Michigan's
Aquatic Invasive Species
State Management Plan Update

List of Appendices

Appendix A: Timeline of Significant AIS Events Relevant to Michigan

This timeline is not an all-inclusive/exhaustive list of events, but rather a snapshot of those events that have most significantly shaped aquatic invasive species management in the State of Michigan.

Date	Event
1829	The Welland Canal opens, connecting Lakes Ontario and Erie and allowing Great Lakes ships to bypass Niagara Falls.
1848	The Illinois and Michigan Ship Canal opens, creating a hydrological connection between the Mississippi River and Great Lakes basins. It was deepened in 1900 and renamed the Chicago Ship and Sanitary Canal.
1873	Alewife (*Alosa pseudoharengus*) are first recorded in Lake Ontario, though introduction probably occurred sometime prior.
1879	Purple Loosestrife (*Lythrum salicaria*) is collected in the Muskegon area, representing the oldest Michigan collection (Voss, 1985).
1900	The Federal Lacey Act is enacted, prohibiting the trade of certain plant and animal species.
1919	Mute swans are introduced to Michigan in Charlevoix County as an ornamental.
1920	Sea lamprey (*Petromyzon marinus*) are observed in Michigan portions of Lake Erie and the upper Great Lakes. The species entered the Great Lakes Basin via the Erie Canal sometime in the 1820's or 1830's. Some contend it is native to Lake Ontario.
1935	Cabomba (*Cabomba caroliniana*) or fanwort is reported as "abundant" in several Kalamazoo and St. Joseph County lakes, representing the earliest observations in Michigan (Voss, 1985).
1946	Curlyleaf pondweed (*Potamogeton cripsus*) is identified in the Little Traverse Bay of Lake Michigan in Emmet County (Voss, 1985).
1959	The St. Lawrence Seaway opens, connecting the Great Lakes to the Atlantic Ocean.
1970	Eurasian watermilfoil (*Myriophyllum spicatum*) is first officially recorded in Michigan, however it was likely present for many years prior to 1970 (Voss, 1985).
1974	The Federal Noxious Weed Act is enacted to address the spread of noxious weeds. It is later superseded, in part, in 2000 by the Plant Protection Act.
1984	The spiny water flea (*Bythotrephes cederstroemi/longimanus*) is first recorded in the Great Lakes (Lake Huron) (Bur et al., 1986).
1986	Starry stonewort (*Nitellopsis obtusa*) is identified in the Detroit River (Scloesser et al., 1986), the earliest known confirmation of this species in the state. The first confirmation in an inland lake occurs in 2006.
1988	The zebra mussel (*Dreissena polymorpha*) is discovered in Lake St. Clair. By the mid 1990's, the mussels had spread and researchers had started to document significant changes to the Great Lakes biological communities.
1989	The quagga mussel (*Dreissena bugensis*) is first recorded in the Great Lakes near Port Colborne, Lake Erie (USGS NAS: http://nas.er.usgs.gov/). By 2005, it was determined that the quagga had overtaken its formerly ubiquitous cousin, the zebra mussel, as the dominant mussel in Lake Michigan.
1990	The Federal Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA of 1990) is enacted.
1990	The round goby (*Neogobius melanostomus*) is first recorded in Michigan in the St. Clair River.
1991	The Great Lakes Panel on Aquatic Nuisance Species is established.
1994	Galerucella beetles are released in the Saginaw Bay area as a biological control for purple loosestrife.
1994	The amphipod *Echinogammarus ischnus* is discovered in the Detroit River.
1994	Eurasian ruffe (*Gymnocephalus cernuus*) is first recorded in Michigan from the Black and Ontonagon rivers in the Upper Peninsula (USGS NAS: http://nas.er.usgs.gov/)
1996	The National Invasive Species Act (NISA) of 1996 (now expired) reauthorizes the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990.

Date	Event
1996	The State of Michigan's first Aquatic Nuisance Species (ANS) State Management Plan (SMP) is developed and approved by the federal ANS Task Force.
1996	Commission Fish Order 193, entitled "Possession and Transportation of Exotic Species," is issued in 1996 and prohibits any person from possessing or transporting live Eurasian Ruffe (*Gymnocephalus cernuus*), tubenose goby (*Proterorhinus marmoratus*), and round goby (*Neogobius melanostomus*). Subsequent revisions in 2001, 2003 and 2007 prohibits individuals from possessing or transporting any of the following, including their eggs: black carp (*Mylopharyngodon piceus*), bighead carp (*Hypophthalmichtys nobilis*), silver carp (*Hypophthalmichtys molitrix*), largescale silver carp (*Hypophthalmichthys harmandi*) and all members of the snakehead family Channidae, genus Channa. The order will remain in effect through March 31, 2012.
1998	The State of Michigan develops and begins to distribute boat launch signs to alert boaters to the dangers of introducing aquatic nuisance species.
1999	A National Invasive Species Council is created by federal executive order to address all invasive species, both aquatic and terrestrial.
2000	The Council of Great Lakes Governors establishes a Ballast Water Task Force.
2001	Michigan enacts ballast water legislation that requires ships entering or using the Great Lakes to report to the DEQ annually on compliance with ballast water best management practices established by shipping associations and federations.
2002	The NISA expires.
2002	Michigan Executive Order No. 2002-21 creates the Aquatic Nuisance Species Coordinating Council. In 2009, Executive Order No. 2009-44 abolishes the Council.
2002	Michigan ANS SMP is updated.
2002-2004	Michigan Sea Grant develops additional AIS watch cards, including Eurasian watermilfoil, rusty crayfish, spiny and fishhook waterflea, European frogbit, bighead and silver carp, and Hydrilla.
2003	The first Aquatic Nuisance Species Awareness Week is proclaimed by Governor Jennifer Granholm to be the first week of June, 2003. An Awareness Week designation occurs annually thereafter.
2003	Michigan enacts Part 413, Transgenic and Nonnative Organisms, of the Natural Resources and Environmental Protection Act, Act 451 of 1994, as amended. It becomes effective on March 30, 2004. Part 413 is subsequently amended several times to update various aspects of the Act, including modifying the prohibited & restricted species lists and adding a section prohibiting placement of a boat, boating equipment, or trailer in waters of the state with aquatic plants attached.
2003	A muskellunge from Lake St. Clair becomes the earliest confirmed report of Viral hemorrhagic septicemia (VHS) in the Great Lakes, although it is likely to have been introduced in 2002 or 2003. By 2009, VHS was found in all of the Great Lakes. In 2007, Budd Lake in Clare County became the first inland lake in the state confirmed to be infected by VHS.
2004	Construction begins on the permanent electrical barrier in the Chicago Sanitary and Ship Canal to prevent spread of AIS (particularly Asian carp).
2004	Michigan drafts a Hydrilla Rapid Response Plan, a rapid response case study.
2004	The Michigan and Minnesota Sea Grant Programs team together to update their "Aquatic Invasive Species – Hazard Analysis and Critical Control Point Training Curriculum."
2004	The DNR Director issues Fisheries Order 227 entitled "Waters Open and Regulations Governing the Taking of Wigglers and Crayfish for Commercial Purposes" which prohibits the take, possession, or sale of rusty crayfish anywhere in the State of Michigan.
2005	The Great Lakes Regional Collaboration releases the "Strategy to Restore and Protect the Great Lakes," which has AIS as one of its focal areas.
2005	Michigan's Invasive Species Advisory Council, whose purview includes both aquatic and terrestrial invasive species, is created. In 2007, Executive Order No. 2007-14 abolishes the Council as part of a general downsizing of committees.
2005	The DEQ Director issues a final determination regarding ballast water treatment for ocean-going vessels.

Date	Event
2005	Michigan enacts legislation requiring all oceangoing vessels engaging in port operations to obtain a permit from the DEQ.
2006	Michigan issues state Ballast Water Control General Permit, which requires the treatment of ballast water discharges.
2006	Bloody red mysid (*Hemimysis anomala*) is discovered in Lake Michigan.
2006	Michigan Sea Grant and DEQ team up to adapt the Clean Boats, Clean Waters Program (developed by Wisconsin's Department of Natural Resources, UW-Extension and the Wisconsin Association of Lakes) for Michigan and created the manual, "Guidelines for Clean Boats, Clean Waters – Michigan's Aquatic Invasive Species Volunteer Program."
2007	DEQ, DNR, Ducks Unlimited and other partners joined forces to initiate the multi-year Saginaw Bay Phragmites Control and Restoration Demonstration Project to investigate various control strategies. The project spurs the development of several popular publications, including "A Landowner's Guide to Invasive Phragmites Control" and "A Guide to the Control and Management of Invasive Phragmites."
2008	The USEPA issues the Vessel General Permit, which includes ballast water requirements.
2008	The Midwest Invasive Species Information Network (MISIN), established at Michigan State University, goes online to serve as a database of invasive plant information and to geospatially track infestations.
2008	DEQ's Water Resources Division issues a General Permit for chemical control of certain invasive aquatic plants along the Great Lakes shoreline.
2008	DEQ hosts a public workshop, "Michigan's Call to Action on Aquatic Invasive Species." Over 80 stakeholders attended to discuss the various economic and environmental challenges caused by AIS.
2008	DEQ develops the Michigan Great Lakes Plan (MI-Great Lakes Plan) to protect, restore, and sustain the Great Lakes for current and future generations. More than 20 public meetings were held across the state and more than 2,000 citizens were ultimately involved in the review and comment process. One of the eight priority areas in the Plan is aquatic invasive species. The final Plan was released in January 2009.
2008-2009	The Great Lakes Commission, working with an advisory team of experts from government, businesses and conservation groups, holds a series of workshops aimed at addressing AIS introduction and spread through Organisms in Trade.
2009	DNR Wildlife Division, in cooperation with MNFI, finalizes its invasive species strategy, "Meeting the Challenge of Invasive Plants: A Framework for Action."
2010	The State of Michigan formally creates a multi-department AIS Program using federal grant funding and for the first time has a full-time AIS Program Coordinator.
2010	The multi-year, federal Great Lakes Restoration Initiative (GLRI) is initiated to address Great Lakes priorities, including AIS prevention, early detection, rapid response, and management. In the first year alone, public and private organizations in Michigan receive grants for a dozen projects focused on AIS, totaling almost twelve million dollars in funding.
2010	DNR Fisheries Division drafts the "Proposed Plan for the Prevention, Detection, Assessment, and Management of Asian Carps in Michigan Waters," and develops related outreach materials (e.g., fact sheets and identification guides) and reporting procedures.
2010	MDNR Wildlife Division is awarded a GLRI grant from the U.S. EPA to develop and test an early detection and rapid response program for six aquatic invasive plant species.
2010	The Lake Superior Binational Program drafts the Lake Superior Complete Prevention Plan (LSCPP), the first comprehensive plan to cover an entire Great Lake basin. The LSCPP was also among the first to focus attention on vectors and pathways, rather than individual species.
2011	The federal Asian Carp Prevention and Control Act (S. 1421) is signed into law and bighead carp is added to federal injurious wildlife list (Lacey Act). Also in 2011, the federal Asian Carp Regional Coordinating Committee releases the 2001 Asian Carp Control Strategy Framework.
2011	The Great Lakes Commission convenes a 3-day symposium to discuss coordinated and strategic management and control of invasive phragmites in Michigan. The symposium draws over 120 participants from across Michigan and the Great Lakes region.

Date	Event
2011	Michigan establishes an Aquatic Invasive Species Advisory Council. The 19-member group includes leaders from industry, conservation organizations, and state agencies.
2012	The Great Lakes Commission and the Great Lakes and St. Lawrence Cities Initiative releases their study, “Restoring the Natural Divide: Separating the Great Lakes and Mississippi River Basins in the Chicago Area Waterway System.”
2012	Michigan reissues the state ballast water control general permit.
2012	The National Park Service outfits the Ranger III with a ship-based ballast water treatment system, the first of its kind in the Great Lakes. The Ranger III provides access to Isle Royale via Houghton, Michigan.

Appendix B. Progress Toward Recommended Actions Identified in 2002 ANS Plan Update

In the 2002 ANS Update, the State of Michigan identified recommended actions in three broad categories: legislation and policy; information and education; and research and monitoring. Summary implementation tables were provided to complement the narrative text descriptions. For each recommended action, the 2002 ANS Update named the primary lead and cooperator organizations (a list of representative entities for each of these classifications follows the tables).

In this Appendix B, the original implementation tables from the 2002 ANS Update are provided, with two additional columns to summarize the progress on each recommended action. The purpose of this Appendix is to highlight accomplishments made since 2002, as well as identify gaps and incomplete progress which will guide future actions. In the majority of cases, progress has been made on the recommended actions. However, most actions are on-going in nature and cannot be considered "complete."

Legislation and Policy

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.

Table B-1. Status of Recommended Legislative and Policy Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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.				
Activity A: Appoint/create an aquatic nuisance species Coordinator for the implementation of aquatic nuisance species activities within state government.	State		Complete	Historically, staff from the MDEQ, Office of the Great Lakes served as the de facto state AIS coordinator, including representing the State of Michigan on the Great Lakes Panel on Aquatic Nuisance Species. In 2010, Michigan received a state AIS capacity grant from the U.S. Fish and Wildlife Service to create a full-time, dedicated Coordinator role, which is now housed within the MDEQ, Water Resources Division.
Activity B: Appoint/create a Michigan Aquatic Nuisance Species Council through executive order.	State		Complete	In 2002, Executive Order No. 2002-21 created the Aquatic Nuisance Species Coordinating Council. In 2009, Executive Order No. 2009-44 abolished the Council. In late 2011, a new Aquatic Invasive Species Advisory Council was created.

Table B-1. Status of Recommended Legislative and Policy Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
Activity C: 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	In Progress	The state continues to participate as a member of the Great Lakes Panel on Aquatic Nuisance Species.
Activity D: 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		In Progress	Historically, cooperation between the state agencies has been informal and minimally coordinated. In 2010, the state created an Aquatic Invasive Species Program, consisting of representatives from each of the relevant departments, divisions and programs within state government, using federal funding sources. Several staff representatives have full-time, dedicated AIS positions. Coordination and cooperation among state programs has improved considerably.
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				
Activity A: 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	In Progress	The research on the use of chlorine as a ballast water biocide in Michigan determined that it could be used as treatment technology, and two of the four approved treatments in the state's general permit are for chlorination of ballast water.
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.	Federal	Private	In Progress	Michigan has engaged with the U.S. EPA and the U.S. Coast Guard on issues of discharge standards and permitting for ballast water. The 2007 state ballast water control permit has been a driver in the regional discussions and the federal regulations.
Objective 3: Develop a risk assessment process for potential and existing aquatic nuisance species.				
Activity A: Develop a system based on risk assessment to evaluate the potential intentional introductions of species into Michigan waters.	State	NGO	In Progress	The Great Lakes Regional Collaboration and other regional efforts have sought to further the development of risk assessments and AIS screening tools for the Great Lakes basin. The University of Notre Dame and federal agencies have projects under way. State staff have contributed to these projects and related activities.

Table B-1. Status of Recommended Legislative and Policy Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
Activity B: Develop a "watch list" of plant and animal species that may have negative economic or ecological impacts.	State	Federal, NGO	Complete	In 2003, the Michigan Legislature enacted Part 413, Transgenic and Nonnative Organisms, of the Natural Resources and Environmental Protection Act, Act 451 of 1994, as amended. Section 41301 provides lists of prohibited and restricted species, which includes species that are not yet known to be present in the state. Part 413 has been amended several times since 2003.
Activity C: Develop a high risk list of ports and boat launches where additional assistance would potentially reduce the spread of aquatic nuisance species.	State	NGO, Federal	In Progress	Ports, harbors, marinas, and boat launches, and their users, are increasingly the focus of many aquatic invasive species prevention efforts and awareness campaigns.
Objective 4: Consider establishment of a regional aquatic nuisance species "Rapid Response Team" for areas identified as having new infestations of aquatic nuisance species.				
Activity A: 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	In Progress	Michigan participates in regional rapid response planning with the Great Lakes Commission and Great Lakes Panel on Aquatic Nuisance Species. A formal rapid response plan for the Great Lakes region as a whole does not yet exist.
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.	State	Regional	In Progress	MDEQ, Office the Great Lakes staff participated in various rapid response planning activities with the Great Lakes ANS Panel, Great Lakes Commission, and the Rapid Response Workgroup of the International Joint Commission to explore the challenges and opportunities for building rapid response capacity on an international level. In 2004, a rapid response plan for the aquatic plant hydrilla was prepared and can be used as a model for other species. In 2011, the MDNR received federal funding to create a new staff position to further develop and implement early detection and rapid response activities for invasive aquatic plants.

Table B-1. Status of Recommended Legislative and Policy Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
Activity C: 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		In Progress	Although it was discussed in the 2004 hydrilla response plan, a full review of the state's statutory authority has not been conducted for all response situations and many outstanding questions remain. Periodic review of legal authority may be required due to statutory changes. Coordination with the Michigan Office of the Attorney General may be warranted due to on-going court cases that involve riparian rights.
Activity D: The state should work with other partners within the state to increase training for aquatic nuisance species identification.	State	Regional, NGO	In Progress	The state has cooperated with Michigan Sea Grant, Michigan Natural Features Inventory, and others to develop and offer training opportunities. Other regional or local efforts have begun to address this need as well.
Activity E: Develop an active risk assessment process to assist in the decision-making process regarding potential rapid response actions.	State		In Progress	Michigan developed a case study for rapid response using hydrilla as an example in 2005. Risk-based assessment on feasibility and management actions are included in the process.
Objective 5: Support regional efforts for prevention and control of aquatic nuisance species to minimize the economic and environmental impacts of aquatic nuisance species.				
Activity A: Explore development of an interstate decision-making protocol for aquatic nuisance species management.	Regional		In Progress	A variety of Great Lakes basin-wide efforts are being developed to facilitate and coordinate regional decision-making.
Activity B: Pursue better regional coordination for efforts involving the U.S. Congress, Coast Guard, Army Corps of Engineers, International Maritime Organization, and other federal and international stakeholders.	Federal		In Progress	Michigan encourages regional coordination efforts and participates on various Great Lakes basin-wide AIS work groups and partnerships, including Great Lakes ANS Panel, the Council of Great Lakes Governors, the International Joint Commission's Rapid Response Workgroup, and the Ballast Water Collaborative. In 2010, state staff led efforts to create the Lake Superior Aquatic Invasive Species Complete Prevention Plan, a binational planning effort aimed at preventing new AIS and coordinating current and future activities.

Table B-1. Status of Recommended Legislative and Policy Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
Activity C: Continue to coordinate efforts between states, Great Lakes Panel and the Council of Great Lakes Governors ballast water control efforts.	Regional		In Progress	MDEQ staff participate on the Great Lakes ANS Panel and the Council of Great Lakes Governors AIS Task Force to discuss states' policies on ballast water.
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.	Regional	State, Federal	In Progress	Michigan participates in several voluntary Great Lakes coordination efforts, including Great Lakes ANS Panel. Basin-wide legislation, as envisioned in the 2002 Michigan ANS Update, does not yet exist.
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 introductions.	Regional		In Progress	MDEQ staff participate on the Council of Great Lakes Governors regarding state policies on prevention and control.
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	Federal	Regional	In Progress	Michigan has supported reauthorizing NISA both individually and as a collaborator in the Great Lakes Regional Collaboration (2005). NISA expired in 2002. Reauthorization efforts and a variety of other federal actions continue.

Information and Education (I/E)

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.

Table B-2. Status of Recommended Information and Education Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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.				
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 multiple channels	State	Regional, University, NGO	In Progress	The MDEQ and Sea Grant developed a Clean Boats, Clean Waters program to train volunteers to provide information to boaters at public access sites about aquatic invasive species identification and best management practices to prevent the introduction and spread of AIS through transfer of boats and boating and fishing equipment. In addition, MDEQ, Sea Grant, and partners have distributed thousands of educational materials at various venues, including boat shows, outdoor events, and fishing tournaments. Lake Associations have begun to canvass access sites and educate their members. Important AIS information is now routinely included in the Michigan fishing guide, outdoor magazines, and similar publications.
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.	University	Regional	In Progress	The MDEQ has reviewed and provided edits to existing AIS information included in training manuals for marine safety, personal watercrafts, and other licensing training materials and programs.

Table B-2. Status of Recommended Information and Education Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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.	State	Federal	In Progress	In 1998, MDEQ first created and mass produced a boat launch sign to remind users of preventive actions that are both important and required under state law. In 2010, approximately 2,500 updated signs were ordered. Older signs are being currently replaced at boat launches around the state. Nearly all public boat launches now display a sign. In 2010 and 2011, the state partnered with Wildlife Forever to put up 10 "Stop Aquatic Hitchhikers!" billboards in strategic locations throughout the state.
Activity D: 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	In Progress	Under the Clean Boats Clean Waters program, organized by Michigan Sea Grant and MDEQ, volunteers are trained to organize and conduct watercraft inspections and educational programming in their communities. In addition, small grants have been made available to support local boat wash demonstrations and inspections throughout Michigan.
Activity E: Include information about aquatic nuisance species in state/provincial fishing regulations.	State		In Progress	Information on preventing the spread of AIS, including diseases, has been provided in Michigan's annual fishing guide for the past decade. In 2010, a total of 200,000 Asian carp brochures and 5,000 fact sheets were produced and printed in collaboration with Michigan Sea Grant. In addition, a total of 200,000 "Don't Dump Your Bait" stickers were produced for distribution throughout the state. Michigan established an Angler Monitoring Network to communicate AIS information to licensed angers and set up a reporting system for new species. In 2012, the DNR Fisheries Division received a federal grant to develop public education and outreach materials to inform Michigan residents and visitors about VHS, it's associated regulations and measures they can take to reduce its spread.

Table B-2. Status of Recommended Information and Education Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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.	State		In Progress	Staff have contributed to various newspaper, radio and television announcements and programs to draw attention to AIS. Public service announcements have been developed by Michigan United Conservation Clubs and aired as part of the Out of Doors Television show during the annual AIS week.
Activity G: Notify tourism related industries, such as travel agencies and resorts, of the informational materials available for distribution and/or posting.	State	Regional	In progress	Educational materials have been made available to MDOT visitor centers and at tourism-related events.
Activity H: Develop letters and fact sheets for the legislature.	State	NGO, Federal, Regional	In progress	Great Lakes Commission has developed the Aquatic Invasion brochure to be used as an educational tool for state legislators and congressional members. The MDEQ has provided this brochure with a cover letter to Michigan legislators annually as part of the annual AIS awareness week.
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.	Private	State	In Progress	Implementation of Aquatic Invasive Species-Hazard Analysis and Critical Control Point program (AIS-HACCP) in Michigan has been focused on private aquaculture and baitfish industries as well as State of Michigan fish hatchery and natural resources personnel, including Tribes. In 2008 and 2009, the Great Lakes Commission, working with an advisory team of experts from government, businesses and conservation groups, held a series of workshops aimed at addressing AIS introduction and spread through Organisms in Trade. In 2010, approximately 200,000 Asian carp brochures and 200,000 “Don’t Dump Your Bait” stickers were produced for distribution throughout the state.

Table B-2. Status of Recommended Information and Education Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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	State		No action	A public outreach program dedicated to ruffe control is not needed at this time.
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.	Regional	State	In Progress	Informal inventories of existing materials and gaps occur periodically, however a comprehensive accounting has not occurred. Similar to Activity C immediately below.
Activity B: Training sessions for educators/information providers ("Train the Trainers") in formal and non-formal settings using PowerPoint presentations.	Regional	State	In Progress	Under the Clean Boats Clean Waters program, organized by Michigan Sea Grant and MDEQ, volunteers are trained to organize and conduct watercraft inspections and educational programming in their communities. In addition, small grants have been made available to support local boat wash demonstrations and inspections throughout Michigan. In addition, MDEQ and Sea Grant have conducted "train the trainer" sessions to identify and detect *Hydrilla* and other invasive species through the Michigan Lakes and Streams Association, Inland Lakes Partnership and Cooperative Lakes Monitoring Program.
Activity C: Evaluate I/E materials and distribution methods for outreach programs targeted to Great Lakes user groups.	State	Regional	In Progress	Informal inventories of existing materials and gaps occur periodically, however a comprehensive accounting has not occurred. Similar to Activity A immediately above.

Table B-2. Status of Recommended Information and Education Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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.	Regional	State	In Progress	Various tools and kits have been developed, however most need to be continually updated to address current needs and maintain relevancy.
Activity E: Develop aquatic nuisance species curriculum to be used in various educational programs i.e. Adventure Ranger Program, Master Gardener program, teachers.	Regional	State	In Progress	The Inland Seas Education Association offers an annual Invasive Species Course for teachers, teens, news media, lake associations, and environmental professionals. MDEQ staff participate as faculty. MSU Extension and Master Gardener programs are starting to incorporate invasive species considerations into their programming. The Michigan Environmental Education Curriculum includes an AIS chapter which was edited and informed by MDEQ.
Activity F: Develop newsletter inserts for user groups.	State		In Progress	State agencies, the Michigan Natural Features Inventory, and other partners have created fact sheets and similar materials suitable for newsletters and other types of user group communications.
Activity G: Produce slide show, PowerPoint and/or video to raise awareness among Great Lakes Basin residents on the aquatic nuisance species problem	State		In Progress	Various PowerPoint presentations have been developed by MDEQ, Sea Grant and others that have been shared as resources.
Activity H: Provide web access to aquatic nuisance species information.	State	Regional, Federal	In Progress	AIS information is widely available on several state and partner websites, however similar content is not often linked and the information is sometimes duplicative, incomplete, incorrect, and/or out of date.
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.	State		In Progress	The Aquatic Nuisance Species Coordinating Council, created in 2002, was used to accomplish these communication activities. However, it was abolished by Executive Order in 2009. Michigan's internal AIS Program (created in late 2010) and the Aquatic Invasive Species Advisory Council (created in late 2011) will seek to coordinate information and actions among state agencies and their external partners.

Table B-2. Status of Recommended Information and Education Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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."	Regional	State	In Progress	The National Oceanic and Atmospheric Administration maintains the Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS). The Federal Aquatic Nuisance Species Task Force created the Invasive Species Experts Database. Both GLANSIS and the Experts Database are available on-line and are being continually updated and expanded. The State of Michigan has not historically maintained an organized, up-to-date list of contacts and roles across all of the different agencies and programs.
Activity B: Evaluate the need for a regional contact list.	Regional		In Progress	See above.
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.	State		In Progress	This activity was flagged as a priority by the federal ANS Task Force. The Great Lakes Commission has developed the Aquatic Invasion brochure to be used as an educational tool for state legislators and congressional members. The MDEQ has provided this brochure with a cover letter to Michigan legislators annually as part of the annual AIS awareness week. Michigan still needs to develop a specific factsheet that includes the cost benefit analysis and willingness to pay by the public and user groups (e.g., Michigan boaters) to support AIS prevention and control efforts.
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.	State		In Progress	See comments above.

Table B-2. Status of Recommended Information and Education Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
Activity C: Designation of an annual aquatic nuisance species Awareness Week.	State		In Progress	AIS Awareness Week has been held in Michigan on an annual basis since 2002. The Michigan Governor and Legislature offer proclamations and resolutions. The MDEQ leads the promotion of AIS Awareness Week through press releases, website information, and support of local events around the 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.				
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.	State	Federal, Regional, NGO	In Progress	I/E collaboration occurs formally through the Great Lakes ANS Panel, and informally between agencies and organizations throughout the Great Lakes basin. Regional organizations such as Cooperative Weed Management Areas seek to integrate programs and share resources across jurisdictional boundaries.

Research and Monitoring

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.

Table B-3. Status of Recommended Research and Monitoring Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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.	Private	Federal, State, University	In Progress	Some research has been completed and published. Studies are ongoing.
Activity B: Evaluative effectiveness of ballast water treatments.	Private	Federal, State, University	In Progress	MDEQ evaluated ballast water treatment systems and issued a Director's determination in 2005. The California State Lands Commission has evaluated treatment systems with the most recent report issued in 2011. Other sources of information are available including advisory reports issued to inform USEPA's 2012 draft Vessel General Permit, among others.
Activity C: Provide scientific support for ballast water standards such as those under development the U.S. Coast Guard.	University	Federal	In Progress	Some research has been completed and published on risk/release relationship models. Studies are ongoing.
Activity D: Monitor for new invasives based on specific locations and species to provide data for rapid response.	State	Federal, NGO	In Progress	Numerous partnerships have developed between federal, state, local agencies, tribes, non-governmental organizations, and other groups. Monitoring has most often focused on particular species, such as phragmites, hydrilla, lyme grass, ruffe, and Asian carp.
Activity E: Conduct research on resting stage and probabilities for establishment by species.	University		In Progress	Some research has been completed and published. Studies are ongoing.

Table B-3. Status of Recommended Research and Monitoring Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
Activity F: Develop a hot list of potential invasives with locations/characteristics and probabilities.	State	Federal, NGO, University	In Progress	On-going research on and use of risk assessments by universities, state agencies, and federal agencies, and other organizations. In 2003, Michigan enacted Part 413 of NREPA, which includes lists of invasive species with high potential to colonize and adversely impact the state. In 2010, the Michigan Natural Features Inventory conducted a review of potential invasive plants for inclusion in its "Field Guide to Invasive Plants of Aquatic and Wetland Habitats for Michigan." In 2011, the National Oceanic and Atmospheric Administration identified high-priority "watchlist" species for the Great Lakes basin.
Activity G: Conduct a boater and angler survey to determine the best way to implement methods of preventing spread of aquatic nuisance species.	University		In Progress	In 2003, MDEQ contracted with the University of Wisconsin to conduct a Michigan boater survey. The results were used to develop/target educational materials for boater outreach. MDEQ also incorporated survey results from other states into its messaging. Michigan Sea Grant received federal funding to conduct another survey in spring 2012.
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; e.g., sea lamprey pheromones).	University		In Progress	Universities, extension faculty and staff, and state and federal agencies in Michigan have significantly contributed to biological control research, including biocontrol options for purple loosestrife, sea lamprey, and Eurasian water milfoil.
Activity B: Conduct research on pesticide controls for both plants and animals.	University	State, Federal	In Progress	Industry, universities, extension offices, and federal agencies (including U.S. Fish and Wildlife Service and the Army Corps of Engineers) are actively engaged in the many aspects of pesticide research and usage. State of Michigan agency staff, in cooperation from pesticide applicators and chemical manufacturers/distributors, has conducted new herbicide evaluations for controlling various species of invasive aquatic plants.
Activity C: Conduct research on physical controls for both plants and animals.	University	State, Federal	In Progress	State agency staff has researched various physical controls for aquatic plant species (e.g., phragmites), including mechanical control and flooding.
Activity D: Conduct research on social/political/economic acceptability of control options.	University		No action	The State is not aware of any major action in this area.

Table B-3. Status of Recommended Research and Monitoring Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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	State	University	In Progress	Studies have been conducted on a variety of treatment methods, including chemical, biological and physical controls. Many inland lakes around the state employ integrated pest management strategies for controlling invasive aquatic plants. Cooperators typically include federal and state agency staff, pesticide applicators, chemical manufacturers/distributors, consultants, universities, and lake associations. Grand Valley State University researchers are studying hybridization in water milfoils.
Objective 3: Support specific research and monitoring on aquatic nuisance species effects.				
Activity A: Conduct food web disruption studies, including mechanisms and trophic levels.	University		In Progress	Various federal and state agencies, universities, and non-governmental organizations are investigating these issues.
Activity B: Conduct research on effects of aquatic nuisance species on water quality.	State			
Activity C: Support research on Great Lakes Region aquatic nuisance species exports.	Regional	Federal		
Activity D: Conduct fish disease transport research.	University			
Activity E: Support research on human health issues from pathogen transport.	University			
Activity F: 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.				
Activity: A: Conduct research on invasive characteristics of genetically modified aquatic plants and animals.	University		In Progress	Various federal and state agencies, universities, and non-governmental organizations are studying genetically modified plants and animals, such as triploid carp.

Table B-3. Status of Recommended Research and Monitoring Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
***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.				
Activity A: Coordinate data and mapping to improve availability and utility of information	Regional	Federal	In Progress	Data and mapping coordination has occurred sporadically and inconsistently since 2002. NOAA's GLANSIS database continues to offer high-level mapping for many invasive species. The Midwest Invasive Species Information Network (MISIN) was established at Michigan State University in 2008 to provide data and mapping capabilities for early detection and rapid response efforts. Information sharing within state agencies, and between agencies and external partners, will improve with the creation of Michigan's AIS Program.
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	University		In Progress	Grand Valley State University researchers are investigating hybridization and genetic variation in native and invasive milfoils. Much of the research into herbicide tolerance in terrestrial plants will be transferrable to aquatic settings.
Activity C: Support collaboration on projects and data sharing among research entities	Regional	State	In Progress	Numerous public/private partnerships have been formed or become more established since 2002. Relationships among researchers have been strengthened with the arrival of Great Lakes Restoration Initiative funding in 2010, which put significant emphasis on regional partnering and collaboration.
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.	University	Regional	In Progress	More than ever, researchers are more heavily relying on email list-servs, wikis, webinars, and similar means of internet-based communication. Numerous meetings, workshops and conferences have been held in Michigan since 2002, including those related to AIS in general as well as specific species, such as Asian carps, zebra mussels, and phragmites.

Table B-3. Status of Recommended Research and Monitoring Actions

2002 Michigan ANS Update			2013 Michigan ANS Update	
Recommended Actions	**Lead***	**Cooperator(s)***	**Status**	**Comments**
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.	Regional	Federal	In Progress	The State of Michigan contributed to the research inventory when it was first set up, but has not used it in recent years.
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.				
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.	State		In Progress	Adequately addressing the funding issue is a complex, multi-year task that would involve agency staff, legislators and stakeholders. In 2009, the Michigan Office of the Great Lakes conducted a review of other state's AIS programs to identify the variety of potential funding sources, including general fund allocations, gas or property taxes, and permit and user fees. The application of these concepts to Michigan has been limited because of the lack of a strong legislative champion and overall uncertainty and caution due to the poor economic climate.
Activity B: Evaluate Supplemental Environmental Projects (settlement) funding for research, including in-kind or cash account funds.	State		Complete	MDEQ evaluated this option, and ultimately decided not to use it for aquatic invasive species.
Activity C: Encourage public and private grant programs to focus on aquatic nuisance species in requests for proposals	State	NGO, Federal	In Progress	Many recent funding sources, most notably the American Recovery and Reinvestment Act of 2009 and the on-going Great Lakes Restoration Initiative, have placed significant resources on AIS prevention, control, education and research.

* 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

Appendix C: Species of Concern

Dozens of species are currently restricted by law in Michigan. Various state and/or federal statutes and orders regulate their possession, introduction, sale, and/or transport. For ease of discussion, species in this appendix have been split into separate tables for plants (Table C-1) and animals (Table C-2). As the species on these lists will change over time, website links are provided for each law or order. Additional laws and regulations pertain to broad taxa rather than individual species (e.g., stocking of spawn or fry of any fish species) but are not included here; see Appendix D for a complete inventory of AIS-related laws and regulations.

The current distribution in Michigan, based on best available knowledge, is provided for each listed species. This coarse-scale distribution is intended to provide a basic snapshot of where each species exists along the invasion curve. Some of these species are not yet known to be present within the state, while others have been present in certain parts of the state for decades, causing significant on-going management and control costs. In Table C-3, the many harmful aquatic invasive species already established in Michigan are identified, along with their primary vector and year of first collection in the Great Lakes basin.

Regulated Aquatic Plant Species

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

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

Regulated Aquatic Animal Species

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

Watch List Species

In addition to the regulatory lists, several recent non-regulatory initiatives are underway that aim to create "watch lists" of high-risk species, including those that are not yet present in the Great Lakes basin. Notable examples include the National Oceanic and Atmospheric Administration's "Watchlist of Potential Great Lakes Aquatic Invasive Species" and the Great Lakes and Mississippi River Interbasin Study's "Aquatic Nuisance Species White Paper." Additionally, other Great Lakes states, universities, non-governmental organizations, and trade associations

are developing invasive species risk assessment and related tools. The Michigan AIS Program is actively tracking these initiatives and will consider their results as it develops a risk assessment process and early detection/rapid response program for the state.

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

Species	Federal Laws		State of Michigan Laws			Distribution in the State of Michigan[1]	Comments
	Federal Noxious Weeds List[2]	Title 18, Section 46 of U.S. Code[3]	Part 413 of NREPA[4]	State Noxious Weeds List[5]	1995 PA 182[6]		
African oxygen weed (*Lagarosiphon major*)	X		P			Absent	
Alligator weed or grass (*Alternanthera philoxeroides*)		X				Absent	
Anchored water hyacinth (*Eichhornia azurea*)	X					Absent	See below for the related *Eichhoria crassipes* under "water hyacinth'
Arrowleaf false pickerelweed (*Monochoria hastata*)	X					Absent	
Asian marshweed (*Limnophila sessiliflora*)	X					Absent	
Brazilian waterweed (*Egeria densa*)			P			Absent	Isolated populations in MN, IN, IL, and OH.
Curly leaf pondweed (*Potamogeton crispus*)			R			Widespread	Common, especially in the lower peninsula.
Cylindro (*Cylindrospermopsis raciborskii*)			P			Isolated	Recorded in several drowned river mouths in the Lake Michigan basin.
Duck lettuce (*Ottelia alismoides*)	X					Absent	
Eurasian watermilfoil (*Myriophyllum spicatum*)			R			Widespread	Common, especially in the lower peninsula.
European frogbit (*Hydrocharis morsus-ranae*)			P			Locally Abundant	Herbarium records exist for several southeast counties and the Saginaw Bay area; nine locations were field verified through 2012; likely fairly widespread in SE MI but not in high densities.

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

Species	Federal Laws		State of Michigan Laws			Distribution in the State of Michigan[1]	Comments
	Federal Noxious Weeds List[2]	Title 18, Section 46 of U.S. Code[3]	Part 413 of NREPA[4]	State Noxious Weeds List[5]	1995 PA 182[6]		
Fanwort (*Cabomba caroliniana*)			P			Locally Abundant	Recorded in several dozen inland lakes in lower peninsula; present in IN, IL, OH, and ONT
Flowering rush (*Butomus umbellatus*)			R			Locally Abundant	Two dozen observations confirmed in the field in southeast Michigan, both inland and coastal; also identified in MN, WI, IN, IL, OH, and ONT.
Giant hogweed[7] (*Heracleum mantegazzianum*)	X		P	X		Isolated	Found scattered throughout the Lower Peninsula and western Upper Peninsula; some occurrences have been controlled.
Giant salvinia (*Salvinia molesta, auriculata, biloba*, or *herzogii*)	X		P			Absent	
Hawaii arrowhead (*Sagittaria sagittifolia*)	X					Absent	
Heartshape false pickerelweed (*Monochoria vaginalis)*	X					Absent	
Hydrilla or waterthyme (*Hydrilla verticillata)*	X		P			Absent	Isolated populations in IN, WI, and OH.
Indian hygrophila (*Hygrophila polysperma)*	X					Absent	
Japanese knotweed (*Fallopia japonica*)			P			Widespread	Scattered throughout lower and upper peninsulas
Killer algae (*Caulerpa taxifolia*)	X					Absent	

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

Species	Federal Laws		State of Michigan Laws			Distribution in the State of Michigan[1]	Comments
	Federal Noxious Weeds List[2]	Title 18, Section 46 of U.S. Code[3]	Part 413 of NREPA[4]	State Noxious Weeds List[5]	1995 PA 182[6]		
Mosquito fern (*Azolla pinnata*)	X					Absent	
Parrot feather (*Myriophyllum aquaticum)*			P			Absent	Isolated populations in IN, IL, OH, PA, and NY.
Phragmites or common reed (*Phragmites australis*)			R			Widespread	Common and established in coastal and inland areas of southern lower peninsula; somewhat less abundant from south to north; common in western UP and southern UP along Lake Michigan shoreline. Often confused with native subspecies, or found intermixed.
Punktree or broadleaf paper bark tree (*Melaleuca quinquenervia*)	X					Absent	
Purple loosestrife (*Lythrum salicaria*)			R[8]		X	Widespread	Biological control is reducing populations statewide.
Simplestem bur-reed (*Sparganium erectum*)	X					Absent	
Starry stonewort (*Nitellopsis obtusa*)			P			Locally Abundant	Recorded in over one hundred inland waterbodies, mostly in southern peninsula.
Swamp morning-glory (*Ipomoea aquatica*)	X					Absent	
Water chestnut (*Trapa natans*)		X	P			Absent	Observations in PA and NY.

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

Species	Federal Laws		State of Michigan Laws			Distribution in the State of Michigan[1]	Comments
	Federal Noxious Weeds List[2]	Title 18, Section 46 of U.S. Code[3]	Part 413 of NREPA[4]	State Noxious Weeds List[5]	1995 PA 182[6]		
Water hyacinth (*Eichhornia crassipes*)		X				Isolated	Six populations verified in southeast Michigan in 2012 (not verified as overwintering). Also see above for related species, Anchored water hyacinth (*Eichhornia azurea*)
Wetland nightshade (*Solanum tampicense*)	X					Absent	
Yellow floating heart (*Nymphoides peltata*)			P			Absent	Isolated populations in WI, IL, IN, OH, and ONT.

[1] State-wide distribution based on best available knowledge. Intensive state-wide surveillance has not been conducted for some species; those marked as "absent" may be merely undetected. Categories: Absent; Isolated; Locally Abundant; Widespread.
[2] Federal Noxious Weed Act of 1974, as amended (7 U.S.C. 2801 *et seq*.): https://www.fws.gov/laws/lawsdigest/fednox.html
The species found on the federal noxious weed list are not necessarily non-native. Species displayed in Table C-1 are those federally-listed noxious weeds that are categorized as "aquatic/wetland" by the U.S. Department of Agriculture (as of May 1, 2010). Presence in this column does not imply that the species could become naturalized in Michigan. It would be a federal offense to transport any of noxious weeds across state lines.
[3] Title 18, Section 46 of the U.S. Code, entitled "Transportation of water hyacinths," prohibits knowingly transporting three species in interstate commerce.
[4] Part 413, Transgenic and Nonnative Organisms, of the Natural Resources and Environmental Protection Act, Act 451 of 1994: http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-2-1-WILDLIFE-CONSERVATION-413. Definitions of Prohibited ("P") and Restricted ("R") can be found in the statute.
[5] Act 359 of 1941, Noxious Weeds: http://legislature.mi.gov/doc.aspx?mcl-Act-359-of-1941
[6] The Insect Pest and Plant Disease Act, Act 189 of 1931: http://legislature.mi.gov/doc.aspx?mcl-Act-189-of-1931
[7] The National Wetland Indicator status is facultative, meaning the species is equally likely to occur in wetlands or non-wetlands. Giant hogweed is often associated with wet areas in Michigan.
[8] Certain sterile cultivars are exempt (see Part 413 for details), however no sterile cultivars have been proposed to, or approved by, the state.

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

Species	Federal Laws	State of Michigan Laws			Distribution in the State of Michigan[1]	Comments
	Lacey Act[2]	Part 413 of NREPA[3]	DNR Admin. Rule 299.1052[4]	DNR FO 227[5]		
Crustaceans						
Mitten Crab (genus *Eriocheir* - 3 species)	X				Absent	Isolated occurrences in the Great Lakes, including the Detroit River, Lake Erie, and Lake Superior (though not in Michigan waters).
Rusty crayfish (*Orconectes rusticus*)		P		X	Widespread	Widespread and breeding in inland waters.
Fishes						
Bighead carp (*Hypophthalmichthys nobilis*)	X	P			Absent	Several isolated, historical specimens were collected from western Lake Erie (Ohio), however no established population.
Bitterling (*Rhodeus sericeus*)		P	X		Absent	
Black carp (*Mylopharyngodon piceus*)	X	P			Absent	
Eurasian ruffe (*Gymnocephalus cernuus*)		P			Locally Abundant	Patchy distribution in the Great Lakes, absent from inland waters.
Grass carp (*Ctenopharyngodon idellus* or *idella*)		P	X		Isolated	Isolated collection from Michigan inland waters; no evidence of breeding.
Ide (*Leuciscus idus*)		P	X		Absent	
Japanese weatherfish (*Misgurnus anguillicaudatus*)		P	X		Isolated	Single breeding population in the Shiawassee River.
Largescale silver carp (*Hypophthalmichthys harmandi*)	X				Absent	
Round goby (*Neogobius melanostomus*)		P			Widespread	Widespread and established in Lakes Michigan, Huron, and Erie; isolated collection in Lake Superior near Marquette; isolated but established populations in inland waters.

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

Species	Federal Laws	State of Michigan Laws			Distribution in the State of Michigan[1]	Comments
	Lacey Act[2]	Part 413 of NREPA[3]	DNR Admin. Rule 299.1052[4]	DNR FO 227[5]		
Rudd (*Scardinius erythrophthalamus*)		P	X		Absent	Isolated collections on the Ontario side of Lake St. Clair.
Silver carp (*Hypophthalmichthys molitrix*)	X	P			Absent	
Snakehead family (family Channidae)	X	P			Absent	
Tench (*Tinca tinca*)		P	X		Absent	
Tubenose goby (*Proterorhinus marmoratus*)		P			Isolated	Isolated, established populations in the St. Clair River, Lake St. Clair, Detroit River, and western Lake Erie.
Walking catfish (family Clariidae - 13 genera, ~100 species)	X				Absent	
Mammals						
Nutria (*Myocastor coypus*)		P			Absent	Farmed in Michigan in the 1930s; accidentally released but did not survive.
Mollusks						
New Zealand mud snail (*Potamopyrgus antipodarum*)		P			Isolated	
Quagga mussel (*Dreissena bugensis*)		R			Widespread	Found in all of the Great Lakes, although limited in Lake Superior; isolated inland occurrence in the Great Lakes basin, including a single confirmation from Michigan's Upper Peninsula.
Zebra mussel (*Dreissena polymorpha*)	X	R			Widespread	Widespread in inland and Great Lakes waters of the Lower Peninsula; patchy distribution in inland waters of the Upper Peninsula and Lake Superior.

[1] State-wide distribution based on best available knowledge. Intensive state-wide surveillance has not been conducted for some species; those marked as "absent" may be merely undetected. Categories: Absent; Isolated; Locally Abundant; Widespread.
[2] Lacey Act: http://www.aphis.usda.gov/plant_health/lacey_act or http://www.fws.gov/injuriouswildlife.
[3] Part 413, Transgenic and Nonnative Organisms, of the Natural Resources and Environmental Protection Act, Act 451 of 1994: http://legislature.mi.gov/doc.aspx?mcl-451-1994-III-2-1-WILDLIFE-CONSERVATION-413. Definitions of Prohibited ("P") and Restricted ("R") can be found in the statute. The New Zealand mud snail was added to Part 413 through a DNR Director's Order, entitled Invasive Species Order Amendment No. 1 of 2009.
[4] DNR Fisheries Division Administrative Rule 299.1052 (Importation and Transportation of Fish and Eggs): http://www.michigan.gov/dnr/0,4570,7-153-10366_37141---,00.html.
[5] DNR Fisheries Order 227 (Waters Open and Regulations Governing the Taking of Wigglers and Crayfish for Commercial Purposes): http://www.michigan.gov/dnr/0,1607,7-153-10366_37141-237033--,00.html.

Table C-3. Significantly Harmful AIS Established in Michigan Waters (Source: GLANSIS, 2011)

Year First Collected in Great Lakes Basin	Group	Species	Common Name	Vector
1971	Algae	*Cylindrospermopsis raciborskii*	cyanobacterium	Unknown
1983	Algae	*Nitellopsis obtusa*	green alga (starry stonewort)	Ballast
1902	Bacteria	*Aeromonas salmonicida*	furunculosis	Contaminant with cultivated plants or stocked fish
1967	Bacteria	*Renibacterium (Corynebacterium) salmoninarum*	Bacterial Kidney Disease	Contaminant with cultivated plants or stocked fish
1982	Crustaceans-Cladocerans	*Bythotrephes longimanus*	spiny waterflea	Ballast
1998	Crustaceans-Cladocerans	*Cercopagis pengoi*	fish-hook waterflea	Ballast
To be determined	Crustaceans-Crayfish	*Orconectes rusticus*	Rusty Crayfish	Range Expander
2006	Crustaceans-Mysids	*Hemimysis anomala*	mysid shrimp	Ballast
1868	Fishes	*Alosa pseudoharengus*	alewife	Canal
1880	Fishes	*Cyprinus carpio*	common carp	Stocked
1921	Fishes	*Petromyzon marinus*	sea lamprey	Canal
1986	Fishes	*Gymnocephalus cernua*	Eurasian ruffe	Ballast
1990	Fishes	*Neogobius melanostomus*	round goby	Ballast
1990	Fishes	*Proterorhinus semilunaris*	tubenose goby	Ballast
1980	Mollusks-Bivalves	*Corbicula fluminea*	Asiatic clam	Escaped cultivation
1986	Mollusks-Bivalves	*Dreissena polymorpha*	zebra mussel	Ballast
1989	Mollusks-Bivalves	*Dreissena rostriformis bugensis*	quagga mussel	Ballast
1991	Mollusks-Gastropods	*Potamopyrgus antipodarum*	New Zealand mud snail	Ballast
To be determined	Plants	*Phragmites australis*	Phragmites or common reed	Multiple vectors
1864	Plants	*Najas marina*	spiny naiad	Ballast
1869	Plants	*Lythrum salicaria*	purple loosestrife	Ballast

1879	Plants	*Potamogeton crispus*	curlyleaf pondweed	Escaped cultivation
1905	Plants	*Butomus umbellatus*	flowering rush	Ballast
1913	Plants	*Frangula alnus*	glossy buckthorn	Escaped cultivation
1932	Plants	*Najas minor*	minor naiad- brittle leaf	Contaminant with cultivated plants or stocked fish
1935	Plants	*Cabomba caroliniana*	fanwort	Escaped cultivation
1950	Plants	*Cirsium palustre*	marsh thistle	Unknown
1952	Plants	*Myriophyllum spicatum*	Eurasian watermilfoil	Escaped cultivation
1972	Plants	*Hydrocharis morsus-ranae*	European frogbit	Escaped cultivation
1968	Protozoans	*Myxobolus cerebralis*	salmonid whirling disease	Contaminant with cultivated plants or stocked fish
1999	Viruses	*Novirhabdovirus* sp.	Viral Hemorrhagic Septicemia (VHS) virus	Ballast

Appendix D: AIS Specific Laws and Regulations State Laws, regulations, Orders. Federal legislation

The following table presents federal laws and Michigan laws and subsequent rules, regulations, and orders that have direct implications for AIS within the state. Other Michigan laws not listed in this table may have indirect implications for AIS and as such, this table should not be considered a conclusive listing of all invasive species law within Michigan. Summaries of the some of the most relevant federal laws can also be found in main text of the Plan within section 1.3.3 Policy Background.

Vector and pathway	Law (Federal or State)	Rules, Regulations, or Order	Summary
Boating, live bait, aquaculture, fish stocking and hatcheries, habitat modification	Part 413, Transgenic and Nonnative Organisms, of the NREPA. Section 324.	N/A	Regulates the sale and possession of the listed species
Overall State AIS Program and Funding, Ballast Water, Organisms in Trade, and Phragmites Management.	Part 414 Aquatic Invasive Species Advisory Council of the NREPA Section 324	N/A	Creates an AIS Advisory Council tasked with providing recommendations on the AIS SMP, ballast water regulation, organisms in trade, management and control of *Phragmites australis*, and funding for the AIS Program.

Vector and pathway	Law (Federal or State)	Rules, Regulations, or Order	Summary
Shipping and boating: Ballast Water	P.L. 101-646, Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA) amended by P.L. 104-332, National Invasive Species Act of 1996 (NISA)	33 CFR 151 Subparts C and D, Ballast Water Management 46 CFR Part 162 Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters	Aims to prevent the unintentional introduction of non-indigenous species into waters of the U.S. and control the spread of species already introduced. Requires vessels entering ports on the Great Lakes to exchange ballast water and meet other requirements, with voluntary guidelines for similar actions on other waters of the U.S. Also authorizes a number of studies and monitoring programs to assess the spread of AIS and develop methods for controlling them. NISA amends NANPCA to require voluntary guidelines to become law if voluntary compliance is inadequate. See Section 1.3.3 of the SMP for more detail on NANPCA Subpart C describes the ballast water management requirements for the control of non-indigenous species for vessels operating in the Great Lakes and Hudson River. Subpart D presents penalties for violations, exemptions for vessels, and additional requirements. Main portions published in 1999, most recent amendments in 2010. 2012 amendments to USCG regulations on ballast water management establishes a standard for the allowable concentration of living organisms in ships' ballast water discharged in waters of the United States. Amends USCG regulations for engineering equipment by establishing an approval process for ballast water management systems

Vector and pathway	Law (Federal or State)	Rules, Regulations, or Order	Summary
Shipping and boating: Ballast Water	P.L. 92-500, Clean Water Act of 1977, Section 312(n) Uniform National Discharge Standards for Vessels of the Armed Forces	40 CFR Part 9 and Chapter VII, Part 1700, Uniform National Discharge Standards for Vessels of the Armed Forces	1996 amendment requires the USEPA and the Department of Defense to identify and evaluate discharges, other than sewage, of armed forces vessels that should have pollution controls and set standards for environmental protection. The 1999 rule identifies discharges of Armed Forces vessels (including Coast Guard vessels), that require control. Ballast water discharges are included in this list. Discharge standards will be promulgated in the future.
Shipping and boating: Ballast Water	P.L. 92-500, Clean Water Act of 1977, Section 402 National Pollutant Discharge Elimination System	40 CFR Part 122 EPA Administered Programs: The National Pollutant Discharge Elimination System	Allows the USEPA to issue permits for the discharge of pollutants. Section 122.3(a), which exempted ballast water from regulation under this section, was revoked in 2006 by U.S. District Court. USEPA's Vessel General Permit for discharges incidental to the normal operation of vessels (including ballast water discharge) is issued pursuant to Section 122.28.
Shipping and boating: Ballast Water	P.L. 92-500, Clean Water Act of 1977, Section 401 Certification		Requires states to approve, waive certification, or deny federal licenses or permits that may result in any discharge and allows states to add conditions and requirements, if necessary, above and beyond those present in the federal permit. Michigan issued a 401 certification under USEPA's VGP containing additional requirements.
Shipping and boating: Ballast Water	Title 33 U.S.C. Navigation and Navigable Waters, Chapter 19 Saint Lawrence Seaway	33 CFR 401, Seaway Regulations and Rules	Sections 983 and 984 describe the functions and general powers of the Saint Lawrence Seaway Corporation, respectively Describes the rules, regulations, practices, and procedures for vessels operating in the St. Lawrence Seaway. 2008 update added section 401.30 Ballast water and trim, which requires saltwater flushing.

Vector and pathway	Law (Federal or State)	Rules, Regulations, or Order	Summary
Shipping and boating: Ballast Water	Title 16 U.S.C. Conservation, Chapter 67 Aquatic Nuisance Prevention and Control (2002)		Intended to prevent unintentional introduction and dispersal of non-indigenous species into waters of the United States through ballast water management and other requirements; coordinate research on prevention and control, carry out control methods, monitor vector pathways other than ballast water, investigate economic and ecological impacts of AIS.
Shipping and boating: Ballast Water	Title 16 U.S.C. Conservation, Chapter 1 National Parks, Military Parks, Monuments, and Seashores, Section 3 Rules and regulations of national parks, reservations, and monuments; timber; leases	36 CFR Chapter 1 National Park Service-Department of the Interior, Parts 1-7.	Gives authority to the Secretary of the Interior to make and publish rules and regulations necessary for the use and management of the parks, monuments, and reservations under the jurisdiction of the National Park Service. Contains regulations and delegates authority. Superintendent's Compendium for Isle Royale National Park issued in 2007 added an Emergency Restriction that prohibits the discharge of untreated ballast water within Isle Royale National Park waters and within the boundaries of Isle Royale National Park.
Shipping and boating: Ballast Water	Presidential Executive Order 13112		Issued in 1999, created the National Invasive Species Council, consisting of 13 agencies to prevent the introduction of invasive species, provide for their control, and minimize their economic, ecological, and human health impacts. Also defined invasive species.
Shipping and boating: Ballast Water	Natural Resources and Environmental Protection Act Act 451, Part 31 Water Resources Protection, Section 3103a.	N/A	The addition of Section 3103a in 2001 requires the Michigan Department of Environmental Quality to compile and maintain, on a yearly basis, a list of all oceangoing vessels and nonoceangoing vessels that it determines have complied with ballast water management practices.
Shipping and boating: Ballast Water	Natural Resources and Environmental Protection Act Act 451, Part 31 Water Resources Protection, Section 3112.	N/A	2005 amendment of Section 3112 requires all ocean going vessels engaging in port operations in Michigan to obtain a permit beginning January 1, 2007.

Vector and pathway	Law (Federal or State)	Rules, Regulations, or Order	Summary
Shipping & Boating: Water Recreation	Public Law 110-288-July 29, 2008 Clean Boating Act of 2008	N/A	States that aquatic plants attached to boats, boating equipment or boating trailers need to removed and placing a boat, boating equipment or boating trailer in a body of water with aquatic plants attached is illegal and punishable by fine.
Organisms in trade: Live Bait	Part 487, Sport Fishing, of the NREPA, Section 48730.	Fisheries Order-203 Waters Closed for the Taking of Minnows for Personal Use	This order includes provisions intended to reduce the movement of fish diseases.
Organisms in trade: Live Bait	Part 487, Sport Fishing, of the NREPA Section 48730.	Fisheries Order-216 Regulations for the Taking of Minnows for Commercial Purposes	This order includes provisions intended to reduce the movement of fish diseases.
Organisms in trade: Live Bait	Part 487, Sport Fishing, of the NREPA Section 48730.	Fisheries Order-227 Waters Open and Regulations Governing the Taking of Wigglers and Crayfish for Commercial Purposes	This order prohibits any person to take, possess, or sell rusty crayfish anywhere in the State of Michigan.

Vector and pathway	Law (Federal or State)	Rules, Regulations, or Order	Summary
Organisms in trade: Live Bait	Part 487, Sport Fishing, of the NREPA. Section 48730.	Fisheries Order 231 Catch Reporting Regulations for Commercial Minnow, Wigglers and Crayfish Catchers	Licensed commercial minnow, wiggler, and crayfish catchers are required to submit monthly reports of their fishing activities. This information may be valuable should infected fish are identified during disease sampling. The reporting would allow DNR personnel to backtrack to locations potentially with infected populations of baitfish.
Organisms in trade: Live Bait	Part 411, Protection and Preservation of Fish, Game, and Birds, of the NREPA.	Fisheries Order-245 Fish Disease Control	The goals of the Department's actions under this Fish Disease Control Order are to protect the aquatic resources of the State, minimize the spread of Pathogens of concern to uninfected waters, and protect the Department's fish hatchery system. The Department will address the control of diseases of fish through the development of regulations for specific Management Areas that are designed to contain or slow the spread of Pathogens of concern, including VHS susceptible species.
Organisms in Trade: Aquaculture	Michigan Aquaculture Development Act, Act 199 of 1996.	N/A	Identifies species of fish and other aquatic organisms that may be used in aquaculture. Requires registration of aquaculture facilities.
Organisms in Trade: Aquaculture	Animal Industry Act, Act 466 of 1988.	N/A	Aquaculture brought into Michigan from another state must be accompanied by a fish disease inspection report.
Fish Stocking and Hatchery Activities	Part 487 Sport Fishing, of the NREPA. Section 48735.	N/A	A person shall not plant any spawn, fry, or fish of any kind in any public water without a permit.
Fish Stocking and Hatchery Activities	Part 459 Propagation of Game Fish in Private Waters, of the NREPA.	N/A	Restricts and regulates the propagation of game fish.
Fish Stocking and Hatchery Activities	Animal Industry Act, Act 466 of 1988.	N/A	Protect aquaculture industry through prevention, control, and eradication of infectious, contagious, or toxicological diseases of livestock and other animals.
Fish Stocking and Hatchery Activities	Michigan Aquaculture Development Act, Act 199 of 1996.	N/A	Regulates aquaculture as an agricultural enterprise; provides authorities to state agencies; defines aquaculture species.

Vector and pathway	Law (Federal or State)	Rules, Regulations, or Order	Summary
Habitat Modification	Part 33, Aquatic Nuisance Control Program of the NREPA.	N/A	Requires a permit from the DEQ to apply chemical products to waters of the state for treatment of nuisance aquatic vegetation.
Habitat Modification	Part 325, Great Lakes Submerged Lands and Part 303, Wetland Protection, of NREPA	N/A	Requires a permit for mechanical mowing of vegetation below the OHWM along the Great Lakes shoreline.
Manage and control	Part 309 Inland Lake Improvements, of the NREPA	N/A	Allows for the establishment of Lake Improvement Boards, which often undertake projects to control aquatic nuisance species.
Manage and control	Public Improvements, Act 188 of 1954	N/A	Provides townships the legal authority to issue bonds and levy taxes to make certain improvements (e.g., eradication or control of aquatic weeds and plants).