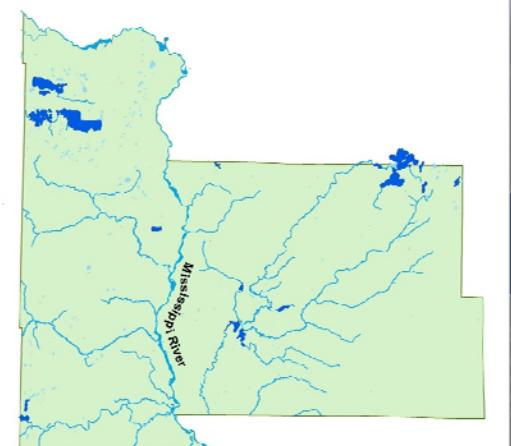


Morrison County

AIS Prioritization

A planning tool developed for AIS risk management and prevention

2016



Produced by Morrison County and RMB Environmental Laboratories, Inc.

EXECUTIVE SUMMARY

Background

Aquatic Invasive Species (AIS) are aquatic plants and animals that are not native to Minnesota, and cause environmental changes to our waters, have negative economic consequences to our communities, or are harmful to human health. Minnesota's natural resources are threatened by a number of Aquatic Invasive Species such as Zebra mussels, Flowering rush, Eurasian watermilfoil and Asian carp. Invasive species are usually spread by humans.

Zebra mussels are particularly harmful because they spread so rapidly and there are currently no effective treatment options. They attach to hard surfaces such as boats, docks, boat lifts, aquatic plants, and water intake pipes, and can clog pipes, cut feet, and damage boats. Zebra mussels have a large economic impact to water treatment facilities, lakeshore owners, lake recreators, and the tourism industry.

Zebra mussels also affect the aquatic ecosystem by filtering out microscopic plankton from the water, and therefore removing the food source for other aquatic organisms. This has implications up the food chain, such as affecting fish populations.

As of the end of 2015 Zebra mussels have been found in approximately 94 lakes in Minnesota, and the DNR has included an additional 106 water bodies on their infested waters list because they are connected to a lake infested with Zebra mussels (MNDNR 2015) (Figure 1). The infestations are clustered around areas with high traffic lakes such as Brainerd, Alexandria, Detroit Lakes and Minneapolis. This pattern of spread is consistent with what has been seen in Michigan, another state with Zebra mussel infested lakes (Johnson *et al.* 2006).

In order to slow or stop the spread of Zebra mussels in Minnesota, a concentrated effort is required. Ideally, unlimited resources would be available to protect all lakes, but in reality budgets are always limited. Therefore, prioritizing lakes due to their risk of infestation is helpful in creating and implementing an AIS management plan.

Project Goals

Highest risk time of year
+
Highest risk lakes
=
When/where to focus AIS prevention

The goals of this project were to assess the risk of Zebra mussel infestation in Morrison County in order to prioritize funding and efforts to prevent the further spread of Zebra mussels. Twenty-one lakes were selected by Morrison County for this prioritization document. Lakes were chosen based on size, public accesses and use.

Vectors of spread were evaluated for each lake such as connectivity to other water bodies and public use. In addition, the suitability of each water body to Zebra mussel establishment was evaluated considering water chemistry, substrate, dissolved oxygen and temperature. A report card was developed for each water body showing the available data and assigned risk category.

These risk ratings can be used in AIS management plans to prioritize lakes for specific prevention measures. A summary table using the assessments to form management recommendations is provided (Table 13). This table can be used to guide the most efficient use of AIS funds in the most effective way possible.

Zebra Mussel Risk Assessment

Infestation Risk Rating

The two main vectors of spread for Zebra mussels are lake connectivity and public use. One of the highest risks to a water body becoming infested with Zebra mussels is if a nearby upstream lake is infested. Infested lakes can serve as a source of Zebra mussel veligers for downstream water bodies and adjacent lakes; however the inter-lake distance must be fairly close for the spread to be possible.

Public use can be measured by some surrogate statistics. First, the number of public accesses and related parking spots are known on each lake. The more public accesses on the lake, the more potential boats can use the lake. Secondly, the number of resorts and hotels on the lake are documented through the Little Falls Area Chamber of Commerce. A lot of resorts and hotels on the lake show that there are many visitors to the lake outside the immediate area, which poses more risk for infestation. Thirdly, the number of fishing tournaments and special events on lakes is documented through a permitting process. Fishing tournaments and special events draw visitors to the lakes. And finally, the homeowners on the lake own an average of one dock/boat lift/boat per property. The purchase of an infested boat lift or other water related equipment has been the source of several documented new infestations in Minnesota. The risks from connectivity and public use were combined for an overall risk of infestation rating for each lake. A scoring system was used to weight each of these two categories, which resulted in three overall risk categories, low, medium and high.

Zebra mussel Suitability Rating

The two main factors for zebra mussels thriving in a lake are suitable water chemistry and suitable substrate. The risks from these two categories were combined for an overall suitability rating for each lake. This suitability rating can be interpreted as the probability that Zebra mussels will thrive in the lake. A scoring system was used to weight each of these two categories, which resulted in three overall risk categories, low, medium and high.

River Science

Unlike lakes, rivers are not usually ideal habitat for Zebra mussels. Studies have shown that the turbulence in streams and rivers causes high Zebra mussel veliger mortality and assists in preventing the veligers from settling on hard substrates. Without an infested lake upstream continually supplying the

stream with Zebra mussel veligers, the stream is unlikely to sustain a large population on its own. Although streams can be pathways for downstream infestations, the probability of Zebra mussel veliger survival decreases with distance downstream.

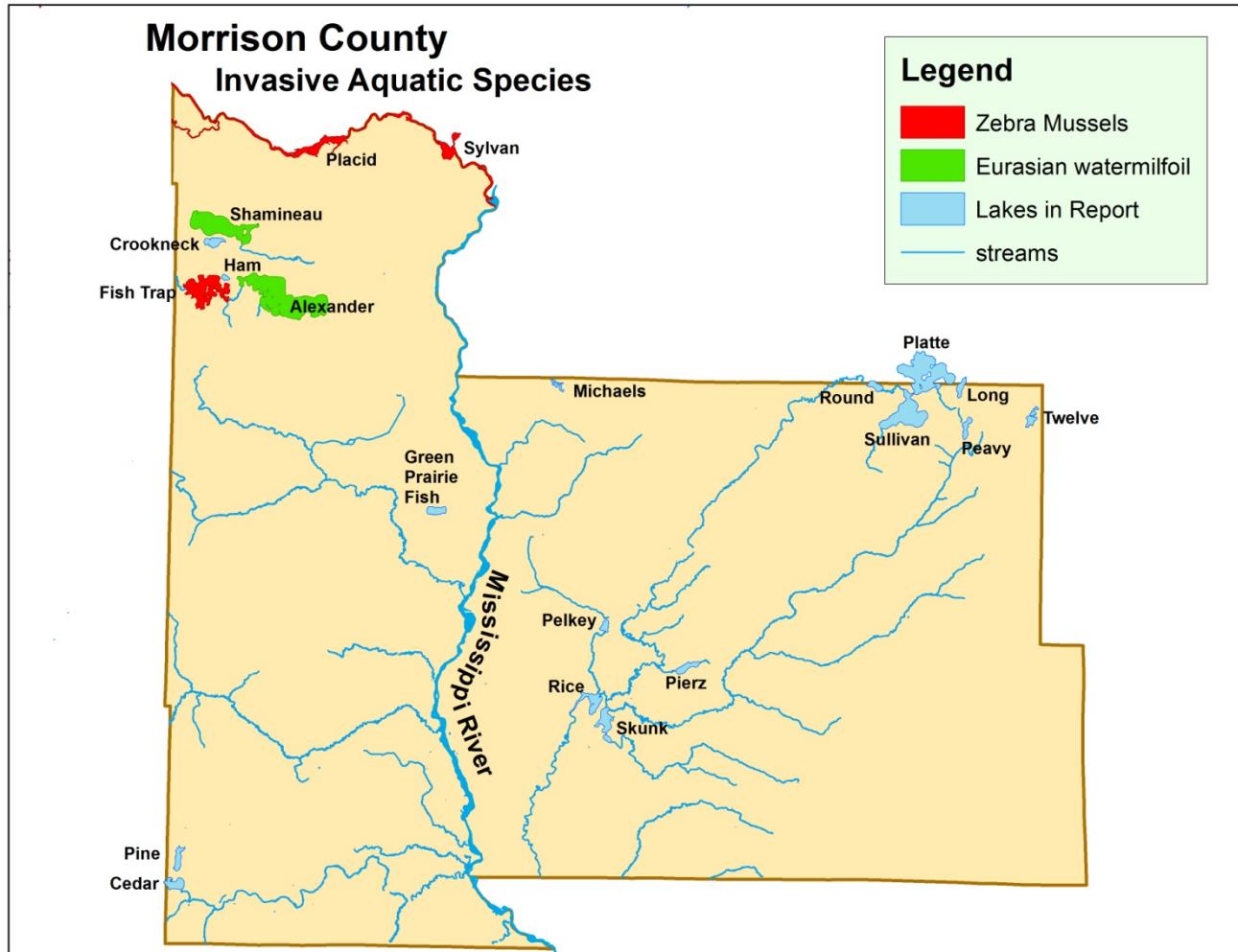


Figure 1. Aquatic species infestations in Morrison County (as of the end of 2015).

Results

The following three maps summarize the scoring of the selected Morrison County lakes for Public Use, Overall Infestation Risk and Suitability Risk (Figures 2-4).

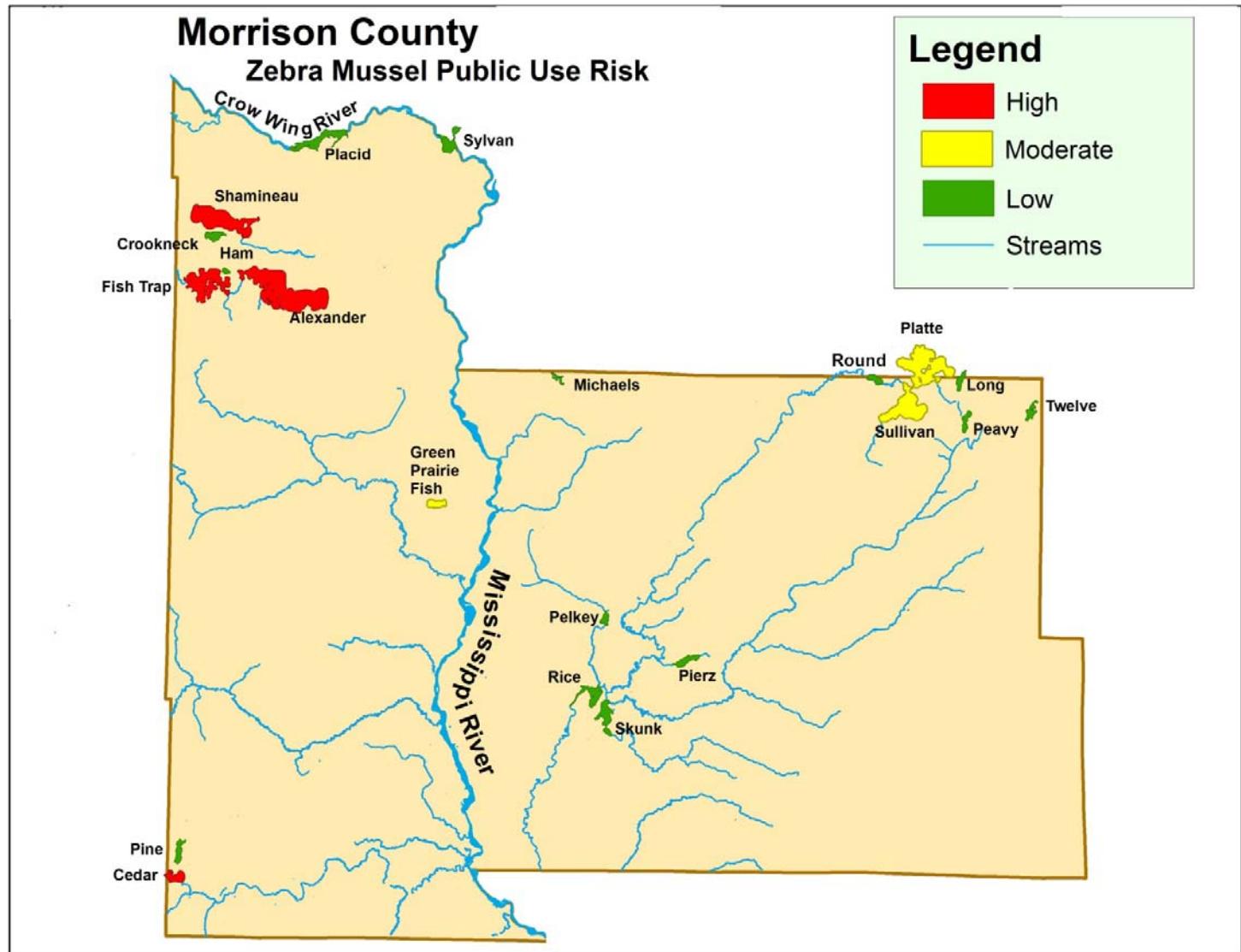


Figure 2. Public use risk rating for lakes in Morrison County.

Morrison County Zebra Mussel Infestation Risk

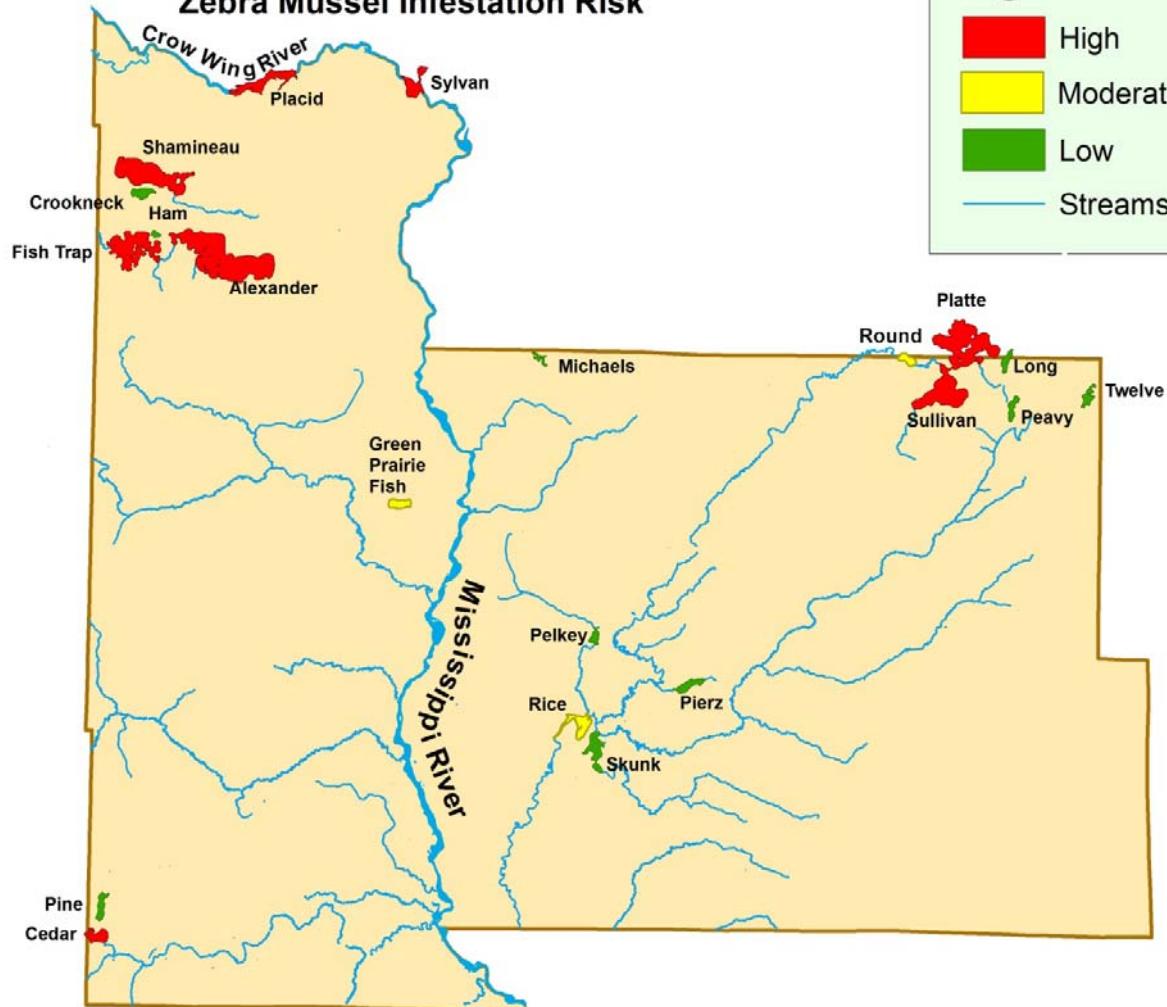


Figure 3. Overall Zebra mussel infestation risk rating in Morrison County.

Morrison County Zebra Mussel Suitability Risk

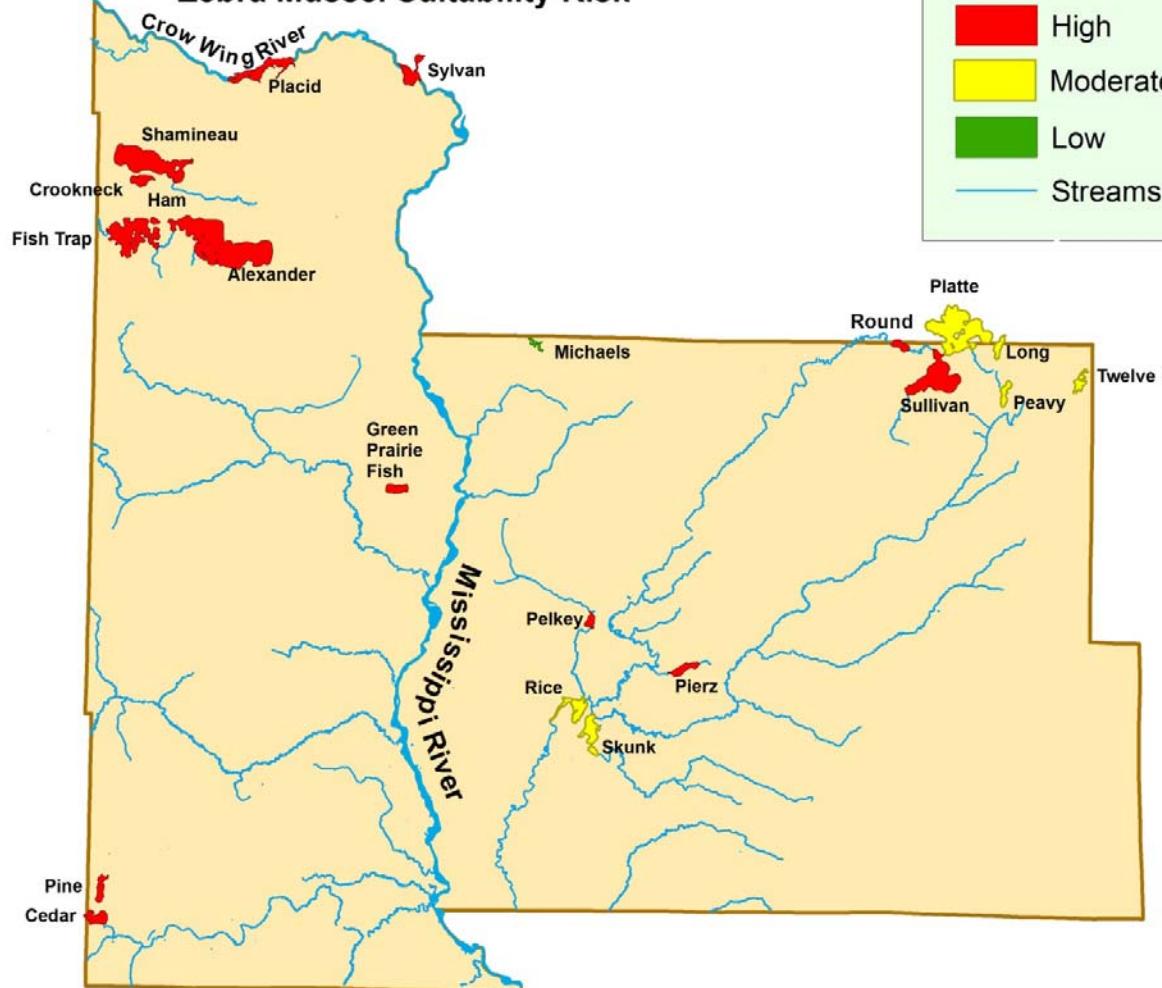


Figure 4. Overall Zebra mussel suitability risk rating in Morrison County.

Risk – Time of Year

The risk of Zebra mussel infestation varies by the time of year. Data sources show that in Minnesota, the time of year that has the highest concentration of Zebra mussel veligers matches up with the highest use time for the public (Figures 23-24, Pesch & Bussiere 2014, Rufer 2015). The implications of these data indicate that additional prevention measures should be implemented during July to prevent Zebra mussel spread.

In Pesch and Busierre's (2014) survey of 2nd Homeowners in Central and West Central Minnesota, the highest use time of year was July, at an average of 16 days during that month (Figure 23, Pesch & Bussiere 2014). Rufer's monitoring of Zebra mussel veligers in Pelican Lake, a Zebra mussel infested lake in Otter Tail County, shows the peak density for Zebra mussels is in July (Figure 24, Rufer 2015).

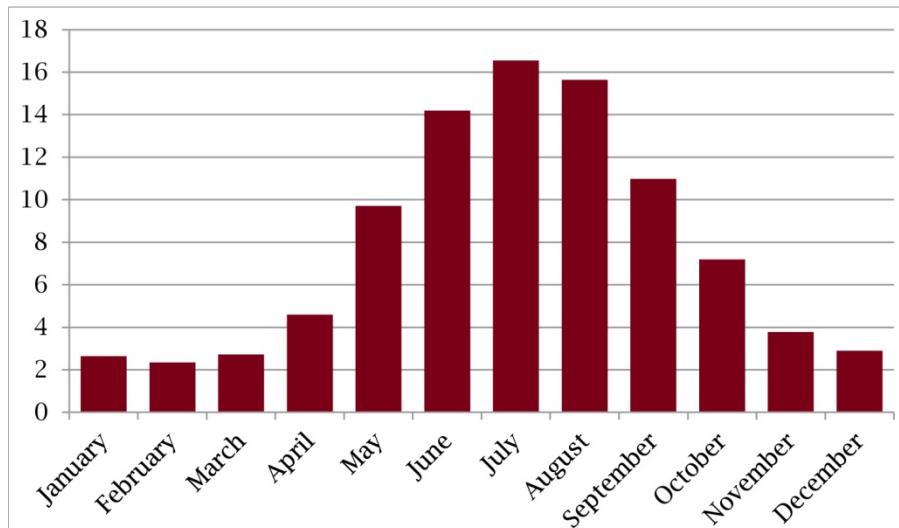


Figure 5. Average number of days occupied per month (n=552) from Pesch & Bussiere 2014.

The full report can be downloaded from this link:

<http://www.extension.umn.edu/community/research/reports/docs/2014-2nd-Homeowners.pdf>

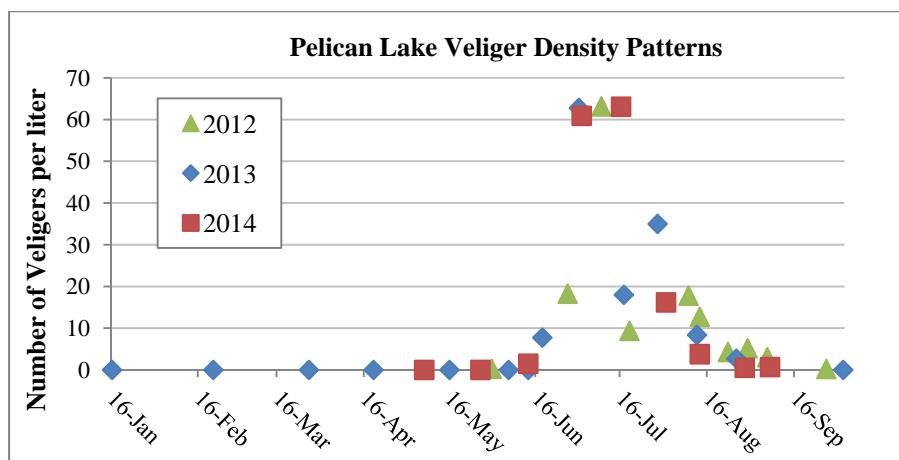


Figure 6. Veliger densities in Pelican Lake, 2012-2014 from Rufer 2015.

The full report can be downloaded from this link:

<http://pgolid.org/wp-content/uploads/2014/01/PGOLID-Veliger-Report-2012-2014.pdf>

Table 1. Summary of risk pathways depending on the time of year. The Zebra mussel life stage for the pathway is indicated in italics.

Risk Pathway	Typical Minnesota Open Water Season							Typical Minnesota Ice-covered season				
	April	May	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb	March
1. Connectivity via a river or stream.	insignificant	insignificant	Low <i>Veligers</i>	High <i>Veligers</i>	Moderate <i>Veligers</i>	Low <i>Veligers</i>	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant
2. Transfer of equipment from lake to lake.	insignificant	insignificant	Moderate <i>Adults & juveniles</i>	High <i>Adults & juveniles</i>	High <i>Adults & juveniles</i>	Low <i>Adults & juveniles</i>	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant
3. Transfer of mussels hitchhiking on vegetation or mud on boats, trailers and gear.	Low <i>Adults & juveniles</i>	Low <i>Adults & juveniles</i>	Moderate <i>Adults & juveniles</i>	High <i>Adults & juveniles</i>	High <i>Adults & juveniles</i>	Moderate <i>Adults & juveniles</i>	Low <i>Adults & juveniles</i>	insignificant	insignificant	insignificant	insignificant	insignificant
4. Transfer of veligers via water in boats (live wells, bilges, etc) and float planes.	insignificant	insignificant	Low <i>Veligers</i>	High <i>Veligers</i>	Moderate <i>Veligers</i>	Low <i>Veligers</i>	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant
5. Transfer of juvenile mussels on boats not thoroughly cleaned after being tied up on infested waters for an extended period of time.	insignificant	insignificant	Moderate <i>Adults & juveniles</i>	High <i>Adults & juveniles</i>	High <i>Adults & juveniles</i>	Moderate <i>Adults & juveniles</i>	Low <i>Adults & juveniles</i>	insignificant	insignificant	insignificant	insignificant	insignificant
6. Transfer of veligers and juvenile mussels on swimwear, SCUBA equipment, waders or other gear used in water.	insignificant	insignificant	Low <i>Veligers</i>	High <i>Veligers</i>	Moderate <i>Veligers</i>	Low <i>Veligers</i>	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant

Sources: Zebra mussel veliger time-of-year risk was taken from Rufer 2015.

Zebra mussel adult and juvenile time-of-year risk was taken from Mackie & Claudi 201, Mackie 1996, McMahon 1996.

AIS Program Management Recommendations

In an ideal world, all Aquatic Invasive Species (AIS) prevention programs would be applied to all lakes. In reality, budgets are always limited, so prioritization of programs due to risk ratings is necessary. Due to the differing risk ratings, programs can be individualized to fit each lake's risk category (Table 2). Lakes with high public use ratings should be at the highest priority for boat inspections at public accesses. Lakes that are already infested should have boat-washing stations nearby for decontamination. All lakes should be targeted with a watershed-wide education program. Because the highest risk time of the summer and one of the highest tourism times of the summer intersect on 4th of July week, focus *additional* targeted education and outreach during this time of year. For monitoring, ideally all lakes would be monitored for adult Zebra mussels because if trained volunteers are used there is no monetary cost, but there is a large benefit.

The assessments in this report result combine the report cards with the risk of time of year (Figure 6) in the following specific Aquatic Invasive Species Program Management Recommendations (Table 2). This portion of the report can be inserted directly into the county's AIS Plan, and guide the use of the county's AIS funds in the most efficient and effective way possible.

Table 2. Framework for the watershed's AIS plan.

Activity	Target Lakes	Target Time of Year	Who	Cost	Narrative
Watercraft Inspections	<u>Priority 1:</u> • Fishtrap • Alexander • Shamineau • Cedar <u>Priority 2:</u> • Sullivan • Green Prairie Fish • Platte	<u>Priority 1:</u> July <u>Priority 2:</u> August <u>Priority 3:</u> June	County	TBD	This activity depends on available funding. If limited funding is available, focus inspections on the high risk public use lakes and the infested lakes (Fishtrap) in July. If more funding is available, add in moderate public use risk lakes in July. Next, add in August and June inspections.
Water Quality Monitoring	See Table 11 for data gaps.	May – September	Lake Associations	TBD	Monitor lakes for missing parameters shown in Table 11. Priority parameters for each lake would be Calcium, Alkalinity, pH and Specific Conductance as they have the most effect on Zebra mussel suitability.

Table 2 continued on the next page...

Table. 2 continued. Framework for the watershed's AIS plan.

Activity	Target Lakes	Target Time of Year	Who	Cost	Narrative
<i>Early Detection Monitoring: Zebra mussel veligers</i>	<ul style="list-style-type: none"> • Alexander • Shamineau • Cedar 	July	County or Lake Associations	\$540	Collect plankton tow samples in high infestation risk lakes in early and late July for veliger analysis. Early detection allows for possible treatment.
<i>Early Detection Monitoring: Adult Zebra mussels</i>	<u>Priority 1:</u> <ul style="list-style-type: none"> • Alexander • Shamineau • Cedar <u>Priority 2:</u> <ul style="list-style-type: none"> • Sullivan • Green Prairie Fish • Platte <u>Priority 3:</u> All lakes	<u>Priority 1:</u> September <u>Priority 2:</u> Every other week from late June to mid-September	Volunteers, Lake Associations	\$0	a. In September, conduct a lake-wide inspection of docks and boat lifts as they are removed from the lake. b. Place a cinder block or hang a pvc pipe in 5-8 feet of water near the public access and any other heavily used areas of the lake, and have the volunteers check the block/pipe (pull it up or snorkel) every other week from late June to mid-September. Record results on the MN DNR's website: http://www.dnr.state.mn.us/volunteering/zebramussel_monitoring/report.html
<i>Monitoring: Invasive Plants</i>	<u>Priority 1:</u> <ul style="list-style-type: none"> • Alexander • Shamineau • Cedar • Fishtrap <u>Priority 2:</u> <ul style="list-style-type: none"> • Sullivan • Green Prairie Fish • Platte 	Mid to late June	County, Lake Associations, or private contractor	TBD	Conduct plant surveys to look for aquatic invasive plants. Mid to late June will catch Curly-leaf pondweed, Flowering rush, and Eurasian watermilfoil.

Table 2 continued on the next page...

Table. 2 continued. Framework for the watershed's AIS plan.

Activity	Target Lakes	Target Time of Year	Who	Cost	Narrative
<i>Education and Outreach</i>	All	<u>Priority 1:</u> 4 th of July week <u>Priority 2:</u> Memorial day to labor day <u>Priority 3:</u> Year round	County and watershed	TBD	Conduct a consistent watershed-wide education program to schools and the general public. In high tourism areas such as Morrison, focus <i>additional</i> education around 4 th of July since that is the highest risk time of the year for spread.
<i>Decontamination</i>	Fishtrap	Priority 1: July Priority 2: August	County, DNR, or private business	TBD	Provide decontamination opportunities for boats leaving infested lakes. Inform boaters on where the decontamination station is located.