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

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Abstract

The Adirondack Lakes Survey Corporation (ALSC) and the New York State Department of Environmental Conservation (NYSDEC) have compiled a compendium of site descriptions, recent lake chemistry and selected research information of the 52 Adirondack Long-Term Monitoring (ALTM) waters since the mid-1980s. This compilation is distributed free to the public on CDROM and via the web at www.adirondacklakessurvey.org and www.nyserda.org/programs/Environment/EMEP/finalreports.asp in Adobe PDF format. For each of the lakes, we provide descriptions of: geomorphology; water chemistry summaries/time series (1992-2009); thumbnail summaries of historical and recent aquatic biota; fish stocking and netting histories; key intensive research studies; and watershed and land cover/use overviews in an easy-to-use desk reference format. The work is organized by watershed and supplemented with maps and tables to complete the overview for each ALTM water. This work was designed to offer researchers, resource managers, policy makers and the public an easy reference to the current research and chemistry at the diverse sites represented by the ALTM waters 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. Nevertheless, the more technical reader may use the report to compare and contrast ALTM sites and cross reference selected intensive research efforts conducted at them and others over the past two decades.

Adirondack Long Term Monitoring

The Adirondack Long Term Monitoring (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, C. T. and van Dreason, R.1993). Shortly thereafter, an intensive chemical and biological survey of nearly 1500 lakes within the Adirondack Park was undertaken by the Adirondack Lakes Survey Corporation (ALSC) and others. This survey was conducted from 1984 through 1987. At the completion of a comprehensive interpretive analyses of the ALSC survey (Baker, J. P. 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.

Maps & 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. The horizontal datum is NAD83. Bathymetric maps, unless otherwise indicated, are produced from field work conducted during the 1984 – 1987 ALTM survey. Chemistry and fish netting/stocking information are from the digital records maintained by the ALSC.

Availability

A copy of the desk reference may be obtained by following the links at www.adirondacklakessurvey.org. The report is provided in Adobe™ PDF format. If you do not have internet access you may request a copy on CDROM using the contact information found below.

Chapter Layout

Lake: Descriptive overview complemented by topographic and bathymetric maps of the site.

Lake chemistry: Summarizes results from the ALSC lakes survey of 1984-87.

Aquatic biota: Provides an overview of major biota surveys conducted since the mid 1980s.

Fisheries: Summarizes historical fish stocking and netting efforts . Recent results are presneted Tables 3 & 4.

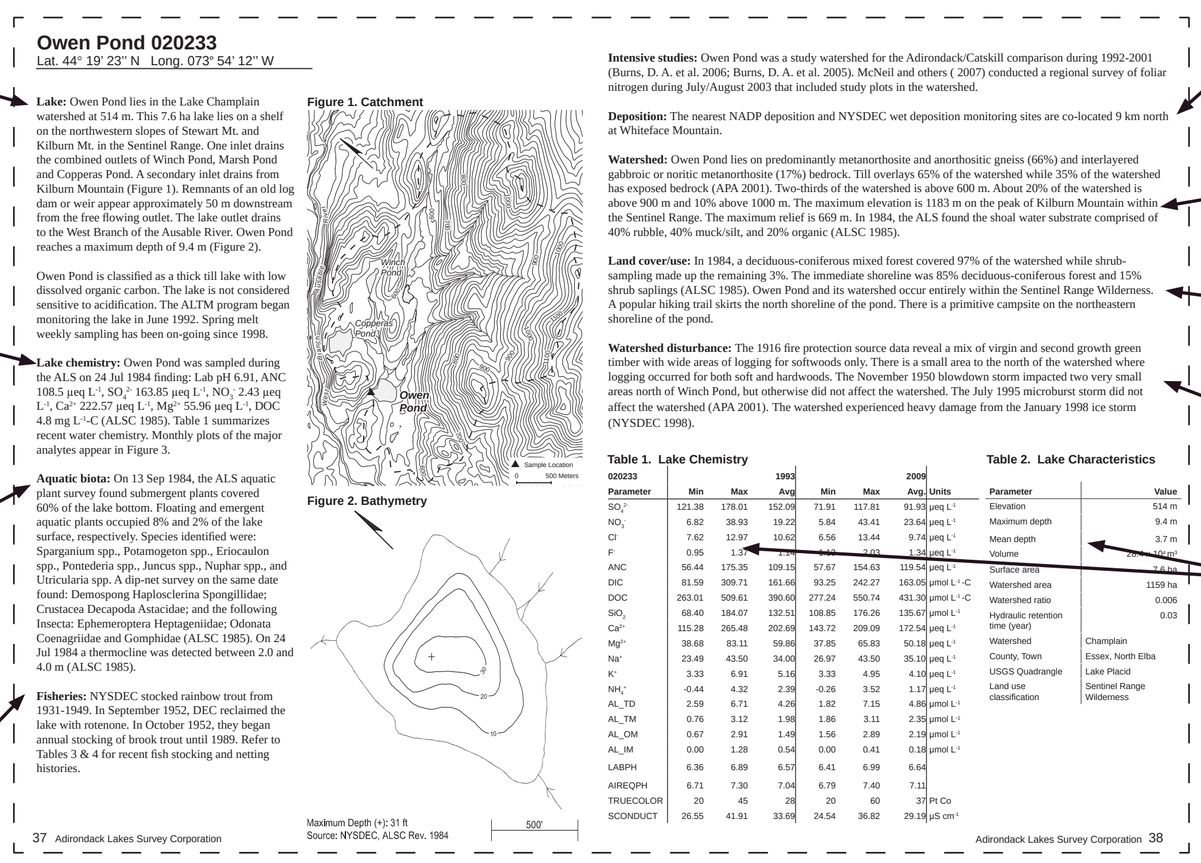
Chemistry Time Series: Time series plots of 7 key chemical parameters are the “vital signs” of lake chemistry.

Sulfate and nitrate are the critical pollutants.

ANC (acid neutralizing capacity) and pH are the indicators of ecosystem buffering.

Inorganic aluminum is toxic to nearly all forms of life.

Data points in red represent additional samples taken at select sites on a weekly basis during the annual snowmelt period to capture peak pollutant concentrations e.g. nitrate.



Owen Pond 020233
Lat. 44° 19' 23" N Long. 073° 54' 12" W

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 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 (Figure 2).

Owen Pond is classified as a thick till lake with low dissolved organic carbon. The lake is not considered sensitive to acidification. The ALTM program began monitoring the lake in June 1992. Spring melt weekly sampling has been on-going since 1998.

Lake chemistry: Owen Pond was sampled during the ALS on 24 Jul 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 4.8 mg L^{-1}-C (ALSC 1985). Table 1 summarizes recent water chemistry. Monthly plots of the major analytes appear in Figure 3.

Aquatic biota: On 13 Sep 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 24 Jul 1984 a thermocline was detected between 2.0 and 4.0 m (ALSC 1985).

Fisheries: NYSDEC stocked rainbow trout from 1931-1949. In September 1952, DEC reclaimed the lake with rotenone. In October 1952, they began annual stocking of brook trout until 1989. Refer to Tables 3 & 4 for recent fish stocking and netting histories.

Figure 1. Catchment

Figure 2. Bathymetry

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

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

Deposition: The nearest NADP deposition and NYSDEC wet deposition monitoring sites are co-located 9 km north at Whiteface Mountain.

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. 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 did not affect the watershed (APA 2001). The watershed experienced heavy damage from the January 1998 ice storm (NYSDEC 1998).

Table 1. Lake Chemistry

020233			1993			2009	
Parameter	Min	Max	Avg	Min	Max	Avg.	Units
SO_4^{2-}	121.38	178.01	152.09	71.91	117.81	91.93	μeq L^{-1}
NO_3^-	6.82	38.93	19.22	5.84	43.41	23.64	μeq L^{-1}
Cl^-	7.62	12.97	10.62	6.56	13.44	9.74	μeq L^{-1}
F^-	0.95	1.37	1.16	1.13	2.03	1.34	μeq L^{-1}
ANC	56.44	175.35	109.15	57.67	154.63	119.54	μeq L^{-1}
DIC	81.59	309.71	161.66	93.25	242.27	163.05	μmol L^{-1}-C
DOC	263.01	509.61	390.60	277.24	550.74	431.30	μmol L^{-1}-C
SiO_2	68.40	184.07	132.51	108.85	176.26	135.67	μmol L^{-1}
Ca^{2+}	115.28	265.48	202.69	143.72	209.09	172.54	μeq L^{-1}
Mg^{2+}	38.68	83.11	59.86	37.85	65.83	50.18	μeq L^{-1}
Na^+	23.49	43.50	34.00	26.97	43.50	35.10	μeq L^{-1}
K^+	3.33	6.91	5.16	3.33	4.95	4.10	μeq L^{-1}
NH_4^+	-0.44	4.32	2.39	-0.26	3.52	1.17	μeq L^{-1}
AL_TD	2.59	6.71	4.26	1.82	7.15	4.86	μmol L^{-1}
AL_TM	0.76	3.12	1.98	1.86	3.11	2.35	μmol L^{-1}
AL_OM	0.67	2.91	1.49	1.56	2.89	2.19	μmol L^{-1}
AL_IM	0.00	1.28	0.54	0.00	0.41	0.18	μmol L^{-1}
LABPH	6.36	6.89	6.57	6.41	6.99	6.64	
AIREQPH	6.71	7.30	7.04	6.79	7.40	7.11	
TRUECOLOR	20	45	28	20	60	37	Pt Co
SCONDUCT	26.55	41.91	33.69	24.54	36.82	29.19	μS cm^{-1}

Table 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	Champlain
County, Town	Essex, North Elba
USGS Quadrangle	Lake Placid
Land use classification	Sentinel Range Wilderness

Deposition: Location of the nearest federal and state monitoring sites.

Watershed: General geology and relief.

Land cover / use: Vegetation cover types and land use information.

Watershed disturbance: Significant changes to soils and vegetation.

Lake Chemistry - Characteristics: ALTM chemistry summaries from 1993 and 2009 offer a quick glance at responses over the record (plots appear on the next page). Basin metrics (ALSC) describe the location and hydrology of the lake.

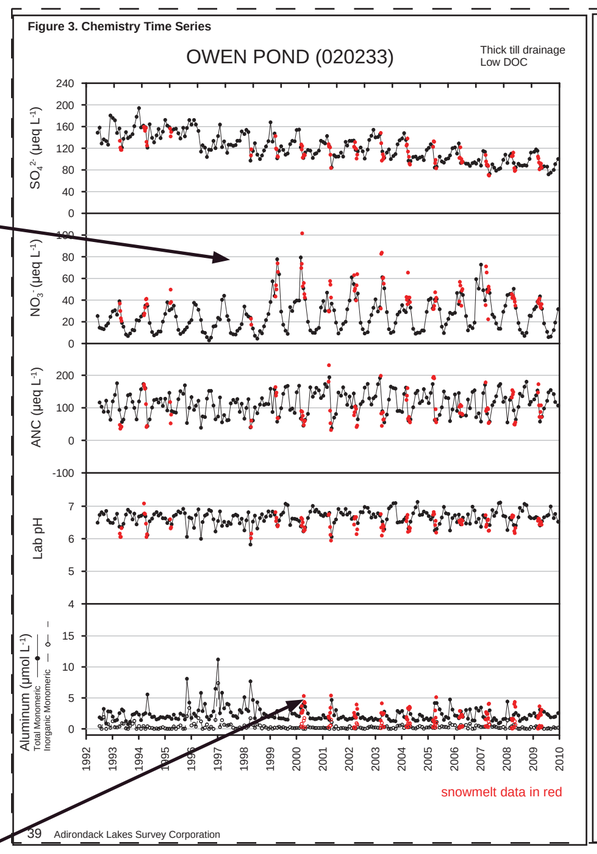


Figure 3. Chemistry Time Series

Table 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	79
1997	Brown trout	900	55
1998	Brown trout	430	85
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

Table 4. Netting History

Date Month-Year	Species	Number	Length Min (mm)	Length Max (mm)	Weight Grams	Total Number
May-94	Brown trout	1	310	357	1424	1
May-94	Brook trout	8	144	293	1086	8
May-94	N. redbelly dace	4	50	65	6	5
May-94	Fathead minnow	1	65	68	3	1
May-94	Blacknose dace	25	55	70	27	28
May-94	Creek chub	34	88	128	187	34
May-94	White sucker	28	165	418	4901	74
May-94	Pumpkinseed	12	61	128	190	12
May-94	Common shiner	3	91	97	21	3
September-84	Brown trout	5	249	550	3580	5
September-84	Brook trout	3	194	202	185	3
September-84	Creek chub	20	89	117	-	31
September-84	Pearl dace	2	62	76	-	2
September-84	White sucker	16	100	349	2249	16
September-84	Pumpkinseed	2	62	111	33	2

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Stocking - Netting History: Stocking histories are gleaned from the records of the NYSDEC. Netting histories are derived from surveys undertaken by the ALSC from 1992 through 2009.

References: Lists publications specific to the information summarized within the chapter. This serves as a mini-literature search of that lake.

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