ALSC netted the lake on June 16, 2004 and September 12, 2012 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 19.3 and 19.4 for recent fish stocking and netting histories.

Intensive studies: Middle Branch Lake has been studied as part of the AEAP (Momen et al. 1999, Momen et al. 2006, Momen and Zehr 1998). Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998 through 2000.

Figure 19.3 Chemistry Time Series

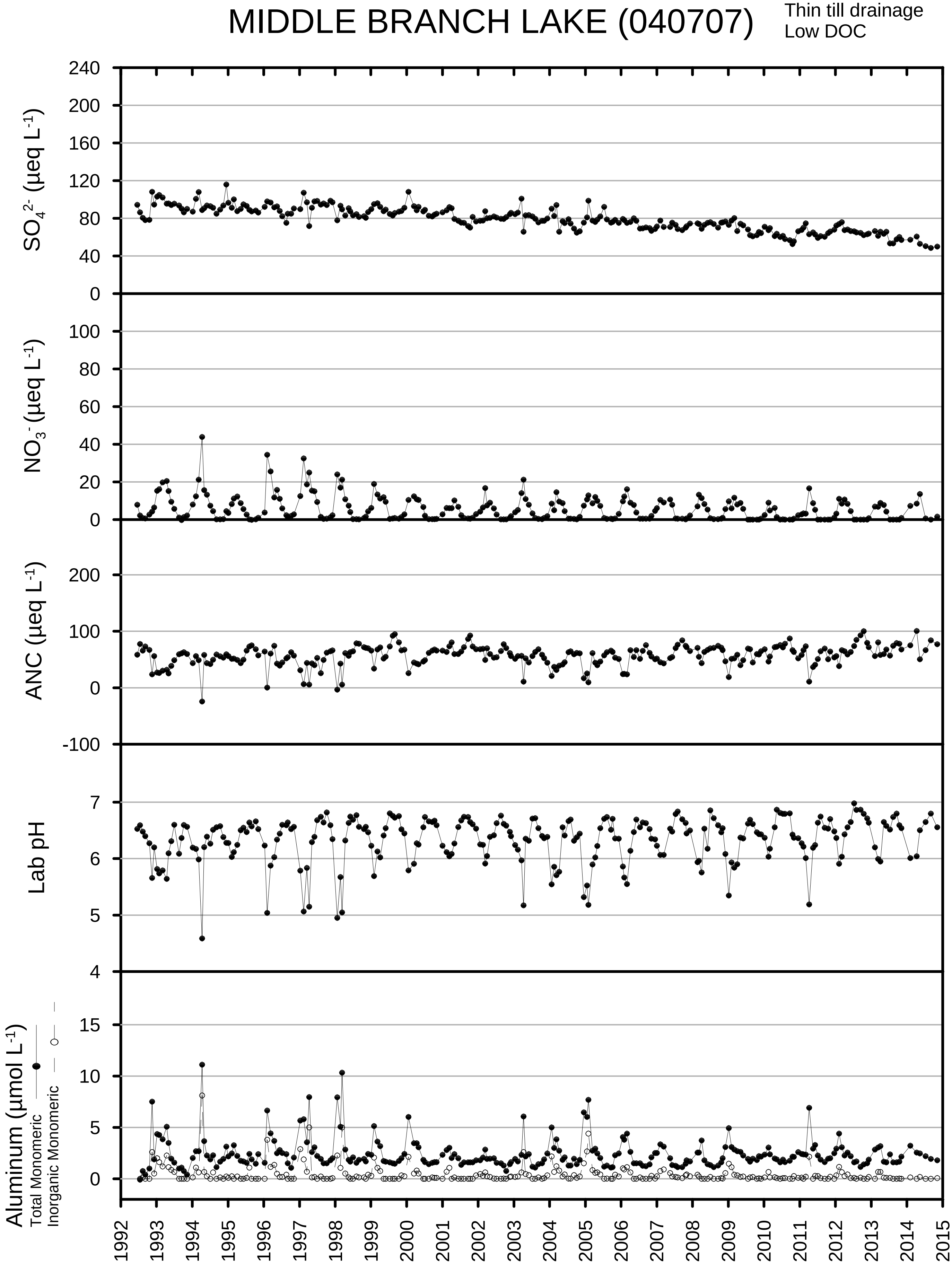


Table 19.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	950	21
1981	Brook trout	990	31
1982	Brook trout	1100	8
1983	Brook trout	1100	40
1984	Brook trout	814	19
1985	Brook trout	1210	27
1986	Brook trout	1100	14
1987	Brook trout	1100	9
1988	Brook trout	1100	13
1989	Brook trout	1210	13
1990	Brook trout	1100	47
1991	Brook trout	1100	16
1992	Brook trout	1100	26
1993	Brook trout	1100	39
1994	Brook trout	870	29
1995	Brook trout	1120	62
1996	Brook trout	1200	23
1997	Brook trout	1260	24
1998	Brook trout	1260	16
1999	Brook trout	1200	18
2000	Brook trout	1200	15
2001	Brook trout	1070	15
2002	Brook trout	1200	29
2003	Brook trout	1200	29
2004	Brook trout	1200	29
2005	Brook trout	1200	29
2006	Brook trout	1320	21
2007	Brook trout	1200	17
2008	Brook trout	1200	24
2009	Brook trout	1200	18
2010	Brook trout	450	4
2011	Brook trout	1200	27
2012	Brook trout	400	5
2013	Brook trout	400	5
2014	Brook trout	1200	18

Table 19.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1984	Brook trout	8	200	370	1920	8
Sep-1984	Central mudminnow	1	89	89	7	1
Sep-1984	Golden shiner	2	92	102	18	2
Sep-1984	Common shiner	4	145	150	140	4
Sep-1984	Creek chub	2	75	220	125	2
Sep-1984	White sucker	17	168	345	1890	50
Sep-1984	Pumpkinseed	2	100	115	45	2
Jun-2004	Brook trout	12	176	322	1535	12
Jun-2004	Golden shiner	25	78	115	194	375
Jun-2004	Common shiner	8	29	134	119	8
Jun-2004	Fathead minnow	25	75	85	147	30
Jun-2004	Blacknose dace	16	53	64	58	16
Jun-2004	Creek chub	20	85	168	618	20
Jun-2004	White sucker	23	90	477	8020	59
Jun-2004	Pumpkinseed	27	60	125	181	431
Sep-2012	Brook trout	3	265	362	1244	3
Sep-2012	Golden shiner	4	67	90	21	4
Sep-2012	Common shiner	13	69	100	114	13
Sep-2012	Fathead minnow	7	75	80	34	7
Sep-2012	Creek chub	12	111	210	426	12
Sep-2012	White sucker	27	80	440	6426	57
Sep-2012	Pumpkinseed	26	54	100	106	44

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 9.0 km east of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Middle Branch Lake and its watershed lies on biotite and hornblende granite gneiss with little to no ANC (Roy et al. 1997). Till overlays 100% of the watershed. Basal till is found in the immediate area around the lake. There is a small area of organic hydric soils between the inlet and outlet. Shallow soils occur above 520 m (APA 2001). The highest elevation in the watershed is 560 m and it has a maximum relief of 64 m. In 1984, the ALS found the shoal water substrate comprised of 80% sand and gravel, and 20% boulder/rubble (ALSC 1985).

Land cover/use: In 1984, deciduous forest covered 90% of the watershed while the remaining 10% was deciduous-coniferous mixed forest (ALSC 1985). Total wetland area is 23.8 ha comprising 18.4% of the watershed (Roy et al. 1996). The predominant wetland vegetation types are: forested needle-leaf evergreen and forested broad-leaf deciduous covering 9.6% and 6.7% of the watershed, respectively. Wetlands appear in the seepage areas along the north shore of the lake. The watershed occurs within the Ha-De-Ron-Dah Wilderness (NYSDEC 1995). A trail runs along the northwestern edge of the pond leading to a lean-to and a number of primitive campsites.

Disturbance: The 1916 fire protection source data show 89.2% of the watershed as burned over and 1% logged for softwood only with considerable amounts of slash. The watershed was undisturbed in the November 1950 blowdown storm. The July 1995 microburst storm caused a 0 to 30% change in tree crowns throughout the entire watershed (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Lake Rondaxe 040739
EPA ID: 1A1-110O

Lake: Lake Rondaxe lies in the Oswegatchie-Black watershed at 524 m. The lake is part of the Moose River flow. Its primary tributary is from Dart Lake (040750), which includes the Big Moose Lake (040752) watershed. A secondary inflow drains from Moss Lake (040746), which includes the Bubb Lake (040748) watershed. The watershed includes nearly 60 ponded sub-watersheds and is the largest lake by watershed area in the ALTM Program (Roy et al. 1996). A metal dam, reconstructed in the summer of 2007, is at the outlet. Lake Rondaxe has two islands and small areas of floating bogs (ALSC 1987). The maximum depth is 10.1 m (33.1 ft) (Figures 20.1 and 20.2).

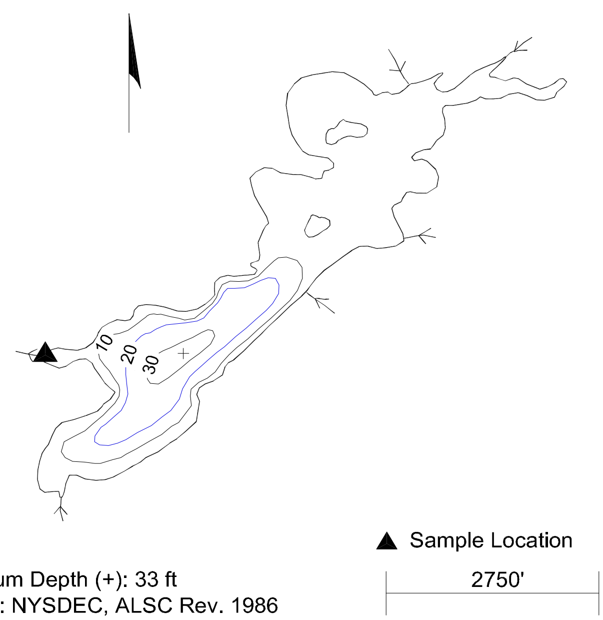
ALSC Staff Photo 2000

Lake Rondaxe is classified as a thin-till chain drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification and is one of the original ALS lakes monitored on a monthly basis since June 1982.

Lake chemistry: Lake Rondaxe was sampled near its deepest point during the ALS on July 29, 1986 finding: Lab pH 6.14, ANC 27.5 µeq L^{-1}, SO_4^{2-} 116.18 µeq L^{-1}, NO_3 3.07 µeq L^{-1}, Ca^{2+} 97.81 µeq L^{-1}, Mg^{2+} 30.45 µeq L^{-1}, DOC 308.05 µmol L^{-1}-C (ALSC 1987). Table 20.1 summarizes recent ALTM water chemistry taken at the outlet. Major analytes through 2013 are shown in Table 20.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 20.3.

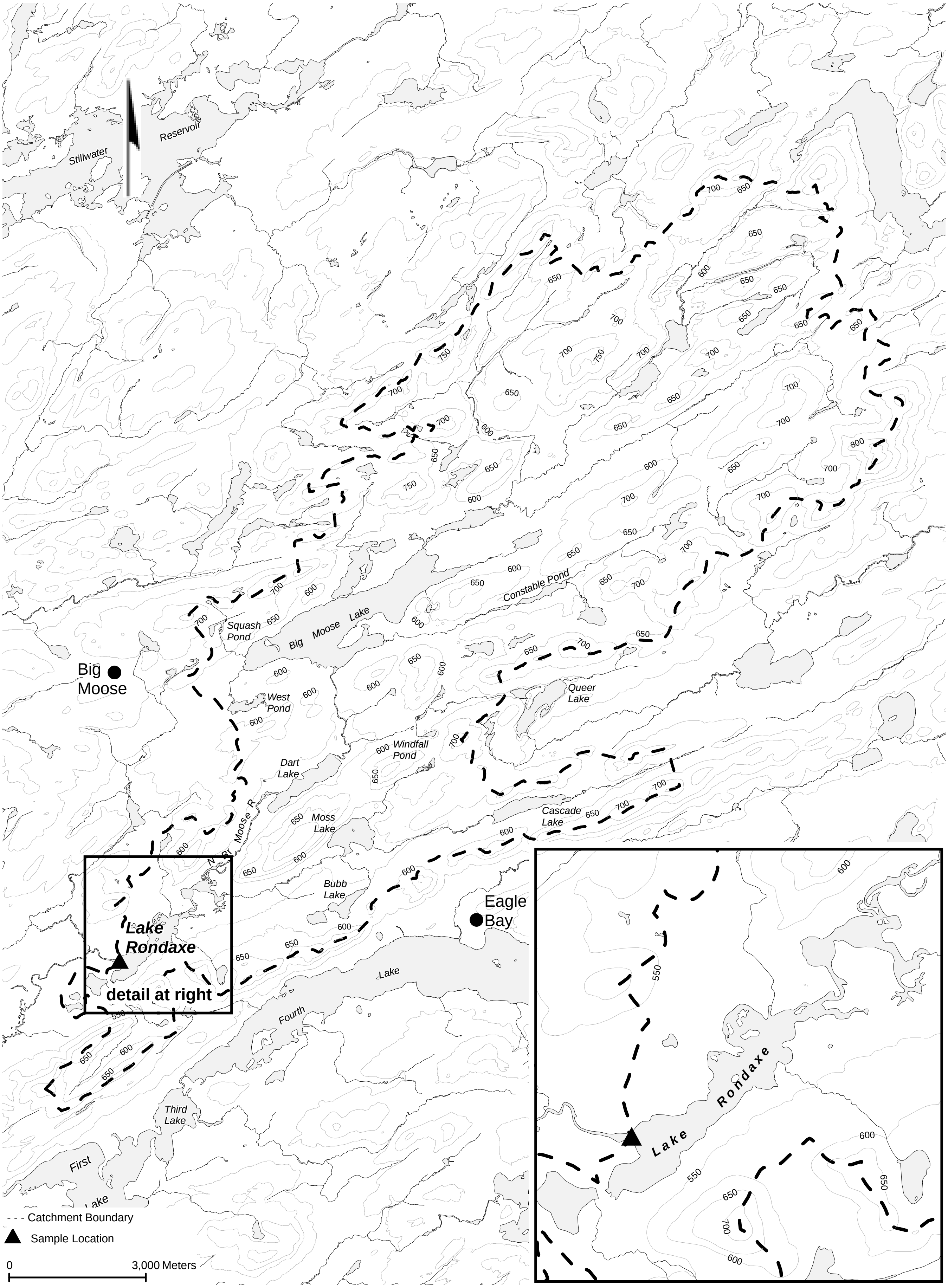
Aquatic biota: On July 29, 1986, the ALS found submergent plants occupied 20% of the lake bottom. Emergent and floating vegetation occupied 15% and 5% of the surface, respectively. Plants identified were: Sparganium spp., Carex spp., Pontederia spp., Juncus spp., Nuphar spp., Nymphaea spp., Brasenia spp., Nymphoides spp., and Utricularia spp. On October 6, 1986, ALS collected the following Insecta: Odonata Libellulidae and Coenagriidae; Hemiptera Notonectidae and Gerridae; and Diptera Chironomidae, in a dipnet survey. Also found were Crustacea Decapoda Astacidae (ALSC 1987). The lake was thermally stratified between 3.0 and 4.0 m on July 29, 1986 (ALSC 1987). The average value of chlorophyll a was 2.20 µg L^{-1} in 2003 (Momen et al. 2006).

Figure 20.1 Bathymetry



Maximum Depth (+): 33 ft
Source: NYSDEC, ALSC Rev. 1986

Figure 20.2 Catchment



Fisheries: The DEC first stocked Lake Rondaxe with lake trout in 1929. From 1931 to 1951 intermittent stocking of brook trout occurred. In 1951 and 1952, smallmouth bass were added. In the recent past, both smallmouth and largemouth bass were stocked by the lake association. There is no recent history of stocking. In addition to the ALS fisheries survey on July 10, 1986, the ALSC netted the lake on October 18, 2000 and September 18, 2009 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 20.3 for recent fish netting history.

Intensive studies: The RILWAS and NBMR studied the lake in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). NBMR evaluated the recovery of fisheries in this water in 2000 (Raynal et al. 2004). The lake is studied as part of the AEAP (Momen et al. 2006). The Mercury Response Project studied changes in mercury in fish populations at this site. The lake was originally sampled on October 8, 1992 and resurveyed on october 3, 2005 (Dittman and Driscoll 2009). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). Common loons were surveyed for mercury content in 1998–2000 (Schoch and Evers 2002) and again in 2003–2004 (Schoch et al. 2004). Lake Rondaxe was a study watershed for an Adirondack/Catskill comparison during 1992–2001 (Burns et al. 2005, Burns et al. 2006).

Soils: The NBMR study sampled this watershed for soils, mineralogy, and chemistry of surficial materials (Newton et al. 1987). A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 10 km southwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Lake Rondaxe lies on undivided metasedimentary rock and related migmatite with medium to high ANC. The majority of the watershed lies on biotite and/or hornblende granite gneiss with low to no ANC (Roy et al. 1997). Till accounts for 65% of the watershed, while bedrock accounts for 14%, outwash sand and gravel 19%, and kame deposits 1.4%. The area proximal to the lake is mostly glacial outwash (APA 2001). The highest elevation in the watershed is 850 m. The watershed has a maximum relief of 326 m. In 1986, the ALS found the shoal water substrate to be comprised of 35% sand/gravel with 65% muck/silt/organic (ALSC 1987).

Land cover/use: In 1986, the ALS described the watershed as: 70% deciduous-coniferous mixed forest; 20% coniferous forest; 5% deciduous forest and 5% shrub/sapling vegetation. The immediate shoreline of the lake was 60% deciduous-conifer mix, 15% developed, 18% coniferous forest, 5% sand-gravel beach and 2% wetland areas (ALSC 1987). Total wetland area is 1726 ha and comprises 12.2% of the watershed. Wetlands are associated with inlets. The dominant wetland type is forested needle-leaf evergreen (ALSC 2003). A majority of the watershed lies within the Pigeon Lake Wilderness to the north, while a small portion on the southern boundary lies within the Fulton Chain Wild Forest (NYSDEC 1990) according to the Adirondack Park Agency Land Use and Development Plan. The shoreline of the lake is privately owned with a mix of Moderate Use Intensity and Resource Management lands. The shoreline is approximately 15% developed with roads and private residences (Roy et al. 1997).

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	43.76088	-74.91592	43° 45′ 39.2″ N	074° 54′ 57.3″ W
Lake centroid	43.76221	-74.90681	43° 45′ 44.0″ N	074° 54′ 24.5″ W

Table 20.1 Lake Chemistry

040739			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	97.85	130.75	112.50	63.77	83.78	71.57	51.40	68.56	58.78	µeq L^{-1}
NO_3^-	6.68	32.09	19.20	1.24	16.16	8.17	2.58	26.39	12.87	µeq L^{-1}
Cl^-	8.46	11.56	9.85	8.86	11.99	9.60	9.43	13.98	11.36	µeq L^{-1}
F^-	4.26	5.90	4.97	3.67	4.87	4.17	3.35	5.01	4.06	µeq L^{-1}
ANC	13.41	74.16	35.74	26.11	76.25	45.38	38.19	107.02	58.14	µeq L^{-1}
DIC	25.81	159.85	82.49	57.45	123.22	84.21	67.80	150.35	105.78	µmol L^{-1}-C
DOC	207.64	350.42	271.38	302.97	430.18	348.09	330.91	455.20	380.77	µmol L^{-1}-C
SiO_2	71.73	123.32	93.21	58.34	109.34	79.33	55.58	105.36	75.69	µmol L^{-1}
Ca^{2+}	86.33	138.73	114.82	78.85	101.08	88.49	73.93	109.67	90.13	µeq L^{-1}
Mg^{2+}	30.45	43.61	35.32	23.04	32.25	27.04	20.78	37.04	27.89	µeq L^{-1}
Na^+	23.92	37.41	29.98	23.92	31.32	29.02	27.04	42.22	33.81	µeq L^{-1}
K^+	6.39	9.46	8.63	5.63	7.16	6.51	5.97	8.27	7.43	µeq L^{-1}
NH_4^+	-0.33	2.88	1.35	-0.78	2.44	0.79	-0.02	3.11	1.45	µeq L^{-1}
AL_TD	1.22	13.08	6.21	1.72	9.64	5.45	1.13	7.54	4.58	µmol L^{-1}
AL_TM	0.08	8.88	3.61	1.79	4.26	2.78	1.44	3.94	2.42	µmol L^{-1}
AL_OM	-0.38	3.72	1.94	1.74	3.11	2.27	1.52	3.19	2.12	µmol L^{-1}
AL_IM	0.00	5.16	1.78	0.00	1.48	0.54	0.00	0.92	0.33	µmol L^{-1}
LABPH	5.53	6.98	5.97	5.81	6.59	6.14	5.98	6.69	6.24	
AIREQPH	5.75	7.04	6.24	6.24	6.90	6.56	6.50	7.22	6.72	
TRUECOLOR	10	30	20	30	45	38	25	40	32	Pt Co
SCONDUCT	20.31	26.29	22.92	16.87	20.14	18.28	15.86	22.09	19.08	µS cm^{-1}
TOTALP	na	na	na	1.15	17.58	5.86	2.23	13.19	4.99	µg L^1
CHLORA	na	na	na	0.47	4.03	2.39	0.53	2.63	1.81	µg L^1

Table 20.2 Lake Characteristics

Parameter	Value
Elevation	524 m
Maximum depth	10.1 m
Mean depth	3.0 m
Volume	273.3 x 10^4 m^3
Surface area	90.5 ha
Watershed area	14,155.6 ha
Watershed ratio	0.01
Hydraulic retention time (year)	0.03
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Eagle Bay
Land use classification	Private, Moderate Intensity use and Resource Management

Table 20.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total
Oct-1986	Atlantic salmon	1	155	155	110	1
Oct-1986	Brook trout	1	185	185	60	1
Oct-1986	Common shiner	5	95	167	857	42
Oct-1986	Creek chub	16	166	205	1020	16
Oct-1986	White sucker	25	175	385	4920	135
Oct-1986	Brown bullhead	25	135	295	2190	25
Oct-1986	Banded killifish	2	43	50	3	2
Oct-1986	Rock bass	6	90	211	575	6
Oct-1986	Pumpkinseed	6	152	175	430	6
Oct-1986	Yellow perch	25	141	327	2265	73
Oct-2000	Brook trout	1	490	490	1231	1
Oct-2000	Golden shiner	35	80	175	304	35
Oct-2000	Common shiner	19	37	153	-	19
Oct-2000	Creek chub	8	101	246	611	8
Oct-2000	White sucker	37	159	435	8700	103
Oct-2000	Brown bullhead	38	96	250	2382	73
Oct-2000	Banded killifish	1	87	87	4	1
Oct-2000	Pumpkinseed	3	104	126	73	3
Oct-2000	Smallmouth bass	1	313	313	456	1
Oct-2000	Largemouth bass	3	67	320	529	3

Figure 20.3 Chemistry Time Series

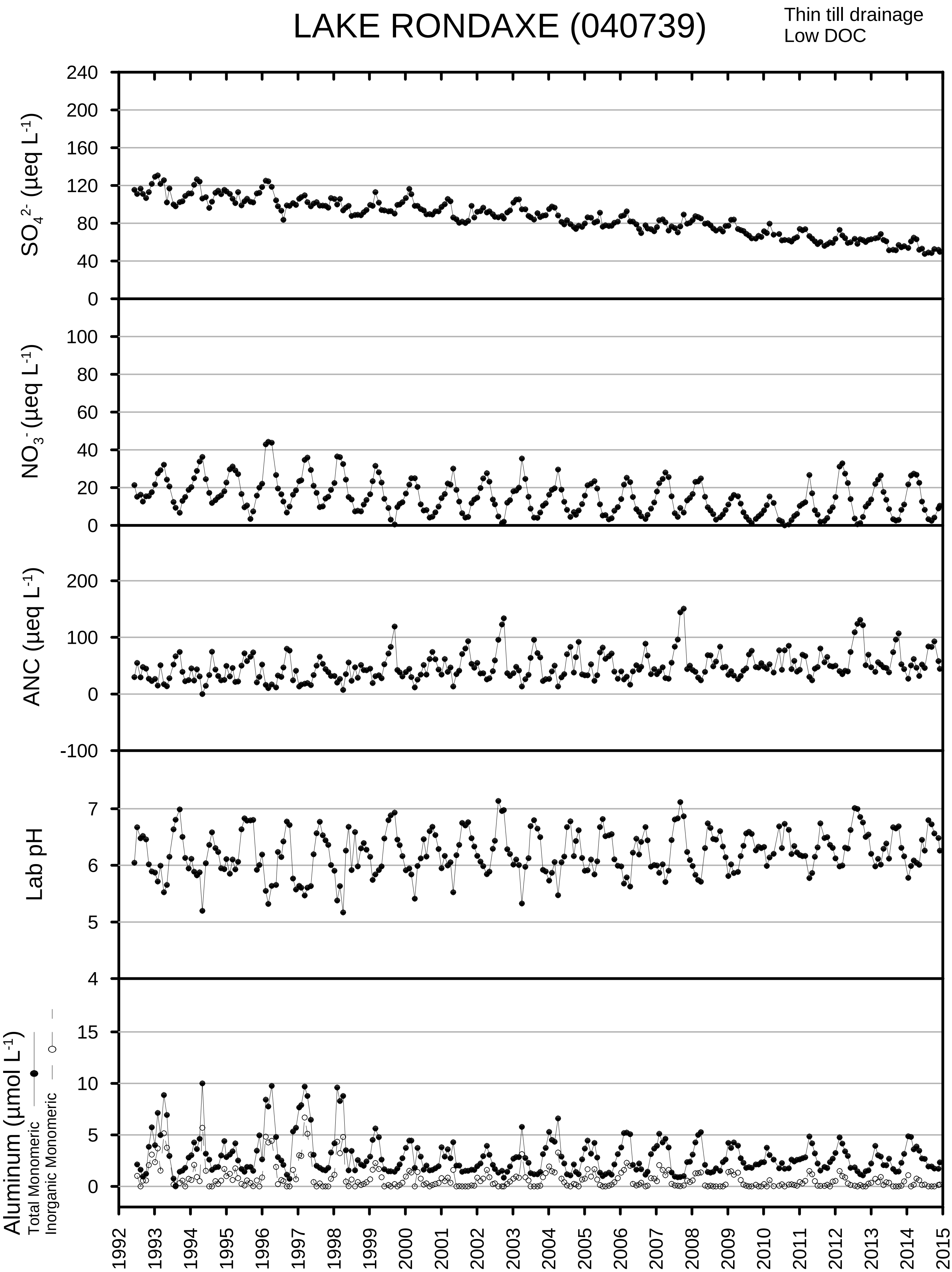


Table 20.3 Netting History cont'd

Oct-2000	Yellow perch	44	110	264	198	44
Sep-2009	Brook trout	4	309	389	1718	4
Sep-2009	Golden shiner	11	80	95	75	11
Sep-2009	White sucker	35	177	476	26196	53
Sep-2009	Brown bullhead	20	237	338	6859	20
Sep-2009	Banded killifish	6	28	56	6	6
Sep-2009	Rock bass	24	126	210	1895	24
Sep-2009	Pumpkinseed	6	120	208	630	6
Sep-2009	Smallmouth bass	3	153	399	1683	3
Sep-2009	Largemouth bass	10	70	370	1518	10
Sep-2009	Yellow perch	23	55	252	621	23

Watershed disturbance: The 1916 fire protection source data reveal 86.3% of the watershed as green timber of virgin and second growth with no slash; 6.8% of the watershed as logged for softwoods only with considerable amounts of slash; 0.1% as logged for both softwood and hardwood with much slash; and 0.5% is shown as a burned over area. Portions of the Lake Rondaxe watershed were disturbed by the November 1950 storm in which 0.9% received 25 to 50% blowdown and 21.6% of the area 50 to 100% blowdown damage. The July 1995 microburst storm damaged 92.6% of the area with 0-30% change in tree crowns, 5.5% with a 30-60% change, and 1.9% with 60-100% change (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Moss Lake 040746

EPA ID:1A1-109O

ALSC Staff Photo 2015

Lake: Moss Lake lies in the Oswegatchie-Black watershed at 536 m. It has four inlets, one of which drains from Cascade Lake (040747) (Figure 21.1). The uncontrolled outlet flows into Lake Rondaxe (040739) approximately 2,600 m downstream. The lake has a maximum depth of 15.2 m (49.9 ft) (Figure 21.2).

Moss Lake is classified as a medium-till chain drainage lake, with low dissolved organic carbon (<500 μmol L^{-1}-C). The lake is considered moderately sensitive to acidification. This is one of the original ALS lakes monitored on a monthly basis since June 1982.

Lake chemistry: Moss Lake was sampled near its deepest point during the ALS on July 28, 1986 finding: Lab pH 6.80, ANC 72.5 μeq L^{-1}, SO_4^{-2} 132.21 μeq L^{-1}, NO_3^- 4.05 μeq L^{-1}, Ca^{2+} 128.25 μeq L^{-1}, Mg^{2+} 41.97 μeq L^{-1}, DOC 382.98 μmol L^{-1}-C (ALSC 1987). Table 21.1 summarizes recent ALTM chemistry taken at the outlet. Major analytes through 2013 are shown in Table 21.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 21.3 with spring melt data shown in red.

Aquatic biota: On July 28, 1986, submergent aquatic plants occupied 10% of the lake bottom. Identified were: Sparganium spp., Potamogeton spp., Scripus spp., Pontederia spp., Eriocaulon spp., Nuphar spp., Nymphaea spp., Utricularia spp. and Lobelia spp. On September 23, 1986, emergent and floating plants each occupied 1% of the surface. Submergent vegetation covered 1% of the bottom. A dip-net survey on the same date found the

Figure 21.1 Catchment

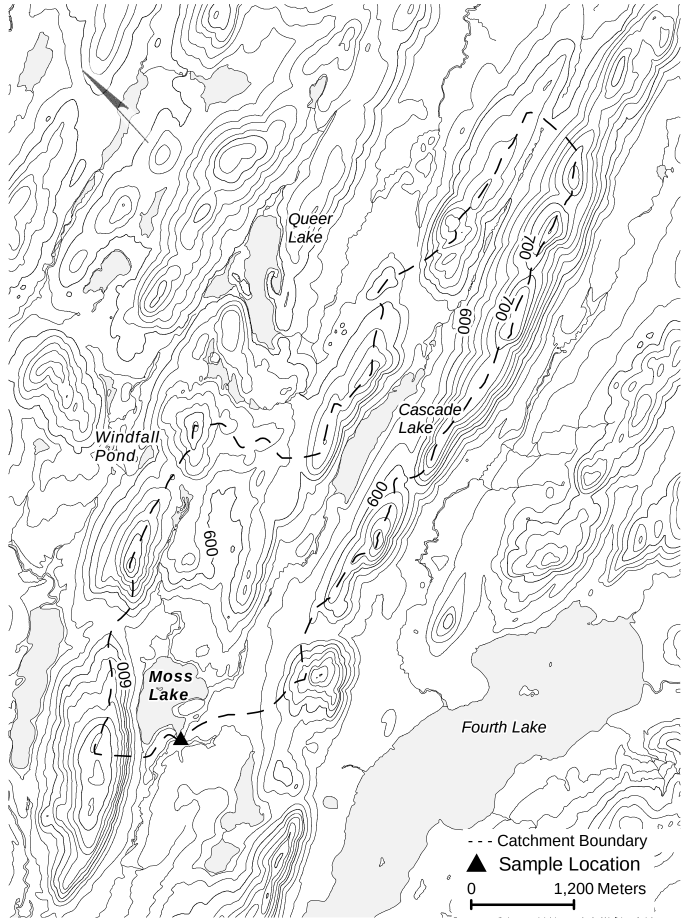
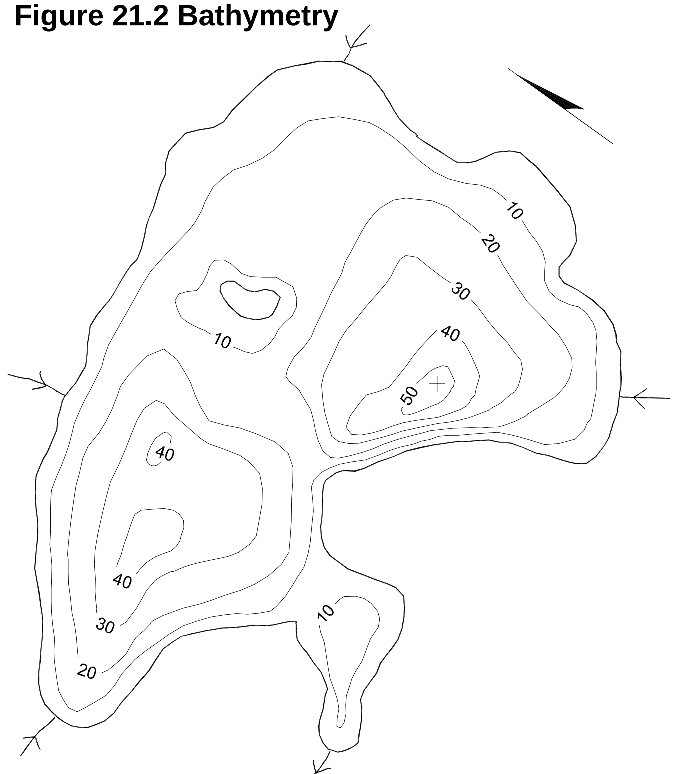


Figure 21.2 Bathymetry



Maximum Depth (+): 50 ft
Source: NYSDEC 1978, ALSC Rec'd c.1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	43.78140	-74.85299	43° 46′ 53.0″ N	074° 51′ 10.7″ W
Lake centroid	43.78559	-74.85002	43° 47′ 08.1″ N	074° 51′ 00.1″ W

Table 21.1 Lake Chemistry

040746			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	106.81	143.03	120.63	69.76	96.03	82.98	55.47	77.90	66.69	μeq L^{-1}
NO_3^-	12.52	39.03	22.37	3.70	23.15	11.50	0.88	37.26	15.01	μeq L^{-1}
Cl^-	9.03	12.97	10.72	9.77	12.99	11.36	10.61	16.68	13.24	μeq L^{-1}
F^-	5.95	7.26	6.40	4.66	6.76	5.94	4.74	6.39	5.64	μeq L^{-1}
ANC	26.72	88.42	62.10	41.48	107.13	82.21	60.16	121.18	90.07	μeq L^{-1}
DIC	72.43	207.31	121.55	94.91	171.51	124.59	102.30	195.22	144.56	μmol L^{-1}-C
DOC	216.30	446.09	297.78	278.19	391.30	315.41	289.62	442.93	371.02	μmol L^{-1}-C
SiO_2	88.04	147.29	119.23	81.72	140.80	105.90	77.43	130.77	103.60	μmol L^{-1}
Ca^{2+}	111.78	177.16	141.60	88.33	134.17	121.16	104.41	129.10	116.06	μeq L^{-1}
Mg^{2+}	32.92	50.20	43.41	25.51	42.96	38.44	31.26	42.23	37.00	μeq L^{-1}
Na^+	27.40	44.80	35.12	26.53	43.06	37.46	35.31	43.31	39.77	μeq L^{-1}
K^+	5.88	11.25	9.74	5.88	8.72	7.97	7.25	9.82	8.69	μeq L^{-1}
NH_4^+	0.00	2.61	1.16	-0.52	1.55	0.28	-0.28	2.41	0.86	μeq L^{-1}
AL_TD	1.07	10.45	5.21	0.94	6.67	3.30	1.18	7.25	3.77	μmol L^{-1}
AL_TM	0.69	7.47	2.87	1.46	3.93	2.26	1.48	3.61	2.25	μmol L^{-1}
AL_OM	0.48	3.91	1.80	1.64	3.34	2.15	1.41	3.23	2.07	μmol L^{-1}
AL_IM	0.19	3.56	1.07	0.00	1.07	0.20	0.00	0.60	0.21	μmol L^{-1}
LABPH	5.61	6.82	6.22	5.95	6.88	6.39	6.14	6.95	6.49	
AIREQPH	6.03	7.19	6.59	6.54	7.16	6.89	6.77	7.21	6.99	
TRUECOLOR	10	30	20	25	35	30	20	35	28	Pt Co
SCONDUCT	23.65	30.13	26.80	18.38	25.77	23.55	20.46	25.35	23.51	μS cm^{-1}
TOTALP	na	na	na	2.22	6.53	3.67	3.18	8.54	4.27	μg L^1
CHLORA	na	na	na	0.34	3.27	1.73	0.49	5.40	2.31	μg L^1

Table 21.2 Lake Characteristics

Parameter	Value
Elevation	536 m
Maximum depth	15.2 m
Mean depth	5.7 m
Volume	259.8 x 10^4 m^3
Surface area	45.7 ha
Watershed area	1234.6 ha
Watershed ratio	0.04
Hydraulic retention time (year)	0.28
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Eagle Bay
Land use classification	Fulton Chain Wild Forest

following Insecta: Odonata Coenagriidae, Cordulegastridae, Gomphidae and Aeshnidae; Diptera Chironomidae; and Hemiptera Gerridae. Also found were Crustacea Amphipoda Unspecified; Hirudinea Unspecified; and Demospong Haplosclerina Spongillidae (ALSC 1987).

The lake was thermally stratified between 6.0 and 8.0 m on July 28, 1986 (ALSC 1987). Bukavecas and Shaw (1998) found phosphorus as the limiting nutrient and chlorophyll a averages of 1.76 μg L-1 in 1990 and 1991. The AEAP reported an average value of chlorophyll a of 2.84 μg L-1 in 2003 (Momen et al. 2006).

Fisheries: The earliest records show Moss Lake stocked with brook and lake trout in 1898. In addition to the ALS fisheries survey on September 23, 1986, the ALSC netted the lake on August 21, 2000 and October 26, 2010 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 21.3 and 21.4 for recent fish stocking and netting histories.

Intensive studies: The RILWAS and NBMR studied the lake in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Moss Lake was used as

Figure 21.3 Chemistry Time Series

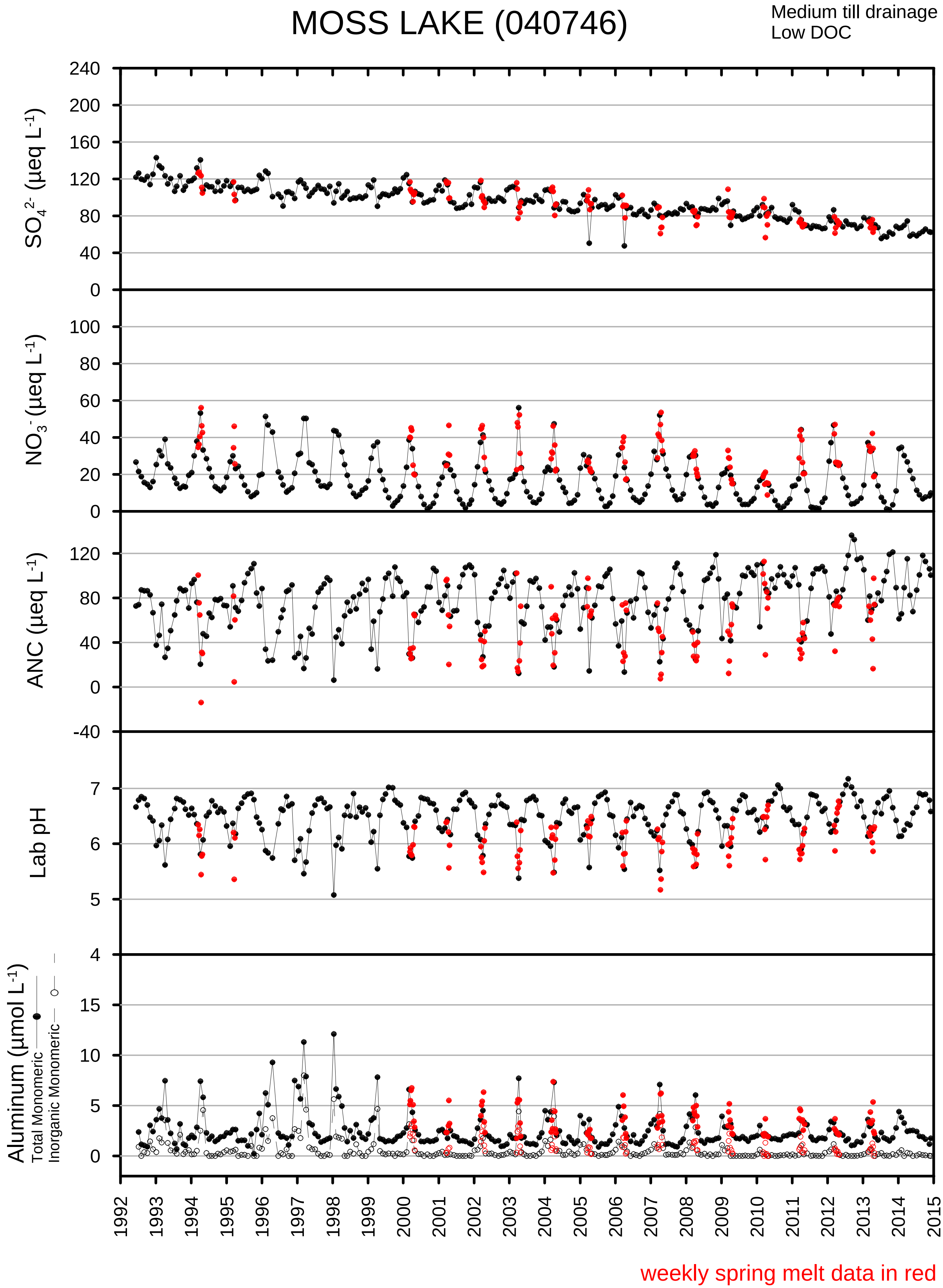


Table 21.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1986	Lake trout	6000	14
1986	Brook trout	2500	82
1987	Brook trout	33500	105
1988	Brook trout	5000	8
1989	Lake trout	3700	99
1990	Lake trout	1000	45
1992	Brook trout	4000	143
1993	Lake trout	3000	294
1994	Brook trout	7500	379
1995	Lake trout	2000	421
1998	Lake trout	2000	24
2000	Brook trout	6000	97
2010	Lake trout	2000	128

Table 21.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1986	Brook trout	12	176	335	1565	12
Sep-1986	Central mudminnow	1	96	96	9	1
Sep-1986	Golden shiner	1	97	97	10	3
Sep-1986	Common shiner	22	86	162	659	22
Sep-1986	White sucker	25	177	456	7325	85
Sep-1986	Brown bullhead	12	113	228	1100	12
Sep-1986	Pumpkinseed	1	129	129	40	1
Sep-1986	Yellow perch	25	142	235	1350	329
Aug-2000	Brook trout	3	266	330	1030	3
Aug-2000	Lake trout	1	625	625	2600	1
Aug-2000	Central mudminnow	1	89	89	8	1
Aug-2000	Golden shiner	25	85	109	215	30
Aug-2000	Common shiner	29	28	150	188	101
Aug-2000	Creek chub	35	54	110	206	82
Aug-2000	White sucker	26	200	450	9396	47
Aug-2000	Brown bullhead	10	75	233	466	10
Aug-2000	Pumpkinseed	39	21	115	-	40
Aug-2000	Largemouth bass	5	84	93	41	5
Aug-2000	Yellow perch	73	105	284	-	73
Oct-2010	Brook trout	1	105	-	9	1
Oct-2010	Lake trout	9	468	618	16643	9
Oct-2010	Rainbow smelt	7	130	150	102	7
Oct-2010	Golden shiner	7	164	193	455	7
Oct-2010	Common shiner	2	156	165	86	2
Oct-2010	White sucker	26	221	471	13207	85
Oct-2010	Brown bullhead	9	220	308	2404	9
Oct-2010	Pumpkinseed	10	104	180	542	10
Oct-2010	Largemouth bass	12	168	404	5228	12
Oct-2010	Yellow perch	27	150	328	2032	48

a comparison lake in the LAMP study (Heinemann et al. 1985). A phytoplankton and zooplankton experiment was conducted in 1990 (Bukaveckas and Shaw 1998). The AEAP has studied the lake since 1994 (Momen et al. 2006). During the 1986 and 1987 snowmelt, Schaefer and Driscoll (1993) evaluated episodic acidification at the outlet. Moss Lake was studied by the Mercury Response Project to evaluate mercury in fish. The lake was sampled on October 6, 1992 and September 27, 2006 (Dittman and Driscoll 2009). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). NBMR evaluated the recovery of fisheries in this water in 2000 (Raynal et al. 2004). Common loons were surveyed for mercury content in 1998–2000 (Schoch and Evers 2002) and again in 2003–2004 (Schoch et al. 2004). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Soils: The NBMR study sampled this watershed for soils, mineralogy and chemistry of surficial materials (Newton et al. 1987). General soils maps are available for the area (NYSDEC 1990). A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 15 km southwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The northern area of the watershed is underlain by interlayered metasedimentary rock and granitic gneiss with medium to high ANC. The main body of the watershed (60%), in which Moss Lake lies, is underlain by biotite and/or hornblende granite gneiss with low to no ANC. The watershed south of the inlet from Cascade Lake along Moss Lake is undivided metasedimentary rock and related migmatite with medium to high ANC. There is a small band (12%) of charnockite, mangerite, pyroxene-quartz syenite gneiss, with low to no ANC, that extends the length of the southern boundary of the watershed (Roy et al. 1997). The watershed is composed of 66% till; 23.0% outwash sand and gravel, 0.7% kame deposits, with 10.3% exposed bedrock (ALSC 2003). Glacial tills comprise the low lying areas surrounding Moss Lake. Basal tills occur in the wetland areas draining Cascade Lake and the wetlands of an unnamed pond to the north. Rock outcrops and shallow (<50 cm) soils occur above 600 m. The highest elevation in the watershed is 740 m at Cascade Mountain. The watershed has a maximum relief of 204 m. In 1986, the ALS found the shoal water substrate comprised of 74% sand and gravel, 25% bedrock/rubble/boulder, and 1% muck/silt (ALSC 1987).

Land cover/use: In 1986, deciduous-coniferous mixed forest covered 80% of the watershed, and the remaining cover was 17% deciduous forest and 3% shrub/sapling/wetland. The immediate shoreline vegetation was primarily deciduous-coniferous mixed forest (78%) with shrub/sapling (10%) and a small area of wetland (1%) near an inlet (ALSC 1987). Wetland area totals 117.8 ha and comprised 9.5% of the watershed (Roy et al. 1996). The predominant wetland types are forested needle-leaf evergreen (5%) and scrub/shrub broad-leaf deciduous (3.5%). A portion of these wetlands (29.8 ha) are associated with Cascade Lake. Virgin forest comprises 27.5% of the watershed and is located on the eastern half of Cascade Lake's watershed (ALSC 2003). The pond and southern watershed lie in the Fulton Chain Wild Forest (NYSDEC 1990). The watershed north of the Big Moose Road lies in the Pigeon Lake Wilderness. A trail exists around the lake, and numerous primitive campsites exist along the shore. There is a wooden foot bridge across the outlet and the pond is wheelchair accessible.

Watershed disturbance: The 1916 fire protection source data show 93.7% of the watershed as green timber with no slash. In 1950, the watershed was moderately impacted by a November storm that caused 50 to 100% blowdown in 13.2% of the watershed and 25 to 50% blowdown in 3.5% of the watershed. A July 1995 micro-burst storm moderately damaged 93.2% of the area with 0-30% change in tree crowns, and more heavily damaged 6.8% of the area with 30-60% change in tree crowns (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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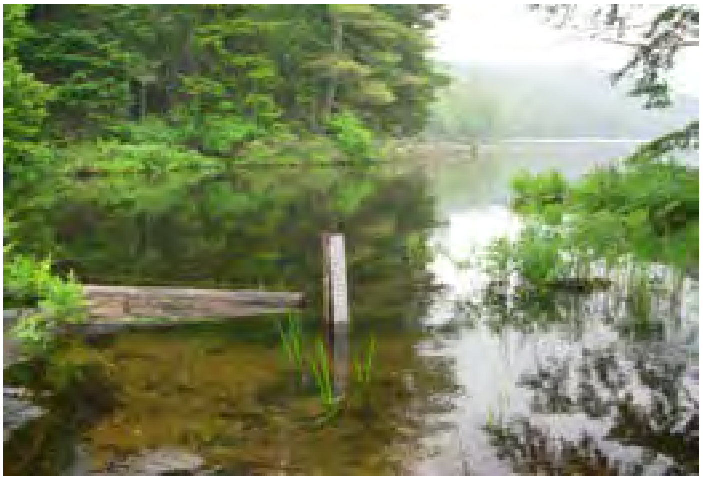
Cascade Lake 040747 and Cascade Lake Stream 040747A

EPA IDS: 1A1-105O and 1A1-105S



ALSC Staff Photo 2015 Cascade Lake

ALSC Staff Photo 2015 Cascade Lake Stream

Lake: Cascade Lake lies in the Oswegatchie-Black watershed at 557 m. This 40.4 ha headwater lake has one inlet. It drains through an unnamed 3.4 ha pond (040747A) approximately 300 m downstream, continues for another 2.0 km into Moss Lake (040746) and ultimately into the North Branch of the Moose River (Figure 22.1). In 1984, an active beaver dam was noted at the outlet (ALSC 1985). The lake reaches a maximum depth of 6.1 m (20.0 ft) (Figure 22.2).

Cascade Lake (040747) is classified as a medium-till chain drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered moderately sensitive to acidification. Cascade Lake Stream (Station 1, 040747A) is one of 17 original ALTM sites monitored on a monthly basis since June 1982. The sampling site is about 2.0 km downstream from the outlet of the lake, near Big Moose Road. Sampling at the Cascade Lake site (Station 1, 040747) started in June 1993. Sampling frequency at both sites was modified to seasonal in 2014.

Figure 22.1 Catchment

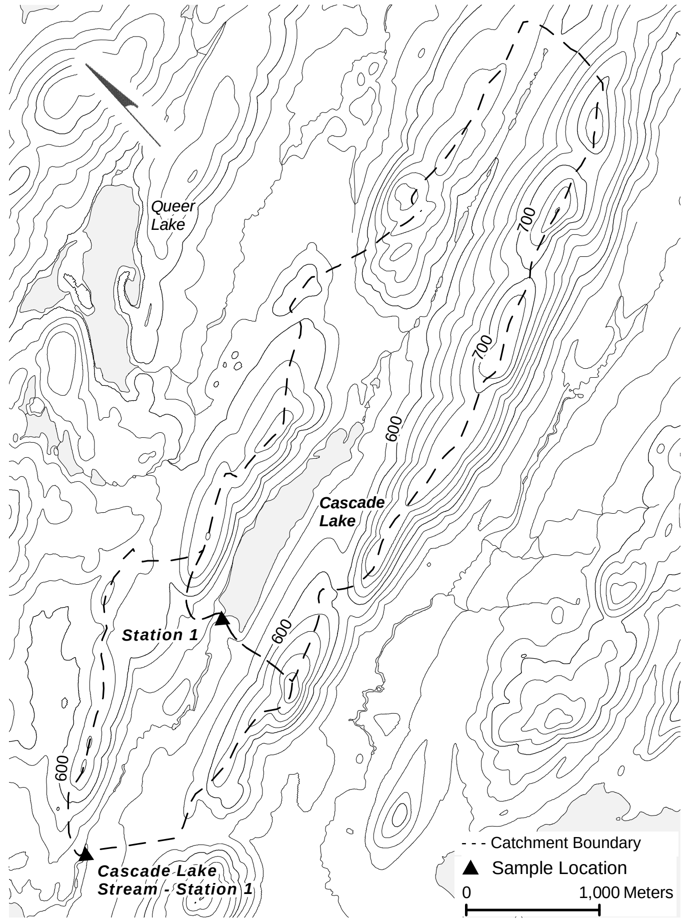
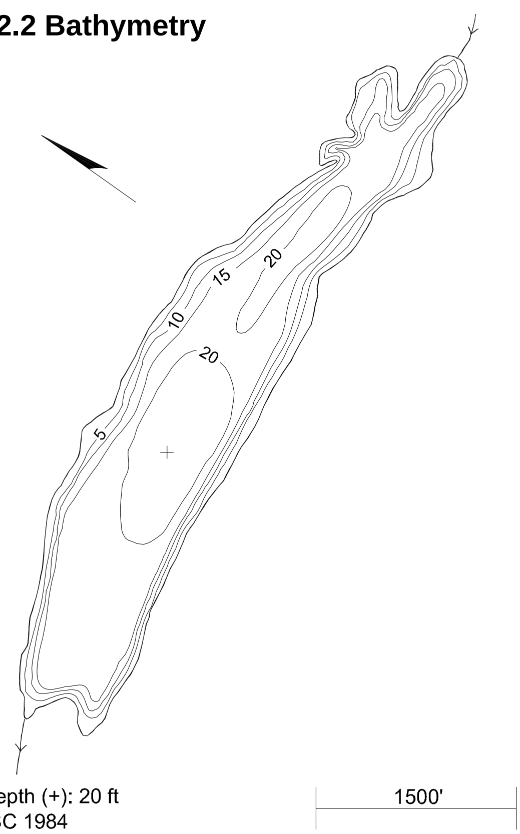


Figure 22.2 Bathymetry



Maximum Depth (+): 20 ft
Source: ALSC 1984

Table 22.1 Stream Chemistry (040747A)

040747A	1993			2009			2013			
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	106.60	132.21	121.19	74.73	101.28	83.85	47.27	73.25	60.92	µeq L^{-1}
NO_3^-	15.29	46.29	25.86	6.70	27.85	14.55	2.06	36.14	14.72	µeq L^{-1}
Cl^-	7.62	10.72	9.26	6.78	12.46	8.93	6.86	11.98	9.37	µeq L^{-1}
F^-	5.53	8.84	6.58	4.53	6.95	5.68	4.90	6.98	5.51	µeq L^{-1}
ANC	8.69	184.64	87.62	48.15	125.91	87.23	45.97	166.51	97.15	µeq L^{-1}
DIC	73.27	210.64	139.80	85.75	161.52	124.00	107.75	209.19	154.48	µmol L^{-1}-C
DOC	230.20	530.51	290.27	230.75	359.08	313.33	313.09	543.73	449.93	µmol L^{-1}-C
SiO_2	75.56	167.10	132.64	96.59	148.79	111.82	75.92	135.94	104.47	µmol L^{-1}
Ca^{2+}	118.77	208.10	157.86	101.30	141.72	122.65	88.33	148.35	118.45	µeq L^{-1}
Mg^{2+}	32.92	68.30	49.51	30.45	46.23	39.25	28.29	49.40	37.40	µeq L^{-1}
Na^+	24.36	53.94	39.95	26.53	49.15	38.36	30.09	51.91	39.98	µeq L^{-1}
K^+	8.70	11.77	10.25	5.37	9.46	7.67	7.29	13.55	9.16	µeq L^{-1}
NH_4^+	0.00	2.00	0.79	-0.50	1.12	0.25	-0.21	2.66	0.91	µeq L^{-1}
AL_TD	1.74	10.34	5.30	1.56	7.97	4.27	2.42	9.49	4.41	µmol L^{-1}
AL_TM	0.96	7.10	2.84	1.82	3.41	2.34	1.72	5.86	2.58	µmol L^{-1}
AL_OM	0.84	7.78	2.83	1.82	2.82	2.20	1.66	4.61	2.41	µmol L^{-1}
AL_IM	0.00	3.14	0.48	0.00	0.59	0.17	0.00	1.24	0.22	µmol L^{-1}
LABPH	5.71	7.14	6.30	6.05	6.80	6.43	6.02	6.80	6.41	
AIREQPH	5.81	7.41	6.59	6.58	7.26	6.95	6.55	7.32	6.96	
TRUECOLOR	15	45	22	25.00	45	32	25	60	40	Pt Co
SCONDUCT	23.65	35.88	29.17	19.70	27.66	23.90	19.72	27.49	23.06	µS cm^{-1}
TOTALP	na	na	na	2.03	6.67	4.03	2.43	9.20	6.28	µg L^{1}
CHLORA	na	na	na	na	na	na	na	na	na	µg L^{1}

Table 22.2 Lake Chemistry (040747)

040747	1993			2009			2013			
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	108.47	123.67	117.32	75.63	94.03	82.34	55.85	70.85	63.37	µeq L^{-1}
NO_3^-	12.69	24.16	16.53	4.03	21.76	12.26	0	50.3	17.16	µeq L^{-1}
Cl^-	7.62	9.31	8.27	6.15	8.77	7.03	5.95	7.93	7.15	µeq L^{-1}
F^-	3.68	5.53	4.94	3.43	5.00	4.21	3.85	5.15	4.4	µeq L^{-1}
ANC	29.63	60.46	49.07	16.22	69.23	54.02	35.6	92.42	70.48	µeq L^{-1}
DIC	39.13	91.58	67.71	60.78	203.14	115.14	79.03	183.5	121.91	µmol L^{-1}-C
DOC	186.66	276.83	215.73	235.78	349.68	267.55	264.05	414.58	335.48	µmol L^{-1}-C
SiO_2	66.90	95.70	84.13	60.88	105.35	85.59	85.89	111.29	96.4	µmol L^{-1}
Ca^{2+}	97.81	128.75	118.44	75.35	106.79	99.54	81.78	114.65	99.31	µeq L^{-1}
Mg^{2+}	34.56	41.97	39.09	23.04	35.05	31.80	28.13	36.7	31.79	µeq L^{-1}
Na^+	25.23	32.19	30.30	21.75	35.23	30.35	29.18	37.01	32.94	µeq L^{-1}
K^+	8.44	9.72	9.25	4.60	7.67	6.98	6.6	9.23	7.86	µeq L^{-1}
NH_4^+	0.39	1.61	0.90	-0.33	1.72	0.62	-0.37	3.08	0.77	µeq L^{-1}
AL_TD	0.67	3.78	2.19	0.47	15.71	4.40	0.37	9.39	3.6	µmol L^{-1}
AL_TM	0.74	1.38	1.02	1.60	5.41	2.34	1.33	4.64	2.24	µmol L^{-1}
AL_OM	0.37	0.77	0.53	1.67	9.56	2.61	1.13	3.16	1.94	µmol L^{-1}
AL_IM	0.29	0.82	0.49	0.00	2.08	0.30	0	1.65	0.37	µmol L^{-1}
LABPH	6.41	6.78	6.59	5.42	6.80	6.13	5.67	6.98	6.29	
AIREQPH	6.50	7.05	6.77	5.66	6.98	6.53	6.39	7.16	6.83	
TRUECOLOR	5	10	8	20	30	23.85	15	30	20	Pt Co
SCONDUCT	22.53	24.83	23.59	18.40	22.09	20.32	18.47	21.95	20.37	µS cm^{-1}
Total P	na	na	na	1.11	24.46	5.69	0.62	17.33	5.59	µg L^{-1}
Chlor a	na	na	na	0.46	2.36	1.46	0.58	23.30	7.53	µg L^{-1}

Table 22.3 Lake Characteristics

Parameter	Value
Elevation	557 m
Maximum depth	6.1 m
Mean depth	4.2 m
Volume	171.9 x 10^4 m^3
Surface area	40.4 m
Watershed area	498.8 ha
Watershed ratio	0.08
Hydraulic retention time (year)	0.46
Watershed	Oswegatchie/ Black
County, Town	Herkimer, Inlet
USGS Quadrangle	Eagle Bay
Land use classification	Pigeon Lake Wilderness

Figure 22.3 Chemistry Time Series / Stream site

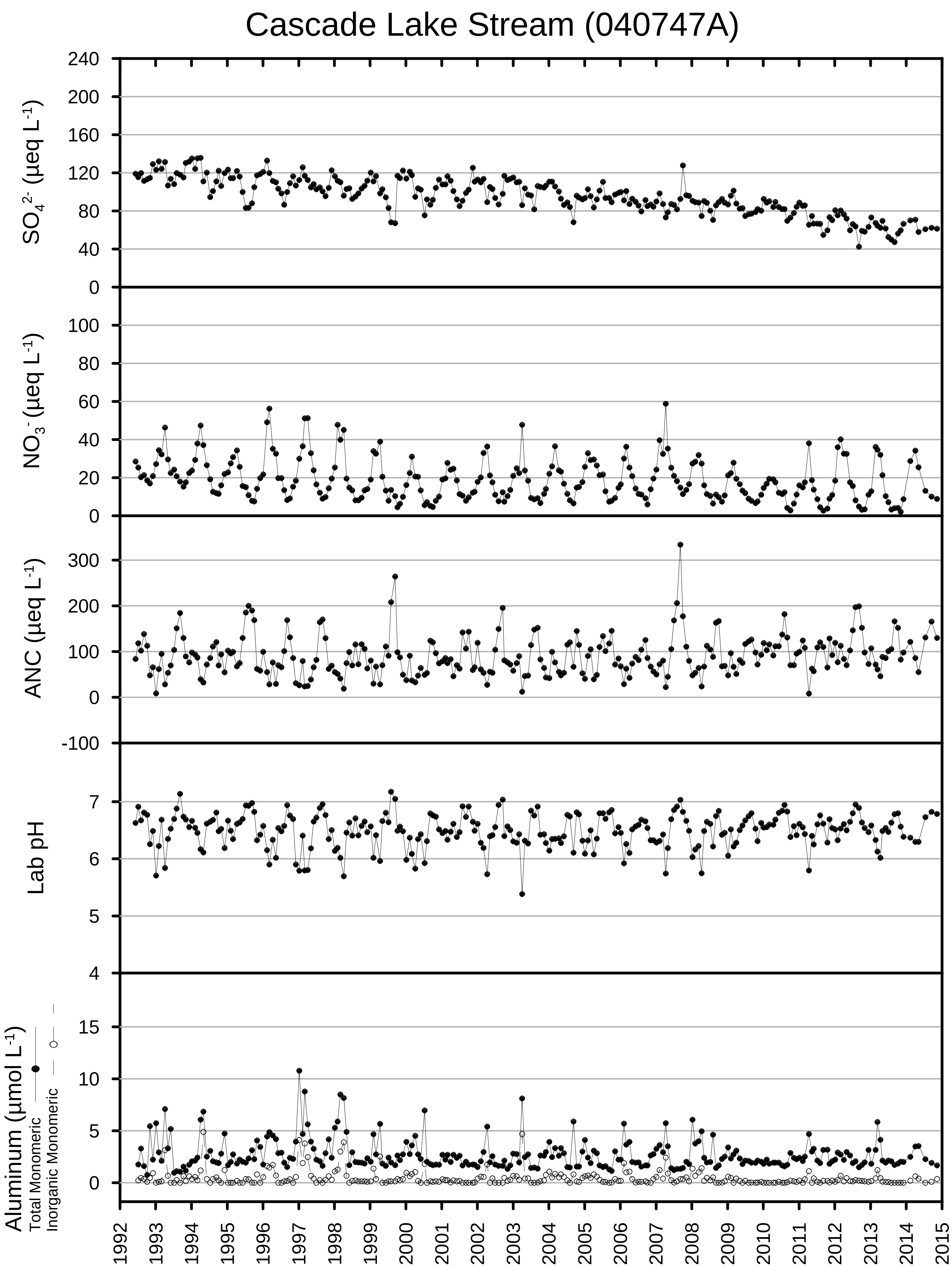
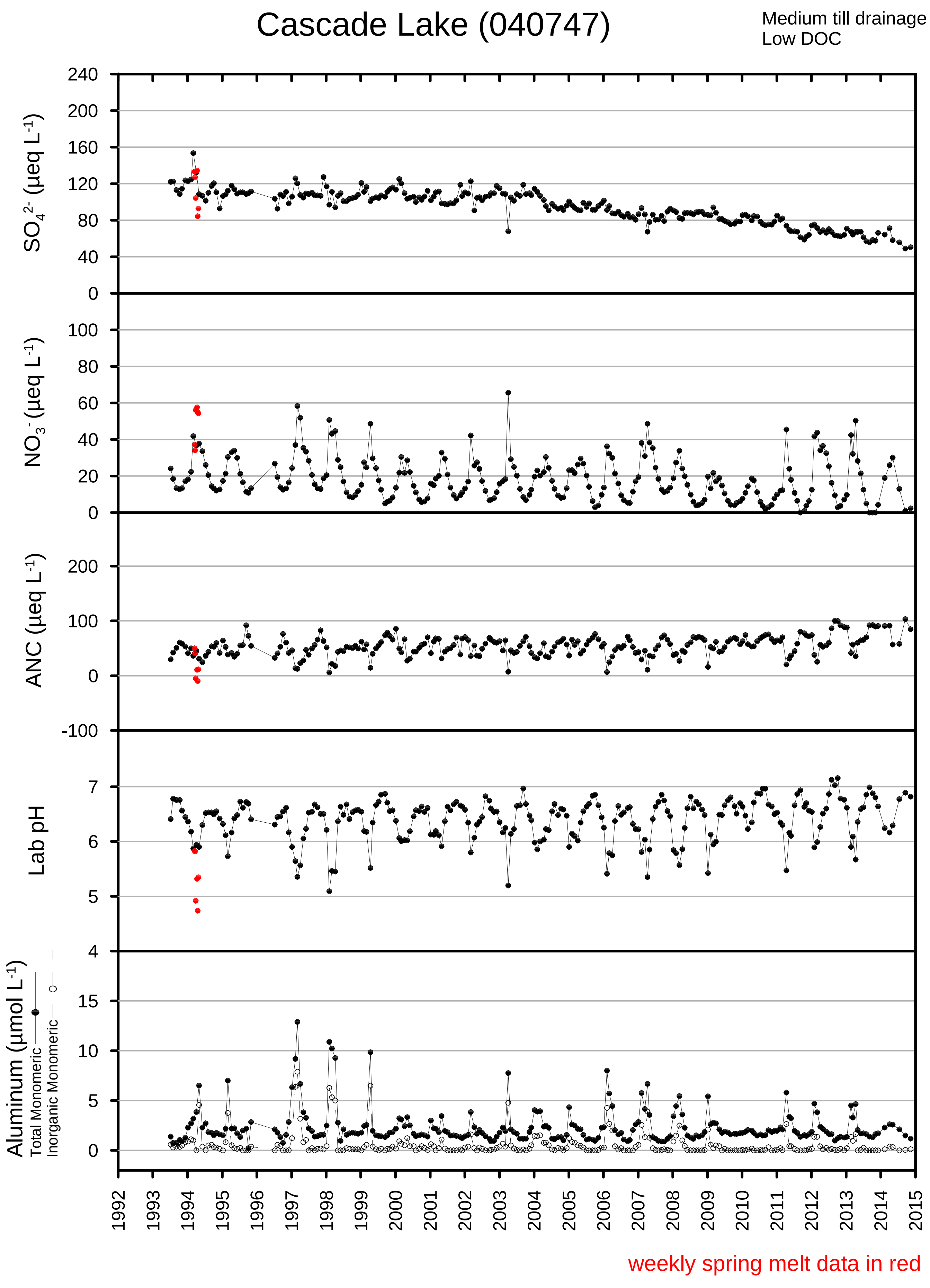


Figure 22.4 Chemistry Time Series / Lake site



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.ss	DDD MM SS.ss
Sample site - Stream	43.78369	-74.83659	43° 47' 01.27" N	074° 50' 11.73" W
Sample site - Lake	43.78910	-74.81204	43° 47' 20.76" N	074° 48' 43.34" W
Lake centroid	43.79166	-74.80148	43° 47' 29.97" N	074° 48' 05.32'' W

Table 22.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Jun-1984	Brook trout	5	133	287	572	5
Jun-1984	White sucker	68	-	-	13250	68
Jun-1984	Brown bullhead	9	-	-	750	9
Jun-1984	Yellow perch	135	-	-	6210	135
Jun-1999	Brook trout	3	200	319	562	3
Jun-1999	Golden shiner	28	80	125	243	52
Jun-1999	Common shiner	33	90	142	373	136
Jun-1999	Creek chub	8	90	192	195	8
Jun-1999	White sucker	25	190	463	11819	56
Jun-1999	Brown bullhead	9	180	218	717	9
Jun-1999	Pumpkinseed	10	57	134	228	10
Jun-1999	Yellow perch	31	80	270	1855	231
Sep-2010	Brook trout	1	270	-	196	2
Sep-2010	Creek chub	5	152	169	224	5
Sep-2010	White sucker	27	260	475	17274	49
Sep-2010	Brown bullhead	1	265	-	237	1
Sep-2010	Pumpkinseed	1	144	-	57	1
Sep-2010	Largemouth bass	7	95	395	1718	7
Sep-2010	Yellow perch	25	152	230	1680	82

Lake chemistry: Cascade Lake (040747) was sampled near its deepest point during the ALS on August 8, 1984 finding: Lab pH 6.70, ANC 54.7 μeq L^{-1}, SO_4^{2-} 128.67 μeq L^{-1}, NO_3^- 3.72 μeq L^{-1}, Ca^{2+} 126.25 μeq L^{-1}, Mg^{2+} 40.32 μeq L^{-1}, DOC 208.14 μmol L^{-1}-C (ALSC 1985). Tables 22.1 and 22.2 summarize recent ALTM chemistry taken at Cascade Lake and Stream. Major analytes for Cascade Lake Stream (040747A) through 2013 are shown in Table 22.1, including total phosphorus (TP). Major analytes for Cascade Lake through 2013 are shown in Table 22.2, including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figures 22.3 and 22.4.

Aquatic biota: During the summers of 1983 and 1984, the Adirondack Biota Project found average lake chlorophyll a values of 2.20 and 1.96 μg L^{-1}, respectively. Average total phosphorus values were 5.0 and 6.0 μg L^{-1}; and Secchi depths were 5.5 and 4.3 m. During May, July, and November 1984, the phytoplankton community was dominated by Dinobryon bavaricum, Merismopedia tenuissima, and Cyclotella glomerata, respectively. Kellicottia longispina was the dominant rotifer in May and November, but in July Conochilus hippocrepis was most prominent. Diaptomus minutus was the dominant crustacean zooplankton during all three months (Sutherland 1989). In 2003, the average lake chlorophyll a was 1.28 μg L^{-1} (Momen et al. 2006).

On June 11, 1984, the ALS macrophyte survey of the lake found Utricularia spp. A dip-net survey on that day identified Crustacea Decapoda Astacidae (ALSC 1985). The ALS found the lake isothermal on August 9, 1984 (ALSC 1985).

Fisheries: The DEC stocked brook trout in the lake from 1964–1979 (ALSC 1985). In addition to the ALS fisheries survey on June 12, 1984, the ALSC netted the lake on June 16, 1999 and September 27, 2010 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 22.4 for netting history.

Intensive studies: Cascade Lake was surveyed during 1982–1984 as part of the DEC Biota Project (Sutherland 1989). The RILWAS and NBMR studied the Cascade Lake and Cascade Lake Stream in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). During 1986 and 1987 snowmelt, Schaefer and Driscoll (1993) evaluated episodic acidification at the outlet. NBMR evaluated the recovery of fisheries in this water in 2000 (Raynal et al. 2004). The lake has been studied by the AEAP starting in 1994 (Momen et al. 2006). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995).

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b). The NBMR study sampled nine sites within this watershed for soils, mineralogy, and chemistry of surficial materials (Newton et al. 1987).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 18 km southwest of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Cascade Lake Stream watershed lies predominately (65%) on biotite and/or hornblende granite gneiss with low to no ANC. Smaller areas of interlayered metasedimentary rock and granitic gneiss (1%) and undivided metasedimentary rock and related migmatite (14%), both with medium to high ANC, are found in the northern and southwestern portions, respectively. Charnockite, magerite, and pyroxene-quartz syenite gneiss, with no to low ANC, compose approximately 20% of the watershed along the southern boundary (Roy et al. 1997). Till comprises 78% of the watershed while 12% of the watershed is exposed bedrock found at elevations above 600 m in the southeast. The remaining 10% is classified as outwash sand and gravel and contains a majority of the outlet stream. Basal tills are found along the southern shoreline and areas to the northeast along the inlet stream (APA 2001). Cascade Mountain, at 762 m, is the highest elevation in the watershed. The watershed has a maximum relief of 205 m. In 1984, the ALS found the shoal water substrate around the lake comprised of 80% rubble and gravel; 15% sand; 3% muck/silt and 2% boulders (ALSC 1985).

Land cover/use: In 1984, the ALS described the watershed as: 60% deciduous forest and 40% coniferous forest (ALSC 1985). Virgin forest stands dominate the eastern portion of the watershed (ALSC 2003). The immediate shoreline is primarily a deciduous-coniferous forest mix (90%) with some shrub/sapling areas (10%) (ALSC 1985). Total wetland area is 29.8 ha and comprises 6.0% of the watershed (Roy et al. 1996). The predominant wetland types are forested needle-leaf evergreen and scrub/shrub broad-leaf deciduous covering 2.7% and 2.1% of the watershed, respectively. These wetlands occur primarily along the inlet stream. The lake and its watershed lie in the Pigeon Lake Wilderness. A trail goes around the lake and there are a number of primitive campsites on the shoreline (NYSDEC 1992).

Watershed disturbance: The 1916 fire protection source data show 92.1% of the Cascade Lake watershed as virgin and second growth green timber with no slash. The watershed was moderately impacted by the November 1950 storm as 19.5% of the watershed incurred 50-100% blowdown, while 8.7% of the watershed incurred 25-50% blowdown. The July 1995 microburst storm also caused moderate forest damage that impacted 98.5% of the watershed with 0 to 30% change in tree crowns. The remaining 1.5% incurred 30-60% change in tree crowns (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Bubb Lake and Bubb Lake Stream 040748

EPA IDS: 1A1-113O and 1A1-113S

ALSC Staff Photo 2015 Bubb Lake

ALSC Staff Photo 2015 Bubb Lake Outlet

Lake: Bubb Lake lies in the Oswegatchie-Black watershed at 554 m. This 18.2 ha lake has two inlets on the western shore. The primary inlet originates from Sis Lake, while the secondary inlet is intermittent (ALSC 1987). The lake drains north into the North Branch of the Moose River approximately 4.0 km downstream (Figure 23.1). In 1986, an active beaver dam was noted at the outlet (ALSC 1987). Bubb Lake reaches a maximum depth of 4.3 m (14.1 ft) (Figure 23.2).

Bubb Lake is a thin-till chain drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). It is considered sensitive to acidification. The Bubb Lake Stream site (Station 1) is one of the 17 original ALTM sample sites and has been monitored monthly since June 1982. Station 1 is 1100 m downstream from the lake, immediately upstream of the confluence with the outlet of Moss Lake (040746). The ALTM program began collecting a monthly sample at the outlet of the lake (Station 2) in June 1993 (Figure 23.1). Station 2 was monitored on a weekly basis during snowmelt from March 2002 until 2014. Sampling frequency at both sites was modified to seasonal in 2014.

Figure 23.1 Catchment

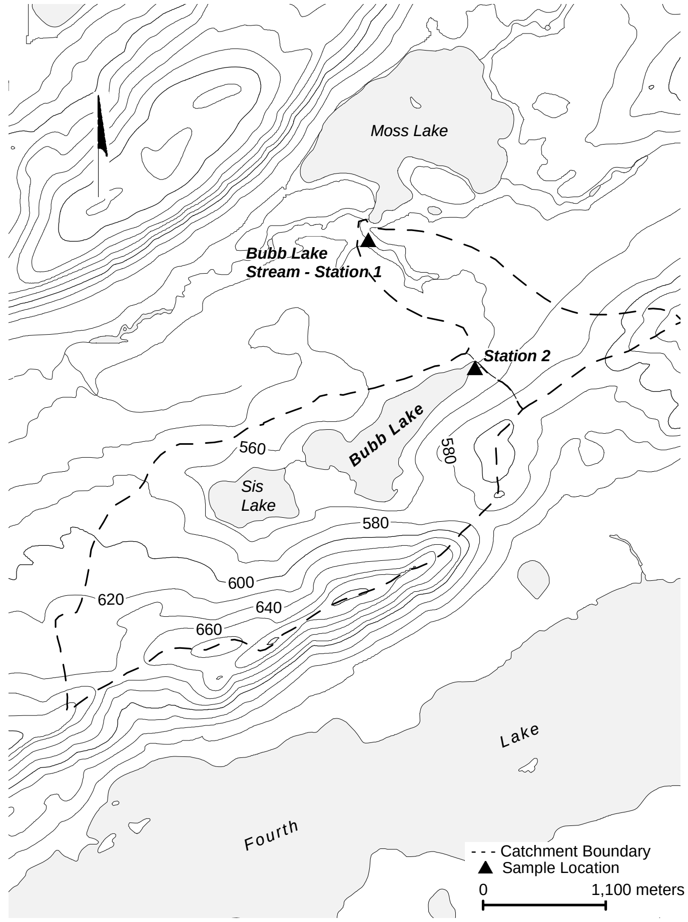
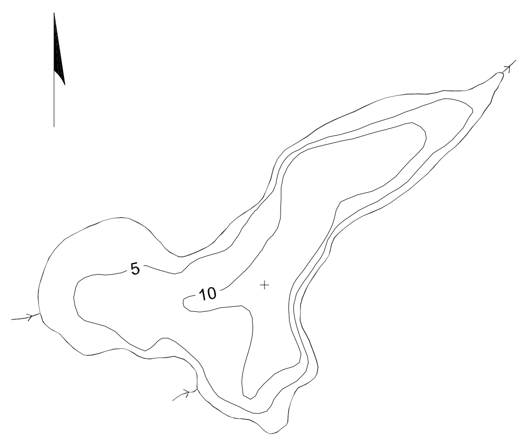


Figure 23.2 Bathymetry



Maximum Depth (+): 14 ft
Source: NYSDEC, ALSC Rev. 1986

1250'

Table 23.1 Stream Chemistry (Station 1)

040748		1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	86.61	119.92	105.64	72.12	82.93	76.50	57.50	76.13	66.79	µeq L^{-1}
NO_3^-	1.15	34.68	13.79	1.18	18.08	7.74	3.09	33.62	15.02	µeq L^{-1}
Cl^-	6.21	8.74	7.83	6.39	8.64	7.27	6.26	8.65	7.31	µeq L^{-1}
F^-	3.21	5.58	4.58	3.28	4.63	3.96	3.75	4.93	4.20	µeq L^{-1}
ANC	15.48	51.17	34.23	34.77	54.55	45.20	46.77	81.33	66.68	µeq L^{-1}
DIC	43.29	104.90	71.18	66.60	83.26	76.21	94.07	127.76	105.09	µmol L^{-1}-C
DOC	193.15	406.96	261.64	242.52	355.09	281.61	216.37	302.67	264.56	µmol L^{-1}-C
SiO_2	30.12	101.36	67.64	38.61	72.90	53.83	41.33	73.77	58.82	µmol L^{-1}
Ca^{2+}	89.33	124.76	101.39	77.49	90.82	84.10	87.99	99.55	94.82	µeq L^{-1}
Mg^{2+}	26.33	41.14	35.52	27.16	31.06	29.46	27.80	36.21	32.30	µeq L^{-1}
Na^+	20.01	33.93	29.72	26.53	33.06	30.89	32.24	38.56	34.28	µeq L^{-1}
K^+	5.63	10.23	8.80	6.65	8.70	7.54	7.56	11.59	8.68	µeq L^{-1}
NH_4^+	-0.44	3.27	1.06	-0.64	3.05	0.42	0.01	3.60	1.37	µeq L^{-1}
AL_TD	1.45	6.93	3.95	0.91	8.34	3.08	0.93	3.85	2.10	µmol L^{-1}
AL_TM	0.84	3.59	2.08	1.56	2.74	2.02	1.14	2.11	1.66	µmol L^{-1}
AL_OM	0.73	2.15	1.34	1.63	2.26	1.95	1.19	2.07	1.65	µmol L^{-1}
AL_IM	0.04	1.48	0.74	0.00	0.67	0.14	0.00	0.21	0.05	µmol L^{-1}
LABPH	5.70	6.52	6.13	6.13	6.55	6.34	6.47	6.82	6.58	
AIREQPH	5.87	6.81	6.36	6.53	6.90	6.71	6.82	7.12	6.93	
TRUECOLOR	15	40	20	25	30	28	15	25	18	Pt Co
SCONDUCT	17.54	23.96	21.25	17.39	19.90	18.10	18.53	21.91	20.18	µS cm^{-1}
TOTALP	na	na	na	2.54	10.41	5.42	2.07	11.09	4.99	µg L^{1}
CHLORA	na	na	na	2.25	2.25	2.25	na	na	na	µg L^{1}

Table 23.2 Lake Chemistry (Station 2)

040748		1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	99.94	105.97	102.40	69.20	84.00	73.96	58.09	71.79	63.76	µeq L^{-1}
NO_3^-	-0.23	14.21	3.19	0.00	21.14	7.08	0.00	34.48	13.12	µeq L^{-1}
Cl^-	6.77	9.87	7.99	6.21	8.97	7.15	6.26	8.58	7.20	µeq L^{-1}
F^-	3.79	5.16	4.50	3.11	4.30	3.73	3.56	4.51	4.10	µeq L^{-1}
ANC	18.79	43.60	35.96	16.40	56.00	46.05	52.59	82.45	69.78	µeq L^{-1}
DIC	42.46	112.40	79.51	60.78	228.95	111.07	104.67	240.84	149.17	µmol L^{-1}-C
DOC	217.30	328.36	263.09	238.69	345.10	280.74	208.61	281.25	258.46	µmol L^{-1}-C
SiO_2	23.63	52.59	33.73	25.76	68.24	44.06	30.91	71.18	48.78	µmol L^{-1}
Ca^{2+}	86.33	96.31	90.24	78.94	84.34	81.45	85.71	98.16	91.93	µeq L^{-1}
Mg^{2+}	32.92	40.32	37.17	26.33	31.77	28.99	30.12	33.41	31.79	µeq L^{-1}
Na^+	26.10	32.19	30.16	25.23	32.62	29.82	31.25	37.05	33.82	µeq L^{-1}
K^+	7.67	9.98	8.74	6.39	8.70	7.20	7.21	9.10	8.04	µeq L^{-1}
NH_4^+	-0.44	2.66	1.02	-0.81	4.60	0.44	0.37	4.07	1.68	µeq L^{-1}
AL_TD	0.26	2.04	1.24	0.20	7.26	2.94	0.12	5.73	2.13	µmol L^{-1}
AL_TM	0.44	1.38	0.97	1.46	3.85	2.22	1.11	2.85	1.74	µmol L^{-1}
AL_OM	0.57	1.75	1.02	1.52	2.63	1.93	1.01	2.38	1.66	µmol L^{-1}
AL_IM	0.00	0.41	0.17	0.00	1.52	0.34	0.00	0.50	0.13	µmol L^{-1}
LABPH	5.87	6.55	6.21	5.56	6.56	6.08	5.93	6.74	6.31	
AIREQPH	6.38	6.90	6.62	6.30	6.87	6.68	6.85	7.11	6.97	
TRUECOLOR	10	15	12	20	35	26	10	20	15	Pt Co
SCONDUCT	19.27	20.76	19.99	17.08	19.90	17.78	17.82	23.54	19.83	µS cm^{-1}
TOTALP	na	na	na	2.41	6.12	3.66	1.66	10.77	4.78	µg L^{1}
CHLORA	na	na	na	0.73	12.22	3.30	0.67	6.35	2.59	µg L^{1}

Table 23.3 Lake Characteristics

Parameter	Value
Elevation	554 m
Maximum depth	4.3 m
Mean depth	2.1 m
Volume	38.5 x 10^4 m^3
Surface area	18.2 ha
Watershed area	199.1 ha
Watershed ratio	0.09
Hydraulic retention time (year)	0.25
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Eagle Bay
Land use classification	Fulton Chain Wild Forest

Figure 23.3 Chemistry Time Series / Station 1

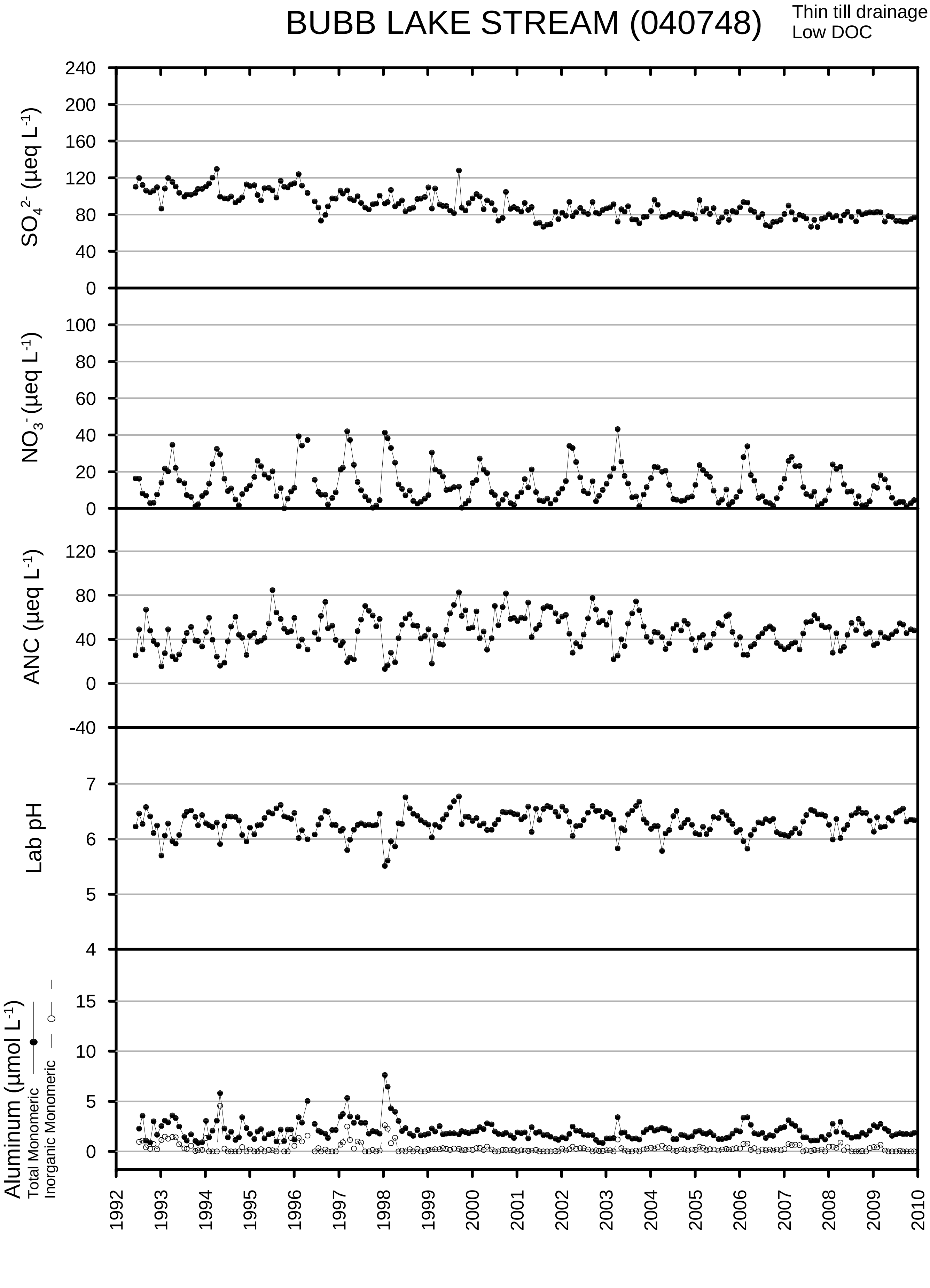
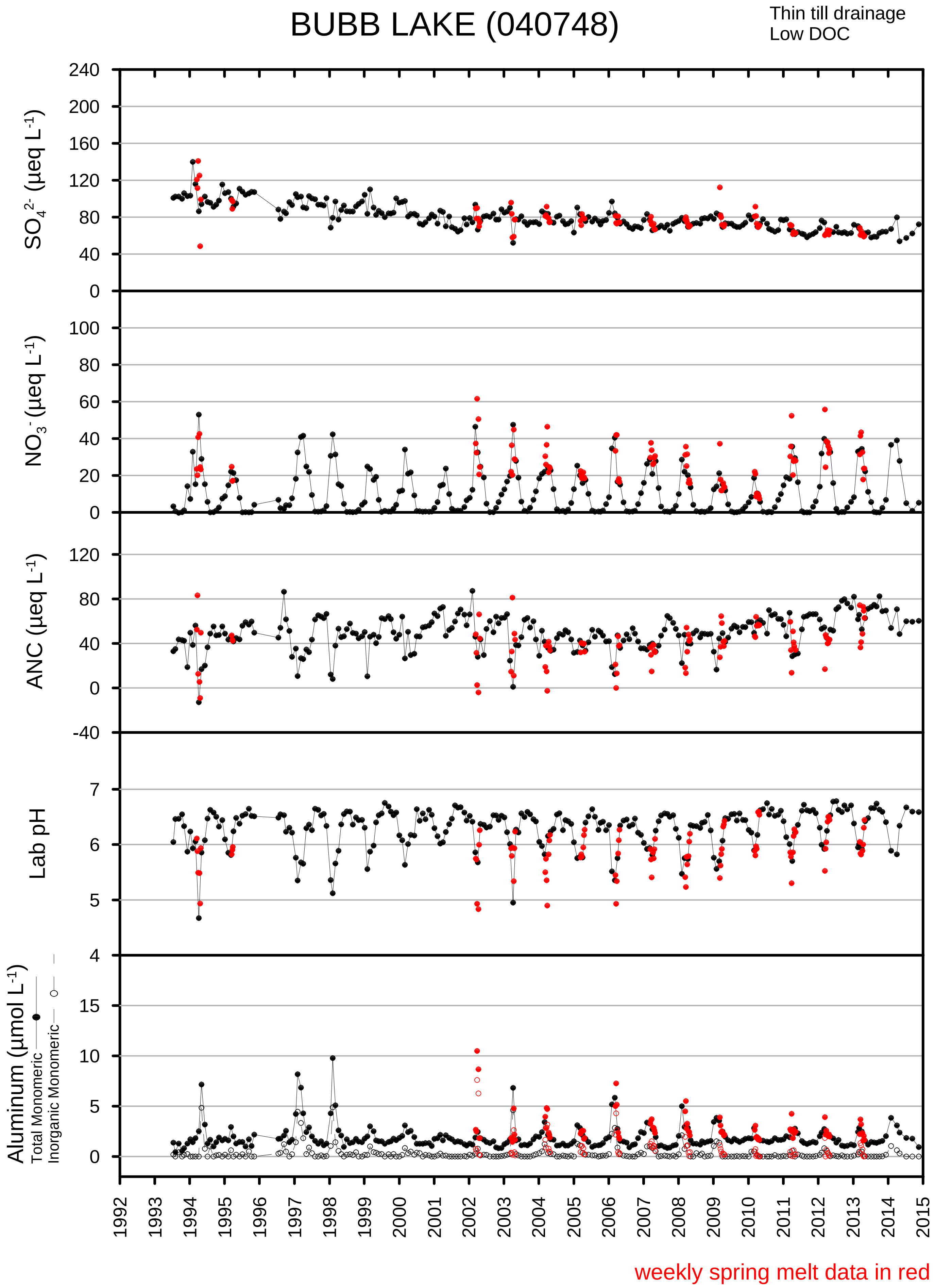


Figure 23.4 Chemistry Time Series / Station 2



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.ss	DDD MM SS.ss
Sample site - Stream	43.78088	-74.85339	43° 46′ 51.16″ N	074° 51′ 12.22″ W
Sample site - Lake	43.77499	-74.84641	43° 46′ 30.00″ N	074° 50′ 47.10″ W
Lake centroid	43.77136	-74.85223	43° 46′ 16.89″ N	074° 51′ 08.01″ W

Table 23.4 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	2850	34
1981	Brook trout	2160	68
1984	Brook trout	2076	77
1985	Brook trout	2640	59
1986	Brook trout	2400	73
1987	Brook trout	2400	21
1988	Brook trout	2400	26
1989	Brook trout	2640	28
1990	Brook trout	2400	103
1991	Brook trout	2400	35
1992	Brook trout	2400	58
1993	Brook trout	2400	86
1994	Brook trout	1900	63
1995	Brook trout	1860	-
1996	Brook trout	2000	38
1997	Brook trout	2100	39
1998	Brook trout	2100	27
1999	Brook trout	2000	30
2001	Brook trout	4147	136
2002	Brook trout	1800	9
2003	Brook trout	1800	37
2004	Brook trout	800	18
2005	Brook trout	500	8
2006	Brook trout	800	14
2007	Brook trout	800	11
2008	Brook trout	300	5
2009	Brook trout	1000	12
2010	Brook trout	800	10
2011	Brook trout	1000	15
2013	Brook trout	1000	14
2014	Brook trout	2000	15

Table 23.5 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-1986	Brook trout	25	175	375	6050	41
May-1986	Central mudminnow	1	65	65	3	1
May-1986	Brown bullhead	33	63	289	1745	68
Sep-1995	Creek chub	27	93	188	472	41
Sep-1995	White sucker	1	445	445	1000	1
Sep-1995	Brown bullhead	37	70	255	2408	435
Sep-1995	Pumpkinseed	26	55	136	454	28
Sep-1995	Yellow perch	30	92	255	2012	83
Sep-2009	Brook trout	8	153	373	2946	8
Sep-2009	Central mudminnow	11	47	98	63	11
Sep-2009	Brown bullhead	33	70	272	2544	80

Lake chemistry: Bubb Lake was sampled near its deepest point during the ALS on July 28, 1986 finding: pH 6.59, ANC 53.8 μeq L^{-1}, SO_4^{2-} 109.51 μeq L^{-1}, NO_3^- LTD, Ca^{2+} 85.83 μeq L^{-1}, Mg^{2+} 33.74 μeq L^{-1}, DOC 316.37 μmol L^{-1}-C (ALSC 1987). Table 23.1 summarizes recent ALTM chemistry taken at the Bubb Lake Stream site. Major analytes collected at Station 1 (Stream) through 2013 are shown in Table 23.1 including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes collected at Station 2 (Lake) appear in Table 23.2 including total phosphorus (TP) and chlorophyll a (Chl a). Plots for Station 1 (Stream) through 2014 appear in Figure 23.3, and plots for Station 2 (Lake) appear in Figure 23.4 with spring melt data in red.

Aquatic biota: On May 20, 1986, the ALS macrophyte survey found: Sparganium spp., Dulichium spp., Carex spp. Eriocaulon spp. and Lobelia spp. On the same day a dipnet survey identified the following Insecta: Ephemeroptera Ephemerellidae; Odonata Coenagriidae and Aeshnidae; Trichoptera Limnephilidae; Diptera Chironomidae; Hemiptera Corixidae; and Coleoptera Helodidae and Chrysomelidae. Also found were Crustacea Decapoda Astacidae and Branchiob Unspecified. A second macrophyte survey on July 28, 1986, identified the following species: Sparganium spp., Sagittaria spp., Dulichium spp, Carex spp., Eriocaulon spp., Pontederia spp., Nymphaea spp. and Brasenia spp. The ALS found the lake isothermal on July 28, 1986 (ALSC 1987).

Fisheries: DEC stocked brook trout in the lake from 1934 to 1986 (ALSC 1987). Brook trout continue to be stocked annually. The DEC treated the lake with rotenone in 1983 and in 2000 (ALSC 2003). The fish barrier dam was rebuilt on the lake outlet in 1999 (Bath 2003). In addition to the ALS fisheries survey on May 21, 1986, the ALSC netted the lake on September 19, 1995 and September 24, 2009 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 23.4 and 23.5 for recent stocking and netting histories.

Intensive studies: Bubb Lake was sampled during the RILWAS and NBMR studies in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). This area was a study watershed for the Adirondack/Catskill comparison conducted from 1992 through 2001 (Burns et al. 2005, Burns et al. 2006). NBMR evaluated the recovery of fisheries in Bubb Lake in 2000 (Raynal et al. 2004).

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b). The NBMR study sampled this watershed for soils, mineralogy, and chemistry of surficial materials (Newton et al. 1987).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 15 km southwest of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Bubb Lake Stream watershed is primarily (88%) underlain by charnockite, mangerite, pyroxene-quartz syenite gneiss with low to no ANC (Roy et al. 1997). Till comprises 74 % of the watershed while outwash sand and gravel covers 4.5% in the area immediately upstream of Station 1 (Stream). The remaining 21% is exposed bedrock found above 600 m in the southern portion of the watershed above the headwater Sis Lake (APA 2001). The highest point in the watershed is an unnamed mountain that rises to 705 m directly south of Sis Lake. The watershed has a maximum relief of 151 m. In 1986, the ALS described the shoal water substrate around the lake as 50% boulder/rubble/bedrock, 10% sand and 40% muck/silt (ALSC 1987).

Land cover/use: In 1986, deciduous-conifer mixed forest covered 85% of the Bubb Lake watershed, deciduous forest 10%, and coniferous forest 5%. The immediate shoreline was characterized as 78% deciduous-conifer mixed forest, 20% coniferous, and 2% wetland (ALSC 1987). Total wetland area is 13.0 ha comprising 6.5% of the watershed (Roy et al. 1996). The watershed occurs within the Fulton Chain Wild Forest (NYSDEC 1990). A foot trail crosses the outlet of the lake and parallels the northern and western shores.

Watershed disturbance: The 1916 fire protection source data reveal nearly 84% of the Bubb Lake watershed as green timber with no slash, with a small area (3.1%) between Sis Lake and Bubb Lake as burned over with some slash. The November 1950 blowdown affected 92.1% of the watershed with 50-100% change in tree crowns. The July 1995 microburst resulted in 0-30% change in tree crowns over the entire watershed (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Dart Lake 040750

EPA ID: 1A1-106O

Lake: Dart Lake lies in the Oswegatchie-Black watershed at 537 m. The 51.8 ha lake receives most of its flow from the outlet of Big Moose Lake (040752) and its confluence with the tributaries of Townsend and Windfall (040750A) ponds. The uncontrolled outlet flows west, becoming the North Branch of Moose River flowing into Lake Rondaxe (040739). Dart Lake reaches a maximum depth of 17.7 m (58.1 ft) (Figures 24.1 and 24.2).

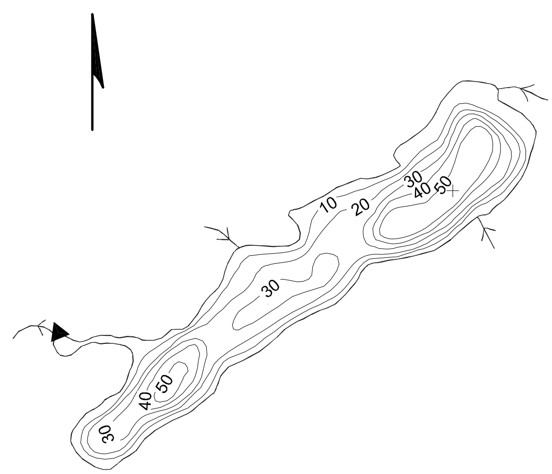
ALSC Staff Photo 2000

Dart Lake is classified as a thin-till chain drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. This is one of the original ALS lakes monitored on a monthly basis from June 1982 through 2013. Sampling frequency at this pond was modified to seasonal in 2014.

Lake chemistry: Dart Lake was sampled near its deepest point during the ALS on July 31, 1986 finding: Lab pH 5.27, ANC 4.8 µeq L^{-1}, SO_4^{2-} 108.26 µeq L^{-1}, NO_3^- 3.07 µeq L^{-1}, Ca^{2+} 92.32 µeq L^{-1}, Mg^{2+} 28.80 µeq L^{-1}, DOC 333.02 µmol L^{-1}-C (ALSC 1987). Table 24.1 summarizes recent ALTM chemistry taken at the outlet. Major analytes including total phosphorus (TP) and chlorophyll a (Chl a) through 2013 are summarized in Table 24.1. Plots through 2014 appear in Figure 24.3 including intermittent weekly spring melt data collected in the 1990s (shown in red).

Aquatic biota: On July 31, 1986, the ALS found submergent aquatic plants occupied 5% of the lake bottom and emergent and floating vegetation occupied 5% and 10% of the lake surface, respectively. Identified were: Nuphar spp.; Nymphaea spp.; Nymphoides spp.; Lobelia spp.; Callitriche spp.; Juncus spp.; Dulichiumspp.; Equisetum spp.; Eleocharis spp.; Scirpus spp.; Eriocaulon spp.; and several Algae. On September 22, 1986, a dip-net survey found the following Insecta: Odonata Coenagriidae; Hemiptera Gerridae; and Megaloptera Sialidae. The ALS found the lake thermally stratified between 8.0 and 10 m on July 31, 1986 (ALSC 1987). Bukavecas and Shaw (1998) found phosphorus as the limiting nutrient and chlorophyll a averaged 0.90 µg L^{-1} during 1990 and 1991. The AEAP reported the average value of chlorophyll a was 1.6 µg L^{-1} in 2003 (Momen et al. 2006).

Figure 24.1 Bathymetry

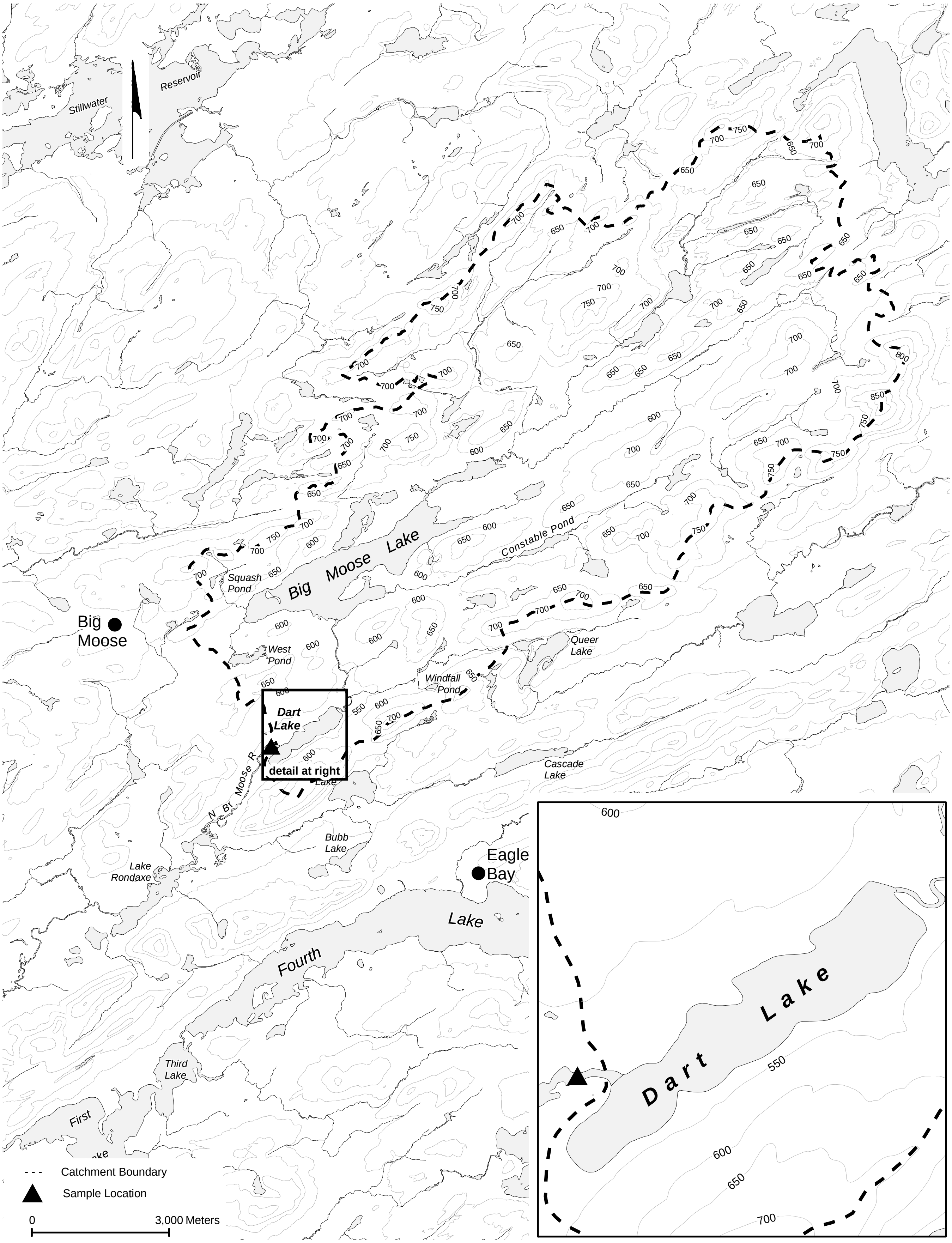


▲ Sample Location
Maximum Depth (+): 58 ft
Source: ALSC 1986

2500'

Fisheries: There are no records of fish stocking in Dart Lake (ALSC 1987). In addition to the ALS fisheries survey on September 23, 1986, the ALSC has netted the lake on September 27, 2000 and October 19, 2010 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 24.3 for recent netting history.

Figure 24.2 Catchment



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	43.79376	-74.87257	43° 47′ 37.5″ N	074° 52′ 21.3′′ W
Lake centroid	43.79558	-74.86322	43° 47′ 44.1″ N	074° 51′ 47.6′′ W

Table 24.1 Lake Chemistry

040750			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	103.27	134.08	117.96	62.72	82.15	69.09	48.26	65.62	55.89	µeq L^{-1}
NO_3^-	14.48	27.58	19.72	2.39	14.67	7.96	5.59	25.65	13.77	µeq L^{-1}
Cl^-	8.18	11.28	9.31	8.75	12.50	9.50	9.01	13.48	11.22	µeq L^{-1}
F^-	3.26	4.58	3.85	2.96	3.47	3.19	2.74	3.71	3.21	µeq L^{-1}
ANC	-6.93	10.70	4.14	9.94	34.19	21.96	21.10	39.05	28.37	µeq L^{-1}
DIC	18.32	86.59	39.69	36.63	69.10	52.96	46.38	81.55	61.92	µmol L^{-1}-C
DOC	222.88	399.96	299.44	332.36	461.74	386.91	376.36	489.15	437.48	µmol L^{-1}-C
SiO_2	61.58	93.20	75.55	48.24	85.88	67.20	50.26	86.09	64.76	µmol L^{-1}
Ca^{2+}	73.36	103.30	91.82	67.37	75.77	71.79	65.57	78.88	72.50	µeq L^{-1}
Mg^{2+}	21.39	28.80	25.92	18.10	21.39	19.91	17.83	22.79	20.32	µeq L^{-1}
Na^+	16.96	26.97	22.98	20.88	26.97	23.53	24.18	29.96	27.66	µeq L^{-1}
K^+	5.37	8.95	8.10	4.60	6.39	5.62	4.77	7.24	6.13	µeq L^{-1}
NH_4^+	-0.17	2.44	1.07	-0.81	2.27	0.98	-0.53	3.12	1.53	µeq L^{-1}
AL_TD	3.22	16.42	9.23	3.72	11.64	7.29	3.33	8.62	6.41	µmol L^{-1}
AL_TM	1.88	12.82	6.67	1.92	6.00	3.53	2.12	5.05	3.37	µmol L^{-1}
AL_OM	0.48	4.37	2.12	1.61	3.60	2.53	2.05	4.28	2.85	µmol L^{-1}
AL_IM	1.14	8.45	4.55	0.08	3.04	1.00	0.00	1.27	0.53	µmol L^{-1}
LABPH	4.97	5.69	5.28	5.45	6.28	5.77	5.62	6.33	5.93	
AIREQPH	5.00	5.82	5.34	5.47	6.40	5.89	5.90	6.63	6.22	
TRUECOLOR	5	30	20	30	50	40	25	45	38	Pt Co
SCONDUCT	18.98	25.34	21.53	15.24	17.81	16.00	14.31	18.19	16.25	µS cm^{-1}
TOTALP	na	na	na	1.57	11.42	4.40	3.37	8.65	4.62	µg L^1
CHLORA	na	na	na	0.42	5.51	2.29	0.45	5.02	1.77	µg L^1

Table 24.2 Lake Characteristics

Parameter	Value
Elevation	537 m
Maximum depth	17.7 m
Mean depth	7.3 m
Volume	380.7 x 10^4 m^3
Surface area	51.8 ha
Watershed area	10,804.5 ha
Watershed ratio	0.01
Hydraulic retention time (year)	0.05
Watershed	Oswegatchie/ Black
County, Town	Herkimer, Webb
USGS Quadrangle	Eagle Bay
Land use classification	Private - Resource Management and Rural Use

Intensive studies: The lake was sampled during the RILWAS and NBMR studies in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). During 1985, Dart Lake was used as a comparison lake for the LAMP study on acidification mediation (Heinemann et al. 1985, Driscoll and Schafran 1984) and was evaluated for episodic acidification biweekly from October 1981 - November 1982 to analyze flow-path relationships (Schafran and Driscoll 1988, Schafran and Driscoll 1993) and variations in aluminum chemistry (Schafran and Driscoll 1987). A phytoplankton and zooplankton experiment was conducted in 1990 (Bukaveckas and Shaw 1998). Arbutus Lake (050684) and Dart Lake were analyzed in the early 1990s for nitrogen and carbon isotopic composition in seston and sediment (Owen et al. 1999). Dart Lake was a study watershed for the Adirondack/Catskill comparison during 1992 - 2001 (Burns et al. 2005, Burns et al. 2006). The lake has been studied by the AEAP (Momen et al. 2006). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). The NBMR study evaluated the recovery of fisheries in this water in 2000 (Raynal et al. 2004).

Figure 24.3 Chemistry Time Series

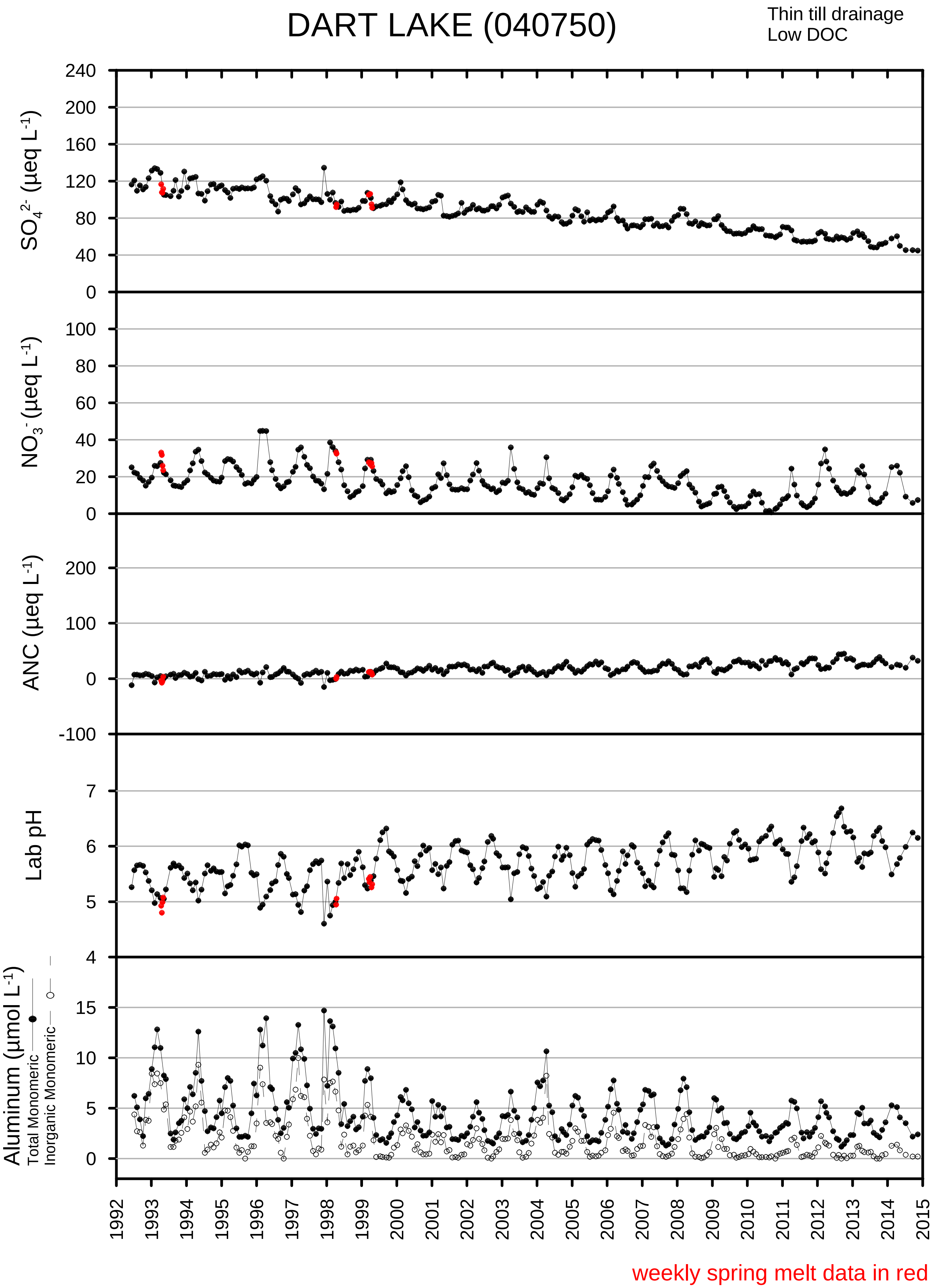


Table 24.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1986	Brook trout	3	243	422	1310	3
Sep-1986	Golden shiner	1	122	122	20	1
Sep-1986	Common shiner	3	89	92	23	3
Sep-1986	Creek chub	7	100	177	266	7
Sep-1986	White sucker	30	175	428	8060	120
Sep-1986	Brown bullhead	25	168	288	3910	62
Sep-1986	Banded killifish	9	81	99	69	9
Sep-1986	Yellow perch	25	153	221	1335	71
Sep-2000	Common shiner	5	148	157	202	5
Sep-2000	Creek chub	3	92	98	22	3
Sep-2000	White sucker	48	90	432	14664	72
Sep-2000	Brown bullhead	30	144	262	2493	30
Sep-2000	Banded killifish	30	23	78	-	30
Sep-2000	Rock bass	4	114	181	255	4
Sep-2000	Pumpkinseed	3	65	112	70	3
Sep-2000	Yellow perch	16	130	343	1643	16
Oct-2010	Brook trout	2	256	276	360	2
Oct-2010	Lake trout	7	318	539	4375	7
Oct-2010	Golden shiner	3	139	153	101	3
Oct-2010	Common shiner	1	152	-	49	1
Oct-2010	Creek chub	4	161	190	218	4
Oct-2010	White sucker	25	171	440	8497	92
Oct-2010	Brown bullhead	12	196	297	2222	12
Oct-2010	Rock bass	15	100	205	1062	15
Oct-2010	Pumpkinseed	2	150	186	201	2
Oct-2010	Yellow perch	25	142	276	1429	40

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b). The NBMR study sampled this watershed for soils, mineralogy, and chemistry of surficial materials (Newton et al. 1987).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 15 km southwest of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Dart Lake watershed lies on interlayed metasedimentary rock and granitic gneiss with medium to high ANC and is overlain by basal and glacial tills (Roy et al. 1997). Till predominates 70.4% of the watershed while shallow soils and bedrock outcrops (12.5%) are found at the higher elevations above 600 m. Outwash sand and gravel comprise 16.6% of the watershed and are found mostly along the lower elevations of Big Moose Lake. A small band of kame deposits (0.4%) exists near the outlet of Big Moose Lake. Glacial outwash patches appear along the main inlet to Big Moose, along the mid southern shore of Big Moose and along the north shoreline of Dart Lake (APA

2001). A lookout tower once sat on West Mountain, the watersheds highest elevation at 850 m. The maximum relief is 313 m. In 1986, the ALS found the shoal water substrate comprised of 28% bedrock/boulder/rubble and 72% sand and gravel (ALSC 1987).

Land cover/use: In 1986, the ALS reported the watershed cover as: 50% deciduous forest; 43% deciduous-conifer mix; 5% shrub-sapling; 1% open grass; and 1% developed (ALSC 1987). Wetlands covered 1412 ha, or 13.1% of the watershed. The predominant wetland cover types are forested needle-leaved evergreen (778 ha) and scrub/shrub broad leaf deciduous (519 ha) that are interspersed along the tributary channels. A small wetland is associated with the shoreline near the inlet (Roy et al. 1996).

Dart Lake is located on private land. The northwestern section is classified as Rural Use, and has a YMCA camp with numerous cabins, buildings, and a developed beach. A gravel road extends the length of the lake through the camp property. The steeper south shore is classified as Resource Management. Parts of the immediate watershed lie in the Fulton Chain Wild Forest (NYSDEC 1990) and in the Pigeon Lake Wilderness (NYSDEC 1992, Roy et al. 1997).

Watershed disturbance: The 1916 fire protection source data show 85% of the watershed as green timber with no slash, while 9% was logged for softwood with a considerable amount of slash. Less than 1% of the watershed was burned over. The November 1950 storm data reveal that 20% of the watershed was severely damaged (50 to 100% blowdown) and less than 1% of the watershed was moderately damaged (25 to 50% blowdown). The July 1995 micro-burst storm source data show 91.1% of the watershed with low damage (0-30% change in crowns), 6.5% with moderate damage (30 to 60% change in crowns) and 2.4% with severe damage (60 to 100% change in crowns) (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Windfall Pond and Windfall Pond Stream 040750A

EPA IDS: 1A1-087O and 1A1-087S

ALSC Staff Photo 2015 Windfall Pond

ALSC Staff Photo 2015 Windfall Pond Stream

Lake: Windfall Pond lies in the Oswegatchie-Black River watershed at 591 m. Two spring-seeps on the southern and eastern shorelines were noted as inlet sources in 1985 (ALSC 1986). In 1985, the outlet was uncontrolled (ALSC 1986). Beaver activity has increased over the past few years and a series of small beaver dams are now found along the outlet stream. Approximately 350 m downstream from the pond, a tributary that drains a chain of unnamed ponds enters the outlet stream (Figure 25.1). Windfall Pond is a 2.4 ha headwater lake and has a maximum depth of 6.1 m (20.0 ft) (Figure 25.2).

Windfall Pond (Station 2) is classified as a carbonate influenced drainage lake. The pond is considered insensitive to acidification. Windfall Pond Stream (Station 1) is one of the original 17 ALTM sites, and was monitored on a monthly basis from June 1982 through 2013. Station 1 is located approximately 2.0

Figure 25.1 Catchment

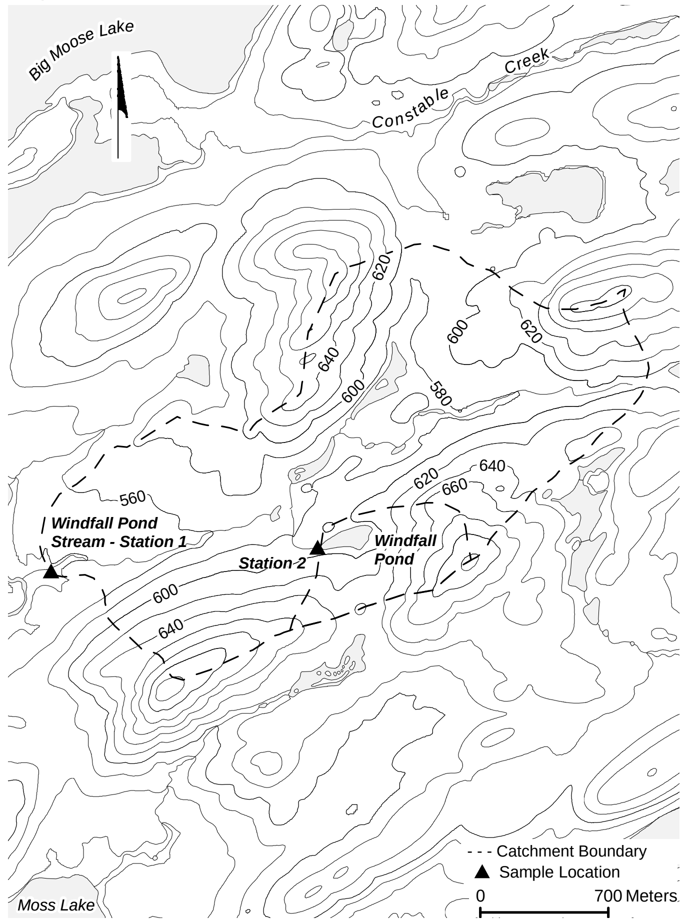
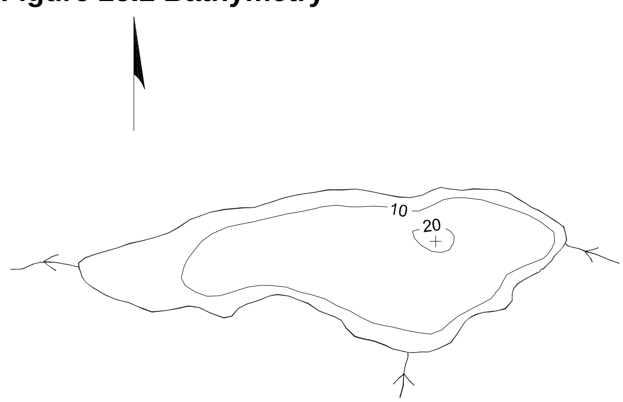


Figure 25.2 Bathymetry



Maximum Depth (+): 20 ft
Source: NYSDEC 1982, ALSC Rec'd c.1984

Table 25.1 Stream Chemistry (Station 1)

040750A		1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	95.15	153.86	129.55	46.37	102.44	77.79	37.70	79.92	59.25	µeq L^{-1}
NO_3^-	4.42	40.64	19.06	1.91	32.20	10.41	1.33	47.91	21.83	µeq L^{-1}
Cl^-	5.92	11.28	8.39	5.21	8.04	7.02	5.49	10.36	7.15	µeq L^{-1}
F^-	4.84	6.74	5.69	3.86	5.67	4.53	3.81	5.10	4.43	µeq L^{-1}
ANC	1.32	108.08	44.15	28.92	120.36	56.50	20.46	134.19	64.60	µeq L^{-1}
DIC	33.30	156.52	81.45	47.46	148.24	86.65	56.47	184.58	100.62	µmol L^{-1}-C
DOC	244.11	443.67	336.97	258.34	691.61	437.98	312.19	602.26	457.63	µmol L^{-1}-C
SiO_2	80.72	146.13	101.19	61.58	126.82	85.90	66.06	110.52	84.98	µmol L^{-1}
Ca^{2+}	104.30	194.12	142.27	92.32	147.21	114.30	85.18	145.35	113.27	µeq L^{-1}
Mg^{2+}	27.98	56.78	42.17	25.51	46.06	32.93	24.03	44.29	32.36	µeq L^{-1}
Na^+	15.66	26.97	20.99	16.96	25.66	20.31	17.43	25.29	22.02	µeq L^{-1}
K^+	3.58	12.28	6.99	2.81	6.65	5.02	2.59	9.37	5.76	µeq L^{-1}
NH_4^+	-0.55	2.77	0.99	-0.66	4.77	0.74	-0.55	2.28	0.70	µeq L^{-1}
AL_TD	4.63	13.82	8.53	5.05	10.34	7.49	5.63	9.93	7.63	µmol L^{-1}
AL_TM	1.30	10.16	4.30	2.01	4.48	3.49	2.42	6.20	3.95	µmol L^{-1}
AL_OM	1.39	14.46	3.89	1.70	3.48	2.74	2.36	4.70	3.38	µmol L^{-1}
AL_IM	0.00	5.06	1.15	0.00	1.41	0.76	0.00	1.50	0.57	µmol L^{-1}
LABPH	5.11	6.70	5.82	5.91	6.78	6.22	5.57	6.75	6.14	
AIREQPH	5.18	7.24	5.96	6.12	7.24	6.53	5.92	7.31	6.51	
TRUECOLOR	20	45	29	25	90	47	20	70	43	Pt Co
SCONDUCT	20.81	30.71	25.46	17.25	26.07	20.17	15.99	23.59	20.3	µS cm^{-1}
TOTALP	na	na	na	2.46	16.42	6.61	1.51	16.14	7.20	µg L^{1}
CHLORA	na	na	na	na	na	na	na	na	na	µg L^{1}

Table 25.2 Lake Chemistry (Station 2)

040750A		1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	120.34	153.44	135.40	67.74	88.05	78.07	37.90	71.76	61.58	µeq L^{-1}
NO_3^-	0.73	38.97	12.54	0.00	54.62	15.65	0.00	65.57	27.00	µeq L^{-1}
Cl^-	5.92	9.87	7.10	5.48	9.00	6.26	5.05	8.27	6.61	µeq L^{-1}
F^-	2.95	3.90	3.37	2.28	3.21	2.88	2.26	3.17	2.81	µeq L^{-1}
ANC	75.97	114.70	98.11	56.13	128.73	96.41	33.08	134.75	91.10	µeq L^{-1}
DIC	103.24	158.19	128.63	61.61	229.79	129.93	76.63	183.83	140.64	µmol L^{-1}-C
DOC	261.59	329.61	300.69	237.86	585.69	421.26	265.94	634.56	407.02	µmol L^{-1}-C
SiO_2	46.27	69.07	54.51	53.26	67.99	59.29	41.03	69.23	59.78	µmol L^{-1}
Ca^{2+}	195.62	228.06	216.16	144.72	184.14	173.20	60.39	195.30	157.51	µeq L^{-1}
Mg^{2+}	37.03	42.79	41.01	23.86	34.88	30.52	17.17	32.59	28.58	µeq L^{-1}
Na^+	10.44	13.48	12.32	10.00	13.36	11.64	12.18	25.87	14.27	µeq L^{-1}
K^+	5.12	6.14	5.58	3.84	5.66	4.60	4.25	6.08	4.96	µeq L^{-1}
NH_4^+	-0.44	2.88	1.70	-0.79	3.83	0.73	-0.60	7.76	1.36	µeq L^{-1}
AL_TD	-0.07	3.71	1.45	1.45	4.78	3.22	1.00	7.99	3.80	µmol L^{-1}
AL_TM	0.41	1.22	0.75	1.47	2.56	2.05	1.69	3.35	2.30	µmol L^{-1}
AL_OM	0.39	2.12	0.90	1.36	2.45	1.84	1.84	3.16	2.26	µmol L^{-1}
AL_IM	0.00	0.52	0.19	0.00	0.74	0.21	0.00	0.28	0.09	µmol L^{-1}
LABPH	6.32	7.02	6.70	6.26	7.53	6.63	6.06	6.85	6.44	
AIREQPH	7.03	7.26	7.16	6.85	7.26	7.07	6.40	7.27	6.97	
TRUECOLOR	15	20	17	25	35	28	15	35	22.08	Pt Co
SCONDUCT	27.44	30.95	29.39	21.55	26.27	24.10	13.31	28.6	23.37	µS cm^{-1}
TOTALP	na	na	na	1.23	9.51	4.86	1.95	10.40	4.68	µg L^{1}
CHLORA	na	na	na	0.43	23.92	11.22	0.22	29.44	8.18	µg L^{1}

Table 25.3 Lake Characteristics

Parameter	Value
Elevation	591 m
Maximum depth	6.1 m
Mean depth	3.2 m
Volume	7.8 x 10^4 m^3
Surface area	2.4 ha
Watershed area	41.1 ha
Watershed ratio	0.06
Hydraulic retention time (year)	0.25
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Eagle Bay
Land use classification	Pigeon Lake Wilderness

Figure 25.3 Chemistry Time Series / Station 1

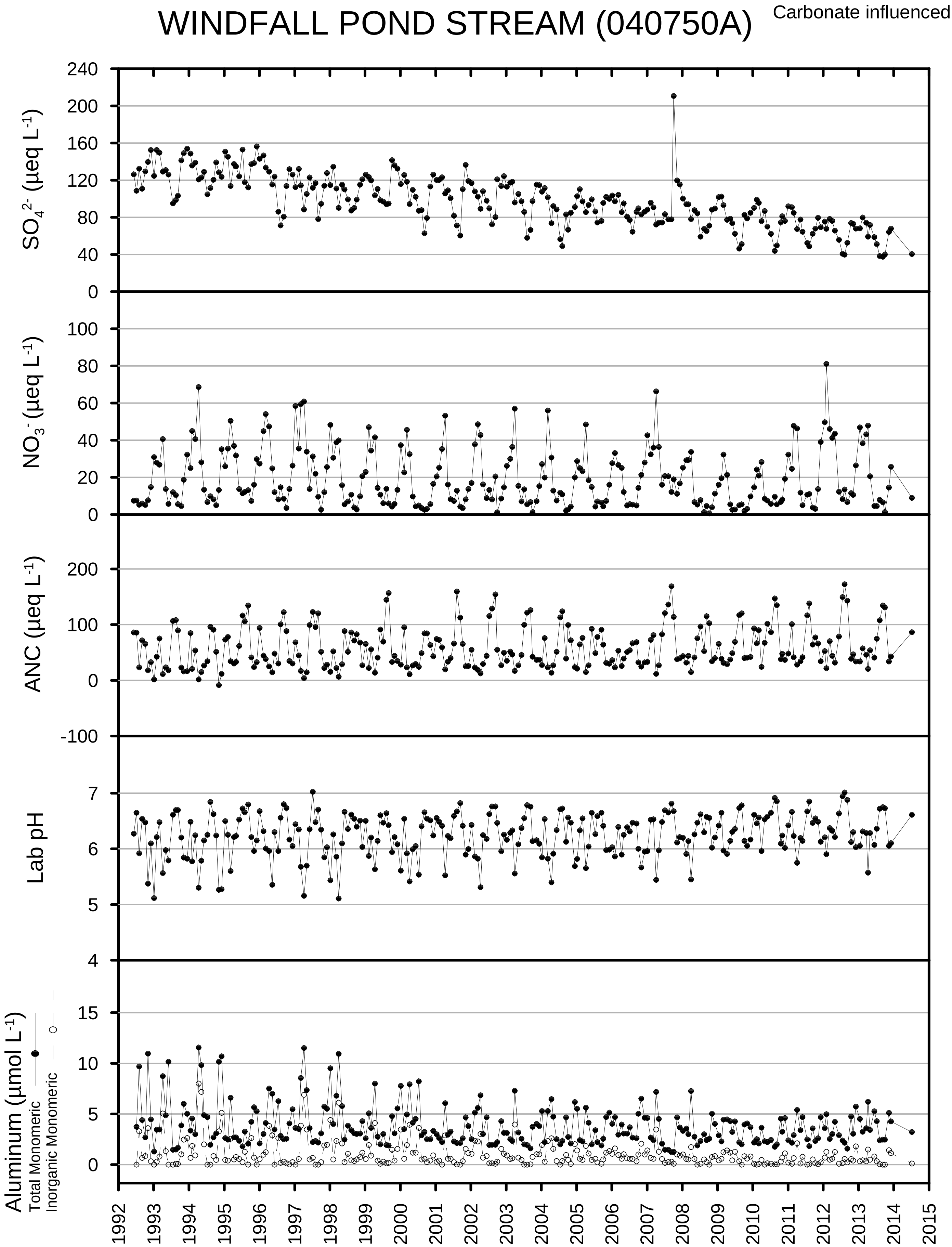
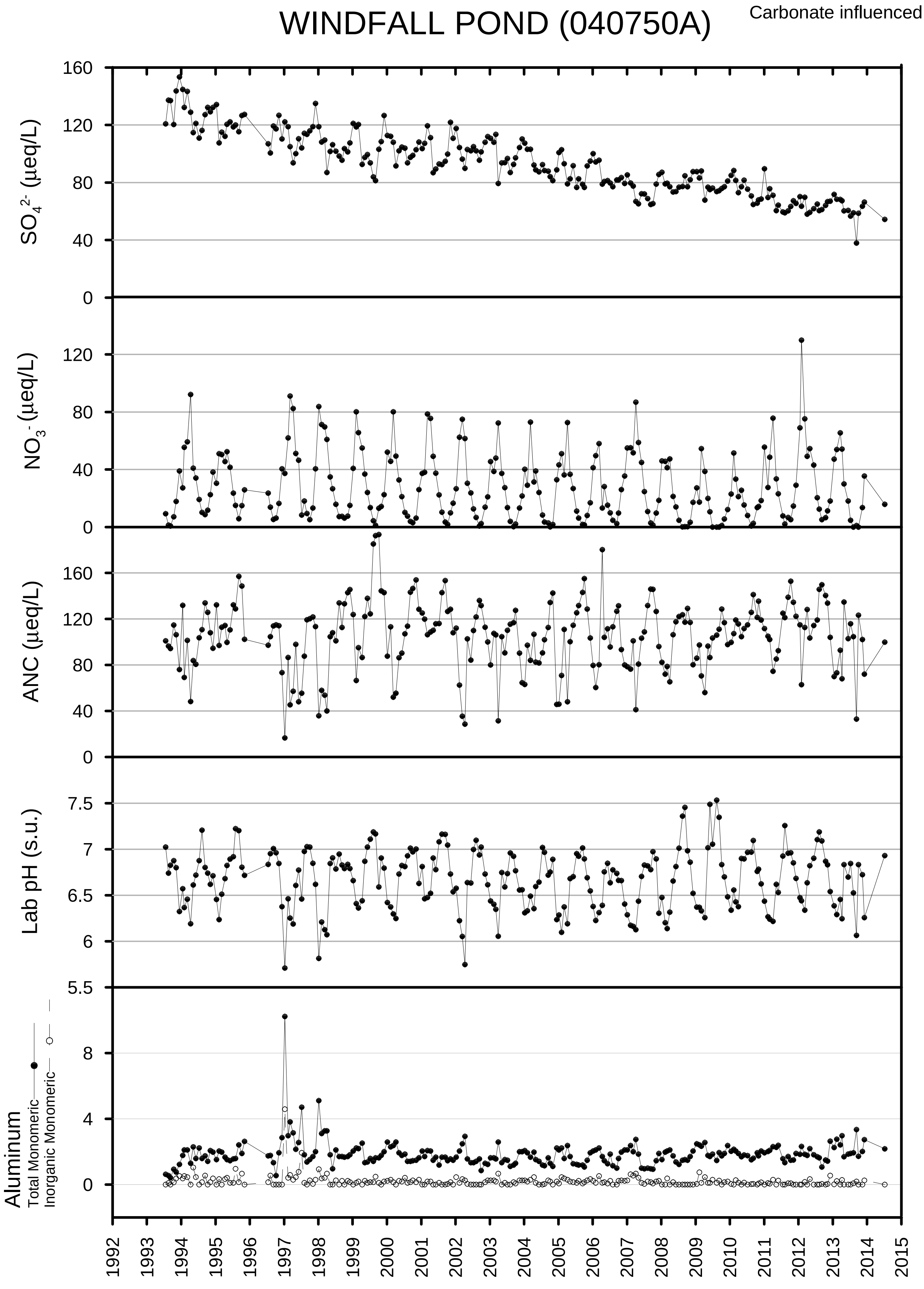


Figure 25.4 Chemistry Time Series / Station 2



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.ss	DDD MM SS.ss
Sample site - Stream	43.80395	-74.84911	43°48’14.20” N	074°50’56.80” W
Sample site - Lake	43.80497	-74.83077	43°48’17.88” N	074°49’50.76” W
Lake centroid	43.80544	-74.82881	43°48’19.58” N	074°49’43.72” W

Table 25.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Jun-1985	Brook trout	1	305	305	390	1
Jun-1985	Northern redbelly dace	25	48	56	25	105
Jun-1985	Blacknose dace	25	57	66	50	179
Jun-1985	Creek chub	2	69	86	10	2
Jun-1985	White sucker	12	164	275	905	16
May-1995	Northern redbelly dace	3	60	62	8	3
May-1995	Blacknose dace	25	54	67	60	37
May-1995	Creek chub	29	64	134	316	46
May-1995	White sucker	21	158	450	3664	21
May-2009	Northern redbelly dace	8	53	59	9	8
May-2009	Blacknose dace	8	51	64	12	8
May-2009	Creek chub	19	98	169	437	19
May-2009	White sucker	27	112	411	2207	66

km downstream from the lake on the upstream side of lake on the upstream side of a culvert that runs under the Big Moose Road (Figure 25.1). The ALTM program collected monthly samples at Windfall Pond (Station 2) in June 1993 through 2013. Sampling frequency at both sites was modified to annual (July or August) starting in 2014.

Lake chemistry: Windfall Pond was sampled near its deepest point during the ALS on July 30, 1985 finding: Lab pH 7.39, ANC 149.2 µeq L^{-1}, SO_4^{2-} 130.75 µeq L^{-1}, NO_3^- 4.85 µeq L^{-1}, Ca^{2+} 254.51 µeq L^{-1}, Mg 45.26 µeq L^{-1}, DOC 274.74 µmol L^{-1}-C (ALSC 1986). Tables 25.1 and 25.2 summarize recent water ALTM chemistry taken at Windfall Pond Stream site (Station 1). Major analytes collected at the stream site (Station 1) through 2013 are shown in Table 25.1 including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes collected at the lake site (Station 2) through 2013 are shown in Table 25.2 including total phosphorus (TP) and chlorophyll a (Chl a). Plots for Station 1 (Stream) through 2014 appear in Figure 25.3. Plots for Station 2 (Lake) are shown in Figure 25.4.

Aquatic biota: On June 6, 1985, submergent aquatic plants occupied 10% of the lake bottom. Floating and emergent vegetation occupied 15% and 5%, respectively, of the lake surface. ALS identified Dulichium spp., Nuphar spp., Nymphaea spp. and Utricularia spp. A dip-net survey on the same date found the following Insecta: Odonata Libellulidae and Gomphidae and Diptera Unspecified. On June 30, 1985, a thermocline was found between 4.0 and 5.0 m (ALSC 1986). In August 1975, the DOH found total phosphorus of 18.4 mg m^{-3} and total chlorophyll a of 7.27 µg L^{-1} (Wood 1978). In 2003, the AEAP reported an average value of chlorophyll a of 4.3 µg L^{-1} (Momen et al. 2006).

Fisheries: There is no recent record of fish stocking in Windfall Pond. Detailed information about the historic NSA brook trout population is provided in the Pigeon Lake Wilderness Unit Management Plan (NYSDEC 1992). In addition to the ALS fisheries survey on June 7, 1985, the ALSC netted the lake on May 24, 1995 and May 12, 2009 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 25.4 for netting history.

Intensive studies: The DOH conducted a limnological survey of Windfall Pond in August 1975 (Wood 1978). The RILWAS and NBMR studies surveyed the lake and its watershed in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). Diatom stratigraphies were developed from sediment cores in the late 1980s (Charles et al. 1990). Diatoms were evaluated for use as environmental indicators for the EMAP-Surface Water project in 1991 (Dixit and Smol 1994). The lake has been studied by the AEAP beginning in 1994 (Momen et al. 2006). This was a study watershed for the Adirondack/ Catskill comparison in 1992–2001 (Burns et al. 2005, Burns et al. 2006). Fisheries recovery since the NBMR survey was evaluated in this water in 2000 (Raynal et al. 2004).

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 18 km southwest of the lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Windfall Pond Stream watershed lies on interlayered metasedimentary rock and granitic gneiss, having medium to high ANC (Roy et al. 1997). Till overlies 71% of the watershed. Exposed bedrock appear on the higher portions of the watershed to the south, while a small area (13%) to the western side contains outwash sand and gravel. Basal soils predominate throughout the watershed. The small chain of unnamed ponds (that contribute to Windfall Pond Stream) lie in organic hydric soils, which make up 10% of the watershed. Shallow (<0.5 m) soils and rock outcrops appear above the 600 m elevation (APA 2001). The highest elevation in the watershed is 722 m. The maximum relief is 131 m. In 1985, the ALS found the shoal water substrate comprised of 15% bedrock/boulder, 40% sand/rubble and 45% muck/silt/organic (ALSC 1986).

Land cover/use: In 1985, the ALS described the watershed as: 90% deciduous forest and 10% deciduous-coniferous mixed forest. The immediate shoreline consisted of 65% coniferous forest, 10% wetland, 10% deciduous forest, and 15% open grass (ALSC 1986). Total wetland area is 2.0 ha and comprises 5% of the watershed (Roy et al. 1996). Scrub/shrub broad-leaf deciduous wetland occurs in a contiguous band along two-thirds of the shoreline (APA 2001). The entire watershed of the pond lies within the Pigeon Lake Wilderness (NYSDEC 1992) and Windfall Pond Stream (Station 1) is located in Resource Management. There is a hiking trail that follows the outlet stream up to the pond.

Watershed disturbance: The 1916 fire protection source data show 100% of the Windfall Pond watershed as green timber with no slash. Logging was thought to have occurred in the 1890s, but no records of any major watershed disturbances were found (Charles et al. 1990). The July 1995 microburst storm damaged 99% of the watershed with 0-30% change in dominant and co-dominant crowns, less than 1% of the remaining watershed revealed 30-60% damage (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Big Moose Lake 040752
EPA ID: 1A1-103O

Lake: Big Moose Lake is the largest lake in the ALTM program. This glacially scoured water body lies in the Oswegatchie-Black watershed at 558 m. Thirty-eight lakes drain into Big Moose Lake including three ALTM waters (Squash, West and Constable) and one TIME lake (Upper Sister). The uncontrolled outlet of Big Moose Lake flows south through Dart Lake (040750) and then onto the North Branch of Moose River. Big Moose Lake reaches a maximum depth of 21.3 m (69.9 ft) (Figures 26.1and 26.2).

ALSC Staff Photo 2015

Big Moose Lake is a thin-till chain drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). It is considered sensitive to acidification. This is one of the original ALTM lakes monitored on a monthly basis since June 1982.

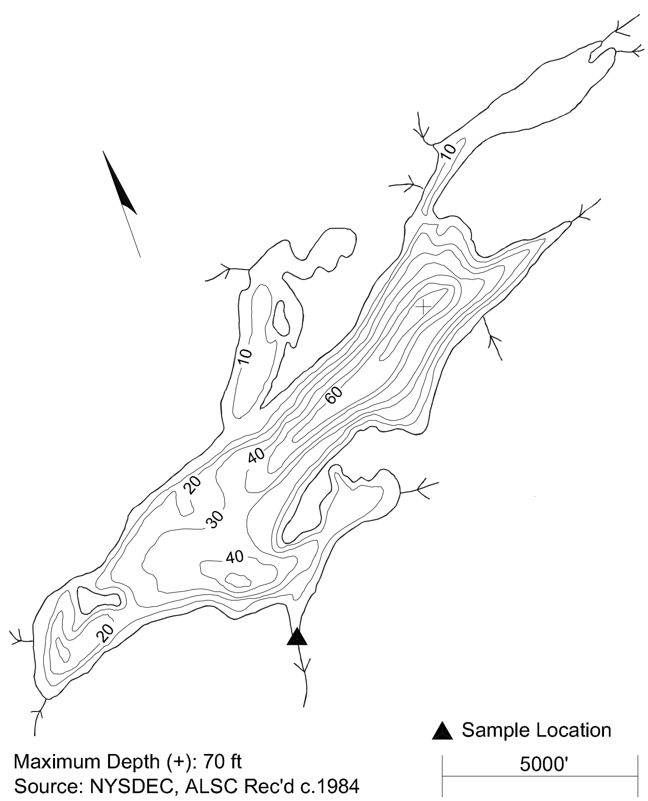
Lake chemistry: Big Moose Lake was not sampled during the 1984–1987 ALS, but was sampled as part of the ELS (1A1-103) on October 16, 1984 finding: pH 5.24, ANC 5.2 µeq L^{-1}, SO_4^{2-} 132.4 µeq L^{-1}, NO_3^- 18.4 µeq L^{-1}, Ca^{2+} 91.3 µeq L^{-1}, Mg^{2+} 26.1 µeq L^{-1}, DOC 195.65 µmol L^{-1}-C (Kanciruk, et al. 1986). Table 26.1 summarizes recent ALTM chemistry taken at the outlet including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes through 2013 are shown in Table 26.1. Plots through 2014 appear in Figure 26.3 including spring melt data in red.

Aquatic biota: On October 16, 1984, the ELS survey found: Secchi depth 6.0 m; no measureable total phosphorus; and the lake thermally mixed, i.e., difference between surface and bottom temperatures less than 4 °C (Kanciruk et al. 1986).

Fisheries: This lake has a history of fisheries stocking by the DEC. The ALSC conducted fisheries surveys on September 25, 2000 and October 22, 2009 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 26.3 and 26.4 for recent fish stocking and netting histories.

Intensive studies: Big Moose Lake was sampled during the RILWAS and NBMR studies in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). Diatom stratigraphies were developed from sediment cores in the late 1980s (Charles et al. 1990). Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Sullivan and others (1996) evaluated landscape changes with sediment records. Big Moose Lake was one of 20 Adirondack lakes studied to evaluate regional trends in chrysophyte-inferred lake water pH changes (Cumming et al. 1994, Smol et al. 1998).

Figure 26.1 Bathymetry



Maximum Depth (+): 70 ft
Source: NYSDEC, ALSC Rec'd c.1984

Figure 26.2 Catchment

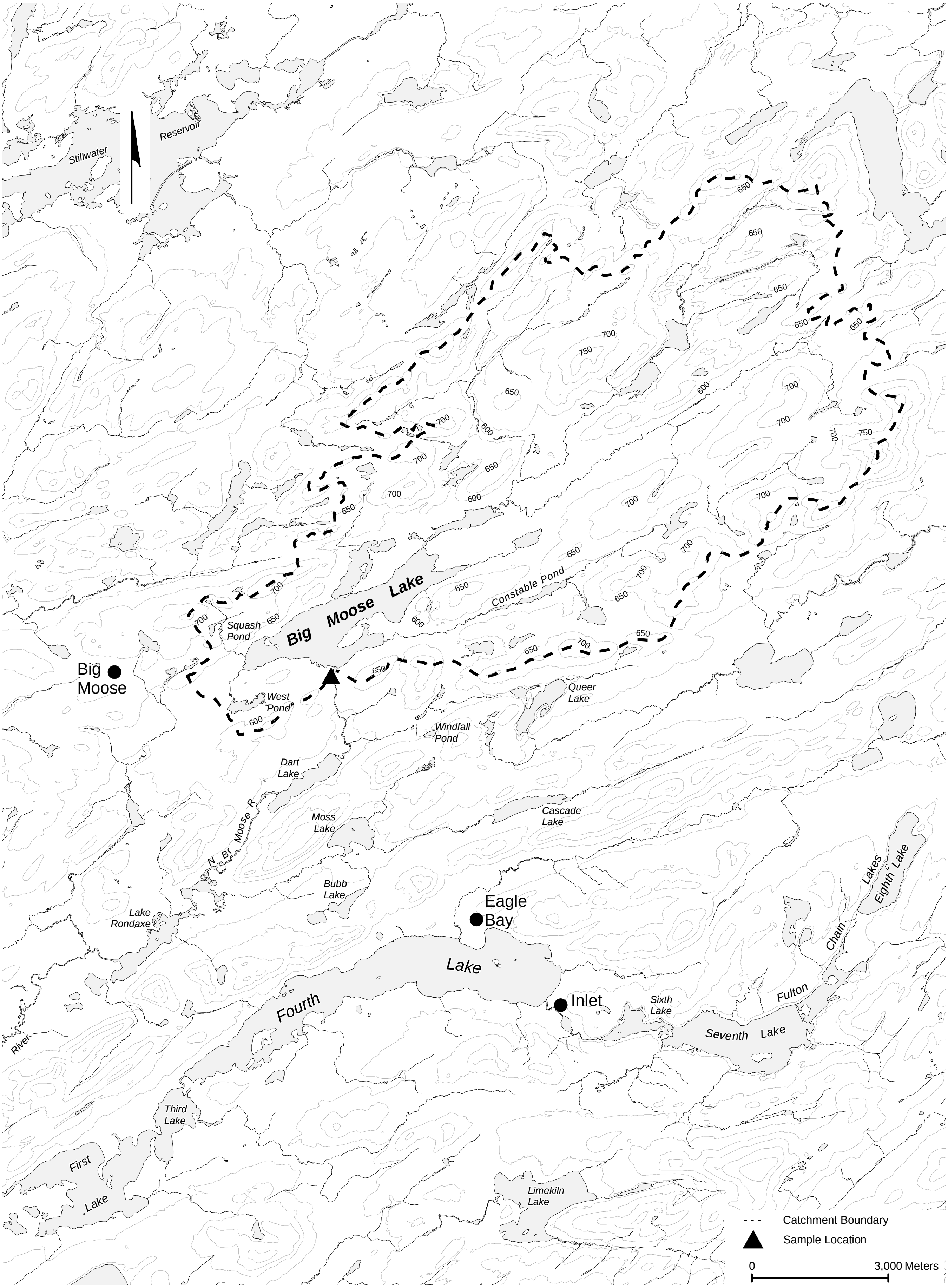
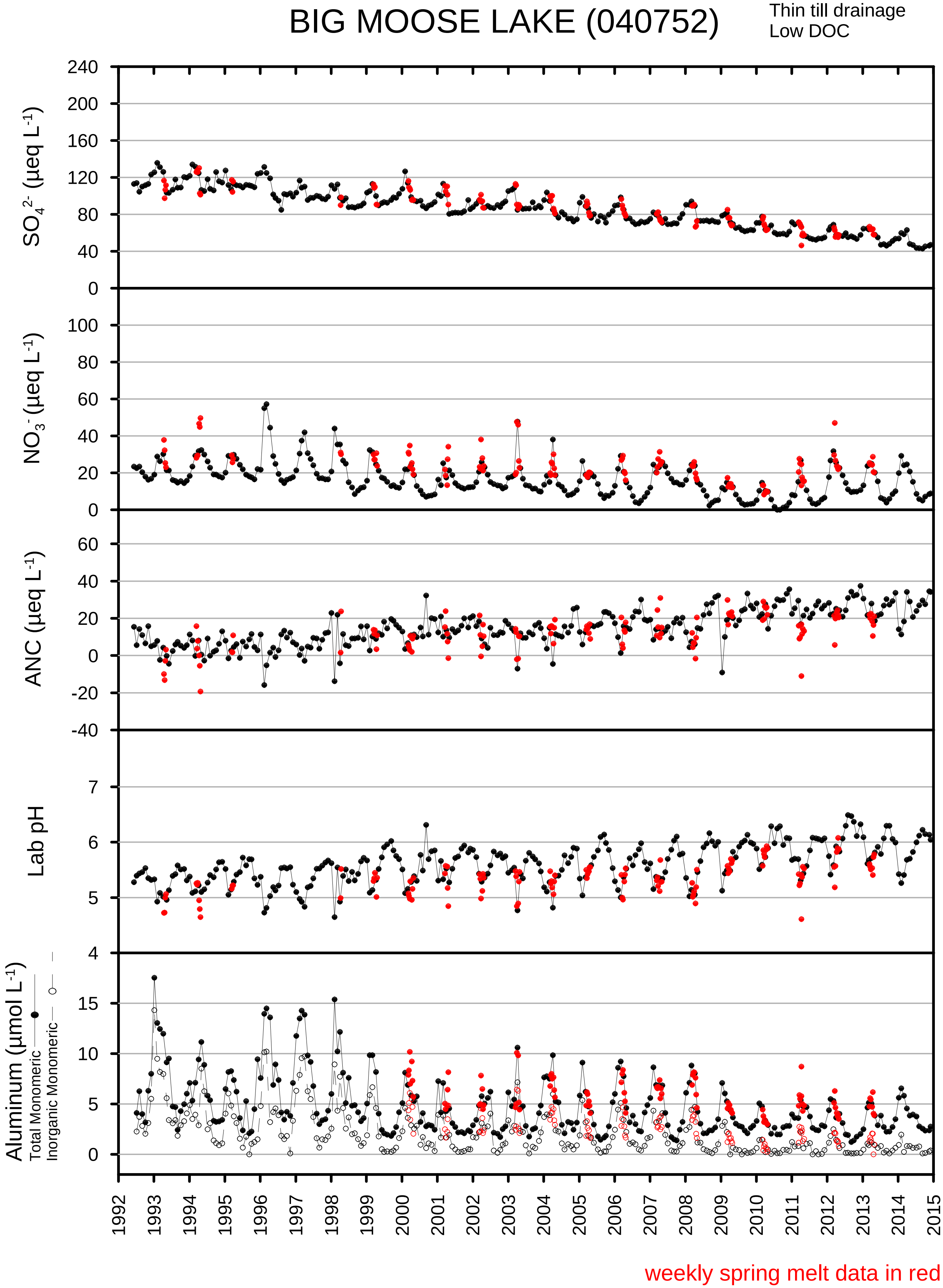


Figure 26.3 Chemistry Time Series



It was one of 25 Adirondack lakes studied within the Mercury Response Project, samples were taken on October 25, 1992 and September 26, 2005 (Dittman and Driscoll 2009). Historical rates of mercury deposition were analyzed using sediment cores from 1982–1983 (Lorey and Driscoll 1999) and 1998 (Raynal et al. 2004). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). Big Moose Lake was sampled by the Statewide Monitoring of Mercury Project in 2003 (Simonin et al. 2008) and by the Cooperative Loon Project in 2003–2004 (Schoch et al. 2004). The lake has been studied by the AEAP (Momen et al. 2006).

Soils: The NBMR study sampled this watershed for soils, mineralogy and chemistry of surficial materials (Newton et al. 1987). A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 18 km south of this lake. Retrieved January 19, 2017 from: [http://nadp.slh.wisc.edu.](http://nadp.slh.wisc.edu)

Watershed: The Big Moose Lake watershed is underlain primarily by biotite and hornblende granite gneiss having low to no ANC. Areas of interlayered metasedimentary rock (medium to high ANC) occur in the southern portion of the watershed. The northern portion of the watershed is dominated by charnockite, mangerite, pyroxene-quartz syenite gneiss, with low to no ANC (Roy et al. 1997). The watershed area is overlain primarily by basal till. The Big Moose Lake shoreline is primarily outwash sand and

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	43.81687	-74.85611	43° 49′ 00.7″ N	074° 51′ 22.0″ W
Lake centroid	43.82870	-74.85440	43° 49′ 43.3″ N	074° 51′ 15.8″ W

Table 26.1 Lake Chemistry

040752			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	103.27	135.75	117.36	61.66	81.69	68.80	46.00	64.72	55.31	μeq L^{-1}
NO_3^-	14.37	30.16	19.92	2.65	14.79	7.66	3.87	24.96	13.50	μeq L^{-1}
Cl^-	7.05	10.72	8.79	7.93	10.96	8.86	8.17	11.33	10.21	μeq L^{-1}
F^-	3.00	4.42	3.65	2.68	3.43	3.05	2.37	3.51	3.05	μeq L^{-1}
ANC	-4.43	7.79	3.44	-9.12	33.24	19.20	18.63	33.61	25.99	μeq L^{-1}
DIC	14.99	129.88	55.37	29.14	111.56	61.26	36.18	126.27	65.98	μmol L^{-1}-C
DOC	211.39	405.71	307.45	340.91	483.22	404.12	376.46	513.20	456.14	μmol L^{-1}-C
SiO_2	52.26	100.36	74.44	46.77	88.87	66.10	45.82	86.27	61.38	μmol L^{-1}
Ca^{2+}	69.37	113.78	88.62	65.95	75.35	69.96	64.34	77.02	70.23	μeq L^{-1}
Mg^{2+}	19.75	27.16	24.82	18.10	21.39	19.09	17.19	24.02	19.89	μeq L^{-1}
Na^+	19.14	26.97	22.47	21.31	26.53	23.06	24.44	30.56	27.22	μeq L^{-1}
K^+	7.16	9.72	7.93	4.86	6.65	5.57	4.85	7.92	6.32	μeq L^{-1}
NH_4^+	0.22	3.27	1.48	-0.81	2.49	0.74	0.08	3.76	1.52	μeq L^{-1}
AL_TD	2.15	18.27	10.02	4.35	13.16	7.51	4.47	9.62	7.11	μmol L^{-1}
AL_TM	2.41	17.53	8.40	2.09	7.08	3.74	2.26	5.13	3.44	μmol L^{-1}
AL_OM	0.56	6.13	2.78	1.96	4.37	2.87	1.91	4.21	2.80	μmol L^{-1}
AL_IM	1.85	14.31	5.62	0.00	3.22	0.89	0.08	1.18	0.64	μmol L^{-1}
LABPH	4.92	5.58	5.21	5.12	6.13	5.65	5.61	6.29	5.89	
AIREQPH	4.98	5.57	5.27	5.21	6.40	5.79	5.92	6.36	6.13	
TRUECOLOR	10	30	22	30	50	41	25	60	40	Pt Co
SCONDUCT	17.33	26.79	21.52	14.45	18.12	15.83	14.05	18.5	15.84	μS cm^{-1}
TOTALP	na	na	na	2.05	20.04	4.70	3.83	13.56	5.42	μg L^1
CHLORA	na	na	na	0.50	3.33	2.00	0.44	7.00	2.39	μg L^1

Table 26.2 Lake Characteristics

Parameter	Value
Elevation	558 m
Maximum depth	21.3 m
Mean depth	6.8 m
Volume	3488.2 x 10^4 m^3
Surface area	512.5 ha
Watershed area	9643.8 ha
Watershed ratio	0.05
Hydraulic retention time (year)	0.48
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Eagle Bay
Land use classification	Private, many classifications

Table 26.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1986	Brook trout	25000	986
1993	Brook trout	10000	154
1993	Lake trout	5000	495
1993	Lake trout	3000	297
1993	Brook trout	25000	116
1994	Brook trout	5000	296
1994	Brook trout	10000	333
1995	Lake trout	7500	-
1995	Brook trout	10940	-
1996	Brook trout	20000	1029
1997	Lake trout	4500	518
1997	Brook trout	8000	71
1998	Brook trout	6200	69
1998	Lake trout	4000	47
1999	Brook trout	4000	59
2000	Brook trout	13000	198
2001	Brook trout	3560	60
2002	Brook trout	9000	214
2003	Lake trout	6800	417
2003	Brook trout	16000	426
2004	Brook trout	5700	470
2004	Lake trout	5000	64
2005	Brook trout	4000	82
2005	Lake trout	4000	218
2006	Brook trout	7400	283
2007	Lake trout	2700	129
2007	Brook trout	4000	40
2008	Brook trout	4000	79
2009	Brook trout	4000	70
2010	Brook trout	2000	43
2011	Brook trout	4000	67
2012	Brook trout	5360	533
2013	Lake trout	5100	69
2014	Lake trout	4000	10
2014	Brook trout	4000	649

Table 26.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-2000	Brook trout	22	95	430	1840	22
Sep-2000	Lake trout	5	198	556	-	5
Sep-2000	Golden shiner	10	95	141	128	10
Sep-2000	Common shiner	4	105	144	105	4
Sep-2000	Creek chub	12	100	190	312	12
Sep-2000	White sucker	41	213	435	15736	102
Sep-2000	Brown bullhead	38	43	226	656	331
Sep-2000	Banded killifish	47	25	61	-	47
Sep-2000	Pumpkinseed	17	37	148	485	17
Sep-2000	Largemouth bass	1	83	83	6	1
Sep-2000	Yellow perch	81	87	363	-	81
Oct-2009	Brook trout	4	194	389	1193	4
Oct-2009	Lake trout	34	352	570	21325	34
Oct-2009	Golden shiner	2	103	177	76	2
Oct-2009	White sucker	28	177	502	19998	68
Oct-2009	Brown bullhead	20	203	315	4245	21
Oct-2009	Rock bass	7	135	241	628	7
Oct-2009	Pumpkinseed	1	157	-	79	1
Oct-2009	Largemouth bass	1	389	-	734	1
Oct-2009	Yellow perch	29	52	317	2638	37

gravel. Exposed bedrock predominates at the higher elevations (> 650 m). The highest elevation in the watershed is West Mountain at 850 m.The maximum relief is 292 m.

Land cover/use: The Big Moose Lake watershed is primarily forested (75%) with coniferous and deciduous-coniferous mixed forest. The area has 1,310 ha of wetland that comprises 13.6% of the watershed (Roy et al. 1996). The watershed is a mixture of public and private lands. The Pigeon Lake Wilderness (NYSDEC 1992) comprises part of the watershed in the south and east, while the Fulton Chain Wild Forest lies in a smaller portion to the west. Shorelines of several of the larger lakes are privately owned, and generally fall within the Resource Management classification. The shoreline of Big Moose Lake is a combination of Rural and Low to Moderate Intensity uses. A majority of the shoreline is developed with a mix of seasonal and year-round residences (ALSC 2003).

Watershed disturbance: The 1916 fire protection source data show 83% of the watershed as green timber with no slash. Nearly 10% was logged for softwood with much slash and less than 1% was burned over. The watershed was moderately impacted by the November 1950 storm when 22.5% of the watershed incurred 50-100% blowdown. The July 1995 icroburst storm damaged: 90% of the area with 0-30% change in tree crowns; 7.2% with 30-60% change; and 2.7% with 60-100% change (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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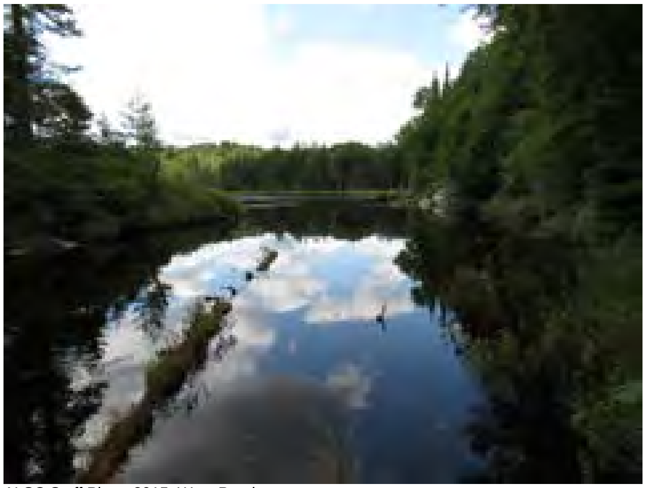
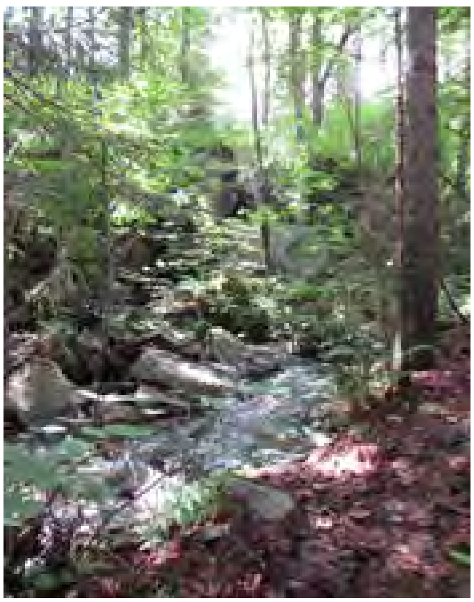
West Pond and West Pond Stream 040753

EPA IDS: 1A1-112O and 1A1-112S



ALSC Staff Photo 2015 West Pond



ALSC Staff Photo 2015 West Pond Stream

Lake: West Pond lies in the Oswegatchie-Black watershed at 581 m. The outlet of this 10.4 ha headwater lake flows north into Big Moose Lake 1.0 km downstream (Figure 27.1). A small inlet enters at the east shore of West Pond. Evidence of an old beaver dam at the lake outlet was reported in 1985 (ALSC 1986). Historically, beaver have been noted to be very active around this pond. Approximately 300 m downstream from the outlet, a barrier falls prevents immigration of fish from Big Moose Lake. The lake reaches a maximum depth of 5.2 m (17.1 ft) (Figure 27.2).

Figure 27.1 Catchment

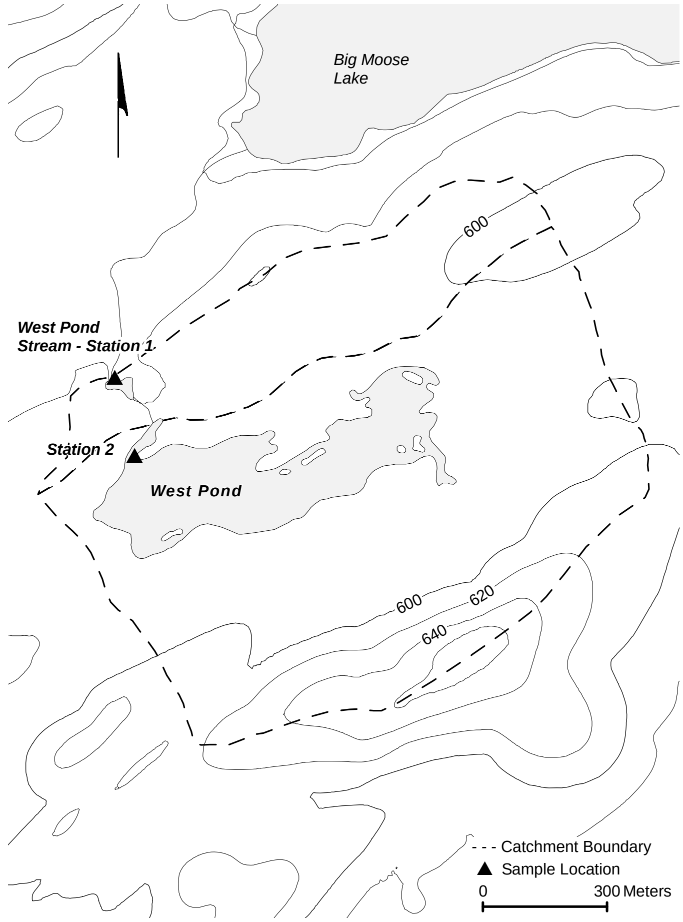


Figure 27.2 Bathymetry

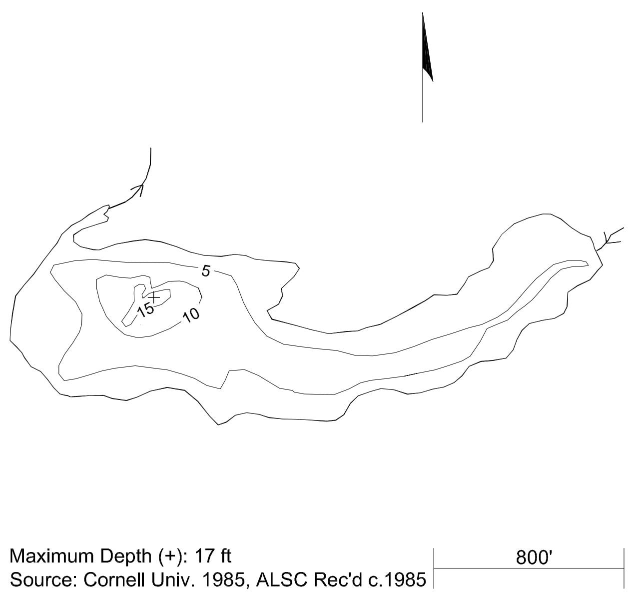


Table 27.1 Stream Chemistry (Station 1)

040753			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	77.24	109.31	95.32	44.73	69.43	56.04	22.81	50.15	35.53	µeq L^{-1}
NO_3^-	2.31	27.10	9.31	0.00	11.13	3.72	0.82	19.19	6.24	µeq L^{-1}
Cl^-	2.82	10.44	6.51	2.41	7.30	4.80	3.44	8.80	6.24	µeq L^{-1}
F^-	3.21	4.84	4.07	2.69	4.07	3.46	2.91	3.65	3.39	µeq L^{-1}
ANC	-31.92	35.79	-1.59	-10.35	21.97	9.58	-0.54	26.62	10.04	µeq L^{-1}
DIC	23.31	182.33	60.43	32.47	145.70	60.33	37.84	119.01	79.74	µmol L^{-1}-C
DOC	381.23	834.97	584.44	563.73	873.60	736.30	650.33		893.88	µmol L^{-1}-C
SiO_2	26.80	107.18	56.54	18.97	106.85	55.74	20.32	102.39	52.78	µmol L^{-1}
Ca^{2+}	59.88	99.81	75.19	48.90	68.87	57.08	40.27	58.72	47.33	µeq L^{-1}
Mg^{2+}	17.28	31.27	25.37	16.46	22.22	19.49	13.62	18.11	15.92	µeq L^{-1}
Na^+	15.66	30.01	22.37	18.27	25.23	21.62	18.81	24.58	21.75	µeq L^{-1}
K^+	3.84	9.46	6.16	0.99	5.63	3.38	2.62	9.00	6.61	µeq L^{-1}
NH_4^+	-0.17	10.09	3.07	-0.63	8.98	2.11	0.82	7.60	2.55	µeq L^{-1}
AL_TD	5.15	13.71	9.41	8.11	12.49	9.74	6.94	10.86	9.08	µmol L^{-1}
AL_TM	3.50	13.86	7.76	4.48	7.08	5.46	4.34	7.65	5.80	µmol L^{-1}
AL_OM	3.31	8.01	4.93	3.01	5.52	4.01	3.19	5.77	4.49	µmol L^{-1}
AL_IM	0.00	5.86	2.84	0.00	2.67	1.50	0.50	1.87	1.31	µmol L^{-1}
LABPH	4.42	5.98	4.89	4.84	5.51	5.08	4.79	5.38	5.07	
AIREQPH	4.48	6.29	4.91	4.86	5.75	5.11	4.81	5.41	5.10	
TRUECOLOR	30	90	66	90	140	108	80	200	121	Pt Co
SCONDUCT	17.16	29.75	21.48	14.09	19.00	15.77	12.31	16.61	14.39	µS cm^{-1}
TOTALP	na	na	na	3.57	8.39	5.99	2.86	12.32	7.49	µg L^{1}
CHLORA	na	na	na	na	na	na	na	na	na	µg L^{1}

Table 27.2 Lake Chemistry (Station 2)

040753			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	97.44	106.60	101.22	52.47	70.96	59.60	29.60	51.74	40.72	µeq L^{-1}
NO_3^-	-0.24	8.23	3.12	0.00	14.47	3.83	0.00	25.31	7.67	µeq L^{-1}
Cl^-	2.54	8.18	5.03	1.50	7.65	4.62	2.14	7.82	5.17	µeq L^{-1}
F^-	4.16	4.84	4.47	2.79	4.34	3.71	2.97	3.66	3.34	µeq L^{-1}
ANC	-7.26	9.07	1.34	-15.80	52.52	18.07	0.43	29.55	13.51	µeq L^{-1}
DIC	18.32	49.95	36.08	26.74	408.79	128.08	56.01	426.71	159.44	µmol L^{-1}-C
DOC	348.93	514.52	435.32	416.36	790.35	599.46	434.52	810.78	624.55	µmol L^{-1}-C
SiO_2	5.49	50.43	25.77	12.15	112.34	55.26	4.96	103.39	43.61	µmol L^{-1}
Ca^{2+}	57.89	83.84	73.11	49.90	86.33	59.10	39.39	57.78	45.40	µeq L^{-1}
Mg^{2+}	22.22	27.16	24.96	15.63	26.33	20.19	13.99	18.68	15.61	µeq L^{-1}
Na^+	20.44	25.23	23.85	18.27	26.53	22.59	19.12	25.22	21.81	µeq L^{-1}
K^+	4.60	6.39	5.29	1.20	6.65	3.70	4.52	9.02	6.16	µeq L^{-1}
NH_4^+	0.50	3.27	1.52	-0.69	11.48	2.16	-0.58	8.73	2.22	µeq L^{-1}
AL_TD	5.45	10.27	7.41	5.15	15.27	9.05	5.34	9.53	7.23	µmol L^{-1}
AL_TM	2.41	7.11	4.38	2.78	8.82	5.00	3.18	6.52	4.53	µmol L^{-1}
AL_OM	1.34	3.06	2.40	2.30	5.19	3.37	2.10	5.11	3.44	µmol L^{-1}
AL_IM	0.59	4.10	1.98	0.48	3.63	1.63	0.35	1.90	1.09	µmol L^{-1}
LABPH	5.04	5.56	5.24	4.64	5.77	5.27	4.89	5.53	5.22	
AIREQPH	5.10	5.70	5.26	4.67	6.57	5.38	5.02	6.06	5.40	
TRUECOLOR	30	45	36	60	120	78	45	90	69.58	Pt Co
SCONDUCT	16.97	21.05	18.46	12.78	21.20	15.11	10.59	18.24	13.41	µS cm^{-1}
TOTALP	na	na	na	2.15	9.21	4.99	3.87	13.14	6.52	µg L^{1}
CHLORA	na	na	na	0.77	8.49	3.28	0.63	8.15	2.93	µg L^{1}

Table 27.3 Lake Characteristics

Parameter	Value
Elevation	581 m
Maximum depth	5.2 m
Mean depth	1.5 m
Volume	15.2 x 10^4 m^3
Surface area	10.4 ha
Watershed area	99.6 ha
Watershed ratio	0.10
Hydraulic retention time (year)	0.20
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Eagle Bay
Land use classification	Fulton Chain Wild Forest

Figure 27.3 Chemistry Time Series / Station 1

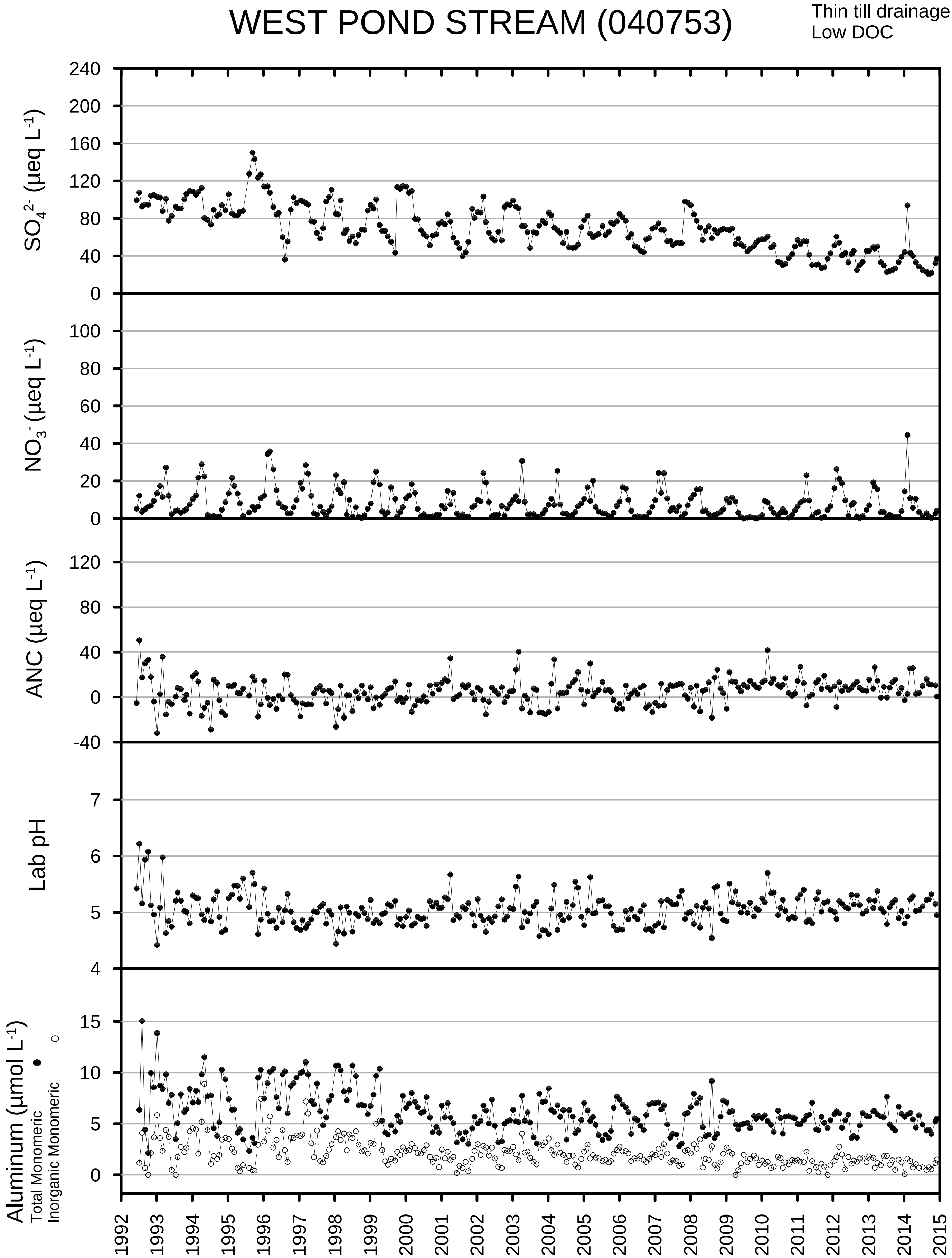
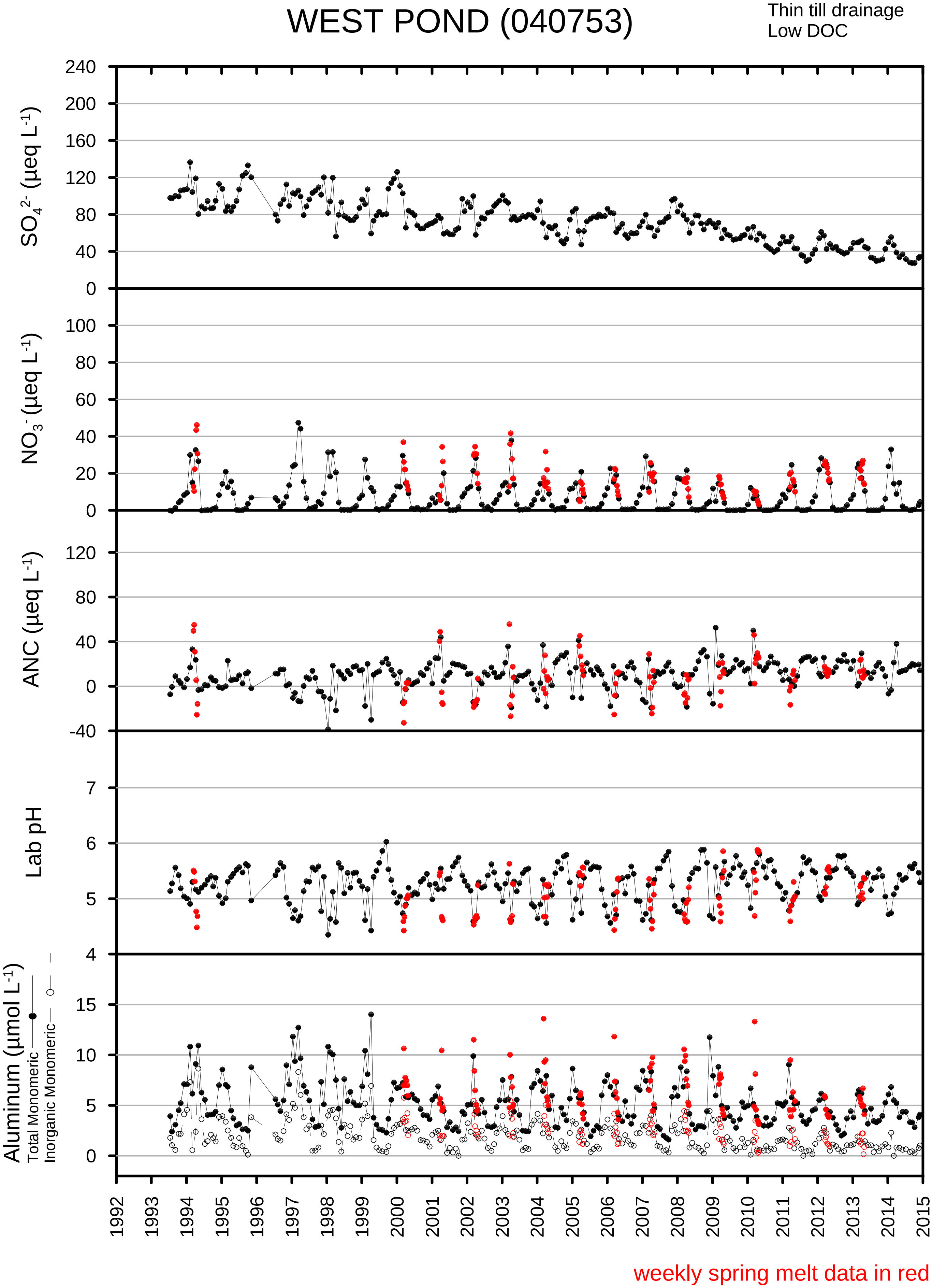


Figure 27.4 Chemistry Time Series / Station 2



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.ss	DDD MM SS.ss
Sample site - Stream	43.81358	-74.88374	43° 48' 48.87" N	074° 53' 01.45" W
Sample site - Lake	43.81189	-74.88296	43° 48' 42.80" N	074° 52' 58.65" W
Lake centroid	43.81086	-74.88165	43° 48' 39.11" N	074° 52' 53.94" W

Table 27.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Jun-1985	Brook trout	11	173	235	1275	11
Jun-1985	Brown bullhead	28	68	290	3100	58
May-1999	Brown bullhead	48	54	294	2659	48
Jun-2010	Brown bullhead	25	88	177	948	44

West Pond is classified as a thin-till drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. West Pond Stream (Station 1) is one of the original 17 ALTM waters, monitored monthly since June 1982. Originally, Station 1 was located near Big Moose Road approximately 800 m downstream from the outlet of the lake. In September 1992, Station 1 was moved upstream to the base of the barrier falls approximately 300 m downstream from the outlet of the lake. In June 1993, additional monthly sampling began at the main lake outlet (Station 2).

Lake chemistry: West Pond was sampled near its deepest point during the ALS on July 30, 1985 finding: Lab pH 5.25, ANC -3.4 µeq L^{-1}, SO_4^{2-} 116.59 µeq L^{-1}, NO_3^- 0.81 µeq L^{-1}, Ca^{2+} 79.84 µeq L^{-1}, Mg^{2+} 22.22 µeq L^{-1}, DOC 407.95 µmol L^{-1}-C (ALSC 1986). Tables 27.1 and 27.2 summarize recent ALTM water sample chemistry taken at the West Pond Stream and Lake sites. Major analytes collected at Station 1 through 2013 are shown in Table 27.1 including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes collected at Station 2 through 2013 are shown in Table 27.2 including total phosphorus (TP) and chlorophyll a (Chl a). Plots for Station 1 (Stream) through 2014 appear in Figure 27.3 and at Station 2 (Lake) are shown in Figure 27.4 with spring melt data in red.

Aquatic biota: On June 5, 1985, the ALS found submergent vegetation occupied 10% of the lake bottom. Emergent and floating vegetation occupied 5% and 1%, respectively, of the lake surface. Aquatic plants identified were: Vallisneria spp., Eriocaulon spp. and Nuphar spp. A dip-net survey on the same date found Insecta: Ephemeroptera Caenidae; Odonata Libellulidae and Aeshnidae; Hemiptera Corixidae and Gerridae; Trichoptera Limnephilidae; and Coleoptera Dytiscidae. Also found were: Crustacea Decapoda Unspecified and Pelecypod Veneroida Sphaeriidae. On July 30, 1985, the lake was isothermal (ALSC 1986). The AEAP reports an average value of chlorophyll a of 3.36 µg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: Historic records indicate brook trout were last stocked in 1894 and 1897 (ALSC 1986). In addition to the ALS fisheries survey, the ALSC netted the lake on May 26, 1999 and June 23, 2010 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 27.4 for recent fish netting history.

Intensive studies: West Pond Stream was sampled during the RILWAS and NBMR studies in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). Diatom stratigraphies were developed from sediment cores in the late 1980s (Charles et al. 1990). During 1986 and 1987 snowmelt, Schaefer and Driscoll (1993) evaluated episodic acidification in this watershed. Historical rates of mercury deposition were analyzed using sediment cores from 1982-1983 (Lorey and Driscoll 1999) and again in 1998 (Raynal et al. 2004). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). The AEAP has studied the lake (Momen et al. 2006). NBMR evaluated the recovery of fisheries in this water in 2000 (Raynal et al. 2004). The Adirondack/Catskill comparison from 1992–2001 included this watershed (Burns et al. 2005, Burns et al. 2006). Chen and others studied this watershed as a water with elevated concentrations of dissolved organic carbon (DOC) using the PnET-BGC model (Chen and Driscoll 2004, Chen et al. 2004).

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b). The NBMR study sampled this watershed for soils, mineralogy, and chemistry of surficial materials (Newton et al. 1987).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 16 km southwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The West Pond Stream watershed is 70% underlain by interlayered metasedimentary rock and granitic gneiss, having medium to high ANC. The remaining 30% of the northern portion of the watershed is underlain by biotite and/or hornblende granite gneiss with low to no ANC (Roy et al. 1997). Shallow (< 0.5 m) soils appear above 600 m elevation and make up 33% of the southern portion of the watershed. Basal till is found below 600 m and comprises a majority of the southern shoreline. The northern shoreline consists primarily of glacial outwash (APA 2001). The watershed has maximum elevation of 667 m. The maximum relief is 86 m. In 1985, the ALS characterized the shoal water substrate around the lake as 75% organic, 10% muck/silt and 15% bedrock/boulder/sand (ALSC 1986).

Land cover/use: In 1985, the ALS described the watershed as 80% deciduous-coniferous mixed forest and 20% coniferous forest. The immediate shoreline was 50% coniferous forest, 40% wetland and 10% deciduous-conifer mixed forest (ALSC 1986). Wetland area totals 21.8 ha and comprises 21.7% of the watershed (Roy et al. 1996). Predominant wetland types are: scrub/shrub broad-leaf deciduous (11.7 ha); forested needle-leaf evergreen (6.9 ha) and broad-leaf deciduous (3.2 ha) (ALSC 2003). The lakeshore is nearly surrounded by a scrub shrub wetland fringe (Roy et al. 1996).

The lake and 95% of the watershed occur within the Fulton Chain Wild Forest (NYSDEC 1990). A small area in the northeast is in private ownership and classified Low Intensity by the Adirondack Park Agency Land Use and Development Plan. A foot trail leads to the shoreline on the west side of the lake.

Watershed disturbance: The 1916 fire protection source data shows 88.3% of the West Pond watershed as green timber comprised of virgin and second growth with no slash. The July 1995 microburst storm produced 0-30% change in dominant tree crowns over the entire watershed (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Squash Pond and Squash Pond Stream 040754

EPA IDS: 1A1-111O and 1A1-111S

ALSC Staff Photo 2015 Squash Pond

ALSC Staff Photo 2015 Squash Pond Stream

Lake: Squash Pond lies in the Oswegatchie-Black watershed at 653 m. The lake receives drainage from Silver Dollar and Pocket Ponds (Figure 28.1). In 1986, the ALS noted that the lake outlet showed remnants of a concrete dam with a beaver dam built on it (ALSC 1987). Approximately 600 m downstream, a natural barrier falls prevents immigration of fish from Big Moose Lake. The outlet stream continues another 300 m past the falls, becoming a tributary into Big Moose Lake on the northwestern shore (Figure 28.1). The lake reaches a maximum depth of 5.8 m (19.0 ft) (Figure 28.2).

Squash Pond is classified as a thin-till drainage lake, with high dissolved organic carbon (>500 μmol L^{-1}-C) and considered sensitive to acidification. Squash Pond Stream (Station 1) is one of the 17 original ALTM lakes and has been monitored on a monthly basis since June 1982.

Figure 28.1 Catchment

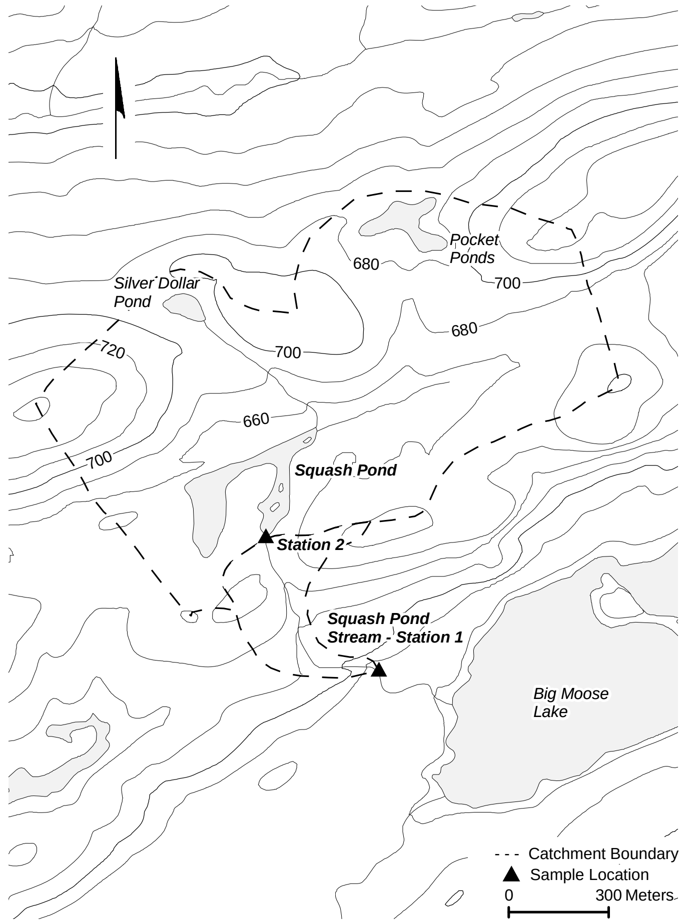
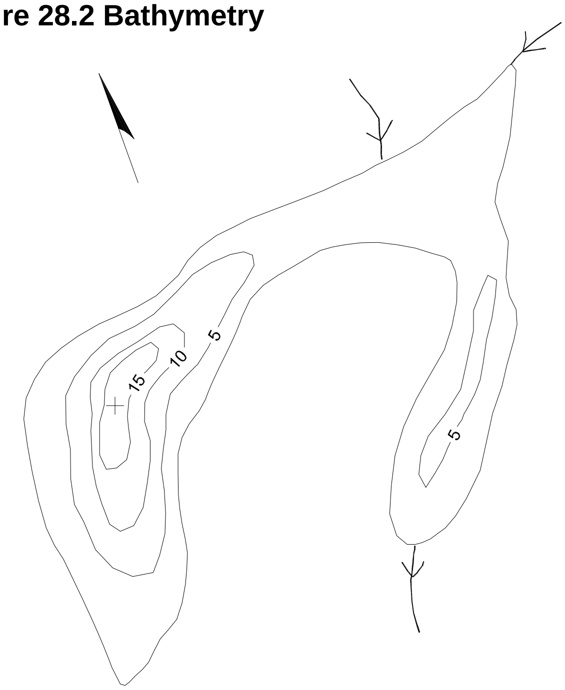


Figure 28.2 Bathymetry



Maximum Depth (+): 19 ft
Source: ALSC 1986

400'

Table 28.1 Stream Chemistry (Station 1)

040754			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	79.53	139.91	103.44	36.34	71.40	54.07	37.61	54.44	47.22	µeq L^{-1}
NO_3^-	4.05	44.51	17.60	1.28	30.45	10.45	0.00	43.86	16.83	µeq L^{-1}
Cl^-	4.23	11.00	7.38	3.44	8.46	5.96	4.22	7.90	6.24	µeq L^{-1}
F^-	1.89	3.11	2.47	1.83	2.75	2.15	1.72	2.72	2.15	µeq L^{-1}
ANC	-42.17	-16.77	-29.41	-27.29	-8.91	-19.10	-26.20	3.66	-12.58	µeq L^{-1}
DIC	3.33	34.97	18.46	12.49	28.31	20.49	13.38	28.84	21.74	µmol L^{-1}-C
DOC	422.61	727.82	567.34	589.04	900.18	712.90	592.17	951.07	708.22	µmol L^{-1}-C
SiO_2	26.30	95.20	61.63	23.27	92.54	56.74	25.41	95.27	57.40	µmol L^{-1}
Ca^{2+}	31.44	56.89	46.37	25.83	35.43	30.12	24.11	35.44	29.33	µeq L^{-1}
Mg^{2+}	12.34	17.28	15.09	8.21	12.34	10.20	8.25	12.39	10.25	µeq L^{-1}
Na^+	12.18	21.75	16.42	12.67	19.57	15.46	13.84	23.26	18.39	µeq L^{-1}
K^+	3.84	8.70	6.61	3.05	6.91	4.80	2.68	17.99	5.77	µeq L^{-1}
NH_4^+	-0.50	8.59	3.03	-0.63	4.60	0.92	0.10	6.45	2.31	µeq L^{-1}
AL_TD	13.71	29.32	21.12	16.27	24.98	20.36	13.18	23.94	18.01	µmol L^{-1}
AL_TM	10.53	25.74	17.30	8.47	14.57	11.38	6.72	15.83	10.57	µmol L^{-1}
AL_OM	0.11	8.97	6.06	3.48	7.83	6.20	4.04	9.34	6.71	µmol L^{-1}
AL_IM	1.67	25.63	11.24	2.18	8.64	5.18	0.59	7.13	3.86	µmol L^{-1}
LABPH	4.33	4.56	4.44	4.48	4.70	4.58	4.54	5.01	4.67	
AIREQPH	4.36	4.59	4.46	4.47	4.70	4.58	4.52	5.05	4.68	
TRUECOLOR	40	80	54	60	120	88	60	100	76	Pt Co
SCONDUCT	21.53	35.36	27.93	15.17	24.47	19.89	13.69	24.12	18.15	µS cm^{-1}
TOTALP	na	na	na	1.35	13.52	5.18	2.42	13.28	7.10	µg L^1
CHLORA	na	na	na	1.10	1.10	1.10	na	na	na	µg L^1

Table 28.2 Lake Chemistry (Station 2)

040754			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	69.54	144.70	98.51	30.09	72.15	49.31	28.53	57.08	44.43	µeq L^{-1}
NO_3^-	-0.24	26.98	6.02	0.00	30.34	8.03	0.00	43.84	14.63	µeq L^{-1}
Cl^-	3.95	12.13	7.05	2.90	8.52	5.75	3.25	8.56	6.06	µeq L^{-1}
F^-	0.53	2.11	1.53	1.51	2.56	1.84	1.56	2.62	1.99	µeq L^{-1}
ANC	-53.15	-30.92	-37.83	-35.76	-6.23	-19.90	-33.02	4.60	-11.68	µeq L^{-1}
DIC	65.77	147.36	100.46	54.12	363.00	133.23	75.28	279.09	151.88	µmol L^{-1}-C
DOC	568.64	857.37	679.44	628.67	1056.98	860.05	669.71	1063.55	789.55	µmol L^{-1}-C
SiO_2	3.99	93.20	39.69	10.71	83.88	49.60	10.78	106.73	55.82	µmol L^{-1}
Ca^{2+}	26.45	54.89	39.51	24.45	34.43	28.84	23.26	33.06	28.40	µeq L^{-1}
Mg^{2+}	9.87	17.28	13.44	8.20	11.52	9.80	7.68	12.20	9.75	µeq L^{-1}
Na^+	10.44	18.70	14.21	11.09	19.57	14.53	13.40	24.50	17.80	µeq L^{-1}
K^+	2.81	9.21	5.07	2.81	8.18	4.89	2.31	7.94	4.49	µeq L^{-1}
NH_4^+	0.28	3.83	2.18	-0.36	8.20	1.97	0.88	13.21	5.90	µeq L^{-1}
AL_TD	9.08	28.35	16.76	16.31	25.94	20.83	15.25	25.10	19.09	µmol L^{-1}
AL_TM	7.38	20.83	13.54	9.03	15.90	12.33	6.90	15.92	11.65	µmol L^{-1}
AL_OM	3.11	7.93	5.59	3.67	8.23	6.80	4.15	11.05	7.37	µmol L^{-1}
AL_IM	4.27	12.90	7.95	2.51	9.12	5.52	1.34	6.44	4.28	µmol L^{-1}
LABPH	4.19	4.45	4.35	4.39	4.75	4.54	4.47	5.01	4.66	
AIREQPH	4.31	4.47	4.40	4.38	4.72	4.55	4.44	5.07	4.67	
TRUECOLOR	60	70	63	70	160	126	60	140	93	Pt Co
SCONDUCT	21.72	37.72	27.13	15.25	26.80	20.20	11.39	26.03	18.38	µS cm^{-1}
TOTALP	na	na	na	0.57	25.36	6.96	1.92	17.39	6.81	µg L^1
CHLORA	na	na	na	1.23	7.47	3.59	0.70	7.49	3.20	µg L^1

Table 28.3 Lake Characteristics

Parameter	Value
Elevation	653 m
Maximum depth	5.8 m
Mean depth	1.4 m
Volume	4.5 x 10^4 m^3
Surface area	3.3 ha
Watershed area	125.1 ha
Watershed ratio	0.03
Hydraulic retention time (year)	0.05
Watershed	Oswegatchie/Black
County, Town	Herkimer, Webb
USGS Quadrangle	Eagle Bay
Land use classification	Private - Rural Use and Fulton Chain Wild Forest

Figure 28.3 Chemistry Time Series / Station 1

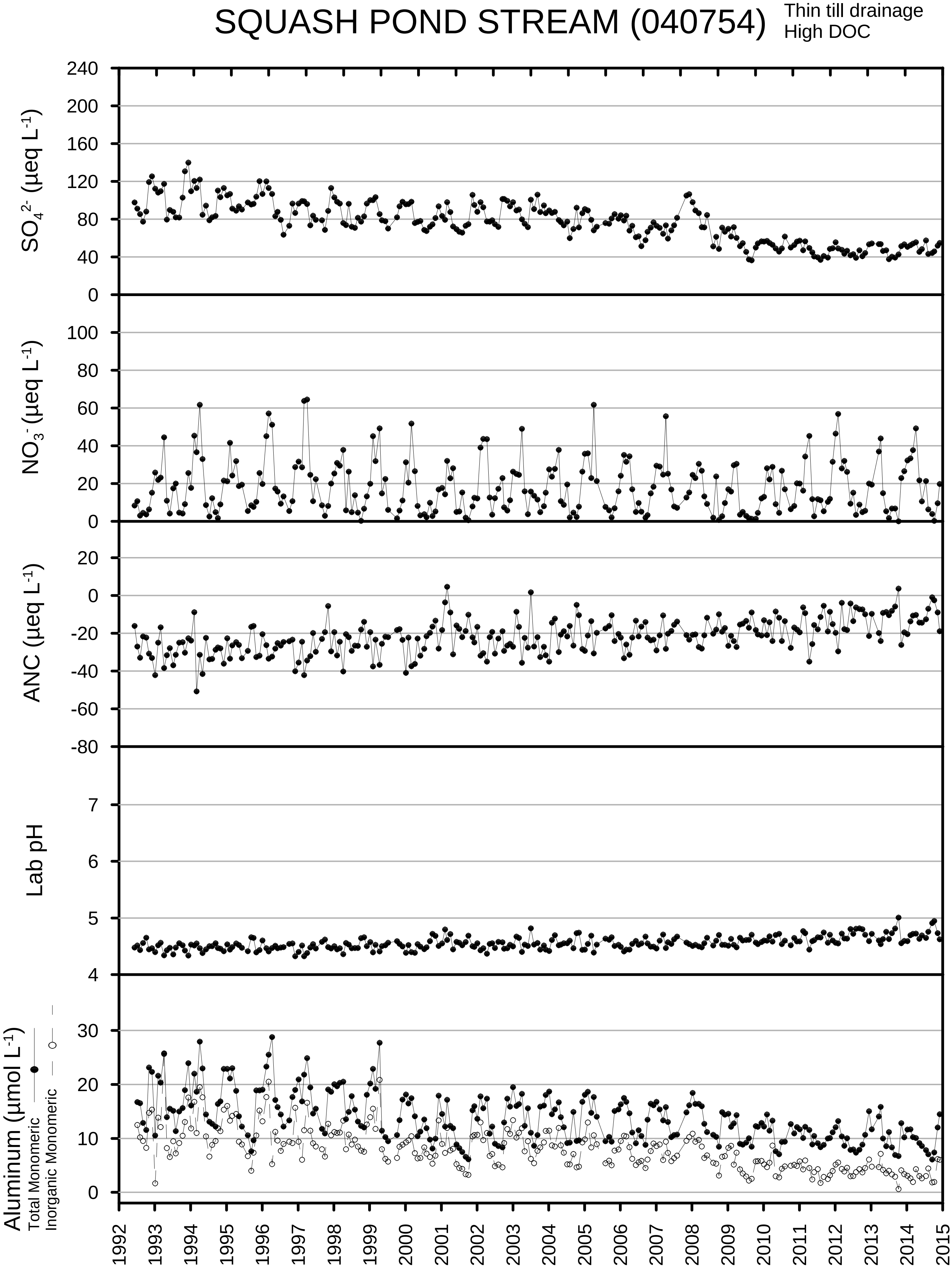
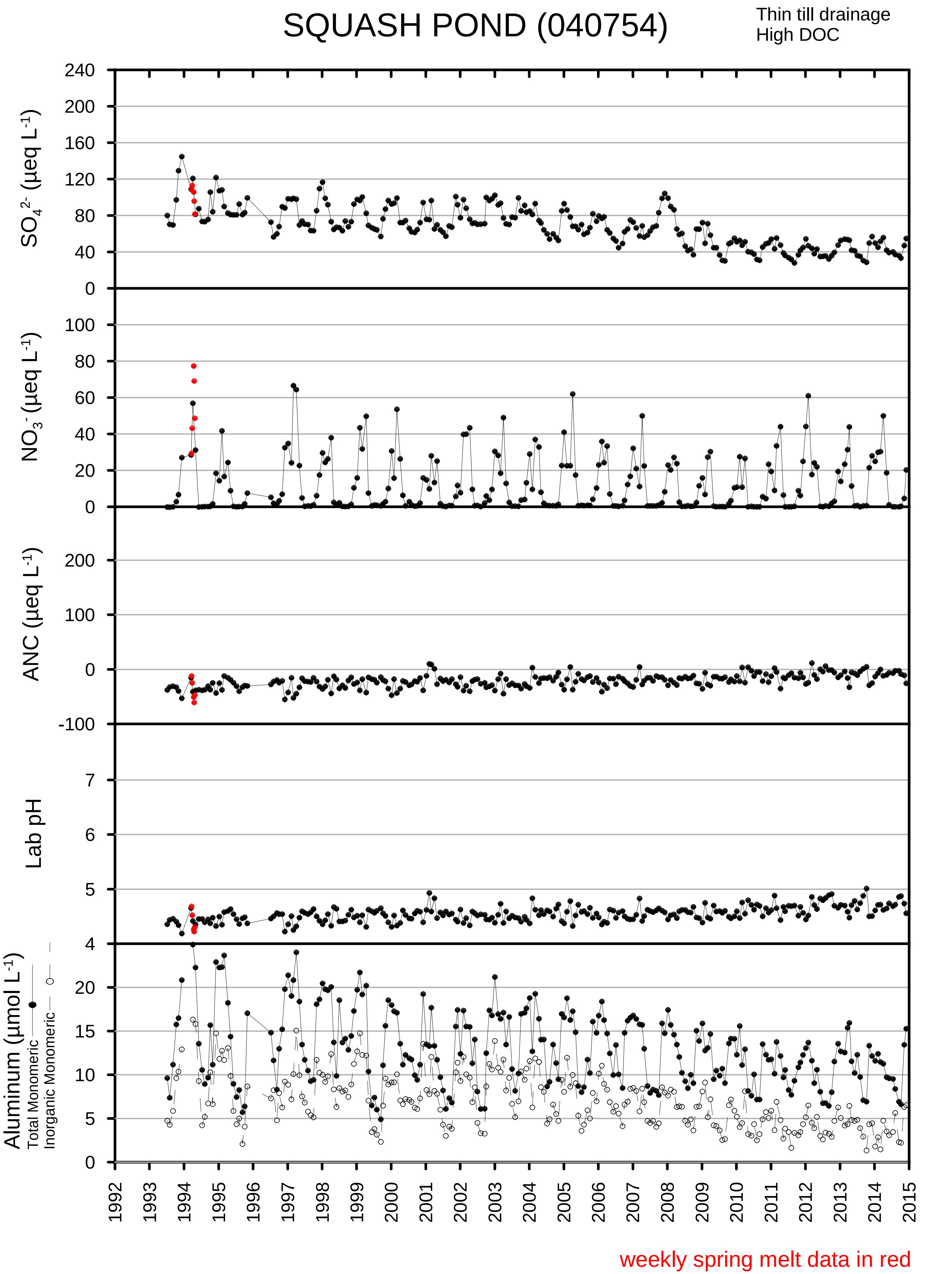


Figure 28.4 Chemistry Time Series / Station 2



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site - Stream	43.82170	-74.88246	43° 49' 18.1" N	074° 52' 56.9" W
Sample site - Lake	43.82557	-74.88614	43° 49' 32.0" N	074° 53' 10.1" W
Lake centroid	43.82621	-74.88822	43° 49' 34.3" N	074° 53' 17.6'' W

Station 1 is approximately 600 m downstream from the pond outlet at the base of the barrier falls. The ALTM program began collecting monthly samples from the outlet of Squash Pond (Station 2) in June 1993.

Lake chemistry: Squash Pond was sampled near its deepest point during the ALS on July 28, 1986 finding: Lab pH 4.36, ANC -45.8 µeq L^{-1}, SO_4^{2-} 87.65 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 30.94 µeq L^{-1}, Mg^{2+} 9.87 µeq L^{-1}, DOC 1065.68 µmol L^{-1}-C (ALSC 1987). Tables 28.1 and 28.2 summarize recent ALTM water chemistry at the Squash Pond Stream site. Major analytes collected at Station 1 (Stream) through 2013 are shown in Table 28.1 including total phosphorus (TP) and chlorophyll a (Chl a). Table 28.2 summarizes major analytes at Station 2 (Lake) including total phosphorus (TP) and chlorophyll a (Chl a). Plots for Station 1 through 2014 appear in Figure 28.3. Plots for Station 2 are shown in Figure 28.4 with spring melt data in red.

Aquatic biota: On May 28, 1986, the ALS found submergent plants occupied 95% of the lake bottom. Plants found: Iris spp. and Utricularia spp. A dip-net survey on the same date identified the following Insecta: Odonata Coenagriidae, Libellulidae, and Aeshnidae; Trichoptera Phryganeidae and Polycentropodidae; Diptera Chironomidae and Unspecified; Coleoptera Dytiscidae and Gyrinidae; Hemiptera Gerridae; Ephemeroptera Leptophlebiidae; and Megaloptera Sialidae. The macrophyte survey on July 28, 1986, found Utricularia spp., Nuphar sp., and Sphagnum spp. A thermocline was identified between 2.0 and 3.0 m on July 28, 1986 (ALSC 1987). The AEAP reported an average value of chlorophyll a of 2.92 µg L^{-1} in 2003 (Momen et al. 2006)

Fisheries: Squash Pond has no history of stocking (ALSC 1987). In addition to the ALS fisheries survey on May 29, 1986, the ALSC netted the lake on June 17, 1998 and June 15, 2009 (Roy et al. 2015, Baldigo et al. 2016). No fish were caught in any of the surveys.

Intensive studies: The RILWAS and NBMR studies surveyed Squash Pond in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). During 1986 and 1987 snowmelt, Schaefer and Driscoll (1993) evaluated episodic acidification at Squash Pond Stream. The pond was one of 20 Adirondack lakes studied to evaluate regional trends in chrysophyte-inferred lake water pH changes (Cumming et al. 1994, Smol et al. 1998). Squash Pond was a study watershed for an Adirondack/ Catskill comparison during 1992–2001 (Burns et al. 2005, Burns et al. 2006). The lake has been studied by the AEAP (Momen et al. 2006). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). NBMR evaluated the recovery of fisheries in this water in 2000 (Raynal et al. 2004).

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b). The NBMR study sampled this watershed for soils, mineralogy, and chemistry of surficial materials (Newton et al. 1987).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 17 km southwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Squash Pond Stream watershed is entirely underlain by biotite and/or hornblende granite gneiss with low to no ANC (Roy et al. 1997). Till overlies 99% of the watershed, with a small outcropping of outwash sand and gravel around the southern tip of the outlet (APA 2001). The highest elevation in the watershed is 760 m. The maximum relief is 107 m. In 1986, the ALS characterized the shoal water substrate as 98% muck/silt/organic and 2% boulders (ALSC 1987).

Land use/cover: In 1986, the ALS described the watershed as: 50% deciduous-coniferous mixed forest; 40% deciduous forest; and 10% scrub/sapling (ALSC 1987). Total wetland area is 10.7 ha and comprises 8.5% of the watershed. The lake is surrounded by a scrub shrub wetland fringe. The predominant wetland cover types are emergent marsh (3.1%), forested needle-leaf evergreen (3%), and broad leaf evergreen scrub/shrub (2.4%). A wetland fringe occurs around Silver Dollar Pond, portions of Pocket Pond, and along the western inlet of Squash Pond (Roy et al. 1996).

Squash Pond is in mixed ownership. Nearly all the pond and watershed lies in the Fulton Chain Wild Forest (NYSDEC 1990). The remainder is classified as Rural Use under the Adirondack Park Agency Land Use and Development Plan Map. There is no development in the watershed.

Watershed disturbance: The 1916 fire protection source data show 96.5% of the watershed as green timber with no slash. The watershed was affected by the November 1950 storm that damaged 32% of the area with 50 to 100% blow down. The July 1995 microburst storm caused 0-30% change in crowns in 93% of the watershed and 30-60% change in crowns in 7% of the watershed (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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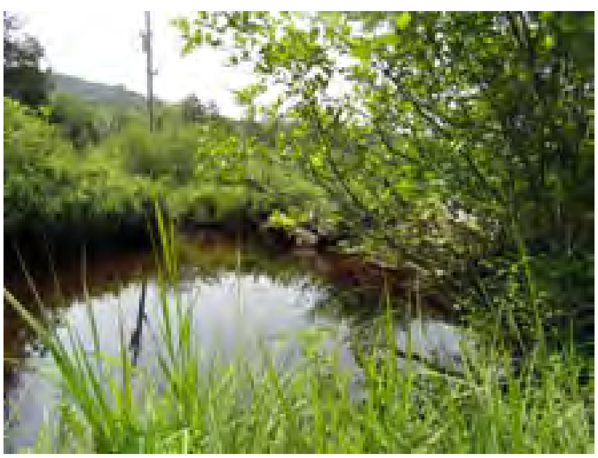
Constable Pond and Constable Pond Stream 040777

EPA IDS: 1A1-017O and 1A1-017S


ALSC Staff Photo 2015 Constable Pond


ALSC Staff Photo 2015 Constable Pond


ALSC Staff Photo 2015 Constable Pond Stream

Lake: Constable Pond lies in the Oswegatchie-Black watershed at 580 m. The 20.6 ha pond receives drainage from three lake sub-watersheds: Pigeon Lake, Chub Lake, and an Unnamed Pond. A beaver dam exists on the outlet. The outlet stream flows through an old beaver meadow/wetland complex called Constable Creek, which

Figure 29.1 Catchment

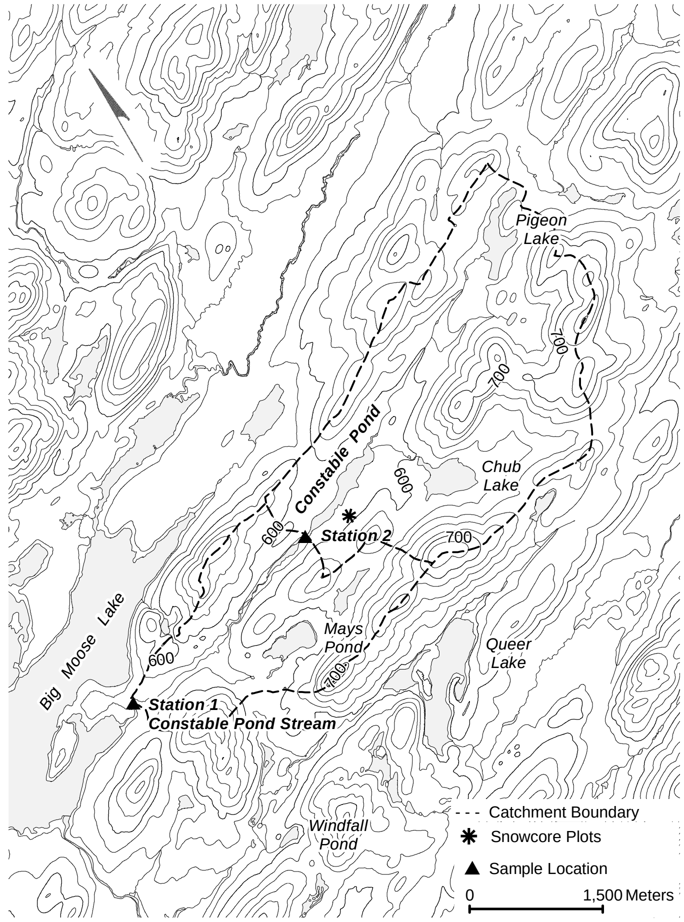
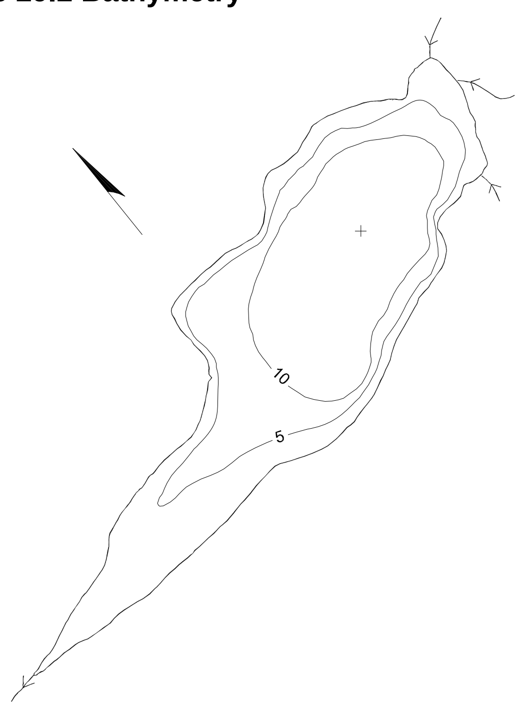


Figure 29.2 Bathymetry



Maximum Depth (+): 13 ft
Source: ALSC 1984

Table 29.1 Stream Chemistry (Station 1)

040777			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	103.68	159.06	130.16	53.36	93.77	72.07	41.13	73.45	57.80	µeq L^{-1}
NO_3^-	3.84	46.77	18.91	0.31	30.11	8.08	0.00	42.52	16.73	µeq L^{-1}
Cl^-	6.49	13.82	8.81	4.62	9.51	6.39	4.78	15.78	7.12	µeq L^{-1}
F^-	3.74	5.37	4.29	2.67	3.65	3.21	2.90	4.21	3.47	µeq L^{-1}
ANC	-26.46	33.00	1.33	-2.06	32.64	12.08	-0.92	111.12	24.64	µeq L^{-1}
DIC	22.48	87.42	46.48	25.81	70.77	44.07	38.14	121.92	61.90	µmol L^{-1}-C
DOC	318.95	555.90	396.50	394.80	570.27	483.35	424.39	672.24	565.45	µmol L^{-1}-C
SiO_2	53.92	105.52	76.57	27.29	92.37	59.86	33.17	95.60	67.57	µmol L^{-1}
Ca^{2+}	62.88	122.26	90.07	52.44	77.85	61.97	51.08	160.64	69.26	µeq L^{-1}
Mg^{2+}	20.57	34.56	26.95	14.81	23.11	17.83	14.70	29.46	19.16	µeq L^{-1}
Na^+	15.66	33.93	24.11	16.96	26.13	21.08	13.44	35.59	23.83	µeq L^{-1}
K^+	6.65	10.23	8.21	4.35	8.18	5.67	3.81	9.71	6.20	µeq L^{-1}
NH_4^+	0.22	4.60	1.97	-0.75	3.22	0.57	-0.72	4.78	1.33	µeq L^{-1}
AL_TD	5.97	21.76	14.57	8.82	16.94	11.33	1.48	14.49	10.15	µmol L^{-1}
AL_TM	2.69	18.83	11.08	3.07	8.82	5.83	1.81	10.06	6.17	µmol L^{-1}
AL_OM	0.70	7.89	3.88	2.35	4.82	3.49	1.85	6.50	4.31	µmol L^{-1}
AL_IM	0.74	13.96	7.21	0.50	4.00	2.34	0.00	3.56	1.87	µmol L^{-1}
LABPH	4.51	6.12	4.94	4.81	6.13	5.21	4.92	7.02	5.26	
AIREQPH	4.54	6.54	4.96	4.83	6.34	5.21	4.86	7.06	5.28	
TRUECOLOR	20	40	28	35	80	53	20	70	49	Pt Co
SCONDUCT	18.95	31.40	24.84	13.79	21.29	16.58	12.36	22.08	17.11	µS cm^{-1}
TOTALP	na	na	na	1.04	4.61	3.17	3.39	12.88	6.02	µg L^1
CHLORA	na	na	na	na	na	na	na	na	na	µg L^1

Table 29.2 Lake Chemistry (Station 2)

040777			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	117.42	178.22	137.55	55.15	93.70	73.36	44.89	73.67	58.56	µeq L^{-1}
NO_3^-	2.87	25.93	9.82	0.00	30.56	7.83	0.00	40.35	16.18	µeq L^{-1}
Cl^-	6.77	11.00	8.56	4.39	8.53	6.20	4.53	7.56	6.17	µeq L^{-1}
F^-	3.42	4.21	3.76	2.75	3.41	3.02	2.66	4.05	3.31	µeq L^{-1}
ANC	-16.39	-3.51	-7.87	-8.43	11.64	3.62	-1.65	18.33	8.65	µeq L^{-1}
DIC	14.99	79.93	40.93	36.63	172.34	69.20	45.55	177.87	80.80	µmol L^{-1}-C
DOC	262.17	510.19	363.97	403.96	617.36	514.63	431.64	693.63	584.53	µmol L^{-1}-C
SiO_2	26.30	95.53	51.79	6.28	89.37	50.14	14.54	91.86	55.84	µmol L^{-1}
Ca^{2+}	66.37	88.33	74.69	47.19	65.87	54.35	43.61	67.77	54.12	µeq L^{-1}
Mg^{2+}	22.22	26.33	23.86	13.99	18.10	15.70	12.84	18.99	15.79	µeq L^{-1}
Na^+	16.53	22.18	20.37	15.66	21.75	18.76	17.73	25.91	21.61	µeq L^{-1}
K^+	7.16	8.44	7.89	4.66	8.18	5.88	3.05	10.12	5.88	µeq L^{-1}
NH_4^+	-0.22	4.55	2.61	-0.64	3.38	0.57	-0.34	5.69	1.39	µeq L^{-1}
AL_TD	8.08	20.20	13.11	9.52	17.49	12.66	8.89	15.37	11.75	µmol L^{-1}
AL_TM	5.86	15.05	9.33	4.60	10.41	6.84	3.83	10.63	7.23	µmol L^{-1}
AL_OM	1.30	3.21	2.41	2.57	5.60	3.66	3.04	6.72	4.75	µmol L^{-1}
AL_IM	3.60	11.84	6.91	1.66	4.82	3.19	0.80	3.91	2.48	µmol L^{-1}
LABPH	4.42	5.08	4.80	4.66	5.12	4.94	4.81	5.59	5.06	
AIREQPH	4.50	5.12	4.82	4.71	5.20	4.97	4.80	5.70	5.10	
TRUECOLOR	15	25	20	35	90	53	30	70	51	Pt Co
SCONDUCT	19.49	34.95	23.93	13.93	24.08	17.44	12.29	22.57	16.64	µS cm^{-1}
TOTALP	na	na	na	2.21	25.94	6.36	3.15	9.77	5.33	µg L^1
CHLORA	na	na	na	0.36	2.59	1.54	0.39	2.84	1.44	µg L^1

Table 29.3 Lake Characteristics

Parameter	Value
Elevation	580 m
Maximum depth	4.0
Mean depth	2.1 m
Volume	43.5 x 10^4 m^3
Surface area	20.6 ha
Watershed area	937.4 ha
Watershed ratio	0.02
Hydraulic retention time (year)	0.06
Watershed	Oswegatchie/Black
County, Town	Herkimer, Long Lake
USGS Quadrangle	Eagle Bay
Land use classification	Pigeon Lake Wilderness

Figure 29.3 Chemistry Time Series / Station 1

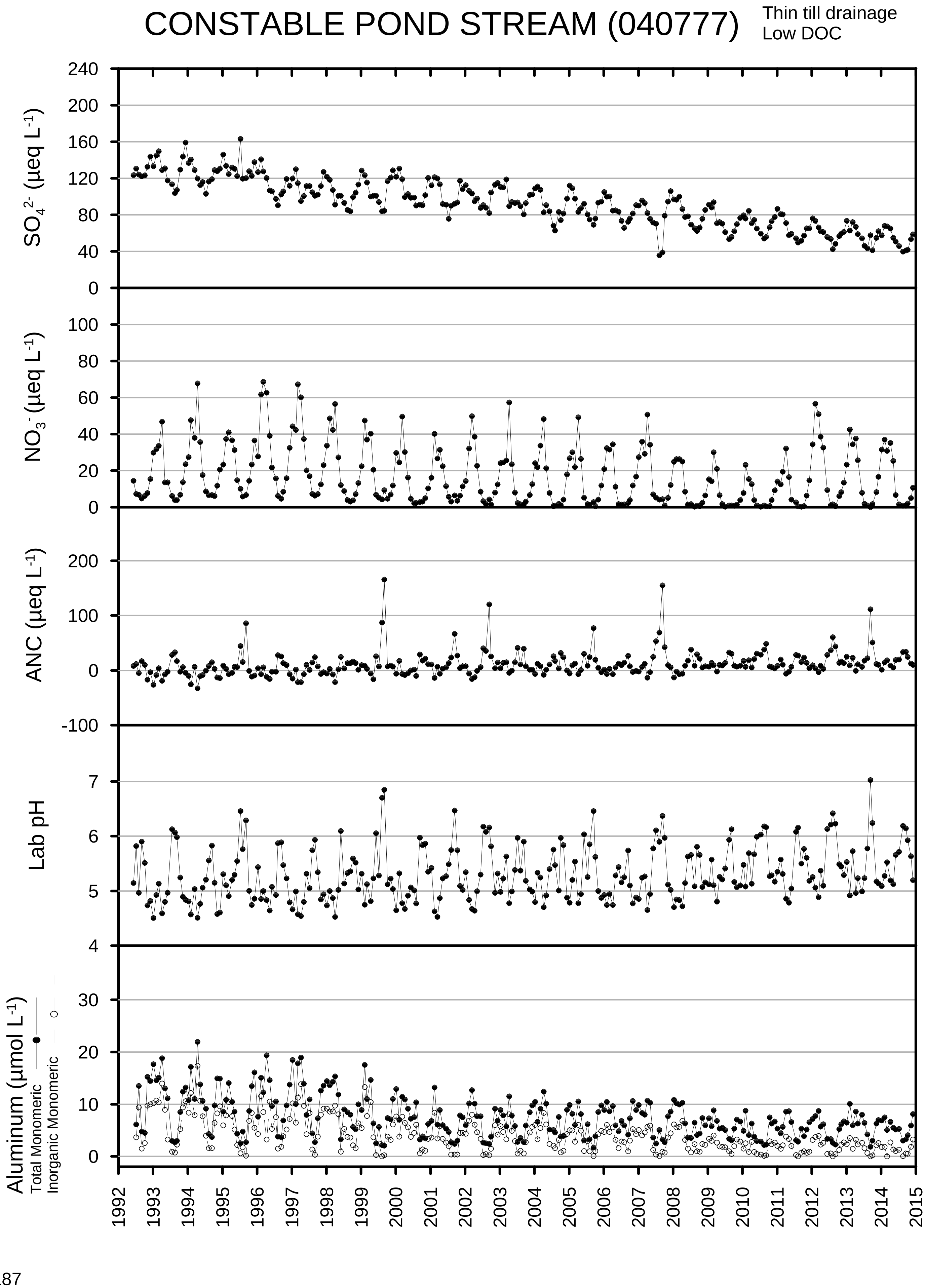
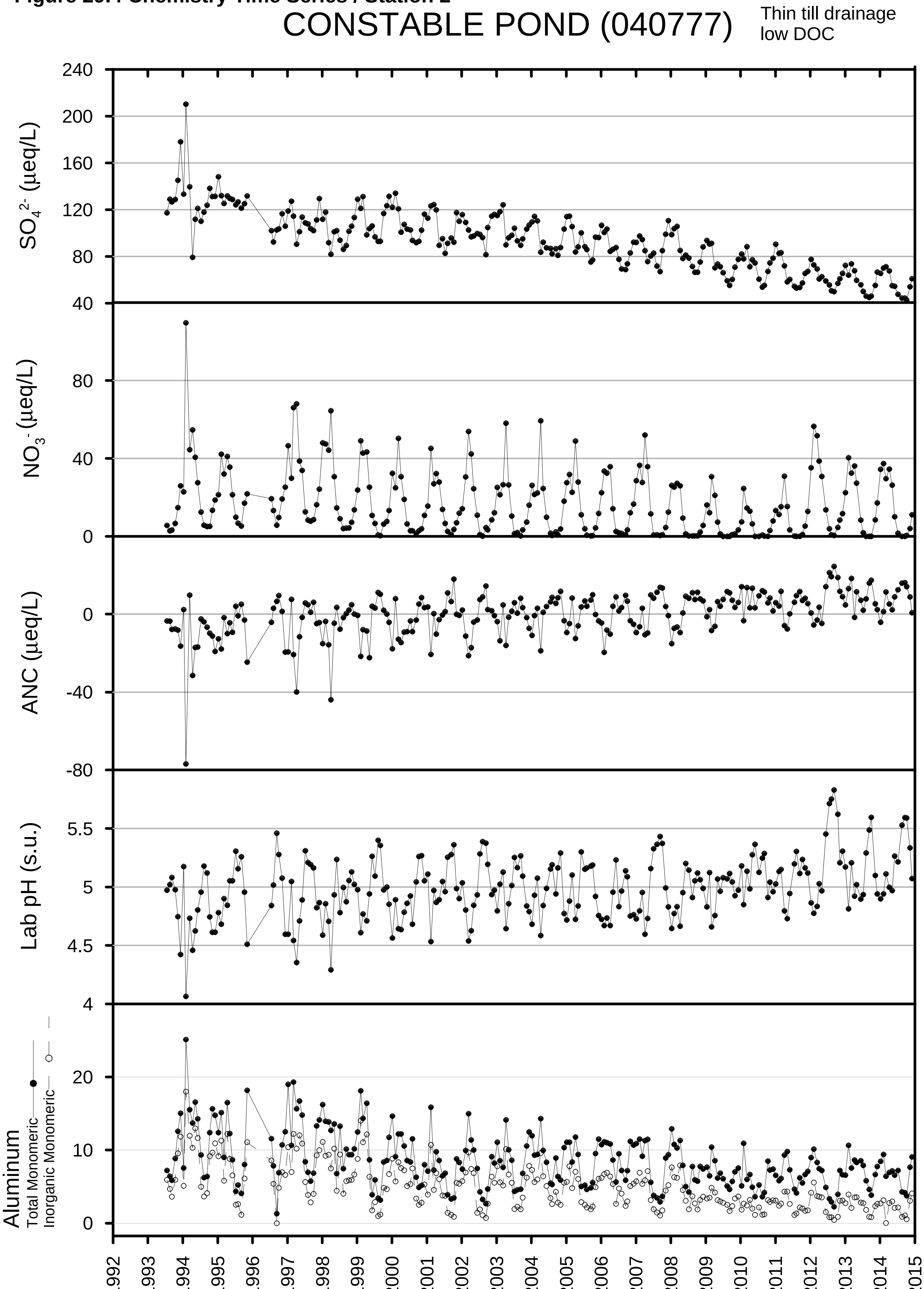


Figure 29.4 Chemistry Time Series / Station 2



receives drainage from two additional sub-watersheds: Mays Pond and an Unnamed Pond ultimately flows into the South Bay of Big Moose Lake (Figure 29.1). Constable Pond reaches a maximum depth of 4.0 m (13.1 ft) (Figure 29.2).

Constable Pond is classified as a thin-till chain drainage lake, with low dissolved organic carbon a (<500 µmol L^{-1}-C) and is considered sensitive to acidification. Constable Pond Stream (Station 1) is one of 17 original ALTM sites, monitored monthly since June 1982. Station 1 is located approximately 2,700 m downstream from the lake outlet just above where Constable Creek flows through a culvert under Higby Road. The ALTM program began collecting a monthly sample at Constable Pond (Station 2) in July 1993. Sampling continues on a monthly basis at both locations.

Lake chemistry: Constable Pond was sampled near its deepest point during the ALS on July 31, 1984 finding: Lab pH 4.94, ANC -9.0 µeq L^{-1}, SO_4^{2-} 142.41 µeq L^{-1}, NO_3^- 0.16 µeq L^{-1}, Ca^{2+} 77.85 µeq L^{-1}, Mg^{2+} 24.69 µeq L^{-1}, DOC 291.40 µmol L^{-1}-C (ALSC 1985). Tables 29.1 and 29.2 summarizes recent ALTM water chemistry at the Constable Pond and Stream sites. Major analytes collected at Station 1 through 2013 are shown in Table 29.1 including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes collected at Station 2 is shown in Table 29.2 including total phosphorus (TP) and chlorophyll a (Chl a). Plots for Station 1 (Stream) through 2014 appear in Figure 29.3 and for Station 2 (Lake) in Figure 29.4.

Aquatic biota: On August 10, 1984, the ALS aquatic plant survey identified: Eriocaulon spp. and Nymphaea spp. Emergent vegetation covered 25% of the lake surface. On June 12, 1984, a dip-net survey identified the following Insecta: Odonata Corduliidae and Libellulidae; and Hemiptera Corixidae. On July 31, 1984, the lake was isothermal (ALSC 1985).

During the DEC Biota project, the lake had an average chlorophyll a value of 2.97 µg L^{-1}, and an average total phosphorus value of 8.0 µg L^{-1} in July 1984. The phytoplankton community was dominated by a Chrysophcea unidentified spherical cell #2. Collotheca mutabilis was the dominant rotifer and Diaptomus minutus was the dominant crustacean zooplankton (Sutherland 1989). In August 1975, the DOH found total phosphorus to be 14.9 mg m^{-3} and chlorophyll a to be 3.17 µg L^{-1} (Wood 1978). In 2003, the AEAP reported the average value of chlorophyll a was 1.79 µg L^{-1} (Momen et al. 2006).

Fisheries: Earliest records show brook trout were stocked in 1932 and 1934 and annually from 1949 to1975 (ALSC 1985). No stocking has been recorded since then. During the NBMR study in 1982–1983, brown bullhead, yellow perch, and brook trout were captured (Schofield and Driscoll 1987). In addition to the ALS fisheries survey on June 11, 1984, the ALSC netted the lake on May 24, 1999 and October 14, 2010 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 29.4 for recent netting history.

Intensive studies: The DOH conducted a limnological survey of Constable Pond in August 1975 (Wood 1978). Constable Pond Stream was studied during the RILWAS and NBMR in the early 1980s (Newton et al. 1987, Driscoll et al. 1987, Schofield and Driscoll 1987, Driscoll and Newton 1985). Constable Pond was surveyed in 1984 as part of the DEC Biota Project (Sutherland 1989). During the 1986 and 1987 snowmelts, Schaefer and Driscoll (1993) evaluated snowmelt acidification in Constable Pond Stream. Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Landscape characteristics and disturbance history have been evaluated within this watershed (Sullivan et al. 1999). This lake has been studied as part of the AEAP (Momen et al. 2006) and was one of 20 Adirondack lakes evaluated for regional trends in chrysophyte-inferred lake water pH (Cumming et al. 1994, Smol et al. 1998). Constable Pond was studied as part of the Adirondack/Catskill comparison study from 1992–2001 (Burns et al. 2005, Burns et al. 2006). During 1999 and 2000, mass-balance studies at three ALTM lakes (Grass, Constable, and G) included the installation of snow core plots in these watersheds (Figure 29.1). Inlets were sampled monthly by the ALSC from August 1998 through 2001 during ice free periods, along with monthly snow core sampling from 1999 through 2013 in the watershed of this pond. Grass Pond and Constable Pond were studied intensively for nitrogen dynamics in 1999–2000 (Ito et al. 2006). Fisheries recovery since the NBMR survey was evaluated for this water in 2000 (Raynal et al. 2004). The lake is characterized as an example of an acid-sensitive watershed using biogeochemical model PnET-BGC (Chen and Driscoll 2004, Chen et al. 2004). Detailed

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site - Stream	43.82509	-74.83850	43° 49' 30.3" N	074° 50' 18.6" W
Sample site - Lake	43.83101	-74.80642	43° 49' 51.6" N	074° 48' 23.1" W
Lake centroid	43.83307	-74.79712	43° 49' 59.0" N	074° 47' 49.6" W

Table 29.4 Netting History

Date		Number	Length	Length	Weight	Total
			Min	Max		
Month-Year	Species	Measured	(mm)	(mm)	Grams	Number
Jun-1984	Brown bullhead	2	195	210	340	2
May-1999	Brook trout	27	177	343	3622	28
May-1999	Brown bullhead	8	123	241	1091	8
May-1999	Pumpkinseed	9	125	184	445	9
May-1999	Yellow perch	16	131	157	574	16
Oct-2010	Brook trout	6	200	330	1370	6
Oct-2010	Golden shiner	1	145	-	35	1
Oct-2010	Creek chub	1	196	-	4	1
Oct-2010	White sucker	25	211	290	4146	34
Oct-2010	Brown bullhead	25	108	237	1875	42
Oct-2010	Pumpkinseed	22	55	150	514	22
Oct-2010	Yellow perch	57	85	220	1942	109

mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Soils: Ito and others (2006) conducted a study of surficial geology and soils in the Constable Pond and Grass Pond (040706) watersheds. In 1985, five soils pits, field observations, and aerial photographs were used to map areas of thick till deposits within the Constable Pond watershed (Ito et al. 2006). The NBMR study sampled this watershed for soils, mineralogy, and chemistry of surficial materials (Newton et al. 1987). A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 22 km southwest of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Approximately 63% of the Constable Pond Stream watershed lies on interlayered metasedimentary rock, granitic gneiss, having medium to high ANC. This area includes Chub Lake, Mays Pond and the Unnamed Pond in between. The remaining 37% of the watershed that contains Pigeon Lake and Constable Pond is over biotite and/or hornblende granite gneiss having low to no ANC (Roy et al. 1997). The watershed is primarily (84%) overlain by till while 11.3% of the watershed has exposed bedrock. The remaining 4.3% is outwash sand and gravel and appears just above the outlet on the western tip of the watershed. The immediate area around Constable Pond and the majority of the low lying areas draining into it are basal till. An area of hydric soils occurs just north of the lake outlet and along the outlet stream extending to and including the outlet stream from Mays Pond. Rock outcrop and shallow soils predominate in areas above 600 m along the southern end of the watershed (APA 2001). The highest elevation in the watershed is found between Chub Lake and Pigeon Lake at 752 m. The watershed has a maximum relief of 172 m. In 1984, the ALS found the shoal water substrate comprised of 70% rubble and 30% muck/silt (ALSC 1985).

Land cover/use: In 1984, deciduous forest covered 60% of the Constable Pond watershed, deciduous-conifer mixed forest 20%, coniferous forest 10%, and open space 10%. The immediate shoreline was comprised of 30% open grass, 20% wetland, 20% shrub-sapling, 10% deciduous forest, 10% coniferous forest and 10% sand-gravel beach (ALSC 1985). Total wetland area is 88.4 ha comprising 9.4% of the watershed (Roy et al. 1996). The predominant wetland cover type is forested needle-leaf evergreen (57.2 ha) and scrub/shrub broad-leaf deciduous (23.4 ha). Wetlands dominate the main inlet and outlet of Constable Pond.

Constable Pond and its watershed occur within the Pigeon Lakes Wilderness Area (NYSDEC 1992). The ALTM sampling Station 1 is on private land. There is a foot trail that runs parallel to the south shore of the outlet and along the southern shoreline of the pond.

Watershed disturbance: The 1916 fire protection source data show 96.3% of the Constable Pond watershed as green timber with no slash. The forest age source data show 100% of the watershed as old growth, with no evidence of logging. The November 1950 storm caused 50 to 100% blowdown in 36.4% of the watershed. The July 1995 microburst storm caused forest damage with 72.2% of the watershed showing 0 to 30% change, 21.6% showing 30 to 60% change, and 6.2% of the watershed had 60 to 100% tree crown damage (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Limekiln Lake 040826
EPA ID: 040826O

ALSC Staff Photo 2000

Lake: Limekiln Lake lies in the Oswegatchie-Black watershed at 575 m. Fawn Lake drains into the lake from the east. A large wetland on the southeastern shore is another major tributary (Figure 30.1). A small concrete dam constructed on the outlet in 1972 is used to elevate the water level during the summer. Approximately 500 feet downstream, a fish barrier dam was built in 1961 prior to reclamation. The outlet becomes Limekiln Creek and flows into the South Branch of Moose River. Limekiln Lake has a number of bays and small islands, and reaches a maximum depth of 22 m (72.2 ft) (Figure 30.2).

Limekiln Lake is a medium-till chain drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered to be moderately sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992 and sampling frequency was modified to seasonal in 2014.

Lake chemistry: Limekiln Lake was sampled near its deepest point during the ALS survey on July 22, 1985 finding: Lab pH 6.06, ANC 8.9 µeq L^{-1}, SO_4^{2-} 119.72 µeq L^{-1}, NO_3^- 4.37 µeq L^{-1}, Ca^{2+} 111.78 µeq L^{-1}, Mg^{2+} 30.45 µeq L^{-1}, DOC 224.79 µmol L^{-1}-C (ALSC 1986). Table 30.1 summarizes recent ALTM water sample chemistry taken at the outlet. Major analytes through 2013 are shown in Table 30.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 30.3 with intermittent weekly spring melt data collected in the 1990s in red. (Aluminum was not analyzed during springmelt).

Figure 30.1 Catchment

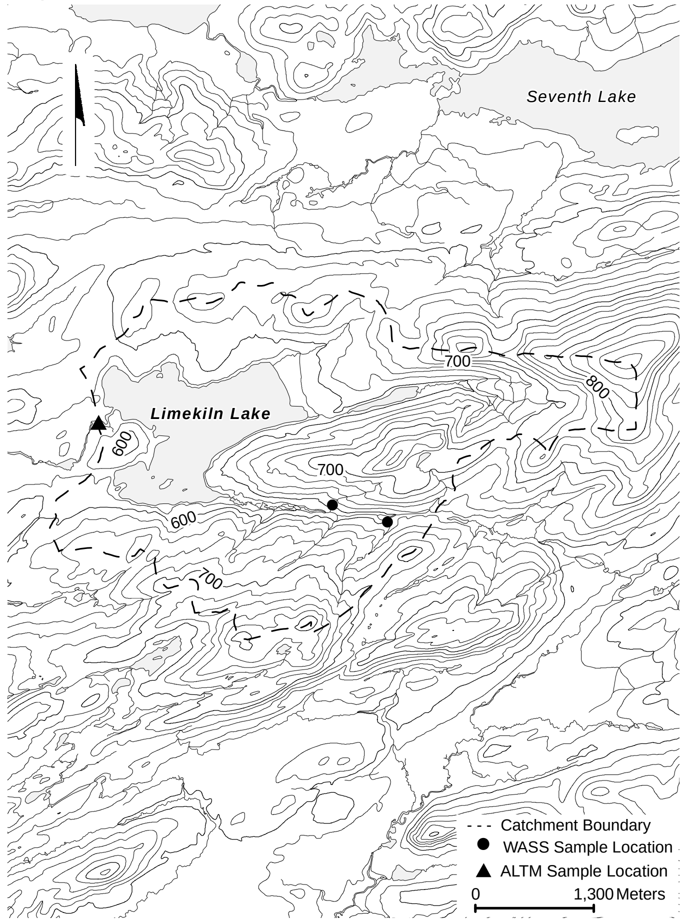
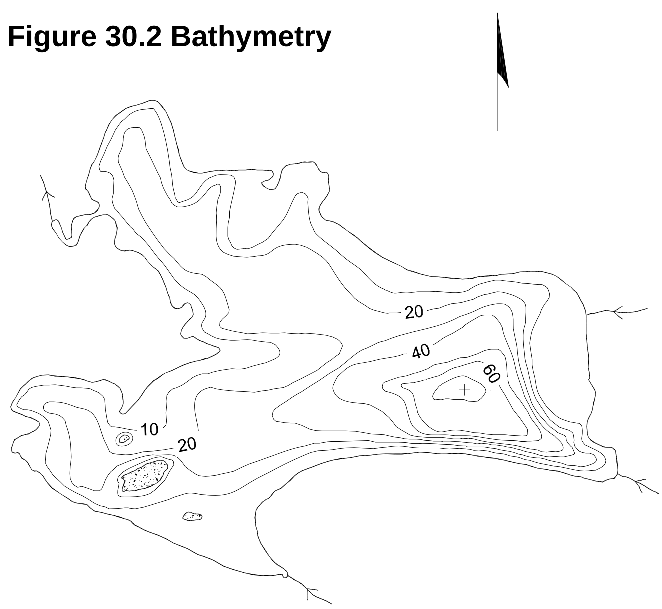


Figure 30.2 Bathymetry



Maximum Depth (+): 72 ft
Source: NYSDEC 1949, ALSC Rec'd c.1984
2750'

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	43.63508	-74.73960	43° 38′ 06.3″ N	074° 44′ 22.6″ W
Lake centroid	43.71270	-74.79934	43° 42′ 45.7″ N	074° 47′ 57.6″ W

Table 30.1 Lake Chemistry

040826			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	99.31	124.71	111.06	59.68	76.69	65.71	45.91	55.30	50.99	µeq L^{-1}
NO_3^-	9.39	28.67	15.53	1.48	13.39	6.24	1.26	14.72	7.91	µeq L^{-1}
Cl^-	18.90	25.39	21.98	16.62	19.52	18.73	15.60	18.82	17.47	µeq L^{-1}
F^-	2.26	3.21	2.73	2.33	3.33	2.67	2.19	2.64	2.44	µeq L^{-1}
ANC	2.58	28.37	13.78	25.72	43.79	36.05	39.60	63.07	52.88	µeq L^{-1}
DIC	28.31	95.74	51.69	44.96	94.08	66.52	67.84	126.27	89.99	µmol L^{-1}-C
DOC	167.76	285.82	224.69	245.85	324.95	275.69	270.57	386.75	306.51	µmol L^{-1}-C
SiO_2	28.46	61.75	42.54	32.37	54.42	43.32	33.60	58.04	44.17	µmol L^{-1}
Ca^{2+}	69.37	113.78	97.69	74.85	86.33	82.87	78.11	91.64	83.09	µeq L^{-1}
Mg^{2+}	26.33	31.27	29.08	21.39	24.71	23.42	17.44	24.66	23.00	µeq L^{-1}
Na^+	26.97	32.62	30.09	23.49	31.75	29.15	28.81	33.54	31.48	µeq L^{-1}
K^+	5.63	7.16	6.48	4.09	5.88	4.79	4.61	6.07	5.43	µeq L^{-1}
NH_4^+	-0.61	1.83	0.89	-0.35	2.22	0.43	0.35	2.43	1.05	µeq L^{-1}
AL_TD	1.11	10.04	4.35	0.71	6.67	3.06	0.47	5.55	2.49	µmol L^{-1}
AL_TM	1.03	8.83	3.10	1.57	3.45	2.06	1.16	3.09	1.79	µmol L^{-1}
AL_OM	0.42	11.04	2.30	1.67	2.52	1.92	1.30	2.45	1.64	µmol L^{-1}
AL_IM	0.00	6.32	1.56	0.00	0.93	0.19	0.00	0.72	0.16	µmol L^{-1}
LABPH	5.20	6.07	5.70	5.86	6.57	6.20	6.08	6.70	6.39	
AIREQPH	5.27	6.31	5.83	6.28	6.72	6.55	6.55	6.94	6.75	
TRUECOLOR	5	20	12	15	25	21	10	30	16	Pt Co
SCONDUCT	20.23	23.76	21.63	16.32	19.05	17.26	16.06	18.42	17.12	µS cm^{-1}
TOTALP	na	na	na	1.14	4.48	2.17	0.64	4.97	3.50	µg L^{1}
CHLORA	na	na	na	0.63	2.22	1.55	0.84	10.00	2.71	µg L^{1}

Table 30.2 Lake Characteristics

Parameter	Value
Elevation	575 m
Maximum depth	21.9
Mean depth	6.1 m
Volume	1147.6 x 10^4 m^3
Surface area	186.9 ha
Watershed area	1409.7 ha
Watershed ratio	0.13
Hydraulic retention time (year)	1.07
Watershed	Oswegatchie/Black
County, Town	Herkimer, Ohio
USGS Quadrangle	Old Forge
Land use classification	Moose River Plains Wild Forest,Intensive Use,Rual Use

Aquatic biota: On October 14, 1985, the ALS reported no emergent aquatic plants, and the following submergent plants were found: Eriocaulon spp. and Utricularia spp. The dip-net sampling found Insecta: Odonata Coenagriidae and Ephemeroptera Leptophlebiidae; Crustacea Amphipoda Unspecified; and Hirudinea Unspecified (ALSC 1986). The ALS found the lake thermally stratified between 12.0 and 14.0 m on July 22, 1985 (ALSC 1986). Bukavecas and Shaw (1998) found phosphorus as the limiting nutrient and a chlorophyll a average of 0.69 µg L^{-1} during 1990 and 1991. The AEAP reported the average value of chlorophyll a as 1.90 µg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: Early records show brook trout stocking began in 1888. Stocking from 1888 to 1985 have included a mix of species (ALSC 1986). Annual stocking of Splake began in 1998. In addition to the ALS fisheries survey on October 15, 1985, the ALSC netted the lake on June 21, 2004 and October 18, 2012 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 30.3 and 30.4 for recent fish stocking and netting histories.

Intensive studies: A phytoplankton and zooplankton experiment was conducted in 1990 (Bukaveckas and Shaw 1998). Limekiln Lake was studied by the Mercury Response Project to evaluate mercury in fish. It was sampled on

Figure 30.3 Chemistry Time Series

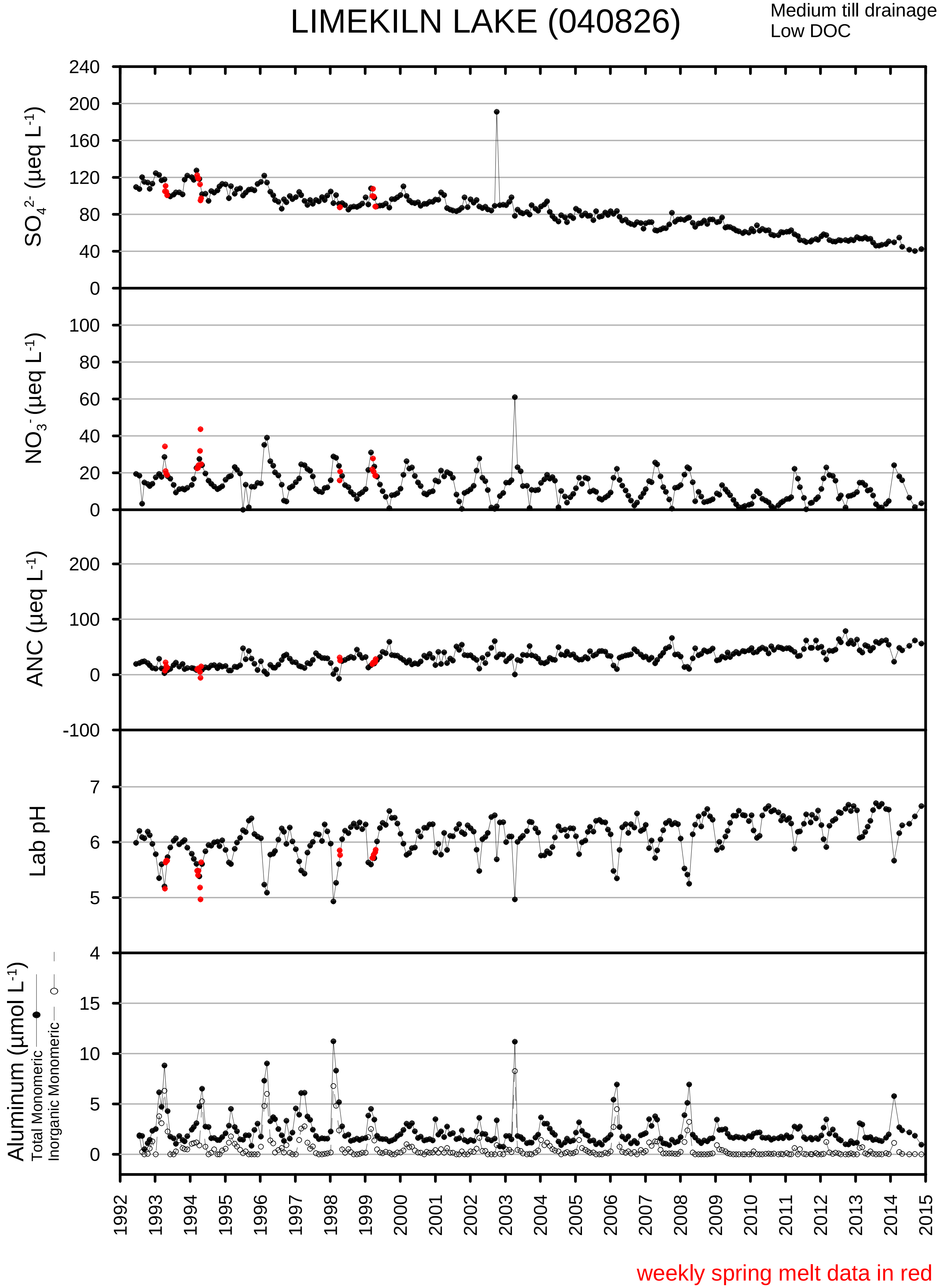


Table 30.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Splake	5000	74
1982	Splake	3790	96
1983	Splake	4210	411
1984	Splake	5000	422
1985	Splake	5000	409
1986	Splake	3500	290
1987	Splake	5280	307
1987	Brook trout	13790	38
1988	Splake	5000	355
1989	Splake	5000	383
1990	Splake	8700	520
1991	Splake	5000	284
1992	Splake	3250	194
1992	Brown trout	13000	873
1993	Splake	4240	110
1993	Brown trout	8500	443
1994	Brown trout	8500	143
1995	Splake	1300	147
1995	Brown trout	8500	77
1996	Splake	1880	469
1996	Brown trout	8500	252
1997	Brown trout	9000	551
1997	Splake	2000	452
1998	Brown trout	4040	346
1998	Splake	3400	598
1999	Splake	2000	348
2000	Splake	2000	308
2001	Splake	2000	153
2002	Splake	2000	246
2003	Splake	2000	258
2004	Splake	2000	235
2005	Splake	1620	153
2006	Splake	1730	205
2007	Splake	2320	237
2009	Splake	790	119
2010	Splake	1860	173
2011	Splake	2000	144
2012	Splake	1580	197
2013	Splake	2000	158
2014	Splake	2000	210

Table 30.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Oct-1985	Splake	26	203	286	2681	49
Oct-1985	Golden shiner	24	137	180	1095	33
Oct-1985	White sucker	26	207	414	13110	28
Oct-1985	Brown bullhead	25	196	274	3800	241
Oct-1985	Rock bass	26	76	217	1513	34
Oct-1985	Pumpkinseed	16	112	151	670	19
Oct-1985	Yellow perch	28	149	212	1400	86
Jun-2004	Splake	68	204	428	13170	69
Jun-2004	Golden shiner	27	108	166	621	100
Jun-2004	White sucker	2	395	450	2540	2
Jun-2004	Brown bullhead	25	165	300	6443	59
Jun-2004	Banded killifish	23	75	102	-	93
Jun-2004	Rock bass	26	110	188	1489	86
Jun-2004	Pumpkinseed	25	78	155	703	91
Jun-2004	Yellow perch	20	125	229	943	20
Oct-2012	Splake	22	230	493	7161	22
Oct-2012	Central mudminnow	1	80	-	5	1
Oct-2012	Golden shiner	13	83	123	131	13
Oct-2012	Creek chub	1	151	-	31	1
Oct-2012	White sucker	2	462	530	2967	2
Oct-2012	Brown bullhead	25	145	330	5540	50
Oct-2012	Banded killifish	1	95	-	8	1
Oct-2012	Rock bass	26	50	192	1365	66
Oct-2012	Pumpkinseed	8	60	166	289	8
Oct-2012	Yellow perch	22	145	190	1073	29

October 1, 1992 and resurveyed on September 7, 2006 (Dittman and Driscoll 2009). The lake has been studied by the AEAP beginning in 1994 (Momen et al. 2006). Common loons were surveyed for mercury content in 1998-2000 (Schoch and Evers 2002) and in 2003-2004 (Schoch et al. 2004). Limekiln Lake was sampled by the Statewide Monitoring of Mercury Project in 2004 (Simonin et al. 2008). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed. Two WASS streams studied during 2003-2005 (Lawrence et al. 2008) are located in this watershed (Figure 30.1).

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 14 km west of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Limekiln Lake watershed lies on interlayered metasedimentary rock and granitic gneiss with medium to high ANC (Roy et al. 1997). Till overlays 72% of the watershed while approximately 23% of the watershed has exposed bedrock, the remaining 4.7% is kame deposits. Soils data show 48% of the watershed as basal till primarily in the south, while shallow to bedrock and rock outcrop appear in the east (37%) above 600 m. A small area of hydric soils (1%) appears on the western shoreline of the lake and by the outlet. The highest elevation in the watershed is on Seventh Lake Mountain at 888 m. The maximum relief is 313 m. In 1985, the ALS found the shoal water substrate composed of 85% sand and gravel, 13% bedrock, boulder and rubble, and 2% muck/silt (ALSC 1986).

Land cover/ use: In 1985, the forest cover within the watershed was: 90% deciduous forest; 7% deciduous-coniferous mixed forest; and the remaining 3% coniferous forest (ALSC 1986). Wetland area was 58.1 ha and comprised 4.1% of the watershed. The predominant wetland cover type is forested needle-leaf evergreen (ALSC 2003).

The eastern shore of Limekiln Lake is classified as rural use and is privately owned and developed with numerous houses and camps. There is a DEC campground along the northern shore, in an Intensive Use area, that offers a sandy beach and a paved boat launch. The remaining shoreline falls within the Moose River Plains Wild Forest (NYSDEC 2011).

Watershed disturbance: The 1916 fire protection source data show 70% of the watershed as logged for softwood only and 30% logged for both softwood and hardwood. The watershed was significantly disturbed by the November 1950 storm with 33% of the watershed suffering severe (50-100%) blowdown damage and 31% moderately (25-50%) disturbed. The July 1995 microburst storm source data show 40% of the watershed with low (0-30% change in crowns) damage (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Squaw Lake 040850
EPA ID: 040850O EMAP ID: NY014L

ALSC Staff Photo 2015

Lake: Squaw Lake lies in the Oswegatchie-Black watershed at 646 m. This 36.4 ha lake has three inlets and drains north into Beaver Lake 2.0 km downstream (Figure 31.1). During the 1984 survey of Squaw Lake, an active beaver dam was present at the outlet (ALSC 1985). The lake has a number of islands and reaches a maximum depth of 6.7 m (22.0 ft) (Figure 31.2).

Squaw Lake is classified as a thin-till chain drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C) and considered sensitive to acidification. The ALTM program began monthly monitoring of this lake in June 1992. This lake is accessed by helicopter and continues to be sampled monthly.

Lake chemistry: Squaw Lake was sampled near its deepest point during the ALS on August 18, 1984 finding: Lab pH 6.05, ANC 13.8 µeq L^{-1}, SO_4^{2-} 122.01 µeq L^{-1}, NO_3^- 1.62 µeq L^{-1}, Ca^{2+} 92.82 µeq L^{-1}, Mg^{2+} 36.21 µeq L^{-1}, DOC 241.44 µmol L^{-1}-C (ALSC 1985). Table 31.1 summarizes recent ALTM chemistry including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes through 2013 are shown in Table 31.1. Plots through 2014 appear in Figure 31.3.

Aquatic biota: On September 18, 1984, the ALS found emergent vegetation occupied 1% of the lake surface. Species identified included Sphagnum spp., Carex spp. and Eriocaulon spp. A dip net survey on September 20, 1984, found the following Insecta: Odonata Libellulidae and Aeshnidae; Hemiptera Notonectidae and Gerridae; Diptera Unspecified;

Figure 31.1 Catchment

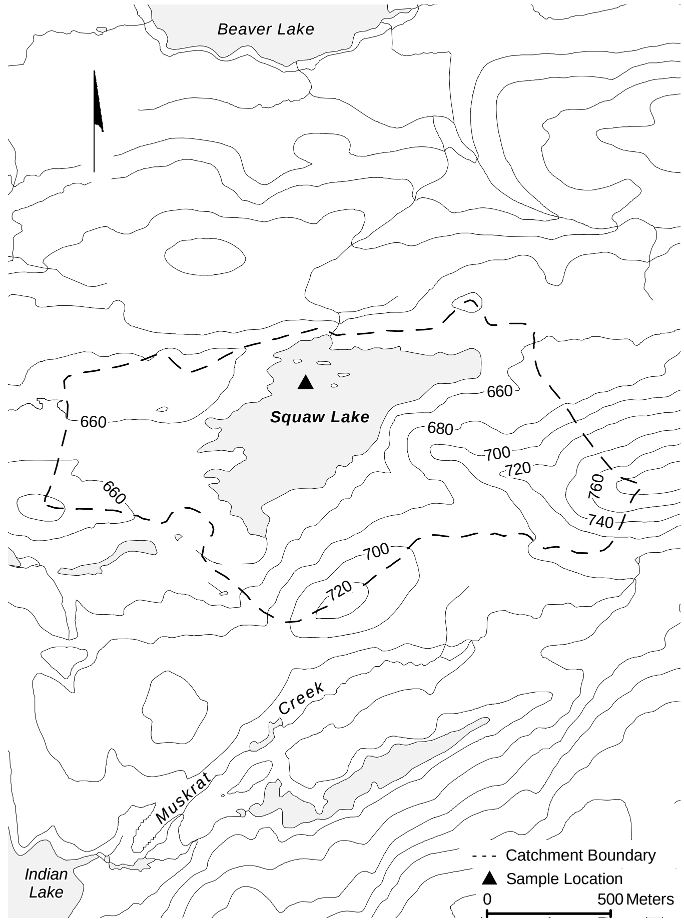
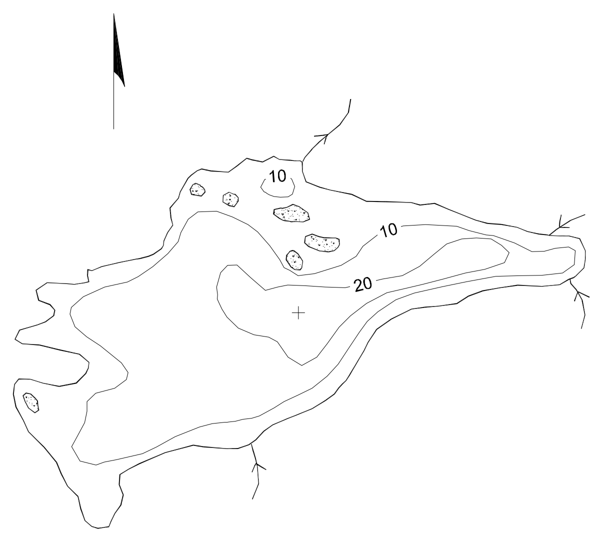


Figure 31.2 Bathymetry



Maximum Depthn (+): 22 ft
Source: NYSDEC, ALSC Rec'd c.1984

1250'

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.63477	-74.73167	43° 38’ 05.2” N	074° 43’ 54.0’’ W
Helo sample site	43.63508	-74.73960	43° 38’ 06.3’’ N	074° 44’ 22.6’’ W
Lake centroid	43.63347	-74.73905	43° 38’ 00.5” N	074° 44’ 20.6” W

Table 31.1 Lake Chemistry

040850			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	74.12	140.12	115.20	58.39	74.11	65.67	47.28	63.54	53.40	µeq L^{-1}
NO_3^-	4.39	36.29	14.28	0.00	15.81	4.85	0.00	17.94	4.94	µeq L^{-1}
Cl^-	6.77	9.87	8.37	5.72	7.25	6.45	5.88	8.23	6.89	µeq L^{-1}
F^-	1.84	4.32	2.28	1.68	2.65	2.14	1.76	2.50	2.15	µeq L^{-1}
ANC	-13.45	14.27	6.55	10.15	29.87	21.71	25.00	40.41	33.94	µeq L^{-1}
DIC	10.82	99.07	43.85	33.24	149.03	61.88	36.63	85.63	56.28	µmol L^{-1}-C
DOC	185.08	300.64	226.02	213.88	293.23	251.32	271.97	411.98	309.42	µmol L^{-1}-C
SiO_2	3.99	37.95	21.51	9.13	35.62	22.85	12.02	28.07	20.54	µmol L^{-1}
Ca^{2+}	65.37	125.76	95.11	56.39	72.36	64.68	57.41	82.05	66.21	µeq L^{-1}
Mg^{2+}	20.57	39.50	34.15	23.04	29.62	26.34	25.44	34.72	27.76	µeq L^{-1}
Na^+	11.31	18.70	14.90	13.48	17.83	15.18	16.52	21.83	18.41	µeq L^{-1}
K^+	4.09	7.42	5.35	3.58	4.59	4.14	3.44	4.86	4.01	µeq L^{-1}
NH_4^+	0.11	4.99	2.14	-0.76	4.38	0.59	-0.22	2.15	0.60	µeq L^{-1}
AL_TD	0.30	5.30	2.71	0.17	3.41	1.69	0.27	3.03	1.55	µmol L^{-1}
AL_TM	0.13	4.52	2.01	1.53	2.33	1.90	1.37	1.92	1.59	µmol L^{-1}
AL_OM	-0.13	1.56	0.75	1.54	2.33	1.78	1.39	1.84	1.59	µmol L^{-1}
AL_IM	0.00	3.52	1.26	0.00	0.74	0.16	0.00	0.41	0.06	µmol L^{-1}
LABPH	4.69	5.96	5.44	5.31	6.34	5.87	5.88	6.53	6.27	
AIREQPH	4.77	6.13	5.57	5.58	6.44	6.17	6.27	6.73	6.55	
TRUECOLOR	5	20	11	15	25	22	10	25	20	Pt Co
SCONDUCT	18.75	23.66	20.22	13.34	15.67	14.20	12.84	16.62	14.07	µS cm^{-1}
TOTALP	na	na	na	1.77	11.53	5.93	2.65	10.97	4.53	µg L^1
CHLORA	na	na	na	0.39	7.49	3.27	0.24	24.69	6.47	µg L^1

Table 31.2 Lake Characteristics

Parameter	Value
Elevation	646 m
Maximum depth	6.7 m
Mean depth	3.4 m
Volume	124.9 x 10^4 m^3
Surface area	36.4 ha
Watershed area	182.7 ha
Watershed ratio	0.20
Hydraulic retention time (year)	0.77
Watershed	Oswegatchie/Black
County, Town	Hamilton, Morehouse
USGS Quadrangle	Wakely Mtn.
Land use classification	Moose River Plains Wild Forest

Coleoptera Dytiscidae; and Trichoptera Phryganeidae. Crustacea Amphipoda Unspecified and Decapoda Astacidae; Oligochae Unspecified and Hirudinea Unspecified were also found. The ALS found the lake isothermal on August 13, 1984 (ALSC 1985).

In 1984, the DEC Biota Project found summer average values for: chlorophyll a of 2.6 µg L^{-1}; total phosphorus of 13.0 µg L^{-1}, and a Secchi depth of 3.5 m. A thermocline was observed at 5.0 m in July. The phytoplankton community was dominated by unknown spherical chrysophyte cells and Schroederia setigera in May, and Merismopedia tenuissima in July and October. Keratella taurocephala was the dominant rotifer and Diaptomus minutus was the dominant crustacean zooplankton during all three months (Sutherland 1989).

In August 1975, the DOH found total phosphorus at 4.7 mg m^{-3} and total chlorophyll a at 7.90 µg L^{-1} (Wood 1978). The AEAP reported the average value of chlorophyll a at 2.86 µg L^{-1} in 2003 (Momen et al. 2006).

Figure 31.3 Chemistry Time Series

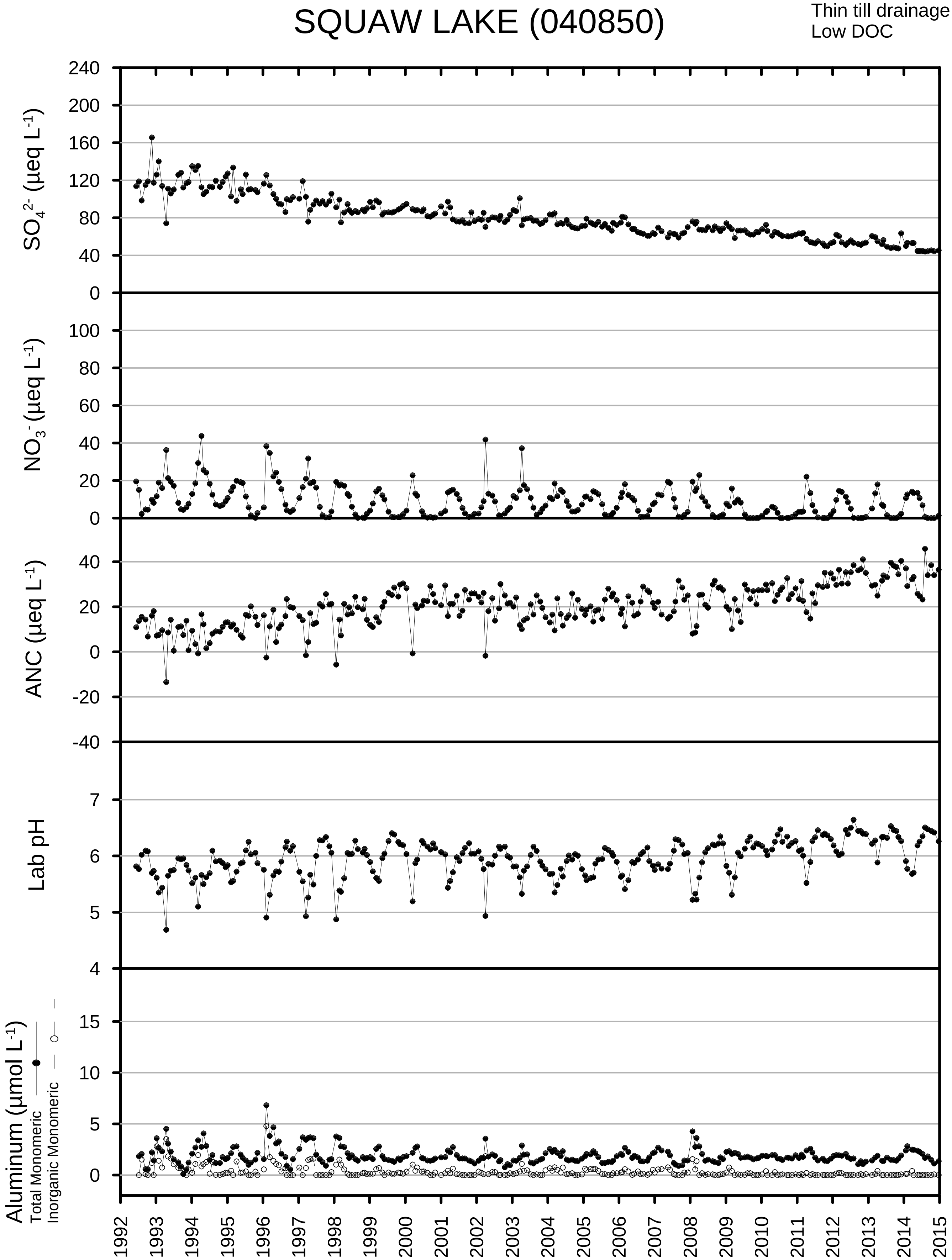


Table 31.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	2625	32
1981	Brook trout	3780	57
1982	Brook trout	4200	33
1983	Brook trout	4200	29
1984	Brook trout	3108	32
1985	Brook trout	4620	68
1986	Brook trout	4200	49
1987	Brook trout	4200	39
1988	Brook trout	4200	36
1989	Brook trout	4620	30
1990	Brook trout	4580	21
1991	Brook trout	4200	52
1992	Brook trout	4200	45
1993	Brook trout	4200	66
1994	Brook trout	3320	42
1995	Brook trout	3910	81
1996	Brook trout	4200	80
1997	Brook trout	4410	134
1998	Brook trout	4410	57
1999	Brook trout	4200	54
2000	Brook trout	4200	54
2001	Brook trout	3740	63
2002	Brook trout	4200	99
2003	Brook trout	4200	99
2004	Brook trout	3000	71
2005	Brook trout	3000	71
2006	Brook trout	3300	60
2007	Brook trout	3000	43
2008	Brook trout	3000	59
2009	Brook trout	3000	52
2010	Brook trout	1500	32
2011	Brook trout	3000	25
2012	Brook trout	1500	19
2014	Brook trout	3000	45

Table 31.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1984	Brook trout	11	204	415	5250	11
Sep-1984	White sucker	4	160	311	467	63
Sep-1984	Creek chub	2	-	-	145	2
Oct-1994	Brook trout	15	115	465	6030	15
Oct-1994	Blacknose dace	2	90	95	16	2
Oct-1994	Creek chub	3	103	172	100	3
Oct-1994	White sucker	50	90	283	3152	87
Aug-2008	Brook trout	8	257	325	2069	8
Aug-2008	Blacknose dace	8	75	91	57	8
Aug-2008	White sucker	27	84	290	2205	77

Fisheries: Early records indicate lake trout were stocked in 1899 and that brook trout were stocked annually from 1942 to 1984 (ALSC 1985). Brook trout continue to be stocked annually. In addition to the ALS fisheries survey on September 18, 1984, the ALSC netted the lake on October 17, 1994 and August 21, 2008 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 31.3 and 31.4 for recent fish stocking and netting histories.

Intensive studies: The DOH conducted a limnological survey of Squaw Lake in August 1975 (Wood 1978). The lake was surveyed by the Biota Project between 1982 and 1984 (Sutherland 1989). The AEAP (Momen et al. 2006) has studied aquatic biota in this lake as has the Adirondack Cooperative Loon Project (Schoch et al. 2004). This watershed has been analyzed using the integrated biogeochemical (PnET-BGC) model (Zhai 2006). Squaw Lake was sampled by EPA's EMAP in 1991 and 1997. Since 1999, the lake is sampled annually by the ALSC as part of the TIME project (Stoddard et al. 2003). This is a crossover water TIME/ALTM (Civerolo et al. 2011) with uninterrupted annual summer sampling through 2016. McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 21 km west of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Squaw Lake watershed lies on interlayered metasedimentary rock and granitic gneiss considered to have medium to high ANC (Roy et al. 1997). Till overlies 99.9% of the watershed and exposed bedrock accounts for the remaining surface area (ALSC 2003). Bedrock outcrop and shallow (<0.5 m) soils predominate at elevations above 700 m and cover approximately 20% of the watershed. The rest of the watershed is basal till (APA 2001). The watershed has a maximum elevation of 795 m on the south ridge. The maximum relief is 149 m. In 1984, the ALS described the shoal water substrate as 15% bedrock/boulder, 45% rubble/gravel and 40% muck/silt/organic (ALSC 1985).

Land cover/use: In 1984, deciduous forest covered 80% of the watershed and coniferous forest 20%. The immediate shoreline was described as primarily coniferous forest 55%, deciduous forest 35%, shrub/saplings 5% and boulder/rock ledge 5% (ALSC 1985). Total wetland area was 33.9 ha and comprised 11.6% of the watershed. The predominant wetland vegetation types are forested needle-leaf evergreen (22 ha) and scrub/shrub broad leaf deciduous (10.3 ha) and found primarily in the western area of the watershed (Roy et al. 1996). The lake is located within the Moose River Plains Wild Forest. A trail leads to the pond and a number of primitive campsites (NYSDEC 2011).

Watershed disturbance: The 1916 fire protection source data show 100% of the watershed as green timber with no slash. In November 1950, the watershed was disturbed by a storm that caused 50 to 100% blowdown in 44 % of the watershed. A July 1995 microburst storm damaged 100% of the watershed with a 0 to 30% change in forest crown (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Sullivan, T. J., Fernandez, I. J., Herlihy, A. T., Driscoll, C. T., McDonnell, T. C., Nowicki, N. A., Snyder, K. U., and Sutherland, J. W. 2006b. Acid-base characteristics of soils in the Adirondack Mountains, New York. Soil Science Society of America Journal 70: 141-152.

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Indian Lake 040852

EPA ID: 040852O EMAP ID: NY015L

ALSC Staff Photo 2015

Lake: Indian Lake lies in the Oswegatchie-Black watershed at 654 m. The 32 ha lake has four inlets, two of which are associated with a wetland at the southwest corner of the lake. The main inlet drains from the east and contains a stream sampled during the Western Adirondack Stream Survey (WASS) in 2003–2005 (Figure 32.1). In 1984, beaver dams were noted at two of the inlets (ALSC 1985). The source of the major inlet on the eastern shore of the lake drains from Muskrat Pond. The lake has a maximum depth of 10.7 m (35.1 ft) (Figure 32.2).

Indian Lake is classified as a thin-till chain drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. This lake is accessed by helicopter and sampled monthly.

Lake chemistry: Indian Lake was sampled during the ALS on August 7, 1984 finding: Lab pH 4.88 ANC -6.0 µeq L^{-1}, SO_4^{2-} 117.63 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 69.37 µeq L^{-1}, Mg^{2+} 23.04 µeq L^{-1}, DOC 358.00 µmol L^{-1}-C (ALSC 1985). Table 32.1 summarizes recent ALTM chemistry including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes through 2013 are shown in Table 32.1. Plots through 2014 appear in Figure 32.3.

Aquatic biota: On September 17, 1984, the ALS found submergent vegetation covered 5% of the lake bottom and floating vegetation occupied 10% of the lake surface. Plant species identified included: Sphagnum spp., Sparganium spp.,

Figure 32.1 Catchment

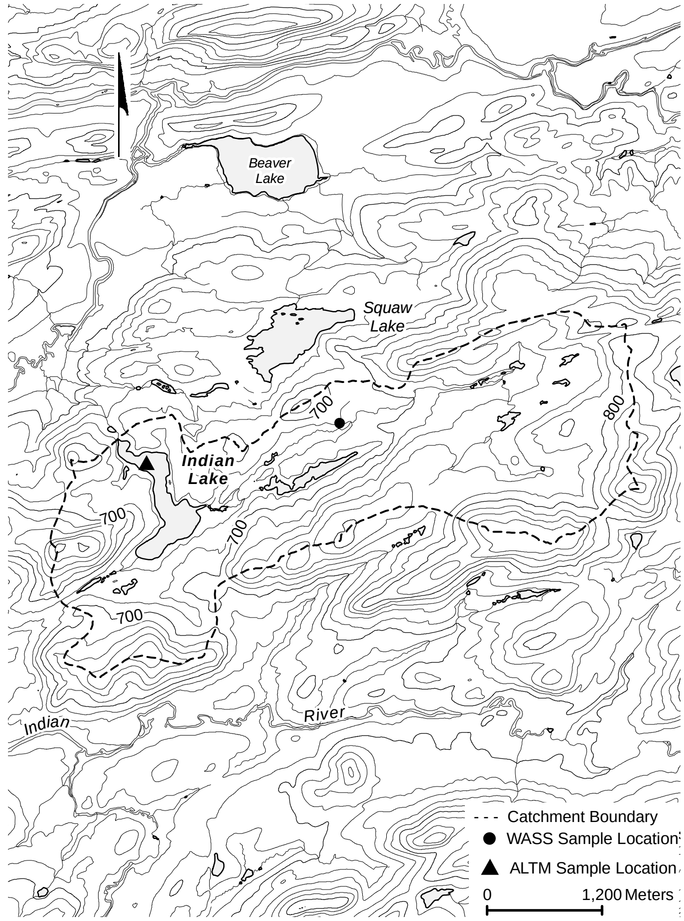
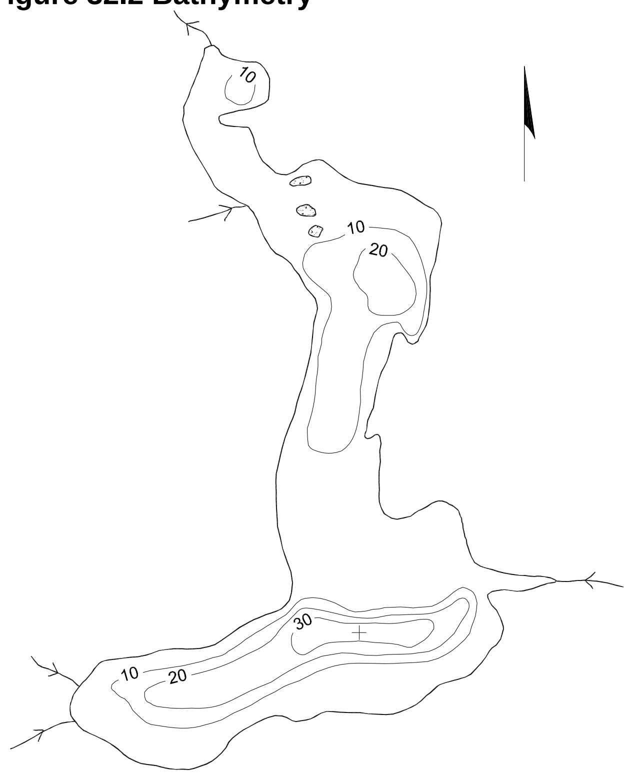


Figure 32.2 Bathymetry



Maximum Depth (+): 35 ft
Source: NYSDEC, ALSC Rec'd c.1984

Geographic coordinates (NAD 83)

	Latitude Φ DD.ddd	Longitude λ DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.61466	-74.75211	43° 36′ 52.8″ N	074° 45′ 07.6′′ W
Helo sample site	43.62286	-74.76075	43° 37′ 22.3′′ N	074° 45′ 38.7′′ W
Lake centroid	43.61691	-74.75507	43° 37′ 00.9″ N	074° 45′ 18.2″ W

Table 32.1 Lake Chemistry

040852		1993			2009			2013		
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	86.82	129.29	106.95	38.05	75.99	55.23	30.93	62.77	44.47	μeq L^{-1}
NO_3^-	-0.16	57.88	23.04	0.00	33.24	8.19	0.00	39.59	14.02	μeq L^{-1}
Cl^-	5.08	10.72	7.24	3.50	8.74	5.91	2.98	9.34	6.10	μeq L^{-1}
F^-	1.95	3.11	2.27	1.54	2.19	1.87	1.61	2.41	2.02	μeq L^{-1}
ANC	-27.08	0.91	-10.16	-9.76	19.93	4.43	-1.85	19.54	9.46	μeq L^{-1}
DIC	15.82	213.97	56.54	39.96	137.37	69.31	30.42	203.16	83.30	μmol L^{-1}-C
DOC	249.68	508.86	362.42	371.24	595.53	504.86	390.54	763.60	561.24	μmol L^{-1}-C
SiO_2	4.16	95.36	49.22	15.15	86.21	49.81	17.66	100.26	51.21	μmol L^{-1}
Ca^{2+}	60.38	104.30	74.60	39.42	60.88	46.90	37.96	57.49	46.11	μeq L^{-1}
Mg^{2+}	18.93	32.92	25.72	16.36	24.69	18.96	14.80	23.85	19.28	μeq L^{-1}
Na^+	12.61	20.88	15.95	13.05	19.14	16.00	14.27	23.62	18.67	μeq L^{-1}
K^+	2.81	6.39	4.43	1.79	5.63	3.73	1.80	6.37	4.08	μeq L^{-1}
NH_4^+	-0.33	4.49	1.46	-0.63	1.98	0.57	0.21	4.36	1.46	μeq L^{-1}
AL_TD	6.45	19.83	12.93	7.13	14.16	9.83	7.02	13.35	10.00	μmol L^{-1}
AL_TM	3.78	15.05	9.89	3.10	7.82	5.17	3.20	9.73	5.85	μmol L^{-1}
AL_OM	1.00	4.89	3.15	2.45	5.34	3.61	2.81	7.43	4.18	μmol L^{-1}
AL_IM	2.78	10.48	6.73	0.26	4.56	1.55	0.09	3.87	1.67	μmol L^{-1}
LABPH	4.42	5.15	4.77	4.72	5.46	5.06	4.78	5.69	5.18	
AIREQPH	4.45	5.13	4.76	4.74	5.63	5.09	4.80	5.83	5.24	
TRUECOLOR	15	40	26	45	70	58	30	80	55	Pt Co
SCONDUCT	16.68	30.62	23.39	10.97	23.25	14.92	9.97	19.83	14.07	μS cm^{-1}
TOTALP	na	na	na	1.17	6.14	3.47	2.73	10.67	5.30	μg L^1
CHLORA	na	na	na	0.35	2.17	1.30	0.44	3.96	1.62	μg L^1

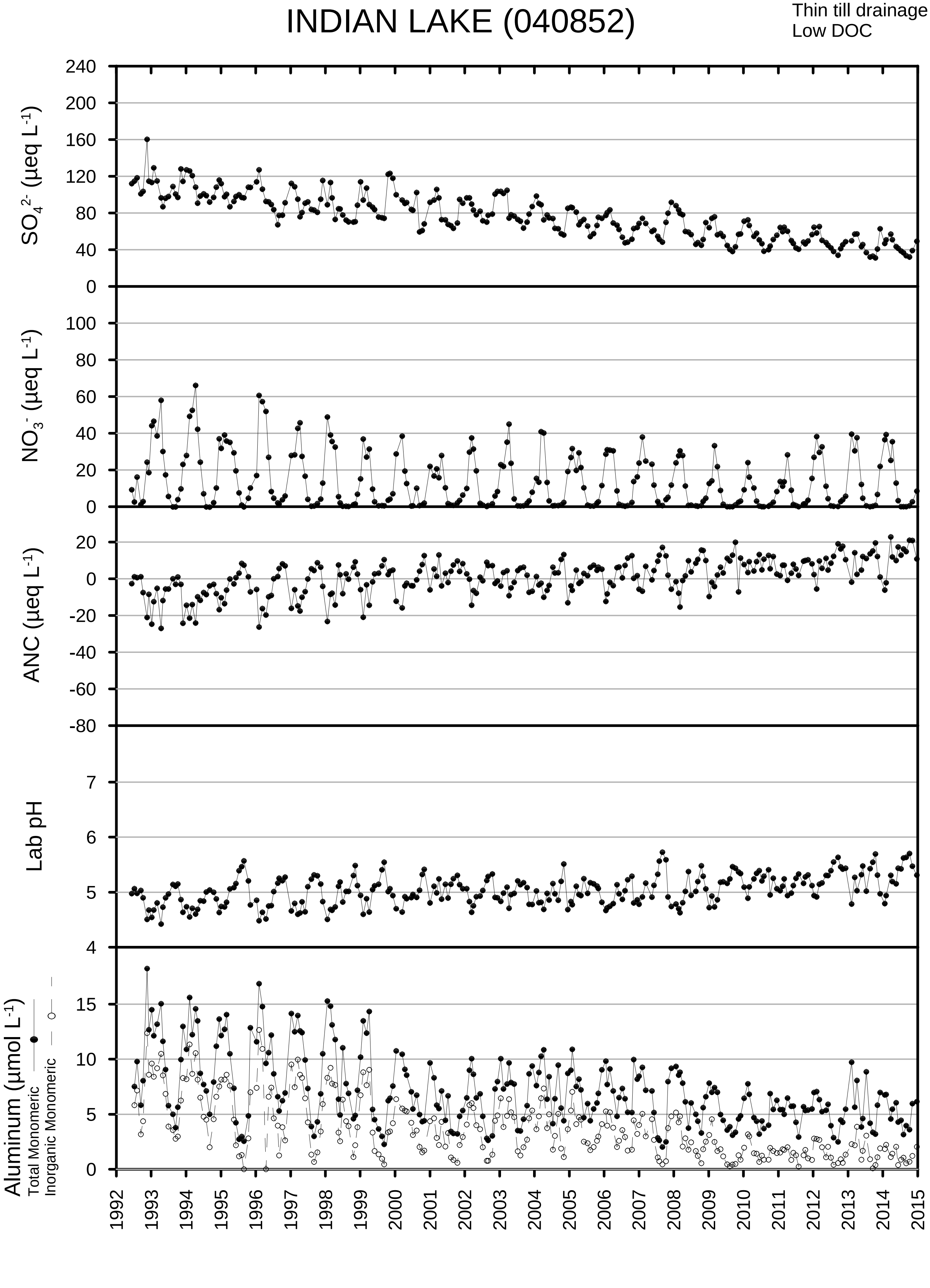
Table 32.2 Lake Characteristics

Parameter	Value
Elevation	654 m
Maximum depth	10.7 m
Mean depth	3 m
Volume	98.1×10^4 m^3
Surface area	33.2 ha
Watershed area	1121.4 ha
Watershed ratio	0.03
Hydraulic retention time (year)	0.10
Watershed	Oswegatchie/Black
County, Town	Hamilton, Morehouse
USGS Quadrangle	Honnedaga Lake
Land use classification	West Canada Lake Wilderness and Moose River Plains Wild Forest

Potamogeton spp., Eriocaulon spp., Nuphar spp., and Utricularia spp. A dip net survey on September 18, 1984, found the following Insecta: Odonata Libellulidae and Coenagriidae; Hemiptera Notonectidae and Corixidae; Coleoptera Dytiscidae; and Trichoptera Polycentropodidae. Also found were Demospong Haplosclerina spongillidae; Crustacea Amphipoda Unspecified; and Decapoda Astacidae (ALSC 1985). On August 8, 1984, the ALS found the lake stratified between 2.0 and 4.0 m (ALSC 1985).

The DEC Biota Project sampled the lake on July 9, 1984, and found a chlorophyll a value of 2.38 μg L^{-1}, a total phosphorus value of 11μg L^{-1}, and a Secchi depth of 3.5 m. In May, July, and October of 1984, the phytoplankton community was dominated by Unknown spherical chrysophyte cells, Merismopedia tenuissima, and Unknown elliptical flagellate #1, respectively. Karatella taurocephala was the dominant rotifer during all three months and Diaptomus spp., Diaptomus minutus, and Bosmina longirostris were the dominant crustacean zooplankton, respectively (Sutherland 1989).

Figure 32.3 Chemistry Time Series



In August 1975, the DOH found total phosphorus at 14.4 mg m^{-3} and chlorophyll a at 1.56 µg L^{-1} (Wood 1978). The AEAP reported the average summer value of chlorophyll a in 2003 as 1.70 µg L^{-1} (Momen et al. 2006).

Fisheries: Brook trout were stocked annually from 1942 to 1982. Lake trout were stocked in 1947 and in 1982. Atlantic salmon were stocked in 1981 (ALSC 1985). In addition to the ALS fisheries survey on August 14, 1984, the ALSC netted the lake on October 17, 1994 and October 15, 2008 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 32.3 and 32.4 for recent fish stocking and netting histories.

Intensive studies: The DOH conducted a limnological survey of Indian Lake in August 1975 (Wood 1978). Indian Lake was surveyed by the Biota Project during 1984 (Sutherland 1989). The integrated biogeochemical (PnET-BGC) model has been applied to this lake (Burns et al. 2005, Burns et al. 2006, Zhai 2006). Indian Lake was sampled as part of EPA's EMAP in 1991, 1994, and 1997. Since 1999, the lake is sampled annually as part of the TIME project (Stoddard et al. 2003). This is a crossover water TIME/ALTM (Civerolo et al. 2011) with uninterrupted annual summer sampling through 2016. Indian Lake is also an AEAP study lake (Momen et al. 2006). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed. One of the headwater streams of Indian Lake (Figure 32.1) was evaluated during the Western Adirondack Stream Survey (WASS) in 2003–2005 (Lawrence et al. 2008).

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Table 32.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	3570	43
1981	Brook trout	3420	51
1981	Atlantic salmon	11900	108
1982	Lake trout	3500	144
1982	Brook trout	3800	30
1983	Brook trout	3800	23
1985	Brook trout	4180	30
1988	Atlantic salmon	6700	152
2013	Brook trout	3700	51

Table 32.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1984	No fish caught					
Oct-1994	Central mudminnow	12	80	103	92	12
Oct-2008	Brook trout	1	358	-	624	1
Oct-2008	Central mudminnow	31	76	106	244	157

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 19 km west of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Indian Lake watershed lies on interlayered metasedimentary rock and granitic gneiss considered to have medium to high ANC (Roy et al. 1997). Till overlays 68.4% of the watershed while 31.6% is exposed bedrock (ALSC 2003). Bedrock outcrop and shallow (<0.5 m) soils predominate at elevations between 700 and 800 m throughout the watershed, while basal till makes up the remainder (APA 2001). The watershed rises to a maximum elevation of approximately 880 m. The watershed has a maximum relief of 226 m. In 1984, the ALS found the shoal water substrate comprised of 59% organic, 39% muck/silt and 2% boulder/bedrock (ALSC 1985).

Land cover/use: In 1984, deciduous forest covered 90% of the watershed and the remaining 10% was coniferous forest (ALSC 1985). Wetland area totaled 144.3 ha comprising 12.9% of the watershed (Roy et al. 1996). The predominant wetland types are forested needle-leaf evergreen (4.6%) and scrub/shrub broad leaf deciduous (5.7%) (ALSC 2003). Indian Lake is in the Moose River Plains Wild Forest and the West Canada Lake Wilderness. There is a trail to the pond and a number of primitive camp sites along the shore (NYSDEC 2011).

Watershed disturbance: The 1916 fire protection source data reveal 100% of the watershed as green timber with no slash. In November 1950, a storm caused 50 to 100% blowdown in 10.8% of the watershed and 25 to 50% blowdown in 27.4% of the watershed. The watershed was undisturbed by the July 1995 microburst storm and the ice storm of January 1998 (ALSC 2003, NYSDEC 1998).

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Zhai, J. 2006. Regional application of PnET-BGC to lake-watersheds of the Adirondacks, NY to investigate past and future response to acidic deposition. Master of Science in Environmental Engineering thesis, Syracuse University.

Brook Trout Lake 040874

EPAID: 040874O

ALSC Staff Photo 2015

Lake: Brook Trout Lake lies in the Oswegatchie-Black watershed near the Mohawk River watershed divide at 724 m. It is one of the highest elevation lakes in the ALTM program. This 28.7 ha headwater lake lies in a relatively steep watershed with no perennial inlets. The outlet flows southwest into the Indian River (Figure 33.1). In 1984, an inactive beaver dam was present at the outlet (ALSC 1985). The lake reaches a maximum depth of 23.2 m (76.1 ft) (Figure 33.2).

Brook Trout Lake is classified as a thin-till drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C) and considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992 and continues at this frequency. This lake is accessed by helicopter.

Note, the ALS traditionally used the variant spelling of this lake, Brook Trout Lake, and that convention is continued here. The current spelling favored by the Geographic Names Information Service (GNIS) is Brooktrout Lake and appears on recent USGS maps and publications.

Lake chemistry: Brook Trout Lake was sampled during the ALS on August 20, 1984 finding: Lab pH 5.13, ANC -15.6 µeq L^{-1}, SO_4^{2-} 107.85 µeq L^{-1}, NO_3^- 2.1 µeq L^{-1}, Ca^{2+} 71.36 µeq L^{-1}, Mg^{2+} 24.69 µeq L^{-1}, DOC 58.28 µmol L^{-1}-C (ALSC 85). Table 33.1 summarizes recent ALTM water sample chemistry including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes through 2013 are shown in Table 33.1. Plots through 2014 appear in Figure 33.3.

Figure 33.1 Catchment

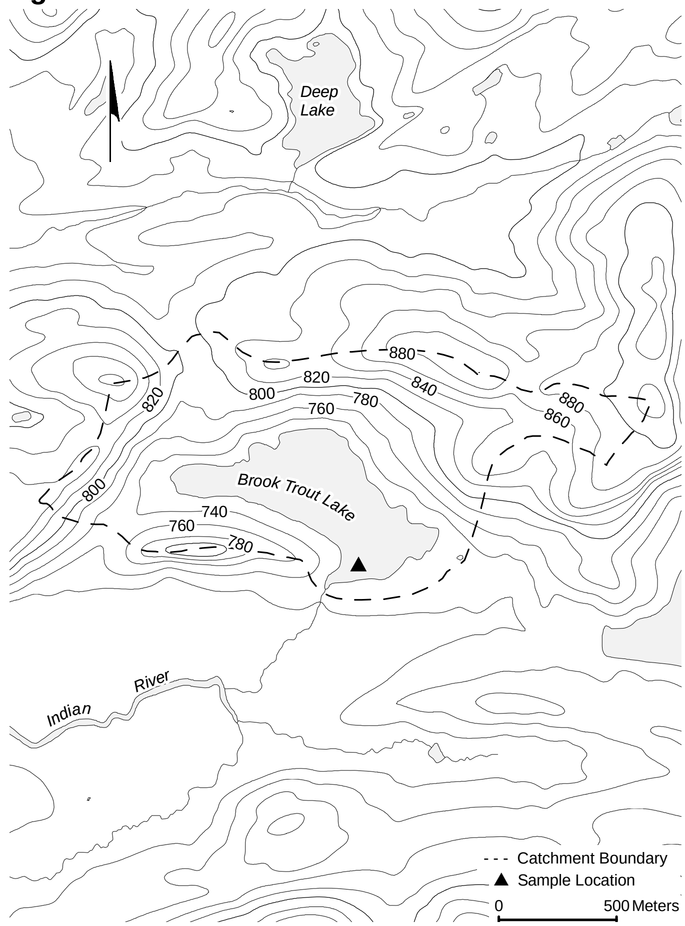
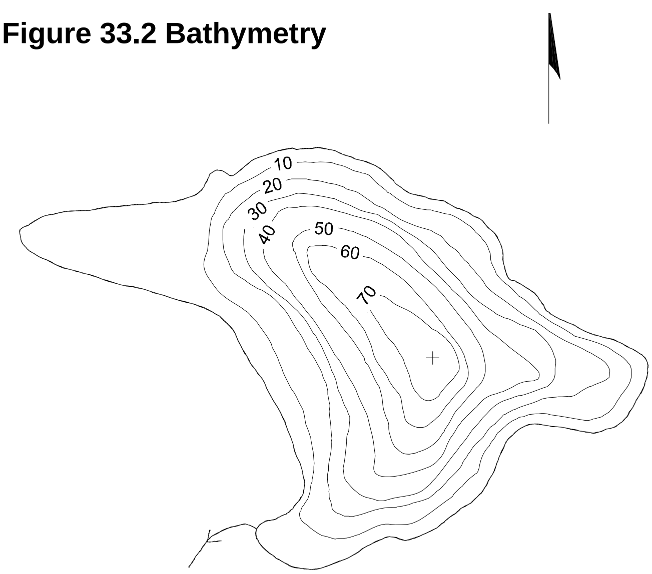


Figure 33.2 Bathymetry



Maximum Depth (+): 76 ft
Source: NYSDEC, ALSC Rev. 1984

1250'

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.59990	-74.66236	43° 35′ 59.6″ N	074° 39′ 44.5″ W
Helo sample site	43.60097	-74.66062	43° 36′ 03.5″ N	074° 39′ 38.2″ W
Lake centroid	43.60323	-74.66235	43° 36′ 11.6″ N	074° 39′ 44.5″ W

Table 33.1 Lake Chemistry

040874		1993			2009			2013		
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	102.43	127.00	112.19	56.20	85.89	63.33	46.77	60.06	51.63	µeq L^{-1}
NO_3^-	9.48	41.61	16.08	0.00	22.23	5.69	1.78	20.88	9.68	µeq L^{-1}
Cl^-	7.05	9.31	8.13	5.46	9.29	6.34	5.51	7.75	6.63	µeq L^{-1}
F^-	2.05	2.89	2.39	1.45	2.16	1.92	1.72	2.44	2.11	µeq L^{-1}
ANC	-27.17	0.47	-5.76	-6.04	21.56	7.44	3.48	15.59	9.48	µeq L^{-1}
DIC	11.66	75.76	36.22	18.32	92.41	52.24	17.60	74.23	42.71	µmol L^{-1}-C
DOC	12.57	256.76	124.79	204.73	277.16	242.62	206.20	275.64	248.80	µmol L^{-1}-C
SiO_2	55.75	69.73	64.85	38.77	59.75	48.08	28.87	50.82	40.61	µmol L^{-1}
Ca^{2+}	51.40	81.34	64.37	23.45	46.98	43.52	35.99	41.72	39.50	µeq L^{-1}
Mg^{2+}	16.46	27.16	22.90	9.05	19.42	17.09	15.22	17.46	16.36	µeq L^{-1}
Na^+	14.79	20.44	17.33	13.05	20.88	16.82	17.38	21.85	18.91	µeq L^{-1}
K^+	4.09	6.39	5.01	2.05	4.60	4.07	3.37	4.86	4.18	µeq L^{-1}
NH_4^+	0.22	2.77	2.02	-0.22	6.93	2.20	0.02	3.47	1.52	µeq L^{-1}
AL_TD	4.34	28.65	10.53	2.32	12.38	5.40	1.92	8.46	4.77	µmol L^{-1}
AL_TM	4.19	18.64	8.74	1.93	6.71	3.09	1.69	4.90	2.80	µmol L^{-1}
AL_OM	0.16	10.30	2.02	1.70	3.04	2.09	1.64	2.80	1.97	µmol L^{-1}
AL_IM	0.00	15.84	6.82	0.00	3.67	1.02	0.04	2.35	0.83	µmol L^{-1}
LABPH	4.43	5.36	4.98	4.79	5.91	5.30	5.19	6.05	5.56	
AIREQPH	4.49	5.32	4.98	4.77	6.24	5.32	5.20	6.10	5.61	
TRUECOLOR	0	15	9	15	30	22	10	20	14	Pt Co
SCONDUCT	17.47	30.27	20.47	11.56	21.13	13.69	10.17	15.02	12.09	µS cm^{-1}
TOTALP	na	na	na	1.16	12.29	3.06	1.72	11.12	3.78	µg L^1
CHLORA	na	na	na	1.33	5.87	2.98	0.37	2.32	1.17	µg L^1

Table 33.2 Lake Characteristics

Parameter	Value
Elevation	724 m
Maximum depth	23.2 m
Mean depth	8.4 m
Volume	242.0 x 10^4 m^3
Surface area	28.7 ha
Watershed area	165.7 ha
Watershed ratio	0.17
Hydraulic rentention time (year)	1.64
Watershed	Oswegatchie/Black
County, Town	Hamilton, Morehouse
USGS Quadrangle	West Canada Lakes
Land use classification	West Canada Lake Wilderness

Aquatic biota: An ALS dip net survey on June 28, 1984, identified the following Insecta: Odonata Libellulidae and Coleoptera Gyrinidae. Also found was Crustacea Decapoda Astacidae. On August 14, 1984, the lake was thermally stratified between 7.0 and 8.0 m. No macrophyte data were available (ALSC 1985). In August 1975, DOH found total phosphorus at 4.7 mg m^{-3} and total chlorophyll a was 0.67 µg L^{-1} (Wood 1978). In 2003, the AEAP reported the average value of chlorophyll a was 9.63 µg L^{-1} (Momen et al. 2006).

In July 1984, the DEC Biota Project found: chlorophyll a 2.1 µg L^{-1}, total phosphorus 6 µg L^{-1}, and a Secchi depth of 8.0 m. The phytoplankton community was composed of 10 species, dominated by Chrysophceae spherical cell #2. Bosmina longirostris was the dominant of three crustacean zooplankton species. Karatella taurocephala was the dominant of three rotifer species (Sutherland 1989).

Fisheries: Brook trout were stocked annually by DEC from 1956 to 1971 (ALSC 1985). In addition to the ALS fisheries survey on June 29, 1984, the ALSC netted the lake on June 26, 2002 and on October 17, 2012 in conjunction with the AEAP (Roy et al. 2015, Baldigo et al. 2016). No fish were caught in the first two surveys. Refer to Tables 33.3 and 33.4 for recent fish stocking and netting history.

Figure 33.3 Chemistry Time Series

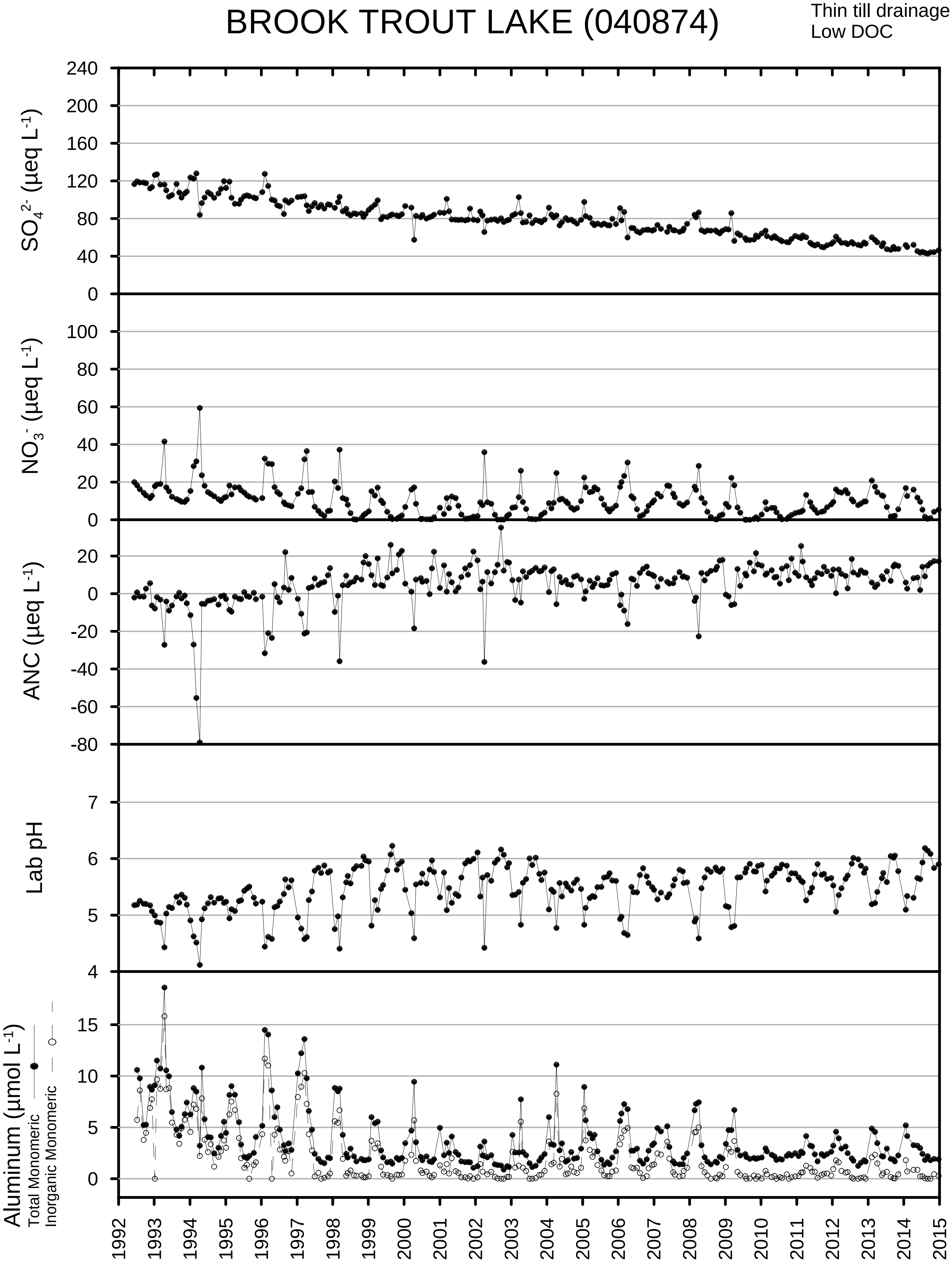


Table 33.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
2005	Brook trout	2000	25
2006	Brook trout	900	11
2007	Brook trout	1100	10
2010	Brook trout	2400	23
2011	Brook trout	2000	19

Table 33.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Oct-2012	Brook trout	19	124	410	3481	20
Oct-2012	Creek Chub	1	203	203	152	1

In 2005, the DEC undertook an experimental stocking of heritage strain brook trout (Sutherland 2005). A series of studies, reports and papers on water quality and biotic recovery that documented response to S deposition reductions during the last three decades were recently published (Sutherland et. al. 2015).

Intensive studies: The DOH conducted a limnological survey of Brook Trout Lake in August 1975 (Wood 1978). Brook Trout Lake was surveyed in 1984 as part of the DEC Biota Project (Sutherland 1989). The lake is part of the AEAP (Momen et al. 2006) with additional biological studies associated with brook trout recovery. McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed. Water quality biotic recovery were examined in context of regional recovery of food webs by acid deposition (Sutherland et al. 2015).

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY28 Piseco Lake (start date December 31, 2012; elevation 519 m) located 20 km southeast of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The watershed lies on interlayered metasedimentary rock and granitic gneiss with medium to high ANC (Roy et al. 1997). Till comprises 83.3% of the watershed while the remaining 16.7% is exposed bedrock. General soils source data reveal bedrock outcrops in the steep sloped areas (approximately 50% of the watershed) with the remaining area as shallow (<0.5 m) to bedrock soils. The area near the outlet is basal till (APA 2001). The watershed rises sharply on three sides to a maximum elevation of 890 m on the north ridge. The maximum relief is 166 m. In 1984, the ALS described the shoal water substrate as 40% bedrock and boulder and 60% mud/silt and organic (ALSC 1985).

Land cover/use: In 1984, deciduous forest covered 80% of the watershed, and deciduous-coniferous mixed forest covered the remainder. The immediate shoreline was dominated by coniferous forest interspersed with 5% deciduous-coniferous mixed forest (ALSC 1985). Total wetland area comprises 0.7 ha or 0.4% of the watershed. The predominant wetland type is forested needle-leaf evergreen found in two small isolated pockets in the upper reaches of the western portion of the watershed (Roy et al. 1996). The watershed lies entirely within the West Canada Lakes Wilderness Area (NYSDEC 2016). There is a trail along the north shore of the lake, with a lean-to structure on the eastern shore.

Watershed disturbance: The 1916 fire protection source data shows 83.4% of the watershed as green timber with no slash. The source data did not reveal any disturbance from the November 1950 blowdown, July 1995 microburst, or the January 1998 ice storms (ALSC 2003, NYSDEC 1998).

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Lost Pond 040887

EPA ID: 040887O

ALSC Staff Photo 2000

Lake: Lost Pond lies in the Oswegatchie-Black River watershed near the Upper Hudson watershed divide at 717 m. This 4.4 ha headwater lake has no channelized tributaries (Figure 34.1), but inflows are evident from the shoreline fringe wetland and the wetland complex on the southeastern shoreline (APA 2001). In 1984, a beaver dam was present at the outlet (ALSC 1985). The outlet forms a tributary to Otter Brook. The lake reaches a maximum depth of 1.2 m (3.9 ft) (Figure 34.2).

Lost Pond is classified as a thin-till drainage lake, with high dissolved organic carbon (>500 µmol L^{-1}-C) and is considered sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014. This lake is accessed by helicopter.

Lake chemistry: Lost Pond was sampled during the ALS near its deepest point on August 24, 1984 finding: Lab pH 5.13, ANC 4.0 µeq L^{-1}, SO_4^{-2} 82.03 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 61.38 µeq L^{-1}, Mg^{2+} 24.69 µeq L^{-1}, DOC 807.58 µmol L^{-1}-C (ALSC 1985). Table 34.1 summarizes recent ALTM chemistry collected at the outlet. Major analytes through 2013 are shown in Table 34.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 34.3.

Aquatic biota: On September 12, 1984, ALS found submergent vegetation occupied 40% of the lake bottom. Emergent and floating vegetation occupied 10% and 5% of the lake surface, respectively. Species

Figure 34.1 Catchment

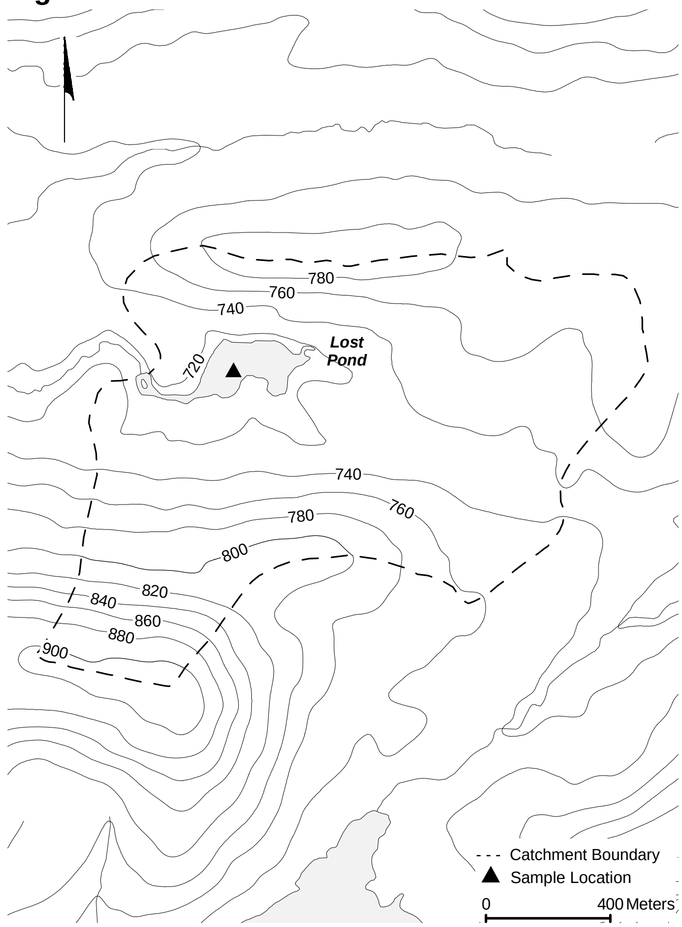
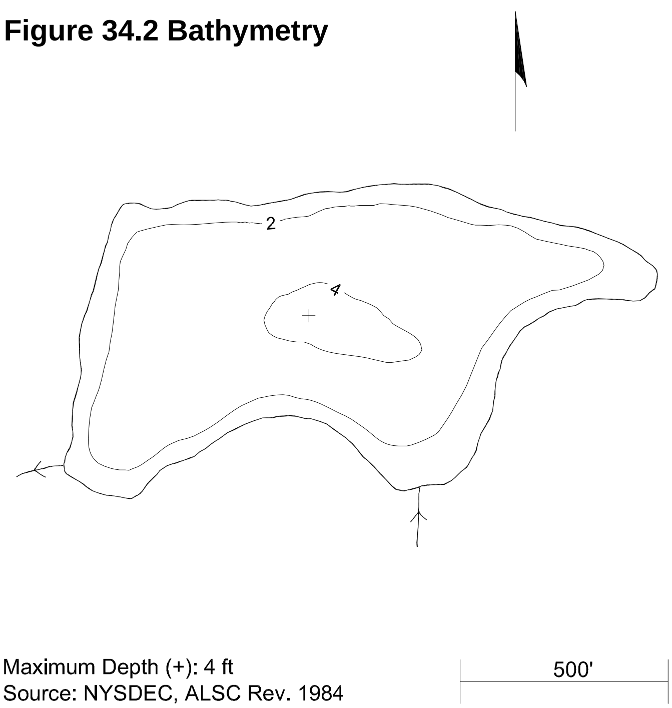


Figure 34.2 Bathymetry



Maximum Depth (+): 4 ft
Source: NYSDEC, ALSC Rev. 1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.64643	-74.56177	43° 38′ 47.1″ N	074° 33′ 42.4′′ W
Helo sample site	43.64673	-74.55793	43° 38′ 48.2″ N	074° 33′ 28.6″ W
Lake centroid	43.6465	-74.55794	43° 38′ 47.4″ N	074° 33′ 28.6″ W

Table 34.1 Lake Chemistry

040887			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	78.28	118.67	92.84	48.81	85.86	65.60	50.58	74.62	65.06	µeq L^{-1}
NO_3^-	1.15	92.25	38.26	0.00	33.25	9.63	0.98	60.81	22.37	µeq L^{-1}
Cl^-	4.51	15.51	8.70	1.88	7.64	5.72	3.54	22.52	9.04	µeq L^{-1}
F^-	1.05	3.00	2.42	2.09	3.12	2.43	1.83	3.47	2.94	µeq L^{-1}
ANC	-33.87	37.31	-2.34	-19.40	19.53	0.90	-8.83	130.49	33.74	µeq L^{-1}
DIC	24.14	322.20	113.92	44.50	239.78	91.86	38.70	263.90	105.50	µmol L^{-1}-C
DOC	280.49	844.80	525.28	336.60	757.46	523.99	288.67	819.27	567.17	µmol L^{-1}-C
SiO_2	35.78	168.09	86.70	35.78	111.84	72.97	41.67	196.74	106.45	µmol L^{-1}
Ca^{2+}	52.90	104.30	80.39	41.92	58.39	47.58	41.48	114.04	67.01	µeq L^{-1}
Mg^{2+}	21.39	39.50	30.04	15.63	23.86	19.19	14.31	73.28	33.49	µeq L^{-1}
Na^+	13.92	37.41	23.56	16.53	26.76	21.44	17.21	59.43	33.68	µeq L^{-1}
K^+	1.79	10.74	5.99	0.35	4.09	2.46	1.05	9.06	5.24	µeq L^{-1}
NH_4^+	-0.06	25.00	5.99	-0.59	5.04	0.94	0.39	29.35	5.03	µeq L^{-1}
AL_TD	8.82	21.98	13.62	8.07	13.05	11.45	4.09	18.15	10.65	µmol L^{-1}
AL_TM	3.60	17.64	10.63	4.11	8.75	6.65	2.16	11.49	6.05	µmol L^{-1}
AL_OM	2.96	11.19	4.86	3.09	5.72	4.15	1.73	7.53	4.13	µmol L^{-1}
AL_IM	0.52	13.01	5.78	1.02	4.72	2.50	0.00	5.85	1.93	µmol L^{-1}
LABPH	4.42	6.10	4.81	4.71	5.58	4.95	4.74	6.84	5.24	
AIREQPH	4.39	6.43	4.83	4.69	5.69	4.99	4.75	7.20	5.28	
TRUECOLOR	30	80	46	30	80.00	52	30	90	58	Pt Co
SCONDUCT	16.40	37.14	26.05	13.04	21.33	16.66	13.70	34.37	20.11	µS cm^{-1}
TOTALP	na	na	na	1.97	11.87	5.25	5.12	14.96	9.39	µg L^{1}
CHLORA	na	na	na	0.39	2.36	1.41	0.57	6.25	2.71	µg L^{1}

Table 34.2 Lake Characteristics

Parameter	Value
Elevation	717 m
Maximum depth	1.2 m
Mean depth	0.7 m
Volume	3.2 x 10^4 m^3
Surface area	4.4 ha
Watershed area	173.8 ha
Watershed ratio	0.03
Hydraulic retention time (year)	0.03
Watershed	Oswegatchie/ Black
County, Town	Hamilton, Arietta
USGS Quadrangle	Wakely Mtn.
Land use classification	West Canada Lake Wilderness

identified included: Sphagnum spp., Sparganium spp., Potamogeton spp., Nuphar spp., Brasenia spp., and Utricularia spp. A dip net survey on that date found the following Insecta: Odonata Libellulidae, Hemiptera Notonectidae and Gerridae, and Coleoptera Gyrinidae. On August 24, 1984, ALS found the lake isothermal (ALSC 1985).

In August 1975, the DOH found total phosphorus was 16.6 mg m^{-3} and total chlorophyll a was 3.62 µg L^{-1} (Wood 1978).

Fisheries: Brook trout were stocked annually from 1956 to 1969 (ALSC 1985). In addition to the ALS fisheries survey on September 12, 1984, the ALSC netted the lake on June 23, 1994 and October 16, 2008 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 34.3 for recent netting history.

Intensive studies: DOH conducted a limnological survey of Lost Pond in August 1975 (Wood 1978). Lost Pond was one of 36 ALTM lakes evaluated by Momen and Zehr (1998) during 1994 examining lake-water chemistry and terrestrial characteristics with the existing watershed classifications. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000.

Figure 34.3 Chemistry Time Series

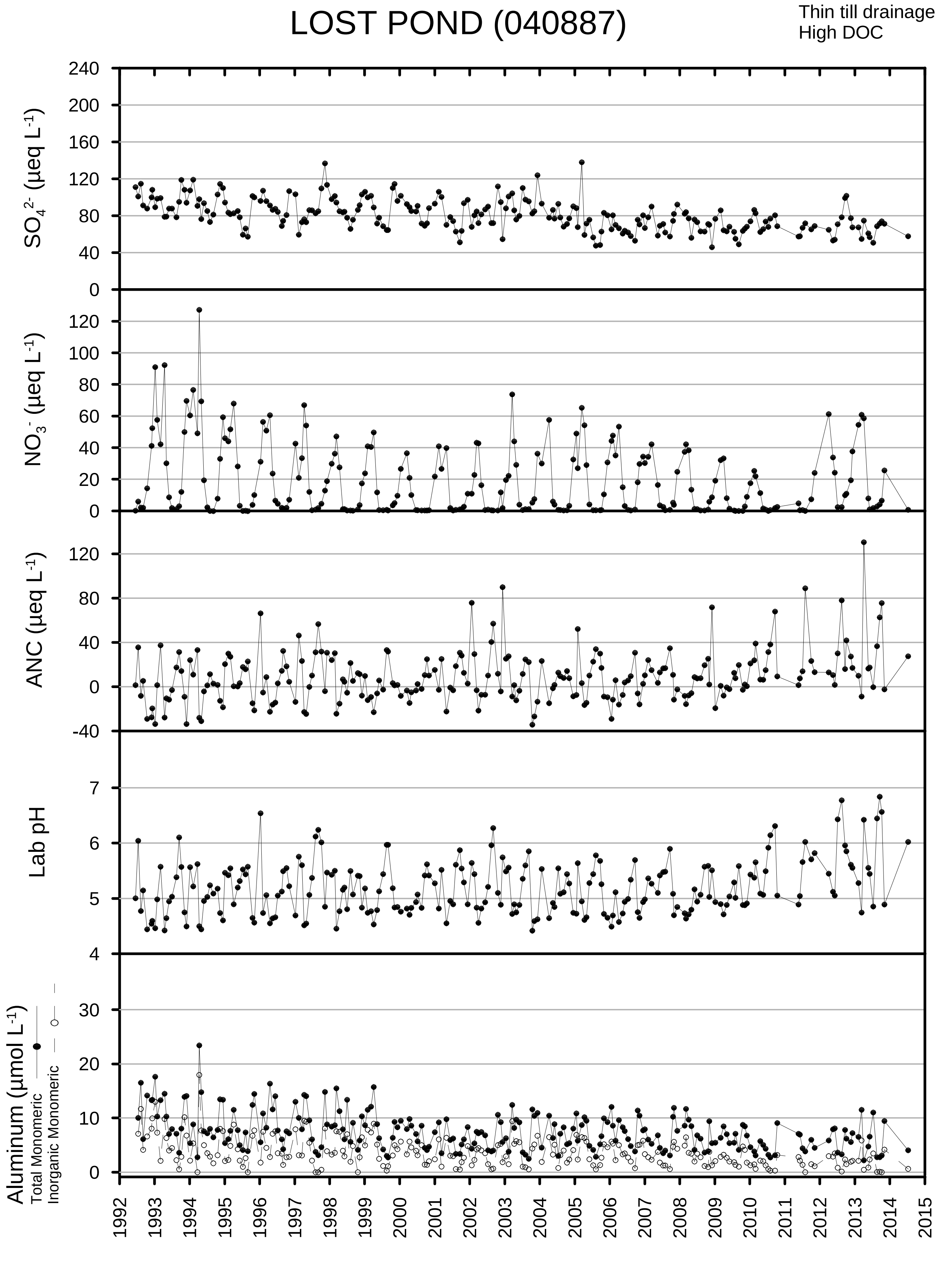


Table 34.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1984	Brook trout	17	105	250	1934	17
Jun-1994	Brook trout	9	183	340	2382	9
Oct-2008	Brook trout	6	180	231	564	6

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY28 Piseco Lake (start date December 31, 2012; elevation 519 m) located 22 km south of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Lost Pond lies on interlayered metasedimentary rock and granitic gneiss with medium to high ANC (Roy et al. 1997). Till overlays 85.7% of the watershed, while exposed bedrock makes up the remainder, and is found at elevations above 800 m. Basal till is found on the immediate shoreline, while shallow soils and rock outcrop are found around the lake at elevations between 750 and 800 m (APA 2001). The maximum elevation is 913 m. The maximum relief is 196 m. In 1984, the ALS found the shoal water substrate to be 50% organic and 50% muck/silt (ALSC 1985).

Land cover/use: In 1984, the ALS found deciduous-coniferous mixed forest covered 70% of the watershed (ALSC 1985). Total wetland area is 21.9 ha and comprises 12.6% of the watershed. Wetlands border the lake and the inlet drainage area. The predominant wetland type is forested needle-leaf evergreen (6.1%) and scrub/shrub broad leaf deciduous (6.5%) (ALSC 2003). The watershed is located entirely within the West Canada Lakes Wilderness Area (NYSDEC 2016).

Watershed disturbance: The 1916 fire protection source data reveal 87.4% of the watershed as green timber with no slash. The remaining area, at the upper reaches of the watershed, is shown as logged for softwood only, with considerable slash. The November 1950 blowdown and July 1995 microburst storm source data show no recorded disturbances (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Barnes Lake 040905
EPA ID: 1A2-076E

ALSC Staff Photo 2015

Lake: Barnes Lake lies in the Oswegatchie-Black watershed at 395 m. It is the only ALTM water located outside of the Adirondack Park. The 2.9 ha lake receives no channelized direct drainage from its small watershed. Most of its inputs are considered to be from direct deposition. The lake has no outlet (Figure 35.1) and reaches a maximum depth of 10.1 m (33.1 ft) (Figure 35.2).

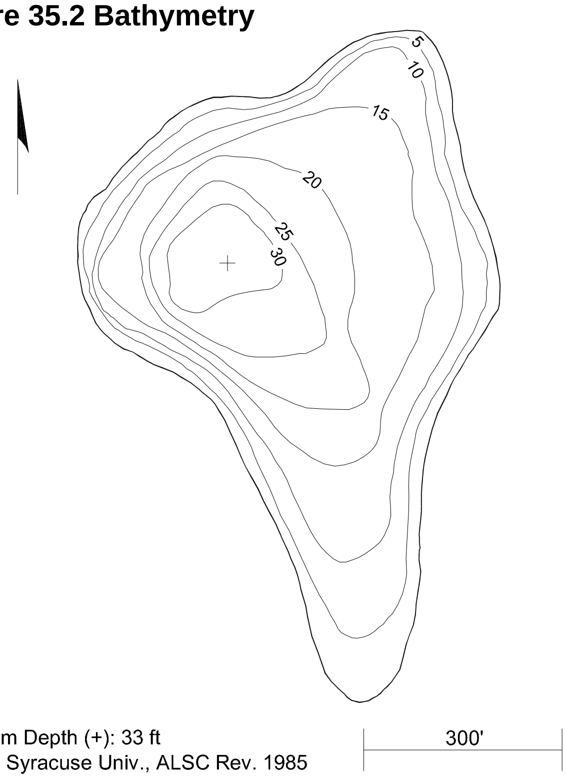
Barnes Lake is classified as a mounded seepage lake with relatively high dissolved organic carbon (>500 µmol L^{-1}-C). The lake is considered sensitive to acidification. Sampling frequency was modified to annual (July or August) starting in 2014.

Lake chemistry: On July 23, 1985 the ALS found: Lab pH 4.67, ANC -25.0 µeq L^{-1}, SO_4^{-2} 59.75 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 26.95 µeq L^{-1}, Mg^{2+} 10.70 µeq L^{-1} DOC 740.98 µmol L^{-1}-C. Barnes Lake is not included in the ALTM overall water chemistry trend analyses due to its liming history. Table 35.1 summarizes recent ALTM chemistry. Major analytes through 2013 are shown in Table 35.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 35.3.

Aquatic biota: On September 5, 1985, ALS found submergent vegetation occupied 10% of the lake bottom. Emergent and floating vegetation occupied 10% of the lake surface. Aquatic plant species identified were Nuphar spp. and Dulichium spp. A dip net survey on that date found the following Insecta: Odonata Libellulidae, Lestidae, and Coenagriidae; Hemiptera Unspecified, Corixidae,

Figure 35.1 Catchment

Figure 35.2 Bathymetry



Maximum Depth (+): 33 ft
Source: Syracuse Univ., ALSC Rev. 1985

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.56626	-75.22701	43° 33′ 58.5″ N	075° 13′ 37.2″ W
Lake centroid	43.56626	-75.22701	43° 33′ 58.5″ N	075° 13′ 37.2″ W

Table 35.1 Lake Chemistry

040905			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	36.64	47.68	40.74	18.29	32.04	22.27	8.99	14.03	11.51	µeq L^{-1}
NO_3^-	-0.40	8.71	3.22	0.00	7.45	1.21	0.00	1.51	0.13	µeq L^{-1}
Cl^-	5.08	13.26	7.52	4.83	9.74	5.89	4.18	6.80	5.11	µeq L^{-1}
F^-	0.63	1.05	0.78	0.57	0.89	0.68	0.46	1.18	0.64	µeq L^{-1}
ANC	5.92	43.81	22.02	-6.21	8.28	2.14	-3.42	9.38	3.67	µeq L^{-1}
DIC	11.66	283.90	79.44	-0.83	109.07	38.27	-0.58	138.41	36.81	µmol L^{-1}-C
DOC	303.47	563.98	450.55	457.66	946.63	689.27	933.95	1347.16	1127.59	µmol L^{-1}-C
SiO_2	-2.83	8.49	1.87	0.32	5.99	3.88	5.22	15.25	10.03	µmol L^{-1}
Ca^{2+}	49.40	87.33	63.96	23.45	29.94	26.44	26.19	32.46	28.41	µeq L^{-1}
Mg^{2+}	9.87	12.34	10.70	6.58	8.00	7.10	6.70	8.22	7.51	µeq L^{-1}
Na^+	2.61	8.70	4.46	3.32	5.65	3.76	3.60	5.16	4.10	µeq L^{-1}
K^+	6.14	11.77	8.21	4.35	5.63	5.19	5.56	6.58	6.22	µeq L^{-1}
NH_4^+	-0.78	20.46	8.97	-0.65	2.27	0.20	-0.77	0.73	0.08	µeq L^{-1}
AL_TD	0.33	5.34	1.17	0.23	0.96	0.57	0.12	0.65	0.46	µmol L^{-1}
AL_TM	0.66	3.56	1.51	1.41	1.82	1.62	1.15	1.76	1.42	µmol L^{-1}
AL_OM	0.07	2.13	0.68	1.30	2.01	1.62	1.20	1.91	1.50	µmol L^{-1}
AL_IM	0.24	3.48	0.84	0.00	0.26	0.07	0.00	0.07	0.01	µmol L^{-1}
LABPH	5.36	6.45	5.71	4.89	5.24	5.11	5.15	5.51	5.30	
AIREQPH	5.41	6.65	5.97	4.97	5.38	5.17	5.12	5.70	5.36	
TRUECOLOR	25	35	30	25	40	30	25	40	32	Pt Co
SCONDUCT	9.75	15.46	12.00	7.17	11.09	8.07	5.94	7.18	6.64	µS cm^{-1}
TOTALP	na	na	na	3.51	13.69	9.76	6.87	18.30	13.47	µg L^{1}
CHLORA	na	na	na	6.93	67.14	33.43	19.89	223.00	95.13	µg L^{1}

Table 35.2 Lake Characteristics

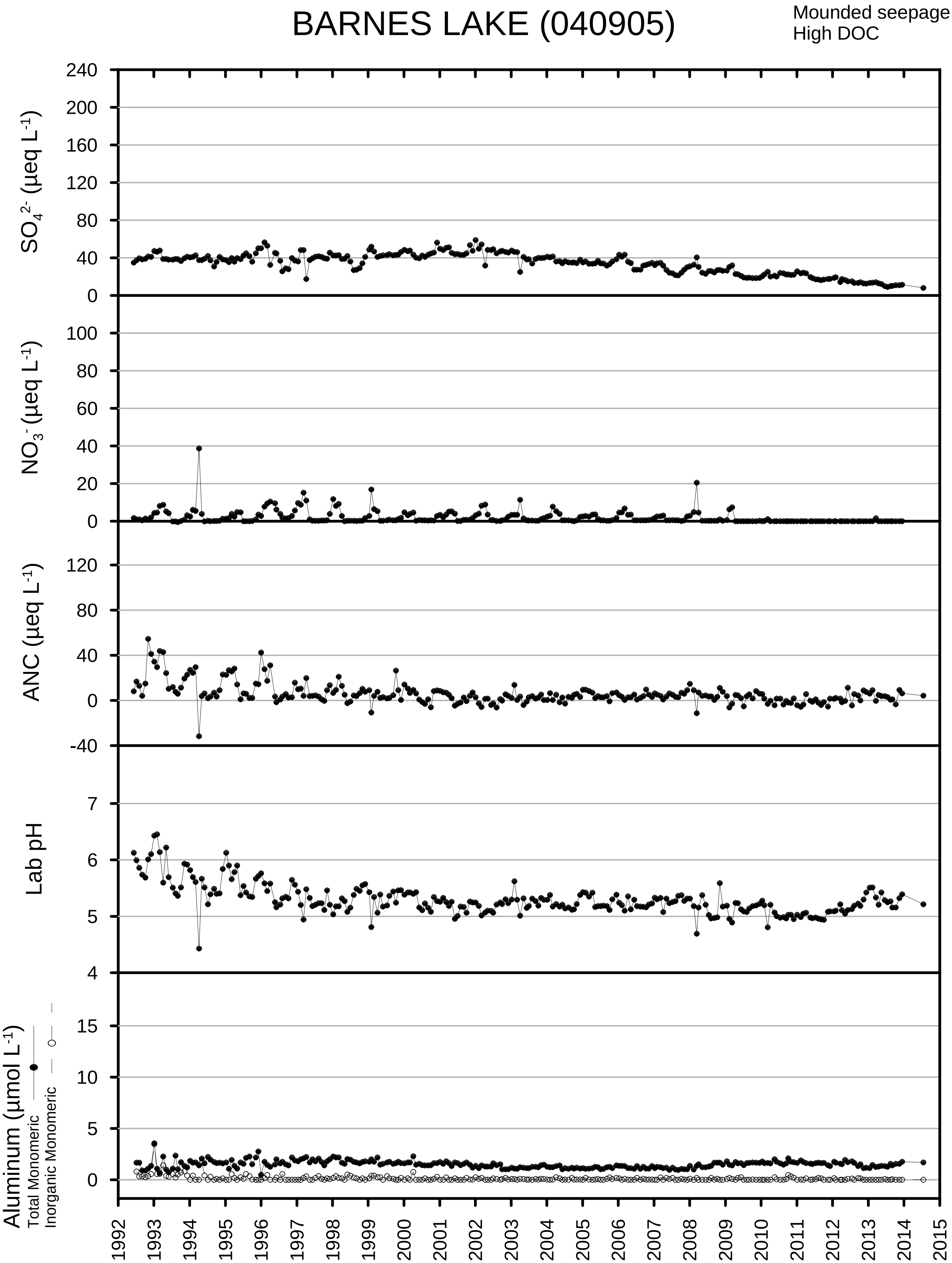
Parameter	Value
Elevation	395 m
Maximum depth	10.1 m
Mean depth	4.5 m
Volume	13.1 x 10^4 m^3
Surface area	2.9 ha
Watershed area	6.5 ha
Watershed ratio	0.45
Hydraulic retention time (year)	NA
Watershed	Oswegatchie/Black
County, Town	Lewis, Lyonsdale
USGS Quadrangle	McKeever
Land use classification	Private - outside Adirondack Park

Notonectidae, and Nepidae; Megaloptera Sialidae; Trichoptera Phryganeidae; Coleoptera Dytiscidae, Gryinidae, and Chrysomelidae; Diptera Culicidae and Chironomidae. Also found were Oligochae Unspecified. On July 23, 1985, the ALS found the lake stratified between 4.0 and 6.0 m (ALSC 1986).

Fisheries: Barnes Lake has no recent (since 1971) history of stocking and was limed in 1987 (ALSC 2003). In addition to the ALS fisheries survey on September 6, 1985 (ALSC 1986), the ALSC netted the lake on October 25, 2002 and May 19, 2011 (Roy et al. 2015, Baldigo et al. 2016). No fish were caught in any of the surveys.

Intensive studies: A 1931 survey of Barnes Lake reported the lake as a sterile bog water (NYSDEC 1932). Barnes Lake was studied under RILWAS in 1985 (Driscoll and Newton 1985). Charles and others (1990) found evidence of recent acidification in Barnes Lake. The historic diatom inferred pre-industrial (1850s) and recent

Figure 35.3 Chemistry Time Series



(1985) pH values were estimated at 5.2 and 4.7, respectively. The Barnes Lake profile was very similar to that of Little Echo Pond (020126), another small acidified high DOC lake. Diatoms stratigraphy in both lakes contained many fewer total taxa, with many taxa commonly associated with bog environments (e.g., several Eunotia and Pinnularia species). The short form of Asterionella ralfsii var. Americana increased up to 58% in the surface of recent sediments at Barnes Lake.

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 24 km northeast of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Barnes Lake is underlain by deep quaternary deposits of bedrock and is overlain by deep deposits of glacial outwash (ALSC 1986). The watershed is generally characterized as a predominately northern hardwood stand with second growth forest. Barnes Lake is a perched mounded seepage water, the 400 m elevation generally represents its watershed boundary. In 1985, the shoal water substrate of the lake was described as 60% mud silt and organic with the remaining 40% as sand (ALSC 1986).

Land use/cover: In 1985, the ALS described the watershed as 60% deciduous-conifer mixed forest with 5% coniferous forest and 35% wetland shrub/sapling mix. The immediate shoreline consisted of 55% deciduous-conifer mixed forest and 25% wetland shrub/sapling mix. A few pockets of bog mat habitat occur around the shoreline and a wetland is associated with a small portion of the southern shore of the lake (ALSC 1986). Approximately 10% of the watershed is developed. A gated private gravel road leads to a few seasonal camps along the southern shoreline, one of which has a sand-gravel beach. The lake and its watershed are on private land just outside the Adirondack Park.

Watershed disturbance: Logging and agricultural practices took place in the early to mid-1900s in the vicinity of the lake (Charles et al. 1990). There is no coverage for this watershed area pertaining to the 1916 fire map, the November 1950 blowdown or the July 1995 microburst storms (APA 2001). This watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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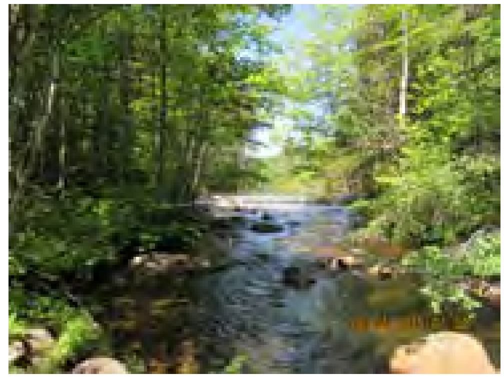
South Lake 041004
EPA ID: 1A3-065O EMAP ID: NY282L

Lake: South Lake lies in the Oswegatchie-Black watershed at 615 m. Several tributaries flow into this 197.4 ha reservoir (Figure 36.1). The lake was formed by two dams built on the South Branch of the Black River in the mid-1800s. The primary outlet is a concrete control structure located on the main outlet in the southeast end of the lake. A secondary outlet is a low, noncontrollable concrete structure approximately 0.5 km west of the main outlet. The outlet flows southeast and joins the south branch of the Black River. Lake levels are currently managed by the New York State Thruway Authority. The lake has a maximum depth of 18.3 m (60.0 ft) (Figure.36.2).



ALSC Staff Photo 2015

South Lake is classified as a thin-till chain drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C) and is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. This lake is accessed by helicopter most of the year, except during the summer months when it is sampled at the outlet. The lake continues to be sampled monthly.

Figure 36.1 Catchment

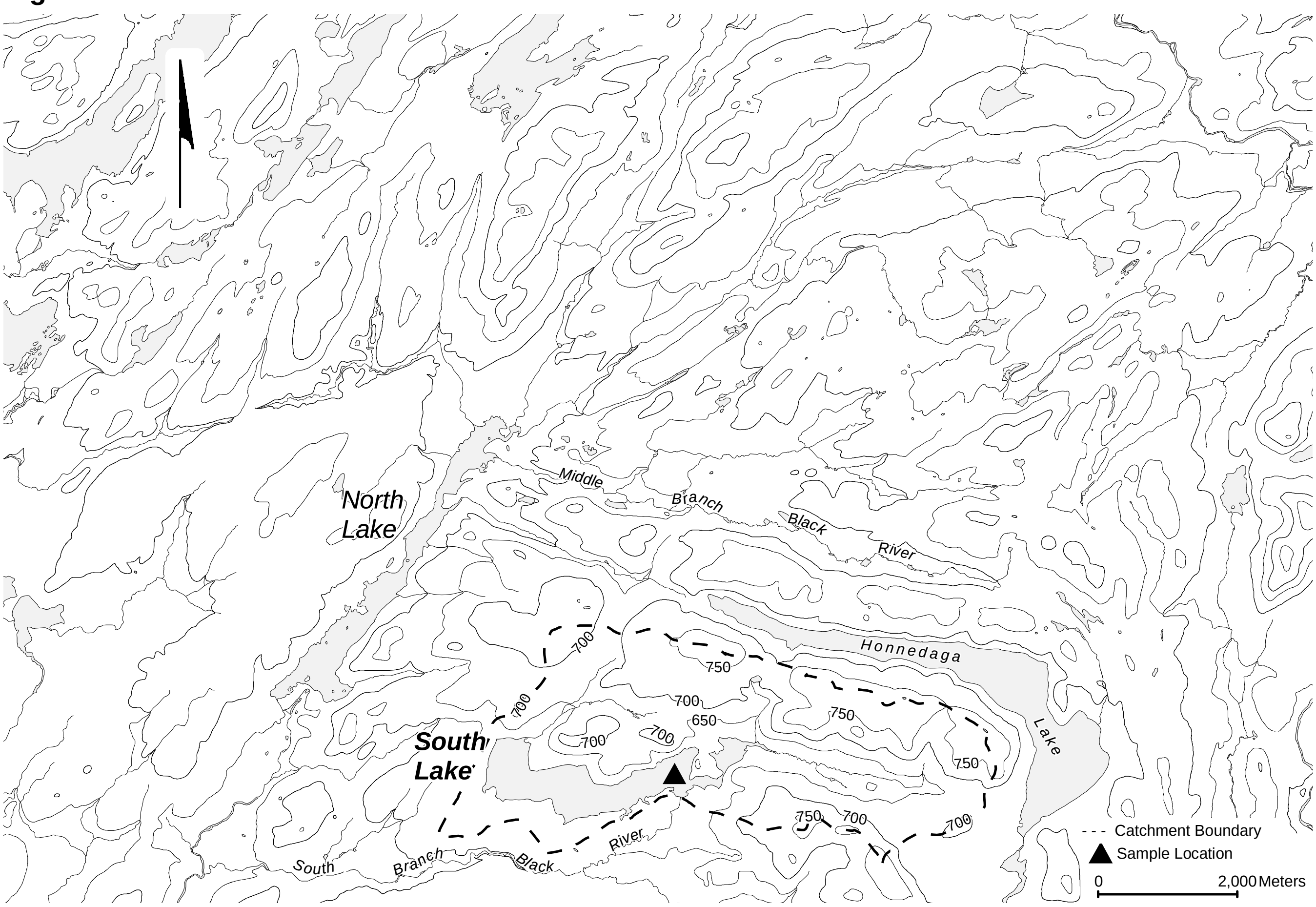
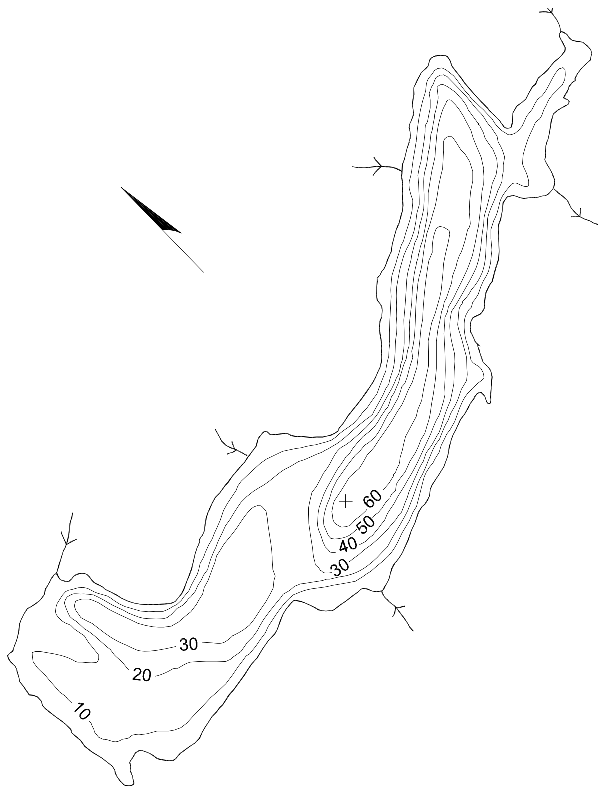


Figure 36.2 Bathymetry



Maximum Depth (+): 60 ft
Source: NYSDEC, ALSC Rec'd c.1984

3000'

Lake chemistry: South Lake was not sampled during the ALS, but was sampled as part of the ELS (1A3-065) on October 16, 1984, which found: Field pH 5.22, ANC 2.9 µeq L^{-1}, SO_4^{2-} 113.5 µeq L^{-1}, NO_3^- 15.1 µeq L^{-1}, Ca^{2+} 72.6 µeq L^{-1}, Mg^{2+} 25.3 µeq L^{-1}, DOC 139.04 µmol L^{-1}-C (Kanciruk, et al. 1986). Table 36.1 summarizes recent ALTM chemistry including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes through 2013 are shown in Table 36.1. Plots through 2014 appear in Figure 36.3.

Aquatic biota: In 2003, the AEAP reported the average value of chlorophyll a was 1.11 µg L^{-1} (Momen et al. 2006).

Fisheries: DEC has stocked the lake annually with brook trout and other species since 1995. The ALSC netted the lake on May 16, 2002 and September 27, 2011 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 36.3 and 36.4 for recent fish stocking and netting histories.

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.52775	-74.93957	43° 31′ 39.9″ N	074° 56′ 22.4″ W
Helo sample site	43.51096	-74.87589	43° 30′ 39.4″ N	074° 52′ 33.2″ W
Lake centroid	43.5102	-74.89290	43° 30′ 36.7″ N	074° 53′ 34.4″ W

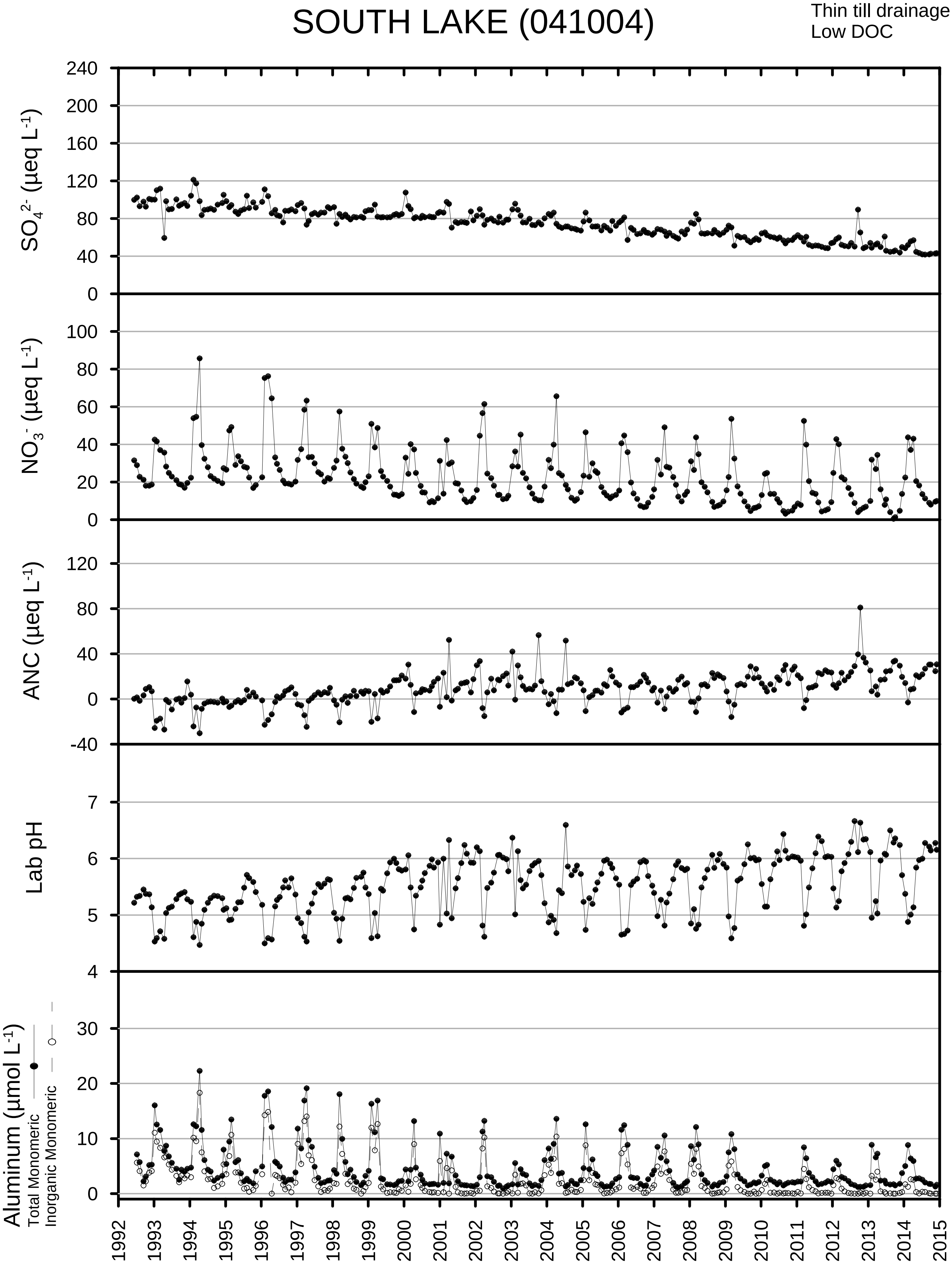
Table 36.1 Lake Chemistry

041004			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	59.34	111.80	94.85	51.10	72.56	60.77	43.93	60.97	49.60	µeq L^{-1}
NO_3^-	17.02	42.56	27.31	4.67	53.51	16.39	0.55	34.40	13.52	µeq L^{-1}
Cl^-	5.36	8.74	7.50	4.71	8.05	6.26	5.68	7.83	6.43	µeq L^{-1}
F^-	1.58	4.21	2.76	2.12	2.87	2.52	2.10	3.46	2.54	µeq L^{-1}
ANC	-27.12	15.57	-7.42	-15.83	28.81	11.21	3.74	33.97	20.56	µeq L^{-1}
DIC	11.66	110.73	50.79	21.31	110.73	56.13	34.65	132.73	69.70	µmol L^{-1}-C
DOC	127.46	452.83	212.34	201.98	421.86	260.84	239.15	482.56	307.11	µmol L^{-1}-C
SiO_2	34.28	66.41	56.06	42.33	78.22	54.49	46.27	74.82	56.99	µmol L^{-1}
Ca^{2+}	30.44	79.35	66.08	36.43	71.86	55.57	45.17	64.75	52.58	µeq L^{-1}
Mg^{2+}	11.52	25.51	22.77	13.17	21.39	19.13	17.24	20.74	19.03	µeq L^{-1}
Na^+	10.44	22.62	18.45	14.79	21.65	19.65	18.47	25.26	22.40	µeq L^{-1}
K^+	2.81	7.16	5.22	3.33	5.12	4.09	3.89	6.49	4.70	µeq L^{-1}
NH_4^+	-0.06	14.58	3.39	-0.89	2.42	0.81	-0.68	3.02	1.35	µeq L^{-1}
AL_TD	4.26	18.79	9.40	2.08	17.57	6.43	1.39	13.22	5.42	µmol L^{-1}
AL_TM	2.56	16.05	7.42	1.47	10.82	3.93	1.49	8.90	3.44	µmol L^{-1}
AL_OM	0.48	5.00	1.86	1.61	4.97	2.48	1.49	5.66	2.54	µmol L^{-1}
AL_IM	2.08	11.04	5.56	0.00	5.86	1.49	0.00	3.97	0.91	µmol L^{-1}
LABPH	4.53	5.41	4.91	4.59	6.25	5.26	4.95	6.50	5.55	
AIREQPH	4.46	5.40	4.91	4.59	6.40	5.26	5.03	6.68	5.65	
TRUECOLOR	0	35	13	20	35	25	15	40	23	Pt Co
SCONDUCT	17.34	29.56	20.81	13.01	25.38	15.41	12.16	17.40	13.93	µS cm^{-1}
TOTALP	na	na	na	1.66	59.74	8.17	0.53	7.86	4.27	µg L^{1}
CHLORA	na	na	na	0.35	3.33	1.59	0.58	9.09	3.43	µg L^{1}

Table 36.2 Lake Characteristics

Parameter	Value
Elevation	615 m
Maximum depth	18.3 m
Mean depth	8.3 m
Volume	1630.2 x 10^4 m^3
Surface area	197.4 ha
Watershed area	1662.2 ha
Watershed ratio	0.12
Hydraulic retention time (year)	1.30
Watershed	Oswegatchie/Black
County, Town	Herkimer, Ohio
USGS Quadrangle	Honnedaga Lake
Land use classification	Black River Wild Forest, Rural Use

Figure 36.3 Chemistry Time Series



Intensive studies: Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Landscape characteristics and disturbance history have been evaluated within this watershed (Sullivan et al. 1999). The AEAP has studied aquatic biota at this site (Momen et al. 2006). South Lake was one of 20 Adirondack lakes evaluated for regional trends in chrysophyte-inferred lake water pH changes (Cumming et al. 1994, Smol et al. 1998). This watershed has been analyzed using the integrated biogeochemical (PnET-BGC) model (Zhai 2006). Common loons were surveyed for mercury content in 1998–2000 (Schoch and Evers 2002) and in 2003–2004 (Schoch et al. 2004). The lake was part of EPA's EMAP in 1992, 1994, 1995, and 1997. Since 1999, the lake is sampled each year by the ALSC as part of the TIME project (Stoddard et al. 2003). This is a crossover TIME/ALTM lake (Civerolo et al. 2011) with uninterrupted annual sampling through 2016. McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 21 km northwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Table 36.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1993	Brook trout	11760	60
1995	Lake trout	5000	-
1995	Brook trout	14240	-
1996	Brook trout	6700	162
1997	Brook trout	3500	53
1997	Atlantic salmon	5000	142
1998	Brook trout	35910	619
1999	Brook trout	5500	85
1999	Atlantic salmon	6000	249
2000	Brook trout	16460	899
2001	Brook trout	3120	53
2002	Brook trout	8500	206
2003	Brook trout	6000	68
2004	Brook trout	10125	262
2005	Brook trout	6100	275
2006	Brook trout	3850	45
2007	Brook trout	3500	43
2008	Brook trout	7500	160
2009	Brook trout	6500	120
2011	Brook trout	3500	53
2012	Brook trout	1500	19

Table 36.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-2002	Atlantic salmon	1	466	466	1422	1
May-2002	Brook trout	70	155	502	30835	70
May-2002	Lake chub	5	105	116	62	5
May-2002	N. redbelly dace	2	95	106	16	2
May-2002	Blacknose dace	1	99	99	8	1
May-2002	Creek chub	8	101	200	343	8
May-2002	Brown bullhead	14	55	192	753	14
Sep-2011	Brook trout	30	205	420	9568	30
Sep-2011	Lake chub	25	10	116	225	59
Sep-2011	Creek chub	23	98	215	1388	23
Sep-2011	Brown bullhead	25	130	232	1854	56

Watershed: The watershed lies on biotite and/or hornblende granitic gneiss with low to no ANC (Roy et al. 1997). Till overlays 77.7% of the watershed, while bedrock makes up the remainder primarily to the east. Bedrock outcrop and shallow (<0.5 m) soils occur over 12% of the watershed and generally appear at elevations above 650 m and along the north shore of the Lake. Basal till predominates in the rest of the watershed (71%) except for two wetland areas along the western shore and the northwestern inlet where hydric soils occur (APA 2001). The highest elevation in the watershed is 802 m. The maximum relief is 187 m.

Land cover/use: Total wetland area is 119 ha comprising 7.1% of the watershed. The predominant wetland vegetation types are: forested needle-leaf evergreen (70 ha) and scrub/shrub broad leaf deciduous (23 ha). Wetlands are primarily distributed along surface drainage channels throughout the watershed (Roy et al. 1996).

This watershed is a combination of public and private land ownership. The southern half (56%) of the watershed is Forest Preserve – Black River Wild Forest (NYSDEC 1996). A small area of private land in Rural Use contains a cluster of camps and houses on the northwestern shore. There are gravel roads around the perimeter of the northwestern bay, along with a snowmobile trail along most of the southern shore. Approximately 4% of the shoreline is considered developed, Rural Use. The remaining portion of the watershed to the north is private ownership in Resource Management with little to no development (Roy et al. 1997).

Watershed disturbance: The 1916 fire protection source data show 100% of the watershed as green timber with no slash. A storm in November 1950 caused 50 to 100% blowdown in 65.8% of the watershed and 25 to 50% blowdown in 34.2% of the watershed. The July 1995 microburst storm did not record any damage throughout the watershed (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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North Lake 041007
EPA ID: 041007O EMAP ID: NY279L


ALSC Staff Photo 2015

Lake: North Lake lies in the Oswegatchie-Black watershed at 555 m. The 176.8 ha lake has a number of major inlets, two of which are the Middle and North Branches of the Black River (Figure 37.1). Twenty-six ponded sub-watersheds feed North Lake (Roy et al. 1996). The North Lake Reservoir was reconstructed in 1870 as part of the Black River Canal (Boonville Black River Canal Museum 2005). The lake has two outlets. The main outlet has a concrete dam with a head height of approximately 10 m. Lake levels are currently managed by the New York State Thruway Authority. The lake is drawn down significantly every winter. North Lake reaches a maximum depth of 17.7 m (58.1 ft) near the southern end (Figure 37.2).

North Lake is classified as a thin-till chain drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C) and is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. This lake is accessed by helicopter most of the year, except during the summer months when it is sampled at the outlet. The lake continues to be sampled monthly.

Lake chemistry: North Lake was sampled near its deepest point during the ALS on July 8, 1986 finding: Lab pH 5.06, ANC -1.9 µeq L^{-1}, SO_4^{2-} 109.72 µeq L^{-1}, NO_3^- 3.07 µeq L^{-1}, Ca^{2+} 79.35 µeq L^{-1}, Mg^{2+} 26.33 µeq L^{-1}, DOC 416.28 µmol L^{-1}-C (ALSC 1987). Table 37.1 summarizes recent ALTM chemistry. Major analytes through 2013 are shown in Table 37.1. Plots through 2014 appear in Figure 37.3.

Figure 37.1 Catchment

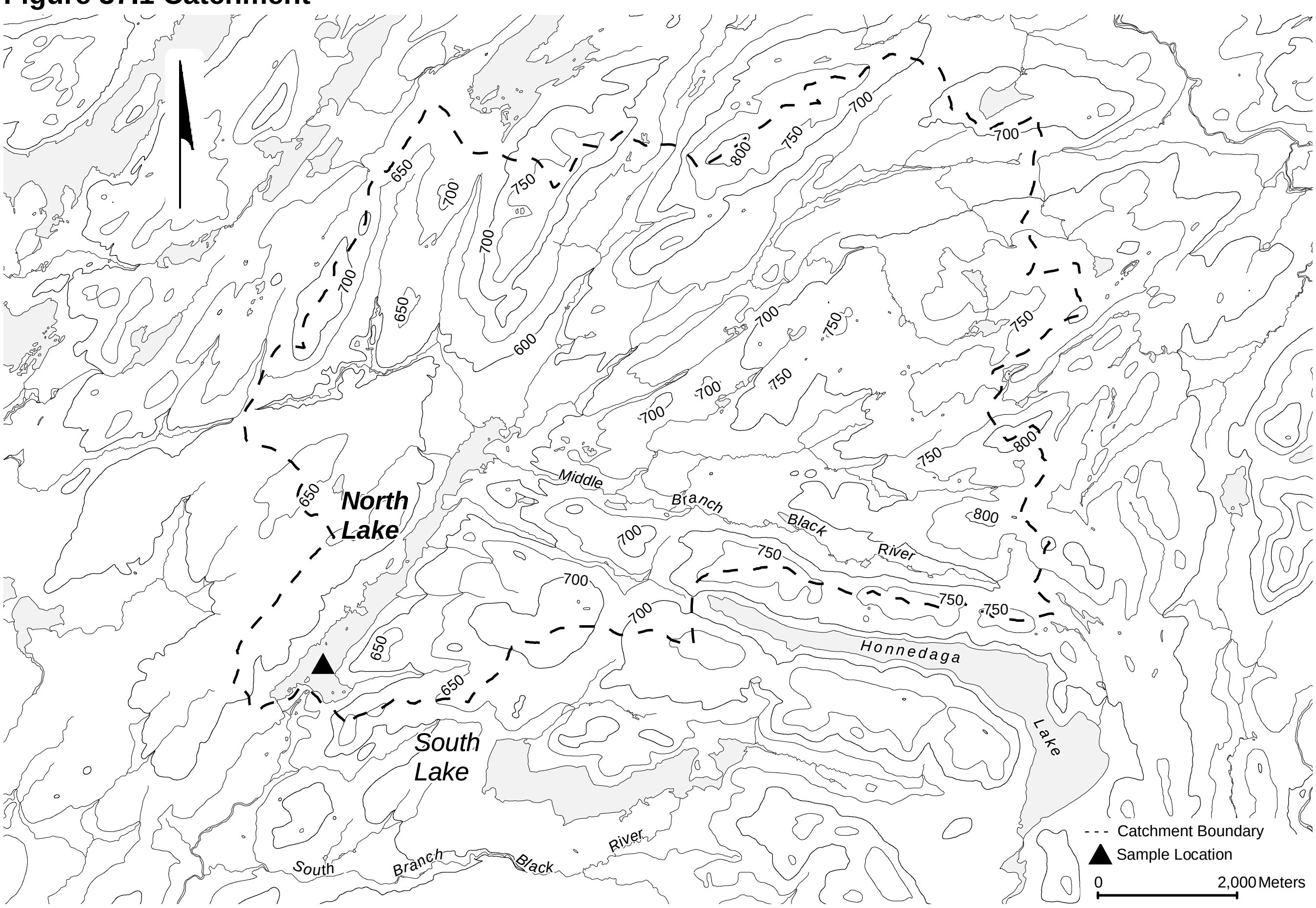
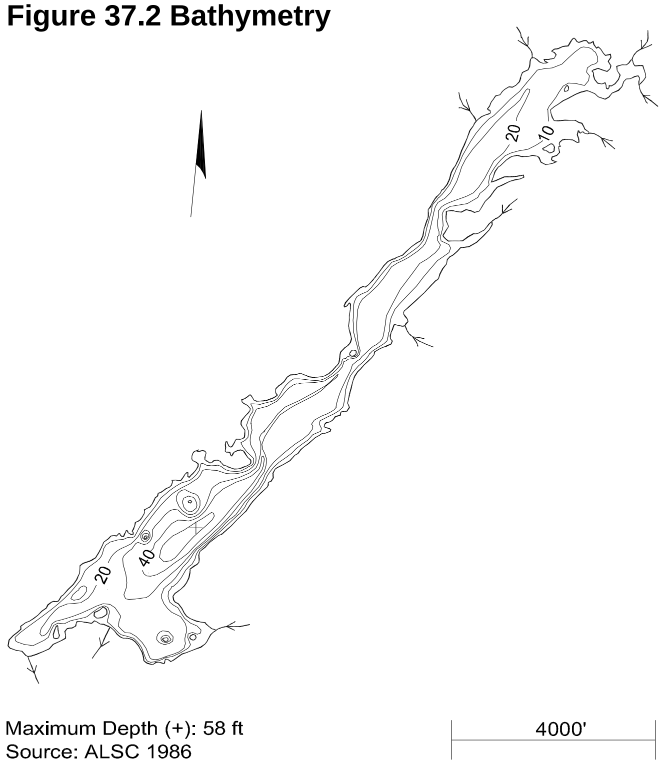


Figure 37.2 Bathymetry



Maximum Depth (+): 58 ft
Source: ALSC 1986

Aquatic biota: On September 15, 1986, submergent vegetation covered 30% of the lake bottom and emergent plants covered 1% of the surface. Species identified were: Sphagnum spp., Sparganium spp., Potamogeton spp., Eriocaulon spp., Typha spp., Scirpus spp., Iris spp., and Utricularia spp. A dip net survey on the same date found Coleoptera Dytiscidae; Diptera Chironomidae; Decapoda Astacidae; Haplosclerina Spongillidae; and Oligochae Unspecified (ALSC 1987). On July 8, 1986, the lake was thermally stratified between 4.0 and 6.0 m. In 2003, the AEAP reported the average value of chlorophyll a was 3.15 µg L^{-1} (Momen et al. 2006).

Fisheries: The earliest records indicate the lake was stocked with brook trout in 1893 and brown trout in 1899. North Lake was intermittently stocked between 1933 and 1980 with brook

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	**DDD.ddd**	**DD MM SS.s**	**DDD MM SS.s**
Grab sample site	43.52227	-74.94790	43° 31′ 20.2″ N	074° 56′ 52.4′′ W
Helo sample site	43.52775	-74.93957	43° 31′ 39.9″ N	074° 56′ 22.4″ W
Lake centroid	43.52881	-74.93819	43° 31′ 43.7″ N	074° 56′ 17.5″ W

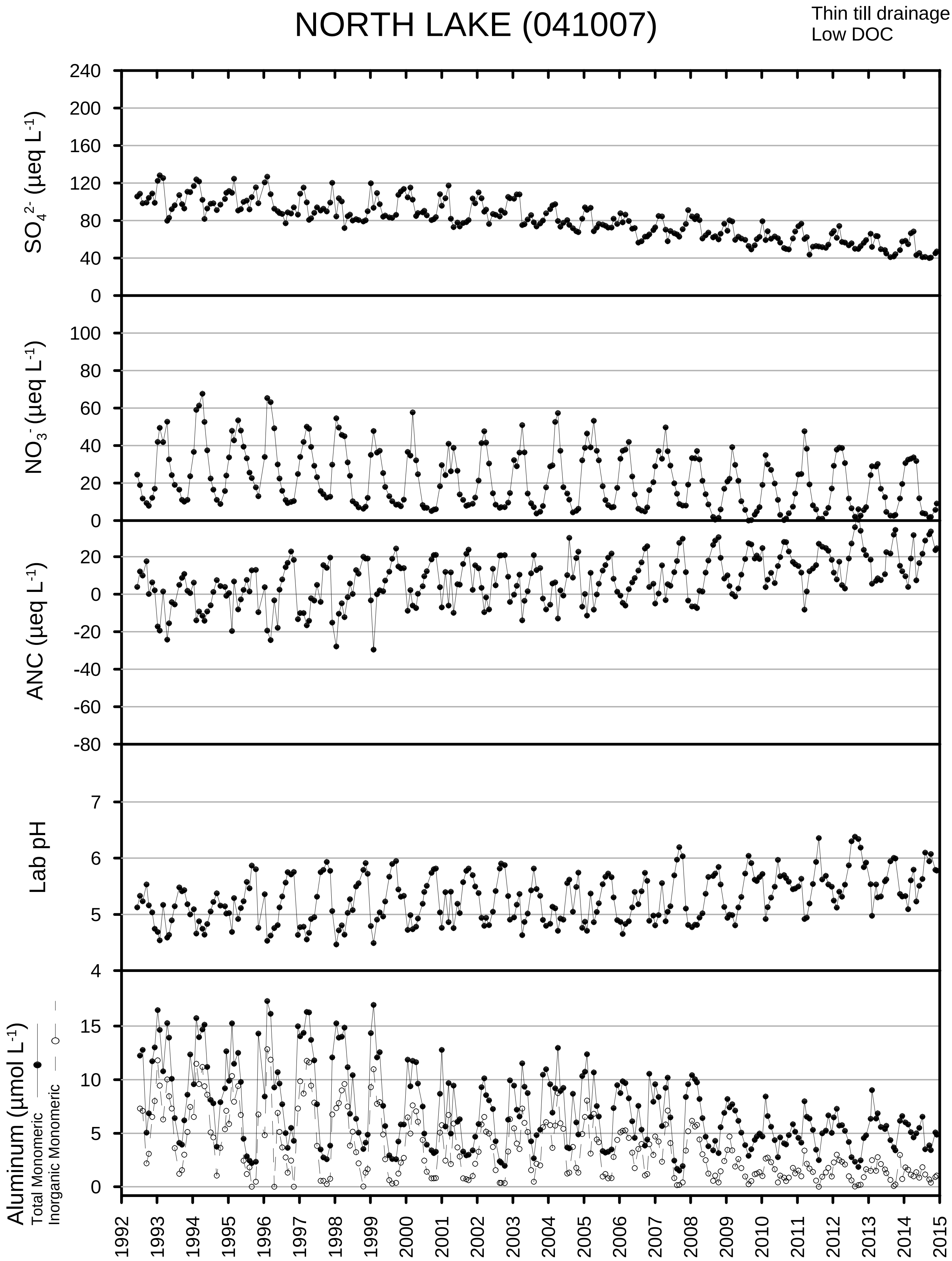
Table 37.1 Lake Chemistry

041007			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	79.74	128.25	103.79	49.38	80.30	62.47	40.86	66.08	51.70	µeq L^{-1}
NO_3^-	10.13	52.72	27.84	0.00	39.21	13.72	2.52	30.19	15.49	µeq L^{-1}
Cl^-	5.92	10.44	7.43	4.69	8.67	6.28	5.11	8.73	6.48	µeq L^{-1}
F^-	2.26	3.58	2.70	2.22	2.87	2.49	2.23	3.21	2.62	µeq L^{-1}
ANC	-24.20	10.73	-4.82	-1.27	27.13	13.13	5.60	34.31	16.28	µeq L^{-1}
DIC	12.49	91.58	43.64	22.89	68.27	49.83	40.84	79.19	58.42	µmol L^{-1}-C
DOC	248.77	440.92	372.71	365.41	585.92	455.81	410.74	690.58	526.00	µmol L^{-1}-C
SiO_2	51.26	105.35	76.49	54.59	93.87	72.73	53.95	102.58	74.44	µmol L^{-1}
Ca^{2+}	55.39	100.80	77.06	48.41	63.38	57.63	46.63	67.74	56.71	µeq L^{-1}
Mg^{2+}	19.75	33.74	27.29	18.10	26.33	21.80	16.79	26.73	21.92	µeq L^{-1}
Na^+	12.61	30.88	20.55	17.40	27.40	21.66	19.03	28.46	23.53	µeq L^{-1}
K^+	5.12	7.67	6.03	3.07	6.39	4.85	3.61	7.48	5.03	µeq L^{-1}
NH_4^+	0.28	4.32	1.54	-1.05	2.31	0.68	-0.94	1.88	0.79	µeq L^{-1}
AL_TD	6.78	19.12	13.21	7.38	13.79	10.60	8.18	13.41	10.19	µmol L^{-1}
AL_TM	3.93	16.49	10.23	2.89	8.19	5.49	3.41	9.03	5.79	µmol L^{-1}
AL_OM	2.37	5.48	3.96	2.65	5.23	3.55	3.19	6.54	4.30	µmol L^{-1}
AL_IM	1.22	11.79	6.27	0.24	4.71	1.94	0.07	2.97	1.49	µmol L^{-1}
LABPH	4.54	5.48	4.89	4.80	6.04	5.23	4.97	6.00	5.44	
AIREQPH	4.53	5.55	4.91	4.84	6.10	5.24	4.97	6.34	5.51	
TRUECOLOR	20	40	33	40	90	56	35	80	57	Pt Co
SCONDUCT	17.91	30.40	22.86	13.21	21.84	16.17	12.56	17.8	14.95	µS cm^{-1}
TOTALP	na	na	na	1.09	6.86	3.34	1.42	11.66	5.20	µg L^{1}
CHLORA	na	na	na	0.23	7.86	2.06	0.32	5.24	1.93	µg L^{1}

Table 37.2 Lake Characteristics

Parameter	Value
Elevation	555 m
Maximum depth	17.7 m
Mean depth	5.7 m
Volume	1010.7 x 10^4 m^3
Surface area	176.8 ha
Watershed area	7,700.8 ha
Watershed ratio	0.02
Hydraulic retention time (year)	0.15
Watershed	Oswegatchie/Black
County, Town	Herkimer, Ohio
USGS Quadrangle	Honnedaga Lake
Land use classification	Black River Wild Forest

Figure 37.3 Chemistry Time Series



trout and rainbow trout (ALSC 1987). In addition to the ALS fisheries survey on September 16, 1986, the ALSC netted the lake on June 25, 2001 and August 26, 2011 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 37.3 and 37.4 for recent fish stocking and netting histories.

Intensive studies: North Lake has been modeled using the integrated biogeochemical (PnET-BGC) model (Zhai 2006). North Lake was sampled by the Statewide Monitoring of Mercury Project in 2003 (Simonin et al. 2008). Common loons were surveyed for mercury content in 1998–2000 (Schoch and Evers 2002) and in 2003–2004 (Schoch et al. 2004). North Lake was part of EPA's Environmental Monitoring and Assessment Program (EMAP) in 1992, 1994, 1995, and 1997. Since 1999, the lake is sampled annually as part of the TIME project (Stoddard et al. 2003). This is a crossover TIME/ALTM water (Civerolo et al. 2011) with uninterrupted annual summer sampling through 2016. The lake is an AEAP water (Momen et al. 2006). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 18 km north of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Approximately 80% of the watershed lies on metasedimentary rock, migmatite, and granitic gneiss with medium to high ANC. The remainder of the watershed is underlain by biotite and other hornblende granite gneiss, with a small portion of leucograntic gneiss to the east, both of which have low to no ANC (Roy et al. 1997). Till overlays 85.9% of the watershed, of which basal till is the predominate soil type. Bedrock outcrops and shallow (<0.5 m) soils appear between 650 and 700 m and together account for about 30% of the watershed. Hydric soils appear along the broad stream valleys where the wetlands occur and cover about 8% of the watershed. Glacial outwash soils appear at the north shore along the southern half of North Lake and near its outlet (APA 2001). The watershed rises to a maximum of about 817 m at Ice Cave Mountain. The watershed has a maximum relief of 262 m. In 1986, the ALS found shoal water substrate comprised of 70% sand and gravel, 25% boulders and rubble, and 5% muck/silt (ALSC 1987).

Table 37.3 Stocking

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1990	Bass-Lg/Sm	300	600
1993	Brook trout	11760	27
1995	Brook trout	6000	-
1995	Tiger musky	2000	114
1998	Brook trout	700	78
1998	Tiger musky	400	16
1999	Splake	2000	368
2000	Tiger musky	5000	130
2002	Brook trout	5000	151
2003	Brook trout	2500	14
2004	Brook trout	6625	177
2005	Brook trout	6100	275
2006	Brook trout	3000	231
2014	Tiger musky	2200	91

Table 37.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1986	Brook trout	10	213	415	3300	10
Sep-1986	Lake chub	25	95	177	1350	37
Sep-1986	Golden shiner	31	80	186	929	40
Sep-1986	Creek chub	25	92	195	951	37
Sep-1986	White sucker	25	205	389	5800	342
Sep-1986	Brown bullhead	25	108	302	1960	51
Jun-2001	Brook trout	1	275	275	204	1
Jun-2001	Golden shiner	5	106	173	143	5
Jun-2001	White sucker	23	222	333	5175	170
Jun-2001	Brown bullhead	24	135	175	909	24
Jun-2001	Yellow perch	136	85	370	-	136
Sep-2011	Tiger musky	2	260	270	160	2
Sep-2011	Golden shiner	6	104	184	269	6
Sep-2011	Creek chub	1	9	-	95	1
Sep-2011	White sucker	25	189	404	9421	118
Sep-2011	Brown bullhead	26	136	291	2076	121
Sep-2011	Yellow perch	71	83	383	6066	118

Land cover/use: In 1986, the ALS characterized the watershed as 90% deciduous forest, 8% deciduous-coniferous mixed forest, 1% shrub/sapling and 1% developed. The immediate shoreline was bounded by 70% deciduous forest, 10% deciduous-coniferous mixed forest, 10% developed, 5% shrub-sapling vegetation, 3% boulder rock ledge, 1% open grass area, and 1% sand and gravel beach (ALSC 1987). Total wetland area consists of 1018 ha comprising 13.2% of the watershed. The predominant wetland types are forested needle-leaved evergreen and scrub/shrub broad leaf deciduous. Wetlands are primarily distributed along surface drainage channels throughout the watershed (Roy et al. 1996).

This watershed is a combination of public and private land ownership. The southern half (44%) of the watershed is Forest Preserve, Black River Wild Forest (NYSDEC 1996). Several primitive campsites are located along the southwestern shore of the lake. Other portions of the southern shoreline in private ownership are developed (6% of shoreline) in Low and Moderate Intensity and Rural Use classifications. The northern portion of the watershed in private ownership is in Resource Management with little to no development (Roy et al. 1997). A road follows the entire western and southern shoreline. There are numerous camps and buildings along the private shoreline.

Watershed disturbance: The 1916 fire protection source data reveal 96.1% of the watershed as green timber with no slash. The remaining portion, in the north, is indicated as logged for softwoods only. In November 1950, a storm caused 50 to 100% blowdown in 21.2% of the watershed and 25 to 50% blowdown in 68.2% of the watershed. The watershed was not impacted by the July 1995 microburst (ALSC 2003). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Willis Lake 050215
EPA ID: 050215O

ALSC Staff Photo 2015

Lake: Willis Lake lies in the Upper Hudson watershed at 400 m. The wide outlet flows approximately 300 m until it is channelized through a culvert under the causeway. The lake has no primary inlets (Figure 38.1) and has a maximum depth of 2.7 m (8.9 ft) (Figure 38.2).

Willis Lake is a medium-till drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). It is considered moderately sensitive to acidification. The ALTM program began monthly monitoring in June 1992 (Figure 38.1). Sampling frequency was modified to annual (July or August) starting in 2014.

Lake chemistry: Willis Lake was sampled near its deepest point during the ALS on August 13, 1987 finding: Lab pH 6.67, ANC 58.8 µeq L^{-1}, SO_4^{2-} 98.27 µeq L^{-1}, NO_3^- 0.16 µeq L^{-1}, Ca^{2+} 111.78 µeq L^{-1}, Mg^{2+} 34.56 µeq L^{-1}, DOC 399.63 µmol L^{-1}-C (ALSC 1989). Table 38.1 summarizes recent ALTM water chemistry taken at the outlet. Major analytes through 2013 are shown in Table 38.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 38.3.

Aquatic biota: On September 8, 1987, the ALS found submergent vegetation occupied 30% of the lake bottom, while emergent and floating vegetation occupied 5% and 15%, respectively, of the surface. The following aquatic plant species were identified: Chara spp., Potamogeton spp., Sparganium spp., Carex spp., Fontinalis spp., Sagittaria spp., Dulichium spp., Eleocharis spp, Iris spp., Nuphar spp., Nymphaea spp., Brasenia spp., Hypericum spp., Utricularia spp., and Eriocaulon spp. Also identified was Poaceae. Also identified was Poaceae.

Figure 38.1 Catchment

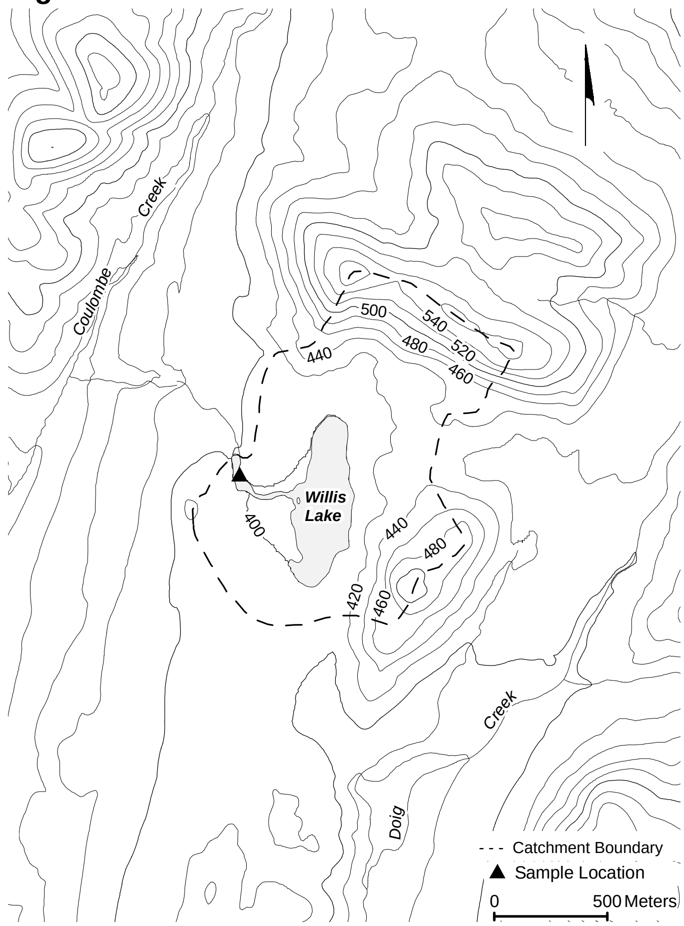
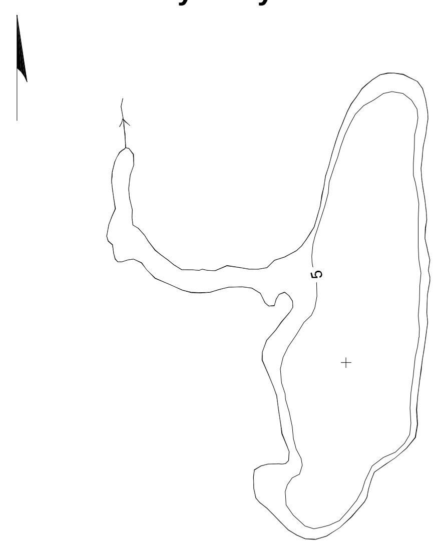


Figure 38.2 Bathymetry



Maximum Depth (+): 9 ft
Source: ALSC 1987

1000'

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.37029	-74.24624	43° 22′ 13.0″ N	074° 14′ 46.5″ W
Lake centroid	43.36873	-74.24147	43° 22′ 07.4″ N	074° 14′ 29.3″ W

Table 38.1 Lake Chemistry

050215 Parameter	1993 Min	1993 Max	1993 Avg	2009 Min	2009 Max	2009 Avg	2013 Min	2013 Max	2013 Avg	Units
SO_4^{2-}	65.58	133.25	91.04	39.42	76.34	58.21	36.15	74.55	53.25	µeq L^{-1}
NO_3^-	-0.27	7.40	1.30	0.00	7.71	1.19	0.00	5.46	1.17	µeq L^{-1}
Cl^-	13.82	27.36	19.74	17.99	71.32	33.55	17.65	59.25	31.44	µeq L^{-1}
F^-	1.58	2.11	1.81	1.77	2.35	2.03	1.67	2.23	1.93	µeq L^{-1}
ANC	23.55	91.00	59.28	27.93	103.53	66.44	32.32	120.66	76.75	µeq L^{-1}
DIC	14.99	519.52	211.19	153.19	444.59	253.16	122.63	356.96	243.22	µmol L^{-1}-C
DOC	292.73	1208.63	682.69	341.85	1145.49	614.71	382.60	1410.85	692.47	µmol L^{-1}-C
SiO_2	20.97	89.37	53.48	22.63	85.55	49.22	19.93	91.45	53.80	µmol L^{-1}
Ca^{2+}	92.32	148.21	127.67	97.31	165.59	116.35	95.17	144.95	113.89	µeq L^{-1}
Mg^{2+}	30.45	48.55	38.54	28.80	48.17	34.17	27.50	47.09	35.29	µeq L^{-1}
Na^+	29.14	40.89	36.10	29.58	60.41	43.77	37.27	58.43	46.13	µeq L^{-1}
K^+	1.02	4.60	2.96	0.51	3.84	2.18	1.23	4.78	2.89	µeq L^{-1}
NH_4^+	-0.06	5.38	1.62	-0.61	3.27	0.74	-0.77	3.39	1.08	µeq L^{-1}
AL_TD	1.78	5.34	2.91	1.47	2.82	2.25	1.34	5.46	2.63	µmol L^{-1}
AL_TM	1.00	3.70	2.33	1.84	2.56	2.18	1.58	3.12	2.20	µmol L^{-1}
AL_OM	1.11	3.68	1.98	1.48	2.56	2.17	1.84	2.93	2.21	µmol L^{-1}
AL_IM	0.00	1.85	0.48	0.00	0.59	0.09	0.00	0.40	0.08	µmol L^{-1}
LABPH	5.38	6.21	5.85	5.37	6.28	5.79	5.21	6.37	5.85	
AIREQPH	5.79	7.07	6.44	6.42	7.15	6.69	5.88	7.14	6.61	
TRUECOLOR	25	100	63	30	160	80	35	180	76	Pt Co
SCONDUCT	18.82	25.01	22.65	17.71	27.73	21.69	18.72	27.98	22.04	µS cm^{-1}
TOTALP	na	na	na	3.49	7.50	5.65	2.53	9.50	5.57	µg L^1
CHLORA	na	na	na	na	na	na	0.58	6.41	2.60	µg L^1

Table 38.2 Lake Characteristics

Parameter	Value
Elevation	400 m
Maximum depth	2.7 m
Mean depth	1.6 m
Volume	22.9 x 10^4 m^3
Surface area	14.6 ha
Watershed area	136.4 ha
Watershed ratio	0.11
Hydraulic retention time (year)	0.22
Watershed	Upper Hudson
County, Town	Hamilton, Wells
USGS Quadrangle	Harrisburg
Land Use Classification	Wilcox Lake Wild Forest, Resource Mangement
Land use classification	Private Land - Resource Management and Wilcox Lake Wild Forest

A dip-net survey on the same date found the following Insecta: Odonata Gomphidae, Libellulidae and Coenagriidae; and Hemiptera Mesoveliidae. Also found were Crustacea Isopoda Unspecified and Amphipoda Unspecified; Gastropod Basommatophora Planorbidae; and Demospong Haplosclerina Spongillidae (ALSC 1989). The ALS found no evidence of a thermocline (i.e., it was isothermal) on August 13, 1987 (ALSC 1989). The AEAP reported an average value of chlorophyll a of 5.3 µg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: The earliest DEC records indicate smallmouth bass were stocked three times during 1947 with no records of stocking since then (ALSC 1989). In addition to the ALS fisheries survey on September 9, 1987, the ALSC netted the lake on May 21, 2001 and September 8, 2011 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 38.3 for recent netting history.

Intensive Studies: Diatoms were evaluated for use as environmental indicators for the EMAP-Surface Water project in 1991 (Dixit and Smol 1994). Willis Lake was sampled by EMAP in 1991, 1992, and 1995. The lake as been studied by the AEAP beginning in1994 (Momen et al. 2006). The Statewide Monitoring of Mercury Project surveyed the lake in 2003 (Simonin et al. 2008). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Figure 38.3 Chemistry Time Series

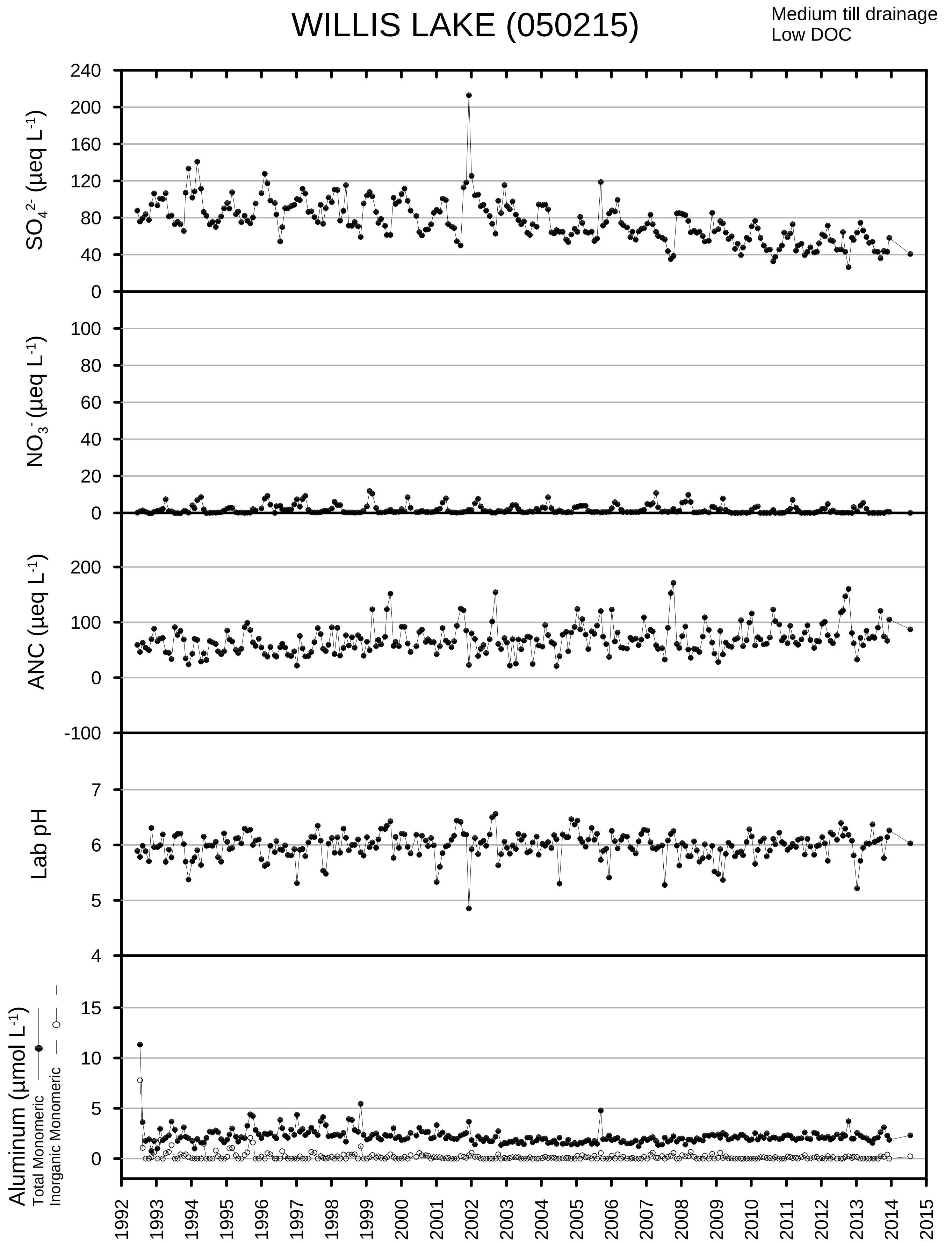


Table 38.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1987	Golden shiner	25	85	205	449	60
Sep-1987	Brown bullhead	3	301	355	1430	3
Sep-1987	Pumpkinseed	16	58	225	1112	16
Sep-1987	Largemouth bass	11	186	500	6070	11
Sep-1987	Yellow perch	18	105	342	3489	18
May-2001	Chain pickerel	7	170	460	2554	7
May-2001	Golden shiner	23	136	190	1052	68
May-2001	Brown bullhead	8	215	363	4385	8
May-2001	Pumpkinseed	20	120	230	3569	20
May-2001	Smallmouth bass	3	310	455	-	3
May-2001	Largemouth bass	1	390	390	1193	1
May-2001	Yellow perch	20	145	312	1722	20
Sep-2011	Chain pickerel	4	378	512	1857	4
Sep-2011	Golden shiner	17	96	175	274	21
Sep-2011	Brown bullhead	1	599	-	350	1
Sep-2011	Yellow perch	12	82	336	785	14

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY28 Piseco Lake (start date December 31, 2012; elevation 519 m) located 24 km west of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Willis Lake watershed lies primarily (64%) on biotite and/or hornblende granite gneiss with low to no ANC. The northern portion of the watershed (36%) lies on interlayered metasedimentary rock and granitic gneiss with medium to high ANC (Roy et al. 1997). Till overlies 85% of the watershed, while exposed bedrock makes up the remainder. Shallow to bedrock soils (<0.5 m) with bedrock outcrop predominate above 420 m elevations occurs in 58% of the watershed. The remaining portion on the western shore of the lake consists of basal till soils (APA 2001). The highest elevation in the watershed is Corrigan Hill at 571 m. The watershed has a maximum relief of 171 m. In 1987, the ALS described the shoal water substrate around the lake as 40% rubble, sand, gravel and 60% muck/silt/organic (ALSC 1989).

Land cover/use: In 1987, the watershed was characterized as: deciduous forest 15%; coniferous forest 15%; deciduous-coniferous mixed forest 20%; shrub/sapling 15%; wetland 20%; and developed land accounted for 15%. The immediate shoreline was characterized as: deciduous forest 50%; wetland 20%; deciduous-coniferous forest mix 10% and developed 20% (ALSC 1989). Wetland area totals 8.5 ha comprising 6.2% of the watershed. The predominant wetland types are scrub/shrub needle leaf evergreen and scrub/shrub broad-leaf evergreen (Primack et al. 2000, ALSC 2003). Wetlands exist along the northern and southern shorelines and dominate the entire shoreline of the outlet (ALSC 1989). Most of Willis Lake and its watershed occur within the Wilcox Lake Wild Forest (NYSDEC). Twenty percent of the shoreline, northwest of the outlet, is privately owned and classified as Resource Management land (APA 2001). There are approximately eight permanent homes within the area.

Watershed disturbance: The 1916 fire protection data shows 92% of the watershed as green timber with no slash and less than 1% as open grazing and farm land. A November 1950 storm damaged 100% of the watershed causing 25 to 50% blowdown (ALSC 2003). The watershed was not affected by the 1995 microburst or the January 1998 ice storms (ALSC 2003, NYSDEC 1998).

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Jockeybush Lake 050259
EPA ID: 1A2-066O

ALSC Staff Photo 2015

Lake: Jockeybush Lake lies in the Upper Hudson watershed at 599 m. This headwater lake has no perennial inlets (Figure 39.1). In 1987, an active beaver dam was present at the outlet (ALSC 1989). The outlet drains east into the West Branch of the Sacandaga River. Jockeybush Lake reaches a maximum depth of 11.3 m. (37.1 ft) (Figure 39.2).

Jockeybush Lake is classified as a thin-till drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. The lake is accessed by helicopter and continues to be sampled monthly.

Lake chemistry: Jockeybush Lake was sampled during the ALS on August 4, 1987 finding: Lab pH 5.34, ANC -1.1 µeq L^{-1}, SO_4^{2-} 113.47 µeq L^{-1}, NO_3^- 1.94 µeq L^{-1}, Ca^{2+} 63.38 µeq L^{-1}, Mg^{2+} 31.27 µeq L^{-1}, DOC 233.12 µmol L^{-1}-C (ALSC 1989). Table 39.1 summarizes recent ALTM water chemistry including total phosphorus (TP) and chlorophyll a (Chl a). Major analytes through 2013 are shown in Table 39.1. Plots through 2014 appear in Figure 39.3.

Aquatic biota: On September 2, 1987, the ALS found submergent vegetation covered 20% of the bottom and emergent vegetation covered 1% of the surface. ALS identified the following aquatic plants: Sphagnum spp.; Sparganium spp.; Nuphar spp.; Hypericum spp.; Utricularia spp.; Eriocaulon spp. and numerous Algae. A dip-net survey on the same date found the following Insecta: Odonata Coenagriidae and Aeshnidae; Coleoptera Dytiscidae and Hydrophilidae; Diptera Chironomidae;

Figure 39.1 Catchment

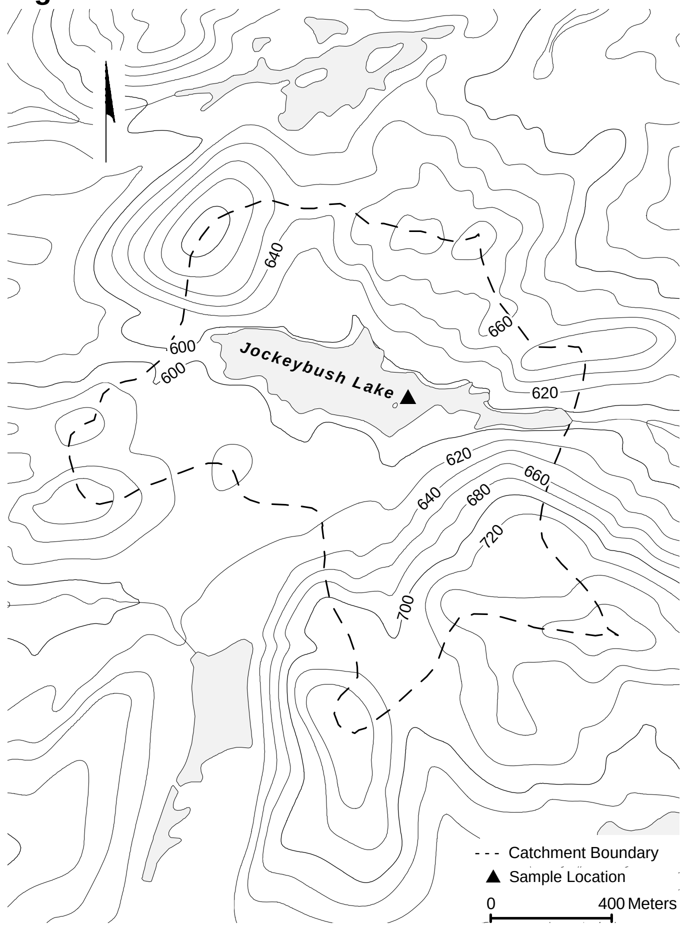
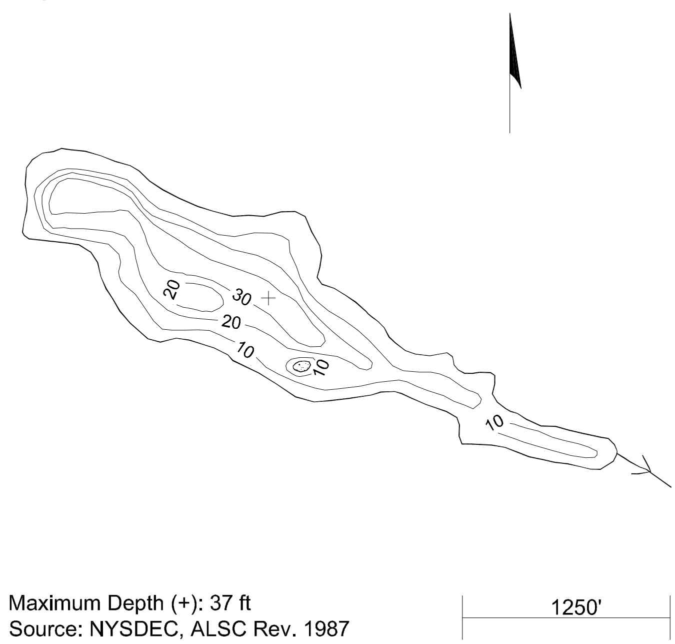


Figure 39.2 Bathymetry



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.30203	-74.58581	43° 18′ 07.3″ N	074° 35′ 08.9″ W
Helo sample site	43.30278	-74.59144	43° 18′ 10.0″ N	074° 35′ 29.2″ W
Lake centroid	43.30322	-74.59386	43° 18′ 11.6″ N	074° 35′ 37.9″ W

Table 39.1 Lake Chemistry

050259			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	95.15	142.20	112.15	66.31	89.59	73.31	52.98	64.81	58.38	μeq L^{-1}
NO_3^-	2.82	54.84	16.76	0.00	42.07	9.69	1.26	39.89	16.00	μeq L^{-1}
Cl^-	6.21	19.74	9.54	6.13	10.95	7.49	5.84	8.44	7.32	μeq L^{-1}
F^-	0.89	2.47	1.79	1.00	1.78	1.56	1.28	2.05	1.60	μeq L^{-1}
ANC	-10.86	-0.74	-5.02	-2.25	24.72	11.37	6.88	21.56	16.40	μeq L^{-1}
DIC	8.33	183.16	65.36	22.48	134.87	60.26	31.30	154.51	72.34	μmol L^{-1}-C
DOC	132.54	336.35	201.47	188.66	256.76	210.53	183.34	285.03	242.64	μmol L^{-1}-C
SiO_2	27.63	65.74	45.69	39.78	63.08	50.23	39.15	86.90	56.32	μmol L^{-1}
Ca^{2+}	61.38	96.81	71.61	48.41	66.87	55.66	44.55	64.58	55.03	μeq L^{-1}
Mg^{2+}	23.04	30.45	26.13	18.93	25.51	22.02	19.16	28.04	23.04	μeq L^{-1}
Na^+	15.22	30.88	18.52	15.94	23.49	17.54	18.34	24.67	21.21	μeq L^{-1}
K^+	3.58	7.93	4.69	2.30	3.84	3.01	2.33	4.48	3.33	μeq L^{-1}
NH_4^+	-0.06	5.71	2.19	-0.34	2.88	0.86	0.12	1.94	0.94	μeq L^{-1}
AL_TD	4.00	20.09	9.39	2.67	13.86	5.86	2.72	10.34	5.66	μmol L^{-1}
AL_TM	3.07	16.63	8.01	1.61	14.38	3.62	1.42	5.73	2.62	μmol L^{-1}
AL_OM	0.76	6.60	1.91	1.63	3.11	2.10	1.40	3.63	2.08	μmol L^{-1}
AL_IM	2.05	13.71	6.10	0.00	11.60	1.53	0.00	2.20	0.57	μmol L^{-1}
LABPH	4.65	5.27	4.96	4.84	5.91	5.45	5.29	6.23	5.72	
AIREQPH	4.76	5.32	5.01	4.86	6.00	5.52	5.59	6.41	6.03	
TRUECOLOR	5	20	11	10	20	17	5	25	13	Pt Co
SCONDUCT	17.06	30.49	21.34	12.84	23.66	14.98	11.75	17.99	14.19	μS cm^{-1}
TOTALP	na	na	na	0.77	17.51	4.46	2.25	4.67	3.35	μg L^1
CHLORA	na	na	na	0.23	0.90	0.55	0.13	2.38	0.91	μg L^1

Table 39.2 Lake Characteristics

Parameter	Value
Elevation	599 m
Maximum depth	11.3 m
Mean depth	4.5 m
Volume	78.6 x 10^4 m^3
Surface area	17.3 ha
Watershed area	160.0 ha
Watershed ratio	0.11
Hydraulic retention times (year)	0.55
Watershed	Upper Hudson
County, Town	Hamilton, Arietta
USGS Quadrangle	Piseco Lake
Land use classification	Ferris Lake Wild Forest

Hemiptera Notonectidae and Gerridae. Also found were Crustacea Amphipoda Unspecified and Demospong Haplosclerina Spongillidae (ALSC 1989). The ALS found evidence of a thermocline between 6.0 and 8.0 m on August 4, 1987 (ALSC 1989). The AEAP reported the average value of chlorophyll a as 0.8 μg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: The DEC has stocked this lake annually with brook trout since 1952 (ALSC 1989). In addition to the ALS fisheries survey on September 2, 1987, the ALSC netted the lake on July 17, 1996 and October 8, 2009 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 39.3 and 39.4 for recent fish stocking and netting histories.

Figure 39.3 Chemistry Time Series

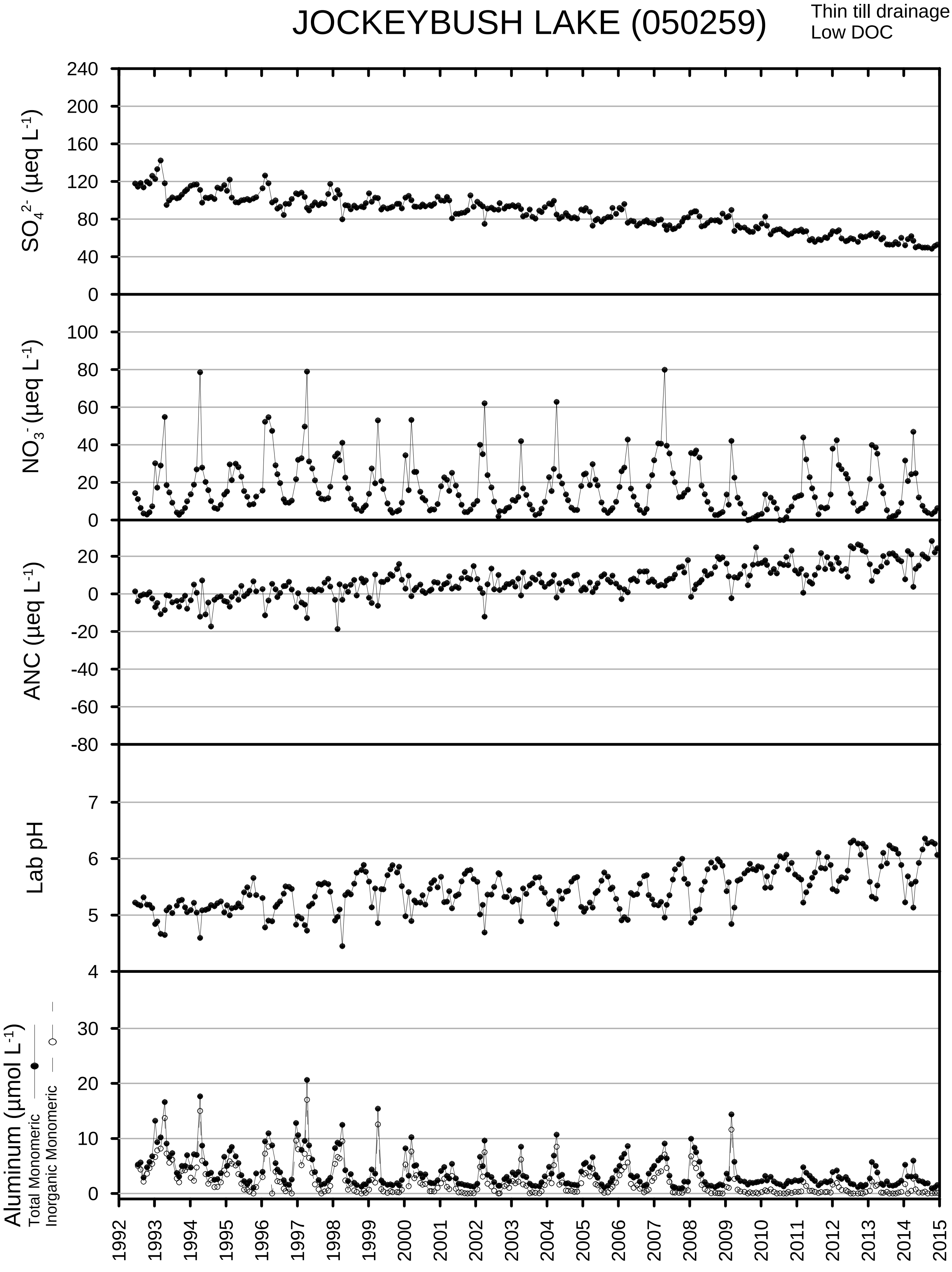


Table 39.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	1680	19
1981	Brook trout	1260	36
1982	Brook trout	1400	8
1983	Brook trout	1400	10
1984	Brook trout	1036	10
1985	Brook trout	1540	16
1986	Brook trout	1400	13
1987	Brook trout	1400	10
1988	Brook trout	1400	12
1989	Brook trout	1540	10
1990	Brook trout	1530	17
1991	Brook trout	1400	16
1992	Brook trout	1400	13
1993	Brook trout	1400	20
1994	Brook trout	1100	14
1995	Brook trout	1300	27
1996	Brook trout	1400	28
1997	Brook trout	1470	22
1998	Brook trout	1470	19
1999	Brook trout	1400	18
2000	Brook trout	1400	18
2001	Brook trout	1250	21
2002	Brook trout	1400	22
2003	Brook trout	1400	22
2004	Brook trout	1400	29
2005	Brook trout	1400	29
2006	Brook trout	1540	25
2007	Brook trout	1400	24
2008	Brook trout	1400	28
2009	Brook trout	1400	25
2010	Brook trout	450	4
2011	Brook trout	750	9
2012	Brook trout	400	5
2013	Brook trout	500	5
2014	Brook trout	1400	13

Table 39.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1987	Brook trout	40	86	389	11978	40
Jul-1996	Brook trout	19	212	423	-	19
Oct-2009	Brook trout	36	95	325	7976	36

Intensive studies: Jockeybush Lake has been studied by the AEAP beginning in 1994 (Momen et al. 2006). It was one of 36 ALTM lakes evaluated by Momen and Zehr (1998) during 1994 examining lake-water chemistry and terrestrial characteristics with the existing watershed classifications. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. In 2003, this lake watershed was part of a 36 lake-watershed regional survey of foliar nitrogen gradients in the Adirondack Park (McNeil et al. 2007).

Soils: A soil plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY28 Piseco Lake (start date December 31, 2012; elevation 519 m) located 17 km north of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Jockeybush Lake lies on charnockite, granitic, and quartz syenite gneiss bedrock with low to no ANC (Roy et al. 1997). The southern half of the watershed is dominated by biotite-quartz-plagioclase paragneiss, commonly with leucocratic bedrock. Till comprises 71% of the watershed, while the remainder is exposed bedrock (ALSC 2003). Shallow soils and rock outcrops predominate in areas between 640 and 700 m in elevation. Basal till soils are located around most of the lake shoreline and throughout the remainder of the watershed except near the outlet and in the higher elevations above 640 m where rock outcrop predominates (APA 2001). To the southeast, the watershed rises to a maximum of 773 m. The maximum relief is 174 m. In 1987, the shoal water substrate is 75% sand and gravel, 5% boulder and 20% organic (ALSC 1989).

Land cover/use: In 1987, deciduous forest covered 75% of the watershed, while the remaining 20% was deciduous-coniferous mixed forest and 5% shrub/sapling. The immediate shoreline consists of 55% deciduous-coniferous mixed forest, 40% coniferous forest, 3% wetland and 2% boulder/rock ledge (ALSC 1989). Total wetland area was 4.9 ha and comprised 3.1% of the watershed (Primack et al. 2000, ALSC 2003). The watershed lies entirely in the Ferris Lake Wild Forest. There is a foot trail along the outlet stream that leads to the lake and a primitive campsite near the shore (NYSDEC 2006).

Watershed disturbance: The 1916 fire protection map shows 88.8% of the watershed as virgin and second growth green timber with no slash. The watershed was not disturbed by the 1950, 1995, or 1998 storms (ALSC 2003, NYSDEC 1998).

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Sullivan, T. J., Fernandez, I. J., Herlihy, A. T., Driscoll, C. T., McDonnell, T. C., Nowicki, N. A., Snyder, K. U., and Sutherland, J. W. 2006b. Acid-base characteristics of soils in the Adirondack Mountains, New York. Soil Science Society of America Journal 70: 141-152.

Clear Pond 050458
EPA ID: 1A2-077O

ALSC Staff Photo 2015

Lake: Clear Pond lies in the Upper Hudson River watershed at 584 m (Figure 40.1). There is one primary inlet in the northeast. The outlet flows west to join the outlet of Elk Lake approximately 650 m downstream. This headwater lake (ALSC 2003) reaches a maximum depth of 24.4 m (80.1 ft) (Figure 40.2).

Clear Pond is classified as a thick-till drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). It is considered insensitive to acidification. This is one of the original ALS waters and was monitored on a monthly basis from June 1982 through 2013. Sampling frequency at this pond was modified to seasonal in 2014.

Lake chemistry: Clear Pond was sampled near its deepest point during the ALS on August 4, 1987 finding: Lab pH 6.48, ANC 110.5 µeq L^{-1}, SO_4^{2-} 112.43 µeq L^{-1}, NO_3^- 1.62 µeq L^{-1}, Ca^{2+} 157.19 µeq L^{-1}, Mg^{2+} 31.27 µeq L^{-1}, DOC 249.77 µmol L^{-1}-C (ALSC 1989). Table 40.1 summarizes recent ALTM water chemistry taken at the outlet. Major analytes through 2013 are shown in Table 40.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 40.3.

Aquatic biota: On October 20, 1987, the ALS identified the following aquatic plants: Eriocaulon spp. and numerous Algae. A dip-net survey on that date found the following Insecta: Odonata Libellulidae, Aeshnidae and Gomphidae; Ephemeroptera Heptageniidae, Ephemerellidae

Figure 40.1 Catchment

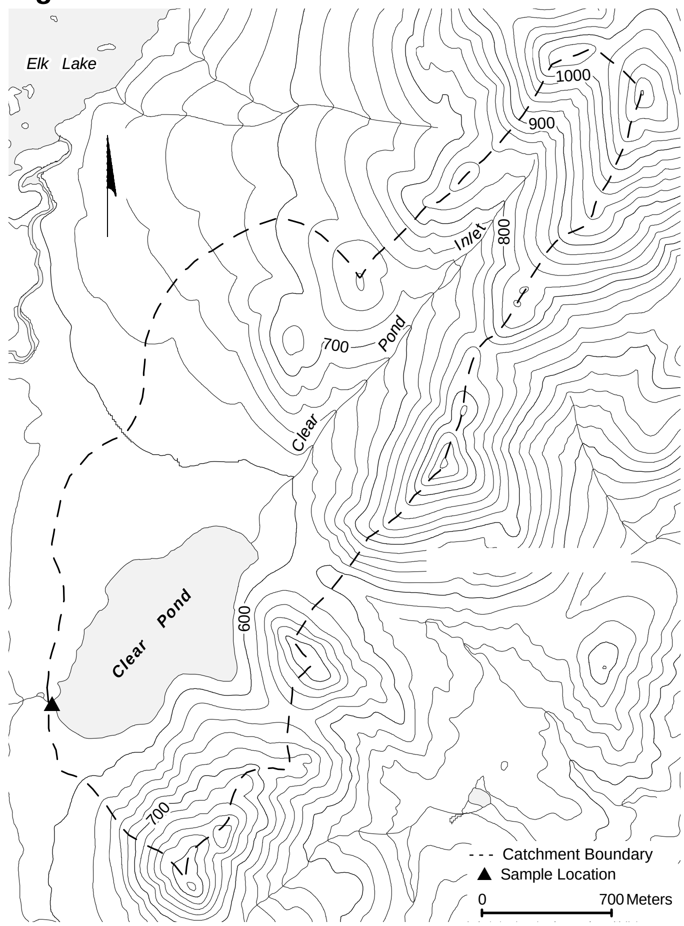

Figure 40.2 Bathymetry

Maximum Depth (+): 80 ft
Source: Cornell Univ. 1961, ALSC Rec'd c.1984

Geographic coordinates (NAD 83)

	Latitude Φ DD.ddd	Longitude λ DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.99568	-73.83082	43° 59' 44.4" N	073° 49' 51.0" W
Lake centroid	43.99877	-73.82381	43° 59' 55.6" N	073° 49' 25.7" W

Table 40.1 Lake Chemistry

050458			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	94.73	127.83	107.67	62.86	91.25	72.33	50.52	75.21	59.05	μeq L^{-1}
NO_3^-	-0.16	16.95	3.80	0.00	12.79	3.66	0.00	11.10	4.51	μeq L^{-1}
Cl^-	7.05	10.15	8.06	5.55	8.82	6.62	5.00	8.49	6.50	μeq L^{-1}
F^-	0.32	0.74	0.44	0.58	0.78	0.67	0.00	1.02	0.61	μeq L^{-1}
ANC	72.87	124.86	108.63	74.78	113.80	102.91	101.79	133.67	116.16	μeq L^{-1}
DIC	104.90	203.98	154.16	96.58	170.67	128.87	104.49	189.24	144.79	μmol L^{-1} -C
DOC	231.37	331.44	263.16	247.44	359.88	300.66	261.75	344.44	310.28	μmol L^{-1} -C
SiO_2	82.72	123.66	96.28	86.71	113.51	99.66	86.15	117.28	99.34	μmol L^{-1}
Ca^{2+}	88.83	206.10	166.93	111.28	151.21	135.21	118.41	154.77	132.79	μeq L^{-1}
Mg^{2+}	28.80	38.68	32.09	19.75	31.27	26.37	22.03	29.95	25.46	μeq L^{-1}
Na^+	33.49	48.28	38.60	28.71	46.11	36.90	36.58	46.25	39.27	μeq L^{-1}
K^+	1.79	3.33	2.34	1.02	2.30	1.71	1.38	2.43	1.90	μeq L^{-1}
NH_4^+	-0.06	3.77	0.97	-0.74	1.66	0.30	-0.68	1.63	0.41	μeq L^{-1}
AL_TD	0.74	3.37	1.63	1.99	3.11	2.64	1.63	3.36	2.48	μmol L^{-1}
AL_TM	0.59	4.00	1.18	1.45	2.08	1.81	1.25	1.76	1.54	μmol L^{-1}
AL_OM	-0.04	2.93	0.96	1.52	2.22	1.77	1.32	1.78	1.55	μmol L^{-1}
AL_IM	0.00	1.07	0.40	0.00	0.22	0.07	0.00	0.12	0.03	μmol L^{-1}
LABPH	6.48	7.18	6.84	6.36	7.20	6.75	6.60	7.37	6.90	
AIREQPH	6.82	7.29	7.12	7.02	7.35	7.13	7.16	7.30	7.23	
TRUECOLOR	5	20	13	20	25	23	15	20	18	Pt Co
SCONDUCT	24.61	29.77	26.47	18.76	26.69	22.17	19.44	26.67	22.24	μS cm^{-1}
TOTALP	na	na	na	1.33	5.32	3.03	2.61	15.01	5.39	μg L^1
CHLORA	na	na	na	0.40	2.88	1.44	0.52	3.65	2.08	μg L^1

Table 40.2 Lake Characteristics

Parameter	Value
Elevation	584 m
Maximum depth	24.4 m
Mean depth	9.2 m
Volume	651.1 x 10^4 m^3
Surface area	70.4 ha
Watershed area	565.0 ha
Watershed ratio	0.12
Hydraulic retention time (year)	1.80
Watershed	Upper Hudson
County, Town	Essex, North Hudson
USGS Quadrangle	Schroon Lake
Land use classification	Private land - Resource Management

and Unspecified; and Hemiptera Notonectidae. Also found were Crustacea: Amphipoda Unspecified and Decapoda Astacidae; and Demospong Haplosclerina Spongillidae. The ALS found the lake thermally stratified between 6.0 and 8.0 m on August 4, 1987 (ALSC 1989).

Fisheries: Clear Pond was intermittently stocked with Atlantic salmon from 1945 to 1954. There are no records of lake stocking since that time (ALSC 1989). In addition to the ALS fisheries survey on October 20, 1987, the ALSC netted the lake on April 24, 1995 and October 25, 2009 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 40.3 for recent netting history.

Intensive studies: The DOH conducted a limnological survey of Clear Pond in August 1975 (Wood 1978). Clear Pond was studied under RILWAS in 1985 (Driscoll and Newton 1985). Diatom stratigraphies were developed from sediment cores in the late 1980s (Charles et al. 1990). Diatoms were evaluated for use as environmental indicators for the EMAP-Surface Water project in 1991 (Dixit and Smol 1994). Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Landscape characteristics and disturbance history have been evaluated within this watershed (Sullivan et al. 1999). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed. Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995).

Figure 40.3 Chemistry Time Series

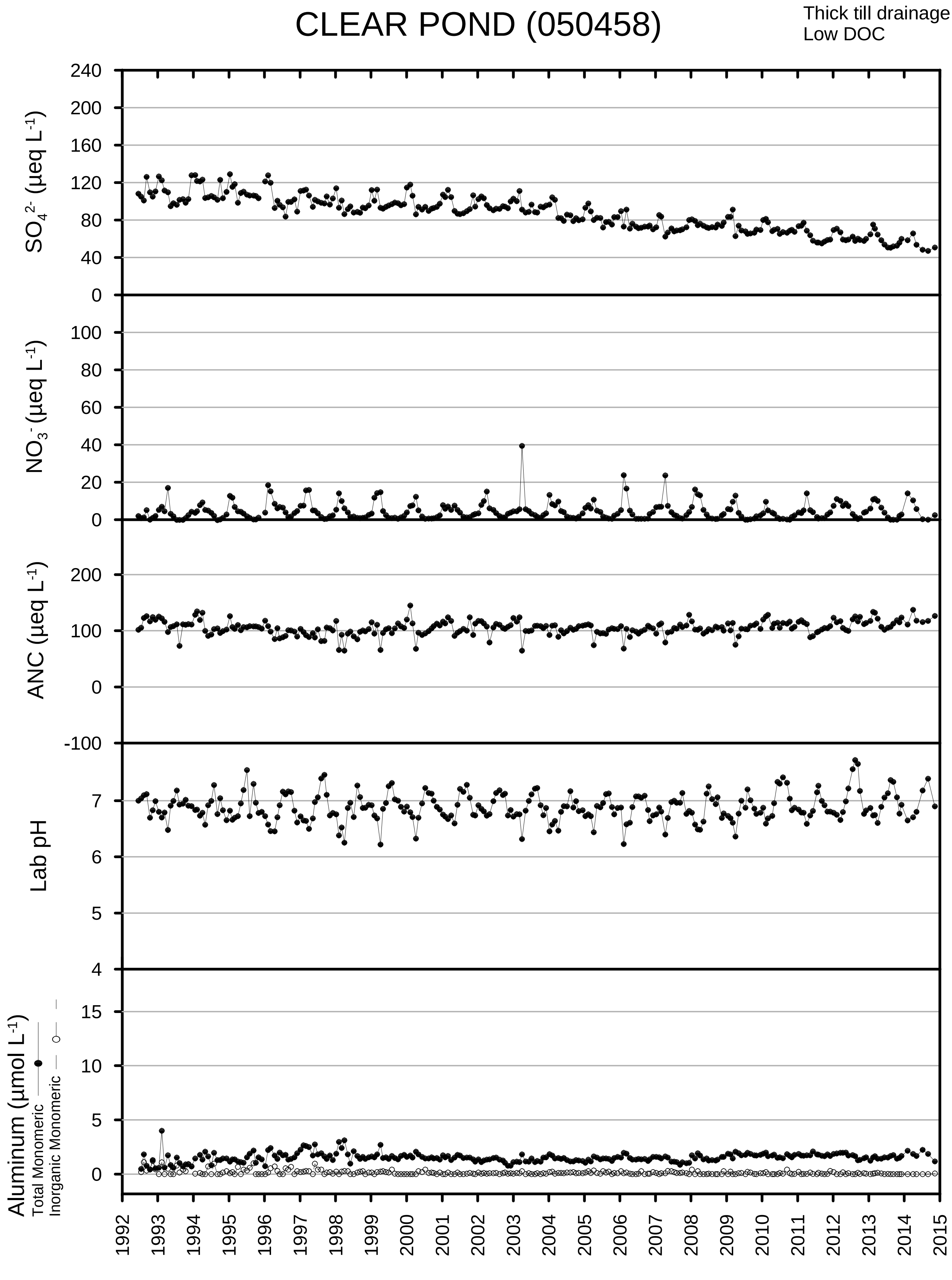

Table 40.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Oct-1987	Brook trout	1	149	149	11	1
Oct-1987	Cutlips minnow	25	60	118	117	37
Oct-1987	Common shiner	6	57	112	30	6
Oct-1987	Bluntnose minnow	21	55	76	60	21
Oct-1987	Longnose dace	3	58	69	9	3
Oct-1987	Creek chub	1	104	104	10	1
Oct-1987	White sucker	3	65	94	15	3
Oct-1987	Brown bullhead	4	62	172	69	4
Oct-1987	Banded killifish	26	61	82	94	110
Oct-1987	Pumpkinseed	26	33	92	78	32
Apr-1995	Rainbow smelt	1	131	131	10	1
Apr-1995	Cutlips minnow	2	80	85	13	2
Apr-1995	Common shiner	9	65	86	29	9
Apr-1995	Bluntnose minnow	24	45	72	39	24
Apr-1995	Creek chub	1	90	90	8	1
Apr-1995	Banded killifish	45	35	85	95	645
Apr-1995	Pumpkinseed	2	35	59	3	2
Oct-2009	Atlantic salmon	1	562	-	2000	1
Oct-2009	Brook trout	2	146	184	74	2
Oct-2009	Lake trout	8	449	560	9073	8
Oct-2009	Cutlips minnow	24	55	122	173	24
Oct-2009	Common shiner	25	73	109	154	223
Oct-2009	Creek chub	28	52	72	69	31
Oct-2009	Banded killifish	25	56	82	68	146
Oct-2009	Pumpkinseed	25	47	114	136	49

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY20 Huntington Wildlife (start date October 31, 1978; elevation 500 m) located 32 km west of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Clear Pond watershed is underlain by anorthosite bedrock overlain by thin to moderate depths of till (Charles et al.1990). Till comprises 89.9% of the watershed and 10.1% is exposed bedrock (ALSC 2003). Shallow (<0.5 m) soils and rock outcrops are found in the steep-sloped areas above 650 m throughout the watershed. A small area, below 600 m, along the north shore of the lake consists of hydric soils. Abalation till dominates the watershed in areas between 600 and 680 m, and is the primary soil type on the western and southern shore of the lake (APA 2001). The watershed is situated between the eastern watershed divide of Elk Lake and Sunrise Mountain. The watershed rises to a maximum elevation of 1103 m at Sunrise Mountain. The maximum relief is 519 m. In 1987, the ALS found the shoal water substrate comprised of 80% sand/gravel, 15% boulder/rubble and 5% organic (ALSC 1989).

Land cover/use: In 1987 the watershed was: 80% deciduous forest; 15% deciduous-conifer mixed forest; and 5% coniferous forest. The immediate shore line was 85% deciduous-conifer mixed forest, 5% coniferous forest, 5% deciduous and 5% shrub/sapling mix (ALSC 1989). Total wetland area was 15.3 ha and comprised 2.7% of the watershed. The predominant wetland type is forested needle-leaf evergreen with a total area of 13.6 ha (Primack et al. 2000, ALSC 2003).

Clear Pond and most of its watershed are located on private land classified as Resource Management. The remainder of the eastern watershed is in the Dix Mountain Wilderness. A paved road crosses the outlet, and a foot path intersects the southern portion of the watershed.

Watershed disturbance: The 1916 fire protection source show heavy disturbance where 41.9% of the area was logged for softwoods; 27.7% was identified as waste or denuded lands; 16.6% was burned over and 4.8% was considered grazed or farm land. The watershed did not show any disturbance from the November 1950 blowdown and July 1995 microburst storms (ALSC 2003). Logging began in the late 1800s into the early 1900s and has continued over the past 50 years (Charles et al. 1990). The watershed experienced light ice damage from the January 1998 ice storm (NYSDEC 1998).

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Nate Pond 050577

EPA ID: 1A3-001O

ALSC Staff Photo 2015

Lake: Nate Pond lies in the Upper Hudson watershed at 613 m. The 8.3 ha headwater lake has three inlets (Figure 41.1) and a free flowing outlet (ALSC 1989). The outlet flows southwest to Mink Pond, which drains into the Hudson River. Nate Pond reaches a maximum depth of 6.4 m (21.0 ft) (Figure 41.2).

Nate Pond is classified as a medium-till drainage lake, with high dissolved organic carbon (>500 µg L^{-1}-C). The lake is considered moderately sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014. This lake is accessed by helicopter.

Lake chemistry: The ELS surveyed the pond on October 15, 1984 finding: Field pH 6.84, ANC 85.0 µeq L^{-1}, SO_4^{2-} 135.0 µeq L^{-1}, NO_3^- 0.6 µeq L^{-1}, Ca 139.6 µeq L^{-1}, Mg 57.3 µeq L^{-1}, DOC 4.32 µg L^{-1}-C (Kanciruk et al. 1986). The ALS survey on August 7, 1987 found: Lab pH 6.7, ANC 78.2 µeq L^{-1}, SO_4^{2-} 119.51 µeq L^{-1}, NO_3 LTD, Ca^{2+} 125.76 µeq L^{-1}, Mg^{2+} 54.31 µeq L^{-1}, DOC 516.19 µmol L^{-1}-C (ALSC 1989). Table 41.1 summarizes recent ALTM water chemistry. Major analytes through 2013 are shown in Table 41.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 41.3.

Aquatic biota: On October 28, 1987, the ALS found submergent vegetation covered 20% of the pond bottom, while emergent and floating vegetation each covered 1% of the lake surface. The following species of aquatic plants were identified: Sphagnum spp.; Sparganium spp.;

Figure 41.1 Catchment

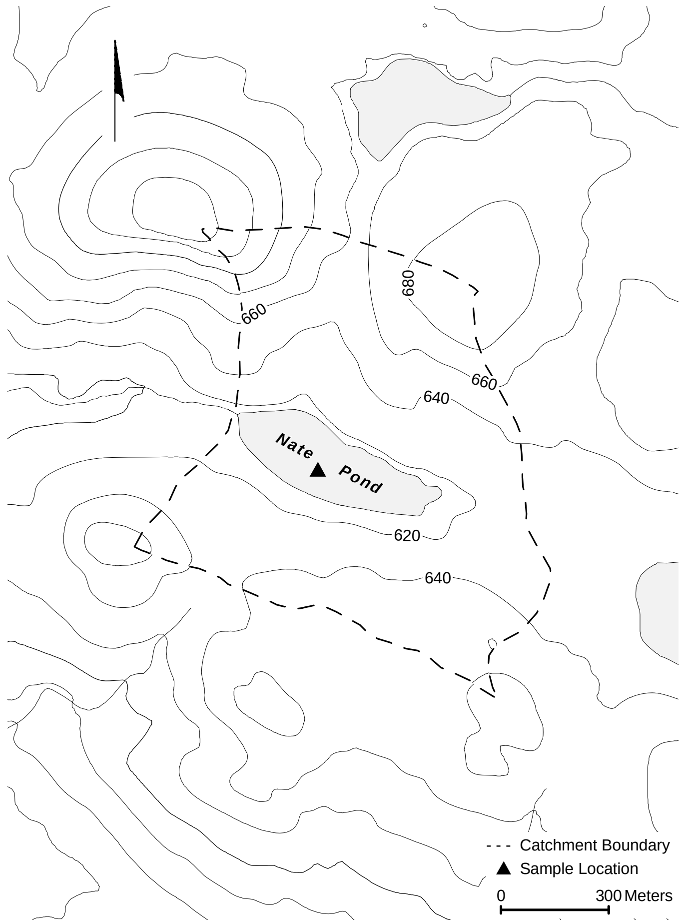
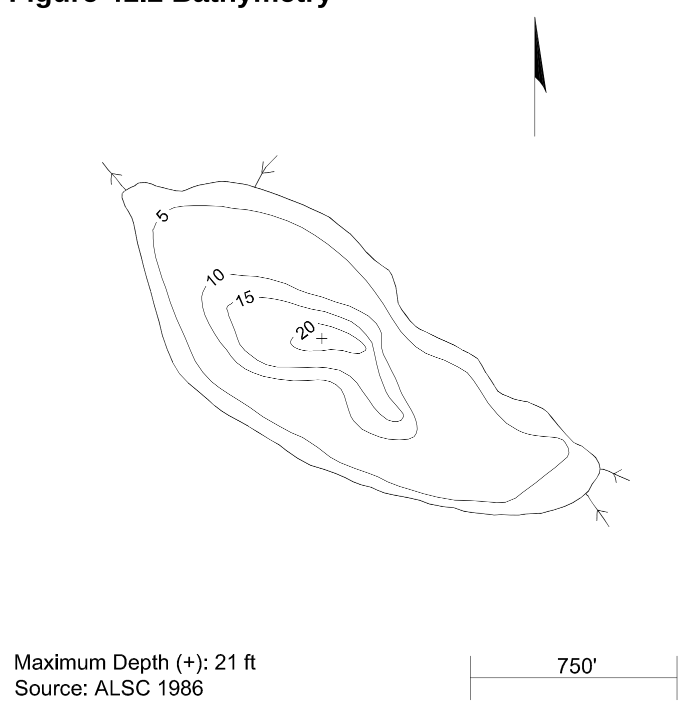


Figure 41.2 Bathymetry



Geographic coordinates (NAD 83)

	Latitude Φ DD.ddd	Longitude λ DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.85890	-74.09377	43° 51′ 32.0″ N	074° 05′ 37.6′′ W
Helo sample site	43.85740	-74.09034	43° 51′ 26.7″ N	074° 05′ 25.2″ W
Lake centroid	43.85740	-74.09034	43° 51′ 26.7″ N	074° 05′ 25.2″ W

Table 41.1 Lake Chemistry

050577			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	94.11	147.20	122.46	73.80	112.16	84.54	54.62	80.63	66.11	µeq L^{-1}
NO_3^-	-0.13	31.47	10.54	0.00	13.23	3.56	0.00	15.78	5.64	µeq L^{-1}
Cl^-	6.49	13.26	8.65	4.95	9.32	6.39	5.39	8.47	6.73	µeq L^{-1}
F^-	3.16	5.26	3.93	3.15	4.26	3.66	2.93	3.91	3.39	µeq L^{-1}
ANC	7.45	88.28	65.54	25.40	104.09	71.85	61.49	106.94	86.14	µeq L^{-1}
DIC	18.32	201.48	107.26	74.93	263.92	120.52	64.86	279.04	132.68	µmol L^{-1}-C
DOC	283.07	451.75	357.65	412.93	490.96	441.66		651.91	514.50	µmol L^{-1}-C
SiO_2	28.13	125.16	71.66	47.43	123.49	81.69	42.06	116.63	68.12	µmol L^{-1}
Ca^{2+}	82.84	171.67	138.23	77.85	127.75	108.57	89.42	126.55	106.77	µeq L^{-1}
Mg^{2+}	24.69	65.83	51.16	31.27	54.31	44.02	35.52	54.76	44.43	µeq L^{-1}
Na^+	17.40	43.06	32.99	22.18	40.89	31.45	28.64	41.31	34.34	µeq L^{-1}
K^+	6.14	11.77	8.82	5.12	9.21	6.34	5.55	8.42	7.02	µeq L^{-1}
NH_4^+	-0.94	3.71	1.00	-1.12	4.60	0.56	-0.16	6.11	1.35	µeq L^{-1}
AL_TD	1.04	8.01	3.48	1.72	7.23	3.87	2.64	5.55	3.55	µmol L^{-1}
AL_TM	0.34	5.74	1.89	1.76	3.74	2.39	1.67	2.77	2.10	µmol L^{-1}
AL_OM	-0.00	2.93	1.24	1.67	3.15	2.19	1.80	2.97	2.10	µmol L^{-1}
AL_IM	0.06	2.82	0.64	0.00	1.33	0.24	0.00	0.32	0.06	µmol L^{-1}
LABPH	5.33	6.78	6.16	5.53	6.78	6.21	6.14	6.86	6.51	
AIREQPH	5.42	7.08	6.36	6.00	7.09	6.69	6.72	7.20	6.99	
TRUECOLOR	20	35	24	30	55	41	35	70	44	Pt Co
SCONDUCT	20.02	29.85	25.49	17.17	27.30	21.45	17.39	25.63	21.44	µS cm^{-1}
TOTALP	na	na	na	2.33	7.51	4.35	3.11	11.42	5.83	µg L^{1}
CHLORA	na	na	na	0.53	5.53	2.73	0.59	22.81	7.65	µg L^{1}

Table 41.2 Lake Characteristics

Parameter	Value
Elevation	613 m
Maximum depth	6.4 m
Mean depth	2.3 m
Volume	19.4 x 10^4 m^3
Surface area	8.3 ha
Watershed area	89.2 ha
Watershed ratio	0.09
Hydraulic retention time (year)	0.29
Watershed	Upper Hudson
County, Town	Essex, Minerva
USGS Quadrangle	Dutton Mtn.
Land use classification	Vanderwhacker Mountain Wild Forest

Carex spp.; Dulichium spp.; Juncus spp.; Hypericum spp.; Fontinalis spp.; Equisetum spp.; Potamogeton spp.; Eriocaulon spp.; Iris spp.; Myrica spp.; and Nymphaea spp. Also identified was Poaceae and numerous Algae. A dip-net survey on that date found the following Insecta: Ephemeroptera Leptophlebiidae, Coenagriidae, Ephemerellidae, and Aeshnidae; Trichoptera Limnephilidae; Diptera Chironomidae; and Hemiptera Corixidae. Also found were Gastropoda Basommatophora Lymnaeidae, Hirudinea Unspecified and Demospong Haplosclerina Spongillidae. A thermocline was found between 3.0 and 4.0 m on August 7, 1987 (ALSC 1989).

Fisheries: The pond has no history of stocking, liming, or reclamation. In addition to the ALS fisheries survey on October 28, 1987, the ALSC netted the lake on October 18, 2005 and September 26, 2012 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 41.3 for recent netting history.

Intensive studies: Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Nate Pond was one of five ALTM lakes in a probability sample of 37 Adirondack lakes where sediment diatom and chrysophyte assemblages were used to infer present day (1979–1980) and

Figure 41.3 Chemistry Time Series

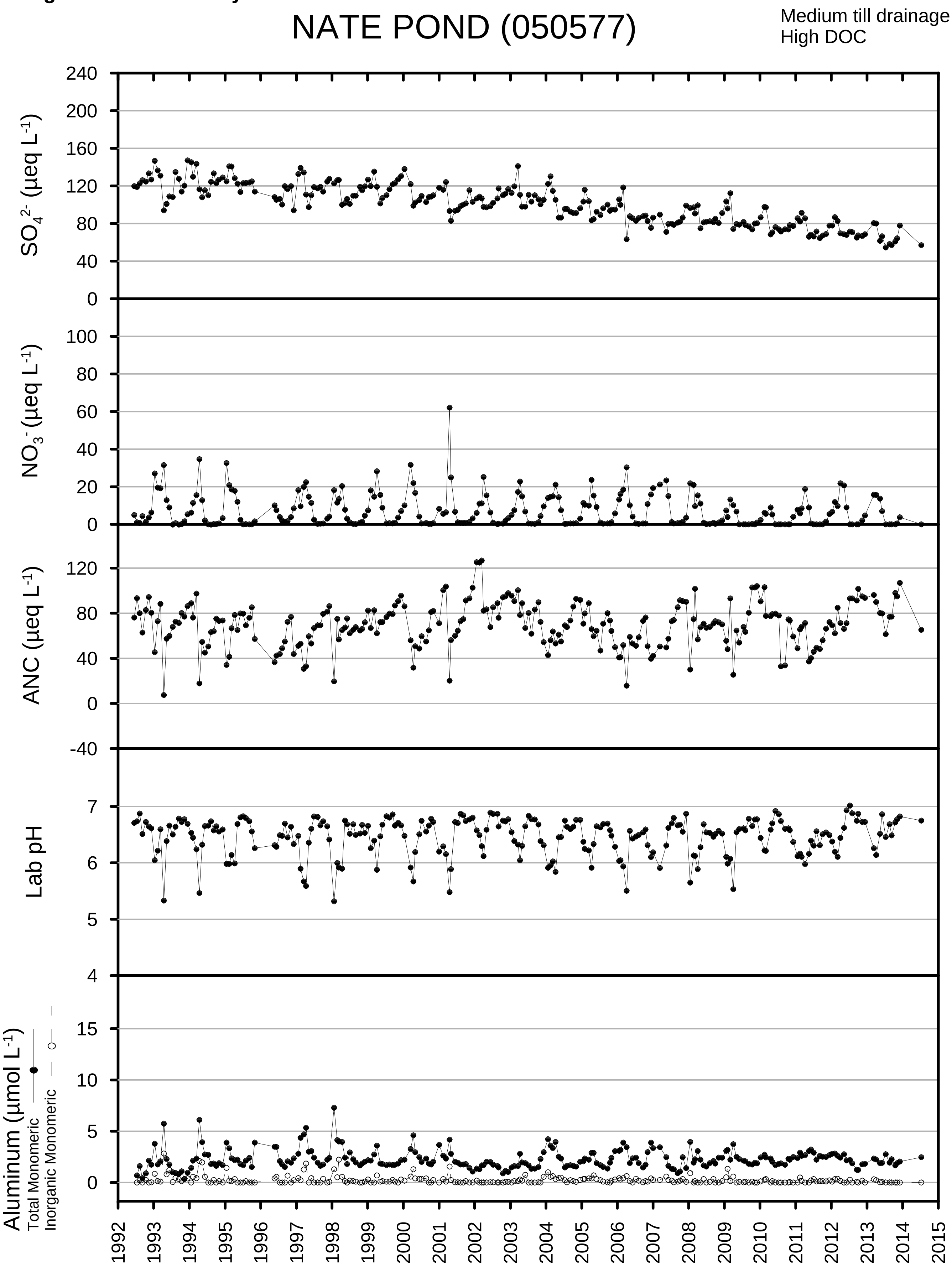


Table 41.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Oct-1987	Brook trout	26	105	447	7219	26
Oct-1987	Golden shiner	21	87	115	168	21
Oct-1987	Creek chub	2	178	180	100	2
Oct-1987	Redbreast sunfish	3	117	130	75	3
Oct-2005	Brook trout	2	162	285	282	2
Oct-2005	Golden shiner	25	66	118	188	156
Oct-2005	Creek chub	25	55	137	269	102
Oct-2005	Redbreast sunfish	25	71	155	517	126
Sep-2012	Brook trout	8	206	330	1504	8
Sep-2012	Golden shiner	25	60	125	128	891
Sep-2012	Creek chub	25	55	157	294	113
Sep-2012	Redbreast sunfish	25	52	156	569	236

pre-industrial lake chemistry (Cumming et al. 1992). Bukaveckas and Robbins-Forbes (2000) characterized the attenuation of photosynthetic radiation in relation to lake chemistry in this lake as part of a regional survey. Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. McNeil and others (2007) conducted a regional survey of foliar nitrogen in July and August 2003 that included study plots in this watershed.

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY20 Huntington Wildlife (start date October 31, 1978; elevation 500 m) located 16 km northwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Nate Pond and most of its watershed lie on charnockite, mangerite, pyroxene-quartz syenite gneiss with low to no ANC (Roy et al. 1997). The southern area of the watershed is underlain by undivided metasedimentary rock and related migmatite. The entire watershed is overlain by till (APA 2001). The highest elevation in the watershed is 750 m. The maximum relief is 137 m. In 1987, the ALS found the shoal water substrate comprised of 45% sand and gravel, 20% boulder and rubble, and 35% muck/silt/organic (ALSC 1989).

Land cover/use: In 1987 the watershed was described as: 40% deciduous-coniferous mixed forest; 30% coniferous forest; 20% deciduous forest; and 10% shrub-sapling vegetation. The immediate shoreline was a mix of 75% deciduous forest, 10% shrub-sapling vegetation, 5% deciduous-coniferous mixed forest, and 5% wetland (ALSC 1989). Total wetland area for the watershed is 4.5 ha and comprises 5% of the watershed. The predominant wetland cover type is forested needle-leaf evergreen (Primack et al. 2000). The pond lies in the Vanderwhacker Mountain Wild Forest (NYSDEC 2005). North of the lake, a section of the watershed is privately owned by the Moose Pond Club and is classified as Resource Management.

Watershed disturbance: The 1916 fire protection source data reveal 91.3% of the watershed as virgin and second growth timber with no slash and 0.6% of the watershed as logged for softwoods with considerable amounts of slash. The watershed was not impacted by the November 1950 blowdown, the July 1995 microburst or the January 1998 ice storms (ALSC 2003, NYSDEC 1998).

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Roy, K. M., Allen, E. B., Barge, J. W., Ross, J. A., Curran, R. P., Bogucki, D. J., Franzi, D. A., Kretser, W. A., Frank, M. M., Spada, D. M., and Banta, J. S. 1997. Influences on Wetlands and Lakes in the Adirondack Park of New York State: A Catalog of Existing and New GIS Data Layers for the 400,000-Hectare Oswegatchie/Black River Watershed. No. Adirondack Park Agency Final Report to U.S. Environmental Protection Agency, Ray Brook, NY.

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Long Pond 050649

EPA ID: 050649O

ALSC Staff Photo 2015

Lake: Long Pond lies in the Upper Hudson watershed at 574 m. This 17 ha headwater lake has no inlets with an outlet that seeps through a bog (Figure 42.1). This lake reaches a maximum depth of 4.0 m (13.1 ft) (Figure 42.2).

Long Pond is classified as a thin-till drainage lake, with high dissolved organic carbon (>500 µeq L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014.

Lake chemistry: Long Pond was sampled during the ALS survey on August 11, 1987 finding: Lab pH 4.51, ANC -23.6 µeq L^{-1}, SO_4^{2-} 77.24 µeq L^{-1}, NO_3 LTD, Ca^{2+} 39.42 µeq L^{-1}, Mg^{2+} 27.16 µeq L^{-1}, DOC 1057.35 µmol L^{-1}-C (ALSC 1989). Table 42.1 summarizes recent ALTM water sample chemistry. Major analytes through 2013 are shown in Table 42.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 42.3 including intermittent spring melt data in red.

Aquatic biota: On September 8, 1987, the ALS found submergent vegetation covering 10% of the lake bottom, while emergent vegetation occupied 2% of the surface and floating vegetation 3% of the surface. ALS identified the following aquatic plants: Sphagnum spp.; Carex spp.; Nuphar spp.; Hypericum spp.; Utricularia spp. and numerous Algae. The dip-net survey on that date found tthe following Insecta: Odonata

Figure 42.1 Catchment

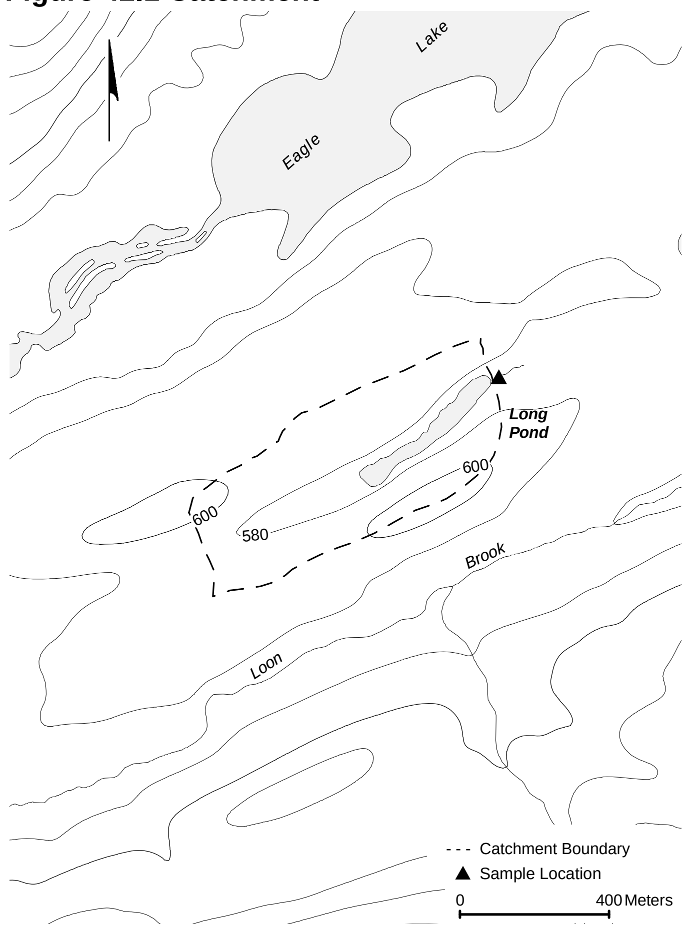
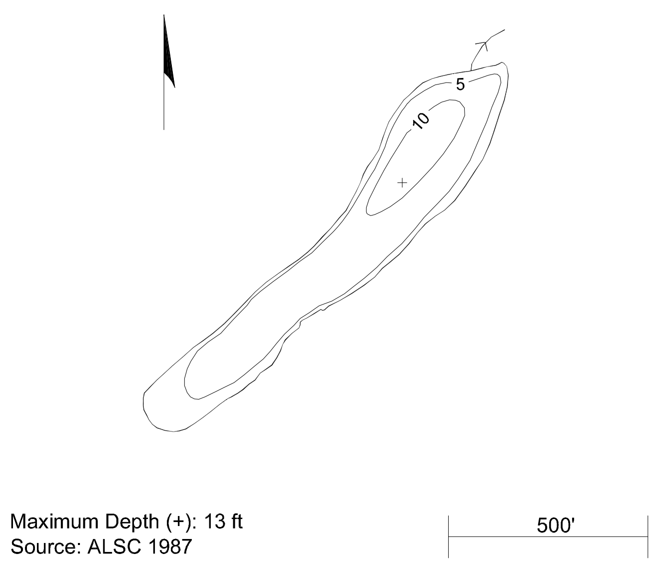


Figure 42.2 Bathymetry



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.83789	-74.47903	43° 50' 16.4" N	074° 28' 44.5" W
Lake centroid	43.83696	-74.48048	43° 50' 13.1" N	074° 28' 49.7" W

Table 42.1 Lake Chemistry

050649			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	92.86	130.54	106.81	34.03	58.20	43.69	26.46	46.30	34.98	µeq L^{-1}
NO_3^-	-0.27	8.82	2.65	0.00	3.34	1.13	0.00	3.66	1.41	µeq L^{-1}
Cl^-	5.08	18.90	9.78	4.58	13.20	7.96	4.58	9.26	6.46	µeq L^{-1}
F^-	2.63	5.05	4.18	2.69	5.95	4.11	3.37	4.34	3.96	µeq L^{-1}
ANC	-58.15	-8.71	-26.95	-19.82	23.13	1.76	-22.62	17.30	1.22	µeq L^{-1}
DIC	42.46	402.13	164.85	77.43	492.88	207.92	73.58	494.27	205.74	µmol L^{-1}-C
DOC	584.04	1371.73	937.93	762.87	1469.14	1215.92	1162.49	1536.63	1277.42	µmol L^{-1}-C
SiO_2	6.16	107.18	53.95	8.09	115.50	66.02	13.24	114.63	60.55	µmol L^{-1}
Ca^{2+}	40.92	83.34	60.42	24.45	61.00	47.10	27.27	57.88	44.84	µeq L^{-1}
Mg^{2+}	27.98	44.44	34.08	13.99	30.45	25.64	17.78	32.74	25.96	µeq L^{-1}
Na^+	14.79	30.88	20.30	13.92	23.49	18.39	16.14	23.04	20.18	µeq L^{-1}
K^+	4.60	10.49	7.72	7.93	13.81	10.50	4.39	8.19	6.25	µeq L^{-1}
NH_4^+	-0.72	5.04	1.80	-0.39	7.98	3.60	0.07	9.06	3.11	µeq L^{-1}
AL_TD	6.93	19.57	12.99	10.67	19.87	15.80	12.04	19.18	15.70	µmol L^{-1}
AL_TM	3.03	16.23	9.43	6.63	11.56	8.94	7.40	11.79	9.23	µmol L^{-1}
AL_OM	2.49	9.97	5.79	4.60	8.19	6.11	5.24	10.31	7.04	µmol L^{-1}
AL_IM	0.00	6.66	3.75	1.25	4.89	2.83	1.08	3.33	2.19	µmol L^{-1}
LABPH	4.22	4.73	4.48	4.50	5.00	4.71	4.47	5.08	4.74	
AIREQPH	4.21	4.72	4.48	4.54	5.06	4.77	4.55	5.09	4.80	
TRUECOLOR	25	140	85	100	320	227	140	280	188	Pt Co
SCONDUCT	21.42	37.86	27.60	16.51	24.68	19.18	14.69	23.17	18.37	µS cm^{-1}
TOTALP	na	na	na	3.69	12.76	7.08	5.09	24.58	8.85	µg L^{1}
CHLORA	na	na	na	2.18	20.36	6.30	1.49	22.97	4.73	µg L^{1}

Table 42.2 Lake Characteristics

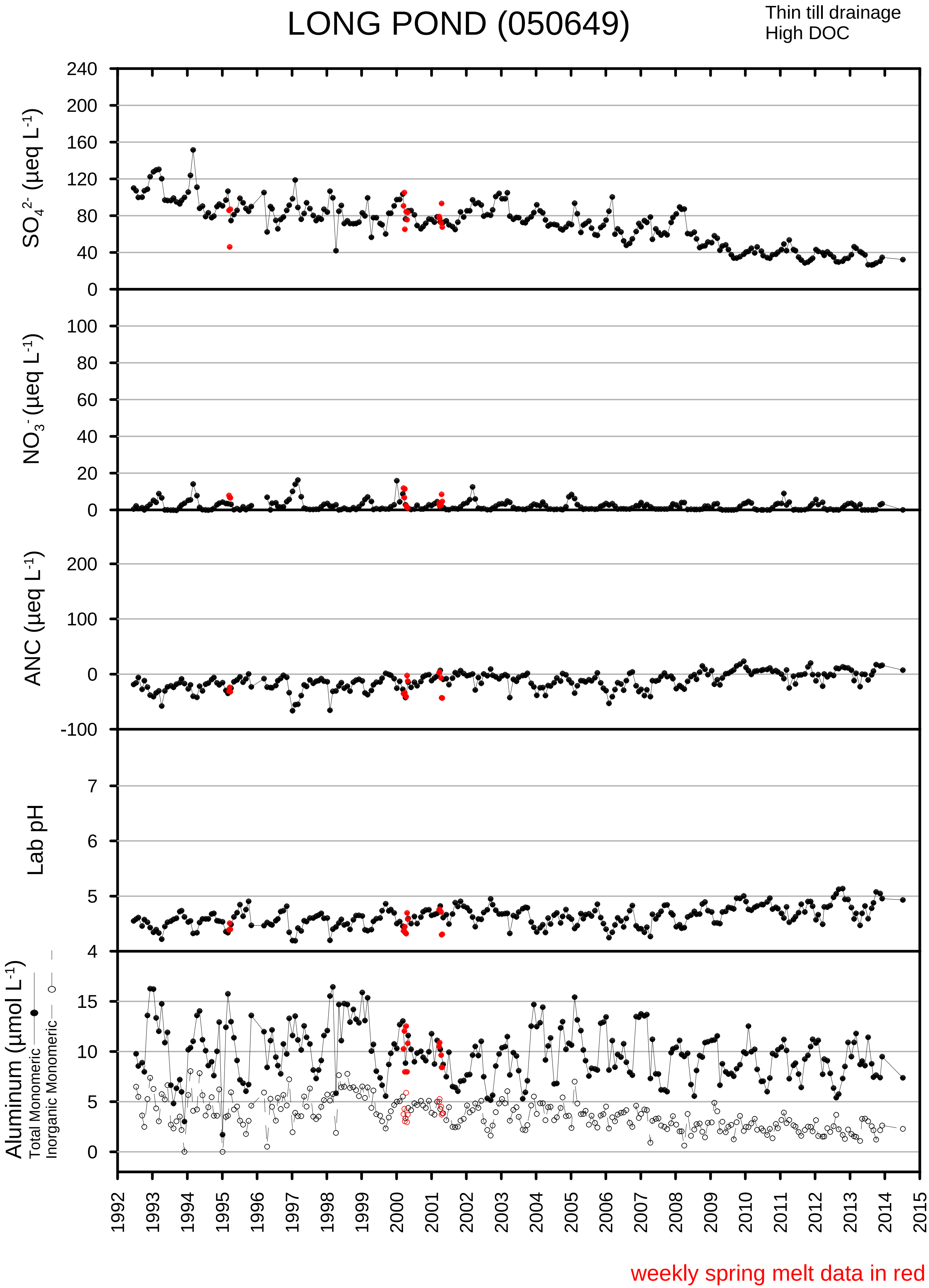
Parameter	Value
Elevation	574 m
Maximum depth	4.0 m
Mean depth	2.0 m
Volume	3.3×10^4 m^3
Surface area	1.7 ha
Watershed area	29.6 ha
Watershed ratio	0.06
Hydraulic retention time (year)	0.15
Watershed	Upper Hudson
County, Town	Hamilton, Indian Lake
USGS Quadrangle	Blue Mountain Lake
Land use classification	Blue Ridge Wilderness

Libellulidae; Coenagriidae and Aeshnidae; Trichoptera Polycentropodidae; Coleoptera Dytiscidae; Diptera Chironomidae and Heleidae; and Hemiptera Notonectidae and Belostomatidae. Also found were Arthropoda Arachnoid Hydracarina Unspecified. The ALS found the lake thermally stratified between 2.0 and 3.0 m on August 11, 1987 (ALSC 1989). The AEAP reported the average value of chlorophyll a as 5.0 µg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: Long Pond has no history of fish stocking. In addition to the ALS fisheries survey on September 8, 1987, the ALSC netted the lake on June 16, 1998 and June 21, 2010 (Roy et al 2015, Baldigo et al. 2016). No fish were caught in any of the surveys.

Intensive studies: Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). Landscape characteristics and disturbance history have been evaluated within this watershed (Sullivan et al. 1999). Long Pond was studied as part of the Adirondack/Catskill comparison study from 1992–2001 (Burns et al. 2005, Burns et al. 2006). Long Pond is part of the AEAP (Momen et al. 2006). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Figure 42.3 Chemistry Time Series



Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY20 Huntington Wildlife (start date October 31, 1978; elevation 500 m) located 26 km northeast of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Long Pond watershed lies on interlayered metasedimentary rock and granitic gneiss with medium to high ANC (Roy et al. 1997). The watershed is comprised of basal soils. Wetlands occupy approximately 18% of the watershed and are located across the center of the watershed under 580 m elevation. The watershed rises to a maximum elevation of 600 m. The maximum relief is 26 m. In 1987, the shoal water substrate was identified as 50% muck/silt and 50% organic (ALSC 1989).

Land cover/use: In 1987, the ALS found that deciduous-coniferous mixed forest covered 60% of the watershed, deciduous forest 20%, coniferous forest 10%, shrub-sapling 5%, and wetland 5%. Sixty percent of the pond shoreline is a scrub-shrub wetland fringe. Coniferous forest and boulder rock ledge predominate on both sides of the pond (ALSC 1989). Total wetland area is 5.3 ha and comprises 18% of the watershed. The predominant wetland cover types are scrub-shrub broad leaf evergreen (10.7%) and forested needle-leaf evergreen (5.8%) with some scrub-shrub needle leaf evergreen (1.5%) (Primack et al. 2000, ALSC 2003). The northern portion of the watershed is classified as Resource Management and is undeveloped private land. The remaining 75% of the watershed lies within the Blue Ridge Wilderness area of the Forest Preserve (APA 2001). There is a narrow, unmarked foot path that skirts the northern shoreline of the pond (NYSDEC 2006)

Watershed disturbance: The 1916 fire protection map shows considerable slash remaining after logging for softwood on 92% of the watershed. Approximately 7% of the watershed was moderately disturbed (25 to 50% blowdown) by the 1950 storm. The watershed was not disturbed by the July 1995 microburst or January 1998 ice storms (ALSC 2003, NYSDEC 1998).

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Carry Pond 050669

EPA ID: 050669E

ALSC Staff Photo 2015

Lake: Carry Pond lies in the Upper Hudson watershed at 652 m. It has no inlets or outlets and is the highest elevation seepage lake of the seven in the 52 ALTM lakes set. A small open water area exists within the seepage depression about 100 m off the southern shore (Figure 43.1). Carry Pond reaches a maximum depth of 4.6 m (15.1 ft) (Figure 43.2).

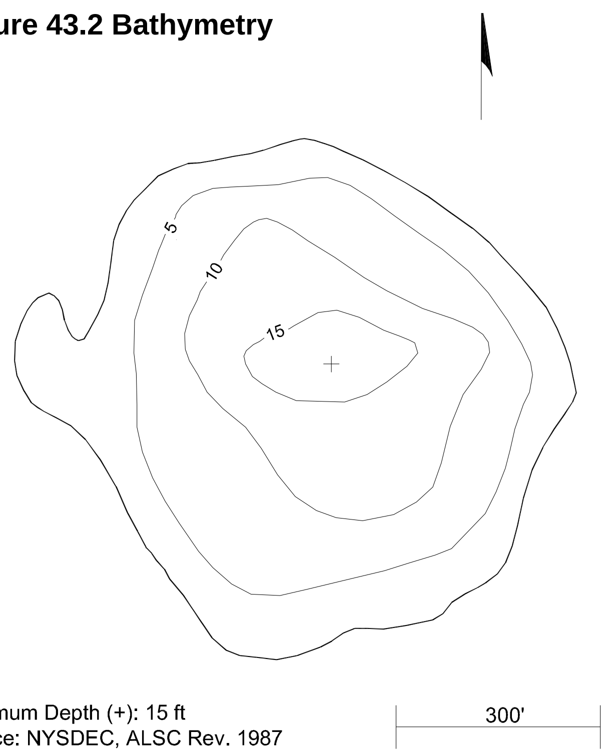
Carry Pond is classified as a mounded seepage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C) and considered sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014. This lake is accessed by helicopter.

Lake chemistry: Carry Pond was sampled during the ALS on August 6, 1987 finding: Lab pH 4.73, ANC -15.7 µeq L^{-1}, SO_4^{2-} 81.82 µeq L^{-1}, NO_3^- LTD, Ca^{2+} 38.92 µeq L^{-1}, Mg^{2+} 13.99 µeq L^{-1}, DOC 24.98 µmol L^{-1}-C (ALSC 1989). Table 43.1 summarizes recent ALTM chemistry. Major analytes through 2013 are shown in Table 43.1, plotted results through 2014 appear in Figure 43.3.

Aquatic biota: On September 24, 1987, the ALS found submergent vegetation covered 20% of the pond bottom, while emergent and floating vegetation covered 2% and 5% of the surface, respectively. ALS identified the following aquatic plants: Sphagnum spp.; Sparganium spp.; Carex spp.; Eleocharis spp.; Dulichium spp.; Scirpus spp.; Juncus spp.; Nuphar spp.; and Hypericum spp.. Poaceae and numerous Algae were also identified.

Figure 43.1 Catchment

Figure 43.2 Bathymetry



Maximum Depth (+): 15 ft
Source: NYSDEC, ALSC Rev. 1987

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Helo sample site	43.68204	-74.48856	43° 40′ 55.3″ N	074° 29′ 18.8″ W
Lake centroid	43.68204	-74.48856	43° 40′ 55.3″ N	074° 29′ 18.8″ W

Table 43.1 Lake Chemistry

050669			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	61.21	88.28	75.72	15.40	36.77	29.81	38.36	46.08	42.56	μeq L^{-1}
NO_3^-	-0.23	29.19	5.27	0.00	8.38	1.71	0.00	3.25	1.29	μeq L^{-1}
Cl^-	0.85	9.31	5.64	4.68	7.11	5.56	2.70	4.77	3.96	μeq L^{-1}
F^-	0.79	1.11	0.97	0.66	1.28	0.93	0.92	1.18	1.05	μeq L^{-1}
ANC	-23.40	1.55	-11.62	-0.38	13.74	9.17	-5.25	5.12	0.91	μeq L^{-1}
DIC	11.66	255.60	89.22	14.99	144.03	63.33	31.13	176.51	84.14	μmol L^{-1}-C
DOC	129.13	257.26	186.54	275.66	363.48	318.77	173.64	234.03	201.41	μmol L^{-1}-C
SiO_2	-4.49	13.81	5.06	1.67	6.99	4.44	3.97	9.49	6.75	μmol L^{-1}
Ca^{2+}	32.94	71.36	43.67	23.72	41.09	28.93	20.61	33.86	25.31	μeq L^{-1}
Mg^{2+}	13.99	21.39	17.76	11.52	12.55	11.99	10.99	12.03	11.58	μeq L^{-1}
Na^+	6.52	10.87	8.41	6.94	9.13	7.87	5.95	8.75	7.67	μeq L^{-1}
K^+	0.51	11.00	5.22	3.10	7.93	6.12	4.67	6.22	5.35	μeq L^{-1}
NH_4^+	-0.11	11.86	3.77	-0.21	9.15	3.60	0.47	6.58	2.49	μeq L^{-1}
AL_TD	1.30	2.19	1.66	1.24	2.85	1.95	0.78	1.64	1.16	μmol L^{-1}
AL_TM	1.46	4.10	2.41	1.69	2.22	2.00	1.21	1.95	1.58	μmol L^{-1}
AL_OM	-0.28	10.56	1.36	1.56	2.15	1.97	1.02	1.73	1.37	μmol L^{-1}
AL_IM	0.00	3.70	1.70	0.00	0.63	0.08	0.00	0.55	0.21	μmol L^{-1}
LABPH	4.43	5.19	4.76	5.15	6.14	5.44	5.12	5.47	5.24	
AIREQPH	4.57	5.29	4.82	5.39	6.13	5.66	5.12	5.62	5.37	
TRUECOLOR	5	15	10	30	55	44	5	25	15	Pt Co
SCONDUCT	12.94	23.06	17.31	6.38	11.12	8.84	8.52	11.2	9.59	μS cm^{-1}
TOTALP	na	na	na	8.69	30.51	18.09	7.30	21.04	11.70	μg L^1
CHLORA	na	na	na	1.00	104.41	17.59	1.33	10.21	4.00	μg L^1

Table 43.2 Lake Characteristics

Parameter	Value
Elevation	652 m
Maximum depth	4.6 m
Mean depth	2.2 m
Volume	6.2×10^4 m^3
Surface area	2.8 ha
Watershed area	20.8 ha
Watershed ratio	0.13
Hydraulic retention time (year)	NA
Watershed	Upper Hudson
County, Town	Hamilton, Lake Pleasant
USGS Quadrangle	Indian Lake
Land use classification	West Canada Lake Wilderness

A dip-net survey on that same date found the following Insecta: Odonata Libellulidae, Coenagriidae and Aeshnidae; Trichoptera Phryganeidae; Coleoptera Dytiscidae; Diptera Chironomidae; Hemiptera Corixidae, Notonectidae, Nepidae and Mesoveliidae. Also found were Crustacea Amphipoda Unspecified. The ALS found no evidence of a thermocline on August 6, 1987 (ALSC 1989). The AEAP reported the average value of chlorophyll a was 2.03 μg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: The DEC began stocking Carry Pond annually with brook trout in 1942 (ALSC 1989). In addition to the ALS fisheries survey on September 24, 1987, the ALSC netted the lake on June 23, 1994 and October 16, 2008 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 43.3 and 43.4 for recent fish stocking and netting histories.

Intensive studies: The lake has been studied by the AEAP beginning in 1994 (Momen et al. 2006, Methé et al. 1998, Methé and Zehr 1999, Momen et al. 1999).

Figure 43.3 Chemistry Time Series

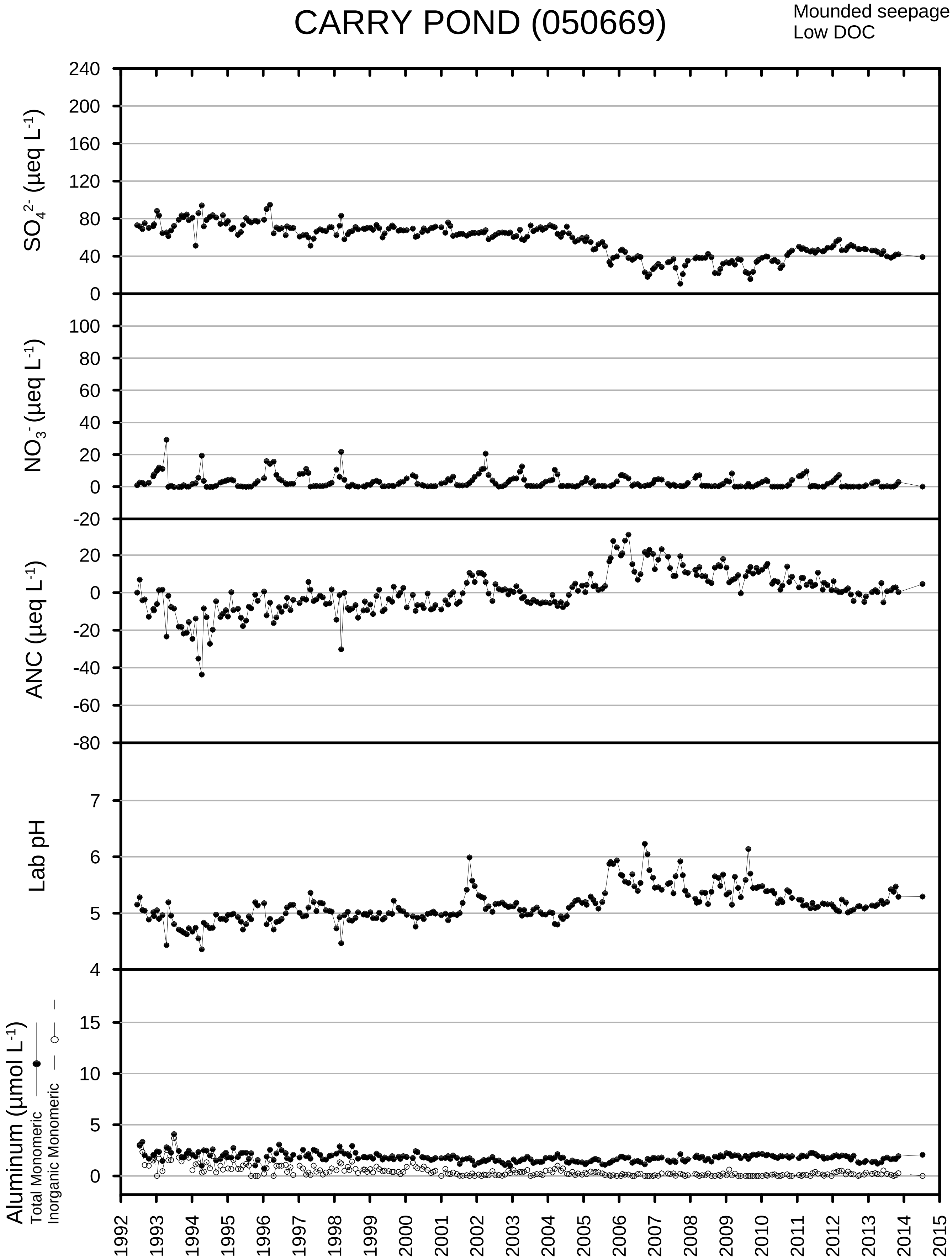


Table 43.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	525	6
1981	Brook trout	450	5
1982	Brook trout	500	3
1983	Brook trout	500	3
1984	Brook trout	370	9
1985	Brook trout	550	11
1986	Brook trout	650	3
1987	Brook trout	500	3
1988	Brook trout	500	3
1989	Brook trout	550	5
1990	Brook trout	545	3
1991	Brook trout	500	4
1992	Brook trout	500	6
1993	Brook trout	500	7
1994	Brook trout	400	8
1995	Brook trout	460	5
1996	Brook trout	500	4
1997	Brook trout	530	3
1998	Brook trout	530	4
1999	Brook trout	500	6
2000	Brook trout	500	5
2001	Brook trout	450	5
2002	Brook trout	500	10
2003	Brook trout	500	4
2004	Brook trout	200	3
2005	Brook trout	200	4
2006	Brook trout	220	3
2007	Brook trout	200	4
2008	Brook trout	200	3
2009	Brook trout	200	3
2010	Brook trout	180	1
2011	Brook trout	100	2
2012	Brook trout	200	2
2013	Brook trout	200	2
2014	Brook trout	200	1

Table 43.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Sep-1987	No fish caught					
Jun-1994	Brook trout	6	250	410	4327	6
Oct-2008	Brook trout	39	98	408	9028	39

Soils: A soil plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 31 km west of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: Carry Pond lies in a bowl-like depression in 100% alluvial in-wash. The highest elevation in the watershed is 660 m. The maximum relief is 8.0 m. In 1987, the shoal water substrate was characterized as 60% muck/silt/organic, 35% sand/gravel, and 5% rubble (ALSC 1989).

Land cover/use: In 1987, the watershed was described as: 55% deciduous forest; 30% deciduous-coniferous forest mix; 10% shrub-sapling; and 5% coniferous forest. A conifer fringe surrounded the immediate shoreline (ALSC 1989). Total wetland area is 4.4 ha and comprises 21.3% of the watershed. The wetlands are predominated by forested needle-leaf evergreen (3.6 ha) and forested broad leaf deciduous (0.8 ha) (ALSC 1989). The lake and its watershed lie totally within the West Canada Lake Wilderness (NYSDEC 2016). An unmarked foot trail makes the pond accessible from the north.

Watershed disturbance: The 1916 fire protection source data reveal 96.3% of the watershed as green timber, of virgin and second growth, with no slash. The watershed was not affected by the November 1950 blowdown, the July 1995 microburst or the January 1998 ice storm (ALSC 2003, NYSDEC 1998).

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Arbutus Lake 050684

EPA ID: 1A1-052O

ALSC Staff Photo 2015

Lake: Arbutus Lake lies in the Upper Hudson River watershed at 516 m. Archer Creek flows into the lake from the north and forms the single major inlet (Figure 44.1). Seven small wetlands connect with the lake shoreline. The largest forested wetland connects with a beaver meadow on Archer Creek. The 49 ha lake reaches a depth of 7.9 m (25.9 ft) (Figure 44.2). At the outlet is a V-notch weir. Weekly flow and discharge data have been collected by SUNY College of Environmental Science and Forestry (SUNY ESF) since October 1990.

Arbutus Lake is a medium-till drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered moderately sensitive to acidification. This is one of the original ALTM waters and has been monitored monthly at the outlet since February 1983.

Lake chemistry: Arbutus Lake was not surveyed during the ALS, but was sampled as part of the ELS (1A1-052) on October 15, 1984. The survey found: Field pH 6.76, ANC 75.2 µeq L^{-1}, SO_4^{2-} 133.6 µeq L^{-1}, NO_3^- 0.6 µeq L^{-1}, Ca^{2+} 148.3 µeq L^{-1}, Mg^{2+} 44.3 µeq L^{-1}, DOC 326.36 µmol L^{-1}-C (Kanciruk et al. 1986). Table 44.1 summarizes recent ALTM water chemistry taken at the outlet showing major analytes through 2013 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 44.3 including intermittent weekly spring melt data collected in the 1990s shown in red.

Aquatic biota: In 1990 and 1991, Bukavecas and Shaw (1998) found phosphorus as the limiting nutrient and a chlorophyll a average of 2.96 µg L^{-1}.

Figure 44.1 Catchment

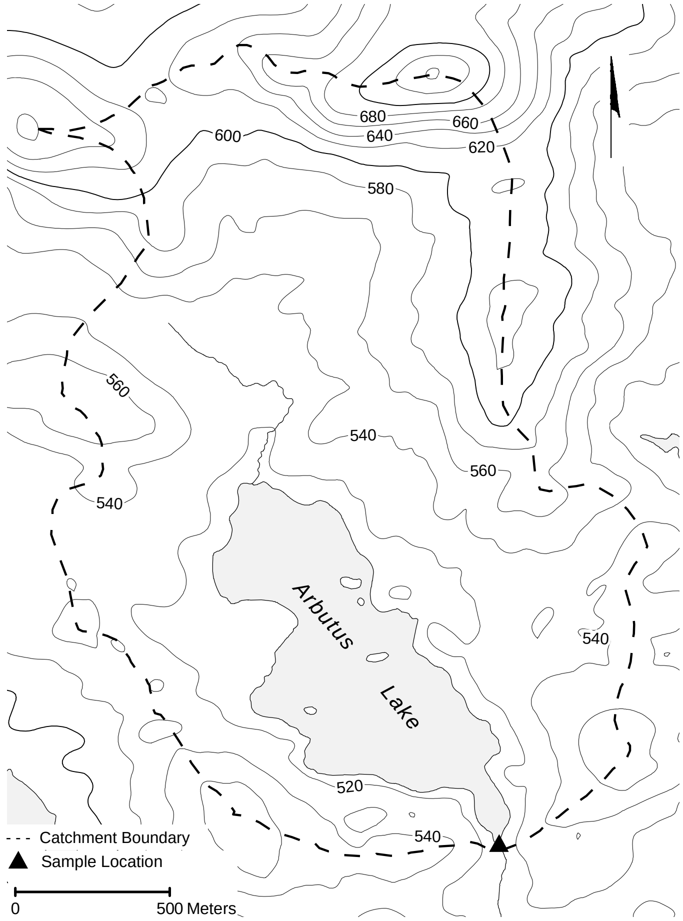
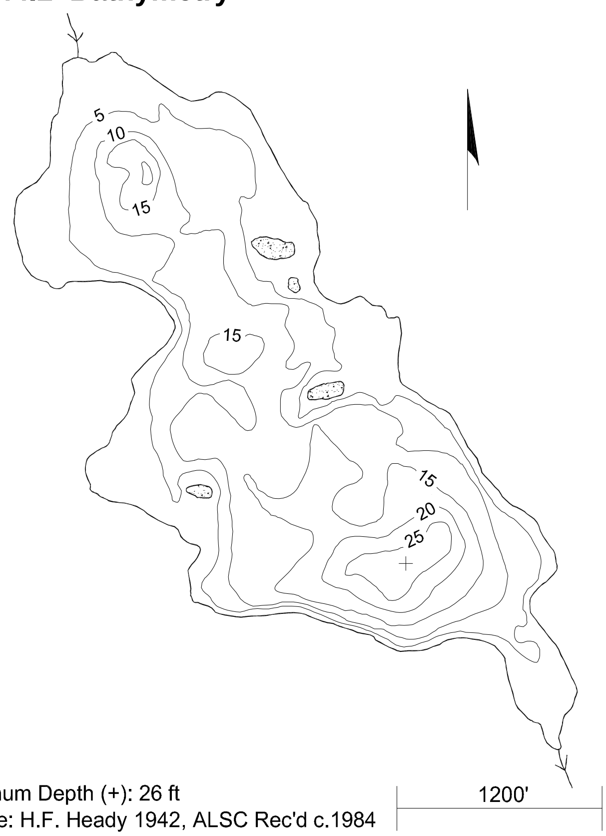


Figure 44.2 Bathymetry



Maximum Depth (+): 26 ft
Source: H.F. Heady 1942, ALSC Rec'd c.1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.98230	-74.23556	43° 58′ 56.3″ N	074° 14′ 08.0″ W
Lake centroid	43.9876	-74.24190	43° 59′ 15.4″ N	074° 14′ 30.8″ W

Table 44.1 Lake Chemistry

050684			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	108.26	148.24	128.93	76.08	103.55	85.48	58.77	84.21	69.12	µeq L^{-1}
NO_3^-	-0.16	23.30	7.77	0.00	9.62	2.84	0.23	16.96	5.92	µeq L^{-1}
Cl^-	7.33	12.13	9.83	6.66	11.79	8.30	6.34	9.43	8.17	µeq L^{-1}
F^-	3.84	5.11	4.66	3.92	4.78	4.47	4.01	4.75	4.34	µeq L^{-1}
ANC	44.84	81.09	68.66	63.95	76.53	70.52	73.51	98.20	89.37	µeq L^{-1}
DIC	58.28	188.99	111.56	74.10	238.11	120.29	100.77	210.22	133.71	µmol L^{-1}-C
DOC	304.13	427.19	356.57	356.42	474.98	416.63	342.00	485.12	440.43	µmol L^{-1}-C
SiO_2	30.62	101.36	71.79	44.56	86.88	66.39	38.00	70.96	57.74	µmol L^{-1}
Ca^{2+}	126.25	189.13	154.70	116.77	140.73	124.75	114.46	142.11	127.22	µeq L^{-1}
Mg^{2+}	35.38	55.13	45.40	32.09	40.32	35.58	30.99	39.78	35.12	µeq L^{-1}
Na^+	26.10	36.10	31.14	26.10	34.80	28.81	29.04	36.08	31.81	µeq L^{-1}
K^+	6.91	9.46	7.99	3.84	5.88	4.69	4.90	6.56	5.61	µeq L^{-1}
NH_4^+	-0.61	2.61	0.79	-1.07	1.83	0.42	-0.71	2.19	0.51	µeq L^{-1}
AL_TD	0.48	5.00	2.33	0.55	3.97	2.24	0.89	2.63	1.85	µmol L^{-1}
AL_TM	0.19	10.27	1.86	1.62	2.52	1.96	1.42	2.02	1.70	µmol L^{-1}
AL_OM	0.05	2.19	0.88	1.59	2.30	1.87	1.47	2.06	1.78	µmol L^{-1}
AL_IM	0.00	8.86	1.01	0.00	0.56	0.12	0.00	0.09	0.02	µmol L^{-1}
LABPH	5.91	6.87	6.49	5.92	6.73	6.41	6.17	6.88	6.54	
AIREQPH	6.47	7.08	6.80	6.79	7.05	6.89	6.90	7.10	7.03	
TRUECOLOR	15	35	25	30	40	36	25	45	34	Pt Co
SCONDUCT	23.87	29.94	26.61	19.82	25.48	21.80	20.02	25.22	22.27	µS cm^{-1}
TOTALP	na	na	na	2.25	8.45	3.93	2.79	9.17	5.00	µg L^{1}
CHLORA	na	na	na	0.24	6.30	2.79	1.99	25.32	8.43	µg L^{1}

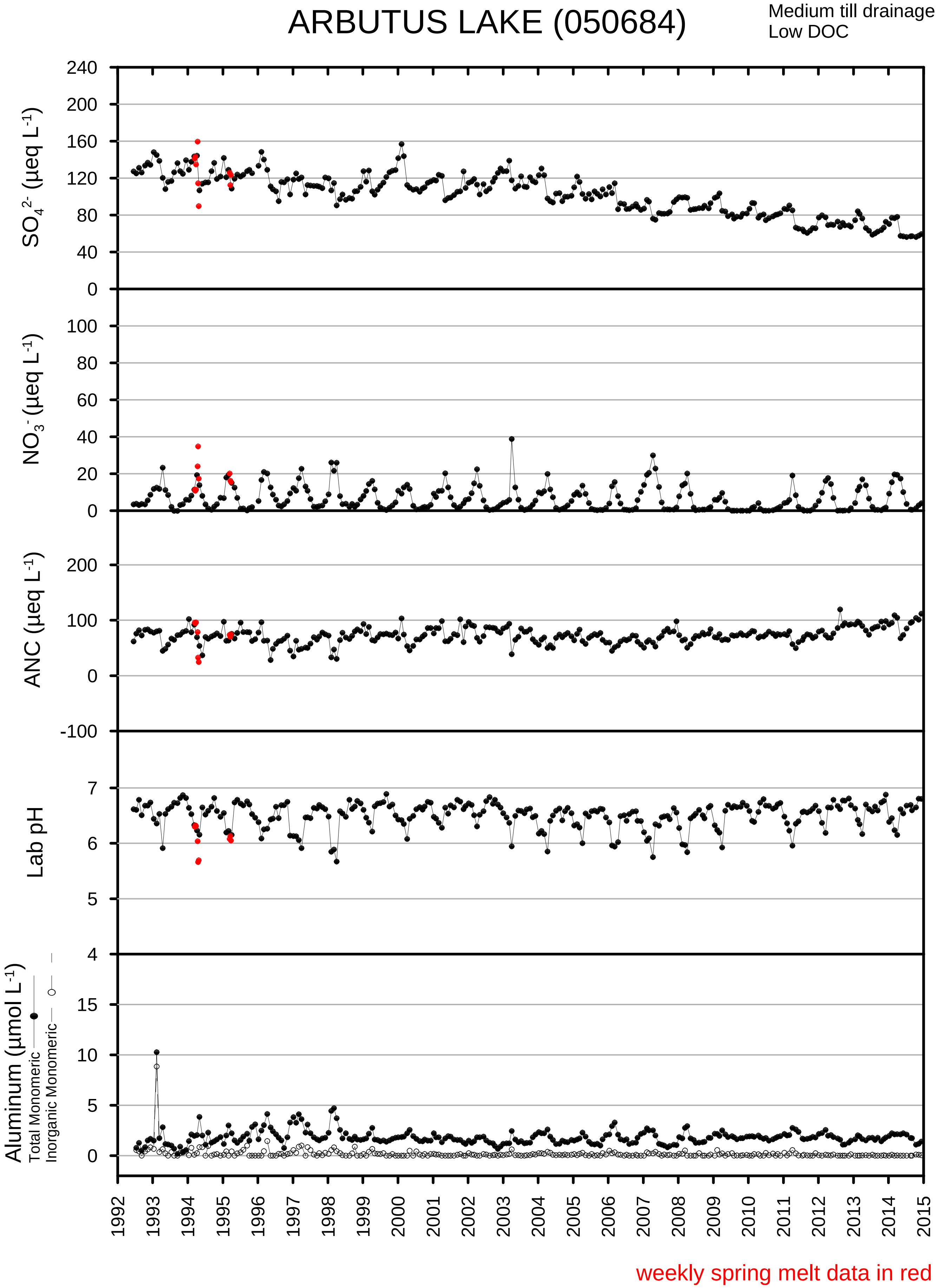
Table 44.2 Lake Characteristics

Parameter	Value
Elevation	516 m
Maximum depth	7.9 m
Mean depth	2.8 m
Volume	134.5 x 10^4 m^3
Surface area	48.9 ha
Watershed area	354 ha
Watershed ratio	0.14
Hydraulic retention time (year)	0.5
Watershed	Upper Hudson
County, Town	Essex, Newcomb
USGS Quadrangle	Newcomb
Land use classification	Private Land - Resource Management

Fisheries: Fish stocking data are not available. The ALSC netted the lake on June 27, 2001 and September 27, 2011 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 44.4 for recent netting results.

Intensive studies: Arbutus Lake is one of the most intensively studied ALTM waters. Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). The lake was studied under RILWAS in 1985 (Driscoll and Newton 1985). During the 1986 and 1987 snowmelts, Schaefer and Driscoll (1993) evaluated episodic acidification at the outlet. A phytoplankton and zooplankton experiment was conducted in 1990 (Bukaveckas and Shaw 1998). Arbutus Lake and Dart Lake were analyzed in the early 1990s for nitrogen and carbon isotopic composition in seston and sediment (Owen et al. 1999). A detailed GIS is available that includes a Digital Elevation Model (SUNY ESF 2009). In 1994, an H-flume equipped with automated discharge logging and sample collection was installed at Archer Creek. Historic and current data were retrieved January 18, 2017 from: http://www.esf.edu/hss/em/huntington/index.html.

Figure 44.3 Chemistry Time Series



Biogeochemical and hydrologic response studies are ongoing. From 1992 through 2001, Arbutus Lake was a study watershed for the Adirondack/Catskill comparison (Burns et al. 2005, Burns et al. 2006). Arbutus Lake was studied as an example of a relatively insensitive watershed using the model PnET-BGC (Chen and Driscoll 2004, Chen et al. 2004). Detailed mercury deposition and cycling studies are being conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995). Common loons were surveyed for mercury content in 1998–2000 (Schoch and Evers 2002) and in 2003–2004 (Schoch et al. 2004). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

The Adirondack Ecological Center (AEC) keeps a list of publications that involve AEC staff, field data collection or data-mining from the Huntington Wildlife Forest, including Arbutus watershed research and monitoring. The list has links to the original articles or abstracts and is searchable by author or keyword online. Retrieved January 18, 2017 from: http://www.esf.edu/aec/publications/.

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY20 Huntington Wildlife (start date October 31, 1978; elevation 500 m) located within the watershed of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Table 44.3 Precipitation NADP NY20 Newcomb, NY

	1993		2009	
	Total		Total	
	Concentration	Deposition	Concentration	Deposition
Parameter	**µeqL^{-1}**	**kgha^{-1}**	**µeqL^{-1}**	**kgha^{-1}**
SO_4^{2-}	1.68	17.100	0.710	7.670
NO_3^-	1.49	15.110	0.730	7.840
Cl^-	0.09	0.960	0.050	0.500
Ca^{2+}	0.06	0.630	0.070	0.700
Mg^{2+}	0.013	0.132	0.008	0.086
Na^+	0.052	0.530	0.020	0.216
K^+	0.01	0.130	0.010	0.108
NH_4^+	0.18	1.870	0.160	1.710
Lab H+	4.38	0.420	4.800	0.169
Conductivity	22.1		20.32	
(50th percentile(µS cm-1))				
Precipitation (cm)		101.6		107.8

Table 44.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Jun-2001	Brook trout	33	171	419	10178	33
Jun-2001	Northern redbelly dace	27	44	111	56	157
Jun-2001	Blacknose dace	22	51	76	46	23
Jun-2001	Brown bullhead	28	82	210	1321	220
Oct-2011	Brook trout	22	205	409	7463	22
Oct-2011	Northern redbelly dace	5	49	58	5	5
Oct-2011	Brown bullhead	25	139	219	1543	107

Additionally, located near and within the watershed are combined meteorological and deposition monitoring efforts. Retrieved January 18, 2017 from: http://www.esf.edu/hss/em/huntington/ackerman.html.

Since 1978, the station has participated as part of the National Atmospheric Deposition Program (NADP) National Trends Network (NTN). The site also participates in the National Mercury Deposition Network (MDN) (NADP 2009). On a walk-up tower adjacent to the Arbutus Lake Watershed, air chemistry and dry deposition are monitored as part of the Atmospheric Integrated Research Monitoring Network (AIRMoN). In 2002, a Clean Air Status and Trends Network (CASTNET) site was installed (U.S. Environmental Protection Agency 2009). The EPA and its partners as part of a pilot monitoring program to evaluate proposed secondary national ambient air quality standards (NAAQS) for oxides of sulfur and nitrogen installed additional sensors at the site in 2012. Information and data were retrieved January 18, 2017 from: http://nadp.slh.wisc.edu. Additional information is available at NADP about the Huntington Wildlife Forest research facility via the link.

Watershed: The watershed is primarily underlain by granitic gneiss with some gabbro-amphibolite. The parent material is a thin, bouldery glacial till. Soil depth varies, but is typically less than 1.0 m, and is dominated by coarse, loamy, mixed, frigid Typic Haplorthods. Greenwood mucky peats occupy wetlands in the bottoms of the valleys (McHale et al. 2000). Till comprises 98.4% of the watershed, while 1.6% has exposed bedrock (ALSC 2003). To the northeast, the watershed rises to a maximum elevation of 741 m. The watershed has 225 m of relief with an average slope of 11% (McHale et al. 2000). Approximately 15% of the watershed is above 600 m.

Land cover/use: Northern hardwood forest predominates the watershed. Conifers prevail along the lake shore, stream riparian zones, and higher elevations. Dominant species include: American beech, sugar maple, yellow birch, red spruce, and balsam fir (McHale et al. 2000). Total wetland area is 17.5 ha, or 4.9% of the watershed. The predominant wetland types are forested needle-leaved evergreen (13.5 ha), emergent persistent (2.5 ha), forested broad leaved deciduous (0.7 ha), scrub/shrub needle-leaf evergreen (0.4 ha), and forested dead vegetation (0.4 ha) (Primack et al. 2000, ALSC 2003).

The lake and its watershed are classified as Resource Management and lie within the SUNY ESF Huntington Wildlife Forest. The watershed is largely undeveloped. Seasonal roads, cabins and outbuildings that support the research community are at the southeastern shore of the lake.

Watershed disturbance: The 1916 fire protection source data reveal 87.9% of the watershed as virgin and second growth green timber with no slash. No damage was reported from the November 1950 blowdown and July 1995 microburst storms (ALSC 2003). There is a history of logging within the watershed. In the winter of 1960–1961, a total of 1.5 million cubic meters of timber, primarily softwoods, were removed from about 162 ha in and around the watershed (McHale et al. 2000). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Sullivan, T.J., Fernandez, I. J., Herlihy, A. T., Driscoll, C. T., McDonnell, T. C., Nowicki, N. A., Snyder, K. U., and Sutherland, J. W. 2006b. Acid-base characteristics of soils in the Adirondack Mountains, New York. Soil Science Society of America Journal 70: 141-152.

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Lake Colden   050706
EPA ID: 050706O

ALSC Staff Photo 2015

Lake: Lake Colden lies in the Upper Hudson watershed at 843 m. This 15.4 ha lake is the second highest in the ALTM program. Avalanche Lake is a tributary along with 2-3 other inlet streams. The outlet dam is wood and stone with a head height of about 1.5 m (ALSC 1989). The lake reaches a maximum depth of 7.3 m (24.0 ft) (Figure 45.2).

Lake Colden is classified as a thin-till chain drainage lake with low dissolved organic carbon (<500 μmol L^{-1}-C). It is considered sensitive to acidification. Sampling frequency at this pond was modified to seasonal in 2014.

Lake chemistry: Lake Colden was sampled near its deepest point during the ALS on August 18, 1987 finding: Lab pH 5.13, ANC 0.6 μeq L^{-1}, SO_4^{2-} 106.60 μeq L^{-1}, NO_3^- 1.46 μeq L^{-1}, Ca^{2+} 79.84 μeq L^{-1}, Mg^{2+} 18.10 μeq L^{-1}, DOC 291.40 μmol L^{-1}-C (ALSC 1989). Table 45.1 summarizes recent ALTM chemistry taken at the outlet. Major analytes through 2013 are shown in Table 45.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 45.3.

Aquatic biota: On October 19, 1987, the following aquatic plants were identified: Fontinalis spp.; Sparganium spp.; Potamogeton spp.; Najas spp.; Eriocaulon spp.; numerous Algae and Poeceae. Submergent vegetation covered 60% of the bottom of the lake. The surface of the lake was occupied by 8% emergent plants. A dip-net survey on that day found: Crustacea Decapoda; Insecta, Ephemeroptera Leptophlebiidae; Odonata Libellulidae; Hemiptera Notonectidae; Megaloptera Sialidae; Trichoptera Phryganeidae; Coleoptera Dytiscidae; and Diptera

Figure 45.1 Catchment

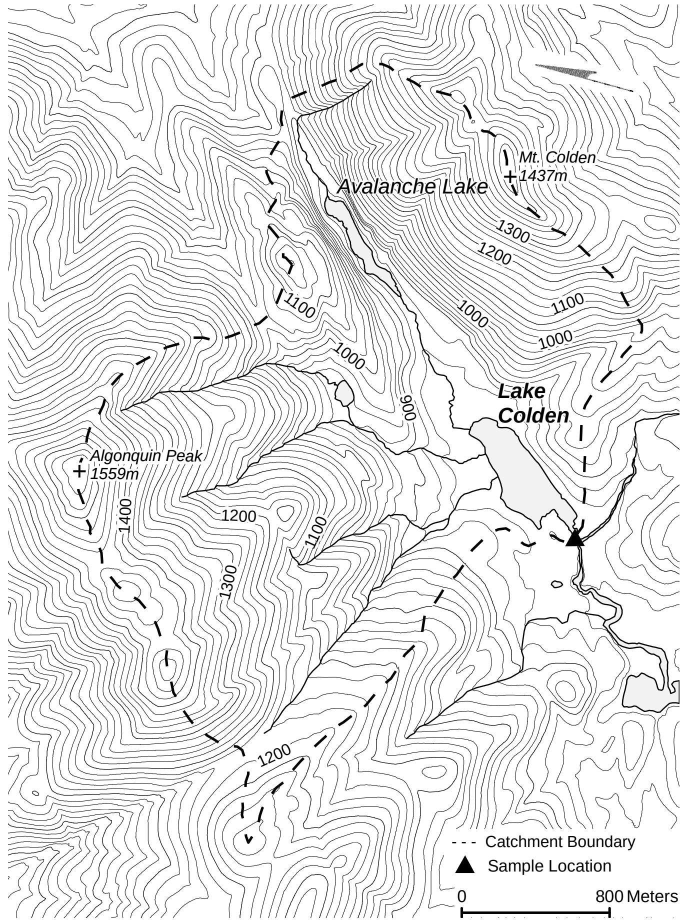
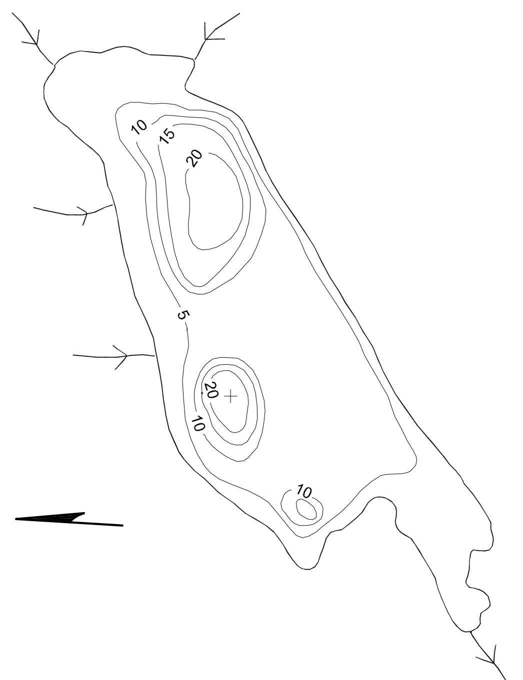


Figure 45.2 Bathymetry



Maximum Depth (+): 24 ft
Source: NYSDEC, ALSC Rev. 1987

800'

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	44.11938	-73.98261	44° 07′ 09.7″ N	073° 58′ 57.4″ W
Lake centroid	44.12187	-73.98037	44° 07′ 18.7″ N	073° 58′ 49.3″ W

Table 45.1 Lake Chemistry

050706			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	65.58	123.05	97.40	45.76	78.70	57.43	32.40	58.91	41.77	µeq L^{-1}
NO_3^-	8.02	54.35	26.83	2.38	54.29	19.40	2.34	45.16	22.35	µeq L^{-1}
Cl^-	4.23	12.41	6.98	2.82	12.02	5.08	2.70	9.78	5.7	µeq L^{-1}
F^-	0.58	1.21	0.76	0.40	1.32	0.87	0.39	1.14	0.76	µeq L^{-1}
ANC	-9.62	11.58	-0.37	4.51	17.68	9.87	3.19	21.19	12.77	µeq L^{-1}
DIC	23.31	319.70	75.83	29.14	184.83	57.49	33.48	171.79	73.39	µmol L^{-1}-C
DOC	233.78	414.28	347.70	233.70	488.15	391.17	307.18	651.98	452.56	µmol L^{-1}-C
SiO_2	43.77	108.68	82.34	55.25	117.00	92.28	59.07	115.59	85.14	µmol L^{-1}
Ca^{2+}	50.90	96.31	76.35	46.91	76.85	58.67	41.82	63.60	51.39	µeq L^{-1}
Mg^{2+}	11.52	19.75	17.35	9.87	20.57	14.44	10.28	19.30	13.75	µeq L^{-1}
Na^+	10.87	25.23	17.51	12.18	26.97	18.13	14.87	27.53	19.43	µeq L^{-1}
K^+	1.28	6.39	2.79	0.32	2.30	1.11	0.38	2.71	1.57	µeq L^{-1}
NH_4^+	-2.27	5.93	1.40	-1.36	2.27	0.36	-0.25	3.39	1.35	µeq L^{-1}
AL_TD	5.78	27.80	19.17	11.54	22.05	15.06	10.92	23.24	14.82	µmol L^{-1}
AL_TM	5.30	22.27	13.77	4.03	10.04	7.07	4.45	10.90	7.44	µmol L^{-1}
AL_OM	2.13	6.73	4.56	2.67	5.74	4.21	3.36	6.83	5.23	µmol L^{-1}
AL_IM	3.14	16.83	9.21	1.21	4.97	2.86	1.10	4.07	2.21	µmol L^{-1}
LABPH	4.75	5.20	4.95	5.04	5.74	5.27	4.97	5.76	5.29	
AIREQPH	4.73	5.33	4.96	5.05	5.75	5.27	5.06	5.97	5.42	
TRUECOLOR	15	30	23	25	45	33	15	50	34	Pt Co
SCONDUCT	16.26	27.64	21.10	11.56	21.74	14.94	9.93	17.02	13.32	µS cm^{-1}
TOTALP	na	na	na	1.02	4.20	2.80	2.50	10.64	5.38	µg L^1
CHLORA	na	na	na	0.06	2.34	1.17	0.35	4.37	1.72	µg L^1

Table 45.2 Lake Characteristics

Parameter	Value
Elevation	843 m
Maximum depth	7.3 m
Mean depth	2.3 m
Volume	35.5 x 10^4 m^3
Surface area	15.4 ha
Watershed area	656.3 ha
Watershed ratio	0.02
Hydraulic retention time (year)	0.08
Watershed	Upper Hudson
County, Town	Essex, Keene
USGS Quadrangle	Mt. Marcy
Land use classification	High Peaks Wilderness

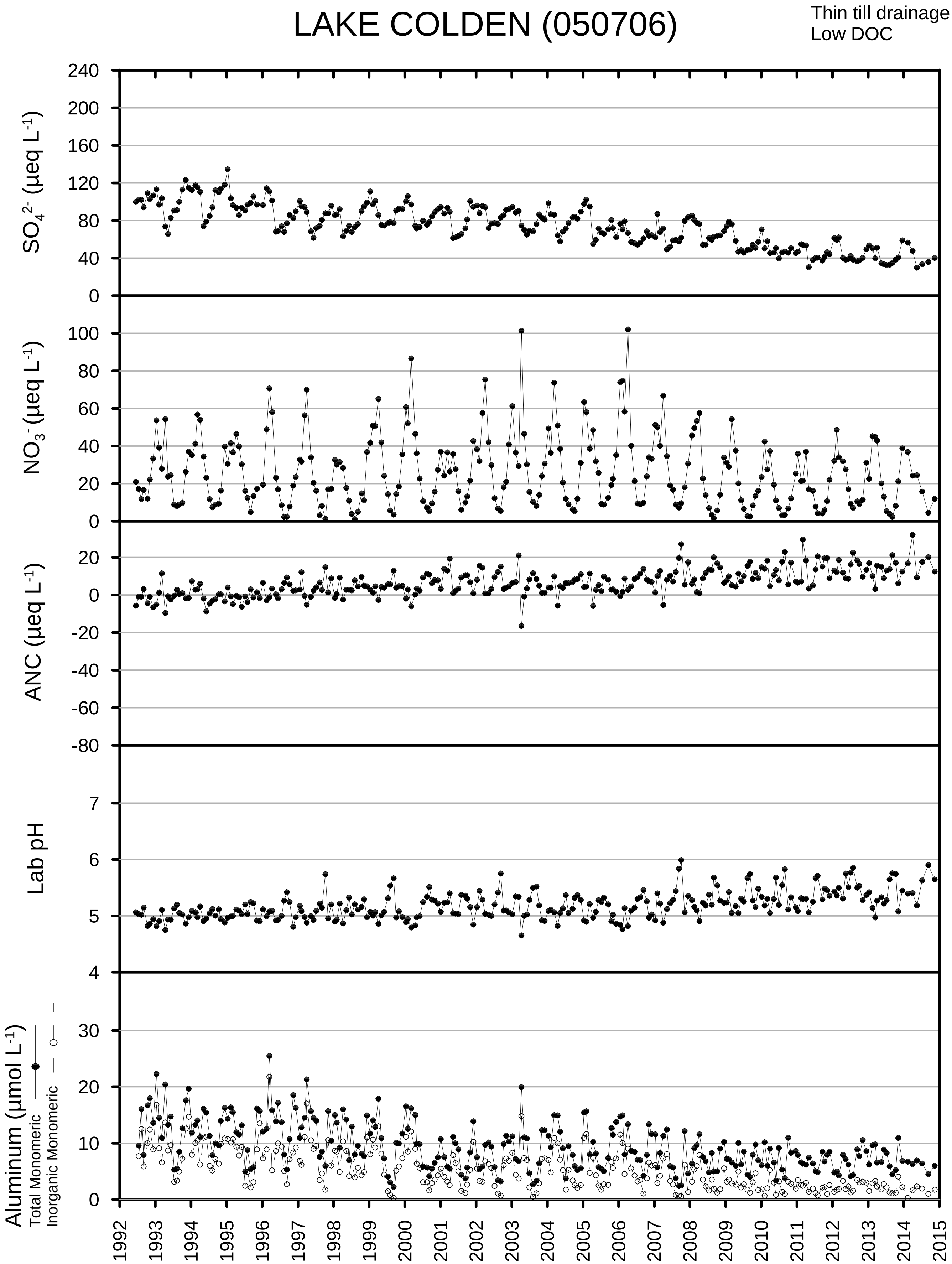
Culicidae and Chironomidae (ALSC 1989). No complete temperature profile was available during the ALS (1989). Charles and others (1990) reported total phosphorus was 3.8 µg L^{-1}, chlorophyll a was 0.7 µg L^{-1} and a Secchi depth was 6.3 m.

Fisheries: The DEC stocked brook trout from 1941 through 1972 (ALSC 1989). In addition to the ALS fisheries survey on October 20, 1987, the ALSC netted the lake on September 29, 2004 and on June 13, 2011. No fish were caught in any of these surveys (Roy et al. 2015, Baldigo et al. 2016).

Intensive studies: Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). McNeil and others (2007) conducted a regional survey of foliar nitrogen in July and August 2003 that included study plots in this watershed.

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY20 Huntington Wildlife (start date October 31, 1978; elevation 500 m) located 25 km south of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Figure 45.3 Chemistry Time Series



Watershed: The Lake Colden watershed lies on metanorthosite and anorthositic gneiss bedrock with medium to high ANC (Roy et al. 1997). Till comprises 58% of the watershed, while the remaining 42% is exposed bedrock. Basal soils are concentrated in elevations lower than 800 m, primarily around the lake, while a majority (85%) of the watershed is comprised of shallow soils and rock outcrops. The highest point in the watershed is Algonquin Peak at 1559 m. The maximum relief is 716 m. In 1987, the ALS described the shoal water substrate around the lake as 50% muck/silt/organic, 30% sand/gravel, and 20% boulder/rubble (ALSC 1989).

Land cover/use: In 1987, coniferous forest covered 80% of the watershed, deciduous-conifer mixed forest 10%, and shrub/sapling/wetland 10%. The immediate shoreline area was 70% coniferous forest, 12% shrub/sapling mix, 10% wetland and open grass; 7% boulder rock ledge, and 1% developed. The lake has a wetland complex at the eastern end (ALSC 1989). Total wetland area is 12.5 ha and comprises about 1.9% of the watershed. The predominant wetland vegetation types are: scrub/shrub needle-leaf evergreen (5.2 ha); forested needle-leaved evergreen (2.6 ha); emergent persistent marsh (2.6 ha); and scrub/shrub broad-leaf deciduous (2.0 ha) (Primack et al. 2000, ALSC 2003).

Lake Colden and its watershed occur entirely within the High Peaks Wilderness Area (HPWA), the largest (780 km^2) designated wilderness in New York. Fourteen campsites and one ranger outpost (near Cold Brook) are found within the lakes watershed. The Lake Colden ranger outpost was destroyed by fire in March 1998 and replaced in the fall of that year. Hiking trails meet at, and circumnavigate the lake. The dam at Lake Colden is one of four functional and maintained dams in the HPWA (NYSDEC 1999).

Watershed disturbance: In the nineteenth century, the area supported a logging industry that denuded vast areas of the watershed and left it prone to wildfires. During the summer and fall of 1903, an estimated 600,000 acres of land burned in the Adirondacks, including areas of the High Peaks Watershed. Contributing to the fire storms were dry logging slash, an extended drought, and unseasonably high winds. Fire storms raged again in 1908 and 1909. Lumbering practice reforms were made in 1912 to reduce future fire risk (NYSDEC 1999).

The 1916 fire protection source data reveal 93.4% of the watershed as having green timber of virgin and secondary growth with no slash and 3.6% of the watershed as logged for softwood only with considerable slash. A November 1950 storm caused 50–100% severe blow down over 4.3% of the watershed (ALSC 2003). Clean up of trails blocked by fallen trees was not complete until 1955 (NYSDEC 1999). The watershed was not impacted by the July 1995 microburst storm (ALSC 2003). The watershed experienced light ice damage from the January 1998 ice storm (NYSDEC 1998).

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Avalanche Lake 050707
EPA ID: 050707O

ALSC Staff Photo 2015

Lake: Avalanche Lake lies in the Upper Hudson watershed at 873 m. This 4.4 ha headwater lake is the highest in the ALTM program. A single permanent inlet drains from the northeast (Figure 46.1). The narrow lake is constrained by Mt. Colden and Avalanche Mt. In 1987, an active beaver dam was present at the outlet (ALSC 1989). The lake reaches a maximum depth of 7.0 m (23.0 ft) (Figure 46.2).

Avalanche Lake is a thin-till drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. Sampling frequency at this pond was modified to seasonal in 2014.

Lake chemistry: Avalanche Lake was sampled near its deepest point during the ALS on August 18, 1987 finding: Lab pH 4.99, ANC -1.7 µeq L^{-1}, SO_4^{2-} 96.19 µeq L^{-1}, NO_3^- 3.24 µeq L^{-1}, Ca^{2+} 74.85 µeq L^{-1}, Mg^{2+} 18.93 µeq L^{-1}, DOC 349.68 µmol L^{-1}-C (ALSC 1989). Table 46.1 summarizes recent ALTM chemistry taken at the outlet. Major analytes through 2013 are shown in Table 46.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 46.3.

Aquatic biota: On October 21, 1987, the ALS found submergent vegetation covered 5% of the lake bottom, while emergent plants covered 2% of the water surface. ALS identified the following aquatic plants: Sparganium spp.; Eleocharis spp.; Eriocaulon spp. and Poaceae. On that date, a dip-net survey identified the following Insecta: Hemiptera Corixidae; Trichoptera Phryganeidae; Coleoptera

Figure 46.1 Catchment

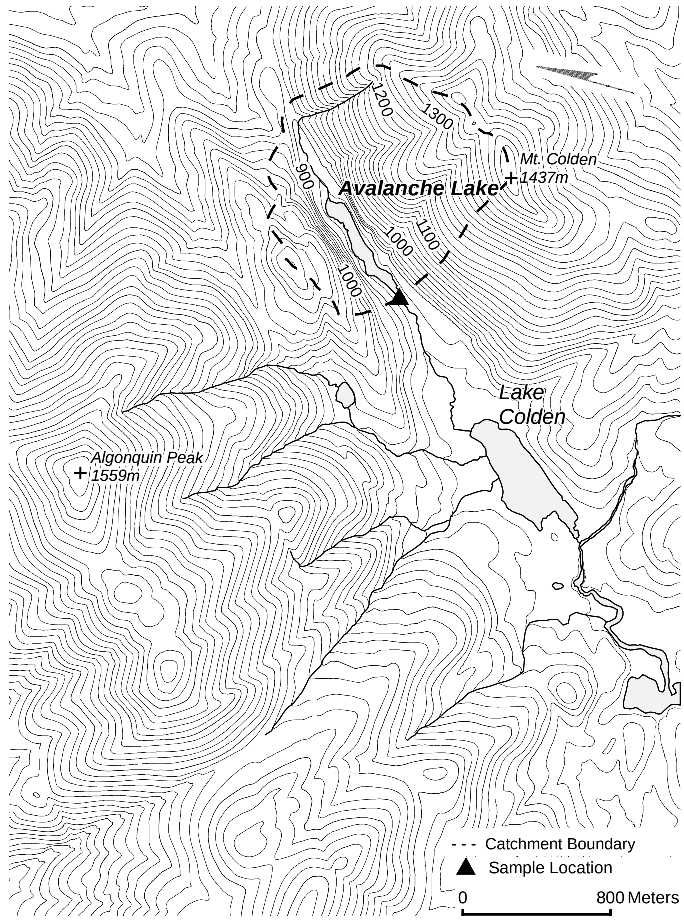
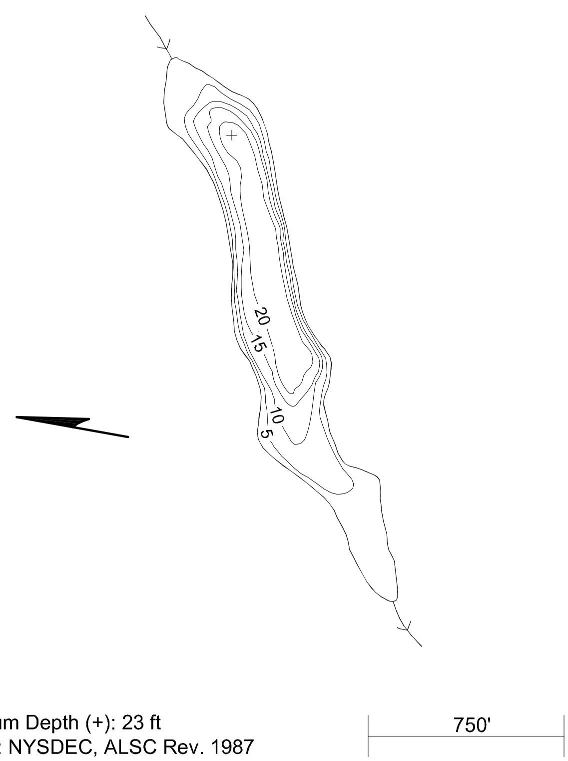


Figure 46.2 Bathymetry



Maximum Depth (+): 23 ft
Source: NYSDEC, ALSC Rev. 1987

Geographic coordinates (NAD 83)

	Latitude Φ DD.ddd	Longitude λ DDD.ddd	Latitude Φ DD MM SS.s	Longitude λ DDD MM SS.s
Grab sample site	44.13056	-73.96983	44° 07′ 50.0″ N	073° 58′ 11.4″ W
Lake centroid	44.13306	-73.96708	44° 07′ 59.0″ N	073° 58′ 01.5″ W

Table 46.1 Lake Chemistry

050707	1993			2009			2013			
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	60.79	140.33	100.28	38.69	71.62	50.34	23.80	51.78	34.77	µeq L^{-1}
NO_3^-	13.69	82.51	36.29	6.84	68.26	25.89	7.31	48.54	22.13	µeq L^{-1}
Cl^-	5.08	11.00	7.19	3.20	8.15	5.24	2.57	10.75	6.26	µeq L^{-1}
F^-	0.53	1.21	0.79	0.58	1.06	0.79	0.25	1.05	0.70	µeq L^{-1}
ANC	-34.83	7.88	-7.49	-6.46	19.17	8.68	-1.03	30.88	18.05	µeq L^{-1}
DIC	28.31	214.80	71.67	32.47	156.52	70.56	48.73	354.21	153.53	µmol L^{-1}-C
DOC	231.04	588.45	425.57	341.52	699.35	533.41	474.82	713.03	619.77	µmol L^{-1}-C
SiO_2	40.44	125.82	78.65	51.59	107.60	80.41	51.36	107.31	78.21	µmol L^{-1}
Ca^{2+}	51.40	101.80	77.39	49.40	71.86	59.06	40.24	63.70	49.90	µeq L^{-1}
Mg^{2+}	13.17	20.57	17.62	11.52	16.46	13.75	10.62	17.24	13.58	µeq L^{-1}
Na^+	11.31	22.62	16.53	13.05	20.01	16.19	13.23	21.70	17.54	µeq L^{-1}
K^+	1.28	4.60	2.52	0.77	2.56	1.61	1.78	4.08	2.85	µeq L^{-1}
NH_4^+	0.28	7.21	2.25	-0.79	4.49	0.97	-0.10	10.80	5.60	µeq L^{-1}
AL_TD	9.90	34.69	23.27	16.17	26.50	20.16	10.50	24.76	19.25	µmol L^{-1}
AL_TM	8.57	28.98	17.40	7.02	14.34	10.43	7.66	12.52	10.20	µmol L^{-1}
AL_OM	2.78	9.60	6.40	4.01	7.78	5.75	5.72	9.33	7.43	µmol L^{-1}
AL_IM	5.79	19.38	11.00	2.45	8.34	4.69	1.52	5.10	2.77	µmol L^{-1}
LABPH	4.37	5.11	4.78	4.74	5.55	5.09	4.83	5.68	5.23	
AIREQPH	4.37	5.11	4.76	4.71	5.55	5.08	4.91	5.96	5.42	
TRUECOLOR	25	45	33	35	70	53	40	100	67	Pt Co
SCONDUCT	17.16	41.61	24.42	11.72	26.19	15.91	10.28	18.15	13.58	µS cm^{-1}
TOTALP	na	na	na	2.76	15.81	5.30	4.45	16.85	9.05	µg L^{1}
CHLORA	na	na	na	0.51	3.70	1.99	0.28	6.87	3.15	µg L^{1}

Table 46.2 Lake Characteristics

Parameter	Value
Elevation	873 m
Maximum depth	7.0 m
Mean depth	3.3 m
Volume	14.6 x 10^4 m^3
Surface area	4.4 ha
Watershed area	115.2 ha
Watershed ratio	0.04
Hydraulic retention time (year)	0.20
Watershed	Upper Hudson
County, Town	Essex, Keene
USGS Quadrangle	Keene Valley
Land use classification	High Peaks Wilderness

Dytiscida and Gyrinidae; and Diptera Chironomidae. Also found was Oligochaeta Unspecified. A temperature profile to the lake bottom was unavailable during this survey (ALSC 1989). Charles and others (1990) reported total phosphorus was 4.4 µg L^{-1}, chlorophyll a was 1.3 µg L^{-1} and Secchi depth was 4.8 m.

Fisheries: The DEC limed the lake in 1981 and 1982. The lake was stocked with brook trout from 1982 through 1987 (ALSC 1989). In addition to the ALS fisheries survey on October 21, 1987, the ALSC netted the lake on September 29, 2004 and June 13, 2011 (Roy et al. 2015, Baldigo et al. 2016). No fish were caught in any of the surveys. Refer to Table 46.3 for recent fish stocking history.

Intensive studies: Sediment diatom assemblages were characterized as part of the PIRLA paleolimnological studies (Dixit et al. 1993). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Figure 46.3 Chemistry Time Series

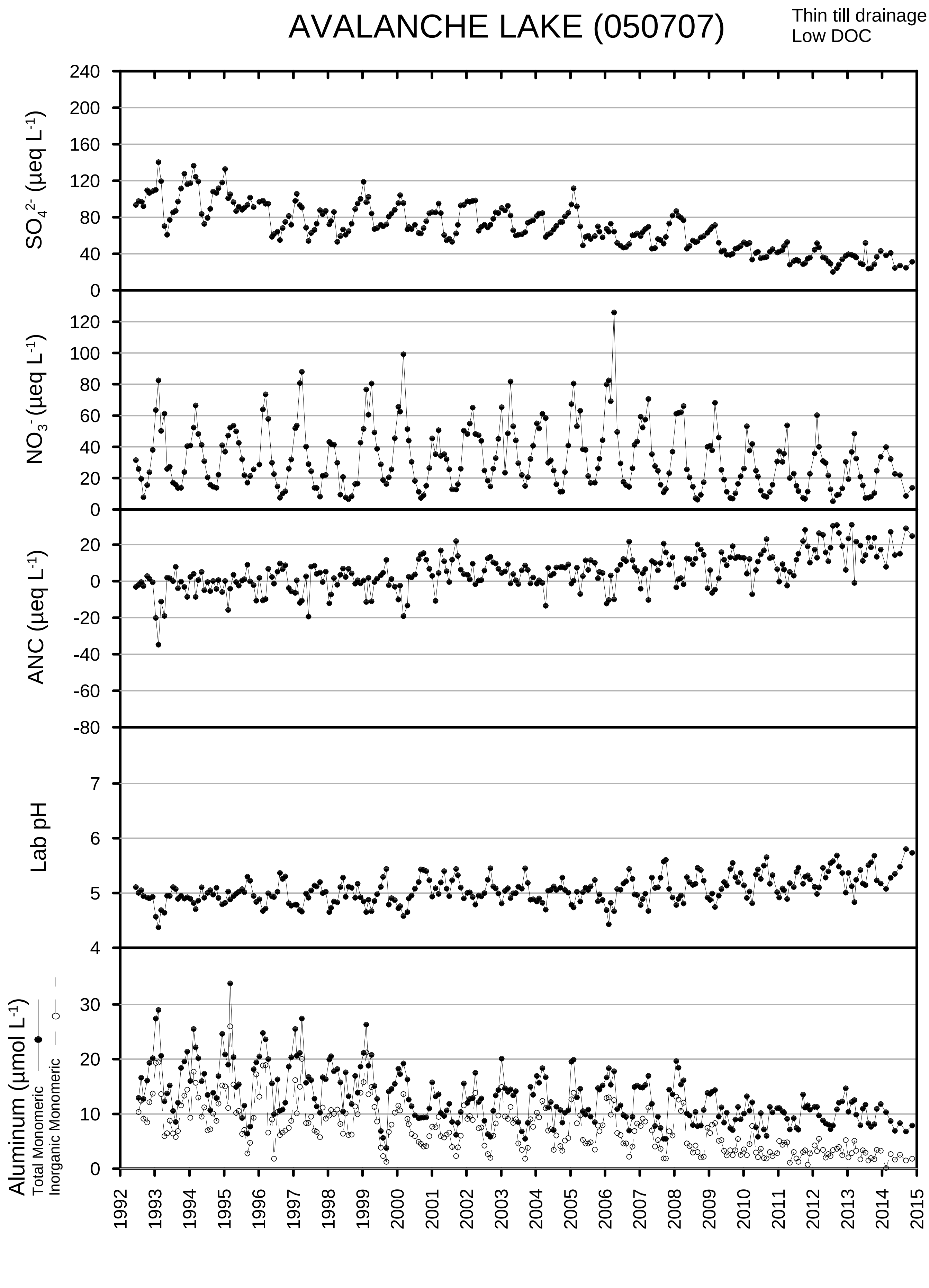


Table 46.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1982	Brook trout	956	30
1983	Brook trout	929	25
1984	Brook trout	481	4
1985	Brook trout	715	5
1986	Brook trout	650	3
1987	Brook trout	650	7

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY98 Whiteface Mountain (start date July 3, 1984; elevation 610 m) located 30 km north of this lake. Retrieved January 18, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Avalanche Lake watershed lies on metanorthosite and anorthositic gneiss with medium to high ANC (Roy et al. 1997). In the high peaks region, deposited glacial till, a mixture of clay, silt, sand, and stone are more common near and around the base of mountains where hardwoods and mixed conifers dominate (NYSDEC 1999). Exposed bedrock comprises 39% of the watershed at elevations above 1100 m; the remaining 61% is basal till. Basal tills appear in the lower elevations surrounding the lake. The 119 ha watershed is characterized by very steep slopes resulting in 90% of the shoreline as steep cliffs. Approximately 75% of the watershed is above 1000 m. At 1437 m, Mt. Colden is the highest peak within the watershed. The maximum relief is 564 m. In 1987, the ALS found the shoal water substrate comprised of 65% bedrock/ boulder/rubble, 30% muck/silt/organic, and 5% sand (ALSC 1989).

Land cover/use: In 1987, the ALS described the watershed as: 60% high elevation coniferous forest, 20% deciduous-conifer mix, and 20% shrub-sapling mix. The immediate shoreline consisted of 90% boulder rock ledge and 10% mix of coniferous forest and shrub-sapling vegetation (ALSC 1989). Total wetland area is 1.7 ha, or 1.5% of the watershed. The predominant wetland types are forested, needle-leaved evergreen (1 ha), emergent persistent marsh (0.6 ha), and scrub/shrub needle-leaf evergreen (0.1 ha) (Primack et al. 2000, ALSC 2003). The pond and watershed are located in the High Peaks Wilderness Area (NYSDEC 1999). A hiking trail runs along the western shore of the pond, including a series of foot bridges with supports that are drilled into the rock walls along Avalanche Mountain.

Watershed disturbance: In the nineteenth century, the area around Avalanche Lake supported a logging industry that denuded vast areas of the watershed and left it prone to wildfires. During the summer and fall of 1903, an estimated 600,000 acres of land burned in the Adirondacks, including areas of the High Peaks Watershed. Contributing to the fire storms were dry logging slash, an extended drought and unseasonably high winds. Fire storms raged again in 1908 and 1909. Lumbering practice reforms were made in 1912 to reduce future fire risk (NYSDEC 1999).

The 1916 fire protection source data show 95.9% of the watershed as virgin and second growth green timber with no slash. The November 1950 storm caused severe blow down over 1.9% of the watershed with 50 to 100% damage to the tree crowns (ALSC 2003). Clean up of blocked trails was not complete until 1955 (NYSDEC 1999). The watershed experienced light ice damage from the January 1998 ice storm (NYSDEC 1998). Mud slides occurred on slopes of Mt. Colden on September 1999 caused by hurricane Floyd. Two slides had direct impact on the lake, a very large slide on the watershed boundary and a smaller one on the northeastern shore of the lake itself. On March 15, 2007, there was an avalanche on Mt. Colden in the draw called the Trap Dike on the southeastern shore of the lake. This slide sent debris onto and across the entire lake surface to the far shore.

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Little Simon Pond   060182

EPA ID: 060182O

ALSC Staff Photo 2015

ALSC Staff Photo 2015 Dam at Little Simon Pond

Lake: Little Simon Pond lies in the Raquette River watershed at 546 m elevation. The 58.1 ha headwater lake flows into Simon Pond approximately 2.0 km downstream. Five perennial streams discharge into Little Simon Pond, two of which enter wetlands at the southwestern end of the lake. There is also evidence of intermittent and ephemeral tributaries (Heinemann et al. 1985). One small island occurs at the southern end of the pond (Figure 47.1). The pond is privately owned and has been a potable water source for the Village of Tupper Lake. A concrete dam is at the outlet. The lake reaches a maximum depth of 32.0 m (105 ft) (Figure 47.2).

Figure 47.1 Catchment

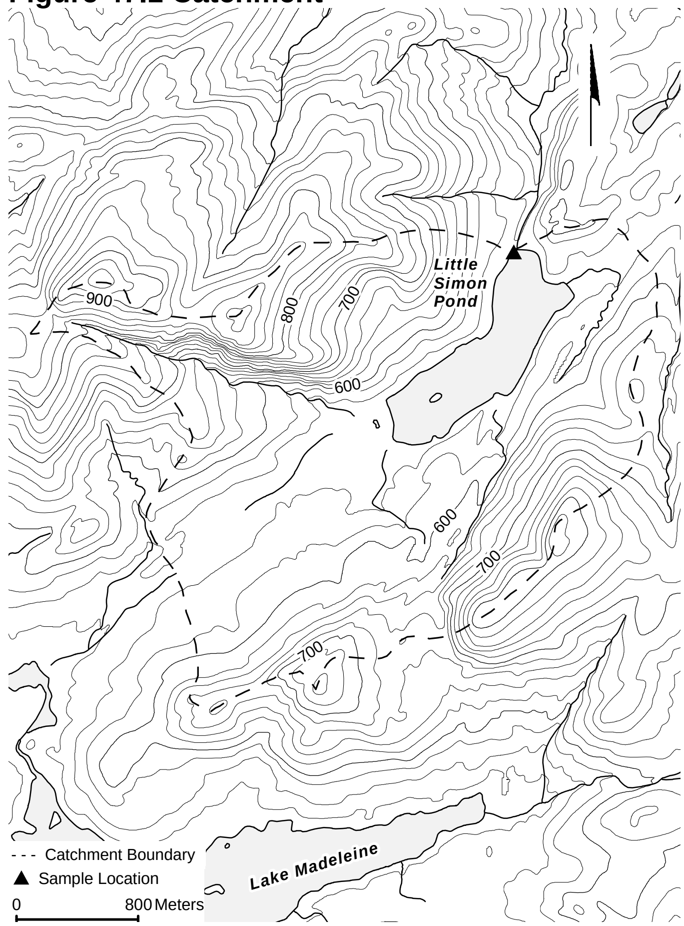
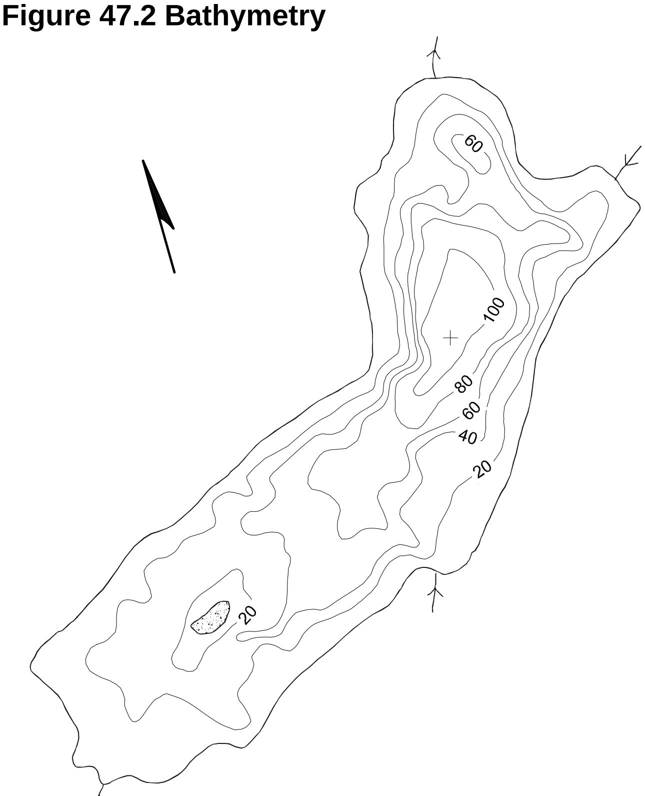


Figure 47.2 Bathymetry



Maximum Depth (+): 105 ft
Source: ALSC Rec'd c. 1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	44.16154	-74.44130	44° 09' 41.5" N	074° 26' 28.7" W
Lake centroid	44.15500	-74.44328	44° 09' 18.0" N	074° 26' 35.8" W

Table 47.1 Lake Chemistry

060182			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	111.39	143.45	128.15	78.62	101.52	86.49	58.57	79.68	66.93	µeq L^{-1}
NO_3^-	5.68	49.44	20.68	7.47	40.25	14.24	9.38	46.76	21.10	µeq L^{-1}
Cl^-	7.90	11.56	9.26	6.52	10.71	7.87	5.65	10.96	7.76	µeq L^{-1}
F^-	1.79	3.26	2.86	1.82	3.08	2.61	2.07	3.03	2.43	µeq L^{-1}
ANC	9.12	132.24	74.14	17.28	109.91	75.43	24.93	119.08	77.57	µeq L^{-1}
DIC	88.25	190.66	138.83	78.26	162.35	117.83	76.50	159.13	122.96	µmol L^{-1}-C
DOC	252.60	406.87	287.55	286.15	373.32	326.02	269.77	436.77	353.07	µmol L^{-1}-C
SiO_2	69.23	105.52	88.64	82.68	110.51	92.52	82.08	109.91	91.57	µmol L^{-1}
Ca^{2+}	129.25	226.06	175.74	108.79	172.17	147.58	110.81	166.79	136.45	µeq L^{-1}
Mg^{2+}	26.33	41.97	35.18	20.57	24.69	22.93	18.67	24.33	21.38	µeq L^{-1}
Na^+	22.62	30.01	25.01	22.18	29.58	24.41	24.28	30.09	26.55	µeq L^{-1}
K^+	5.63	6.91	6.29	2.81	4.60	3.93	3.60	5.50	4.22	µeq L^{-1}
NH_4^+	-1.39	3.27	0.91	-0.56	1.50	0.41	-0.12	1.42	0.72	µeq L^{-1}
AL_TD	2.59	16.16	7.46	3.69	13.75	6.45	4.03	10.31	5.82	µmol L^{-1}
AL_TM	0.16	12.37	3.48	1.78	5.15	2.59	1.59	4.85	2.52	µmol L^{-1}
AL_OM	0.16	4.86	2.06	1.75	3.60	2.16	1.64	4.25	2.28	µmol L^{-1}
AL_IM	0.00	9.07	1.54	0.00	1.67	0.46	0.00	1.32	0.29	µmol L^{-1}
LABPH	5.30	6.98	6.01	5.53	6.86	6.24	5.80	6.87	6.35	
AIREQPH	5.48	7.33	6.32	6.00	7.15	6.67	5.94	7.26	6.70	
TRUECOLOR	10	30	19	20	35	27	15	30	22	Pt Co
SCONDUCT	26.21	32.66	28.25	19.72	25.67	23.30	18.49	25.13	22.24	µS cm^{-1}
TOTALP	na	na	na	1.70	8.98	3.80	2.16	12.00	4.18	µg L^1
CHLORA	na	na	na	0.19	1.72	0.82	0.21	1.64	0.96	µg L^1

Table 47.2 Lake Characteristics

Parameter	Value
Elevation	546 m
Maximum depth	32.0 m
Mean depth	11.0 m
Volume	631.3 x 10^4 m^3
Surface area	58.1 ha
Watershed area	774 ha
Watershed ratio	0.08
Hydraulic retention time (year)	1.28
Watershed	Raquette
County, Town	Franklin, Altamont
USGS Quadrangle	Tupper Lake
Land use classification	Private – Resource Management

Little Simon Pond is classified as a medium-till drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). It is considered moderately sensitive to acidification. The ALTM program began monthly monitoring in June 1992. Sampling frequency was modified to annual (July or August) starting in 2014.

Lake Chemistry: Little Simon Pond was sampled during the ALS on August 12, 1985 finding: Lab pH 5.71, ANC 11.4 µeq L^{-1}, SO_4^{2-} 152.40 µeq L^{-1}, NO_3^- 5.99 µeq L^{-1}, Ca^{2+} 113.78 µeq L^{-1}, Mg^{2+} 31.27 µeq L^{-1}, DOC 233.12 µmol L^{-1}-C (ALSC 1986). Since Little Simon Pond has a recent liming history, it is not reported in the ALTM overall water chemistry trend analyses. Table 47.1 summarizes recent water chemistry. Major analytes through 2013 are shown in Table 47.1 including total phosphorus (TP) and chloropyll a (Chl a). Plots through 2014 appear in Figure 47.3.

Figure 47.3 Chemistry Time Series

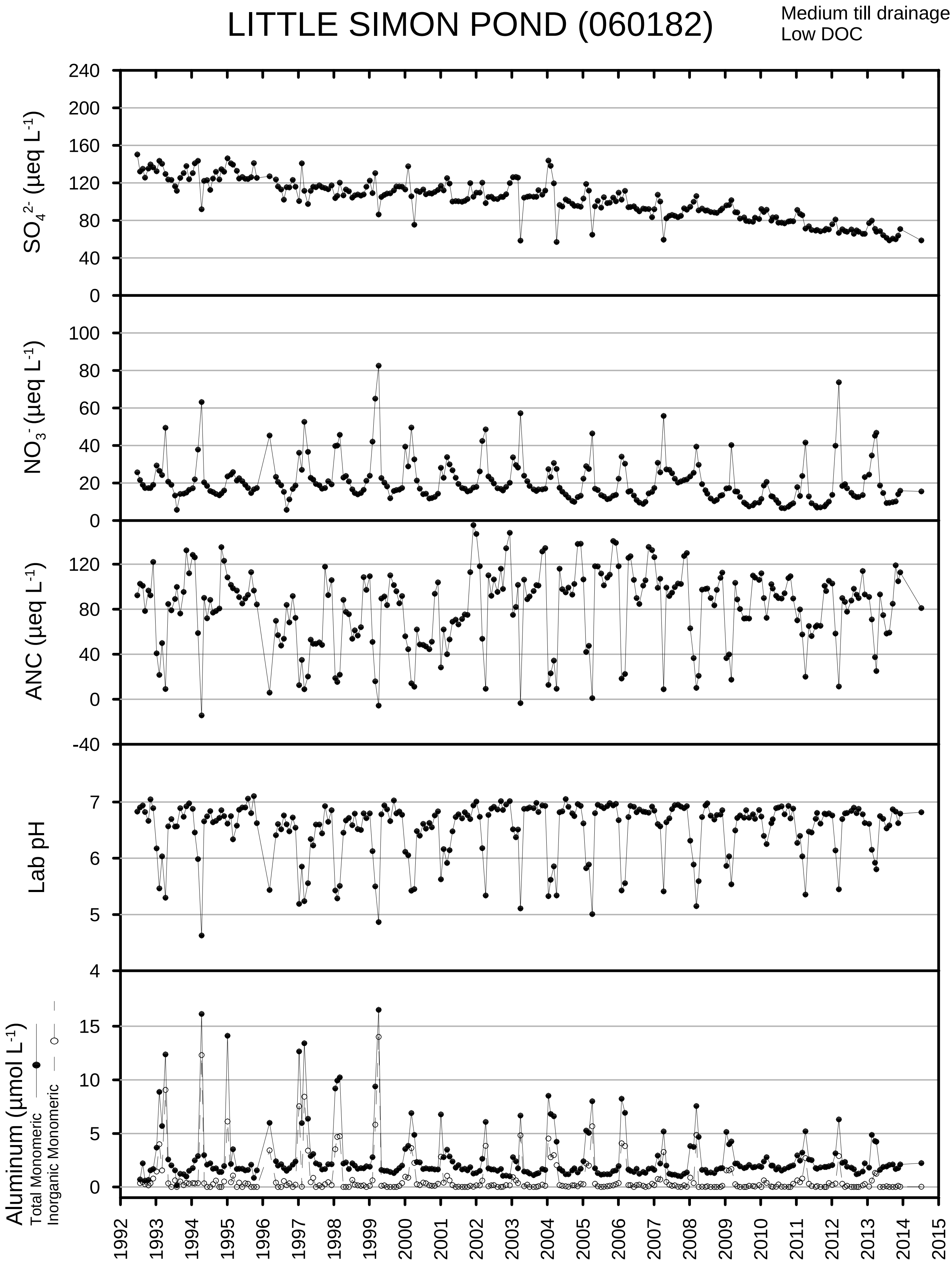


Table 47.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Nov-1985	Brook trout	70	-	-	-	-
Nov-1985	Lake trout	1	-	-	-	-
Nov-1985	Creek chub	49	-	-	-	-
Nov-1985	White sucker	56	-	-	-	-
Jun-2002	Brook trout	16	161	391	1864	16
Jun-2002	Lake trout	1	225	225	80	1
Jun-2002	Creek chub	45	76	125	411	179
Jun-2002	White sucker	37	55	344	2103	111
Oct-2011	Brook trout	14	90	337	1504	14
Oct-2011	Lake trout	1	429	-	586	1
Oct-2011	Creek chub	28	71	115	236	41
Oct-2011	White sucker	25	88	279	1188	79

Aquatic biota: The Lake Acidification Mitigation Project (LAMP) surveyed the lake in June through August of 1984 and found the crustacean community composed of three dominant copepods: the calanoid Diaptomus minutus, and the cyclopoids Mesocyclops edax and Cyclops scutifer. The survey found two cladocerans Bosmina longirostris and Daphnia catawba. Rotifers found were: Keratella taurocephala, Keratella hiemalis, Polyarthra spp., Collotheca spp., and Gastropus stylifer. Chlorophyll a concentrations ranged from 0.5 to 2.6 mg m^{-3}. The lake is relatively deep and experiences strong stratification in the summer. The lake is typically mixed by late fall (October–November) and ice covered by early December (Heinemann et al. 1985). The ALS found a thermocline between 8.0 and 10.0 m on August 12, 1985 (ALSC 1986).

Fisheries: The DEC stocked the lake with landlocked salmon, lake trout, and brook trout intermittently between 1915 and 1940. Brook trout were stocked from 1970 to 1983. Little Simon Pond is now privately managed. The lake was limed in 1985 during the LAMP study (Heinemann et al. 1985) and has been limed intermittently by the private land owner since then. In addition to the ALS fisheries survey on May 14, 1985, the ALSC netted the lake on June 19, 2002 and October 17, 2011 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 47.3 for recent netting history.

Intensive studies: Little Simon Pond was part of the Lake Acidification Mitigation Project (LAMP), which also included Woods Lake (040576) and Cranberry Pond, to assess the chemical and biological effects of liming on lake ecosystems. LAMP model calibrations were made from detailed geologic, hydrologic, bathymetric, baseline biota, and chemistry data collected in the survey (Heinemann et al. 1985). Little Simon Pond was one of 20 Adirondack lakes studied to evaluate regional trends in chrysophyte-inferred lake water pH changes (Cumming et al. 1994, Smol et al. 1998). Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. McNeil and others (2007) conducted a regional survey of foliar nitrogen in July and August 2003 that included study plots in this watershed.

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY20 Huntington Wildlife (start date October 31, 1978; elevation 500 m) located 27 km southeast of this lake. Retrieved January 19, 2017 from: [http://nadp.slh.wisc.edu.](http://nadp.slh.wisc.edu)

Watershed: Little Simon Pond and its watershed are underlain primarily (92%) by mangerite, pyroxene-hornblende syenite gneiss. A band of biotite and/or hornblende granite gneiss occupies approximately 6% of the watershed along the southern portion. Leucogranitic gneiss, found at higher elevations, occupies 2% of the watershed. General soils source data reveal 55% of the watershed as basal till along three quarters of the shoreline of Little Simon Pond and the entire eastern portion of the watershed. The western portion of the watershed is Potsdam 36% overall with the highest elevations showing Rawsonville 9% overall. The surficial geology source data show 81% of the watershed as till, silt to boulders, with the remaining 19% as exposed bedrock (APA 2001). Bedrock outcrops occur on both sides at the higher elevations. Unconsolidated deposits occur in parts of the watershed near the areas drained by the northeast inlet and along the base of Buck Mountain to the southwest. Other areas of unconsolidated deposits occur at the lake outlet and at the southwest shore of the lake. The rest of the 774 ha watershed is covered with shallow deposits of 3.0 m or less. Swamp deposits occur with the wetlands along the southwestern inlet (Heinemann et al. 1985). There is a lookout tower on Mt. Morris, the watershed's highest elevation, at 956 m. The maximum relief is 410 m. In 1985, the ALS characterized the shoal water substrate as 60% sand and gravel, 25% boulder and rubble, 10% bedrock and 5% organic (ALSC 1986).

Land cover/use: In 1985, the ALS found deciduous-coniferous mixed forest covered 70% of the watershed while 20% was deciduous forest, and 10% coniferous forest. The lake shoreline was predominately fringed with conifers described as: 40% deciduous-coniferous forest, 30% coniferous forest, and 20% deciduous forest (ALSC 1986). Total wetland area is 38.3 ha and comprises 5.3% of the watershed. The predominant wetland type is forested needle-leaved evergreen. Most of the wetlands occur along the main inlet stream. Small scrub-shrub wetlands occur at the shoreline where inlets enter the lake. The lake and its watershed are classified as Resource Management according to the APA Land Use and Development Plan Map. There is a private gravel road along the northwest part of the lake, which leads to a private camp with several outbuildings along the shoreline.

Watershed disturbance: The 1916 fire protection map shows most of the watershed (86%) as virgin or second growth green timber with no slash. The northeast portion (6%) of the watershed, in the higher elevations of Mt. Morris, is shown as waste and denuded lands with little flammable material. The November 1950 storm left 27% of the watershed with severe (50-100%) blowdown, and an additional 6% moderately (25-50%) damaged. The watershed was not impacted by the July 1995 microburst storm (APA 2001). This watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Sagamore Lake 060313
EPA ID: 1A1-059O

ALSC Staff Photo 2015

Lake: Sagamore Lake lies in the Raquette River watershed at 580 m. The primary tributary to this 68 ha lake flows from the eastern end of the watershed. This tributary is formed from two streams, East Inlet and Lost Brook, which drains from 3.2 ha Aluminum Pond (Figure 48.1). Two other smaller inlets occur on the south shore of Sagamore Lake. The lake outlet is uncontrolled and drains into South Inlet 1.25 km downstream. The lake reaches a maximum depth of 22.9 m (75.1 ft) (Figure 48.2).

Sagamore Lake is classified as a medium-till chain drainage lake, with high dissolved organic carbon (>500 µmol L^{-1}-C). It is considered moderately sensitive to acidification. The ALTM program began monthly monitoring of the lake at the outlet in June 1992 and it is sampled monthly.

Lake chemistry: Sagamore Lake was sampled near its deepest point during the ALS on July 8, 1986 finding: Lab pH 6.04, ANC 28.4 µeq L^{-1}, SO_4^{2-} 134.91 µeq L^{-1}, NO_3^- 1.46 µeq L^{-1}, Ca^{2+} 120.77 µeq L^{-1}, Mg^{2+} 45.26 DOC 591.12 µmol L^{-1}-C (ALSC 1987). Table 48.1 summarizes recent ALTM water chemistry collected at the outlet. Major analytes through 2013 are shown in Table 48.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 48.3 including spring melt data in red.

Figure 48.1 Catchment

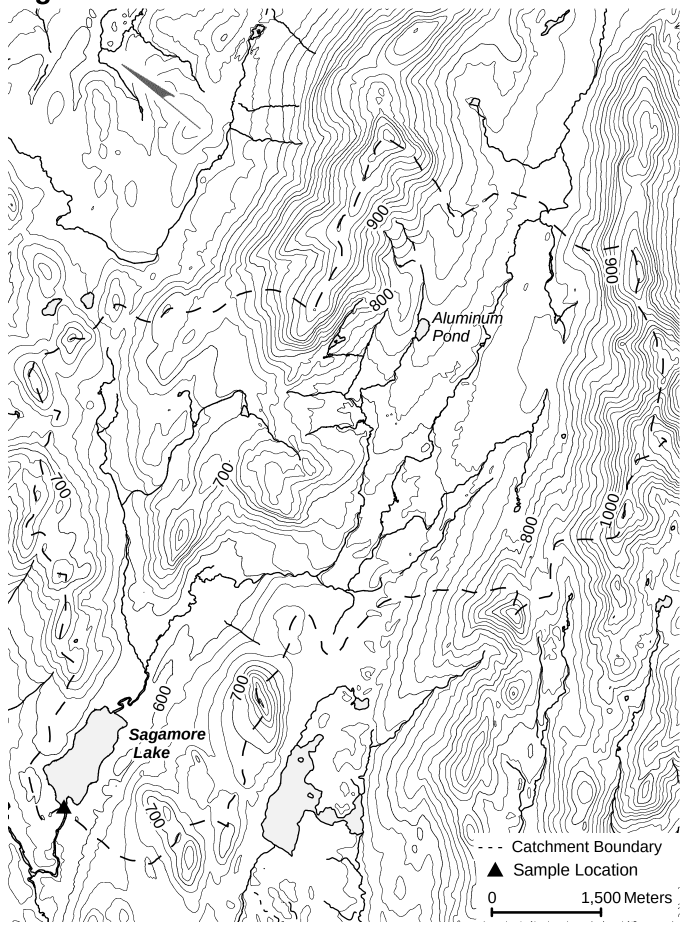
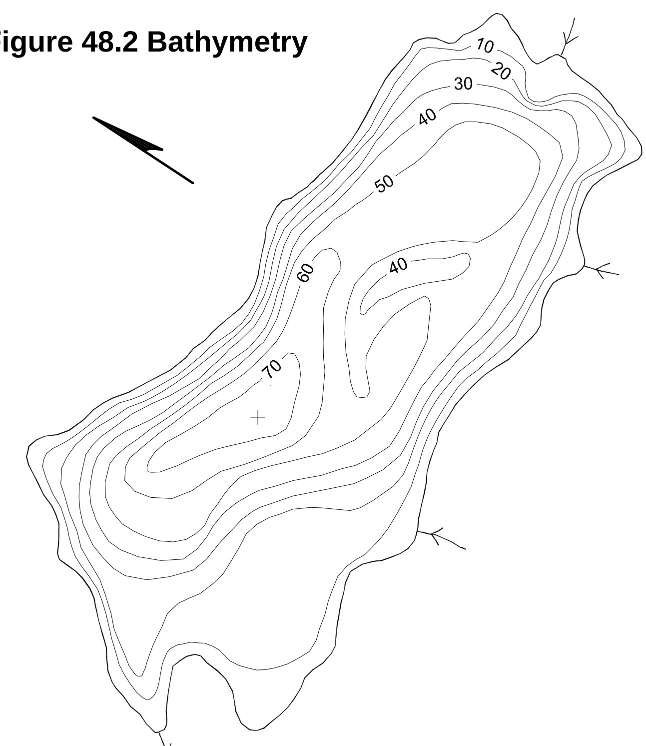


Figure 48.2 Bathymetry



Maximum Depth (+): 75 ft
Source: NYSDEC, ALSC Rev. 1986

1300'

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.76605	-74.62837	43° 45' 57.8" N	074° 37' 42.1" W
Lake centroid	43.76786	-74.61937	43° 46' 04.3" N	074° 37' 09.7" W

Table 48.1 Lake Chemistry

060313			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	108.06	154.07	135.00	66.06	105.40	82.65	49.97	89.84	67.41	μeq L^{-1}
NO_3^-	9.29	45.11	21.98	1.09	25.11	10.39	2.81	34.76	16.90	μeq L^{-1}
Cl^-	6.49	12.41	9.24	6.74	10.97	7.97	5.37	9.85	7.88	μeq L^{-1}
F^-	3.63	4.90	4.15	3.34	4.15	3.86	3.36	5.03	3.90	μeq L^{-1}
ANC	9.75	67.03	34.47	22.13	76.42	47.82	29.23	77.46	50.98	μeq L^{-1}
DIC	40.80	159.85	82.84	44.96	141.54	89.02	67.49	151.62	103.91	μmol L^{-1}-C
DOC	407.79	704.93	532.17	471.23	924.80	664.11	487.35	1033.41	747.86	μmol L^{-1}-C
SiO_2	89.21	170.59	133.20	95.53	161.60	126.14	99.24	160.17	132.24	μmol L^{-1}
Ca^{2+}	90.82	164.68	127.75	80.34	109.79	98.74	80.54	118.63	97.46	μeq L^{-1}
Mg^{2+}	34.56	58.42	49.03	31.27	47.73	40.43	32.71	47.88	40.00	μeq L^{-1}
Na^+	21.31	46.11	32.73	24.79	40.45	33.17	30.03	43.08	35.74	μeq L^{-1}
K^+	7.16	9.21	7.97	4.60	6.91	5.89	4.02	8.18	6.01	μeq L^{-1}
NH_4^+	-1.39	1.05	0.33	-0.50	1.90	0.26	0.07	1.26	0.59	μeq L^{-1}
AL_TD	7.19	16.38	11.20	8.71	12.12	10.30	7.56	13.92	10.59	μmol L^{-1}
AL_TM	1.78	10.46	6.11	4.06	6.41	4.76	4.02	6.80	5.31	μmol L^{-1}
AL_OM	0.93	17.31	4.96	3.00	5.68	4.00	3.08	6.10	4.73	μmol L^{-1}
AL_IM	0.00	4.81	1.78	0.00	1.78	0.81	0.00	1.54	0.64	μmol L^{-1}
LABPH	5.12	6.64	5.65	5.52	6.30	5.93	5.64	6.41	5.95	
AIREQPH	5.21	6.84	5.77	5.79	6.67	6.27	5.99	6.85	6.33	
TRUECOLOR	35	60	45	50	140	84	50	140	88	Pt Co
SCONDUCT	22.57	30.42	26.69	18.58	24.28	20.91	17.52	24.97	20.77	μS cm^{-1}
TOTALP	na	na	na	3.39	8.13	5.84	6.14	25.11	10.60	μg L^1
CHLORA	na	na	na	0.39	3.07	1.64	0.25	6.87	2.00	μg L^1

Table 48.2 Lake Characteristics

Parameter	Value
Elevation	580 m
Maximum depth	22.9 m
Mean depth	10.5 m
Volume	713.1 x 10^4 m^3
Surface area	68.0 ha
Watershed area	4,723.0 ha
Watershed ratio	0.01
Hydraulic retention time (year)	0.20
Watershed	Raquette
County, Town	Hamilton, Long Lake
USGS Quadrangle	Raquette lake
Land use classification	Blue Ridge Wilderness

Aquatic biota: On October 9, 1986, the ALS identified the following aquatic plants: Sphagnum spp.; Sparganium spp.; Carex spp.; Equisetum spp. and Eriocaulon spp. A dip-net survey on that date found the following Insecta: Odonata Macromiidae and Gomphidae; Ephemeroptera Leptophlebiidae, Heptageniidae and Unspecified; Megaloptera Sialidae; Trichoptera Molannidae; and Coleoptera Elmidae. Also found were Crustacea: Amphipoda Unspecified; Decapoda Astacidae as well as Pelecypod Veneroida Sphaeriidae. The lake was thermally stratified between 4.0 and 5.0 m on July 8, 1986 (ALSC 1987). The AEAP reported an average value of chlorophyll a of 1.29 μg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: Sagamore Lake was stocked with brook trout three times between 1955 and 1961 (ALSC 1987). Lake and brook trout are considered Natural Spawning Adequate (NSA) (NYSDEC 2005). In addition to the ALS fisheries survey on October 1, 1986, the ALSC netted the lake on June 18, 2001 and September 15, 2011 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 48.3 for netting history.

Figure 48.3 Chemistry Time Series

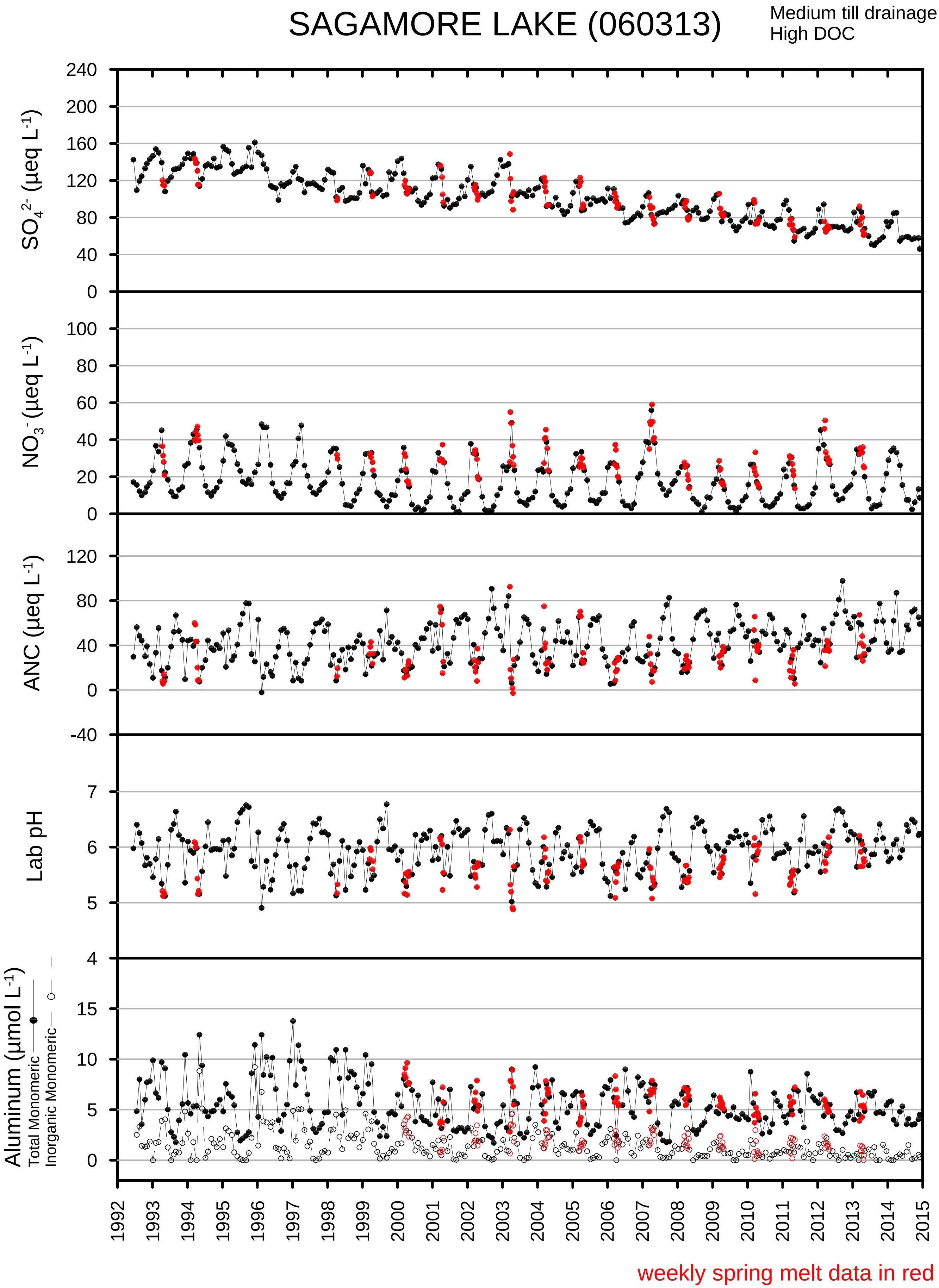


Table 48.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Oct-1986	Lake whitefish	1	521	521	1000	1
Oct-1986	Brook trout	17	169	292	1645	17
Oct-1986	Lake trout	27	350	555	20625	27
Oct-1986	Creek chub	10	175	198	610	10
Oct-1986	Longnose sucker	12	364	430	8290	12
Oct-1986	White sucker	25	174	390	6075	63
Oct-1986	Brown bullhead	9	162	205	760	9
Oct-1986	Yellow perch	25	144	187	1195	47
Jun-2001	Brook trout	7	185	240	671	7
Jun-2001	Lake trout	7	366	695	6125	7
Jun-2001	Lake chub	3	102	115	29	3
Jun-2001	Creek chub	1	151	151	39	1
Jun-2001	Longnose sucker	8	263	480	4252	8
Jun-2001	White sucker	29	93	430	9036	76
Jun-2001	Brown bullhead	12	134	205	824	12
Jun-2001	Pumpkinseed	4	100	125	97	4
Jun-2001	Smallmouth bass	1	195	195	95	1
Jun-2001	Yellow perch	9	80	177	163	13
Sep-2011	Lake whitefish	4	262	418	2276	4
Sep-2011	Brook trout	11	217	392	3558	11
Sep-2011	Lake trout	3	400	520	2036	3
Sep-2011	Splake	6	180	382	1916	6
Sep-2011	Creek chub	14	79	187	295	14
Sep-2011	Longnose sucker	25	176	448	7180	25
Sep-2011	White sucker	27	204	373	6292	97
Sep-2011	Brown bullhead	25	125	263	2728	25
Sep-2011	Pumpkinseed	7	65	125	101	7
Sep-2011	Smallmouth bass	10	187	418	6313	10
Sep-2011	Yellow perch	19	106	229	932	19

Intensive studies: The Integrated Lake-Watershed Acidification Study (ILWAS) considered Sagamore Lake the intermediately sensitive of the three lakes that included Woods Lake (ALTM) and Panther Lake. All three study lakes had detailed soils and bedrock maps developed to evaluate acidification and aluminum mobilization processes (Schofield et al. 1985). Sullivan and others (1996) evaluated landscape changes with sediment records at this site. Sagamore Lake was studied by the Mercury Response Project to evaluate mercury in fish, sampled on September 30, 1992 and October 11, 2005 (Dittman and Driscoll 2009). The lake has been studied by the Adirondack Effects Assessment Program beginning in 1994 (Momen et al. 2006). Sagamore Lake was studied as part of the Adirondack/Catskill comparison study from 1992–2001 (Burns et al. 2005, Burns et al. 2006). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 30 km southwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The lake and watershed are primarily underlain by interlayered, metasedimentary rock and granitic gneiss. Approximately 2% of the watershed is underlain by amphibolite, or pyroxenic amphibolite, both of which have medium to high ANC. The remaining 17% of the watershed lies on charnockite, granitic and quartz syenite gneiss that are found in the southeast. This rock has relatively no to low ANC (Roy et al. 1997). Eighty-three percent of the watershed is overlain by till, 10.2% by exposed bedrock, 4.6% kame deposits, and 2.5% by outwash sand and gravel. Kame deposits surround the lake. Bedrock outcrops generally occur above 700 m. Sand and gravel deposits are associated with the Aluminum Pond watershed. Basal till comprises 51.5% of the overall watershed, and shallow to bedrock soils 34.3% in areas above 700 m. Organic soils make up 4.3% of the watershed, while glacial outwash covers approximately 10% (APA 2001). The highest elevation in the watershed is Wakely Mountain at 1148 m. The maximum relief is 568 m. In 1986, the ALS found the shoal water substrate around the lake comprised of 60% gravel/sand; 35% boulder/rubble and 5% organic (ALSC 1987).

Land cover/use: In 1986, the ALS found deciduous-coniferous mixed forest covered 85% of the watershed, while the remaining cover was 10% deciduous and 5% coniferous forest. The immediate shoreline consisted of 69% coniferous forest, 20% deciduous-coniferous mixed forest, 5% shrub-sapling mix, 5% boulder-rock ledge and 1% developed (ALSC 1987). Total wetland area is 626 ha and comprises 13% of the watershed. The predominant wetland type is forested needle-leaf evergreen (428 ha). The largest area of emergent marsh is associated with the main inlet. Smaller patches of emergent marsh and broad leaf evergreen scrub-shrub are found along the eastern shoreline. Major wetlands occur over the glacial outwash sections of the watershed between Aluminum Pond and higher elevations to the south (APA 2001, Karasin et al. 2002).

The lake and watershed occur almost exclusively within the Blue Ridge Wilderness (NYSDEC 2006). Historic Camp Sagamore is a 7.0 ha private in-holding at the outlet. This private land is classified as Resource Management. Camp Sagamore was built in 1897 by W.W. Durant for his personal use, later owned by the Vanderbilt family and is currently owned and operated by the Sagamore Institute of the Adirondacks, Inc. A gravel road leads to a complex of buildings on the Sagamore property on the southeast corner of the lake. A hiking trail circumnavigates the lake.

Watershed disturbance: The 1916 fire protection source data shows the watershed as 100% green timber with no slash. The November 1950 storm source data shows 33% of the watershed was severely disturbed (50-100% blowdown) in the northern portion of the watershed. Less than 1% of the watershed was moderately disturbed with 25-50% blowdown occurring in the southwestern corner. The July 1995 microburst storm source data shows 24% of the watershed, in the same northern portion, had low levels (0-30% change in crowns) of disturbance. The remaining portion of the watershed was outside the study area (APA 2001). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Raquette Lake Reservoir 060315A

EPA ID: 060315AO

ALSC Staff Photo 2015

Lake: Raquette Lake Reservoir lies in the Raquette River watershed at 564 m. This small 1.5 ha headwater lake has one major inlet at its southern end (Figure 49.1). A concrete dam forms the outlet that flows into Raquette Lake about 1.7 km downstream. The lake reaches a maximum depth of 3.0 m (9.8 ft) near the outlet (Figure 49.2).

Raquette Lake Reservoir is classified as a medium-till drainage lake, with high dissolved organic carbon (>500 µmol L^{-1}-C). The lake is considered moderately sensitive to acidification. The ALTM program began monthly monitoring of the lake at the outlet in June 1992.

Lake chemistry: Raquette Lake Reservoir was sampled during the ALS on July 11, 1985 finding: Lab pH 6.61, ANC 66.8 µeq L^{-1}, SO_4^{2-} 153.44 µeq L^{-1}, NO_3^- 0.32 µeq L^{-1}, Ca^{2+} 136.24 µeq L^{-1}, Mg^{2+} 51.84 µeq L^{-1}, DOC 591.12 µmol L^{-1}-C (ALSC 1986). Table 49.1 summarizes recent water chemistry at the outlet. Major analytes through 2013 are shown in Table 49.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 49.3 including spring melt data in red.

Aquatic biota: On October 10, 1985, the ALS found submergent vegetation covered 10% of the lake bottom, while emergent and floating plants occupied 4% and 1% of the lake surface, respectively. Aquatic plants identified were: Sparganium spp.; Potamogeton spp.; Nuphar spp.; Carex spp.; Equisetum spp.; Juncus spp.; Iris spp.; Sphagnum spp.; Fontinalis spp.; Isoetes spp.; Scirpus spp.; and several Algae. A dip-net survey on that date found the following Insecta: Odonata

Figure 49.1 Catchment

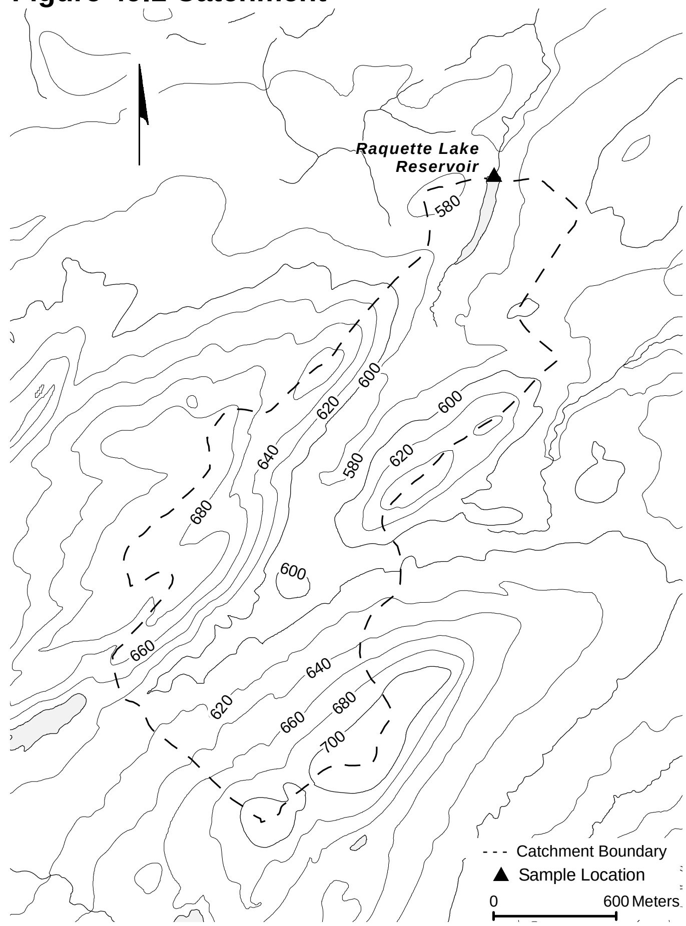
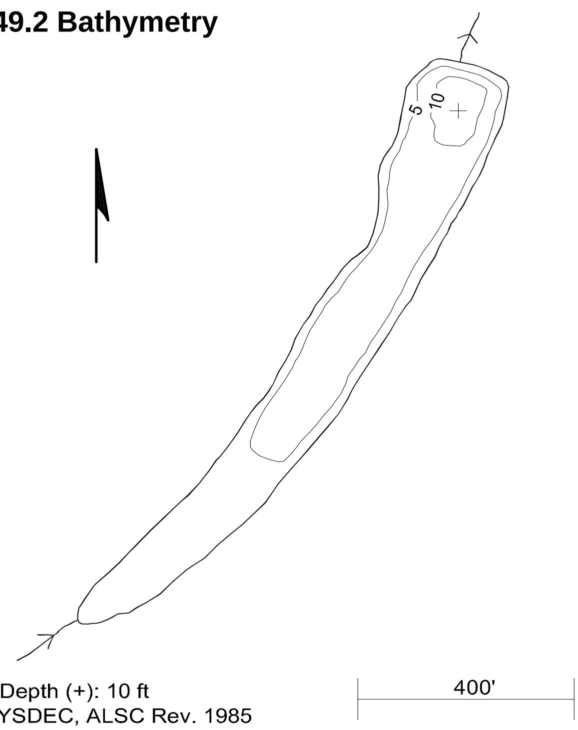


Figure 49.2 Bathymetry



Maximum Depth (+): 10 ft
Source: NYSDEC, ALSC Rev. 1985

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Sample site	43.79492	-74.65130	43° 47’ 41.7” N	074° 39’ 04.7” W
Lake centroid	43.79327	-74.65153	43° 47’ 35.8” N	074° 39’ 05.5” W

Table 49.1 Lake Chemistry

060315A			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	104.93	164.06	141.37	47.38	116.37	79.34	37.65	100.24	69.91	μeq L^{-1}
NO_3^-	2.26	34.94	16.33	0.00	32.98	9.19	0.00	34.03	13.55	μeq L^{-1}
Cl^-	7.62	13.82	10.60	5.81	13.79	8.74	5.74	13.86	8.78	μeq L^{-1}
F^-	3.21	4.63	3.81	2.42	3.63	3.24	3.30	4.60	3.63	μeq L^{-1}
ANC	-21.54	62.36	23.61	3.72	61.58	27.96	17.54	127.66	47.76	μeq L^{-1}
DIC	49.95	179.83	98.31	72.43	267.25	136.62	107.04	248.60	173.66	μmol L^{-1}-C
DOC	311.71	995.16	593.09	411.20	980.80	683.57	438.97	1103.41	671.76	μmol L^{-1}-C
SiO_2	92.70	174.59	123.98	56.42	168.09	106.60	65.53	151.98	117.44	μmol L^{-1}
Ca^{2+}	101.80	157.69	122.43	69.37	91.82	82.59	70.43	121.56	87.39	μeq L^{-1}
Mg^{2+}	34.56	55.13	44.30	23.04	37.85	31.03	25.83	50.97	33.98	μeq L^{-1}
Na^+	19.57	44.80	31.90	20.01	37.84	29.84	28.99	53.52	35.91	μeq L^{-1}
K^+	6.39	11.51	8.23	2.56	12.37	6.99	2.69	12.36	7.92	μeq L^{-1}
NH_4^+	-1.39	2.33	0.50	-0.84	2.77	0.54	0.02	2.38	0.99	μeq L^{-1}
AL_TD	8.04	17.35	13.77	9.30	15.42	12.29	5.34	17.34	10.41	μmol L^{-1}
AL_TM	3.20	13.71	8.39	4.89	8.36	6.44	2.76	7.85	5.70	μmol L^{-1}
AL_OM	0.87	9.04	5.06	2.82	8.63	4.73	3.17	7.17	4.69	μmol L^{-1}
AL_IM	0.00	7.20	3.35	0.00	2.96	1.73	0.00	3.25	1.07	μmol L^{-1}
LABPH	4.64	6.24	5.20	5.03	5.85	5.39	5.27	6.40	5.57	
AIREQPH	4.57	6.70	5.22	5.06	6.38	5.60	5.44	7.27	5.95	
TRUECOLOR	30	90	48	40	200	94	35	180	78	Pt Co
SCONDUCT	23.77	32.94	27.31	16.58	23.18	19.56	15.89	25.6	20.44	μS cm^{-1}
TOTALP	na	na	na	1.66	10.51	5.15	4.51	21.16	9.15	μg L^1
CHLORA	na	na	na	0.22	1.96	1.00	0.26	4.05	1.46	μg L^1

Table 49.2 Lake Characteristics

Parameter	Value
Elevation	564 m
Maximum depth	3.0 m
Mean depth	1.6 m
Volume	2.4×10^4 m^3
Surface area	1.5 ha
Watershed area	305.5 ha
Watershed ratio	0.01
Hydraulic retention time (year)	0.01
Watershed	Raquette
County, Town	Hamilton, Long Lake
USGS Quadrangle	Raquette Lake
Land use classification	Moose River Plains Wild Forest

Coenagriidae; Ephemeroptera Leptophlebiidae; and Megaloptera Sialidae. The lake was thermally stratified between 1.5 and 2.0 m on July 11, 1985 (ALSC 1986). The AEAP reported an average value of chlorophyll a of 10.3 μg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: The DEC annually stocked the lake with brook trout from 1957 to 1963. This lake is considered Natural Spawning Adequate for brook trout (NYSDEC 2011). In addition to the ALS fisheries survey on October 10, 1985, the ALSC netted the lake on June 19, 2001 and September 27, 2011 (Roy et al. 2015, Baldigo et al. 2016). Refer to Table 49.3 for recent netting history.

Intensive studies: Raquette Lake Reservoir has been studied by the AEAP (Momen et al. 2006). McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Figure 49.3 Chemistry Time Series

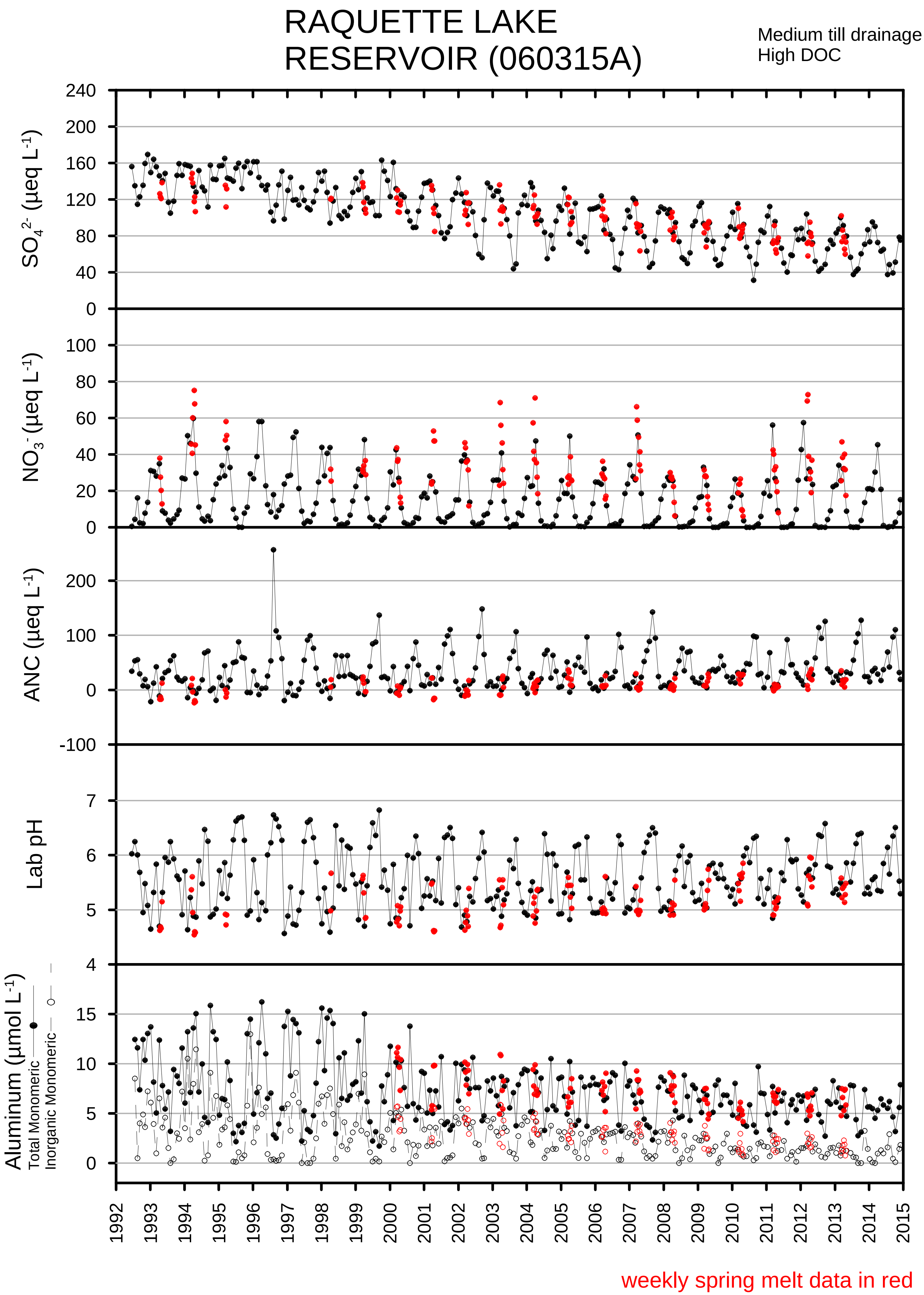


Table 49.3 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Oct-1985	Brook trout	15	97	404	3543	17
Oct-1985	Brown bullhead	16	71	206	858	21
Jun-2001	Brook trout	22	154	285	2517	22
Jun-2001	Brown bullhead	25	67	149	302	140
Sep-2011	Brook trout	18	107	355	3240	18
Sep-2011	Brown bullhead	25	84	204	1301	32

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 30 km southwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Raquette Lake Reservoir watershed lies primarily on interlayered, metasedimentary rock and granitic gneiss. Undivided metasedimentary rock and related migmatite found in a band near the outlet of the lake underlie 2% of the watershed. Till overlays 65% of the watershed, while exposed bedrock is primarily found above 650 m. A small area, 1% of the watershed near the outlet, is outwash sand and gravel. Basal till overlays 54% of the watershed area and encompasses 100% of the immediate shoreline of the lake. Becket, Tunbridge and Rawsonville soils predominate (APA 2001, Karasin et al. 2002). The maximum elevation in the watershed is 717 m and the maximum relief is 153 m. The ALS described the shoal water substrate around the lake as: 50% sand/gravel, 40% bedrock/boulder and rubble, and 10% muck/silt (ALSC 1986).

Land cover/use: In 1985, the ALS described the watershed as: 50% coniferous forest, 45% deciduous forest, 3% wetland and 2% shrub/sapling mixed vegetation. The immediate shoreline was fringed with 70% coniferous forest, 20% deciduous forest, 5% shrub/sapling, and 5% wetland/open grass vegetation (ALSC 1986). Total wetland area is 13.2 ha and comprises 4.3% of the watershed. The predominant wetland vegetation types are: scrub-shrub broad-leaf deciduous (5.6 ha) in association with the major inlet in the south. Forested needle-leaf evergreen (7.5 ha) is found in patches in the upland areas associated with scrub-shrub wetland (APA 2001, Karasin et al. 2002).

The Raquette Lake Reservoir was created in 1931 by the construction of a 13-foot concrete dam in the course of an unnamed tributary to Raquette Lake. The lake served as a potable water source for the village of Raquette Lake until 2005. A gated road leads to the lake from the east. The watershed lies entirely within the Moose River Plains Wild Forest (NYSDEC 2011).

Watershed disturbance: The 1916 fire protection source data shows 100% of the watershed as virgin and second growth green timber with no slash. The November 1950 storm severely damaged 48% of the watershed with 50-100% blowdown, and moderately damaged 44% of the watershed with 25-50% blowdown. The July 1995 microburst storm affected 100% of the watershed with low (0-30% change in crowns) damage (APA 2001). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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Queer Lake   060329
EPA ID: 1A1-089O

ALSC Staff Photo 2015

Lake: Queer Lake lies in the Raquette River watershed on the Oswegatchie-Black River watershed divide at 597 m. The main tributary derives flow from an unnamed pond approximately 1500 m upstream (Figure 50.1). A number of intermittent streams occur along the shoreline of this 54.5 ha lake. In 1986, the ALS reported an inactive beaver dam at the lake outlet. The outlet flows into Sucker Brook approximately 300 m downstream. The lake reaches a maximum depth of 21.3 m (69.9 ft) (Figure 50.2).

Queer Lake is classified as a thin-till chain drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. This lake is accessed by helicopter and sampling frequency at this pond was modified to seasonal in 2014.

Lake chemistry: Queer Lake was sampled near its deepest point during the ALS on July 8, 1986 finding: Lab pH 5.47, ANC 1.9 µeq L^{-1}, SO_4^{2-} 122.63 µeq L^{-1}, NO_3^- 3.24 µeq L^{-1}, Ca^{2+} 92.32 µeq L^{-1}, Mg^{2+} 27.16 µeq L^{-1}, DOC 191.49 µmol L^{-1}-C (ALSC 1987). Table 50.1 summarizes recent ALTM water chemistry including total phosphorus and chlorophyll a (Chl a). Major analytes through 2013 are shown in Table 50.1. Plots through 2014 appear in Figure 50.3.

Figure 50.1 Catchment

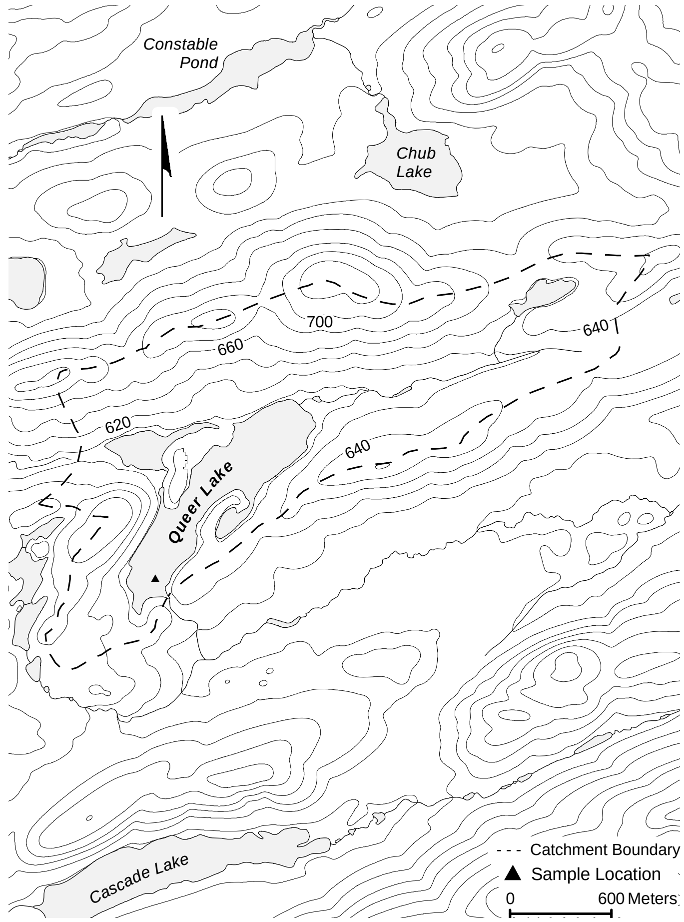
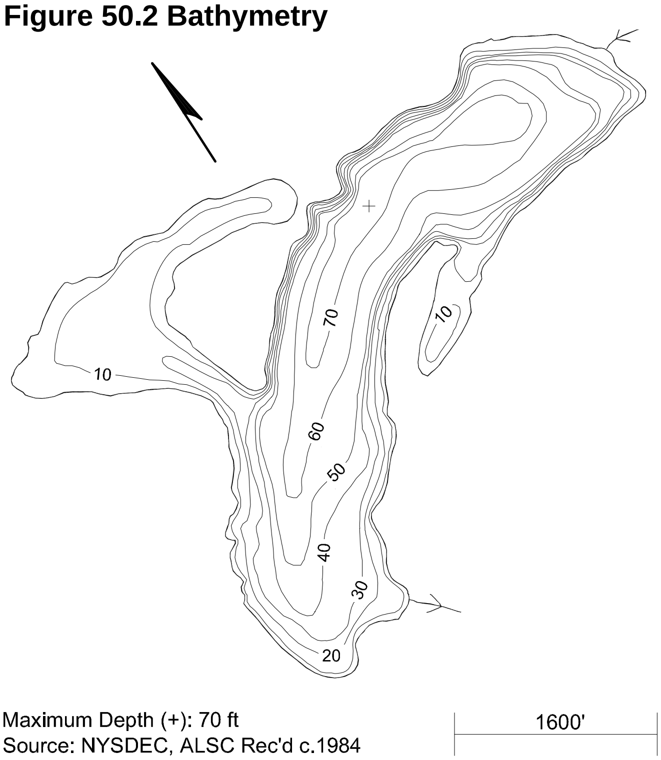


Figure 50.2 Bathymetry



Maximum Depth (+): 70 ft
Source: NYSDEC, ALSC Rec'd c.1984

Geographic coordinates (NAD 83)

	Latitude Φ DD.ddd	Longitude λ DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.80543	-74.80230	43° 48′ 19.5″ N	074° 48′ 08.3′′ W
Helo sample site	43.80596	-74.80352	43° 48′ 21.4′′ N	074° 48′ 12.7′′ W
Lake centroid	43.81181	-74.79889	43° 48′ 42.5″ N	074° 47′ 56.0′′ W

Table 50.1 Lake Chemistry

060329			1993			2009			2013	
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	107.22	143.03	120.57	69.51	83.06	75.50	50.93	66.00	58.88	µeq L^{-1}
NO_3^-	12.40	48.06	20.33	4.25	11.79	7.68	7.91	25.09	14.21	µeq L^{-1}
Cl^-	7.05	13.26	8.96	6.30	8.39	7.07	5.80	8.92	6.74	µeq L^{-1}
F^-	3.05	5.26	3.89	3.13	3.78	3.28	2.79	3.48	3.16	µeq L^{-1}
ANC	-16.47	14.28	4.14	12.60	31.66	22.65	-6.95	32.09	22.02	µeq L^{-1}
DIC	6.66	89.92	54.53	26.03	126.55	58.37	27.05	84.21	54.32	µmol L^{-1}-C
DOC	150.94	405.62	243.00	253.71	356.00	288.61	273.68	469.20	321.92	µmol L^{-1}-C
SiO_2	34.12	60.91	47.64	37.36	54.26	46.11	37.10	57.85	48.20	µmol L^{-1}
Ca^{2+}	75.85	130.25	94.73	74.85	83.34	77.30	47.21	76.23	69.83	µeq L^{-1}
Mg^{2+}	19.75	38.68	28.05	20.57	22.59	21.88	13.81	22.51	20.18	µeq L^{-1}
Na^+	13.05	22.62	17.25	16.09	20.01	17.82	17.80	20.18	19.21	µeq L^{-1}
K^+	6.91	13.04	8.55	5.12	7.16	6.06	4.90	6.49	5.60	µeq L^{-1}
NH_4^+	0.61	3.83	2.52	-0.21	2.61	1.10	-0.06	5.29	1.46	µeq L^{-1}
AL_TD	2.71	19.57	7.37	1.32	6.82	3.98	1.28	8.39	3.81	µmol L^{-1}
AL_TM	2.24	16.59	5.96	1.66	3.60	2.35	1.62	6.41	2.56	µmol L^{-1}
AL_OM	0.33	3.97	1.67	1.72	2.82	2.08	1.56	3.59	2.09	µmol L^{-1}
AL_IM	1.52	12.65	4.29	0.00	1.59	0.32	0.00	2.83	0.48	µmol L^{-1}
LABPH	4.58	5.73	5.15	5.53	6.29	5.89	4.75	6.37	5.60	
AIREQPH	4.63	5.89	5.17	5.82	6.46	6.15	4.88	6.45	5.77	
TRUECOLOR	5	30	13	15	30	24	15	40	20	Pt Co
SCONDUCT	19.28	28.83	22.10	15.41	17.81	16.19	14.06	17.92	15.43	µS cm^{-1}
TOTALP	na	na	na	0.35	4.80	2.52	1.85	9.83	3.83	µg L^1
CHLORA	na	na	na	0.53	9.68	2.48	0.42	2.54	1.31	µg L^1

Table 50.2 Lake Characteristics

Parameter	Value
Elevation	597 m
Maximum depth	21.3 m
Mean depth	10.9 m
Volume	596.0 x 10^4 m^3
Surface area	54.5 ha
Watershed area	375.4 ha
Watershed ratio	0.15
Hydraulic retention time (year)	2.1
Watershed	Raquette
County, Town	Hamilton, Long Lake
USGS Quadrangle	Eagle Bay
Land use classification	Pigeon Lake Wilderness

Aquatic biota: On May 21, 1986, the ALS found submergent vegetation covered 1% of the lake bottom. Aquatic plants identified were: Eriocaulon spp., Utricularia spp. and numerous Algae. A dip-net survey on that date found the following Insecta: Odonata Libellulidae; Ephemeroptera Leptophlebiidae; Trichoptera Limnephilidae; Coleoptera Dytiscidae; Diptera Chironomidae; Hemiptera Corixidae and Gerridae. Also found were Crustacea: Amphipoda Unspecified and Decapoda Astacidae; as well as Demospong Haplosclerina Spongillidae. The lake was thermally stratified between 6.0 and 8.0 m on July 8, 1986 (ALSC 1987). The AEAP reported an average value of chlorophyll a of 0.81 µg L^{-1} in 2003 (Momen et al. 2006).

Fisheries: The DEC manages the lake as a coldwater fishery (NYSDEC 1992) and stocked the lake with brook trout each year from 1942 to 1975 (ALSC 1987). Stocking resumed in 1995 and continues annually. In addition to the ALS fisheries survey on May 22, 1986, the ALSC netted the lake on June 14, 1999 and October 20, 2010 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 50.3 and 50.4 for recent fish stocking and netting histories.

Figure 50.3 Chemistry Time Series

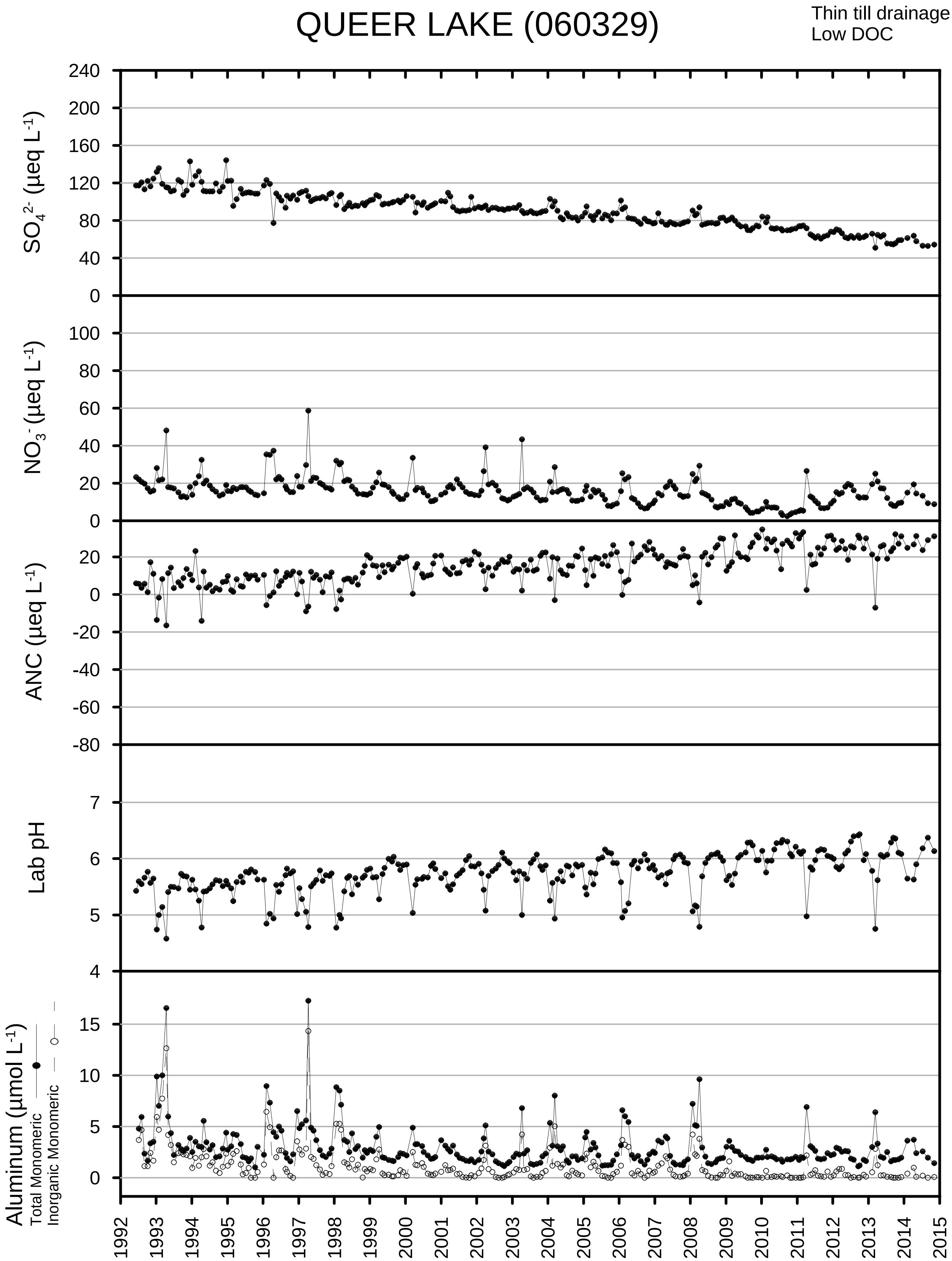


Table 50.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1995	Brook trout	2050	62
1996	Brook trout	2200	44
1997	Brook trout	2310	35
1998	Brook trout	2310	30
1999	Brook trout	2200	32
2000	Brook trout	2200	28
2001	Brook trout	3960	39
2002	Brook trout	2200	52
2003	Brook trout	2200	52
2004	Brook trout	2200	52
2005	Brook trout	2200	52
2006	Brook trout	2420	39
2007	Brook trout	2200	31
2008	Brook trout	2200	44
2009	Brook trout	2200	32
2010	Brook trout	1000	22
2011	Brook trout	1200	15
2012	Brook trout	800	10
2013	Brook trout	2200	3
2014	Brook trout	2200	33

Table 50.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-1986	Brook trout	18	173	395	3880	18
May-1986	Golden shiner	1	110	110	13	1
May-1986	White sucker	2	480	530	2650	2
May-1986	Brown bullhead	26	75	203	1077	217
May-1986	Pumpkinseed	10	62	141	185	10
Jun-1999	Brook trout	20	160	362	3179	20
Jun-1999	Lake trout	2	425	540	2200	2
Jun-1999	Golden shiner	3	72	90	17	3
Jun-1999	White sucker	4	485	510	5300	4
Jun-1999	Brown bullhead	28	65	162	658	37
Jun-1999	Banded killifish	11	58	97	57	12
Jun-1999	Pumpkinseed	41	38	140	239	65
Oct-2010	Brook trout	13	162	367	2692	13
Oct-2010	Lake trout	1	420	-	758	1
Oct-2010	Common shiner	25	80	102	164	33
Oct-2010	Creek chub	7	95	213	346	7
Oct-2010	White sucker	26	115	499	8984	98
Oct-2010	Brown bullhead	22	137	247	1698	22
Oct-2010	Banded killifish	1	89	-	5	1

Intensive studies: Diatom stratigraphies were developed from sediment cores in the late 1980s (Charles et al. 1990). Historical rates of mercury deposition were analyzed using sediment cores from 1982–1983 (Lorey and Driscoll 1999) and again in 1998 (Raynal et al. 2004). Landscape characteristics and disturbance history have been evaluated within this watershed (Sullivan et al. 1999). The lake has been studied by the AEAP (Momen et al. 2006). Ito and others (2006) evaluated nitrogen deposition, export, and the capacity for lake watersheds to remove, store, or release nitrogen in this lake by estimating annual nitrogen input-output budgets during 1998–2000. McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY94 Nick's Lake (start date November 3, 2015; elevation 525 m) located 20 km southwest of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The lake and watershed lie on interlayered metasedimentary rock and granitic gneiss. Till overlies 89% of the watershed with the remaining 11% exposed bedrock found generally at elevations above 800 m. Basal till is found around the northwestern end of the lake and Tunbridge soils overlay the remaining area (APA 2001, Karasin et al. 2002). The maximum elevation is 711 m. The maximum relief is 114 m. In 1986, the ALS reported the shoal water substrate around the lake comprised of 55% bedrock/boulder/rubble, 35% sand/gravel and 10% muck/silt (ALSC 1987).

Land cover/use: In 1986 the ALS described the watershed as: 90% deciduous-conifer mixed forest, 5% deciduous, and 5% coniferous forest. The immediate lake shoreline was 78% deciduous/conifer mix, 20% coniferous forest and 2% boulder rock ledge (ALSC 1987). Total wetland area is 12 ha and comprises 3% of the watershed. The predominant wetland type is broad leaf deciduous scrub/shrub (APA 2001). The lake and watershed lie completely within the Pigeon Lakes Wilderness (NYSDEC 1992). A trail runs along the north shore of the lake. A lean-to and a number of primitive campsites are located along the shore.

Watershed disturbance: The 1916 fire protection source data show 100% of the watershed as green timber identified as virgin and second growth forest, with no slash (Roy et al. 1997). The watershed map did not indicate any storm damage from the November 1950 blowdown. The entire watershed was damaged in a July 1995 microburst storm causing low damage (0-30% change) in the tree crowns (APA 2001). The watershed was not affected by a January 1998 ice storm (NYSDEC 1998).

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Otter Lake 070729 and Otter Lake Stream 070728
EPA IDS: 1A2-078O and 1A2-078S


ALSC Staff Photo 2015 Otter Lake


ALSC Staff Photo 2015 Otter Lake Stream

Lake: Otter Lake lies in the Mohawk River watershed at 505 m. The primary inlet is the outlet of Stewart Lake (Figure 51.1). The outlet of the main Otter Lake (070729) is free flowing and forms the primary inlet to a 4.0 ha impoundment called Fish Hatchery Pond, also known as Otter Lake Outlet (or Otter Lake Stream (070728)). A concrete dam forms the outlet here that flows into Green Lake and ultimately to Canada Lake (Figure 51.1). The main Otter Lake has a surface area of 14.8 ha and a maximum depth of 4.0 m (13.1 ft) (Figure 51.2).

Otter Lake is a thin-till chain drainage lake with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. Otter Lake Stream is one of the 17 original ALTM sites monitored on a monthly basis since June 1982 (Station 1, 070728). The ALTM program began collecting a monthly sample at Otter Lake (Station 1, 070729) in July 1993 until the end of 2013. Sampling frequency at both sites was modified to seasonal in 2014.

Figure 51.1 Catchment

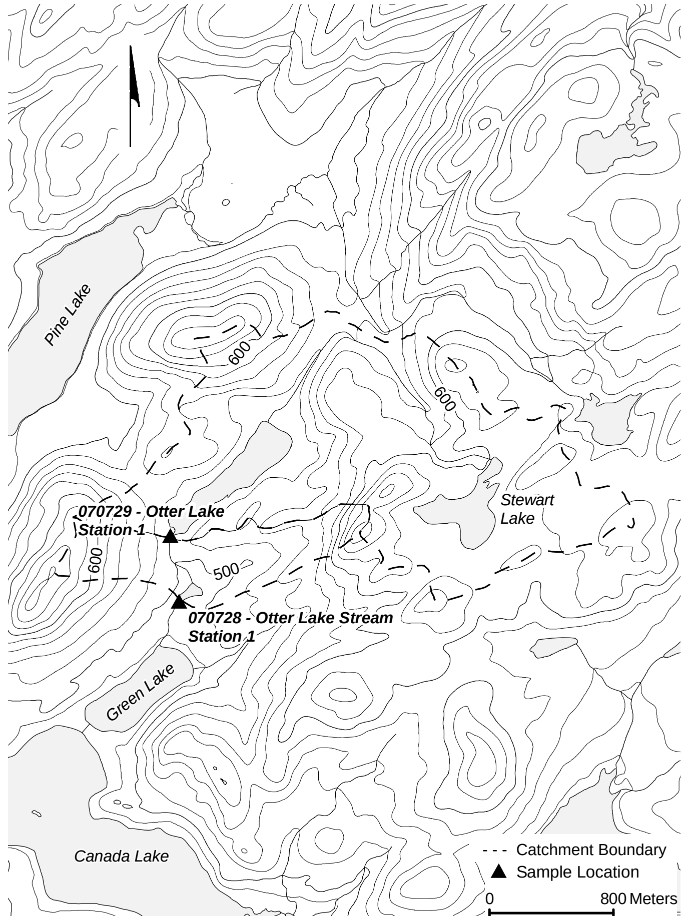


Figure 51.2 Bathymetry

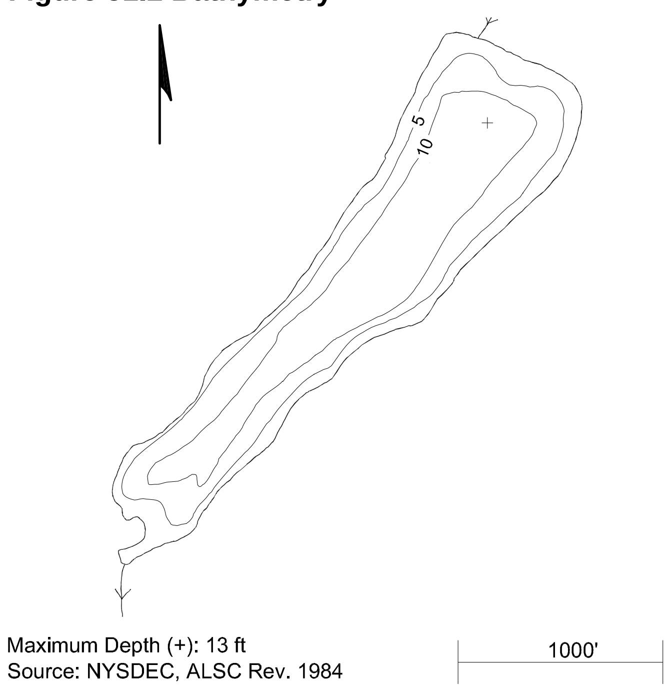


Table 51.1 Stream Chemistry (070728)

070728	1993			2009			2013			
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	106.60	137.62	121.52	69.15	97.29	82.09	50.72	76.44	63.30	µeq L^{-1}
NO_3^-	-0.27	37.57	12.65	0.44	22.79	6.81	0.58	45.56	17.53	µeq L^{-1}
Cl^-	5.36	11.00	8.74	7.04	12.25	8.70	7.43	11.92	9.46	µeq L^{-1}
F^-	1.79	3.00	2.42	1.93	4.02	2.40	1.75	3.14	2.24	µeq L^{-1}
ANC	-7.49	15.73	5.18	5.23	35.02	19.29	10.92	48.42	22.97	µeq L^{-1}
DIC	33.30	86.59	60.36	42.46	77.94	58.79	49.54	85.70	68.16	µmol L^{-1}-C
DOC	120.72	316.71	178.96	134.29	277.43	213.33	174.74	318.34	264.63	µmol L^{-1}-C
SiO_2	12.15	87.04	56.57	33.06	82.05	62.79	27.61	90.58	61.87	µmol L^{-1}
Ca^{2+}	61.38	90.82	77.06	50.40	66.37	60.78	46.38	72.59	57.88	µeq L^{-1}
Mg^{2+}	25.51	36.21	31.20	19.75	27.16	24.20	19.39	28.21	24.56	µeq L^{-1}
Na^+	20.44	30.88	26.03	20.01	30.88	25.65	23.88	32.66	28.58	µeq L^{-1}
K^+	1.53	6.14	4.71	3.33	5.63	4.31	4.22	7.61	5.76	µeq L^{-1}
NH_4^+	-0.72	1.83	0.37	-0.38	1.79	0.46	-0.52	1.69	0.61	µeq L^{-1}
AL_TD	2.19	17.20	7.87	1.66	10.60	5.12	3.32	9.05	5.44	µmol L^{-1}
AL_TM	1.23	12.90	6.00	1.73	5.23	2.88	1.68	4.89	2.93	µmol L^{-1}
AL_OM	0.63	4.15	1.68	1.63	2.74	2.12	1.65	3.26	2.29	µmol L^{-1}
AL_IM	0.55	10.56	4.32	0.00	2.48	0.78	0.00	1.62	0.64	µmol L^{-1}
LABPH	4.90	5.88	5.28	5.22	6.19	5.61	5.46	6.35	5.76	
AIREQPH	4.86	6.22	5.32	5.16	6.57	5.70	5.57	6.67	5.99	
TRUECOLOR	5	15	11	15	25	21	10	25	19	Pt Co
SCONDUCT	17.34	25.98	20.62	14.45	20.06	16.17	12.86	19.78	15.8	µS cm^{-1}
TOTALP	na	na	na	2.35	4.86	3.86	3.38	15.24	5.69	µg L^{1}
CHLORA	na	na	na	na	na	na	na	na	na	µg L^{1}

Table 51.2 Lake Chemistry (070729)

070729	1993			2009			2013			
Parameter	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Units
SO_4^{2-}	110.76	136.16	120.69	51.79	95.21	79.32	47.53	76.14	59.80	µeq L^{-1}
NO_3^-	-0.27	7.02	1.91	0.00	22.00	6.12	0.00	44.80	16.38	µeq L^{-1}
Cl^-	4.51	11.28	7.80	4.67	12.44	8.44	7.27	12.24	9.37	µeq L^{-1}
F^-	1.74	2.42	1.97	1.69	4.07	2.30	1.47	2.97	2.16	µeq L^{-1}
ANC	-4.50	4.64	-0.39	-4.13	15.89	9.87	-0.57	28.88	14.12	µeq L^{-1}
DIC	20.81	152.36	55.37	24.98	148.20	69.80	49.70	196.67	92.63	µmol L^{-1}-C
DOC	115.14	190.99	147.78	206.56	292.02	227.75	196.93	353.55	295.13	µmol L^{-1}-C
SiO_2	7.49	53.59	23.77	42.65	81.05	52.59	14.00	87.76	51.50	µmol L^{-1}
Ca^{2+}	52.40	72.36	64.79	33.44	58.89	53.76	43.30	66.63	51.56	µeq L^{-1}
Mg^{2+}	25.51	29.62	27.70	12.34	23.86	20.57	17.44	25.74	21.17	µeq L^{-1}
Na^+	18.70	24.79	22.47	16.53	26.97	22.32	22.32	30.97	25.54	µeq L^{-1}
K^+	0.77	5.63	3.33	1.57	5.88	4.27	4.44	7.66	5.90	µeq L^{-1}
NH_4^+	-0.44	1.05	0.22	-1.03	2.44	0.48	-0.89	1.89	0.62	µeq L^{-1}
AL_TD	3.08	9.86	4.79	2.78	10.79	5.71	2.53	10.08	5.80	µmol L^{-1}
AL_TM	2.48	7.27	3.84	1.70	5.93	3.34	1.63	6.62	3.47	µmol L^{-1}
AL_OM	0.33	1.30	0.86	1.74	2.93	2.20	1.64	3.83	2.44	µmol L^{-1}
AL_IM	1.84	5.96	2.98	0.00	3.15	1.16	0.00	2.79	1.04	µmol L^{-1}
LABPH	5.14	5.40	5.26	4.83	5.81	5.37	5.10	5.97	5.50	
AIREQPH	5.18	5.52	5.30	4.82	5.97	5.45	5.17	6.49	5.69	
TRUECOLOR	0	10	6	15	25	20.00	10	25	20	Pt Co
SCONDUCT	16.87	21.10	18.40	11.48	20.56	15.59	11.76	20.19	15.1	µS cm^{-1}
Total P	na	na	na	1.71	6.57	3.82	3.31	12	5.37	µg L^{-1}
Chlor a	na	na	na	0.18	7.87	2.18	0.32	5.1	1.89	µg L^{-1}

Table 51.3 Lake Characteristics

Parameter	Value
Elevation	505 m
Maximum depth	4.0 m
Mean depth	2.3
Volume	34.1 x 10^4 m^3
Surface area	14.8 ha
Watershed area	340.8 ha
Watershed ratio	0.04
Hydraulic retention time (year)	0.14
Watershed	Mohawk
County, Town	Fulton, Caroga
USGS Quadrangle	Canada Lake
Land use classification	Shaker Mountain Wild Forest

Figure 51.3 Chemistry Time Series / Stream Site

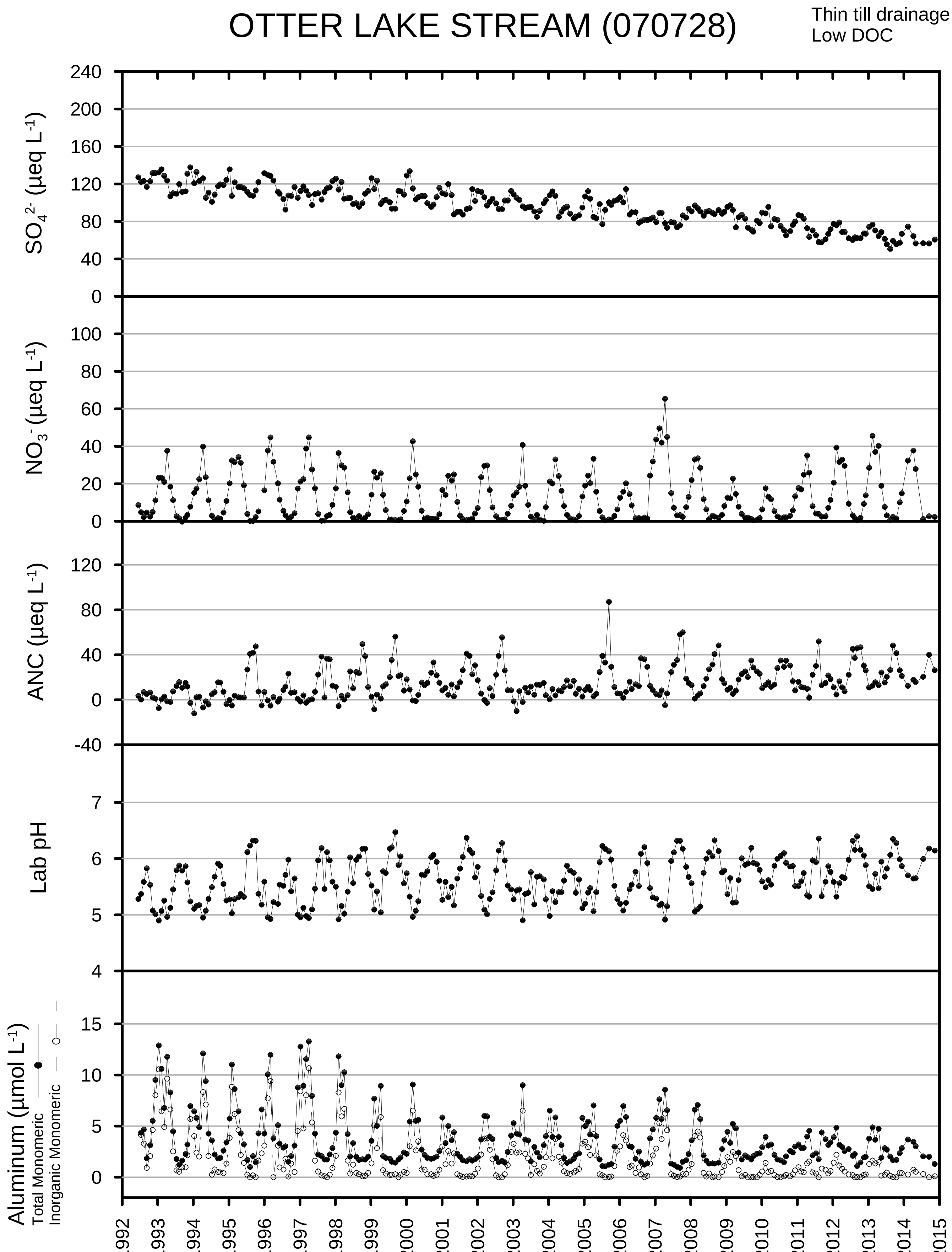
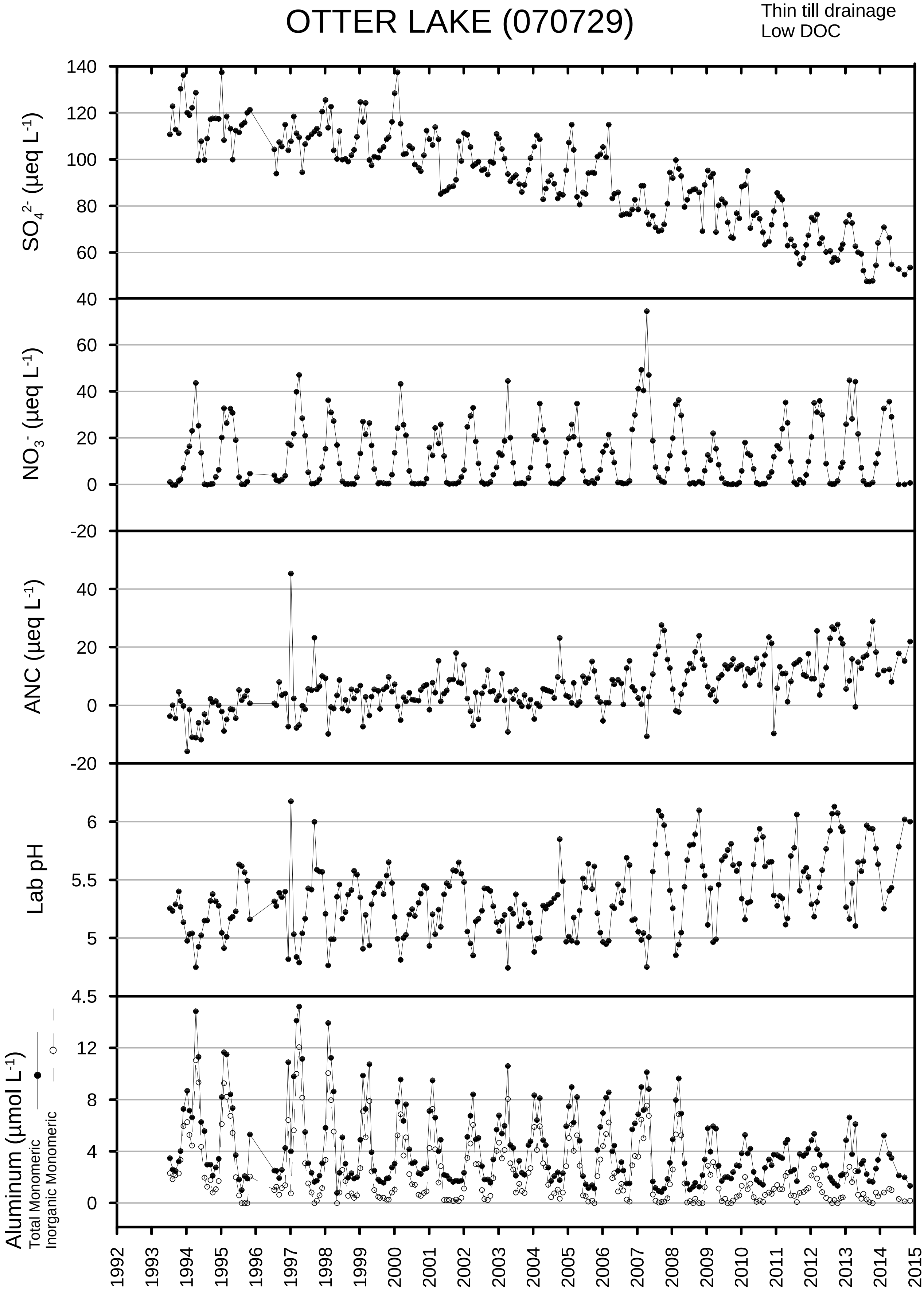


Figure 51.4 Chemistry Time Series / Lake Site



Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.ss	DDD MM SS.ss
Sample site - Stream	43.18109	-74.50320	43° 10' 51.92" N	074° 30' 11.52" W
Sample site - Lake	43.18466	-74.50416	43° 11' 04.77" N	074° 30' 15.00" W
Lake centroid	43.1881	-74.49940	43° 11' 17.15" N	074° 29' 57.83" W

Table 51.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	475	5
1996	Brook trout	1800	34
1997	Brook trout	1890	62
1998	Brook trout	1890	29
1999	Brook trout	1800	23

Table 51.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Jul-1999	Brown bullhead	7	73	204	-	7
Jun-2010	Brown bullhead	22	65	135	365	23

Lake chemistry: Neither Otter Lake (070729) nor Otter Lake Stream (070728) were sampled during the ALS, but Otter Lake 070729 was sampled as part of ELS (1A2-078) on October 31, 1984 finding: pH 5.06, ANC -2.0 µeq L^{-1}, SO_4^{2-} 137.5 µeq L^{-1}, NO_3^- 0.4 µeq L^{-1}, Ca 54.9 µeq L^{-1}, Mg 26.5 µeq L^{-1} (Kanciruk et al. 1986). Tables 51.1 and 51.2 summarize recent ALTM samples collected at Otter Lake Stream (070728 - Station 1) and Otter Lake (070729 - Station 1). Major analytes collected at Otter Lake Stream through 2013 are shown in Table 51.1, including total phosphorus (TP). Major analytes collected at Otter Lake (070729) appear in Table 51.2 including total phosphorus (TP) and chlorophyll a (Chl a). Plots for the Stream site through 2014 appear in Figure 51.3, and plots for the Lake site appear in Figure 51.4.

Aquatic biota: The ELS survey found the lake thermally mixed on October 31, 1984, a Secchi depth of 3.0 m and total phosphorus of 9.0 µg L^{-1} (Kanciruk et al. 1986).

Fisheries: The DEC has stocked the lake with brook trout. The ALSC netted the lake (070729) for fish on July 22, 1999 and June 28, 2010 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 51.3 and 51.4 for recent fish stocking and netting histories.

Intensive studies: Otter Lake Stream was studied by RILWAS in 1985 (Driscoll and Newton 1985). During 1986 and 1987, Schaefer and Driscoll (1993) evaluated snowmelt acidification in Otter Lake Stream. Otter Lake was a study watershed for the Adirondack/Catskill comparison in 1992–2001 (Burns et al. 2005, Burns et al. 2006). Detailed mercury deposition and cycling studies have been conducted within this watershed (Driscoll et al. 1994, Driscoll et al. 1995).

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY28 Piseco Lake (start date December 31, 2012; elevation 519 m) located 29 km north of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The Otter Lake Stream watershed lies on crystalline silicate rock with 45% of the areas as quartz-feldspar paragneiss, 28% biotite-quartz-plagioclase paragneiss, 26% pyroxene-hornblende-quartz-plagioclase gneiss and less than 1% quartzite, graphitic schist and quartz-biotite schist. Till overlies 100% of the watershed (APA 2001). The highest elevations in the watershed are Camel's Hump Mountain to the east, Pine Mountain to the north, and Kane Mountain to the west. The maximum watershed elevation is 617 m at Kane Mountain. The maximum relief of the watershed is 112 m.

Land cover/use: Total wetland area within the Otter Lake watershed is 9.0 ha comprising 2% of the watershed. The total open water component is 30 ha. The predominant wetland type is emergent marsh. A small 1.0 ha wetland is contiguous with the shoreline of Otter Lake at its northern end (APA 2001, Karasin et al. 2002).

Otter Lake and its watershed lie almost entirely within the Shaker Mountain Wild Forest (NYSDEC 2006). There is a private 30 ha in-holding located between the outlet of the lake (070729) and the inlet of Otter Lake Outlet (070728). This private land is classified as Resource Management by the Adirondack Park Agency Land Use and Development Plan. A seasonal cabin and an outbuilding are located adjacent to the outlet of Otter Lake (070729). There is a private seasonal gravel road along the western shoreline of Otter Lake Outlet that terminates at a small parking area. A foot path crosses the outlet stream via a wooden foot bridge and follows the eastern side of the outlet up to Otter Lake.

Watershed disturbance: The 1916 fire protection source data show 22% of the Otter Lake Stream watershed logged for both softwood and hardwood with much slash left on the ground. The remaining watershed was green timber identified as virgin and second growth forest. The watershed was not affected by the November 1950 blowdown and July 1995 microburst storms (APA 2001). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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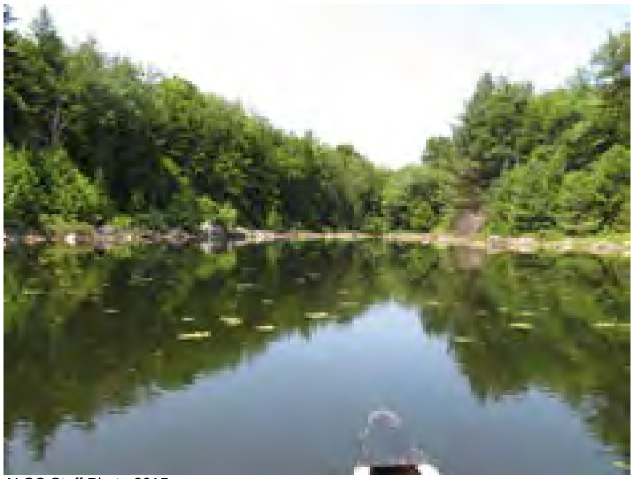
G Lake   070859
EPA ID: 070859O


ALSC Staff Photo 2015

Lake: G Lake lies in the Mohawk River watershed at 620 m. The 32.2 ha headwater lake has one major tributary (Figure 52.1). A man-made concrete dam was constructed at the outlet in 1950, but has since fallen into disrepair (NYSDEC 2006). The outlet flows north approximately 2.0 km where it meets the South Branch of West Canada Creek. The maximum depth of the lake is 9.8 m (32.2 ft) (Figure 52.2).

G Lake is classified as a thin-till drainage lake, with low dissolved organic carbon (<500 µmol L^{-1}-C). The lake is considered sensitive to acidification. The ALTM program began monthly monitoring of the lake in June 1992. This lake is accessed by helicopter. Sampling frequency at this pond was reduced from monthly to seasonal in 2014.

Lake chemistry: G Lake was not surveyed during the ALS nor during the ELS. A summary of recent ALTM chemistry is provided in Table 52.1. Major analytes through 2013 are shown in Table 52.1 including total phosphorus (TP) and chlorophyll a (Chl a). Plots through 2014 appear in Figure 52.3.

Aquatic biota: In 2003, the AEAP reported the average value of chlorophyll a was 0.92 µg L^{-1} (Momen et al. 2006).

Figure 52.1 Catchment

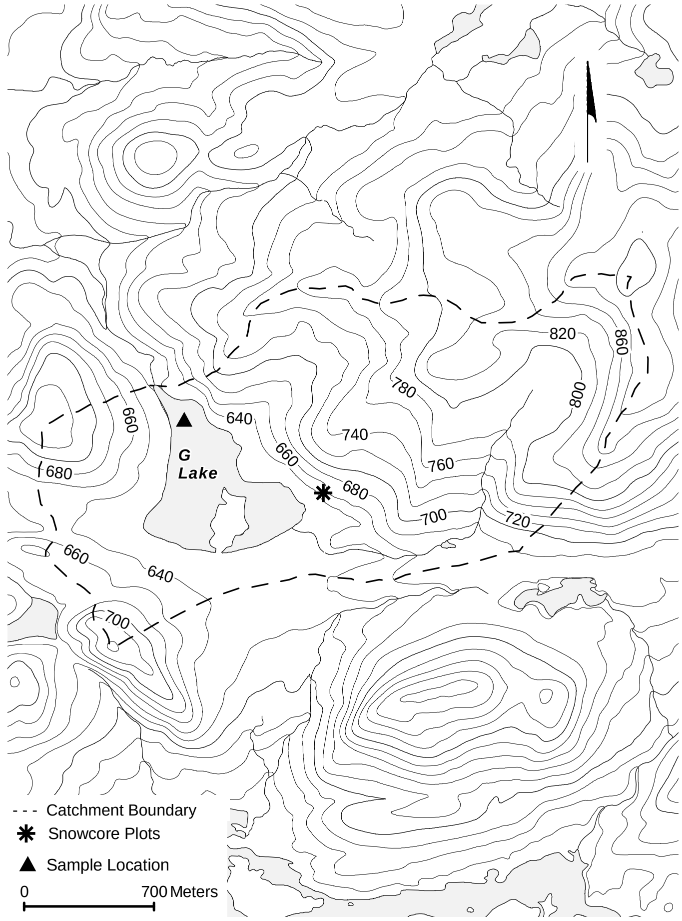
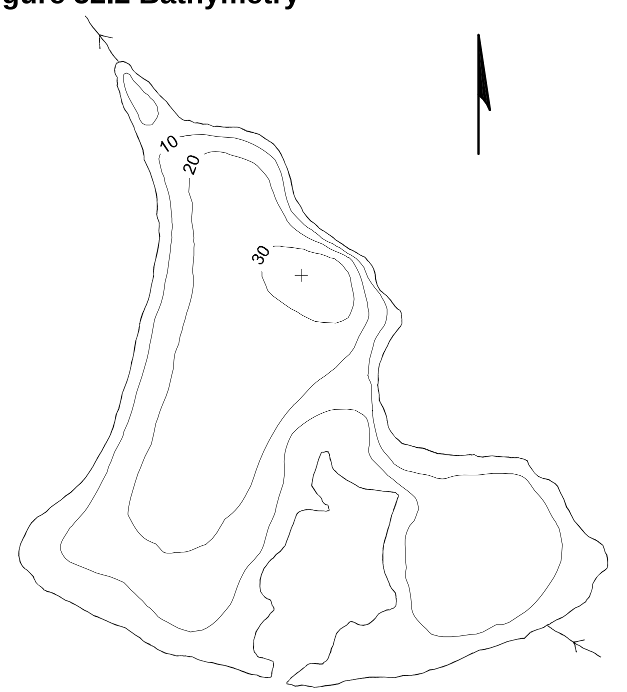


Figure 52.2 Bathymetry



Maximum Depth (+): 32 ft
Source: NYSDEC, ALSC Rev. 1984

Geographic coordinates (NAD 83)

	Latitude Φ	Longitude λ		
	DD.ddd	DDD.ddd	DD MM SS.s	DDD MM SS.s
Grab sample site	43.41862	-74.63616	43° 25′ 07.0″ N	074° 38′ 10.2′′ W
Helo sample site	43.41714	-74.63395	43° 25′ 01.7″ N	074° 38′ 02.2″ W
Lake centroid	43.4143	-74.63200	43° 24′ 51.5″ N	074° 37′ 55.2″ W

Table 52.1 Lake Chemistry

070859			1993			2009			2013	
Parameter	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Units**
SO_4^{2-}	85.36	167.60	100.84	51.79	77.98	61.21	42.70	57.79	49.72	µeq L^{-1}
NO_3^-	-0.27	52.90	16.77	0.00	33.28	7.77	0.00	38.75	11.57	µeq L^{-1}
Cl^-	5.64	10.72	7.99	4.67	8.59	5.76	5.36	8.46	7.13	µeq L^{-1}
F^-	1.79	2.79	2.23	1.69	2.06	1.94	1.58	2.79	2.11	µeq L^{-1}
ANC	-18.40	14.33	1.73	-4.13	24.95	13.90	4.97	34.31	19.42	µeq L^{-1}
DIC	13.32	129.05	56.75	24.98	185.66	60.00	37.45	115.73	66.44	µmol L^{-1}-C
DOC	148.53	303.63	241.61	206.56	292.40	254.80	201.86	318.67	266.98	µmol L^{-1}-C
SiO_2	38.78	72.73	53.24	42.65	96.86	57.94	21.91	71.04	43.98	µmol L^{-1}
Ca^{2+}	58.89	81.84	67.49	33.44	60.38	47.84	37.52	52.26	47.16	µeq L^{-1}
Mg^{2+}	16.46	27.16	23.52	12.34	27.98	19.32	15.37	22.76	19.40	µeq L^{-1}
Na^+	15.66	23.05	19.50	16.53	24.36	19.32	18.81	26.20	23.32	µeq L^{-1}
K^+	3.07	6.14	4.63	1.57	3.58	2.49	2.01	5.11	3.59	µeq L^{-1}
NH_4^+	-0.55	3.99	1.36	-1.03	1.00	-0.06	-0.37	1.55	0.32	µeq L^{-1}
AL_TD	1.41	29.54	10.09	2.78	15.83	6.79	1.09	10.73	5.83	µmol L^{-1}
AL_TM	1.14	18.35	7.43	1.70	9.27	3.67	1.54	6.17	2.93	µmol L^{-1}
AL_OM	0.57	3.23	1.87	1.74	4.30	2.43	1.42	3.56	2.18	µmol L^{-1}
AL_IM	0.52	15.31	5.55	0.00	5.67	1.33	0.00	3.10	0.75	µmol L^{-1}
LABPH	4.58	5.99	5.12	4.83	6.12	5.40	5.12	6.27	5.69	
AIREQPH	4.64	6.25	5.14	4.82	6.26	5.45	5.25	6.66	5.89	
TRUECOLOR	10	20	14	15	25	21	10	25	16	Pt Co
SCONDUCT	14.78	26.55	18.96	11.48	20.52	13.62	10.44	17.1	12.86	µS cm^{-1}
TOTALP	na	na	na	1.32	11.62	4.06	1.55	8.85	4.24	µg L^1
CHLORA	na	na	na	0.42	3.28	1.75	0.73	7.84	2.51	µg L^1

Table 52.2 Lake Characteristics

Parameter	Value
Elevation	620 m
Maximum depth	9.8 m
Mean depth	4.5 m
Volume	143.7 x 10^4
Surface area	32.2 ha
Watershed area	409.6 ha
Watershed ratio	0.08
Hydraulic retention time (year)	0.39
Watershed	Mohawk
County, Town	Hamilton, Arietta
USGS Quadrangle	Piseco Lake
Land use classification	Ferris Lake Wild Forest

Fisheries: The DEC stocks and manages the lake for brook trout. The ALSC netted the lake on June 14, 1994 and October 21, 2008 (Roy et al. 2015, Baldigo et al. 2016). Refer to Tables 52.3 and 52.4 for recent fish stocking and netting histories.

Intensive studies: G Lake has been studied by the Adirondack Effects Assessment Program (Momen et al. 2006). This lake was part of the Adirondack Cooperative Loon Project in 2003–2004 (Schoch et al. 2004). During 1999 and 2000, mass-balance studies at three ALTM lakes (Grass, Constable and G) included the installation of snow core plots in these watersheds (Figure 52.1). Inlets were sampled monthly by the ALSC from August 1998 through 2001 during ice free periods, along with monthly snow core sampling from 1999 through 2013 in the watershed of this lake. McNeil and others (2007) conducted a regional survey of foliar nitrogen during July and August 2003 that included study plots in this watershed.

Soils: A soil reference plot was established in this watershed in 2003 (Sullivan et al. 2006a, Sullivan et al. 2006b).

Figure 52.3 Chemistry Time Series

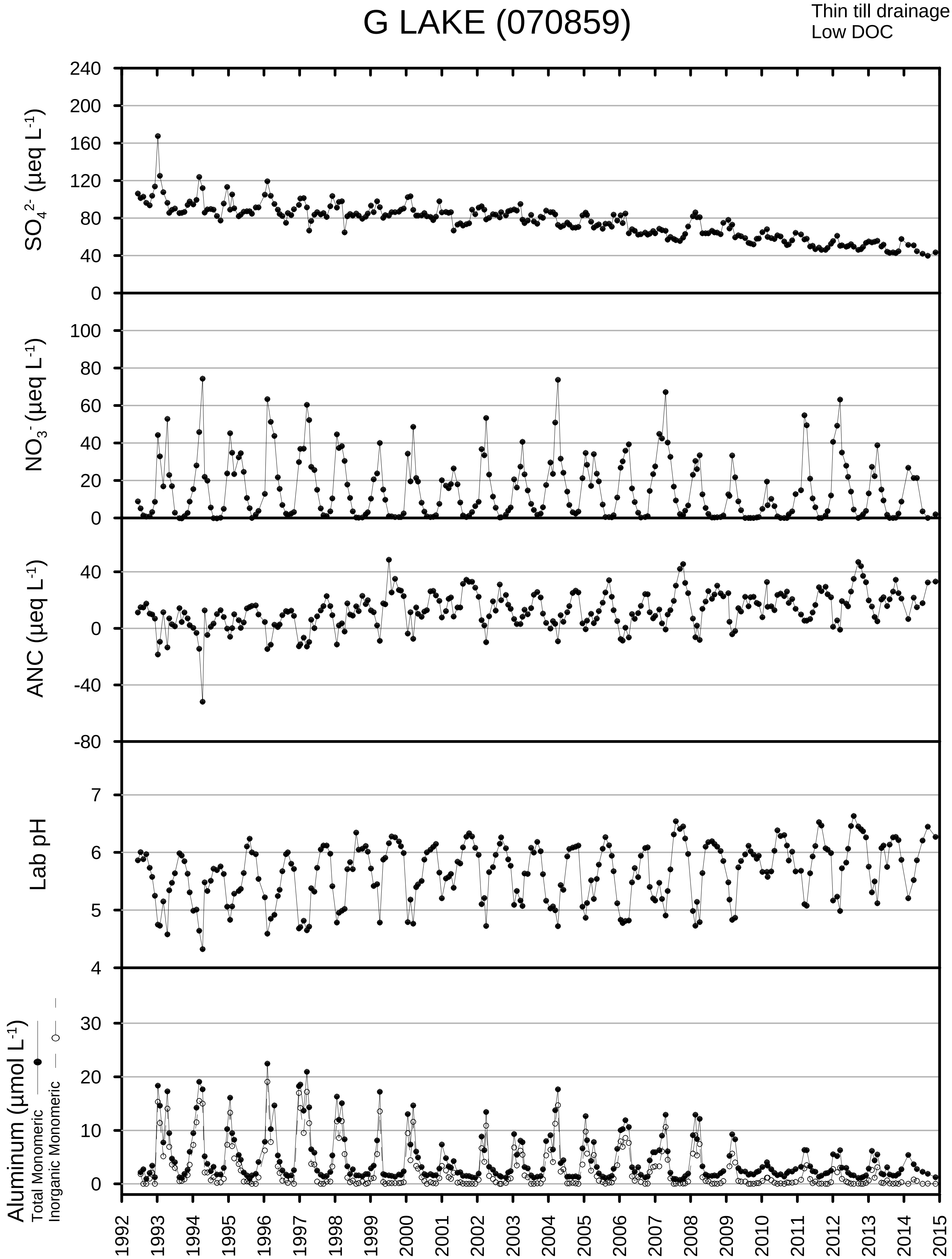


Table 52.3 Stocking History

Year Stocked	Species Stocked	Number Stocked	Total Weight Stocked (kg)
1980	Brook trout	1890	22
1981	Brook trout	1800	12
1982	Brook trout	1800	9
1983	Brook trout	1800	13
1984	Brook trout	1332	13
1985	Brook trout	1980	25
1986	Brook trout	1800	17
1987	Brook trout	1800	13
1988	Brook trout	1800	15
1989	Brook trout	1980	13
1990	Brook trout	1960	22
1991	Brook trout	1800	22
1992	Brook trout	1800	19
1993	Brook trout	1800	28
1994	Brook trout	1420	18
1995	Brook trout	1670	34
1996	Brook trout	1800	35
1997	Brook trout	1890	29
1998	Brook trout	1890	24
1999	Brook trout	1800	23
2000	Brook trout	1800	23
2001	Brook trout	1600	27
2002	Brook trout	1800	28
2003	Brook trout	1800	28
2004	Brook trout	1000	20
2004	Brown trout	800	18
2005	Brown trout	800	18
2005	Brook trout	1000	20
2006	Brook trout	1100	18
2006	Brown trout	800	28
2007	Brook trout	1000	17
2007	Brown trout	800	20
2008	Brown trout	800	30
2008	Brook trout	1000	20
2009	Brook trout	1000	17
2009	Brown trout	800	30
2010	Brown trout	800	36
2010	Brook trout	360	3
2011	Brown trout	800	15
2011	Brook trout	750	9
2012	Brook trout	500	6
2013	Brook trout	400	4
2013	Brown trout	800	16
2014	Brown trout	800	22
2014	Brook trout	1000	9

Table 52.4 Netting History

Date Month-Year	Species	Number Measured	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
Jun-1994	Brook trout	24	172	526	5775	24
Jun-1994	Golden shiner	35	66	164	354	2819
Jun-1994	Brown bullhead	29	59	185	1020	185
Sep-2008	Brown trout	3	173	277	330	3
Sep-2008	Brook trout	32	95	317	4080	32
Sep-2008	Golden shiner	25	90	163	326	163
Sep-2008	Creek chub	2	160	167	98	2
Sep-2008	Brown bullhead	28	79	212	1423	121

Deposition: The nearest National Atmospheric Deposition Program (NADP) National Trends Network (NTN) station is NY28 Piseco Lake (start date December 31, 2012; elevation 519 m) located 10 km east of this lake. Retrieved January 19, 2017 from: http://nadp.slh.wisc.edu.

Watershed: The G Lake watershed lies primarily on biotite and/or hornblende granitic gneiss with low to no ANC (Roy et al. 1997). A small area in the eastern part of the watershed is underlain by charnockite, mangerite, and pyroxene-quartz syenite gneiss. Basal till Becket soil comprises 60% of the watershed while 29% of the watershed is made up of Rawsonville soils (APA 2001). The highest elevation in the watershed is 913 m and the maximum relief is 293 m.

Land cover/use: The southern shore is fringed with a scrub-shrub wetland dominated by sweet gale and leatherleaf. The peninsula is coniferous forest. The northern shore on both sides of the outlet is dominated with boulders and fringed with scrub-shrub wetlands giving way to coniferous forest. Wetlands data are available from the NYS Adirondack Park Agency (LaPoint et al. 2003).

The lake is located completely within the Ferris Lake Wild Forest. There is a network of old roads around the lake and several primitive campsites on the shore (NYSDEC 2006).

Watershed disturbance: The 1916 fire protection source data show 100% of the watershed as green timber of virgin and second growth with no slash. Source data from the November 1950 and July 1995 storms show no disturbance from these events (APA 2001). The watershed was not affected by the January 1998 ice storm (NYSDEC 1998).

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New York State Energy Research and Development Authority

17 Columbia Circle
Albany, NY 12203-6399

toll free: 866-NYSERDA
local: 518-862-1090
fax: 518-862-1091

info@nyserda.ny.gov
nyserda.ny.gov