Plant Community Foot Race

Invasive and Native Plant Species in Central Oregon

How do plants become established?

Overview

Students will learn about invasive and native plants species in Central Oregon, plant characteristics that promote establishment, disturbances that can influence plant community composition, and the role that people play in causing as well as preventing invasions.

Objectives

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

- Identify characteristics (traits) that are common to successful plant establishment
- Recognize some common native and invasive plant species in Central Oregon
- Present information on the role that people play in the introduction and spread, as well as the treatment of invasive species
- Talk about populations, disturbances, 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 disturbance events were spun on the wheel and to redistribute the species cards so each student can be a new plant with different traits than their first. Ideally, a 1.5-hour session would be best.

- 10 minutes – Introduction: What makes a successful plant? What are disturbances? How do invasive species differ from native species?
- 10 minutes – Examples of invasive and native plant (look-a-likes?) in Central Oregon
- 5 minutes – Summary of introduction: students should now be able to describe characteristics that make a prosperous plant
- 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 their species successful 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, environmental disturbances, niche, plant structures, 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 Oregon 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

- Notebook (stapled paper) for presentation and exercise results

- One species card per student (12 different invasive, and 24 native species cards- 2 copies of each)
- Disturbance event spinner
- 3 Lifestage signs
- Powerpoint presentation- introduction: What makes a successful plant? What are disturbances? How do invasive species differ from native species?
- Two ropes to mark start and finish line
- A large space (gym or school yard is the best) to conduct activity

Background (use power point for image cues for concepts, using comment insert for presentation slide cues)

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 the folks responsible for fighting plant infestations realize that it is easier 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!
- Abundant flowering
- High number of seeds produced
- Able to grow in a wide range of environments (ie. Meadow, grassland, woodland)
- Long seed dormancy
- Efficient method of seed dispersal
- Able to reproduce vegetatively (ex. parts of a plant that can break off and make new roots)
- If reproducing with flowers, 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 limit the growth of other plants, alleopathy
- 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 Oregon (presentation contains slides on Spotted Knapweed, Yellow Start Thistle and Eurasian water milfoil)

c. What characteristics did all this 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 an activity to learn about native vs. invasive plant responses to disturbance.

2. Activity
    a. Introduce the rules of the activity. Go over species cards, life stages, and the disturbance events wheel. Describe how students will move backwards and forwards heel-to-toe and that the students who cross the finish line will be "in the plant 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 life stages (growth, seeds, dispersal) when the appropriate sign is held up. They will move backwards when a disturbance event is spun on the wheel (ex. fire, native browse, livestock browse, human recreation, drought, removal treatment if applicable). Demonstrate how they will take steps **(heel-to-toe).**
    f. Start the activity – **2 stages**
        i. Hold up a sign for one of the Life stages
        ii. Students move forward the number of steps indicated on their card.
        iii. Monitor students closely for too large/many steps, if so 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 disturbance 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 plant community")
    i. Have the students in the plant community line up along the finish line, with invasive and native plants on opposite sides.
    j. Have students that did not 'establish' into the community sit in front of the standing students.
    k. Have each student in the plant 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? When did they notice their advantage over others? The students should remember which of the disturbance events hurt them the most or which life stage allowed them to take the most steps. (This should be different depending on what species they are and what sorts of disturbance events were spun for this round).
    l. Ask some of the sitting students why their plant species did not make it.
    m. Link the characteristics of the invasive species that made it into the plant 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 disturbance 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), life stage signs (3), and disturbance event spinner are available on the “Invasive Species in Central Oregon” lesson page on the Discover Your Forest 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’ life stage, the student will take four steps forward (indicated by the four plant images). During an herbivory disturbance event, the student would take one step backwards (indicated by one caterpillar).