

Photo on cover: A DNR invasive species specialist pulling a plankton net out of Big Lake in Sherburne County as part of a search for zebra mussels in October 2021.



ECOLOGICAL AND WATER RESOURCES
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For current invasive species regulations, a list of infested waters, species information, and local DNR contacts, visit mndnr.gov/ais.

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Note from the Program

The Minnesota Department of Natural Resources (DNR) is pleased to provide the 2021 Invasive Species Annual Report to the governor, legislature and people of Minnesota. This report summarizes our efforts to prevent the introduction and spread of invasive species of aquatic plants and animals in Minnesota.

The report provides an overview of program activities, finances, prevention and management efforts, goals, highlights, partnerships, and future needs and plans for individual program areas.

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A Letter from the Invasive Species Program

Welcome to the 2021 Minnesota Department of Natural Resources (DNR) Invasive Species Program annual report. The report highlights the accomplishments of the Invasive Species Program and keeps you up to date with new issues facing the program as we work to reduce impacts of invasive species on Minnesota's outdoor traditions.

Great work was accomplished in 2021, with the help of our partners. Some highlights include:

- Invasive Species Program staff issued 388 permits to control invasive aquatic plants, completed 66,574 watercraft inspections, and trained 811 local government watercraft inspectors who accomplished an additional 472,189 watercraft inspections. Staff provided technical support to counties that received AIS Prevention Aid, and continued work with local groups who'd received \$60,000 in grants to support their work in behavior change around AIS prevention. Staff worked with the public at lake association meetings, conferences, and outdoors shows, and financially supported the inventory and management of terrestrial invasive species on 3,728 acres of state and adjacent land. Conservation officers completed 14,464 hours of invasive species education and enforcement.
- The DNR, in partnership with Wisconsin DNR, U.S. Geological Survey and U.S. Fish and Wildlife Service, led two Modified-Unified Method (MUM) events in Pool 8 of the Mississippi River in 2021, one April 5th-9th and one October 25th-29th. These events use a technique adapted from traditional fishing methods in China to divide a waterbody into cells with large block nets, and slowly herd invasive carp from one cell to another. Thirty-one silver carp were removed during the MUM events.
- The DNR continued to work with cooperators to implement recommendations from the University of Minnesota's Assessment to Support Strategic Coordinated Response to Invasive Phragmites (*Phragmites australis subsp. australis*) in Minnesota. The DNR continued a statewide nonnative Phragmites control effort. In 2021 the DNR funded treatment of 141 nonnative Phragmites sites in 24 counties. Most of the counties where treatment occurred had a limited number of small sites; 16 counties had less than five sites.
- In 2021, the DNR conducted an assessment of the availability of prohibited AIS by Minnesota aquarium and seafood sellers. We also conducted online surveys of hobbyists to better understand the risks associated with specific hobbies and how best to serve hobbyists.
- In 2021 the DNR completed permit training for 560 Lake Service Provider (LSP) business owners and managers, issuing 541 permits while 1,011 LSP employees completed online employee certificate training.

Thank you for partnering with the Invasive Species Program this year. We look forward to working with you in 2022 as we search for new technologies, create new partnerships, and strengthen current partnerships to protect Minnesota from invasive species.



Heidi Wolf, Invasive Species Program Supervisor
Minnesota Department of Natural Resources

Program Overview

Invasive species have serious economic, environmental and recreational impacts in Minnesota. In 1991, the Minnesota Legislature directed the DNR to establish an Invasive Species Program. The program is tasked with preventing the spread of invasive species and managing invasive aquatic plants and wild animals (Minnesota Statutes 84D).

In 2021, the Invasive Species Program included 24 full-time positions, plus affiliated staff in DNR offices across Minnesota whose work is primarily or partly focused on invasive species. In the summer, the DNR hired 61 watercraft inspection staff.

Program staff work with many partners, including:

- Local government units (LGU).
- Tribes, states, provinces, multi-jurisdictional and national groups.
- Researchers, including the Minnesota Aquatic Invasive Species Research Center (MAISRC) and the Minnesota Invasive Terrestrial Plants and Pests Center (MITPPC) at the University of Minnesota.
- The DNR AIS Advisory Committee.

The DNR Operational Order 113, which applies to DNR staff and contractors, provides policies and guidance for including invasive species prevention measures in their work.

The program tracks invasive species in other areas of North America and the world, works with partners to understand and manage pathways of spread, and works to reduce the potential for their introduction and spread in Minnesota.

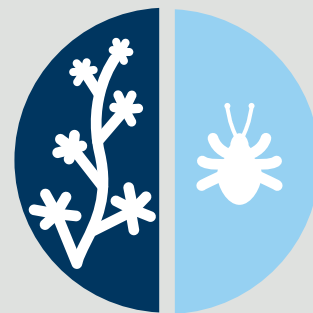
Examples of key invasive species of concern that we are tracking outside of Minnesota include:

- Hydrilla, an invasive aquatic plant.
- Water chestnut, an invasive aquatic plant.
- Northern snakehead, an invasive fish.

The program addresses invasive species in Minnesota, such as Eurasian watermilfoil, purple loosestrife, zebra mussel, spiny waterflea, starry stonewort, and invasive carp. Efforts in this area include working to prevent further spread and to manage impacts from invasive populations.

DNR prevention and management activities depend on collaboration with Tribes; other states; local governments including counties, cities and townships; agencies and other partners with similar concerns. Coordinated prevention efforts reduce the spread of invasive species and buy time needed for research and management that may provide long-term control solutions.

The program also addresses terrestrial invasive species on DNR-managed lands and provides information for private landowners. The program works to enhance the ability of DNR field staff to prevent and manage terrestrial invasive species effectively.



GOALS

- Prevent the introduction of new invasive species into Minnesota.
- Prevent the spread of invasive species within Minnesota.
- Reduce the impacts caused by invasive species to Minnesota's ecology, society and economy.

KEY STRATEGIES

1. Creating and maintaining effective invasive species regulations across the state and working with enforcement to ensure compliance.
2. Deepening partnerships with local governments, research institutions, interest groups, lake associations, related businesses and others.
3. Coordinating watercraft inspection and decontamination with counties, tribal governments, lake associations, resort owners and DNR Enforcement.
4. Verifying and responding to all new reports of possible invasive species as soon as possible.
5. Coordinating invasive species management efforts and inventories and sharing knowledge of aquatic and terrestrial invasive species.

HIGHLIGHTS

- Level 1 and level 2 watercraft inspectors hired by the DNR, and 67 local units of government with delegated authority from the DNR, accomplished more than 500,000 watercraft inspections in 2021, which makes Minnesota's watercraft inspection program one of the largest in the nation.
- The Great Lakes Restoration Initiative funded a DNR project beginning in June 2019 focused on trade pathways for AIS. In 2021, the DNR conducted an assessment of the availability of AIS by Minnesota aquarium and seafood sellers. We also conducted online surveys of hobbyists to better understand the risks associated with specific hobbies and how best to serve hobbyists. Partnerships with the DNR Enforcement Division and the Great Lakes Commission also supported response to illegal invasive species sales.
- The DNR partnered with MAISRC, the University of Minnesota Extension and many counties and local partners on an annual statewide search for new populations of starry stonewort, called Starry Trek. In 2021, 200 volunteers searched 222 Minnesota lakes. No new starry stonewort infestations were found during the 2021 Starry Trek.
- The DNR has continued working to educate the public about jumping worms, an invasive worm that can dramatically change soil, giving it a unique texture similar to coffee grounds, which can increase erosion and make it difficult for plants to grow. The DNR is partnering with the University of Minnesota to increase awareness of jumping worms and how to prevent their spread. Additionally, the DNR partners with the University of Minnesota in responding to jumping worm reports by confirming identification, maintaining maps of confirmed locations, and providing guidance to homeowners and businesses affected by jumping worms. As a part of this work the DNR created two videos on jumping worms titled "Invasive jumping worms: Impacts and prevention" and "Jumping worms: What anglers should know." They can be found on the DNR jumping worm webpage and have been viewed more than 63,000 times by September 2021. The DNR jumping worm webpage was viewed over 31,322 times from January 1, 2021 to September 20, 2021.



- AIS prevention planners continued to build a network of support with local AIS program managers who oversee the use of their counties' AIS prevention aid funds. In February and March 2021, DNR staff facilitated a series of six, 1½-hour online workshops designed to help local AIS program managers and their partners be more successful in their AIS prevention work through peer-to-peer sharing and collaboration. On average, there were four presenters and 63 attendees at each of the six online workshops.
- The Invasive Species Program, with funding from the Great Lakes Restoration Initiative and State-Interstate Grants administered by the U.S. Fish and Wildlife Service, continued to work with experts in the science of behavior change to better understand what motivates people in Minnesota to practice AIS prevention behaviors. This work continued with (1) Community Asset Mapping (CAM), which identifies a community's existing resources, organizations, programs, and individuals and 'maps' some of their interconnections; (2) Administration of grants to 12 local governments piloting AIS prevention behavior change strategies in their communities; and (3) An online survey of aquarium and water garden owners to better understand their awareness, attitudes, practices, motivations, concerns and communication preferences.
- The Invasive Species Program continued to foster key partnerships with organizations and agencies in other jurisdictions to help Minnesota stay aware of threats coming from watersheds shared with other states, like the Mississippi River and the Great Lakes basin. The DNR participates in regional groups to provide mutual support of interjurisdictional AIS prevention and management efforts, share information and experience, and contribute to regional AIS efforts.





Program Finances

TIME FRAME

The other chapters in this report cover activities that took place in calendar year 2021. However, to provide a comprehensive review of expenditures and to coordinate with the state funding cycle, this chapter refers to expenditures incurred in fiscal year 2021: July 1, 2020 to June 30, 2021.

FUNDING SOURCES

The Invasive Species Program was mostly supported by state funds in fiscal year 2021, with additional funding from the U.S. Fish and Wildlife Service.

State Funds

\$4,772,537 from a general fund appropriation, of which \$4,505,537 supported the Aquatic Invasive Species Program and \$267,000 supported the Terrestrial Invasive Species Program.

\$4,222,000 from the invasive species account, including the following funding:

- \$3,093,027 from a \$10.60 surcharge on watercraft registration (valid for three years) in Minnesota.
- \$1,308,990 from a \$5 fee on non-resident fishing licenses.

Federal Funds

Funds from the U.S. Fish and Wildlife Service, including those from the Great Lakes Restoration Initiative, supported the implementation of the Minnesota State Management Plan for Invasive Species. Federal funds helped support public awareness efforts, enforcement, watercraft inspections, invasive carp management, work with behavior change experts and the new staff position focusing on organisms in trade. In fiscal year 2021 the program was supported by \$1,196,234 in federal funds.



Photo on left:

DNR invasive species specialists monitoring for zebra mussels in Christmas Lake in Hennepin County, July 2021.

FISCAL YEAR 2021 EXPENDITURES

Invasive Species Unit expenditures on invasive species activities during fiscal year 2021 (July 1, 2020–June 30, 2021) totaled \$9,248,846.

The pie chart on the following page provides a broad look at how invasive species funding was spent in fiscal year 2021. The funds are focused on the prevention and management of invasive species, with Inspection/Enforcement and Education/Public Awareness falling under prevention, Management/Control falling under management and State and Regional Coordination divided among prevention and management.

Funding for Management/Control was spent on Eurasian watermilfoil, starry stonewort, zebra mussels and curly-leaf pondweed inventory and control, as well as grants for starry stonewort management monitoring.

The table below lists expenditures from the Invasive Species account and General Fund account, along with spending from other accounts including grants received from various state or federal funding sources, such as the U.S. Fish and Wildlife Service.

The terrestrial invasive species program expended \$267,000 in fiscal year 2021. The work was funded exclusively from the general fund.

COST ACCOUNTING

Minnesota Statutes 2021, section 84D.02, subdivision 6 identifies five expenditure categories that must be reported annually: Administration, Education/Public Awareness, Management/Control, Inspections/Enforcement, and Research. A sixth category, State and Regional Coordination, covers a variety of program-wide activities that do not fit easily into the five reporting categories required by statute.

ADMINISTRATION includes general office supplies, office rent, telephones, workers' compensation fees, computer support fees, the state accounting system fees, departmental operational support costs, as well as clerical and administrative support costs. Staff leave time (time used for holidays, sick leave, and vacation) has been apportioned across all categories based on the proportion of staff time invested in that category.

EDUCATION/PUBLIC AWARENESS includes staff time, in-state travel expenses, fleet charges, mailings, supplies, printing and advertising costs, and radio and TV time to increase public awareness of AIS. The costs of developing and producing pamphlets, public service announcements, videos, and similar material are included, as are the costs of developing and maintaining invasive species information on the DNR website.

MANAGEMENT/CONTROL includes staff time, in-state travel expenses, fleet charges, commercial

applicator contracts, and supplies to survey the distribution of AIS in Minnesota and to prepare for, conduct, supervise, and evaluate control activities. Funds provided to local government units and organizations to offset the cost of Eurasian watermilfoil, flowering rush and/or curly-leaf pondweed management efforts also are included.

INSPECTIONS/ ENFORCEMENT includes the costs that conservation officers incur enforcing invasive species rules and laws, the costs of implementing watercraft inspections at public water accesses, and staff time and expenses associated with promulgation of rules, development of legislation, conducting risk assessments, and other efforts to prevent the introduction of additional invasive species into Minnesota.

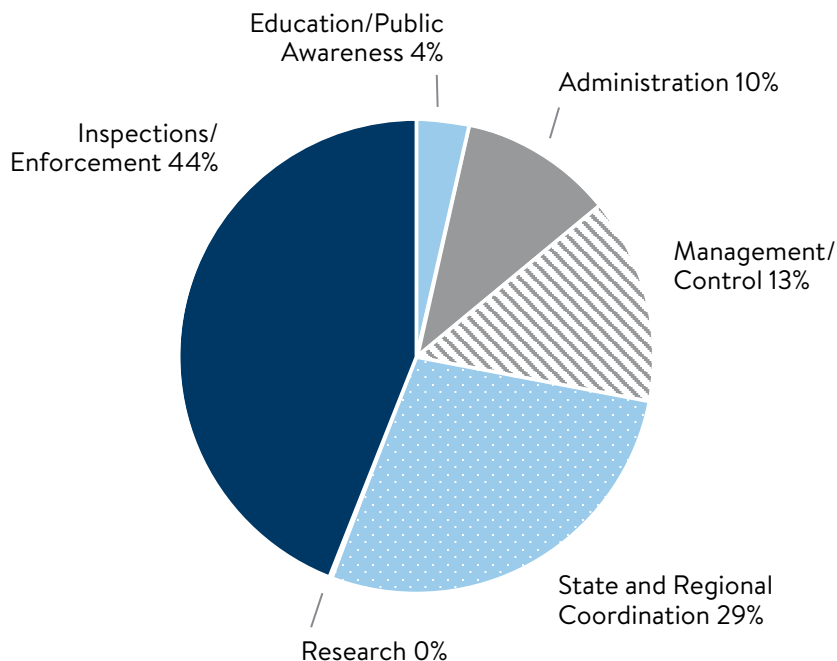
RESEARCH includes staff time, travel expenses, fleet charges, supplies, and contracts with the University of Minnesota and other

research organizations to conduct research. These include efforts to develop new or to improve existing control methods, better understand the ecology of invasive species, improve risk assessment tools, and evaluate program success.

STATE AND REGIONAL COORDINATION includes general program planning, preparation of state plans and reports, and general invasive species coordination with a wide variety of groups. This category also includes the work of program staff as well as various managers in the Ecological and Water Resources Division who periodically work on invasive species issues. Expenditures primarily represent staff time spent on these activities, as well as staff time and out-of-state travel expenses to work with regional and federal partners on AIS issues; work activities that staff participate in to improve their skills, direct co-workers, or help on other projects; and a portion of fleet costs and the cost to purchase and repair boats, trailers, computers, and similar items.

The program spent \$3,280,309 from the Invasive Species account in fiscal year 2021, which is \$941,691 less than the \$4,222,000 appropriated by the Legislature. The unspent funds in the Invasive Species account appropriation will go back to the invasive species fund. General Fund expenditures were \$4,732,642, slightly less than the \$4,772,537 appropriated by the legislature. The program also spent \$1,196,234 in federal funds in fiscal year 2021, with the majority of those funds supporting watercraft inspections and enforcement, management and control of aquatic invasive species and state and regional coordination.

INVASIVE SPECIES PROGRAM SPENDING



FISCAL YEAR 2021 INCOME

State and Local Funding Invasive Species Account	\$4,222,000
State and Local Funding General Fund.....	\$4,772,537
Federal Funding: Implement State Management for Aquatic Nuisance Species	\$1,495,512

FISCAL YEAR 2021 EXPENDITURES

	Invasive Species Account	General Fund	Federal/Other	Total Expenditures
Administration	\$168,597	\$541,000	\$8,275	\$717,872
State/Regional Coordination	\$846,037	\$1,416,049	\$249,099	\$2,511,185
Education/Public Awareness	\$9,414	\$109,221	\$63,274	\$181,909
Management/Control: Aquatic	\$507,590	\$739,701	\$300,558	\$1,547,849
Management/Control: Terrestrial		\$157,086		\$157,086
Inspections/Enforcement	\$1,747,948	\$1,736,098	\$604,368	\$4,088,414
Research: Aquatic	\$723	\$33,487	\$10,321	\$44,531
Total Expenditures	\$3,280,309	\$4,732,642	\$1,235,895	\$9,248,846



Prevention

GOALS

- Prevent the introduction of new invasive species to the state.
- Prevent the spread of AIS within Minnesota.

HIGHLIGHTS

- Invasive species staff worked to prevent the introduction and spread of new AIS in Minnesota by working with partners locally, statewide, regionally, nationally, and internationally. DNR invasive species prevention work includes outreach, enforcement, regulations, permitting, collaboration, and coordination.

Prevention Activities

In 2021, invasive species staff:

- Conducted outreach to businesses operating in trade pathways for invasive species and assessed risks associated with these pathways.
- Surveyed lakes for AIS and reviewed reports from lake users about suspected AIS.
- Searched for zebra mussels and other AIS on water-related equipment on lakes and at public water accesses. Staff occasionally worked with a DNR Enforcement zebra mussel detection dog.
- Built relationships with local program managers utilizing their county's AIS Prevention Aid funds. Invasive species staff provided technical guidance on AIS prevention and management activities.
- Increased public awareness of AIS via interviews with radio, newspaper and television outlets.
- Enforcement staff investigated pathways for spreading AIS such as equipment and watercraft, food markets, bait dealers, and aquatic plant dealers.
- Enforcement pilots worked with the Minnesota Seaplane Association to develop recommendations to prevent the spread of AIS by seaplanes.



Photo on left:

A dock and lift installer pulls aquatic plants from a boat lift being removed for the season.



Permits

The DNR has authority to issue permits to allow the public to conduct certain activities with invasive species or in listed infested waters that would otherwise be prohibited under state regulations. The DNR provides information or training to permittees on how to reduce the risk of spreading AIS. Permit conditions require permittees to take actions to prevent the spread of AIS.

DNR permits related to AIS include:

- Lake service provider permits.
- Infested waters permits.
- Prohibited invasive species permits.
- Bait harvest permits.

LAKE SERVICE PROVIDER PERMITS

Legislation authorizing a permit program for lake service providers (LSPs) to help prevent the spread of AIS in the state took effect in 2012.

Lake service provider business owners are required to complete AIS prevention training and receive a Lake Service Provider Permit before conducting work that involves decontaminating, installing, removing, or renting water-related equipment from or in state waters. Employees who work for a LSP must also successfully complete a free online training course and receive a training certificate. Permits and certificates are valid for three calendar years.

TOTAL STATEWIDE CERTIFICATIONS AND LSP PERMITS



2,613
Certified LSP
employees



905
Permitted
LSPs

Photo above:

A lake service provider employee sees off rental customers as they get out onto the lake.

2021 Activities

- The DNR completed permit training for 560 LSP business owners and managers, issuing 541 permits.
- 1,011 LSP employees completed online employee certificate training.
- 905 businesses were permitted LSPs at the end of 2021. The current list of businesses is on the DNR website.

Future Plans

Assess ways to improve the LSP course delivery, outreach and compliance.

INVASIVE SPECIES AND INFESTED WATERS PERMITS

People need a permit to divert or transport water from listed infested waters (Minnesota Rules, part 6216.0500). In 2021, the Invasive Species Program issued 15 infested waters permits. Permits for water appropriation and work in public waters issued through the DNR Permitting and Reporting System (MPARS) also include invasive species conditions.

People need a permit to possess, transport, sell, purchase, or import prohibited invasive species. The Invasive Species Program issued 144 prohibited invasive species permits in 2021 (the majority of which were for use of frozen dead red swamp crayfish in crayfish boils, as described on page 17).

Individuals can access several general permits on the DNR website, for example: to possess certain preserved specimens of prohibited invasive species; for fire departments using infested waters for training purposes; to transport water for water quality sampling; and to transport certain equipment away from a water body to a cleaning or storage location.

PERMITS TO HARVEST BAIT FROM INFESTED WATERS

In Minnesota, commercial bait harvesters need a permit to work in listed infested waters. DNR Fisheries issues permits to licensed minnow dealers who work in infested waters. Permittees must successfully complete AIS training and comply with permit conditions to prevent the spread of AIS from infested waters. For example, permitted commercial bait harvesters must attach tags to equipment used in infested waters and they may not use that gear in waters other than those identified by the tag.

In general, people cannot harvest bait for personal use from waters listed as infested with AIS.

Regulations

Regulations, including laws and rules, are an important part of Minnesota's AIS prevention strategy that complement our education and outreach efforts. The Invasive Species Program works to review and refine state regulations to prevent the introduction and spread of invasive species and to clarify regulations for the public. That includes establishing new and revising existing regulations to address pathways of AIS spread, designating certain nonnative species as prohibited or regulated invasive species, and listing water bodies as infested with AIS within our existing authorities.

Minnesota state law governing AIS is primarily located in Minnesota Statutes, chapter 84D. Authorities and prohibitions related to AIS also can be found in chapter 86B, Water Safety and Watercraft; chapter 97C, Fishing; and chapter 103G, Waters of the State. The administrative rules related to AIS are primarily found in Minnesota Rules, chapter 6216.

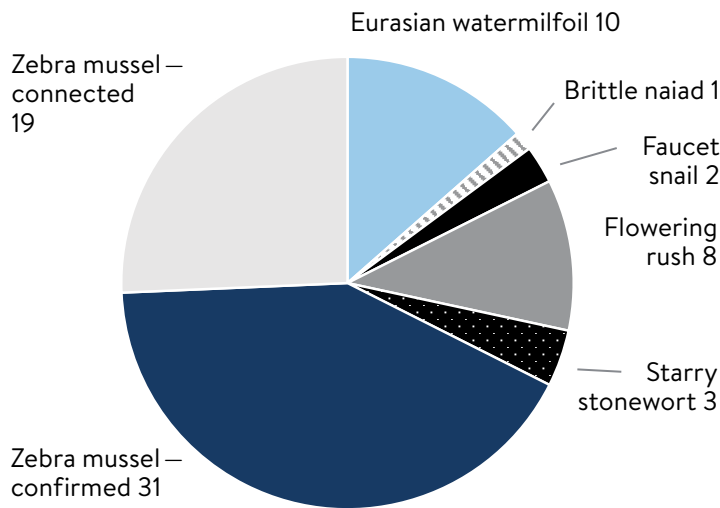
Past annual reports of the program are also a good source of summaries of changes to statute and rule related to invasive species; many of these are available from the Minnesota Legislative Reference Library. The most recent reports are available on the DNR website.

There were no changes to invasive species statutes or rules in 2021. The Invasive Species Program is proposing rule changes that would add species to the prohibited invasive species list. This will help align invasive species classifications with the Great Lakes St. Lawrence Governors and Premiers "Least Wanted Aquatic Invasive Species" list and fill critical gaps created by a 2015 legal decision that reinterpreted provisions of the national Lacey Act related to interstate species transport. The formal rule making process will continue into 2022 and includes a public comment period.

Infested Waters

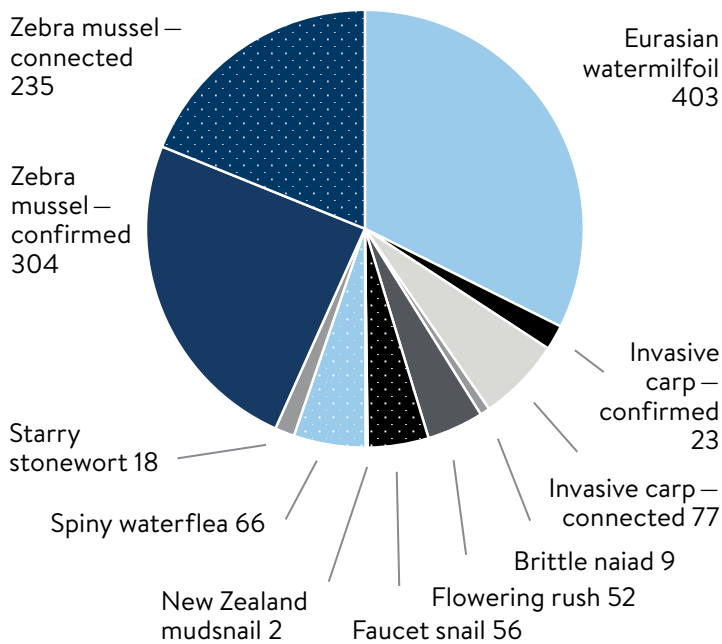
The DNR will add a lake, river, pond or wetland to the infested waters list if it contains certain AIS that could spread to other waters. The DNR may also list a lake, river, pond or wetland as infested if it is connected to a body of water where AIS are present. To reduce the risk of spreading AIS, activities like bait harvest, commercial fishing, and water use are managed differently in infested waters.

NEW WATER BODIES LISTED AS INFESTED IN 2021



For more information on waters listed in 2021, see Appendix B.

TOTAL WATER BODIES LISTED AS INFESTED



Not included in the total water bodies infested chart:

- One lake is listed as infested with red swamp crayfish, though red swamp crayfish have not been detected there since 2016.
- Lake Superior, the St. Louis River estuary, and other Superior tributaries are listed as infested with VHS, round goby, ruffe and white perch.

INVASIVE SPECIES IN TRADE

The Invasive Species Program continues to assess risks associated with trade pathways for invasive species. Known pathways include the aquarium, horticulture, food, bait and classroom and laboratory biological supply industries, and their customers. The program assessed the availability of invasive species in aquarium stores and food markets. A hired contractor visited all known Minnesota aquarium stores and live seafood markets (Hennepin County stores were assessed as part of a separate project led by the county). The contractor examined the retailers' stocks, maintained data on any invasive species found and provided educational materials to store employees. The Invasive Species Program also administered online surveys of 1) anglers that use live bait and 2) aquarium and water garden hobbyists. These surveys will provide an understanding of respondents' invasive species awareness, motivations, concerns and practices to improve prevention and outreach. Formal reports summarizing these efforts are available on the DNR website.

Collaboration and coordination with industry, interstate and national invasive species professionals, the DNR Enforcement Division and others also aided trade pathway prevention in 2021. The Invasive Species Program:

- Partnered with the Great Lakes Commission and other states in the region to identify and educate online sellers of invasive species and host a symposium on law enforcement in trade pathways.
- Collaborated with the DNR Enforcement Division to determine and implement a standardized process for responding to illegal invasive species sales and educate Minnesota aquarium retailers on safe disposal of zebra-mussel contaminated moss balls, in partnership with U.S. Fish and Wildlife Service.
- Continued to build relationships with businesses by serving as a point-of-contact for invasive species-related inquiries and providing educational materials to share with customers.
- Through a collaboration with the Minnesota Science Teachers Association, educated teachers on regulations related to classroom use of live organisms.

- Provided the public with alternatives to releasing pets and plants through at least eight media interviews, following public interest in Keller Lake's goldfish population.

The Invasive Species Program also determined, implemented and conducted public outreach about a permitting process for using frozen dead prohibited invasive crayfish in crayfish boils (it is unlawful to possess prohibited invasive species whether they are living or dead). Through increased public awareness, these efforts likely reduced the number of individuals importing live red swamp crayfish for consumption purposes. The program received at least 183 crayfish boil-related inquiries from Minnesotans in 2021, with many initially requesting permits to import live crayfish. All inquirers were provided with alternatives, including options using Minnesota crayfish from harvesters or aquatic farmers, and 115 permits for using non-living red swamp crayfish in crayfish boils were ultimately issued. The DNR educated the public on crayfish regulations through distribution of a news release that was shared by at least nine media outlets and a direct mailing to 117 crayfish distributors and 135 local restaurants and seafood markets.

The vast majority of the work described in this section was funded through a grant from the Great Lakes Restoration Initiative administered by the U.S. Fish and Wildlife Service.



While goldfish are a popular aquarium fish, they can be harmful to wildlife and the environment if released into Minnesota waters.

PARTNERSHIPS

The Invasive Species Program partners with other people and organizations in Minnesota, regionally, and nationally to help prevent the introduction and spread of AIS.

Invasive Species Program staff represent the state on two regional panels of the federal Aquatic Nuisance Species Task Force: the Great Lakes Panel on Aquatic Nuisance Species and the Mississippi River Basin Panel on Aquatic Nuisance Species. These panels provide an opportunity to share Minnesota's prevention priorities with other jurisdictions in those regions, and to hear about emerging AIS threats in locations further downstream to inform adaptive management actions in Minnesota.

The U.S. Fish and Wildlife Service provides funding for AIS prevention projects and scientific expertise about the risk of AIS to Minnesota. Some collaborative projects supported in 2021 through Great Lakes Restoration Initiative grants administered by the U.S. Fish and Wildlife Service included hosting the western Lake Superior AIS working group and updates to the DNR's invasive species response plan and state invasive species management plan. The western Lake Superior AIS work group includes representatives of state, federal, tribal, and county government organizations, as well as research and educational institutions. It 1) supports effective responses to suspected discoveries of previously unrecorded AIS populations and 2) provides a forum for communication and collaboration on AIS projects in the region encompassing western Lake Superior, the surrounding watershed, and nearby areas.

Invasive Species Program staff also coordinate with partners such as Minnesota Sea Grant, MAISRC and others.

FUTURE NEEDS AND PLANS

Over the next year, the DNR will continue to:

- Work with partners and stakeholders to plan and implement prevention activities.
- Monitor the distribution of AIS in the state.
- Assess the risk of spreading AIS during different activities.
- Improve and refine the DNR AIS prevention program and supporting regulations.



Education and Public Awareness

GOALS

- Help Minnesota residents and visitors understand their role in preventing the spread of AIS.
- Provide clear actions to prevent the introduction and spread of AIS, including both the Clean, Drain, Dispose steps required by Minnesota law and other specific behaviors identified by the DNR and partners.
- Heighten understanding of aquatic invasive species' potential negative impacts on natural resources that are central to Minnesota's ecology, economy, recreation, identity and overall quality of life.
- Increase awareness of the DNR's AIS research, management and prevention efforts.
- Inform stakeholders, residents and other agencies of available training, funding and educational resources.

HIGHLIGHTS

- The Invasive Species Program continued leading a multi-year effort focused on positive messaging to build community norms around desirable behaviors. Expanding on a "community-based social marketing" model, the program and an expert research group identified which behaviors would have the greatest impact on AIS prevention, the barriers and benefits associated with those behaviors, and effective strategies for implementation. The next phase of the project focused on community asset mapping, which identifies a community's existing resources, organizations, programs and individuals and 'maps' some of their interconnections. A related survey of aquarium and water garden owners was administered online.
- The Invasive Species Program continued to advise 12 local government grantees across the state implementing behavior change pilot projects. The DNR grants, funded through the Great Lakes Restoration Initiative administered by the U.S. Fish and Wildlife Service, support pilot projects that address proper bait disposal, cleaning boats, and drying docks and lifts for 21 days before being moved to another water body.
- Program staff continued public engagement efforts primarily online, due to the COVID-19 pandemic.
- The Enforcement Division conducted media interviews on the importance of AIS regulation compliance.
- The Enforcement Division canine zebra mussel detection teams provided educational demonstrations at several public events.



Photo on left:

DNR Invasive Species Specialist Keegan Lund demonstrates how to collect beetles for biological control of purple loosestrife in Roseville.

Strategic Communications

DNR information officers continued the integration of news and media relations, web, social media, publications and graphic design, public access signs, advertising and public interactions.

Promoting Behavior Change

The Invasive Species Program, in consultation with behavior change experts, continued to utilize “community-based social marketing” (CBSM) methodologies to promote AIS prevention behaviors in Minnesota (<https://www.dnr.state.mn.us/invasives/ais/prevention/behavior-change.html>). CBSM is a social science approach to foster sustainable, environmentally beneficial behaviors, providing a step-by-step process for assessing risks and identifying opportunities for long-term change. People may be aware of an issue such as invasive species, but they don’t always adopt or consistently practice desired behaviors over the long-term. We want to understand what people know, believe and currently do about AIS, to build community norms around effective prevention actions. These efforts focus on the previously identified five major pathways of AIS: watercraft, live bait, gear/equipment, aquarium trade and aquatic plant trade.

This work continued with Community Asset Mapping (CAM), which identifies and ‘maps’ interconnections between a community’s existing resources, organizations, programs, and individuals. The CAM process collects quantitative data such as geographic influences, trusted influencers, social media channels, and social network connections; and collects qualitative data such as information about social channels, community life, and values. Results will be compiled into a living database and a final report.

An online survey of aquarium and water garden owners was conducted in 2021 to better understand their awareness, attitudes, practices, motivations, concerns and communication preferences. Site visits were conducted at more than 20 independent aquarium and garden stores, providing an opportunity to engage businesses on invasive species in trade issues. Preliminary survey results found that the DNR is the highest trusted source of information about invasive species regulations. A majority of the 482 survey respondents are aware of and care about invasive species, are taking proper actions and are interested in learning more. Survey results will be used to inform future public engagement efforts with hobbyists and businesses.

Twelve behavior change grant projects funded in 2020 through \$60,000 from the Great Lakes Restoration Initiative continued their work in 2021. Projects address behaviors that support proper bait disposal, drying docks and lifts for 21 days before moving them to another water body, and thoroughly cleaning boats and trailers at public accesses. The combination of baseline behavioral data and local pilot projects is key to developing statewide initiatives that will help Minnesotans and visitors adopt desirable AIS prevention behaviors and create positive social norms around AIS prevention throughout Minnesota.

Informational Materials

The program continued to assess and revise informational materials for public distribution. Program staff worked with the DNR Creative Services Unit and other staff to create the following new materials:

- License holder with “Clean, Drain, Dispose, Spray, Rinse, Dry, Never Release” messaging.
- “Attention Boater” flier.
- Clean, Drain, Dispose, and Decontaminate icons.
- Videos and photos about how to collect and raise beetles for purple loosestrife biocontrol.

Staff distributed license holders and temporary tattoos (six invasive species designs) at the DNR Building during the 2021 State Fair.

Staff provided invasive species content and advertising for the 2022 Minnesota Fishing Regulations handbook. The handbook, available in five languages, includes information about AIS laws and watercraft inspections, species identification information, advertising to remind anglers to help prevent the spread of AIS, and information about the infested waters list. More than 850,000 copies of the fishing regulations will be distributed beginning in March.

Staff conducted a bi-annual inventory and bulk order of AIS signs for posting at public water accesses. Signs are made available to local partners for posting with permission at public and private water accesses as well. Signs with consistent messaging statewide provide a reminder to act and are posted at locations where boaters and anglers prefer to receive AIS information.

Web/Digital

The program made greater use of social media and other new media platforms, in addition to continued traditional media. Numerous webpages were updated with new information and a new page was developed to highlight the DNR's invasive carp efforts on the Mississippi River using the Modified-Unified Method (<https://www.dnr.state.mn.us/invasives/ais/invasive-carp-modified-unified-method.html>).

Media Relations

In 2021, the program continued to expand placement of more stories about innovations and new steps to reduce the spread of invasive species. DNR news releases about new AIS confirmations focused on the unique dynamics of each lake and river. Additionally, news releases created greater awareness of proactive steps the program is taking, such as aggressive actions to prevent the spread of invasive carp, advances in research and technologies, and the broad range of partnerships with stakeholders across the state. Additionally, the Enforcement Division conducted media interviews on the importance of AIS regulation compliance. Finally, the state's first Modified Unified Method operations to remove invasive carp from Pool 8 of the Mississippi River were a focal point for media, with the DNR coordinating communications with multiple agencies and providing video and photos for media use.

Public Engagement in an Online World

Staff participated online in conferences, water festivals and many other special events throughout the year to educate the public. Program staff also made online presentations to lake associations and community groups to answer questions and discuss invasive species issues and activities.

PARTNERSHIPS

Statewide Aquatic Invasive Species Advisory Committee

This committee plays a vital role in reviewing and guiding the AIS prevention and management work of the Invasive Species Program. Members are appointed by the DNR Commissioner. They bring a range of personal and professional experience to the discussion on preventing the spread and managing impacts of invasive aquatic plants and animals in Minnesota. Their interest and engagement with other stakeholders informs the program regarding policy, outreach, research, operations and other stakeholder interests. Visit mndnr.gov/aisadvisory.

Minnesota Aquatic Invasive Species Research Center

MAISRC, at the University of Minnesota, is a valuable partner, working closely with the program on research and advances in AIS management and related information. The DNR's Assistant Commissioner is a member of the Center's Advisory Board (CAB), he and the program supervisor attend quarterly CAB meetings. The section manager and program supervisor of the DNR's Invasive Species Program also have monthly coordination meetings with MAISRC's director and assistant director. Many Invasive Species Program staff attended an online version of the center's annual showcase and explored new ways to work together. Visit maisrc.umn.edu.

Minnesota Sea Grant

Minnesota Sea Grant continues to partner with the DNR and other organizations to help prevent the spread of invasive species. Through scientific research and public education programs, Minnesota Sea Grant works to enhance Minnesota's coastal environment and economy. Visit seagrant.umn.edu.

Wildlife Forever

This nonprofit organization leads the Clean, Drain, Dry Initiative in Minnesota and provides content and resources to multiple partners throughout Minnesota and across the country. Visit wildlifeever.org.

FUTURE NEEDS AND PLANS

- Apply behavior change findings and related messaging to communications planning and implementation.
- Deepen engagement with behavior change experts and trained partners and staff.
- Develop and use surveys, pilot testing and focus group instruments to better understand and measure effectiveness of communication efforts.
- Continue to engage and train Invasive Species Program staff about plain language, behavior change, electronic information accessibility and other communication techniques.
- Continue to work collaboratively with MAISRC, Minnesota Sea Grant, Wildlife Forever and other stakeholders to pursue research and secure funding through National Sea Grant, the Great Lakes Restoration Initiative, U.S. Fish and Wildlife Service, foundations and other sources for additional invasive species public awareness efforts.



Enforcement

GOALS

- Provide advanced training to conservation officers and train local law enforcement to effectively enforce AIS laws.
- Analyze the DNR AIS laws and work with stakeholders on legislative issues to give law enforcement necessary tools to assist in AIS prevention.
- Continue to emphasize AIS as priority work and a core responsibility.
- Continue inspections by conservation officers to reduce the risk of spreading AIS by water-related equipment. Assist level 1 and level 2 watercraft inspectors at public access sites and investigate violations reported by inspectors
- Continue to analyze data, develop protocols and secure equipment to administer AIS check stations safely and effectively.
- Train and educate commercial entities to increase compliance with invasive species regulations.

HIGHLIGHTS

- DNR conservation officers provided 14,464 hours of AIS enforcement and education.
- The Enforcement Division's two zebra mussel detection canine officers assisted conservation officers and AIS inspectors. The dogs improved the efficiency of conservation officers and inspectors, with faster and more thorough inspections of water-related equipment.
- Four conservation officers, designated as water resource enforcement officers (WREO), continued to dedicate a significant portion of their work toward aquatic invasive species enforcement. Currently, there are two WREO vacancies, the Enforcement Division intends to fill these positions in 2022.



Photo on left:

Conservation Officer Joel Heyn inspects a watercraft at a public access during the 2019 waterfowl season.



Conservation Officer Hannah Mishler and zebra mussel-sniffing K9 (Storm) inspect watercraft at a public access area during the summer of 2019.

ENFORCEMENT CONTACTS (Citations/Warnings)

Numbers vary due to officer staffing levels, public compliance, length of open-water season, local law enforcement involvement and outreach efforts. Although the decrease in enforcement activity related to AIS violations during the 2021 season may be associated with a higher compliance rate, it should be noted that Enforcement Division hours dedicated to AIS efforts decreased during the same period due to competing work priorities including the support of local law enforcement agencies in response to civil unrest activity. In addition, the tools (e.g. AIS check stations) available to effectively monitor AIS activity continued to be limited due to ongoing COVID pandemic requirements.

	2021	2020	2019	2018	2017	2016	2015
Citations issued	39	61	98	95	127	123	244
Warnings	266	365	485	476	557	671	911

AQUATIC INVASIVE SPECIES CHECK STATIONS (SPRING TO FALL 2021)

In both 2020 and 2021, due to the COVID-19 pandemic, the DNR did not use roadside check stations to inspect watercraft and watercraft equipment transported in Minnesota.

Statewide Open Water Season Enforcement Results

Review of past data from DNR Enforcement check stations shows the compliance with invasive species regulations has risen every year since the first year of check stations back in 2012.

PARTNERSHIPS

Enforcement of Minnesota's invasive species regulations is essential to preventing invasive species' spread into and across Minnesota. Conservation officers continue to work with local law enforcement, lake associations, local government units, user groups, and other DNR divisions to assist in controlling the spread of invasive species.

FUTURE NEEDS AND PLANS

The Enforcement Division continues to focus its efforts on enforcement and education, both critical tactics in preventing the introduction and spread of invasive species.

The Enforcement Division will continue to monitor and evaluate our actions to provide the most effective measures available. We will work with the public and private entities on legislative initiatives to provide law enforcement with the tools necessary to prevent the spread of AIS.

The Enforcement Division will continue to emphasize invasive species enforcement as priority work and a core responsibility.



Watercraft Inspections

GOALS

- Conduct watercraft inspections at public water accesses throughout Minnesota and require watercraft users to decontaminate their watercraft if AIS or water are found.
- Increase public awareness about AIS and reduce the potential for boaters to transport species to other water bodies.
- Increase education efforts with stakeholder and user groups.
- Distribute information at events throughout the state.
- Employ level 1 and level 2 watercraft inspectors.
- Provide training and support to local government inspection programs.

HIGHLIGHTS

- Hired 61 watercraft inspectors for the 2021 season.
- Updated our existing online training program for local government inspection staff. This distance-learning process trained 811 level 1 inspectors and 161 level 2 inspectors.
- Completed 538,763 incoming and outgoing watercraft inspections with the DNR and local government watercraft inspectors.
- 295,468 incoming watercraft were in compliance with state laws. 98% of incoming watercraft were found free of plants, invasive animals, mud or water.
- 97% incoming watercraft arrived in compliance with state drain plug laws.
- 95% of incoming watercraft were in compliance with all AIS transport laws.



Photo on left:

Level 2 Inspector Tyler Fougner checks water temperature during an engine decontamination in the summer of 2019.

Transportation of Invasive Species

Boaters in Minnesota must remove drain plugs from watercraft and livewells to reduce the risk of transporting AIS like spiny waterflea or zebra mussel larvae, as required by the state's "drain plug law." People in Minnesota also may not transport aquatic plants under most circumstances. This helps prevent the spread of invasive plants as well as other AIS that can be attached to plants, like zebra mussels.

In 2021, watercraft inspectors observed that the majority of people arriving at accesses were in compliance with state AIS prevention laws.

- 97% of people arriving at accesses had removed drain plugs from their watercraft.
- 98% of people arrived at accesses with watercraft and trailers that were free of aquatic plants.
- Watercraft inspectors found zebra mussels on 156 incoming watercraft (2020 had 109 occurrences). Sixteen were at water bodies not known to be infested with zebra mussels.

DNR-authorized watercraft inspectors took the following actions to follow-up with the few individuals who were in violation of state laws:

- Watercraft inspectors instructed owners not to launch until watercraft passes inspection.
- Zebra mussel violations are forwarded to DNR Enforcement for follow-up.

- Watercraft inspectors required decontamination prior to launching for any watercraft with vegetation or attached zebra mussels attempting to enter a water body. Decontamination methods include hand removal, draining or a high-pressure, hot water treatment.

Decontamination Units

The Watercraft Inspection Program hires level 2 watercraft inspectors to decontaminate watercraft with high-pressure, hot-water wash units. DNR staff used 23 portable wash units around the state to perform 1,616 decontaminations. Local inspection programs operated an estimated 34 decontamination units in addition to DNR operated units. Partner units decontaminated an additional 3,173 watercraft. DNR decontamination units were located at high-use watercraft accesses on zebra mussel-infested water bodies.

DNR Volunteer Training

The Watercraft Inspection Program conducts AIS volunteer training sessions to teach people how to educate watercraft users at waters where they live or recreate. In 2021 volunteers were given the opportunity to take a self-guided online training in order to volunteer at public water accesses. Typically volunteers receive classroom training every three years, with an online refresher course each year between classroom training. In 2021, eight people signed up for the online training. Volunteers must pass a yearly background check.

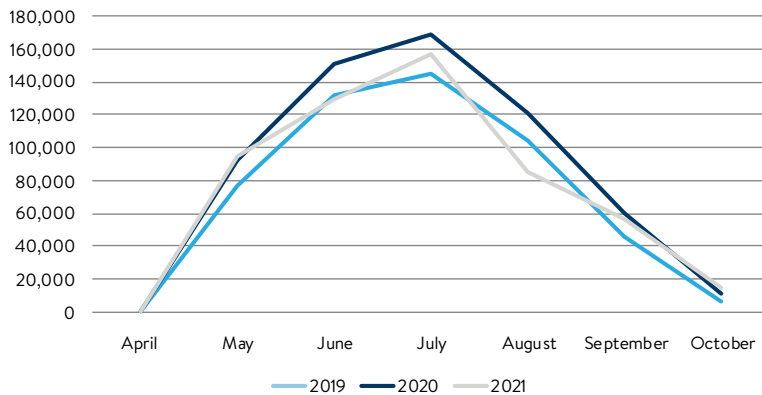
NUMBER OF DNR WATERCRAFT INSPECTIONS

	2021	2020	2019	2018	2017	2016	2015	2014
Inspections	66,574	56,813	70,762	66,833	84,824	102,445	103,500	119,000
Inspection Hours	22,755	19,509	25,451	21,826	29,400	38,000	35,000	49,550
Inspections per Hour	2.93	2.91	2.78	3.06	2.88	2.7	2.96	2.42

NUMBER OF DNR WATERCRAFT INSPECTIONS BY REGION

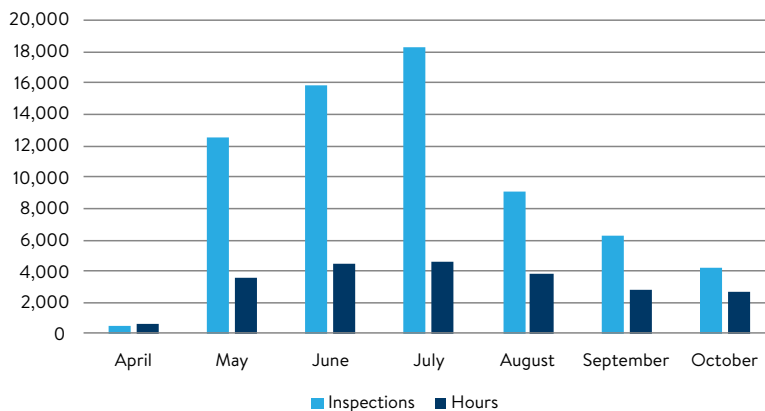
DNR Region	2021	2020	2019	2018	2017	2016	2015	2014
Northwest - 1	18,102	18,121	19,437	13,539	17,857	23,575	20,250	26,500
Northeast - 2	7,560	7,093	8,152	7,266	11,413	13,770	12,450	14,100
Central - 3	35,874	27,797	40,623	43,653	51,513	62,150	67,800	74,900
Southern - 4	5,038	3,778	2,550	2,375	4,041	2,950	3,000	3,600
Total Inspections	66,574	56,813	70,762	66,833	84,824	102,445	103,500	119,100

DNR AND LGU INSPECTIONS PER MONTH 2019–2021



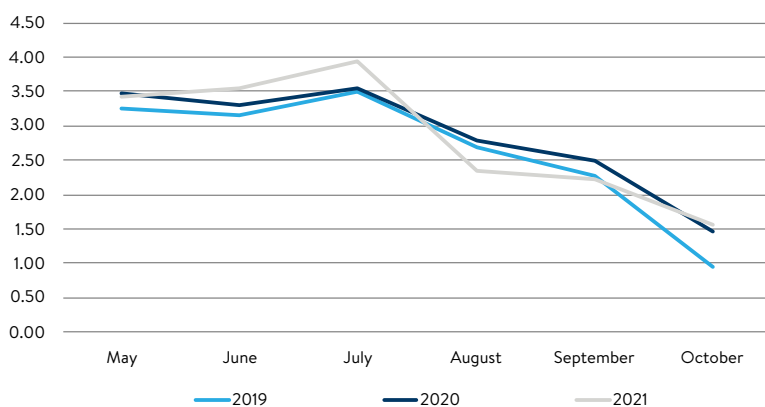
Authorized watercraft inspections start in early April, peak in July, and fall off in October when most inspection programs end and boat activity reduces.

DNR INSPECTIONS AND HOURS PER MONTH: 2021



Inspections are performed statewide from April through October. The number of inspections peak in July, while staff presence remains fairly consistent.

DNR INSPECTIONS PER HOUR, BY MONTH



DNR inspections per hour have followed a consistent pattern each year since 2019.

PARTNERSHIPS

Local and Tribal Governments

Local and tribal governments can partner with the DNR through a delegation agreement. This agreement allows governments to hire authorized watercraft inspectors to support local watercraft inspection programs. There were 67 active delegation agreements during the 2021 season. These programs hired an additional 811 watercraft inspectors. This compares with 66 active delegation agreements and 756 trained inspectors in 2020.

The local and tribal government employees follow the DNR's watercraft inspection process using DNR survey questions. The findings are reported to the Watercraft Inspection Program through a statewide watercraft inspection mobile application.

FUTURE NEEDS AND PLANS

In 2022, the Watercraft Inspection Program will continue to improve online and in-person training programs as well as watercraft inspection handbooks to help increase inspector knowledge, and ensure programs are ready to start at their desired times. This year set a record for the most inspections completed by DNR and local unit of government watercraft inspectors in a single boating season. As these numbers grow, increased training and communication with partners is essential to ensuring each watercraft inspection is done correctly.

The program will review 2021 data to refine the DNR's watercraft inspection survey process and adjust the hours and days spent at watercraft accesses to try to increase our inspections per hour. The program will train local units of government staff to conduct AIS education at local watercraft accesses and work to expand the number of partnerships with tribal and local governments in an effort to increase total watercraft inspection capacity throughout the state.



Aquatic Invasive Species Prevention Aid

The Minnesota Legislature provides \$10 million directly to Minnesota counties to help prevent the spread of aquatic invasive species: AIS Prevention Aid. The funds are allocated based on each county's share of watercraft trailer launches (50%) and watercraft trailer parking spaces (50%).

Each county board and/or designated local government decides how to use the funds. Each county submits a copy of its guidelines for use of the funding to the DNR by December 31 of each year. The Invasive Species Program has two full-time staff dedicated to working with these local programs.

GOALS

- Annually review and document county AIS plans and resolutions.
- Provide opportunities for local government staff to share and learn from one another's collective experiences.
- Provide opportunities for local government staff to maintain strong relationships with stakeholders such as other local governments, tribal governments, state and federal agencies, nonprofits, businesses, lake associations, outdoor recreation groups, etc.
- Provide technical support and training to local governments and their partners as they develop, implement and evaluate their local prevention strategies.
- Provide opportunities for local government staff to infuse their AIS prevention programs with behavior change strategies.

HIGHLIGHTS

- In February and March 2021 the Invasive Species Program facilitated a series of six, 1½-hour online workshops designed to help local AIS program managers and their partners be more successful in their AIS prevention work through peer-to-peer sharing and collaboration.
- Worked with counties to revise and put into practice a metrics template designed to capture data and stories about local AIS prevention programs. This information helps demonstrate the statewide impact of AIS Prevention Aid.



Photo on left:

Kylie Cattoor, natural resources specialist, demonstrates aquatic invasive species monitoring techniques at a DNR-hosted learning session at Lake Ann in 2018.

Technical support

- Provided technical support to local governments and their partners as they develop, implement and evaluate their AIS prevention strategies.
- Received guidelines including plans and resolutions from the 83 Minnesota counties receiving funds and provided feedback on those guidelines to counties.
- Provided information on DNR AIS programs (e.g., public outreach, watercraft inspection, invasive aquatic plant management, behavior change). This included updating key resources and promoting available support from the DNR on the AIS Prevention Aid webpage (www.mndnr.gov/invasives/ais/prevention).
- Played an advisory role on county AIS task forces and advisory committees.
- Developed guidance documents and online resources, hosted workshops and provided presentations as ways to relay information to counties and their local stakeholders.
- Provided feedback on communication materials developed by local AIS program managers to promote consistent messages about AIS and prevention steps (e.g., Clean, Drain, Dispose).
- Revised a template of metrics based on comments received from counties. The template provides a voluntary way for local AIS program managers and their partners to track accomplishments and demonstrate how AIS Prevention Aid is making a difference in their communities. Sixty-one counties submitted a template summarizing their work in 2020. We learned that 865 paying jobs were created and supported with AIS Prevention Aid and \$1,153,913.06 in additional funds was leveraged to support AIS prevention activities. Forty-one counties surveyed 605 lakes and rivers for AIS. Twenty-three counties funded invasive aquatic plant management on 176 lakes in partnership with 71 lake associations.

Engaged local governments and partners

- Maintained a network and community of support by continuously updating a primary contact list of county AIS program managers online and encouraged them to use the list to collaborate with one another. DNR planners used the list to disseminate timely and relevant information about AIS Prevention Aid funding

and requirements, new resources, innovative activities, learning/collaboration opportunities, DNR program updates, etc.

- The Invasive Species Program hosts yearly workshops for local AIS program managers and stakeholders to share their AIS prevention experiences, discuss successes and challenges, support collaborative efforts, broaden their knowledge on AIS issues, and build stronger inter-county relationships. In February and March 2021, these workshops were transitioned to an online format due to the ongoing COVID-19 pandemic. The DNR hosted a series of six, 1½-hour WebEx meetings each on a specific topic of interest that included a few short presentations primarily from local programs and a facilitated discussion. On average, there were four presenters and 63 attendees at each of the six online workshops. Attendees included staff and stakeholders involved in developing and implementing local AIS programs. This includes, but is not limited to: local and tribal government staff overseeing a county's AIS Prevention Aid or local AIS program, watercraft inspection staff, local AIS task forces/committees members, state and federal agency staff, regional and statewide partners, non-government organizations, businesses, etc.
- Presented about the AIS Prevention Aid program and behavior change tips and tricks at an online "Enhanced Watercraft Inspection Training" hosted by North St. Louis Soil and Water Conservation District. This training is in addition to the baseline DNR watercraft inspection training and covered additional topics on customer service, conflict resolution, diversity and species of concern.
- Hosted two in-person, outdoor AIS identification sessions in cooperation with the University of Minnesota-Extension to help their site coordinators prepare for the 2021 Starry Trek event.
- Provided information about the AIS Prevention Aid program and general AIS education to groups such as AIS task forces, lake associations, college courses, and assorted youth events.



PARTNERSHIPS

Creating new and deepening existing partnerships at all scales with a diversity of stakeholders is the heart of the AIS Prevention Aid program.

- Connected local AIS program managers interested in conducting new AIS projects with AIS experts and other local organizations that have experience implementing similar projects. Often these connections evolved into multi-county collaborative initiatives.
- Provided technical support to a group of 14 counties developing a bait bag, poster and survey to be distributed to bait shops. The bait bags make it easy for anglers to properly dispose of unwanted live bait or keep their bait for a future fishing trip.

Photo above:

In January 2020 the DNR hosts a workshop in Duluth to provide local government staff and their partners an opportunity to share and learn from each other's experiences.

FUTURE NEEDS AND PLANS

AIS Prevention Aid funded programs are diverse, at different stages of development and implementation, and cover a spectrum of AIS activities. As the needs of the programs change, so will the technical support provided.

- Work to improve online resources, like the DNR's Local Aquatic Invasive Species Prevention Aid webpage, to provide a "one-stop shop" of resources local governments and their partners can use to develop and implement their programs.
- Support implementation of local projects that employ behavior change strategies.
- Continue to support communication and collaboration among local program managers about AIS prevention strategies. For example, continue to host workshops and learning sessions.
- Continue to provide technical support, tools, and resources to help local governments achieve their goals and run successful AIS prevention programs.



Invasive Aquatic Plant Management

GOALS

- Reduce the impacts of invasive aquatic plants on Minnesota's ecology, society and economy.
- Prevent the spread of invasive aquatic plants within Minnesota.
- Provide technical and financial assistance to individuals and organizations working to manage invasive aquatic plants.
- Issue permits for the management of invasive aquatic plants.
- Support research that leads to improved aquatic invasive plant management techniques.

HIGHLIGHTS

- The DNR continued to work with cooperators to implement recommendations from the University of Minnesota's Assessment to Support Strategic Coordinated Response to Invasive Phragmites (*Phragmites australis subsp. australis*) in Minnesota. In 2021 the DNR funded treatment of 183 nonnative Phragmites sites in 28 counties. Most of the counties where treatment occurred had a limited number of small sites; 16 counties had less than five sites. The average site size was 0.2 acres.
- The DNR made \$430,000 in grants available for the control of Eurasian watermilfoil, curly-leaf pondweed, and flowering rush. Those funds provided grants to 148 local organizations for both pre-treatment delineation surveys and chemical and/or mechanical control of those invasive species.
- The DNR published a study on the efficacy of the first florpypauxifen-benzyl (ProcellaCOR®) treatment on a public water body in Minnesota (Lake Jane, Washington County). The treatment successfully reduced hybrid Eurasian watermilfoil coverage in target areas with little to no observed effects on native aquatic plants. Reductions to hybrid watermilfoil persisted through at least one year following treatment.



Photo on left:

A DNR invasive species specialist hand pulls starry stonewort from Grand Lake in Stearns County in July 2018.

Management

Invasive aquatic plant management is an attempt to reduce the abundance or distribution of an invasive plant in a waterbody or wetland. The DNR's invasive plant management program supports efforts to minimize harmful effects caused by invasive plants while also protecting natural resources. The program works to preserve and enhance the native aquatic plant community for the ecological benefits those plants provide. Sometimes invasive plant management is done to help prevent the spread of that species to other uninfested waterbodies.

Plant management is complex, and reductions in invasive plants often require long-term and resource-intensive efforts. Management that involves either mechanical removal of plants or application of herbicides to public waters requires a permit from the DNR. Permits may be issued to property owners, lake organizations and local governments. Permit applications are accepted through the [Minnesota DNR Permitting and Reporting System](#) (MPARS). DNR Aquatic Invasive Species Specialists worked with permit applicants and contractors to provide permits for work, advice on best management practices for treatments and assistance in monitoring the results of management projects.

The three most commonly managed aquatic invasive plant species have been in the state for many decades. Curly-leaf pondweed (*Potamogeton crispus*) in was first noted in Minnesota in 1910, flowering rush (*Butomus umbellatus*) in 1968, and Eurasian watermilfoil (*Myriophyllum spicatum*) in 1987. The DNR supports the management of these species through the issuance of permits for their control, grants to help cover the costs of management and support for research into new management methods. In 2021 the DNR issued a total of 388 Invasive Aquatic Plant Management Permits, 347 of which were for curly-leaf pondweed, Eurasian watermilfoil, flowering rush, or a combination of those species.

The Invasive Species Program has provided grants for the control of Eurasian watermilfoil, curly-leaf pondweed, and/or flowering rush since 2006. In 2021, the DNR was able to offer 148 grants to local organizations for the control of curly-leaf pondweed, Eurasian watermilfoil, and/or flowering rush, for a total grant offer of \$430,000. Those grants helped fund both pre-treatment delineation surveys and chemical and/or mechanical control of the invasive species.

INVASIVE AQUATIC PLANT MANAGEMENT PERMITS ISSUED BY REGION IN 2021

Species	Northwest	Northeast	Central	Southern	Total
Curly-leaf pondweed	21	19	144	34	218
Eurasian watermilfoil	11	16	65	14	106
Curly-leaf pondweed and Eurasian watermilfoil	0	1	5	0	6
Eurasian watermilfoil and flowering rush	0	1	0	0	1
Flowering rush	10	0	6	0	16
Java water dropwort	0	0	0	1	1
Nonnative Phragmites	0	2	9	4	15
Purple loosestrife	3	0	4	0	7
Starry stonewort	3	0	10	0	13
Yellow iris	0	0	5	0	5
Total	39	48	248	53	388



Curly-leaf pondweed.

DNR staff worked with local and industry partners to evaluate the aquatic herbicide ProcettaCOR® for the management of Eurasian watermilfoil and its hybrids. In 2021 DNR published the results of three years of work done in Lake Jane in Washington County with ProcettaCOR® (florpyrauxifen-benzyl). The treatments successfully reduced hybrid Eurasian watermilfoil coverage in target areas with little to no observed effects on native aquatic plants. Reductions to hybrid watermilfoil persisted through at least the year following treatment.

The DNR is collaborating with researchers, industry, local units of government, and local stakeholders on the management of two other invasive aquatic plants, starry stonewort (*Nitellopsis obtusa*), and nonnative Phragmites (*Phragmites australis subsp. australis*) to reduce the populations of these species where they occur and to prevent further spread in the state. In 2021 the DNR provided technical support for management programs, grants for management and monitoring of treatment results, and has directly funded control of those species.

Starry stonewort was first confirmed in Minnesota in Lake Koronis and connected Mud Lake in Stearns County in 2015. Since the initial discovery, treatment methods have included chemical treatment with herbicides or algaecides, Diver Assisted Suction Harvesting (DASH), suction dredging, and hand-pulling followed by chemical treatment. It is known to occur in 18 water bodies in the state.



Hand pulling starry stonewort.

In 2021, the DNR confirmed starry stonewort in two new lakes in Minnesota, Pimushe in Beltrami County and Leech in Cass County. It was also confirmed in the Mississippi River in Beltrami County. In Leech Lake, because of its limited distribution and location near valuable wild rice beds, the DNR provided funding to do diver hand removal with a hand operated suction dredge.

Hand pulling of starry stonewort has been very successful in Grand Lake (Stearns County). The DNR, in cooperation with local partners, has hand pulled starry stonewort in Grand Lake several times a summer every year since it was found by the access in 2017. These treatments have been very effective at reducing the extent and biomass of starry stonewort since its initial discovery. No starry stonewort has been located in any other area of the lake. A small amount was found by the access in 2021 and hand pulled. In Lake Carnelian (Stearns County) an isolated population of starry stonewort near the public water access was managed by hand pulling. In 2021 another smaller area was found nearby. Both areas were managed by hand pulling combined with herbicide treatment.

In 2021 the DNR worked with cooperators to implement recommendations from the University of Minnesota's Assessment to Support Strategic Coordinated Response to Invasive Phragmites (*Phragmites australis subsp. australis*) in Minnesota. Management efforts focus on "clearing counties" by targeting management in areas of the state with

continued

Management *continued*

a limited number of small infestations. The DNR funded treatment of 183 nonnative Phragmites sites in 28 counties. Most of the counties where treatment occurred had a limited number of small sites; 16 counties had less than five sites. The average site size was 0.2 acres. Cooperators on this project include the University of Minnesota, the Minnesota Department of Agriculture, counties, private landowners, the Minnesota Department of Transportation, the U.S. Fish and Wildlife, Soil and Water Conservation Districts, professional herbicide applicators, and other stakeholder groups.



Nonnative Phragmites.

PARTNERSHIPS

The management of nonnative Phragmites (*Phragmites australis* subsp. *australis*) in Minnesota has been an area of ongoing research by the Minnesota Aquatic Invasive Species Research Center (MAISRC) at the University of Minnesota. The DNR began work with the center in 2015 to identify gaps in knowledge about the extent, distribution and genetic diversity of Phragmites in the state, and to strategize the best method to control its spread in the state.

In 2021 the University of Minnesota began a project to provide technical and extension support for the transition away from nonnative Phragmites at wastewater treatment facilities (WWTFs). This project involves the development of best practices for complete, cost-effective control and containment of established populations of invasive Phragmites in WWTFs. It will also identify candidate native plant populations and develop improved approaches for cultivating and establishing new plant materials. This project was funded by the DNR through funding obtained from the Great Lakes Restoration Program, Aquatic Invasive Species Interjurisdictional Grants to Great Lakes States and Tribes.

The DNR again participated with MAISRC and the University of Minnesota Extension, along with counties and local partners, in a statewide search for waters infested with starry stonewort. The event, called Starry Trek, involved more than 200 trained volunteers searching 222 Minnesota lakes. No new starry stonewort infestations were found during the 2021 Starry Trek.

The DNR helped fund continued research on starry stonewort by Dr. Ryan Wersal at Minnesota State University, Mankato. In 2021 he began research on the seasonal phenology and biomass allocation in starry stonewort. The purpose of this research is to look at how seasonal and environmental factors affect biomass allocation and bulbil production to improve management efforts.



| *Eurasian watermilfoil.*

FUTURE NEEDS AND PLANS

- Continue to work with stakeholders to refine the issuance of permits and grants for the control of invasive aquatic plants.
- Work with partners to manage invasive aquatic plants.
- Monitor the distribution of invasive aquatic plants in the state, with emphasis on verification of reports of new occurrences.
- Assess risks posed to Minnesota by various nonnative aquatic plants.
- Continue to work with researchers to improve our understanding of the ecology and management of invasive aquatic plants, including nonnative Phragmites, the macroalgae starry stonewort, and hybrids of Eurasian watermilfoil.
- Review and revise best management practices for herbicide treatment of aquatic invasive plants, in light of results from ongoing research and pilot projects.



| *Flowering rush.*



Invasive Aquatic Animals—Invertebrates

GOALS

- Prevent the introduction of zebra mussels (*Dreissena polymorpha*) to lakes and rivers in Minnesota.
- Support, assist and conduct research on AIS invertebrates (such as spiny waterflea, faucet snail, zebra mussels and others) ecology, biology, life history, and other aspects to help manage and prevent spread.

HIGHLIGHTS

- DNR staff worked on assessing and providing technical expertise for a proposed filtration system to prevent veliger movement from water transfer in northern Minnesota and to provide filtration information and alternatives to northern Minnesota community water supply operations.
- DNR staff provided input into trials examining new zebra mussel control technology.
- DNR staff provided a presentation and addressed questions at the International Joint Commission meeting on Rainy-Lake of the Woods Watershed about the zebra mussel veliger findings in Rainy Lake.

Research

DNR staff continued working with a national boating group examining boat design to change recreational watercraft so there are fewer risks of movement of zebra mussels and other AIS.

DNR biologists finished the final year of multi-year research monitoring number and size of zebra mussels in Green Lake (Kandiyohi County).

DNR biologists provided technical expertise and assistance in a study on AIS Organisms in Trade.



Photo on left:

Zebra mussels attach to one another in a clump on the sandy bottom of Lake Winnibigoshish.

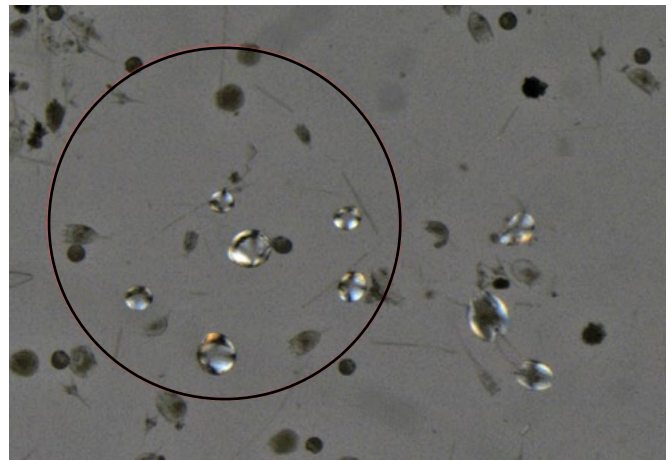


Photo above:

Zebra mussels cluster on a submerged log pulled from the bottom of Lake Carlos in a survey on the zebra mussel population.

Photo above right:

Microscopic image showing zebra mussel veligers (circled) collected from Rainy Lake, Black Bay in 2021.



Volunteer Zebra Mussel Monitoring Program

Volunteers with the Zebra Mussel Monitoring Program monitor lakes or rivers. They regularly look at docks, lifts, boats, recreational equipment, shorelines and other objects for the presence of zebra mussels. Volunteers provide important help in tracking zebra mussel distribution throughout the state. People who live and recreate on lakes in Minnesota are often the first to discover and report new zebra mussel populations.

PARTNERSHIPS

Minnesota Aquatic Invasive Species Research Center – University of Minnesota

DNR biologists continued to provide technical assistance, expertise and input on zebra mussel project proposals, the inclusion of zebra mussels and the evaluation of other species for potential inclusion in the MAISRC priority species list and publications from zebra mussel research.

DNR biologists have provided technical assistance and expertise to both public and private researchers investigating eDNA as a developing detection method for zebra mussels.



A red swamp crayfish collected from a crayfish boil event.



FUTURE NEEDS AND PLANS

- Examine potential uses of pesticides to control zebra mussels as opportunities arise.
- Monitor, with partners, the post-treatment efficacy of previous control projects.
- Continue to investigate ecology, biology and possible control of AIS invertebrates.

Two spiny waterflea from Sand Point Lake showing resting eggs that will produce next seasons population.



Invasive Aquatic Animals — Invasive Carp

GOALS

- Prevent or limit the range expansion and proliferation of the following invasive carp: bighead carp (*Hypophthalmichthys nobilis*), black carp (*Mylopharyngodon piceus*), grass carp (*Ctenopharyngodon idella*), and silver carp (*Hypophthalmichthys molitrix*).
- Monitor Minnesota waters for changes in population sizes, range expansion and reproduction, and respond to changes.
- Encourage and support research on control strategies.

HIGHLIGHTS

- The DNR invasive fish coordinator continues to participate in regional efforts to prevent the expansion of invasive carp populations.
- The DNR led two Modified-Unified Method (MUM) events to remove invasive carp from Pool 8 of the Mississippi River.

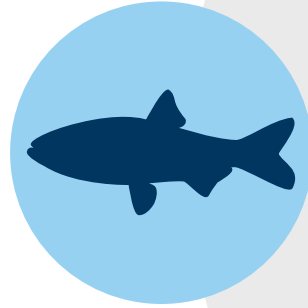


Photo on far left:

DNR staff with their catch of silver carp from a MUM carp removal event. Catches like these show the need for continued monitoring and response to invasive carp.

Photo on left:

DNR fisheries staff uses an electrofishing boat to herd invasive carp. In a MUM event, nets are used to block off areas that have already been cleared, and carp are slowly moved towards a removal site.

New Detections of Adult, Juvenile, and Larval Invasive Carp

The DNR relies on six methods to detect and monitor the expansion of invasive carp into Minnesota:

- Traditional fisheries monitoring programs
- Targeted sampling
- Contracted commercial fishing
- Monitoring the commercial catch
- Public reported sightings
- Tagging

The invasive carp monitoring crew received 20 encounter reports from the public in 2021. All reports were investigated in person, by phone or via e-mail. All 20 reports were determined not to be invasive carp, based on either photos or follow-up conversations.

Sixty-nine invasive carp were captured in Minnesota and border waters in 2021, the second largest annual catch to date. In response to recent large catches of invasive carp in Pool 8 of the Mississippi River, DNR implemented two large-scale removal events known as MUMs. Thirty-one of the 2021 captures were silver carp removed from Pool 8 during the April MUM event (see below for more information on MUM events).

INVASIVE CARP CAPTURES IN 2021

Location	Species	Date of Capture	Number	Method of Capture
Mississippi River Pool 8	Silver Carp	3/5/21	1	Contracted Commercial Fisher
Lake Bella Outlet	Silver Carp	3/14/21	6	MN DNR
Mississippi River Pool 8	Silver Carp	3/16/21	1	Contracted Commercial Fisher
Mississippi River Pool 8	Silver Carp	3/18/21	4	Contracted Commercial Fisher
Mississippi River Pool 8	Silver Carp	3/21/21	5	Contracted Commercial Fisher
Mississippi River Pool 8	Hybrid Silver-Bighead	3/21/21	2	Contracted Commercial Fisher
Bluff Slough, Mississippi River Pool 8	Silver Carp	4/7/21	29	MUM Event
Bluff Slough, Mississippi River Pool 8	Silver Carp	4/9/21	2	MUM Event
Point Douglas, St. Croix River	Silver Carp	4/15/21	1	Contracted Commercial Fisher
Bluff Slough, Mississippi River Pool 8	Silver Carp	4/15/21	3	Contracted Commercial Fisher
Bluff Slough, Mississippi River Pool 8	Silver Carp	5/11/21	1	Commercial Fisher
Bluff Slough, Mississippi River Pool 8	Grass Carp	5/11/21	1	Commercial Fisher
Airport Seine Site, Mississippi River Pool 8	Silver Carp	9/15/21	9	Contracted Commercial Fisher
Airport Seine Site, Mississippi River Pool 8	Silver Carp	9/23/21	1	Contracted Commercial Fisher
Mississippi River Pool 8	Silver Carp	12/2/21	3	Commercial Fisher



DNR and U.S. Fish and Wildlife Service staff measure and weigh some of the native fish captured during the October MUM event.

Invasive Carp Tracking

The Minnesota Legislature granted the DNR authority to tag invasive carp for research. This allows the DNR to better understand the movements of individual fish and leads researchers to other invasive carp. The DNR tagged its first fish, a bighead carp, in the St. Croix River on July 28, 2017. The bighead carp is still alive and fish biologists continue tracking its movement using active boat tracking and the passive receiver array. Five silver carp were tagged in Pool 8 of the Mississippi River in October 2020. Active and passive tracking suggest that one of those fish has remained in Pool 8, and four have moved downstream outside of Minnesota waters.

DNR plans to tag additional invasive carp in Spring 2022, with tagging assistance from the U.S. Fish and Wildlife Service. Tagged fish will be actively tracked when river conditions allow. The Wisconsin DNR and U.S. Fish and Wildlife Service will provide assistance with the tracking effort. Movement and habitat data from these fish will be used to inform future detection and removal efforts. This project has received funding to maintain its dedicated tracking crew in 2022.

Modified-Unified Method (MUM) Invasive Carp Removal Events

The DNR led two Modified-Unified Method (MUM) events in Pool 8 of the Mississippi River in 2021, on April 5-9 and October 25-29. These events use a technique adapted from traditional fishing methods in China to minimize disturbance and prevent invasive carp escape by jumping. Agency staff and contracted commercial fishers divide a waterbody into cells with large block nets, and slowly herd invasive carp from one cell to another. Nets, sound, and electricity are used to move invasive carp towards a central point where they can be removed by seining. Usually MUMs are used where invasive carp are already at high density, and it often takes a week or more to remove invasive carp from one site. Since invasive carp are at lower density in Minnesota, DNR is able to use smaller, faster “mini-MUMs” to target as many sites as possible, up to two in one day. This helps us cover more area in a large, complex river location such as Pool 8.

USGS, who pioneered the use of MUM events for invasive carp removal, partnered with DNR to help plan and execute these events. Other

continued

partners who provided support include U.S. Fish and Wildlife Service, Wisconsin DNR, National Park Service, and Wild Rivers Conservancy.

Thirty-one silver carp were removed during the April MUM. No invasive carp were captured during the October MUM. Six sites in Pool 8 were targeted during the April event. The experience gained from the April event allowed DNR to target an additional three sites during the October event, for a total of nine sites. Over 100,000 lbs of native fish were sampled and released during the October MUM. Additional tagging and monitoring activities will be important to enhancing our ability to capture invasive carp. DNR will continue to use the best available science and information to guide targeted detection and removal efforts.

PARTNERSHIPS

Minnesota Aquatic Invasive Species Research Center

The DNR is an active partner with MAISRC at the University of Minnesota. The DNR serves on both the advisory board and the technical committee. Technical committee responsibilities include prioritizing AIS research needs, scoring project proposals, and providing comments on research project plans. Invasive carp continues to be a priority for the center. Please visit the MAISRC website, <https://www.maisrc.umn.edu/asiancarp-research>, for past, current, and future projects.

The DNR also continues to support research being conducted by Dr. Peter Sorensen's lab at the University of Minnesota. Among other areas, this lab is researching the use of underwater acoustics to deter invasive carp from swimming upstream. More information can be found at: <https://www.maisrc.umn.edu/team-sorensen>. The DNR provided Dr. Sorensen with a letter of support in 2020 to the Legislative-Citizen Commission on Minnesota Resources for proposed invasive carp work at Lock and Dam 5 on the Mississippi River. The DNR communicates regularly with Dr. Sorensen and provided staff assistance and logistical support in 2021.

Agency staff and commercial fishers work to contain invasive carp in the removal site during a MUM event in Pool 8 of the Mississippi River. The seine net will slowly be pulled in to shore, fish sorted, and invasive carp removed. Boats stand ready to respond to any escapees.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service leads environmental DNA (eDNA) sampling for invasive carp. 2021 eDNA sampling showed multiple positive detections for bighead and silver carp DNA in Pool 8 of the Mississippi River. A March 2021 sampling event found that of 550 samples, fourteen were positive for silver carp DNA, one was positive for bighead carp DNA, and seven were positive for a genetic marker that indicates bighead and/or silver carp. A July 2021 sampling event found that of 550 samples, nine were positive for silver carp DNA, and five were positive for a genetic marker that indicates bighead and/or silver carp. Given the recent invasive carp captures in Pool 8, these eDNA detections are to be expected. June 2021 sampling in the St. Louis Estuary of Lake Superior found no invasive carp DNA in any of the 110 samples taken. The most recent and past results can be viewed at fws.gov/midwest/fisheries/edna.html.

Upper Mississippi River Collaboration

The DNR is an active partner in a multi-state and federal agency collaboration working on preventing the expansion and reducing the impacts of invasive carp. This workgroup operates at an Upper Mississippi River basin level rather than the individual state level to develop projects and strategies to meet objectives. This includes a system-wide detection and evaluation program, implementing a commercial harvest program at the reproduction front, and deploying a deterrent strategy. The DNR represents the collaboration at federal briefings, meetings, and conferences.



Invasive Carp Regional Coordinating Committee (ICRCC)

The ICRCC was formally established in early 2010 and represents the collective efforts of international, federal, state and municipal agencies to combat the spread of invasive carp into the Great Lakes. The ICRCC provides oversight and coordination of interagency prevention activities through development and implementation of an annual Invasive Carp Action Plan and complementary Monitoring and Response Plan. The work of the ICRCC is supported by the Great Lakes Restoration Initiative, as well as partner agency resources. The ICRCC works to ensure a sustainable population of invasive carp does not become established in the Great Lakes by funding monitoring, control and technological development for invasive carp. The DNR is an active member of the committee. The ICRCC maintains a webpage at invasivecarp.us with background information, recent news, resource materials, action plans, and reports.

FUTURE NEEDS AND PLANS

The DNR and its partners will be updating the Minnesota Invasive Carp Action Plan, implementing large, targeted netting efforts, tracking tagged fish, and increasing commercial harvest of invasive carp. Continued funding is needed for these and other prevention, monitoring and response projects. An updated action plan will help quantify future resource needs.

DNR specialists, partner agency staff, and contracted commercial fishers come together to remove fish from the seine during the October MUM event. Native fish were measured and released.





Terrestrial Invasive Species Program

GOALS

- Improve or enhance the ability of DNR staff to effectively manage terrestrial (land-based) invasive species on DNR-managed lands.
- Prevent or limit the negative impacts on Minnesota's ecology, economy and human health that can result from terrestrial invasive species such as oriental bittersweet, wild parsnip, buckthorn, garlic mustard, earthworms, emerald ash borer and gypsy moth.
- Prevent and manage terrestrial invasive species to protect and/or restore native plant communities, rare plant species and natural features, and biological diversity.
- Prevent and manage terrestrial invasive species to protect and/or restore habitats for wildlife species, especially those species in greatest conservation need.
- Engage partners in invasive species prevention, management, inventory, outreach, communication and research.

HIGHLIGHTS

Prevention

Jumping worms (*Amyntas agrestis* and related species) are an emerging invasive earthworm threat in Minnesota that damage plants and soils. They are called “jumping worms” because of their unusual behavior: active when disturbed, they move like a snake and sometimes appear to jump. The program continued to work with partners to examine how regulations, research, and outreach can prevent jumping worm spread in Minnesota. Visit mndnr.gov/invasives/terrestrialanimals/jumping-worm.

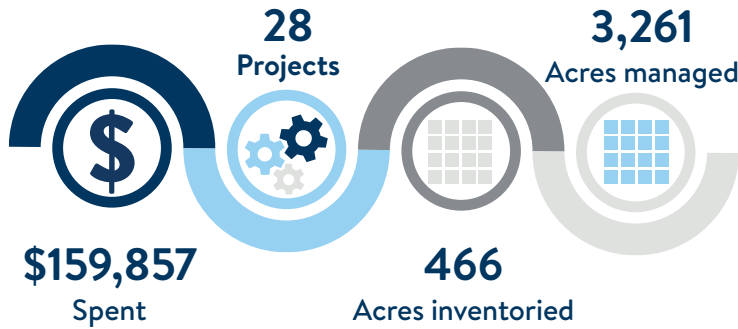
The program led an interdisciplinary team to review the DNR's internal operational guidance regarding invasive species. They found it up to date and did not have any revisions to recommend. The program worked with DNR staff to ensure they have the training and equipment needed to prevent the spread of invasive species during the course of DNR activities.



Photo on left:

Native prairie plants fill in around treated crown vetch at the DNR New Ulm Headquarters prairie.

FISCAL YEAR 2021



FUNDING HISTORY AND RESULTS

Fiscal Year/s	Dollars Spent	Acres (Inventoried and Managed)	Number of Projects
2006-2007	\$365,000	27,375	31
2008	\$435,660	26,523	32
2009	\$610,807	40,000 est.	47
2010	\$606,777	27,955 + 40,000 from aerial survey	42
2011	\$438,000	18,258	33
2012	\$178,340	24,989 + 13,500 from aerial survey	26
2013	\$160,000	7,547	22
2014	\$144,249	11,860	18
2015	\$270,674	12,994	26
2016	\$192,339	5,501	23
2017	\$219,834	5,755	21
2018	\$173,824	6,592	24
2019	\$245,727	6,186	21
2020	\$165,735	2,331	24
2021	\$159,857	3,728	28

Management and Inventory

The Invasive Species Program initiated a funding program in 2006 for the management and inventory of terrestrial invasive plant species on state managed lands. DNR divisions and regions spent \$159,857 of these funds in FY21 for high priority activities. Priorities include treatment of early detection invasive plants and management on high quality habitats. In total \$267,000 was spent in FY21 on grants and statewide terrestrial invasive species coordination.

The following species were inventoried and/or managed in fiscal year 2021 projects:

Amur corktree, birdsfoot trefoil, Bohemian knotweed, black locust, butter and eggs, Canada thistle, common buckthorn, common mullein, common tansy, crown vetch, dame's rocket, garlic mustard, glossy buckthorn, goutweed, greater celandine, Japanese hops, Japanese knotweed, leafy spurge, moth mullein, non-native bush honeysuckles, non-native thistles, oriental bittersweet, poison hemlock, Queen Anne's lace, reed canarygrass, Siberian elm, spotted knapweed, wild parsnip and yellow sweetclover.

Outreach and Communication

The program continued to promote the use of EDDMapS.org for reporting invasive species locations. Reporters include state agency staff, members of the public, county agricultural inspectors, and cooperative weed management area partners. DNR staff assisted in sharing information about reporting, making reports, and verifying reports before they are made public.

DNR terrestrial invasive species webpages continue to be extensively viewed. From January 1, 2021 to September 20, 2021, the terrestrial invasive plants homepage had 22,909 views, the buckthorn webpages had 44,621 views, and the individual plant species webpages (not including buckthorn) had 107,667 views.

Jumping worms continue to attract press coverage and public interest. The DNR jumping worm videos were viewed more than 63,000 times by September 2021. The DNR jumping worm webpage was viewed over 31,322 times from January 1, 2021 to Sept 20, 2021. DNR staff regularly responded to reports of jumping worms by coordinating identification, reporting, and

follow up actions. DNR staff communicated with other state agencies, industry, master gardeners and researchers about jumping worm best management practices and continued to update information available about jumping worms.

Research

In 2017, the Technical Advisory Group for Biological Control Agents of Weeds recommended that the root mining weevil, *Ceutorhynchus scrobicollis* be released for the biological control of garlic mustard in the United States. Since that time the U.S. Department of Agriculture (USDA) has worked with the U.S. Fish and Wildlife Service on the next regulatory steps. In 2021, the University of Minnesota (U of M) submitted additional research on biological control weevils to USDA.

The program collaborated with U of M researchers leading the “Jumping worms in Minnesota” research project that focuses on detecting jumping worms, understanding their survival and pathways of spread, and studying potential management methods.

The program collaborated with U of M researchers leading the “Forecasting life cycles of Japanese knotweed and wild parsnip for better management in Minnesota” research project that tracks phenology of these plants through experiments and community science.

Research funding for these three projects was supported by the Minnesota Invasive Terrestrial Plants and Pests Center (MITPPC), through an appropriation from the Environmental and Natural Resources Trust Fund.

PARTNERSHIPS

Minnesota Department of Agriculture

The Minnesota Department of Agriculture (MDA) is the state regulatory lead for terrestrial invasive plant pests (such as emerald ash borer) and noxious weeds. Visit mda.state.mn.us.

The DNR is a member of the Noxious Weeds Advisory Committee convened by the MDA to evaluate plant species for invasiveness, difficulty of control, cost of control, benefits, and amount of injury caused by the species. For each species evaluated, the committee recommends to the MDA commissioner whether the species should be placed on a noxious weed list. Visit mda.state.mn.us/plants/pestmanagement/weedcontrol/mnnwac.

PlayCleanGo

The PlayCleanGo program is built around partnering and using consistent messaging to prevent the introduction and spread of invasive species. Visit playcleango.org.

Minnesota Invasive Species Advisory Council

The Minnesota Invasive Species Advisory Council (MISAC) continues to provide a mechanism for interagency and inter-organization communication and collaboration on invasive species issues. The program collaborated with MISAC members in the development of the “MISAC Ratings of Invasive Species of Concern to Minnesota.” MISAC produced a 2022 wall calendar highlighting 12 invasive species and issues of concern to Minnesotans. Visit mninvasives.org.

Minnesota Invasive Terrestrial Plants and Pests Center

The Minnesota Invasive Terrestrial Plants and Pests Center (MITPPC) at the University of Minnesota focuses on science-based solutions to protect Minnesota’s prairies, forests, wetlands, and agricultural resources. Funding for this work is provided by the Environment and Natural Resources Fund (ENRTF). Three MITPPC projects are highlighted in the research section of this chapter. In total, 12 projects involve a level of coordination and collaboration between MITPPC researchers and DNR staff. Visit mitppc.umn.edu to view current research projects.

FUTURE NEEDS AND PLANS

There is an ongoing need to expand awareness, data, tools and resources to reduce impacts of terrestrial invasive species in Minnesota. The DNR’s future focus includes continuing outreach on jumping worms, assisting in the update of MISAC’s statewide invasive species management plan, verifying invasive species reports in EDDMapS.org, updating additional DNR terrestrial invasive species webpages, and preparing for the 2022 state fair. Funding for terrestrial invasive species work has decreased since 2010. The terrestrial invasive species program plans to continue to work to meet the growing needs for outreach materials, data, tools and resources.

Ecological and Water Resources Division

Districts by County

Northwest Region (1 - Bemidji)

North district: Beltrami, Cass, Clearwater, Hubbard, Kittson, Lake of the Woods, Marshall, Pennington, Polk, Red Lake, Roseau, and Wadena

South district: Becker, Clay, Douglas, Grant, Mahanomen, Norman, Otter Tail, Pope, Stevens, Traverse, and Wilkin

Northeast Region (2 - Grand Rapids)

East district: Carlton, Cook, Lake, and St. Louis

West district: Aitkin, Crow Wing, Itasca, Koochiching, and Pine

Central Region (3 - St. Paul)

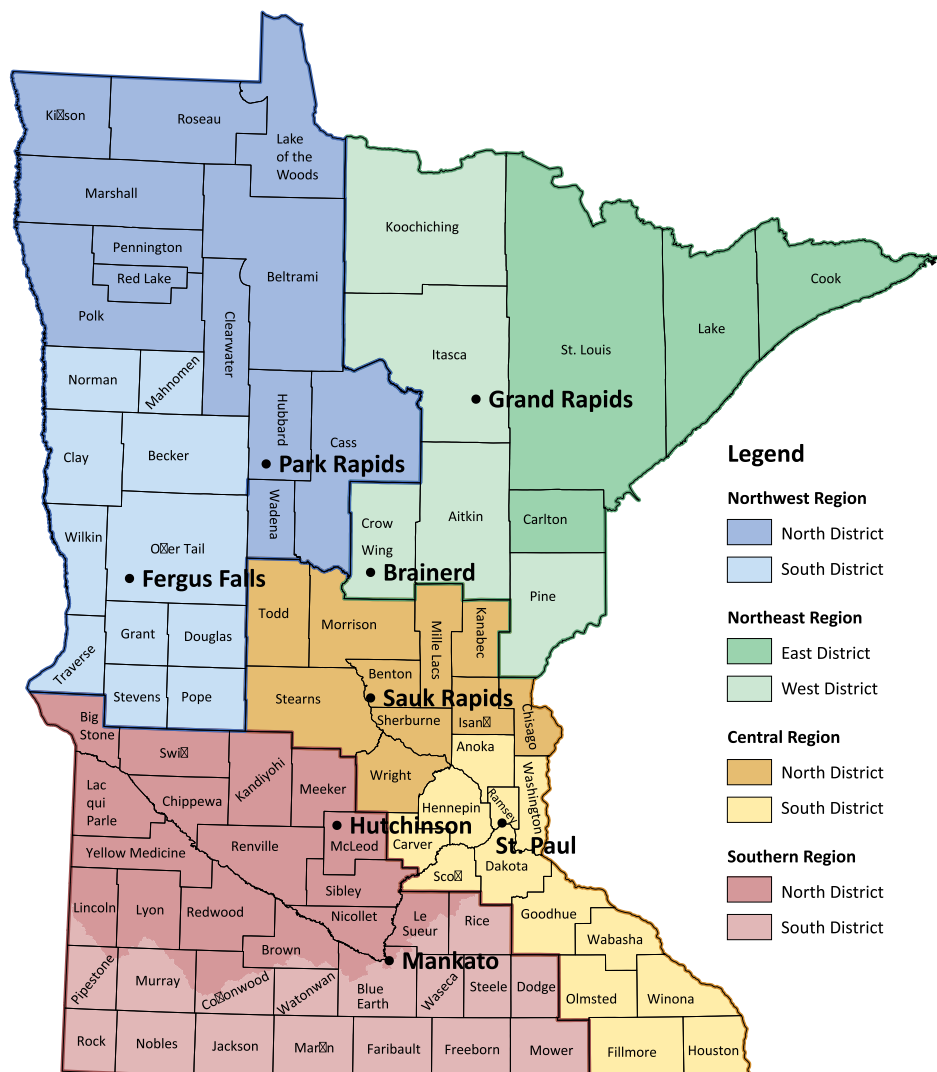
North district: Benton, Chisago, Isanti, Kanabec, Mille lacs, Morrison, Sherburne, Stearns, Todd and Wright

South district: Anoka, Carver, Dakota, Fillmore, Goodhue, Hennepin, Houston, Olmsted, Ramsey, Scott, Wabasha, Washington, and Winona

Southern Region (4 - New Ulm)

North district: Big Stone, Brown, Chippewa, Cottonwood – north of the Minnesota River, Kandiyohi, Lac qui Parle, LeSueur – north of the Minnesota River, Lincoln, Lyon, McLeod, Meeker, Nicollet, Redwood, Renville, Sibley, Swift, and Yellow Medicine

South district: Blue Earth, Cottonwood – south of the Minnesota River, Dodge, Faribault, Freeborn, Jackson, LeSueur – south of the Minnesota River, Martin, Mower, Murray, Nobles, Pipestone, Rice, Rock, Steele, Waseca, and Watonwan



Appendix A INVASIVE SPECIES PROGRAM STAFF

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Appendix B

WATER BODIES LISTED AS INFESTED IN 2021

This table includes all water bodies added to the infested waters list in 2021. Explanations of the last two columns are below:

Year species was first confirmed, or connected water body: Either 1) the year in which we first confirmed a population of the aquatic invasive species in the water body, or 2) “connected” to indicate that we listed the water body because it is connected to a water body where the aquatic invasive species has been confirmed; this column may also contain the name and/or Lake ID number of the connected, confirmed water body.

Lake ID number: an identifying number the DNR uses for lakes. Ponds and wetlands that are not on the public waters inventory are listed with “none” in the number column. Most rivers and streams on the public waters inventory are listed without a number or “NA” in the number column; some river pools are identified with a Lake ID number.

WATER BODY NAME	COUNTY OR COUNTIES	LISTED FOR AQUATIC INVASIVE SPECIES	YEAR SPECIES WAS FIRST CONFIRMED, OR CONNECTED WATER BODY	LAKE ID NUMBER
Barbour	Crow Wing	zebra mussel	connected to Smith (18-0028)	18-0030
Beaudry	Sherburne	zebra mussel	connected to Big (71-0082)	71-0062
Big	Beltrami	zebra mussel	2021	04-0049
Blacks	Sherburne	zebra mussel	connected to Big (71-0082)	71-0097
Blackwell	Douglas	zebra mussel	2021	21-0151
Cedar	Aitkin	zebra mussel	2021	01-0209
Chippewa River, East Branch (M-055-158-034); portion between Villard (61006700) and Amelia (61006400)	Pope	zebra mussel	connected to Villard (61006700)	NA
Clitherall	Otter Tail	zebra mussel	2021	56-0238
Clitherall to West Battle Lake (56-0239) stream connection	Otter Tail	zebra mussel	connected to Clitherall (56-0238)	NA
Eagle	Becker	zebra mussel	2021	03-0265
East Mahnomen	Crow Wing	zebra mussel	2021	18-012601
Ely	St. Louis	zebra mussel	2021	69-0660
Francis	Meeker	zebra mussel	2021	47-0002
Girl	Cass	zebra mussel	connected to Woman (11-0201)	11-0174

WATER BODY NAME	COUNTY OR COUNTIES	LISTED FOR AQUATIC INVASIVE SPECIES	YEAR SPECIES WAS FIRST CONFIRMED, OR CONNECTED WATER BODY	LAKE ID NUMBER
Henderson	Kandiyohi	zebra mussel	2021	34-0116
Highland	Itasca	flowering rush	2021	31-0481
Holt	Crow Wing	zebra mussel	connected to Smith (18-0028)	18002900
Horseshoe	Crow Wing	zebra mussel	2021	18-0251
Horseshoe	Stearns	Eurasian watermilfoil	2021	73-0157
Kroon	Chisago	Eurasian watermilfoil	2021	13-0013
Leech	Cass	starry stonewort	2021	11-0203
Leek	Otter Tail	zebra mussel	2021	56-0532-02
Leif	Becker	zebra mussel	2021	03-0575
Leven	Pope	zebra mussel	2021	61-0066
Little Comfort	Chisago	Eurasian watermilfoil	2021	13-0054
Little Pelican	Otter Tail	flowering rush	2021	56-0761
Little Rose	Otter Tail	zebra mussel	connected to Scalp (56-358)	56-0365
Little Waverly	Wright	zebra mussel	connected to Waverly (86-0114)	86-0106
Locke	Wright	zebra mussel	2021	86-0168
Locke	Anoka	Eurasian watermilfoil	2021	02-0077
Long	Stearns	zebra mussel	2021	73-0139
Mahnomen	Crow Wing	zebra mussel	2021	18-0126
Mandall	Chisago	Eurasian watermilfoil	2021	13-0074
Maple	Wright	zebra mussel	connected to Upper Maple (86-0134-01)	86-0134
Mississippi River between Wolf Lake (04-0079) and Andrusia Lake (04-0038)	Beltrami	starry stonewort	2021	NA
Mississippi River, Pool 3	Multiple	flowering rush	2021	25-0017
Mississippi River, Pool 5A	Multiple	flowering rush	2021	85-0013
Mississippi River, Pool 6	multiple	flowering rush	2021	85-0002

continued

WATER BODY NAME	COUNTY OR COUNTIES	LISTED FOR AQUATIC INVASIVE SPECIES	YEAR SPECIES WAS FIRST CONFIRMED, OR CONNECTED WATER BODY	LAKE ID NUMBER
Mississippi River, Pool 7	multiple	flowering rush	2021	85-0001
Mississippi River, Pool 9	Multiple	flowering rush	2021	28-0001
Moose	Wright	zebra mussel	connected to West Sylvia (86-0279)	86-0271
Nokasippi River downstream from Lower South Long Lake (18-0136) to Unnamed Wetland 18-0485	Crow Wing	faucet snail	2021	NA
Nokasippi River 500 feet downstream from South Long (18-0136)	Crow Wing	zebra mussel	connected to South Long (18-0136)	NA
Nokasippi River between South Long (18-0136) and Upper South Long (18-096)	Crow Wing	zebra mussel	connected to South Long (18-0136)	NA
Nokasippi River, 500 feet upstream from Upper South Long (18-0096)	Crow Wing	zebra mussel	connected to Upper South Long (18-0096)	NA
Otter Tail River; portion from the confluence of the Unnamed Creek (H-026-081-029) to Mud Lake (56022200)	Otter Tail	zebra mussel	connected to Long (56-0388)	NA
Owasso	Ramsey	zebra mussel	2021	62-0056
Pike	Scott	zebra mussel	2021	70-0076
Pimushe	Beltrami	starry stonewort	2021	04-0032
Pine Mountain	Cass	zebra mussel	2021	11-0411
Pine Tree	Washington	Eurasian watermilfoil	2021	82-0122
Rabour	Chisago	Eurasian watermilfoil	2021	13-0079
Rainy	St. Louis	zebra mussel	2021	69-0694
Roe Mine	Crow Wing	zebra mussel	2021	18-0119
Sauk River between Sauk Lake (77-0150) and Melrose Lake (73-0251)	Stearns	flowering rush	2021	NA
Scalp	Otter Tail	zebra mussel	2021	56-0358

WATER BODY NAME	COUNTY OR COUNTIES	LISTED FOR AQUATIC INVASIVE SPECIES	YEAR SPECIES WAS FIRST CONFIRMED, OR CONNECTED WATER BODY	LAKE ID NUMBER
Scalp Lake to Rose Lake (56-0365) stream connection	Otter Tail	zebra mussel	connected to Scalp (56-358)	NA
Seguchie Creek between Smith (18-28) and Holt (18-29)	Crow Wing	zebra mussel	connected to Smith (18-0028)	NA
Shady Oak	Hennepin	brittle naiad	2021	27-0089
Silver	Ramsey	Eurasian watermilfoil	2021	62-0083
Smith	Crow Wing	zebra mussel	2021	18-0028
South Long	Crow Wing	faucet snail	2021	18-0136
South Long	Crow Wing	zebra mussel	2021	18-0136
Spring	Scott	Eurasian watermilfoil	2021	70-0054
St. James Pit	St. Louis	zebra mussel	2021	69-0428
Thompson	Dakota	Eurasian watermilfoil	2021	19-0048
Trowbridge	Otter Tail	zebra mussel	2021	56-0532-01
Turtle	Becker	zebra mussel	2021	03-0657
Unnamed Creek (H-026-081-029) downstream from Long Lake (56038800) to the Ottertail River	Otter Tail	zebra mussel	connected to Long (56-0388)	NA
Unnamed lake	Otter Tail	zebra mussel	Connected to Clitherall (56-0238)	56-0284
Upper South Long	Crow Wing	zebra mussel	2021	18-0096
Waverly	Wright	zebra mussel	2021	86-0114
West Silent	Otter Tail	zebra mussel	2021	56-0519
Woman	Cass	zebra mussel	2021	11-0201



ECOLOGICAL AND WATER RESOURCES

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