



3088 Hottis Rd. Hale, MI 48739 Hale: 989.728.2200 Clare: 989.386.0600 Fax: 989.516.5900

October 15th, 2019

Lakeville Lake Improvement Board
Wayne Hodges
825 Cove Dr
Leonard, MI 48367

Lakeville Lake

2019 Year End Report

It has been a pleasure managing Lakeville Lake this summer. Every year seems to bring a unique set of challenges and we welcome the opportunity to meet these challenges every single year. We hope that you feel that your lake was managed professionally, economically, and effectively.

In 2019, a more aggressive approach to controlling the Eurasian watermilfoil was used. We utilized a higher rate of the systemic herbicide triclopyr. Areas not treated with triclopyr were treated with diquat dibromide. Curly leaf pondweed was also treated with diquat as in years past. As for starry stonewort, we continued with the same treatment plan we have done before. We have had no complaints or issues with this treatment before, however it was observed that some treatment areas were not as affected as others during our last treatment for the starry stonewort. Lastly, no emergent vegetation (such as flowering rush or purple loosestrife) was treated, due to only a few plants that looked dead already were discovered during the fall survey.

For our initial treatment we wanted to treat earlier in the year than in prior years. Therefore we treated on May 28th. We treated the Eurasian watermilfoil with higher rates of triclopyr in order to increase efficacy of the treatment. Both the hybrid species nature of the plant, and it's relatively low bed sizes, has made the plant difficult to treat systemically. During the fall survey, it was very noticeable that we had much greater control this year. This treatment also contained some starry stonewort and curly leaf milfoil treatment.

For the 2nd treatment, all three species of invasive plants were targeted again. In areas where we systemically treated the milfoil for the first treatment, curly leaf pondweed was still present (as we do not use diquat in the same area we use triclopyr). Starry stonewort was present as usual. For the Eurasian watermilfoil, we retreated the areas we used diquat in May. We also treated areas that were systemically treated with triclopyr. It is common for the plant to still be up and visible 4 weeks after treatment when using systemics. The systemic herbicide is now out of the waterbody, and into the plants roots, so we treat these plants to give them a last oomph to drop.

A similar treatment occurred for our last visit on August 5th, treating all three species where necessary.



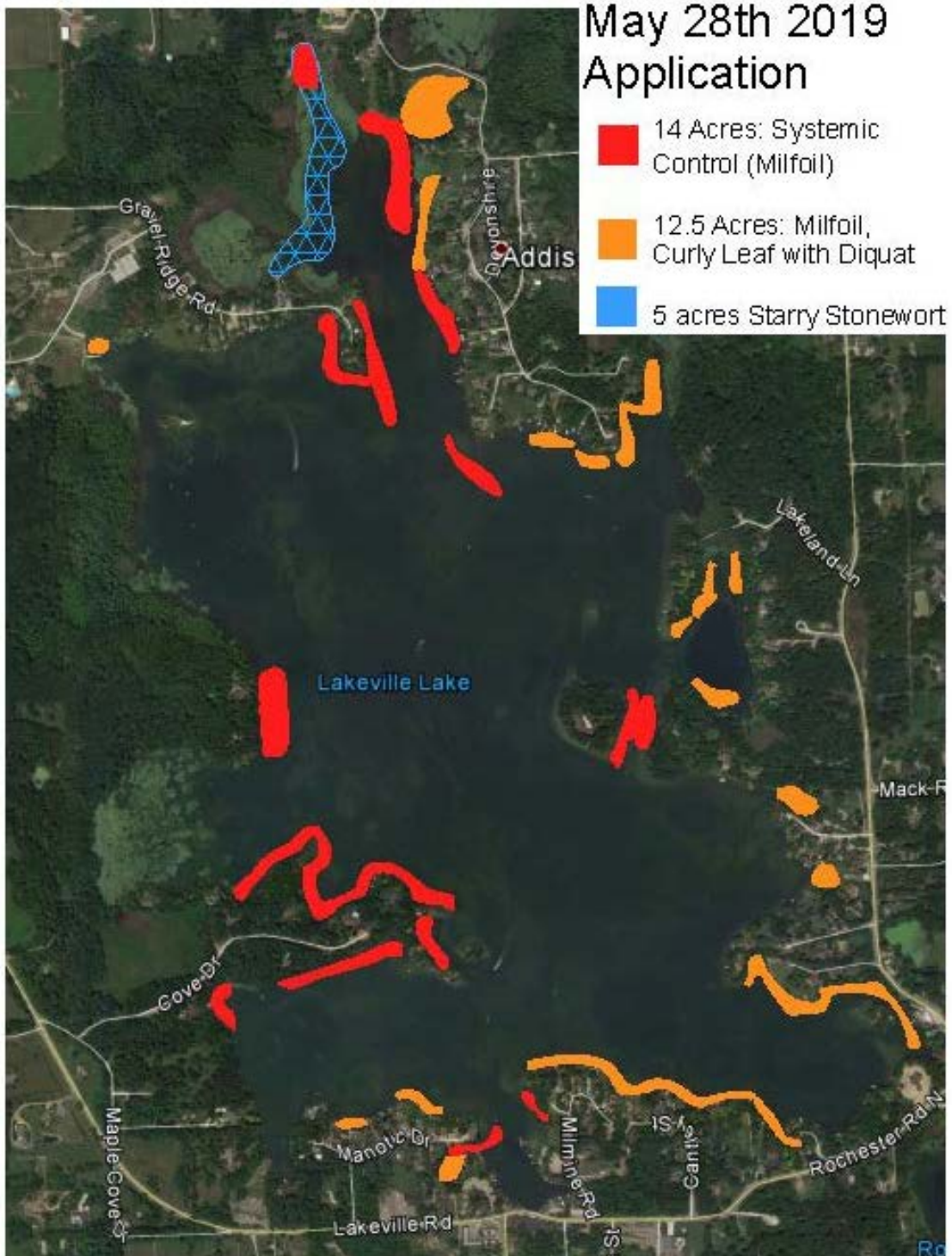
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We were able to perform the AVAS survey on September 20th. While surveying, it was noted that much of the Eurasian watermilfoil that was treated was no longer present. Native milfoil and other native pondweeds were growing in its place.

Below is a summary of the services performed in 2019:

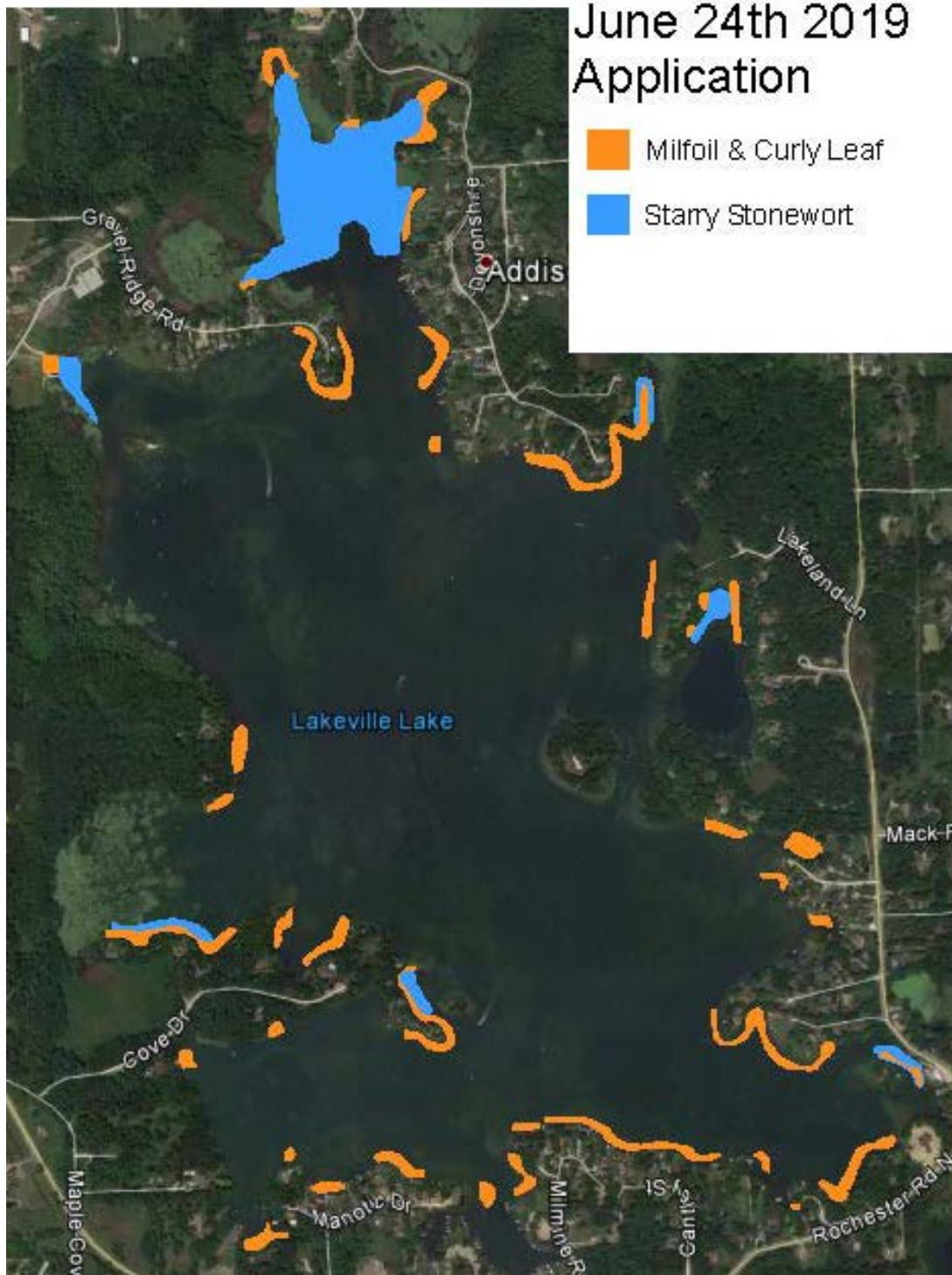
Date	Service Performed	Figure #	Target Invasive Species	Treatment Type
May 14 th	Spring Survey		Starry Stonewort Curly Leaf Pondweed Eurasian Watermilfoil	Survey and Water Samples
May 28 th	Lake Treatment	1	Eurasian Watermilfoil Curly Leaf Pondweed Starry Stonewort	Systemic Triclopyr & Diquat - Dibromide Diquat Dibromide CuSO4 + Hydrothol 191
June 24 th	Lake Treatment	2	Starry Stonewort Eurasian Watermilfoil Curly Leaf Pondweed	CuSO4 + Hydrothol 191 Diquat Dibromide Diquat Dibromide
August 5 th	Lake Treatment	3	Eurasian Watermilfoil Starry Stonewort	Diquat Dibromide CuSO4 + Hydrothol 191
September 20 th	Lake Survey		All Aquatic Vegetation	AVAS Survey and Water Samples

May 28th Treatment



(Figure 1)

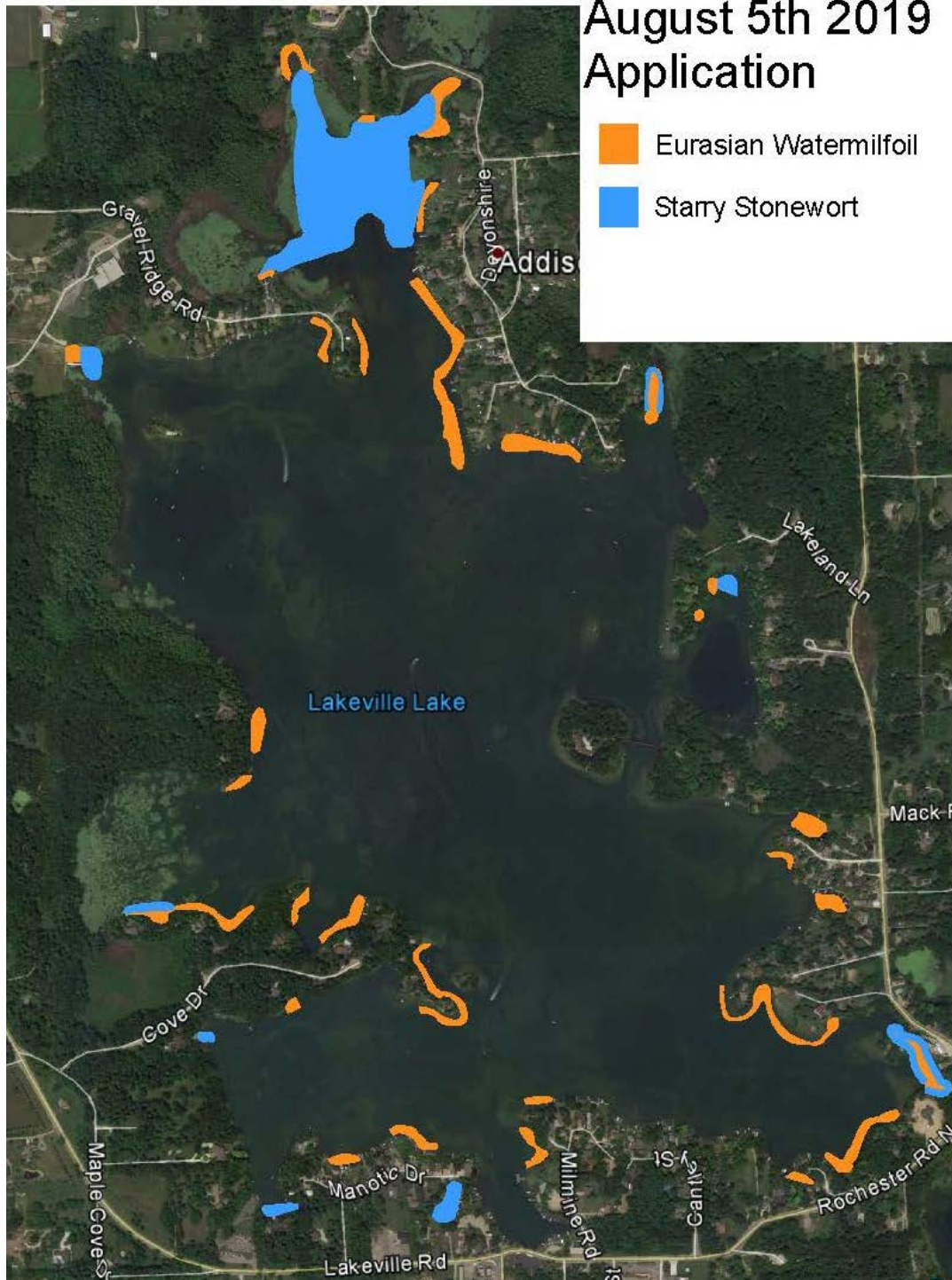
June 24th Treatment



(Figure 2)

August 5th Treatment

August 5th 2019 Application



(Figure 3)



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AVAS Survey

A comprehensive vegetation survey called an Aquatic Vegetation Assessment Survey (AVAS), was performed on Lakeville Lake at the end of the year on September 20th. During this survey, the lake is divided into evenly spaced sections. Inside each section, we document every type of aquatic vegetation found and determine its density inside of that section. Compiling all of these sections into a summary page, we determine a complete set of plant species found within Lakeville Lake and its approximate abundance.

There are 3 different sets of pages. The first is the summary page which gives you the lake wide plant coverage shown as an approximate percentage in column 11. Next is the lake map showing the numerous AVAS sections. The last set of pages are the density pages. Using the map and the density pages together you can determine what plant species exist in each section of the lake.

Looking through all of the pages will look very confusing if you do not understand what the numbers and letters mean. Each plant species has a 'code number'. You can see this on the summary and density pages on the left side. There are 4 different density categories:

- A = found, or <2% of the area
- B = sparse (2% - 20%)
- C = common (20% - 60%)
- D = dense (60% - 100%)

When surveying the lake, we take the plant species number and pair it with a density rating for each AVAS section. We then compile the totals and the results are generated. The results are on the next couple of pages.



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LAKE NAME- Lakeville Lake

COUNTY- Oakland

SURVEY DATE: 9/16/19

Standard Aquatic Vegetation Summary Sheet

SURVEY BY: Savin Lake Services

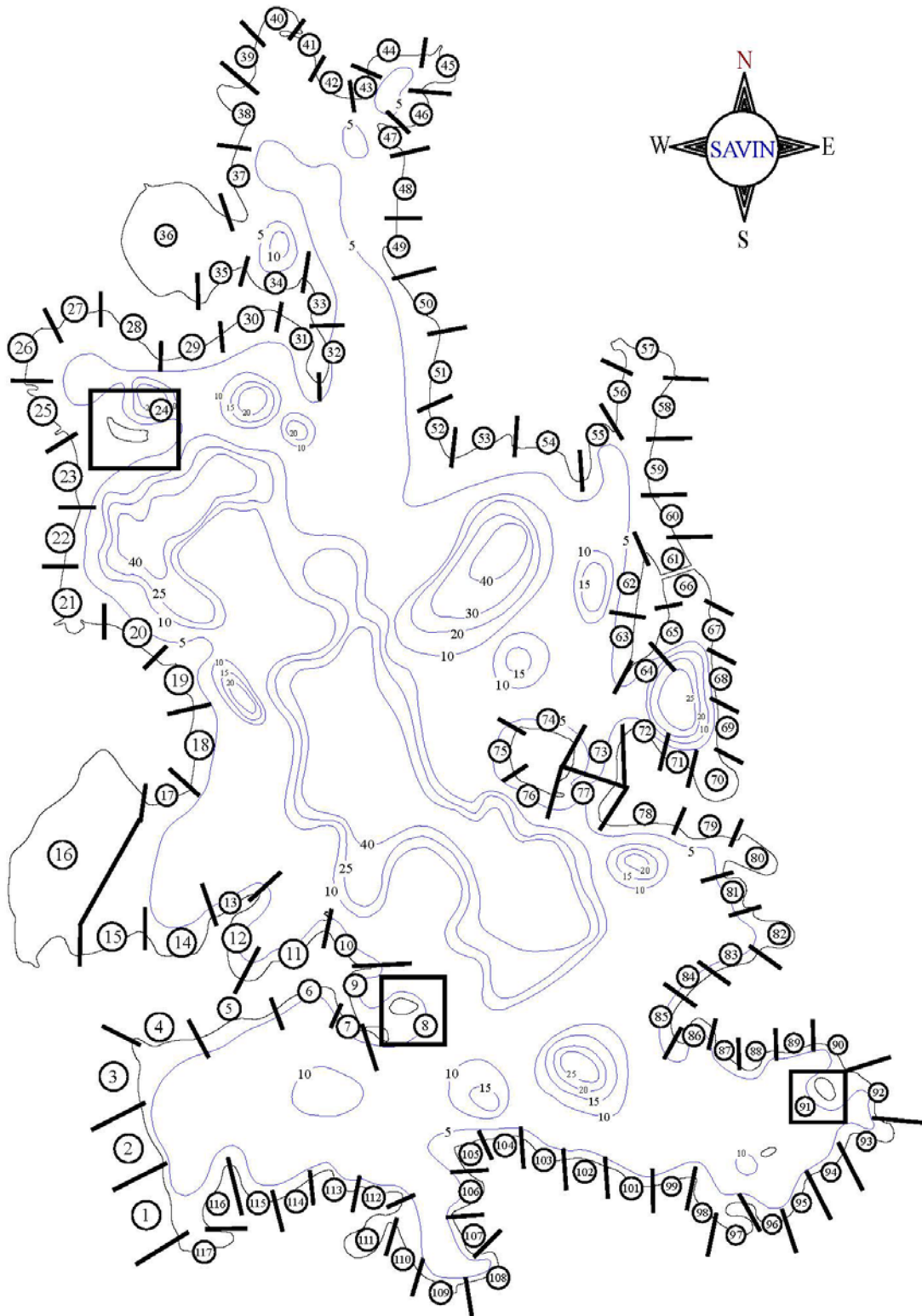
		Total number of AVAS's for each Density Category				Calculations				Sum of Previous	Total Number of	Quotient of Column 9 divided by		
		A	B	C	D	Category A x 1	Category B x10	Category C x 40	Category D x 80	Four Column 9	AVAS's	Column 10		
Code No	Plant Name	1	2	3	4	5	6	7	8	9	10	11	Code No	Plant Name
1	Eurasian milfoil	27	28	7		27	280	280	0	587	117	5.0	1	Eurasian milfoil
2	Curly leaf pondweed	1				1	0	0	0	1	117	0.0	2	Curly leaf pondweed
3	Chara	11	49	22	6	11	490	880	480	1861	117	15.9	3	Chara
4	Thinleaf pondweed	16	8			16	80	0	0	96	117	0.8	4	Thinleaf pondweed
5	Flatstem pondweed					0	0	0	0	0	117	0.0	5	Flatstem pondweed
6	Robbins pondweed					0	0	0	0	0	117	0.0	6	Robbins pondweed
7	Variable pondweed					0	0	0	0	0	117	0.0	7	Variable pondweed
8	Whitestem pondweed	22	66	7		22	660	280	0	962	117	8.2	8	Whitestem pondweed
9	Richardsons pondweed					0	0	0	0	0	117	0.0	9	Richardsons pondweed
10	Illinois pondweed	10	6			10	60	0	0	70	117	0.6	10	Illinois pondweed
11	Large leaf pondweed					0	0	0	0	0	117	0.0	11	Large leaf pondweed
12	American pondweed					0	0	0	0	0	117	0.0	12	American pondweed
13	Floating leaf pondweed	14	22	4		14	220	160	0	394	117	3.4	13	Floating leaf pondweed
14	Water stargrass					0	0	0	0	0	117	0.0	14	Water stargrass
15	Wild Celery	6	51	14		6	510	560	0	1076	117	9.2	15	Wild Celery
16	Sagittaria					0	0	0	0	0	117	0.0	16	Sagittaria
17	Northern milfoil	13	25	6	2	13	250	240	160	663	117	5.7	17	Northern milfoil
18	M. verticillatum					0	0	0	0	0	117	0.0	18	M. verticillatum
19	M. heterophyllum					0	0	0	0	0	117	0.0	19	M. heterophyllum
20	Coontail	5	6	1		5	60	40	0	105	117	0.9	20	Coontail
21	Elodea	1				1	0	0	0	1	117	0.0	21	Elodea
22	Utricularia spp.	14	23			14	230	0	0	244	117	2.1	22	Utricularia spp.
23	Bladderwort-mini					0	0	0	0	0	117	0.0	23	Bladderwort-mini
24	Buttercup					0	0	0	0	0	117	0.0	24	Buttercup
25	Najas spp.	21	29	11		21	290	440	0	751	117	6.4	25	Najas spp.
26	Brittle naiad					0	0	0	0	0	117	0.0	26	Brittle naiad
27	Sago pondweed	23	21	2		23	210	80	0	313	117	2.7	27	Sago pondweed
28						0	0	0	0	0	117	0.0	28	
29						0	0	0	0	0	117	0.0	29	
30	Nymphaea	15	47	15	16	15	470	600	1280	2365	117	20.2	30	Nymphaea
31	Nuphar					0	0	0	0	0	117	0.0	31	Nuphar
32	Brasenia	2				2	0	0	0	2	117	0.0	32	Brasenia
33	Lemna minor					0	0	0	0	0	117	0.0	33	Lemna minor
34	Spirodella		3			0	30	0	0	30	117	0.3	34	Spirodella
35	Watermeal					0	0	0	0	0	117	0.0	35	Watermeal
36	Arrowhead		2			0	20	0	0	20	117	0.2	36	Arrowhead
37	Pickeralweed					0	0	0	0	0	117	0.0	37	Pickeralweed
38	Arrow Arum					0	0	0	0	0	117	0.0	38	Arrow Arum
39	Cattails	4	10	10	11	4	100	400	880	1384	117	11.8	39	Cattails
40	Bulrushes	3	5	1		3	50	40	0	93	117	0.8	40	Bulrushes
41	Iris					0	0	0	0	0	117	0.0	41	Iris
42	Swamp Loosestrife					0	0	0	0	0	117	0.0	42	Swamp Loosestrife
43	Purple Loosestrife					0	0	0	0	0	117	0.0	43	Purple Loosestrife
44	Starry Stonewort	6	18	7	15	6	180	280	1200	1666	117	14.2	44	Starry Stonewort
45	Phragmites		1			0	10	0	0	10	117	0.1	45	Spiny Naiad

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Lake Name: Lakeville Lake

County: Oakland

Surveyor Name: Matt Novotny

Survey Date: September 16th, 2019

Standard Aquatic Vegetation Assessment Site Species Density Sheet																			
Code No.	Plant Name	Aquatic Vegetation Assessment Site Number								Code No.	Plant Name	Aquatic Vegetation Assessment Site Number							
		NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6	NO. 7	NO. 8			NO. 9	NO. 10	NO. 11	NO. 12	NO. 13	NO. 14	NO. 15	NO. 16
1	Eurasian watermilfoil	B	A	B	A	A	C	B	B	1	Eurasian watermilfoil	B	C	B	A	A	A	A	
2	Curly leaf pondweed									2	Curly leaf pondweed								
3	Chara	B	C	B	D	B	B		B	3	Chara	C	B	B	C	B	D	C	C
4	Thin leaf pondweed					A				4	Thin leaf pondweed			A					
5	Flat stem pondweed									5	Flat stem pondweed								
6	Robbins pondweed									6	Robbins pondweed								
7	Variable pondweed									7	Variable pondweed								
8	White stem pondweed	A	A	B	B	C	A	B	B	8	White stem pondweed	B	B	C	B	B	B	B	
9	Richardsons pondweed									9	Richardsons pondweed								
10	Illinois pondweed			A						10	Illinois pondweed								
11	Large leaf pondweed									11	Large leaf pondweed								
12	American pondweed									12	American pondweed								
13	Floating leaf pondweed						B	C	B	13	Floating leaf pondweed		B		A				
14	Water stargrass									14	Water stargrass								
15	Wild Celery	B	B	B	B		B	B	C	15	Wild Celery	C	B	C	B		B	B	
16	Arrowhead (submergent)									16	Arrowhead (submergent)								
17	Native milfoil	B								17	Native milfoil							A	
18	Whorled watermilfoil									18	Whorled watermilfoil								
19	Various leaf watermilfoil									19	Various leaf watermilfoil								
20	Coontail									20	Coontail					A			
21	Elodea									21	Elodea								
22	Bladderwort									22	Bladderwort					A	B		
23	Bladderwort (mini)									23	Bladderwort (mini)								
24	Buttercup									24	Buttercup								
25	Najas spp.	C	B	B	B	B	B	B	B	25	Najas spp.	B	A	A		A			
26	Brittle naiad									26	Brittle naiad								
27	Sago pondweed	A	A	A	B	A	B	B		27	Sago pondweed	B				A	A		
28										28									
29										29									
30	White waterlily	B	B	B	C	B	B	A		30	White waterlily	C		A	B		B	B	D
31	Yellow waterlily									31	Yellow waterlily								
32	Watershield									32	Watershield			A	A				
33	Small duckweed									33	Small duckweed								
34	Great duckweed									34	Great duckweed								
35	Watermeal									35	Watermeal								
36	Arrowhead									36	Arrowhead								
37	Pickerselweed									37	Pickerselweed								
38	Arrow arum									38	Arrow arum								
39	Cattail									39	Cattail			A					
40	Bulrush									40	Bulrush								
41	Iris									41	Iris								
42	Swamp Loosestrife									42	Swamp Loosestrife								
43	Purple Loosestrife									43	Purple Loosestrife								
44	Starry Stonewort	B								44	Starry Stonewort							B	B
45	Phragmites									45	Phragmites								

Sheet Number 1 of 8

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		Aquatic Vegetation Assessment Site Number										Aquatic Vegetation Assessment Site Number							
Code No.	Plant Name	NO. 33	NO. 34	NO. 35	NO. 36	NO. 37	NO. 38	NO. 39	NO. 40	Code No.	Plant Name	NO. 41	NO. 42	NO. 43	NO. 44	NO. 45	NO. 46	NO. 47	NO. 48
1	Eurasian watermilfoil									1	Eurasian watermilfoil								
2	Curly leaf pondweed									2	Curly leaf pondweed								
3	Chara	C		A						3	Chara	A		B					
4	Thin leaf pondweed									4	Thin leaf pondweed								
5	Flat stem pondweed									5	Flat stem pondweed								
6	Robbins pondweed									6	Robbins pondweed								
7	Variable pondweed									7	Variable pondweed								
8	White stem pondweed	B							B	8	White stem pondweed		B	B	B	B	B	B	A
9	Richardsons pondweed									9	Richardsons pondweed								
10	Illinois pondweed									10	Illinois pondweed								
11	Large leaf pondweed									11	Large leaf pondweed								
12	American pondweed									12	American pondweed								
13	Floating leaf pondweed									13	Floating leaf pondweed								
14	Water stargrass									14	Water stargrass								
15	Wild Celery	B								15	Wild Celery								
16	Arrowhead (submergent)									16	Arrowhead (submergent)								
17	Native milfoil	B							A	17	Native milfoil	B	A	B	C	C	C	B	B
18	Whorled watermilfoil									18	Whorled watermilfoil								
19	Various leaf watermilfoil									19	Various leaf watermilfoil								
20	Coontail									20	Coontail				B	B	B		
21	Elodea									21	Elodea								
22	Bladderwort		B	B		B	B	B	B	22	Bladderwort	B	B	B	B	B		B	B
23	Bladderwort (mini)									23	Bladderwort (mini)								
24	Buttercup									24	Buttercup								
25	Najas spp.									25	Najas spp.								B
26	Brittle naiad									26	Brittle naiad								
27	Sago pondweed								A	27	Sago pondweed								
28										28									
29										29									
30	White waterlily	B	C	C	D	D	D	D	C	30	White waterlily	D	D	C	D	D	C	D	D
31	Yellow waterlily									31	Yellow waterlily								
32	Watershield									32	Watershield								
33	Small duckweed									33	Small duckweed								
34	Great duckweed		B							34	Great duckweed								
35	Watermeal									35	Watermeal								
36	Arrowhead									36	Arrowhead								
37	Pickerelweed									37	Pickerelweed								
38	Arrow arum									38	Arrow arum								
39	Cattail	A	C	B	D	D	D	D	C	39	Cattail	D	C	C	D	D	B	B	C
40	Bulrush	B								40	Bulrush								A
41	Iris									41	Iris								
42	Swamp Loosestrife									42	Swamp Loosestrife								
43	Purple Loosestrife									43	Purple Loosestrife								
44	Starry Stonewort	A	D	D	D	D	D	D	C	44	Starry Stonewort	D	D	C	B	B		D	D
45	Phragmites		B							45	Phragmites								



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Code No.	Plant Name	Aquatic Vegetation Assessment Site Number										Code No.	Plant Name	Aquatic Vegetation Assessment Site Number									
		NO. 49	NO. 50	NO. 51	NO. 52	NO. 53	NO. 54	NO. 55	NO. 56		NO. 57			NO. 58	NO. 59	NO. 60	NO. 61	NO. 62	NO. 63	NO. 64			
1	Eurasian watermilfoil	A			A	A	A				1	Eurasian watermilfoil						A	B	A			
2	Curly leaf pondweed										2	Curly leaf pondweed											
3	Chara	B	B	C	B	B	B	A			3	Chara					B			B			
4	Thin leaf pondweed						A				4	Thin leaf pondweed					B						
5	Flat stem pondweed										5	Flat stem pondweed											
6	Robbins pondweed										6	Robbins pondweed											
7	Variable pondweed										7	Variable pondweed											
8	White stem pondweed	A	B	B	B	A	C	A			8	White stem pondweed			A		A	A	A				
9	Richardsons pondweed										9	Richardsons pondweed											
10	Illinois pondweed					B	B				10	Illinois pondweed								A			
11	Large leaf pondweed										11	Large leaf pondweed											
12	American pondweed										12	American pondweed											
13	Floating leaf pondweed				A	B					13	Floating leaf pondweed					B	B	C	A			
14	Water stargrass										14	Water stargrass											
15	Wild Celery	C	C	C		B	B	B			15	Wild Celery					B	B	A				
16	Arrowhead (submergent)										16	Arrowhead (submergent)											
17	Native milfoil	B	B	C	B	B	C		B		17	Native milfoil			A	B	B			B			
18	Whorled watermilfoil										18	Whorled watermilfoil											
19	Various leaf watermilfoil										19	Various leaf watermilfoil											
20	Coontail										20	Coontail	C	B	A					A			
21	Elodea										21	Elodea											
22	Bladderwort	B	A	A		A		B	B		22	Bladderwort	B	B	B					A			
23	Bladderwort (mini)										23	Bladderwort (mini)											
24	Buttercup										24	Buttercup											
25	Najas spp.	B	A			A	C	B	A		25	Najas spp.					A	B	B	B			
26	Brittle naiad										26	Brittle naiad											
27	Sago pondweed	A		B		A		C	B		27	Sago pondweed	B					B	B	B			
28											28												
29											29												
30	White waterlily	B	A	B	A	A		B	B		30	White waterlily	D	D	C		C	C	B	B			
31	Yellow waterlily										31	Yellow waterlily											
32	Watershield										32	Watershield											
33	Small duckweed										33	Small duckweed											
34	Great duckweed										34	Great duckweed											
35	Watermeal										35	Watermeal											
36	Arrowhead										36	Arrowhead											
37	Pickerelweed										37	Pickerelweed											
38	Arrow arum										38	Arrow arum											
39	Cattail										39	Cattail	C	C			C						
40	Bulrush		A								40	Bulrush											
41	Iris										41	Iris											
42	Swamp Loosestrife										42	Swamp Loosestrife											
43	Purple Loosestrife										43	Purple Loosestrife											
44	Starry Stonewort	B	A					D	D		44	Starry Stonewort		D	D	C	B						
45	Phragmites										45	Phragmites											

Sheet Number 4 of 8



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Standard Aquatic Vegetation Assessment Site Species Density Sheet																							
		Aquatic Vegetation Assessment Site Number												Aquatic Vegetation Assessment Site Number									
Code No.	Plant Name	NO. 65	NO. 66	NO. 67	NO. 68	NO. 69	NO. 70	NO. 71	NO. 72	Code No.	Plant Name	NO. 73	NO. 74	NO. 75	NO. 76	NO. 77	NO. 78	NO. 79	NO. 80				
1	Eurasian watermilfoil								B	1	Eurasian watermilfoil	C	B	C	C	C	A		A				
2	Curly leaf pondweed									2	Curly leaf pondweed												
3	Chara	C	B		B	D	B	B	A	3	Chara	B				B		C	C				
4	Thin leaf pondweed	A			A	B			A	4	Thin leaf pondweed	A		A	A	B							
5	Flat stem pondweed									5	Flat stem pondweed												
6	Robbins pondweed									6	Robbins pondweed												
7	Variable pondweed									7	Variable pondweed												
8	White stem pondweed	B	B	B	B	B	B	B	B	8	White stem pondweed	B	B	B	B	B	B	A					
9	Richardsons pondweed									9	Richardsons pondweed												
10	Illinois pondweed	A								10	Illinois pondweed		A		B			B					
11	Large leaf pondweed									11	Large leaf pondweed												
12	American pondweed									12	American pondweed												
13	Floating leaf pondweed			A			A	A	B	13	Floating leaf pondweed	B	B	C	C	B	A						
14	Water stargrass									14	Water stargrass												
15	Wild Celery								B	15	Wild Celery	B	A	B		B	C	B	B				
16	Arrowhead (submergent)									16	Arrowhead (submergent)												
17	Native milfoil	B						B		17	Native milfoil		B			B			A				
18	Whorled watermilfoil									18	Whorled watermilfoil												
19	Various leaf watermilfoil									19	Various leaf watermilfoil												
20	Coontail									20	Coontail						A		A				
21	Elodea									21	Elodea												
22	Bladderwort					A	A	A		22	Bladderwort								B				
23	Bladderwort (mini)									23	Bladderwort (mini)												
24	Buttercup									24	Buttercup												
25	Najas spp.			A					A	25	Najas spp.	B				B	A	A	A				
26	Brittle naiad									26	Brittle naiad												
27	Sago pondweed				A	A				27	Sago pondweed	A	A			A	B						
28										28													
29										29													
30	White waterlily	B	B	B	B	B	C	B	A	30	White waterlily	B	B			B	A	B	B				
31	Yellow waterlily									31	Yellow waterlily												
32	Watershield									32	Watershield												
33	Small duckweed									33	Small duckweed												
34	Great duckweed									34	Great duckweed												
35	Watermeal									35	Watermeal												
36	Arrowhead									36	Arrowhead												
37	Pickerelweed									37	Pickerelweed												
38	Arrow arum									38	Arrow arum												
39	Cattail		C	A			C			39	Cattail												
40	Bulrush									40	Bulrush												
41	Iris									41	Iris												
42	Swamp Loosestrife									42	Swamp Loosestrife												
43	Purple Loosestrife									43	Purple Loosestrife												
44	Starry Stonewort	C	B	B			B	A		44	Starry Stonewort					B			C				
45	Phragmites									45	Phragmites												



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Lake Name: Lakeville Lake

County: Oakland

Surveyor Name: Matt Novotny

Survey Date: September 16th, 2019

Standard Aquatic Vegetation Assessment Site Species Density Sheet																			
Aquatic Vegetation Assessment Site Number										Aquatic Vegetation Assessment Site Number									
Code No.	Plant Name	NO. 81	NO. 82	NO. 83	NO. 84	NO. 85	NO. 86	NO. 87	NO. 88	Code No.	Plant Name	NO. 89	NO. 90	NO. 91	NO. 92	NO. 93	NO. 94	NO. 95	NO. 96
1	Eurasian watermilfoil				B	B	A	B		1	Eurasian watermilfoil						A	B	A
2	Curly leaf pondweed									2	Curly leaf pondweed								
3	Chara	C	B	A	B	B	B	A	A	3	Chara			C	B	B		B	B
4	Thin leaf pondweed	A	B			A	B	B		4	Thin leaf pondweed					A			A
5	Flat stem pondweed									5	Flat stem pondweed								
6	Robbins pondweed									6	Robbins pondweed								
7	Variable pondweed									7	Variable pondweed								
8	White stem pondweed	B		B	B	B		B	B	8	White stem pondweed	A	B	B	B	B	B	C	B
9	Richardsons pondweed									9	Richardsons pondweed								
10	Illinois pondweed	A			A		A	A		10	Illinois pondweed			B			A		
11	Large leaf pondweed									11	Large leaf pondweed								
12	American pondweed									12	American pondweed								
13	Floating leaf pondweed	B				B			B	13	Floating leaf pondweed			B					
14	Water stargrass									14	Water stargrass								
15	Wild Celery	B	C	B	B		B	C	B	15	Wild Celery	B	B	B	C	C	B	B	B
16	Arrowhead (submergent)									16	Arrowhead (submergent)								
17	Native milfoil		A							17	Native milfoil		A	B			B		A
18	Whorled watermilfoil									18	Whorled watermilfoil								
19	Various leaf watermilfoil									19	Various leaf watermilfoil								
20	Coontail									20	Coontail								
21	Elodea									21	Elodea								
22	Bladderwort									22	Bladderwort								
23	Bladderwort (mini)									23	Bladderwort (mini)								
24	Buttercup									24	Buttercup								
25	Najas spp.	B		A	B		C			25	Najas spp.	B		B	B		A	B	
26	Brittle naiad									26	Brittle naiad								
27	Sago pondweed	B	B	A	A		C	B		27	Sago pondweed								A
28										28									
29										29									
30	White waterlily								B	30	White waterlily	B	A	C	B	B			B
31	Yellow waterlily									31	Yellow waterlily								
32	Watershield									32	Watershield								
33	Small duckweed									33	Small duckweed								
34	Great duckweed									34	Great duckweed								
35	Watermeal									35	Watermeal								
36	Arrowhead									36	Arrowhead								
37	Pickeralweed									37	Pickeralweed								
38	Arrow arum									38	Arrow arum								
39	Cattail									39	Cattail								
40	Bulrush								A	40	Bulrush								
41	Iris									41	Iris								
42	Swamp Loosestrife									42	Swamp Loosestrife								
43	Purple Loosestrife									43	Purple Loosestrife								
44	Starry Stonewort									44	Starry Stonewort	C	B	B	B	B			
45	Phragmites									45	Phragmites								

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Lake Name: Lakeville Lake

County: Oakland

Surveyor Name: Matt Novotny

Survey Date: September 16th, 2019

Standard Aquatic Vegetation Assessment Site Species Density Sheet																							
		Aquatic Vegetation Assessment Site Number												Aquatic Vegetation Assessment Site Number									
Code No.	Plant Name	NO. 97	NO. 98	NO. 99	NO. 100	NO. 101	NO. 102	NO. 103	NO. 104	Code No.	Plant Name	NO. 105	NO. 106	NO. 107	NO. 108	NO. 109	NO. 110	NO. 111	NO. 112				
1	Eurasian watermilfoil	A	A	A	A	A		A	B	1	Eurasian watermilfoil	B	B		B		B	A	B				
2	Curly leaf pondweed									2	Curly leaf pondweed												
3	Chara	B	B	B	B	B	A	B	A	3	Chara	C	B	B	B	B	C	A	B				
4	Thin leaf pondweed									4	Thin leaf pondweed		B		B			A					
5	Flat stem pondweed									5	Flat stem pondweed												
6	Robbins pondweed									6	Robbins pondweed												
7	Variable pondweed									7	Variable pondweed												
8	White stem pondweed	A	A	C	C	C	B	B	B	8	White stem pondweed	B	A	B	B	B	A	A	B				
9	Richardsons pondweed									9	Richardsons pondweed												
10	Illinois pondweed									10	Illinois pondweed				A								
11	Large leaf pondweed									11	Large leaf pondweed												
12	American pondweed									12	American pondweed												
13	Floating leaf pondweed			B	A	A	A			13	Floating leaf pondweed	A											
14	Water stargrass									14	Water stargrass												
15	Wild Celery	B	B		B	B	B	B	A	15	Wild Celery		B		B	C	B	B	B				
16	Arrowhead (submergent)									16	Arrowhead (submergent)												
17	Native milfoil	A	A							17	Native milfoil												
18	Whorled watermilfoil									18	Whorled watermilfoil												
19	Various leaf watermilfoil									19	Various leaf watermilfoil												
20	Coontail	B	B							20	Coontail												
21	Elodea									21	Elodea												
22	Bladderwort	A	A							22	Bladderwort												
23	Bladderwort (mini)									23	Bladderwort (mini)												
24	Buttercup									24	Buttercup												
25	Najas spp.	C	C	B	A	A	A			25	Najas spp.		C			B	B	B	C				
26	Brittle naiad									26	Brittle naiad												
27	Sago pondweed									27	Sago pondweed				B	B	B	A	A				
28										28													
29										29													
30	White waterlily	A	A		A	A		A		30	White waterlily		B	B	B	B		B					
31	Yellow waterlily									31	Yellow waterlily												
32	Watershield									32	Watershield												
33	Small duckweed									33	Small duckweed												
34	Great duckweed	B	B							34	Great duckweed												
35	Watermeal									35	Watermeal												
36	Arrowhead									36	Arrowhead												
37	Pickerelweed									37	Pickerelweed												
38	Arrow arum									38	Arrow arum												
39	Cattail									39	Cattail				B								
40	Bulrush	B	B							40	Bulrush					B							
41	Iris									41	Iris												
42	Swamp Loosestrife									42	Swamp Loosestrife												
43	Purple Loosestrife									43	Purple Loosestrife												
44	Starry Stonewort									44	Starry Stonewort							B					
45	Phragmites									45	Phragmites												

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Lake Name: Lakeville Lake

County: Oakland

Surveyor Name: Matt Novotny

Survey Date: September 19th, 2019

Standard Aquatic Vegetation Assessment Site Species Density Sheet																			
Code No.	Plant Name	Aquatic Vegetation Assessment Site Number								Code No.	Plant Name	Aquatic Vegetation Assessment Site Number							
		NO. 113	NO. 114	NO. 115	NO. 116	NO. 117	NO. 118	NO. 119	NO. 120			NO. 121	NO. 122	NO. 123	NO. 124	NO. 125	NO. 126	NO. 127	NO. 128
1	Eurasian watermilfoil	B	B	A	B	B				1	Eurasian watermilfoil								
2	Curly leaf pondweed									2	Curly leaf pondweed								
3	Chara	B	B	B	B	B				3	Chara								
4	Thin leaf pondweed				A					4	Thin leaf pondweed								
5	Flat stem pondweed									5	Flat stem pondweed								
6	Robbins pondweed									6	Robbins pondweed								
7	Variable pondweed									7	Variable pondweed								
8	White stem pondweed	B	B	B	B					8	White stem pondweed								
9	Richardsons pondweed									9	Richardsons pondweed								
10	Illinois pondweed									10	Illinois pondweed								
11	Large leaf pondweed									11	Large leaf pondweed								
12	American pondweed									12	American pondweed								
13	Floating leaf pondweed		B	B						13	Floating leaf pondweed								
14	Water stargrass									14	Water stargrass								
15	Wild Celery	C	B	B	C	B				15	Wild Celery								
16	Arrowhead (submergent)									16	Arrowhead (submergent)								
17	Native milfoil									17	Native milfoil								
18	Whorled watermilfoil									18	Whorled watermilfoil								
19	Various leaf watermilfoil									19	Various leaf watermilfoil								
20	Coontail									20	Coontail								
21	Elodea									21	Elodea								
22	Bladderwort		A							22	Bladderwort								
23	Bladderwort (mini)									23	Bladderwort (mini)								
24	Buttercup									24	Buttercup								
25	Najas spp.	C	C	C	C	A				25	Najas spp.								
26	Brittle naiad									26	Brittle naiad								
27	Sago pondweed	A	A	B	B					27	Sago pondweed								
28										28									
29										29									
30	White waterlily			B	B	B				30	White waterlily								
31	Yellow waterlily									31	Yellow waterlily								
32	Watershield									32	Watershield								
33	Small duckweed									33	Small duckweed								
34	Great duckweed									34	Great duckweed								
35	Watermeal									35	Watermeal								
36	Arrowhead									36	Arrowhead								
37	Pickeralweed									37	Pickeralweed								
38	Arrow arum									38	Arrow arum								
39	Cattail					A				39	Cattail								
40	Bulrush									40	Bulrush								
41	Iris									41	Iris								
42	Swamp Loosestrife									42	Swamp Loosestrife								
43	Purple Loosestrife									43	Purple Loosestrife								
44	Starry Stonewort					B				44	Starry Stonewort								
45	Phragmites									45	Phragmites								

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Water Quality

During certain periods of the year, Michigan lakes have poorer water quality than the rest of the year. The water quality sampling in this study is designed to look at two of those poor water quality periods each year. One in the early spring when phosphorus, which may be released from the bottom sediments, is distributed throughout the water column by spring mixing and a second in late summer when the water is warmest, and the lake is stratified (if it stratifies). During most of the remainder of the year, the water quality is better. Thus, if the lake gets high marks for water quality during early spring and late summer, it probably has good water quality all year long.

Lakeville Lake had water samples taken on May 14th, 2019 and September 17th, 2019. Water samples were taken from sites 1, 2, and 3 for water quality testing (refer to Figure 4). Nine parameters were analyzed from the water samples at these three sites for this report. These nine are generally considered most important to a waterbody's quality. Additionally, the trophic state index is calculated based on chlorophyll α , total phosphorus, and secchi disk values. This index is used to generalize the biological productivity of a waterbody. The 3 main trophic states for a lake are oligotrophic (low productivity), mesotrophic (medium productivity), and eutrophic (high productivity). A complete lake profile for temperature and dissolved oxygen only was taken from site 4, which is the deepest part of the lake. The results are shown below.

(At time of this report being made, Late Summer Chlorophyll a values were not available)



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Date: 5/14/19						
Site Number:	1	2	3		Average	Grade
Chlorophyll α (ug/L)	0.27	0.27	0.27		0.27	A
Total Phosphorus (ug/L)	<8	<8	9		<8	A
Nitrate-N	<130	<130	<130		<130	A
Alkalinity (mg/L)	190	200	240		210	A
pH	8.35	8.17	8.32		8.28	B
Conductivity (umho/cm)	530	530	520		527	B
Secchi Disk Depth (meters)	5.18	6.25	N/A		5.7	B
Surface Temp (°C)	12.3	12.4	12.1		12.3	A
Surface D.O. (mg/L)	10.3	10.27	10.93		10.50	A
TSI	Value		Trophic State			
Secchi Disk	34.9		Oligotrophic			
Chlorophyll α	17.8		Oligotrophic			
Total Phosphorus	34.1		Oligotrophic			

Date: 9/17/19						
Site Number:	1	2	3		Average	Grade
Chlorophyll α (ug/L)	N/A	N/A	N/A		N/A	N/A
Total Phosphorus (ug/L)	11	<8	9		~9	A
Nitrate-N	<130	<130	<130		<130	A
Alkalinity (mg/L)	160	170	180		170	A
pH	8.37	8.31	8.09		8.26	B
Conductivity (umho/cm)	460	470	480		470	B
Secchi Disk Depth (meters)	4.11	4.42	N/A		4.3	C
Surface Temp (°C)	21.8	21.5	21.5		21.6	A
Surface D.O. (mg/L)	9.58	9.44	12.48		10.50	B
TSI	Value		Trophic State			
Secchi Disk	39.1		Oligotrophic			
Chlorophyll α	N/A		N/A			
Total Phosphorus	35.8		Oligotrophic			

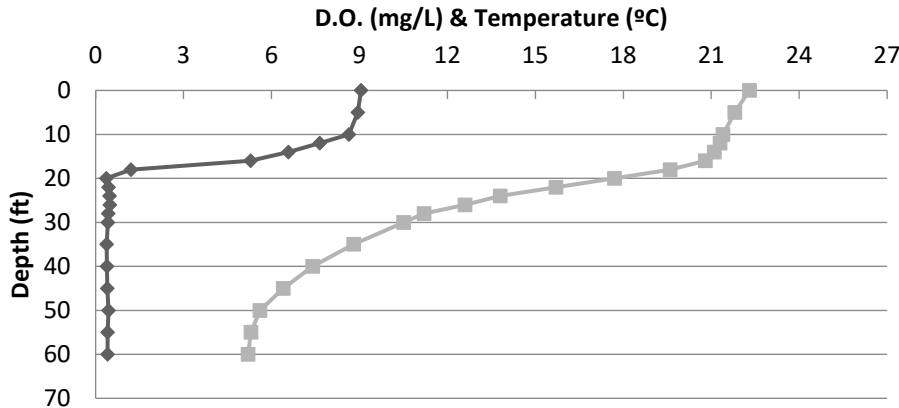


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(Figure 4: Sampling locations for water quality)

Lakeville Lake 9/17/2019 Dissolved Oxygen Profile



Temp (°C)	D.O. (mg/L)	Depth (ft)
22.3	9.05	0
21.8	8.94	5
21.4	8.64	10
21.3	7.64	12
21.1	6.57	14
20.8	5.29	16
19.6	1.2	18
17.7	0.36	20
15.7	0.44	22
13.8	0.47	24
12.6	0.48	26
11.2	0.43	28
10.5	0.42	30
8.8	0.38	35
7.4	0.39	40
6.4	0.4	45
5.6	0.44	50
5.3	0.41	55
5.2	0.41	60

Dissolved oxygen is the parameter most often selected by lake water quality scientists as being important. Besides providing oxygen for aquatic organisms, in natural lakes dissolved oxygen is involved in phenomena such as phosphorus precipitation and release from the lake bottom sediments and decomposition of organic material in the lake. Some experts like to see some dissolved oxygen in the bottom water of a lake, even if it is almost zero. This is because as long as there is some dissolved oxygen in the water, phosphorus precipitated by iron to the bottom sediments will remain there. Once a lake runs out of dissolved oxygen, iron comes back into solution and releases the phosphorus back into the water.

Overall, Lakeville Lake's water quality data looks great. A thermocline developed from 16 to 30 feet. Only the summer's secchi disk readings are slightly poor, which is consistent with past years. The lake contains hard water with a moderate amount of dissolved material. Nutrients are low in value as well. The overall spring grade is an A, whereas the summer grade is a B due to the secchi values.

Monitoring of Lakeville Lake's water quality should be continued in future years to determine trends in the analysis and to be proactive in the health of the lake.



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Conclusions

In 2019 the curly leaf pondweed was addressed and controlled during the first treatment where triclopyr was not utilized. The remaining curly leaf pondweed was then treated during our second application. Starry stonewort treatments maintained their similarity in areas around the lake, most notably the northern part of the lake near the inlet from Upper Lakeville Lake. A few other bays around the lake were treated once or twice this year as well as needed. Over the last couple of years, new patches of starry stonewort were found and treated at the public launch and around the small island (with the small bridge) in the south east corner of the lake.

We followed through with increase the rate of systemic herbicide used for the Eurasian watermilfoil. Later summer survey suggests the treatment was much more effective. This was needed due to the narrow band that the milfoil beds exhibit. Since we cannot treat water that milfoil does not exist, we are limited to only applying over those narrow bands. This fact, coupled with a highly recreational lake and also sees high wind/wave action, and that the milfoil had hybridized, created efficacy issues with normal treatment rates. Thus, a higher rate was needed.

Looking to 2020, we will maintain our treatment strategy toward curly leaf pondweed, starry stonewort, and emergent vegetation. We will continue in coordination between the mechanical harvesting operation and herbicide applications, however this area does need to improve. The necessity (or lack of) starry stonewort applications will be looked at as well in coordination with board members; as there is some concern of the benefit of these treatments.

Also in 2020 for the Eurasian watermilfoil treatment, we will be using a new product and not triclopyr. This product is new to the market and called ProcellaCOR. It is fast acting, so water movement won't be a factor. It actively targets the plants, so narrow banding won't be an issue. And there is no 120 day irrigation restriction; as well as no water well location restriction. So all of the issues and inconveniences we've encountered before are fixed with this product. The manufacturer will even guarantee the treatment if it is larger than 10 acres.

Please keep in mind that we are a fully integrated lakes management company offering solutions including but not limited to mechanical harvesting, herbicide control, dredging, bio-augmentation, and aeration. Savin Lake Services also offers a complete range of water quality testing, depth contour mapping, individual property solutions, and even aquatic plant density reporting.

We look forward to working with the Lakeville Lake Improvement Board next year.

Sincerely,

Matthew Novotny
Regional Lakes Manager