Case Studies of AIS Detection and Response

Upper Midwest Invasive Species Conference

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Blue Water Science

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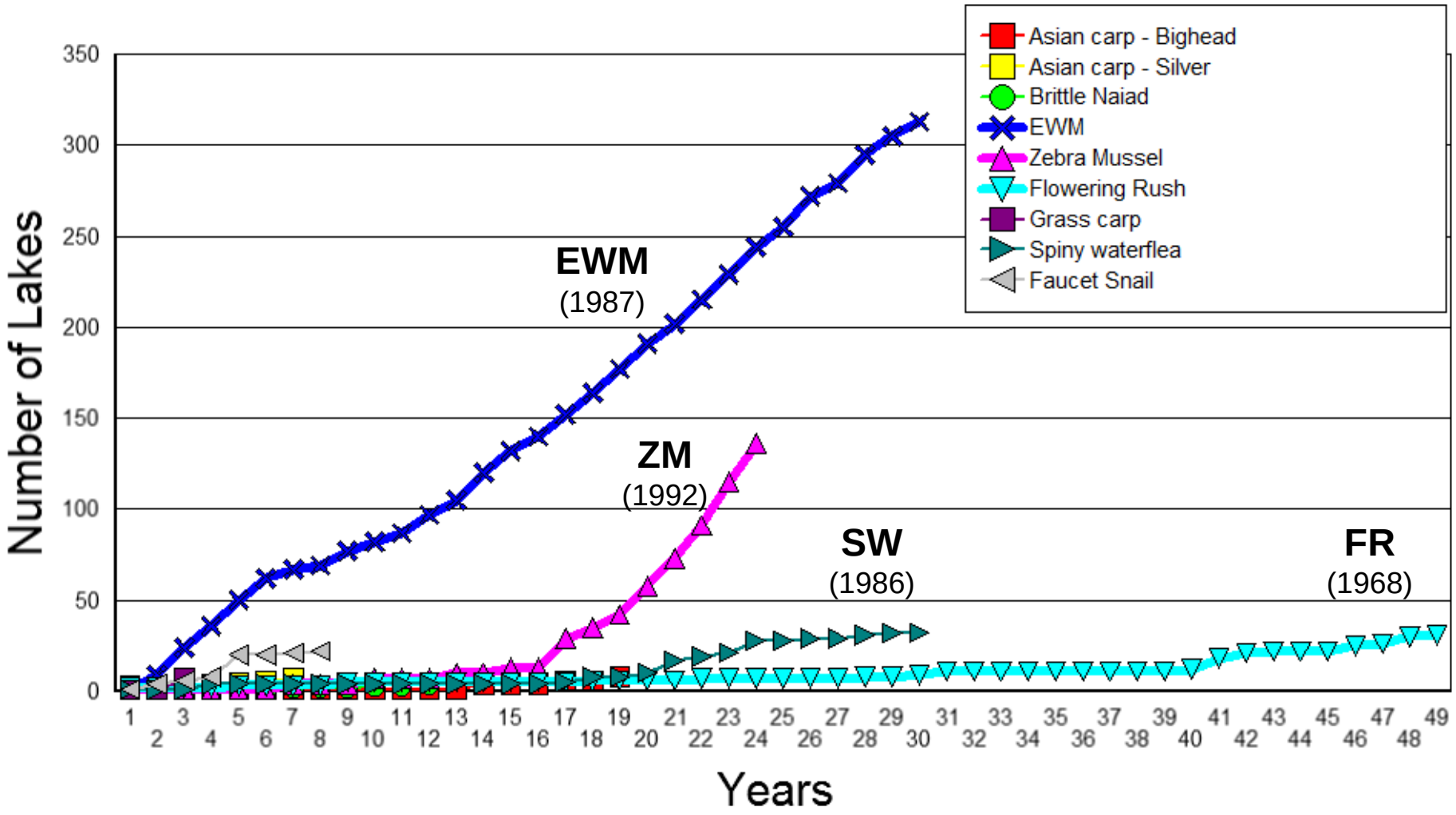
AIS Spread at Different Rates in MN



(CLP = 115 years, 800 lakes)

(source: MnDNR Sept 28, 2016)

Early Detection and Rapid Response

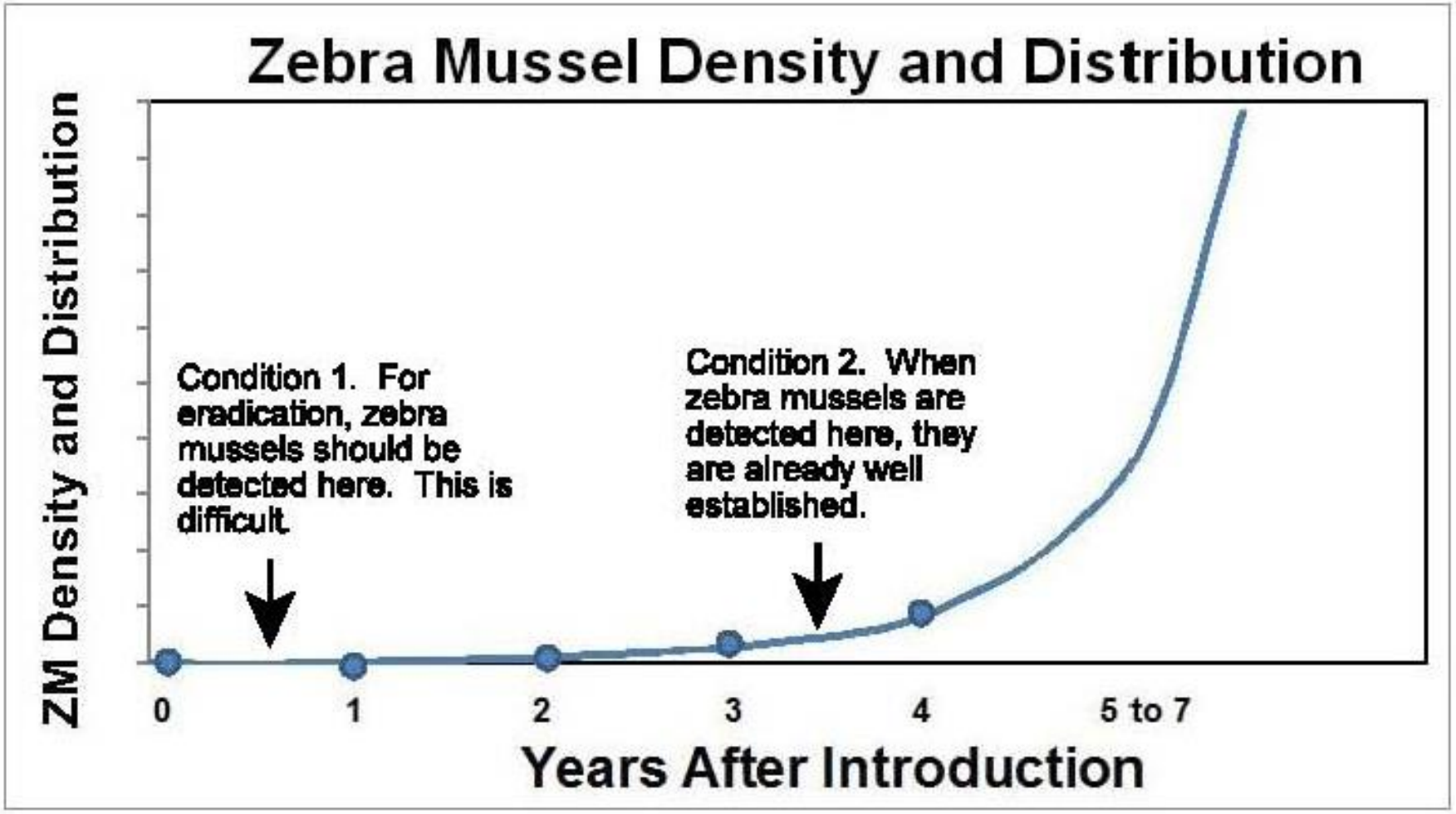
Detection Strategies

1. Static samplers (plate samplers)
2. Active searching
3. eDNA

Rapid Response

1. Pre-planning (suitability, materials, permits)
2. Rapid assessment (search, assess)
3. Rapid action (eradication or management)

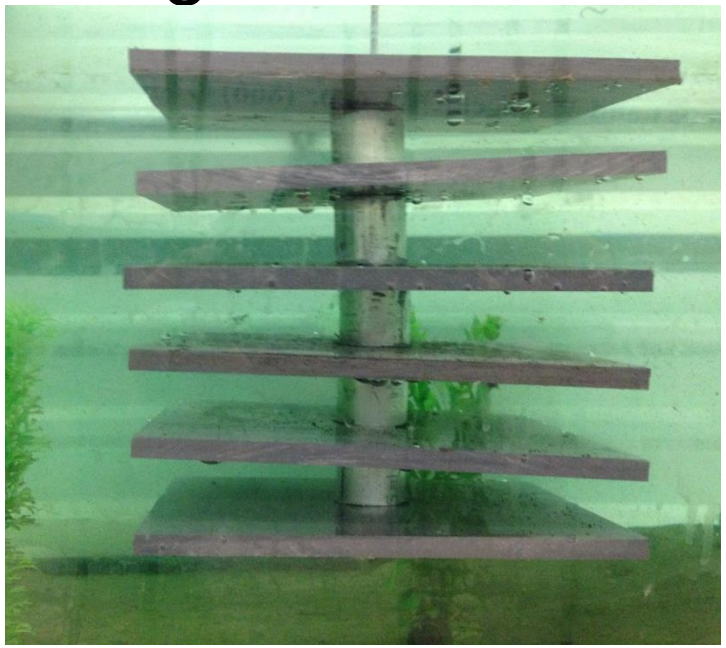
AIS Early Detection Challenge



AIS Detection Strategies:

Zebra Mussel examples:

- Static samplers – single object
- Active search – multiple strategies (include volunteers)



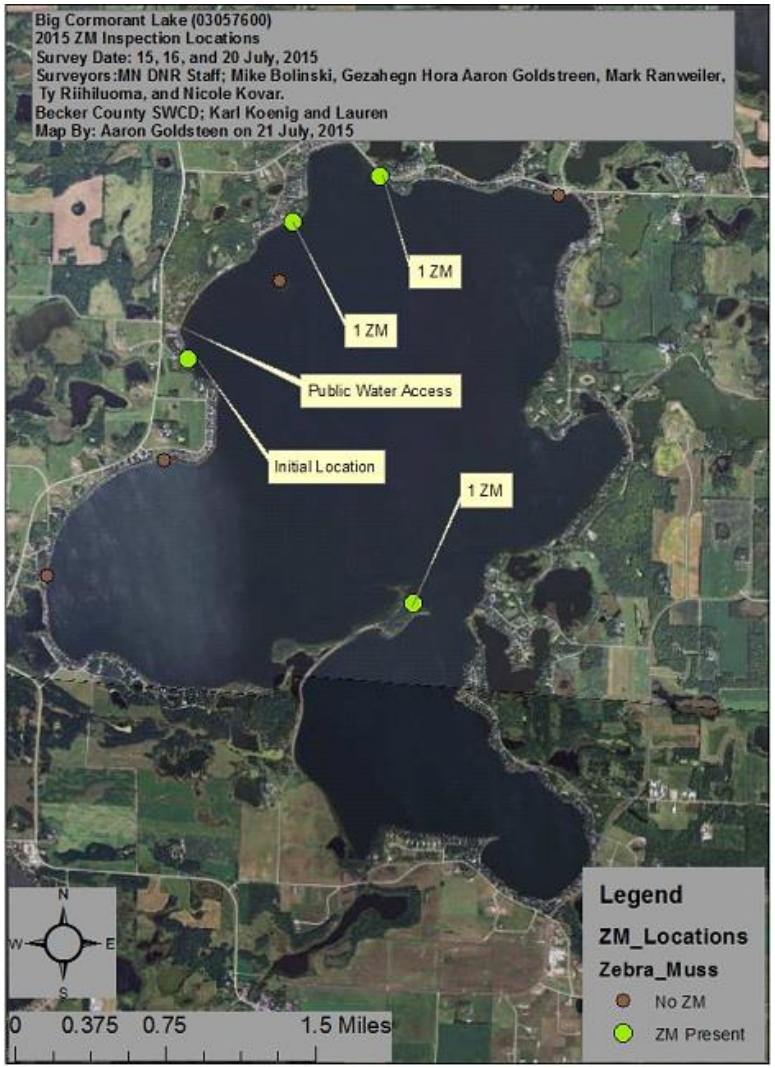
What Level of Searching Is Needed for Early Detection?

- Is plate sampling enough?
- How many objects to examine?
- Monthly searching should be considered.

  Example: Big Cormorant

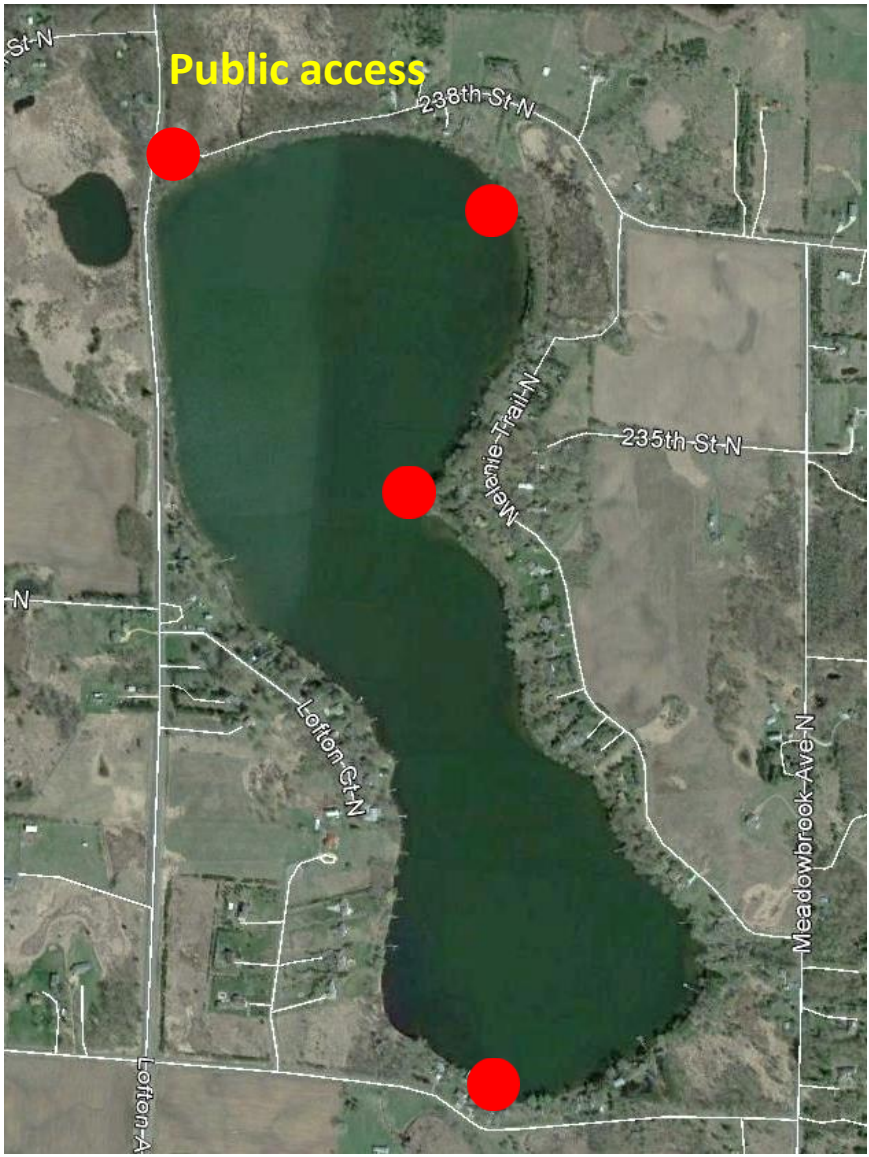
  7,000 objects = 1 ZM

  3.5 objects/minute = 30 hrs of searching for 1 ZM



Search Strategies

- Look at high probability targets like lake access and drift points.
- Search patterns are parallel to shore in shallow water.
- Search efficiency test helps to put search results in perspective.



Search Efficiency Tests

- 0-60% of the objects recovered is typical range.
- 30% found is about average.

Early Detection Strategies

Ramsey County

12 lakes with public access monitored based on availability

- Plate samplers at public access
- Search survey at public access

Mpls Parks and Rec Board

5 lakes have full-time inspections

- Boat inspectors conduct weekly searches at public accesses
- Intensive search every 4 years

What Happens If AIS Are Found?

Rapid Response – 3 part plan

1. **Pre-planning** (growth suitability, materials, permits)
2. **Rapid assessment** (search, index)
3. **Rapid action** (eradication or management)

1. Rapid Response – Pre Planning

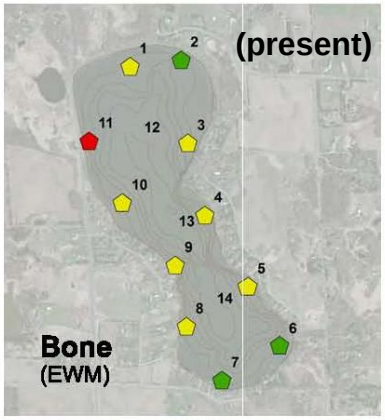
- **Suitability maps** – the kind of growth that is expected sets priorities
- **Materials for treatment** – containment barrier and applicator should be lined up
- **Permits**
- **Public relations and meetings**
- **Authorization** – can you block a public access if necessary?
- **Budget** - Is a treatment fund available ($30,000 or more for zebra mussels)?

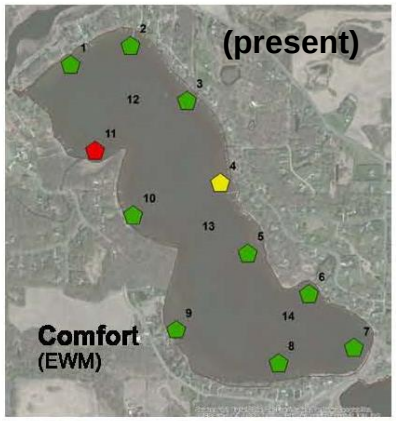
1. Pre-Planning

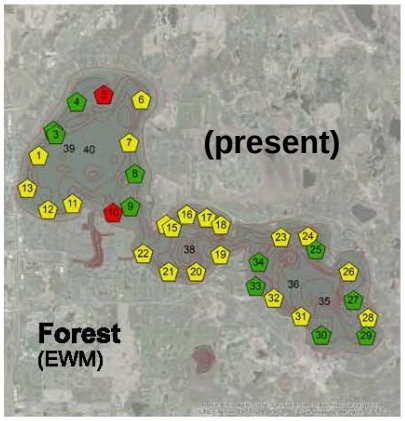
Eurasian Watermilfoil Suitability Criteria

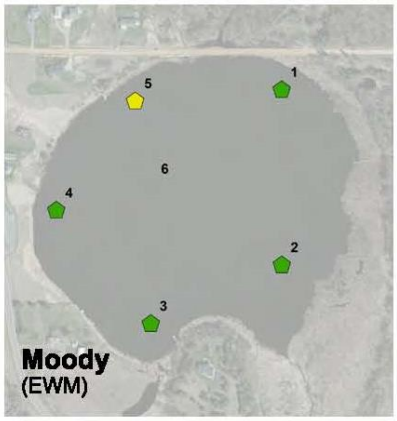
- **Sediment nitrogen (>10 ppm by volume)**
- **Organic matter (>20%)**

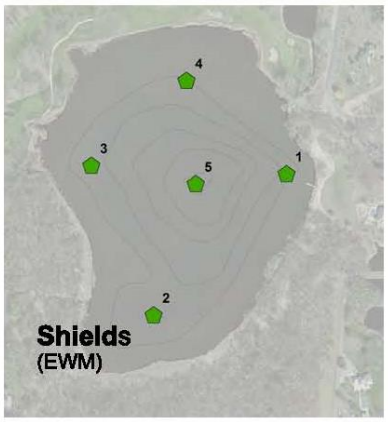
(Comfort Lake/ Forest Lake Watershed District lakes)

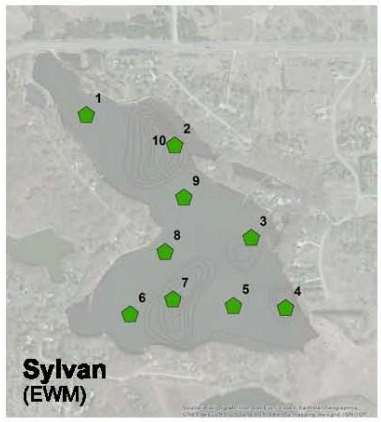












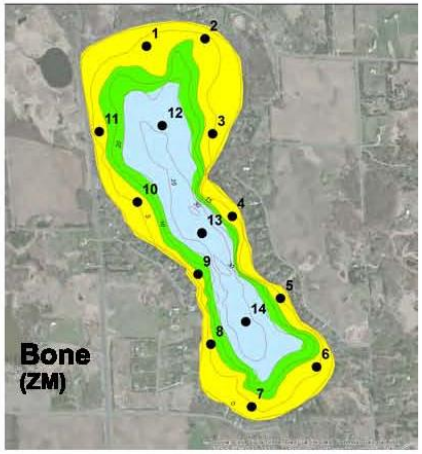
1. Pre-Planning

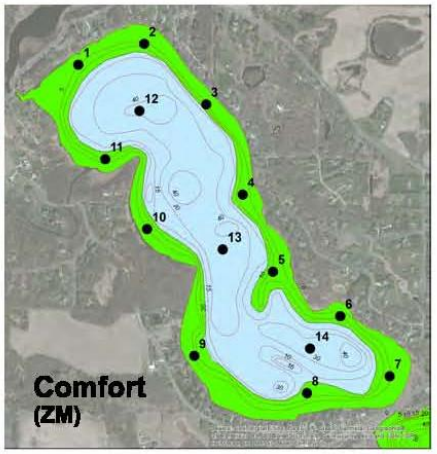
Zebra Mussel Suitability Criteria

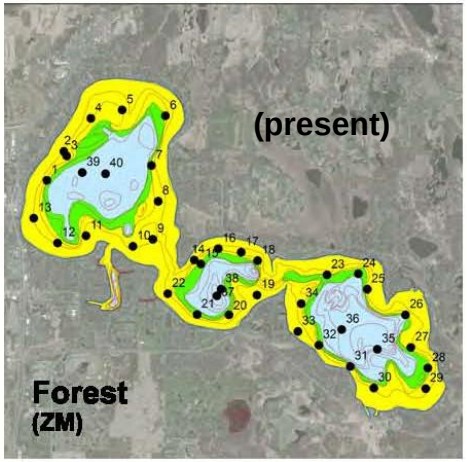
- **Calcium**
  (>30 mg/l)
- **Chlorophyll**
  (2-8 µg/l)
- **Dissolved oxygen**
  (>7 mg/l)

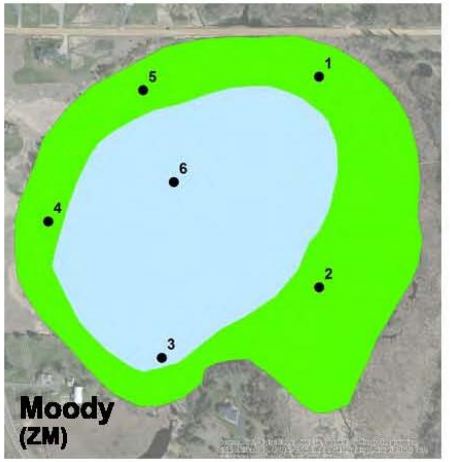
(Macki and Claudi, 2010)

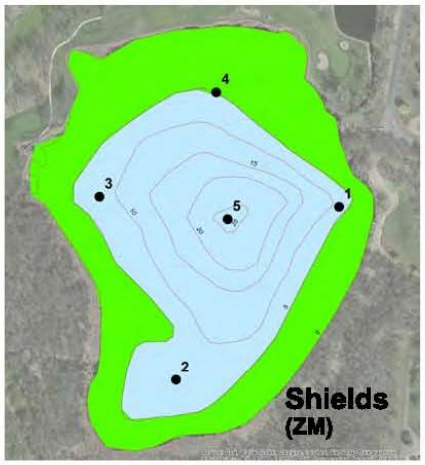
(Comfort Lake/ Forest Lake Watershed District lakes)

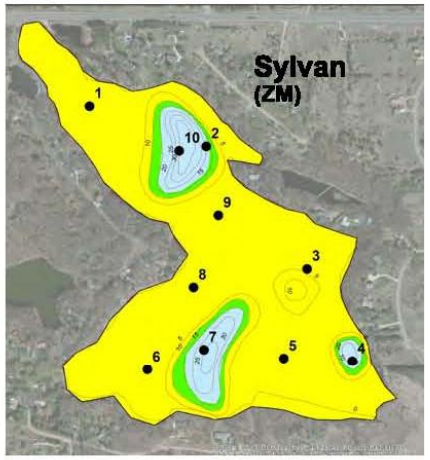






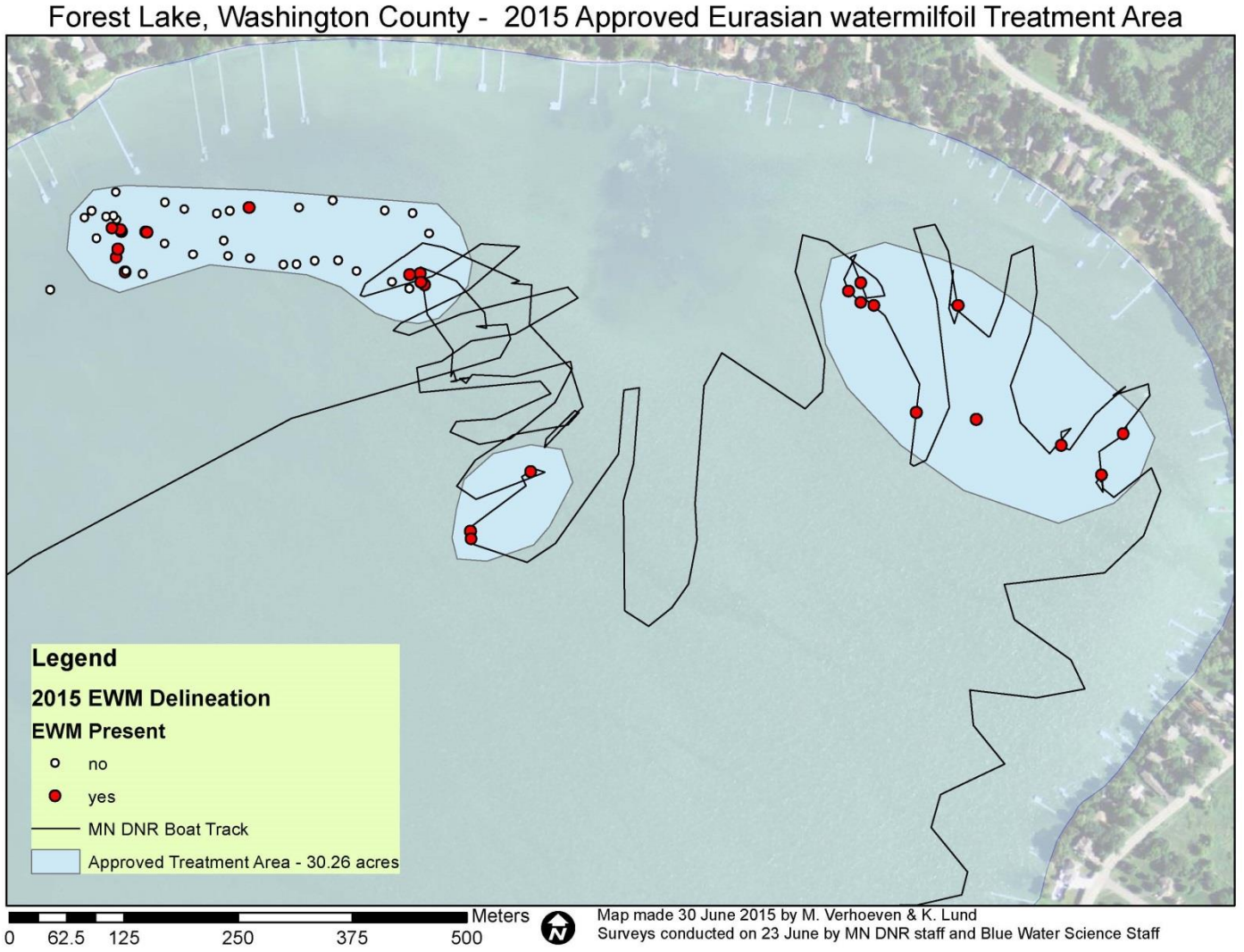




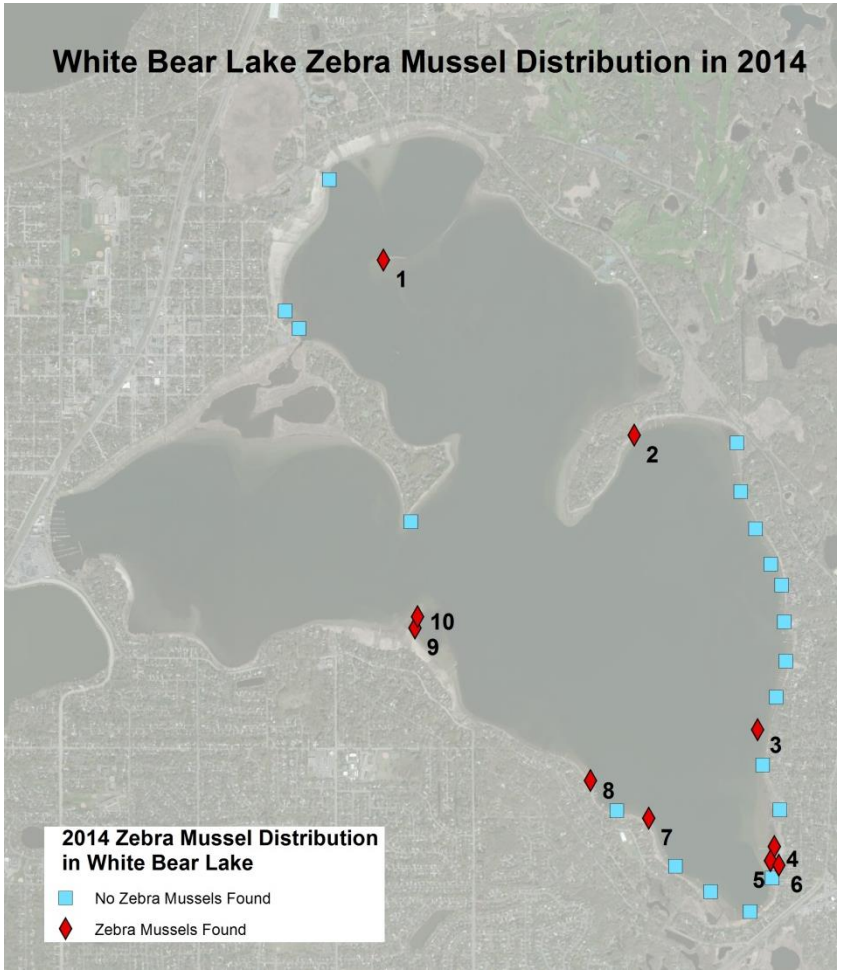


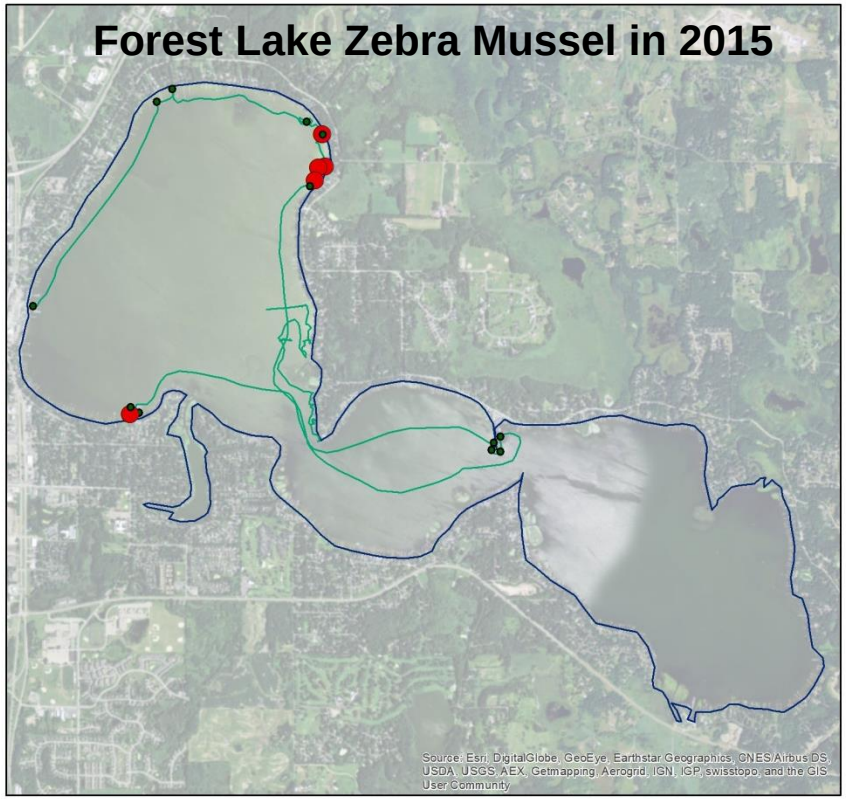
2. Rapid Response Assessment: EWM

EWM: After initial detection, conduct a thorough search of the area.



2. Rapid Response Assessment: ZM





Forest Lake GPS Points July 3, 2015

- 0 Zebra Mussels Found
- 1 Zebra Mussel Found

Forest Lake, Washington County
Inventory Number: 820-159-00

Blue Water Science
Steve McComas
UTM NAD 1983

Rapid Response Assessment Search Results for ZMs

	Objects Searched	Search Hours	Sites with ZMs	ZMs/objects
Green	1,200	13	**6**	1 per 86 rocks
John	8,500	31	**12**	1 per 121
Big Cormorant	21,000	86	**3**	1 per 7,000
White Bear (Washington Co)	2,400	20	**10**	1 per 240
Forest (Washington Co)	920	5	**6**	1 per 184
Independence – 1	1,500	8	**2**	1 per 83
Christmas – 1	23,000	125	**1**	1 per 5

(green shading = unsuccessful eradication)

Should an Eradication Attempt Occur?

Zebra Mussel Example:

- Compile an eradication index
- 10 criteria, total points = 1,000

ZM Eradication Index Criteria

1. Public access inspection protocols.
2. Early detection searches and frequencies.
3. Rapid assessment: up to 30 hours.
4. Number of ZM locations in lake.
5. ZMs: mature or juveniles.
6. Number of ZMs per object.
7. Potential treatment setting in lake.
8. Treatment area <10 ac?
9. Potential for ZM re-introduction.
10. Lake size (up to 300 ac).

Eradication Index Scores and Actions

	Index Score	Action	Results
White Bear	**280**	No treatment	Management
Forest	**305**	No treatment	Management
Big Cormorant	**410**	No treatment	Management
Independence	**300**	Copper sulfate, KCl	Management
Christmas	**740**	Zequanox, KCl, CuSO4	Management

Conclusion: A high score is necessary to consider an eradication attempt.

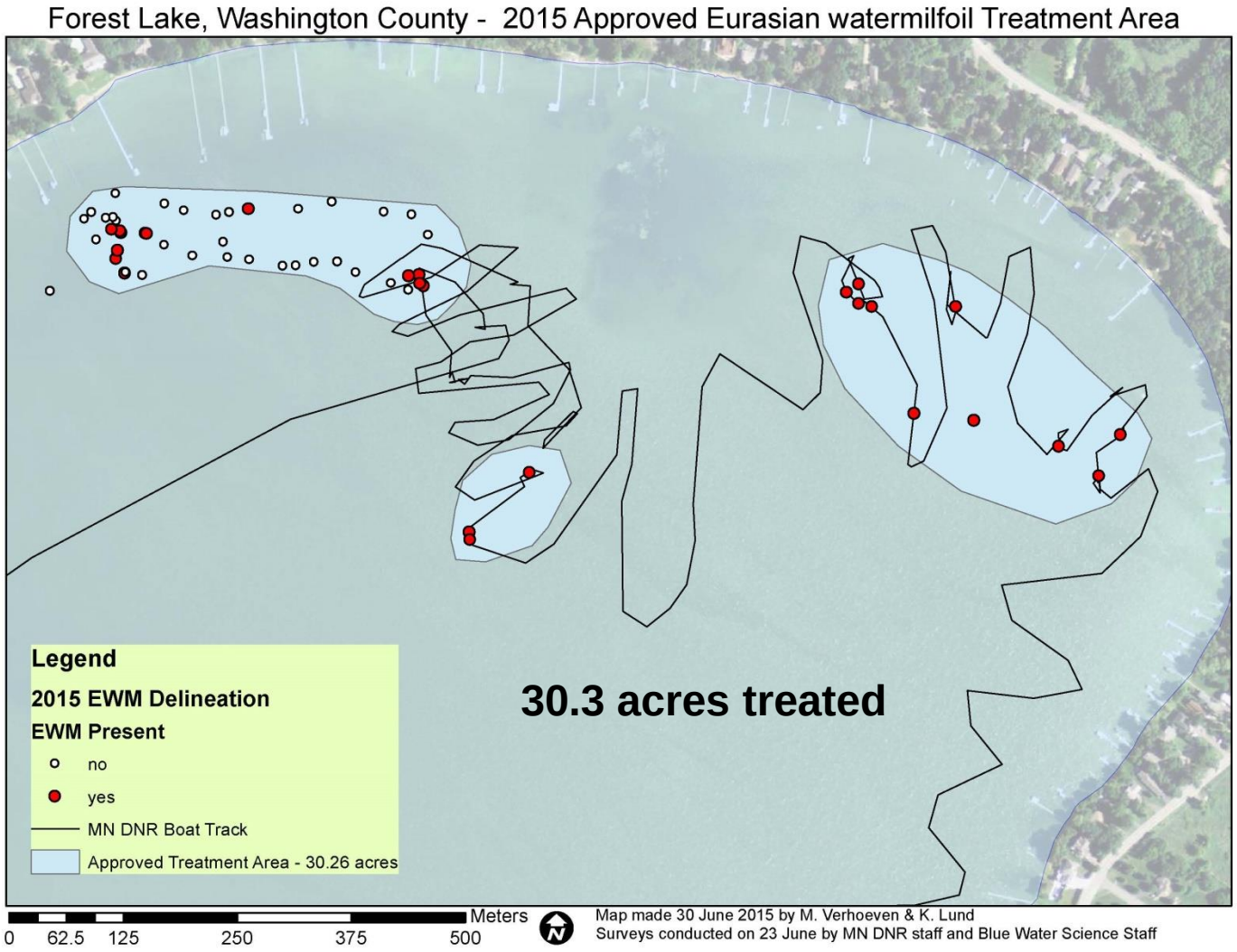
2. ZM Rapid Response Assessment – What did we learn

- Need to be fortuitous (lucky) to find an introduction early
- 2 or more sites will make an eradication success unlikely
- Need a high ZM index score to take action
- Eradication index can be used for other AIS

3. Rapid Response Action - EWM

EWM: Aggressive control: July 2015

(eradication was not the objective)

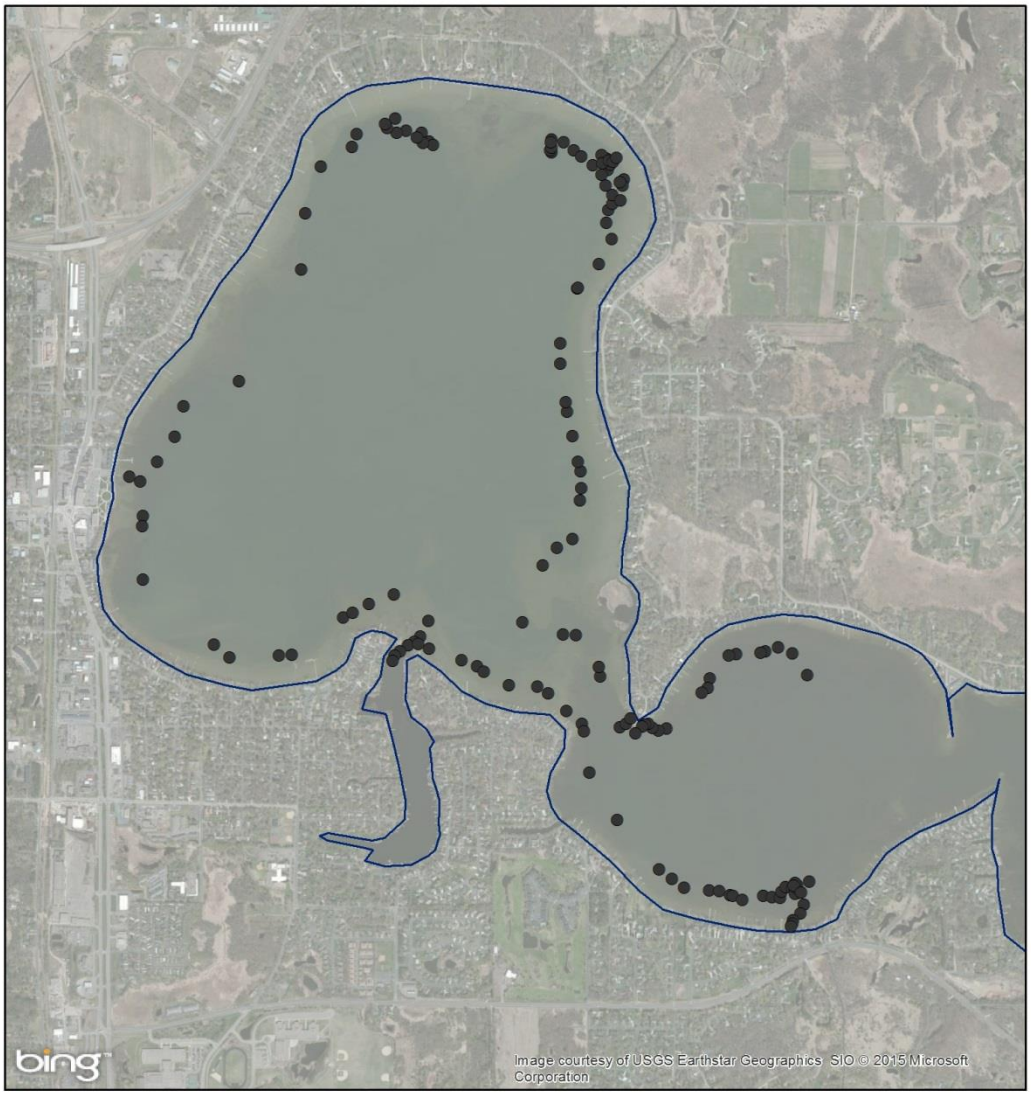


EWM Rapid Response Action: Sept 2015

- Not eradication.
- Temporary containment.
- Long-term control.

(Forest Lake, MN)

Forest Lake EWM Assessment
September 18, 2015



- No Eurasian Watermilfoil

Sites Sampled September 18, 2015

Forest Lake, Washington County
Inventory Number: 820-159-00

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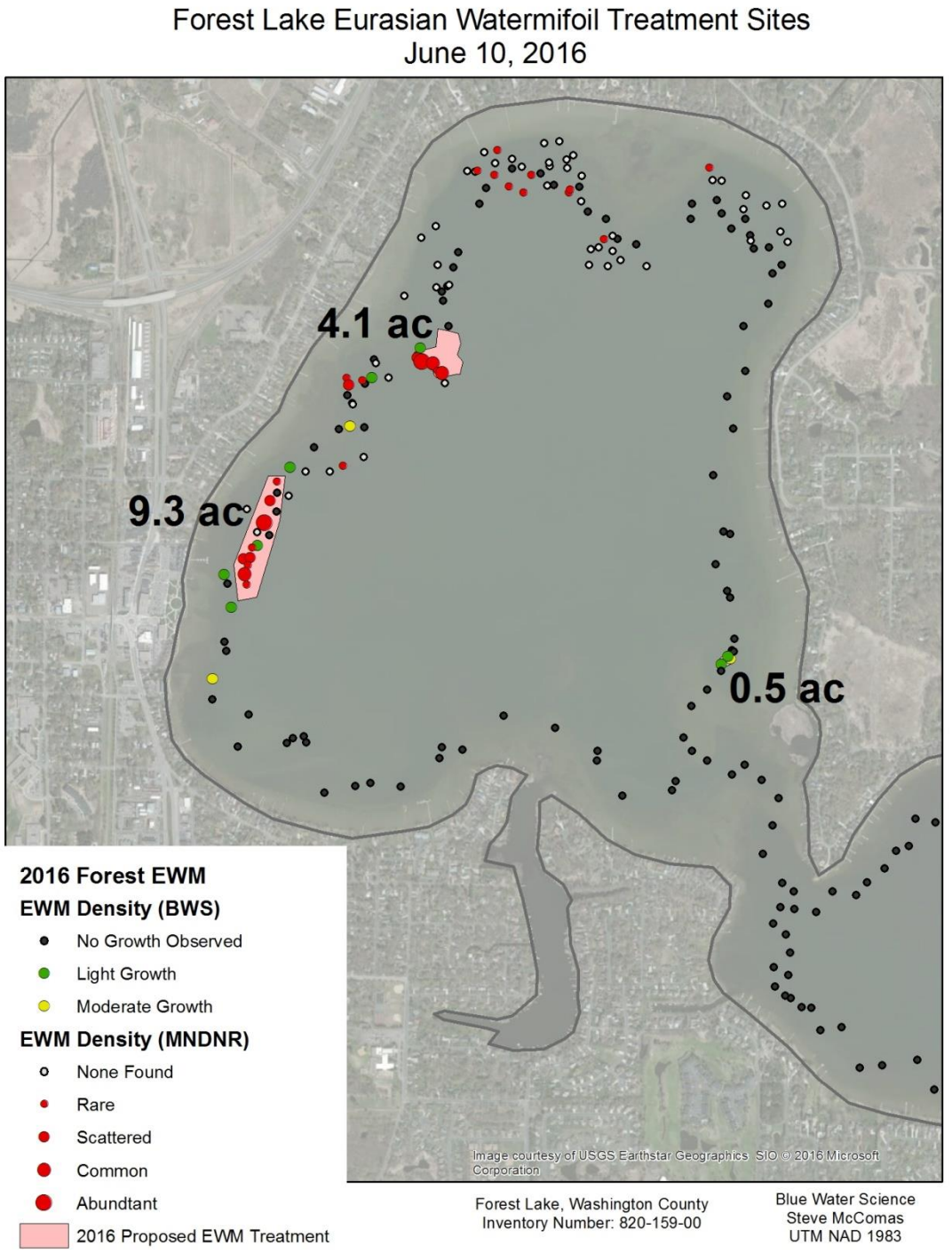
UTM NAD 1983

EWM Long Term Control: June 2016

- No heavy growth observed.

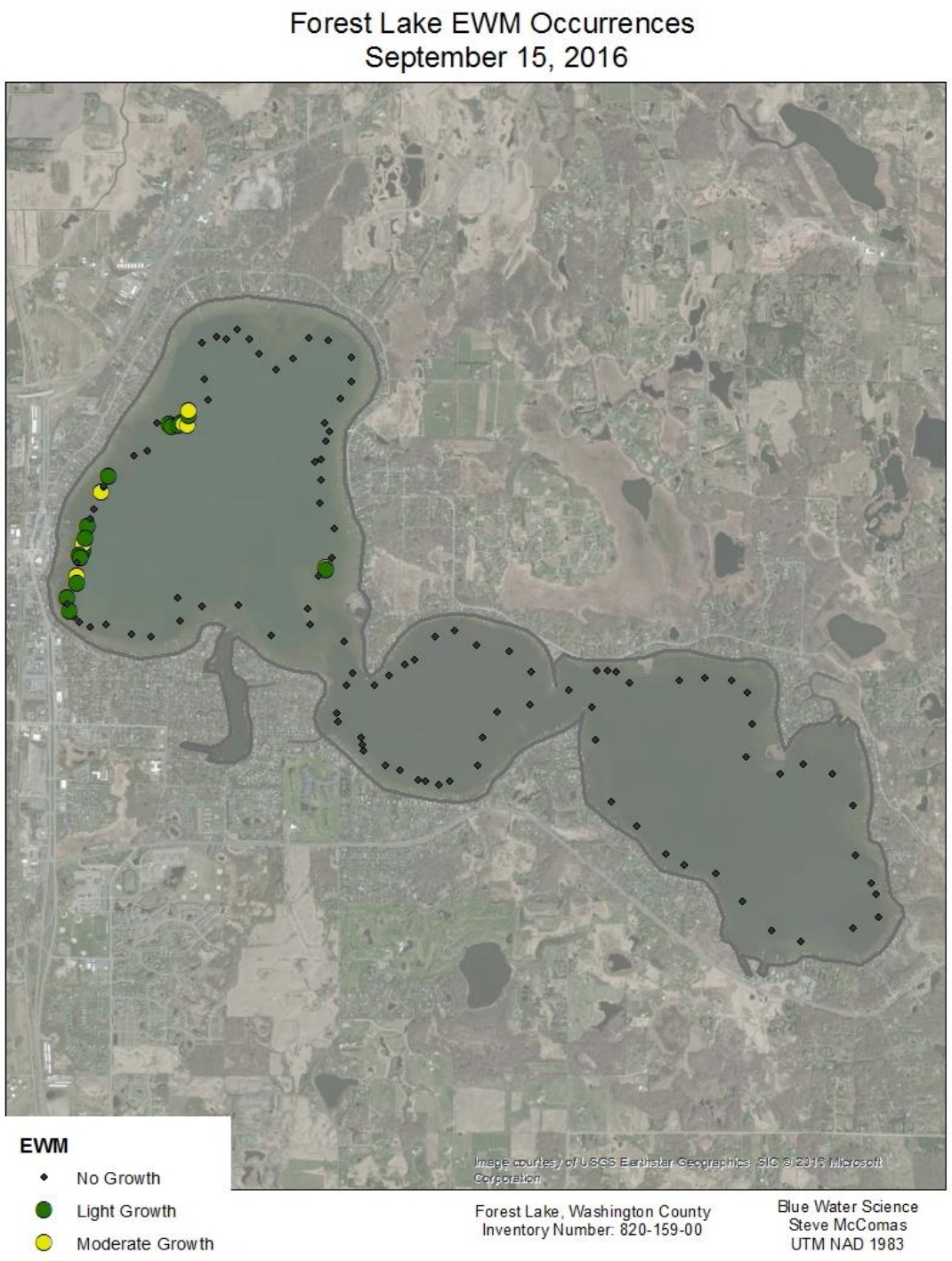
(Forest Lake, MN)



EWM Long Term Control: Sept 2016

- No heavy growth observed.

(Forest Lake, MN)



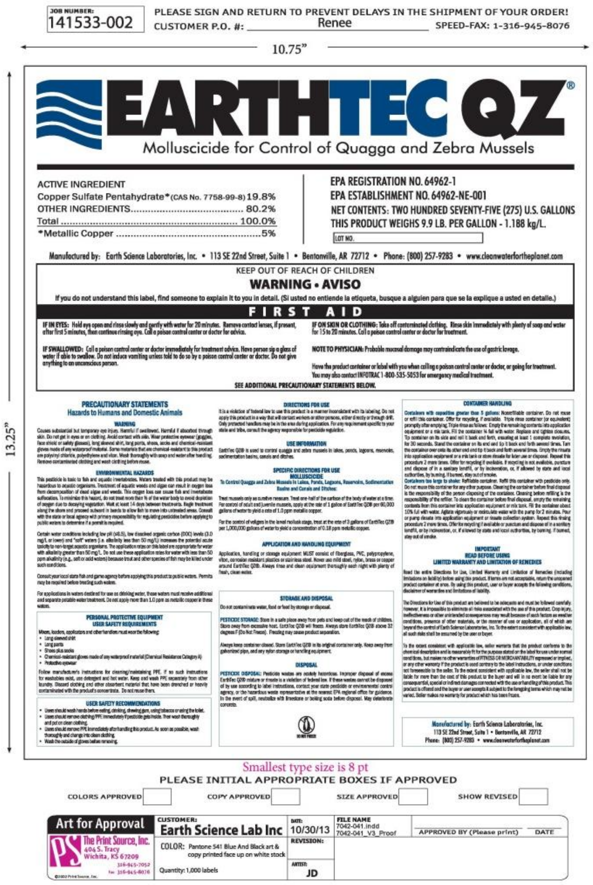
3. Rapid Response Actions - ZM

Three products that are known to kill zebra mussels

1. Zequanox (dead bacteria)(expensive)
2. Potash (KCl)(not registered)
3. EarthTec ($CuSO_4$)(good candidate)

(Tarps have also been used.)

ZM Eradication: EarthTec ($CuSO_4$)
(Product Is Registered)



3. Rapid Response Action Summary

Eradication

- Contact authorities that an eradication is going to occur
- Permit updated
- Set barriers and apply CuSO4
- Monitor
- Cost $10,000-$30,000 per site

-- or --

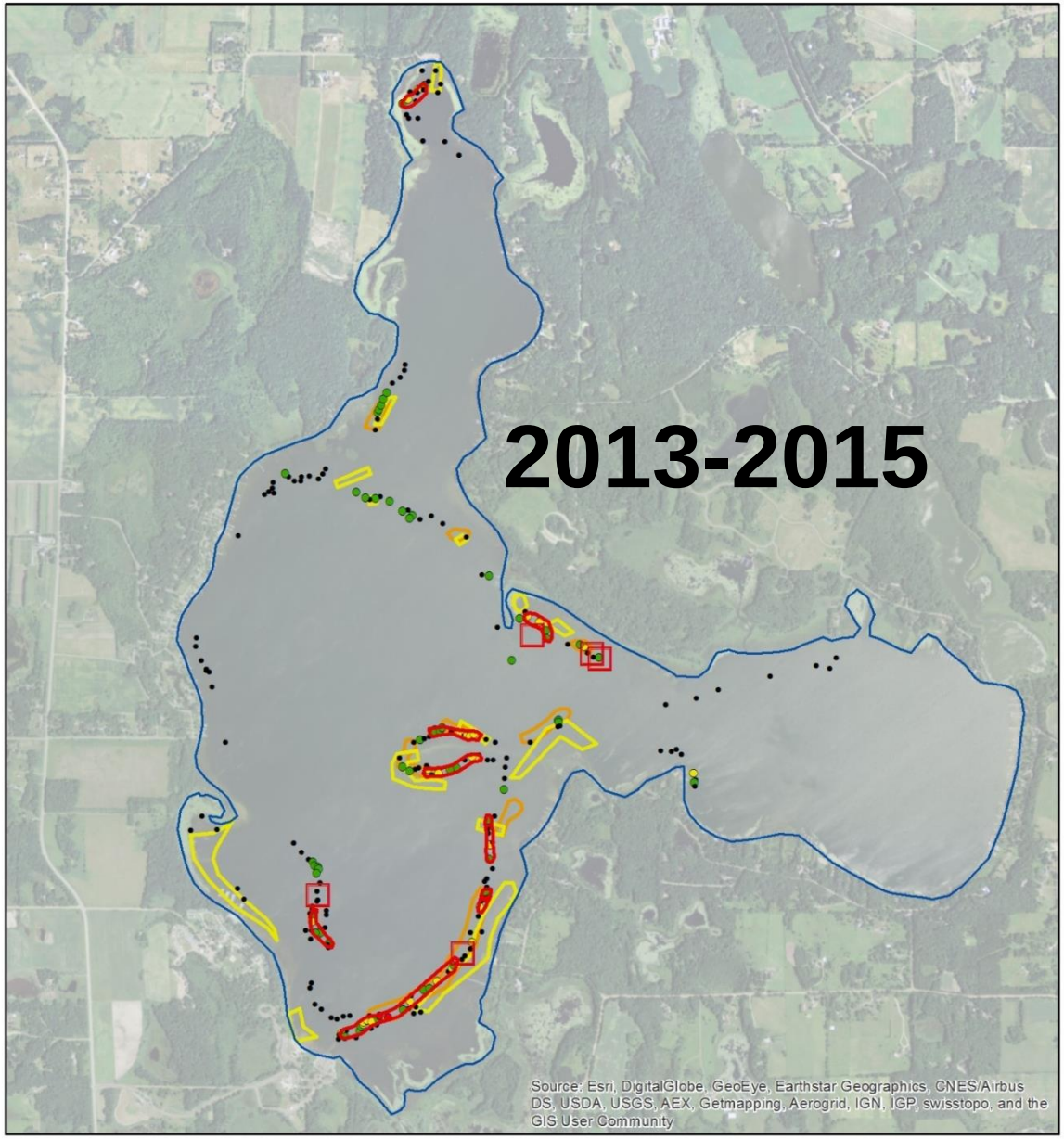
Contain/Control

- Long term small-scale control
- Monitor
- Cost of management is variable: water quality and AIS distribution and density

Big Marine EWM Control

2, 4-D or Triclopyr

Two treatments within 12 hours

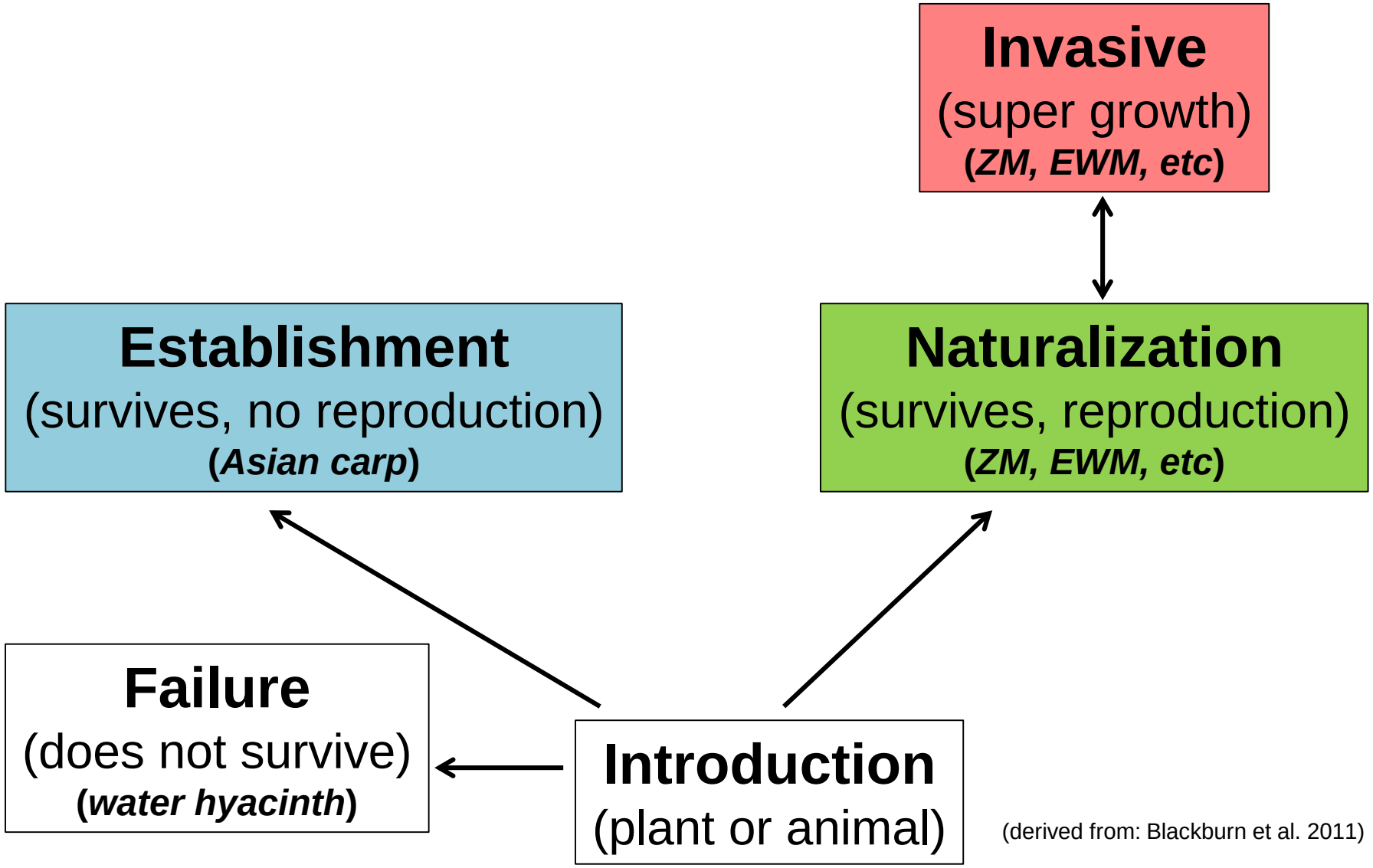


Control/Management Actions for Zebra Mussels

(small scale projects)

Zebra Mussel Grabber

AIS Growth Possibilities



(derived from: Blackburn et al. 2011)

White Lilies

Summary

AIS Program Components

- Prevention
- Detection
- Response *(pre-planning, assessment, action*)
- Management

Applies to a variety of AIS