INTRODUCTION

Upper Kaubashine Lake is a 190 acre spring lake in Oneida County. The invasive Eurasian water milfoil (EWM) was first discovered within the lake in July of 2013. Following consultation with the Wisconsin Department of Natural Resources (WDNR), the Upper Kaubashine Lake Property Owners Association (UKPOA) contracted Onterra, LLC to complete a EWM survey in September of 2013. This 2013 survey provided data on the extent of EWM within the lake, which was used to develop a project strategy during the winter of 2013/2014. It should be noted that although the EWM was believed to be pure strain, samples of EWM were collected during this survey and sent to a lab in Michigan for genetic testing. The testing confirmed the plants were pure-strain *Myriophyllum spicatum* (EWM) as opposed to a hybrid species between northern water milfoil (*Myriophyllum sibericum*) and the aforementioned EWM. This hybrid species (termed HWM) has been confirmed in several Wisconsin lakes and may complicate management due to its aggressive nature and suspected decreased susceptibility to herbicides. The Town of Hazelhurst was awarded a three-year Aquatic Invasive Species (AIS) Early Detection & Response in February of 2014 to initiate monitoring and hand-removal actions in 2014-2016. This report discusses the second year of monitoring and control under this grant-funded project.

Photo 1. Upper Kaubashine Lake, Oneida County, Wisconsin.

Early Season AIS Survey

Onterra ecologists visited Upper Kaubashine Lake on June 16, 2015 to complete an Early Season AIS (ESAIS) survey. This survey is completed during the late spring/early summer (June) and consists of a crew meandering over the entire littoral (shallow, plant growing) zone. EWM, while not at its peak growth yet, is typically taller in the water column than native plant species and thus is quite visible. Furthermore, during the early summer algae growth is limited in comparison to late summer, creating better viewing conditions yet. Finally, the timing of this survey allows for data collection for mid-summer control efforts; in this case, hand-harvesting.

When AIS were encountered, data was collected using a Trimble Global Positioning System (GPS) unit with sub-meter accuracy. Mapping was completed using a point-based and polygon-based methodology. Point-based information was collected on AIS occurrences less than 30-40 feet in diameter. Density ratings were assigned to the observed AIS plant groupings in terms of whether a *Single or Few Plants, Clump* (5-10 plants), or *Small Plant Colony* (colony ranging from 10-30 ft in size) was observed. For larger, colony-forming observations, AIS were mapped through use of a polygon or aerial designation. Density was also applied to these observations in categories of *Highly Scattered, Scattered, Dominant, Highly Dominant and Surface Matting.*

On June 17, conditions were good for this visual survey with full, sunlit skies and only a light breeze. EWM was located in many of the areas it had been observed in 2013 and 2014, however, any newly established areas were marked by the Onterra crew. Additionally, several areas of the lake were observed to hold EWM that was highly dense when compared to past observations (Map 1).

At the end of 2014, it was believed that hand-harvesting was still a realistic approach to managing EWM within Upper Kaubashine Lake. With the startling survey results of the June 17 survey, it was strongly believed that hand-harvesting would have little impact upon several of the lake's most dense EWM colonies. In their planning for 2015 however, the UKPOA had reserved 100 diver hours of work from Aquatic Plant Management, LLC (APM). With that, it was recommended to the UKPOA by Onterra that they have APM target some of the lesser EWM colonies on the lake. While it was certain no impact could be made on the densest colonies on the lake, reducing EWM elsewhere might result in containing the EWM to only several areas of the lake. These areas, it was thought at the time, could be targeted in 2016 using a different strategy.

Mid-Summer Control Efforts

APM crews visited Upper Kaubashine Lake on July 27, 28, 30 as well as August 4 and 12, 2015 to complete hand-removal of EWM within the areas defined following the June ESAIS survey (Map 1). In winter of 2015, the UKPOA confirmed an informal agreement with APM to complete roughly 100 hours on the project. Staff from APM (four crew members July 30, three crew members on all other dates) spent a combined total of 66 hours and 55 minutes removing EWM from the lake, while additional hours were spent in travel, set-up, EWM disposal and other miscellaneous tasks. Table 1 indicates that APM was able to remove 587 gallons of EWM from the lake. In 2014, a comparable amount of time (67 hours) was spent removing 695 gallons of EWM from the lake. The difference in gallons removed can most likely be attributed to the strategy enacted during each year – in 2014, the densest EWM colonies were targeted for APM's efforts. In 2015, realizing the dense colonies were beyond the level of hand-removal, priority areas were set up in less dense areas of the lake where *Scattered* plants or colonies were located. With more time dedicated to moving equipment and personnel from site to site and with a lesser density of EWM, it is expected that a reduction in EWM harvested would be had.

Table 1 displays a summary of diving time and hand-removal results from these dates, while an expanded diver report with comments can be viewed in Appendix A.

Table 1: 2015 Upper Kaubashine Lake professional hand-harvesting summary, by control site. Data provided by Aquatic Plant Management, LLC. Site locations depicted on Map 1. In-depth hand-harvest data, with diver comment reports, are attached as Appendix A.

Upper Kaubashine Lake Professional Hand-Harvesting Summary, 2015

Date	Site	Time Underwater (minutes unless specified)	Number of Divers	Total Effort (minutes unless specified)	Est. EWM Removed (Gallons)
6/28/2015	A-15	60	3	180	25
6/28/2015	A-15	40	3	120	15
7/30/2015	A-15	35	4	140	15
7/30/2015	A-15	60	4	240	25
7/30/2015	A-15	60	4	240	30
7/30/2015	A-15	70	4	280	30
7/30/2015	A-15	40	4	160	25
7/30/2015	A-15	30	4	120	15
8/4/2015	A-15	45	3	135	5
8/12/2015	A-15	30	3	90	10
	Total	***7 hrs, 50 mins***		***28 hrs, 25 mins***	***195***
6/27/2015	B-15	50	3	150	20
8/4/2015	B-15	40	3	120	12
8/4/2015	B-15	30	3	90	10
	Total	***2 hrs***		***6 hrs***	***42***
6/27/2015	C-15	45	3	135	20
8/4/2015	C-15	60	3	180	80
8/4/2015	C-15	45	3	135	45
	Total	***2 hrs, 30 mins***		***7 hrs, 30 mins***	***145***
6/27/2015	D-15	60	3	180	30
8/4/2015	D-15	40	3	120	30
8/12/2015	D-15	60	3	180	15
8/12/2015	D-15	45	3	135	30
	Total	***3 hrs, 25 mins***		***10 hrs, 15 mins***	***105***
6/27/2015	E-15	80	3	240	35
8/12/2015	E-15	50	3	150	10
8/12/2015	E-15	60	3	180	10
	Total	***3 hrs, 10 mins***		***9 hrs, 30 mins***	***55***
6/27/2015	F-15	45	3	135	15
6/28/2015	F-15	35	3	105	10
8/12/2015	F-15	25	3	75	20
	Total	***1 hr, 45 mins***		***5 hrs, 15 mins***	***45***
Grand Total		**20 hrs, 40 mins**		**66 hrs, 55 mins**	**587**

EWM Peak Biomass Survey

On September 23, 2015, Onterra ecologists visited Upper Kaubashine Lake to complete the EWM Peak Biomass survey. This meander-based survey, which mimics the methodology used in the ESAIS survey, is completed in the late growing season (August/September) when EWM has reached its peak growth. Because EWM should be at its maximum density, the results of this survey provide an accurate assessment of where EWM is in the lake and what its full impact on

the ecology is. As a result, this data is useful in determining the efficacy of control actions used during the summer months as well as being heavily relied upon for next year's planning.

The weather on September 23 was slightly overcast, with a light breeze and air temperatures at roughly 60 degrees F. Onterra staff meandered the littoral region of the lake, marking scattered *Single or Few Plants*, *Clumps of Plants*, and *Small Plant Colonies* relatively often. Polygons were utilized to delineate larger-reaching colonies in several areas of the lake. Overall, the EWM appeared to be more prevalent and higher in density in many of the unmanaged areas of the lake (Map 1 and Map 2, Figure 1). However, some noticeable differences in EWM presence were noted within the hand-harvest areas, as described in the next section.

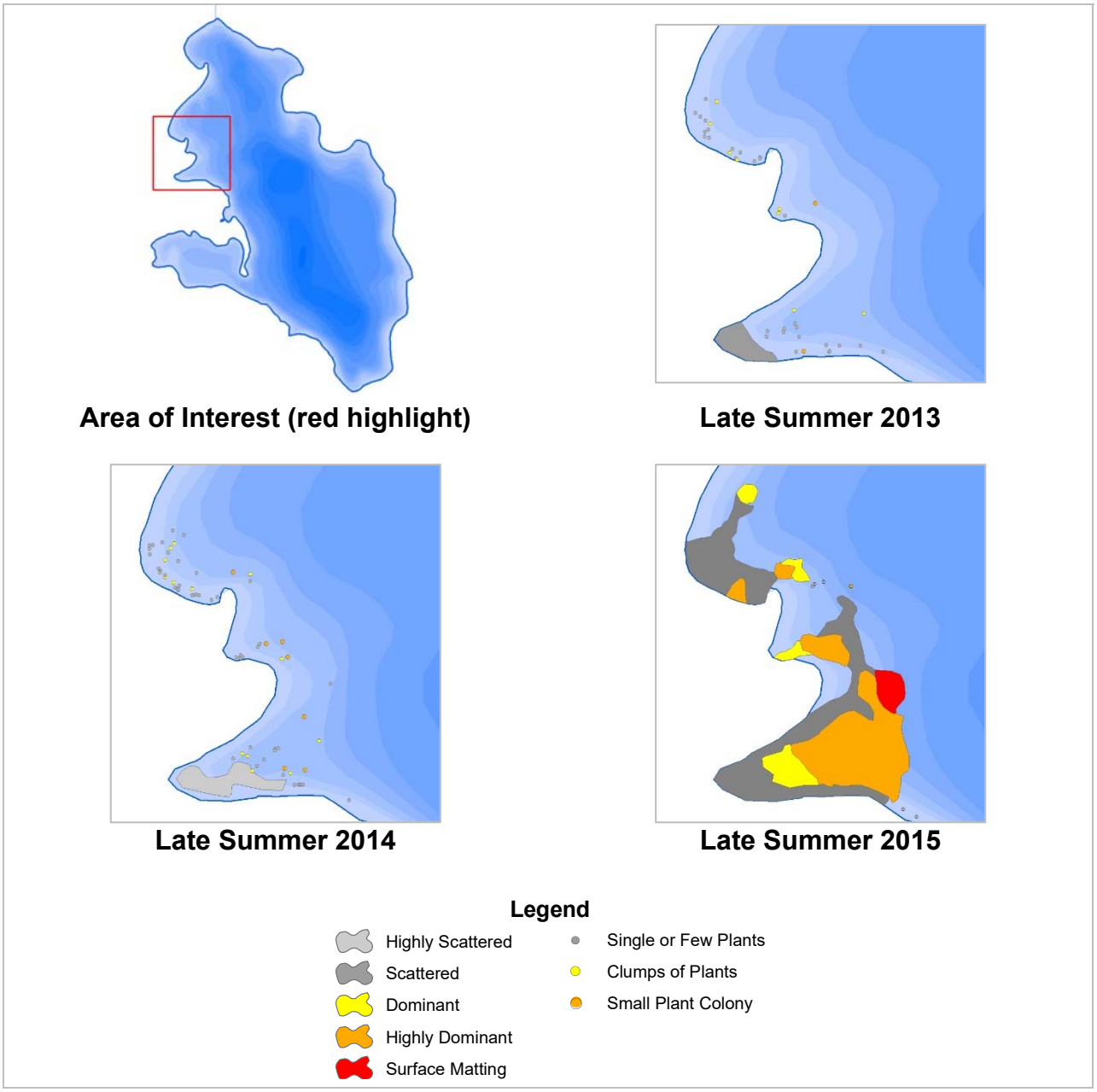


Figure 1: Upper Kaubashine Lake western shoreland area EWM density, 2013-2015. Data consists of late summer Onterra EWM peak-biomass survey results.

EWM Hand-Removal Control Results

Six areas were delineated for APM to direct their efforts at (Site A-15, B-15, C-15, D-15, E-15, and F-15, Map 1). Each treatment site is evaluated below. Maps 1 and 2 may be referred to for a visual aid of before/after hand-harvesting control comparisons.

A-15

In June, numerous *Single or Few Plants* and *Clumps*, along with a *Small Plant Colony* and *Scattered* polygon were observed in this area. APM crew members spent a combined 28 hours, 25 minutes (42% of their overall Upper Kaubashine 2015 effort) hand-pulling plants in this area, removing a total of 195 gallons of EWM. Following these efforts, these EWM occurrences were reduced to a handful of *Single or Few Plants*, a single *Clump* and a *Scattered* polygon.

B-15

This area held numerous *Single or Few Plants* within it, as well as a *Clump* roughly *10* ft in diameter. APM crew members spent 6 hours on this site, removing 42 gallons of EWM. In late summer, only a handful of *Single or Few Plants* remained.

C-15

APM crew members spent a combined 7 hours and 30 minutes on this site between two visit dates (June 27 and August 4). From this location, 145 gallons of EWM were removed. Unfortunately, the *Highly Scattered* and *Scattered* polygons observed in the ESAIS survey were once again delineated during the EWM Peak Biomass survey. Additionally, a *Small Plant Colony* was observed in late summer that was not there previously.

D-15

During the June 2015 survey, numerous *Single or Few Plants,* two *Clumps* and two *Small Plant Colonies* were observed in the site. Following 10 hours and 15 minutes of hand-harvesting, in which 105 gallons of EWM were removed, the site still contained numerous *Single or Few Plants,* and two *Clumps*. However, the observed late-summer occurrences were not overlying many of the June observations, indicating that these plants were likely new growth since the hand-harvesting had occurred.

E-15

APM crew members spent a combined 9 hours and 30 minutes on this site between two visit dates (June 27 and August 12). From this location, 55 gallons of EWM were removed. Unfortunately, despite these efforts the occurrence of EWM increased within the site, with a *Highly Scattered* polygon later being ranked as *Scattered* and several additional *Single or Few Plants* being observed in late summer.

F-15

During the June 2015 survey, a *Highly Scattered* polygon was delineated along with a *Small Plant Colony* within this site. Following 5 hours and 15 minutes of hand-harvesting, 45 gallons of EWM were removed. However, this level of effort was not adequate to suppress EWM growth and by late summer the site contained a similar *Highly Scattered* polygon along with denser EWM in shallow water, noted on Map 2 as *Scattered* EWM.

Conclusion and 2016 Monitoring and Control Strategy

The proliferation of EWM throughout Upper Kaubashine Lake between 2014 and 2015 was unforeseen by the UKPOA and management partners. However, this occurrence cannot be called rare, as it has been observed on other lakes within Wisconsin. AIS management and monitoring is still a relatively new concept, so long-term datasets are hard to come by. WDNR researchers are building databases on longer-term trends of AIS establishments on Wisconsin lakes in an effort to understand relationships and patterns. In lakes without management (any action to suppress or control AIS), the AIS of interest may fluctuate from year to year. There are likely several environmental variables at play that help to determine that year's growth patterns. What is now known is that in some Wisconsin lakes, species such as EWM will proliferate to a point at which they meet an equilibrium within the lake ecosystem. Where that equilibrium line ends is not predictable – will the species be a dominant presence within the system, or perhaps co-mingle nicely with native species? The EWM in Upper Kaubashine Lake certainly had a "banner" year in 2015, with a demonstrated large increase in frequency and density from the year previous. Is this year an exception, or will this be typical growth in the lake? Unfortunately, these are questions that may only be answered with time.

Upon observing the EWM conditions in June of 2015, Onterra staff met with the UKPOA Board of Directors on July 7, prior to a UKPOA annual meeting. During the July 7 meeting, Onterra and the UKPOA representatives discussed the growing concerns regarding the EWM in the lake. Alternative strategies were discussed, including the use of Diver Assisted Suction Harvest (DASH) and herbicide treatments. Use of DASH during 2015 was not determined to be feasible, as this method would not be useful in making substantial reductions to the EWM population. While an herbicide treatment would be the best approach for making an impact upon EWM in the lake, these treatments are often completed in the late spring as to minimize impacts upon native aquatic plants. An additional complication arose in that the lake group was newly forming and did not have a management plan in place for their lake. Concerns arose as to what the level of comfort would be amongst riparians regarding an herbicide treatment. At a later date however, the UKPOA Board of Directors did provide a vote in support of the use of herbicides in the lake as part of a 2016 strategic approach.

UKPOA representatives and Onterra staff decided that further discussions on the matter would be held in fall / winter 2015 to outline a plan for 2016. A teleconference was held in October of 2015 with Kevin Gauthier, WDNR Water Resources Management Specialist. During the call, Mr. Gauthier expressed concern over the use of herbicides in the lake. Using herbicides within a single area of the lake (roughly 6.2 acres of the densest EWM in the lake was proposed) would result in only temporary nuisance relief and would not address EWM throughout the lake, as the grant funded project had initially been designed to do. The UKPOA, being a new organization and rallying behind a recent threat to their lake (EWM- 2013), also did not have a management plan in place to prescribe a course of action to follow. Typically, herbicide treatments are called for within a lake's management plan, though the WDNR has permitted herbicide treatments to be completed without a management plan in some circumstances.

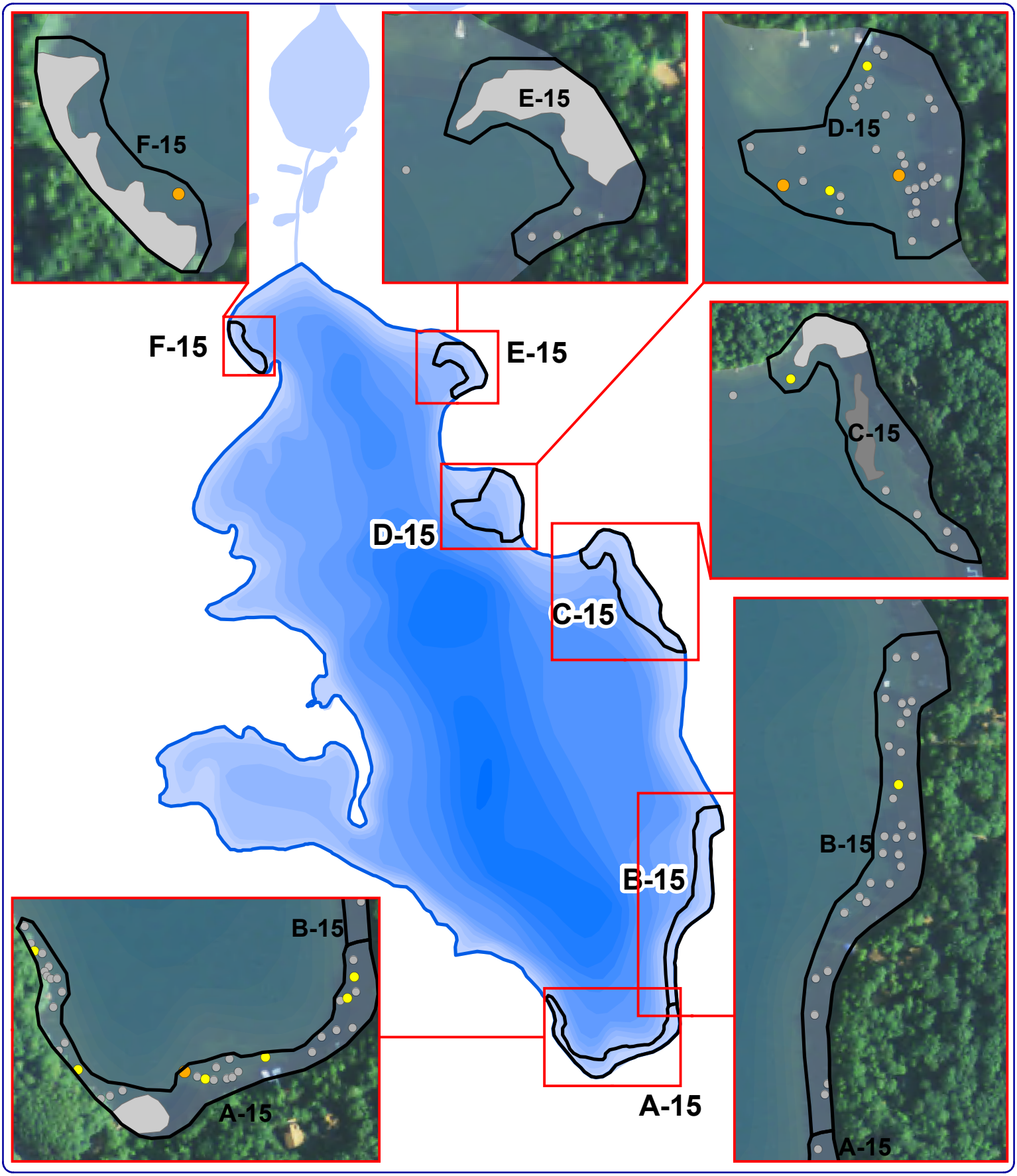
At the end of the call, it was mutually agreed upon by all parties that the UKPOA would benefit from completing a management planning process to better understand the lake's aquatic plant community and develop a long-term plan to address EWM. Mr. Gauthier offered that this

process could be partially funded through the state by completing a Phase II AIS-EDR grant application.

A grant proposal and budget was assembled by Onterra in December 2015 and was sent to Mr. Gauthier on January 13, 2016. The proposal outlined lake management planning components as well as a plan to utilize DASH on a 0.54 acre area overlapping the lake's densest EWM colony and also comprising of an area frequented by pontoon cruisers during the summer. Mr. Gauthier sent the grant proposal to other WDNR staff for review. In late January, Onterra and WDNR staff discussed the proposal and its components in terms of eligibility for the AIS-EDR grant category. The AIS-EDR grant category is intended to provide funding for lake groups to "*provide early identification and control of pioneer populations of AIS*". In the WDNR's review, it was determined that an action such as the use of DASH, while providing a nice visual to lake residents, an examination of the tool's effectiveness on the lake, and a slight navigation aid, would not be in line with the AIS-EDR's intended goal. Other components related to aquatic plant studies and aquatic plant management planning would be acceptable in the grant application.

For 2016, no control actions are recommended to take place on Upper Kaubashine Lake. Instead, Onterra recommends that the UKPOA and Town of Hazelhurst (official project sponsor) pursue a Phase II AIS-EDR grant application to fund a planning process that will ultimately bring the UKPOA an Aquatic Plant Management Plan (APM plan). An APM planning process begins with an in-depth examination of the aquatic plant communities within the lake, understanding the species present, their relative abundance, the extent of AIS within the lake, etc. The scientific end of the study would be combined with several planning elements, which include a stakeholder survey to be sent to all lake property owners and several public meetings. The survey would collect information pertaining to lake property owner's concerns about aquatic plants and AIS, comfort levels with AIS and aquatic plant management, etc. The public meetings are a forum for the dissemination of information pertaining to the value of a lake's aquatic plant community, aquatic plant control pro's and con's, and other elements pertaining to an APM plan. When completed, the APM plan will be a document framed by the UKPOA that outlines an approach for managing aquatic plants (native and non-native) within the lake and would include thresholds (triggers) for control action initiation, the types of control actions to be used, the monitoring that should accompany such control action use, and what the anticipated result of the control action would be. Other elements such as timelines for implementation and potential funding sources would be outlined as well.

With a successful grant application, submitted in early February of 2016, the UKPOA can expect to begin these studies and planning process in July of 2016. The first public meeting is tentatively scheduled to occur in conjunction with the UKPOA's annual meeting, on Saturday, July 16, 2016. Please plan on attending to learn more about the studies to be completed and discussions to be had regarding Upper Kaubashine Lake's aquatic plant community and managing EWM on a long-term basis.



N
W E
S

750
Feet

Onterra LLC
Lake Management Planning
815 Prosper Road
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Hydro and Roads: WDNR
Bathymetry: WDNR, digitized by Onterra
Aquatic Plant Survey: Onterra, 2015

Map Date: June 16, 2015
Filename: UpKaub_Oneida_ESAIS_June2015.mxd

Legend

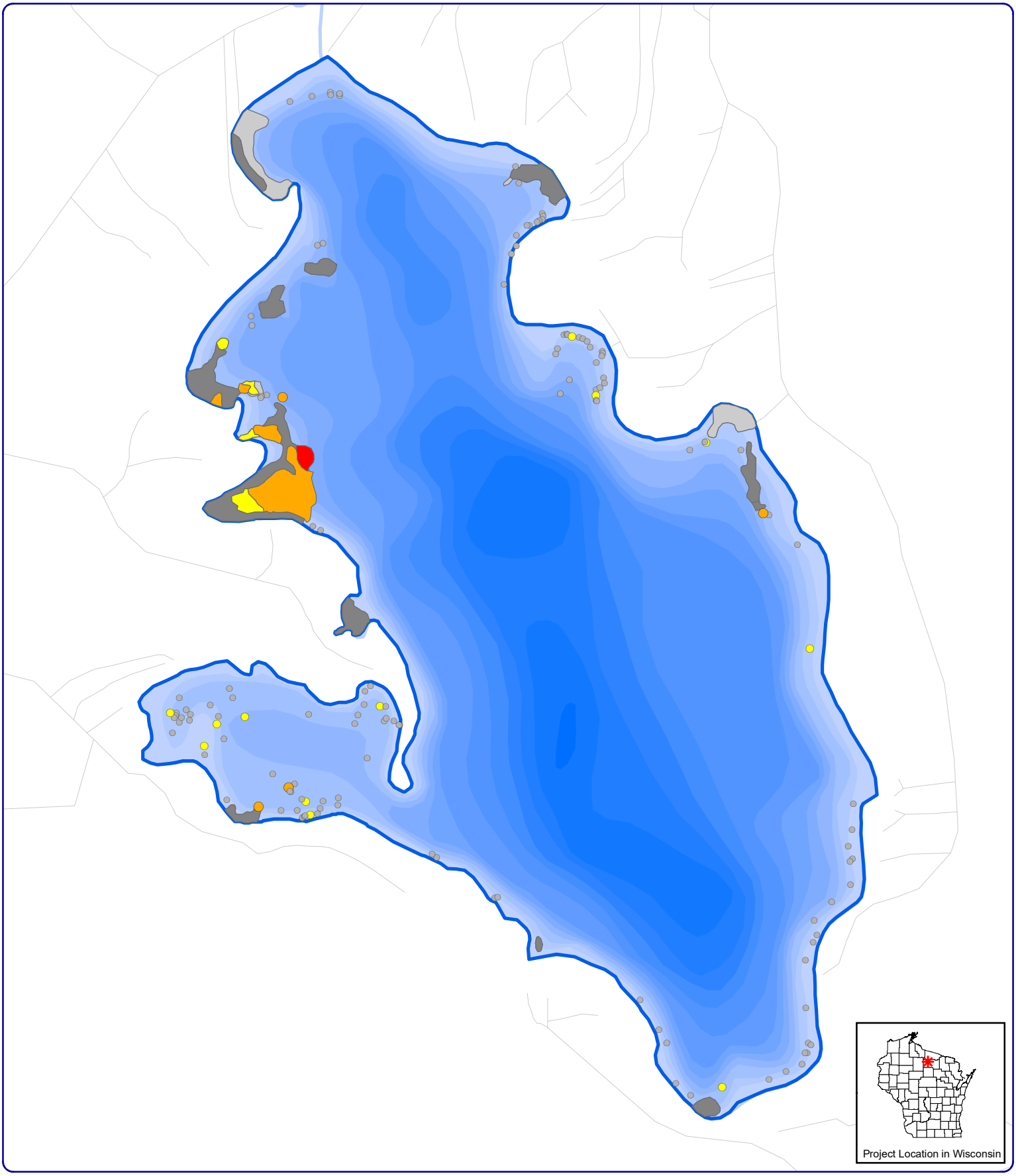
- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting
- Single or Few Plants
- Clump of Plants
- Small Plant Colony

Map 1

Upper Kaubashine Lake

Oneida County, Wisconsin

2015 Hand-Harvest Control Strategy



N
W E
S

550
Feet

Legend

- Highly Scattered
- Scattered
- Dominant
- Highly Dominant
- Surface Matting
- Single or Few Plants
- Clump of Plants
- Small Plant Colony
- Potential 2016 Treatment Area

Onterra LLC
Lake Management Planning
815 Prosper Road
De Pere, WI 54115
920.338.8860
www.onterra-eco.com

Sources:
Hydro and Roads: WDNR
Bathymetry: WDNR, digitized by Onterra
Aquatic Plant Survey: Onterra, 2015

Map Date: Sept 23, 2015
Filename: UpKaub_Oneida_EWMPB_Sept2015.mxd

Map 2

Upper Kaubashine Lake

Oneida County, Wisconsin

2015 Peak-Biomass Survey Results