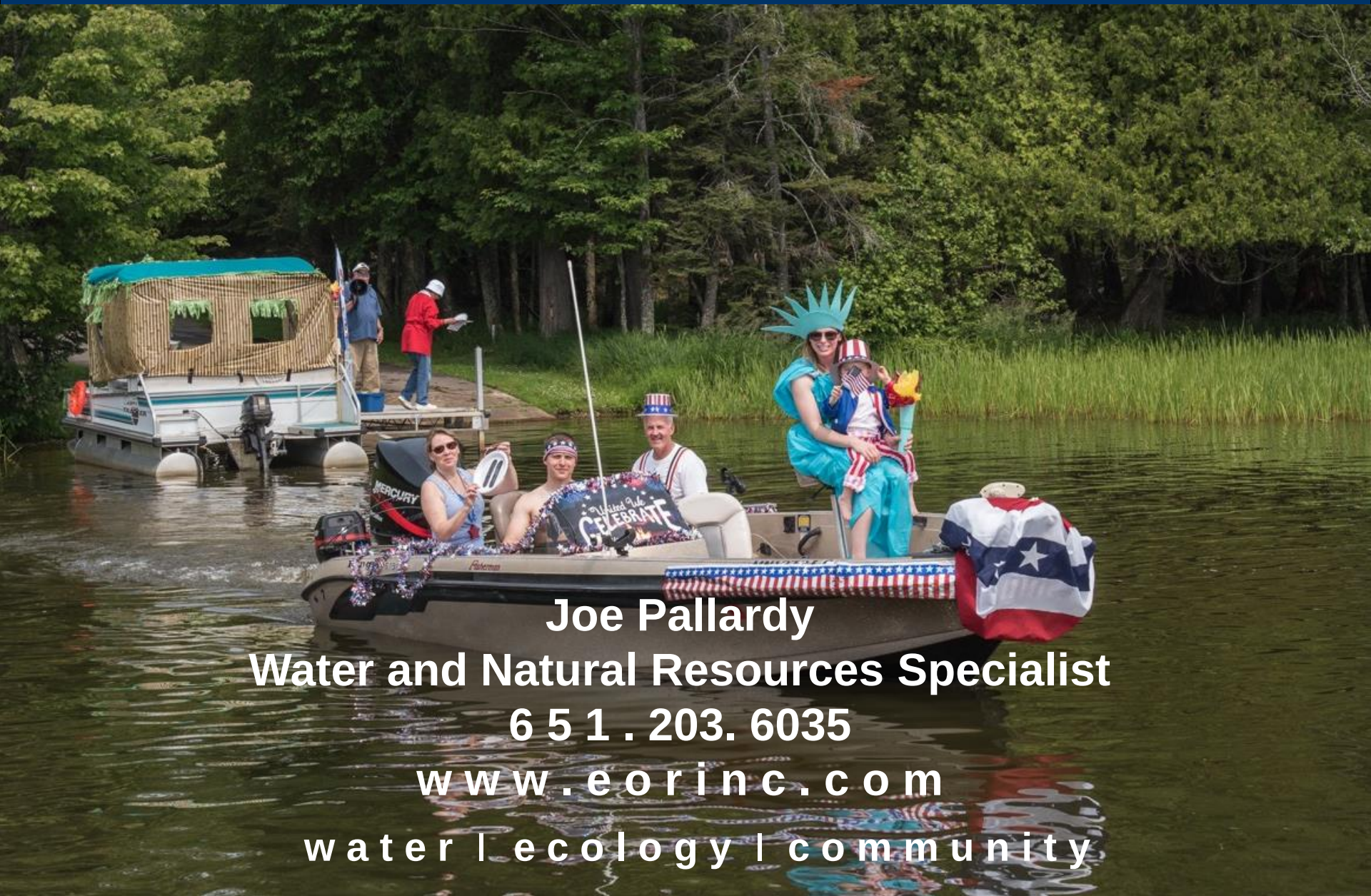
Emmons & Olivier Resources, Inc.



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w a t e r | e c o l o g y | c o m m u n i t y

Rule of Three

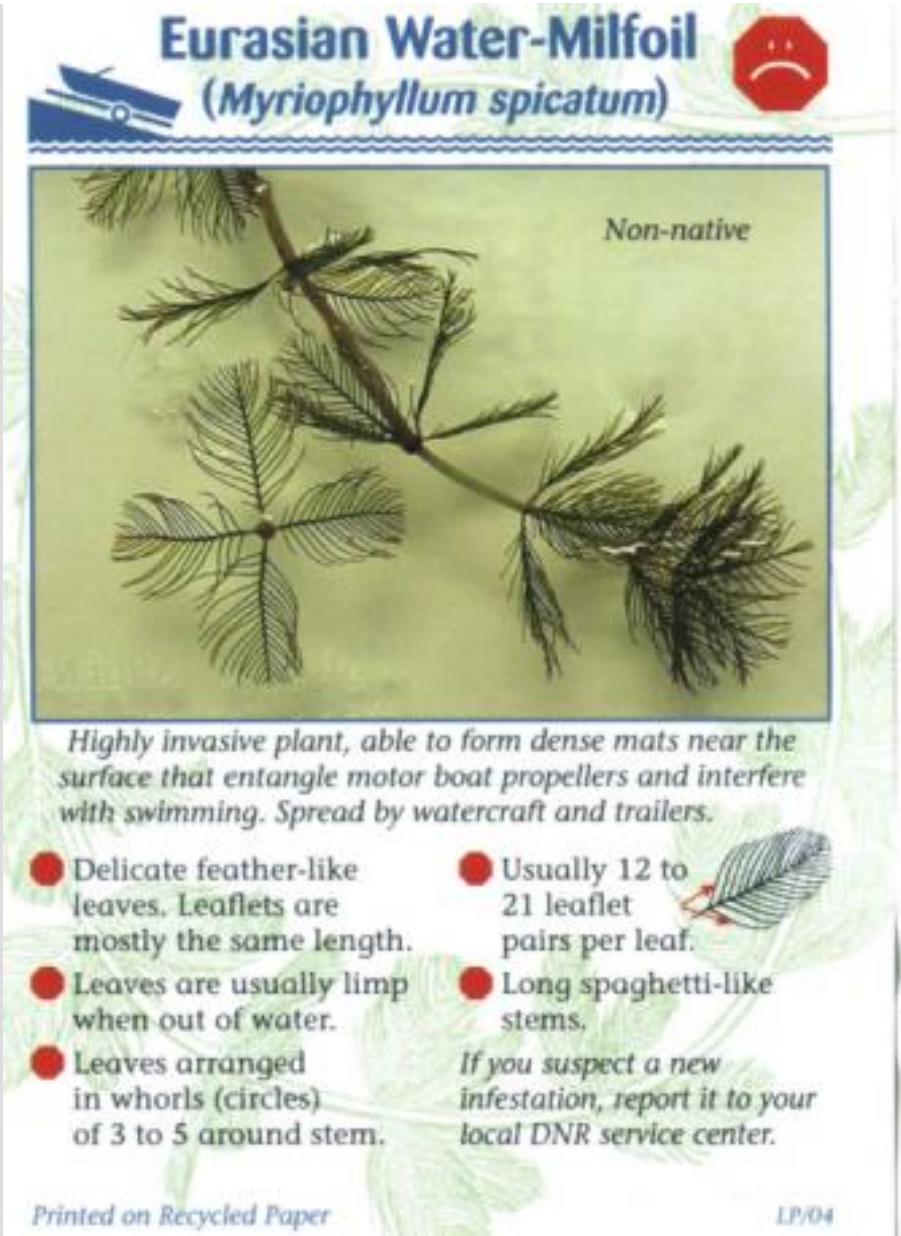
- Project Background / EOR

- Muskellunge Lake Association Volunteer Monitoring Efforts

- DNR Point Intercept Study /Professional AIS Monitoring Results

Project Background

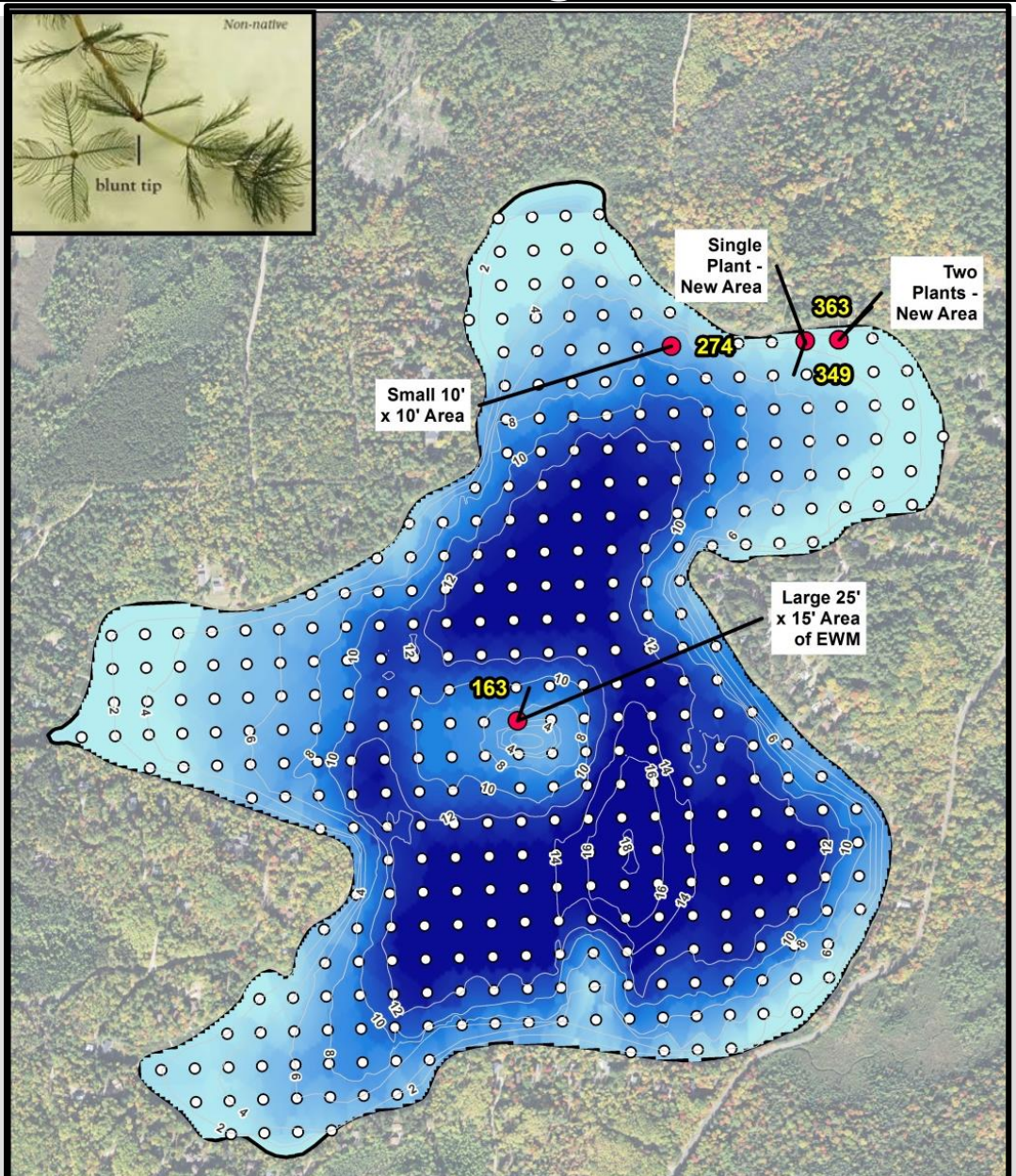
- EWM - 2016
- MLA meeting with EOR in Winter 2016/2017
- DNR Early Detection and Response Grant on Behalf of MLA
  - Total Project Cost = $19,996.00
  - State Aid = $14,997.00
  - Sponsor (In-kind) = $3,749.25
  - Time Period = October, 2016 – December 31, 2020



2017 MLA Volunteer Work: AIS Monitoring Class

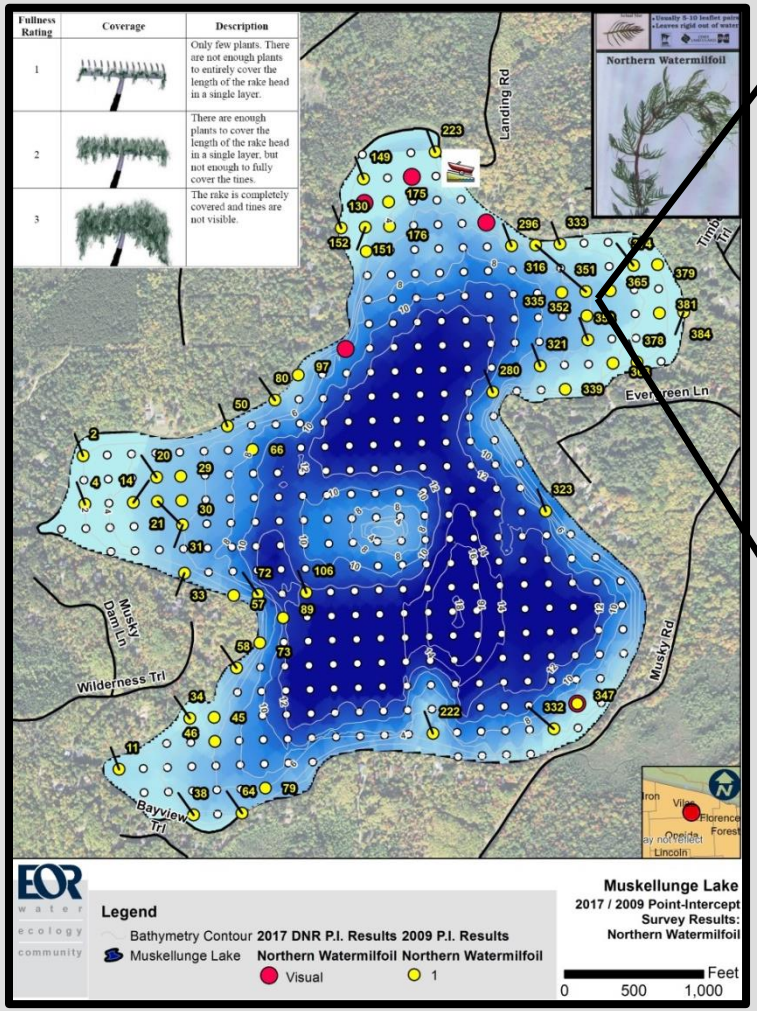
- Eight MLA Members
- Divided Lake into 8 Sections
- Voucher Specimens of suspicious samples to Cathy Higley
- AIS Monitoring logging data sheets
- Jeff Rappold for SWIMS entry
- 12 Total In-Kind Hours

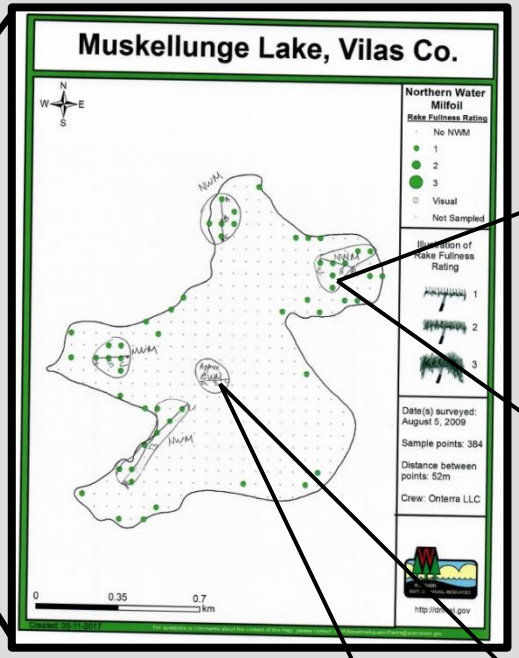
2017 MLA Volunteer Work: EWM Monitoring



2017 MLA Volunteer Work: Weevil Monitoring

- 10 MLA Members
- Two Pontoons
- 37 Total In-Kind Hours!



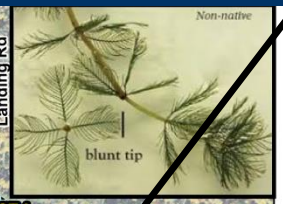


2017 Work Completed to Date: MLA

2017 MLA Scope of Work				
Task	**Hours Planned**	**Planned Deliverable**	**Progress to Date**	**In-kind Hours Completed**
AIS Monitoring Workshop	8	4 MLA Members attend one of Cathy's AIS Monitoring Class on 6-17-17	8 MLA members attended Cathy's Class. Class was from 1:00 to 2:30 on 6/17/2017.	12
Volunteer AIS Monitoring / Training	27	MLA attendance at weevil training on 7/14/2017	1. 7 MLA Members attended from 8-12 = 28 hours 2. 3 stayed for an additional 2 hours searching for weevils and 3 were there for 1 hour = 9 hours	37
			Total	49

2017 DNR Point Intercept Survey: Eurasian watermilfoil

Fullness Rating	Coverage	Description
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover the tines.
3		The rake is completely covered and tines are not visible.



- 53 Meter Grid Spacing
- 384 Total Points
- EWM Only Found at 5 points (1.3%)

2017 DNR Point Intercept Survey: Eurasian watermilfoil

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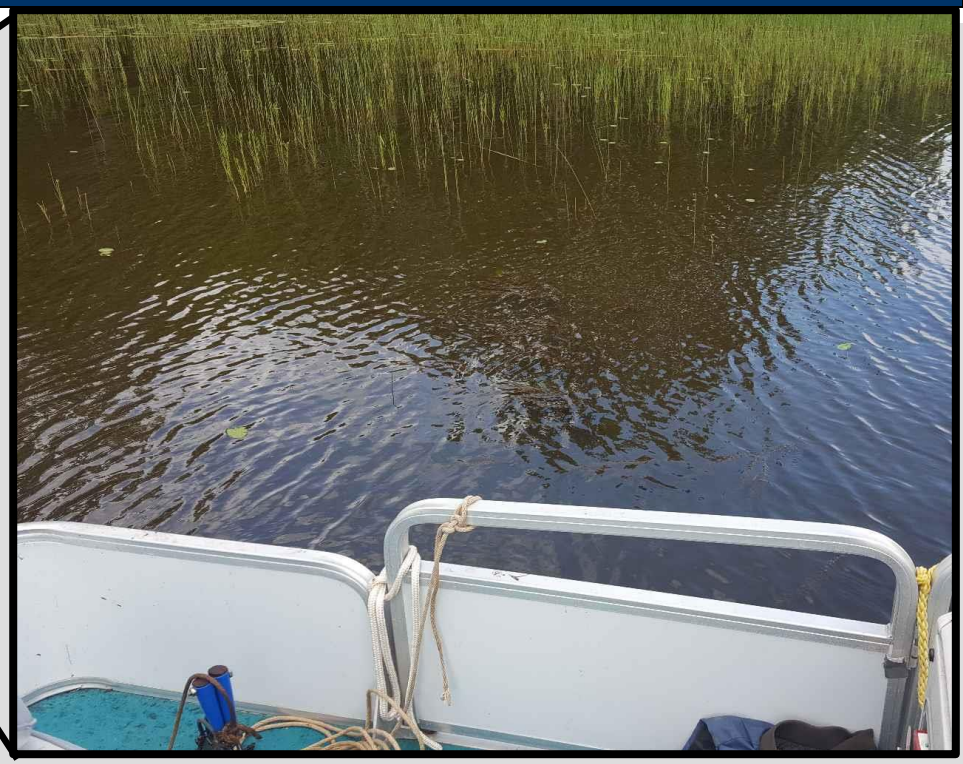
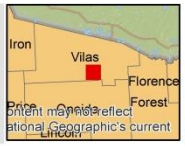


Legend

Bathymetry Contour
Muskellunge Lake

2017 DNR P.I. Results
Eurasian Watermilfoil Abundance
1
Visual



Muskellunge Lake
2017 Point-Intercept Survey Results:
Eurasian Watermilfoil

Feet
0 480 960

2017 DNR Point Intercept Survey: Floristic Quality Index

Common Name	Scientific Name	C- Value
Common bur-reed	*Sparganium eurycarpum*	5
Common waterweed	*Elodea canadensis*	3
Coontail	*Ceratophyllum demersum*	3
Creeping spikerush	*Eleocharis palustris*	6
Fern pondweed	*Potamogeton robbinsii*	8
Flat-stem pondweed	*Potamogeton zosteriformis*	6
Floating-leaf bur-reed	*Sparganium fluctuans*	10
Hardstem bulrush	*Schoenoplectus acutus*	6
Large-leaf pondweed	*Potamogeton amplifolius*	7
Leafy pondweed	*Potamogeton foliosus*	6
Muskgrasses	*Chara*	7
Slender naiad	*Najas flexilis*	6
Small pondweed	*Potamogeton pusillus*	7
Spatterdock	*Nuphar variegata*	6
Variable pondweed	*Potamogeton gramineus*	7
Water horsetail	*Equisetum fluviatile*	7
Water marigold	*Bidens beckii*	8
Watershield	*Brasenia schreberi*	6
White water lily	*Nymphaea odorata*	6
White-stem pondweed	*Potamogeton praelongus*	8
Wild celery	*Vallisneria americana*	6

Summary Table

FQI = C*√S

C= Mean Coefficient of conservatism value = **6.38**

S= Number of species in sample = **21**

6.38 * √21 = 29.24 = FQI Score

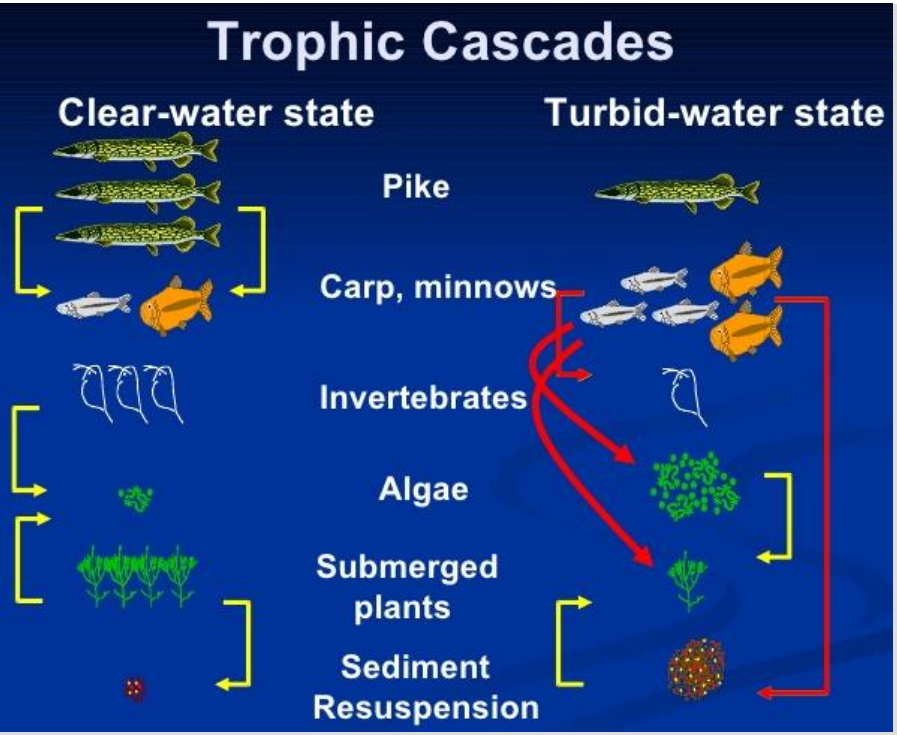
2009 Survey Results:

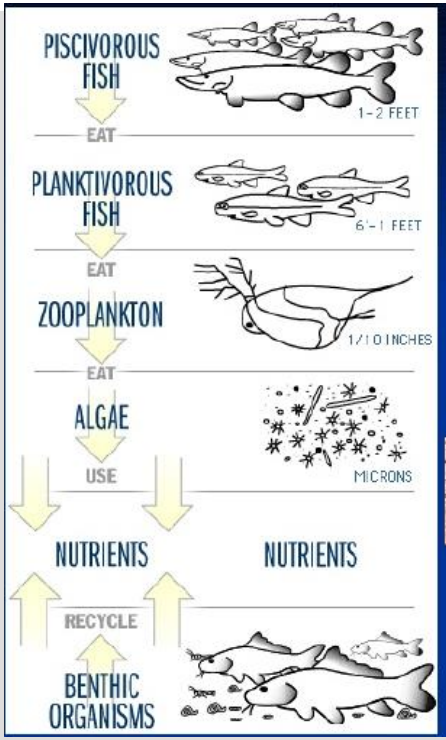
C= Mean Coefficient of conservatism value = **6.88**

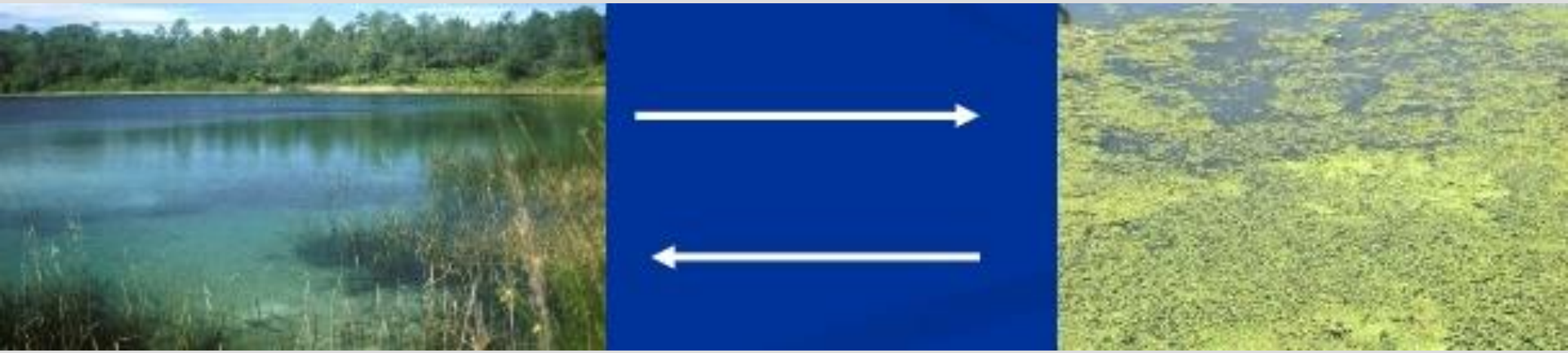
S= Number of species in sample = **26**

6.88 * √26 = 35.11 = FQI Score

2017 DNR Point Intercept Survey: Shallow Lake Dynamics







2017 Professional AIS Monitoring: Focused Meander Study

Fullness Rating	Coverage	Description
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
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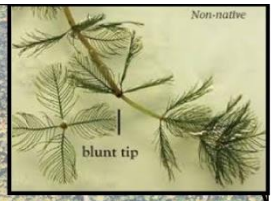

Legend
- Bathymetry Contour
- Muskellunge Lake
- EWM Present - July, 2017
- Treatment Area

Muskellunge Lake
2017 EOR Professional AIS Monitoring Treatment Areas

0 500 1,000 Feet

2017 Professional AIS Monitoring: Focused Meander Study

water ecology community

Fullness Rating	Coverage	Description
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
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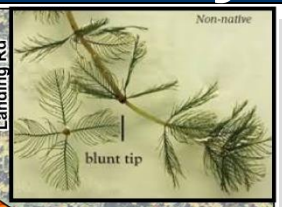


Legend

Bathymetry Contour
Muskellunge Lake

Sediment Characteristics
Texture
Sand/Rock
Deep

2017 DNR P.I. Results
Eurasian Watermilfoil Abundance
1
Visual

Muskellunge Lake
2017 Point-Intercept Survey Results: Sediment Characteristics

Feet
0 500 1,000

2017 Professional Services: Google Earth Files

DNR Point-Intercept points
GIS\ecology\MuskellungeLake2017.kmz

EWM Locations
GIS\ecology\MuskellungeLakeEWM2017.kmz

2017 Professional Services: Evaluate Treatment Options

- Do Nothing
- Volunteer Hand Removal
- Diver Assisted Suction Harvesting (DASH)
- Herbicide Treatment
- Biological (Weevil Control)

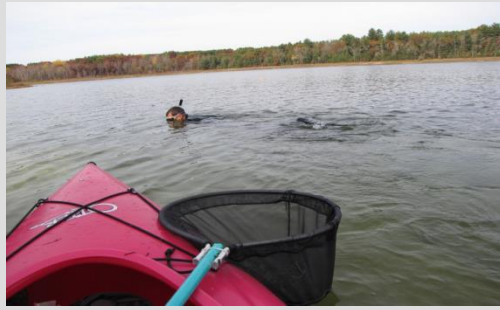
2017 Professional Services: Volunteer Hand Removal

Method

- Pulling by hand or with hand-held devices that do not use external or auxiliary power sources (e.g. small rakes)

Benefits

- Preferred control method for colonies of under 0.75 acres
- No Permit Needed



Negatives

- Water Clarity
- Fragmentation
- Time Intensive
- Special care must be taken to collect all roots and plant fragments during removal

2017 Professional Services: Diver Assisted Suction Harvesting

Method

- Divers hand remove target plants
- Plants are fed into a suction line that transports plants to the surface.

Benefits

- Selectivity
- 86%-94% removal efficiency*

Negatives

- Cost - $1,500 - $3,000
- Water Clarity
- Time/Labor Intensive
- Permit Required

More Information

https://www.uwsp.edu/cnrap/UWEXLakes/Documents/programs/convention/2016/ThursdayConcurrent/Se
n2/BarbGajewski_MgmntofAquaticInvasivePlantSpeciesUsingDiverAssistedSuctionHarvesting.pdf

2017 Professional Services: Herbicide Treatment

Method

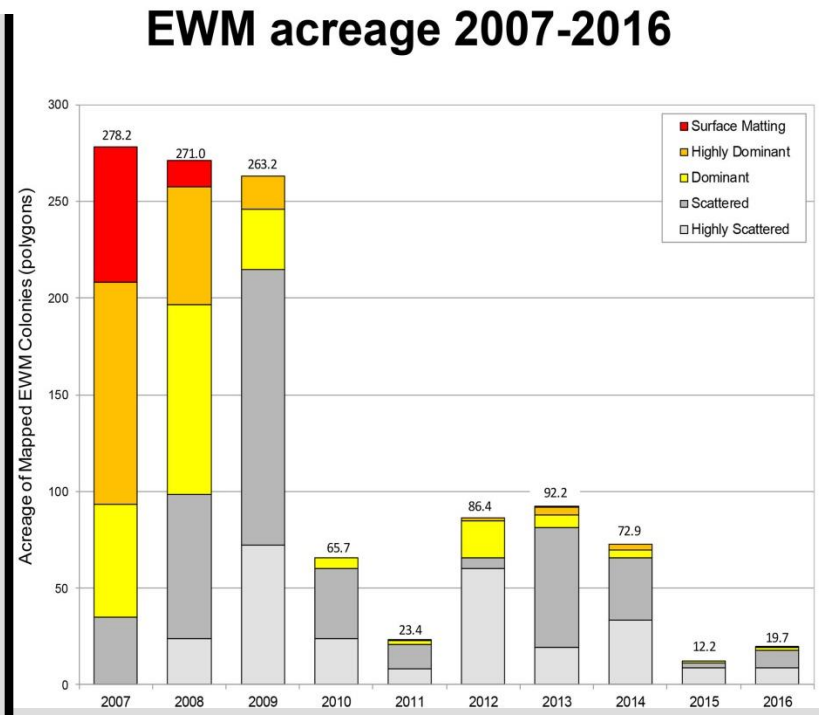
- Apply a granular herbicide (2,4-D) in the early spring before native plants begin to grow.

Benefits

- Proven success on area lakes

Negatives

- Permit needed
- Cost - $1,000- $2,000
- Impacts to Native Plants
- Wind drift
- Generally used to target larger areas



- First discovered in 2004
- Treatment areas reduced from 278 acres in 2007 to just 20 acres in 2016
- No herbicide treatment occurred in 2016 or 2017.

2017 Professional Services: Biological Treatment

Method

- Supplement native weevil populations to suppress EWM over time

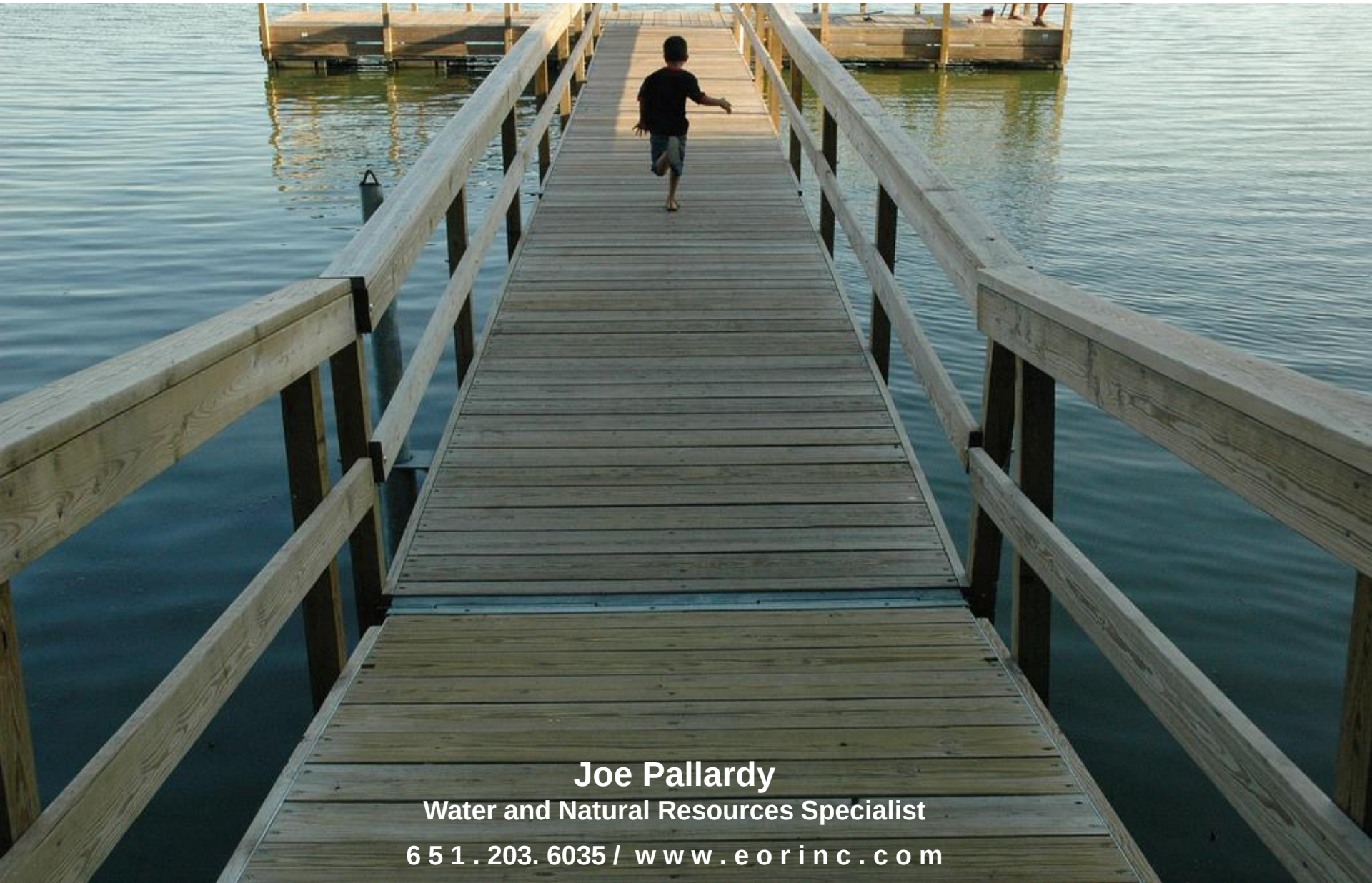
Benefits

- Environmentally friendly
- Natural solution
- Prefer EWM vs. NWM

Negatives

- Low population density
- Cost 1.25- $1.50/ Insect
- Manage not eradicate
- Shoreline development
- Northern watermilfoil

Thank you



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