LITTLE SQUAM LAKE

SITE 1A (WEST) 2013 SAMPLING HIGHLIGHTS

HOLDERNESS & ASHLAND, NH

NEW HAMPSHIRE
LAKES LAY MONITORING

Little Squam Lake volunteers collected water quality data between June 10 and October 11, 2013, while more in depth water quality surveys of the deep Little Squam Lake sampling stations were conducted by the **Center for Freshwater Biology** on June 19, July 17, and August 20, 2013.

Light Blue = Outstanding = Ultraoligotrophic

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

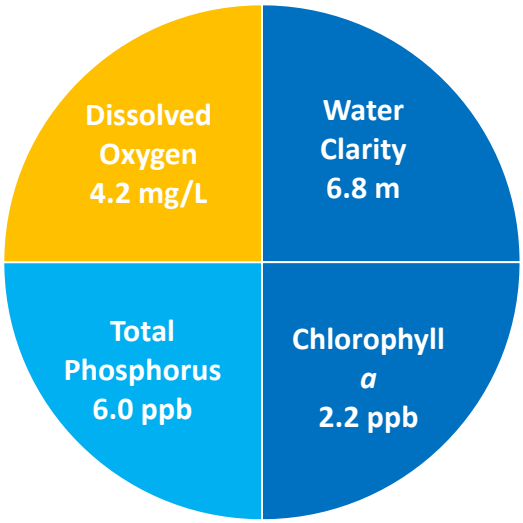


Figure 1. Average Water Quality Conditions

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 6.8 meters (m) at the westerly sampling location, Site 1A. The 2013 Site 1A water clarity was slightly shallower than the 2012 water clarity.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 2.2 parts per billion (ppb) at the westerly sampling location, Site 1A. The 2013 Little Squam Lake chlorophyll *a* concentrations at Site 1A was higher (greener water) than the 2012 level.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 6.0 parts per billion (ppb) and remained below 10 ppb. A total phosphorus concentration of 10 ppb is considered sufficient to support green water events that are referred to as algal blooms.

DISSOLVED OXYGEN: Dissolved oxygen is important for healthy fisheries. Dissolved oxygen concentrations collected in the bottom waters ranged from 0.1 to 9.1 milligrams per liter (mg/L) on August 20. Dissolved oxygen concentrations varied among depths and remained above 5.0 mg/L until approximately 16.0 meters. The dissolved oxygen concentration of 5.0 mg/L is commonly considered the threshold for the growth and reproduction of coldwater fish, such as trout and salmon.

COLOR: Color is a result of naturally occurring "tea" color substances from the breakdown of soils and plant materials. The Site 1A color concentration averaged 9.4 color units (CPU) and is characteristic of an uncolored lake water.

ALKALINITY: Alkalinity measures the resistance the lake has against acid rain. The Site 1A alkalinity averaged 6.6 milligrams per liter (mg/L) and indicated a moderate vulnerability to acid rain. The Site 1A **pH**, a measure of lake acidity, measured 6.9 units on August 20, 2013 and remained within the acceptable range for most aquatic organisms.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. Specific conductivity ranged from 49.0 to 61.1 micro-Siemans per centimeter (*u*S/cm) at Site 1A. The Site 1A specific conductivity indicates moderate concentrations of dissolved substances such as nutrients (e.g. phosphorus and nitrogen) and other dissolved salts (e.g. sodium and chloride).

CYANOBACTERIA: Little Squam Lake did not take part in the 2013 cyanobacteria monitoring program. Please refer to the recommendation section for further information.

Note: For a more detailed discussion of water quality measurements and a discussion on the inter-comparison of sample sites, please refer to the executive summary within the annual Squam Lake report.

Table 1. 2013 Little Squam Lake Site 1A West Seasonal Average Water Quality Readings and Trophic Level Classification Criteria used by the New Hampshire Lakes Lay Monitoring Program

Parameter	Ultraoligo "Outstanding"	Oligo "Excellent"	Meso "Fair"	Eutrophic "Poor"	Site 1A West Average (range)	Site 1A West Classification
Water Clarity (meters)	> 7.0	4.0 – 7.0	2.5 - 4.0	< 2.5	**6.8** meters (range: 5.3 – 8.4)	Oligotrophic
Chlorophyll *a* (ppb)	< 2.0	2.0 - 3.0	3.0 - 7.0	> 7.0	**2.2** ppb (range: 1.4 – 3.7)	Oligotrophic
Total Phosphorus (ppb)	< 7.0	15.0 – 7.0	15.0 - 25.0	> 25.0	**6.0** ppb (range: 4.7 – 7.6)	Ultraoligotrophic
Dissolved Oxygen (mg/L)	> 7.0	5.0 – 7.0	2.0 – 5.0	<2.0	**4.2** mg/L (range: 0.1 – 9.1)	Mesotrophic
Cyanobacteria (cell counts, microcystin concentration & Water safety)	The Massachusetts Department of Public Health considers dangerous microcystin (MC) levels to be 14 micrograms per liter (ug/l) lake water, and/or 70,000 cyanobacteria cells per milliliter lake water.				The New Hampshire Department of Environmental services posts warnings at State beaches when cyanobacteria cell numbers exceed 70,000 cells per milliliter lake water.	

*** Dissolved oxygen concentrations taken from the bottom layers**

LONG TERM WATER QUALITY TRENDS

WATER CLARITY: Water clarity has decreased in the past thirty-five years of sampling by approximately 50 centimeters. The trend of decreasing water clarity is not statistically significant.

CHLOROPHYLL: Chlorophyll *a* has increased approximately 0.2 parts per billion (ppb) between 1979 and 2013. This trend is not statistically significant.

COLOR: Color concentrations have remained stable over the twenty-six years of sampling, indicating virtually no change in color within the lake. The trend is not statistically significant.

TOTAL PHOSPHORUS: Total phosphorus has decreased over thirty-two years of sampling. The trend is not statistically significant.

In summary, there are some indications of a slight decrease in the Little Squam Lake water quality over the past thirty-five years of water quality monitoring. The water clarity has decreased, while there has been a slight increase in chlorophyll *a* concentrations. Overall, each parameter stayed relatively stable excluding long-term total phosphorus (nutrient) levels, which indicated a decrease in phosphorus concentrations.

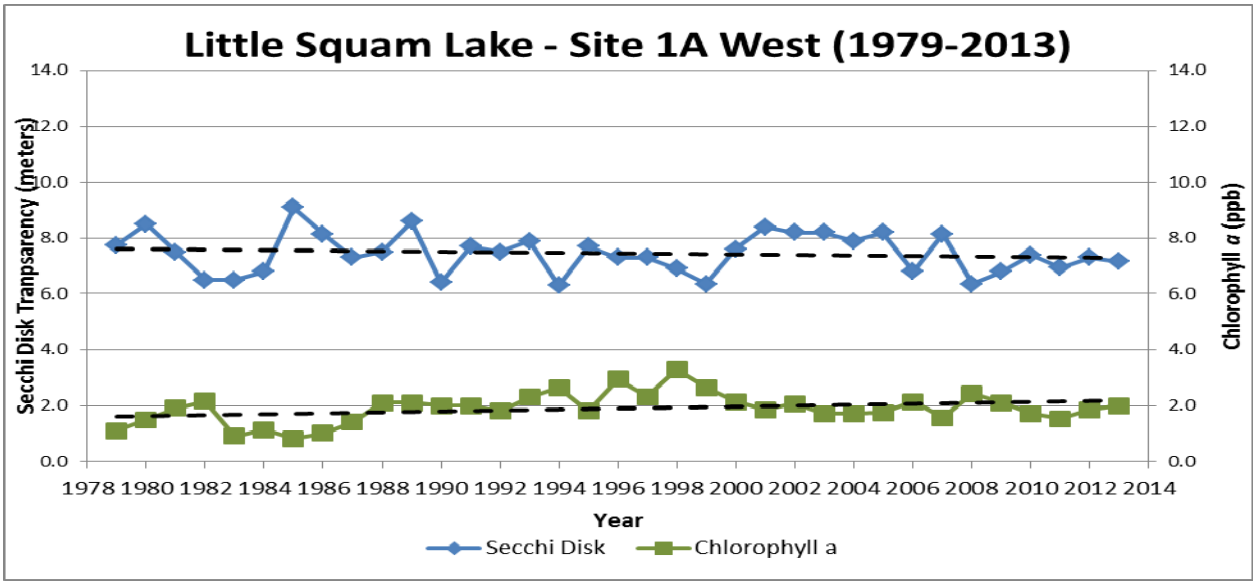


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1979 and 2013 at Site 1A West. There has been a decreasing trend for water clarity over the past thirty-five years, although the trend is not statistically significant (dashed line). Algal growth (chlorophyll) has increased slightly since 1979, however, the trend is not significantly significant (dashed line).

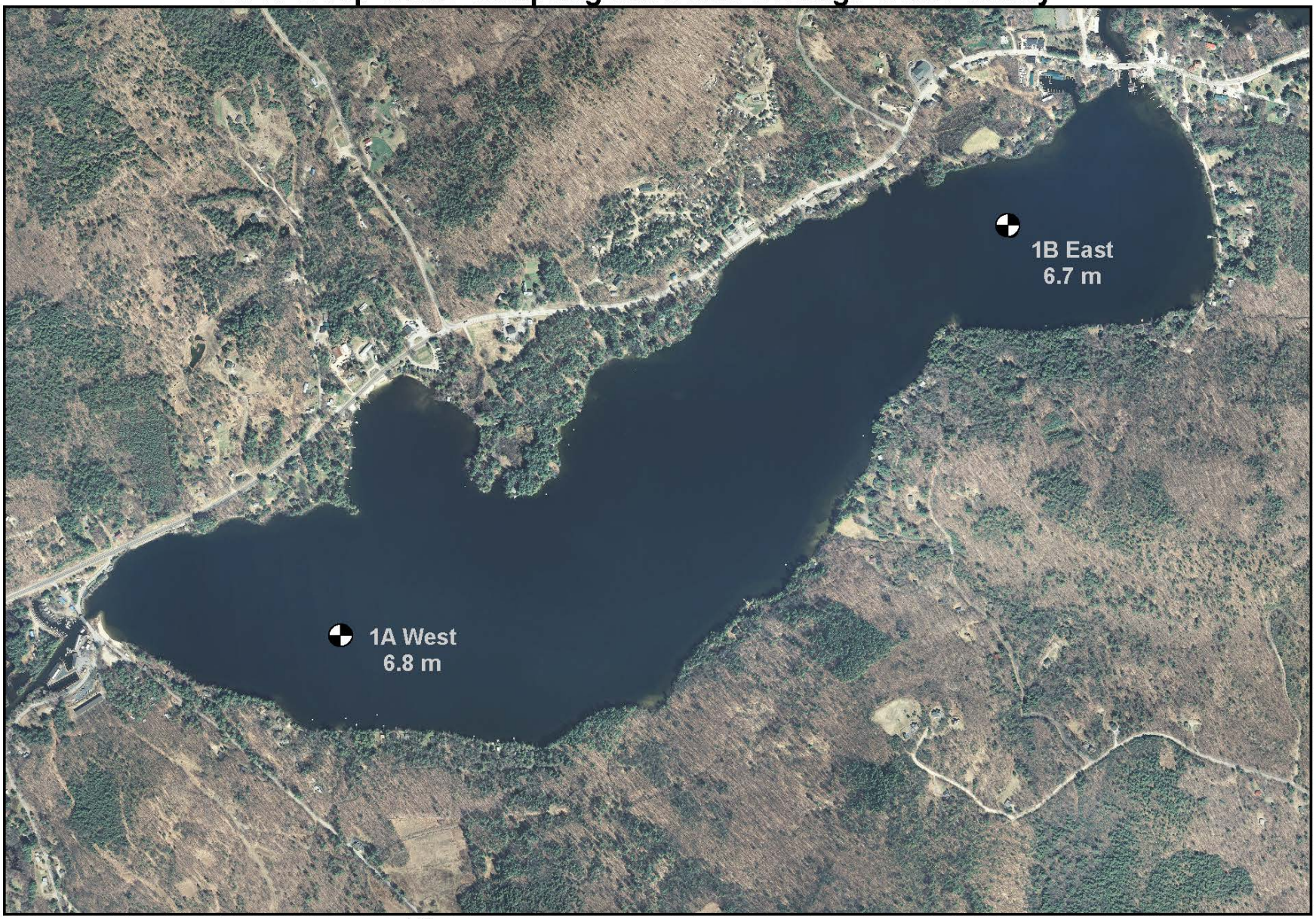
Recommendations:

- Conduct early season sampling (April/May) to document Little Squam's reaction to periods of high stream flow during and after spring thaw.
- Implement a simple cyanobacteria-monitoring routine into the conventional water quality monitoring methods including monthly water samples. Cyanobacteria collections throughout the summer and fall months can give insight as to how these populations are distributed throughout the seasons and when they are most likely to be at harmful levels. If you are interested in discussing additional water quality monitoring options that would meet your needs please contact Bob Craycraft by phone, 862-3696, or via email, bob.craycraft@unh.edu
- Implement Best Management Practices within the Little Squam Lake watershed to minimize the adverse impacts of polluted runoff and erosion into the lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off.
    - https://extension.unh.edu/resources/files/Resource001799_Rep2518.pdf
    - http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf

Little Squam Lake

Holderness & Ashland, NH

2013 Deep water sampling sites and average water clarity



N

0 0.075 0.15 0.3 0.45 0.6 Miles

Aerial Orthophoto Source: NH GRANIT
Site locations GPSed by the UNH Center of Freshwater Biology

University of New Hampshire Cooperative Extension

New Hampshire Lakes Lay Monitoring