Wisconsin Department of Natural Resources
Aquatic Invasive Species Grant Program
Grant # ACEI-150-14

2014 Lac Vieux Desert Aquatic Invasive Species Control Program

Lac Vieux Desert - Vilas County, WI and Gogebic County, MI

Annual Reporting

Submitted To:
Lac Vieux Desert Home Owners Association
P.O. Box 432
Land O' Lakes, WI 54540

And

Wisconsin Department of Natural Resources
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Submitted By:
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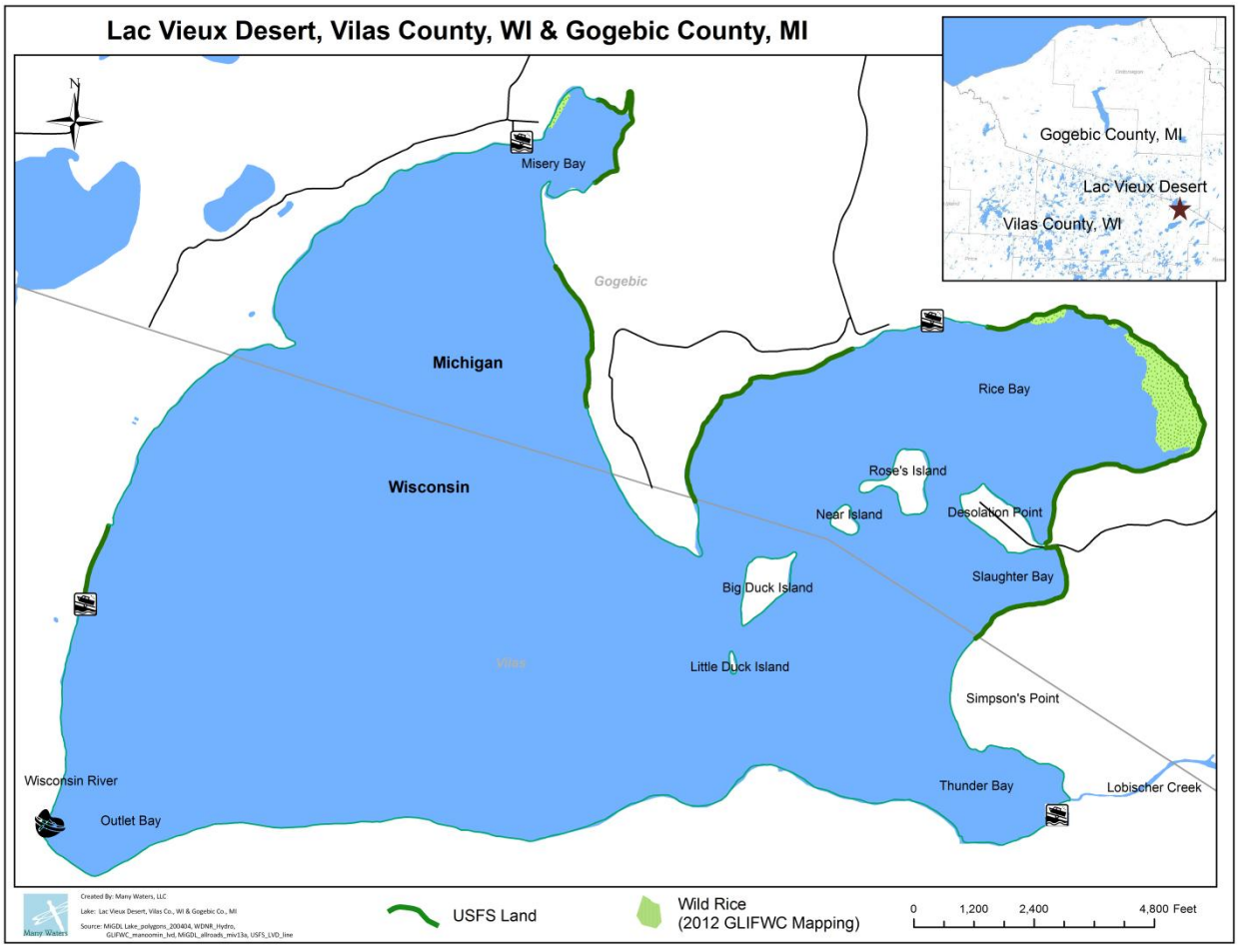
PROJECT AREA

Lac Vieux Desert, located in Vilas County, WI and Gogebic County, MI is 4,247 acres and serves as the headwaters to the Wisconsin River (LVD, Comprehensive Management Plan, 2012). Lac Vieux Desert is the largest lake in Vilas County and the second largest lake in Gogebic County after Lake Gogebic. Riparian ownership includes USFS Ottawa National Forest, USFS Nicolet National Forest, the Lac Vieux Desert Band of Lake Superior Chippewa, Michigan Department of Natural Resources (MDNR), Wisconsin Department of Natural Resources (WDNR), Wisconsin Valley Improvement Company and MI and WI riparians. Wisconsin Valley Improvement Company owns and operates a water level control structure at the outlet to the Wisconsin River.

Project Location



OVERVIEW

In 2014, the Lac Vieux Desert Lake Association (LVDLA) received a Wisconsin Department of Natural Resources (WDNR) Aquatic Invasive Species Established Population Control Grant to manage for Eurasian watermilfoil (EWM) on Lac Vieux Desert. These funds will assist in management efforts for the proposed project period from 2014 to 2017. This report is an annual update of progress and work completed as detailed under the proposed project scope for 2014. Specifically this report is a synthesis of (1) aquatic invasive species (AIS) monitoring efforts and findings, (2) management strategies and efforts, (3) and summary of lake stewardship and AIS prevention activities.

Through dialog amongst stakeholders, the foremost shared concern with the traditional management of EWM using aquatic herbicides are unknown non-target impacts to wild rice (*Zizania palustris*). At this time, there is a mutual understanding that to provide added protection to wild rice, the management of aquatic invasive species on Lac Vieux Desert will not include the use of aquatic herbicides. The chosen strategy discussed and favored by stakeholders is to manage EWM on Lac Vieux Desert with hand removal. This strategy is selective at removing the target species and is consistent with options that would provide the desired level of protection to wild rice at this time.

Hand removal includes two methods: the use of divers alone and the use of divers with Diver Assisted Suction Harvesting equipment. Hand removal alone, does not require a permit from the State of Wisconsin, however requires a joint MDEQ/USACE permit from the State of Michigan. The use of DASH requires a joint MDEQ/USACE permit from the State of Michigan and a Mechanical Harvesting permit from the State of Wisconsin.

MONITORING

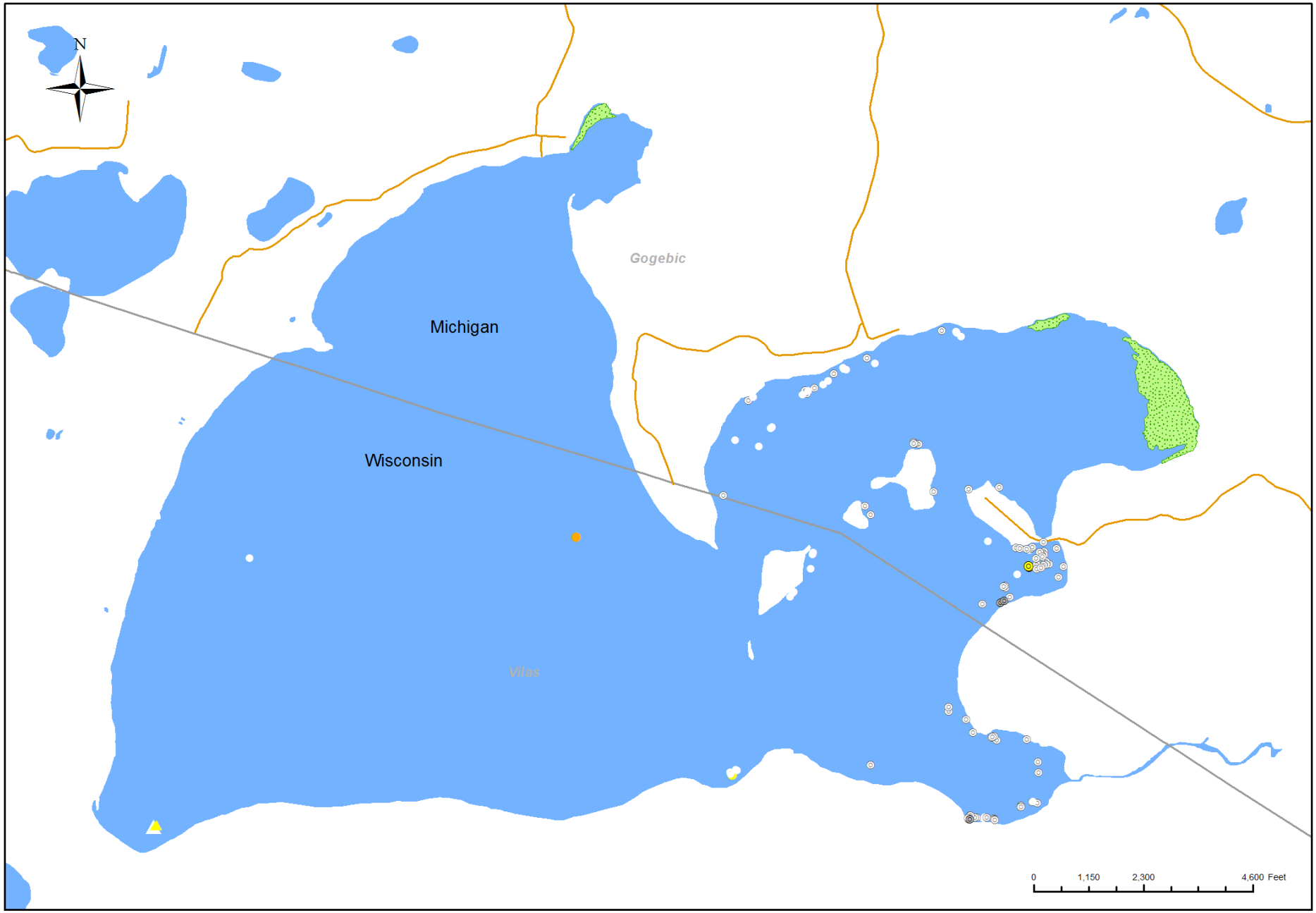
Monitoring efforts on Lac Vieux Desert comes with challenges. These challenges include weather, primarily winds and waves across a large fetch that limit prime surveying windows. Furthermore, the majority of Lac Vieux Desert can support aquatic vegetation, making survey efforts a substantial under taking. Monitoring Lac Vieux Desert in 2014 was a combined effort with Great Lakes Indian Fish and Wildlife Commission (GLIFWC), the Invasive Species Control Coalition of Watersmeet (ISCCW) and Many Waters. GLIFWC and the ISCCW contributed to the first or early season portion of efforts, whereas Many Waters, complete the second portion or mid-late season efforts.

Early season monitoring for curly-leaf pondweed (CLP) and EWM took place on Lac Vieux Desert during the months of May and June. Efforts found curly leaf pondweed at previously documented areas at the outlet area to the Wisconsin River and several previously known EWM locations of Lac Vieux Desert from Duck Point south and to the east into Rice Bay, Slaughter Bay, Simpson's Point and Thunder Bay. The early season survey detected several new EWM locations primarily all within Thunder Bay. The second mid to late summer survey completed by Many Waters, LLC took place in July and August. Efforts found several new locations of EWM in portions of the lake where EWM had not previously occurred. These sites include a low-density location of a few individual plants along the west shore, a moderate to dense bed

located west of Duck Point and several low to moderate density locations along the south shore west of those found in 2013.

Table 1: Estimated qualitative density rankings

Very Low	Typically consists of less than 10 plants visually observed, unless otherwise noted. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area.
Low	Typically consisted of 10-20 plants visually observed, unless otherwise noted. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area.
Moderate	Typically consists primarily of EWM with some native vegetation visually observed to be intermixed. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area.
Moderate-Dense	Typically consists of dominant EWM with little observed native vegetation intermixed. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area.
Dense	Dominant EWM, with little to no native vegetation observed. Dense locations may or may not have surface matting depending on the time of year. Extent varies and is estimated visually for smaller locations and noted. Larger locations are delineated using GPS to calculate area. (Note: No dense areas of EWM have been found on Lac Vieux Desert to date.)



Lake: Lac Vieux Desert – Vilas Co., WI & Gogebic Co., MI
Map Date & Creator: 2.6.2015, Many Waters, LLC
Source: MiGDL Lake_polygon_200403, WI Hydro, ESRI base maps, GLIFWC manoomin_lvd_wgs84, MiGDL allroads_miv13a
File: LVD_2014_EW_MS_Mapping

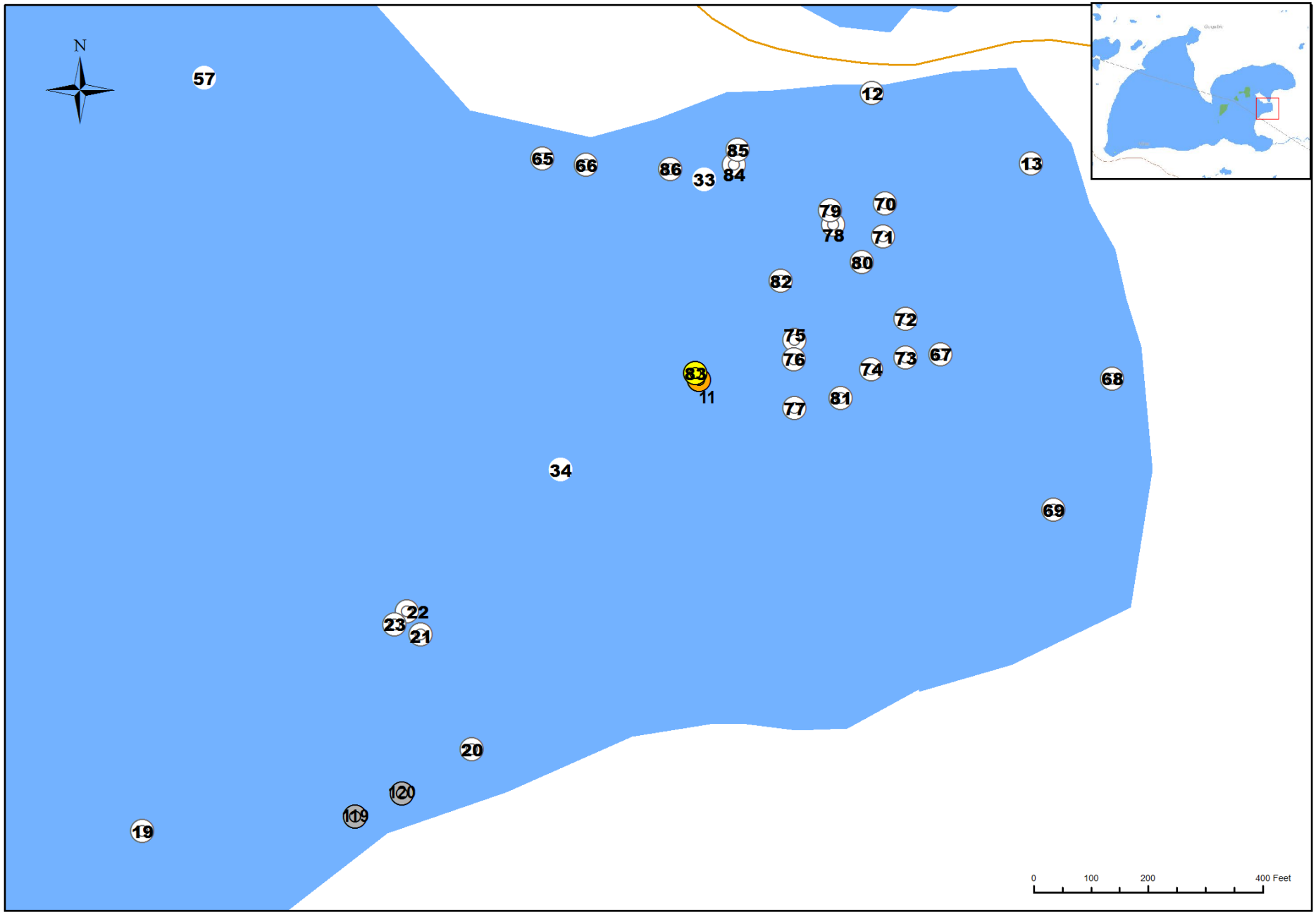
EWM Density Mid Season Survey
- Very Sparse
- Sparse
- Moderate
- Moderate-Dense
- Dense (none)

EWM Density Early Season Survey
- Very Sparse
- Sparse
- Moderate
- Moderate-Dense
- Dense (none)

CLP Density
- Very Sparse
- Sparse (none)
- Moderate
- Moderate-Dense (none)
- Dense (none)

Wild Rice (2013)

Lac Vieux Desert 2014 EWM Locations Overview



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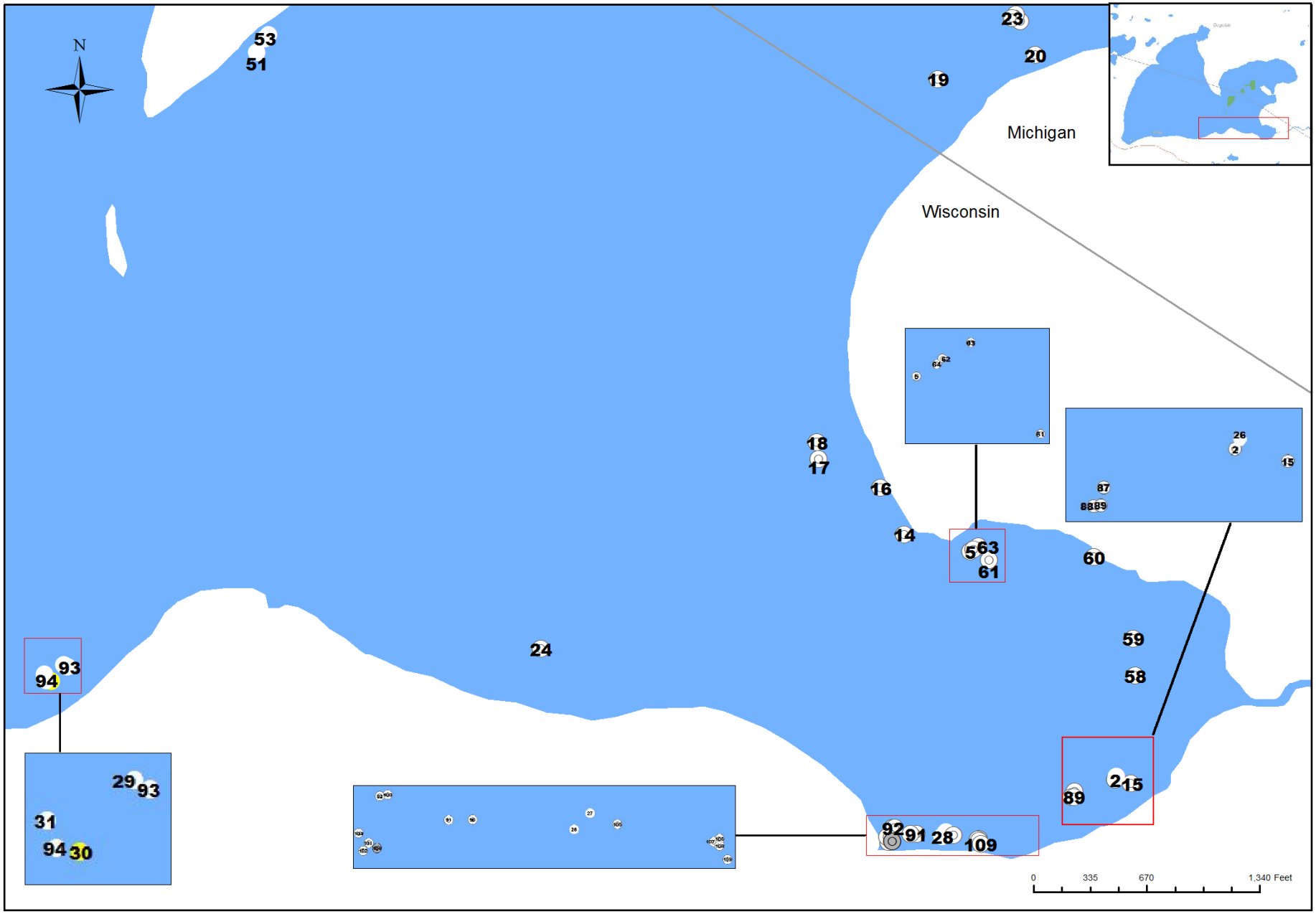
EWM Density Mid Season Survey

- Very Sparse
- Sparse
- Moderate
- Moderate-Dense
- Dense (none)

EWM Density Early Season Survey

- Very Sparse
- Sparse
- Moderate
- Moderate-Dense
- Dense (none)

Lac Vieux Desert
2014 EWM Locations
Slaughter Bay



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Source: MiGDL Lake_polygon_200403, WI Hydro, ESRI base maps, GLIFWC manoomin_lvd_wgs84, MiGDL allroads_miv13a
File: LVD_2014_EW_MS_Mapping

Location

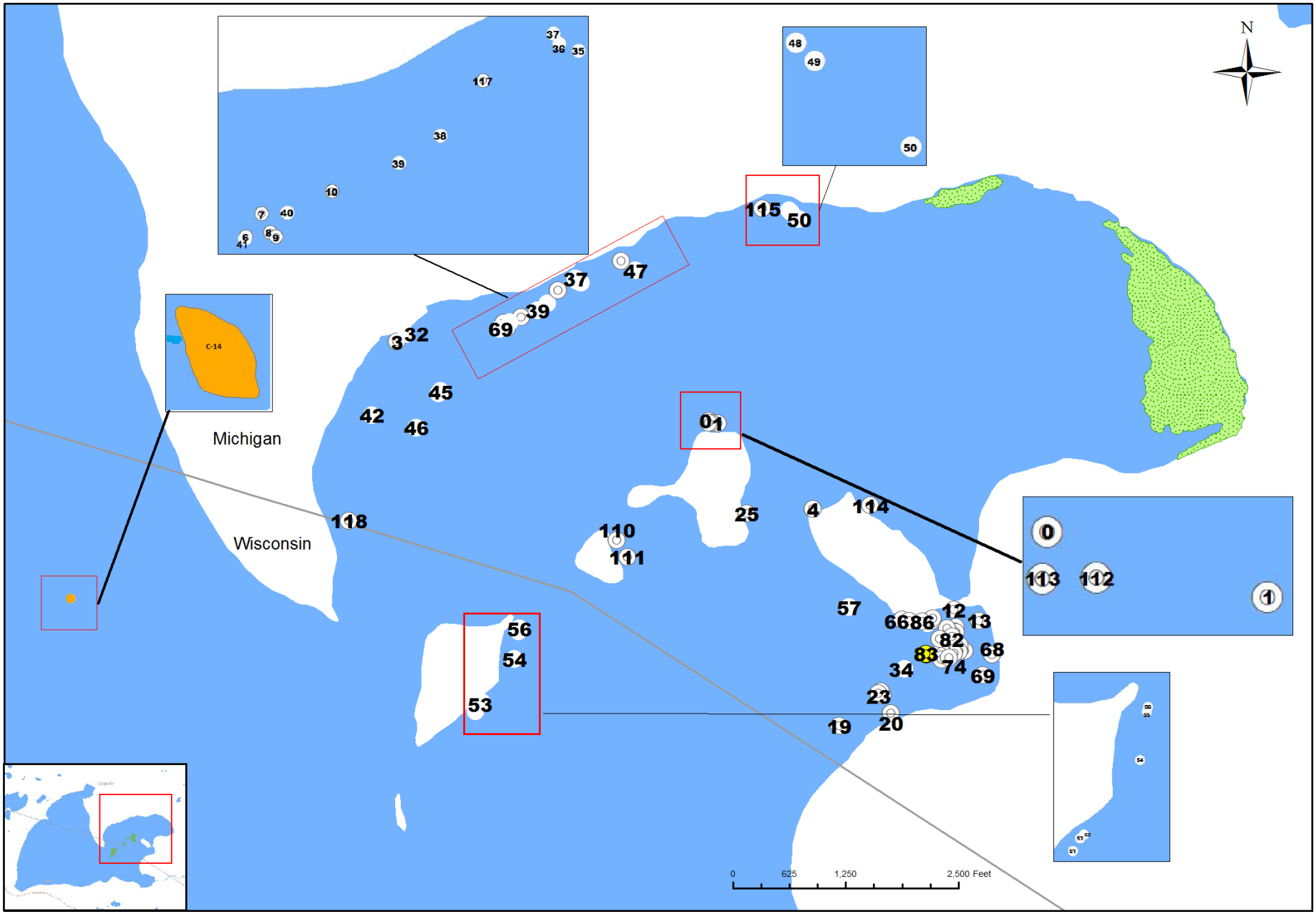
EWM Density Mid Season Survey

- Very Sparse
- Sparse
- Moderate
- Moderate-Dense
- Dense (none)

EWM Density Early Season Survey

- Very Sparse
- Sparse
- Moderate
- Moderate-Dense
- Dense (none)

Lac Vieux Desert
2014 EWM Locations
South Shore & Thunder Bay


N
Michigan
Wisconsin
C-14
0 625 1,250 2,500 Feet
Location
EWM Density Mid Season Survey
Very Sparse
Sparse
Moderate
Moderate-Dense
Dense (none)
EWM Density Early Season Survey
Very Sparse
Sparse
Moderate
Moderate-Dense
Dense (none)
Wild Rice (2013)
Lake: Lac Vieux Desert – Vilas Co., WI & Gogebic Co., MI
Map Date & Creator: 2.6.2015, Many Waters, LLC
Source: MiGDL Lake_polygon_200403, WI Hydro, ESRI base maps,
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File: LVD_2014_EW_MS_Mapping
Lac Vieux Desert
2014 EWM Locations
Rice Bay, Duck Point and Islands

2014 MANAGEMENT STRATEGIES

To determine whether a site is controlled using hand removal alone versus DASH, several factors are considered. DASH improves the efficiency of hand removal at locations when multiple large to very large EWM plants exist (especially later in the season) and when larger patches or continuous beds of EWM exist. Hand removal is preferred when locations consist of isolated individual or low-density EWM plants, when low-density plants are scattered over a larger area and swimming with divers is more efficient, and when set up and break down of the DASH boat is more effort than the actual time using DASH.

Hand Removal

Hand removal commenced on Lac Vieux Desert on June 16th 2014 and continued with weekly visits until September 18th 2014. On average, there was three less weeks of hand removal efforts in 2014 compared to 2013 due to the unseasonably cool weather and water temperatures. Hand removal efforts focused on areas identified during the spring and mid-late summer surveys where EWM densities ranged from very low to moderate. Hand removal efforts totaled 98 dive hours removing approximately 780 EWM plants weighing roughly 390.0 pounds wet weight.

Dive Methods

Divers Bagging EWM Plants Underwater

First, divers locate EWM plants visually from the boat and mark them with buoys before entering the water. Marking plants, as simple as it may seem, greatly shortens the time divers have to search for plants once in the water. At each marked location, two divers descend to the bottom, careful not to stir up sediment, which deteriorates visibility. Maintaining good visibility improves visual inspection for remaining plants and fragments. The first diver will reach into the plant's roots and slowly work them free of the sediment. Once removed, a quick shake of the roots dislodges any remaining sediment in the root wad. The plant is rolled up, the second diver opens the bag, and the plant is watchfully placed into the bag by the first diver and then closed prior to moving to the next plant. The entire time when one diver is hand pulling the other diver is watching for any fragments and collecting them in the bag. Divers inspect the general area for other plants and fragments before ascending and moving on to the next location. Often when one plant is marked for hand pulling, divers will find additional smaller-satellite plants extending out from the larger targeted plant. This is why searching the adjacent area and keeping good visibility is critical.

Diver Assisted Suction Harvesting

DASH efforts included 10 sites (3 days) on Lac Vieux Desert between July 30th 2014 to September 18th 2014. DASH sites focused on moderate to moderate-dense locations of EWM, but also included several sites where the EWM plants were at lower densities however covered a workable area that did not require substantial mobilization between sites. DASH removed a total of 312.5 pounds of EWM in 8.75 hours. Diver Assisted Suction Harvesting was used in both Michigan and Wisconsin. (MI Permit Nos. 13-27-0012-P & 14-27-0036-P & and WI Permit # MNOR-64-14-04).

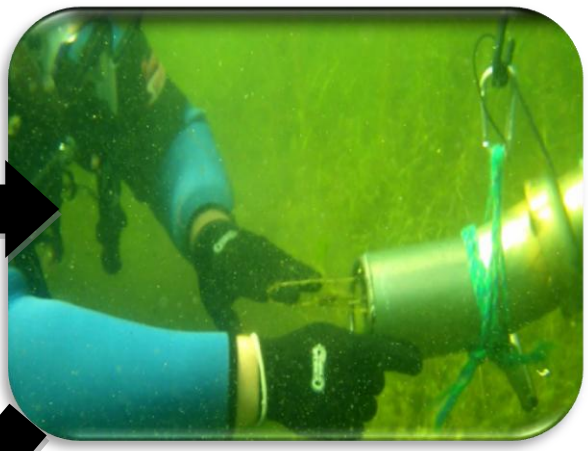
While using DASH, a diver typically begins by locating a EWM plant from the surface, and then descends next to the plant while lowering the nozzle. Divers works along the bottom by using fin pivots, kneeling on the bottom or hovering above the bottom at a distance where the root mass of the plant is within hands reach. Divers either feed the top of the plant into the hose first and then uproot the plant or uproot the plant and feed it root wad first into the hose. It is very important that the diver shake as much sediment from the root wad before getting the root wad near the nozzle. Shaking the root wad away from the nozzle helps maintain visibility for the diver and minimizes debris and sediment in the holding bins. The diver observes plants fed into the nozzle for fragmentation and will catch any fragments and feed them into the nozzle.

Work sites that have dense and contiguous EWM beds, the initial DASH efforts are quite simple. The diver will descend adjacent to the bed and begin hand pulling or harvesting systematically across the bed to dismantle the bed. Once dismantled, a more systematic approach follows to target remaining clustered, scattered or outlier plants in the work site. As part of our method for covering a work area while using DASH (or divers alone), a grid pattern is used. A diver will start at either the port or starboard side of the boat and work to and from the boat perpendicular to the direction the boat is facing. For example, with the boat facing north and the diver starting on the port side, the diver begins by heading west. The diver will continue to work perpendicular to the boat until reaching the end of the suction hose. The diver then works back to the boat on a new transect line. Distance between each transect is dictated by visibility, density of plants, and obstructions. This process is repeated on the opposite side and in front of the boat. Depending on the site, once the diver has adequately covered the area which the suction hose can reach, the diver will signal the deckhand to let out more anchor line or determine that the boat needs re-positioning.

Once plants reach the surface, a hose dispenses the plant material into a series of screened bins located on the deck of the boat. These bins capture plants and allow water to drain out back into the lake. The person on deck sorts plants into two categories: the targeted invasive plant and incidentally harvested native vegetation. Two wet weights taken include one weight of the target invasive plant and one weight for all native species combined. Plants are then placed in sealable containers or bags for transport to the dumping site. The dumping site is a pre-determined site upland, away from any water body.

DASH Process

Divers Locate Plants



Diver Uproots and Feeds Plant into Nozzle

Plants Transported to Bin on Deck

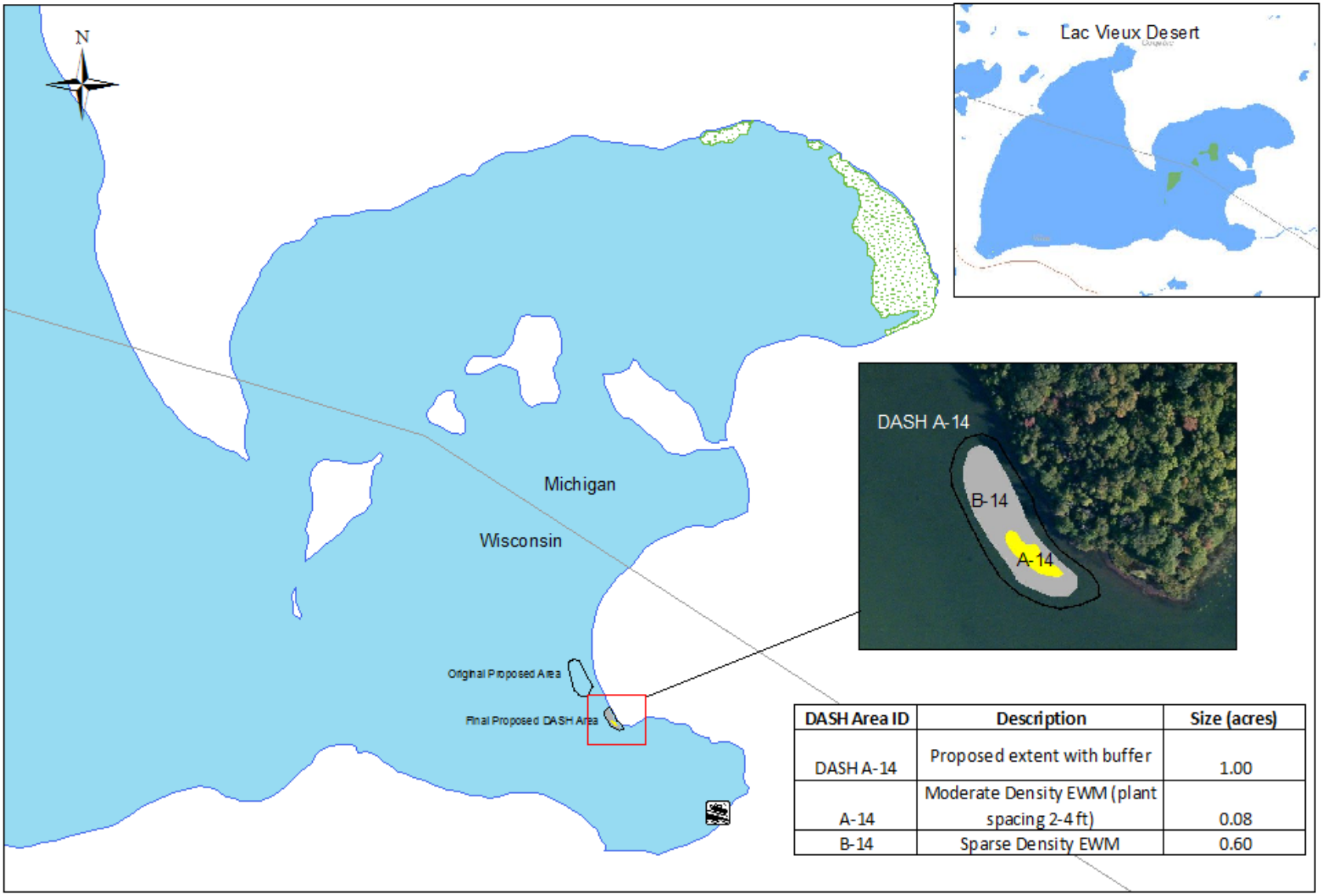
Plants Sorted & Weighed

Plants Placed in Sealable Container for Transport

Table 2: Summary of diver assisted suction harvesting efforts.

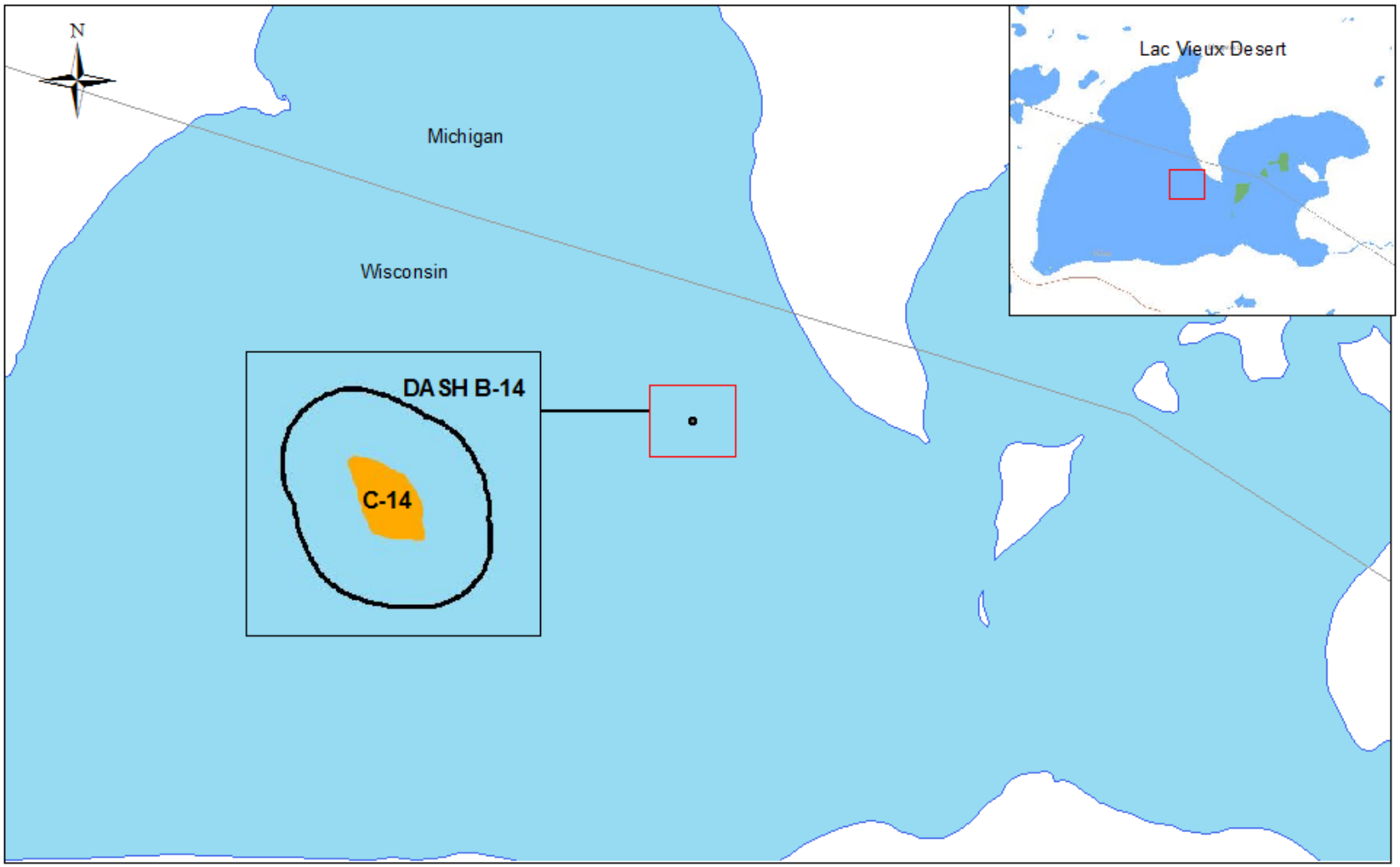
Date	Location	Size	Ave. Depth (ft)	DASH Boat Location		Dive Time (hrs)	EWM (lbs*)	Native Vegetation (lbs*)	Percent Incidental Harvest	Total (lbs*)
				Lat (NAD 83)	Long (NAD 83)					
7/30/2014	DASH A -14 (WI)	1.0 acre	7	46.12730	89.08005	1.75	41.0	11.0	26.83%	52.0
7/30/2014	DASH A-14 (WI)	1.0 acre	7	46.12740	89.08014					
7/30/2014	119 (MI)	~20' area	7	46.13487	89.07813	1.00	23.0	3.0	13.04%	26.0
7/30/2014	120 (MI)	~30' area	7	46.13468	89.07841	0.50	8.0	1.0	12.50%	9.0
8/5/2014	20	~10' area	7	46.13524	89.07735	0.50	18.5	0.5	2.70%	19.0
8/5/2014	S. Slaughter Bay (558-MDEQ permitted area 2013)	~10' area	6	46.13525	89.07706	0.50				
8/5/2014	S. Slaughter Bay (557-MDEQ permitted area 2013)	~10' area	6	46.13535	89.07663	0.25				
8/5/2014	S. Slaughter (556 & 552-MDEQ permitted 2013)	2 ~10' areas	6	46.13547	89.07635	0.50				
8/5/2014	11 & 83 (MI)	~10' x 10'	5	46.13692	89.0759	1.50	129.0	7.0	5.43%	136.0
9/18/2014	DASH B -14 (WI)	0.01 acre	9	46.13771	89.11361	2.25	93.0	2.0	2.15%	95.0
	* wet weight					**8.75**	**312.5**	**24.5**	**10.44% (average)**	**337.0**

2014 Proposed Diver Assisted Suction Harvesting Area - Lac Vieux Desert, Vilas County, WI



DASH Area ID	Description	Size (acres)
DASH A-14	Proposed extent with buffer	1.00
A-14	Moderate Density EWM (plant spacing 2-4 ft)	0.08
B-14	Sparse Density EWM	0.60

2014 Ammended Proposed Diver Assisted Suction Harvesting Areas
Lac Vieux Desert, Vilas County, WI



Lake: Lac Vieux Desert, Vilas County, WI & Gogebic County, MI

Map Create: 8.20.2014 by Many Waters, LLC

Source: WDNR_DASH_v1, ESRI Base Maps, Mi GDL Lake_polygons_200403

DASH Area ID	Description	Size (acres)
DASH B-14	Proposed extent with buffer	0.10
C-14	Moderate-Dense Density EWM (plant spacing <2 ft)	0.01

0 1,100 2,200 4,400 Feet

7/30/14 Weather – 62˚ F, light and variable wind becoming WNW 5-10 mph, mostly sunny

The DASH boat anchored on the south central portion of DASH A -14 and faced north/northwest and worked a transect heading north. A substantial algae bloom limited visibility to around 1-2 ft. Due to low visibility, the deck hand assisted divers by directing them to EWM plants. One and three quarter dive hours removed 72 pounds of EWM. Incidental non-target harvest of native plant species comprised of *C. demersum*, *M. sibericum*, *E. canadensis* and *P. zosteriformis*, however the majority of incidental harvest consisted of *C. demersum*.

8/5/2014 Weather – 74 F, sunny, light wind

DASH efforts focused on areas along the southern portion of Slaughter Bay and a moderate to dense location within the center of the bay (Sites 11, 20 & 83). Furthermore, four areas found last year, but not identified in survey efforts to date in 2014 had new plants (MDEQ permit # at sites 552, 556, 557 & 558). These areas were permitted by the MDEQ in 2013 and since the 2013 MDEQ permits remains open until 2018, these sites were included "on the fly" in daily DASH efforts. The sites along the southern Slaughter Bay all had relatively low density, however, there were continued challenges of water clarity. Additional search time and assistance from above were required to locate and dive plants. The area identified in the spring survey as two distinct moderate to moderate-dense EWM within the center of the bay had grown into one contiguous area of moderate to dense EWM about 10' x 10' in area. Three and a quarter dive hours removed 147.5 pounds of EWM. Incidental non-target harvest of native plant species comprised of *C. demersum*, *M. sibericum*, *E. canadensis* and *P. zosteriformis*, however the majority of incidental harvest consisted of *C. demersum.*

9/18/2014 Weather – 45˚ F, cloudy, south wind 5-10 mph

The DASH boat positioned along the central western portion of DASH B-14 and faced east. Two divers entered the water and worked a grid pattern around the boat. A combination of overcast skies, water depth, water turbidly, and soft sediments affected visibility. Two and one quarter hour of dive time removed 93 pounds of EWM. Both divers agreed that plants may still remain in this area, however, efforts were limited due to cold water. Incidental non-target harvest of native plant species remained similar to those from DASH A-14, and again, primarily consisted of *C. demersusm.*

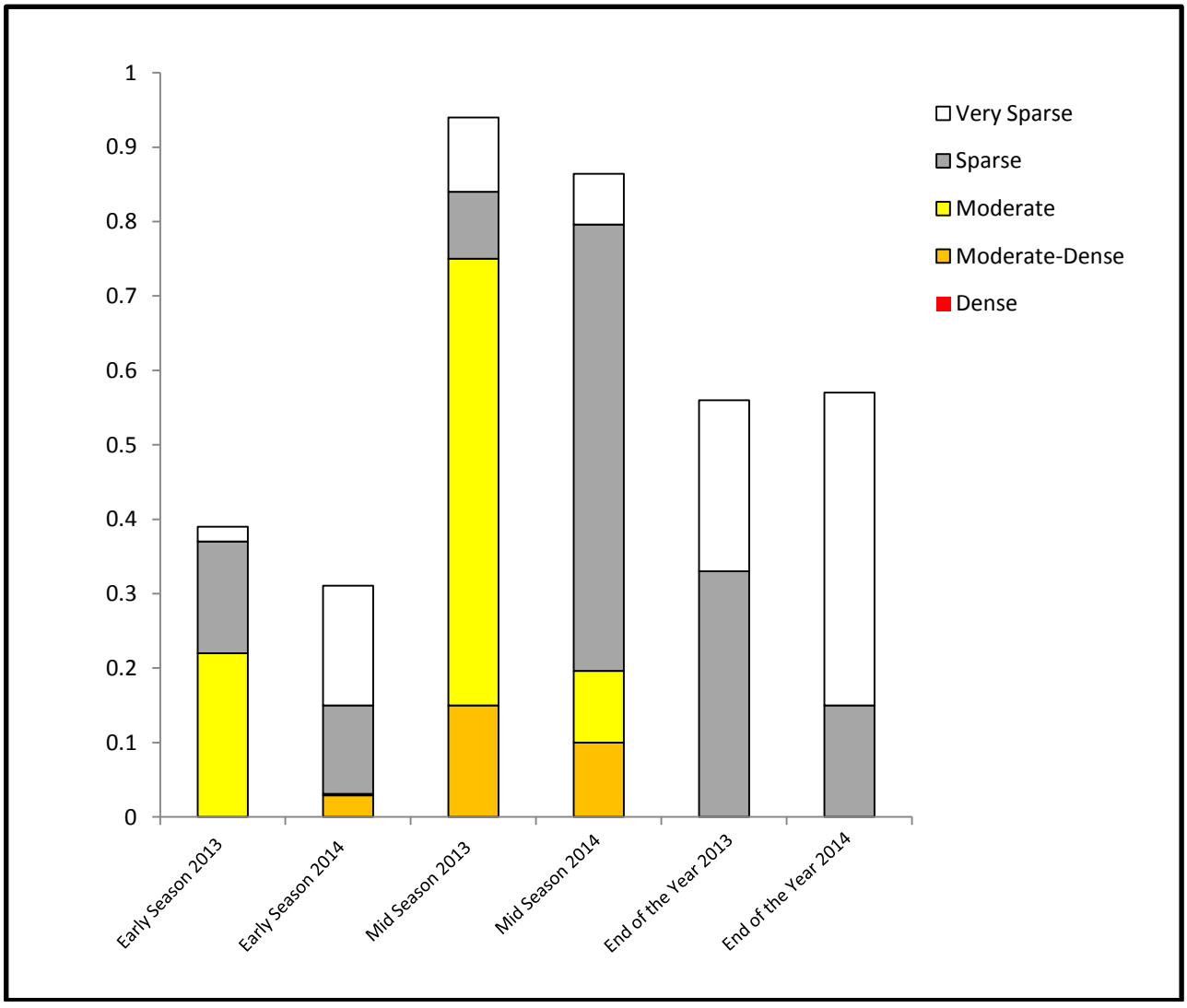
Table 3: Summary of 2013 and 2014 hand removal efforts.

Area of Lake	2013 Hand Removal		2014 Hand Removal		2013 DASH	2014 DASH
	~ Number of Plants	Weight* (lbs)	~ Number of Plants	Weight* (lbs)	Weight* (lbs)	Weight* (lbs)
Thunder Bay	33	70.0	170	117.0	0	0.0
North Desolation Point	35	25.0	7	3.0	0	0.0
Simpson's Point	398	334.0	40	6.0	974	41.0
South Shore	15	13.0	16	~7.0	0	0.0
Rice Bay	131	115.0	224	149.0	0	0.0
Rose's Island	30	25.0	15	5.5	0	0.0
Near Island	5	4.0	30	11.0	0	0.0
West Shore	0	0.0	8	7.5	0	0.0
Slaughter Bay	529	398.0	165	73.0	59	178.5
Big Duck	2	2.0	105	18.0	0	0.0
West of Duck Point	0	0.0	0	0.0	0	93.0
Open Water (east of islands)	36	30.0	0	0.0	0	0.0
TOTALS	**1,214**	**1,016.0**	**780**	**390.0**	**1,033.0**	**312.5**

EVALUATION

An end of the year evaluation took place on October 13th 2014. This survey assessed hand removal and DASH sites. The purpose of the end of year evaluation was to visit all known managed sites, not survey for additional EWM locations, however, a few new EWM locations in Thunder Bay were found.

Table 4: Estimated EWM density and distribution on Lac Vieux Desert from 2013 to 2014.



Values are determined by using a combination of size calculated by GPS delineated EWM beds (polygons) and estimated extents or coverage for all remaining known EWM sites (points).

EWM Density

- Very Sparse
- Sparse
- Moderate
- Moderate-Dense
- Dense (none)

Wild Rice (2013)

Lake: Lac Vieux Desert – Vilas Co., WI & Gogebic Co., MI
Map Date & Creator: 2.6.2015, Many Waters, LLC
Source: MiGDL Lake_polygon_200403, WI Hydro, ESRI base maps, GLIFWC manoomin_lvd_wgs84, MiGDL allroads_miv13a
File: LVD_2014_EW_MS_Mapping

Lac Vieux Desert
2014 End of the Year EWM Locations Overview

Lake: Lac Vieux Desert – Vilas Co., WI & Gogebic Co., MI
Map Date & Creator: 2.6.2015, Many Waters, LLC
Source: MiGDL Lake_polygon_200403, WI Hydro, ESRI base maps, GLIFWC manoomin_lvd_wgs84, MiGDL allroads_miv13a
File: LVD_2014_EW_MS_Mapping

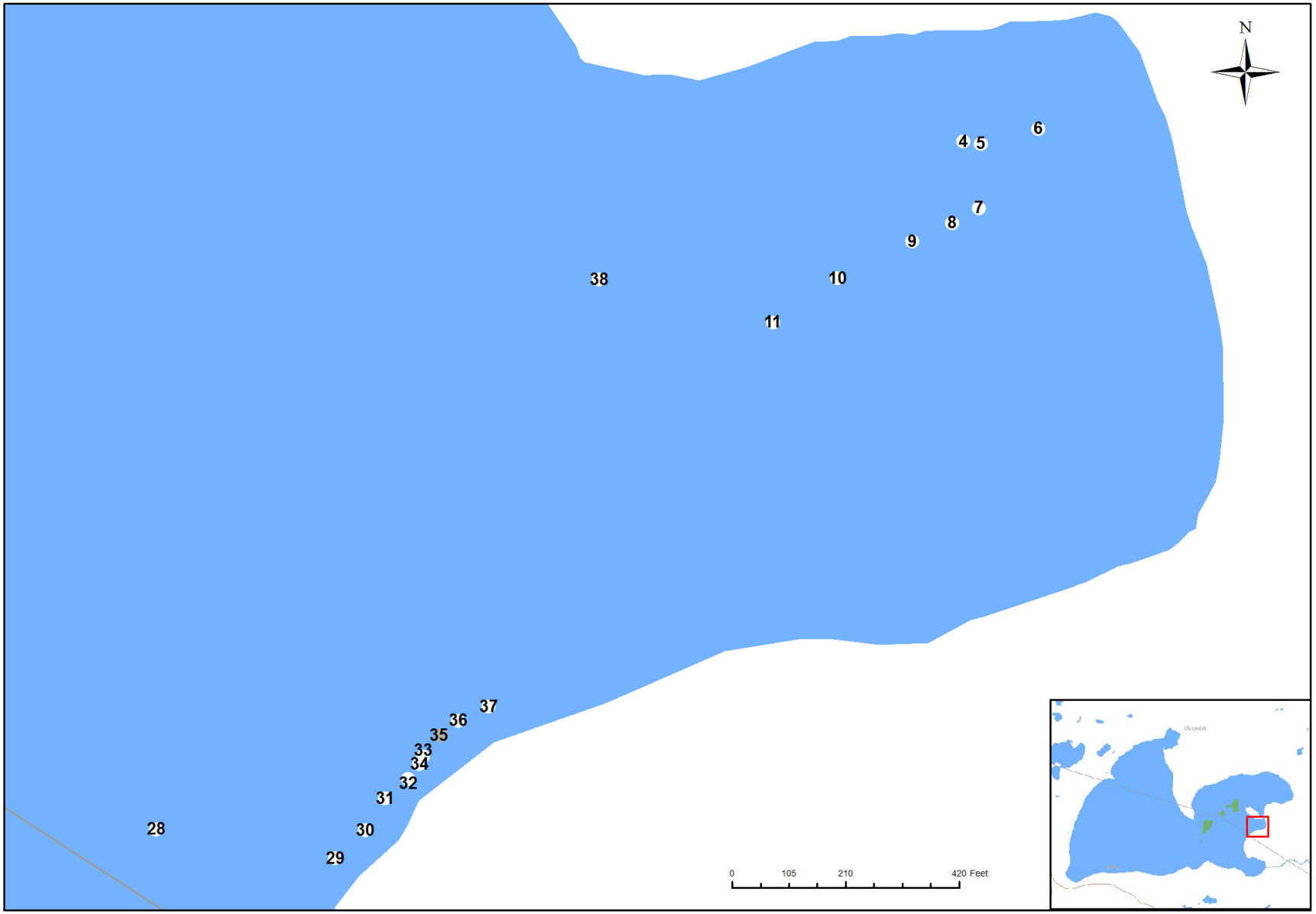
Location

EWM Density

- Very Sparse
- Sparse
- Moderate (none)
- Moderate-Dense (none)
- Dense (none)

Wild Rice (2013)

Lac Vieux Desert
2014 End of the Year EWM Locations
Rice Bay, Duck Point and Islands



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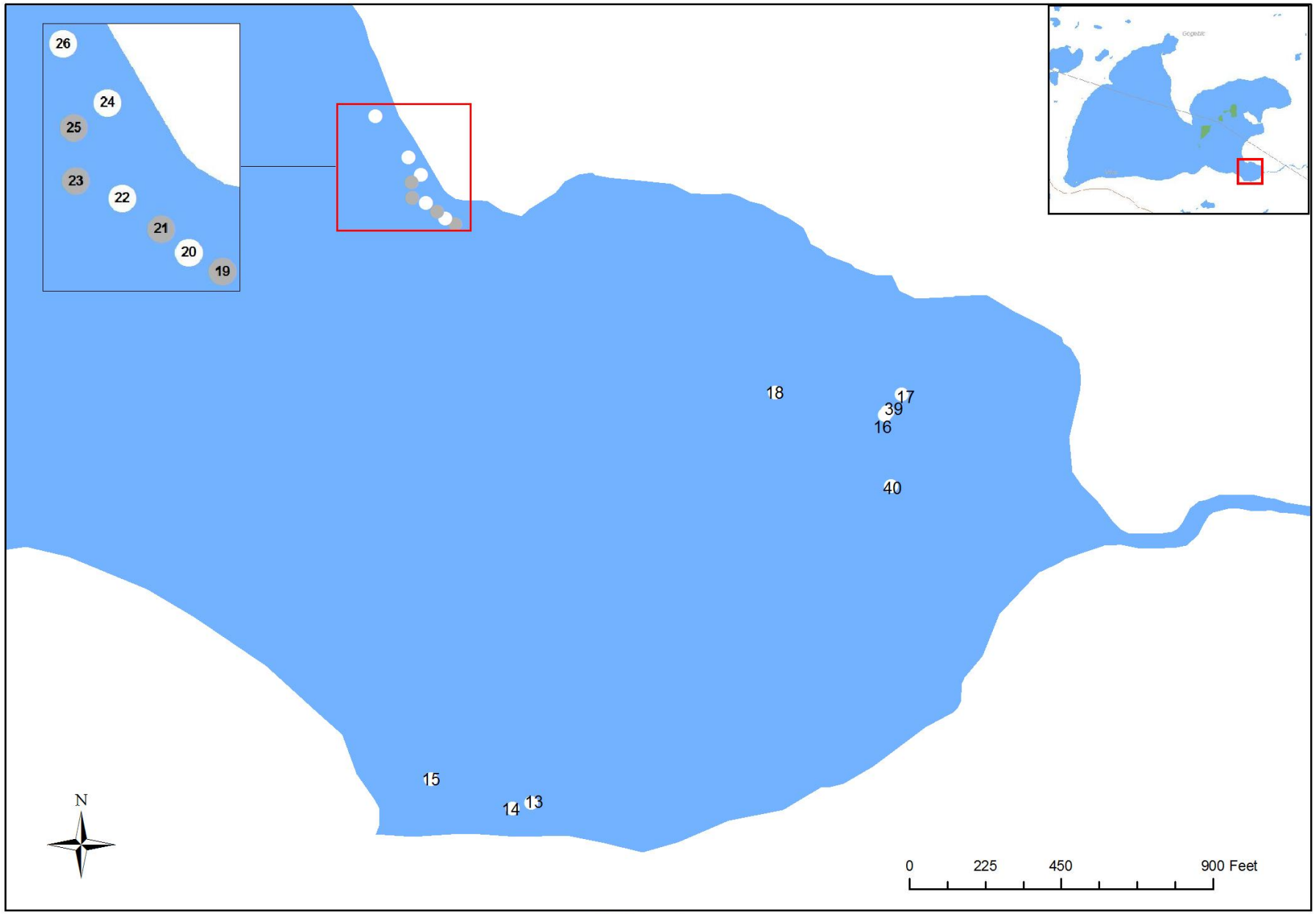
File: LVD_2014_EW_MS_Mapping

EWM Density

- Very Sparse
- Sparse
- Moderate (none)
- Moderate-Dense (none)
- Dense (none)

Lac Vieux Desert
2014 End of the Year EWM Locations
Slaughter Bay



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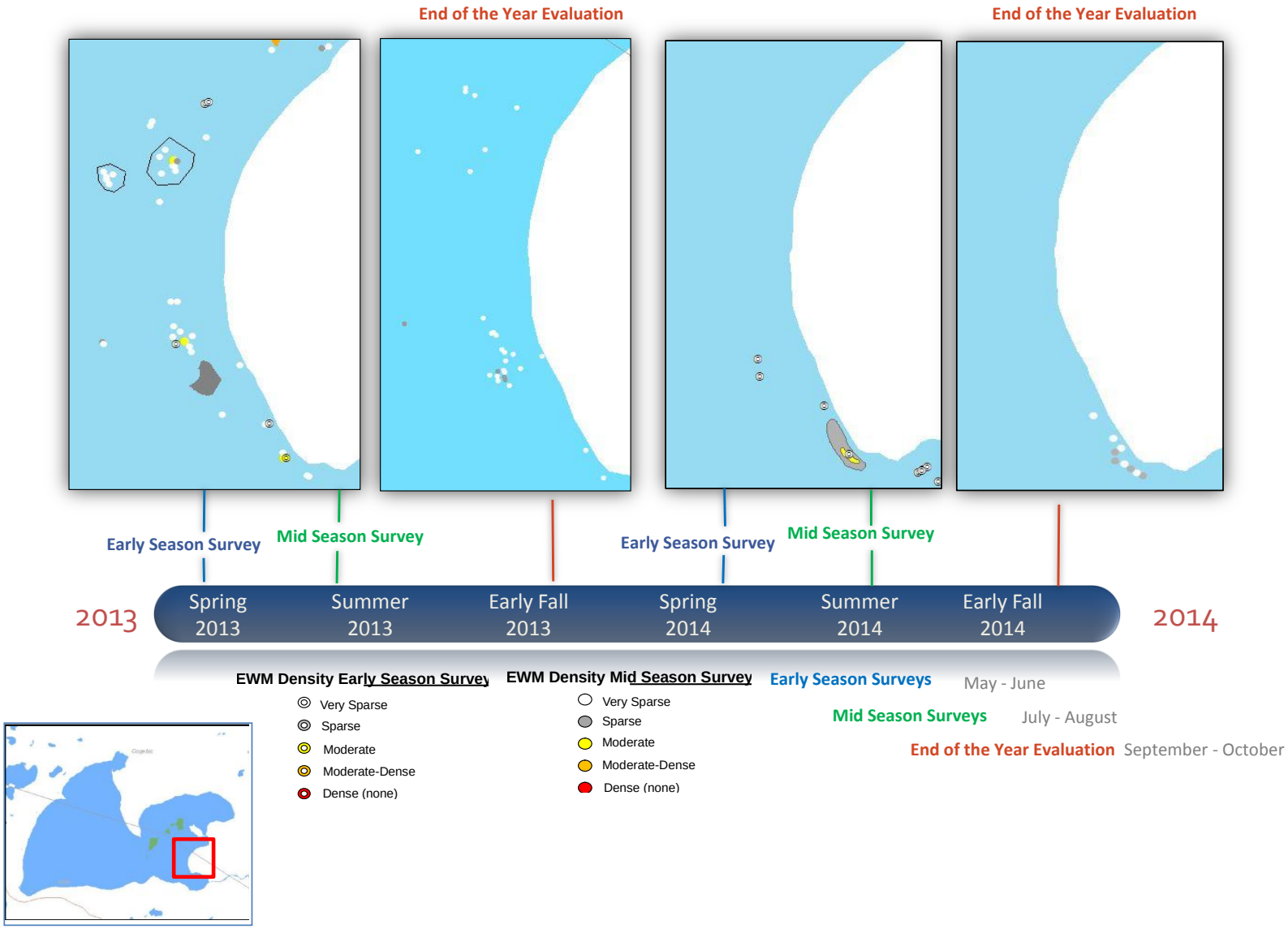
GLIFWC manoomin_lvd_wgs84, MiGDL allroads_miv13a
File: LVD_2014_EW_MS_Mapping

EWM Density

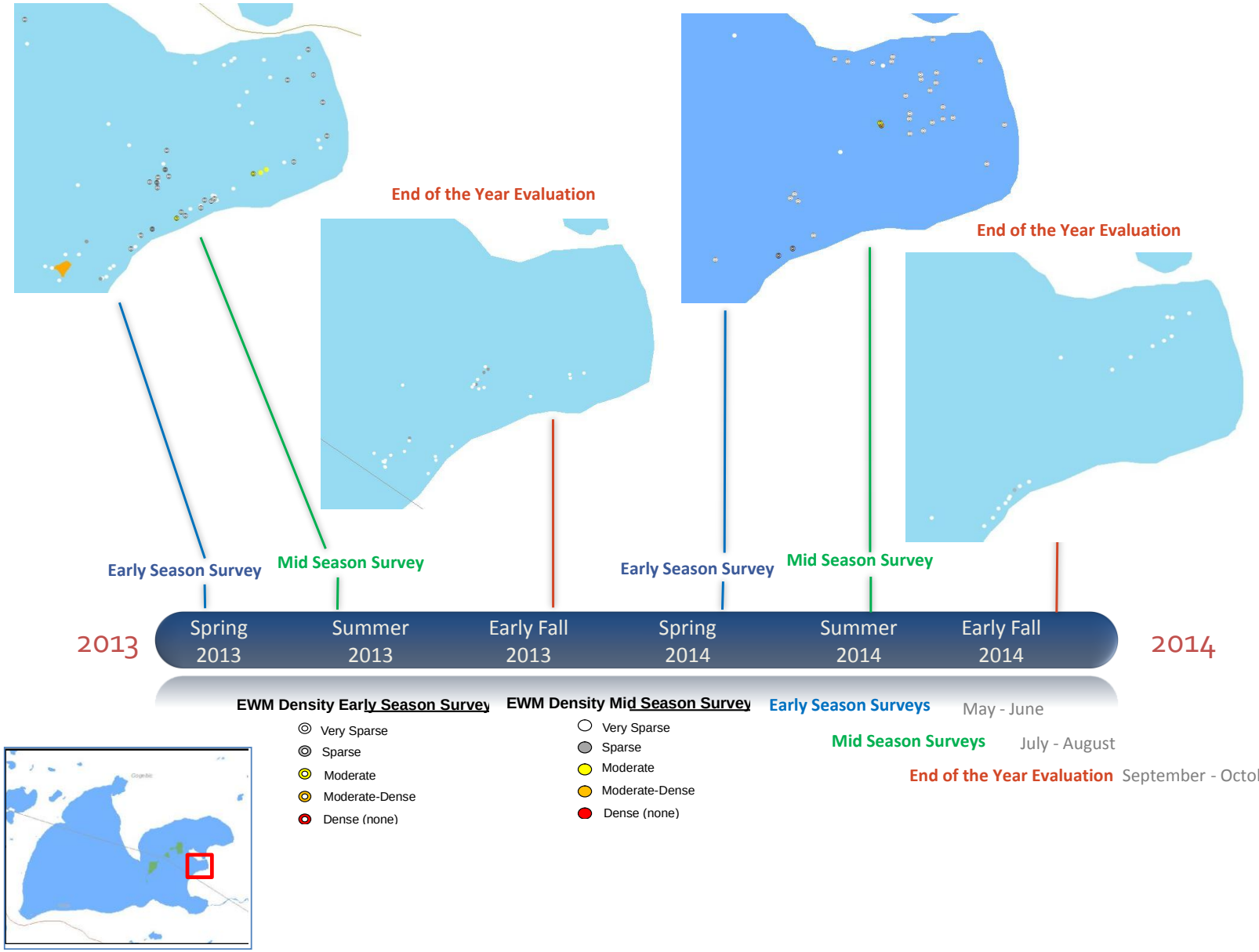
- Very Sparse
- Sparse
- Moderate (none)
- Moderate-Dense (none)
- Dense (none)

Lac Vieux Desert
2014 End of the Year EWM Locations
Thunder Bay

Distribution and density of EWM along Simpsons's Point from 2013 to 2014



Distribution and density of EWM within Slaughter Bay from 2013 to 2014



2015 PROPOSED MANAGEMENT STRATEGIES

Continuing monitoring efforts in 2015 at levels completed in 2014 will improve the likelihood of detecting new EWM locations on Lac Vieux Desert. At current levels, this includes on average over 380 miles of survey track annually. The ISCCW and GLIFWC have committed to support 2015 early season survey efforts and Many Waters will complete the mid-late season efforts. However, given the size of potential littoral zone adequate to support aquatic plant growth, including EWM, current monitoring efforts are not inclusive. To improve the likelihood of finding new EWM locations without having to substantially increasing professional level monitoring, volunteer monitoring will be necessary. Furthermore, advising volunteer monitors on priority areas to fill in any gaps may lead to better seasonal coverage of Lac Vieux Desert and also damper thoughts of the overwhelming task of monitoring this very large lake. For instance, it is known that EWM exists in Slaughter Bay. Volunteer efforts may provide information on new EWM locations in Slaughter Bay, however, the use of their time may benefit the overall project by directing their efforts.

The distribution and density of CLP observed in 2014 is less than observations from previous years. Whether, this species will continue to act in a non-nuisance level is difficult to predict. Early season monitoring efforts shall continue to take into account timing when CLP is actively growing prior to seasonal senescence.

Management efforts will continue with seasonal use of hand removal and DASH. Hand removal spread throughout the growing season we feel will improve the likelihood of successful long-term control. This strategy, allows flexibility to address new locations, allows re-visits to problematic areas, and improves the likelihood of visiting all known locations. DASH sites and hand removal sites will be determined based on findings from the early and mid season monitoring efforts, however may include "on the fly" efforts as seen in Slaughter Bay this year. Shallow hand removal sites that can easily be dove with the use of snorkel gear will be prioritized and information on these sites can be given to partners including the USFS Ottawa National Forest for assistance in hand removal efforts.

Adoption of legislature by the State of Michigan in 2014 will allow hand removal (without auxiliary power) of nuisance species in Michigan waters without a permit. Furthermore, hand removal alone will no longer have seasonal restrictions that have significantly narrowed the working window of efforts in the past (Senate Bill 444, Section 30103 (o).) DASH still requires a permit and can only be used after the second week of July to protect nesting loons. MDEQ permits typically remain open for five years, so previous permits that include areas that may necessitate DASH in the future will not require re-permitting within the five-year period.

LAKE WIDE STEWARDSHIP AND AIS PREVENTION ACTIVITIES

In 2014, the LVDLA began several activities to promote lake wide stewardship on Lac Vieux Desert, including a Lake Preservation Initiative and volunteer monitoring for Eurasian watermilfoil. These initiatives will continue throughout the proposed grant project period and will be reviewed and adapted or improved upon at the end of the proposed project period (2017).

The Lake Preservation Initiative was introduced to all riparians of Lac Vieux Desert in newsletters sent in summer and winter of 2014. This initiative seeks to educated lakeshore owners on the importance of being good lake stewards and what the LVDLA has done to promote and maintain the ecological health of this waterbody. The Lake Preservation Initiative invites riparian owners to sign a volunteer pledge to not use fertilizers on their property that contains phosphorous and also not to remove rooted aquatic native vegetation from their near shore areas. Furthermore, this initiative provides information and cash assistance to owners that wish to restore or "soften' their shoreland areas with native plants.

During the summer of 2014, a training session hosted by the LVDLA (with assistance from Many Waters) on how to identify and monitor for EWM took place. This session was open to all interested people, whether they lived on the lake or not and was published in the Vilas County News Review. Participants learned how to distinguish from native and invasive milfoils and became familiar with methods and techniques on how to monitor for EWM and what to do if EWM is found.

The LVDLA through a WDNR grant program hired a Clean Boats Clean Waters inspector stationed at the Thunder Bay launch. In addition to these efforts the ISCCW also provide an educator and staff that operated a portable boat washing station. These efforts contacted 5,783 people and washed 504 boats at the Thunder Bay launch alone. The ISCCW also supports educational and boat-washing efforts along the Michigan side at the MDNR launch located in Misery Bay. These efforts contacted 516 people and washed 92 boats. In total 6,299 people were contacted about aquatic invasive species and 596 boats were washed either entering or leaving Lac Vieux Desert.

SUMMARY

Overall, the level and distribution of EWM within Lac Vieux Desert consists of isolated low to moderate-dense locations distributed primarily within the east portion of the lake. Currently, the number and size of the location are small and management with hand removal is resource reasonable. The concern is the finding of new locations along the western shore and the denser area just west of Duck Point. The location along the west shore is approximately 2 miles from previously known EWM locations. These locations will require continuous monitoring in 2015 and follow up hand removal if necessary.

There are more known EWM locations in Thunder Bay and with a major launch located within this bay, these sites should be early season priorities, especially when in direct paths to and from the boat launch and high traffic areas. Some areas on Lac Vieux Desert will continue to require hand removal management, including Slaughter Bay. Other than the first discovery of EWM in Thunder Bay, Slaughter Bay has the longest record of known EWM locations. Great improvements have been made along Simpsons' Point, another popular boating and fishing area. Many of the 2013 DASH locations along the northern portion of Simpson's Point have required minimum follow up hand removal in 2014. In addition, the two open water locations between the islands and Simpson's Point, EWM was not detectable in 2014. Again, in addition to targeting these locations during the early season and mid season surveys, periodic monitoring visits when feasible will improve the likelihood of long-term control of these locations.

Overall, the observed abundance of EWM found on Lac Vieux Desert during the mid-season survey declined slightly from 2013 to 2014. (Note: there is subjectively in estimating relative abundance and distribution and this information is a qualitative estimate and only general suggestions or conclusions can be made.) The substantive improvement seen in the mid-season surveys from 2013 to 2014 is the reduction of moderate density areas from 2013 to lower densities in 2014. A decline in EWM is likely a positive result of active management, however, can include natural annual variation. Cool weather and water temperatures and extended winter conditions including ice and snow pack can potentially influence observed annual variation.

Lac Vieux Desert is a large expanse of water with a large portion of littoral zone that poses certain challenges to lake and aquatic plant management. However, the lake has a tremendous amount of vested support and interested stakeholders that have provided many key assets in preserving Lac Vieux Desert. The continued support and work of the LVDLA and its stakeholders have expanded the ability to share knowledge and resources to tackle the immense amount of effort required to manage for EWM in Lac Vieux Desert and also minimize spread to surrounding un-infested waters. Annual management efforts will continue at varying levels depending on need and resources available, however the support of those vested in Lac Vieux Desert will continue to be a strategic and collaborative effort.

Appendix A

Details of Early Season and Mid Season Monitoring Efforts

Map ID	Density Description	~ Size (ft-cir)	~ Size (acres)	Depth (ft)	Latitude	Longitude	Notes	Surveyor	Survey	Taxon
0	Very Sparse	<2	0.0002		46.143860	89.085870	1 lg plant, bright green	ISCCW	Early Season	EWM
1	Very Sparse	<2	0.0002		46.143790	89.085470	1 sm plant, green	ISCCW	Early Season	EWM
3	Very Sparse	<2	0.0002		46.145891	89.099662	1 sm brown plant, probably over wintered	ISCCW	Early Season	EWM
4	Very Sparse	<2	0.0002		46.141298	89.081180	1 lg brown plant, probably over wintered	ISCCW	Early Season	EWM
5	Very Sparse	<2	0.0002		46.127077	89.078470	2 lg brown plants, probably over wintered	ISCCW	Early Season	EWM
6	Very Sparse	15	0.016	5	46.146416	89.095182	3 plants, one sm 10-15 ft south of 2 med others	ISCCW	Early Season	EWM
8	Very Sparse	5	0.002	5	46.146456	89.094927	2 med plants, 3 ft apart	ISCCW	Early Season	EWM
9	Very Sparse	<2	0.0002	5.5	46.146421	89.094862	1 lg plant	ISCCW	Early Season	EWM
10	Very Sparse	<2	0.0002	5	46.146779	89.094273	1 med plant	ISCCW	Early Season	EWM
11	Moderate - Dense	20	0.029		46.136998	89.075940	mod-dense with outliers	ISCCW	Early Season	EWM
12	Very Sparse	<2	0.0002	3.5	46.138404	89.074826	1 med plant	ISCCW	Early Season	EWM
13	Very Sparse	<2	0.0002	2	46.138098	89.073710	2 sm plants	ISCCW	Early Season	EWM
14	Very Sparse	<2	0.0002	6	46.127314	89.080031	2-3 plants 2 feet apart	ISCCW	Early Season	EWM
15	Very Sparse	<2	0.0002		46.123410	89.074510	1 sm plant	ISCCW	Early Season	EWM
16	Very Sparse	<2	0.0002	6	46.128055	89.080625	1 sm plant	ISCCW	Early Season	EWM
17	Very Sparse	<2	0.0002	8.5	46.128482	89.082095	1 lg plant	ISCCW	Early Season	EWM
18	Very Sparse	<2	0.0002	7.5	46.128753	89.082150	2-3 lg plants	ISCCW	Early Season	EWM
19	Very Sparse	10	0.007	8	46.134732	89.079658	~6 lg plants	ISCCW	Early Season	EWM
20	Very Sparse	10	0.007	7.5	46.135184	89.077408	6-8 med plants	ISCCW	Early Season	EWM
21	Very Sparse	<2	0.0002		46.135726	89.077792	2 lg plants	ISCCW	Early Season	EWM
22	Very Sparse	<2	0.0002	6.5	46.135834	89.077892	1 lg plant	ISCCW	Early Season	EWM
23	Very Sparse	5	0.002	6.5	46.135770	89.077976	4 lg plants	ISCCW	Early Season	EWM
24	Very Sparse	<2	0.0002	11	46.125221	89.088404	1 lg plant	ISCCW	Early Season	EWM

Map ID	Density Description	~ Size (ft-cir)	~ Size (acres)	Depth (ft)	Latitude	Longitude	Notes	Surveyor	Survey	Taxon
25	Very Sparse	5	0.002	4	46.141081	89.084069	3-4 med plants	ISCCW	Early Season	EWM
26	Very Sparse	10	0.007	3	46.123510	89.074860	2 lg plants	Many Waters	Mid Season	EWM
27	Very Sparse	<2	0.0002	3	46.122500	89.078780	1 lg plant	Many Waters	Mid Season	EWM
28	Very Sparse	<2	0.0002	3	46.122430	89.078870	1 med plant	Many Waters	Mid Season	EWM
29	Very Sparse	<2	0.0002	8.5	46.124660	89.099530	1 lg plant	Many Waters	Mid Season	EWM
30	Moderate	15	0.016	7.5	46.124390	89.099800	3' x 3' clump mod density surrounded by 15' circle of sparse density outliers	Many Waters	Mid Season	EWM
31	Very Sparse	<2	0.0002	8.5	46.124500	89.099980	1 sm plant	Many Waters	Mid Season	EWM
32	Very Sparse	<2	0.0002	3	46.146140	89.099270	1 very sm plant	Many Waters	Mid Season	EWM
33	Very Sparse	<2	0.0002	4	46.137960	89.075960	3 sm plants	Many Waters	Mid Season	EWM
34	Very Sparse	5	0.002	5.5	46.136540	89.076870	~5 plants	Many Waters	Mid Season	EWM
35	Very Sparse	10	0.007		46.147903	89.091687	2 plants	Many Waters	Mid Season	EWM
36	Very Sparse	<2	0.0002		46.147953	89.091898	1 sm plant	Many Waters	Mid Season	EWM
37	Very Sparse	15	0.016		46.148024	89.091966	2 plants, 15 ft apart	Many Waters	Mid Season	EWM
38	Very Sparse	<2	0.0002		46.147229	89.093134	1 med plant	Many Waters	Mid Season	EWM
39	Very Sparse	<2	0.0002		46.147010	89.093567	1 lg plant	Many Waters	Mid Season	EWM
40	Very Sparse	<2	0.0002		46.146610	89.094749	1 sm plant	Many Waters	Mid Season	EWM
41	Very Sparse	10	0.007		46.146403	89.095194	~5 sm plants	Many Waters	Mid Season	EWM
42	Very Sparse	<2	0.0002		46.143629	89.100641	1 lg plant	Many Waters	Mid Season	EWM
43	Very Sparse	<2	0.0002		46.144447	89.097658	1 lg plant	Many Waters	Mid Season	EWM
44	Very Sparse	<2	0.0002		46.144375	89.097751	1 med plant	Many Waters	Mid Season	EWM
45	Very Sparse	<2	0.0002		46.144415	89.097675	2 lg plants	Many Waters	Mid Season	EWM
46	Very Sparse	<2	0.0002		46.143297	89.098677	1 lg plant	Many Waters	Mid Season	EWM
47	Very Sparse	<2	0.0002		46.148340	89.089337	2 lg plants	Many Waters	Mid Season	EWM
48	Very Sparse	<2	0.0002		46.150342	89.082713	1 med plant	Many Waters	Mid Season	EWM
49	Very Sparse	<2	0.0002		46.150297	89.082640	1 sm plant	Many Waters	Mid Season	EWM

Map ID	Density Description	~ Size (ft-cir)	~ Size (acres)	Depth (ft)	Latitude	Longitude	Notes	Surveyor	Survey	Taxon
50	Very Sparse	10	0.007		46.150089	89.082278	2 lg plants, 2nd 10 ft to west	Many Waters	Mid Season	EWM
51	Very Sparse	5	0.002	5	46.134736	89.095591	5-6 med plants	Many Waters	Mid Season	EWM
52	Very Sparse	<2	0.0002	5	46.135027	89.095319	1 sm plant	Many Waters	Mid Season	EWM
53	Very Sparse	5	0.002	4.5	46.134963	89.095409	2 lg, 3 sm plants	Many Waters	Mid Season	EWM
54	Very Sparse	<2	0.0002	4.5	46.136381	89.093973	1 med plant	Many Waters	Mid Season	EWM
55	Very Sparse	10	0.007	3.5	46.137230	89.093849	5-10 plants in a 10 foot area	Many Waters	Mid Season	EWM
56	Very Sparse	<2	0.0002	4	46.137319	89.093827	1 med plant	Many Waters	Mid Season	EWM
57	Very Sparse	<2	0.0002	6	46.138352	89.079431	1 med plant	Many Waters	Mid Season	EWM
58	Very Sparse	<2	0.0002		46.125163	89.074507	1 sm plant, pulled	ISCCW	Early Season	EWM
59	Very Sparse	<2	0.0002		46.125767	89.074584	1 sm plant	ISCCW	Early Season	EWM
60	Very Sparse	<2	0.0002		46.127062	89.075579	1 sm plant	ISCCW	Early Season	EWM
61	Very Sparse	<2	0.0002		46.126947	89.078027	2 lg plants	ISCCW	Early Season	EWM
62	Very Sparse	10	0.007		46.127123	89.078382	2 lg plants 3 ft apart, 1 m and 1 sm 10 ft south of lg plants	ISCCW	Early Season	EWM
63	Very Sparse	<2	0.0002		46.127165	89.078283	1 med plant	ISCCW	Early Season	EWM
64	Very Sparse	<2	0.0002		46.127109	89.078401	1 med plant	ISCCW	Early Season	EWM
65	Very Sparse	<2	0.0002		46.138031	89.077079	1 med plant	ISCCW	Early Season	EWM
66	Very Sparse	<2	0.0002		46.138008	89.076778	3 med plants	ISCCW	Early Season	EWM
67	Very Sparse	10	0.007		46.137166	89.074284	5-10 plants, med and sm	ISCCW	Early Season	EWM
68	Very Sparse	<2	0.0002		46.137081	89.073092	1 med plant	ISCCW	Early Season	EWM
69	Very Sparse	<2	0.0002		46.136441	89.073462	1 sm plant	ISCCW	Early Season	EWM
70	Very Sparse	<2	0.0002		46.137878	89.074707	1 sm plant	ISCCW	Early Season	EWM
71	Very Sparse	<2	0.0002		46.137719	89.074711	1 lg plant	ISCCW	Early Season	EWM
72	Very Sparse	<2	0.0002		46.137329	89.074531	1 med plant	ISCCW	Early Season	EWM
73	Very Sparse	<2	0.0002		46.137143	89.074522	2 lg plants	ISCCW	Early Season	EWM

Map ID	Density Description	~ Size (ft-cir)	~ Size (acres)	Depth (ft)	Latitude	Longitude	Notes	Surveyor	Survey	Taxon
74	Very Sparse	10	0.007		46.137081	89.074758	2 lg plants 10 ft apart	ISCCW	Early Season	EWM
75	Very Sparse	<2	0.0002		46.137207	89.075293	1 med plant	ISCCW	Early Season	EWM
76	Very Sparse	<2	0.0002		46.137115	89.075294	1 sm plant	ISCCW	Early Season	EWM
77	Very Sparse	<2	0.0002		46.136880	89.075273	1 lg plant	ISCCW	Early Season	EWM
78	Very Sparse	<2	0.0002		46.137766	89.075055	1 sm plant	ISCCW	Early Season	EWM
79	Very Sparse	<2	0.0002		46.137835	89.075081	1 med plant	ISCCW	Early Season	EWM
80	Very Sparse	<2	0.0002		46.137593	89.074850	1 sm plant	ISCCW	Early Season	EWM
81	Very Sparse	<2	0.0002		46.136938	89.074961	2 med plants	ISCCW	Early Season	EWM
82	Very Sparse	5	0.002		46.137488	89.075403	2 med plants, 5 ft apart	ISCCW	Early Season	EWM
83	Moderate	5	0.002		46.137030	89.075970	3' x 3' clump med plants	ISCCW	Early Season	EWM
84	Very Sparse	<2	0.0002		46.138035	89.075755	1 sm plant	ISCCW	Early Season	EWM
85	Very Sparse	<2	0.0002		46.138108	89.075737	1 sm plant	ISCCW	Early Season	EWM
86	Very Sparse	10	0.007		46.138004	89.076196	~ 5 sm and med plants, 10 ft area	ISCCW	Early Season	EWM
87	Very Sparse	5	0.002		46.123243	89.075819	2 lg plants, 5 ft apart	ISCCW	Early Season	EWM
88	Very Sparse	10	0.007		46.123150	89.075888	5-10 plants, 10 ft circle	ISCCW	Early Season	EWM
89	Very Sparse	<2	0.0002		46.123153	89.075835	1 sm plant	ISCCW	Early Season	EWM
90	Very Sparse	<2	0.0002		46.122454	89.079475	1 lg plant and 1 med plant, 2 ft apart	ISCCW	Early Season	EWM
91	Very Sparse	<2	0.0002		46.122449	89.079617	1 sm plant	ISCCW	Early Season	EWM
92	Very Sparse	10	0.007		46.122536	89.080030	3 med plants, 10 ft apart in triangle shape	ISCCW	Early Season	EWM
93	Very Sparse	<2	0.0002		46.124630	89.099440	1 plant	Many Waters	Mid Season	EWM
94	Very Sparse	<2	0.0002		46.124400	89.099920	2 plants	Many Waters	Mid Season	EWM
95	Very Sparse	10	0.007	8.5	46.135740	89.140420	3 med plants	Many Waters	Mid Season	EWM
96	Very Sparse	<5	0.002		46.120048	89.147507	3 plants	GLIFWC	Early Season*	CLP
97	Moderate		<.25 acres		46.120183	89.147220	11-50 plants	GLIFWC	Early Season*	CLP

Map ID	Density Description	~ Size (ft-cir)	~ Size (acres)	Depth (ft)	Latitude	Longitude	Notes	Surveyor	Survey	Taxon
98	Moderate		<.25 acres		46.120165	89.147247	11-50 plants	GLIFWC	Early Season*	CLP
99	Moderate		<.25 acres		46.120170	89.147342	11-50 plants	GLIFWC	Early Season*	CLP
100	Very Sparse	<5	0.002		46.122543	89.079983	probably 2-3 plants	GLIFWC	Early Season*	EWM
101	Very Sparse	<2	0.0002		46.122342	89.080085	1 plant	GLIFWC	Early Season*	EWM
102	Very Sparse	<2	0.0002		46.123460	89.074890	1 lg plant	ISCCW	Early Season	EWM
102	Very Sparse	<2	0.0002		46.122308	89.080115	1 plant	GLIFWC	Early Season*	EWM
103	Very Sparse	10	0.007		46.122380	89.080147	3 plants scattered around point	GLIFWC	Early Season*	EWM
104	Sparse	20	0.029		46.122322	89.080033	15 plants or so	GLIFWC	Early Season*	EWM
105	Very Sparse	<2	0.0002		46.122458	89.078615	1 plant	GLIFWC	Early Season*	EWM
106	Very Sparse	<2	0.0002		46.122415	89.078007	1 plant	GLIFWC	Early Season*	EWM
107	Very Sparse	<2	0.0002		46.122402	89.078040	1 plant	GLIFWC	Early Season*	EWM
108	Very Sparse	<2	0.0002		46.122387	89.078005	1 plant	GLIFWC	Early Season*	EWM
109	Very Sparse	<2	0.0002		46.122332	89.077955	1 plant	GLIFWC	Early Season*	EWM
110	Very Sparse	<2	0.0002		46.140117	89.089707	1 plant	GLIFWC	Early Season*	EWM
111	Very Sparse	<2	0.0002		46.139617	89.089212	1 plant	GLIFWC	Early Season*	EWM
112	Very Sparse	<2	0.0002		46.143805	89.085778	1 unknown plant, too deep and windy, maybe a couple more	GLIFWC	Early Season*	EWM
113	Very Sparse	20	0.029		46.143802	89.085873	1 plant maybe more scattered in area	GLIFWC	Early Season*	EWM
114	Very Sparse	<2	0.0002		46.141478	89.078653	1 plant	GLIFWC	Early Season*	EWM
115	Very Sparse	20	0.029		46.150373	89.083893	couple plants	GLIFWC	Early Season*	EWM
116	Very Sparse	<2	0.0002		46.148618	89.090000	1 plant	GLIFWC	Early Season*	EWM
117	Very Sparse	<2	0.0002		46.147652	89.092698	1 plant	GLIFWC	Early Season*	EWM
118	Very Sparse	<2	0.0002		46.140388	89.101450	1 plant	GLIFWC	Early Season*	EWM
119	Sparse	20	0.029		46.134840	89.078195	~6 lg plants	ISCCW	Early Season	EWM

Map ID	Density Description	~ Size (ft-cir)	~ Size (acres)	Depth (ft)	Latitude	Longitude	Notes	Surveyor	Survey	Taxon
120	Sparse	30	0.06		46.134961	89.077878	~20 + med plants	ISCCW	Early Season	EWM
A-14	Moderate		0.08					Many Waters	Mid Season	EWM
B-14	Sparse		0.6					Many Waters	Mid Season	EWM
C-14	Moderate - Dense		0.01					Many Waters	Mid Season	EWM
			1.0864							

* Extent estimated based office digitization, rather than field observation

ISCCW & Many Waters Datum = NAD 83
GLIFWC Datum = WGS 84

Appendix B

Details of End of the Year Evaluation Survey

Map ID	Density Description	~ Size (ft-cir)	~ Size (acres)	Depth (ft)	Latitude (NAD 83)	Longitude (NAD 83)	Notes
0	5	<2	0.0002	8	46.124653	89.099272	2 med plants
1	5	<2	0.0002	8.5	46.124514	89.099763	1 med plant
2	5	<2	0.0002	7.5	46.124354	89.100158	2 lg plants
3	5	<2	0.0002	5	46.139634	89.089277	1 sm plant
4	5	<2	0.0002	3.5	46.137903	89.074709	2 plants
5	5	<2	0.0002	3	46.137895	89.074579	2 plants
6	5	<2	0.0002	3	46.137983	89.074164	1 plant
7	5	<2	0.0002	3.5	46.137569	89.074575	1 lg plant
8	5	15	0.016	3	46.137487	89.074767	4 plants spread over 15 ft
9	5	<2	0.0002	4	46.137386	89.075056	2 plants
10	5	10	0.007	5	46.137185	89.075591	3 plants spread over 10 foot area
11	5	<2	0.0002	6	46.136948	89.076046	1 plant
12	5	20	0.029		46.1377046	89.1135591	6-7 plants in DASH site
13	5	<2	0.0002	4	46.122477	89.078563	1 lg plant
14	5	10	0.007	3	46.122426	89.078780	1 lg plant and 1 med plant 10 ft apart
15	5	10	0.007	3	46.122636	89.079750	~ 10 med plants, one xlg plant
16	5	<2	0.0002	3	46.125739	89.074607	1 lg plant
17	5	<2	0.0002	2.5	46.125909	89.074424	1 med plant
18	5	<2	0.0002	3.5	46.125886	89.075904	1 sm plant
19	4	20	0.029	5	46.127152	89.079717	10-20 plants
20	5	20	0.029	6	46.127194	89.079836	< 10 plants
21	4	20	0.029	6	46.127248	89.079934	10-20 plants
22	5	20	0.029	4.5	46.127318	89.080072	10 plants
23	4	20	0.029	5	46.127355	89.080233	10-20 plants
24	5	20	0.029	4	46.127545	89.080137	< 10 plants
25	4	20	0.029	4	46.127481	89.080247	10-20 plants
26	5	20	0.029	3	46.127681	89.080297	< 10 plants
27	5	5	0.002	8	46.128003	89.080695	< 10 plants

Map ID	Density Description	~ Size (ft-cir)	~ Size (acres)	Depth (ft)	Latitude (NAD 83)	Longitude (NAD 83)	Notes
28	5	20	0.029	8	46.134255	89.080406	< 10 plants observed
29	5	5	0.002	8.5	46.134143	89.079093	2 plants
30	5	20	0.029	7	46.134292	89.078883	< 10 plants observed
31	5	20	0.029	8	46.134458	89.078747	< 10 plants observed
32	5	20	0.029	6	46.134562	89.078583	< 10 plants observed
33	5	20	0.029	6	46.134678	89.078478	< 10 plants observed
34	5	20	0.029	6.5	46.134639	89.078506	< 10 plants observed
35	4	20	0.029	7.5	46.134789	89.078355	< 10 plants observed
36	5	20	0.029	7	46.134866	89.078233	< 10 plants observed
37	5	20	0.029	7	46.134943	89.078017	< 10 plants observed
38	5	5	0.002	6	46.137131	89.077332	< 10 plants observed
39	5	<2	0.0002	3	46.125767	89.074584	1 med plant
40	5	<2	0.0002	3.5	46.125163	89.074507	1 med plant
41	5	<2	0.0002		46.125221	89.088404	1 plants at 24
			0.5684				