**MERRymeeting Lake**

**2019 Sampling Highlights**

Station – 1 Broad Cove
New Durham, NH

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, 2 and 3 are surface water measurements with the exception of the dissolved oxygen data that were collected near the lake bottom.

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**Table 1. 2019 Merrymeeting Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Oligotrophic “Excellent”</th>
<th>Mesotrophic “Fair”</th>
<th>Eutrophic “Poor”</th>
<th>Merrymeeting Lake Site 1 Broad Cove Average (range)</th>
<th>Merrymeeting Lake Site 1 Broad Cove Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Clarity (meters)</td>
<td>&gt; 4.0</td>
<td>2.5 - 4.0</td>
<td>&lt; 2.5</td>
<td>10.2 meters (8.2 – 12.5)</td>
<td>Oligotrophic</td>
</tr>
<tr>
<td>Chlorophyll a (ug/l)</td>
<td>&lt; 3.3</td>
<td>3.3 – 5.0</td>
<td>5.0 – 11.0</td>
<td>0.7 ug/l (0.1 – 1.0)</td>
<td>Oligotrophic</td>
</tr>
<tr>
<td>Total Phosphorus (ug/l)</td>
<td>&lt; 8.0</td>
<td>8.0 – 12.0</td>
<td>12.0 – 28.0</td>
<td>3.7 ug/l (2.6 – 6.5)</td>
<td>Oligotrophic</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>&gt; 5.0</td>
<td>2.0 – 5.0</td>
<td>&lt; 2.0</td>
<td>10.9 mg/L (8.7 – 12.2)</td>
<td>Oligotrophic</td>
</tr>
</tbody>
</table>

* Dissolved oxygen concentrations were measured on July 30, 2019 between 11.5 and 31.1 meters, in the bottom waters.

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**Table 2. 2019 Merrymeeting Lake Seasonal Average Accessory Water Quality Measurements**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Assessment Criteria</th>
<th>Merrymeeting Lake Site 1 Broad Cove Average (range)</th>
<th>Merrymeeting Lake Site 1 Broad Cove Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color (color units)</td>
<td>&lt; 10 uncolored</td>
<td>10 – 20 slightly colored</td>
<td>4.2 color units (range: 1.4 – 7.4)</td>
</tr>
<tr>
<td></td>
<td>&lt; 0.0 acidified</td>
<td>0.1 – 2.0 extremely vulnerable</td>
<td>8.3 mg/L (range: 7.6 – 8.7)</td>
</tr>
<tr>
<td>Alkalinity (mg/l)</td>
<td>&lt; 5.5 suboptimal for successful growth and reproduction</td>
<td>6.5 – 9.0 optimal range for fish growth and reproduction</td>
<td>7.1 standard units (range: 6.7 – 7.3)</td>
</tr>
<tr>
<td>pH (std units)</td>
<td>&lt; 50 uS/cm Characteristic of minimally impacted NH lakes</td>
<td>50-100 uS/cm Lakes with some human influence</td>
<td>53.7 uS/cm (range: 52.0 – 57.3)</td>
</tr>
</tbody>
</table>

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**Figure 1. Merrymeeting Lake Water Quality (2019)**

**Figure 2. Merrymeeting Lake - Site 1 Broad Cove (2019 Seasonal Data) Secchi Disk Transparency and Chlorophyll a Data**

**Figure 3. Merrymeeting Lake - Site 1 Broad Cove (2019 Seasonal Data) Secchi Disk Transparency and Dissolved Color Data**

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-six years of water quality monitoring conducted between 1981 and 2019 (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-six years of water quality monitoring conducted between 1981 and 2019 (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-three years of water quality monitoring conducted between 1981 and 2019 (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-two years of water quality monitoring conducted between 1987 and 2019 (Figure 5).

Table 3. Merrymeeting Lake Seasonal Average Water Quality Inter-Site Comparison (2019)

<table>
<thead>
<tr>
<th>Sampling Station</th>
<th>Average (range) Secchi Disk (meters)</th>
<th>Average (range) Total Phosphorus (ug/l)</th>
<th>Average (range) Chlorophyll ( a ) (ug/l)</th>
<th>Average (range) Dissolved Oxygen (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Broad Cove</td>
<td>10.2 m (range: 8.2 – 12.5)</td>
<td>3.7 ug/l (range: 2.6 – 6.5)</td>
<td>0.7 ug/l (range: 0.1 – 1.0)</td>
<td>10.9 mg/L (range: 8.7 – 12.2)</td>
</tr>
<tr>
<td>2 Owls Head</td>
<td>9.5 m (range: 7.4 – 12.0)</td>
<td>3.8 ug/l (range: 2.6 – 10.7)</td>
<td>0.8 ug/l (range: 0.5 – 1.1)</td>
<td>10.3 mg/L (range: 8.0 – 12.1)</td>
</tr>
<tr>
<td>3 East End</td>
<td>9.0 m (range: 6.8 – 11.8)</td>
<td>3.6 ug/l (range: 2.7 – 5.9)</td>
<td>0.8 ug/l (range: 0.3 – 1.5)</td>
<td>----------</td>
</tr>
</tbody>
</table>

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 2019. 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. Long-term trends are based on the analysis of annual median values.

Figure 6. Merrymeeting Lake dissolved oxygen profile collected on July 30, 2019. 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.

Recommendations


Figure 7. Merryymeeting Lake
New Durham, NH
2018 Deep water sampling site locations with seasonal average water clarity

Disclaimer: Due to the COVID-19 pandemic, access to University files needed to update this image are limited. Thus, the 2018 map was used. The sampling locations, average depth, maximum depth and surface area are accurately depicted. However, the year and seasonal average water transparency have not been updated. Once full University resources become available this map will be updated.

The information in the first two pages of this report reflects the 2019 conditions and is final.

Merryymeeting Lake
Average Depth = 49.8 feet
Maximum Depth = 136.0 feet
Surface Area = 1230 acres

1 Broad Cove
Secchi Disk Transparency = 35.4 feet

2 Owls Head
Secchi Disk Transparency = 33.5 feet

3 East End
Secchi Disk Transparency = 31.8 feet

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