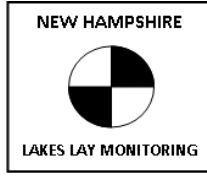


SQUAM LAKE

SITE 2 COTTON COVE 2013 SAMPLING HIGHLIGHTS

HOLDERNESS, NH



Squam Lake volunteers collected water quality data between May 19 and October 11, 2013 while more in depth water quality surveys of Site 2 Cotton Cove 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

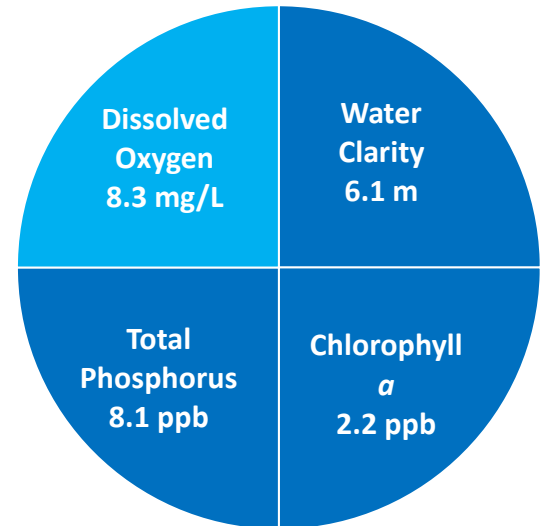


Figure 1. Average Water Quality Conditions

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 6.1 meters (m) at Site 2 Cotton Cove. The 2013 Site 2 Cotton Cove water clarity was slightly deeper 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 Site 2 Cotton Cove. The 2013 Site 2 Cotton Cove chlorophyll *a* concentrations were higher (greener water) than the 2012 chlorophyll *a* concentrations.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 8.1 parts per billion (ppb) and remained well 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 were high at Site 2 Cotton Cove. Oxygen concentrations ranged from 8.3 to 8.4 mg/L on July 17 and were optimal for warm-water species, such as bass and perch.

COLOR: Color is a result of naturally occurring “tea” color substances from the breakdown of soils and plant materials. Site 2 Cotton Cove color averaged 9.5 color units (CPU).

ALKALINITY/pH: Alkalinity measures the resistance the lake has against acid rain. The Site 2 Cotton Cove alkalinity averaged 6.6 milligrams per liter (mg/L) and indicated a moderate vulnerability to acid rain. The Site 2 Cotton Cove **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 45.6 to 52.0 micro-Siemans per centimeter ($\mu\text{S}/\text{cm}$) at Site 2 Cotton Cove. Specific conductivity indicates low to moderate concentrations of dissolved substances such as nutrients (e.g. phosphorus and nitrogen) and other dissolved salts (e.g. sodium and chloride).

CYANOBACTERIA: 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 Squam Lake, Site 2 Cotton Cove 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 2 Cotton Cove Average (range)	Site 2 Cotton Cove Classification
Water Clarity (meters)	> 7.0	4.0 – 7.0	2.5 - 4.0	< 2.5	6.1 meters (range: 4.7 – 7.2)	Oligotrophic
Chlorophyll <i>a</i> (ppb)	< 2.0	2.0 - 3.0	3.0 - 7.0	> 7.0	2.2 ppb (range: 1.9 – 3.9)	Oligotrophic
Total Phosphorus (ppb)	< 7.0	15.0 – 7.0	15.0 - 25.0	> 25.0	8.1 ppb (range: 5.8 – 14.8)	Oligotrophic
Dissolved Oxygen (mg/L)	> 7.0	5.0 – 7.0	2.0 – 5.0	<2.0	8.3 mg/L (range: 7.7 – 8.4)	Ultraoligotrophic
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 approximately 80 centimeters (cm) in the thirty-three years of sampling, although the trend is not statistically significant.

CHLOROPHYLL: Chlorophyll *a* has increased approximately 1.0 parts per billion (ppb) between 1979 and 2013.

COLOR: Color concentrations have remained relatively stable over the twenty-seven years of sampling; however, the trend is not statistically significant.

TOTAL PHOSPHORUS: Total phosphorus has increased over the twenty-one years of sampling; however, the trend is not statistically significant.

In summary, Site 2 Cotton Cove has shown some indications of a slight decrease in water quality over the past thirty-three of years of monitoring. Water clarity at Site 2 Cotton Cove has decreased, while chlorophyll *a* and total phosphorus concentrations have displayed a corresponding increase in concentrations.

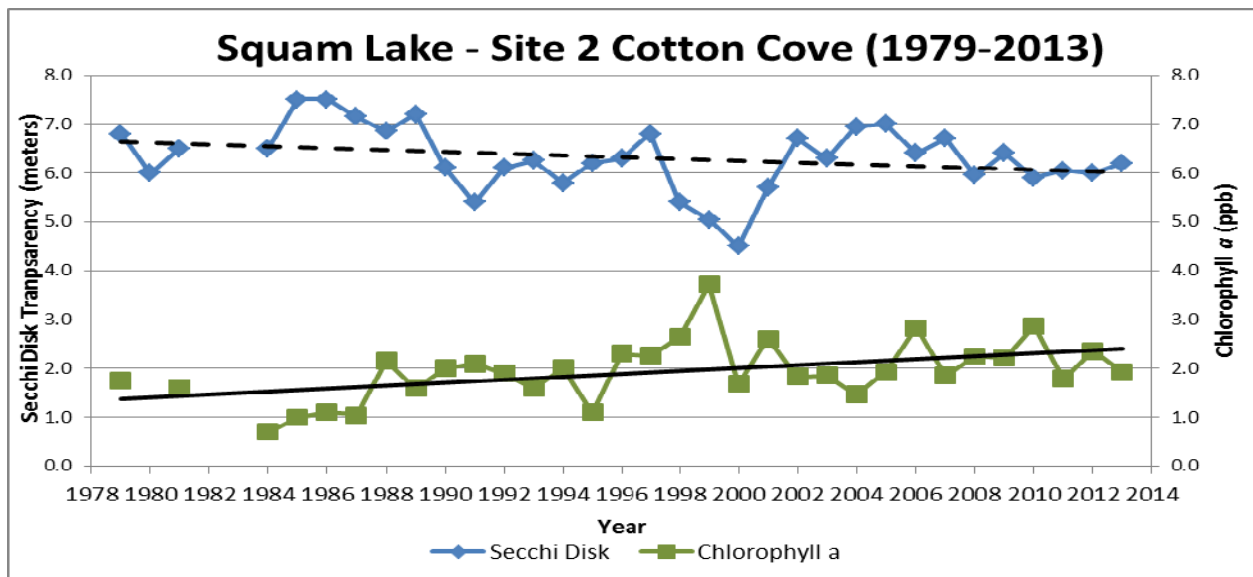


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* (algal growth) measured between 1979 and 2013 at Site 2 Cotton Cove. There has been a decreasing trend in water clarity, although the trend is not statistically significant with time (dashed line). The algal growth exhibits a statistically significant increase since 1979 (solid line).

Recommendations:

- Conduct early season sampling (April/May) to document 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 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>

Squam Lakes - Site 2 Cotton Cove

Holderness, NH

2013 Deep water sampling site locations with annual seasonal water clarity



2 Cotton Cove
6.1 m



UNIVERSITY
of NEW HAMPSHIRE

Cooperative Extension