



*Michigan's
Aquatic Nuisance Species
State Management Plan Update*

Prevention and Control in Michigan Waters

*A cooperative effort of the
Michigan Department of Environmental Quality
Michigan Department of Natural Resources
Michigan Department of Agriculture
In Partnership with other Interested Parties*

*Prepared by Michigan's Office of the Great Lakes
October 2002*

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*Prepared by:
Michigan's Office of the Great Lakes
Michigan Department of Environmental Quality
P.O. Box 30473
Lansing, Michigan 48909-7973
517-335-4056
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(Cover photo of round goby and zebra mussels courtesy Dave Brenner, MI Sea Grant)

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Executive Summary

Michigan's waters are under assault from aquatic nuisance species. Aquatic nuisance species (ANS) are waterborne, non-native organisms that threaten the diversity or abundance of native species, or the ecological stability of impacted waters, or threaten a commercial, agricultural, aquacultural, or recreational activity dependent on waters of the state.

This plan is an update to the ***Nonindigenous Aquatic Nuisance Species State Management Plan***, approved in 1996 as Michigan's plan under the auspices of the National Invasive Species Act.

To develop this update, an Aquatic Nuisance Species Action Team consisting of the Directors of the Michigan Departments of Environmental Quality, Natural Resources and Agriculture was convened by the Director of the Office of the Great Lakes in February 2002. Three committees were established to recommend actions needed to address the problem of prevention and control of ANS in Michigan's waters. The committees addressed:

- Legislation and Policy
- Information and Education
- Research and Monitoring

Approximately 40 people, representing more than a dozen public agencies and private institutions, drafted the update. In addition, comments on the draft received during a 30-day public comment period were incorporated into the final version.

The recommended implementation actions include:

- Coordination of policies and enactment of legislation that will reduce the economic and environmental impacts of ANS in Michigan;
- Development of information and education materials and activities addressing ANS prevention, control, monitoring, research and policy making;
- Establishment of a network of collaborative entities for research and monitoring of ANS in Michigan with the goal of providing high quality information to legislators, educators and policy makers.

As Michigan moves ahead with implementation of actions to prevent and control ANS, extra care in prevention of new introductions is necessary. Federal, state, regional and local initiatives all have a role to play in providing tools for the purpose of protecting our waters and wetlands from exotic species that disrupt habitat for our native species and impact our beneficial uses of all Michigan's water resources.

I. Introduction

Michigan's waters are under assault from aquatic nuisance species already here and are threatened by those yet to come. An extraordinary amount of time and money is spent each year to control Eurasian watermilfoil in our beautiful waters and zebra mussels in our municipal and industrial pipes. Many reading this will have cursed the round gobies biting the fish hook instead of the desired perch and other fish. Numerous species are knocking at the door, including Asian carp coming up the Chicago diversion and snakehead fish already found in other states. Aquatic nuisance species are waterborne, non-native organisms that threaten the diversity or abundance of native species, or the ecological stability of impacted waters, or that threaten a commercial, agricultural, aquacultural, or recreational activity dependent on waters of the state.

This plan is an update to the ***Nonindigenous Aquatic Nuisance Species State Management Plan***, approved in 1996 as Michigan's plan under the auspices of the National Invasive Species Act. The purpose of this update is to summarize the good work accomplished during the past 6 years and provide guidance to continue the effort. The accomplishments are in Section II. Recommendations for needed actions are in Section III. More background information and history can be found in the original 1996 Plan: *Nonindigenous Aquatic Nuisance Species State Management Plan: A Strategy to Confront Their Spread in Michigan*, available at:

http://www.michigan.gov/deq/0,1607,7-135-3313_3677_8314-16514--,00.html

To develop this update, an Aquatic Nuisance Species Action Team consisting of the Directors of the Michigan's Departments of Environmental Quality (MDEQ), Natural Resources and Agriculture was convened by the Director of the Office of the Great Lakes in February 2002. Three committees were established by the Action Team to determine recommended actions needed to address the problem of prevention and control of aquatic nuisance species in Michigan's waters. They were:

- *Legislation and policy*
- *Information and education*
- *Research and monitoring.*

Approximately 40 people, representing more than a dozen public agencies and private institutions were involved in producing the update. In addition, the document was placed on the MDEQ website with associated announcements and comments received on the draft during a 30 day public comment period,

which were incorporated into the final version. The organizational structure of the Action Team is in Appendix A.

The recommended implementation actions in Section III are guided by 7 goals:

Legislative and Policy Goal: Coordinate the necessary policies and enact the necessary legislation to reduce the economic and environmental impacts of aquatic nuisance species in Michigan.

Information and Education Goal I: The prevention of the unintentional introduction and dispersal of aquatic nuisance species into, within and from Great Lakes waters through implementation of information/education (I/E) activities.

Information and Education Goal II: Statewide coordination of information dissemination regarding aquatic nuisance species programs involving prevention, control, monitoring, research, education, policy and other related activities.

Information and Education Goal III: The active involvement of Great Lakes regional policymakers and user groups in the promotion of aquatic nuisance prevention and control programs.

Information and Education Goal IV: Provide adequate resources to implement Michigan's Information/Education Strategy for Aquatic Nuisance Prevention and Control.

Research and Monitoring Goal I: Provide high quality information to policy decisions, legislation, educational efforts, and regulatory work regarding aquatic nuisance species prevention, control, and effects in Michigan

Research and Monitoring Goal II: Provide resources and collaborative networks for research and monitoring activities regarding aquatic nuisance species in Michigan.

As Michigan moves ahead with implementation of actions to prevent and control aquatic nuisance species, extra care to prevent new introductions is necessary. The growth potential of certain species in a new place, uninhibited by natural predation or disease, can be explosive and cause changes in Michigan's waters that are quick, permanent, and seriously detrimental to human, ecological, or economic health.

The diagram below illustrates some of the paths that exotic species have used to enter the Great Lakes and spread throughout the basin. The circular arrows in the center illustrate the cycling nature of the spread of aquatic nuisance species once they are here. The arrows pointing into the Great Lakes illustrate the typical entry points for introductions. Stopping the introduction and spread of exotic species by eliminating the paths represented by the arrows is a major

challenge we all face. Actions such as checking and cleaning boats and fishing equipment can dramatically reduce the likelihood of an exotic species getting a free ride from lake to lake. Ships practicing good ballast water management can greatly reduce the number of species traveling in ballast water from world ports. Barriers placed in tributaries can make it difficult for exotic species to enter the Great Lakes via natural dispersal.



Federal, state and local initiatives have all been important tools in this effort to reduce aquatic nuisance species introductions and cycling.

There's Work To Be Done.

Much remains to be done to shut off the paths that aquatic nuisance species use to enter the Great Lakes and to disperse within Michigan. Species can still get in via ballast water in ships that have only unpumpable slop in the bottom of their tanks. Aquatic weeds still hitchhike rides on boats that travel from lake to lake, sometimes several lakes in a day. The sea lamprey is still spawning in tributaries and destroying valuable lake trout and whitefish in the Great Lakes. Other species are poised to come into the Great Lakes through holes in our protection. We all need to do our part to protect our waters and wetlands from exotic species that disrupt habitat for our native species and impact our beneficial uses of all water resources. Federal, state, regional and local initiatives all have a role to play providing tools for this purpose.

The ***Present State of Affairs*** section summarizes the problem and accomplishments since the 1996 plan was released. The ***Recommended Actions*** section details the outputs of the Action Team sub-committees concerning needed actions in Michigan. It is intended to guide legislation, policy, information, education, research, and monitoring in Michigan for the next 3-5 years. Clearly, some actions require a permanent commitment from the partners in the effort to prevent and control the ecological and economic damage of aquatic nuisance species.

II. The Present State of Affairs

Aquatic nuisance species continue to be a serious problem in the state of Michigan. Non-native plants foul our beautiful inland lakes and wetlands, mussels from another continent choke off our drinking water and cooling water intake pipes, fish from other parts of the world displace or eat our native species and dramatically lower the quality and quantity of fishing. The aquatic ecosystems of Michigan are under assault by non-native species already here and are threatened by new invasions. The effects of aquatic nuisance species already here and habitat loss are the most significant problems facing Michigan's plants and animals.

Additional species may enter the Great Lakes through pathways such as the Chicago Sanitary and Ship Canal. Asian carp species are close to Lake Michigan already in the Mississippi River basin and may enter the lake if there is a problem with the electrical barrier in the canal. New species may also come in on ships arriving from the St. Lawrence Seaway that declare no ballast on board. These ships may be harboring ANS but do not have to conduct ballast exchanges with salt water on the open ocean because they are not carrying pumpable ballast.

In addition to concerns about species that may be coming, Michigan has numerous issues with species already here. These include mitigation of effects by control where possible and prevention of range expansions within the state.

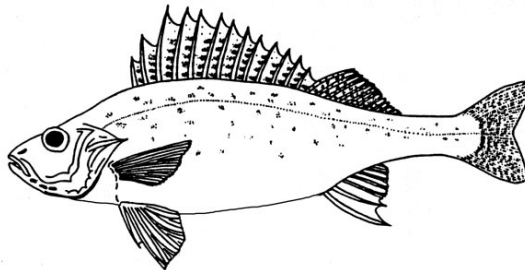
Selected Species of Concern

In the spring of 1988, the zebra mussel (*Dreissena polymorpha*) was discovered in Lake St. Clair. Scientists believe the zebra mussel was transported to North America in the ballast water of a transatlantic freighter that previously visited a port in Eastern Europe where this mollusk is common. Zebra mussels have now spread to all five Great Lakes and are also found in the Mississippi, Tennessee, Hudson, and Ohio River Basins, among others. It was the zebra mussel, with its direct impact on public uses of water resources that brought increased recent attention to aquatic nuisance species in Michigan.



Zebra mussels: 0.25-0.5 inch

Zebra mussels readily attach to most submerged surfaces including boats, rocky shoals, water intake pipes, navigational buoys, docks, piers, and indigenous species such as clams. They affix themselves to shells of their own species and are able to form dense layered colonies of thousands per square meter. The mussels have been able to colonize and foul heat exchangers, valves, and small diameter piping once the organism gains entry into power plants. Irrigation, fire protection, and dust suppression systems have also experienced problems associated with mussel colonization. The filtering action of zebra mussels as they feed has also cleared the water of algae and plankton. This clarity can lead to greatly increased rooted plant growth and to subsequent changes in the food web detrimental to native species and certain uses of the water.



Ruffe: 5 inches

Another important aquatic nuisance species already established in the Great Lakes Basin is the ruffe (*Gymnocephalus cernuus*), a small perch-like, Eurasian fish. It was apparently introduced to the Great Lakes in the St. Louis River near Duluth, Minnesota, from a ballast discharge. In Europe the ruffe feeds on whitefish eggs and competes with other more desirable fish. The spiny dorsal fins of the ruffe discourage predation by other fish. In Lake Superior, the species of fish that is most affected by the ruffe is the yellow perch. The ruffe continues to spread along the shores of Lake Superior toward the St. Marys River where it could then gain access to the rest of the Great Lakes. One other localized population of ruffe occurs in Thunder Bay, Michigan, and a ruffe was discovered near Escanaba, Michigan, in the summer of 2002, which may signal yet another range expansion.



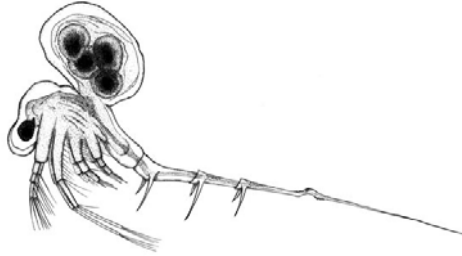
Quagga mussel: 0.5 inch

The quagga mussel (*Dreissena bugensis*) is related to the zebra mussel but is a distinct species. It prefers deeper, colder waters which is consistent with laboratory studies indicating that the quagga has a lower temperature tolerance than the zebra mussel. In addition, it may have the same potential as the zebra mussel to clog water intakes. The discovery of this second type of mussel increases the probability that other species of Dreissenidae have been introduced into the Great Lakes.



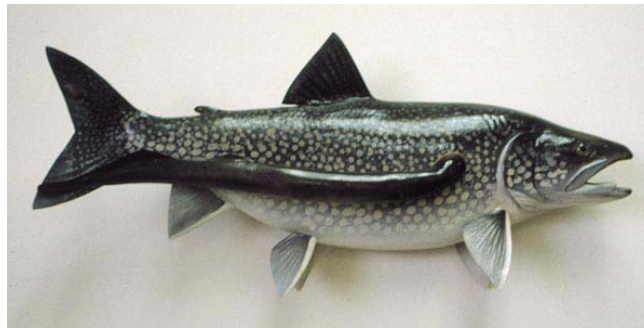
Round Goby: 3-6 inches

The round goby (*Neogobius melanostomus*) is an abundant species with origins in the Black and Caspian Seas. They are a small fish that feed chiefly on bivalves, amphipod crustaceans, small fish, and fish eggs. It is also believed this fish was introduced into the Great Lakes from discharged ballast water. Consumption studies of fish suggests round gobies have a detrimental impact on native species through competition for food and predation on eggs and young fish. Anglers now catch many round goby in certain areas such Lake St. Clair instead of the more desirable native species.



Spiny Water Flea: 0.4 inch

The spiny water flea (*Bythotrephes cederstroemi*) is also believed to have entered the waters of the Great Lakes from discharged ballast water. Although its average length is rarely more than one centimeter, this large predaceous zooplankton can have a profound effect on a lake's plankton. The spiny water flea sometimes competes directly with young fish for food. Because this organism can reproduce many times faster than fish, it monopolizes the food supply at times, to the detriment of the fish. Although *Bythotrephes* can also fall prey to fish, its spine seems to frustrate most small fish, which experience great difficulty swallowing the animal.



Sea lamprey on fish: 12 inches

The sea lamprey (*Petromyzon marinus*) has been a serious problem in the Great Lakes for more than 50 years. After more than 30 years of trying to eradicate lamprey, the parasitic invader is still having a serious effect on the lake trout fishery in northern Lakes Michigan and Huron. An adult lamprey can kill up to 40 pounds of fish in just 12 to 20 months. A lamprey attaches itself to a fish with a sucking disk, pierces its scales and skin and sucks out body fluids, often killing the fish. Control efforts have been expensive. An integrated pest management plan implemented to control the St. Marys River sea lamprey population has had some success in recent years through the use of sterile male releases and chemical treatments of larvae beds. Recent research on pheromones may hold additional promise for control.



Eurasian watermilfoil choking a lake

Eurasian watermilfoil (*Myriophyllum spicatum*), a nonindigenous aquatic plant, reached the midwestern states between the 1950s and 1980s. In nutrient rich lakes watermilfoil can form thick underwater stands of tangled stems and vast mats of vegetation at the water's surface. In shallow areas the plant can interfere with water recreation such as boating, fishing, and swimming. The plant's floating canopy can also crowd out native water plants. Chemical control is widely used but expensive. Treatments have cost over \$1,000,000 per lake, with costs of \$10,000-\$40,000 per lake per year common. In 2002, there were 1212 lakes in Michigan where permits were applied for to treat aquatic nuisance plants. Weevils that eat milfoil have been released to test biological control. Long term effectiveness of this is under investigation.



Purple loosestrife: 5 feet

Purple Loosestrife (*Lythrum salicaria*), is a perennial wetland plant native to Europe and Asia. It was introduced into the United States in the early 1800s and continues to spread. The plant is impacting Michigan wetland ecosystems by changing the structure, function, and productivity of the wetlands. The plant forms dense monoculture stands, sometimes hundreds of acres in size, which displace native vegetation and threaten the biotic integrity of wetland ecosystems. The loss of plant species richness and diversity has eliminated natural foods and cover essential to many wetland wildlife species. The *Galerucella* beetle has been used

successfully for biological control over the past 6 years in certain areas. Purple loosestrife is otherwise very difficult to discourage, let alone control.

Once established in open aquatic systems, harmful, aquatic nuisance species such as those described above have proven impossible to eradicate. Where control is possible, it usually means just keeping populations from causing unacceptable ecological or economic damage. These species represent only a small percentage of the 160 invaders to arrive in the Great Lakes. Control of numbers and range extensions may, in specific instances, be attempted, although usually at great cost, continuous effort, and limited results. New species introductions are a constant threat, with Asian carp, snakehead fish, and other species from around the world poised to spread to the Great Lakes.

Legislation and Policy Accomplishments Since 1996

The **1996 Management Plan** for aquatic nuisance species listed the following general strategy for legislation and policy actions: ***Existing laws and regulations will be reviewed, consolidated, updated and publicized. In addition, innovative and alternative policy initiatives to enhance aquatic nuisance species control will be explored.***

Michigan has accomplished much with legislation and policy, notably with the enactment of PA 114 in 2001. Federal legislation and regional policy have also improved over the past 8 years. Key accomplishments are detailed below.

State Initiatives

The state of Michigan has taken a leadership role within the Great Lakes basin for policies concerning prevention and control of aquatic nuisance species. The state management plan, approved in 1996 and updated in 2002 with this document, has provided guidance for numerous information and education activities by state agencies. Posting of signs at boat launches, reminding the boating public to check and clean boats of aquatic nuisance species, is one of many examples. The Michigan Great Lakes Protection Fund has been available as a source of funding for research projects on aquatic nuisance species.

Regulatory programs in Michigan under the Departments of Environmental Quality, Natural Resources and Agriculture provide for control of aquatic nuisance species in the state's lakes and rivers. These include requirements for permits to treat exotic weeds in lakes, restrictions on transport of nuisance species of fish, and participation in actions to control sea lamprey in Great Lakes tributaries. A table of state laws on aquatic nuisance species is in Appendix D.

Michigan enacted ballast water legislation in 2001 that requires ships entering or using the Great Lakes to adhere to ballast water management practices established by shipping associations and federations. A list of ships complying with the law (presently virtually all ships on the Great Lakes) is posted on the MDEQ web site at:

http://www.michigan.gov/deq/0,1607,7-135-3307_3667_8278---,00.html

Michigan participates in the Great Lakes Panel on Aquatic Nuisance Species, a regional forum that provides a mechanism for state agencies to share information and coordinate planning on prevention and control of exotics.

Federal Initiatives

The National Invasive Species Act (NISA) of 1996 reauthorized the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. It establishes the National Aquatic Nuisance Species Task Force of federal agencies, authorizes regional aquatic nuisance species panels and provides guidance on development and approval of state management plans for aquatic nuisance species prevention and control. There are approved management plans for aquatic nuisance species from 7 states on the Aquatic Nuisance Species Task Force web site, including Michigan's. Several other states have draft plans in development.

Federal ballast water regulation under NISA helps protect the Great Lakes by requiring transoceanic ships to manage ballast water to reduce new aquatic nuisance species introductions. The U.S. Coast Guard has authority to enforce the ballast water provisions of NISA and does so at their Massena, New York facility on the St. Lawrence Seaway.

Michigan Sea Grant, part of the National Oceanographic and Atmospheric Administration (NOAA) plays a key role in ANS education and research in Michigan. NOAA also operates research laboratories focused on the Great Lakes.

A National Invasive Species Council with a mandate to address all invasive species, both aquatic and terrestrial, was created by executive order in 1999.

Regional Initiatives

The Great Lakes Panel on Aquatic Nuisance Species (Panel) was established in 1991. The Panel is coordinated by the Great Lakes Commission. For the past 11 years the Panel has:

- Identified Great Lakes priorities;
- Made recommendations to a national Task Force on Aquatic Nuisance Species;
- Coordinated exotic species program activities in the region;
- Advised public and private interests on control efforts;
- Submitted an annual report to the task force describing prevention, research and control activities in the Great Lakes Basin.

The Council of Great Lakes Governors established a Ballast Water Task Force in 2000. The purpose of the Task Force is to advise the governors on state and federal initiatives that need to be taken to control invasions of aquatic nuisance species through ballast water treatment or management.

Local Initiatives

Municipal efforts to control aquatic nuisance species include large investments in zebra mussel elimination programs for water intakes and dealing with the effects of exotic fish such as alewife fouling beaches. Private organizations such as the Michigan Lake and Stream Association play a pivotal role in education and monitoring concerning ANS prevention and control in lakes and rivers.

Information and Education Accomplishments Since 1996

The **1996 Management Plan** for aquatic nuisance species listed the following general strategy for use of information and education tools to control the spread of those species in Michigan: ***Inform and educate the appropriate public/private groups on aquatic nuisance species impacts, the value of a healthy lake ecosystem that supports a diverse native aquatic community, and the control tactics needed to protect the aquatic community from the spread of aquatic nuisance species. Focus on changing the behavior of user groups to control the spread of targeted aquatic nuisance species. Also, volunteer groups such as lake associations and outdoor recreation groups will be actively recruited to become involved in outreach efforts.***

Much has been accomplished with information and education activities. Some key examples are summarized below.

- Five thousand boat launch signs were produced and placed at state-owned boat launches throughout Michigan in July 1998. The advisories on the signs recommend precautionary measures for boaters to help minimize the spread of aquatic nuisance species.
- In July 1999, the Office of the Great Lakes (OGL) released a document entitled, *Aquatic Nuisance Species Handbook for Government Officials*. The

purpose of the handbook is to educate local, county, and state government officials about problems and solutions relating to the on-going invasion and spread of exotic species. Eight thousand copies of the manual were printed for distribution.

- The OGL, in cooperation with Michigan State University Extension, released a manual in June 2000 entitled, *Integrated Pest Management (IPM) for Nuisance Exotics in Michigan's Inland Lakes*. The manual targets waterfront property owners and other citizens concerned about the prevention and control of exotic species. Approximately 7000 copies from 2 printings have been distributed throughout Michigan.
- The OGL awarded a \$10,000 grant to the Information Television Network for production of the *Cutting Edge Technology Report*, focusing on the prevention and control of aquatic nuisance species and other issues relating to ballast water exchange in the Great Lakes Region. The program aired in winter 2000.
- Watch cards for several species have been widely distributed throughout Michigan. These small, easy to carry cards are reminders to users to be careful of distributing ANS.
- Distribution of educational materials on ANS has occurred at many venues throughout Michigan all year long. Examples include Outdoorama and local events hosted by many organizations.
- The Michigan Department of Agriculture (MDA) serves as a key partner on the Michigan Invasive Plant Council, a multi-agency organization that promotes the exchange of information on invasive plant issues. The council has begun the process to evaluate the invasive ability of over 900 non-native plants that have become established in Michigan. The results from this science-based assessment will serve to identify nuisance plant species that require regulatory action.
- The MDA provides outreach information on invasive species issues at public events such as the Michigan State Fair, the Upper Peninsula State Fair and Agriculture and Natural Resources Week at MSU. Exhibits have been used to educate the industry and public at trade shows and industry field days. In addition, MDA regularly participates in ongoing nursery industry training sessions providing information on both aquatic and terrestrial pest species to the target audience.

Research and Monitoring Accomplishments Since 1996

The **1996 Management Plan** for aquatic nuisance Species in Michigan had the following general strategy for research and monitoring related to those species in Michigan: ***Develop monitoring programs that determine the presence, distribution, and abundance of aquatic nuisance species in Michigan waters. Conduct research to reduce the potential of these species to spread further into uncolonized waters. Study impacts on aquatic community of native plants and animals.***

Much has been accomplished with regard to research and monitoring for aquatic nuisance species in the past 6 years. Key examples are summarized below.

- The Great Lakes Fishery Trust awarded a \$250,000 grant to the Cooperative Institute for Limnology and Ecosystems Research and the School of Naval Architecture, University of Michigan, as a result of a prior study funded under the aquatic nuisance species State Management Plan. The research project conducted extensive toxicity testing of glutaraldehyde on ANS in the laboratory on ballast water.
- The Office of the Great Lakes (OGL) staff worked with Cooley Law School to conduct a historical overview of the International Convention for the Prevention of Pollution from Ships (MARPOL) while examining the United Nations' recent attempt to amend MARPOL to address the spread of aquatic nuisance species around the world. A final report was submitted to OGL in November 1998, pursuant to the Plan.
- The Northeast-Midwest Institute and the Lake Carriers Association partnered with others to conduct the Ballast Technology Demonstration Project, research on treatment of ballast water to reduce ANS introductions. The ship-board demonstration part of the project is on-going.
- Research on organisms in the ballast holds of ships that declare no ballast on board when transiting the St. Lawrence Seaway conducted by the National Oceanographic and Atmospheric Administration and cooperating universities is being completed. Initial results have shown many organisms in NOBOBs.
- The OGL awarded a \$3,000 grant to Michigan State University for a symposium on environmental strategies for aquaculture held in December 2000 in conjunction with the Midwest Fish and Wildlife Conference in Minneapolis, Minnesota. By identifying areas of mutual interest, particularly in research areas, many of the environmental concerns with aquaculture can now be addressed in a scientific fashion. The symposium proceedings are available on compact disk.

- The OGL awarded a \$70,000 research grant to Michigan Natural Features Inventory to inventory the presence of native unionid mussel communities in the Grand and St. Joseph Rivers. Preliminary results show little impact from invasive mussel species in the Grand River as of 2001.
- The OGL awarded a \$10,000 research grant to Enviroscience, Inc. to study the potential for biological control by *Euhrychiopsis lecontei*, a North American weevil, on populations of Eurasian watermilfoil while examining other changes in the macrophyte community. Results documented a dramatic decline in Eurasian watermilfoil density from July 1998 to September 2000 at all sampling locations in Paradise Lake. Long term effects are not known.
- The OGL and the MDEQ, Land and Water Management Division, awarded a \$10,000 grant to the Michigan Sea Grant College Program to inventory the presence of the wetland invader purple loosestrife throughout Michigan. The inventory was completed in 2000.
- The MDEQ, Surface Water Quality Division, has completed (2001-2002) a ballast water treatment project in which hypochlorite and copper ion were evaluated as potential ballast water biocides. The Michigan Environmental Science Board (MESB) is currently (2002) reviewing the study findings via a Ballast Water Biocides Investigation Panel. The MESB review is expected to be completed in 2002. Based on the result of the review process to date, concerns regarding use of both potential ballast water biocides have been identified. As a result, the OGL, through the Michigan Great Lakes Protection Fund, released a supplemental Ballast Water Control Request for Proposals (RFP) for funding projects to review these concerns. An additional project has been funded under this RFP that examines the corrosivity of chlorine on ballast tanks in 2003.
- The OGL awarded a grant to the University of Windsor to monitor Lake Superior for new aquatic nuisance species. Preliminary results have indicated at least two species new to Lake Superior and expanded ranges for three others.
- The Michigan Great Lakes Protection Fund is supporting a study on round goby in 2002-2003 to determine whether practical control actions can be taken through the use of pheromones.
- The Lake St. Clair fish community study is being completed by the MDNR. This was a 5-year MDNR federal aid study designed to assess impacts of round gobies and collect baseline data on ruffe. This will allow an evaluation of fish community impacts related to colonization by ruffe, which is expected in the near future.

- Zebra mussel - yellow perch pond study: This was a 2-year pond enclosure experiment conducted at the MDNR, Mt. Clemens Station, during 1992 and 1993. The objective was to test for effects of zebra mussel presence on zoobenthos and the diet and growth of yellow perch.
- The Saginaw Bay fish community study has been on-going by the MDNR. Federal aid studies have monitored the fish community of Saginaw Bay since the early 70s to assess impacts resulting from introductions of zebra mussel and round gobies.
- For the past five years MDA has provided \$70,000 funding in support of the Purple Loosestrife Project at Michigan State University. This project focuses on biological control of purple loosestrife, *Lythrum salicaria*, an aquatic nuisance species that is an aggressive invader of North American wetlands, lakes and rivers.

In addition to the Michigan specific studies, much research regionally, nationally, and internationally has contributed to the information necessary to manage aquatic nuisance species. The International Conference on Aquatic Invasive Species held in February 2002 had over 150 presentations on research results. Further information on the conference proceedings is available at:

<http://www.aquatic-invasive-species-conference.org/>

Present State of Affairs Summary

There is clearly interest at all levels to successfully manage the problem of aquatic nuisance species. Since the Nonindigenous Aquatic Nuisance Species State Management Plan for Michigan was completed in 1996, much has been accomplished. The public is now far more aware of potential problems, our state and federal agencies have confronted the issue and responded with legislation and policy that support prevention and control, and research entities are supplying needed information to managers.

Much also remains to be done to protect Michigan's water from the threat of ecological and economic problems caused by ANS. New threats are not far away, with new introductions and spread of those species already here likely. An example is the 2002 discovery of the ruffe in Lake Michigan, a clear sign this species has the potential to spread throughout the Great Lakes from its original introduction site in Duluth Harbor. This update of the 1996 plan provides guidance for recommended actions to reduce the threat, as detailed below.

III. The Plan: Recommended Actions

Overview

Updated actions to protect Michigan's waters from aquatic nuisance species were developed in 2002 using a multi-stakeholder process guided by an Aquatic Nuisance Species Action Team as detailed in the introduction. Goals, objectives, and specific actions recommended by the 3 committees (Legislation and Policy, Information and Education, and Research and Monitoring) are presented in this section. The recommended implementation actions are guided by 7 goals, 1 for legislation and policy, 4 for information and education, and 2 for research and monitoring. All actions support the overall goal of the updated plan: **prevention and control of aquatic nuisance species in Michigan's waters**. The recommendations serve as guidance for implementing agencies and organizations. Specific proposals and budgets will be developed by the implementers as these recommendations are put into action.

Legislation and Policy

Legislation and policy concerning aquatic nuisance species will drive much of the changes needed to protect Michigan waters from new introductions and from spread of species already here. The potential for better coordination of available funding is a key component of legislation and policy actions.

Recommendations from the Legislation and Policy Committee

Legislative and Policy Goal: Coordinate the necessary policies and enact the necessary legislation to reduce the economic and environmental impacts of aquatic nuisance species in Michigan.

Objective 1: Coordinate Michigan's policies dedicated to aquatic nuisance species control to reduce the economic and environmental impacts of aquatic nuisance species in Michigan. The limited control activities surrounding aquatic nuisance species are funded within the existing framework of various natural resource programs. Better coordination and information sharing would greatly improve data collection and information dissemination, thus increasing the effectiveness of aquatic nuisance species controls.

Activity A: Appoint/create an aquatic nuisance species Coordinator (Bovine TB effort as a model). Responsibilities include coordination of implementation for aquatic nuisance species activities within state government and coordinate those activities with other efforts within the state. The focus of the efforts of the

coordinator would be to coordinate activities necessary to reduce the economic and environmental impacts of aquatic nuisance species in Michigan.

Activity B: Appoint/create a Michigan Aquatic Nuisance Species Council through executive order. The council would assist in providing direction for preventing and controlling the spread of aquatic nuisance species within the state.

The Council would direct information/education activities in addition to efforts to coordinate research and pursue implementation efforts toward preventing and controlling aquatic nuisance species. The focus of the efforts of the council would be to assist in the coordination of activities necessary to reduce the economic and environmental impacts of aquatic nuisance species in Michigan. The council could consult non-state partners such as Sea Grant, USFWS, Michigan Invasive Plant Council, etc.

Activity C: The Great Lakes Commission is coordinating regional efforts towards preventing and controlling aquatic nuisance species within the Great Lakes region through the Great Lakes Panel on Aquatic Nuisance Species. The state should continue coordinating activities between the state and the ANS Panel and to develop mechanisms to implement findings of the ANS Panel in Michigan.

Activity D: Currently, aquatic nuisance species prevention and control activities are on-going in numerous state agencies. Examples include regulatory programs, information and education efforts, and research projects. Efforts should be made to increase coordination and cooperation between state government agencies in the efforts to prevent and control the spread of aquatic nuisance species within the state.

Objective 2: Promote the various aspects of the recent amendments to Section 3103 of the 1994 PA 451, as amended, (Michigan Public Act 114 of 2001) regarding ballast water reporting and treatment technology determination as a model for legislation and policy in the other Great Lakes states to reduce the economic and environmental impacts of aquatic nuisance species in Michigan.

The passage of legislation in other Great Lakes states will lead to an approved technology to treat ballast water, create the impetus for federal action, and provide incentive to develop one central reporting point that can disseminate information to the states. Michigan's legislation can be found at:

http://www.michigan.gov/deq/0,1607,7-135-3307_3667_8278---,00.html

Activity A: Pursue further investigation/discussion/research on the use of biocides or other treatment technologies as an interim solution, with zero aquatic nuisance species introductions as the final goal. Undertake the necessary studies to enable the MDEQ to definitively identify ballast water treatment

technologies that can be determined by the MDEQ to be effective and implementable for ballast water control in new and present ships.

Activity B: Support national and international efforts to develop ballast water discharge standards with consideration of legal authority, economic impact on shippers, ports and general trade, and practical management considerations such as controls on sediment discharge.

Objective 3: Develop a risk assessment process for potential and existing aquatic nuisance species.

This process would include “watch lists” of Michigan waters and aquatic nuisance species organisms to assist in the control and spread of aquatic nuisance species to reduce the economic and environmental impacts of aquatic nuisance species in Michigan.

Activity A: Develop a system based on risk assessment to evaluate the potential intentional introductions of species into Michigan waters. This would include identification of pathways for introduction and identification of waters vulnerable to future aquatic nuisance species introductions. This system could be similar to existing efforts by the U.S. Fish and Wildlife Service and the Michigan Department of Agriculture.

Activity B: Develop a “watch list” of plant and animal species that may have negative economic or ecological impacts. This list would assist in focusing resources on the control and spread of aquatic nuisance species and would help minimize economic and ecological impacts. Examples include the snakehead fish recently found in other states as well as the plant hydrilla already a serious pest in the south.

Activity C: Develop a list of waters where additional assistance would potentially reduce the spread of aquatic nuisance species. This list would assist in focusing resources for the control and spread in areas where these resources can be of most benefit. This list should focus on areas where threatened/endangered species have been identified; would assist in focusing resources on the control and spread of aquatic nuisance species; and would help minimize economic and ecological impacts.

Objective 4: Consider establishment of a regional aquatic nuisance species “Rapid Response Team” for areas identified as having new infestations of aquatic nuisance species or are threatened by potential introductions.

Because new aquatic nuisance species are expected to be introduced in Michigan waters in the future, it is important for there to be a mechanism in place for early response to new introductions. Any early response effort would

hopefully reduce the potential economic and ecological impacts of future aquatic nuisance species introductions.

Activity A: Currently the Great Lakes Commission is developing a conceptual rapid response” proposal for the Great Lakes region. The state should work with the Great Lakes Commission in the on-going development of the rapid response plan for the Great Lakes region.

Activity B: Using models such as the Great Lakes Commission’s conceptual rapid response plan, the state should consider development of a process and procedures to help guide rapid response decision making in Michigan. This consideration should include efforts to evaluate the potential value, role, and future implementation efforts needed.

Activity C: An important component of a rapid response effort is the identification of legal authority of a “Rapid Response Team.” The state should undertake an evaluation of the legal authority within Michigan for operation of a rapid response team with consideration of factors such as state and local control of water resources and sensitivity to property rights.

Activity D: Any rapid response effort requires the ability to accurately identify aquatic nuisance species. The state should work with other partners within the state to increase training for aquatic nuisance species identification.

Activity E: Develop an active risk assessment process to assist in the decision-making process regarding potential rapid response actions.

Objective 5: Support regional efforts for prevention and control of aquatic nuisance species to minimize the economic and environmental impacts of aquatic nuisance species.

Many governmental entities (state, federal, and local) are undertaking efforts to control the introduction of new aquatic nuisance species to their area. Michigan cannot isolate itself from the regional impacts of aquatic nuisance species. There is clearly a potential interstate impact of individual state and local decisions and practices with regard to controlling the spread of aquatic nuisance species, yet there is also clearly an issue of Michigan’s responsibility to protect our Great Lakes ecosystem.

Activity A: Explore development of an interstate decision-making protocol for aquatic nuisance species management. This could possibly be accomplished through the efforts of the Council of Great Lakes Governors, Great Lakes Commission or other regional entity.

Activity B: Pursue better regional coordination for efforts involving the U.S. Congress, Coast Guard, Army Corps of Engineers, the International Maritime Organization, other federal and international stakeholders.

Activity C: Continue to coordinate efforts between states, Great Lakes Panel and the Council of Great Lakes Governors on ballast water control efforts.

Activity D: Support creation of a new Great Lakes legislative effort to create an aggressive basin-wide aquatic nuisance species program implemented at the state, provincial and federal level.

Activity E: Support efforts of the Council of Great Lakes Governors to establish a regional decision making process at the multi-jurisdictional, basin-wide level for the purpose of establishing and implementing prevention and control policies and programs, including procedures for emergency response to new or threatened introductions. An example is support for operation of the electrical barrier in the Chicago Diversion.

Activity F: Support the actions of Congress in the process of reauthorizing the National Invasive Species Act and other federal actions to address the control and prevention of aquatic nuisance species.

Information and Education

Information and education efforts are at the forefront of prevention and control of aquatic nuisance species. Many long-term goals are best achieved through education because direct regulation can be of limited effectiveness for such a diffuse problem. Information can change behaviors under many circumstances, especially when the public sees direct benefit and direct costs. The effects of aquatic nuisance species such as Eurasian watermilfoil and zebra mussels are clearly seen.

Recommendations from the Information and Education Committee

Goal I: The prevention of the accidental introduction and dispersal of aquatic nuisance species into, within and from Michigan's waters through implementation of information and education activities.

Objective 1: Ensure that all recreational boaters take action to prevent the introduction and dispersal of aquatic nuisance species.

Activity A: Distribute existing I/E resources targeted to recreational boaters through the following channels: 1) marine safety certificate and watercraft examinations; 2) boat manufacturers' owners' manuals; 3) marine dealers; 4) state boat registration materials; 5) power squadron courses; 6) personal

watercraft training; 7) boat show displays and sport shows; 8) sheriff marine department; 9) Michigan Lakes and Streams Association; 10) Michigan Boating Association; 11) agricultural shows; 12) state parks; 13) licensing agents; 14) fishing competitions; 15) trade shows, etc.

Activity B: Develop an aquatic nuisance species curriculum to be included in training manuals for marine safety certificates, personal watercraft training, and other relative licensing programs including minimal level of proficiency of species identification and removal from equipment.

Activity C: Distribute standardized signs and billboards to deliver the message on aquatic nuisance species at waterfront areas and along major transportation routes used by boaters. In addition, develop a sign that identifies which species have been confirmed by county.

Activity D: Implement regional boat-wash demonstrations and/or inspections to show boaters how to prevent the spread of aquatic nuisance species on their boats. To impede the spread to inland waters, target areas where there is high traffic between Great Lakes basin and inland waters. Demonstrations should be conducted at public accesses or infested waters.

Activity E: Include information about aquatic nuisance species in state/provincial fishing regulations.

Activity F: Develop and distribute television and radio public service announcements about aquatic nuisance species to draw attention to the issue and provide precautions that boaters should take to prevent further spread.

Activity G: Notify tourism related industries, such as travel agencies and resorts, of the informational materials available for distribution and/or posting.

Activity H: Develop I/E materials that will help pave the way for appropriate laws to be enacted that will reduce the risk of aquatic nuisance introduction and spread.

Objective 2: Ensure that all permitted aquaculture operators, bait dealers, aquarium hobbyists, commercial fishers, and other resource harvesters, take action to prevent the introduction and dispersal of aquatic nuisance species.

Activity A: Distribute informational materials and regulations about aquatic nuisance species to permitted aquaculture operators, bait dealers, aquarium hobbyists, commercial anglers, and other resource harvesters in Michigan.

Objective 3: Continue supporting USFWS efforts to encourage and foster voluntary compliance with the ruffe control activities on Lake Superior.

Activity A: Develop a public outreach program (i.e. public meetings, video, brochures) to gain public understanding and support for proposed ruffe control activities.

Goal II: Statewide coordination of information dissemination regarding aquatic nuisance species programs involving prevention, control, monitoring, research, education, policy and other related activities.

Objective 1: Provide coordinated, non-conflicting outreach programming to the public and private sector regarding aquatic nuisance species issues to eliminate duplication of efforts, efficiently use limited financial resources, and to be consistent in the message being delivered.

Activity A: Conduct an inventory to determine the status of existing outreach resources and to identify the gaps. Based on inventory findings, provide guidance (i.e. policy statements) to agencies, institutions and organizations that 1) support coordination of existing outreach resources, and 2) assist in planning efforts regarding the development of future outreach programming.

Activity B: Training sessions for educators/information providers “Train the Trainers” in formal and non-formal settings using PowerPoint presentations.

Activity C: Evaluate I/E materials and distribution methods for outreach programs targeted to Great Lakes user groups. Assemble and review all existing fact sheets and related materials; identify and fill gaps; assess effectiveness of distribution mechanisms; and explore and pursue opportunities to combine disparate fact sheets into I/E “kits” for broad distribution.

Activity D: Develop an aquatic nuisance species display and a single “kit” that contains materials for user groups, i.e. teachers, garden clubs, general public, museums, science centers, etc.

Activity E: Develop aquatic nuisance species curriculum to be used in various educational programs, i.e. Adventure Ranger Program, Master Gardener program, and K-12 teachers.

Activity F: Develop newsletter inserts for user groups.

Activity G: Produce slide show, PowerPoint and/or video to raise awareness among Great Lakes Basin residents on the aquatic nuisance species problem.

Activity H: Provide web access to aquatic nuisance species information.

Objective 2: Strengthen existing lines and establish new lines of communication between agencies, institutions, and organizations to effectively disseminate information on aquatic nuisance species activities between agencies, institutions

and organizations.

Activity A: Utilize an Aquatic Nuisance Species Council as a tool to coordinate information dissemination and to discuss needed actions.

Objective 3: Provide access to current information regarding aquatic nuisance species contacts and their roles from all state, provincial, tribal and federal governments and other organizations participating in aquatic nuisance prevention and control.

Activity A: Develop a database on aquatic nuisance species and the role of each stakeholder in addressing the aquatic nuisance species problem that would be accessible “on line.”

Activity B: Evaluate the need for a regional contact list.

Goal III: The active involvement of Great Lakes regional policymakers and user groups in the promotion of aquatic nuisance prevention and control programs.

Objective 1: Educate decision-makers on the irreversible economic and ecological impacts caused by aquatic nuisance species infestation in the Great Lakes and the need for significant increased attention to prevent future introductions.

Activity A: Develop and implement an outreach strategy that will frame aquatic nuisance species issues to address the agenda priorities of elected officials and policymakers pivotal in establishing the legislative mandates and funding necessary to develop and implement regional solutions to the aquatic nuisance species problem. An important step in developing this strategy is determining the type of economic, ecological and social information that would gain the support of policymakers in their decisions regarding aquatic nuisance species issues.

Activity B: Develop an informational brochure targeting legislators and other elected officials throughout Michigan that would introduce legislators to the magnitude and urgency of the issue, economic and environmental aspects, current legislative and program initiatives, and agencies and individuals to contact for more information.

Activity C: Designation of an annual Aquatic Nuisance Species Awareness Week in the spring.

Goal IV: Provide adequate resources to implement Michigan’s Information/Education Strategy for Aquatic Nuisance Prevention and

Control.

Objective 1: Promote collaboration among agencies to support the I/E strategy.

Activity A: Collaborative arrangements for I/E strategy implementation among relevant state and federal agencies. In consultation with those collaborators, develop a scope of work for each activity that maximizes and coordinates financial resources and/or in-kind contributions.

Research and Monitoring

Research and monitoring related to aquatic nuisance species provides the science-based information needed to prevent their introduction and spread as well as mitigate their impacts on other species. Monitoring provides evaluation of management actions and policies as well as forecasting for the future. Prevention is the first line of defense against aquatic nuisance species in Michigan. Control of aquatic nuisance species already present in Michigan is the second line of defense against ecological and economic harm caused by aquatic nuisance species. Data on ecological, economic, and health effects should support management decisions. The following activities are recommended to be developed into research proposals for various sources of funding.

Recommendations from the Research and Monitoring Committee

Goal I: Provide high quality information for policy decisions, legislation, educational efforts, and regulatory work regarding aquatic nuisance species prevention, control, and effects in Michigan.

Objective 1: Support specific research and monitoring for aquatic nuisance species **prevention**.

Activity A: Evaluate effectiveness of ballast water best management practices.

Activity B: Evaluative effectiveness of ballast water treatments.

Activity C: Provide scientific support for ballast water standards such as those under development by the U.S. Coast Guard.

Activity D: Monitor for new invasives based on specific locations and species to provide data for rapid response.

Activity E: Conduct research on resting stage and probabilities for establishment by species.

Activity F: Develop a hot list of potential invasives with locations/characteristics and probabilities.

Activity G: Conduct a boater and angler survey to determine the best way to implement methods of preventing spread of aquatic nuisance species.

Objective 2: Support specific research and monitoring for aquatic nuisance species **control**.

Activity A: Conduct targeted biological research on control points for reducing potential aquatic nuisance species invasions (what are vulnerabilities of species; ex. Sea lamprey pheromones).

Activity B: Conduct research on pesticide controls for both plants and animals.

Activity C: Conduct research on physical controls for both plants and animals.

Activity D: Conduct research on social/political/economic acceptability of control options.

Activity E: Conduct inland lake aquatic nuisance species treatment effectiveness studies to improve treatment/response using targeted biological research and factoring in lake physical characteristics.

Objective 3: Support specific research and monitoring on aquatic nuisance species **effects**.

Activity A: Conduct food web disruption studies, including mechanisms and trophic levels. (More than simple population studies).

Activity B: Conduct research on effects of aquatic nuisance species on water quality.

Activity C: Support research on Great Lakes Region aquatic nuisance species exports.

Activity D: Conduct fish disease transport research.

Activity E: Support research on human health issues from pathogen transport.

Activity F: Conduct research on potential effects of aquatic nuisance species identified as possible invaders of Michigan's aquatic ecosystems.

Objective 4: Determine potential invasive risks of genetically modified aquatic plants and fish to Michigan's aquatic ecosystems and to aquaculture and sport fishing.

Activity: A: Conduct research on invasive characteristics of genetically modified aquatic plants and animals.

Goal II: Provide collaborative networks and resources for research and monitoring activities regarding aquatic nuisance species in Michigan.

Objective 1: Build capacity in Michigan for aquatic nuisance species data and quality scientific research by promoting data availability and collaboration among agencies, researchers, and industry. This will increase the efficiency and usefulness of information and technology transfer in decision-making.

Activity A: Coordinate data and mapping to improve availability and utility of information.

Activity B: Apply new concepts from other disciplines to aquatic nuisance species (ex. nano-biology and DNA matrix research) to improve capacity for identification of problems and solutions.

Activity C: Support collaboration on projects and data sharing among research entities.

Activity D: Evaluate and strengthen lines of communication (networks, publications, meetings/conferences, etc.) used by aquatic nuisance species researchers to facilitate information transfer regarding aquatic nuisance species research needs and findings.

Activity E: Support enhanced use of the Great Lakes-St. Lawrence Research Inventory, developed by the Council of Great Lakes Research Managers, International Joint Commission (IJC). Work with the IJC staff to expand the aquatic nuisance species component of its research inventory, provide input from Michigan's perspective, and promote its use as a coordination tool among researchers, managers, and policy makers.

Objective 2: Build capacity in Michigan for aquatic nuisance species research funding by coordination and collaboration among agencies, researchers, and industry for funding aquatic nuisance species research and monitoring.

Activity A: Evaluate private entity funding with user fees/port charges (ex. California), boater registration fees, partial gas tax, etc. for aquatic nuisance species research. Funding would be specific to species or issues, as appropriate, including sea lamprey, ballast water, and inland lakes research, among others. Review actions in other states along these lines.

Activity B: Evaluate Supplemental Environmental Projects (settlement) funding for research, including in-kind or cash account funds.

Activity C: Encourage public and private grant programs to focus on aquatic nuisance species in requests for proposals.

IV. Implementation Tables

The following implementation tables summarize the narrative descriptions of recommended actions in the section above. The Lead and Cooperators are listed generally by state, federal, regional, non-governmental organization (NGO), university, and private. A list of representative entities for each category follows the tables.

Legislation and Policy Implementation

Legislative and Policy Goal: Coordinate the necessary policies and enact the necessary legislation to reduce the economic and environmental impacts of aquatic nuisance species in Michigan.

<i>Actions</i>	<i>Lead*</i>	<i>Cooperators*</i>
Objective 1: Coordinate Michigan’s policies dedicated to aquatic nuisance species control to reduce the economic and environmental impacts of aquatic nuisance species in Michigan.		
<u>Activity A</u> : Appoint/create an aquatic nuisance species Coordinator for the implementation of aquatic nuisance species activities within state government.	State	
<u>Activity B</u> : Appoint/create a Michigan Aquatic Nuisance Species Council through executive order.	State	
<u>Activity C</u> : Through the aquatic nuisance species Council, the state should undertake efforts to better coordinate activities between the state and Great Lakes Panel on Aquatic Nuisance Species and to develop mechanisms to implement findings of the Panel in Michigan.	State	Regional
<u>Activity D</u> : Increase coordination and cooperation between state government agencies in the efforts to prevent and control the spread of aquatic nuisance species within the state.	State	
Objective 2: Promote the various aspects of the recent amendments to Section 3103 of the NREPA 1994 PA 451, as amended, (Michigan Public Act 114 of 2001) regarding ballast water reporting and treatment technology determination as a model for legislation and policy in the other Great Lakes states		
<u>Activity A</u> : Pursue further investigation, discussion, and research on the use of biocides or other treatment technologies as an interim solution, with zero aquatic nuisance species introductions as the final goal.	State	Federal, Private

<u>Activity B</u> : Support national and international efforts to develop ballast water discharge standards with consideration of legal authority, economic impact on shippers, ports and general trade, and practical management considerations such as controls on sediment discharge.	Federal	Private
Objective 3: Develop a risk assessment process for potential and existing aquatic nuisance species.		
<u>Activity A</u> : Develop a system based on risk assessment to evaluate the potential intentional introductions of species into Michigan waters.	State	NGO
<u>Activity B</u> : Develop a “watch list” of plant and animal species that may have negative economic or ecological impacts.	State	Federal, NGO
<u>Activity C</u> : Develop a list of waters where additional assistance would potentially reduce the spread of aquatic nuisance species.	State	NGO, Federal
Objective 4: Consider establishment of a regional aquatic nuisance species “Rapid Response Team” for areas identified as having new infestations of aquatic nuisance species.		
<u>Activity A</u> : The state should work with the Great Lakes Commission in the on-going development of the rapid response plan for the Great Lakes region.	Regional	State
<u>Activity B</u> : Using models such as the Great Lakes Commission’s conceptual rapid response plan, the state should consider development of a process and procedures to help guide rapid response decision making in Michigan.	State	Regional
<u>Activity C</u> : The state should undertake an evaluation of the legal authority within Michigan for operation of a rapid response team with consideration of factors such as state and local control of water resources and sensitivity to property rights.	State	
<u>Activity D</u> : The state should work with other partners within the state to increase training for aquatic nuisance species identification	State	Regional, NGO
<u>Activity E</u> : Develop an active risk assessment process to assist in the decision-making process regarding potential rapid response actions.	State	
Objective 5: Support regional efforts for prevention and control of aquatic nuisance species to minimize the economic and environmental impacts of aquatic nuisance species.		
<u>Activity A</u> : Explore development of an interstate decision-making protocol for aquatic nuisance species management.	Regional	

<u>Activity B</u> : Pursue better regional coordination for efforts involving the U.S. Congress, Coast Guard, Army Corps of Engineers, the International Maritime Organization, other federal and international stakeholders.	Federal	
<u>Activity C</u> : Continue to coordinate efforts between states, Great Lakes Panel and the Council of Great Lakes Governors ballast water control efforts.	Regional	
<u>Activity D</u> : Support creation of a new Great Lakes legislative effort to create an aggressive basin-wide aquatic nuisance species program implemented at the state, provincial and federal level.	Regional	State, Federal
<u>Activity E</u> : Support efforts of the Council of Great Lakes Governors to establish a regional decision making process at the multi-jurisdictional, basin-wide level for the purpose of establishing and implementing prevention and control policies and programs, including procedures for emergency response to new introductions.	Regional	
<u>Activity F</u> : Support the actions of Congress in the process of reauthorizing the National Invasive Species Act and other federal actions to address the control and prevention of aquatic nuisance species	Federal	Regional

Information and Education Implementation

Goal I: The prevention of the accidental introduction and dispersal of aquatic nuisance species into, within and from Michigan's waters through implementation of I/E activities.

Goal II: Statewide coordination of information dissemination regarding aquatic nuisance species programs involving prevention, control, monitoring, research, education, policy and other related activities

Goal III: The active involvement of Great Lakes regional policymakers and user groups in the promotion of aquatic nuisance prevention and control programs.

Goal IV: Provide adequate resources to implement Michigan's Information/Education Strategy for Aquatic Nuisance Prevention and Control.

<i>Actions</i>	<i>Lead*</i>	<i>Cooperators*</i>
<i>Goal I: The prevention of the accidental introduction and dispersal of aquatic nuisance species into, within and from Michigan's waters through implementation of I/E activities.</i>		
Objective 1: Ensure that all recreational boaters take action to prevent the introduction and dispersal of aquatic nuisance species.		

<u>Activity A</u> : Distribute existing I/E resources targeted to recreational boaters through the multiple channels	State	Regional, University, NGO
<u>Activity B</u> : Develop an aquatic nuisance species curriculum to be included in training manuals for marine safety certificates, personal watercraft training, and other relative licensing programs including minimal level of proficiency of species identification and removal from equipment.	University	Regional
<u>Activity C</u> : Distribute standardized signs and billboards to deliver the “message” on aquatic nuisance species at waterfront areas and along major transportation routes used by boaters.	State	Federal
<u>Activity D</u> : Implement regional boat-wash demonstrations and/or inspections to teach boaters how to prevent the spread of aquatic nuisance species on their boats.	NGO	State
<u>Activity E</u> : Include information about aquatic nuisance species in state/provincial fishing regulations	State	
<u>Activity F</u> : Develop and distribute television and radio public service announcements about aquatic nuisance species to draw attention to the issue and provide precautions that boaters should take to prevent further spread.	State	
<u>Activity G</u> : Notify tourism related industries, such as travel agencies and resorts, of the informational materials available for distribution and/or posting.	State	Regional
<u>Activity H</u> : Develop I/E materials that will help pave the way for appropriate laws to be enacted that will reduce the risk of aquatic nuisance introduction and spread.	State	NGO, Federal, Regional
Objective 2: Ensure that all permitted aquaculture operators, bait dealers, aquarium hobbyists, commercial fishers, and other resource harvesters, take action to prevent the introduction and dispersal of aquatic nuisance species		
<u>Activity A</u> : Distribute informational materials and regulations about aquatic nuisance species to permitted aquaculture operators, bait dealers, aquarium hobbyists, commercial anglers, and other resource harvesters in Michigan.	Private	State
Objective 3: Continue supporting USFWS efforts to encourage and foster voluntary compliance with the ruffe control activities on Lake Superior		
<u>Activity A</u> : Develop a public outreach program (i.e. public meetings, video, brochures) to gain public understanding and support for proposed ruffe control activities	State	
Goal II: Statewide coordination of information dissemination regarding aquatic nuisance species programs involving prevention, control, monitoring, research, education, policy and other related activities		

Objective 1: Provide coordinated, non-conflicting outreach programming to the public and private sector regarding aquatic nuisance species issues to eliminate duplication of efforts, efficiently use limited financial resources, and to be consistent in the message being delivered		
<u>Activity A:</u> Conduct an inventory to determine the status of existing outreach resources and to identify the gaps.	Regional	State
<u>Activity B:</u> Training sessions for educators/information providers "Train the Trainers" in formal and non-formal settings using Powerpoint presentations.	Regional	State
<u>Activity C:</u> Evaluate I/E materials and distribution methods for outreach programs targeted to Great Lakes user groups.	State	Regional
<u>Activity D:</u> Develop an aquatic nuisance species display and a single "kit" that contains materials for user groups i.e teachers, garden clubs, general public, museums, science centers, etc.	Regional	State
<u>Activity E:</u> Develop aquatic nuisance species curriculum to be used in various educational programs i.e. Adventure Ranger Program, Master Gardener program, teachers.	Regional	State
<u>Activity F:</u> Develop newsletter inserts for user groups.	State	
<u>Activity G:</u> Produce slide show, Powerpoint and/or video to raise awareness among Great Lakes Basin residents on the aquatic nuisance species problem	State	
<u>Activity H:</u> Provide web access to aquatic nuisance species information.	State	Regional. Federal
Objective 2: Strengthen existing lines and establish new lines of communication between agencies, institutions, organizations to effectively disseminate information on aquatic nuisance species activities between agencies, institutions and organizations.		
<u>Activity A:</u> Utilize an aquatic nuisance species Council as a tool to coordinate information dissemination and to discuss needed actions.	State	
Objective 3: Provide access to current information regarding aquatic nuisance species contacts and their roles from all state, provincial, tribal and federal governments and other organizations participating in aquatic nuisance prevention and control.		
<u>Activity A:</u> Develop a database on aquatic nuisance species and the role of each stakeholder in addressing the aquatic nuisance species problem that would be accessible "on line."	Regional	State
<u>Activity B:</u> Evaluate the need for a regional contact list.	Regional	

Goal III: The active involvement of Great Lakes regional policymakers and user groups in the promotion of aquatic nuisance prevention and control programs.		
Objective 1: Educate decision-makers on the irreversible economic and ecological impacts caused by aquatic nuisance species infestation in the Great Lakes and the need for significant increased attention to prevent future introductions		
<u>Activity A</u> : Develop and implement an outreach strategy that will frame aquatic nuisance species issues to address the agenda priorities of elected officials and policymakers pivotal in establishing the legislative mandates and funding necessary to develop and implement regional solutions to the aquatic nuisance species problem.	State	
<u>Activity B</u> : Develop an informational brochure targeting legislators and other elected officials throughout Michigan that would introduce legislators to the magnitude and urgency of the issue, economic and environmental aspects, current legislative and program initiatives, and agencies and individuals to contact for more information.	State	
<u>Activity C</u> : Designation of an annual aquatic nuisance species Awareness Week.	State	
Goal IV: Provide adequate resources to implement Michigan's Information/Education Strategy for Aquatic Nuisance Prevention and Control.		
Objective 1: Promote collaboration among agencies to support the I/E strategy.		
<u>Activity A</u> : Collaborative arrangements for I/E strategy implementation among relevant state and federal agencies. In consultation with those collaborators, develop a scope of work for each <u>Activity</u> that maximizes and coordinates financial resources and/or in-kind contributions	State	Federal, Regional, NGO

Research and Monitoring Implementation

Goal I: Provide high quality information for policy decisions, legislation, educational efforts, and regulatory work regarding aquatic nuisance species prevention, control, and effects in Michigan.

Goal II: Provide collaborative networks and resources for research and monitoring activities regarding aquatic nuisance species in Michigan.

Actions	Lead*	Cooperators*
Goal I: Provide high quality information for policy decisions, legislation, educational efforts, and regulatory work regarding aquatic nuisance species prevention, control, and effects in Michigan.		

Objective 1: Support specific research and monitoring for aquatic nuisance species prevention.		
<u>Activity A</u> : Evaluate effectiveness of ballast water best management practices	Private	Federal, State, University
<u>Activity B</u> : Evaluate effectiveness of ballast water treatments	Private	Federal, State, University
<u>Activity C</u> : Provide scientific support for ballast water standards such as those under development the U.S. Coast Guard	University	Federal
<u>Activity D</u> : Monitor for new invasives based on specific locations and species to provide data for rapid response	State	Federal, NGO
<u>Activity E</u> : Conduct research on resting stage and probabilities for establishment by species	University	
<u>Activity F</u> : Develop a hot list of potential invasives with locations/characteristics and probabilities	State	Federal, NGO, University
<u>Activity G</u> : Conduct a boater and angler survey to determine the best way to implement methods of preventing spread of aquatic nuisance species	University	
Objective 2: Support specific research and monitoring for aquatic nuisance species control.		
<u>Activity A</u> : Conduct targeted biological research on control points for reducing potential aquatic nuisance species invasions (What are vulnerabilities of species; ex. Sea lamprey pheromones)	University	
<u>Activity B</u> : Conduct research on pesticide controls for both plants and animals	University	State, Federal
<u>Activity C</u> : Conduct research on physical controls for both plants and animals	University	State, Federal
<u>Activity D</u> : Conduct research on social/political/economic acceptability of control options	University	
<u>Activity E</u> : Conduct Inland lake aquatic nuisance species treatment effectiveness studies to improve treatment/response using targeted biological research and factoring in lake physical characteristics	State	University
Objective 3: Support specific research and monitoring on aquatic nuisance species effects.		
<u>Activity A</u> : Conduct food web disruption studies, including mechanisms and trophic levels.	University	
<u>Activity B</u> : Conduct research on effects of aquatic nuisance species on water quality	State	

<u>Activity C</u> : Support research on Great Lakes Region aquatic nuisance species exports.	Regional	Federal
<u>Activity D</u> : Conduct fish disease transport research	University	
<u>Activity E</u> : Support research on human health issues from pathogen transport	University	
<u>Activity F</u> : Conduct research on potential effects of aquatic nuisance species identified as possible invaders of Michigan's aquatic ecosystems.	State	University
Objective 4: Determine potential invasive risks of genetically modified aquatic plants and fish to Michigan's aquatic ecosystems and to aquaculture and sport fishing.		
<u>Activity A</u> : Conduct research on invasive characteristics of genetically modified aquatic plants and animals.	University	
Goal II: Provide collaborative networks and resources for research and monitoring activities regarding aquatic nuisance species in Michigan.		
Objective 1: Build capacity in Michigan for aquatic nuisance species data and quality scientific research by promoting data availability and collaboration among agencies, researchers, and industry to increase the efficiency and usefulness of information and technology transfer in decision-making.		
<u>Activity A</u> : Coordinate data and mapping to improve availability and utility of information	Regional	Federal
<u>Activity B</u> : Apply new concepts from other disciplines to aquatic nuisance species (ex. nano-biology and DNA matrix research) to improve capacity for identification of problems and solutions	University	
<u>Activity C</u> : Support collaboration on projects and data sharing among research entities	Regional	State
<u>Activity D</u> : Evaluate and strengthen lines of communication (networks, publications, meetings/conferences, etc.) used by aquatic nuisance species researchers to facilitate information transfer regarding aquatic nuisance species research needs and findings.	University	Regional
<u>Activity E</u> : Support enhanced use of the Great Lakes-St. Lawrence Research Inventory, developed by the Council of Great Lakes Research Managers, International Joint Commission	Regional	Federal
Objective 2: Build capacity in Michigan for aquatic nuisance species research funding by coordination and collaboration among agencies, researchers, and industry for funding aquatic nuisance species research		

<p><u>Activity A:</u> Evaluate private entity funding with user fees/port charges (ex. California), boater registration fees, partial gas tax, etc. for aquatic nuisance species research. Funding would be specific to species or issues, as appropriate, including sea lamprey, ballast water, and inland lakes research, among others. Review actions in other states along these lines.</p>	State	
<p><u>Activity B:</u> Evaluate Supplemental Environmental Projects (settlement) funding for research, including in-kind or cash account funds.</p>	State	
<p><u>Activity C:</u> Encourage public and private grant programs to focus on aquatic nuisance species in requests for proposals</p>	State	NGO, Federal

* Lead and Collaborator for Implementation:

State

- Department of Environmental Quality
- Department of Natural Resources
- Department of Agriculture

Federal

- Fish and Wildlife Service
- Environmental Protection Agency: Great Lakes National Program Office
- Geological Survey
- Army Corps of Engineers
- National Oceanographic and Atmospheric Administration
- Coast Guard
- National Park Service

Regional

- Great Lakes Commission
- Great Lakes Fisheries Commission
- Council of Great Lakes Governors
- Northeast-Midwest Institute
- Great Lakes Protection Fund

Non-Governmental Organization (NGO)

- The Nature Conservancy-Michigan Chapter
- Michigan United Conservation Clubs

Private

- Lake Carriers Association
- U.S. Great Lakes Shipping Association
- Michigan Aquaculture Association
- Michigan Bait Dealers Association
- Michigan Lake and Stream Association

University

- Michigan State University Extension
- Michigan Sea Grant College Program
- Research Departments

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Appendix A: Michigan's ANS Action Team

Michigan's Aquatic Nuisance Species Action Team

Russell J. Harding, Director
Michigan Department of
Environmental Quality

K.L. Cool, Director
Michigan Department of
Natural Resources

Dan Wyant, Director
Michigan Department
Agriculture

Facilitated by:

David K. Ladd, Director
Office of the Great Lakes

Committees:

Legislation and Policy
Jim Bredin, Chair

Information and Education
Emily Finnell, Chair

Research and Monitoring
Roger Eberhardt, Chair

Update prepared by Office of the Great Lakes Staff:

Roger Eberhardt
Jim Bredin
Emily Finnell

For further information contact:

Roger Eberhardt
Office of the Great Lakes
P.O. Box 30473
Lansing, Michigan, 48909
517-335-4227
eberharr@michigan.gov

October 2002

Appendix B. Stakeholders and Web Sites

Aquatic Nuisance Species Task Force

www.invasivespecies.gov/council/main.shtml

The Task Force is co-chaired by the Fish and Wildlife Service and the National Oceanographic and Atmospheric Administration to coordinate actions to address aquatic nuisance species nationally.

Chippewa-Ottawa Resource Authority

www.1836cora.org

Fisheries research related to the 1836 treaty is one of the mandates of CORA.

Council of Great Lakes Governors Ballast Water Task Force

www.cglg.org

The Council was created by the governors of the 8 Great Lake states in 2000 to advise the governors on ballast water management and treatment.

Great Lakes Fisheries Commission

www.glfc.org

Sea lamprey control and fisheries management coordination for each of the Great Lakes are activities of the Great Lakes Fisheries Commission.

Great Lakes Panel on Aquatic Nuisance Species

www.glc.org/ans/anspanel.html

The Great Lakes Panel is one of several regional panels authorized under NISA to address aquatic nuisance species on a multi-state basis.

Great Lakes Protection Fund

www.glpf.org (regional)

http://www.michigan.gov/deq/0,1607,7-135-3313_3677_3699---,00.html
(Michigan)

The Protection Fund is a both a regional and state-specific source of funding for a wide variety of Great Lakes research, including aquatic nuisance species.

International Joint Commission

www.ijc.org

The IJC advises the governments of Canada and the United States on implementation of the Great Lakes Water Quality Agreement and regulates water quantity issues between the two nations under the Boundary Waters Treaty.

Lake Carriers Association

www.lcaships.com

A professional association of ship owners and other Great Lakes shipping interests.

Michigan Department of Agriculture

www.michigan.mda

The MDA regulates agricultural programs, including aquaculture and terrestrial nuisance species.

Michigan Department of Environmental Quality

www.michigan.gov/deg

The MDEQ houses the regulatory programs for water, air, and land quality as well as a number of grant programs.

Michigan Department of Natural Resources

www.michigan.gov/dnr

The MDNR regulates the natural resources of the state, including fisheries and wildlife.

Michigan Lake and Stream Association

<http://www.mlswa.org/>

The MLSA provides communications and information for member lake associations.

Michigan's Office of the Great Lakes

www.michigan.gov/deg/0,1607,7-135-3313_3677_8314---,00.html

The Office of the Great Lakes coordinates some aspects of the aquatic nuisance species program in Michigan, including the ballast water reporting program and the Michigan Great Lakes Protection Fund.

Michigan Sea Grant College Program

www.miseagrant.org

Sea Grant plays a key role in extension, outreach, and education about aquatic nuisance species in Michigan.

National Invasive Species Council

www.invasivespecies.gov/council/main.shtml

The NISC was created by executive order to coordinate federal programs for all invasive species, both aquatic and terrestrial.

National Oceanographic and Atmospheric Administration

www.noaa.gov

NOAA funds the Sea grant program as well as key research entities for the Great Lakes including the Great Lakes Environmental Research Laboratory and Cooperative Institute for Limnology and Ecosystems Research.

Northeast-Midwest Institute

www.nemw.org

The Institute provides information and support to Congress on issues of the northeast and Midwest, including aquatic nuisance species legislation.

U.S. Army Corps of Engineers

www.usace.army.mil

Cooperators in many aquatic nuisance species control efforts, including construction of the electrical barrier in the Chicago ship canal and sea lamprey traps in their power canal at Sault Ste. Marie.

U.S. Coast Guard

www.usgc.mil

The Coast Guard is the federal agency assigned responsibility for enforcement of the ballast water regulations of NISA as well as development of ballast water standards for aquatic nuisance species.

U.S. Environmental Protection Agency

www.epa.gov/grtlakes

The Great Lakes National Program Office, U.S. EPA, provides funding each year for research and demonstration projects on exotics.

U.S. Fish and Wildlife Service

www.usfws.gov

The Fish and Wildlife Service co-chairs the Federal Task Force on Aquatic Nuisance Species and provides funding to states with aquatic nuisance species management plans for their control.

U.S. Geological Survey

www.usgs.gov

Mapping, monitoring, and research services at the Great Lakes Science Center are the primary function of the USGS related to aquatic nuisance species.

Appendix C. Acronyms

ANS Panel	Great Lakes Panel on Aquatic Nuisance Species
ANS	Aquatic Nuisance Species
CGLG	Council of Great Lakes Governors
EPA	United States Environmental Protection Agency
I/E	Information and education
IJC	International Joint Commission
GLC	Great Lakes Commission
GLFC	Great Lakes Fisheries Commission
MDA	Michigan Department of Agriculture
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MESB	Michigan Environmental Science Board
MGLPF	Michigan Great Lakes Protection Fund
MLSA	Michigan Lake and Stream Association
NGO	Non-governmental association
NISA	National Invasive Species Act
OGL	Office of the Great Lakes
P.A.	Public Act
RFP	Request for Proposals
USFWS	United States Fish and Wildlife Service

Appendix D. Michigan's ANS Laws

1978 PA 368	323.3101 - 323.3110	DEQ, Great Lakes Shoreland Section, Inland Lakes and Wetlands Unit
<p>The Land and Water Management Division administers a permit program for the chemical control of aquatic nuisance species in waters of the state. The permits are issued under the Public Health Code, 1978 PA 368, as amended and Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. The majority of the aquatic nuisance problems addressed through this program are nuisance aquatic plants, including the non-native plants Eurasian watermilfoil (<i>Myriophyllum spicatum</i>) and Curly leaf pondweed (<i>Potamogeton crispus</i>). It is estimated that approximately 50 percent of the permit applications received request chemical control of one or both of these plants. In addition to the permitting program, the LWMD provides information and assistance to individuals and groups regarding the prevention and control (chemical and non-chemical) of these nuisance exotic plants.</p>		
1978 PA 368	323.1097	DEQ, Great Lakes and Environmental Assessment Section
<p>The Surface Water Quality Division water quality standards program covers issuance of the Rule 97 Certificates of Approval for lamprey treatments, fish reclamation projects, blackfly control treatments, dye studies and other water resource management projects. Plans for lamprey treatments are reviewed and, where appropriate, Rule 97 Certificates of Approval are issued by the Chief of the Great Lakes and Environmental Assessment Section of the Surface Water Quality Division.</p>		
1994 PA 451 (2001 PA 114)	324.3101-3103a	DEQ, Office of the Great Lakes and Surface Water Quality Division
<p>The DEQ is to compile lists of local and foreign shippers that are in compliance with certain specified ballast water management practices or using ballast water treatment methods. The law encourages vessel owners/operators to voluntarily comply with ballast water management practices and with onboard treatment. The list will be distributed to companies with vessels for the transportation of cargo. Companies using vessels that are not listed would not be allowed grants, loans, or awards administered through the DEQ. The DEQ must also determine whether one or more ballast water treatments could be safely used to prevent future introductions of ANS into the Great Lakes while protecting the vessel, crew and passengers.</p>		
1995 PA 182	286.216a	Department of Agriculture
<p>This act regulates the sale and distribution of nursery stock, plants, and plant products. It prohibits the sale or distribution of purple loosestrife <i>Lythrum salicaria</i> throughout the state of Michigan. The director of the Department of Agriculture may approve cultivars that have been developed and recognized to be sterile. Cultivars of <i>Lythrum virgatum</i> such as rose queen and mordon gleam may be sold at retail.</p>		
1999 PA 451, Part 459	286.874	DNR, Fisheries Division
<p>The Game Fish in Private Waters Law controls the import of game fish for private use, requiring a license from the DNR. It prohibits the import of "...any other species of fish when the importation of such species would endanger the public fishery resources of this State." The restrictions are defined by rules, promulgated by the DNR Fisheries Division. Violation of this law is also a misdemeanor, and carries a 90-day jail term, \$100 fine or both as a maximum penalty.</p>		
1994 PA 451, Part 5	299.3, 299.3a, 16.109, 16.352	DNR, Fisheries Division

The DNR requires a Site Launch Site Special Use Permit for the use of state access sites for fishing and boating tournaments according to rules under the enabling legislation for the DNR, 1921 PA 17, now Part 5 of 1994 PA 451. The current rules do not contemplate potential cross-contamination of public waters with exotic species, so the restrictions are limited in purpose to public safety and protection of property. Follow the above recommended precautions when moving a boat from lake to lake.

1994 PA 487	324.48701-324.48740	DNR, Fisheries Division
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The Sport Fishing Law requires a license from the DNR for taking or possessing minnows, wigglers or crayfish for other than personal use. It prohibits the import and export to the state of these species without a license, and prohibits all import of minnows and wigglers that are not native to Michigan. It also prohibits the import of live game fish or eggs except with a permit and prohibits planting fish, fish fry, or spawn without a permit. Violation of the law is a misdemeanor and carries a 90-day jail term, \$500 fine, or both, as a maximum penalty.



Purple loosestrife

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U.S. Army Corps of Engineers
Roger Eberhardt, MDEQ
Minnesota Sea Grant

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Prepared by:
The Office of the Great Lakes
Michigan Department of Environmental Quality
P.O. Box 30473
Lansing, Michigan 48909
517-335-4056
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