



Zebra Mussel (10 mm) Found in Lake Johanna on September 13, 2018

Zebra Mussel Rapid Response Assessment For Lake Johanna, Ramsey County, Minnesota, September 13-14, 2018

Prepared for:
Ramsey County
Parks and Recreation -
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Summary

The first zebra mussel observation in Lake Johanna, Ramsey County, was reported on August 18, 2017 and was found during an early detection survey and was found at the public access. On August 21, 2018, MnDNR, Rice Creek Watershed District, and Ramsey County staff looked for additional zebra mussels in Lake Johanna and found 5 adults zebra mussels. The searchers spent a total of 5.6 hours to search different areas in Lake Johanna. Blue Water Science conducted searches on September 13 and 14, 2018. Blue Water Science searched for 20 hours and found one 10 mm zebra mussel on a rock at the public access and another 10 mm zebra mussel on a rock to the east of the public access (Figures 1 and 2). As of September 14, a total of 8 zebra mussels have been found, 7 at the public access and 1 at a location east of the public access.

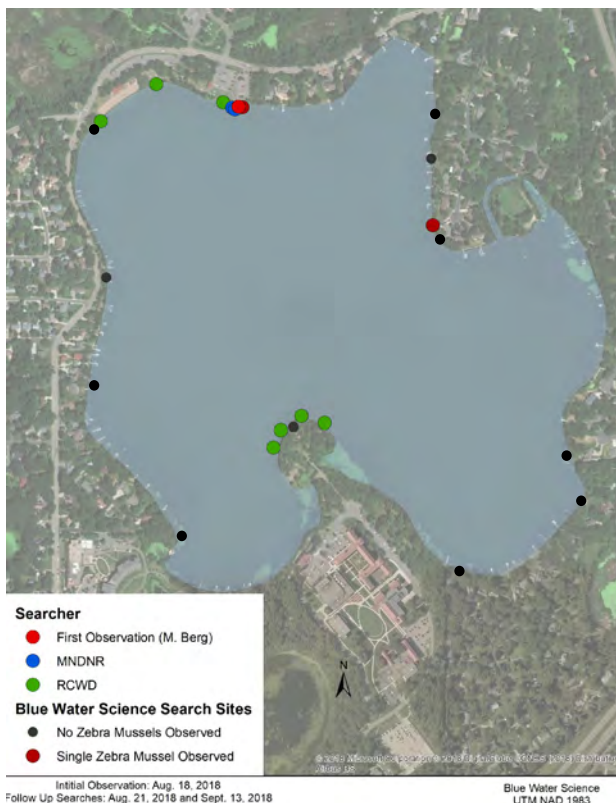


Figure 1. Zebra mussels found in Lake Johanna, collected in 2018. Two distinct year classes were found (top numbers on ruler are in mm).

Figure 2. Location of the search sites for Lake Johanna on September 13-14, 2018.

Next Steps: Zebra mussels have been found at 2 separate locations and based on shell lengths, there are 2 year classes. Because zebra mussels were found at 2 sites and because at least 2 year classes were present, the odds are high that zebra mussels may be spawning in Lake Johanna but are still at low densities. A zebra mussel eradication effort would have a low probability of success and is not recommended. Long-term management should include water quality monitoring and potential small scale control efforts in the future.

Overview: Locations of Zebra Mussels Found in Lake Johanna

Initially, a zebra mussel was found by a contractor doing an early detection survey (conducted on August 18, 2018). On August 21, MnDNR, Rice Creek Watershed District and Ramsey County staff conducted a follow-up survey using wading, snorkeling and scuba methods and 5 additional zebra mussels were found by the public access. On September 13 and 14, additional searching was conducted by Blue Water Science and 2 additional zebra mussels were found, one at the public access area and another on the east side of Lake Johanna (Figure 3). As of September 14, a total of 8 zebra mussels have been found.

Lake Johanna Zebra Mussels Searches

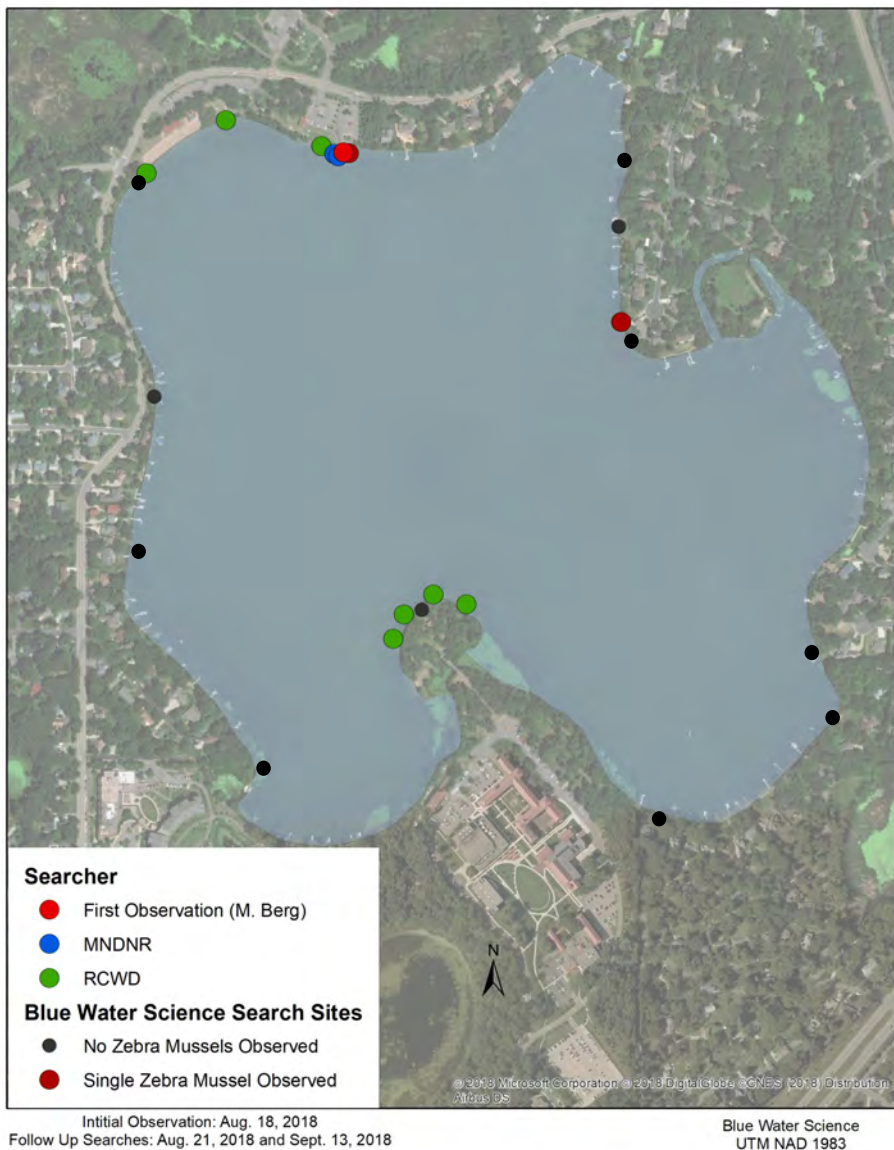


Figure 3. Two zebra mussels, both 10 mm in length, were found at 2 areas on September 13, 2018 (red dots) by Blue Water Science. This findings indicate that these zebra mussels are likely from this year and that zebra mussels could be spawning in Lake Johanna.

Search Results

Over 25 hours of searching have been conducted in Lake Johanna (Table 1). A total of 8 zebra mussels have been found, 7 at the public access and 1 to the east of the public access. Two zebra mussels found on September 13 were 10 mm in length (Figure 4).

Table 1. Search results for the zebra mussel inspection sessions on September 13-14, 2018 (BWS) and August 21, 2018 (MnDNR, Ramsey Co, RCWD).

	13 Sites Searched (Blue Water Science)	10 Sites (MnDNR, Ramsey Co, RCWD)	Total
Site description	Potential drift areas, scattered around the perimeter of the lake	High potential settling sites	All areas
Duration of search at this site (minutes)	about 50 minutes per site	20 - 50 minutes/site	20 - 50 minutes/site
Number of searchers	3 (Blue Water Science search)	4 (MnDNR, Ramsey co, RCWD)	3 - 4
Total search time (minutes)	1,200 minutes (20 hours)	338 (5.6 hours)	25.6 hours
Number of objects (rocks, branches, etc) examined in duration of the search (estimated)	3,600	1,200	4,800
Length of shoreline searched (ft)	2,000	900 (estimated)	2,900
Range of water depths (ft)	0 - 4	0 - 8	0 - 8
Total number of zebra mussels found	2	6 (5 plus the initial discovery)	8
Approximate size of zebra mussels	10 mm	20 - 34 mm	10 - 34 mm
Substrate	Sand, cobble, rocks, boulders	Sand, cobble, rocks	Sand, cobble, rocks, boulders
Search methodology	wading, snorkeling	Wading, diving	wading, snorkeling, diving



Figure 4. Two zebra mussels found on September 13, 2018 were 10 mm in length.

Lake Johanna Zebra Mussels

A single zebra mussel at 2 locations was found during the Lake Johanna zebra mussel search on September 13 and 14, 2018 (Figure 3). Size of the zebra mussels was about 10 mm (Figure 5). Both zebra mussels were found as solitary individuals on a rock in shallow water.

Zebra mussels collected on August 21, 2018 were up to 34 mm in length (Figure 6).



Figure 5. Two zebra mussels collected on September 13, 2018 were 10 mm in length.



Figure 6. Zebra mussels found in Lake Johanna, collected in 2018 represent at least 2 year classes.

Rapid Response Plan for Zebra Mussels

In this search, zebra mussels were found at 2 different locations in Lake Johanna as of September 14, 2018. A previously prepared rapid response plan, shown in Table 2, has a number of steps. The actions in August and September, 2018 involved Steps 2.1 and 2.2 (blue shading in Table 2). Step 3, the Rapid Response Action, was determined after evaluating available information. The Rapid Response Action is summarized on the next page.

Table 2. Tasks and assignments for an early detection and rapid response program for Ramsey County, Minnesota.

	Ramsey County	MnDNR	Lake Association and Others	Treatment Contractor	Blue Water Science
1. Early Detection					
1.1. Create website information.	May-Aug				
1.2. Designate contact person.	May				
1.3. Install plate samplers at public access. Check monthly. Remove in October.	Jun-Oct				
1.4. Conduct training session for volunteer searchers (optional).	Jun				
1.5. Conduct monthly targeted searches (Jul-Oct).					
1.6. Press release if zm are found.	X	X			
2. Rapid Response Assessment					
2.1. Conduct an initial exploratory search after the first report of a zebra mussel observation.	X	X			X
2.2. Conduct an expanded targeted search with diving.	X	X			X
3. Rapid Response Action					
3.1. Meet to determine treatment options. (Does the lake score on the zebra mussel eradication index make this a good candidate?)	X	X	X	X	X
3.2. If an eradication treatment is the preferred action, close public access, if necessary.	X	X	X		
3.3. Set-up containment area.				X	
3.4. Treat area within the containment area.				X	
3.5. Evaluate treatment.		X			X
3.6. Report all findings and results.	X	X			X

Zebra Mussel Eradication Index and a Recommended Action Plan

Ten criteria are considered when evaluating a potential success of conducting a zebra mussel eradication treatment. Points are assigned on a scale from 0 to 100 for each criterion. Points are added up and the higher the score, the higher the probability for a successful eradication.

Christmas Lake is used as a reference lake. Christmas Lake, Hennepin County, had an eradication treatment in April of 2015. However zebra mussels were observed later in Christmas Lake. The Zebra Mussel Eradication Index score for Christmas Lake was 810. When index scores are less than 800 the probability of a successful eradication attempt diminishes.

The Lake Johanna index score of 385 is low enough to indicate that an eradication attempt has a very low probability to succeed.

Based on available information an eradication attempt would have a low probability of success and is not recommended for Lake Johanna. Instead the recommended action is to continue lake monitoring and conduct small scale zebra mussel control projects in the future.

Zebra Mussel Eradication Index Scores for Lake Johanna

Criteria	Scores for the Zebra Mussel Eradication Index		
	Poor 0 - 30	Fair 30 - 60	Excellent 60 - 100
1. Early Detection Methods: Minimum of 30 hours and 7,000 objects checked monthly in early detection surveys. Plate or tube samplers should be deployed and checked monthly.		30 (plate samplers were deployed)	
2. Early Detection Inspections: Monthly early detection inspections indicate zebra mussels came into the lake within a month. Alternatively, there is specific knowledge of a recent introduction on an object (for example recent installation of a used boatlift with zebra mussels).		40 (search once per summer)	
3. Rapid Response Search Efforts: Rapid response assessment involves up to 90 hours of additional searching and 20,000 objects should be checked.		50 (25+ search hours)	
4. Locations: Zebra mussels are found at 1 or 2 sites. If three sites or more are found the probability of eradication decreases. Low numbers of zebra mussels should be found, If zebra mussel densities are high, the odds increase that they have detached and drifted to other locations.	25 (found at 2 sites includes adults and juveniles)		
5. Growth Stage: Zebra mussels should be immature. It has to be assumed immature zebra mussels were introduced on objects detached and reattached to new objects. Presence of mature zebra mussels indicates the probability of ongoing spawning.		30 (adults present)	
6. Density: Individual mature zebra mussels should be separated by distance. If two or more mature zebra mussels are found in close proximity successful spawning is likely to have occurred and dispersal of veligers and juveniles may be widespread but undetected.	25 (adults found in close proximity to each other)		
7. Treatment Settings: Wave action on containment barriers along open stretches of shoreline causes leakage of treatment water and dilution by lake water reducing the chemical concentration of the toxic agent within the containment area. It is best if the containment area is in a secluded location such as a bay or a cove.		35 (public access on linear stretch of shoreline)	
8. Treatment Areas: Treatment area should be at least 3 times larger than known area of distribution at a site. A total area greater than 10 acres will be difficult to administer. Treatment should occur as soon as possible after the rapid response assessment.		50 (treatment areas likely less than 10 ac)	
9. Probability of Reintroduction: Is the public access gated, are inspectors present from sunup to sundown, etc? Also do nearby lakes have zebra mussels?	30 (zebra mussels in nearby lakes)		
10. Lake Size: The smaller the lake the better. The odds of a successful eradication for lakes greater than 300 acres in size is low.			70 (lake size is 212 ac)
Total Score	385		

What Will Zebra Mussels Do in Lake Johanna?

Zebra mussels are present in Lake Johanna. One of many questions is what kind of a population will they produce. Based on available data it appears conditions would support initially moderate to heavy growth and in the long-term mostly light growth (Table 3). The chlorophyll levels indicate algae would support moderate growth in the early stages of zebra mussel population expansion.

Table 3. Zebra Mussel Suitability for Lake Johanna uses water column criteria to predict growth conditions.

JOHANNA		Little Potential for Adult Survival	Little Potential for Larval Development	Moderate (survivable, but will not flourish)	High (favorable for optimal growth)
Shell Formation Factors					
Calcium (mg/l)	Johanna				31.2 (Aug 17, 2015)
	Mackie and Claudi 2010	<8	8 - 15	15 - 30	>30
pH	Johanna				8.7 (Aug 17, 2015)
	Mackie and Claudi 2010	<7.0 or >9.5	7.0 - 7.8 or 9.0 - 9.5	7.8 - 8.2 or 8.8 - 9.0	8.2 - 8.8
Alkalinity* (as mg CaCO ₃ /l)	Johanna			71 (Aug 17, 2015)	
	Mackie and Claudi 2010	<30	30 - 55	55 - 100	100 - 280
Conductivity* (umhos)	Johanna				605 (Aug 17, 2015)
	Mackie and Claudi 2010	<30	30 - 60	60 - 110	>110
Food Factors					
Secchi depth (m) (May-Sept)	Johanna		2 (10 year average)		2 (10 year average)
	Mackie and Claudi 2010	<1 or >8	1 - 2 or 6 - 8	4 - 6	2 - 4
Chlorophyll a (ug/l)(food source) (May-Sept)	Johanna			11 (10 year average)	
	Mackie and Claudi 2010	<2.5 or >25	2.0 - 2.5 or 20 - 25	8 - 20	2.5 - 8
Total phosphorus (ug/l) (May-Sept)	Johanna				28 (10 year average)
	Mackie and Claudi 2010	<5 or >50	5 - 10 or 35 - 50	10 - 25	25 - 35

*Mackie, G.L. and R. Claudi. 2010. Monitoring and control of macrofouling mollusks in fresh water systems. Second Edition. CRC Press, Boca Raton, FL.

Lake Johanna Zebra Mussel Substrate Conditions



Figure 7. Wading was used for zebra mussel searching in Lake Johanna in September. The substrate in Lake Johanna was mainly sand, cobble, and boulders.

The Minnesota DNR Infestation Report for Lake Johanna is found on the next 3 pages.

ZEBRA MUSSEL INFESTATION REPORT: LAKE JOHANNA, RAMSEY COUNTY

MnDNR – Division of Ecological and Water Resources - Invasive Species Program

Lake: Johanna (62007800)

County: Ramsey

Type of report: Zebra mussel - new infestation

Date of report: September 7, 2018

Author[s] of report: K. Lund, K. Cattoor

Date of inspection: August 21, 2018

Survey methods: SCUBA, snorkel, wading

Results: **6 ADULT ZEBRA MUSSELS FOUND**

Observers: Keegan Lund, Caroline Fazzio, Kylie Cattoor, Rice Creek and Ramsey County staff

Summary: On August 18, 2018, as part of a county led early detection program, Noah Berg (Endangered Resource Services LLC) discovered one live adult zebra mussel on Lake Johanna, Ramsey County at the Tony Schmidt Regional Park public boat landing. The zebra mussel was attached to a rock in 5 feet of water with an additional half shell located in the same vicinity. Photos of the live specimen were submitted to Ramsey County and the MnDNR staff on August 20, 2018.

On August 21, DNR, Rice Creek Watershed District and Ramsey County staff conducted a follow-up survey using wading, snorkeling and SCUBA methods. They searched prioritized areas of suitable zebra mussel habitat throughout the lake with the majority time spent at the public access (see Map 1). Water clarity at time of search was approximately 2-4 feet. The survey crew found five additional zebra mussels (see Photos 3-5). The adult zebra mussels ranged in size from 2 to 3.4 cm in shell length.

A total of 5.63 search hours were completed on Lake Johanna. Veliger tows were taken as well with a plankton net and no veligers were identified to date, although timing for zebra mussel reproduction was not ideal. Zebra mussel reproduction in central Minnesota lakes is peak from mid-June through late July then tapering off in August.

Lake Johanna will be added to the Designated Infested Waters list as infested with zebra mussels and reported in EDDMaps Record ID 7808618.



Photos 1 & 2. One adult zebra mussel found by Matt Berg (Endangered Resource Services LLC) at initial survey of Lake Johanna on 18 August 2018.



Photos 3-5. Five additional adult zebra mussels found near the public access on Lake Johanna on 21 August 2018. Size of mussels ranged from approximately 2 to 3.4 cm in length.



Lake Johanna, Ramsey County Zebra Mussel Searches



Map 1. Map of zebra mussel search locations. In total the search effort in Lake Johanna was 338 minutes (5.63 hours) resulting in six confirmed zebra mussels. Initial observation (red) was on August 18, 2018 while additional searches were conducted on August 21, 2018.