



Moody Lake, Chisago County, Minnesota, June 6, 2019

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## Curlyleaf Pondweed Delineation and Assessment Surveys for Moody Lake, Chisago County, Minnesota, 2019

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Curlyleaf Pondweed Delineation: April 24, 2019

**Curlyleaf Treatment: May 20, 2019 (7.8 ac)**

Curlyleaf Pondweed Assessment: June 17, 2019

Prepared for:  
Comfort Lake/Forest Lake  
Watershed District  
Forest Lake, Minnesota



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**December 5, 2019**

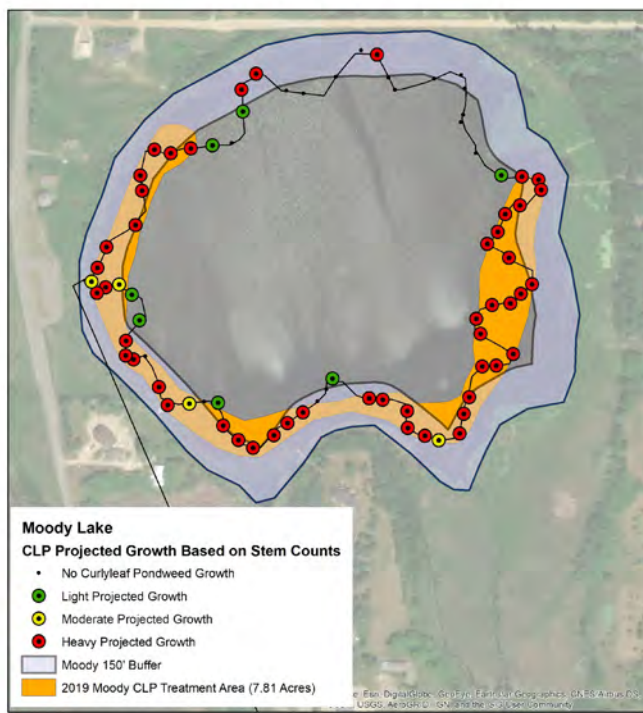
# Curlyleaf Pondweed Delineation and Assessment Surveys for Moody Lake, Chisago County, Minnesota, 2019

## Summary

**Curlyleaf Pondweed Delineation:** Moody Lake (MnDNR ID #13-0023) is a 45 acre lake located in Chisago County, Minnesota. Water clarity has a summer average of 2.3 feet in 2018 (source: Comfort Lake/Forest Lake Watershed District). A curlyleaf pondweed delineation was conducted on April 24, 2019 by Blue Water Science to characterize conditions of curlyleaf pondweed and to look for Eurasian watermilfoil. Results of the curlyleaf delineation indicated that on April 24, 2019 curlyleaf pondweed was widespread showing up in 60 of the 77 sample sites (Figure S1). A treatment area of 7.81 acres was delineated and was treated on May 20, 2019 using Aquathol K at 1.25 ppm (4 gallons/acre). A lakewide concentration of the active ingredient was 98 ppb.

**Curlyleaf Pondweed Assessment:** A curlyleaf pondweed assessment was conducted on June 17, 2019 by Blue Water Science (Figure S1). Results of the curlyleaf pondweed assessment indicated there was no viable curlyleaf observed. Mood Lake has a low diversity of aquatic plants, with elodea and coontail the only other submerged aquatic plant species observed. Eurasian watermilfoil was not observed on June 16, 2014.

Moody Lake Curlyleaf Pondweed Delineation  
April 24, 2019



Moody Lake Curlyleaf Pondweed  
June 17, 2019

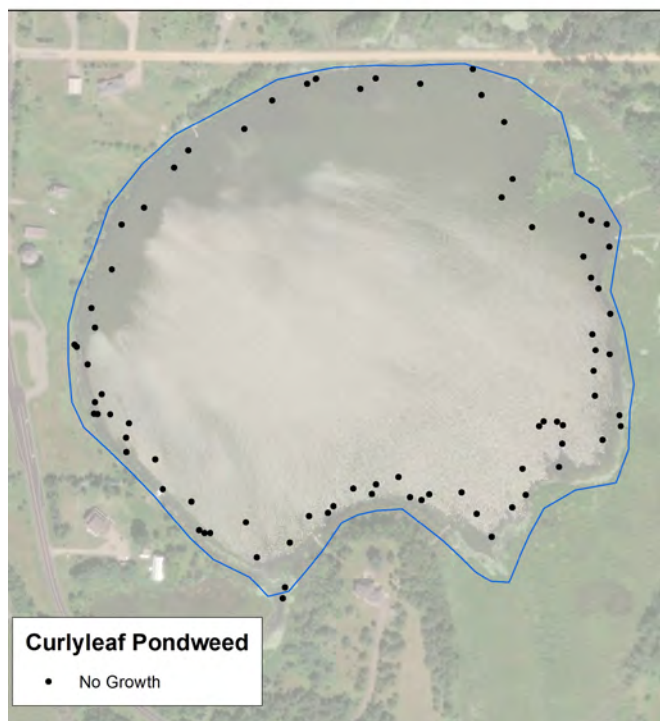


Figure S1. [left] Curlyleaf pondweed potential treatment areas Moody Lake that were delineated on April 24, 2019. [right] Curlyleaf pondweed coverage for Moody Lake on June 17, 2019. Key: green dots = light growth, yellow dots = moderate growth, red dots = heavy growth, orange shaded areas = treatment area, and light blue shaded area = 150 foot buffer around the perimeter of the lake.

# Curlyleaf Pondweed Delineation and Assessment Surveys for Moody Lake, Chisago County, Minnesota, 2019

**Moody Lake, Chisago County (ID: 13-0023)**

**Size: 45 acres (MnDNR)**

**Littoral area: 22 acres (MnDNR)**

**Maximum depth: 48 ft (MnDNR)**

## Introduction

A curlyleaf pondweed delineation was conducted on April 24, 2019 on 45 acre Moody Lake, Chisago County. The objective of the delineation was to check the distribution and abundance of curlyleaf pondweed. A curlyleaf pondweed assessment was conducted on June 17, 2019 again to check the distribution and abundance of curlyleaf pondweed and Eurasian watermilfoil.

## Methods

**Curlyleaf Pondweed Delineation:** At the time of the spring CLP delineations, only a fraction of the peak curlyleaf biomass is present. For spot treatments, the areas to be treated should be delineated prior to curlyleaf developing peak biomass. Curlyleaf stem counts on a rake sampler were used to identify areas that had a potential to produce dense curlyleaf. After a short sweep of about 1-foot (30 cm), 4 curlyleaf stems or more per rake sample generally indicated some CLP plants had developed runners and would likely produce heavy growth in the next few weeks. Alternatively, sites where 3 stems or less were collected per rake sample were not predicted to produce dense growth at the peak growing period. These areas were not treated. This delineation method was used for spot lake treatments in Gleason Lake and has worked for other lakes as well (McComas et al, 2015\*).

An endothall herbicide application at 4 gallons/acre was conducted by Lake Management, Inc and a total of 7.81 acres were treated on May 20, 2019. A lakewide concentration of the active ingredient was estimated at 98 ppb.

**Curlyleaf Pondweed Assessment:** A CLP assessment was conducted by Blue Water Science on June 17, 2019. The assessment involved surveying the entire lake nearshore area, observing CLP growth, and sampling aquatic plants with rakes. The plant species were recorded and the density of each species was assigned. Densities were based on the coverage on the teeth of the rake. Density ratings were from 1 to 3 with 1 being sparse and 3 being a nuisance. Based on these sample sites, plant distribution maps were constructed.

*\*McComas, S.R., Y.E. Christianson, and U. Singh. 2015. Effects of curlyleaf pondweed control on water quality and coontail abundance in Gleason Lake, Minnesota. Lake and Reservoir Management. 31:109-114.*

## Results for the April 24, 2019 Delineation

Results of the delineation conducted on April 24, 2019 found there was significant curlyleaf pondweed growth at most of the sample sites (Table 1). One area representing 7.81 acres was delineated that had the characteristic stem densities that were predicted to produce heavy growth at peak CLP abundance in June (Figure 1). Elodea was the only other plant species observed (Tables 1 and 2).

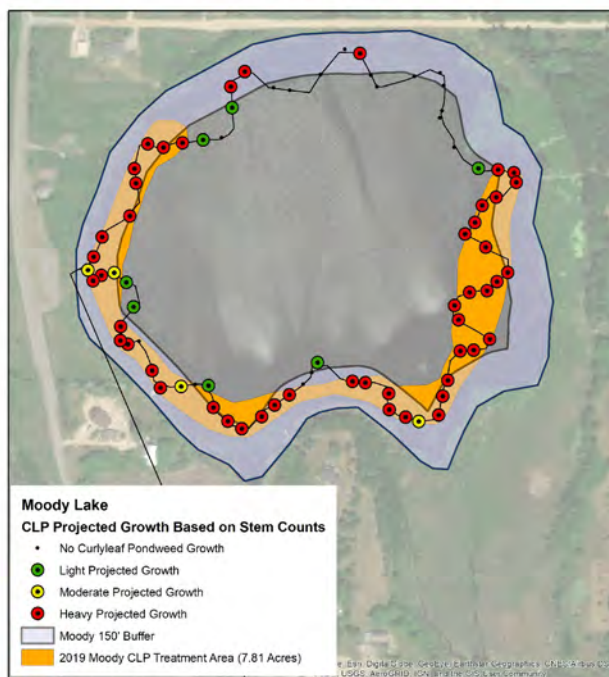
**Table 1. Moody Lake aquatic plant occurrences and densities for the April 24, 2019 survey based on 77 sites. Density ratings are 1-3 with 1 being low and 3 being most dense.**

|  | All Stations (n=77) |         |
|--|---------------------|---------|
|  | Occur               | % Occur |
| Elodea<br>( <i>Elodea canadensis</i> )               | 3                   | 4       |
| Curlyleaf pondweed<br>( <i>Potamogeton crispus</i> ) | 60                  | 78      |

**Table 2. Occurrence of plants by depth in Moody Lake out to a depth of 14 feet.**

| Depth (feet)             | Number of Sites Sampled | Elodea | Curlyleaf Pondweed |
|--------------------------|-------------------------|--------|--------------------|
| 1                        |                         |        |                    |
| 2                        |                         |        |                    |
| 3                        |                         |        |                    |
| 4                        | 1                       |        | 1                  |
| 5                        | 14                      | 3      | 14                 |
| 6                        | 20                      |        | 20                 |
| 7                        | 25                      |        | 19                 |
| 8                        | 8                       |        | 3                  |
| 9                        | 5                       |        | 2                  |
| 10                       | 3                       |        | 1                  |
| 11                       |                         |        |                    |
| 12                       |                         |        |                    |
| 13                       |                         |        |                    |
| 14                       | 1                       |        |                    |
| Sites Sampled to 14 feet | 77                      | 3      | 60                 |

Moody Lake Curlyleaf Pondweed Delineation  
April 24, 2019



**Figure 1. Curlyleaf pondweed potential treatment areas Moody Lake that were delineated on April 24, 2019. Key: Green dots = light growth, yellow dots = moderate growth, red dots = heavy growth, orange shading = treatment area, and blue shading = 150 foot contour from shore.**

## Individual Site Plant Data for the Delineation

Low plant diversity was found in Moody Lake with a total of 2 aquatic plant species (Table 3). Curlyleaf pondweed was the most common plant observed in this delineation survey.

**Table 3. Aquatic plant occurrence and stem density for CLP sample points in Moody Lake, April 24, 2019.**

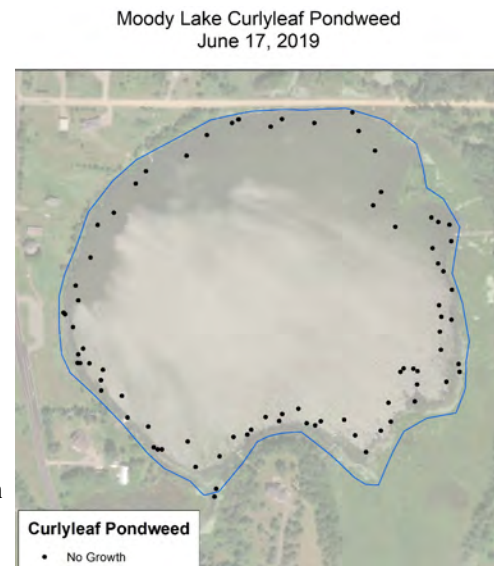
| Site                  | Depth (ft) | CLP stems | Elodea | No Plants |
|-----------------------|------------|-----------|--------|-----------|
| 243                   | 5          | 6         |        |           |
| 244                   | 5          | 5         |        |           |
| 245                   | 6          | 4         |        |           |
| 246                   | 7          | 10        |        |           |
| 247                   | 7          | 12        |        |           |
| 248                   | 7          | 14        |        |           |
| 249                   | 6          | 5         |        |           |
| 250                   | 5          | 4         |        |           |
| 251                   | 9          | 1         |        |           |
| 252                   | 10         |           |        | 1         |
| 253                   | 8          | 1         |        |           |
| 254                   | 7          | 8         |        |           |
| 255                   | 5          | 10        |        |           |
| 256                   | 7          |           |        | 1         |
| 257                   | 7          |           |        | 1         |
| 258                   | 8          |           |        | 1         |
| 259                   | 7          |           |        | 1         |
| 260                   | 7          | 8         |        |           |
| 261                   | 8          |           |        | 1         |
| 262                   | 9          |           |        | 1         |
| 263                   | 9          |           |        | 1         |
| 264                   | 8          |           |        | 1         |
| 265                   | 7          |           |        | 1         |
| 266                   | 10         |           |        | 1         |
| 267                   | 14         |           |        | 1         |
| 268                   | 9          |           |        | 1         |
| 269                   | 8          | 2         |        |           |
| 270                   | 6          | 20        |        |           |
| 271                   | 5          | 18        |        |           |
| 272                   | 5          | 5         |        |           |
| 273                   | 6          | 20        |        |           |
| 274                   | 6          | 8         |        |           |
| 275                   | 7          | 10        |        |           |
| 276                   | 7          | 8         |        |           |
| 277                   | 6          | 10        |        |           |
| 278                   | 6          | 30        |        |           |
| 279                   | 6          | 20        |        |           |
| 280                   | 7          | 20        |        |           |
| 281                   | 7          | 12        |        |           |
| 282                   | 7          | 14        |        |           |
| 283                   | 7          | 20        |        |           |
| 284                   | 7          | 8         |        |           |
| 285                   | 7          | 30        |        |           |
| 286                   | 6          | 25        |        |           |
| 287                   | 6          | 18        |        |           |
| 288                   | 6          | 20        |        |           |
| 289                   | 6          | 22        |        |           |
| 290                   | 5          | 3         | 1      |           |
| 291                   | 5          | 6         | 1      |           |
| 292                   | 5          | 5         | 1      |           |
| 293                   | 5          | 10        |        |           |
| 294                   | 5          | 8         |        |           |
| 295                   | 6          | 8         |        |           |
| 296                   | 9          | 1         |        |           |
| 297                   | 8          |           |        | 1         |
| 298                   | 8          |           |        | 1         |
| 299                   | 7          | 4         |        |           |
| 300                   | 6          | 20        |        |           |
| 301                   | 6          | 15        |        |           |
| 302                   | 5          | 12        |        |           |
| 303                   | 5          | 12        |        |           |
| 304                   | 6          | 15        |        |           |
| 305                   | 7          | 1         |        |           |
| 306                   | 7          |           |        | 1         |
| 307                   | 7          | 3         |        |           |
| 308                   | 7          | 8         |        |           |
| 309                   | 6          | 8         |        |           |
| 310                   | 7          |           |        | 1         |
| 311                   | 7          | 6         |        |           |
| 312                   | 6          | 10        |        |           |
| 313                   | 6          | 10        |        |           |
| 314                   | 7          | 1         |        |           |
| 315                   | 10         | 1         |        |           |
| 316                   | 8          | 3         |        |           |
| 317                   | 6          | 12        |        |           |
| 318                   | 5          | 8         |        |           |
| 319                   | 4          | 3         |        |           |
| Average               |            | 10.35     | 1      |           |
| Occurrence (77 sites) |            | 60        | 3      | 17        |

## Results for the June 17, 2019 Assessment

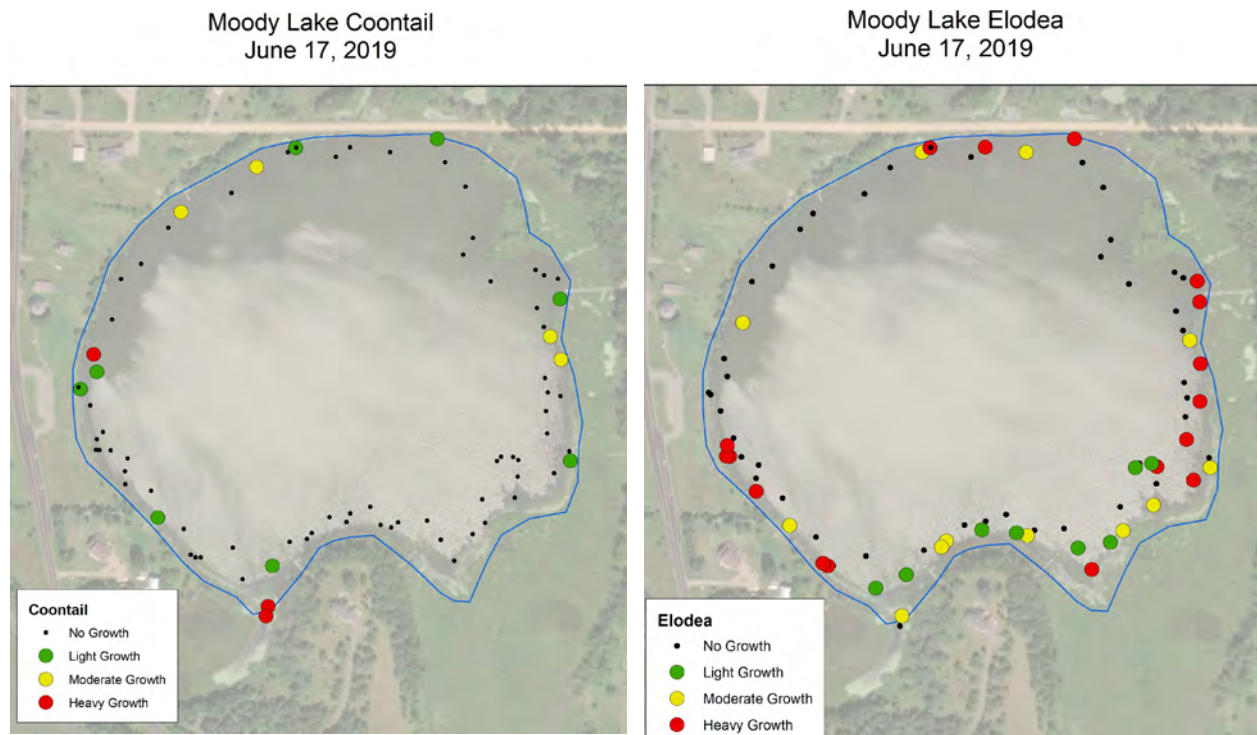
Results of the June 17, 2019 assessment found there were 2 submerged plant species, coontail and elodea with elodea being the dominant plant (Table 4). No curlyleaf pondweed was observed in the lake (Table 4 and Figure 2). Results from the assessment found native plants growing out to a depth of 5 feet (Table 5)(Figure 3).

**Table 4. Moody Lake aquatic plant occurrences and densities for the June 17, 2019 survey based on 53 sites. Density ratings are 1-3 with 1 being low and 3 being most dense.**

|  | All Stations (n=81) |         |         |
|--|---------------------|---------|---------|
|  | Occur               | % Occur | Density |
| Elodea<br>( <i>Elodea canadensis</i> )               | 37                  | 46      | 2.2     |
| Coontail<br>( <i>Ceratophyllum demersum</i> )        | 15                  | 19      | 1.7     |
| Curlyleaf pondweed<br>( <i>Potamogeton crispus</i> ) | 0                   | 0       | 0       |



**Figure 2. [right] Curlyleaf pondweed coverage for Moody Lake on June 17, 2019. Key: black dots = no growth.**



**Figure 3. Coontail (left) and elodea (right) coverage for Moody Lake on June 17, 2019. Key: green dots = light growth, yellow dots = moderate growth, red dots = heavy growth, and black dots = no growth.**

## Individual Site Plant Data for the Assessment

Low plant diversity was found in Moody Lake with a total of 2 submerged aquatic plant species (Table 5). Elodea was the most common plant observed in this survey. Elodea was sampled at moderate to heavy growth.

**Table 5. Aquatic plant occurrence and density for individual sample points in Moody Lake, June 16, 2014. Density is rated on a scale from 1 to 3 with 3 being the densest.**

| Site           | Depth (ft) | Duckweed   | Coontail   | Elodea    | No plants |
|----------------|------------|------------|------------|-----------|-----------|
| 1              | 1          |            | 1          |           |           |
| 2              | 4          |            | 1          |           |           |
| 3              | 4          |            | 3          |           |           |
| 4              | 4          | 1          |            | 2         |           |
| 5              |            |            |            |           | 1         |
| 6              |            |            |            |           | 1         |
| 7              |            | 1          |            |           |           |
| 8              | 3          |            | 2          |           |           |
| 9              |            |            |            |           | 1         |
| 10             | 3          | 1          | 2          |           |           |
| 11             | 3          | 1          |            | 2         |           |
| 12             | 3          | 1          | 1          | 3         |           |
| 13             |            |            |            |           |           |
| 14             |            |            |            |           |           |
| 15             | 4          | 1          |            | 3         |           |
| 16             | 4          |            |            | 2         |           |
| 17             | 3          |            | 1          | 3         |           |
| 18             |            |            |            |           |           |
| 19             |            |            |            |           |           |
| 20             |            |            |            |           |           |
| 21             |            |            |            |           |           |
| 22             |            |            |            |           |           |
| 23             |            |            |            |           |           |
| 24             |            |            |            |           |           |
| 25             | 5          |            |            | 3         |           |
| 26             | 4          |            | 1          | 3         |           |
| 27             |            |            |            |           |           |
| 28             |            |            |            |           |           |
| 29             | 3          |            | 2          | 2         |           |
| 30             | 4          | 1          | 2          | 3         |           |
| 31             |            |            |            |           |           |
| 32             |            |            |            |           |           |
| 33             | 4          | 1          |            | 3         |           |
| 34             | 5          |            |            |           | 1         |
| 35             | 4          |            |            | 3         |           |
| 36             |            |            |            |           |           |
| 37             | 4          |            | 1          | 2         |           |
| 38             | 4          |            |            | 3         |           |
| 39             | 4          |            |            | 3         |           |
| 40             | 4          |            |            | 1         |           |
| 41             |            |            |            |           |           |
| 42             | 5          |            |            | 1         |           |
| 43             | 4          |            |            |           | 1         |
| 44             | 4          |            |            | 2         |           |
| 45             |            |            |            |           |           |
| 46             | 4          |            |            | 2         |           |
| 47             | 5          |            |            | 1         |           |
| 48             | 4          |            |            | 3         |           |
| 49             | 4          |            |            | 1         |           |
| 50             |            |            |            |           |           |
| 51             |            |            |            |           |           |
| 52             | 3          |            |            | 2         |           |
| 53             | 3          |            |            | 1         |           |
| 54             |            |            |            |           |           |
| 55             |            |            |            |           |           |
| 56             | 4          |            |            | 1         |           |
| 57             |            |            |            |           |           |
| 58             | 3          |            |            | 2         |           |
| 59             | 4          |            |            | 2         |           |
| 60             |            |            |            |           |           |
| 61             | 2          |            | 1          | 1         |           |
| 62             | 2          | 2          | 3          | 2         |           |
| 63             | 2          | 2          | 3          |           |           |
| 64             | 4          |            |            | 1         |           |
| 65             |            |            |            |           |           |
| 66             |            |            |            |           |           |
| 67             | 3          |            |            | 3         |           |
| 68             | 3          |            |            | 3         |           |
| 69             |            |            |            |           |           |
| 70             | 3          | 2          | 1          | 2         |           |
| 72             | 3          |            |            | 3         |           |
| 73             |            |            |            |           |           |
| 74             |            |            |            |           |           |
| 75             |            |            |            |           |           |
| 76             | 4          |            |            | 3         |           |
| 77             | 3          |            |            | 3         |           |
| 78             | 4          |            |            | 3         |           |
| 79             |            |            |            |           |           |
| 80             |            |            |            |           |           |
| 81             | 1          |            |            |           | 1         |
| <b>Average</b> |            | <b>1.3</b> | <b>1.7</b> |           |           |
| <b>Occur</b>   | <b>80</b>  | <b>11</b>  | <b>15</b>  | <b>37</b> | <b>6</b>  |
| <b>% occur</b> |            | <b>14</b>  | <b>19</b>  | <b>46</b> |           |



**Figure 4. (top) A mix of dead curlyleaf pondweed, algae, elodea and coontail in Moody Lake on June 17, 2019. (bottom) Curlyleaf pondweed was not observed alive in the June 17, 2019 assessment survey following the CLP treatment.**