



White Water Lilies in Bone Lake, June 24, 2021

Curlyleaf Pondweed and Eurasian Watermilfoil Delineation, Treatment, and Assessment for Bone Lake, Washington County, Minnesota in 2021

	Delineation	Treatment	Assessment
CLP	April 30, 2021	4.38 acres on May 26, 2021	June 24, 2021
EWM	June 24, 2021	No treatment	August 20, 2021

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



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Curlyleaf Pondweed and Eurasian Watermilfoil Delineation, Treatment, and Assessment for Bone Lake, Washington County, Minnesota in 2021

Summary

Curlyleaf Pondweed Delineation, Treatment, and Assessment: Bone Lake (MnDNR ID #82-0054) is a 221 acre lake located in Washington County, Minnesota. An initial curlyleaf pondweed (CLP) delineation was conducted on April 30, 2021 by Blue Water Science to characterize areas that could be treated. Results of the curlyleaf delineation on April 30, 2021 found CLP present at 22 sample sites. Two treatment areas were delineated totaling 4.38 acres. Treatment of 4.38 acres of curlyleaf pondweed using Aquathol at 1.25 ppm was conducted on May 26, 2021.

A CLP assessment was conducted on June 24, 2021, which was the time period of peak CLP growth in area lakes. CLP control in the treatment area was good (Figure S1).

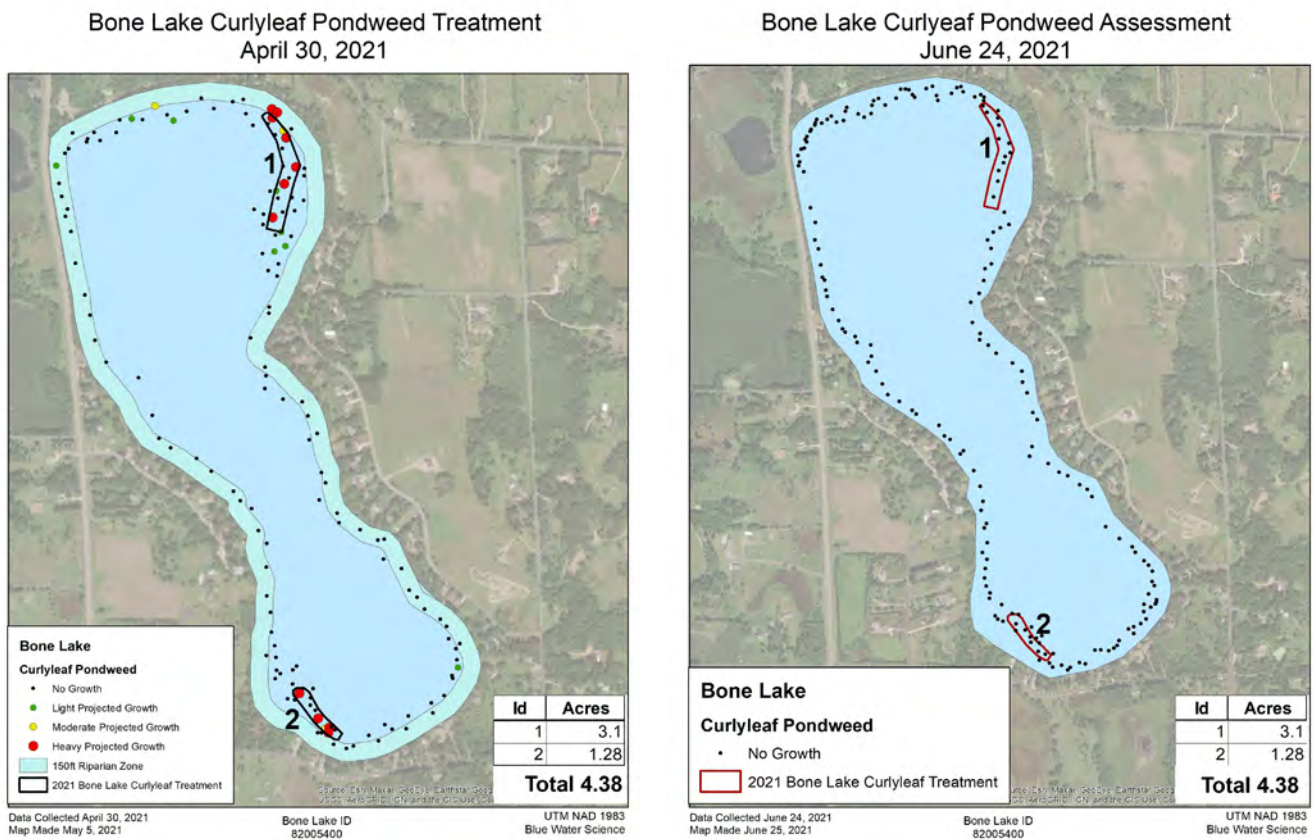


Figure S1. [left] CLP was found at 22 out of 153 sample sites in Bone Lake on April 30, 2021.

[right] CLP was not found at any of the 186 sample sites on June 24, 2021.

Key: green = light growth potential, yellow = moderate growth potential, red = heavy growth potential.

Eurasian Watermilfoil Delineation, Treatment, and Assessment: Eurasian watermilfoil (EWM) was verified in Bone Lake in 2006. In 2021, an initial early EWM check was conducted on April 30, 2021, EWM was found at 13 sites out of 153 sites sampled and only light growth observed. Another EWM delineation was conducted on June 24, 2021 and EWM was found at 4 sites out of the 186 sites sampled again only light growth was observed (Figure S2). No areas were delineated for EWM treatment in 2021.

A follow-up assessment was conducted on August 20, 2021. Eurasian watermilfoil had increased in distribution and was found at 25 sites out of 125 sample locations. EWM density was mostly light in Bone Lake (Figure S2).

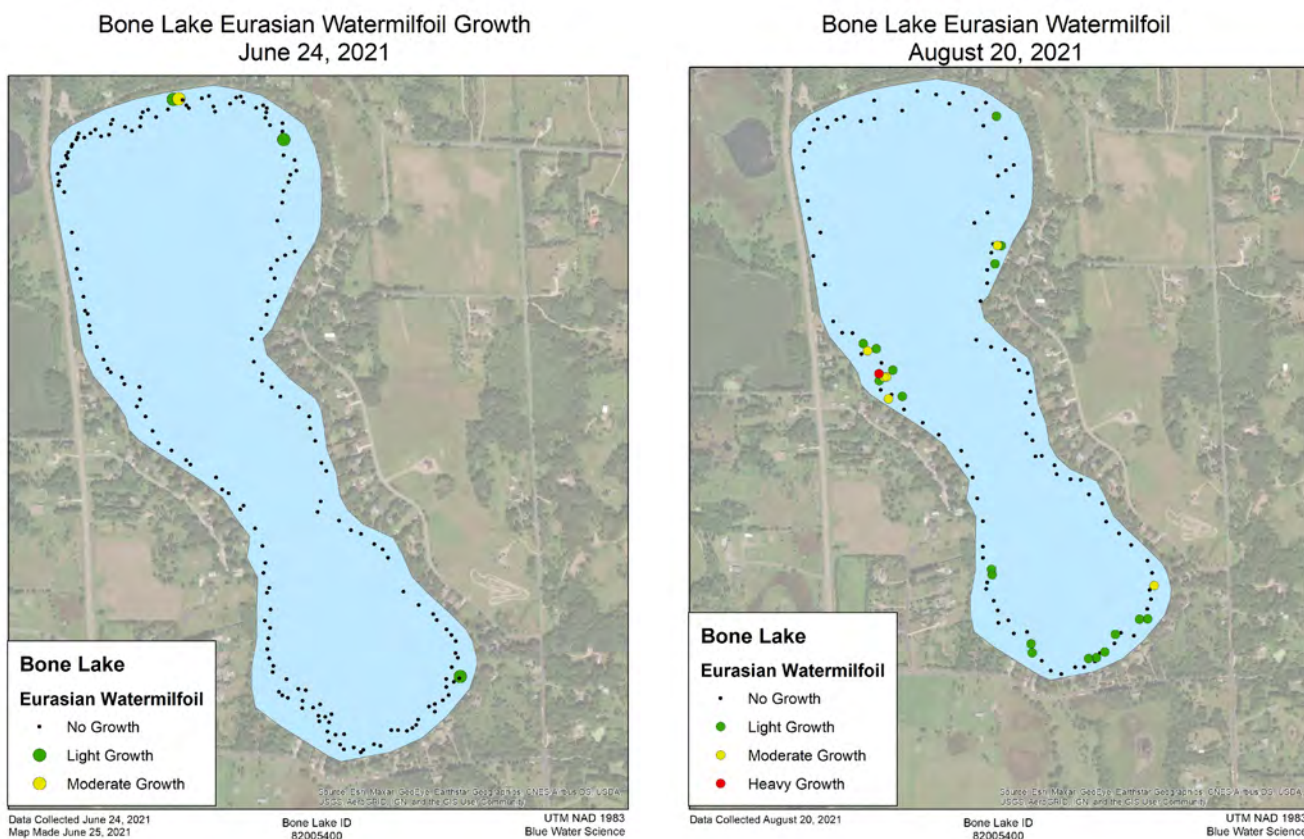


Figure S2. [left] EWM coverage for Bone Lake on June 24, 2021. [right] EWM delineation for Bone Lake on August 20, 2021.

Summary of CLP and EWM Bone Lake Treatments: CLP has been treated in 5 out of the last 8 years including the last 3 years. EWM has been treated in 3 out of the last 8 years. However, no EWM has been treated in the last 5 years (Figure S3).

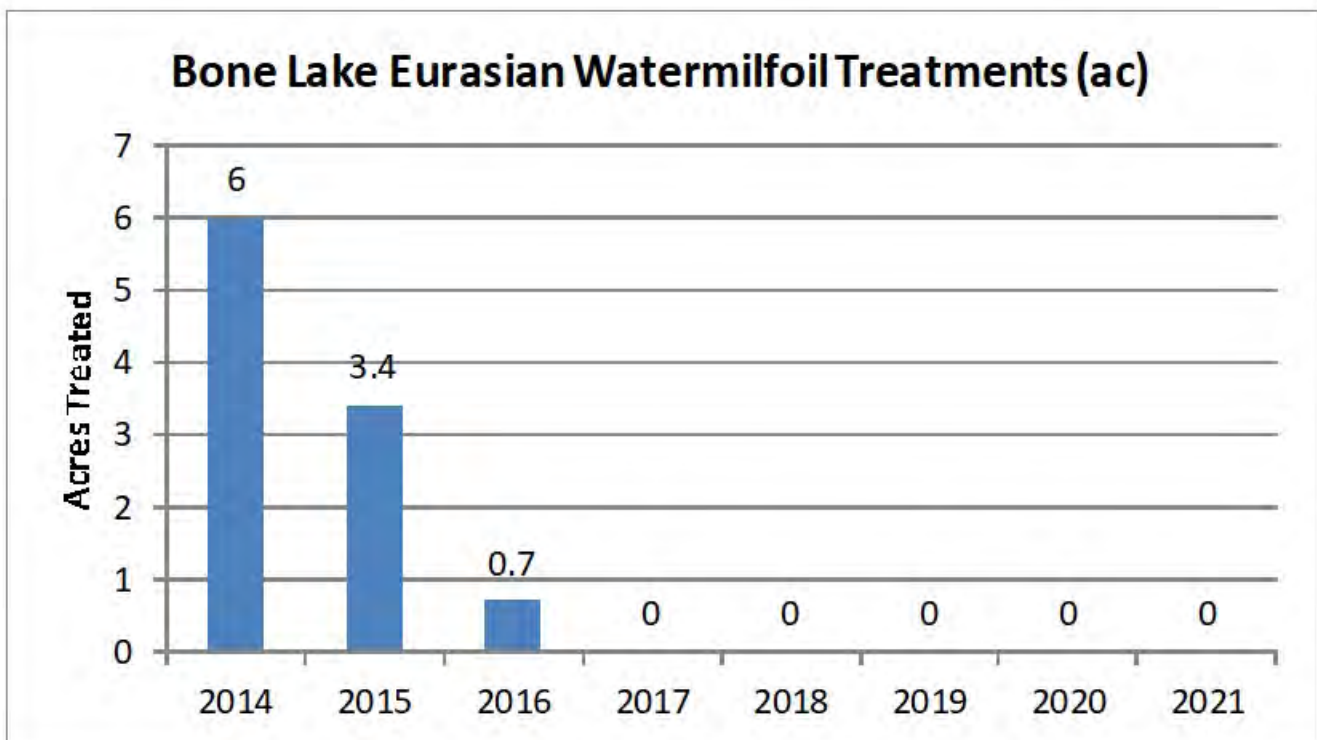
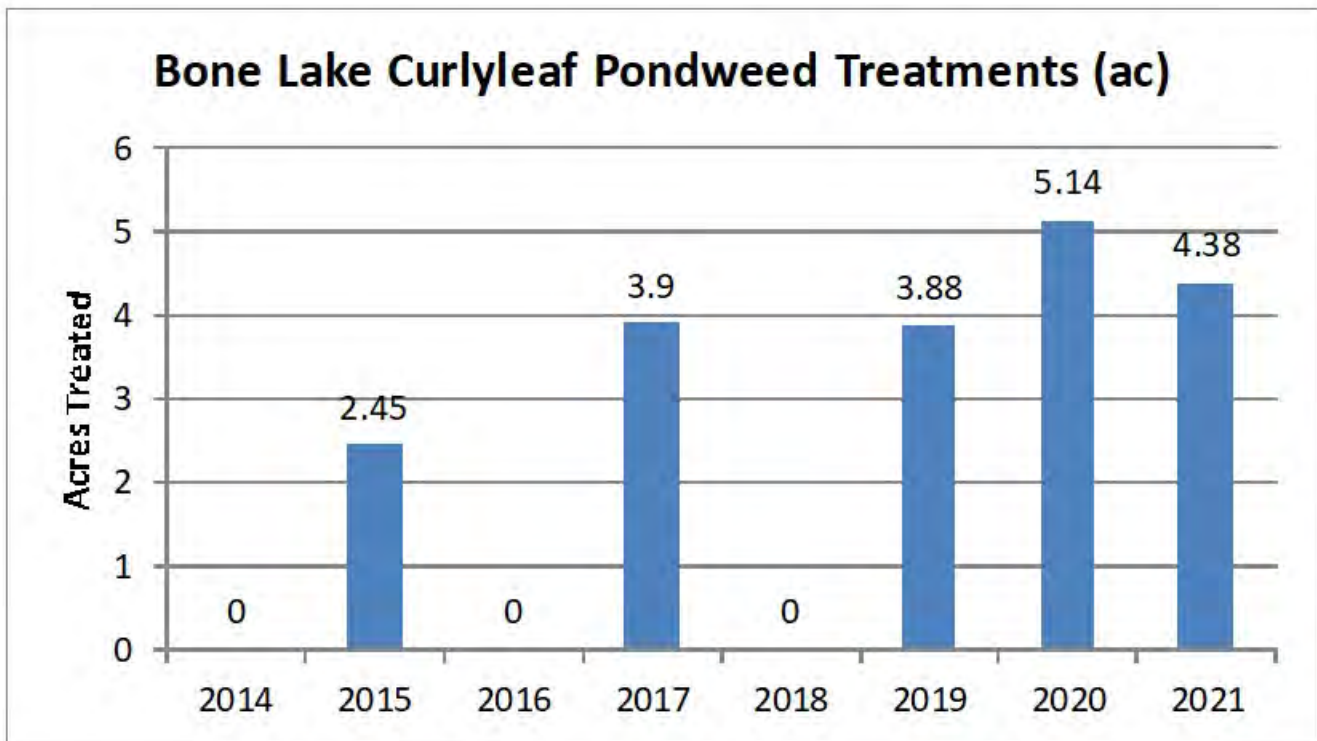


Figure S3. Summary of CLP and EWM treatment acreage for 2014-2021.

Curlyleaf and Milfoil Treatments from 2015-2021: A summary of CLP and EWM treatments from 2015 through 2021 is shown in Figure S4. CLP growth has been variable for the last couple of years. Lake ice, snow cover, and even cloudy days can limit curlyleaf growth. EWM treatment areas have decreased since 2014, but EWM is still present in nearshore areas in Bone Lake.

A hotspot map of sites of EWM moderate and heavy growth for 2015 through 2021 is shown in Figure S4. In the last 5 years EWM growth has been most evident in the northern and southern ends of Bone Lake where growing conditions are conducive to heavy plant growth. EWM has typically grown to a water depth of 6 feet or less.

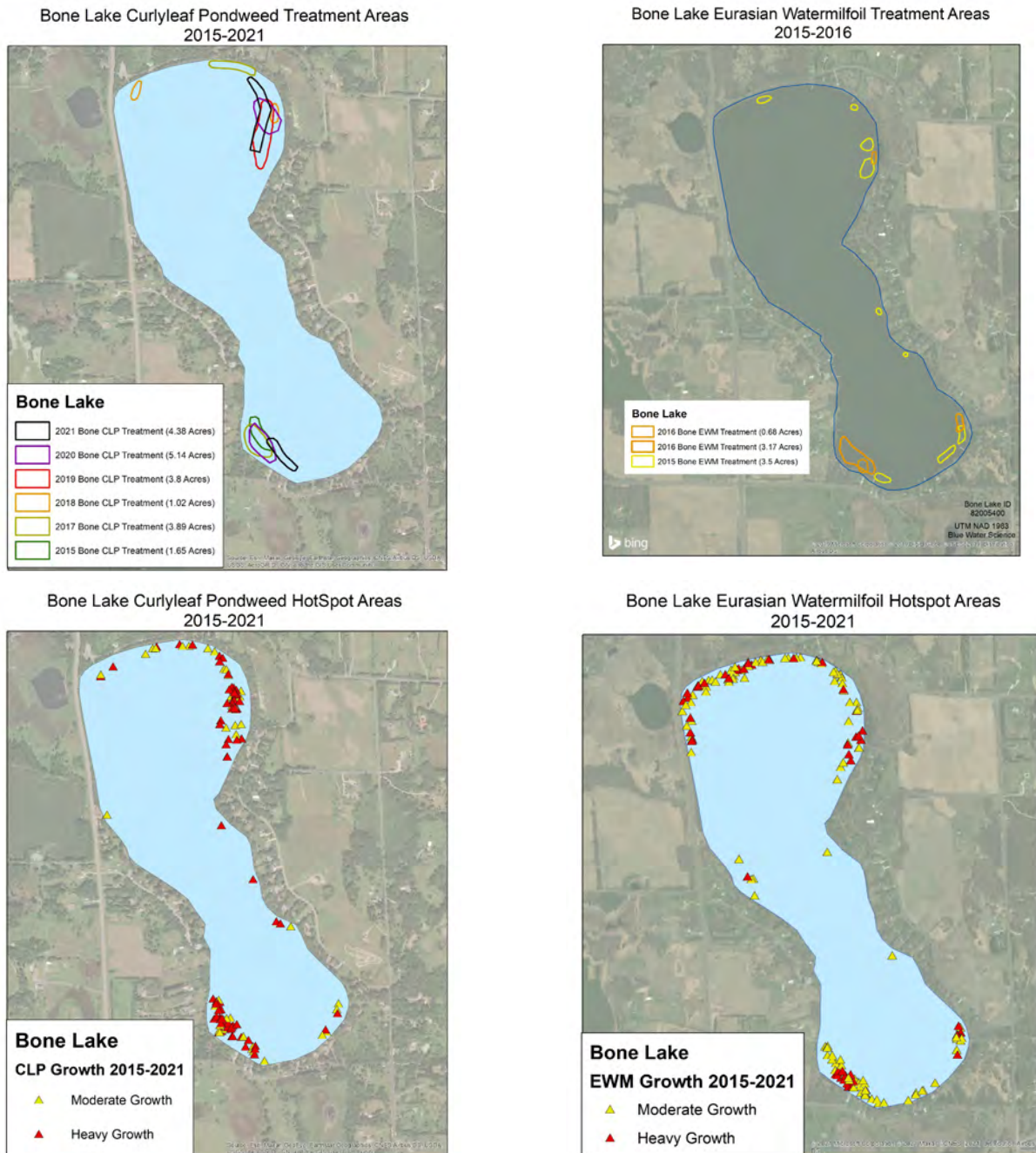


Figure S4. [top-left] Bone Lake CLP treatment map 2015-2021. [top-right] Bone Lake EWM treatment map 2015-2016. [bottom-left] Hotspot map of CLP growth over the years of 2015-2021 placed on a single map. [right] Hotspot map of EWM growth over the years of 2015-2021 placed on a single map
Key: yellow = moderate growth, and red = heavy growth.

Curlyleaf Pondweed and Eurasian Watermilfoil Delineation, Treatment, and Assessment for Bone Lake, Washington County, Minnesota in 2021

Bone Lake, Washington County (ID: 82-0054)

Size: 221 acres (MnDNR)

Littoral area: 124 acres (MnDNR)

Maximum depth: 30 ft (MnDNR)

Introduction

Curlyleaf pondweed (CLP) and Eurasian watermilfoil (EWM) are non-native species and both are present in Bone Lake. CLP and EWM delineations were conducted on 221 acre Bone Lake, Washington County in 2021. The objectives of the delineations were to locate areas of nuisance invasive species and recommend areas for potential treatments.



Figure 1. Water lilies in Bone Lake on June 24, 2021.

Methods

Curlyleaf Pondweed Delineation and Assessment Methods: At the time of the spring curlyleaf delineation on April 30 only a fraction of the peak curlyleaf biomass is present compared to what could be present in June, at its peak. For spot treatments, the areas to be treated are delineated prior to curlyleaf developing peak biomass.

The delineation survey is conducted using a meandering path around the nearshore area of the entire lake. Curlyleaf is sampled using a fixed 14 tine rakehead on a pole. Curlyleaf stem counts on a rake sampler were used to identify areas that had a potential to produce curlyleaf growth at its June peak. After a short sweep of about 1-foot (which samples about 0.1 m²), if one or two stems (10-20 stems/m²) were collected on the rake sweep, it was predicted that this area would produce only future light growth at its peak and was not delineated for treatment. Alternatively, sites where 3 stems (30 stems/m²) were collected per rake sample future potential growth was considered to be moderate. However if 4 curlyleaf stems (40 stems/m²) or more per rake sample generally indicated some plants had developed runners and would likely produce heavy growth in the next few weeks and this site would be marked for potential treatment. This survey method used for determining curlyleaf pondweed spot herbicide treatments was similar to the methodology published in a peer reviewed journal (McComas et al, 2015)*.

Delineation and Assessment Sampling Sites: An initial delineation was conducted on April 30 and 153 sites were sampled. On June 24 the entire perimeter of the lake was checked for CLP and EWM. On June 24, a total of 186 sites were sampled for CLP, EWM, and other aquatic plants. A follow-up EWM assessment was conducted on August 20. A total of 125 sites were sampled for aquatic plants. EWM was not chemically treated in 2021.

Chart of Aquatic Plant Density Ratings



Figure 2. Aquatic plant density ratings from 1 to 3.

*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.
<https://doi.org/10.1080/10402381.2015.1014583>

Curlyleaf Pondweed Delineation on April 30, 2021

Results of the delineation conducted on April 30, 2021 found CLP present at 22 sample sites out of a total of 153 sites sampled. Two areas were delineated for CLP treatment (Figure 3). A CLP treatment of 4.38 acres was conducted on May 26, 2021 using Aquathol at 1.25 ppm (3.2 gallons per acre).

Bone Lake Curlyleaf Pondweed Treatment April 30, 2021

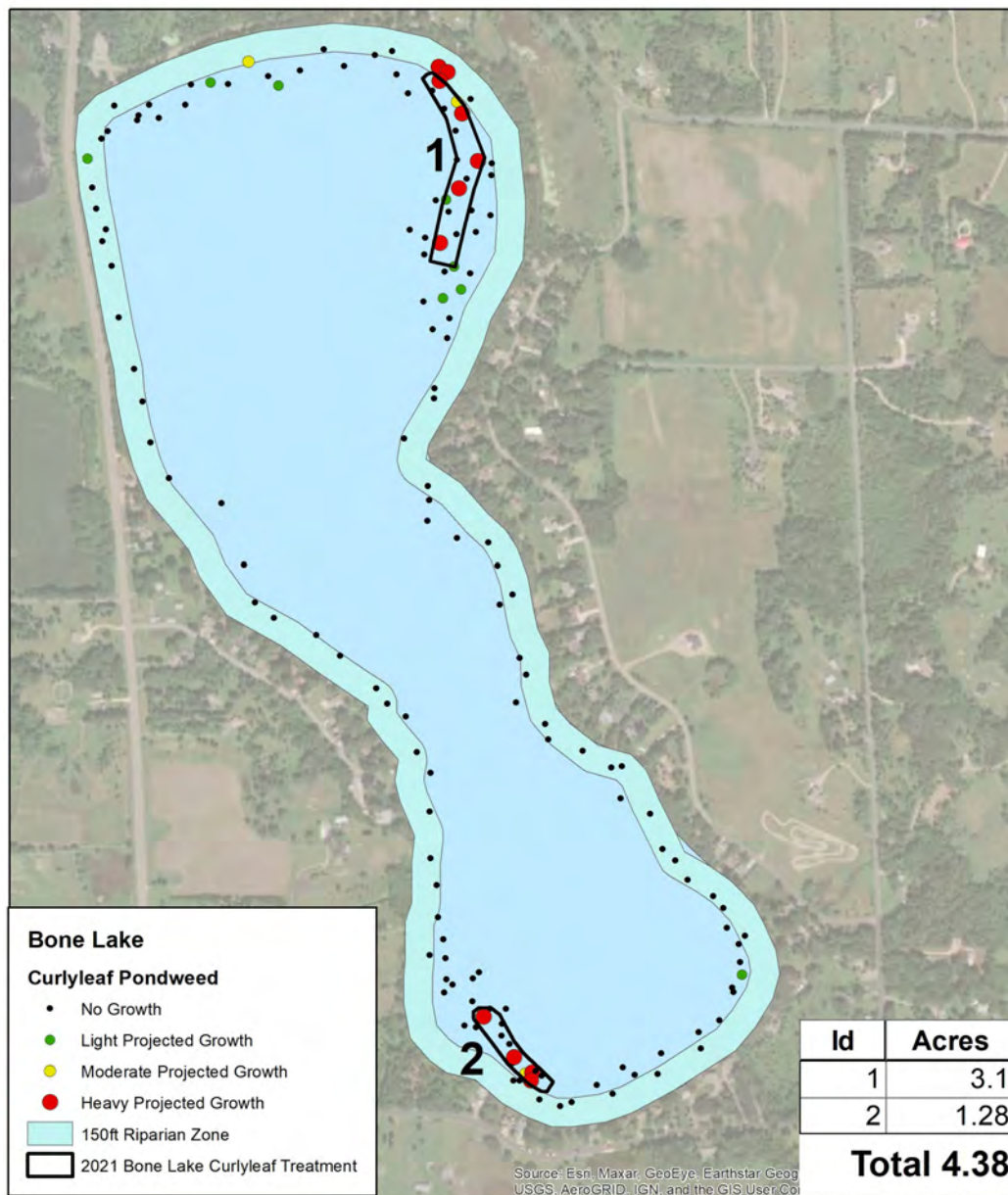


Figure 3. CLP coverage for Bone Lake on April 30, 2021.

Key: green dots = light growth, yellow dots = moderate growth, red dots = heavy growth, black dots = no growth, and blue shading = 150 ft riparian zone.

Curlyleaf Pondweed Assessment on June 24, 2021

Results of an assessment conducted on June 24, 2021 found that CLP was not present in the 186 locations sampled. The CLP treatment on May 26, 2021 of 4.38 acres had good control results. Very little CLP was present in lake areas outside of the treatment polygons (Figure 4).

Bone Lake Curlyleaf Pondweed Assessment June 24, 2021

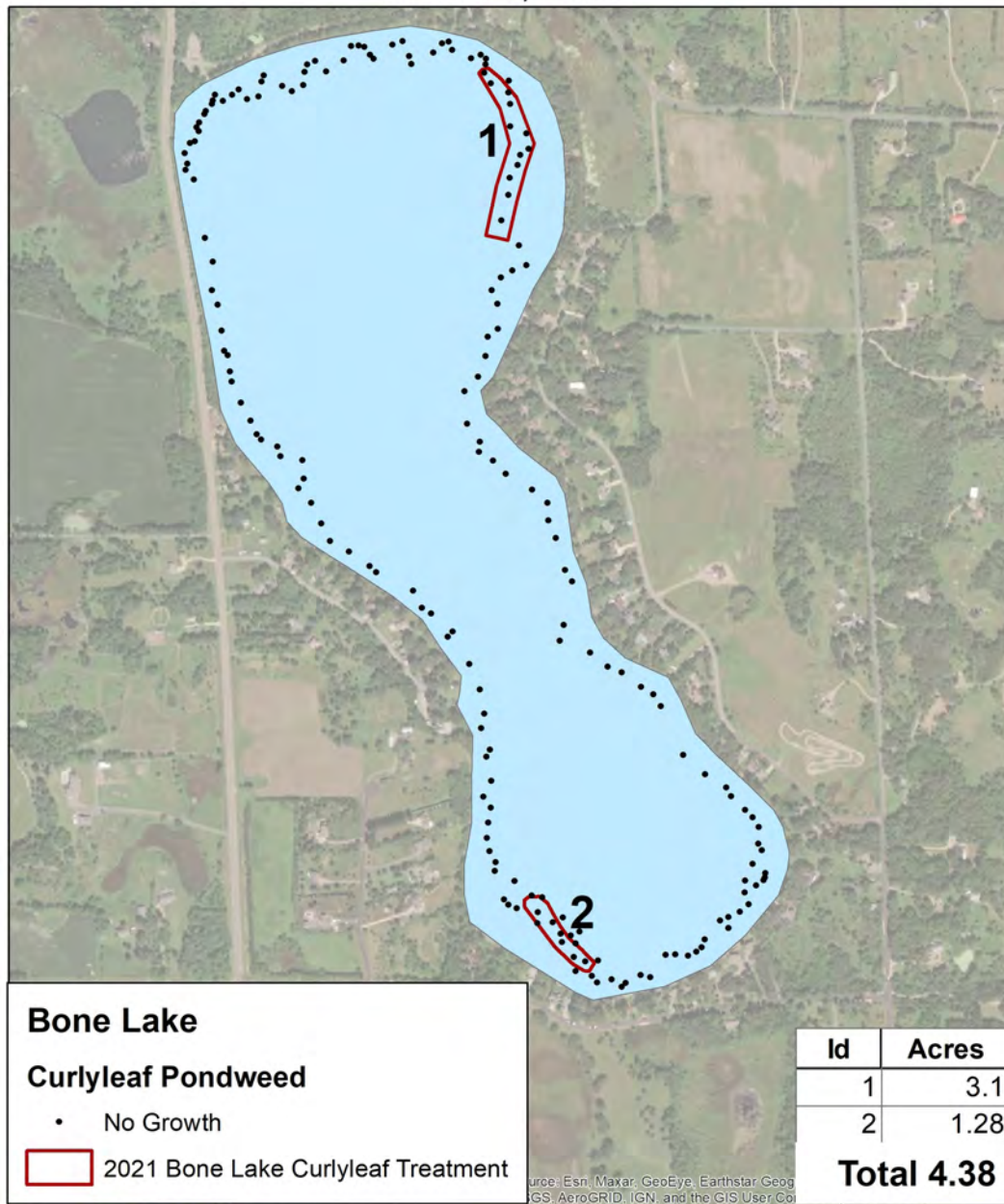


Figure 4. CLP was not found in Bone Lake on June 24, 2021.

Key: black dot = no curlyleaf growth and red outlined areas = 2021 CLP treatment areas.

Eurasian Watermilfoil Delineations on June 24, 2021

An EWM delineation was conducted on June 24, 2021. EWM was found at 4 sites out of 186 sites sampled (Figure 5). No areas were delineated for treatment (Figure 5).

Bone Lake Eurasian Watermilfoil Growth June 24, 2021

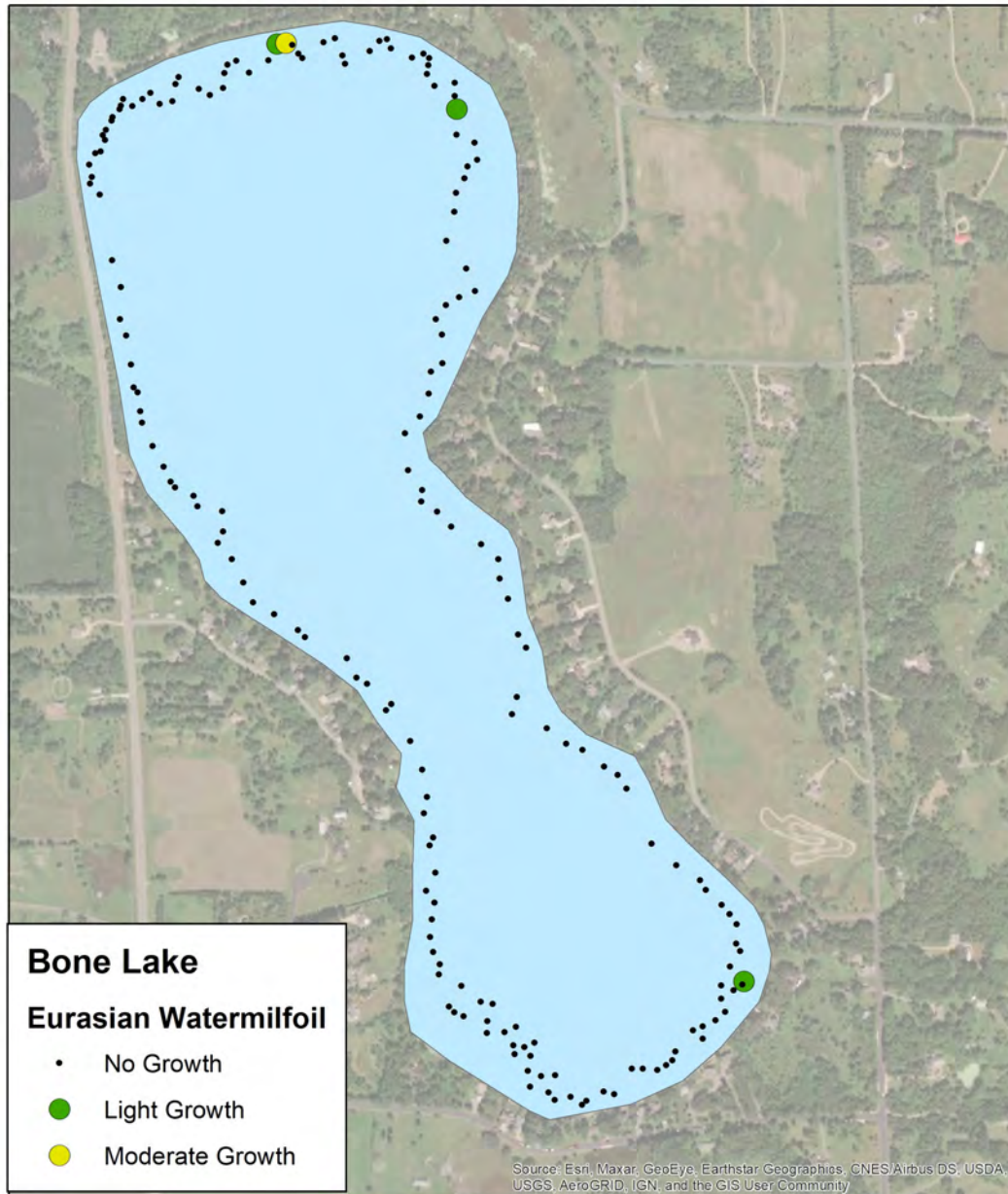


Figure 5. EWM coverage for Bone Lake on June 24, 2021.

Key: green dots = light growth, yellow dots = moderate growth, and black dots = no growth.

Eurasian Watermilfoil Assessment on August 20, 2021

EWM growth was assessed on August 24, 2021 and 25 occurrences of EWM were observed in Bone Lake (Figure 6). No large scale treatment (greater than 1 acre) of EWM was conducted in 2021.

Bone Lake Eurasian Watermilfoil August 20, 2021

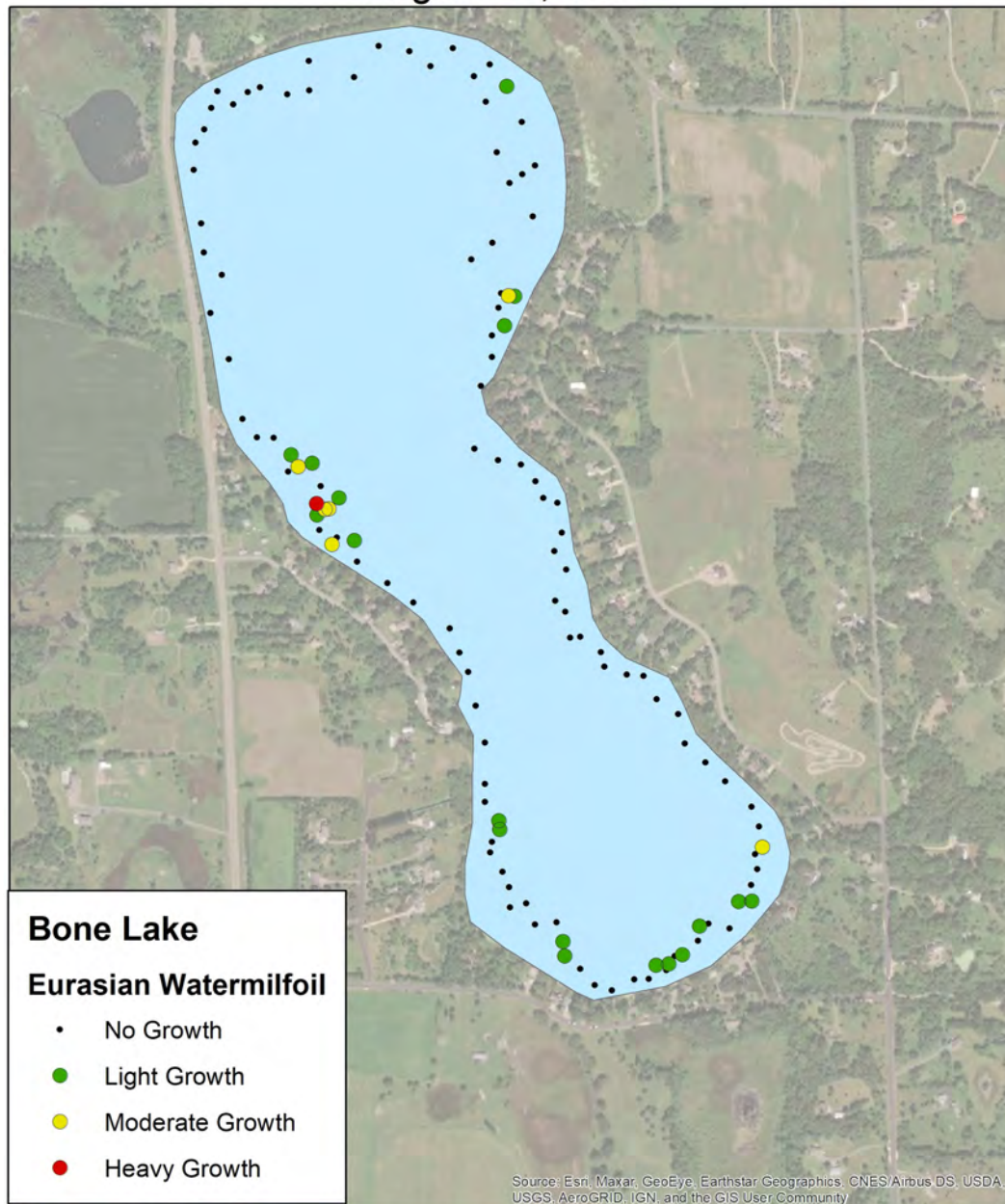
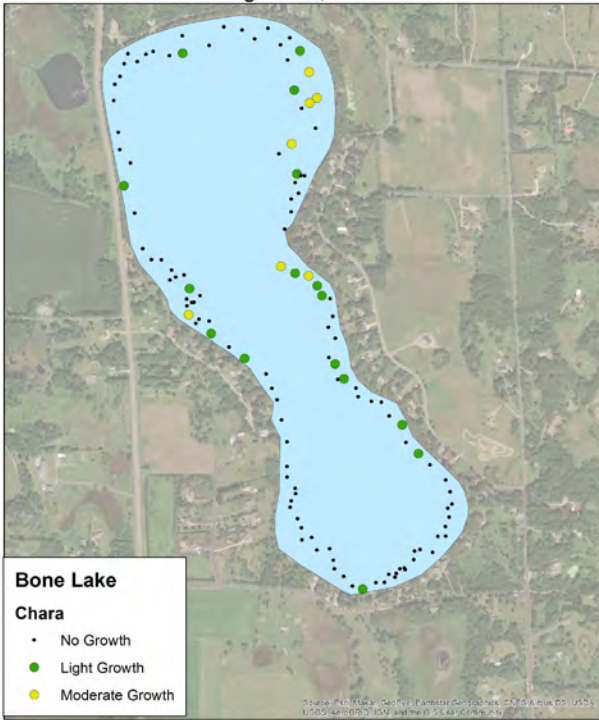


Figure 6. EWM coverage for Bone Lake on August 20, 2021.

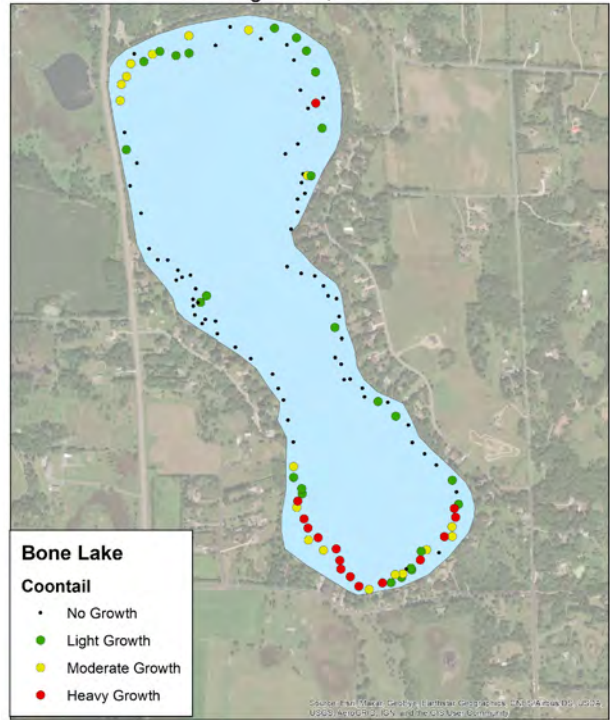
Key: green dots = light growth, yellow dots = moderate growth, red dots = heavy growth, and black dots = no growth.

Bone Lake Aquatic Plants Found on the August 20, 2021 Meander Survey

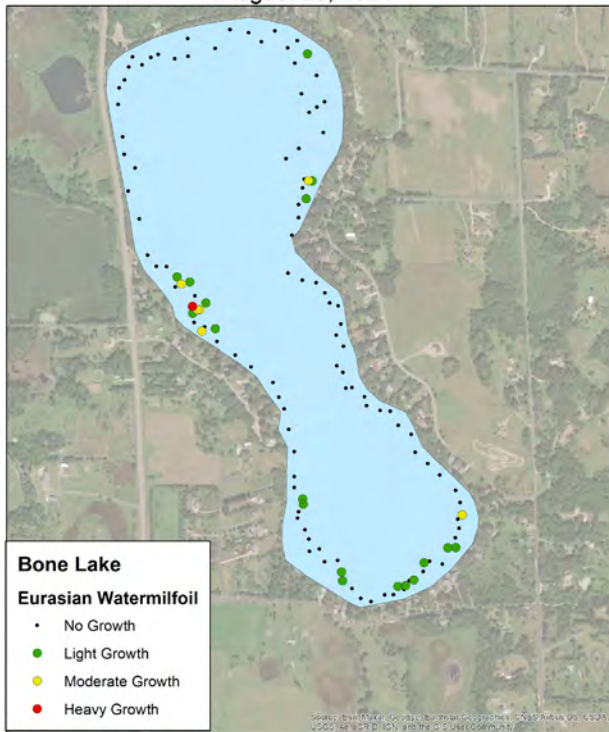
Bone Lake Chara
August 20, 2021



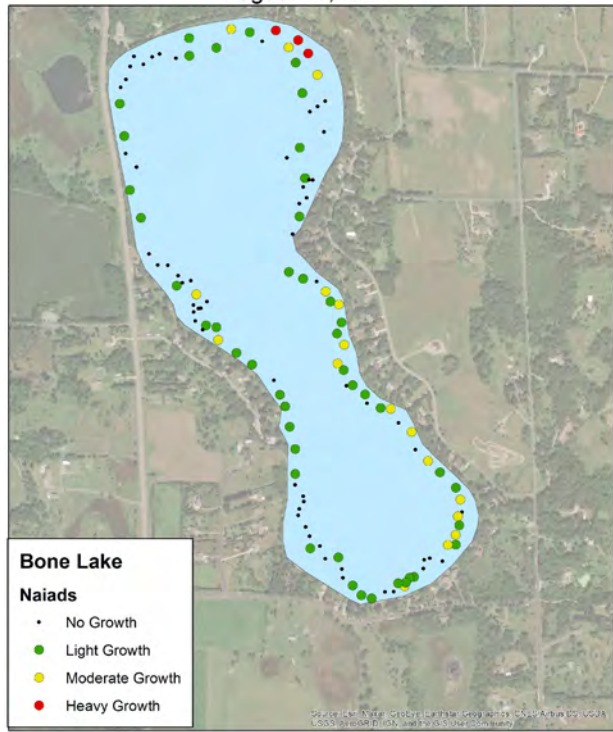
Bone Lake Coontail
August 20, 2021



Bone Lake Eurasian Watermilfoil
August 20, 2021



Bone Lake Naiads
August 20, 2021



APPENDIX

Curlyleaf Pondweed and Eurasian Watermilfoil Assessments from 2014 - 2020

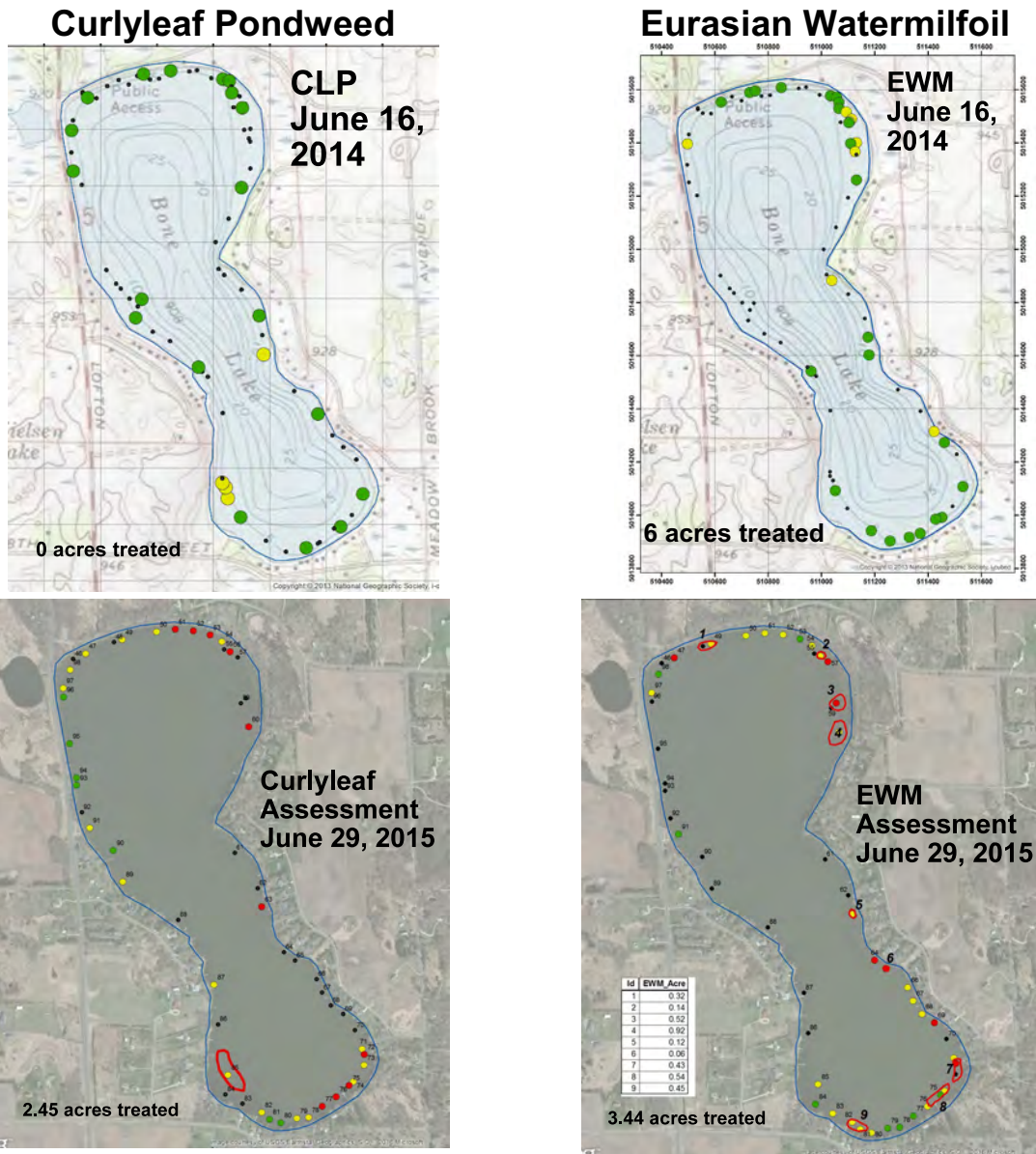


Figure 7. CLP and EWM maps for 2014 through 2020 (continued on the next 2 pages).

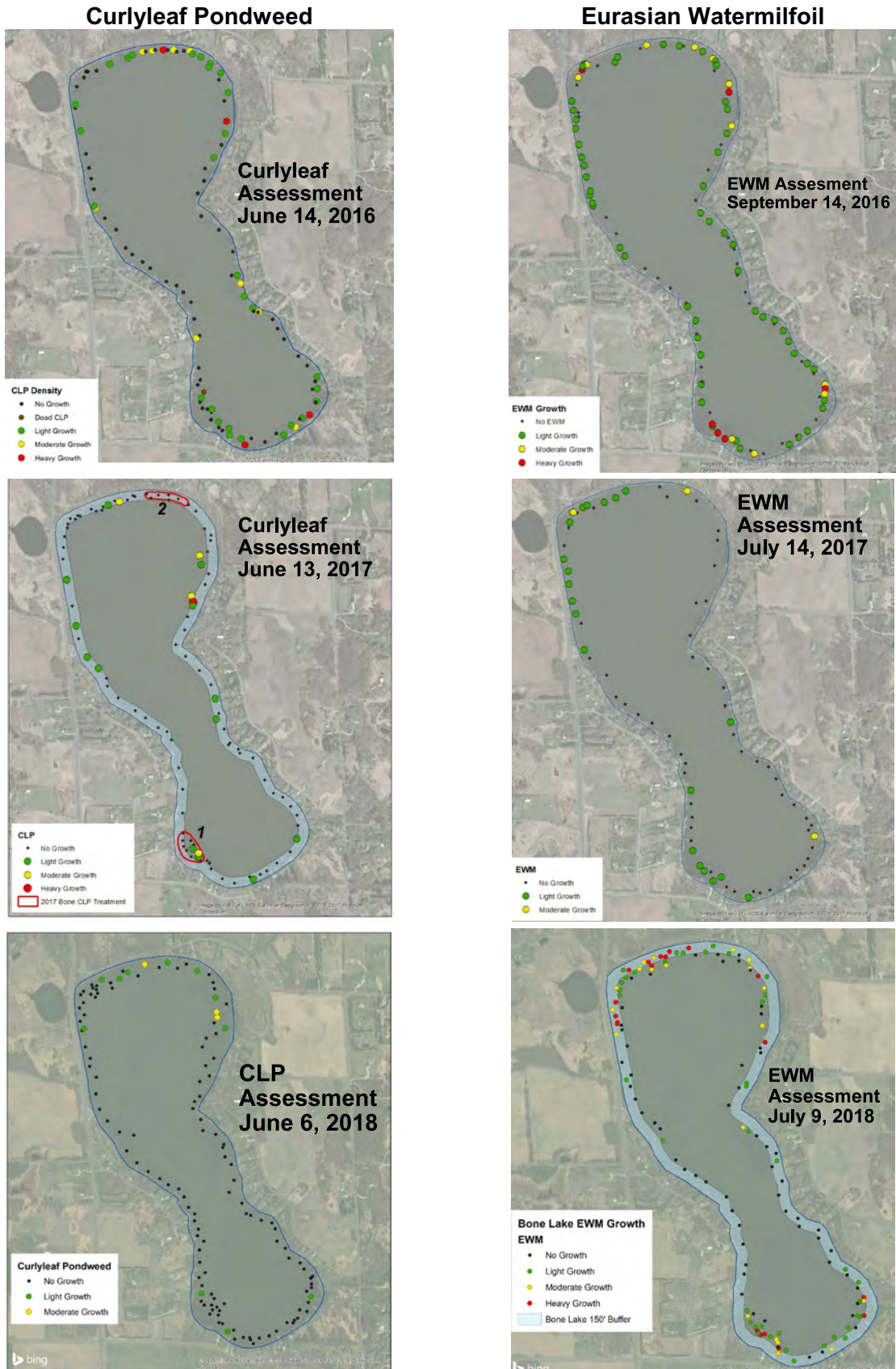
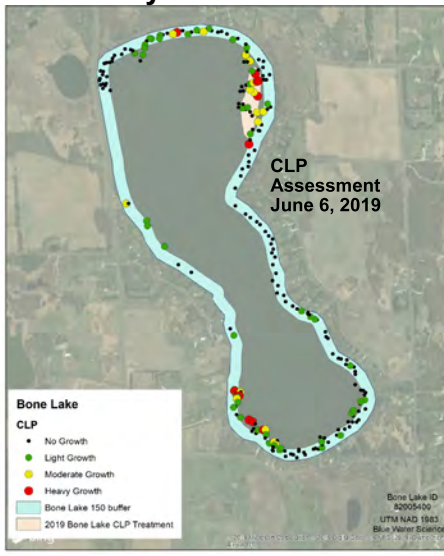


Figure 7. CLP and EWM maps for 2014 through 2020.

Curlyleaf Pondweed



Eurasian Watermilfoil

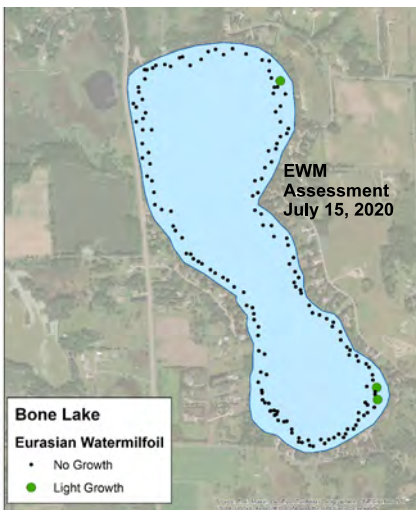
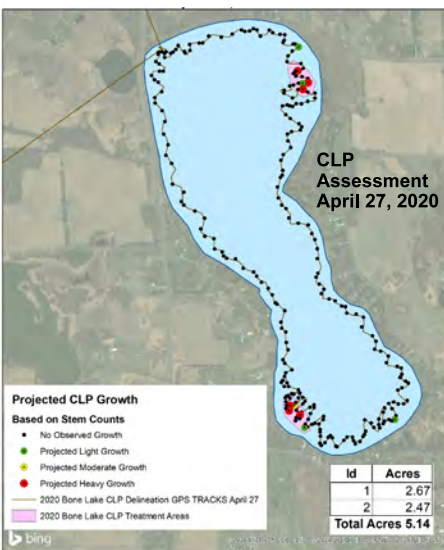
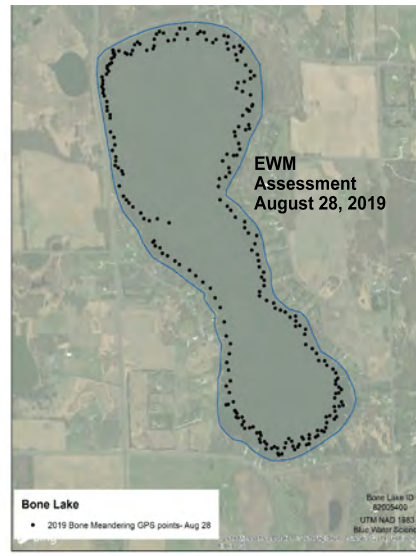


Figure 7. CLP and EWM maps for 2014 through 2020.

Curlyleaf Pondweed from 2015 - 2020

A summary of CLP treatments from 2015 through 2020 is shown in Figure 8. CLP growth has been variable for the last couple of years. Lake ice, snow cover, and even cloudy days can limit curlyleaf growth. A hotspot map of sites of CLP moderate and heavy growth for 2015 through 2020 is shown in Figure 8. In the last 5 years CLP growth has been most evident in the northern and southern ends of Bone Lake where growing conditions are conducive to heavy plant growth. CLP has typically grown to a water depth of 6 feet or less.

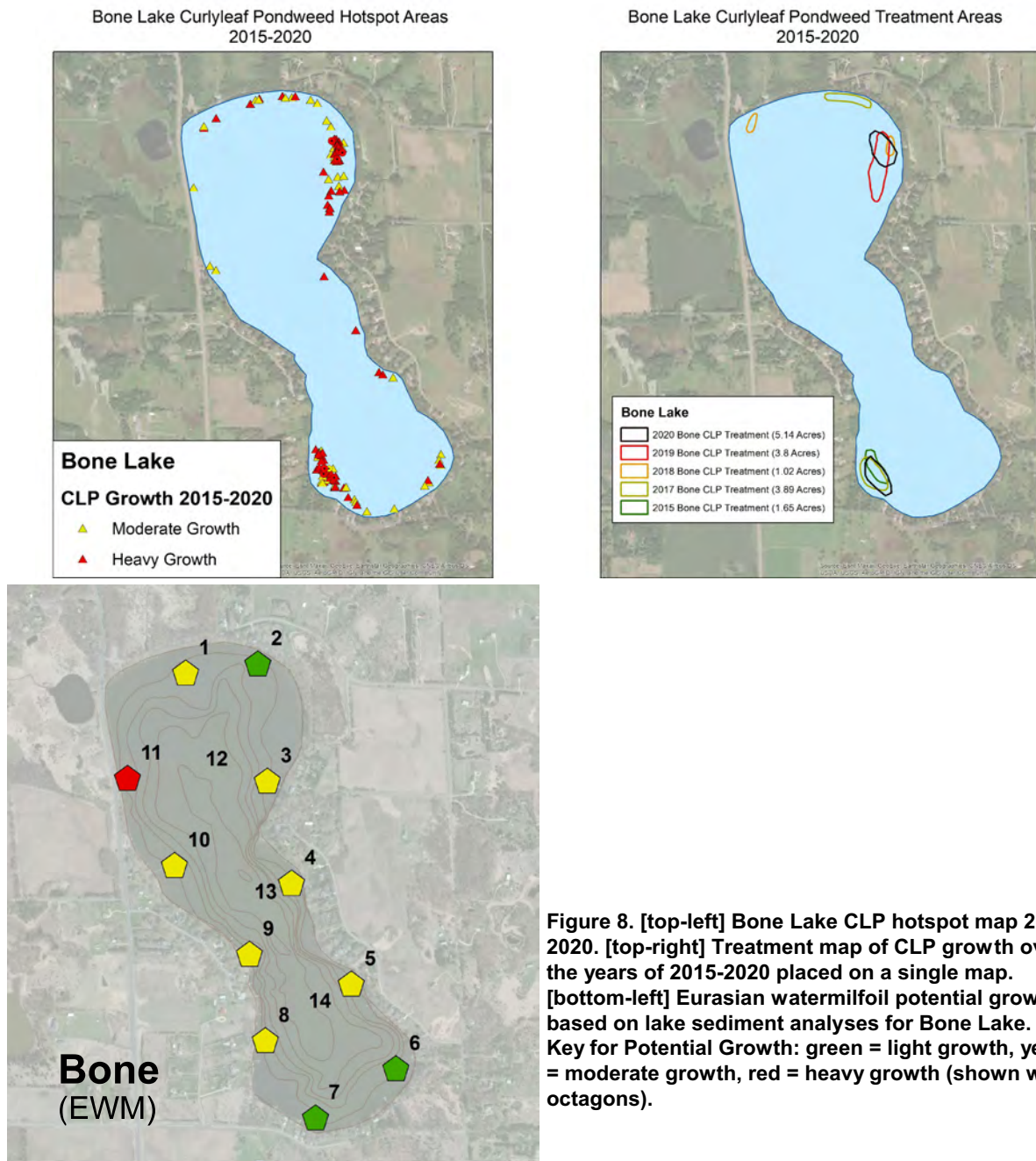


Figure 8. [top-left] Bone Lake CLP hotspot map 2015-2020. [top-right] Treatment map of CLP growth over the years of 2015-2020 placed on a single map. [bottom-left] Eurasian watermilfoil potential growth based on lake sediment analyses for Bone Lake. Key for Potential Growth: green = light growth, yellow = moderate growth, red = heavy growth (shown with octagons).

Eurasian Watermilfoil from 2015 - 2020

EWM has been in Bone Lake since 2006. Although control of EWM has been ongoing since 2006, EWM continued to expand around the lake. A map showing the occurrence of moderate to heavy growth of EWM in Bone Lake from 2015 through 2020 is shown in Figure 9. Some nearshore areas in the north and south ends of Bone Lake support consistently significant growth. These “hotspot” areas are shown in Figure 9.

Heavy milfoil growth has been correlated with high sediment nitrogen conditions and from a soils survey conducted in 2014, Bone Lake has at least 1 area with high lake sediment nitrogen conditions. The potential for long term milfoil growth, based on lake sediment sampling, predicts mostly moderate growth with the potential for annual heavy growth limited to the northwest side of Bone Lake.

For Bone Lake, it is estimated the plants have the potential to grow down to at least 7 feet of water depth based on low Secchi transparencies, restricting milfoil growth to nearshore areas. Results of the sediment survey indicate growth would be primarily light on a long term basis.

