



Northern Research Station

Rooted in Research

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A New Decision Support Tool for Preventing the Spread of Aquatic Invasive Species

Every time a watercraft moves from one lake to another, it could potentially carry an aquatic invasive species (AIS) attached to the exterior, in bilge water, or in bait buckets. Aquatic invasive species can cause ecological and economic damage by degrading water quality, which in turn can harm fisheries, native species, and human health. Invasive species may also interfere with human use of lakes and lead to lower property values.

Eradicating aquatic invasive species from an infested waterbody is nearly impossible, so water managers typically focus on prevention through inspection. Resources are limited, however, and choosing where to place inspectors can be a challenge. To help managers with these decisions, U.S. Department of Agriculture Forest Service Northern Research Station researcher Robert Haight and collaborators at the University of Minnesota modeled inspection strategies in Minnesota and have developed a web-based decision support tool that facilitates detailed analysis of tradeoffs between management objectives and the effects of cost constraints.

Invasive Species in Minnesota Lakes

Minnesota's 11,842 freshwater lakes are an iconic natural resource. According to the Minnesota Department of Natural Resources [Infested Waters List](#), an estimated 2.6 percent of the state's lakes larger than 10 acres are infested with zebra mussels (*Dreissena polymorpha*). Eurasian watermilfoil (*Myriophyllum spicatum*), which creates thick floating mats that interfere with swimming and boating, infest approximately 3.9 percent of the state's lakes. Both species were first discovered in Minnesota in the 1980s, and since then infestations have increased.

The Minnesota Watercraft Inspection Program, a key part of the effort to contain aquatic invasives, sends trained inspectors to strategic locations to look for signs of invasive species, ask questions, and educate boaters. "Boat inspection is important because aquatic invaders primarily spread by hitchhiking on recreational watercraft," Haight says. "It also helps educate boaters about the risk." In 2019, inspection stations were located at 550 water bodies, but with more than 11,000 lakes in the state, being strategic about the location of inspection stations is vital.

KEY MANAGEMENT CONSIDERATIONS

- A web-based decision support tool, [AIS Explorer: Prioritization for Watercraft Inspections](#), can help water managers prioritize resource allocations.
- A case study in a Minnesota county found that about 88 percent of boats inspected for aquatic invasive species were traveling to lakes in different counties.
- The same study found that focusing boat inspections to protect lakes within a single county resulted in 25 percent fewer inspections of boats at high risk of harboring aquatic invasive species than inspections of boats that were moving from infested lakes in one county to lakes in other counties.
- The best strategy for locating inspection stations was to first rank lakes according to risky movements (the sum of the number of risky boats they send and the number of risky boats they receive annually) and then locate inspection stations at the highest ranking lakes until inspection resources are exhausted.
- Pooling resources and coordinating inspection efforts at regional or statewide levels are likely the most effective strategies for preventing the spread of aquatic invasive species among lakes.

Deciding Where to Put Inspection Stations: A Case Study

The researchers used Stearns County, Minnesota, as the site of a case study. The county is home to more than 150,000 residents and contains 192 lakes larger than 10 acres. According to the Minnesota Department of Natural Resources Infested Waters List, 25 of these lakes are infested with one or more aquatic invasive species. The county has a \$330 million tourism industry related to lake recreation, and decision makers have an interest in preventing the spread of invasive species. Minnesota's AIS Prevention Aid Program distributes \$10 million a year to counties based on the number of public boat ramps and parking spaces they have, leaving each county to decide how to use the funds to protect waterbodies. In 2019, Stearns County posted inspectors at 9 of the 25 infested lakes, where they completed 12,000 watercraft inspections. Summarizing the problem of

having more infested lakes than inspectors and resources, Haight explains, “County planners have to prioritize and decide where to place inspectors based on their knowledge about which lakes are infested, which lakes are most important to protect against becoming infested, and how popular the lakes are for boats.”

To develop their model, the research team estimated annual boat movement among infested and uninfested lakes within and outside Stearns County and examined two potential strategies:

- protecting only Stearns County’s lakes from aquatic invasive species
- protecting lakes both inside and outside the county from aquatic invasive species

In a 2021 article, they reported that using resources to protect only Stearns County lakes resulted in inspecting 25 percent fewer boats at high risk of harboring invasive species compared to focusing on protecting lakes both inside and outside of the county. In fact, 88 percent of the inspected vessels were traveling to uninfested lakes outside of the county. Therefore, targeting boats moving from the county’s 25 infested lakes to uninfested lakes both inside and outside of the county would have the greatest overall benefit. The researchers concluded that pooling resources and coordinating efforts at a regional or statewide level would be the most effective strategy for combating aquatic invasives.



A graduate student at the University of Minnesota evaluates a trained watercraft inspector as they inspect a fishing boat. Courtesy photo by John Gerritsen/University of Minnesota Department of Fisheries, Wildlife, and Conservation Biology.

“The quality of lakes in Minnesota is affected by individual decisions from each county,” Haight says. “In some counties, the county manager has a choice. They can focus resources on protecting the good water quality in their own county or they can think about protecting water quality throughout the state.”

A New Tool for Helping Managers Make Decisions about Inspections

To help inform decision making, Haight and colleagues developed AIS Explorer: Prioritization for Watercraft Inspections, a web-based decision-making support tool for optimizing watercraft inspection efficiency. The online dashboard incorporates data about which lakes are infested and how boats move among lakes in Minnesota (gathered from surveys at watercraft inspection stations), and it updates automatically as new entries are added to the Minnesota DNR Infested Water List.

This decision support tool can help counties position their limited inspection resources strategically to protect the greatest number of waterbodies and safeguard the state’s ecological and economic assets.

PROJECT LEAD

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FURTHER READING

AIS Explorer landing page: <https://www.aisexplorer.umn.edu/#/>

Haight, Robert G.; Kinsley, Amy C.; Kao, Szu-Yu; Yemshanov, Denys; Phelps, Nicholas B.D. 2021. [Optimizing the location of watercraft inspection stations to slow the spread of aquatic invasive species](#). *Biological Invasions*. 23(12): 3907–3919. <https://doi.org/10.1007/s10530-021-02620-6>.

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Kinsley, Amy C.; Haight, Robert G.; Snellgrove, Nicholas; Muellner, Petra; Muellner, Ulrich; Duhr, Meg; Phelps, Nicholas B.D. 2022. [AIS explorer: prioritization for watercraft inspections-A decision-support tool for aquatic invasive species management](#). *Journal of Environmental Management*. 314(6): 115037. <https://doi.org/10.1016/j.jenvman.2022.115037>.

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