Family Fued: Why Deer and Moose Can't Get Along

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Grades: 1-12
Subject: science, geography
Skills: analysis, discussion
Duration: 30-40 minutes
Vocabulary: parasite, habitat, competition

Objectives:

Students will be able to: 1) explain several factors that cause deer and Moose populations to fluctuate.
2) describe why young forests are important to the survival of deer.
3) discuss parasite-host relationship

Method:

Students role-play deer and Moose in a low-energy game.

Background:

Algonquin Provincial Park is home to two members of the deer family, the Moose, and the White-tailed Deer. Over the years, the numbers of Moose and White-tailed Deer have fluctuated greatly. Prior to European settlement, logging, and establishment of Algonquin Park, deer were virtually absent from the Algonquin landscape. The forests in Algonquin in the pre-logging era (before 1830) were mature forests of giant Red and White pine and deciduous trees. This mature forest was suitable habitat for Moose, which thrived in the area. This mature forest did not favour deer, which prefer younger forests.

As European settlers pushed farther northward in Ontario, and cleared the land for farming, so too moved the range of White-tailed Deer. The Algonquin area escaped the agricultural settlement that had swept across many of the regions to the south in part due to the poor agricultural opportunities and the establishment of the Park which restricted settlement.

The establishment of Algonquin Park, however, did not stop logging. Early logging practices were responsible for much of the original mature forest being destroyed. Logging did remove some of the forest cover, but fires, ignited by lightning strikes in the large amounts of pine slash left by the loggers, destroyed much of the original forests in Algonquin Park. The fires, unchecked by humans, burned vast areas, often burning until they ran out of fuel or extinguished by encountering a major lake or river. As a result, much of Algonquin's original mature forests had been burnt by the turn of the twentieth century.

These large fires were not good or bad, rather they produced a new opportunity for sun loving plant species to grow and reproduce. With an abundance of young forest habitat and food, the deer population in Algonquin Park exploded in the early part of the twentieth century. Some estimates put the White-tailed Deer population in Algonquin in the first half of the twentieth century between 30,000 and 100,000 animals.

In the eyes of early Park managers, the large number of deer was a good thing for Algonquin. Visitors to Algonquin Park reveled at feeding roadside deer along Highway 60. Wolves, the deer's main predator, also benefited from the large deer population. While both humans and wolves benefited from the high number of deer, the Moose population suffered.

As members of the same family (Cervidae), Moose and deer share similar characteristics, habitat, and food needs. One attribute they do not share is the tolerance for certain parasites. Deer carry a parasite that, while not harmful to the deer itself, is fatal to Moose.

Since Algonquin Park's establishment in 1893, it has been noted that Moose and deer populations have greatly fluctuated opposite to one another. During the 1990s the population of Moose in Algonquin was estimated to be 4600 animals. For many years the population was meagre, while the deer population flourished. Algonquin Park staff and researchers had known Moose to suffer from a strange illness known as "moose sickness". This ailment caused blindness, lack of coordination, and paralysis in only Moose. The cause of the disease was unknown for many years, until research done in Algonquin Park at the Wildlife Research Station found the source of the disease. Living in the spinal column and brain of White-tailed Deer was a small nematode worm. This worm does not harm deer, but is fatal to Moose. Researchers discovered the brainworm lives out its life in the brain and spinal column of the deer without harm. It reproduces, and the young are subsequently passed out of the deer through feces. At

this point, a snail may come along and feed on the deer droppings, unknowingly ingesting the worm, which then starts the next stage of its life cycle. Moose consume a many kilograms of browse in a day, and can easily ingest an infected snail. Once inside, the brainworm burrows into the Moose's spinal column and brain. This disruption leads to the very visible "moose sickness". A Moose infected with brainworm is eventually killed by the parasite.

Although Moose and White-tailed Deer are related, Moose are relative new comers to North America, arriving from Asia only 10,000 years ago. As a result, Moose have not evolved a viable defense to the brainworm, unlike White-tailed Deer.

It is easy to see then, why over the years, Moose populations remained low in years when numbers of deer numbers were high. More White-tailed Deer meant more brainworms, more infected snails, and thus more sick Moose.

The fluctuating White-tailed Deer population also accounted for the increase in the Moose population in Algonquin Park in the later 1970s. In the late 1960s several factors contributed to the crash of the deer population; more ecologically sound logging practices, better forest fire suppression, and a series of harsh winters. All these factors meant a decrease in White-tailed Deer and infected snails, which, in turn, meant more Moose in Algonquin Park.

Materials:

✓	Items Required	Quantity
	Large playing area outdoors or indoors	One
	Food tokens in 4-6 different colours	Ten per colour
	Food stations	Ten
	Blindfolds	One per student
	Watch	One

Procedure:

1) Before starting, select an outside area or use a large inside area such as a gym. Set up 10 food stations throughout the area, each the same height. On each food station place the food tokens. Vary the number of tokens per station as well as the number of infected tokens. Start with a small number of infected food tokens for the first round and gradually increase the number as the deer population increases. Not all stations have to have infected food tokens.
2) Define the playing area to students. Stress the boundaries. You may wish to penalize students that roam (intentionally or not) outside of the boundaries, e.g. If you leave the Park boundary you may be killed by hunters, or hit by a vehicle and have to sit out the rest of the round.
3) Explain that students will be role-playing White-tailed Deer and Moose in Algonquin Park. Choose at least ¾ of the class to be Moose. You can do this by numbering the students from 1 to 4 and having numbers 1 to 3 be Moose.
4) Tell the students that they represent Moose and deer in Algonquin Park. Moose and deer are always eating, sometime up to 25 kg of browse per day in the case of Moose. Walking on their hands and knees, students must visit food stations and take one token each from each station. If they have visited all stations before the end of the round students may revisit stations until time expires.
5) At the end of the first round, ask all the Moose if they have a marked food token. Explain that these tokens are infected with a parasite that has been passed on by the deer. Because the Moose have eaten food with this parasite on it they are now sick. Explain that deer that have eaten infected food are not sick as the parasite does not affect them.
6) For the start of the next round, blindfold all sick Moose telling them that the parasite they have has made them blind. Also explain that it has partially paralyzed them so they can not use their legs and must only use their arms to drag themselves around to get to the food stations.
7) Replace all food tokens at the food stations and start the next round. Some students may actively look for infected food tokens to avoid them. As animals cannot differentiate from diseased or infected food tell them that they must not search out uninfected tokens. Once they touch or take a token they can not put it back. You may wish to use four different coloured food tokens and assign a colour for infected food for each round to enable fair play.
8) At the end of the second (and subsequent rounds) ask the sick Moose how many of them were able to find all the food stations. Tell them that they have become so sick from the parasite that

they have died. These dead Moose now become deer for the next round. Tell any healthy Moose that have eaten an infected food token they are now sick.

9) For the third and subsequent rounds increase the number of infected food tokens as there will be more deer.
10) Continue with the game very few Moose remain or time expires.

Variations:

To show how changes in habitat can affect deer numbers have two different food station heights. The taller food stations only Moose can reach. Moose can obtain food tokens from both the tall and short food stations but deer can only obtain food tokens from the shorter stations. Limit the amount of food on the shorter stations. Deer need to get at least three food tokens to survive. Any deer that gets less than three tokens in a round dies (this can represent lack of food, cold winter with deep snow, or predation). When a deer dies they become a Moose for the next round. Each round reduce the number of food tokens at each deer station or even eliminate all tokens at various stations. Increase the amount of food at the Moose stations. Continue until very few deer remain or time elapses.

Evaluation:

Ask students to:

1) Explain why most parasites do not kill or harm their hosts. Why is this a benefit to the parasite?
2) Explain why some animals get sick from parasites while others do not.
3) Draw a diagram of the life cycle of the brainworm as it travels through the White-tailed Deer to the Moose.

Activities:

1) Research and report on the relationship between White-tailed Deer and Moose.
2) Research and report on the life history of Moose brainworm.