

MERRYMEETING LAKE

2013 SAMPLING HIGHLIGHTS

NEW DURHAM, NH



Light Blue = Outstanding = Ultraoligotrophic

Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Light Gray = No Data

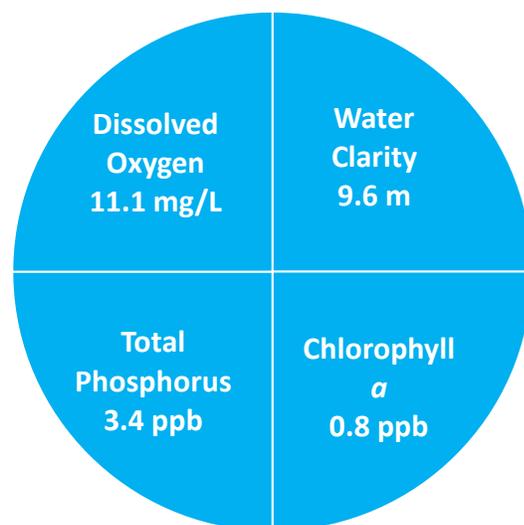


Figure 1. Average Water Quality Conditions

Merrymeeting Lake volunteers collected water quality data between July 29 and October 15, 2013 while a more in depth water quality survey of the Merrymeeting Lake deep sampling stations were conducted by the **Center for Freshwater Biology** on July 29, 2013.

2013 RESULT HIGHLIGHTS

WATER CLARITY: Water clarity, measured as Secchi disk depth, averaged 9.5 meters (m) in Merrymeeting Lake. The 2013 Merrymeeting Lake water clarity was shallower than the 2012 water clarity.

CHLOROPHYLL: Chlorophyll *a*, a measure of microscopic plant life within the lake, averaged 0.8 parts per billion (ppb) in Merrymeeting Lake. The 2013 Merrymeeting Lake chlorophyll *a* concentration was higher (greener water) than the 2012 level.

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. Total phosphorus concentrations taken from the surface waters averaged 3.5 parts per billion (ppb) and remained well 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 8.9 to 12.7 milligrams per liter (mg/L) on July 29. Dissolved oxygen concentrations were well 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. The Merrymeeting Lake color averaged 6.7 color units (CPU).

ALKALINITY: Alkalinity measures the resistance the lake has against acid rain. The Merrymeeting Lake alkalinity averaged 7.9 milligrams per liter (mg/L) and indicated a moderate vulnerability to acid rain. The Merrymeeting Lake **pH**, a measure of lake acidity, 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 38.6 to 53.1 micro-Siemans per centimeter (μ S/cm) in Merrymeeting Lake. The Merrymeeting Lake 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: Merrymeeting Lake did not take part in the 2013 cyanobacteria monitoring program. Please refer to the recommendation section for further information.

Note: Site 2 Owl’s Head (see map) was used as the reference point to give an overall representation of the Merrymeeting Lake water quality discussed above. For a more detailed discussion of water quality measurements, please refer to the executive summary within the annual Merrymeeting Lake report.

Table 1. 2013 Merrymeeting Lake 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”	Merrymeeting Lake Average (range)	Merrymeeting Lake Classification
Water Clarity (meters)	> 7.0	4.0 – 7.0	2.5 - 4.0	< 2.5	9.6 meters (range: 8.7 – 11.1)	Ultraoligotrophic
Chlorophyll <i>a</i> (ppb)	< 2.0	2.0 - 3.0	3.0 - 7.0	> 7.0	0.8 ppb (range: 0.5 – 1.3)	Ultraoligotrophic
Total Phosphorus (ppb)	< 7.0	15.0 – 7.0	15.0 - 25.0	> 25.0	3.4 ppb (range: 2.3 – 5.0)	Ultraoligotrophic
Dissolved Oxygen (mg/L)	> 7.0	5.0 – 7.0	2.0 – 5.0	<2.0	11.1 mg/L (range: 8.9 – 12.7)	Ultraoligotrophic
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 over 100 centimeters (cm) in the past thirty years of sampling, although the trend is not statistically significant.

CHLOROPHYLL: Chlorophyll *a* has decreased approximately 0.1 parts per billion (ppb) between 1981 and 2013, although the trend is not statistically significant. Preliminary precipitation (rainfall and snowfall) data suggest a relationship between rainfall and annual chlorophyll *a* measurements. Rainfall data will be discussed further in next year's report and should provide additional insight into the annual water quality variability.

TOTAL PHOSPHORUS: Total phosphorus has increased over twenty-seven years of sampling but the trend is not statistically significant.

In summary, there are some indications of a slight increase in the Merrymeeting Lake water quality over the past thirty years of water quality monitoring. The water clarity has increased while there has been a slight decrease in chlorophyll *a* concentrations. However, increasing long-term Total Phosphorus (nutrient) levels remain a threat to the high Merrymeeting Lake water quality.

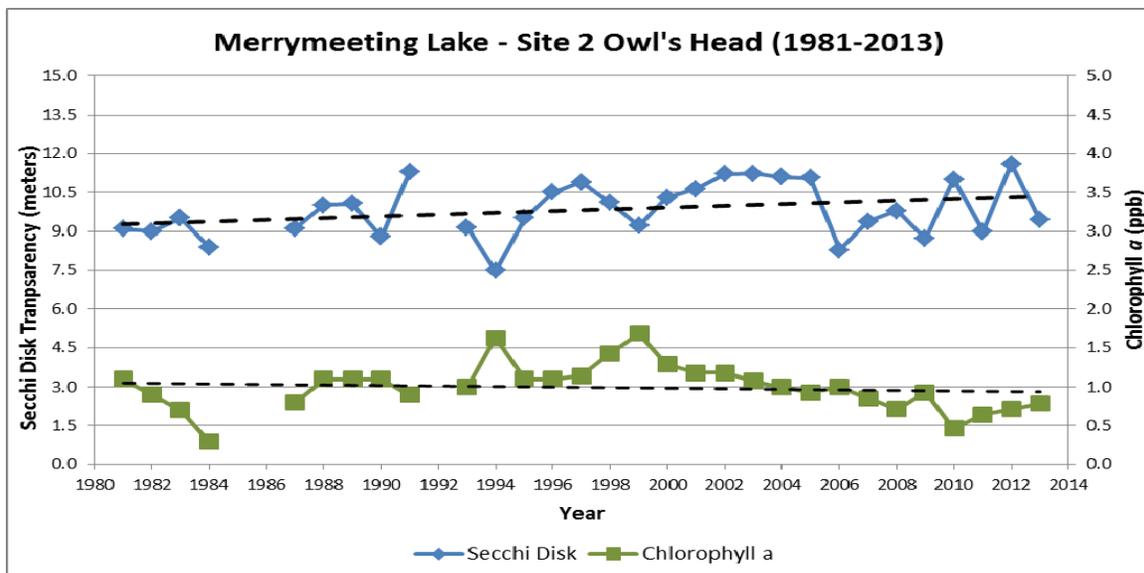


Figure 2. Changes in water clarity (Secchi disk depth) and chlorophyll *a* measured between 1981 and 2013 at Site 2 Owl's Head. There has been an increasing water clarity trend with time, although the trend is not statistically significant (dashed line). Algal growth (chlorophyll) has decreased slightly since 1981 although the trend is not significantly significant (dashed line).

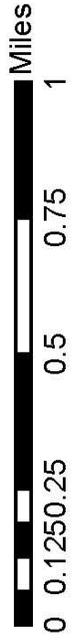
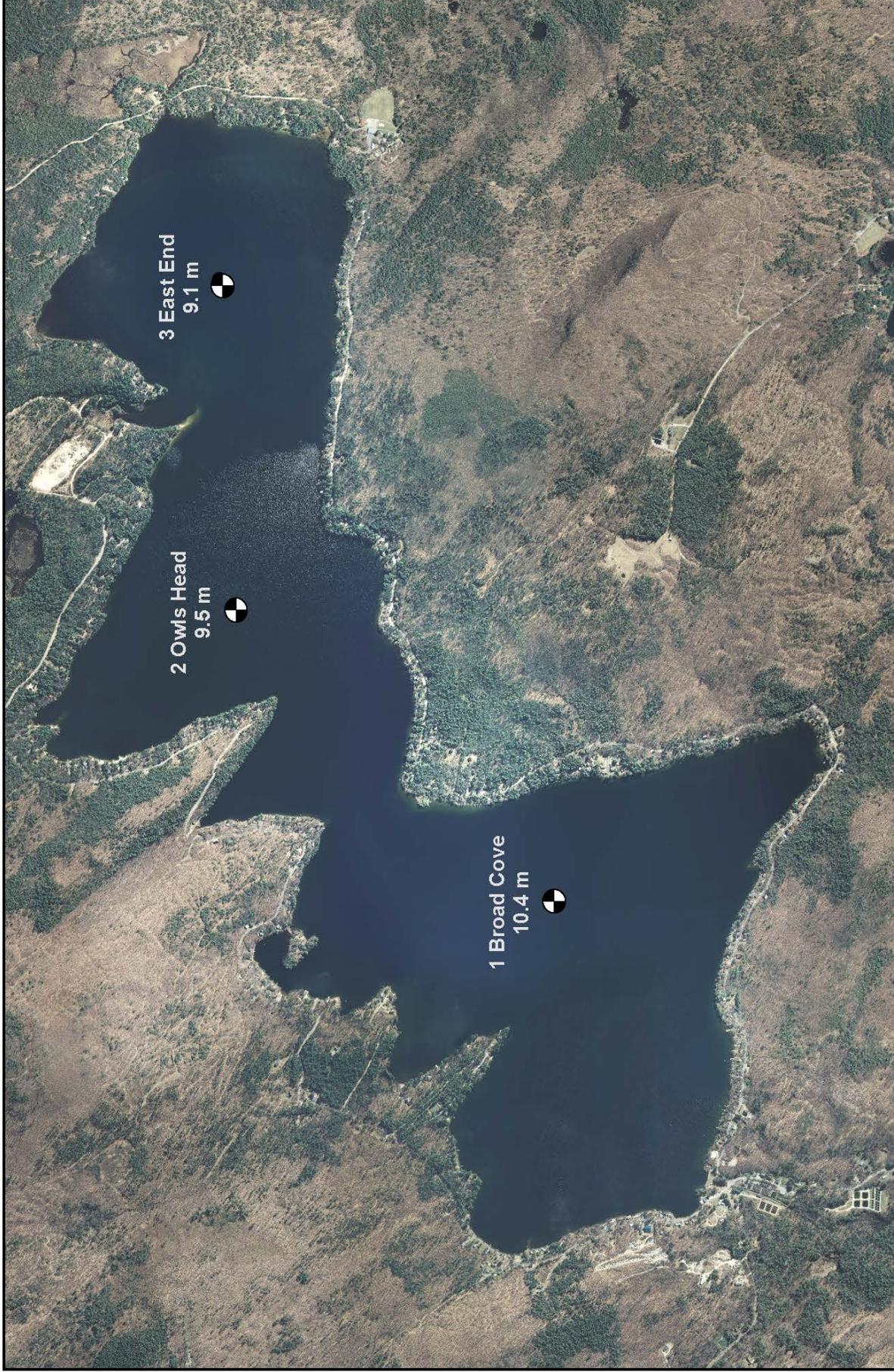
Recommendations:

- Conduct early season sampling (April/May) to document Merrymeeting Lake's reaction to periods of high stream flow during and after spring thaw.
- Many lakeshore residents and visitors have expressed concerns that the slimy coating on rocks is increasing along the shoreline. The slimy coating of microscopic plants is a response to nutrient levels and other factors. If interested in discussing options available to monitor this near-shore growth please contact Bob Craycraft by phone, 862-3696, or via email, bob.craycraft@unh.edu
- 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

Merrymeeting Lake

New Durham, NH

2013 Deep water sampling site locations with average seasonal water clarity



UNIVERSITY
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Cooperative Extension

Site locations GPS coordinates collected by the UNH Center of Freshwater Biology
Aerial Orthophoto Source: 2010-11 Statewide High Resolution Aerial Photography, NH GRANIT