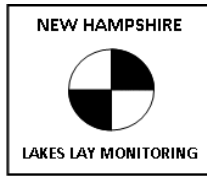


SQUAM LAKE

SITE 8 RATTLESNAKE COVE 2013 SAMPLING HIGHLIGHTS

SANDWICH, NH



Water quality surveys of Rattlesnake 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

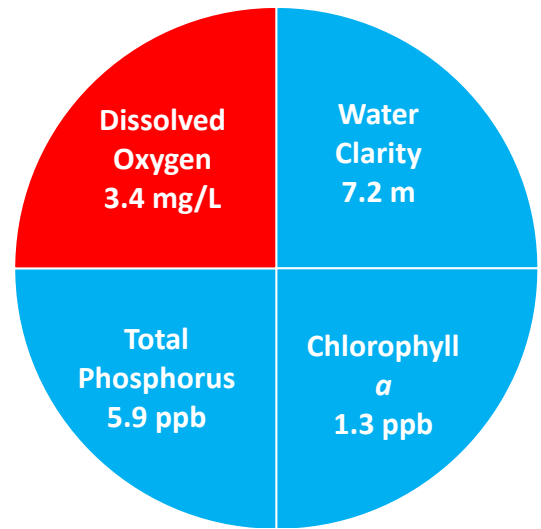


Figure 1. Average Water Quality Conditions

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 7.2 meters (m) at Site 8 Rattlesnake site. The 2013 Site 8 Rattlesnake Cove water clarity was deeper than the 2012 water clarity.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 1.3 parts per billion (ppb) at Site 8 Rattlesnake Cove. The 2013 chlorophyll *a* concentrations were lower (less green water) than those seen in 2012.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 5.9 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 on August 20 were below 5.0 mg/L, which is 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. Site 8 Rattlesnake Cove color averaged 7.3 color units (CPU).

ALKALINITY/pH: Alkalinity measures the resistance the lake has against acid rain. Site 8 Rattlesnake Cove alkalinity averaged 6.8 milligrams per liter (mg/L) and indicated a moderate vulnerability to acid rain. The pH, a measure of lake acidity, at Site 8 Rattlesnake Cove ranged from 7.1 to 7.2 units and remained within the acceptable range for most aquatic organisms.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. Specific Conductivity ranged from 43 to 54 micro-Siemans per centimeter ($\mu\text{S}/\text{cm}$) at the 8 Rattlesnake site. 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 8 Rattlesnake 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 8 Rattlesnake Cove Average (range)	Site 8 Rattlesnake Cove Classification
Water Clarity (meters)	> 7.0	4.0 – 7.0	2.5 - 4.0	< 2.5	7.2 meters (range: 5.9 – 7.9)	Ultraoligotrophic
Chlorophyll <i>a</i> (ppb)	< 2.0	2.0 - 3.0	3.0 - 7.0	> 7.0	1.3 ppb (range: 1.2 – 1.4)	Ultraoligotrophic
Total Phosphorus (ppb)	< 7.0	15.0 – 7.0	15.0 - 25.0	> 25.0	5.9 ppb (range: 5.8 – 6.0)	Ultraoligotrophic
Dissolved Oxygen (mg/L)	> 7.0	5.0 – 7.0	2.0 – 5.0	<2.0	3.4 mg/L (range: 3.2 – 3.6)	Eutrophic
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 increased approximately 2 meters over the past twenty-one years of sampling.

CHLOROPHYLL: Chlorophyll *a* displays a relatively stable long-term trend from 1982 to 2013 although the chlorophyll *a* concentration has decreased over the past four years. However, the trend is not statistically significant.

COLOR: Color concentrations have increased although the trend is not statistically significant.

TOTAL PHOSPHORUS: Total phosphorus has increased over the nineteen years of sampling. However, the trend is not statistically significant.

In summary, Site 8 Rattlesnake Cove has displayed an increase in water quality over the past twenty-one years of water quality monitoring. Water clarity has increased, while there has been a decrease in chlorophyll *a* concentrations. Although water clarity and chlorophyll *a* concentrations suggest an increase in water quality, increasing long-term total phosphorus (nutrient) levels remain a threat to the high Squam Lake water quality.

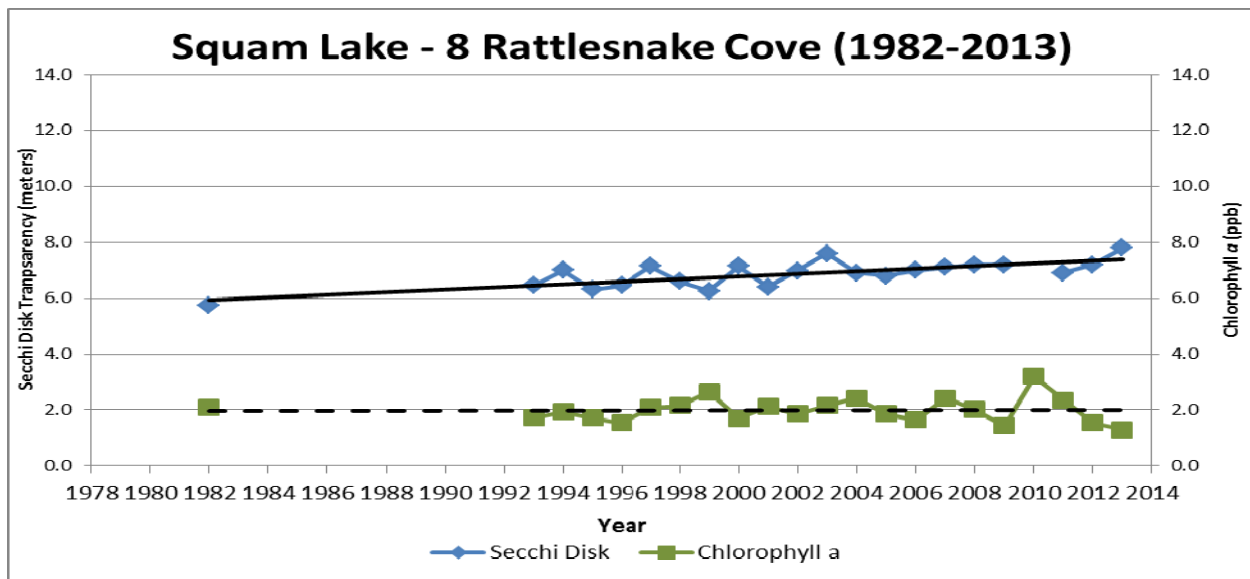


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1982 and 2013 at Site 8 Rattlesnake Cove. There has been an increasing water clarity trend that is statistically significant with time (solid line). The long-term algal growth (chlorophyll *a*) trend has been relatively stable over the past twenty-one years of sampling. However, the trend is not statistically significant (dashed line).

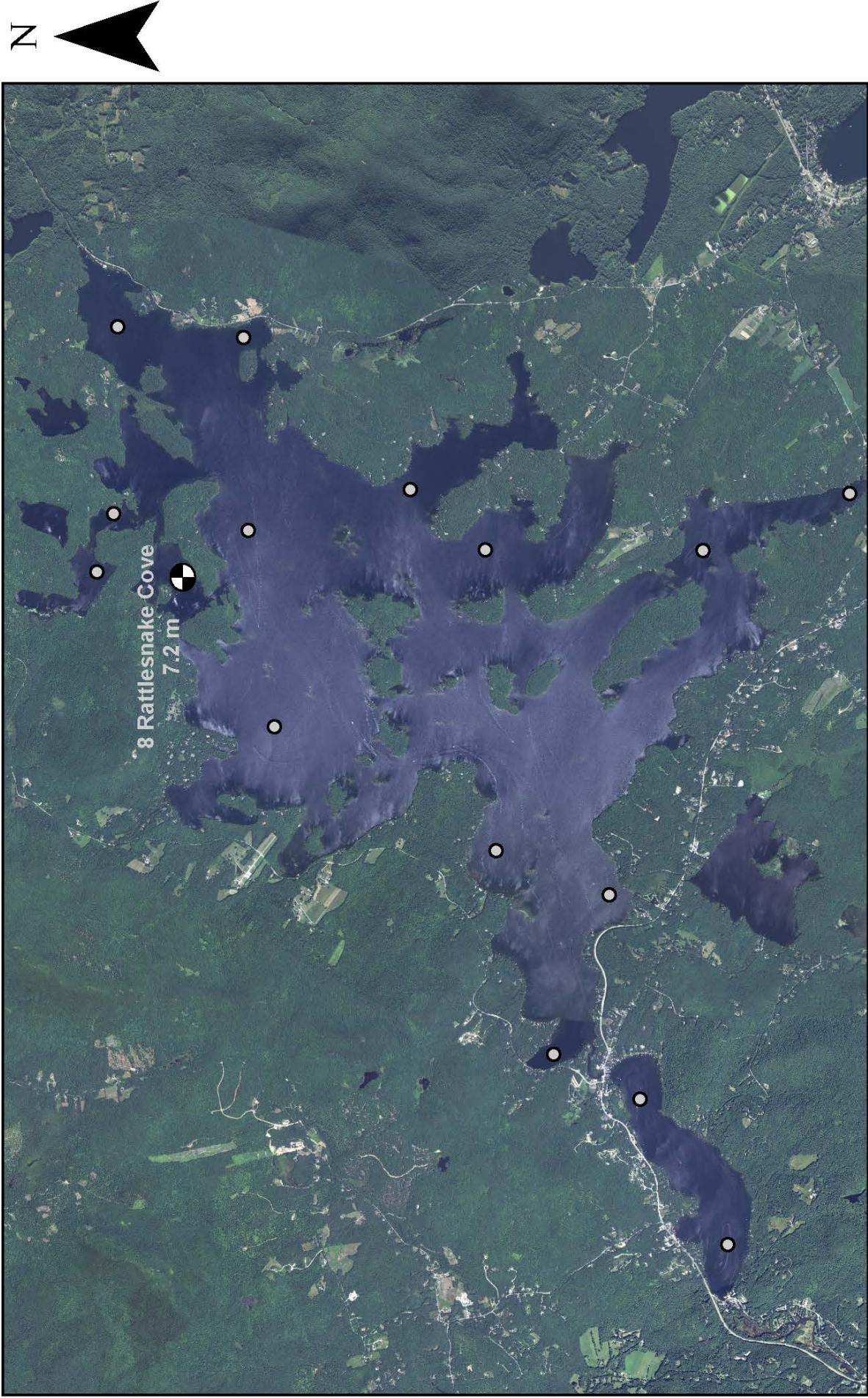
Recommendations:

- 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 8 Rattlesnake Cove

Sandwich, NH

2013 Deep water sampling site locations with annual seasonal water clarity



0 0.3 0.6 1.2 1.8 2.4 Miles



Aerial Orthophoto Source: NH GRANIT
Site location GPS coordinates collected by the UNH Center of Freshwater Biology