MEMORANDUM
Comfort Lake-Forest Lake Watershed District

Date: December 8th, 2025
To: CLFLWD Board of Managers
From: Mike Kinney, District Administrator
Subject: Blue Water Science Survey Summaries

District Wide

Background/Discussion:
Blue Water Science was contracted to complete surveys on several District lakes. These included Moody Lake pre- and post-curly-leaf pondweed (CLP) treatment point-intercept macrophyte surveys; Bone Lake CLP and Eurasian watermilfoil (EWM) delineation and assessment surveys; a Shield Lake CLP delineation and assessment survey; Forest Lake flowering rush, EWM, and CLP delineations and assessment surveys; Comfort CLP and EWM delineations and assessment surveys; and a Lake Keewahtin Point Intercept Macrophyte Survey.

Attached is a document containing a summary report for each of these surveys. More detailed reports will be provided in January 2026.

Attached:
2025 Blue Water Science Survey Summaries

Curlyleaf Pondweed in Forest Lake, April 23, 2025

Curlyleaf Pondweed and Eurasian/Hybrid Watermilfoil Delineation, Treatment, and Assessment for Forest Lake, Washington County, 2025

	Delineation	Treatment	Assessment
CLP	April 23, 2025	2025 (167.44 acres)	June 20, 2025
EWM	June 20, 2025	2025 (47.37 acres)	September 15, and October 24, 2025

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

December 8, 2025

Prepared by:
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Curlyleaf Pondweed and Eurasian Watermilfoil Delineation, Treatment, and Assessment for Forest Lake, Washington County, 2025

Summary

Curlyleaf Pondweed (CLP) Delineation, Treatment, and Assessment: Forest Lake (MnDNR ID#82-015900) is a 2,271 acre lake in Washington County, Minnesota. On April 23, 2025 a curlyleaf pondweed delineation survey sampled 674 sites (Figure 1). Curlyleaf pondweed was growing most frequently in 5-12 feet of water and was found at 344 out of 674 sample sites. Eleven areas of projected heavy growth totaling about 167.44 acres were delineated for treatment. Eurasian watermilfoil was found at 23 sites on this April 23, 2025 survey as well.

A total of 167.44 acres of curlyleaf areas were treated in May 2025.

A post treatment curlyleaf assessment was conducted on June 20, 2025. The curlyleaf pondweed assessment survey sampled 384 sites (Figure 1). Curlyleaf pondweed was growing most frequently in 5-13 feet of water and was found at 90 out of 384 sample sites. The June curlyleaf assessment found excellent control in the treated areas however new curlyleaf pondweed sprouting was observed in 3rd lake due to sprouting after the April 23, 2025 delineation (Figure 1).

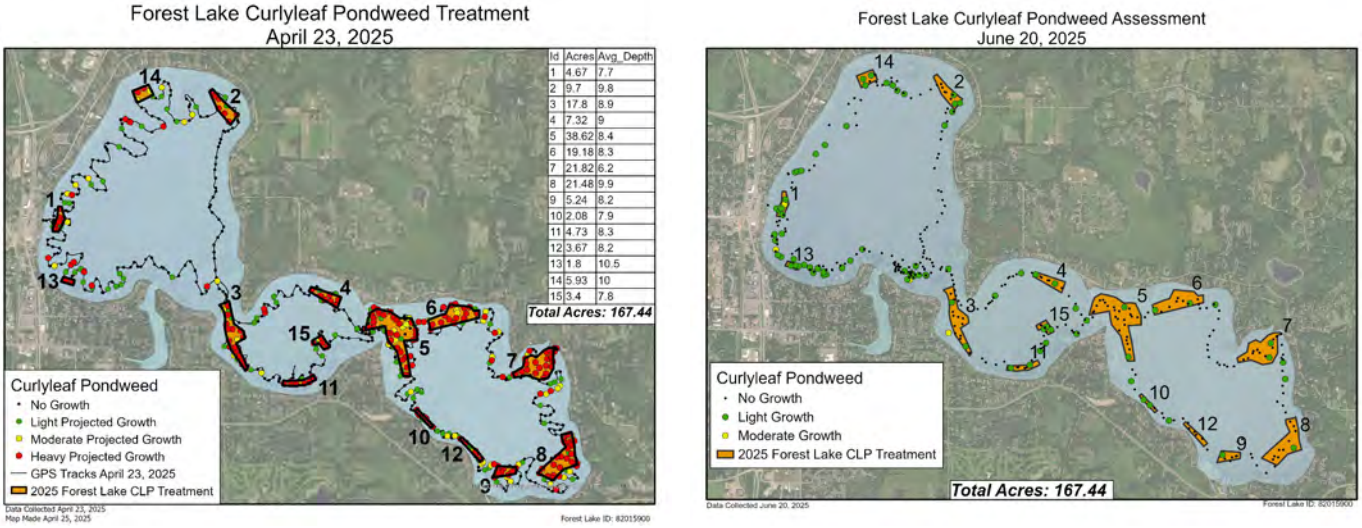

Figure 1. [left] DELINEATION: Map of curlyleaf pondweed distribution from the April 23, 2025 survey. Approximately 167.44 acres were delineated for CLP treatment.
[right] ASSESSMENT: Map of curlyleaf pondweed assessment sites for June 20, 2025.
Key: green dots = light growth, yellow dots = moderate growth, red dots = heavy growth, and black dots = no curlyleaf growth.

Eurasian Watermilfoil (EWM) Delineation, Treatment, and Assessment: EWM distribution and abundance were evaluated June 20, 2025. Somewhat surprisingly, the delineation found no milfoil growth in 2nd lake and a treatment area of 47.37 acres was outlined for the entire lake (Figure 2).

Treatment of 47.37 acres occurred in July 2025 using ProcellaCor/Diquat herbicides in 6 areas (1, 6, 7, 8, 9, 10) and 2,4-D in 4 areas (2, 3, 4, 5).

An assessment conducted on September 15, 2025, after the EWM treatment, found excellent control in the treated areas and a follow-up assessment was conducted on October 24, 2025 found very little EWM (Figure 3).

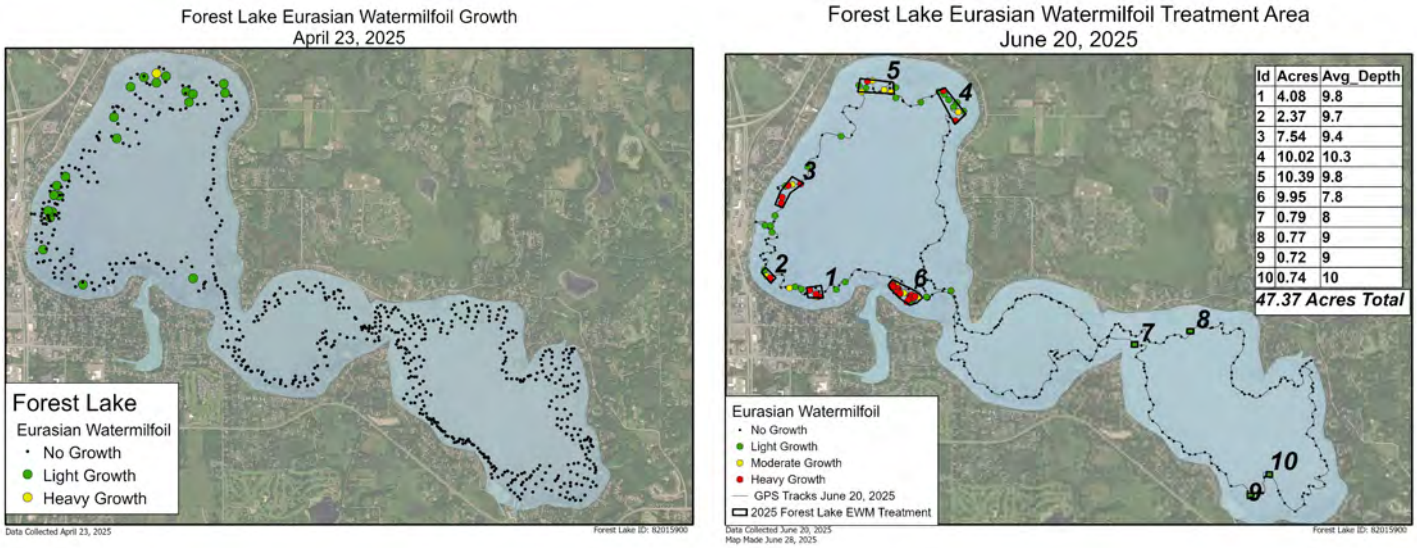

Figure 2. [left] DELINEATION: Map of EWM distribution from the April 23, 2025 survey. [right] DELINEATION: Map of EWM distribution from the June 20, 2025 survey. A proposed treatment area of 47.37 acres was based on the June 20, 2025 EWM delineation. TREATMENT: Occurred in July 2025.

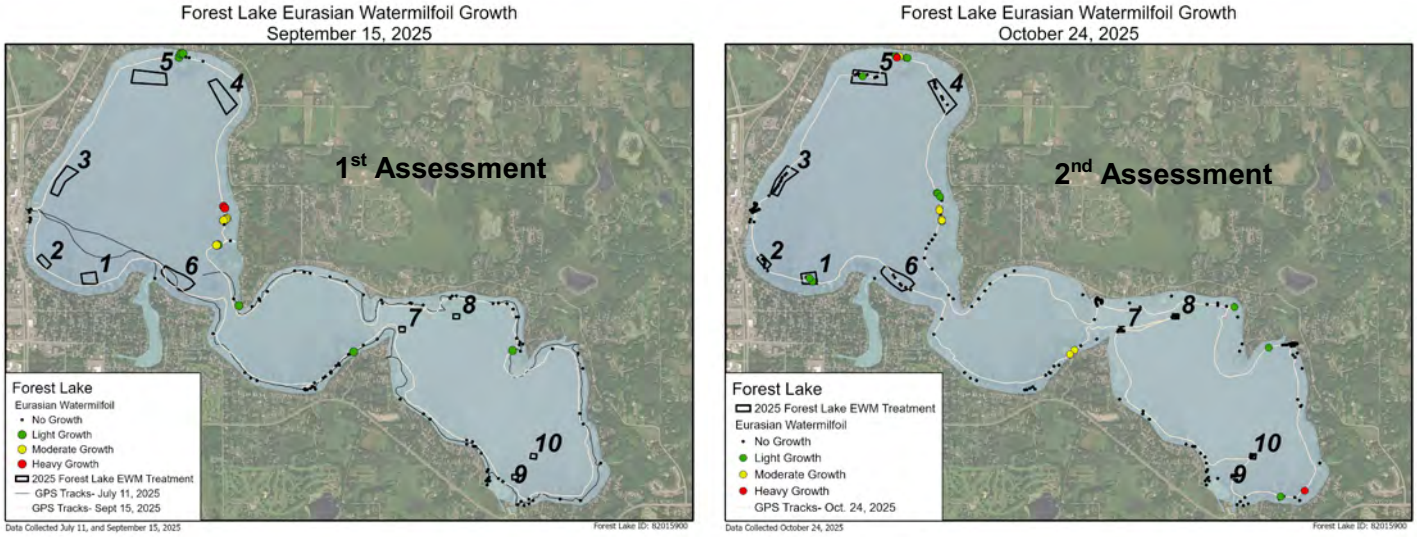

Figure 3. [left] ASSESSMENT: Map of EWM distribution in Forest Lake and in the treatment areas on September 15, 2025. [right] ASSESSMENT: Map of EWM distribution in Forest Lake and the treatment areas on October 24, 2025.

Summary of CLP and EWM Treatments from 2009-2025: Historically two non-native submerged aquatic plants have been treated with herbicides and curlyleaf pondweed and Eurasian watermilfoil were treated again in 2025 (Table 1 and Figure 4). Curlyleaf pondweed treatments have ranged from 16 to 168 acres from 2009 through 2025 with variability from year to year.

Eurasian watermilfoil was discovered in Forest Lake in 2015 and 30 acres were treated in the first year. From 2016 through 2025, EWM treatments have ranged from 5.86 acres to 53.83 acres (Table 1 and Figure 4). Eurasian watermilfoil has been confined mostly to the first lake but there is some growth in second and third lakes at the end of 2025. The greatest number of acres treated were in 2020 (Figure 4).

Table 1. Acres of non-native plants treated from 2009 through 2025.

	CLP (acres)	EWM (acres)
2009	98	
2010	155	
2011	168	
2012	155	
2013	60	
2014	101	
2015	88	30
2016	114	13.9
2017	169	33.35
2018	16.59	40.74
2019	99.11	49.34
2020	59.29	53.83
2021	120.33	5.86
2022	103.96	22.3
2023	61.55	8.41
2024	15.79	47.94
2025	167.44	47.37

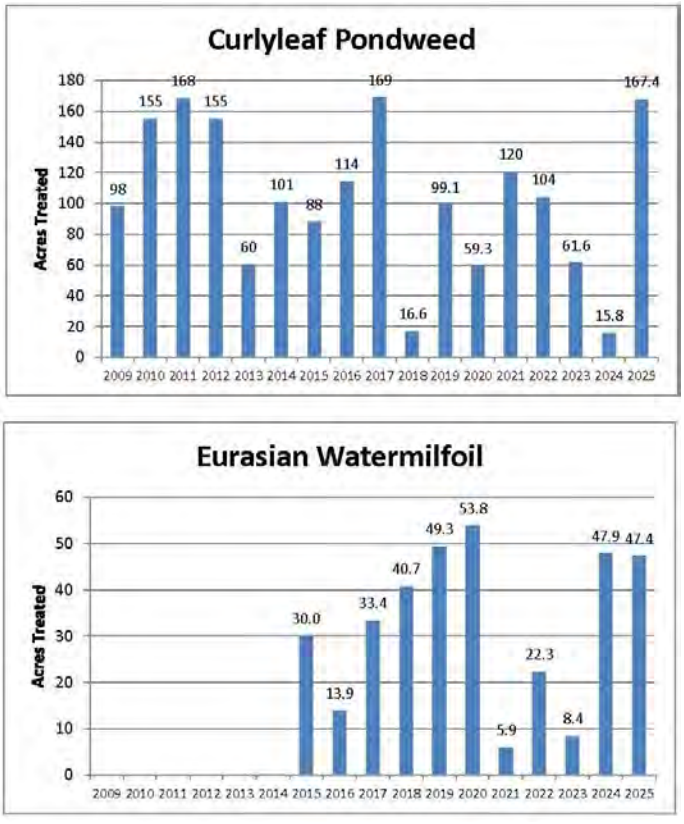

Figure 4. [top] Curlyleaf pondweed treated from 2009-2025.
[bottom] Eurasian watermilfoil treated from 2015-2025. Eurasian watermilfoil was first found in Forest Lake in 2015.

ADDITIONAL INFORMATION

Curlyleaf Pondweed and Eurasian Watermilfoil Delineation, Treatment, and Assessment for Forest Lake, Washington County, 2025

Size: 2,271 acres
Littoral area: 1,531 acres
Maximum depth: 37 feet

Overview

Forest Lake is located within Washington County. A meander survey in 2025 was used to characterize the status of curlyleaf pondweed. Curlyleaf pondweed was sampled at 344 sites out of 674 sites on the April 23, 2025 delineation survey. Eleven areas of projected heavy growth totaling about 167.44 acres were delineated for treatment and curlyleaf pondweed was treated in May 2025. A follow-up curlyleaf pondweed assessment was conducted on June 20, 2025 to characterize the status of CLP at its peak growing period. Curlyleaf pondweed was observed at 90 sites out of 384 sites sampled.

Eurasian watermilfoil distribution and abundance were delineated on June 20, 2025 and 47.37 acres were treated in July 2025. An EWM assessment for all treatment areas occurred on September 15 and October 24, 2025.

Figure 5. After treatment, curlyleaf pondweed growth was light to moderate on June 20, 2025.

Methods

Curlyleaf Pondweed: 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*).

Eurasian Watermilfoil: A Eurasian watermilfoil delineation was conducted by Blue Water Science on June 20 (384 sample sites). The delineation involved surveying the entire lake nearshore area, observing milfoil growth, and sampling aquatic plants with rakes. Areas to be treated were selected based on the growth status of milfoil in mid June, the known previous occurrence of EWM and the importance for navigation and/or recreation in the area.

A herbicide application was conducted in 2025 on 47.37 acres for EWM control. A follow-up EWM assessment was conducted by Steve McComas, Blue Water Science, on September 15 and on October 24, 2025 to evaluate the EWM growth. EWM density ratings used in the June delineation and the assessments are shown in the chart below.

Chart for Curlyleaf Projected Growth on the Early Delineations, April 24

Rake Sample	Early Season Density (stems/m^2)	Potential Future Growth	Map Color Code
1-2 stems	10-20 stems/m^2	Light	Green
3 stems	30 stems/m^2	Moderate	Yellow
4+ stems	40+ stems/m^2	Heavy	Red

Chart of Density Ratings for Mature Plant Growth

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.

Curlyleaf Pondweed Delineation on April 23, 2025

In the delineation survey, potential curlyleaf growth was found in a number of locations around the full lake with mostly light to moderate projected growth (Figure 6). The projected summer heavy growth was estimated at 167.44 acres and a total of 167.44 acres of curlyleaf areas were treated in May 2025 with the herbicide flumioxazin.

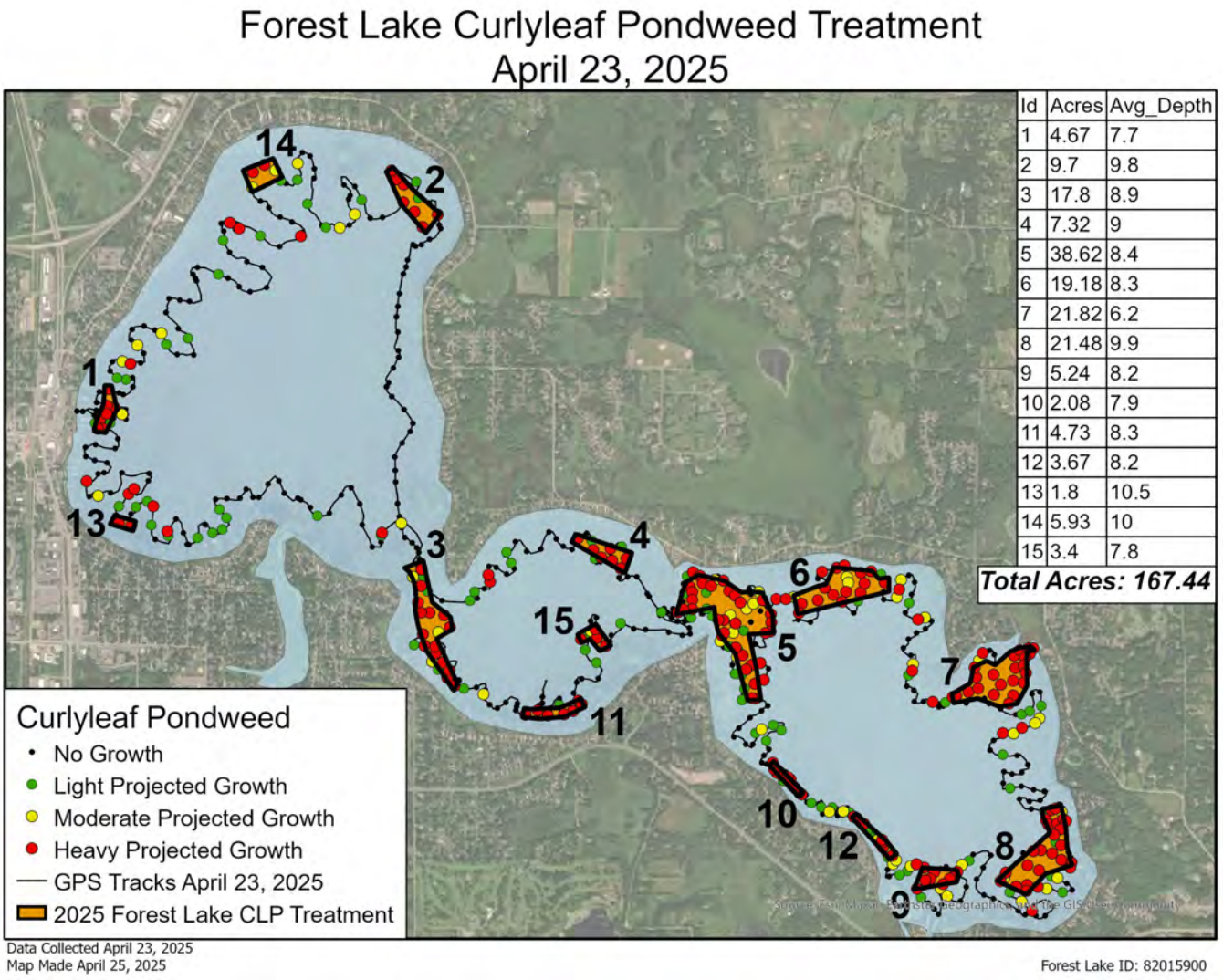

Figure 6. DELINEATION: Map of curlyleaf pondweed distribution from the April 23, 2025 survey. Approximately 167.44 acres were delineated for CLP treatment.

Curlyleaf Pondweed Assessment on June 20, 2025

A total of 167.44 acres of curlyleaf areas were treated in May 2025. A post treatment curlyleaf assessment was conducted on June 20, 2025. The June curlyleaf assessment found excellent control in the treated areas that used the flumioxazin herbicide although there was some new curlyleaf pondweed sprouting after the April 23, 2025 delineation in a number locations in each lake (Figure 7). Some of the regrowth may have occurred in the treatment areas.

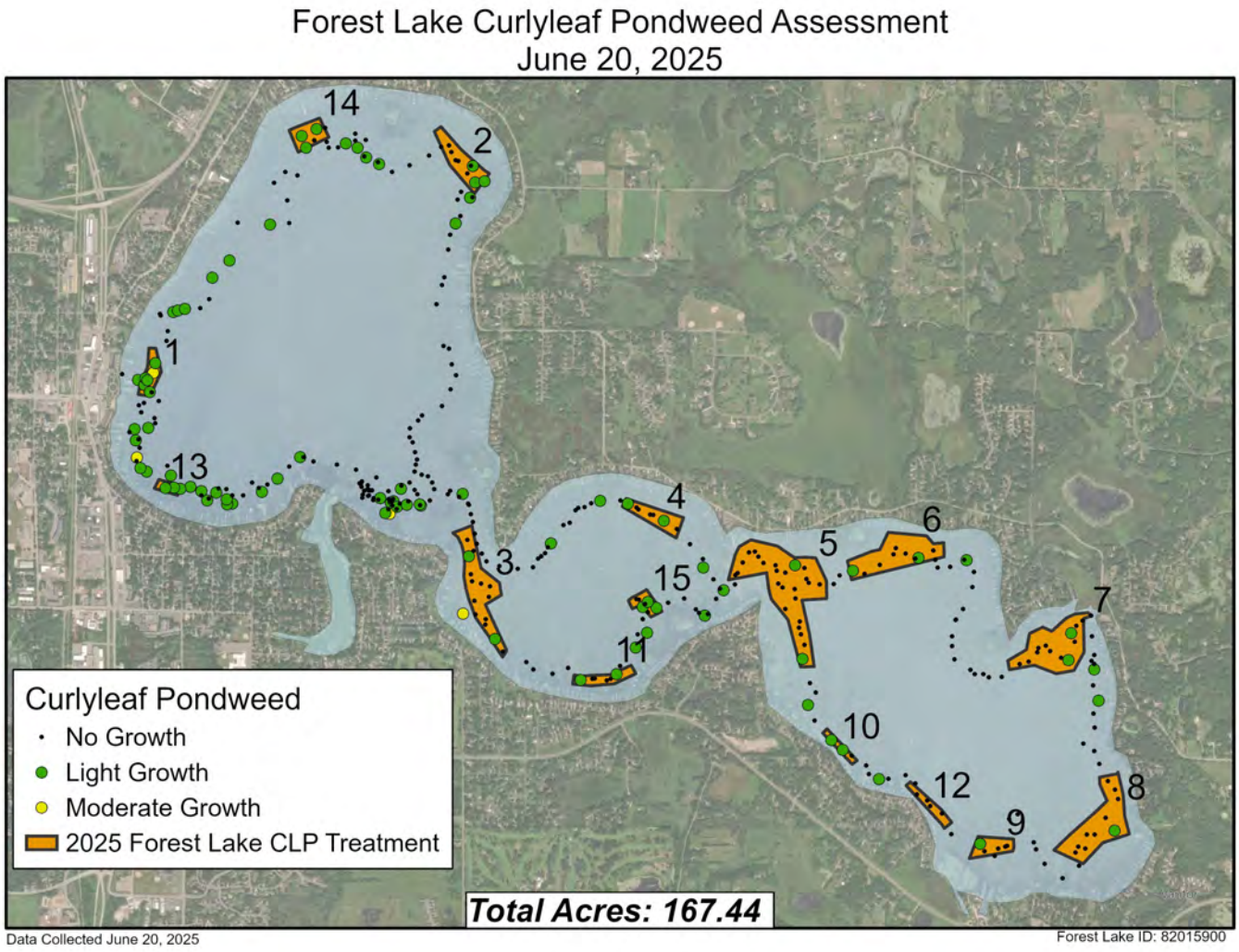

Figure 7. ASSESSMENT: Map of curlyleaf pondweed assessment sites for June 20, 2025.
Key: green dots = light growth, yellow dots = moderate growth, red dots = heavy growth, and black dots = no curlyleaf growth.

Compilation of Curlyleaf Treatment Areas from 2012 through 2025

Curlyleaf pondweed growth patterns are somewhat established in Forest Lake. All treatment areas from 2012 through 2025 are compiled in Figure 8. These “hotspot” areas have covered much of the nearshore area, but not every year. Some years there will be more than 100 acres and other years there will be less than 100 acres to treat (Table 2). Variables to growth include previous treatments, snow cover, ice off, sunny days, and water temperatures.

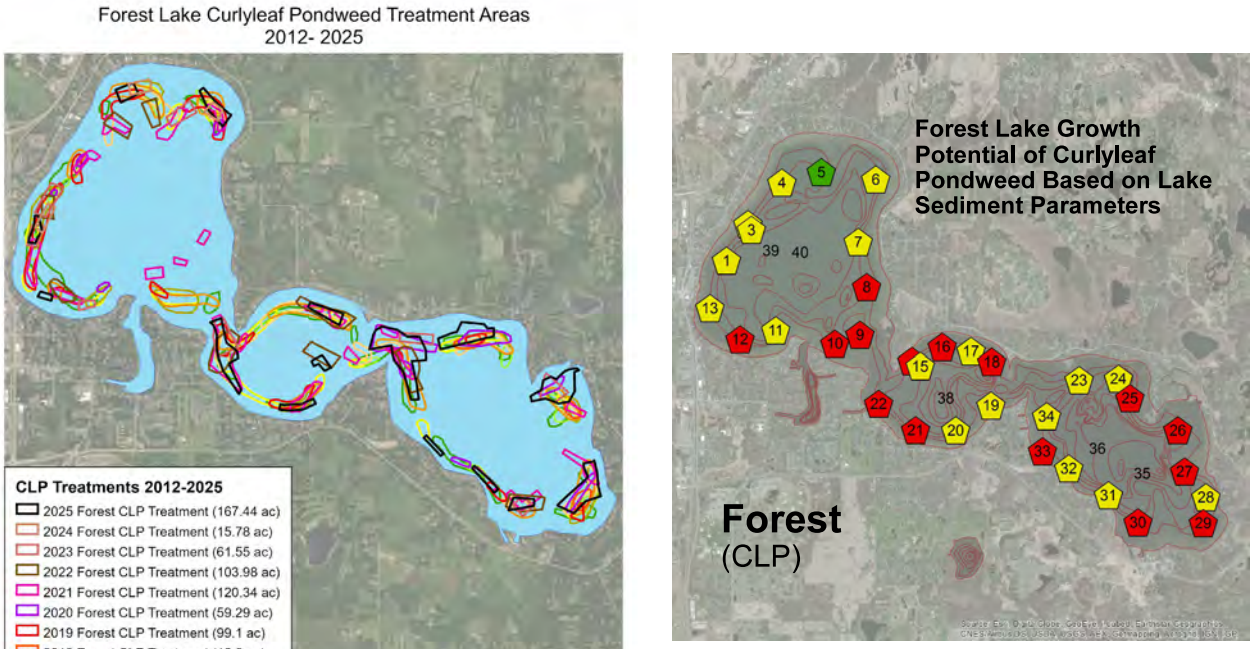

Figure 8. [left] Map of historical treatment of curlyleaf pondweed in Forest Lake, 2012-2023.
[right] Curlyleaf potential growth based on lake sediment analyses for Forest Lake.
Key: green = light growth, yellow = moderate growth, and red = heavy growth.

Table 2. Acres of non-native plants treated from 2009 through 2025.

	CLP (acres)	EWM (acres)
2009	98	
2010	155	
2011	168	
2012	155	
2013	60	
2014	101	
2015	88	30
2016	114	13.9
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2018	16.59	40.74
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2023	61.55	8.41
2024	15.79	47.94
2025	167.44	47.37

Eurasian Watermilfoil Delineation on April 23 and June 20, 2025

An early EWM delineation was conducted on April 23, 2025 and the next EWM delineation was conducted on June 20, 2025 (Figure 9). Based on this delineation, eleven treatment areas of 47.37 acres were delineated (Figure 10). Treatment of EWM was conducted on 47.37 acres in July 2025 using 2,4-D in areas 2, 3, 4, and 5 and a combination of diquat and ProcellaCOR in areas 1, and 6-10.

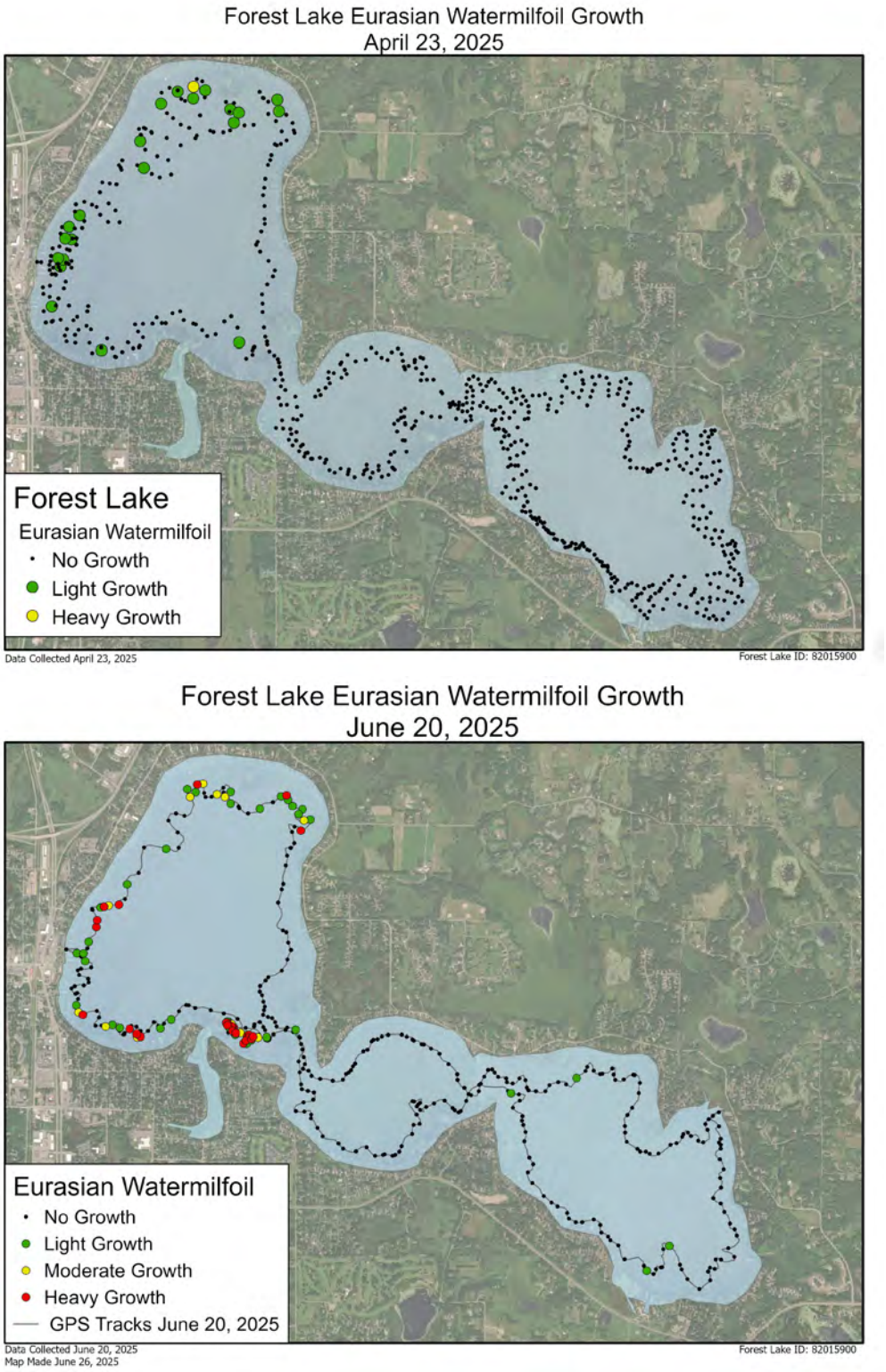

Figure 9. DELINEATION: Map of EWM distribution from the April 23 (top) and June 20, 2025 (bottom) surveys, 47.37 acres were delineated for EWM treatment.

Eurasian Watermilfoil Treatment 2025

A total of 47.37 acres were treated in 2025 using 2,4-D (Alligare) and a mixture of diquat and ProcellaCOR (Table 3 and Figure 10).

Table 3. Treatment on July 2, 2024.

Treatment Area	Size (ac)	Herbicide
1	4.08	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
2	2.37	2,4-D Amine (Alligare)
3	7.54	2,4-D Amine (Alligare)
4	10.02	2,4-D Amine (Alligare)
5	10.39	2,4-D Amine (Alligare)
6	9.95	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
7	0.79	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
8	0.77	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
9	0.72	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
10	0.74	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
Total	**47.94**	

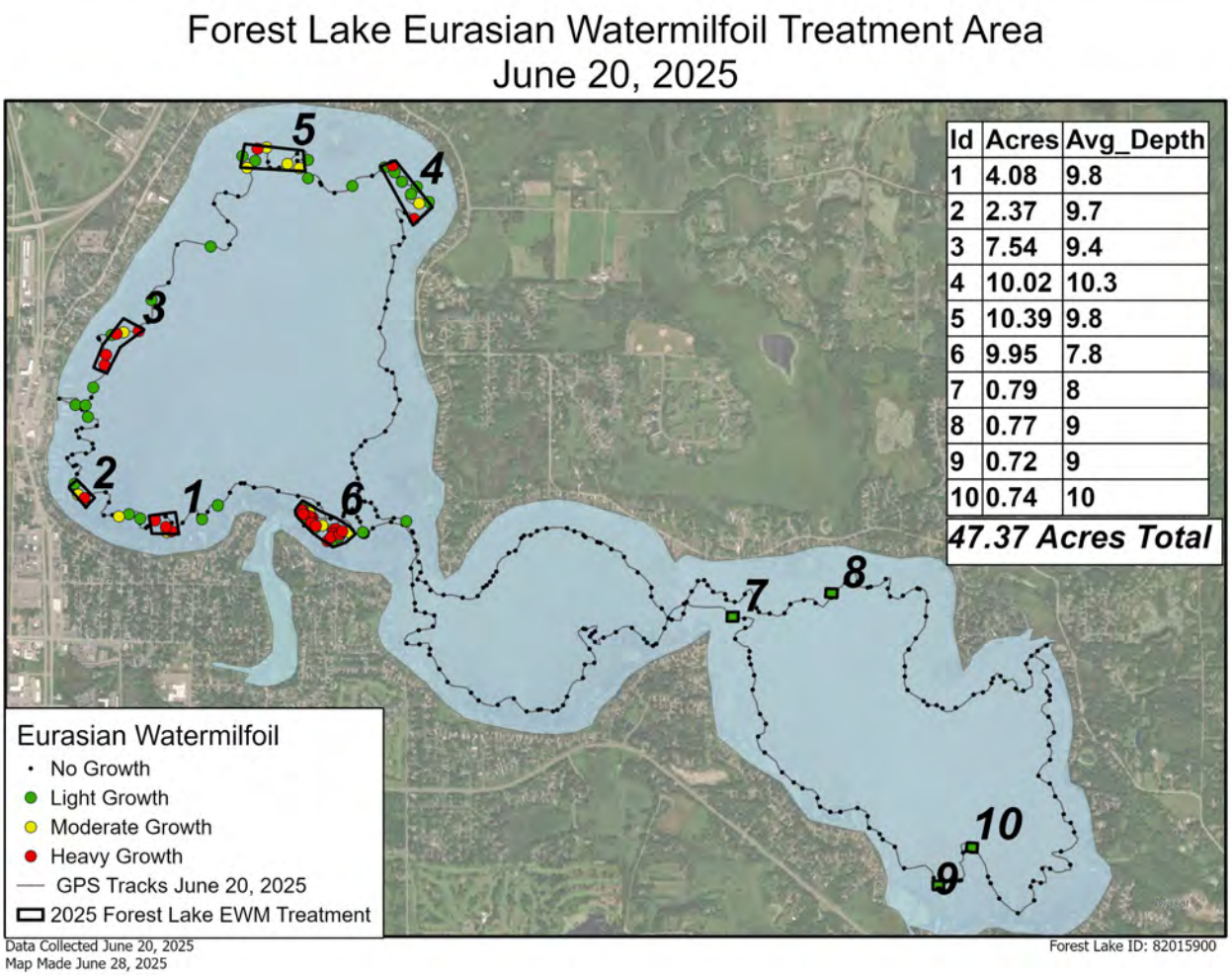

Figure 10. EWM treatment areas in 2025.

Eurasian Watermilfoil Assessment on September 15 and October 24, 2025

After the EWM treatment in July 2025, an EWM assessment on September 15 and October 24, 2025 was conducted using a combination of visual inspections and rake sampling. Only light EWM growth was observed in the treated areas in Forest Lake (Table 4 and Figure 11). The 2,4-D herbicide had good control as did the diquat plus ProcellaCOR herbicide combination.

Table 4. Treatment on July 2, 2024.

Treatment Area	Size (ac)	Herbicide
1	4.08	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
2	2.37	2,4-D Amine (Alligare)
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5	10.39	2,4-D Amine (Alligare)
6	9.95	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
7	0.79	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
8	0.77	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
9	0.72	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
10	0.74	Diquat (Tribune) and florpyrauxifen-benzyl (ProcellaCOR)
Total	**47.94**	

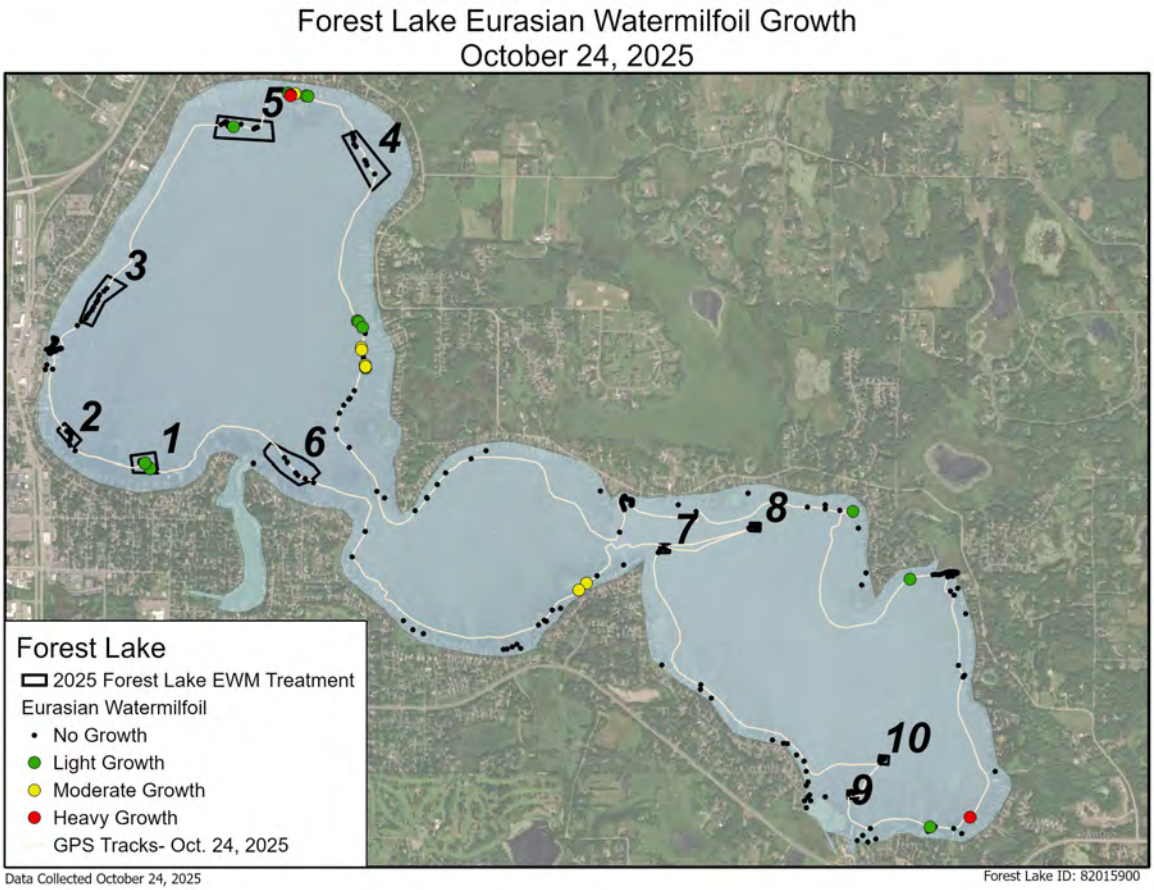
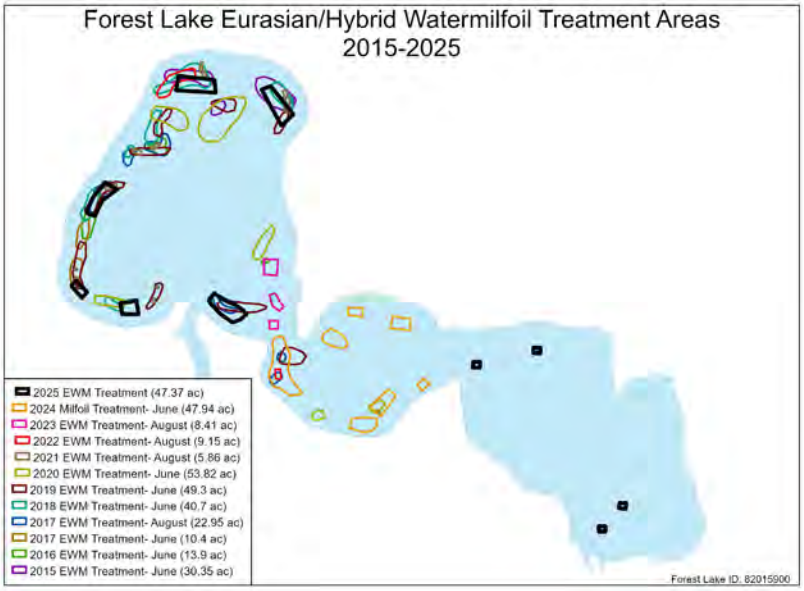


Figure 11. ASSESSMENT: Map of EWM distribution in Forest Lake and the treatment areas on October 24, 2025.

Eurasian Watermilfoil Treatments from 2015-2025

Eurasian watermilfoil was first observed in Forest Lake in 2015. EWM treatments have occurred in 2015 through 2025. All areas from 2015-2025 that have been treated are shown in Figure 12. EWM growth is primarily in the first and second lakes at this time.

Based on lake sediment characteristics, it is predicted that EWM growth should be mostly light to moderate in much of Forest Lake with some variability from year to year (Figure 12).



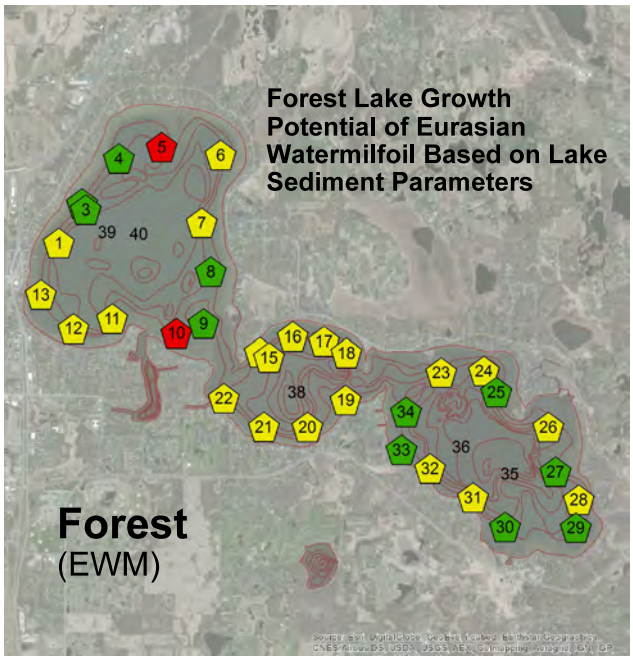


Figure 12.[left] Map of historical treatment of Eurasian watermilfoil in Forest Lake, 2015-2025.
[right] Eurasian watermilfoil potential growth based on lake sediment analyses for Forest Lake.
Key: green = light growth, yellow = moderate growth, and red = heavy growth.

What's Next for 2026?

Curlyleaf Pondweed: Treating heavy growth of curlyleaf pondweed based on early season curlyleaf distribution is a challenge. Curlyleaf in late April or early May has just started to go into a rapid growth phase. However, not all early season curlyleaf growth will result in heavy curlyleaf growth in June. It appears there are factors that limit curlyleaf growth and significant variables are associated with sediment conditions.

For CLP, there may be a growth pattern in Forest Lake. Since 2012, over 100 acres of curlyleaf has been treated annually for 1 or 2 years, followed by treatments of less than 100 acres for 1 or 2 years.

In the long history of CLP management, mechanical harvesting was conducted before large-scale herbicide treatments took over and CLP has frequently sustained heavy growth over the years. Despite annual control efforts, CLP has not shown a declining growth trend. It is likely that unless lake sediment chemistry conditions change, CLP will continue to produce heavy growth in most years.

Using existing delineation methods, most of the projected heavy growth of curlyleaf pondweed was controlled in 2025 although the early warm weather forced an early delineation and some CLP sprouted after the April 23, 2025 delineation.

Since 167 CLP acres were treated in 2025, it is predicted a lower acreage will be considered for treatment in 2026. For 2026, it is proposed to delineate CLP later in April or early May to capture late sprouting CLP.

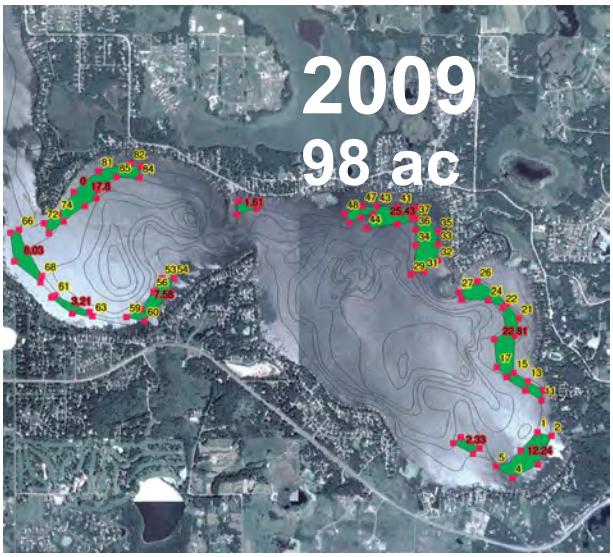
Eurasian Watermilfoil: In 2025, the application of 2,4-D herbicide for EWM controlled the heavy EWM growth. The same basic approach for EWM control was used in 2017 through 2019. In 2020 through 2024, the herbicides diquat and ProcellaCOR were applied together and control was very good. In 2025, diquat and ProcellaCOR were applied in 6 treatment areas and 2,4-D Amine was applied in 4 areas. Excellent control was found in all treated areas. Often ProcellaCOR can produce EWM control for more than 1 growing season, whereas 2,4-D is good for 1 growing season and sometimes additional years.

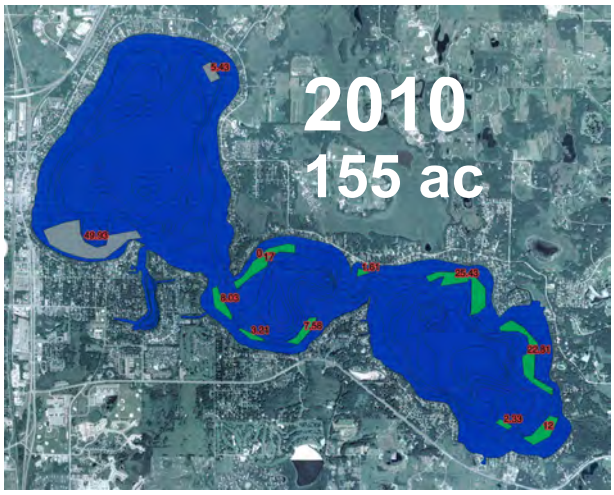
In 2024, a new milfoil outbreak was found in the middle basin. Genotype sampling found most of the milfoil to be hybrid milfoil with 6 out of 8 treatment areas dominated by the hybrid. All areas were treated with ProcellaCOR in 2024. No milfoil was observed in the middle basin in 2025.

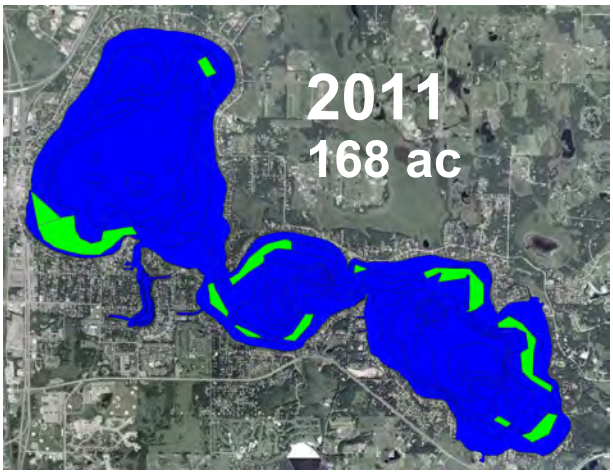
For 2026, the 2025 treatment areas should be checked and 2,4-D may be a good option for treatments in 2026 along with some diquat/ProcellaCOR treatments as well.

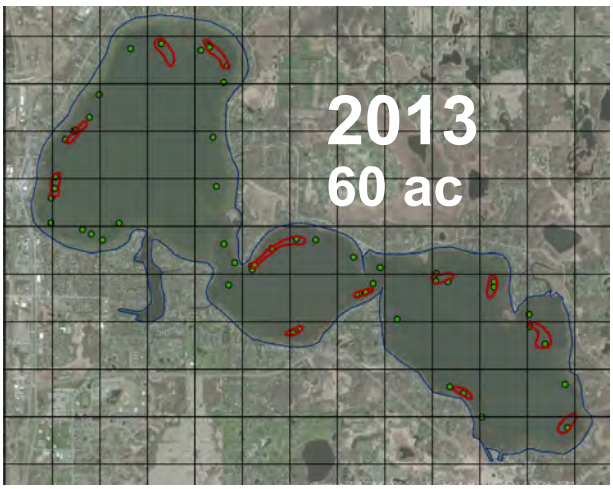
APPENDIX

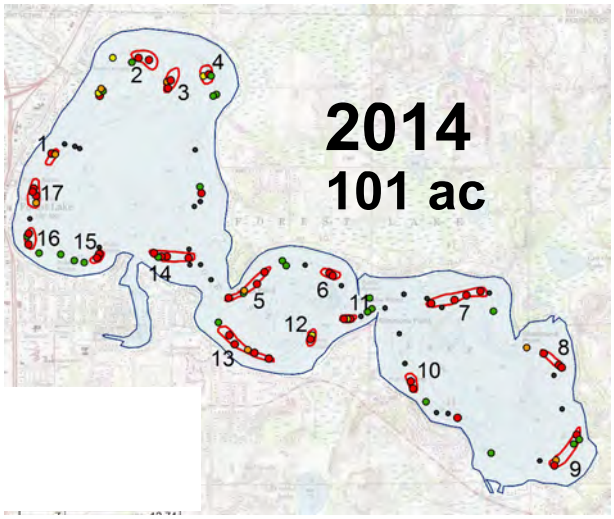
Forest Lake Curlyleaf Treatment Areas for 2009-2024



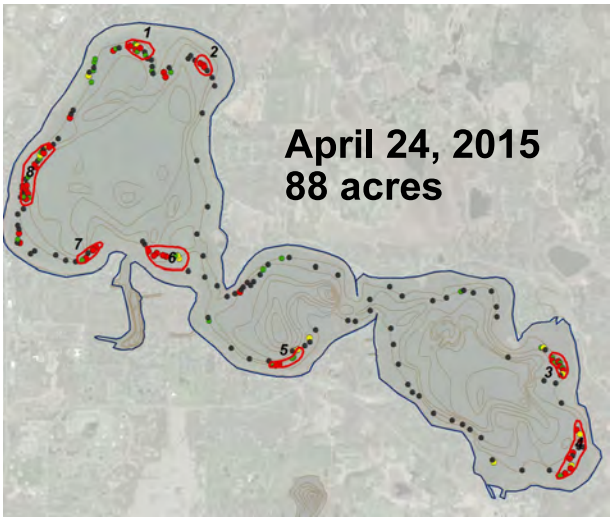


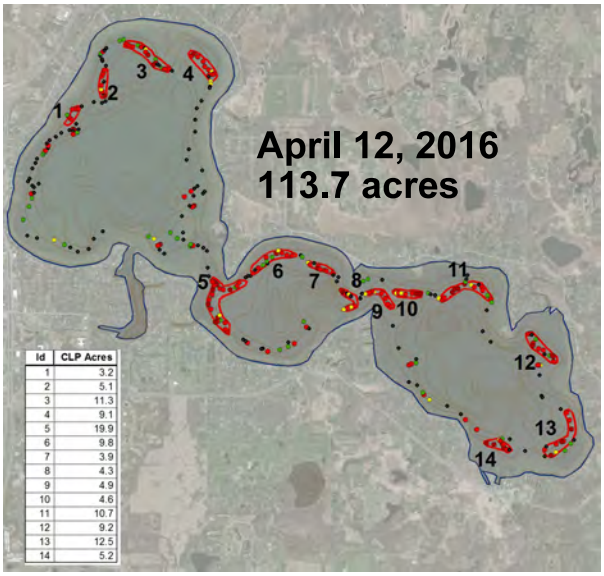


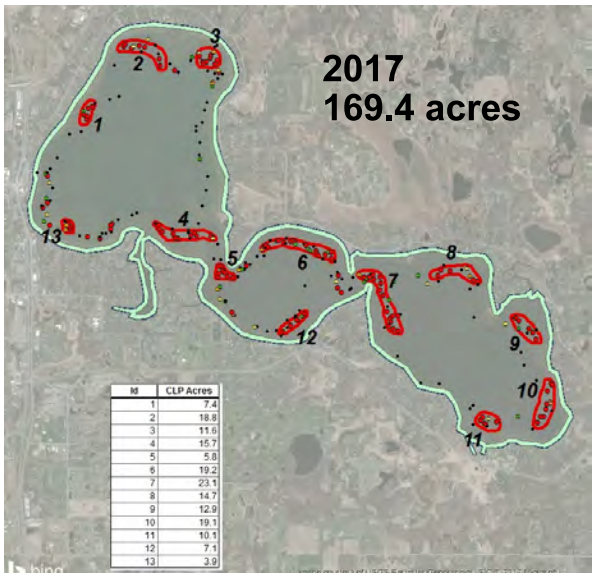


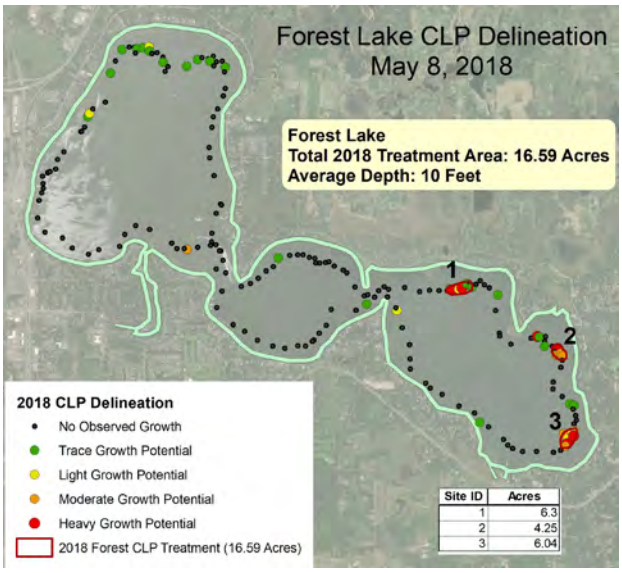


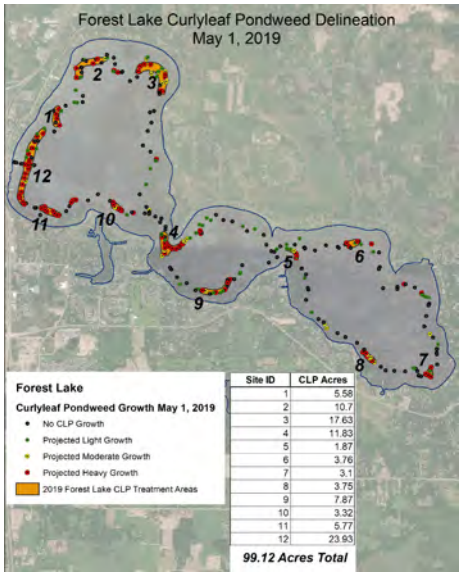
Curlyleaf treatment areas in 2009 through 2014.

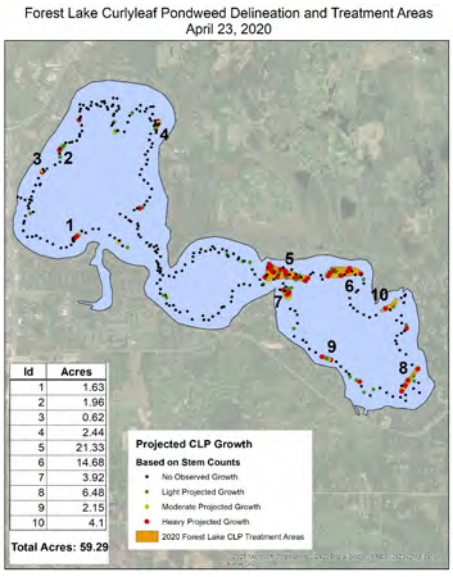




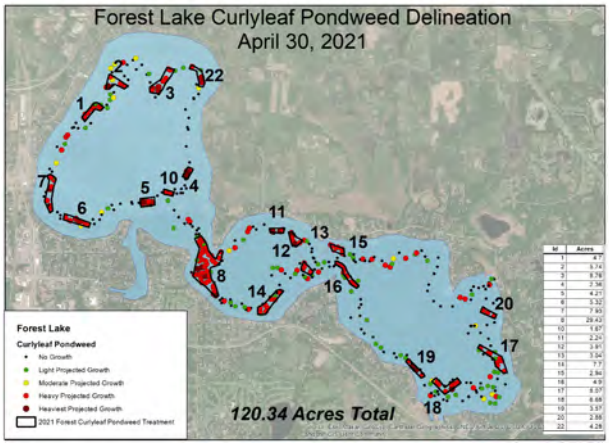


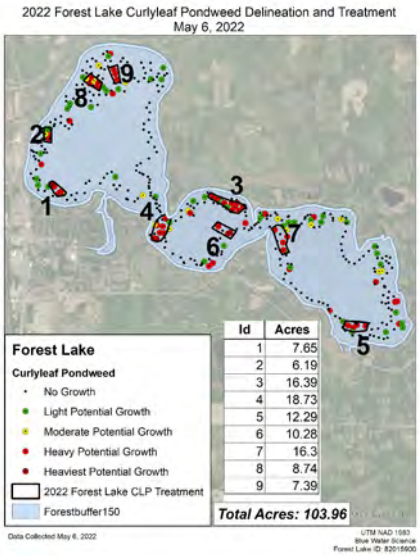


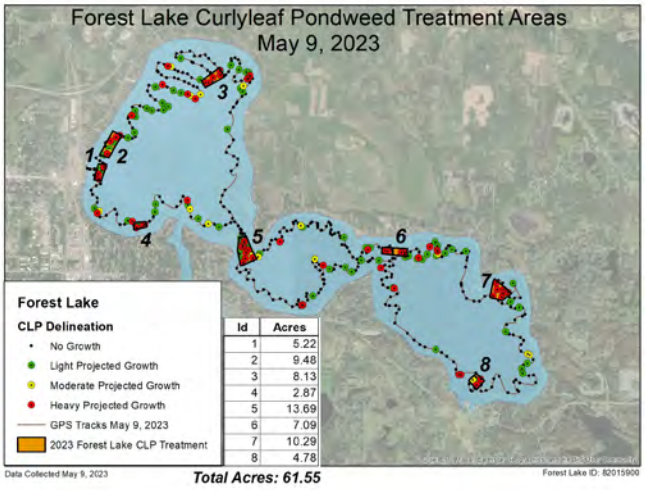


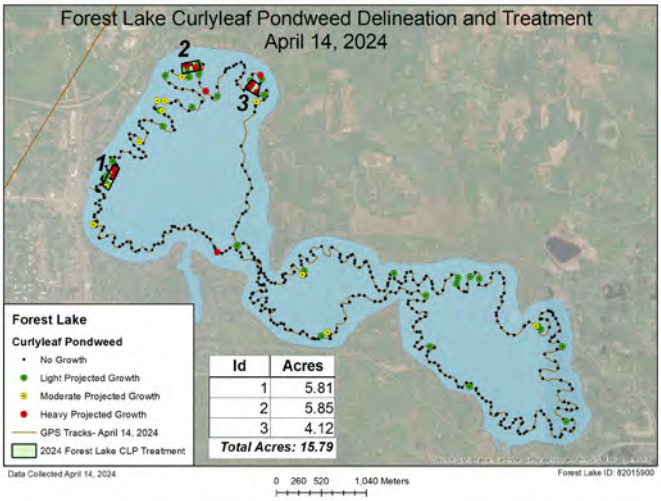


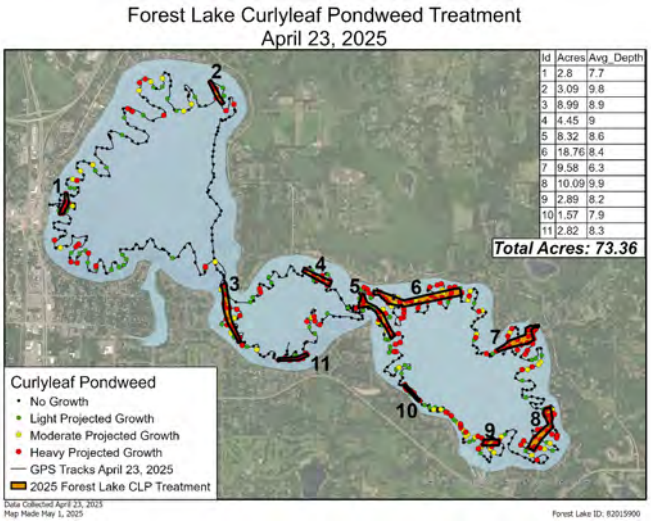
Curlyleaf treatment areas in 2015 through 2020.





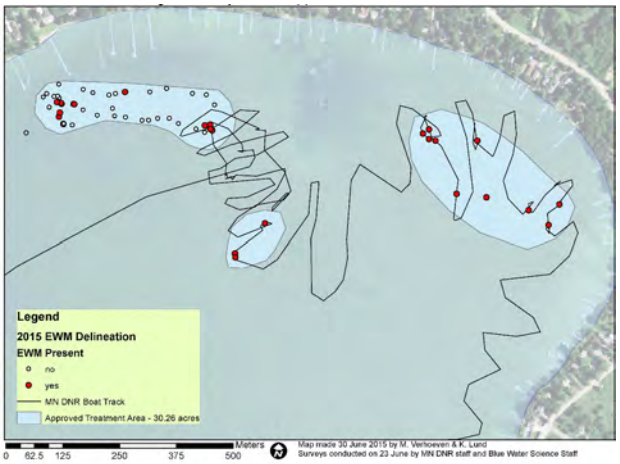


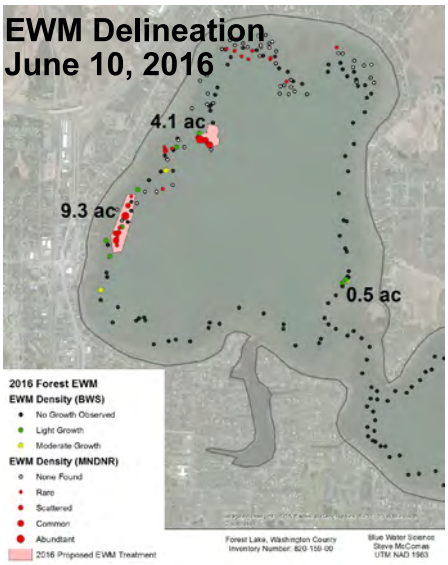


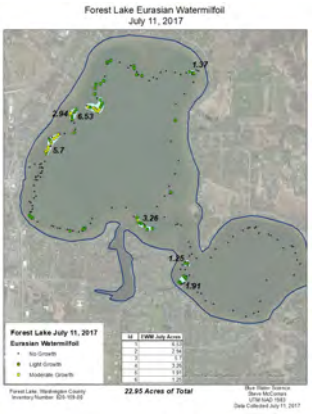


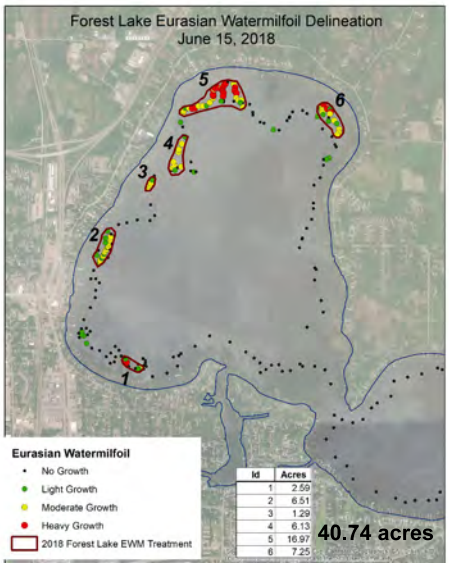
Curlyleaf treatment areas in 2021 through 2025.

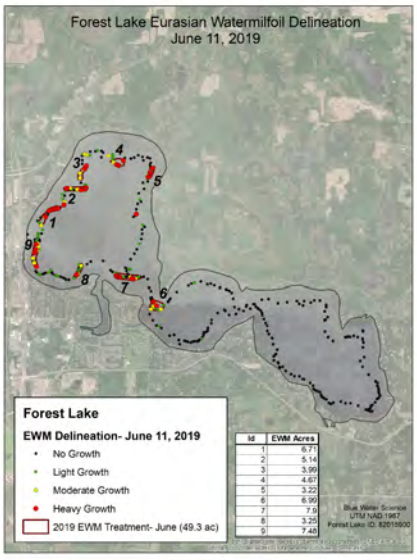
Forest Lake EWM Treatment Areas for 2015-2025

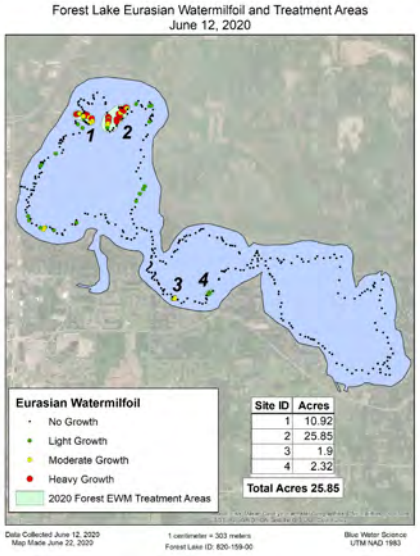






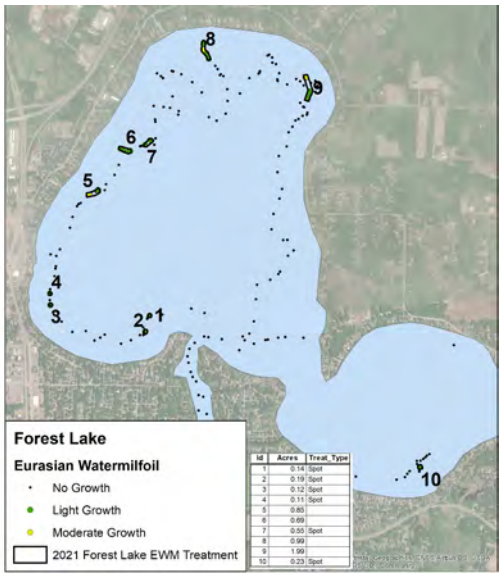






Eurasian watermilfoil treatment areas in 2015 through 2020.

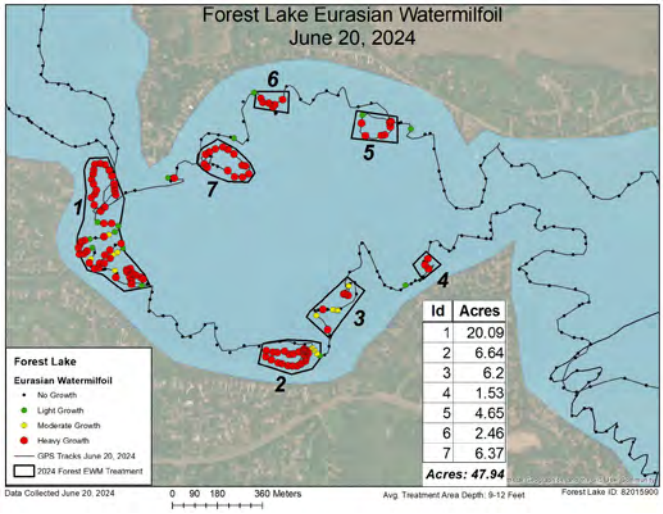
2021



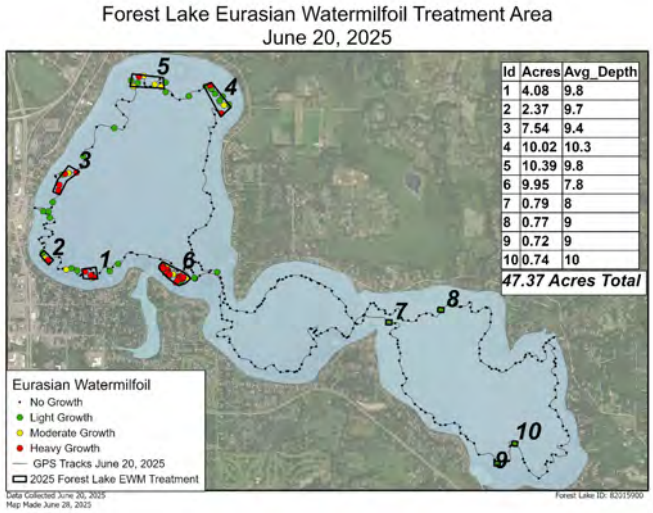
2022

2023

2024



2025



Eurasian watermilfoil treatment areas in 2021 through 2025.

Flowering Rush Flowerheads, Forest Lake, September 15, 2025

Flowering Rush Delineation, Treatment, and Assessment for Forest Lake, Washington County, Minnesota, 2025

Pre-Treatment Delineation: *July 11, 2025*
Pre-Treatment Delineation and Assessment: *September 15, 2025*
Post Treatment Assessment: *October 24, 2025*

Prepared for:
Washington County and Comfort Lake - Forest Lake Watershed District

Prepared by:
Steve McComas
Blue Water Science

November 21, 2025

Flowering Rush Delineation, Control, and Assessment for Forest Lake, Washington County, Minnesota, 2025

Summary

In 2025, the flowering rush treatment program successfully contained flowering rush area to less than 0.2 acres over the entire Forest Lake (Table 1). A total of 28 sites with flowering rush was observed in the last survey date of October 24, 2025.

Table 1. Summary of flowering rush sites, total area, and size of areas for 3 survey dates in 2025.

	July 11, 2025	September 15, 2025	October 24, 2025
Flowering rush sites	67	51	28
Flowering rush area (sq/ft)	5,970 (0.14 acres)	8,070 (0.12 acres)	2,670 (0.06 acres)
Flowering rush average size (sq/ft)	89	158	95
Range of flowering rush areas (sq/ft)	10-2,000	10-700	10-400

July 11, 2025

- A total of 67 flowering rush sites were observed.
- A total area of flowering rush was estimated at 5,970 square feet (0.14 acres).
- Five sites had flowers present.

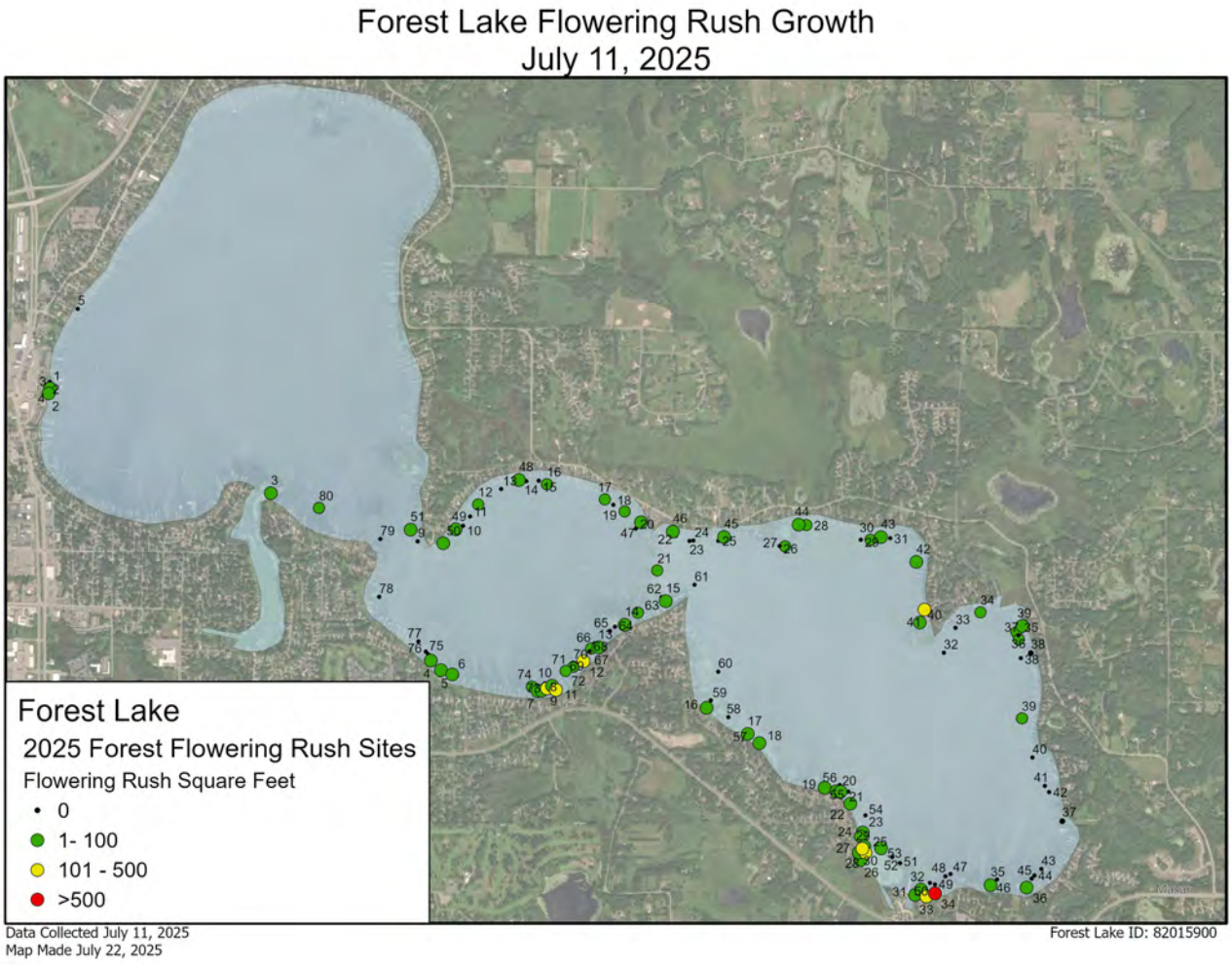


Table 2. Individual flowering rush sites on July 11, 2025.

NEW GPS Site	GPS Site	Flowering rush (sq ft)	Flowering rush clumps	Flowering rush on shore	Flowering rush near shore	Flowering rush off shore	Flowering rush continuous	Sites with flowers	Notes
1		20	1		1				
2		20	1		1				
3		10	1			1			
4		40	1			1			
5		60	3			1			
6		30	3			1			
7		20	1			1			
8		40	2			1			
9		160	10			1			
10		60	3			1			
11		120	6		1				
12		160	4			1			
13		50	2			1			
14		20	2			1			
15		30	3			1			
16		50	3	1				3	
17		40	4			1			
18		90	3			1			
19		60	6			1			
20		90	3			1			
21		100	2			1			
22		60	2			1			
23		40	2			1			
24		40	2		1				
25		40	2		1				
26		40	2	1				1	
27		60	2	1				8	
28		200	10			1			
29		180	1	1				5	
30		100	9			1			
31		60	4			1			
32		40	4			1			
33		200	10+	1			1	15	
34		2000		1		1	1		
35		30	3		1				
36		20	2			1			
37				1					Sagittaria?
38				1					Sagittaria?
39		40	2	1					
40		60	2			1			
41		400	10		1				
42		20	2			1			
43		20	2			1			
44		50	5			1			
45		80	2			1			
46		10	1			1			
47		80	2	1					
48		20	2		1				
49		100	3			1			
50		10	1	1					
51		10	1			1			
	12	10	1			1			
	16	10	1			1			
	17	10	1			1			
	19	20	2			1			
	21	40	2			1			
	27	100	2			1			
	28	60	2			1			
	30	10	1			1			
	34	20	1		1				
	35	20	2			1			
	37	80	5		1				
	39	10	1			1			
	63	60	3			1			
	67	40	2			1			
	71	40	2			1			
	72	60	2			1			
	74	60	3			1			
	80	40	2			1			
Average		89.1	2.8	1.0	1.0	1.0	1.0	6.4	
Occurrence		67	65	11	10	49	2	5	
Total		5970	179	11	10	49	2	32	

September 15, 2025

- A total of 51 flowering rush sites were observed.
- A total area of flowering rush was estimated at 8,070 square feet (0.12 acres).
- Three sites had flowers present.

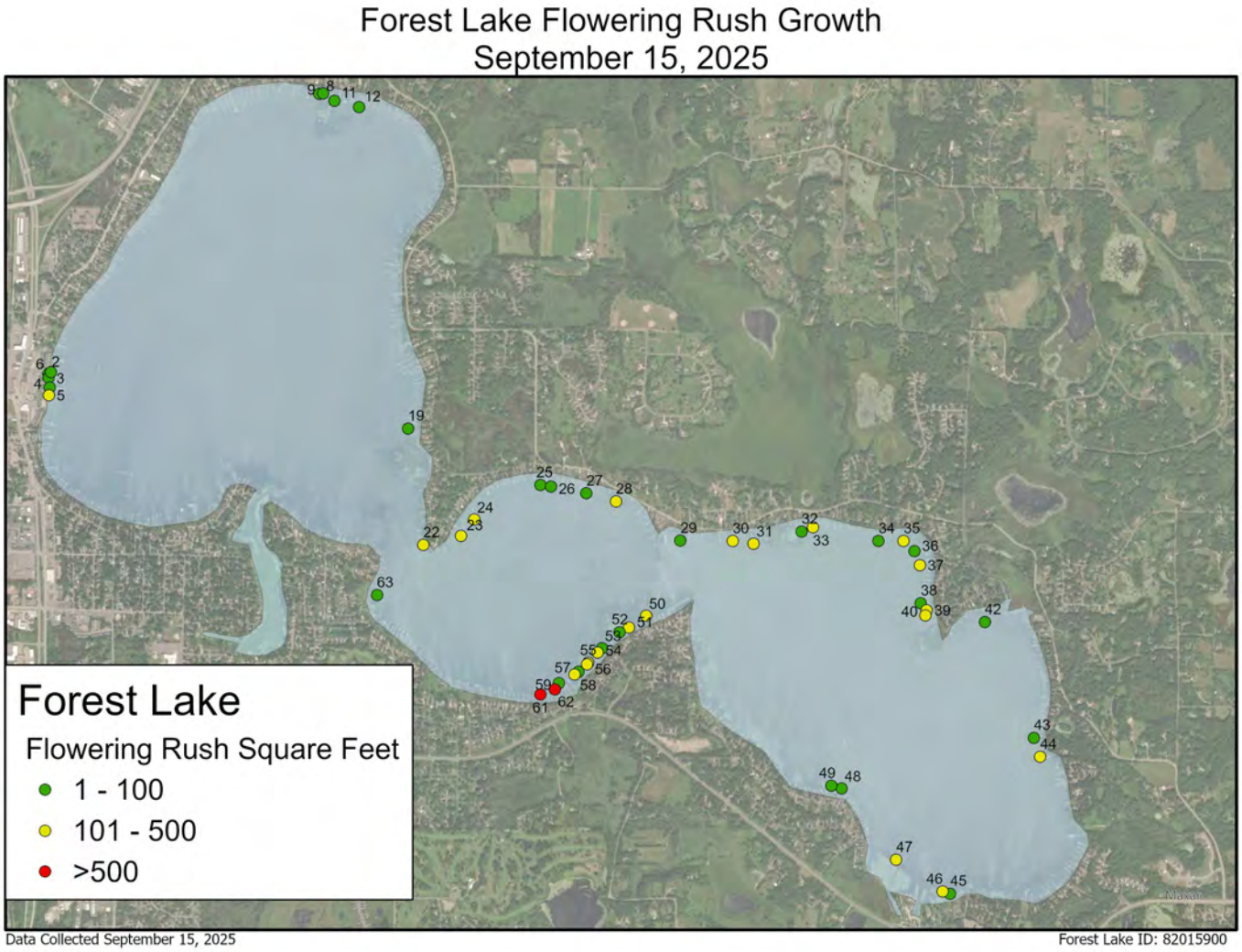


Table 3. Individual flowering rush sites on September 15, 2025.

NEW GPS Site	July 11 FR Site	FR (sq ft)	FR patches	FR on shore	FR off shore	Sites with flowers	Depth (ft)	EWM
1		700		1				
2		50		1				
3		50		1				
4		50		1				
5		150		1				
6		100		1				
7								1
8		100		1		2		1
9		50		1		1		1
10								
11		50		1				
12		20		1				
13							6	3
14							6	3
15								2
16								2
17								2
18								
19		100		1				
20								1
21								2
22		200	20	1				1
23		200	10	1				
24		150	10	1				
25		20		1				
26	64	10						
27		100		1				
28		150	6	1	1			
29	59	20	1					
30	58	400	10		1			
31		300	10	1				
32	56	20	2		1			
33	55	200						
34	54	100	4					
35		300	10		1			
36		20	2					
37	52	300	2					
38		20			1			
39	51	400	10					
40		150	10		1			
41							4	1
42		80	5	1				
43		10		1				
44		150	10					
45		100		1	1			
46		200	20		1			
47	37	200	20					
48	28	10		1				
49	26	10		1				
50	21	200	10		1			
51		200	10		1		5	1
52		10			1			
53	19	100		1				
54	18	200	6					
55		200		1				
56	17	200	10					
57	16	100	5					
58	15	300	15					
59		20			1			
60								
61	10	600	20		1			
62	13	600	30		1			
63		100			1			
Average		158.2	10.3	1.0	1.0	1.5	5.3	1.6
Occur		51	26	25	15	2	4	13
Total		8070	268	25	15	3	21	21

October 24, 2025

- A total of 28 flowering rush sites were observed.
- A total area of flowering rush was estimated at 2,670 square feet (0.06 acres).
- No sites with flowers were observed.

Forest Lake Flowering Rush Growth
October 24, 2025

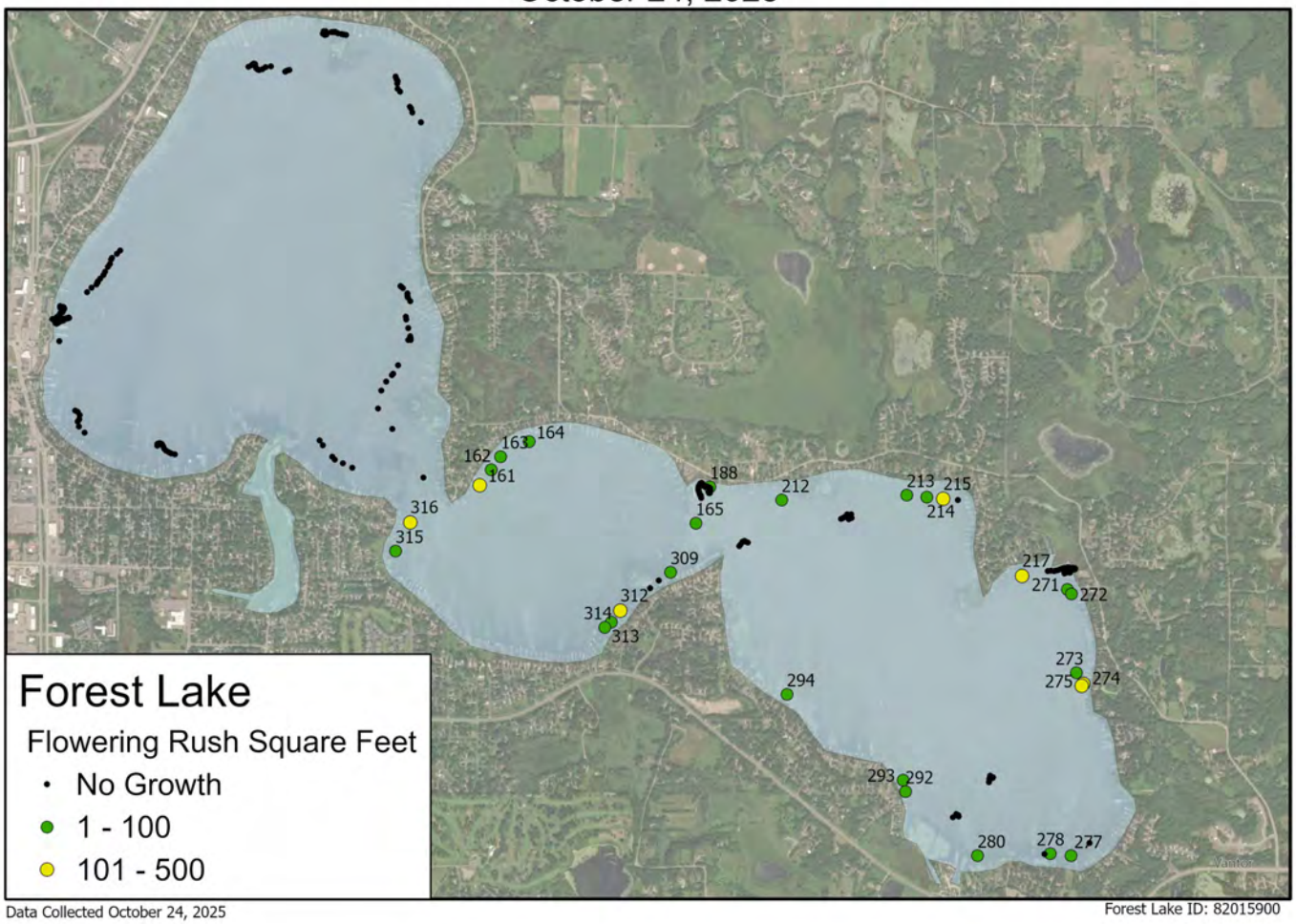


Table 4. Individual flowering rush sites on October 24, 2025.

GPS Site	FR (sq ft)	FR patches	FR on shore	FR off shore
161	200	10		1
162	100	5		1
163	50	5		1
164	50	1	1	
165	100	5		1
188	20	2	1	
212	50	3		1
213	30	3		1
214	10	1		1
215	200	20		1
217	150	6		1
271	40	2		1
272	20	2		1
273	10	1		1
274	400	1		1
275	150	1		1
277	80	4		1
278	60	3		1
280	100	10		1
292	60	3	1	
293	10	1	1	
294	20	2		1
309	100	4		1
312	200	5		1
313	100	10	1	
314	60	2		1
315	100	1		1
316	200	5	1	
Average	95.4	4.2	1.0	1.0
Occur	28	28	6	22
Total	2670	118	6	22

Looking Out from the Public Access on Bone Lake, April 7, 2025

Curlyleaf Pondweed and Eurasian Watermilfoil Meander Surveys for Bone Lake, Washington County, Minnesota, 2025

	Delineation	Treatment	Assessment
CLP	April 7, 2025	3.66 acres were treated	May 23, 2025
EWM	May 23, 2025	No EWM treatment	July 28, 2025

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

December 3, 2025

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

Curlyleaf Pondweed and Eurasian Watermilfoil Meander Surveys for Bone Lake, Washington County, Minnesota, 2025

Summary

Curlyleaf Pondweed Delineation and Assessment: Bone Lake (MnDNR ID #82-0054) is a 221 acre lake located in Washington County, Minnesota. On April 7, 2025 the curlyleaf pondweed (CLP) delineation survey sampled 163 sites. Curlyleaf pondweed growth was light and sparse and was found at 28 sample sites (Figure 1). One area of 3.66 acres was delineated for treatment in 2025.

Treatment was conducted in 2025.

A CLP assessment was conducted on May 23, 2025, during the peak growth of CLP. Curlyleaf was sampled at 66 sites at light to heavy growth conditions on May 23, 2025 (Figure 1). It appears some curlyleaf sprouted after the April 7, 2025 delineation.

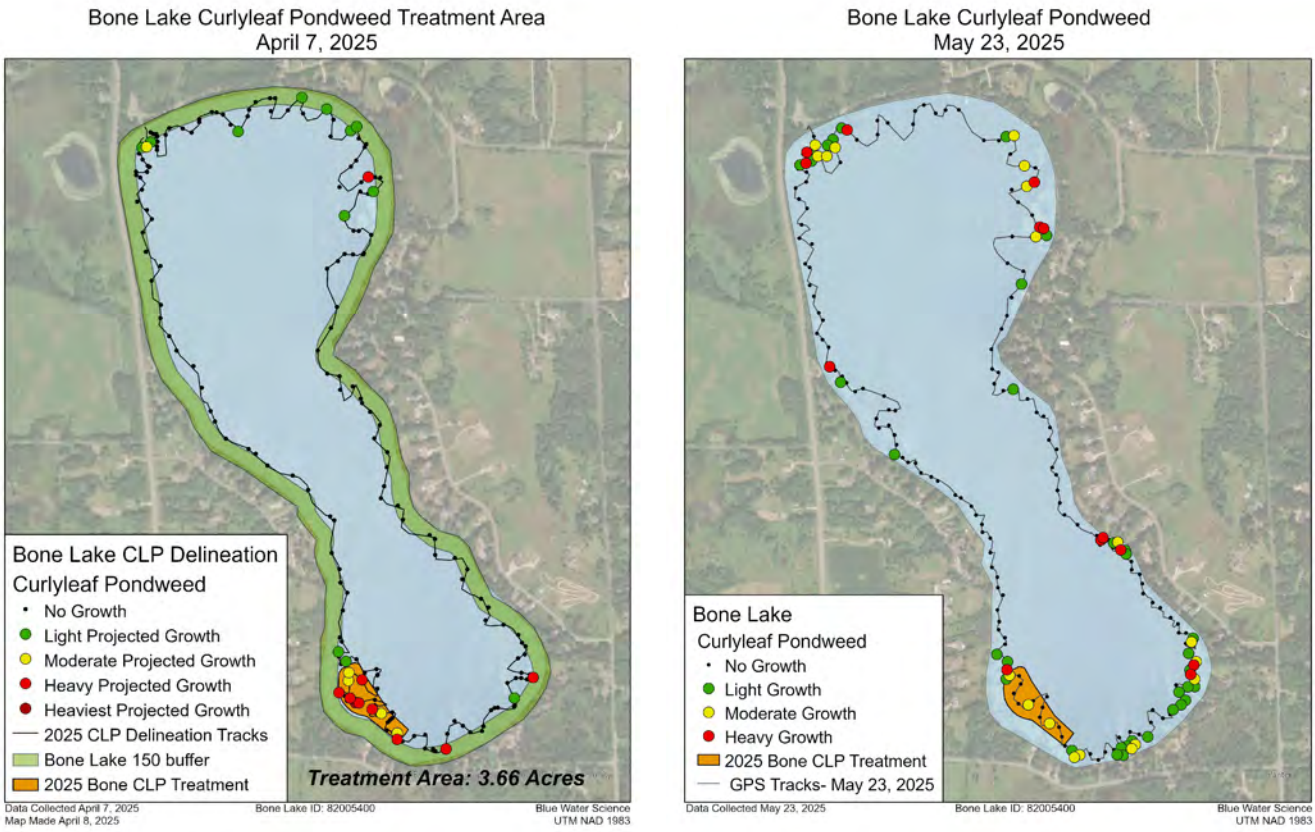
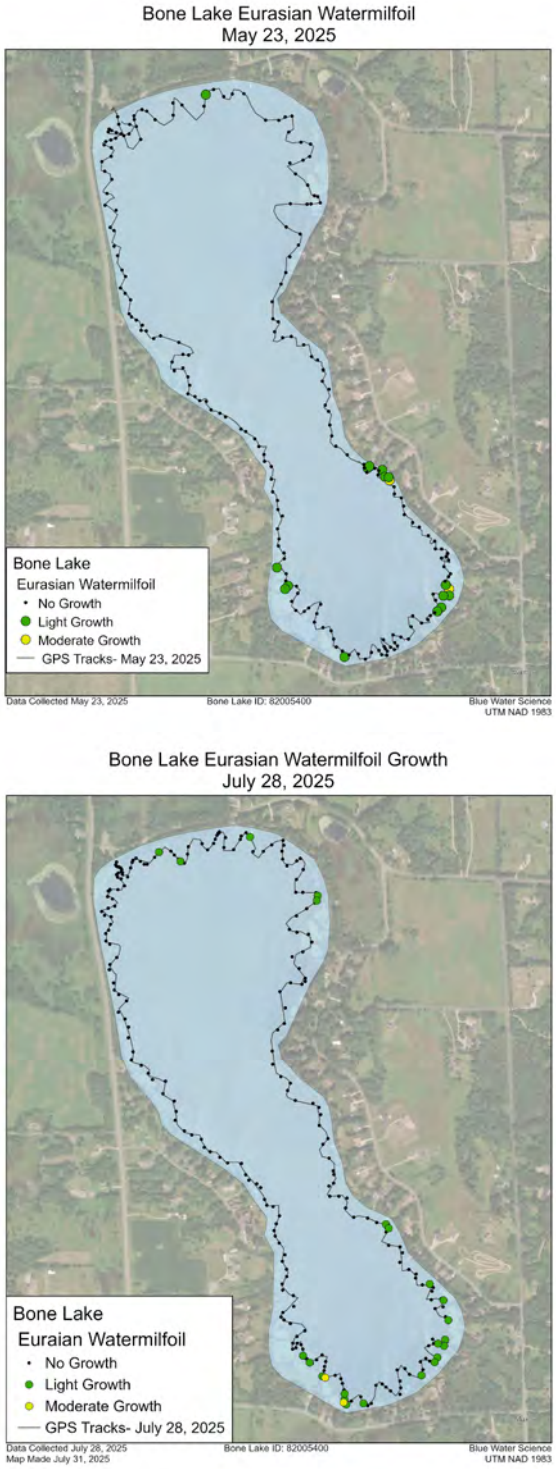


Figure 1. [left] CLP was found at 28 out of 163 sample sites in Bone Lake on April 7, 2025. [right] CLP was found at 66 out of 212 sample sites on May 23, 2025. Key: green = light growth potential, yellow = moderate growth potential, and red = heavy growth potential.

Eurasian Watermilfoil Delineation and Assessment: Eurasian watermilfoil was verified in Bone Lake in 2006. On May 23, 2025, Eurasian watermilfoil (EWM) was found at 17 sites out of 212 sites sampled. Eurasian watermilfoil growth was light and sparse (Figure 2).

No EWM treatment was conducted in 2025.

An assessment conducted with a meander survey occurred on July 28, 2025. Eurasian watermilfoil was sampled at 25 sites out of 252 sample locations out to 7 feet (depth of plant growth). EWM density was mostly light in 2025 (Figure 2).



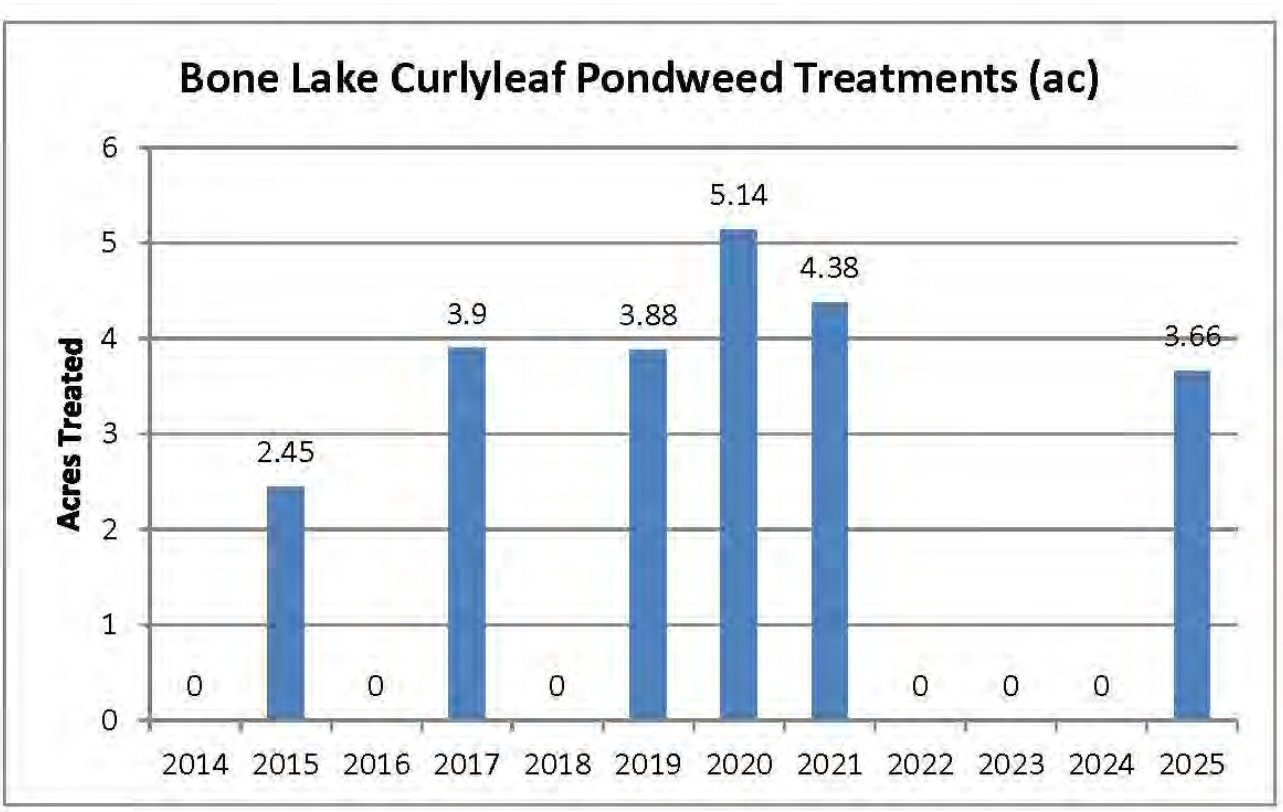
Summary of CLP and EWM Observations in 2025

Table 1. Number of observations of CLP and EWM for the meander surveys. The number of parentheses is the total number of samples.

	Curlyleaf Pondweed	Eurasian Watermilfoil
April 7, 2025	28 (n=163)	0 (n=163)
May 23, 2025	66 (n=212)	17 (n=212)
July 28, 2025	17 (n=252)	25 (n=252)

Figure 2. [top-left] EWM coverage for Bone Lake on May 23, 2025. [bottom] EWM coverage on for Bone Lake on July 28, 2025.

Summary of CLP and EWM Bone Lake Treatments from 2014 through 2025: CLP has been treated in 6 out of the last 12 years. EWM has been treated in 3 out of the last 12 years. In 2025, 3.66 acres of CLP was treated. EWM was not treated in 2025 (Figure 3).



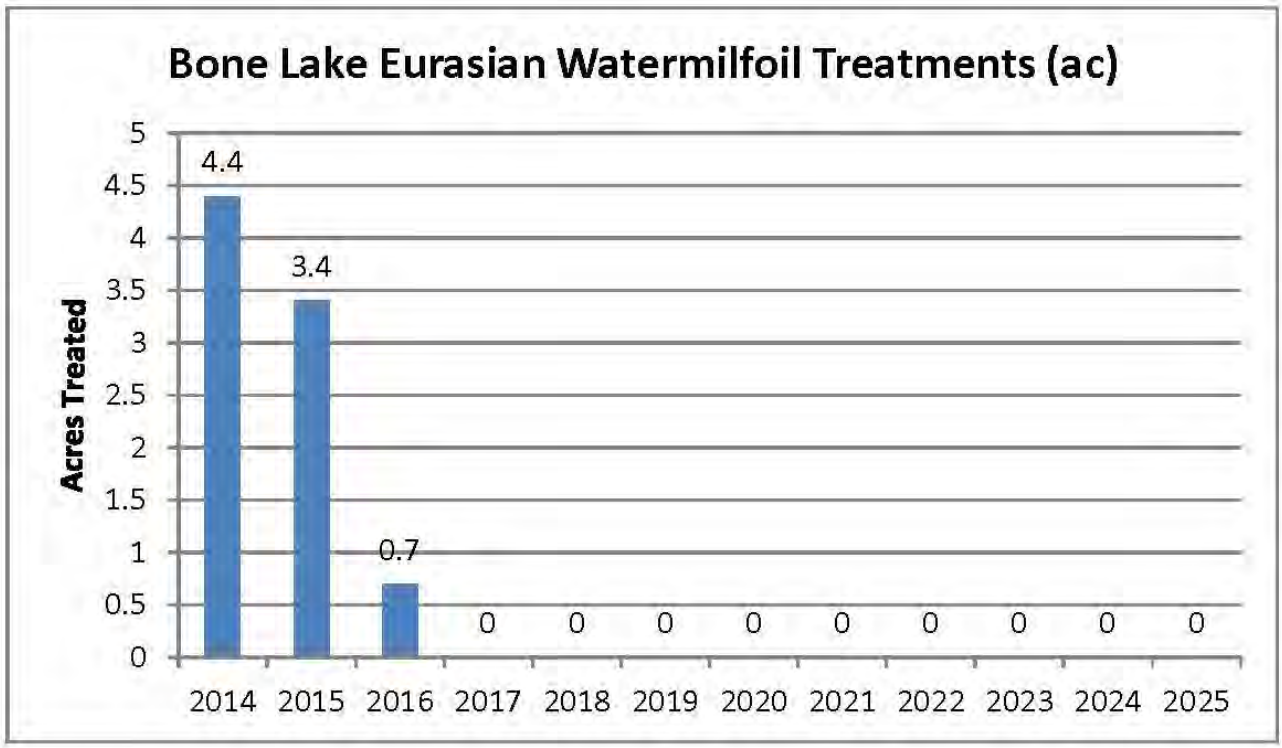


Figure 3. Summary of CLP and EWM treatment acreage for 2014-2025.

Curlyleaf and Milfoil Treatments from 2015-2025: A summary of CLP and EWM treatments from 2015 through 2025 is shown in Figure 4. Curlyleaf pondweed growth has fluctuated over the years. No treatment was conducted in 2022 through 2024. EWM treatment areas have decreased since 2014 with no treatment occurring 2017 through 2025 in Bone Lake.

A hotspot map of sites of CLP and EWM that show moderate and heavy growth for 2015 through 2025 is shown in Figure 4. CLP and EWM have typically grown to a water depth of 7 feet or less.

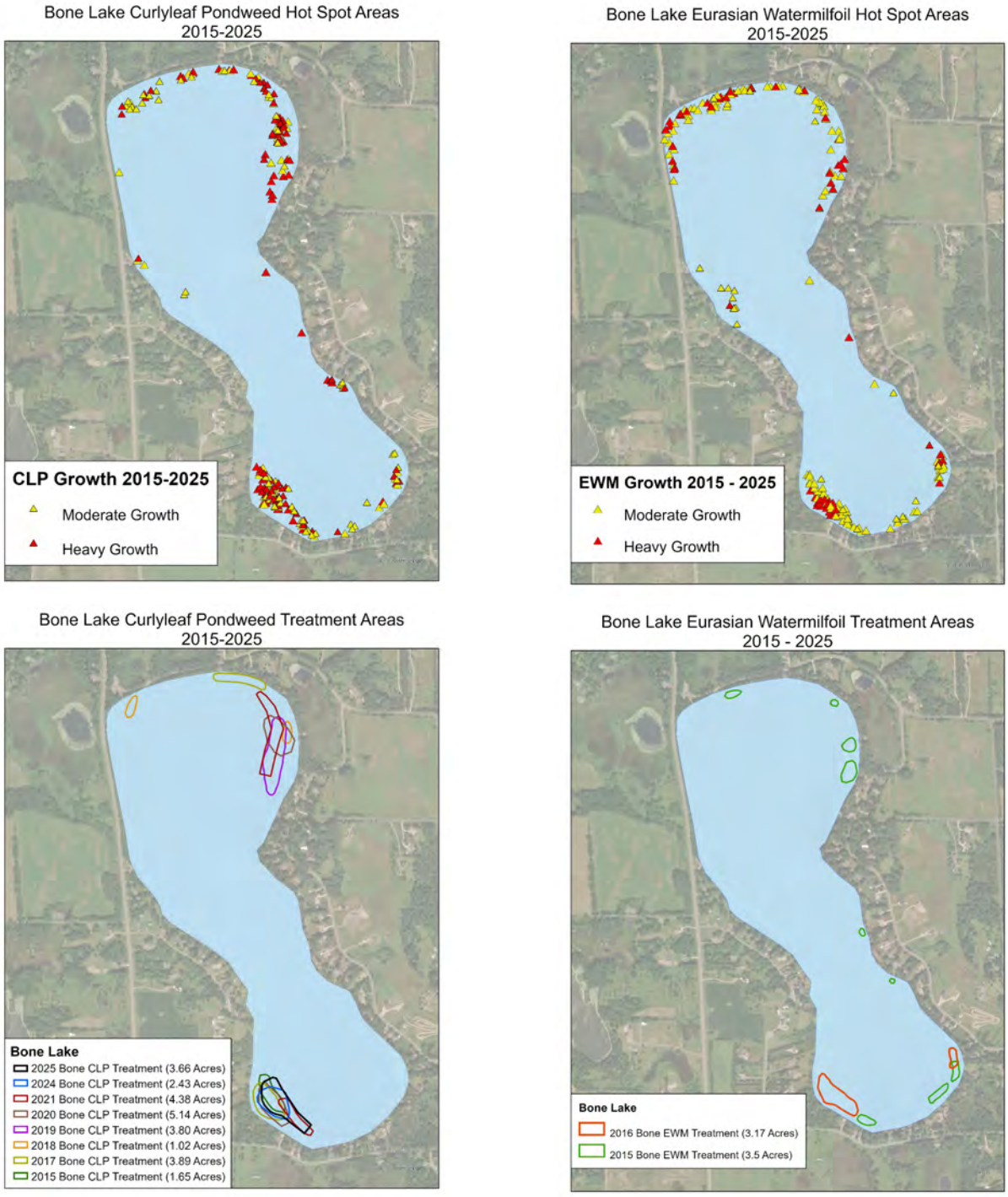


Figure 4. [top-left] Hot spot map of CLP growth over the years of 2015-2025 placed on a single map. [top-right] Hot spot map of EWM growth over the years of 2015-2025 placed on a single map. [bottom-left] CLP treatment map over the years of 2015-2025. [bottom-right] EWM treatment map over the years of 2015-2025.

Curlyleaf Pondweed and Eurasian Watermilfoil Meandering Surveys for Bone Lake, Washington County, Minnesota, 2025

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. Curyleaf pondweed and Eurasian watermilfoil delineations and assessments were conducted in Bone Lake in 2025. The objectives of the delineations were to locate areas of nuisance invasive species and recommend areas for potential treatments. The purpose of the assessments were to determine if any nuisance growth of CLP or EWM were missed during the delineations.

Methods

Curlyleaf Pondweed Delineation Method for Projected Growth: At the time of the spring curlyleaf delineation on April 7 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 CLP 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)*.

*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

Aquatic Plant Density Rating: Aquatic plant densities were evaluated based on rake fullness with a scale of 1, 2, or 3 for light, moderate, or heavy density (Figure 5).

Curlyleaf Assessment and Eurasian Watermilfoil Delineation and Assessment Sampling: An initial EWM delineation along with a CLP assessment were conducted on May 23 and 212 sites were sampled. On July 28 an EWM assessment was conducted and the entire perimeter of the lake was checked for CLP and EWM.

Chart of Aquatic Plant Density Ratings

Figure 5. Aquatic plant density ratings from 1 to 3.

Curlyleaf Pondweed Delineation on April 7, 2025

A CLP delineation was conducted on April 7, 2025 and found CLP present at 28 sample sites out of a total of 163 sites. Curlyleaf pondweed growth was light to heavy. In a few locations CLP was present but nuisance conditions were minimal. A CLP treatment of 3.66 acres was recommend in 2025 (Figure 6).

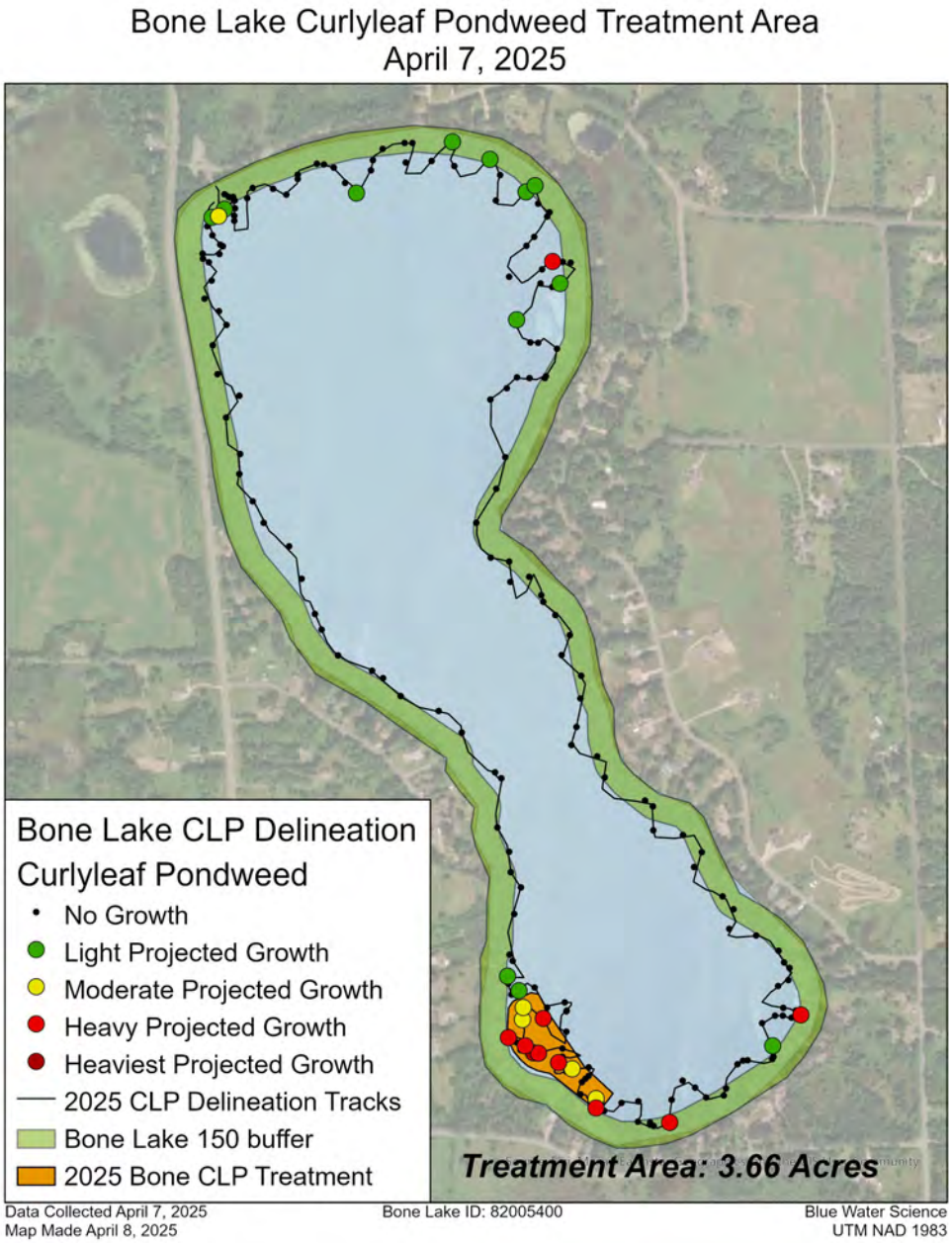


Figure 6. Curlyleaf coverage for Bone Lake on April 7, 2025. Key: black dot = no growth, green dots = light growth, yellow dot = moderate growth, red dot = heavy growth, light green = 150 ft buffer, and orange = treatment area.

Curlyleaf Pondweed Assessment on May 23, 2025

A curlyleaf pondweed assessment was conducted on May 23, 2025 and found CLP was present at 66 sites out of the 212 sample sites (Figure 7). Curlyleaf growth in the treated area was good. However, new curlyleaf growth had sprouted since April 7, 2025. Curlyleaf was growing in a number of locations, producing heavy growth at 13 individual sites and moderate growth at an additional 19 sites.

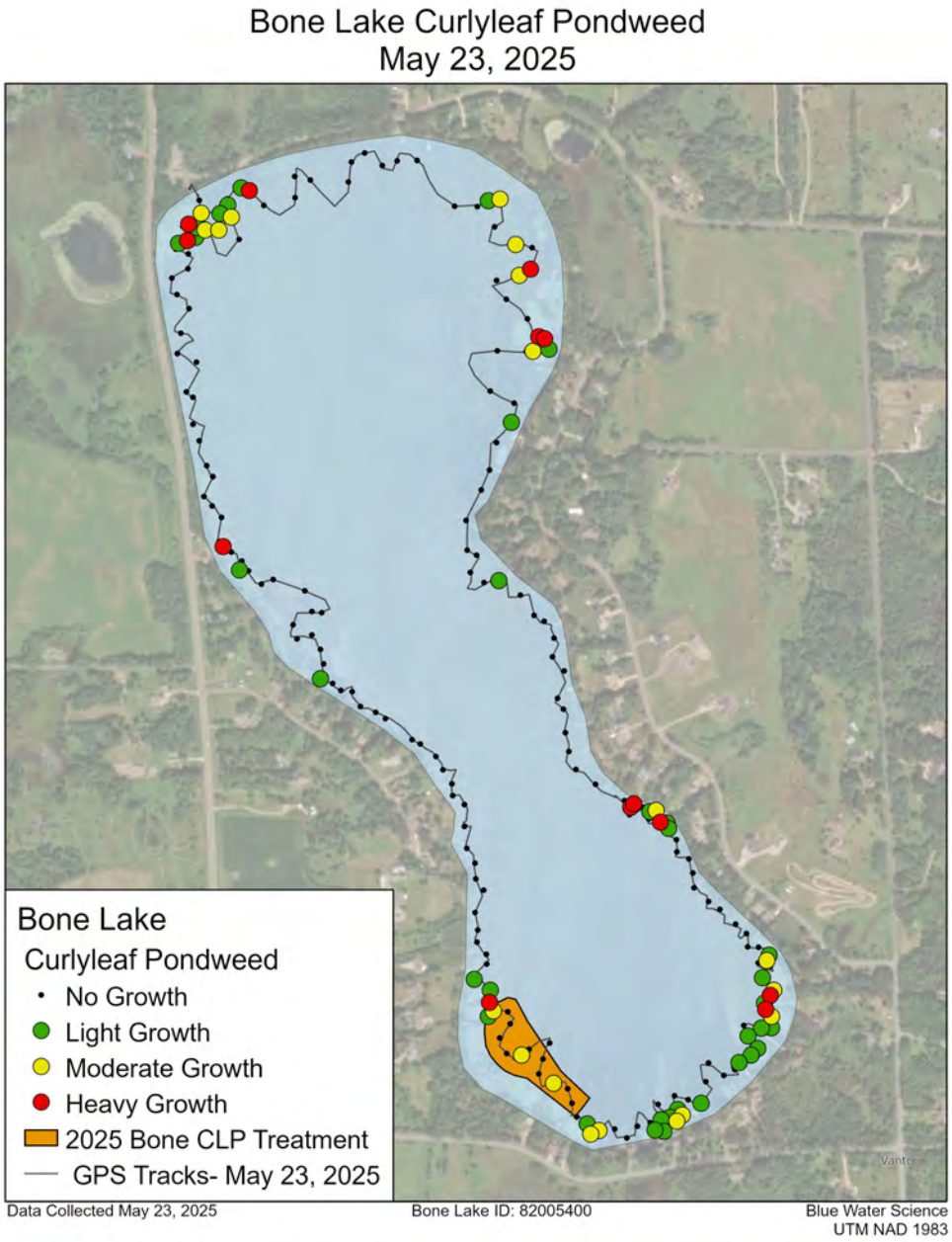


Figure 7. Curlyleaf growth in Bone Lake on May 23, 2025.
Key: black dot = no curlyleaf growth, green dot = light growth, yellow dot = moderate growth, and red dot = heavy growth.

Eurasian Watermilfoil Delineation on May 23, 2025

An EWM delineation was conducted on May 23, 2025. Eurasian watermilfoil was sampled at 17 sites out of 212 sites sampled and had mostly light growth (Figure 8).

No treatment areas were delineated for 2025.

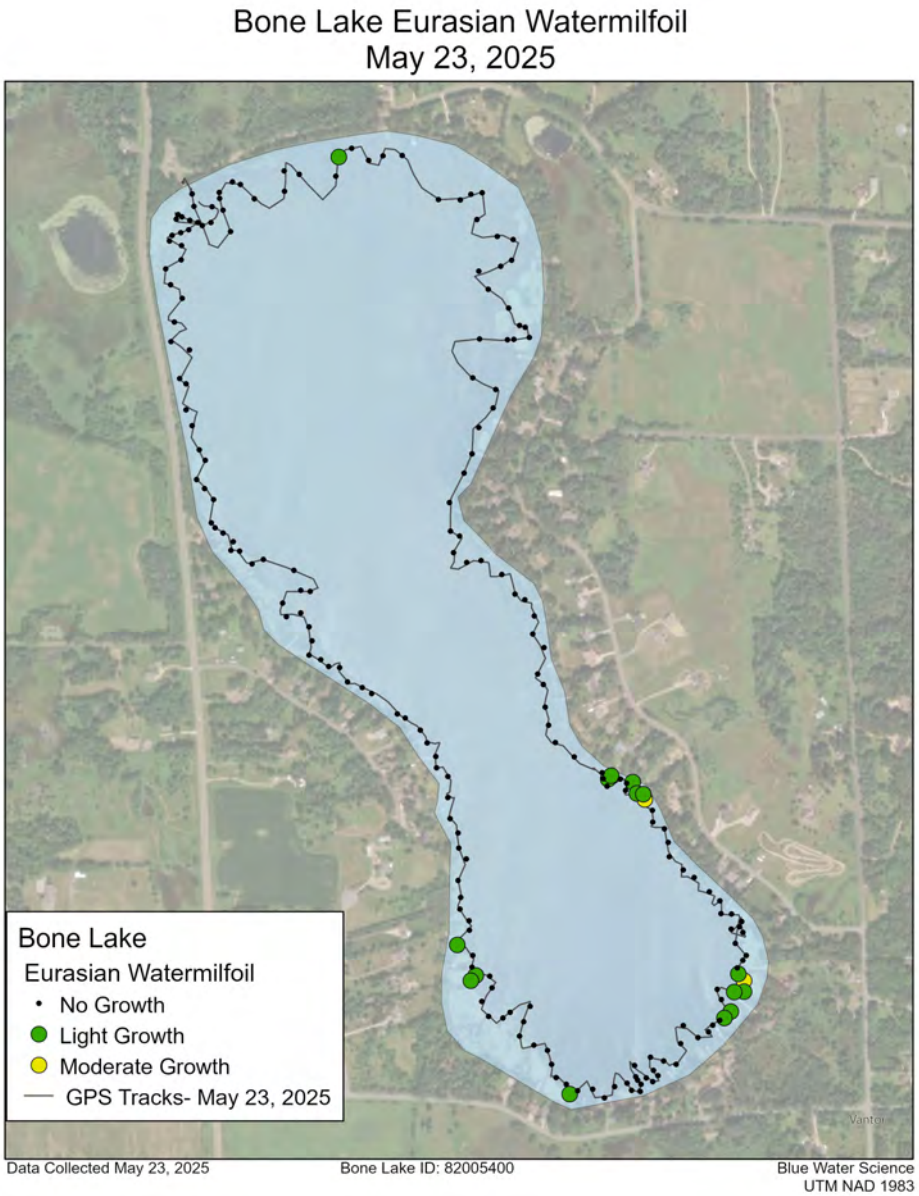


Figure 8. Eurasian watermilfoil coverage for Bone Lake on May 23, 2025.
Key: black dot = no growth, green dots = light growth, and yellow dots = moderate growth.

Late Summer Meandering Survey July 28, 2025

The late summer GPS meander survey found EWM growth at 25 sites producing light growth. Eurasian watermilfoil was sparse and scattered and growing at single stem densities. Several other aquatic plant species were noted in the survey including coontail, naiad, sago, and stringy pondweed.

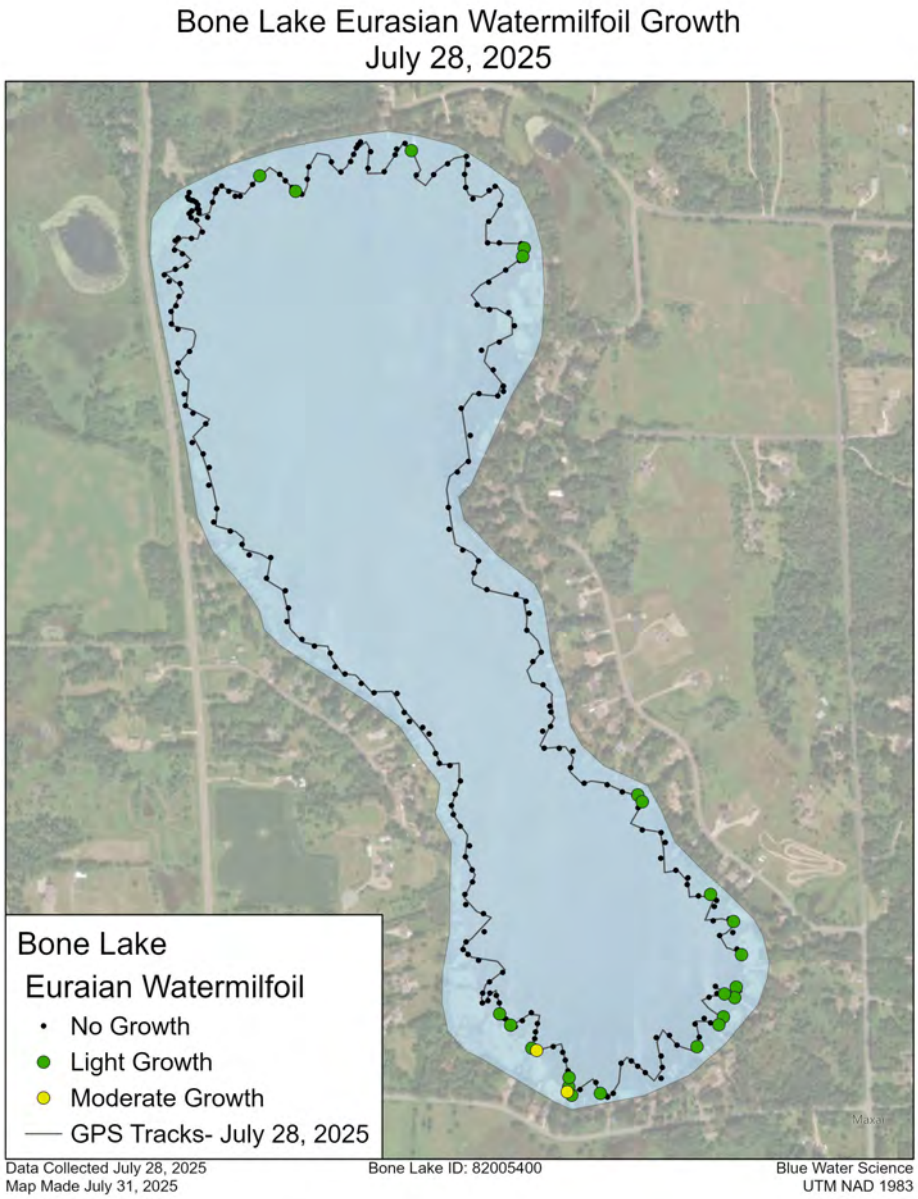


Figure 9. Eurasian watermilfoil coverage for Bone Lake on July 28, 2025.
Key: black dot = no growth, green dots = light growth, and yellow dots = moderate growth.

APPENDIX

Curlyleaf Pondweed and Eurasian Watermilfoil Assessments From 2014 - 2025

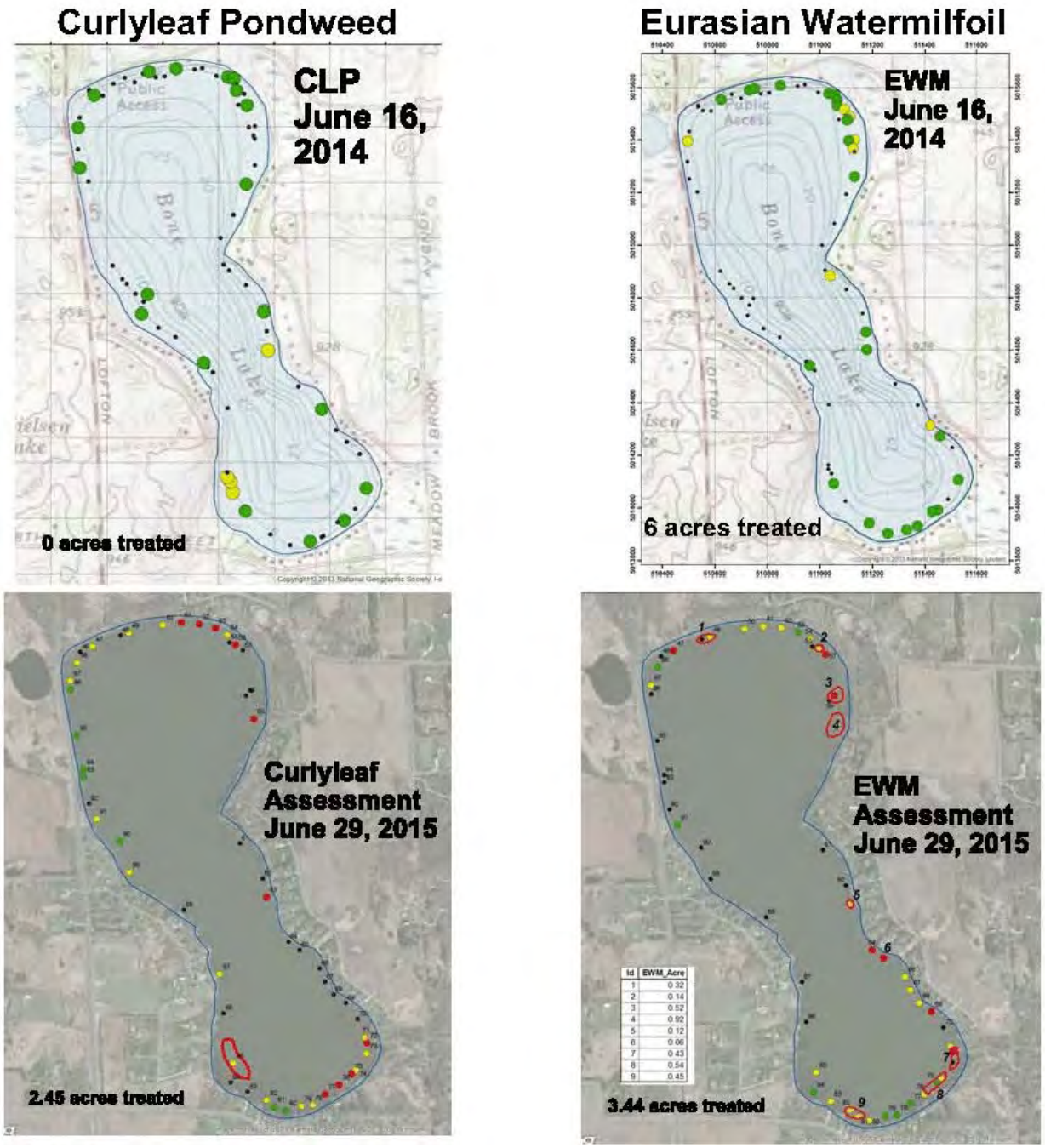
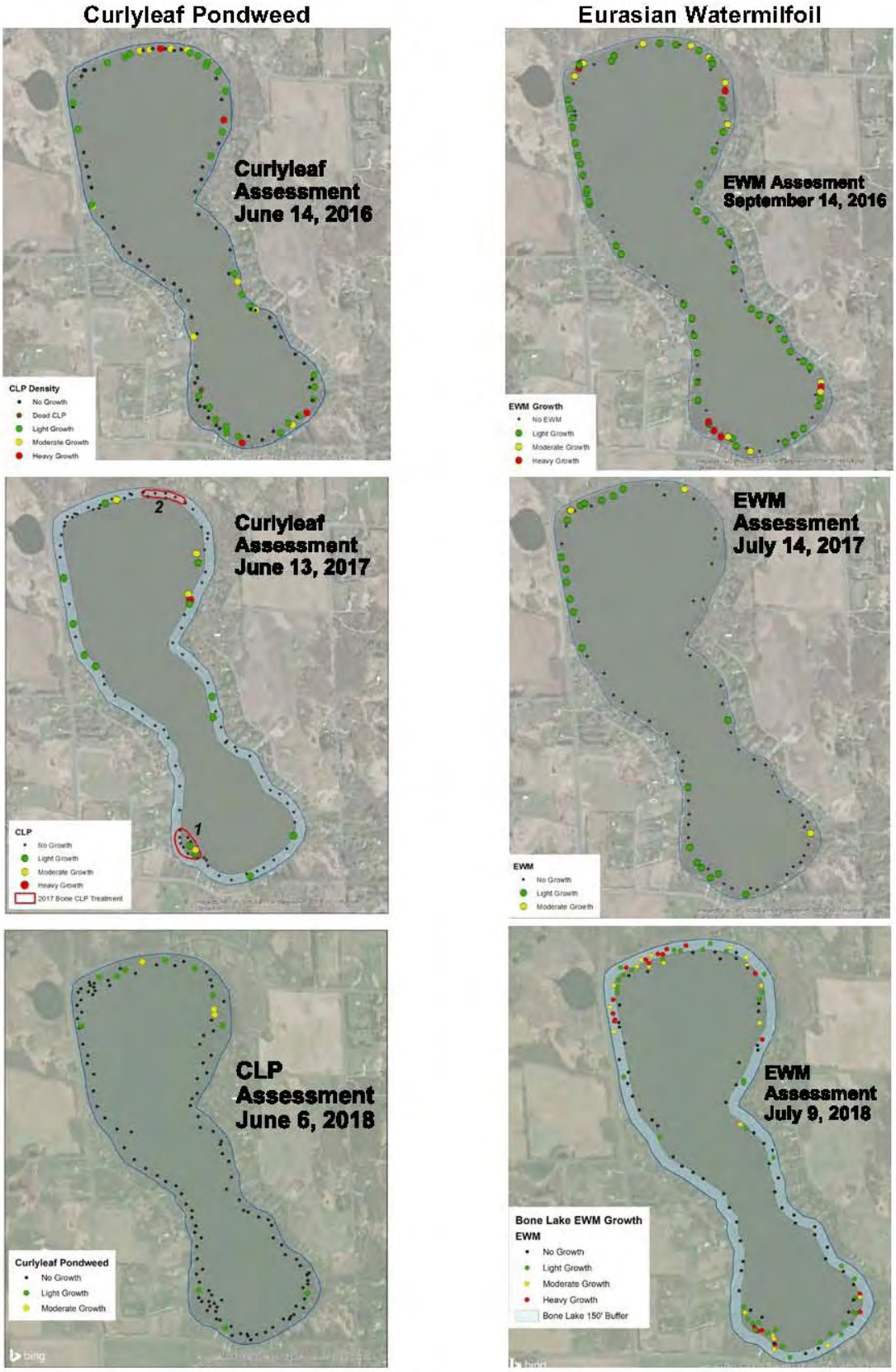
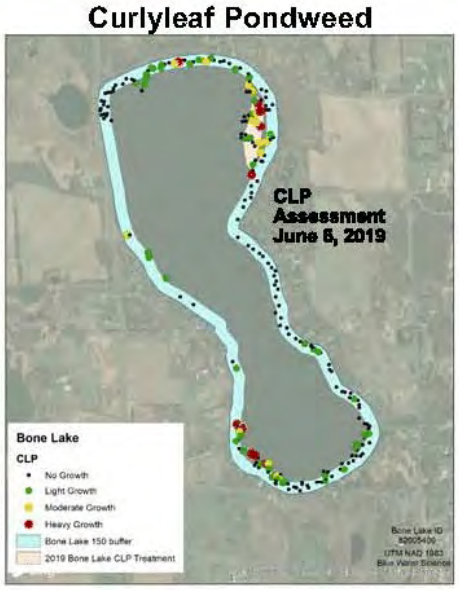
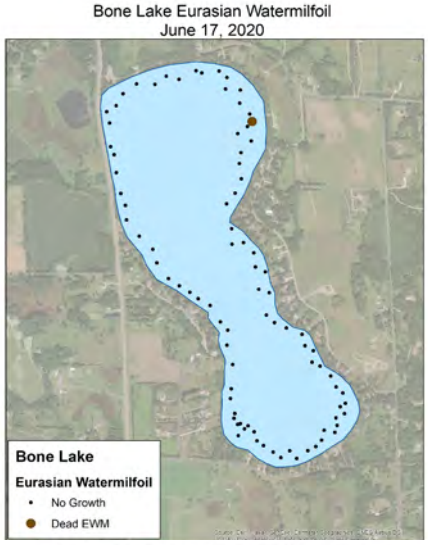


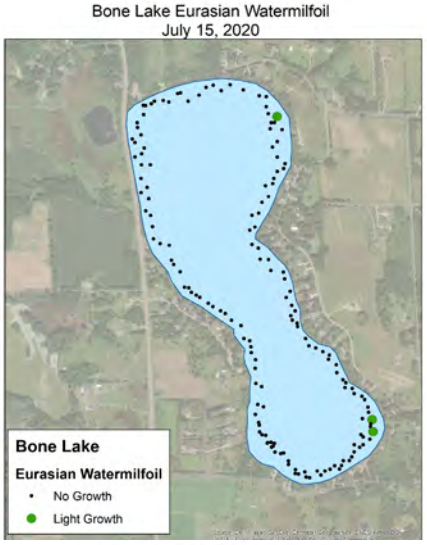
Figure 10. CLP and EWM maps for 2014 through 2024 (continued on the next few pages).

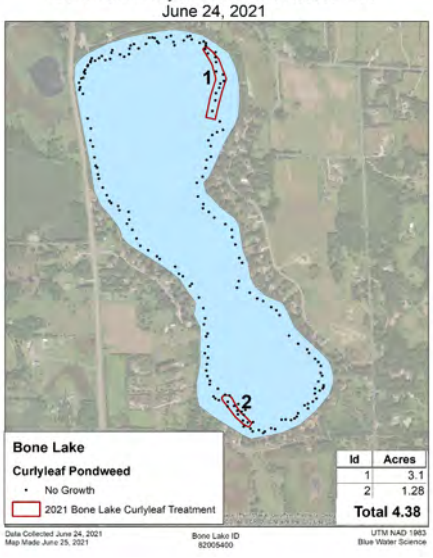


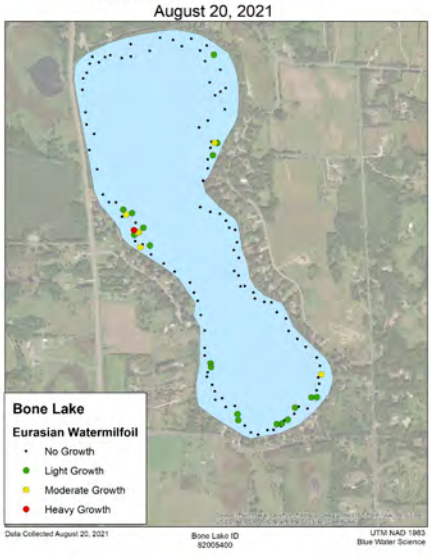
CLP and EWM maps for 2014 through 2024.











CLP and EWM maps for 2014 through 2024.

Curlyleaf Pondweed **Eurasian Watermilfoil**

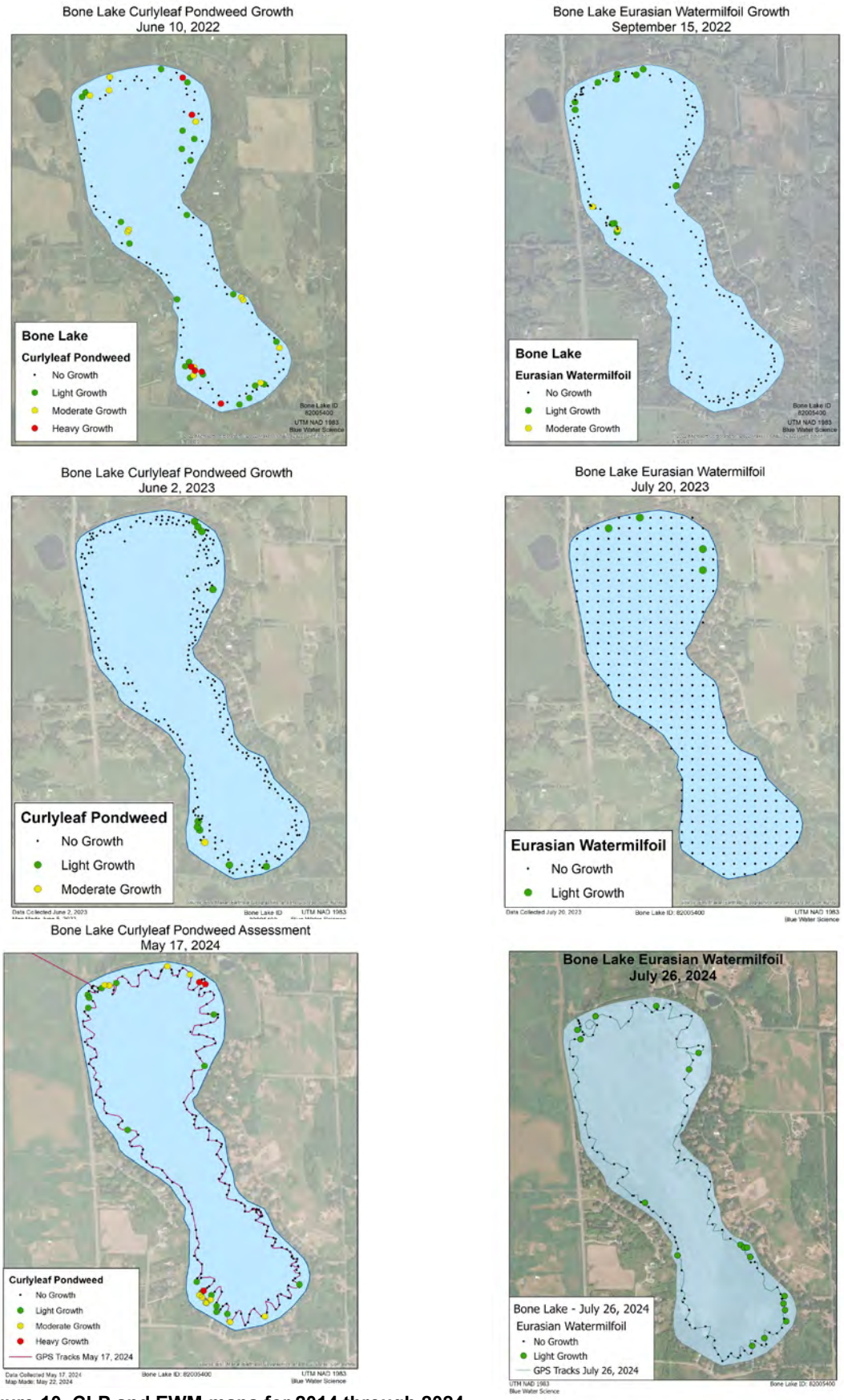
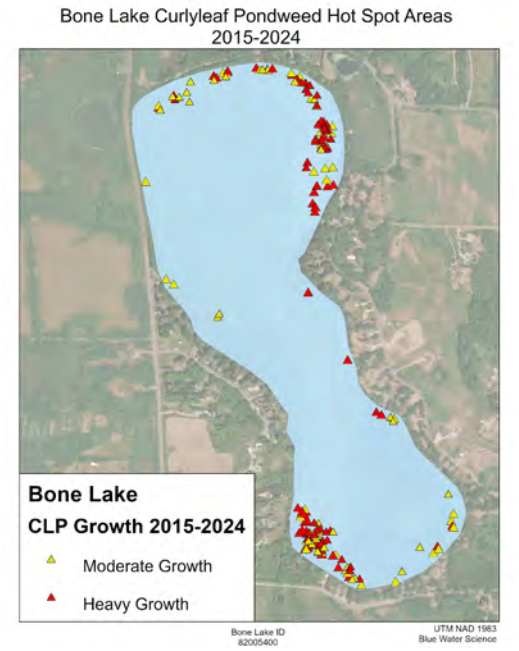
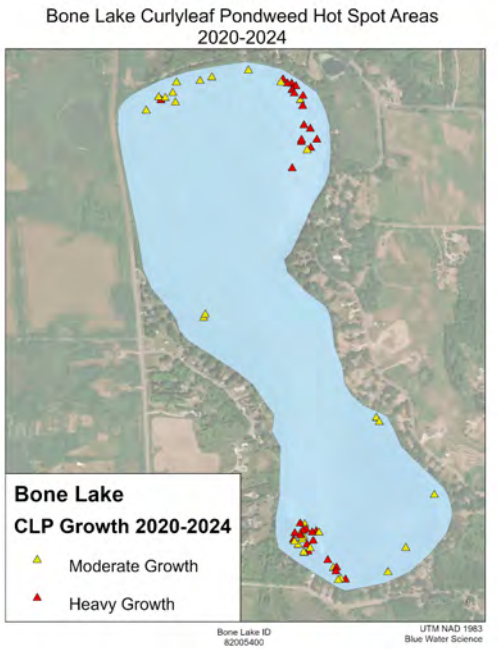


Figure 10. CLP and EWM maps for 2014 through 2024.

Curlyleaf Pondweed from 2015 - 2024

A summary of CLP hotspots from 2015 through 2024 is shown below (Figure 11). 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 from 2020-2024 show CLP still present in the hotspot areas, but not expanding. 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 moderate plant growth. CLP has typically grown to a water depth of 6 feet or less.





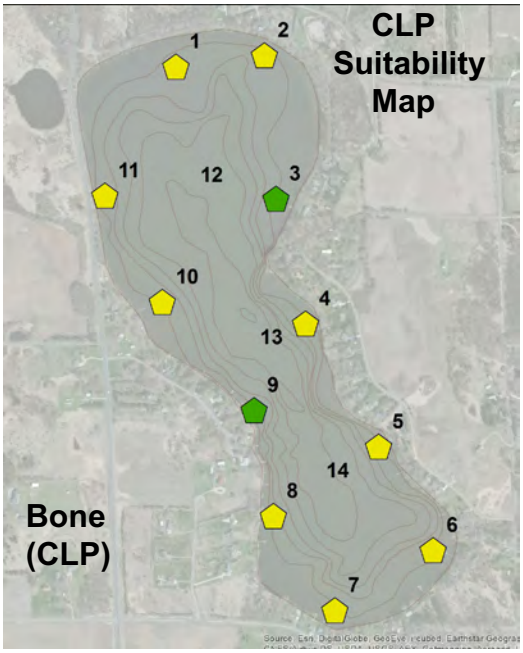


Figure 11. [top-left] Bone Lake CLP hotspot map 2015-2024. [top-right] Treatment map of CLP growth over the years of 2020-2024 placed on a single map. [bottom-left] Curlyleaf pondweed potential growth based on lake sediment analyses for Bone Lake. Key for Potential Growth: green = light growth, yellow = moderate growth, red = heavy growth (shown with octagons).

Eurasian Watermilfoil from 2015 - 2024

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 2024 is shown below (Figure 12). Some nearshore areas in the north and south ends of Bone Lake support consistently significant growth. However, EWM growth has been less abundant from 2020-2024 (Figure 12).

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.

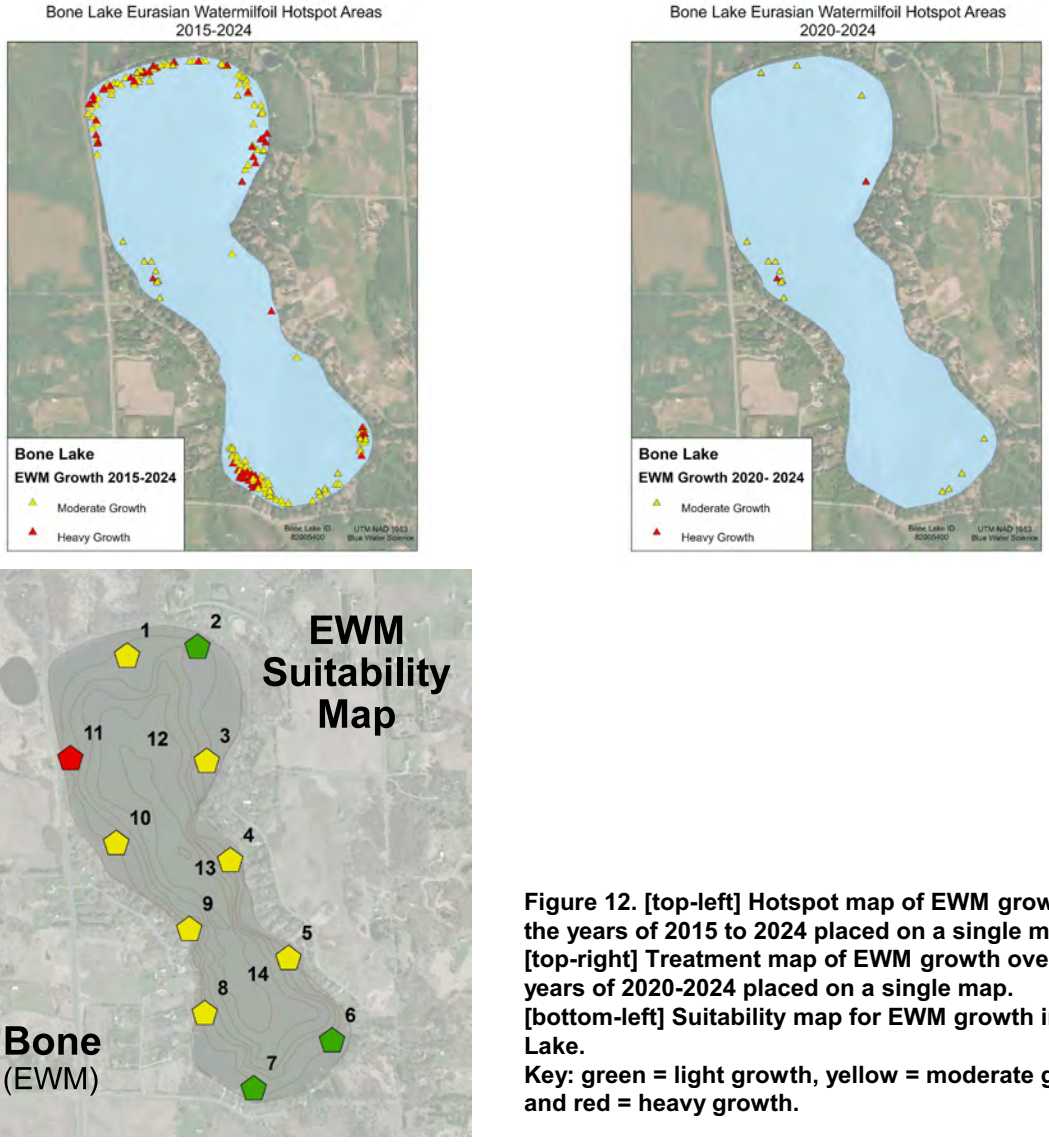


Figure 12. [top-left] Hotspot map of EWM growth over the years of 2015 to 2024 placed on a single map. [top-right] Treatment map of EWM growth over the years of 2020-2024 placed on a single map. [bottom-left] Suitability map for EWM growth in Bone Lake.
Key: green = light growth, yellow = moderate growth, and red = heavy growth.

Water Lilies in Comfort Lake, July 28, 2025

Curlyleaf Pondweed and Eurasian Watermilfoil Management for Comfort Lake, Chisago Co, 2025

	Delineation	Treatment	Assessment
CLP	April 8, 2025	No CLP Treatment	May 23, 2025
EWM	May 23, 2025	No EWM Treatment	July 28, 2025

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

December 4, 2025

Prepared by:
Steve McComas
Jo Stuckert
Connor McComas
Blue Water Science
St. Paul, MN 55116

Curlyleaf Pondweed and Eurasian Watermilfoil Management for Comfort Lake, Chisago County, 2025

Summary

Three GPS meander surveys were conducted in Comfort Lake in 2025 to delineate and assess curlyleaf pondweed (CLP) and Eurasian watermilfoil (EWM). On April 8, 2025 the spring survey to delineated CLP, then on May 23, 2025 the second survey was used to assessment CLP and to delineate EWM. The final survey on July 28, 2025 was to assess EWM.

Curlyleaf Pondweed Delineation and Assessment Surveys: A meander CLP survey was conducted on April 8, 2025 to characterize the status of CLP. A total of 198 sites were sampled and CLP was observed in 4 sites out to 6 feet of water depth (Figure 1). No treatment was recommended for 2025.

On May 23, 2025, a follow-up CLP assessment was conducted using a meander survey. Curlyleaf was found at a total of 68 sites in the assessment. Curlyleaf had sprouted in a number of sites since the April 8 survey. However, curlyleaf pondweed growth was mostly light and with scattered growth (Figure 1).

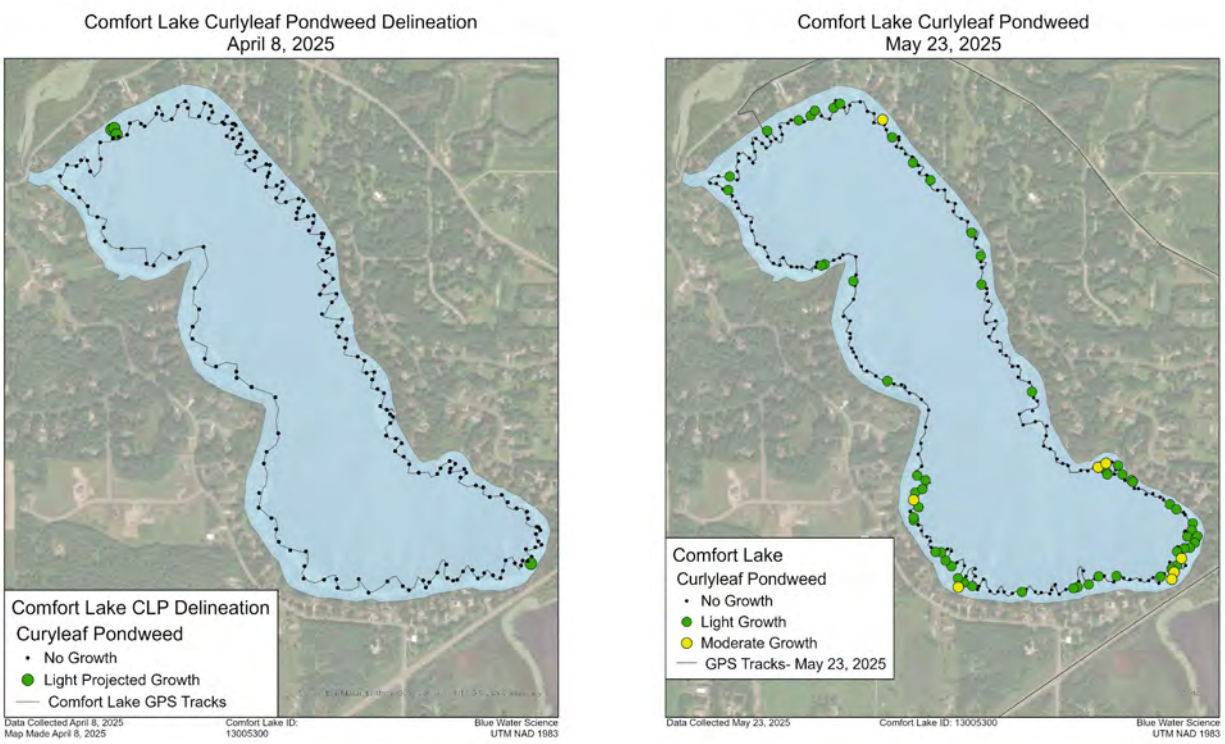


Figure 1. [left] DELINEATION: Map of curlyleaf pondweed distribution from the April 8, 2025 meander survey. [right] ASSESSMENT: Map of curlyleaf pondweed assessment sites for the May 23, 2025 meander survey. Key: black dots = no curlyleaf growth, green dots = light growth, and yellow dots = moderate growth.

Eurasian Watermilfoil Delineation and Assessment Surveys: A whole lake EWM treatment using Fluridone was conducted on June 22, 2022. In 2023, one EWM spot-treatment was conducted on 2.77 acres of EWM in August on Comfort Lake. Surveys in 2024 did not find enough EWM to treat.

In 2025, a Eurasian watermilfoil delineation was conducted on May 23, 2025. A total of 42 sites out of 268 sites sampled had EWM. However, the EWM was found at light to moderate growth and did not pose a recreational nor ecological problem (Figure 2). No open water treatment was conducted.

On July 24, 2025, an assessment survey was conducted and EWM was present at 46 sites with mostly light to moderate growth. The EWM was not a recreational nor an ecological problem and very little surface matting was observed.

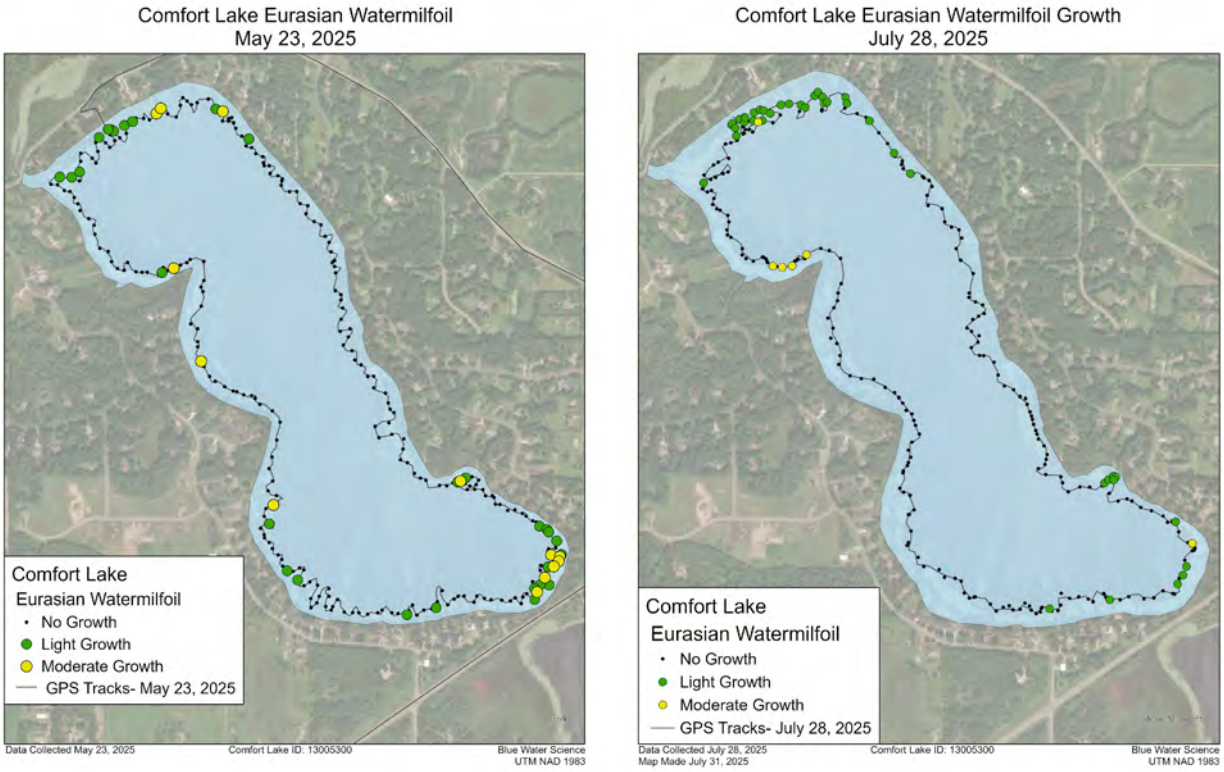


Figure 2. [left] DELINEATION: Map of EWM distribution from the May 23, 2025 survey. EWM was found at 42 sites.
[right] ASSESSMENT: Map of a meander survey on July 28, 2025. EWM was found at 46 sites.

Summary of CLP and EWM Observations.
Number of CLP and EWM observations for the meander surveys. The number in parenthesis is the total number of samples.

	Curlyleaf Pondweed	Eurasian Watermilfoil
April 8, 2025	4 (198)	0 (198)
May 23, 2025	68 (268)	42 (268)
July 28, 2025	5 (269)	46 (269)

Curlyleaf Pondweed and Eurasian Watermilfoil Treatments from 2014 Through 2025: A summary of CLP and EWM treatments from 2014-2025 is shown in Figure 3. Curlyleaf was only treated at 1 acre in 2015 and at 9.45 ac in 2024. 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 from 2018 to 2021 in nearshore areas by the Comfort Lake Association. On June 22, 2022 a whole lake fluridone treatment of 218 acres was conducted and on September 19, 2023 two areas totaling 2.77 acres were treated. There was no EWM treatment in 2024 and 2025.

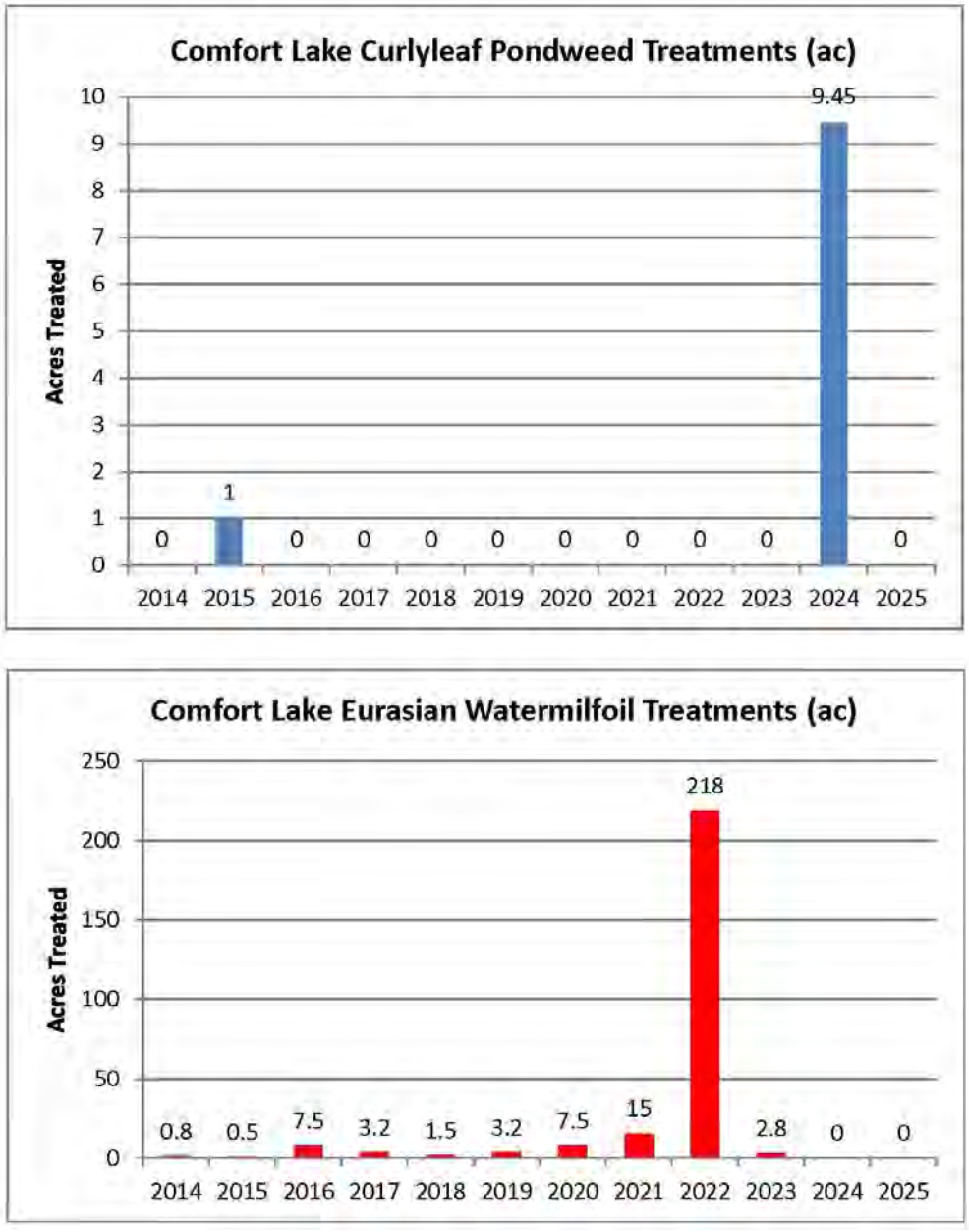


Figure 3. CLFLWD Sponsored Treatments with blue bars and Comfort Lake Association sponsored treatments with red bars: [top] Curlyleaf pondweed treated in 2014-2025. [bottom] Eurasian watermilfoil treated in 2014-2025 (2018 is estimated based on individual permits and 2019, 2020, and 2021 treatments were by the Comfort Lake Association). A full lake fluridone treatment was conducted in 2022. An EWM treatment of 2.77 acres occurred in 2023.

Curlyleaf Pondweed and Eurasian Watermilfoil Management for Comfort Lake, Chisago Co, 2025

ID: 13005300
Size: 217.82 acres (MnDNR)
Littoral Area: 90 acres (MnDNR)
Mean depth: 21 feet (MnDNR)
Maximum depth: 47 feet (MnDNR)

Introduction

Curlyleaf pondweed (CLP) and Eurasian watermilfoil (EWM) have been managed in Comfort Lake since at least 2014. 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 chemically treat if necessary and then after treatment, assess the effectiveness of the treatment.

Methods

Curlyleaf Pondweed Delineation Method for Projected Growth: At the time of the spring curlyleaf delineation on April 8 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 CLP 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)*.

*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

Aquatic Plant Density Rating: Aquatic plant densities were evaluated based on rake fullness with a scale of 1, 2, or 3 for light, moderate, or heavy density (Figure 4).

Curlyleaf Assessment and Eurasian Watermilfoil Delineation and Assessment Sampling: An initial EWM delineation along with a CLP assessment were conducted on May 23 and 268 sites were sampled. On July 28 an EWM assessment was conducted and the entire perimeter of the lake was checked for CLP and EWM.

Chart of Aquatic Plant Density Ratings

Figure 4. Aquatic plant density ratings from 1 to 3.

Curlyleaf Pondweed Delineation, April 8, 2025

A curlyleaf delineation was conducted using a meander rake sampling survey on April 8, 2025 and 198 sites were examined. Curlyleaf was found at 4 sites in Comfort Lake (Figure 5). No treatment was recommended.

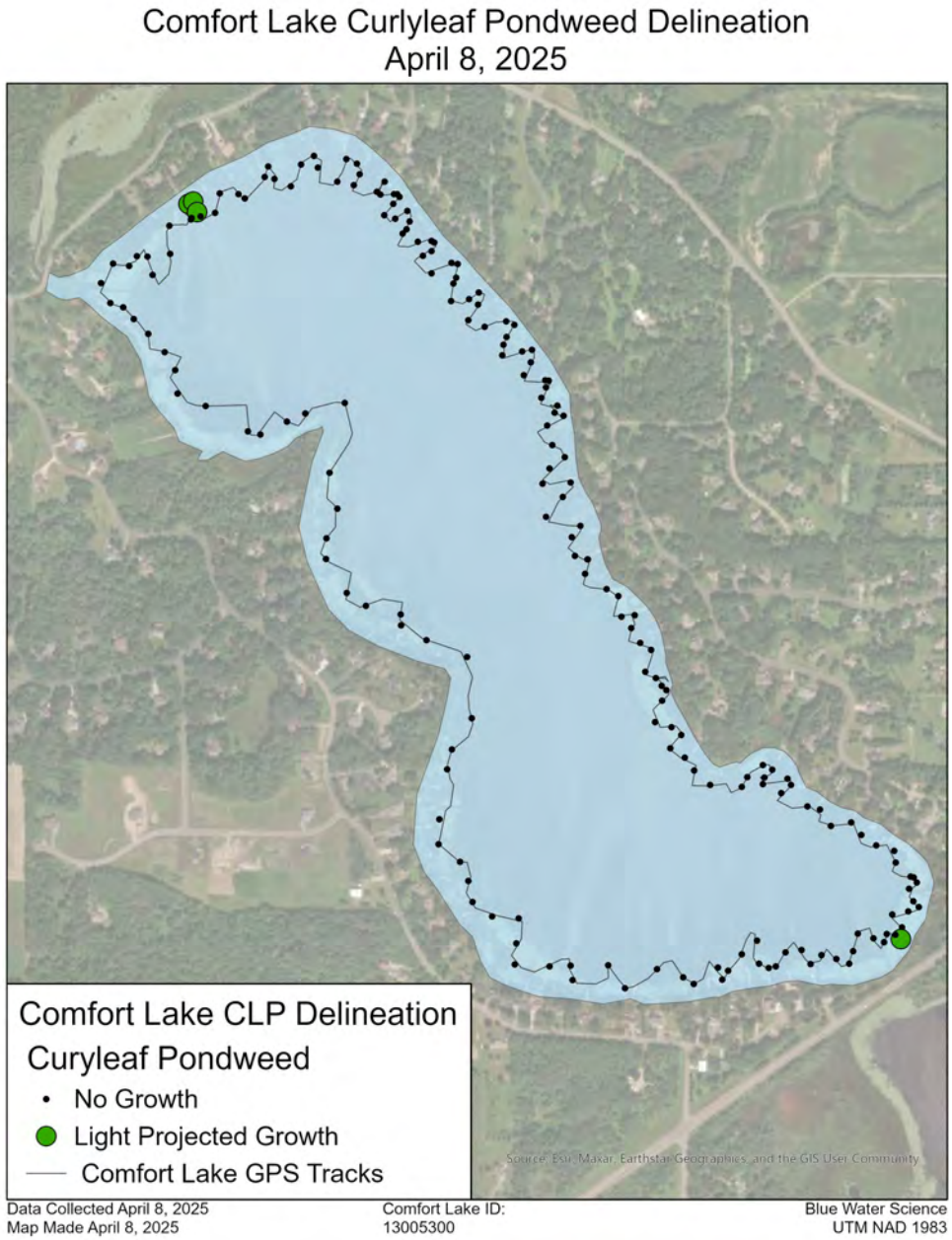


Figure 5. DELINEATION: Map of curlyleaf pondweed distribution from the April 8, 2025 meander survey. Key: black dots = sample locations and green dot = light growth potential.

Curlyleaf Pondweed Assessment, May 23, 2025

A curlyleaf assessment occurred on May 23, 2025 using a GPS meander survey. A total of 268 sites were sampled and curlyleaf was found at 68 sample sites. Curlyleaf growth was mostly light and scattered (Figure 6). It appears CLP sprouted in a number of sites after the April 8, 2025 delineation. The CLP growth did not produce a navigational nor ecological problem.

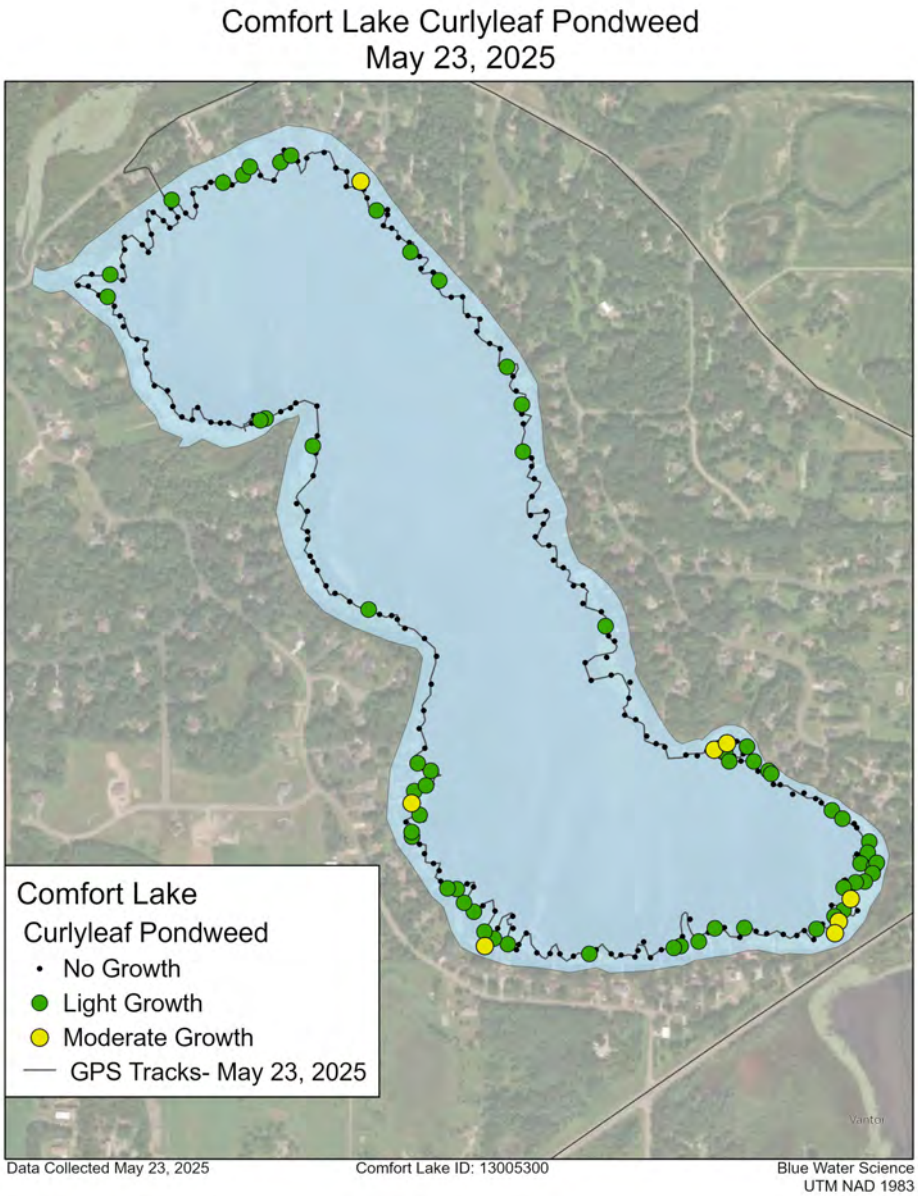


Figure 6. ASSESSMENT: Map of curlyleaf pondweed assessment sites for May 23, 2025. Key: black dots = no curlyleaf growth, green dots = light growth, and yellow dots = moderate growth.

Eurasian Watermilfoil Delineation, May 23, 2025

An initial EWM delineation was conducted using a GPS meander rake sampling survey on April 8, 2025 and 198 sites were examined. EWM was not found in Comfort Lake on April 8, 2025.

On May 23, 2025, an EWM delineation survey using a GPS meander survey found EWM at 42 sample sites out of the 268 sites (Figure 7). Although EWM was common, EWM growth was found to be light and producing single stems when present. No lake-wide EWM treatment was conducted in 2025.

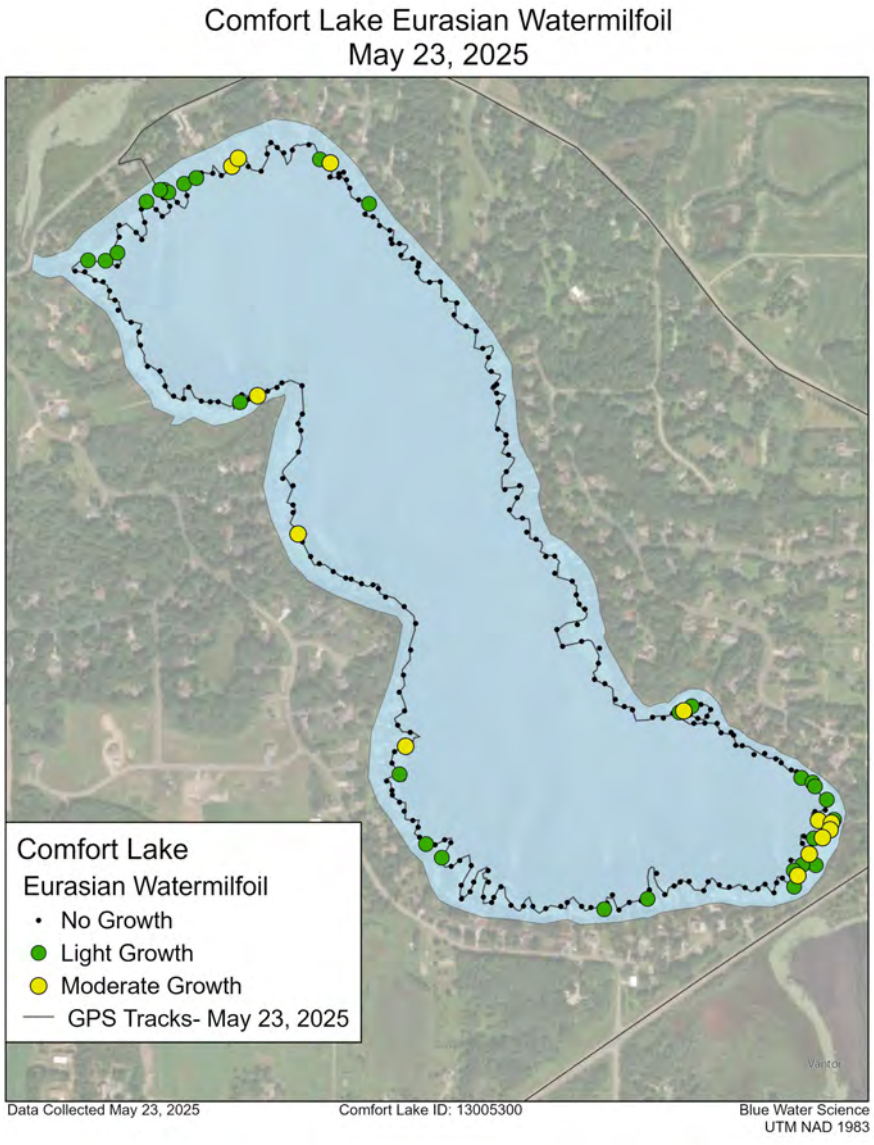


Figure 7. ASSESSMENT: Map of EWM distribution from the May 23, 2025 (left) survey. EWM was sampled at 42 sites.

Eurasian Watermilfoil Assessment, July 28, 2025

On July 28, 2025, an EWM assessment survey using a meander survey found mostly light growth of EWM at 46 sample sites out of the 269 sites (Figure 8). The EWM growth was typically single, unbranched stems, with very little surface matting.

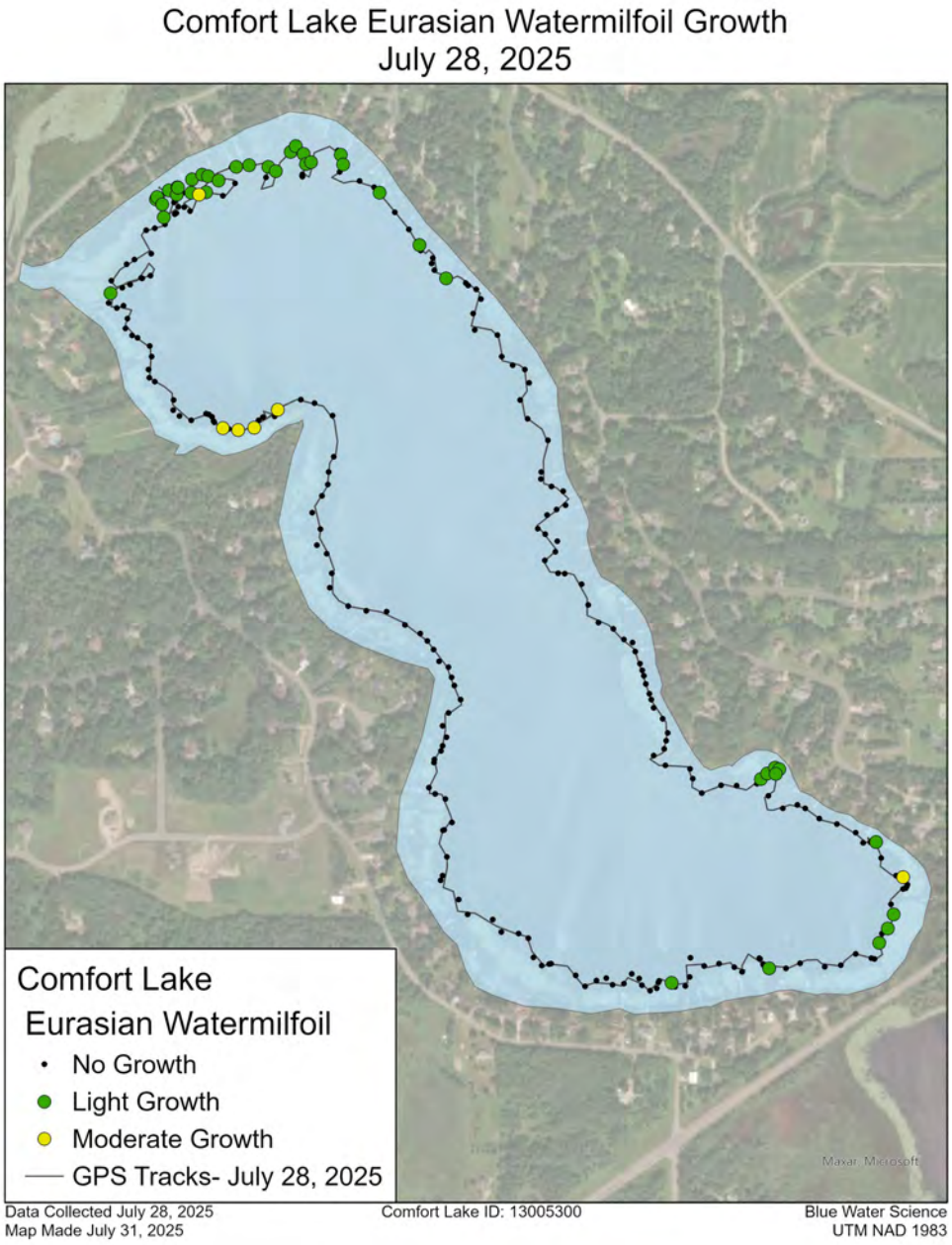


Figure 8. ASSESSMENT: Map of EWM distribution from the July 28, 2025 survey. EWM was sampled at 46 sites at light growth.

Summary of Plant Surveys from 2019-2025

Results of aquatic plant occurrence for surveys from 2019-2025 are shown in Table 1. A whole lake fluridone herbicide treatment was conduced on June 22, 2022. The results of the September 2022 point intercept survey which reflects the impact of the fluridone treatment showed a significant decrease in EWM. Several other aquatic plant species also decreased in occurrence in September of 2022 compared to the June 10, 2022 point intercept survey.

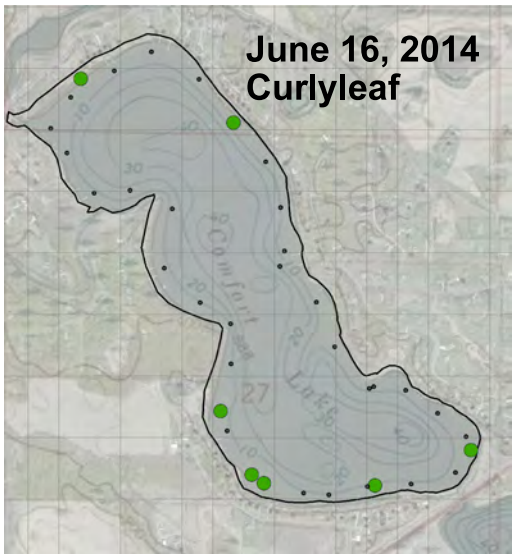
However, a point intercept survey conducted on June 2, 2023 showed a decrease in EWM compared to June 10, 2022 and found an increase in submerged aquatic plants compared to the September 15, 2022 survey. Eurasian watermilfoil was found in 1 sample site on June 2, 2023 point intercept survey growing at light conditions. The fluridone treatment reduced EWM in 2022 and through July of 2024. However, the distribution of EWM increased in 2025. Future surveys will track EWM occurrences. Table 1 shows both point intercept data as well as GPS meander survey data targeting non-native aquatic plant species.

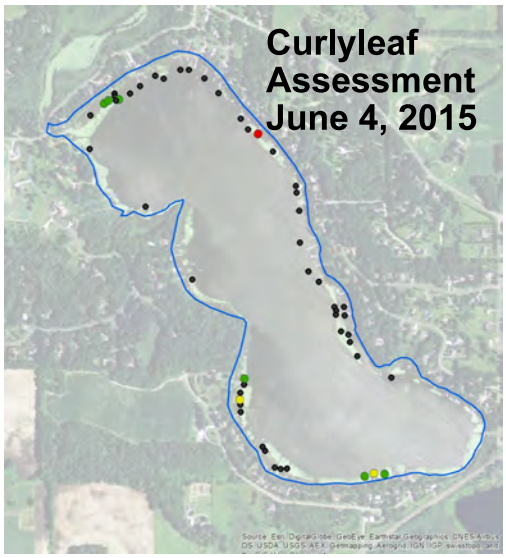
Table 1. Comfort Lake aquatic plant occurrences for point intercept surveys in 2019, 2021, 2022, and 2023 based on 180 sample sites for each of the surveys (blue shading). Meander surveys are shown with yellow shading. No point intercept surveys were conducted in 2024 or 2025. Meander surveys are typically used to track aquatic invasive species and only recorded CLP or EWM occurrences while the point-intercept surveys track all aquatic plant species on an established grid.

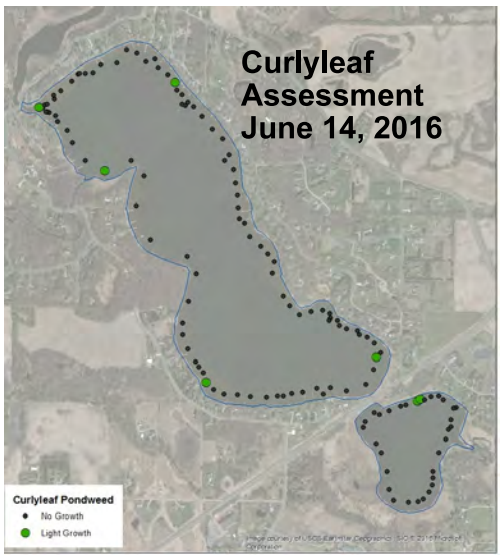
	Aug 28, 2019 PI	June 17, 2020 Meander	June 24, 2021 Meander	Aug 20, 2021 PI	June 10, 2022 PI	Sept 15, 2022 PI	June 2, 2023 PI	May 17, 2024 Meander	July 26, 2024 Meander	May 23, 2025 Meander	July 28, 2025 Meander
Bulrush (*Typha sp*)				4	2	1	2				
Spatterdock (*Nuphar advena*)	38	27	79	71	25	51	11				
White lilies (*Nymphaea odorata*)	21	7	8	8	36	19	50				
Cabbage (*Potamogeton amplifolius*)	4	2		8	3	2	13				
Chara (*Chara sp*)					18		5				
Coontail (*Ceratophyllum demersum*)	32	8		22	26	3	6				
Curlyleaf (*P. crispus*)		2	3	20	26		32	38		68	5
Elodea (*Elodea canadensis*)				2	16						
EWM (*Myriophyllum spicatum*)	36	58	50	118	35		1	1	11	42	46
Flatstem (*P. zosteriformis*)	7			3	9	1	7				
Illinois (*P. illinoensis*)	10			12	2						
Naiad (*Najas sp*)	1			2	7						
Narrowleaf (*P. sp*)							1				
NWM (*M. sibiricum*)					1						
Sago (*Stuckenia pectinata*)	1			2		2	7				
Stringy (*P. sp*)	1			7	10		29				
Water celery (*Vallisneria americana*)					1						
Water stargrass (*Heteranthera dubia*)	1						1				
Total number of species	11			13	15	7	13				

Previous CLP and EWM Delineation or Assessments

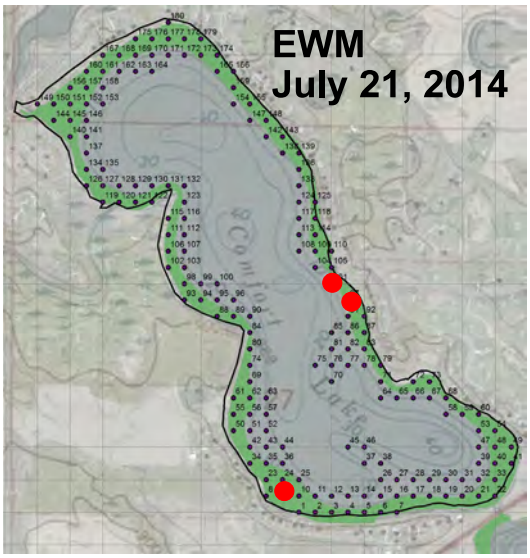
Curlyleaf Pondweed 2014-2025

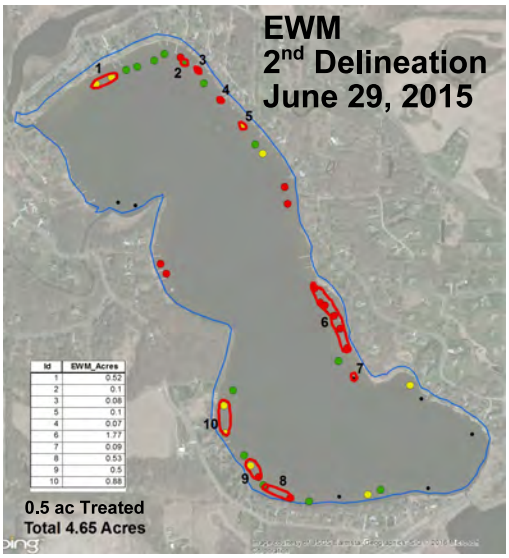


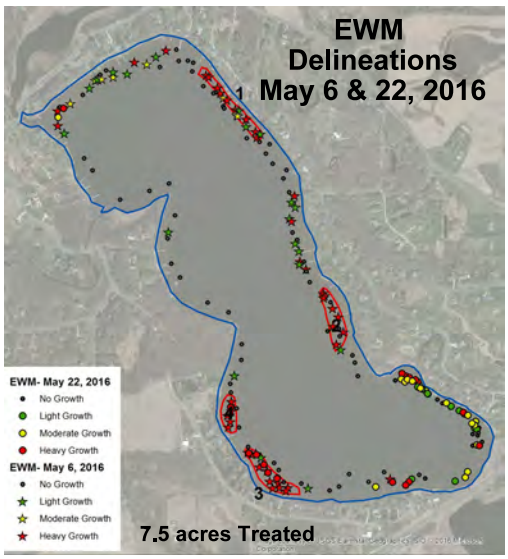




Eurasian Watermilfoil 2014-2025



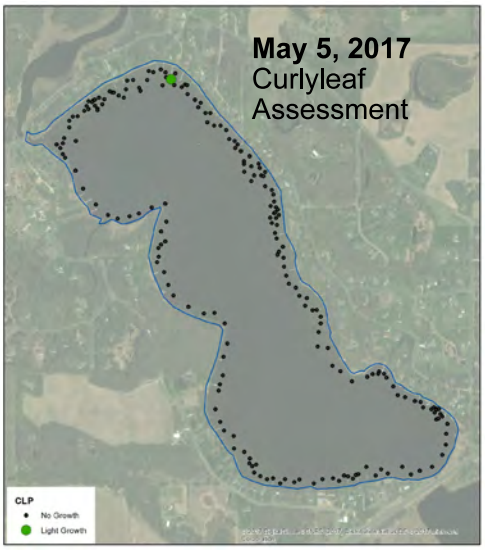


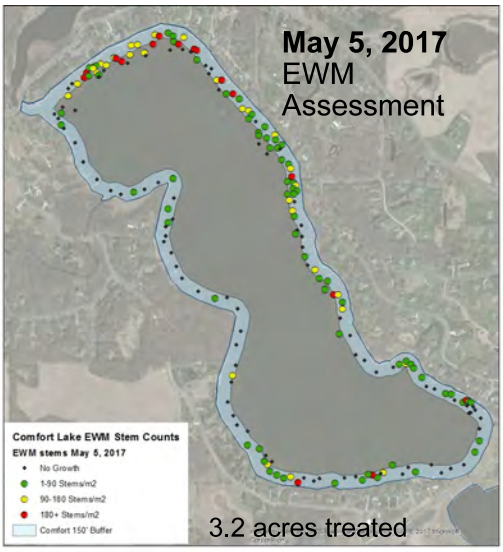


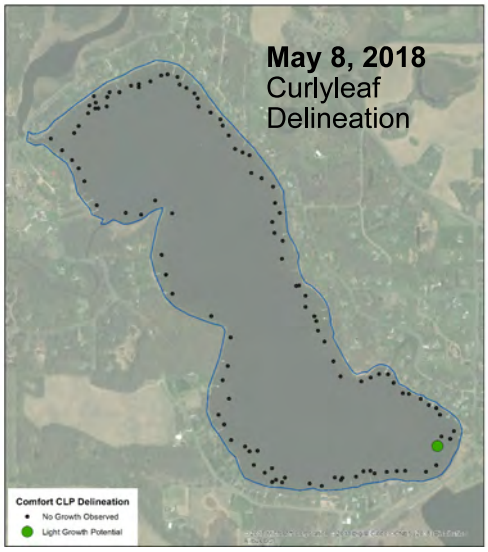
Curlyleaf pondweed and Eurasian watermilfoil maps for 2014 through 2025

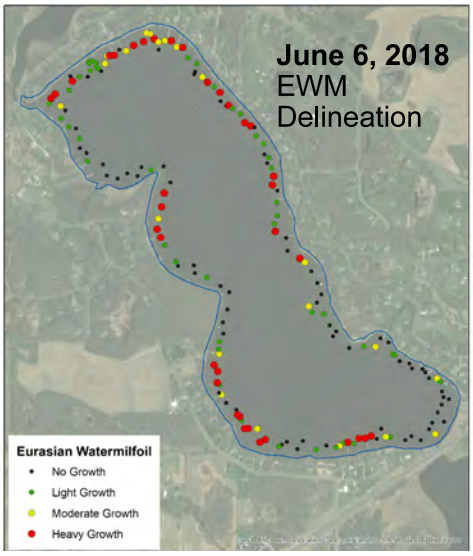
Curlyleaf Pondweed 2014-2025

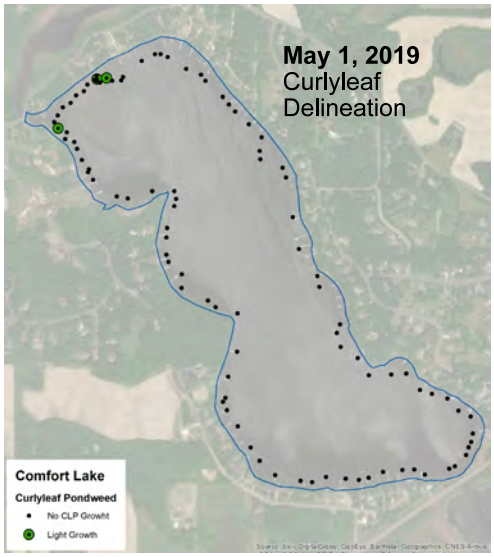
Eurasian Watermilfoil 2014-2025

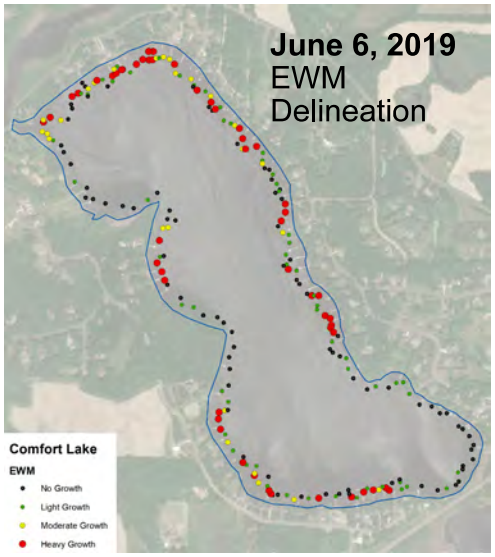








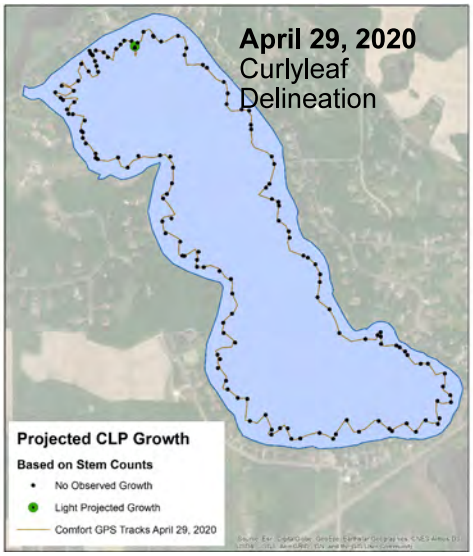


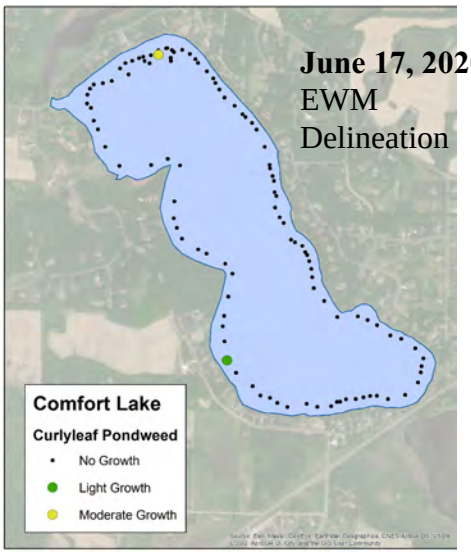


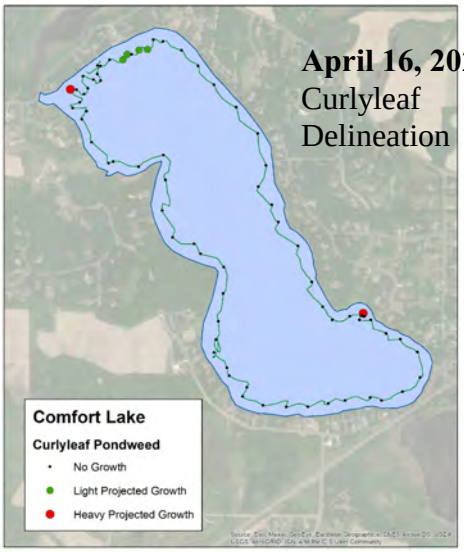
Curlyleaf pondweed and Eurasian watermilfoil maps for 2014 through 2025.

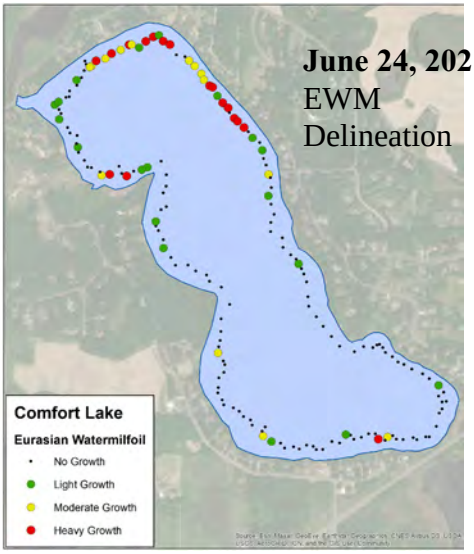
Curlyleaf Pondweed 2014-2025

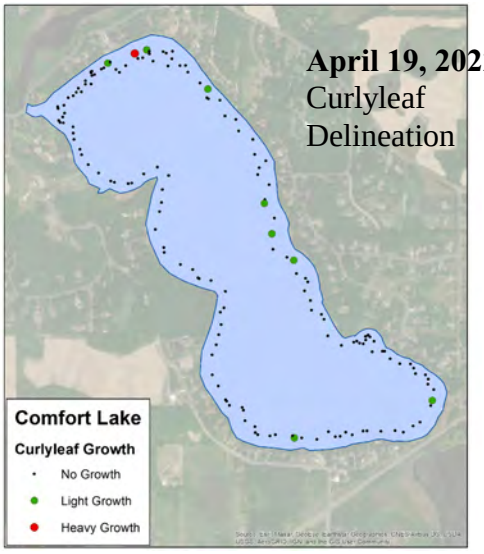
Eurasian Watermilfoil 2014-2025

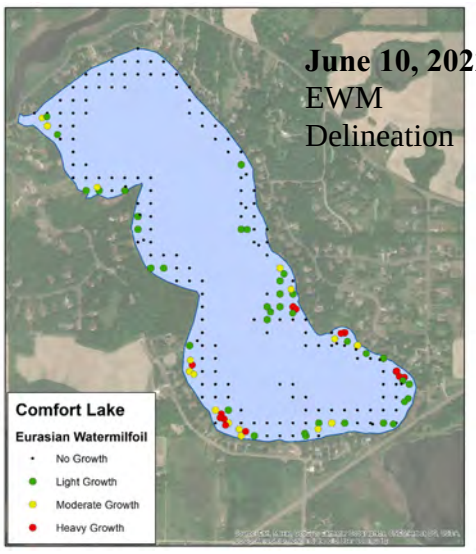










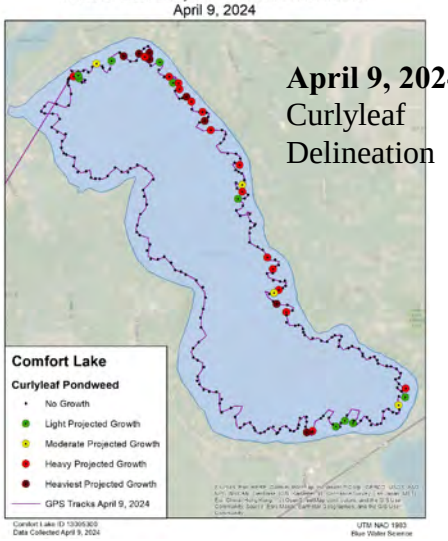


Curlyleaf pondweed and Eurasian watermilfoil maps for 2014 through 2025.

Curlyleaf Pondweed 2014-2025

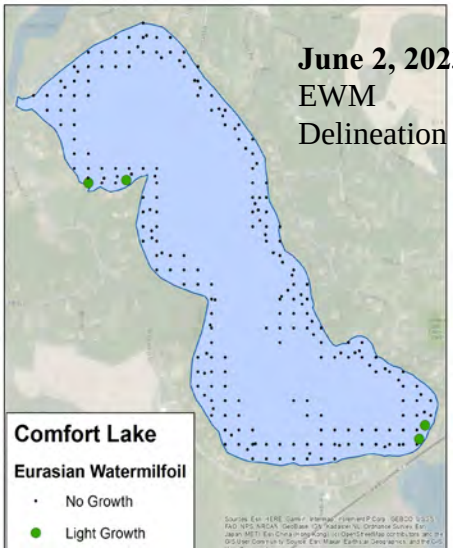
April 24, 2023
Curlyleaf
Delineation

Comfort Lake Curlyleaf Pondweed Delineation
April 9, 2024



April 9, 2024
Curlyleaf
Delineation

Eurasian Watermilfoil 2014-2025



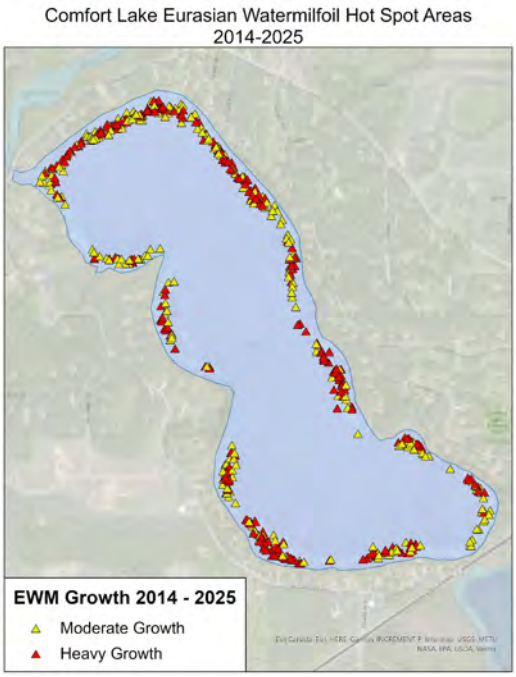
June 2, 2023
EWM
Delineation

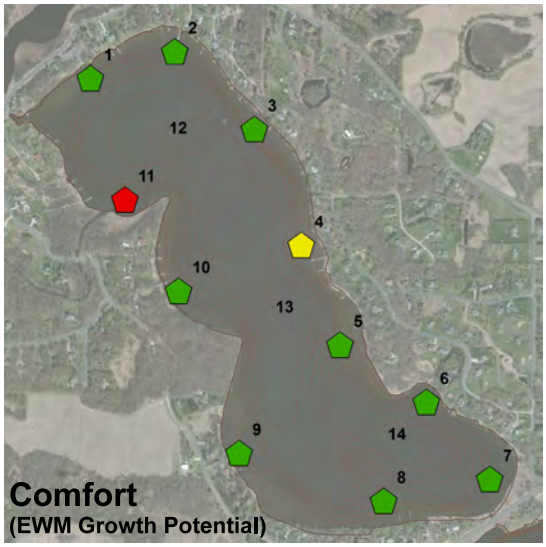
Comfort Lake Eurasian Watermilfoil Growth
May 17, 2024

May 17, 2025
EWM
Delineation

Curlyleaf pondweed and Eurasian watermilfoil maps for 2014 through 2025.

Milfoil Hotspots and Growth Potential in Comfort Lake: Eurasian watermilfoil was first observed in Comfort Lake in 2014. Areas of moderate and heavy growth of EWM for 2015 through 2025 are shown on the hotspot map in Figure 9. In the last couple of years EWM has nearly ringed the lake with growth (Figure 9). However lake sediment nitrogen concentrations collected in 2014 found mostly low nitrogen, except for 1 location near the Comfort Lake inlet (Figure 9). 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.





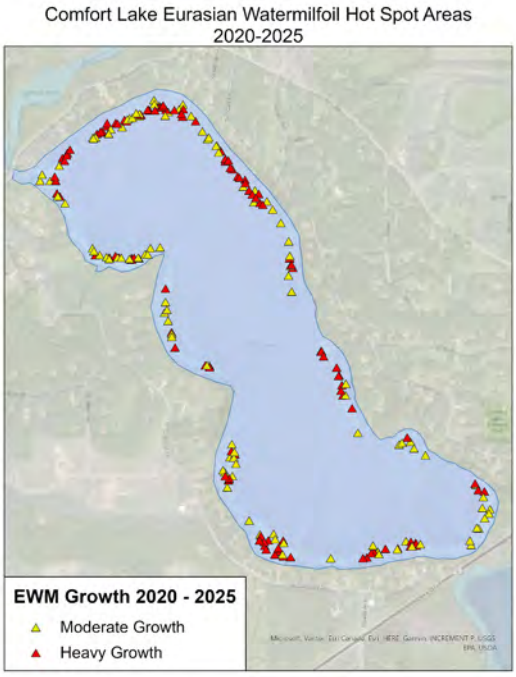


Figure 9. [top-left] EWM growth distribution and density for 2014-2025.
[top-right] EWM potential growth based on lake sediment analyses for Comfort Lake.
[bottom-left] EWM growth distribution and density for 2020-2025.
Key: green = light growth, yellow = moderate growth, and red = heavy growth.

Underwater View of Coontail in Little Comfort Lake, Chisago County, Minnesota, August 1, 2025

Meander Aquatic Plant Survey for Little Comfort Lake, Chisago Co, MN, 2025

Meander Survey: August 1, 2025

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

December 3, 2025

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

Meander Aquatic Plant Survey for Little Comfort Lake, Chisago Co, MN, 2025

Lake ID: 13-0054
Size: 36 acres
Littoral area: 16 acres
Maximum depth: 56 ft (at normal lake level)

In a meander survey with 55 sample sites on the 37 acre Little Comfort Lake on August 1, 2025, coontail, a native submerged aquatic plant, was the dominant plant (Figure 1). Curlyleaf pondweed (at one site) and Eurasian watermilfoil (sampled at 2 sites)(both non-native submerged aquatic plants) were found at light densities.

Aquatic plant maps for the dominant floatingleaf species which were white water lilies (Figure 2), the dominant submerged plant species (coontail) (Figure 3), and a non-native species, Eurasian watermilfoil (Figure 4) are found on the following pages.

Figure 1. Heavy coontail growth and water lilies were the dominant aquatic plants in Little Comfort Lake in 2025.

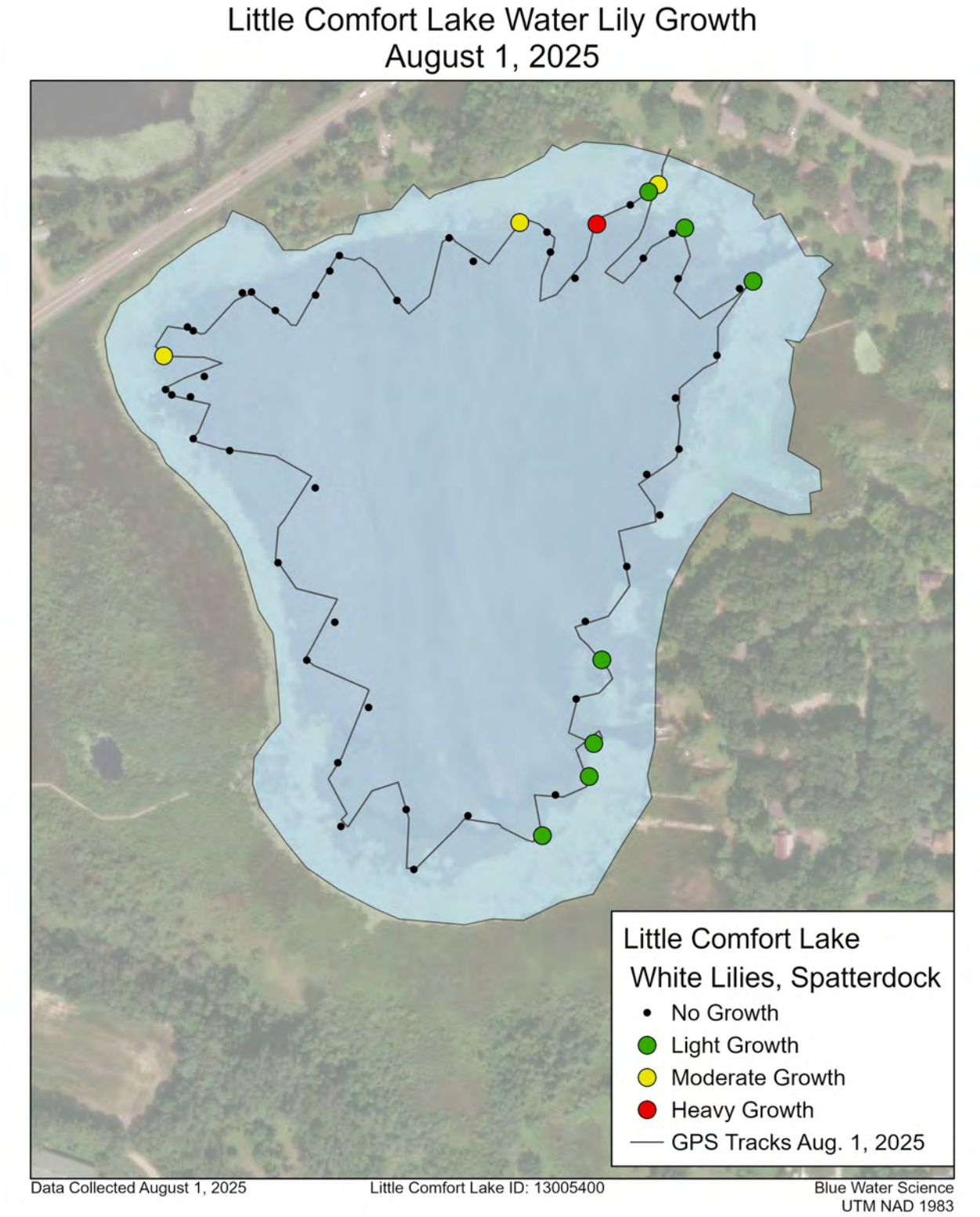


Figure 2. White water lilies were the dominant floatingleaf plant in Little Comfort Lake on August 1, 2025. Growth was observed primarily on the east side of the lake in 2025.

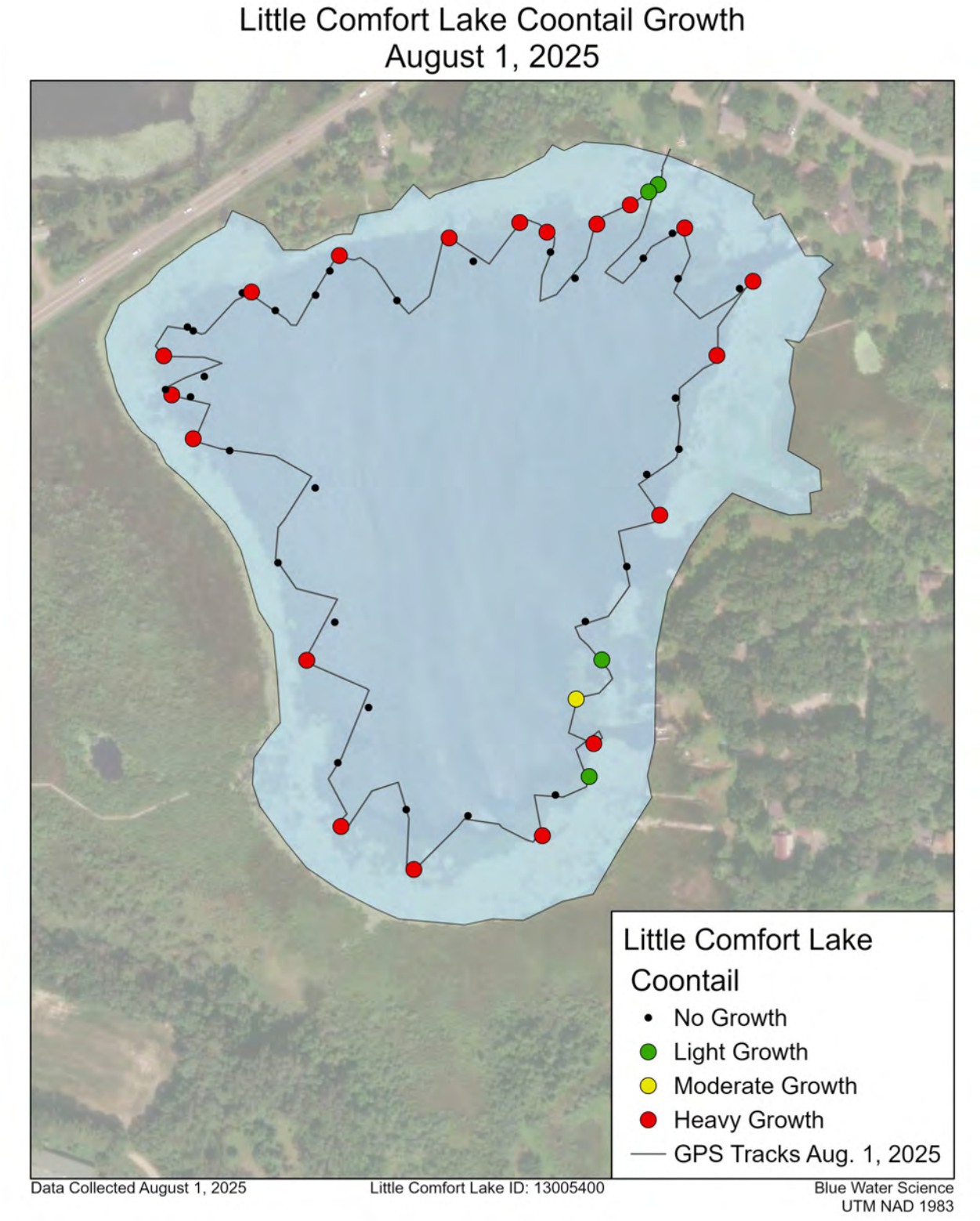


Figure 3. Coontail was the dominant plant with abundant growth out to 10 feet around the lake on August 1, 2025.

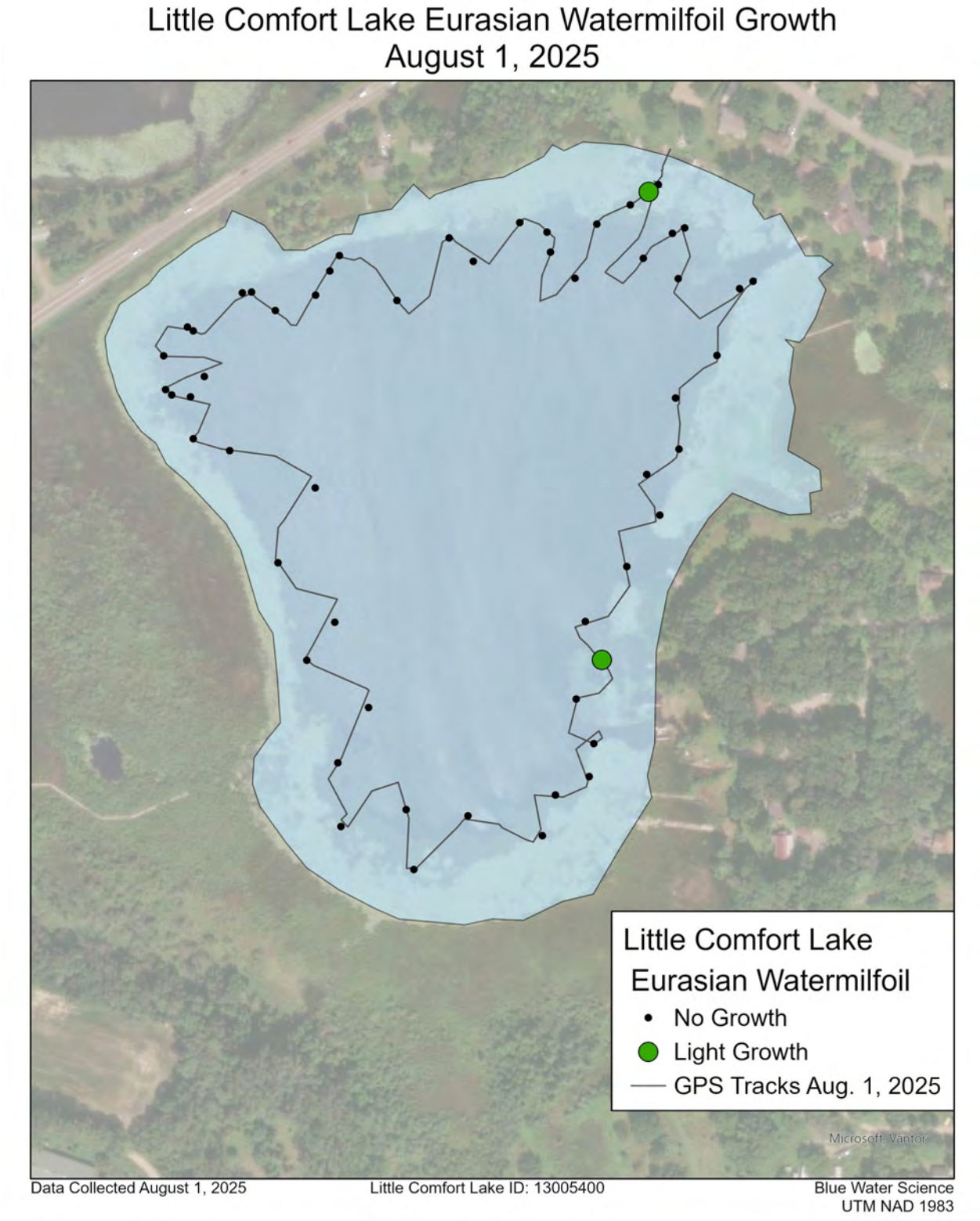


Figure 4. Eurasian watermilfoil was found at a light density generally a single stem, at two locations on August 1, 2025.

Management Recommendations: In May and June, floating filamentous algae may be present on Little Comfort. Some years filamentous algae is worse than others. Copper sulfate is an algaecide that could hasten the algal decline, but should only be used in severe filamentous years.

Eurasian watermilfoil and curlyleaf pondweed are present in Little Comfort, but in 2025 the growth may have been overwhelmed by the dense coontail growth. In years with heavy coontail growth, treating EWM will not have much impact on recreational use since coontail is the dominant plant.

Coontail is a potential navigational and recreational nuisance in some years (as it was in 2025). Herbicides would be only a temporary solution. Mechanical harvesting could be employed to cut channels to open water, but it may be difficult for a harvester to gain access to Little Comfort.

Figure 5. Coontail growth in Little Comfort Lake in 2025 was dense out to 10 feet.

APPENDIX

Individual site aquatic plant data for Little Comfort Lake on August 1, 2025.

Site	Depth (ft)	Spatterdock	White Lilies	Coontail	CLP	EWM	Flatstem	No plants
1	4		2	1				
2	4		1	1		1		
3								
4	7							1
5	6		1	3				
6	14							1
7								
8	8		1	3				
9	8			3				
10	13							1
11	9							1
12								
13	8			3				
14	7				1			
15	12							1
16	4		1	1		1		
17	10			2				
18	10		1	3				
19	10		1	1				
20	9							1
21	7		1	3				
22								
23	7			3				
24	14							1
25	8			3				
26	8							1
27	13							1
28	8			3				
29	15							1
30								
31	26							1
32	15							1
33	9			3				
34								
35	9			3				
36								
37								
38	8		2	3				
39								
40	12							1
41								
42	8			3				
43	18							1
44	19							1
45	13							1
46	8			3				
47								
48	5			3				
49	12							1
50	4	2		3			1	
51	9			3				
52	15							1
53	19							1
54	7		3	3				
55	5			3				
Average		2	1	3	1	1	1	1
Occurrence (55 sites)		1	10	24	1	2	1	19

Shields Lake, Washington County, Minnesota, May 17, 2024

Curlyleaf Pondweed Delineation and Assessment Surveys for Shields Lake, Washington County, Minnesota, 2025

Curlyleaf Delineation (Point-Intercept and GPS): April 10, 2025

No Curlyleaf Pondweed Treatment in 2025

Curlyleaf Assessment (Point-Intercept): May 13, 2025

Prepared for:

Comfort Lake/Forest Lake Watershed District
Forest Lake, Minnesota

December 2, 2025

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

Curlyleaf Pondweed Delineation and Assessment Surveys for Shields Lake, Washington County, Minnesota, 2025

Summary

Curlyleaf Pondweed Delineation: Shields Lake (MnDNR ID #82-016200) is a 30 acre lake located in Washington County, Minnesota. Water clarity has a summer average of 4.5 feet in 2024 (source: CLFLWD, most recent full year available). A curlyleaf pondweed (CLP) point intercept survey was used to the delineate curlyleaf pondweed on April 10, 2025 by Blue Water Science. Results of the curlyleaf delineation survey found curlyleaf pondweed was most abundant in water depths of 4 to 9 feet(Figure 1). The maximum observed depth of CLP colonization was 11 feet. Curlyleaf pondweed, coontail, and elodea were the only aquatic plant species found on April 10, 2025. No treatment for CLP was conducted in 2026.

Curlyleaf Pondweed Assessment: A point intercept survey was used for the curlyleaf pondweed assessment and was conducted on May 13, 2025 by Blue Water Science (Figure 1). Results of the curlyleaf pondweed assessment found curlyleaf growing most abundantly in water depths of 3-7 feet. Several areas were producing heavy growth, occasionally matting at the surface in Shields Lake. Coontail was the only other submerged plant found in Shields Lake on May 13, 2025. Coontail and curlyleaf pondweed were observed to maximum water depths of 11 feet in May.

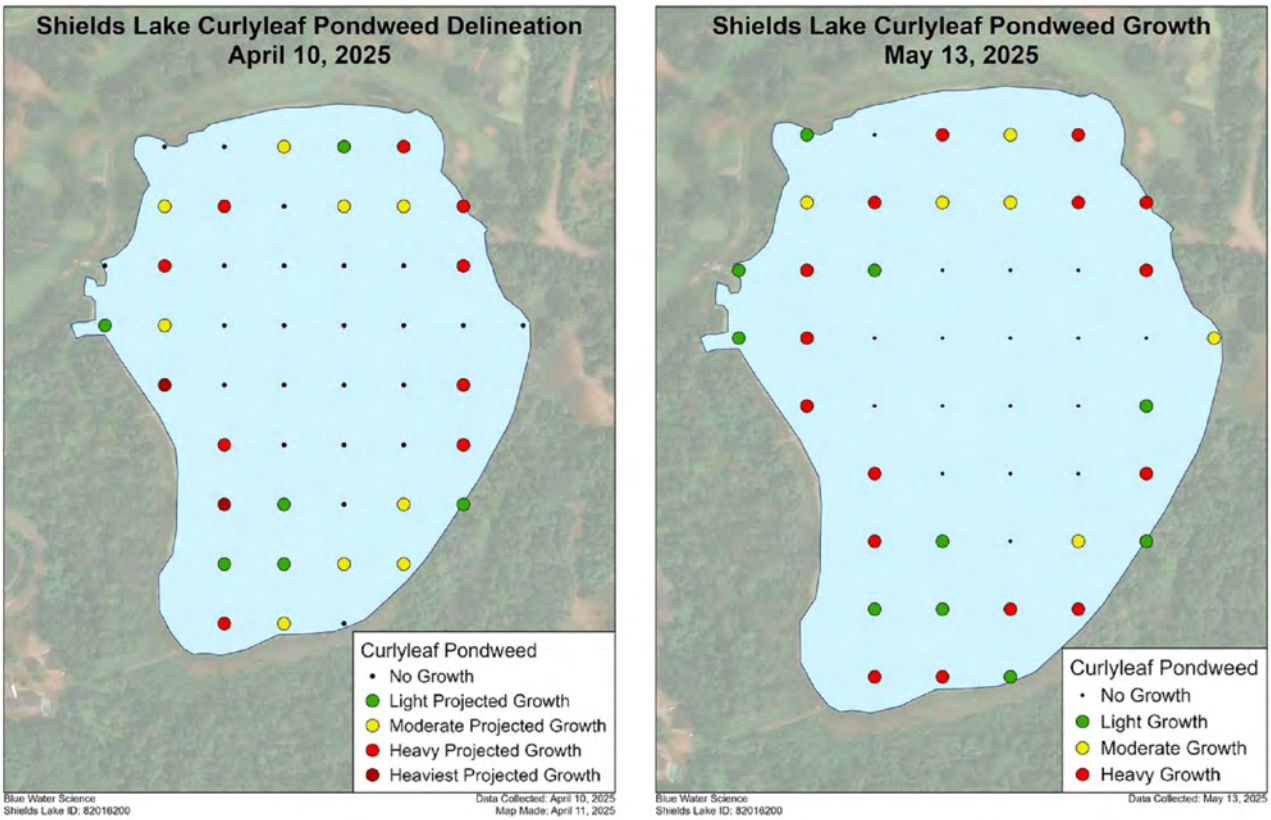


Figure 1. [left] Curlyleaf pondweed delineation on Shields Lake, surveyed on April 10, 2025. [right] Curlyleaf pondweed coverage (peak growing conditions) for Shields Lake on May 13, 2025.

Curlyleaf Pondweed Delineation and Assessment Surveys for Shields Lake, Washington County, Minnesota, 2025

Shields Lake, Washington County (ID: 82-016200)
Size: 29.6 acres (MnDNR)
Littoral area: 22 acres (MnDNR)
Maximum depth: 27 ft (MnDNR)

Introduction

A curlyleaf pondweed delineation using a point intercept survey was conducted on April 10, 2025 on 30 acre Shields Lake, Washington County. The objective of the delineation was to check the distribution and abundance of curlyleaf pondweed and document all aquatic plants. A second point intercept was conducted on May 13, 2025 to assess the status of CLP and to check the distribution and abundance of all aquatic plants.

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*).

Point Intercept Surveys and the Curlyleaf Pondweed Assessment: Two point intercept surveys were conducted by Blue Water Science on April 10 and May 13, 2025. Grid spacing was 50 meters. 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 Curlyleaf Pondweed Delineation on April 10, 2025

A point intercept survey was conducted to delineate curlyleaf pondweed on April 10, 2025 (Figure 1). Results from the survey found curlyleaf pondweed growing in water depths of 3 to10 feet, with abundant curlyleaf most common at water depths of 3 to 6 feet. Areas of significant curlyleaf pondweed growth were delineated (Figure 2) based on CLP stem densities that were projected to produce heavy growth at peak CLP abundance in June (Figure 2). However acreas of projected heavy growth were somewhat isolated and no treatment was recommended. Coontail was the only other species observed, coontail was found at light to moderate densities in water depths of 2-10 feet (Tables 1 and 2).

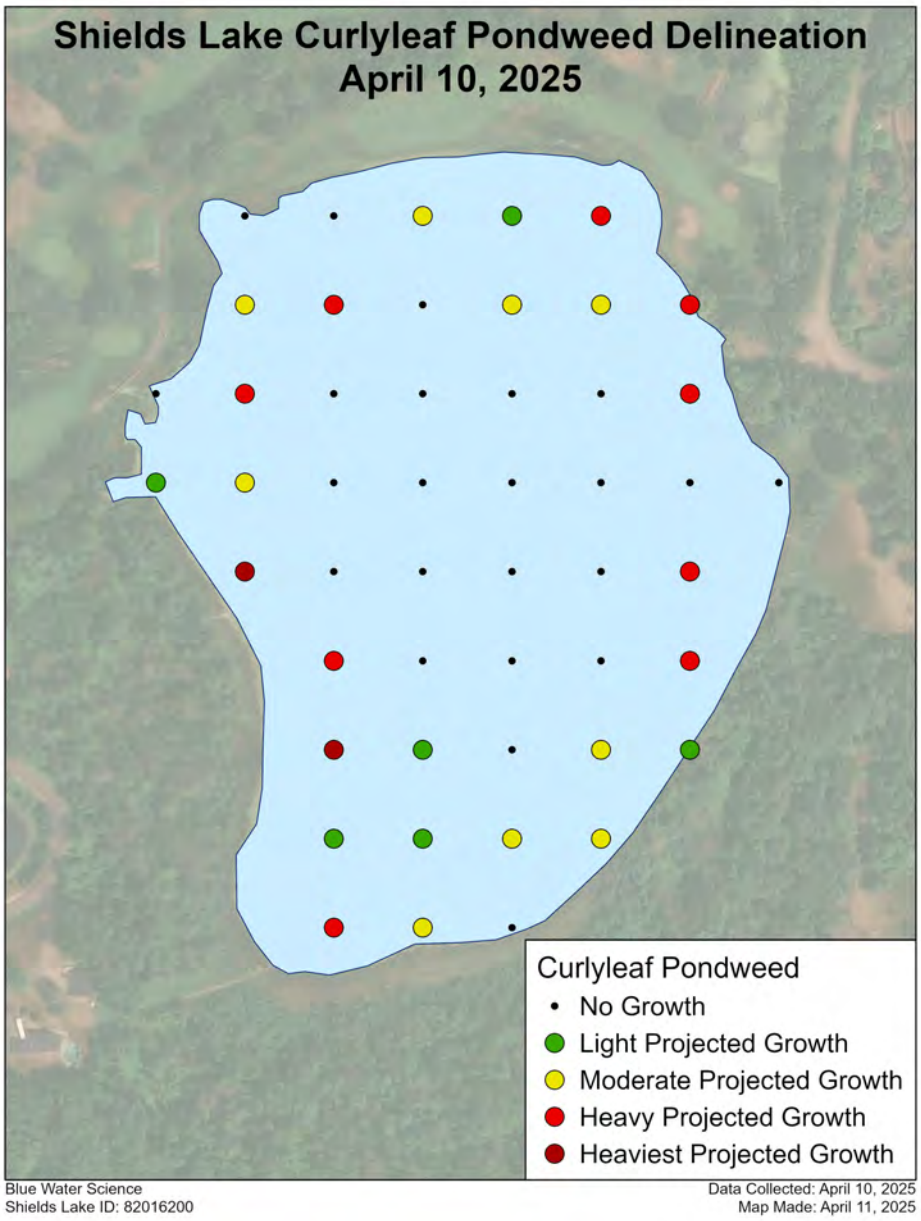


Figure 2. Curlyleaf pondweed potential treatment area in Shields Lake, delineated on April 10, 2025.

Point Intercept Survey on April 10, 2025: Results of the point intercept survey conducted on April 10, 2025 found curlyleaf pondweed growth distributed around most of Shields Lake in the nearshore growing zone (Table 1).(Figure 2).

Table 1. Curlyleaf pondweed occurrences and stem densities for the April 10, 2025 point intercept survey based on 49 sites.

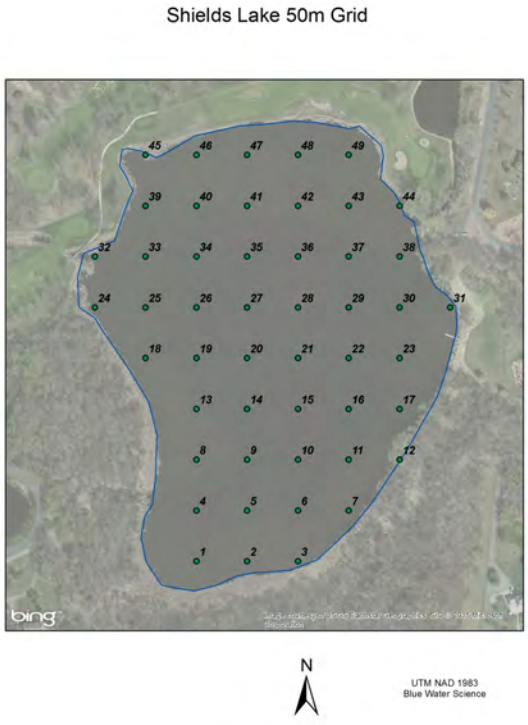
	All Stations (n=49)		
	Occur	% Occur	Density
Coontail *(Ceratophyllum demersum)*	17	35	1.2
Elodea *(Elodea canadensis)*	1	2	1.0
Curlyleaf pondweed - stems (*Potamogeton crispus*)	26	53	4.8 (avg stems)
Filamentous Algae	11	22	1.3

Figure 3. Curlyleaf pondweed rake sample on April 10, 2025.

Point Intercept Survey on April 10, 2025 Plant Data for the Delineation: Low plant diversity was found in Shields Lake in the April 10, 2025 point intercept survey with curlyleaf pondweed and coontail being the only aquatic plant species observed (Table 2).

Table 2. Aquatic plant occurrence and stem density for the point intercept sample points in Shields Lake, April 10, 2025.

Site	Depth (ft)	CLP-stems	Coontail	Elodea	Filamentous Algae
1	5	7			
2	5	3	1		
3	3		1	1	
4	9	2	1		
5	10	1			
6	8	3			1
7	5	3	1		
8	5	14			1
9	11	1			
10	13				
11	9	3	1		
12	2	2			
13	7	6			
14	13				
16	14				
17	5	11	1		
18	5	14			
19	14				
23	9	6			
24	3	2	1		1
25	7	3			
26	12				
30	12				
31	3		2		
32	3		2		2
33	5	7			2
34	13				
35	17				
36	15				
37	12				
38	5	8			1
39	4	3	1		1
40	5	6			
41	6				1
42	6	3			2
43	5	3	1		
44	2	5	1		
45	2		2		
46	4		1		1
47	3	3	1		1
48	4	1	1		
49	3	6	1		
Average		4.8	1.2	1.0	1.3
Occur (49 sites)		26	17	1	11
% occur		53	35	4	22



Results of the May 13, 2025 Point Intercept Survey

Results of the May 13, 2025 assessment using a point intercept survey found two submerged plant species, curlyleaf pondweed and coontail(Table 3). The curlyleaf pondweed was observed in the lake both living and dead (Table 3 and Figure 4). Results from the assessment found native coontail growing out to a water depth of 11 feet (Table 4)(Figure 4).

The projected CLP growth from the April 10, 2025 PI survey was fairly accurate in predicting CLP growth at the peak growing period.

Table 3. Shields Lake aquatic plant occurrences and densities for the M ay 13, 2025 survey based on 49 sites. Density ratings are 1-3 with 1 being low and 3 being most dense.

	All Stations (n=49)		
	Occur	% Occur	Density
Filamentous Algae	14	29	1.6
Coontail *(Ceratophyllum demersum)*	25	51	1.5
Curlyleaf pondweed (*Potamogeton crispus*)	32	65	2.2

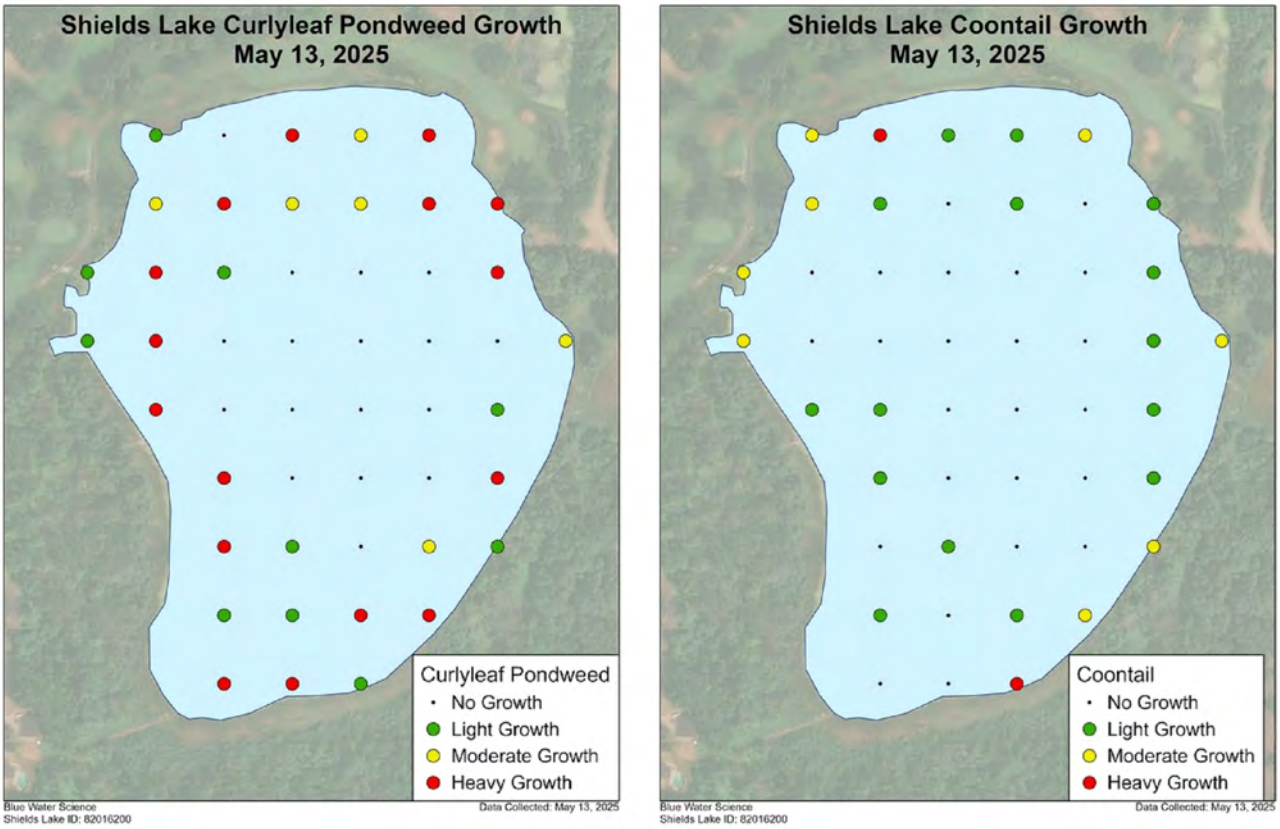


Figure 4. (Left) Curlyleaf pondweed coverage for Shields Lake on May13, 2025. (Right) Coontail coverage for Shields Lake on May 13, 2025.

Point Intercept Survey (May 13, 2025) Plant Data for the Assessment

Low plant diversity was found in Shields Lake with a total of 2 submerged aquatic plant species (Table 4). Aquatic plant richness was low.

Table 4. Aquatic plant occurrence and density for the point intercept sample points in Shields Lake, May 13, 2025.

Site	Depth (ft)	Coontail	CLP	Filamentous Alg	No plants
1	4		3		
2	3		3		
3	2	3	1	2	
4	9	1	1		
5	9		1		
6	7	1	3		
7	3	2	3		
8	5		3	1	
9	10	1	1		
10	13				1
11	9		2	2	
12	2	2	1	1	
13	6	1	3		
14	14				1
16	15				1
17	4	1	3		
18	5	1	3		
19	10	1			
20	17				1
23	8	1	1		
24	2	2	1	2	
25			3		
30	11	1			
31	3	2	2		
32	2	2	1	3	
33	5		3	1	
34	11		1		
35	17				1
36	16				1
37	14.5				1
38	4	1	3		
39	3	2	2	1	
40	5	1	3		
41	6		2		
42	6	1	2		
43	5		3		
44	3	1	3	2	
45	2	2	1	2	
46	3	3		2	
47	4	1	3	1	
48	4	1	2	1	
49	3	2	3	2	
Average		1.5	2.2	1.6	
Occur (49 sites)		25	32	14	7
% occur		51	65	56	

Moody Lake, Chisago County, Minnesota, May 13, 2025

Curlyleaf Pondweed Delineation and Assessment Surveys for Moody Lake, Chisago County, Minnesota, 2025

Curlyleaf Pondweed Delineation: April 10, 2025
Curlyleaf Treatment: No Treatment in 2025
Curlyleaf Pondweed Assessment: May 13, 2025

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

December 2, 2025

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

Curlyleaf Pondweed Delineation and Assessment Surveys for Moody Lake, Chisago County, Minnesota, 2025

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 4.0 feet in 2024 (source: CLFLWD). A point intercept survey was conducted on April 10, 2025 by Blue Water Science. Data from the point intercept survey was used to determine potential areas for curlyleaf pondweed treatment and to look for Eurasian watermilfoil. Results of the curlyleaf delineation found curlyleaf pondweed most abundant in water depths of 3-8 feet and produced a range of projected densities from light growth to heavy growth (Figure 1). No treatment for curlyleaf pondweed was conducted in 2025.

Curlyleaf Pondweed Assessment: A point intercept survey was used for the curlyleaf pondweed assessment and was conducted on May 13, 2025 by Blue Water Science (Figure 1). Results of the curlyleaf pondweed assessment found curlyleaf pondweed in Moody Lake had slightly expanded and was growing at light to heavy densities. Heaviest curlyleaf growth was observed on the north and west sides of Moody Lake, mainly in water depths of 3-7 feet. In May, Moody Lake had a fair diversity of native submerged aquatic plants, with coontail, elodea, flatstem pondweed and large-leaf pondweed present on the PI survey.

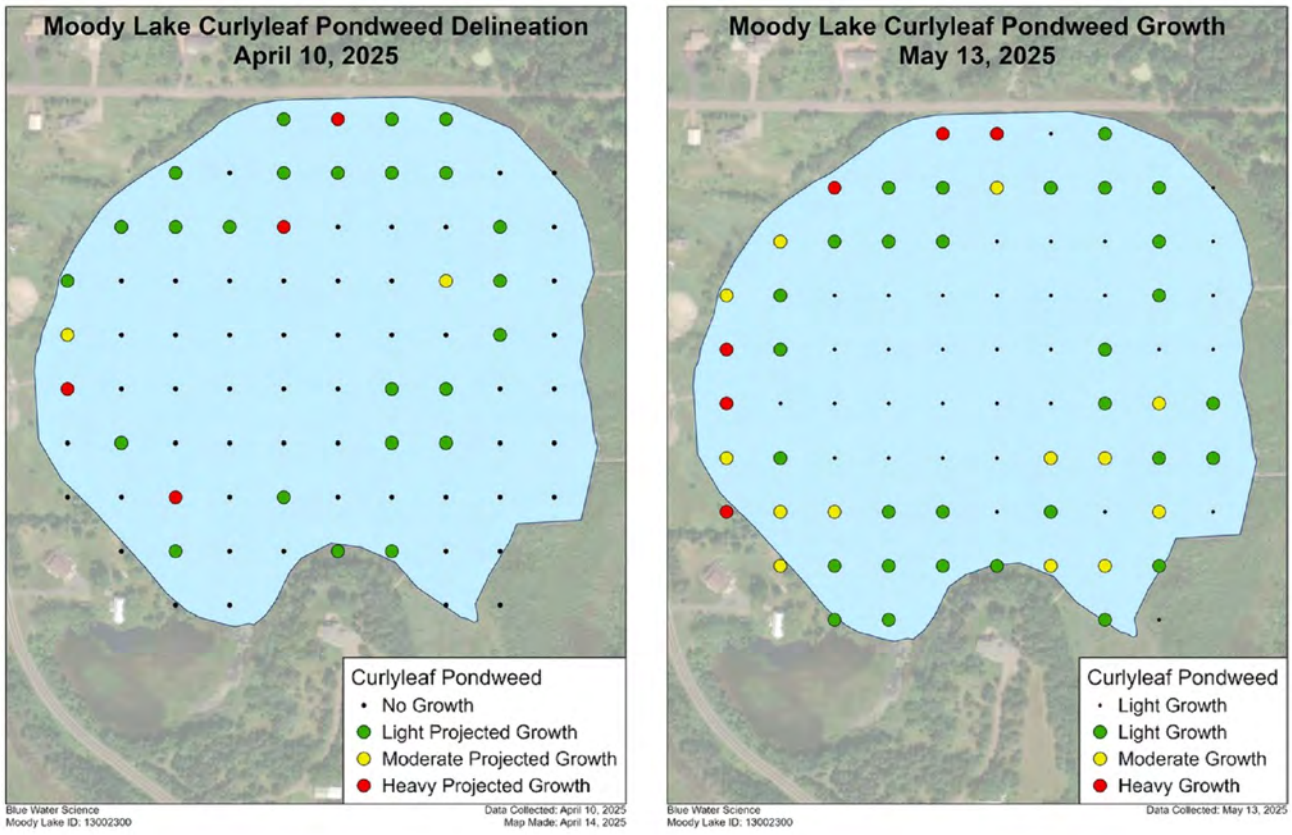


Figure 1. [left] Curlyleaf pondweed growth in Moody Lake, delineated on April 10, 2025. [right] Curlyleaf pondweed coverage for Moody Lake on May 13, 2025.

Curlyleaf Pondweed Delineation and Assessment Surveys for Moody Lake, Chisago County, Minnesota, 2025

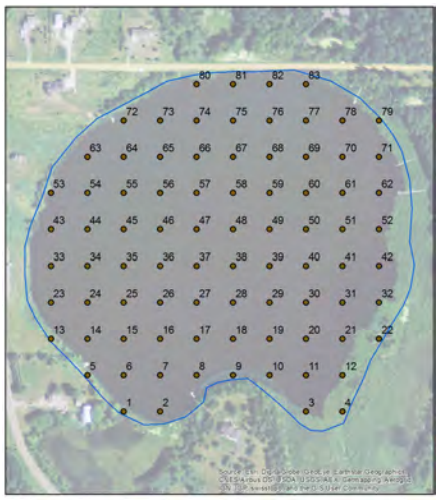
Moody Lake, Chisago County (ID: 13-0023)
Size: 45 acres (MnDNR)
Littoral area: 22 acres (MnDNR)
Maximum depth: 48 ft (MnDNR)

Introduction

A curlyleaf pondweed delineation using a point intercept (PI) survey was conducted on April 10, 2025 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 using a PI survey was conducted on May 13, 2025 again to check the distribution and abundance of curlyleaf pondweed, check for the presence of Eurasian watermilfoil, and to characterize all native plants.

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*).



Point Intercept Surveys and the Curlyleaf Pondweed Assessment: Two point intercept surveys were conducted by Blue Water Science on April 10 and May 13, 2025. Grid spacing was 50 meters. 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.

Figure 2. Point intercept site map for Moody Lake.

**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 CLP Delineation: April 10, 2025

A point intercept survey was used to delineate CLP on April 10, 2025 in Moody Lake (Figure 3). Results from the survey found a mix of CLP stem densities at sites around the lake. No treatment occurred in 2025. Coontail and elodea were the only other submerged plant species observed (Tables 1 and 2).

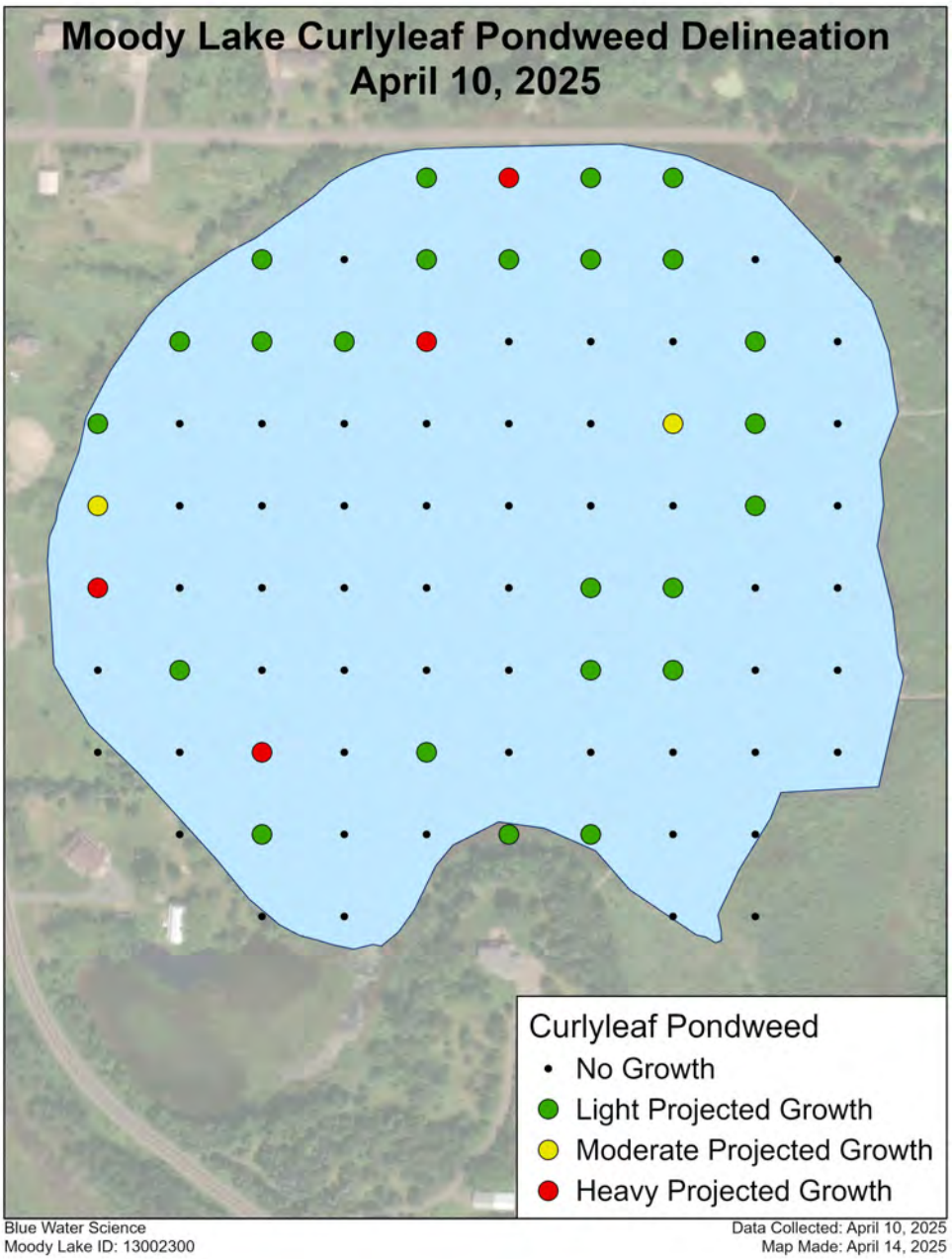


Figure 3. Curlyleaf pondweed growth from the point intercept survey conducted on April 10, 2025.

Table 1. Moody Lake aquatic plant occurrences and densities for the April 10, 2025 point intercept survey based on 83 sites. Density ratings are 1-3 with 1 being low and 3 being most dense.

	All Stations (n=83)		
	Occur	% Occur	Density
Coontail (*Ceratophyllum demersum*)	47	57	1.3
Elodea (*Elodea canadensis*)	9	11	1.3
Curlyleaf pondweed - stems (*Potamogeton crispus*)	30	36	2.1 (avg stems/rake)

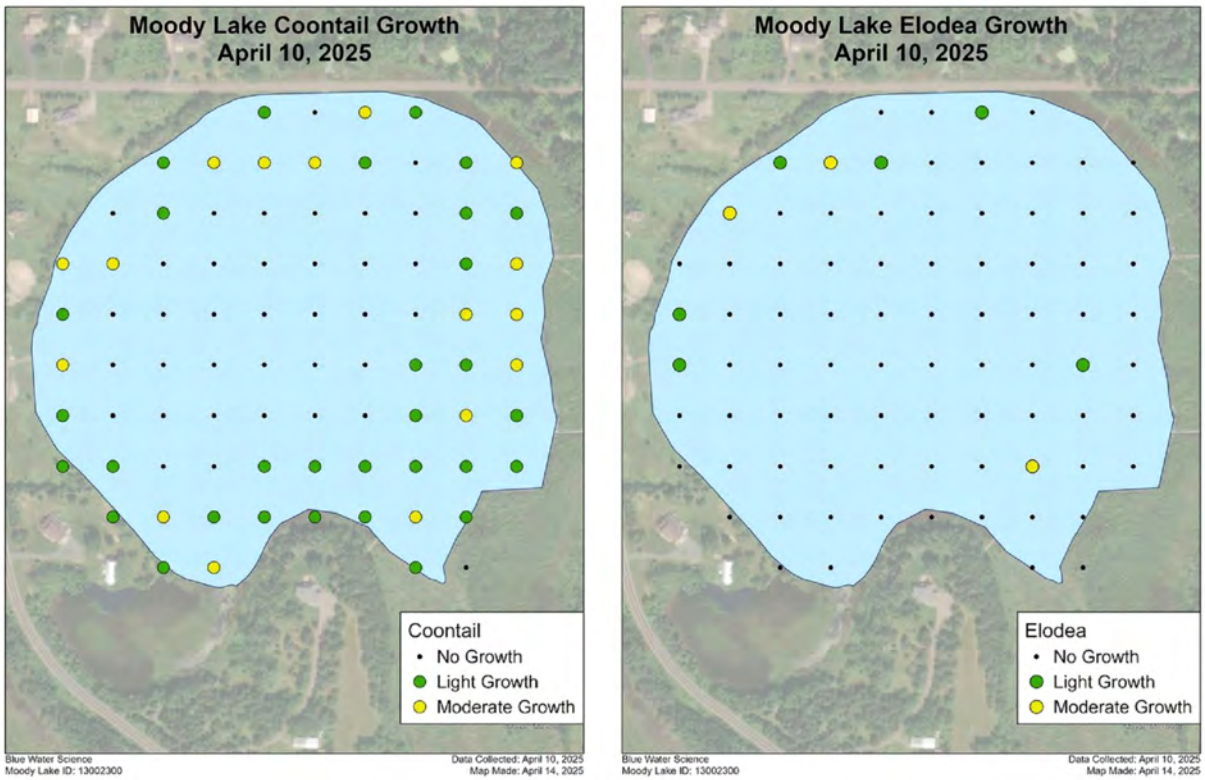


Figure 4.Coontail and elodea growth from the point intercept survey conducted on April 10, 2025.

Results for the May 13, 2025 Point Intercept Survey and CLP Assessment

Results of the May 13, 2025 assessment using a point intercept survey found five submerged plant species, coontail, curlyleaf pondweed, elodea, flatstem pondweed, and large-leaf pondweed with coontail and curlyleaf being the dominant native plants (Table 2). Flatstem pondweed and large-leaf pondweed were rare in Moody Lake. No CLP treatment occurred in 2025 and CLP was observed at 49 sites. The heaviest CLP growth was on the west and northwest side of Moody Lake growing most abundantly in water depths of 3-7 feet (Table 2 and Figure 5). Results from the assessment found native plants growing out to a max depth of 10 feet (Figure 6).

Table 2. Moody Lake aquatic plant occurrences and densities for the May 13, 2025 survey based on 83 sites. Density ratings are 1-3 with 1 being low and 3 being most dense.

	All Stations (n=83)		
	Occur	% Occur	Density
White waterlily (*Nymphaea ordata*)	14	17	1.0
Coontail *(Ceratophyllum demersum)*	49	59	1.9
Curlyleaf pondweed (*Potamogeton crispus*)	49	59	1.5
Elodea (*Elodea canadensis*)	4	5	1.0
Flatstem pondweed (*P. zosteriformis*)	1	1	1.0
Large-leaf (*P. amplifolius*)	2	2	1.0

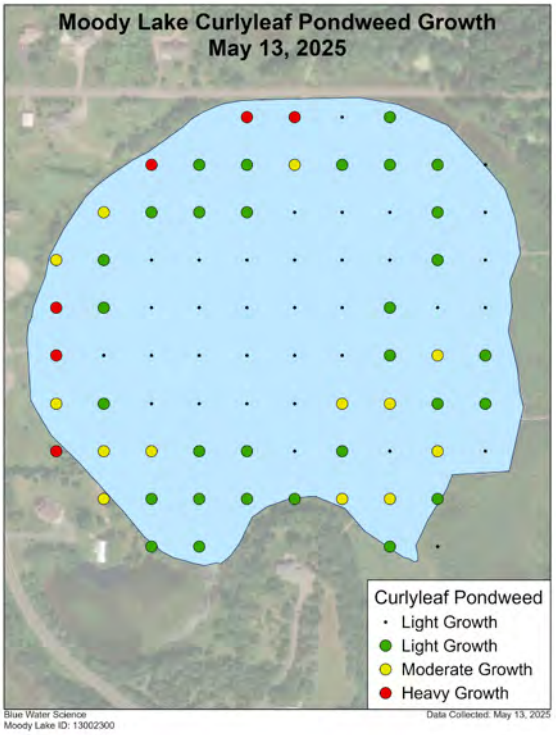


Figure 5. Curlyleaf pondweed coverage for Moody Lake on May 13, 2025.

Aquatic Plant Maps for Individuals Species - May 13, 2025

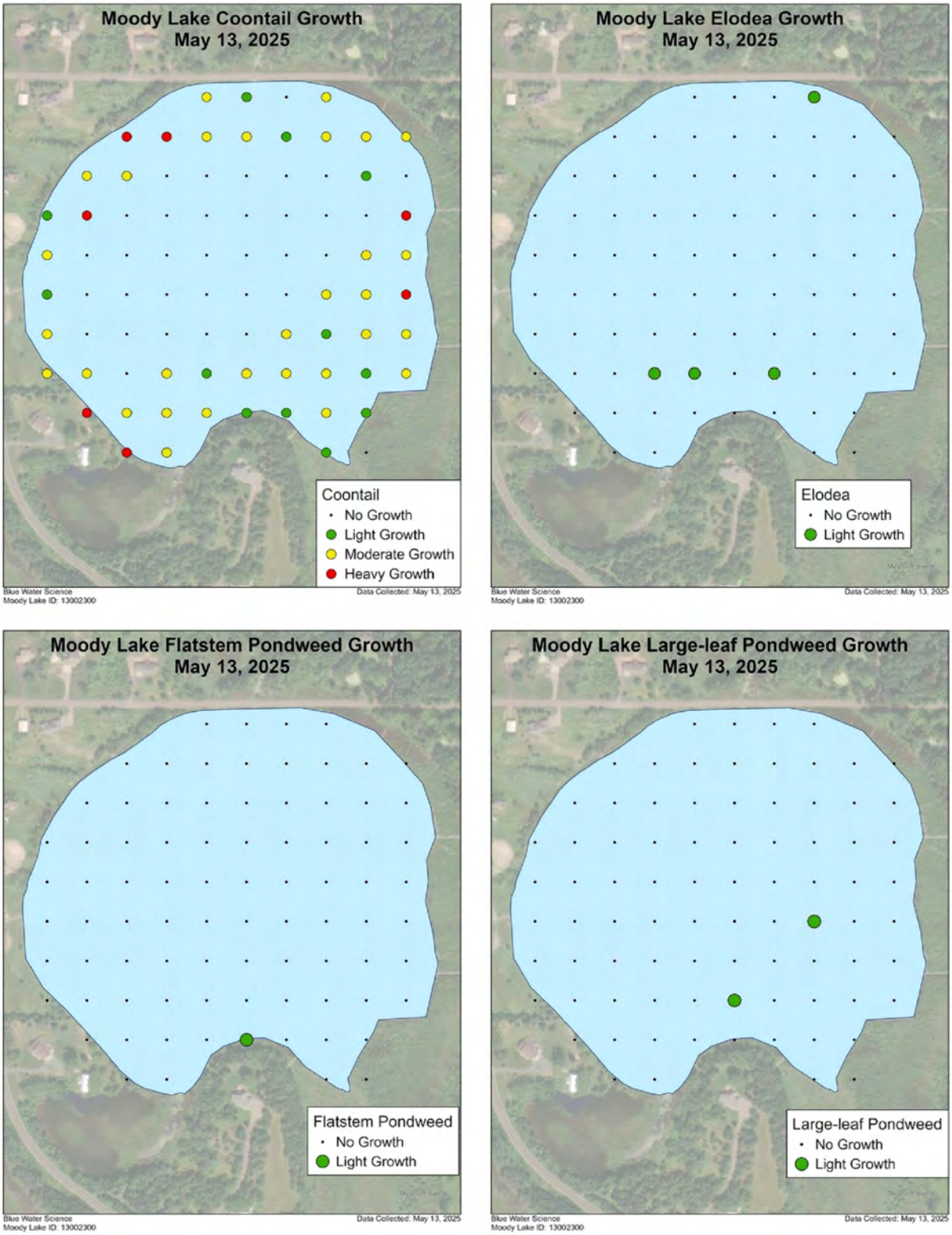


Figure 6. Aquatic plant distribution and abundance for individual species on May 13, 2025.

APPPENDIX

Moody Lake aquatic plant occurrence and densities for the April 10, 2025 survey. Density ratings are 1-3 with 1 being the low and 3 being most dense.

Site	Depth (ft)	CLP-stems	Cattails	Coontail	Elodea
1	1			1	
2	4			2	
3	2			1	
4			1		
5	3			1	
6	6	1		2	
7	6			1	
8	6			1	
9	3	1		1	
10	4	2		1	
11	5			2	
12	2			1	
13	1			1	
14	6			1	
15		4			
16	13				
17	7	1		1	
18	7			1	
19	6			1	
20	6			1	2
21	5			1	
22	5			1	
23	5			1	
24	10	1			
25	21				
27	18				
28	11				
29	9	1			
30	7	1		1	
31	5			2	
32	4			1	
33	5	7		2	1
34	14				
35	29				
39	11	2			
40	9	1		1	
41	6			1	1
42	5			2	
43	5	3		1	1
44	14				
45	25				
46	30				
47					
49	21				
50	12				
51	6	2		2	
52	5			2	
53	4	1		2	
54	6			2	
55	16				
56	31				
60	11	3			
61	7	1		1	
62	5			2	

Site	Depth (ft)	CLP-stems	Cattails	Coontail	Elodea
63	5	2			2
64	7	1		1	
65	10	2			
65					
66	8	9			
66					
67	14				
68	28				
69	21				
70	5	2		1	
71	4			1	
72	5	2		1	1
73	6			2	2
74	7	1		2	1
75	8	2		2	
76	11	2		1	
77	12	2			
78	6			1	
79	2			2	
80	4	1		1	
81	5	4			
82	6	1		2	1
83	5	1		1	
Average		2.1	1.0	1.3	1.3
Occur (83 sites)		30	1	47	9
% occur		36	1	57	30

Moody Lake aquatic plant occurrence and densities for the May 13, 2025 survey. Density ratings are 1-3 with 1 being the low and 3 being most dense.

Site	Depth (ft)	White lily	Cab-bage	Coon-tail	CLP	Elodea	Flat-stem	FA - benthic	FA - float	No plants
1	3	1		3	1				3	
2	4	1		2	1				3	
3	2	1		1	1					
4	0									1
5	4	1		3	2				3	
6	6			2	1				2	
7	6			2	1				2	
8	4			2	1			1		
9	2	1		1	1		1			
10	3	1		1	2			2		
11	4			2	2				1	
12	3	1		1	1					
13	3	1		2	3				1	
14	6			2	2			1		
15	8				2					
16	8			2	1	1				
17	7			1	1	1				
18	7		1	2						
19	7			2	1	1				
20	6			2				1		
21	5			1	2				2	
22	4	1		2				1		
23	4	1		2	2				3	
24	10				1					
25	25									1
26	25									1
27	19									1
28	10							1		
29	8			2	2					
30	6			1	2					
31	6			2	1				2	
32	4			2	1					
33	6.5			1	3			1		
34	16									1
35	26									1
39	18									1
40	7		1	2	1					
41	6			2	2			2		
42	5			3	1				1	
43	6			2	3					
44	11				1					
45	27									1
50	11				1					
51	6			2						
52	5			2						
53	4	1		1	2			1		
54	7			3	1					
55	16									1
56	23									1
60	16									1
61	6				1					
62	5			3						
63	6			2	2			1		
64	8			2	1					
65	10				1					
66	10				1					
67	22									1

Site	Depth (ft)	White lily	Cab-bage	Coon-tail	CLP	Elodea	Flat-stem	FA - benthic	FA - float	No plants
68	27									1
69	17									1
70	5			1	1					
71	0									1
72	4			3	3			2		
73	6			3	1			2		
74	6			2	1			1		
75	6			2	2			1		
76	10			1	1					
77	9			2	1					
78	6			2	1					
79	2	1		2				1		
80	3			2	3				2	
81	4	1		1	3				2	
82	4									
83	4	1		2	1	1		1		
Average		1.0	1.0	1.9	1.5	1.0	1.0	1.3	2.1	
Occur (83 sites)		14	2	49	49	4	1	16	13	15
% occur		17	2	59	59	5	1	19	16	

Watershield in Keewahtin Lake, August 12, 2025

Aquatic Plant Point Intercept Survey and AIS Check for Lake Keewahtin, Washington County, Minnesota, 2025

Survey conducted on August 12, 2025

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

December 5, 2025

Prepared by:
Steve McComas
Jo Stuckert
Connor McComas
Blue Water Science
St. Paul, MN 55116

Aquatic Plant Point Intercept Survey and AIS Check for Lake Keewahtin, Washington County, Minnesota in 2025

Summary

ID: 82008000
Area: 91 acres
Littoral Area: 67 acres
Maximum depth: 34 feet

An aquatic plant point intercept survey was conducted on Lake Keewahtin (91 acres) on the August 12, 2025. The objectives of the survey were to characterize the existing plant community and to look for any aquatic non-native species including Eurasian watermilfoil and starry stonewort.

On August 12, 2025, a total of 28 aquatic plants species were observed with some growing to 20 feet of water depth. No submerged aquatic non-native species were observed in the August survey (Table 1).

Table 1. The percent occurrence of aquatic plants for Lake Keewahtin on August 12, 2025. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station divided into the total number of stations for the survey.

Species	Percent Occurrence (145 samples)
Sagittaria (*Sagittaria spp*)	1%
Wild rice (*Zizania palustris*)	1%
Watershield (*Brasenia schreberi*)	41%
Spatterdock (*Nuphar variegatum*)	26%
White lily (*Nymphaea sp*)	30%
Marsh marigold (*Bidens Beckii*)	4%
Coontail (*Ceratophyllum demersum*)	56%
Brauns stonewort (*Chara braunii*))	1%
Chara (*Chara spp*)	13%
Moss (*Drepanocladus sp*)	1%
Elodea (*Elodea canadensis*)	66%
Water stargrass (*Heteranthera dubia*)	6%
Northern Watermilfoil (*Myriophyllum sibiricum*)	21%
Naiads (*Najas flexilis*)	52%
Nitella (*Nitella spp*)	1%

Species	Percent Occurrence (145 samples)
Large-leaf pondweed (*Potamogeton amplifolius*)	7%
Fries (*P. friesii*)	5%
Variable pondweed (*P. gramineus*)	1%
Illinois pondweed (*P. illinoensis*)	33%
Floatingleaf pondweed (*P. natans*)	1%
Whitestem pondweed (*P. praelongus*)	5%
Fern pondweed (*P. robbinsii*)	4%
Flatstem pondweed (*P. zosteriformis*)	27%
White water crowfoot (*Ranunculus aquatilis*)	19%
Sago pondweed (*Stuckenia pectinata*)	1%
Bladderwort (*Utricularia spp*)	31%
Bladderwort - minor (*Utricularia spp*)	14%
Water Celery (*Vallisneria americana*)	6%
Number of submerged plants	23

Survey Methods

An aquatic plant survey of Keewahtin Lake using a point intercept survey method was conducted by Blue Water Science on August 12, 2025. The grid spacing was 50 meters. A plant density rating was assigned to each plant species on a scale from 1 to 3 (Figure 1). A density of a “1" indicated sparse growth with one or two stems present on the rake sampler. A 3 rating indicated dense growth.

Chart of Aquatic Plant Density Ratings

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

Lake Keewahtin Site Map

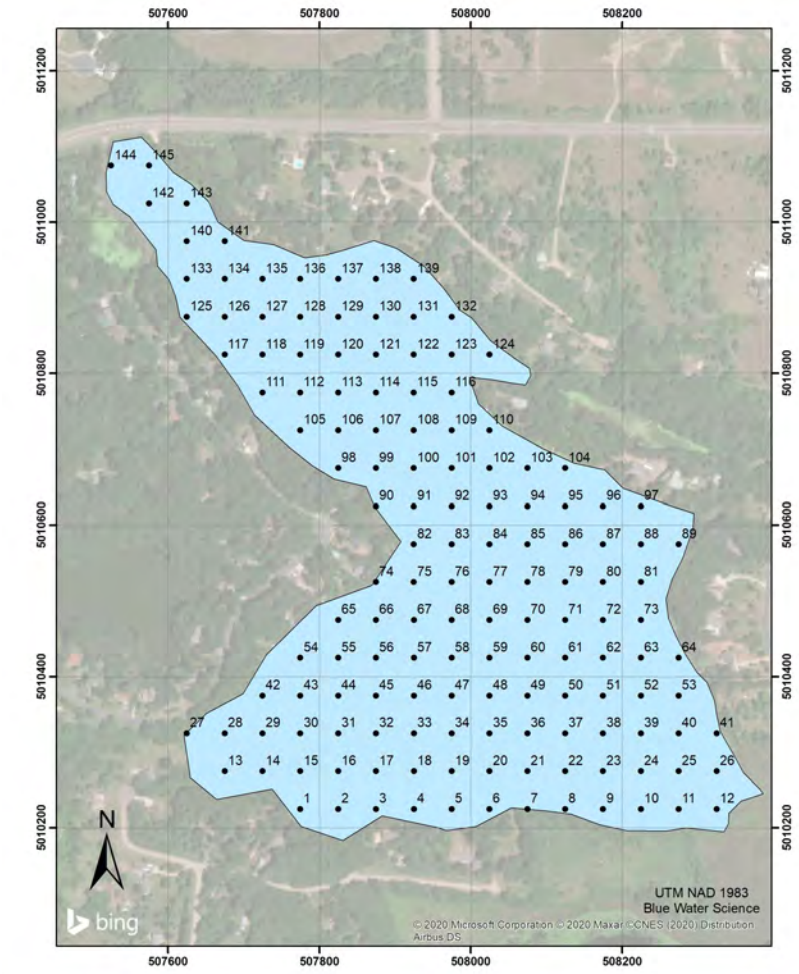


Figure 2. Sample site locations were spaced 50 meters apart. A total of 145 sites were sampled.

Aquatic Plant Survey Results

The aquatic plant community in 2025 had 23 species of submerged plants, 3 species of floating plants, and 2 emergent plants. Plant productivity and plant diversity was excellent at most sites, with an average of 4.3 plant species per site. The most common plants were coontail, elodea, illinois pondweed, and naiads. No known non-native plants were observed in the lake.

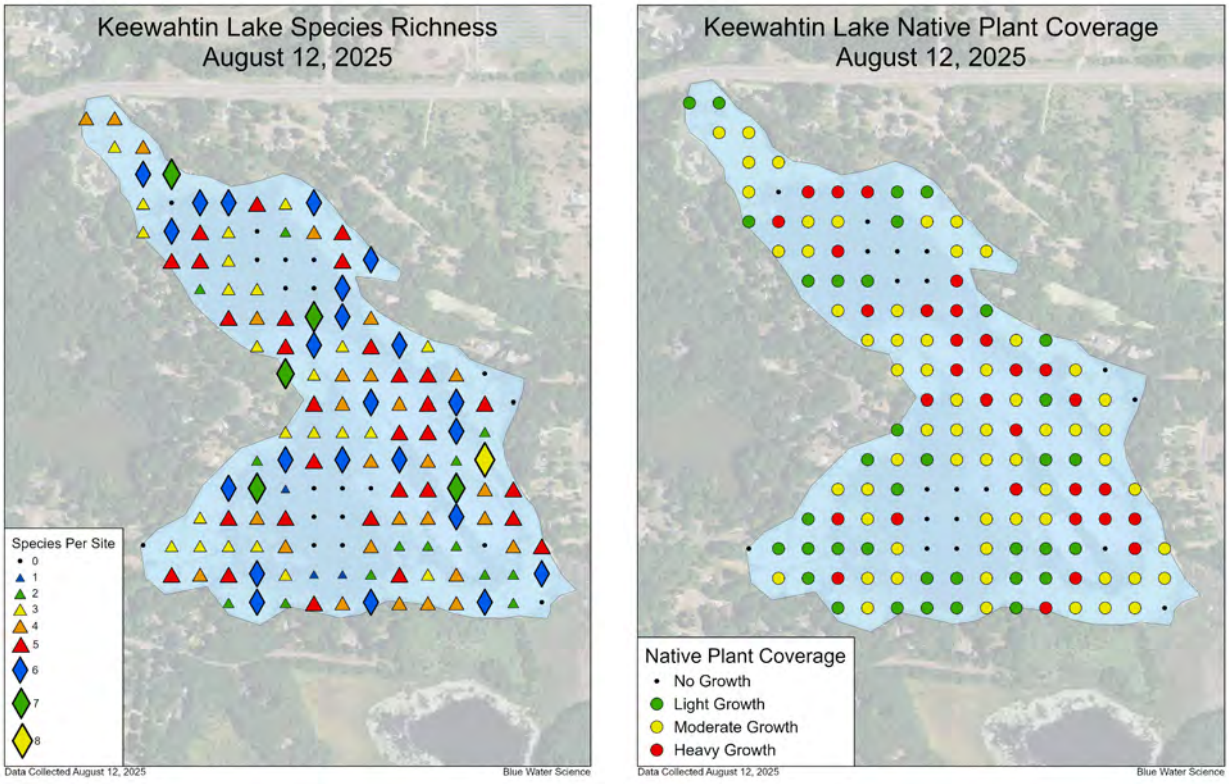


Figure 3. [left] Species richness on August 12, 2025. Number of species ranged from 0 to 8 species/site. [right] Native plant coverage on August 12, 2025. Plant growth ranged from no plants to heavy growth but was dominated by light to moderate growth.

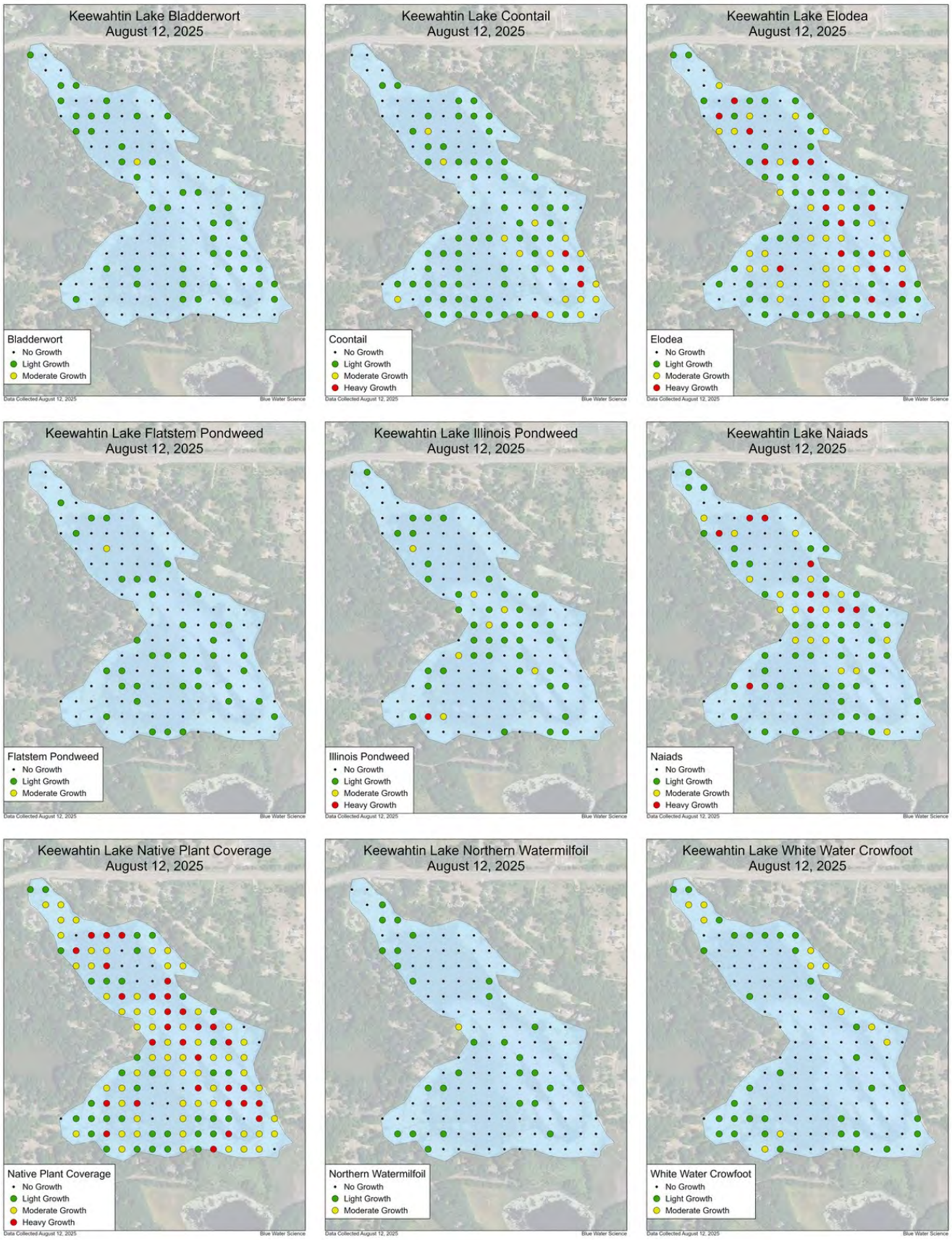


Figure 4. Individual site maps for selected aquatic plants sampled on August 12, 2025 in Lake Keewahtin.

Figure 5. [top] Spatterdock, white lilies, and watershield growth in Lake Keewahtin on August 12, 2025. [bottom] Submerged native plants were common in Lake Keewahtin on August 12, 2025.

Table 2. The percent occurrence of aquatic plants for Lake Keewahtin on August 12, 2025. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station divided into the total number of stations for the survey.

Species	Percent Occurrence (145 samples)
Sagittaria (*Sagittaria spp*)	1%
Wild rice (*Zizania palustris*)	1%
Watershield (*Brasenia schreberi*)	41%
Spatterdock (*Nuphar variegatum*)	26%
White lily (*Nymphaea sp*)	30%
Marsh marigold (*Bidens Beckii*)	4%
Coontail (*Ceratophyllum demersum*)	56%
Brauns stonewort (*Chara braunii*))	1%
Chara (*Chara spp*)	13%
Moss (*Drepanocladus sp*)	1%
Elodea (*Elodea canadensis*)	66%
Water stargrass (*Heteranthera dubia*)	6%
Northern Watermilfoil (*Myriophyllum sibiricum*)	21%
Naiads (*Najas flexilis*)	52%
Nitella (*Nitella spp*)	1%
Large-leaf pondweed (*Potamogeton amplifolius*)	7%
Fries (*P. friesii*)	5%
Variable pondweed (*P. gramineus*)	1%
Illinois pondweed (*P. illinoensis*)	33%
Floatingleaf pondweed (*P. natans*)	1%
Whitestem pondweed (*P. praelongus*)	5%
Fern pondweed (*P. robbinsii*)	4%
Flatstem pondweed (*P. zosteriformis*)	27%
White water crowfoot (*Ranunculus aquatilis*)	19%
Sago pondweed (*Stuckenia pectinata*)	1%
Bladderwort (*Utricularia spp*)	31%
Bladderwort - minor (*Utricularia spp*)	14%
Water Celery (*Vallisneria americana*)	6%
Number of submerged plants	23

Figure 6. Submerged aquatic plants were sampled with a double-head rake.

Lake Keewahtin Point Intercept Survey Statistics

A summary of plant statistics from the point intercept survey is shown in Tables 3 and 4 and Figure 7. Plants were observed in depths up to 20 feet (Table 2).

Table 3. Lake Keewahtin aquatic plant statistics (using MnDNR format).

Total # Points Sampled to 15 feet	**142**
Depth Range of Rooted Veg	**0-20 feet**
Maximum Depth of Growth (95%) in feet	**15**
# Points in Max Depth Range	**126**
# Points in Littoral Zone (0-15 feet)	**126**
% Points w/ Submersed Native Taxa	**97**
Mean Submersed Native Taxa/Point	**4.3**
# Submersed Native Taxa	**23**
# Submersed Invasive Taxa	0

Table 4. Aquatic plants sampled by depth. Littoral zone goes to 15 feet of water depth.

Depth (feet)	Number of Sites Sampled at that Depth	Percent Occurrence of Plants at that Depth
0	3	0%
1	2	0%
2	9	100%
3	16	100%
4	11	100%
5	10	90%
6	19	100%
7	19	100%
8	13	100%
9	7	100%
10	5	100%
11	4	100%
12	3	100%
13	1	100%
14	1	100%
15	3	100%
16	2	100%
17	0	0%
18	2	100%
19	0	0%
20	1	100%
All sites	131	

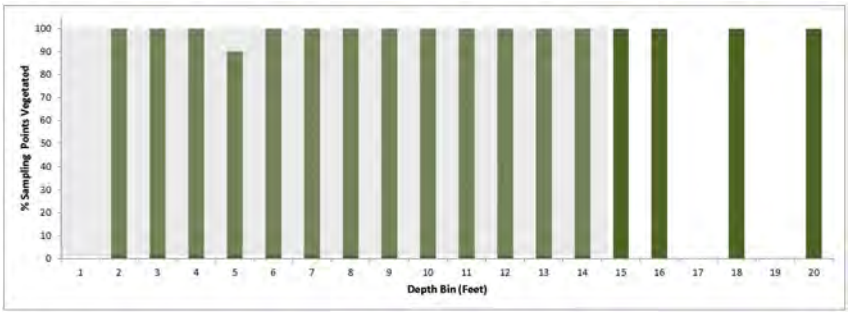


Figure 7. Depth of plant colonization (in feet).

Comparison of 2015, 2020, and 2025 Point Intercept Surveys

Point intercept surveys were conducted in 2015, 2020, and 2025. The number of aquatic plant species have increased from 2015 to 2025 (Table 5). It appears a couple species increased in occurrence from 2015 to 2025 and include coontail, elodea, and white water crowfoot. Also several species were less frequent in occurrence and included chara, northern watermilfoil, and illinois pondweed. Some of these changes may be due to annual variation. The plant community remains in good condition in 2025.

Table 5. The percent occurrence of aquatic plants for Lake Keewahtin for 2015, 2020, and 2025. Percent occurrence is calculated based on the number of times a plant species occurs at a sampling station divided into the total number of stations for the survey. For example, if coontail was found in 25 out of 50 stations, its percent occurrence would be 50%.

	2015 August 26 % Occur (145 sites)	2020 Sept 4 % Occur (145 sites)	2025 August 12 % Occur (145 sites)
Sagittaria (*Sagittaria spp*)			1
Bulrush (*Scirpus sp*)	1	1	
Cattails (*Typha sp*)	1		
Wild rice (*Zizania aquatica*)	5		1
Watershield (*Brasenia Schreberi*)	22	30	41
Spatterdock (*Nuphar variegatum*)	23	27	26
White waterlily (*Nymphaea sp*)	21	24	30
Water marigold (*Bidens Beckii*)	8	6	4
Coontail (*Ceratophyllum demersum*)	43	88	56
Brauns stonewort (*Chara braunii*)			1
Chara (*Chara spp*)	25	3	13
Moss (*Drepanocladus sp*)	6	1	1
Elodea (*Elodea canadensis*)	36	39	66
Star duckweed (*Lemna trisulca*)		1	
Northern watermilfoil (*Myriophyllum sibiricum*)	31	23	21
Naiads (*Najas flexilis*)	41	35	52
Nitella (*Nitella sp*)	1		1
Large-leaf pondweed (*Potamogeton amplifolius*)	3	5	7
Fries pondweed (*P. friesii*)		2	5
Variable pondweed (*P. gramineus*)			1
Illinois pondweed (*P. illinoensis*)	59	57	33
Floatingleaf pondweed (*P. natans*)	3	3	1
Whitestem pondweed (*P. praelongus*)	8	4	5
Fern pondweed (*P. robbinsii*)			4
Stringy pondweed (*P. sp*)	3		
Flatstem pondweed (*P. zosteriformis*)	11	28	27
White water crowfoot (*Ranunculus aquatilis*)			19
Sago pondweed (*Stuckenia pectinata*)			1
Bladderwort (*Utricularia sp*)	15	6	31
Bladderwort (*Utricularia sp*)		10	14
Water celery (*Vallisneria americana*)	8	8	6
Water stargrass (*Zosterella dubia*)	12	3	6
Total Number of Submerged Species	17	18	23

APPENDIX

August 12, 2025: Lake Keewahtin aquatic plant occurrence and densities. Density ratings are 1-3 with 1 being the low and 3 being most dense.

Site	Depth (ft)	Wild rice	Sagit-taria	Spatter dock	Water-shield	White lilies	Bladder wort	Bladder wort - Minor	Chara	Brauns stone-wort	Coon-tail	Elodea	Fern	Flat-stem	Float-ingleaf	Fries	Illinois	Large-leaf	Marsh mari-gold	Moss	Naiads	Nitella	NWM	Sago	Vari-able	Water celery	Water star-grass	White water crow-foot	White-stem	No plants
1	2			1	3	1					1												1							
2	3			2	1	2			1		1	1									1			1				2		
3	4			2	1	3					1																	1		
4	5			1	2	2					1	1		1							1					1				
5	5				1	1					1	1		1				1												
6	3			1		2					1	1		1			1									1	2			
7	1	1		2	1	2					1	1									1					1				
8	3				2	2					3	1															1	1		
9	3				2	2					2	1					1				1									
10	4			1	1	2			1		1	1					1				2							1		
11	3			2	1	1					2	1																		
12	0																													1
13	3			1	1	3	1				2					1							1					1		
14	3					3											1				1		1					1		
15	6					1					1	1		1			3		2											
16	7				1			1			1	1					2						1					1		
17	10										1	2																2		
18	15										1																			
19	16										1																			
20	11						1					2																		
21	5			2	3		1		1			1									1							1		
22	5			1	2							1									1							1		
23	6				1		1					3									1		1							
24	20										2						1													
25	5			2	2	1					2	1																		
26	4			2	2	2	1	1			2	1		1		1														
27	0																													1
28	2				1	3					1	1																1		
29	4			2	3	1					1													1				1		
30	6			1	2	2					1	1																1		
31	6			3				1			1					1														
32	15						1				1	2		1																
33	28																													1
34	29																													1
35	9				1		1				1	2																	1	
36	6			3	2																1							1		
37	6			2	3		1		1																					
38	10											1		1																
39	29																													1
40	7						1				3	3		1																
41	2						1	1			2	1									1									
42	5				2	3						1									1							1		
43	6				1		1				1	2					1				3									
44	7											2		1							1								1	
45	12						1				1	3		1							1									
46	28																													1
47	30																													1
48	10						1				1	2		1							1									
49	7				2							2		1							1		1							
50	7				1						1	2									1		1							
51	8						1				2	3		1			1	1												
52	9						1				1	3					1													

August 12, 2025: Lake Keewahtin aquatic plant occurrence and densities. Density ratings are 1-3 with 1 being the low and 3 being most dense.

Site	Depth (ft)	Wild rice	Sagit-taria	Spatter dock	Water-shield	White lilies	Bladder wort	Bladder wort - Minor	Chara	Brauns stone-wort	Coon-tail	Elodea	Fern	Flat-stem	Float-ingleaf	Fries	Illinois	Large-leaf	Marsh mari-gold	Moss	Naiads	Nitella	NWM	Sago	Vari-able	Water celery	Water star-grass	White water crow-foot	White-stem	No plants
53	6				1		1				3	2				1		1												
54	7				2			1			1	2		1			1						1							
55	9										1	2		1			1				1		1						1	
56	18										1																			
57	25																													1
58	26																													1
59	25																													1
60	11										2	3		1			1				2									
61	8						1				1	1					2				2									
62	8						1	1			2	3					1				1		1							
63	8						1				3	2		1																
64	4				2	3		1			2	1				1							1							
65	6				3							1									1									
66	7				1			1			1	1	2				2						1							
67	10										1	1		1			1				1									
68	8										1	2		1			1	1			1									
69	9										2	2		1															1	
70	10										1	2					1				1		1						2	
71	11						1				1			1									1							
72	16										1										1									
73	6						1		1		2	2		1	1				1		1									
74	3				2	2			1					1													1			
75	7																1	1			2									
76	6												2				1				2									
77	8											1					1				2									
78	8										1	3					1				1		1							
79	12						1				2	1		1														1		
80	7						1				1	2					1	1			1									
81	4				3	2			1												2									
82	4						1						3				1				1		1							
83	7						1					2					2				1									
84	7										1	3		1			1				1		1							
85	8								1			2					1				1									
86	7										1	1		1			1				1									
87	6						1				1	3		1			1	1												
88	4			1	2	2			1		1										1	1						2		
90	2			1	1	1						2					1				2		2		1	1	1			
91	3			2	1	3						1	2								2									
92	7											1					1				3						1			
93	8						1					1					2				2									
94	7						1					1					1				3								1	
95	6															1		1			3		1					1		
96	5			2	2	1						1									1	1						2		
97	0																													1
98	6				3	1						1	2								1									
99	6						1					1					1	1			2									
100	6										1	1		1			2			1	1									
101	9								1												3						2			
102	7										1	1					1			1	3									
103	3			2	3	1						1		1		1		1			2							2		
104	2		1	1	2	3					1						1				1									
105	8				2						1	1					1				2							1		

August 12, 2025: Lake Keewahtin aquatic plant occurrence and densities. Density ratings are 1-3 with 1 being the low and 3 being most dense.

Site	Depth (ft)	Wild rice	Sagit-taria	Spatter dock	Water-shield	White lilies	Bladder wort	Bladder wort - Minor	Chara	Brauns stone-wort	Coon-tail	Elodea	Fern	Flat-stem	Float-ingleaf	Fries	Illinois	Large-leaf	Marsh mari-gold	Moss	Naiads	Nitella	NWM	Sago	Vari-able	Water celery	Water star-grass	White water crow-foot	White-stem	No plants
106	12						1				2	3		1																
107	13						2				1	2		1															1	
108	9						1		1		1	3		1							1						1			
109	7								2		1	3					1				2		1							
110	4				3	2		1			1										1					1				
111	7				3																1		1							
112	11										1						1				1									
113	15						1				1	1																		
114	39																													1
115	34																													1
116	7											1		1							3		1			1		1		
117	4				3		1		1			2											1			1				
118	8						1				1	2					2				1									
119	9										2	3		2																
120	36																													1
121	30																													1
122	25																													1
123	3			1	1	3		2	1		1	1									1									
124	2			2	2	3		1	1			2							1		1							2		
125	3				3																1		1					1		
126	8						1					3		1			1				3		1							
127	8						1		1			1					1				2									
128	14						1				1	2																		
129	31																													1
130	18						1				1																			
131	4			1	2	2		1			1	2									2									
132	2			2	2	1	1	2			1	1							1											
133	5			3	1	2	1					1									2									
134	5																													1
134	6			1							2	2		1							1		1							
135	6				1			1				3		1			1		1				1							
136	7						1	1				1		1			1				3									
137	6							1				1					1				3					1				
138	5			2	2	3		1	1		1																			
139	3			2	1	3		1	1	1	1	1			1															
140	3			3	2	2	1	2			1			1					1				1							
141	2			3	1	2	1	1			1	2	1										1				1			
142	3			1	2	2			1												1							2		
143	3			3	2	2		1													1		1					2		
144	1			2	1		1					1															1	1		
145	2			2	1	1						1					1				1							1		
Average		1.0	1.0	1.8	1.8	2.0	1.0	1.1	1.1	1.0	1.3	1.6	2.0	1.0	1.0	1.0	1.2	1.0	1.2	1.0	1.5	1.0	1.0	1.0	1.0	1.0	1.2	1.3	1.1	
Occurrence (145 sites)		1	1	38	60	43	45	21	19	1	81	95	6	39	2	7	48	10	6	2	75	2	30	2	1	8	9	28	7	18
% occur		1	1	26	41	30	31	14	13	1	56	66	4	27	1	5	33	7	4	1	52	1	21	1	1	6	6	19	5	

Predicted CLP and EWM Growth Potential in Lake Keewahtin

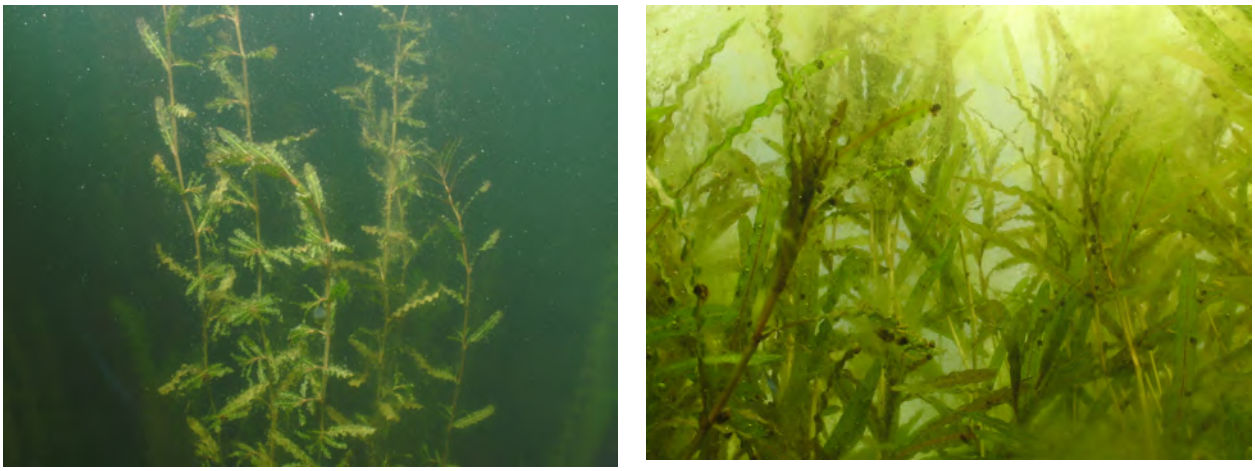
Curlyleaf Pondweed (non-native aquatic plant)

Keewahtin Lake Status: Present in Keewahtin Lake.

Potential for Curlyleaf Pondweed Growth in Keewahtin Lake: Mostly light growth potential with scattered areas of moderate growth potential.

Lake sediment sampling results from 2014 have been used to predict lake bottom areas that have the potential to support heavy curlyleaf pondweed plant growth. Various types of curlyleaf growth patterns are shown below. 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 Keewahtin Lake are shown on the next page.

Curlyleaf pondweed growth is predicted to produce light to moderate growth in Keewahtin Lake.



Underwater views of curlyleaf pondweed. Light growth (left) and moderate growth (right).

Examples of Curlyleaf Pondweed Growth Characteristics

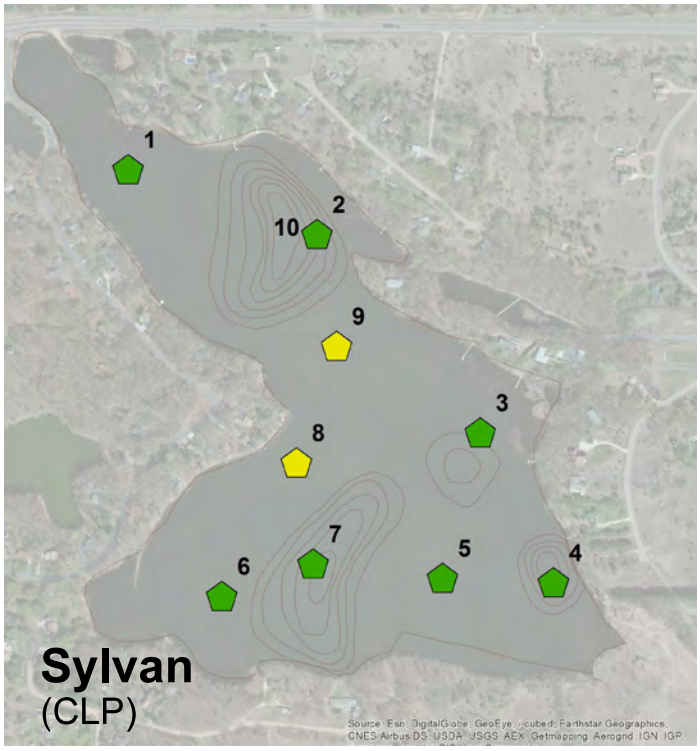
Light growth (left) refers to non-nuisance growth that is mostly below the surface and is not a recreational or ecological problem. Moderate growth (middle) refers to growth that is just below the water surface. Heavy growth (right) refers to nuisance matting curlyleaf pondweed. This is the kind of nuisance growth predicted by high sediment pH and a sediment bulk density less than 0.51.

Curlyleaf Pondweed Growth Potential Based on Lake Sediments: Curlyleaf pondweed is present in Keewahtin Lake. Research has found curlyleaf is limited or enhanced based on lake sediment characteristics. Based on lake sediment characteristics, curlyleaf has the potential to produce light, moderate, or heavy growth on an annual basis.

In Keewahtin Lake it is predicted that curlyleaf will grow at mostly light to moderate densities. Low sediment pH and high Fe:Mn ratios are predicted to limit curlyleaf growth.

Keewahtin Lake sediment data and ratings for potential growth of curlyleaf pondweed growth.

Site	Depth (ft)	pH (su)	Bulk Density (g/cm^3 dry)	Organic Matter (%)	Fe:Mn Ratio	Potential for Curlyleaf Pondweed Growth
Light Growth		**<7.4**	**>1.04**	**0.1-5**	**>4.5**	**Light (green)**
Moderate Growth		**7.4 - 7.7**	**0.52 - 1.03**	**6-20**	**1.6 - 4.5**	**Moderate (yellow)**
Heavy Growth		**>7.7**	**<0.51**	**>20**	**<1.6**	**Heavy (red)**
Keewahtin 1	6	6.7	0.20	64.6	49.0	Light
Syl 2	6	6.8	0.10	76.5	30.2	Light
Syl 3	7	7.4	0.16	67.5	30.3	Light
Syl 4	7	7.2	0.21	66.9	24.1	Light
Syl 5	5	7.0	0.13	77.9	28.8	Light
Syl 6	6	6.9	0.20	76.4	20.2	Light
Syl 7	32	5.6	0.62	38.5	16.0	Light
Syl 8	6	7.5	0.16	61.0	18.1	Moderate
Syl 9	6	7.5	0.28	64.9	22.3	Moderate
Syl 10	33	6.3	0.57	52.7	ND	



The color indicates the potential growth of curlyleaf pondweed.
Key: green = light growth and yellow = moderate growth.

Eurasian Watermilfoil (non-native aquatic plant)

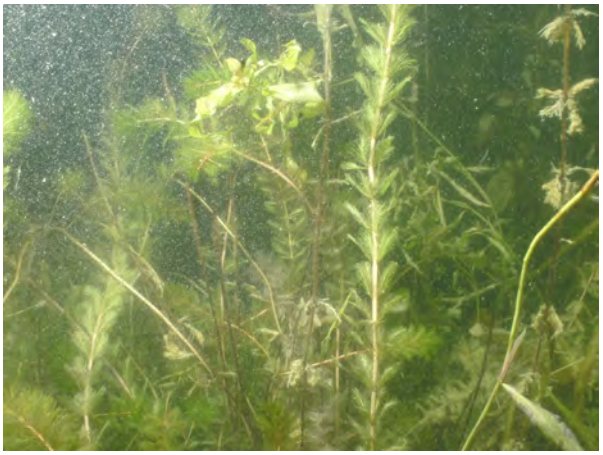
Keewahtin Lake Status: Not found in Keewahtin Lake.

Nearest Occurrence: Bone Lake, Washington County

Potential for Eurasian Watermilfoil Growth in Keewahtin Lake: Potential for mostly light growth.

Lake sediment sampling results from 2014 have been used to predict lake areas that have the potential to support heavy Eurasian watermilfoil growth. Examples of milfoil growth characteristics are shown in below. Based on the key sediment parameters of NH_4 and organic matter (McComas, unpublished), a table and map were prepared that predict the type of growth that could be expected in the future if milfoil becomes established in Keewahtin Lake .

In Keewahtin Lake a majority of sites had low nitrogen and high organic matter and these areas are predicted to have the potential to produce light growth of milfoil on an annual basis unless water clarity is limiting.



Underwater views of Eurasian watermilfoil.

Examples of Eurasian Watermilfoil Growth Characteristics

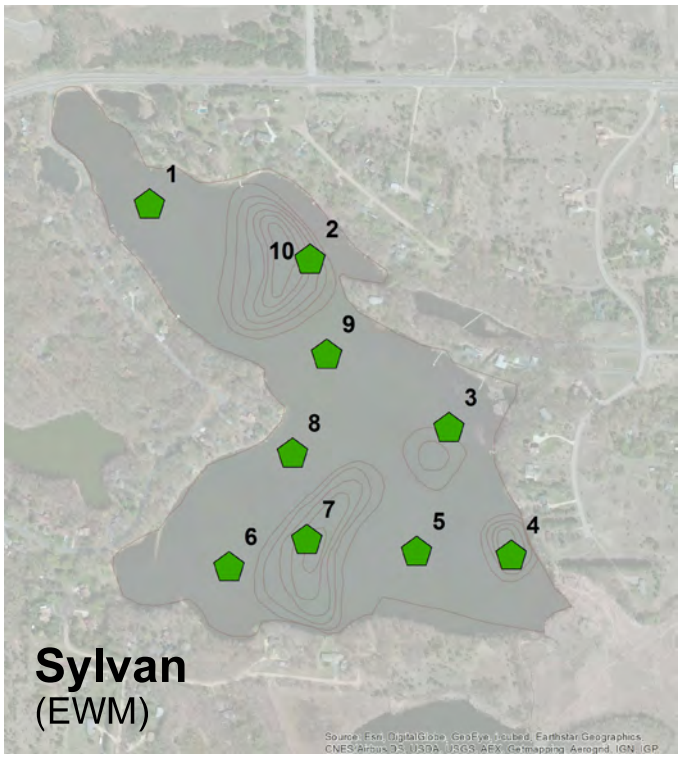
Light growth (left) refers to non-nuisance growth that is mostly below the surface and is not a recreational or ecological problem. Heavy growth (right) refers to nuisance matting Eurasian watermilfoil. This is the kind of nuisance growth predicted by high sediment nitrogen values and a sediment organic matter content less than 20%.

Eurasian Watermilfoil (EWM) Growth Potential Based on Lake Sediments: Lake sediment sampling results from 2014 have been used to predict lake bottom areas that have the potential to support EWM growth. Eurasian watermilfoil has not been observed in Keewahtin Lake as of June 2014. The potential for milfoil growth, based on lake sediment sampling, would be for light growth. Light milfoil growth has been correlated with low sediment nitrogen and high organic matter conditions and Keewahtin Lake has both of these conditions.

For Keewahtin Lake, it is estimated the plants have the potential to grow down to about 20 feet of water depth based on existing water clarity conditions.

Keewahtin Lake sediment data and ratings for potential growth of Eurasian watermilfoil.

Site	Depth (ft)	NH_4 Conc (ppm)	Organic Matter (%)	Potential for Eurasian Watermilfoil Growth
Light Growth		**<4**	**<0.5 and >20**	**Light (green)**
Moderate Growth		**4 - 10**	**0.6 - 2 and 18 - 20**	**Moderate (yellow)**
Heavy Growth		**>10**	**3 - 17**	**Heavy (red)**
Keewahtin 1	6	3.2	64.6	Light
Syl 2	6	0.4	76.5	Light
Syl 3	7	0.6	67.5	Light
Syl 4	7	2.5	66.9	Light
Syl 5	5	0.7	77.9	Light
Syl 6	6	1.9	76.4	Light
Syl 7	32	75.8	38.5	Light
Syl 8	6	0.5	61.0	Light
Syl 9	6	2.1	64.9	Light
Syl 10	33	41.1	52.7	



The color indicates the potential growth of Eurasian watermilfoil. Key: green = light growth.