Dedicated to Reducing Pesticides

Unit 5 Section 1 Lesson 2: The Solution, or Part of the Problem?

Focus Areas: Pest Control: Biological; Science

Focus Skills: determining cause and effect, using simulation to gain understanding, working cooperatively, drawing conclusions

Objective

To determine the potential danger of indiscriminate biological control use

Essential Question

How can an introduced biological control impact native species?

Essential Understanding

Unless potential biological controls are screened carefully, they may pose a potential danger to native species.

Background

In theory, biological control of pests is a safe, environmentally friendly alternative to chemical pest control. In practice, this is not always true, particularly with some biological control agents that were allowed to be released in the past.

Biological control involves the introduction of a targeted pest's natural enemy into the pest's environment. Often, these natural enemies come from other parts of the world, and are therefore considered non-native. Unless these introduced species are carefully screened to determine that their diet is highly selective (limited to the targeted pest), they may pose a threat to native plants or animals that inhabit the same environment as the pest.

University of Connecticut
College of Agriculture and Natural Resources
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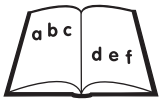
Non-native species released into the environment can become invaders! Biological control agents can produce unintended side effects. The lesson's simulation will illustrate this potential danger.



Vocabulary

adaptation	changing a life style or form in order to survive
biological control	a species of plant or animal introduced into an environment in order to control a pest population
food source	a plant or animal eaten by another organism
introduced species	organisms taken from one environment and placed into another
native species	organisms found naturally in an environment
non-native species	see **introduced species**
organism	a member of the plant or animal kingdom
simulation	a demonstration to portray an actual event or concept

Logistics

Time: 50 minutes
Group Size: 6 to 30
Space: 25' x 3' of floor space

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Materials

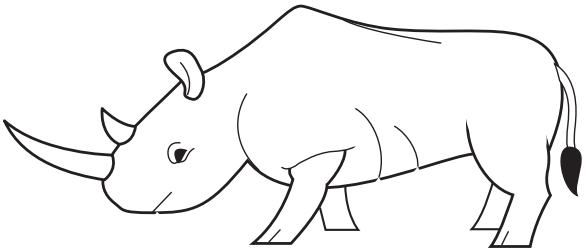
Handout 1 "Introduced Species" *
Handout 2 "Simulation Directions" *
Handout 3 "Data Sheet A: Number of Food Pieces Eaten" *
Handout 4 "Supplemental Data Sheet: Number of Food Pieces Eaten" *
Handout 5 "Data Sheet B: Population Numbers" *
(also to be used as overheads for easy group viewing)
Assessment for a Graph *
yarn or masking tape to mark off feeding area
plastic cups, approximately 32 (numbered to accommodate the members of Teams A through D; 1 through 5 or 1 through 8, etc.)

Food supply:

- 2 boxes of paper clips
- 1 bag of dry kidney beans
- 1 bag of tubular macaroni (ziti or penne)
- 50 to 75 2" pieces of yarn

Tools for food procurement:

- paper clips bent into a hook shape (species A)
- plastic spoons (species B)
- magnets (species C)
- masking tape to tape the fingers (species D) or mittens (not preferable)



Note: Provide enough tools for food procurement to accommodate your group size

* single copy provided

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Preparation

1. Read the **Background** material and Handout 1 article, "Introduced Species."
2. Read Handout 2, "Simulation Directions."
3. Gather food supplies and tools.
4. Prepare copies of Handout 1, "Introduced Species" and Handout 2, "Simulation Directions," one per child.
5. Prepare copies of Handout 3, "Data Sheet A: Number of Food Pieces Eaten," Handout 4, "Supplemental Data Sheet: Number of Food Pieces Eaten," and Handout 5, "Data Sheet B: Population Numbers," one per team.
6. Prepare the area to be used for the simulation.
7. Create two large data tables using 3, 4, and 5 "Recorder/Counter Data Sheets" as a model, or use the overhead of the data sheets, to be filled in by recorders as the simulation progresses.

Activity

Challenge: Recognize the potential problems of careless control selection.
(Display for group viewing)

Introduction

1. Introduce the concept of non-native (introduced) species.
   a. Distribute copies of Handout 1 "Introduced Species." Allow time to read and then discuss.
   b. Summarize Handout 1.
2. Determine the potential danger of introduced species to native species.
3. Create the following scenario for the children: three groups of native species live in a habitat, and each one has a choice of four

food sources. However, depending on the "mouth" you will be given for your simulation, you may prefer one type of food to another.

4. Distribute Handout 2, "Simulation Directions," and go over Round 1 direction for Native Animals #1 through #6.
5. Divide the group into 4 teams of species (Species A, B, C, and D; equal numbers are not necessary) and explain that one group may have an easier time gathering food than another because this is a simulation, not a game, in which all participants must have equal opportunity "to win." **Note:** Each team represents one species.
6. Assign one member of each species to be the recorder, or, if the group is small, assign one member to record all species' statistics.
7. Scatter the food supply in the designated area.
8. Distribute tools (spoons, paper clips, and magnets) and paper cups.

Involvement

1. Record numbers of players on Handout 5, "Data Sheet B: Population Numbers," Round 1 for Species A through C. **Note:** Species D doesn't feed until Round 3.
2. "Play" Round 1 according to the Handout 2 Simulation Direction for Round 1, #1 through #6.
3. Record the results of food gathering on Handout 3, "Data Sheet A: Number of Food Pieces Eaten" according to the Simulation Directions for Counter/Recorder #1 through #4.
4. 'X' out the lowest number of food pieces eaten on Handout 3, Round 1 and eliminate that person. Circle the highest number of food pieces eaten on Handout 3, Round 1 and add a player to that team. (Explain that an increase in species number is dependent on the ability to get food.) **Note:** The eliminated person from one team can become the added member of the high scoring team. Give this player the proper tool and add their name to Handout 4, "Supplemental Data Sheet" in the correct category.

5. Record new population numbers on Handout 5, "Data Sheet B: Population Numbers" under Round 2.
6. Complete Round 2 of the simulation as explained in the directions.
7. Following Round 2, discuss the following questions:
    a. Is each species best able to eat one particular type of food? (yes, spoon – beans; hook – macaroni; magnet - paper clips)
    b. Which type of food was the most difficult to eat? (most likely the yarn)
8. Add the final Team, Species D to the mix for Round 3, explaining that this represent an introduced species. Although they were released into the environment to control the pest (yarn), they can eat any other food stuffs in the environment!
9. Complete Rounds 3 through 7 according to directions. Discuss the following questions by interpreting the charts:
    a. What effect did the introduced species have on the food supply? (They were able to consume other types of food stuffs and therefore impacted the native species in a negative manner.)
    b. Which of the native species suffered most? Why? (The magnets, because they could only "eat" the paper clips.)
    c. Explain that some introduced species were purposefully released to control a targeted pest. These are known as biological controls. While some biological control agents are introduced, the vast majority of non-native species are not biological control agents.
    d. Before selecting a biological control, what should biologists do? (Determine the specifics of its dietary adaptability; that is, does the introduced species feed on only the targeted pest or will it threaten the food supply of native species?)

Follow Up

Using the data from Handout 3, "Data Sheet A: Number of Food Pieces Eaten" and Handout 5, "Data Sheet B: Population Numbers," prepare a graph to illustrate the impact of an introduced species on native species.

Assessment

Evaluate the graphs developed in the **Follow Up** using the Assessment for a Graph.

Follow Through

Additional Areas of Focus: Language Arts, Art
Additional Focus Skills: thinking creatively, developing and executing a plan, making an oral presentation

Directions

In teams of four of five, develop an original game or simulation that illustrates the potential problem of introduced species. Present your game or simulation to the group.

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Notes