Michigan Invasive Species Program 2022 Annual Report

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

DEPARTMENT OF NATURAL RESOURCES · DNR · MICHIGAN ™

Michigan Department of AGRICULTURE & Rural Development

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Michigan Invasive Species Program 2022 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 2022 Annual Report highlights the program's goals and accomplishments for invasive species prevention, management and outreach; the status of prohibited and restricted species in Michigan; and recommendations to further the 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 about invasive species in Michigan are 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. Plants, animals and pathogens that are introduced into the environment and flourish without natural predators to keep them in check cause significant damage to Michigan's economy and ecosystems. These invasive species negatively affect property values, tourism, recreation, utilities and industry. They lead to reduction of native species, habitat degradation and altered food webs. Some invasive species can threaten even human 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 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. The funding also launched the Michigan Invasive Species Grant Program, providing $3.6 million in awards annually to agencies, universities and nonprofit organizations to aid prevention, detection, eradication and control of aquatic and terrestrial invasive species. A portion of the MISP is dedicated to annual funding for 22 cooperative invasive species management areas to support locally led invasive species initiatives in Michigan's 83 counties.

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 Aquatic Invasive Species and Terrestrial Invasive Species 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 2022: Oct. 1, 2021, through Sept. 30, 2022.

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.

St. Clair CISMA volunteer work day

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.

Boating pathway

Recreational boating, especially the transportation of watercraft from lake to lake, is a primary pathway for the introduction and spread of aquatic invasive species. Since 2019, Michigan boaters have been required by law to remove drain plugs, drain all water from bilges, ballast tanks and live wells, and remove aquatic organisms and plants from boats and trailers before transport. Each year, MISP enlists the help of partners and volunteers to spread the "Clean, Drain, Dry" message to boaters around the state.

- In 2022, the DNR Law Enforcement Division dedicated 6,240 enforcement hours, nearly double the hours allocated in 2019, to educating the public at state-managed boating access sites. Often working in conjunction with lake associations or other stakeholder groups, conservation officers focused on education, reserving enforcement actions for only the most egregious cases. These patrols resulted in 106 warnings and four citations issued in 2022. The DNR boating enforcement effort is supported by funds from the Great Lakes Restoration Initiative.
- Gov. Gretchen Whitmer proclaimed July 3-9, 2022, Aquatic Invasive Species Awareness Week in Michigan. To celebrate, EGLE sponsored the ninth annual AIS Landing Blitz, partnering with local volunteers, the DNR and MDARD at more than 70 boating access sites to reach over 8,000 boaters with tips to prevent the spread of harmful species and comply with laws. With support from the Great Lakes Commission, the AIS Landing Blitz became a regional effort in 2019. Now, events are held in eight Great Lakes states and Ontario and Quebec, providing boaters with a consistent "Clean, Drain, Dry" message.
- In 2022, the Michigan Clean Boats, Clean Waters program granted $26,000 to fund 11 aquatic invasive species education projects across the state. Funds were awarded to lake associations, paddling groups,

conservation districts and other local nonprofit organizations to purchase decontamination equipment, educational signage and print materials and to support in-person outreach events at boating access sites. This is the second year of this grant program, made possible through partnership between Michigan State University and the Michigan Department of Environment, Great Lakes, and Energy with support from the Great Lakes Restoration Initiative.

"Invading Classrooms and Communities"

Lake Superior State University's Center for Freshwater Research and Education is helping K-12 teachers integrate invasive species issues into STEM – science, technology, engineering and math – education. With support from the Michigan Invasive Species Grant Program, the center's "Invading Classrooms and Communities" program provides teachers with free training and access to mentoring professionals from CISMAs, conservation districts, tribes, universities and MiSTEM regional networks. Teachers and mentors then help students conduct hands-on research into local invasive species issues, with the goal of developing local, student-led stewardship projects to raise awareness and inspire action.

To date, 20 teachers in 15 Upper Peninsula and northern Lower Peninsula schools have engaged 700 students in the program. Capstone projects include autumn olive hand-removal and native dogwood planting by high school students on the Interlochen Academy campus, student-guided hikes to identify glossy buckthorn at Copper Island Academy's community harvest festival, and elementary and high school students collaborating to map woody invasive plants near East Jordan schools. East Jordan students took their interest to the next level, applying for and receiving a Clean Boats, Clean Waters grant to design and install a "Clean, Drain, Dry" sign at a local boat launch and print stickers to distribute at local events.

The program's first year culminated in a virtual symposium, where students and teachers proudly showcased their projects and shared plans for the coming year.

Nursery pathway

One potential pathway for the introduction of invasive plants, pests and diseases is the nursery trade. The Insect Pest and Plant Disease Act (189 of 1931, as amended) regulates the distribution of nursery stock – trees, shrubs, etc. – to prevent the introduction of insect pests and plant diseases into, out of and

within Michigan. This act also authorizes MDARD to establish quarantines to further regulate movement of goods that may carry invasive species. In addition, Michigan's Natural Resources Environmental Protection Act (451 of 1994, as amended) prohibits or restricts the sale and possession of certain species.

Using a risk-based model, MDARD staff inspect a percentage of Michigan's 1,179 licensed nursery growers and 4,155 licensed dealers each year to determine compliance with these acts and regulations. MDARD also provides certifications for interstate or international shipment of nursery stock and Christmas trees from Michigan producers following inspection or compliance measures to ensure stock is free of harmful insects and diseases.


Copper Island Academy Fall Festival


East Jordan 4th grade Browns Creek survey


Pellston schoolyard survey


Sault H.S. Voyageur Island survey

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.

Social media "gamification" boosts outreach

The DNR's IdentiFriday social media challenge has become a successful way to encourage new audiences to identify and report invasive species. Each Friday afternoon, the host posts a mystery closeup photo, and followers guess what in the natural resource world it might be. This year, IdentiFriday species included invasive red swamp crayfish, Asian longhorned beetle and spotted lanternfly. Participants not only posted their guesses but also engaged in funny and interesting discussions about the species while they awaited the week's answer, which was accompanied by species facts and links to more information. The invasive species posts on this popular Friday game were a hit, with a combined 278,000 impressions.

Takin' it to the trails

The North Country Cooperative Invasive Species Management Area is engaging in a unique campaign to deliver the "Play, Clean, Go" message to off-road enthusiasts on state-designated trails. Staff and volunteers held a trail blitz in September, greeting riders at the Tin Cup trailhead and a popular trailside bar in Baldwin to explain the importance of cleaning dirt bikes and four-wheelers to prevent the spread of invasive species. Riders share a love of the beautiful outdoor places they can access on Michigan's trail systems, but most are unaware they may be transferring invasive plants in the mud and debris on their vehicles. NCCISMA is installing trailhead signs indicating invasive species locations and reminding users to clean their machines.

Campaigning for clean marinas

The Michigan Clean Marina Foundation is on board with the "Clean, Drain, Dry" message, helping boaters understand their role in stopping the spread of aquatic invasive species. With support from the Michigan Invasive Species Grant

Program, the foundation initiated an ad campaign, buying space in popular boating and leisure magazines and boating industry newsletters. Boosted social media posts including short videos or web links garnered nearly 2 million impressions. The foundation is making waves at boat shows and Michigan Boating Industry Association events with its "Wash your Bottom" promotional materials – an eye-catching twist on the national message reminding boaters to clean the undersides of boats and trailers. Working closely with the MBIA and marinas across the state, the foundation continues to find innovative ways to increase the adoption of clean boating practices.

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.

Successful eradication of parrot feather at two sites

Parrot feather, a fast-spreading aquatic plant, is prohibited in Michigan due to its adverse impacts on ecosystems and outdoor recreation. Since 2013, it has been found in 12 locations, likely introduced by aquarium dumping or water garden escapes. After years of treatment and monitoring to assure no regrowth has occurred, EGLE has deemed parrot feather eradicated from two more ponds, one in Calhoun County and one in Jackson County. Two infestations in southeast Michigan were successfully eradicated in 2019. An aquatic invasive plant is considered eradicated when a site is free of the species for three consecutive years.

A Calhoun County pond before and after parrot feather treatment.

No new balsam woolly adelgid infestations found

Since the detection of balsam woolly adelgid at a single private residential property in Rockford, Michigan, in 2021, MDARD has been working diligently to protect balsam, Fraser and white fir trees from the tiny, destructive, sap-sucking insects. Balsam woolly adelgid poses a threat to the roughly 1.9 billion balsam fir trees located in Michigan's northern Lower and Upper peninsulas. Fraser fir and white fir are not native to Michigan but are planted as landscape trees. Fir trees are a major component in Michigan's Christmas tree industry, the third largest in the country, producing nearly 13.5 million fir trees each year.

Staff removed infested Fraser fir trees from the site in 2021 and conducted extensive door-to-door surveys of the area in both 2021 and 2022, finding no additional evidence of infestation. Site monitoring will continue annually for the next few years. Without the aid of human movement, balsam woolly adelgid spreads slowly via wind and birds. Fortunately, the infested trees were south of balsam fir's native range in Michigan.

One water lettuce harvest leads to another

In fall 2021, the Lake St. Clair Cooperative Invasive Species Management Area surveyed areas of the North Branch and Lower Clinton rivers and McBride Drain, finding and removing a small amount of invasive water lettuce in the county drain. The CISMA used the opportunity to issue a press release urging residents to look for the plant, which resembles a floating, open head of lettuce, and report sightings through the Midwest Invasive Species Information Network platform. After the story was picked up by local news outlets and broadcast on WDIV Channel 4 News (Detroit), the CISMA received a report of water lettuce in Miller Drain. Staff was able to remove nearly 3,400 pounds of water lettuce and invasive water hyacinth from an impounded area of the drain before the dam was drawn down for the winter.

Residents indicated plants were introduced by a neighbor before spreading to cover a half-acre of the waterway. Staff reached out to all neighbors with information about the plants' invasive tendencies and shared RIPPLE (Reduce Invasive Pet and PLant Escapes) program materials highlighting ways to contain plants in water gardens. The CISMA will continue to monitor the area for regrowth.

Genetic codes help with early detection

Environmental DNA, known as eDNA, is proving to be an important tool in the early detection of invasive species in Michigan. The genetic codes of plants, animals and diseases can help identify their presence when they can't easily be

seen or otherwise detected. The most prominent and widespread use is the U.S. Fish and Wildlife Service's annual invasive carp survey, which collects and analyzes over 10,000 water samples from the Great Lakes region each year to look for signs of bighead and silver carp.

Now, the technology is helping in many new ways, supported by Michigan's Invasive Species Grant Program. In 2019, Oakland University partnered with Trout Unlimited to develop a simple method for volunteers to collect water samples from Michigan rivers to test for invasive New Zealand mudsnail eDNA. In 2022, Grand Valley State University began using the technology to pilot eDNA traps to monitor for hemlock woolly adelgid more easily in high-risk areas along the Lake Michigan coast. After beech leaf disease was detected in southeast Michigan in 2022, Michigan State University began eDNA surveys in northern Michigan, searching for signs of Litylenchus crenatae, the microscopic worm associated with the disease, to determine if it had spread beyond areas where symptoms were visible.

Collecting Great Lakes water samples for invasive carp eDNA testing.


Environmental DNA is used to confirm the presence of beech leaf disease.


A hemlock woolly adelgid eDNA trap.

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.

Volunteer stewards lend a helping hand

The DNR volunteer stewardship program engages people in projects to protect and restore thousands of acres of habitat for species of greatest conservation need. Volunteer workdays, held throughout the year in state parks and recreation areas, focus on invasive species management that ranges from removing garlic mustard to cutting and treating invasive shrubs like buckthorn. Volunteers learn species identification and get hands-on experience in the negative impacts of invasive species on native ecosystems. Volunteers come from all walks: everyone from Scouts and students to corporate groups looking to give back to Michigan's natural resources.

Tackling a thorny problem

Woody invasive shrubs like autumn olive and buckthorn are becoming a common sight along roadsides and forest edges. They quickly form dense thickets, preventing native plant growth and wildlife movement and making hand-removal difficult. The Central Michigan Cooperative Invasive Species Management Area has initiated forestry mowing to remove acres of woody invasives at the Chippewa Nature Center. A tracked skid steer, sometimes called a bobcat, with a mulching head quickly grinds large shrubs from top to stump, leaving only a fine mulch that will easily decompose. Smaller invasive plants are simply mowed over, opening space for native trees to reseed. The work draws attention of passersby, providing staff opportunities to explain the

benefits of the practice, including limiting herbicide use for spot-treatment of stump shoots and new growth in the spring.

U.P. unites against aquatic invasive plants

In 2013, the Upper Peninsula Resource Conservation and Development Council brought together U.P. CISMAs to find and remove invasive phragmites in the region. Ten years and $2.7 million in grants later, the collaborative effort has surveyed over 10,000 acres, treated 3,800 acres and reached over 1 million people with educational information about invasive phragmites. With the help of landowners across the peninsula, most phragmites infestations are in maintenance mode, with any regrowth treated annually.

Capitalizing on this successful model, the coalition is now turning its attention to European frog-bit. Keweenaw Invasive Species Management Area, Lake to Lake CISMA, Three Shores CISMA, Western Peninsula Invasives Coalition and Wild Rivers Invasive Species Coalition have completed 1,500 acres of frog-bit survey. This year CISMAs treated newly detected infestations around the Les Cheneaux islands and in areas of Menominee County. Their survey efforts have identified new locations of other invasive plants including phragmites, Himalayan balsam, flowering rush and purple loosestrife. The CISMAs have embraced the benefits of teamwork, collaborating on additional projects including the removal of over 1 ton of purple loosestrife in an 8-mile stretch of the Michigamme River above the reservoir to reduce the plant's persistence in the popular fishery.

Volunteer stewards with bags of removed invasive plants.

Spotlight

Responding to spotted lanternfly in Oakland County

Since the arrival of spotted lanternfly in Pennsylvania in 2014, Michigan has paid close attention to its spread, adding it to the invasive species watch list in 2018 and encouraging the public to report sightings of the attractive but damaging plant-hopper and to take precautions when traveling to infested areas. By 2021, the insect had spread to eight other states, including Ohio, and dead spotted lanternflies were found on shipments at several warehouses in Michigan. With vehicles and goods regularly moving from infested states into Michigan, it seemed only a matter of time before the sap-sucking insects or their egg masses would make their way here.

That time arrived sometime before Aug. 10, 2022, when MDARD confirmed a photo report of a live spotted lanternfly nymph (young life stage) on municipal land in Oakland County. Upon receiving the report, MDARD and U.S. Department of Agriculture Animal and Plant Health Inspection Service staff completed an extensive survey within a half-mile radius of the location, mapping live insects, egg masses and tree of heaven, the insect's preferred host plant. Evidence of the insect was found only at the original site.

Preventing adverse impacts on trade

Due to the rapid spread of spotted lanternfly across portions of the United States, California has implemented regulatory measures that could restrict the sale of agricultural products and ornamental plants from infested states.

The MDARD Pesticide and Plant Pest Management Division is working diligently with both California regulators and Michigan growers to ensure the uninterrupted movement of Michigan plant products to California.

Shortly after the detection was confirmed, MDARD notified partners and the public through email, a news release and social media, urging anyone encountering a suspected spotted lanternfly to photograph the insect and report it using the DNR's Eyes in the Field online system. Over 100 reports were received through October, with staff inspecting any locations that had viable reports. No additional infested areas were found.

Because the infested site includes two plant nursery retailers, MDARD inspectors immediately began working with owners and staff to inspect on-site stock and

provided compliance agreements to ensure spotted lanternfly would not be moved off-site. Inspectors also traced stock that had left the site within the last year, inspecting each tree in its new location for signs of spotted lanternfly. A single, old, unhatched egg mass was found on each of two plants at separate locations, but no other signs of lanternfly populations were found at either site.

Through the next month, MDARD extended its survey range to a 1-mile radius without finding evidence of infestation beyond the original site. Under the direction of MDARD and Michigan State University forest entomologist Dr. Deb McCullough, Oakland County staff injected tree of heaven on-site with insecticide, creating "trap trees" to kill lanternflies as they feed on sap. Follow-up surveys showed a population decline and evidence of dead spotted lanternfly on trees. USDA-APHIS placed spotted lanternfly traps around and outside the infested area to monitor population density and spread.

In November, crews undertook an egg mass survey to determine the level of reproduction and spread, finding egg masses on tree of heaven, box elder, buckthorn and black locust. The survey determined infestation within a quarter-mile radius of the initially infested trees. Though this area is larger than the original infestation, all spread is still contained on the site. In early 2023, staff from MDARD and USDA spent two days scraping and destroying egg masses to further suppress the population and lower the chances of the insect spreading off-site.

MDARD is coordinating a campaign to contact homeowners and businesses in the vicinity of the infested site and discussing long-term plans for tree removal and insecticide with USDA, Michigan State University Extension and Oakland County. MDARD and the DNR are coordinating a mock exercise with local, state and federal partners to build a response network to address the future challenges posed by spotted lanternfly.

Program outcomes

The following outcomes were established in 2014 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.

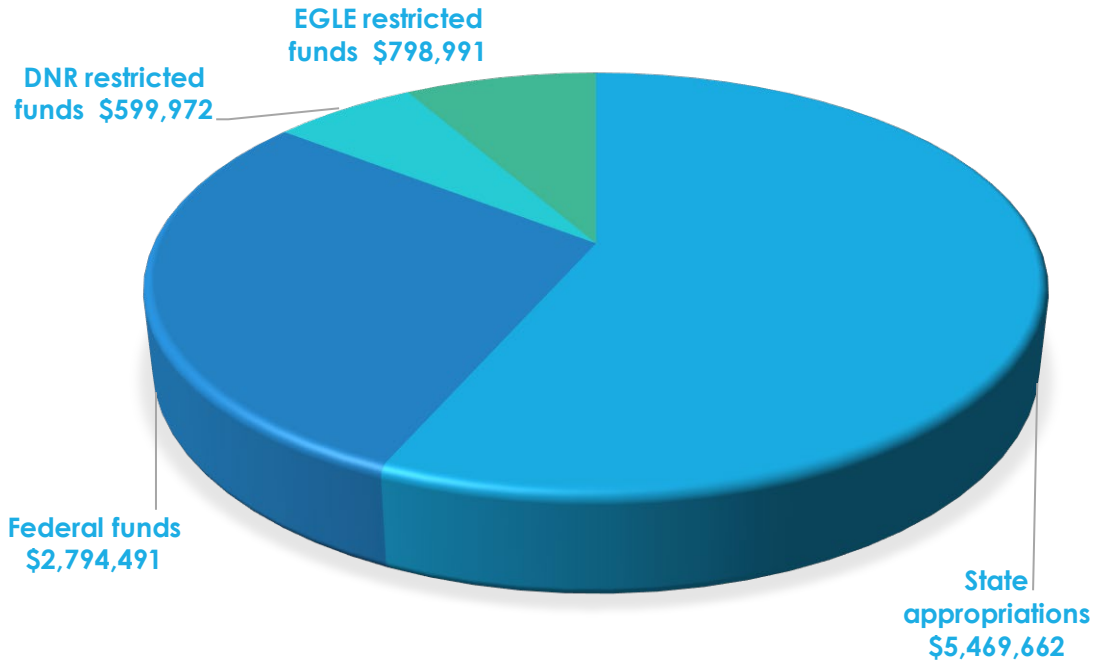
Table 1 – Michigan Invasive Species Program outcomes 2015-2022

	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
2021	83	34	20,461,963	36,717*
2022	83	7	9,955,778	22,049

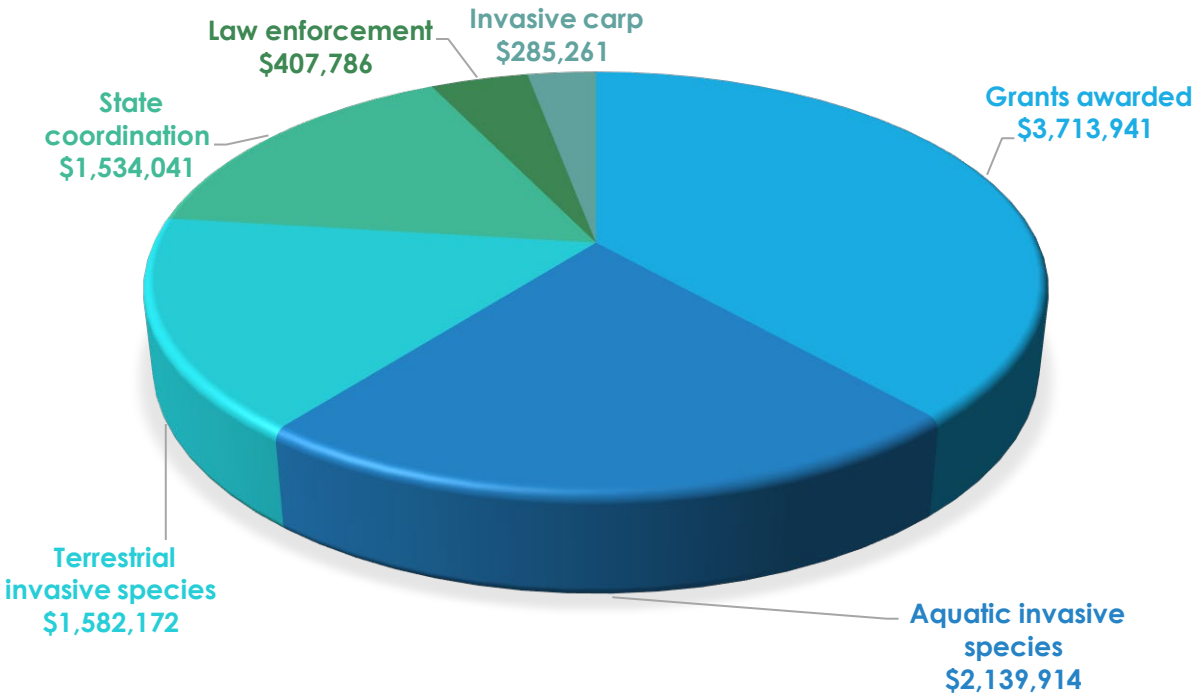
** In the last two years, control practices conducted by DNR's Wildlife Division on state-managed lands and wetlands, including mowing, prescribed fire, aerial spraying and hand-removal, have been included in the annual calculation, totaling over 14,000 acres in 2021 and 8,000 acres in 2022. A reassessment of Wildlife Division's control activities in 2021 has led to a reduction of overall program-controlled acres from the number appearing in the 2021 report (54,245) to the number listed here (36,717).*

Program finances – fiscal year 2022

Funding – $9,663,116



Expenditures by program area – $9,663,116



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 in Appendix 1 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.

The 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

There were no changes to Michigan's prohibited and restricted species lists in 2022.

Scientific permits issued for prohibited or restricted species in 2022

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 review process.

In 2022, 62 permits were granted to partner agencies, universities and other entities including consulting firms, zoos, nature centers and other educational institutions.

Table 2 – Prohibited and restricted species permits issued in 2022

Species	Status	Number of Permits Issued	Permittees
African oxygen weed	Prohibited	2	1 partner, 1 other
Autumn olive	Restricted	1	1 partner
Brazilian waterweed	Prohibited	3	1 university, 1 partner, 1 other
Carolina fanwort	Prohibited	2	1 partner, 1 other
Curly leaf pondweed	Restricted	2	1 partner, 1 other
Cylindro	Prohibited	1	1 partner
Eurasian watermilfoil	Restricted	2	1 partner, 1 other
European frog-bit	Prohibited	5	2 universities, 2 partners, 1 other
Flowering rush	Restricted	2	1 partner, 1 other
Giant hogweed	Prohibited	1	1 partner
Giant salvinia	Prohibited	1	1 partner
Hydrilla	Prohibited	2	1 partner, 1 other
Invasive phragmites	Restricted	4	3 partners, 1 other
Japanese knotweed	Prohibited	1	1 partner
Parrot feather	Prohibited	2	1 partner, 1 other
Purple loosestrife	Restricted	3	1 university, 1 partner, 1 other
Quagga mussels	Restricted	3	2 universities, 1 partner
Red swamp crayfish	Prohibited	3	1 university, 1 partner, 1 other
Round goby	Prohibited	7	5 universities, 1 partner, 1 other
Rusty crayfish	Restricted	5	5 universities
Water chestnut	Prohibited	2	1 partner, 1 other
Water soldier	Prohibited	1	1 partner
Yellow floating heart	Prohibited	2	1 partner, 1 other
Zebra mussels	Restricted	5	4 universities, 1 partner

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 in the state. 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 2022 for the prohibited, restricted or other problematic species listed below.

Beech leaf disease detected in southeast Michigan

Invasive beech leaf disease was first confirmed in Michigan in July 2022 in St. Clair County. Since then, new detections in Oakland and Wayne counties indicate the disease is more widespread. Beech leaf disease is associated with the nematode Litylenchus crenatae, a microscopic worm that causes damage to leaf tissue, making trees susceptible to other diseases and leading to mortality in six to 10 years. With no known treatment, the disease's potential spread through the region could have a devastating effect on Michigan's approximately 37 million American beech trees, which provide food and shelter for wildlife. Available information on the disease's biology and pathways of spread indicates it is not possible to establish an effective quarantine; however, nurseries, tree care professionals and the public are being urged to refrain from moving beech material from known infested areas.

New detection of box tree moth

In October 2022, MDARD detected box tree moth (Cydalima perspectalis) at two residences in the village of Clinton in Lenawee County. Although not a threat to Michigan's natural resources, extensive feeding from box tree moth can lead to significant defoliation and death of ornamental boxwood. In May 2021, potentially infested boxwood plants were shipped to retail locations in several states, including six in Michigan. The pest then was identified in three of the six Michigan facilities. It is not known whether the box tree moth populations detected in Clinton are linked to these retailers or if the pest entered the state through another pathway. MDARD is developing a survey plan to further determine the extent of the infestation and asking Michiganders to inspect their

boxwood plants and report any signs of the pest to assist in determining the scope of the infestation and limiting its spread.

Didymo detections in Upper Manistee and Boardman rivers

Blooms of didymo, a nuisance alga also known as rock snot, were detected on the Upper Manistee River in Kalkaska County in December 2021 and on the Boardman River in Grand Traverse County in August 2022. Didymo has been found in the St. Marys River in the Upper Peninsula since 2015. Unlike harmful algal blooms that flourish in warm temperatures and excess nutrients, didymo blooms form in cold, low-nutrient streams – the same streams prized for their sport fisheries. Though it can be spread by attaching to waders and gear, it's possible didymo's microscopic single cells have been present but undetected in Michigan waterways until environmental factors like changes in water chemistry or quality have caused it to "bloom." The resulting long stalks cover hard surfaces in the streambed, reducing habitat for macroinvertebrates including mayfly and caddisfly nymphs, which are important food for fish.

Currently, there are no effective methods to eradicate didymo once it is established. In addition to MISGP support for research undertaken at Lake Superior State University, EGLE and the DNR have installed new signs at river access points and provided print materials to outfitters and bait shops to share the "Clean, Drain, Dry" message with their customers.

Invasive carp prevention: The Brandon Road Interbasin Project

Invasive bighead, silver and black carp pose significant threats to the Great Lakes and Michigan's rivers and inland lakes. Past issues of this report have documented the potential for ecological harm posed by these fish, including the disruption of food webs and competition for space in rivers, the risk to water-based recreation such as boating, and the loss of revenue and value of real estate. Though these threats are still very real, to date, there is no evidence of any live bighead, silver or black carp in the Great Lakes.

In a Canadian risk assessment regarding invasive carp, scientists noted that the greatest risk for introduction to the Great Lakes was through the Chicago Area Waterway. After reviewing several options, the U.S. Army Corps of Engineers Brandon Road Interbasin Project was selected for development to reduce the risk of introduction. The project includes a series of deterrents to prevent carp from moving through the Brandon Road lock. Deterrents include bubblers, sound, an electric barrier and a flushing lock. With Michigan's 2020 contribution of $8 million to Illinois, the nonfederal sponsor, the design and engineering for the project made significant advances in 2022. Elements of the project's design

are being modeled by USACE experts to evaluate details and determine their efficacy. Meetings with barge industry representatives have helped mesh barge operation needs and expectations with proposed design features.

Before the project can move to the construction phase, sources of nonfederal cost-share must be determined and a project partner agreement between Illinois and USACE needs to be signed. The 2023 Water Resources Development Act reduces the project's nonfederal cost share from 20% to 10%. Cost estimates will be developed in early 2023 to determine the nonfederal sponsor cost-share amount.

With the assistance of the Great Lakes Commission, Illinois and Michigan are working together to host a Great Lakes States and Provinces forum to provide updates regarding the project and to develop a plan for sharing the costs for the nonfederal sponsor portion. Once the nonfederal sponsor funding is identified and the agreement is signed, USACE will have access to $226.8 million allocated in the 2022 Bipartisan Infrastructure Law to finish the design and begin construction. For more detailed information, to view previous webcasts of updates and to sign up for the BRIP newsletter, please visit BR Interbasin Project (army.mil).

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:

1. Supporting and expanding the invasive species fund in Part 413 of the NREPA to address emergency/rapid response.

Background
Invasive species like emerald ash borer, phragmites and zebra mussels already negatively affect Michigan's forests, rivers, inland lakes, wetlands and coastlines. Once they are well established and widespread, the damage is irreversible. These invasions translate to economic impacts in the form of management and control costs as well as reduced tourism and recreation opportunity and damage to infrastructure. Michigan's Invasive Species Program addresses all stages of invasion, including prevention, early detection, response and management. But even with the best prevention efforts, Michigan continues to experience new invasions like New Zealand mudsnails and threats like invasive carp and Asian longhorned beetles that could devastate waterways and forests.

Early detection and response to invasive species new to Michigan is a key program component to ensure natural resource protection. Timely response to new invasions corresponds to a higher likelihood of containment and eradication.

MDARD, DNR and EGLE, in collaboration with partners, manage a highly successful invasive species program; however, coordinated response to emerging invasive species threats remains a substantial challenge. The departments' response actions are limited by the inability to quickly access resources. This lack of funding leads to delayed response, which may enable further spread of new invasive species infestations and missed opportunity for eradication. Quick access to a stable source of funding would enable coordinated short-term response actions while long-term solutions are sought. Part 413 currently contains authorization for the creation of an Invasive Species Fund (section 324.41311). The fund's purpose is narrowly defined for the DNR and MDARD to deposit civil fines and permit fees collected under Part 413 to be used by those two departments for administering enforcement activities related to Part 413 or public education about invasive species prevention and control.

Recommendation No. 1
Modify the existing statutory language under 324.41311(4) to provide funding for invasive species emergency response activities. Language should be modified in three ways:

1) Include EGLE as an agency able to use funds since the invasive species program is cooperatively implemented by the three departments, and EGLE has responsibilities related to emergency response.

2) Include emergency response as an eligible activity for which the fund can be used. Specific criteria for use of emergency response funds would be developed.

3) Consider allocation to the invasive species fund for emergency response.

2. Supporting local aquatic invasive species prevention and control in inland lakes.

Background
Hundreds of Michigan's inland lakes are affected by widely distributed aquatic invasive plant species like Eurasian watermilfoil and starry stonewort that continue to spread to previously uninfested lakes. In Michigan, the cost of control and management of Eurasian watermilfoil and other invasive and nuisance aquatic plant and algae species adds up to approximately $24 million annually. Aquatic invasive plants can interfere with recreation activities such as swimming, fishing, water skiing and boating, and these plants significantly alter water body ecology.

Once these species become well established, they are often challenging to control. The financial burden of the management and control of aquatic invasive plants in Michigan inland lakes is placed largely upon the riparian landowners.

Given costs and challenges associated with controlling established populations of aquatic invasive plants, limiting the spread of these species via recreational boating and other pathways is critical for inland lake protection and efficient use of funding. The departments implemented a successful statewide outreach campaign to remind boaters to "Clean, Drain and Dry" boats, trailers and gear before moving to another body of water; however, resources for local prevention activities are limited.

EGLE and Michigan State University cooperatively implement Michigan's Clean Boats, Clean Waters program, and using federal grant funding, they initiated a

pilot mini-grant program in 2020 that funded seven local outreach projects for a total of $21,000. The program is gaining interest throughout Michigan. In 2021, with a budget of $25,691, the grant program received 42 project proposals. The first two years of this pilot project indicate the interest and need for inland lake prevention efforts at the local level far exceed the currently available resources. Because the CBCW mini-grant program is a pilot effort using federal grant funds, the future of the program is uncertain.

The Michigan Aquatic Invasive Plant Control Grant Program went into effect in 2019 through the addition of Part 414 to the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Through Part 414, EGLE is directed to provide grants to eligible applicants for the control or eradication of aquatic invasive plant species in inland lakes. The Aquatic Invasive Plant Control Grant Program, which was suspended in 2020 due to COVID-19-related budget cuts, is constrained by statutory language that limits the use of funds.

Recommendation No. 2
Modify the existing statutory language under 324.414 to allow for broader protection of inland lakes from aquatic invasive plants. Language should be modified in three ways:

1) Include aquatic invasive species prevention, monitoring and inland lake management plan development as eligible activities for grant funds.

2) Remove statutory application and award deadlines and grant administration expenditure limits, which prohibit EGLE from properly implementing the grant program.

3) Bolster the Inland Lake Aquatic Invasive Plant Control and Eradication Fund over time.

3. Continuing and enhancing support for Michigan's Invasive Species Program.

Background
Since 2014, the state Legislature has designated $5 million in annual funding to address invasive species. This support substantially enhanced Michigan's Invasive Species Program for aquatic organisms, supported a formal program for terrestrial species and initiated the Michigan Invasive Species Grant Program. Over the last eight years, the MISP – cooperatively implemented by the Michigan departments of Agriculture and Rural Development; Environment, Great Lakes, and Energy; and Natural Resources – has grown significantly to address Michigan's broad invasive species concerns.

This progress has both broadened the understanding and sharpened the focus of invasive species prevention, detection and management in Michigan, leading to a clearer assessment of program needs to both sustain current efforts and meet future challenges.

Recommendation No. 3
Support increased program capacity in the following key areas:

1) CISMA capacity

Today, 22 regional cooperative invasive species management areas are serving the needs of all 83 counties in Michigan, assisting the public in identifying and managing invasive species. To sustain these local delivery networks, each CISMA receives $60,000 in annual base operations funding. Currently a few CISMAs have been able to assist with early detection and response efforts for species newly detected and expanding in Michigan, like hemlock woolly adelgid, European frog-bit and red swamp crayfish. More robust funding to all CISMAs to support seasonal "strike team" staff would ensure regional collaboration in early detection and response efforts across the state and support prevention and preparedness efforts for emerging threats such as beech leaf disease, spotted lanternfly and Asian longhorned beetle.

2) Environmental justice

MISP leadership is aware of the need to deliver state and regional invasive species efforts that are inclusive of all populations. Additional funding in this area would support a needs assessment and the development and adoption of best practices to address issues of equity, inclusion and environmental justice. Once needs are understood, funding will provide additional CISMA staff in targeted areas to improve outreach and services in underserved communities.

3) Law enforcement sustainability

The DNR's Law Enforcement Division has become an integral part of the MISP's efforts to communicate and enforce Part 413 invasive species regulations. Short-term federal grants from the Great Lakes Restoration Initiative have ensured that officers across the state are trained in invasive species boating laws and spend time at boating access sites each summer talking to boaters and boosting compliance. LED's Organisms in Trade initiative, also supported by annual GLRI grants, has grown to include inspection of live food markets, pet stores and commercial haulers, and monitoring internet and interstate sales to prevent or

intercept prohibited and restricted species. However, competitive GLRI grants do not provide stable, long-term support of these activities.

4) Terrestrial invasive species program capacity

Michigan's Aquatic Invasive Species program benefits from support through the Great Lakes Restoration Initiative, which provides dedicated funds for implementation of Michigan's federally approved AIS State Management Plan, interjurisdictional AIS projects and AIS projects related to lakewide action management plans. GLRI funds bolster AIS prevention activities, early detection and response efforts, and regional control of key species like phragmites and European frog-bit. Without a similar external funding source to broadly support its initiatives, Michigan's Terrestrial Invasive Species program is lagging in all these areas. Recent detections of new terrestrial invasive species including mile-a-minute weed and Japanese stiltgrass, and a growing list of emerging threats like spotted lanternfly and beech leaf disease, make the need for additional terrestrial efforts much more urgent.

4. Modernizing NREPA Part 413 to enhance biosecurity of Michigan natural, agricultural and cultural resources from threats posed by invasive species.

Background
Part 413 is the primary statutory mechanism to address invasive species issues in Michigan. A 2019 amendment strengthening boating laws to limit the spread of aquatic invasive species and creating a registration requirement for sellers of live, non-native aquatic organisms has been successful in helping to address risks associated with known pathways of invasive species introductions.

However, certain aspects of the statute may not fully protect Michigan from invasive species threats. Through the Great Lakes Fishery Commission Law Enforcement Committee and the Great Lakes Panel on Aquatic Nuisance Species, Michigan staff have participated in joint enforcement activities, workshops and discussions to examine case studies, and analysis of statutory authorities regarding AIS across the Great Lakes States and Provinces. For example, the 2021 response to aquarium moss balls contaminated with invasive zebra mussels that were transported and sold in 46 states and multiple provinces highlights the need for comprehensive protective laws. To enable appropriate enforcement, close regulatory gaps, and keep pace with scientific advances, clarification of key terms and concepts in the statute is needed.

Recommendation No. 4

Modify the existing statutory language under 324.413.

1) Clarify or update definitions of key terms:
    a. Refine definitions for the terms "introduction" and "possession" to clarify intent, address ambiguities associated with contaminated materials and aid in enforcement. Add and clarify key words such as "transport, import, purchase, barter, trade, gift, transfer, lease, loan, and propagate" to directly address a full range of activities.
    b. Update the current definition of "genetically engineered" to address advances in genetic biocontrol technology and close regulatory gaps.
    c. Incorporate Fisheries Order 248, requiring evisceration, when appropriate, for transport of regulated species such as invasive carp.
    d. Distinguish between natural and intentional spread as it relates to introduction and possession of prohibited and restricted species.

2) Expand the definition in Section 324.41305, which prohibits the introduction of certain types of plants and animals, to include amphibians, reptiles and invertebrates. Provide clear authority to access land, waters, buildings, structures or conveyances for inspection and control of regulated species in certain scenarios.

3) Increase clarity for the distinction between "prohibited" and "restricted" designations to align with intentional spread, natural spread, and possession; reclassify species currently listed in these categories based on current geographic distribution; and update associated fines and penalties.

Appendix A – Species listed as prohibited (P) or restricted (R) under Part 413

Table 3.A - Fish

Species	Part 413 Status	Distribution in Michigan	Comments
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 Erie, Huron and Michigan; 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	

Table 3.B - Crustaceans

Species	Part 413 Status	Distribution in Michigan	Comments
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	Populations exist in private waters near Farmington Hills and Novi, Michigan. Additional isolated populations in Vicksburg and Howell, Michigan.
Yabby (Cherax destructor)	P	Absent	
Killer shrimp (Dikerogammarus villosus)	P	Absent	

Table 3.C - Mollusks

Species	Part 413 Status	Distribution in Michigan	Comments
Brown garden snail (Helix aspersa)	P	Absent	Two Michigan detections in the past – both eradicated.
Carthusian snail (Monacha cartusiana)	P	Locally abundant	Wayne County.
Giant African snail (Achatina fulica)	P	Absent	
Girdled snail (Hygromia cinctella)	P	Locally abundant	Wayne County.
Heath snail (Xerolenta obvia)	P	Locally abundant	Lapeer County/southeast Michigan.
New Zealand mudsnail (Potamopyrgus antipodarum)	P	Isolated	Established in Lake Ontario and Lake Erie and present in Lake Superior. Established populations in the Au Sable, Boardman, Grass, Pere Marquette and Upper Manistee rivers.
Golden mussel (Limnoperna fortunei)	P	Absent	
Wrinkled dune snail (Candidula intersecta)	P	Locally abundant	Wayne County.
Quagga mussel (Dreissena bugensis)	R	Widespread	Found in all 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.

Table 3.D - Plants

Species	Part 413 Status	Distribution in Michigan	Comments
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 Illinois, Indiana, Minnesota and Ohio.
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 morsus ranae)	P	Locally abundant	Locally abundant along eastern coastline from Lake Erie to St. Marys River and in Alpena, Chippewa, Ingham, Jackson, Kent, Mackinac, Oakland, Oceana, Ottawa and Washtenaw counties.
Fanwort (Cabomba caroliniana)	P	Locally abundant	Locally abundant in Lower Peninsula, primarily in southwest Lower Peninsula; present in Illinois, Indiana, Ohio 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 Indiana, Illinois, Minnesota, Ohio, Wisconsin 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 Indiana, Wisconsin, Ohio and Pennsylvania.
Japanese knotweed (Fallopia japonica)	P	Widespread	Patchy distribution throughout Lower and Upper peninsulas; some populations under management by CISMAs.
Parrot feather (Myriophyllum aquaticum)	P	Isolated	Active management of isolated populations in Berrien, Calhoun, Jackson, Washtenaw and Wayne counties; isolated populations in Illinois, Indiana, New York, Ohio and Pennsylvania.
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 Upper Peninsula. Many populations in the U.P. and northern Lower are under CISMA or other local management.
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 New York, Pennsylvania and Ontario.
Water soldier (Stratiotes aloides)	P	Absent	Isolated population in Ontario.
Yellow floating heart (Nymphoides peltata)	P	Isolated	Active management of Isolated populations in Ingham, Kent, Oakland, Ottawa and Wayne counties.

Table 3.E - Mammals

Species	Part 413 Status	Distribution in Michigan	Comments
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 Jackson County.
Nutria (Myocastor coypus)	P	Absent	Farmed in Michigan in the 1930s. No confirmed detections since the 1960s.

Table 3.F - Birds

Species	Part 413 Status	Distribution in Michigan	Comments
Eurasian collared dove (Streptopelia decaocto)	P	Isolated	First observed in Michigan in 2002; has since been documented in Alger, Berrien, Kalamazoo, Mason and Grand Traverse counties.

Table 3.G - Insects

Species	Part 413 Status	Distribution in Michigan	Comments
Asian longhorned beetle (Anoplophora glabripennis)	P	Absent	Not detected in Michigan. Active infestations in Massachusetts, New York, Ohio, Ontario and South Carolina. Eradicated from Illinois, New Jersey and parts of New York.
Emerald ash borer (Agrilus planipennis)	P	Widespread	Widespread throughout Lower Peninsula; isolated or patchy distribution across Upper Peninsula.