



1987

Best selling car: Honda Accord for \$10k

Top film: Three Men and a Baby w/ Steven Gootenberg, Tom Sellac, and Ted Danson

Top Album/Single: Michael Jackson's Bad

U.S. President: Ronald Reagan

The Simpsons were seen on TV for the first time

First criminal convicted using DNA evidence

1987 was the last year that anyone could have visited the Great Lakes in the absence of zebra mussels, which illustrates the long-term impacts of invasions and the importance of prevention.

## What You'll Learn Today...

- What's an INVASIVE SPECIES?
- Why are they bad?
- How do they get here?
- What is the state doing?
- What can you do to help?

# What is an invasive species?

- Non-native
- Causes harm to:
  - The Economy
  - The Environment
  - Human Health

Invasive species are often referred to by other names such as “nuisance species”, “invasive species”, “exotic”, “non-native”, “non-indigenous”, “noxious weed”, etc. Sometimes it can get confusing.

The State of Michigan’s definition of invasive species contains two important criteria: 1) Invasive species are non-native; and 2) Cause harm to either the economy, the environment and/or human health.

## Non-native...but NOT invasive



Let's look at some example species and determine if they're invasive or not in Michigan. First, apple trees! Apple trees are not native to Michigan, but they are not invasive because they do not meet the 2<sup>nd</sup> criteria of causing harm. In fact, apple trees are an important part of Michigan's agricultural (and sometimes social) economy.

## Non-native...but NOT invasive



Pacific salmon species such as king and coho are also not native to Michigan (they we're originally stocked to control invasive alewife and create a fishery), but again are not considered invasive because they don't cause harm. They are part of Michigan's very important Great Lakes fishery.

## Non-native...but NOT invasive



What about alligators? Clearly alligators are not native to Michigan, but they are not considered invasive either because they can't survive in Michigan's winter climate and therefore would not be able to become established.



## Native or Invasive?



Zebra mussels are not native to Michigan and are invasive! They cause harm to the economy by costing millions of dollars in repairs and maintenance to water intake pipes, docks, seawalls, and beaches. They can also cause harm to human health in certain instances. Have you ever walked on a beach littered with zebra mussel shells? They're sharp and hurtful with bare feet!

**Why are invasive  
species bad?**





First, let's talk about preventing invasive species from getting here. Why is prevention important? Let's take a trip back to 1988...

1. Snapple lemon-flavored iced tea first distributed
2. Doppler radar invented by Christian Andreas Doppler
3. CDs out-sold vinyl records for the first time
4. #1 movie: Rain Man (Cruise, Hoffman)

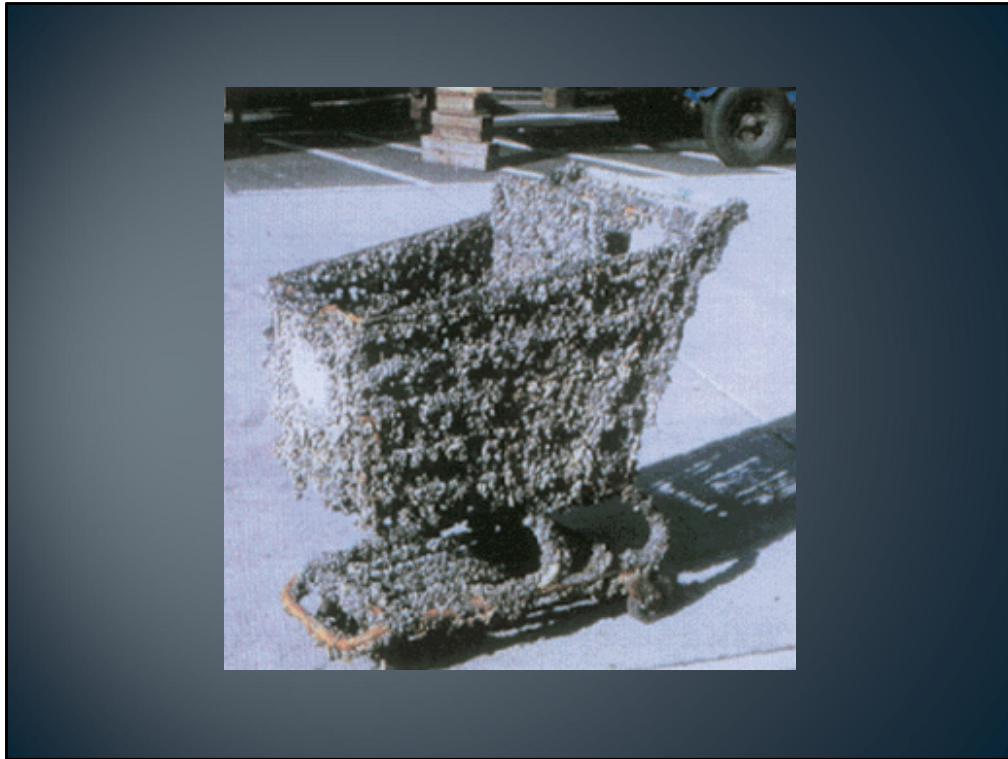
1988 was also the last year anyone could have visited the Great Lakes in the absence of zebra mussels. They were introduced to the Great Lakes basin in 1988 in Lake St. Clair and have been here ever since, illustrating the long-term impact and consequence of new introductions. **Prevention is important!**

## Why it is important to do something about about invasive species



They're expensive!

Another reason invasive species are bad – They cost us a lot of money. \$20M per year is spent on sea lamprey control in the Great Lakes. \$25M per year is spent on aquatic nuisance weed control in Michigan's lakes, including control for invasive species such as Eurasian watermilfoil. \$10M per year is spent on zebra mussel control (clearly intake pipes, boat hulls, etc.).



Here's an example of what happens when shopping cart is left in zebra mussel infested waters for about 1 year. Completely covered! The same can happen to docks, boat hulls, boat motors, intake pipes and even native species of clams.



Harm to the economy – Costs us money!

While shopping carts in the water is unusual, boats are not. Both commercial and recreational boats/ships need costly annual maintenance and repair from zebra mussels.



Harm to the economy – Costs us money!

Here's a clogged water intake pipe.



And here are native clams covered with zebra mussels. Clearly these mussels are impacting the clams ability to burrow and feed.





Harm to human health – Ouch!

And here's an example (from Green Bay, WI) of how zebra mussel shells can be harmful to human health. Don't walk bare foot on this beach!





## Giant Hogweed



Giant hogweed, and terrestrial invasive plant species, is another example of an invasive that's harmful to human health. They look like a very large Queen Anne's lace.



Habitat alteration is just one problem with invasive species. As you can see, some are toxic and cause human health concerns. We can all agree on this impact, right?

Giant hogweed: native to Eastern Europe, member of the Parsley family, contact with sap causes painful burns and blisters in the presence of sunlight



Sea lamprey



Sea lamprey are a good example of an invasive species that causes environmental and economic harm.



They are parasitic and feed on many of our favorite game fish such as trout and salmon.



When they are done feeding, they leave open wounds that can become infected and weaken the fish, sometimes leading to death.



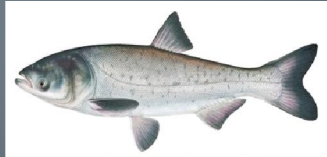
Now let's look at some examples of aquatic invasive species of concern for Michigan.

## Asian carp



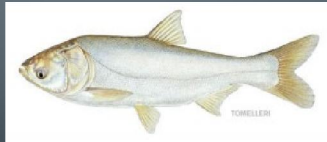
### Grass carp

- Large cross-hatched scales
- Eyes even with mouth
- Cylindrical body form



### Bighead carp

- Large body (up to 90lbs)
- Large head w/ toothless mouth
- Eyes below mouth



### Silver carp

- Smaller than bighead (up to 60 lbs)
- Light silver color w/ white belly
- Eyes sit below mouth

There are actually 4 species of invasive carp that Michigan is concerned with: black carp, silver carp, bighead carp and grass carp.





You may have seen YouTube or news video footage of invasive carp jump when disturbed by boating activities. Here's a picture of silver carp startled by boat wakes.



It may look comical, but it can actually be dangerous. Imagine a 20 pound fish leaping into your face!

## Northern snakehead



Not known in Michigan

### Northern Snakehead:

- Native to China
- Voracious predators
- Can grow to at least 15lbs and nearly 3 ft.
- Can move short distances between ponds on pelvic fins
- Can live up to 3 days without being submerged (e.g. in a puddle)– Can go dormant while buried in the mud during droughts
- Easily confused with the native bowfin\burbot, but the key identifiers above and the bowfin's caudal fin spot should clear things up
- Not in Michigan yet, but known occurrences have been found in Illinois (Chicago), Maryland, Virginia, California, others?

## Invasive crayfish



Rusty  
crayfish  
(Common in  
Michigan)



Red swamp  
crayfish

Red swamp crayfish sightings just confirmed by DNR in multiple Michigan locations. These invasive crayfish out compete native crayfish with their larger claws and aggressive behaviors. They also alter the shoreline by digging deep burrows.



Invasive Phragmites is common sight in Michigan, unfortunately. It has the ability to drastically alter shorelines and wetlands by creating a monoculture. This blocks views and access to the water and crowds out native species. Invasive Phrag can also be a road hazard by blocking sightlines at intersections since it's common along roadsides and drainage ditches.



## Water hyacinth



Common water garden plant



Isolated occurrences are known from SE Michigan

Anyone know this plant? Here's a hint: This particular photo shows it floating on a lake (where's the lake!?). It's water hyacinth (show name)

Water hyacinth (*Eichhornia crassipes*) is another floating aquatic plant that may completely blanket lakes and bays, altering light availability and dissolved oxygen levels. Common water garden plant. Native to South America, but is a serious pest in warm temperate areas around the world. In the US, it has invaded central California, Arizona, the Gulf states, Georgia, the Carolinas, Tennessee, Missouri, Kentucky and Virginia. Not entirely known if it can survive in Michigan, but we don't want to find out. Isolated occurrences are known from SE Michigan.

Though invasive plants can sometimes be the easiest invasive species to detect in lakes and streams, they're not the only type of AIS we're concerned with. There are obviously many other AIS to consider such as fish, invertebrates.

Photo credit: Mandy Tu – TNC's Global Invasive Species Team

## European frogbit



Isolated occurrences - found in Michigan

European frogbit is another AIS that can quickly take over a waterbody and crowd out native species, block light penetration to plants below and make swimming/boating/fishing difficult.



## Water lettuce

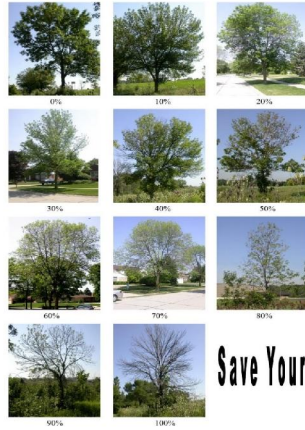


Isolated occurrences - found in Michigan



## Emerald ash borer

**Decline Stages of Ash Trees  
Infested with Emerald Ash Borer**



Invasive insects are another concern. Have you heard of EAB?

## Water chestnut



Not known in Michigan

Ok, quiz time! Anyone know this invasive aquatic plant? It's water chestnut (show name). And why is it bad? (show lake photo)

Invasive aquatic plants can sharply reduce light levels (as evidenced in this picture) and dissolved oxygen concentrations in the waters they occupy. Water chestnut (*Trapa natans*) is shown here infesting an embayment at the southern end of Lake Champlain.

Water chestnut is not currently known in Michigan, but given the evidence presented in this photo from Lake Champlain in Vermont, it may very well survive here.

Photo credit: John M. Randall – TNC's Global Invasive Species Team

## Asian longhorn beetle



Not known in Michigan

How do invasive species get here?

- Global transportation and shipping
- Habitat modifications
- Organisms in trade
- Hitchhiking on clothing, vehicles, gear and equipment

## Global transportation and shipping



The world is more connected than ever via ships and airplanes. Unfortunately, that also means there are many routes by which invasive species can hitch a ride.



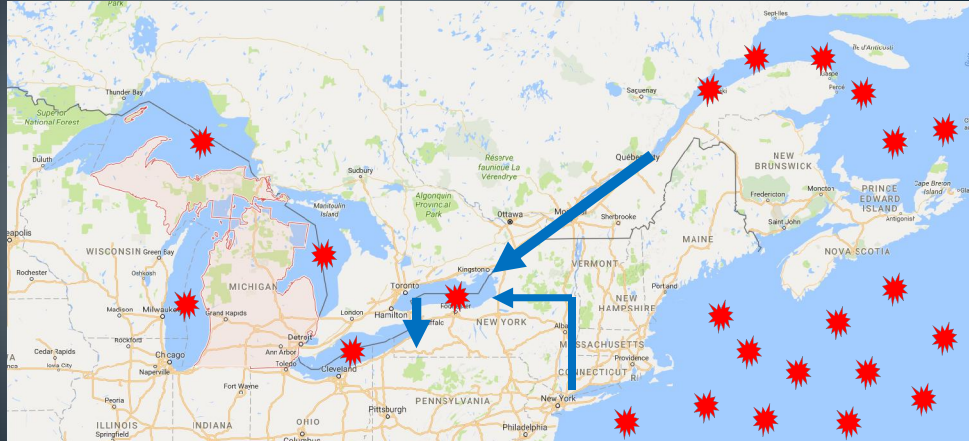
## Global transportation and shipping



Global Air Traffic Routes



## Habitat Modifications



When waterways are opened up and connected, invasive species can gain access. The Great Lakes hasn't always been directly connected to the Atlantic ocean, but the canal systems that were built (Erie, Welland, St. Lawrence Seaway, etc.) have all opened up ways for ships and invasives to come into the Great Lakes. Sea lamprey may have come to the Great Lakes through these canals.

## Organisms in Trade



Landscape  
Ornamentals -  
Barberry



Ornamental and landscaping species such as Japanese barberry are popular for home owners and businesses, but they can become a problem if they escape or are planted in the wild.



Other organisms in trade, such as aquarium fish and plants, can also escape or are sometimes intentionally released into rivers, ponds and lakes. Many of these species are not native to Michigan and a few are actually invasive! Don't release your pets and plants!



Upper left is a pacu fish, which is a popular aquarium fish imported from South America. The U.S. leads the world in importing ornamental fish, supporting a worldwide aquarium industry that tops \$1 billion annually. Though the pacu is a non-native fish, it is not considered invasive in Michigan. Goldfish and Koi from aquariums and ornamental ponds can sometimes be found in lakes and rivers.



## Invasive Species Hitchhiking



Invasive species often arrive and are spread via hitchhiking. It's important to clean, drain and dry your boats and fishing gear after each use for this very reason.

## Invasive Species Hitchhiking



And don't forget to clean your other toys too! (bikes, motorcycles, tools, etc.)

## Invasive Species Hitchhiking



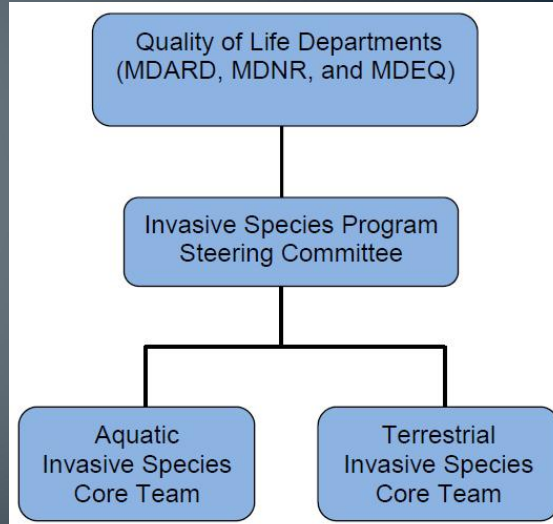
Firewood can also harbor invasive species if it's not sourced locally. Invasive insects often use wood for homes.



**What is the state  
doing?**

# Invasive Species Program

A species that is **not** **native** and whose introduction causes, or is likely to cause, economic or environmental **harm** or harm to human health



# State of Michigan AIS Team

established 2010



## Department of Environmental Quality

- **Water Resources**  
(Sarah LeSage, Anne Garwood, Eric Bacon, Tom Alwin, Kevin Walters Bill Keiper)
- **Office of the Great Lakes** (Matt Preisser)



## Department of Natural Resources

- **Fisheries** (Nick Popoff, Seth Herbst, Christina Baugher)
- **Wildlife** (Greg Norwood, Ryan Wheeler)
- **Parks and Recreation** (Christina Baugher)
- **Law Enforcement** (Steve Huff)
- **Forest Resources** (Sue Tangora)
- **Marketing and Outreach** (Joanne Foreman, Kevin Frailey, Jon Spieles)



- **Department of Agriculture and Rural Development**
  - **Pesticide and Plant Pest Management** (John Bedford, Mike Bryan)
  - **Animal Industry** (Steve Hussey)



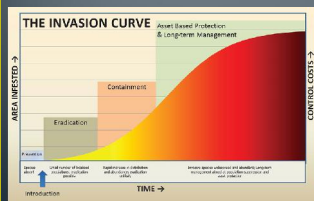
- **Department of Transportation** (Tim Jones, Darwin Heme)

There is also a Terrestrial Invasive spp team

# AIS State Management Plan



Finalized 2013



- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990
- **Goal I: Prevent new introductions** of AIS into Michigan waters.
- **Goal II: Limit the dispersal of established populations** of AIS into uninfested waters of the state.
- **Goal III: Develop an early detection and rapid response program** to address new AIS invasions.
- **Goal IV: Manage and control AIS** to lessen the harmful ecological, economic, social and public health impacts resulting from infestation of AIS.

## Prevention by pathways

**Preventing  
new introductions  
and  
limiting dispersal  
of established AIS  
by blocking  
pathways**



## M ichigan I nvasive S pecies G rant P rogram



2016  
Michigan  
Invasive Species  
Grant Program



**Address strategic issues  
of prevention, detection,  
eradication, and control  
for both terrestrial  
invasive species and  
aquatic invasive species  
in Michigan**

This is a relatively new grant program that is funded by state money that is appropriated by the State Legislature each year. The call for pre-proposals for the 2016 grant cycle was recently announced. The purpose of the grant program should have a couple of familiar topics...

## Decontamination

- DNR, DEQ, MDARD supplies and training
- Video under media [mi.gov/invasives](https://www.mi.gov/invasives)
- Interactive training module

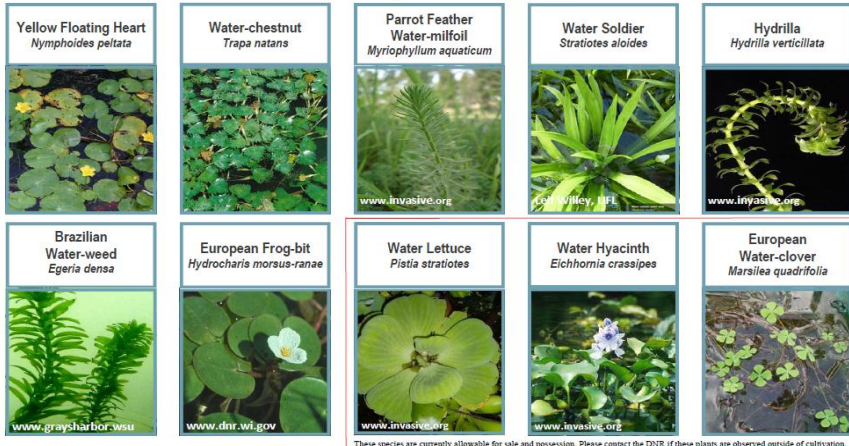




## Michigan's Aquatic Invasive Plant Watch List

Aquatic invasive species on the watch list have been identified as being an immediate and significant threat to Michigan's natural resources. These species either have never been confirmed in the wild in Michigan or have a limited known distribution. Early detection and timely reporting are crucial for preventing establishment and limiting impacts. For more information on these plants, visit: [www.misin.msu.edu](http://www.misin.msu.edu)

**Be on the lookout for these invasive species!**



These species are currently allowable for sale and possession. Please contact the DNR if these plants are observed outside of cultivation.

**If you have seen any of these aquatic invaders, note their location and contact:**



Michigan DNR Wildlife Division  
 Phone: (517) 641-4903 ext. 260  
[www.mi.gov/invasivespecies](http://www.mi.gov/invasivespecies)



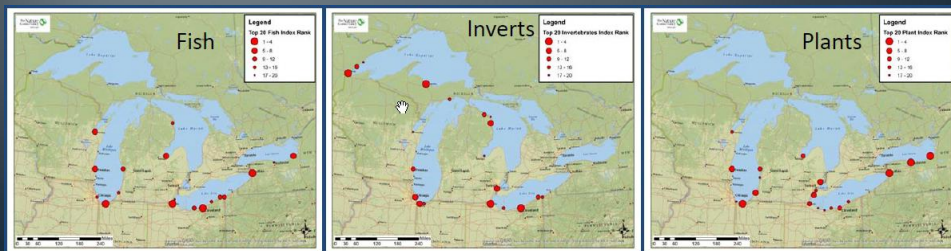
Questions about other aquatic invasive plants? Contact the DEQ Aquatic Nuisance Control Program at 517-284-5593, [www.mi.gov/anc](http://www.mi.gov/anc)

51  
 Revised: June 2015

an interagency decision support tool for new invasive infestations

# Great Lakes Surveillance and Response

- Draft surveillance plan and draft response plan
- Mock exercise
- Phase II
  - Coordination meetings
  - Method development aquatic plants, surveys
  - Pathway analysis
  - Mock exercise



**What can you  
do to help?**

Clean



Drain



Dry



# STOP INVASIVE SPECIES IN YOUR TRACKS.



## Help Prevent The Spread Of Invasive Plants And Animals.

- **REMOVE** plants, animals & mud from boots, gear, pets & vehicle.
- **CLEAN** your gear before entering & leaving the recreation site.
- **STAY** on designated roads & trails.
- **USE CERTIFIED** or local firewood & hay.



**STOP INVASIVE SPECIES  
IN YOUR TRACKS.**

[PlayCleanGo.org](http://PlayCleanGo.org)

## **GIVE INVASIVE SPECIES THE BRUSH OFF.**



Help Prevent  
The Spread Of  
Invasive Plants  
And Animals.





## RIPPLE: Reduce Invasive Pet and PLant Escapes

Inspect and rinse new aquatic plants to rid them of seeds, plant fragments, snails and fish.

Build water gardens well away from other waters.

Seal aquatic plants for disposal in a plastic bag in the trash. Do not compost.

Give or trade unwanted fish or plants with another hobbyist, environmental learning center, aquarium or zoo.

Contact a veterinarian or pet retailer for guidance on humane disposal of animals.





Don't release classroom pets! Instead, talk to your local pet store about turning them in.



And don't release your pets from home either.



When you're looking for reasons to control the spread of invasive species, it's very important to understand that invasive species are NOT everywhere!