# Charley Lake

## Macrophyte and Biovolume Survey 8/04/17

This document contains two types of vegetation data collected on Charley Lake. The first section details the methods and findings of a point intercept survey of macrophyte vegetation. The second section details the methods and results of a vegetation bio-volume survey.


Data collected and prepared by **Ramsey Conservation District** for

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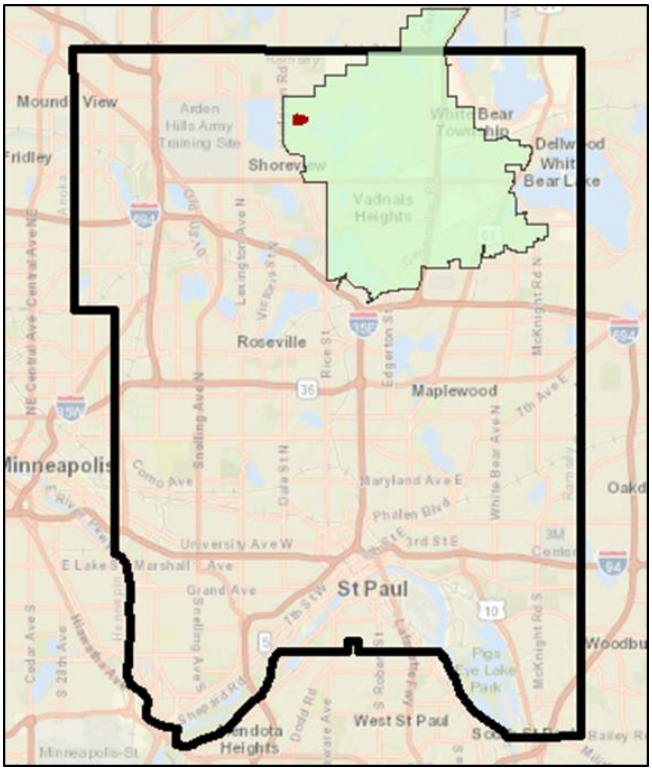



Figure 1. Location of Charley Lake (red) in Ramsey County within VLAWMO borders

# Charley Lake Macrophyte Survey

August 4, 2017

**Methods:**

The point intercept method incorporating aerial photography and a Lowrance HDS-5™ Global Positioning System (GPS) was used to assess the aquatic macrophyte community on Charley Lake on August 4, 2017. Samples were taken at twenty-three evenly spaced (80 m) geo-referenced points (Figure 2). Data on depth, plant species, and abundance rank was recorded as displayed in Tables 2 and 3 and in the maps of this report. A secchi disk measurement was also taken in the center of the lake on the shady side of the boat, with results in Table 3.

A double-tined metal rake attached to an 11-meter rope was used to collect specimens. At each point, the device was thrown out approximately 1 meter and then dragged across the substrate for approximately one meter. Species were identified and given a ranking based on cover of rake tines (Table 1). Plant species that were floating in the water at the collection points were also counted.

Table 1

*Abundance rankings for percent cover of rake tines*

| Percent Cover of Tines | Abundance Ranking |
|---|---|
| 81-100 | 5 |
| 61-80 | 4 |
| 41-60 | 3 |
| 21-40 | 2 |
| 1-20 | 1 |

**Results:**

Aquatic macrophytes were found at 14 of 23 points surveyed (Figure 2). Coontail *(Ceratophyllum demersum)*, Canada Waterweed (*Elodea canadensis),* and Curly Leaf Pondweed (*Potamogeton crispus*) were the most common species, found at over half of the points where vegetation was detected (at least 7). Other prominent species, detected at six survey points, were Northern Watermilfoil (*Myriophyllum sibiricum*) and Filamentous Algae *(Spirogyra/Cladophora sp.).* Found at one survey point each were Water Stargrass (*Heteranthera dubia*), Lesser Duckweed *(Lemna minor),* Star Duckweed *(Lemna trisulca)*, White Water Lily *(Nymphaea odorata)*, and Leafy Pondweed (*Potamogeton foliosus)*. Eurasian Watermilfoil (*Myriophyllum* spicatum), Greater Duckweed (*Spirodela polyriza),* Sago Pondweed *(Potamogeton pectinatus)*, Yellow Water Lily (*Nuphar lutea*); and Watermeal (*Wolffia)* were also observed in the lake, though not at any survey points. The secchi disk reading was 1.5m (4.9 ft) (Table 3).

Table 2

% Occurrence & Avg Abundance of aquatic plant taxa present on Charley Lake, Aug 4, 2017

| Species | Common Name | Scientific Name | Average Abundance 8/4/2017 | Percent Occurrence 8/4/2017 |
|---|---|---|---|---|
| 1 | Coontail | *Ceratophyllum demersum* | 2.85 | 93% |
| 2 | Canada Waterweed | *Elodea canadensis* | 2.25 | 86% |
| 3 | Curly Leaf Pondweed | *Potamogeton crispus* | 1.13 | 57% |
| 4 | Filamentous Algae | *Spirogyra/Cladophora sp* | 2.83 | 43% |
| 5 | Northern Watermilfoil | *Myriophyllum sibiricum* | 1 | 43% |
| 6 | Leafy Pondweed | *Potamogeton foliosus* | 2 | 7% |
| 7 | Water Stargrass | *Heteranthera dubia* | 1 | 7% |
| 8 | White Water Lily | *Nymphaea odorata* | 1 | 7% |
| 9 | Star Duckweed | *Lemna trisulca* | 1 | 7% |
| 10 | Lesser Duckweed | *Lemna minor* | 1 | 7% |

Also observed: Watermeal, Greater Duckweed, Yellow Water Lily, Sago Pondweed, Eurasian Watermilfoil

Note. Percent occurrence represents the number of times a plant species was observed divided by the number of total sample sites where vegetation was observed. Average abundance is calculated as the average of the abundance ranking for an individual species present.

Table 3

*Depth, secchi disk and vegetation abundance point survey results, August 4, 2017*

| Point | Coontail | Curly Leaf Pondweed | Canada Waterweed | Northern Watermilfoil | Filamentous Algae | Leafy Pondweed | Water Stargrass | Star Duckweed | White Water Lily | Lesser Duckweed |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **4** | **1** | **1** | **1** | | | | | | |
| **2** | **2** | **1** | | | | | | | | |
| **3** | | | | | | | | | | |
| **4** | | | | | | | | | | |
| **5** | **4** | | **2** | | **2** | | | | | |
| **6** | | | | | | | | | | |
| **7** | | | | | | | | | | |
| **8** | **4** | **1** | **1** | **1** | | | | | | |
| **9** | **3** | | **2** | **1** | | | | | | |
| **10** | | | | | | | | | | |
| **11** | | | | | | | | | | |
| **12** | **3** | **2** | **2** | **1** | | | | | | |
| **13** | **1** | **1** | **1** | **1** | | | | | | |
| **14** | | | | | | | | | | |
| **15** | | | | | | | | | | |
| **16** | **1** | **1** | **2** | | **1** | | | **1** | | |
| **17** | **1** | | | | | | | | **1** | |
| **18** | | | | | | | | | | |
| **19** | **3** | | **3** | | | | **1** | | | |
| **20** | **5** | **1** | **3** | **1** | **4** | | | | | |
| **21** | | | **5** | | **5** | | | | | **1** |
| **22** | **2** | | **4** | | **3** | | | | | |
| **23** | **4** | **1** | **1** | | **2** | **2** | | | | |
| Total Abundance | 37 | 9 | 27 | 6 | 17 | 2 | 1 | 1 | 1 | 1 |
| Count | 13 | 8 | 12 | 6 | 6 | 1 | 1 | 1 | 1 | 1 |
| Avg. Abundance | 2.85 | 1.13 | 2.25 | 1.00 | 2.83 | 2.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| % Occurrence | 93% | 57% | 86% | 43% | 43% | 7% | 7% | 7% | 7% | 7% |

| Secchi Depth: | 1.5m |
|---|---|

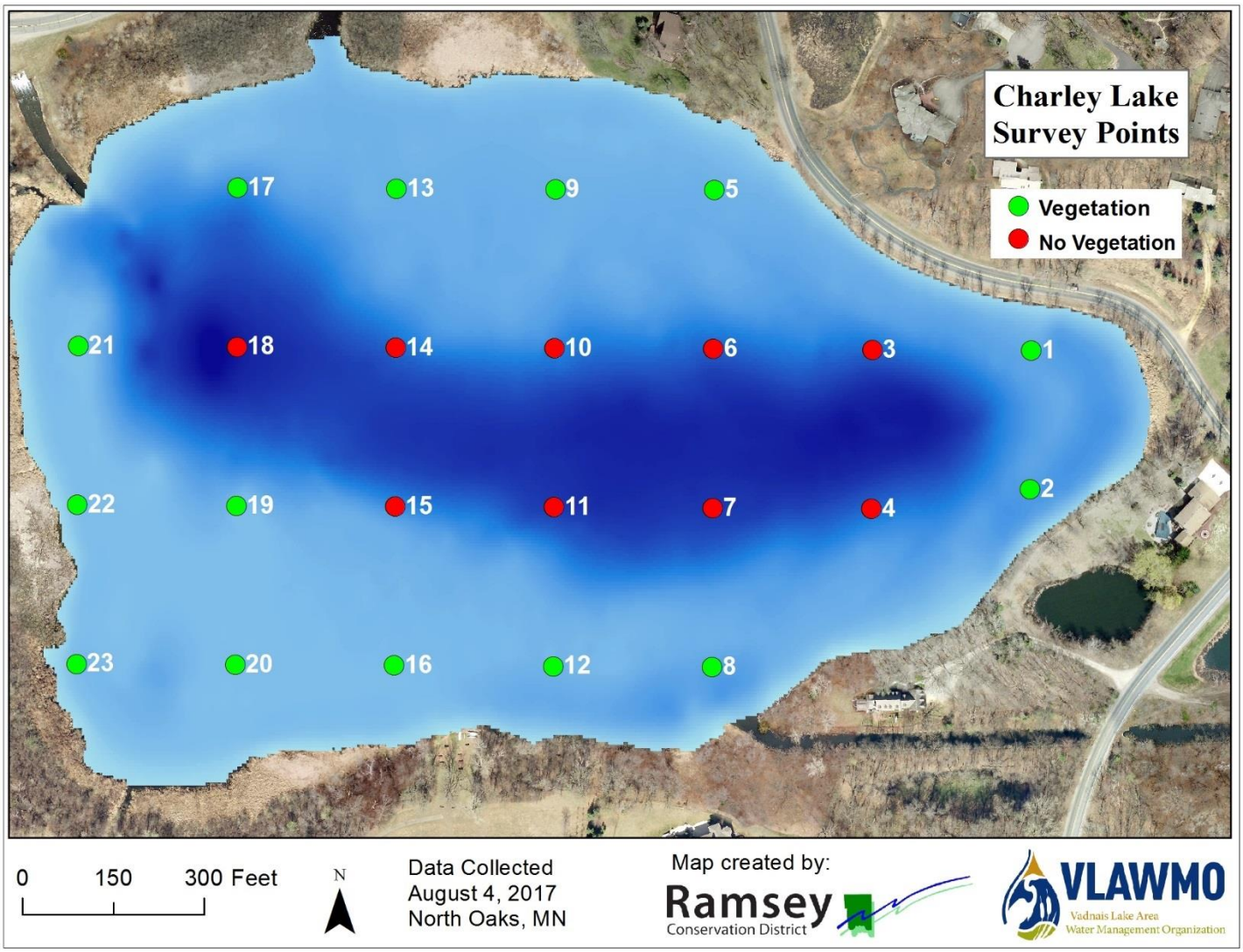



Figure 2. Charley Lake vegetation point intercept survey locations. N=23.

# Charley Lake Biovolume Survey

August 4, 2017

**Methods:**

A Lowrance HDS-5TM Global Positioning System (GPS)-enabled depth finder was used to collect submerged aquatic vegetation biovolume data on Charley Lake on August 4, 2017. The lake was transected at a distance of 40 meters between transects at a speed of no more than 4 miles per hour. Sonar log data was recorded using the Lowrance HDS-5TM Global Positioning System (GPS)-enabled depth finder to assess this data. Transducer data was processed using Contour Innovations, LLC, BioBase software.

**Results:**

The results below were produced by exporting the processed data from the BioBase system and interpolating spatial data using ArcGIS software. Results include maps as well as statistics of biovolume distribution represented as total percent of water column occupied by plant matter ranging from zero to one hundred. Interactive map data, including sonar log trip replays, can be viewed on the BioBase website:www.cibiobase.com.

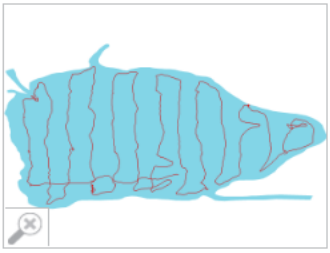
BIOBASE — VEGETATION ANALYSIS REPORT

**Charley Lake**, Ramsey County Minnesota

Generated: 8/4/2017 8:48:49 PM (UTC)

**Waterbody Size:** 15.77 ha *(39.00 acres)*

report link



**Data Collector**
Andrea Prichard

**Data Collection Date**
8/4/2017 2:38:48 PM (UTC)

**Average Water Temperature**
23° C (73.4° F)

**Location**
Start: 45.09999084, -93.11615753
End: 45.09951401, -93.11862183

**Survey Size**
Area: 15.31 ha (37.84 acres)
Percent: 97.08% of waterbody
Volume: 247,924.30 cu. m (201.00 acre ft)

**Est. Waterbody Volume** ?
255,399.30 cu. m
(207.06 acre ft)

**Settings**

| | |
|---|---|
| Track Buffer: | 25 m |
| Grid Cell Size: | 5 m |
| Min. BV Detect: | 5% |
| Min. Veg Depth Detect: | 0.73152 m |

## Area of Interest Summary

| AOI ? | Type ? | PAC ? | Avg BVp ? | SD BVp ? | Avg BVw ? | SD BVw ? | Depth Range | Avg Depth | Distance | No. Points |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Point | 51.3% | 72.9% | ±31.6% | 37.4% | ±42.9% | 0.31-4.75 m | 1.25 m | 5.1 km | 1,761 |
| | Grid | 68.7% | 66% | ±29.4% | 45.3% | ±39.1% | 0-4.69 m | 1.74 m | - | 3,656 |

## Biovolume Analysis by Quantity

| AOI | 0-5% | 5-20% | 20-40% | 40-60% | 60-80% | >80% |
|---|---|---|---|---|---|---|
| 1 | 48.67% | 6.64% | 3.69% | 3.92% | 8.23% | 28.85% |

## Biovolume Analysis by Depth

| AOI | Depth | Type | Count | PAC | Avg BVp | SD BVp | Avg BVw | SD BVw |
|---|---|---|---|---|---|---|---|---|
| 1 | 0-1m | Point | 460 | 98.3% | 86.3% | ±21.8% | 84.8% | ±24.4% |
| | 1-2m | | 505 | 76.4% | 65.3% | ±31.5% | 49.9% | ±39% |
| | 2-3m | | 357 | 18.5% | 25.4% | ±28.8% | 4.7% | ±15.8% |
| | 3-4m | | 314 | 0% | - | - | 0% | ±0% |
| | 4-5m | | 125 | 0% | - | - | 0% | ±0% |
| | 5-6m | | 0 | - | - | - | - | - |
| | 6-7m | | 0 | - | - | - | - | - |
| | 7-8m | | 0 | - | - | - | - | - |
| | 8-9m | | 0 | - | - | - | - | - |
| | >9m | | 0 | - | - | - | - | - |
| | 0-1m | Grid | 1529 | 99.3% | 81.5% | ±19.5% | 80.9% | ±20.5% |
| | 1-2m | | 824 | 95.4% | 49.4% | ±24.2% | 47.1% | ±25.8% |
| | 2-3m | | 425 | 43.8% | 16.5% | ±11.2% | 7.2% | ±11% |
| | 3-4m | | 650 | 2.9% | 7.7% | ±2.1% | 0.2% | ±1.3% |
| | 4-5m | | 228 | 0% | - | - | 0% | ±0% |
| | 5-6m | | 0 | - | - | - | - | - |
| | 6-7m | | 0 | - | - | - | - | - |
| | 7-8m | | 0 | - | - | - | - | - |
| | 8-9m | | 0 | - | - | - | - | - |
| | >9m | | 0 | - | - | - | - | - |

## Glossary

**AOI**

***Area of Interest:*** Defines the individual transects or contiguous data samples as depicted by the color coding of each trip line. Seperate areas of interest can be generated through merging of multiple trips, appending data to a single sonar log or lapses in time (greater than five minutes) within a sonar log.

**BVp**

***Biovolume (Plant):***: Refers to the percentage of the water column taken up by vegetation when vegetation exists. Areas that do not have any vegetation are not taken into consideration for this calculation.

**BVw**

***Biovolume (All water):*** Refers to the average percentage of the water column taken up by vegetation regardless of whether vegetation exists. In areas where no vegetation exists, a zero value is entered into the calculation, thus reducing the overall biovolume of the entire area covered by the survey.

**PAC**

***Percent Area Covered:*** Refers to the overall surface area that has vegetation growing.

**Grid**

***Geostatistical Interpolated Grid:*** Interpolated and evenly spaced values representing kriged (smoothed) output of aggregated data points. The gridded data is most accurate summary of individual survey areas.

**Point**

***Individual Coordinate Point:*** A single point represents a summary of sonar pings and the derived bottom and canopy depths. Individual point data create an irregularily spaced dataset that may have overlaps and/or gaps in the data resulting in a increased potential for error.

Figure 3. Charley Lake BioBase survey summary statistics.

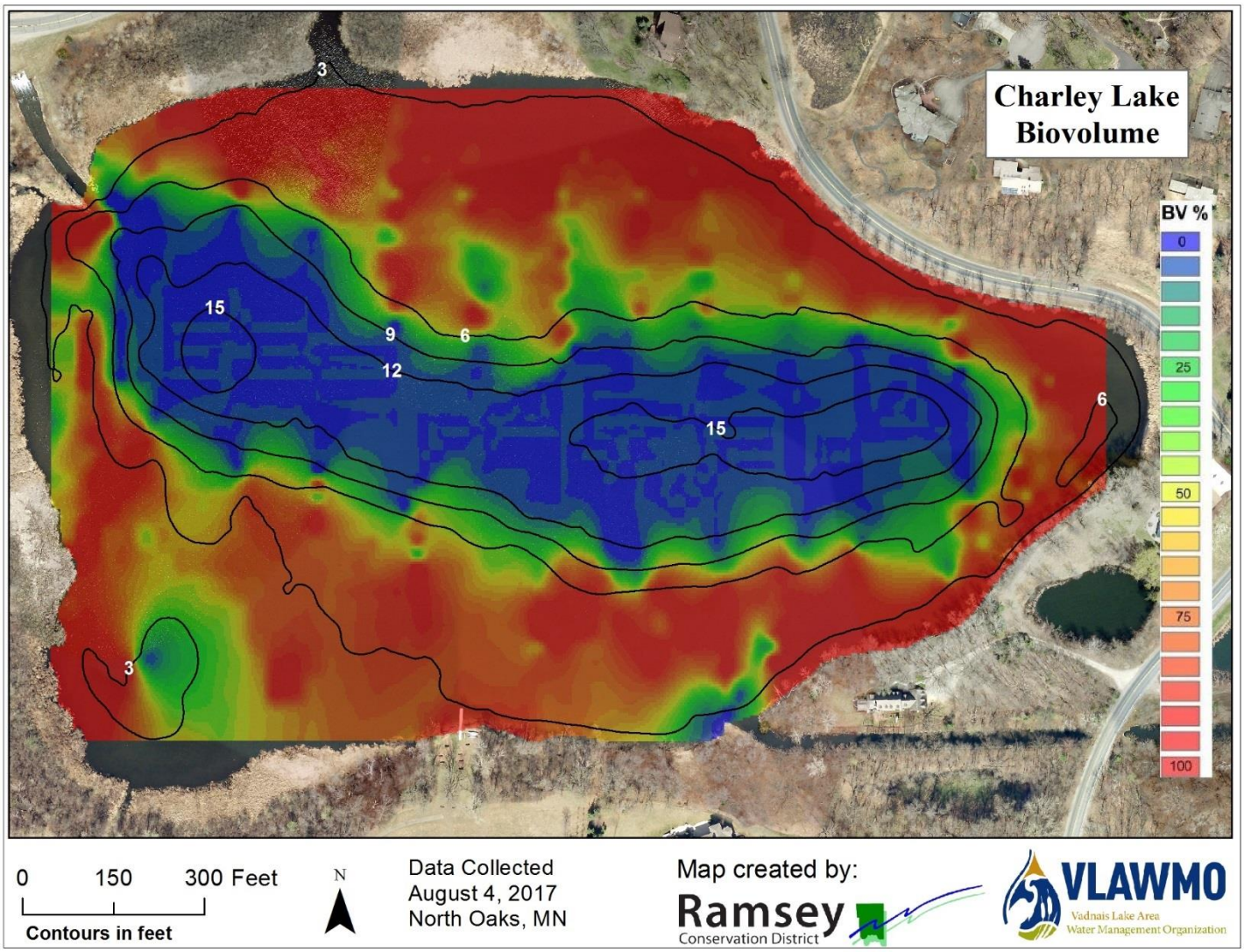



Figure 4. Charley Lake vegetation biovolume with 3ft contours. Blue = 0% and Red = 100%