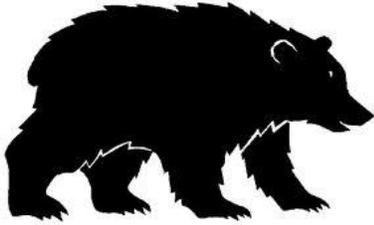


How Many Bears Can Live in This Forest? Teacher Plan



Nuts and Bolts

Objective: Students will define a limiting factor, and describe how limiting factors affect populations

Grade Level: 5-8

Time: 20-45 minutes

Group Size: 10-45

Setting: Outdoors or large open area

Materials

- Five colors of construction paper
- Black felt pens
- Envelopes (one per student)
- Pencils
- One blindfold
- Five sheets green construction paper

Preparation

Make a set of 2"X2" cards from colored construction paper. Use the chart below to determine how many cards of each color to make and what to write on each one.

Number of Cards to Make

Paper Color	Label	Represents	Number of Students in each Group						
			10-15	16-20	21-25	26-30	31-35	36-40	41-45
Orange	N-20	Nuts, 20 lb	2	3	3	4	5	6	7
Orange	N-10	Nuts, 10 lb	8	13	17	21	25	29	33
Blue	B-20	Berries, 20 lb	2	3	3	4	5	6	7
Blue	B-10	Berries, 20 lb	8	13	17	21	25	29	33
Yellow	I-12	Insects, 12 lb	2	3	3	4	5	6	7
Yellow	I-6	Insects, 6 lb	8	13	17	21	25	29	33
Red	M-8	Meat, 8 lb	2	3	3	4	5	6	7
Red	M-4	Meat, 8 lb	8	13	17	21	25	29	33
Green	P-20	Plants, 20 lb	2	3	3	4	5	6	7
Green	P-10	Plants, 10 lb	8	13	17	21	25	29	33

As shown in the chart, the color of the card determines the type of food it represents:

Orange- Nuts (acorns, walnuts, hickory nuts)

Blue- Berries and fruit (blackberries, elderberries, raspberries, wild cherries)

Red- Meat (mice, rodents, beaver, muskrat, young deer)

Green- Plants (leaves, grasses, herbs)

Background Information

Black bears are the focus of this activity illustrating the importance of suitable habitat for wildlife. The activity demonstrates the consequences for a population of bears if one or more habitat components are relatively scarce. When any element or factor in a habitat is inappropriate or exceeds the tolerance range for an animal or population, it directly affects the well-being of the animal(s) and may result in death or population reduction. This factor “limits” the animal or population. Limiting factors may include habitat components such as food, water, shelter and necessary space, as well as life history parameters such as disease, predation and climatic conditions. Limiting factors also may be related to human activity such as development, population and hunting. Populations tend to increase in size until limited by one or more of these factors.

Black bear habitat limits black bear populations, especially through the influences of shelter, food supply and social tolerances or territoriality of the animal. Shelter or cover is a prime factor. Black bears need cover for feeding, hiding, bedding, traveling, raising cubs and denning. With limits of space, adult bears will kill young bears or run them out of the area. These young bears must keep moving around until they die or find an area vacated by an adult.

When food supplies are reduced by factors such as climatic fluctuations, competition for food becomes more aggressive. Some adult bears might temporarily move to seldom used areas of their home range, sometimes many miles away. They must live on what food is available in the area. Bears may become malnourished for hibernation.

All possible conditions are not covered by the design of the activity. However, by this simple illustration it is possible for students to grasp the essential nature of the concept of “limiting factors”- habitat components that affect the survival of an animal or restrict the numbers or range of an animal population.

The following estimates the total pounds of food needed for one bear for 10 day are used for this activity:

Nuts	20 pounds	(25%)
Berries and Fruit	20 pounds	(25%)
Insects	12 pounds	(15%)
Meat	8 pounds	(10%)
Plants	20 pounds	(25%)
	80 pounds	100%

Note: This is only an estimate of a bear’s diet. If you follow the table when making the food cards, there should be less than 80 pounds of food per student, so there is not enough food in the area for all the “bears” to survive.

Introduction (5-15 minutes)

Scatter the colored construction paper in a large open area. Do not tell the students what the colors, initials or numbers represent. Tell them only that the pieces of paper represent various kinds of bear food and students should gather different colored squares to represent a variety of food.

Have the students write their names on an envelope, which will represent each student's "den site" and should be left on the ground at the perimeter of the area.

Have the student's line up on a starting line, leaving their envelopes between their feet on the ground. Give them the following instructions: "You are now black bears. Among you there is a bear that broke his leg in territory fight with another bear. Assign one student as the injured bear and must hunt hopping on one leg. Another bear is investigated a porcupine too closely and was blinded by the quills. Assign one student as the blind bear; he or she must hunt blindfolded. There is also a bear in the group that has two small cubs and she must gather twice as much food. Assign one student as the mother bear.

Body (10-30 minutes)

Students must walk into the "forest." Bears do not run down their food; they gather it. As students find colored squares, they must bring it back to their "den" before picking up another colored square. Bears would not return to their den to eat, they would eat as they find the food.

When all of the colored squares have been picked up, have students pick up their den envelopes containing the food that was gathered.

Explain what the colors and numbers represent. Ask students to add up the total number of pounds of food they gathered. Have students write the total weight on the outside of their envelopes.

On a chalkboard, list “blind,” “injured” and “mother.” Ask the blind bear how much food she acquired, same with the blind bear and the injured bear. Ask the other students how much food they found and record each response on the chalkboard. Tell the students that each bear needs 80 pounds to survive. Which bears survived? Is there enough to feed all the bears? How many pounds did the blind, injured, mother bear collect? Will they survive?

Ask the students to record how many pounds of each of the five categories of food they gathered. Next, ask each student to convert those numbers into percentages of the total poundage of food each gathered. Provide the students with the background information about black bears so that they can compare their percentages to the “typical percentages.”

Ask the students to calculate the total amount of food that they collected as bears. Divide the total by the 80 pounds needed by an individual bear in order to survive in a 10-day period. How many bears could the habitat support? What percentage of bears survived? What percentage of bears would have survived if the food had been evenly distributed?

Ask the students to determine the amount of food tokens that must be added to support all the bears in this activity. If sufficient food were available for all of the bears, would the population likely increase the following year? Have the students support their answers. Other than food, what factors, natural or human-related, might also limit the growth of the bear population? How would each of the factors affect the bear population? Could the bear population increase indefinitely if unlimited food were available? Why or why not?

Conclusion (5-15 minutes)

Drawing on their discussion, ask the students to try to define the term “limiting factor.” Have them suggest examples of limiting factors that would influence the survival of other animals and their populations.