

Alien Invasion

Subject: Life science, writing, story problems (math)

Grade: 6-8

Lesson Topic: seed dispersal

Length: 1-2 Period

Learner Objective:

Students will investigate the means and rate of invasive weed spread.

Students will calculate the extent of an invasion after seeds have dispersed to understand exponential growth.

Students will create their own story problems that illustrate how humans contribute to the spread of invasive weed species.

Introduction:

In this lesson, students will encounter a scenario that may indeed be quite familiar to them, one in which it is possible that they have instigated the spread of invasive weed species through their own actions. Invasive weed species are often carried unintentionally by humans to new areas (cars, trucks, bikes, clothes or our pets). With increasing access to field and forest as our population grows, more and more opportunities exist for seeds and plant parts to be carried to new areas. With the ease of air and ship travel, non-native species are often just a few hours away from being transported thousands of miles to habitat that may be favorable to setting the stage for an invasion. More often than not, our rather innocent recreational activities can become significant sources of redistributing plant species (second to development).

Content:

The leading cause of loss of [biodiversity](#) is development because native flora and fauna are removed to make way for our needs and because the disturbed environment is primed to receive alien species. Alien weed species are particularly suited to these disturbed lands through [adaptations](#) that enable them to survive in a wide range of environmental conditions. Because of this, invasive weeds are the second leading cause of our loss of biodiversity. With an ever-increasing range of all invasive weed species and our increase access to wildlands, the wildfire of noxious weeds runs unabated. Invasive weed species also produce large numbers of seed that, if not immediately germinated, remain viable in the soil over many years in a wide range of conditions. Therefore, when alien seeds are carried by humans to new areas (particularly back to areas of disturbance like roadsides), factors such as temperature, moisture, soil types and time may *not* significantly limit the chances for a plant to become invasive.

Materials and Supplies:

Magnifying glasses
Weed Journals
Calculators
Alien Invasion Worksheet

Anticipatory Set:

Begin a discussion by asking how many of them have started an alien invasion (imply that some of them have). Ask about their recreational activities and if they can imagine ways by which those activities may have started an invasion.

Take a walk out to the parking lot to examine the tires, bumpers, doors and undercarriage of the vehicles (as always, a reminder to be respectful of other people's property... they are just *looking*). Vegetation may be caught in doors or in the undercarriage; seeds may be found in the tire tread (use magnifying glasses) or behind the bumper or other places where dirt is thrown and accumulates. Did they find any vehicles that are spreading the invasion?

Activity Outline:

List the various ways that the students have discussed as possible scenarios whereby they may have started an invasion.

Hand out the Alien Invasion Worksheet, then provide them with the following scenario and have them calculate the extent of the invasion (they should listen carefully and record important numbers):

A tract of land that had once been cleared was now overgrown with weeds and brush, including spotted knapweed (a Class A noxious weed). This land separated an urban neighborhood from the nearby national forested lands, and a few miles beyond that was a National Park. Although this tract of land was private property, it had several trails across it, used by people living nearby to access the forests beyond. A local mountain bike club requested permission from the owner to cross the land and join the forest trail system rather than drive their vehicles from town to the trail system. Securing permission, the club organized a 50 mile "City To The Park" benefit ride to advertise their new club and help vitalize their town and the nearby National Park with this popular recreational activity.

The event went off as planned, but 150 bicyclists cutting across the weeded tract of land also carried broken bits of seed-bearing knapweed branches caught in the gears of their bikes and knapweed seed caught in the deep lugs of their tires. After a few miles of jarring along the forest trails, 300 seeds were dislodged. Assuming 50% will germinate and grow to maturity, and a mature plant may develop 1000 seeds, how many plants grew after the event, how many seeds would be produced for the [seedbank](#), and how many plants would appear in the forest the following year?

Calculation

300 seeds x 50% germination = 150 mature plants

150 mature plants x 1000 seeds per plant = 150000 seeds

150000 seeds x 50% germination = 75000 new knapweed plants in the forest the second year.

75000 new knapweed plants + 150 plants after the race = 75150 of plants one year after the benefit race!

The students could calculate the second year:

75150 plants x 1000 seeds per plant x 50% germination = 37,575,000 plants, *plus* the 75150 plants from the year prior because spotted knapweed is a [perennial](#), **37,650,150 plants!!**

Carried out and graphed over five years, the rapidly rising plot line exhibits [exponential growth](#). Refer to the chart below for germination and survival rates of various weed species (to be used in the activity below). The germination rate was placed at a high level for dramatic effect, though in under some conditions a 50% germination rate may be possible. The story also does not include a factor for seedling success. Like germination rates, seedlings have their own survival rates based upon local environmental conditions.

Return to the list of recreational activities the students developed at the opening discussion. Working in teams of two, have them invent similar story problems based upon:

- activities they actually do
- weed seed production numbers of actual weeds in their community (refer to chart above or have the students research local species)

The stories may be as complex as they can imagine, but they must have a sense of reality... in other words, they are creating story problems that might explain how their own recreational activities could lead to aliens in their neighborhood.

Closure and Assessment:

Have the students exchange and solve each other's story problems. Assessment may be in the form of a rubric to evaluate how realistic the stories problems are, the degree of complexity in math skills, and their ability to work in partnerships to create the story. Evaluate the completeness of their notes on the Alien Invasion Worksheet, in particular, notice how they interpreted the instruction to "record important numbers," not all numbers given in the story was important to the calculation of a knapweed invasion.

Independent Practice and Related Activities:

List of plants and seed viability data, available from local weed districts or by searching web sites such as <http://plants.usda.gov>

Advanced students may want to pursue their storylines over a five year period and graph the exponential growth. These "real life" scenarios can be used to educate others in their community.

Vocabulary:

Adaptations, biodiversity, exponential growth, perennial, seedbank

National Science Education Standards:

Science as Inquiry - CONTENT STANDARD A:

As a result of activities in grades 5-8, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Life Science - CONTENT STANDARD C:

As a result of their activities in grades 5-8, all students should develop understanding of

- Structure and function in living systems
- Reproduction and heredity
- Regulation and behavior
- Populations and ecosystems
- Diversity and adaptations of organisms

Science in Personal and Social Perspectives - CONTENT STANDARD F:

As a result of activities in grades 5-8, all students should develop understanding of

- Populations, resources, and environments
- Natural hazards
- Risks and benefits
- Science and technology in society

History and Nature of Science -CONTENT STANDARD G:

As a result of activities in grades 5-8, all students should develop understanding of

- Science as a human endeavor

Alien Invasion Worksheet

Name_____

Date_____

In the space below, write important information from the story, and record important numbers to be used in the activity below:

Using information from the story, answer the following questions and *show your calculations*.

How many plants grew after the event?

How many seeds would be produced for the [seedbank](#)?

How many plants would appear in the forest the following year?

I bet there would be over **37 million plants** in the forest by the end of the second year! How is that possible?!?! Show your work!