Long Lost Lake (15-0068-00)

Aquatic Vegetation Survey
Introduction

Long Lost Lake (DOW 15-0068-00) is a large 501 acre lake located in Clearwater County near Zerkel, MN. According to the Department of Natural Resources, Long Lost Lake has a maximum depth of 53 feet and contains a littoral area of about 76 percent which permits light penetration and allows plant growth.

Long Lost Lake is classified as an oligotrophic lake with excellent water clarity as measured from 2004 to 2014 by mean secchi depth of approximately 20 feet. Total phosphorus and chlorophyll-a (values that provide a measure of the amount of algae in the water) are considered low with mean values 10 and 2 ug/L.

Table 1. Water quality means over the last 10 years for Long Lost Lake.

<table>
<thead>
<tr>
<th>Lake</th>
<th>Trophic State</th>
<th>Mean Secchi depth (ft)</th>
<th>Phosphorus (ug/L)</th>
<th>Chlorophyll a (ug/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Lost Lake</td>
<td>Oligotrophic</td>
<td>20.2</td>
<td>9.7</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Objectives of Survey

This survey describes the aquatic plant community of Long Lost Lake including:
1) Vegetation data to include; sample point number, depth, plant taxa observed, and the estimated abundance of each taxon.
2) Identification of taxa to the level of species when possible.
3) Frequency of occurrence of each taxon found, stating the number of points used as the denominator for the calculations.
4) Combined frequency of all aquatic plants found
5) Estimation of maximum depth of submersed vegetation
6) Estimation of abundance of species sampled using MN DNR ranking system
7) Distribution map for common species
8) Determination of any invasive aquatic plants
Methods:

The point-intercept survey followed methodology described by Madsen (1999). Geographic Information System (GIS) software was used to generate sample points across the littoral zone surface in 100 meters by 100 meters grid with a few points added around the perimeter for better shoreline cover, resulting in a total of 165 potential survey points on Long Lost Lake (Figure 3). In the field, 158 points were sampled plus eight additional points making a total of 166 sampled points. Vegetation was not found beyond 24 feet in depth. A Global Positioning System (GPS) unit was used to navigate the boat to each sample point. Water depths at each site were recorded in 1-foot increments using an electronic depth finder.

A double-headed, weighted garden rake, attached to a rope (Figure 1 and 2) was used to survey vegetation. Vegetation that was found under the surface by use of the double-headed garden rake was assigned a number between 1 and 4; 1 being rare (≤ 1/3 of the rake head covered), 2 being scattered (>1/3 but ≤ 2/3 of the rake head covered), 3 being common (> 2/3 of the rake head covered), and 4 being abundant (plants over top of rake head). Plant identification followed Blickenderfer (2007).

Frequency of occurrence was calculated for each species as the number of sites in which a species occurred divided by the total number of sample sites. Frequency was calculated for all sampled locations as well as locations 18 feet or less. The average number of native submersed plants per rake sample was calculated as the total number of plants sampled divided by the number of sample locations.

Sampling points were also grouped by water depth and separated into 5 depth zones for analysis. Depth zones included less than 3 feet, 4 to 7 feet, 8 to 11 feet, 12 to 16 feet, 17 to 21 feet, and over 21 feet (Figure 8).

Figures 1 and 2. Double-headed, weighted garden rake, attached to a rope used to survey aquatic vegetation.
Summary

On June 25 2015, 166 locations were observed and sampled for a point intercept survey of aquatic vegetation (Figure 3 and 4). Sixteen different types of native plants were found across the lake and no invasive plants. The weather was good for the survey with partially cloudy skies, temperatures reaching 78 degrees and some wind.

Long Lost Lake (15-0068-00)
Site Modifications

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Site Description

Three submerged species made up the majority of plants sampled in Long Lost Lake. Chara (*Chara sp.*) was sampled at 40.00% of all sites and 42.58% of sites less than 21 feet, Yellow Waterlily, (*Nuphar variegata*) was sampled at 16.36% of all sites and 17.42% of sites less than 21 feet, and Canada Waterweed (*Elodea canadensis*) was sampled at 15.76% of all sites and 16.77% of sites less than 21 feet. (Figures 5, 6, 7 and Table 2).
Figure 5. Locations with density of Chara present, Long Lost Lake, Clearwater County, MN: June 25, 2015.
Figure 6. Locations with density of Yellow Waterlily present, Long Lost Lake, Clearwater County, MN: June 25, 2015.
Figure 7. Locations with density of Canada Waterweed present, Long Lost Lake, Clearwater County, MN: June 25, 2015.
Table 2. Aquatic plants surveyed from Long Lost Lake, Clearwater County, MN: June 25, 2015.

<table>
<thead>
<tr>
<th>Life Form</th>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Count</th>
<th>Frequency (%)</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUMMERGED - ANCHORED</td>
<td>Bushy Pondweed</td>
<td>Najas flexilis</td>
<td>3</td>
<td>1.82%</td>
<td>1.94%</td>
</tr>
<tr>
<td></td>
<td>Canada Waterweed</td>
<td>Elodea canadensis</td>
<td>26</td>
<td>15.76%</td>
<td>16.77%</td>
</tr>
<tr>
<td></td>
<td>Chara</td>
<td>Chara sp.</td>
<td>66</td>
<td>40.00%</td>
<td>42.58%</td>
</tr>
<tr>
<td></td>
<td>Claspingleaf Pondweed</td>
<td>Potamogeton richardsonii</td>
<td>23</td>
<td>13.94%</td>
<td>14.84%</td>
</tr>
<tr>
<td></td>
<td>Coontail</td>
<td>Ceratophyllum demersum</td>
<td>3</td>
<td>1.82%</td>
<td>1.94%</td>
</tr>
<tr>
<td></td>
<td>Flatstem Pondweed</td>
<td>Potamogeton zosteriformis</td>
<td>16</td>
<td>9.70%</td>
<td>10.32%</td>
</tr>
<tr>
<td></td>
<td>Large-Leaf Pondweed</td>
<td>Potamogeton amplifolius</td>
<td>17</td>
<td>10.30%</td>
<td>10.97%</td>
</tr>
<tr>
<td></td>
<td>Narrow Leaf Pondweed</td>
<td>Potamogeton sp.</td>
<td>4</td>
<td>2.42%</td>
<td>2.58%</td>
</tr>
<tr>
<td></td>
<td>Northern water milfoil</td>
<td>Myriophyllum sibiricum</td>
<td>25</td>
<td>15.15%</td>
<td>16.13%</td>
</tr>
<tr>
<td></td>
<td>Floatingleaf Pondweed</td>
<td>Potamogeton natans</td>
<td>10</td>
<td>6.06%</td>
<td>6.45%</td>
</tr>
<tr>
<td></td>
<td>Sago Pondweed</td>
<td>Potamogeton pectinatus</td>
<td>2</td>
<td>1.21%</td>
<td>1.29%</td>
</tr>
<tr>
<td></td>
<td>Water Celery</td>
<td>Vallisneria americana</td>
<td>1</td>
<td>0.61%</td>
<td>0.65%</td>
</tr>
<tr>
<td></td>
<td>White Water Buttercup</td>
<td>Ranunculus longirostris</td>
<td>1</td>
<td>0.61%</td>
<td>0.65%</td>
</tr>
</tbody>
</table>

| FLOATING - LEAF            | Yellow Waterlily     | Nuphar variegata        | 27    | 16.36%        | 17.42%        |

| EMERGENT                   | Bulrush              | Scirpus acutus          | 1     | 0.61%         | 0.65%         |
|                            | Spikerush            | Elocharis sp.           | 1     | 0.61%         | 0.65%         |

Total number of plants (species diversity for the lake) 16
Total number of plant occurrences 226
Total number of sites 165
Total number of sites <21 feet 155
Sampling occurred to a maximum depth of 30 feet; however, no plants were found to be growing beyond 24 feet of water. Plant abundance was greatest between one and 11 feet of water. As depths increased beyond that range, the presences of vegetation decreased and became less dense (Figure 8).

Of the 165 sampled locations in Long Lost Lake, 56 sites had no vegetation present. A total of 155 sites were observed at locations with depths of 21 feet or less.

The average number of plants per rake sample on Long Lost Lake was 1.3 for all sampled depths and 1.5 for depths less than 21 feet. Eight was the maximum number of species sampled at one location in Long Lost Lake while values of one and two species were sampled regularly (Figure 9).

Figure 8. Frequency of vegetation vs. water depth, Long Lost Lake, Clearwater County, MN: June 25, 2015.
Discussion

Long Lost Lake was found to be a relatively deep lake for northern Minnesota with a maximum depth of 63 feet. The presence of plants and the depth at which one finds them is related to the water clarity. In areas where the sunlight does not reach the lake’s bottom, there won’t be plants present. Plants were found in up to 20 feet of water, which reflects the excellent clarity in Long Lost Lake.

The plant community found in Long Lost Lake is indicative of a healthy ecosystem. Some plants are found more often in lakes with good water clarity, such as Chara. Chara was found at 42% of the sample sites in Long Lost Lake (Figures 5 & 13). There were many sample sites that had more than one plant species present, which shows the good plant diversity in the lake (Figure 9).

Aquatic plant communities are important to a body of water because of their ability to maintain water clarity and good fish habitat. Plants in all lakes lock up nutrients in their tissues which limit algae growth keeping lakes clear and healthy. Aquatic plants produce oxygen throughout the water column as a byproduct of photosynthesis, which oxygenates the water column. Plants also help to keep the sediments stable at the bottom of the lake and prevent it from mixing into the water column. Tiny invertebrates called zooplankton eat algae and use plants as a hiding place from predators such as perch, sunfish and crappies.
Figure 11. Rake with Coontail and Flatstem Pondweed. Photo from a 2015 vegetation survey.
Figure 12. Long Lost Lake, Clearwater County, MN: June 18, 19, and 23 of 2015.
Figure 13. Chara beds in clear water from a 2015 plant survey.
Literature Cited
