

Annual Invasive Species Report
1994 PA 451, MCL 324.41323
March 2013

This report is intended to satisfy the requirements of Michigan's Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, MCL 324.41323. This report covers information on invasive species ("transgenic and nonnative organisms"), mostly from 2012. The format for this report follows the order from MCL 324.41323.

Several state agencies and divisions contributed to this report and are recognized in the Contributors section at the end of this report. Additionally, this report was largely guided by input from Michigan's Aquatic Invasive Species Core Team and work completed on the update of Michigan's Aquatic Invasive Species State Management Plan (SMP). Both the Core Team and SMP have been instrumental in increasing communication and coordination on invasive species issues across departments and divisions (See sections a-x below for more details about both the team and the plan).

Per MCL 324.41323, The Michigan Department of Natural Resources (MDNR) shall make recommendations on all of the following:

(a-i) Additions/deletions for prohibited and restricted species lists

The Aquatic Invasive Species Advisory Council (AIS Council) created by Part 414 of NREPA was tasked with making recommendations on the risk assessment processes to evaluate species that may be considered for listing and harmonizing federal and state law. MCL 324.41409 specifically states that the council must make recommendations on the following:

- "Risk assessment processes to screen aquatic species proposed for trade and to screen pathways of introduction and spread. The risk assessment processes shall consider potential net harm to public health and safety, the environment and natural resources, and the economy. The processes shall place the burden to demonstrate the harmlessness of an aquatic species or pathway on the importer or other person responsible for introduction or distribution. The risk assessment process for species shall classify species into 3 lists: "prohibited", "permitted", and "restricted".
- "Harmonizing federal and state law so that aquatic species on federal lists of either prohibited or permitted species of plants and animals are placed on the appropriate lists of this state."

Since the inception of the AIS Council in 2011, AIS council meetings have been well attended, with good participation and engagement of members in discussions on these issues. The AIS Council is developing recommendations that consider all federally listed aquatic species. It is anticipated that a final recommendation from the AIS Council on additions to the prohibited and restricted species lists will be completed in 2013. The final recommendation will include a list of aquatic species and a proposed process for reviewing additional aquatic species for future listing.

For more details about the AIS Council, see a-x below.

(a-ii) Status of various prohibited species and other problematic species

Dozens of invasive species are currently prohibited or restricted by law in Michigan. Various state and/or federal statutes and orders regulate their possession, introduction, sale, and/or transport. Tables 1 (Aquatic Plants) and 2 (Aquatic Animals) at the end of this report show the primary species of concern for Michigan that are currently prohibited, restricted or otherwise regulated by either state or federal law in Michigan. As the species on these lists will change over time, website links are provided for each law or order. Additional laws and regulations pertain to broad taxa rather than individual species (e.g. stocking of spawn or fry of any fish species) but are not included here.

The current distribution in Michigan, based on best available knowledge, is provided for each listed species. Note that some species in the tables are absent (or thus far undetected) in Michigan. This coarse-scale distribution is intended to provide a basic snapshot of where each species exists along the invasion curve. 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 particular species is truly not present at all in Michigan or that no confirmed detections have been made.

Terrestrial and Aquatic Invasive Plant Species

In 2009 the MDNR Wildlife Division contracted with Michigan Natural Features Inventory to assess the status of invasive plants in Michigan and develop a strategy to address their negative impacts to natural resources. Six strategic goals and associated objectives were identified based upon this project. The goals and objectives, along with status reports and strategies developed during this effort are available in a guidance document titled “Meeting the Challenge of Invasive Plants: A Framework for Action” and can be found online at http://www.michigan.gov/documents/dnr/Invasives_strategy_final_289799_7.pdf

Regulated Aquatic Plant Species

Aquatic plant species are shown in Table 1. As demonstrated by the table, aquatic plants exhibit a wide variety of growth patterns and exist in a range of conditions. These include the submerged and floating-leaf species growing directly in lakes and ponds as well as the emergent grasses and woody plants that often grow in wetlands and along riparian fringes. Also included are some “marginal” aquatic species, such as giant hogweed, that are capable of growing in both aquatic/riparian and upland habitats and thus are included here for discussion and information purposes.

Invasive aquatic plants can cause considerable recreational problems for property owners and outdoor enthusiasts, including disruptions to swimming, boating, fishing and hunting. They can out-compete native aquatic plants, and impact fish and wildlife populations. Invasive aquatic plants may also degrade property values and can cause direct economic losses to certain industries.

Regulated Aquatic Animal Species

Aquatic animal species are shown in Table 2. The listed animals are mostly fish; however, there are three mollusks, two crustaceans, and one aquatic-dependent mammal. Invasive aquatic animals can disrupt natural biological communities through competition and direct predation. Some, like the crustaceans, are small and go relatively unnoticed by most of the public, while others are not so discrete, like the mollusks whose shells leave lingering reminders along many of Michigan's beaches and waterways.

Priority Terrestrial and Aquatic Invasive Species Status Reports

The following is provided as a more detailed description and status report of some priority invasive species with which the MDNR is currently involved:

Bighead Carp (*Hypophthalmichthys nobilis*)

Current distribution in Michigan: Absent

There have been five documented catches of individual bighead carp in Ohio waters of Lake Erie between 1995 and 2003; however, at this time there does not appear to be a naturally reproducing population in Lake Erie (Kolar et al. 2007). In August 2011, four water samples from Lake Erie near Sandusky Bay, Ohio tested positive for bighead carp eDNA. In 2012, no water samples from Lake Erie tested positive for bighead carp eDNA.

Silver Carp (*Hypophthalmichthys molitrix*)

Current distribution in Michigan: Absent

Water samples from Lake Erie near Maumee Bay in Michigan and Ohio tested positive for silver carp eDNA in August 2011. In July 2012, 20 water samples from Sandusky Bay and Sandusky River, Ohio tested positive for silver carp eDNA.

In July and August 2012, Ohio Department of Natural Resources (ODNR), Michigan Department of Natural Resources (MDNR), and U.S. Fish and Wildlife Service (USFWS) collected 350 water samples from western Lake Erie's Maumee Bay and River, of which three samples tested positive for silver carp eDNA. The positive samples were collected from Maumee Bay – two in Michigan waters and one in Ohio waters.

Grass Carp (*Ctenopharyngodon idella*)

Current distribution in Michigan: Isolated

Isolated detections of grass carp from Michigan inland waters in 2012 included Lake Erie, Marris Lake (private), St. Joseph River, and Kalamazoo River. There is no evidence of breeding or established populations. However, fish collected by commercial fishermen in western Lake Erie were reproductively viable and represented multiple age classes.

In May 2012, the MDNR received a report that grass carp were present in Marris Lake, a small private lake located in Lenawee County. The MDNR responded by conducting several meetings with riparian owners and mechanically removing grass carp from Marris Lake. Following removal, eDNA results for the Marris Lake water samples were negative for grass carp. These results indicate fish removal efforts were successful and that grass carp were likely eradicated from the lake.

The MDNR engaged with state-licensed commercial fishers to mechanically remove and euthanize Lake Erie grass carp captured in their commercial fishing gear in 2012.

Sea Lamprey (*Petromyzon marinus*)

Current distribution in Michigan: Widespread

The state has cooperated with the Great Lakes Fishery Commission (GLFC), USFWS, and other partners to control and monitor Great Lakes populations of invasive sea lamprey. The GLFC currently spends approximately \$20 million annually for sea lamprey control programs. The MDNR has collaborated with the GLFC's sea lamprey control effort for over 30 years. Sea lamprey are widespread throughout the Great Lakes and tributaries up to the first dam or physical barrier.

Sea lamprey control is performed by the USFWS. The control program uses chemical and mechanical controls, barriers, pheromones, and a sterile-male-release-technique. Chemical control relies heavily on the use of the lampricides TFM (3-trifluoromethyl-4-nitrophenol) and granular bayluscide. Mechanical control relies heavily on the use of sea lamprey traps and sometimes uses natural pheromones to attract spawning lampreys to traps. Barriers have been constructed to block the upstream migration of spawning sea lampreys. Most barriers allow other fish to pass with minimal disruption. The sterile-male-release-technique aims to reduce the success of sea lamprey spawning by annually collecting, sterilizing, and releasing male sea lampreys.

The sea lamprey control program has been successful in reducing the nuisance level of sea lamprey by up to 90% in some areas, creating a healthier environment for native fish survival. However, sea lamprey populations are well established in the Great Lakes, and eradication is presently unlikely. Some non-target impact from sea lamprey control methods on Michigan's four native species of lamprey and mudpuppies is likely.

Mute Swan (*Cygnus olor*)

Current distribution in Michigan: Widespread

MDNR developed a population model in 2010 to assess mute swan population growth and to assist in management decisions. Mute swans were increasing approximately 9-10% annually and population estimates exceeded 15,500 in 2010. Mute swans are now found throughout the entire state and in every county, and Michigan now has more mute swans than any place else in North America. Increased control efforts were implemented in 2011 to stabilize mute swan numbers, and the 2012 population estimate of 15,500 is consistent with the goal of stabilizing the population in the short-term. Control efforts include nest and egg destruction and lethal removal through shooting. Long-term goals include reducing mute swan numbers to less than 2,000 throughout Michigan by 2030, which will require increased control efforts in the next several years.

Increased outreach and education efforts were also implemented in 2011, and included formation of a mute swan website (www.michigan.gov/muteswans) and development of an informational brochure.

Recommendation - Continue mute swan control efforts over the next 2-3 years to stabilize the population and increase control efforts over the next 4-20 years to significantly reduce mute swan numbers throughout Michigan.

Prohibited Swine (*Sus scrofa* Linnaeus)

Current distribution in Michigan: Widespread

In December 2010, the MDNR issued Invasive Species Order Amendment No. 1 of 2010, which added “wild boar, wild hog, wild swine, feral pig, feral hog, feral swine, Old World swine, razorback, Eurasian wild boar, and Russian wild boar (*Sus scrofa* Linnaeus)” to the list of prohibited species under Part 413 (Transgenic and Nonnative Organisms) of the Natural Resources and Environmental Protection Act, 1995 PA 451, MCL 324.41301 et seq. The Order was amended by Invasive Species Order Amendment No. 1 of 2011, issued July 8, 2011, to postpone the Order’s effective date to October 8, 2011. The MDNR further delayed enforcement of the Order until April 1, 2012. The listing of this species prohibits a person from selling, possessing or introducing prohibited swine in Michigan.

The Order was issued to address Michigan’s growing feral swine problem. Feral swine are defined under Michigan law as “swine which have lived their life or any part of their life as free roaming or not under the husbandry of humans” (MCL 287.703). Feral swine pose a significant threat to Michigan’s resources. They destroy the habitat of native plants and animals and compete for food, they carry diseases that are harmful to humans and to domesticated animals, and they do significant damage to crops. In Michigan, the majority of feral swine encountered or killed are Russian boar or Eurasian wild boar or hybrids of these animals.

The MDNR began enforcement of the Order on April 1, 2012. To date, the MDNR has inspected several facilities that were previously known to have prohibited swine. The majority of those facilities had complied with the Order prior to the inspection date. Some facilities continued to possess prohibited swine at the time of inspection but had come into compliance by the time a follow-up inspection was conducted. One facility did not come into compliance, and the MDNR has initiated legal proceedings against this facility to enforce the Order. Twelve facilities previously known to have owned prohibited swine remain uninspected.

Additionally, four individuals in possession of prohibited swine initiated litigation against the MDNR prior to April 1, 2012. Those facilities remain in possession of prohibited swine, and the MDNR is seeking enforcement of the Order through the courts.

In addition, the MDNR continues to take steps to control and eradicate the prohibited swine that remain feral in the state. Feral swine are currently found in 76 of 83 counties in Michigan. Reports of sightings and kills throughout the state have been tracked since 2001. Since that time there have been 428 sightings and 393 kills. The latest distribution of sightings and kills for calendar year 2012 can be seen in the figure below.

Lower Peninsula (funded, in part, by the Pest and Disease Loan Fund Grant (USDA-FS)). These grants are seeking to assist private and non-federal public landowners with EAB-impacted stands, or stands likely to be impacted in the near future by EAB, with professional forestry assistance to salvage ash.

Recommendation - Continuation of the private and non-federal public land ash prevention and restoration efforts until the end of the current grants (2013) is recommended.

Recommendation - Supporting continuation of EAB quarantine restrictions is also recommended.

See Harvesting Ash and Beech Ahead of BBD and EAB Impacts below for additional recommendations.

Beech Bark Disease

Current distribution in Michigan: Widespread

Since the discovery of beech bark disease (BBD) in 2000, this invasive disease has spread widely through Michigan's forests. BBD is initiated by a scale insect that attaches to the tree and feeds on sap. Damage from this feeding allows one of two *Neonectria* fungi to invade the tree. The fungus inhibits the flow of sap through infested portions of the tree, causing a general decline in tree health – eventually killing it.

Controlling the natural spread of BBD is not feasible because both the scale and fungus are moved by the wind. According to the latest U.S. Department of Agriculture Forest Service Forest Inventory and Analysis (FIA) data for the period 2007-2011, there are 31.6 million American Beech trees greater than 5 inches in diameter and 2.5 million standing dead beech in the same size category. The FIA report estimates annual beech mortality in this time period to be 5.3 million cubic feet of growing stock beech and 21.1 million board feet of sawtimber beech. Much of this loss is in the eastern Upper Peninsula where the beech resource has been greatly affected. Michigan's American Beech resource is under attack, as newly infested areas are being reported in the Lower Peninsula every year. See Harvesting Ash and Beech Ahead of BBD and EAB Impacts below for recommendations.

Harvesting Ash and Beech Ahead of BBD and EAB Impacts

Foresters from the MDNR and Michigan Technological University are examining thousands of acres of state forest land with American Beech and ash species doomed by the continuing spread of beech bark disease (BBD) and the emerald ash borer (EAB). This effort is funded in part by federal grants from the Great Lakes Restoration Initiative and the Pest and Disease Revolving Loan Fund, which are administered by the U.S. Department of Agriculture Forest Service's State and Private Forestry, Forest Health Program. Based on inventory data, 166,000 acres were identified as potentially at risk. Within these acres, more detailed surveys will determine:

- Whether the resource is infested
- Proximity of un-infested resources to the nearest infested site
- Value and volume of the at-risk resource
- Ease of access

A primary goal of this effort is to promote healthy forests through harvest prescriptions which remove most of the beech and ash, and replace them with a desired mix of productive species. It is not the goal to remove all beech or ash, but to remove and replace many of these trees so that the impacts of anticipated mortality will not significantly impair the quality or productivity of the remaining forest.

It should be noted that timber harvest alone may do little to slow the spread of EAB and BBD. Harvest of beech may indeed remove 1-3 percent of trees that will be resistant to BBD. Likewise, conversion to other forest types may be a wise economic decision for timber production but may or may not be the best ecological decision.

Recommendation - Continuation of the Ash and Beech Harvest Initiative to completion is recommended.

Recommendation - Assuring the regeneration of impacted stands to productive species mixes to maintain sustainable productivity of desired forest values including timber, wildlife habitat and mast production, and recreational and aesthetic values is also recommended.

Hemlock Woolly Adelgid (*Adelges tsugae*)

Current distribution in Michigan: Absent (isolated occurrences in the past)

Hemlock woolly adelgid (HWA) is a small, aphid-like insect that uses its long, siphoning mouthparts to extract sap from hemlock trees. Native to eastern Asia, HWA was discovered in Virginia in 1951, and has since spread over an area from Georgia to Maine, decimating hemlock stands across much of the eastern U.S. Hemlock forests provide considerable ecological value to Michigan. Once infested by HWA, hemlocks typically die in 4-10 years. HWA stands among the most serious invasive forest pests to enter Michigan.

HWA has been detected in 4 counties in Michigan since 2006 (2006 – Emmet Co., 2010 – Ottawa Co., 2010 – Macomb Co., 2012 – Berrien Co.). All sites of known infestation have been surveyed by the Michigan Department of Agriculture and Rural Development (MDARD) to delimit the area of infestation and have known infested trees removed from the sites. Subsequently, pesticide treatments were applied to nearby hemlocks at risk of being infested, and the sites have been re-surveyed on an annual basis to monitor for signs of continued infestation. At this time, no known established population of HWA exists in Michigan.

Michigan maintains an external quarantine for HWA. The quarantine restricts the movement of hemlock into the state and includes a complete ban on the movement of hemlock from infested areas.

Oak Wilt (*Ceratocystis fagacearum*)

Current distribution in Michigan: Locally abundant

Oak wilt is one of the most serious tree diseases in the eastern United States, killing thousands of oaks each year in forests, woodlots and home landscapes. Oak wilt was first identified in 1944. The extent of its impact wasn't realized until the 1980s. Only in the last few years has oak wilt been reclassified as an exotic/invasive disease.

Although oak wilt can infect many species of oak, red oak, pin oak, black oak, scarlet oak and red oak hybrids are most susceptible. Infected red oaks die within days or weeks of being infected. Members of the white oak group are much less susceptible and rarely die from the disease.

Oak wilt is established widely in the southern Lower Peninsula with spotty distribution in the northern Lower and Upper Peninsulas. One method of spread is by movement of firewood. Confirming oak wilt as the cause of oak mortality is not always easy. Not all oak mortality is oak wilt-caused. The MDNR has stepped up efforts to detect and confirm oak wilt where symptoms are found. Knowledge of the number and distribution of oak wilt pockets is crucial to understanding short and long-term impacts of oak wilt on Michigan's oak resource. This knowledge is also needed as we seek funding to combat the continued spread of oak wilt and resulting loss of oak resources.

In the Lower Peninsula, oak wilt control efforts are focused on protecting high value areas like state parks and state forest campgrounds. In 2012, MDNR Parks and Recreation Division (PRD) treated oak wilt pockets in several state parks.

The U.S. Department of Agriculture Forest Service, Forest Health Protection Program continued providing Oak Wilt Suppression funds in 2012. Michigan Technological University's Department of Natural Resources and the Environment joined the MDNR in an effort to rid the Upper Peninsula (U.P.) of oak wilt. The long-term objectives of this effort are to:

- Remove oak wilt from the U.P. by detecting and treating infection centers on all ownerships
- Educate affected communities to prevent the reintroduction of oak wilt
- Demonstrate an approach for detecting and effectively treating oak wilt infection centers throughout Michigan

Michigan State University Extension evaluated past U.P. oak wilt suppression efforts in 2011. Many treated areas in Menominee and Dickinson counties remain free of oak wilt. Although much has been achieved, untreated oak wilt pockets remain. Until removed, these untreated oak wilt pockets serve as a source of inoculum for the continued overland spread to adjacent oak resources and to more distant areas via movement of firewood and logs.

Recommendation - Continuation and expansion of oak wilt confirmation and control efforts in the Upper Peninsula is recommended as funding allows.

Recommendation - Continuing to confirm and control oak wilt in the Lower Peninsula on high value sites including state parks and state forests campgrounds is also recommended as funding is available.

For more details about these and other forest health issues see:
http://www.michigan.gov/documents/dnr/ForestHH_409440_7.pdf

(a-iii) Preventing the introduction of and controlling or eradicating invasive species

A variety of efforts are ongoing around the State of Michigan that are aimed at preventing new introductions of invasive species and controlling existing invasions. It should be noted that prevention of new introductions is a primary goal in Michigan's Aquatic Invasive Species State Management Plan (see a-x below). The following are summaries of the most relevant efforts.

Early Detection and Rapid Response Project & Program Development

The most effective and efficient means of reducing the impact of invasive species beyond prevention is to respond efficiently to new invasions or existing outlier populations of invasive species. Even the best prevention program cannot keep all invasive species out, but a program that responds quickly, uses cost-effective methods, and engages key stakeholders will minimize the threat of invasions impacting the waters of Michigan.

The MDNR Wildlife Division is currently leading a Great Lakes Restoration Initiative grant project for aquatic invasive species in Michigan. The first goal of this project is to develop a state-wide Early Detection Rapid Response program through revision and implementation of the Michigan Aquatic Invasive Species State Management Plan (led by the MI Department of Environmental Quality). Development of this program is a collaborative effort by many state agency partners, including many divisions within the Michigan Departments of Environmental Quality, Natural Resources, and Agriculture and Rural Development.

The second goal of this grant project is to eradicate/control six to eight high-threat aquatic invasive plant species in Michigan. Six species are listed specifically in the grant due to low distribution levels, which are documented in previous research projects and other data sources. Verifying these occurrences and conducting response actions is currently underway and has relied primarily upon science-based decision making processes. Analysis of these species' current distribution, an improved understanding of their impacts, and an evaluation of the effectiveness of response efforts are all ongoing and will provide enhanced decision making into the future.

Progress on this project began in May 2011, and as of February 2013, activities have resulted in 42 new detections of 4 species of aquatic invasive plants (24 flowering rush, 9 European frog-bit, 6 water hyacinth, 3 water lettuce). Chemical and/or physical treatments at many of these sites are being conducted and evaluated for effectiveness.

Environmental DNA (eDNA) Surveillance for Asian Carp in Michigan Waters

Asian carp shed cellular material in their surrounding environment, and traces of DNA extracted from water samples can be used to determine if a specific Asian carp species has been in the vicinity. Since 2010, water samples have been collected in numerous locations across the Great Lakes to detect and monitor the presence of specific Asian carp species using eDNA technology. This is a collaborative program with other Great Lakes states and is funded by the U.S. Fish and Wildlife Service (USFWS) with a federal Great Lakes Restoration Initiative (GLRI) grant administered under the Asian Carp Control Strategy Framework.

In 2010, eDNA surveillance sampling was conducted on the St. Joseph, Galien, and Paw Paw Rivers. In 2011, sampling was conducted on the following systems: Galien River, Kalamazoo River, Muskegon River, Grand River, and Lake St. Clair/St. Clair River. Asian carp eDNA was not detected in these systems. The processing of these water samples was funded through a grant to the University of Notre Dame Center for Aquatic Conservation (CAC).

In 2012, GLRI AIS program project funds were used to develop a state-wide eDNA surveillance plan as outlined in Michigan's Asian Carp Management Plan. However, surveillance was limited in 2012 due to the sampling required in response to the presence of grass carp in Marris Lake and the positive eDNA results from Lake Erie in 2011. Therefore, sampling for eDNA was limited to Lake Erie and Marris Lake in 2012.

For 2013, Fisheries Division developed a list of high priority rivers to conduct eDNA sampling. The plan is to collect roughly 500 water samples from several tributaries to Lakes Michigan, Huron, and Erie. Most of the samples will be collected during the spring because the testing is most effective after heavy rain events. Collecting water samples immediately downstream of the most downstream dam or coffer on the selected river is a priority.

Phragmites Recommendations for Management and Control From the AIS Council
The Aquatic Invasive Species Advisory Council (AIS Council), created by Part 414 of the Natural Resource and Environmental Protection Act, 1994 PA 451, as amended, was tasked with making recommendations on the management of phragmites. Specifically, MCL 324.41412 states:

“The council shall review and provide recommendations on *Phragmites australis* control measures to the department and to the standing committees of the senate and house of representatives with primary jurisdiction relating to natural resources and the environment.”

The AIS Council is developing recommended control measures for *Phragmites australis* that include long-term and short-term management goals and funding programs to support targeted management and research activities. It is anticipated that final recommendations from the AIS Council will be completed sometime in 2013.

DNR Parks and Recreation Division (PRD) has been working to control hundreds of acres of invasive phragmites at over 12 different state parks throughout Michigan. PRD's experience controlling phragmites and other invasive species on state park lands for over a decade will prove valuable as other departments and divisions move forward with invasive species prevention, control, and eradication efforts.

Prohibited Swine Control

Much of the time and money spent by the MDNR on prohibited swine is currently attributed to implementation and enforcement of the Invasive Species Order. The Department is taking steps to prevent the further introduction of prohibited swine by actively enforcing the Invasive Species Order.

Current control and eradication efforts are ongoing within the MDNR and sister agencies. In an effort to control and eradicate established wild populations of prohibited swine, a voluntary trapping program financed through Environmental Quality Incentive Program (EQIP) grants and

the local Natural Resources Conservation Services (NRCS) offices was initiated in 2011 (MI-EQIP11-1). The landowner response was low and the number of feral swine trapped was minimal. A partnership was formed with the Michigan Wildlife Conservancy (MWC), the USDA-Wildlife Services, MDARD and the MDNR to provide traps and bait to landowners. The MWC created a statewide feral swine training and trapping program to educate people about the deleterious effects of feral swine and how to properly build and use a feral swine trap. This partnership is still ongoing.

In addition to the trapping program, the MDNR has put information on its website regarding prohibited swine to educate the public and swine owners on what types of pigs are no longer permitted in Michigan. Additionally, to address the wider feral swine problem in Michigan, new laws were passed in 2010 (PA 69, 70, 71 of 2010) declaring feral swine a public nuisance and allowing hunters throughout Michigan to shoot feral swine opportunistically while out hunting other species. The law requires that the person have any valid hunting license or a concealed weapons permit. The Department continues to distribute posters and magnets and attend outdoor shows to educate the public about prohibited swine and the feral swine shoot-on-sight law.

Emerald Ash Borer Control

Since its identification in 2002, the emerald ash borer (EAB) has killed an estimated 50 million ash trees in the Lower Peninsula (LP) of Michigan and surrounding states. An EAB Response Project partnership consisting of staff from the MDARD, MDNR, United States Department of Agriculture, Michigan Technological University and Michigan State University has initiated a number of actions related to regulatory, survey, control, restoration and outreach:

- Michigan's EAB Interior State Quarantine was last revised on February 8, 2011.
- MDARD staff renews and issue intra-state compliance agreements (CA) as necessary (A CA is a written agreement between a person moving or receiving regulated articles and MDARD). MDARD maintains approximately 120 CAs with receivers, brokers and shippers and conducts compliance inspections with CA holders.
- MDARD staff writes phytosanitary certificates for ash lumber being shipped internationally.
- MDARD staff conducts random inspections for quarantine compliance at the intra-state quarantine boundary between the LP and the UP.
- USDA-funded trapping was conducted at 260 sites in FY 2012. In FY 2013, however, due to USDA budget reductions and its use of a model that predicts likely sites of EAB infestation, USDA will only provide funding for 34 trap sites in the UP (in Gogebic and Iron counties), leaving five non-quarantined counties un-surveyed.
- MDARD staff work with USDA staff to conduct establishment studies on the three Asian parasitic wasps that have been released in Michigan for biological control of EAB. Trapping was conducted in 2012, followed with a laboratory-based sampling program in

2013 (Inspection and peeling of ash logs to detect and quantify parasite eggs and parasitized EAB larvae).

- MDARD staff responds to citizen inquiries regarding EAB from EAB hotline calls and email. Due to USDA budget reductions and reduced caller activity, the EAB hotline has been deactivated.
- Outreach efforts include the MDARD website (Michigan.gov/eab), emeraldashborer.info, responding to media inquiries, presentations at industry conferences and workshops, and other public events.

Recommendation - Continued support of efforts in Michigan to release and establish biological organisms for long-term control of EAB is recommended, as well as continuing support for maintaining EAB outreach information on the MDARD website.

(a-iv) Restoration/remediation of damaged habitats

Restoration of both damaged habitats and populations of native species should be made an integral part of control and management efforts to help guard against future re-invasions and to mitigate impacts from previous invasions and subsequent treatments. Assessment of the ecosystem's current condition and restoration potential across a range of spatial scales allows managers to strategically control and eradicate invasive species and to restore areas with high value, such as important fish and wildlife habitat and areas critical for navigation, recreation, and economic development. These efforts can result in lower control costs, increased effectiveness, and improved chances for restoration success.

Refer to Goal 6 – “Control, Management, and Restoration” of [Meeting the Challenge of Invasive Plants: A Framework for Action](#) to get restoration and remediation information on specific invasive plant species in Michigan.

Two current examples are presented below to show how the State of Michigan can be involved in the restoration of damaged habitats and native populations.

Lake Trout Rehabilitation

Invasive lamprey prey on lake trout, among other native fish species, and have had large negative impacts on their populations. In attempts to overcome lamprey predation and other invasive species, over 4 million lake trout were stocked during 2012 into Lake Huron and Lake Michigan.

Weed Seed-Free Mulch

MDARD was contacted several times during FY 2012 by firms requesting information on in-state sources of weed seed-free mulch for use in restoration projects, where pipeline companies' contracts specified that weed seed-free mulch be used by restoration contractors. Although there is a voluntary program for certified noxious weed seed-free forage and mulch offered through the Michigan Crop Improvement Association (MCIA), no growers in Michigan had enrolled in the program, and therefore no material was available from Michigan. MCIA primarily focuses its work on helping to ensure compliance with other states' noxious weed regulations. There is also

a gap in this process related to recent budget cuts. MDARD no longer has a seed analyst on staff and therefore lacks the expertise that would normally support a seed program and its requirements for identification of weed seeds.

Recommendation - The State of Michigan should promote the production and use of Michigan-grown weed seed-free products instead of importing these products from other states.

(a-v) Prioritizing efforts to prevent NREPA Part 413 violations

MDNR Law Enforcement Division Outreach, Education, Enforcement and Interdiction Recommendations and Update for Preventing Part 413 Violations

It is the goal of Law Enforcement Division to prevent the introduction of prohibited invasive species through a proactive approach of education, detection and interdiction. This proactive effort is ongoing and being accomplished through education of law enforcement agencies, user groups, and business owners. In addition, this effort is being accomplished through increased inspections of businesses associated with invasive species and the vigorous investigation of information cultivated regarding the illegal possession, transportation or commercialization of prohibited species. These efforts of outreach, education and enforcement are critical to preventing the introduction of invasive species. Law Enforcement Division recommends these efforts are continued in order to protect Michigan's citizens, resources and economy.

The following are ongoing efforts by the MDNR Law Enforcement Division to prevent NREPA Part 413 violations and address invasive species issues:

1. Law Enforcement Division officers continue to interact with the public via sport club meetings, sport shows, hunter safety classes and routine patrols. These interactions provide opportunities to educate the public and distribute information in regard to invasive species.
2. The Commercial Fish Enforcement Unit continues working and meeting with the International Great Lakes Fishery Law Enforcement Committee, Michigan State Police Motor Carrier Division, Ontario Ministry of Natural Resources, United States Coast Guard, United States Fish and Wildlife Service, United States Customs, United States Border Patrol and Great Lakes states' law enforcement agencies. These coordinated, cooperative law enforcement efforts are vital for detecting, interdicting and prosecuting offenders for violations of NREPA Part 413.
3. Commercial Fish Enforcement Unit officers continue to provide education and training to law enforcement agencies on the following topics related to prohibited species:
 - Asian carp identification
 - Minnow identification and associated regulations
 - Modes of transportation used in the illegal marketing of live and prohibited species
 - Suspected routes/times of movement of live and prohibited species
 - 24/7 contact information for Law Enforcement Division officers
4. Commercial Fish Enforcement Unit officers are in the process of inspecting most state-licensed wholesale bait dealers and bait catchers in 2013.
5. Law Enforcement Division officers continue retail bait dealer inspections state-wide.

6. Law Enforcement Division officers continue inspections of state-licensed wholesale fish dealers.
7. Law Enforcement Division officers continue to conduct random retail fish market inspections.
8. Commercial Fish Enforcement Unit officers continue inspections of commercial fishing vessels, allowing for education, information sharing and detection of invasive species.

Recommendation – Continue the above listed efforts in order to protect Michigan’s citizens, resources, and economy.

MDARD Nursery Inspections - Aquatic Invasive Species Compliance Monitoring

In FY 2012, MDARD conducted targeted site visits for the purpose of ensuring compliance with NREPA Part 413. These sites consisted of firms which had potential to be selling aquatic plants on a wholesale or retail basis, including plant growers, plant dealers, home improvement chain stores and pet stores. Site visits were conducted statewide at 154 locations. A total of 61 out of the 154 firms were found to have aquatic plant species in stock. The majority of firms with aquatic plants in stock were in compliance with NREPA.

Four firms carried plant species which were positively identified as species prohibited or restricted under NREPA. Species encountered included *Butomus umbellatus* (flowering rush), *Cabomba caroliniana* (Carolina fanwort), and *Myriophyllum aquaticum* (parrot feather). Plants at one site were labeled *Myriophyllum brasiliense*, which is listed in the synonymy for *M. aquaticum*. MDARD issued destruction orders for the prohibited species at the four sites indicated.

Funding for compliance monitoring was made possible due to federal funds received by the Michigan Department of Environmental Quality (MDEQ) through the Great Lakes Restoration Initiative (GLRI). Due to the April 2012 revision of Public Act 189 of 1931, Insect Pests and Plant Diseases Act, MDARD is now able to conduct inspections at licensed nursery stock dealers and recoup expenses through nursery dealer inspection fees. Although GLRI funding may disappear, NREPA compliance monitoring at nursery stock dealers and growers is ensured by including this in the normal inspection process. The cost of these inspections is offset by inspection fees allowed under Public Act 189 of 1931 for inspection of licensed nursery stock dealers. NREPA compliance monitoring at pet shops and aquarium suppliers, however, is unlikely to occur in the future unless additional funding is supplied either through General Fund or legislation allowing for inspection fees for this purpose.

Recommendation – Support a mechanism for funding compliance monitoring at establishments such as pet shops and aquarium dealers where inspection fees are not currently addressed under state law.

Recommendation – Incorporate all 12 federally listed aquatic noxious weed species into NREPA Part 413 that are not currently regulated by Michigan to better ensure that these species are not brought into and sold in Michigan.

(a-vii) Educating citizens about prevention/control/eradication

In an effort to educate citizens and provide outreach about invasive species prevention and control, the following press releases were all issued by either MDNR or MDARD during 2012:

- Six Lake Erie water samples test positive for Asian carp eDNA: Michigan and Ohio planning follow-up action.
- Sample results found Asian carp eDNA in Sandusky Bay
- Water samples detect Asian carp eDNA in Lake Erie's Maumee Bay
- DNR to survey Marris Lake in Lenawee County for presence of grass carp
- DNR to remove grass carp from Marris Lake, Lenawee County
- Testing in Marris and Washington lakes shows no signs of grass carp reproduction -
- DNR warns of prohibited species that may be available at pet, aquarium stores
- Prohibited invasive plant species a high concern for MDARD and DNR

In addition, several outreach efforts have been ongoing for multiple years, such as the DEQ/DNR "Stop Aquatic Hitchhikers" billboard campaign and the DNR Parks and Recreation Division aquatic invasive species signs at boating access sites throughout the state.

(a-viii) Simplifying citizen access to state government for compliance with NREPA Part 413 During 2012, MDNR created a new website (www.michigan.gov/invasivespecies) designed to organize the majority of the MDNR's information about invasive species in one convenient location. In an effort to specifically simplify citizen access to information and increase compliance with NREPA Part 413, the new website has an "Invasive Species Laws" page that shows both state and federal laws, including NREPA Part 413 and descriptions and photos of prohibited and restricted species.

Additionally, the new website also provides:

- Answers to frequently asked invasive species questions
- Protocols for reporting invasive species detections
- Profiles of relevant invasive plant and animal species along with guidance for control and management where appropriate
- Opportunities for citizens to get involved in addressing invasive species issues
- A list of current MDNR activities related directly to invasive species
- Relevant and useful invasive species publications (management plans, guides, etc.)
- Links to other useful invasive species information

- A contact list for specific staff and programs relevant to invasive species in Michigan

Additionally, the Michigan Department of Environmental Quality maintains a separate website focused specifically on aquatic invasive species that can be found at www.michigan.gov/aquaticinvasives.

(a-ix) Legislation and funding to carry out the recommendations of the MDNR and otherwise further the purpose of this Part

Historically, invasive species activities in Michigan have been limited or sporadic largely due to inadequate funding. In 2010, the State of Michigan received a significant influx of funding from a federal Great Lakes Restoration Initiative grant to address priority aquatic invasive species (AIS) actions. This funding is short-term and focused specifically on aquatic species, and therefore, a reliable long-term funding source is needed. At minimum, the state's current AIS Program should be funded at approximately \$1.5 million annually to implement the highest priority strategic actions identified in Michigan's AIS State Management Plan and to maintain the current level of effort. This minimal funding level would support several full-time employees in Michigan's multi-departmental AIS core team and provide a modest budget for projects.

The funding estimate above is provided for aquatic invasive species only and does not include funding needs to address terrestrial invasive species such as the many priority invasive plants and animals. In the past, MDARD has received federal money for the management and control of terrestrial invasive plant species with specific impacts to human health (e.g. giant hogweed), but as with the AIS funding above, this funding was only available on a short-term basis.

In addition to long-term invasive species funding, all invasive species activities need to be better integrated into existing organizational frameworks to ensure state management plan implementation at some level, regardless of funding. The funding estimate provided above is specific to state agencies. It should be recognized there are significant costs for the prevention and management of invasive species to other partners, including other agencies, industries, and citizens.

Michigan's AIS Advisory Council (see a-x below for more details about the Council) is tasked with making recommendations on AIS Program funding, which includes funding mechanisms for the implementation of the AIS State Management Plan. The AIS Advisory Council will consider various scenarios ranging from maintaining the current level of effort to an enhanced program that could include AIS management and control grants; additional prevention, education and outreach, and enforcement components; and early detection/rapid response funds.

(a-x) Other matters that the MDNR considers pertinent to the purpose of NREPA Part 413

Michigan's Aquatic Invasive Species State Management Plan and AIS Core Team
Michigan's first aquatic invasive species state management plan (SMP), "Nonindigenous Aquatic Nuisance Species State Management Plan," was approved in 1996. At the time, it was among the first SMPs in the nation approved by the federal Aquatic Nuisance Species Task Force. In 2002, Michigan prepared an update to the original SMP, "Michigan's Aquatic

Nuisance Species State Management Plan Update: Prevention and Control in Michigan.” Additional background information and history can be found in the original 1996 SMP. Both the 1996 SMP and 2002 update can be found at www.michigan.gov/aquaticinvasives.

Since 2002, implementation of the SMP has occurred as resources have allowed. However, implementation has been limited by lack of funding and consistent coordination between the state agencies. Aquatic invasive species (AIS) management and control efforts have most often occurred on a site-specific basis and have been driven by the interest and ability of a particular property owner, stakeholder, or interest group.

Beginning in 2010, the State of Michigan received a significant influx of funding from a federal Great Lakes Restoration Initiative (GLRI) grant to address priority AIS actions. Michigan's work plan for this GLRI grant focused on establishing a more formal, cohesive AIS Program, updating the AIS SMP, and implementing priority strategic action activities in the AIS SMP. A full-time AIS Program Coordinator was established and is housed within the Michigan Department of Environmental Quality's (MDEQ) Water Resources Division (WRD). Funding is also being used to support staff in a newly established interdepartmental AIS Core Team with representatives from each of the state agencies with environmental or natural resource responsibilities: MDEQ's WRD and Office of the Great Lakes (OGL); MDNR's Fisheries Division (FD), Wildlife Division (WLD), Parks and Recreation Division (PRD), and Law Enforcement Division (LED); MDARD's Pesticide and Plant Pest Management Division; and MDOT's Project Planning Division.

With capacity funding in place, in early 2011 the newly organized AIS Core Team staff began efforts to again revise the AIS SMP. The current SMP summarizes the significant progress made since the 2002 update and provides new guidance to continue AIS prevention and control efforts. The SMP retains the same general purpose and goals of the previous plans: to guide efforts to prevent new introductions, limit the spread of established species, and abate the harmful effects of AIS. Most importantly, unlike earlier versions, this SMP takes a new organizational approach to prevent AIS by identifying the vectors and pathways used by AIS to enter the state or disperse within the state, and then identifying the actions necessary to block or interrupt each of these pathways. In addition, this SMP includes a new goal to develop a statewide interagency Early Detection and Rapid Response (EDRR) program to address new AIS invasions (see a-iii above).

The newly established interdepartmental AIS Core Team experienced its first year of activities with notable improvements in communication and strategy among the departments and divisions. It is recommended that support (both financial and programmatic) for the AIS Core Team be continued to further state agency communication and coordination on invasive species issues.

Relevant New Legislation for Invasive Species

Legislation creating a new Michigan Aquatic Invasive Species (AIS) Advisory Council was passed and made effective immediately on December 21, 2011. The AIS Advisory Council is composed of 19 members representing a broad spectrum of interests, including regulated entities, citizen organizations, governmental agencies, academia, and citizen stakeholders. The AIS Advisory Council is charged with making recommendations on the following issues:

- The update to the AIS State Management Plan and funding to implement the plan

- Prevention of introduction and spread of aquatic invasive species through trade
- The state's certification of U.S. EPA's Vessel General Permit (ballast water permit)
- AIS program funding
- Invasive phragmites control and management

(b) Establish criteria for identifying waterbodies infested by prohibited species

The MDNR developed the Status and Trends Program, a statewide inventory effort designed to provide information to address local and regional management issues on inland waters, including identification of waterbodies infested with AIS. This program allows the MDNR to track AIS metrics such as presence/absence, infestation rates, and estimates of relative abundance while serving as a mechanism for EDRR or assessment. Information gathered from the Status and Trends Program helps with development of AIS management plans. The major components of the program involve standardization of sampling gear, statistical basis for site selection, and an expansion of traditional game fish surveys to include items such as habitat, water quality, and non-game fish.

Other state agencies use similar assessments for identifying waterbodies infested with AIS. The Michigan Department of Environmental Quality (MDEQ) Surface Water Assessment Section (SWAS) oversees the protection of the quality of surface waters throughout the State of Michigan. To do this, SWAS develops standards for the protection of water quality and monitors water, sediments and aquatic life to ensure the state's aquatic ecosystems remain viable, that water quality standards are being met, and that surface waters meet designated uses.

The United States Environmental Protection Agency (USEPA) conducted a national lake survey of the nation's lakes, ponds, and reservoirs in 2007 and 2012. Assessment of AIS was included in the 2012 survey. The National Lakes Assessment (NLA) helps build the capacity for monitoring and assessment and promotes collaboration across jurisdictional boundaries in the assessment of water quality (http://water.epa.gov/type/lakes/lakessurvey_index.cfm).

(c) Monitor and promote efforts to rescind the exemption under 40 CFR for ballast water discharges

Since 1973 the United States Environmental Protection Agency (USEPA) has exempted the regulation of ballast water discharges under 40 CFR 122.3(a). The Northwest Environmental Advocates brought suit in federal district court against the USEPA, alleging that a regulation exempting certain marine discharges from the permitting scheme of sections 301(a) and 402 of the Clean Water Act (CWA) was beyond the scope of the Act. The district court concluded USEPA exceeded its authority under the CWA in exempting the marine discharges from the permitting requirements and vacated challenged portions of the regulation. On appeal, the Ninth Circuit affirmed the decision of the district court in 2008. As a result of these rulings, the USEPA issued its first Vessel General Permit under the National Pollutant Discharge Elimination System regulating incidental discharges from the normal operation of vessels in 2008.

In 2009, Michigan, along with several environmental organizations, challenged the USEPA Vessel General Permit arguing that the USEPA failed to regulate ballast water discharges in a manner that satisfies Michigan Water Quality Standards and protects the Great Lakes from aquatic invasive species. Through negotiations with the USEPA, a settlement agreement was

reached in May 2011 that outlines a process for the USEPA to establish common protective standards for ballast water discharges to United States waters. The next draft permit was released on November 30, 2011. A final permit is expected on or by March 15, 2013.

Contributors

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Table 1. Federal and State Regulated Species Lists: Aquatic Plants.

Species	Federal Laws		State of Michigan Laws			Distribution in the State of Michigan	Comments
	Federal Noxious Weeds List	Title 18, Section 46 of U.S. Code	Part 413 of NREPA	State Noxious Weeds List	1995 PA 182		
African oxygen weed (Lagarosiphon major)	X		P			Absent	
Alligator weed or grass (Alternanthera philoxeroides)		X				Absent	
Anchored water hyacinth_ (Eichhornia azurea)	X					Absent	See below for the related Eichhornia crassipes under ‘water hyacinth’
Arrowleaf false pickerelweed (Monochoria hastata)	X					Absent	
Asian marshweed_ (Limnophila sessiliflora)	X					Absent	
Brazilian waterweed (Egeria densa)			P			Absent	Isolated populations in MN, IN, IL, and OH.
Curly leaf pondweed (Potamogeton crispus)			R			Widespread	Common, especially in the lower peninsula.
Cylindro (Cylindrospermopsis raciborskii)			P			Isolated	Recorded in several drowned river mouths in the Lake Michigan basin.
Duck lettuce (Ottelia alismoides)	X					Absent	
Eurasian watermilfoil (Myriophyllum spicatum)			R			Widespread	Common, especially in the lower peninsula.
European frogbit (Hydrocharis morsus-ranae)			P			Locally Abundant	Herbarium records exist for several southeast counties and the Saginaw Bay area; nine locations were field verified through 2012; likely fairly widespread in SE MI but not in high densities.
Fanwort (Cabomba caroliniana)			P			Locally Abundant	Recorded in sixteen lakes in lower peninsula; present in IN, IL, OH, and ONT

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Flowering rush (<i>Butomus umbellatus</i>)			R			Locally Abundant	Two dozen observations confirmed in the field in southeast Michigan, both inland and coastal; also identified in MN, WI, IN, IL, OH, and ONT.
Giant hogweed (<i>Heracleum mantegazzianum</i>)	X		P	X		Isolated	Found scattered throughout the Lower Peninsula and western Upper Peninsula; some occurrences have been controlled.
Giant salvinia (<i>Salvinia molesta</i> , <i>auriculata</i> , <i>biloba</i> , or <i>herzogii</i>)	X		P			Absent	
Hawaii arrowhead_ (<i>Sagittaria sagittifolia</i>)	X					Absent	
Heartshape false pickerelweed_ (<i>Monochoria vaginalis</i>)	X					Absent	
Hydrilla or waterhyme (<i>Hydrilla verticillata</i>)	X		P			Absent	Isolated populations in IN, WI, and OH.
Indian hygrophila (<i>Hygrophila polysperma</i>)	X					Absent	
Japanese knotweed (<i>Fallopia japonica</i>)			P			Widespread	Scattered throughout lower and upper peninsulas
Killer algae (<i>Caulerpa taxifolia</i>)	X					Absent	
Mosquito fern (<i>Azolla pinnata</i>)	X					Absent	
Parrot feather (<i>Myriophyllum aquaticum</i>)			P			Absent	Isolated populations in IN, IL, OH, PA, and NY.

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Phragmites or common reed (<i>Phragmites australis</i>)			R			Widespread	Common and established in coastal and inland areas of southern lower peninsula; somewhat less abundant from south to north; common in western UP and southern UP along Lake Michigan shoreline. Often confused with native subspecies, or found intermixed.
<u>Punktree or broadleaf paper bark tree (<i>Melaleuca quinquenervia</i>)</u>	X					Absent	
Purple loosestrife (<i>Lythrum salicaria</i>)			R		X	Widespread	Biological control is reducing populations statewide.
<u>Simplestem bur-reed (<i>Sparganium erectum</i>)</u>	X					Absent	
Starry stonewort (<i>Nitellopsis obtusa</i>)			P			Locally Abundant	Recorded in over one hundred inland waterbodies, mostly in southern peninsula.
<u>Swamp morning-glory (<i>Ipomoea aquatica</i>)</u>	X					Absent	
Water chestnut (<i>Trapa natans</i>)		X	P			Absent	Observations in PA and NY.
Water hyacinth (<i>Eichhornia crassipes</i>)		X				Isolated	Six populations verified in southeast Michigan in 2012 (not verified as overwintering). Also see above for related species, Anchored water hyacinth (<u><i>Eichhornia azurea</i></u>)
Wetland nightshade (<i>Solanum tampicense</i>)	X					Absent	

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Species	Federal Laws		State of Michigan Laws			Distribution in the State of Michigan	Comments
	Federal Noxious Weeds List	Title 18, Section 46 of U.S. Code	Part 413 of NREPA	State Noxious Weeds List	1995 PA 182		
Yellow floating heart (Nymphoides peltata)			P			Absent	Isolated populations in WI, IL, IN, OH, and ONT.

Table 2. Federal and State Regulated Species Lists: Aquatic Animals.

Species	Federal Laws	State of Michigan Laws			Distribution in the State of Michigan	Comments
	Lacey Act	Part 413 of NREPA	DNR Admin. Rule 299.1052	DNR FO 227		
Crustaceans						
Mitten Crab (genus Eriocheir - 3 species)	X				Absent	Isolated occurrences in the Great Lakes, including the Detroit River, Lake Erie, and Lake Superior (though not in Michigan waters).
Rusty crayfish (Orconectes rusticus)		P		X	Widespread	Widespread and breeding in inland waters.
Fish						
Bighead carp (Hypophthalmichthys nobilis)	X	P			Absent	Several isolated, historical specimens were collected from western Lake Erie (Ohio), however no established population.
Bitterling (Rhodeus sericeus)		P	X		Absent	
Black carp (Mylopharyngodon piceus)	X	P			Absent	
Eurasian ruffe (Gymnocephalus cernuus)		P			Locally Abundant	Patchy distribution in the Great Lakes, absent from inland waters.
Grass carp (Ctenopharyngodon idellus or idella)		P	X		Isolated	Isolated collection from Michigan inland waters; no evidence of breeding.
Ide (Leuciscus idus)		P	X		Absent	
Japanese weatherfish (Misgurnus anguillicaudatus)		P	X		Isolated	Single breeding population in the Shiawassee River.
Largescale silver carp (Hypophthalmichthys harmandi)	X				Absent	
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 erythrophthalmus)		P	X		Absent	Isolated collections on the Ontario side of Lake St. Clair.
Silver carp (Hypophthalmichthys molitrix)	X	P			Absent	

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	Lacey Act	Part 413 of NREPA	DNR Admin. Rule 299.1052	DNR FO 227		
Snakehead family (family Channidae)	X	P			Absent	
Tench (Tinca tinca)		P	X		Absent	
Tubenose goby (Proterorhinus marmoratus)		P			Isolated	Isolated, established populations in the St. Clair River, Lake St. Clair, Detroit River, and western Lake Erie.
Walking catfish (family Clariidae - 13 genera, ~100 species)	X				Absent	
Mammals						
Nutria (Myocastor coypus)		P			Absent	Farmed in Michigan in the 1930s; accidentally released but did not survive.
Mollusks						
New Zealand mud snail (Potamopyrgus antipodarum)		P			Isolated	
Quagga mussel (Dreissena bugensis)		R			Widespread	Found in all of the Great Lakes, although limited in Lake Superior; isolated inland occurrence in the Great Lakes basin, including a single confirmation from Michigan's Upper Peninsula.
Zebra mussel (Dreissena polymorpha)	X	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.