

Early-Season AIS Survey (ESAIS Survey)

On July 3, 2013, three Onterra field crews (3 boats) visited Anvil Lake to complete an early-season aquatic invasive species (ESAIS) survey as part of the Wisconsin Department of Natural Resources (WDNR) grant funded Aquatic Invasive Species (AIS) Early Detection and Response project. While Eurasian water milfoil (EWM, *Myriophyllum spicatum*) surveys are normally conducted later in the summer to coincide with its peak growth, this survey was completed in the early-summer survey so the Anvil Lake Association (ALA) hand-harvesters could better allocate their time to removing EWM, rather than searching for suitable areas to conduct the hand-removal control strategy.

All of the early-July 2013 findings were marked point-based mapping techniques. If EWM colonies exceeding 40-feet in diameter would have been located, area-based (polygon) mapping methods would have been utilized. This mapping technique involves delineating the extents of the colony and rating its density on a 5-tiered density scale

The largest EWM occurrences located during this survey was a dense 40-foot diameter colony in found in relatively deep water (8-9 feet) within the North Bay (Map 1). Onterra ecologists were discouraged by this finding, immediately taking two ALA volunteers to the location after discovery. While locating numerous EWM plants within the North Bay, fewer *Single or Few Plants* were encountered within the shallow parts (< 4 feet) of this bay in comparison with the previous year. This was attributed to successful volunteer-based hand-harvesting efforts that were focused along the shallow margins of this bay.

Another purpose of this survey was to locate any potential occurrences of the invasive curly-leaf pondweed (CLP, *Potamogeton crispus*) as this is when this plant is at or near its peak growth. Unfortunately, field crews did locate a small clump and a few individuals of CLP (Map 1). While this occurrence is mostly near/under a dock, people should resist the temptation of linking that riparian to the cause of this new population. It is most likely that this invasive plant species came into the lake as a hitch-hiker on a boat launched at the landing and it just happened to float to this location before it fell to the bottom and sprouted.

CLP is a European exotic first discovered in Wisconsin in the early 1900's that has an unconventional lifecycle giving it a competitive advantage over our native plants. CLP begins growing almost immediately after ice-out and by late-summer is at peak biomass. While it is growing, each plant produces many turions (asexual reproductive shoots). By mid-July most of the plants have senesced, or died-back, leaving the turions to float away and eventually end up in the sediment. The turions lie dormant until autumn when they germinate to produce winter foliage, which thrives under the winter snow and ice. It remains in this state until spring foliage is produced almost immediately following ice-out, giving the plant a significant jump on native vegetation. CLP can become so abundant that it hampers recreational activities within the lake. Furthermore, its mid-summer die back can cause algal blooms spurred from the nutrients released during the plant's decomposition.

More information on CLP can be found on the WDNR's website:

<http://dnr.wi.gov/topic/Invasives/fact/CurlyLeafPondweed.html>.

Soon following the distribution of the ESAIS survey results, Onterra provided the ALA with an updated GPS basemap of their AIS findings. With the aid of the grant-funded GPS unit, ALA volunteers immediately focused hand-harvesting efforts on these CLP locations. Annual follow-up surveillance monitoring and potentially hand-harvest efforts will be important to ensure this species does not gain foothold within Anvil Lake.

Hand-harvesting Control Methods

While Onterra ecologists believe the volunteer-based hand-harvesting was having a positive outcome in the shallow parts of the North Bay, EWM expansion was occurring in waters greater than 4-feet deep. After numerous correspondences between ALA members, Onterra ecologists, and the WDNR; a decision to solicit professional hand-harvesting services was made. Using available online resources (i.e. Google Earth), an ALA volunteer used GPS data to approximate hand-harvesting areas to be used by Many Waters, LLC using their Diver-Assisted Suction Harvester (DASH). These areas are shown on Maps 1 and 2. The DASH system involves divers hand-removing the EWM plants, then inserting the removed biomass into a suction hose to be delivered up to the deck of a boat. Because this technique utilizes a mechanical device, a WDNR Mechanical Harvesting Permit is required. Please note that A-13 was added to the control strategy based upon the results of an ALA-initiated scuba survey.

Late-Season EWM Survey

As discussed above, EWM continues to grow and spread throughout the summer. For this reason, a late-summer EWM survey was conducted to understand the peak growth (peak biomass) of the EWM population during 2013. On September 17, 2013 Onterra ecologists meandered the entire littoral zone of Anvil Lake. With previous EWM survey data integrated into the onboard computer system, additional attention was focused on known hotspots of EWM.

During the meander survey, two EWM plants were located on the far southwest part of the lake (one in a previously noted location) and one EWM plant along the northeastern shore, a short distance south of the northern bay (Map 2). The survey also located numerous *Single or Few Plants* and *Clumps of Plants* within the northern bay of the lake.

After completion of the boat survey, two crew members donned scuba equipment and dove the three areas where hand harvesting using the DASH system was conducted. The survey did not yield any EWM within B-13, indicating the 0.5 hours of effort conducted within this area resulted in effective control. Many Waters reported 4 lbs of hydrated EWM was removed within this site, with a negligible amount of native plant bi-catch. However, the scuba survey located a few single EWM plants in the vicinity of where these activities took place (Figure 1).

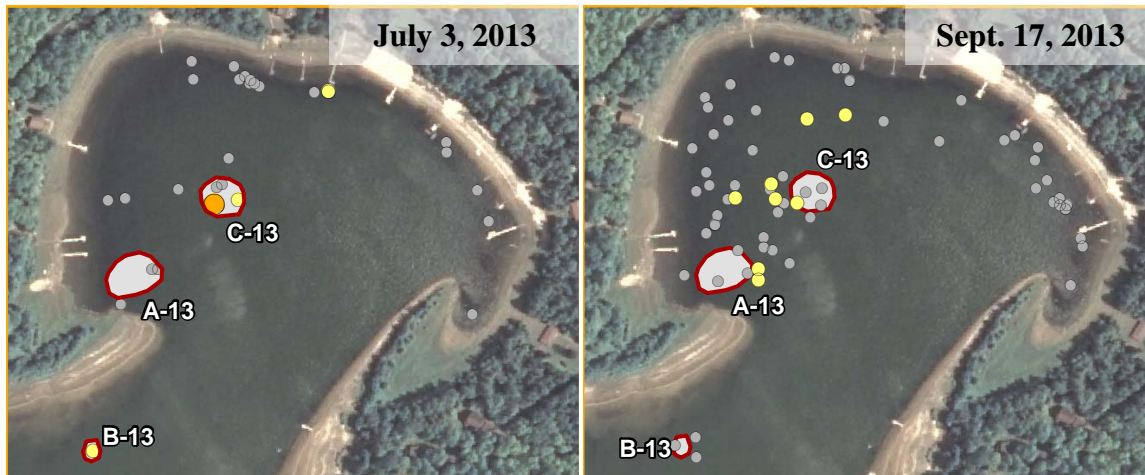


Figure 1. North Bay EWM locations from July 2013 and September 2013 surveys. Gray Point = Single or Few Plants; Yellow Point = Clumps of Plants; Orange Point = Small Plant Colony (approx. 40-ft diameter). Red outlined areas are where DASH activities took place.

Figure 1 shows that numerous *Single or Few Plants* and one *Clump of Plants* was located within C-13, greatly reduced from the *Small Plant Colony* that was located in this area prior to control actions taking place. While complete control was not achieved in this location, only 1 hour of effort was applied in this area. During that time period, 19 lbs of EWM and 11 lbs of native plants were removed.

A small number of *Single or Few Plants* were located within A-13 following the hand-harvesting efforts. Divers spend 2.5 hours in this one-third acre location. In total, 71.5 lbs of EWM and 19.75 lbs of native plants were removed from this site. As noted above, ALA scuba surveys located numerous short-statured plants within this site that escaped detection during the ESAIS survey. Therefore, direct comparisons between the two surveys cannot be made.

As reported by Many Waters, wild celery (*Vallisneria americana*) was the main bi-catch during the harvesting efforts. During Onterra's scuba survey, the thick carpet of wild celery was observed to be a little thinner and dotted with bare spots within the DASH areas. This is an expected result of this treatment method, especially when conducted late in the year when these native plants are also at their peak growth stages.

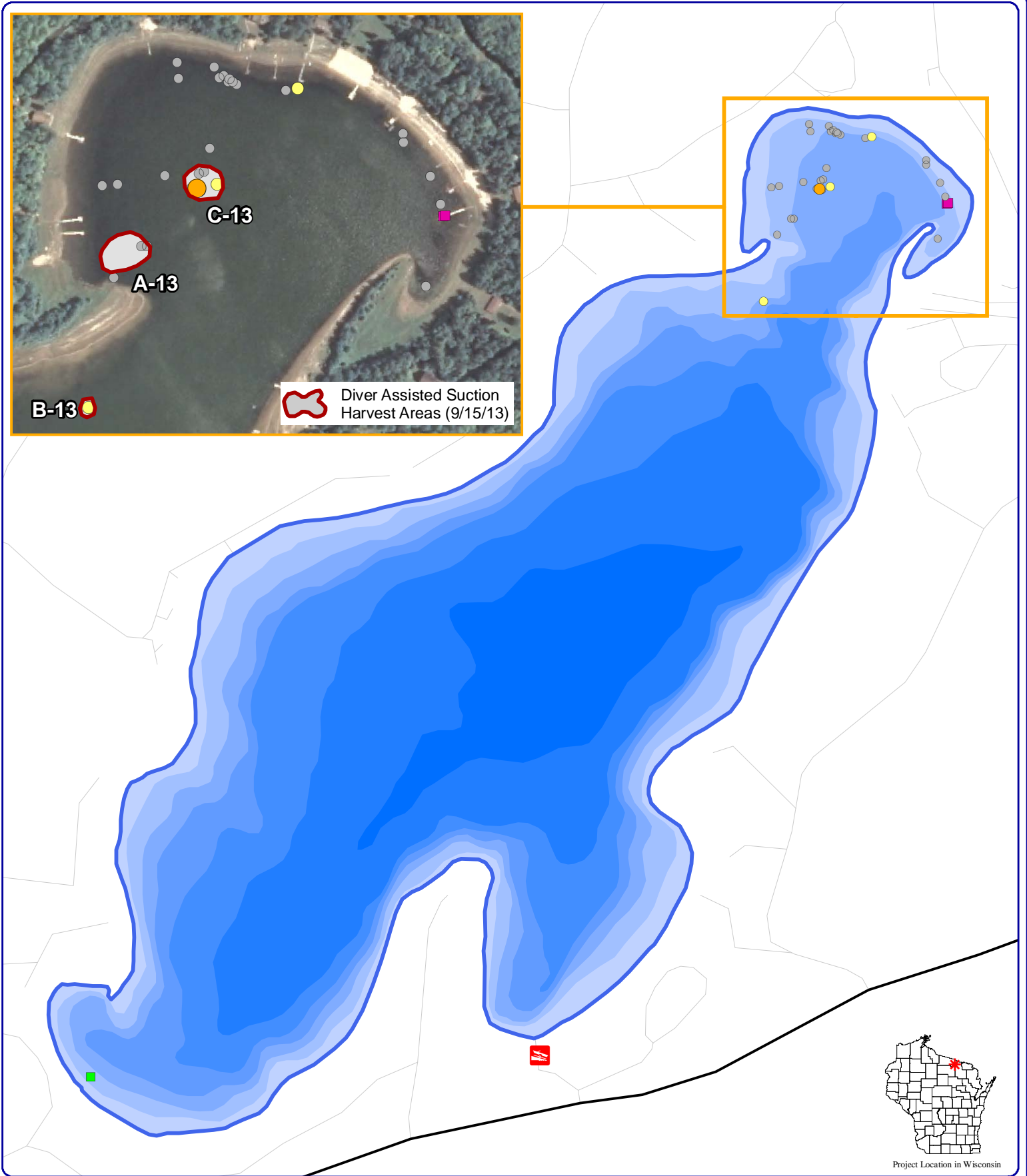
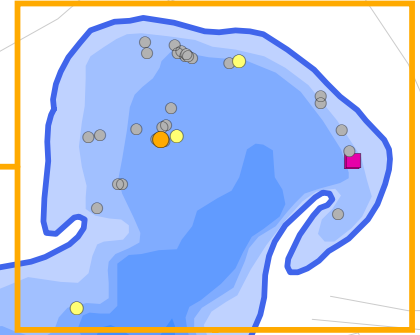
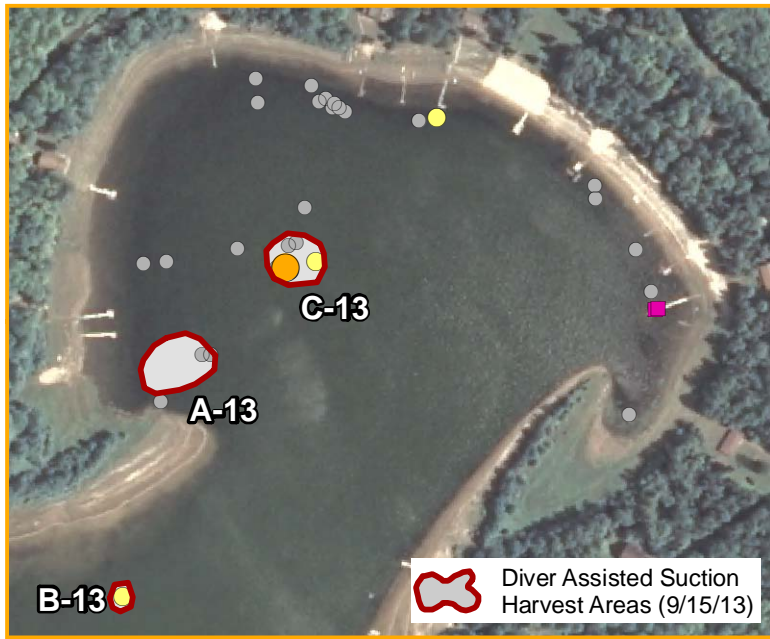
2013 Conclusions

Overall, the 2013 EWM control program on Anvil Lake was met with encouraging results. Great strides were made by utilizing 4 hours of the DASH system. The ALA learned how to navigate the WDNR permit system and developed a relationship with a hand-harvesting firm. While a step in the right direction, Map 2 clearly shows that these efforts were not sufficient to impact the EWM population as a whole on Anvil Lake.

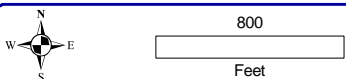
The flaw of many hand-harvesting programs is not due to a faulty technique; rather an insufficient amount of effort is conducted to achieve the desired goals. Therefore, a 2-tiered hand-removal program is proposed for Anvil Lake in 2014. Volunteer-based hand-removal methods would continue to focus in the shallow margins of the North Bay, as well as the isolated occurrences located outside of

the North Bay. Prior to spring 2014, the ALA's GPS will be updated with the results of the 2013 late-summer EWM survey to guide these efforts. The remainder of the North Bay is recommended to be targeted with professional hand-removal services, at a significantly greater effort than was applied in 2013. These activities could begin in late-spring and would be monitored and coordinated by Onterra's two EWM mapping surveys (late-spring and late-summer) that are scheduled to occur. Onterra would also aid in creating the mechanical harvesting permit maps and supplying that spatial information to the hand-harvesting firm.

Dovetailing with the numerous projects currently occurring on Anvil Lake, including the AIS Early Detection and Response Project and the USGS Watershed Study, the ALA is encouraged to investigate the creation of an updated comprehensive lake management plan. This process will result in a holistic understanding of the Anvil Lake ecosystem that includes assessments of the water quality, watershed, shoreline condition, fisheries, native aquatic plant communities, and stakeholder perceptions. As indicated above, some of these study components have been or already being addressed and would be incorporated into the larger planning effort. An important component of this process will allow the ALA to objectively review their ongoing management activities and establish measurable success criteria standards to evaluate future AIS control efforts. A WDNR-approved lake management plan would also align the ALA to be eligible to apply for future WDNR grants to continue to help fund their management efforts.



Project Location in Wisconsin



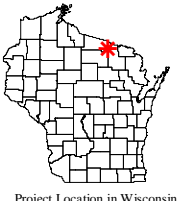
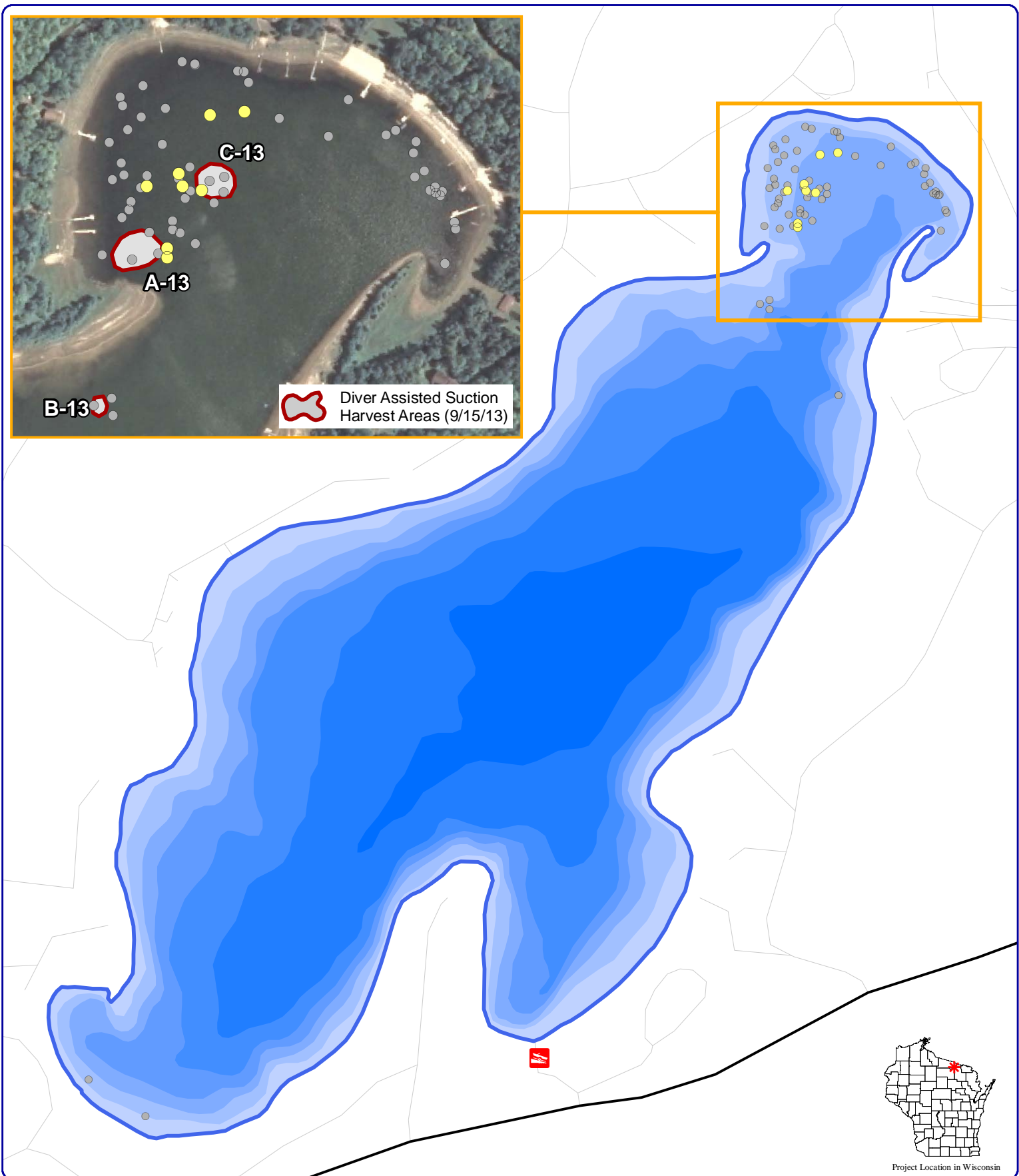
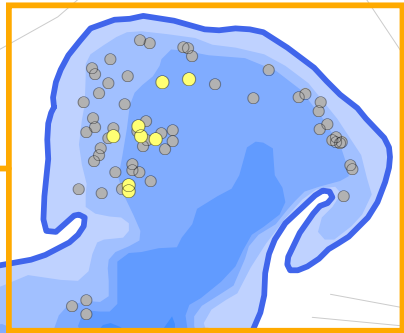
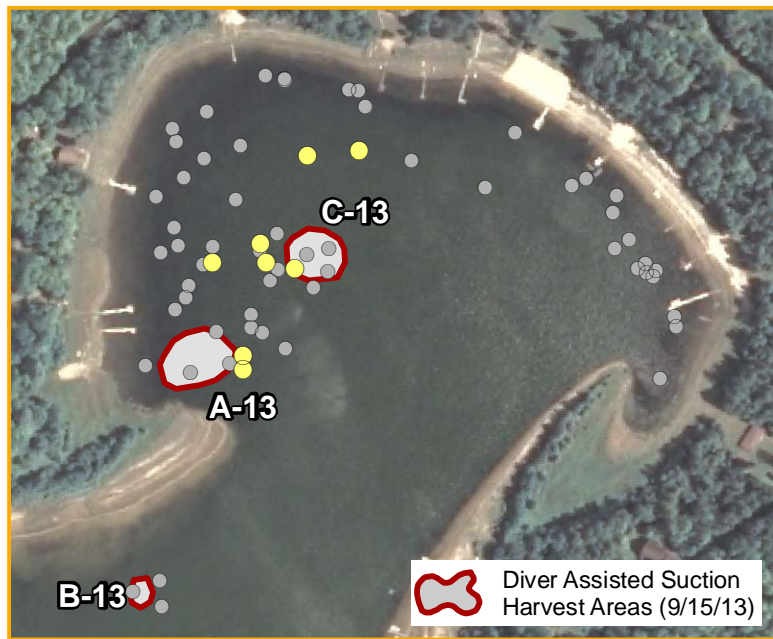
Onterra LLC
 Lake Management Planning
 815 Prosper Road
 De Pere, WI 54115
 920.338.8860
 www.onterra-eco.com

Sources:
 Roads & Hydro: WDNR
 Orthophotography: NAIP 2010
 Aquatic Plant Survey: Onterra, 2013
 Map date: July 3, 2013

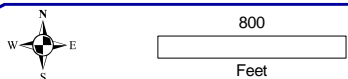
Legend

- | | |
|---|--|
| EWM Locations (Onterra, 7/03/13) | EWM Locations (Anvil Lake Assoc.) |
| ● Single or Few Plants | ■ Single Plant Hand-removed |
| ● Clump of Plants | ■ CLP Locations (Onterra, 7/03/13) |
| ● Small Plant Colony | ■ Clump of Plants |

Map 1
Anvil Lake
 Vilas County, Wisconsin
2013 ESAIS
Survey Results



Project Location in Wisconsin



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 De Pere, WI 54115
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Sources:
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 Orthophotography: NAIP 2010
 Aquatic Plant Survey: Onterra, 2013
 Map date: September 17, 2013

Legend
EWM Locations (Onterra, 9/17/13)

- Single or Few Plants
- Clump of Plants
- Small Plant Colony

Map 2
Anvil Lake
 Vilas County, Wisconsin
2013 Late-Summer
EWM Survey Results