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# Project Caribou

## An Educator's Guide to Wild Caribou of North America

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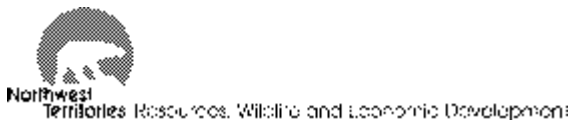
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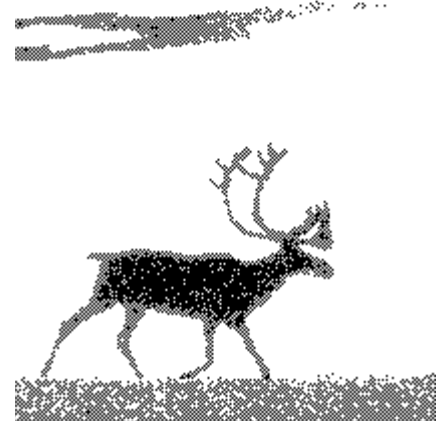
For more info: [www.projectcaribou.org](http://www.projectcaribou.org)

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**Environment Canada (Canadian Wildlife Service—Yukon)**

**Beverly and Qamanirjuaq Caribou Management Board**



**Age**

Grades 8 – 12

**Subjects**

Science, Math, Social Studies

**Skills**

Analysis, application, species identification, drawing, measuring, mapping, reporting

**Duration**

Two one-hour class periods

**Group size**

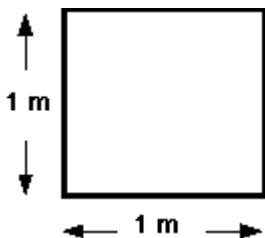
Variable

**Setting**

Known lichen area

**Materials**

- Samples of lichens
- 1 x 1 metre quadrat made of wood or wire (see illustration below)
- Grid paper and pencil
- Clipboard



A quadrat is a rigid frame of a standard size, in this case 1m x 1m. It can be made from wood, wire or other rigid material. Classroom metre sticks fastened with masking tape may make a good temporary quadrat.

## Likin' lichen

### Objectives

Students should be able to:

1. Identify the various species of lichen in their area.
2. Conduct a ground study and measure the amount of lichen in a given area.
3. Research and identify airborne pollutants lichen may absorb in their tissues.

### Method

Students will be given samples of the types of lichen they may find in their area and identify them as fruticose, crustose or foliose. (They may also find filamentous.) Students will do a ground plot survey and determine the percentage composition of lichen in a specific area.

### Background

Caribou are herbivores, or plant-eating animals. The average caribou eats at least three kilograms of vegetation each day, the equivalent of about two garbage bags of food! Caribou eat different types of plants during the year, but their most important food is lichen. "Fruticose" ground lichens are the most significant. Famous among these is the "reindeer lichen," called *Cladina rangiferina*. In winter, when green vegetation is not available, caribou depend on the lichens they find beneath the snow. In boreal forests, caribou will eat lichens growing on the ground or on trees.

Lichens are made up of two kinds of plants—algae and fungi—that live together in a mutually beneficial, or symbiotic, relationship. Algae contain chlorophyll, which produces sugars and starches through the process of photosynthesis. Fungi are able to store lots of water to support the algae, in return absorbing the sugars and starches produced by the algae.

Lichens come in many shapes and sizes. They do not have roots, stems, leaves or flowers. There are over two thousand kinds of lichens. These are divided into three main groups. "Crustose" lichens are flat lichens that often attach themselves to rocks. "Foliose" lichens have a leaf-like form. "Fruticose" lichens are tufted, or composed of erect stalks.

Lichens need water to grow. They act like sponges, absorbing moisture from the air, rain and snowmelt. When there is no moisture available, lichens dry out and become dormant. In the north, the season when lichens can grow is very short. Thus, even small-sized lichens can be decades or centuries old.

Caribou depend on lichens as a primary source of food in the winter months. Lichens take nutrition from moisture. Lichens grow very slowly and live a very long time; because of this, nutrients are more concentrated in them than in other plants.

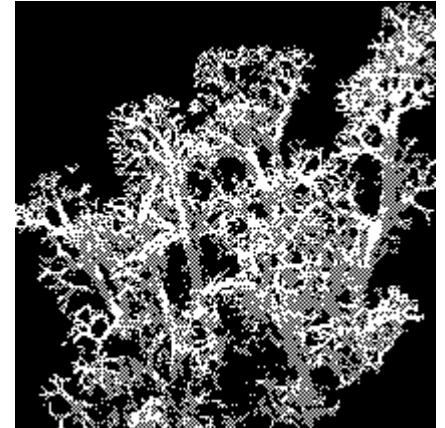
Unfortunately, heavy metals such as cadmium and cesium accumulate and become concentrated in the same way. Cesium is passed along to caribou that eat the lichens. Radioactive elements like cesium may be cancer causing. In northern Canada, tests have shown the levels of contamination to be low enough that Health and Welfare Canada have not recommended against the human consumption of caribou meat. However, contamination levels were so high in northern Europe after the Chernobyl nuclear disaster that reindeer meat had to be destroyed. Even in Canada, levels of contamination increased by up to 25% in some caribou herds after the disaster.

Cesium does not persist in the body tissues of caribou. This means that the level of it found in meat will be higher in winter, when the animals are on a lichen diet, than in summer, when caribou eat a wider variety of plants. However, other forms of pollution, like heavy metal fallout, do accumulate in body tissues such as the liver and kidneys.

When studying large communities of plants or animals, scientists are unable to examine every individual. Instead, they take random samples and apply statistical analysis to determine 'average' characteristics of the group. For forest floor cover studies, scientists use simple devices called quadrats for sampling. Quadrats are placed on the ground, and everything found within its frame is measured carefully. In this activity, students follow the same process.

### Procedure

1. Pre-measure sample area.
2. Provide students with background information and samples of lichen in a manner appropriate to the group.
3. Discuss with the group proper survey techniques and procedures.
4. Divide students into pairs and provide them with proper materials.
5. Go to sample area.
6. Place quadrat in sample area. Identify all the ground cover lichen and other types of vegetation that fall inside the quadrat.
7. Map the plot on grid paper, indicating the vegetation. Label the map.
8. Find the percentage of each type of lichen for the sample area.
9. Combine group data for the area and find the average percentage ground cover of lichen for the entire area.
10. Prepare written submissions as if they were to be presented to caribou biologists.



*Reindeer moss (Cladonia mitis) is an important lichen for woodland caribou.*

### **Variations**

1. Have students study (and possibly map) the effects of various air- and water-borne contaminants on lichens and caribou.
2. With the help of a chemistry teacher, have students test lichens for minerals and contaminants.

### **Extensions**

1. Invite someone who does vegetation mapping to come into the classroom and talk about his or her work, possibly assisting with the activity.
2. Do the "Bioaccumulation: the story of time" activity described in this guide.

### **Evaluation**

Discuss with students:

1. Two different varieties of lichens.
2. Why people perform vegetation mapping and how mapping helps in understanding and managing caribou herds.
3. How heavy metals like cesium accumulate in caribou.