





ECOLOGICAL AND WATER RESOURCES
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Note from the Program

The Minnesota Department of Natural Resources (DNR) is pleased to submit the 2022 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 2022 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 2022, with the help of our partners. Some highlights include:

- Invasive Species Program staff issued 404 permits to control invasive aquatic plants and the DNR Aquatic Invasive Species (AIS) Control Grant Program funded 223 invasive aquatic plant treatments through 142 grants, totaling \$1.25 million.
- DNR and local government watercraft Inspectors completed 439,770 incoming and outgoing watercraft inspections.
- Staff provided technical support to counties that received AIS Prevention Aid and worked with the public at lake association meetings, conferences and outdoor events.
- The DNR financially supported the inventory and management of terrestrial invasive species on 1,875 acres of state and adjacent land.
- Conservation officers completed 11,014 hours of invasive species education and enforcement.
- Invasive species program staff worked with partners from the Minnesota Invasive Species Advisory Council to complete an update to the statewide plan, "A Minnesota Management Plan for Invasive Species". The primary purpose of this voluntary plan is to provide a framework to coordinate and guide efforts to prevent the introduction and establishment of new terrestrial and aquatic invasive species, to reduce the spread of existing populations, and to promote the management of invasive species within Minnesota.
- The DNR continues to build partnerships with the U.S. Geological Survey (USGS), the U.S. Fish and Wildlife Service (USFWS), Wisconsin DNR, NPS, and Wild Rivers Conservancy as it leads Modified-Unified Method (MUM) events to remove invasive carp from Minnesota waters. Two MUM events were held on the Mississippi River in 2022. Each event provided valuable information that was used to inform DNR's approach to capturing invasive carp.

Thank you for partnering with the Invasive Species Program this year. We look forward to working with you in 2023 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 2022, 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 employed 67 watercraft inspection staff.

Program staff work with many partners, including:

- Local government units (LGU).
- Tribes, states, provinces, federal agencies and 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.

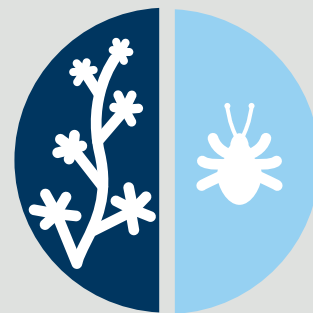
Examples of key invasive species of concern that we are tracking outside of Minnesota include:

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

The program addresses aquatic 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; regional task force panels, local governments including counties, cities and townships; agencies and other partners with similar concerns. Coordinated prevention efforts reduce the spread of invasive species and provide 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 65 local units of government with delegated authority from the DNR, inspected more than 400,000 watercraft in 2022, which makes Minnesota's watercraft inspection program one of the largest in the nation.
- 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 2022, 233 volunteers searched 248 Minnesota waterbodies. No new starry stonewort infestations were found during the 2022 Starry Trek.
- A new webpage was created where individuals can "Take the Pledge" to take AIS prevention steps ([mndnr.gov/AIS Pledge](https://mndnr.gov/AIS-Pledge)). This public commitment to protect Minnesota waters was taken by over 400 people in 2022—a scrolling list of names and photos appear on the website.
- The Invasive Species Program co-hosted an Aquatic Plant Identification Training with University of Minnesota-Extension and the MAISRC. Staff and researchers throughout the state collected, sorted and identified over 70 species to be used in the training. Attendees included 12 consultants and eight local government staff that conduct aquatic plant surveys and 22 volunteers interested in building identification skills.
- Staff co-chaired and took leadership roles in supporting the eighth Biennial Upper Midwest Invasive Species Conference (hybrid) in Green Bay in October. Over 500 participants from 22 states, two provinces and three countries gathered to learn about advancements regarding invasive species management, outreach, research and policy. The three-day conference featured plenary and topical sessions, posters, exhibits, workshops, and field trips. Over a dozen DNR AIS staff met with other AIS professionals, researchers, business and non-profit representatives, and land managers. Conference hosts were the Minnesota Invasive Species Advisory Council, Invasive Plants Association of Wisconsin, and Midwest Invasive Plant Network.



- 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 2022, the Invasive Species Program facilitated a series of four, two-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. Attendance included 101 individuals, 42 counties, ten partner organizations, and 21 DNR staff.
- The DNR laid the groundwork for using structured decision-making to inform the update of the Invasive Carp Action Plan. It will evaluate the full suite of invasive carp management options in a transparent, inclusive, and comprehensive way.
- Watercraft inspection training staff completed 24 in-person trainings before the fishing opener, training 237 inspectors, and an additional 160 inspectors by Memorial Day.
- The DNR continued to fund nonnative *Phragmites* control throughout the state. Management efforts focused on “clearing counties” by targeting control in areas of the state with a limited number of small infestations. During the 2022 treatment season DNR contractors visited 423 nonnative *Phragmites* sites in 31 counties. At 100 sites no treatment was done because no live nonnative *Phragmites* was found, largely due to previous years' effective treatments.
- 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 2022. 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 2022: July 1, 2021 to June 30, 2022.

FUNDING SOURCES

The Invasive Species Program was mostly supported by state funds in fiscal year 2022, with additional funding from the U.S. Fish and Wildlife Service.

State Funds

\$5,399,000 from a general fund appropriation, of which \$5,176,447 supported the Aquatic Invasive Species Program and \$222,553 supported the Terrestrial Invasive Species Program.

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

- \$2,708,692 from a \$10.60 surcharge on watercraft registration (valid for three years) in Minnesota.
- \$1,184,736 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 (including the zebra mussel K9 program), watercraft inspections, invasive carp management and nonnative *Phragmites* management. In fiscal year 2022 the program received \$1,495,512 in federal grants.



Photo on left:

Invasive Species Specialist Emelia Hawk-Jacobs instructs how to identify aquatic plants at the Aquatic Plant Identification training hosted by the Minnesota DNR, the University of Minnesota Extension and MAISRC.

FISCAL YEAR 2022 EXPENDITURES

Invasive Species Unit expenditures on invasive species activities during fiscal year 2022 (July 1, 2021–June 30, 2022) totaled \$8,960,620.

The pie chart on the following page provides a broad look at how invasive species funding was spent in fiscal year 2022. 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.

COST ACCOUNTING

Minnesota Statutes 2022, 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.

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.

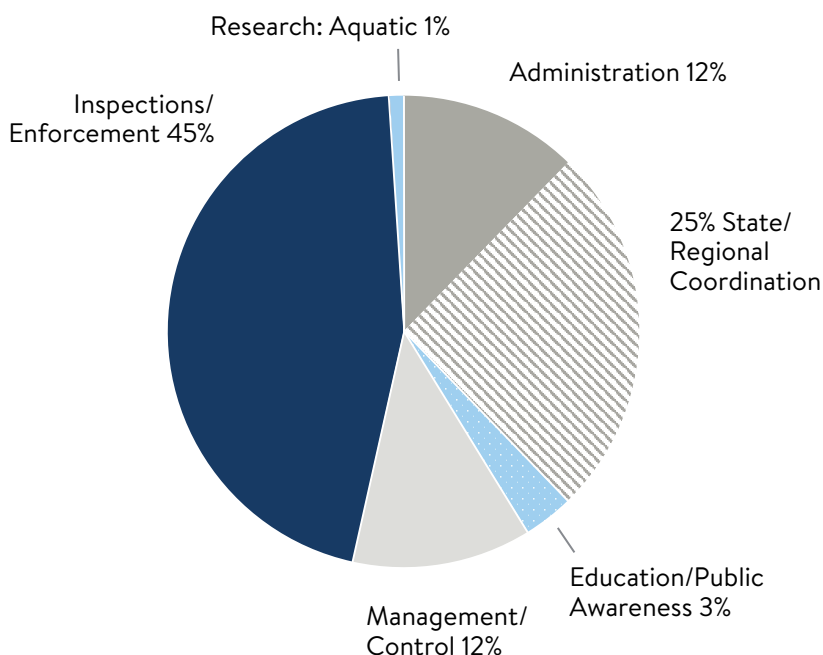
RESEARCH includes staff time, travel expenses, fleet charges, supplies, and contracts with the University of Minnesota and other research organizations to conduct research. These include efforts to develop new or to improve existing control methods, better

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 knowledge and skills, direct co-workers, or help on other projects; and fleet costs and the cost to purchase and repair boats, trailers, computers, and similar items.

The program spent \$3,588,821 from the Invasive Species account in fiscal year 2022. General Fund expenditures were \$4,325,113. Unspent funds, including those encumbered, such as invasive aquatic plant management grants which are paid as reimbursement after work is completed, will be used in the second half of the biennium. The program also spent \$1,046,686 in federal funds in fiscal year 2022, 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 2022 EXPENDITURES

	Invasive Species Account	General Fund	Federal/Other	Total Expenditures
Administration	\$486,194	\$600,951	\$542	\$1,087,687
State/Regional Coordination	\$1,099,497	\$995,229	\$162,711	\$2,257,437
Education/Public Awareness	\$48,405	\$164,596	\$87,029	\$300,030
Management/Control: Aquatic	\$161,240	\$717,286	\$211,347	\$1,089,873
Management/Control: Terrestrial		\$105,451		\$105,451
Inspections/Enforcement	\$1,793,485	\$1,736,670	\$509,077	\$4,039,232
Research: Aquatic	\$0	\$4,930	\$75,980	\$80,910
Total Expenditures	\$3,588,821	\$4,325,113	\$1,046,686	\$8,960,620



HELP
STOP
AQUATIC
INVASION

Invasive
Species
Alert

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 2022, invasive species program conducted the following activities to prevent the introduction and spread of AIS:

- Continued outreach to businesses and consumers regarding invasive species in trade.
- Surveyed lakes for AIS and reviewed reports from lake users about potential 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.
- Provided technical guidance on AIS prevention and management activities.
- Increased public awareness of AIS via interviews with radio, newspaper and television outlets.
- Division of Enforcement staff investigated pathways for spreading AIS such as equipment and watercraft, food markets, bait dealers, and aquatic plant dealers.
- Staffed events with community partners to promote public awareness and preventative actions
- Division of Enforcement staff continued the transition to aerial helicopter fish stocking in remote lakes; this method reduces the risk of spreading AIS.



Photo on left:

A native mussel with attached zebra mussels found in Big Lake, Minnesota

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. A lake service provider (LSP) includes anyone who is paid to decontaminate, rent/lease, install or remove water-related equipment in or from Minnesota waters. Common LSP businesses include marinas, dock and lift installers, resorts and outfitters, local parks departments and lawn irrigation companies.

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



2,565
Certified LSP
employees



957
Permitted
LSPs



Boater drains water from kayak before leaving the public access.

2022 ACTIVITIES

- The DNR completed permit training for 221 LSP business owners and managers, issuing 214 permits.
- 929 LSP employees completed online employee certificate training.
- 957 businesses were permitted LSPs at the end of 2022. The current list of businesses is on the DNR website.
- The DNR offered two optional trainings on decontamination methods, in Backus and St. Paul.

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 2022, the Invasive Species Program issued six individual 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 17 prohibited invasive species permits in 2022 for species other than red swamp crayfish. In 2022, 86 people were permitted to import and/or possess frozen dead red swamp crayfish for consumption.

Individuals can access several general permits on the DNR website, for example: to possess certain preserved specimens of prohibited invasive species for educational purposes; 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.

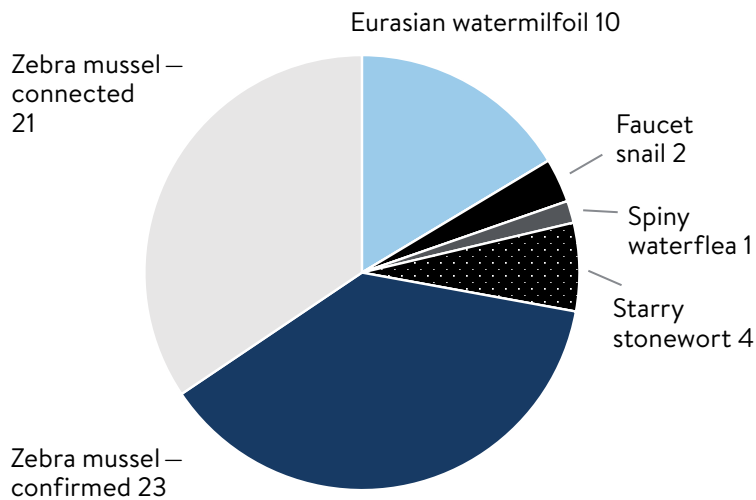
There were no changes to invasive species statutes or rules in 2022. In 2021, Minnesota Statutes, section 84D.11, subdivision 1a, was changed to remove the end date for the authority to permit DNR to tag and re-release bighead, black, grass, or silver carp for research or control (Laws of Minnesota 2021, 1st Spec. Sess. chapter 6, article 2, section 31).

The Invasive Species Program proposed rule changes that would add species to the prohibited invasive species list. The rule was proposed to strengthen our ability to prevent the introduction and spread of priority species like jumping worms and nonnative *Phragmites*, align invasive species classifications with regional priority species lists, and fill critical gaps created by a 2015 legal decision that reinterpreted federal injurious species authorities. The public comment period for the proposed rule closed on December 9, 2022, and the rulemaking process will continue into 2023.

Infested Waters

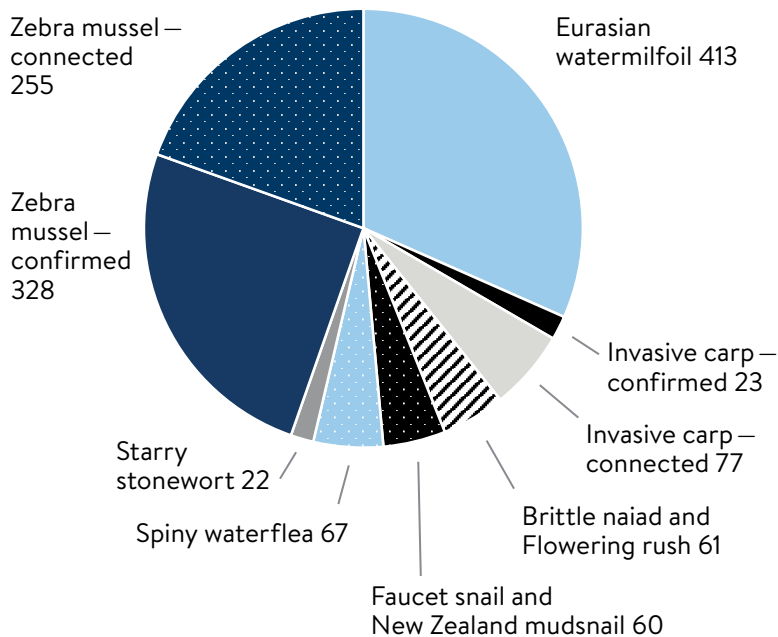
The DNR will add a lake, river, pond, or wetland to the infested waters list if it contains certain AIS that could spread to other waters. The DNR may also list a lake, river, pond, or wetland as infested if it is connected to a body of water where AIS are present. To reduce the risk of spreading AIS, activities like bait harvest, commercial fishing, and water use are managed differently in infested waters. In 2022, invasive species program staff updated guidance for moving water from infested waters so that permits require filtration or other measures to prevent the introduction and spread of AIS.

NEW WATER BODIES LISTED AS INFESTED IN 2022



For more information on waters listed in 2022, see Appendix B.

TOTAL WATER BODIES LISTED AS INFESTED



Not included in the summary 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, Eurasian ruffe, round goby, and white perch.

INVASIVE SPECIES IN TRADE

Global trade drives invasive species introductions to Minnesota and the United States. There are trades built on the movement and possession of live plants and animals which have historically led to invasive species introductions. The DNR invasive species program received Great Lakes Restoration Initiative funding to support a three-year position focused on invasive species in trade from June 2019 through June 2022. As this position ended, the program focused on communicating key findings from the past few years of work to partners and stakeholders. The invasive species in trade specialist presented to a wide variety of partner organizations, such as the Minnesota Invasive Species Advisory Council, DNR Aquatic Invasive Species Advisory Committee, county and local government invasive species professionals, the Great Lakes Fishery Commission Law Enforcement Committee, and others. Recent work was shared with stakeholders through online presentations specifically for interested responsible buyers and sellers of live organisms. News releases, social media posts and targeted email lists were used to advertise the presentations and continue to educate the public about risks and regulations associated with prohibited invasive crayfish and crayfish importation.

The program continued to work with the DNR Enforcement Division and Great Lakes regional partners to address risks of invasive species introduction through trade. Enforcement Division staff identified individuals selling prohibited invasive crayfish online and coordinated with the invasive species program to either provide education or enforcement as appropriate. The program also contributed to multiple interjurisdictional projects in the Great Lakes region related to online sales, regulations, and invasive crayfish in trade research.

A series of workshops was hosted by the program to familiarize DNR staff and key partners with recent work related to invasive species in trade and identify potential next steps. The importance of trade pathway invasive species prevention efforts, ongoing leadership at multiple scales, and issues with funding and capacity were commonly discussed throughout the workshop series. Federal, state, county and local agencies, researchers and

Extension professionals could all play important roles in furthering prevention of invasive species introductions through trade. Continued work on trade pathway invasive species prevention should include:

- Continuing to build a database of sellers of live organisms
- Periodic invasive species education to sellers and further developing partnerships with sellers
- Development of additional educational materials and further educational outreach to hobbyists and buyers of live organisms
- Outreach and enforcement of illegal online sales of invasive species
- Enforcement of invasive species in trade regulations when needed
- Continuing coordination with other jurisdictions

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. For example, Invasive Species Program staff are part of the Minnesota Invasive Species Advisory Council (MISAC), and regularly collaborate with counties (as described in the chapter on Aquatic Invasive Species Prevention Aid), MAISRC, Minnesota Sea Grant, and others.



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

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 2022 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 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 supports effective responses to suspected discoveries of previously unrecorded AIS populations and provides a forum for communication and collaboration on AIS projects in the region encompassing western Lake Superior, the surrounding watershed, and nearby areas.

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.



 DEPARTMENT OF
NATURAL RESOURCES

A Model Approach for AIS Outreach Product Development

Wendy Johnson
Wendy.Johnson@dnr.wa.gov

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 to advise 11 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.
- A new webpage was created where individuals can pledge to take AIS prevention steps (mndnr.gov/AISPledge). This public commitment to protect Minnesota waters was taken by over 400 people in 2022—a scrolling list of names and photos appear on the website.
- Seven new publications were created or updated, with a strong focus on the specific actions people can take to prevent the spread of AIS based on their recreational activities.
- Program staff continued online public engagement efforts.
- The Enforcement Division conducted media interviews on the importance of AIS regulation compliance. They also worked with lake associations, user groups and media to raise awareness about controlling the spread of invasive species. This includes attending statewide public input meetings to maintain and increase dialogue with concerned stakeholders.
- The Enforcement Division canine zebra mussel detection teams provided educational demonstrations at several public events.



Photo on left:

AIS Prevention Planner Doug Jensen gives a presentation at the 2022 Upper Midwest Invasive Species Conference in Green Bay Wisconsin.

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 may not adopt or consistently practice desired behaviors over the long-term. The Invasive Species Program wants 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.

Eleven behavior change grant projects that were funded in 2020 through \$60,000 from the Great Lakes Restoration Initiative were completed in 2022. Projects addressed 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 angler-focused projects installed and maintained 41 disposal bins at public water accesses and partnered with six bait shops and three fishing tournaments. The boater-focused projects installed 12 tool stations at public water accesses and distributed 250 watercraft cleaning kits. The lakeshore-focused projects partnered with 15 lake associations and created a video about cleaning and drying shoreline equipment. In total, the grantees administered seven surveys, conducted seven observation studies, and created 26 new print and digital materials focused on behavior change. Collectively through these projects, there were 751 people that made commitments to take AIS prevention actions. The Invasive Species Program will use the results of these local pilot projects to create materials and initiatives for use 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:

- Help Protect Minnesota Waters Brochure
- Attention Boater Card
- Attention Angler Card
- Attention Shoreline Resident Card
- Never Release Bait Sticker
- Never Release Bait Poster
- Winch Post Pledge Sticker
- Professional photos of invasive species and people taking AIS prevention actions for a variety of pathways
- Goldfish and Koi best management practices and fact sheet
- How to collect and move purple loosestrife beetles for biological control
- How to rear and release purple loosestrife beetles for biological control
- Minnesota Invasive Species Calendar 2023 on behalf of the Minnesota Invasive Species Advisory Council

Digital versions of most AIS materials can be found online (<https://www.dnr.state.mn.us/invasives/ais/outreach.html> and <https://www.mninvasives.org/educational-materials>)

Staff provided invasive species content and advertising for the 2023 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 800,000 copies of the fishing regulations will be distributed beginning in March.

Events

The Invasive Species Program co-hosted an Aquatic Plant Identification Training with University of Minnesota-Extension and MAISRC. Staff and researchers throughout the state collected, sorted and identified over 70 species to be used in the training. Attendees included 12 consultants and 8 local government staff that conduct aquatic plant surveys and 22 volunteers interested in building identification skills.

The Invasive Species Booth within the DNR Building at the 2022 Minnesota State Fair included new invasive-themed tablecloths and an eye-catching large banner. The booth focused on the steps people can take to prevent the spread of terrestrial and aquatic invasive species. Seventeen staff and 10 volunteers worked the booth and distributed publications, license holders, boot brushes and temporary tattoos featuring six invasive species prevention designs.

Staff participated on the planning teams, attended and presented at the Upper Midwest Invasive Species Conference (UMISC) in October 2022. As the largest invasive species conference in the world, it provides current information to managers, planners, and field staff on invasive species management, prevention, technological developments, and outreach throughout the Midwest and beyond. It provides a conduit for communication and coordination among staff and between staff and people in other government agencies, private organizations, and the general public. Finally, UMISC is an opportunity to demonstrate that Minnesota continues to be a leader in invasive species management and prevention.

AIS Prevention Planner Tina Fitzgerald does a live television interview at the Invasive Species Booth in the DNR Building at the 2022 Minnesota State Fair.



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 visuals. New webpages for purple loosestrife biocontrol and goldfish were created in response to increasing public interest.

Anyone 18 or older can visit the new Pledge to Protect Minnesota Waters website (mndnr.gov/AISPledge) to take the pledge and upload a photo, if desired. The pledge affirms that participants will follow Minnesota's "Clean, Drain, Dispose" laws and encourages others to do so. Regardless of the activity—boating, paddling, fishing, moving shoreline equipment, using recreational gear on the water, or caring for aquarium pets or water gardens—everyone can pledge to do their part and take several simple actions to prevent the spread of AIS. As of November 2022, 434 people have taken the pledge. The program will continue to explore promotion of this webpage through various methods, partnerships, and events as well as opportunities to involve youth.

Media Relations

In 2022, 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. 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 and nation. Additionally, the Enforcement Division conducted media interviews on the importance of AIS regulation compliance. Finally, the state's Modified Unified Method (MUM) operations to remove invasive carp from the Mississippi River in the spring and fall of 2022 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.



A homepage slider graphic for the DNR landing webpage and a QR code were developed to promote the new AIS Pledge.

mndnr.gov/AISPledge

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, watercraft inspection, 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, program supervisor, program prevention consultant, and program research and grants coordinator of the DNR's Invasive Species Program also have monthly coordination meetings with MAISRC's director and assistant director. Many Invasive Species Program staff attend 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 beyond, and provides content and resources to multiple partners throughout Minnesota and across the country. Visit wildlifeforever.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 groups to better understand and measure effectiveness of communication efforts.
- Improve public education to emphasize proper bait disposal options.
- 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 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

- To date in 2022, DNR conservation officers provided 11,014 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.
- Six conservation officers, designated as water resource enforcement officers (WREO), are currently dedicated to prioritizing a significant portion of their work toward aquatic invasive species enforcement.



Photo on left:
*Conservation Officer
Brent Grewe with a K-9
zebra mussel detection dog
inspects a boat.*



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

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. Enforcement activity related to AIS violations during the 2022 season increased slightly. 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 responding to high profile public safety needs, chronic wasting disease enforcement activity, and other competing departmental priorities.

NUMBER OF CITATIONS AND WARNINGS BY YEAR

	2022	2021	2020	2019	2018	2017	2016	2015
Citations issued	58	39	61	98	95	127	123	244
Warnings	310	266	365	485	476	557	671	911

AQUATIC INVASIVE SPECIES CHECK STATIONS (SPRING TO FALL 2022)

In 2022, the DNR resumed AIS check stations across the state. To date in 2022, DNR Conservation Officers have completed nine 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 generally 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 67 DNR watercraft inspectors for the 2022 season.
- Updated our existing online training program for local government inspection staff to include additional in-person instruction. This hybrid learning system trained 797 level 1 inspectors and 172 level 2 inspectors.
- Training staff completed 24 in-person trainings before the fishing opener, training 237 inspectors. An additional 160 inspectors attended in-person training by Memorial Day.
- Completed 439,770 incoming and outgoing watercraft inspections with DNR and local government watercraft inspectors. This number is lower than previous years but is consistent with a reduction of inspection numbers nationwide. Many factors influenced this including rising costs and challenges hiring and retaining staff.
- Over 248,000 incoming watercraft were in compliance with state laws. 98% of incoming watercraft were found free of plants, invasive animals, mud or water.
- 97% of incoming watercraft arrived in compliance with state drain plug laws.
- 95% of incoming watercraft were in compliance with all AIS transport laws.
- Watercraft inspection staff participated in the Great Lakes Panel AIS landing blitz.
- Inspection program staff participated in public awareness events such as the Brainerd Kids Fishing Clinic.
- Region 2 staff assisted with DNR goose banding efforts and helped to decontaminate equipment between lakes.
- Participated in nine AIS check stations in partnership with the Division of Enforcement.

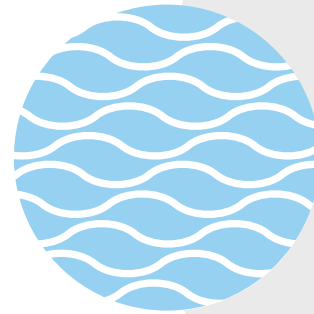


Photo on left:

Level 2 Inspector Matt Dwelly conducts an engine decontamination on a pontoon boat's outboard motor in 2022.

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 2022, watercraft inspectors observed that a majority of people arriving at accesses were in compliance with state AIS prevention laws. Ninety-seven percent 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 174 incoming watercraft (2021 had 156 occurrences). Eleven were at water bodies not known to be infested with zebra mussels.
- Watercraft inspectors prevented the introduction of starry stonewort in Lake Superior during a watercraft inspection in Two Harbors.

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 1,073 decontaminations. Local inspection programs operated an estimated 34 decontamination units in addition to DNR operated units. Partner units decontaminated an additional 2,318 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 2022, volunteers were given the opportunity to take a self-guided online training for volunteers at public water accesses. Typically, volunteers receive classroom training every three years, with an online refresher course each year between classroom training. In 2022, 28 people signed up for the online training. Volunteers must pass a yearly background check.

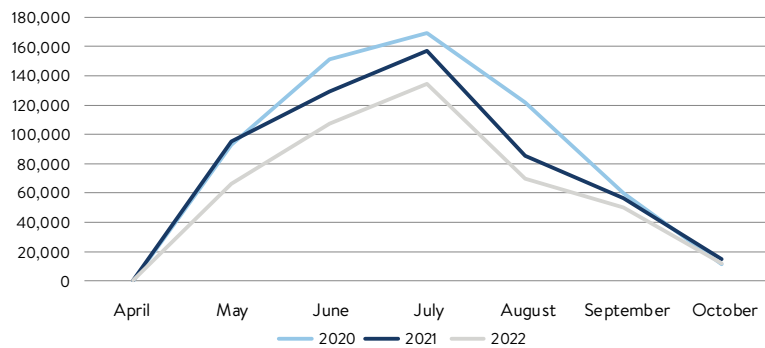
NUMBER OF DNR WATERCRAFT INSPECTIONS

	2022	2021	2020	2019	2018	2017	2016	2015
Inspections	47,682	66,574	56,813	70,762	66,833	84,824	102,445	103,500
Inspection Hours	16,876	22,755	19,509	25,451	21,826	29,400	38,000	35,000
Inspections per Hour	2.83	2.93	2.91	2.78	3.06	2.88	2.7	2.96

NUMBER OF DNR WATERCRAFT INSPECTIONS BY REGION

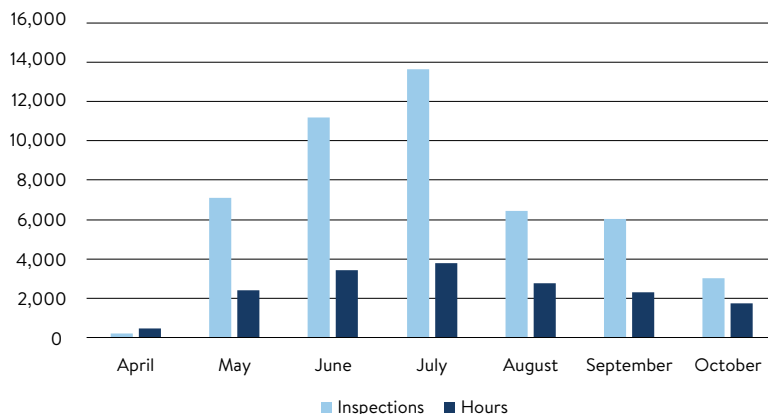
DNR Region	2022	2021	2020	2019	2018	2017	2016	2015
Northwest - 1	11,947	18,102	18,121	19,437	13,539	17,857	23,575	20,250
Northeast - 2	6,625	7,560	7,093	8,152	7,266	11,413	13,770	12,450
Central - 3	26,167	35,874	27,797	40,623	43,653	51,513	62,150	67,800
Southern - 4	2,943	5,038	3,778	2,550	2,375	4,041	2,950	3,000
Total Inspections	47,682	66,574	56,813	70,762	66,833	84,824	102,445	103,500

DNR AND LGU INSPECTIONS PER MONTH 2020 - 2022



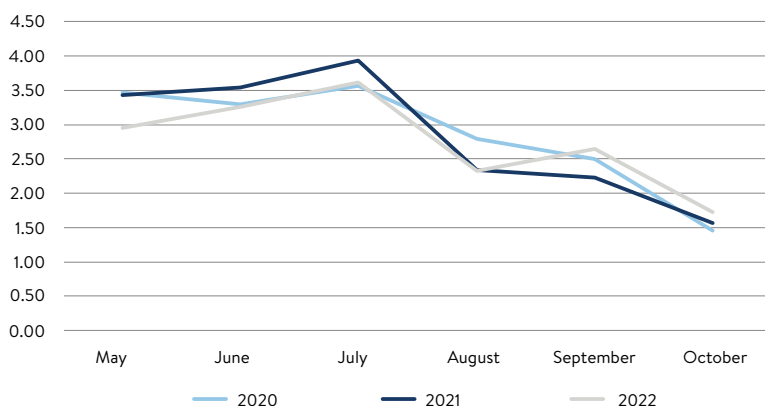
Authorized watercraft inspections start in early April, peak in July, and decline in October when most inspection programs end and boat activity reduces.

DNR INSPECTIONS AND HOURS PER MONTH: 2022



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 2020.

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 65 active delegation agreements during the 2022 season. These programs hired an additional 797 watercraft inspectors. This compares with 67 active delegation agreements and 811 trained inspectors in 2021.

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 2023, 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. Training materials for the AIS volunteer program will be updated to include information from new watercraft inspection manuals. Additional training improvements are planned to improve online authorized inspection training materials as well as in-person exercises.

The program will review 2022 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 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 2022, the Invasive Species Program facilitated a series of four, two-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 build reporting consistency and capture data and stories about local AIS prevention programs. This information helps demonstrate the statewide investment and impact of the AIS Prevention Aid.

Photo on left:

DNR and University staff present to attendees at the Aquatic Plant Identification training hosted by the Minnesota DNR, the University of Minnesota Extension and MAISRC.

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 that qualify to receive funds and provided feedback on those guidelines to counties.
- Provided information on DNR AIS programs (e.g., public engagement, watercraft inspection, trade pathways, invasive aquatic plant management, and 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 counties submitted a template summarizing their work in 2021. We learned that 976 paying jobs were created and supported with AIS Prevention Aid and \$1,831,794.16 in additional funds were leveraged to support AIS prevention activities. Forty-four counties surveyed 698 lakes and rivers for AIS. Twenty-five counties funded invasive aquatic plant management on 197 lakes in partnership with 147 local lake groups.

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 2022, these workshops continued to be held online due to the ongoing COVID-19 pandemic. The DNR hosted a series of four, two-hour WebEx meetings each on a specific topic of interest that included a few short presentations primarily from local programs and a facilitated discussion: (1) Behavior Change for AIS Prevention, (2) Control Grants & Species-Specific Topics, (3) Public Engagement, (4) Early Detection and Response & Organisms in Trade. Attendance included 101 individuals, 42 counties, 10 partner organizations, and 21 DNR staff. People attended an average of 2.3 workshops. Attendees included staff and stakeholders involved in developing and implementing local AIS programs. This included, but was not limited to, local and tribal government staff overseeing an AIS Prevention Aid or local AIS programs, watercraft inspection staff, local AIS task forces/committee members, state and federal agency staff, regional and statewide partners, non-government organizations, academia, businesses, etc. The workshops were recorded, accessible videos were posted on the AIS Prevention Aid webpage, and the videos received nearly 100 views.
- 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.
- Updated guidance materials for purple loosestrife biocontrol and connected with local AIS leads interested in conducting biocontrol efforts in their area.
- 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.

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.
- Continue to support development of programs that prevent release through the pet trade.

- 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 support local program managers in their efforts to track metrics and performance measures. For example, continue to refine the metrics template to help meet their needs and compile results to showcase statewide achievements.
- Continue to provide technical support, tools, and resources to help tribal and local governments achieve their goals and run successful AIS prevention programs.

Photo above:

Invasive Species Specialist Keegan Lund demonstrates how to collect purple loosestrife biocontrol beetles.



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 a coordinated response to nonnative *Phragmites* (*Phragmites australis* subsp. *australis*) in Minnesota. In 2022, DNR contractors visited 423 nonnative *Phragmites* sites in 31 counties. Most of the counties where treatment occurred had a limited number of small sites; 23 counties had less than ten sites. At 100 of the sites no treatment was done because no nonnative *Phragmites* was found at the site, largely due to previous years' effective treatment.
- The DNR made \$1.25 million in grants available for the control of Eurasian watermilfoil, curly-leaf pondweed, and flowering rush. The DNR divided these funds into two grant types: 1) \$800,000 for traditional AIS control grants selected by lottery of all applicants and 2) \$450,000 awarded competitively for treatment of new infestations and / or to pilot innovative control methods. One hundred and twenty-seven traditional grants were awarded to local organizations for both pre-treatment delineation surveys and control of those invasive species and 15 grants were awarded for new infestation and innovative pilot project control grants.
- In response to increased reports of purple loosestrife infestations in the state and interest in helping reestablish loosestrife biocontrol beetle populations in those areas, the DNR revised the [purple loosestrife biocontrol website](#) and created two instructional documents, [How to collect and move loosestrife beetles](#), and [How to rear and release loosestrife beetles](#).

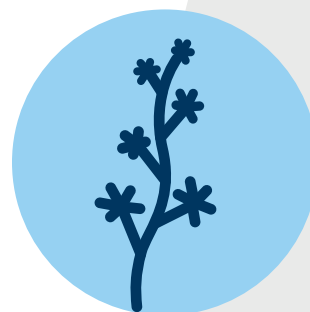


Photo on left:

A new nonnative *Phragmites* population found by Conservation Corps of Minnesota and Iowa individual placement staff in the fall of 2022 in Chisago County.

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 longterm 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.

Eurasian watermilfoil, curly-leaf pondweed and flowering rush

The three most commonly managed aquatic invasive plant species have been in the state for many decades. Curlyleaf pondweed (*Potamogeton crispus*) 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 2022 the DNR issued a total of 404 Invasive Aquatic Plant Management Permits, 360 of which were for those species.

The Invasive Species Program has provided grants for the control of Eurasian watermilfoil, curlyleaf pondweed, and/or flowering rush since 2006. In recent years, the DNR has awarded approximately \$400,000 per year in grants for the control of those species. In 2022, the Minnesota legislature made an additional one-time appropriation of \$850,000 available for lake associations to treat invasive aquatic plants, so that a total of \$1.25 million was made available.

INVASIVE AQUATIC PLANT MANAGEMENT PERMITS ISSUED BY REGION IN 2022

Species	Northwest	Northeast	Central	Southern	Total
Curly-leaf pondweed	17	14	142	31	204
Eurasian watermilfoil	9	18	86	23	136
Curly-leaf pondweed and Eurasian watermilfoil	0	0	5	0	5
Eurasian watermilfoil and flowering rush	0	1	0	0	1
Flowering rush	8	0	4	0	12
Java water dropwort	0	0	0	1	1
Nonnative <i>Phragmites</i>	1	1	13	4	19
Purple loosestrife	1	0	3	0	4
Starry stonewort	8	0	8	0	16
Yellow iris	0	0	4	0	4
Flowering rush and brittle naiad	0	0	1	0	1
Flowering rush and nonnative <i>Phragmites</i>	0	0	1	0	1
Total	44	34	267	59	404



The DNR divided these funds into two grant types: 1) \$800,000 for traditional AIS control grants selected by lottery of all applicants and 2) \$450,000 awarded competitively for treatment of new infestations and / or to pilot innovative control methods. Applicants for both types of grants were able to propose two years of treatment if all grant work could be completed before July 1, 2023. The program received 244 applications and awarded a total of 142 grants (15 new infestations and /or pilot projects and 127 lottery-chosen traditional control grants). Eighty-one grants were awarded for two-year projects, for a total of 223 treatments funded.

The traditional control grants helped fund both pretreatment delineation surveys and chemical and/or mechanical control of the invasive species. New infestation and pilot project grants funded those activities as well as the collection of quantitative data to allow the evaluation of the effectiveness and non-target effects of the innovative control methods. For traditional grants, the average one-year grant award was \$5,000 and the average two-year award was \$7,500. For new infestation or pilot project grants, the average one-year award was \$20,000 and the average two-year award was \$33,000.

Photo above:

Invasive Species Specialist April Londo sampling an area with dense Eurasian watermilfoil.

Starry stonewort

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 handpulling followed by chemical treatment. In 2022, the DNR confirmed starry stonewort in four new lakes in Minnesota, all in the northwest region of the state, Bemidji and Turtle River lakes in Beltrami County and Bowen and Thunder lakes in Cass County. It is now known to occur in 22 water bodies in the state.

Hand pulling was used successfully to significantly reduce starry stonewort by the public water access in Grand Lake (Stearns County). To slow the spread of starry stonewort the DNR arranged for a contractor to hand pull of starry stonewort at five water accesses on four lakes in the northwest region of the state. Scuba divers removed starry stonewort from public access sites in Leech Lake in Cass County and in Pimushe, Beltrami and Wolf lakes in Beltrami County. The amount of starry stonewort varied quite a bit between lakes. Only 230 pounds were removed from the Lake Pimushe PWA while 20,250 pounds were removed from the Leech Lake Marina. Overall, 36,875 pounds of starry stonewort were removed from the four lakes for a cost of \$24,720.

continued

Nonnative *Phragmites*

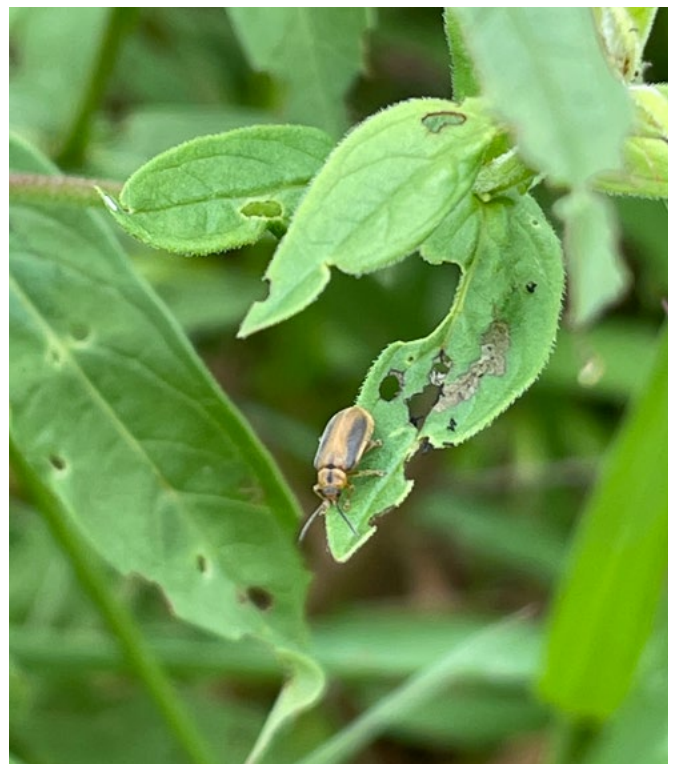
The overall statewide response to nonnative *Phragmites* is coordinated by University of Minnesota researcher Julia Bohnen, whose efforts are funded in part by the DNR Invasive Species Program through a Great Lakes Restoration Initiative (GLRI) grant. Cooperators on this project include the other University of Minnesota researchers, the Minnesota Department of Agriculture, counties, private landowners, the Minnesota Department of Transportation, the U.S. Fish and Wildlife Service, Soil and Water Conservation Districts, professional herbicide applicators, and other stakeholder groups.

Using GLRI funding the DNR continued to fund nonnative *Phragmites* control throughout the state. Management efforts focused on “clearing counties” by targeting control in areas of the state with a limited number of small infestations. In 2021 the DNR funded treatment of 183 nonnative *Phragmites* sites in 28 counties. In 2022, DNR increased this effort, directly funding treatment of 370 nonnative *Phragmites* sites in 31 counties. Most of the counties where treatment occurred had a limited number of small sites; 23 counties had less than ten sites. The average size of treatment size was 0.12 acres. Control efforts are showing success. At many of the sites no treatment was done because no nonnative *Phragmites* was found at the site due to previous years’ treatment. In addition, the DNR provided GLRI funding to four metro counties (Anoka, Carver, Washington and Wright) to manage their populations. In addition, the DNR administered a pass-through grant from the U.S. EPA to Community Action Duluth for their nonnative *Phragmites* response effort in the Duluth area.

To track the spread of nonnative *Phragmites* and to evaluate treatment effectiveness, the DNR hired two Conservation Corps Minnesota-Iowa (CCMI) summer workers to monitor treated sites and to locate new populations of nonnative *Phragmites*. University of Minnesota researcher Julia Bohnen designed the monitoring protocol they used and supervised their work, confirming the identity of every nonnative *Phragmites* site they visited. They monitored 531 sites throughout the state, using the online invasive species reporting tool [EddMaps](#) to record their findings.

Purple loosestrife

The DNR began work on the biological control of purple loosestrife in 1992 and it has been a success. After years of rigorous testing, the DNR, in cooperation with partners all over the state, reared and released more than eight million leaf-eating beetles on more than 700 purple loosestrife infestations statewide. Once the leaf-eating beetles successfully limited the abundance of a purple-loosestrife infestation, the beetles dispersed to other sites with higher abundance of the plant. Following the statewide decline in purple loosestrife beetle populations also declined. Over time purple loosestrife reemerged from seed in areas where it had been controlled in the past. In response to increased reports of purple loosestrife infestations and interest in helping reestablish beetle populations in those areas, the DNR revised the [purple loosestrife biocontrol website](#) and created two instructional documents, [How to collect and move loosestrife beetles](#), and [How to rear and release loosestrife beetles](#). The DNR plans to hold beetle rearing workshops in the spring of 2023 and work with MDA to establish local rearing sites for the public.



Purple loosestrife biocontrol beetle on a purple loosestrife plant.

PARTNERSHIPS

The management of nonnative *Phragmites* (*Phragmites australis* subsp. *australis*) in Minnesota has been an area of ongoing research by 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. The DNR Invasive Species Program continues to work closely with University of Minnesota researchers on the statewide nonnative *Phragmites* response effort.

The University of Minnesota continued its 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. They are also working to identify candidate native plant species and develop improved approaches for cultivating and establishing new plant materials. Several promising species have been identified, including river bulrush and native *Phragmites*. The DNR has assisted with this project by arranging for the control of nonnative *Phragmites* in reed beds so that native species can be tested in the future. This project is funded by the DNR through funding obtained from the Great Lakes Restoration Initiative, Aquatic Invasive Species Interjurisdictional Grants to Great Lakes States and Tribes.

The DNR in partnership with the University of Minnesota Extension and MAISRC put on an Aquatic Plant Identification Workshop. This workshop supports the management of invasive aquatic plants by training professional aquatic plant surveyors and citizen scientists in the identification of native and invasive aquatic plants found in Minnesota.

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 and other invasive species, called “Starry Trek”. In 2022, 233 volunteers searched 248 Minnesota waterbodies. No new starry stonewort infestations were found during the 2022 Starry Trek.

The DNR continued to fund research on starry stonewort by Dr. Ryan Wersal at Minnesota State University, Mankato. In 2022, his research on the seasonal phenology and biomass allocation in starry stonewort was completed and a final report produced. The purpose of this research was to look at how seasonal and environmental factors affect biomass allocation and bulbil production to improve management efforts. Data from the study indicated that management in May and early June could target the plants when biomass is low and bulbil production is limited.

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.



Invasive Aquatic Animals—Invertebrates

GOALS

- Prevent the introduction of AIS invertebrates such as zebra mussels, spiny waterflea, faucet snails and other organisms to lakes and rivers in Minnesota.
- Detect new infestations early when they are newly established.
- Support, assist and/or 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 filtration systems to prevent veliger movement from water transfer in three different locations in Minnesota and to provide information on filtration and alternatives to prevent the movement of zebra mussel veligers through water transfer.
- DNR staff conducted field surveys and confirmed a new spiny waterflea infestation in Snowbank Lake in northern Minnesota after a report from an angler.
- DNR staff worked with DNR Fisheries biologists and managers to develop a pilot project to investigate changes in early spring bait harvest procedures.
- DNR staff updated the webpage on zebra mussel pilot projects, providing more information on projects, results and actions.
- DNR staff coordinated with biologists from the White Earth Nation to confirm a new infestation of faucet snails in Mahnomen County.



Photo on left:

Sampling for zebra mussel veligers through the ice on Ely Lake in St. Louis County.



| A highly-magnified adult spiny waterflea from Snowbank Lake.

Research

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

DNR staff completed the final report on a five-year population study of zebra mussels in Green Lake.

DNR staff provided ongoing technical input into a University of Minnesota research effort examining control of zebra mussels in lakes using copper control products.



| Zebra mussels scattered on rocks in Canisteo Pit.

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



| A red swamp crayfish collected from a crayfish boil event.

PARTNERSHIPS

Minnesota Aquatic Invasive Species Research Center — University of Minnesota

DNR biologists continued to provide technical assistance, expertise and input on AIS invertebrate project proposals ranging from zebra mussels to freshwater golden clams (*Corbicula fluminea*) and rusty crayfish, as well as the evaluation of other species for potential inclusion in the MAISRC priority species list. DNR biologists provided technical input into MAISRC development of volunteer monitoring programs for AIS invertebrates.

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

National Park Service — Voyageurs National Park

DNR staff provided technical assistance and information to NPS staff to develop an enhanced sampling program for zebra mussels in Rainy Lake and an NPS boat inspection and rinse station between Rainy and Namakan Lakes.

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.



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.
- DNR led two Modified-Unified Method (MUM) events to capture invasive carp in the Mississippi River.
- DNR is pursuing a structured decision-making process to inform the update of our Invasive Carp Action Plan.

New Detections of Adult, Juvenile, and Larval Invasive Carp

The DNR relies on seven 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
- MUM events

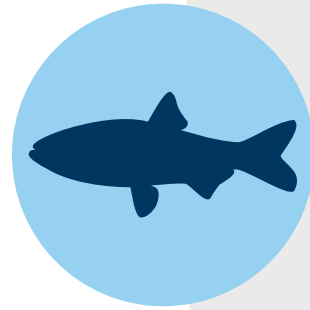


Photo on left:

DNR contracts a commercial fisher to gillnet and seine for invasive carp using nets up to 5,000 feet long.

INVASIVE AQUATIC ANIMALS – INVASIVE CARP

The invasive carp monitoring crew received nine encounter reports from the public in 2022. All reports were investigated in person, by phone or via email. All nine reports were determined not to be invasive carp, based on either photos or follow-up conversations.

In 2022, 148 invasive carp were captured in Minnesota and border waters. Of these, 140 were carcasses recovered from a fish kill below the Lake Bella outlet in southwest Minnesota. Lake Bella is located about 100 yards from the Iowa border, in the Missouri River basin where invasive carp are abundant. There is a dam at the Lake Bella outlet

that keeps invasive carp out of the lake. It would take an extraordinary flood event to overtop the structure, so there is currently no concern about carp moving further into Minnesota from this location. Of the eight invasive carp captured in the Mississippi River basin, six were captured during large-scale removal events known as MUMs (see below for more information on MUM events). One silver carp was tagged and released so that its movements could be tracked (see below for more information on tracking). To date, no evidence of reproduction has been found in Minnesota waters.

INVASIVE CARP CAPTURES IN 2022

Location	Species	Date of Capture	Number	Method of Capture	Notes
La Crosse Airport, Mississippi River Pool 8	Silver Carp	4/5/2022	5	MUM Event	
NSP Power Plant, Mississippi River Pool 8	Silver Carp	4/5/2022	1	MUM Event	
N. Okamanpeedan Lake	Grass Carp	4/6/2022	1	Commercial Fisher	
Bluff Slough, Mississippi River Pool 8	Silver Carp	5/18/2022	1	Contracted Commercial Fisher	Tagged and released
Lake Bella Outlet	Silver Carp	8/3/2022	137	MN DNR	Carcasses collected from fish kill
Lake Bella Outlet	Bighead Carp	8/3/2022	3	MN DNR	Carcasses collected from fish kill

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. Fish biologists continue to track this bighead carp 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 moved from Pool 8 to Pool 5A, and four have moved downstream outside of Minnesota waters. In response to the 2022 movement of one tagged silver carp to Pool 5A, DNR has moved additional sampling effort to Pool 5A, including larval tows and MUM sampling.

The DNR tagged one silver carp in Pool 8 of the Mississippi River on May 18, 2022, with assistance from the U.S. Fish and Wildlife Service. The last known location of this individual is Pool 9 of the Mississippi River.

Tagged fish are actively tracked when river conditions allow. DNR coordinates with partners including Wisconsin DNR and U.S. Fish and Wildlife Service to share detection data from our respective receiver arrays. Movement and habitat data from tagged fish will be used to inform future detection and removal efforts. This project has received funding to maintain its dedicated tracking crew in 2023.

Modified-Unified Method (MUM) Invasive Carp Removal Events

The DNR led two Modified-Unified Method (MUM) events in the Mississippi River in 2022. MUM events were implemented in Pool 8 near La Crosse, Wisconsin on April 4-7, and in Pools 5A-8 on September 26-30. These events used a technique adapted from traditional fishing methods in China to capture invasive carp. 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 captured by seining. Usually, MUMs are used where invasive carp are already at high density, and it often takes a week or more to capture invasive carp from one site. Since invasive



Three silver carp captured during the Spring 2022 MUM.

carp are at lower density in Minnesota, DNR uses smaller, faster “mini-MUMs” to target as many sites as possible, up to three in one day. This helps us cover more area in a large, complex river location such as Pool 8.

The U.S. Geological Survey (USGS), who pioneered the use of MUM events for invasive carp capture, partnered with DNR to help plan and execute these events. Other partners integral to this project include: the U.S. Fish and Wildlife Service, Wisconsin DNR, National Park Service, and Wild Rivers Conservancy. These valuable partnerships expand DNR’s capability to respond to invasive carp by providing staff and equipment support as well as additional information and expertise.

Six silver carp were removed during the April MUM. No invasive carp were captured during the September MUM. Four of the most productive sites in Pool 8 were targeted during the April event, and sites were sampled multiple times during the week. New net configurations were used to entangle invasive carp that attempted to escape by jumping, and one silver carp was captured using this technique. Lessons

continued

learned from the April 2022 MUM and evidence of invasive carp moving upstream to Pool 5A prompted us to target multiple new sites for the September MUM. A total of 11 sites in Pools 5A through 8 during the September MUM. Although no invasive carp were captured, several invasive carp were detected at one site in Pool 8. Detection data is valuable as we work to monitor invasive carp in Minnesota, and to target sampling efforts.

The DNR has secured funding to implement two MUM events in 2023. Data on movement patterns from tagging and tracking, eDNA detections, and standard sampling will be important to enhancing our ability to capture invasive carp. Several new technologies to enhance the MUM are in development and are on track to be implemented in 2023. The DNR will continue to use the best available science and information to guide targeted detection and capture 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://maisrc.umn.edu/research>, for past, current, and future projects.

The DNR also continues to support research 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. 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. In March 2022, the DNR received a draft feasibility report for a deterrent project at Lock and Dam 5. The DNR has since been reviewing and providing feedback on this proposal and has hosted forums to allow opportunity for input from partners such as Wisconsin DNR, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Geological Survey, the Stop Carp Coalition, and Friends of the Mississippi River.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service leads environmental DNA (eDNA) sampling for invasive carp. 2022 eDNA sampling showed multiple positive detections for bighead and silver carp DNA in Pool 8 of the Mississippi River. A March 2022 sampling event found that of 300 samples, one was positive for silver carp DNA and one was positive for bighead carp DNA. A July 2022 sampling event found that of 100 samples, one was positive for silver carp DNA, and two 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 were expected. A May 2022 sampling event in the Minnesota River near the confluence with the Mississippi River did not detect invasive carp eDNA in any of the 100 samples taken.

Two sites in the St. Croix River were sampled for eDNA in May 2022. Of the 100 eDNA samples taken in Andersen Bay near Bayport, five tested positive for bighead carp DNA and three tested positive for a general marker that indicates bighead and/or silver carp. The DNR regularly samples for invasive carp in Andersen Bay and has removed several bighead and silver carp from the bay in years



| Multiple agencies work together to seine fish at the spring 2022 MUM.

past. Andersen Bay is one of the locations that the DNR-tagged bighead carp frequents, making this area a target for surveillance and management. Of 100 eDNA samples taken at the Boom Site just upstream of Stillwater, three tested positive for silver carp DNA and one tested positive for the general invasive carp marker. These detections are approximately four miles north of the farthest upstream capture of invasive carp in the St. Croix River, and approximately one and-a-half miles upstream from the farthest detection of a tagged invasive carp. In response to these detections, additional sampling was conducted at the Boom Site. No invasive carp were captured. The DNR uses eDNA data as a monitoring tool that may indicate changes in relative abundance of invasive carp. Most recent and past results can be viewed at <https://fws.maps.arcgis.com/apps/dashboards/52b22abe9c4d4575adfe851a946f444d> strategy. The DNR represents the collaboration at federal briefings, meetings, and conferences.

Invasive Carp Regional Coordinating Committee (ICRCC)

The ICRCC was formally established in 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 a 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.

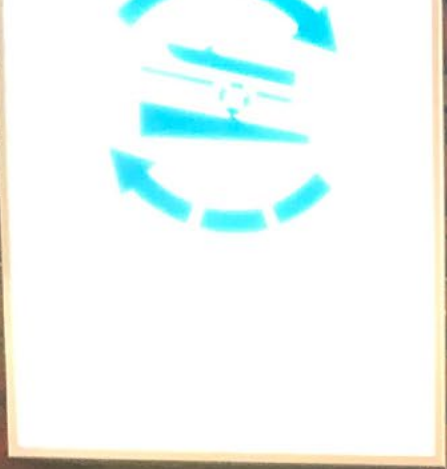
Other Collaborations

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. Projects include 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. The DNR also meets regularly with the Stop Carp Coalition and Friends of the Mississippi River to provide them with updates and get their perspectives on invasive carp efforts.

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. DNR is pursuing a structured decision-making (SDM) process to inform the update of the action plan. The SDM process will incorporate public stakeholders and invasive carp experts in a transparent, inclusive, and comprehensive process to evaluate options to address invasive carp. An updated action plan will help quantify future resource needs and identify priority activities. The DNR expects to complete the update of the action plan by August 2023.





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 round leaf bittersweet, wild parsnip, buckthorn, garlic mustard, earthworms, emerald ash borer and spongy 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.

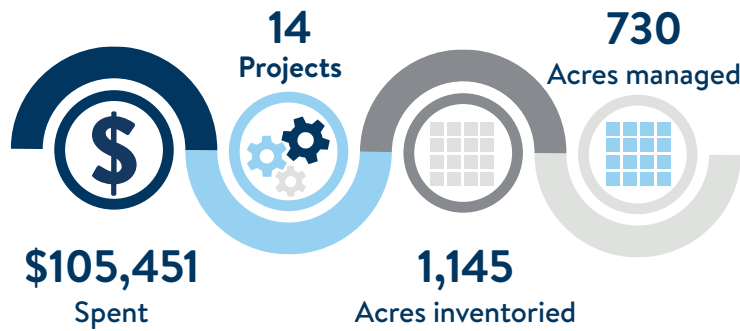
The program led the Invasive Species Operational Order 113 Committee, an interdisciplinary team that works to engage DNR divisions in prevention and management efforts. The committee wrote articles for the DNR Spotlight newsletter, provided field season reminders, updated the special events handbook and shared prevention resources and trainings.



Photo on left:

The terrestrial invasive species booth at the 2022 state fair highlighted terrestrial invasive species prevention actions.

FISCAL YEAR 2022



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
2022	\$105,451	1,875	14

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 \$105,451 in fiscal year 2022 for high priority activities. Priorities include treatment of early detection invasive plants and management in high quality habitats. For fiscal year 2023, \$172,880 has been distributed among 21 projects.

The following species were inventoried and/or managed in fiscal year 2022 projects:

Black locust, Bohemian knotweed, burdock, Canada thistle, common buckthorn, crown vetch, erect hedgeparsley, garlic mustard, Japanese barberry, Japanese knotweed, leafy spurge, miscanthus, non-native bush honeysuckle, non-native thistles, round leaf bittersweet, poison hemlock, Siberian elm, spotted knapweed and wild parsnip.

Outreach and Communication

The 2022 Minnesota State Fair provided an opportunity for outreach. The terrestrial invasive species display showcased new tattoos, signage and display materials. Visitors learned about using boot brushes to prevent the spread of invasive plants, how to prevent the spread of invasive insects by not moving firewood and how to avoid introducing jumping worms to their yards.

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

The DNR terrestrial invasive species webpages continue to be an important resource for the public. Key webpages include the terrestrial invasive plants homepage, buckthorn webpages, additional invasive plant webpages and the jumping worm webpage. The DNR regularly responded to reports of jumping worms by coordinating identification, reporting and follow up actions. They 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

The program collaborated with University of Minnesota 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. Research funding for this project 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 DNR Invasive Species Program collaborated with MISAC members in the development of the statewide plan “A Minnesota Management Plan for Invasive Species.” MISAC produced a 2023 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). In total, nine projects in 2022 involved 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 implementation of MISAC’s Statewide Management Plan for Invasive Species, verifying invasive species reports in [EDDMapS.org](https://eddmapp.org), updating additional DNR terrestrial invasive species webpages and preparing for the 2023 Minnesota 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)

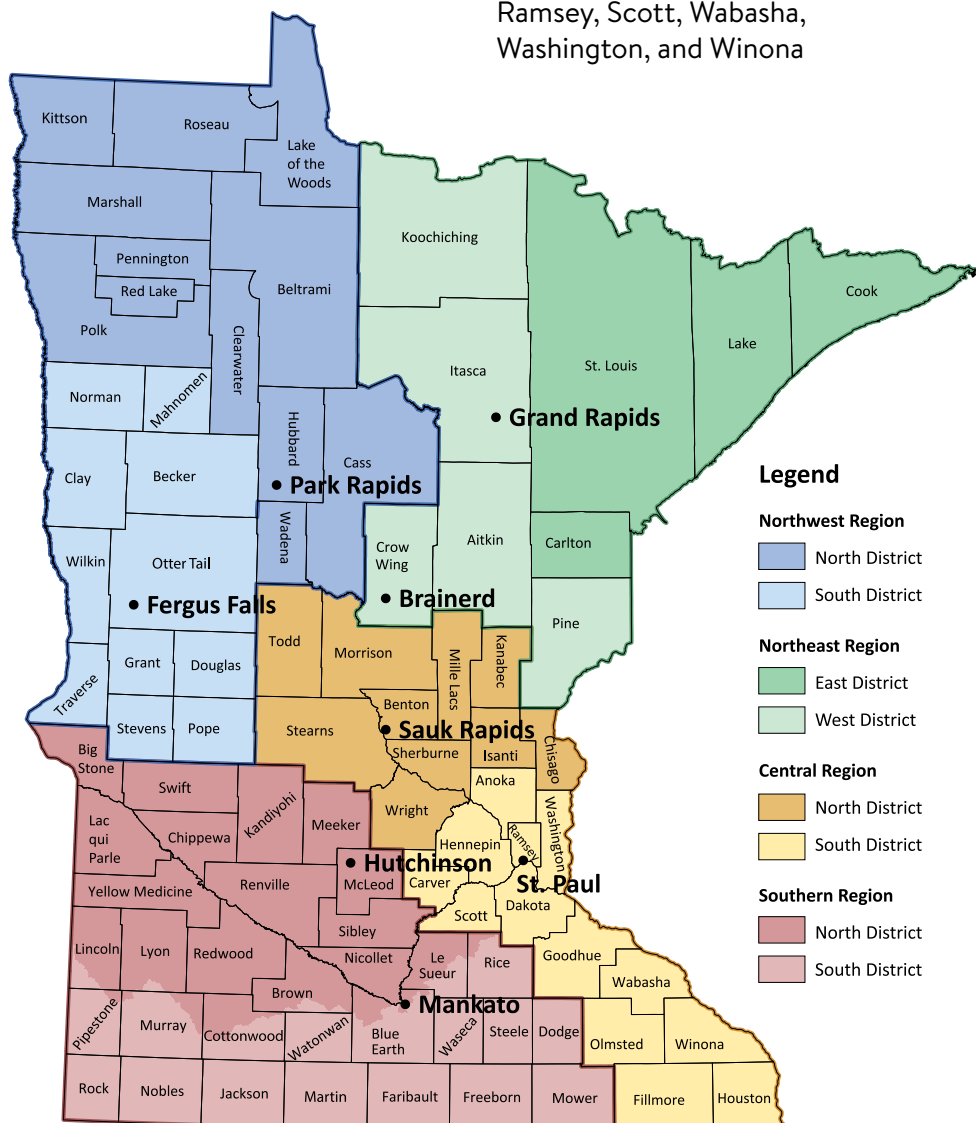
North district: Benton, Chisago, Isanti, Kanabec, Mille lacs, Morrison, Sherburne, Stearns, Todd and Wright

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 2022

This table includes all water bodies added to the infested waters list in 2022. 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 listed as infested	Year species was first confirmed, or connected water body	Lake ID number
Agnes	Douglas	zebra mussel	2022	connected to Henry (21-0051)	21-0053
Armstrong Slough	Murray	zebra mussel	2022	connected to Shetek (51-0046)	51-0045
Bass	Crow Wing	zebra mussel	2022	2022	18-0358
Bassett Creek from Wirth (27-0037) to Mississippi River	Hennepin	Eurasian watermilfoil	2022	2018	NA
Bemidji (includes Stump)	Beltrami	starry stonewort	2022	2022	04-0130
Bloody	Murray	zebra mussel	2022	connected to Shetek (51-0046)	51-0040
Bowen	Cass	starry stonewort	2022	2022	11-0350
Buchanan	Otter Tail	zebra mussel	2022	2022	56-0209
Buffalo	Wright	zebra mussel	2022	2022	86-0090
Canisteo Mine Pit	Itasca	zebra mussel	2022	2022	31-1325-04
Channel between Waverly and Little Waverly	Wright	zebra mussel	2022	connected to Waverly (86-0114)	NA
Chippewa River from Ellingson to 170th Street	Grant	zebra mussel	2022	connected to Red Rock (21-0291)	NA
Clear	Crow Wing	zebra mussel	2022	2022	18-0364
Clinker	Crow Wing	zebra mussel	2022	connected to West Rabbit (18-0093-02)	18-0131
Crooked	Douglas	zebra mussel	2022	2022	21-0199
East Rabbit	Crow Wing	zebra mussel	2022	connected to West Rabbit (18-0093-02)	18-0093-01
Ellingson	Grant	zebra mussel	2022	connected to Red Rock (21-0291)	26-0024
Embarrass Mine Pit (Sabin)	St. Louis	zebra mussel	2022	2022	69-0429
Fish	Hennepin	zebra mussel	2022	2022	27-0188
Fremont	Murray	zebra mussel	2022	connected to Shetek (51-0046)	51-0039

Water body name	County or counties	Listed for aquatic invasive species	Year listed as infested	Year species was first confirmed, or connected water body	Lake ID number
Geneva	Douglas	Eurasian watermilfoil	2022	2022	21-0052
George	Mahnomen	faucet snail	2022	2022	44-0085
Grand	Stearns	zebra mussel	2022	2022	73-0055
Henry	Douglas	zebra mussel	2022	2022	21-0051
Island	Anoka	Eurasian watermilfoil	2022	2022	02-0022
Koronis (includes Mud)	Stearns	zebra mussel	2022	2022	73-0200
Limestone	Wright	zebra mussel	2022	2022	86-0163
Linn	Chisago	Eurasian watermilfoil	2022	2022	13-0014
Little	Chisago	Eurasian watermilfoil	2022	2022	13-0033
Long	Kandiyohi	zebra mussel	2022	2022	34-0192
Louisa	Wright	Eurasian watermilfoil	2022	2022	86-0282
North Twin	Mahnomen	zebra mussel	2022	2022	44-0023
Park	Murray	zebra mussel	2022	connected to Shetek (51-0046)	51-0028
Pioneer	Chisago	Eurasian watermilfoil	2022	2022	13-0034
Pulaski	Wright	zebra mussel	2022	2022	86-0053
Rabbit River between West Rabbit (18-0093-02) and Mahnomen (18-0126)	Crow Wing	zebra mussel	2022	connected to West Rabbit (18-0093-02)	NA
Red Rock	Douglas	zebra mussel	2022	2022	21-0291
Shetek	Murray	zebra mussel	2022	2022	51-0046
Smith	Douglas	zebra mussel	2022	2022	21-0016
Snowbank	Lake	spiny waterflea	2022	2022	38-0529
Spring	Scott	zebra mussel	2022	2022	70-0054
Stocking	Wadena	faucet snail	2022	2022	80-0037
Stuart (including Little West Bay)	Otter Tail	zebra mussel	2022	2022	56-0191
Thunder	Cass	zebra mussel	2022	2021	11-0062
Thunder	Cass	starry stonewort	2022	2022	11-0062
Turner	Crow Wing	zebra mussel	2022	connected to West Rabbit (18-0093-02)	18-0135
Turtle River Lake	Beltrami	starry stonewort	2022	2022	04-0111
Tustin	Le Sueur	Eurasian watermilfoil	2022	2022	40-0061
Twelve Mile Creek downstream from Little Waverly (86-0106) to the confluence with the Crow River	Wright	zebra mussel	2022	connected to Little Waverly (86-0106)	NA
Unnamed (Schwanz)	Dakota	Eurasian watermilfoil	2022	2022	19-0063

continued

Water body name	County or counties	Listed for aquatic invasive species	Year listed as infested	Year species was first confirmed, or connected water body	Lake ID number
Unnamed creek between Stuart (56-0191) and East Battle (56-0138)	Otter Tail	zebra mussel	2022	connected to Stuart (56-0191)	NA
Unnamed lake	Douglas	zebra mussel	2022	connected to Red Rock (21-0291)	21-0267
Unnamed lake	Douglas	zebra mussel	2022	connected to Red Rock (21-0291)	21-0321
Unnamed lake	Douglas	zebra mussel	2022	connected to Henry (21-0051)	21-0425
Unnamed stream connecting unnamed (21-0425) to Le Homme Dieu (21-0056)	Douglas	zebra mussel	2022	connected to Henry (21-0051)	NA
Unnamed stream from Red Rock (21-0291) to Ellingson (26-0024)	Multiple Counties (Grant and Douglas)	zebra mussel	2022	connected to Red Rock (21-0291)	NA
Upper Pine	Pine	Eurasian watermilfoil	2022	2022	58-0130
Webster Slough	Murray	zebra mussel	2022	connected to Shetek (51-0046)	51-0035
West Rabbit	Crow Wing	zebra mussel	2022	2022	18-0093-02
Willmar	Kandiyohi	zebra mussel	2022	2022	34-0180



ECOLOGICAL AND WATER RESOURCES

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