1.0 INTRODUCTION

Little Star Lake, Vilas County, is a 95-acre drainage lake with a maximum depth of 9 feet (Figure 1.0-1). Eurasian watermilfoil (*Myriophyllum spicatum*; EWM) was first discovered in Little Star Lake in June 2017 by Onterra during an Early-Season AIS mapping survey. The voucher collected by Onterra was subsequently confirmed by Dr. Robert Freckmann (UW-Stevens Point). Professional SCUBA divers were hired to harvest EWM from the lake in August 2017 resulting in the removal of approximately 7.7 cubic feet of EWM from all mapped EWM occurrences. Ultimately, the Town of Plum Lake contracted with Onterra, LLC to conduct future studies aimed at understanding the extent of the EWM population in the lake and form an appropriate course of action for management going forward. Onterra included an AIS mapping survey in 2018 and 2019 and found similar results on the northeast shoreline while also finding more occurrences of EWM on the north and northwest shorelines.

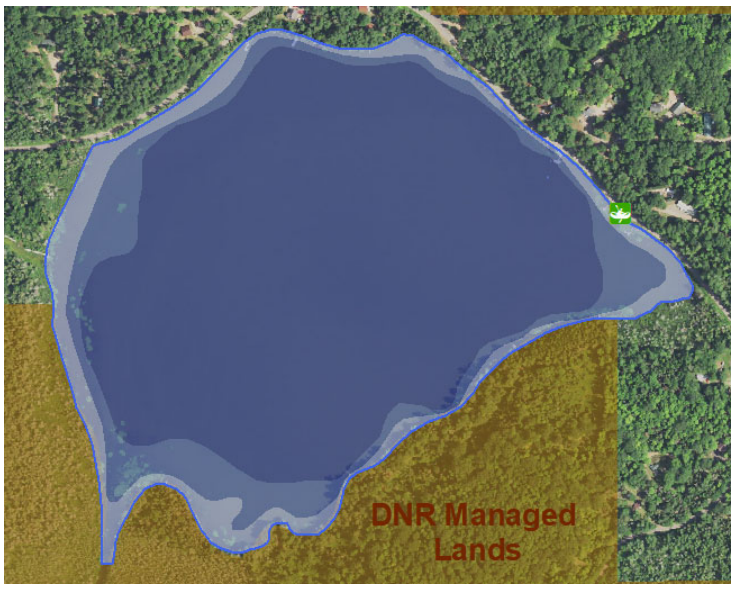


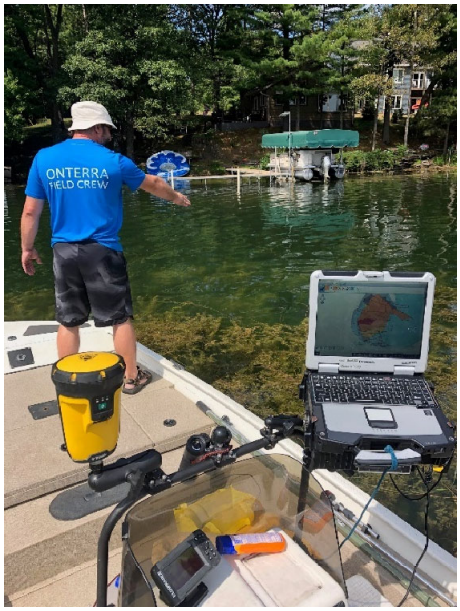
Figure 1.0-1. Little Star Lake - Vilas County, WI.

With assistance from Onterra, in February 2020, the Town of Plum Lake successfully applied for an Aquatic Invasive Species Early Detection Response Grant (AIS-EDR) through the Wisconsin Department of Natural Resources (WDNR). This grant provided funding assistance for EWM monitoring, a point-intercept survey, and hand harvesting activities from 2020 to 2022. Professional monitoring surveys conducted in 2020, 2021, 2022 showed the EWM population had remained relatively stable until 2022 when very little EWM was found in Little Star Lake. Specific details of the professional EWM mapping surveys and the Town of Plum Lake's EWM monitoring and hand harvesting efforts were included within each year's respective annual email narrative reports.

The 2022 EWM management and monitoring strategy mirrored the same course of events as 2020-2021, with two professional EWM mapping surveys to guide the Town of Plum Lake's coordinated hand harvesting efforts. Specific details of the management activities that were completed during 2022 and their results are discussed within this report. Additionally, the scope of this project included analysis and reporting related to the 2017 and 2020 whole-lake point-intercept surveys that were conducted by Onterra. The results of the point-intercept surveys are included within this report in section 6.0.

2.0 2022 EWM MANAGEMENT AND MONITORING STRATEGY

A pair of EWM mapping surveys were used to coordinate and monitor the hand-harvesting efforts in Little Star Lake. During the EWM mapping survey, the entire littoral area of the lake is surveyed through visual observations from the boat (Photograph 2.0-1). Field crews supplement the visual survey by deploying a submersible camera along with periodically doing rake tows. The EWM population is mapped using sub-meter GPS technology by using either 1) point-based or 2) area-based methodologies. Large colonies >40 feet in diameter are mapped using polygons (areas) and are qualitatively attributed a density rating based upon a five-tiered scale from *highly scattered* to *surface matting*. Point-based techniques were applied to EWM locations that were considered as *small plant colonies* (<40 feet in diameter), *clumps of plants*, or *single or few plants*.



Photograph 2.0-1. EWM mapping survey on a Wisconsin Lake. Photo credit Onterra.

An Early Season AIS Survey is employed with the purpose of determining an appropriate hand harvesting strategy for the summer and providing the spatial data to guide the harvesting efforts. The Late-Summer EWM Mapping Survey is typically conducted after most or all harvesting efforts have been completed in order to evaluate the hand harvesting control strategy. The late-summer survey also provides an opportunity to follow up with additional hand harvesting efforts following the survey if applicable. Additionally, the late-summer mapping survey is used to determine an initial management strategy for the following year.

3.0 EARLY-SEASON AQUATIC INVASIVE SPECIES SURVEY (ESAIS)

Onterra ecologists completed the Early-Season AIS Survey on June 22, 2022. The entire littoral area of the lake was surveyed with extra attention devoted to searching in areas where EWM has been found in previous surveys. The crew noted great survey weather of sunny skies with light winds. While EWM is usually not at its peak growth at this time of year, the water is typically clearer during the early summer allowing for more effective viewing of submersed plants, and EWM is often growing higher in the water column than many of the native aquatic plants at that time of year.

All previously located EWM occurrences were loaded onto the on-board computer allowing the survey crew to search these sites with added focus including the use of a submersible camera. During the course of the survey, the crews found five *single or few plants* of EWM along the northeastern shoreline (Map 1). Following the survey, Onterra provided the spatial data of the survey results to the contracted professional hand harvesting firm to guide the professional hand harvesting efforts.

4.0 HAND-HARVESTING ACTIVITIES

The Town of Plum Lake has utilized professional divers from Aquatic Plant Management, LLC (APM) to conduct hand-harvesting activities of EWM in Little Star Lake over the course of the project. Divers harvested a total of 70.95 cubic feet of EWM within Little Star Lake since it's discovery. Table 4.0-1 highlights the hand-harvesting activities during this timeframe.

Two professional hand harvesting days took place in 2022, occurring on July 8, and August 17. Details of the 2022 professional hand harvesting activities are included in the Little Star Lake EWM Removal Report authored by APM, LLC and included with this report as Appendix A.

Year	Hours	Area Harvested (ft^3)
2017	24.00	7.65
2018		2.30
2019		12.00
2020	5.50	1.50
2021	12.20	28.50
2022	6.50	19.00
Totals	48.2*	70.95

*does not include 2018 and 2019 totals

Table 4.0-1. 2017-2022 hand-harvesting activities in Little Star Lake.

5.0 LATE-SUMMER EWM MAPPING SURVEY RESULTS

The Late-Summer EWM Mapping Survey was conducted on August 2, 2022 to qualitatively assess the hand harvesting efforts as well as to understand the peak growth (peak-biomass) of the EWM population throughout the lake. The entire littoral zone of Little Star Lake was meandered and any EWM occurrences were mapped by using the same methodology as the ESAIS survey described above.

The entire littoral area of the lake was searched during the visit with some extra focus given to all areas where EWM has been located previously. The crews located several *single or few plant* occurrences on the northeast and northwest end of the lake and one *small plant colony* occurrence on the southeast shoreline (Map 2). No colonized areas of EWM that required area-based mapping methodologies were located anywhere in the lake during the survey. All of these occurrences were visible from viewing from the bow of the boat.

The completion of the late-summer survey was purposely scheduled to occur early enough such that follow up hand harvesting efforts could take place if warranted, during the same season. The results of the August survey showed a modest EWM population that hand harvesting continued to be a scale appropriate management technique. Onterra once again provided the spatial data from the survey to APM, LLC to guide the subsequent harvesting effort. Aquatic Plant Management, LLC revisited Little Star Lake on August 17, 2022, and removed 10 cubic feet of EWM from the lake.

6.0 2017 AND 2022 POINT-INTERCEPT SURVEY ANALYSIS

A whole-lake point-intercept aquatic plant survey was conducted in Little Star Lake by Onterra on August 3, 2017 and August 2, 2022. These are the only point-intercept surveys that have taken place on the lake to date and analysis of these studies are included in the following text. Appendix B contains the occurrences of all plant species recorded in the 2017 and 2022 point-intercept surveys.

Species List

The species list is simply a list of all of the aquatic plant species, both native and non-native, that were located during the surveys completed in Little Star Lake in 2017 and 2022 (Table 6.0-1). The list also

contains the growth-form of each plant found (e.g., submergent, emergent, etc.), its scientific name, common name, and its coefficient of conservatism. The latter is discussed in more detail below. Changes in this list over time, whether it is differences in total species present, gains and losses of individual species, or changes in growth forms that are present, can be an early indicator of changes in the ecosystem.

Table 6.0-1. Aquatic plant species located in Little Star Lake during the 2017 and 2022 point-intercept survey.

Growth Form	Scientific Name	Common Name	Status in Wisconsin	Coefficient of Conservatism	2017	2022
Emergent	*Eleocharis palustris*	Creeping spikerush	Native	6	I	
	Iris versicolor	Northern blue flag	Native	5	I	
	Schoenoplectus acutus	Hardstem bulrush	Native	5	I	
	Sparganium americanum	American bur-reed	Native	8	I	
	Typha spp.	Cattail spp.	Unknown (Sterile)	N/A	I	
FL	*Nuphar variegata*	Spatterdock	Native	6	X	X
	Nymphaea odorata	White water lily	Native	6	X	X
Submergent	*Chara spp.*	Muskgrasses	Native	7	X	X
	Elodea canadensis	Common waterweed	Native	3	X	X
	Heteranthera dubia	Water stargrass	Native	6	I	
	Myriophyllum spicatum	Eurasian watermilfoil	Non-Native - Invasive	N/A	I	
	Najas flexilis	Slender naiad	Native	6	X	X
	Nitella spp.	Stoneworts	Native	7	X	
	Potamogeton amplifolius	Large-leaf pondweed	Native	7	X	
	Potamogeton berchtoldii	Slender pondweed	Native	7		X
	Potamogeton berchtoldii & P. pusillus	Slender and Small pondweeds	Native	N/A		X
	Potamogeton foliosus	Leafy pondweed	Native	6	X	
	Potamogeton pusillus	Small pondweed	Native	7		X
	Potamogeton robbinsii	Fern-leaf pondweed	Native	8	X	X
	Potamogeton vaseyi	Vasey's pondweed	Native - Special Concern	10	X	
	Potamogeton zosteriformis	Flat-stem pondweed	Native	6	X	X

X = Located on rake during point-intercept survey; I = Incidentally located; not located on rake during point-intercept survey
FL = Floating-leaf; S = Submergent; E = Emergent

A total of 21 native aquatic plant species were located within or along the immediate shores of Little Star Lake between the 2017 and 2022 surveys (Table 6.0-1). Total rake fullness values from the 2017 and 2022 point-intercept surveys are displayed on Figure 6.0-1. These data represent the aquatic plant biomass at each sampling location and does not differentiate between native or non-native vegetation. Some of the greatest amount of plant biomass in these surveys was found along the western shoreline of the lake.

Of the 42 point-intercept sampling locations that fell within Little Star Lake's littoral zone (≤ 25 feet and reachable by boat) in 2022, 79% contained aquatic vegetation (Figure 6.0-1). Aquatic plant total rake fullness (TRF) data, a measure of plant abundance, showed that 38% of the 42 littoral sampling locations contained vegetation with a TRF rating of 1, 12% had a TRF rating of 2, and 29% had a TRF rating of 3 (Figure 6.0-1). These TRF ratings indicate that where vegetation is present in Little Star Lake, its biomass was moderate.

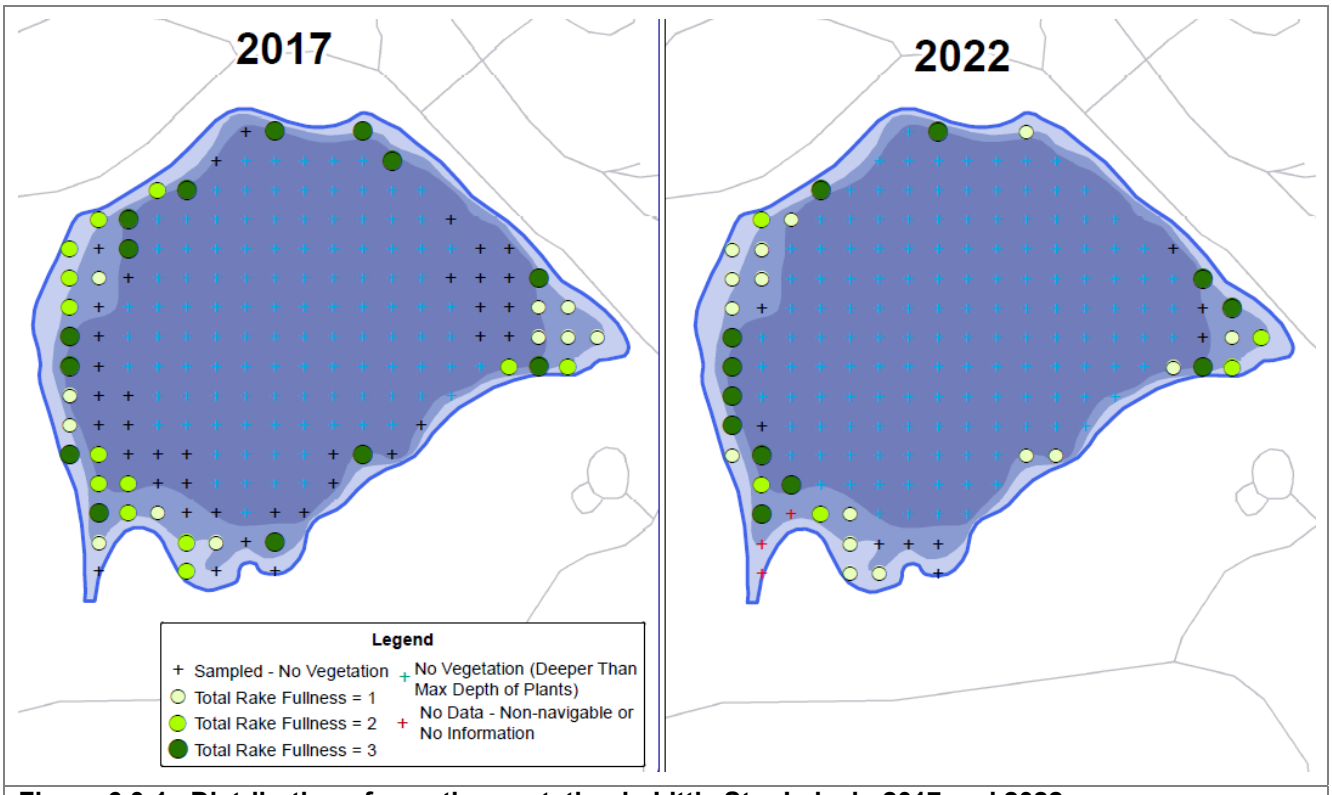


Figure 6.0-1. Distribution of aquatic vegetation in Little Star Lake in 2017 and 2022.

Frequency of Occurrence

Frequency of occurrence describes how often a certain aquatic plant species is found within a lake. Obviously, all of the plants cannot be counted in a lake, so samples are collected from pre-determined areas. In the case of the whole-lake point-intercept survey completed on Little Star Lake; plant samples were collected from plots laid out on a grid that covered the lake. Using the data collected from these plots, an estimate of occurrence of each plant species can be determined. The occurrence of aquatic plant species is displayed as the *littoral frequency of occurrence*. Littoral frequency of occurrence is used to describe how often each species occurred in the plots that are within the maximum depth of plant growth (littoral zone), and is displayed as a percentage.

Of the 19 species directly sampled with the rake during the 2017 point-intercept survey, wild celery, slender naiad, and stoneworts were the three most frequently encountered with a littoral frequency of occurrence of 26.3%, 18.4%, and, 17.1% respectively (Figure 6.0-2). Eurasian watermilfoil, although known to be present in the lake, was below detectable levels with this survey methodology and thus had an occurrence of 0%. In the field, it is often difficult to distinguish between certain species of aquatic plants that are very similar morphologically, especially when flowering/fruiting material is not present. Because of this, the littoral occurrences of the following morphologically-similar species were combined for this analysis: muskgrasses (*Chara* spp.) and stoneworts (*Nitella* spp.) will be referred to as charophytes as well as small pondweed (*Potamogeton pusillus*), slender pondweed (*P. berchtoldii*), Vaseys' pondweed (*P. vaseyi*), and leafy pondweed (*P. foliosus*) will be referred to as thin-leaved pondweeds.

Of the 10 species directly sampled with the rake during the 2022 point-intercept survey, slender naiad, common waterweed, and wild celery were the three most frequently encountered with a littoral frequency of occurrence of 57.1%, 33.3%, and, 26.2% respectively (Figure 6.0-2). Eurasian watermilfoil, although known to be present in the lake, was below detectable levels with this survey methodology and thus had an occurrence of 0%.

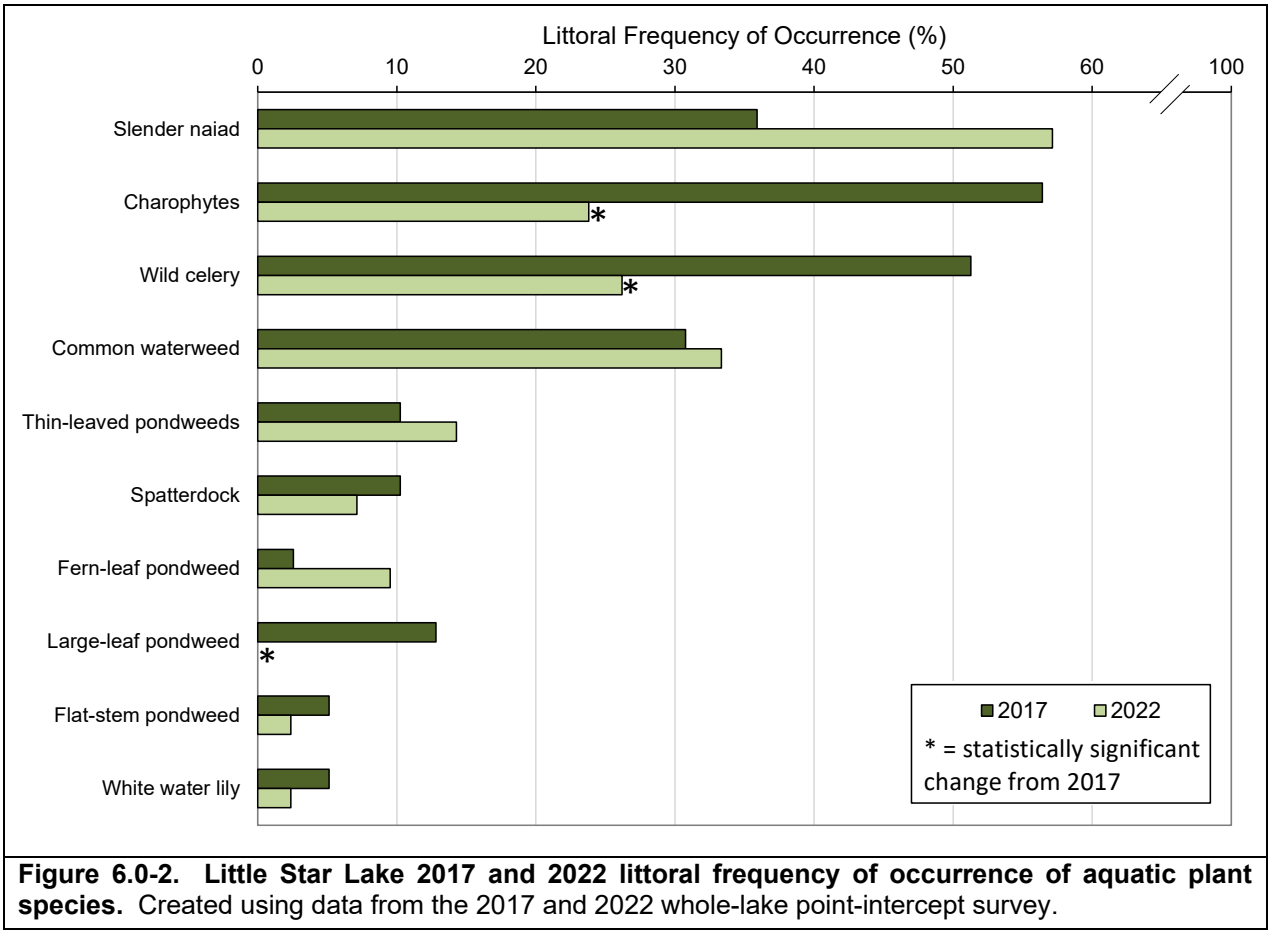


Figure 6.0-2. Little Star Lake 2017 and 2022 littoral frequency of occurrence of aquatic plant species. Created using data from the 2017 and 2022 whole-lake point-intercept survey.

Slender naiad (*Najas flexilis*) was the most frequently encountered aquatic plant species overall in Little Star Lake at a littoral frequency of occurrence of 57.1%. Slender naiad, a common annual species in Wisconsin, is considered to be one of the most important food sources for a number of migratory waterfowl species (Borman et al. 1997). Their numerous seeds, leaves, and stems all provide sources of food. The small, condensed network of leaves provide excellent habitat for aquatic invertebrates (Photo 6.0-1). This species was found in littoral depths of 3-6 feet in the 2022 point-intercept survey.

Common waterweed (*Elodea canadensis*) was the second most frequency encountered species at a littoral frequency of occurrence of 33.3%. Common waterweed is an interesting plant in that although it sometimes produces root-like structures that bury themselves into the sediment, it is largely an unrooted plant that can obtain nutrients directly from the water. As a result, this plant's location in a lake can be dependent upon water movement (Photo 6.0-1). This species was found in littoral depths of 3-6 feet in the 2022 point-intercept survey.

Wild celery (*Vallisneria americana*) was the third most frequently encounter species at a littoral frequency of occurrence of 26.2%. Wild celery is a submerged aquatic plant with ribbon-shaped floating leaves that may grow to as long as two meters, depending on water depth. It is a preferred food choice by numerous species of waterfowl and aquatic invertebrates (Photo 6.0-1). This species was found in littoral depths of 3-6 feet in the 2022 point-intercept survey.

Photograph 6.0-1. Slender naiad (Najas flexilis), wild celery (Vallisneria americana), and common waterweed (Elodea canadensis). Photo credit Onterra.

One native aquatic plant species present in Little Star Lake, Vasey's pondweed (*Potamogeton vaseyi*), is listed by the Wisconsin Natural Heritage Inventory Program as a species of special concern. This species is rare in Wisconsin, and there is uncertainty regarding its abundance and distribution within the state (Photograph 6.0-2).

Vasey's pondweed produces very thin and pointed leaves that alternate along a long fine stem. In instances when it is able to reach the surface it frequently produces small oval to oblong floating leaves no larger than a human thumbnail. When floating leaves are produced, they often support a small cluster of flowers on a stalk which are held above the water's surface. In Wisconsin, Vasey's pondweed is generally found in lakes in the northern and central regions of the state. Vasey's pondweed was located at one sampling location in 2017 (1.32% occurrence).

Photograph 6.0-2. Vasey's pondweed (*Potamogeton vaseyi*). Photo credit Onterra.

Floristic Quality Assessment

The floristic quality of a lake's aquatic plant community is calculated using its native *species richness* and their *average conservatism*. Species richness is the number of native aquatic plant species that were physically encountered on the rake during the point-intercept survey. Average conservatism is calculated by taking the sum of the coefficients of conservatism (C-values) of the native species located and dividing it by species richness. Every plant in Wisconsin has been assigned a coefficient of

conservatism, ranging from 1-10, which describes the likelihood of that species being found in an undisturbed environment. Species which are more specialized and require undisturbed habitat are given higher coefficients, while species which are more tolerant of environmental disturbance have lower coefficients. Higher average conservatism values generally indicate a healthier lake as it is able to support a greater number of environmentally-sensitive aquatic plant species. Low average conservatism values indicate a degraded environment, one that is only able to support disturbance-tolerant species.

On their own, the species richness and average conservatism values for a lake are useful in assessing a lake's plant community; however, the best assessment of the lake's plant community health is determined when the two values are used to calculate the lake's floristic quality. The floristic quality is calculated using the species richness and average conservatism value of the aquatic plant species that were solely encountered on the rake during the point-intercept surveys (equation shown below). This assessment allows the aquatic plant community of Little Star Lake to be compared to other lakes within the region and state.

$$FQI = \text{Average Coefficient of Conservatism} * \sqrt{\text{Number of Native Species}}$$

Combining Little Star Lake's aquatic plant species richness and average conservatism values to produce its Floristic Quality Index (FQI) results in a value of 22.5 in 2017 and 19.6 in 2022. In both years, floristic quality values fell below the median values for the ecoregion and state (Figure 6.0-3). Overall, this analysis shows that Little Star Lake's aquatic plant community is of slightly lower quality when compared to the majority of lakes in the ecoregion and the state.

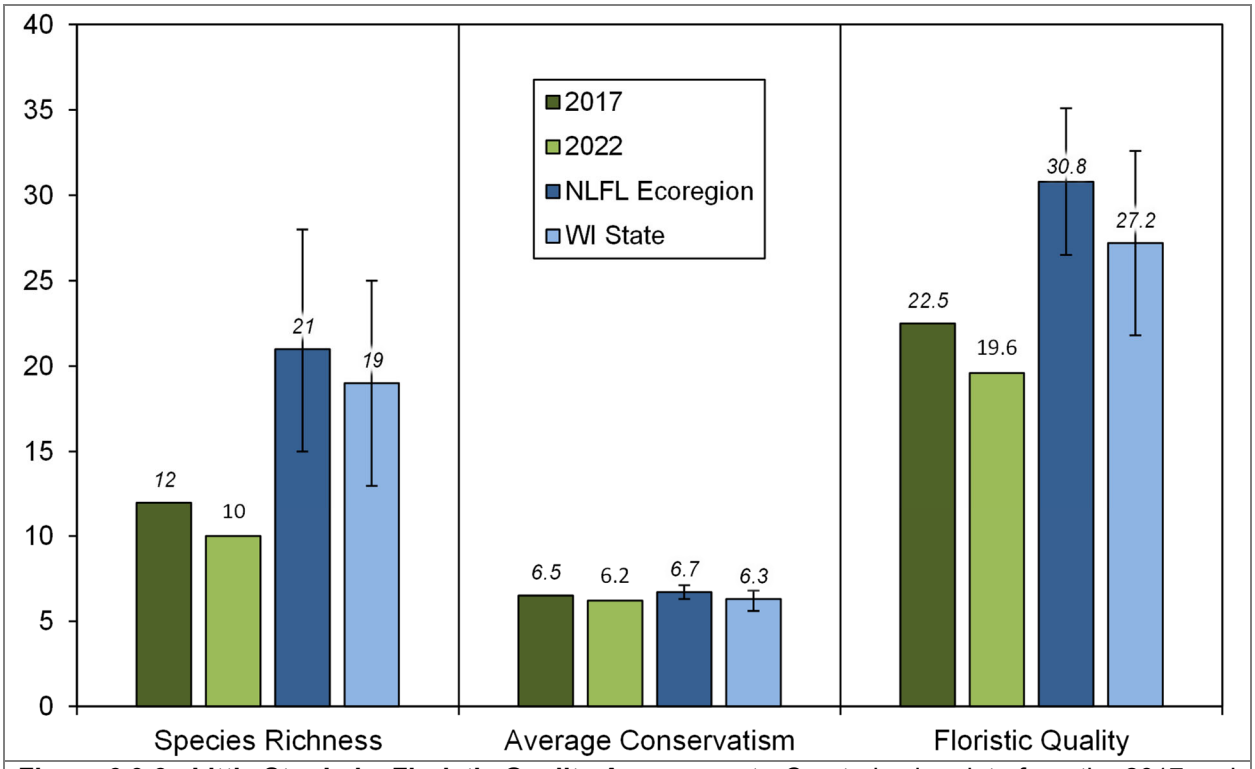


Figure 6.0-3. Little Star Lake Floristic Quality Assessment. Created using data from the 2017 and 2022 point-intercept surveys. Analysis following Nichols (1999) where NLFL = Northern Lakes and Forests - Lakes Ecoregion.

Species Diversity

Species diversity is often confused with species richness. Species richness is simply the number of species found within a given community. While species diversity utilizes species richness, it also takes into account evenness or the variation in abundance of the individual species within the community. For example, a lake with 10 aquatic plant species that had relatively similar abundances within the community would be more diverse than another lake with 10 aquatic plant species were 50% of the community was comprised of just one or two species.

An aquatic system with high species diversity is more stable than a system with a low diversity. This is analogous to a diverse financial portfolio in that a diverse aquatic plant community can withstand environmental fluctuations much like a diverse portfolio can handle economic fluctuations. Some managers believe a lake with a diverse plant community is also better suited to compete against exotic infestations than a lake with a lower diversity. However, in a recent study of 1,100 Minnesota lakes, researchers concluded that more diverse communities were not necessarily more resistant or resilient to invaders (Muthukrishnan et al. 2018).

The diversity of a lake's aquatic plant community is determined using the Simpson's Diversity Index (1-D):

$$D = \sum (n/N)^2$$

where:
n = the total number of instances of a particular species
N = the total number of instances of all species and
D is a value between 0 and 1

If a lake has a diversity index value of 0.90, it means that if two plants were randomly sampled from the lake there is a 90% probability that the two individuals would be of a different species. The Simpson's Diversity Index value from Little Star Lake is compared to data collected by Onterra and the WDNR Science Services on lakes within the Northern Lakes and Forests ecoregion and on lakes throughout Wisconsin (Figure 6.0-4). While a method for characterizing diversity values of fair, poor, etc. does not exist, lakes within the same ecoregion may be compared to provide an idea of how Little Star Lake's diversity values rank. Little Star Lake's Simpson's Diversity Index value was 0.86 in 2017 and 0.81 in 2022, compared to a northern lakes and forests ecoregion median value of 0.88.

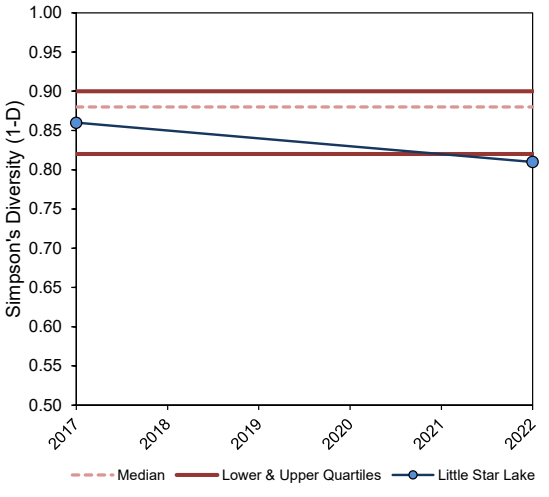


Figure 6.0-4. Little Star Lake Simpson's Diversity Index. Created using data from the 2017 and 2022 point-intercept surveys.

7.0 CONCLUSIONS AND DISCUSSION

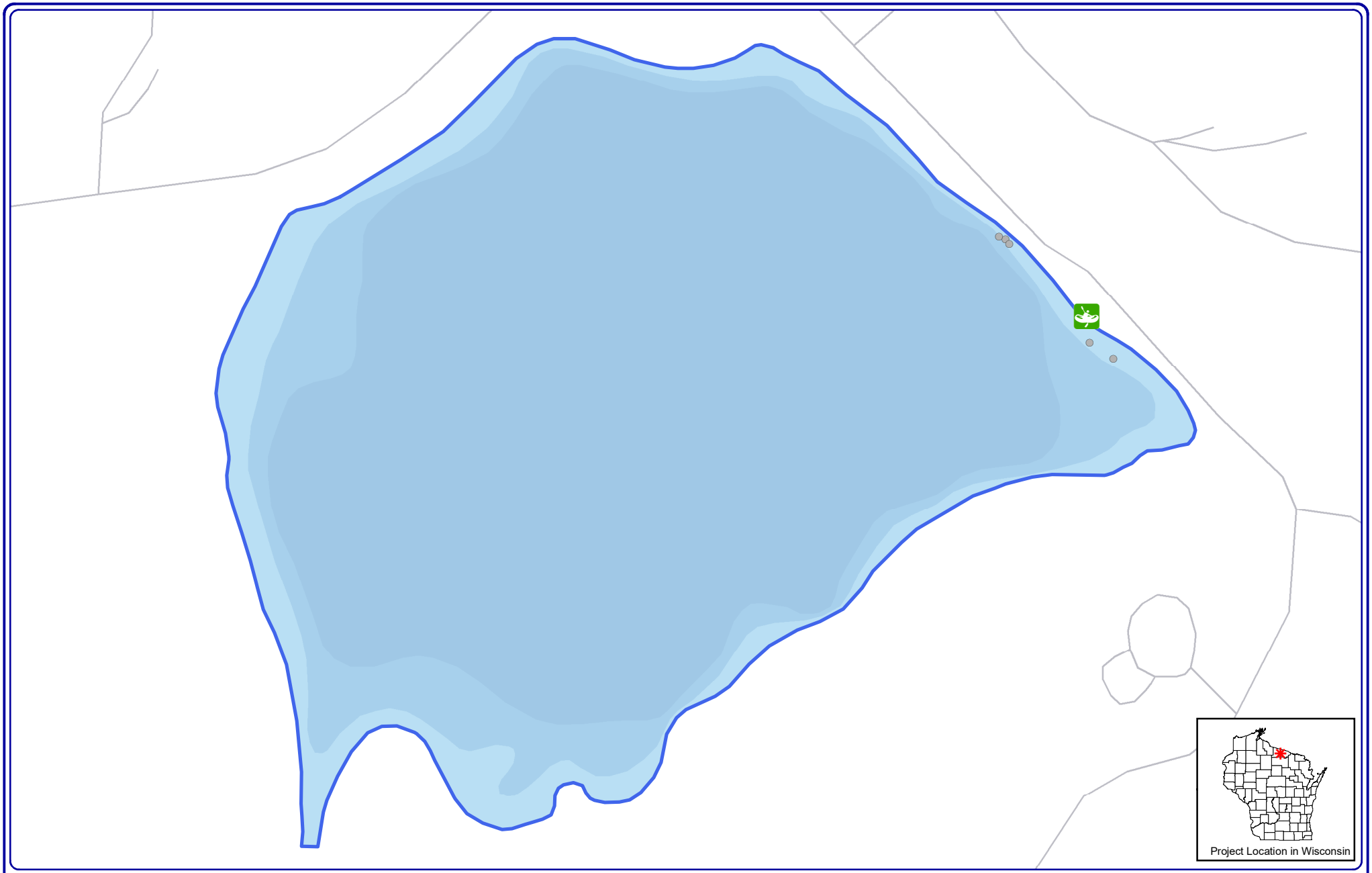
Over the course of this project, semi-annual professional monitoring surveys, paired with professional hand harvesting have guided hand harvesting efforts that results in EWM occurrences to be harvested. Targeted hand harvesting efforts have been instrumental in maintaining the low EWM population by inhibiting population expansion and spread within the lake. Detection has been a focus of the Town of Plum Lake's strategy in managing EWM in the lake. During the 2022 monitoring surveys, the EWM population was visibly located at very low levels. Professional hand harvesting actions resulted in the harvest of 19 cubic feet of EWM which is more than anticipated based on the monitoring survey results. Water clarity was likely low inhibiting Onterra crews from visually locating some of the EWM from the water's surface. Continued monitoring efforts will ensure that EWM will be spotted and harvested prior to forming larger and potentially colonized areas within the lake that could exceed the capabilities of a hand harvesting management approach.

Since its discovery, traditional hand harvesting has been the control strategy utilized on Little Star Lake. In many Wisconsin lakes, this method is able to slow the spread and decrease the population of EWM throughout the lake with some even being able use this control method as a long-term control solution. The current multi-year control project using hand-harvesting will help the Town of Plum Lake and lake managers have a better understanding of the EWM population dynamics in Little Star Lake and develop realistic long-term management strategies and goals over the time period. This program has proven capable to date in locating and harvesting all known occurrences of pioneering EWM plants in Little Star Lake. With the low EWM population, the Town of Plum Lake is encouraged to continue to strive for EWM management with aggressive monitoring and management efforts.

Analysis of the 2022 point-intercept survey indicates a below average quality aquatic plant community present in Little Star Lake. Aquatic plants were somewhat sparse within the lake with 79% of the littoral sampling locations devoid of aquatic plants. Low water clarity likely limits the growth potential of all aquatic plants in the lake. The point-intercept survey data provides the Town of Plum Lake with a better understanding of which species are present within the lake and their distribution. The methodology used in the point-intercept survey is not particularly useful for detecting EWM at its current very low population in the lake; however, if EWM becomes more common in the lake, it provides a quantitative measure of its population. The 2022 point-intercept survey indicates that there were no other native milfoils, present in the lake that are likely to be confused as EWM.

The current AIS-EDR grant, which was originally scheduled to end in 2022, has remaining funds available following the 2022 growing season. A request for a project time extension was requested by the Town of Plum Lake and approved by WDNR in early 2023. This time extension will allow for the remaining funds from the grant to be used during 2023 for continued professional AIS monitoring, reporting, and harvesting that will mirror previous activities that have taken place since the start of the project.

An Early-Season AIS (ESAIS) survey and EWM peak-biomass survey will also be included in the 2023 season. The 2023 ESAIS survey would be used by APM to target the current EWM population. It would be beneficial to conduct the 2023 late-summer EWM mapping survey after all hand-harvesting activities have been completed. Prior to conducting the late-summer 2023 mapping survey, Onterra will reach out to the Town of Plum Lake and/or APM to ensure the timing of the survey aligns with the conclusion of hand harvesting activities.



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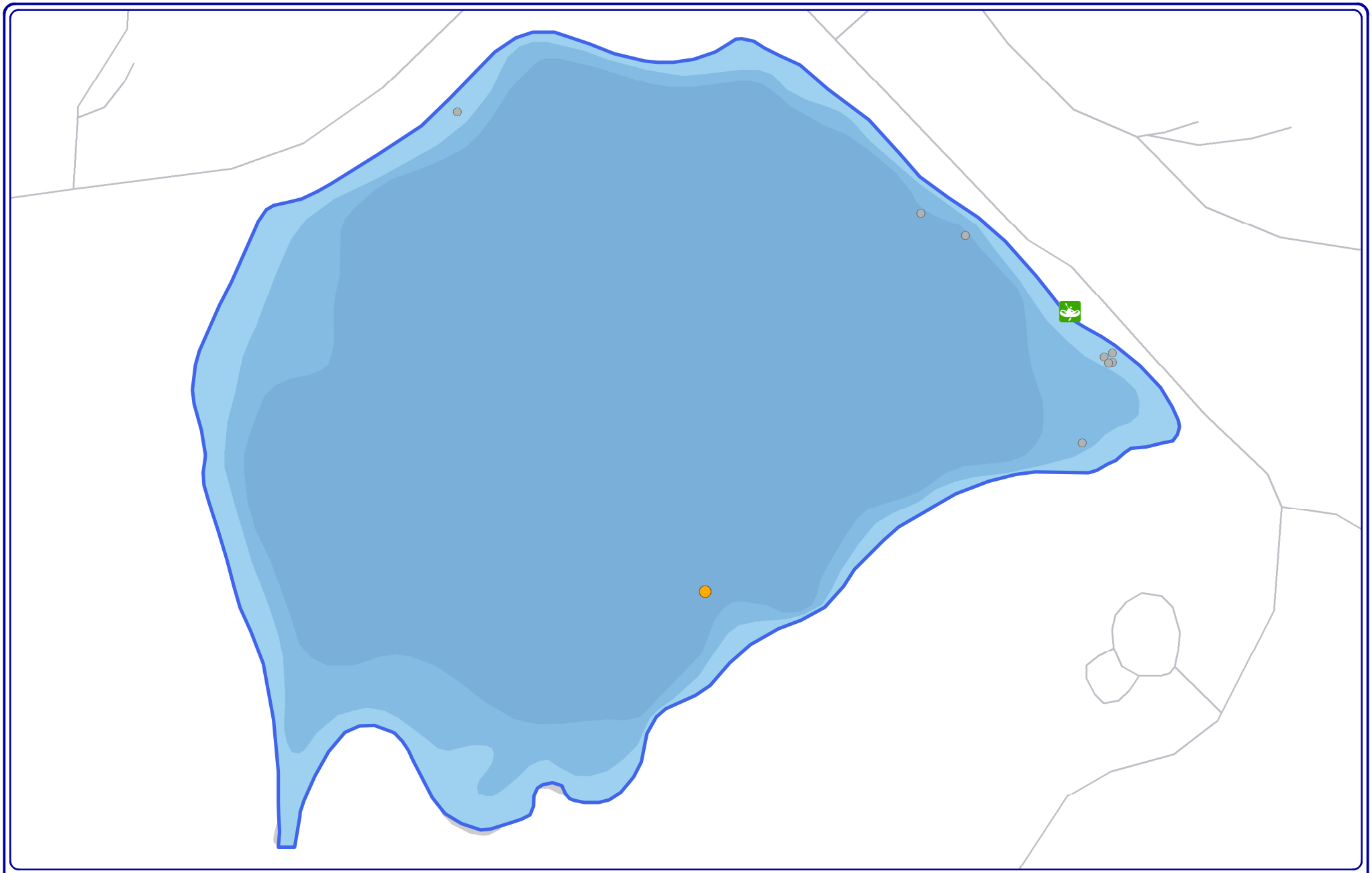
Sources:
Roads and Hydro: WDNR
Bathymetry: WDNR, digitized by Onterra
Ortho: NAIP 2020
Aquatic Plants: Onterra, June 2022
Map Date: June 27, 2022 TWH

EWM Survey: June 22, 2022

Legend

- Highly Scattered *(None found)*
- Scattered *(None found)*
- Dominant *(None found)*
- Highly Dominant *(None found)*
- Surface Matting *(None found)*
- Single or Few Plants
- Clumps of Plants *(None found)*
- Small Plant Colony *(None found)*
- Carry-In Access

Map 1
Little Star Lake
Vilas County, Wisconsin
June 2022 EWM Survey Results



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Sources:
Roads and Hydro: WDNR
Ortho: NAIP 2020
Bathymetry: WDNR, digitized by Onterra
Aquatic Plants: Onterra, August 2022
Map Date: August 5, 2022 AMS

Project Location in Wisconsin

Legend

EWM Survey: August 2, 2022

- Highly Scattered *(None)*
- Scattered *(None)*
- Dominant *(None)*
- Highly Dominant *(None)*
- Surface Matting *(None)*
- Single or Few Plants
- Clumps of Plants *(None)*
- Small Plant Colony
- Carry-In Access

Map 2
Little Star Lake
Vilas County, Wisconsin
Late-Season 2022
EWM Survey Results

A

APPENDIX A

2022 Aquatic Plant Management Report

Little Star Lake EWM Removal Report 2022

PO Box 1134 Minocqua, WI 54548

Little Star Lake EWM Removal Summary 2022

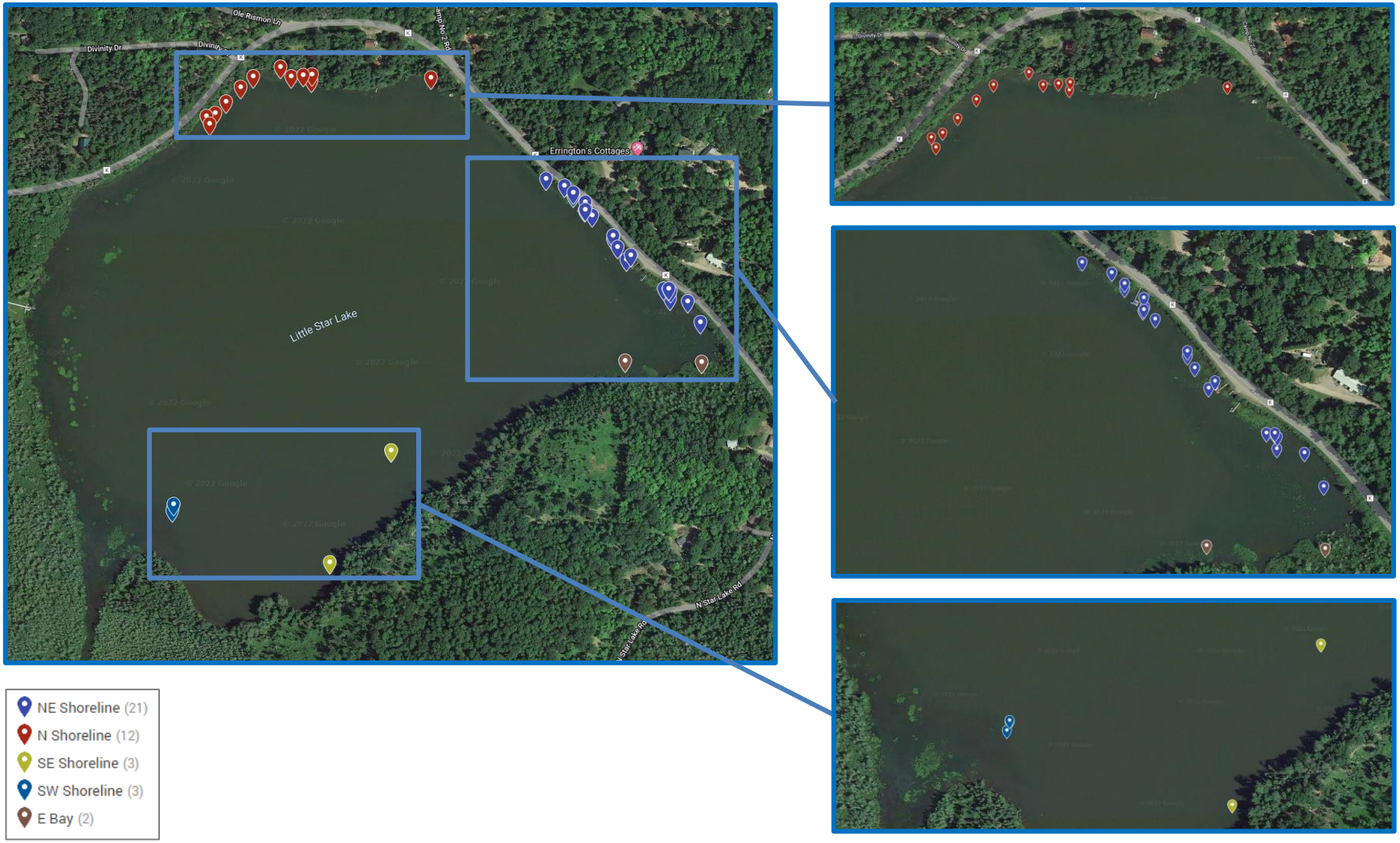
Dive Background: In July and August Aquatic Plant Management LLC (APM) conducted two (2) days of hand harvesting for Eurasian Watermilfoil (EWM) on Little Star Lake in Vilas County, WI. The team focused their efforts at two sites as prioritized by the Little Star Lake Association. In total APM was able to remove **19.0 cubic feet of EWM** from Little Star Lake.

Date	Weather Conditions	Water Temp (F)	Underwater Dive Time (hrs)	AIS Removed (cubic ft)
7/8/2022	Partly Cloudy	72	3.1	9.0
8/17/2022	Partly Cloudy	74	3.4	10.0
Grand Total			**6.5**	**19.0**

Dive Location	Avg. Water Depth	# of Dives	Underwater Dive Time	AIS Removed (cubic feet)
E Bay	1.0	2	0.2	1.0
N Shoreline	3.0	12	1.4	5.5
NE Shoreline	3.2	21	3.5	10.0
SE Shoreline	5.7	3	0.8	1.0
SW Shoreline	5.8	3	0.8	1.5
Grand Total	**3.4**	**41**	**6.5**	**19.0**

Dive Highlights and Recommendations: The dive team spent the bulk of their time in the north end of the lake where they removed 16.5 cubic feet of EWM. Overall, Little Star Lake should continue to take an Integrated Pest Management (IPM) approach and evaluate different strategies to manage the EWM population on the lake. Continued monitoring and management efforts are important to prevent the spread of EWM throughout Little Star Lake.

Map of Little Star Lake Dive Sites



Detailed Diving Activities

Date	Dive Location	Latitude	Longitude	Underwater Dive Time (hrs)	AIS Removed (cubic ft)	AIS Density	Avg Water Depth (ft)	Native Species	Native By-Catch	Substrate Type
7/8/2022	NE Shoreline	46.04842	-89.47673	0.50	0.5	Single or Few	3.0	None	0.0	Organic/Sand
7/8/2022	NE Shoreline	46.04949	-89.47816	0.33	0.5	Single or Few	3.0	None	0.0	Organic/Sand
7/8/2022	NE Shoreline	46.04854	-89.47684	0.17	0.5	Single or Few	3.0	None	0.0	Organic/Sand
7/8/2022	N Shoreline	46.05091	-89.48402	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
7/8/2022	N Shoreline	46.05104	-89.48380	0.17	0.5	Single or Few	3.0	None	0.0	Organic/Sand
7/8/2022	N Shoreline	46.05099	-89.48282	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
7/8/2022	NE Shoreline	46.04956	-89.47817	0.33	0.5	Single or Few	3.0	None	0.0	Organic/Sand
7/8/2022	NE Shoreline	46.04888	-89.47747	0.17	0.5	Single or Few	3.0	None	0.0	Organic/Sand
7/8/2022	NE Shoreline	46.04853	-89.47675	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
7/8/2022	SW Shoreline	46.04599	-89.48515	0.33	0.5	Single or Few	6.5	None	0.0	Organic/Sand
7/8/2022	SE Shoreline	46.04531	-89.48251	0.17	0.0	None	2.0	None	0.0	Organic/Sand
7/8/2022	E Bay	46.04767	-89.47620	0.08	0.5	Single or Few	1.0	None	0.0	Organic/Sand
7/8/2022	NE Shoreline	46.04912	-89.47770	0.08	0.5	Single or Few	2.5	None	0.0	Organic/Sand
7/8/2022	NE Shoreline	46.04963	-89.47838	0.08	0.5	Single or Few	1.5	None	0.0	Organic/Sand
7/8/2022	N Shoreline	46.05104	-89.48316	0.08	0.5	Single or Few	2.0	None	0.0	Organic/Sand
7/8/2022	N Shoreline	46.05061	-89.48445	0.08	0.5	Single or Few	3.5	None	0.0	Organic/Sand
7/8/2022	SW Shoreline	46.04592	-89.48518	0.17	0.5	Single or Few	6.0	None	0.0	Organic/Sand
7/8/2022	N Shoreline	46.05106	-89.48281	0.08	0.5	Single or Few	2.0	None	0.0	Organic/Sand
7/8/2022	N Shoreline	46.05057	-89.48460	0.08	0.5	Single or Few	2.5	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04851	-89.47672	0.42	0.5	Scattered	4.5	None	0.0	Organic/Sand
8/17/2022	E Bay	46.04769	-89.47749	0.08	0.5	Single or Few	1.0	None	0.0	Organic/Sand
8/17/2022	SE Shoreline	46.04663	-89.48146	0.33	0.5	Clumps	7.5	None	0.0	Organic/Sand
8/17/2022	SE Shoreline	46.04663	-89.48146	0.25	0.5	Single or Few	7.5	None	0.0	Organic/Sand
8/17/2022	SW Shoreline	46.04600	-89.48515	0.25	0.5	Single or Few	5.0	None	0.0	Organic/Sand
8/17/2022	N Shoreline	46.05048	-89.48454	0.08	0.5	Single or Few	4.0	None	0.0	Organic/Sand
8/17/2022	N Shoreline	46.05074	-89.48426	0.25	0.5	Single or Few	4.0	None	0.0	Organic/Sand
8/17/2022	N Shoreline	46.05115	-89.48334	0.25	0.0	None	3.0	None	0.0	Organic/Sand
8/17/2022	N Shoreline	46.05105	-89.48296	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
8/17/2022	N Shoreline	46.05102	-89.48079	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04983	-89.47884	0.17	0.0	None	4.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04946	-89.47818	0.25	0.5	Scattered	3.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04940	-89.47805	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04916	-89.47770	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04903	-89.47762	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04893	-89.47740	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04854	-89.47675	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04839	-89.47643	0.17	0.5	Single or Few	3.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04814	-89.47622	0.08	0.5	Single or Few	4.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04975	-89.47852	0.08	0.5	Single or Few	3.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04967	-89.47838	0.08	0.5	Single or Few	4.0	None	0.0	Organic/Sand
8/17/2022	NE Shoreline	46.04947	-89.47817	0.08	0.5	Single or Few	4.0	None	0.0	Organic/Sand
Total	**41**			**6.52**	**19.0**					

B

APPENDIX B

Littoral Frequency of Occurrence of Aquatic Plants in Little Star Lake from 2017-2022 Sub-set Point-Intercept Surveys

Scientific Name	Common Name	LFOO (%)			2017-2022	
		2017	2022	2022	% Change	Direction
Najas flexilis	Slender naiad	35.9	57.1	57.1	59.2	▲
Vallisneria americana	Wild celery	51.3	26.2	26.2	-48.9	▼
Elodea canadensis	Common waterweed	30.8	33.3	33.3	8.3	▲
Chara spp.	Muskgrasses	33.3	23.8	23.8	-28.6	▼
Nitella spp.	Stoneworts	33.3	0.0	0.0	-100.0	▼
Potamogeton berchtoldii & P. pusillus	Slender and Small pondweeds	0.0	14.3	14.3		▲
Nuphar variegata	Spatterdock	10.3	7.1	7.1	-30.4	▼
Potamogeton robbinsii	Fern-leaf pondweed	2.6	9.5	9.5	271.4	▲
Potamogeton pusillus	Small pondweed	0.0	7.1	7.1		▲
Potamogeton berchtoldii	Slender pondweed	0.0	7.1	7.1		▲
Potamogeton amplifolius	Large-leaf pondweed	12.8	0.0	0.0	-100.0	▼
Potamogeton zosteriformis	Flat-stem pondweed	5.1	2.4	2.4	-53.6	▼
Potamogeton foliosus	Leafy pondweed	10.3	0.0	0.0	-100.0	▼
Nymphaea odorata	White water lily	5.1	2.4	2.4	-53.6	▼
Potamogeton vaseyi	Vasey's pondweed	2.6	0.0	0.0	-100.0	▼