

LESSON 4: SPACE INVADERS—UNWANTED NEIGHBORS

NOTE: This lesson was developed by the Center for Environmental Education at Middle Tennessee State University. See “A Date with Freddie Kudzu” in *Noxious Neighbors: Exotics in Our Backyard* (Murfreesboro: Middle Tennessee State University, 1998). It has been adapted for incorporation into this curriculum.

Duration: Two 45-minute class periods

Background information:

“Exotic species tend to be destructive because they usually have no controls (such as insects or other predators) that keep them in check . . . because they have not evolved within the native ecosystem. For this reason, [exotic invasives] have a competitive edge over native species. Exotics tend to take over and force out native populations. Many invasive exotic plants thrive not only in native plant communities but on disturbed sites, such as abandoned fields and construction sites.”

“Biological diversity (biodiversity) is reduced as native species are displaced by [exotic invasive plants]. Biodiversity is further impacted when exotic plants harbor invasive pathogens (harmful microorganisms), fungi, or other organisms that decimate native species. For example, the American chestnut blight was caused by a fungus introduced with the Chinese chestnut. The blight destroyed one of the most important hardwoods in eastern North America.”

“Most introductions of exotic plants are intentional and usually relate to aquaculture, horticulture, or conservation purposes. When problems occur later, exotics are not as economical as they first seemed. Awareness of the problem caused by [exotic invasives] is the first step in preventing their continued widespread use. Public awareness will increase responsible landscaping practices. Awareness by resource managers will help prevent introductions on public lands and preserve our natural heritage.”

“Characteristics of [exotic invasive] plants are that they:

- grow and mature rapidly
- have prolific reproductive capacities
- are highly successful in seed dispersal, germination, and colonization
- rampantly spread and out-compete native plants
- are difficult and costly to remove and control”
- originate from similar climate as the ecosystems they invade
- quickly colonize open spaces
- have few natural consumers present in the ecosystems they invade

The seeds of some exotic invasive species can lie dormant in the ground for many years. For example, garlic mustard seed can remain viable for up to ten years. When conditions are right for growth, the seeds germinate. Suddenly, many exotic invasives appear where there had been none for years.

Vocabulary:

Community	All populations living in an ecosystem
Competition	More than one species tries to use the same resource for survival
Ecosystem	All the living things plus the non-living things in an area
Exotic plant	A plant brought into an area and planted by people, or brought in by storms or wildlife; plants that are not part of the native or naturally existing landscape
Exotic invasive plant	An exotic plant that has no natural limits on its growth and reproduction
Habitat	Place providing the types of food, shelter, moisture, and temperature needed for survival of a living organism
Monoculture	Occurrence or cultivation of one type of plant, excluding all other types of plants
Population	All organisms that are the same species living in one community

Sources: Some vocabulary and other definitions are adapted from "Glossary," Glencoe Science: Ecology, McGraw-Hill Companies, 2002. (See their "Online Learning Center" at <<http://www.glencoe.com/sites/wisconsin/teacher/science/index.html>>, under "Classroom Tools," "Student," click on "Multilingual Glossary MS," (accessed 09/05).

Objectives:

- Identify characteristics of exotic invasive plants.
- Describe how exotic invasive plants are injurious to ecosystems.

Day One—Video (one – 45-minute class period)**Prepare in advance:**

- Copy Handout 1 (Video Activity Sheet—Notes) for each student
- Copy Handout 2 (Video Activity Sheet—Assignment) for each student
- Obtain a copy of the DVD “If It’s Green, It’s Good?” by contacting the SAMAB office at 865-974-5912.

Materials:

- DVD: “If It’s Green, It’s Good?”
- DVD player

Description:

After viewing a short film (“If It’s Green, It’s Good?”) students review characteristics of a healthy ecosystem, then contrast a healthy ecosystem with an “unhealthy” ecosystem invaded by exotic plants.

Instructional sequence:

(10 minutes)

- **Review** the components of a *healthy* ecosystem (write these on the chalkboard):
 - sunlight (energy source)
 - characteristic living organisms (producers, consumers, decomposers; predator/prey)
 - characteristic non-living things (land forms, water sources, soil, rocks)
 - dead organisms
 - natural boundaries, set by the living and non-living things within
- **Hand out** video activity sheets. Students will need the information from the guide to do the film follow-up activity.
- **Introduce video**—sometimes a healthy ecosystem is upset by invaders that don’t belong there. This video talks about some of the consequences of exotic plant invasion.

(20 minutes)

- **Video presentation:** “If It’s Green, It’s Good?”

(10 – 15 minutes)

- **Recall** the components of a *healthy* ecosystem.

- **Discuss and clarify** points students wrote down in their notes during the film.
- **Guide** discussion of the contrast between a healthy and an unhealthy ecosystem. For example:
 - How do exotic plant species compete for important resources (like water, sunlight and soil) in an ecosystem?
 - Why does the animal community change when exotic plants invade?

(10 minutes)

- **Assignment:** Using their notes from the video, students write a paragraph describing consequences of exotic plant invasion (page 2 of the Video Activity Sheet)

Day Two—Chain Tag Game (one – 45-minute class period)

Note: This activity is a simulation of an exotic invasive plant taking over a native ecosystem and crowding out the native plants. Although plants are not mobile as they are in this simulation, plants compete for sun, water, space, and soil nutrients. In this game *running away from the students playing the role of an invasive exotic* substitutes for the *competition that exists* for sun, water, space, and soil nutrients.

Prepare in advance:

- Mark off a large field for running, using cones or other highly visible boundary markers.
- Optional:
 - student copies of the “Space Invaders Game Rules” (handout 3)
 - overhead transparency of “Space Invaders Game Rules” (handout 3)

Materials:

- *large* outdoor area (i.e., large enough for students to play chain tag) with defined boundaries (e.g., mark off the area with brightly colored cones)
- flip chart (for class discussion after the simulation)
- marker for flip chart

Description:

Students simulate exotic invasive plants by taking part in a fun group game.

Instructional sequence:

(10 minutes)

- **Review** the types of requirements plants need: sun, water, space, and soil nutrients.
- **Review** the characteristics of an exotic invasive plant: they grow and mature rapidly, they reproduce prolifically, they colonize new areas, they out compete native plants.
- Introduce game/simulation:
 - **Tell** the students that they are about to play a game of chain tag that simulates an exotic invasive plant crowding out native plants in an ecosystem. At the beginning of the game, one student will represent an exotic invasive plant (kudzu) and the others represent native plants. The boundaries for their ecosystem are the markers are the outer edges of the ecosystem.
 - **Explain** that the kudzu is going to grow fast, spread rapidly, and reproduce a lot in the ecosystem. This growth is simulated by tagging native plants and forming a long kudzu vine. (Students who have been tagged form a chain by holding hands.)
 - **Explain** that the game starts with the student representing kudzu running to tag a student representing a native plant. Then, the two students join hands. Together, they form a chain and run to tag another student representing a native plant. That third student will join hands at the end of the line becoming part of the kudzu vine.
 - **Explain** that when a student joins the kudzu vine this represents a native plant being crowded out by kudzu. The kudzu vine will continue to grow until it reaches ten students, and then the vine splits into two parts.
 - **Explain** that this splitting apart represents reproduction. The game ends when there are no native plants left.
 - **Explain** that there is no natural defense against kudzu in the Southern Appalachian Region.

(5 minutes)

- **Explain** the game rules using the overhead transparency “Space Invaders Game Rules”

(25 minutes)

- **Escort** students to game area.
- **Direct** students to go and stand anywhere they wish to grow in the ecosystem.
- **Select** one student to be the exotic invasive plant kudzu.
- **Play** the game.

(10 minutes)

- **Lead a discussion** to help the students process the simulation and connect the game to their knowledge of concepts.

- **Review** vocabulary as needed.
- **Ask:**
 - What did you learn? (For example: Kudzu spreads slowly at first and faster later.)
 - How is this simulation like reality? (For example: The kudzu takes over an ecosystem, crowding out native species.)
 - How is this simulation not like reality? (For example: Plants cannot run; they stay in one place.)