

1.0 INTRODUCTION

The Unified Lower Eagle River Chain of Lakes Commission (ULERCLC) has been the successful recipients of Wisconsin Department of Natural Resources (WDNR) Aquatic Invasive Species (AIS) Control Grants for the past eight years as they conduct a project aimed at reducing the Eagle River Chain's Eurasian water milfoil (*Myriophyllum spicatum*; EWM) population. This report specifically discusses the control activities conducted during 2016. The chain-wide results will be presented first followed by results from each lake individually.

Additional information regarding the control actions completed in 2008-2015 can be found in their respective annual reports. Native aquatic vegetation inventories from whole-lake point-intercept surveys are conducted on the chain roughly every 5 years. Through funding from the ULERCLC (and WDNR grant funds), whole-lake point-intercept surveys on all lakes will take place in 2017 during the final phases of the Comprehensive Lake Management Planning Project and compared to surveys conducted in 2006 and 2012.

2.0 2016 CHAIN-WIDE EWM CONTROL STRATEGY RESULTS

From 2007 to 2015, the ULERCLC have coordinated strategically targeted herbicide spot treatments and limited large-scale treatments targeting EWM within the system. The lessons learned over this time period resulted in the ULERCLC developing a strategy where areas would be considered for spot treatment if they meet the following threshold (i.e. trigger):

colonized areas of EWM with a density of *dominant* or greater where a sufficiently large treatment area can be constructed to hold adequate herbicide concentrations and exposure times (CETs)

Based upon this threshold (trigger), no locations in the Eagle River Chain warranted herbicide treatment in 2016. Over the course of control program, EWM colonial acreage has been reduced from 278.2 acres in 2007 to 12.2 acres in 2015 (Figure 1). While no herbicide treatment was conducted in 2016, EWM colonial acreage remained low with a slight increase from 12.2 acres in 2015 to 19.7 acres in 2016 (Figure 1).

Please note that Figures 1 and 2 only represents the acreage of mapped EWM polygons, not EWM mapped within point-based methodologies (*single or few plants, clumps of plants, or small plant colonies*). Taken out of context, this figure can be misleading as large increases in EWM colonial acreage may be the results of low-density point-based data increasing to levels that now are best delineated with EWM colonies.

The colonial acreage from the 2016 EWM Peak-Biomass Mapping Survey was found to be 19.7 acres within the Eagle River Chain, a small increase over 2015 and much lower than when the control program started in 2007 (Figure 1). Approximately 77% of the remaining acreage is within Watersmeet Lake, of which the majority is in areas of high water exchange making attaining necessary herbicide concentration exposure times more difficult.

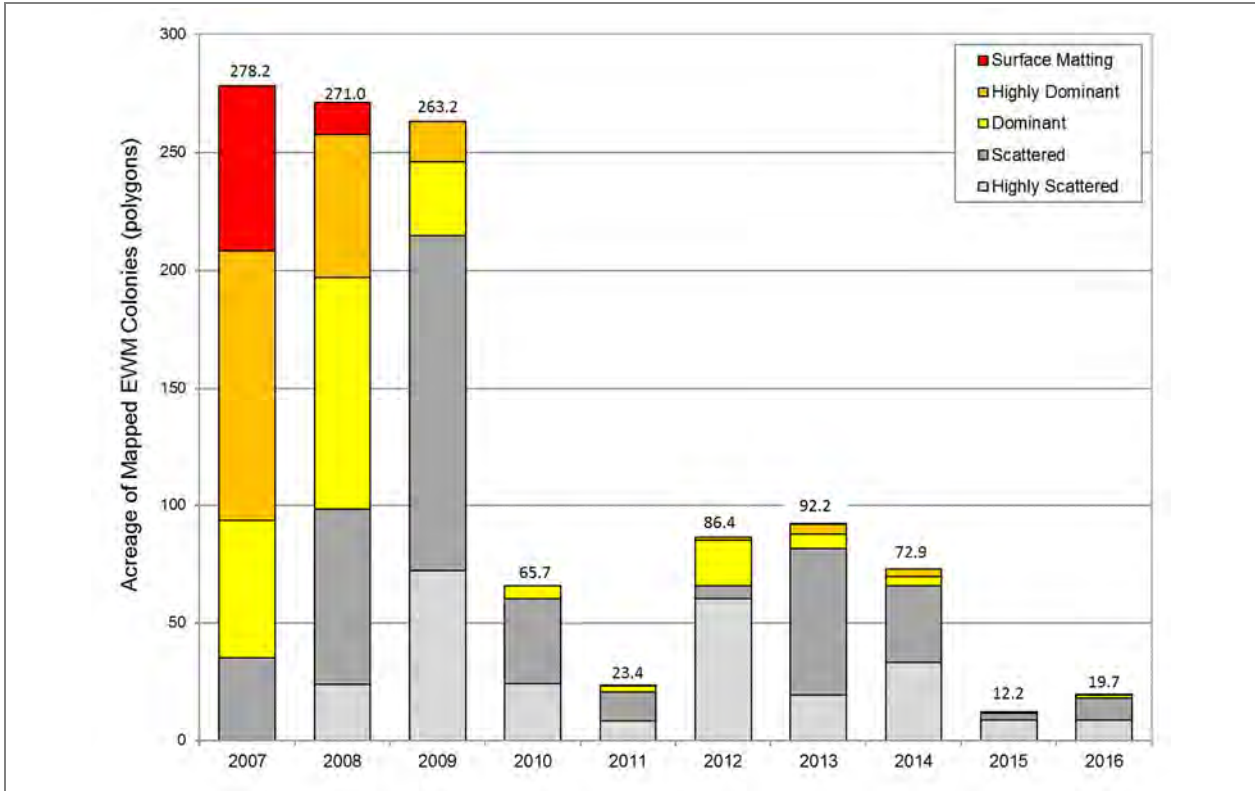


Figure 1. Acreage of mapped EWM colonies on the Eagle River Chain of Lakes from 2007-2016.

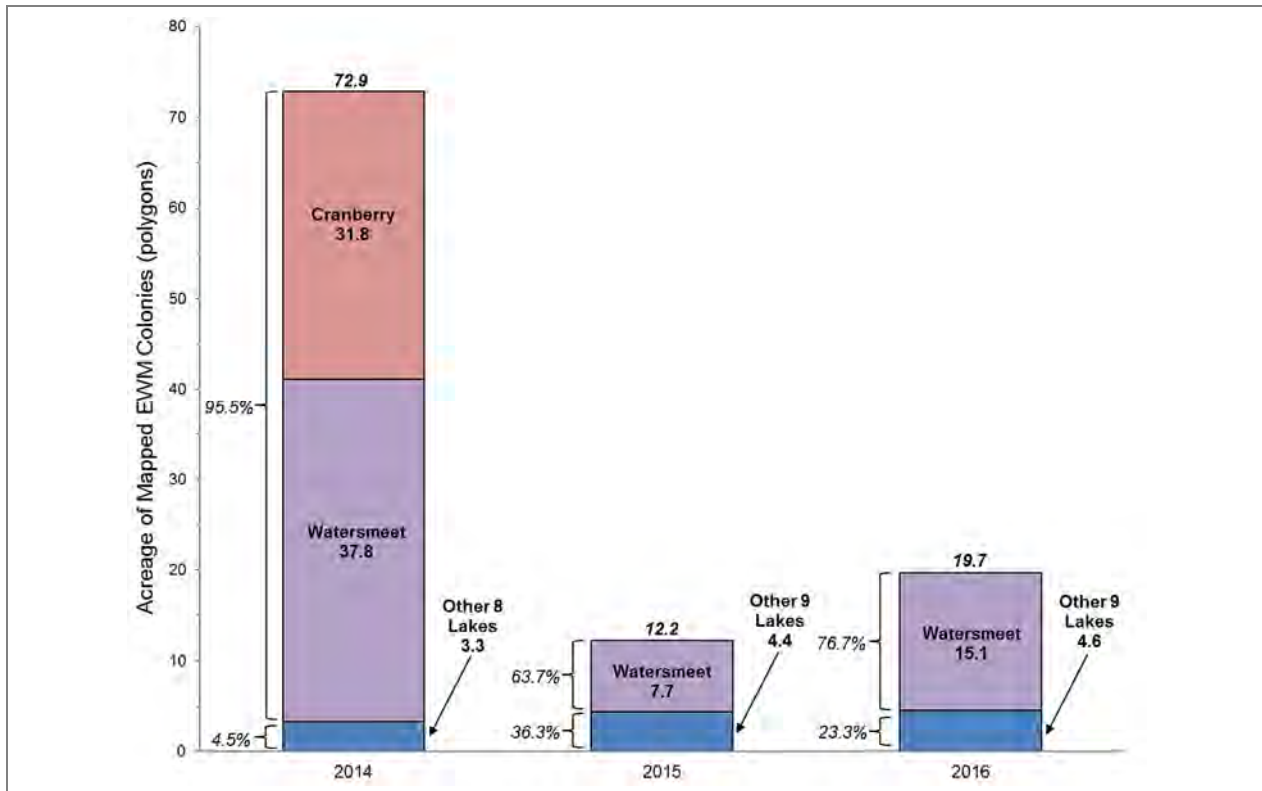


Figure 2. Acreage of mapped EWM colonies on the Eagle River Chain of Lakes from 2014, 2015, and 2016.

Following the 2015 herbicide treatment, the remnant EWM population on the Eagle River Chain of Lakes have been reduced to levels where herbicide treatment strategies are not an effective control strategy. It is extremely difficult in small spot treatment scenarios to keep a sufficient herbicide concentration exposure time (CET) to be effective. Therefore, for the first time since coordinated active management began in 2007, herbicide control strategies did not occur on the Eagle River Chain of Lakes in 2016.

The management strategy for the Eagle River Chain of Lakes has evolved into a strategy to maintain the positive strides in reducing the EWM population. The difficulty of any maintenance strategy is to balance a level of EWM population tolerance while not allowing the population to return to pre-management levels. The ULERCLC did not want to abandon management and simply wait for EWM populations to reach levels that are again applicable for herbicide control. Therefore, the ULERCLC entertained the applicability of a hand-harvesting program for 2016.

The ULERCLC gave consideration to multiple types of hand-harvesting. While volunteer efforts have their role in the management of many lakes, the ULERCLC decided that hiring a third-party firm to conduct these efforts would be appropriate for a pilot program. This would insure they would have an appropriate amount of effort (i.e. person-hours). Traditional hand-harvesting consists of a trained snorkelers or divers to swim to the bottom of the lake and extract an individual EWM plant, roots and all. The plants are transported to the surface one at a time, or are put in a mesh bag underwater until brought to the surface. While on the surface, the plants are placed onto a transport boat until disposal.

Where water clarity is high and target plants are growing in deeper water, a Diver Assisted Suction Harvesting (DASH) program is generally recommended. During this process a scuba diver manually extracts the plant (roots and all) and then feeds the removed plants into vacuum tube that transports the plant to a bin on a boat. They do not, however, simply vacuum the plants up, as that would also take in large amounts of sediment and would be considered suction dredging (requires elaborate permitting). A mechanical harvesting permit from the WDNR is needed (fee of \$30 per acre) to use the DASH system. The DASH system is said to be more efficient, as the diver does not have to go to the surface to hand the pulled plants to someone on a boat. The DASH system also is theorized to cause less fragmentation, as the plants are immediately transported to the surface using the vacuum technology. However, the costs of conducting hand-harvesting with one of these firms is more expensive than just hiring trained divers and/or snorkelers.

Hand-harvesting control methods may pose a challenge on the chain due to dark stained water and plethora of native plants in the targeted areas. Because of these factors, using a DASH system on some parts of the Eagle River Chain of Lakes may not be worth the extra costs of implantation. Also, the agility of having professional divers/snorkelers may be advantageous. For these reasons, the ULERCLC piloted a professional-based hand-harvesting program in 2016 using a traditional hand-harvesting approach. Onterra's initial recommendations were to target areas in Voyageur Lake for this pilot program in 2016. The EWM colonies were relatively small and low-density, ideal for this control strategy. These locations were also within one of the higher areas of flow in the system and may not be applicable to future herbicide control strategies.

During the 2016 Early Summer AIS Survey (ESAIS), the mapping of the EWM populations within this part of the chain were refined and a final hand-harvesting strategy was derived (Map Voy 1). Onterra provided the hand-harvesting firm with the with the spatial data from the ESAIS Survey to coordinate the removal efforts.

As is discussed specifically within the Voyageur Lake Summary and Conclusions Section (4.5), the professional hand-harvesting actions occurred on Voyageur Lake over three days during July. The hand-harvesting strategy appeared to be moderately effective in controlling the EWM

population at the targeted sites with an overall reduction in EWM observed between the early-July ESAIS survey and the August EWM Peak-Biomass survey.

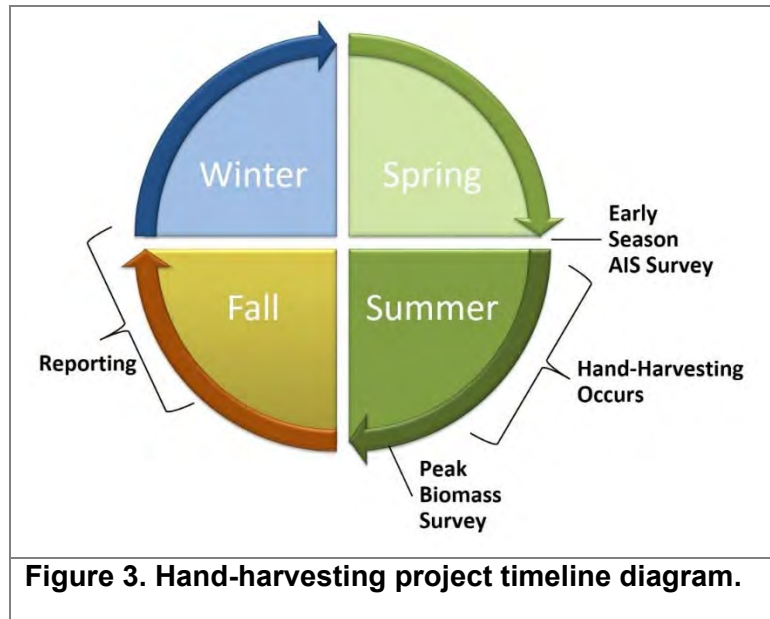


Figure 3. Hand-harvesting project timeline diagram.

3.0 2017 PRELIMINARY CHAIN-WIDE EWM CONTROL STRATEGY

The population of EWM continues to be widespread throughout the Eagle River Chain of Lakes with the majority of occurrences consisting of either point based or low density, polygon based colonies. At current, no areas of the lake exceed the threshold or “trigger” previously developed for implementing herbicide control actions in 2017. Several colonies of EWM in Watersmeet are approaching levels that may meet the predefined trigger. However, these EWM colonies are in areas of high flow where past spot-treatments have produced only short-term successes. Large-scale herbicide efforts have had longer-term results in these areas, but the current level of EWM within Watersmeet is far below levels that would justify this herbicide use pattern. A few locations within the upstream Cranberry Channel are also beginning to see an increase in the EWM population since the spring 2015 treatment, where the plants are forming large enough colonies such that area-based mapping techniques are used.

Based on the results of the 2016 professional hand-harvesting program, the ULERCLC would like to build upon the positive strides gained in 2016 through increasing the amount of professional hand-harvesting effort devoted to EWM control during the 2017 growing season. A preliminary hand-harvesting EWM control strategy for 2017 includes both DASH and traditional hand-harvesting methods. The ULERCLC has identified an EWM population in Scattering Rice Lake in which to implement a DASH harvesting methodology at two sites mapped during the late-summer 2016 survey (Map Scat 1). The ULERCLC would like to target EWM colonies within Voyageur and Watersmeet Lakes through conventional divers in 2017. An Early Summer AIS Survey (ESAIS) will be conducted in 2017 from which a final hand-harvesting strategy would derive. Onterra will provide the hand-harvesting firm with the spatial data from the early-July survey to aid the removal efforts. Following the hand removal efforts, a Late-Summer EWM Peak Biomass Survey will qualitatively assess the hand harvesting efforts (Figure 3).

4.0 INDIVIDUAL LAKE SECTIONS

The remainder of this report will focus on 2016 EWM monitoring and control strategy assessments (if applicable) on a lake-by-lake basis. Some of the text may seem redundant if one reads each lake section. However, this is intentional to ensure the information is portrayed to those that just read the chain-wide sections and their individual lake-specific section.

4.1 Cranberry Lake Summary and Conclusions

A concerted effort has been made to control the EWM population within the Eagle River inlet to Cranberry Lake (Photo 1). This part of the chain has been targeted for control from 2007-2013, with mostly seasonal control being achieved. This suggests that appropriate concentration and exposure times (CETs) were not met to kill the EWM, rather plant injury suppressed growth for the season. In 2014, the decision not to target this part of the lake was made based upon these past efforts.



Photo 1. Cranberry Lake Channel.

The development of a study to understand the water flow rate and direction in this area was developed and implemented for the spring of 2015 and is fully discussed within the *2015 EWM Monitoring and Control Strategy Assessment Report*. The study found that water velocities were higher in upstream areas and near the river channel. For the most part, the water flow direction was parallel with the river channel near where the sample was collected. The data also indicate that water movement was much lower on inside bends of the river channel, where most of the EWM exists within this part of the system. Coordination with the Wisconsin Valley Improvement Company (WVIC) was undertaken to lower the flow rate through the Burnt Rollways Dam for the time period surrounding the 2015 herbicide treatment in an effort to increase herbicide exposure times in the targeted area. Herbicide concentration monitoring data collected in association with the 2015 treatment indicated that the herbicide CETs were met for control in the treatment areas, and post-treatment surveys conducted during the late-summer of 2015 indicated successful EWM control was achieved during the year-of-treatment (Figure 4).

During the early-summer survey, the entire littoral zone of the Eagle River Chain of Lakes was searched for EWM by Onterra field staff. Completing the Early-Season AIS (ESAIS) Surveys present numerous advantages. Typically, the water is clearer during the early summer allowing for more effective viewing of submersed plants. While not at their peak growth stage (peak biomass), EWM plants are higher in the water column than most native plants during this time of year which increases the chances that even low-density and isolated EWM occurrences would be located.

The results of Onterra's ESAIS survey were loaded onto specific ULERCLC GPS units and trained volunteers were challenged to locate additional EWM occurrences within the chain during the remainder of the summer. The volunteer data were provided to Onterra prior to the late-summer 2016 EWM surveys and integrated into the onboard GPS-enabled computer system.

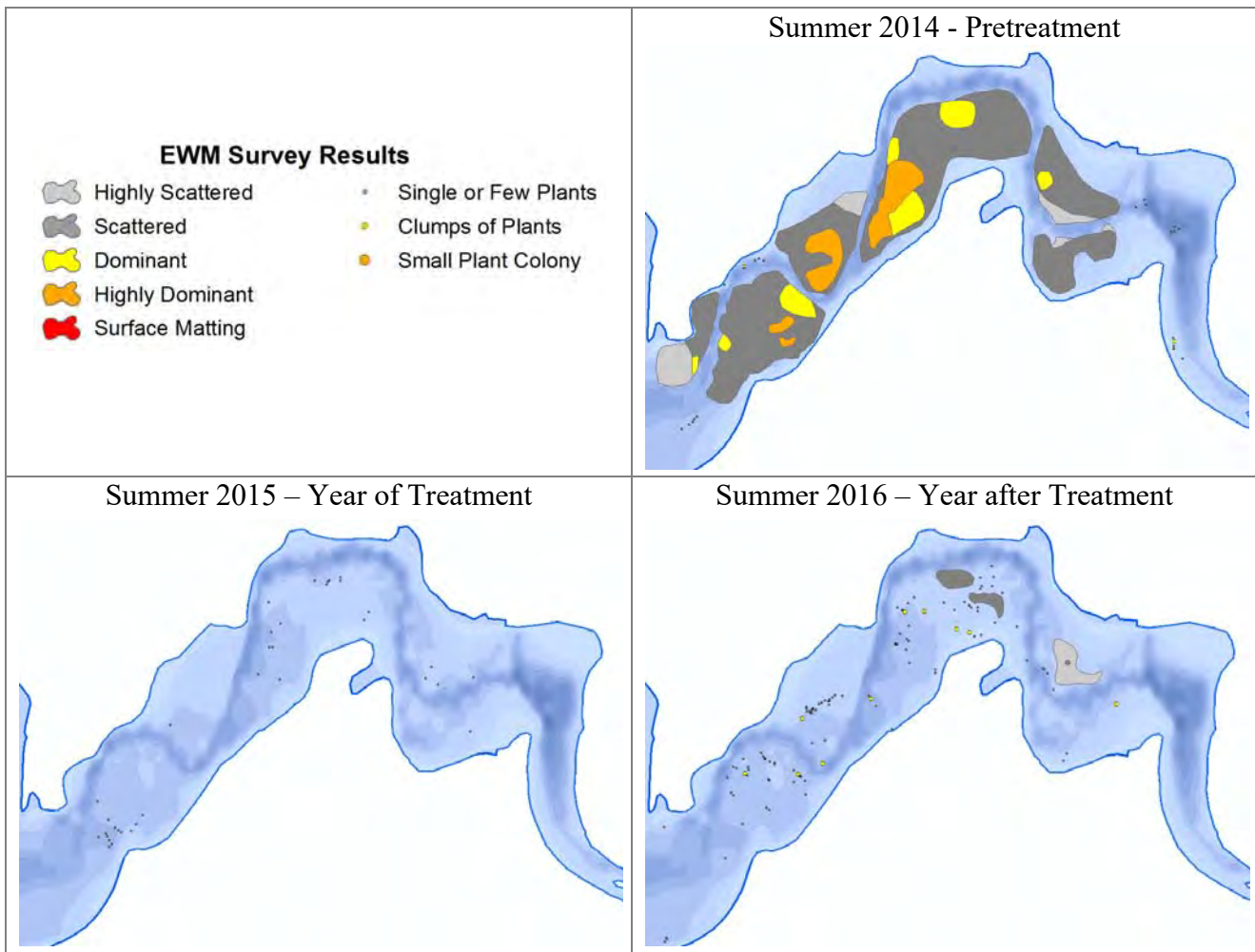
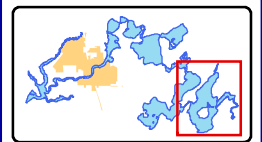
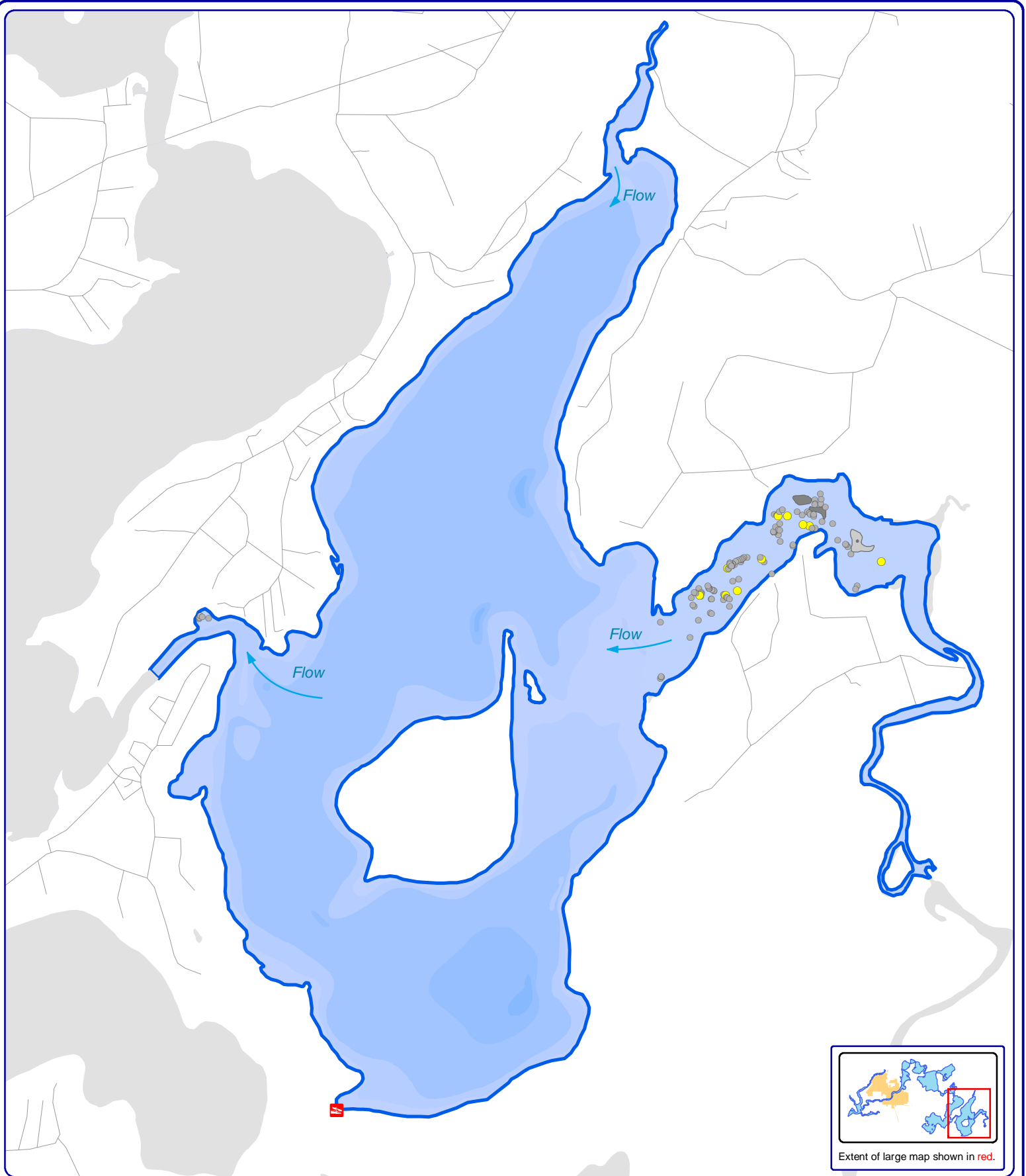


Figure 4. Late-summer EWM populations within the Eagle River inlet to Cranberry Lake.

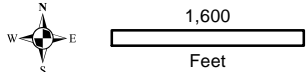
During the Late-Summer 2016 EWM Peak-Biomass Survey, Onterra field crews visited the following areas: all 2015 final herbicide treatment sites, all EWM locations that were located during the Early-Summer ESAIS Survey, and all EWM locations the volunteers located during their mid-summer surveys.

Within Cranberry Lake, the majority of the EWM was mapped within the channel in the 2015 herbicide treatment area, and consisted of small *scattered* or *highly scattered* colonies as well as several point-based EWM occurrences including *single or few plants* and several *clumps of plants* (Figure 4, Map Cran 1). A few *single or few plants* were located in the channel leading into Catfish Lake and EWM was not located anywhere else in Cranberry Lake during the late-summer 2016 survey.

The EWM mapped in the former herbicide treatment area in the channel of Cranberry Lake is beginning to show signs of re-establishment or recovery however remain far below the pre-treatment levels observed in 2014. This area will continue to be monitored in 2017 and control strategies, if necessary will be developed for 2018.



Extent of large map shown in red.



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

Sources:
 Roads and Hydro: WDNR
 Aquatic Plants: Onterra, 2016
 Map Date: October 25, 2016
 Filename: Cran_EWMPB_2016.mxd

- Legend**
2016 EWM PB Survey (September 2016)
- Highly Scattered
 - Scattered
 - Dominant
 - Highly Dominant
 - Surface Matting
 - Single or Few Plants
 - Clumps of Plants
 - Small Plant Colony

Cran 1
Cranberry Lake
 Vilas County, Wisconsin
2016 EWM PB
Survey Results