



WHERE ARE THE ZEBRA MUSSELS?

GRADES: 9-12

ACTIVITY OVERVIEW

Zebra mussels are an invasive species native to Eurasia that were likely brought to North America in the ballast water of ships. Invasive species are non-native species that have been inadvertently introduced to a new ecosystem or geographic area through human involvement. Zebra mussels are very prolific in North American waters, forming colonies of many individuals that can encrust natural and artificial objects in the water. The primary concern with zebra mussels is that they outcompete native mussels, causing a reduction in their numbers. If teachers need more background information on zebra mussels, they can consult the links in the “Lesson Resources” section below.

In this activity, students will be provided with a USGS mapping resource with zebra mussel locations. They will manipulate the map to interpret the data and make predictions about the future of zebra mussels.

OBJECTIVES

Students will be able to interpret and manipulate an online mapping resource to predict trends in zebra mussel impacts.

STANDARD CONNECTION

State

9.4.2.1.2

The interrelationship and interdependence of organisms generate dynamic biological communities in ecosystems.

Explain how ecosystems can change as a result of the introduction of one of more new species. For example: The effect of migration, localized evolution or disease organism.

NGSS

HS-LS2-7

Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*[Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

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MATERIALS

Computers or tablets with Internet access

- If you do not have access to the Internet, you can project the pictures found in the Resource Section.
- Otherwise, use the following link: [USGS Mussel Data Map](https://www.usgs.gov/ecosystems/invasive-species-program/maps)
 - <https://www.usgs.gov/ecosystems/invasive-species-program/maps>

PROCEDURE

1. Teachers can select appropriate background resources for their students. In the lesson resources below, teachers can find online zebra mussel resources.
2. Share mapping resource with students. Teachers could place links online to help students.
 - a. If you do not have internet access for all students, use the slideshow to show maps to help students understand zebra mussel spread.
3. Students work alone or in pairs to complete worksheet.
4. Have a class discussion regarding question 5 on the worksheet. Consider having students pair share and then share out to the larger group or discuss in small groups. Look for students applying what they have learned in the lesson. Students should take geographical distribution of populations of zebra mussels into account.

ASSESSMENT

This activity will be assessed based on the completion of the activity and the students' ability to answer the questions in order to relate the activity to evolution by natural selection.

EXTENSION

Have students engineer a plan to abate future zebra mussel spread. Have students research current control methods online and build off of existing work. They could share out in a poster, slideshow presentation, or other media appropriate to the classroom.

LESSON RESOURCES

Background information for students:

- [MN Department of Natural Resources](#)
- [USGS](#)

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Pictures in case you don't have access to the internet:

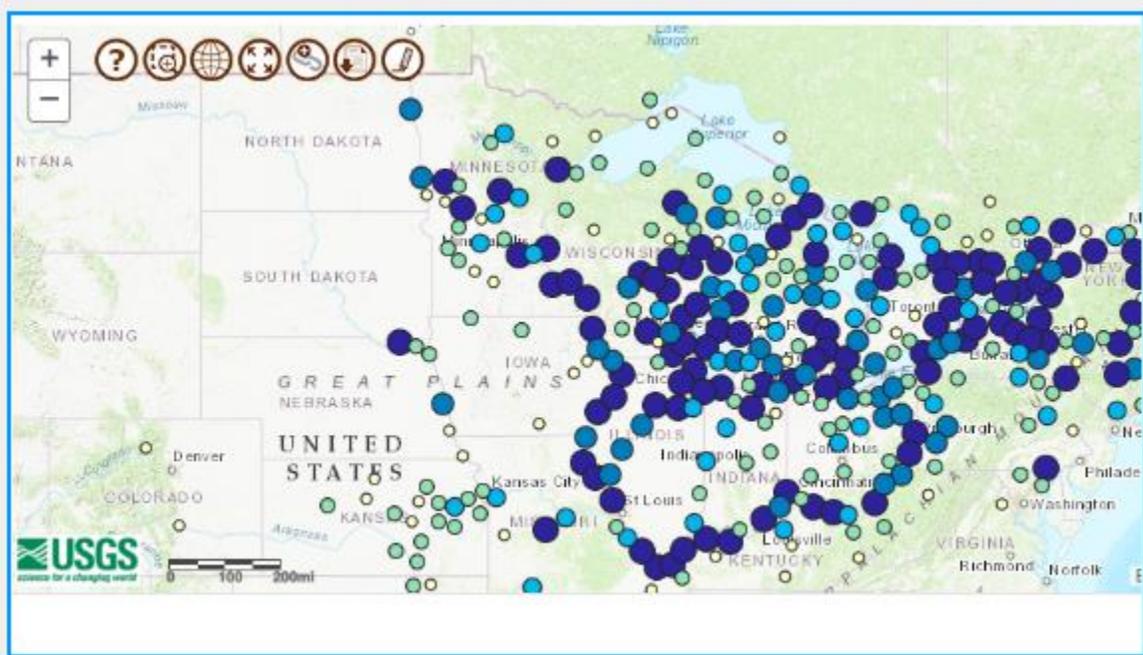


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KEY TO STUDENT SHEET

Where are the Zebra Mussels?

Use the links provided by your teacher to answer the following questions. Your primary resource will be the USGS Zebra Mussel Map:

<https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=5>

This map shows data of areas zebra mussels have been found in the environment. Your teacher may also provide other online resources to aid you in answer the questions.

1. Take some time to study and manipulate the map. What is your initial interpretation of the data? Include trends you see and identify specific places you see concentrations of zebra mussels.

Trends to look for:

- *Eastern North America*
- *Great Lakes*
- *Rivers, Lakes, other bodies of water*

2. Why do you think that there are higher concentrations of zebra mussels in the locations you identified above?

Look for students to connect the prevalence of zebra mussels to water and especially the Great Lakes.

3. Based on the map, list two locations where zebra mussels might have been introduced to North America and explain why you think that?

Possible answers could include Milwaukee, Chicago, Detroit, Rochester, NY. Ensure that the student area using some sort of reasoning around the proximity to water and/or the prevalence of mussels in those areas.

4. There are some isolated records of zebra mussels west of the Great Plains. Identify three of these locations and describe how you think the zebra mussels might have gotten to these locations.

This data set shows that there are two occurrences in Colorado and one each in Utah, California, and Montana. Possible explanations could include accidental transportation on a private boat or the data is incomplete and there are actually many more zebra mussels than the data shows.



5. Zebra mussels can harm our native freshwater mussels, many of which are threatened or endangered. What do you think the key is to controlling zebra mussels in North America? Describe why you believe this is key.

Students' responses may vary greatly. Encourage students to back their ideas with reasoning. This question would be a great opportunity for a small group or class discussion. Possible ideas might include, engineering, pesticides, or engineering.

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