

# Starry Trek

Dan Larkin  
April 13, 2018

Photo: Dave Hansen



UNIVERSITY OF MINNESOTA  
**EXTENSION**



MINNESOTA AQUATIC INVASIVE  
SPECIES RESEARCH CENTER  
UNIVERSITY OF MINNESOTA  
Driven to Discover<sup>SM</sup>



# Starry stonewort

- Native to Eur. & Asia
- Red listed (CHE, CZE, FIN, DEU, GBR, JPN, SWE)
  - Special concern
  - Near threatened
  - Vulnerable
  - Endangered
  - Regionally extinct

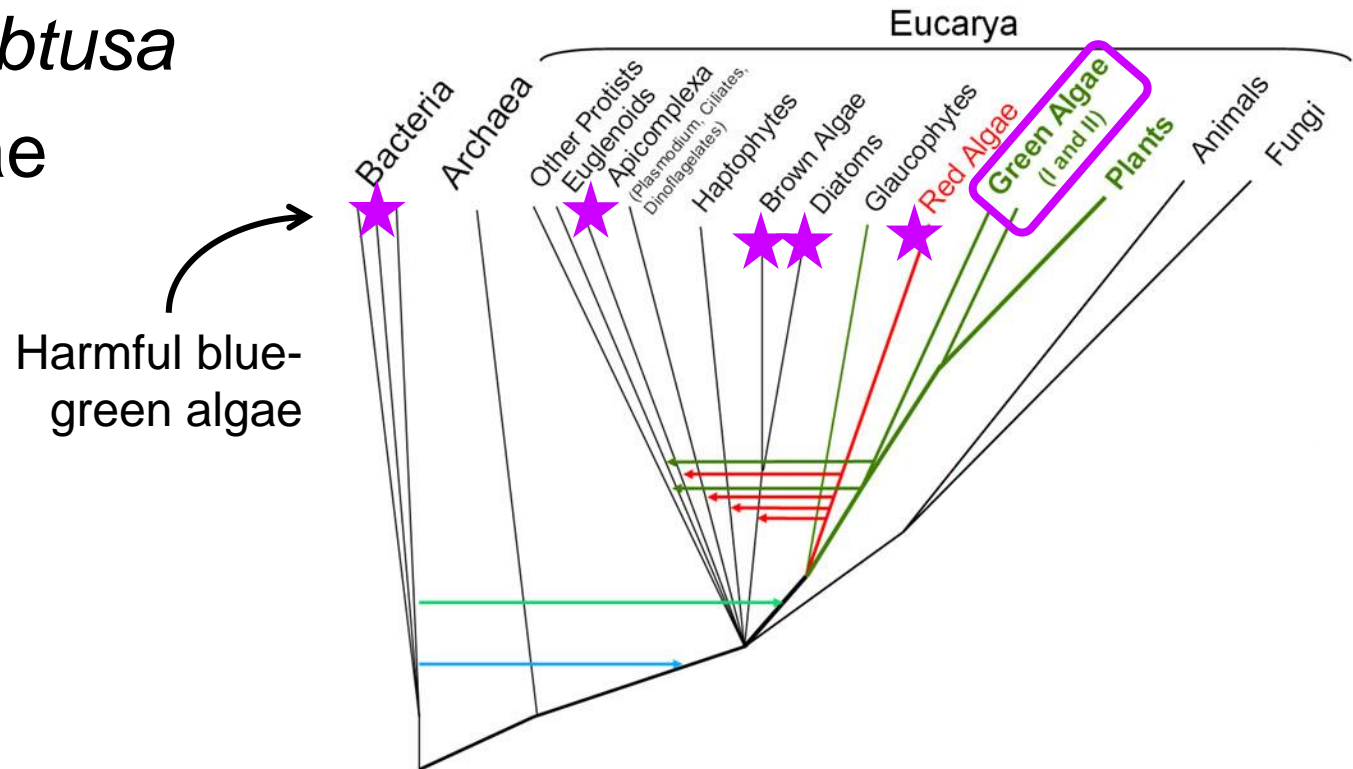


Photo: Scott Brown

# Starry stonewort

*Nitellopsis obtusa*

- Green algae

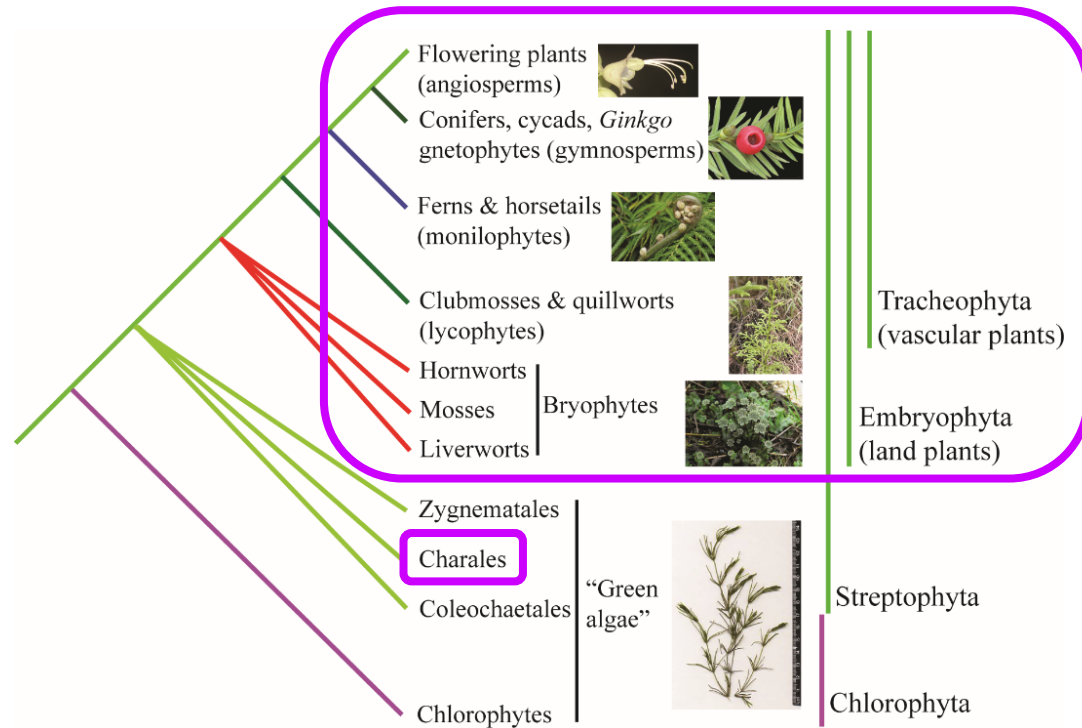


Three domains of living organisms  
(Gogarten, Taiz et al. 2015)

# Starry stonewort

*Nitellopsis obtusa*

- Charophyte  
(green algae)

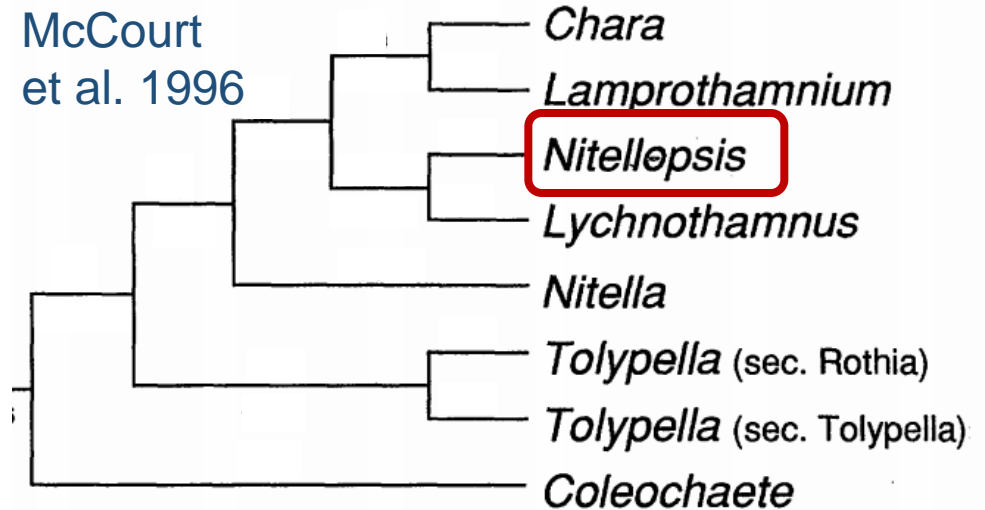


Phylogeny of green plants, Viridiplantae  
(Soltis Lab)



# Starry stonewort

- Closely related to stoneworts / muskgrasses native to Minnesota
- Ecologically important
  - Water quality
  - Habitat



*Chara aspera*



### *C. contraria*



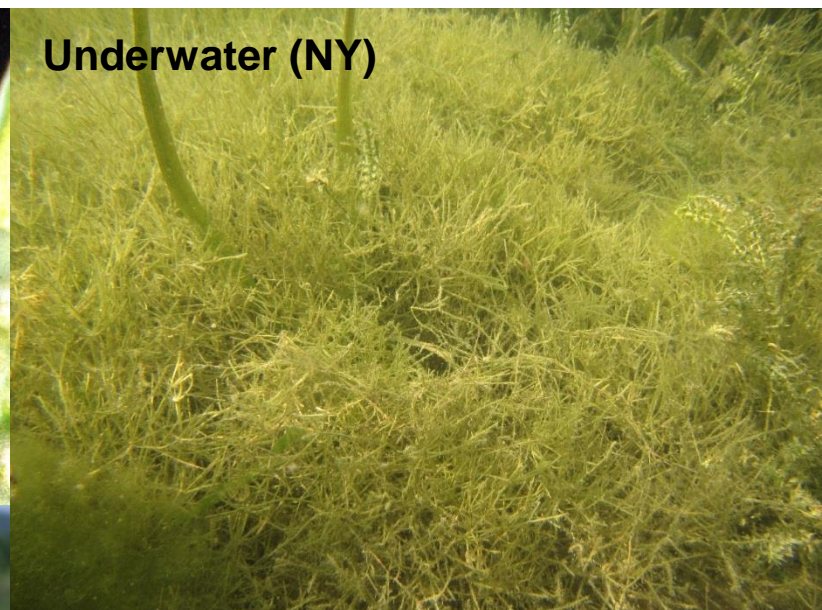
## Nitella flexilis



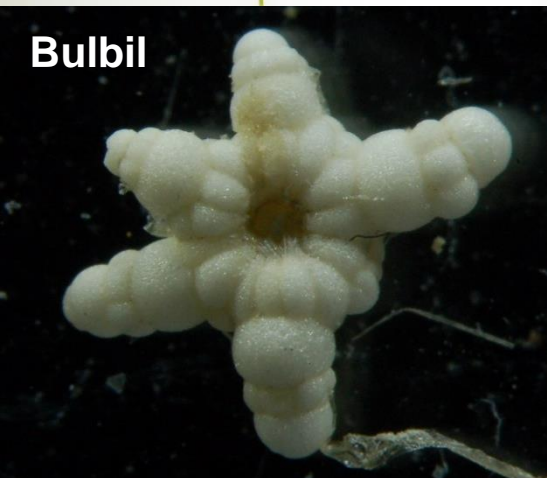
**Male, w/  
antheridia**



**Female oogonium**



**Underwater (NY)**



**Bulbil**



**Filamentous  
rhizoids**



**Growth at surface (Koronis)**

# Reproduction and spread

- Dioecious, only males known in North America
- Spread here by fragments and bulbils
  - Asexual reproductive structures





# Reproduction and spread

- Concentrated in lakes w/ accesses and high-use areas
- Human movement



Photo: Paul Skawinski

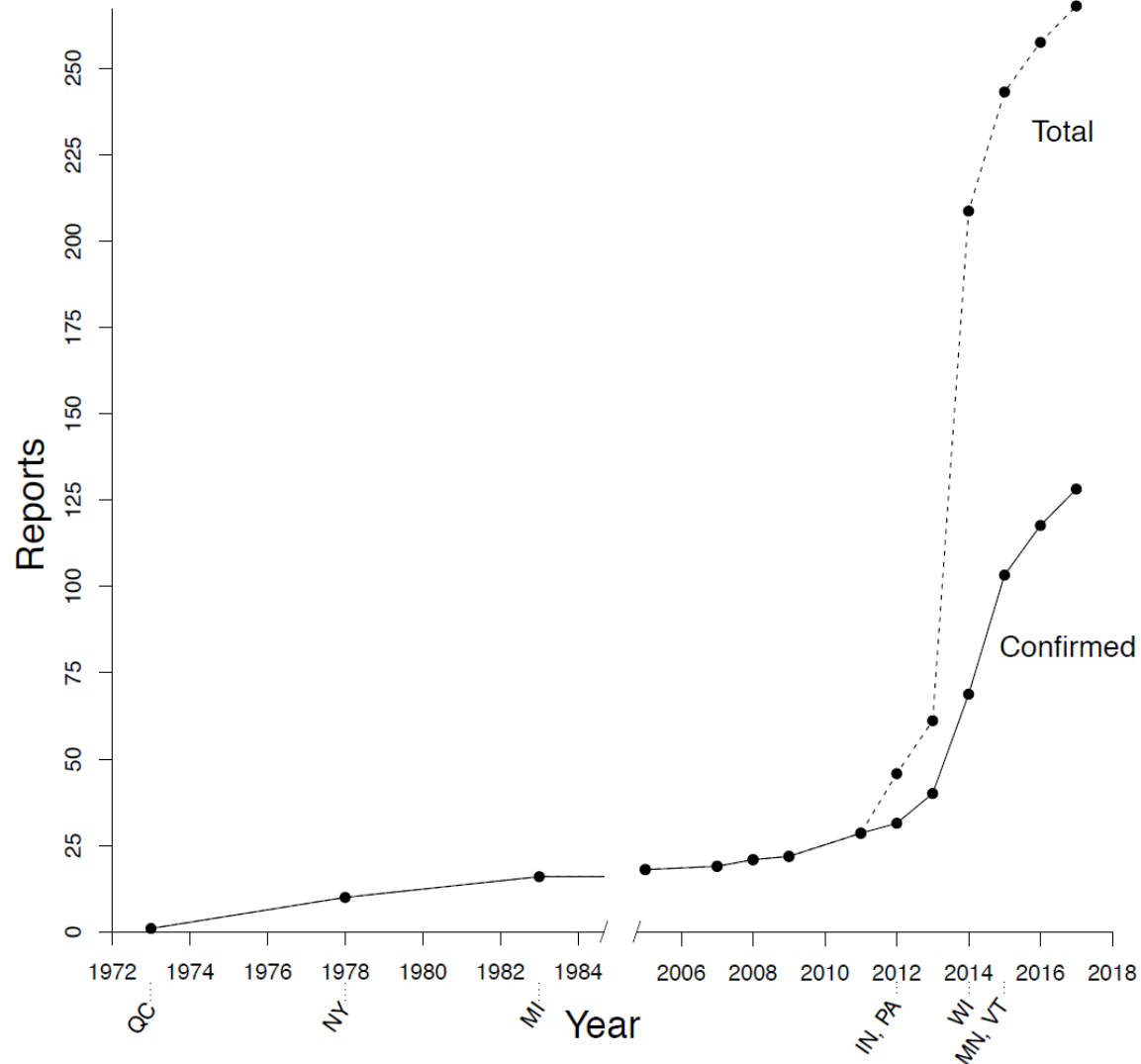


# Invasion history

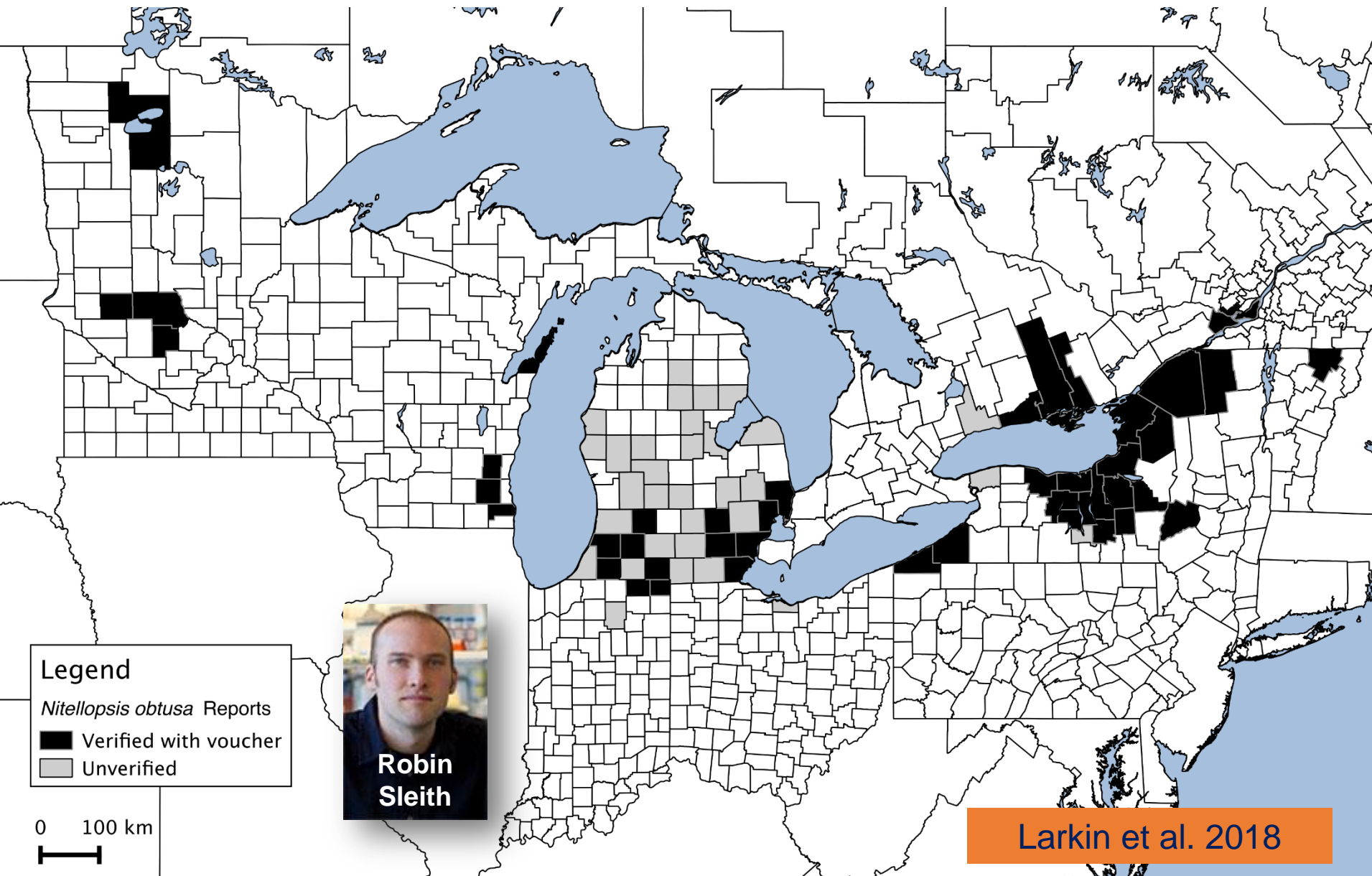
- Relatively new invader
- Increasing concern for AIS management

# Invasion history

Larkin et al.  
2018



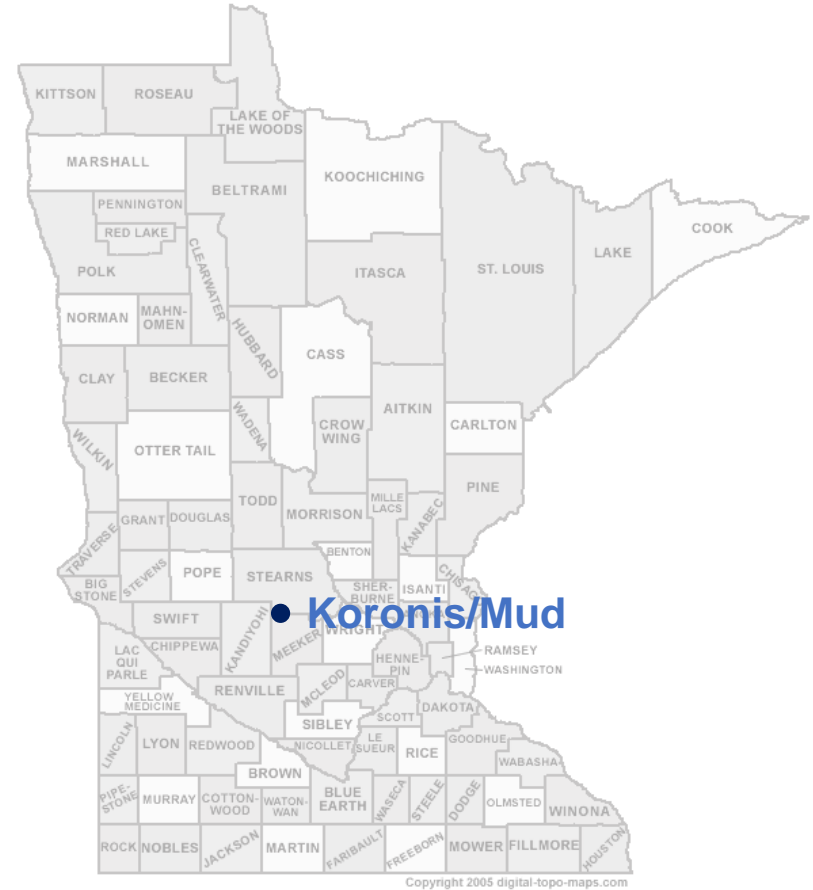
# Current known distribution



# Known occurrences in Minnesota

2015

- Koronis/Mud





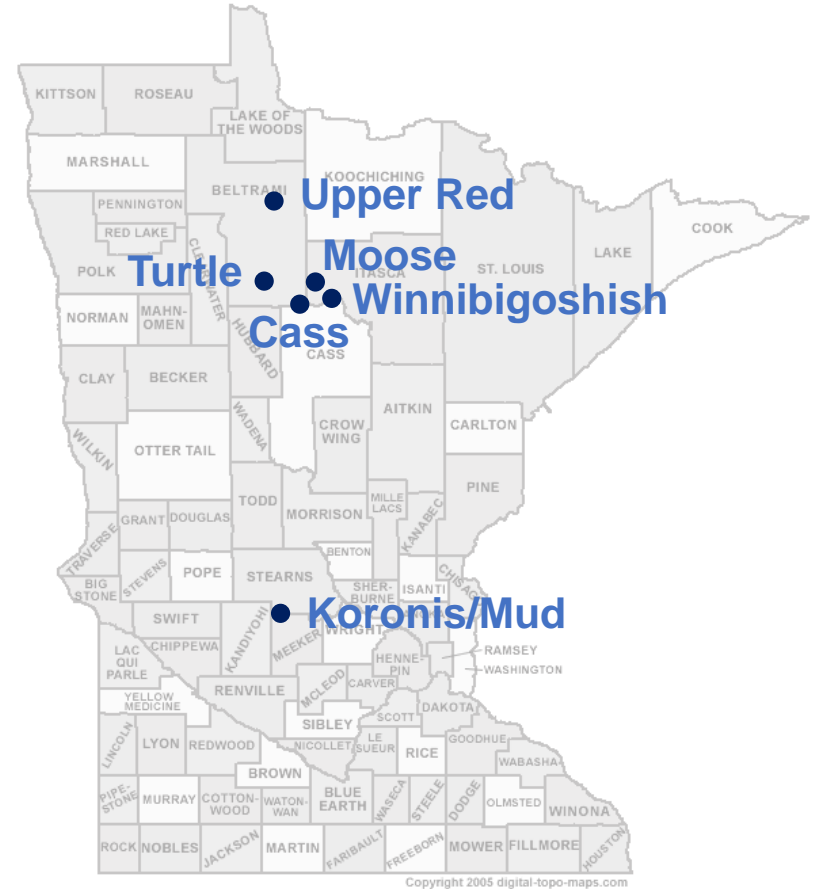
# Known occurrences in Minnesota

## 2015

- Koronis/Mud

## 2016

- Cass
- Moose
- Turtle
- Upper Red
- Winnibigoshish



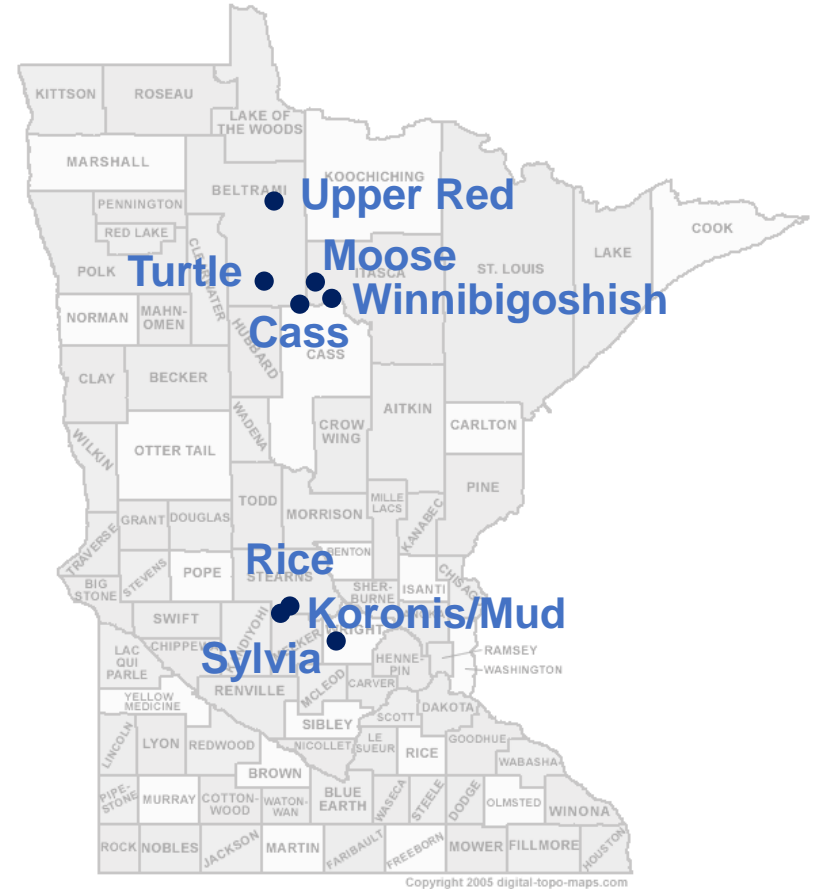
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- Rice
- Sylvia



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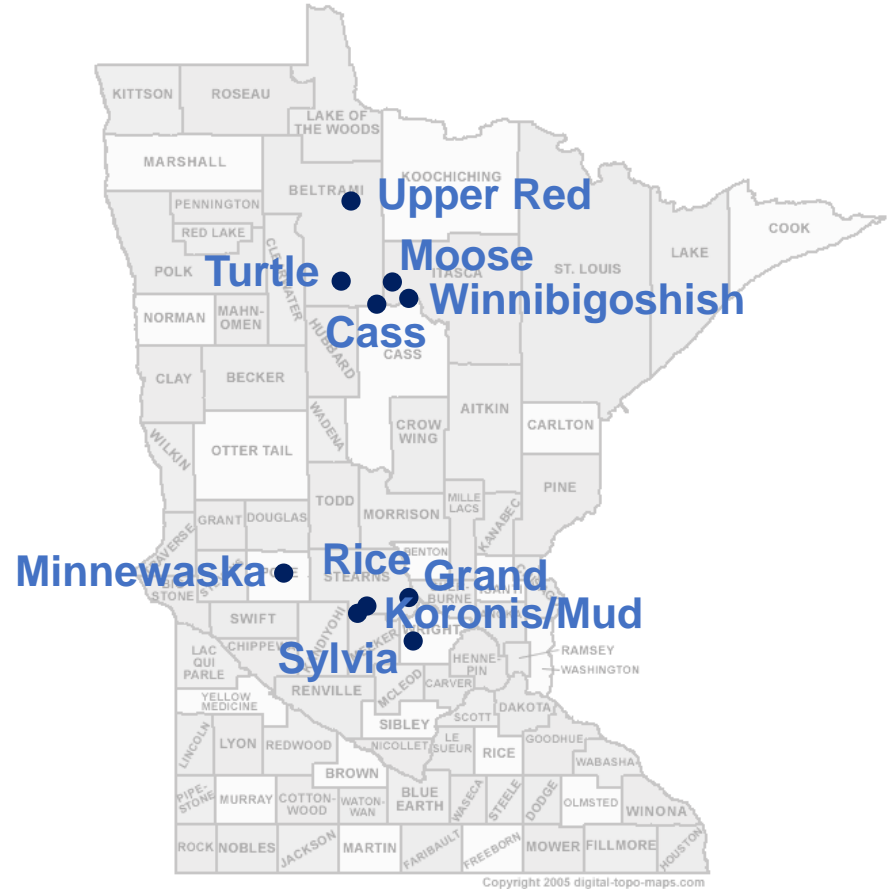
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## 2016

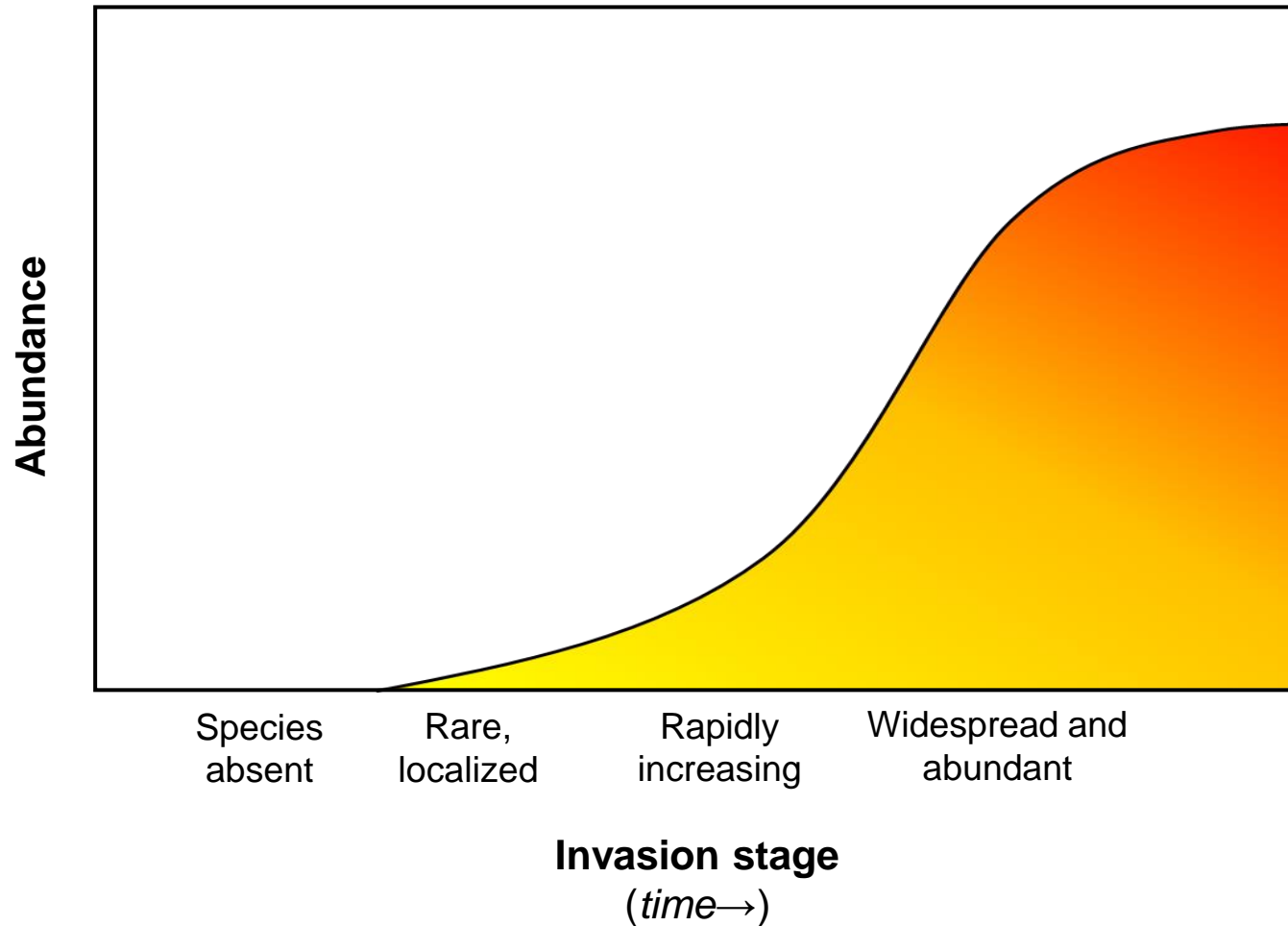
- Cass
- Moose
- Turtle
- Upper Red
- Winnibigoshish
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## 2017

- Grand
- Minnewaska

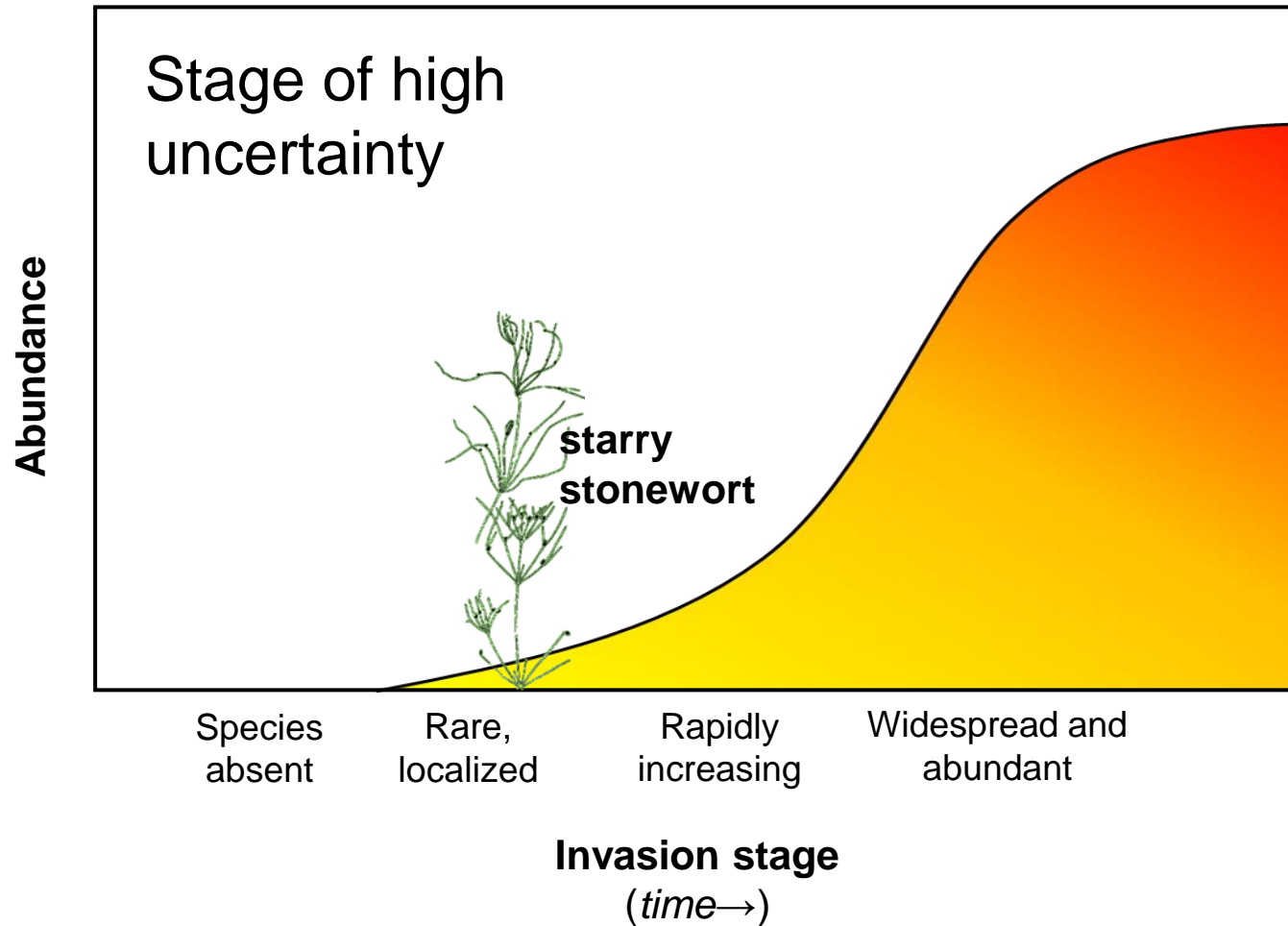


# Invasion process

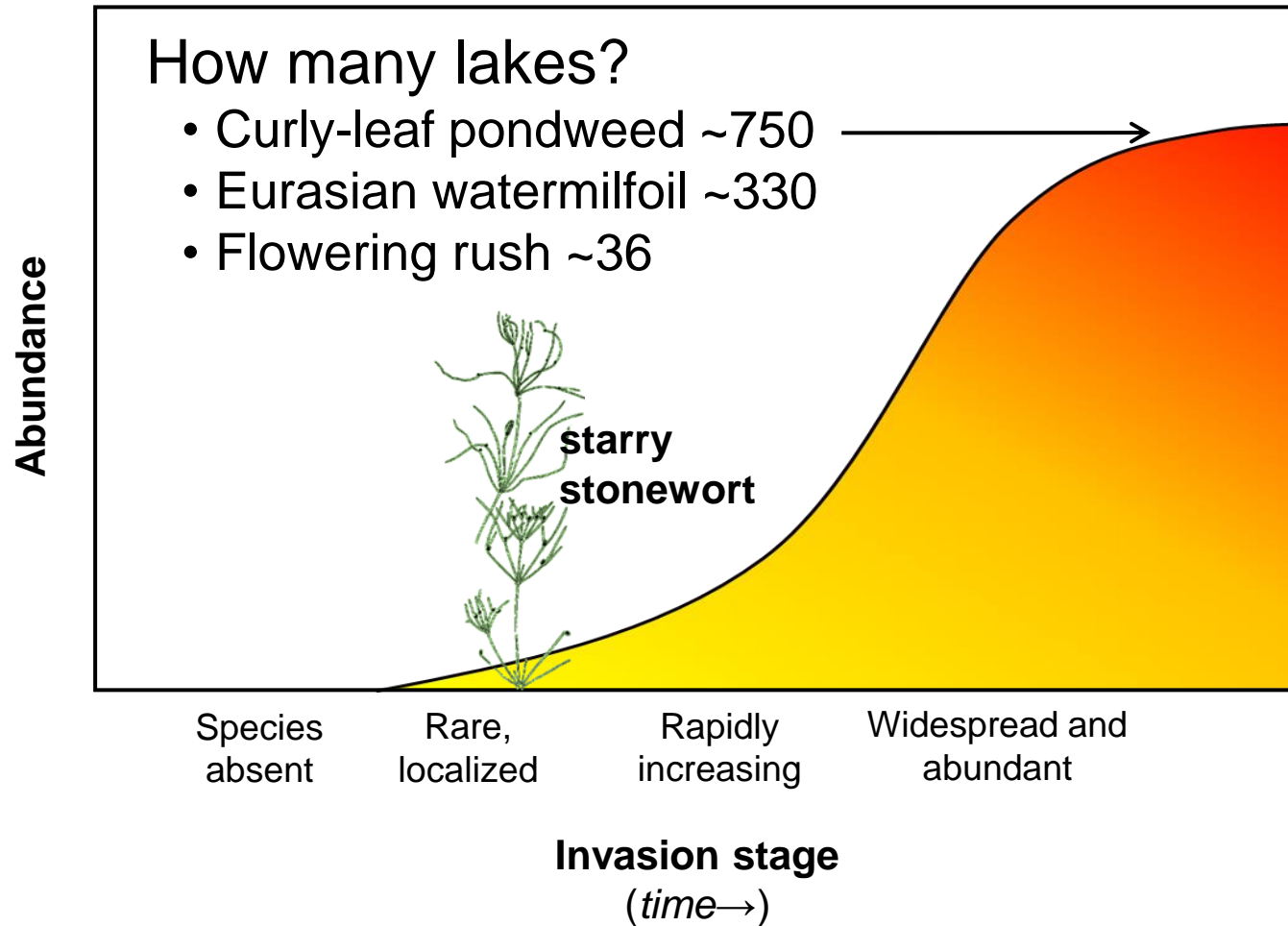




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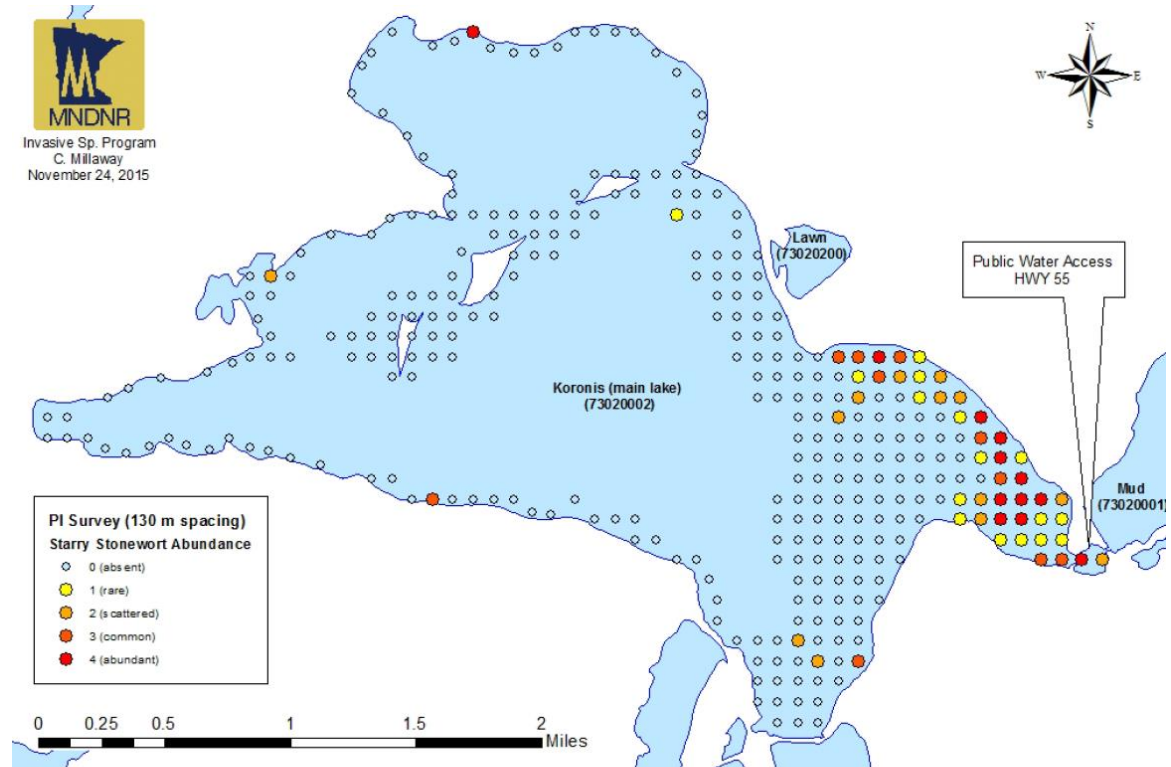


# Invasion process



# Invasion process

- How much of an invaded lake?



Starry Stonewort Abundance Map  
Point Intercept Survey (130 Meter Spacing)  
September/October 2015 by FISH/EWR Staff  
Lake Koronis, Stearns County (DOW 73020000)

# Ecological impacts

- High uncertainty
- Not enough research



Photo: Paul Skawinski



# Ecological impacts

- High uncertainty
- Not enough research
- 212 peer-reviewed papers involving SSW  
(Web of Science, Jan. 2018)
  - But only 11 addressing as non-native species in North America
  - Only 1 of those documenting ecological impacts\*\*\*



Photo: Paul Skawinski

# Our research/extension focus

**Spread**

*Where's it going to end up?*



**Impacts**

*What are its effects?*



**Management**

*How can we support early  
detection/rapid response?*

# Our research/extension focus

**Spread**

*Where's it going to end up?*



**Impacts**

*What are its effects?*



**Management**

*How can we support early detection/rapid response?*

# Spread potential

- What is its ecological “niche”?
- Where are those conditions available?

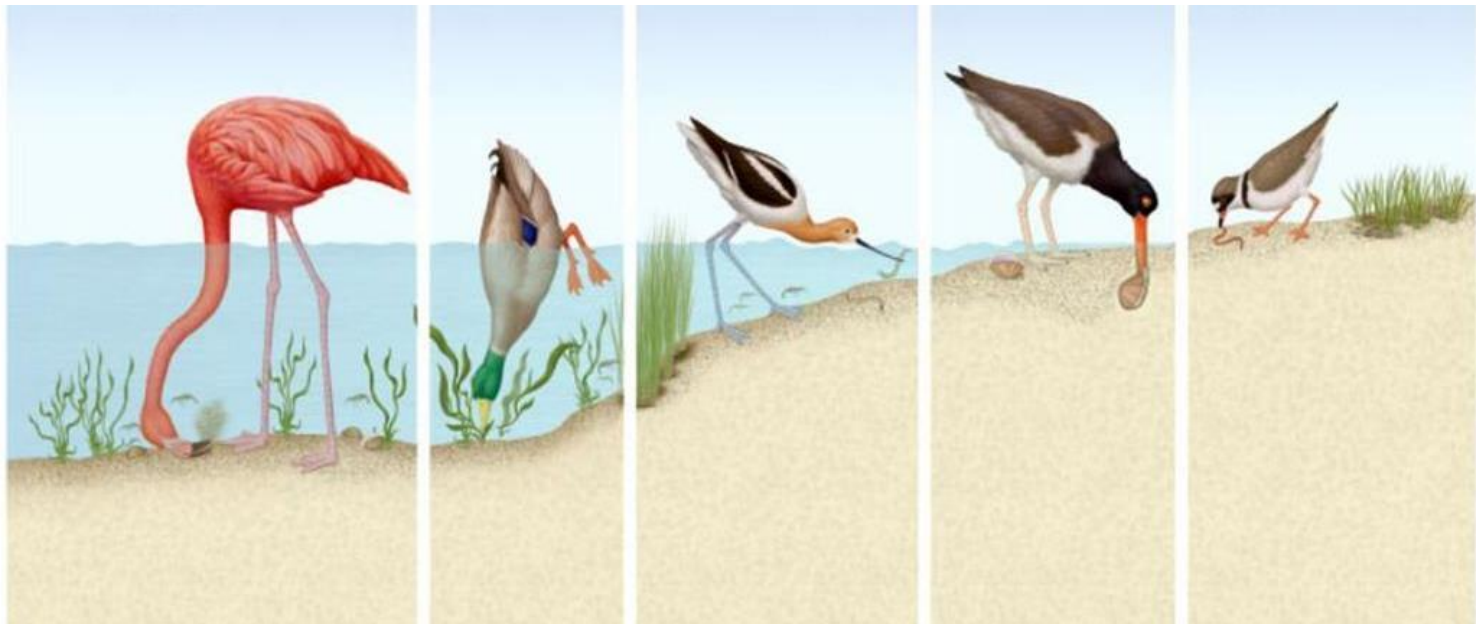


Image: McGraw Hill

# Lake water chemistry

## Chemistry of SSW lakes

- High pH
- High conductivity (Ca, Mg)
- Wide trophic-state ranges

Based on data from NY (Sleith)  
and Europe (Boissezon et al.)



**Dr. Ranjan Muthukrishnan**  
(Postdoc)

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What lakes is it found  
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What lakes is it found in now?



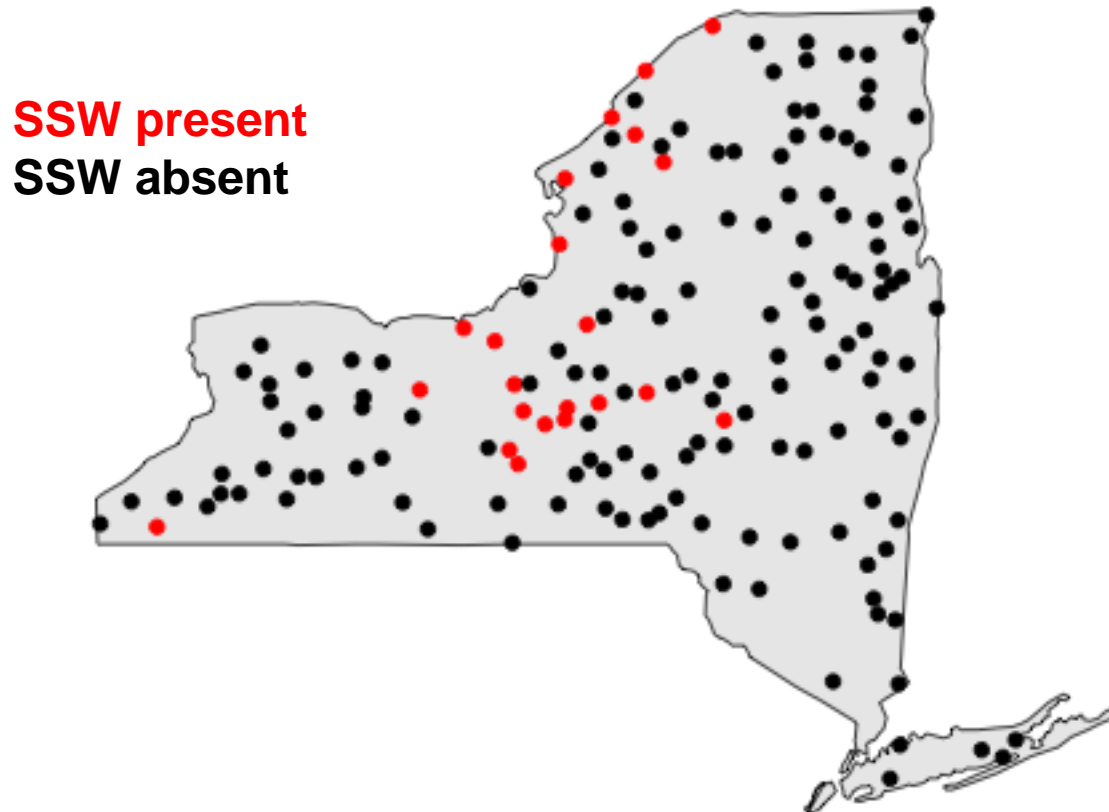
What are environmental conditions of these lakes?



Which Minnesota lakes overlap with these conditions?

# Learning from patterns in New York

## Sampled lakes

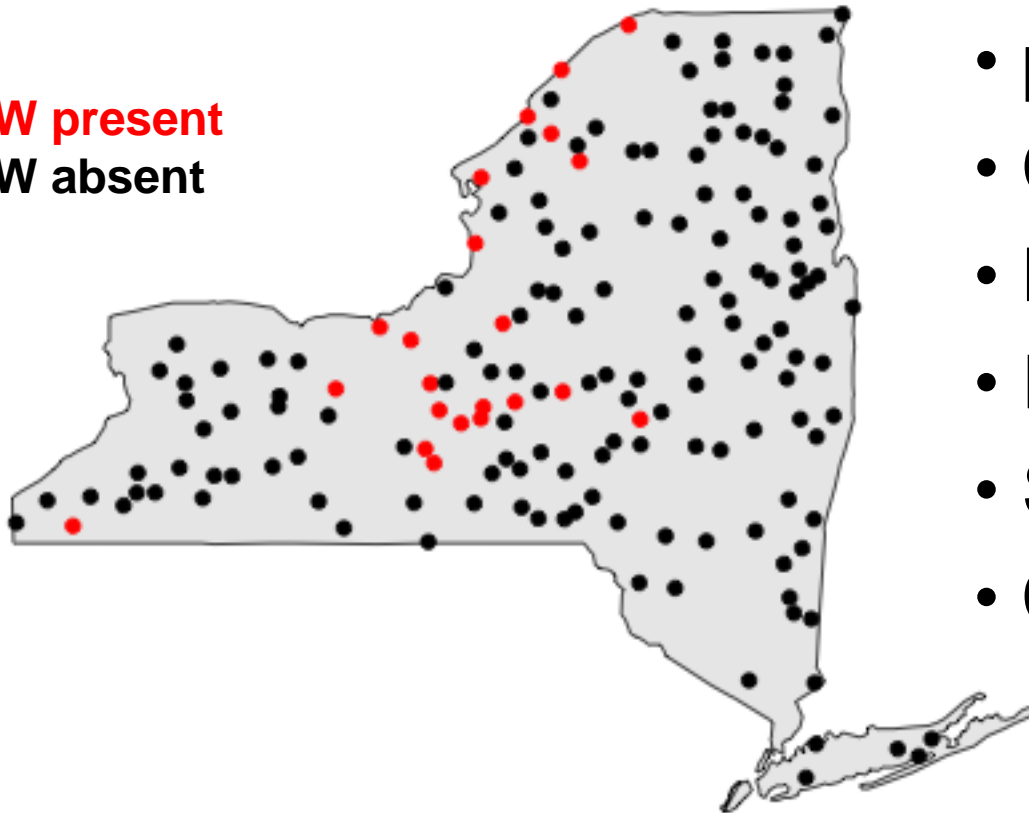


**Robin Sleith, NYBG**

# Learning from patterns in New York

## Sampled lakes

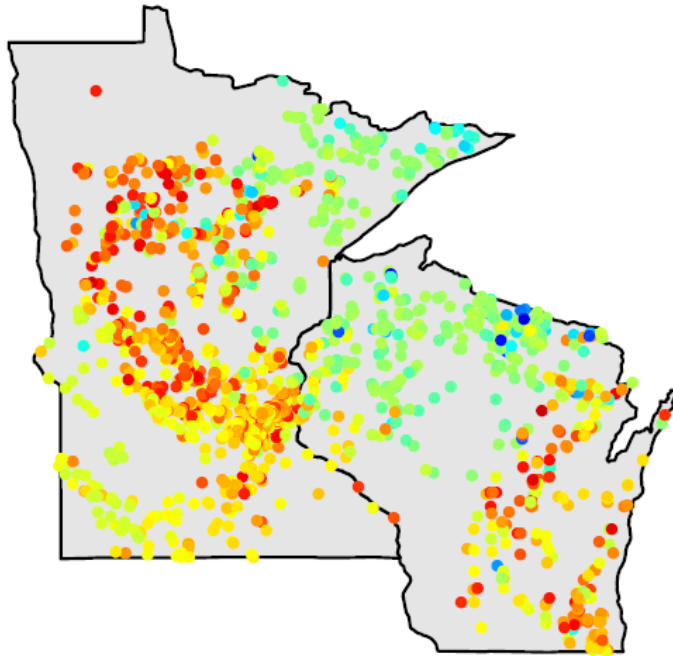
**SSW present**  
SSW absent



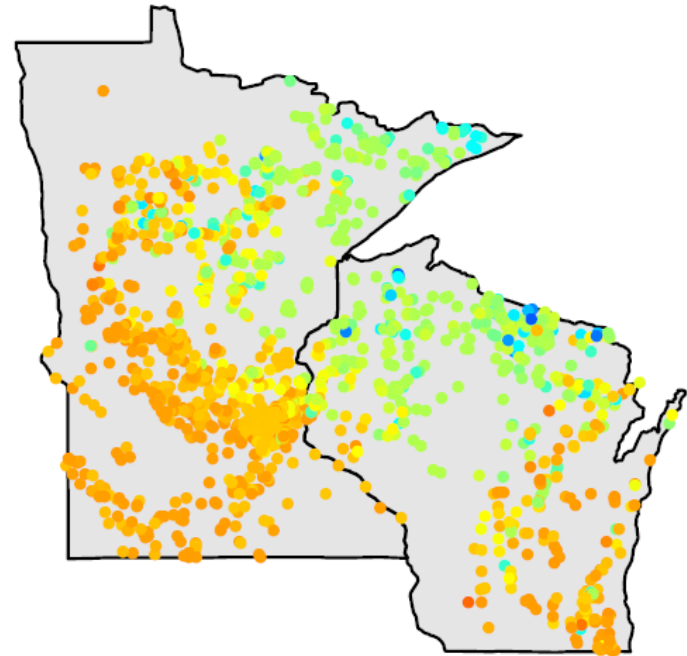
- pH
- Conductivity
- Nitrogen
- Phosphorus
- Secchi depth
- Chl *a*

# Regional risk map

**Random forest**



**Boosted regression tree**



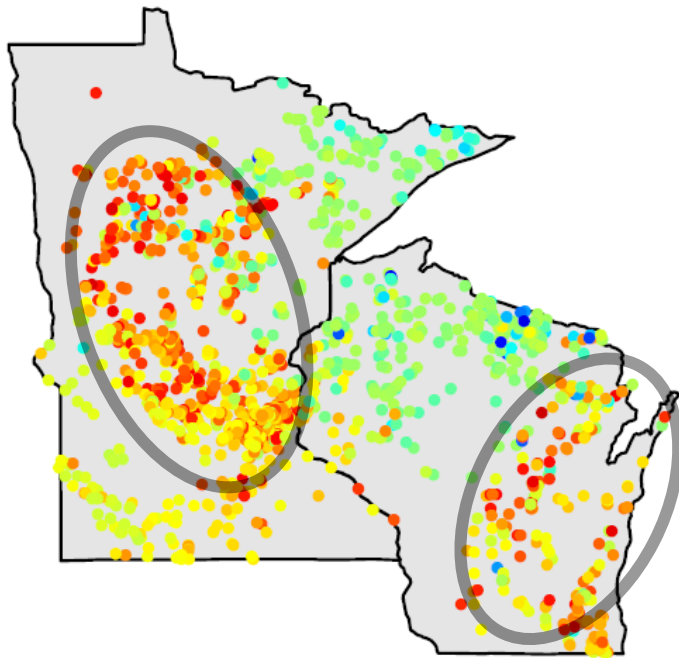
Low risk

High risk

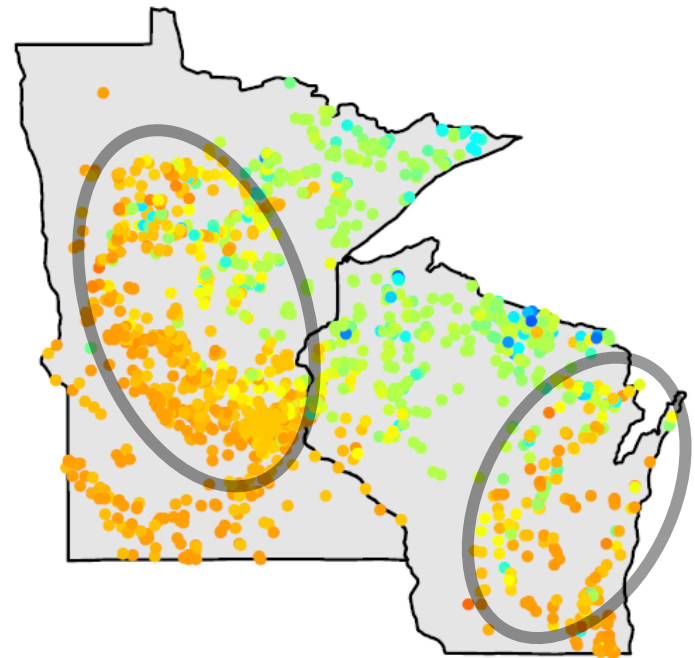


# Regional risk map

**Random forest**



**Boosted regression tree**



Low risk

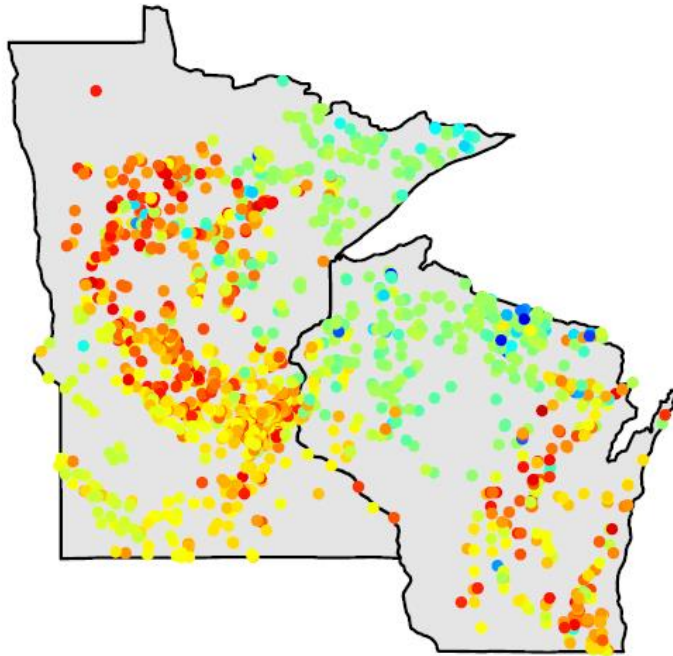
High risk



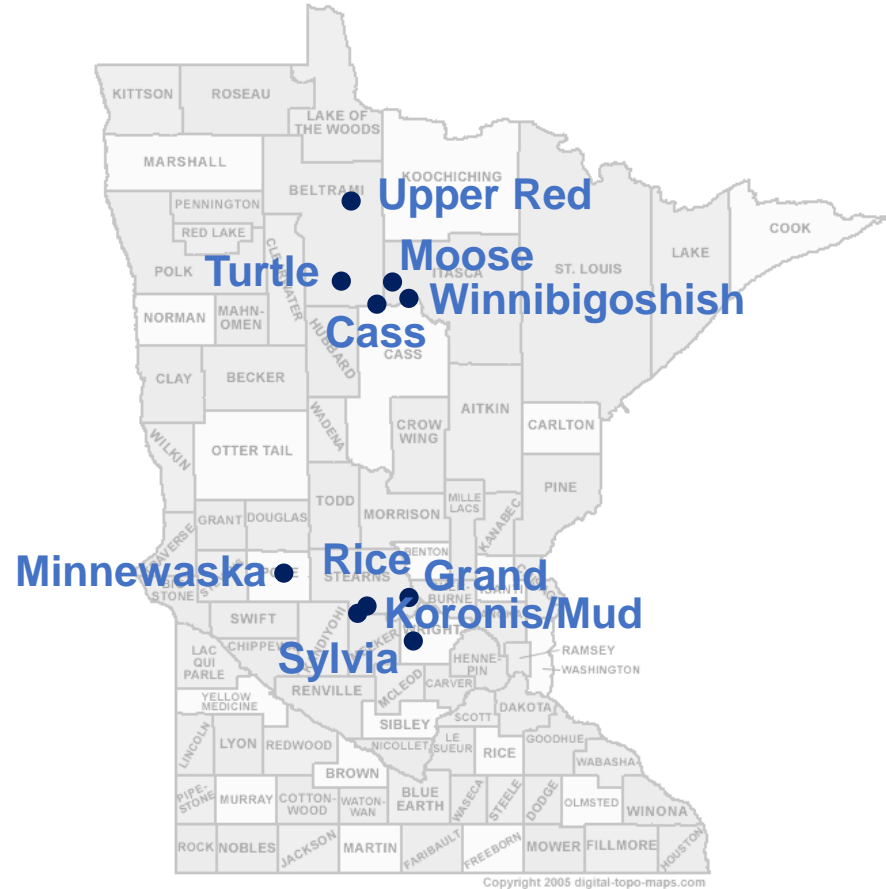


# Regional risk map

## Random forest



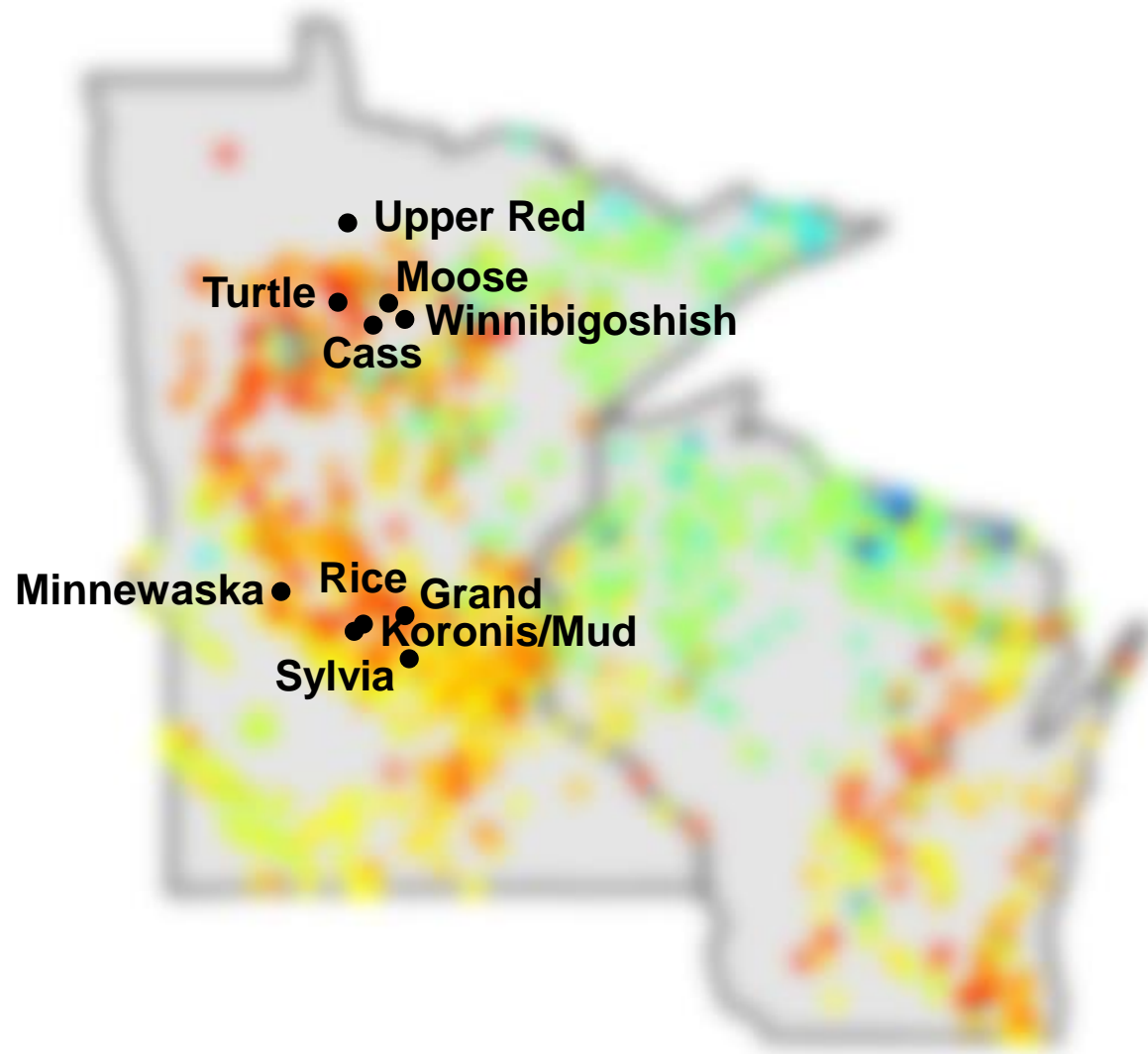
Low risk



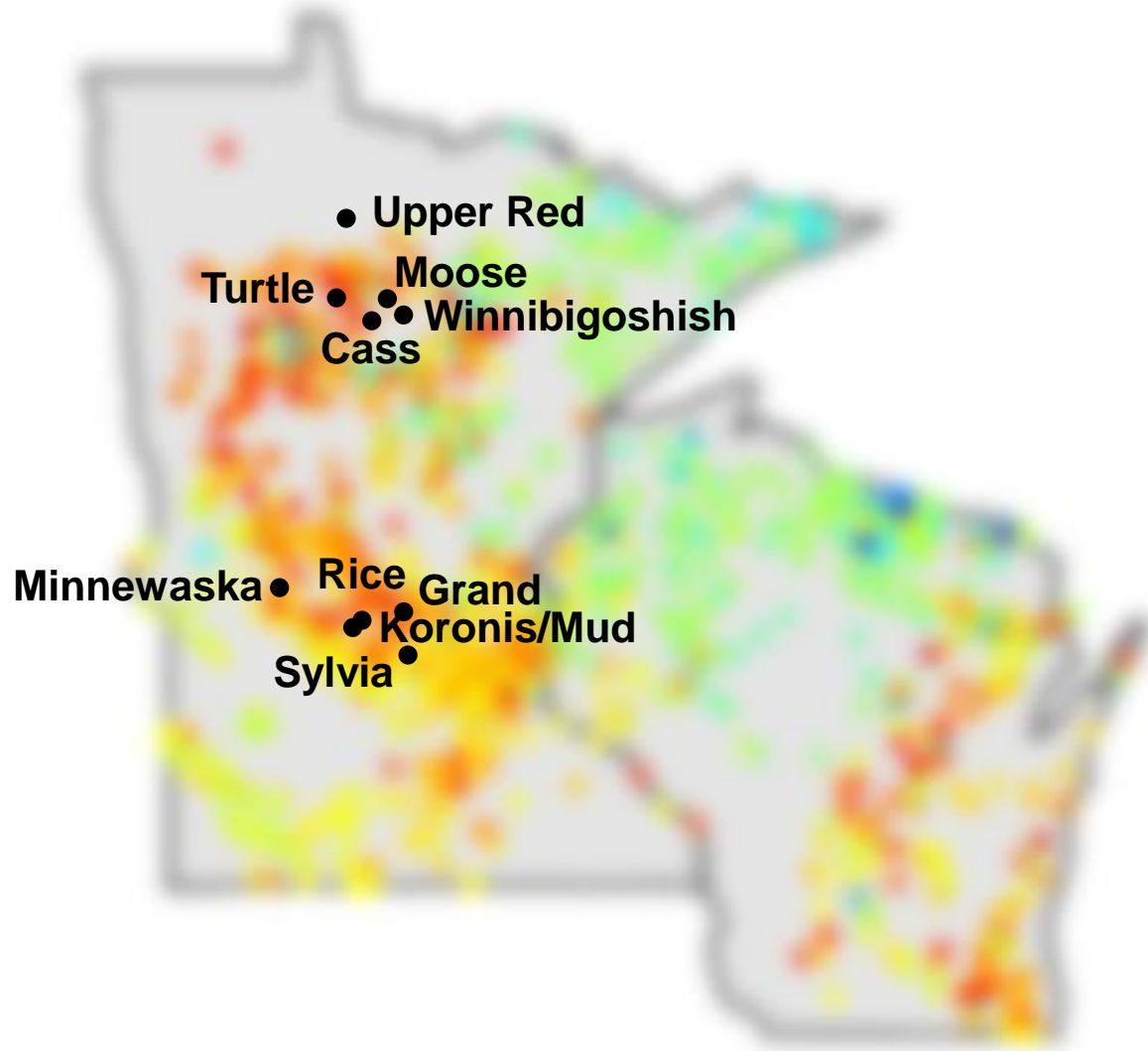
High risk



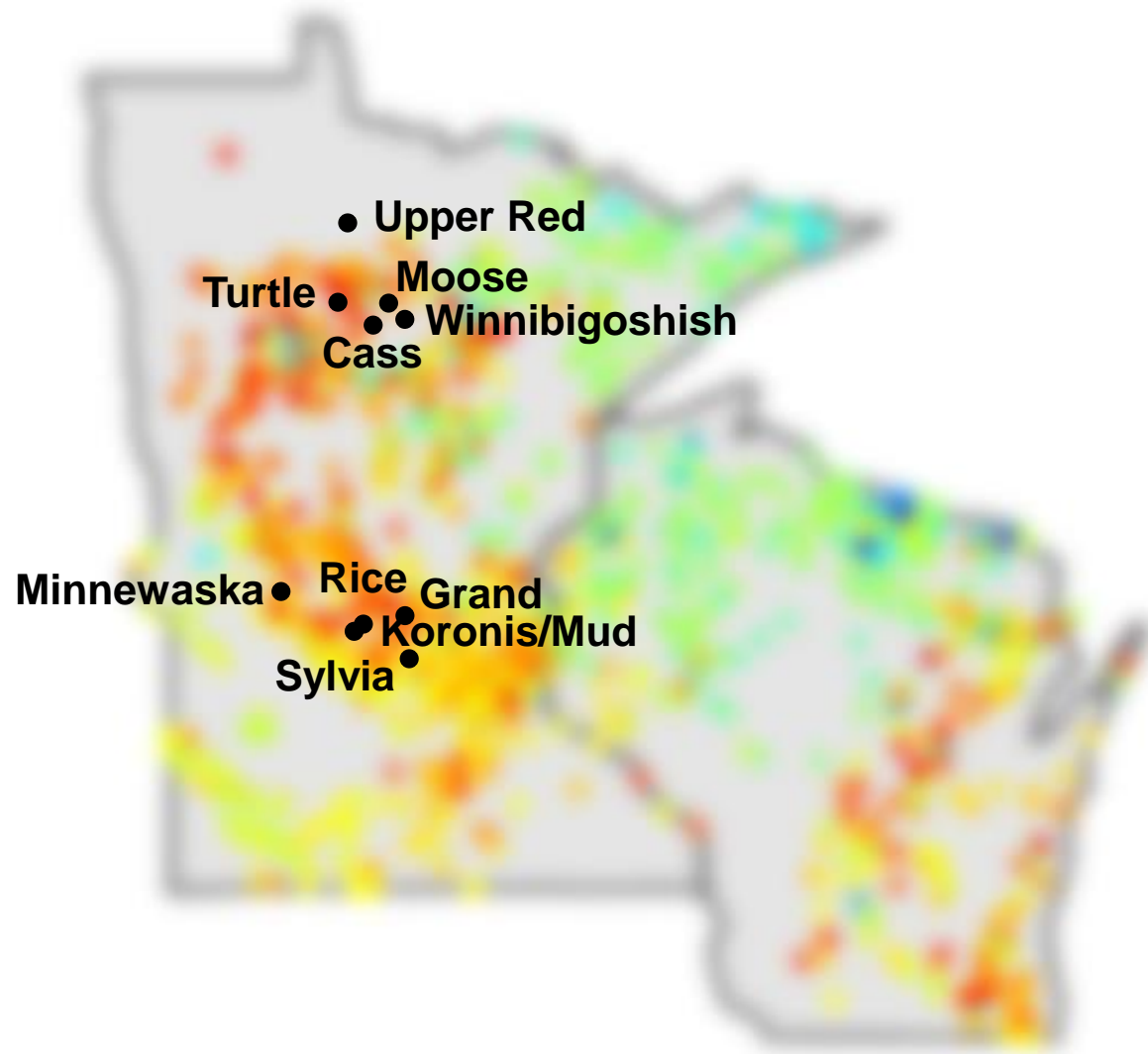
# Where else is it?



# How can we find needles in a haystack?



# Citizen science



# Starry Trek – Aug. 5, 2017



RIVER ALLIANCE  
of WISCONSIN



# Deployed tools and protocols to partner organizations...

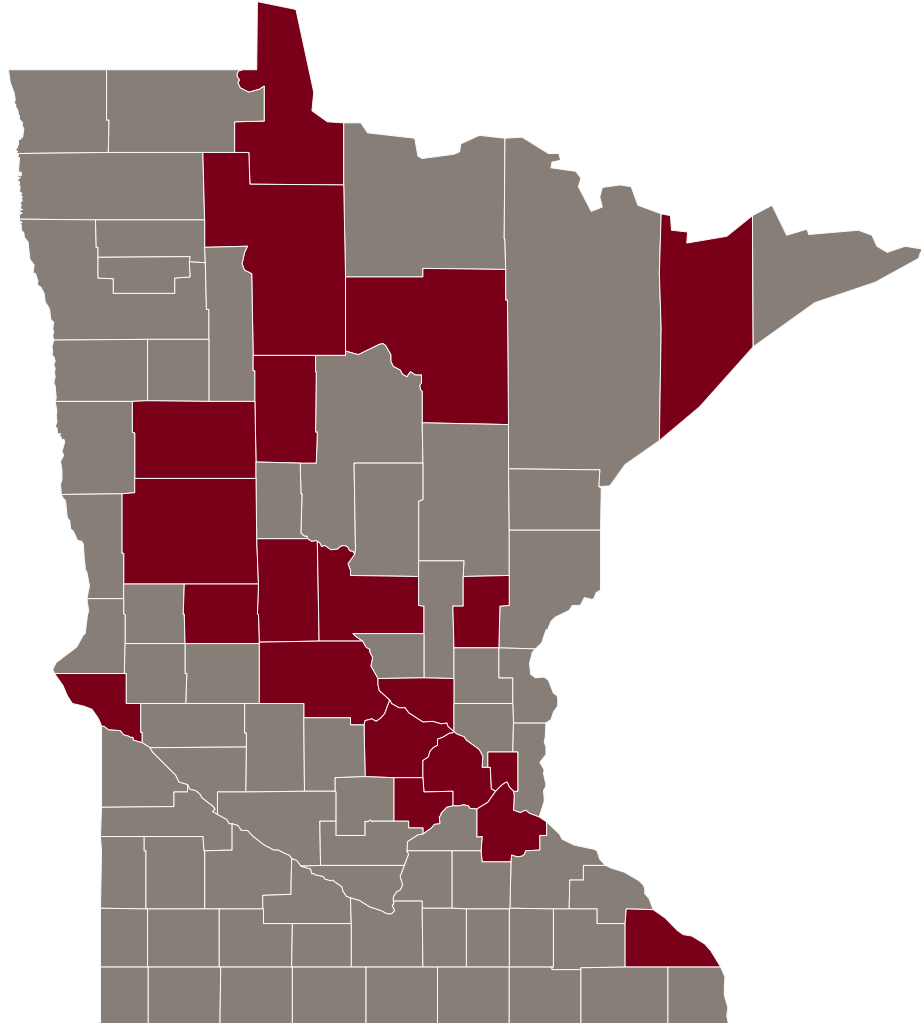




# Who hosted rendezvous sites in...

**20**

Counties



# Training and supporting...



Volunteers

200



# Who searched...

# 211

Public Accesses



In a total of...



178

Waterbodies



# Resulting in...

# 1

New early detection

**Grand Lake (Stearns Co.)**



Photo: MnDNR Invasive Species Program

# MnDNR and Grand Lake Assoc. partnered on rapid response



Photo: MnDNR Invasive Species Program



**Found early → population small → DNR able to hand-pull**



Photo: MnDNR Invasive Species Program



**Good prognosis because of early detection & rapid response**



Photo: MnDNR Invasive Species Program



A photograph of four people (three men and one woman) standing on a wooden dock by a lake. They are all looking down at a large clump of dark, leafy aquatic plants that one of the men is holding. The man on the far left is wearing a white baseball cap and a dark jacket. The man next to him has a beard and glasses and is wearing a plaid shirt. The woman next to him is wearing a light-colored patterned shirt and sunglasses. The woman on the far right is wearing a dark jacket and glasses. In the background, there is a body of water with lily pads and a line of trees under a blue sky with some clouds.

***Save the date!***

**Starry Trek 2018**  
**Saturday Aug. 18, 2018**



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Photo: Megan Weber