

## Lake Mitchell Improvement Plan

By: Restorative Lake Sciences

October 26, 2019

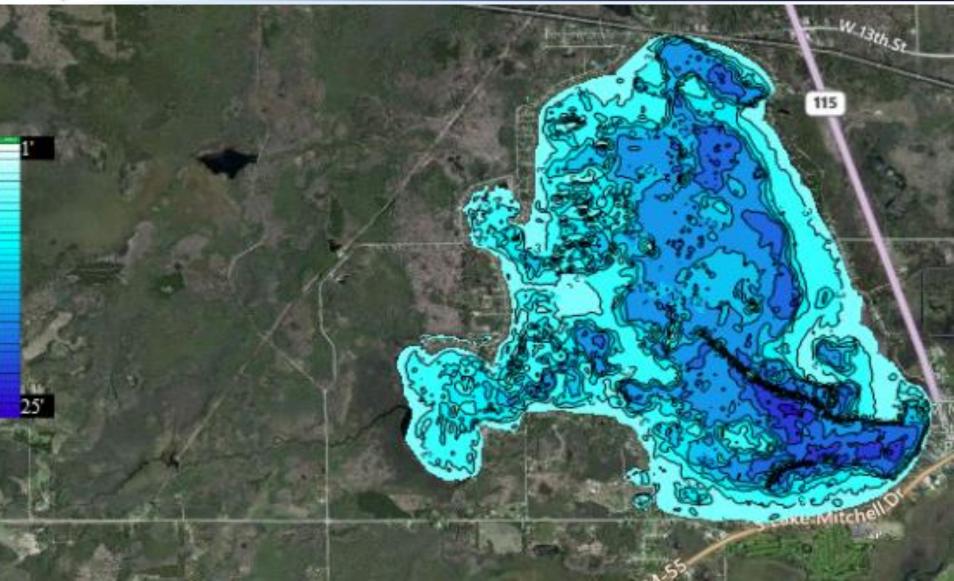
## Lake Mitchell Physical Characteristics

- Shoreline Length: 10.5 mi
- SDF: 1.8
- Surface Area: 2,580 acres
- Elevation: 1,289 feet
- Mean Depth: 8.5 feet
- Max Depth: 22.0 feet
- Volume: 21,321 acre-feet
- Retention Time: 1.06 yrs.
- Watershed: Lake: 22.6

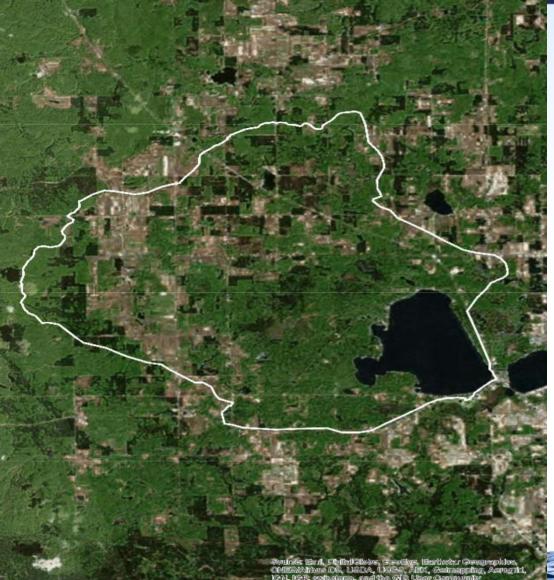




# Lake Mitchell Depth Contours



## Lake Mitchell Immediate Watershed



- 58,256 acres
- Watershed is
   22.6X lake size
  - = large
    watershed =
    more pollution

### Lake Mitchell Aquatic Vegetation **Sampling Locations**

8- ×

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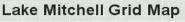
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Wexford County, MI

W85 455° W85 445 Legend

Grid Point

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Aquatic Plant Species	Aquatic Plant Common	Aquatic Plant	% Coverage
Name	Name	Growth	of Lake
		Form	(2018)
Chara vulgaris (macroalga)	Muskgrass	Submersed; Rooted	9
Potamogeton pectinatus	Sago Pondweed	Submersed; Rooted	11
Potamogeton robbinsii	Fern-leaf Pondweed	Submersed; Rooted	62
Potamogeton gramineus	Variable-leaf Pondweed	Submersed; Rooted	19
Potamogeton praelongus	White-stem Pondweed	Submersed; Rooted	47
Potamogeton richardsonii	Clasping-leaf Pondweed	Submersed; Rooted	2
Potamogeton illinoensis	Illinois Pondweed	Submersed; Rooted	24
Potamogeton amplifolius	Large-leaf Pondweed	Submersed; Rooted	16
Myriophyllum sibiricum	Northern Watermilfoil	Submersed; Rooted	6
Ceratophyllum demersum	Coontail	Submersed; Non-rooted	8
Elodea canadensis	Common Waterweed	Submersed: Rooted	6
Utricularia vulgaris	Common Bladderwort	Submersed; Non-rooted	27
Utricularia minor	Mini Bladderwort	Submersed; Non-rooted	2
Najas guadalupensis	Southern Naiad	Submersed; Rooted	22
Najas flexilis	Slender Naiad	Submersed; Rooted	17
Myriophyllum tenellum	Leafless Watermilfoil	Submersed; Rooted	69
Potamogeton pusillus	Small-leaf Pondweed	Submersed; Rooted	10
Megalodonta beckii	Water Marigold	Submersed; Rooted	4
Nymphaea odorata	White Waterlily	Floating-leaved	12
Nuphar variegata	Yellow Waterlily	Floating-leaved	10
Brasenia schreberi	Watershield	Floating-leaved	11
Lemna trisulca	Star Duckweed	Floating-Leaved; Non-rooted	1
Pontedaria cordata	Pickerelweed	Emergent	13
Typha latifolia	Cattails	Emergent	11
Schoenoplectus acutus	Bulrushes	Emergent	28
Decodon verticillatus	Swamp Loosestrife	Emergent	10
Eleocharis acicularis	Spike rush	Emergent	14

#### Table 5. Native aquatic plants found in Lake Mitchell in 2018.

# Lake Mitchell Aquatic Vegetation Biovolume

Lake Mitchell

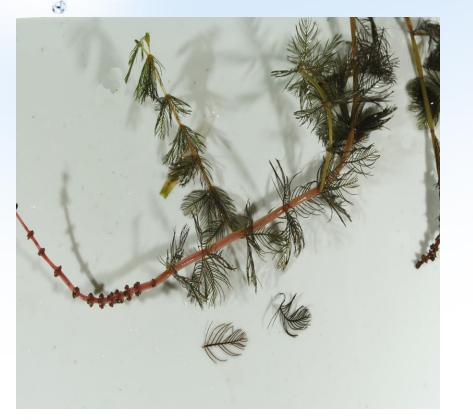
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Birch Dr.

### Lake Mitchell Exotic Aquatic Plants



**Hybrid Watermilfoil** 



#### **Purple Loosestrife**





Figure 4. A photograph of White-stem Pondweed (*Potamogeton praelongus*)



Figure 5. A photograph of Bladderwort (*Utricularia vulgaris*)



Figure 8. A photograph of a *Chara* family plant



Figure 9. A photograph of Illinois Pondweed (*Potamogeton illinoensis*)



Figure 6. A photograph of Wild Celery (*Vallisneria americana*)



Figure 7. A photograph of Northern milfoil (*Myriophyllum sibiricum*)



Figure 10. A photograph of Southern Naiad(*Najas* guadalupensis)



Figure 11. A photograph of Variable-leaf Pondweed (*Potamogeton gramineus*)

Hybrid Watermilfoil (Eurasian Watermilfoil + Native Watermilfoil)





# Grows thicker, wider, faster than EWM and is VERY TOLERANT to herbicides!



### **EWM Overgrowth in Other Lakes:**

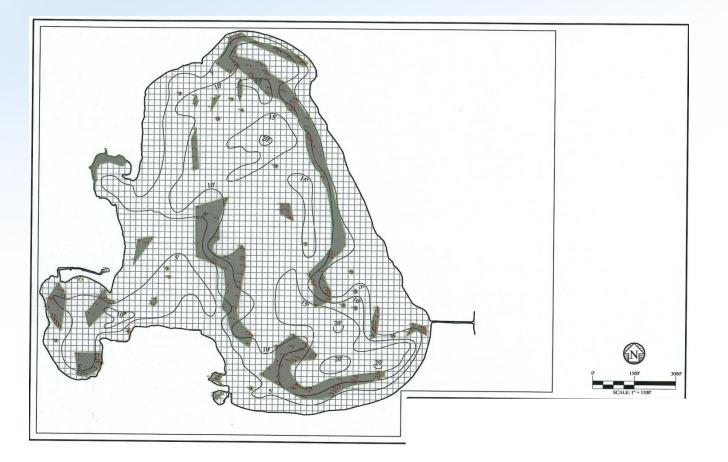








### M. Spicatum Distribution in Lake Mitchell (Spring, 2009)



# Lake Mitchell Milfoil Distribution (June, 2019)

#### Lake Mitchell

Wexford County, MI Eurasian Watermilfoil Treatment Map June 2019

#### Legend

EVVM & Curly Leaf Pondweed ~1 acre
 EVVM Area ~43.6 acres

Lake Mitchell

**N-Division St** 

@2018 Google

# Lake Mitchell Milfoil Distribution (August, 2019)

#### Lake Mitchell

Wexford County, MI August Treatment Map

#### Legend

Eurasian Watermilfoil ~39 acres
Pondweeds & EWM ~1.7 acres

Lake Mitchell

38-Rd-W-Division-S

Google Earth

@2018 Google

# New Herbicide: ProcellaCOR®

- New systemic herbicide used for local control of hybrid EWM
- Dosed in "prescribed dose units" PDU's
- Used in Big Cove (June, 2019) with excellent results!
- Used in Houghton Lake in 2018 with excellent results
- Requires additional EGLE surveys but good for site-specific data

### What Happens if We Kill Too Much Vegetation ?





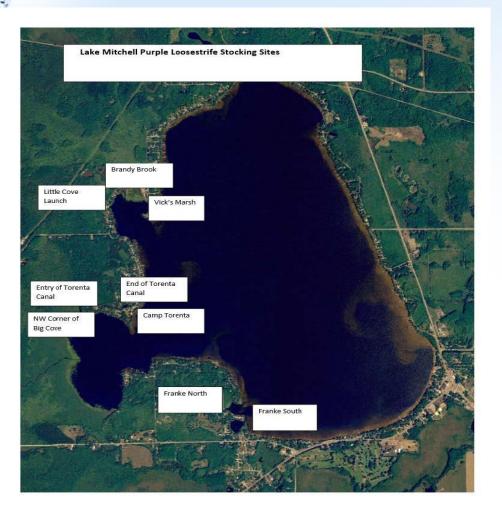
Toxic Blue-green algae bloom, Spring Lake, Ottawa County, MI Lake may not be able to break down plant matter fast enough

### What Will Happen If We Do Nothing?

- EWM will displace native aquatic plant species
- Fishery will decline in quantity and quality
- Excessive die-off of massive EWM beds will cause major declines in water quality parameters
- Hydrilla or other species may invade and further destroy the lake



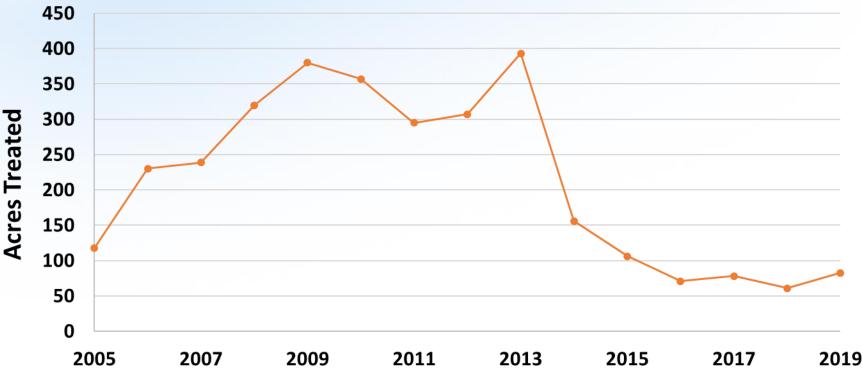
# Lake Mitchell Loosestrife Beetle Stocking Locations



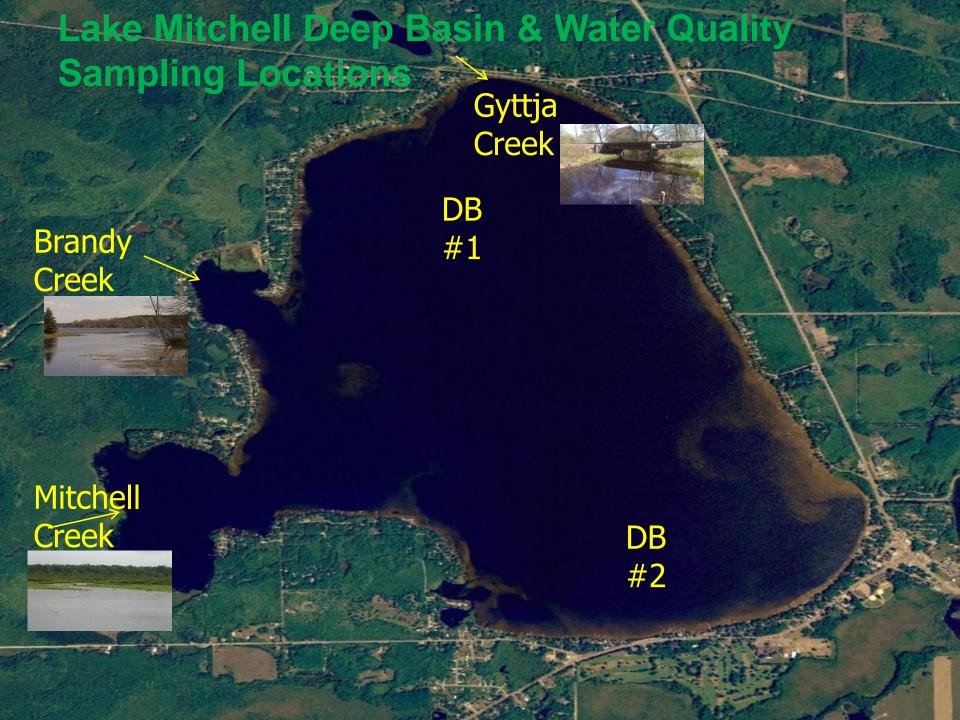


### Lake Mitchell Improvement Cost Savings-EWM Acres Treated to Date

Lake Mitchell Milfoil Treatment Acres with Time (2005-2019)

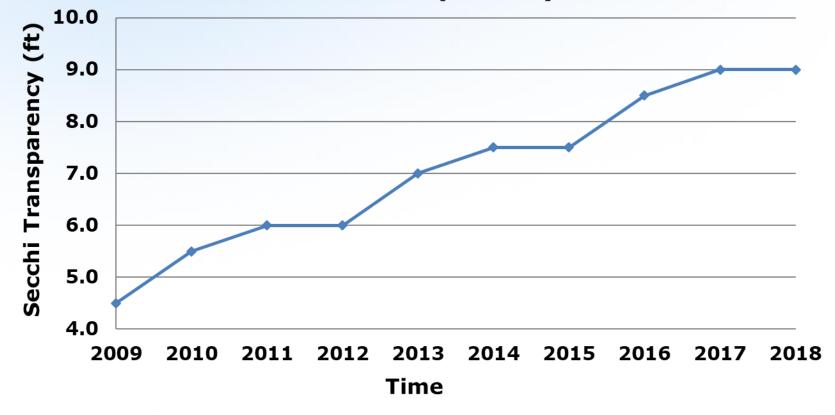


Time

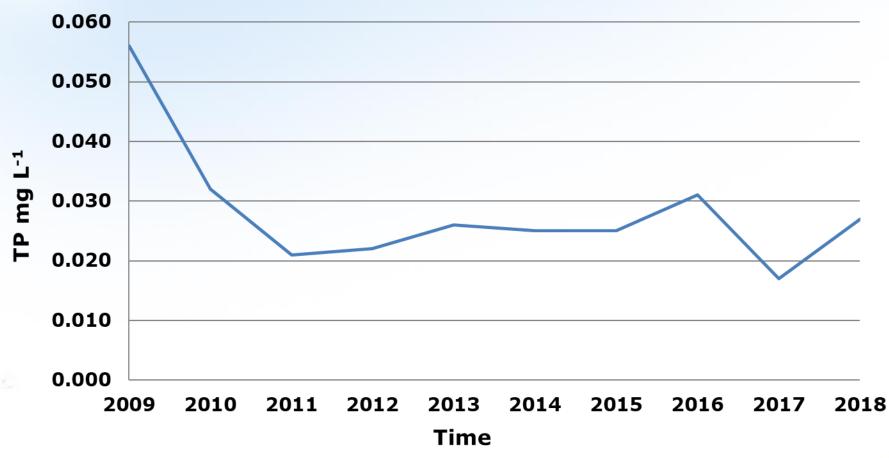


#### Trend in Lake Mitchell Mean Secchi Transparency

0



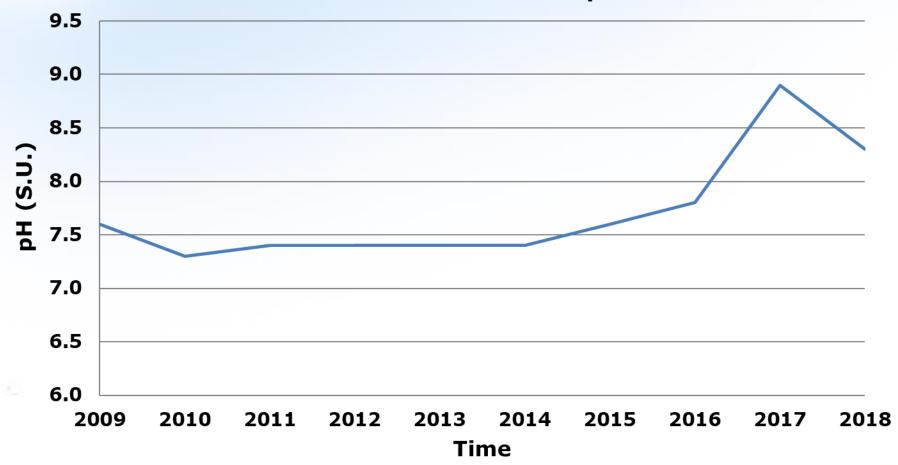




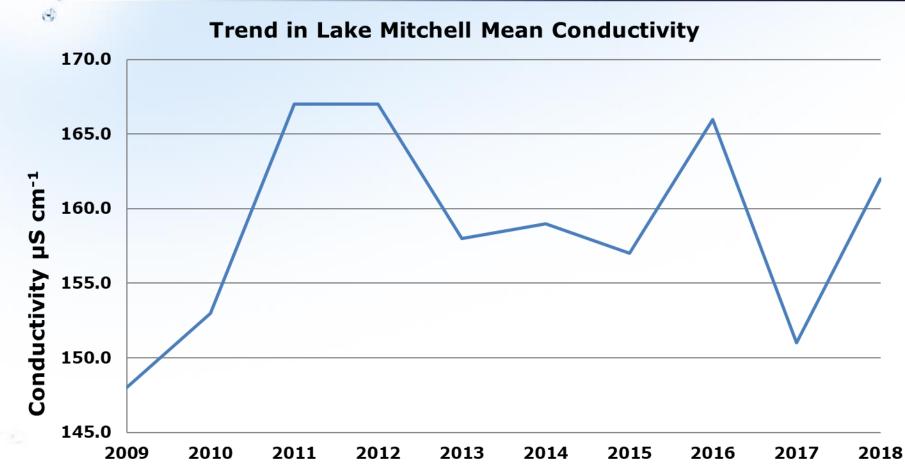
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#### Trend in Lake Mitchell Mean pH



3



Time

#### Trend in Lake Mitchell Mean Chlorophyll-a

3







## **Mechanical Harvesting**

#### **Benefits of Harvesting**

- Removes some plant debris and associated organic nutrient
- Can reduce need for herbicides but is generalist
- Should not be used on species that fragment

#### **Limitations of Harvesting**

- Can increase biomass of fragment-producers
- Does not exclude need for treatments in "highmaintenance" lakes
- Can create floating debris
- May need to be repeated in single season due to re-growth

## **Chemical Herbicides**

- Applied to both exotic and native aquatic plants
- Most commonly used: 2,4-D, Reward, Triclopyr, Fluridone, Aquathol-K, CuSO<sub>4</sub>, Flumioxazin
- Requires MDEQ permit; residue sampling may be required (i.e. Triclopyr, Fluridone)
- Shallow well restrictions, swimming restrictions, watering restrictions-Notifications required

### **Management Recommendations**

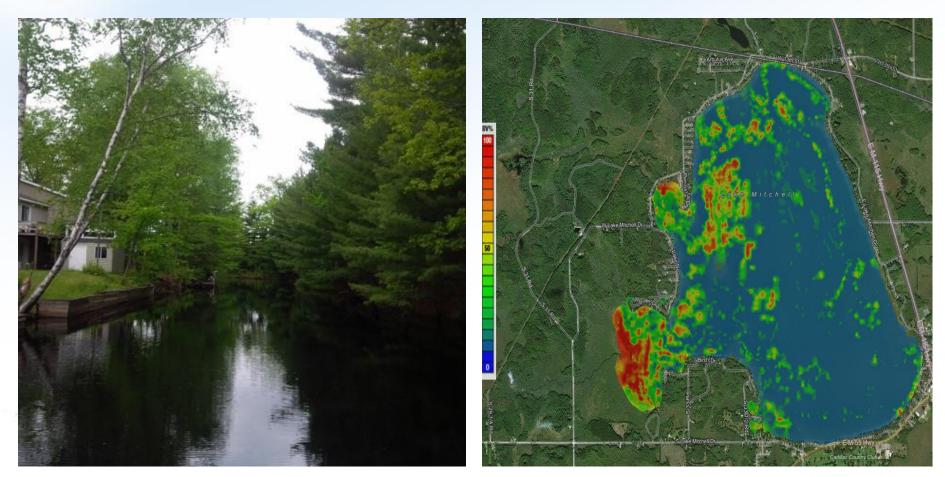
- Spot-treatments with systemic herbicides for long-term control of Hybrid Eurasian Watermilfoil
- Mechanical harvesting for coves and canal if needed
- Biological controls for Purple Loosestrife
- Continued education of all riparians; emphasis on local & affordable watershed management strategies
- Annual WQ monitoring of lake and inlets for nutrients and investigation of long-term BMP's

## Lake Mitchell Improvement Cost Estimates

Proposed Lake Mitchell Management Improvement Item	Estimated 2020 Cost	Estimated 2021-2024 Cost <sup>5</sup>
Herbicides (2,4-D/ Triclopyr) for Hybrid Watermilfoil <sup>1</sup> @\$585 and		
\$744 per acre (plus MDEQ permit fee)	\$98,000	\$98,000
Weed Pickup	\$8,000	\$8,000
Professional Limnologist Services (limnologist surveys, contractor oversight, education) <sup>2</sup>	\$18,500	\$19,000
Attorney Fees	\$5,000	\$5,000
Assessment Appeals	\$3,000	\$3,000
Purple Loosestrife Control	\$2,000	\$2,000
Website Newsletter	\$2,000	\$2,000
Newsletter Preparation	\$800	\$800
Audit, Bond, Insurance	\$1,400	\$1,400
Professional Membership	\$100	\$100
Mailings, Publication	\$800	\$800
Contingency (15%) <sup>3</sup>	\$20,400	\$20,400
TOTAL ANNUAL ESTIMATED COST	\$157,500	\$157,500
APPROX. ANNUAL COST PER UNIT OF BENEFIT <sup>6</sup>	4	
	\$196.88	\$196.88



## **Questions**?



#### Lake Mitchell: Yours to Protect!