Classroom Carrying Capacity

State Mandated Benchmarks and Standards

Grade Level: K-4
Subject Areas: Science, Social Studies, Environmental Education.
Key Terms: carrying capacity, crowded

Objectives

Students will (1) define carrying capacity, (2) give examples of factors that can influence the carrying capacity of an area, and (3) describe how exceeding the carrying capacity can affect the behavior of animals and humans.

Method

Students sit unusually close to each other and describe the results.

Materials

Chalkboard; any area with room to sit closely in crowded conditions, and then move comfortably to a larger area.

Background

Carrying capacity affects all living things, including humans. Carrying capacity may be seen as a type of dynamic equilibrium. It is typically expressed as the number of animals of a given type that can be supported in a given area.

Carrying capacity is also interpreted more broadly as the number of living things – plants and animals – that any area of land or water can support at any one time. It is the dynamic equilibrium expressed by the availability of habitat components (quantity and quality of food, water, shelter, and space, plus the suitability of their arrangement) and the number of organisms that the habitat can support. Each area of land or water, and ultimately the planet, has a carrying capacity of plants and animals. The same area will have different carrying capacities for different life forms.

Carrying capacity for many species is in a constant state of change, both seasonally and annually. For example, terrestrial animals are typically most limited in the winter season when food supplies are reduced. Annual variations may result from factors such as natural disasters, changes in rainfall and temperature patterns, or human interventions. Factors affecting plant growth will affect animals because they are either directly (as herbivores or omnivores) or indirectly (as carnivores) dependent on plants.

Populations of living things tend to fluctuate naturally around some level. Carrying capacity is that level. A population may be below carrying capacity as in the spring following a hard winter, or temporarily above it. The latter situation inevitably results in a decline of the population caused by a variety of natural limiting factors (for example, mortality, disease, emigration, and lowered reproduction rate) and usually lasts for a short period. The carrying capacity of any area can be affected and adjusted by natural factors as well as by human intervention.

A population will, therefore, tend to naturally fluctuate with carrying capacity, with or without human intervention. Humans may not always be willing to accept the consequences of natural events, however. Examples of intentional human intervention are reintroducing predators, feeding in winter, constructing nesting boxes, planting additional vegetation suitable for food, relocating animals, and hunting. Human intervention can reduce a population or prevent its expansion to meet an expected natural reduction in carrying capacity. Such an intervention may result in a higher survival rate.

Intentional intervention may be based on a particular management philosophy or practice. Management of an area of land or water in relation to its carrying capacity for certain species can be subject to question and controversy. Whether and/or how it is appropriate for humans to intervene in natural systems is sometimes a part of such questions and controversy. Management may be defined as intentional choice based

on human goals and objectives. Such goals and objectives are open to question by other groups and individuals.

Procedure

1. Ask the students to sit close together in a group on the floor. They should be fairly tightly packed together. Tell them to pay attention as you give a short lesson in spelling, language, or math. Conduct the lesson for 5 to 10 minutes. Then ask the students to describe what happened during the lesson. Did they feel crowded? How did they act? Is this the way they usually act when they are sitting at their desks, not so close together?

---For Grades K-2---

2. What if you were animals and you were this crowded? You might be domesticated animals like cats or dogs or pet rabbits – or you might be wild animals like deer or wolves. Would you be able to live? Is there enough room for you? What would you need in order to survive? (You would need food, water, shelter, and enough space in which to live, arranged according to your needs). The number of plants and animals that an environment can support is called its "carrying capacity". If the classroom were the environment, were there too many, too few, or just the right number of people for the classroom carrying capacity when everyone sat together and crowded? What are examples of things that can happen to affect how many plants and animals an environment can support?

3. Ask the students to define carrying capacity and say why it is important. In which habitats is carrying capacity important?

---For Grades 3-4---

2. After the students have returned to their seats, develop a basic definition of carrying capacity. How was the "carrying capacity" of their classroom affected when they were sitting so crowded and close together? Some people may have felt uncomfortable when they were squeezed together. Others may not have been bothered at all. It is important to recognize that even within a species, there is a range of tolerance for physical closeness. This is true for humans as well as other animals. Ask the students how the behavior of a population of animals might change if the population suddenly exceeded the carrying capacity of a habitat, or if the size of a habitat was suddenly decreased.

3. Why might an animal population exceed the carrying capacity of a habitat? How might a habitat or its carrying capacity suddenly be decreased in size? What are some of the ways that the carrying capacity of a habitat might be increased? (The carrying capacity might be increased by providing for some of the basic survival needs of the animals, such as putting out nesting boxes, planting food crops, artificial feeding, and revegetation programs. Also natural causes such as increased rainfall or mild winters might result habitat support).

4. Introduce the students to the idea that there may be a set carrying capacity. In what ways, if any, are people, domesticated animals, and wildlife affecting the carrying capacity of the planet Earth? Are there positive effects? Negative effects?

5. Ask the students to summarize what they have learned by listing "Some Important Things to Remember About Carrying Capacity". Ask them to share their lists.

Evaluation

1. What is carrying capacity and how is it important?

2. Identify four things that influence carrying capacity.

3. Describe how exceeding the carrying capacity might affect the behavior of animals and humans.

4. Choose a wildlife species found in your area. Create a plan for a farm, city park, or school grounds that will increase the area's carrying capacity for the wildlife species you choose. Describe some of the possible effects on other wild species and the habitat as a result of your plan. Describe some possible affects on people.

Card Wildlife Education Center

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