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**Preventing the Spread of Invasive Species in the Great Lakes**

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**Lesson Overview**

5th graders take on invasive species in the Great Lakes. Students examine the zebra mussel to discover the impact that the zebra mussel has on an ecosystem and how they can negatively affect tourism, the fishing industry, water quality, and both public and private waterworks. Students read non-fiction articles about zebra mussels, watch a video, and learn ways that scientist are combating other invasive species. Students will then be asked to save our ecosystem by designing a way to catch and destroy these Great Lakes invaders.

**Target Grade/Subject -** 5th Grade science and STEM

**Time:** 10-12 lessons in 45 min. sessions

**Sources Consulted**

Belle Isle Conservancy. *Educating about Invasive Species*. (n.d.). Retrieved March 09, 2018, from

<http://detroitaquarium.weebly.com/educating-about-invasive-species.html>

Aliens Invade. Retrieved March 09,2018, from ReadWorks.org

Great Lakes? Not for Long. Retrieved March 09,2018, from ReadWorks.org

Zebra Mussels and the Hudson River. Retrieved March 09,2018, from ReadWorks.org

An Unwelcome Newcomer. Retrieved March 09,2018, from ReadWorks.org

The Short Term Impact of the Zebra Mussel Invasion. Retrieved March 09,2018, from ReadWorks.org

Long Term Monitoring of the Zebra Mussels. Retrieved March 09,2018, from ReadWorks.org

Driving Away Problem Animals. Retrieved March 09,2018, from NewsELA.com

Bang, M., & Chisholm, P. (2012). Ocean Sunlight How Tiny Plants Feed The Seas. New York, New York. Scholastic.

**Learning Objectives**

After the lessons, students will be able to:

* Identify why invasive species are harmful to Michigan’s water and land ecosystems.
* Describe the zebra mussel and ways that it is harming our ecosystem.
* Create a model of an invasive species trap.
* Present knowledgeably to their peers.

**Michigan Science Standards Addressed**

5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

5-ESS2-1 MI Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact in Michigan and the Great Lakes Basin.

5-ESS3-1 Obtain and combine information about the ways individual communities use science ideas to protect the Earth’s resources and environment.

5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**List Materials & Quantities Needed** per class and per student group

*Per teacher-*

Copies of articles or access to computers for students.

*Per student group*

Supplies for traps: Recyclable materials such as empty containers & cans. PVC piping, fishing line, string, netting.

Paper and pencils for all.

**New Vocabulary**

**Pollution**- poisons, waste, or other materials that cause harm to the environment.

**Damage**- harm or injury that makes something less useful or valuable.

**Habitat**- the natural environment of a plant or an animal.

**Approach**-means or method of dealing with something.

**Factor**- one of the causes of something; something that makes a difference in a result.

**Impact**- effect or influence.

**Filter**- to remove dirt or other solids from a liquid by passing it through a device.

**Population**- the number of inhabitants, human or otherwise, of a particular category in a place.

**Decline**- to grow smaller gradually.

**Rebound**- to recover from a loss.

**Murky**- dark and dirty: not clear.

**Colony-** a group of animals of the same species living closely together.

**Native**- having origins in a particular country or area.

**Turbidity**- cloudiness or haziness or water

## **Focus Question(s)** to kick off the lesson.

*What is an invasive species?*

*Why is the zebra mussel harmful to Michigan?*

*What is currently being done to eradicate the zebra mussel?*

**Classroom Activities**

1. Show the *Invasive Species in Michigan* presentation by Michelle Selzer Office of the Great Lakes on the Bell Isle Aquarium website. (Note: Both the presentation and notes are on the site.) Approx. 20 min.

<http://detroitaquarium.weebly.com/invasive-species-presentation.html>

1. Read the book *Ocean Sunlight How Tiny Plants Feed The Sea* by Molly Bang, to explain phytoplankton and zooplankton and how necessary they are prior to the articles. Approx. 25 min. Video version available here: <https://www.youtube.com/watch?v=TY9QL7fL45E>
2. Students will read the following ReadWorks articles. ReadWorks.org is a free website for educators. The following articles are available there along with vocabulary, question sets, and the ability to make the articles easier to read for lower ability students. Students can access the information online or it can be printed out. Time depends on the student and should take no more than three lessons:

Aliens Invade

[https://www.readworks.org](https://www.readworks.org/article/Aliens-Invade!/30000fa0-7dc4-4132-9d23-14d8b602e05f#!articleTab:content/)

Great Lakes? Not for Long.

[https://www.readworks.org](https://www.readworks.org/article/Great-Lakes-Not-for-Long/1287738c-1101-41ef-8016-de2e37f1e752#!articleTab:content/)

Zebra Mussels and the Hudson River

[https://www.readworks.org](https://www.readworks.org/article/Zebra-Mussels-and-the-Hudson-River/58657653-a9c1-4634-baf0-7a0d9e6af21f#!articleTab:content/)

An Unwelcome Newcomer

[https://www.readworks.org](https://www.readworks.org/article/An-Unwelcome-Newcomer/02b86a84-1add-4341-b566-ee71b85738e9#!articleTab:content/vocabularySection:colony/)

The Short Term Impact of the Zebra Mussel Invasion

[https://www.readworks.org](https://www.readworks.org/article/The-Short-Term-Impact-of-the-Zebra-Mussel-Invasion/d88ed588-05cf-4fa7-aef3-f853fad209c7#!articleTab:vocabulary/vocabularySection:filter/)

Long Term Monitoring of the Zebra Mussels.

[https://www.readworks.org](https://www.readworks.org/article/Long-Term-Monitoring-of-the-Hudson-River/e8003352-04d5-4289-8766-8d7bd017ce7b#!articleTab:content/)

1. Class discussion about the impact of the zebra mussel on an ecosystem and how they can negatively affect tourism, the fishing industry, water quality, and both public and private works. Make a class list of the negative impact.
2. Students will read the following NewsELA article: *Driving Away Problem Animals and Plants*.
3. Students will design (engineer) their own zebra mussel traps using a variety of materials including PVC pipe, netting, string, tape, boxes, cans, etc. following the **Engineering Design Process**  ~2 sessions

ASK- Prior to building students should brainstorm about the three most important properties they would like their trap to have and why. They should also try to figure out what others have done.

IMAGINE- What ideas can they come up with for a trap? Why do they think a zebra mussel will fall for it?

PLAN- Draw it out. What materials are needed?

CREATE- Build your trap. Test it if you can.

IMPROVE- How can you make it better?

Note: With fifth graders I have done this activity with just recyclables, tape, hot glue, wire, pipe cleaners and string. These were not useable traps but students had a blast creating them and thinking outside of the box. You can also offer items like empty metal cans, PVC piping, netting, and more to build some actual traps.

7. Students will share the traps that they built with the class by standing in front of the room and sharing with the class or set up like a trade show. Students design a booth with their trap design and have the opportunity to “sell” it to their classmates. A fake currency could be given out prior with students having the opportunity to “buy” or “invest” in the traps they think have the most promise.

**Assessment of Student Learning**

Students will be assessed using the rubric shown on the next page:

**Zebra Mussel- Invasive Species Unit** Student Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CATEGORY | **4 Distinguished** | **3 Proficient** | **2 Apprentice** | **1 Novice** |
| **Students will be able to identify why invasive species are harmful to Michigan’s water and land ecosystems.** | Student participates at a proficient level and goes significantly beyond. The student is able to identify why invasive species are harmful to Michigan’s water and land ecosystems and make reference to other examples not described in the lesson. | Student correctly identifies and explains why invasive species are harmful to Michigan’s water and land ecosystems. | Student can identify some part of how invasive species are harmful to Michigan’s water and land ecosystems. Their answers are incomplete or partially accurate | Student cannot successfully identify why invasive species are harmful to Michigan’s water and land ecosystems. |
| **Students will be able to describe the zebra mussel and ways that it is harming our ecosystem.** | Student participates at a proficient level and goes significantly beyond. The student is able to identify why zebra mussels are harmful to Michigan's water and land ecosystems and can make reference to examples of damage not described in the lesson. | Student correctly identifies and explains why zebra mussels are so harmful to Michigan's water and land ecosystems. | Students can identify some part of how zebra mussels are harmful to Michigan's water and land ecosystems. Their answers are incomplete or partially accurate. | Student cannot successfully identify why zebra mussels are harmful to Michigan's water and land ecosystems. |
| **Students will be able to create a model of an invasive species trap.** | Student participates at a proficient level and goes beyond, for example by using thorough labeling and thoughtful descriptions in recording observations. | Students correctly uses models and completely and accurately observes and records the performance of their zebra mussel trap. | Student builds or partially builds a zebra mussel trap that will not last or will not collect zebra mussels. The student may partially observes and records the performance of their zebra mussel trap. | Students does not correctly make a trap. The student does not accurately observes and records the performance of their zebra mussel trap. |

**We would greatly appreciate your feedback using this lesson plan! Please visit** [**https://www.biaquariumstem.org/survey.html**](https://www.biaquariumstem.org/survey.html) **to complete a short survey about your experience.**