Water Lilies in Comfort Lake on June 24, 2021

Curlyleaf Pondweed and Eurasian Watermilfoil Delineation and Assessment Surveys for Comfort Lake, Chisago County, 2021

	Delineation	Treatment	Assessment
CLP	April 16, 2021	No treatment	June 24, 2021
EWM	April 16, 2021	May 28: 6.9 acres treatment (endothall)	June 24, 2021
EWM	August 20, 2021	Sept 15: 8.05 acres treatment (ProcelloCOR)	October 18, 2021

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Curlyleaf Pondweed and Eurasian Watermilfoil Delineation and Assessment Surveys For Comfort Lake, Chisago County, 2021

Summary

Curlyleaf Pondweed Delineation and Assessment Surveys: Curlyleaf pondweed delineation for distribution and abundance was conducted on April 16, 2021. A follow-up curlyleaf assessment was conducted on June 24, 2021.

In the delineation survey, curlyleaf was found in Comfort Lake at 6 sites (Figure S1) and a few native plants were sampled as well.

Curlyleaf pondweed was not treated in 2021.

About a month later, in the June curlyleaf assessment, curlyleaf was found at 3 sites and growth was light (Figure S1). Curlyleaf was scarce in Comfort Lake in 2021.

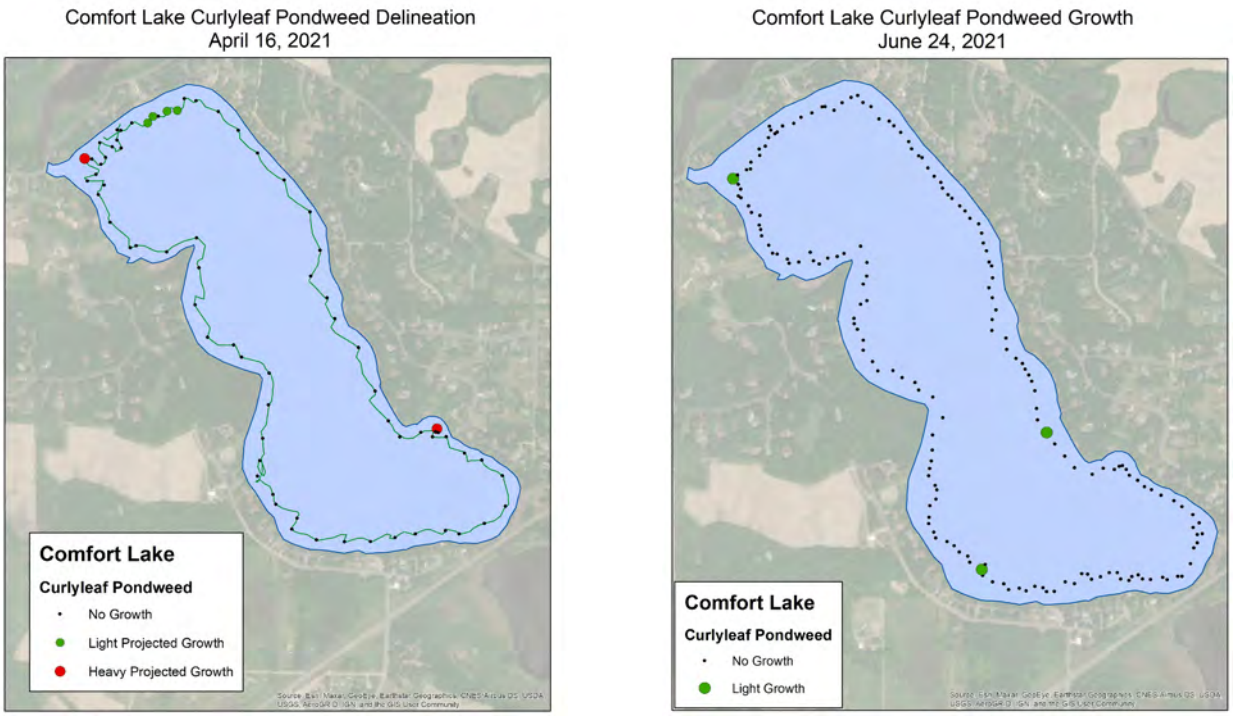


Figure S1. [left] DELINEATION: Map of curlyleaf pondweed distribution from the April 16, 2021 survey. Key: black dots = sample locations, green dot = light growth potential, and red dot = heavy growth potential. TREATMENT: No curlyleaf pondweed treatment occurred in 2021. [right] ASSESSMENT: Map of curlyleaf pondweed assessment sites for June 24, 2021. Key: black dots = no curlyleaf growth and green circles = light growth.

Eurasian Watermilfoil Delineation, Treatment, and Assessment Surveys: Eurasian watermilfoil (EWM) was first observed in Comfort Lake in 2014. An EWM delineation for distribution and abundance was conducted on April 16, 2021 and a mix of dead or dormant EWM combined with new growth of EWM was observed. A milfoil treatment using endothall on 6.9 acres sponsored by the Comfort Lake Association occurred on May 28. A followup survey conducted about a month later on June 24, 2021 found EWM at 50 sites. Another EWM delineation that occurred on August 20, 2021 found EWM was growing at light to heavy densities around much of Comfort Lake (Figure S2). A total of 8.05 acres were treated with ProcelloCOR (also sponsored by the Comfort Lake Association) on September 15, 2021. An assessment survey on October 10, 2021 found good control in the treatment areas (Figure S2).

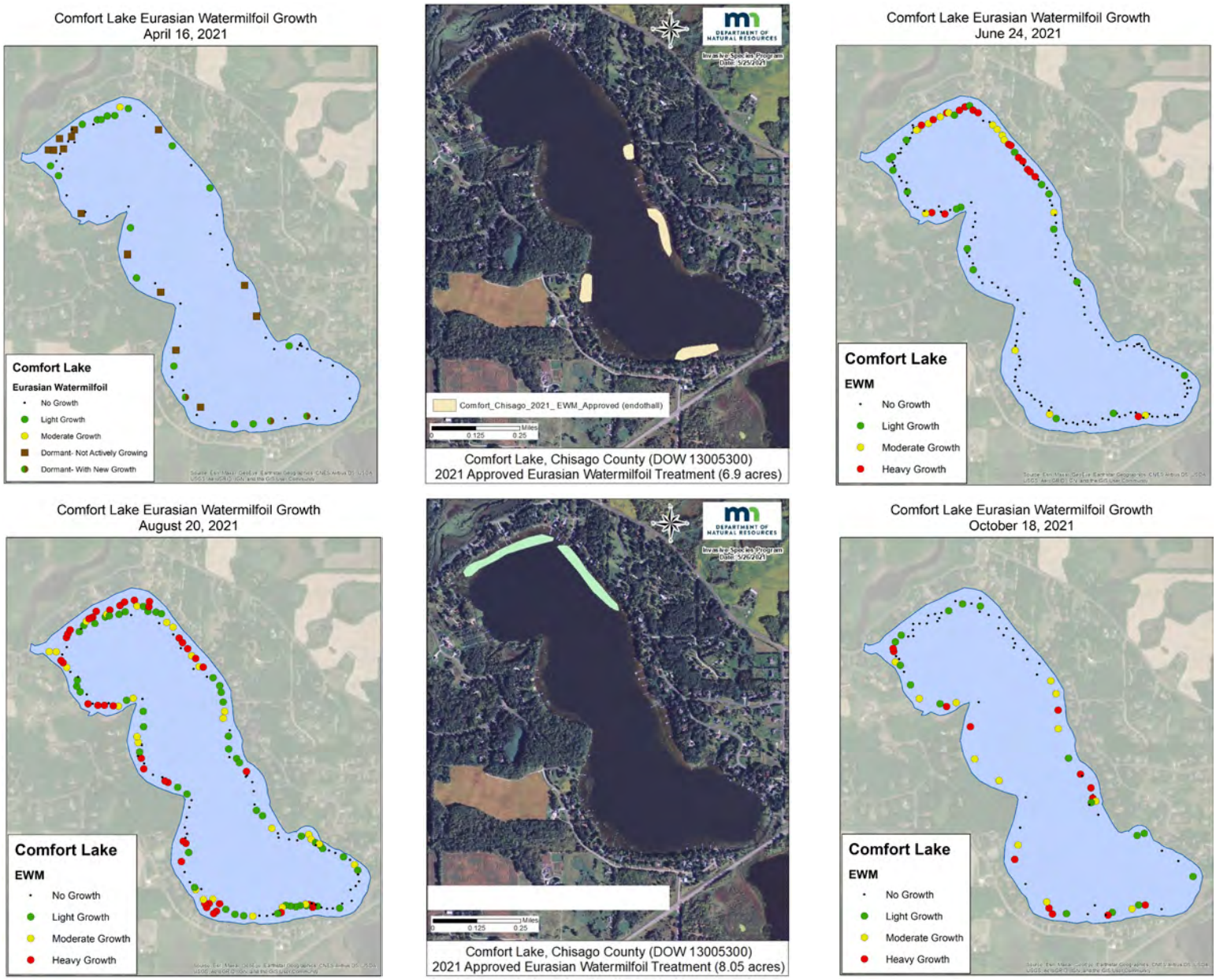


Figure S2. [top-left] DELINEATION: Map of EWM distribution from the April 16, 2021 survey.
[top-center] TREATMENT: May 28, 2021, 6.9 acre treatment with endothall.
[top-right] DELINEATION: Map of EWM distribution from the June 24, 2021 survey.
[bottom-left] ASSESSMENT: Map of EWM sites for August 20, 2021.
]bottom-center] TREATMENT: September 15, 2021, 8.08 acre treatment with ProcelloCOR.
[bottom-right] ASSESSMENT: Map of EWM sites for October 18, 2021.

Curlyleaf Pondweed and Eurasian Watermilfoil Treatments from 2014 Through 2021: A summary of CLP and EWM treatments from 2014-2021 is shown in Figure S3. Curlyleaf was only treated at 1 acre in 2015. Curlyleaf has been sparse in Comfort Lake. EWM was first observed in 2014 and it has spread around the lake in the last few years. A total of 7.5 acres was treated in 2016 and 3.2 acres were treated in 2017. Spot herbicide treatments were conducted in 2018, 2019, and 2020 in nearshore areas by the Comfort Lake Association.

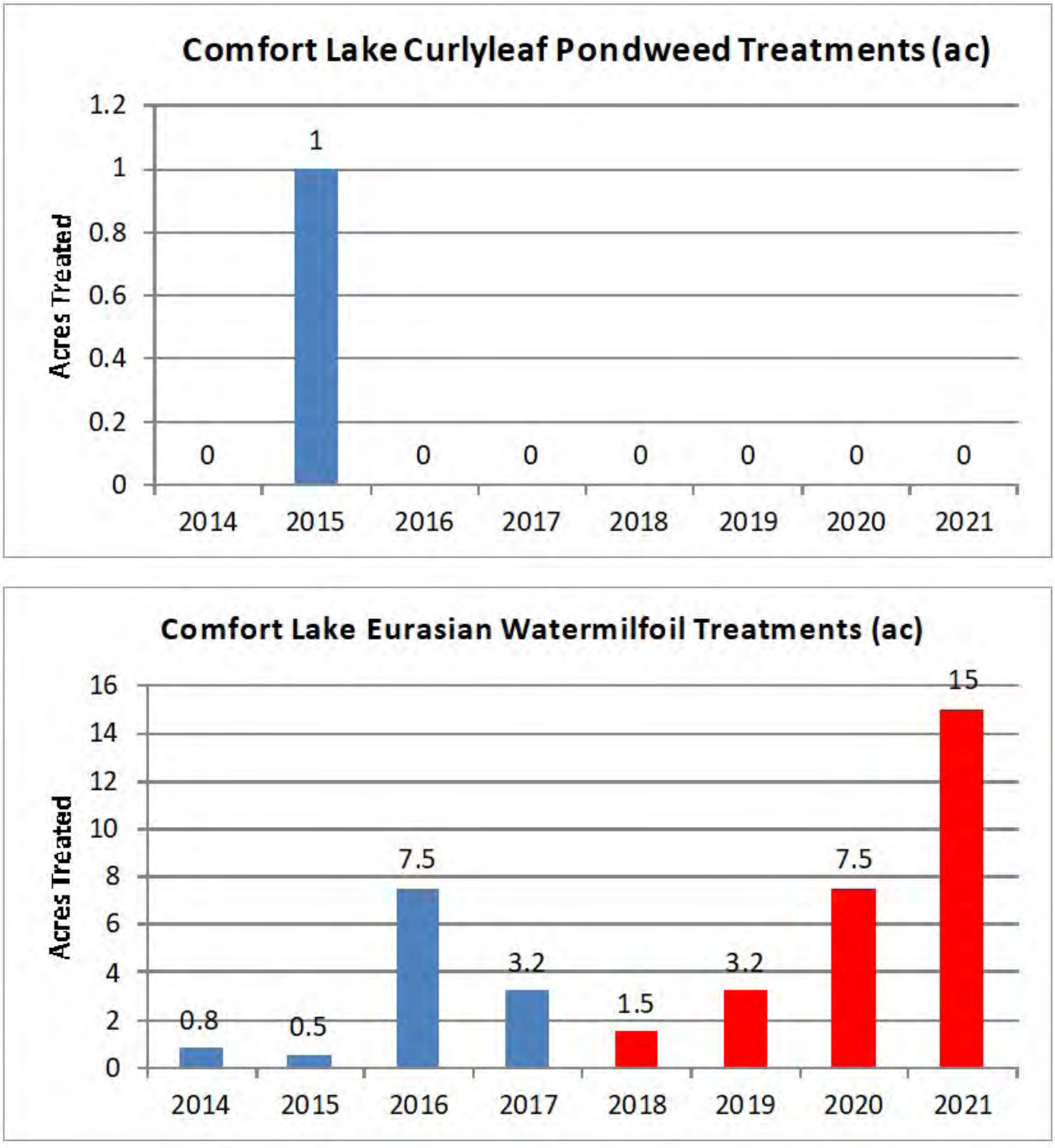


Figure S3. CLFLWD Sponsored Treatments with blue bars and Comfort Lake Association sponsored treatments with red bars: [top] Curlyleaf pondweed treated in 2014-2021. [bottom] Eurasian watermilfoil treated in 2014-2021 (2018 is estimated based on individual permits and 2019, 2020, and 2021 treatments were by the Comfort Lake Association).

Milfoil Hotspots and Growth Potential in Comfort Lake: Areas of moderate and heavy growth of EWM for 2015 through 2021 are shown on the hotspot map in Figure S4. In the last couple of years EWM has nearly ringed the lake with growth (Figure S4). However lake sediment nitrogen concentrations collected in 2014 found mostly low nitrogen, except for 1 location near the Comfort Lake inlet (Figure S4). High nitrogen is correlated with heavy milfoil growth. EWM is still in a heavy growth mode that is typical of new invasive species. EWM growth will likely be reduced in the future but is difficult to pin down a year.

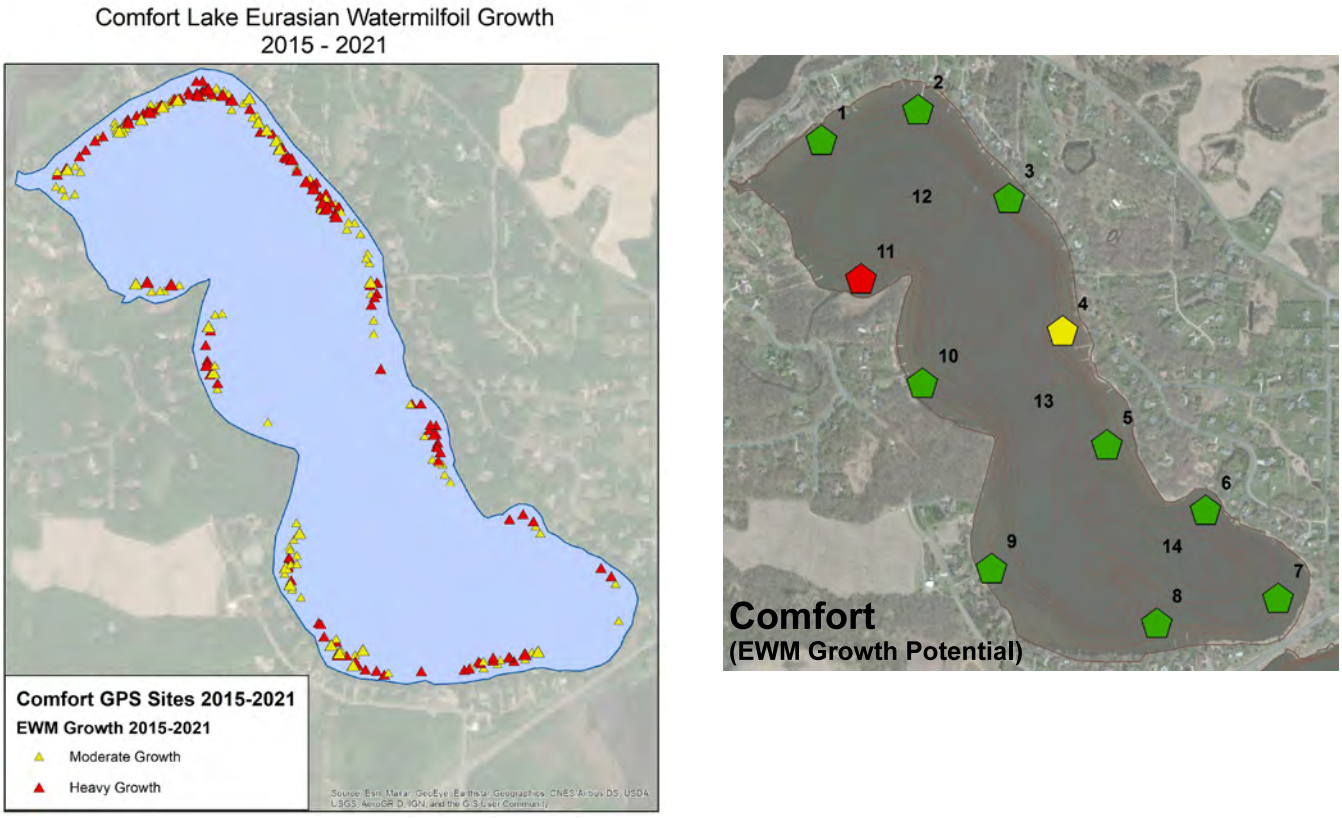


Figure S4. [left] EWM growth distribution and density for 2015-2021.
[right] EWM potential growth based on lake sediment analyses for Comfort Lake.
Key: green = light growth, yellow = moderate growth, and red = heavy growth.

Curlyleaf Pondweed and Eurasian Watermilfoil Delineation and Assessment Surveys for Comfort Lake, Chisago County, 2021

Introduction and Methods

Comfort Lake has an area of 218 acres with a littoral area of 90 acres (MnDNR). The maximum depth of Comfort Lake is 37 feet. The objectives of the curlyleaf surveys were to delineate the acreage of curlyleaf pondweed to treat and then treat is necessary and then after treatment, assess the effectiveness of the treatment. The objectives of the Eurasian watermilfoil (EWM) surveys were to delineate the acreage of EWM to treat and then treat is necessary and then after treatment, assess the effectiveness of the treatment.

Curlyleaf Pondweed Delineation and Assessment Methods: An initial curlyleaf pondweed delineation was conducted on April 16, 2021. The entire perimeter of the lake was checked for curlyleaf pondweed. A total of 72 sites were sampled for aquatic plants. A follow-up curlyleaf pondweed assessment was conducted on June 24, 2021 to characterize the status of curlyleaf pondweed at it's peak growing period. The same methodology that was used for the delineation was used for the assessment. A total of 178 sites were sampled for aquatic plants.

Eurasian Watermilfoil Delineation and Assessment Methods: An initial EWM was conducted on April 16, 2021. The entire perimeter of the lake was checked for EWM. A total of 72 sites were sampled for aquatic plants. Another delineation was conducted on June 24, 2021 and 178 sites were sampled. A follow-up EWM assessment was conducted on August 20, 2021 to characterize the status of EWM. The same methodology that was used for the delineation was used for the assessment. A total of 178 sites were sampled for aquatic plants. Another assessment was conducted on October 18, 2021 and EWM was found at 41 sites out of 85 sites sampled.

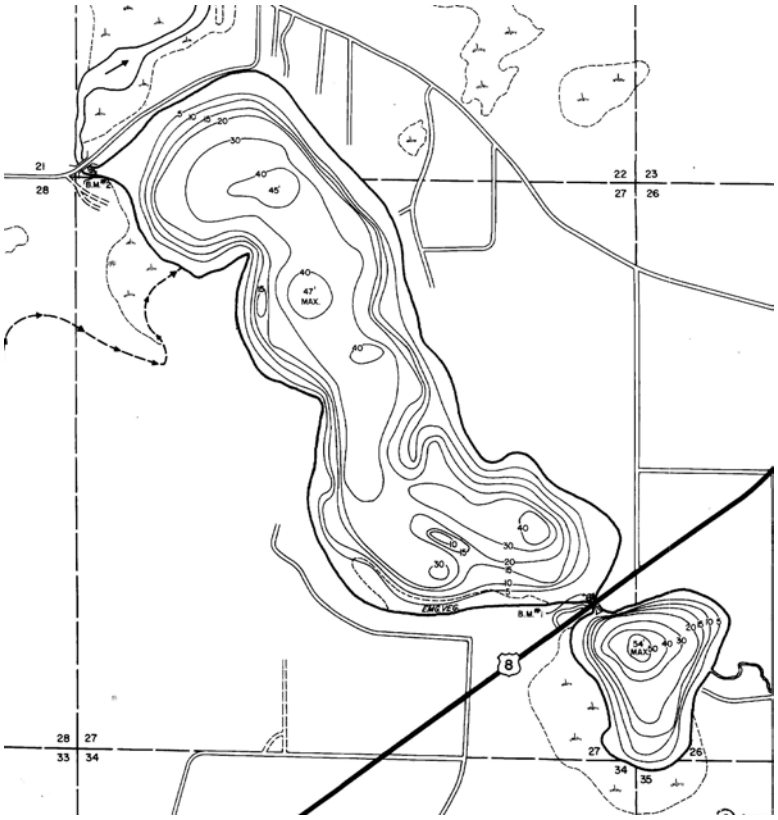


Figure 1. Contour map of Comfort Lake (source: MnDNR).

Curlyleaf Pondweed Results

April 16, 2021 Delineation and June 24, 2021 Assessment

A curlyleaf delineation was conducted using rake sampling on April 16, 2021 and 72 sites were examined. At this time of the year curlyleaf was found at 6 sites in Comfort Lake (Table 1 and Figure 2).

A total of 178 sites were assessed with rake sampling on June 24, 2021. Curlyleaf was found at 1 sample site out of the 178 that were monitored (Table 2). Curlyleaf growth was light (Figure 2 and Table 2).

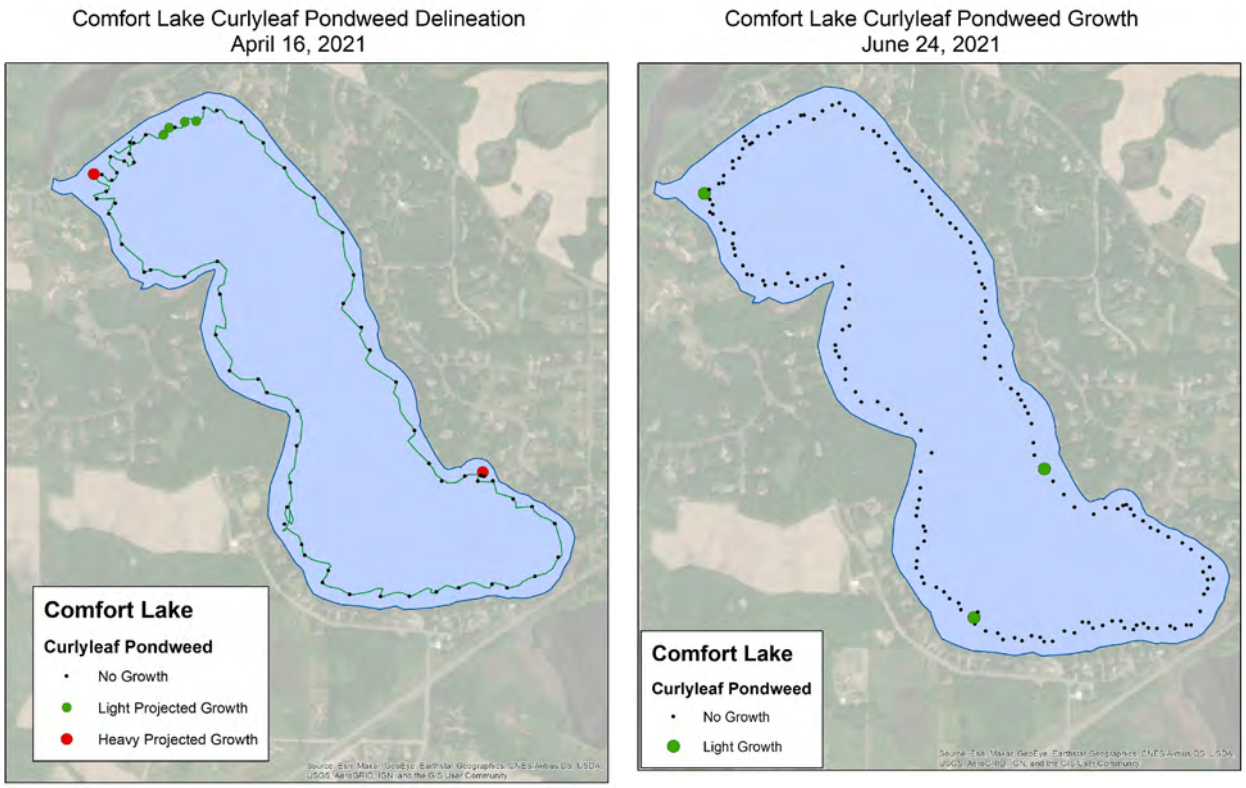


Figure 2. Map of curlyleaf delineation on April 16, 2021 (left) and curlyleaf assessment on June 24, 2021 (right). Key: black dot = no growth, green circles = light growth, and red dots = heavy growth.

Table 1. Comfort Lake aquatic plant occurrences and densities for A pril 16, 2021.

	CLP Stems	EWM	Coontail	No plants
Average density	4	1	1	
Occurrence (72 sites)	6	12	12	31

Table 2. Comfort Lake aquatic plant occurrences and densities for June 24, 2021.

	Spatterdock	White lilies	CLP	EWM
Average density	2	1	1	2
Occurrence (178 sites)	79	8	3	50

Eurasian Watermilfoil Results

April 16, 2021 Delineation and June 24, 2021 Assessment

An EWM survey was conducted using rake sampling on April 16, 2021 and 72 sites were examined. EWM was found at 34 sites in Comfort Lake (Table 1 and Figure 3). Some EWM plants were found to be in a brown dormant state with some green plant material.

An EWM treatment occurred on May 28 and 6.9 acres were treated with an endothall herbicide based on areas of heavy growth that were delineated in 2020.

On June 24, 2021, an EWM assessment survey found EWM at 50 sample sites out of the 178 sites (Table 2). There was minor growth in the treatment areas. EWM growth was light to heavy in other areas of the lake (Figure 3).

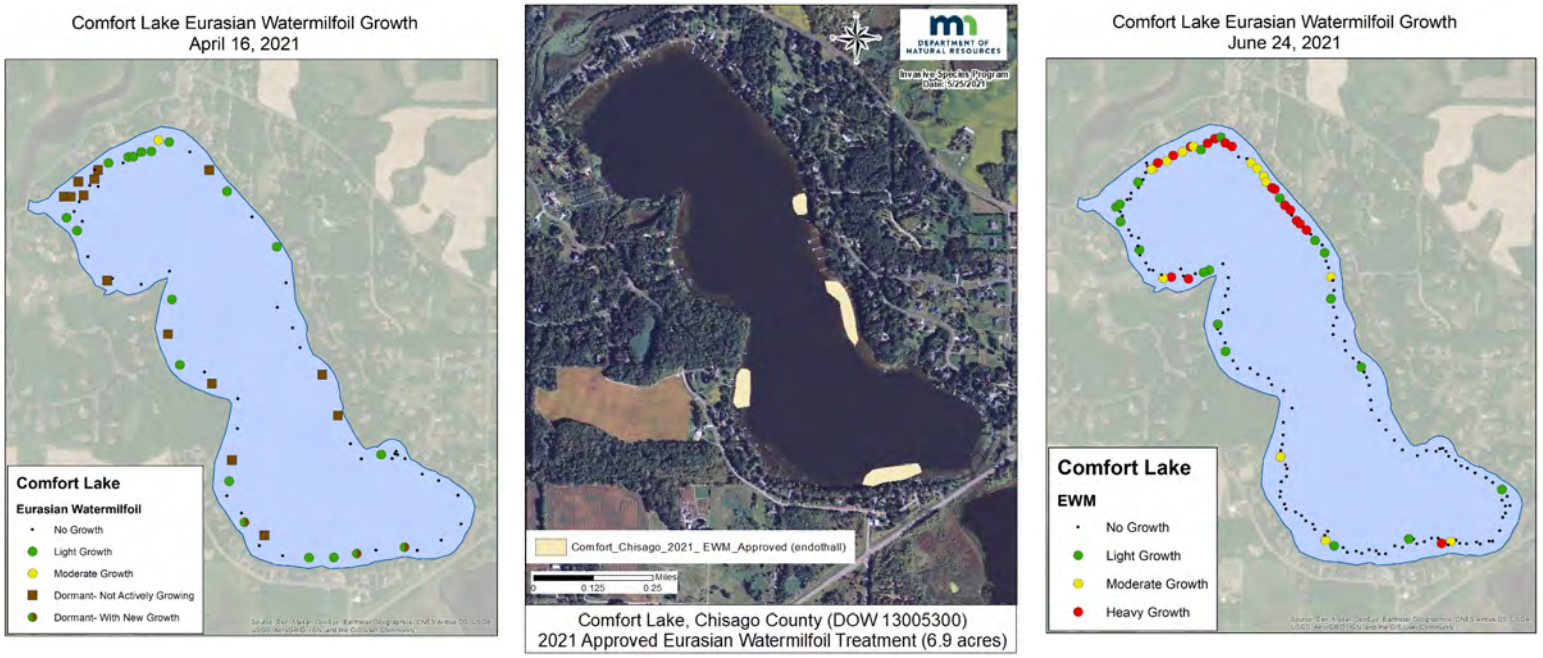


Figure 3. [left] DELINEATION: EWM delineation on April 16, 2021.
[center] TREATMENT: May 28, 2021 with endothall.
[right] ASSESSMENT: EWM assessment on June 24, 2021.
Key: black dot = no growth, green circles = light growth, yellow = moderate growth, red dots = heavy growth, brown square = dormant growth, and brown/green dot = dormant with new growth.

Eurasian Watermilfoil Results

August 20, 2021 Delineation and October 18, 2021 Assessment

A second EWM delineation was conducted on August 20, 2021. EWM growth had expanded and EWM growth was found at 118 samples sites out of 178 sites sampled (Figure 4). A milfoil treatment with ProcelloCOR on September 15, 2021 treated 8.05 acres. An EWM assessment was conducted on October 18, 2021. Control was good in the treated areas with scattered EWM found in other nearshore areas usually in water 6 feet deep or shallower (Figure 4).

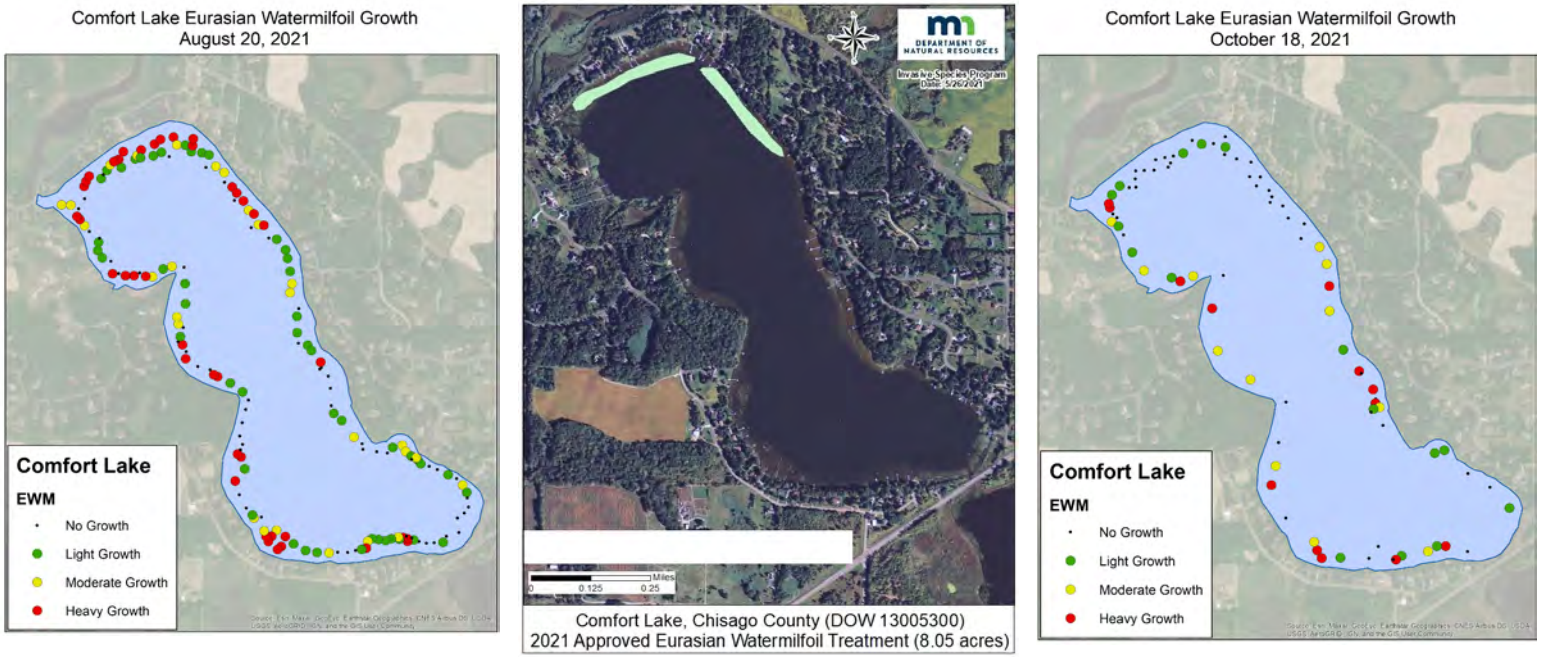


Figure 4. [left] DELINEATION: EWM delineation on August 20, 2021.
[center] TREATMENT: September 15, 2021 with ProcelloCOR on 8.05 acres.
[right] ASSESSMENT: EWM assessment on October 18, 2021.
Key: black dot = no growth, green circles = light growth, yellow = moderate growth, and red dots = heavy growth.

Table 3. Comfort Lake aquatic plant occurrences and densities for August 20, 2021.

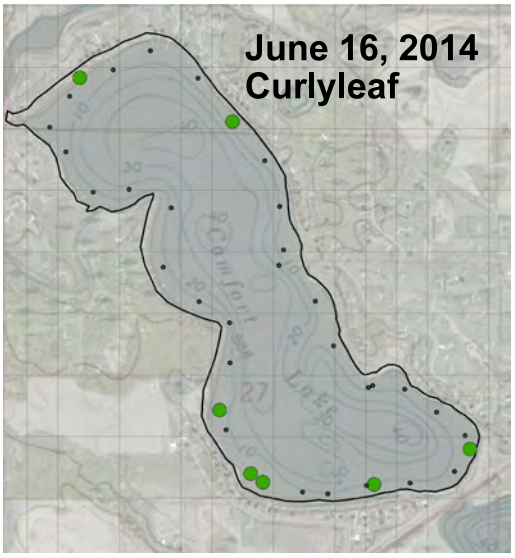
	Bulrush	Spatter-dock	White lilies	Cab-bage	Coontail	CLP	Elodea	EWM	Flat-stem	Illinois	Naiad	Sago	Stringy	No plants
Average density	1	1	1	1	2	1	1	2	1	2	1	2	1	
Occurrence (178 sites)	4	71	8	8	22	20	2	118	3	12	2	2	7	28

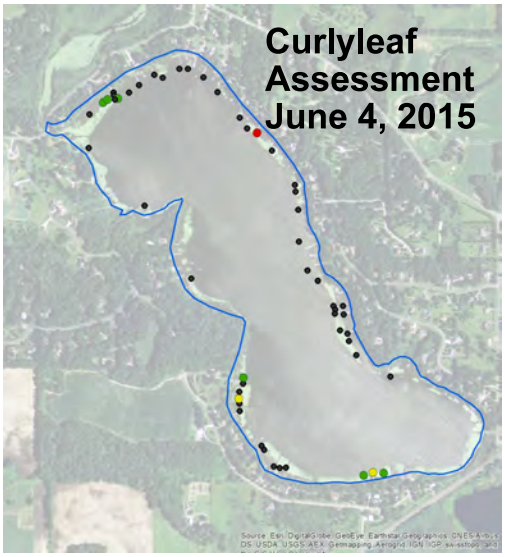
Table 4. Comfort Lake aquatic plant occurrences and densities for October 18, 2021.

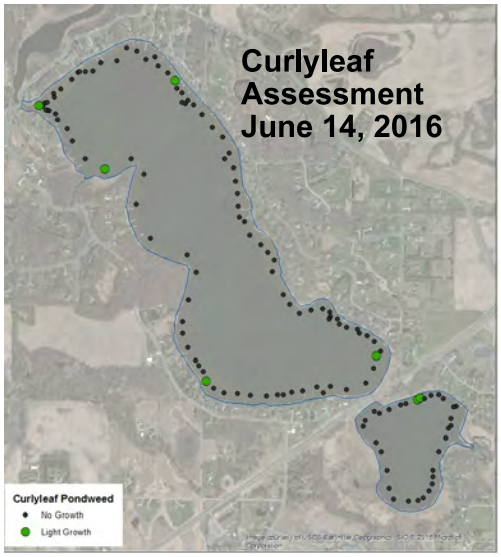
	White lilies	Cabbage	Coontail	CLP	EWM
Average density	1	1	1	1	2
Occurrence (85 sites)	11	3	15	2	41

APPENDIX - CLP and EWM Delineation or Assessments

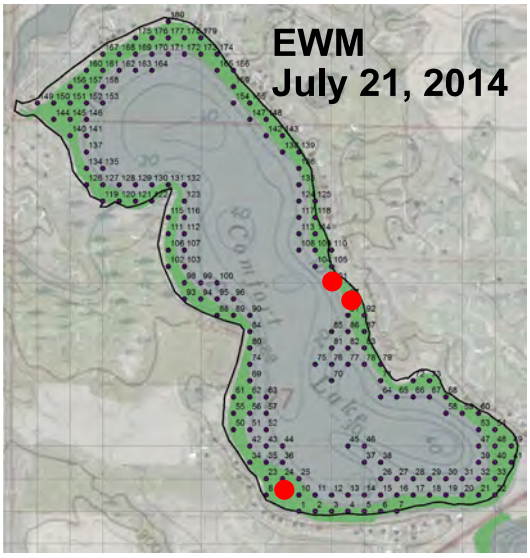
Curlyleaf Pondweed 2014-2021

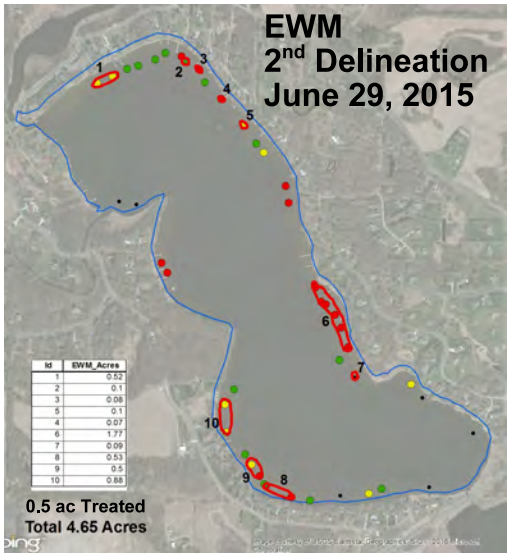


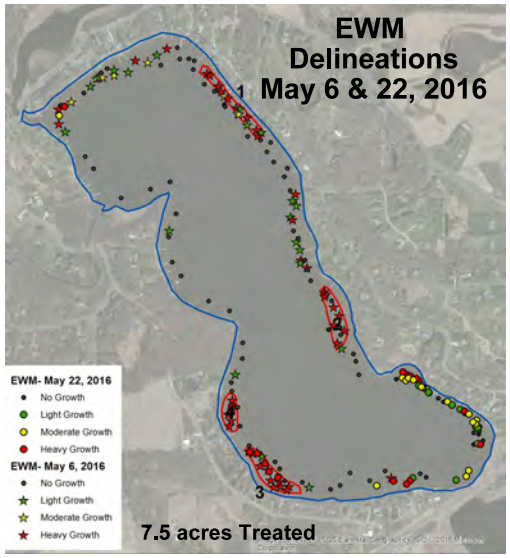




Eurasian Watermilfoil 2014-2021

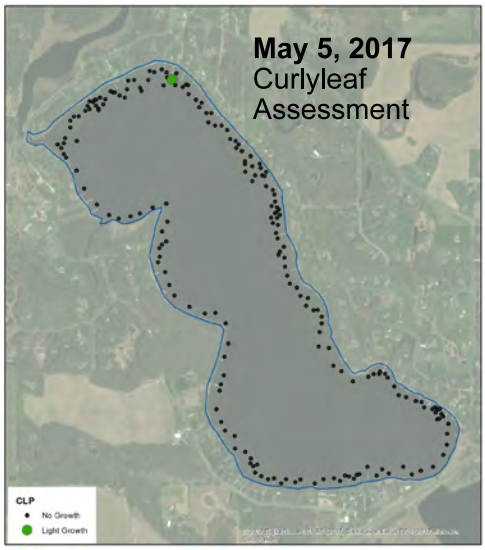


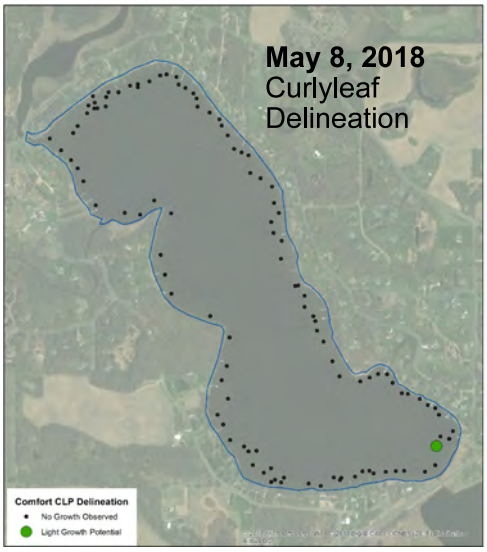


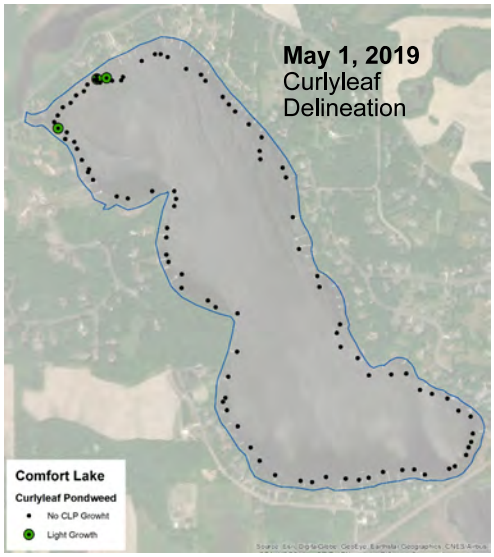


Curlyleaf pondweed and Eurasian watermilfoil maps for 2014 through 2021

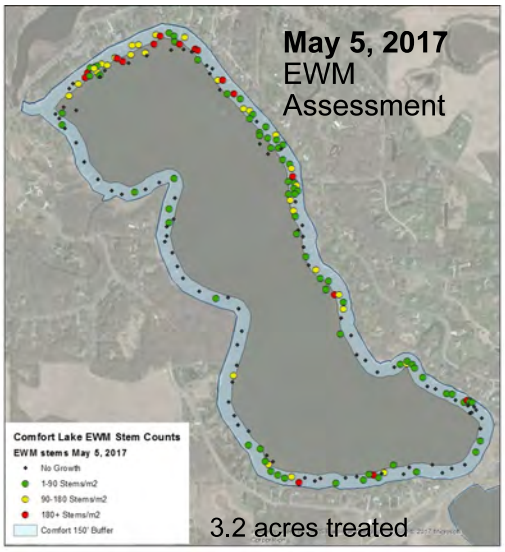
Curlyleaf Pondweed 2014-2021

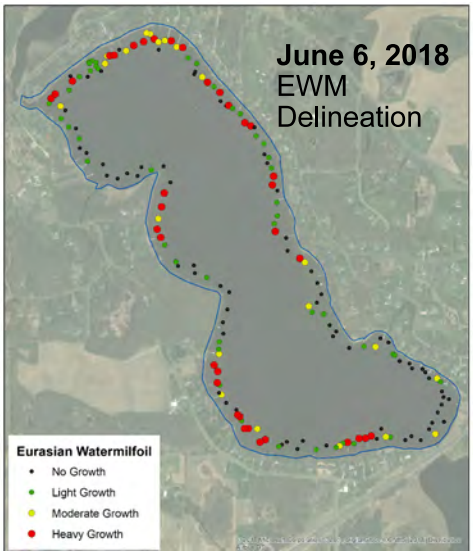


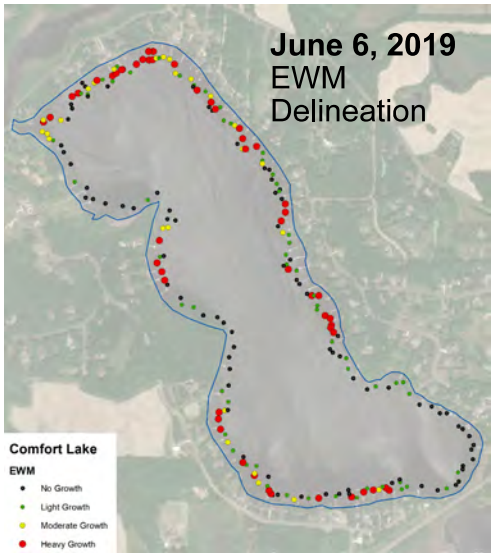




Eurasian Watermilfoil 2014-2021

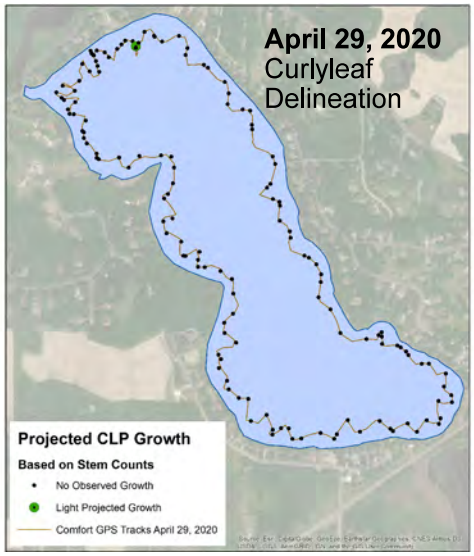


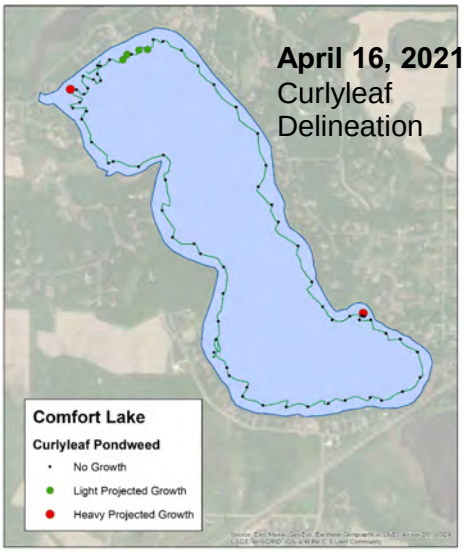




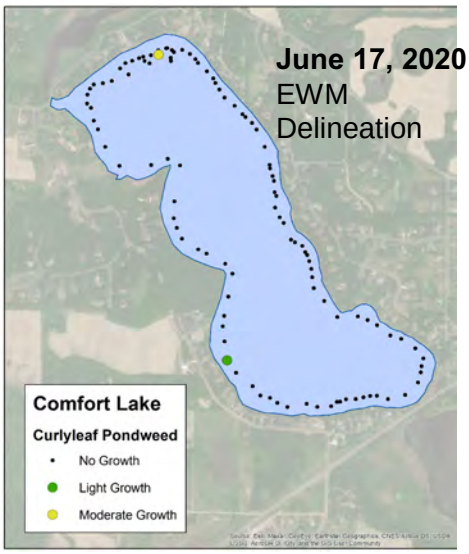
Curlyleaf pondweed and Eurasian watermilfoil maps for 2014 through 2021.

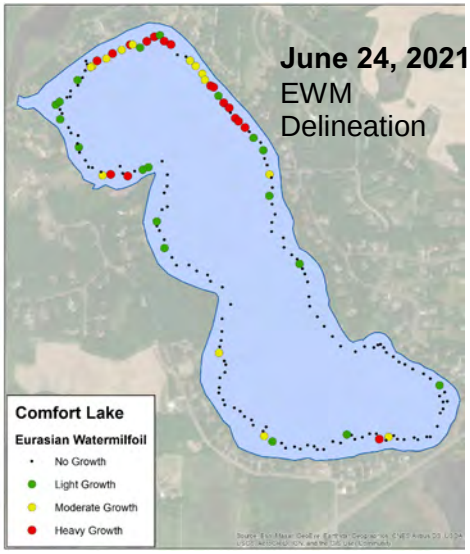
Curlyleaf Pondweed 2014-2021





Eurasian Watermilfoil 2014-2021





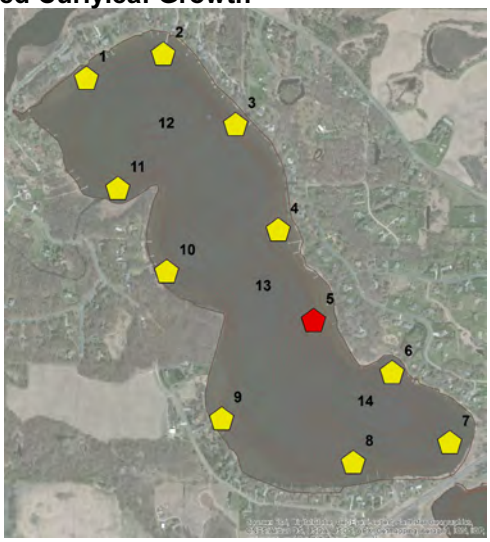
Curlyleaf pondweed and Eurasian watermilfoil maps for 2014 through 2021.

Potential for Curlyleaf Pondweed and Eurasian Watermilfoil Growth Based on Lake Sediment Characteristics

Lake sediment sampling has been used to predict lake bottom areas that have the potential to support heavy curlyleaf pondweed plant growth. Based on the key sediment parameters of pH, sediment bulk density, organic matter, and the Fe:Mn ratio (McComas, unpublished), the predicted growth characteristics of curlyleaf pondweed in Comfort Lake are shown below.

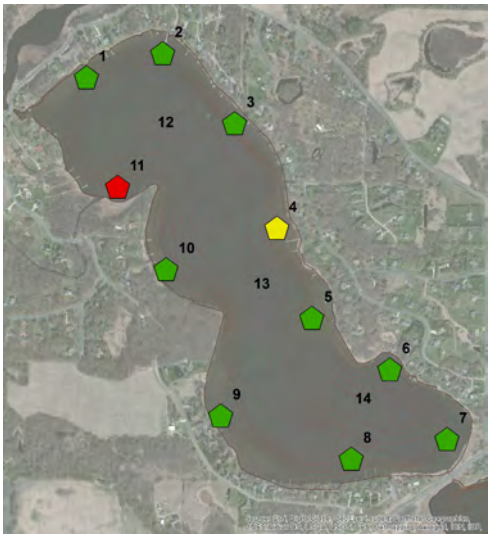
Lake sediment sampling also has been used to predict lake areas that have the potential to support various types of EWM growth. Based on the key sediment parameters of NH_4 and organic matter (McComas, unpublished), a map was prepared that predict the type of growth that could be expected in the future in Comfort Lake.

Predicted Curlyleaf Growth

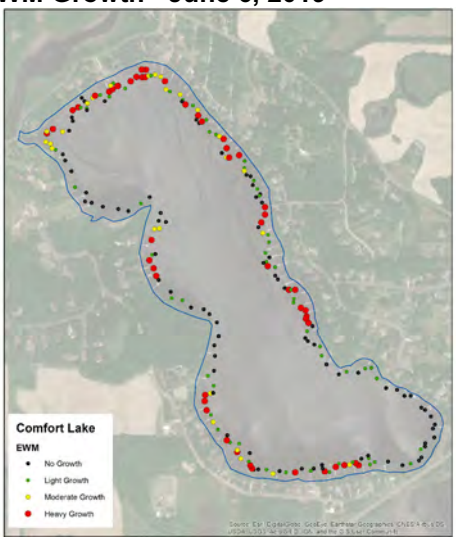


Actual CLP Growth - June 6, 2019

Predicted Eurasian watermilfoil Growth



Actual EWM Growth - June 6, 2019



[top] Curlyleaf pondweed predicted (left) and actual (right) growth maps.
[bottom] Eurasian watermilfoil predicted (left) and actual (right) growth maps.