



# MANAGEMENT OF AQUATIC INVASIVE PLANT SPECIES USING DIVER ASSISTED SUCTION HARVESTING (DASH)

Wisconsin Lake Convention  
Stevens Point, WI

March 31<sup>st</sup> 2016



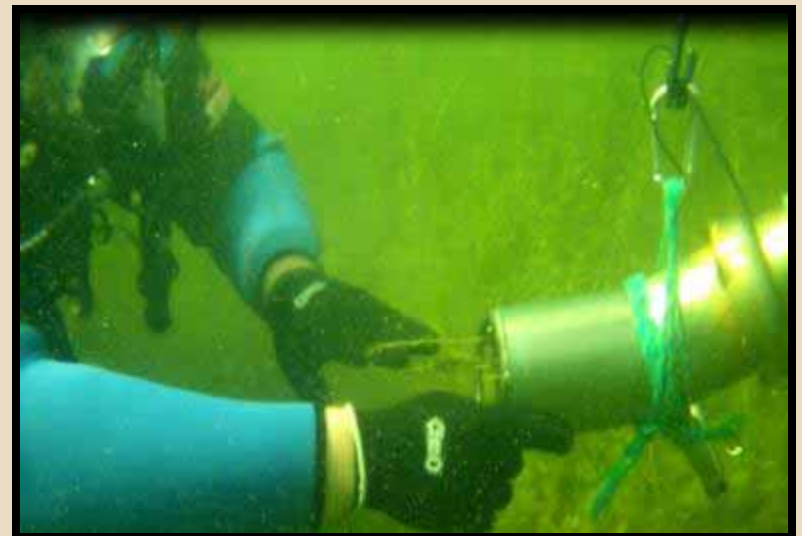
Photo Credit: GLIFWC

# Overview

- What is Diver Assisted Suction Harvesting?
- Considerations
- Efficacy
- Case Studies
- Expectations
- Take Home Messages
- Questions

# What is Diver Assisted Suction Harvesting?

- ❑ DASH is a tool used in the management of aquatic invasive plant species.
- ❑ DASH utilizes divers to hand remove aquatic invasive plants from the lake-bed.
- ❑ Instead of divers coming to the surface to dispose of the removed plants or bagging them underwater, plants are fed into a suction line that transports plants to the surface.
- ❑ DASH is NOT bottom dredging.

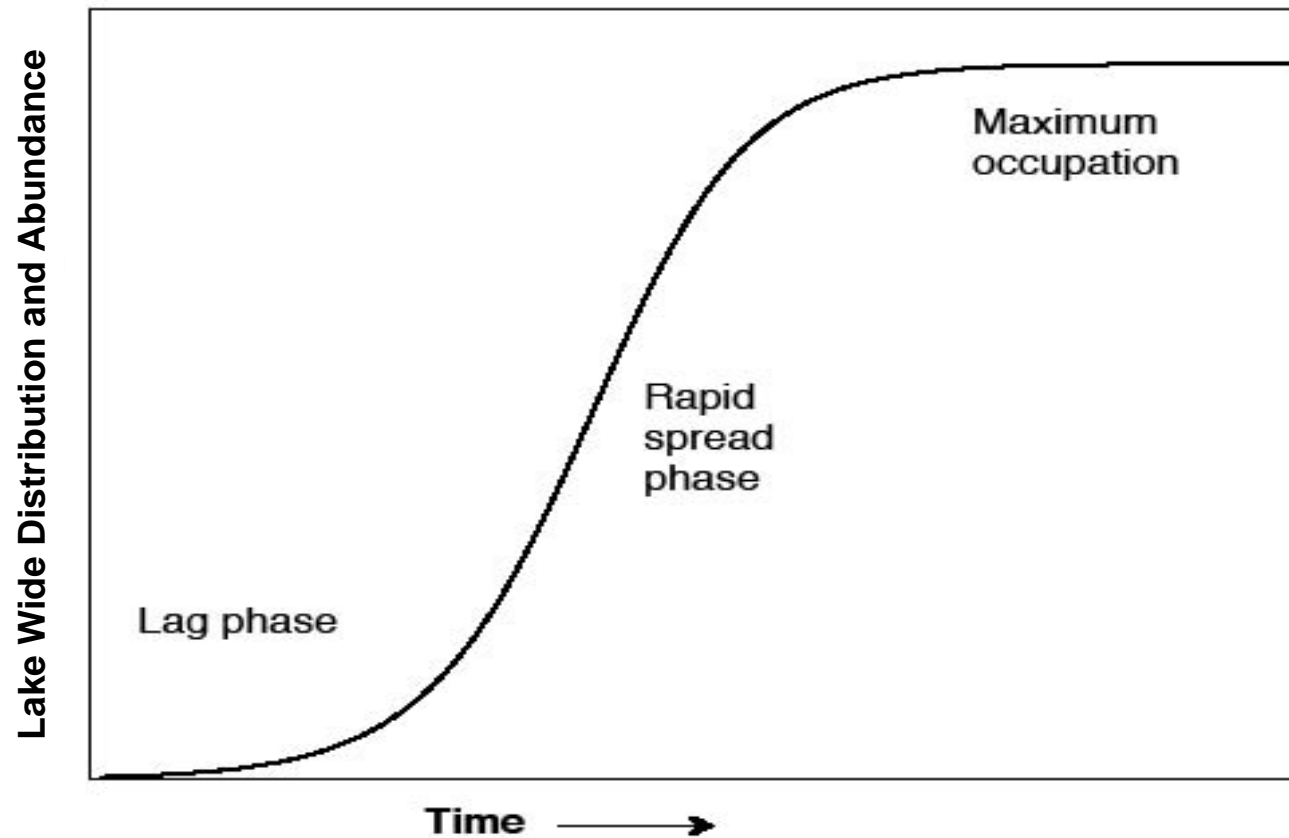


# General Considerations

- Less controversial
- Labor & equipment intensive
- Know your State regulations
- Hard to quantify
- Where you are on the invasive species curve



# Considerations – Invasion Curve

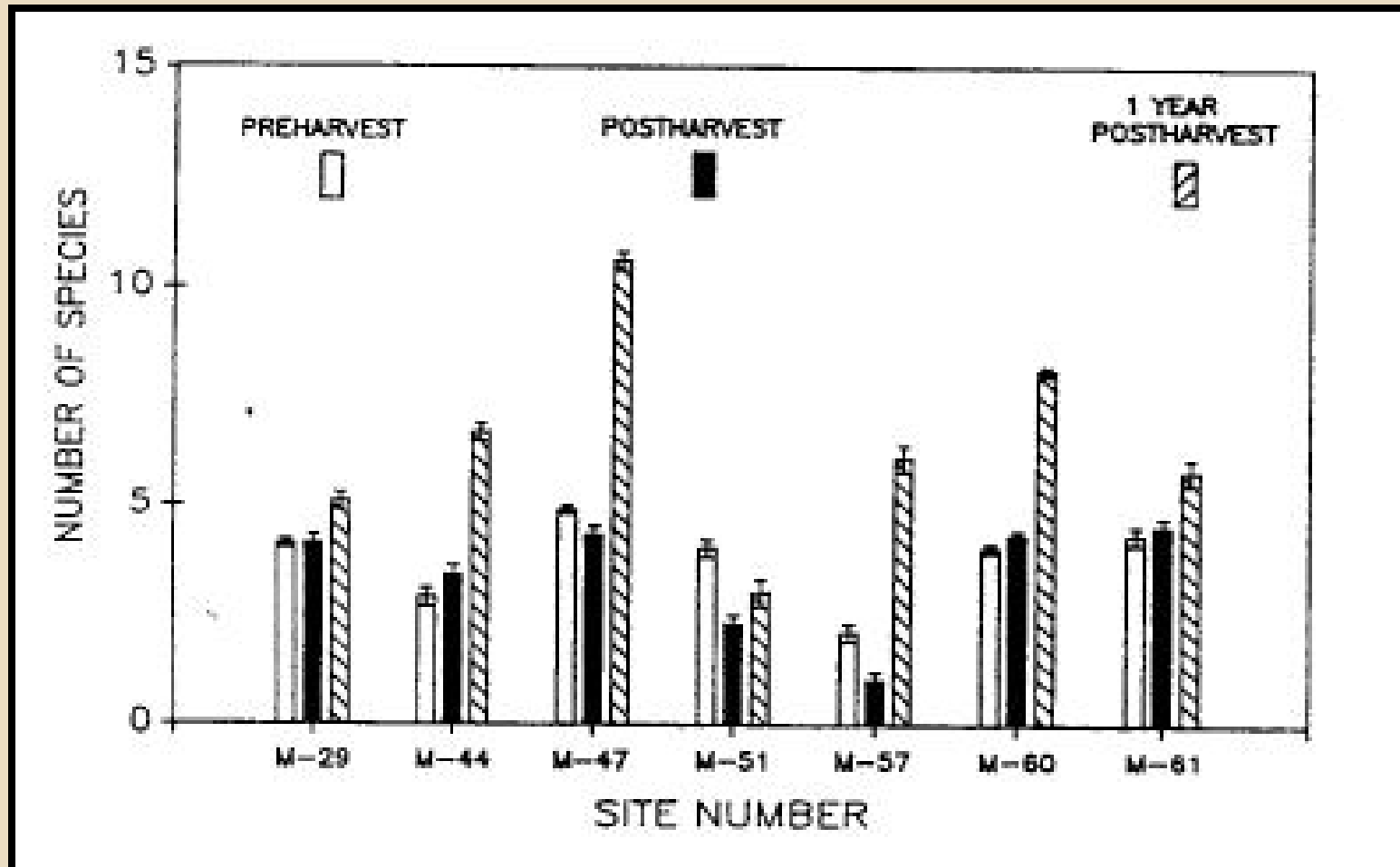


Adapted from: [http://srs.fs.usda.gov/futures/technical-report/15-web-images/15.35\\_opt.jpeg](http://srs.fs.usda.gov/futures/technical-report/15-web-images/15.35_opt.jpeg)

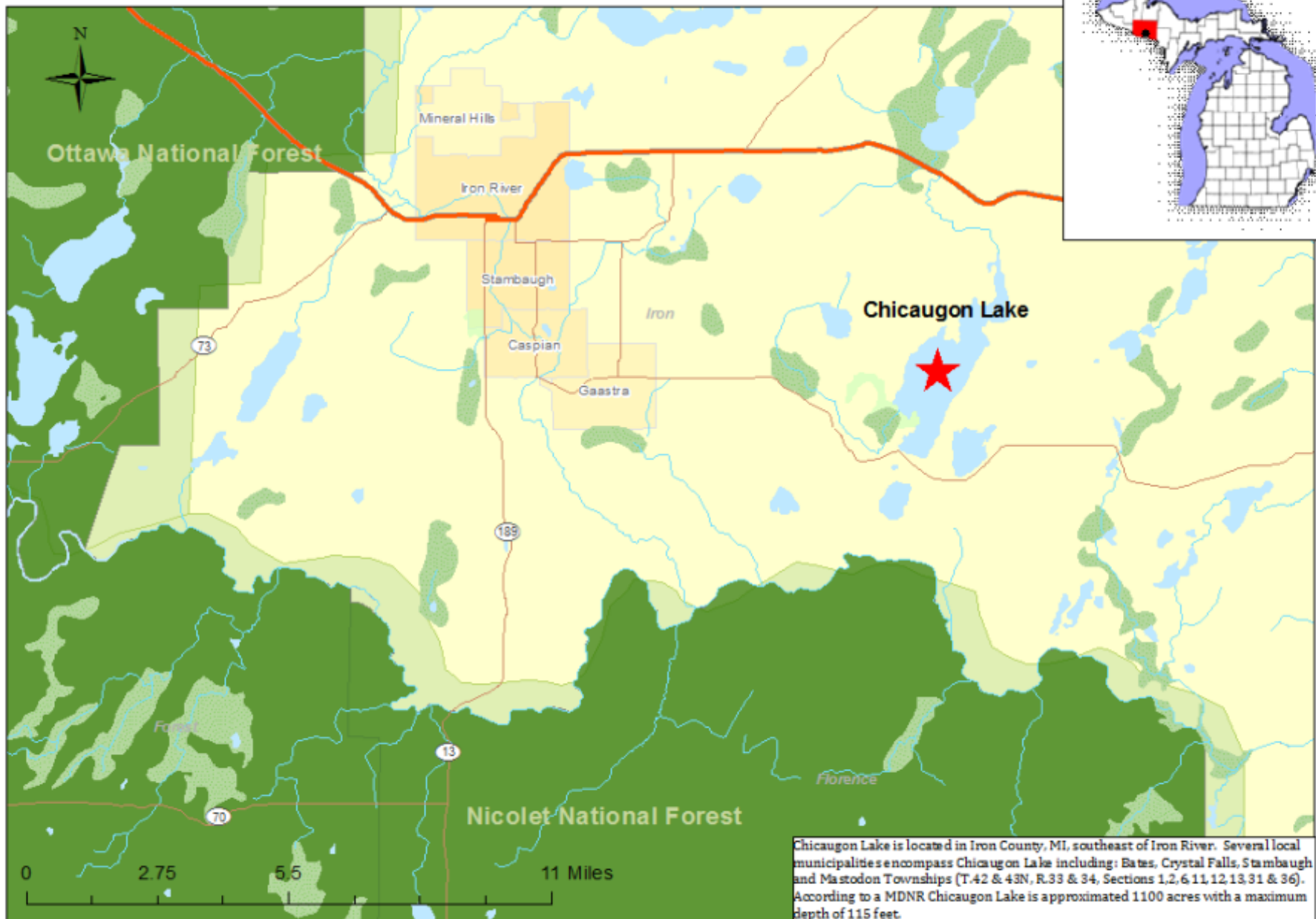
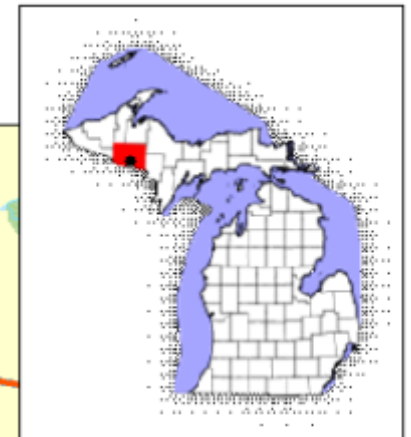
# Efficacy

- Effectiveness of suction harvesting on EWM at one year post removal ranged from 86%-94% (Eichler et al., 1993).
- At large scale moderate to high densities of EWM, hand removal resulted in less than 5% of frequency over 90% of the littoral area (Keltina & Laxar, 2010).
- Removal of hydrilla biomass successful with the use of suction harvesting, however, effectiveness at removing tubers limited (Johnston & Johnson, 2011 Interim conclusions).

# Selectivity

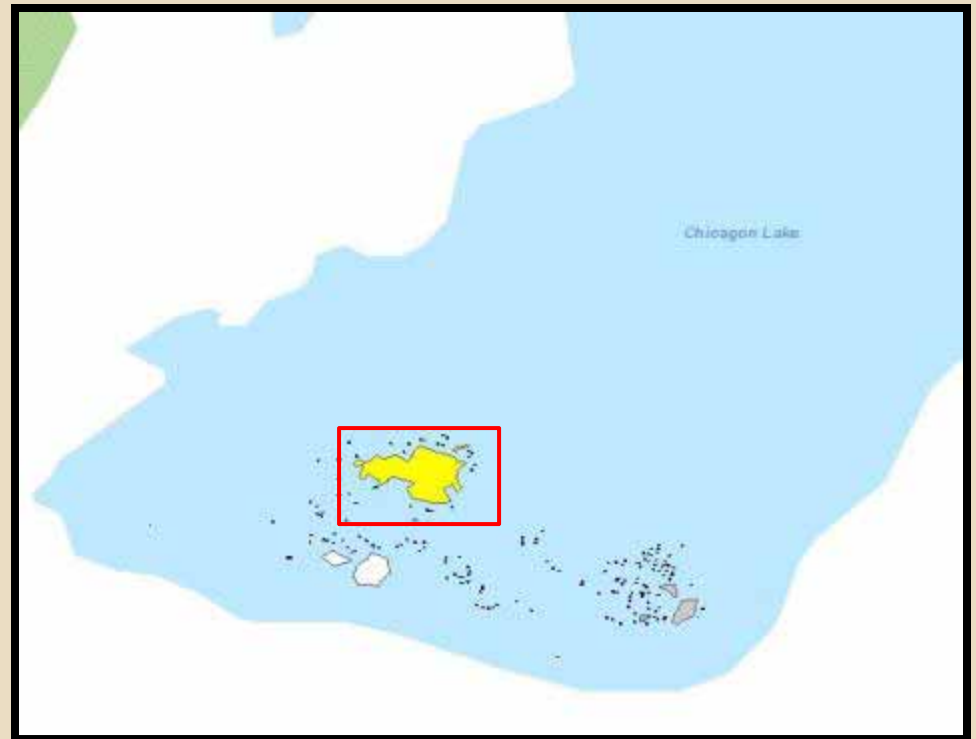
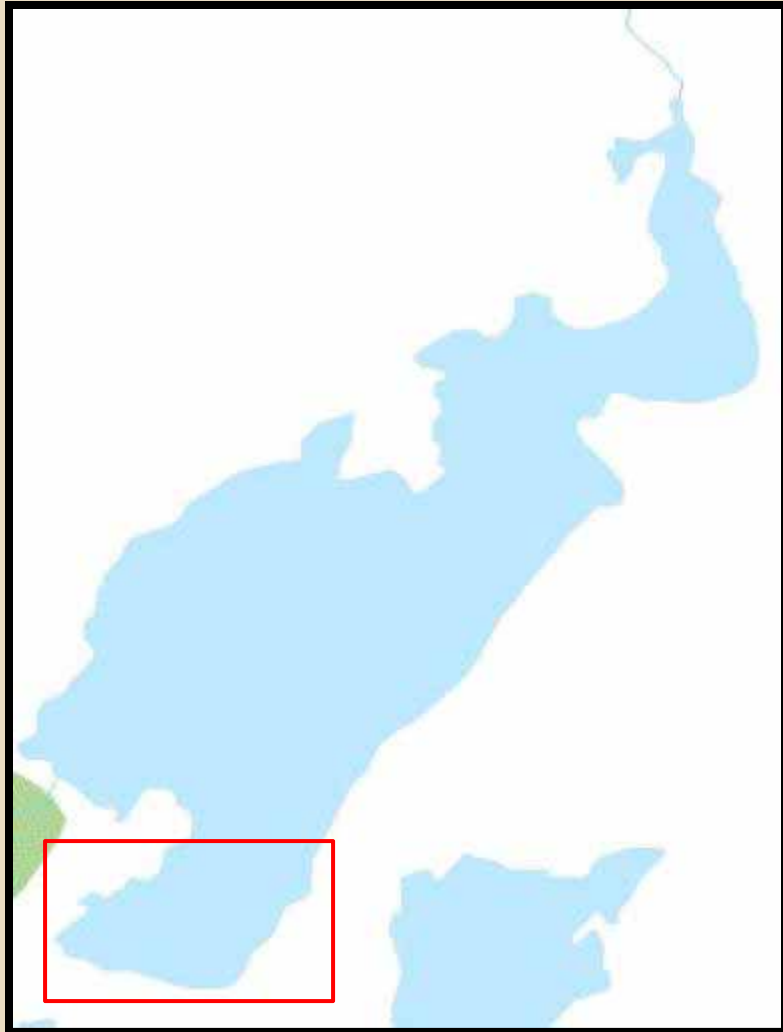


# Chicaugon Lake - Iron County, MI

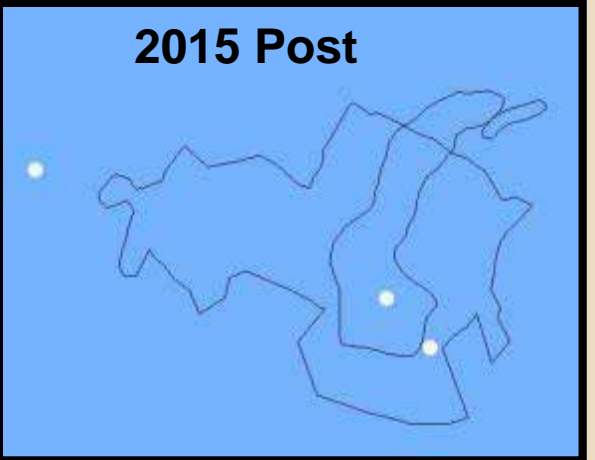
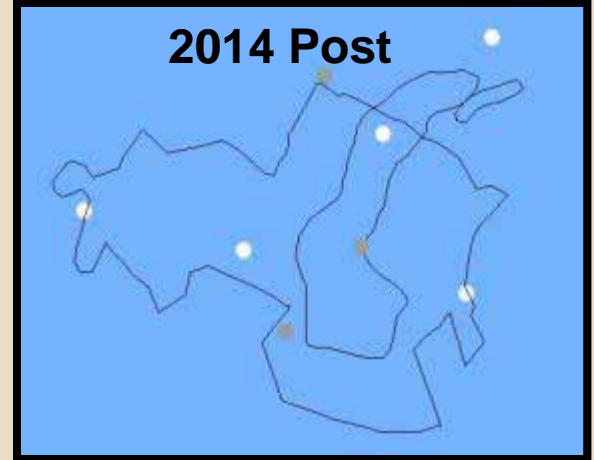
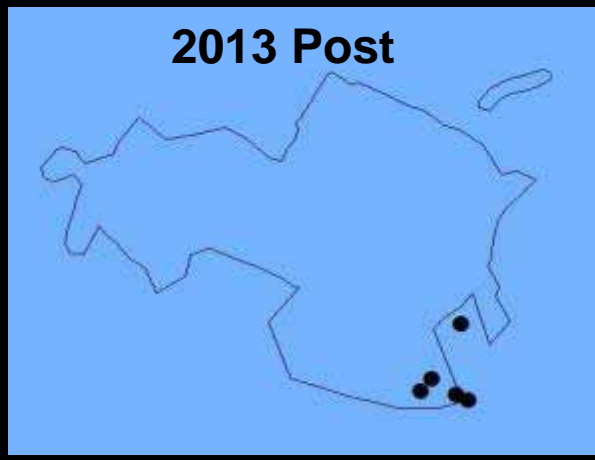
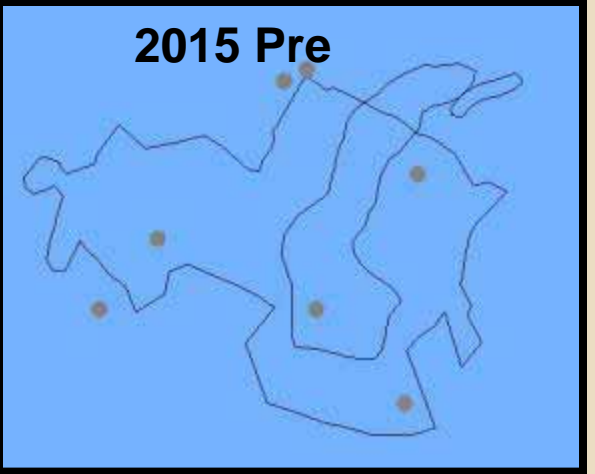
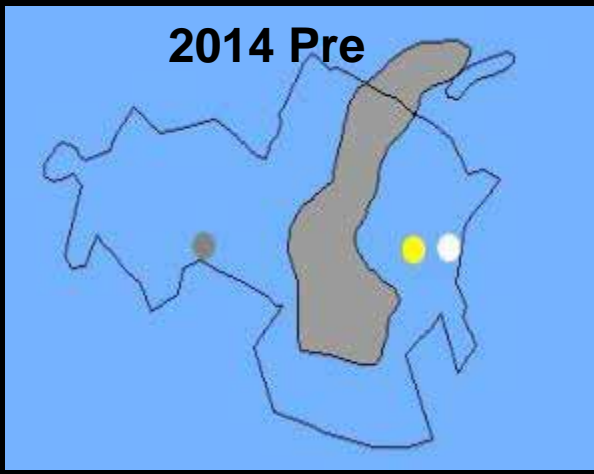
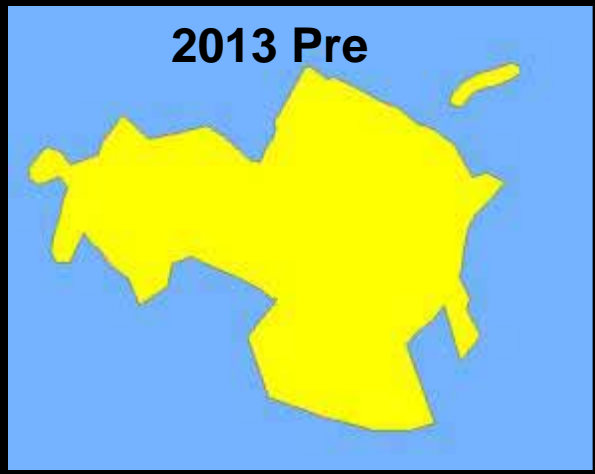




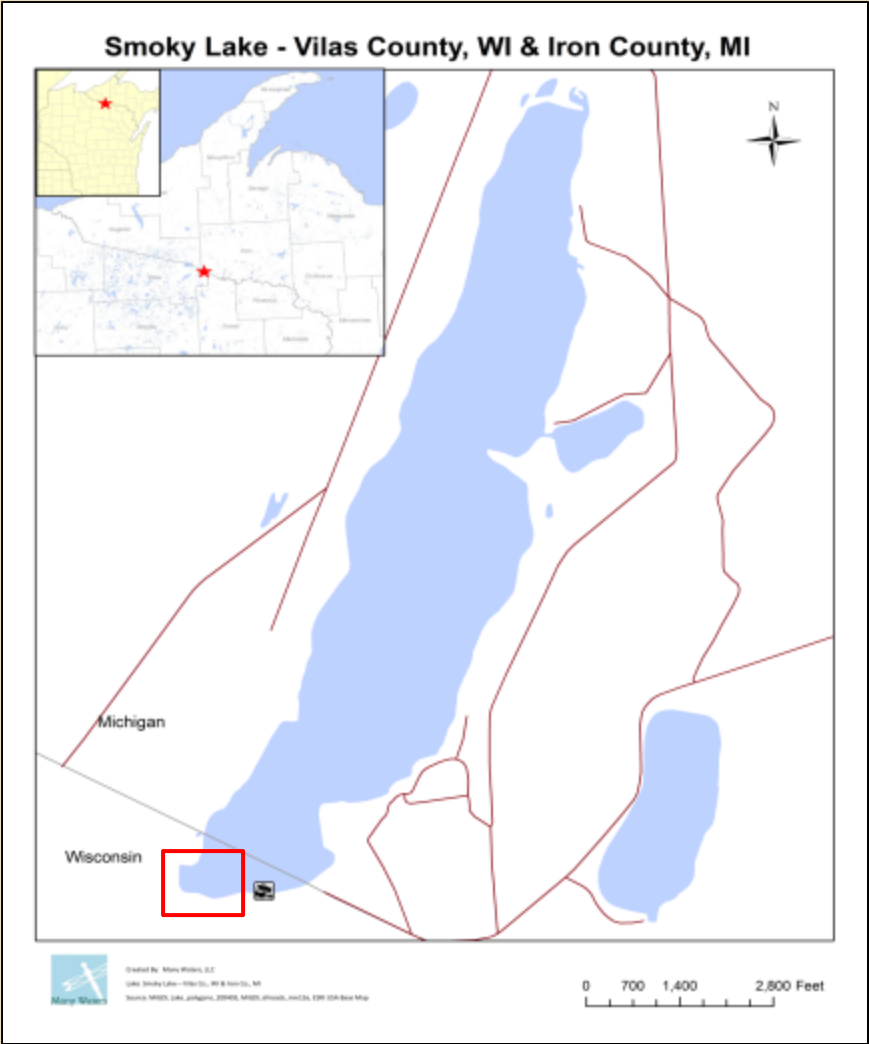
# Chicaugon Lake - Iron County, MI



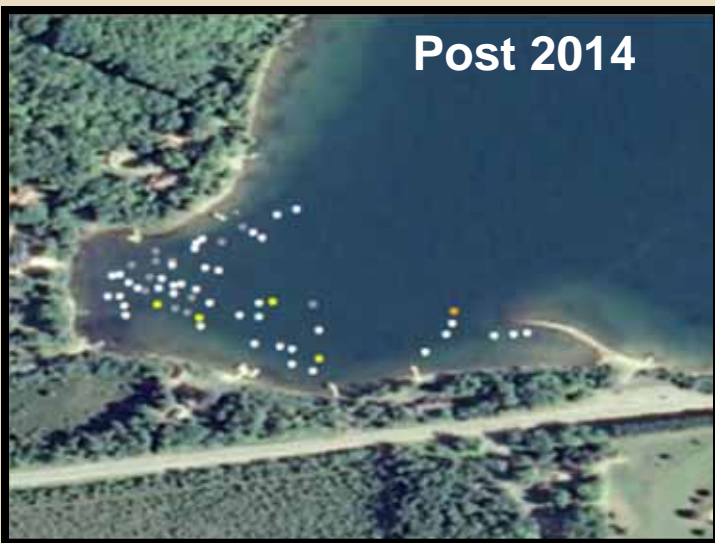
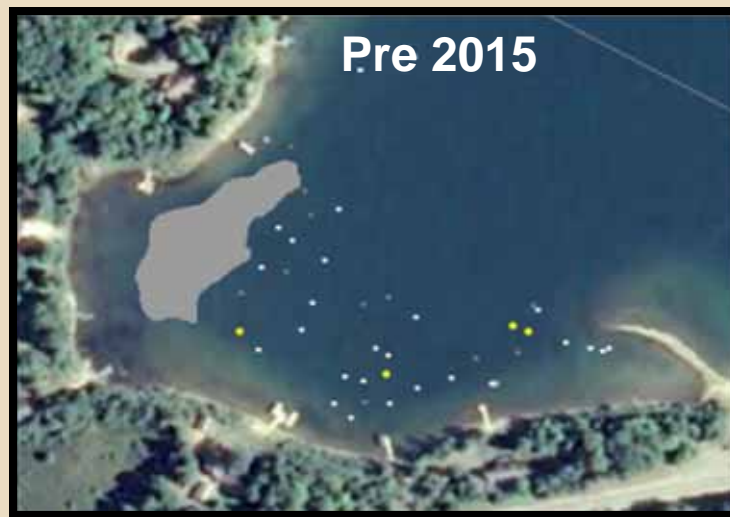
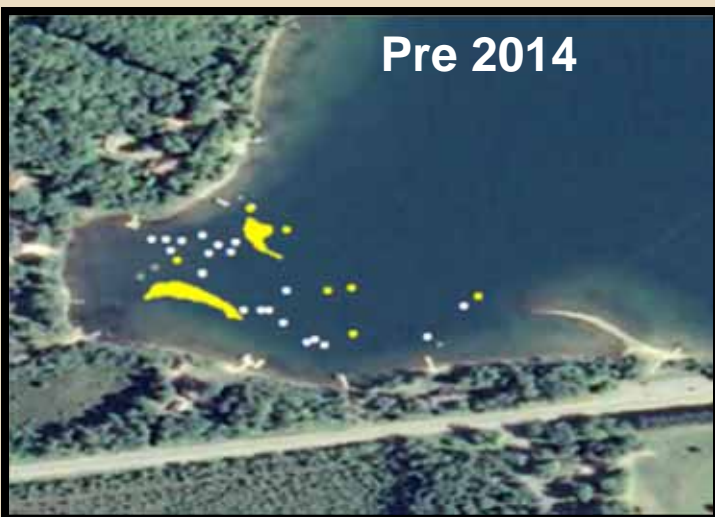
# Chicaugon Lake - Iron County, MI



# Smoky Lake – Vilas County, WI & Iron County, MI



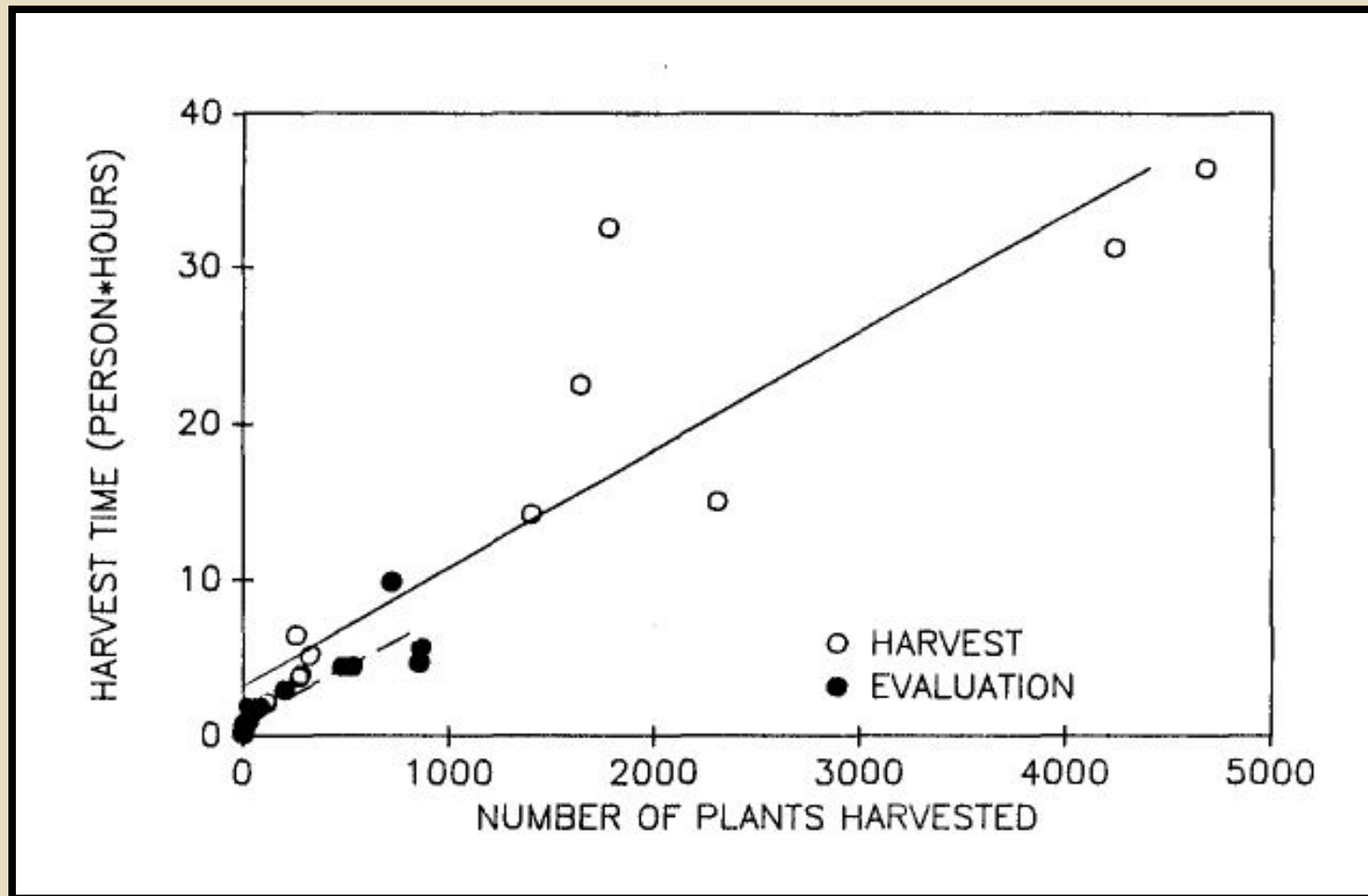
# Smoky Lake – Vilas County, WI & Iron County, MI



# Expectations – Garden Analogy



# Expectations – Garden Analogy



Madsen et al., 1989

# Take Home Messages - BMPs

Table 2 Efficacy of treatment methods for invertebrates.

AIS	Steam Cleaning (212°F)	Hot Water (140°F, ≤10 min)	Drying (5 days)	Chlorine (500 ppm, ≤10 min)	Virkon (2:100 solution, ≤20 min)	Freezing (26°F, ≤24hrs)
Faucet Snail	☑	☑ <sup>18*</sup>	☒ <sup>18,35</sup>	☒ <sup>18</sup>	Ⓡ <sup>18</sup>	☑
New Zealand mud snail	☑	☑ <sup>4,65*</sup>	☑ <sup>6*,66*</sup>	☒ <sup>21,78*</sup>	☑ <sup>10*,76,77</sup>	☑ <sup>4,6*</sup>
Quagga Mussel (Adults)	☑ <sup>†</sup>	☑ <sup>7*,16*</sup>	☑ <sup>14*,67</sup>	☑	☑ <sup>9</sup>	☑
Quagga Mussel (Veligers)	☑ <sup>†</sup>	☑ <sup>4,17</sup>	☑ <sup>69*,79*</sup>	☑	☑ <sup>9</sup>	☑
Zebra Mussel (Adult)	☑ <sup>†</sup>	☑ <sup>7*,8*,54,67</sup>	☑ <sup>14*,25*,67</sup>	☑ <sup>11,19,22</sup>	Ⓡ	☑ <sup>25,27,67,68</sup>
Zebra Mussel (Veligers)	☑ <sup>†</sup>	☑ <sup>4</sup>	Ⓡ	☑	Ⓡ	☑
Asian Clam	☑	☑ <sup>4,37,41,42,43</sup>	☒ <sup>4,44*,45</sup>	☒ <sup>36*,37*,38*,39*,40</sup>	☑ <sup>23</sup>	☑ <sup>46*</sup>
Spiny Water Flea (Adult)	☑	☑ <sup>7*,47*</sup>	☑ <sup>4</sup>	☑ <sup>78</sup>	☑ <sup>78</sup>	☑ <sup>78</sup>
Spiny Water Flea (Resting Eggs)	☑	☑ <sup>2*</sup>	☑ <sup>2*</sup>	☒ <sup>2,78*</sup>	☑ <sup>78</sup>	☑ <sup>2*</sup>
Bloody Red Shrimp	Ⓡ	Ⓡ	Ⓡ	Ⓡ	Ⓡ	Ⓡ
Rusty Crayfish	?	?	?	?	?	?

# Take Home Messages

- Can be integrated, but may need to pay attention to timing.
- It is not a silver bullet, annual monitoring and follow up visits are necessary to ensure success.
- Hard to generalize across lakes, results maybe site or lake specific.
- Limited non-target ecological impacts.
- Decontamination takes time.
- Good to have a plan.



Eichler, L. W., Bombard, R. T., Sutherland, J. W., & Boylen, C. W.. 1993. Suction Harvesting of Eurasian Water milfoil and Its Effects on Native Plant Communities. JAPM. 31: 144-148.

Madsen, J.D., Sutherland, J. W., & Eichler, L. W.. 1989. Hand Harvesting Water milfoil In Lake George. Interim Report. FWI Report #89-08.

Kelting, D. L., & Laxon, C. L. 2010. Cost and Effectiveness of Hand Harvesting to Control the Eurasian Water milfoil Population in Upper Saranac Lake, New York. JAPM 48: 1-5.

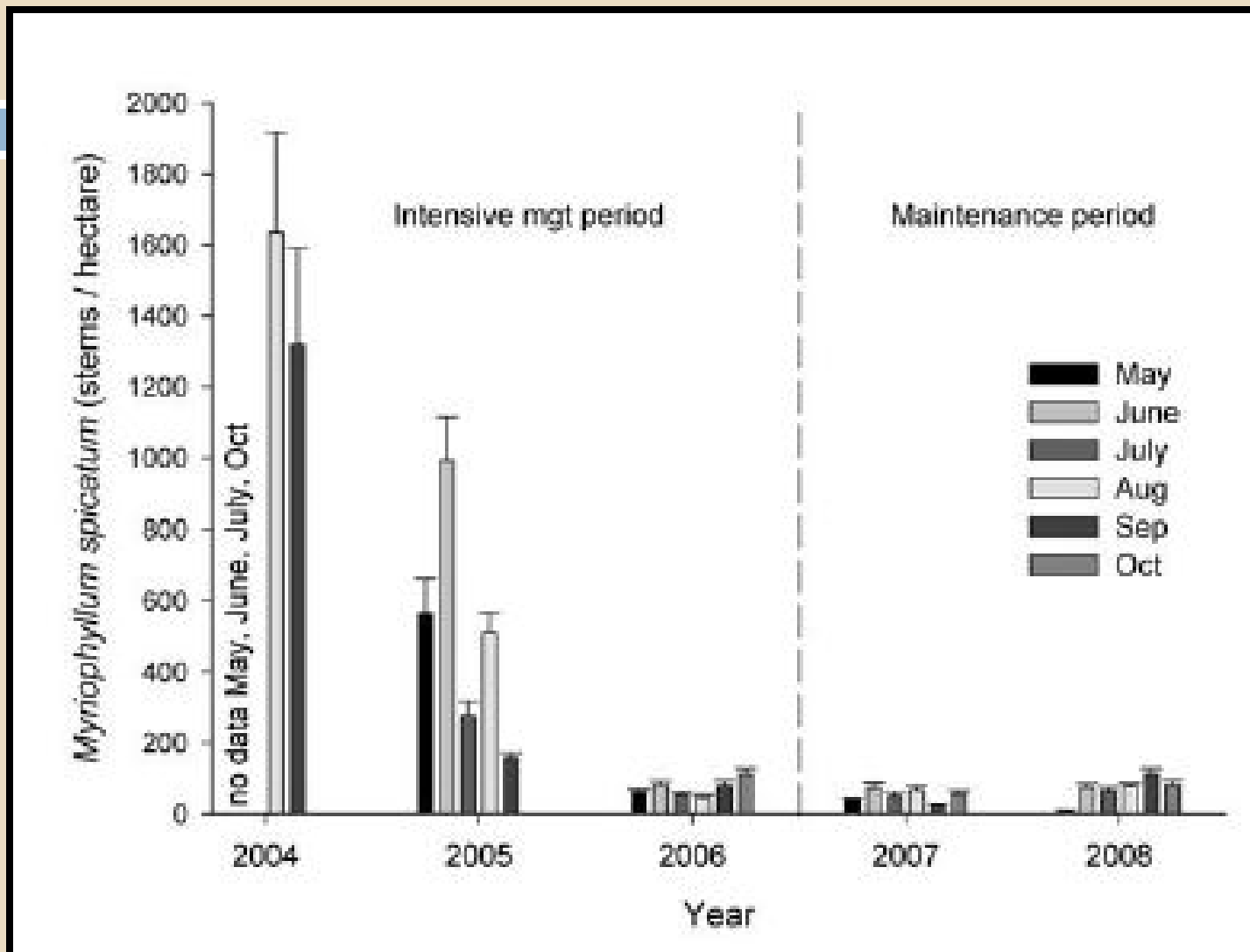
Johnston, R. & Johnson, R. (2011). *Hydrilla verticillata Hand Removal: A review of suction-assisted hand-harvesting by divers in the Cayuga Inlet, Interim Conclusions.*



**Thank you!**

# Lac Vieux Desert – Vilas County, WI & Gogebic County, MI

Area of Lake	2013 Hand Removal		2014 Hand Removal		2013 DASH	2014 DASH	2015 DASH
	~ Number of Plants	Weight* (lbs)	~ Number of Plants	Weight* (lbs)	Weight* (lbs)	Weight* (lbs)	Weight* (lbs)
Thunder Bay	33	70.0	170	117.0	0.0	0.0	0.0
North Desolation Point	35	25.0	7	3.0	0.0	0.0	0.0
Simpson's Point	398	334.0	40	6.0	974.0	41.0	238.0
South Shore	15	13.0	16	~7.0	0.0	0.0	0.0
Rice Bay	131	115.0	224	149.0	0.0	0.0	0.0
Rose's Island	30	25.0	15	5.5	0.0	0.0	0.0
Near Island	5	4.0	30	11.0	0.0	0.0	0.0
West Shore	0	0.0	8	7.5	0.0	0.0	0.0
Slaughter Bay	529	398.0	165	73.0	59.0	178.5	166.0
Big Duck	2	2.0	105	18.0	0.0	0.0	0.0
West of Duck Point	0	0.0	0	0.0	0.0	93.0	24.0
Open Water (east of islands)	36	30.0	0	0.0	0.0	0.0	0.0
<b>TOTALS</b>	<b>1214</b>	<b>1016.0</b>	<b>780</b>	<b>390.0</b>	<b>1033.0</b>	<b>312.5</b>	<b>428.0</b>



# Considerations – Integrated Management



# Considerations - AIS Management Practices

Small Scale	Large Scale
Aquatic Herbicides	Aquatic Herbicides
Benthic Barriers	Draw Downs
Hand Removal - DASH	Mechanical Harvesting
Do Nothing	Do Nothing



State Regulations  
Costs  
Desires/Values  
Management Goals/Objectives

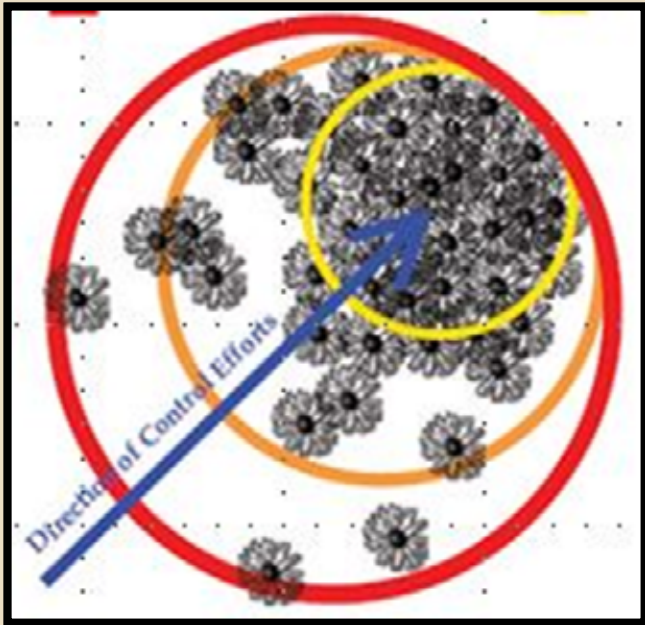
# Considerations- Efficiency

## Efficiency is affected by:

- ❑ Obstacles/Structure
- ❑ Water Clarity
- ❑ Sediment Type
- ❑ EWM Density & Distance Between Sites
- ❑ Native Vegetation Density & Type



# Smoky Lake – Vilas County, WI & Iron County, MI



Adapted from work by Fred Clark, Clark Forestry, Inc. and WNR-Urban Forestry



# Smoky Lake – Vilas County, WI & Iron County, MI

