Zebra mussel eradication efforts in Minnesota

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INVASIVE MUSSEL COLLABORATIVE WEBINAR JANUARY 19, 2018





Outline

- Zebra mussel infestations in MN
- Control methods & case studies
- Eradication efforts in MN
 - Christmas
 - Independence
 - Ruth
 - Minnewashta
- Lessons learned & final thoughts



THE FACTS: Zebra mussels in MN



- ▶ 1989: First discovered Duluth harbor
- > 2010: First discovered in metro lake
- < 2% of lakes are listed as infested</p>
- ▶ 150 lakes, rivers and wetlands confirmed
- ▶ 153 bodies are listed due to connectivity
- ▶ **42%** new infestation as of 2014

Control efforts are challenging... why?



Physical Control Methods



Hand removal (via SCUBA)

labor intensive, hard to keep up!

- Lake Mille Lacs, MN
- Lake George, NY

Tarps & benthic barriers

non-selective, destruction of habitat

Lake Tahoe, CA/NV (Asian clams)

Drawdowns

long seasonal exposure, non-selective

Lake Zumbro, MN (winter)

Molluscicide Control

Open water applications

- Product selection
 - ► Copper (Cu²⁺)
 - ▶ EPA approval (e.g. Potassium [K⁺])
 - Zequanox
- Concentration & exposure time
- Impacts to non-target organisms?



DNR Pilot Projects



Image from Marrone Bio Innovations, Inc.



Eradication 'minded' projects approved by DNR

- Small, localized population
- Stakeholder interest and support necessary
- Majority of new infestations do not qualify...non-localized

Pre & Post Treatment Monitoring

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

Lakewide Survey Efforts IS THE POPULATION LAKE WIDE?

IS THE POPULATION REPRODUCING?

HOW DO WE ACCOUNT FOR UNCERTAINTY?







Photos by MNDNR & MAISRC

Pilot Projects 2000-present

Year	Location	Treatment Type	Result	
2016	Lake Minnewashta (Carver County)	EarthTec QZ® (copper product)	Post-treatment monitoring will occur in spring 2017.	
2015	Ruth Lake (Crow Wing County)	EarthTec QZ® (copper product)	Adult zebra mussel found outside treatment area in fall 2016. Post- treatment monitoring will continue through 2018.	
2014 - 2015	Christmas Lake (Hennepin County)	Zequanox®, some physical removal, EarthTec QZ® (copper product), potassium chloride	Zebra mussels found lakewide post- treatment.	
2014 - 2015	Lake Independence (Hennepin County)	EarthTec QZ® (copper product), potassium chloride	Zebra mussels found near boat access post-treatment.	
2011	Rose Lake (Otter Tail County)	Cutrine Ultra® (chelated copper)	Adult zebra mussel reported in 2016 (no zebra mussels had been found since 2012).	
2011	Lake Irene (Douglas County)	Cutrine Ultra® (chelated copper)	Zebra mussels found post-treatment.	
2000	Lake Zumbro (Olmsted County)	Mussels exposed to air by lowering water level	Zebra mussels found post-treatment, survived in remaining water.	

http://www.dnr.state.mn.us/invasives/aquaticanimals/zebramussel/pilot_project.html

Treatments of zebra mussels in Minnesota lakes

Pilot Projects



http://www.dnr.state.mn.us/invasives/aquaticanimals/zebramussel/pilot_project.html

Christmas Lake (2014-2015)



Lake Independence (2014-2015)





Ruth Lake (18-212) Crow Wing County Zebra Mussel Pilot Project Control Site Barrier Placement on September 30, 2015

Ruth Lake (2015)





Lake Minnewashta (2016-2017)







Acrylic tubes with fine mesh on each end.

DNR Perspective: Project Evaluation

	CHRISTMAS (2014-2015)	INDEPENDENCE (2014-2015)	RUTH (2015- present)	MINNEWASHTA (2016- present)
Early detection monitoring program	Х	~ sort of~	~ sort of~	Х
New infestation	Х	Х	Х	Х
Small & localized	Х	~ sort of~	Х	Х
Treatment Area Size	1-10 acres	1 acre	3 acres	29 acres
Curtain barrier	Х	Х	Х	Х
Cost	\$64,000	\$12,000	\$10,000	\$32,000
Labor	600 hours	300 hours	200 hours	100 hours
Outcome			TBD	TBD

Treatment Success???

- Aquaria testing:
 - All products 100% effective!
 - Created monitoring protocol
 Refining treatment process
- BUT...Difficult to find and contain all zebra mussels early
- Threat of re-infestation after eradication efforts



Lessons Learned

- Early detection (look before they show up)
- Extensive in-lake surveys (dive & repeat)
- Treatment size (how much to buffer?)
- Treatment best practices
 - Curtain barrier
 - Concentration monitoring
 - Cage trials/bioassays
- Partnerships and good communications



Photo UMN

