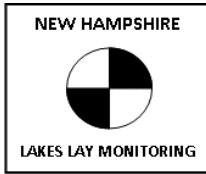


SQUAM LAKE

LOON REEF

2013 SAMPLING HIGHLIGHTS

SANDWICH, NH



Light Blue = Outstanding
= Ultraoligotrophic

Blue = Excellent =
Oligotrophic

Yellow = Fair =
Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

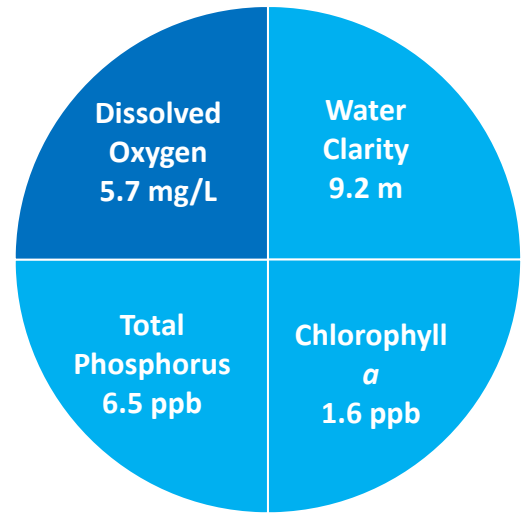


Figure 1. Average Water Quality Conditions

Squam Lake volunteers collected water quality data between June 3 and October 16, 2013 while more in depth water quality surveys of Loon Reef were conducted by the **Center for Freshwater Biology** on June 19 and July 17, 2013.

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 9.2 meters (m) at Loon Reef. The 2013 Site Loon Reef water clarity decreased relative to the 2012 water clarity readings.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 1.6 parts per billion (ppb) at Loon Reef. The 2013 chlorophyll *a* concentrations increased (greener water) relative to the 2012 readings.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 6.5 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 1.2 to 9.1 milligrams per liter (mg/L) on July 17. Dissolved oxygen concentrations stayed above 5.0 mg/L down to approximately 26.0 meters. A dissolved oxygen concentration of 5 mg/L is considered the threshold for the growth and reproduction of coldwater fish that include trout and salmon.

COLOR: Color is a result of naturally occurring “tea” color substances from the breakdown of soils and plant materials. The Loon Reef color averaged 5.9 color units (CPU) in 2013.

ALKALINITY/pH: Alkalinity measures the resistance the lake has against acid rain. The Loon Reef alkalinity averaged 6.5 milligrams per liter (mg/L) and indicated a moderate vulnerability to acid rain. The Loon Reef pH, a measure of lake acidity, ranged from 6.9 to 7.3 units and remained within the acceptable range for most aquatic organisms.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. The Loon Reef specific conductivity ranged from 43 to 44 micro-Siemans per centimeter ($\mu S/cm$). The Loon Reef 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: 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 Loon Reef 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 Loon Reef Average (range)	Site Loon Reef Classification
Water Clarity (meters)	> 7.0	4.0 – 7.0	2.5 - 4.0	< 2.5	9.2 meters (range: 7.4 – 10.2)	Ultraoligotrophic
Chlorophyll <i>a</i> (ppb)	< 2.0	2.0 - 3.0	3.0 - 7.0	> 7.0	1.6 ppb (range: 1.5 – 1.7)	Ultraoligotrophic
Total Phosphorus (ppb)	< 7.0	15.0 – 7.0	15.0 - 25.0	> 25.0	6.5 ppb (range: 5.3 – 7.7)	Ultraoligotrophic
Dissolved Oxygen (mg/L)	> 7.0	5.0 – 7.0	2.0 – 5.0	<2.0	5.7 mg/L (range: 1.2 – 9.1)	Oligotrophic
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 50 centimeters (cm) over the past thirty-three years of sampling. The trend is statistically significant.

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

COLOR: Color concentrations have remained relatively stable. However the trend is not statistically significant.

TOTAL PHOSPHORUS: Total phosphorus has decreased over twenty-nine years of sampling that has been undertaken since 1980. However, the trend is not statistically significant.

Overall, there are some indications of a slight increase in the Loon Reef water quality over the past thirty-three years of water quality monitoring. The water clarity has increased, while there has been a decrease in chlorophyll *a* and total phosphorus concentrations.

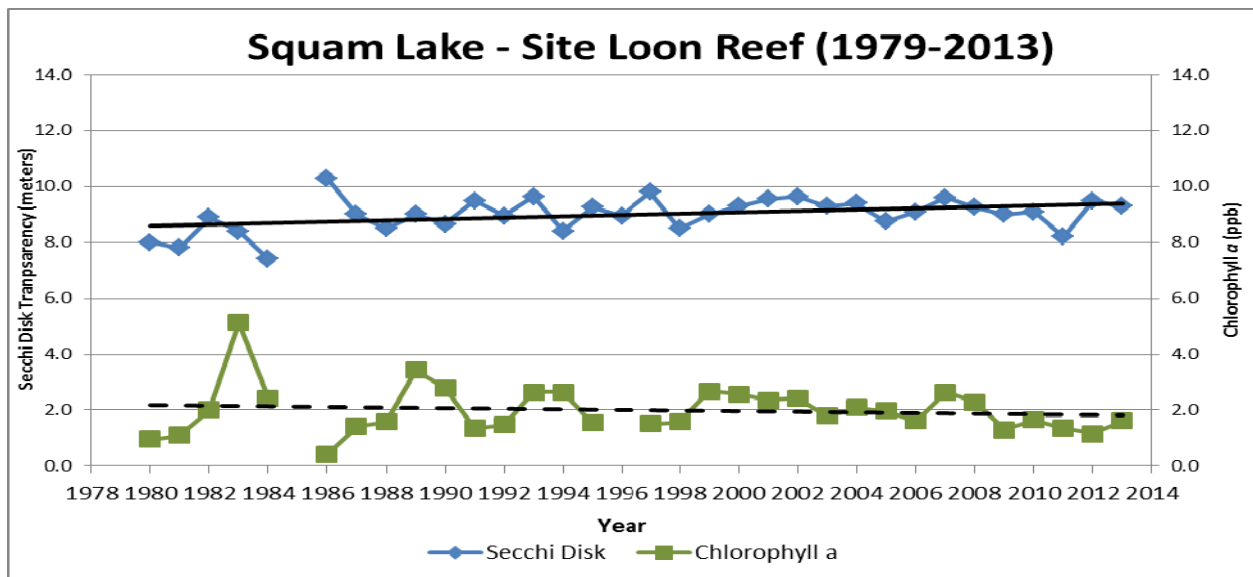


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1980 and 2013 at Site Loon Reef. There has been an increasing trend in water clarity with time. The trend of increasing water clarity is statistically significant (solid line). Algal growth (chlorophyll *a*) has shown a slightly decreasing trend since 1979. However, the trend is not statistically significant (dashed line).

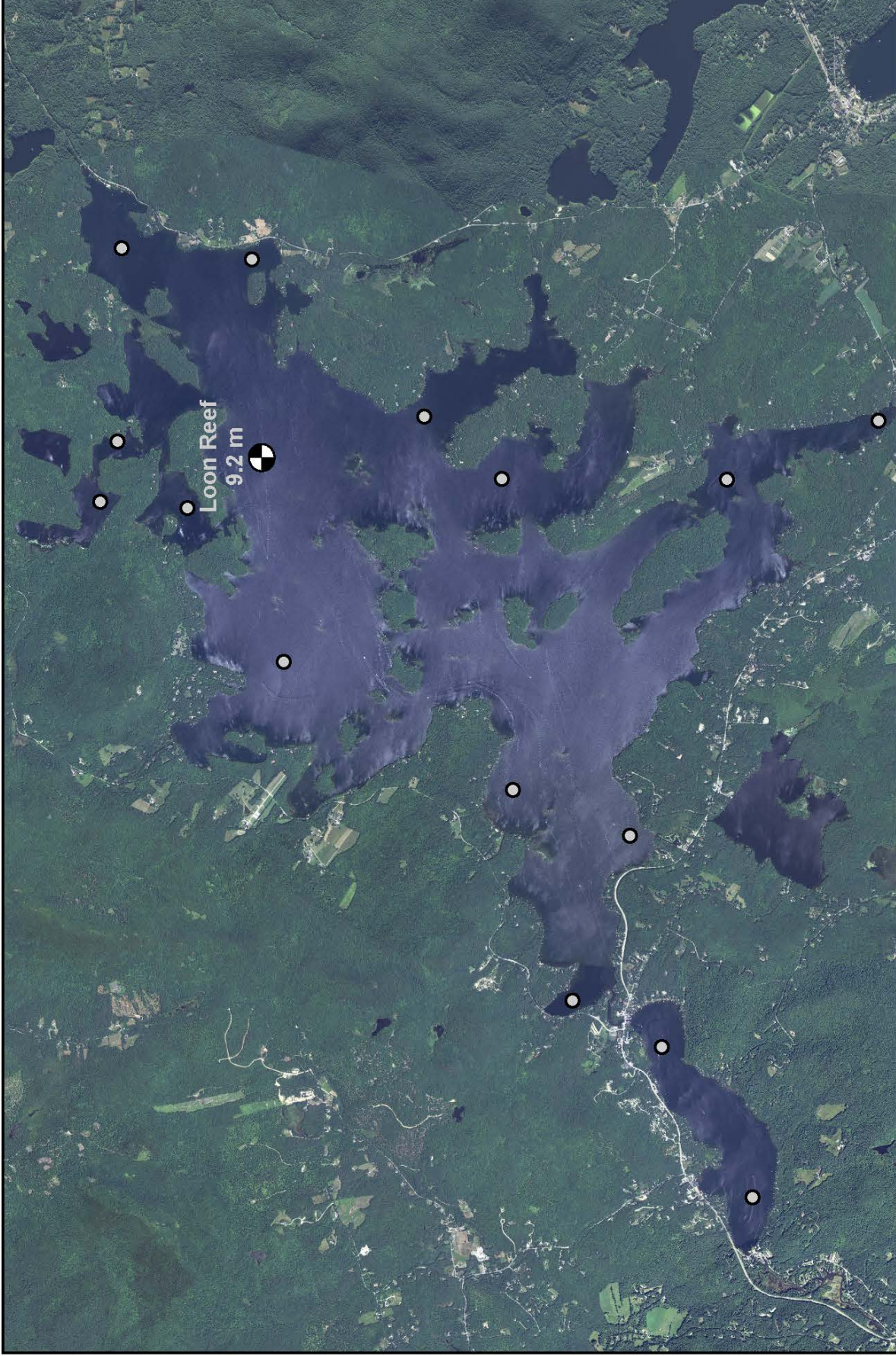
Recommendations:

- 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 Loon Reef

Sandwich, NH

2013 Deep water sampling site locations with annual seasonal water clarity



Cooperative Extension



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