

PREPARATION: Rope off a portion of the room and expand this restricted area before class daily for three days.

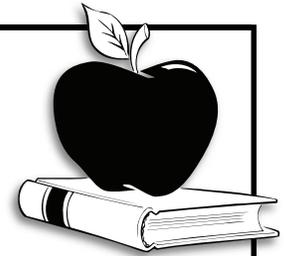
CLASS TIME: t20 minutes

VOCABULARY: habitat, carrying capacity

MATERIALS: rope to stretch across the classroom; sign reading "Off-limits—Do Not Enter!"

COMMON CORE STANDARDS: English language arts MS Writing 4, MS Speaking and Listening 1, MS Speaking and Listening 2, MS Speaking and Listening 4

TEACHER'S GUIDE



ACTIVITY

Habitat Squeeze

OVERVIEW

Through a simulation, students experience habitat loss over time.

CONCEPTS

Human use and management of forests affects bird populations.

OBJECTIVES

Students will be able to: 1) define carrying capacity; and 2) recognize that reduced size and quality of a habitat adds stress to birds and other wildlife populations.

KEY POINTS

Reducing size and/or quality of forest habitat reduces the carrying capacity of the forest for interior forest birds.

TEACHER BACKGROUND

Carrying capacity is defined as the population that a given area, such as a forest, will support without either the area or the population undergoing deterioration. It is a dynamic equilibrium established between any life form and its environment. For example, a particular forest may be capable of providing **habitat** (nesting site, food resources and water) for 100 birds of one species. If the population is slightly under 100, neither the birds nor the forest will suffer. If the population exceeds 100, the forest ecosystem is strained, and each bird is subject to stress with the possible death of some individuals.

Many factors can change an area by either increasing or decreasing the carrying capacity. Some factors are related to the size of the habitat; others are related to the quality of the habitat. For example, an increase in understory shrubs may provide habitat for a particular bird species or group of birds, increasing the carrying capacity of the forest for that bird population without increasing the size of the forest. In another example, a bird species may be dependent upon a stream going through the forest for its water supply. If the stream flow is decreased or eliminated so that it no longer travels through the forest, that forest then has a decreased carrying capacity for that bird species.

Human habitat may be considered in terms of carrying capacity as well. A researcher may indicate that a particular region has a carrying capacity of 10,000 humans. However, people often modify their surroundings in order to increase the carrying capacity of an area, for example, importing food from outside the area. Some people think we have exceeded the earth's carrying capacity for the human population, the result being disease, starvation, war and environmental degradation. A population exceeding the area's carrying capacity may continue to exist with both the area and some individuals being stressed. In the long run, a population that exceeds the carrying capacity of an area is considered unsustainable.

Much of the reduction of interior migratory forest bird populations is the result of the loss of forest habitat for these birds, both here and in their wintering grounds. As suitable forest habitat is reduced, the carrying capacity of the land is reduced for those birds dependent on the forest interior. Birds that depend on fields or forest edges may experience an increase in carrying capacity if forest cover is reduced and not built over.

A picture of forest cover across the United States at four periods in time shows the national changes in large tracts of forests (Appendix F). As the maps show, large tracts of forest cover declined nationally from the year 1620 to a low around 1920, but since then, they have been increasing. Illinois maps show a similar trend. These maps include all tree coverage, small woodlots and savannas, not just large tracts. In Illinois, forest habitat acreage has continually increased from a low of less than one million acres in the early 1900s to nearly 15 million acres today.

One present concern regarding loss of forest habitat for forest interior birds is the reduction of large tracts of forest, especially in southern Illinois. In addition, those areas deforested consist of land that for the most part is being or has been converted to other nonforest uses, such as urban development, subdivisions and farms. These land conversions generally have a long-term effect on the

landscape and the habitat available for a variety of birds. Aside from loss of habitat area, these conversions reduce the quality of habitat for birds that nest in forests. This decrease in habitat size and quality contributes to bird population declines by allowing predators to access songbird nests. For example, suburbanization opens up the forest to nest predators that are associated with human populations, such as raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), Virginia opossums (*Didelphis virginianus*) and house cats (*Felis catus*), plus avian nest predators such as American crows (*Corvus brachyrhynchos*), blue jays (*Cyanocitta cristata*) and common grackles (*Quiscalus quiscula*). Even in the country, free-ranging cats are associated with human populations and are considered a threat to bird populations. One study indicates that 14 million birds are killed by rural free-ranging cats in Illinois each year.

While land conversion away from forests represents the loss of habitat for forest birds, it may simultaneously increase the carrying capacity of Illinois for people and other nonforest wildlife species, including some birds. The question becomes, is there a balance that is sustainable for birds and people?

PROCEDURE

1. Before students enter the classroom, stretch a rope across one small corner of the room and hang the "Off-limits—Do Not Enter" sign on it. (Use an area that is not absolutely essential for the functioning of the class.) Any furniture that can be moved should be removed from this area and crowded into the rest of the room.
2. When students ask about the rope and the sign, explain that it's part of an experiment, and you'll discuss it later in the week. Explain that, until then, the area behind the rope is, indeed, "off-limits," and no one is to enter it for any reason. The students will simply have to learn to function in a slightly smaller space than they are used to. Continue your normal day's activities.
3. Before the students enter the class the next day, move the rope to slightly enlarge the restricted area. Remove any objects from the restricted area and crowd them into the rest of the room.
4. Continue this process for the next two days or least long enough to cause everyone to feel cramped.
5. Ask students how they felt about the rope and the expanding restricted area. Ask why the rope was there. Discuss the effects of the rope. At what point did it interfere with student activities? How much more could the off-limits area have been expanded before it fully impaired the class' function?
6. Introduce the phrase "carrying capacity." Ask how the

rope affected the carrying capacity of the classroom. If their numbers exceed the carrying capacity of their habitat, how would birds be affected? How might habitat loss in one part of the world affect another part of the world? Make the point that solving these kinds of problems requires a global perspective.

DISCUSSION

1. Did the size of the off-limits area on one side of the room affect students on the other side of the room? When? How? Where would students have gone then? What effect would moving out of the classroom have on other people and on the way the class functioned?
2. Do birds that depend on one type of habitat always have the option of moving somewhere else?
3. What will birds do if there is not enough nesting territory or food to sustain them? Humans may be pushing forest bird populations to the limits of survival by removing larger and larger sections of suitable habitat. What are people using the land for when forest is removed? Are these human actions increasing or improving habitat for other birds or wildlife species?
4. Is there a carrying capacity for people in the classroom? In a city? In Illinois? In Latin America? In the world? How much loss of habitat is allowable? How much is too much?

EXTENSIONS

1. Have students research how much change has occurred in forests in their community over the last 200 years. County environmental organizations might be able to provide information about pre-European-settlement vegetation in the area. Topographic maps and aerial photos made years apart will show changes in forest cover. Another source of interesting first-hand information about how the land use of the area has changed over several generations can come from the elderly community. Have students visit nursing homes or senior centers and interview the residents to determine if they remember more or less forest intact when they were young. See if they have noticed any changes in the abundance of birds and other wildlife.

ASSESSMENT

1. Have students write a brief explanation of why the "Keep Out" rope marked off part of the classroom (i.e., why you did this activity).
2. Students should be able to write a reasonable definition of carrying capacity.