An Update on Recent Research into the Natural History, Biology, and Management of Starry Stonewort *Nitellopsis obtusa*

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Senior Scientist, Progressive AE

Starry Stonewort Distribution in Michigan

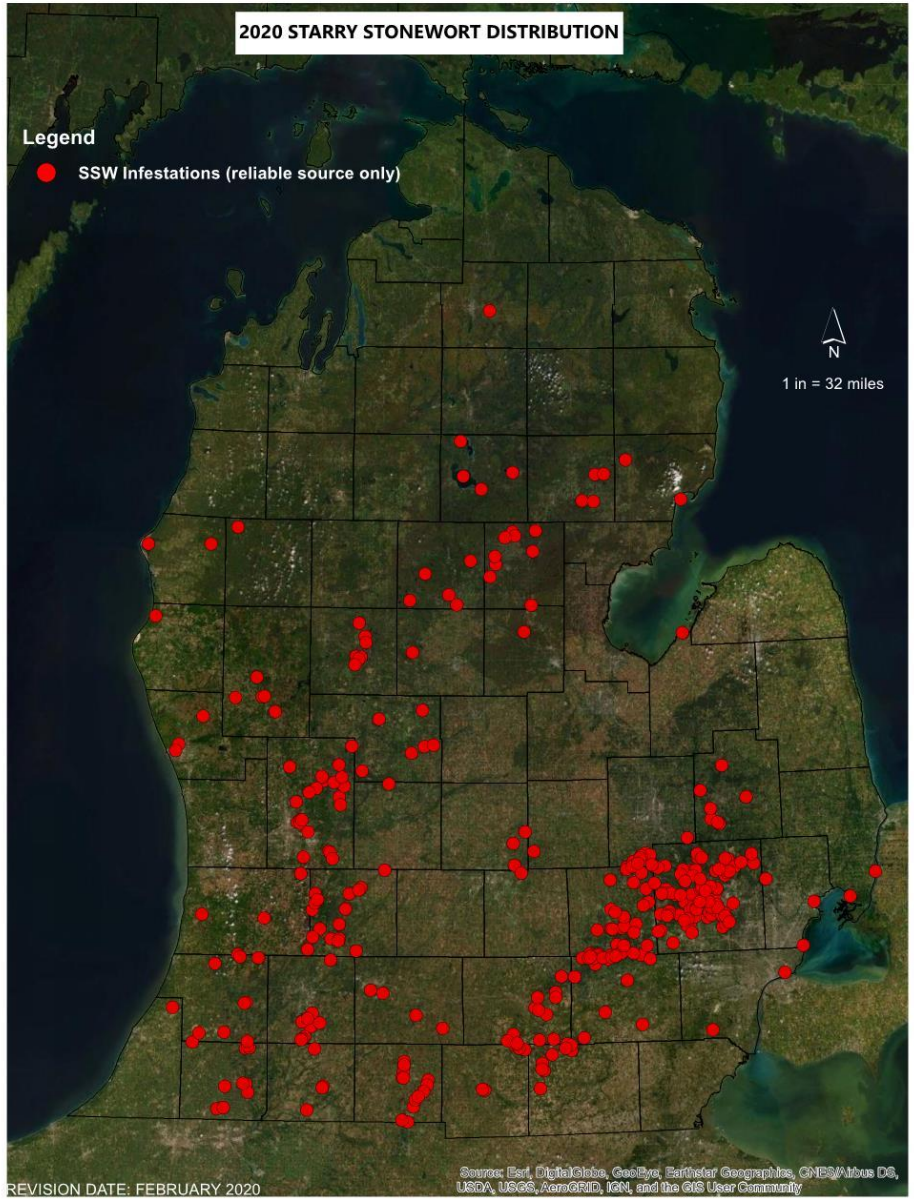
- As of Fall of 2019 – documented in 38 of the 83 counties in MI
- Original point of origin was likely St.

Lawrence Seaway (ballast introduction)

- Expanded rapidly after gaining

dominance on many

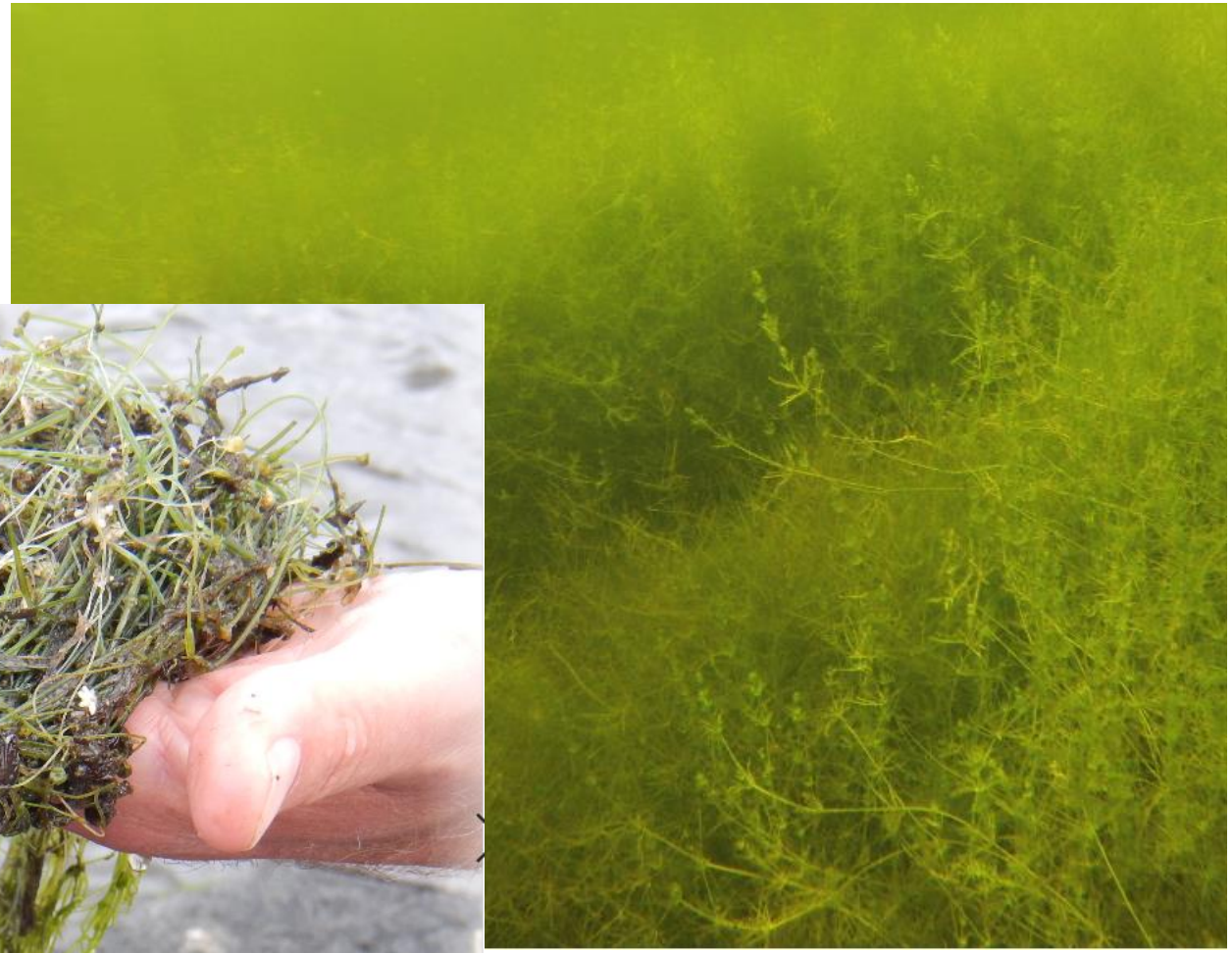
lakes in SE Michigan



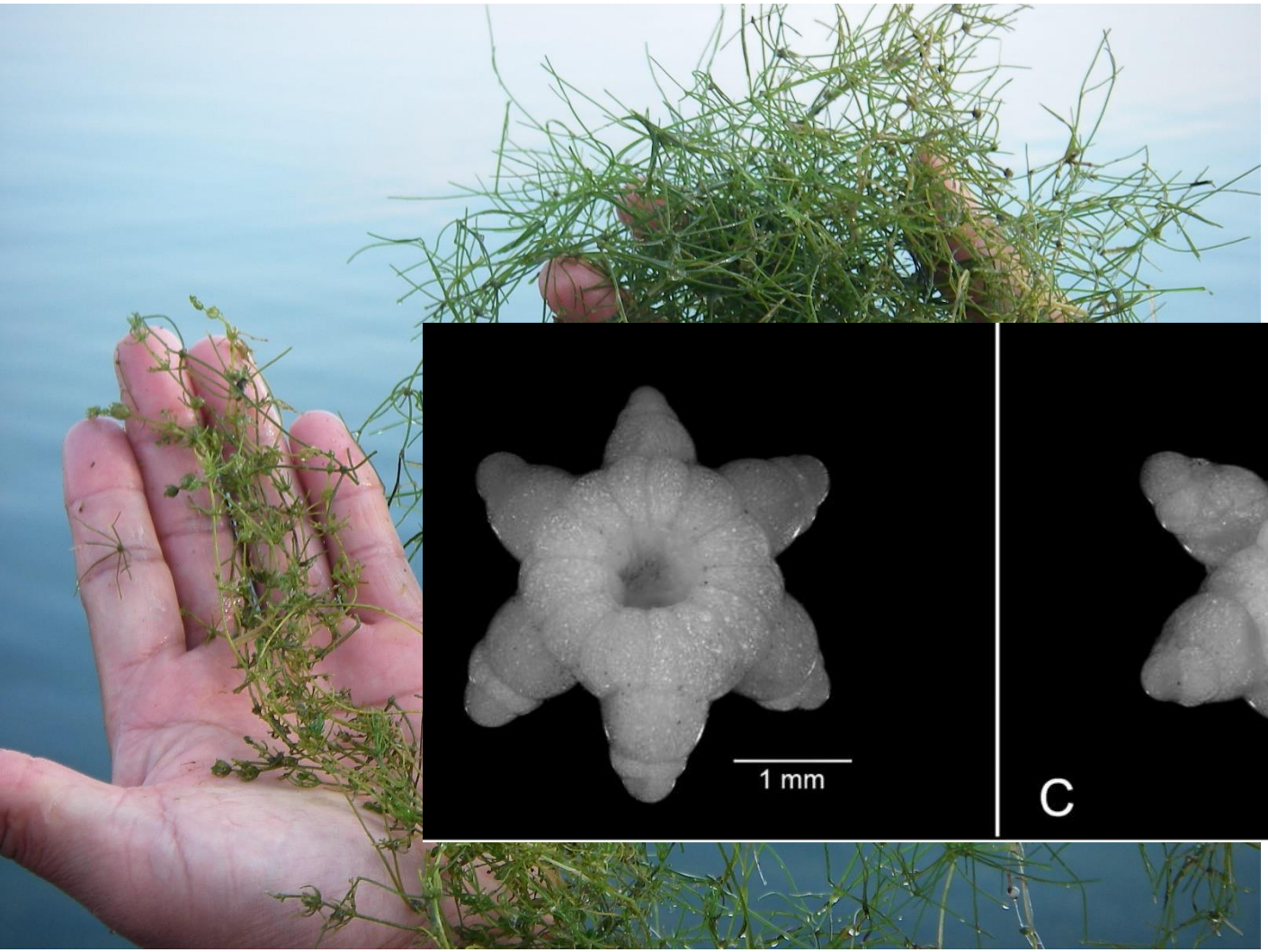
Graphic updated from Steve Hanson, PLM Lake & Land Management Corp. – data sources include EGLE, MICorps, MISIN, and personal observation

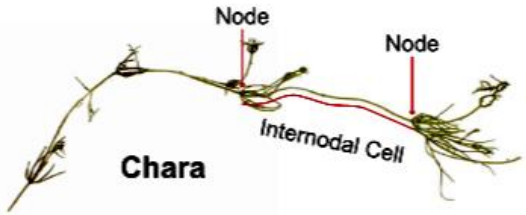
Cryptic growth patterns may hinder ID & early detection

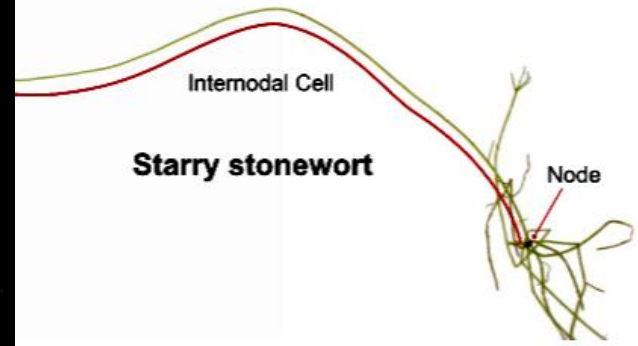
- Often SSW grows in and amongst dense *Chara* beds making ID more difficult
- Early season growth is characterized by prevalence of rhizoids and bulbils, limited green biomass



Starry Stonewort vs. *Chara* sp. Morphology







Bulbil photos from Sleith et al. 2015

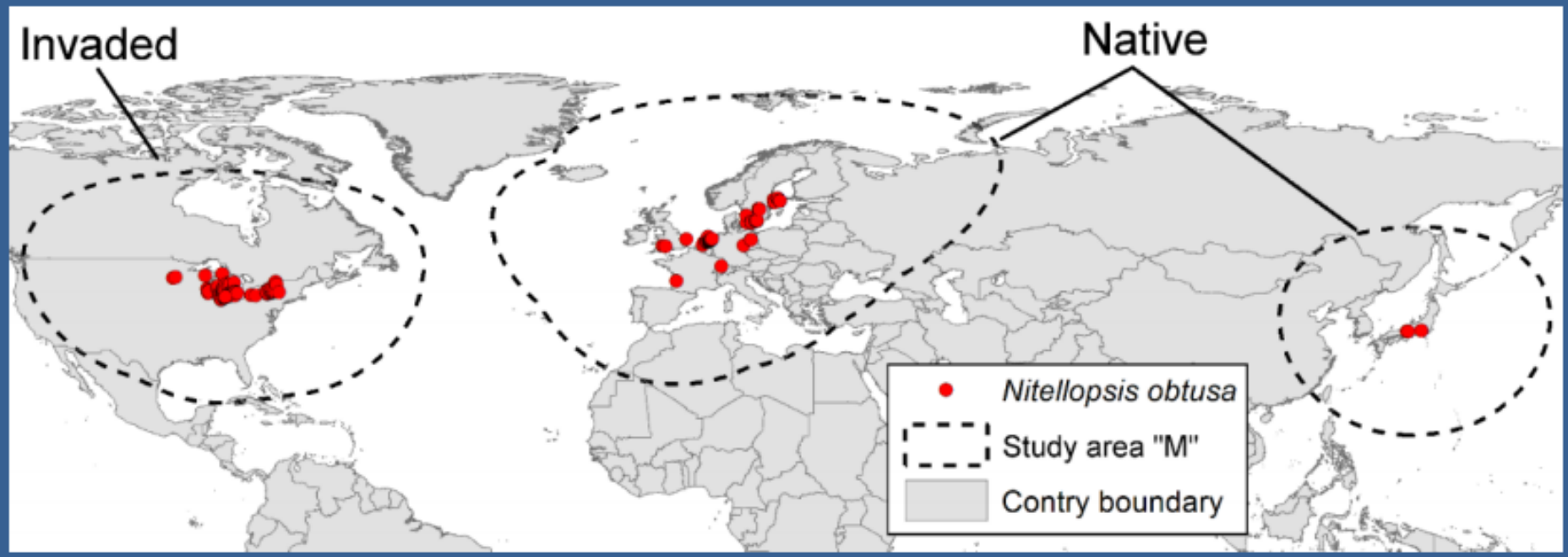
Dan Larkin – University of Minnesota/2016-2019

- Ecological niche modeling based upon known biological/reproductive and chemical and physical requirements for both native and invasive populations
- Spatial predictions (potential for range expansion) based upon available suitable habitat and effects of current/predicted climate
- Dessication study indicated that SSW may be less tolerant of drying than many other AIS – clean/drain/dry protocols may be effective on reducing spread to other water bodies

Risk assessment

- Ecological niche modeling

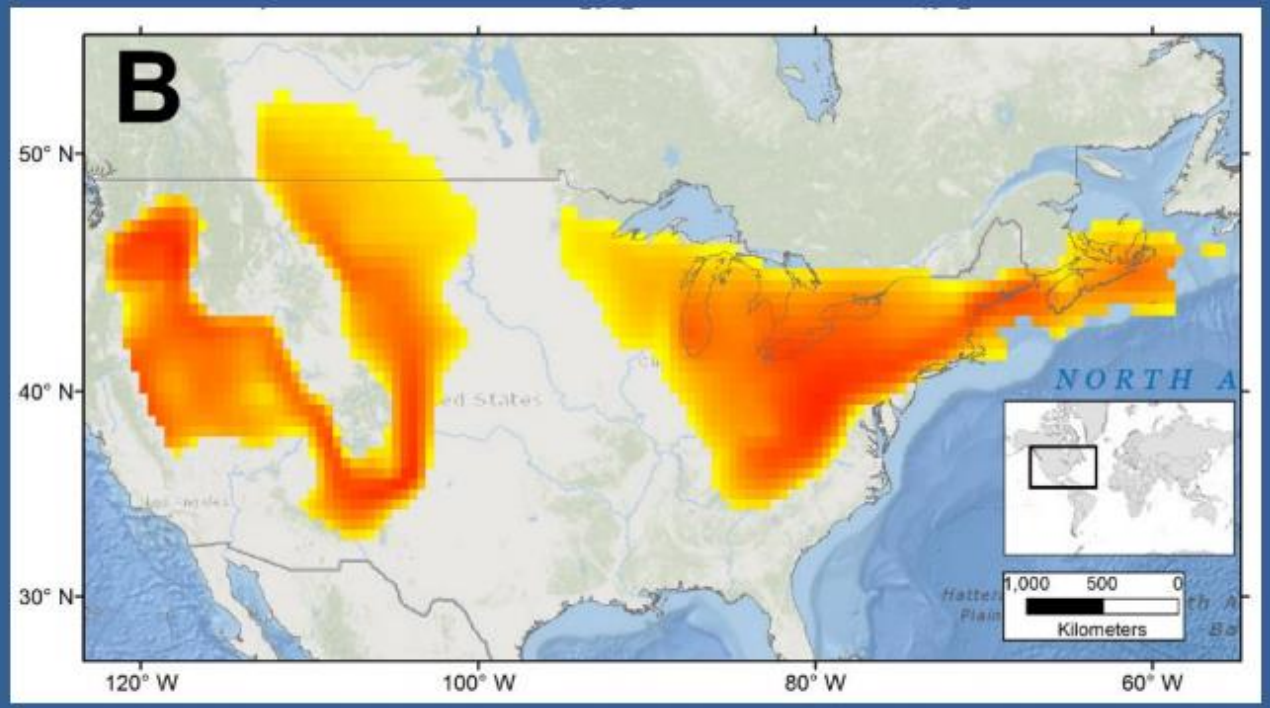
Spatial analysis of potential range



Escobar et al. 2016

Risk assessment

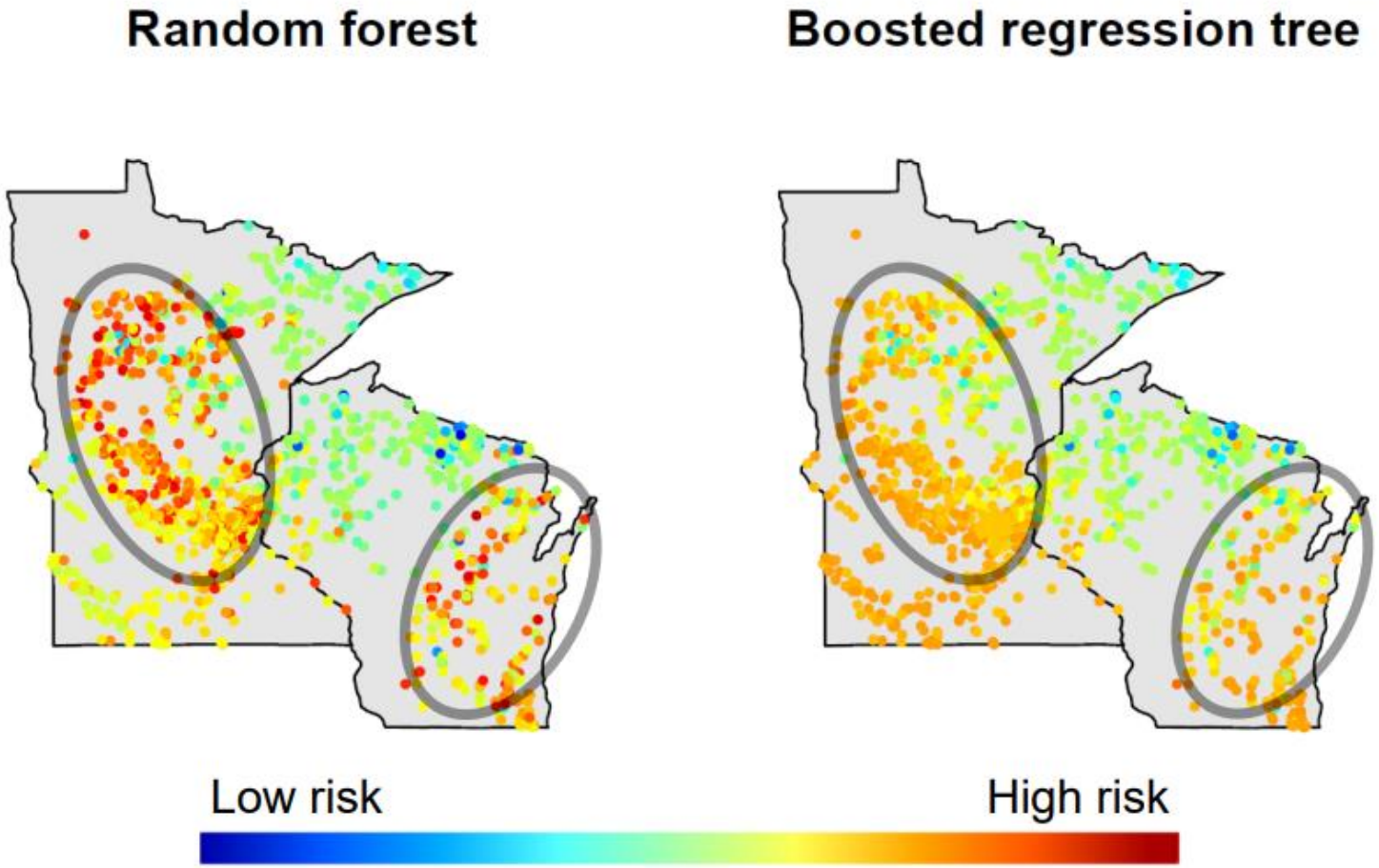
- Predictions of suitable habitat

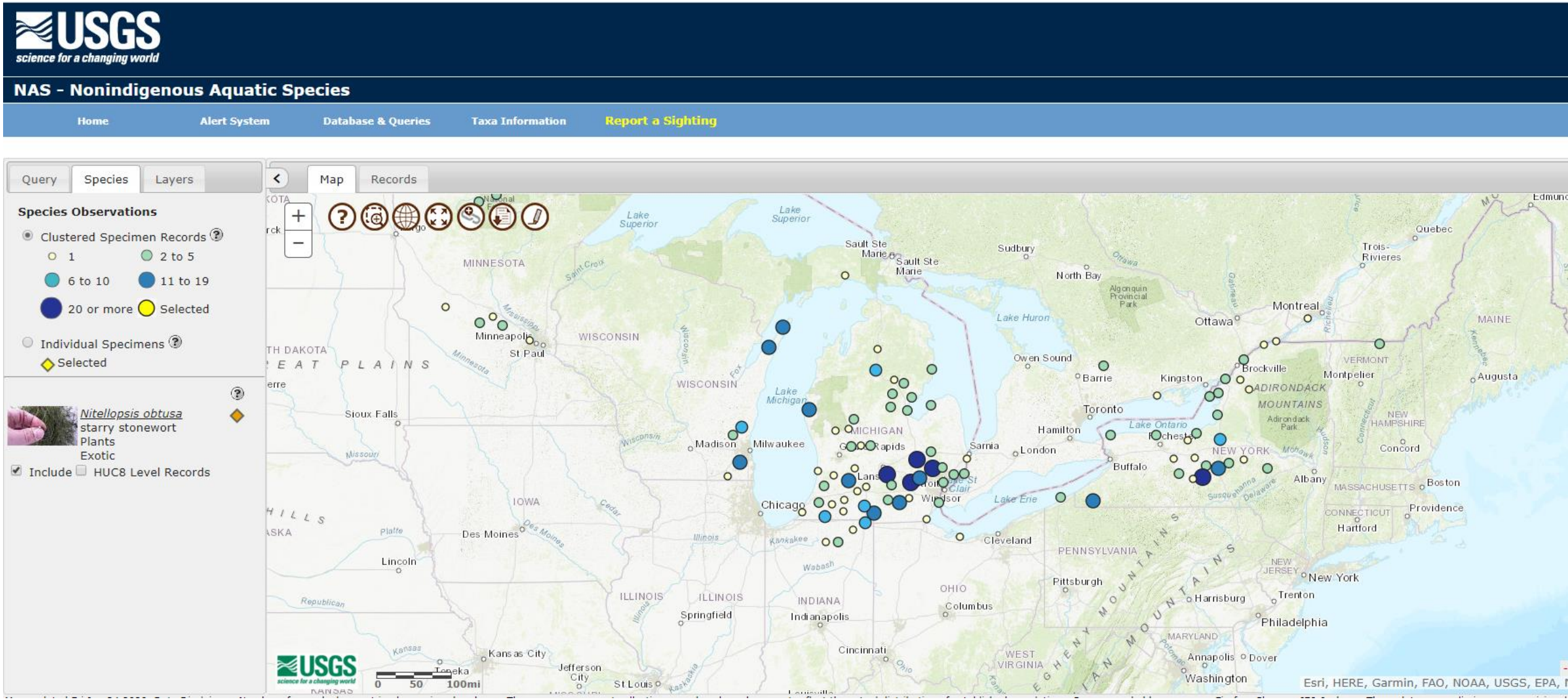


Escobar et al. 2016

Larkin, et al. 2018

Regional risk map




USGS
science for a changing world
NAS - Nonindigenous Aquatic Species
Home
Alert System
Database & Queries
Taxa Information
Report a Sighting
Query
Species
Layers
Species Observations
Clustered Specimen Records
1
2 to 5
6 to 10
11 to 19
20 or more
Selected
Individual Specimens
Selected
Nitellopsis obtusa
starry stonewort
Plants
Exotic
Include
HUC8 Level Records
Map
Records
Lake Superior
Lake Michigan
Lake Huron
Lake Erie
Lake Ontario
MINNESOTA
WISCONSIN
MICHIGAN
IOWA
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
NEW YORK
VERMONT
MAINE
NEW HAMPSHIRE
MASSACHUSETTS
CONNECTICUT
MARYLAND
WEST VIRGINIA
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Harrisburg
Trenton
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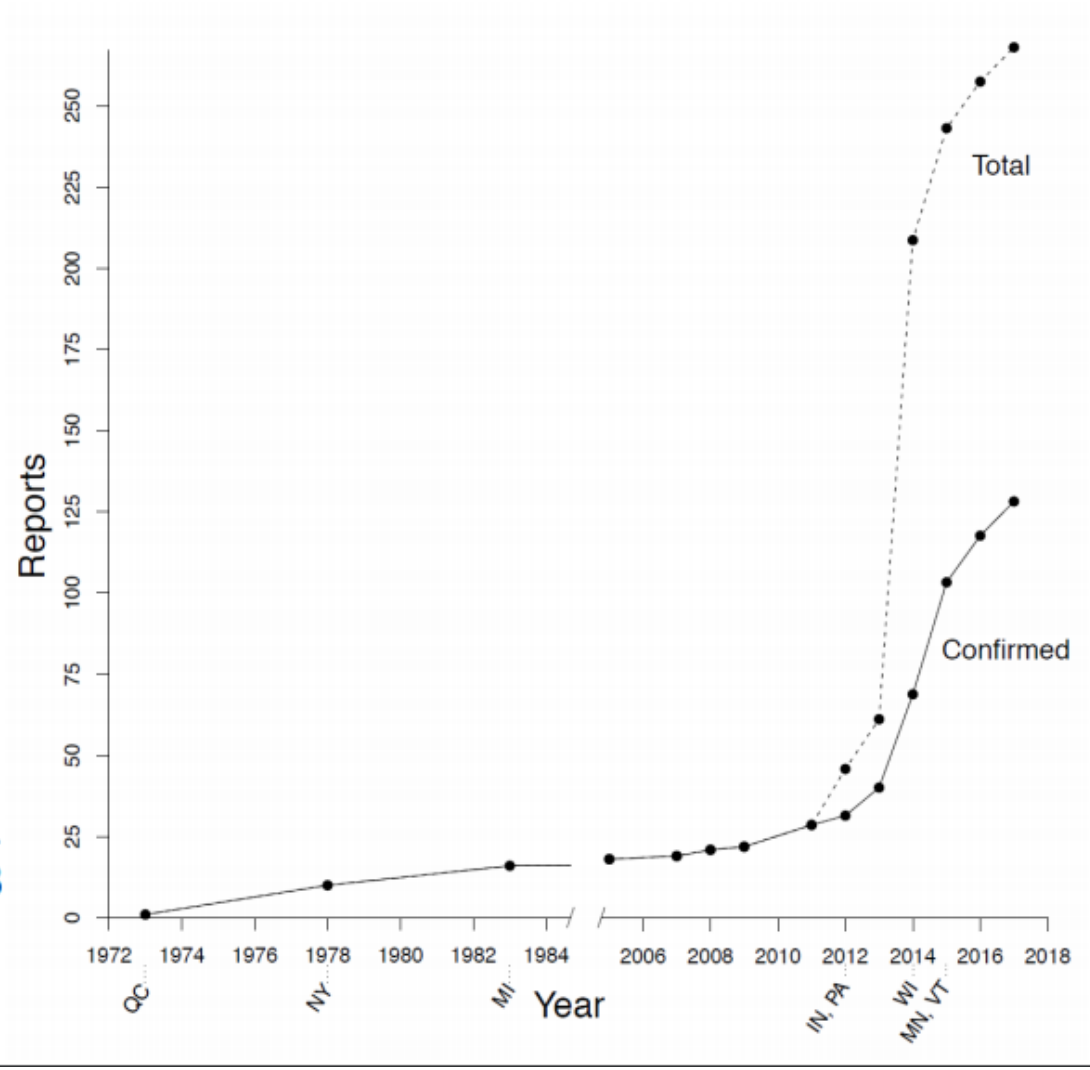
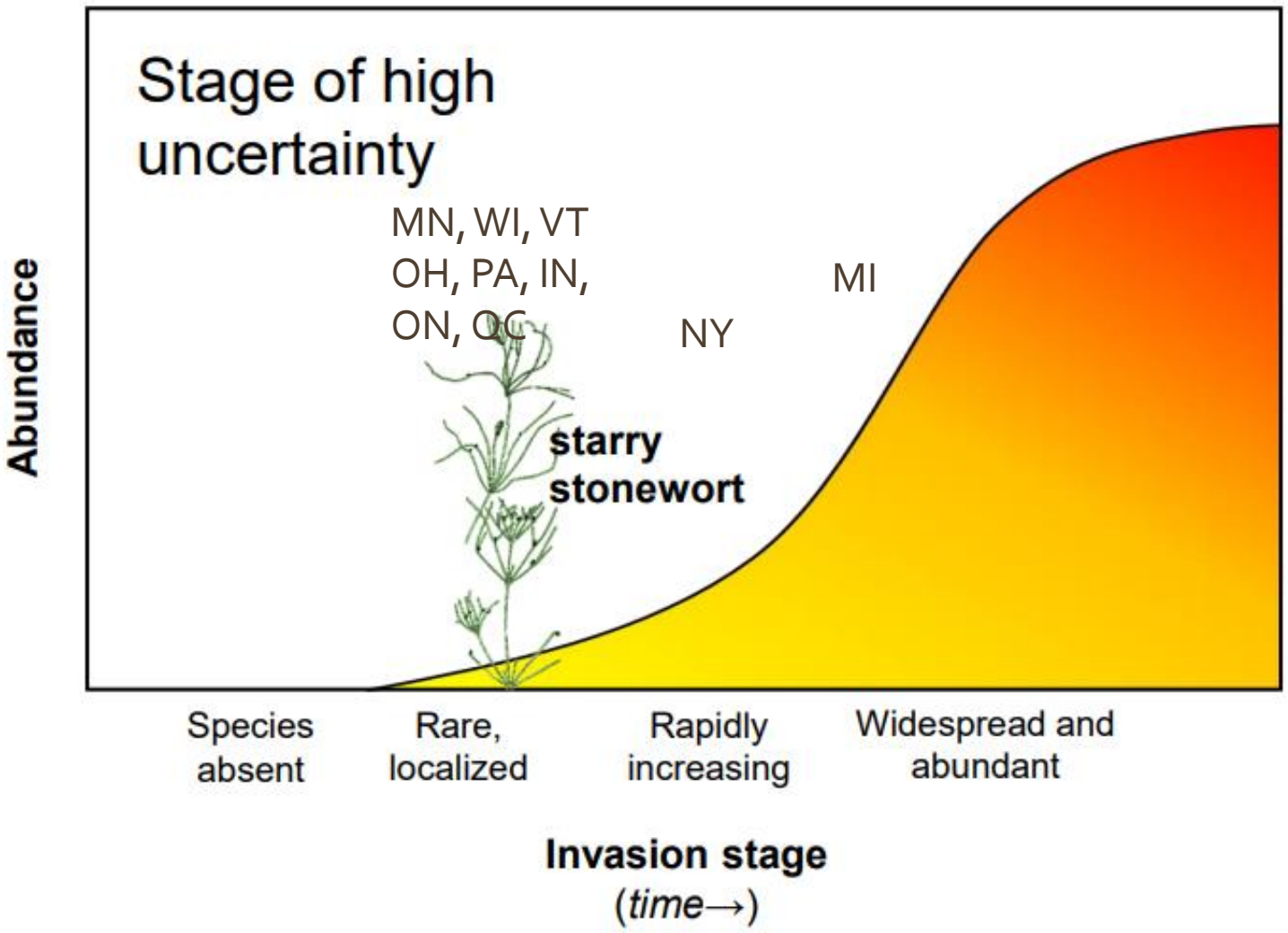
Dover
Washington
Sudbury
North Bay
Owen Sound
Barrie
Kingston
Brockville
Montpelier
Rochester
Hamilton
London
Sarnia
Windsor
Detroit
Lansing
Grand Rapids
Sault Ste Marie
Trois-Rivieres
Algonquin Provincial Park
Adirondack Park
ADIRONDACK MOUNTAINS
APPALACHIAN MOUNTAINS
GREAT PLAINS
0 50 100mi
Esri, HERE, Garmin, FAO, NOAA, USGS, EPA,

Invasion History



Larkin et al. 2018

Invasion Process



Base graphic from Larkin, et al. 2018

Dr. John Rodgers & Tyler Geer (PhD student)

- Risk Assessment – identifying data gaps
- Management Evaluations – currently infested water bodies
- Decontamination & Spread Mitigation – efforts to effectively prevent off-site and on-site movement – currently screening different methods
- Research sites include:
- Lake Sylvia, MN (small infestation of SSW – chelated copper);
- Lake Koronis, MN, Lake Tippecanoe, IN, and Lobdell Lake, MI (large infestations of SSW - chemical);
- Huron Chain of Lakes, MI & Keuka Lake, NY (mechanical harvesting of SSW)
- **Developing regional management strategies are critical to curb SSW expansion**

Starry Stonewort Collaborative – Finger Lakes Institute

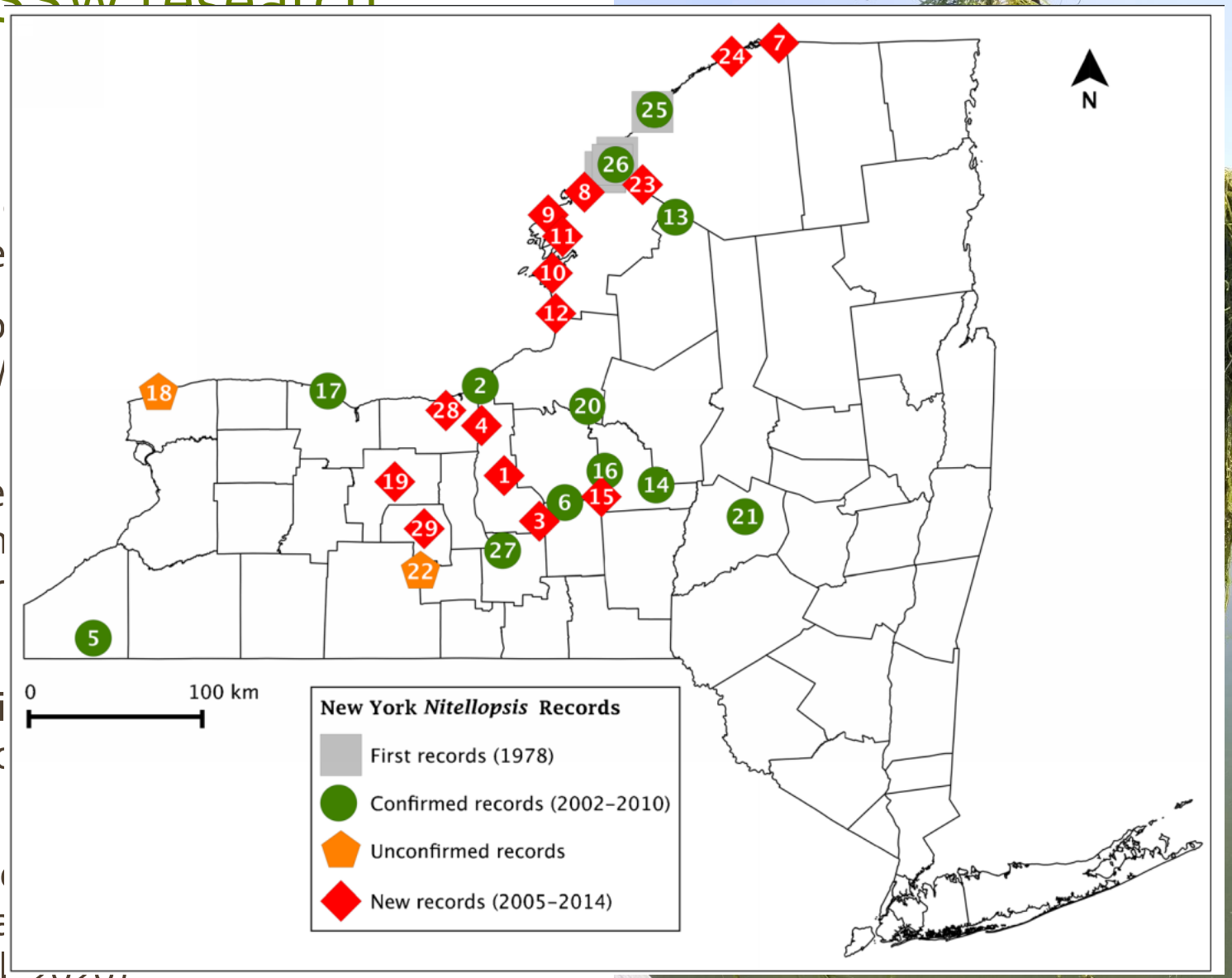
FINGER LAKES INSTITUTE
HOBART AND WILLIAM SMITH COLLEGES

Great Lakes RESTORATION

Starry Stonewort COLLABORATIVE

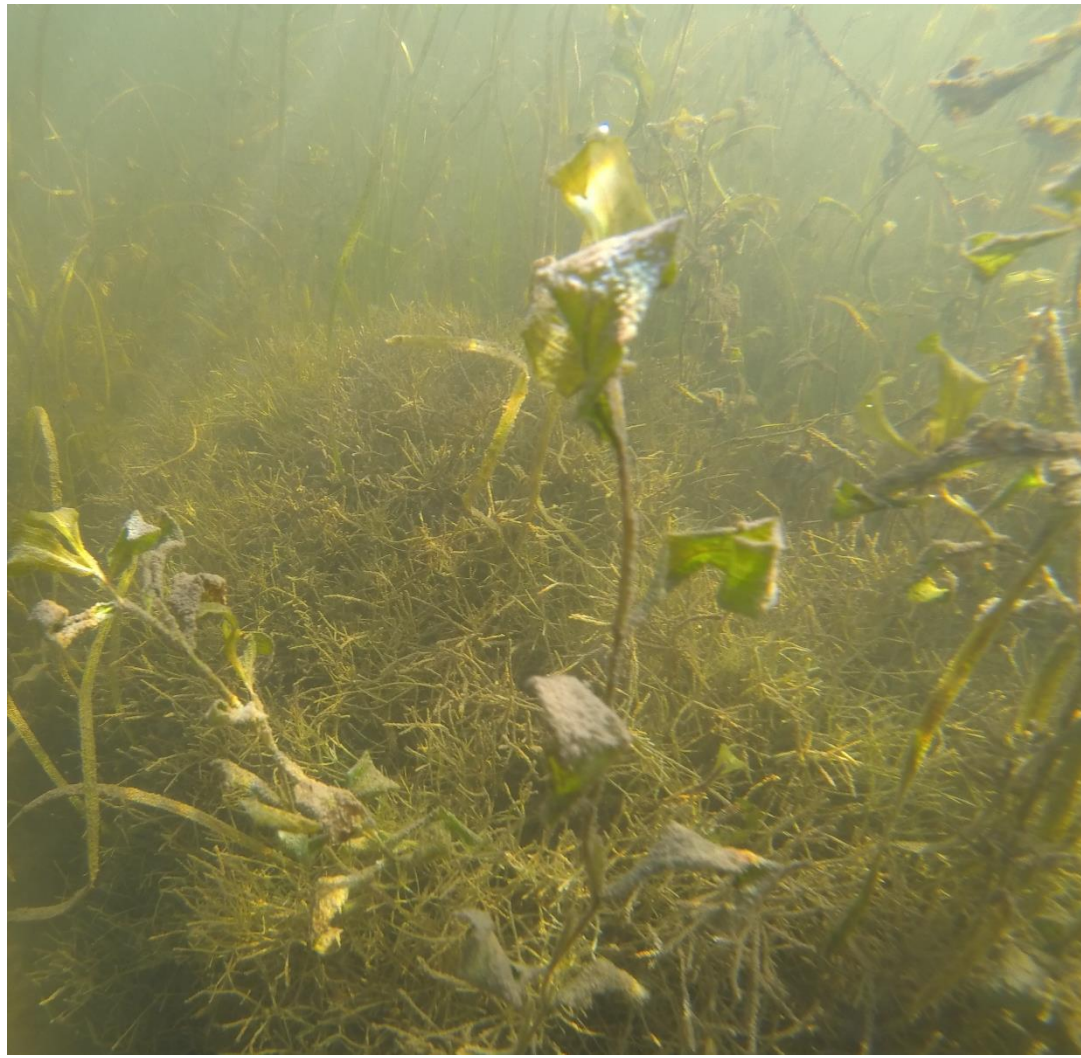
Other recent SSW research findings:

- SSW can use sediment res
  without true roots (Christe
- Human (accidental) transp
  secondary dispersal of SSV
  Larkin, et al. 2017)
- SSW is negatively impacte
  drawdown may be a poten
  (Boissezon, et al. 2017, Lar
  Karol. 2020)
- SSW is widely distributed i
  upon a systematic survey c
  (Sleith, et al. 2015)
- SSW bulbils are susceptibl
  protocols including dessica
  bleach (Gottschalk & Karol. 2020)



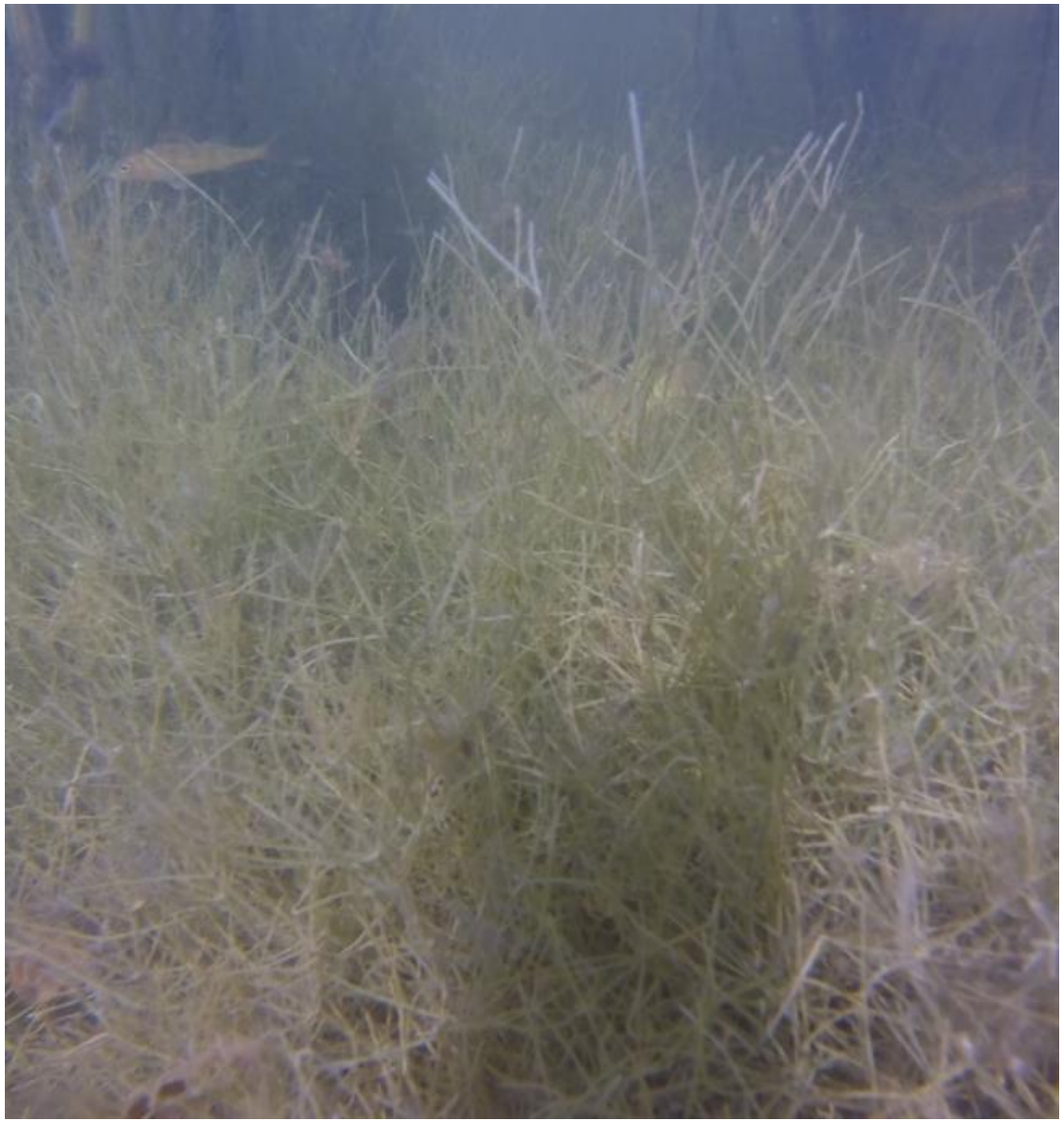
Findings, continued…

- Significantly lower species richness documented when SSW is abundant – documented displacement of native macrophytes in MN (Brainard & Schulz. 2017)
- Higher conductivity, hardness, calcium, and lower wave energy favor distribution of SSW (Midwood et al. 2016, Larkin, et al. 2017, Sleith et al. 2018)
- Bulbil production increases dramatically late in the season (Brainard & Schulz. 2017, Larkin, et al. 2017, Glisson et al. 2018)
- Water chemistry appears to be a better predictor than climate for modeling potential distribution of SSW (Sleith et al. 2018)
- Climate change (snowier winters) could secondarily impact water chemistry which may favor expansion of SSW in New England (Sleith et al. 2018)

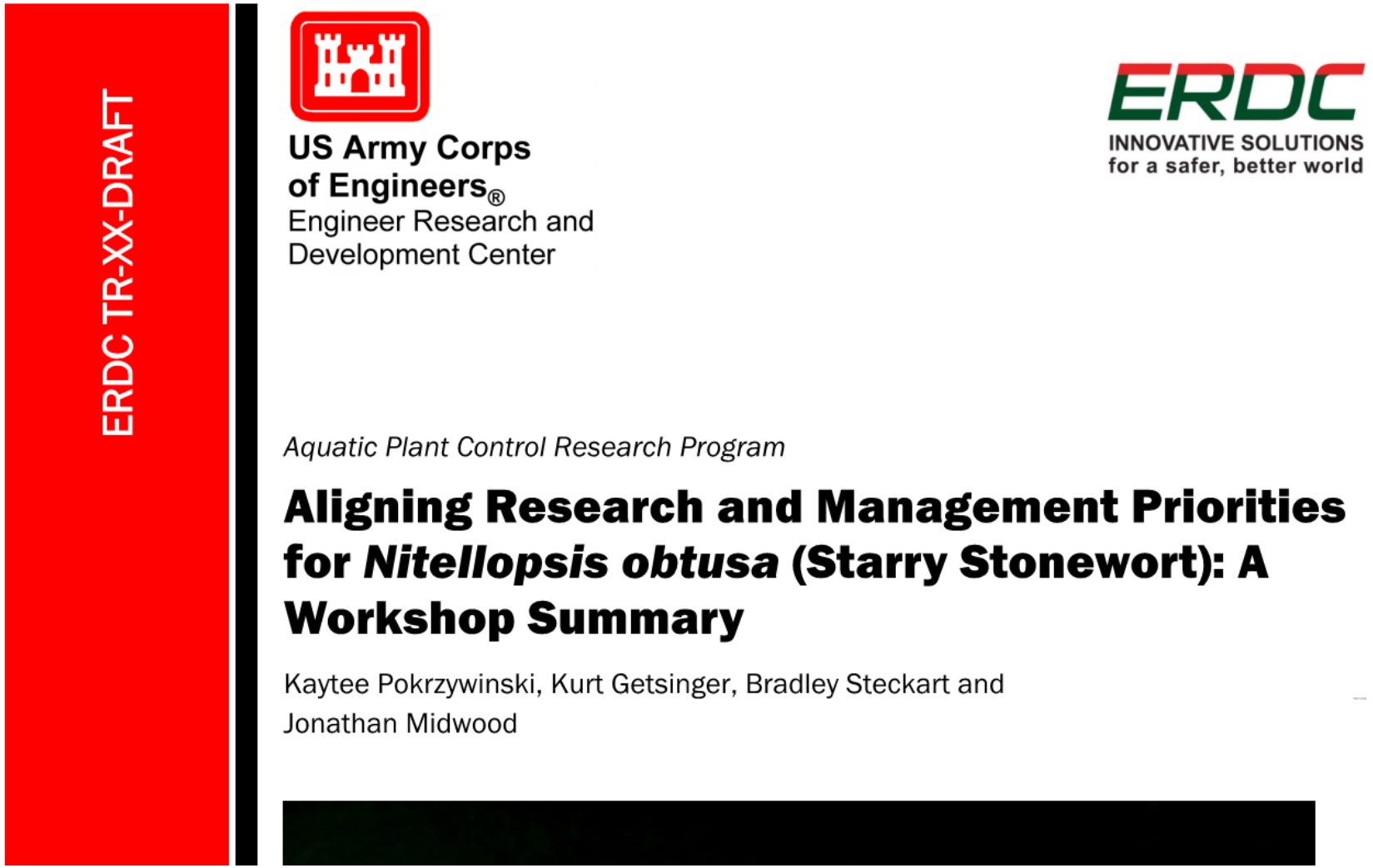


Still more findings…

- Likely first occurrence of SSW in North America has been changed from 1978 to 1974, or earlier, based on a newly discovered voucher sample (Karol & Sleith. 2018)
- A combination of algaecide treatments and mechanical harvesting outperformed algaecide treatments alone in biomass removal and reducing production of bulbils (Glisson, et al. 2018)
- Michigan occupies the "niche centroid" region for the SSW model – this area is hypothesized as having the greatest suitability for SSW (Escobar, et al. 2016)



Now available…

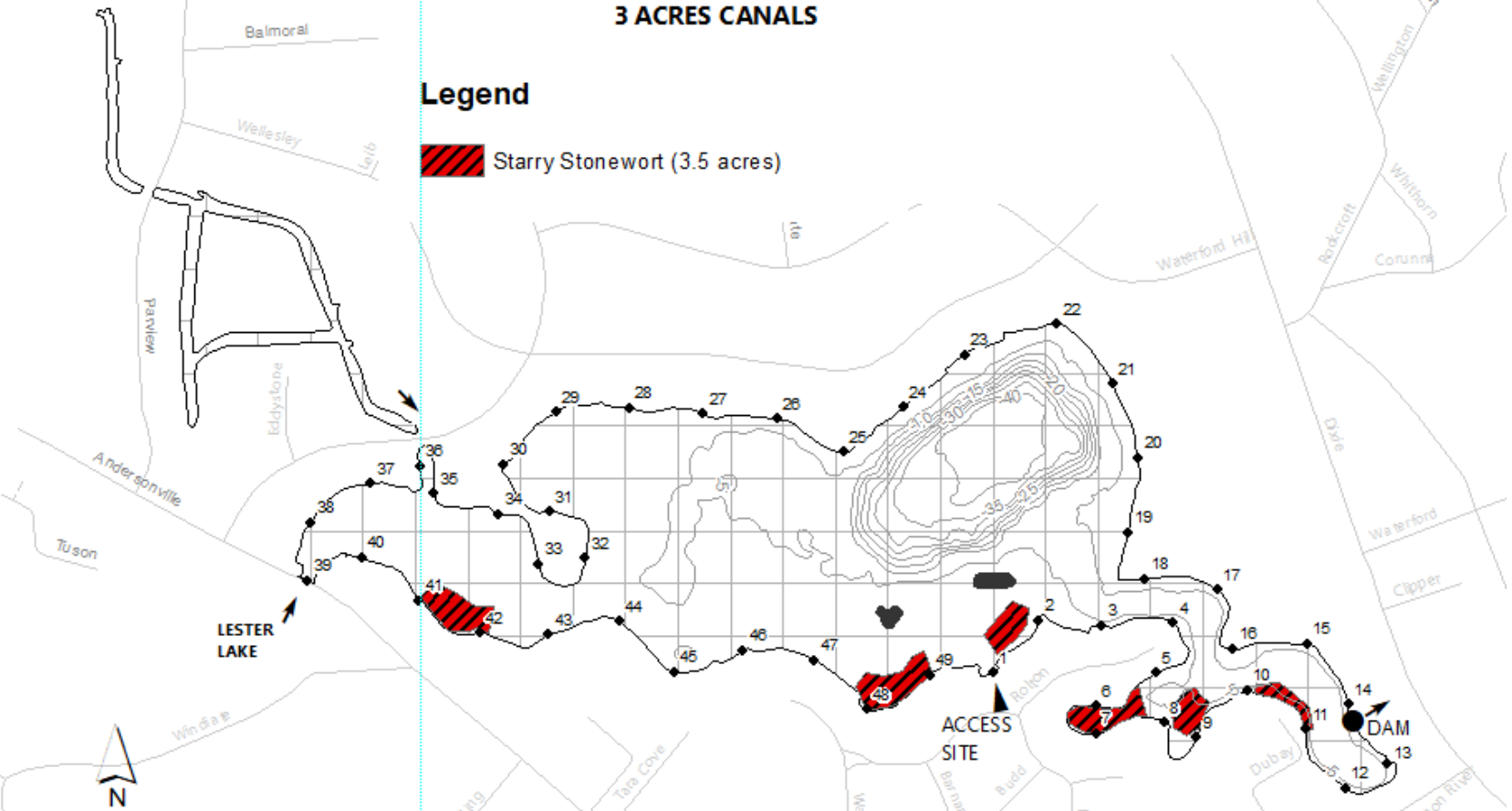


= 1 ACRE

= 1 ACRE

= 1 ACRE

VAN NORMAN LAKE
OAKLAND COUNTY, MICHIGAN
2018 STARRY STONEWORT TREATMENT AREAS MAP
72 ACRES LAKE
3 ACRES CANALS



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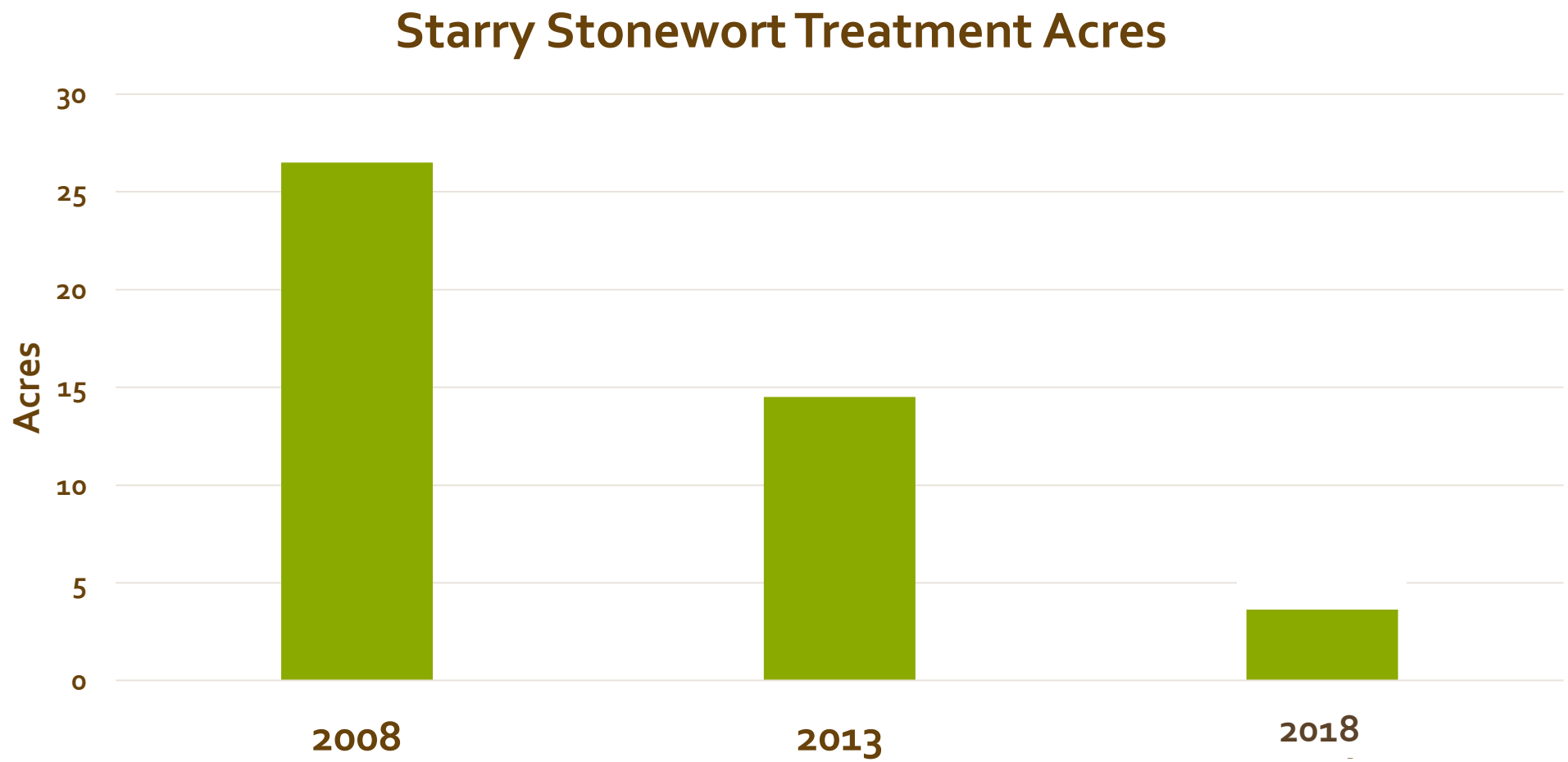
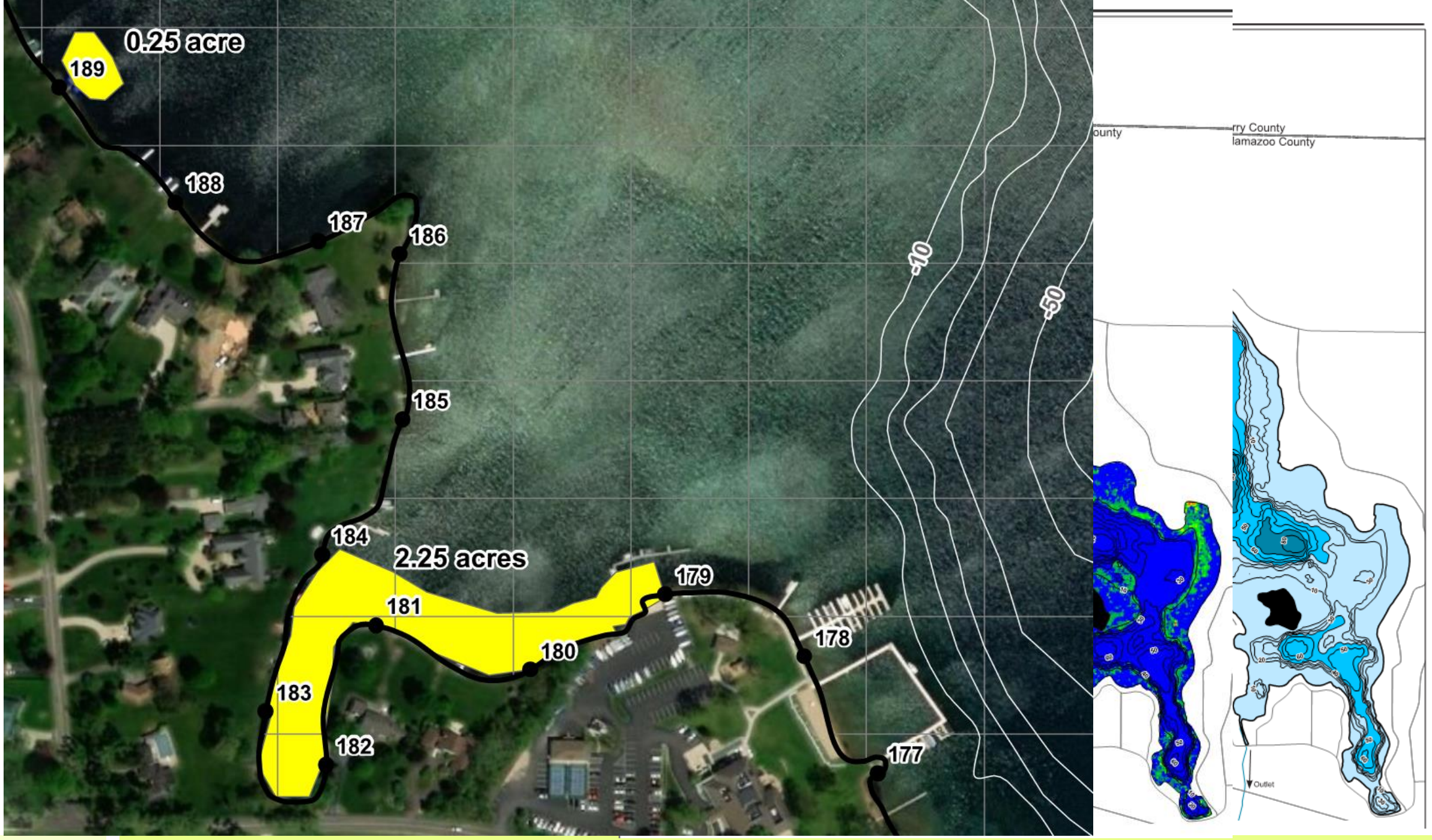
REVISION DATE: MARCH, 2017

Managing Widespread Infestations 2008 - 2018




0.25 acre
189
188
187
186
185
184
2.25 acres
179
181
180
178
183
182
177
-10
-50
ounty
rry County
lamazoo County
Outlet

Lessons Learned

- Early Detection/Rapid Response
- Budget up for best results (penny pinching early may cost you tens of thousands of dollars later – this includes monitoring cost and effort)
- Be aggressive early in the season and early in the infestation cycle/less damage to non-target species and less overall impact to the lake's ecology
- If a lake is already significantly infested, you may be better off managing for biomass/allow for recovery of natives
- Cryptic nature of this species can allow for it to remain undetected for many years – if lakes in your area have SSW and you are not monitoring for it rigorously, you may be lulling yourself into a false sense of security (especially if your lake has a public access or an upstream source of infestation)
- Recent research is valuable, but there still is a great need for more research on all aspects of SSW including habitat and fishery impacts
- Lakes can recover from significant SSW infestations

University of Wisconsin photo

Special Thanks to:

- Marcy Knoll Wilmes, Bill Keiper, Lisa Huberty, Tom Alwin (EGLE)
- Steve Hanson (PLM Lake & Land Mgmt.)

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