Curlyleaf Pondweed in Bone Lake, June 6,2019

Curlyleaf Pondweed and Eurasian Watermilfoil Delineation, Treatment, and Assessment for Bone Lake, Washington County, Minnesota in 2019

	Delineation	Treatment	Assessment
CLP	April 24, 2019	3.88 acres on May 20, 2019	June 6, 2019
EWM	June 6, 2019	No treatment	August 28, 2019

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

Prepared by:
Steve McComas
Jo Stuckert
Connor McComas
Blue Water Science

December 5, 2019

Curlyleaf Pondweed and Eurasian Watermilfoil Delineation, Treatment, and Assessment for Bone Lake, Washington County, Minnesota in 2019

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 24, 2019 by Blue Water Science to characterize areas that could be treated. Results of the curlyleaf delineation on April 24, 2019 found CLP present at 24 sample sites. One treatment area was delineated totaling 3.88 acres. Treatment of 3.88 acres of curlyleaf pondweed using 12.4 gallons of Aquathol K was conducted on May 20, 2019. A lakewide concentration of the active ingredient was 6 ppb.

A CLP assessment was conducted on June 6, 2019, which was the time period of peak CLP growth in area lakes. CLP control in the treatment area was poor and in addition, CLP growth had expanded and was found at sites at light to heavy densities primarily in the southwest area of Bone Lake (Figure S1).

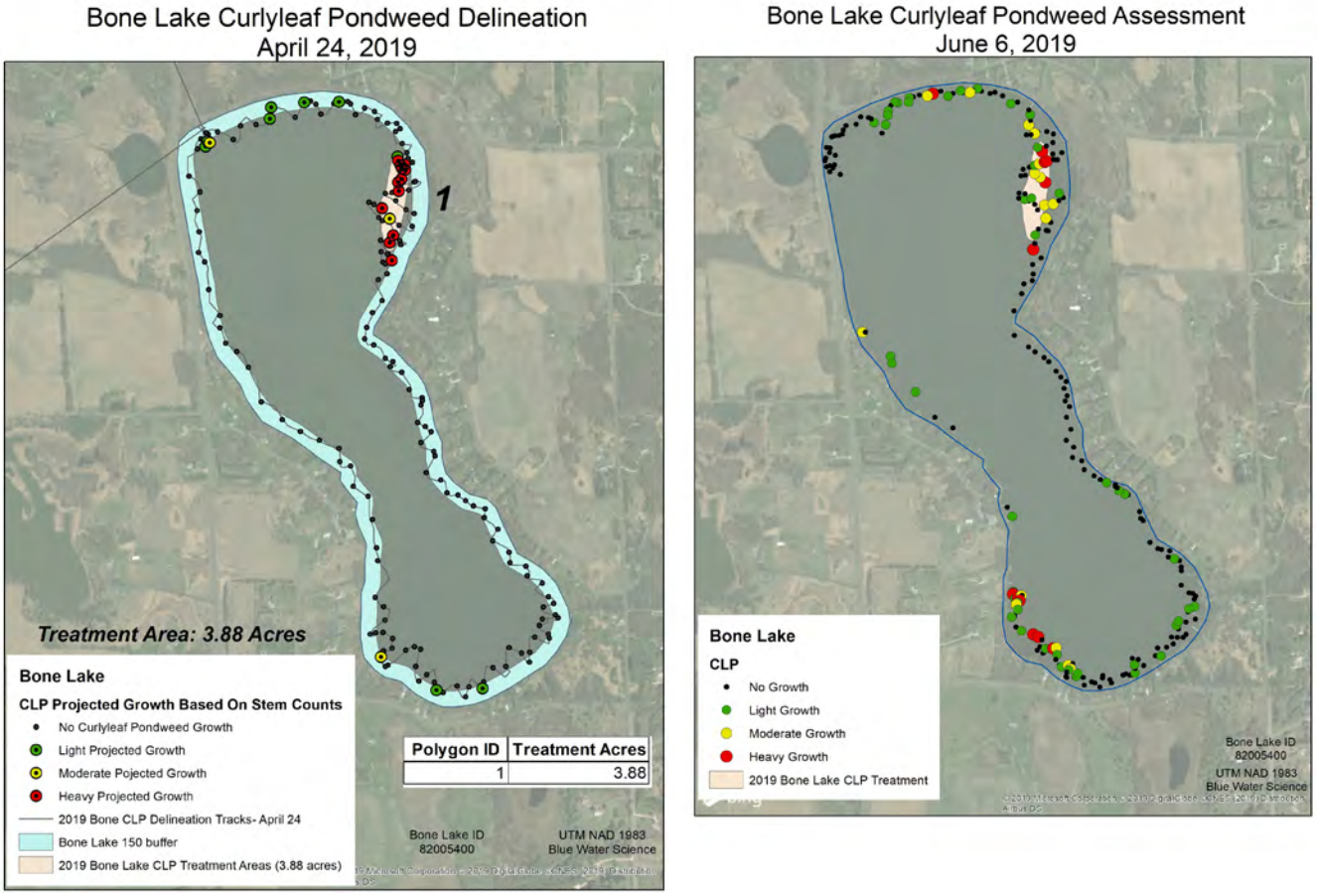
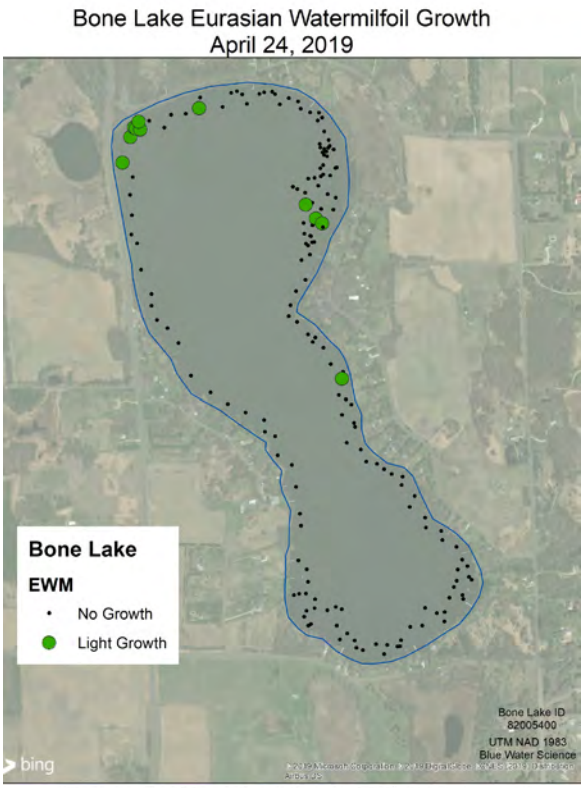


Figure S1. [left] CLP was found at 24 out of 178 sample sites in Bone Lake on April 24, 2019
[right] CLP was found at 74 out of 106 sample sites on June 6, 2019.
Key: green = light growth, yellow = moderate growth, red = heavy growth.

Eurasian Watermilfoil Delineation, Treatment, and Assessment: Eurasian watermilfoil (EWM) was verified in Bone Lake in 2006. In 2019, an initial early EWM check was conducted on April 24, 2019 with only light growth observed. Another EWM delineation was conducted on June 6, 2019 and EWM was found at 42 sites out of the 106 sites sampled, with light to heavy growth out to 6 feet of water depth (Figure S2). No large areas were delineated for EWM treatment in 2019.

A follow-up assessment was conducted on August 28, 2019. Eurasian watermilfoil apparently had died back and no EWM was observed in Bone Lake.



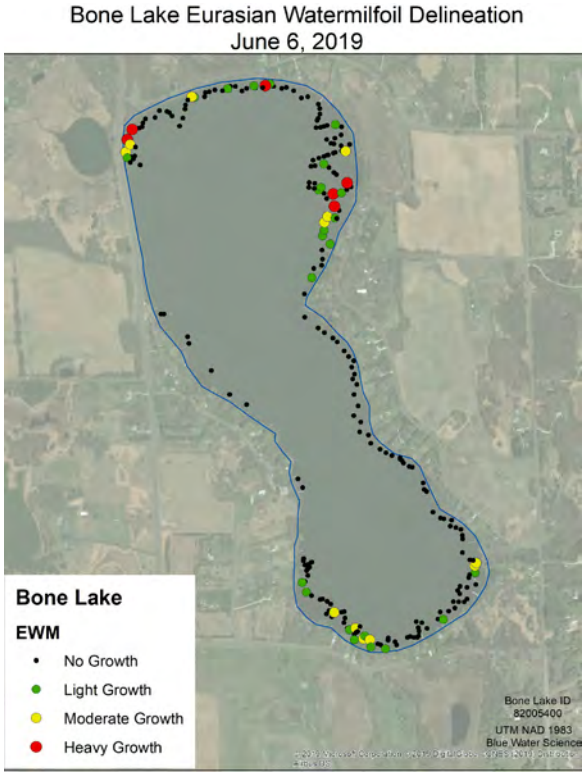


Figure S2. [top-left] EWM coverage for Bone Lake on April 24, 2019. [top-right] EWM delineation for Bone Lake on June 6, 2019. [bottom-left] EWM coverage for Bone Lake on August 28, 2019.

Curlyleaf and Milfoil Treatments from 2014-2019: A summary of CLP and EWM treatments from 2014 through 2019 is shown in Figure S3. 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 2019 is shown in Figure S3. 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.

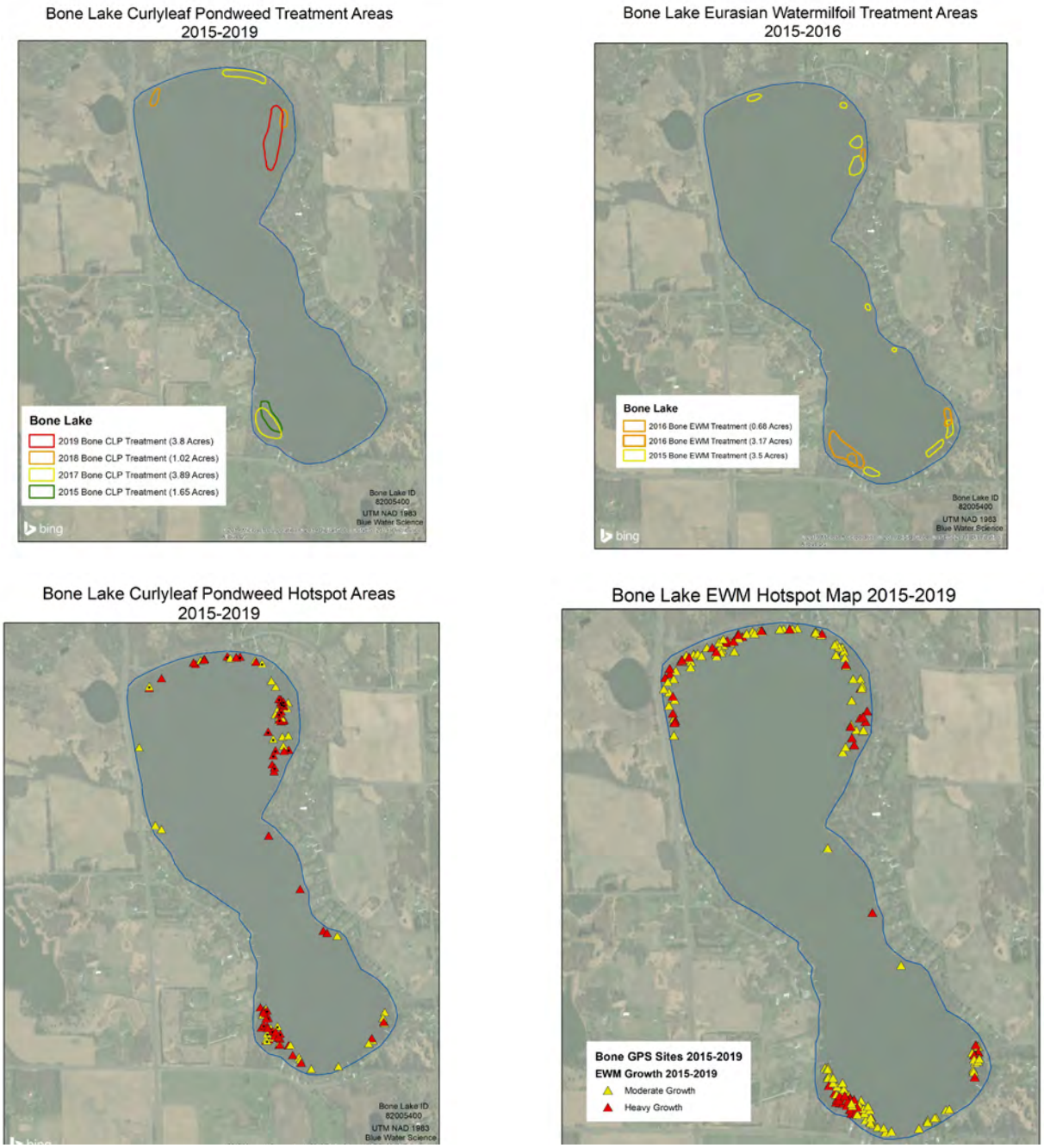
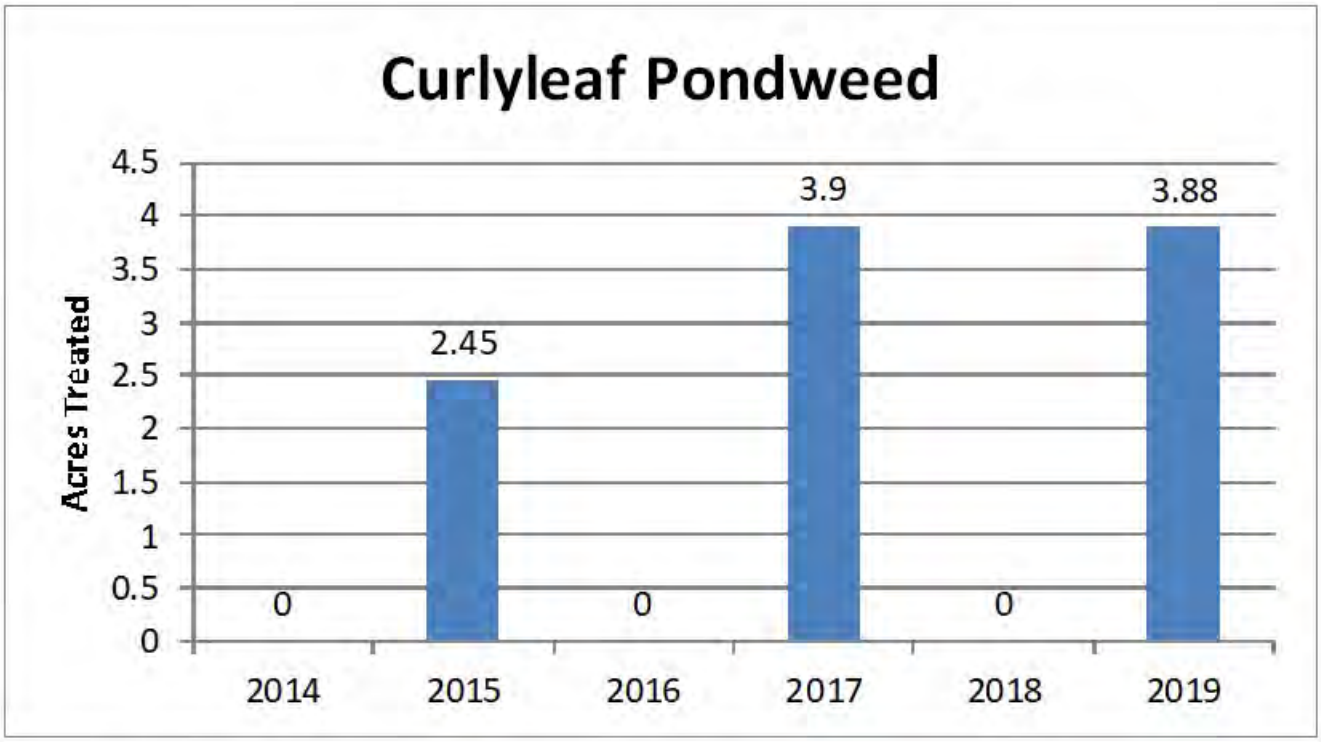


Figure S3. [top-left] Bone Lake CLP treatment map 2015-2019. [top-right] Bone Lake EWM treatment map 2015-2016. [bottom-left] Hotspot map of CLP growth over the years of 2015-2019 placed on a single map. [right] Hotspot map of EWM growth over the years of 2015-2019 placed on a single map Key: yellow = moderate growth, and red = heavy growth.



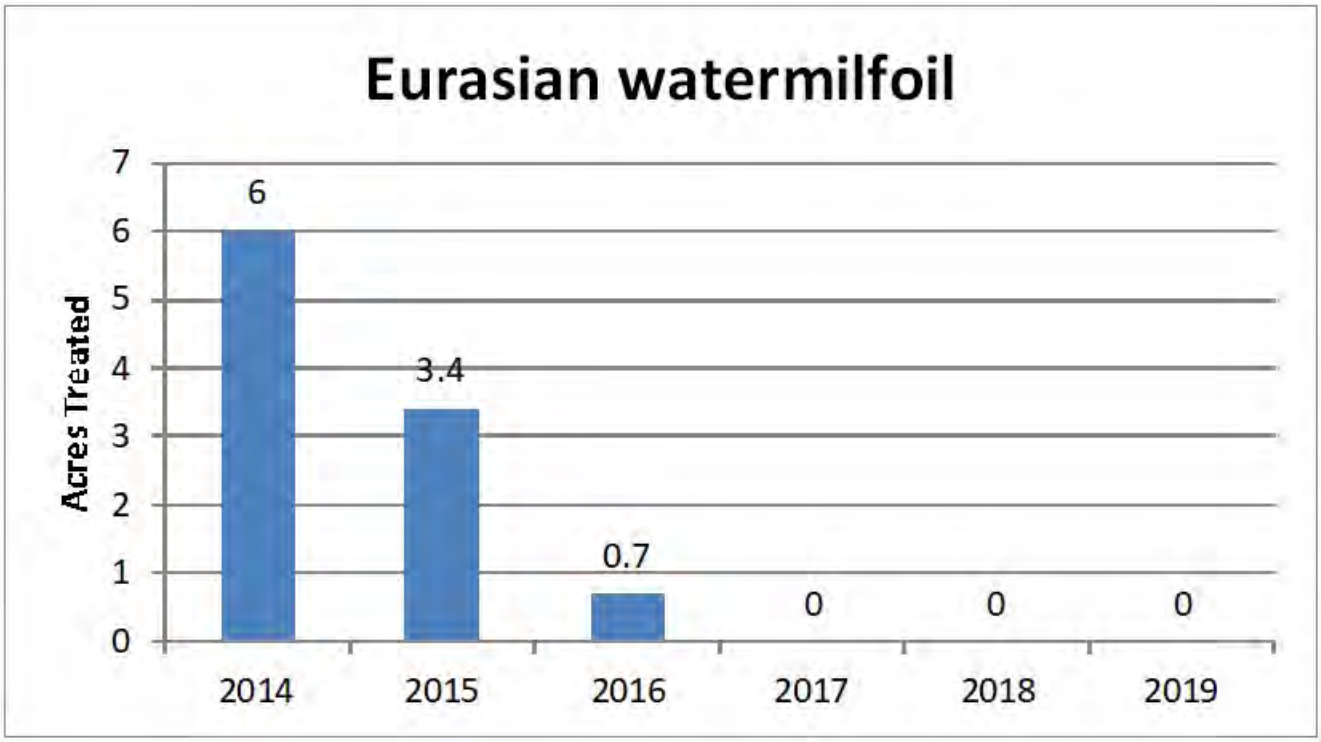


Figure S4. Summary of CLP and EWM treatment acreages for 2014-2019.

Curlyleaf Pondweed and Eurasian Watermilfoil Delineation, Treatment, and Assessment for Bone Lake, Washington County, Minnesota in 2019

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 2019. The objectives of the delineations were to locate areas of nuisance invasive species and recommend areas for potential treatments.

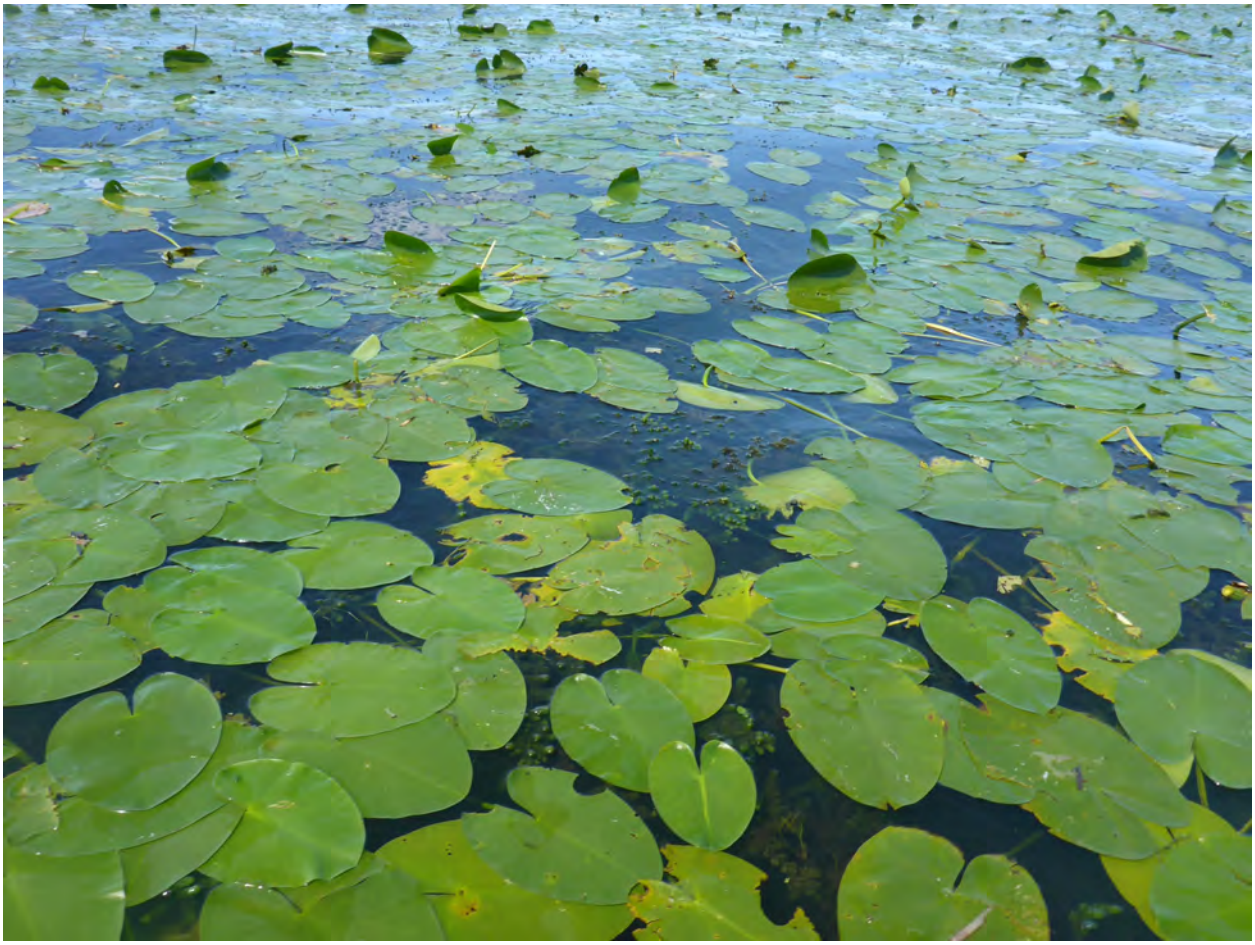


Figure 1. Water lilies in Bone Lake in 2019.

Methods

Curlyleaf Pondweed Delineation and Assessment Methods: At the time of the spring curlyleaf delineation on April 24 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 m^2), if one or two stems (10-20 stems/m^2) 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/m^2) were collected per rake sample future potential growth was considered to be moderate. However if 4 curlyleaf stems (40 stems/m^2) 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)*.

Eurasian Watermilfoil Delineation and Assessment Methods: An initial EWM delineation was conducted on June 6, 2019. The entire perimeter of the lake was checked for EWM. A total of 106 sites were sampled for EWM and other aquatic plants. A follow-up EWM assessment was conducted on August 28, 2019. A total of 240 sites were sampled for aquatic plants. EWM was not chemically treated in 2019.

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.org10.1080/10402381.2015.1014583

Curlyleaf Pondweed Delineation on April 24, 2019

Results of the delineation conducted on April 24, 2019 found CLP present at 24 sample sites. A total of 178 sites were sampled on April 24, 2019. One area was delineated for CLP treatment (Figure 3). A CLP treatment of 3.88 acres was conducted May 20, 2019.

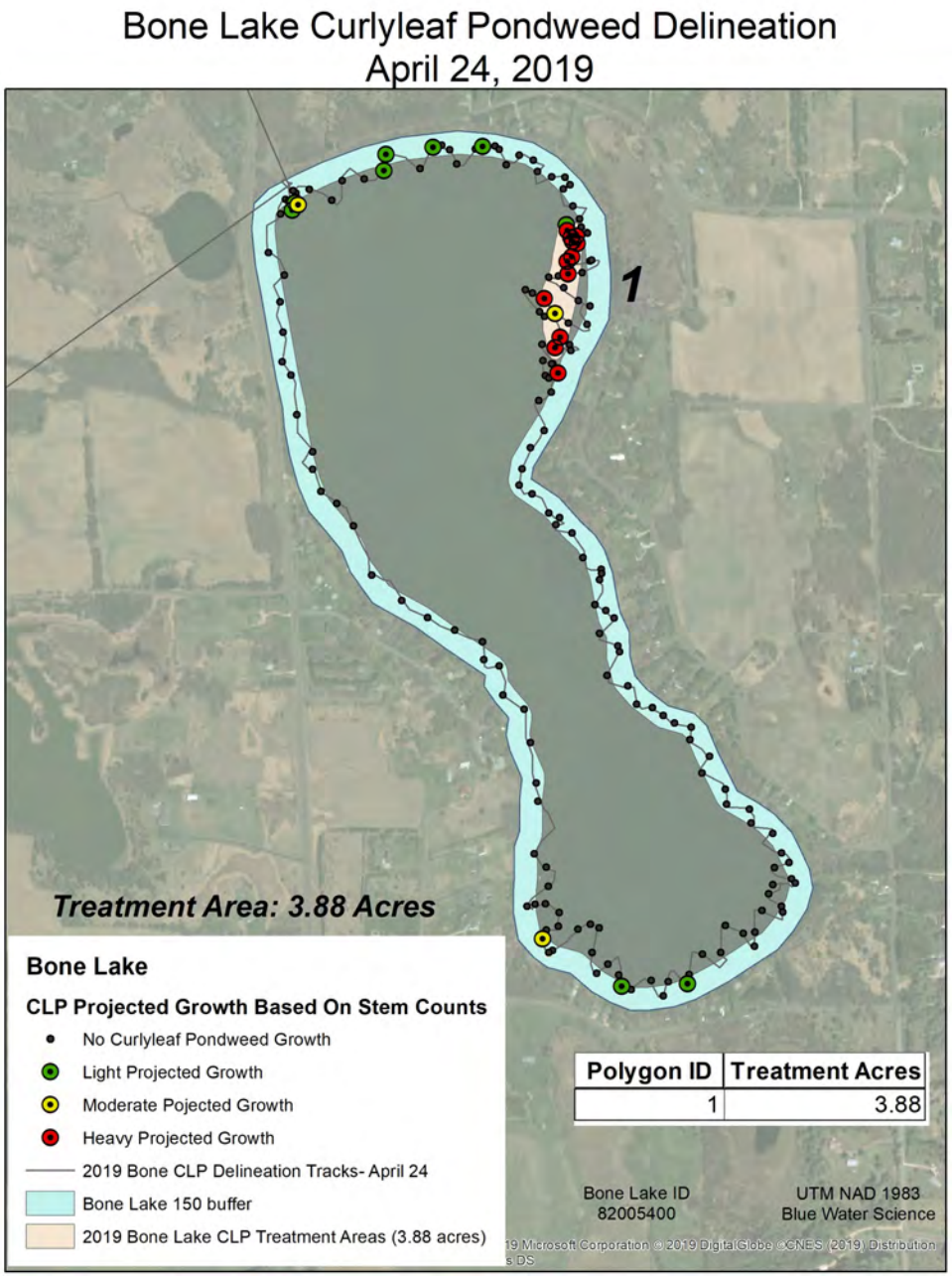


Figure 3. CLP coverage for Bone Lake on April 24, 2019.
Key: green dots = light growth, yellow dots = moderate growth, red dots = heavy growth, black dots = no growth, blue shading = 150 foot buffer, and white shading = treatment area.

Curlyleaf Pondweed Assessment on June 6, 2019

Results of an assessment conducted on June 6, 2019 found that CLP was present at 74 out of 106 locations. The CLP treatment on May 20, 2019 of 3.88 acres had poor control results. In addition, CLP growth in June had slightly expanded from the April survey. Overall, curlyleaf ranged from light growth to heavy growth (Figure 4).

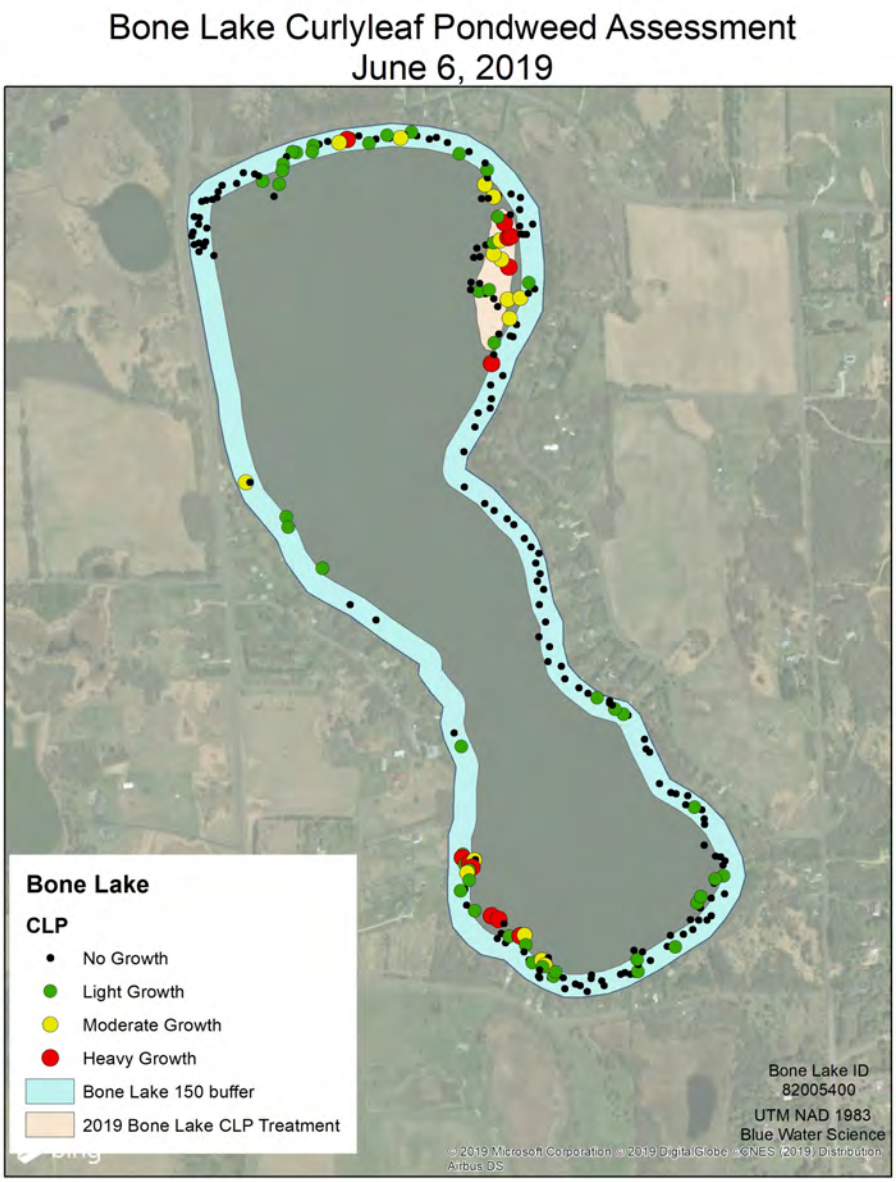


Figure 4. CLP was found at 74 out of 106 sample sites in Bone Lake on June 6, 2019.
Key: green dot = light growth, yellow dot = moderate growth, and black dot = no curlyleaf growth.

Eurasian Watermilfoil Delineations on June 6, 2019

An EWM delineation was conducted on June 6, 2019. EWM was found at 42 sites out of 106 sites sampled (Figure 5). EWM was growing from 2-6 feet water depth with some heavy growth at 3-5 feet of water depth. No areas were delineated for treatment (Figure 5). In 2019, EWM was distributed primarily in the north and south ends of the nearshore area of Bone Lake.

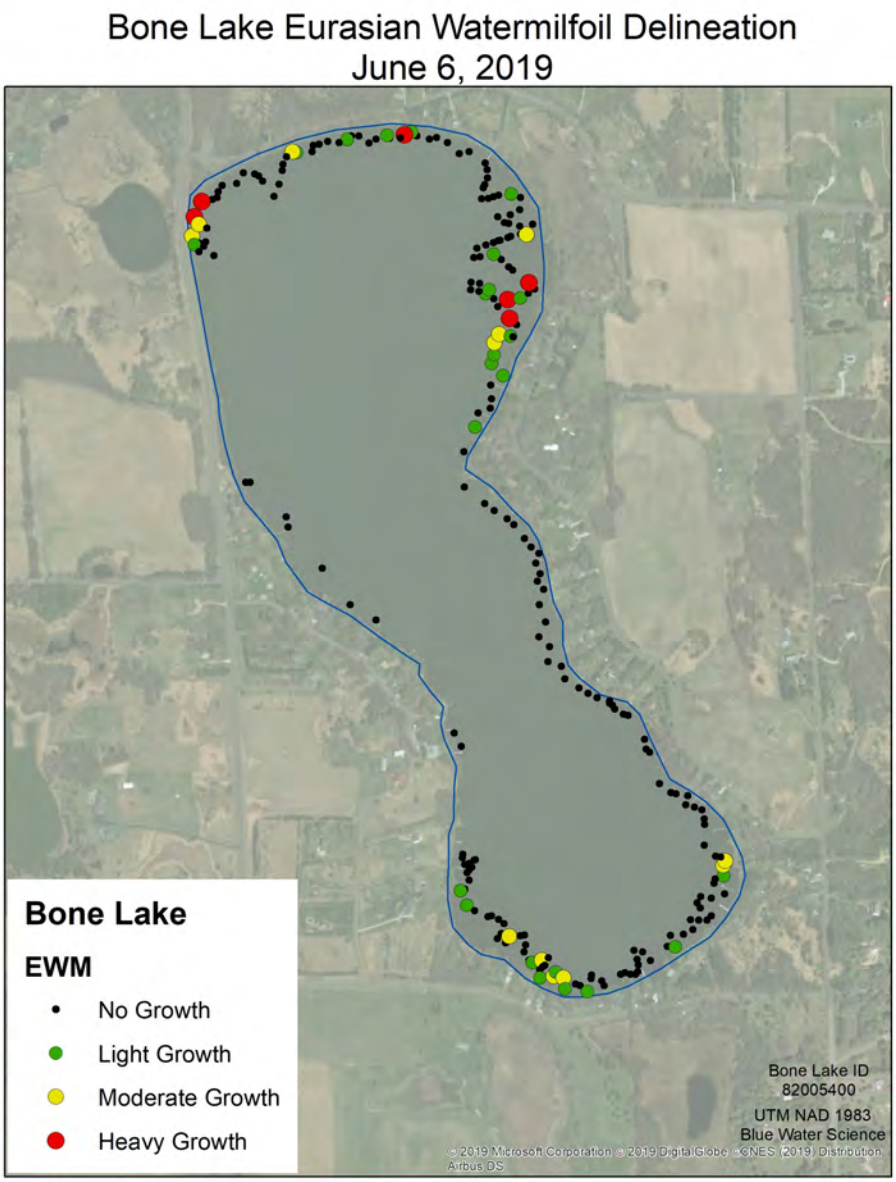


Figure 5. EWM coverage for Bone Lake on June 6, 2019.
Key: green = light growth, yellow = moderate growth, and red = heavy growth.

Eurasian Watermilfoil Assessment on August 28, 2019

No large scale treatment (greater than 1 acre) of EWM was conducted in 2019. EWM growth was assessed on August 28, 2019 and somewhat surprisingly, no occurrences of EWM were observed in Bone Lake (Figure 6). The cause of the EWM decline in 2019 was not determined.

Figure 6. EWM coverage for Bone Lake on August 28, 2019.
Key: green = light growth, yellow = moderate growth, red = heavy growth, black = no EWM growth, and blue shading = 150 foot buffer from shore.

Curlyleaf Pondweed and Eurasian Watermilfoil Assessments from 2014 - 2019

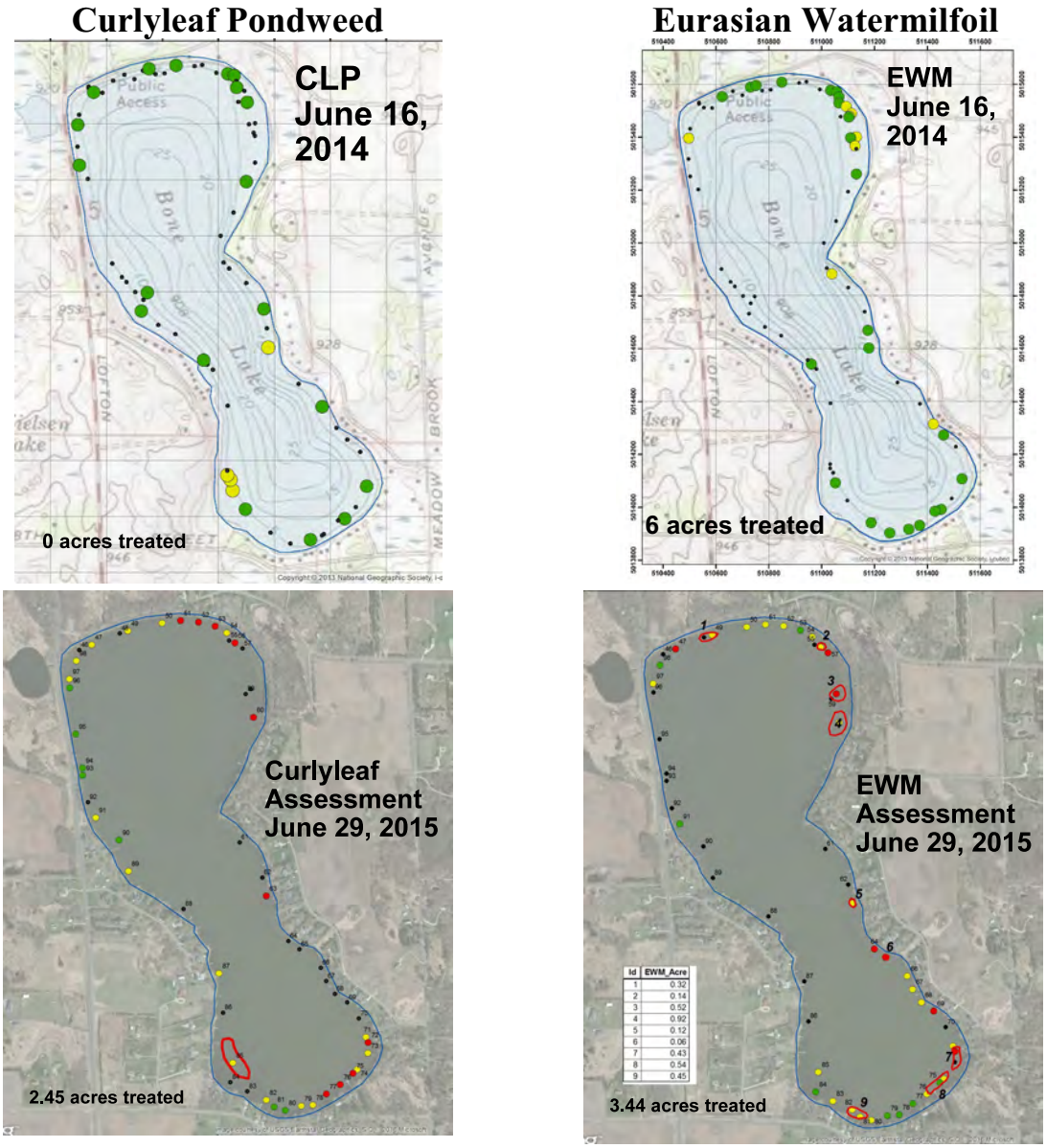


Figure 7. CLP and EWM maps for 2014 through 2019 (continued on the next 2 pages).

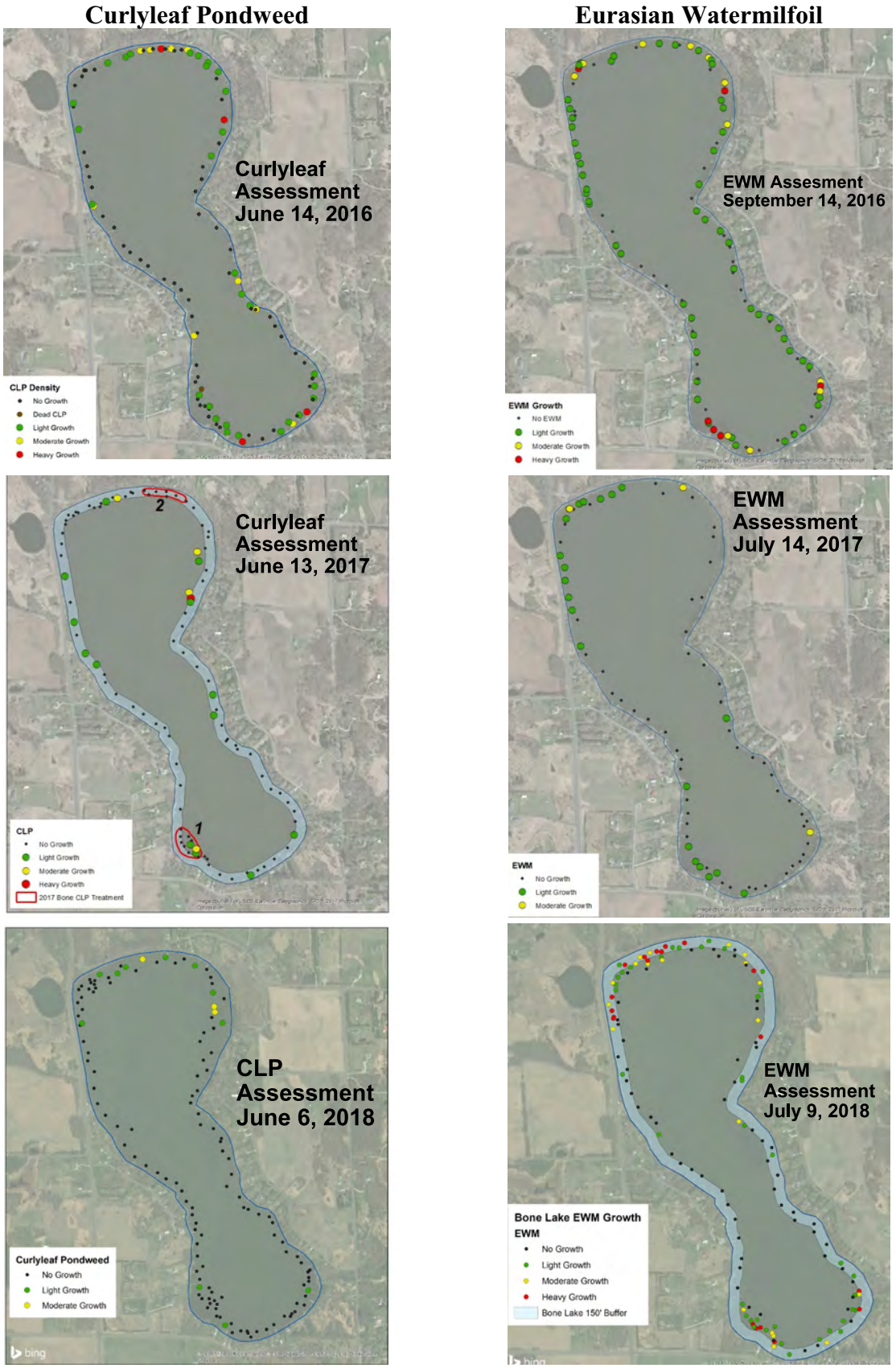
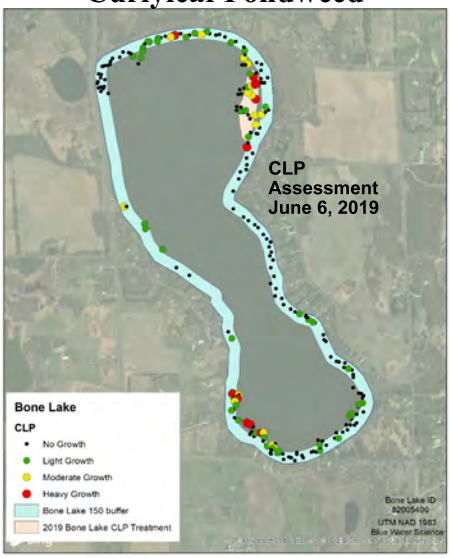


Figure 7. CLP and EWM maps for 2014 through 2019.

Curlyleaf Pondweed



Eurasian Watermilfoil

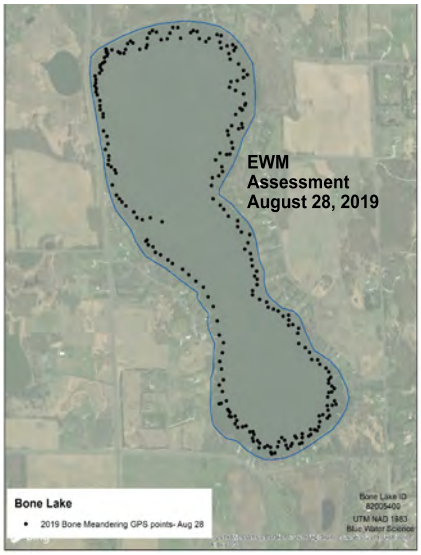


Figure 7. CLP and EWM maps for 2014 through 2019.

Eurasian Watermilfoil from 2015 - 2019

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 2019 is shown in Figure 8. Some nearshore areas in the north and south ends of Bone Lake support consistently significant growth. These “hotspot” areas are shown in Figure 8.

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.

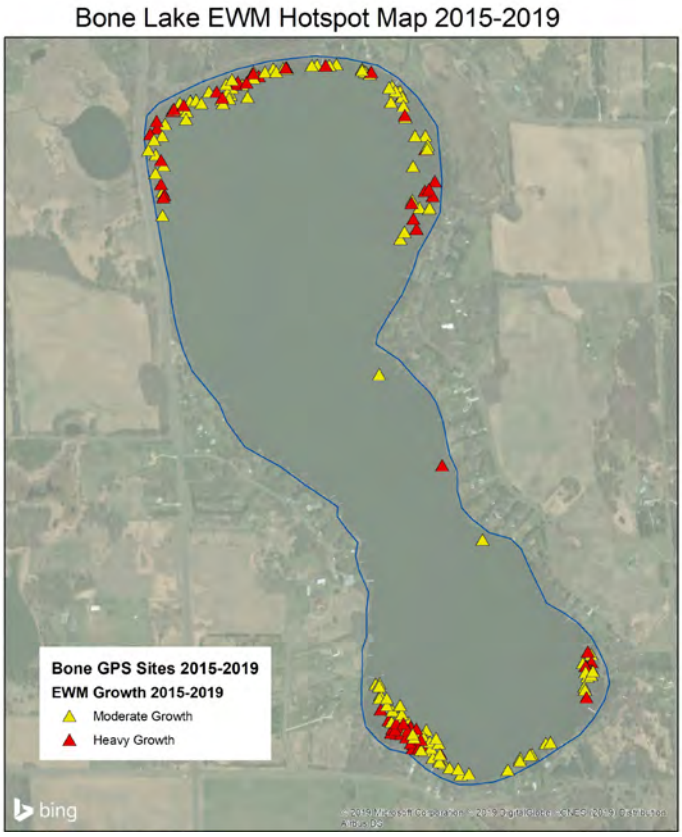


Figure 8. Hotspot map of EWM growth over the years of 2015 to 2019 placed on a single map. Key: yellow = moderate growth, and red = heavy growth.

Does Nitrogen Have an Impact on EWM? EWM growth seems to be enhanced with high sediment nitrogen conditions. In the last 4 years (2015-2019) significant EWM growth has occurred in the north and south ends of Bone Lake (Figure 9). However, lake sediment nitrogen concentrations are low to moderate in those areas (Figure 9). Additional investigations of the role of nitrogen as it impacts EWM would help guide management programs in the future.

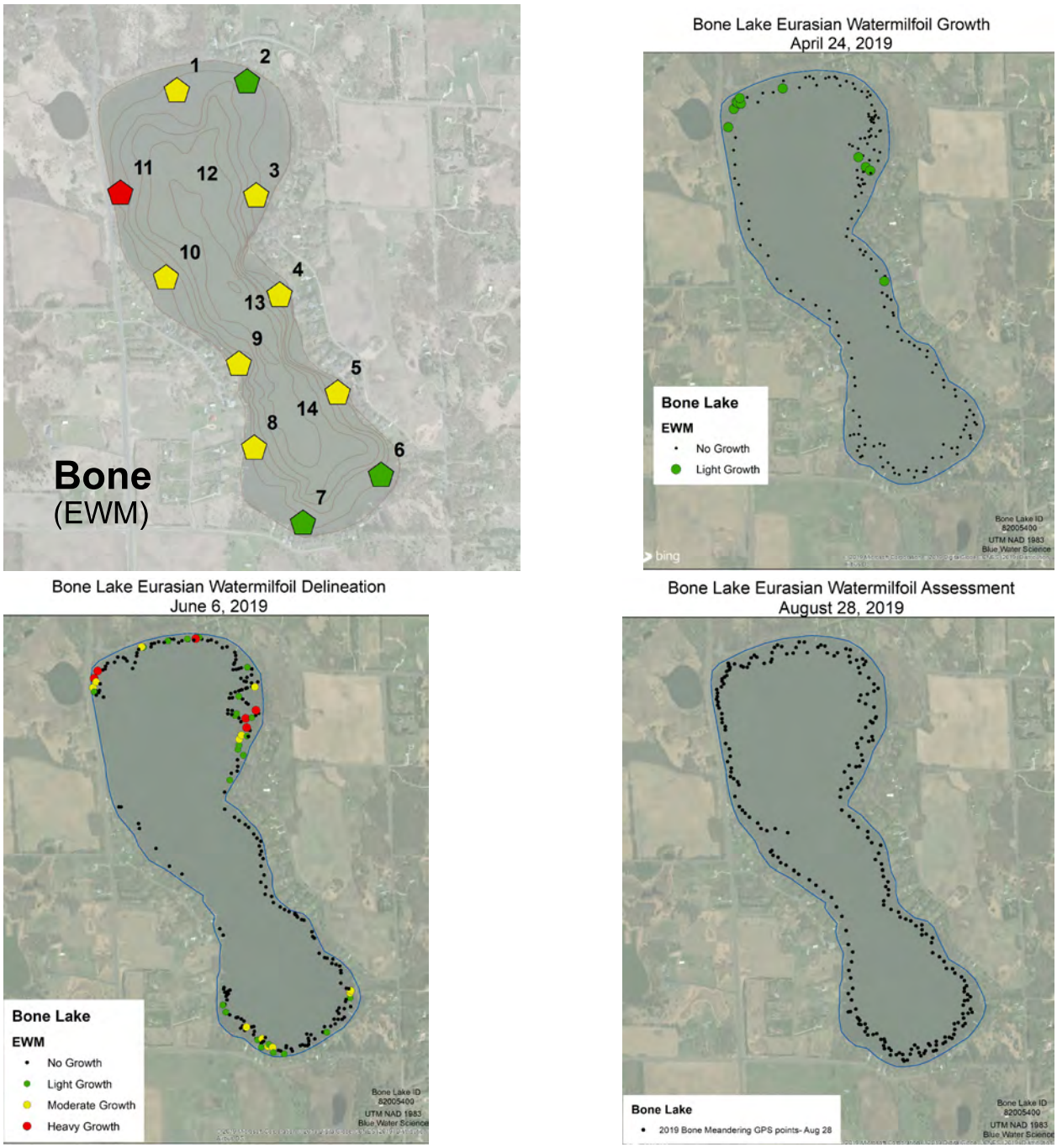


Figure 9. [top-left] EWM potential growth based on lake sediment analyses for Bone Lake. [top-right] EWM on April 24, 2019. [bottom-left] EWM on June 6, 2019. [bottom-right] EWM on August 28, 2019. Key: green = light growth, yellow = moderate growth, and red = heavy growth.