

Merrymeeting Lake

2016 SAMPLING HIGHLIGHTS

Station – 1 Broad Cove

New Durham, NH



Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data

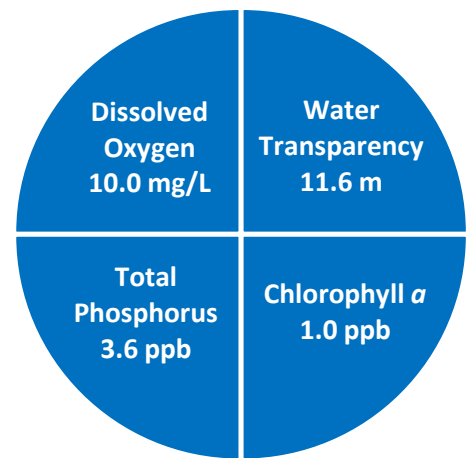


Figure 1. Merrymeeting Lake Water Quality (2016)

Station 1 Broad Cove (Figure 7) was used as a reference point to represent the overall Merrymeeting Lake water quality. Water quality data displayed in Tables 1 and 2 are surface water measurements with the exception of the dissolved oxygen data that were collected near the lake bottom.

Table 1. 2016 Merrymeeting Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria

Parameter	Oligotrophic "Excellent"	Mesotrophic "Fair"	Eutrophic "Poor"	Merrymeeting Lake Site 1 Broad Cove Average (range)	Merrymeeting Lake Site 1 Broad Cove Classification
Water Clarity (meters)	> 4.0	2.5 - 4.0	< 2.5	11.6 meters (8.8 – 13.2)	Oligotrophic
Chlorophyll <i>a</i> (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	1.0 ppb (0.5 – 1.5)	Oligotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	3.6 ppb (< 2.0 – 6.4)	Oligotrophic
Dissolved Oxygen (mg/L)	> 5.0	2.0 – 5.0	< 2.0	10.0 mg/L (7.5 – 13.3)	Oligotrophic

* Dissolved oxygen concentrations were measured on September 14, 2016 between 16.0 and 29.5 meters, in the bottom waters.

Table 2. 2016 Merrymeeting Lake Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Merrymeeting Lake Site 1 Broad Cove Average (range)	Merrymeeting Lake Site 1 Broad Cove Classification
	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored		
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	3.5 color units (range: 2.0 – 6.2)	Uncolored
Alkalinity (mg/L)	< 0.0 acidified	0.1 – 2.0 extremely vulnerable	2.1 – 10 moderately vulnerable	10.1 – 25.0 low vulnerability	> 25.0 not vulnerable	7.7 mg/L (range: 7.5 – 7.8)	Moderately vulnerable
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			7.1 standard units (range: 6.5 – 7.3)	Optimal range for fish growth and reproduction
Specific Conductivity (uS/cm)	< 50 uS/cm Characteristic of minimally impacted NH lakes		50-100 uS/cm Lakes with some human influence	> 100 uS/cm Characteristic of lakes experiencing human disturbances		56.1 uS/cm (range: 55.2- 56.5)	Lakes with some human influence

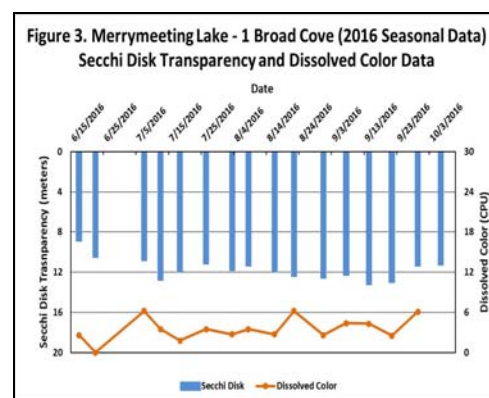
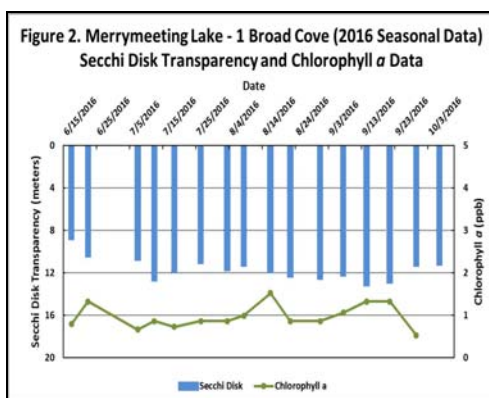


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll *a* concentrations and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll *a* and/or color concentrations.

LONG-TERM TRENDS

WATER CLARITY: The Merrymeeting Lake water clarity measurements, measured as Secchi Disk transparency, display a trend of increasing water clarity over thirty-three years of water quality monitoring conducted between 1981 and 2016 (Figure 4).

CHLOROPHYLL: The Merrymeeting Lake chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, display a trend of decreasing concentrations over thirty-three years of water quality monitoring conducted between 1981 and 2016 (Figure 4).

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. The Merrymeeting Lake total phosphorus concentrations display a trend of increasing concentrations over thirty years of water quality monitoring conducted between 1981 and 2016 (Figure 5).

COLOR: The Merrymeeting Lake color data, the result of naturally occurring “tea” color substances from the breakdown of soils and plant materials, display a trend of decreasing concentrations over twenty-nine years of water quality monitoring conducted between 1987 and 2016 (Figure 5).

**Figure 4. Merrymeeting Lake - Site 1 Broad Cove (1981-2016)
Long-term Secchi Disk Transparency and Chlorophyll *a* Data**

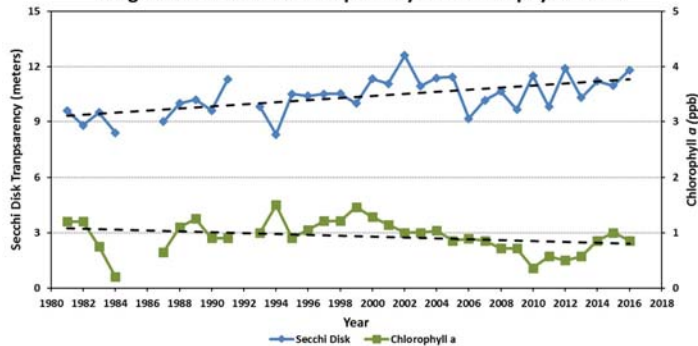
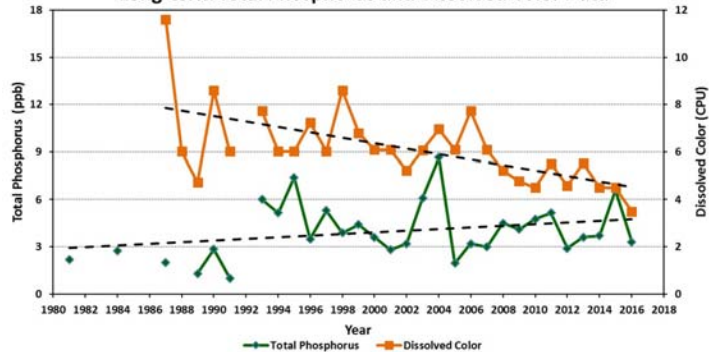


Table 3. Merrymeeting Lake Seasonal Average Water Quality Inter-Site Comparison (2016)

Sampling Station	Average (range) Secchi Disk (meters)	Average (range) Total Phosphorus (ppb)	Average (range) Chlorophyll <i>a</i> (ppb)	Average (range) Dissolved Oxygen (mg/L)
1 Broad Cove	11.6 m (range: 8.8 – 13.1)	3.6 ppb (1.7 – 6.4)	1.0 ppb (range: 0.5 – 1.5)	10.0 mg/L (range: 7.5 – 13.3)
2 Owls Head	11.3 m (range: 8.7 – 13.0)	3.1 ppb (range: 1.9 – 4.4)	0.9 ppb (range: 0.6 – 1.3)	6.6 mg/L (range: 5.7 – 9.0)
3 East End	10.7 m (range: 8.8 – 12.8)	3.5 ppb (range: 1.0 – 6.1)	0.9 ppb (range: 0.7 – 1.5)	Not Assessed. No bottom layer

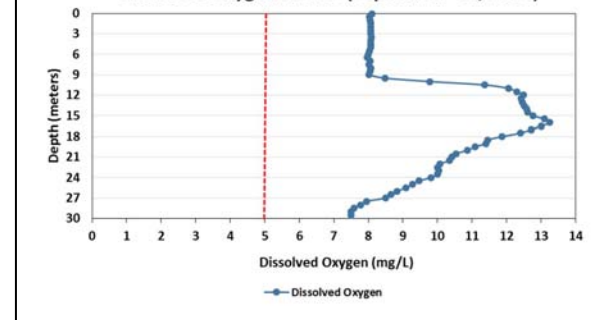
**Figure 5. Merrymeeting Lake - Site 1 Broad Cove (1981-2016)
Long-term Total Phosphorus and Dissolved Color Data**



Figures 4 and 5. Changes in the Merrymeeting Lake water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color and total phosphorus concentrations measured between 1981 and 2016. **These data illustrate the relationship among plant growth, water color and water clarity. Total phosphorus data are also displayed and are oftentimes correlated with the amount of plant growth.**

Figure 6. Merrymeeting Lake dissolved oxygen profile collected on September 14, 2016. The vertical red line indicates the dissolved oxygen concentration commonly considered the threshold for successful growth and reproduction of cold water fish such as trout and salmon. *Notice the high dissolved oxygen concentrations near the lake bottom.*

**Figure 6. Merrymeeting Lake - Site 1 Broad Cove
Dissolved Oxygen Profile (September 14, 2016)**



Recommendations

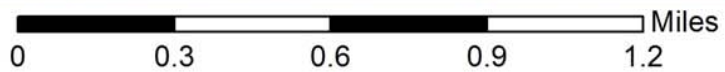
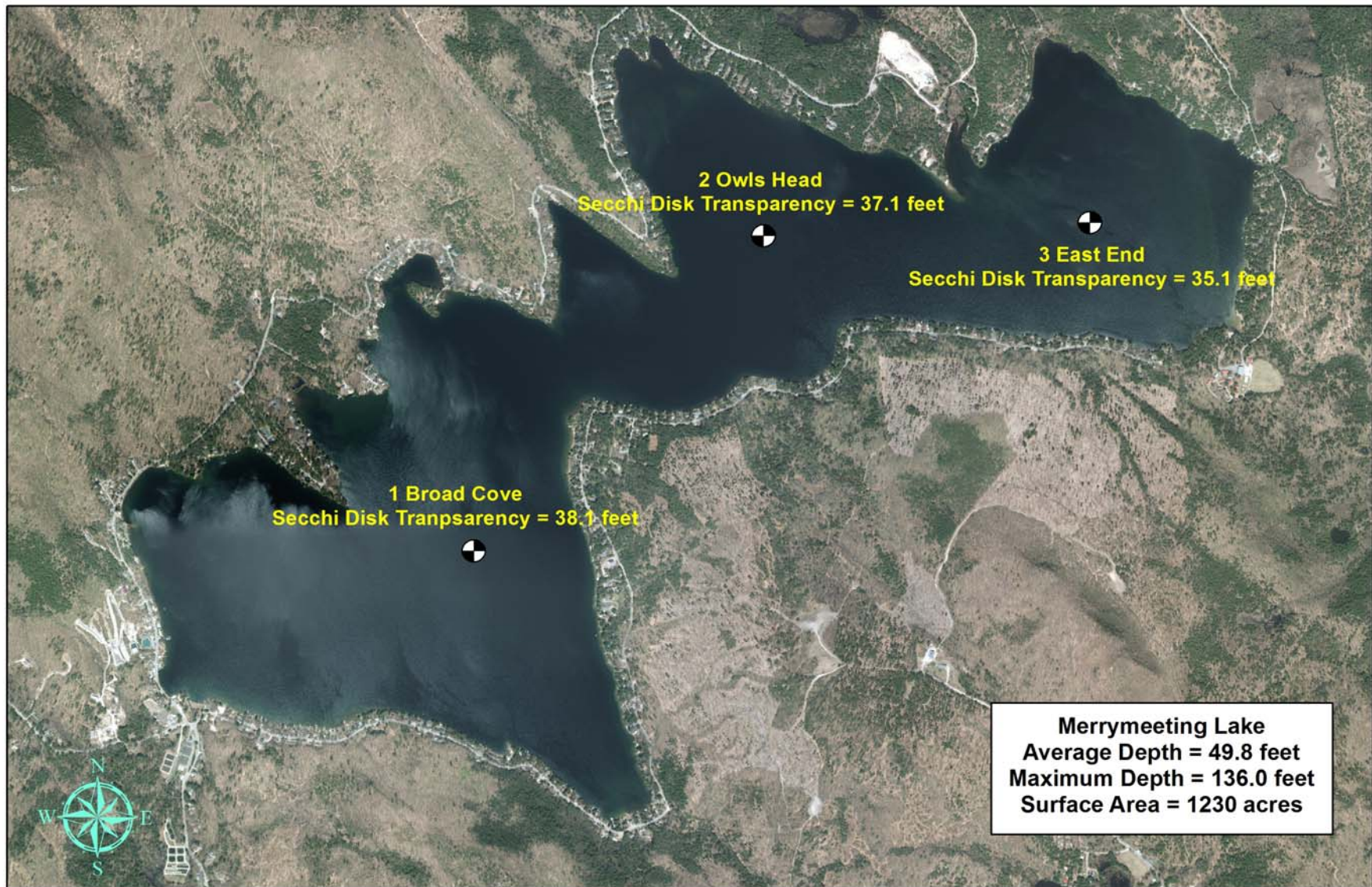
Implement Best Management Practices within the Merrymeeting Lake watershed to minimize the adverse impacts of polluted runoff and erosion on Merrymeeting Lake. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself Stormwater Solutions for Your Home” for more information on how to reduce nutrient loading caused by overland run-off.

- http://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- <http://soaknh.org/wp-content/uploads/2016/04/NH-Homeowner-Guide-2016.pdf>

Figure 7. Merrymeeting Lake

New Durham, NH

2016 Deep water sampling site locations with seasonal average water clarity



Site location GPS coordinates were collected by the UNH Center for Freshwater Biology
Aerial Orthophoto Source: 2015 Statewide High Resolution Aerial Photography, NH GRANIT



Extension

