SQUAM LAKE

SITE 9A INNER SQUAW COVE 2013 SAMPLING HIGHLIGHTS

SANDWICH, NH

NEW HAMPSHIRE
LAKES LAY MONITORING

Squam Lake volunteers collected water quality data between June 3 and October 16, 2013 while more in depth water quality surveys of Site 9A Inner Squaw 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

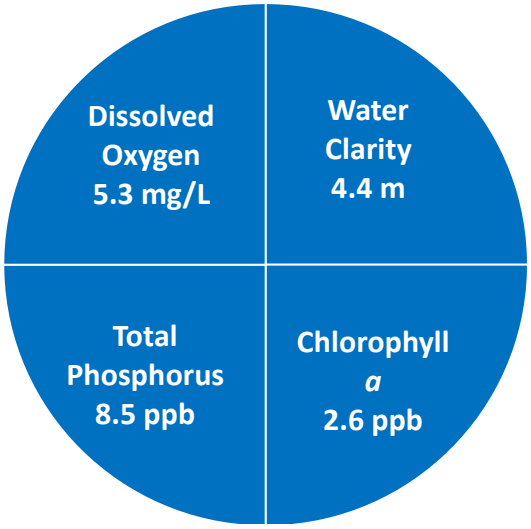


Figure 1. Average Water Quality Conditions

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 4.4 meters (m) at Site 9A Inner Squaw Cove. The 2013 Site 9A Inner Squaw Cove water clarity was slightly shallower than the 2012 water clarity.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 2.6 parts per billion (ppb) at Site 9A Inner Squaw Cove. The 2013 chlorophyll *a* concentrations were higher (greener water) than the 2012 readings.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 8.5parts per billion (ppb) and remained just 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 5.0 to 5.5 milligrams per liter (mg/L) on August 20. Dissolved oxygen concentrations were above 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 9A Inner Squaw Cove color averaged 25.0 color units (CPU).

ALKALINITY/pH: Alkalinity measures the resistance the lake has against acid rain. Site 9A Inner Squaw Cove alkalinity averaged 7.9 milligrams per liter (mg/L) and indicated a moderate vulnerability to acid rain. The 9A Inner Squaw **pH**, a measure of lake acidity, ranged from 6.7 to 7.3 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 44 to 54 micro-Siemans per centimeter (*u*S/cm at Site 9A Inner Squaw Cove. 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 9A Inner Squaw 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 9A Inner Squaw Average (range)	Site 9A Inner Squaw Classification
Water Clarity (meters)	> 7.0	4.0 – 7.0	2.5 - 4.0	< 2.5	**4.4** meters (range: 3.6 – 5.6)	Oligotrophic
Chlorophyll *a* (ppb)	< 2.0	2.0 - 3.0	3.0 - 7.0	> 7.0	**2.6** ppb (range: 0.8 – 5.0)	Oligotrophic
Total Phosphorus (ppb)	< 7.0	15.0 – 7.0	15.0 - 25.0	> 25.0	**8.5** ppb (range: 7.1 – 9.7)	Oligotrophic
Dissolved Oxygen (mg/L)	> 7.0	5.0 – 7.0	2.0 – 5.0	<2.0	**5.3** mg/L (range: 5.0 – 5.5)	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 slightly over the past thirty-four years of sampling. However, the trend is not statistically significant.

CHLOROPHYLL: Chlorophyll *a* has decreased less than 1.0 parts per billion (ppb) between 1980 and 2013. However, the trend is not statistically significant.

COLOR: Color concentrations have decreased over the thirty-four years of sampling. However, the trend is not statistically significantly.

TOTAL PHOSPHORUS: Total phosphorus has decreased less than 1.0 part per billion over twenty-one years of sampling. However, the trend is not statistically significantly.

In summary, there are some indications of a slight increase in the Site 9A Inner Squaw Cove water quality over the past thirty-four years of water quality monitoring. The water clarity has increased slightly between 1980 and 2013 and there has been a corresponding slight decrease in chlorophyll *a* and total phosphorus concentrations.

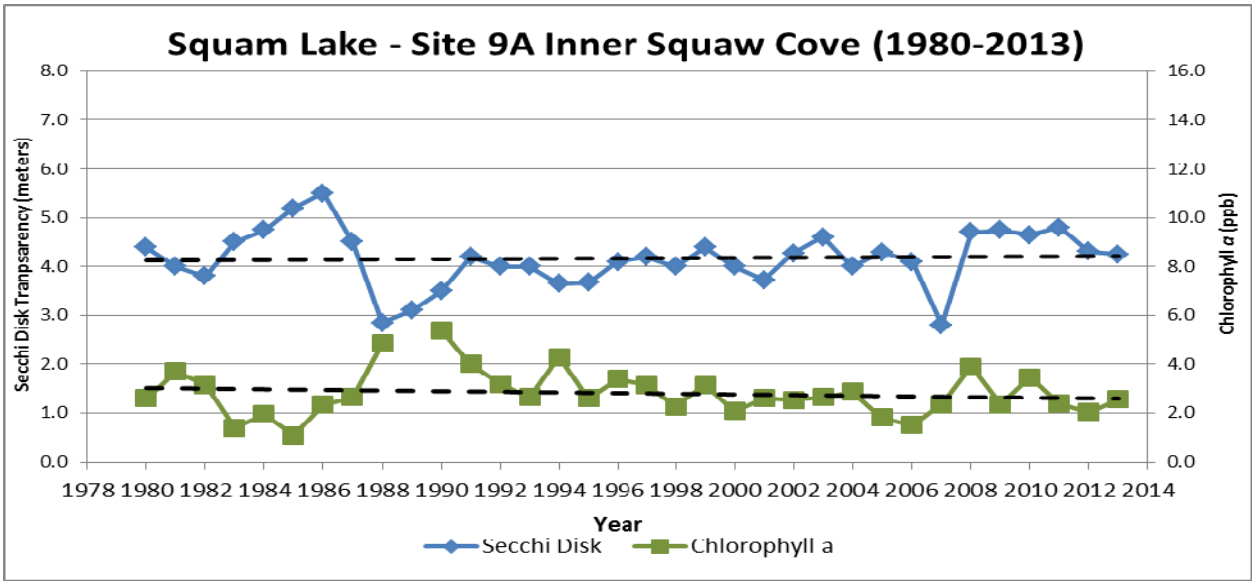


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1980 and 2013 at Site 9A Inner Squaw Cove. There has been an increase in water clarity that is not statistically significant with time (dashed line). Algal growth (chlorophyll *a*) has decreased slightly since 1980. However, the trend is not statistically significant (dashed line).

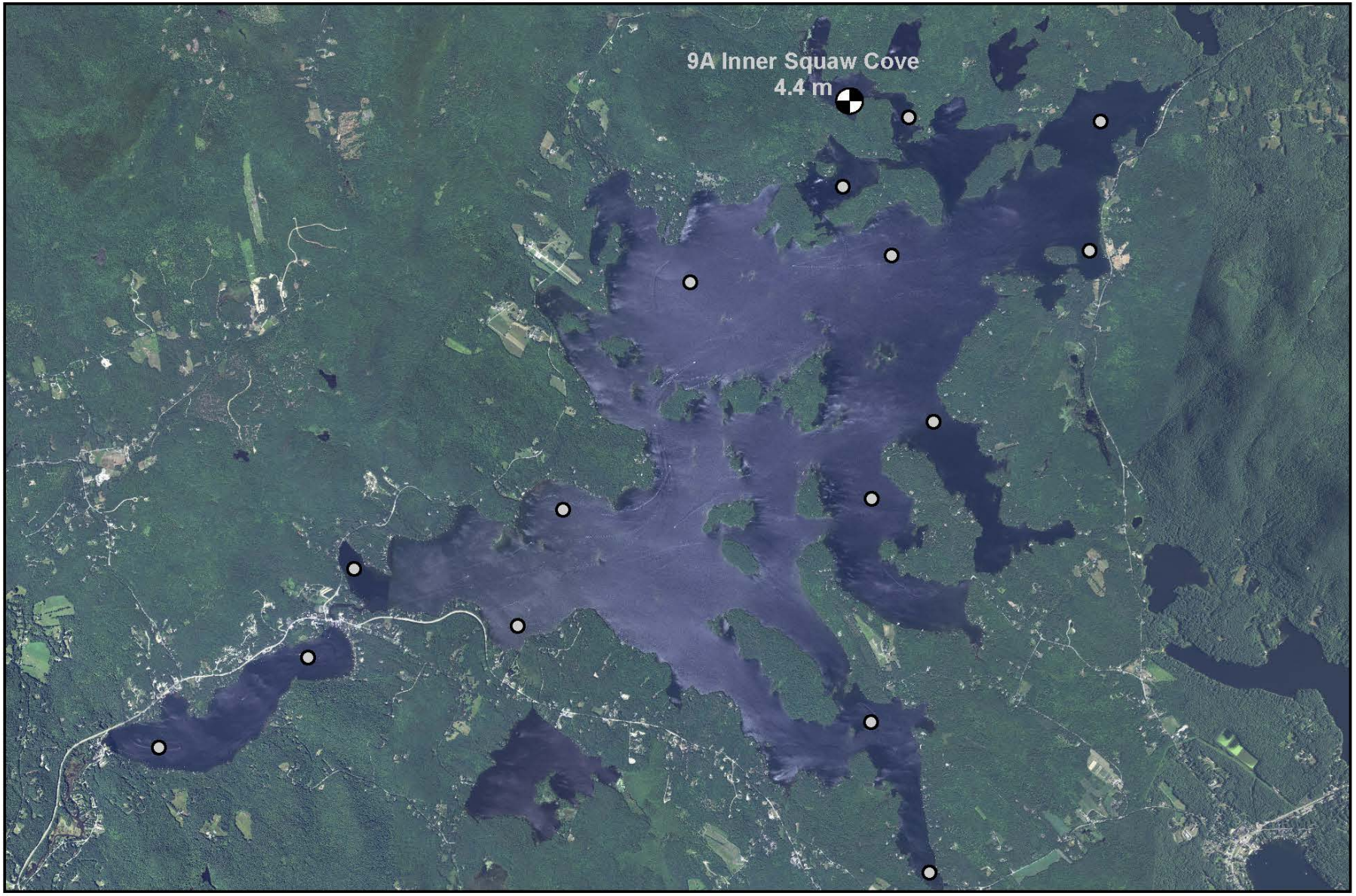
Recommendations:

- 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 9A Inner Squaw Cove

Sandwich, NH

2013 Deep water sampling site locations with annual seasonal water clarity



Aerial Orthophoto Source: NH GRANIT
Site location GPS coordiniates collected by theUNH Center of Freshwater Biology

University of New Hampshire
Cooperative Extension

New Hampshire Lakes Lay Monitoring