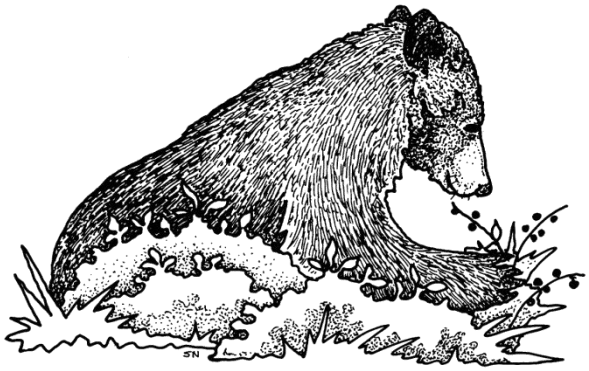
Lesson Five

The Black Bear Necessities



Key question

What do Florida black bears need to survive?

Conceptual frameworks topics

IV.B.1.	Florida black bear feeding behavior
V.B.	Habitat requirements
V.C.	Optimal vs. marginal Florida black bear habitats
V.D.	Florida black bear habitat carrying capacities
VI.A.1.	Natural limiting factors
VI.B.1.	Human-caused limiting factors

Subjects

Mathematics, Science

Time estimates

40-60 minutes per day for two days

Key vocabulary

Habitat, foraging, omnivore, limiting factor, carrying capacity, optimal habitat, marginal habitat

Supplemental video clips

Time 12:04-14:25 from 60-minute video
Time 4:30-5:13 from 15-minute video

Objectives

As part of this activity, students will:

1. Identify the specific habitat requirements of Florida black bears.
2. Define the terms "limiting factor" and "carrying capacity."
3. Describe the types and relative amounts of plant and animal matter eaten by Florida black bears.
4. Explain how a limiting factor such as food affects the carrying capacity of a habitat.
5. Distinguish between optimal and marginal habitat.

Materials

Essential:

Per class:

- Two copies of each Black Bear Food Card Sheet. If possible copy each sheet on a different color of paper or card stock (Plant Cards – green paper, Nut Cards – tan, brown, or orange paper, Berry Cards – blue or purple paper, Insect Cards – yellow paper, Meat Cards – red paper). Laminate the cards, if desired.
- One blindfold

Supplemental:

- Replica of black bear scat
- Color pictures of specific Florida black bear foods
- Calculators

Background

Like all other animals, the four primary habitat requirements of Florida black bears are food, water, shelter, and space. Florida black bears are forest-dwellers. They evolved as forest inhabitants and continue to depend on forests for their survival. Their preferred **habitat** is large, undeveloped woodland tracts with a wide variety of different kinds of vegetation. Like many other large mammals, Florida black bears need large areas of space to survive. The home range of adult Florida black bears can vary from an average of 15 square miles for adult females to an average of 60 square miles for adult males. Scientists estimate that an area of 200,000 to 300,000 acres is necessary to support a viable population of Florida black bears.

Within these large tracts of habitat, bears need access to a water source, preferably a swamp, stream, or river, as well as sheltered areas, such as dense shrub thickets, for winter denning and thick vegetative cover for hiding, bedding, and raising cubs. Although water, shelter, and space requirements are important, food appears to be the most significant factor influencing the Florida black bear's choice of habitat. Florida black bear researchers often refer to Florida black bears as eating machines. Their research shows the average day-to-day movements of Florida black bears appear to focus primarily on finding food.

Contrary to popular belief, Florida black bears eat very little animal matter. In addition, much of the animal matter they do eat consists of insects. Like most other animals that feed primarily on plants, Florida black bears spend a large part of their waking hours wandering around looking for food. This type of meandering feeding behavior is called **foraging**. Foraging behavior can be compared to wandering through the grocery store grabbing anything that catches your eye or nose rather than systematically moving through the aisles buying only those items on a prepared list.

The amount and type of food eaten by Florida black bears varies depending on where they live in the state. For example, black bears living in areas where saw palmettos are abundant eat a greater proportion of saw palmetto berries, while bears living near scrub areas of north Florida eat a greater proportion of acorns from oak trees. Florida black bears are also opportunistic feeders.

Although most of their diet consists of native plants and animals, black bears in south Florida have added berries of the exotic Brazilian pepper plant to their winter diets because it is so readily available.

The average black bear consumes about 80 pounds of food every 10 days, or an average of 8 pounds of food per day. Bear average around 5,000 calories a day in

spring and summer, but jump to 20,000 calories a day in fall. The food eaten by Florida black bears can be grouped into five main categories as follows:

PLANT PARTS – including grasses; saw palmetto hearts, and leaves; alligator flag; pickerel weed stems and leaves; sabal palm hearts; and needle palm

NUTS – including hickory nuts, pecans, and acorns

BERRIES – including tupelo, saw palmetto, blueberry, gallberry, odorless bayberry, Brazilian pepper, elderberry, hackberry, swamp dogwood, persimmon, and red bay

INSECTS – including yellow jackets, bessbugs, ants and ant pupae, honeybees, bumblebees, paper wasps and wasp pupae, and walking sticks

MEAT – including armadillos, white-tailed deer, feral hogs, birds and bird eggs, and carrion

Eighty percent of the Florida black bear's diet consists of plant matter and only 20 percent of its diet consists of animal matter. Because it eats a combination of plant and animal matter, it is a true **omnivore**. By category, the breakdown of relative amounts of each category of food eaten by Florida black bears in a time period of 10 days is as follows:

PLANT PARTS - 20 pounds - 25%
NUTS - 24 pounds - 30%
BERRIES - 20 pounds - 25%
INSECTS - 12 pounds - 15%
MEAT - 4 pounds - 5%
TOTAL - 80 pounds - 100%

The amount and type of food eaten by Florida black bears also varies seasonally. Where available, they especially prefer the sticky, strong-smelling fruits of the saw palmetto during the months of August through October and eat a lot of these fruits during this three-month period. Later in the fall and throughout the winter and spring, Florida black bears begin foraging for cabbage palm seeds, the juicy stems of alligator flag and pickerel weed, acorns, and seasonal berries. Insects comprise about 15 percent of the Florida black bear's diet during the spring and summer, but only about 9 percent of its diet during the fall. Preferred insects are those that live in underground nests or rotten logs, like yellow jackets, bessbugs, and ants. Overall, the food items eaten most often, and in the greatest volume, are seasonally available fruits (nuts and berries) and colonial insects such as ants, bees, and wasps.

Because the type, relative abundance, and distribution of food, water, shelter, and space in a given habitat limit the number of organisms that can survive in that habitat, these factors are often referred to as **limiting factors**. Limiting factors determine the maximum number of organisms that can survive in each habitat. Since each species of animal has specific food, water, shelter, and space requirements, the maximum number of organisms of a given species that an area

of habitat can support on a year-round basis is defined as **carrying capacity**. Because Florida black bears are opportunistic feeders who regularly adapt their diets to changing food availability, it is difficult to provide specific carrying capacity for them. In general, habitats with greater Florida black bear carrying capacities provide a more ideal arrangement of limiting factors than habitats with lower Florida black bear carrying capacities. Florida black bear carrying capacities are higher in larger tracts of habitats containing a wide variety of plant communities than they are in smaller, fragmented tracts of habitats containing only one or two different plant communities.

Habitats with enough food, water, shelter, and space to support a healthy population of Florida black bears are referred to as **optimal habitats**, while habitats providing minimal or less than ideal food, water, shelter, and space requirements are called **marginal habitats**. If the carrying capacity of a given habitat is exceeded and too many bears are crowded into one area, competition for resources can result in adult bears killing the young bears or forcing them into marginal habitats.

In Florida, more and more natural environments are being developed to provide homes and communities for people. When these natural areas are developed for humans, many wildlife species, including bears, are forced to leave and look for new habitats to meet their basic needs. Sometimes they are forced into fragmented marginal habitats while at other times they try to move into optimal habitats that already contain a stable population of black bears. In this role-playing activity, students will experience what can happen to a population of black bears in a given habitat if its carrying capacity is exceeded and suitable amounts of a limiting factor, such as food, are no longer available.

Advance preparation

1. Cut the Black Bear Food Sheets into individual cards. For Round 1 of the game, use the numbers (which represent pounds of food) on the cards to count out enough food cards to feed one-half to two-thirds of the total number of students in your class. Each student needs a total of 80 pounds to survive the round. For example, if you have 30 students in your class, count out 1,200 to 1,600 pounds of food for Round 1 (enough food for 15 to 20 students). For Round 2, you need enough food cards to feed the entire class; for example, if you have 30 students in your class, count out 2,400 pounds of food. Make sure you have a mixture of all five types of food in your sample.

2. Scan the school grounds and locate a large open area (around 50 feet by 50 feet) in which to play the role-playing game. Ideally, the area

should be flat and grassy. If a suitable outdoor area is not available, the game could be played in a large indoor area, such as a gymnasium or cafeteria.

Procedure and discussion questions

1. Begin the lesson by asking students to define the term **habitat**. Make sure students realize that a habitat is an environment that provides all of the basic requirements an organism needs to survive. Next, ask students to brainstorm a list of the basic needs of animals. Develop the idea that, in order to survive in a particular habitat, an animal must be able to meet its specific requirements for the four most basic needs of food, water, shelter, and space. Make sure students realize that different animals need different arrangements of food, water, shelter, and space. Different species eat different kinds of food, need different amounts and sources of water, use different components of the environment for shelter, and need different amounts of space.

2. Ask students what they think the preferred habitat of Florida black bears is. Review pertinent background information regarding the specific water, shelter, and space requirements for black bears, and make sure students understand that Florida black bears are forest-dwellers. Explain that during this activity, they will play a role-playing game to learn more about the specific food requirements of Florida black bears.

3. Review the setting and procedure for the role-playing game. Explain that the game will be played outside in a large, open area representing an actual Florida black bear habitat. (If you live in north Florida, call the area Osceola; if you live in central Florida, call the area the Ocala; and if you live in south Florida call the area the Big Cypress.) The students in the class will represent the population of Florida black bears living in that habitat. Show students the stack of colored cards. Explain that the cards will be scattered throughout the open area (habitat) and represent the different foods black bears eat. **Tell students that the object of the game is for each student (bear) to collect enough food to survive for 10 days**. DO NOT tell students what the colors of the cards represent or what the letters and numbers on the cards represent. Just explain that Florida black bears eat many different kinds of food so they should try to collect a variety of different cards.

4. Next, review the specific rules for the game. You could list the rules

on the board in addition to reviewing them orally.

- Each student (bear) must find their own food. Bears cannot help each other find food.
- In this game, bears do not steal food from each other. Once a piece of food has been picked up, another bear cannot grab it away.
- Introduce and define the term **foraging**. Bears WALK when looking for food; they do not RUN.
- Bears walk on all four legs while foraging for food, so students must walk on all fours during the game.
- Bears do not stockpile their food, but rather eat it as they find it. To represent this behavior, have each student fold a piece of notebook paper into a small "envelope" and have them write their names on their envelopes. The envelopes represent their stomachs; once a piece of food is placed in their stomach, it can't be removed by another bear.
- Each bear can only pick up one piece of food at a time. Students must put each piece of food in their stomachs before they can pick up another piece of food.
- When you say "GO!," all bears will begin foraging for food in the center of the habitat. The game will end when all of the food pieces have been picked up and placed in bear stomachs.

5. Lead students out to the open area and have them form a large circle around the edge of the habitat. Explain that some of the bears in the group have special needs. Ask for one volunteer to assume the role of a mother bear with two cubs. Explain that this bear needs to gather twice as much food as the other bears to feed herself and her two cubs. Ask for two other volunteers to represent injured bears. Explain that one young male bear was injured by an older male bear when he wandered into the larger bear's home range. As a result of the scuffle, one of his legs was broken and he must walk on three legs instead of four. Another female bear was wounded when a car hit her. The accident crushed her hip and she now walks with a severe limp. This bear must also walk on three legs instead of four. Ask for another volunteer to represent a blind bear. Explain that this bear was blinded when he wandered onto private land and was shot by a homeowner.

Blindfold the volunteer representing the blind bear.

6. Have the students get down on the ground on all fours and place their stomach envelopes next to them at the edge of the circle. Remind them that they need to leave their envelopes on the outer edge of the circle and bring food cards back to their envelopes one piece at a time. Scatter the food cards throughout the center of the circle and give the "GO!" signal to begin the game. After all the food cards have been collected, return to the classroom to tally the results.

7. Instruct students to remove all of the food cards from their envelopes and sort them into categories by color. Next, refer to the numbers on the cards and explain that these numbers represent pounds of food. Have students tally the pounds of food they collected of each color and the total number of pounds of food collected.

8. Ask students what they think the letters on each colored card represent. Use pertinent background information to list the five main categories of food consumed by Florida black bears (plants, nuts, berries, insects, and meat) on the board. Next, ask students to share specific examples of each type of food category using the pictures on their cards.

9. Starting with the "special needs" bears (i.e., mother bear with cubs, two injured bears, and blind bear), record the total number of pounds collected by each bear on a whole-class data chart. Remind students that these totals represent the amount of food consumed over a 10-day period. Ask students to review the class totals and speculate how much food they think a Florida black bear needs to consume over a 10-day period. Then tell students that the average Florida black bear consumes about 80 pounds of food every 10 days.

10. Refer to the five categories of black bear foods, and ask students to predict what percent of the average Florida black bear's diet consists of each category. After sharing student speculations, record the correct percentages of each food category on the board. To reinforce mathematics calculation skills, you could help students convert the percentage values to pounds of food, based on an 80 pound total. If available, pass around a replica of black bear scat for students to examine. Ask them if they can identify remnants of any of the five major food categories in the scat replica. Explain to students that the outer husks of berries and other small

fruits are usually easily visible in scat samples. Exoskeletons of insects also may be visible.

11. Next, ask students to determine what percent of a Florida black bear's diet consists of plant matter and what percent consists of animal matter. Remind them that the Plant, Nut, and Berry categories are all types of plant matter and the Insect and Meat categories are types of animal matter. Reinforce the idea that Florida black bears are **omnivores** and that only 20 percent of their diet consists of animal matter. Have students sort the food cards they personally collected into two piles (plant matter and animal matter) and use the pound values on the cards to determine how much of the food they each collected was plant matter and how much was animal matter.

12. Help students determine the grand total of <u>all food</u> collected by the entire class and divide that total by 80. Explain that this number represents the **carrying capacity** (or maximum number of bears that could survive as a sustained population) for their hypothetical class bear habitat. Next, introduce and define the term **limiting factor**. Explain that although this activity focused on food, in the real world, food, water, shelter, and space all act as limiting factors to determine the carrying capacity of a habitat. If time permits, you could briefly discuss Florida's actual bear populations. Here are 2016 population estimates for three of the seven bear subpopulations: the Osceola black bear subpopulation currently contains about 500 bears, the Ocala black bear subpopulation in central Florida currently contains about 1,200 bears, and the Big Cypress black bear subpopulation in south Florida currently contains about 1,000 bears.

13. Conduct a whole-class discussion addressing the following questions:
    - Look at the whole-class list of the amount of food collected by each bear. How many bears collected enough food (at least 80 pounds) to survive? (Answers will vary.)
    - If there was enough food for ___ bears, why did fewer than ___ bears find the food they needed? (The carrying capacity of the habitat was exceeded, thus competition for food was greater. As a result, only a few bears were able to survive in this area, so others would have had to move out to find resources to survive.)
    - How did food act as a limiting factor for the class

population of bears? (There was not enough food available to feed all of the bears in the habitat, so it limited the number of bears that could continue to survive in that habitat.)

- Did the mother, injured, and blind bears find enough food to survive? (Answers will vary, but generally, when food resources are limited all four of these bears do not collect enough food to survive.)
- How did it feel to be a bear competing with so many other bears for food? (Generally, students will describe feelings of anxiety, nervousness, and crowdedness.)
- How could overcrowding and a shortage of food in a habitat affect the behavior of Florida black bears? (It leads to more aggressive behavior, and at times, results in forcing younger, less dominant bears out, who must try to find food elsewhere. Bears wandering out of familiar habitats are more likely to be hit by vehicles, chased by other bears, and get into conflicts with people as they search for food.)

14. Use pertinent background information to introduce and develop the concepts of **optimal habitat** and **marginal habitat**. Using food as a criterion, ask students what could be done to restore the marginal habitat in the first round of the role-playing game to a more optimal habitat for the entire population of bears in the class. Lead students to the idea that an optimal habitat would contain enough food to adequately feed the entire class population of bears. Be sure to reinforce the idea that having people bring additional food to bears is NOT an acceptable approach to dealing with bears in marginal habitats. Your students may come up with the idea that the only way to help Florida black bears is to feed them if their natural food sources are limited. Students need to realize that "A FED Bear is a DEAD Bear." Bears that become dependent on people for food often get into conflicts with people and sometimes have to be killed by wildlife officials. Bears are wild animals and should not be dependent on humans for food.

15. If time allows, conduct the role-playing activity again, making sure there is enough food to feed all of the bears in the class in the second round. Construct another whole-class data table of the total amount of food collected by each bear and

have students compare the survival rate of the bear population in Round 2 with the survival rate in Round 1. Make sure students realize that even in ideal conditions, some bears, especially the sicker, weaker, or older ones, may not find all of the food they need to survive.

Modifications for younger or ESE/ESOL students

1. Provide students with calculators for computations.

2. When analyzing the results of the role-playing activity, heterogeneously group students so that each small group contains at least one student with strong math computation skills. Have these students assist other group members with calculations.

3. Eliminate the discussion of optimal versus marginal habitats.

4. Do not actually conduct the role-playing activity a second time, but instead just have students predict whether more, less, or the same number of bears would survive if there was twice as much food available during the role-playing activity.

Assessment suggestions

1. Provide a writing prompt such as the following: "You are a Florida black bear looking for a place to live. What kind of habitat are you looking for and what do you need to survive in that habitat?" Ask students to write a short paragraph describing the habitat requirements of Florida black bears.

2. Ask students to define the terms "limiting factor" and "carrying capacity" in their own words.

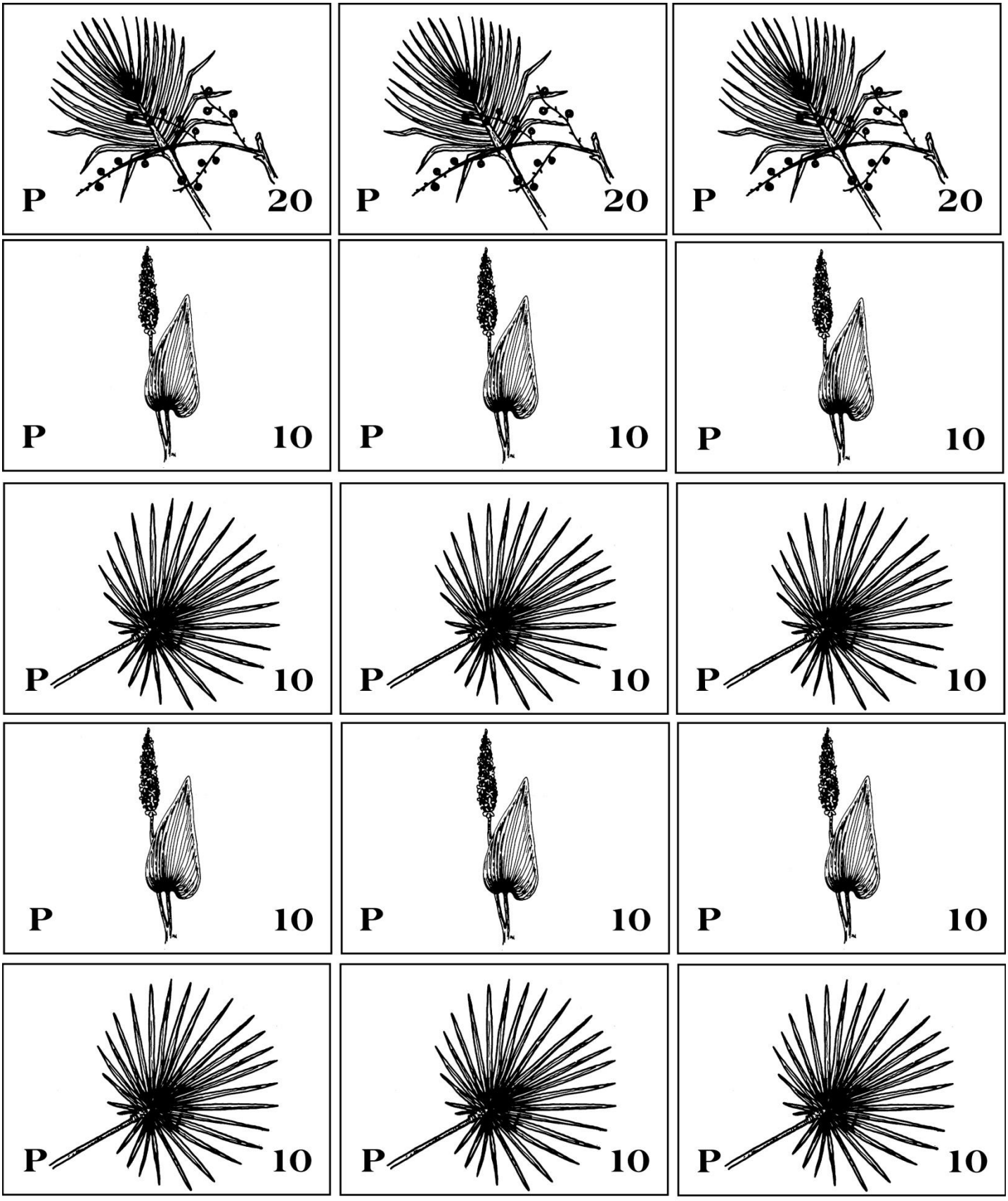
3. Have students construct a bar graph or pie chart illustrating the five types of foods eaten by Florida black bears and the relative amounts (in percent or pounds) they eat of each category.

4. Ask students to explain in their own words how the limited amount of food affected the number of bears that survived in the role-playing game.

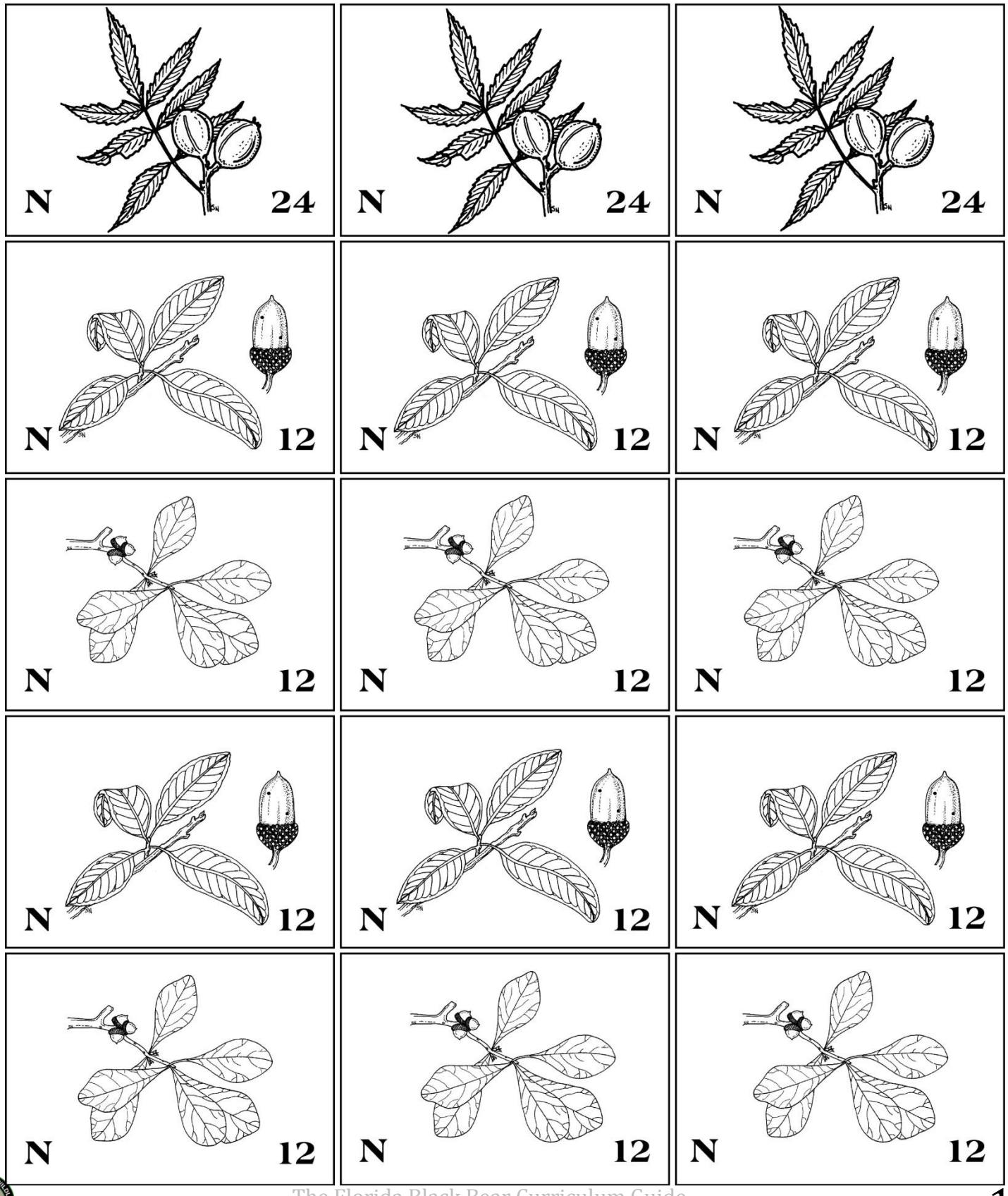
5. Ask students to describe some differences between optimal and marginal Florida black bear habitats.

Food Cards

PLANTS

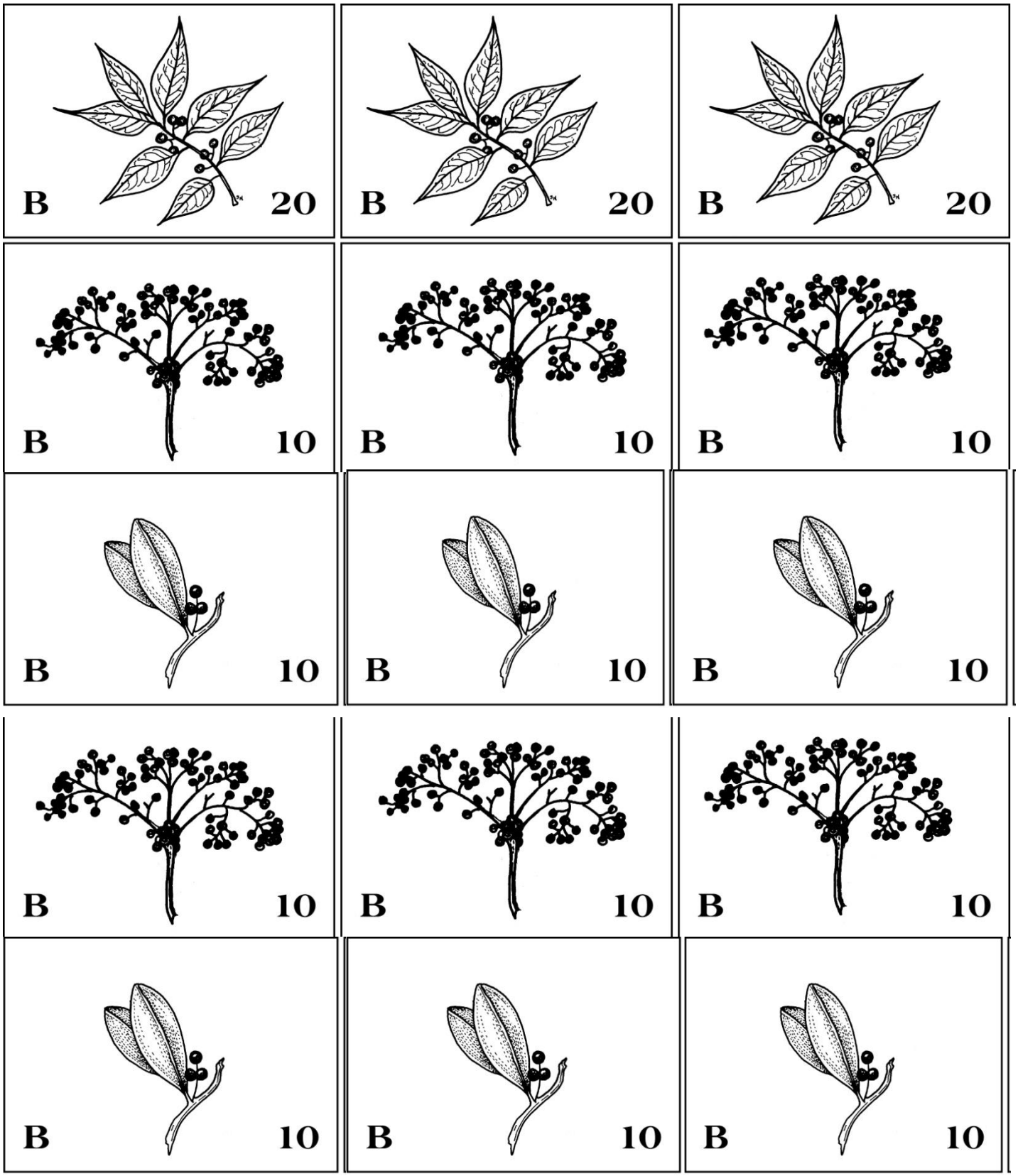


Food Cards NUTS



Food Cards

BERRIES



Food Cards

INSECTS

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I 12

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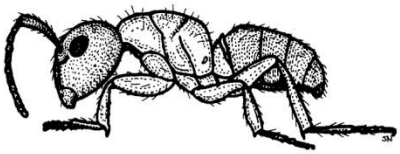
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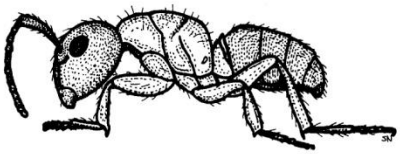
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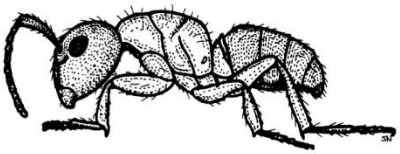
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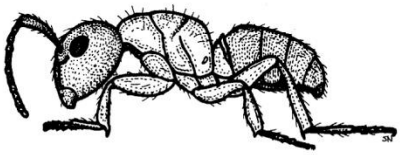
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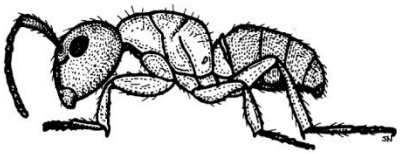
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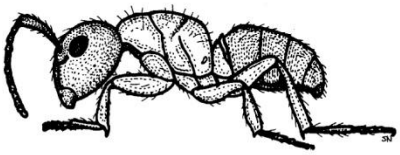
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Food Cards

MEAT

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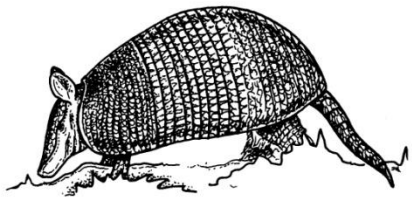
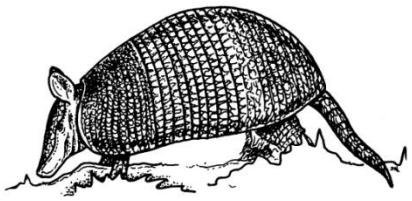
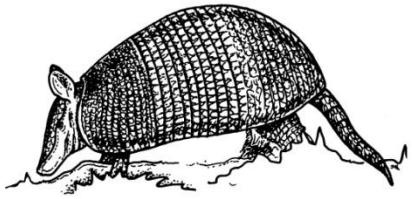
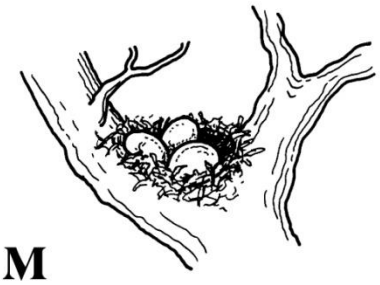
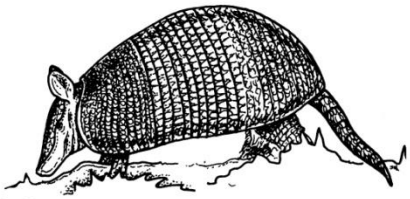
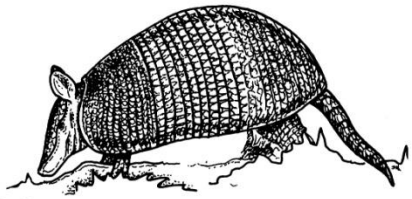
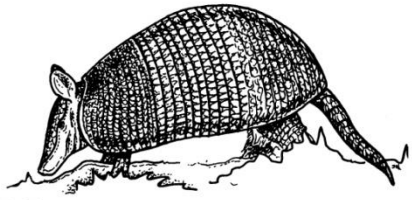
 M 4	 M 4	 M 4
M 4	 M 4	M 4
 M 4	 M 4	 M 4
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