LAKE EDUCATION AND PLANNING SERVICES, LLC
302 21 ¼ STREET
CHETEK, WISCONSIN 54728

SAND LAKE, BARRON COUNTY

2018 AQUATIC PLANT MANAGEMENT SUMMARY REPORT
WDNR WBIC: 2661100

Prepared by: Dave Blumer, Lake Educator

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SAND LAKE MANAGEMENT DISTRICT
CUMBERLAND, WI 54829

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PREPARED FOR THE SAND LAKE MANAGEMENT DISTRICT

INTRODUCTION

This report discusses aquatic plant management activities completed by the Sand Lake Management District (SLMD) and Lake Education and Planning Services (LEAPS) during the 2018 season and provides details of the 2019 Eurasian watermilfoil (EWM) control plan. The following list of education and management actions were completed in 2018.

- 2018 preliminary EWM treatment proposal
- EWM readiness survey, treatment, and changes in EWM over 3 years
- Post-treatment summer littoral zone point-intercept survey results
- Clean Boats Clean Waters
- AIS monitoring
- 2019 preliminary EWM management planning
- Citizen Lake Monitoring Network water quality testing
- Grant funded project and grant applications
- Picnic and Annual Meeting

Each of these actions will be summarized in the following sections of this report.

2018 PRELIMINARY EWM TREATMENT PROPOSAL

Based on 2017 summer littoral point-intercept survey data (Berg, 2017), a proposal for treating 8 areas totaling 14.65 acres was made by LEAPS in March 2018. This included 4 unmodified areas that were also treated in 2017, one 2017 area that had been split into two altered areas, and an additional 2 areas that were not treated in 2017. After EWM readiness survey work, the proposed treatment was not modified which left the final proposal of beds ranging in size from 0.37 – 3.55 acres covering a total of 14.65 acres. All of the areas that had been treated in 2017 were proposed to be treated with Shredder Amine (liquid 2, 4-D) while the new areas were proposed to be treated with Sculpin G (granular 2,4-D) with all of these areas being treated at the maximum label rate of 4.0 ppm (Table 1).

Table 1: 2018 Final EWM treatment proposal

2018 Sand Lake Preliminary Spring EWM Treatment Proposal (6/3/2018)										
New Name	**2017 Name**	**Acres**	**Mean Depth (feet)**	**Acre-feet**	**Target 2,4-D (liquid) (ppm a.e.)**	**Application rate (gal/acre-feet)**	**Liquid 2,4-D (gallons)**	**Target 2,4-D (granular) (ppm a.e.)**	**Application rate (lbs/acre-feet)**	**Granular (lbs)**
BtLdBay1-18	NBtLdBay-17	2.66	6.50	17.29	4.00	2.84	49.10			
BtLdBay2-18		2.79	9.70	27.06	4.00	2.84	76.86			
EstBay6-18	NEBay1-17	1.08	7.30	7.88	4.00	2.84	22.39			
StmpBay3-18	NPtStmpBay-17	1.96	7.60	14.90	4.00	2.84	42.30			
WtSh4-18	not treated in 2017	0.38	11.75	4.47				4.00	56.80	292.01
SilBay5-18	SiloBay-17	3.55	8.90	31.60	4.00	2.84	89.73			
EstShr7-18	EastBay-17	1.86	8.60	16.00	4.00	2.84	45.43			
SWShr8-18	not treated in 2017	0.37	10.38	3.84				4.00	56.80	251.18
Total		**14.65**	**8.84**	**123.03**			**325.82**			**543.19**

EWM READINESS SURVEY, TREATMENT, AND CHANGES IN EWM OVER 3-YEARS: 2016, 2017, AND 2018

EWM READINESS SURVEY

With the implementation of a new Aquatic Plant Management Plan (APMP) for Sand Lake in 2017, pre and post-treatment surveys were no longer being done. Instead, as EWM readiness survey was completed in May of 2018 by LEAPS. A EWM readiness survey involves visually inspecting proposed treatment areas and rake throws to determine if EWM in the proposed treatment areas is ready to treat. At the same time, the rest of the lakes' littoral zone is searched for EWM beds that may have been missed in the previous year. Based on this visual inspection and several rake samples, treatment areas are modified, as needed. Based on EWM readiness survey results, the preliminary chemical treatment plan was not modified.

2018 EWM SPRING TREATMENT

Northern Aquatic Services (NAS) completed the 2018 early season EWM treatment on Sand Lake on June 4th. NAS treated a total eight beds ranging in size from 0.37 acres up to 3.55 acres totaling to 14.65 acres. Water temperature was 65°F, air temperature was 70°F. There was a light breeze of 3-7 mph out of the west/northwest. Six of the areas were treated with DMA 4 (Liquid 2,4-D) with a target concentration of 4.0 ppm. Two areas were treated with Sculpin G (granular 2,4-D). During the treatment, coontail, large-leaf pondweed, clasping-leaf pondweed, northern watermilfoil, white waterlily, and white-stem pondweed were present in the treatment areas.

EWM SPOT TREATMENTS

In most previous years of EWM management, spring treatments have been followed up with chemical treatments of individual EWM plants or small clumps of plants later in the season. With the approval of the new APM Plan in 2016, spot treatments were discontinued in 2017.

CHANGES IN EWM: 2016, 2017, AND 2018

The 2016 survey found Eurasian water-milfoil at 15 points (3.19% of points with vegetation) which resulted in a relative frequency of 0.87. Of these, three had a rake fullness of 3, five were a 2, and the remaining seven were a 1 for a mean rake fullness of 1.73. EWM was also reported as a visual at eight additional survey points.

During the 2017 survey, EWM was found at 20 points (4.22% of points with vegetation) and it accounted for 1.05 of the total relative frequency. Six points had a rake fullness of 3, three were a 2, and 11 were a 1 for a mean rake of 1.75. EWM was recorded as a visual at five additional points. Although both the distribution and density increased in 2017, none of these values represented a significant change over the 2016 survey. Likewise, none of the changes in rake fullness were significant.

In 2018, EWM was present at 11 points (2.32% of points with vegetation) and totaled just 0.59 of the total relative frequency. Five points rated a rake fullness of 3, two points a 2, and four points a 1 for a mean rake of 2.09. EWM was again recorded as a visual at five additional points. Similar to the changes noted in 2017, neither the increase in density nor the decline in distribution was significant (Figure 1).

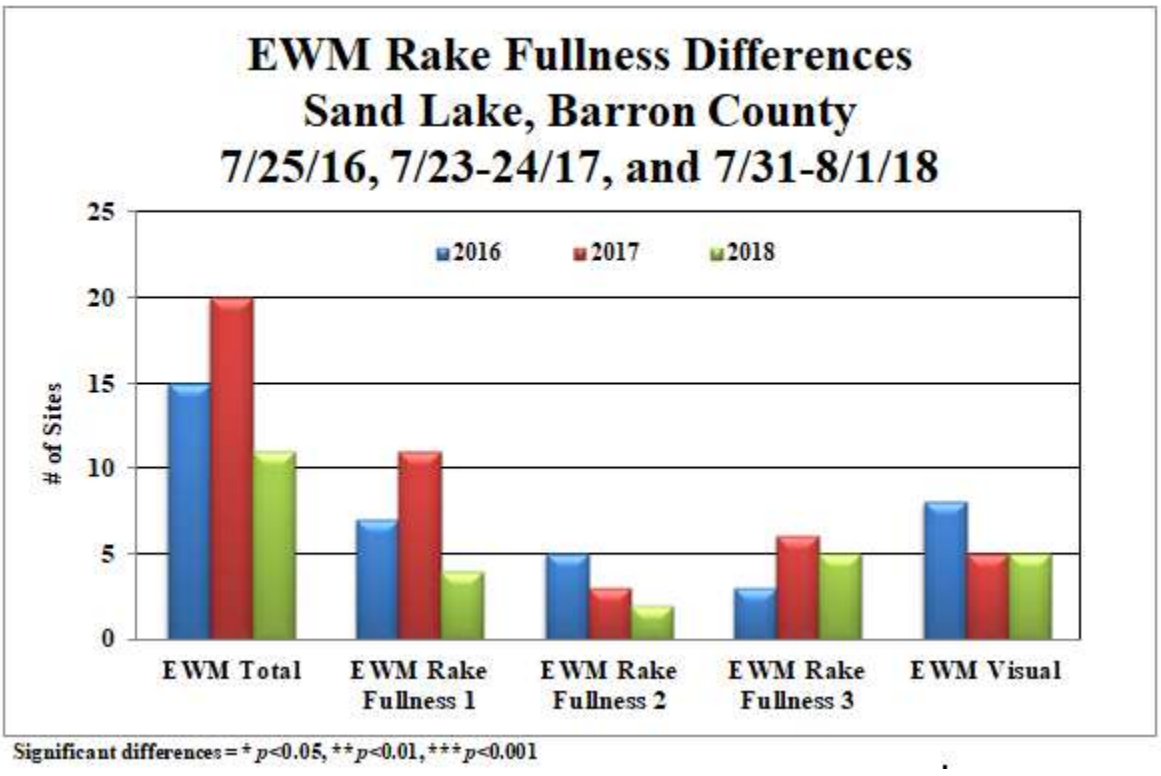

Figure 1: Comparison of EWM Density and significant changes from 2016, 2017, and 2018 (Berg, 2018)

The July 2016 survey identified six significant beds of Eurasian water-milfoil (Figure 2). In July 2017, only two significant beds were documented – both of which were located along the western shoreline in the southern third of the lake. This total jumped back up to five beds in 2018. Each of these areas represent continued "trouble spots" where herbicide control has been difficult because the EWM is located in 8-12ft of water on the outer edge of the littoral zone adjacent to sharp drop-offs into deep water.

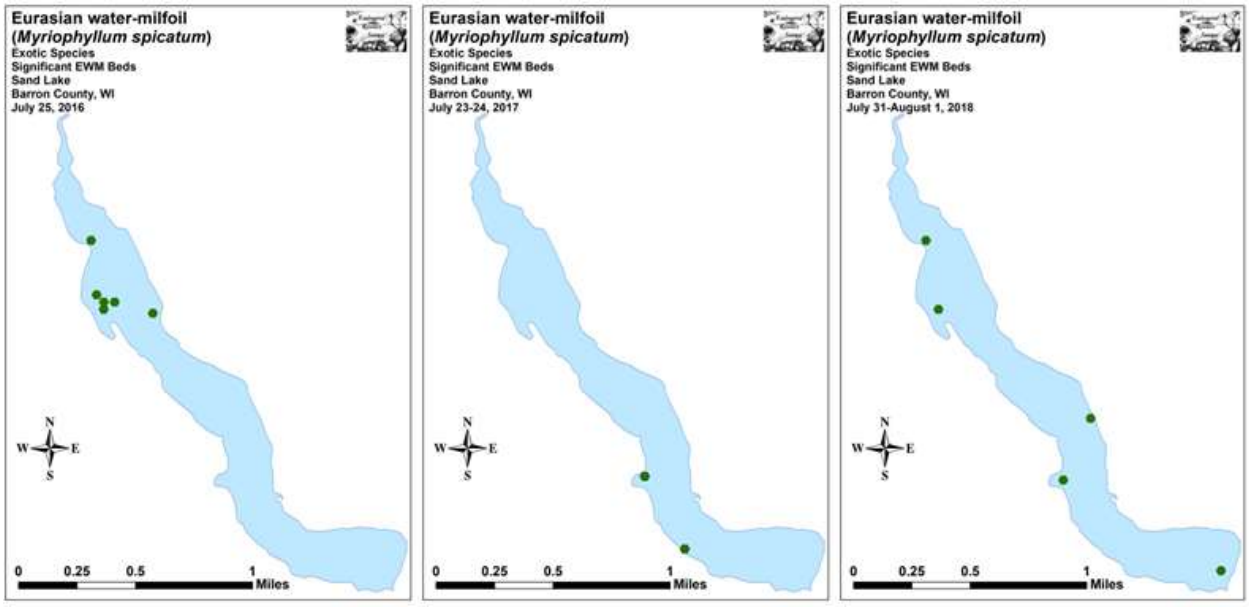

Figure 2: 2016, 2017, and 2018 Significant EWM beds (Berg, 2018)

It appears that three years of spring chemical management of EWM has been effective at reducing the level of EWM in the lake, at least on a seasonal basis. Fall bedmapping results in 2017 and 2018 show a distinct change in the amount of EWM identified (Figure 3). This is also evident in the fact that the preliminary 2019 EWM spring chemical treatment proposal includes less than 3.0 acres of the treatment as opposed to 12 or more acres in both 2017 and 2018.

That said, EWM continues to be difficult to manage along the deep water edges of the littoral zone. It is these areas that are basically being treated every year (Figure 4).

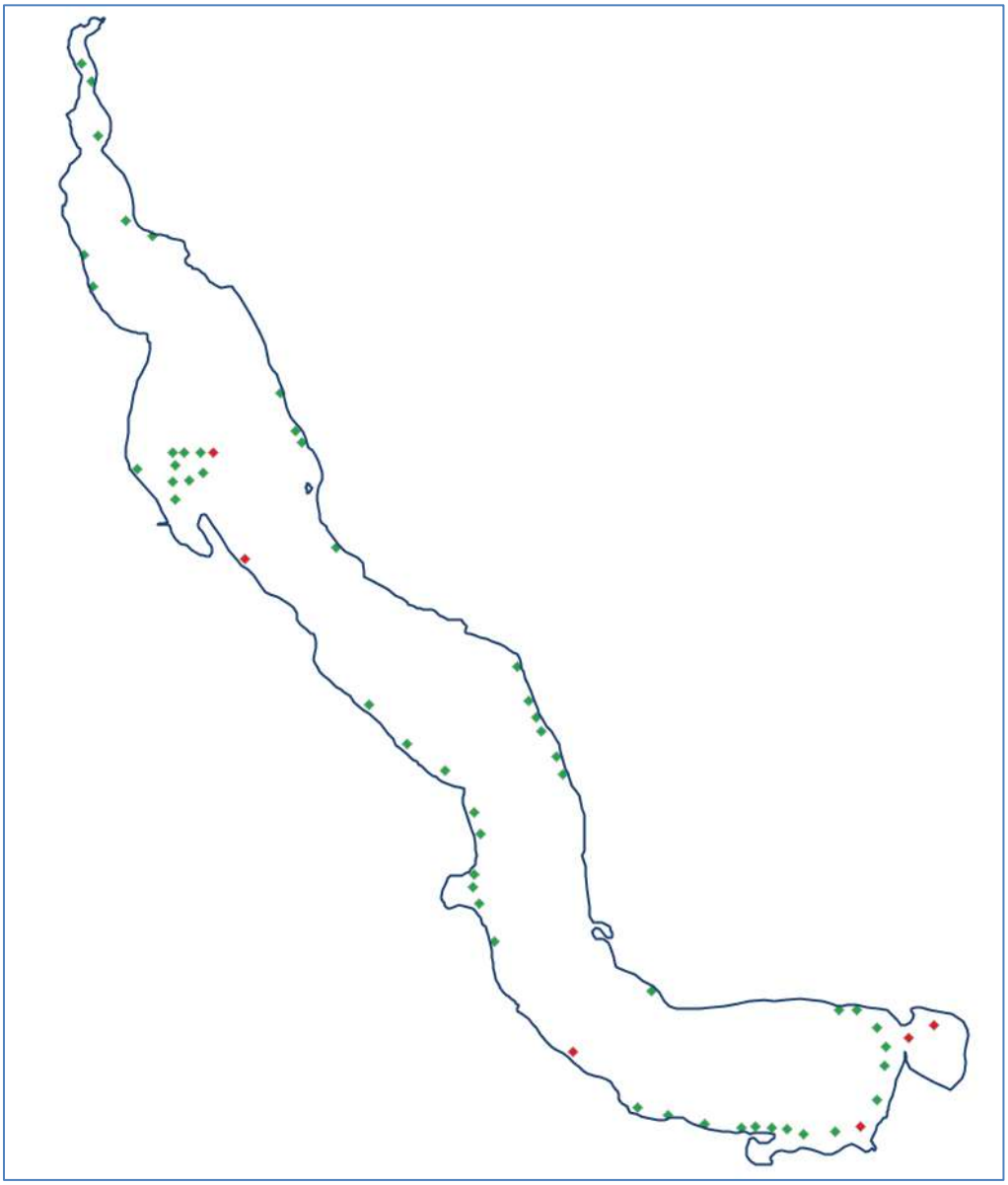

Figure 3: 2017 (green dots) and 2018 (red dots) fall EWM bedmapping survey results (LEAPS, 2018)

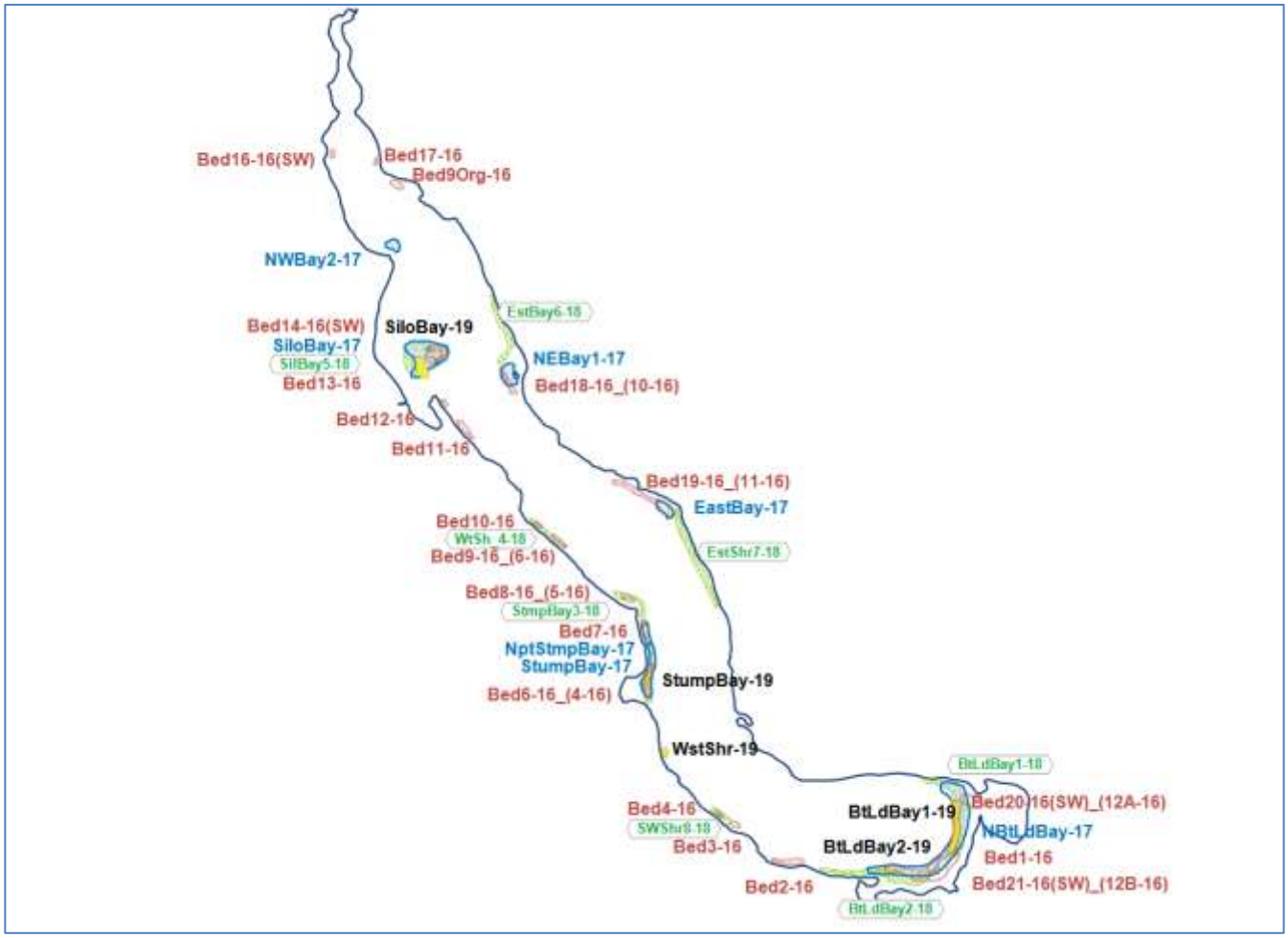

Figure 4: 2016, 2017, 2018, and 2019 chemical treatment areas

POST-TREATMENT SUMMER LITTORAL ZONE POINT-INTERCEPT SURVEY OF ALL AQUATIC PLANTS

A change that was made in the 2016 revision of the APMP was replacing the post-treatment plant survey in just the treated areas with a larger point-intercept survey that covers the entire littoral zone. All EWM and native plants are documented during this survey. Annual results can more accurately compare the results and impacts of each year's treatment.

2018 SUMMER POINT-INTERCEPT SURVEY RESULTS

From July 31-August 1, 2018 ERS conducted a summer warm water full point-intercept survey based on a survey grid established in 2016 that included 518 points within the 20-ft contour of the lake at a distance apart of 25 meters, more than double the number of points in the littoral zone included in the original WDNR survey grid (Figure 5). Using this grid, each point was located with a handheld mapping GPS unit, a depth reading (Figure 6) was recorded with a metered pole rake or hand held sonar, and a rake was used to sample an approximately 2.5ft section of the bottom. Substrate (bottom) type was assigned at each site where the bottom was visible or it could be reliably determined using the rake. The depth of points sampled ranged from 0.5 to 24.5 ft.

Organic and sandy muck in the lake's sheltered bays and flats accounted for 44% (228 points) of the substrate within the littoral zone. Pure sand shorelines that ringed the majority of the central basins composed 45.6% (236 points) of the bottom, and scattered gravel and cobble areas, especially on the south shoreline adjacent to the lake's deepest point, made up the remaining 10.4% (54 points) (Figure 6). All plants on the rake, as well as any that were dislodged by the rake, were identified and assigned a rake fullness value of 1-3 as an estimation of abundance (Figure 7). Visual sightings of all plants within six feet of the sample point but not found in the rake were also recorded. In addition to a rake rating for each species, a total rake fullness rating was also noted.

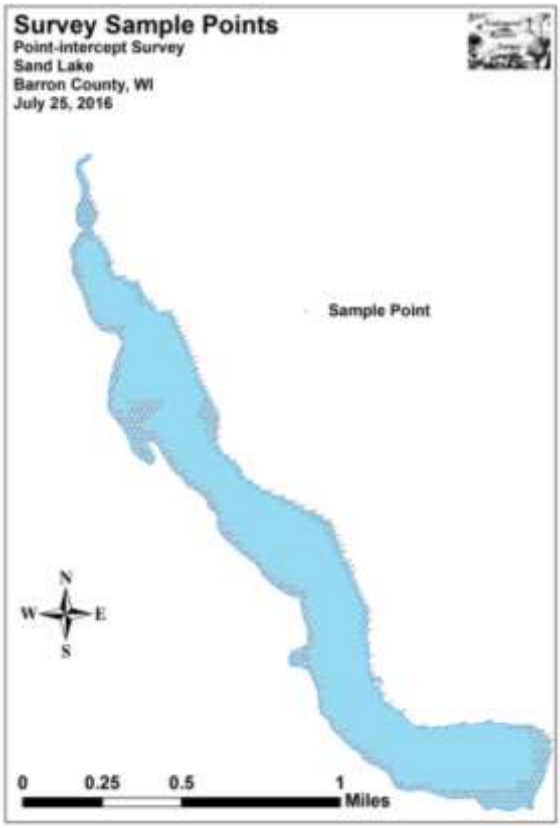

Figure 5: Summer PI survey points (Berg, 2016)

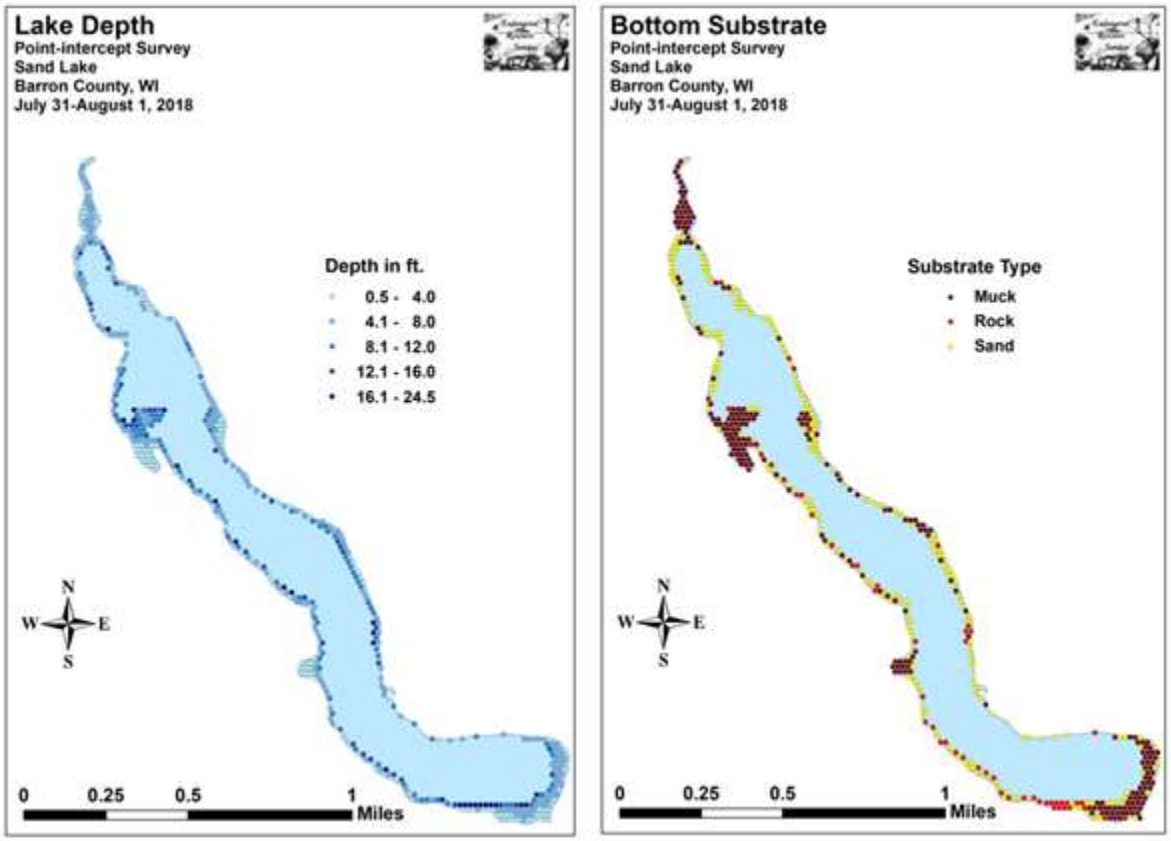

Figure 6: Lake depth and bottom substrate (Berg, 2018)

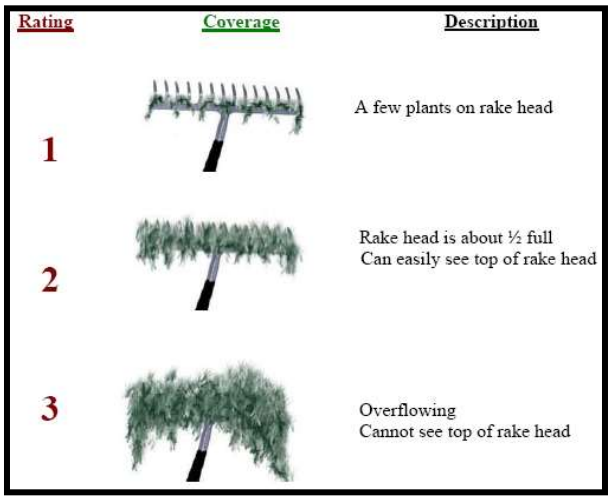

Figure 7: Rake-fullness ratings

Plants were found growing at 474 sites or on approximately 96.3% of the 16.0ft littoral zone (Figure 8). This was identical to 2017 when plants were found at at 474 points (91.9% of the then 19.0ft littoral zone) and similar to 2016 when plants were located at 470 points (90.9% of the 18.5ft littoral zone). The mean depth of plants rose from 6.3ft in 2016 to 6.6ft in 2017 before falling back to 6.2ft in 2018. The median depth was 6.0ft each year suggesting growth was slightly skewed to deep water.

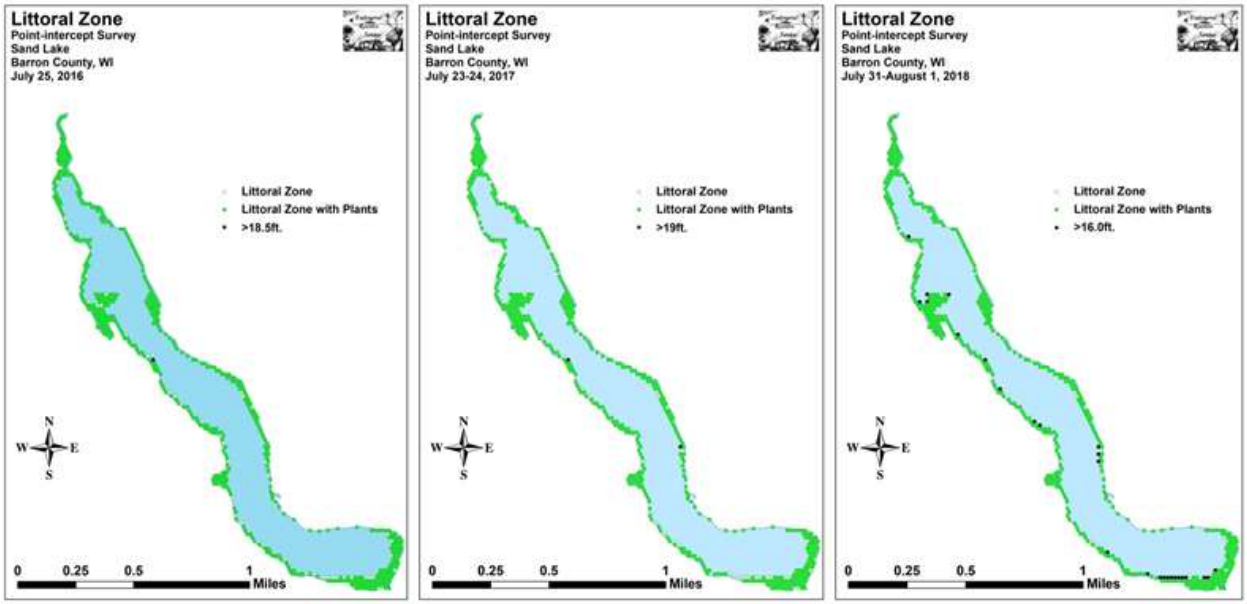

Figure 8: 2016, 2017, and 2018 littoral (plant growing) zone

The intent of the summer survey was to compare the aquatic plant community within the lake over three years (2016, 17, & 18) of active EWM management. Table 2 shows the statistical comparison of the 2016, 2017, and 2018 surveys.

Table 2: 2016, 2017, and 2018 Survey Statistic Comparison (Berg, 2018)

Summary Statistics:	2016	2017	2018
Total number of points sampled	518	518	518
Total number of sites with vegetation	470	474	474
Total number of sites shallower than the maximum depth of plants	517	516	492
Frequency of occurrence at sites shallower than maximum depth of plants	90.9	91.9	96.3
Simpson Diversity Index	0.94	0.94	0.94
Maximum depth of plants (ft)	18.5	19.0	16.0
Mean depth of plants (ft)	6.3	6.6	6.2
Median depth of plants (ft)	6.0	6.0	6.0
Average number of all species per site (shallower than max depth)	3.32	3.71	3.80
Average number of all species per site (veg. sites only)	3.65	4.03	3.95
Average number of native species per site (shallower than max depth)	3.29	3.67	3.78
Average number of native species per site (veg. sites only)	3.62	4.01	3.93
Species richness	43	44	43
Species richness (including visuals)	47	49	46
Species richness (including visuals and boat survey)	51	52	48
Mean rake fullness (veg. sites only)	2.16	2.19	2.18

Significant differences = * $p<0.05$, ** $p<0.01$, *** $p<0.001$

NATIVE AQUATIC PLANTS

Plant diversity was exceptionally high with a Simpson Diversity Index value of 0.93 (down from 0.94 in both 2016 and 2017). Total richness was also moderately high as 43 species were found in the rake (down from 44 in 2017, but identical to 2016). This number jumped to 48 when including visuals and species seen during the boat survey (also similar to 51 in 2016 and 52 in 2017).

In 2016, the mean native species richness at sites with native vegetation was a moderate 3.62 species/site. Following a highly significant increase **(p<0.001)** to a high 4.01 species/site in 2017, the 2018 average underwent a non-significant decline (p=0.27) to 3.93 species/site (Figure 9).

From 2016 to 2017, mean total rake fullness experienced a non-significant increase (p=0.24) from a moderately dense 2.16 to 2.19 (Figure 10). In 2018, this value was nearly unchanged at 2.18.

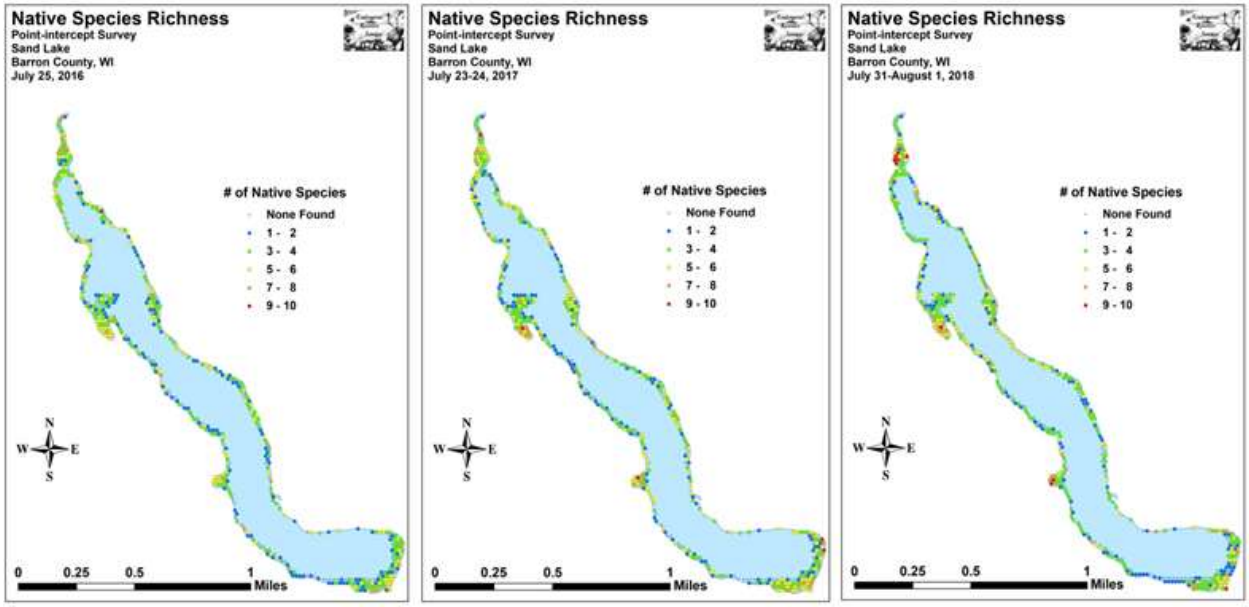

Figure 9: 2016, 2017, and 2018 native species richness (Berg, 2018)

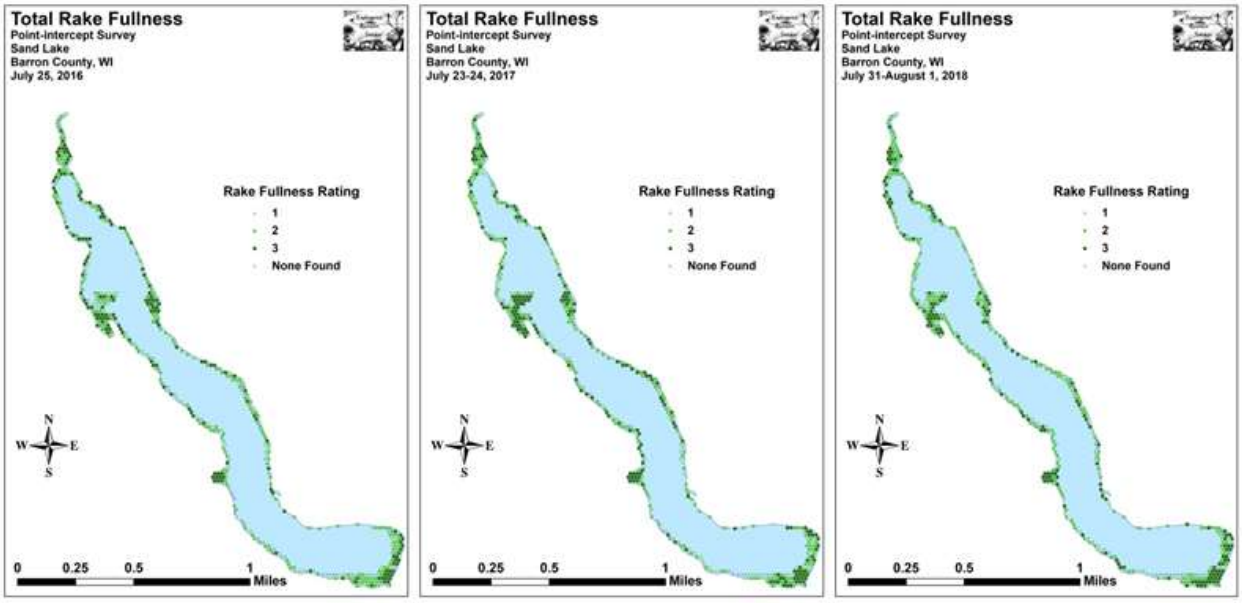

Figure 10: 2016, 2017, and 2018 total rake fullness (Berg, 2018)

COMPARISON OF NATIVE AQUATIC PLANT SPECIES IN 2016, 2017, AND 2018

In 2016, Coontail, Flat-stem pondweed, Small pondweed, and Northern water-milfoil were the most common species. Found at 49.79%, 41.06%, 30.21%, and 28.51% of survey points with vegetation respectively, they accounted for 40.94% of the total relative frequency. Muskgrass (5.94), Illinois pondweed (4.66), Clasping-leaf pondweed (4.60),

Forked duckweed (4.37), Common waterweed (4.19), and Slender naiad (4.14) were the only other species with relative frequencies over 4.00.

During the 2017 survey, these four species were again the most common with Coontail present at 52.95% of sites with vegetation, Flat-stem pondweed at 39.66%, Small pondweed at 35.02%, and Northern water-milfoil at 26.16%. Collectively, they accounted for 38.13% of the total relative frequency. Common waterweed (5.81), Muskgrass (5.07), Clasping-leaf pondweed (4.65), Variable pondweed (4.60), Forked duckweed (4.34), and Fries' pondweed (4.18) also had relative frequency values over 4.00.

In 2018, Coontail, Small pondweed, Flat-stem pondweed, and Muskgrass were the most common species. Found at 47.26%, 45.78%, 43.25%, and 28.27% of survey points with vegetation respectively, they accounted for 41.67% of the total relative frequency. Forked duckweed (6.30), Slender naiad (6.09), and Common waterweed (4.59) also had relative frequency values over 4.00. Northern water-milfoil, which had been one of the four most abundant plants in 2016 and 2017, was found at only 10.76% of the sites with vegetation in 2018, taking it out of the top four species and dropping it to only the 14th most common species. It had a relative frequency of 2.62 in 2018 compared to 6.49 in 2017, and 7.80 in 2016. This decline is potentially at least partially due to the chemical treatments over the three years, although this species is known to go through natural boom/bust population cycles.

When considering only distribution, nine species experienced significant changes from 2016 to 2017, ERS documented a highly significant decline in Illinois pondweed; and a significant decline in Slender naiad. Conversely, they found highly significant increases in Common waterweed and filamentous algae; moderately significant increases in Fries' pondweed, Fern pondweed, Small duckweed, and Nitella; and a significant increase in Large duckweed (Figure 11).

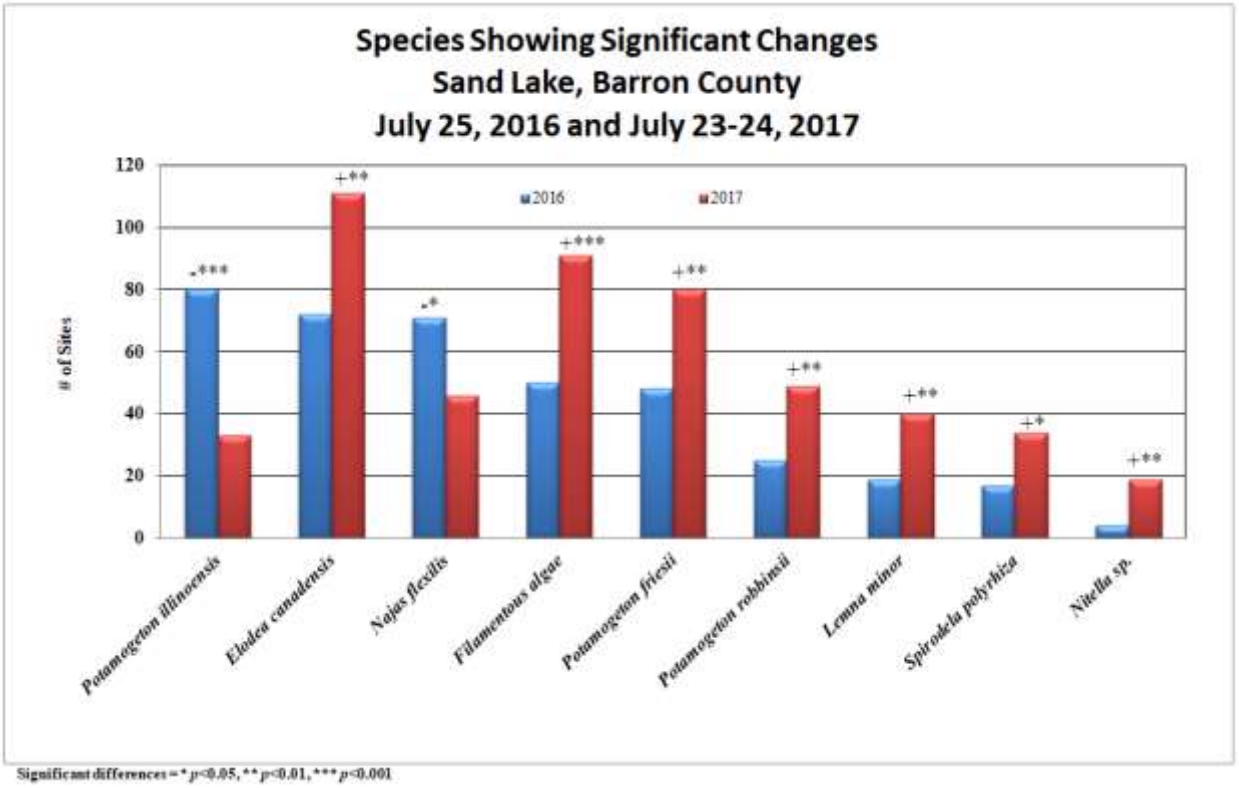

Figure 11: Species with a significant change from 2016 to 2017 (Berg, 2017)

From 2017 to 2018, 12 species experienced significant changes in distribution. Northern water-milfoil, Variable pondweed, White water crowfoot, and Nitella suffered highly significant declines; Large-leaf pondweed demonstrated a moderately significant decline; and Common waterweed and Water star-grass saw significant declines. Despite these

losses, highly significant increases were found in Small pondweed and Slender naiad; and moderately significant increases were found in Muskgrass, Forked duckweed, and Common watermeal (Figure 12).

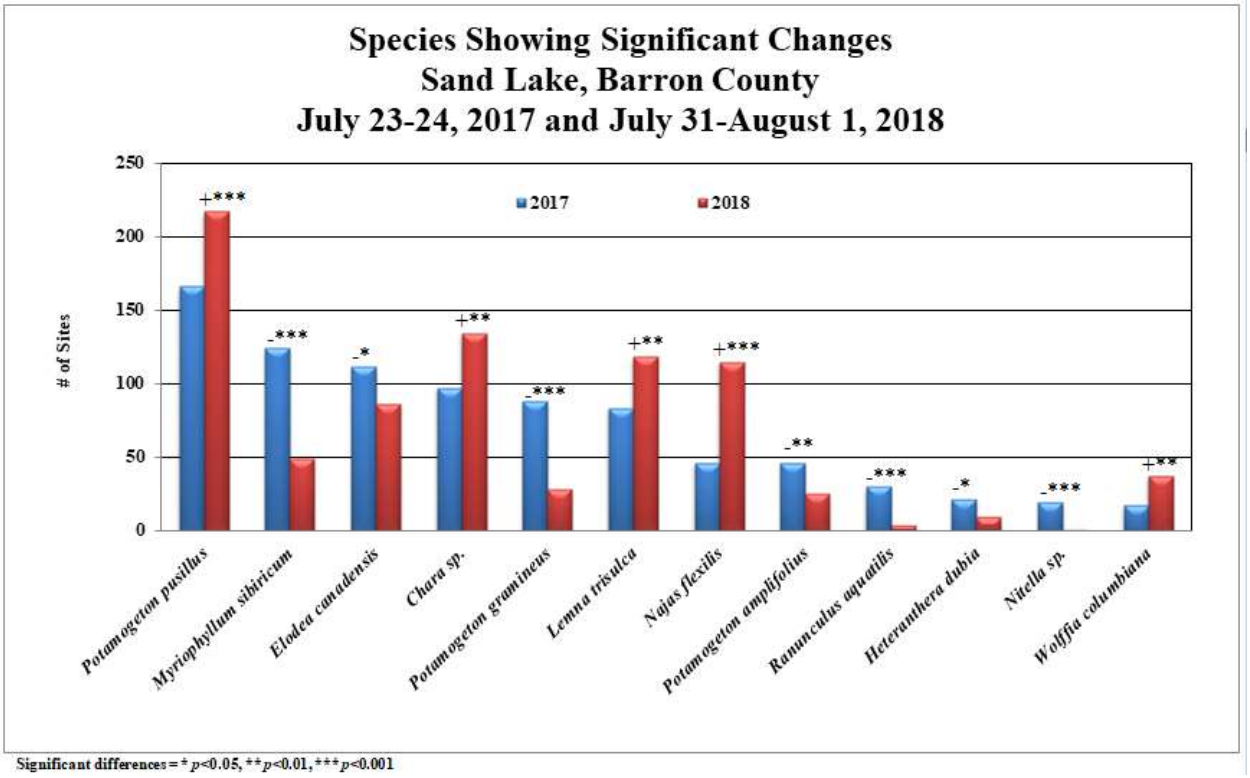

Figure 12: Species with a significant change from 2017 to 2018 (Berg, 2018)

Four aquatic plant species saw large decreases in distribution from 2016 to 2018: Northern watermilfoil, Illinois pondweed, Variable pondweed, and White water crowfoot. Two of these species – Northern watermilfoil and White water crowfoot are species sensitive to herbicide used in Sand Lake. The two pondweeds should be less susceptible to the herbicide used. An analysis of the locations where these plants were located in the lake compared to where EWM has been chemically treated over the three year period shows that distribution and density of these four plants were less in 2018 in the areas chemically treated, than they were in 2016.

Six aquatic plant species that saw an increase is distribution including the three duckweed species, watermeal, water celery, and common waterweed, are plants that usually do well in degraded water quality conditions. However, from 2016 to 2018, water clarity/quality monitoring placed Sand Lake firmly in a mesotrophic state, meaning it was some very good compared to some years. Secchi disk readings of water clarity and total phosphorus numbers remained fairly consistent over the three year period. Only Chlorophyll-a, a measurement of algae growth increased over the same three year period. The extent of filamentous algae in the lake also increased over the same time period, from 50 sites in 2016 to 111 sites in 2018.

COMPARISONS OF FLORISTIC QUALITY INDEXES IN 2016, 2017, AND 2018

In 2016, a total of 41 native index plants in the rake were identified during the point-intercept survey. They produced a mean Coefficient of Conservatism of 6.0 and a Floristic Quality Index of 38.3. In 2017, a total of 43 native index plants were found in the rake during the point-intercept survey. They produced a mean Coefficient of Conservatism of 6.1 and a Floristic Quality Index of 39.8. During the 2018 survey, a total of 42 **native index plants** were identified on the rake during the point-intercept survey. They produced a mean Coefficient of Conservatism of 6.0 and a Floristic Quality Index of 38.7. Nichols (1999) reported an average mean C for the Northern Central Hardwood Forests Region of 5.6 putting Sand Lake above average for this part of the state. The FQI was also nearly double the median FQI of 20.9 for the Northern Central Hardwood Forests Region. Three exceptionally high value

index plants found in each of the three years including Wild calla (C = 9), Crested arrowhead (C = 9), and Creeping bladderwort (C = 9).

PURPLE LOOSESTRIFE

Purple loosestrife is present at several locations around the lake. Gallerucella beetles have been release on the lake for many years, but if a self-replicating population exists, it is small. No purple loosestrife was identified in the 2016 summer survey, but both 2017 and 2018 surveys found several locations scattered along the shoreline of the lake (Figure 13). None of these areas were more than just a few plants, and in most cases, when found, the plants were cut or dug out. Despite this, purple loosestrife is still present suggesting that the lake has a seed bank already established and continual monitoring and removal is needed annually.

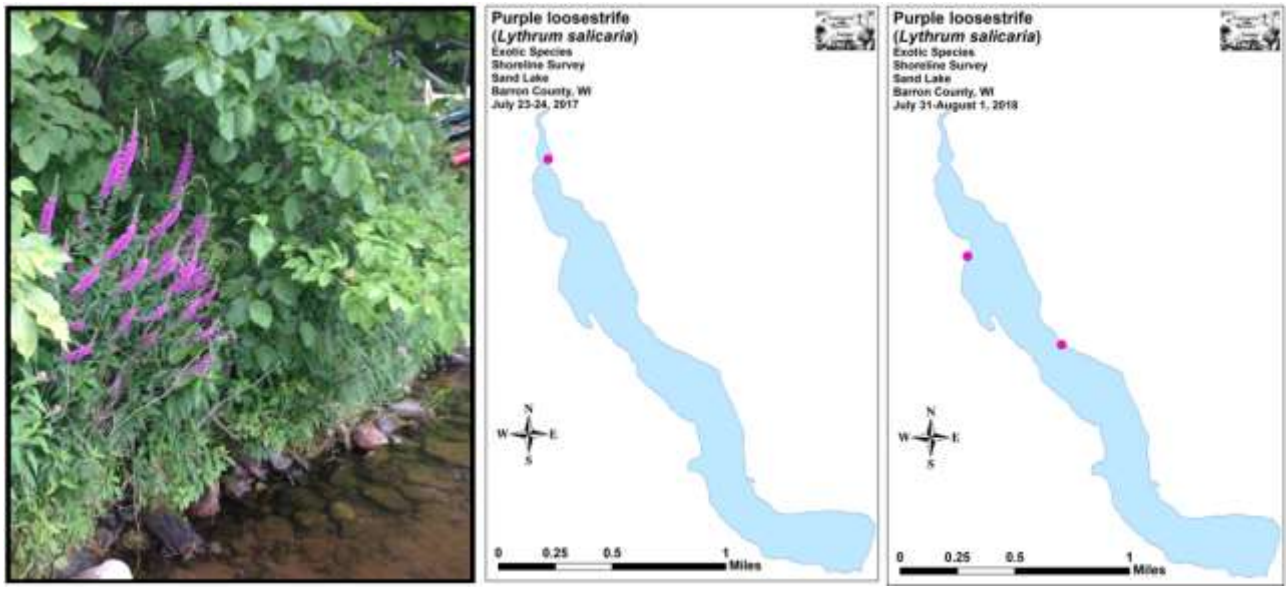

Figure 13: Purple loosestrife flowers and 2017 & 2018 locations (Berg, 2018)

CLEAN BOATS, CLEAN WATERS

Over the course of three years – 2016-2018, the Sand Lake Management District as put in more than 400 hours of CBCW inspection time at the WDNR landing on the lake. There were 126 hours of watercraft inspection time recorded at the Sand Lake public boat landing in 2018. Time recorded was put in by both paid and volunteer watercraft inspectors. At least 352 boats were contacted during this time. Approximately 660 people were contacted. Data recorded during watercraft inspection showed boats coming from 21 different lakes in the area in 2018 – 2 of these lakes have EWM in them (Beaver Dam & Rice).

AIS MONITORING

AIS monitoring was completed each year out of three (2016-18) with no new AIS being discovered in Sand Lake. Volunteers and resource personnel identified purple loosestrife and EWM during the surveys. Japanese knotweed had been present on the shore of the lake, but this was removed prior to 2016 and has not been seen since. There is no curly-leaf pondweed in Sand Lake. What could be Chinese Mystery Snails have been seen, but are few and far between. No rusty crayfish, zebra mussels, or spiny waterflea have been discovered.

In the fall of 2018, LEAPS completed an informal meandering visual survey of EWM in Sand Lake. EWM was found at only a few locations and then only as individual plants or small concentrations of plants (Figure 14). This is substantially difference than what was found in the fall of 2017 when EWM was well distributed and definitely bed forming. It has been anecdotally and formally documented that the amount of EWM through the summer of 2018 was nearly non-existent. Unfortunately, northern watermilfoil experienced a similar fate in 2018.

Figure 14: 2018 fall EWM meandering survey results (red dots =fall meandering survey points with EWM)

Based on results from the 2018 summer point-intercept survey of the littoral zone and the 2018 fall meandering survey, a preliminary treatment proposal was created in early April 2019 that included 5 treatment areas ranging in size from 0.25 acres to 1.22 acres totaling 2.65 acres (Table 3). After the EWM readiness survey the initial proposal was modified slightly with one bed being eliminated and exchanged for a new one (Table 4, Figure 15). The total acreage dropped by 0.11 acres when making the modifications. Since the areas in the final treatment are either small or in deep water, granular 2,4-D (Sculpin G) was used at the maximum label rate of 4.0ppm. The summer spot treatment program will not be continued in 2019.

Table 3: 2019 Sand Lake Preliminary Spring EWM Treatment Proposal

2019 Sand Lake Preliminary Spring EWM Treatment Proposal (4/8/2019)										
New Name	Acres	Mean Depth (feet)	Acre-feet	Target 2,4-D (liquid) (ppm a.e.)	Application rate (gal/acre-feet)	Liquid 2,4-D (gallons)	Target 2,4-D (granular) (ppm a.e.)	Application rate (lbs/acre-feet)	Granular (lbs)	2018 Treatment Notes
BtLdBay1-19	1.22	10.00	12.20				4.00	65.40	797.88	Excellent control except on the deep water edge
BtLdBay2-18	0.25	10.00	2.50				4.00	65.40	163.50	Excellent control except on the deep water edge
StmpBay-19	0.32	7.00	2.24				4.00	65.40	146.50	2018 treatment of a larger area was very successful
SiloBay-19	0.60	8.00	4.80				4.00	65.40	313.92	Nearly all EWM in the flat was gone with the 2018 treatment. 2019 is on the south edge of the 2018 treated area
NWBay-19	0.26	6.00	1.56				4.00	65.40	102.02	was last treated in 2017. Not treated in 2018
Total	**2.65**		**23.30**			**0.00**			**1523.82**	

Table 4: 2019 Sand Lake Final Spring EWM Treatment Proposal

2019 Sand Lake Final Spring EWM Treatment Proposal (5/30/2019)							
New Name	Acres	Mean Depth (feet)	Acre-feet	Target 2,4-D (granular) (ppm a.e.)	Application rate (lbs/acre-feet)	Granular (lbs)	2018 Treatment Notes
BtLdBay1-19	1.22	10.50	12.81	4.00	65.40	837.77	Excellent control except on the deep water edge
BtLdBay2-18	0.25	10.50	2.63	4.00	65.40	171.68	Excellent control except on the deep water edge
StmpBay-19	0.32	7.50	2.40	4.00	65.40	156.96	2018 treatment of a larger area was very successful
SiloBay-19	0.60	9.50	5.70	4.00	65.40	372.78	Nearly all EWM in the flat was gone with the 2018 treatment. 2019 is on the south edge of the 2018 treated area
WstShr-19	0.15	7.50	1.13	4.00	65.40	73.58	
Total	**2.54**		**24.66**			**1612.76**	

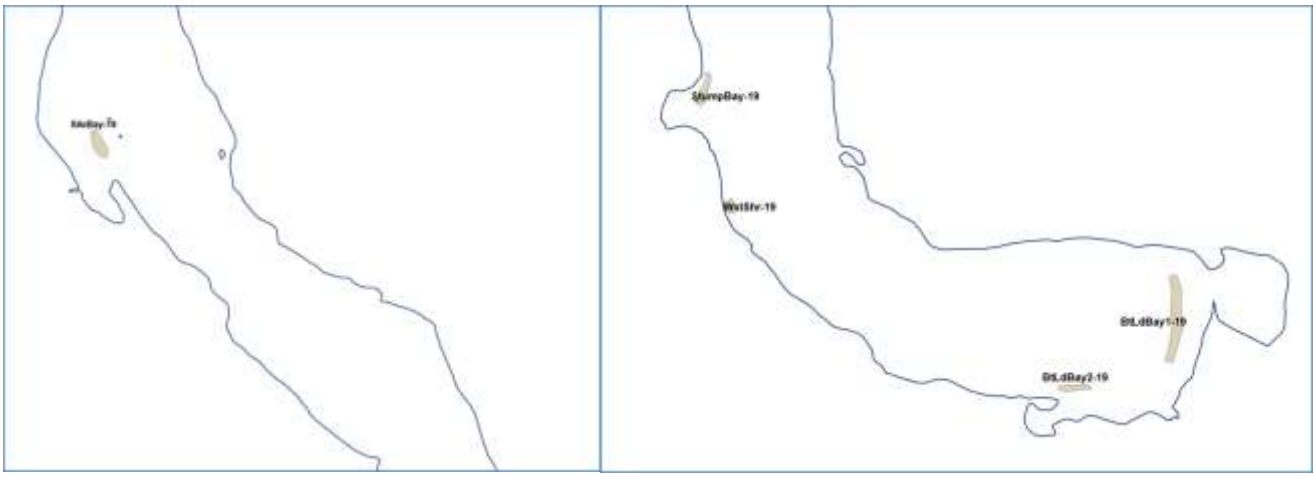

Figure 15: 2019 Sand Lake Final EWM Treatment Areas

CITIZEN LAKE MONITORING NETWORK (CLMN) WATER QUALITY TESTING

There are three water quality monitoring sites in Sand Lake that are a part of the CLMN monitoring program. However, only the main site "Near Deepest Pt" in the southern-most basin had more than one set of data collected from it in 2018. In 2018, water clarity readings were collected at the deep hole on eight different dates. Chlorophyll data was collected on three dates, and TP date was collected on four dates. Figure 16 shows the average summer (July-August) Secchi disk readings since CLMN began. The 2018 average summer (July-Aug) Secchi disk reading for Sand Lake - Near Deepest Pt (Barron County, WBIC: 2661100) was 13.1 feet, somewhat higher than 2017. The average for the Northwest Georegion was 8.5 feet. Summer (July-Aug) water was reported as CLEAR and GREEN suggesting that the Secchi depth may be mostly impacted by algae. Algal blooms are generally considered to decrease the aesthetic appeal of a lake because people prefer clearer water to swim in and look at. Algae are always present in a balanced lake ecosystem. They are the photosynthetic basis of the food web. Algae are eaten by zooplankton, which are in turn eaten by fish.

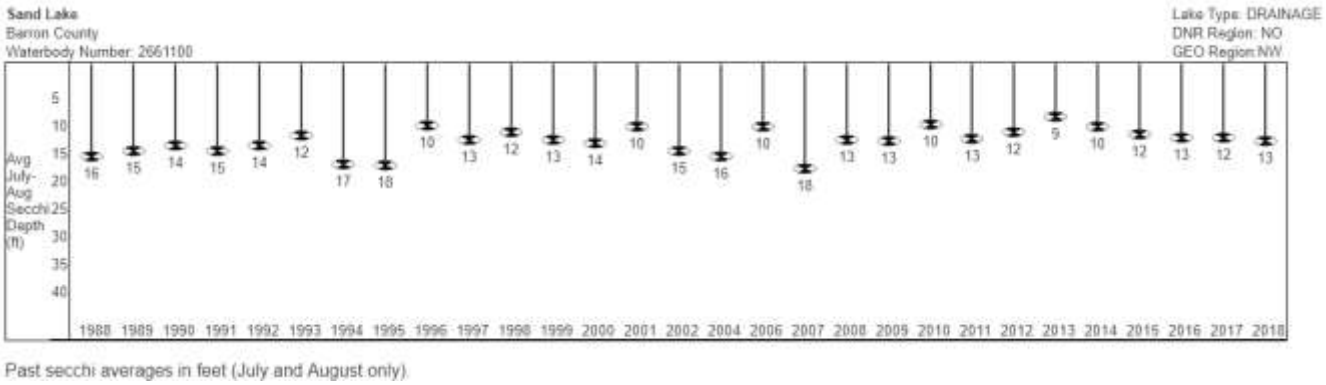

Figure 16: Average summer (July-August) Secchi disk readings at the Near Deepest Pt

Chemistry data was collected on Sand Lake - Near Deepest Pt. The average summer Chlorophyll was 4.5µg/l, an increase of 1.5µg/l from 2017 and 2.2µg/l from 2016. The Northwest Georegion summer average was 16.1µg/l. The summer total phosphorus average was 16.7µg/l. This a decrease of 3.3 µg/l from the values seen in 2017, but even with the values seen in 2016. Lakes that have more than 20 µg/l and impoundments that have more than 30 µg/l of total phosphorus may experience noticeable algae blooms.

Figure 17 shows the average summer Trophic State Index (TSI) value for total phosphorus, chlorophyll, and Secchi disk readings. The overall Trophic State Index (based on chlorophyll) for Sand Lake - Near Deepest Pt was 46. This TSI suggests that Sand Lake - Near Deepest Pt was mesotrophic. Despite being 3 points higher than the TSI found in 2017 and 5 higher than 2016, Sand Lake is still on the low side of being mesotrophic. Mesotrophic lakes are characterized by moderately clear water, but have an increasing chance of low dissolved oxygen in deep water during the summer. These conditions accurately describe Sand Lake in 2018.

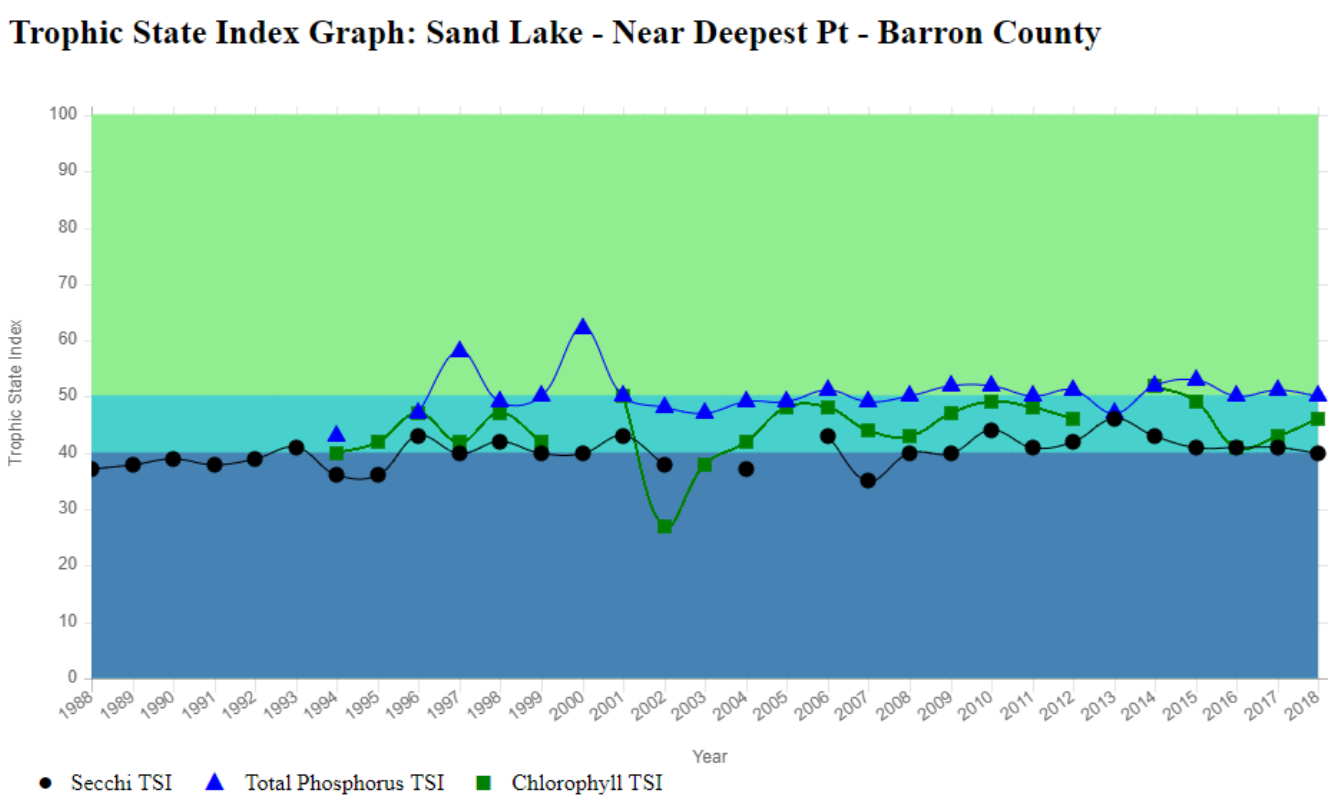

Figure 17: 1988-2018 Summer (July and August) TSI values for total phosphorus and chlorophyll-a at the Near Deepest Pt on Sand Lake

GRANT FUNDED PROJECTS AND GRANT APPLICATIONS

2019 is the third year included in the ACEI grant awarded in 2017. There will be one more summer PI survey and then comparisons can be made across a four year period of management. At that point it will be determined if the summer PI approach to EWM mapping is any better or worse at guiding management and if it does a better job of tracking changes in the native aquatic plant community.

The Lake Protection Grant to cover the repair of the NW Wash was again extended through the end of 2019 to accommodate additional runoff monitoring in it. Monitoring results from 2018 and 2019 will be used to determine if a repair or improvement project is necessary in the NE Wash. Water was moving through the NE wash from April through the middle of June in 2019 so several samples, flow measurements, and cross-sections were recorded.

PICNIC AND ANNUAL MEETING

Every year the SLMD holds a picnic/lake fair event to focus on AIS and other actions being completed by the Lake District. In 2018 this event was held on July 28. More than 50 people attended the Lake Fair/Picnic.

The SLMD held its annual Membership Meeting on August 18, 2018 at 9:00am in the Maple Plain Town Hall. Approximately 25 people were in attendance at the meeting.

Respectfully Submitted by LEAPS on June 25, 2019

REFERENCES

Berg, M. (2018). *Warm-water Point-intercept Macrophyte Survey – Sand Lake WBIC: 2661100 Barron County, WI*. St. Croix Falls, Wisconsin: Endangered Resource Services, LLC.