

BABOOSIC LAKE

2013 SAMPLING HIGHLIGHTS

AMHERST & MERRIMACK, NH



Baboosic volunteers collected water quality data between May 16 and September 9, 2013. A more in depth water quality survey of the Baboosic Lake deep sampling stations was conducted by the Center for Freshwater Biology on August 19, 2013.

Blue = Excellent =
Oligotrophic

Yellow = Fair =
Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

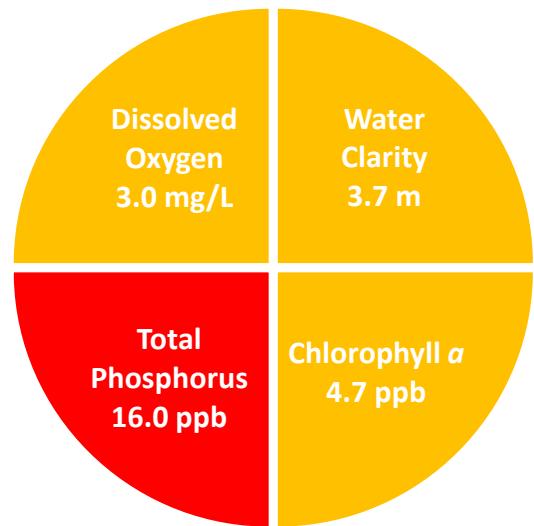


Figure 1. Average Water Quality Conditions

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 3.7 meters (m) in Baboosic Lake. The 2013 Baboosic Lake water clarity was shallower than the 2012 water clarity.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 4.7 parts per billion (ppb) in Baboosic Lake. The 2013 Baboosic Lake chlorophyll *a* concentration decreased (less green water) relative to the 2012 level.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 16.0 parts per billion (ppb) and were consistently 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 the deeper waters ranged from 0.5 to 6.5 milligrams per liter (mg/L) on August 19, 2013. Dissolved oxygen concentrations were reduced below 3.0 mg/L near the lake bottom. A dissolved oxygen concentration of 3.0 mg/L is considered the threshold for the successful growth and reproduction of many warm water fish 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. The Baboosic Lake color averaged 42.0 color units (CPU).

ALKALINITY: Alkalinity measures the resistance the lake has against acid rain. The Baboosic Lake alkalinity averaged 16.8 milligrams per liter (mg/L). The Baboosic Lake alkalinity indicates a low vulnerability to acid rain. The Baboosic Lake pH, a measure of lake acidity, ranged from 7.0 to 7.1 units in the surface waters. The Baboosic Lake pH remained within the acceptable range for most aquatic organisms on the August 19, 2013 sampling date.

SPECIFIC CONDUCTIVITY: Specific conductivity is a general indicator of pollution. The Baboosic Lake specific conductivity measured 110.0 micro-Siemans per centimeter ($\mu\text{s}/\text{cm}$) in the surface waters on August 19, 2013. The Baboosic Lake specific conductivity indicates moderate to 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 19, 2013 sampling event. The cyanobacteria were readily visible and appeared as fluorescent green "paint chips" in the surface waters. Microscopic examination of the August 19 water samples indicated the cyanobacteria primarily consisted of *Oscillatoria* while *Aphanocapsa* and *Microcystis* were also present. All three cyanobacteria identified on August 19 have the potential to produce toxins.

Note: Site 3 Sharks Tooth (see map) was used as the reference point to give an overall representation of the Baboosic Lake water quality discussed above. For a more detailed discussion of water quality measurements, please refer to the executive summary within the annual Baboosic Lake report.

Table 1. 2013 Baboosic 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"	Baboosic Lake Average (range)	Baboosic Lake Classification
Water Clarity (meters)	4.0 – 7.0	2.5 – 4.0	< 2.5	3.7 meters (range: 2.7 – 4.6)	Mesotrophic
Chlorophyll <i>a</i> (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	4.7 ppb (range: 2.6 – 7.6)	Mesotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	16.0 ppb (range: 12.3 – 21.7)	Eutrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	< 2.0	* 3.0 mg/L (range: 0.5 – 6.5)	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 taken from the bottom layer

LONG TERM WATER QUALITY TRENDS

WATER CLARITY: The Baboosic Lake water clarity data display a trend of decreasing water clarity over the past thirty-one years. The trend is statistically significant.

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

COLOR: The Baboosic 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 Baboosic Lake total phosphorus concentrations have decreased over fourteen year period during which total phosphorus data have been collected on a weekly basis (2000 – 2013). However, the trend is not statistically significant.

In summary, there are indications that the Baboosic Lake water quality has declined over the past thirty-one years. The water clarity data display a statistically significant trend of decreasing water clarity while chlorophyll *a* and color data display trends of increasing concentrations. However, total phosphorus has displayed a long-term trend of decreasing concentrations and there are some indications that the water quality has stabilized over the past seven years.

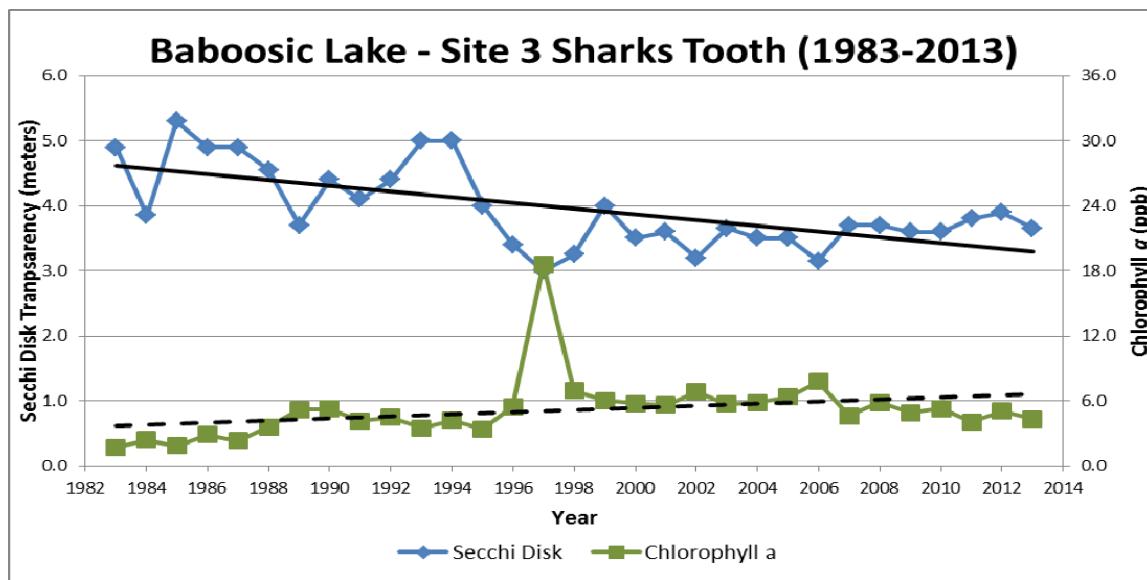
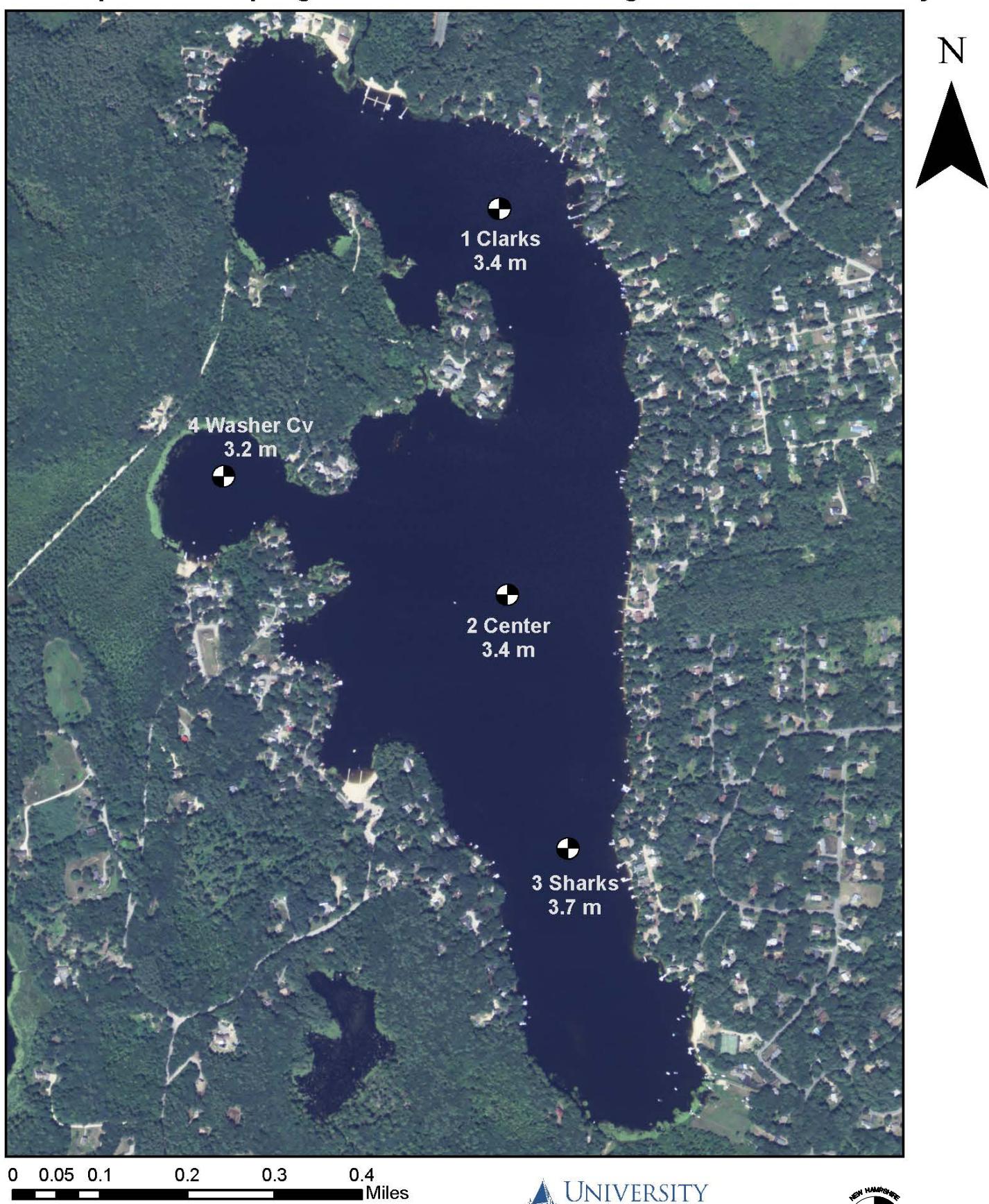


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1983 and 2013 at Site 3 Sharks Tooth. The long-term water clarity data indicate a trend of decreasing water clarity (solid line). The long-term algal growth (chlorophyll *a*) indicate a trend of increasing concentrations (dashed line). The long-term water clarity trend is statistically significant while the long-term chlorophyll *a* trend is not statistically significant.

Recommendations:

- Continue to work with the New Hampshire Department of Environmental Services to implement measures outlined in the Baboosic Lake Watershed Based Plan. Measures that reduce the amount of phosphorus that enters Baboosic Lake will continue to stabilize and improve water quality.
http://des.nh.gov/organization/divisions/water/wmb/was/documents/wbp_baboosic.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 reach harmful levels. If you are interested in discussing additional water quality monitoring options that would meet your needs please contact [Bob Craycraft @ 862-3696](mailto:Bob.Craycraft@862-3696) or bob.craycraft@unh.edu.

Baboosic Lake
Amherst & Merrimack, NH
2013 Deep water sampling site locations with average seasonal water clarity



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

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