Golden Lake—Waukesha and Jefferson Counties, WI

August, 2024 Eurasian/Hybrid Watermilfoil Survey

SOLitude Lake Management
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www.solitudelakemanagement.com

Introduction

In August of 2024, Solitude Lake Management conducted a survey on Golden Lake for the presence of Eurasian and/or Hybrid water-milfoil (EWM/HWM) utilizing the Point-Intercept method. This is a continuation of the monitoring that has been conducted since 2013. These surveys have been conducted on Golden Lake using a combination of Full and Partial Point-Intercept (PI) Surveys. The survey type (Full or Partial) and years conducted are listed below:.

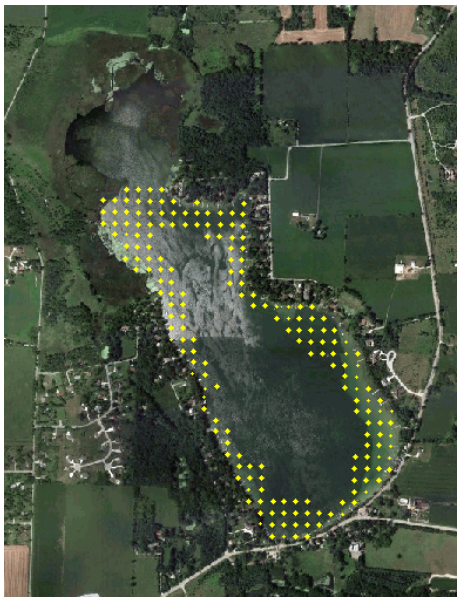
Full PI: May and August 2013, August 2014, September, 2017 and August of 2020 & 2023*
Partial PI: October, 2015, and August of 2016, 2018-19, 2021-22, 2024

* Surveys in 2013/14 conducted by WI DNR staff, remaining years by Marine Biochemists (now Solitude Lake Management).

Maps detailing the location of the data collection points for the Full and Partial PI Surveys are shown in Figure 1 below. Data collection for the surveys consisted of navigating to each point using a Lowrance Hook 9 GPS. At each point, data on the presence/absence of EWM/Hybrid was collected, either by using a Rake on a Pole (depths < 15 ft.), or a Rake on a Rope (depths > 15 feet). Finally, in clear waters less than 3 feet in depth with a largely sand bottom, visual identification was utilized. This made for a much more efficient means of collecting data where vegetative growth was absent. After visiting each site, data on water depth, absence/presence of Milfoil, and if present, rake fullness was recorded, along with the sampling method (P for Pole, R for Rope or V for Visual) used.

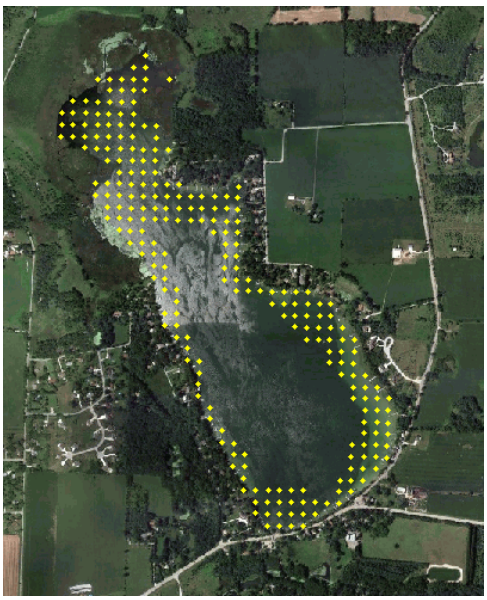
Figure 1
Location of Data Collection Points for Golden Lake Partial and Full P.I. Plant Surveys

Partial PI Survey Points for Oct., 2015



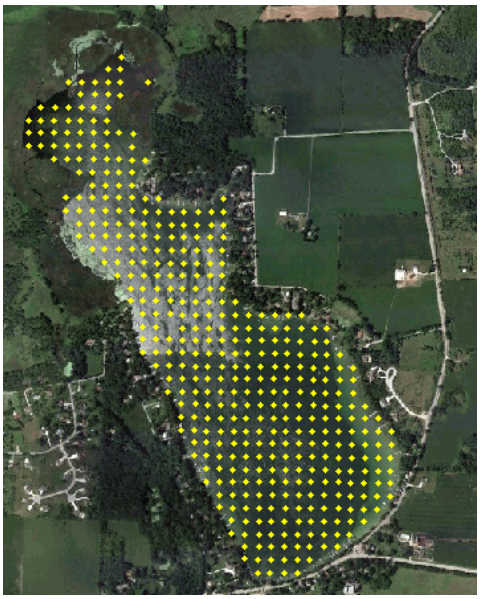
No. of Points: 191

August, 2016 , 2018-19, 2021-22, 2024



No. of Points: 250

Full PI Surveys



No. of Points: 565

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Summary of Results

Figure 2 (following page) is a map detailing the distribution of EWM in Golden Lake during the recent (August, 2024) survey, along with those conducted in August, 2016 through 2022.. Data for August, 2015 Partial PI Survey is located in the Appendix, while Figure 3 (page 4) includes data for all Full PI surveys conducted since May, 2013.

Data collection points are color-coded according to Rake Fullness (relative amount of EWM present), including Visual observations.

During the August, 2024 survey, EWM was collected with a Rake at 12 sites, and was observed at another 16, for a total of 28 sites.

Data for all Partial Point-Intercept Surveys conducted since 2015 is found in Table 1 below:

Table 1
Golden Lake Waukesha/Jefferson Counties, W
I# Sites Present—EWM/HWM
All Partial Point Intercept Surveys 2015-2024

Sensitive Area	2015	2016	2018	2019	2021	2022	2024
By Rake	45	24	50	40	56	23	12
Visual	n/a	1	21	10	21	5	16
Total	45	25	71	50	77	28	28

During the August, 2024 survey, EWM was collected with a Rake at 12 sites, and was observed at another 16, for a total of 28 sites. This number of sites where EWM/HWM was collected with a rake ranks as the lowest recorded since Partial Point-Intercept Surveys began in 2015.

This decline is certainly due in part to control efforts, including chemical and physical removal (Hand Removal and/or D.A.S.H.). However it also appears to be due to a general decline in EWM/HWM throughout the lake, as evidenced by the decline seen in areas of the lake that have been left unmanaged. These include areas of the lake that are 10-15 feet deep, beginning approximately at Rhino Point and extending north of a line heading westward to the west shore where the developed (riparian) shore ends and the wetland ("Sensitive Area") begins.

For perspective. during the May, 2013 Full PI Survey, EWM was found at 118 sites, indicating a reduction of approximately 90% since active control measures began in 2013

EWM data collected during this survey is also provided with prior survey data for comparison in Tables 1-3 (page 5).

Additional discussion begins on page 6.

Figure 2

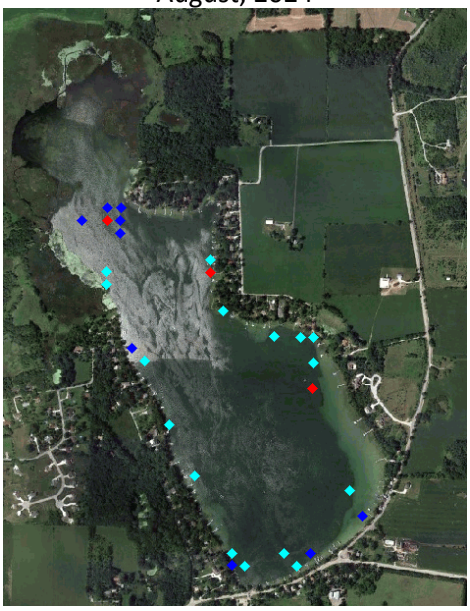
Golden Lake—Waukesha and Jefferson Counties, WI

Point-Intercept Points with Eurasian/Hybrid Watermilfoil

Partial PI Surveys—August, 2016-2024*

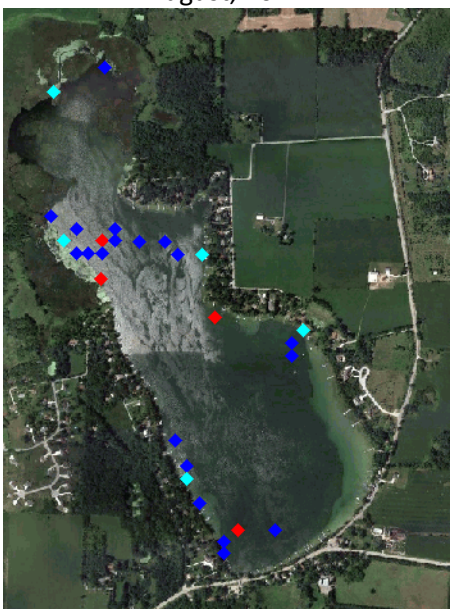
*August, 2015 Partial Point Intercept Survey Located in Appendix

August, 2024



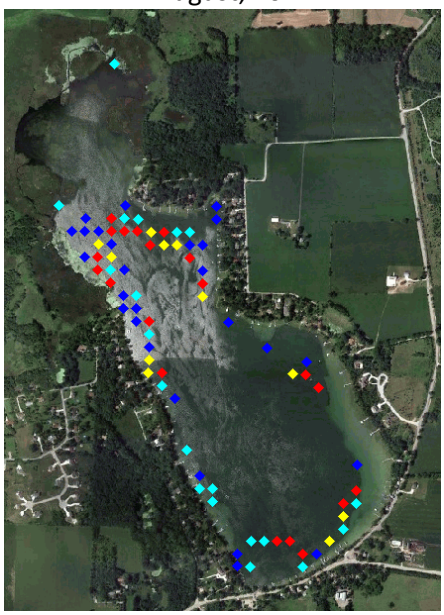
Sites: 12 (28 including Visuals)

August, 2022



Sites: 23 (28 including Visuals)

August, 2021

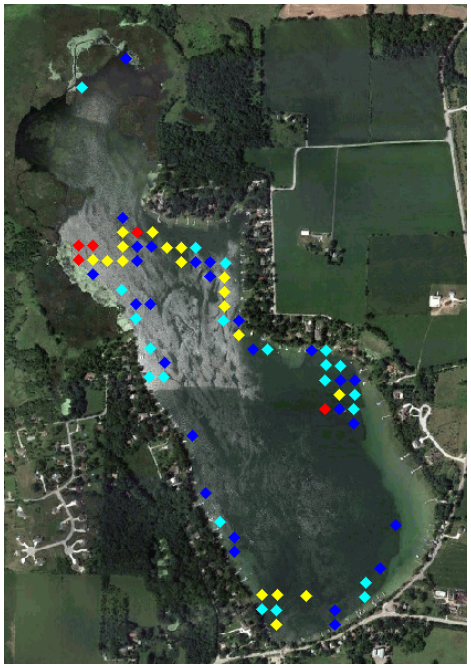


Sites: 56 (77 including Visuals)

August, 2019

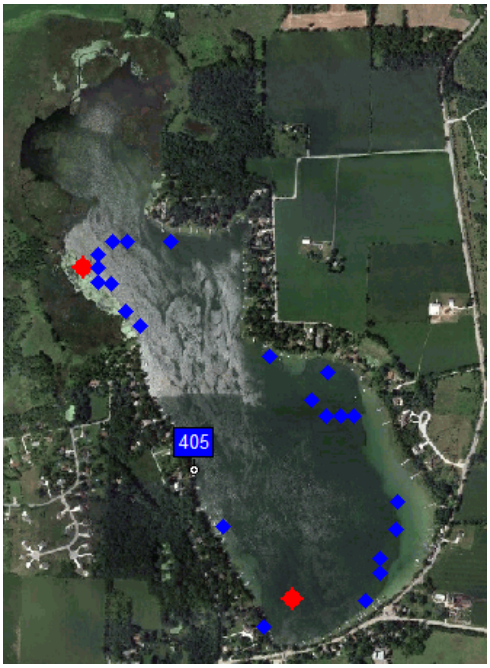
No. of Sites: 40 (50 including Visuals)

August, 2018



No. of Sites: 50 (71 including Visuals)

August, 2016



# of Sites: 24 (25 including Visuals)

Key

Blue = Rake Fullness of 1

Red = Rake Fullness of 2

Yellow = Rake Fullness of 3

Aqua = Visual

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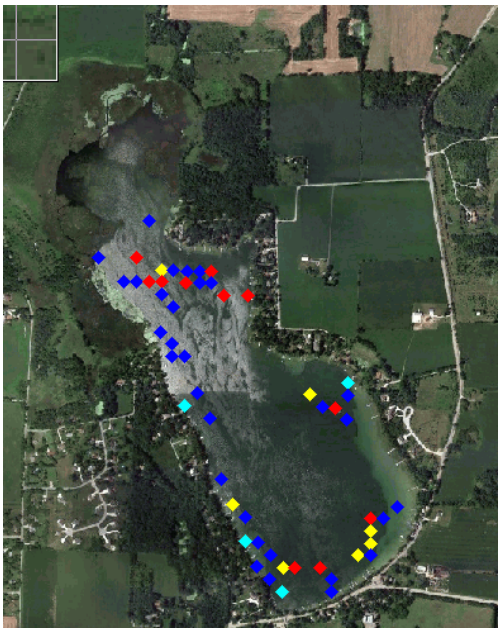
Figure 3
Golden Lake—Waukesha and Jefferson Counties, WI
Point-Intercept Points with Eurasian/Hybrid Watermilfoil
All Full PI Surveys Conducted from May, 2013 thru August, 2023

August, 2023

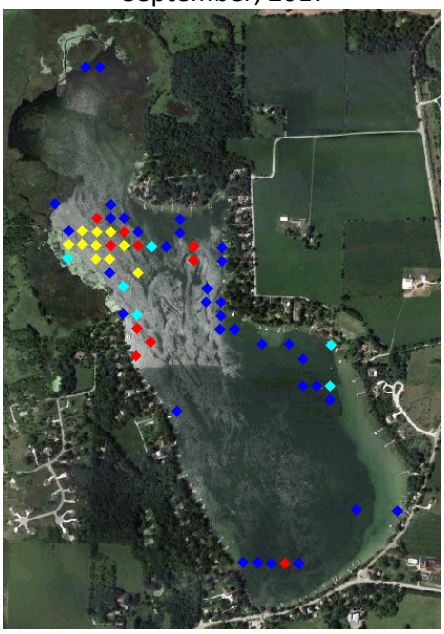


Sites Present: 52 (inc. 4 Visuals)

August, 2020

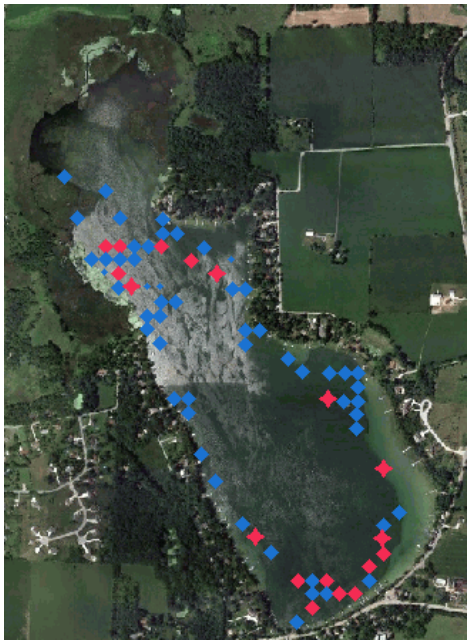
Sites Present: 36

September, 2017



Sites Present: 60 (inc. 6 Visuals)

September, 2014

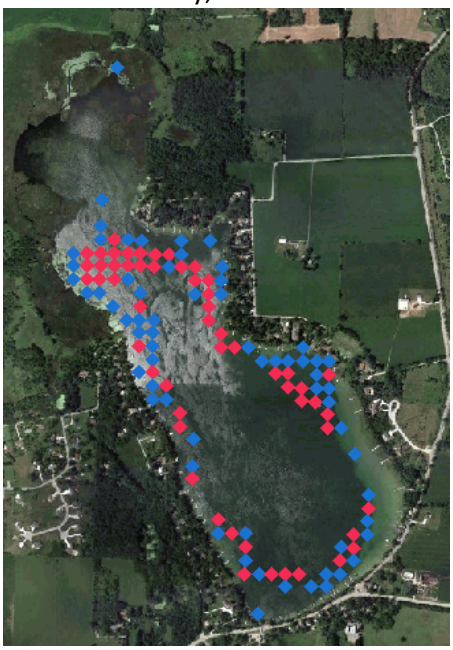


Sites Present: 72

August, 2013

Sites Present: 70

May, 2013



Sites Present: 118

Key
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Red = Rake Fullness of 2
Yellow = Rake Fullness of 3
Aqua = Visual

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Summary of Results, cont'd

Table 1

# of PI Points with EWM/Hybrid Milfoil - May, 2013 thru August, 2024

Full Point-Intercept Surveys

Survey	# Sites Visited	# Sites w EWM
May, 2013	366	118
Aug., 2013	367	72
Sept., 2014	342	70
Sept., 2017	442*	54**
August, 2020	427	36
August, 2023	435	48***

* Includes # sites where depth was recorded.

**60, inc. Visuals . ***52 , inc. Visuals.

Partial Point-Intercept (EWM only) Surveys

Survey	# Sites Visited	# of Sites w EWM	# Sites, inc. Visuals
Oct., 2015	191	46	na
Aug., 2016	250	24	25
Aug., 2018	250	50	71
Aug., 2019	250	40	50
Aug., 2021	250	56	77
Aug., 2022	250	23	28
Aug., 2024	250	12	28

Table 2

EWM/HWM Freq of Occurrence and Rake Fullness Data for all Surveys (2013-2024)

Note: Full PI Survey Years in Blue, Partial Surveys in Black

Parameter	May, 2013	Aug. 2013	Sept. 2014	Oct. 2015	Aug., 2016	Sept., 2017	Aug., 2018	Aug., 2019	Aug., 2020	Aug., 2021	Aug. 2022	Aug., 2023	Aug., 2024
Freq. of occurrence within vegetated areas (%)*	44.70	24.22	25.26	23.5	9.6	16.22	20.00	16.00	13.38	22.86	9.2	18.18	4.8
Freq. of occurrence @ sites shallower than max. depth of plants**	33.62	20.53	21.88	na	na	12.02	na	na	11.5	na	na	14.91	na
Relative Frequency (%)**	21.6	8.7	8.1	na	na	6.0	na	na	5.6	na	na	7.1	na
Relative Frequency (squared)	0.05	0.01	0.01	na	na	0.0	na	na	0.0	na	na		na
Average Rake Fullness	1.36	1.2	1.25	1.36	1.08	1.56	1.56	1.33	1.28	1.68	1.17	1.48	1.25

Table 3

Comparison of EWM Presence Among (32) PI Points in Sensitive Area of Golden Lake

Statistic	May 2013	Aug. 2013	Sept. 2014	Oct. 2015	Aug. 2016	Sept. 2017	Aug. 2018	Aug. 2019	Aug. 2020	Aug. 2021	Aug. 2022	Aug., 2023	Aug., 2024
# with EWM	27	17	19	16	9	19	15	14	11	16	10	9	4
Avg. Rake Fulness	1.48	1.18	1.21	1.63	1.11	2.21	1.94	1.5	1.64	1.63	1.2	1.56	1.0

Discussion

Since 2013 a variety of control methods have been used, including chemical controls, hand removal, and Diver Assisted Scuba Harvesting (DASH). Table 4 (below) provides brief summary of the EWM response to control efforts in each geographical lake "Zones" , as measured by the number of sites where EWM/HWM was collected (and/or observed) from August 2020 through August, 2024. This same data is represented on Figure 4 on the following page.

Table 4

Sites w EWM Present by Year and Management Zone*

Zone	2024	2023	2022	2021	2020
1	4 (6)	12 (12)	10 (12)	16 (18)	11
2	1 (4)	12 (15)	6 (7)	9 (19)	6
3	3 (8)	11 (11)	1 (1)	9 (13)	6
4	1 (6)	5 (6)	3 (4)	6 (7)	5
5	1 (2)	8 (8)	3 (4)	16 (20)	8
Totals	12 (28)	48 (52)	23 (28)	56 (77)	36

* Number in parenthesis includes total # sites identified by both rake and visual means. Zones 2 (west shore) and 3 (south shore) are chemical treatment areas.

Included in the Appendix is a summary of all management activities, including chemical controls, hand removal and diver assisted suction harvesting, that has been conducted b the Golden Lake Association since 2013. Much of this has been taken from the Aquatic Plant Management Plan Update (2023).

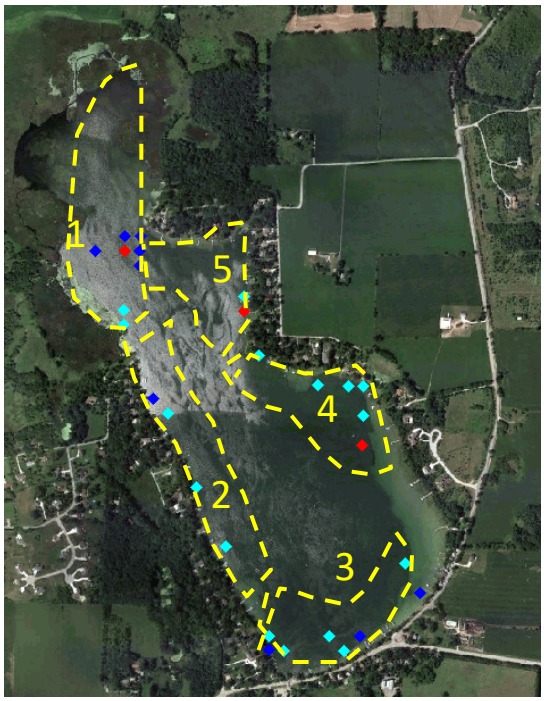
This concludes the presentation and discussion of the data collected during the 2024 EWM (Partial PI) Survey of Golden Lake.

Figure 4

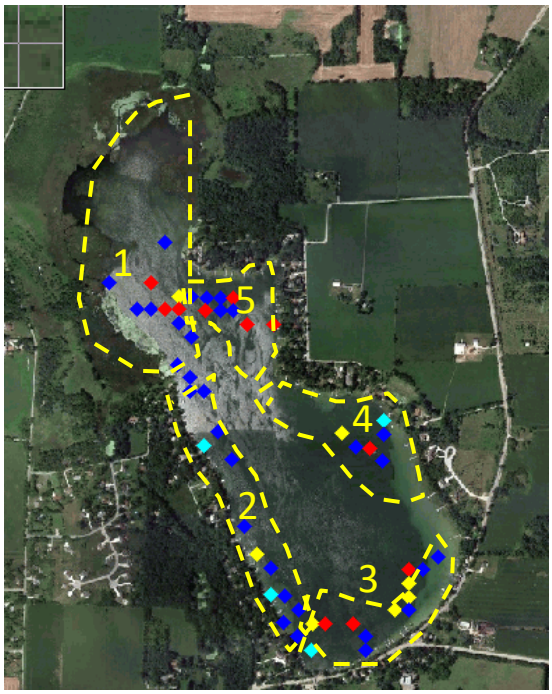
Golden Lake EWM Zones

Comparison of EWM Presence

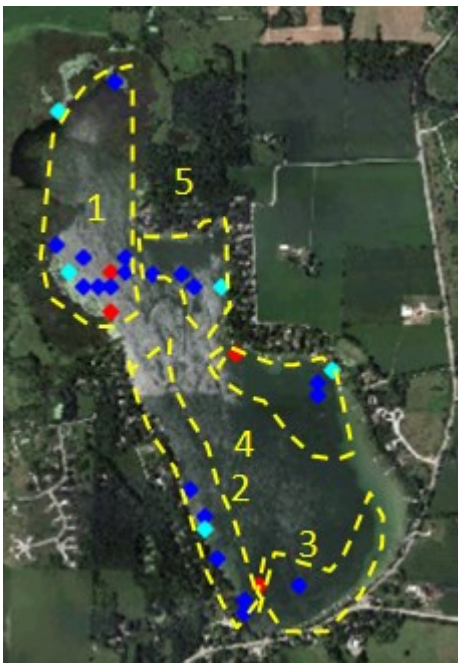
August, 2024 Survey (Partial PI)



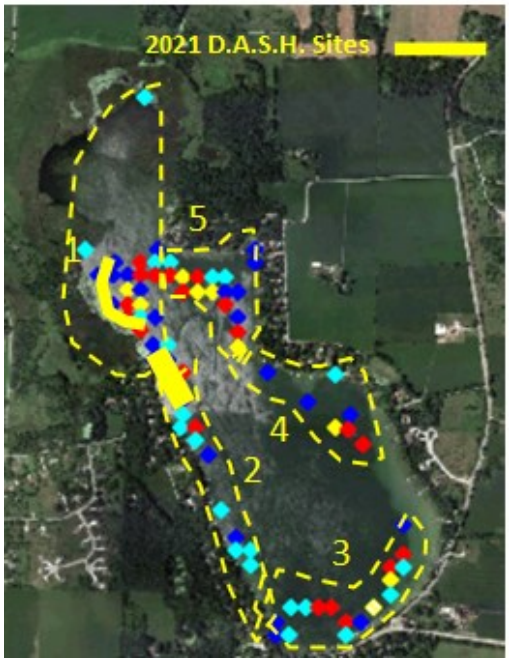
August, 2023 (Full PI)



August, 2022 Survey (Partial PI)



August, 2021 Survey (Partial PI)



August, 2020 Survey (Full PII)

Key

Blue = Rake Fullness of 1

Red = Rake Fullness of 2

Yellow = Rake Fullness of 3

Aqua = Visual

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Appendix

Contents

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Attachment I.

Aquatic Plant Fullness Ratings

Fullness Rating	Coverage	Description
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover the tines.
3		The rake is completely covered and tines are not visible.

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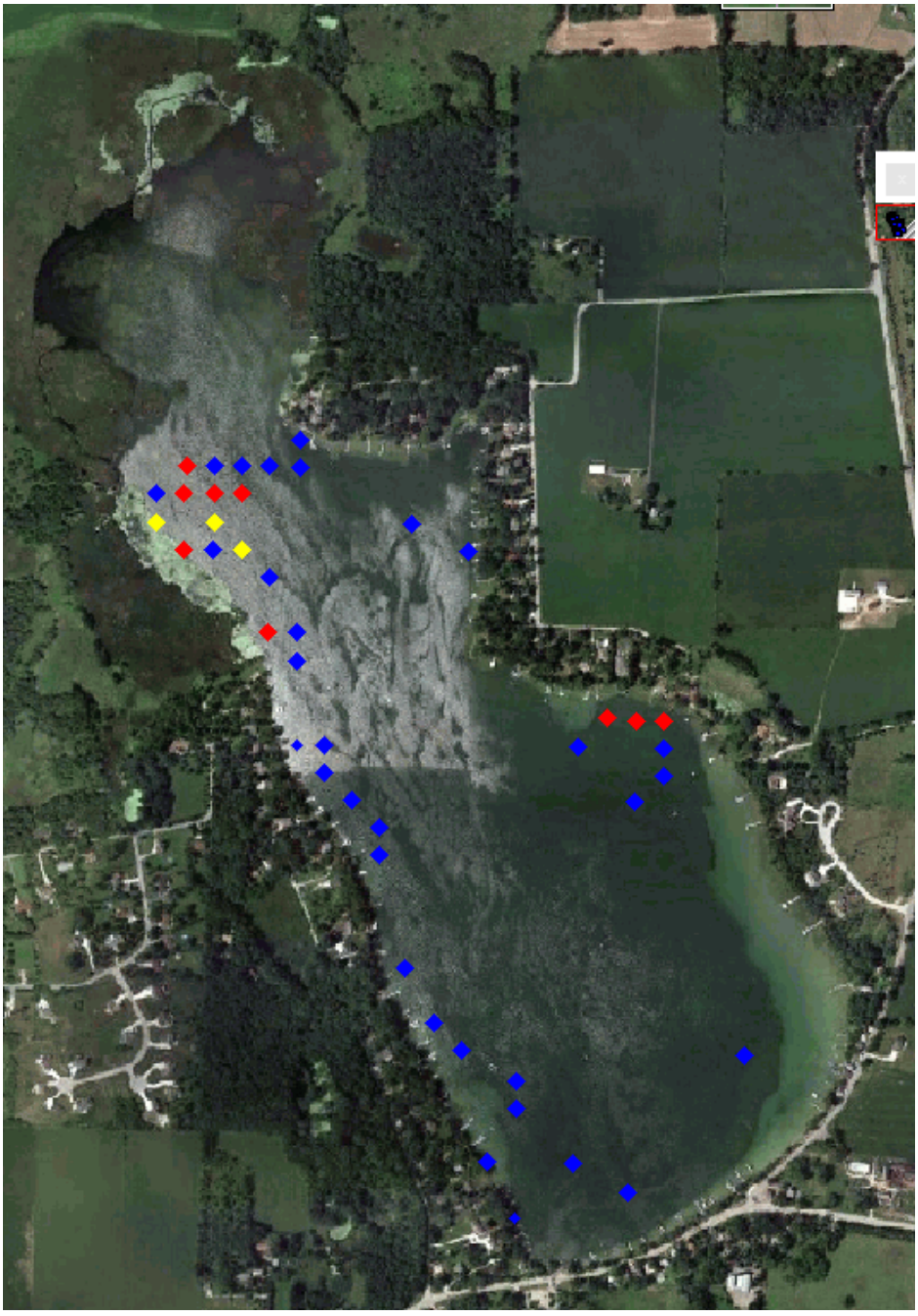
Attachment II

EWM/Hybrid Distribution in Golden Lake

August, 2015 Partial Point-Intercept Survey*



Total # Points where EWM Present: 45

Key

Blue = Rake Fullness of 1

Red= Rake Fullness of 2

Yellow + Rake Fullness of 3

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Attachment III

Summary of Chemical Controls, 2013 -2024

From Aquatic Plant Management Plan for Golden Lake (2023) with Updates

A combination of herbicide (chemical) controls, hand-removal and Diver Assisted Suction Harvesting ("DASH") have been used to manage Eurasian/Hybrid water-milfoil (EWM) and/or Curly-leaf pondweed (CLP) since 2013.. The purpose of this section of the report is to review all activities and discuss their effectiveness relative to the Golden Lake Association's Goals.

Adopted by the Association and incorporated into their 2015 Aquatic Plant Management Plan and 2023 Plan Amendment are the following criteria that *require plant management*((page 37 of 2015 Lake Management Plan):

- Presence of EWM/Hybrid at greater than 25 Points (15% of total number of waypoints in area less than 13 ft. in depth and an average density (Rake Fullness) of greater than (1).
- Areas that have a Rake Fullness greater than (2), or areas where EWM "tops out" and interferes with recreation.

A. Chemical Control

A list of all treatments conducted from 2013-2023, including treatment dates, product types and amounts used and acreage treated is as follows:

Year	Treatment Date(s)	Treatment Area(s)	Herbicides Used	Quantity Used (gal.)	Acres Treated
2013	6/3/13	West. South Shores and East Shore South of Rhino Point	DMA4-IVM/Navigate	227.2 gal/1305 lbs.	26.9/8.7
2014	No Treatment				
2015	5/13/15	South shore. Bay between Golden Cedar Ln./Krueger Rd.	DMA4-IVM	102.75	9.8
2016	5/17/16	West Shore	DMA4-IVM	128.0	10.0
2017	6/6/17	South Shore (4.0 acres). West Shore (0.5 acres)	DMA4-IVM	67.5	4.5*
2018	6/5/18	West Shore	Weedar 64/DMA4-IVM	92.5/21.0	7.6
2019	5/30/19	South and West Shores	Weedar 64	147.5	9.9
2020	6/2/20	South and West Shores	Weedar 64	135.0	9.0
2021	No Treatment				
2022	No Treatment				
2023	6/12/23	West Shore	Weedar 64	3.5	0.25**
2024	6/10 and 6/20/24	South Shore	Weedar 64	65.5	4.1 acres

Notes: * Milfoil stems collected in May of 2017 and presence of hybridized milfoil was verified. ** Treatment limited to one small bed of milfoil located at extreme north end of west shore (just south of Sensitive Area by culvert).

Attachment IV

Summary of DASH & Hand Removal Efforts, 2013 -2024

From Aquatic Plant Management Plan for Golden Lake (2023) with Updates

B. Diver Assisted Suction Harvesting (DASH)

DASH harvesting has been used between 2016-2024, primarily within the Sensitive Area. Over this period DASH has significantly reduced the population within this large, concentrated area of EWM/HWM/CLP. DASH was scheduled each year for up to two weeks in June/early July before significant growth of native species was present. The Association has discovered that DASH is more efficient than Hand Removal and thus, a better use of funds . DASH efforts typically take 50-90 hours annually to manually uproot and suction harvest EWM/HWM/CLP and control floating fragments. DASH is an integral part of the AIS Management Plan for Golden Lake.

D.A.S.H. Removal Efforts in Golden Lake 2016-2023 (unless otherwise noted)

Site	2016	2017	2018	2019	2020	2021	2022	2023	2024
Sensitive Area	47.75 hrs.*	46.75 hrs.	92.0 hrs.	90.0 hrs.	50.0 hrs.	30.5 hrs.	61.5 hrs.	61.5 hrs.	14.5
W. Shore Far North	8.5 hrs.				7.0 hrs.	33.0 hrs.	7.0 hrs.	16.5 hrs.	
Rhino Point South			2 days (Hand)		20.5 hrs.	15.0 hrs.	22.5 hrs.	14.0 hrs.	14 0 hrs. (Hand)
Rhino Point North				9 hrs. Each Dash/Hand	15.0 hrs.	15.0 hrs.			36.75 hrs.
South Shore						2.5 hrs.			

*While primary nuisance was Curly-leaf pondweed, EWM/HWM was also harvested.

The amount of AIS removed via DASH during 2016-2024 is as follows:

2016: 12,985 lbs. 2017: 15,250 lbs. 2018: 34,950 lbs. 2019: 32,050 lbs. 2024: 27,400
2020: 26,400 lbs. 2021: 21,400 lbs. 2022: 26,200 lbs. 2023: 26,050 lbs.

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Attachment V.

SWEENEY'S AQUATIC WEED REMOVAL

2024 Golden Lake Aquatic Invasive Species Report

Summary

Sweeney's Aquatic Weed Removal LLC performed hand-removal services of Eurasian Watermilfoil (EWM) along the eastern shoreline of Golden Lake during the month of July. Our efforts included 4 members of our team: 2 divers on our SNUBA dive system removing the plants, one member in a boat monitoring the divers' safety and collecting bags, and one member in a kayak collecting EWM fragments floating around the divers. The divers removed the plants by their roots, bagged them, and brought the bags to the boat once they were filled. Once the boat was at capacity, the EWM was brought to shore where it was transported to a trailer for disposal.

Location

The area of removal is outlined in red in the project map below. The two yellow ovals are where we found the largest concentrations of EWM. The surrounding areas contained small, sporadic concentrations of EWM.

Removal Hours & Volume of Material

Our divers performed 14 man hours of EWM removal and removed 2.22 cubic yards of material.

Sweeneys Aquatic Weed Removal, LLC Summary

Since 2011, Sweeneys Aquatic Weed Removal LLC has provided lake care services to homeowners, condominium associations, businesses, and lake associations across southeastern Wisconsin. Services offered include vegetation removal via pulling and cutting, muck and leaf removal, shoreline restoration, and surface cleans. The Company's professional advice and techniques are based on years of experience. A commitment to customer satisfaction is the cornerstone of our business. See our website (www.aquaticweedremovers.com) for more information.

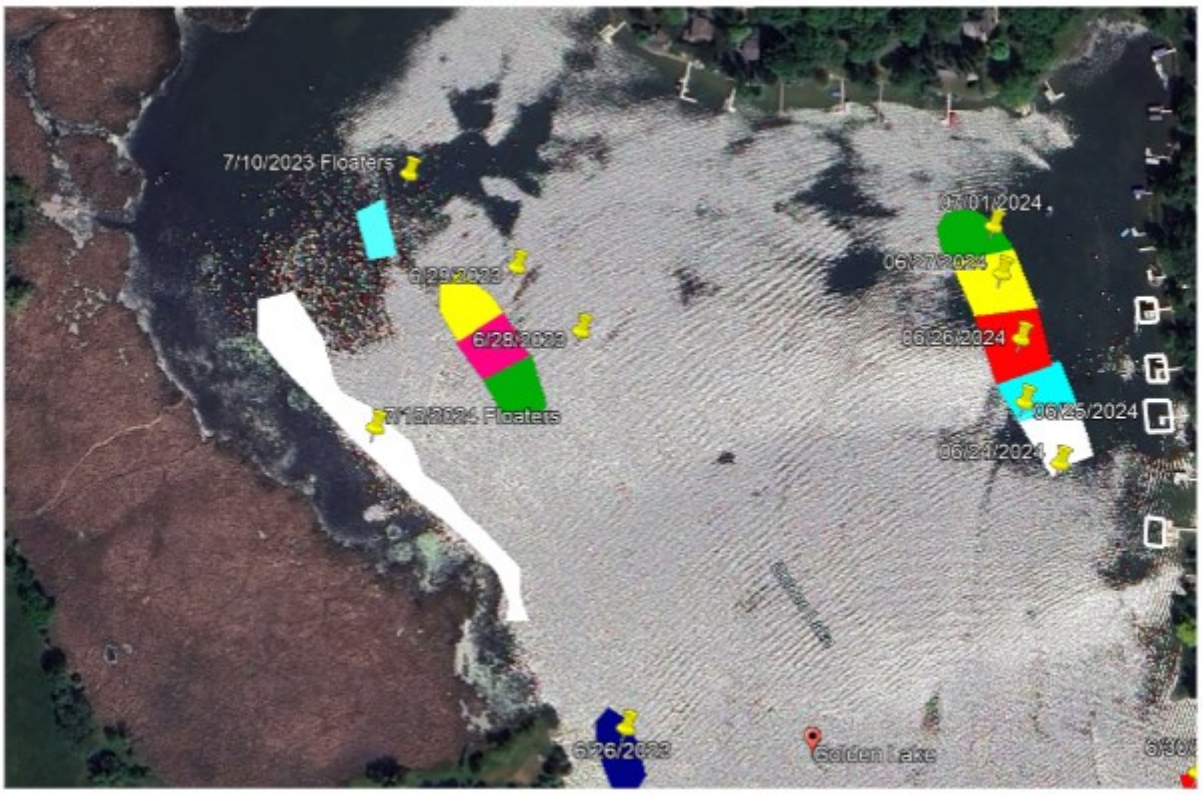
Thanks

Eric Sweeney
Sweeney's Aquatic Weed Removal LLC
eric@aquaticweedremovers.com
262-501-0431

Attachment VI.

2024 DASH Removal Efforts - Golden Lake

June 24—July 1 (East Shore) July 15 (Floating Mats in Sensitive Area)



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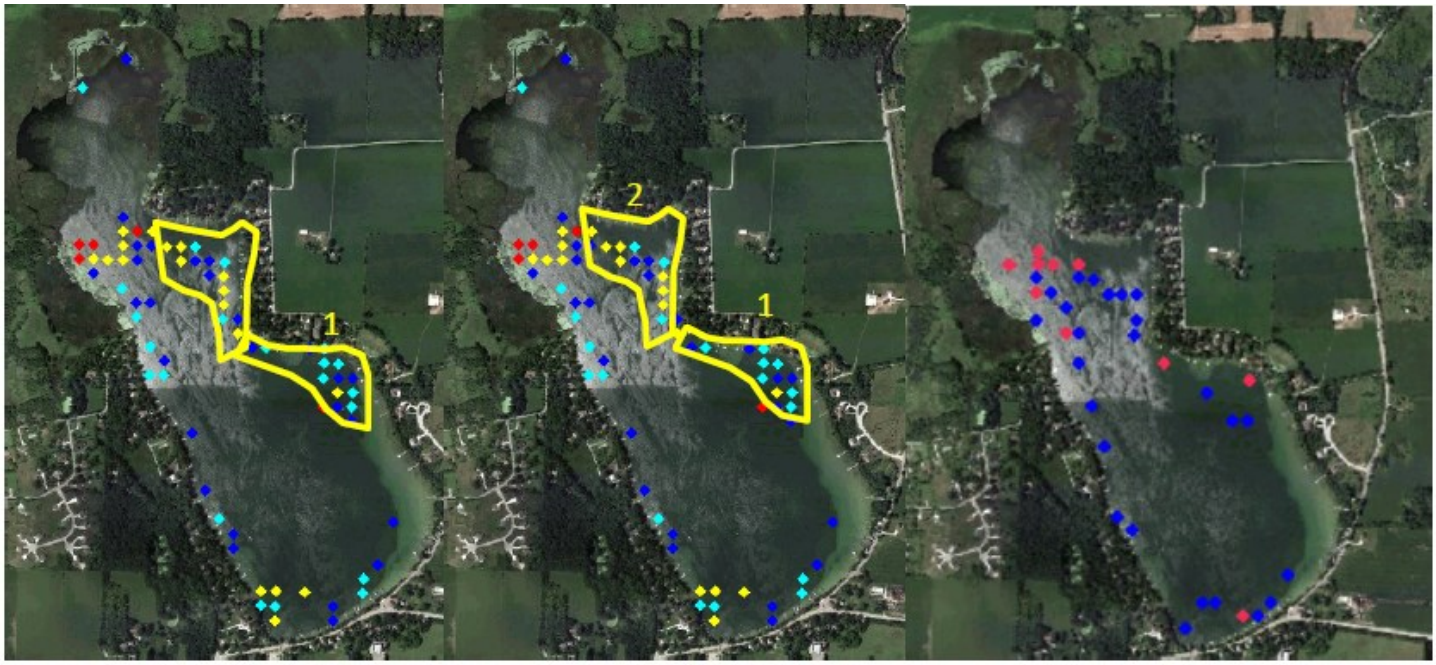
Attachment VII.

Golden Lake

Hand Removal Areas 2018-2023



Area 1: Hand Removal Conducted in Area 1 for 2 days in 2018.

Area 2: Hand Removal Conducted in Area 2 for 1 day in 2019

Note: No Hand Removal conducted 2020 due to Covid.

No Hand Removal during 2021-2023. Funds were used for DASH rather than Hand Removal

Key

Blue = Rake Fullness of 1

Red = Rake Fullness of 2

Yellow = Rake Fullness of 3

Aqua = Visual

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