



If All Else Fails: Analyzing Zebra Mussels Within Minnesota

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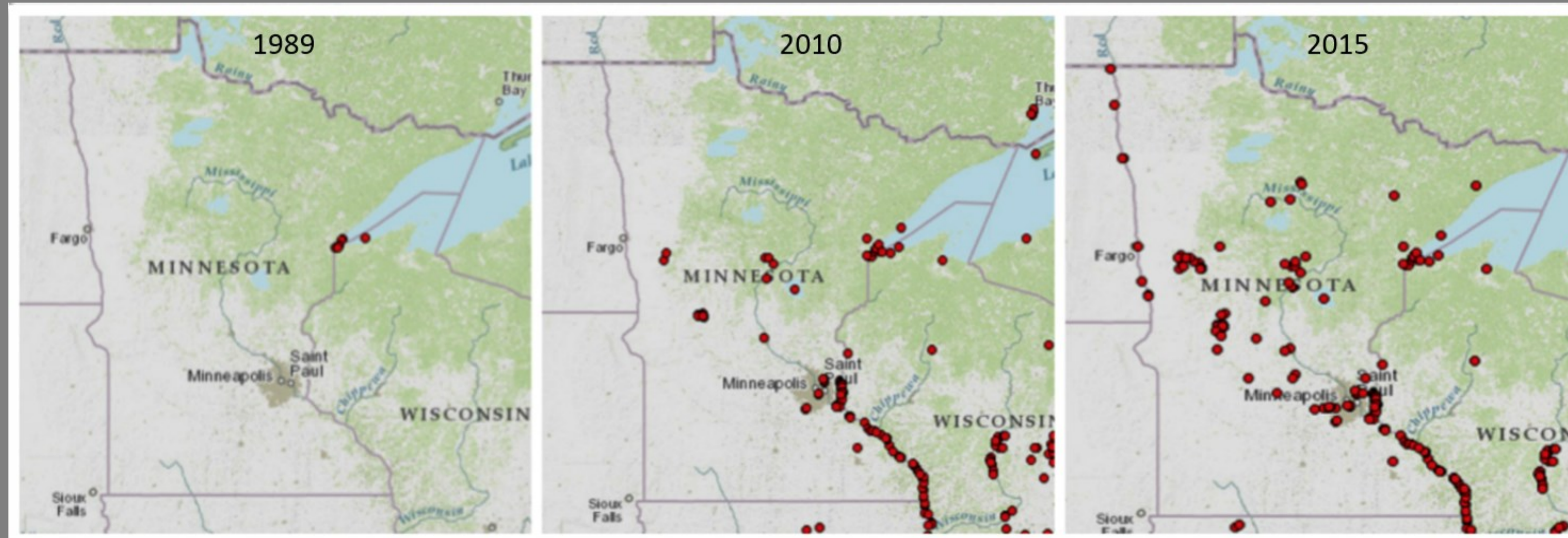


Introduction

Invasive species have become a global issue with few success stories to go along with them. The reason there is little success is there is often a lack of understanding on how invasive species survive biologically. There are not sufficient resources devoted for a long enough time and there is not enough widespread support from relevant agencies and the public. The establishment of zebra mussels in Minnesota is another similar invasive species issue that is trying to have a success story to go along with it. Like many other invasive species, eradication, control, and monitoring of zebra mussels within Minnesota has been an ongoing battle with questionable success as illustrated in Figures 1, 2, and 3. If efforts of monitoring, controlling, and eradicating zebra mussels fail in Minnesota, it is essential to have enhanced reliance on preventing them from spreading to lakes not infested through increased education/technology, more development regarding long term research on the impacts, increased research on relying aquatic ecosystems to adapt over time, and more research on the alternative uses for zebra mussels.

Current Efforts of Dealing with Zebra Mussels in Minnesota

Despite prevention, early detection, and eradication efforts of zebra mussels, these invasive bivalves have continued to spread across lakes in Minnesota. Zebra mussels greatly disrupt aquatic ecosystems and negatively impact survival rates of native mussels, mainly due to their ability to filter water as shown in Figure 4. The Minnesota DNR spent \$8 million on aquatic invasive species in 2014, which illustrates how expensive it is to deal with these species. Much of this money focused on inspections/enforcement, but only 4% focused on education/increasing public awareness (Figure 5). Christmas Lake is an example of a pilot project in Minnesota that deals with early detection and eradication of zebra mussels. Out of the more than 200 lakes infested with zebra mussels, only five have been treated through chemical use and only one has succeeded. Zebra mussels were found throughout Christmas Lake in the fall of 2015 after the treatment in 2014, resulting in a failed experiment (Figure 6). There is little connection between monitoring for early detection and eradicating zebra mussels at this time. Monitoring also has barriers because it can be difficult to find places in which zebra mussels are located throughout a body of water, even if the lake is known to be infested. This summer, while working for the Sauk River Watershed District, we tested over 80 lakes twice throughout the summer. We knew zebra mussels were present in over five of the lakes, but our results continued to come back negative.



Figures 1, 2, and 3 are showing the distribution of zebra mussels across Minnesota since their introduction in 1989 and have continued to spread despite prevention and eradication efforts.

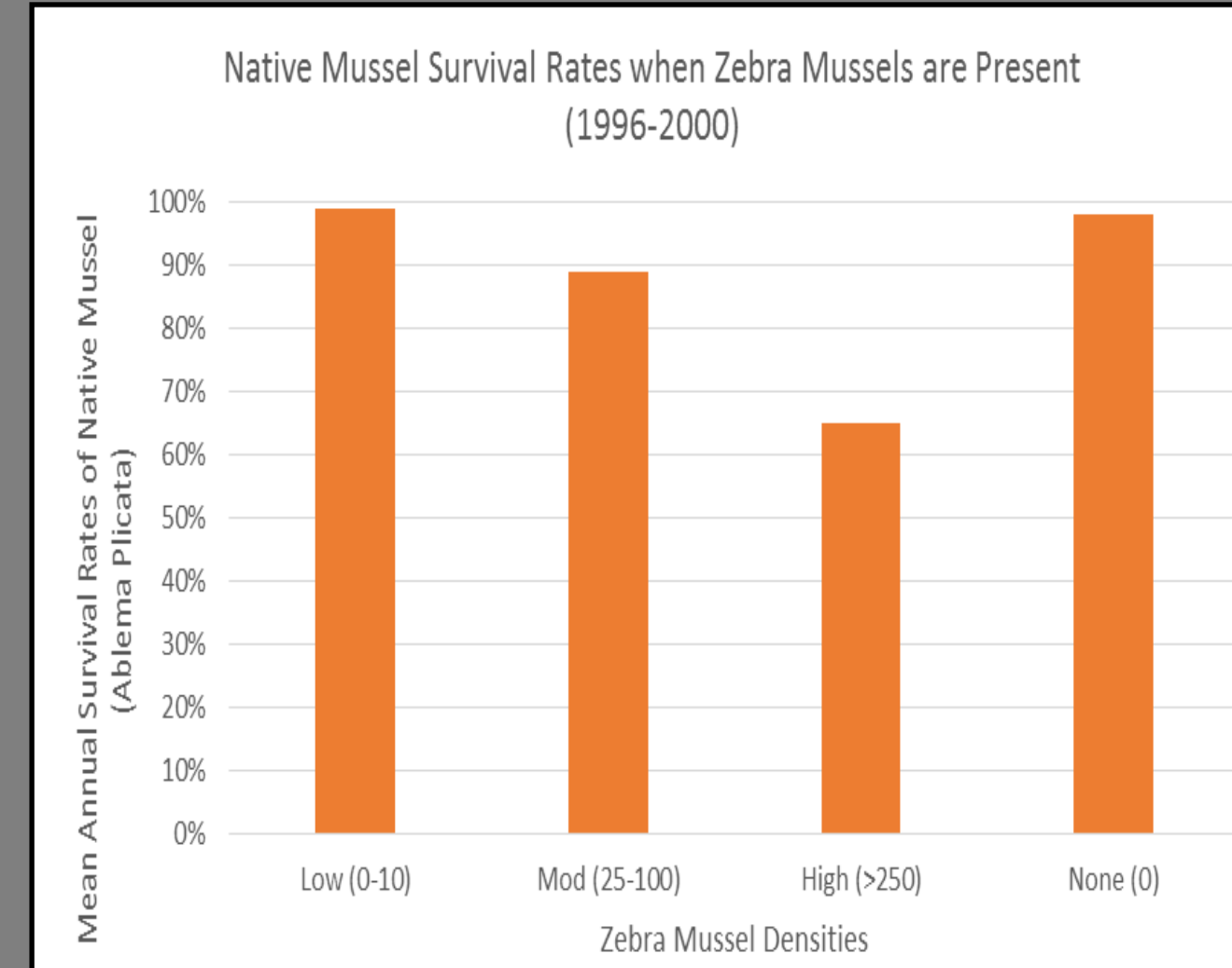


Figure 4. Survival rates of native mussels when zebra mussels are present. Comparing Lake Pepin and the Otter Tail River.

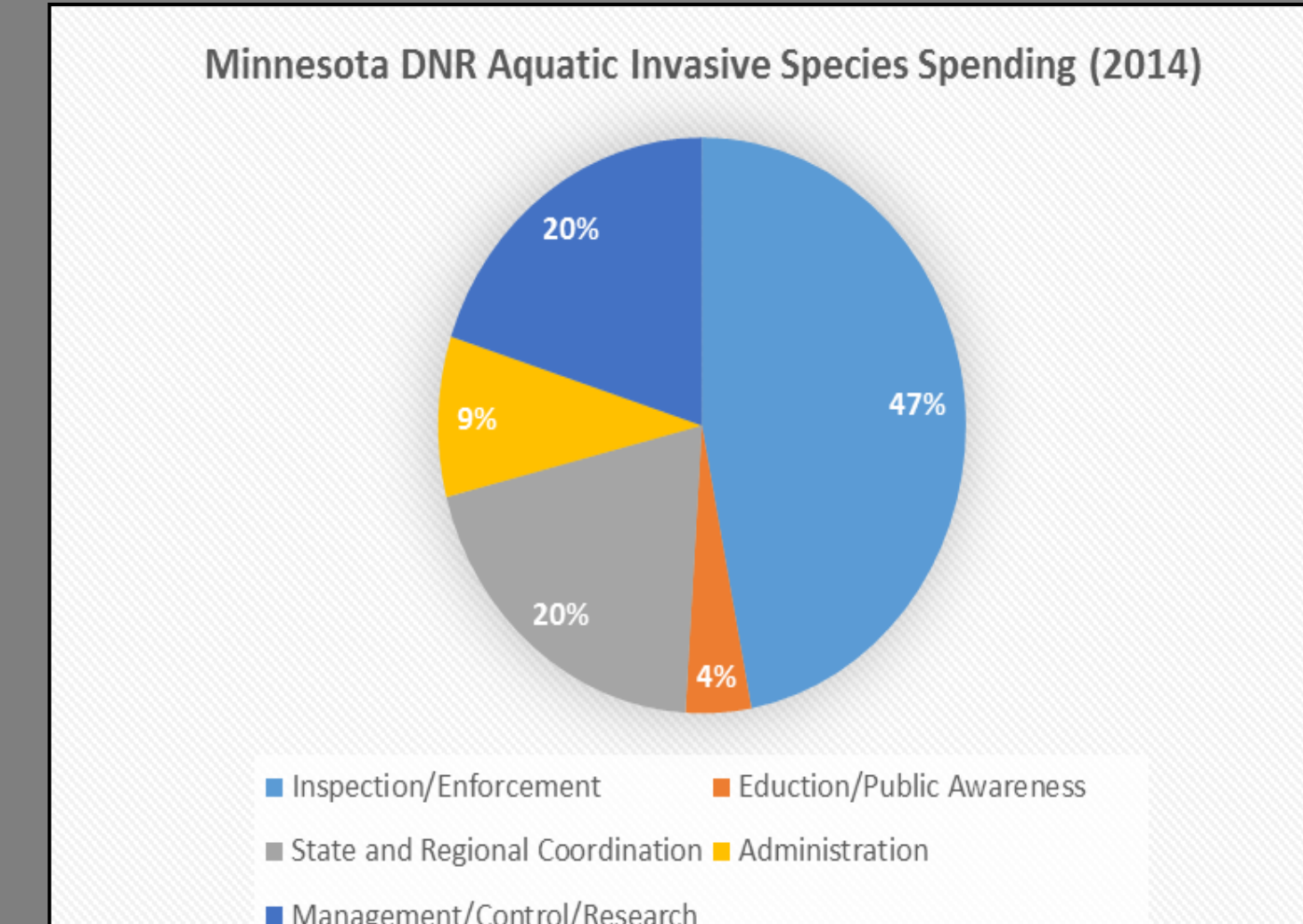


Figure 5. Percentages out of \$8 million spent throughout the fiscal year 2014 on invasive species.

Methods and Materials

- An in depth literature review conducted regarding the background of dealing with invasive species globally and background information related to zebra mussels in Minnesota.
- An analysis of case studies and a literature review was conducted to analyze the ecological and economic impacts of zebra mussels.
- Personal research regarding the monitoring of zebra mussels and development of education programs within the Sauk River Watershed District.
- Interviews with zebra mussel specialists and aquatic invasive species specialists from the Minnesota DNR.
- A final analysis of what should be done to combat the issues regarding zebra mussels is addressed through a literature review, personal experience, and interviews.

How Minnesota Needs to Deal with Zebra Mussels

The traditional approach of trying to prevent, control, and eradicate zebra mussels within Minnesota is not working. Minnesota needs to reevaluate its current plan of dealing with zebra mussels. In a rare twenty year study of the Hudson River, zebra mussels suffered a 100-fold decline in survival rate and the filtration rate dropped by 82%. There needs to be an increase in studies to understand how zebra mussels can adapt over time in Minnesota as well as how aquatic ecosystems can adapt to zebra mussels. Additionally, there needs to be greater reliance on preventing the spread of zebra mussels to uninfested waters through education and increased technology. Increasing funding towards education and public awareness is one way to combat this issue. Finding alternative uses for zebra mussels is another area of research that needs to be explored.



Figure 6. Zebra Mussel distribution after treatment in Christmas Lake.



Figure 7. Zebra Mussels in Open Water

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