Note: Introduce the topic and read/highlight this resource as a whole group during Interactive Read Aloud time at the beginning of the Cycle

MICHIGAN INVASIVE SPECIES

Definition of Invasive Species

An invasive species is one that is ***not native*** and whose introduction ***causes harm***, or is likely to cause harm to Michigan's economy, environment or human health.

Many non-native species in Michigan, including fruits, vegetables, field crops, livestock and domestic animals, are important to our economy and lifestyle. Most non-native species are not harmful and may provide economic benefits. Invasive species cause harm when they out-compete native species by reproducing and spreading rapidly in areas where they have no natural predators and change the balance of the ecosystems we rely on.

How do invasive species get here?

Most invasive species find their way here with the help of humans. Modern means of transportation bring goods, services, people and invasives to all reaches of the globe. Ballast water from ships is to blame for introducing many invasive organisms to Great Lakes waters. Some exotic pets and plants that escape into the wild adapt to local conditions. Insects arriving from abroad in wood packing materials and wood products have caused irreparable damage to native trees and forests. Some invasives were brought to the U.S. intentionally as bio-controls for other invasives; others were introduced as game or food species.

How do they spread?

What makes many invasives so successful is their ability to colonize new areas very rapidly. For plants, this can mean having seeds that are eaten and distributed by birds, such as autumn olive, seeds that easily disperse or catch on clothing or fur, or plant parts that can reproduce whole plants from cut or broken pieces, like Eurasian watermilfoil.

Gypsy moth egg masses and emerald ash borer larvae have been transported to many sites in Michigan on firewood. Microscopic zebra mussel larvae and many invasive aquatic plants have hitchhiked from one lake to another on watercraft and trailers. Garlic mustard has spread along many roadsides and forest trails with the help of cars, plows, ATVs and hikers. In fact, for many invasives, hitchhiking with humans is a common mode of transportation.

Many non-native species have been introduced into the Great Lakes since the early 1800s, either accidentally or intentionally. Nonindigenous or non-native species are

plants and animals living outside of the area where they evolved. A fraction of these species (about 10%) are considered invasive. Aquatic invasive species are non-native plants, animals and microscopic organisms that have a profound negative impact on an aquatic ecosystem or human activity.

Free from natural predators, invasive species reproduce rapidly in their new homes and compete with native species for food and habitat. They disrupt the aquatic food web by reducing food for native species or by preying directly upon native species. Invasive species are often called “biological pollutants.” They’re costly to manage and have led to a severe loss of biodiversity throughout the world.

In the Great Lakes, zebra and quagga mussels and sea lamprey are among the invasive species that have permanently altered the ecosystem, contributed to declines in native species, and impacted sport and commercial fishing. Invasive plants, such as purple loosestrife and Eurasian watermilfoil, have established themselves in many wetlands and inland lakes, respectively, resulting in a loss of native plants and the wildlife that depend upon them.

Many invasive species in the Great Lakes were transported from foreign ports in the ballast water of ocean-going freighters. Ships often take on ballast water for better balance, stability and safety. Today, the United States and Canada require that most ships entering the Great Lakes exchange their ballast water while still at sea to reduce the transport and introduction of new species. Other species like sea lamprey entered the Great Lakes on their own when shipping canals were modernized. Still other introductions are the result of accidental releases, like when a fisherman is using bait that may not be a native species.

How You Can Help

Prevent the transport of aquatic invasive species. Before leaving a body of water:

- Remove mud, plants, fish and animals from fishing gear, boats, motors, and trailers.
- Eliminate water from all equipment, including swimming floats, boat hulls, and bait buckets.
- Clean and dry anything that came in contact with the water—even boots, clothing, and pets.
- Do not release or put plants, fish or animals into a body of water unless they came out of it. Dispose of unused fishing bait in the trash.

INVASIVE SPECIES ANSWER SHEET

SEA LAMPREY

Sea lampreys come from an ancient family of jawless fishes that look like eels. Native to the Atlantic Ocean, they entered the St. Lawrence River and eventually the Great Lakes when the Welland Canal was modernized around 1920. Today sea lampreys are found in all the Great Lakes and many tributaries, with the largest population in northern Lake Huron.

Characteristics

- Eel-like fish that attach to other fish and feed on body fluids.
- Adults grow 12 to 20 inches long.
- Round, suction disk mouth is filled with sharp teeth.

Impacts

- Can kill 40 pounds of fish during its life.
- Often kills large, predator fish, causing populations of smaller fish to grow too large.
- Has contributed to declines in native lake trout and whitefish populations in the Great Lakes.

EURASIAN RUFFE

This fish is native to Europe and Asia. It was first discovered in Minnesota's St. Louis River, the main tributary to western Lake Superior, in 1986. It arrived in the ballast water of an ocean-going vessel.

Characteristics

- Small, aggressive fish with sharp spines on top and bottom fins.
- Grows rapidly and loves to eat.
- Can tolerate a range of water conditions.

Impacts

- Makes up an estimated 80 percent of the fish caught in the St. Louis River.
- Has spread to other areas in western Lake Superior, and Thunder Bay, Lake Huron.
- Reduces food and habitat for native fish, such as walleye and perch.

ROUND GOBY

This fish is originally from the Black and Caspian Seas. It hitched a ride to the Great Lakes in the ballast water of an ocean-going vessel. Round gobies were discovered in the St. Clair River around 1990. They've spread to all of the Great Lakes, with the greatest numbers in Lake Erie, Lake St. Clair, and southern Lake Michigan.

Characteristics

- Small, bottom-dwelling fish that resembles a large tadpole.
- Known to steal fishing bait and is often caught by anglers.
- Likes to live in rocky places and can survive in poor water quality.

Impacts

- Displaces native fish, eats their eggs and young, and takes over optimal habitat.
- Spawns multiple times per season. Population grows rapidly.
- Can become the most numerous fish in a given area.

SPINY WATER FLEA
FISHHOOK WATER FLEA

These tiny creatures are distantly related to shrimp, lobster and crayfish. To see them clearly, you need a microscope. The spiny water flea was discovered in Lake Huron in 1984. The fishhook water flea was discovered in Lake Ontario in 1998.

Characteristics

- Microscopic zooplankton that have long, barbed or hooked tails.
- Tails often catch on fishing lines and downrigger cable.
- Clumps of these zooplankton look and feel like gelatin or cotton batting.

Impacts

These zooplankton:

- Eat small plankton, reducing food for native Great Lakes zooplankton.
- Compete with small and juvenile (baby) fish for plankton such as Daphnia.
- Not a good food source for native fish. Barbed tail spines are hard to digest.
- Clog nets and fishing line, creating problems for fisherman.

ZEBRA MUSSELS

These small, striped mussels are about the size of a fingernail. Zebra mussels are native to the Caspian and Aral Seas of Eastern Europe and Western Asia. They traveled to the Great Lakes in the ballast water of ships. Zebra mussels were discovered in Lake St. Clair in 1988 and have spread to all five Great Lakes and many inland lakes.

Characteristics

- Live in colonies that attach to submerged rocks, dock pilings, boat hulls and even native clams and mussels!
- Filter thousands of gallons of freshwater every day to capture their preferred food—plankton.
- Dead ones can wash up on shore, littering beaches with their sharp shells.

Impacts

- Filter (eat) large quantities of plankton, reducing food for many native species.
- Cause water to become clearer, which promotes excessive growth of aquatic plants.
- Grow in large clusters that clog water intake pipes, boat motors, and pumps, costing millions of dollars to control each year.
- Attach to native Great Lakes mussels and clams, often smothering them.

ASIAN CARP:
BIGHEAD AND SILVER CARP

These two fish were brought to North America in the early 1970s to remove algae from aquaculture ponds (by eating lots of plankton). They escaped from farms along the Mississippi River during a flood in the early 1990s. These big fish now live in the Mississippi and Illinois rivers, and scientists fear they will enter Lake Michigan.

Characteristics

These two fish:

- Grow up to 4 feet long. Weigh over 60 pounds.
- Jump more than 15 feet out of the water. Slam into fishing boats.
- Eat more than 40 percent of their body weight each day.

Impacts

- Eat enormous amounts of plankton—including phytoplankton and zooplankton.
- Could disrupt the Lake Michigan food web and cause problems for fisheries.
- Have been spotted less than 50 miles from Lake Michigan.

PURPLE LOOSESTRIFE

Early settlers brought purple loosestrife to North America from Europe. They liked the plant's eye-catching purple flowers. From its humble beginnings as a garden plant, purple loosestrife quickly invaded wetlands in nearly every U.S. state and Canadian province.

Characteristics

- Tall, flowering plant that can grow from 3 to 7 feet high.
- Often found on the edges of wetlands, roadside ditches and other moist areas.
- Perennial plant that regenerates from its roots every spring.
- Bright purple flowers bloom during midsummer.
- Spreads quickly. A mature plant can produce more than 2.5 million seeds each year.

Impacts

- Competes with native Great Lakes wetland plants and gradually replaces them.
- Not a good food source. When this plant takes over a wetland, ducks, fish, and frogs may leave or die.
- Dense stands of this plant block access to water.

EURASIAN WATERMILFOIL

Eurasian watermilfoil was first spotted in North America in the 1940s, and some say it was brought here intentionally. Others believe the plant was transported in the ballast water of ships from Northern Europe and Asia. Today, Eurasian watermilfoil thrives in nearly every U.S. state, including Michigan, and three Canadian provinces.

Characteristics

- Submerged aquatic plant. Forms thick mats on the water's surface.
- Gets tangled in boat propellers and interferes with swimming and fishing.
- Has feathery leaves, and small red flowers that bloom above water in early summer.

Impacts

- Inhabits inland lakes including some in the Great Lakes region.
- Forms tangled mats that interfere with boating, swimming, and fishing.
- Prevents sunlight from reaching native aquatic plants.
- Reproduces from fragments. Spreads easily by clinging to boats, trailers, and fishing gear.

AQUATIC INVASIVE SPECIES PHOTO CARDS

www.greatlakeslessons.com
MICHU-05-413 COPY MASTER

photo: Dave Brenner

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CUT

photo: Dave Jude

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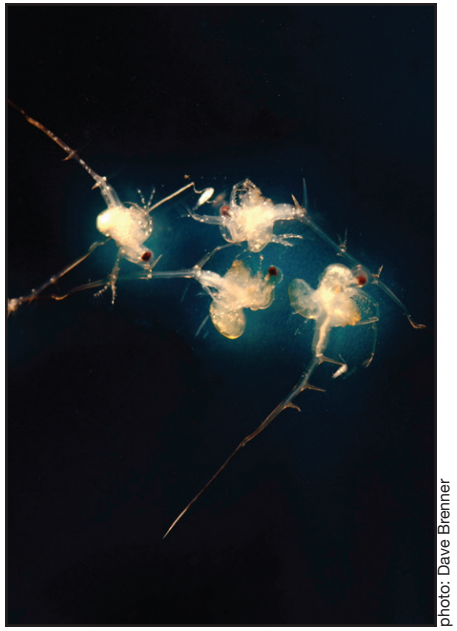

photo: Dave Brenner

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FOLD CUT FOLD

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photo: Simon van Mechelen

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photo: David Riecks

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FOLD CUT FOLD

Challenges Facing Estuaries: Invasive Species

by The Environmental Protection Agency

This text is taken from the United States Environmental Protection Agency's website. This text has been adapted for use by ReadWorks.

Estuaries are places where freshwater rivers and streams flow into the ocean, mixing with the seawater. A wide variety of birds, fish, and other wildlife make estuaries their home. Unfortunately, a number of challenges are threatening the health of estuaries and the wildlife that lives there. One of those challenges is the spread of invasive species.

Sometimes plants and animals that don't grow naturally in an area, also known as "invasive species," can end up in estuaries-either accidentally or intentionally. This can drive out "native" plants and animals; destroy the surrounding habitat; interfere with people who are trying to boat, fish, or swim there; and introduce pathogens into the environment.

Bill Frank (CC BY-SA 4.0)

an oyster drill

Invasive species can spread quickly because they have no natural predators or little competition from other species. Examples include oyster drills, Chinese mitten crabs, and Brazilian pepper trees. These and other invasive species often wind up in estuaries as accidental passengers on ships. Sometimes fish or plants are imported into the country to be sold in aquariums, raised in nurseries, or used in ornamental landscaping but make their way into estuaries by accident.

Dreamyshade (CC BY-SA 3.0)

a Brazilian pepper tree

Long-Term Monitoring of the Hudson River

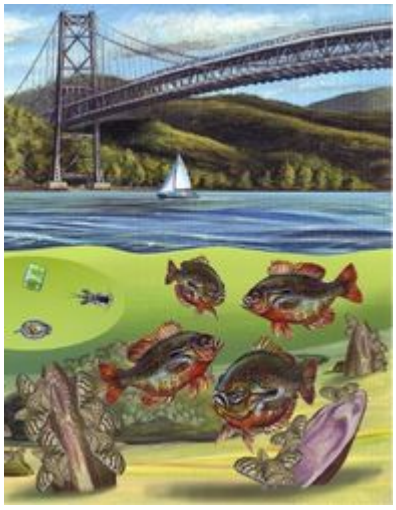
by American Museum of Natural History

This article is provided courtesy of the American Museum of Natural History.

A puzzling reversal

In 2005, 14 years after the first sighting of zebra mussels in the Hudson River, Cary Institute scientists noticed an unexpected change in the river: zooplankton had returned to the same levels as before the invasion. Why weren't the zebra mussels eating as much zooplankton?

Then the scientists observed a change in the zebra mussels they were collecting from the river. Zebra mussels are grouped into three sizes: small (less than 10 mm), medium (10-20 mm), and large (more than 20 mm). While there were still many zebra mussels in the Hudson River, the overall number of zebra mussels was slightly declining, and they were on average much smaller. Populations of the largest - or oldest mussels - were declining greatly. Zebra mussels can live six or seven years, but now it seemed that most were dying after only one or two years. Adult zebra mussels had less than one percent chance of surviving a given year. The impact of the zebra mussel invasion was changing.



WHAT HAPPENS NEXT? What's the future of the Hudson River ecosystem now that zebra mussels have arrived? Only time and observation will tell.

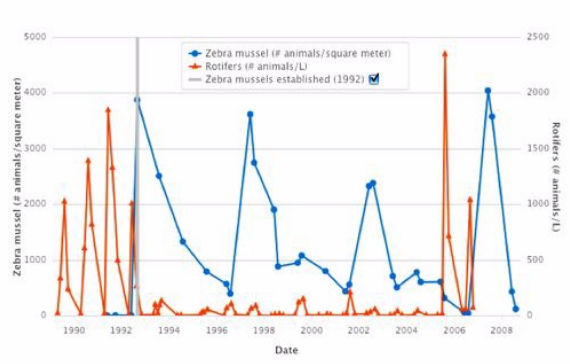
If there were fewer large zebra mussels, it made sense that there was more zooplankton. That's because large zebra mussels feed on bigger food particles like zooplankton. Smaller zebra mussels can eat only smaller particles like phytoplankton and bacteria.

ZEBRA MUSSEL AVERAGE SIZES

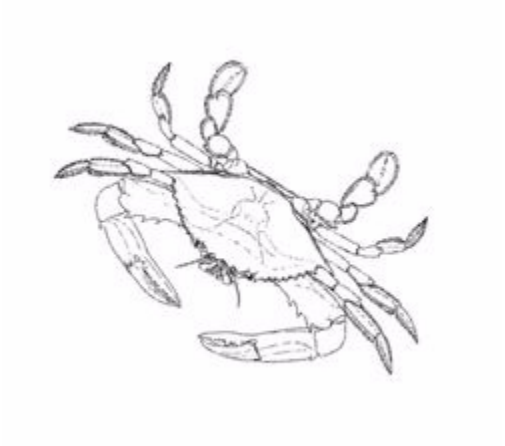
These new effects rippled through the food web. As zooplankton rebounded, so did native mussels and clams. Scientists anticipate some fish species will rebound too as their food supply increases. Scientists don't know exactly what caused the decline in large zebra mussels, but they do know blue crabs were eating some of them.

More time, more data, more answers... and more questions

By monitoring several aspects of the Hudson River over many years, Cary Institute scientists are beginning to answer their original question: How might a zebra mussel invasion affect the Hudson River ecosystem? Early on during the invasion, zebra mussels survived, thrived, and had a huge impact on the ecosystem's food web - just as scientists had predicted.



ANALYZE THIS This graph shows the amounts of rotifers (or zooplankton, shown with an orange line and triangles) and zebra mussels (shown with a blue line and circles) in the Hudson River over 20 years. Look at what happens in the last five years of the graphed data: what do you think is happening to the ecosystem?



Blue crabs are a bottomdwelling predator and a chief consumer of bivalves and other crustaceans, including zebra mussels.

Almost 20 years later, the number of zebra mussels has declined overall. And parts of the ecosystem, such as the number of zooplankton, native mussels, and clams, have started to increase. But is this the end of the story? Or have we just seen the first two stages of an invasion that might have three or four stages, or more?

As their data grows, the scientists are able to track changes in the river - whether from pollution, weather, sea level rise, invasive species, or human activity - and to pose new questions. This broad approach also puts Cary scientists in a unique position to investigate future changes to the Hudson River ecosystem.