Aquatic Biologists, inc.

Specialists in Lake & Pond Management, Services, & Supplies

Random Lake Management Plan 2023

Sheboygan County, Wisconsin

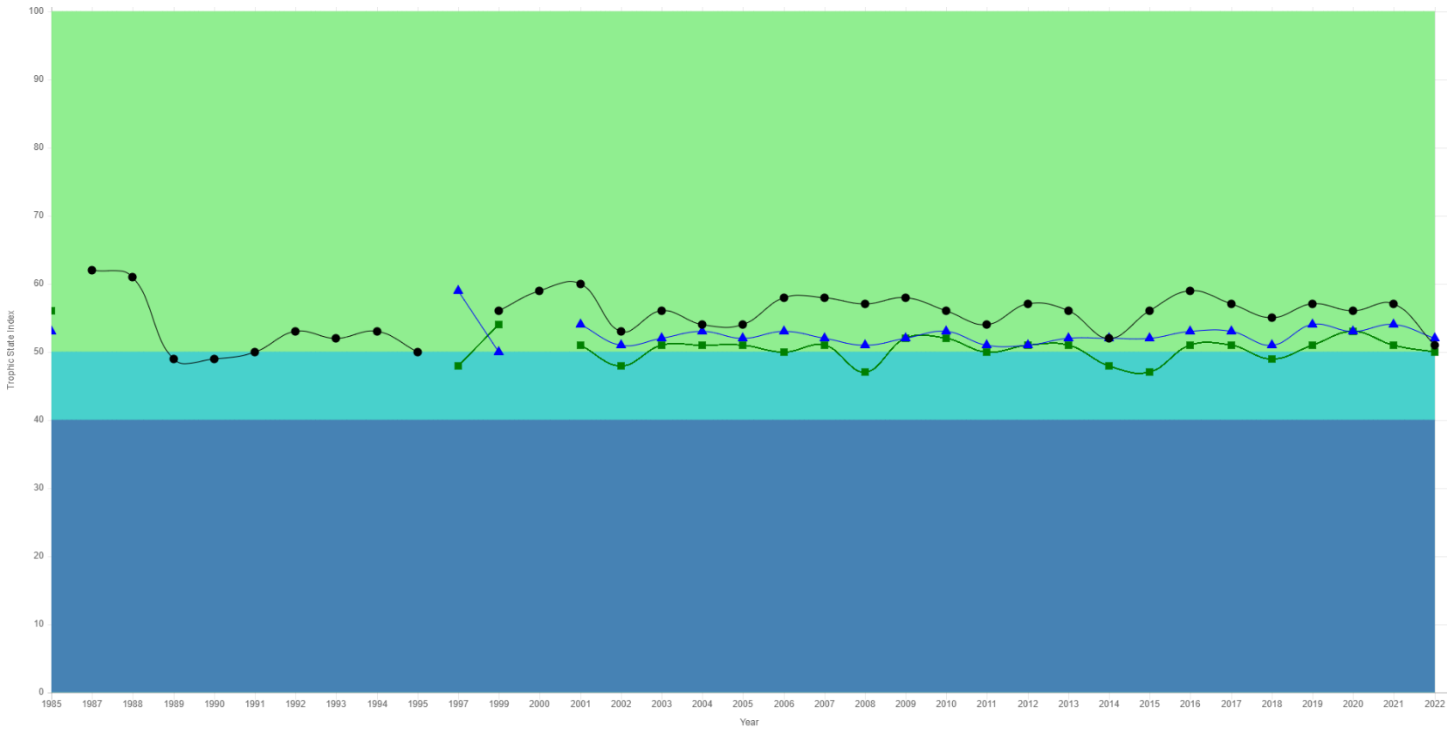
Prepared by Aquatic Biologists, Inc. Fond du Lac, WI

For the Village of Random Lake and the Random Lake Association

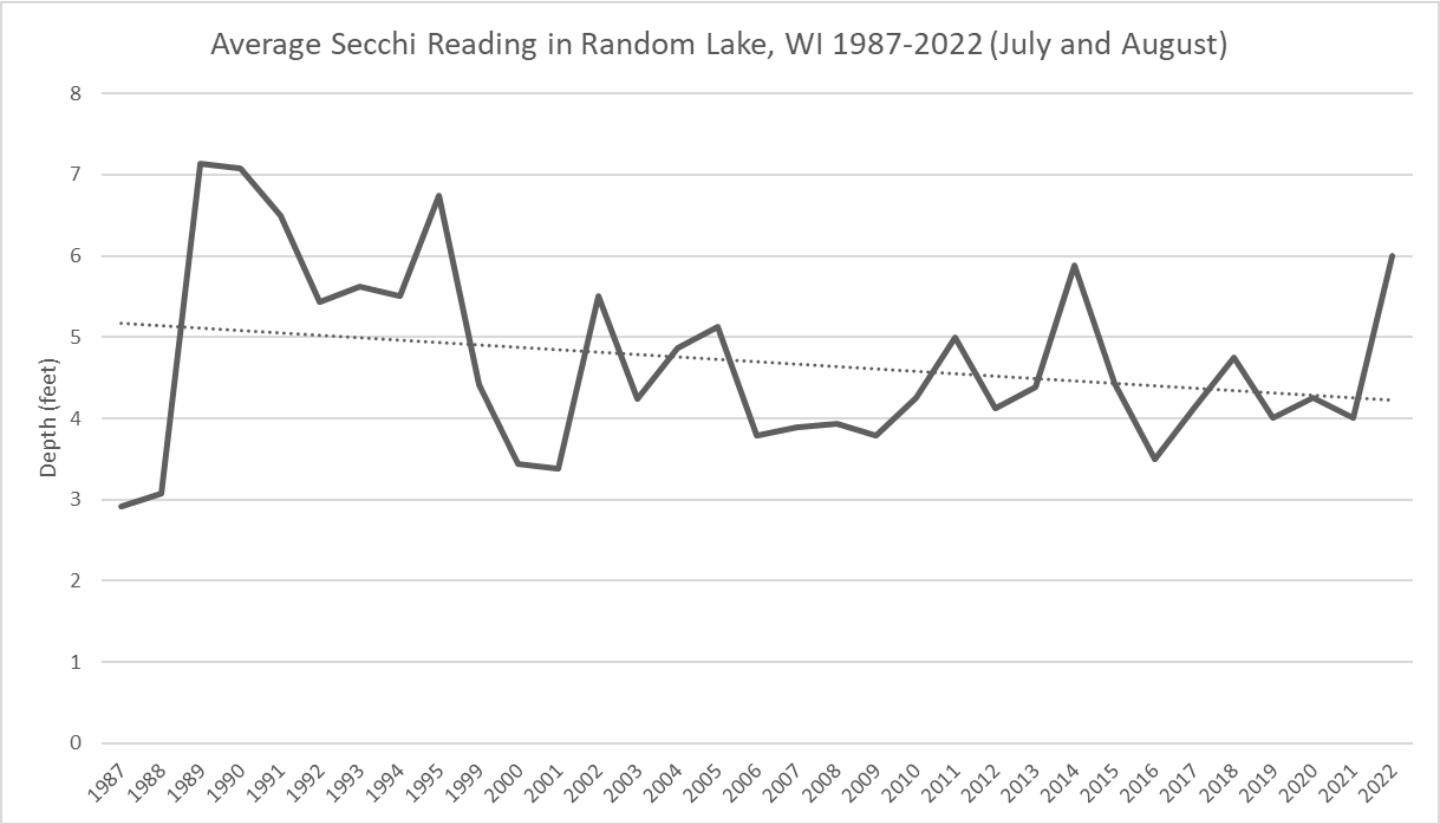
5/26/2023

Random Lake is a 212-acre, shallow, eutrophic headwaters lake in Sheboygan County Wisconsin. The mean depth is 6 feet with a max of 22. 75% of the lake has a muck bottom with sand and gravel making up the other 25%. Being a drainage lake, Random Lake has both an inlet and an outlet. The inlet is a creek connecting to Spring Lake on the Southern end and the lake exits to the North into Silver Creek via a concrete overflow. "Normal" water level marked at the brim of the overflow making any outflow negligible to management decisions.

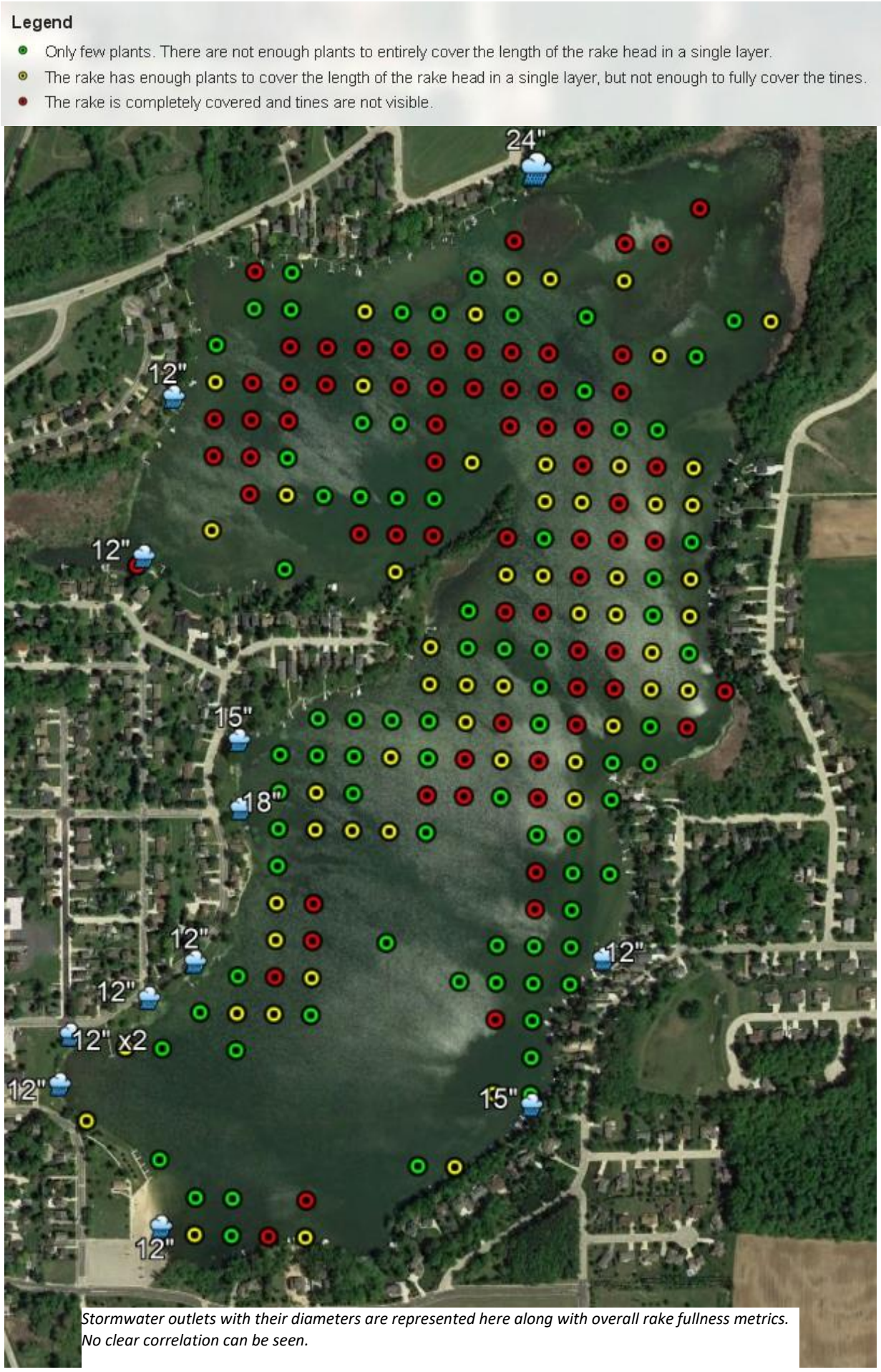
Trophic status in the lake has remained stable over the past 35 years as shown in the chart below despite an increase in average temperatures. Random Lake is listed as a eutrophic lake meaning productivity is high with rooted vegetation around most of the littoral zone and the possibility of algae blooms. This is common of smaller, shallower lakes.



Secchi depth has trended downwards on average during July and August from 1987 until 2022. Comments from the volunteers conducting the lake monitoring, most often marked the color of the lake as "green." This decrease in water clarity is probably a combination of many factors. As development in the watershed increases, runoff and the nutrient carried increases and as a result, the number and severity of algal blooms increases.



Stormwater outlets are marked on the map depicting overall rake fullness below. Aquatic Biologists did not observe an increase or decrease in vegetation in relation to the location of nutrient inflows and the map supports this with indiscriminate rake fullness throughout the littoral zone. Further nutrient testing should be done at stormwater inlets during and/or shortly after rainfall events to gauge the amount of nutrients entering the lake. Testing can also be done at the overflow and it can be determined the level of nutrients staying in the lake. Incoming nutrients as a result of runoff can increase algae blooms and add suspended solids to the water column decreasing clarity. Neither of these metrics was addressed with this PI survey. Historical data does show an overall decrease in clarity throughout the years as discussed above.

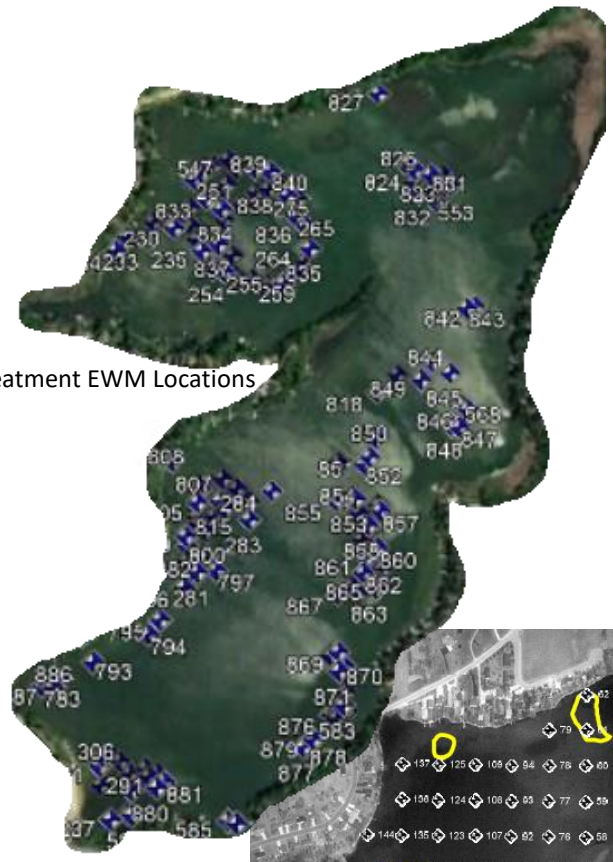


Stormwater outlets with their diameters are represented here along with overall rake fullness metrics. No clear correlation can be seen.

A whole lake point intercept survey was conducted August 22nd, 2022 to evaluate the aquatic plant community in Random Lake. Distribution and density of non-native and native aquatic plants were surveyed to determine the best management practices. Rake samples were taken at predetermined GPS locations and the survey conducted per WDNR Point Intercept Protocol. Species and density of plants were recorded at 335 points spread evenly across the lake. Rake fullness is recorded on a scale of 1 to 3, with 3 being the densest.

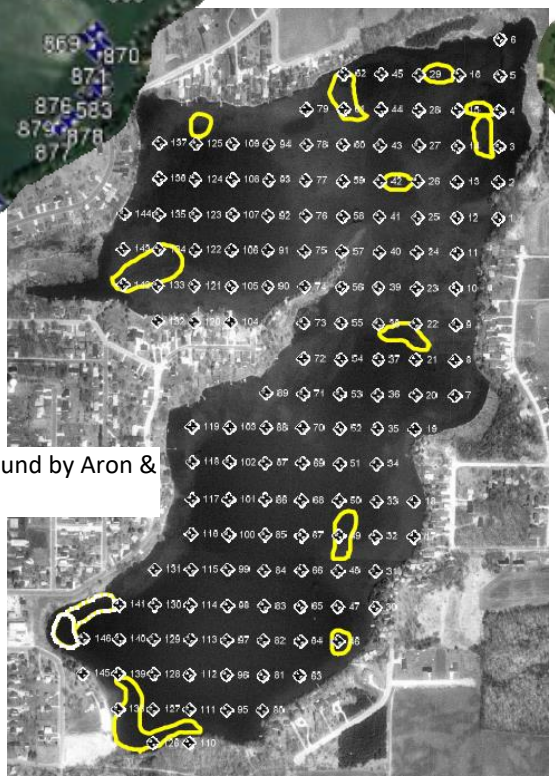
Non-Native Aquatic Plant Species

Eurasian watermilfoil (EWM) was identified during the survey. This non-native has been regularly been managed since its introduction 1993. A whole lake 2,4-D treatment (0.35ppm) was conducted June 27th, 2022 targeting 29 acres of EWM. The post-treatment PI survey showed 17 sites where EWM was found with an average rake fullness of 1.76. It was visually noted at 4 additional sites.



Pre-treatment EWM Locations 2022

Post-treatment EWM Locations 2022



EWM Locations found by Aron & Associates 2008

EWM has been managed in Random Lake almost yearly since 1999 with either partial or whole-lake chemical concentrations. Harvesting occurred up until 2001 when it was believed fragments were spreading and the harvester was doing more harm than good.

Fluoridone was the active ingredient used in the 1999 and 2005 whole-lake treatments. 2,4-D has been used in subsequent years since 2001. Treatments appear to show a seasonal effect by reducing mid-summer biomass to non-nuisance levels with high biomass returning the spring following treatment.

Percent frequency, the percentage of survey points where EWM was collected, was identical between the 2008 and 2022 surveys at 5 percent of surveyed points. We can loosely conclude that repeat annual treatments are not having an effect on long term suppression or control.

Curly-leaf pondweed is also known to be present in the lake. This was chemically treated during the June 27th, 2022 treatment in two locations totaling 1.75 acres. Curly-leaf pondweed dies back during summer months and this is most likely the reason it was not found on the August survey.

Curly-leaf was documented in surveys in the early 2000s. PI surveys are planned for mid-late summer during peak biomass of species other than CLP so it is not unusual to know it exists in the lake but not turn up on the surveys, unless a specific spring survey to document the extent is completed. Management of this species is typically done when water temperatures are between 55-60 degrees Fahrenheit. Once the water temperatures increase, a turion will form. This turion is a seed like structure that can be viable in the sediment for several years before sprouting. The majority of curly leaf pondweed plants will die or subside by late June. Our survey in late August does not accurately give a proper representation of the curly leaf pondweed population.

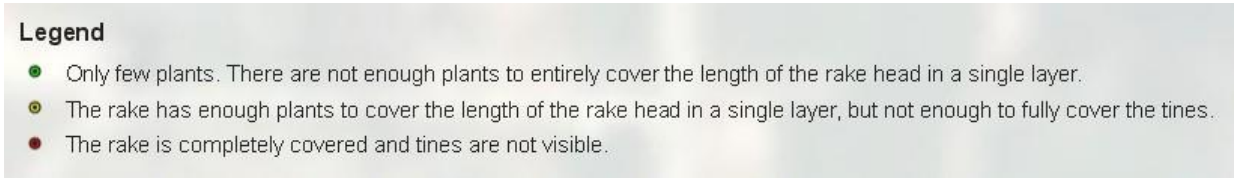
Purple Loosestrife was not documented on the PI survey but it was visually found on the shoreline of the Northwestern inlet. Purple loosestrife grows in wet soil near the water's edge where it spreads rapidly via seeds or re-rooted cut/broken stems. Individual plants should be pulled or dug out, being sure the entire root mass is removed. They should then be burned or disposed on in a landfill. Plants can also be chemically treated; permits are required when near the water. There were only a few plants growing on the marshy northern side of the inlet so manual removal and disposal is recommended.

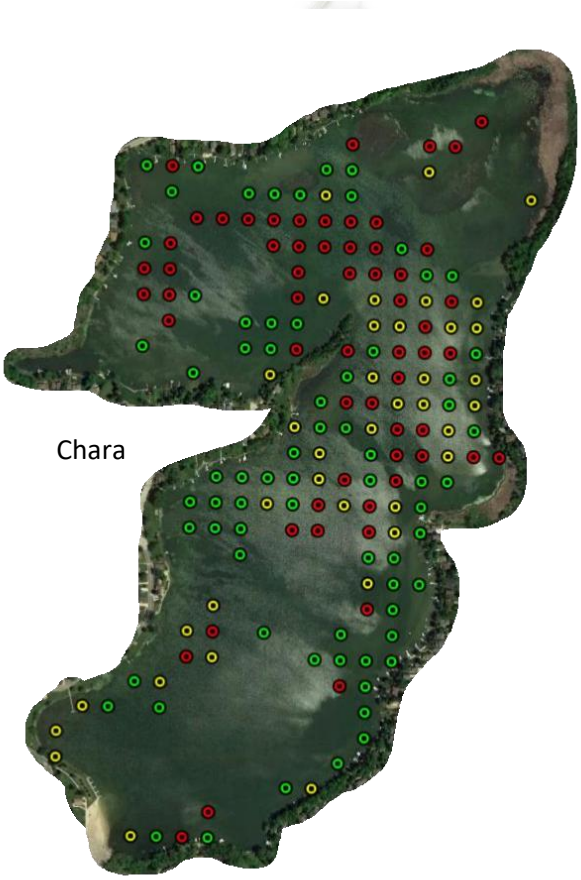
Native Plant Species

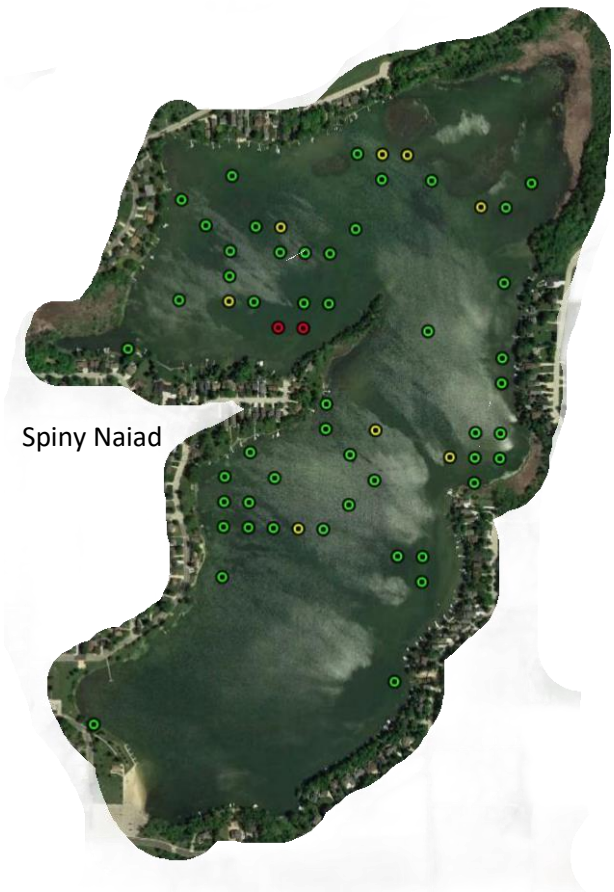
Twelve native plant species were identified during the survey in 2022.

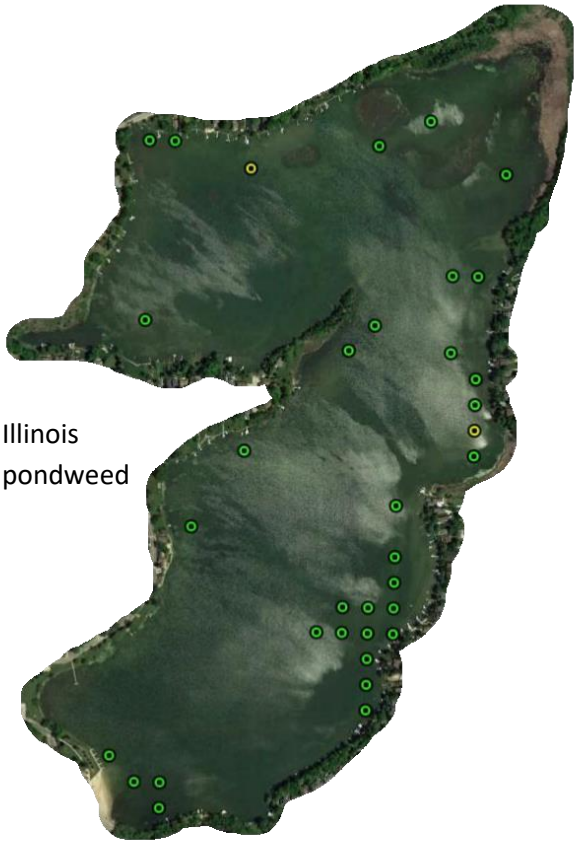
Aquatic Plant Species Found During the 2022 Aquatic Point Intercept Plant Survey			
	Number of Sites Found	Frequency of Occurance	Avgerage Rake Fullness
Myriophyllum spicatum,Eurasian water milfoil	17	4.9	1.76
Ceratophyllum demersum, Coontail	7	2	1.14
Chara sp., Muskgrasses	169	49.1	1.93
Elodea canadensis, Common elodea	1	1	1
Najas flexilis, Slender naiad	1	0.3	1
Najas marina, Spiny naiad	59	17.2	1.2
Nuphar spp., Yellow Water Lily	1	0.3	2
Nymphaea odorata, White water lily		visual	
Potamogeton foliosus, Leafy pondweed	16	4.7	1.19
Potamogeton illinoensis, Illinois pondweed	35	10.2	1.06
Potamogeton nodosus, Long-leaf pondweed	1	0.3	1
Stuckenia pectinata, Sago pondweed	7	2	1
Utricularia vulgaris, Common bladderwort	30	8.7	1.1

The most common native plant species found in 2022 were; chara, spiny naiad, Illinois pondweed, bladderwort, and leafy pondweed. These are native plants to Wisconsin lakes with the exception of spiny naiad which is native to the southern U.S. Chara and spiny naiad are both low growing plants that rarely pose issues. There are no concerns at this time with densities of chara or naiad species. Distribution and rake fullness of these species can be seen in the maps below.

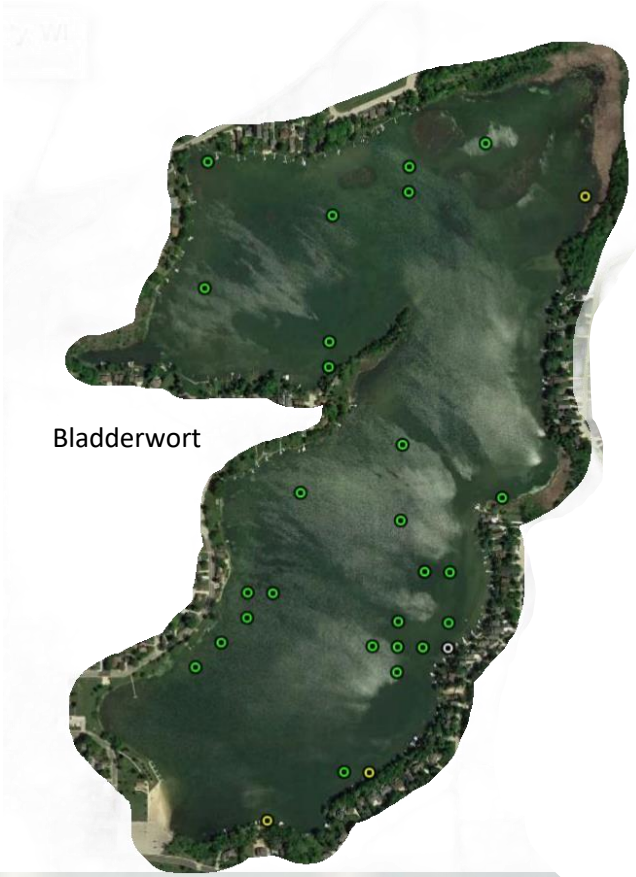








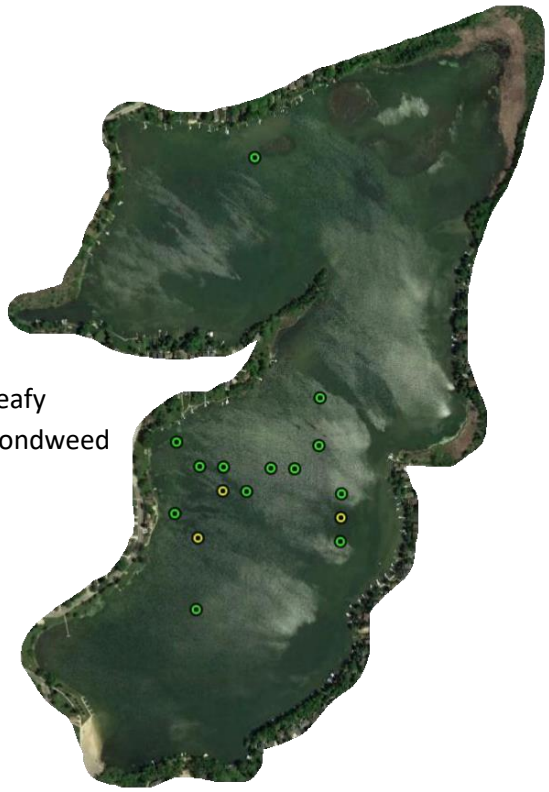
Illinois pondweed



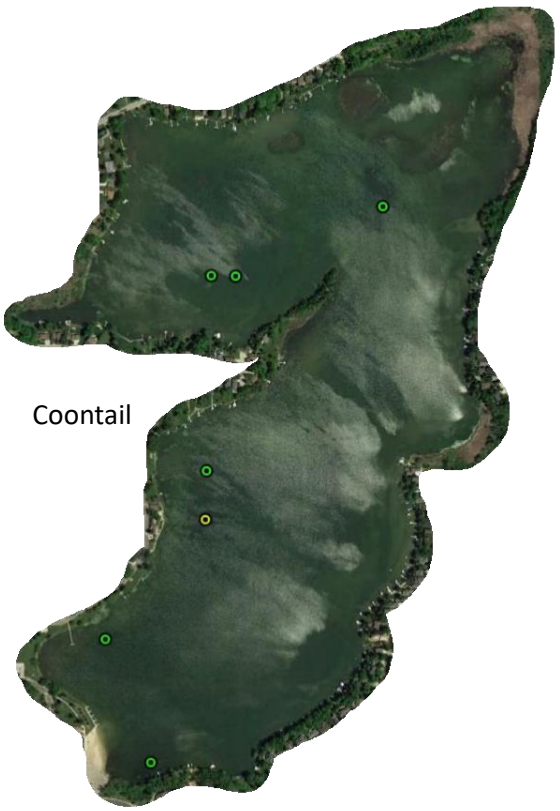
Bladderwort

Legend

- Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
- The rake has enough plants to cover the length of the rake head in a single layer, but not enough to fully cover the tines.
- The rake is completely covered and tines are not visible.



Leafy pondweed



Coontail

Plant Distribution 1974-2022

The large gap between survey years makes it difficult to compare 2022 data to past data. Frequency of occurrence for many of the species remains similar with the exception of sago pondweed. We can speculate that the whole-lake 2,4-D herbicide treatment in summer 2022 may have an impact on the sago population. Throughout the years chara, sago pondweed, and spiny naiad have been the dominate species.

Survey techniques have changed over the years, and for that reason we cannot compare as much on a quantitative approach, but have to look at the data from a general qualitative view. The 1974 survey was a "intensive water reconnaissance", the 1999-2004 surveys used 20 different line transects from the shoreline out into the lake, the 2005-2008 surveys were similar to the 2022 survey protocol with the exception that in the 2000s, about 150 points were surveyed versus the 355 points in 2022.

The table below depicts the plant community over time in Random Lake.

Frequency of Occurance of Aquatic Plant Species in Random Lake, WI											
	1974	1999	2000	2001	2002	2004	2005	2006	2007	2008	2022
Chara	Abundant	34	57	43	49	50	64	50	56	53	49.1
Common Elodea	0	0	0	0	3	1	0	0	0	0	1
Duckweed	0	0	0	0	0	0	0 (found at 1 site)	visual	visual	0	0
Eurasian Watermilfoil	0	60	0 (found at 1 site)	9	69	8	0	0	visual	5	4.9
Whorled Watermilfoil	0	0	0	0	0	0	0	visual	visual	visual	0
Slender Naiad	Common	1	0	visual	2	10	0	2	2	2	0.3
Spiny Naiad	Common	10	0	0	visual	13	0	6	11	20	17.2
Nitella spp.	0	0	0	0	0	0	10	0	0	0	0
Yellow Water lily (Spatterdock)	Scattered	5	5	6	7	4	3	1	visual	2	0.3
White Water Lily	Scattered	5	5	0	4	2	10	5	1	1	visual
Curly-leaf Pondweed	0	1	4	19	25	1	0	7	6	0	0
Large-Leaf Pondweed	0	0	0	1	3	6	0	visual	3	1	0
Illinois Pondweed	Maybe?	14	18	17	34	8	0	visual	1	9	10.2
Leafy Pondweed	Maybe?	0	0	0	visual	1	0	0	0	0	4.7
Floating-leaf Pondweed	0	1	5	5	7	6	5	2	1	1	0
Flat-stem Pondweed	Maybe?	visual	0	10	7	visual	0	0	0	0	0
Long-leaf Pondweed	0	0	0	0	0	0	0	0	0	0	0.3
Sago Pondweed	common	33	57	48	56	37	12	40	32	27	2
Common Bladderwort	0	1	0	2	3	9	0	1	4	8	8.7
Coontail											2
Water Celery	0	0	0	visual	visual	0	0	0	0	0	0
Total Species	8	12	8	11	16	16	7	13	14	12	13

EWM Management Strategy

Digital sonar mapping should be done prior to any estimates for whole-lake treatments to confirm an accurate water volume. The depth of the thermocline also needs to be taken into consideration for any whole-lake oriented application. Approximately $3,500 to obtain current and accurate bathymetry. Any mapping should be done before April 15th before plants start growing.

EWM - Option 1 - Chemical Control Using a Fluoridone Whole-Lake Concentration

The lack of defined milfoil beds on the fall survey do not make spot treatments a viable option. Previous chemical applications have used 2,4-D applied at label rates in targeted areas of milfoil with the goal of reaching a whole-lake concentration to control milfoil lake-wide. Sonar (fluoridone) was used in 1999 and 2005 with 3-4 years of extended control after application. The use of 2,4-D in the past shows that the lake can

hold herbicides for an extended period of time, making a low concentration rate product, such as Sonar ideal. If the treatment is conducted early in the season, a degree of Curly-leaf pondweed control is possible.

At applied rates, Sonar has little to no effects on native vegetation. Past uses on fluoridone on Random Lake support this. A pre-treatment survey would be needed to assess milfoil beds to target with applications.

An initial whole-lake concentration would be targeted using a pelletized SonarOne at 5ppb initial concentration. Regular concentration monitoring would be conducted every 3 weeks after application throughout the season with a bump of 1-2ppb applied to maintain a concentration of between 2-3ppb. Another bump of 1-2ppb would very likely be needed, with the goal of using a total of 8ppb for the season. A total of 5-6 monitoring events should be budgeted for this scenario. There is no water use restriction with this product as opposed to the irrigation restrictions with 2,4-D. Approximate cost estimate $43,000.

EWM Management – Option 2 – Continued Use of 2,4-D at Whole-Lake Concentration

Continued regrowth both late season of treatment and the spring following application is at a great enough scale to require whole-lake treatment. In the past, liquid 2,4-D has been used annually to control milfoil on a seasonal basis. Post-treatment surveys such as the one done in August 2022 as well as fall of 2018, show a reduction in milfoil. Roughly 75% of the milfoil was controlled by spring treatments those years. Repeated 2,4-D use can select for genetic strains of milfoil that show resistance to that specific active ingredient chemistry. Hybridity and genetics testing should be performed to ensure increased 2,4-D resistance is not occurring. Applications of 2,4-D should target an in-water concentration of 0.35ppm. A pre-treatment survey would be needed to assess milfoil beds to target with applications. Approximate cost $17,000.

Integrated Pest Management - Using Alternatives to Chemical Control for EWM

A sound IPM plan includes multiple management tactics with the end goal of long term control or eradication. A mix of management stategies makes the target plant species (EWM) less likely to adapt to the treatment conditions. Various hybrid milfoil strains exist in the wild now that show tolerance to flouridone or 2,4-D doses. Repetition of any chemical formation on an annual basis makes these strains more prevelent.

Using multiple control stratigies is important to effectively manage invasive species. A combination of chemical treatments, mechanical/handpulling, nutrient remediation/control, and education is needed to continue to reduce the population.

DASH and Hand Pulling

Manual removal would be ideal in the fall months following a chemical application. The post-treatment survey in 2022 had 17 sites where milfoil was surveyed. Manual removal could quickly and efficiently remove these individual milfoil plants and small clumps. With a good systemic root crown kill from an herbicide, following up with hand pulling or diver assisted suction harvesting (DASH) could extend the years between chemical application.

Hand pulling would be utilized in shallow parts of the lake while DASH would be recommended for deeper water milfoil areas.

If the use pattern of seasonal suppression using 2,4-D is followed, the regrowth is too great to implement DASH or hand pulling. It is not feasible to manually remove 30 + acres of milfoil on a yearly basis.

2018 WDNR Fish Survey

It was noted in a 2018 fish survey completed by the Wisconsin DNR, that bluegill and other panfish species were below the statewide growth chart across all age classes. This is thought to be in part due to dense submerged aquatic vegetation such as EWM. If native species in the lake grow tall enough and dense enough, they can provide a refuge for these smaller fish and limit predation. It is suggested to mechanically harvest lanes in areas of extremly dense vegetation to allow for ambush areas for predator species such as largemouth bass and muskie/northern pike. These areas limit the hiding places for small panfish which in turn can increase growth rates as competition between small panfish decreases. Mechanically harvested channels also create fishing opportunities as these artifical weed edges are the target of fisherfolks.

It was noted that at the time of our fall plant survey, chara and naiad were the only species in enough abundance to create panfish refuges. Both of these plants usually do not pose an issue as they are considered low growing and tend to stay within the bottom 2-3 feet of the water column. The areas of native pondweeds were spaced out well to create areas of refuge to some but not all of the panfish species. Spacing was adequate to allow for predation in the fall of 2022 following whole-lake 2,4-D treatment.

Harvesting Plan

During a year of high growth, mechanical harvesting is encouraged to allow fish passage lanes in dense vegetation. See maps at the ends of this report for a detailed harvesting plan in the event vegetation is dense. Lanes should be 30 feet wide with a cutting depth no more than half the water column up to a 3 foot cutting depth. Vegetation harvested must be collected to the best of the machines ability with carfeul attention to detail when cutting through milfoil patches. Cut vegetation to be deposited on shore near boat launch area in a manner not to interfere with the laumch lanes and swim area. Vegetation will be disposed of at the Village of Random Lake Recycling Center.

Harvesting paths to start and end at GPS coordinates described on the map below.

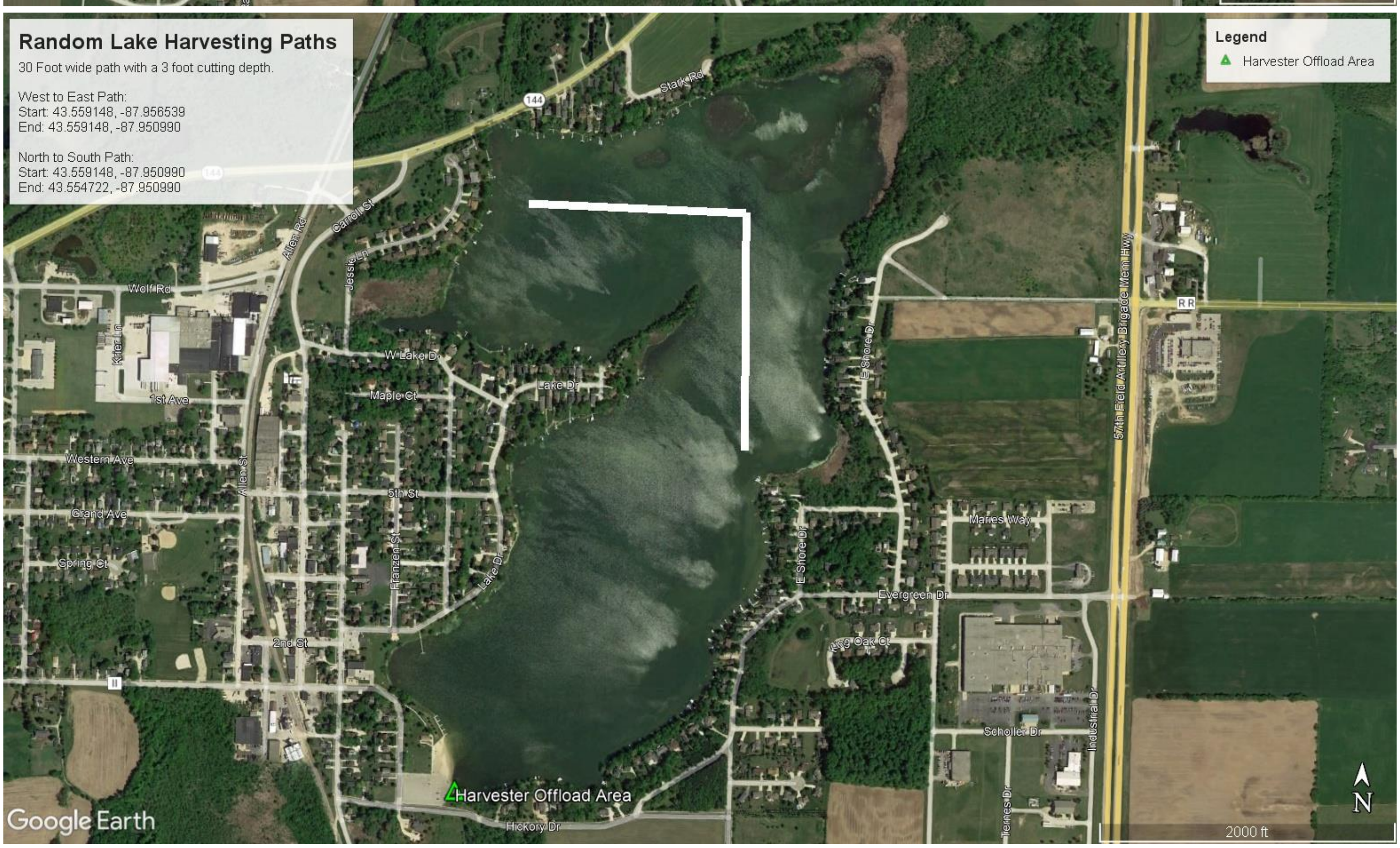
Future Recommendation:

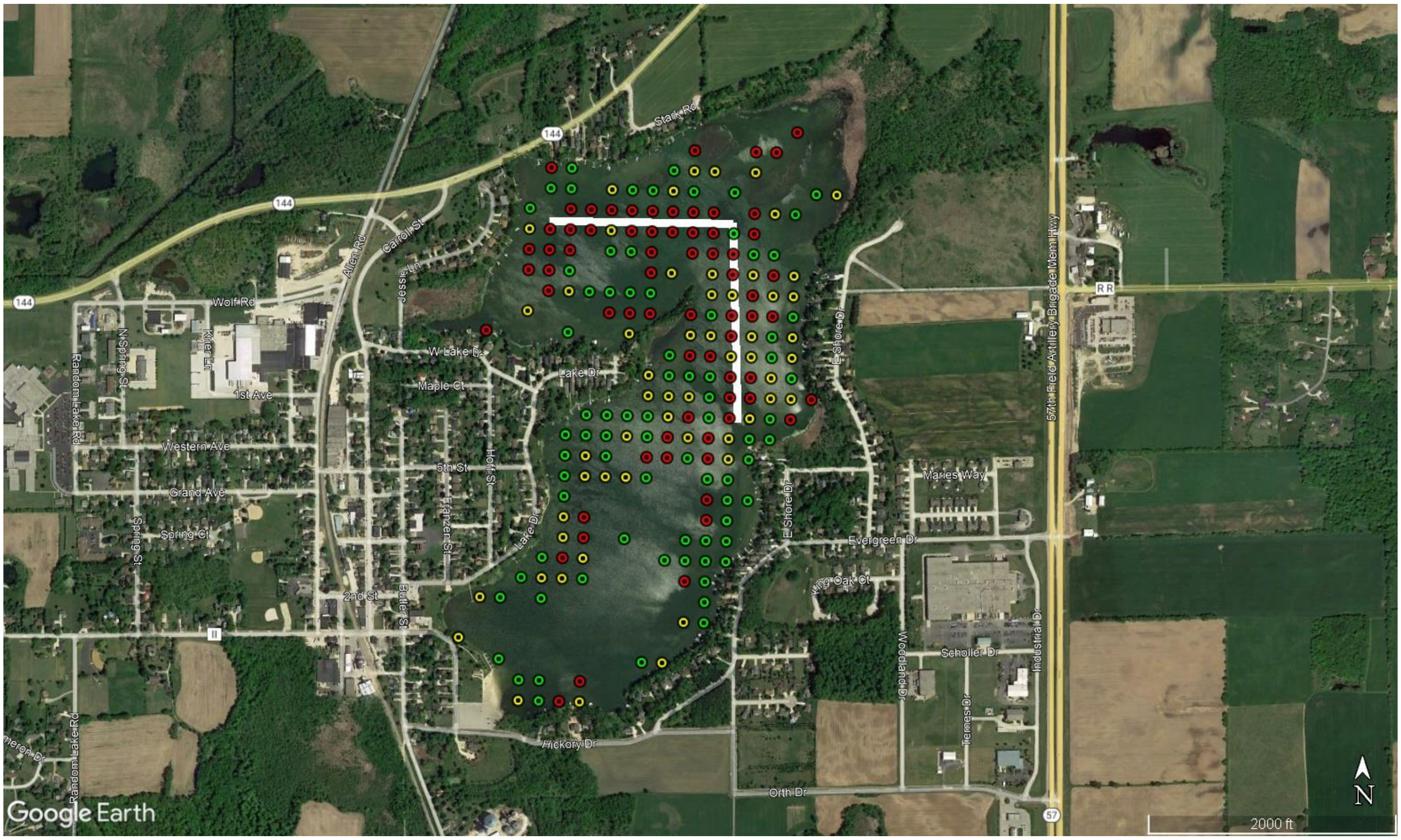
Based on past treatments, Aquatic Biologists is recommending a combination of whole-lake chemical treatment, manual removal, and spot treatments.

- An early-season whole lake pelletized flouridone treatment would be done year 0 with concentration monitoring and concentration bumps as needed.
- Spring of year 1 after treatment, the lake should be visually surveyed to mark individual milfoil plants and beds on GPS. A hand pulling/ DASH approach would then be implemented. Hand pulling would be used on indivual plants and small clumps. Having volunteers from the lake association or village would be the most cost effective. DASH would be needed in areas of the lake were more dense milfoil beds or clumps are found and/or in areas too deep for snorkel hand pulling. DASH is labor intensive and can get costly for large areas.
- Years following…..
    - Random Lake should continue to be monitored and assessed for milfoil growth on an annual basis with a meander survey.
    - Once milfoil beds start approaching a couple acres, a highly selective and effective herbicide such as ProcellaCOR EC should be used. This product has been shown to be very selective in targeting milfoil species with little to no native impacts.
- Nutrients entering Random Lake from the watershed should continue to be monitored and evaluated to slow eutrophication.

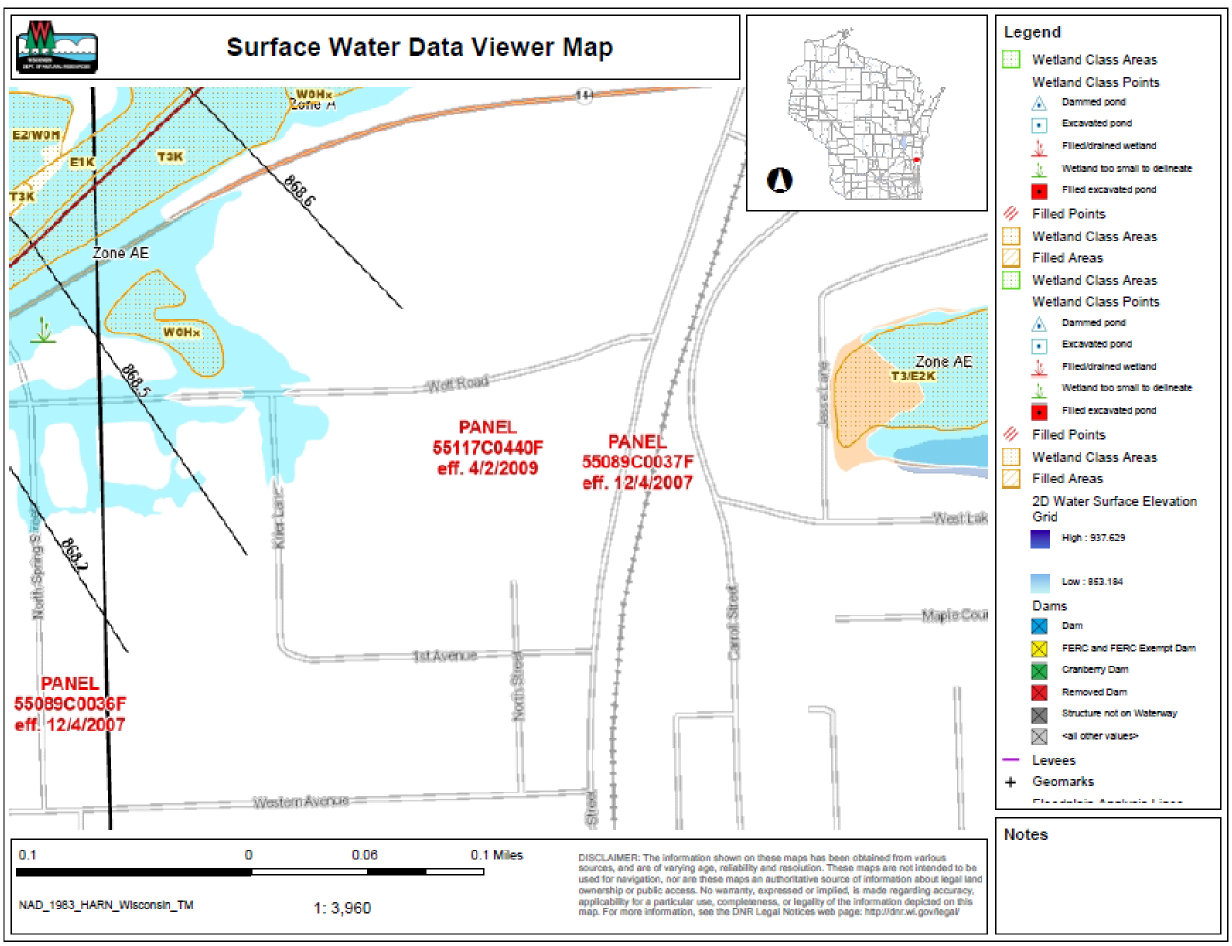
- Signage should be placed at the boat launch to encourage boaters to “Clean, Drain, Dry” after loading their boat and before they leave the lake. Signage is provided at no cost by the WDNR.
- Lake residents should be encouraged to be on the lookout for new aquatic invaders to Random Lake. Starry stonewort, Chinese mystery snails, and rusty crayfish are becoming abdunadnt in Wisconsin Lakes and are not yet reported in Random Lake. If a new invastive species is thought to be found the following steps should be taken:
    - **Photograph** Take a digital photo(s) of the species in the setting where it was found and include a common object in the photo for size reference.
        - For Plants include flowers, leaves, stem arrangements, and fruits.
        - For animals include shells, top and bottom and any identifying characteristics.
    - **Collect** up to 5 intact specimens to aid identification.
        - For plants, try to get the root system, stems, leaves, flowers, and seeds. Place plants in a Ziplock bag with a damp paper towel.
        - For animals, try to get the entire animal if possible. Place animals in a jar with water or ethanol. Place on ice and store in a refrigerator as soon as possible.
    - **Record** details using:
        - Just take notes.
    - **Submit** the photos, specimen and form/notes to
        - Patrick Siwula
          920-893-8552
          patrick.siwula@wisconsin.gov


Random Lake
Vegetation Disposal Route from Boat Launch Area to Village Recycling Center
1.2 Miles
Wolf Rd
Allen Rd
Carroll St
Jessie Ln
W Lake Dr
Lake Dr
Maple Ct
1st Ave
Western Ave
Grand Ave
Spring Ct
5th St
2nd St
Hickory Dr
E Shore Dr
King Oak Ct
1000 ft
N
Google Earth


Random Lake Harvesting Paths
30 Foot wide path with a 3 foot cutting depth.
West to East Path:
Start: 43.559148, -87.956539
End: 43.559148, -87.950990
North to South Path:
Start: 43.559148, -87.950990
End: 43.554722, -87.950990
Legend
Harvester Offload Area
Harvester Offload Area
Stark Rd
Wolf Rd
W Lake Dr
Lake Dr
Maple Ct
1st Ave
Western Ave
Grand Ave
Spring Ct
5th St
2nd St
Evergreen Dr
King Oak Ct
Scholler Dr
Industrial Dr
Hickory Dr
Mares Way
E Shore Dr
RR
2000 ft
N
Google Earth



Stark Rd
144
Wolf Rd
W Lake St
Maple Ct
Lake Dr
1st Ave
Western Ave
Grand Ave
Spring Ct
5th St
2nd Ct
Hickory Dr
Orth Dr
E Shore Dr
Maries Way
Evergreen Dr
Scholler Dr
Woodlands Dr
57th Field Artillery Brigade Mem Hwy
Google Earth
N
2000 ft



Surface Water Data Viewer Map
Zone AE
WOHx
E2/WOH
E1K
T3K
868.6
868.5
868.2
Wet Road
PANEL
55117C0440F
eff. 4/2/2009
PANEL
55089C0037F
eff. 12/4/2007
PANEL
55089C0036F
eff. 12/4/2007
T3/E2K
Kiler Lane
1st Avenue
North Street
Western Avenue
Carroll Street
Maple Cou
West Lak
Jessi Lane
North Spring Street
Legend
Wetland Class Areas
Wetland Class Points
Dammed pond
Excavated pond
Filled/drained wetland
Wetland too small to delineate
Filled excavated pond
Filled Points
Wetland Class Areas
Filled Areas
2D Water Surface Elevation Grid
High : 937.629
Low : 853.184
Dams
Dam
FERC and FERC Exempt Dam
Cranberry Dam
Removed Dam
Structure not on Waterway
<all other values>
Levees
Geomarks
Notes
0.1
0
0.05
0.1 Miles
NAD_1983_HARN_Wisconsin_TM
1: 3,960
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