Oh Deer!

Objectives

Students will (1) identify and describe food, water, and shelter as three essential components of habitat; (2) describe factors that influence carrying capacity; (3) define "limiting factors" and give examples; and (4) recognize that some fluctuations in wildlife populations are natural as ecological systems undergo constant change.

Method

Students portray deer and habitat components in a physical activity.

Materials

An area—either indoors or outdoors—large enough for students to run (e.g., playing field), chalkboard or flip chart, writing materials

Grade Level: 5–8

Subject Areas: Science, Environmental Education, Mathematics, Expressive Arts

Duration: one 30- to 45-minute session

Group Size: 15 and larger recommended

Setting: indoors or outdoors; large area for running needed

Conceptual Framework Topic Reference: WPIIA, WPIIA2, WPIIA2a, WPIIA2a1, WPIIA2a2b, WPIIA2a2ci, WPIIA2a2cii

Key Terms: habitat, limiting factors, predator, prey, population, balance of nature, ecosystem

Appendices: Simulations, Ecosystem, Early Childhood

Background

Carrying capacity refers to the dynamic balance between the availability of habitat components and the number of animals the habitat can support. A variety of factors related to carrying capacity affect the ability of wildlife species to successfully reproduce and to maintain their populations over time. The most fundamental of life's necessities for any animal are food, water, shelter, and space in a suitable arrangement. Without these essential components, animals cannot survive.

However, some naturally caused and culturally induced limiting factors serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support. Disease, predator and prey relationships, varying impacts of weather conditions from season to season (e.g., early freezing, heavy snows, flooding, drought), accidents, environmental pollution, and habitat destruction and degradation are among these factors. An excess of such limiting factors leads to threatening, endangering, and eliminating whole species of animals.

This activity illustrates that

- good habitat is the key to wildlife survival,
- a population will continue to increase in size until some limiting factors are imposed,
- limiting factors contribute to fluctuations in wildlife populations, and
- nature is never in "balance," but is constantly is changing.

Wildlife populations are not static. They continuously fluctuate in response to a variety of stimulating and limiting factors. We tend to speak of limiting factors as applying to a single species, although one factor may affect many species.

Carrying capacity limitations can result in competition among domestic animals, wildlife, and humans.

Natural limiting factors, or those modeled after factors in natural systems, tend to maintain populations of species at levels within predictable ranges. This kind of "balance in nature" is not static but is more like a teeter-totter than a balance. Some species fluctuate or cycle annually. Quail, for example, may start with a population of 100 pairs in early spring, grow to a population of 1,200 birds by late spring, and decline slowly to a winter population of 100 pairs again. This cycle appears to be almost totally controlled by the habitat components of food, water, shelter, and space, which are also limiting factors. Habitat components are the most fundamental and the most critical of limiting factors in most natural settings.

This activity is a simple but powerful way for students to grasp some basic concepts: first, that everything in natural systems is interrelated; second, that populations of organisms are continuously affected by elements of their environment; and third that populations of animals are continually changing in a process of maintaining dynamic equilibrium in natural systems.

Procedure

1. Tell students they will be participating in an activity that emphasizes the most essential things animals need in order to survive. Review the essential components of habitat with the students: food, water, shelter, and space in a suitable arrangement. This activity emphasizes three of those habitat components—food, water, and shelter—but the students should not forget the importance of the animals having sufficient space in which to live, and that all the components must be in a suitable arrangement for wildlife populations to reach their maximum size.
2. Ask the students to count off in fours. Have all the ones go to one area; all twos, threes, and fours go together to another area. Mark two parallel lines on the ground or floor 10 to 20 yards apart. Have the ones line up behind one line; the rest of the students line up behind the other line, facing the ones.
3. The ones become "deer." All deer need good habitat to survive. Again ask the students what the essential components of habitat are (food, water, shelter and space in a suitable arrangement). For this activity, assume that the deer have enough space in which to live. The deer (the ones) need to find food, water, and shelter to survive. When a deer is looking for food, it should clamp its "hooves" over its stomach. When it is looking for water, it puts its "hooves" over its mouth. When it is looking for shelter, it holds its "hooves" together over its head. A deer can choose to look for any one of its needs during each round or segment of the activity; the deer cannot, however, change what it is looking for (e.g., when it sees what is available during that round). It can change what it is looking for in the next round, if it survives.
4. The twos, threes, and fours are food, water, and shelter—components of habitat. Each student is allowed to choose at the beginning of each round which component he or she will be during that round. The students depict which component they are in the same way the deer show what they are looking for (i.e., hands on stomach for food, and so on).
5. The activity starts with all players lined up behind their respective lines (deer on one side, habitat components on the other side)—and with their backs facing the students along the other line.
6. Begin the first round by asking all of the students to make their signs—each deer deciding what it is looking for, each habitat component deciding what it is. Give the students a few moments to put their hands in place—over stomachs, over mouths, or over their heads. (The two lines of students normally will display a lot of variety—with some students portraying water, some food, and some shelter. As the activity proceeds, sometimes the students confer with each other and all make the same sign. That's okay,

continued

although do not encourage it. For example, all the students in habitat might decide to be shelter. That could represent a drought year with no available food or water.)

NOTE: Switching symbols in the middle of a round can be avoided by having stacks of three different tokens—or pieces of colored paper—to represent food, water, and shelter at both the habitat and deer ends of the field. At the start of each round, players choose one of the symbols before turning around to face the other group.

7. When the students are ready, say, "Oh Deer!" Each deer and each habitat component turn to face the opposite group, continuing to hold their signs clearly.

8. When deer see the habitat component they need, they should run to it. Each deer must hold the sign of what it is looking for until getting to the habitat component student with the same sign. Each deer that reaches its necessary habitat component takes the "food," "water," or "shelter" back to the deer side of the line. "Capturing" a component represents the deer successfully meeting its needs and successfully reproducing as a result. Any deer that fails to find its food, water, or shelter dies and becomes part of the habitat. That is, any deer that died will be a habitat component in the next round and so is available as food, water, or shelter to the deer that are still alive.

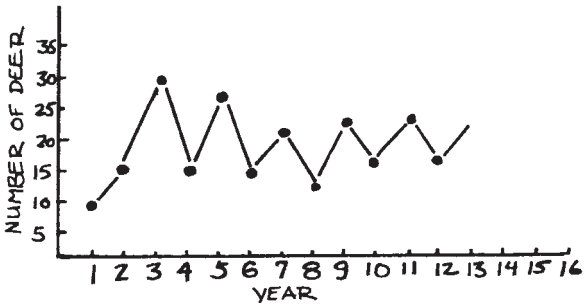
   NOTE: When more than one deer reaches a habitat component, the student who arrives there first survives. Habitat components stay in place until a deer chooses them. If no deer needs a particular habitat component during a round, the habitat component just stays where it is in the habitat. The habitat component can, however, change which component it is from round to round.

9. Record the number of deer at the beginning of the activity and at the end of each round. Continue the activity for approximately 15 rounds.

10. At the end of the 15 rounds, bring the students together to discuss the activity. Encourage them to talk about what they experienced and saw. For example, they saw a small herd of deer (7 students in a class size of 28) begin by finding more than enough of its habitat needs. However, because the population of deer expanded over two to three rounds of the activity until it exceeded the carrying capacity of the habitat, there was not sufficient food, water, and shelter for all members of the herd. At that point, deer starved or died of thirst or lack of shelter, and they returned as part of the habitat. Such things happen in nature also.

    NOTE: In real life, large mammal populations might also experience higher infant mortality and lower reproductive rates.

11. Using a flip chart pad or chalkboard, post the data recorded during the activity. The number of deer at the beginning of the activity and at the end of each round represents the number of deer in a series of years. That is, the beginning of the activity is year one; each round is an additional year. Deer can be posted by fives for convenience. For example,



The students will see this visual reminder of what they experienced during the activity: the deer population fluctuated over a period of years. This process is natural as long as the factors that limit the population do not become excessive to the point where the animals cannot successfully reproduce. The wildlife populations will tend to peak, decline, and rebuild; peak, decline, and rebuild—as long as there is good habitat and sufficient numbers of animals to reproduce successfully.

12. What is realistic and unrealistic about this simulation? (Deer that do not survive **do** become recycled as nutrients but it is not instantaneous. Deer need **all** habitat components to survive. Poor habitat usually results in a weakened individual that succumbs to disease, not instant death.)
13. In discussion, ask the students to summarize some of the things they learned from this activity. What do animals need to survive? How do these components influence carrying capacity? What are some "limiting factors" that affect the survival of animals? How do factors that limit carrying capacity affect the health, numbers, and distribution of animals? How do these factors affect competition within a species? Why is good habitat important for animals? Are wildlife populations static, or do they tend to fluctuate as part of an overall "balance" of nature? Is nature ever really in "balance" or are ecological systems involved in a process of constant change?

Variations

1. After the students have played several rounds of "Oh Deer!," introduce a predator such as a mountain lion or wolf into the simulation. The predator starts in a designated "predator den" area off to the side. The predator has to skip or hop. This impediment reduces the possibility of violent collisions between deer and predator. The predator can tag deer only when they are going toward the habitat and are between the habitat and deer lines. Once a deer is tagged, the predator escorts the deer back to the predator den. The time it takes to escort the deer simulates the time it takes to eat. The "eaten" deer is now a predator. Predators that fail to tag someone die and become habitat. That is, in the next round the predators that died join the habitat line. They will become available to surviving deer as food, water, or shelter. During each round, keep track of the number of predators as well as the number of deer. Incorporate those data into the graphs.
2. Instead of drawing the line graph for students as described in Step 11, have the students create their own graphs. Provide them with the years and numbers of deer.

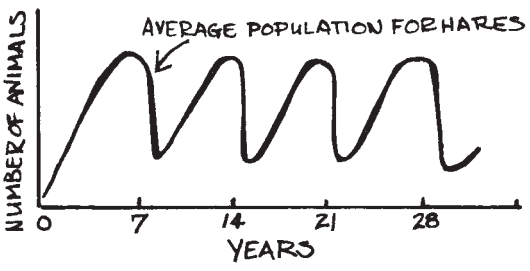
Technology Connections

- Use a search engine or online dictionary to research the key terms used in the activity. (See page 534 for a link to information on maximizing web searches. OneLook Dictionary Search, *www.onelook.com*, directs you to several online dictionaries.)
- Use a computer graphing program to display the data in a variety of 2D and 3D graphs and charts. Animate the graphs using digital presentation software.
- Use a calculator to determine the area of the game field. Compare space available per deer for each round.
- Use GIS (Geographic Information System) data to compare healthy deer habitat to areas changed by development.
- Use the Internet to research specific deer habitat requirements.

Extensions

1. When the students have finished tabulating and discussing the graph data, ask them if they have ever heard of the Hudson Bay trappers in American history. Tell students briefly who the trappers were.

   There are a hundred years or more of records of the activities of these trappers. In those records are some interesting data. The data refer to pelts shipped from America to Europe, particularly the pelts of snowshoe hares and lynx. Researchers have found that snowshoe hare populations seem to peak about every seven to nine years and then crash, repeating the process over each comparable time period. A snowshoe hare population graph would look like this:



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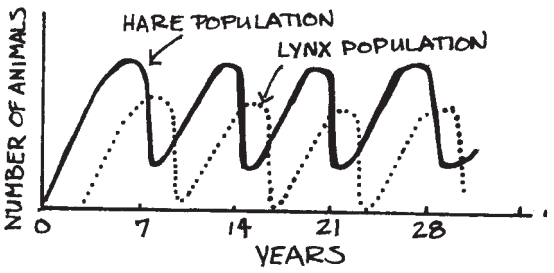
It also has been discovered that lynx populations do the same thing—except that they do it one year behind the hare populations. The combined graph would look like this:



Plot both sets of data on a graph, adding first the hares and then the lynx. Ask the students these questions:

- Which animal is the predator? Which prey?
- Are predators controlling the prey, or are prey controlling the predators? (The number of prey animals available is an indicator of how many predators can live in the area.)
- How is this graph similar to the one created in the deer habitat activity? Who controls the population fluctuations? (Sometimes the habitat—when the deer population is not too large; sometimes the deer—when the deer population destroys the vegetative food and cover.)

2. Some recent research has added a new dimension to the story of the snowshoe hares and the lynx.

   It has been found that a major winter food of the hare is a small willow. As the hare population grows, the use of the willow plants grows too. However, when the willow plant has been "hedged" or eaten back so far, the plant generates a toxin (poison) so the hare can't eat it. That is when the hare population crashes, followed by the crash of the lynx population about a year later. Then the willow is able to grow again. The hare population begins to grow in response, and last of all, within a year or so, the lynx population follows. And the cycle has begun again—over and over—every seven to nine years.

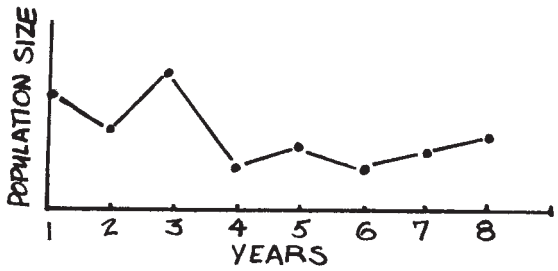
3. Discuss the "balance" of nature. Is it ever in "balance"?

Aquatic Extension

Do the activity in exactly the same fashion, except substitute an aquatic species of wildlife. The essentials are the same. In this case, rather than assuming all the necessary space is available, assume all the water is available but space is needed, as is food and shelter. Hands on stomach is food, hands together over head is shelter, and arms out to the side is space. Otherwise, conduct the activity in the same fashion. The objective remains the same, except that now food, shelter, and space are the three essential components of habitat. Examples of possible aquatic species: manatee, salmon, frog.

Evaluation

1. Identify three essential components of habitat.
2. Define "limiting factors." Identify three examples.
3. Examine the graph below. What factors may have caused the following population changes:
   a. between years 1 and 2?
   b. between years 3 and 4?
   c. between years 5 and 6?
   d. between years 7 and 8?



4. Which of the following graphs represents the more typically balanced population?