

Monitoring and Management of Starry Stonewort (*Nitellopsis obtusa*) in Wisconsin Lakes

Wisconsin Water Week

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Michelle Nault, Heidi Bunk, & Amy Kretlow
Wisconsin Department of Natural Resources



Photo: Paul Skawinski

What is starry stonewort?

- Starry stonewort (*Nitellopsis obtusa*) is a macroalgae in the Characeae family.
- Not a vascular plant like most our aquatic plant species.
- Native to Europe & Asia; rare in portions of its range (endangered species in the United Kingdom and Japan).
- First documented in St. Lawrence River in 1970s; likely transported to U.S. via international ballast water.
- Can survive in a wide range of habitats.
- Primarily reproduces via asexual bulbils.
- Ecological impacts are largely unknown.



Identification

Large compared to most of its native relatives

Starry stonewort

Nitellopsis obtusa



Chara contraria



Chara globularis



Nitella flexilis



Identification

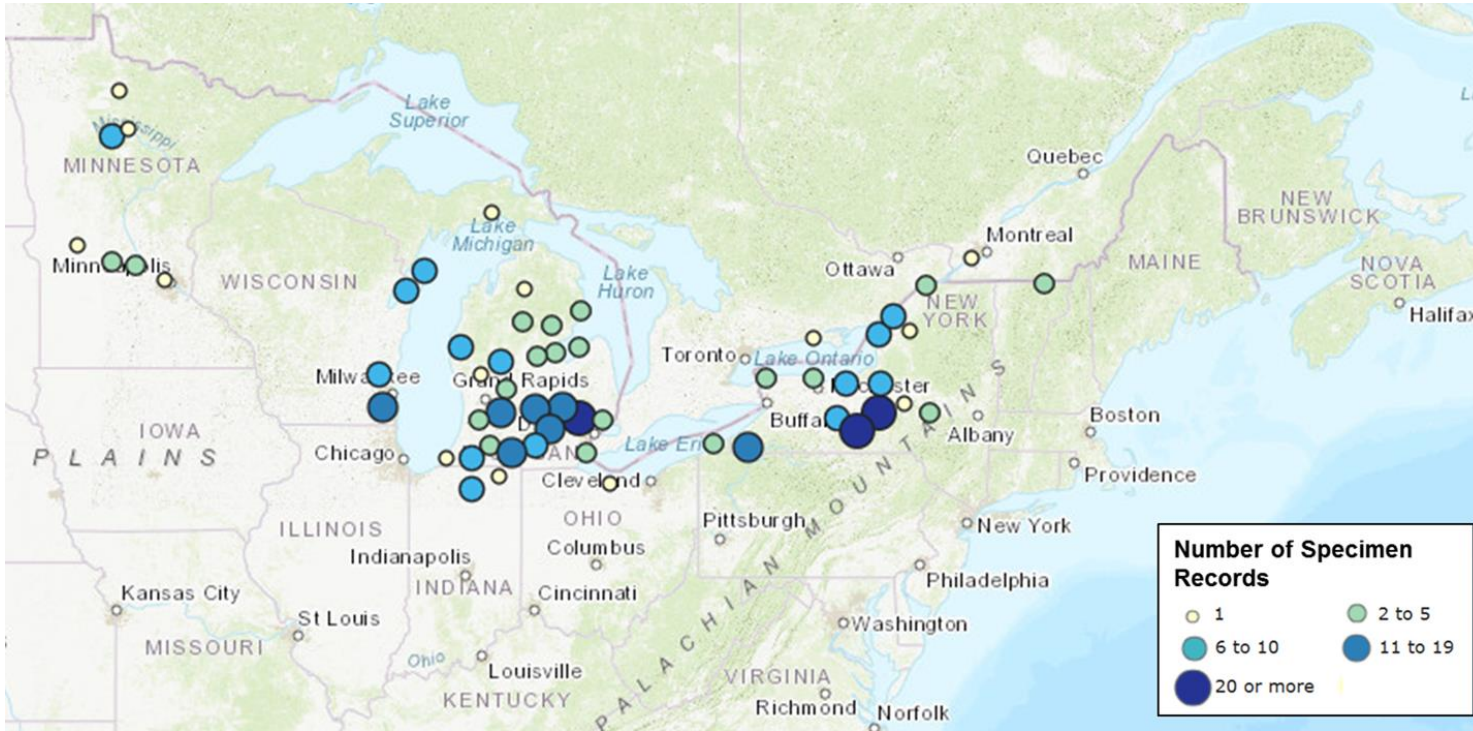
Starry stonewort produces distinct star-shaped bulbils



Photo: Paul Skawinski



Nitellopsis obtusa (starry stonewort) bulbil

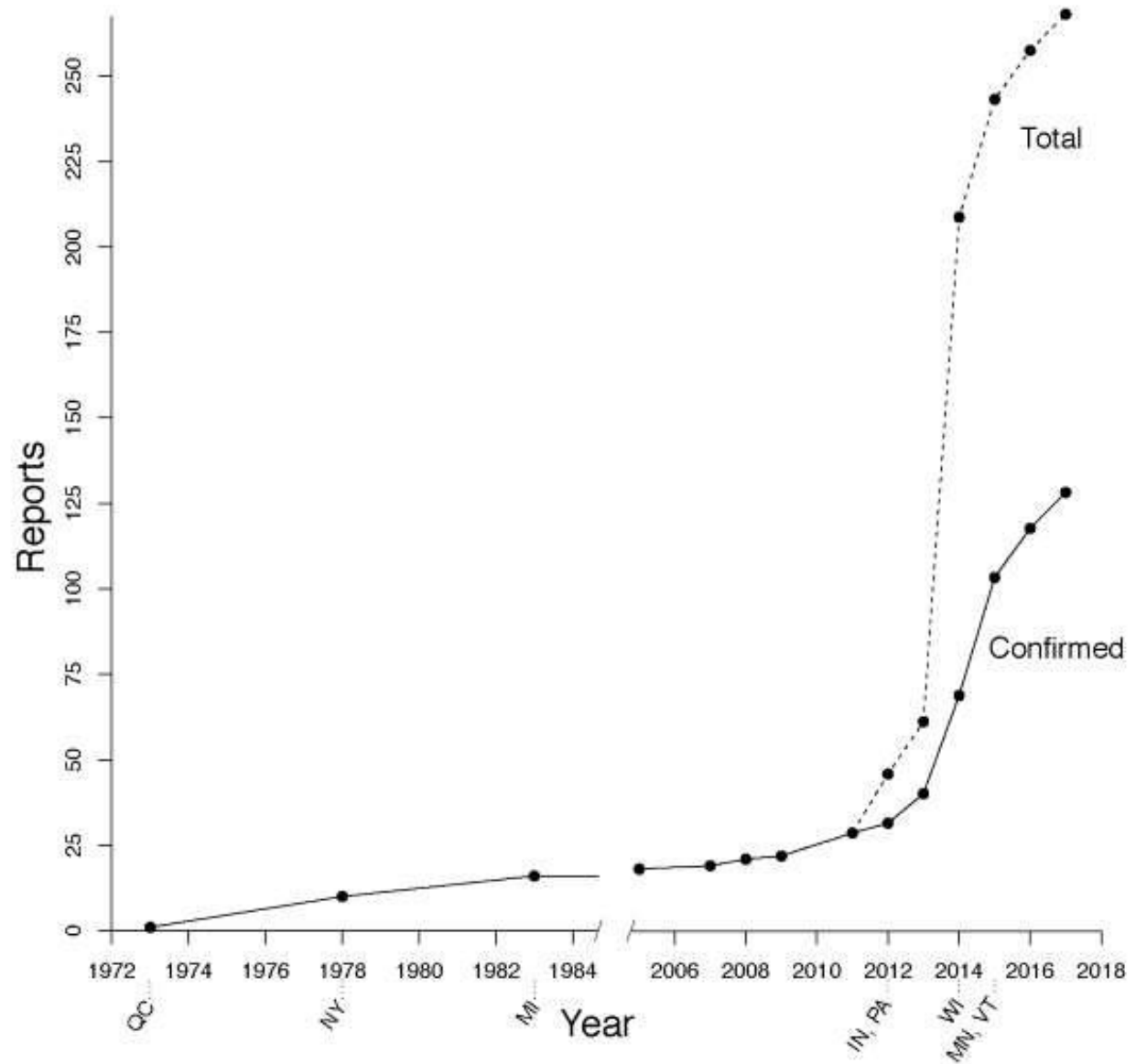


Non-Native Range Expansion

- Documented in lower Michigan inland lakes in the mid-2000s; Indiana in 2008.
- First documented in Wisconsin in 2014; Minnesota in 2015.
- Currently known from Indiana, Michigan (Lower), Minnesota, New York, Ohio, Pennsylvania, Vermont, Wisconsin, and Ontario.

Starry Stonewort Invasion Over Time

Larkin et al. 2018,
Aquatic Botany



First Discovery of Starry Stonewort in Wisconsin

- Wisconsin DNR staff first discovered starry stonewort in September 2014 while conducting an aquatic plant point-intercept (PI) survey out on Little Muskego Lake, Waukesha Co.
- Verified by Wisconsin DNR and the New York Botanical Garden.



Monitoring & Response Approach

- Rapid Assessment Monitoring
 - Targeted monitoring effort in southeast WI waterbodies around Little Muskego Lake
 - Monitoring consisted of rake tosses at boat launches, shoreline meanders, snorkeling, and lakewide AIS surveys
 - Some efforts were made to prioritize surveying waterbodies based on within lake characteristics (i.e., presence of other native Characeae, water hardness)
- Statewide AIS & Point-Intercept Surveys
 - Heightened outreach, education and awareness of starry stonewort



Verified SSW Populations

2014

- Little Muskego

2015

- Big Muskego
- Long
- Pike
- Silver

2016

- Green
- Lake Michigan/Green Bay

2017

- Wind

2018

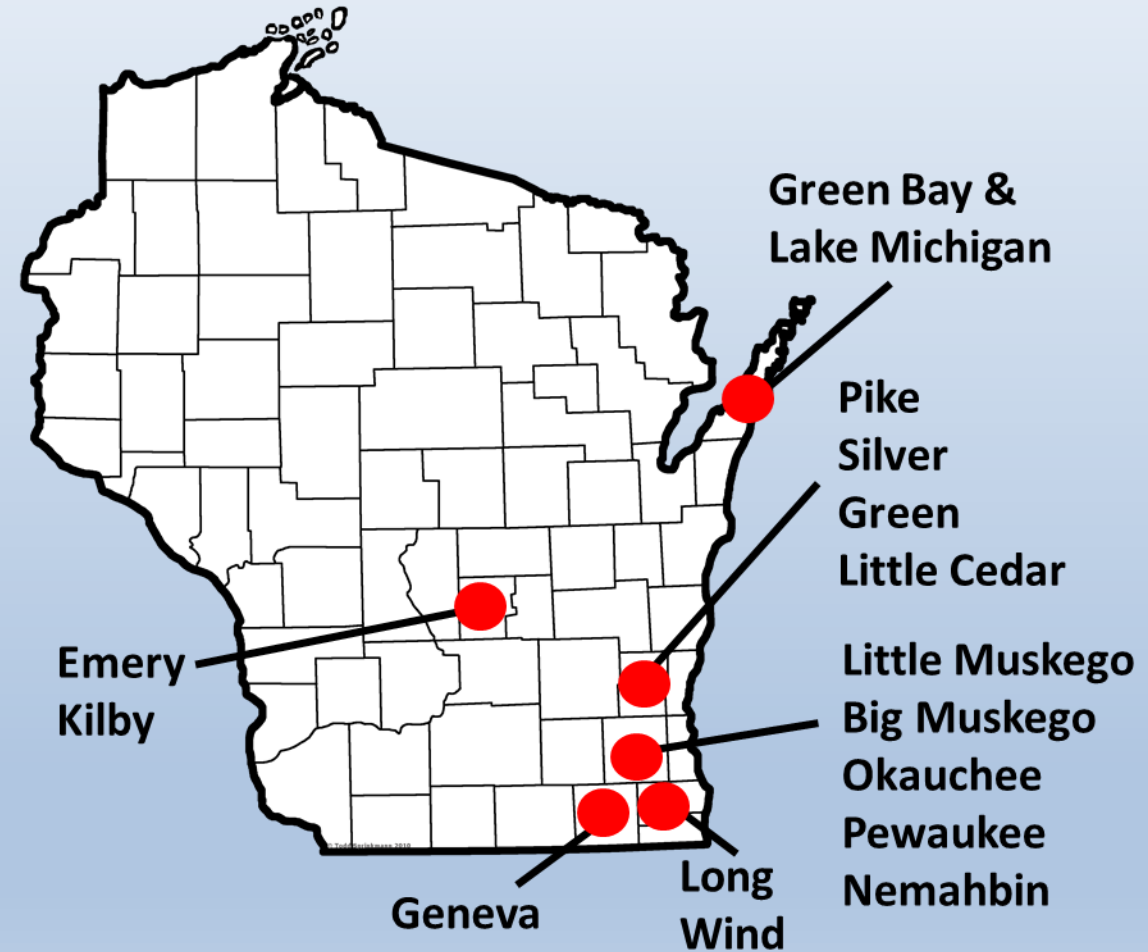
- Geneva
- Little Cedar

2019

- Okauchee
- Pewaukee
- Nemahbin
- Emery

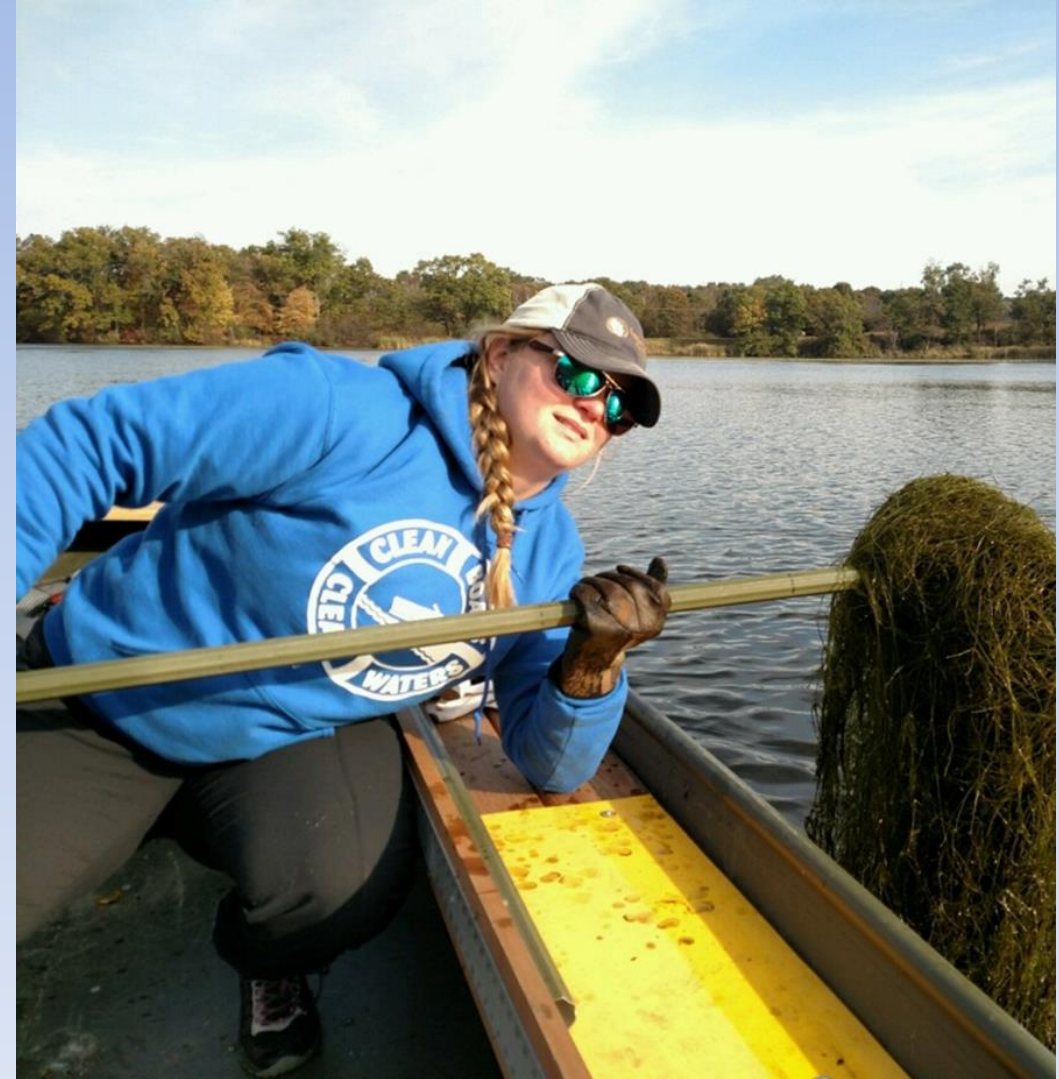
2020

- Kilby

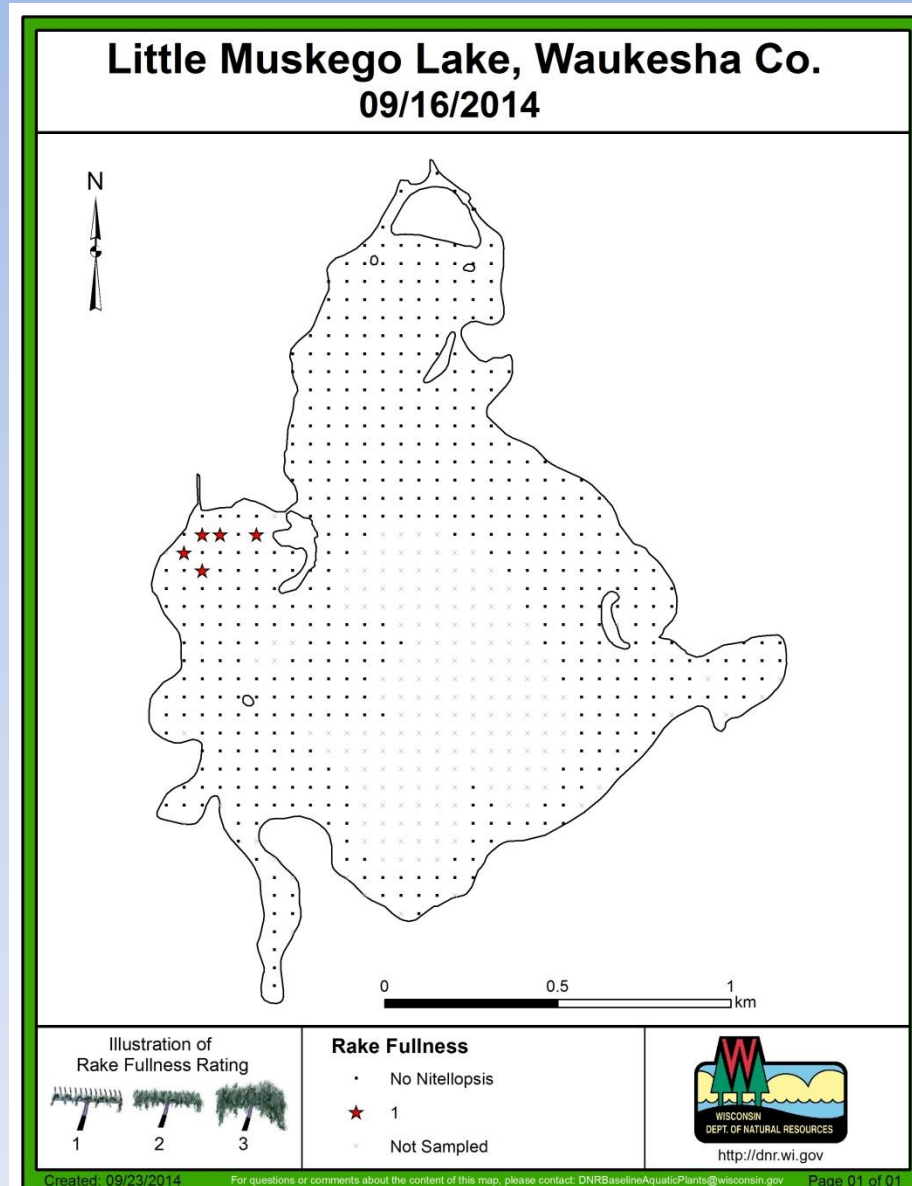
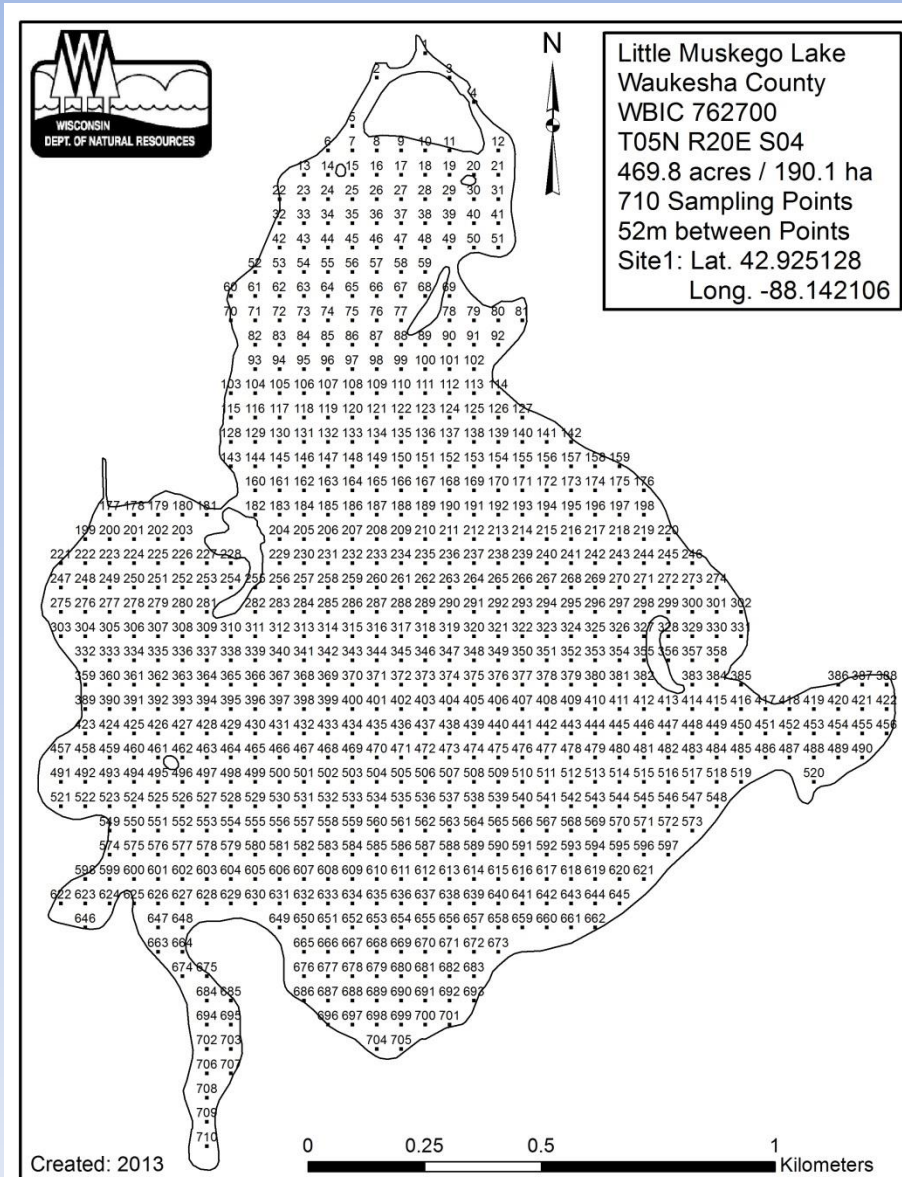


Monitoring Approach

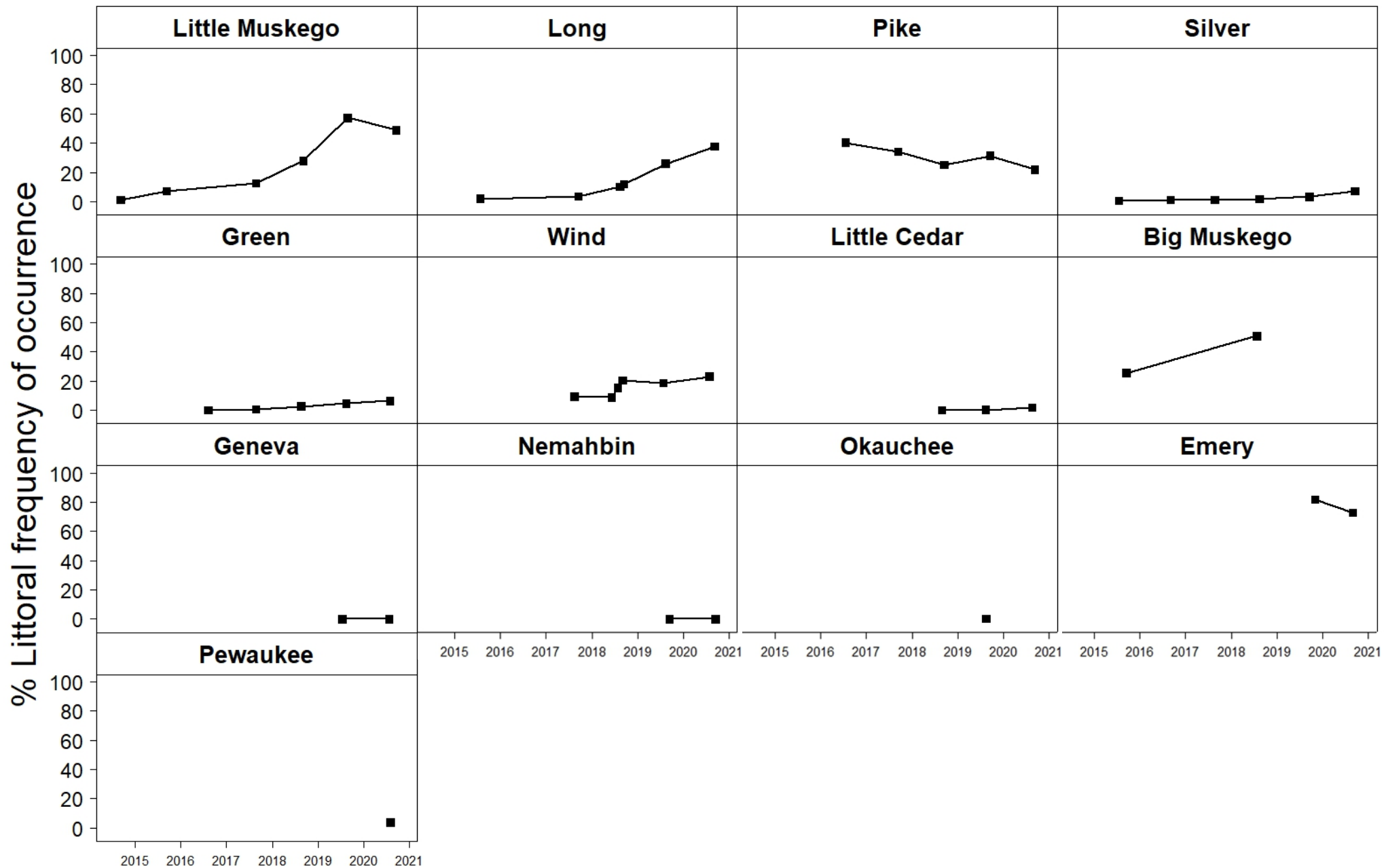
- Lakewide SSW Monitoring
 - Aquatic plant point-intercept (PI) surveys conducted on an annual basis on verified SSW lakes
 - Standardized PI methodology allows for quantitative data collection which is being used to look at plant community changes over time within a lake, as well as changes amongst different lakes
 - PI methodology is relatively easy to implement and provides statistically robust geolocated data
 - Data collected on SSW as well as native plant community



Lakewide SSW Monitoring

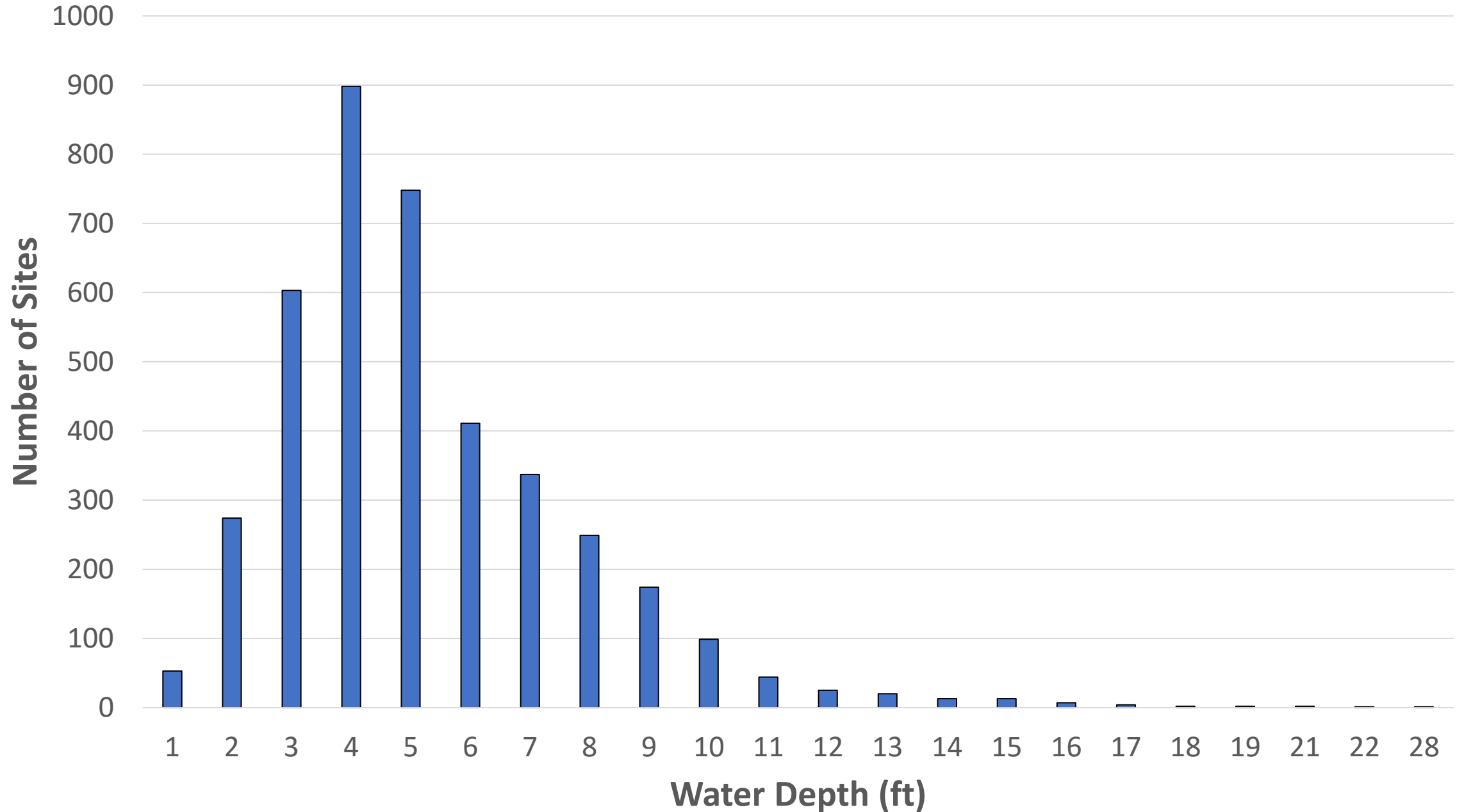


Starry Stonewort % Frequency

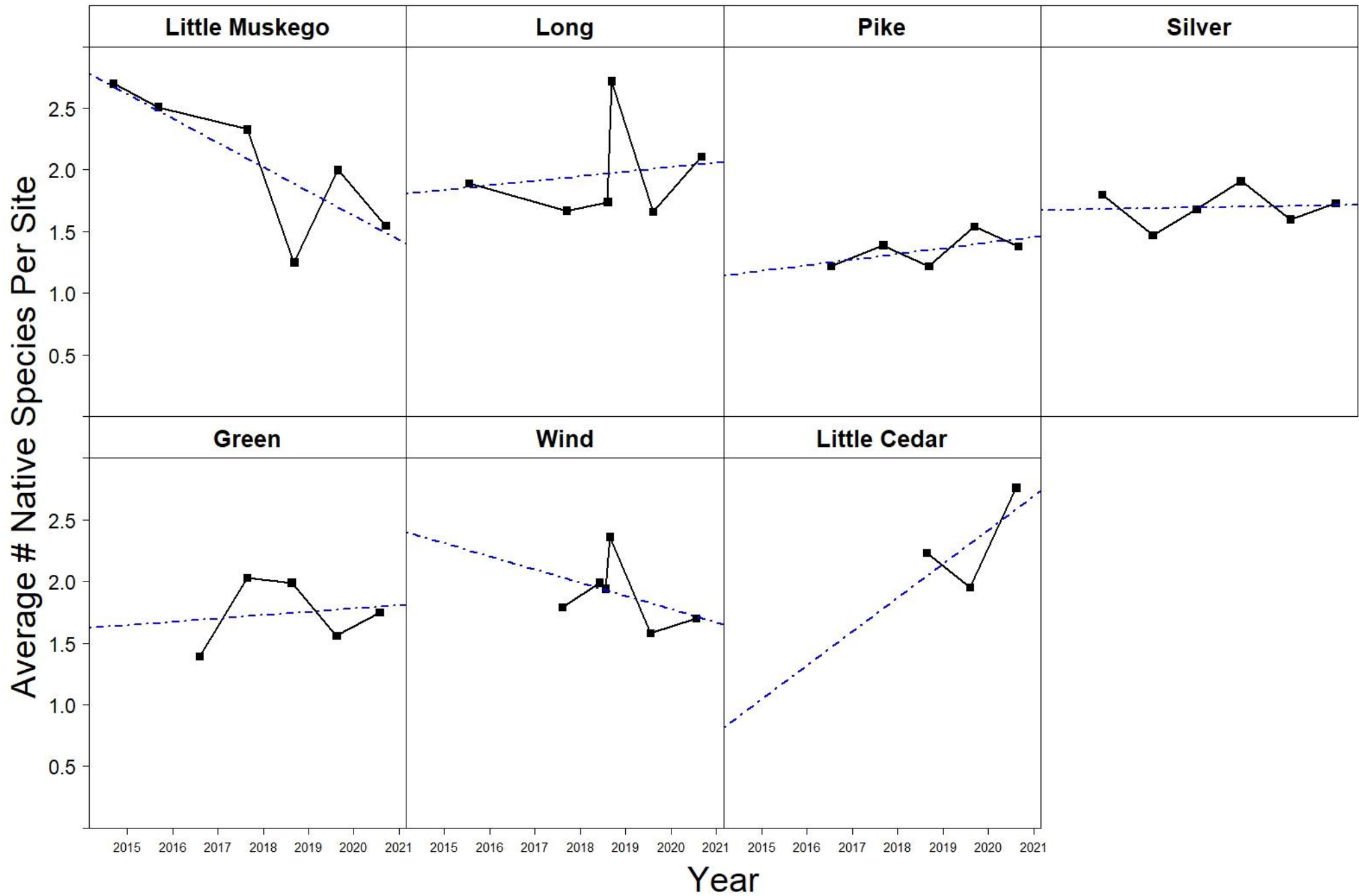


Year

Starry Stonewort Occurrence by Water Depth

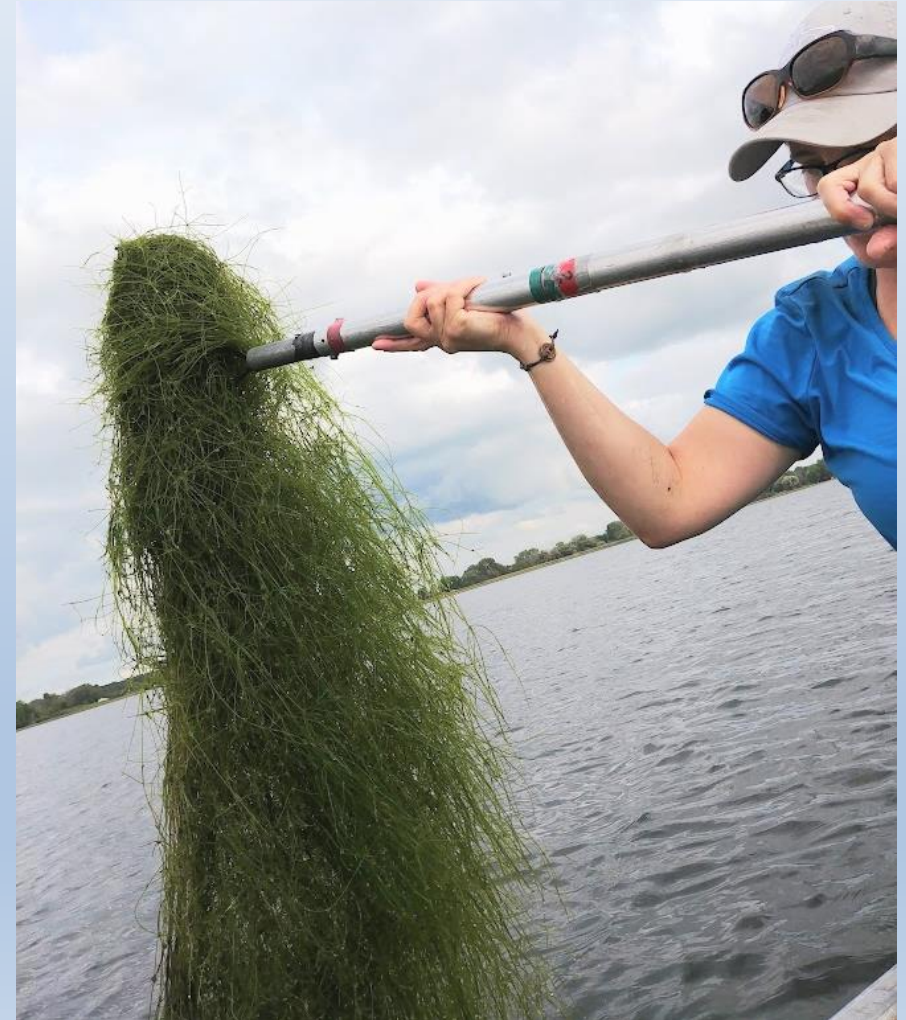


Average # Native Species Per Site

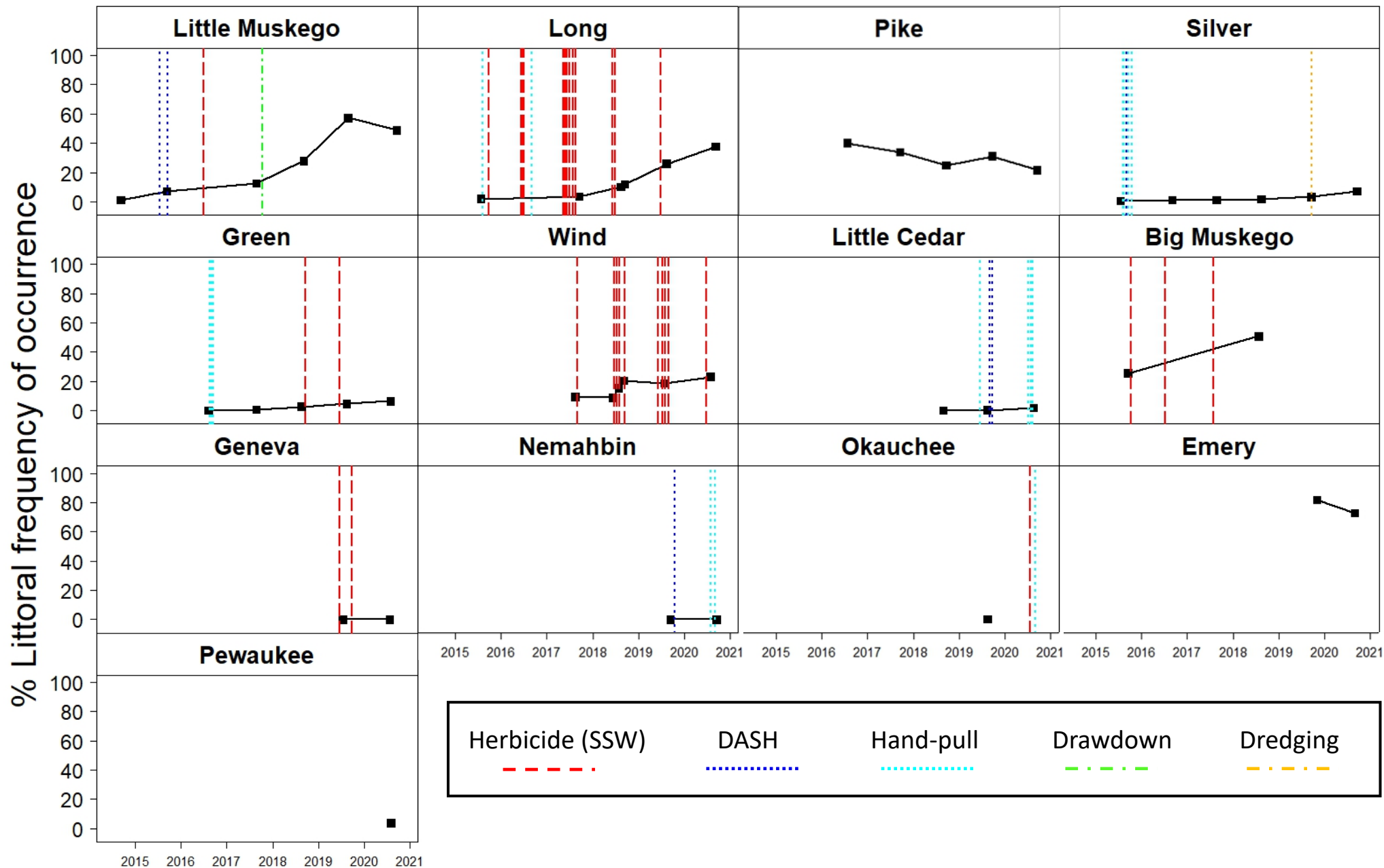


Implementation and Evaluation of Starry Stonewort Control Efforts

- Chemical treatment
 - open water and barrier curtain
- Drawdown
- Diver Assisted Suction Harvest (DASH)
- Hand pulling
- Dredging
- No management



Starry Stonewort % Frequency



Year

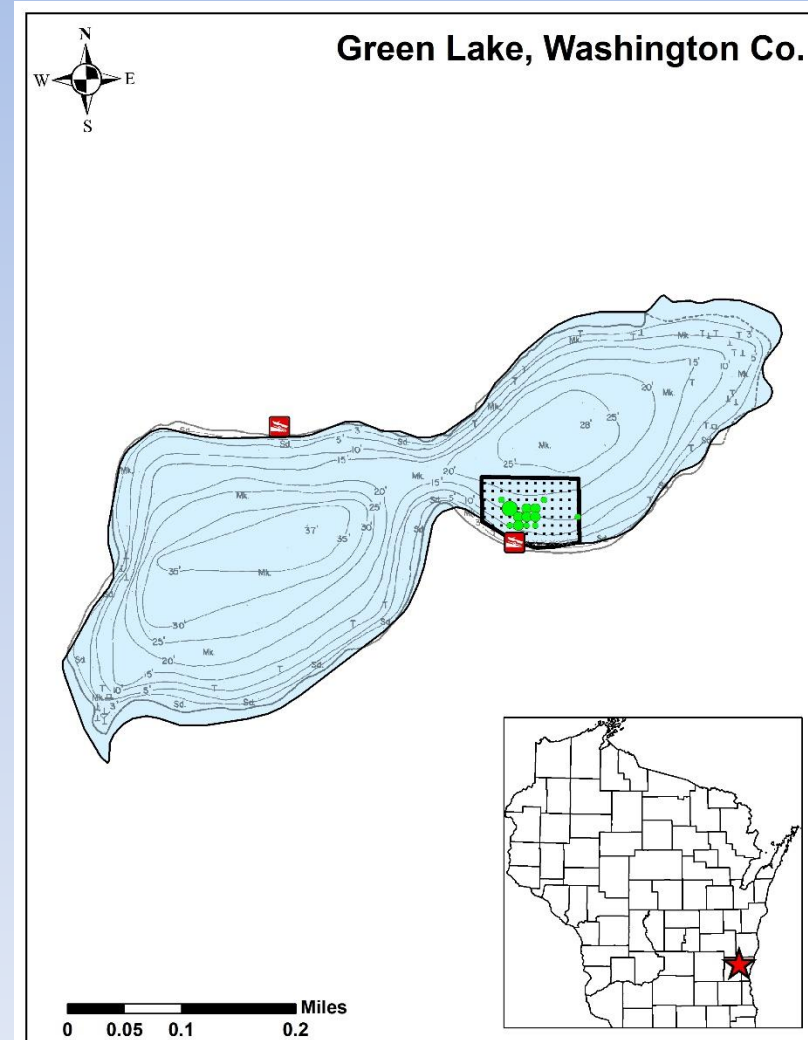
Starry Stonewort Management Projects

- **Green Lake, Washington Co.**
 - Small-scale Cutrine Ultra + Hydrothol 191 herbicide treatments within limno-barrier
- **Okauchee Lake, Waukesha Co.**
 - Small-scale Nautique + Hydrothol 191 herbicide treatment within limno-barrier



Green Lake, Washington Co.

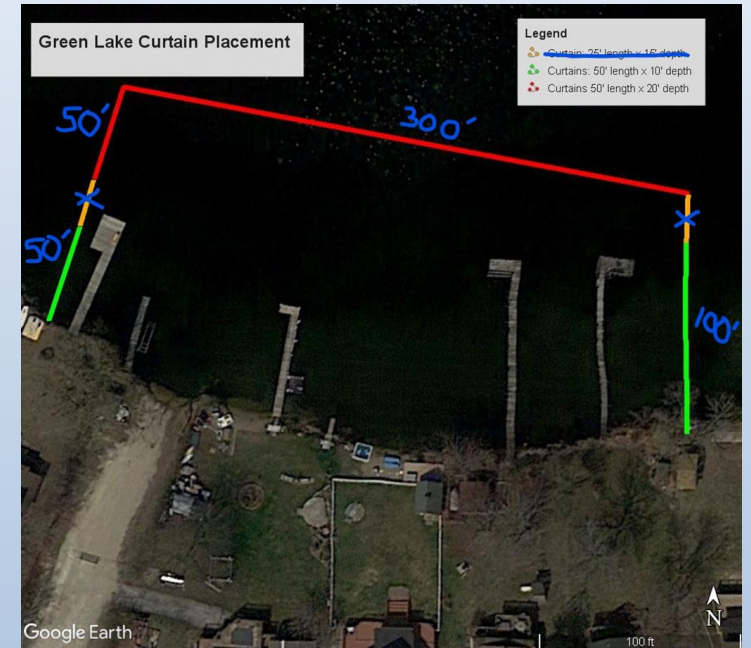
- Management Approach: Chemical Control w/ Limno-barrier
- 70 acre seepage lake
- 37 feet max depth
- 17 feet mean depth
- SSW discovered in July 2016 near public boat access
- Great Lakes Restoration Initiative (GLRI) funding obtained to help support monitoring and control efforts



Green Lake

Management Approach: Chemical Control w/ Limno-barrier

- Localized area of SSW near south public access
- Goal: Apply herbicide within a barrier to increase time plants are exposed to chemical with the hope of achieving greater control of SSW
- 1st Barrier treatment: Sept. 17, 2018 – Sept. 27, 2018
- 2nd Barrier treatment: June 17, 2019 – June 27, 2019
- Treated ~1 ac with Cutrine Ultra (0.8 ppm) & Hydrothol 191 (0.17 ppm)



Green Lake

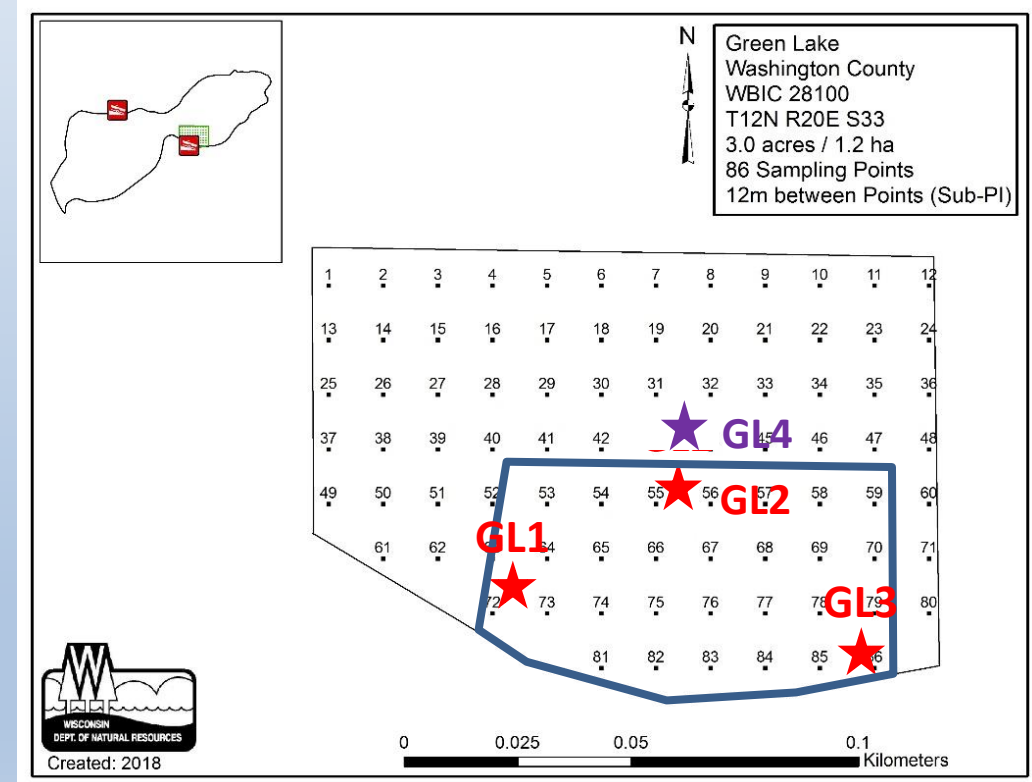
Management Approach: Chemical Control w/ Limno-barrier

Herbicide Concentration Monitoring

- 2018 Sites: GL1, GL2, GL3
- 2019 Sites: GL1, GL2, GL3, GL4
 - Water samples collected at: 1, 2, 3, 6, 9, 24, 48, 72, 96, 144, & 216 HAT
- Analyzed at WSLH for copper and endothall

Aquatic Plant Monitoring

- Pre- and Post-Treatment sub-PI plant surveys
 - June, August & October 2018
 - June, July & August 2019
 - July 2020
- Lakewide PI surveys conducted annually 2016-2021

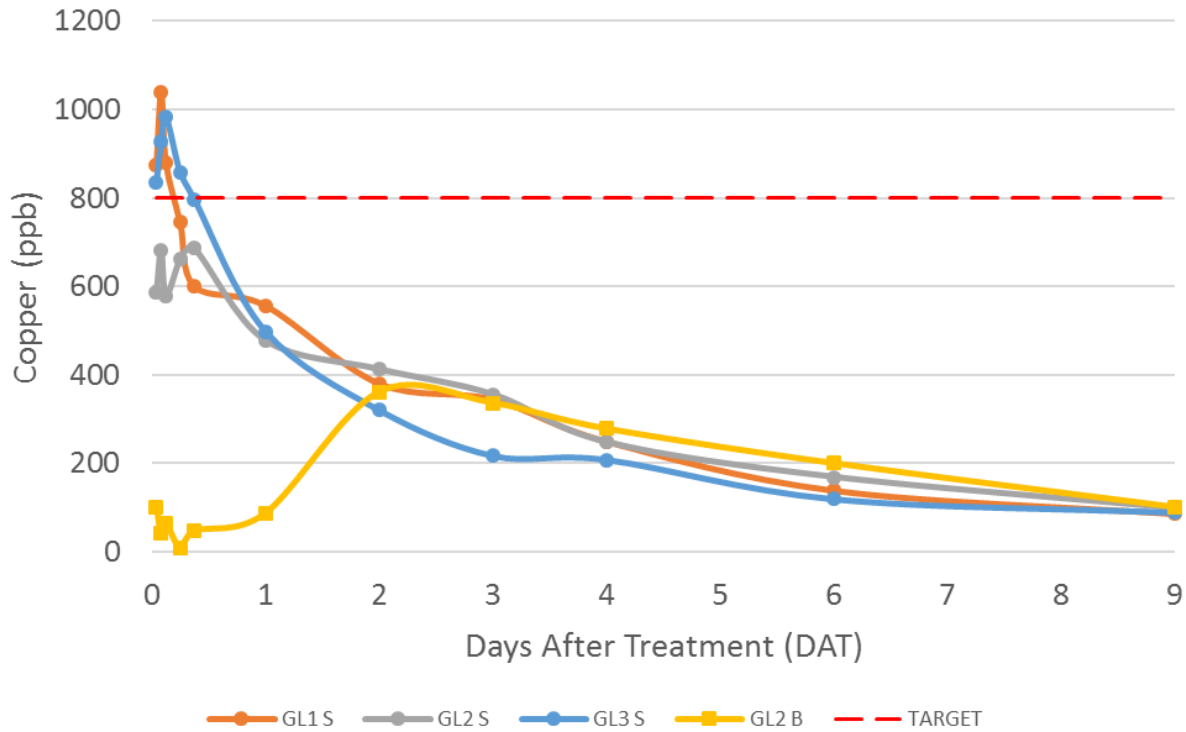


Green Lake

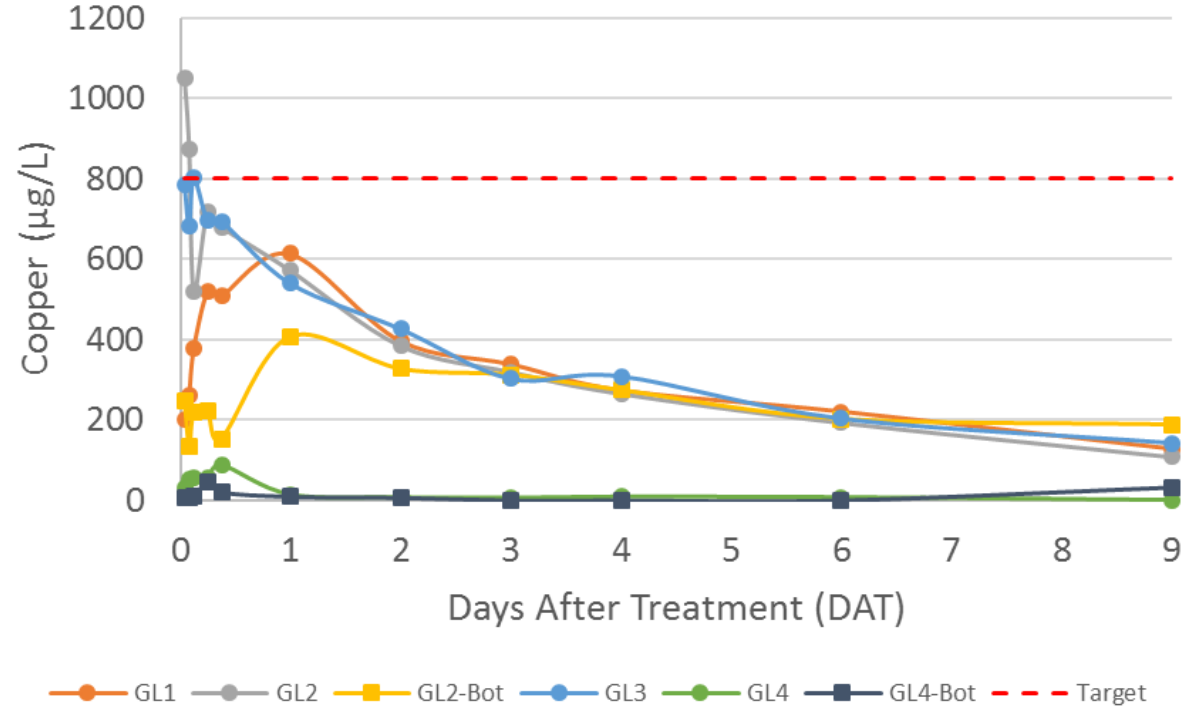
2018 Results

2019 Results

Copper

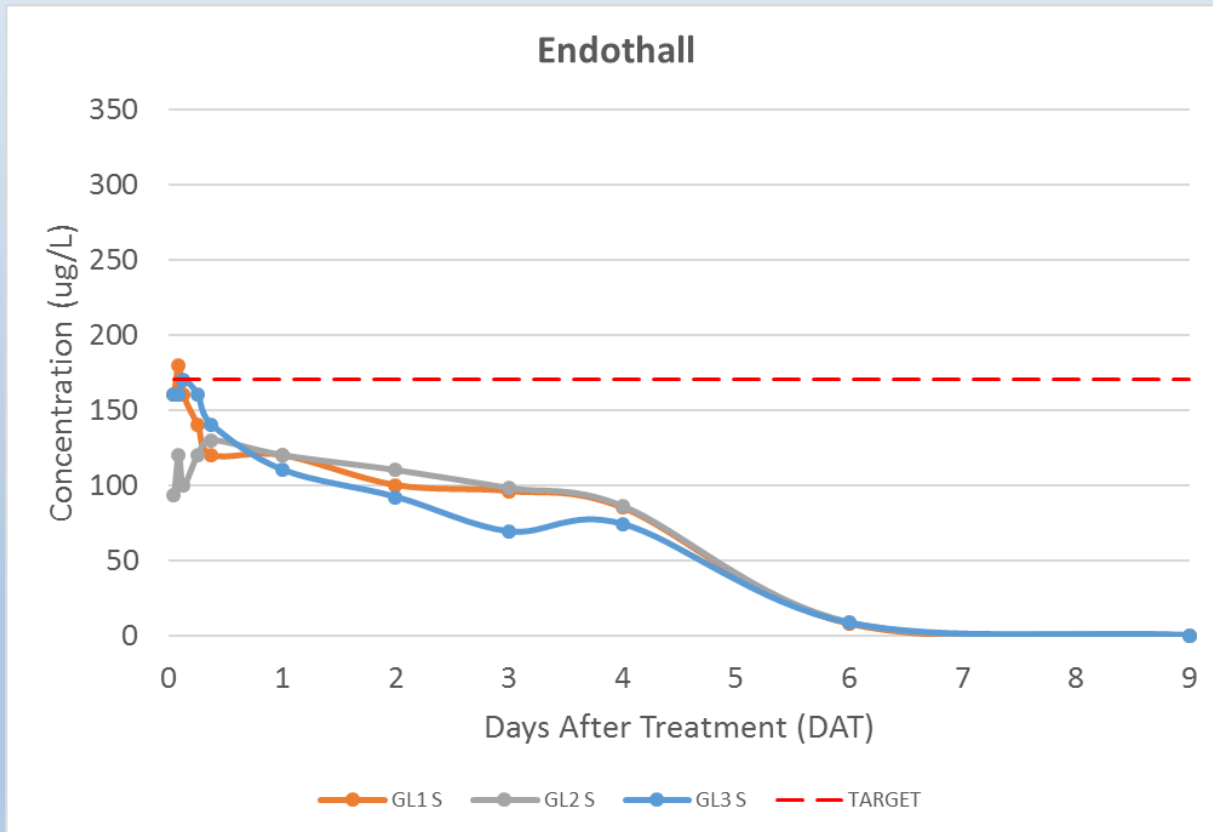


Copper

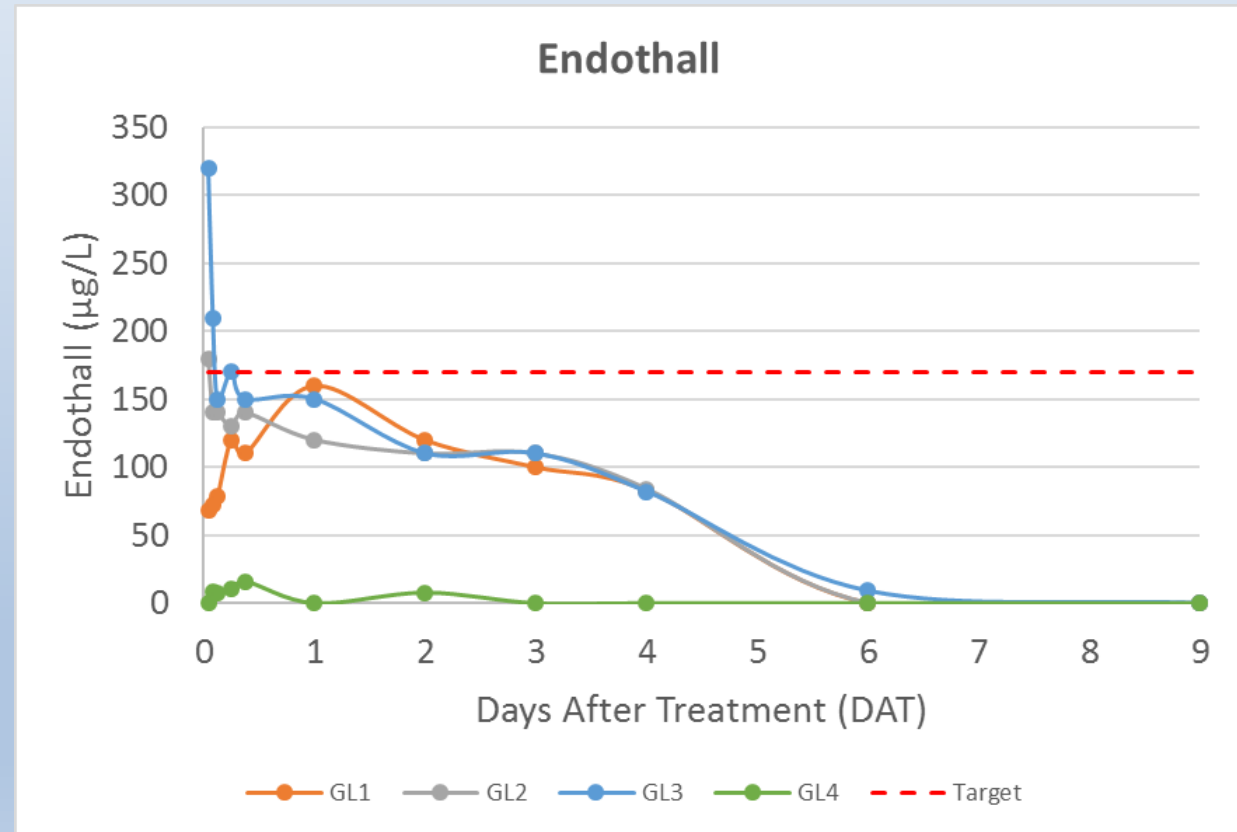


Green Lake

2018 Results



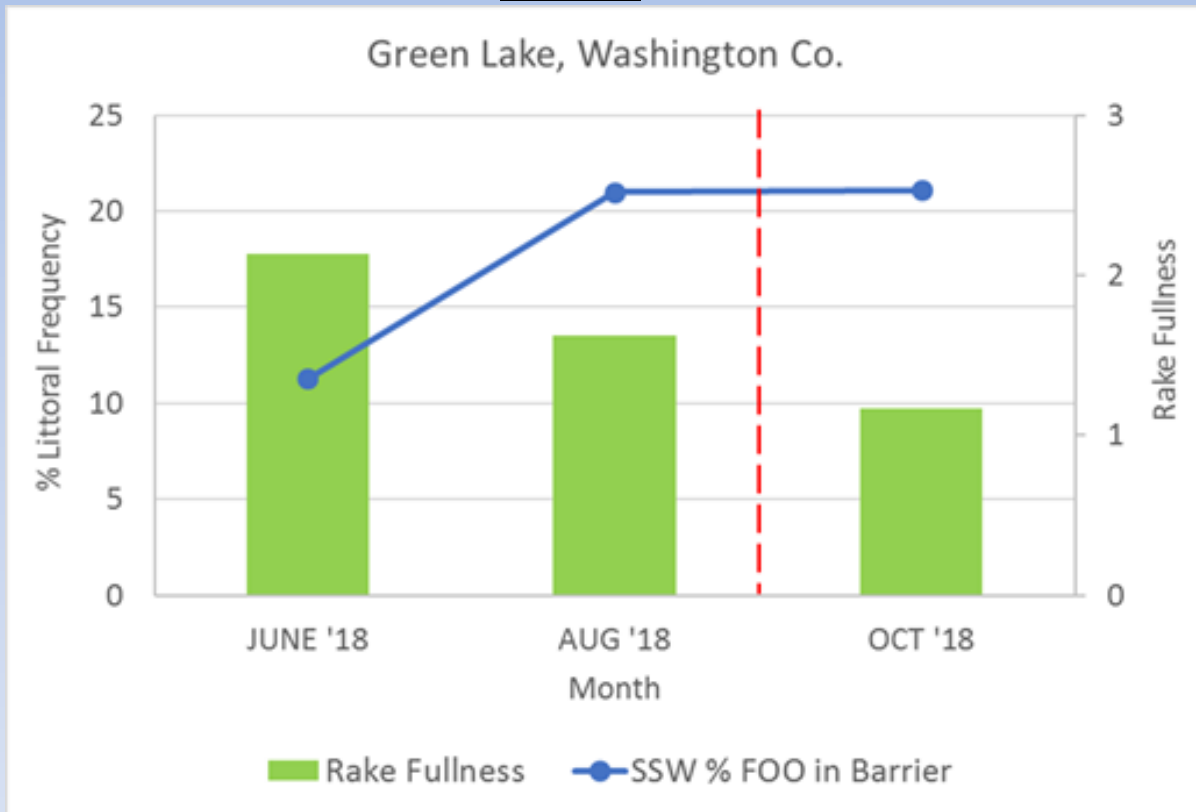
2019 Results



Green Lake

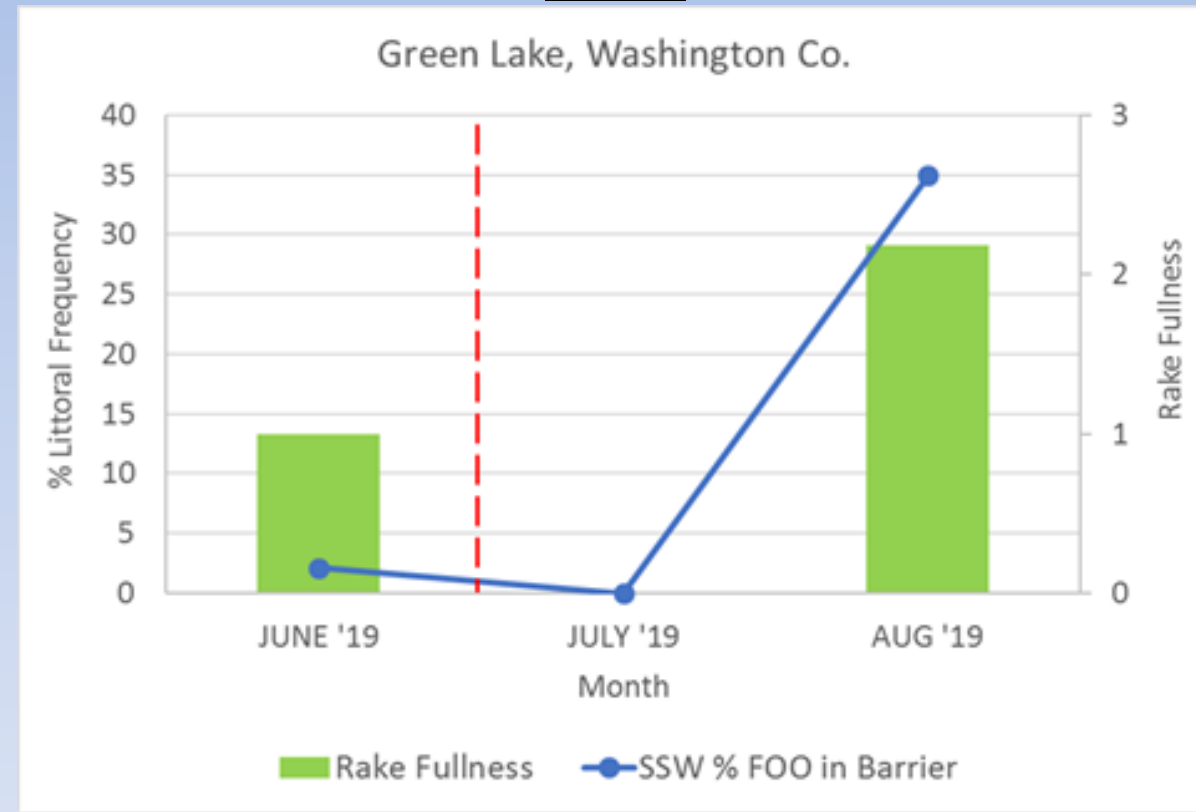
- Management Approach: Chemical Control w/ Limno-barrier

2018



SURVEYS	PRE	POST	CHANGE	P-VALUE
AUG '17 vs OCT '18	21.0	21.1	↑	0.991

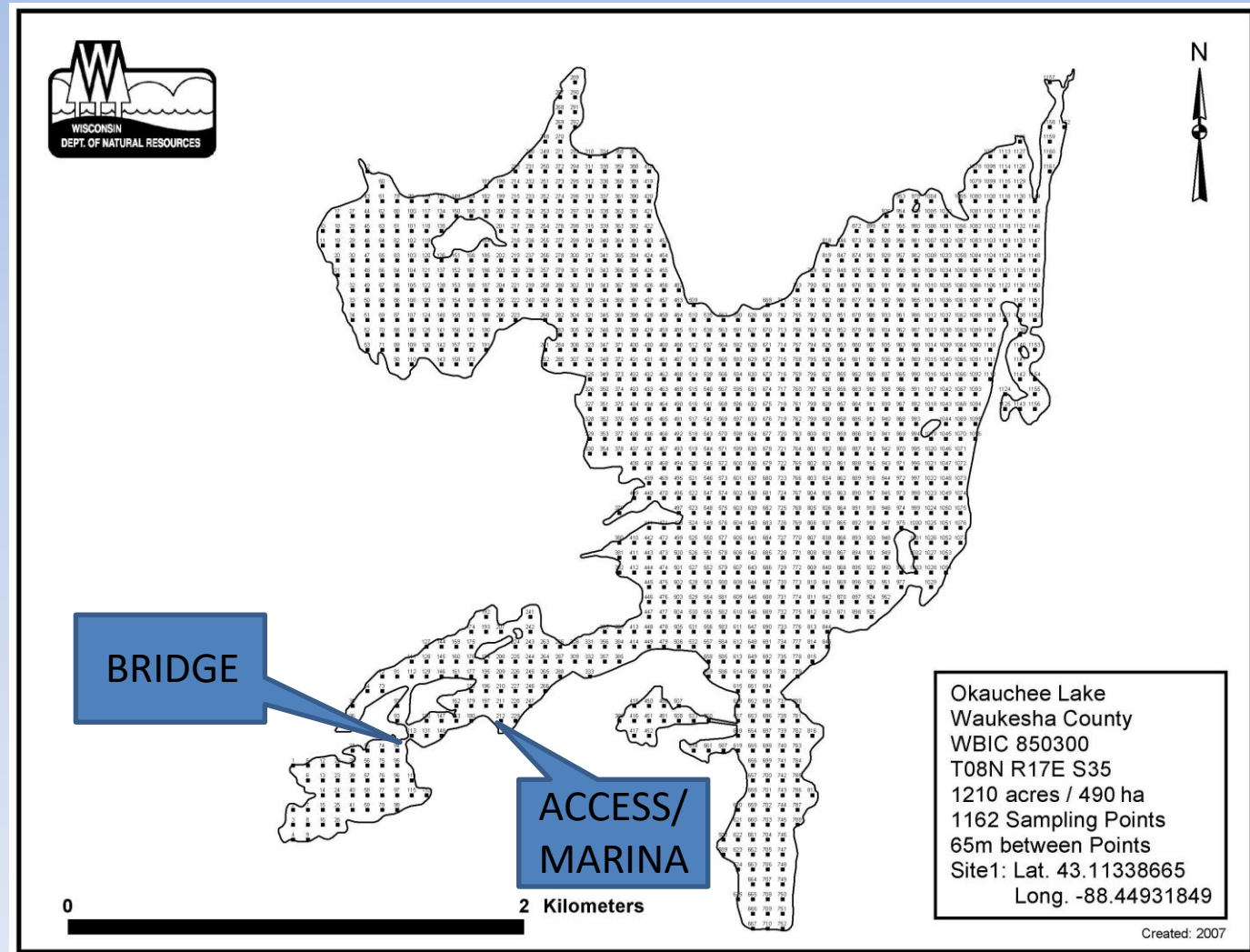
2019



SURVEYS	PRE	POST	CHANGE	P-VALUE
JUNE '19 vs JULY '19	2.1	0	↓	0.39
JULY '19 vs AUG '19	0	34.9	↑	0.00009
JUNE '19 vs AUG '19	2.1	34.9	↑	0.00003

Okauchee Lake, Waukesha Co.

- Management Approach: Chemical Control w/ Limno-barrier
- 1210 acre drainage lake
- 90 feet max depth
- SSW discovered in July 2019 near boat access/marina
- SSW also found near bridge
- WDNR Early Detection & Response Grant funding obtained to help support monitoring and control efforts



Okauchee Lake

Management Approach: Chemical Control w/ Limno-barrier

- Localized area of SSW near boat access & marina
- Goal: Apply herbicide within a barrier to increase time plants are exposed to chemical with the hope of achieving greater control of SSW
- Barrier treatment: July 14, 2020
- Chemically treated ~0.4 ac with Nautique (1.0 ppm) & Hydrothol 191 (0.3 ppm)



Okauchee Lake

Management Approach: Chemical Control w/ Limno-barrier

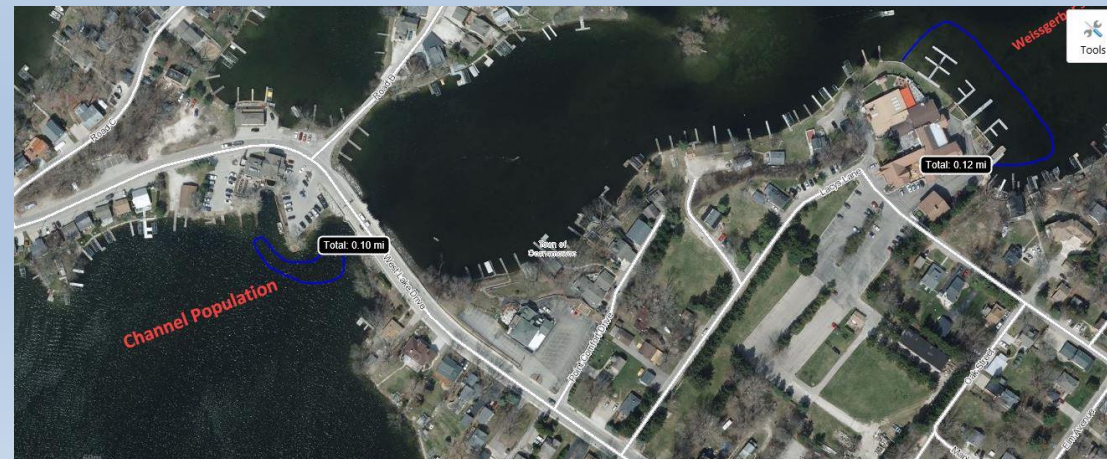
Herbicide Concentration Monitoring

- Sites: OK4, OK5, OK6, & OK7
 - Water samples collected at: 1, 2, 3, 6, 9, 24, 48, 72, 96, & 144 HAT
- Analyzed at WSLH for copper and endothall



Aquatic Plant Monitoring

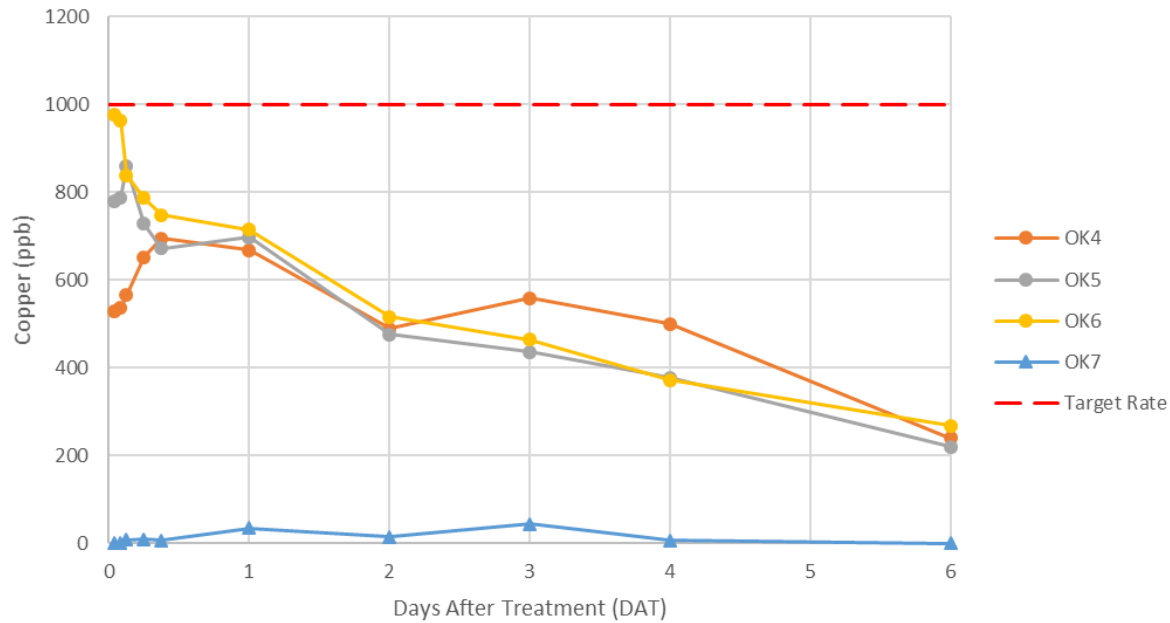
- Pre- and Post-Treatment sub-PI plant surveys
 - Late June, Aug, & Sept 2020
 - Conducted at Golden Mast (treated) & Bridge (untreated reference).



Okauchee Lake

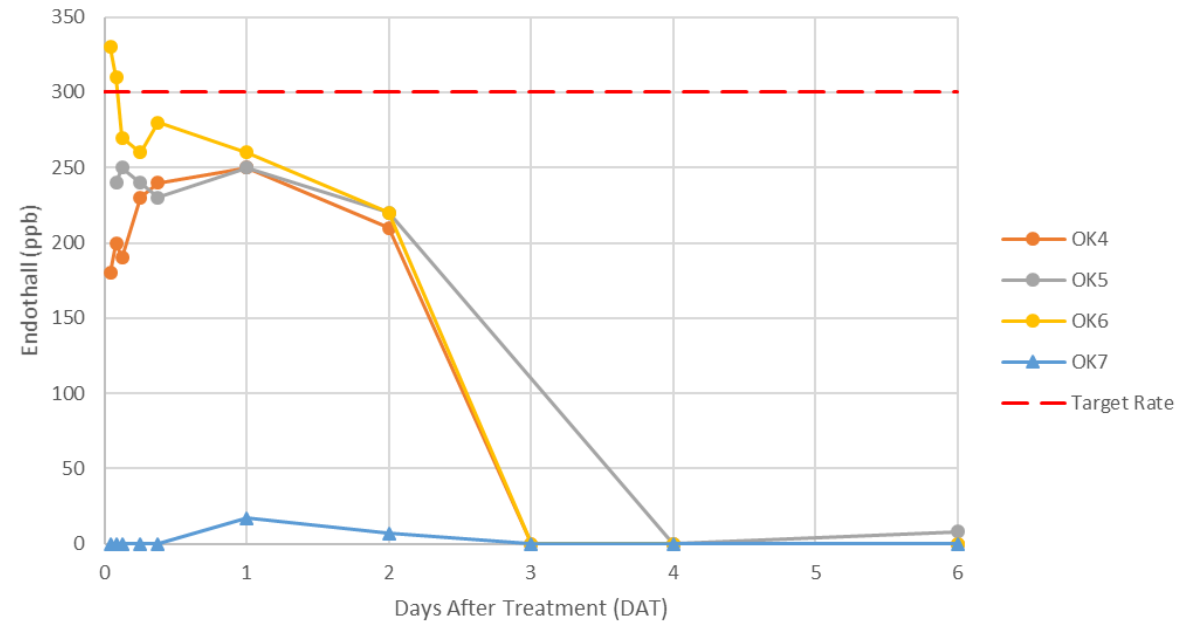
Copper

Okauchee Lake, Golden Mast
Copper



Endothall

Okauchee Lake, Golden Mast
Endothall



Okauchee Lake

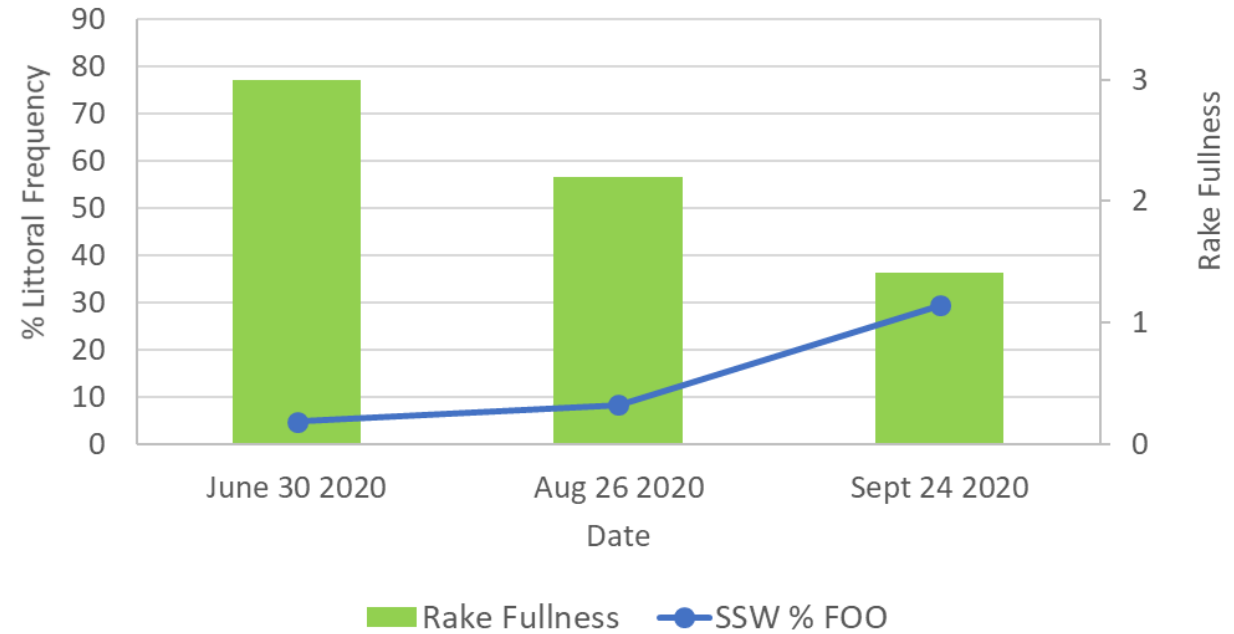
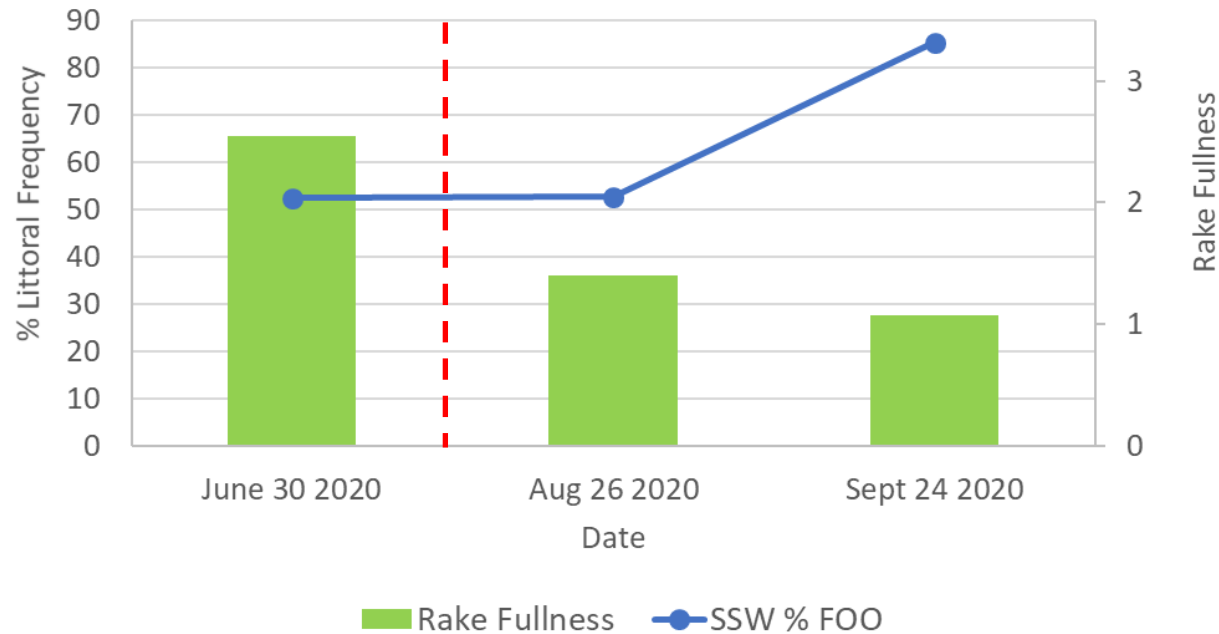
- Management Approach: Chemical Control w/ Limno-barrier

Golden Mast (treated)

Bridge (untreated)

Okauchee Lake, Waukesha Co.
Golden Mast (Treated)

Okauchee Lake, Waukesha Co.
Bridge (Untreated)



Preliminary Conclusions

- Quantitative data on SSW populations in Wisconsin has shown a wide range of invasion trajectories over time, and mixed effects on native plant communities. Data will continue to be collected and evaluated to increase our understanding of potential impacts of this non-native species.
- Evaluation of pre- and post-treatment data from several lakes utilizing chemical control methods (primarily copper/hydrothol) has not resulted in control or eradication of starry stonewort.
- The Department will continue to monitor and collect data on other potential management techniques (i.e., hand pulling, DASH, dredging, etc.).
- The Department is working with other regional and national partners (US ACOE, University of Minnesota, University of Indiana, Great Lakes SSW Collaborative, etc.) to evaluate management techniques for the control of starry stonewort.

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Michaela Kromrey

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Kyle Mosel

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...& many others!!

Questions?



Michelle.Nault@Wisconsin.gov

Amy.Kretlow@Wisconsin.gov

Heidi.Bunk@Wisconsin.gov