2020 Eurasian Watermilfoil Surveys

Round & Little Round Lakes, Sawyer County, WI

- Surveys Completed August 28-30 & September 4, 2020 –

- Report Completed November 2020 -

Project initiated & funded in part by:
Round Lakes Property Owners Association

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Surveys & report completed by:
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Survey assistance from AEM Aquatic Consulting

Photos from Cover Page: 1) Survey rake full of water celery mixed with other native species. Water celery was abundant and found throughout both lakes during the survey. 2) Living/healthy Eurasian watermilfoil canopied at the lake surface in Little Round Lake EWM bed EE20. 3) Living/healthy Eurasian watermilfoil near the lake surface from Round Lake bed R19 (photo taken in 2019).

ABSTRACT

Round and Little Round Lakes, Sawyer County, Wisconsin were surveyed at targeted Eurasian watermilfoil (*Myriophyllum spicatum,* EWM) locations. The surveys occurred August 28-30th and September 4th, 2020. Overall, the surveys were intended to assess the efficacy of 2018 diver assisted suction harvesting (DASH) at several locations, measure the effectiveness of 2018-2020 herbicide control at several locations, and map targeted EWM polygons for future management. Methods of the survey followed WDNR guidelines including delineation of EWM beds while boating around the perimeter. Survey points at 20-meter grid resolution within those EWM beds were sampled using a double-sided rake on a telescopic pole and all species were recorded along with water depth and substrate.

Acreage estimates of EWM in Round Lake were 26.5 acres in 2018, 15.0 acres in 2019, and 4.5 acres in 2020. Acreage estimates of EWM in Little Round Lake were 5.5 acres in 2018, 1.9 acres in 2019, and 0.3 acres in 2020. DASH work was done at 5.4 acres in Round Lake in 2018 but did not occur in 2019 or 2020. DASH work was done among 4.0 acres in Little Round Lake in 2018 but the areas were too large for effective DASH control. Herbicide treatments occurred in Round Lake at 10.9 acres in 2018, 21.9 acres in 2019, and 10.3 acres in 2020. Herbicide treatment occurred in Little Round Lake at 4 acres in 2019 and 3.2 acres in 2020. Survey results from 2020 suggest that herbicide treatment resulted in statistically significant decrease of EWM in Hinton Bay, Richardson's Bay, Little Round Lake, and Musky Bay. Herbicide treatment resulted in decrease of EWM, though not statistically significant, in southwest Round Lake, Musky Bay, and Blue Island Bay. The areas with the most striking reduction in EWM occurrence were Richardson's Bay (whole-bay treatment 2019) and Hinton Bay (herbicide Aug 2019 & June 2020). The few 2018 DASH areas that were not followed up with herbicide treatment in 2019 and/or 2020 have increased in EWM occurrence.

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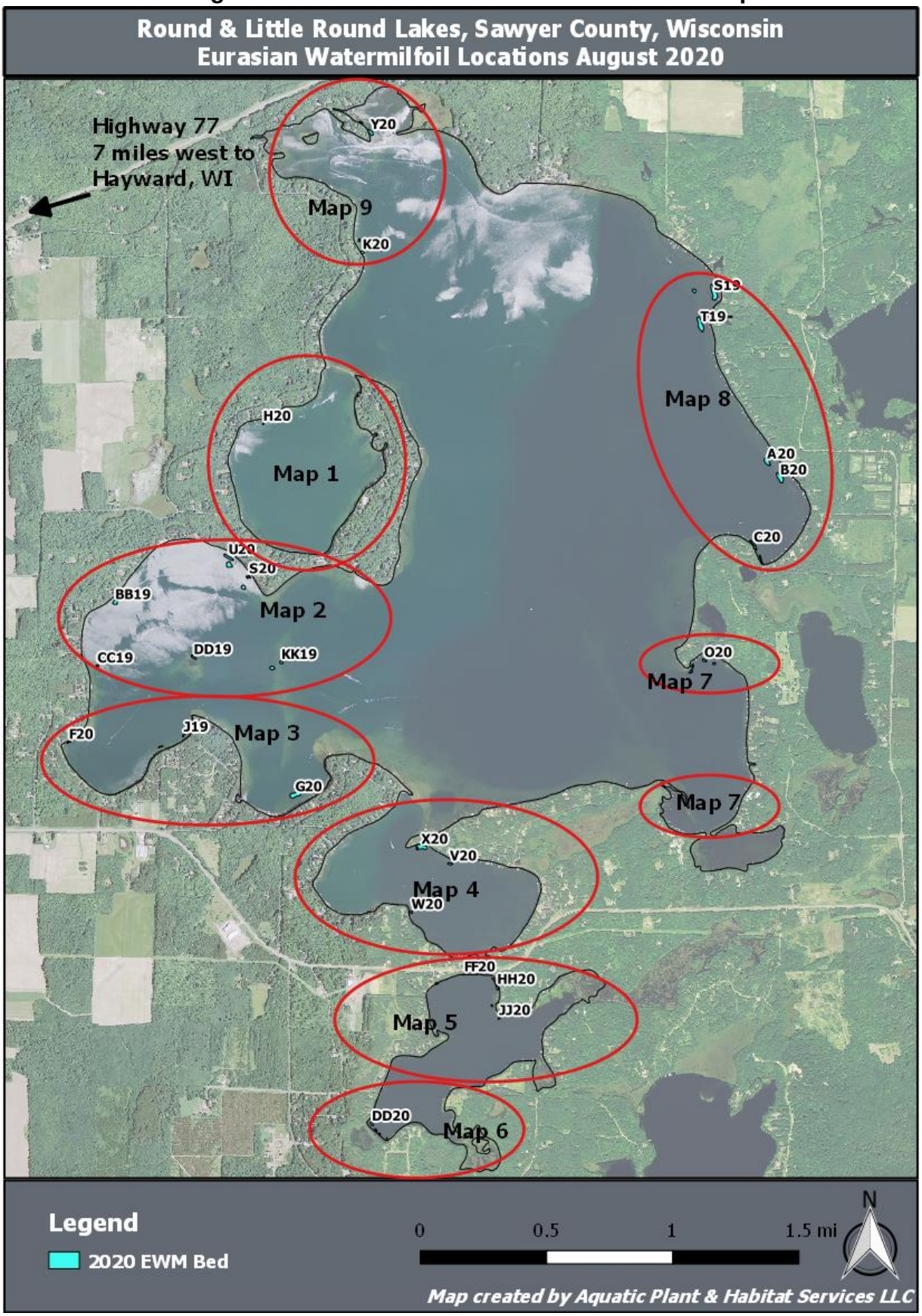
INTRODUCTION

The Round Lake Property Owners Association (RLPOA) was awarded an Aquatic Invasive Species Established Population Control grant from the Wisconsin Department of Natural Resources (WDNR) in April 2018. This report and the EWM surveys completed in 2018, 2019, and 2020 are intended to fulfill part of the grant requirements, particularly pre/post-treatment surveys of Eurasian watermilfoil in Round and Little Round Lakes to gauge efficacy of diver assisted suction harvesting (DASH) and herbicide treatment. The 2020 surveys were completed August 28-30th and September 4th. The results in this report serve as post-DASH assessment from 2018 and post-herbicide assessment from areas treated in 2018, 2019, and 2020.

Study Site

Round Lake is a seepage lake located in Sawyer County, Wisconsin with a surface area of 3,324 acres. The maximum depth is 74 feet and the mean depth is 33 feet. Connected by a narrow channel to the south is Little Round Lake, also considered a seepage lake with a surface area of 179 acres, maximum depth of 38 feet and mean depth of 12 feet. Although the lakes have their own unique Water Body Identification Code (WBIC, Round 2395600, Little Round 2395500), they are sometimes referred to as the Round Chain and the Round Lake Property Owners Association serves both lakes. The lakes are situated approximately 7 miles east of Hayward, Wisconsin (Figure 1). Water clarity for Little Round Lake is moderately clear. Little Round Lake is considered mesotrophic and has abundant vegetation. Water clarity for Round Lake is very high and the lake is considered oligotrophic with low nutrients and sparse vegetation.

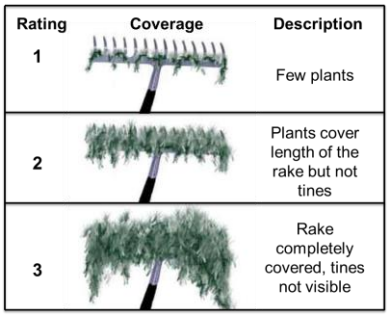
Figure 1 – Round & Little Round Lakes EWM Map



METHODS

Field Methods

Figure 2 – Rake Fullness Illustration



Field methods followed the Draft Aquatic Plant Treatment Evaluation Protocol document from Wisconsin Department of Natural Resources[1]. EWM beds were surveyed August 28-30th and September 4th, 2020 to gauge post-DASH efficacy, post-herbicide efficacy, and provide pre-treatment survey information for possible treatment in 2021. Survey locations and strategy were done in consultation with the WI DNR and RLPOA. Dense stands of EWM were targeted and boundaries were visually determined from a boat and mapped while navigating along the bed perimeter. Each EWM bed was assigned a letter identifier followed by the year (e.g., A20). Locations of sparse EWM (i.e., no more abundant than native species and spread out) were captured but not included in polygons or acreage estimates because the EWM was not dense enough to be mapped as a bed. Within the EWM beds a sampling grid of 20-meter-spaced points was created and then points were sampled. A double-sided rake head on a telescopic pole was used to sample each point for EWM & aquatic plant rake fullness, depth, and dominant sediment type (muck, rock, or sand). The rake fullness rating for total coverage of plants on the rake and a separate rake fullness rating for each species present were recorded (Figure 2). Any survey points that were inaccessible were recorded as such and no sample was taken. Aquatic plants found within 6 feet of the sample point but not found on the rake were counted as visual observations. Plant identification was verified using Skawinski (2014).

Chi-Squared Tests

A chi-squared test of treatment areas was completed to assess the efficacy of DASH or herbicide treatment. Chi-squared tests help determine whether there is a significant difference between two years by comparing the number of sites a particular plant species was found those two years. The alpha, or Type I, error rate was set at 0.05, meaning there is a 5% chance of claiming there is a significant change when no real change has occurred.

Map Development

Aquatic plant survey data were uploaded to an open source geographic information systems (GIS) program known as QGIS (QGIS, 2020). Maps were created to show EWM occurrence, rake fullness, bed location, and past management.

[1] Updated October 1, 2016. https://dnr.wi.gov/lakes/plants/research/.

RESULTS

ROUND EWM ACRES			
	July 2018	August 2019	August-Sept 2020
Hinton Bay	1.468	9.51	0.02
Southwest Round	0.781	1.36	0.97
Musky Bay	3.094	1.81	0.42
Blue Island & NE	0.101	2.30	2.86
Northwest	2	0.02	0.23
Richardsons	19.006	0.00	0.03
TOTALS	26.45	15.00	4.54

LITTLE ROUND EWM ACRES		
July 2018	August 2019	August-Sept. 2020
5.512	1.9	0.343

ROUND HERBICIDE ACRES			
	June-July 2018	June-July 2019	June-July 2020
Hinton Bay	0	2.5*	5.27
Southwest Round	0	0	1
Musky Bay	1.5	1	2.5
Blue Island & NE	0	0	1
Northwest	3.45	0	0.5
Richardsons	6	18.35	0
TOTALS	10.95	21.85	10.27
*treated August 14			

LITTLE ROUND HERBICIDE ACRES		
2018	June-July 2019	June 2020
0	4	3.22

ROUND DASH ACRES			
	August 2018	2019	2020
Hinton Bay	1.417	0	0
Southwest Round	0.781	0	0
Musky Bay	3.094	0	0
Blue Island & NE	0.101	0	0
Northwest	0	0	0
Richardsons	0	0	0
TOTALS	5.393	0	0

LITTLE ROUND DASH ACRES		
August 2018	2019	2020
3.999	0	0

Map 1 – Hinton Bay

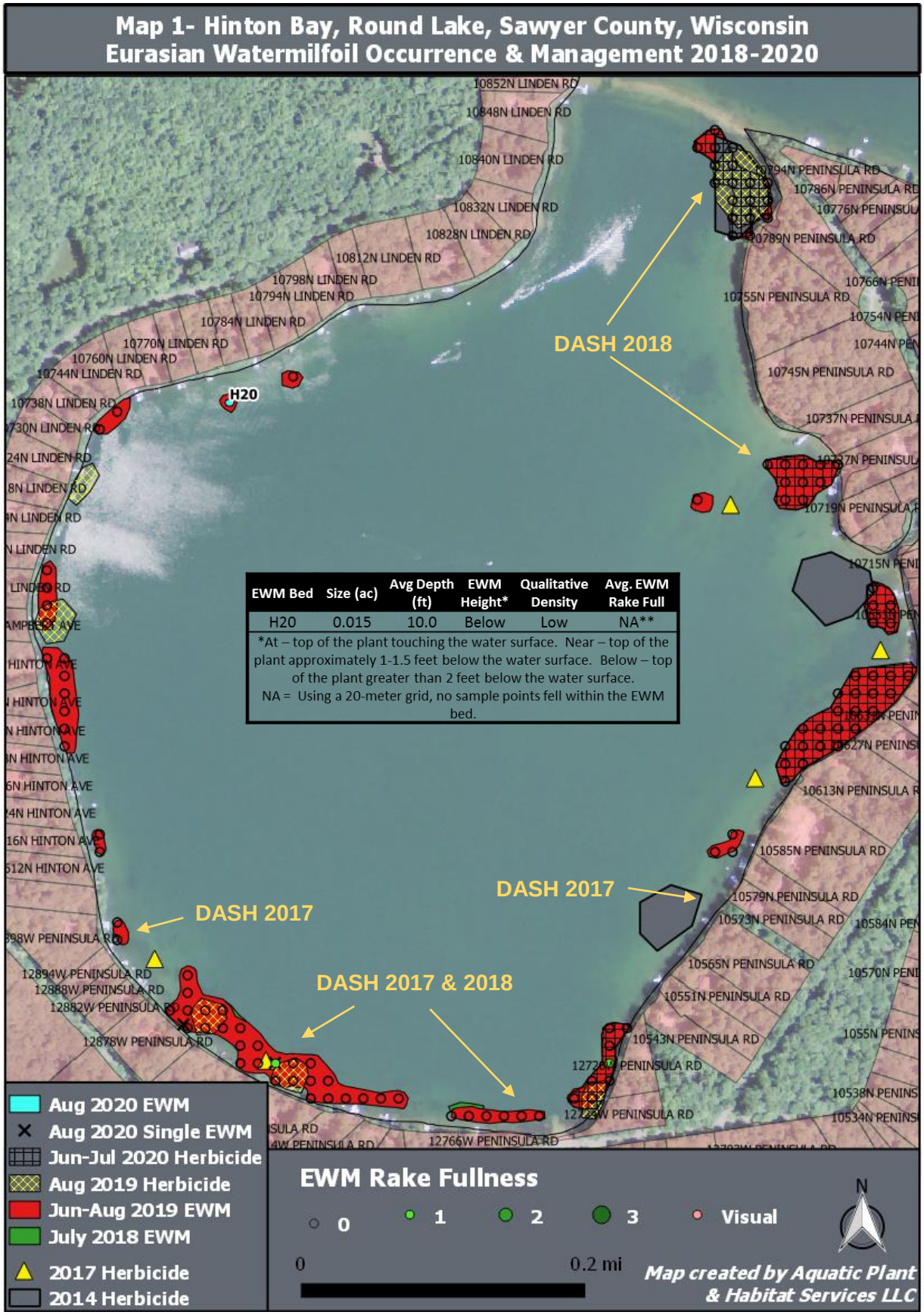
There was a striking reduction of EWM occurrence in Hinton Bay with 0.015 acres mapped in August 2020 compared to 9.5 acres in June 2019 and 1.5 acres in July 2018.

The recent management history of Hinton Bay is somewhat complex. DASH was used to control EWM in four locations in 2017 (approx. 1.9 ac). Herbicide was also used in 2017 at 5 locations (3 ac). DASH efforts continued in 2018 at 4 locations (approx. 1.45 ac) with no herbicide treatment in 2018. Surprisingly in June 2019, the EWM was found to have significantly increased to 9.5 acres and DASH was reportedly believed by many Hinton Bay residents to be the cause of that increase. Furthermore, it was unrealistic that DASH would effectively control the 9.5 acres of EWM in 2019 within the 5 days budgeted. Therefore, DASH was cancelled and did not occur in Hinton Bay in 2019. Instead, contact herbicide was used to control EWM at 6 locations in August 2019 (2.5 ac). The remaining EWM was then planned for control in spring 2020. When the time came for herbicide treatment in 2020, the EWM along the south and western shores totaling 4.3 acres in June 2019 (red polygons in Map 1) was essentially gone. Although contact herbicide was applied at only 1.5 acres within the 4.3-acres of EWM, it was applied during calm weather conditions in mid-August 2019 and targeted exact locations of EWM. In other words, the 4.3 acres of EWM mapped in June 2019 encompassed areas of EWM that ranged in density from "scattered" to "highly dominant" and the herbicide applicator only treated exact spots where EWM was found growing rather than treating the entire polygon of scattered EWM plants. The eastern shoreline polygons were treated in June 2020 as planned. The reason for significant EWM decline along the western and southern shore between 2019 and 2020 is likely due to the highly targeted approach in applying herbicide only where EWM was found growing in August 2019.

There were 117 sample points visited in 2020 among 18 EWM beds to gauge effectiveness of control efforts since 2018. EWM was only found at 2 sample points in 2020 (1.7% littoral frequency). This is a statistically significant reduction in EWM compared to 2019 when EWM was found at 61 of 109 sample points within EWM beds (56% littoral frequency). EWM occurrence was also significantly higher in 2019 than the EWM found in 2018 when EWM was found at 6 of 29 sample points (21% littoral frequency).

List 1 – Recent Management in Hinton Bay

- 2017 herbicide in 5 locations (3 ac)
- 2017 DASH at 4 locations (1.9 ac)
- 2018 DASH at 4 locations (1.45 ac)
- 2019 contact herbicide at 6 locations (2.5 ac)
- 2020 herbicide at 5 locations (5.77 ac)


Map 1- Hinton Bay, Round Lake, Sawyer County, Wisconsin
Eurasian Watermilfoil Occurrence & Management 2018-2020
10852N LINDEN RD
10848N LINDEN RD
10840N LINDEN RD
10832N LINDEN RD
10828N LINDEN RD
10812N LINDEN RD
10798N LINDEN RD
10794N LINDEN RD
10784N LINDEN RD
10770N LINDEN RD
10760N LINDEN RD
10744N LINDEN RD
10738N LINDEN RD
H20
DASH 2018
10794N PENINSULA RD
10786N PENINSULA RD
10776N PENINSULA
10789N PENINSULA RD
10755N PENINSULA RD
10745N PENINSULA RD
10737N PENINSULA
10719N PENINSULA
10715N PENI
10627N PENINS
10613N PENINSULA R
10585N PENINSULA RD
10579N PENINSULA RD
10573N PENINSULA RD
10584N PEN
10565N PENINSULA RD
10570N PENI
10551N PENINSULA RD
10543N PENINSULA RD
1055N PENINS
10538N PENINS
10534N PENINS
DASH 2017
DASH 2017
DASH 2017 & 2018
12894W PENINSULA RD
12888W PENINSULA RD
12882W PENINSULA RD
12878W PENINSULA RD
12766W PENINSULA RD
LINDEN RD
HINTON AVE
10852N LINDEN RD
10848N LINDEN RD
10840N LINDEN RD
10832N LINDEN RD
10828N LINDEN RD
10812N LINDEN RD
10798N LINDEN RD
10794N LINDEN RD
10784N LINDEN RD
10770N LINDEN RD
10760N LINDEN RD
10744N LINDEN RD
10738N LINDEN RD
H20
DASH 2018
10794N PENINSULA RD
10786N PENINSULA RD
10776N PENINSULA
10789N PENINSULA RD
10755N PENINSULA RD
10745N PENINSULA RD
10737N PENINSULA
10719N PENINSULA
10715N PENI
10627N PENINS
10613N PENINSULA R
10585N PENINSULA RD
10579N PENINSULA RD
10573N PENINSULA RD
10584N PEN
10565N PENINSULA RD
10570N PENI
10551N PENINSULA RD
10543N PENINSULA RD
1055N PENINS
10538N PENINS
10534N PENINS
DASH 2017
DASH 2017
DASH 2017 & 2018
12894W PENINSULA RD
12888W PENINSULA RD
12882W PENINSULA RD
12878W PENINSULA RD
12766W PENINSULA RD
LINDEN RD
HINTON AVE
EWM Bed | Size (ac) | Avg Depth (ft) | EWM Height* | Qualitative Density | Avg. EWM Rake Full
H20 | 0.015 | 10.0 | Below | Low | NA**
*At – top of the plant touching the water surface. Near – top of the plant approximately 1-1.5 feet below the water surface. Below – top of the plant greater than 2 feet below the water surface.
NA = Using a 20-meter grid, no sample points fell within the EWM bed.
Aug 2020 EWM
Aug 2020 Single EWM
Jun-Jul 2020 Herbicide
Aug 2019 Herbicide
Jun-Aug 2019 EWM
July 2018 EWM
2017 Herbicide
2014 Herbicide
EWM Rake Fullness
0
1
2
3
Visual
N
0
0.2 mi
Map created by Aquatic Plant & Habitat Services LLC

Maps 2 & 3 – Southwest Region

List 2 – Recent Management

- 2017 Herbicide Treatment in 2 locations (near R20-S20, EE19)
- 2018 DASH around U20-T20, G20, and I20
- 2020 Herbicide Treatment in 2 locations (encompassing R20-S20 and I20, 1 acre)

Total EWM in the large southwest section of Round Lake continued to be very low at 1.49 acres compared to 1.36 acres in 2019. There were 32 survey points within EWM beds and 17 of those sites had EWM present. The largest bed of EWM was located in southern Fisherman's Bay (G20, Map 3) and was 0.46 acres. The next largest beds were quite small at approximate 0.25 acres each (T20 & U20, Map 2). The remaining beds of EWM were very small. The majority of EWM found was below the lake surface, i.e., the top of EWM plants were 2 ft. or more below the lake surface. During the survey, previously undocumented locations of EWM were noted. These areas include E20, F20, J20, and some scattered EWM plants in far southern Edgewater Bay.

An assessment of three DASH areas compared 2018 (pre-DASH) to 2019 & 2020 (post-DASH). Combining areas managed by DASH reveals EWM littoral frequency of 27% in 2018, 50% in 2019, and 86% in 2020 (Table 1). ***A chi-squared analysis confirms that the EWM increase from 2018 to 2020 is statistically significant.*** These results offer some insight on the use of DASH in these areas and suggest a single visit by DASH in 2018 did not reduce EWM in 2019 and 2020.

Table 1 – EWM Occurrence at DASH Sites 2018-2020

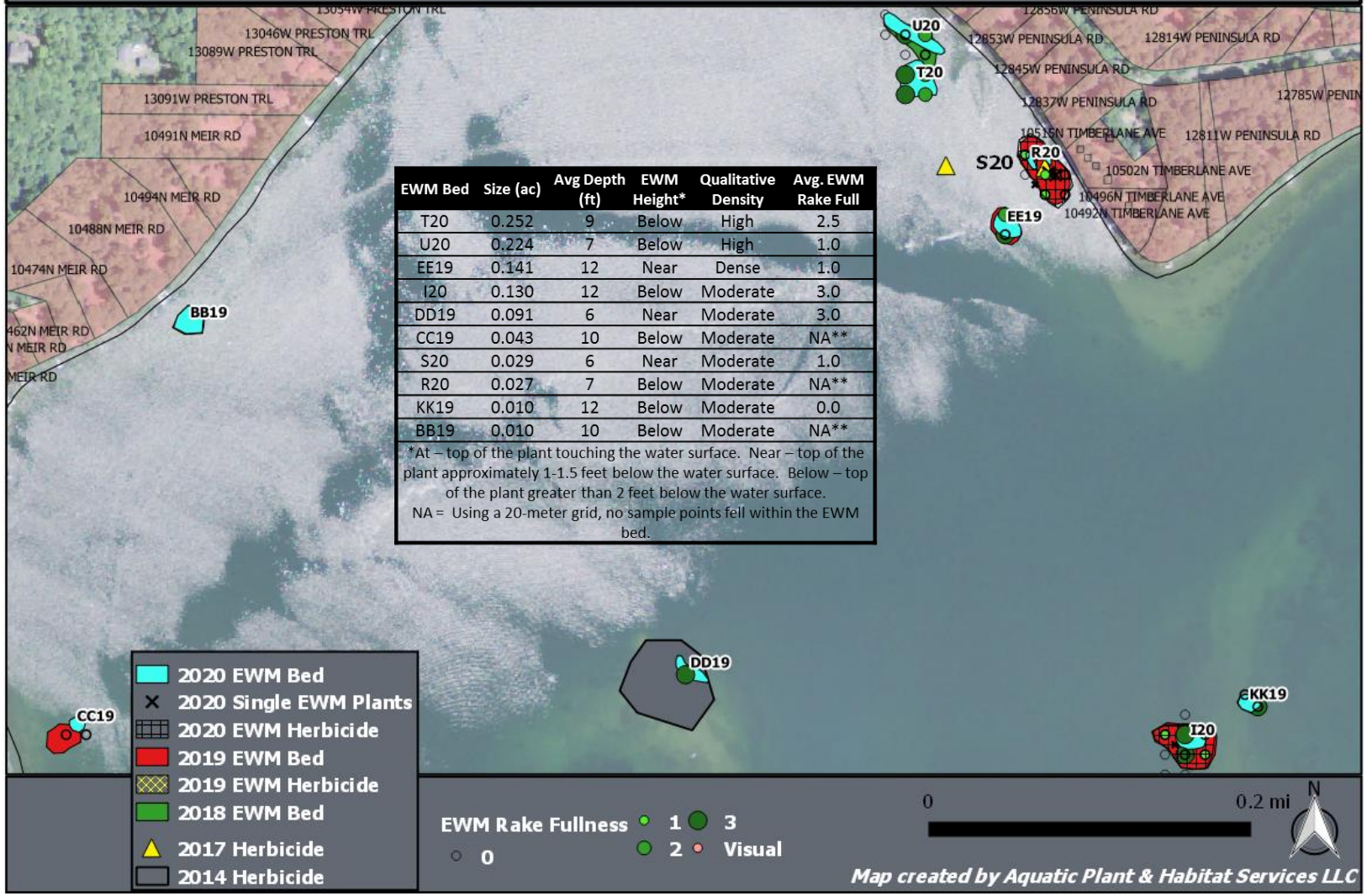
EWM Bed	2018 Points with EWM	2018 Total Points Sampled	2019 Points with EWM	2019 Total Points Sampled	2020 Points with EWM	2020 Total Points Sampled
U20-T20	2	7	1	7	5	7
G20	2	7	3	3	7	7
I20	2	8	6	10	Herbicide	
TOTAL	**6**	**22**	**10**	**20**	**12**	**14**
EWM Littoral Frequency	**27% (pre-DASH)**		**50% (post-DASH)**		**86% (post-DASH)**	

Assessment of two herbicide areas compared 2019 (pre-herbicide) to 2020 (post-herbicide). Combining sample data from these two areas reveals EWM littoral frequency of 56% in 2019 and 27% in 2020. ***A chi-squared test confirms that the EWM decrease from 2019 to 2020 is not statistically significant***. The decrease in EWM is promising, however, it is important to note the post-treatment results are from the same year as herbicide treatment (herbicide treatment occurred June 22 and survey occurred Aug-Sept 2020). Survey in 2021 would help determine the longer term efficacy of herbicide treatment (Navigate 4ppm) in these areas.

Table 2 – EWM Occurrence at Herbicide Sites 2019-2020

EWM Bed	2019 Points with EWM	2019 Total Points Sampled	2020 Points with EWM	2020 Total Points Sampled
AA19	3	6	2	6
I20	6	10	1	5
TOTAL	**9**	**16**	**3**	**11**
EWM Littoral Frequency	**56% (pre-herbicide)**		**27% (post-herbicide)**	

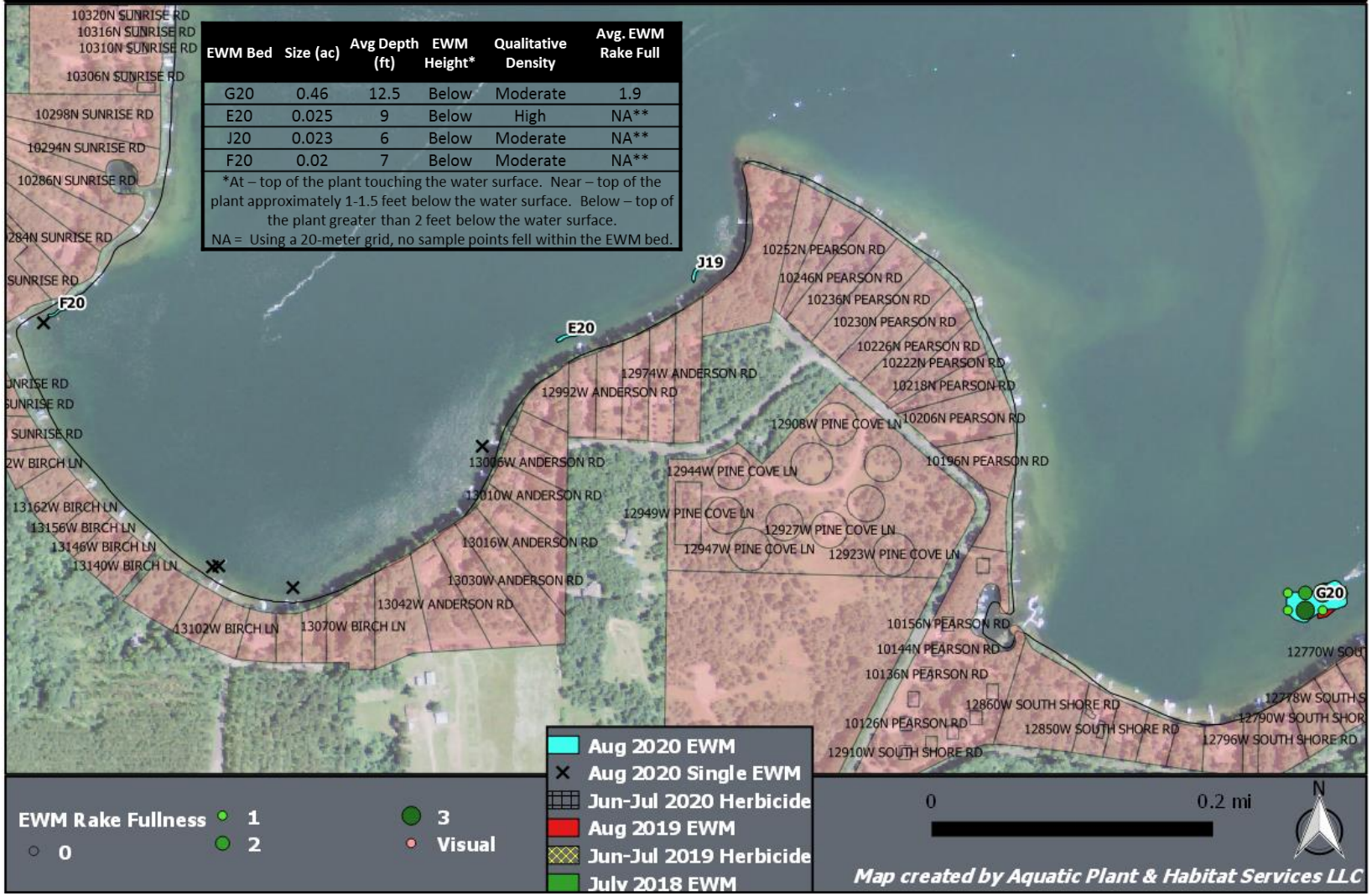
Map 2 - South of Penninsula, Far West, Clay's Bar, & Finger Bar, Round Lake, Sawyer County, Wisconsin
Eurasian Watermilfoil Occurrence & Management 2018-2020



EWM Bed	Size (ac)	Avg Depth (ft)	EWM Height*	Qualitative Density	Avg. EWM Rake Full
T20	0.252	9	Below	High	2.5
U20	0.224	7	Below	High	1.0
EE19	0.141	12	Near	Dense	1.0
I20	0.130	12	Below	Moderate	3.0
DD19	0.091	6	Near	Moderate	3.0
CC19	0.043	10	Below	Moderate	NA**
S20	0.029	6	Near	Moderate	1.0
R20	0.027	7	Below	Moderate	NA**
KK19	0.010	12	Below	Moderate	0.0
BB19	0.010	10	Below	Moderate	NA**

*At – top of the plant touching the water surface. Near – top of the plant approximately 1-1.5 feet below the water surface. Below – top of the plant greater than 2 feet below the water surface.
NA = Using a 20-meter grid, no sample points fell within the EWM bed.

Map 3 - Fisherman's Bay & Edgewater Bay, Round Lake, Sawyer County, Wisconsin
Eurasian Watermilfoil Occurrence & Management 2018-2020



EWM Bed	Size (ac)	Avg Depth (ft)	EWM Height*	Qualitative Density	Avg. EWM Rake Full
G20	0.46	12.5	Below	Moderate	1.9
E20	0.025	9	Below	High	NA**
J20	0.023	6	Below	Moderate	NA**
F20	0.02	7	Below	Moderate	NA**

*At – top of the plant touching the water surface. Near – top of the plant approximately 1-1.5 feet below the water surface. Below – top of the plant greater than 2 feet below the water surface.
NA = Using a 20-meter grid, no sample points fell within the EWM bed.

Map 4 – Richardson's Bay

EWM in Richardson's Bay was low in 2020 at 0.03 acres compared to zero acres in 2019 and 19 acres in 2018 before whole-bay herbicide treatment occurred.

A July 2018 survey revealed that EWM was estimated at 18 acres, which was more EWM than could be controlled by DASH alone. Therefore, no DASH occurred in Richardson's Bay in 2018. An aquatic plant survey of the entire bay was completed in September 2018 by the WDNR. During that survey, EWM was found at 10 sample points.

Whole-bay herbicide treatment of Richardson's Bay occurred in June 2019. An aquatic plant survey by the WDNR two months after treatment yielded no EWM at sample points. APHS also visited the EWM polygons from 2018 as a quick visual assessment. The only EWM detected were scattered along the northwest shore.

No treatment occurred in Richardson's Bay in 2020. An aquatic plant survey by APHS in late August found EWM at 2 sample points. APHS also delineated three beds of EWM, the largest of which was along the northern shore (X20, 0.4 acres). In addition to the beds of EWM delineated, there were scattered clumps of plants in a few locations (X's on map), but particularly along the north central shoreline

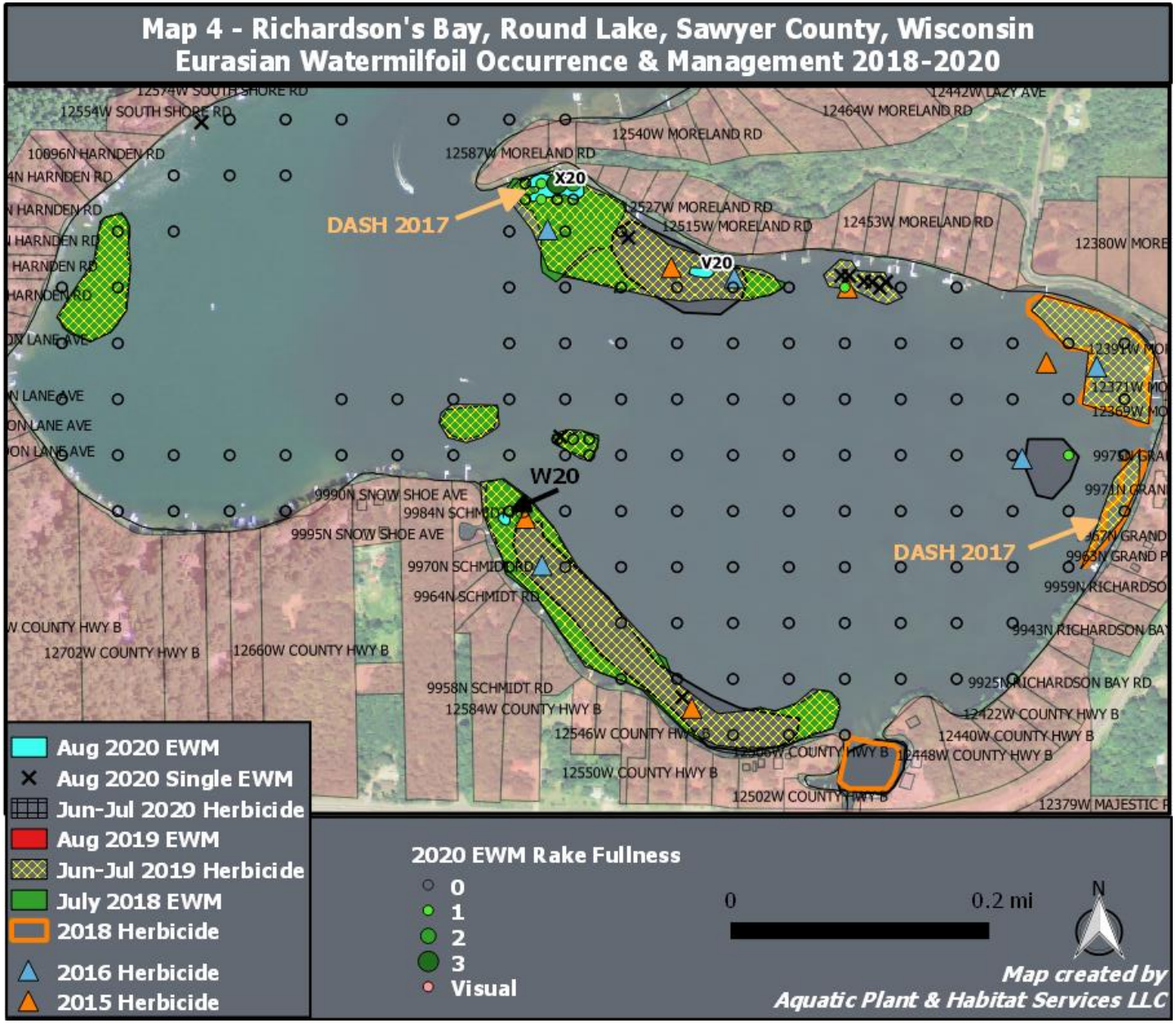
The reduction in EWM from 2018 at 10 sample points down to 0 sample points in 2019 was statistically significant. The increase of EWM from 0 sample points in 2019 compared to 2 sample points in 2020 was not statistically significant. There were four native aquatic plant species that had statistically significant changes between 2018 and 2019: flat-stem pondweed increased from 15 to 32 points, wild celery increased from 44 to 67 points, horned pondweed decreased from 4 to 0 points, and white-stem pondweed increased from 0 to 9 points. There were three native species that had statically significant changes between 2019 and 2020: small pondweed increased from 6 to 17 points, wild celery decreased from 67 to 48 points, and perfoliate pondweed increased from 0 to 12 points.

List 3 – Recent Management in Richardson's Bay

- 2015 herbicide treatment at 5 locations
- 2016 herbicide treatment at 5 locations
- 2017 DASH at 2 locations
- 2018 herbicide treatment at 3 locations (6 acres)
- 2019 herbicide treatment at 8 locations resulting in whole-bay effects, i.e. whole-bay treatment (18.35 acres)

EWM Bed	Size (ac)	Avg Depth (ft)	EWM Height*	Qualitative Density	Avg. EWM Rake Full
X20	0.397	7	Near & Below	Moderate	2.0
V20	0.065	7	Near	Moderate	NA
W20	0.037	6	Near	High	NA

*At – top of the plant touching the water surface. Near – top of the plant approximately 1-1.5 feet below the water surface. Below – top of the plant greater than 2 feet below the water surface. NA = Using a 20-meter grid, no sample points fell within the EWM bed.


Map 4 - Richardson's Bay, Round Lake, Sawyer County, Wisconsin
Eurasian Watermilfoil Occurrence & Management 2018-2020
12554W SOUTH SHORE RD
12464W MORELAND RD
12540W MORELAND RD
12587W MORELAND RD
10896N HARNDEN RD
X20
DASH 2017
12527W MORELAND RD
12515W MORELAND RD
12453W MORELAND RD
V20
W20
9990N SNOW SHOE AVE
9995N SNOW SHOE AVE
9970N SCHMIDT RD
9964N SCHMIDT RD
DASH 2017
12702W COUNTY HWY B
12660W COUNTY HWY B
9958N SCHMIDT RD
12584W COUNTY HWY B
12546W COUNTY HWY B
12550W COUNTY HWY B
12502W COUNTY HWY B
12422W COUNTY HWY B
12440W COUNTY HWY B
12448W COUNTY HWY B
9925N RICHARDSON BAY RD
9943N RICHARDSON BAY
9959N RICHARDSO
Aug 2020 EWM
Aug 2020 Single EWM
Jun-Jul 2020 Herbicide
Aug 2019 EWM
Jun-Jul 2019 Herbicide
July 2018 EWM
2018 Herbicide
2016 Herbicide
2015 Herbicide
2020 EWM Rake Fullness
0
1
2
3
Visual
0
0.2 mi
N
Map created by
Aquatic Plant & Habitat Services LLC

Maps 5 & 6 – Little Round Lake

EWM was low in Little Round Lake in 2020 at 0.34 acres compared to 1.9 acres in 2019 and 5.5 acres in 2018.

There were four areas DASHed in 2018, but those areas were treated with herbicide in 2019. Therefore, the pre-post assessment of DASH as a control method 2018-2020 in those areas is not possible. These areas were decidedly too large for effective control after DASH technicians worked there for some time. Herbicide treatment followed in spring 2019 before a post-DASH assessment was possible. As displayed on Maps 5 and 6, five areas were treated with herbicide in 2019. Those areas were surveyed at 44 sample points in 2018, 2019, and 2020. In 2018, EWM was found at 27 points (littoral frequency 61%) compared to 11 points (littoral frequency 25%) in 2019 after herbicide treatment occurred in those areas. ***This reduction after the 2019 herbicide treatment was statistically significant.*** EWM continued to be low in those areas in 2020 with EWM found at only 8 sample points.

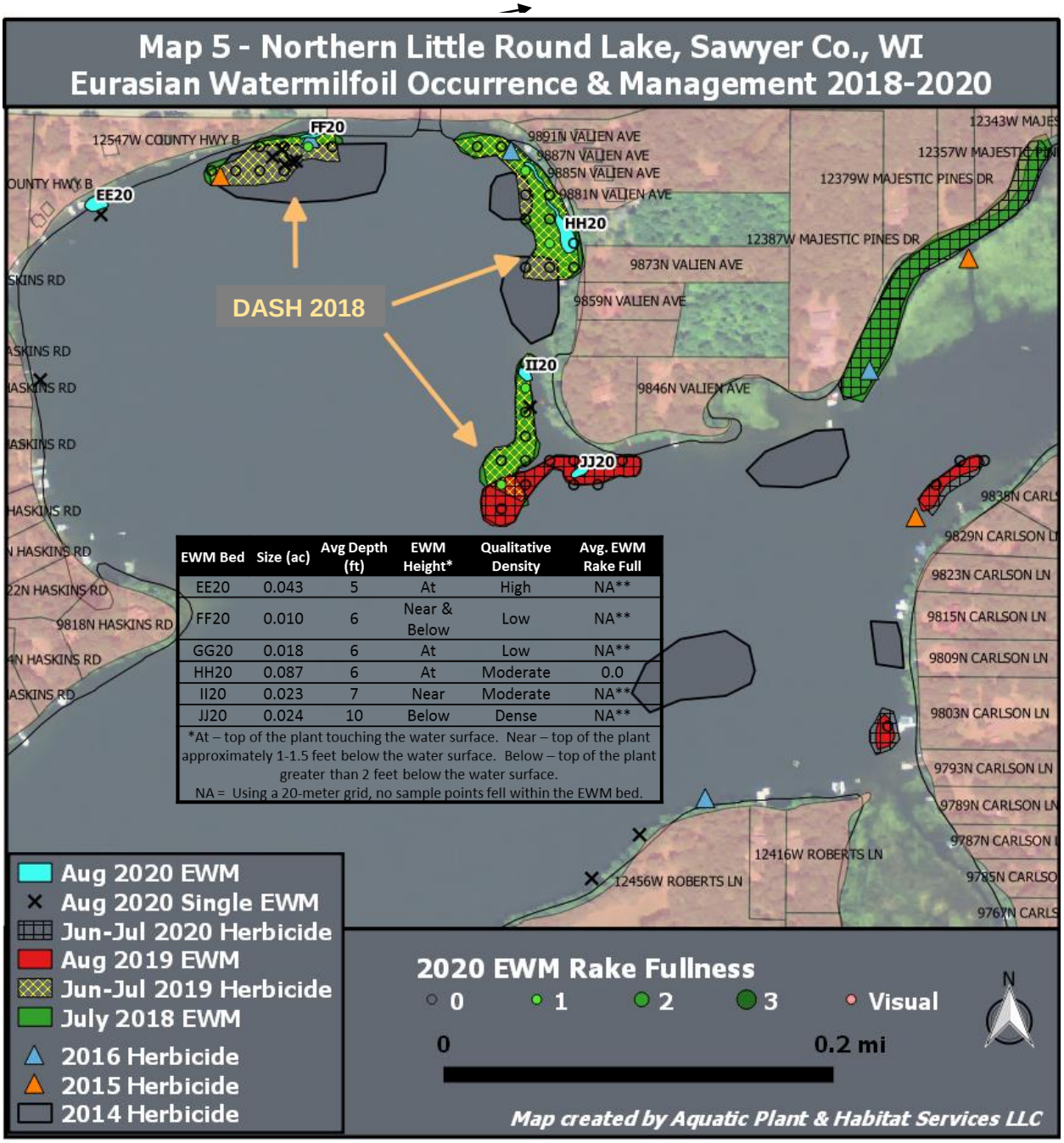
During the 2019 EWM survey of Little Round Lake, beds of EWM were delineated to provide some idea of location and size of EWM beds for future management but sample points within those beds was not part of the survey. Total EWM in Little Round Lake was estimated at 1.9 acres among 6 beds in 2019 (red polygons plus long narrow green EWM bed along Majestic Pines Dr., Maps 5 & 6). All of those area were treated with herbicide on June 23rd, 2020 and totaled 3.22 acres. A survey of 19 sample points in those areas in August 2020 found EWM at only 2 sample points.

List 4 – Recent Management in Little Round Lake

- 2015 herbicide treatment at 3 locations
- 2016 herbicide treatment at 5 locations
- 2018 DASH at 4 locations (These areas were too large for significant EWM reduction by DASH in 2018 so herbicide was used in 2019)
- 2019 herbicide treatment at 5 locations (4 acres)
- 2020 herbicide treatment at 6 locations (3.22 acres)

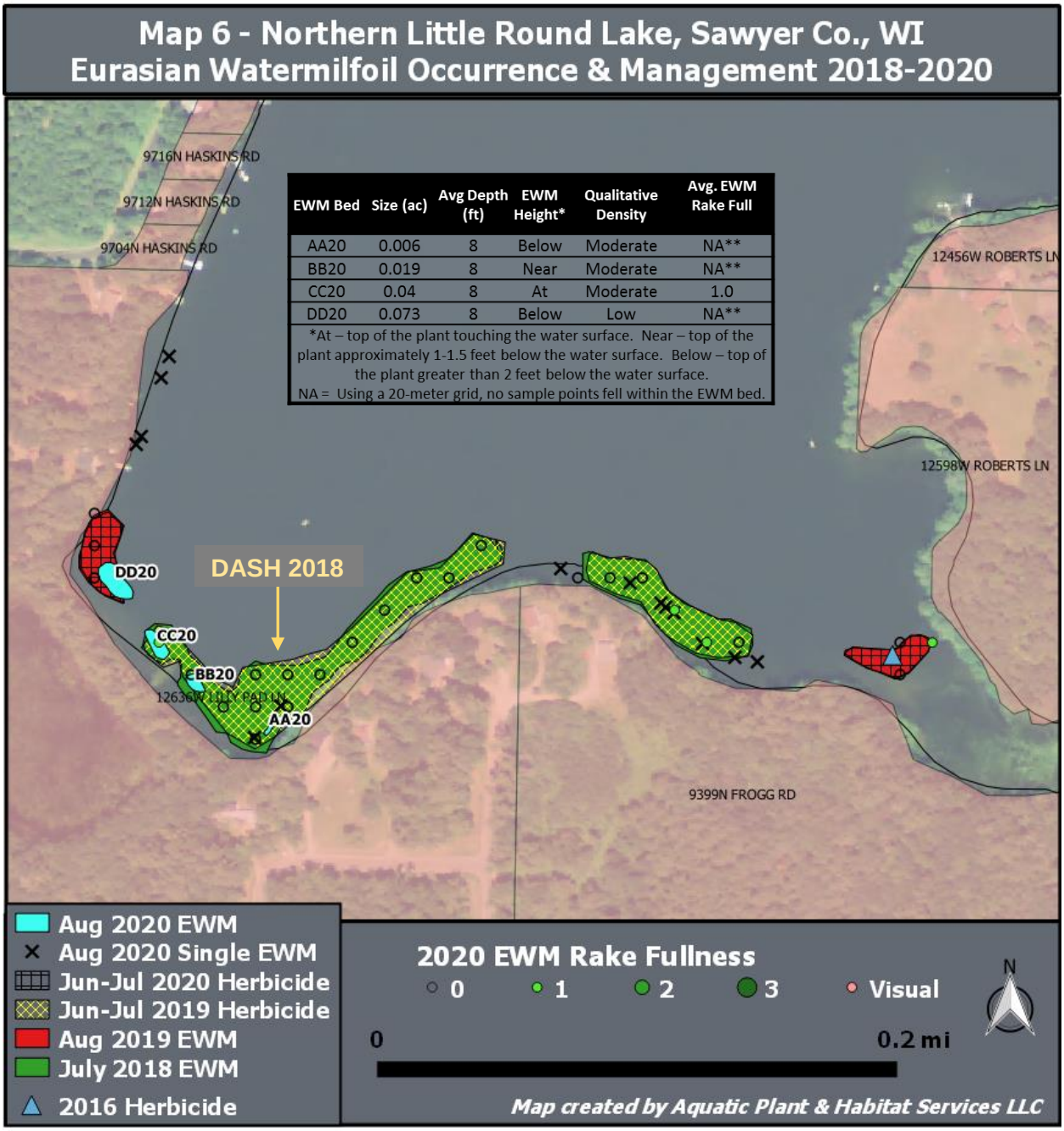
Table 3 – Little Round EWM Results 2018-2020

EWM Bed	2018 Points with EWM	2019 Points with EWM	2020 Points with EWM	Total Sample Points
V-18	4	1	1	8
W-18	10	1	2	12
X-18	3	4	2	6
Z-18	4	2	2	5
AA-18	6	3	1	13
TOTAL	**27**	**11**	**8**	**44**
Littoral Frequency	**61%**	**25%**	**18%**	



EWM Bed	Size (ac)	Avg Depth (ft)	EWM Height*	Qualitative Density	Avg. EWM Rake Full
EE20	0.043	5	At	High	NA**
FF20	0.010	6	Near & Below	Low	NA**
GG20	0.018	6	At	Low	NA**
HH20	0.087	6	At	Moderate	0.0
II20	0.023	7	Near	Moderate	NA**
JJ20	0.024	10	Below	Dense	NA**

*At – top of the plant touching the water surface. Near – top of the plant approximately 1-1.5 feet below the water surface. Below – top of the plant greater than 2 feet below the water surface.
NA = Using a 20-meter grid, no sample points fell within the EWM bed.


Map 6 - Northern Little Round Lake, Sawyer Co., WI
Eurasian Watermilfoil Occurrence & Management 2018-2020
9716N HASKINS RD
9712N HASKINS RD
9704N HASKINS RD
12456W ROBERTS LN
12598W ROBERTS LN
DD20
DASH 2018
CC20
BB20
12636W LILY PAD LN
AA20
9399N FROGG RD
EWM Bed | Size (ac) | Avg Depth (ft) | EWM Height* | Qualitative Density | Avg. EWM Rake Full
AA20 | 0.006 | 8 | Below | Moderate | NA**
BB20 | 0.019 | 8 | Near | Moderate | NA**
CC20 | 0.04 | 8 | At | Moderate | 1.0
DD20 | 0.073 | 8 | Below | Low | NA**
*At – top of the plant touching the water surface. Near – top of the plant approximately 1-1.5 feet below the water surface. Below – top of the plant greater than 2 feet below the water surface.
NA = Using a 20-meter grid, no sample points fell within the EWM bed.
Aug 2020 EWM
Aug 2020 Single EWM
Jun-Jul 2020 Herbicide
Jun-Jul 2019 Herbicide
Aug 2019 EWM
July 2018 EWM
2016 Herbicide
2020 EWM Rake Fullness
0
1
2
3
Visual
N
0
0.2 mi
Map created by Aquatic Plant & Habitat Services LLC

Map 7 – North & South Musky Bay

EWM was low in Musky Bay in 2020 at 0.42 acres compared to 1.8 acres in 2019 and 3.1 acres in 2018.

There were two areas DASHed in 2018, but those areas were treated with herbicide in 2019 and/or 2020. Therefore, the pre-post assessment of DASH as a control method 2018-2020 in those areas is not possible.

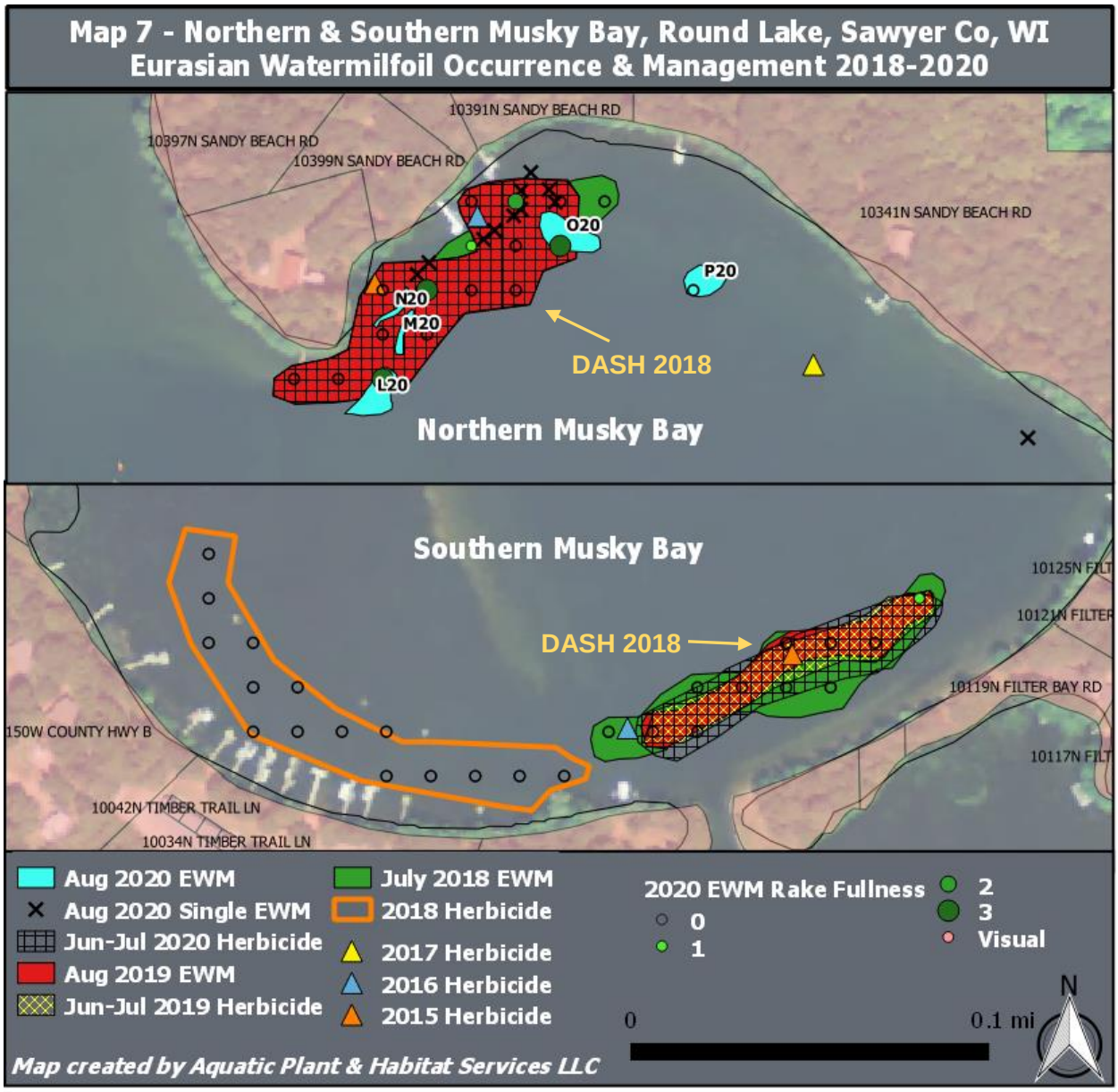
One area in southwestern Musky Bay was treated with herbicide in 2018. Pre-treatment data was not collected, but post-treatment samples at 14 points found EWM at EWM at 3 points in 2019 and 0 points in 2020. ***This would suggest that the 2018 herbicide treatment continued to offer nuisance relief of EWM two full years after treatment.***

Herbicide treatment occurred on July 10th, 2019 at 1 acre in southeastern Musky Bay where DASH had also occurred in 2018. This area was sampled at 10 points in 2018 (pre-treatment) and 7 of those points had EWM. In 2019 (post-treatment), the same area was sampled at 11 points and EWM was found at 6 points. These findings suggest that the 2019 herbicide treatment was not successful in decreasing EWM occurrence within that treatment area in 2019. The area was treated with herbicide again in 2020 and only one sample point had EWM in August. ***This suggests that two consecutive years of herbicide treatment (2019-2020) resulted in significant decrease in EWM in this area.***

DASH was used in northern Musky Bay for 3 hours at 0.6 acres in 2018. That area of EWM grew from 0.6 acres in 2018 (before DASH) to 1.4 acres in 2019. In August 2019, that area was sampled at 17 points, 14 of which had EWM (82% littoral frequency). On June 22, 2020, the area was treated with herbicide on June 22, 2020. In August 2020, EWM was present at 5 sample points out of a total of 16 (31% littoral frequency), which is a statistically significant reduction compared to 2019. Also in 2020, 4 small remnant beds of EWM were still present within the treatment area and totaled 0.17 acres. ***This suggest that the 2020 herbicide treatment resulted in statistically significant decrease in EWM during the same year as treatment.***

List 3 – Recent Management in Musky & Filter Bays, Map 3

- 2015 herbicide treatment in 2 locations
- 2016 herbicide treatment in 2 locations
- 2017 herbicide treatment in 1 location
- 2017 DASH in the northern portion of EWM in northern Musky Bay
- 2018 herbicide treatment at 1 location (1.5 acres)
- 2018 DASH at W19 & X19
- 2019 herbicide treatment at 1 location (1 acre)
- 2020 herbicide treatment at 2 locations (2.5 acres)



EWM Bed	Size (ac)	Avg Depth (ft)	EWM Height*	Qualitative Density	Avg. EWM Rake Full
L20	0.067	11	Below	High	3.0
M20	0.013	11	Below	Moderate	NA**
N20	0.013	6	Near	Low	NA**
O20	0.075	8	Near	High	3.0
P20	0.047	12	Below & Near	Moderate	0.0

*At – top of the plant touching the water surface. Near – top of the plant approximately 1-1.5 feet below the water surface. Below – top of the plant greater than 2 feet below the water surface.
NA = Using a 20-meter grid, no sample points fell within the EWM bed.

Map 8 – Blue Island Bay & Placid Inlet Area

EWM was at 2.11 acres in this area of the lake in 2020 compared to 2.3 acres in 2019 and 0.1 acres in 2018.

An assessment of one DASH location was part of the survey to compare 2018 (pre-DASH) to 2019 and 2020. In 2018, 2019, and 2020, S18 was sampled at one point and EWM was on the rake at high density in 2018 and low density in 2019 and 2020. There was not enough EWM to delineate a bed in 2019 but there was enough to delineate a small 0.09 acre bed in 2020. This area is too small to capture enough sample points that would yield a statistically robust data set. Therefore, these results cannot be considered statistically significant. However, they can provide us with some insight and suggest ***a single visit by DASH in 2018 did reduce EWM in 2019 but the EWM returned to some degree in 2020.***

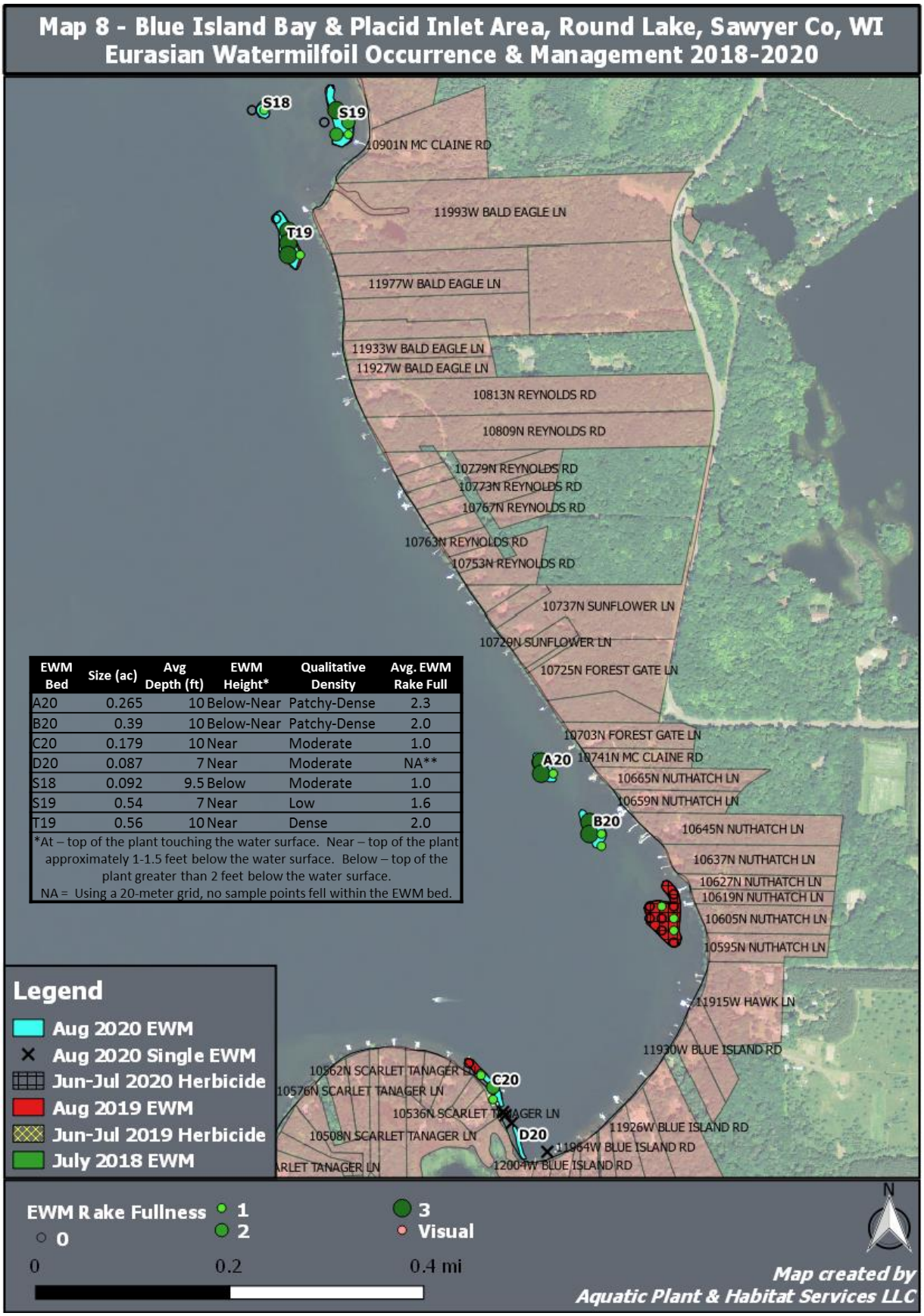
One acre of EWM was treated with herbicide in 2020. EWM was present at 7 out of 11 sample points in 2019 (64% littoral frequency). EWM was present at 3 out of 10 sample points in 2020 after herbicide treatment (30% littoral frequency). This decrease in EWM seems striking, but it is not statistically significant. Although EWM was detected at 3 sample points in 2020, the area was not considered a bed of EWM because it was mixed with native species and EWM was not visible as a bed from the lake surface. ***Even though the decrease is not statistically significant, EWM occurrence and density was clearly reduced during the same year as herbicide treatment.***

Three new or previously undocumented beds of EWM were delineated in 2020. A20 and B20 were two of the larger beds at 0.27 and 0.39 acres. EWM in the area of D20 was previously documented but at low and scattered densities. However, it was dense enough to delineate a small bed of EWM in 2020.

Three beds of EWM remained unaltered by management. C20 appears to be approximately the same size or even slightly smaller compared to 2019 (0.26 acres in 2019 and 0.18 acres in 2020). The northern-most portion of C20 was absent of EWM, which could have been a function of a property owner doing manual removal but this is not confirmed. T19 was the same in size and density compared to 2019. S19 was the same size, but increased in density from average rake fullness of 0.2 in 2019 to 1.6 in 2020.

List 5 – Recent Management Near the Placid Inlet Area

- 2018 DASH at one location (0.10 acres)
- 2020 herbicide treatment at one location (1.0 acre)



EWM Bed	Size (ac)	Avg Depth (ft)	EWM Height*	Qualitative Density	Avg. EWM Rake Full
A20	0.265	10	Below-Near	Patchy-Dense	2.3
B20	0.39	10	Below-Near	Patchy-Dense	2.0
C20	0.179	10	Near	Moderate	1.0
D20	0.087	7	Near	Moderate	NA**
S18	0.092	9.5	Below	Moderate	1.0
S19	0.54	7	Near	Low	1.6
T19	0.56	10	Near	Dense	2.0

*At – top of the plant touching the water surface. Near – top of the plant approximately 1-1.5 feet below the water surface. Below – top of the plant greater than 2 feet below the water surface.
NA = Using a 20-meter grid, no sample points fell within the EWM bed.

Map 9 – Northwest Round Lake

EWM was at 0.327 acres in this area of the lake in 2020 compared to 0.02 acres in 2019 and 3 acres in June 2018 before herbicide treatment occurred in late June and early July 2018.

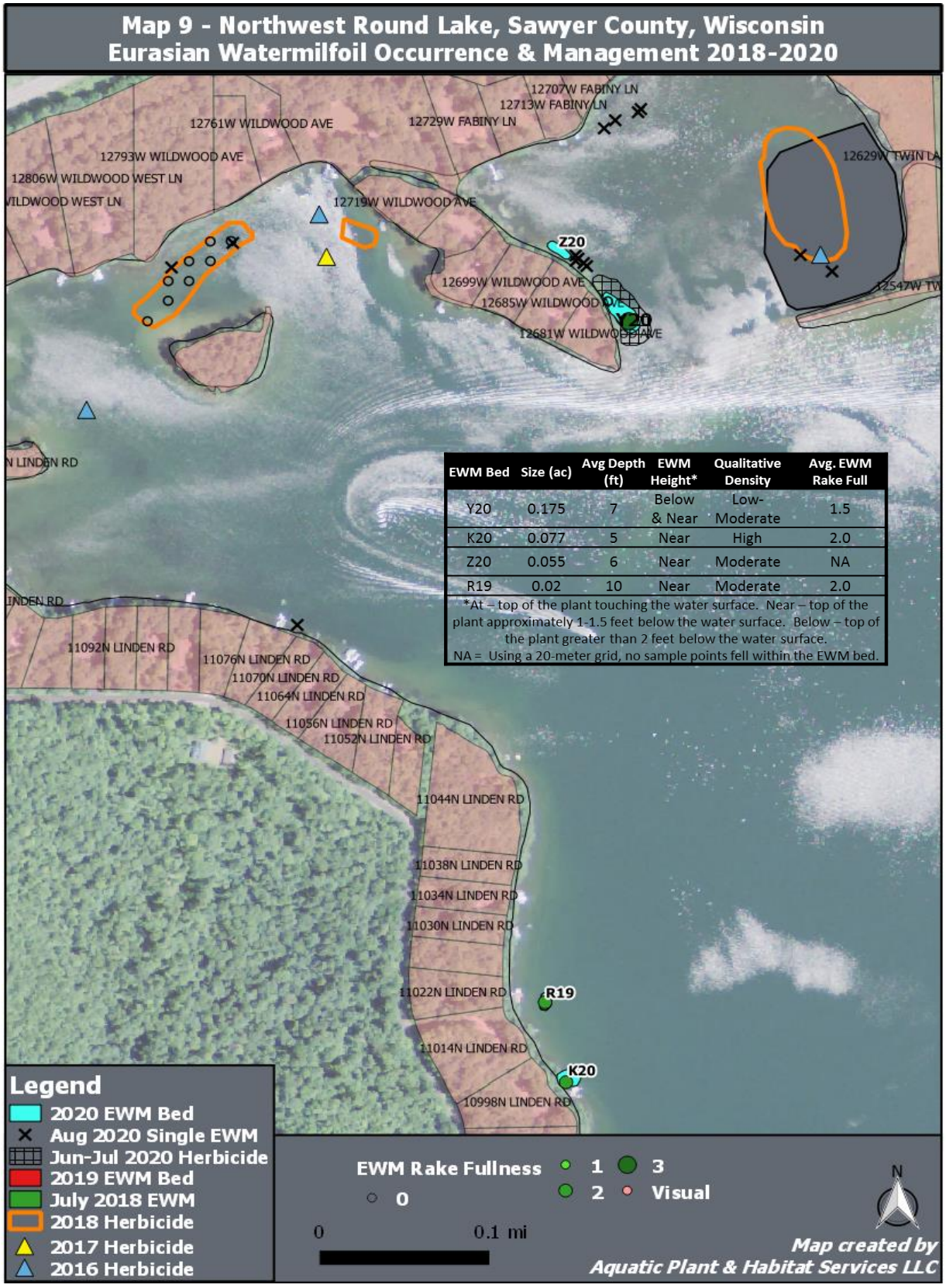
No DASH has been done in this area of the lake. Herbicide treatment done at 3 acres in 2018 appears to continue to be effective in controlling EWM, however, pretreatment rake sample data was not collected in these areas. Even so, boating around these areas yielded only scattered, small clumps of EWM plants. ***Despite the lack in pre-treatment rake sample data, it appears the herbicide treatment from 2018 continues to be effective in controlling EWM.***

In Schoolhouse Bay there were two small beds of EWM found (Z20 & Y20). Between the two beds were several scattered, single EWM plants. Heading south out of Leder Bay and along the western shore were two small beds of EWM, one of which was the same size and location as 2019 (R19) while the other was newly documented in 2020 (K20). The total EWM in this area of the lake was low at 0.3 acre.

Herbicide treatment was done at 0.5 acres in 2020. There were two rake samples taken within this area and 0.18 acre of EWM delineated after the herbicide treatment. Despite the lack in pre-treatment rake sample data, it appears the herbicide treatment in 2020 may not have been as successful as other areas.

List 6 – Recent Management in Northwest Round Lake

- 2016 herbicide treatment at 3 locations
- 2017 herbicide treatment at 1 location
- 2018 herbicide treatment (3 acres)
- 2020 herbicide treatment (0.5 acres)



EWM Bed	Size (ac)	Avg Depth (ft)	EWM Height*	Qualitative Density	Avg. EWM Rake Full
Y20	0.175	7	Below & Near	Low-Moderate	1.5
K20	0.077	5	Near	High	2.0
Z20	0.055	6	Near	Moderate	NA
R19	0.02	10	Near	Moderate	2.0

*At – top of the plant touching the water surface. Near – top of the plant approximately 1-1.5 feet below the water surface. Below – top of the plant greater than 2 feet below the water surface.
NA = Using a 20-meter grid, no sample points fell within the EWM bed.

DISCUSSION

Aquatic Plants are Necessary for Healthy Lakes

Aquatic plants serve important functions in lake systems. They provide structural habitat for small invertebrates that are an important food source for juvenile game fish and adult panfish. Plants also provide structural habitat for juvenile and small fish to hide from predators and vice versa as larger predators may lurk in the shadows of plants in wait of forage. Aquatic plants also provide foraging and/or hiding structure for reptiles, amphibians, and waterfowl. The shorelines of lakes are buffered from wave action when aquatic plants absorb some of the wave energy. Aquatic plants are important consumers of nutrients that would otherwise be available for nuisance algal growth. For these reasons, a healthy and diverse aquatic plant community should be protected and valued.

Efficacy of Herbicide to Control EWM

Herbicide treatment has mixed results in different areas of the lake. General statements about Round Lake are difficult in this regard because the lake is 3300 acres (plus Little Round Lake 179 acres) and various treatment units respond differently to herbicide treatment. Furthermore, the type of herbicide used (contact or systemic, granular or liquid, brand name) also challenges the ability to make broad statements. This list summarizes results 2018-2020 in areas where pre-post data were collected:

- Hinton Bay – 2019 (Aug) & 2020 herbicide treatments resulted in ***statistically significant decrease*** of EWM in 2020
- Southwest Region – 2020 herbicide treatment resulted in ***decrease of EWM, though not statistically significant***
- Richardson's Bay – 2019 whole-bay herbicide treatment resulted in ***statically significant decrease*** in EWM in 2019 & 2020
- Little Round Lake – 2019 herbicide treatments resulted in ***statistically significant decrease*** of EWM in 2019 & 2020
- Musky Bay, South – 2019 herbicide treatment ***did not result in decrease of EWM*** in one that same year. 2020 herbicide treatment of the same area did result in ***statistically significant decrease*** of EWM.
- Musky Bay, North – 2020 herbicide treatment resulted in ***statistically significant decrease*** of EWM in 2020.
- Blue Island – 2020 herbicide treatment resulted in ***decrease of EWM, though not statistically significant***.

Efficacy of DASH to Control EWM

Most of the areas where EWM was controlled using DASH in 2018 have since been treated with herbicide. U20, T20, & G20 in southwest Round Lake have statistically significant increased EWM occurrence since 2018. DASH at S18 effectively controlled EWM for one full year afterward, but the EWM appears to be back to pre-DASH conditions in 2020. S18 is too small for sampling to be statistically significant. It is plausible that these areas combined with others targeted for DASH in 2018 were too large and the 2018 plan for EWM control was too ambitious

for DASH to be effective. These results suggest DASH was not an effective control method except for the small bed of EWM at S18. It is difficult to know the exact reason for this lack of efficacy, especially when published sources suggest high success. For example, Eichler et al (1993) found the effectiveness of suction harvesting on EWM at one year post removal ranged from 86%-94%. Keltina & Laxar (2010) concluded that less than 5% of EWM remained in the littoral area after large scale removal of moderate-to-high densities of EWM for three years.

Prioritizing EWM Control

Unfortunately, complete EWM eradication is not a realistic management goal. It is important to identify EWM locations, bed size, density, and plant height to help prioritize EWM management actions. One possible strategy is to target locations that are of greatest impact to recreation, or in other words, EWM beds that are most dense with plants near the surface or canopied. This strategy would also help address human-induced fragmentation (i.e. boat motors sever plants and those fragments grow new plants). This method of prioritization may call for leaving locations of low density EWM growing well below the surface for close monitoring and future control when the EWM bed becomes larger, taller, or resources are available. These small and scattered colonies would be most appropriate for DASH or volunteer SCUBA divers to remove during organized EWM removal events. Below is a table copied from the 2020 Aquatic Plant Management Plan to help prioritize EWM control efforts in 2021.

Criteria for Prioritizing Eurasian Watermilfoil Control

SIZE	DENSITY	TRAFFIC	IMPAIRMENT	HABITAT	SURVEY DATA
•Is the bed size >0.15 acres (6,500 sq ft)?	•Is EWM the dominant species? •Is EWM rake fullness >2 on average?	•Is the EWM in an area of high boat traffic? (especially marina, restaurant, resort, thoroughfare)	•Is this area causing beneficial use impairment? (aquatic plants prevent activities such as angling, boating, swimming, or other navigation /recreation)	•Is EWM the dominant species to the detriment of native plant species? •Would the proposed treatment have limited impact on native plants.	•Has a pre-treatment survey been completed using standardized methods to document location, size, density, and height?

HOW TO USE THESE CRITERIA – Answer the 6 questions for a particular bed of EWM. If the answer is "yes" for most questions (ideally 4 or more), then that bed of EWM may be considered high priority for control actions. For beds of EWM with fewer "yes" answers, control actions can still be considered but perhaps that area is not the highest priority. This graphic is meant to help the RLPOA prioritize where control actions should take place in any given year. Areas that do not receive attention in a given year may be considered higher priority the following year.

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