

# NATICOOK LAKE

## 2013 SAMPLING HIGHLIGHTS

MERRIMACK, NH



**Blue** = Excellent = Oligotrophic

**Yellow** = Fair = Mesotrophic

**Red** = Poor = Eutrophic

**Light Gray** = No Data

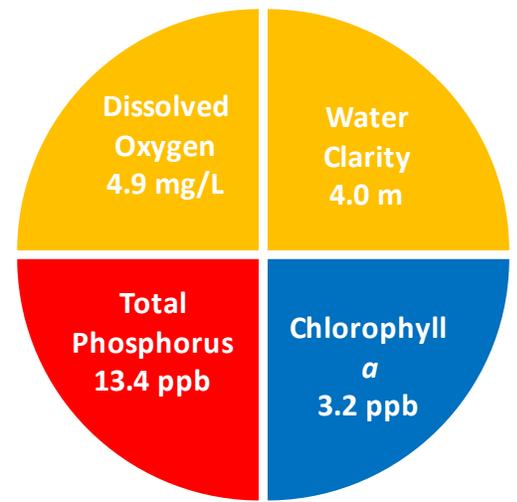


Figure 1. Average Water Quality Conditions

Naticook Lake volunteers collected water quality data between June 2 and September 19, 2013. A more in depth water quality survey of the Naticook Lake deep sampling station was conducted by the Center for Freshwater Biology on August 23, 2013.

### 2013 RESULT HIGHLIGHTS

**WATER CLARITY:** Water clarity, measured as Secchi disk depth, averaged 4.0 meters (m) in Naticook Lake. The 2013 Naticook Lake water clarity was shallower than to the 2012 water clarity.

**CHLOROPHYLL:** Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 3.2 parts per billion (ppb) in Naticook Lake. The 2013 Naticook Lake chlorophyll *a* concentration was higher (more algal greenness) than the 2012 concentration.

**TOTAL PHOSPHORUS:** Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 13.4 parts per billion (ppb) and remained above 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 Naticook Lake ranged from 3.0 to 7.9 milligrams per liter (mg/L) on August 23, 2013. Dissolved oxygen concentrations were lower near the lake bottom. However, all dissolved oxygen concentration remained above 3 mg/L. A dissolved oxygen concentration of 3.0 mg/L is considered the threshold for the growth and reproduction of warm water fish such as bass and perch.

**COLOR:** Color is a result of naturally occurring “tea” color substances from the breakdown of soils and plant materials. The Naticook Lake color averaged 29.7 color units (CPU).

**ALKALINITY:** Alkalinity measures the resistance the lake has against acid rain. The Naticook Lake alkalinity averaged 23.1 milligrams per liter (mg/L) and indicates a low vulnerability to acid rain. The Naticook Lake pH, a measure of lake acidity, ranged from 7.4 to 7.5 units in the surface waters and remained within the acceptable range for most aquatic organisms on the August 23, 2013 sampling date.

**SPECIFIC CONDUCTIVITY:** Specific conductivity is a general indicator of pollution. Specific Conductivity ranged from 194.0 to 195.0 micro-Siemans per centimeter ( $\mu\text{S}/\text{cm}$ ) in the Naticook Lake surface waters. The Naticook Lake specific conductivity indicates high concentrations of dissolved substances such as nutrients (e.g. phosphorus and nitrogen) and other dissolved salts (e.g. sodium and chloride).

**CYANOBACTERIA:** Cyanobacteria are the measure of potentially harmful plant-like bacteria. Cyanobacteria were observed in the surface waters during an August 23, 2013 sampling event. Microscopic examination of the water samples indicated the cyanobacteria primarily consisted of *Oscillatoria*, which have the potential to produce toxins.

**Note:** Site 1 Deep (see map) was used as the reference point to give an overall representation of the Naticook Lake water quality discussed above. For a more detailed discussion of water quality measurements, please refer to the executive summary within the annual Naticook Lake report.

Table 1. 2013 Naticook Lake Seasonal Average Water Quality Readings and Trophic Level Classification Criteria used by the New Hampshire Department of Environmental Services

Parameter	Oligotrophic “Excellent”	Mesotrophic “Fair”	Eutrophic “Poor”	Naticook Lake Average (range)	Naticook Lake Classification
Water Clarity (meters)	4.0 – 7.0	2.5 - 4.0	< 2.5	4.0 meters (range: 2.5 – 5.0)	Mesotrophic
Chlorophyll <i>a</i> (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	3.2 ppb (range: 2.2 – 7.0)	Oligotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	13.4 ppb (range: 10.5 – 19.4)	Eutrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	* 4.9 mg/L (range: 3.0 – 7.9)	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 ( $\mu\text{g}/\text{l}$ ) 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 measured in the zone of rapid temperature decrease (thermocline).

## LONG TERM TRENDS

**WATER CLARITY:** The Naticook Lake water clarity data display a trend of decreasing water clarity over the past thirty-one years. The trend is not statistically significant.

**CHLOROPHYLL:** The Naticook Lake chlorophyll *a* data display a trend of increasing concentrations over the past thirty-one years. The trend is not statistically significant.

**COLOR:** The Naticook Lake color data display a trend of increasing color concentrations over the twenty-nine year period during which color data were collected (1985 – 2013). The trend is statistically significant.

**TOTAL PHOSPHORUS:** The Naticook Lake total phosphorus concentrations have increased over the thirty-one year period during which total phosphorus data were collected (1986 – 2013). The trend is statistically significant.

In summary, there has been a decrease in the Naticook Lake water quality over the thirty-one years of water quality monitoring. The long-term water clarity has decreased while the long-term chlorophyll *a* and total phosphorus concentrations have increased.

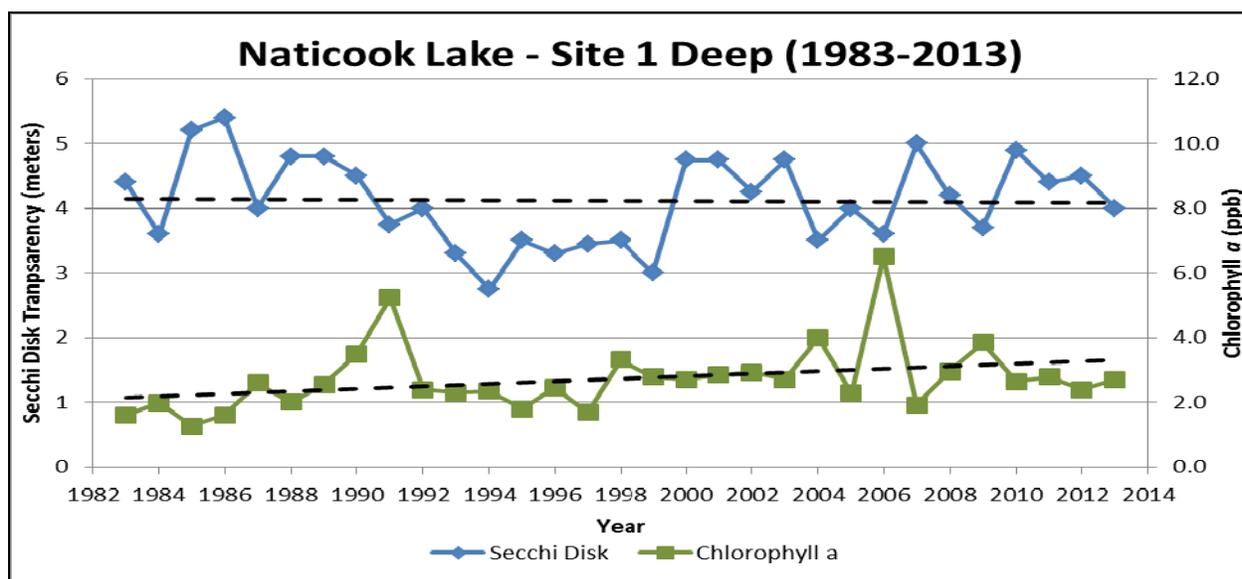


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1983 and 2013 at Site 1 Deep. The long-term water clarity data indicate a trend of decreasing water clarity (dashed line). The long-term algal growth (chlorophyll *a*) indicate a trend of decreasing concentrations (dashed line). Neither the long-term water clarity trend or long-term chlorophyll *a* trend are statistically significant.

### Recommendations:

- Implement Best Management Practices within the Naticook 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](https://extension.unh.edu/resources/files/Resource001799_Rep2518.pdf)  
<http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf>
- Consider adding a simple cyanobacteria monitoring routine that is based on the existing water quality monitoring methods. 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 @ 862-3696 or bob.craycraft@unh.edu.

# Naticook Lake

Merrimack, NH

2013 Deep sampling site with seasonal average water clarity



0.1 0.05 0 0.1 Miles



 UNIVERSITY  
of NEW HAMPSHIRE  
Cooperative Extension



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