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2013 Qualitative Assessment of Eurasian watermilfoil *Myriophyllum spicatum* (including *Myriophyllum sibericum x spicatum)* of Pike Bay – Chassell Township, Houghton County, MI.

Prepared for the Citizen's Committee for Pike Bay Restoration

By:

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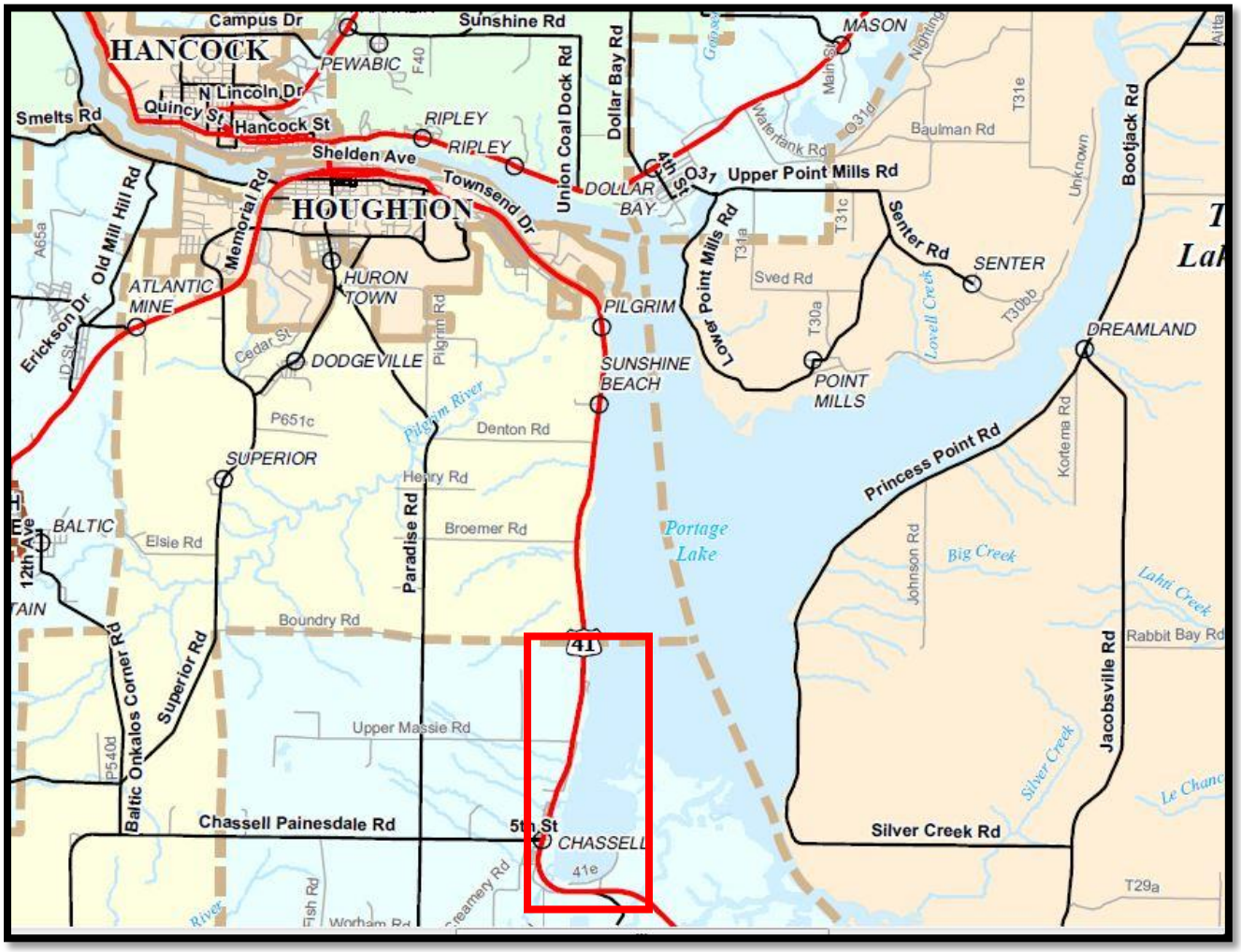
October 1st 2013

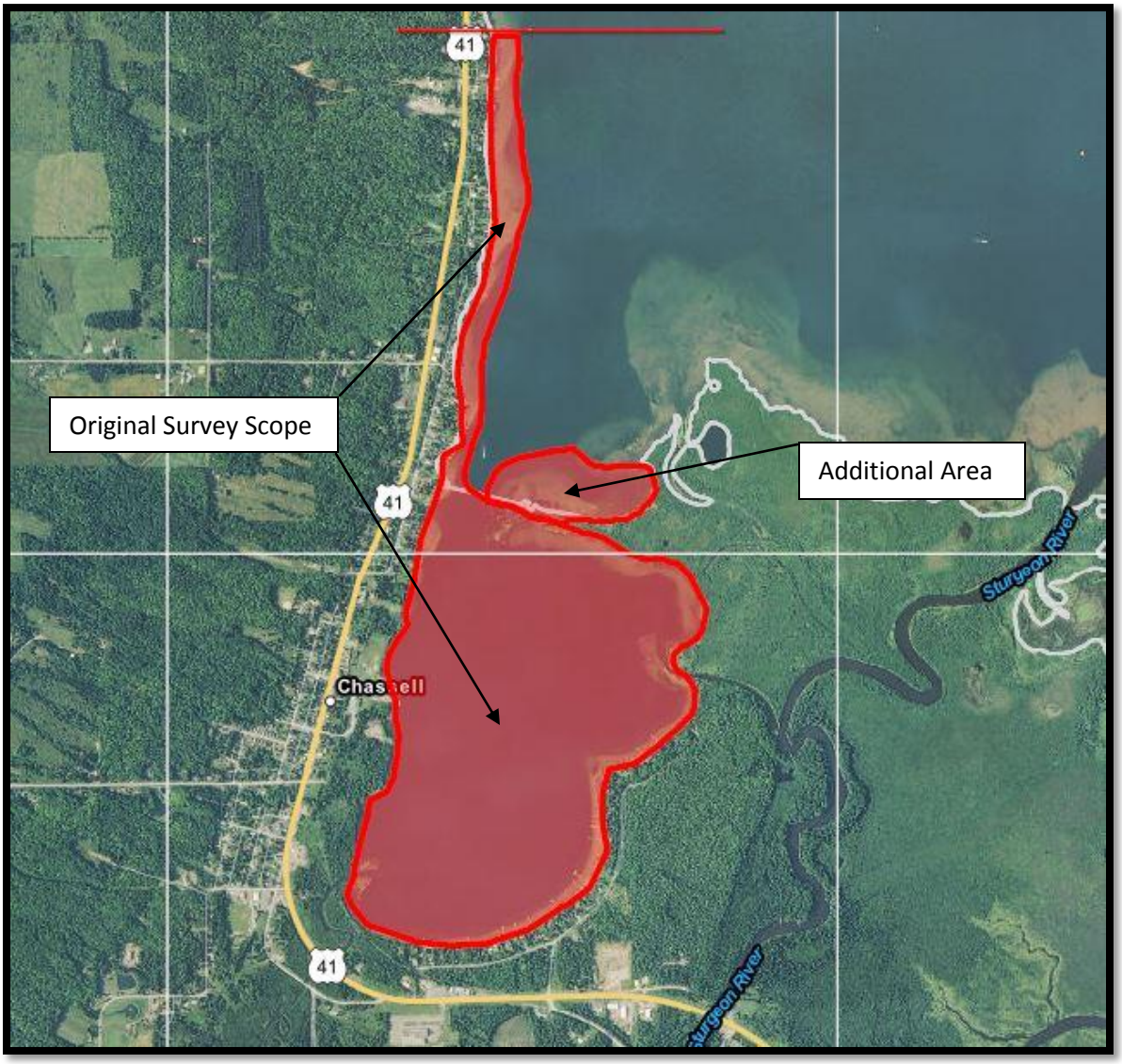
Project Location

Pike Bay is a secluded yet connected bay of Portage Lake located in Chassell Township, Houghton County, MI. Riparian ownership of Pike Bay comprises of Chassell Township, private riparian's and the Michigan Department of Natural Resources (MDNR). This survey includes Pike Bay, waters adjacent to Chassell Township along the western shore of Portage Lake and a shallow region of Portage Lake located just north of Pike Bay along the northeastern shore. The former survey areas are part of the original scope the latter survey area was added on site by verbal agreement.

Overview of Portage Lake and Surrounding Area



Outline of Survey Area

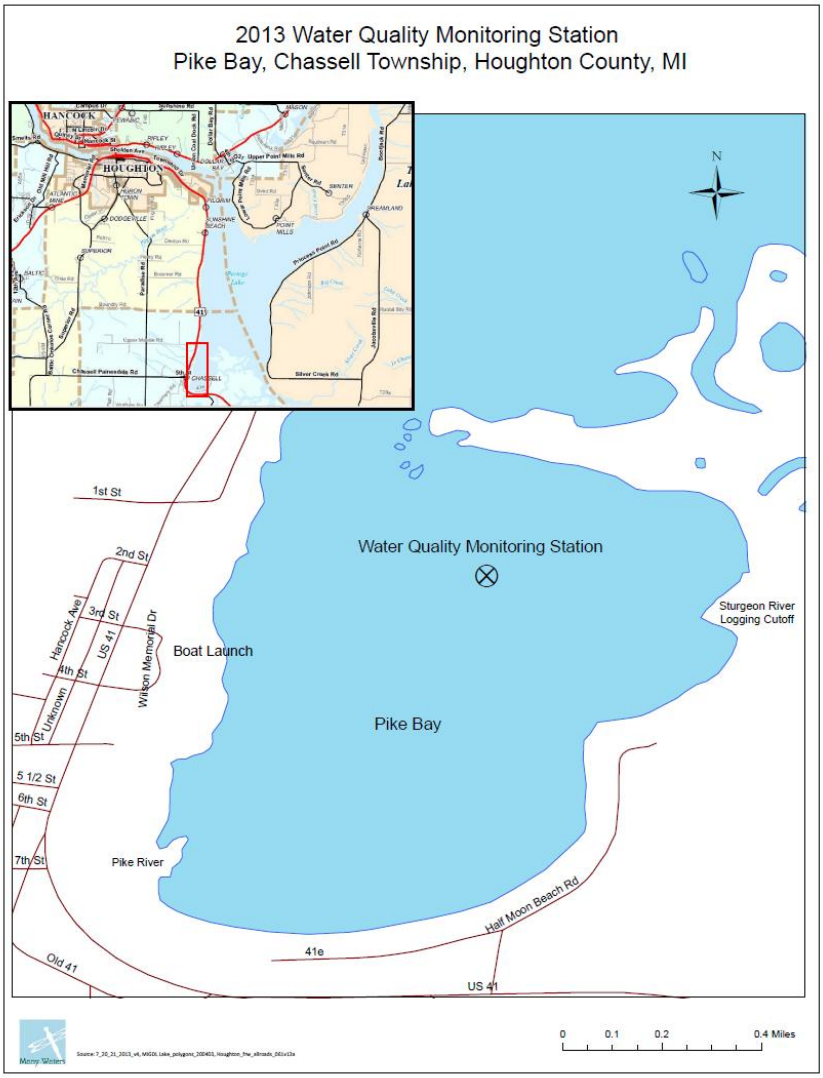


Methods

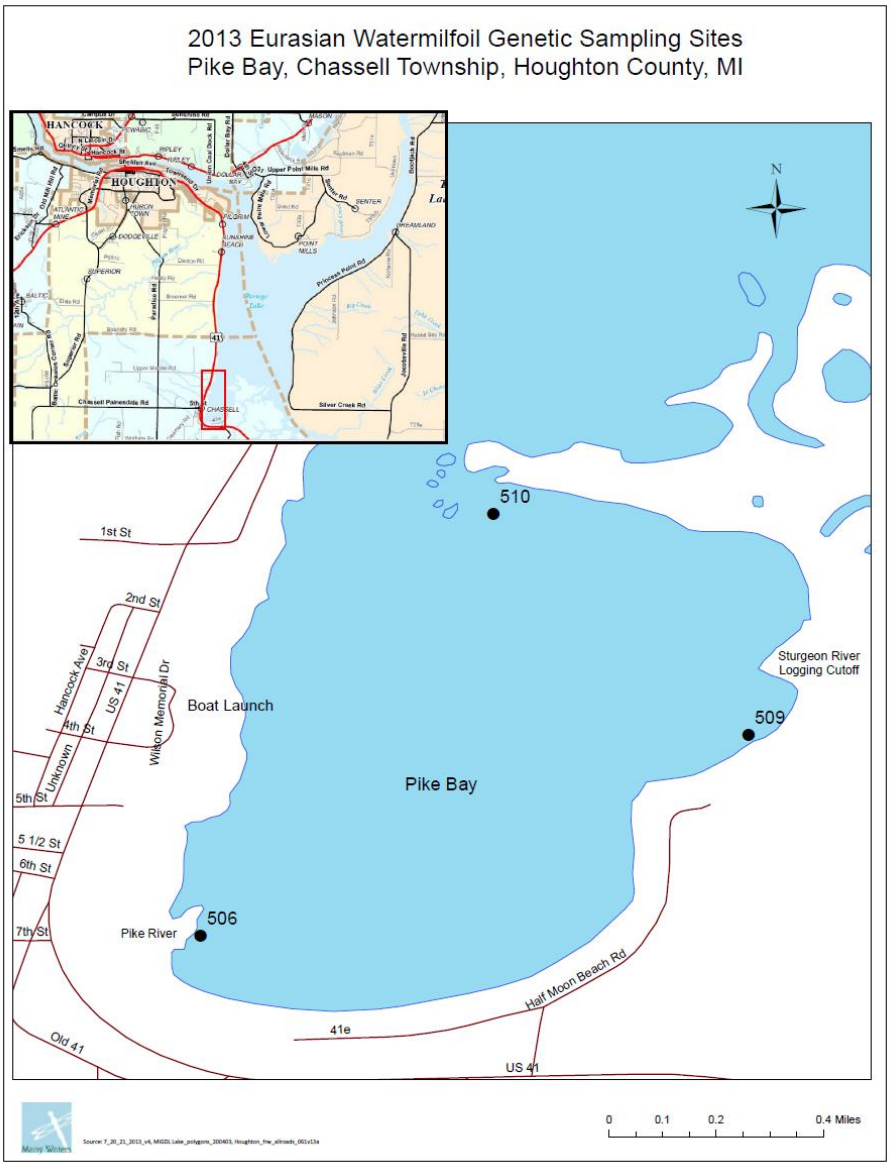
On July 20th and 21st of 2013, a meander survey of the littoral zone within the project area was completed. This survey assessed the extent, location, and density of Eurasian watermilfoil (EWM). Specifically, a boat zigzagged at short transects across the littoral zone and geo-referenced all observed locations of the target species-EWM. When contiguous beds were present, the perimeter of each affected area was delineated.

After determining the extent of EWM, water depths were recorded along the deepest and shallowest edge and a depth profile across the affected area was recorded. These values determined the average water volume for each affected area. To minimize error that may occur when a continuous bed ranges from shallow to deeper water, beds are split into several volume averages when applicable.

A dissolved oxygen profile using a YSI dissolved oxygen meter collected temperature, dissolved oxygen in mg/l and percent saturation of oxygen at half meter intervals from the surface to the bottom. Based on the results of this profile, a hypolimnetic water sample taken at 5.5 meters was sent to White Water Associates Environmental Laboratory and analyzed for total phosphorous.



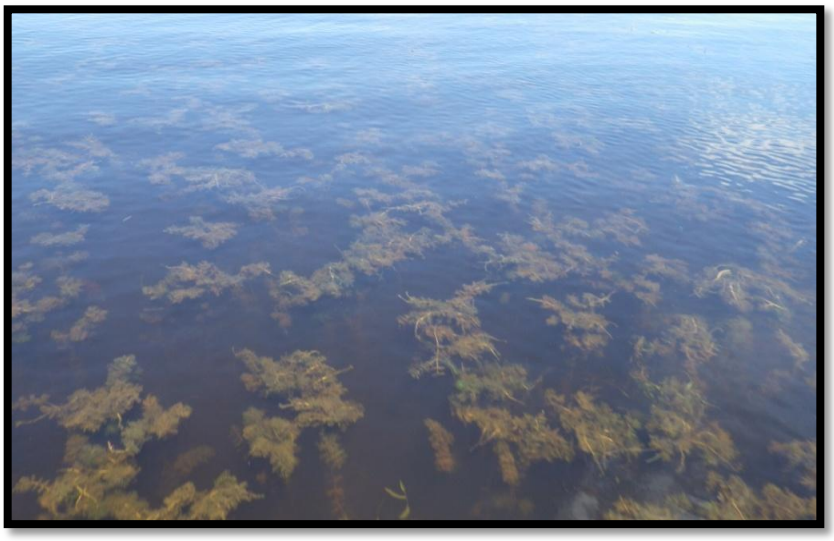
The Annis Water Resources Institute at Grand Valley State University analyzed EWM plant samples collected from three locations on Pike Bay to determine if a hybrid watermilfoil (*Myriophyllum sibericum x spicatum*) is present.



Findings

EWM/HWM growing along the edge of hard stem bulrush

Using the July 20th and 21st 2013 assessment findings, the extend and density of Eurasian watermilfoil (EWM) and laboratory confirmed hybrid watermilfoil (HWM) in Pike Bay is wide spread. Overall densities are consistent with nuisance level conditions typified as dense surface matted monotypic beds. The distribution encompasses the majority of the littoral zone and extends from the shore or the near shore area where sand is the dominant substrate to depth of maximum rooted vegetation. Where sandy substrates near shore are not present, EWM/HWM grows very closely to shore or adjacent to near shore emergent vegetation.

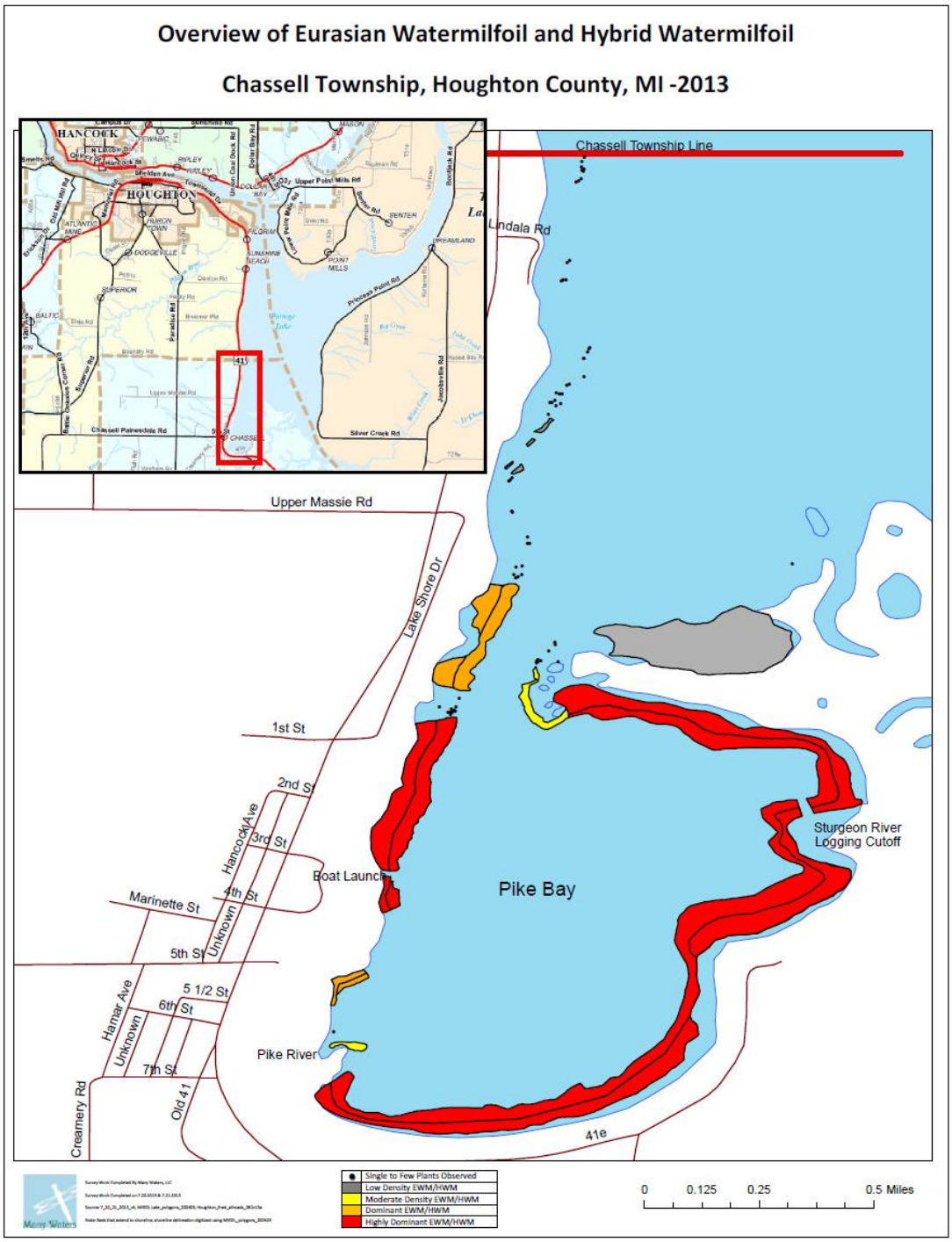


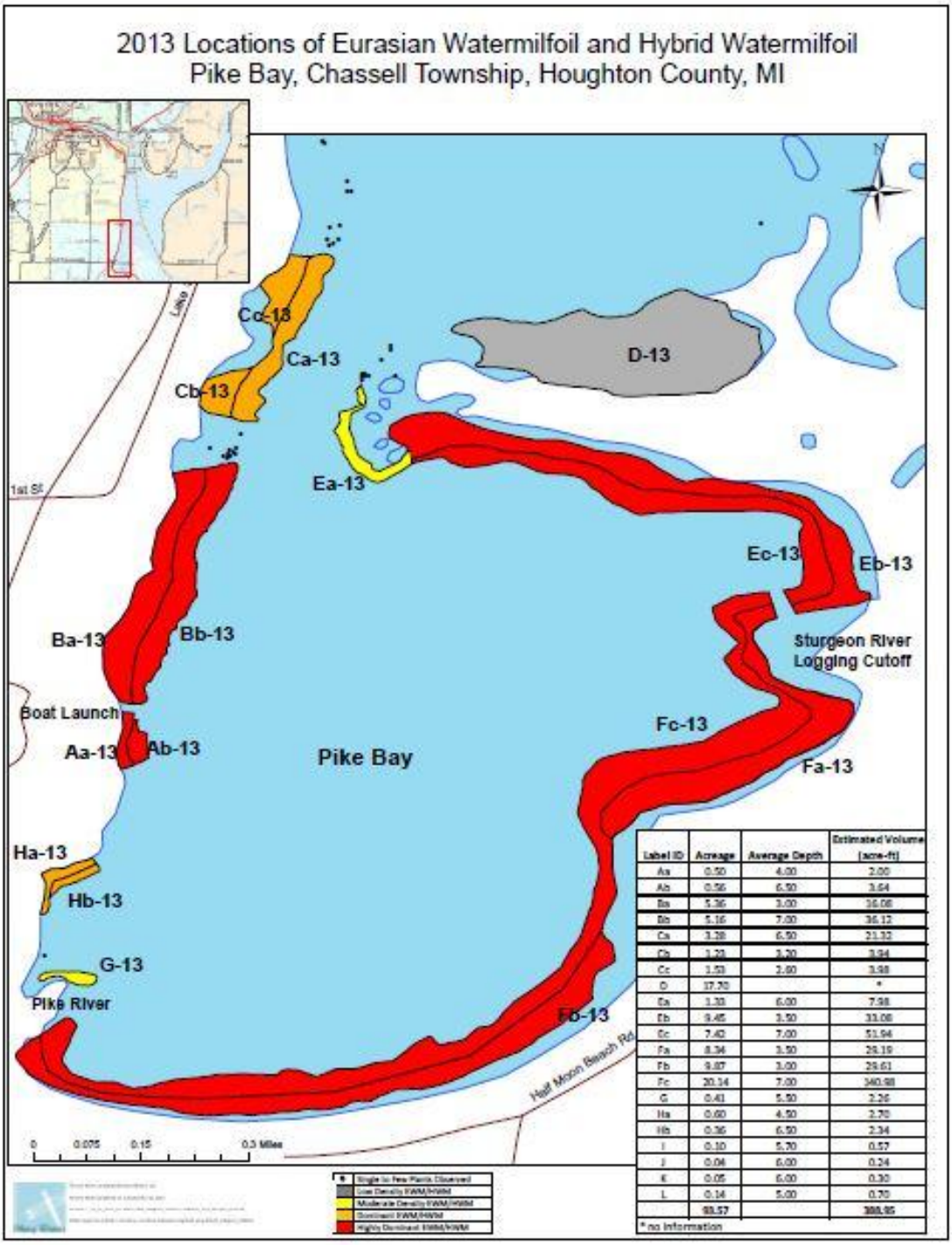
High density bed of EWM/HWM in Pike Bay

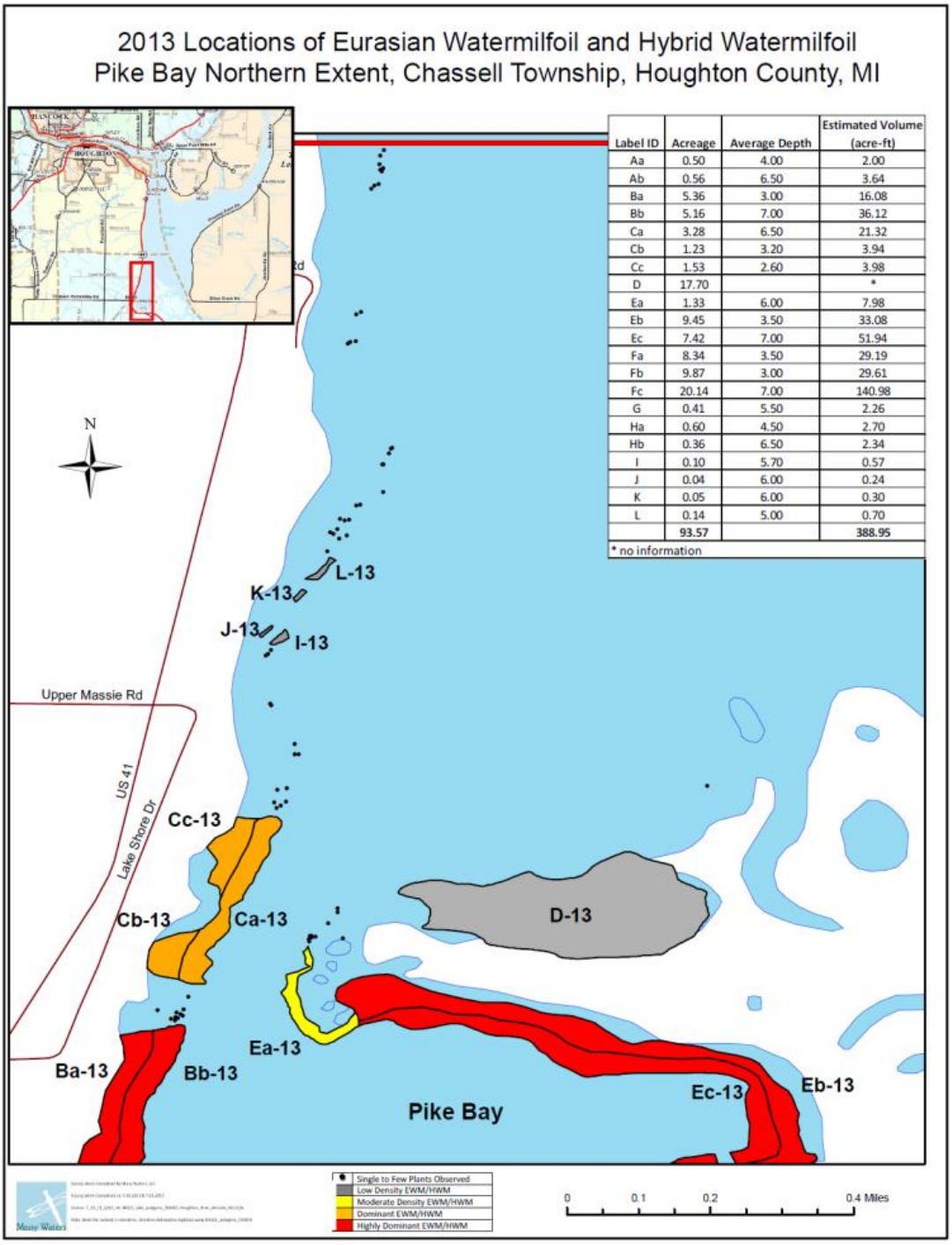
Determining the extent of EWM/HWM as a percentage of littoral frequency is outside the scope of this qualitative assessment. Nevertheless, based on visual observations made, the extent of EWM/HWM encompasses approximately 80%-90% of the littoral zone of Pike Bay. Very little to no EWM/HWM was found at the historical log landing/mill site located south of the park along the western shore. A conversation with the landowner described the adjacent waters to the old mill as having submersed wooden planks along the lakebed, leaving little area for any aquatic vegetation to become rooted and established.

The distribution of EWM/HWM along the western shore of Portage Lake to the Chassell Township line is isolated to patchy and is not at nuisance level conditions at this time.

The distribution of EWM/HWM in D-13 encompasses the entire surveyed area in moderate to low densities. However, a few small pockets of moderate to high density EWM/HWM do exist in this area.


Overview of Eurasian Watermilfoil and Hybrid Watermilfoil
Chassell Township, Houghton County, MI -2013
Chassell Township Line
Lindala Rd
Upper Massie Rd
Lake Shore Dr
1st St
2nd St
Hancock Ave
3rd St
4th St
Boat Launch
Marinette St
5th St
Unknown
5 1/2 St
6th St
Hamar Ave
Unknown
7th St
Creamery Rd
Old 41
Pike River
Pike Bay
Sturgeon River
Logging Cutoff
41e
Single to Few Plants Observed
Low Density EWM/HWM
Moderate Density EWM/HWM
Dominant EWM/HWM
Highly Dominant EWM/HWM
0
0.125
0.25
0.5 Miles


2013 Locations of Eurasian Watermilfoil and Hybrid Watermilfoil
Pike Bay, Chassell Township, Houghton County, MI
Cc-13
Ca-13
Cb-13
D-13
Ea-13
1st St
Ec-13
Eb-13
Ba-13
Bb-13
Sturgeon River
Logging Cutoff
Boat Launch
Aa-13
Ab-13
Pike Bay
Fc-13
Fa-13
Ha-13
Hb-13
G-13
Pike River
Fb-13
Half Moon Beach Rd
0
0.075
0.15
0.3 Miles
Label ID | Acreage | Average Depth | Estimated Volume (acre-ft)
Aa | 0.50 | 4.00 | 2.00
Ab | 0.56 | 6.50 | 3.64
Ba | 5.36 | 3.00 | 16.08
Bb | 5.16 | 7.00 | 36.12
Ca | 3.28 | 6.50 | 21.32
Cb | 1.23 | 3.20 | 3.94
Cc | 1.53 | 2.60 | 3.98
D | 17.70 | | *
Ea | 1.33 | 6.00 | 7.98
Eb | 9.45 | 3.50 | 33.08
Ec | 7.42 | 7.00 | 51.94
Fa | 8.34 | 3.50 | 29.19
Fb | 9.87 | 3.00 | 29.61
Fc | 20.14 | 7.00 | 140.98
G | 0.41 | 5.50 | 2.26
Ha | 0.60 | 4.50 | 2.70
Hb | 0.36 | 6.50 | 2.34
I | 0.10 | 5.70 | 0.57
J | 0.04 | 6.00 | 0.24
K | 0.05 | 6.00 | 0.30
L | 0.14 | 5.00 | 0.70
 | 93.57 | | 368.95
* no information



Label ID	Acreage	Average Depth	Estimated Volume (acre-ft)
Aa	0.50	4.00	2.00
Ab	0.56	6.50	3.64
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Cb	1.23	3.20	3.94
Cc	1.53	2.60	3.98
D	17.70		*
Ea	1.33	6.00	7.98
Eb	9.45	3.50	33.08
Ec	7.42	7.00	51.94
Fa	8.34	3.50	29.19
Fb	9.87	3.00	29.61
Fc	20.14	7.00	140.98
G	0.41	5.50	2.26
Ha	0.60	4.50	2.70
Hb	0.36	6.50	2.34
I	0.10	5.70	0.57
J	0.04	6.00	0.24
K	0.05	6.00	0.30
L	0.14	5.00	0.70
	93.57		**388.95**

* no information

Label ID	Acreage	Average Depth	Estimated Volume (acre-ft)
Aa	0.50	4.00	2.00
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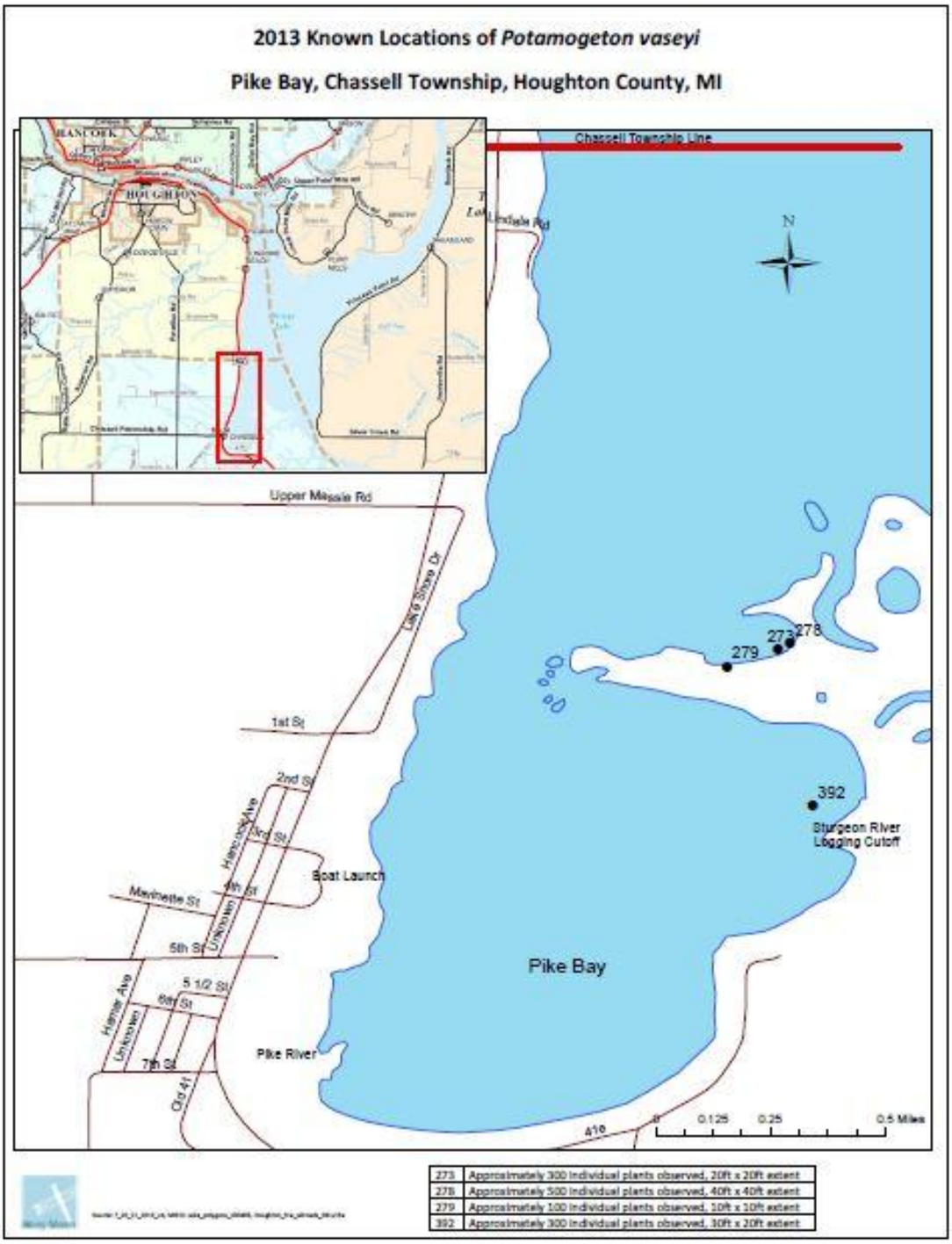
Fb	9.87	3.00	29.61
Fc	20.14	7.00	140.98
G	0.41	5.50	2.26
Ha	0.60	4.50	2.70
Hb	0.36	6.50	2.34
I	0.10	5.70	0.57
J	0.04	6.00	0.24
K	0.05	6.00	0.30
L	0.14	5.00	0.70
	93.57		**388.95**
* no information			
**EWM & HWM located adjacent to State of MI Lands			

A State of Michigan threatened aquatic plant species *Potamogeton vaseyi* is known to occur. Several photos and a sample was collected. Dr. Tony Reznicek at the University of Michigan verified the photos as *Potamogeton vaseyi*. The sample is pressed and dried and will be delivered to Dr. Reznicek at the University of Michigan this fall. Primarily this plant is located within the near shore region of D-13, but also along the northeastern side of Pike Bay.

Potamogeton vaseyi

Potamogeton vaseyi growing in Pike Bay


2013 Known Locations of Potamogeton vaseyi
Pike Bay, Chassell Township, Houghton County, MI
Chassell Township Line
N
Upper Meaole Rd
Lake Shore Dr
1st St
2nd St
3rd St
4th St
5th St
5 1/2 St
6th St
7th St
Hamlin Ave
Unknown
Marinette St
Boat Launch
Pike River
Pike Bay
Sturgeon River Logging Cutoff
392
279
273
278
0 0.125 0.25 0.5 Miles
273 Approximately 300 individual plants observed, 20ft x 20ft extent
278 Approximately 500 individual plants observed, 40ft x 40ft extent
279 Approximately 100 individual plants observed, 10ft x 10ft extent
392 Approximately 300 individual plants observed, 30ft x 20ft extent

The six samples of EWM sent to the Annis Water Resource Institute at Grand Valley State and analyzed for genetic composition came back as both *Myriophyllum spicatum* and *Myriophyllum sibericum x spicatum*.

Details of Results Broken Down by Lake:

Lake Name: Pike Bay of Portage Lake

Date Received: 7/26/13

# of Samples Sent: 6

# of Samples Processed: 6

Genetic IDs:

SW #506: 2 Hybrid watermilfoil (Myriophyllum spicatum x Myriophyllum sibiricum)

NE #509: 2 Eurasian watermilfoil (Myriophyllum spicatum)

N #510: 1 Eurasian watermilfoil (Myriophyllum spicatum)

1 Hybrid watermilfoil (Myriophyllum spicatum x Myriophyllum sibiricum)

Taken from email received from Andrew Pyman at Grand Valley State University on 7.31.2013

Native and other non-native species observed

Ceratophyllum demersum-coontail

Chara-muskgrass

Eleocharis palustris-creeping spikerush

Pontederia cordata-pickerelweed

**Lythrum salicaria*-purple loosestrife (this species was not observed on Pike Bay but in the wetland area adjacent to the parking lot at Centennial Park.

Nuphar variegata-spatterdock

Nymphaea odorata-white water lily

**Phalaris arundinaceae*-reed canary grass

Potamogeton amplifolius-large leaf pondweed

Potagmogeton gramineus-variable pondweed

Potamogeton pusillus-small pondweed

Potamogeton richardsonii-clasping leaf pondweed

Potamogeton vaseyi-Vasey's pondweed

Potamogeton zosteriformis-flatstem pondweed

Scirpus acutus-hardstem bullrush

Sparganium sp.-bur-reed

Stuckenia pectinata-sago pondweed

**Typha angustifolia*-narrow leaved cattail

Typha latifolia-broad leaved cattail

Vallisneria americana-water celery

*Invasive wetland species

Typha angustifolia

Dissolved Oxygen Profile, Pike Bay, Chassell Township, Houghton County, MI (7.21.2013)			
Depth (m)	**Temperature (Celsius)**	**D.O. (mg/l)**	**% Saturation**
Surface	24.4	7.58	90.9
0.5	24.4	7.58	90.5
1.0	24.4	7.61	91.0
1.5	24.1	7.75	91.4
2.0	23.7	7.34	86.9
2.5	23.4	6.77	78.5
3.0	22.7	6.30	72.8
3.5	22.4	6.21	71.3
4.0	19.3	3.04	32.8
4.5	17.7	1.36	14.0
5.0	16.9	0.7	7.7
5.5*	15.8	0.14	1.5
6.0	15.3	0.14	1.4
6.5	15.0	0.13	1.3
Bottom	14.8	0.13	1.3

* Total phosphorous not detectable

Management of EWM/HWM

The current intent of the Citizen's Committee for Pike Bay Restoration is to apply for a MDEQ permit to use aquatic herbicides to manage EWM/HWM in 2014. Ultimately, the final determination of what will be treated in 2014 may depend on what can be afforded fiscally and on decisions from the MDEQ herbicide permit application review. Herbicide selection and concentrations will be based on recommendations from the contracted herbicide applicator and follow all label rate restrictions and State of Michigan aquatic nuisance permitting requirements. The Citizen's Committee for Pike Bay Restoration will work directly with the contracted herbicide applicator through the permit process. Several considerations to the use of herbicides specific to Pike Bay are discussed below.

Herbicide Dissipation and Hydrological Influences

Research has shown that herbicides applied to a water body can dissipate off site rapidly; minimizing the appropriate concentration exposure times necessary to adequately control aquatic invasive species (WDNR, 2011). Weather conditions such as high winds may add to this effect. Any herbicide application should occur only when sustained wind conditions are low, generally less than 10 miles per hour.

Three hydrological influences to Pike Bay that can potentially influence water movement and water volume resulting in impacts to herbicide concentration exposure times include: snow pack and resulting spring "break-up" and run off, isolated precipitation events and connectivity to Lake Superior. Spring break up in the Upper Peninsula of Michigan can have a substantial influence on the amount of water run off depending on how fast or slow snow melt occurs (As seen with several flood stage events that occurred in the Upper Peninsula this spring.). It will be important to watch spring break up conditions closely and time treatment when lower flow conditions occur. A request to the MDEQ Hydrological unit should be made to model flow and discharge for both the Sturgeon River Log Wier and the Pike River. A electronic form can be filled out and submitted online at http://www.michigan.gov/deq/0,1607,7-135-3313_3684_3724_4048-168812--,00.html. Allow a minimum of one month for this information to be returned back once the request has been made.

At the time of the survey, it was noted that a large rain event increased water levels in Pike Bay by 4-6 inches. Inflow from the Sturgeon River Log Weir produced a sediment line that ran from the entrance of the river beyond the water quality-sampling site. A great degree of attention needs to be paid to not only spring runoff, but also local weather conditions that can potentially lead to high run off into Pike Bay near and during the time of treatment.

Portage Lake, where Pike Bay is located, is part of the interconnected waterways of Lake Superior. As Lake Superior water levels rise and fall, so would the interconnected waterways. In addition, Lake Superior seiches's may influence the water level in Pike Bay.

Non-Target Impacts and Treatment Timing

Given the substantial degree of the littoral zone identified for possible treatment in 2014, timing treatment when plants are small and not fully-grown and surface matted may minimize potential negative impacts to water quality including dissolved oxygen and nutrient availability.

Potamogeton vaseyi is a small plant in stature and can often be missed or confused with several other narrow leaf pondweeds. The specific purpose of this assessment was not to quantify the native plant community, and at this time, it is unknown if more locations of *Potamogeton vaseyi* are present. Coordination between the herbicide permit applicant, MDEQ-Aquatic Nuisance Control (ANC) Staff and the MDNR must occur prior to treatment regarding the presence of *Potamogeton vaseyi.* An initial dialog with Lori Sargent of the Michigan Department of Natural Resources, Wildlife Division has begun. She is aware of the presence of this species in Pike Bay, and it will be essential to continue dialog with her and the MDEQ-ANC staff as the permitting process moves forward. Lori's contact information is 517.373.9468, sargentl@michigan.gov.

Hybridity

Grand Valley State has confirmed the presence of hybrid water milfoil in Pike Bay. There is still a lot to learn about a hybrids response to herbicide treatments in lake applications, however, some research has shown that hybrids can be less sensitive to the herbicide 2,4-D at application rates that are comparable to what is seen in lake management scenarios (LaRue et al, 2012). When consulting with herbicide applicators it will be important to inquire about their process on how they approach hybridity management and their level of confidence and assurance of successful control.

The extent and density of EWM/HWM at Pike Bay at this time would deem it as a large-scale treatment. To minimize risks at scales where a large degree of fiscal resources are invested a PlanTEST is a laboratory test that can assist in determining the appropriate herbicide and concentration specific to the invasive plant in that particular water body. These tests require plants to be collected from Pike Bay and delivered to SePRO laboratories. More information about PlanTESTS can be found from the contracted herbicide applicator and from SePRO. More information on SePRO is located at SePRO.com.

Monitoring Parameters

Qualitative metrics in large-scale treatments, as in this case, are not sufficient to monitor responses to aquatic plant communities post treatment. If Pike Bay, were a stand alone lake without connectivity to Portage Lake, a whole lake management approach would have been an option to discuss. This option, if it were available, would have required an aquatic vegetation assessment survey by the MDEQ. The State of MI does not define large scale in regards to total treatment acreages under a non-whole lake strategy, each permit is reviewed and final permit approval, and additional permit requirements are made on a case-by-case basis. It will be important to maintain dialog with MDEQ-ANC staff as the permitting process moves forward. It is understood that this dialog has already begun amongst representatives of the Citizen's Committee for Pike Bay Restoration and the MDEQ-ANC.

Appropriate monitoring and long term management not only includes proper herbicide selection, concentrations, and timing but also includes built in monitoring strategies that "keep track" of the native aquatic community and EWM/HWM response to herbicide management. A quantitative aquatic plant survey would provide information on the richness, density and distribution of the native plant community and EWM/HWM in Pike Bay. This type of assessment is systematic, unbiased and repeatable. In addition, it will provide stakeholders with impartial information on the results of the chosen management strategy. A quantitative plant survey was proposed for 2013, however, the committee decided not to complete this assessment at this time.

Summary

The northeastern side of Pike Bay is an expansive wetland complex owned by the MDNR. This large undeveloped natural area provides vital ecological habitat for local and migrating birds and fish. It is also, where the majority of the *Potamogeton vaseyi* plants are located. The Sturgeon River enters Portage Lake just to the northeast of Pike Bay, however, the Sturgeon River Log Weir enters into Pike Bay along the northeastern side. During the survey, it is obvious where the river got its name due to the large sturgeon observed displaying their acrobatics out of the water.

Areas affected with EWM/HWM adjacent to State of Michigan Lands.

Centennial Park at Pike Bay serves as an access point to the greater Portage Lake system. The park offers a beach, picnic area, boat launch and fishing pier that is used by visitors and local residents. Currently, the majority of the swimming area is occupied by EWM/HWM in high densities and is a recreational impediment to beach users. The level of EWM/HWM present in Pike Bay poses a significant risk to the continued recreation use of the bay, access to the lake by riparian property owners and park users.

To reduce the level of EWM/HWM in Pike Bay, the most cost effective approach will be to conduct annual herbicide treatments. Understand that once management of an invasive species begins, it is a continual process, not once and done. Eradication is not feasible; once an invasive aquatic plant species becomes established in a system it will more than likely never be eradicated. The aim of any herbicide management will be to reduce size but also density of the target species and this may take multiple years to accomplish both. Anticipate annual reduction in density and size, however, significant reduction in overall treatment acreages may take several years to accomplish.

As the Citizen's Committee for Pike Bay Restoration moves forward in the management of EWM/HWM the group will have to determine their long-term aquatic invasive species management goal. Some groups choose to do enough management annually to allow as much unrestricted recreational use as possible while others try to lower the density and acreage low enough that it is possible to control an aquatic invasive species with hand pulling through the summer months. An example of a long-term goal would be over a given time period, continue herbicide treatments at larger scales until the distribution of EWM/HWM is at or less than 20 acres. The long-term maintenance goal would be to keep treatments at or below 5-10 acres. This example goal, not specific to Pike Bay, understands that eradication unrealistic, and a level of 5-10 acres or less is foreseeable fiscally and is tolerable to stakeholders. The Citizen's Committee for Pike Bay Restoration is a committed, organized, and informed group. They have already begun targeting fiscal resources and are poised to move forward with management in 2014. The continued management of EWM/HWM and restoration of Pike Bay, would not have come into impetus without the continued dedication and work that this citizen's group is doing.

Elizabeth A. LaRue, Matthew P. Zuellig, Michael D. Netherland, Mark A. Heilman, and Ryan A. Thum. 2012. Hybrid watermilfoil lineages are more invasive and less sensitive to a commonly used herbicide than their exotic parent (Eurasian watermilfoil). Evolutionary Applications ISSN 1752-4571.

WDNR, Misc. Publication PUB-SS-1077 2011.