

# Treatments to Eradicate Zebra Mussels in Christmas Lake

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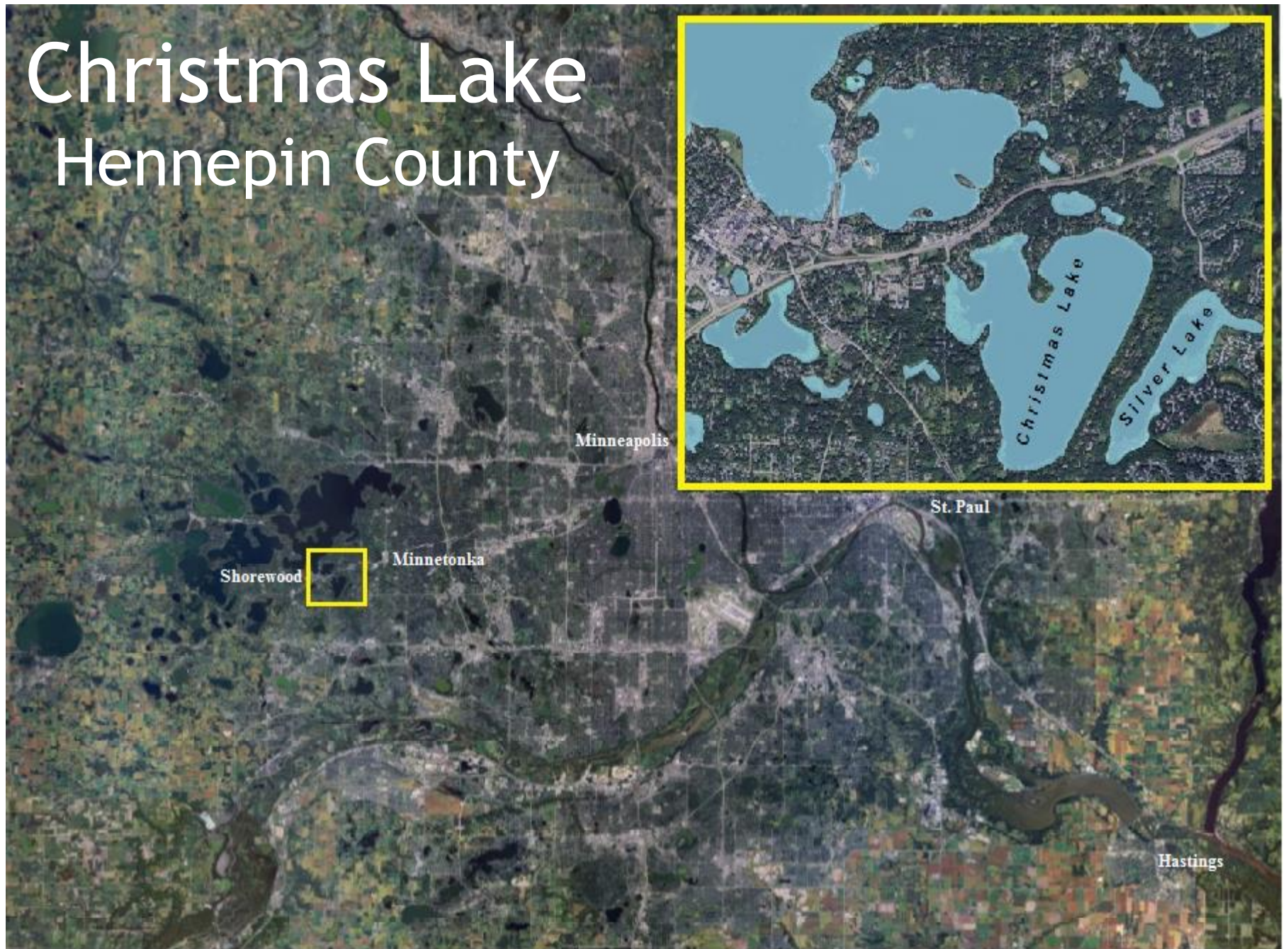
*2015 Pacific Northwest Economic Region- 25<sup>th</sup> Annual Summit  
July 13th, 2015  
Big Sky, Montana*



# Outline

- Initial infestation and rapid response
  - Background AIS and early detection monitoring on Christmas Lake
  - Stakeholder coordination
- Zebra mussel control plan
- Pesticides
  - Background information
  - Process
  - Efficacy results
- What would we do differently – take away
- Management for the future
  - DNR pilot projects

# Christmas Lake Hennepin County



# Initial Infestation and Rapid Response

- MCWD AIS early detection monitoring program in place since 2010
- Infestation: August 2014
  - Zebra mussels found on settlement sampler
  - DNR confirmation + additional searching
- Rapid Response:
  - Containment barrier installed
  - Zebra mussel population assessment



MINNEHAHA CREEK  
WATERSHED DISTRICT

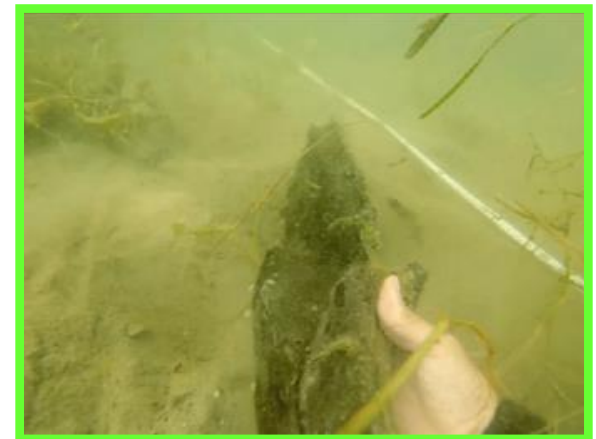
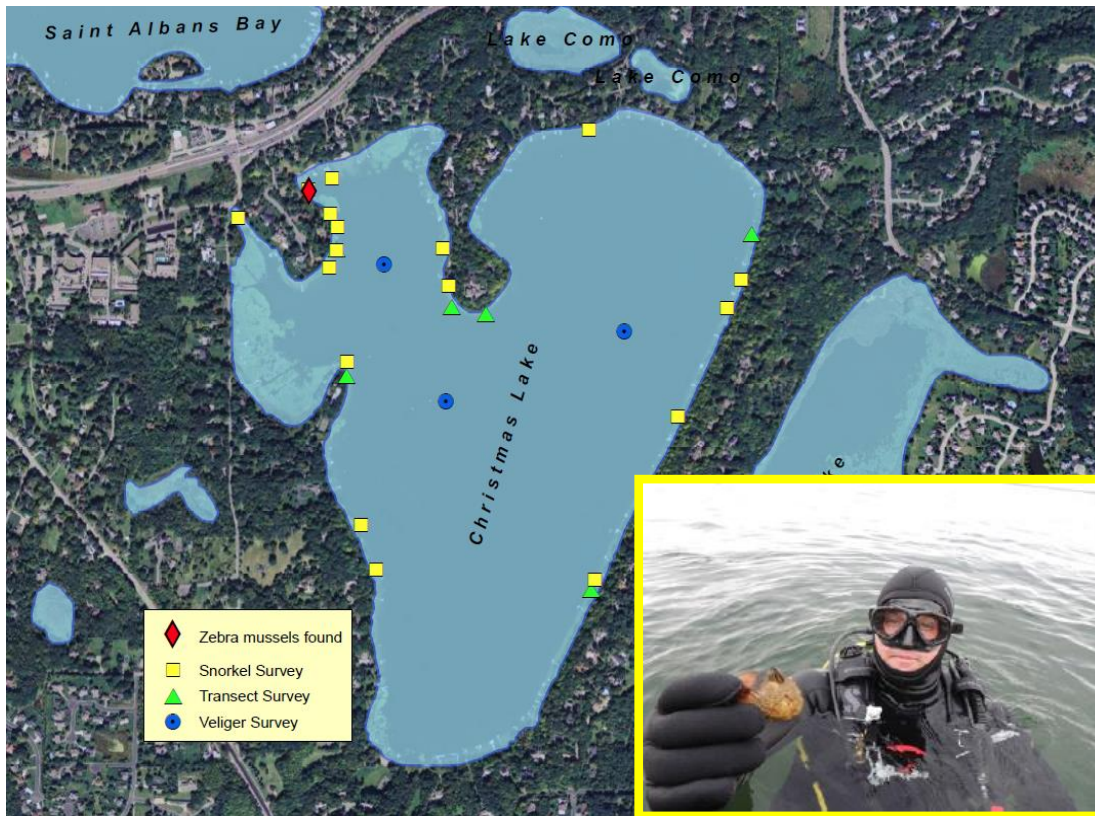


# Project Partners

- Minnehaha Creek Watershed District
- University of Minnesota
- Blue Water Science
- Christmas Lake Association
- City of Shorewood

# Zebra mussel population assessment

- Is the population lake wide?
- Is the population reproducing?
- Survey efforts= 100+ hours



# Christmas Lake Zebra Mussel Control Plan

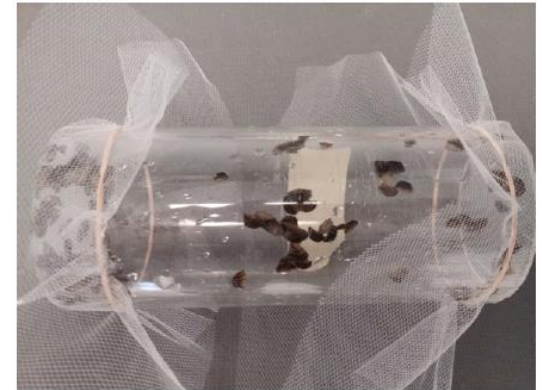
- Objective: zebra mussel eradication
- Control methods - pesticides proposed
  - Zequanox®
  - EarthTec QZ®
  - Muriate of Potash
- Pre and post treatment monitoring protocols developed
- Enclosed treatment area using a curtain barrier

# Pre and Post Treatment Monitoring

- Protocol developed by University of Minnesota 
- Pesticide product efficacy testing
  - Concentration/residual monitoring
  - Zebra mussel mortality



Image from Marrone Bio Innovations, Inc.



Photos by MCWD





## About the product:

- Marrone Bio Innovations
- Biopesticide
  - *Pseudomonas fluorescens*  
(dead bacteria cells)
- Highly selective (zebra and quagga mussels)
  - Destroys digestive system when ingested
- Low risk to non-target organisms
- Examples of application: Illinois (efficacy/research) and Minnesota (efficacy/research management)
  - < 100% kill in open water

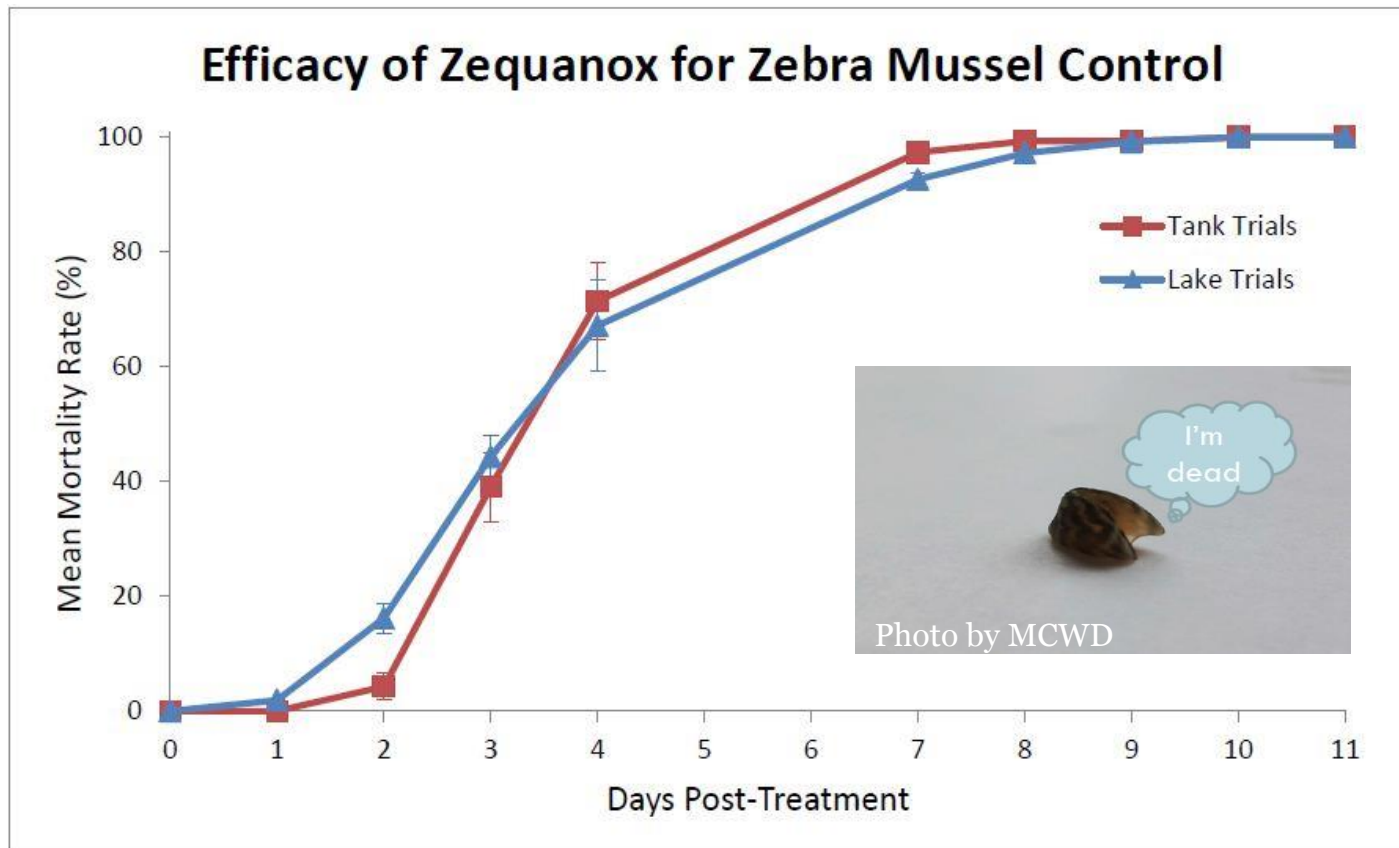
# Zequanox® in Christmas Lake

- Approved open water use, July 2014
- Treated September 2014 (~5,500 juveniles)
- Area treated: 3,000 feet<sup>2</sup> (0.07 acres)
- Product and labor cost: **\$6,800**
- Barrier cost: **\$1,350**



# Zequanox® efficacy testing

- 100% mortality achieved by Day 7 (tank trials)
- Lake trials showed similar trends





## About the product:

- Derived from EarthTec (algaecide/bactericide)
  - Water treatment plants, lakes, irrigation lines, etc.
- Copper sulfate pentahydrate
  - Cupric ion form (environmentally safe)
- Selective (quagga and zebra mussels)
- Non-target effects (invertebrates and fish)
- EPA approved in May 2014 (24 states)

# EarthTec QZ<sup>®</sup> in Christmas Lake

- Label restriction on application frequency
- Special Local Needs required to maintain lethal concentration
- Treated October-November 2014
- Area treated: 32,000 feet<sup>2</sup> (0.75 acres)
- 3 treatment events (additional bump treatments)
- Product cost and labor: **\$1,500**
- Barrier cost: **\$2,700**

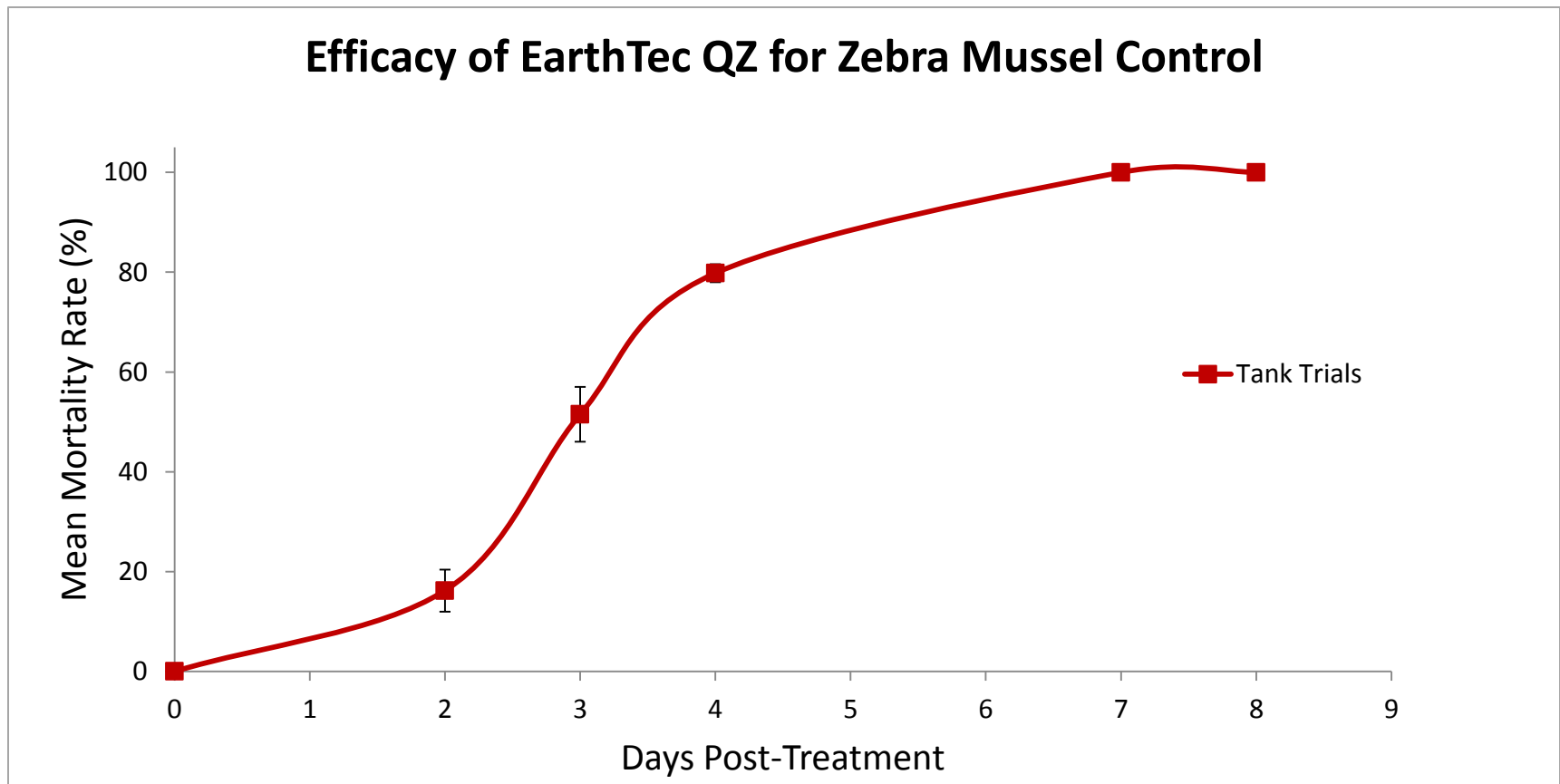


# 24c Special Local Need Registration

- EarthTec QZ submitted request to Minnesota Department of Agriculture
  - Current label restrictions: apply no more than every 14 days
  - Request: greater frequency than 14 days to maintain adequate copper levels
- 5 week process (preparation- approval)
- MDA issued SLN registration and approve new product label
- \*\*Federal label change approved, July 2015

# EarthTec QZ<sup>®</sup> efficacy testing

- Lake application: every 30-40 hours to maintain lethal concentrations
- Product efficacy: 100% mortality achieved by Day 7 (tank trials only)



# Muriate of Potash (Potash)

About the product:

- Potassium chloride
  - $K^+$  (lethal) interferes with gill respiration
- Highly selective (zebra and quagga)
  - compared to other molluscides (Waller et al. 1993)
- Non-target effects (native mussels)
- Not registered for use
  - Previously used in Virginia, Texas, and Manitoba, Canada



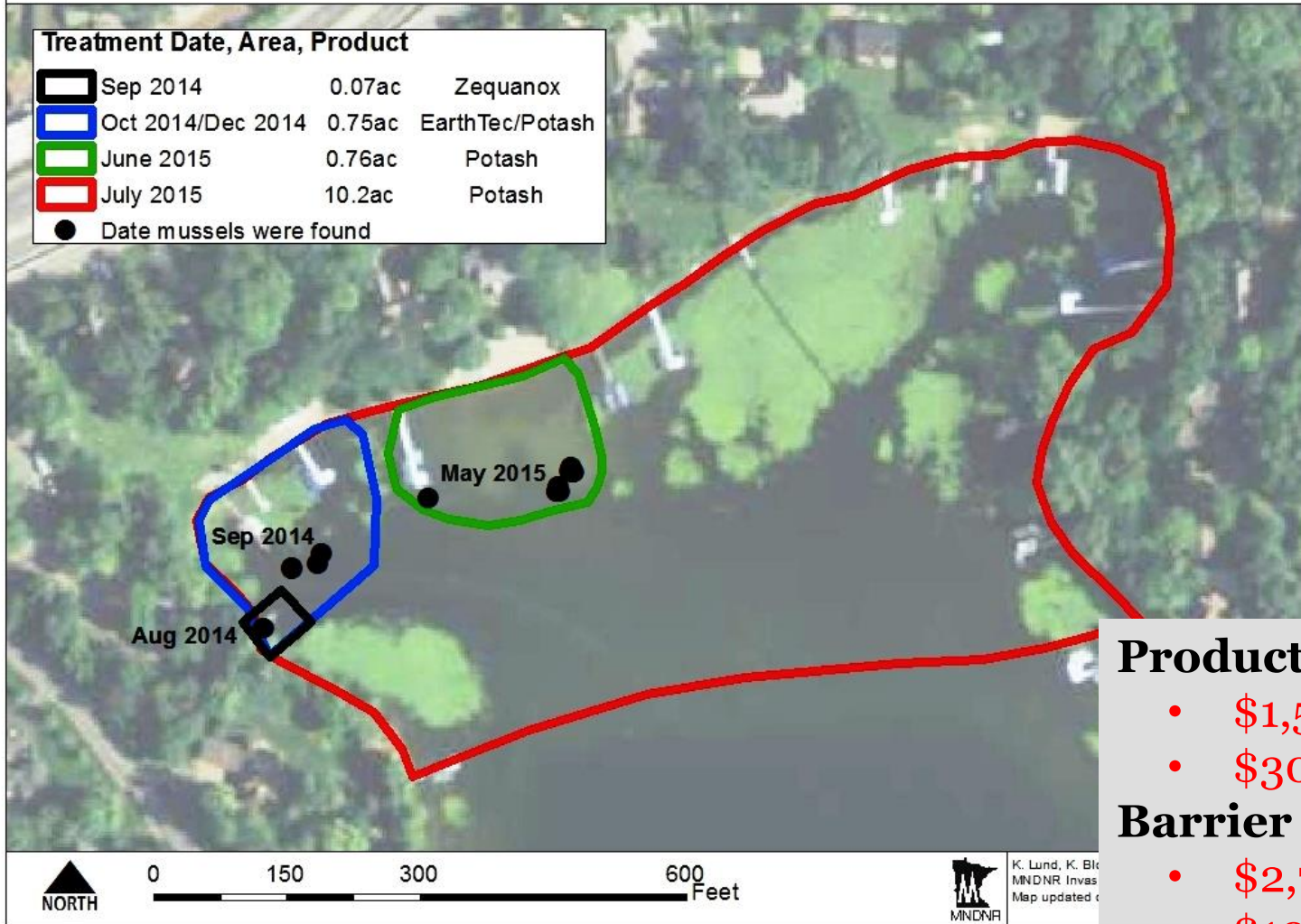
# Quarantine 18c Emergency Exemption

- MDA submitted to EPA
- 9 week process (preparation-approval)
- Issued for 3 years
- 3 treatment events, to date
  - December 2014, June 2015, June/July 2015



# Potash Historical Treatments

## Christmas Lake, Hennepin County: Zebra Mussel Treatments



### Product & labor cost:

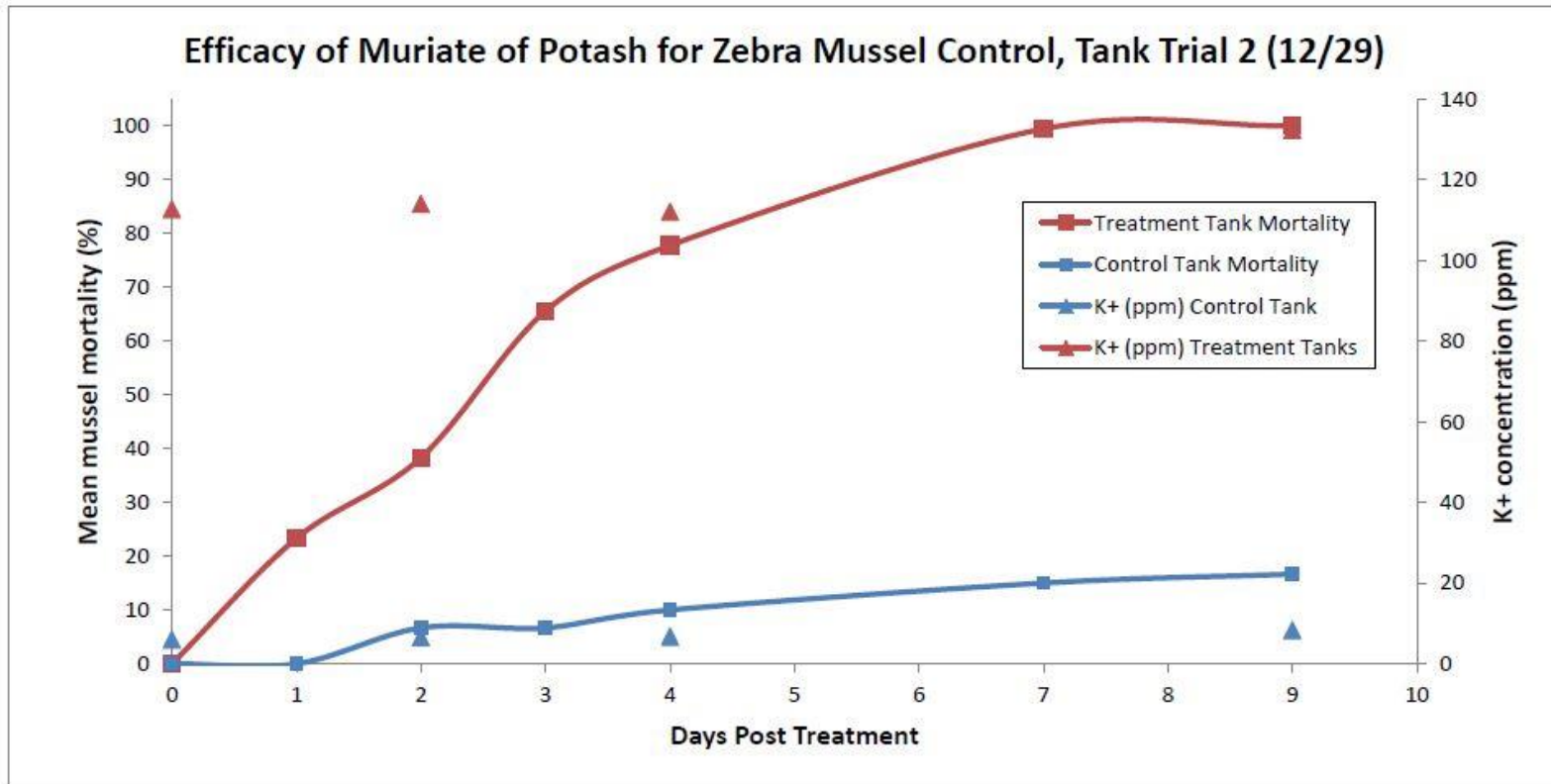
- \$1,500 (2014)
- \$30,000 (2015)

### Barrier cost:

- \$2,700 (2014)
- \$10,500 (2015)

# Potash efficacy testing

- Lake application:
  - Poor mixing at temperatures  $<40^{\circ}\text{F}$  (December 2014)
  - Bump treatments every 3-5 days
- Product efficacy: 100% mortality achieved by Day 9



# Were the treatments successful?

- Aquaria testing: all products 100% effective!
- Lake testing: more difficult to monitor...
  - Field measuring equipment
  - Curtain barrier
  - Cage trials
- Post-treatment assessments are essential
  - SCUBA and snorkel surveys
  - 600+ hours of monitoring
- Treatment area size- How big?
- Next steps...



Photo by U of M

# Takeaways from Rapid Response

- Early detection monitoring
- Initial and thorough population assessment
- Pre and post-treatment monitoring
- Partnerships and good communications



Photo by: MCWD

# Zebra mussel management in the future

- Selective pilot projects
  - review panel
  - data repository (U of M)
- Resources available
  - monitoring protocols (posted online, DNR and MAISRC)
  - training- U of M extension
- Additional research support
  - aquaria trials



# QUESTIONS

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