

## OBJECTIVES

- After participating in this activity, learners will be able to:
- name and visually recognize some invader (nonindigenous/exotic) species of the Great Lakes
  - understand and analyze the positive and negative impacts of invader species on the Great Lakes ecosystem
  - explain the ways in which invader species are introduced into the Great Lakes
  - describe and act out ways to avoid the spread of exotic species

## ACTIVITY SUMMARY

Learners will work in small groups to organize scrambled exotic species cards. Each group will present a different exotic species in a poster or fact sheet to the class, and then the group will act out (charades) a way to avoid the spread of their exotic species.

## BACKGROUND

An exotic plant or animal is one that does not naturally occur in a specific location or ecosystem. Exotics arrive through intentional or accidental actions by humans. Exotics that survive always affect local ecosystems. Biologists usually judge the consequences of these impacts based on how much they add to or detract from some important human endeavor. They also attempt to examine the effects upon other species of animals or plants, and upon ecosystems. Exotics sometimes have no natural predators in their new

locations, and this may allow them to overpopulate an area and kill off native species.

Since the early 1800s, over 140 species of aquatic plants, algae, fish, worms, mollusks, and other organisms have been introduced in the Great Lakes. Some introductions have been intentional and some accidental. Effects from the introduction of exotic or non-native species can range from detrimental to beneficial. Some introductions may have no noticeable effect. Many times humans have a limited understanding of the variety of effects that may result from an introduction. Some introductions may have both positive and negative effects, depending on one's perspective. Many exotics may compete with native species for limited resources or feed upon them.

It is estimated that about 15 percent of the 175 species of fish in the Great Lakes are non-native species that were introduced accidentally or intentionally. Eighty-six invader species are plants,

although plants have received less attention as invaders. A few exotics have had very substantial impacts. One such invader to the Great Lakes is the sea lamprey. Common to the ocean waters from Florida to Labrador, sea lampreys swim inland into fresh waters to spawn. Natural barriers, like Niagara Falls, previously prevented them from reaching the Great Lakes. However, once shipping canals were opened up, the sea lamprey easily found its way to the Great Lakes, where it decimated populations of native fish species.

Many exotic species hitched a ride to the Great Lakes region in the ballast of ships. When ships are not loaded with cargo, they take on ballast for better balance, stability, and safety. The use of water as a ballast has replaced the use of sand and stones during the past 100 years or so. Scientists think many of today's exotic species, such as zebra mussels, the goby, ruffe, and spiny water flea, were sucked up from European harbors by powerful water pumps. Ballast tanks are filled with water from the harbor wherever ships are loaded, and then the water is dumped, along with any aquatic organisms present, when ships reach their destination. It is estimated that in the history of the Great Lakes, 34 percent of the invader species entered in solid ballast and 56 percent through ballast water.

The United States and Canada require that most ships entering the Great Lakes discharge their freshwater ballast while still in the ocean, replacing it with saltwater ballast to reduce the introduction of new exotic species.

There are always trade-offs involved with the accidental or intentional introduction of a species into an ecosystem. Sometimes the impacts are difficult to judge ahead of time. Laws and regulations are intended to force a careful review of pros and cons before the intentional introduction of a new species is allowed. Introduction of a species that

will have mostly detrimental impacts is not allowed.

Accidental introductions of exotic species should be completely avoided. People can help to avoid the spread of exotic species by taking careful precautions. Boaters should be careful to rinse the bottoms of boats, bilge pumps, and live wells with clean tap water before leaving lake or river areas. They should remove aquatic plants that get stuck on boat trailers and boats. This will reduce the chances of transporting exotic plants and animals. Ships should always release foreign ballast before reaching their destination. This will prevent the transport of exotic plankton, plants, and animals. Pets, plants, and unused bait should not be released into the wild.

## MATERIALS

For each group of 3–4 learners:

- copies of the included information cards. Each of the three card categories (invader picture, introduction, positive and negative impacts) should be copied onto a different color card stock paper (18 cards per group)
- answer sheet

## PROCEDURE

- 1) Introduce the topic of exotic species to the class. Explain key points made in the background section and define difficult vocabulary words such as exotic, non-native, invader, ballast, plankton, etc.
- 2) Have learners work in groups of three to four people, each with a complete set of 18 shuffled cards (six "Great Lakes Changes Cards," six "Picture Cards," and six "Introduction Cards").
- 3) Beginning with the picture of the invader, match the cards to determine which introduction and Great Lakes Changes Card goes with each invader. For each picture, there should be one

matching card of each other color.

- 4) When group members agree that they have matched the cards to the best of their ability, they may check their answers on the answer sheets.
- 5) Each group selects an invader to present to the class; construct a poster on the invader or develop a fact sheet. The impact of the invader on human affairs should be included.
- 6) After the group has presented their exotic species, have the learners play a short charade-like game. The group acts out a way to prevent the spread of their exotic species, and the rest of the learners guess the action they are doing.
- 7) After all the groups have presented and acted, review with learners the importance of decision making in exotic species. Remind them there are some positive changes as a result of exotic

species, but that there are also many negative impacts to the Great Lakes ecosystem, and that we are all responsible for making good decisions.

## ASSESSMENT/EVALUATION

- Observe groups as they discuss and organize their cards.
- Observe group presentations of exotic species.
- Collect the groups' invader posters or fact sheets to evaluate according to teacher criteria.
- Ask the learners, "Why should people be concerned about exotic species? How do they affect ecosystems?" (Invading species threaten to change present ecosystems, often in unpredictable ways that may be beneficial or very detrimental.)



## SOURCE

Modified by Anne Williamson, Michigan State University, and Mike Klepinger, Michigan Sea Grant. Adapted with permission from "What do scientists know about invader species of the Great Lakes?" in *Earth Systems—Education Activities for Great Lakes Schools: Life in the Great Lakes*.

## ADAPTATIONS

- Do research on control methods that have been tried on various invader species and report on their successes or failures. Brainstorm a creative way to control one of the invaders.
- Investigate other Great Lakes exotic invaders, such as the Eurasian milfoil, to determine ecological impacts. Add your species to this game.
- Draw a humorous cartoon depicting the problem or benefit of an invader species. (Example: A zebra mussel looking for a place to attach on an already overcrowded lake bottom, a white perch nudging out a yellow perch, purple loosestrife choking other plants, a fisherman eating a salmon whole, etc.)
- Look for exotic species the next time you visit Great Lakes waters!

## COMPUTER EXTENSIONS

Great Lakes Education Program:

<http://www.msue.msu.edu/seagrant/>

Purple Loosestrife Pages:

<http://www.msue.msu.edu/seagrant/pp/>

Great Lakes Panel on Aquatic Nuisance Species:

<http://www.glc.org/projects/ans/anspanel.html>

Exotic Species in the Great Lakes: [http://](http://www.great-lakes.net/envt/exotic/exotic.html)

[www.great-lakes.net/envt/exotic/exotic.html](http://www.great-lakes.net/envt/exotic/exotic.html)

National Biological Services, Nonindigenous

Aquatic Species (NAS) Information Resource:

<http://www.nfrcg.gov/nas/nas.htm>

## ADDITIONAL RESOURCES

### Local Contacts

St. John's Marsh—MDNR

MDNR Research Station, South River Road,  
Harrison Township

Macomb County Community College,

Environmental Centers (South and Center  
campus)—Contact the Biology Department

Belle Isle Aquarium

## Teaching Materials and References

Michigan DNR. *Zebra Mussels in Lake Michigan: What recreational boaters and anglers should know* (brochure). Office of Great Lakes, P.O. Box 30028, Lansing, MI 48909.

Michigan Sea Grant. *Spiny Tailed Bythotrephes. Its Life History and Effect on the Great Lakes* (booklet). Upwellings Vol. 11(3), Summer 1990, Vol. 14(1), Winter 1992.

Michigan United Conservation Clubs. October 1996. *Tracks*, Vol 19(2).

Minnesota Sea Grant. Spring 1992. "Eurasian milfoil: Can it be controlled?" *Seiche*.

Ohio Sea Grant. *The Spiny Waterflea, Bythotrephes. Another unwelcome newcomer to the Great Lakes*. Dave Berg. FS-049, 2 pp.

Ohio Sea Grant. 1997. "What do scientists know about invader species of the Great Lakes?" in *Earth Systems—Education Activities for Great Lakes Schools: Life in the Great Lakes*, pp. 41-52.

Columbus, OH: Ohio Sea Grant Publications. Ohio Sea Grant. *Zebra mussels in North America: The invasion and its implications*. Fred L. Snyder. FS-045, 4 pp.

Wisconsin Sea Grant. 1982. *The Lamprey: Invaders of the Great Lakes*. Warren Downs. WIS-SG-82-138, 8 pp.

Michigan Sea Grant. 1997. *Purple Loosestrife: Biology, Ecology and Life History*.

## Additional Activities

Michigan Sea Grant. 1998. *Purple Loosestrife Cooperators Handbook activities for educators*.

Project Wild Aquatic: Aquatic Roots, pp. 100-103.

TRACKS: An alien: but not from outer space. Vol. 19(2), October 1996. Lansing, MI: MUCC.

Exotic Aquatics Traveling Trunk. From: Minnesota Sea Grant, Exotic Species Information Center, 2305 E. Fifth St., Duluth, MN 55812-1445.



## TEACHER MEMOS

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**Subjects:** Science, Social Studies, English.

**Michigan Standards:** s1, s4, s6, s7, ss6, ss8, ss9, ss21, ss22, ss23, ss26, e7, e8.

**Skills:** Citizenship, Classification, Comparison, Description, Discussion, Listening, Media Construction, Problem Solving, Public Speaking, Reading, Reporting, Responsibility, Role-Playing, Small Group, Writing.

**Timing:** Pre-cruise.

**Charting the GLEP Course:** Do this activity after completing the "Great (Lakes) Connections" activity.

**Conceptual Framework Reference:** IA1, IA2, IC1, IC2, IC3, ID1, ID2, IIA1, IIID1, IID2, IIIA2, IVD1, IVE1, IVF1, VA1, VB1, VC1, VD1, VIA1.

**Duration:** 2 hours. Introduction and card matching = 30 minutes, Report and skit writing = 30 minutes, Report and skit presentations = 1 hour.

**Setting:** Classroom.

***Exotic species #1 causes changes in the Great Lakes:***

**+ Positive**

- 1) Sea lamprey larvae (young) provide some food for other fish. They can also be used as fishing bait.
  - 2) Adult sea lamprey are food for birds, snakes, raccoons, and other fish.
  - 3) Sea lamprey are eaten as a delicacy (tasty food) in Europe. The lamprey are smoked, grilled, fried, and steamed.
- Are there any more positive changes in the Great Lakes because of sea lamprey? Please add any you can think of.

- 4)
- 5)
- 6)

**– Negative**

- 1) Sea lamprey are parasites and feed on other fishes' bodies. Each sea lamprey can kill 40 pounds of fish in its life.
- 2) Sea lamprey kill large, predator fish. Without predator fish, small fish populations can get very large.
- 3) Sea lamprey contributed to lower numbers of native lake trout, whitefish, and chubs in the Great Lakes.
- 4) Since native fish numbers were so low in the 1950s because of sea lamprey, commercial fishermen were not able to harvest much fish to sell.
- 5) U.S. commercial fishermen do not harvest and sell sea lamprey because Americans do not like to eat them.
- 6) The exotic sea lamprey might compete with native Great Lakes lamprey or fish for nesting areas and food.

Are there any more negative changes in the Great Lakes because of sea lamprey? Please add any you can think of.

***Exotic species #3 causes changes in the Great Lakes:***

**+ Positive**

- 1) Salmon eat alewives. This helps keep the alewife population under control.
- 2) People like to eat salmon, so commercial fishermen can catch them and sell them for a profit.
- 3) Sport anglers enjoy catching them with hook and line.
- 4) Many jobs were created. Sport anglers spend millions of dollars at bait shops, on boats, for fishing tournaments, and on fishing licenses.

Are there any more positive changes in the Great Lakes because of salmon? Please add any you can think of.

- 5)
- 6)
- 7)

**– Negative**

- 1) Salmon eat smelt and other forage (small) fish that native fish populations also need to eat.
- 2) Salmon may compete with native lake trout for food.
- 3) Male and female salmon die after spawning.

Are there any more negative changes in the Great Lakes because of salmon? Please add any you can think of.

- 4)
- 5)
- 6)

***Exotic Species #2 causes changes in the Great Lakes:***

**+ Positive**

- 1) Large predator fish feed on alewives.
- 2) When alewives spawn in rivers and near shore, the large predator fish follow them. Sport anglers enjoy catching the large fish that come close to shore.
- 3) Commercial fishermen catch alewives to sell for pet food, fertilizer, and oils.

Are there any more positive changes in the Great Lakes because of alewives? Please add any you can think of.

- 4)
- 5)
- 6)

**– Negative**

- 1) Alewives compete with and reduce numbers of native herring, shiners, and yellow perch.
- 2) Alewives eat the eggs and baby fish of native herring, shiners, and yellow perch.
- 3) People do not like to eat Great Lakes alewives, but herring and yellow perch are very tasty.
- 4) In the 1960s and 1970s, billions of alewives died and covered the beaches. The flies were very thick and the rotting fish were very smelly and had to be bulldozed away. Many beaches were unusable.
- 5) Dead alewives clog our water treatment (drinking water) plants and industrial plants, and they cost money to clean up.

Are there any more negative changes in the Great Lakes because of alewives? Please add any you can think of.

- 6)

***Exotic Species #4 causes changes in the Great Lakes:***

**+ Positive**

- 1) A few fish are able to eat the spiny water flea for food.
- Are there any more positive changes in the Great Lakes because of the spiny water flea? Please add any you can think of.

- 2)
- 3)
- 4)

**– Negative**

- 1) Spiny water fleas eat small plankton and may compete with natural Great Lakes zooplankton. This is a problem for the Great Lakes food web.
- 2) Spiny water fleas compete with small and juvenile (baby) fish for plankton such as Daphnia.
- 3) Spiny water fleas have a long spine, and small fish have a hard time eating them. Most fish learn to avoid them.

Are there any more negative changes in the Great Lakes because of the spiny water flea? Please add any you can think of.

- 4)
- 5)
- 6)

*Exotic species #5 causes changes in the Great Lakes:*

**+ Positive**

- 1) Since every zebra mussel filters about a liter of water per day for food, Great Lakes waters are clearer, so people can see farther, especially underwater divers.
- 2) Zebra mussels are a source of food for diving ducks, drum (a fish), catfish, and carp.
- 3) There are more jobs in the water treatment and industrial plants. Many people work very hard to get rid of zebra mussels. Are there any more positive changes in the Great Lakes because of zebra mussels? Please add any you can think of.

**– Negative**

- 1) Zebra mussels filter and eat small plankton and compete with native Great Lakes zooplankton. This is a problem for the Great Lakes food web.
- 2) Zebra mussels attach to native Great Lakes mussels and clams. This leaves the native mussels and clams handicapped and unable to compete well with the zebra mussels.
- 3) Zebra mussels attach to water treatment plants and clog pumps. It is very expensive to keep water pumps unclogged.
- 4) Zebra mussels attach to boats and overheat engines. Broken engines are expensive to fix.
- 5) When zebra mussels die, they sometimes wash onto beaches. Their lifeless shells cover up the sand and are smelly when they rot. Zebra mussel shells make some swimming beaches dangerous to bare feet. Are there any more negative changes in the Great Lakes because of zebra mussels? Please add any you can think of.
- 6)

*Exotic species #6 causes changes in the Great Lakes:*

**+ Positive**

- 1) Purple loosestrife is a very beautiful plant with lovely purple flowers.
- 2) Honeybees and butterflies are attracted to purple loosestrife because of its flowers and nectar.
- 3) Redwing blackbirds build nests in the stems of purple loosestrife. Are there any more positive changes in the Great Lakes because of loosestrife? Please add any you can think of.
- 4)
- 5)
- 6)

**– Negative**

- 1) Purple loosestrife competes with native Great Lakes wetland plants and quickly takes over habitats.
- 2) Thick roots allow purple loosestrife to fill in wetlands, ponds, lakes, and reservoirs.
- 3) Purple loosestrife fills in drainage ditches, causing flooding.
- 4) Purple loosestrife fills in wetlands, causing less fish spawning habitat and water quality problems.
- 5) Purple loosestrife does not provide food for many animals that live in the habitat, causing ducks, fish, and frogs to leave or die. Are there any more negative changes in the Great Lakes because of loosestrife? Please add any you can think of.
- 6)

## INTRODUCTION

First introduction into the Great Lakes was about 1986. Scientists think the ballast water of a ship from Europe probably contained this exotic's larvae, and it was dumped right into Lake St. Clair. Larva is the "baby" form of the exotic and floats around in the water as plankton before it attaches itself to a hard surface and rapidly forms colonies.

### To avoid the spread of this exotic animal:

- People with ski boats or fishing boats should be careful to rinse everything with clean tap water before leaving lakes or rivers. The bottoms of boats, pumps inside the boats, fish buckets, water skis, jet skis, and anything else that was in the water should be rinsed. This will reduce the chances of transporting the planktonic larvae. If you see adult zebra mussels on boats or equipment, be sure to remove them before moving to the next lake or stream.
- People should also be careful not to collect live animals and then let them go in new areas such as local ponds or rivers. The animals can be studied in tanks, but it is very important not to let the animals go free, especially in new areas. Give them to a scientist or to a nature center.

## INTRODUCTION

Originally this animal came from river mouths at the Atlantic Ocean. For centuries it swam up freshwater rivers like the St. Lawrence Seaway and Hudson River to spawn, but it was not able to swim over natural barriers such as Niagara Falls to reach the Great Lakes. The exotic animal invaded the upper Great Lakes by swimming through the manmade Erie and Welland shipping canals. It also attached itself with its sucker-like mouth to the hulls, or bottoms, of boats for a free ride into the Great Lakes. By 1938, this exotic invaded all five of the Great Lakes.

### To avoid the spread of this exotic animal:

- Anglers using this exotic juvenile (baby form) as fishing bait need to be very careful. Anglers should not use the exotic species for bait in streams and lakes that do not already have this exotic species. The reason for this is because sometimes bait gets off the hook and goes free. The juvenile exotic would then grow up and mature, and then be an invader species into the lake or stream. This would happen because the exotic bait got off the angler's hook.
- Anglers using this exotic juvenile (baby form) as fishing bait in a stream or lake that has already been invaded by the exotic adult forms also need to be careful. After using the exotic juveniles for fishing, the anglers should not let the extra exotic bait go free in the stream or lake. The extra bait should be taken back to the bait shop, or saved for another fishing trip. This will help reduce the number of exotic species in the stream or lake.
- Fish caught with an adult sea lamprey attached to it should not be released without first removing the lamprey from its body. The lamprey should then be killed or taken to a scientist or to a nature center. Do not release the lamprey back into the lake or stream.

## INTRODUCTION

This invader swam in schools through water routes and canals from the Atlantic Ocean. It was able to invade the upper Great Lakes by swimming through the manmade Erie and Welland shipping canals since 1930.

### To avoid the spread of this exotic animal:

- Anglers using this silvery fish as fishing bait need to be very careful. Anglers should not use the exotic species for bait in streams and lakes that do not already have this exotic species. The reason for this is because sometimes bait gets off the hook and goes free. The exotic would then be an invader species into the lake or stream because the exotic bait got off the angler's hook.
- Anglers using this exotic silvery fish as fishing bait in a stream or lake that has already been invaded by the exotic also need to be careful. After using the exotic for fishing, the anglers should not let the extra exotic bait go free in the stream or lake. The extra bait should be taken back to the bait shop, or saved for another fishing trip. This will help reduce the number of exotic species in the stream or lake.

## INTRODUCTION

This exotic species was introduced into the Great Lakes on purpose in 1966 by Michigan Department of Natural Resources (DNR) officials. This large predator fish was introduced to help reduce (eat) the huge numbers of alewives (silver bait fish) that invaded the Great Lakes.

### To avoid the spread of this exotic animal:

- Anglers catching these large exotic sport fish should not release them into new lakes or streams for their own fun. Some anglers may want to release these large fish into their own streams or lakes to catch again, but that is illegal. Only officials from the DNR who have done proper research and experiments should release this exotic into new streams and rivers.

## INTRODUCTION

This tiny animal was accidentally carried into the Great Lakes in fresh water or in mud carried as the ballast for a freighter ship. The shrimp-like plankton was first released in Lake Huron in 1984, and then spread quickly to all the other Great Lakes by 1987. It is hard for other organisms to swallow because of its stiff tail.

**To avoid the spread of this exotic animal:**

- People with ski boats or fishing boats should be careful to rinse everything with clean tap water before leaving lakes or rivers. The bottoms of boats, pumps inside the boats, fish coolers, water skis, jet skis, and any thing else that was in the water should be rinsed. This will reduce the chances of transporting exotic plankton.
- Anglers without boats should also be careful to rinse all their fishing gear with tap water. The exotic plankton with their spiny tails with hooks sometimes get caught on fishing lines and nets. Anglers would not like to accidentally introduce this exotic species into new streams or lakes!

## INTRODUCTION

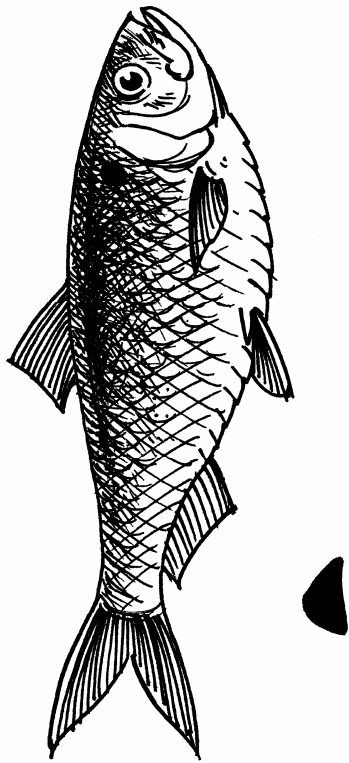
This colorful plant probably first arrived in North America from its home range in Europe in the ballast of sailing vessels in the early 1800s. It is thought that it might have also arrived in imported sheep's wool, because some of the oldest stands on the continent are found just downstream from woolen mills. Because its flowers are very beautiful, it was imported by gardeners and florists for many decades. It is now illegal to sell or distribute this plant in most states.

**To avoid the spread of this exotic plant:**

- This exotic plant should not be planted in yards or fields because it spreads very quickly. An average plant creates over two million tiny seeds per year, so care needs to be taken not to take any seeds with you in your clothing when you leave an infested wetland. Shake out and brush off shirts, pants, socks, and shoes.

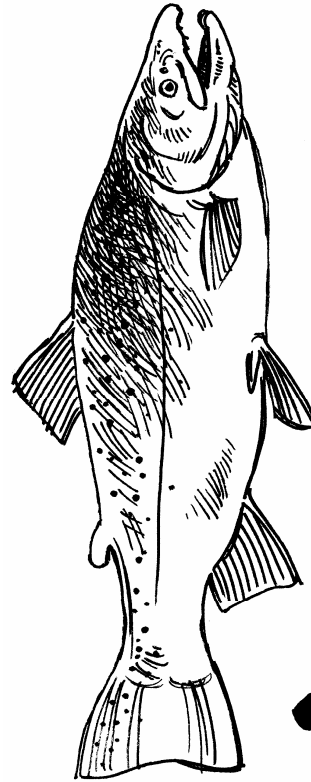


Alewife



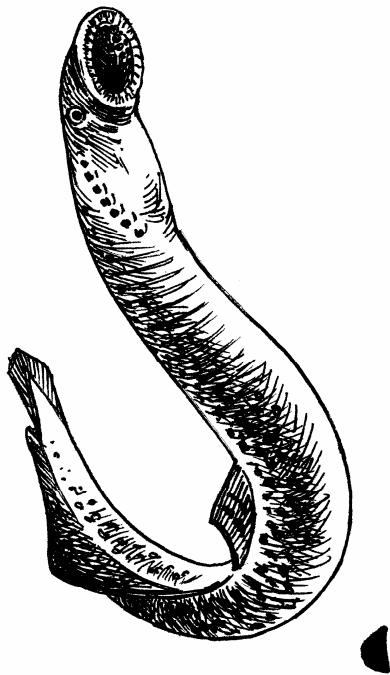
(Zebra mussel shell [1 inch wide] shown for size comparison.)

Coho Salmon



(Zebra mussel shell [1 inch wide] shown for size comparison.)

Sea Lamprey



(Zebra mussel shell [1 inch wide] shown for size comparison.)

Zebra Mussel



(Actual size approximately 1 inch wide)

Spiny Water Flea



Purple Loosestrife



(Zebra mussel shell [1 inch wide] shown for size comparison.)

# Exotic Species Answer Sheet

Match the information on the cards with the first couple of sentences on the answer sheet for each exotic species.

## Exotic Species #1: Sea Lamprey

Exotic Species #1 causes changes in the Great Lakes:

### + Positive

- 1) Sea lamprey larvae provide some food for other fish. They can also be used as fishing bait by anglers.
- 2) Adult sea lamprey are food for birds, snakes, raccoons, and other fish.

### Introduction

Originally this animal came from river mouths at the Atlantic Ocean. For centuries it swam up freshwater rivers like the St. Lawrence Seaway and Hudson River to spawn, but it was not able to swim over natural barriers such as Niagara Falls to reach the Great Lakes. The sea lamprey invaded the upper Great Lakes by swimming through the manmade Erie and Welland shipping canals. It also attached itself with its sucker-like mouth to the hulls, or bottoms, of boats for a free ride into the Great Lakes. By 1938, this exotic invaded all five of the Great Lakes.

## Exotic Species #2: Alewife

Exotic Species #2 causes changes in the Great Lakes:

### + Positive

- 1) Large predator fish feed on alewives.
- 2) When alewives spawn in rivers and

near shore, the large predator fish follow them. Anglers enjoy catching the large fish that come close to shore.

- 3) Commercial fishermen catch alewives to sell for pet food, fertilizer, and oils.

### Introduction

This invader swam in schools through water routes and canals from the Atlantic Ocean. It was able to invade the upper Great Lakes by swimming through the manmade Erie and Welland shipping canals since 1930.

## Exotic Species #3: Pacific Salmon

Exotic Species #3 causes changes in the Great Lakes:

### + Positive

- 1) Salmon eat alewives. This helps keep the alewife population under control.
- 2) People like to eat salmon, so commercial fishermen can catch them and sell them for a profit.
- 3) Sport anglers enjoy catching them with hook and line.
- 4) Many jobs were created. Sport anglers spend millions of dollars at bait shops, on boats, for fishing tournaments, and on fishing licenses.

### Introduction

This exotic species was introduced into the Great Lakes on purpose in 1966 by

the Michigan Department of Natural Resources (DNR) officials. This large predator fish was introduced to help reduce (eat) the huge numbers of alewives (silver bait fish) that invaded the Great Lakes.

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## Exotic Species #4: Spiny Water Flea

Exotic Species #4 causes changes in the Great Lakes:

### + Positive

- 1) A few fish are able to eat the spiny water flea for food.

### Introduction

This tiny animal was accidentally carried into the Great Lakes in fresh water or in mud carried as the ballast for a freighter ship. The shrimp-like plankton was first released in Lake Huron in 1984, and then spread quickly to all the other Great Lakes by 1987. It is hard for other organisms to swallow because of its stiff tail.

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## Exotic Species #5: Zebra Mussel

Exotic Species #5 causes changes in the Great Lakes:

### + Positive

- 1) Since every zebra mussel filters about a liter of water per day for food, Great Lakes waters are clearer, so people can see farther, especially underwater divers.
- 2) Zebra mussels are a secondary source of food for diving ducks, drum, catfish, and carp.
- 3) There are more jobs in the municipal

water supply and industrial plants. Many people work very hard to get rid of zebra mussels.

### Introduction

First introduction into the Great Lakes was about 1986. Scientists think the ballast water of a ship from Europe probably contained zebra mussel larvae, and it was dumped right into Lake St. Clair. Larvae are the "baby" form of the exotic, and they float around in the water as plankton before they attach themselves to a hard surface and rapidly form colonies.

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## Exotic Species #6: Purple Loosestrife

Exotic Species #6 causes changes in the Great Lakes:

### + Positive

- 1) Purple loosestrife is a very beautiful plant with lovely purple flowers.
- 2) Honeybees and butterflies are attracted to purple loosestrife because of its flowers and nectar.
- 3) Redwing blackbirds build nests in the stems of purple loosestrife.

### Introduction

This colorful plant probably first arrived in North America from its home range in Europe in the ballast of sailing vessels in the early 1800s. It is thought that it might have also arrived in imported sheep's wool, because some of the oldest stands on the continent are found just downstream from woolen mills. Because its flowers are very beautiful, it was imported by gardeners and florists for many decades. It is now illegal to sell or distribute purple loosestrife in most states.