

How Many Bears can Live in This Forest?

Age: Grades 3 – 9

Group Size – any (adjust number of food squares per size group; less than 80 lbs of food per Pathfinder)

Duration – 20 – 455 minutes or longer

Settings: outdoors or indoors

OBJECTIVES

Pathfinders will be able to: 1) define a major component of habitat; and 2) identify a limiting factor.

METHOD

Pathfinders become "bears" to look for one or more components of habitat during this physically involving activity.

BACKGROUND

It is recommended that this activity be preceded by one or more activities on adaptation; basic survival needs; components of habitat; crowding; carrying capacity; habitat loss; habitat improvement; herbivores, carnivores, and omnivores; and limiting factors. See the cross references for suggestions. For additional information about black bears, see "Bearly Born."

In this activity, the black bears are the focus in order to illustrate the importance of suitable habitat for wildlife. One or more components of habitat - food, water, shelter and space in a suitable arrangement - are emphasized as one way to convey the concept of "limiting factors."

Black bear habitat limits black bear populations, especially through the influences of shelter, food supply and the 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 for 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 either until they die or find an area vacated by the death of an adult.

When food supplies are reduced by factors such as climatic fluctuations, competition becomes more intense. 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. These individuals may become thin and in poor condition for winter hibernation or, in the case of young bears, be forced from the area by more aggressive adults.

All components of habitat are important. Food, water, shelter and space must not only be available, but must be available in an arrangement suitable to meet the animals' needs. For black bears, shelter is especially important.

All possible conditions are not covered by the design of the activity. However, by this simple illustration, it is possible for Pathfinders quickly to grasp the essential nature of the concept of limiting factors.

The major purpose of this activity is for Pathfinders to recognize the importance of suitable habitat. Inadequate food and/or shelter are two examples of what is called a limiting factor - something which affects the survival of an animal or a population of animals.

MATERIALS

Five colors of construction paper (two to three sheets of each color) or an equal amount of light poster board; one black felt pen; envelopes (one per Pathfinder); pencils; one blindfold; five sheets green construction paper (for extension).

PROCEDURE

1. Make up a set of 2" x 2" cards from the colored construction paper for a group of 31-35 Pathfinders. Make 30 cards of each of five colors to represent food as follows:

orange

nuts (acorns, pecans, walnuts, hickory nuts);
mark five pieces N-20; mark 25 pieces N-10

blue

berries and fruit (blackberries, elderberries, raspberries, wild cherries);
mark five pieces B-20; mark 25 pieces B-10

yellow

insects (grub worms, larvae, ants, termites); mark five pieces I-12; mark 25 pieces I-6

red

meat (mice, rodents, peccaries, beaver, muskrats, young deer);
mark five pieces M-8; mark 25 pieces M-4.

green

plants (leaves, grasses, herbs);
mark five pieces p-20; mark 25 pieces p-10

(The numbers on the cards represent pounds of food.)

There should be less than 80 pounds of food per Pathfinder so that there is not actually enough food in the area for all the "bears" to survive. The following estimates of total pounds of food for one bear in ten days 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%
TOTAL	80 pounds = 100%

NOTE: These figures represent a typical bear's food. The components of an actual bear's diet will vary between areas, seasons and years. For example, a bear in the state of Alaska would likely eat more meat (fish) and fewer nuts than a bear in Arizona. One similarity among black bears everywhere is that the majority of their diet is normally made up of vegetative material. If you want, you can also include "water" by making an additional 50 squares of light blue paper. Mark each stack of ten cards with one of these letters: R, L, ST, SP, and M (representing rivers, lakes, streams, springs and marshes - all places where a bear could find water).

If you have a group of more or less than 31-35 Pathfinders, use this chart to help determine how many cards to make.

	10-15	16-20	21-25	26-30	31-35	36-40	41-45
Nuts (N-20)	2	3	3	4	5	6	7
Nuts (N-10)	8	13	17	21	25	29	33
Berries (B-20)	2	3	3	4	5	6	7
Berries (B 10)	8	13	17	21	25	29	33
Insects (I-12)	2	3	3	4	5	6	7

Insects (I-6)	8	13	17	21	25	9	33
Meat (M-8)	2	3	3	4	5	6	7
Meat (M-4)	8	13	17	21	25	29	33
Plants (P-20)	2	3	3	4	5	6	7
Plants (P-10)	8	13	17	21	25	29	33

2. In a fairly large open area (e.g., 50' x 50'), scatter the colored pieces of paper.

3. Have each Pathfinder write his or her name on an envelope. This will represent the Pathfinder's "den site" and should be left on the ground (perhaps anchored with a rock) at the starting line on the perimeter of the field area.

4. Have the Pathfinders line up on the starting line, leaving their envelopes between their feet on the ground. Give them the following instructions: "You are now all black bears. All bears are not alike, just as you and I are not exactly alike. Among you is a young male bear who has not yet found his own territory. Last week he met up with a larger male bear in the big bear's territory, and before he could get away, he was hurt. He has a broken leg. (Assign one Pathfinder as the crippled bear. He must hunt by hopping on one leg.) Another bear is a young female who investigated a porcupine too closely and was blinded by the quills. (Assign one Pathfinder as the blind bear. She must hunt blindfolded.) The third special bear is a mother bear with two fairly small cubs. She must gather twice as much food as the other bears. (Assign one Pathfinder as the mother bear.)"

5. Do not tell the Pathfinders what the colors, initials, and numbers on the pieces of paper represent. Tell them only that the pieces of paper represent various kinds of bear food. Since bears are omnivores, they like a wide assortment of food, so they should gather different colored squares to represent a variety of food.

6. Pathfinders must walk into the "forest." Bears do not run down their food; they gather it. When Pathfinders find a colored square, they should pick it up (one at a time) and return it to their "den" before picking up another colored square. (Bears would not actually return to their den to eat; they would eat food as they find it.)

7. When all the colored squares have been picked up, the food gathering is over. Have Pathfinder pick up their den envelopes containing the food they gathered and return to class.

8. Explain what the colors and numbers represent. Each color is a kind of food and the numbers represent pounds of food eaten. Ask each Pathfinder to add up the total number of pounds of food he or she gathered - whether it is nuts, meat, insects, berries or plant materials. Each should write the total weight on the outside of his or her envelope.

9. Using a chalkboard, list "blind," "crippled," and "mother." Ask the blind bear how much food she got. Write the amount after the word "blind." Ask the crippled bear and the mother bear how much they got and record the information. Ask each of the other Pathfinders to tell how much food they found; record each response on the chalkboard. Tell the Pathfinders each bear needs 80 pounds to survive. Which bears survived? Is there enough to feed all the bears? How many pounds did the blind bear collect? Will she survive? What about the mother bear? Did she get twice the amount needed to survive? What will happen to her cubs? Will she feed her cubs first or herself? Why? What would happen to her if she fed the cubs? What if she ate first? If the cubs die, can she have more cubs in the future, and perhaps richer, years? (The mother bear will eat first and the cubs will get whatever, if any, is left. The mother must survive; she is the hope for a continued bear population. She can have more cubs in her life; only one needs to survive in order for the population to remain static.)

10. If you included the water squares, each Pathfinder should have picked up at least one square representing a water source, or he or she does not survive. Water can be a limiting factor and is an essential component of habitat.

11. Ask each Pathfinder to record how many pounds of each of the five categories of food he or she gathered. Ask each Pathfinder next to convert these numbers into percentages of the total poundage of food each gathered. Provide the Pathfinders with the background information about black bears so that they can compare their percentages with what are typical percentages eaten by black bears in Arizona. Ask each Pathfinder to attempt to guess how healthy their bear would be. How do the bears' requirements for a diet seem to compare with the needs of humans for a balanced and nutritious diet?

12. Ask the Pathfinders to arrive at a class total for all the pounds of food they gathered as bears. Divide the total by the 80 pounds needed by an individual bear (approximately) in order to survive in a ten-day period. How many bears could the habitat support? Why then did only ____ bears survive when your class did this activity? Is that realistic? What percentage of the bears survived? What percentage would have survived had the food been evenly divided? In each case, what percentage would not survive? What

limiting factors, cultural and natural, would be likely to actually influence the survival of individual bears and populations of bears in an area?

EXTENSIONS

1. Cut paper or poster board into 2" x 2" squares. For a group of 30 Pathfinders, make 150 squares. Make five piles of 30 squares each. Mark each set of 30 cards with one of these letters: B, T, D, H and F. These represent: B = bedding sites, T = travelways, D = dens, H = hiding cover and F = feeding sites. For purposes of this activity, these are defined as follows:
- 2.

Bedding Sites Black bears are usually active in early morning and late evening, and bedded most of the rest of the day and night. Bedding sites are usually in areas of dense vegetation, steep topography, and/or large trees where the bears feel secure.

Travelways Bears require corridors of cover (made up of thick vegetation and/or steep topography) to enable them to travel between areas of food, water and shelter within their home range.

Dens Black bears use dens as shelter for hibernation from November to April in each year. Bears have been found denning in hollow logs, caves, holes dug into hillsides, under buildings and even in culvert pipes. Bears often prepare and may use more than one den, and may change dens during the winter because of disturbance or if the den leaks. Bears seldom re-use dens from one year to the next.

Hiding Cover Black bears evolved as animals that escape danger from predators and other bears by hiding in thick cover.

Feeding Sites Bears will often use areas with less cover than hiding areas or bedding sites for feeding. Feeding sites are, however, often found close to thick hiding cover to allow the bear to quickly escape danger if necessary.

NOTE: This information is based on actual research data from a study in Arizona. These components of shelter may vary slightly in different parts of North America.

2. In a fairly large open area (e.g., 50' x 50'), scatter the colored pieces of paper.

3. Have the Pathfinders line up along one side of the area. Tell them that they are to become "bears" for the purposes of this activity. Review the concept of habitat - that a bear would need shelter, food, water and space in a suitable arrangement in order to survive. Do not tell the Pathfinders what the letters on the squares of paper represent. Tell them only that they represent one element or component of bear habitat.

4. Direct the Pathfinders to move as individual "bears" into the area. Each bear must pick up as many of the components of habitat as possible. Some competitive activity is acceptable as long as it is under control. Bears are territorial. Remember that if bears fight, which they seldom do, they can become injured and unable to successfully meet their needs for survival.

5. When the Pathfinders have picked up all of the squares of paper in the area, have them return to the classroom or be seated in any comfortable area. Ask the Pathfinders to separate their squares of paper into piles according to the letter on each. Using a chalkboard or large pad for a visual reference, ask the Pathfinders to guess what the letters on the green cards represent - giving them the clue that each is an element of cover or shelter for a black bear. What kinds of shelter would a bear need? What do these initials represent? Record how many bears got at least one of each kind of shelter. How many got only four kinds? Three? Two? How many got only one kind of shelter? For the purposes of this activity, only those bears with at least one of each kind of necessary shelter can survive through one year. Ask Pathfinders what would happen if a bear has all types of shelter except a den? (The bear could live from April through October, but would not have a secure place to hibernate and might not survive the winter.) Ask the Pathfinders what would happen if a bear did not have travelways? (Without travelways, home ranges become fragmented and bears are not able to reach needed food, water or other shelter.) Suggesting that the Pathfinders need one of each kind of shelter represents the importance of appropriate shelter as a necessary component of an animal's habitat. Shelter is a very important part of a bear's habitat. A bear needs shelter in which to search for food and water. Bears also need shelter for traveling through their home range; and shelter for bedding, hiding, and denning. In this activity, how many bears survived? What was a "limiting factor" for this population of bears? (Shelter.) What other things possibly could become limiting factors? (Water and space, or territory, are two examples.) Would food be a limiting factor for bears? (Yes; however bears are omnivores and can utilize many sources of food.)

6. Ask the Pathfinders to summarize what they have learned about the importance of suitable habitat for bears' survival. How is this similar and different to the needs of other animals?