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## HOW MANY COYOTES CAN LIVE ON THIS PRAIRIE?

### **How Many Coyotes Can Live On This Prairie?**

is an adaptation of the Project WILD activity, "How Many Bears Can Live in This Forest?" The activity is appropriate for students in grades 3 through 9.

### **Objectives**

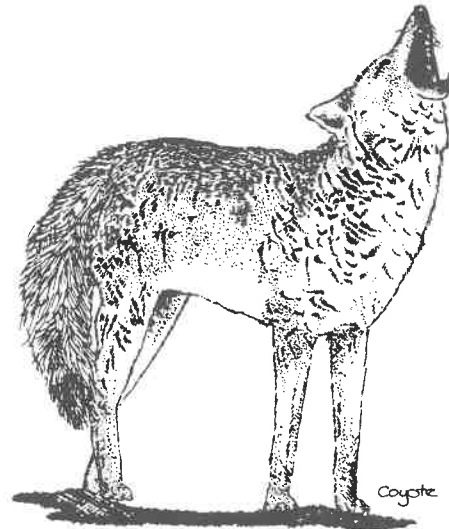
Participants will define a major component of habitat and identify limiting factors for populations of coyotes.

### **Method**

Participants become "coyotes" to look for one or more components of habitat during this physically active lesson. A discussion of coyote population limiting factors is based on the outcome of the activity.

### **Background**

It is suggested that this activity be preceded by lessons on one or more of the following topics: adaptation; basic survival needs; components of habitat; crowding, carrying capacity; habitat loss; habitat improvement; herbivores and carnivores; and limiting factors. See the Project WILD guide cross reference section for suggestions.



The South Dakota coyote is the focus of this activity in order to illustrate the importance of suitable habitat for wildlife. One or more components of habitat - food, water, shelter, and living space in suitable arrangement - are emphasized as one way to convey the concept of "limiting factors."

Coyote habitat limits coyote populations, especially through the influences of shelter, food supply, social tolerances, and territoriality of the animals. Coyotes need proper habitat for feeding, hiding, bedding, traveling, denning, and raising their pups.

Prior to the early 1980's, coyotes were common only in western South Dakota and in the counties bordering the Missouri River on its eastern side. Since that time, coyotes have expanded their range to include the entire state. Coyotes are now known to inhabit all 48 states in the contiguous United States. The estimated coyote population in South Dakota ranges from 70,000 to 75,000, or an average of nearly 1 coyote per square mile.

The highest density of coyotes occurs along the major river drainages in the state. However, they readily adapt to human activity and feed on the easy-to-capture domesticated livestock and tame fowl. This tolerance of humans and the willingness to eat a wide variety of foods have enabled the coyote to expand its range into urban areas. Although coyotes are considered to be carnivores, they will eat wild and domestic fruits and other plant foods.

Coyotes are territorial animals. Mature males establish a home range averaging 10 to 20 square miles, while females range over a smaller area. Coyotes mark the boundaries of their territory with urine and will aggressively defend their space against intrusion by other coyotes. If prey animals are scarce, coyotes will remove other competing predators, such as fox and raccoon, from their territory.

Before the coming of the pioneers, the coyote's natural enemy was the wolf. Since wolves have been removed from most ecosystems, habitat, humans and human activities are the only factors controlling coyote populations. In the past, South Dakota used a bounty system of paying fees for each coyote killed. The bounty system was discontinued in the 1960's. A 5-year study on predator control in the 1970's showed a significant increase in pheasant populations in areas where intensive predator control was practiced. However, there also were large increases in cottontail and small rodent populations. These animals ate and destroyed grasses

and young, woody stems, thus reducing the quality of the habitat. The cost of removing 2/3 of the 4 major predators was \$41 per section per year, making it a very expensive strategy. The study concluded that limiting the size of predator populations by artificial control should not be considered as a substitute for increasing and improving habitat. Predators and prey have always co-existed, and where habitat is adequate, both populations remain healthy.

## Diet of South Dakota Coyotes

55% = mammals (mainly rodents), cottontail rabbits, and other mammals, including domesticated lambs and calves.

15% = birds, including pheasants.

15% = *carrion* - dead animals, including road kills and livestock that have died in the pasture.

10% = vegetation: plums, prickly pear, cactus flowers, watermelons, and other fruits.

5% = grasshoppers and other insects.

## Materials

Make enough food tokens for your class size (provided in Figure 1). See Table 1 for the recommended number of food tokens needed for the size of your group. One stomach (envelope) is needed for each coyote.

**Table 1. Food Token Allotments.** Ideally you want to use a number of food tokens that will allow about 3/4 of the participants to obtain sufficient food for survival (20 pounds in this case) with 1/4 obtaining less. This table provides the numbers of tokens to be used for each group size.

<b>FOOD TYPE</b>	<b>10-14 Players</b>	<b>15-18 Players</b>	<b>20-24 Players</b>	<b>25-29 Players</b>	<b>30-34 Players</b>
Mammal: M5	20	30	40	50	60
Mammal: M1	10	15	20	25	30
Birds: B3	8	12	16	20	24
Birds: B1	6	9	12	15	18
Carrion: C3	8	12	16	20	24
Carrion: C1	6	9	12	15	18
Vegetation: V1	6	9	12	15	18
Vegetation: V2	8	12	16	20	24
Insects: In 1	10	15	20	25	30

## Procedure

**1.** Distribute food tokens randomly over the far end of a playing field. (See Table 1 for the meaning of the token symbols and to determine how many tokens you will need for your class size.) Do not inform the "coyotes" (your students) of the significance of the symbols on the tokens. Only tell them that coyotes are opportunistic feeders, eating almost anything edible that they can find or catch.

**2.** Each participant will act as a coyote, finding and collecting tokens that represent the amount of food a real coyote would find and eat over a 10 day period. Each participant is given a numbered envelope that represents the coyote's stomach. The participants should remember the number on the envelope and put all their food tokens into the envelope.

**3.** Designate 2 of the coyotes as a pair having a litter of pups who will need to obtain enough food for themselves and additional food for their young. Another coyote is designated as wounded and

must hop on one leg as it searches for the food tokens.

**4.** Participants should line up on the starting line at the opposite end of the playing field from where the food tokens have been distributed. Students should place their envelopes ("stomachs") at their feet on the starting line. They must leave their envelopes at the starting line while they go to search for food.

**5.** Participants should walk to the opposite end of the field where the food tokens are, pick up a single token, and return it to their envelopes. This procedure should be repeated until all of the tokens have been gathered and placed into envelopes. **For safety reasons, NO running or fighting over food tokens is allowed.** (Coyotes do, however, run after prey and fight over food in real life.)

**6.** Participants return to their classroom with their envelopes. Provide the students with the information about the percentages of the different types of food in a typical South Dakota coyote diet. Inform the participants that the numbers on the tokens indicate pounds of food and the letters represent the type of food,

i.e.. M=mammal; B=bird; C=carrion; V=vegetation; and In=insects. The blank tokens represent prey that the coyote pursued but did not catch. These are included because coyotes do expend energy in the unsuccessful pursuit of prey.

7. Have each coyote add up the numbers they have collected in each food category and tabulate the total number of pounds of food consumed overall.

## Discussion

Some information to support the class discussion is provided in the Background section of this fact sheet. Additional information is included in the *Coyote* fact sheet in the Mammal section of the Natural Source. To survive over a 10 day period, a coyote must consume 20 pounds of food. How many of the coyotes gathered sufficient food for survival? Did the coyotes collect food equal to an average coyote's diet? How many pounds did the wounded coyote consume? What happened to it? Why? A coyote pair with pups must get 80 pounds of food to support themselves and their young. What happens if they should get 20, 40 or 60 pounds of food? Nursing females require more food since energy is required to produce milk. If the mother cannot produce enough milk, pups will starve. Therefore, pup survival is tied to food availability for the parents.

Discuss what a coyote might do if it cannot get enough food for an extended period of time. Possibilities include moving, adaptive behaviors, illness or death. Then, inform participants that coyotes usually move into a new territory to find the needed food. Can this relocation be a problem? Perhaps this territory is already claimed by other coyotes or the location is one in which the coyote will come into conflict with people and their livestock and crops.

Coyotes may become desperate if the food shortage is severe and may attempt to kill larger prey such as deer. At this point they are likely to prey on livestock and other domestic animals. Table 2 shows losses to personal property caused by coyotes and other wildlife from July 1, 1995 through June 30, 1996. These data were collected by Animal Damage Control trappers, who verified in person the species of wildlife causing the property loss. Also, as mentioned earlier, the stressed coyote will try to drive out or kill competing predators such as foxes and raccoons. Under these conditions, a coyote pair often will produce smaller litters.

Before the coming of the pioneers, the coyote's natural enemy was the wolf. Since wolves have been removed from most ecosystems, what controls coyote populations today? (habitat, humans and human activities) Discuss the idea of bounties. Was the bounty system successful? Is it still being used? In areas where predators were controlled, cottontail and small rodent numbers rose significantly. Is this good or bad? Why?

Why has the coyote been able to extend its range in spite of the pressures caused by urban expansion?

## Extensions

1. Have participants construct a circle graph using food item percentages.
2. Repeat the activity 2 or 3 times and group the food items to see how close to a balanced diet your coyote came, based on the percentages listed earlier.
3. Have a state trapper or conservation officer discuss predator control and the bounty system.
4. Water tokens (W) may be added to give this activity an added dimension. Include 1 water token for each participant. Participants not picking up a water token will not survive.

**Table 2. South Dakota Property Losses.** Data taken from Animal Control Annual Report, July 1, 1995 through June 30, 1996, Field Data and Operational Activities Annual Report for the South Dakota Department of Game, Fish and Parks Animal Damage Control Section.

Wildlife Species	Cows/Calves	Sheep/Lambs	Poultry	Property Damages	Crops	Trees	*Other	Total Market Value
Coyote	230	1141	164	5	0	0	57	\$113,980
Fox	0	36	255	1	0	0	11	\$4,414
Raccoon	0	0	70	12	5	0	0	\$4,539
Skunk	0	0	10	19	0	0	0	\$1,071
Feral Dog	5	42	0	0	0	0	0	\$7,840
Mink	0	0	149	0	0	0	0	\$2,950
Badger	0	0	0	6	0	0	0	\$285
Beaver	0	0	0	217	11	1611	0	\$156,517
Eagle	0	8	0	0	0	0	0	\$200
**Other	0	3	2	17	0	4	0	\$1,365

\* Other includes: Pigs, culverts, grain, roads, and angora goats.

\*\* Other includes: Porcupines, squirrels, muskrats, and dogs.

### References

Project WILD, 1992. How Many Bears Can Live in This Forest?, Western Regional Environmental Education Council.

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<b>M 5</b>	<b>M 5</b>	<b>M 5</b>	<b>M 5</b>	<b>M 5</b>
<b>M 5</b>	<b>M 5</b>	<b>M 5</b>	<b>M 5</b>	<b>M 5</b>
<b>M 1</b>	<b>M 1</b>	<b>M 1</b>	<b>M 1</b>	<b>M 1</b>
<b>B 3</b>	<b>B 3</b>	<b>B 3</b>	<b>B 3</b>	
<b>B 1</b>	<b>B 1</b>	<b>B 1</b>		
<b>C 3</b>	<b>C 3</b>	<b>C 3</b>	<b>C 3</b>	
<b>C 1</b>	<b>C 1</b>	<b>C 1</b>	<b>C 1</b>	
<b>V 2</b>	<b>V 2</b>	<b>V 2</b>		
<b>V 1</b>	<b>V 1</b>	<b>V 1</b>	<b>V 1</b>	
<b>In 1</b>	<b>In 1</b>	<b>In 1</b>	<b>In 1</b>	<b>In 1</b>
<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>

**Figure 1. Token Sheet.** Copy this page to make the number of tokens needed for your size group.