Golden Lake—Waukesha and Jefferson Counties, WI

August, 2019 Eurasian/Hybrid Watermilfoil Survey

Marine Biochemists
N173W21440 Northwest Passage
Jackson, WI 53037
(888) 558-5106
www.marinebiochemists.com

Introduction

The Golden Lake Association (GLA) contracted with Marine Biochemists to conduct a survey in August of 2019 to determine both the distribution and density of Eurasian and/or Hybrid Milfoil within Golden Lake. This is part of an ongoing effort that has included annual surveys since the association's control efforts began in 2013.

The Survey consisted of data collection at 250 Point-Intercept ("PI") points, the same sub-set of points used during previous (2015, 2016, 2018) "Sub PI" Survey (see Figure 1). These points have been selected based upon their having depths between 0-13 feet (approximately). This is the depth range at which a majority of the significant, or problem-causing Milfoil beds have historically been located.

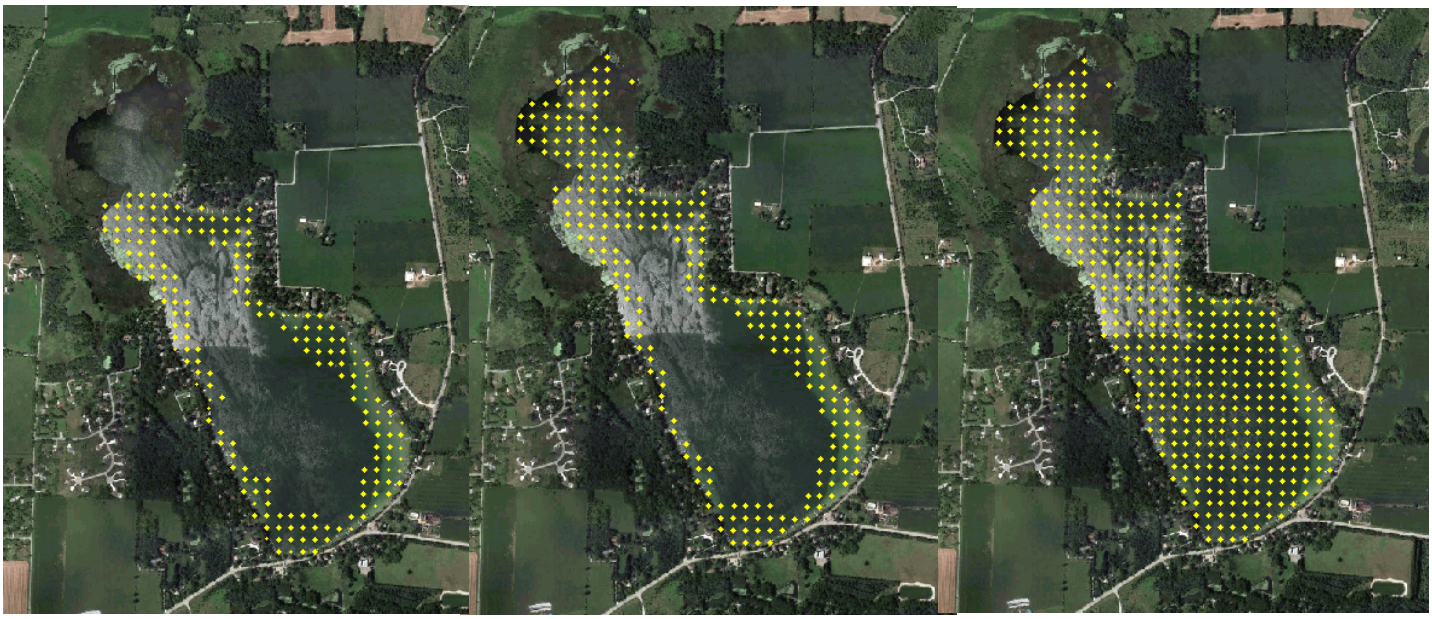
By contrast, the 2013, 2014 and 2017 Full PI surveys consisted of collecting data at all 565 "PI Points". The location of these are also illustrated in map form on Figure 1 below.

In addition to using a reduced number of PI points, this survey differed from the Full PI surveys in that data was collected on the presence/absence and rake "fullness" (density) of EWM and/or it's hybrids alone, as compared to all species (native or non-native) during Full PI surveys.

Data collection for this survey consisted of navigating to each PI 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 an extended Pole (depths 10 feet or less) or a Rake on a Rope (depths greater than 10 feet). Finally, in clear waters less than 3 feet in depth with a largely sand bottom, visual identification was utilized, as this made for a much more time 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

Modified PI Survey Points for Oct., 2015 (left) and August, 2016/19 (center) , Full PI (right)



No. of Points: 191 | No. of Points: 250 | No. of Points: 565

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Summary of Results

The survey results for 2019 were encouraging in comparison with those obtained in 2018, In 2019 a total of 40 of the 250 waypoints sampled contained EWM as compared to 50 in 2018. When "Visual" observations of EWM are included, a total of 50 sites contained EWM in 2019, as compared to 71 in 2018.

For further perspective, the "Low" in terms of EWM observations were 25 sites in August, 2016. Finally of the 40 sites where EWM was collected by Rake in 2019, (15) fell within the DNR designated Sensitive Area, which has ranged from 17-19 in prior surveys. The average rake fullness of EWM in the Sensitive Areas is 1.5 on a scale of 0-3, the remainder of the lake, 1.25.

A comparison in the number of PI points where EWM/Hybrid was found during each of the eight PI surveys conducted to date is as follows:

# of PI Points with EWM/Hybrid Milfoil - May, 2013 thru August, 2019

Full Point-Intercept Surveys

Survey	# Sites Visited	# of Points w EWM
May, 2013	366	118
Aug., 2013	367	72
Sept., 2014	342	70
Sept., 2017	442*	54**

* Includes # sites where depth was recorded. **60, inc. visuals

Partial Point-Intercept (EWM only) Surveys

Survey	# Sites Visited	# of Points w EWM
Oct., 2015	191	46
Aug., 2016	250	24*
Aug., 2018	250	50**
Aug., 2019	250	40***

*25, inc. visuals. **71, inc. visuals. ***50, inc. visuals

Figure 2 (following page), provides a side-by-side comparison of locations (PI Points) where EWM/Hybrid was found for each of the four Partial PI surveys, along with the most recent Full PI Survey (2017) in Map form. The original (May, 2013) WI DNR survey map detailing EWM/Hybrid locations is located in the Appendix as a reference.

Discussion

The above data indicates an approximate reduction of 66% in the number of points where Milfoil was found in the original May, 2013 survey. Following is a comparison of additional data collected on Milfoil for all eight surveys completed since May, 2013, with Full PI Survey Dates highlighted in Blue.

Parameter	May, '13	Aug., '13	Sept.,'14	Oct., '15	Aug., '16	Sept., '17	Aug., '18	Aug., '19
Max. Depth (feet) where plants found. Full PI Only	**32.5**	**29.5**	**29.5**	**na**	**na**	**27**	**na**	**na**
# Sites shallower than max. depth. Full PI Only	**351**	**329**	**329**	**na**	**na**	**335**	**na**	**na**
# Sites w/ vegetation (all species) - Full PI Survey Only	**264**	**289**	**285**	**na**	**na**	**310**	**na**	**na**
Freq. of occurrence within vegetated areas (%)*	**44.70**	**24.22**	**25.26**	**23.5**	**9.2**	**16.22**	**20.00**	**16.00**
Freq. of occurrence @ sites shallower than max. depth of plants**	**33.62**	**20.53**	**21.88**	**na**	**na**	**12.02**	**na**	**na**
Relative Frequency (%)**	**21.6**	**8.7**	**8.1**	**na**	**na**	**6.0**	**na**	**na**
Relative Frequency (squared)	**0.05**	**0.01**	**0.01**	**na**	**na**	**0.0**	**na**	**na**
Average Rake Fullness	**1.36**	**1.2**	**1.25**	**1.36**	**1.08**	**1.56**	**1.56**	**1.33**

Notes: While Number of Vegetated Sites (any species) was not part of the Partial PI Surveys, for the 250 sites sampled in August, 2016/19 (or 191 in Oct., 2015) , the Freq. of Occurrence is listed. ** Relative Frequency is a proportion, calculated by dividing the Frequency of Occurrence of a species by the total Frequency of all Species. It is useful in comparing the importance of a species year to year, and between species. The higher the number, the greater the Importance.

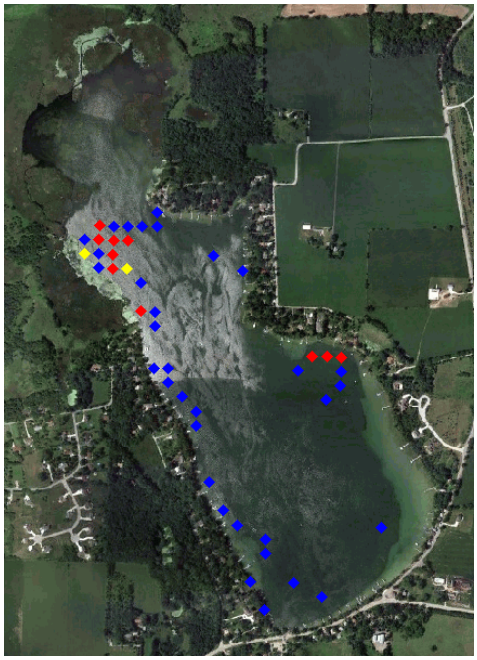
Figure 2

Golden Lake—Waukesha and Jefferson Counties, WI

Point-Intercept Points with Eurasian/Hybrid Watermilfoil

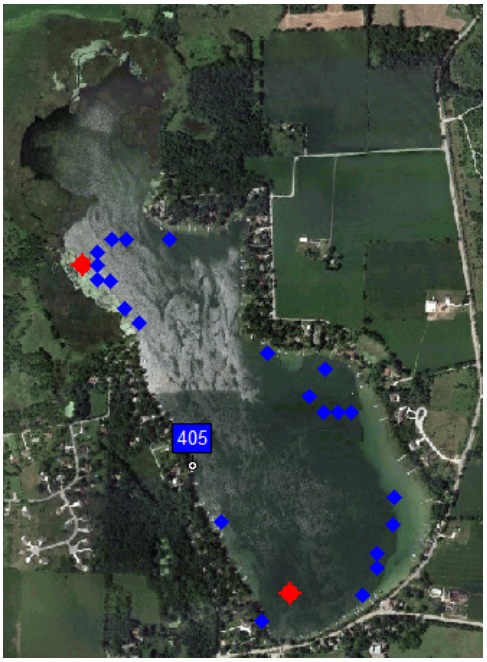
Partial PI Surveys October, 2015 through August, 2019 & Full PI, September, 2017

October, 2015



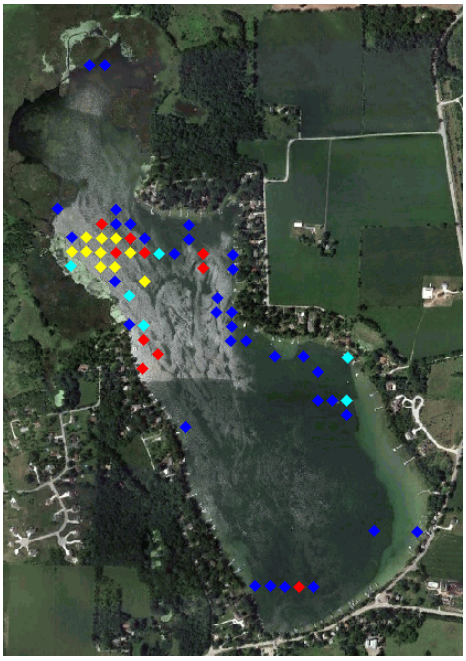
No. of Sites: 46

August, 2016



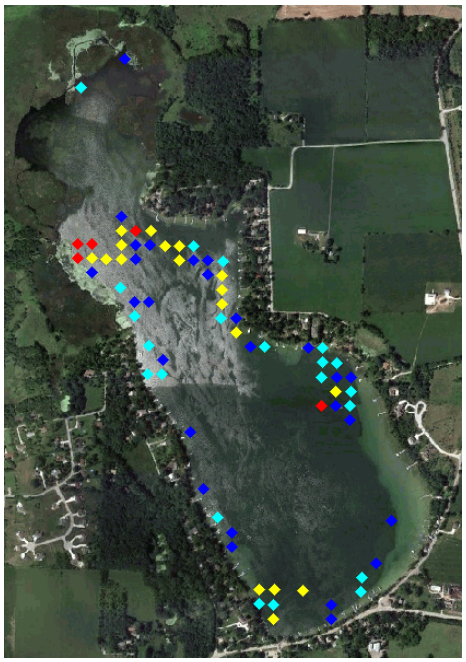
No. of Sites: 24 (25 including Visuals)

September, 2017 (Full PI)



No. of Sites: 54 (60 including Visuals)

August, 2018



No. of Sites: 50 (71 including Visuals)

August, 2019

No. of Sites: 40 (50 including Visuals)

Key

Blue = Rake Fullness of 1

Red = Rake Fullness of 2

Yellow = Rake Fullness of 3

Aqua = Visual

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Discussion, cont'd.

Since 2013 a variety of control methods have been used, including chemical controls, hand removal, and Diver Assisted Scuba Harvesting (DASH). A brief summary of the EWM response to control efforts in each geographical lake "Zones" between the August 2018/19 surveys is provided below. Figure 3 (following page) shows the location of each "Zone".

Zone 1: Sensitive Area

In May, 2013, a total of (27) sites within the DNR designated Sensitive Area were identified by DNR Staff as having EWM present. This was reduced to a total of 17 in August, 2013. The Table below shows a comparison of a total of (32) "Benchmark" sites for each of the eight surveys.

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

Statistic	May,'13	Aug.,'13	Sept.,'14	Oct.,'15	Aug.,'16	Sept.,'17	Aug.,'18	Aug., '19
# with EWM	27	17	19	16	9	19	16	14
Avg. Rake Fullness	1.48	1.18	1.21	1.63	1.11	2.21	1.94	1.5

While the Sensitive Area continues to maintain a significant portion of the overall EWM population (both in areal extent and density), the August, 2018/19 Maps show a small decrease in the amount of EWM present (points present) as well as a decline in density (rake fullness). D.A.S.H. Removal was conducted in this area for nine days in both 2018 and 2019 (eighteen days total)..

Zone 2: West Shore

A portion of the west shore has been treated in both 2018 and 2019. There were a total of (7) waypoints having EWM in 2018. This was reduced to a total of three, including two visuals in 2019.

Zone 3: South Shore

The south shore was treated in 2019 as well, with the last previous treatment being conducted in 2017. A total of eight sites contained EWM, including three sites identified by Visual Means in August, 2018. In August, 2019, EWM was found at a total of five sites, including one Visual. There was also a significant reduction in the density (Rake Fullness) at some of these sites.

Zone 4: South of Rhino Point/Kruger Rd.

A total number of (15) sites (including 7 Visual) in this area were identified as having EWM present in August of 2018. This has been reduced in number to nine, including three Visuals. Hand Removal was conducted in this area in 2019.

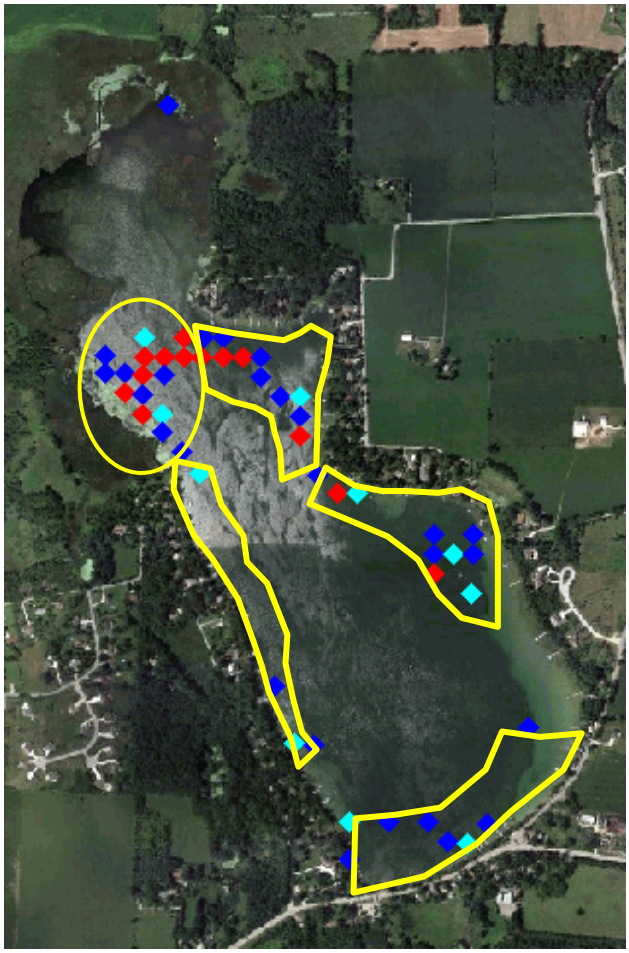
Zone 5: Rhino Point & North

EWM was found at approximately (15) points in this area in August, 2018 (including). The same area contained a total of 12 points (one Visual) in 2019. Both Removal by Hand and D.A.S.H. (one day of each) were conducted here in 2019.

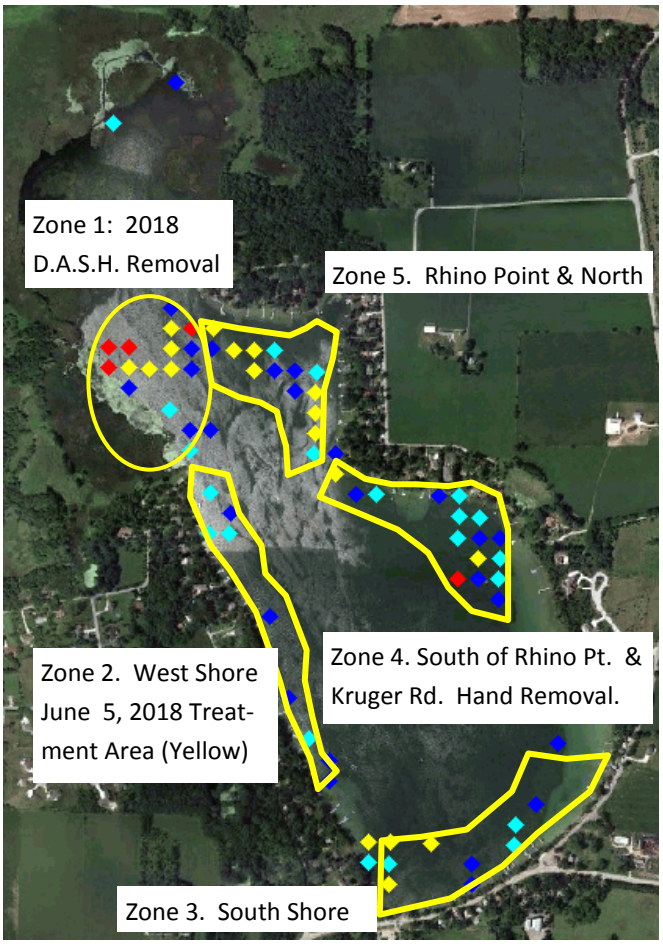
This concludes the presentation and discussion of the data collected during the 2019 EWM (Partial PI) Survey of Golden Lake.

Figure 3
Golden Lake EWM Zones
Comparison of EWM Presence

August, 2019 Survey (Partial PI)



August, 2018 Survey (Partial PI)



Key
Blue = Rake Fullness of 1
Red = Rake Fullness of 2
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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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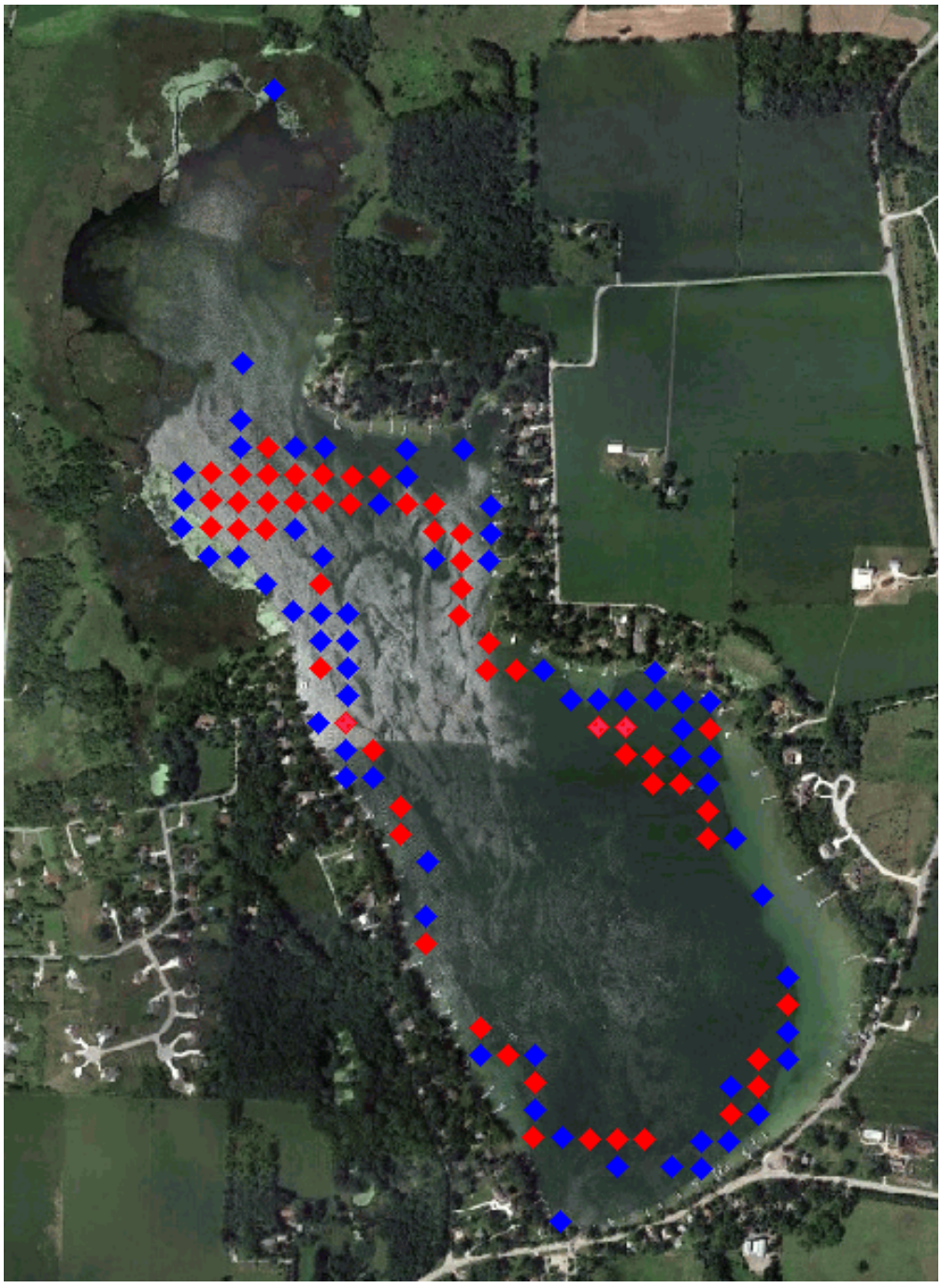
Attachment II

EWM/Hybrid Distribution in Golden Lake

May, 2013 Point-Intercept Survey*

*Data collection by WI DNR staff



Key

Blue = Rake Fullness of 1

Red= Rake Fullness of 2

Total # Points where EWM Present: 118

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