



K-12 Partnership Lesson Plan

Elizabeth Schultheis, Melissa Kjelvik

Invasive Species in Michigan *What makes a good invader?*

Overview

Students will learn about invasive species in Michigan, characteristics that make species good invaders, factors that can influence plant community assembly, and the role that people play in causing and proliferating invasions.

Objectives

At the conclusion of the lesson, students will be able to:

- Provide examples of invasions causing economic and ecological concerns in Michigan
- Identify characteristics (traits) that are common among many invasive species
- Present information on the role that people play in the establishment and spread of invasive species
- Recognize some common native and invasive plant species in Michigan
- Talk about populations, communities, and the niche

Length of Lesson

This lesson can be completed in 1 hour if the activity is only played once. Ideally it should be played multiple times so students can observe different outcomes depending on what events were spun on the wheel and to redistribute the species cards so each student can be a new species with different traits than their first. Ideally, a 1.5-hour session would be best.

- 10 minutes – Introduction: Do you know of any invasive species?
- 10 minutes – Examples of invasive species in Michigan
- 5 minutes – Summary of introduction: students should now be able to describe characteristics that make a good invader
- 5 minutes – describe the rules of the activity
- 45 minutes – play 2-3 rounds of the activity
- 15 minutes – Summary: have students describe what got them “into the community”. Do the characteristics that made them a good invader match the ones we discussed in the introduction? What characteristics of the native species made them successful/unsuccessful? Does the outcome of the activity change between rounds?

Grade Levels

This lesson is most appropriate for 4th-6th grade, but could be used in higher grade levels. The activity can complement lessons where teachers have introduced ecological concepts such as population, community, niche, and invasive species.

Standards covered (NGSS)

Disciplinary Core Ideas:

Elementary School

- **4-LS1-1:** construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction

Middle School

- **MS-LS2-1:** analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem
- **MS-LS2-4:** construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations
- **MS-LS2-2:** construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems
- **MS-LS1-4:** use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively

Cross Cutting Concepts:

- Patterns
- Structure and function
- Stability and change of systems

Science and Engineering Practices

- Developing and using models

Previous Michigan Standards Met:

- **L.OL.02.14:** identify the needs of plants
- **L.EV.03.11:** relate characteristics and functions of observable parts in a variety of plants that allow them to live in their environment (leaf shape, thorns, odor, color)
- **E.ES.03.51:** describe ways humans are dependent on the natural environment (forests, water, clean air, Earth materials) and constructed environments (homes, neighborhoods, shopping malls, factories, and industry)
- **E.ES.03.52:** describe some helpful or harmful effects of humans on the environment (garbage, habitat destruction, land management, renewable, and non-renewable resources)
- **L.EV.04.22:** identify how variations in physical characteristics of individual organisms give them an advantage for survival and reproduction
- **L.EV.05.12:** describe the physical characteristics (traits) of organisms that help them survive in their environment
- **L.EC.06.11:** identify and describe examples of populations, communities, and ecosystems including the Great Lakes region
- **L.EC.06.23:** predict how changes in one population might affect other populations based upon their relationships in the food web
- **L.EC.06.32:** identify the factors in an ecosystem that influence changes in population size
- **L.EC.06.41:** describe how human beings are part of the ecosystem of the Earth and that human activity can purposefully, or accidentally, alter the balance in ecosystem

Materials

- One species card per student (12 different invasive, and 24 native species cards- 2 copies of each)
- Event spinner
- 3 stage signs
- Powerpoint presentation- introduction: examples of Michigan invasive species and what makes a good invader
- Red tape to mark start and finish line

- A large room (gym is the best) to conduct activity

Background

Invasive plants are plants that grow outside of their native habitat and cause harm to their new environment. They are highly competitive and persistent. It is estimated that there are nearly 1,500 species of plants known as “weeds” of foreign origin currently found in the US; there are other plants that are invasive and native to this country. Different researchers have estimated that there are from 1,000 to over 22,000 species of potentially invasive plants that have yet to be introduced into the US. This illustrates the need to be vigilant and to step-up efforts to prevent invasive plant introductions into this country. Most of those responsible for fighting plant infestations realize that it is less expensive to prevent invasive plant introductions than to try to control or eradicate plants once an infestation has occurred.

To prevent future invasions it would be helpful to know the answers to a few questions: Are there characteristics that are common between different invasive species? How can we tell which habitats are most at risk?

Invasive plant species have certain characteristics that tend to make them successful:

- Rapid growth and short life cycle: go from seed to producing seed very rapidly – sometimes within a few weeks!
- Prolific flowering
- Able to grow in a wide range of habitats
- High number of seeds produced
- Long seed dormancy
- Efficient method of seed dispersal
- Able to reproduce asexually (ex. parts of a plant that can break off and make new roots).
- If reproducing sexually, they are able to make use of insects, birds, bats or other pollinators found in the new environment.
- Provide shade, which can be a great detriment for native plants.
- Release of chemicals into the surrounding soil that prohibit the growth of other plants.
- Resistant to grazing.

Activities of the session

The lesson has two parts: the introduction and activity

1. Introduction
 - a. Ask the students about their prior knowledge on invasive species. Can they name any invasive species? Do they know the issues caused by those species or what people are doing to control them?
 - b. Give examples of dramatic invasions in Michigan (presentation contains slides on zebra mussels, emerald ash borer, and Eurasian water milfoil)
 - c. What characteristics did all these invaders share? Ask students to pull together what they can remember from their examples and the ones in the presentation. See if they can come up with their own list before showing the slide with characteristics.
 - d. Tell students that they will now be participating in activity to learn about the characteristics of invaders that make them successful.
2. Activity
 - a. Introduce the rules of the activity. Go over species cards, stages, and events. Describe how students will move backwards and forwards heel-to-toe and that the students who cross the finish line will be “in the community” and will have to describe to the class how they got there.
 - b. Gather students in a large, open room

- c. Students line up, shoulder to shoulder on the start line
 - d. Give each student a species card (you will not use whole set, ratio of invaders to natives should be about 1:2)
 - e. Explain that students will move forward for stages (growth, seeds, reproduction) when the appropriate stage sign is held up. They will move backwards for when an event is spun on the wheel (ex. fire, herbivory, human disturbance). Demonstrate how they will take steps (**heel-to-toe**).
 - f. Start the activity – **2 stages**
 - i. Hold up a sign for one of the stages
 - ii. Students move forward the number of steps indicated on their card.
 - iii. Monitor students closely for too large/many steps. If students are caught not moving heel-toe steps or taking more steps than on their cards, they must move back 5 steps.
 - g. Continue the activity – **2 events**
 - i. Allow a student that has been paying attention and following the directions to spin the event spinner
 - ii. Students move backward the number of steps indicated on their species card.
 - iii. Monitor students to make sure they are taking steps backwards.
 - h. Repeat steps (f) and (g) until you have about 10 students across the finish line (these students are “in the community”)
 - i. Have students in the community (the 10 or so that crossed the red line) line up along the finish line, with invasive and native species on opposite sides.
 - j. Have students that did not make it into the community sit in front of the standing students.
 - k. Have each student in the community read their species name, state whether they are invasive or native, and explain what helped them the most. How is it that they made it into the community? The students should remember which of the events hurt them the most or which stage allowed them to take the most steps. (This should be different depending on what species they are and what sorts of events were spun for this round).
 - l. Ask some of the sitting students why they did not make it.
 - m. Link the characteristics of the invasive species that made it into the community to some of the themes and invasive species examples brought up in the introduction.
3. You may repeat the activity as time allows (usually 2-3 rounds). Point out to students how the outcomes differ between rounds. What events caused the outcomes to change? Did certain things come up more often than others? What events led to a community consisting of mostly invasive species? Native?

Resources

- Powerpoint, invasive and native species cards (see example below), stage signs (3), and event spinner are available on the “Invasive Species in Michigan” lesson page on the KBS GK-12 website.
- For more information:
 - Wildflowers: <http://www.dclunie.com/eshelton/wildflow/wildind.html>
 - Native plant database: <http://www.wildflower.org/plants/>
 - USDA plant database: <http://plants.usda.gov/java/>

Example species card:

Front



Back



Using this species as an example, when there is a growth stage, the student will take four steps forward (indicated by the four plant images). During an herbivory event, the student would take one step backwards (indicated by one caterpillar).