

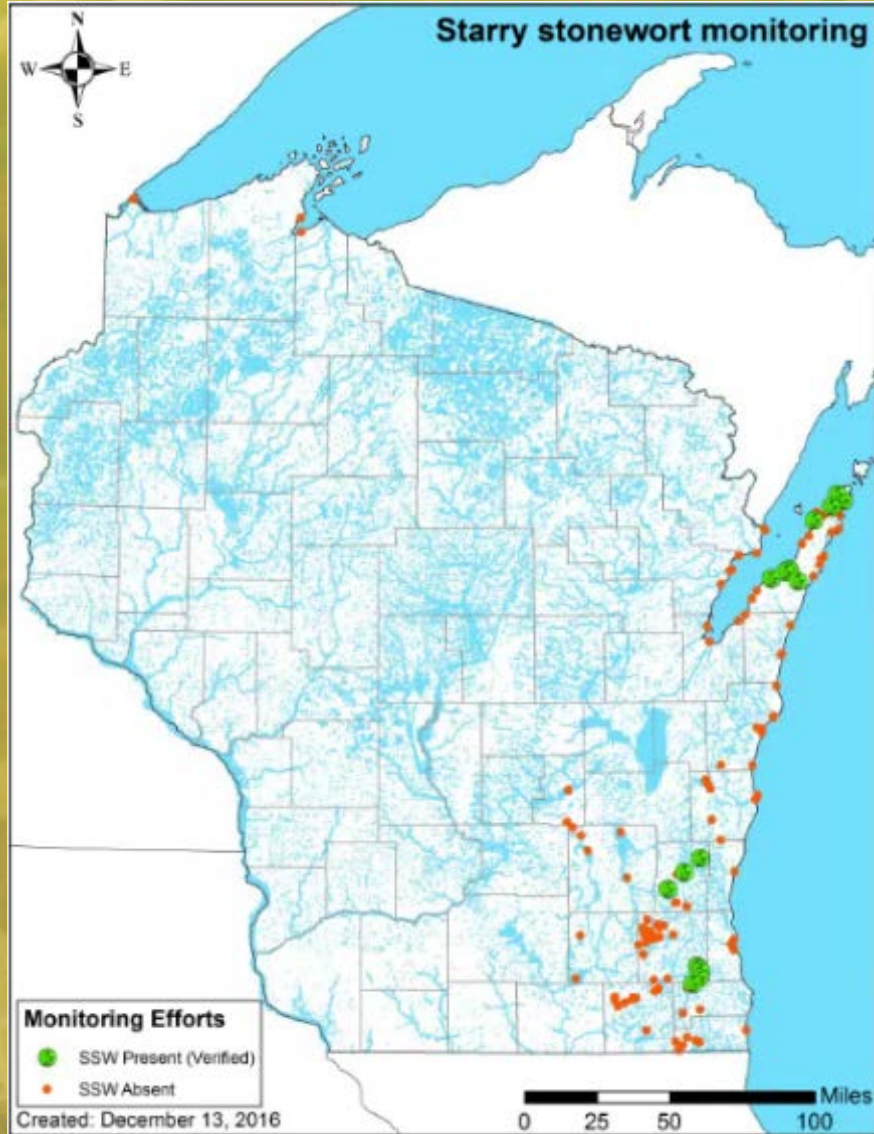
# Starry Stonewort Management in Wisconsin: Outcomes and Forthcoming Efforts

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Heidi Bunk – Water Resources Management Specialist, WI DNR

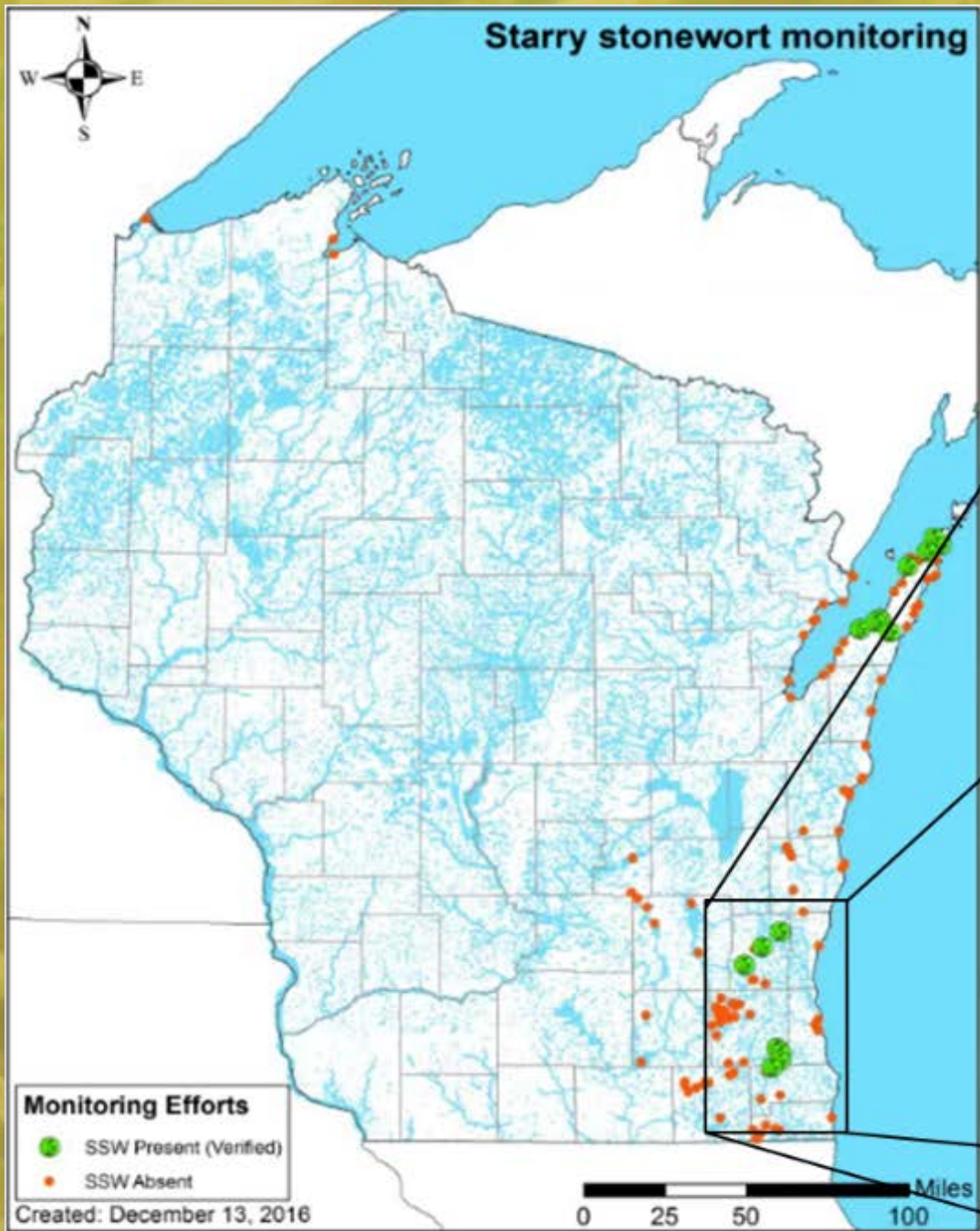
# Agenda

- Starry Stonewort distribution in Wisconsin
- What happens when we find it?
- Four methods that have been attempted
- Future Treatments and Integrated Management Approaches
- Continuous Prevention and Education Efforts
- Questions?

# Distribution in Wisconsin



- Door County and Lake Michigan
  - Bayside and Lakeside
- Washington County
  - Green Lake
  - Silver Lake
  - Pike Lake
- Waukesha County
  - Big Muskego Lake/Bass Bay
  - Little Muskego Lake
- Racine County
  - Long Lake
  - Wind Lake



- Point Intercept Surveys

Once a population is found...



# Monitoring

- Once a population is found...



- Point Intercept Surveys
- Meander Surveys



# Monitoring

- Once a population is found...

- Point Intercept Surveys
- Meander Surveys
- Diving Surveys and Buoy Placement



# Integrated Pest Management Approach

Certain methods work on certain population sizes, etc.





# Integrated Pest Management Approach

On each lake, unique rapid response management techniques have been carefully chosen, yielding results of varying success.

Must consider:

- lake type
- infestation size
- surrounding vegetation
- habitat

## Mechanical

- DASH
- Dredging
- Hand pulling
- Benthic mats

## Chemical

- Copper sulfate
- Flumioxazin (clipper)
- Liquid vs. Granular

## Combination

- Drawdown
- Dredge + benthic mats
- Vertical barriers for chemical treatment

# Hand pulling

- Usually the first step in treatment of AIS
- Especially if population is small and found early on...



# Diver Assisted Suction Harvesting - DASH



Able to physically remove bulbils from sediment

Native plants stay in place for competition and wildlife habitat

Avoids using chemicals that have not worked in past

**DASH**

# DASH from August 20<sup>th</sup> – 26<sup>th</sup>, 2015





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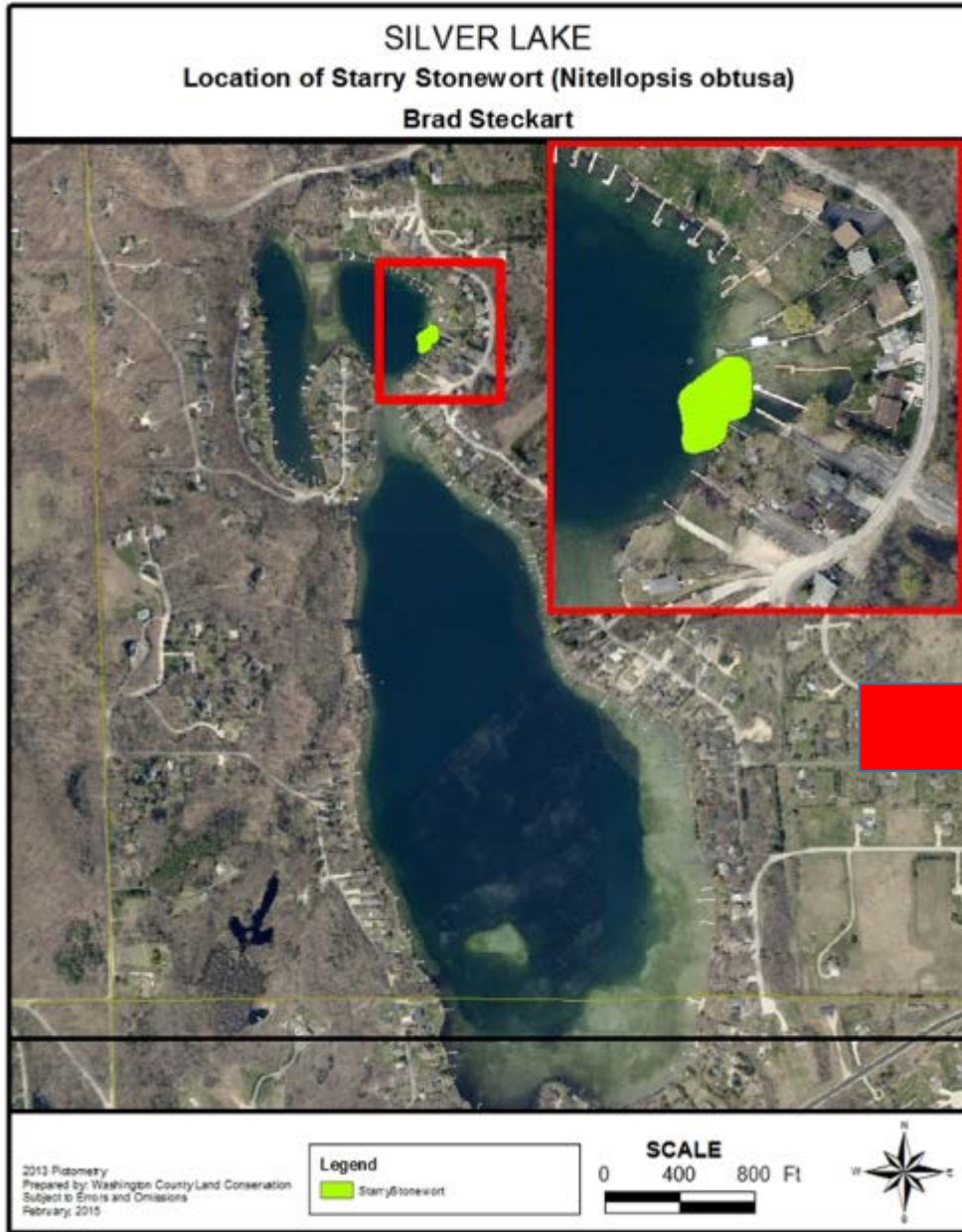


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# Initial Distribution of Starry Stonewort



# 2015 Results

80-90%  
Reduction  
in visible  
population  
of starry  
stonewort

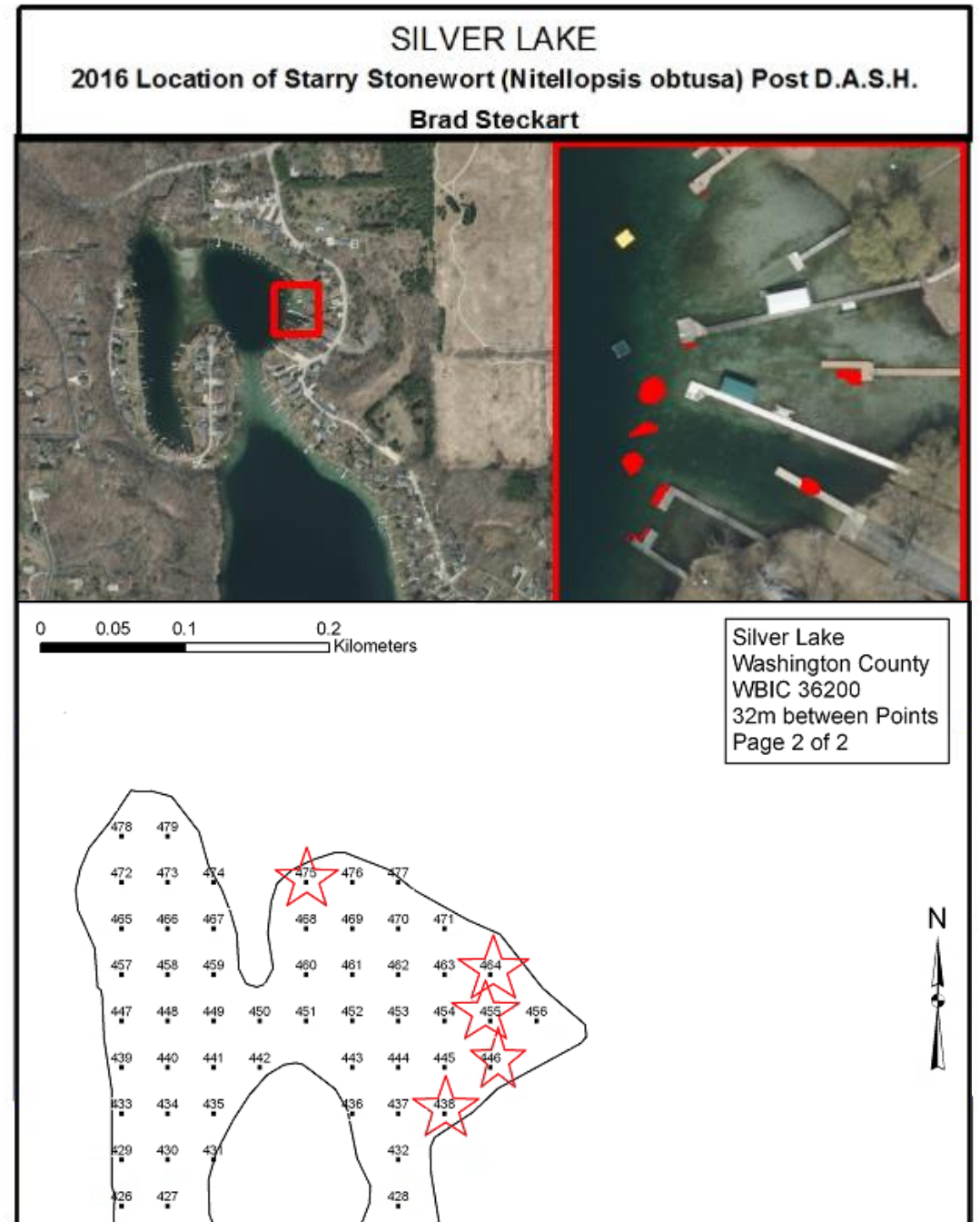
DASH

# Starry Stonewort Distribution after DASH Removal

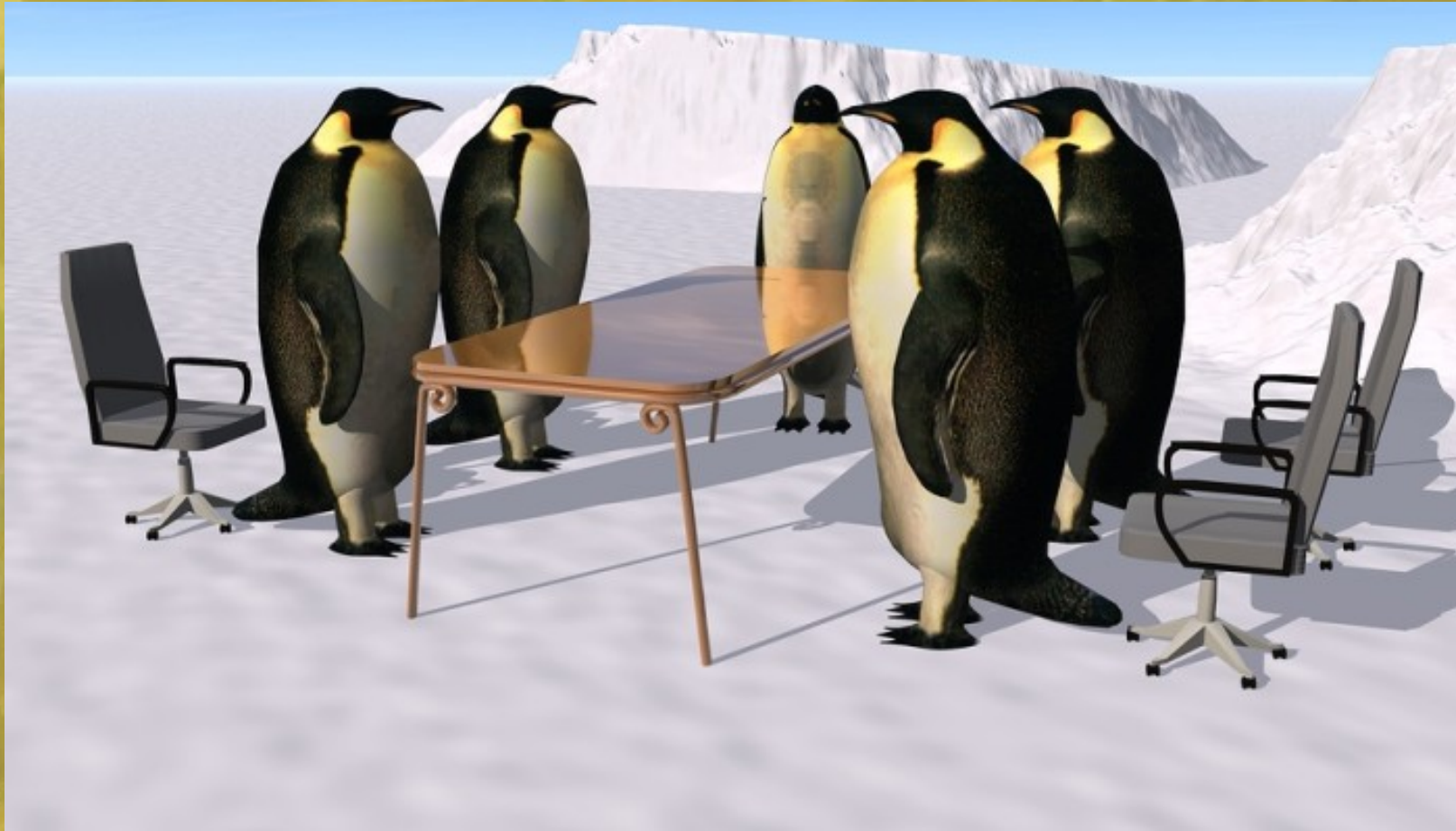


# Results Two Years Later - 2017

- Starry stonewort is still present
- Scattered populations
- Satellite populations found further away from original population



# Lessons Learned: Chemical Treatment of Starry Stonewort





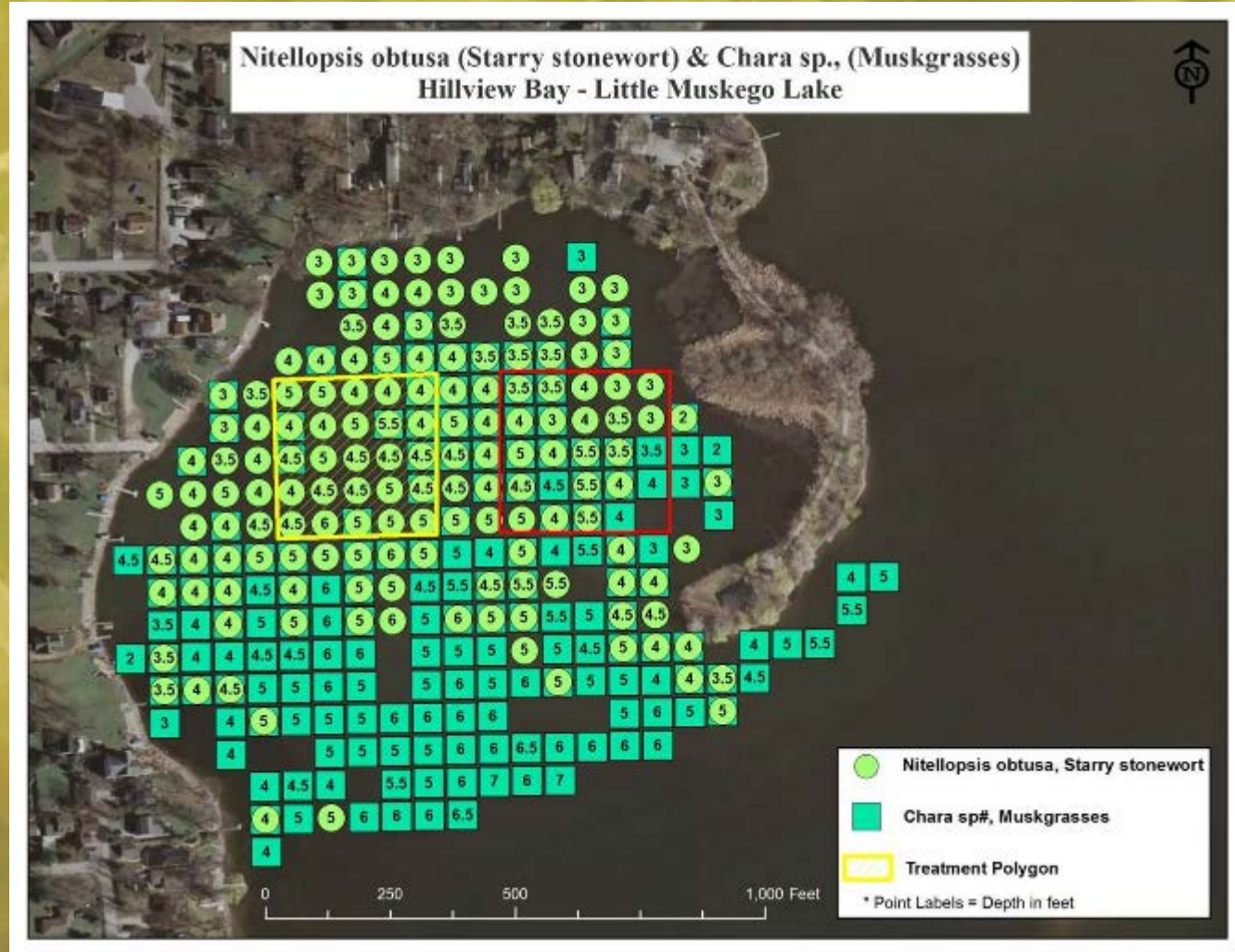
# Herbicides utilized in SE WI for Starry Stonewort treatments

- Endothol (example: Hydrothol)
- Chelated Copper (example: Komeen crystal, Cutrine)
- Flumioxazin (example: Clipper)
- Diquat (example: Reward)



# Metrics studied

- Sub P/I data
- Organism height
- Wet mass



# Wisconsin Herbicide Treatment Evaluations

| Lake           | County   | Date(s) Treated | Product(s)           | Rate(s)             | Treatment area | % SSW Change (Pre vs. Post) |
|----------------|----------|-----------------|----------------------|---------------------|----------------|-----------------------------|
| Little Muskego | Waukesha | 06/29/2016      | Copper               | 0.5 ppm             | 2.4 acres      | -12%                        |
| Long           | Racine   | 06/08/2016      | Copper               | 0.8ppm              | 2.7 acres      | +27%                        |
|                |          | 06/29/2016      | Copper + Hydrothol   | 0.8 ppm + 0.29 ppm  | 2.7 acres      | +57%                        |
|                |          | 06/16/2016      | Copper + Flumioxazin | 0.83 ppm + 0.15 ppm | 1.0 acres      |                             |
|                |          | 06/26/2016      | Copper + Diquat      | 0.83 ppm + 0.35 ppm | 0.74 acres     |                             |
| Big Muskego    | Waukesha | 09/24/2015      | Copper + Hydrothol   | 0.8 ppm + 0.17 ppm  | 1.5 acres      | -10%                        |
|                |          | 06/27/2016      | Copper + Hydrothol   | 0.8 ppm + 0.17 ppm  | 1.5 acres      |                             |
|                |          | 06/27/2016      | Copper + Hydrothol   | 0.8 ppm + 0.17 ppm  | 1.3 acres      | +33%                        |
|                |          | 09/24/2015      | Flumioxazin          | 0.2 ppm             | 0.75 acres     | +89%                        |
|                |          | 06/27/2016      | Copper               | 0.4 ppm             | 0.75 acres     |                             |



# Hillview Bay, Little Muskego Lake

## June 29 Treatment - FOO

| Treatment Area (N=25) |               |              |                |                  |                               |
|-----------------------|---------------|--------------|----------------|------------------|-------------------------------|
|                       | Pre July 2015 | Pre May 2016 | Post July 2016 | Post August 2016 | August 2016 Bulbil Only Sites |
| Nitellopsis           | 100           | 100          | 88             | 96               | 36                            |
| Chara*                | 88            | 32           | <b>12</b>      | 4                |                               |
| Vallisneria*          | 88            | 4            | <b>28</b>      | 36               |                               |
| Control Area (N=25)   |               |              |                |                  |                               |
|                       | Pre July 2015 | Pre May 2016 | Post July 2016 | Post August 2016 | August 2016 Bulbil Only Sites |
| Nitellopsis           | 84            | 80           | 68             | 76               | 36                            |
| Chara*                | 100           | 68           | <b>84</b>      | 52               |                               |
| Vallisneria*          | 100           | 8            | <b>40</b>      | 40               |                               |
| Whole Bay (N=282)     |               |              |                |                  |                               |
|                       | Pre July 2015 | Pre May 2016 | Post July 2016 | Post August 2016 | August 2016 Bulbil Only Sites |
| Nitellopsis*          | 60            | 53           | <b>78</b>      | 78               | 10                            |
| Chara*                | 82            | 63           | <b>57</b>      | 42               |                               |
| Vallisneria*          | 83            | 5            | <b>64</b>      | 60               |                               |

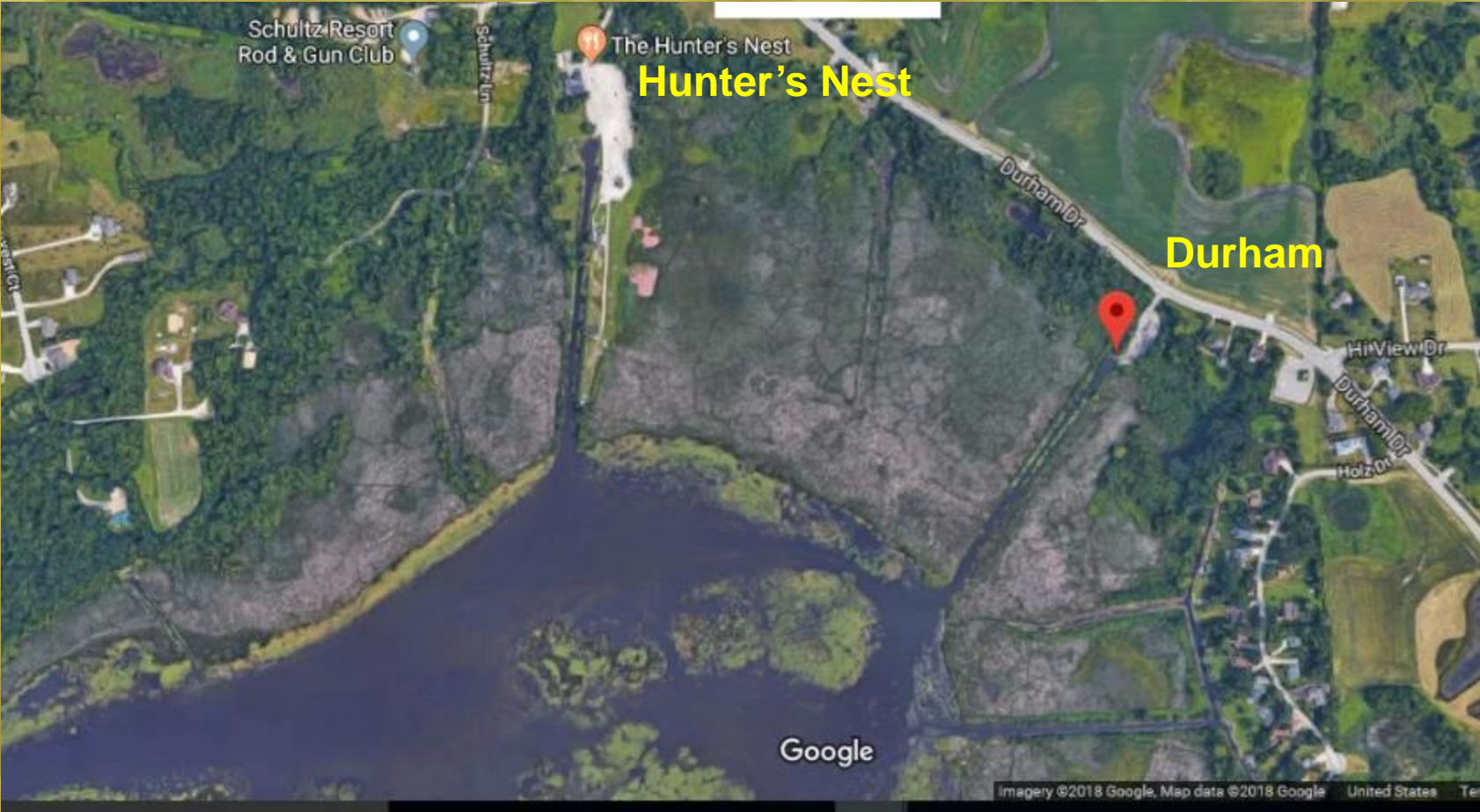
Frequency of dominant plant species in Hillview Bay, Little Muskego Lake before and after a copper (Komeen crystal) treatment. Bold \* items indicate a statistically significant ( $p < 0.05$ ) difference between 2015 pre-treatment and 2016 post-treatment surveys.

# Little Muskego Herbicide Evaluation 2015-2016 Comparison



- Starry stonewort biomass reduction was substantial, but not gone.
- Two dominant native plant species decline more drastically than stary stonewort from 2015 to 2016.
- DNR and partners surveyed Hillview in 2017.

# Big Muskego 2015 Channel Treatment



# Hunters Nest – Treated with Endothol and Chelated Copper

| Hunter's Nest Launch |            |            |            |            |  |
|----------------------|------------|------------|------------|------------|--|
|                      | 9/23/15    | 10/14/15   | 10/26/15   | 6/23/16    |  |
| Site                 | Weight (g) | Weight (g) | Weight (g) | Weight (g) |  |
| 1A                   | 334        | 0          | 0          | 19         |  |
| 1B                   | 6.5        | 0          | 0.2        | 0          |  |
| 2A                   | 3.25       | 0          | 0          | 166        |  |
| 2B                   | 0.5        | 0          | 0          | 35         |  |
| 3A                   | 9          | 0.2        | 0          | 0.75       |  |
| 3B                   | 1.8        | 0          | 1          | 11         |  |
| 4A                   | 396        | 0.8        | 24         | 1533       |  |
| 4B                   | 1853       | 0.3        | 2.8        | 1035       |  |
| 5A                   | 849        | 3          | 16         | 1856       |  |
| 5B                   | 901        | 56         | 20         | 131        |  |
| 6A                   | 81         | 19         | 2          | 905        |  |
| 6B                   | 117        | 0          | 3          | 1254       |  |
| 7A                   | 84         | 0          | 0          | 877        |  |
| 7B                   | 43         | 10         | 0          | 675        |  |
| 8A                   | 385        | 32         | 2          | 877        |  |
| 8B                   | 480        | 0.7        | 0.2        | 760        |  |

# Durham – Control

| Durham Launch (Control Site) |            |            |            |            |  |
|------------------------------|------------|------------|------------|------------|--|
|                              | 9/23/16    | 10/14/15   | 10/26/15   | 6/23/16    |  |
| Site                         | Weight (g) | Weight (g) | Weight (g) | Weight (g) |  |
| 1A                           | 25         | 0          | 0          | 0          |  |
| 1B                           | 0          | 0          | 0          | 0          |  |
| 2A                           | 0          | 0          |            | 0          |  |
| 2B                           | 22         | 0          |            | 0          |  |
| 3A                           | 3.75       | 0          | 111        | 0          |  |
| 3B                           | 15.5       | 0          | 62         | 0          |  |
| 4A                           | 720        | 0          | 1.1        | 4          |  |
| 4B                           | 90         | 0          | 0.2        | 41         |  |
| 5A                           | 3.7        | 610        | 3200       | 412        |  |
| 5B                           | 803        | 590        | 1975       | 50         |  |
| 6A                           | 1803       | 3250       | 1560       | 0          |  |
| 6B                           | 588        | 0          | 1790       | 0          |  |
| 7A                           | 5          | 690        | 560        | 0          |  |
| 7B                           | 1701       | 1070       | 1120       | 0          |  |
| 8A                           | 66         | 1860       | 460        | 0          |  |
| 8B                           | 1503       | 983        | 840        | 0          |  |



# Boxhorn Treatment 2015

- East central side location on Big Muskego
- Open water, no channel



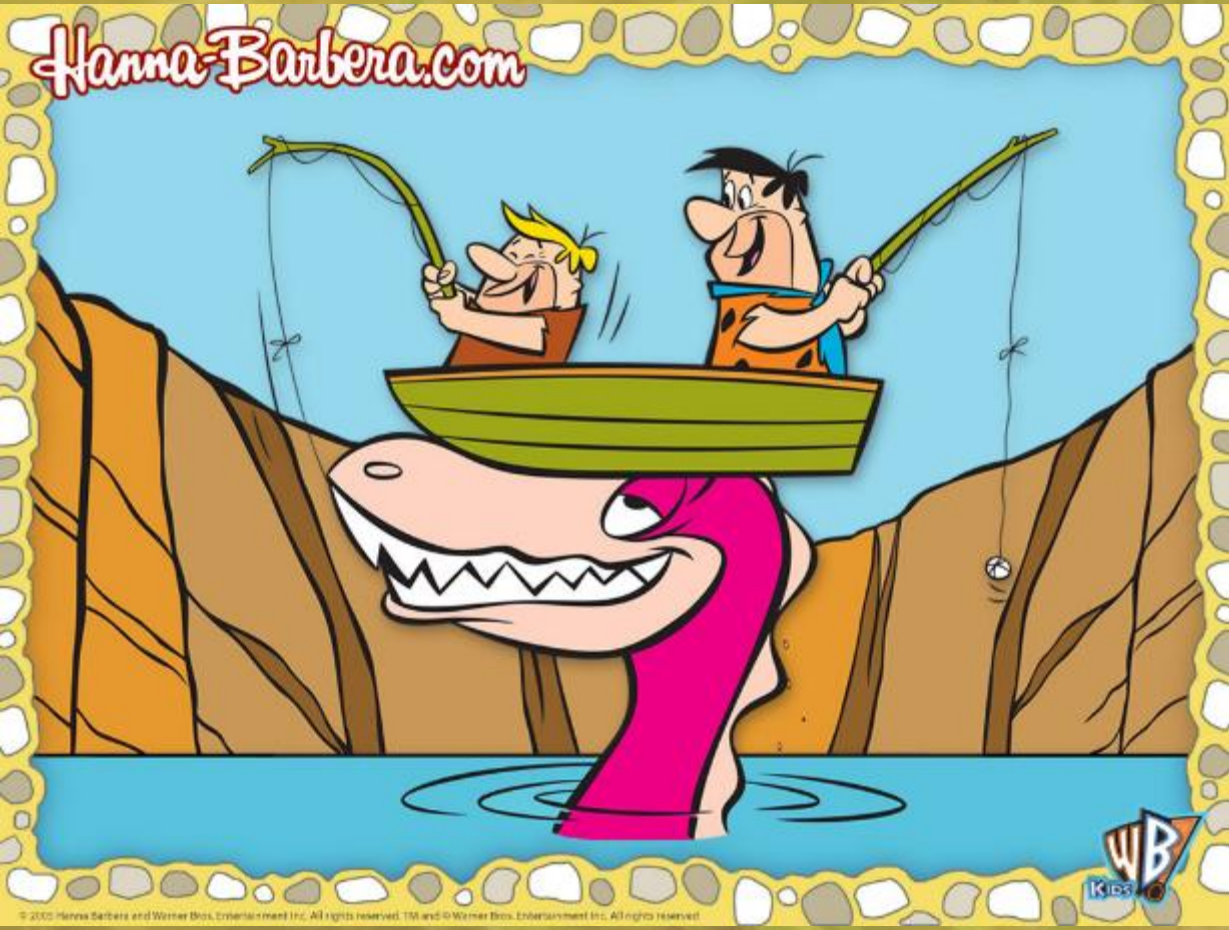
# Boxhorn – Treated with Flumioxazin

|      | Boxhorn Launch |            |            |            |  |
|------|----------------|------------|------------|------------|--|
|      | 9/23/15        | 10/14/15   | 10/26/15   | 6/23/16    |  |
| Site | Weight (g)     | Weight (g) | Weight (g) | Weight (g) |  |
| 1A   | 0.5            | 0.6        | 0.3        | 1808       |  |
| 1B   | 3.9            | 0.1        | 0          | 385        |  |
| 2A   | 0.3            | 0          | 0          | 20         |  |
| 2B   | 0.3            | 0          | 0          | 30         |  |
| 3A   | 10.5           | 0          | 0          | 86         |  |
| 3B   | 0.1            | 0          | 0          | 9.6        |  |
| 4A   | 2.9            | 0          | 0.2        | 0          |  |
| 4B   | 0.6            | 3.2        | 0          | 0          |  |
| 5A   | 2.1            | 0          | 0          | 10         |  |
| 5B   | 0.2            | 0          | 0          | 498        |  |
| 6A   | 3.5            | 0          | 0          | 0          |  |
| 6B   | 0.2            | 0          | 0          | 0          |  |
| 7A   | 3.75           | 0          | 0          | 0          |  |
| 7B   | 0.2            | 0          | 0          | 0          |  |
| 8A   | 24.25          | 0.3        | 1.3        | 8.75       |  |
| 8B   | 14.5           | 1.3        | 0.1        | 21         |  |

# Wisconsin Treatment Evaluation Summary

- No herbicide treatment has provided more than short-term (< 1 year) control.
- Herbicide treatments may reduce SSW biomass in the short-term, but don't kill the entire organism.
- Native charophytes and macrophytes can be impacted by treatments.
- At least some of the herbicide degradation/dissipation appears to be due to off-site water movement.

# Drawdown as a management tool



# Winter Drawdown For Little Muskego Lake

- Started September 5<sup>th</sup> 2017
- Goal to draw down a total of 84 inches
- Raise gates and then pump water after that
- Stop fall drawdown October 1<sup>st</sup> or when water temperature is approaching 55 degrees
- Closed to all fishing starting November 1<sup>st</sup>, 2017 until March 4<sup>th</sup>, 2018
- Ended October 12th
- Achieved 72 inches drawdown

# Starry Stonewort Bulbil Lab Trials

Dr. Ken Karol and Stephen Gottschalk  
New York Botanical Gardens

| Desiccation  | 1hr    | 6 hr   | 1 day  | 5 day  | 1 month | 3 month | Total  |
|--------------|--------|--------|--------|--------|---------|---------|--------|
| Attempts     | 15     | 15     | 45     | 30     | 30      | 25      | 160    |
| Success      | 4      | 0      | 0      | 0      | 0       | 0       | 4      |
| Success Rate | 26.67% | 0.00%  | 0.00%  | 0.00%  | 0.00%   | 0.00%   | 2.50%  |
| Freezing     |        |        | 1 Day  | 5 day  | 1 month | 3 month | Total  |
| Attempts     |        |        | 30     | 30     | 30      | 25      | 115    |
| Success      |        |        | 0      | 0      | 0       | 0       | 0      |
| Success Rate |        |        | 0.00%  | 0.00%  | 0.00%   | 0.00%   | 0.00%  |
| All controls | 1hr    | 6 hr   | 1 Day  | 5 day  | 1 month | 3 month | Total  |
| Attempts     | 15     | 15     | 45     | 30     | 30      | 25      | 160    |
| Success      | 12     | 11     | 27     | 24     | 17      | 19      | 110    |
| Success Rate | 80.00% | 73.33% | 60.00% | 80.00% | 56.67%  | 76.00%  | 68.75% |

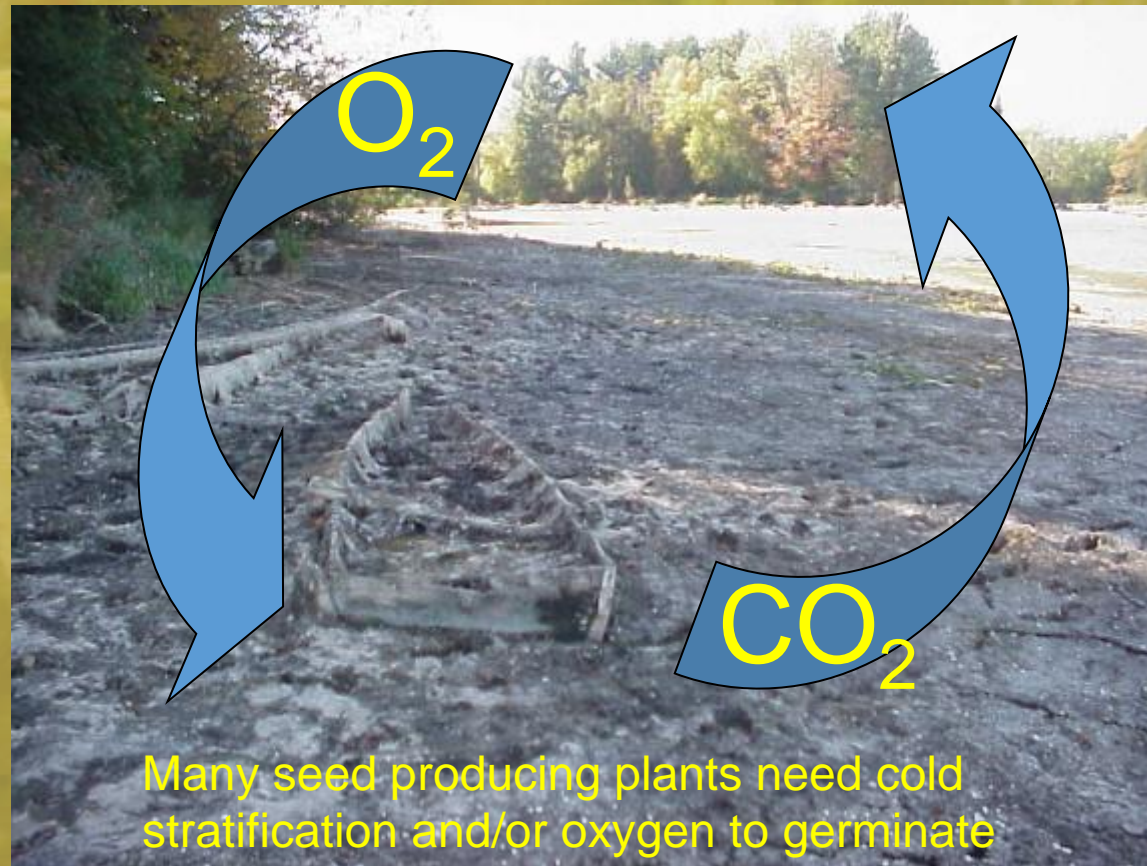
# Goals of a drawdown

Desiccation:



# How does this work?

Aeration:

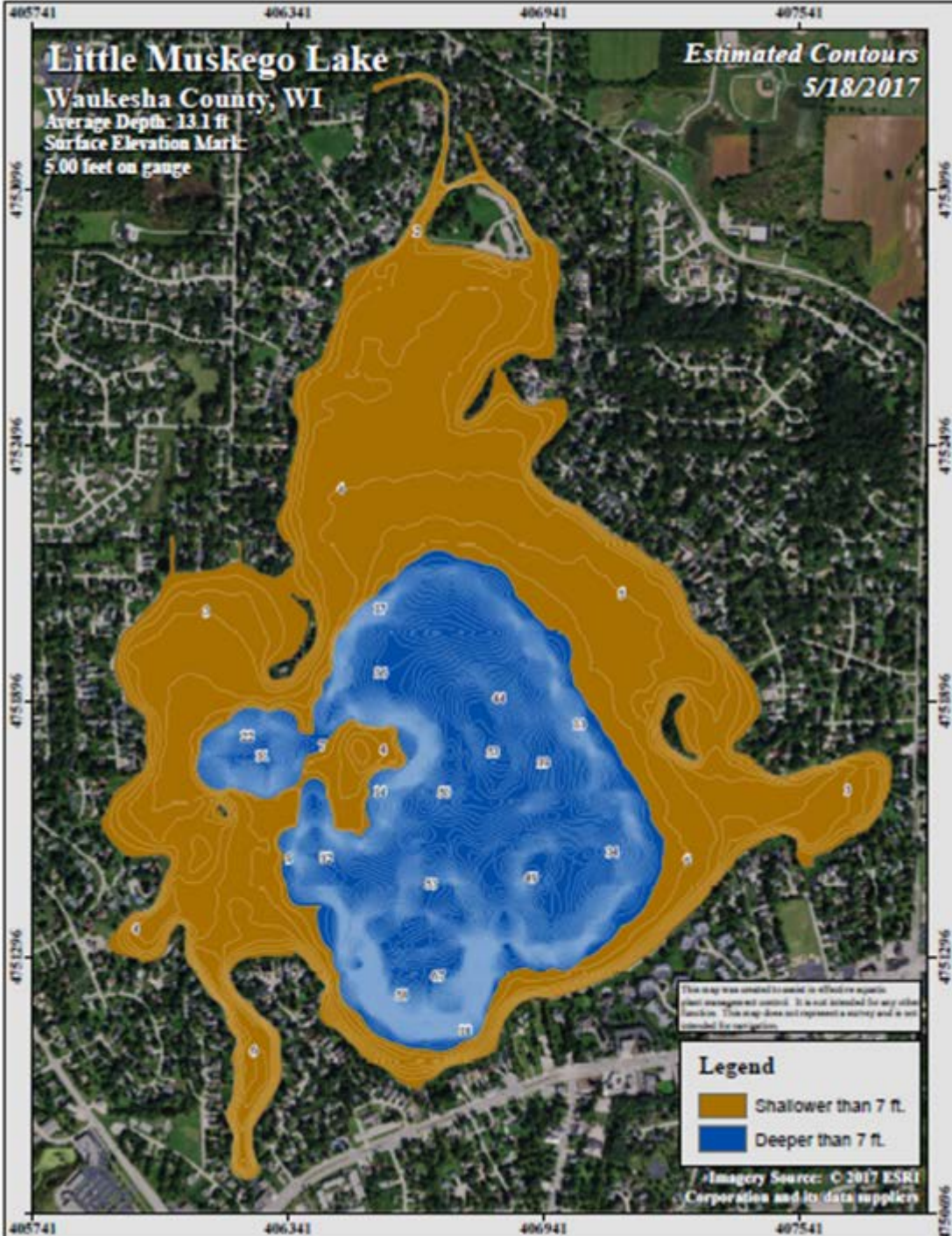




# How does this work?

Freezing:







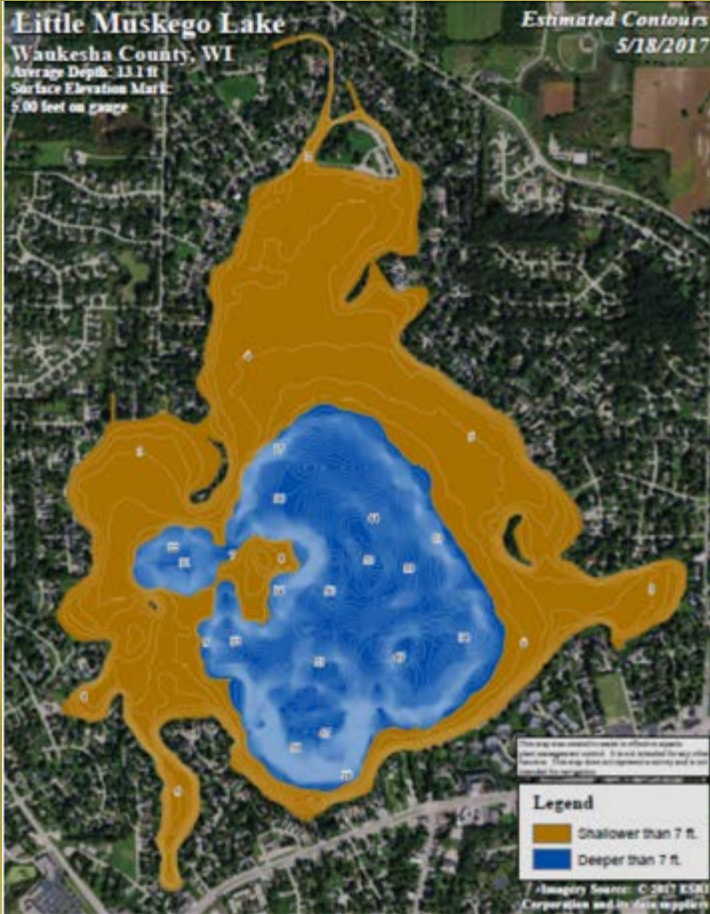








# Little Muskego







12.06.2017



12.06.2017

# Proposed management in 2018

- **Dredging**
- **Benthic barriers**
- **Chemical treatments in contained curtain (sediment barrier) to prevent diffusion**

# Dredging

- Permit process takes time
- Likely will need an individual permit
- Sediment/contaminant testing
- Disposal cost – trucking, burial
- Hydraulic dredging
- Geotextile bags needed on site for weeks
- Cost can quickly add up

# Geotextile Bag



# Benthic barriers

- Wildlife and fisheries have concerns about widespread use – coordination work in progress
- When you put a barrier down on the bed of a lake, sediment is deposited on top – at best, a temporary fix in small area
- Blocks germination of native seed bank
- WDNR studied the use of these barriers in the past – concluded the benefits did not outweigh the ecological cost

# Curtained chemical treatments

- Curtain material needs to not allow water exchange
- Bottom of curtain needs to be weighted
- Top of curtain needs to have floats
- Research question to be answered: If chemical does not diffuse off site and maintains contact with the target organism for a longer period of time, can long term control be achieved?
- In the case of starry stonewort, will the bulbils and rhizoids be killed?

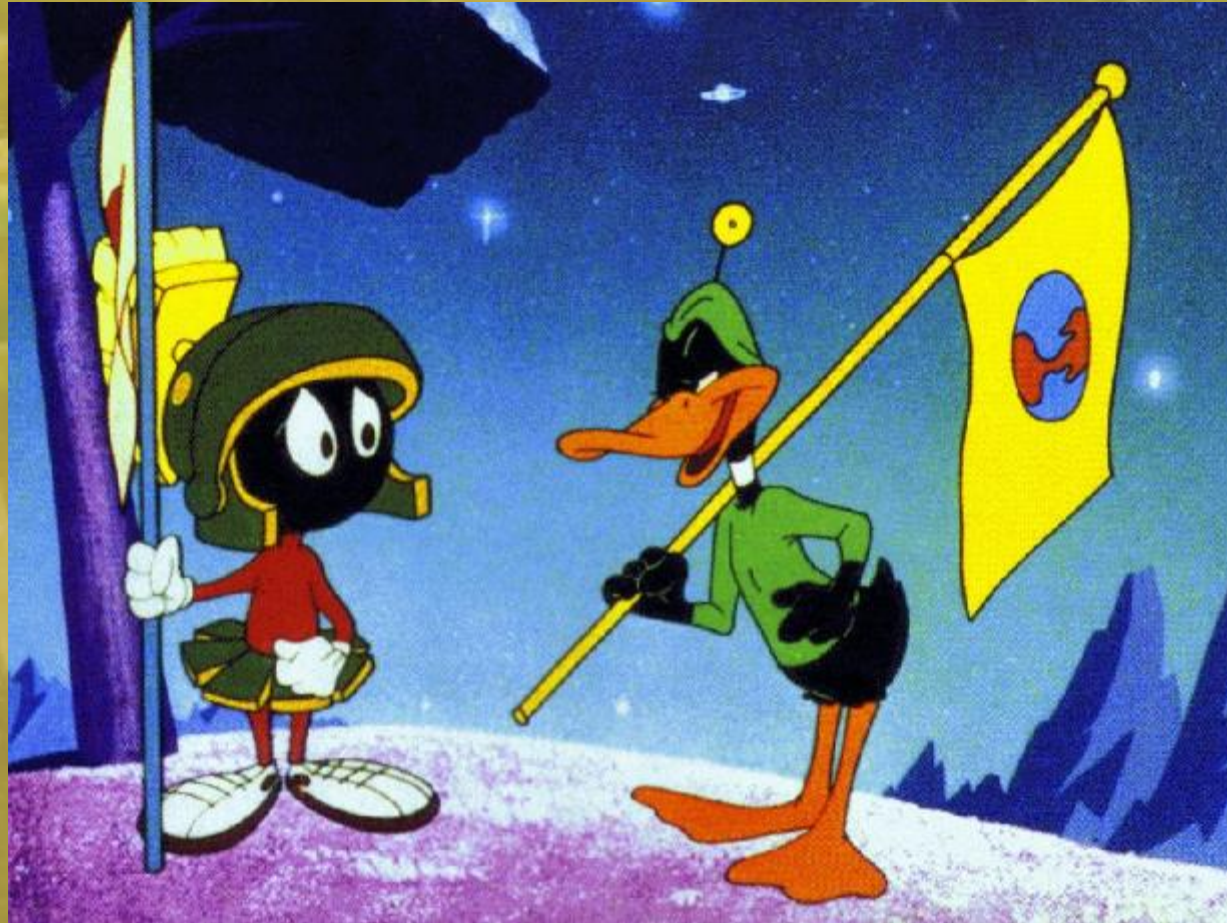
# Examples of containment curtains



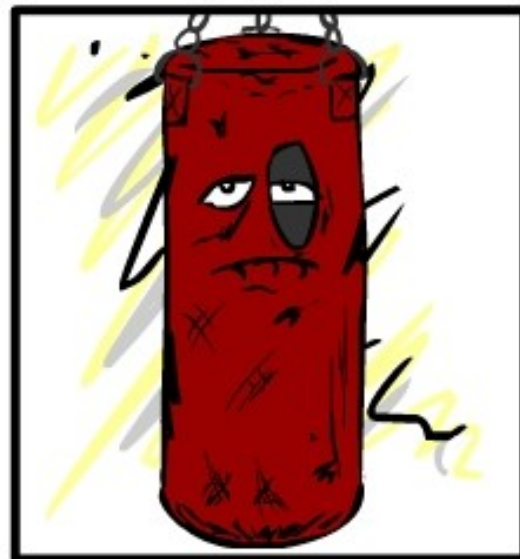
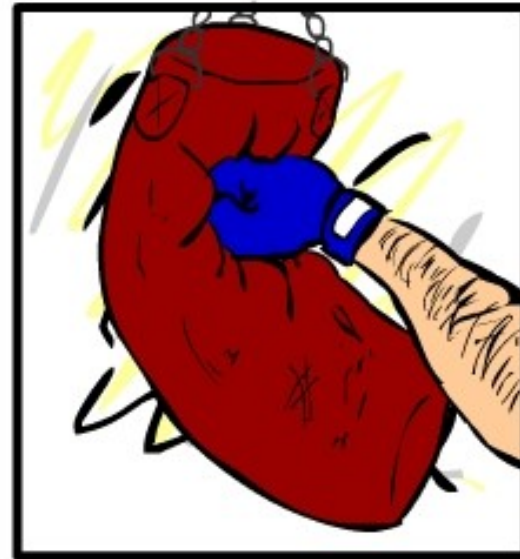
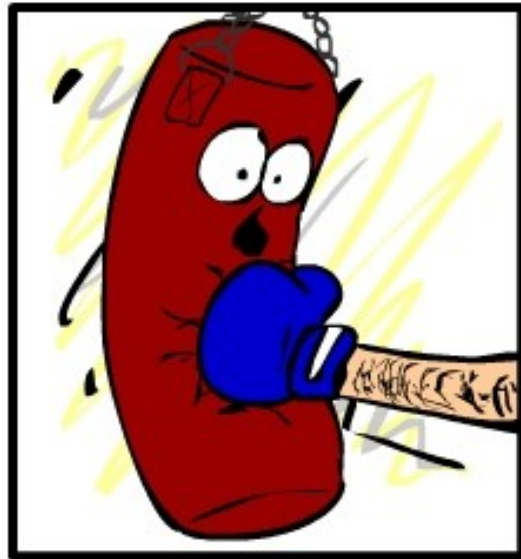
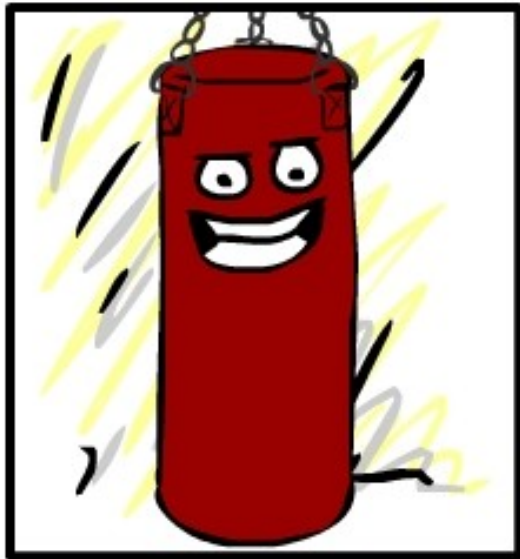




# Outreach and communication



MY LIFE



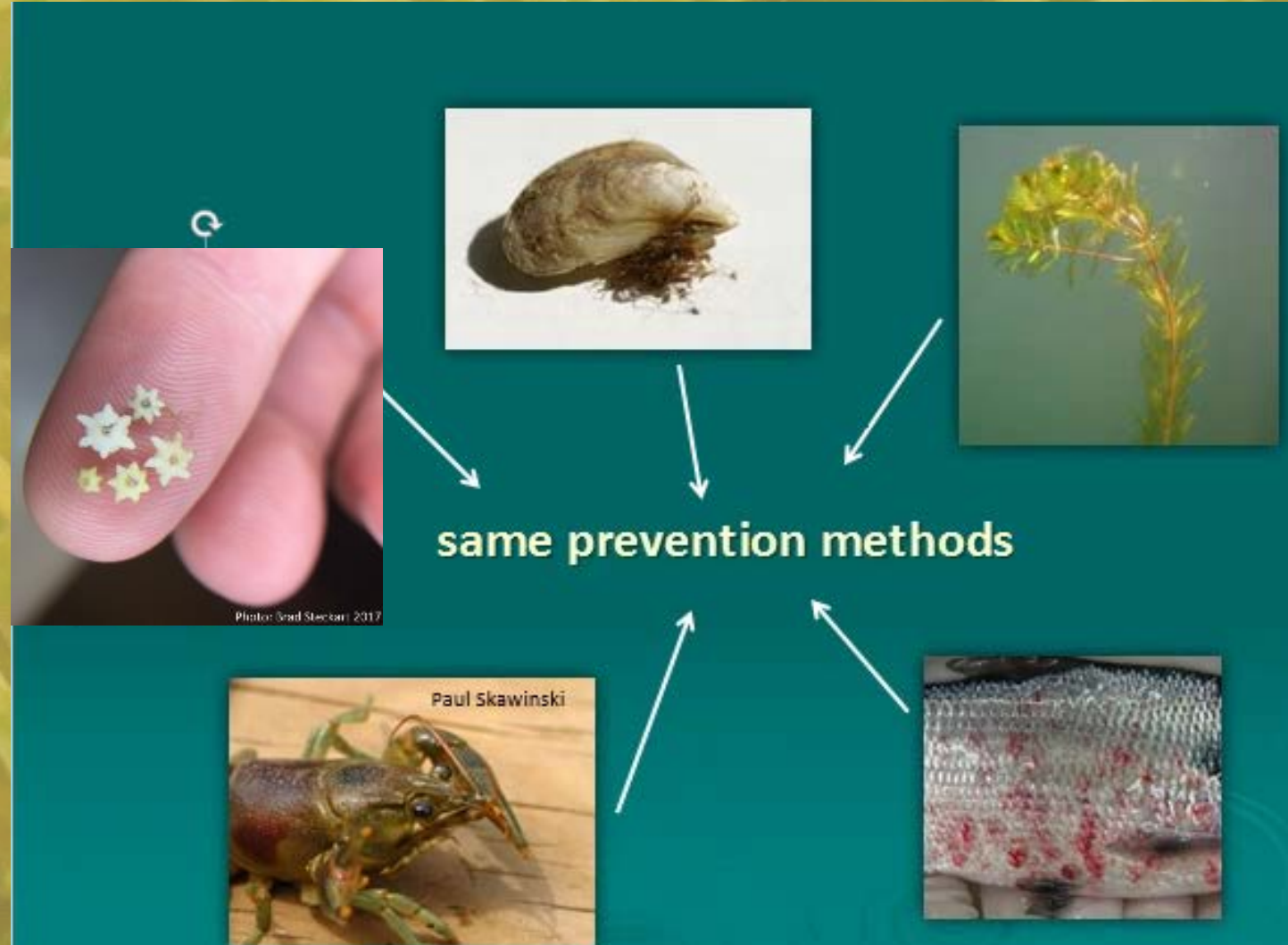
# AIS Cleaning Stations

- Enforcement days at launch
- Use tools at cleaning station



# CBCW

Clean Boats, Clean Waters  
is the best and most effective  
way to prevent the spread of  
aquatic invasive species  
between lakes!



Questions?

