Living Together

Coyote **Mule Deer Fawn**

Objective:

Students will learn about the various interdependent relationships different species of animals have when sharing the same habitat. Identify which animals feed on other animals, the need for habitat as cover, adaptations that help animals survive, instinctive behaviors that help animals survive, components of the food web, and the different interactions among organisms and their environment (e.g., mutualism, commensalism, parasitism, predation).

Grade Levels: K to 5th and 6th to 12th

Setting: Gym or Outdoors

Duration: 30 to 45 Minutes

Group Size: Best to have 20 students, up to 40

Standards: Meets ND Standards
K to 5th: Science and Physical Education.
6th to 12th: Science, Environmental Science, Math.

Key Terms: Predator, Prey, Habitat Cover, Behavior, Food Web, Interdependence of organisms

Method:

Students will go to Prairie Matters link to view the relationship between different North Dakota Animals

(The following may also be found at https://www.facebook.com/prairiematters/) :

Odd Couple on the Prairie: Badgers and Coyotes (Mutualism and Predation)

Lichens (Commensalism)

Ghost Moose: Moose and Winter Ticks (Parasitism)

It's Stotting! (Adaptive Warning Behavior)

Once they have viewed and talked about these different types of relationships younger student can play the Predator Tag game to learn about predator-prey relationships (a version of freeze tag). Sixth to 12th graders can carry out an activity to estimate the surface area taken up by 35,000 winter ticks on a moose.

Materials:

Predator Tag Game:

- White Board and Marker, or Pencil and Paper, safety vests, whistle.
- Tokens (pieces of cardboard); enough so that each student gets three.
- Four or five hula hoops to serve as "cover" (or put masking tape on the floor).

Counting Ticks on a Moose:

- One 16 oz. bag of dried lentil beans for each pair or group of students.
- One shoe box for each pair or group of students.
- One pint jar for each pair or group of students.
- A pocket or phone calculator app.

Background:

Predators are animals that kill and eat other animals for their food.

Prey are the animals that predators kill and eat.

Limiting Factors are things that affect the ability of an animal to survey. They can be abiotic (non-living) factors such as climate, pesticides and pollution; or they can be biotic (living) factors such as disease, parasites, lack of cover habitat, and storage of food (predators on prey, lack of prey for predators).

Mutualism: A relationship where both species benefit (coyote and badgers hunting prairie dogs together).

Commensalism: A relationship where one species benefits and the other species neither benefits or is harmed (algae growth on the shell of a turtle).

Competition: A relationship where both species suffer (moose and snowshoe hare eating the same shrubs)

Predation: A relationship where one species eats the other species (largemouth bass eat frogs).

Parasitism: A relationship where one (host) species is harmed and the other (parasite) benefits (winter ticks on a moose or elk).

Predator Tag (Grades K to 5):

Procedure:

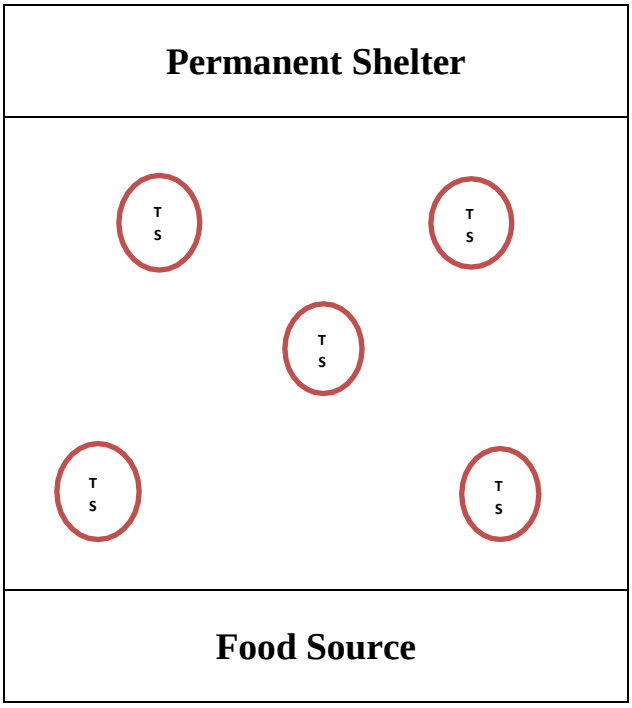
1. Select a predator/prey pair of North Dakota animals from the table below:

Prey	Predators
Eastern Cottontail	Coyote
Prairie Dog	Badger
Mule Deer	Mountain Lion
Muskrat	Mink
Rainbow Trout	Northern Pike
Deer Mouse	Red-tailed hawk

Divide students up as either "predators" or "prey" with about one predator for every four to six prey. Clearly identify predators and prey using safety vest or some other means. Optional: Prey can have bandannas in the pockets that predators have to capture to be successful. Establish ground rules for student behavior so that they do not hurt one another while simulating predator behavior.

2. In a gym or on a playground, designate one end of the field as the "food source" and the other end as the "permanent shelter".
3. Place four to five hula hoops in the open area between the "permanent shelter" and "food source". These hoops represent "temporary shelter" (TS) for the prey and can be distributed randomly in the play area. If hoops are not available, string or masking tape on the gym floor, or chalk on an asphalt playground might be used.
4. Food tokens are placed in the "food source" end zone. Allow three food tokens for each prey animal. Using a whistle or other pre-arranged signal to start each round. When a round begins, have the "prey" students run from their "shelter". The task of the prey animals is to move from the permanent shelter to the food source, collect one food token each trip and return to the permanent shelter. To survive, each prey must collect three food tokens. Travel is hazardous for prey animals. Prey animals need to be alert to possible predators. If they spot a predator, they can use various appropriate prey behaviors, including warning other prey. Prey have two ways of preventing themselves from being caught by a predator: they can "freeze" any time a predator is within 5 feet of them, or they may run to cover (must have at least one foot on a hula hoop). Frozen prey can blink, but otherwise must remain still and silent.
5. Predators start the game anywhere in the open area between the ends of the field. Predators attempt to capture prey to survive, tagging only moving prey (not "frozen" prey). Predators must capture two prey to survive.

6. Set a time limit of 5 minutes for each round of the game. Captured prey on the sidelines will become restless if rounds are much longer. Remind prey that they can remain frozen for as long as they like, but if they do not have enough food at the end of the activity they will starve to death. In the natural world, an animal must balance the need to find food with the conflicting need for safety.
7. Play four rounds, allowing each student to be both prey and predator.
8. Discuss with the students the ways they escaped capture when they were prey. What strategies were the easiest? What strategies were most effective? What did the predators do in response to prey animals who "froze"? In what way are adaptations important to both predator and prey relationships? How do predator and prey relationships serve as natural limiting factors the affect wildlife?



Variations:

1. Conduct the activity three or four rounds, recording the number of captures each playing period. Have the students who are captured become predators, and have each predator that did not acquire enough food in a round become a prey animal in the succeeding round. This feature quickly develops the concept of changing balance of nature as prey and predator populations fluctuate in response to each other.
2. Have the students walk or assign different modes of movement to each animal.

Extensions:

1. Select a prey species and research their behavioral patterns for avoiding detection and capture. Select a predator species and research their hunting behavioral patterns for capturing prey.
2. Select a prey species and research what type of habitat they select to avoid detection and capture.

Aquatic Extensions:

1. Conduct this activity with aquatic predators and prey species (northern pike and rainbow trout; large-mouth bass and leopard frogs).
2. If possible, conduct the activity in the shallow end of a pool.

Evaluation:

1. Choose any predator and its prey. Describe the adaptations of each species.
2. Explain the role and importance of adaptations for each species.
3. Explain the role of habitat for predator avoidance.
4. Draw and imaginary animal that can escape the following hunting strategies:
    a. A fast flying predator
    b. A stalking predator
    c. A pouncing predator
    Have students justify their decisions and logic.
5. Write about a predator that can capture the following prey strategies:
    a. A well-camouflaged prey species
    b. A prey species with excellent eyesight
    c. A prey species that has body armor or quills
    Have students justify their decisions and logic.

Counting Winter Ticks on a Moose (Grades 6 to 12):

Moose Infected with Winter Ticks

Engorged Winter Ticks

Winter ticks can infestations on moose can number from just a few to as many as 150,000 ticks or more. A severe infection rate is considered to be 70,000 ticks or more. The surface area of the torso (neck and body) of an adult cow moose is about 27 square feet. The goal of this exercise is the estimate the percent of surface area an adult moose. Review the posting on Prairie Matters about "Ghost Moose", or search the internet for additional information on winter ticks (*Dermacentor albipictus*) and moose (*Alces americanus*).

Procedure:

1. Divide the class into groups of 2 to 4 students. Provide each group of students with a shoe box and a 16 ounce bag of dry lentil beans (**Note:** Winter tick larvae are about 1/32 inch long (0.8 millimeters), whereas a fully engorged female winter tick is can be more than ½ inch long. Lentil beans were chosen to represent an "average" size winter tick).
2. Have the students determine the surface area of the bottom of the shoe box and determine the area of the bottom of the box. For example, a box 6 inches wide and 12 inches long has a surface area of 72 square inches. A square foot is 144 square inches; therefore, the surface area of this box is: 72 square inches divided by 144 square inches or 0.5 square feet.
3. Have the students spread the beans out over the bottom the box so that one layer of beans covers the bottom of the box.
4. Have the students count the number of beans in the box, and calculate how many ticks would cover a one square foot area.
5. Assuming half of the 70,000 winter ticks on a moose are females, based upon the results from step 4 above, have the students calculate the surface area 35,000 engorged female "winter ticks" (beans) would cover. What percent of an adult cow moose torso (27 square feet) would 35,000 engorged female winter ticks cover?
6. Have each pair or group of students fill a pint jar with beans. Remove the beans and count how many beans fit into a pint jar. This step could be averaged for the class.
7. There are two pints in a quart, and four quarts in a gallon. How many beans would be required to

fill a quart jar? How many beans would be required to fill a gallon jar?

8. What would be the volume required to hold 35,000 engorged female "winter ticks" (lentil beans)? This exercise will approximate the volume of blood consumed by 35,000 winter ticks feeding on a moose.
9. An adult moose has a blood volume of about 3.6 gallons or 32 liters. Winter ticks feed over about a two-month period. What portion of a moose's blood volume would need to be replaced to support 35,000 female winter ticks over that two-month period? (Note: Some research suggest

Extensions:

For students wishing to learn more about wildlife management and predator-prey relationships, sources for additional reading are:

Wildlife Management & Conservation: Contemporary Principles and Practices by Paul R. Krausman and James W. Cain III, 2013. John Hopkins University Press. 342pp.

Antipredator Defenses in Birds and Mammals by Tim Caro, 2005. University of Chicago Press. 587pp.

Evaluation:

1. Explain the role of snow cover on winter tick numbers. How might weather conditions influence the distribution of parasites and their host species?
2. Choose any parasite and its host. Describe the adaptations of each species.
3. Explain the role and importance of adaptations for each species.
4. Write about an imaginary host animal that can avoid parasites that infect their host using the following strategies:
    a. Transmitted by biting insects
    b. Transmitted through infected fecal matter
    c. Infected through standing drinking water
    Have students justify their decisions and logic.
5. Write about an imaginary parasite that can infect a host using following avoidance strategies:
    a. A host species that migrates long distances between summer and winter range
    b. A host species that has a large home range lives a solitary life most of the year
    c. A host species that lives in family units that groom external parasites off of each other
    Have students justify their decisions and logic.