Michigan Invasive Species Program

2020 Annual Report

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

DEPARTMENT OF NATURAL RESOURCES · MICHIGAN · DNR

Michigan Department of Agriculture & Rural Development

Contents

Michigan Invasive Species Program 2020 Annual Report

Preface

Michigan's Invasive Species Program is a joint effort of the Michigan departments of Agriculture and Rural Development; Natural Resources; and Environment, Great Lakes, and Energy. The Michigan Invasive Species 2020 Annual Report highlights the program's goals and accomplishments regarding invasive species prevention, management and outreach; the status of prohibited and restricted species in Michigan; and recommendations for furthering Michigan's Invasive Species Program.

This report is submitted by the DNR in compliance with Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, MCL 324.41323 and by EGLE in compliance with NREPA 324.3104(3). This report and other information pertaining to invasive species in Michigan is available at Michigan.gov/Invasives.

Invasive Species Program overview

Invasive species are those that are not native and whose introduction causes harm, or is likely to cause harm, to Michigan's economy, environment or human health. Michigan's economy and ecosystems experience significant negative impacts from plants, animals and pathogens that are introduced into the environment and flourish without natural predators to restrain them. The economic effects of invasive species include significant consequences to property values, tourism, recreation, utilities and industry. Ecological impacts of invasive species include reduction of native species, habitat degradation and altered food webs. Some species even can threaten public health. While the invasive species already present in Michigan cause substantial harm, the state's land and water are constantly threatened by the introduction of new invasive species.

Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, Part 413 outlines the roles and responsibilities of state departments in relation to prohibiting and restricting invasive species. In 2014, Michigan's governor and Legislature designated $5 million in ongoing funding, beginning in fiscal year 2015, to manage the impact of invasive species. This support substantially enhanced Michigan's Invasive Species Program for aquatic (water-based) organisms and initiated a formal program for terrestrial (land-based) species. This support also initiated the Michigan Invasive Species Grant Program, providing $3.6 million in awards annually to agencies, universities and nonprofit organizations to assist with prevention, detection, eradication and control of aquatic and terrestrial invasive species.

The state of Michigan defines "invasive species" as those that are not native and whose introduction causes harm, or is likely to cause harm, to Michigan's economy, environment or human health.

MDARD, DNR and EGLE share responsibility for invasive species policy, legislation, regulation, education, monitoring, assessment, management and control. These departments provide oversight and guidance for the aquatic invasive species and terrestrial invasive species core teams in alignment with the priorities of the administration and the department directors. The AIS and TIS core teams communicate internally and externally to ensure a cohesive program.

The AIS and TIS core teams develop projects and make recommendations to the departments' leadership based on priorities for each group of invasive species. The AIS core team implements Michigan's Aquatic Invasive Species State Management Plan through both internal and collaborative activities and projects. The TIS core team implements Michigan's Terrestrial Invasive Species State Management Plan to guide efforts in prevention, detection and control in collaboration with local, state and federal partners.

Invasive Species Core Team representation:

- EGLE Water Resources Division
- DNR Fisheries Division
- DNR Forest Resources Division
- DNR Law Enforcement Division
- DNR Parks and Recreation Division
- DNR Wildlife Division
- MDARD Animal Industry Division
- MDARD Environmental Stewardship Division
- MDARD Pesticide and Plant Pest Management Division
- MDOT Project Planning Division

Time frame

This report covers the activities of fiscal year 2020: Oct. 1, 2019, through Sept. 30, 2020.

Goals

As defined by the Invasive Species Program charter signed by department directors in January 2015, the program has four goals:

- Prevent introduction of new invasive species to Michigan.
- Limit the dispersal of established invasive species populations throughout Michigan.
- Develop a statewide, interagency, invasive species Early Detection and Response Program to address new invasions.
- Manage and control invasive species to minimize harmful environmental, economic and public health effects resulting from established populations.

Meeting the challenges of 2020

For most of 2020, invasive species work at all levels was altered by the COVID-19 pandemic. Beginning in March, field operations, public outreach activities and university research projects were curtailed as measures went into effect to prevent the spread of the virus. State restrictions on discretionary spending, beginning March 30, paused Michigan Invasive Species Grant Program agreements, meaning grantees could not incur expenses toward grant-funded project activities.

Fortunately, many grantees were able to find partner support, additional grants or matching funds to carry out activities at some level. Understanding the importance of keeping research, outreach and control efforts going, program partners found innovative ways to get the job done, including adopting new safety protocols, working in small, socially distanced teams and finding new ways to communicate with stakeholders and the public.

The following highlights represent some of the ways state staff, grantees and the program's many federal, state, local and university collaborators were successful in achieving the Michigan Invasive Species Program's goals.

Goal 1 – Prevention

Prevent introduction of new invasive species to Michigan

Prevention, the most effective step in managing invasive species, involves both keeping unwanted organisms out of Michigan and stopping the spread of newly introduced species. Michigan's Invasive Species Program targets pathways that can bring invasive species into the state and those that can move them from place to place.

Enforcing a new prohibition

In May 2020, marbled crayfish were added to Michigan's prohibited species list. Just a few days later, the owner of a tropical pet store contacted DNR's Law Enforcement Division to self-report an incoming order of the self-cloning crayfish. The owner was able to give LED the name of the Florida wholesaler, who was contacted and advised of the new changes in Michigan law. In June, an LED officer located an individual attempting to sell marbled crayfish online. The seller was a college student who had just been informed she could not have them in her apartment and was trying to get rid of them. Officers contacted the suspect, who was not aware marbled crayfish were now illegal to possess in Michigan. The suspect cooperated and gave the crayfish to officers.

Initiating islandwide action

In early March, the Three Shores Cooperative Invasive Species Management Area partnered with the Drummond Island Chamber of Commerce to host an invasive species workshop for chamber members. With a new understanding of how invasive species were affecting recreation opportunities, Drummond Island's Off-Road Club and Sportsman's Club leaders are now exploring ways to help in the CISMA's efforts to protect the island's rare and unique ecosystems. Heightened awareness of invasive species among business owners serving the recreation community is anticipated to help the CISMA's continued survey and treatment efforts on both public and private lands.

Curbing prohibited species sales

Twenty nursery inspectors with MDARD annually inspect perennial plants, trees and shrubs at nurseries and nursery dealers throughout the state to ensure they are pest-free. Since 2012 these inspections have included checking for state prohibited and restricted species, sometimes sold under incorrect or different names. Despite work limitations in 2020, staff completed 1,079 inspections of grower facilities, 90 in-person dealer inspections and 260 dealer contacts. Annual communication about invasive species and assistance in identifying incorrectly labeled plants has helped reduce incidents of prohibited and restricted species entering the state and being marketed to the public.

Hosting virtual workshops

MI Paddle Stewards, a Michigan Sea Grant project with funding from the Michigan Invasive Species Grant Program, seeks to help kayakers and other paddlers identify and map invasive species along Michigan's water trails and prevent their introduction or spread through paddlesport activities. Unable to continue the in-person workshops initiated in 2019, the project team went virtual, launching an online training course in July 2020. By Sept. 30, 180 people had registered for the course and 135 had been mailed tool kits. Despite the pandemic, the project team also reached over 300 people through the virtual Quiet Adventures Symposium and many more through 60 articles and social media posts.

Goal 2 – Limit dispersal

Limit the dispersal of established invasive species populations throughout Michigan

People who work or play in areas where invasive species are already established can unknowingly aid in their spread to new areas. Arming these audiences with information to identify the invaders they encounter and take steps to avoid carrying "hitchhikers" to new locations will have important long-term effects in reducing invasive species populations.

Promoting clean biking

Mid-Michigan CISMA is taking the national PlayCleanGo campaign to a new audience – mountain bikers. Generally targeting hikers, PlayCleanGo encourages outdoor enthusiasts to check for and remove seeds and debris from gear before they leave a recreation area to prevent the spread of invasive plants and insects. Through a new partnership with the Mid-Michigan Mountain Biking Association, the CISMA is spreading the word to bikers – providing tools and tutorials on effectively decontaminating bikes and gear while encouraging eco-friendly habits for this growing recreational user group.

Calling all volunteers

When the North Country CISMA's planned Exotic Aquatic Plant Watch workshops were canceled, staff used a "new" tool – the telephone – to recruit volunteers to monitor for invasive plants in area lakes. Fifty phone calls to lakefront landowners yielded 10 new program enrollees – many more than previous outreach efforts had attracted. Lake communities often are made up of seasonal or weekend residents who may not choose to attend an event during their stay. A personal phone call can be tailored to a would-be volunteer's schedule and can focus on their questions and interests. Volunteers then utilize tools and training modules available online at MiCorps.net.

Protecting high-use areas

European frog-bit was detected in the Lower Grand River and Pentwater Lake in 2019. Heavy recreational use in these areas, as well as their direct connection to Lake Michigan, make them priority sites for limiting the spread. Within the short 2020 field season, West Michigan CISMA, the Gun Lake Tribe and EGLE focused their efforts on removing or treating infestations around heavily used boating access sites in both areas and protecting culturally and ecologically significant sites like wild rice beds in the Lower Grand River. A boom was installed in the Pentwater wetlands to help prevent mats of European frog-bit from flowing into Pentwater Lake.

Surveying boating access sites

To gain information about aquatic invasive species at boating access sites, the DNR completed a representative survey of 157 sites across the state. The survey, published in 2020, measured the presence and density of aquatic invasive species at and around launch areas. At least one of the 10 invasive species included in the survey was found at 55 % of the sites. The most common invasive species identified were Eurasian watermilfoil, zebra or quagga mussels, and starry stonewort. Surveyors also determined that only 3% of sites had signage reflecting new invasive species boating laws. Many sites had outdated signs, and 33% had no signage. To remedy the situation, staff was deployed to update signage at all sites across the state. Seven sites with dense aquatic invasive plant growth were treated in 2020. The results of this project will guide future decisions about state-managed boating access sites.

Goal 3 – Early detection and response

Develop a statewide, interagency, invasive species early detection and response program to address new invasions

Successful early detection of and response to new infestations require widespread monitoring efforts, rapid communication and well-prepared personnel to respond. A statewide approach involves coordinated efforts among agencies, cooperative invasive species management areas, industry professionals, researchers and residents to detect, report, verify and treat emerging invasive species issues.

Tracking invasive crayfish

To understand more about how red swamp crayfish populations are spreading, Michigan State University is working with the DNR to track their movement. As part of a project funded by the Great Lakes Restoration Initiative, 16 radio transmitters were glued to the upper shells of crayfish found in ponds in the city of Livonia. Data indicated that four crayfish remained in burrows while eight moved about in the ponds where they were released. None migrated to new locations. Of the remaining four, one crayfish lost its tag shortly after release, while three others were apparently eaten by a mink who left their tagged shells near a burrow. The crayfish will continue to be monitored throughout the year, and additional crayfish in different locations will be tagged and tracked in 2021.

Strategizing for success

Michigan's European Frog-bit Collaborative brings together entities managing this invasive aquatic plant, including state, CISMA and university staff. With support from the Great Lakes Restoration Initiative, Central Michigan University is coordinating the development of the collaborative's adaptive management strategy, which includes risk assessment criteria, standard survey protocols and a centralized data management system. While piloting these survey and data collection methods on 45 bodies of water newly determined as high-risk, EGLE student assistants detected European frog-bit in five mid-Michigan locations. Though hand-removal was effective at one location, heavy infestations at the other sites will require more intensive efforts in 2021.

Continuing response efforts

Through the combined work of the DNR, West Michigan CISMA and Ottawa County Parks, over 10,648 acres along the Lake Michigan shoreline were surveyed over the winter to locate hemlock woolly adelgid infestations and mark trees for treatment. These early detection efforts resulted in the discovery of infested trees in Mason County, extending the known northern range of hemlock woolly adelgid in the state. With the addition of new personal protective equipment and safe distancing protocols, crews worked throughout the shortened summer field season to treat 30,866 eastern hemlock trees in infested areas, including the new locations in Mason County.

Containing a plant pathogen

When a vigilant grower at a commercial greenhouse in Michigan noticed unusual wilt symptoms on his geraniums in May, he sent a sample to the Michigan State University Plant and Pest Diagnostics Lab for testing. Preliminary results, quickly verified by the U.S. Department of Agriculture, determined the cause to be Ralstonia solanacearum race 3 biovar 2. This bacterial pathogen, last found in the U.S. in 2004, causes a wilt disease in geraniums and several important food crops, including potatoes, tomatoes, peppers and eggplants. The bacteria were traced to a geranium cultivar imported from a facility in Guatemala. The USDA determined an additional 288 plant growers in 39 states received affected shipments from the Guatemalan facility, including 41 growers in Michigan. MDARD officials worked with the USDA to visit each facility to isolate, contain and destroy infected plants and oversee sanitation of each facility. Despite COVID-19 challenges, inspectors completed the process in three weeks, allowing affected nurseries in Michigan to get back up and running shortly after the initial detection.

Goal 4 – Minimize harmful effects

Manage and control invasive species to minimize harmful environmental, economic and public health effects resulting from established populations

Established or widespread infestations can change the makeup of whole ecosystems. The negative effects on native plant and animal populations include displacement, diminishing food and habitat, and species reduction. The recreational value of lakes, dunes and forests is degraded by the presence of invasive species. Invasive species also are taking a toll on Michigan's fisheries, agriculture and timber industries. Both large-scale management efforts and innovative treatment methods are needed to manage invasive species populations in the state.

Partnering for river protection

The Western Peninsula Invasive Species Coalition joined forces with the Wild Rivers Invasive Species Coalition and the Lake-to-Lake Cooperative Invasive Species Management Area to address the largely unmapped population of purple loosestrife in the Michigamme River. The seasonal flowage of the Michigamme is contributing to the invasive plant's spread throughout the river basin and into the Michigamme Reservoir, the largest body of water in Iron County. Left unchecked, this population has the potential to infiltrate the Menominee and Brule rivers. The project, funded by the WE Energies Mitigation and Enhancement Fund Grant Program, highlights cooperation across jurisdictional boundaries to prevent the spread of invasive species into priority ecosystems. Partners are committed to a five-year effort to survey and treat purple loosestrife in the waterway using a combination of mechanical, chemical and biological controls.

Bashing buckthorn

Common and glossy buckthorn are aggressive invasive shrubs that have become established in many parts of the state. To provide motivation and assistance in managing buckthorn infestations, the Keweenaw Invasive Species Management Area, with the help of a local master gardener, hosted the second annual Neighborhood Buckthorn Bash in Houghton. Approximately 30 residents, whose properties comprised 51 acres, joined in to remove shrubs from their properties or provide access to KISMA staff for removal. The city of Houghton provided truck and operator time to load the huge piles of buckthorn and haul the debris to a local composting site.

Keeping a project alive

Maintaining progress on a biocontrol project was critical to Marianna Szucs, assistant professor of entomology at Michigan State University. Her lab is rearing and releasing Hypena opulenta, a non-native moth whose larvae feed on leaves and seed pods of invasive swallow-wort plants. Stopping this work would mean losing valuable data and, perhaps, the insects themselves. Her team was able to work within the pandemic protocols to successfully rear nearly 3,000 larvae in the lab and release several of them in 20 contained experimental plots in Oakland and Lapeer counties and on the MSU campus. The project will help determine whether the insects can survive in Michigan's climate and, if so, how to optimize their ability to control invasive swallow-wort.

Spotlight: Virtual outreach and education

The COVID-19 pandemic necessitated changes in the way invasive species messages could be delivered to the public, but with more and more people heading outdoors, these messages were never more important. Michigan's Invasive Species Program partners found several ways to reach new audiences.

Nature school at home

In 2020, many teachers and families experienced remote school learning for the first time and quickly had to adjust to online lessons and lots of free time. Innovative DNR park interpreters saw a great new opportunity for outreach and went to work creating videos to teach students about the outdoors. Their Nature at School live webinars reached 4,000 students at 200 schools. The webinars, along with short Nature Glance videos, virtual field trips and a host of activities and guides, are available online at Michigan.gov/NatureAtSchool, providing entertaining and accessible lessons about natural resources, invasive species and some of the many amazing parks and recreation opportunities the state has to offer.

Virtual forestry

When the pandemic hit, Alger Conservation District, leading a multiCISMA effort to survey for hemlock woolly adelgid in the Upper Peninsula, had to rethink a planned workshop to help forest professionals identify and report the invasive insect. Their solution – a virtual workshop! Staff took cameras and smartphones into the field to shoot short videos on survey techniques and forest pests to augment PowerPoint presentations. Twenty people attended the Zoom presentation, and an additional 256 viewed the entire program on YouTube afterward – a much larger audience than anticipated for the event.

NotMISpecies webinars

To meet growing public interest in invasive species issues, the Michigan Invasive Species Program launched the NotMISpecies webinar series, highlighting innovative and collaborative prevention and control efforts underway across the state. The monthly program features live presentations by field technicians and researchers exploring environmental impacts, control techniques and programs to help communities prevent and manage harmful invasive species. Programs are reaching a broad audience including municipal leaders, conservationists, state and federal partners, and people with general interest. With attendance averaging 300 people per program, and hundreds more viewing the recordings, the series is off to a positive start.

Answering the calls

Staying at home brought people closer to nature, and for some that meant discovering invasive species on their properties. In 2020, the Three Shores CISMA responded to over 200 inquiries from residents of Chippewa, Luce and Mackinac counties about invasive species management. This level of public engagement indicates the CISMA's success both in raising public awareness and inspiring action. A new website, launched in September, is expanding Three Shores' outreach efforts and providing passive education opportunities to schools and partners.

Workshop in the wild

A native plant restoration workshop hosted by the Mid-Michigan CISMA at the Michigan Wildflower Farm was successful in engaging the community at a time when opportunities for in-person events were very limited. By capping the number of participants and requiring face masks and social distancing, the event exemplified CISMAs' ability to adapt to changing circumstances while still providing active outreach efforts. After a tour of the farm, participants learned how to use native plants to restore sites after invasive species removal.

Program outcomes

The following outcomes were established to direct the use of state funding to further the goals of the Michigan Invasive Species Program.

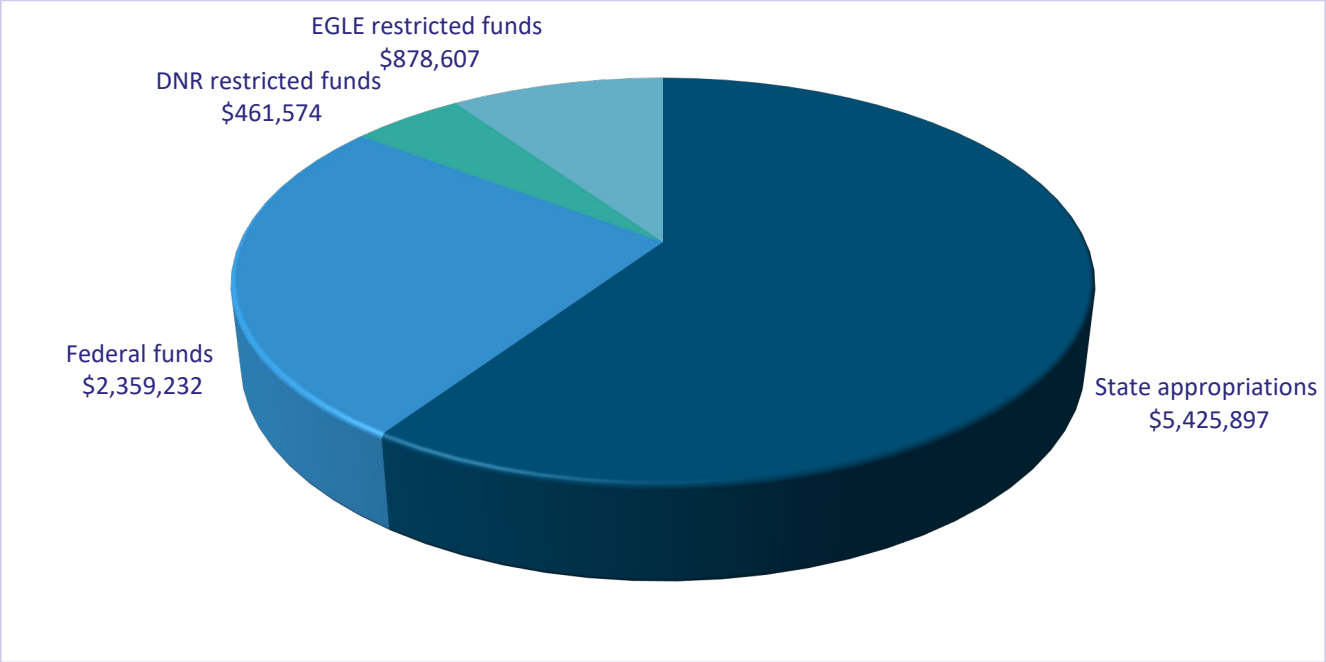
- Establishing cooperative invasive species management areas to ensure statewide coverage.
- Responding to 90 early detection sites.
- Providing outreach to 750,000 citizens to enlist them in detecting and responding to emerging invasive species before they become established.
- Managing and controlling 6,000 acres for terrestrial and aquatic invasive species.

Table 1 – Michigan Invasive Species Program outcomes 2015-2020

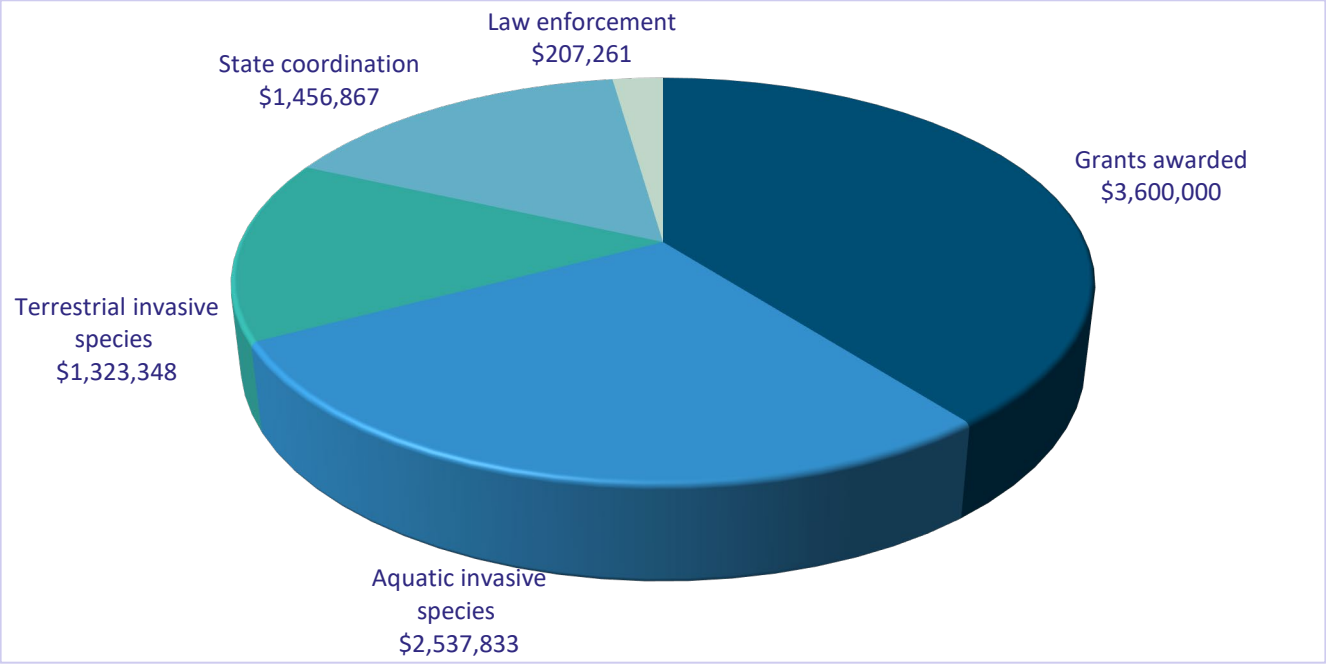
	CISMA statewide coverage (number of counties)	Early detection responses	Outreach impressions	Control acres
Program Goal	**83**	**90**	**750,000**	**6,000**
2015	65	355	1,495,800	8,369
2016	77	175	5,037,627	8,710
2017	77	194	5,090,658	9,370
2018	83	58	4,274,867	9,410
2019	83	24	6,265,359	12,313
2020	83	8	8,333,206	11,867

Program finances – fiscal year 2020

Funding – $9,125,310



Expenditures by program area – $9,125,310



Michigan's prohibited, restricted and problematic species

Michigan laws limit the import, sale and possession of 56 prohibited and restricted species including plants, animals, fish, mollusks and crayfish. A current list is provided at the end of this report. If a species is prohibited or restricted, it is unlawful to possess, introduce, import, sell or offer that species for sale as a live organism, except with a valid permit.

Michigan's Natural Resources Commission, in consultation with MDARD, or the Commission of Agriculture and Rural Development, in consultation with the DNR, may add to the list of prohibited and restricted species.

The term "prohibited" is used for species that are not widely distributed in the state. Often, management or control techniques for prohibited species are not available. The term "restricted" is applied to species that are established in the state. Management and control practices usually are available for restricted species.

Additions or deletions to Michigan's prohibited and restricted species lists

In May 2020, the DNR approved the addition of marbled crayfish (Procambarus virginalis) to Michigan's list of prohibited species. Marbled crayfish are increasing in popularity in the aquarium trade due to their unique ability to reproduce by cloning. Where released into the wild in Europe, marbled crayfish have become established and spread rapidly. Adding marbled crayfish to the state's list of prohibited invasive species aligns Michigan's regulated species with the Conference of Great Lakes and St. Lawrence Governors and Premiers' list of "least wanted" aquatic invasive species.

Scientific permits issued for prohibited or restricted species in 2020

The issuance of permits for the possession of prohibited or restricted species is provided by NREPA Part 413 for MDARD (for plants and insects) and the DNR (for fish or any other species) following an application and review process.

In 2020, 39 permits were granted to partner agencies, universities and other entities including consulting firms, zoos, nature centers and other educational institutions (Table 2).

Table 2 – Prohibited and restricted species permits issued in 2020

Species	Status	Number of Permits Issued	Permittees
Rusty crayfish	Restricted	8	7 universities, 1 other
Zebra mussels	Restricted	6	3 universities, 3 others
Quagga mussels	Restricted	8	6 universities, 2 others
New Zealand mudsnail	Prohibited	1	1 university
Round goby	Prohibited	8	3 universities, 5 others
Red swamp crayfish	Prohibited	2	1 university, 1 partner
Terrestrial and aquatic plants	Prohibited or restricted	6	1 university, 4 partners, 1 other

Status of Michigan's prohibited, restricted and other problematic species

The current distribution of prohibited and restricted species in Michigan, based on best available knowledge, is provided in Appendix A. Some of these species are not yet known to be present within the state, while others have been present in certain parts of the state for decades, causing significant, ongoing management and control costs. In cases where distribution is listed as absent, this may mean a species is truly not present at all in Michigan or that no confirmed detections have been made.

Detection and/or specific management actions occurred in 2020 for the prohibited, restricted or other problematic species listed below:

European frog-bit

In August 2020, EGLE confirmed the presence of European frog-bit, an aquatic invasive plant, in four lakes within the Waterloo Recreation Area in Jackson and Washtenaw counties and one impoundment in the Dansville State Game Area in Ingham County. European frog-bit was first detected in southeast Michigan in 1996 and has since spread along the coastal areas of lakes Erie and Huron up to the eastern Upper Peninsula. More recently the plant was discovered in lakes in East Grand Rapids, several small bodies of water in Oakland County, the Lower Grand River in Ottawa County and Pentwater Lake in Oceana County. EGLE is working with local CISMAs to reduce infestation levels through hand-removal and chemical treatment.

Grass carp

During a routine fish survey in March 2020, DNR staff captured an invasive grass carp in the Tittabawassee River below the Dow Dam in Midland County. Through lab testing, the fish was determined to be diploid, making it the first documented capture in Lake Huron waters of a grass carp capable of reproducing. During a follow-up response action just before the "Stay Home, Stay Safe" Executive Order was issued, no additional grass carp were captured or observed. When it was again permissible, the DNR resumed work surveying for grass carp in the Tittabawassee River and connected waterways in collaboration with regional partners.

Hemlock woolly adelgid

In March 2020, the DNR confirmed the presence of hemlock woolly adelgid in southern Mason County. Prior to this detection, known infestations were limited to Allegan, Ottawa, Muskegon and Oceana counties. Infestations were found in areas north of Bass Lake and in portions of Ludington State Park. Crews from the West Michigan CISMA and the DNR are working to treat hemlock trees in affected areas of Mason County.

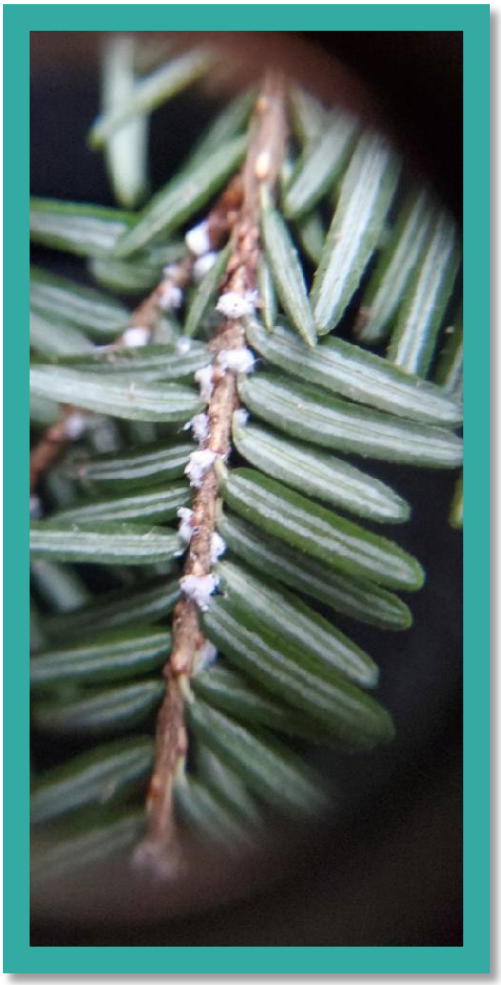
Michigan's interior and exterior hemlock woolly adelgid quarantines were revised effective Sept. 24, 2020. The interior quarantine was updated to include Mason County after the pest was identified there in February 2020. Acceptable methods of moving hemlock yard waste within the regulated counties also were revised. The state's exterior HWA quarantine was updated to clarify responsibilities for notifying MDARD on incoming shipments.

Mountain pine beetle

In September 2020, MDARD enacted a mountain pine beetle exterior state quarantine regulating the movement of pine forest products with bark originating from affected states. Mountain pine beetle outbreaks have killed millions of pine trees in the western United States and Canada and, due to warmer winters, the insect is moving northward and eastward. Michigan's pine resources at risk of attack include white pine, jack pine, red pine, Austrian pine and Scots pine.

Spotted lanternfly

The Michigan Invasive Species Program ramped up early detection efforts for spotted lanternfly as reports of new infestations in Ohio and Connecticut in 2020 indicated the invasive leaf hopper was on the move. Calls for the public to become familiar with the colorful insect and report any sightings resulted in two confirmed reports of dead spotted lanternfly in August. One dead insect was found in the wrapping of nursery stock at a landscape supply outlet in Kent County, and two dead insects were reported on a pallet of goods at a contractor supply business in Wayne County. This insect can damage or kill more than 70 varieties of crops and plants including grapes, apples, hops and hardwood trees. To date, live spotted lanternflies have not been detected in Michigan.



Legislative and funding recommendations

Proposals regarding legislation and funding to carry out and otherwise further the purposes of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, Part 413, MCL 324.41323 include:

Recommendation 1

Continue funding for and support of Michigan's Invasive Species Program, including cooperative invasive species management areas and resources for urgent, high-threat responses.

- Each year, metrics for outreach, response and control are met or exceeded, and annual requests for grant funding are sometimes more than triple the funding available. The program has made great strides in using state funding to leverage additional federal funding, leading to success in phragmites control, grass carp eradication efforts and response to hemlock woolly adelgid. Funding of invasive species work is critical to the state's natural resource-based economy and opportunities to address additional needs will be pursued through the state's budget process.

Recommendation 2

Support more stringent regulations regarding the movement of potentially infested and diseased wood to protect Michigan's forest and landscape resources from the spread of oak wilt and other devastating pests and diseases.

- Michigan currently has an interior quarantine for hemlock woolly adelgid and exterior quarantines for thousand cankers disease and balsam woolly adelgid. Ensuring compliance with these quarantines is critical to the future of Michigan's forests and landscape trees. Expanding the channels of communication about these regulations to include all levels of law enforcement as well as tourism information networks will encourage broader compliance.

Recommendation 3

Continue to work with industries to identify, report and manage invasive species causing harm to Michigan's resources and the industries that rely on them.

- Forest professionals, lake managers, agricultural operators and recreational outfitters are among those who have a stake in the health of Michigan's natural resources. Their daily activities put them in key positions to identify, report and,

in some cases, manage invasive species populations. Sharing information with industry leaders and associations regarding identification and reporting tools, best management practices and emerging research can expand the reach and effectiveness of the state's invasive species program.

Recommendation 4

Increase assistance for identification and treatment of terrestrial invasive species on private lands.

- Raising awareness about invasive species and the harm they cause has encouraged some private landowners to appropriately manage infestations. Providing assistance in treatment, including low-cost or no-cost options in certain scenarios, may also encourage better management.
- Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, Part 413 provides penalties for transporting or possessing prohibited or restricted species but does not require the control of existing populations on private lands, even if the species are spreading onto neighboring properties. Natural resource managers may struggle to control or eradicate invasive species populations due to neighboring private landowners' unwillingness to treat populations along property lines.

Appendix A – Species listed as prohibited or restricted under Part 413

Species	Part 413 Status	Distribution in Michigan	Comments
Plants			
African oxygen weed (Lagarosiphon major)	P	Absent	
Autumn olive (Elaeagnus umbellate)	P	Widespread	Common and widespread throughout southern Lower Peninsula, widespread elsewhere statewide.
Brazilian waterweed (Egeria densa)	P	Absent	Isolated populations in IL, IN, MN and OH.
Curly leaf pondweed (Potamogeton crispus)	R	Widespread	Common, especially in the Lower Peninsula.
Cylindro (Cylindropermopsis raciborskii)	P	Isolated	Recorded in several drowned river mouths in the Lake Michigan Basin.
Eurasian watermilfoil (Myriophyllum spicatum)	R	Widespread	Common, especially in the Lower Peninsula.
European frog-bit (Hydrocharis morsusranae)	P	Locally abundant	Locally abundant along eastern coastline from Lake Erie to St. Marys River; isolated populations in Saginaw Bay, Kent County, Alpena County, Oakland County, Washtenaw County, Oceana County and Chippewa County.
Fanwort (Cabomba caroliniana)	P	Locally abundant	Locally abundant in Lower Peninsula, primarily in southwest Lower Peninsula; present in IL, IN, OH and Ontario.
Flowering rush (Butomus umbellatus)	R	Locally abundant	Common in southeast Michigan, both inland and coastal, one isolated population in Alger County; also identified in IN, IL, MN, OH, WI and Ontario.
Giant hogweed (Heracleum mantegazzianum)	P	Isolated	Patchy distribution throughout the Lower Peninsula and western Upper Peninsula; some occurrences have been controlled.
Giant salvinia (Salvinia molesta, auriculata, biloba or herzogii)	P	Absent	
Hydrilla (Hydrilla verticillata)	P	Absent	Isolated populations in IN, WI, OH and PA.
Japanese knotweed (Fallopia japonica)	P	Widespread	Patchy distribution throughout Lower and Upper peninsulas.
Parrot feather (Myriophyllum aquaticum)	P	Isolated	Active management of isolated populations in Berrien, Calhoun, Wayne, Washtenaw and Jackson counties; isolated populations in IL, IN, NY, OH and PA.
Phragmites or common reed (Phragmites australis)	R	Widespread	Common and established in coastal and inland areas of southern Lower Peninsula; somewhat less abundant from south to north; common in western U.P.
Purple loosestrife (Lythrum salicaria)	R	Widespread	Biological control is reducing population statewide.
Starry stonewort (Nitellopsis obtusa)	P	Locally abundant	Recorded in over 100 inland bodies of water, mostly in Lower Peninsula.
Water chestnut (Trapa natans)	P	Absent	Observations in NY, PA and Ontario.
Water soldier (Stratiotes aloides)	P	Absent	Isolated population in Ontario.
Yellow floating heart (Nymphoides peltata)	P	Isolated	Isolated populations in IL, IN, OH, WI and Ontario. Active management of Isolated populations in Wayne, Kent, Ottawa, Ingham, and Oakland counties in Michigan.

Crustaceans			
Marbled crayfish (Procambarus virginalis)	P	Absent	No populations detected in the wild, but this species historically has been available for sale in the pet trade.
Rusty crayfish (Faxonius rusticus)	R	Widespread	Widespread and breeding in Great Lakes and inland waters.
Red swamp crayfish (Procambarus clarkii)	P	Isolated	Isolated population in Sunset Lake in Vicksburg, MI. Other isolated populations exist in private waters near Novi and Farmington Hills, MI.
Yabby (Cherax destructor)	P	Absent	
Killer shrimp (Dikerogammarus villosus)	P	Absent	
Fish			
Bighead carp (Hypopthalmichthys nobilis)	P	Absent	
Bitterling (Rhodeus sericeus)	P	Absent	
Black carp (Mylopharyngodon piceus)	P	Absent	
Eurasian ruffe (Gymnocephalus cernuus)	P	Locally abundant	Patchy distribution in Great Lakes; absent in inland waters.
Grass carp (Ctenopharyngodon idellus)	P	Isolated	Suspected limited natural reproduction in Ohio waters of Lake Erie; isolated detections have been reported in other Great Lakes and inland waters.
Ide (Leuciscus idus)	P	Absent	
Japanese weatherfish (Misgurnus anguillicaudatus)	P	Isolated	Single breeding population in the Shiawassee River.
Round goby (Neogobius melanostomus)	P	Widespread	Widespread and established in lakes Michigan, Huron and Erie; isolated collection in Lake Superior near Marquette; isolated but established populations in inland waters.
Rudd (Scardinius erythrophthalamus)	P	Absent	Isolated collections on the Ontario side of Lake St. Clair.
Silver carp (Hypophthalmichthys molitrix)	P	Absent	
Any fish from the snakehead family (Channidae)	P	Absent	
Stone moroko (Pseudorasbora parva)	P	Absent	
Tench (Tinca tinca)	P	Absent	
Tubenose goby (Proterorhinus marmoratus)	P	Isolated	Isolated, established populations in the St. Clair River, Lake St. Clair, Detroit River and western Lake Erie. Additional observations in northern Lake Huron and Western Lake Superior.
Wels catfish (Silurus glanis)	P	Absent	
Zander (Sander lucioperca)	P	Absent	

Mollusks			
Brown garden snail (Helix aspersa)	P	Absent	Two MI detections in the past - both eradicated.
Carthusian snail (Monacha cartusiana)	P	Locally abundant	Wayne County, MI.
Giant African snail (Achatina fulica)	P	Absent	
Girdled snail (Hygromia cinctella)	P	Locally abundant	Wayne County, MI.
Heath snail (Xerolenta obvia)	P	Locally abundant	Lapeer County/SE MI.
New Zealand mudsnail (Potamopyrgus antipodarum)	P	Isolated	Established in Lake Ontario and Lake Erie and present in Lake Superior. Established populations in the Pere Marquette, Au Sable, Upper Manistee and Boardman rivers.
Golden mussel (Limnoperna fortunei)	P	Absent	
Wrinkled dune snail (Candidula intersecta)	P	Locally abundant	Wayne County, MI.
Quagga mussel (Dreissena bugensis)	R	Widespread	Found in all of the Great Lakes, although limited in Lake Superior; isolated inland occurrences in the Great Lakes Basin.
Zebra mussel (Dreissena polymorpha)	R	Widespread	Widespread in inland and Great Lakes waters of the Lower Peninsula; patchy distribution in inland waters of the Upper Peninsula and Lake Superior.
Mammals			
Feral swine (Sus scrofa Linnaeus)	P	Widespread	Historically, feral swine have been reported in 72 of 83 Michigan counties, but occurrences presently are limited to a few localized areas in the northern Lower Peninsula and central Upper Peninsula. Active management has reduced occurrences statewide.
Nutria (Myocastor coypus)	P	Absent	Farmed in Michigan in the 1930s. No confirmed detections since the 1960s.
Birds			
Eurasian collared dove (Streptopelia decaocto)	P	Isolated	First observed in Michigan in 2002, has since been documented in Kalamazoo, Traverse, Berrien, Alger and Mason counties.
Insects			
Asian longhorned beetle (Anoplophora glabripennis)	P	Absent	Not detected in Michigan; ALB infestations currently active in NY, MA, OH and Ontario; ALB eradicated from IL and NJ.
Emerald ash borer (Agrilus planipennis)	P	Widespread	Widespread throughout Lower Peninsula; isolated or patchy distribution across Upper Peninsula.