

MERRYMEETING LAKE

2017 SAMPLING HIGHLIGHTS

Station – 1 Broad Cove

New Durham, NH

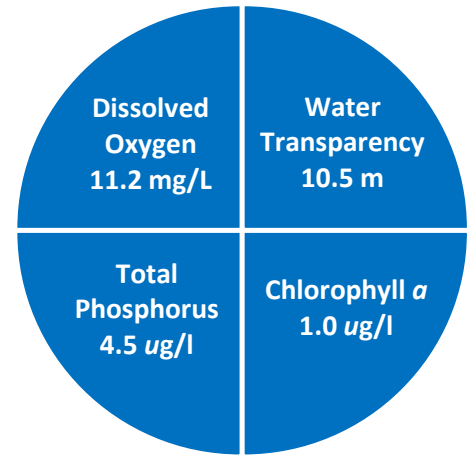


Blue = Excellent = Oligotrophic

Yellow = Fair = Mesotrophic

Red = Poor = Eutrophic

Gray = No Data



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.

Figure 1. Merrymeeting Lake Water Quality (2017)

Table 1. 2017 Merrymeeting Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria¹

| 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 | 10.5 meters (8.3 – 12.2) | Oligotrophic |
| Chlorophyll <i>a</i> ¹ (ug/l) | < 3.3 | > 3.3 – 5.0 | > 5.0 – 11.0 | 1.0 ug/l (0.4 – 2.0) | Oligotrophic |
| Total Phosphorus ¹ (ug/l) | < 8.0 | > 8.0 – 12.0 | > 12.0 – 28.0 | 4.5 ug/l (2.0 – 7.3) | Oligotrophic |
| Dissolved Oxygen (mg/L) | > 5.0 | 2.0 – 5.0 | <2.0 | 11.2 mg/L (10.0 – 11.8) | Oligotrophic |

* Dissolved oxygen concentrations were measured on July 31, 2017 between 11.0 and 26.0 meters, in the bottom waters.

Table 2. 2017 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 | 5.5 color units (range: 2.6 – 7.9) | 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 | 8.0 mg/L (range: 7.7 – 7.3) | Moderately vulnerable |
| pH (std units) | < 5.5 suboptimal for successful growth and reproduction | | 6.5 – 9.0 optimal range for fish growth and reproduction | | | 7.3 standard units (range: 7.2 – 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 | | 57.4 uS/cm (range: 53.4 – 60.5) | Lakes with some human influence |

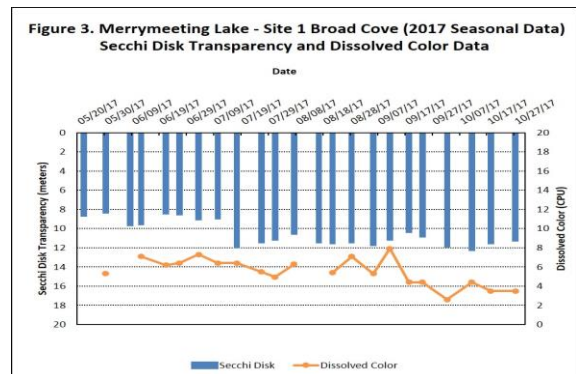
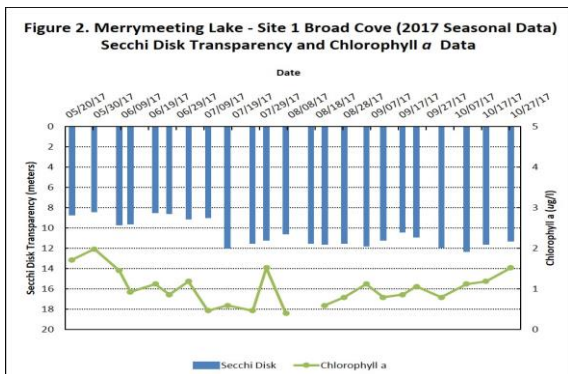


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll *a* concentrations and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll *a* and dissolved color. Shallower water transparency measurements oftentimes correspond to increases 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-four years of water quality monitoring conducted between 1981 and 2017 (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-four years of water quality monitoring conducted between 1981 and 2017 (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-one years of water quality monitoring conducted between 1981 and 2017 (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 thirty years of water quality monitoring conducted between 1987 and 2017 (Figure 5).

**Figure 4. Merrymeeting Lake - Site 1 Broad Cove (1981-2017)
Long-term Secchi Disk Transparency and Chlorophyll *a* Data**

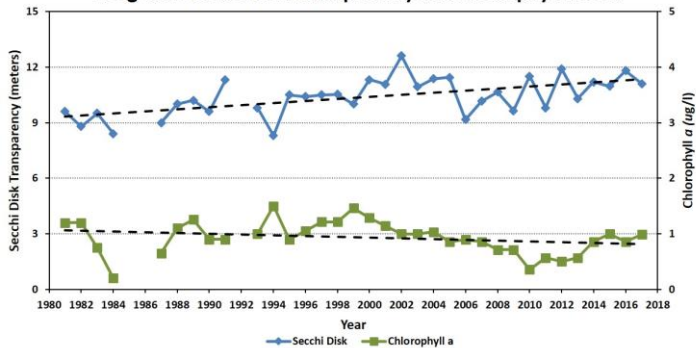
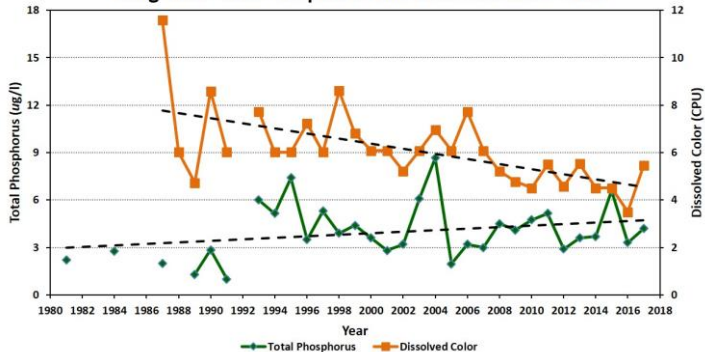


Table 3. Merrymeeting Lake Seasonal Average Water Quality Inter-Site Comparison (2017)

| Sampling Station | Average (range) Secchi Disk (meters) | Average (range) Total Phosphorus (ug/l) | Average (range) Chlorophyll <i>a</i> (ug/l) | Average (range) Dissolved Oxygen (mg/L) |
|------------------|--------------------------------------|---|---|---|
| 1 Broad Cove | 10.5 m (range: 8.3 – 12.2) | 4.5 ug/l (2.0 – 7.3) | 1.0 ug/l (range: 0.4 – 2.0) | 11.2 mg/L (range: 10.0 – 11.8) |
| 2 Owls Head | 10.0 m (range: 7.4 – 12.2) | 4.1 ug/l (range: 2.1 – 6.6) | 1.0 ug/l (range: 0.3 – 2.1) | 10.1 mg/L (range: 8.1 – 11.5) |
| 3 East End | 9.3 m (range: 7.2 – 11.0) | 4.5 ug/l (range: 2.3 – 7.9) | 1.0 ug/l (range: 0.4 – 2.7) | 10.5 mg/L (range: 9.4 – 11.2) |

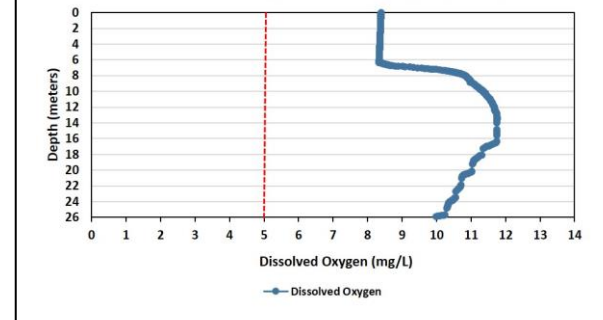
**Figure 5. Merrymeeting Lake - Site 1 Broad Cove (1981-2017)
Long-term Total Phosphorus and Dissolved Color Data**



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 2017. **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 July 31, 2017. 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 (July 31, 2017)**



Recommendations

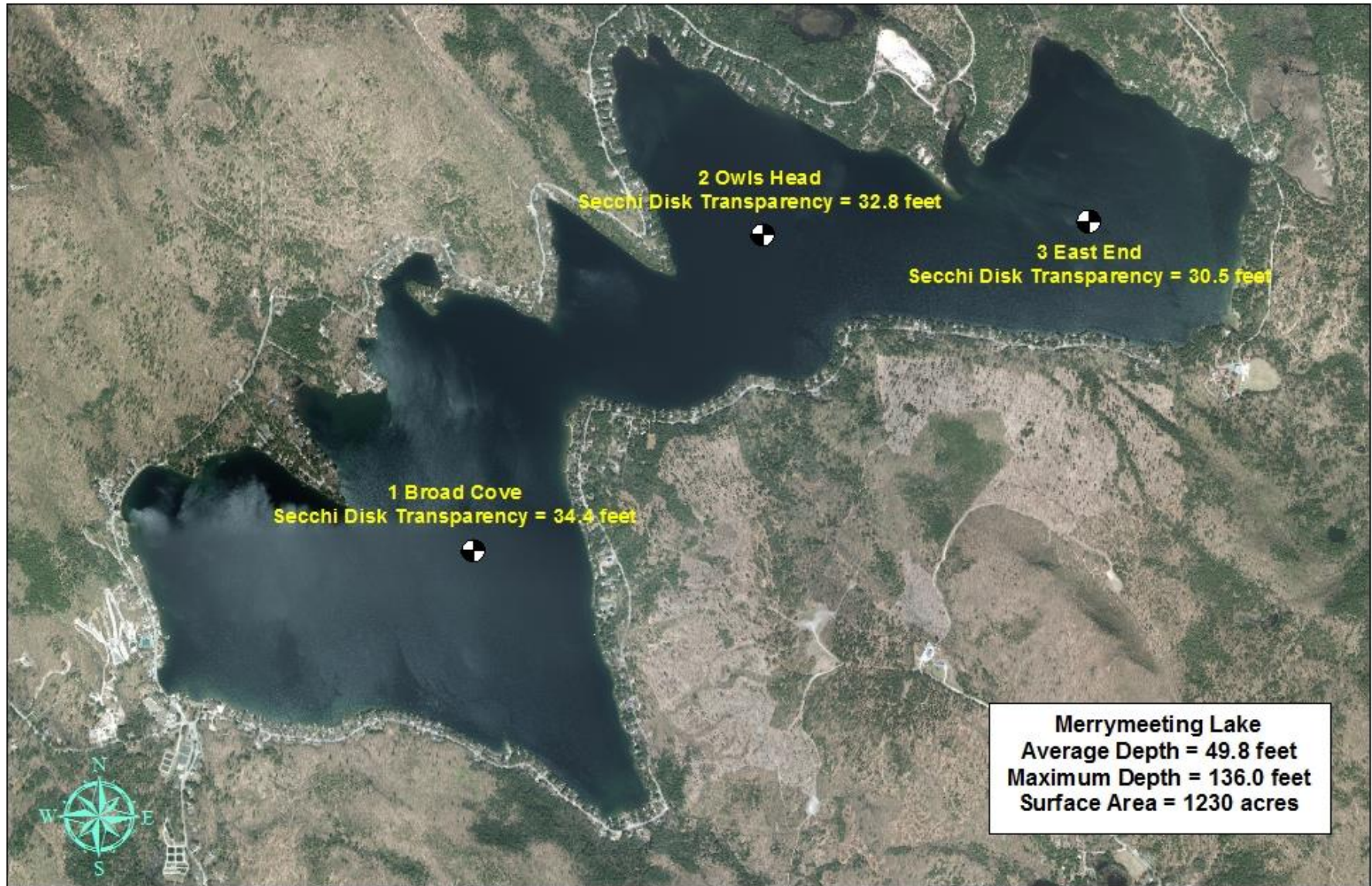
Implement Best Management Practices within the Merrymeeting Lake watershed to minimize the adverse impacts of polluted runoff and erosion on Merrymeeting Lake. Refer to “Landscaping at the Water’s Edge: An Ecological Approach” and “New Hampshire Homeowner’s Guide to Stormwater Management: Do-It-Yourself 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

2017 Deep water sampling site locations with seasonal average water clarity



0 0.3 0.6 0.9 1.2 Miles

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

