

Rival for Survival

Trip at a Glance

This game presents real-life choices involving exotic species found in the Great Lakes, such as zebra mussels and purple loosestrife. Students are to analyze a situation related to ecology and make an environmentally sound decision. After playing the game, students organize what they learned into a concept map.

Destination

Students will be able to

- ✿ Analyze situations and factors affecting ecosystems.
- ✿ Recognize exotic species found in the Great Lakes.
- ✿ Create a concept map that interrelates the topics presented in the game.



Adventure Levels

Grades 6–9

This activity can be adapted for younger students.

Areas of Interest

Science and Citizenship

Locale

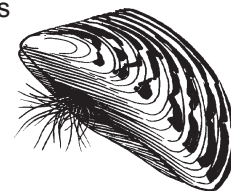
Classroom tables, desks, and/or the floor

Length of Stay

Two class periods

Invader Background Check

Exotic species are organisms that are brought into an ecosystem that is not their own. These organisms attempt to fill the niche of organisms that are already present. There is a limited amount of resources in any environment. Adding new species means that species already present now have more competition for food and shelter. If an exotic species does well, it usually means a preexisting species begins to decrease in numbers through intense competition for ecosystem resources.



Exotic species have been introduced into new environments both intentionally and unintentionally. For example, purple loosestrife was introduced for landscaping purposes. Other species, such as zebra mussels, were transferred unintentionally through the ballast water of ocean freighters.

Foreign Language

Alewife
 Eurasian watermilfoil
 Exotic species
 Fishhook flea

Indigenous species
 Niche
 Organism
 Purple loosestrife

Round goby
 Sea lamprey
 Zebra mussel

Amenities Provided

Rival for Survival game board found in “Posters and Games”
Game Cards 15.1–15.6
Rival for Survival game Instructions 15.7

Things to Pack

Dice
Movable game pieces
Paper for keeping score
Pen or pencil



Itinerary

Preparing for the activity

1. Copy and assemble the game boards for each learning group. See “Travel Tips” for a way to prepare the game board and other materials.
2. Copy game cards and instructions. Copy one set of cards for each game (matching front and back by letters, such as “Front a” to “Back a”). Copy one game instruction page for each game.

First class period: Introducing and playing the game

3. Divide students into cooperative learning groups of two to five people.
4. Provide an introduction to exotic species. Ask the following questions:
What are exotic species?
How do you think exotic species affect the environment?
(See “Invader Background Check.”)
5. Explain that students will be playing this game to learn about exotic species—how they affect the ecosystem and how our actions affect the control or spread of exotic species.
6. Distribute the games and materials. Read the directions and rules of the game. Explain that students will be allowed to play the game for the majority of the class hour. Establish a time limit for play so that they are aware that all points will be counted at a certain time.
7. Clean up with five minutes left in class.

Second class period: Building concept maps

8. Give each student a sheet of paper and request that a concept map be developed for the term “exotic species.” Ask the following questions to direct students to the relevant topics that should be included:
Can you name some exotic species?
What are the potential problems of taking a species out of its natural habitat?
How did some exotic species get transported to the Great Lakes region?
9. After their individual concept maps have been collected for evaluation, create a “class” concept map for the term “exotic species” using an overhead projector or the chalkboard. Discuss how their concept maps compare to the one the class created.

Directions

1. The objective of the game is to have the most points when all players have reached the “Finish” position, at the Great Lakes.
2. Each player rolls the die, and the player with the highest number goes first.
3. Player 1 rolls the die and moves the playing piece the number of spaces shown on the die. Player 1 chooses a question card and hands it to the player on the left, who reads the question aloud. Player 1 chooses the best answer.
4. Points received are based on the player’s answer and are recorded on the score sheet.
5. When landing on a space that requires the player to move ahead or backward, the player moves the game piece before picking a question card.
6. Some answers will cause a player to lose points. If the player has no points, however, he or she cannot go below zero, even if told to subtract a point.
7. Play continues in a clockwise direction until all players reach the Great Lakes region or the time limit is reached. The player with the **most points** is the winner—not the player who reaches the Great Lakes first. Finishing first may not necessarily be a good thing in this game!

Travel Tips

- ✿ Here is a great way to preserve and store your games. Glue each game board inside a file folder, and glue the game instructions on the back of the folder. For each game, make an envelope to store the cards for that game. Laminate everything: the folders, the game cards, and the envelope. Place the envelope into the file folder. Then it’s ready to store.
- ✿ To help the game move more smoothly, you can
 - Make sure you keep the numbers in the cooperative groups as low as possible.
 - Have each player keep track of his or her own score on a sheet of paper, or assign one scorekeeper per group if you feel there will be arguments about the scores.
 - Assign one student to pick up and return the game so that there is no confusion at the end.
- ✿ This activity relates to several 9th Grade Proficiency Test Learning Outcomes [noted for the state of Ohio but likely relates to other states as well]:
 - Science: Trace the flow of energy and/or interrelationships of organisms in an ecosystem.
 - Science: Describe how a given environmental change affects an ecosystem.
 - Citizenship: Identify opportunities for involvement in civic activities.

Debriefing

Use a rubric similar to the following to evaluate the concept map and assess what the students have learned:

Exotic Species Concept Map Rubric

Demonstrates what an exotic species is	1
Mentions at least three exotic species	3
Includes one method of transport of exotic species	1
Includes one way native species are affected	1

Total: 6

Sample Concept Map Information

Exotic species are nonindigenous organisms that have invaded an ecosystem. Some exotic species are purple loosestrife, goldfish, zebra mussels, sea lamprey, and starlings. Some were transported intentionally by people, such as purple loosestrife for landscaping. Some were transferred unintentionally, such as zebra mussels, through the ballast water of ocean freighters. If exotics do well, they can lower the numbers of some native species in an ecosystem through intense competition for the ecosystem resources.

Extending the Visit

- ✿ Take a field trip to places where students can observe actual specimens of exotic species. If possible schedule a talk by park staff or a water-resource manager knowledgeable about the effects of the organisms and any actions that have been taken to control them.
- ✿ Add more questions to the game that are geared specifically to your curriculum.

Places to Go

Web Sites

Great Lakes Information Network (GLIN)

Main Web site: <http://www.great-lakes.net>

Exotic Species Web site: <http://www.great-lakes.net/envt/flora-fauna/invasive/invasive.html>

National Aquatic Nuisance Species Clearinghouse Web site: <http://www.entryway.com/seagrant>

U.S. Geological Survey, Biological Resources Division

Nonindigenous Aquatic Species Web site: <http://nas.er.usgs.gov>

Fact Sheets and Publications

Great Lakes Commission. *ANS (Aquatic Nuisance Species) Update* quarterly newsletter. View at the Great Lakes Commission Web site: <http://www.glc.org/ans/ansupdate/ansupdate.html> or e-mail: shwayder@glc.org

Multimedia

Zebra Mussel Information System CD-Rom, available from the U.S. Army Corps of Engineers:

Waterways Experiment Station

3909 Halls Ferry Rd.

Vicksburg, MS 39180

Phone: 601-634-2972



Travel Agents

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Rival for Survival Game Instructions

Materials

Game board
Movable pieces
Game cards
Score paper
Die
Pen or pencil

Number of Players

2–5

Objective

To have the **most points** when all players have reached the “Finish” position, at the Great Lakes.

Directions

1. Each player rolls the die, and the player with the highest number goes first.
2. Player 1 rolls the die and moves the playing piece the number of spaces shown on the die. Player 1 chooses a question card and hands it to the player on the left, who reads the question aloud. Player 1 chooses the best answer.
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Game Cards—Front a

- Q** Your aquarium is no longer functioning. You decide to get rid of the fish. You should
- flush them.
 - find them a new home in another aquarium.
 - drop them in the local pond.

- Q** To prevent the transfer of exotic species from one lake to another, you should
- pull your boat quickly from one lake to another.
 - inspect your boat trailer and equipment.
 - wash your boat in cold water.

- Q** How many of these species are exotic: goldfish, purple loosestrife, sea lamprey, starling?
- one
 - three
 - four

- Q** Bringing in natural predators may be the way to handle exotic species such as purple loosestrife. Choose a potential problem with the above idea.
- Purple loosestrife would decrease.
 - Predators may not die out after plants are gone.
 - Native plants would repopulate area.

- Q** Some exotic species can be a nuisance. How many of these are nuisance species: carp, alewife, purple loosestrife, zebra mussels, sea lamprey?
- two
 - three
 - five

- Q** You find a beautiful plant while on vacation in Mexico. Do you
- take a picture?
 - dig it up and transplant it in your garden?
 - pick the flowers off of it?

- Q** The role an organism has in its environment is its niche. Exotic species
- try to take over the niche of another organism in an ecosystem.
 - have no niche in an ecosystem.
 - are not organisms.

- Q** Zebra mussels each filter about
- 0.25 liter of water per day.
 - 0.50 liter of water per day.
 - 1.0 liter of water per day.

- Q** How could you gain information about exotic species in your area of the country?
- Contact the Wildlife Service.
 - Complete an Internet search on the topic.
 - Both a and b.

- Q** The sea lamprey is an exotic species in Lake Erie. Why is it so damaging to other fish?
- It eats their eggs.
 - It carries a large number of diseases.
 - It sucks out the blood and body tissues of other fish through its suckerlike mouth.

- Q** In any ecosystem, there is a limited amount of resources. If an exotic does well in a new ecosystem, that usually means native species are
- getting more resources than before.
 - getting the same amount of resources than before.
 - getting less resources than before.

- Q** Exotic species are
- rare organisms.
 - organisms brought into an environment not their own.
 - worth a lot of money.

Game Cards—Back a

A a = 0 pts. No! You might transfer species from one body of water to another.
b = 3 pts. Good decision! You ensure there are no organisms transported on your boat.
c = 1 pt. You're trying to remove all organisms—use 140°F water.

A a = 0 pts. This is what we would want to happen!
b = 3 pts. Could be a very real problem. You'd just be trading one exotic species for another.
c = 0 pts. This is a positive effect of introducing a natural predator; the question asked for negative effect.

A a = 3 pts. Correct! You can enjoy the plant without damaging it or carrying it into an ecosystem not its own.
b = -1 pt. Take a point away. You risk creating an invader species that could damage the ecosystem back home.
c = 0 pts. This could damage the plant.

A a = 0 pts. Not right!
b = 0 pts. Closer, but still not right.
c = 3 pts. You got the right answer!

A a = 0 pts. Not true.
b = 0 pts. Not the problem.
c = 3 pts. Gross, but true.

A a = 0 pts.
b = 3 pts. This is the correct answer.
c = 0 pts. b is a much better choice.

A a = 0 pts. Not a good choice!
b = 3 pts. This is the best thing to do.
c = -1 pt. Take a point away. You could be introducing a new species to the pond and upsetting the ecosystem!

A a = 1 pt.
b = 2 pts. All four are exotic!
c = 3 pts.

A a = 1 pt. True, but not the best food answer.
b = 2 pts. You are getting closer.
c = 3 pts. This is right! All are nuisances!

A a = 3 pts. They try to do this.
b = 0 pts. No.
c = 0 pts. All living things are organisms.

A a = 1 pt. Good choice, but not the best!
b = 1 pt. Good choice, but not the best!
c = 3 pts. This is the best choice!

A a = 0 pts. Have new competition for and usually get less.
b = 0 pts. No! If there are more organisms trying to eat the same food, they won't get as much.
c = 3 pts. Correct, because there are more species competing for the resources.

Game Cards—Front b

- Q** You find some zebra mussels on a beach. You should
- leave them where they are.
 - take them home.
 - put them in a pond near your home.

- Q** Exotic species are
- plants.
 - animals.
 - both.

- Q** Zebra mussels are believed to have entered the Great Lakes
- by traveling in the ballast water of commercial freighters.
 - by attaching to large fish.
 - because people brought them here to increase the mussel population.

- Q** Purple loosestrife was brought into the United States to
- beautify wetlands.
 - be used in landscaping.
 - feed large herbivores.

- Q** While traveling through another part of the country, you encounter a small tortoise. Do you
- put it in your aquarium?
 - sell it to a pet store?
 - leave it alone?

- Q** Purple loosestrife is an exotic species that is invading North American
- deserts.
 - forests.
 - wetlands.

- Q** Indigenous plants and animals are those
- that are naturally found in an ecosystem.
 - are imported into an ecosystem.
 - make you sick if you eat them.

- Q** Exotic species
- are good for the environment they enter.
 - are bad for the environment they enter.
 - can be either good or bad, and some have no effect.

- Q** The effect zebra mussels have on water intake pipes is to
- help rebuild them.
 - clog them.
 - clean them.

- Q** Round gobies can eat up to
- five sea lampreys per day.
 - 1 pound of purple loosestrife per day.
 - 78 zebra mussels per day.

- Q** How are yellow perch affected by aquatic invaders?
- The round goby eats yellow perch eggs.
 - The fishhook flea competes for the same food as the yellow perch.
 - The yellow perch swallows zebra mussels that get stuck in its digestive system.

- Q** The fishhook flea keeps from being eaten because
- its long tail, shaped like a fishhook, makes it difficult for larger fish to swallow.
 - it latches on to fishhooks and escapes when fishermen pull their poles out of the water.
 - it stays away from fishhooks and thus is not eaten by fish.

Game Cards—Back b

A a = 1 pt. True, but not the best choice.
b = 1 pt. Also true, but not the best choice.
c = 3 pts. Exotic species can be plants or animals.

A a = 0 pts. Not true.
b = 3 pts. This was why people brought purple loosestrife into the United States.
c = 0 pts. Purple loosestrife has no natural enemies in the United States.

A a = 0 pts. Wrong.
b = 0 pts. Wrong.
c = 3 pts. Purple loosestrife is a wetland plant.

A a = 1 pt. Might be true, but unlikely.
b = 1 pt. True often, but not always.
c = 3 pts. This is the best choice.

A a = 0 pts. This would be helpful, but it is not true.
b = 0 pts. This is also incorrect.
c = 3 pts. This is correct.

A a = 3 pts. Exactly! This is why it is called the fishhook flea.
b = 0 pts. Sorry, this is incorrect.
c = 0 pts. This is also a wrong answer.

A a = 3 pts. This is the best choice.
b = 0 pts. You risk spreading them to new locations.
c = -1 pt. Take 1 point away. This is a very poor choice because you may infest the pond.

A a = 3 pts. True. Ballast water is used by freighters to keep the ship evenly weighted.
b = 0 pts. Sea lampreys attach to fish; zebra mussels do not.
c = 0 pts. Not true.

A a = 0 pts. While this wouldn't hurt the environment, it could be an endangered species and should be left alone.
b = 0 pts. Same reason as choice a.
c = 3 pts. Best choice. Allows the animal to remain in its ecosystem; wouldn't negatively affect another ecosystem.

A a = 3 pts. This is the correct definition of indigenous.
b = 0 pts. This is the definition of nonindigenous.
c = 1 pt. Some may make you sick, others may not. Not the best choice.

A a = 0 pts. No, zebra mussels do not help rebuild pipes.
b = 3 pts. Yes! Zebra mussels cause problems because they clog water intake pipes.
c = 0 pts. This is also incorrect. They clog pipes, not clean them.

A a = 3 pts. Good answer!
b = 3 pts. This is also a correct answer!
c = 0 pts. The yellow perch do not eat zebra mussels.

Game Cards—Front c

Q Boaters or anglers can prevent the spread of zebra mussels by

- a. wearing gloves while they are fishing.
- b. emptying their bait buckets on land only.
- c. washing their boat, tackle, trailer, and other equipment in 104° F water.

Q A sea lamprey can grow

- a. up to 6 inches long.
- b. up to 36 inches long.
- c. up to 18 inches long.

Q The fishhook flea most likely traveled to the United States

- a. attached to other fish migrating toward the United States.
- b. because it got lost.
- c. in the ballast water of freighters.

Q How might a native brown trout be killed by an aquatic invader?

- a. Round gobies could eat eggs of the brown trout.
- b. A sea lamprey could carve a hole in the side of the brown trout and suck out its bodily fluids.
- c. The brown trout could try to swallow a fishhook flea and get it stuck in its digestive system.

Q A female zebra mussel can produce up to

- a. 10,000 eggs a year.
- b. 100,000 eggs a year.
- c. 1 million eggs a year.

Q What do round gobies do to make fishermen angry?

- a. They eat all the eggs of the native fish, leaving no more fish to catch.
- b. They tease them that they can't catch fish.
- c. They aggressively take bait from hooks used by fishermen.

Game Cards—Back c

A a = 0 pts. Sea lampreys can get bigger than that!
b = 0 pts. Wow, that would be one giant sea lamprey.
c = 3 pts. That is correct!

A a = 2 pts. This is close. Round gobies eat the eggs of the lake trout.
b = 3 pts. Exactly, this is why the sea lamprey is so dangerous!
c = 1 pt. This might be possible.

A a = 1 pt. This is a possibility.
b = 0 pts. This is unlikely.
c = 3 pts. That's right!

A a = 0 pts. Unfortunately, wearing gloves has nothing to do with it.
b = 3 pts. Good job! This will help prevent the spread of zebra mussels.
c = 3 pts. This too will aid in the prevention of zebra mussel infestation.

A a = 0 pts. No, it is the sea lamprey that attaches to fish.
b = 0 pts. This is incorrect.
c = 3 pts. You got it!

A a = 0 pts. This isn't even close.
b = 1 pt. This is getting closer.
c = 3 pts. Yes, this is correct.