

---

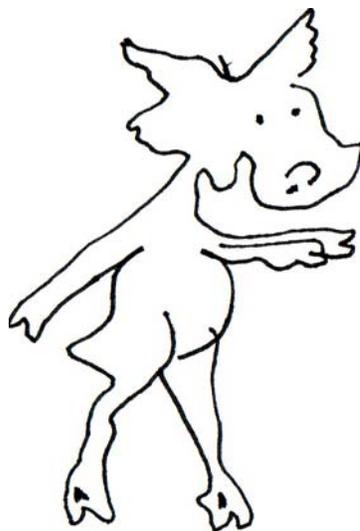
# **PORCUPINE CARIBOU MANAGEMENT BOARD**

**VIDEO SERIES  
TEACHERS' MANUALS**

**UNIT ONE**

**AWARENESS AND APPRECIATION**





**CHIKKYI**

**Chikkyi is the Gwich'in name for baby caribou. Chikkyi will be used to mark student activity and information sheets.**

Chikkyi was created by D. Urquhart

**Unit 1: AWARENESS AND APPRECIATION**

**TABLE OF CONTENTS**

<b>Page</b>	
4	Classification
10	Body Parts
13	Age and Sex
17	Skeleton
20	Antlers
23	Senses
25	Digestion
27	Adaptations
29	Yukon Herds
33	Porcupine Herd Range
37	Annual Cycle
42	Winter Range
46	Calving Grounds and Calving
57	Spring Migration
61	Fall Migration
64	Caribou Rut
69	Annual Diet
71	Lichens
74	Habitat

## **CLASSIFICATION**

### **CONCEPT**

- There are five subspecies of caribou.

### **OBJECTIVE**

- To make students aware of the five subspecies of caribou.

### **BACKGROUND INFORMATION**

There are five subspecies of caribou in North America. Four are indigenous and one is transplanted. Caribou can also be identified generally as either being “woodland” or “barren-ground” caribou.

1. The woodland or mountain type (*Rangifer tarandus caribou*) has the largest body size of the subspecies. They can be found in southern Yukon, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, Newfoundland and Labrador.
2. The Grant's caribou type (*Rangifer tarandus granti*) is found throughout Alaska and the northern Yukon. The Porcupine Caribou herd belongs to this subspecies.
3. The Arctic mainland of the Northwest Territories type (*Rangifer tarandus groenlandicus*) is commonly referred to as barren-ground caribou.
4. Peary's caribou type (*Rangifer tarandus pearyi*) is found on the Arctic islands.
5. The reindeer type (*Rangifer tarandus tarandus*) are domesticated caribou that have been transplanted from the Soviet Union.

In the Yukon, there are both the woodland and barren-ground type and recently boreal caribou have been reported coming into the southwestern Yukon. There is also a small herd of reindeer kept at a Whitehorse farm. Caribou are the most abundant big game mammal in the Yukon. About 123,000 caribou make up the Porcupine herd and 43,300 caribou make up the Forty-Mile herd, which totals close to 166,300 barren-ground caribou. Another estimated 33,000 woodland caribou are distributed in 22 smaller herds throughout central and southern Yukon.

Woodland caribou are generally heavier than barren-ground caribou. They do not migrate the long distances between winter and summer ranges and are found south of the Arctic Circle.

There are barren-ground, pearyi and woodland caribou in the Northwest Territories as well as herded reindeer.

**COMMON CHARACTERISTICS OF THE CARIBOU**

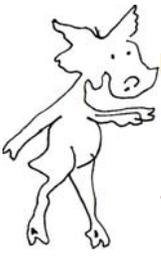
1. All have four toes on each foot; two are hoof lobes and two are dewclaws that are higher up on the legs and are used for support.
2. All are cud-chewers. They have a four-chambered stomach. Food is briefly chewed, then swallowed into a chamber known as a rumen. Food is brought back up and chewed (cud) when the animal is resting.
3. They are strictly plant-eaters.
4. They shed their antlers annually (in autumn).
5. They have huge, long skulls without upper incisor teeth.
6. They do not have gallbladders.

**DNA RESEARCH**

Research undertaken by biologists with the Northwest Territories Department of Resources, Wildlife, and Economic Development indicates that there are DNA markers of Porcupine Caribou in many of the other herds across northern Canada. DNA samples are taken during routine body condition studies undertaken by caribou biologists.

**SUGGESTED ACTIVITIES**

1. Photocopy the background information sheet on classification of caribou, distribute to students and guide the class through it to ensure they know the five types of caribou.
2. Distribute activity sheet with map of Canada and have students work through it using the classification information.
3. Have students collect pictures from magazines, internet, newspapers, Yukon Mammal Series pamphlets, or their own photographs of the five subspecies of the caribou family. Make a poster to show the relationship.
4. Have students search the internet for information on species of caribou in North America. See attached list of websites at back of manual.
5. If in Whitehorse, arrange a trip to the Northern Splendor Reindeer Farm (Mile 10 of Klondike Highway) to view the reindeer or to the Yukon Game Farm to view woodland caribou and reindeer. (Check with local Department of Environment Conservation office for location of the farms). Have students take notes to compare the similarity of these animals to other caribou.
6. Have students research the body parts of an animal of their choice and compare the digestive system to the caribou.
7. Have students draw a diagram of a 4-chambered stomach using pictures from encyclopedias, internet and other resource books.
8. Have students choose a plant-eater animal to research.
9. Have students research the annual cycle of the caribou.
10. Have students research to learn why caribou do not have gallbladders.



## STUDENT INFORMATION SHEET

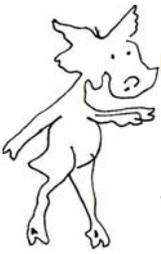
### Worldwide Distribution of Caribou



- Peary caribou and Arctic-island caribou
- Grant's caribou
- Barren-ground caribou
- Woodland caribou

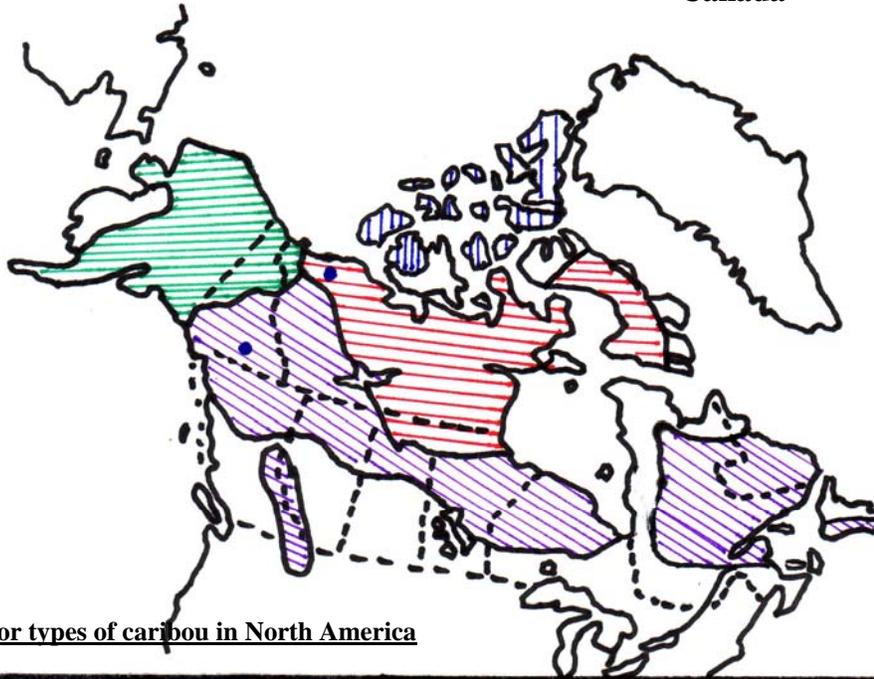
- Domestic reindeer 1 500/pt
- Svalbard reindeer
- Tundra reindeer
- Wild forest reindeer

— CAFF boundary



# STUDENT INFORMATION SHEET

Canada



Subspecies or types of caribou in North America



1. Caribou

Woodland or mountain caribou named by Gmelin. This is a large dark subspecies found in central and southern Yukon.



2. Granti

Latin name given to caribou in Alaska and the northern Yukon, by J. A. Allen in 1902.



3. Tarandus

Latin name given to the European reindeer by Linnaeus. In 1929 several thousand reindeer left Alaska and five years later reached the Mackenzie Delta in the NWT.



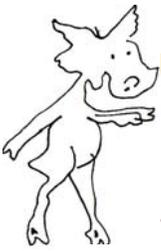
4. Pearyi

Latin name after the explorer Peary is given to caribou in the Arctic Islands by J.A. Allen. These caribou are small and light coloured.



5. Groenlandicus

Latin name given to the barren-ground caribou of the NWT mainland.



# STUDENT ACTIVITY AND INFORMATION SHEET

## TYPES OF CARIBOU (TAXONOMY)

Find the words taken from the following paragraph.  
Words can go horizontally, vertically and diagonally in all eight directions.

The earliest fossil evidence of caribou comes from Germany and has been dated to about 440,000 years ago. All existing caribou belong to the tarandus species and separate Rangifer genus of the deer family (Cervidae) in the order of even-toed ruminants (Artiodactyla). Porcupine Caribou together with the migratory barren-ground caribou of Alaska compose the subspecies granti. The other four current subspecies in the genus refer to the arctic mainland in the Northwest Territories (groenlandicus), the arctic island (pearyi), woodland and mountain (caribou), and reindeer (tarandus) types.

Y N I A T N U O M X L V S E P A R A T E J  
 B N I B R L E I L M L Z X Y W M B J M T S  
 D T N S C E G A K L R G N M H H Q R B S U  
 B R D J L R F K R R I A K S N A R E X U N  
 W T Z N A A M I M L M S T K M L W E V B E  
 K J K T U H N R G R I N S E J Y V D Z S G  
 T T O K K O X D E N A E A O E T B N R P K  
 Q R W Z P Q R G H N A D S X F C R I P E R  
 Y T X U R E Y G I N I R I T N A T E X C N  
 Q K B O D R A M N V K S F L T D M R L I Y  
 X T D B N N U R R E T C M C M O A L Q E Z  
 G A M I R R A E Y I R L V C M I I F Z S Q  
 V R R R Y T C L N I B R X K A T N F M R K  
 J A T A Q Y J G D L F C A L R R L W D J E  
 K N K C M K Z N P O J N A B Q A A M D T V  
 N D Q P Y W K M L M O S H M Q L N T N V I  
 L U F G R A N T I L K W J K B V D E M L D  
 N S Q R R N B Y T A D A T E D N R Q J L E  
 G R O E N L A N D I C U S M Z R L C K J N  
 R K N H K K Q W Y L I M A F U R G W R K C  
 T A R A N D U S M K P L K C C I T C R A E

© Porcupine Caribou Management Board. Made using 1-2-3 Word Search Maker™

ALASKA  
 BARRENGROUND  
 CURRENT  
 EVIDENCE  
 FOSSIL  
 GRANTI  
 MAINLAND  
 PEARYI  
 RUMINANTS  
 TARANDUS

ARCTIC  
 CARIBOU  
 DATED  
 EXISTING  
 GENUS  
 GROENLANDICUS  
 MIGRATORY  
 RANGIFER  
 SEPARATE

ARTIODACTYLA  
 CERVIDAE  
 EARLIEST  
 FAMILY  
 GERMANY  
 ISLAND  
 MOUNTAIN  
 REINDEER  
 SUBSPECIES

## BODY PARTS

### CONCEPT

- Caribou have many body parts.

### OBJECTIVE

- To learn the names of body parts of the caribou by naming and labeling a diagram of a caribou.

### BACKGROUND INFORMATION

The barren-ground caribou is a medium-sized mammal with long legs and large hooves. The Porcupine Caribou is smaller in body size than the woodland caribou. In the fall, Porcupine bulls (males) average 125 kg in weight and 112 cm in shoulder height. Cows (females) average 89 kg and 104 cm in shoulder height. By comparison, a cow from the Finlayson Caribou herd would be similar in size to a Porcupine bull.

Caribou are the only deer of which both males and females have antlers. The bulls' antlers are usually larger and more complex than females'. Antler shape varies greatly and it is said that no two sets are exactly alike. The shovel, or brow tine, is that part of the antler that projects forward over the face.

The caribou are an even toed animal. Each foot is called a **hoof**, two feet are called **hooves**. The foot is comprised of four toes: two crescent-shaped, sharp-edged toes bearing most of the weight and two dewclaws located farther up on the leg.

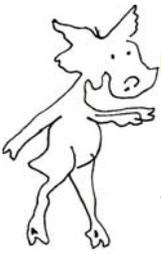
The caribou have small, well-furred ears, a broad and blunt **muzzle** (the projecting part of the head that includes the nose and mouth) and a short tail.

The **rump** is the part of the body from which the tail projects. These are the **hindquarters**, or the posterior. Fat builds up over the back and rump.

The **pelage** (or hair covering the body of the caribou) varies in colour throughout the seasons. Generally the coat colour of the Porcupine Caribou is darker than the Peary caribou but lighter than the woodland caribou.

**SUGGESTED ACTIVITIES**

1. Distribute the activity sheet on body parts, have the students fill in the names of the body parts and colour the picture.
2. Have students write at least 5 facts about the caribou to accompany picture.
3. Have students write a story about caribou discussing how each part is used.
4. Have students view Video #3 - The Value of the Caribou and write a report on how the parts of the caribou are used.

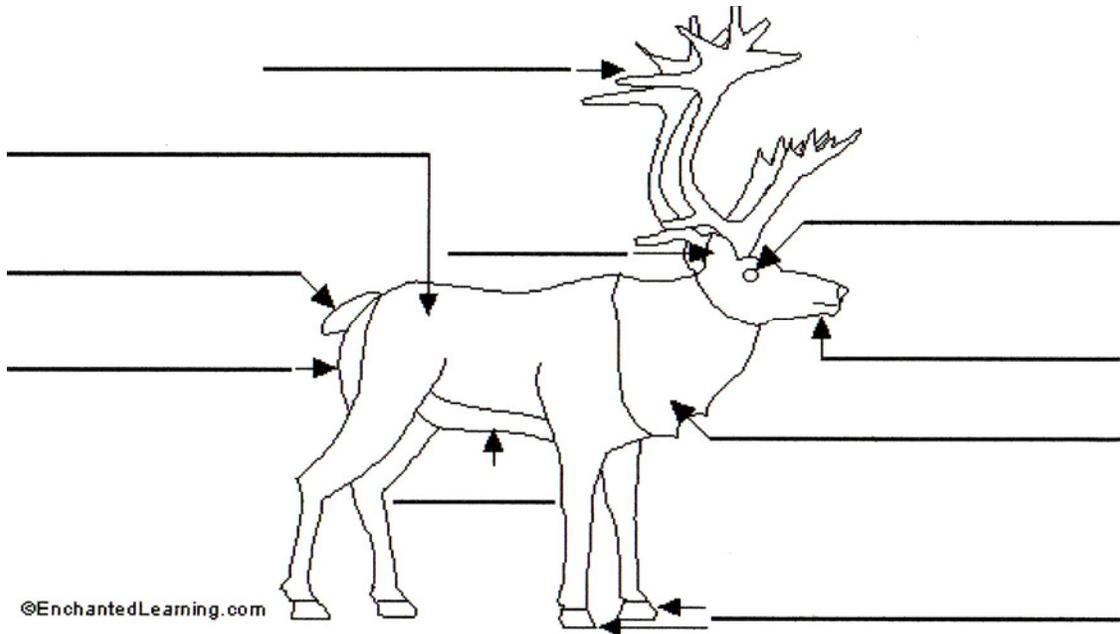


---

## STUDENT ACTIVITY SHEET

---

Name the body parts of the caribou.



- Antlers
- Ear
- Eye
- Gray to brown coat
- Hooves
- White belly
- White mane (males only)
- White rump
- White tail
- Wide muzzle

## AGE AND SEX

### CONCEPT

- The age and sex of a caribou can be determined by various features.

### OBJECTIVE

- To make students aware of the methods used to determine the age and sex of caribou.

### BACKGROUND INFORMATION

There are several methods of determining age or sex depending on whether the animal is at hand for examination, is available for viewing with binoculars, or has left only its sign.

The best features for determining age when viewing from a distance are the body size, basic characteristics and the antler growth.

A **calf** in the fall has a small body size of only 91 cm at the shoulder. It has velveted spikes between 10 cm - 24 cm (may have a fork) and is accompanied by the cow and can be seen nursing occasionally.

A **yearling**, or one-year-old, in the fall still has a rather small body compared to the adults and can be exceptionally curious. The velveted antlers of the yearling can be 24 cm – 46 cm without a brow tine. Also the neck mane is very short or non-existent.

A **two-year-old male** in the fall will have 51 cm - 66 cm antlers with a poorly developed brow tine and its neck mane will still be short. The two-year-old females will still have small poorly formed antlers and are often seen with a calf at heel.

A **three-year-old male** in the fall will have well-developed antlers of 66 cm – 86 cm with a small brow tine and its neck mane can be fairly well-developed. The same age female will still have poorly formed antlers and are often seen with a calf at heel.

A **four-year-old male** in the fall has well-developed antlers with large brow tines and its velvet starts to come off early. They have a waddling type walk, their neck mane is well-developed and a conspicuous white colour compared to their dark body. The same age female will have quite a variation in antler development and can have a developed brow tine. The cows often have a calf at heel. The cow has a small neck mane.

A tooth can be pulled to be examined in the laboratory. Under a microscope a stained slice of the tooth will show annual rings in the cementum, which is similar to the growth rings in the

tree. This method can give the most accurate age.

The best feature for identifying the sex of the caribou is the presence or absence of a vulva patch or a penis sheath. Because both sexes have antlers it can be difficult to determine the sex of the younger aged animals that have similar antler growth.

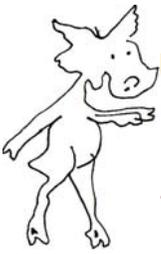
The cow, or female caribou, have the **vulva patch**, which is a dark patch of hair around the vulva that contrasts with the lighter coloured rump. This feature is best observed from a close view while the cow is standing or moving slowly away. When the animal is alarmed the tail is raised and it is very easy to see the vulva patch.

A bull caribou has a **penis sheath**, which can be observed from a side view when the animal is standing or moving slowly away.



**SUGGESTED ACTIVITIES**

1. Have students look at pictures of the caribou or view one of the videos showing a close-up of a caribou to see if students can determine the age and sex of the animals.
2. Show the video (part 1, 2, or 3) that deals with the age and sex of the caribou and have students share their ideas.
3. Hand out the copies of page 16 describing the differences between cows and bulls. Have students identify the various differences between the caribou bulls and cows.
4. Because the population of the Porcupine herd is declining and because the best way to preserve the population of the herd is shown to be by not harvesting cows, all hunters are asked to select only bulls for harvest. Discuss features that would help you identify the bulls from cows. (The mature bulls have already lost their antlers, and the younger bulls will also be losing theirs over the months, both the immature and mature bulls will have a penis sheath, the bulls tend to winter in groups away from the cows, and if you have seen an animal with a calf it is probably a cow.)
5. Next time you go on a hunt and see caribou from a distance, try to sex and age the caribou.



## STUDENT ACTIVITY SHEET

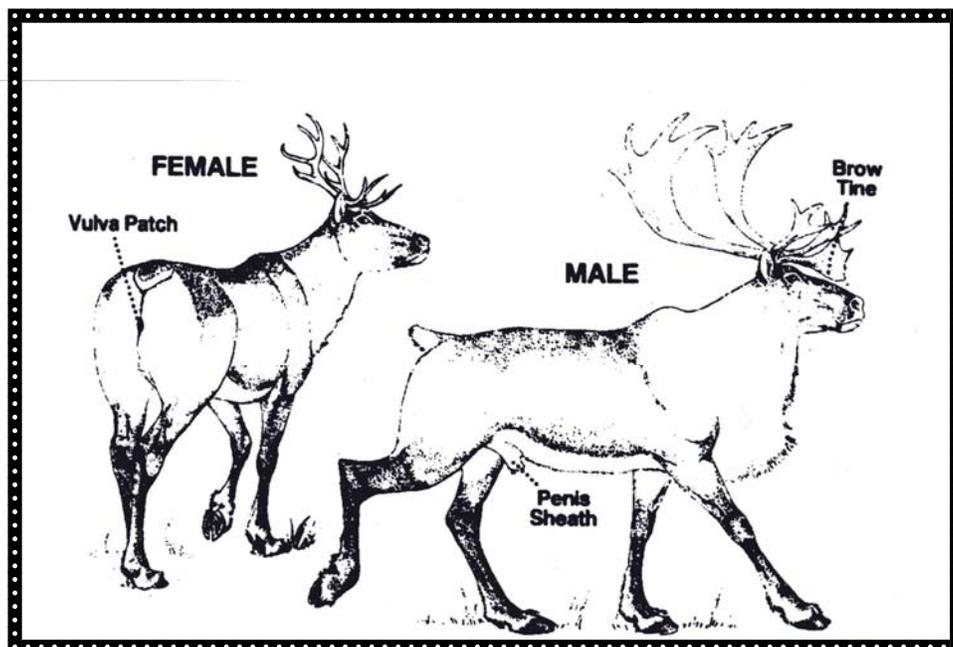
### DIFFERENCES BETWEEN ADULT FEMALE (COW) AND MALE (BULL) CARIBOU

#### PHYSICAL CHARACTERISTICS

	<u>FEMALE</u>	<u>MALE</u>
Genital organs	vulva patch	penis sheath
Antlers	poorly formed antlers but can have a small brow tine	generally larger and have a well-developed brow tine
Neck mane	some development	conspicuous neck mane
Body size	medium	large

#### HABITS

Urination	squatting	leg to one side
Association	may have calf at heel	alone or with bull groups except in rutting season



Yukon Department of Environment

## **SKELETON**

### **CONCEPTS**

- All the bones in a caribou make up the skeleton, which gives the caribou shape and protects certain organs. Some of the bones make blood. The caribou bones have provided the material for people to make tools, weapons, toys and food. The bone marrow is also an important food item.

### **OBJECTIVES**

- To compare the human skeleton to the caribou skeleton.
- To understand the function of bones and bone marrow in caribou (and their use by native people).
- To recognize the individual caribou bones and to be able to assemble them.

### **BACKGROUND INFORMATION**

The caribou skeleton has a number of functions. The skeletal bones act as a reserve of minerals, nutrients and blood cells. Also the skeleton is a framework that supports the muscles and protects some internal organs. Caribou antlers are solid bone extensions of the skull and are made of calcium and other minerals.



**Wooden puzzle available from the Porcupine Caribou Management  
Board showing skeleton and colour variations of caribou.**

### **SUGGESTED ACTIVITIES**

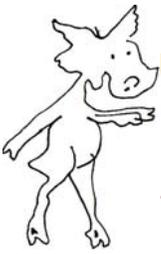
1. Hand out the activity sheet and have the students draw lines joining the common bones of the human and caribou. Discuss the similarities and differences between the skeletons.
2. Cut a caribou leg bone in the middle to look at the yellow marrow and at the end to look at the red marrow. If the bone has been cooked, let the students eat the marrow.
3. Divide the students into two groups. Have the students in turn take out a paper bone from a box and tell what part of the caribou it came from. If they answer correctly let them keep the bone, if not then put the bone back in the box. The group with the most bones wins.

### **SUPPLEMENTARY ACTIVITIES**

1. Draw a caribou or make a caribou out of modeling clay, keeping in mind the form the skeleton provides.
2. Research the use of some of the bones for making tools, ornaments, toys and food (see Unit 2 - Traditional Use). Bring some of these examples to class from home, or obtain some bones from the next hunt and try to make them.
3. The characteristic “clicking” when the caribou moves comes from the tendons slipping over the bones in their feet. Check this out with the next freshly killed animal and report back on it.

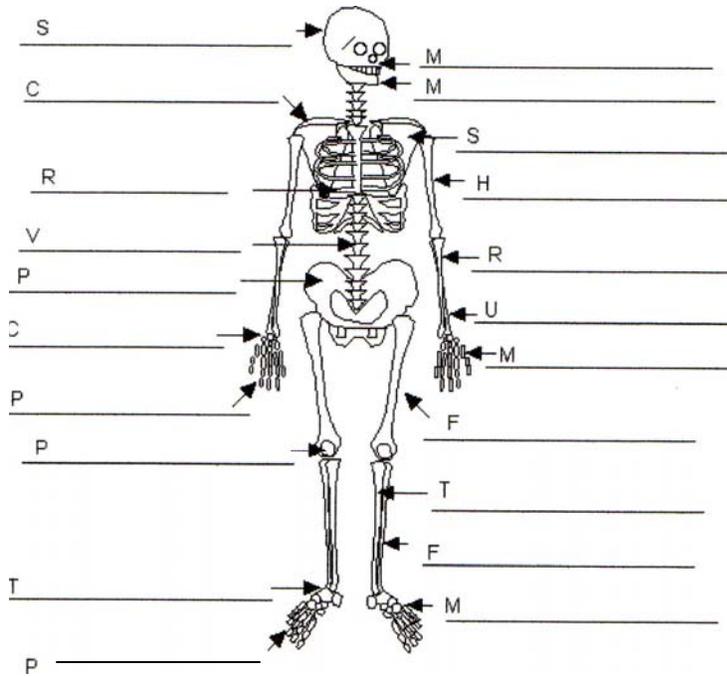
### **EXTENSION ACTIVITIES**

1. Obtain samples of caribou hooves and the ankle and foot bones. Have students skin them and boil the meat off at home and try to scrape most of the material off the bones. Prepare accurate drawings for display and assemble the bones as a skeleton using snare wire to join the bones.
2. Invite an elder to the classroom for native language lessons and have them name the parts of the caribou skeleton.
3. Let students describe the butchering of the caribou keeping in mind the skeletal structure.
4. Research the fact that marrow is used as an indicator of body condition in caribou. This can be accomplished by a visual inspection or through a laboratory process.

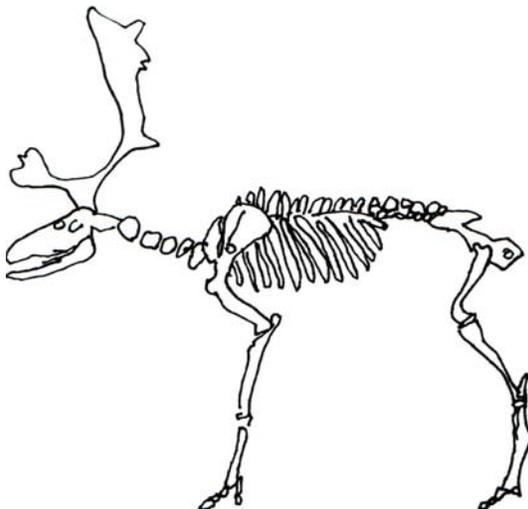


## STUDENT ACTIVITY SHEET

Name the bones of the human skeleton and the caribou skeleton. Colour the bones they have in common.



ribs  
skull  
radius  
patella  
mandible  
tibia  
vertebrae  
scapula  
carpals  
tarsals  
phalanges  
femur  
ulna  
humerus  
fibula  
maxilla  
metatarsals  
clavicle  
pelvis  
phalanges



Compare this caribou skeleton to the human skeleton.

## ANTLERS

### CONCEPTS

- Antlers are true bony outgrowths of the frontal bones of the caribou's skull and are replaced every year. Caribou are unique amongst deer in that both males and females have antlers.

### OBJECTIVE

- To familiarize students with the growth of antlers and the behavioural strategies for having antlers for both males and females.

### BACKGROUND INFORMATION

Caribou are unique amongst deer in that both male and female caribou have antlers. The bulls' antlers are usually larger and more complex than the females' antlers. About 3 - 5% of cows do not grow antlers at all. They are called **bald or poled**. Antler shape varies greatly and it is said that no two sets are exactly alike.

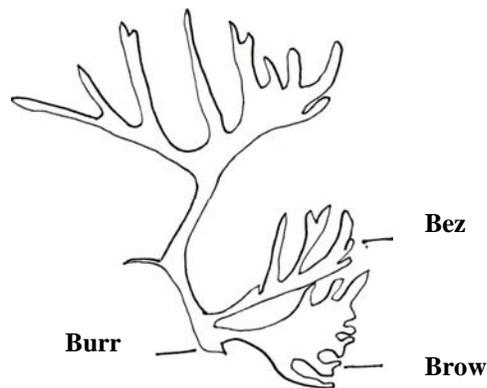
Every year the caribou grow a new set of antlers that start from two permanent stumps of bone (**pedicles**) on the caribou head. While they are growing, the antlers are soft and fragile and sensitive to touch. They are covered in a furry-haired skin called **velvet**. Beneath the velvet are thousands of blood vessels and nerves that carry calcium and other minerals to the developing soft tissue that eventually hardens into new bone. A caribou that is growing antlers has a built-in cooling system. The warm blood rushing to its antlers is quickly cooled by the outside air, which then helps cool the caribou's whole body.

By fall time the antlers are full size and become hard as the bone becomes denser and the blood supply to them is eventually cut off. In September the velvet starts to come off and the bulls rub the antlers on shrubs and trees. During the breeding season (**rut**) a bull uses its antlers to threaten rival bulls for the opportunity to mate with the cows. Sometimes bulls can engage in clashes where their antlers can break or they sustain body injuries. On very rare occasions the antlers can become tightly locked, which results in a horrible death by starvation of both animals

Eventually a ring of cells breaks down beneath the **burr** and the antler drops or breaks off. The bull caribou shed their antlers after early November as hormone levels decrease after the rut. Generally the older the bull or the bigger the antlers the sooner he **sheds** or **casts** his antlers. Occasionally young bulls are seen carrying small antlers as late as March. Most calves carry their small antlers until late May and June of the year following their birth. The cow caribou retain their antlers until after their calves are born in June. They may be used in the winter to defend the best feeding areas from non-antlered bulls and non-pregnant cows

that do not have antlers. This helps the pregnant cows to obtain the high quality food they need to nourish their rapidly growing fetuses.

Antler size and shape depends on the quality of the habitat, climate, inherited characteristics and the age of the caribou. Antlers generally reach maximum length and width during the caribou's fourth to fifth year.



**Bull, cow and calf, note the difference in antler size.**

**SUGGESTED ACTIVITIES**

1. Collect pictures of caribou with velveted antlers and fall bony antlers.
2. Obtain samples of hard and velveted antlers and a caribou skull, if possible.
3. Go through the background information sheet with students. Discuss the differences between cows and bulls and the reasons why they each have antlers. Have the students underline when the antlers are shed and reasons for the caribou having antlers.
4. Look at the caribou skull and locate the frontal bones and then pedicles, from which the antlers grow.
5. Examine the velvet on the antlers. See how it looks and feels. Perhaps look at the velvet under the microscope.
6. Weigh a set of antlers and measure their width and length. Imagine what it is like to carry these on your head walking through the bush.
7. Research all traditional uses of caribou antlers and the velvet. Also try to think of modern uses of caribou antlers. Write a report on your findings. Perhaps some of these things can be made in shop.
8. The sale of antlers has been a controversial issue. Research the history of antler sales in the Yukon and other jurisdictions and develop arguments for and against the sales. This could be in the form of a class debate. (Refer to RCMP and PCMB)
9. Research the Boone and Crocket system of scoring antlers. Obtain a large rack of antlers of an adult bull caribou. Contact a Conservation Officer to do the measurements in class. The students can take turns helping or redoing the measurements and each student could fill out his/her own form and do the necessary math to determine the final score.

## **SENSES**

### **CONCEPTS**

- The caribou has an adequate sense of hearing and sight but relies mainly on its sense of smell for locating food and identifying danger.

### **OBJECTIVE**

- To identify the five senses that caribou use to detect the many different changes in their environment.

### **BACKGROUND INFORMATION**

Caribou have large eyes that are located on the side of their heads so they can see in almost every direction except right behind them. The eyes are rod-rich so that they can see well in poor light. They have few cones in comparison so they generally are colour-blind in poor light, but when there is adequate light for both the rods and cones to work together they might perceive colour. Caribou are very good at detecting movement so one must “freeze” if a caribou notices you while you are approaching.

The hearing of caribou is adequate although caribou pay little attention to soft voices or crackling twigs.

The sharpest sense appears to be the sense of smell. The caribou uses its nose to find food through the snow by smelling along a branch shoot opening to locate lichens. A cow can recognize its own calf by its smell. A caribou will try to identify an unknown presence by moving downwind in a characteristic trot with their tails up and their head held high testing the wind for a scent. Once they have determined they are in danger, they rear up on their hind legs depositing a scent from their tarsal glands. Any other caribou in the vicinity will react to the rearing posture and will also flee and any caribou that come by the scent will be warned of danger.

**SUGGESTED ACTIVITIES**

1. Look at pictures of heads of caribou and determine the placement of their eyes. Are they on the sides of their heads and why? Try to imagine their field of view as compared to human eyes. Perhaps draw a human's face with peripheral eyes to have the same perspective.
2. Have the students try to imagine viewing the world in shades of black and white. If you were a hunter wearing red and approaching a caribou at dawn, do you think you would stand out? (No, because in the poor light the few cones do not work well so the caribou is colour-blind.)
3. Obtain the eye of a caribou and locate the lens. Place the lens down on printed material. Does it magnify the print? Is this an example of a convex lens?
4. Draw a picture of both a human and caribou face sized to scale to sensory importance. For example, humans would have very large eyes and a caribou would have a very large nose.
5. Have the students sit and imagine perceiving the world in black and white and having a great sense of smell. Write a story describing a typical human day with these perceptions.

## DIGESTION

### CONCEPTS

- Caribou, like other deer, have a four-chambered stomach and a complex digestive system that allows them to thrive on vegetation that may be low in nutrition but available in large quantities.

### OBJECTIVE

- To introduce students to the complex digestive system of a caribou, and in particular to the four-chambered stomach.

### BACKGROUND INFORMATION

The upper jaw of the caribou has no front teeth (incisors), but instead has a callous pad against which the cutting teeth or incisors of the lower jaw can press, and in this way the food can be ripped or chopped off.

Caribou, like other deer, have a special **four-chambered stomach** and digestive system that allow them to thrive on vegetation that might be low in nutrition but available in large quantities.

Caribou do not chew their food but instead swallow it immediately. The food enters the first and largest chamber of the stomach called the **rumen**. Here the bacteria begin breaking down the coarse plant material. Caribou can actively feed for an hour or more filling up their rumen.

Then they lie down in a place safe from predators and ruminate to further process their food. The food is brought back up (regurgitated) in small portions called cud. The caribou chews its cud with its back teeth (molars and premolars) until it is reduced to a pulp and is swallowed again. This time it bypasses the rumen and goes into the second and third chambers (**reticulum** and **omasum**) where much of the water is removed from the food. In that last chamber (**the abomasum**) the absorption of the nutrients into the blood begins. This is the part of the stomach that is most comparable to the human stomach.

**SUGGESTED ACTIVITIES**

1. Refer to the internet, encyclopedia and other resource books to view four-chambered stomachs.
2. Have students draw a diagram of a four-chambered stomach and label it.
3. Have students describe how a four-chambered stomach works. Using a coloured pencil show how food is digested.
4. Obtain a skull and lower jaw of a caribou, examine the teeth and notice the lack of upper incisors.
5. Obtain a caribou stomach and let students examine it. Identify the four parts. Research some of the uses native people have for the stomach.

## ADAPTATIONS

### CONCEPT

- Caribou are highly adapted to living in a land of snow and cold temperatures.

### OBJECTIVE

- To make students aware of some of the adaptations of caribou to their cold environment.

### BACKGROUND INFORMATION

Caribou are highly adapted to living in an environment of snow and cold temperatures and can be called “**chionophiles**”, meaning snow-loving animals.

A caribou is suited to living in a land where it is cold and covered in snow for most of the year.

The body of the caribou is completely covered in a thick coat of hollow guard hairs and finely crinkled under-fur. The air cells in the hollow hair act as an insulating layer to keep in the body heat. Even the **muzzle** (part of the head that includes the nose and mouth) and tail are fully furred. Caribou are well able to withstand even the most extreme temperatures in the winter with their warm coats.

The **hooves** (feet) of the caribou are another good example of adaptation to their environment. The hooves are very large and wide like “snowshoes”, helping to support the caribou when walking in the snow. The caribou support most of their weight on the two big **crescent-shaped toes**, which can bend almost horizontally. In the summer the pads under these toes are enlarged and soft with the edges of the toes worn flat so the pad rests on the ground. However, in the winter the edges of the toes grow longer and make a horny rim or winter shoe that the animal can walk on instead of the soft fleshy pad. The pads shrink and hair between the toes grows longer and covers the pads to protect them from the cold. The two smaller toes (**dewclaws**) farther up on the leg also provide support when the caribou is walking on soft ground or snow. The caribou use their sharp-edged, large hooves to dig through the snow to get at the lichens on the ground for food.

**SUGGESTED ACTIVITIES**

1. Preview the video on Awareness and Appreciation of Caribou (Video #1).
2. Ask the students to describe how a caribou looks and whether this helps them to live in an environment of snow and cold temperatures. Provide a few pictures for students who might not have seen caribou. (Caribou are covered in hair to keep them warm, they have large feet for walking in snow and digging through the snow to get food).
3. Read through the background information sheet with the students and let them ask questions and discuss the adaptations.
4. View the portion of the video that deals with the adaptations of caribou. Have students write a paragraph or two on what they have learned.
5. Have students think of other places in the world where caribou could live. Research the distribution of caribou to check their guesses.
6. Study a diagram of a caribou hair cross-section as a class project. Have students bring in small samples. If possible, view under a microscope and prepare labeled illustrations.
7. Obtain samples of caribou hooves and prepare accurate drawings and label the dewclaws, hoof pad, etc.
8. Have students research clothing that can be made using caribou skin with the hair on.
9. Take the class outside where caribou have been wintering and examine the area. Compare the sinking depth of the caribou in the snow compared to the student's sinking depth.
10. Describe at least one adaptation caribou have to make living in a cold and snowy environment.



**Fur of caribou showing the various layers.**

## **YUKON HERDS**

### **CONCEPT**

- There are two barren-ground caribou herds located in the northern Yukon and 22 woodland herds in the central and southern Yukon.

### **OBJECTIVE**

- To familiarize students with the ranges of caribou herds in the Yukon.

### **BACKGROUND INFORMATION**

There are both barren-ground and woodland caribou in the Yukon. The barren-ground type of caribou found in the northern Yukon and Northwest Territories form the large herd sizes that migrate long distances between the calving grounds and their winter ranges. The woodland type is a larger body sized animal and forms relatively smaller populations that do not occupy large home ranges or do not migrate as far between winter and summer ranges.

Both the Porcupine Caribou herd (numbering 123,000 animals) and the Forty-mile herd are barren-ground types and can be found in the northern Yukon.

The remaining caribou are of the woodland type and are scattered in some 22 smaller herds across central and southern Yukon. The total Yukon population of woodland caribou is about 33,000 animals.

Some of the Yukon caribou herd range includes parts of Northwest Territories, British Columbia and Alaska, giving them inter-provincial or international status.

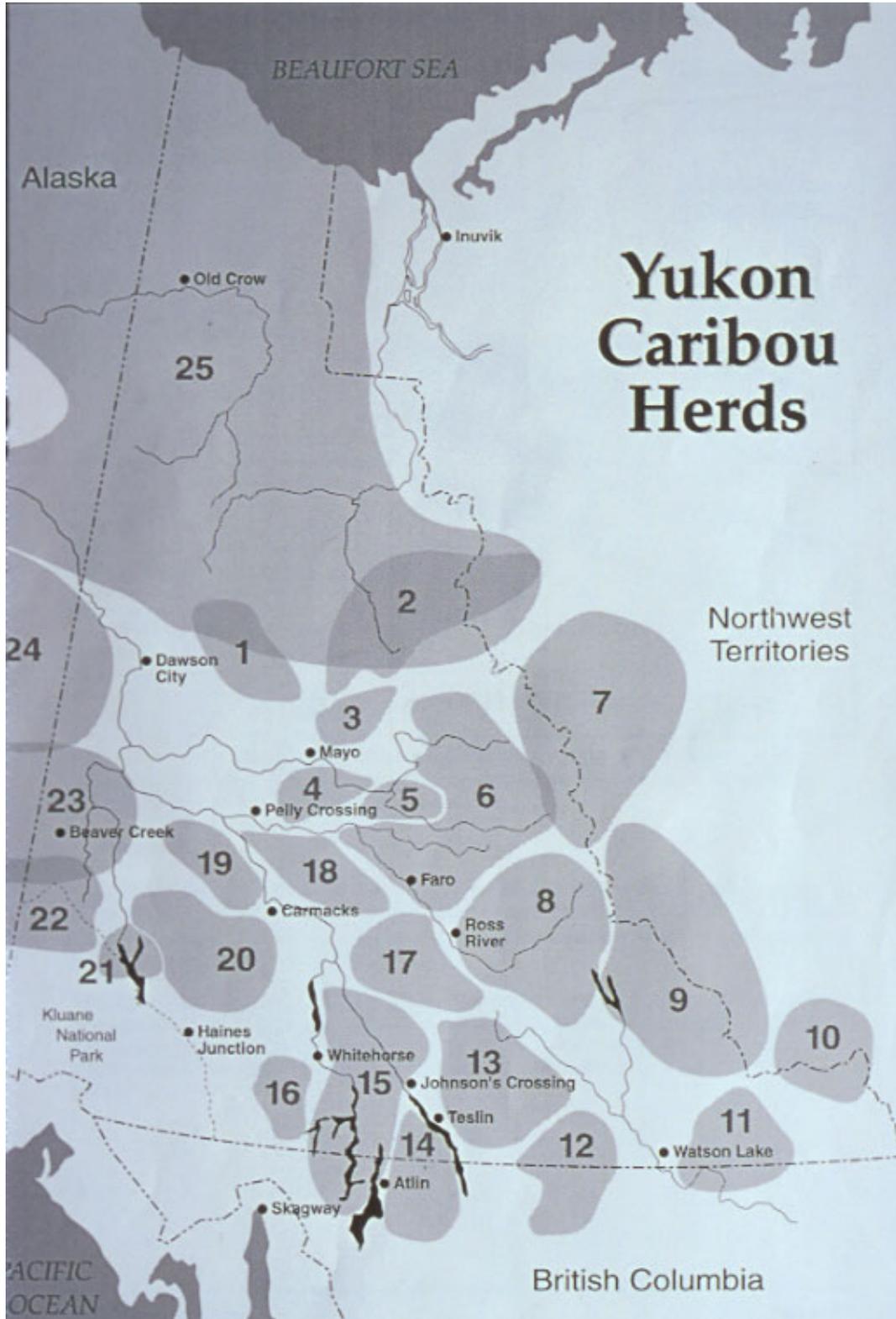
### **SUGGESTED ACTIVITIES**

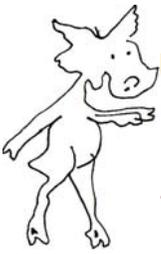
1. Guide the students through the information sheet and discuss some of the information provided.
2. Distribute the activity sheet.
3. Have the students research the name of the herd in their area. (Is it named after a lake or river in the range of the herd? Is there a native name for these places?) Have students think of new names for a herd in their area.
4. Have students research and write for specific reports on a herd in their area.
5. Have students ask elders where the range of the caribou used to be. Has the range size shrunk or increased? Are there more caribou now?
6. Have a Conservation Officer or biologist in the area come to the classroom to present information on the herd in your area.



## STUDENT INFORMATION SHEET

Map of Yukon Herds





---

## STUDENT ACTIVITY SHEET

---

**A. Use your map to answer the following questions:**

1. What herd range is closest to your community?

\_\_\_\_\_

2. Which herds are shared with Alaska?

\_\_\_\_\_, \_\_\_\_\_,

and \_\_\_\_\_.

3. Which herds are shared with N.W.T.?

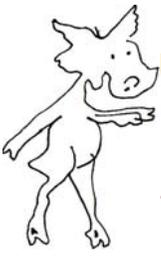
\_\_\_\_\_,

\_\_\_\_\_, and \_\_\_\_\_.

4. Which herds are shared with B.C.?

\_\_\_\_\_, \_\_\_\_\_, and

\_\_\_\_\_.



# STUDENT INFORMATION SHEET

## STATUS OF CARIBOU IN YUKON

Herd	Population Estimate	Survey Technique	Last Surveyed	Trend	Comments
<i>Woodland Caribou</i>					
1 Hart River	1,200	Estimate (1)	1978	Stable	Difficult herd to count because of mixing with Porcupine herd
2 Clear Creek	900	Estimate (2)	2001	Stable	Newly identified herd based on radio-tracking study
3 Bonnet Plume	5,000	Guess	1982	Unknown	Lightly hunted due to inaccessibility
4 Ethel Lake	300	Estimate (2)	1993	Stable	Vulnerable to over-hunting
5 Moose Lake	200	Estimate (2)	1991	Stable	Small herd with limited access
6 Tay River	4,000	Estimate (2)	1991	Stable	Naturally regulated population with limited human access
7 Redstone	5-10,000	Guess	1982	Unknown	Ranges largely in NWT - heavy hunting pressure
8 Finlayson	4,100	Estimate (2)	1999	Stable	Harvest reduction strategy in effect - Permit hunt
9 Nahanni	900	Estimate (1)	2001	Declining	Initial inventory complete 2001
10 Coal River	800	Estimate (3)	1996	Unknown	Newly identified herd - presently under study.
11 La Biche	400	Guess	1993	Unknown	Ranges in area with high oil & gas exploration interest.
12 Little Rancheria	1,000	Estimate (2)	1999	Increasing	Potential degradation of winter range due to forestry activity.
13 Wolf Lake	1,400	Estimate (2)	1998	Stable	Naturally regulated herd with limited access
14 Atlin	800	Estimate (3)	1999	Stable	Ranges mostly in BC - Closed to hunting in Yukon
15 Carcross	450	Estimate (2)	1997	Increasing	Recovery plan in effect - Closed to hunting since 1989
16 Ibx	400	Estimate (2)	1998	Uncertain	Recovery plan in effect - Closed to hunting since 1989
17 Pelly Herds	1,000	Guess	2001	Unknown	Presently under range use study
18 Tatchun	500	Estimate (1)	2000	Stable	Good recruitment but high harvest
19 Klaza	>600	Estimate (1)	2000	Increasing	Permit hunt needs re-evaluation
20 Aishihik	1,500	Estimate (2)	1998	Increasing	Wolf control used to restore the herd - Open to hunting in 2002.
21 Klwane	200	Estimate (1)	1999	Declining	At very low level - Under study - Closed to hunting since 1991
22 Chisana	350	Estimate (1)	2001	Declining	Rapidly declining - Under study - Closed to hunting since 1994
<i>Barren Ground Caribou</i>					
23 Nelchina	33,000	Estimate (4)	1999	Declining	Ranged in Yukon for only a few years in the 1990's
24 Fortymile	40,200	Estimate (4)	2001	Increasing	Management plan in effect to increase herd to 50,000
25 Porcupine	123,000	Estimate (4)	2001	Declining	Herd decline is still within range of previous known population sizes
<i>Techniques</i>					
(1) Total Count (2) Stratified Random Quadrats (3) Extrapolation (4) Direct Photocount					

Woodland

Barren Ground

## **PORCUPINE HERD RANGE**

### **CONCEPTS**

- The total documented range of the Porcupine herd covers a vast area in the northern Yukon, Alaska, and Northwest Territories.
- The Porcupine herd also overlaps with the Central Arctic herd, Forty-mile herd, Bonnet Plume and the Hart River herds sometime in its life cycle period.

### **OBJECTIVE**

- To introduce the total documented range of the Porcupine Caribou herd and its overlap with other herds. Also to emphasize its international status.

### **BACKGROUND INFORMATION**

The documented range of the Porcupine herd, based on distribution studies since 1970, covers virtually the entire Yukon Territory north of Dawson, some bordering sections of the Northwest Territories (particularly west of Aklavik and Fort McPherson) and a substantial portion of northeastern Alaska from the Arctic Coast almost to the Alaska Highway.

Within this total documented range the caribou winters, migrates both in the spring and fall, has a calving ground, and summers.

The range of the Porcupine herd overlaps with the Central Arctic herd, the Forty-mile herd and the Hart River and Bonnet Plume herds.

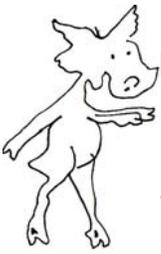
The Porcupine Caribou herd is the 8<sup>th</sup> largest herd of migratory caribou in North America. The range of the herd covers approximately 250,000 km<sup>2</sup>.

**SUGGESTED ACTIVITIES**

1. Hand out the activity sheet, read through the information and discuss the map by having the students name some of the towns and highways.
2. Hand out the activity sheet and let the students complete this using the information sheet.
3. Where does the name Porcupine come from? Is there a native name for this river?



**Large aggregation of caribou on Alaskan coastal plain**



---

## STUDENT ACTIVITY SHEET

---

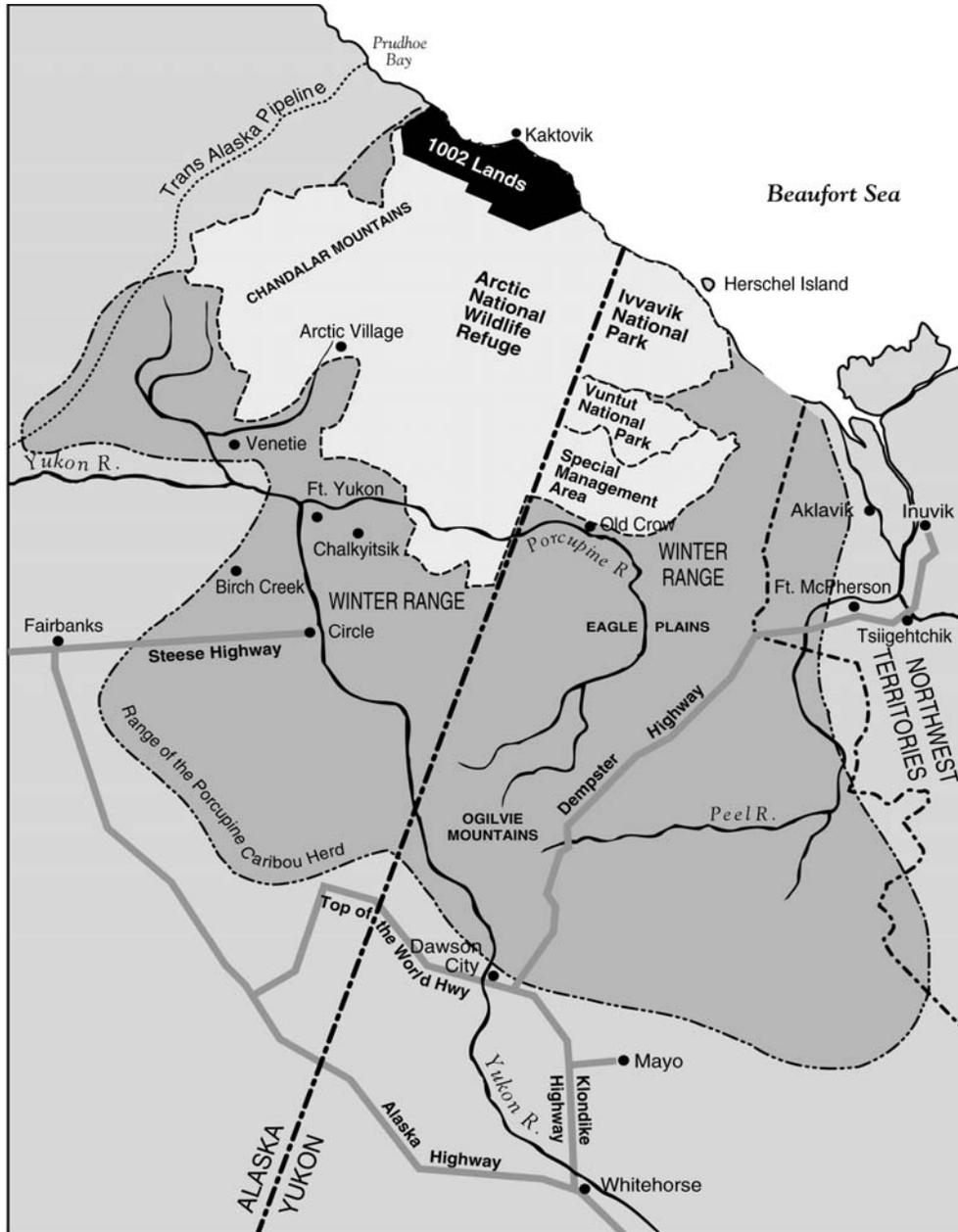
Use the map showing the total documented range of the Porcupine Caribou herd to complete the following activities.

1. How many communities in the Yukon are in the range of the Porcupine herd? \_\_\_\_  
Name it: \_\_\_\_\_
2. How many communities in the Yukon are close to the range of the herd?  
Name them: \_\_\_\_\_,  
and \_\_\_\_\_.
3. How many communities in Alaska are in the range of the Porcupine herd?  
\_\_\_\_\_
4. How many communities in the N.W.T. are near the range of the Porcupine herd?  
\_\_\_\_\_
5. When do you usually have caribou near your community?  
In \_\_\_\_\_.
6. Draw a box around your home community.
7. Colour Vuntut National Park in blue, Ivvavik National Park in red, and the Arctic National Wildlife Refuge in green.



# STUDENT INFORMATION SHEET

## PORCUPINE CARIBOU HERD RANGE MAP



## ANNUAL CYCLE

### CONCEPT

- Changing environmental conditions influence the behaviour and energetics of the caribou over their annual cycle.

### OBJECTIVE

- To learn the major points in the annual cycle of the Porcupine Caribou herd.

### BACKGROUND INFORMATION

Within the Porcupine Caribou herd, almost all caribou calves are born during the last week of May and the first week in June. Most are born on the **calving grounds** in the northern Yukon and on the northern coastal plain in Alaska. After they have given birth, the mothers shed their antlers. If the cows calve in the northern Yukon, the mothers and calves start to move north as the snow melts on the **coastal plain**.

The caribou eat **cottongrass** in early June and later feed on **willows** in late June and July.

In the summer, caribou are bothered by **mosquitoes** and **oestrid flies**. The caribou form large groups or **aggregations** that move to windy, cool areas for relief from the insects.

Later in August when the insects are not a problem, the caribou feed and move through the mountains. The caribou use this time to build up their fat deposits for the winter.

By mid-September, early snow storms force the caribou south into the trees and back across the flats and the Porcupine River. This movement is known as **fall migration**.

In October, the bulls fight each other to find out which is dominant. The dominant bulls then mate with cows that are old enough to bear young. This mating is known as the **rutting** period.

In November, the snow stays on the ground. The bulls lose their antlers at this time. Caribou greatly reduce their movement and can be considered to be on their **winter range**.

In the winter, the caribou have to live with the snow, cold temperatures and short day length. They dig through the snow (make a **crater**) to get at the ground lichens.

Then in late March and April the snow cover starts decreasing and the length of the days gets longer. The instinct to migrate stirs in the herd again. The pregnant cows are the first to move north in May. This is called the **spring migration**. The cows are in a hurry to get to the calving grounds to have their calves. The bulls travel with the young animals and the cows that were not bred. They move from the wintering areas about three weeks later than the cows. Often the bulls and cows do not

see each other until July when they regroup on the coastal plain. And the cycle continues...

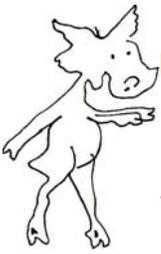
The annual life cycle of the Porcupine Caribou herd can be divided into 8 periods (see table).

The winter periods have changing snow conditions and day length. Springtime periods have different nutritious plants that are available for food. The summer periods have different insects that harass the caribou.

### **SUGGESTED ACTIVITIES**

To complete the following activities use the “Sensitive Habitats of the Porcupine Caribou Herd” report published by the International Porcupine Caribou Board.

1. Read the background information and discuss with students the main points and unfamiliar terms.
2. Discuss the winter, spring, summer and fall time periods as they relate to caribou. Imagine living outside year-round. What environmental conditions change throughout the year that would affect you or the caribou?
3. Hand out the activity sheet and let students work on it individually.
4. Give students a calendar and the table listing the 8 periods in the caribou life cycle. Have them block off the periods with different colours and write some of the main characteristics of the environmental conditions. Hang up one of these calendars in the room and announce each time a new period is taking place.



---

## STUDENT ACTIVITY SHEET

---

Fill in the missing words on the activity sheet to finish the annual cycle diagram.  
Choose the word from the box at the bottom.

### Winter December 1 - March 31

Caribou live with the snow, cold temperatures and short \_\_\_\_\_. They dig \_\_\_\_\_ through the snow to get at the \_\_\_\_\_.

### Fall September 8 - November 30

Early \_\_\_\_\_ storms force caribou \_\_\_\_\_ to the trees. The breeding season or \_\_\_\_\_ is when bulls fight each other to find out which is \_\_\_\_\_. Bulls \_\_\_\_\_ their antlers starting in November.

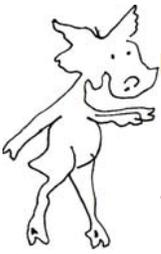
### Spring April 1 - June 30

The spring \_\_\_\_\_ north begins. Cows have their calves on the \_\_\_\_\_ grounds. Cows \_\_\_\_\_ their antlers. Caribou eat c \_\_\_\_\_.

### Summer July 1 - September 7

Cows and bulls feed on \_\_\_\_\_. \_\_\_\_\_ and oestrid flies harass caribou. Cows and bulls form large \_\_\_\_\_ or groups in July.

rut	mosquitoes	day length	aggregations	south	shed
craters	fall	willows	dominant	shed	north
cottongrass	lichens	migration	calving		



## STUDENT INFORMATION SHEET

Chart from "Sensitive Habitats of the Porcupine Caribou Herd"

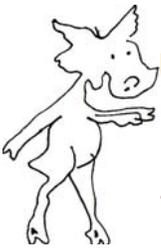
**TABLE 1**  
**LIFE CYCLE PERIODS OF THE PORCUPINE CARIBOU HERD**

SEASON	DATES	CHARACTERISTICS
Early, Mid and Late Winter	1 December - 31 March	snow cover; short day length; cold
Spring, Spring Migration and Pre-calving	1 April - 31 May	snow cover decreasing; animals move north beyond the treeline; cottongrass in bud
Calving	1 - 10 June	0 - 10% snow cover; cottongrass in full flower; willow leaves in bud
Post-calving and Movement	11 - 30 June	cottongrass past flowering; willow leaves emerge; biomass increasing rapidly
Early Summer	1 - 15 July	biomass peaking; mosquitoes peaking
Mid Summer	16 July - 7 August	biomass at peak; mosquitoes past peak; oestrid flies peaking
Late Summer and Fall Migration	8 August - 7 October	vascular forage quality declining; early snow storms
Rut and Late Fall	8 October - 30 November	snow, but can melt

8

**Large aggregation of caribou.**





# STUDENT ACTIVITY/INFORMATION SHEET

## BEHAVIOR

Find the words taken from the following paragraph.  
Words can go horizontally, vertically and diagonally in all eight directions.

Porcupine Caribou are highly social animals usually spending their time with other caribou in small groups, large bands or massive aggregations. Rutting behavior is similar to that of other deer in which bulls vocalize, execute threat displays and spar among each other with their antlers. These fights can result in injury and even death at times although most contests end with little or no apparent damage. Calving is probably the only major solitary activity that Porcupine Caribou regularly engage in. Although pregnant cows reach the calving grounds in large groups, pregnant females isolate themselves for the period required to give birth and attend the calf until it is mobile. After that, most cows, calves and many yearlings usually gather into very large post-calving aggregations often consisting of many thousands of animals. Daily activities such as feeding and resting vary considerably during the year. In October and November, caribou spend more time walking and trotting than they do in December to March. On the other hand, they spend more time eating in the winter than in the fall.

R	Y	P	R	Z	Y	L	R	A	L	U	G	E	R	M	B	H	M	X
P	R	R	K	S	R	R	D	I	S	P	L	A	Y	S	M	L	X	S
V	U	O	B	E	C	L	Z	S	Q	R	S	B	B	K	K	Q	L	T
M	J	B	A	I	M	J	H	M	G	I	T	E	Y	P	L	Q	B	S
D	N	A	N	T	B	O	F	F	M	N	H	R	E	H	T	A	G	E
T	I	B	D	I	M	P	B	I	E	A	I	F	O	M	K	S	P	T
C	N	L	S	V	C	W	L	I	V	E	I	L	K	T	N	V	R	N
R	A	Y	G	I	J	A	L	I	L	G	D	G	R	O	T	B	E	O
S	L	P	Y	T	R	Z	O	F	H	E	M	I	I	A	C	I	G	C
L	D	P	P	C	H	R	H	T	R	I	B	T	N	M	E	E	N	K
Q	V	N	D	A	T	N	S	B	E	R	A	G	C	G	T	Y	A	G
B	K	D	U	V	R	R	K	G	F	G	F	L	N	A	T	R	N	L
T	G	E	L	O	R	E	A	T	E	N	N	Y	L	I	H	N	T	T
H	B	R	D	R	R	M	N	R	M	T	W	O	M	R	V	W	K	T
R	K	I	C	N	A	G	G	T	A	T	S	R	R	T	Z	L	M	B
E	Q	U	C	D	E	G	B	K	L	I	M	A	J	O	R	K	A	K
A	X	Q	G	T	A	P	T	K	E	H	M	L	F	C	J	T	Q	C
T	C	E	G	L	R	X	S	T	S	S	D	N	A	S	U	O	H	T
J	N	R	T	Z	R	R	T	A	N	T	L	E	R	S	Q	K	Y	G

© Porcupine Caribou Management Board. Made using 1-2-3 Word Search Maker™

ACTIVITIES  
 APPARENT  
 BIRTH  
 DAMAGE  
 FEMALES  
 GROUNDS  
 MAJOR  
 PROBABLY  
 SIMILAR  
 THREAT

AGGREGATIONS  
 BANDS  
 CALVING  
 DISPLAYS  
 FIGHTS  
 INJURY  
 MOBILE  
 REGULARLY  
 SPEND  
 TROTTING

ANTLERS  
 BEHAVIOR  
 CONTESTS  
 FEEDING  
 GATHER  
 ISOLATE  
 PREGNANT  
 REQUIRED  
 THOUSANDS  
 YEARLINGS

## **WINTER RANGE**

### **CONCEPT**

- The winter range of the Porcupine Caribou herd covers a wide area south of the Arctic coast within their known range. Winters are a critical time period for caribou as they have to deal with low temperatures and continuous snow cover. Caribou feed on lichens under the snow and tend to occupy areas with favourable long-term snow conditions.

### **OBJECTIVE**

- To familiarize students with the winter distributions of the Porcupine Caribou herd documented over the last 25 years. To generally describe suitable winter range conditions for caribou.

### **BACKGROUND INFORMATION**

The winter range of the Porcupine Caribou herd covers a wide area south of the Arctic coast within their known range. It is the area they occupy between the fall and spring migration. In the last 25 years of documented winter distribution, caribou have repeatedly used portions of the range on a rotational basis.

Winters are a critical time period as they have to deal with low temperatures and continuous snow cover. Caribou feed on lichens under the snow and tend to occupy areas with favourable long-term snow conditions and avoid areas of unfavourable snow conditions. Favourable areas for digging feeding craters have snow depths of less than 50 - 60 cm and densities of less than 0.34 g/cm.

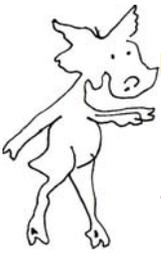
In the Yukon the winter range of the Porcupine Caribou herd is situated in the snow shadow region of the Ogilvie and Hart Rivers basin. Pacific storms from the south and southwest deposit most of the moisture on the south slopes of the Ogilvie and Wernecke Mountains. Storms from the Bering Sea do not affect these headwater basins. The Richardson Mountains winter region has less snowfall, as it is affected by high winds that redistribute the snow.

The general pattern of winter range occupation is that in early winter caribou can be found in one or more of the core wintering areas. If snow becomes very deep, they generally stay within this area. If snow accumulation is light, then the animals will expand into more of the occupied region or move into other regions.

The winter range of the Porcupine Caribou herd in the Yukon has a reasonably predictable pattern of snow accumulation. Other important features of the winter range are the diversity of terrain features, vegetation types, forage resources and fire history. The lichen resources appear to be average to above average compared to other caribou winter ranges.

### **SUGGESTED ACTIVITIES**

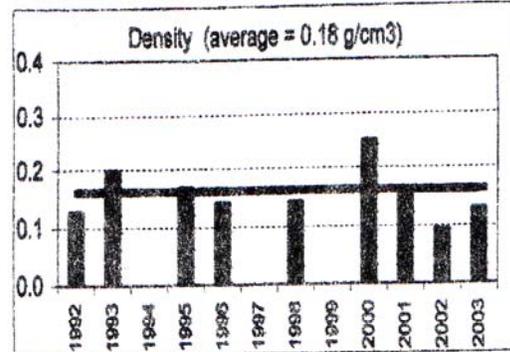
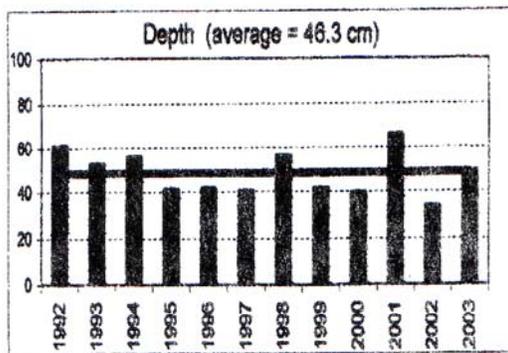
1. View the video showing caribou on a winter range. Have students discuss how the snow depths affect caribou in the winter. View video to be able to show wintering scenes of caribou.
2. Discuss the main food source for caribou in the winter: lichens and how the caribou dig through the snow to get at the lichens on the ground. Introduce the snow depth measurement of less than 50 to 60 cm being an important parameter for favourable feeding areas in the winter for caribou. Go outside and measure the snow with a meter stick once every five meters, 10 times. Have the students work in pairs, with one student recording the depths while the other one measures. Then have them switch roles. Once back in class have the students add up the snow depths and divide by the number of sample points to get an average snow depth. Is the area you sampled a good feeding area for caribou? Plot the data on a piece of graph paper.
3. Using a shovel - or, better yet, let the students excavate a hole in the snow (crater) with their hands or feet - to get an idea of the energetics of cratering. Have the class group around you as you cut through the snow profile with your hand. Whenever you come to a different snow layer, mark it with a line with your finger. Have the students examine the different layers and talk about the types of snow (ice layer, corn or granular snow, etc.) that caribou have to dig through.
4. If caribou are known to be wintering close to town, arrange a field trip to an area where caribou have been feeding. Examine the feeding craters that caribou dig through the snow to get at lichens. Look at their trails and compare how deep in the snow caribou sink compared to the students. Collect some of the caribou fecal pellets and dry them back at class. Break them apart and see if you can tell if they have been eating lichens.
5. Invite a weather person to class to talk about weather patterns in your area and if you live in an area with a snow shadow effect. Have them bring data on snow depths for your area for you to look at. Have the students discuss if their area is a good place for caribou to winter.
6. Invite a person from the DIAND Water Survey office and have them demonstrate the snow sampling for water equivalence and density.
7. Discuss the snow depth chart and compare the readings from the various stations along the Dempster Highway.



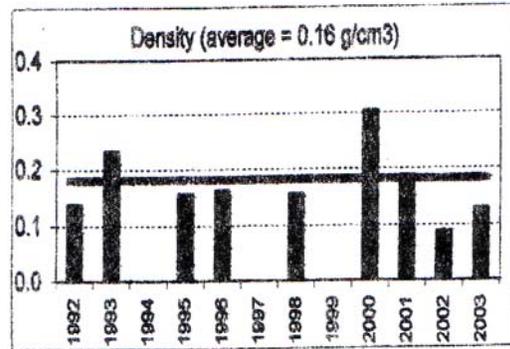
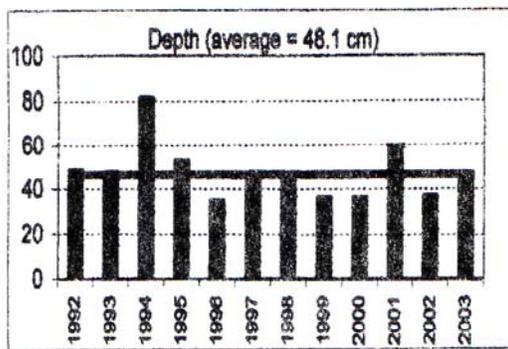
# STUDENT INFORMATION SHEET

## Summary of Dempster Snow Stations by region

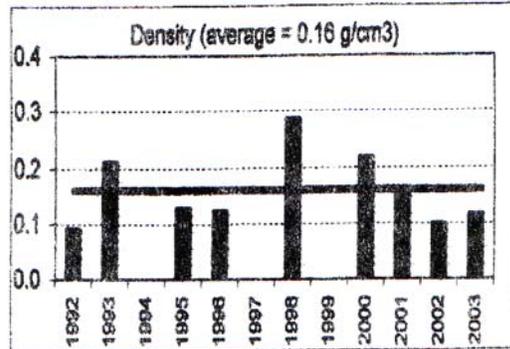
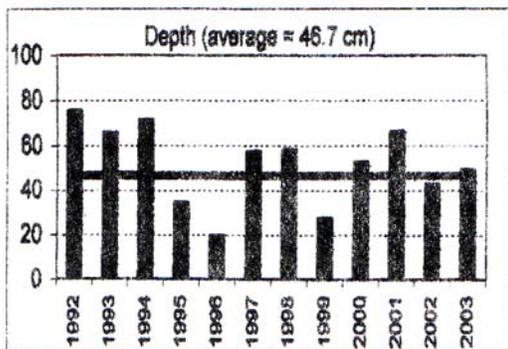
### Ogilvie Region



### Eagle Region

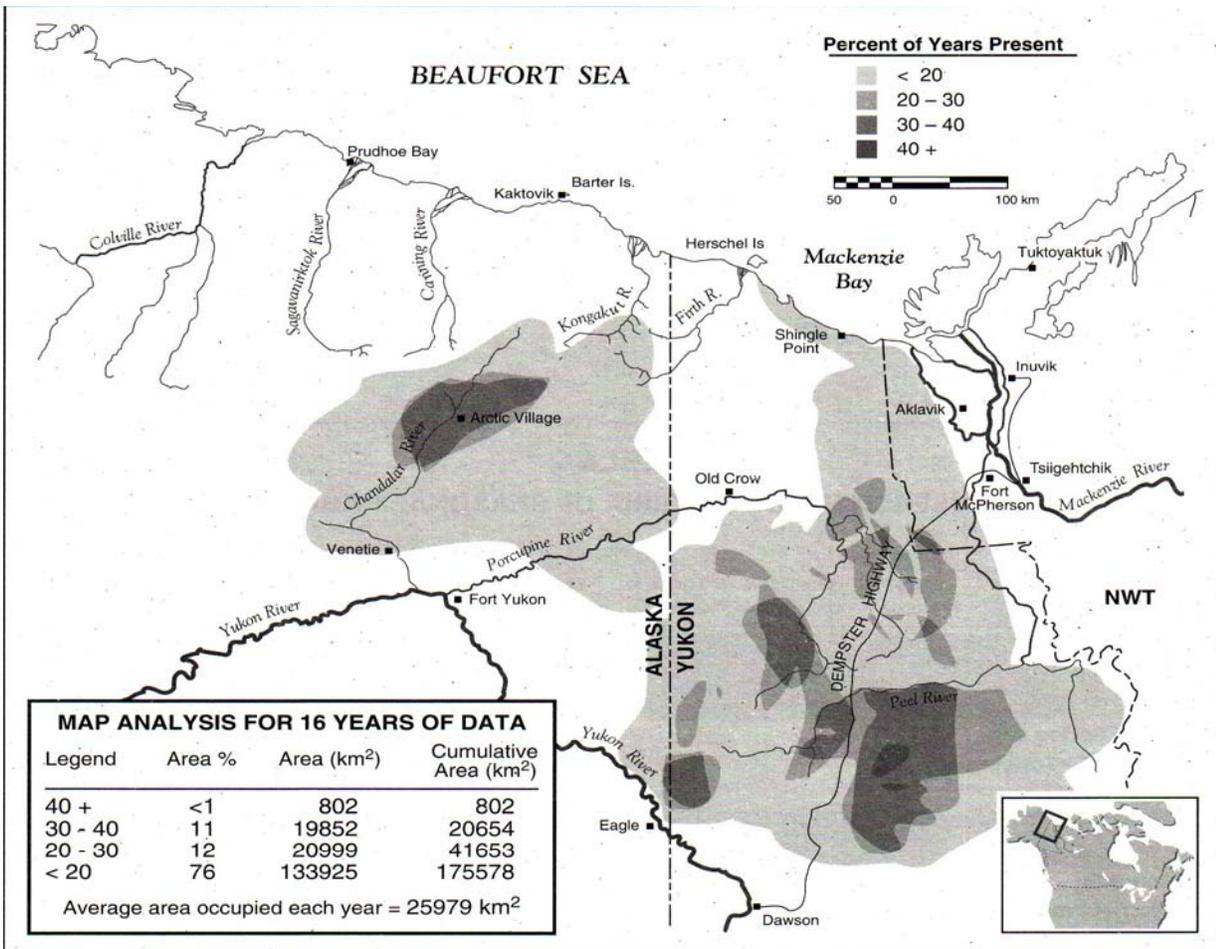


### Richardson Region





# STUDENT INFORMATION SHEET



This map represents the distribution of the herd in late winter for all years with data. Early and mid-winter distributions tend to overlap with late winter distributions.

## EARLY, MID, AND LATE WINTER

**Time period: December 1 - March 31**

**(total rating = 17 importance rank = 4)**

### Importance

The winter period is primarily influenced by snow depth and condition. Animals at this time of year are relatively tolerant to human activity. In shallow to normal snow years, animals can gain weight. Winter ranges are occupied at low densities.

### Distribution

The Porcupine Caribou Herd occupies a vast area of

northcentral Yukon and northeastern Alaska. In Canada, use of two regions occurs in normal to deep snow years, the Richardson Mountains and the Ogilvie-Hart basins. In shallow snow years the region with the most abundant lichen resources, the Whitestone River/Eagle Plains is used. The use of the range in Alaska is centred in the Chandalar River/Arctic Village area and use appears correlated with normal to deep snow years.



## **CALVING GROUNDS**

### **CONCEPTS**

- The calving grounds of the Porcupine Caribou herd are the most vital areas for the herd. The bond between the cows and calves is very important to the survival of the herd. The majority of calving takes place during the last week in May and the first week of June. There is an ongoing political dispute over opening the calving grounds in the Arctic National Wildlife Refuge to oil development.

### **OBJECTIVE**

- To familiarize students with importance of the calving grounds and the behaviour of the cows and calves.

### **BACKGROUND INFORMATION**

Each year in the spring, the caribou migrate to the calving grounds to give birth to their young.

The calving grounds of the Porcupine Caribou herd are international in scope, extending from the Babbage River in the Yukon to the Canning River in Alaska. The area includes the arctic foothills up to 1,000 meters elevation and the arctic coastal plain to the Beaufort Sea coast. Within this general area certain “core” areas have been documented where the majority of the calving takes place. These areas are the upper Jago uplands and/or in the foothills regions from the Firth Delta to the Yukon/Alaska border.

Factors such as the location of the previous wintering, weather, snow conditions encountered on spring migration, and the snow melt pattern encountered on the calving ground all interact to effect the distribution of the herd at the peak of calving in any given year. For example, in years of deep snow conditions the pregnant cows can give birth along the migration route south and east of the calving grounds as in 2000. In years of shallow snow conditions along the migration route and early snow melt within the calving grounds, all of the herd calved on the extreme western edge of the traditional calving area.

The calving grounds of other barren-ground caribou herds tend to have one characteristic in common: they are generally found north of treeline at approximately June 1. At the beginning and throughout the normal calving period these areas are characterized by a mosaic of new flushing vegetation and melting snow patches. When the pregnant cows arrive on the calving ground after the long migration, give birth and start producing milk, their energy demands are high. This coincides with the maximum growth and nutrient dynamics of the newly flushing vegetation that occurs during the two-week period after the week of calving.

Some of the theories explaining why caribou are loyal to a calving ground are:

1. Avoidance of insects at that time period on the winter range.
2. Avoidance of high density predator populations that occur at treeline in the winter range.
3. The ability of the cows (at a time when their energy demands are high for producing milk) to locate the newly flushing, nitrogen-rich vegetation that occurs on the calving grounds.

For whatever reason or reasons, the caribou consistently use this traditional area and it should be recognized as critical habitat.

Oil development proposals for the "1002" section of the Arctic Wildlife Refuge in Alaska pose a serious threat to the caribou as it is part of the calving area. In fact, the US Department of the Interior presented an environmental impact statement predicting a 40% reduction of the herd if full leasing were permitted in the core calving grounds.

The rutting season usually peaks during a week in the fall and, as a result, caribou calves are usually born within a short time of each other the following spring, in early June. This **synchronous** birthing provides a number of advantages for the caribou. When there is a group of caribou gathered in an area such as the calving ground there is a greater collective alertness to predators and less individual conspicuousness. Group behavioural processes, which are important to the calf's survival, are also reinforced by the large numbers of animals. Calves born at roughly the same time develop at the same rate and are able to travel with the herd within a short period of time. Those born outside the main time frame, either on the migration to the calving ground or later, are not able to keep up with the still-migrating groups of caribou. Some cows have shown a tendency to abandon their calves in order to keep up with the other adults. Calves born late are often not as physically strong as the others and are more likely to be targets for predators and succumb to severe weather conditions.

Cows become more alert as their pregnancy progresses and this reaches a peak just before birth. Before labour a cow may move a short distance away from the other animals. The length of labour varies from 15 minutes to a few hours and the female is usually lying down. Calves may also be born while the cow is in the prone position or while she is standing. Within minutes after birth the cow begins to lick and clean her calf. Soon after the calf is born the cow will eat the afterbirth.

The rate of motor development varies with each calf. Within the first half hour of birth the calf may attempt to stand briefly, but loses its balance easily and falls. Within the second half hour the calf may be able to stand and some may be moving a few yards. Within one to six hours the calf may walk and travel a few hundred yards. By the first day the calf may be running and trotting and by the second day the calf is usually able to keep up a running pace and to swim across streams.

## SUCKLING AND BONDING

Caribou calves generally wean from their mothers by October, when suckling seems to have stopped. The first attempt at suckling may occur within a few minutes or a few hours after birth, depending on factors such as the physical condition of the calf and cow, their behaviour instincts, and the weather conditions. A heavy snow storm or wind may prevent the calf from making an attempt to suckle. Once suckling is established the calf usually stands near the cow. Frequent suckling may strengthen the bond between cow and calf as the calf begins to recognize its mother.

Attempts to graze and actual grazing start soon after birth. Calves are usually born with some teeth already protruding from their gums. Calves seem to spend more time attempting to graze and grazing than they do suckling.

Early grazing is one of the caribou's survival techniques. It reduces the calf's dependency on its mother and encourages the calf to find food for itself. Although the calf's dependency on its mother for food ceases after weaning, the calf is still dependent on its mother to learn appropriate behavioural responses.

## GROUPING

The herds travel to the calving grounds in the spring and the cows are usually at the front of the herd. The pace quickens as the cows are in a hurry to get to their destination and a cow may give birth within a short time after arriving. During the calving season there is a tendency for pregnant cows to band together to form small groups called **maternity bands**. There may be many small groups on the calving grounds during the early part of the calving season. This grouping tendency continues after the peak of calving as cows with calves begin to form associations with other cows. These are called **nursery bands**. After the peak of calving, these bands join together to form larger and larger groups called **post-calving aggregations**. This tendency is more noticeable in the middle of a herd, while on the outskirts nursery bands tend to stay together for a longer period of time.

These aggregations usually form when the number of cows giving birth decreases. If a census is scheduled, it takes place at this time. They occur in mid-July and the herd becomes concentrated along certain pathways. The aggregation reaches and maintains its maximum size by August after which time it begins to break up due to the insect season, rough terrain or weather. During calving, cows with calves tend to move together and the yearlings mix with the barren cows, but toward the end of the season the groups of caribou are increasingly mixed. The number of bulls within the herd begins to increase as the post-calving season comes to a close.

## **DURING CALVING**

Generally cows become very sensitive to external stimuli during the calving season. This sensitivity reaches its peak just before birth and the cow can be easily startled and take flight.

After birth the cow is extremely attentive to her calf and this attention creates a strong maternal bond. The cow begins licking and cleaning the calf within minutes after birth. There is frequent contact within the first few hours with the calf attempting to nurse and actually nursing. This frequent physical contact enables the cow and calf to get to know each other's scent so if they are separated they can find each other.

Within a short time after birth the calf makes its first attempt to suckle, usually from the side or from between the cow's hind legs. The calf will approach from the rear to feed if the cow is moving to avoid being struck by the cow's rear legs. The cow will usually end the suckling by moving away from the calf. The cow may encourage the calf to suckle by moving away and encouraging it to follow. This action reinforces the response of following, which is an important group response.

Another behaviour pattern is **bunting** where the calf pushes against the cow's udder. It is thought that this action may stimulate milk production and is commonly observed in groups of ungulates. Older calves have a greater tendency to bunt either before or during suckling.

One behaviour that is frequently used by the cow is **headbobbing** where the cow's head is lowered until it nearly touches the ground and it bobs up and down. The cow uses this action to encourage her calf to get up and follow her, especially in an alarming or dangerous situation or if a calf has become separated from its mother and is searching for her. This behaviour is a stereotyped motor pattern that appears during the first hours of life. A newborn calf will often put its head to the ground without actually eating.

## **FRIGHT AND ESCAPE REACTIONS**

The closeness and degree of the danger or alarm determines the cow's response. If a cow is suspicious of an object, or if an alarm has been given, she will move to her calf and persuade it to follow her by **headbobbing**, soft grunting and nudges. The cow and calf will then move away from the source of danger. If the calf cannot move quickly enough, the cow will move in front of the calf and pace herself to the speed the calf can maintain.

If the calf cannot keep up, the cow will usually react in one of two ways. The cow may move beside the calf or behind it and extend her neck until it is at the same level as the calf's; she will try to nudge it and encourage it with continual grunts. If a calf stops completely, the cow may run back and lay down facing it with her muzzle extended. Or she may run up to the calf and headbob towards it.

## SEPARATION

Separation usually occurs when the calf has left the mother to explore and the mother has moved away from the spot to feed or has fled from some alarm or another caribou may distract a calf and draw it away from its mother. Cows will search for their calf after being separated if the maternal bond is strong. If a cow approaches a stray calf she will sniff it from a few feet away. If it is hers, then she will lead it away; if it is not, she will move away.

The cow initiates and maintains the bond between her own calf and herself and also strengthens the bond between other cows and their calves. She uses body postures (headbobbing) to attract the attention of her own calf and searches for her calf when they are separated. If approached by a strange calf, she may try to avoid it or display a **threat posture**. If sufficiently annoyed, the cow may strike out at the calf with her hooves but the calf is usually able to dodge them. Caribou are normally non-aggressive in behaviour and attempts are usually made to avoid a strange calf. This life-long pattern of avoidance is established within a few days after birth.

The cow also provides the link between the calf and the rest of the group. While the calf is following the mother it is also following the rest of the group and developing its own group responses. As it grows older, the calf will learn from its mother to follow more **generalized stimuli**, such as a group alarm or alert.

If her calf is approached by another cow, a mother will intervene and regain control by using an attraction pose and moving between her calf and the other cow. The mother will approach from the side and hold her head beside the calf's to gain the maximum amount of **visual, auditory and olfactory** contact with the calf. The cow may not make any response if her calf is being chased by another cow unless the other cow intrudes upon her space. The mother will then try to regain control of her calf by using sight, sound and posture.

There is a strong possibility of separation during the post-calving aggregations or at any other time when there is a large group because of the stress and confusion of numbers. The time of separation may vary due to circumstances and it can be permanent if the bond between cow and calf has not developed since birth. During June and July the searching behaviour exhibited by cow and calf is still strong, but it diminishes quite rapidly by late September and October.

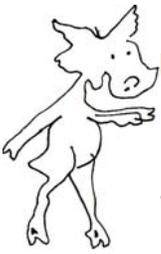
If separation occurs before the calf is able to take care of itself, it may die. Of the calves that die, up to 50% do so during the first month after birth, either from separation, bad weather, predators or other physical causes.

**DEFINITIONS**

afterbirth:	placenta and fetal membrane discharged after birth
behavioural responses:	actions or responses brought about by the behaviour of other caribou, especially the mother
labour:	uterine contractions in process of giving birth
motor development:	development of muscular actions
olfactory:	concerned with smelling
synchronous birthing:	birth (of caribou calves) occurring within the same, short time period
wean:	accustom to foods (e.g. vegetation) other than mother's milk

**Calving grounds of the herd in the Alaska National Wildlife Refuge.**





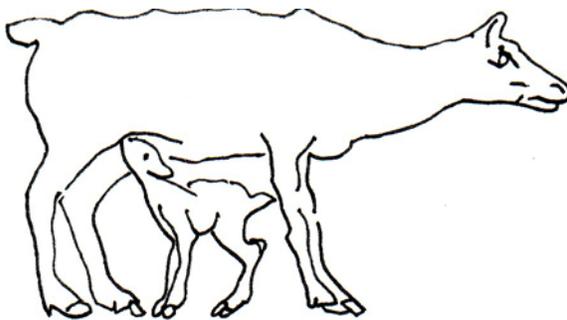
## STUDENT INFORMATION SHEET

---

### CARIBOU CALVING

In the spring, caribou migrate to the calving grounds to give birth. Most calves are born within a few days of each other. This means they all grow up together and can all keep up with the herd as it moves. Many calves that are born during the migration or after the calving season are not strong. They may be killed by predators. They may also be abandoned by their mothers because they cannot keep up with the herd, where it is safe.

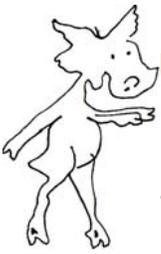
When giving birth the **cow's labour** may last from 15 minutes to a few hours. Once her calf is born the cow cleans it by licking it. The calf **suckles** its mother to get milk. It tells its mother it wants milk by pushing against her **udder**. This is called **bunting**. Suckling makes the maternal bond between the cow and calf strong. Calves try to eat vegetation when they are a few days old. This is called **grazing**. It makes them less **dependent** on the mothers. They are fully **weaned** by October.



**Calf suckling.**

**Caribou calf.**





## STUDENT INFORMATION SHEET

### CARIBOU CALVING

The cow teaches her calf how to behave. One way is called **headbobbing**. It is used to teach the calf to follow its mother. It is used when there is danger. The cow lowers her head to the ground and bobs it up and down. Cows with calves are most likely to use this **behaviour**.

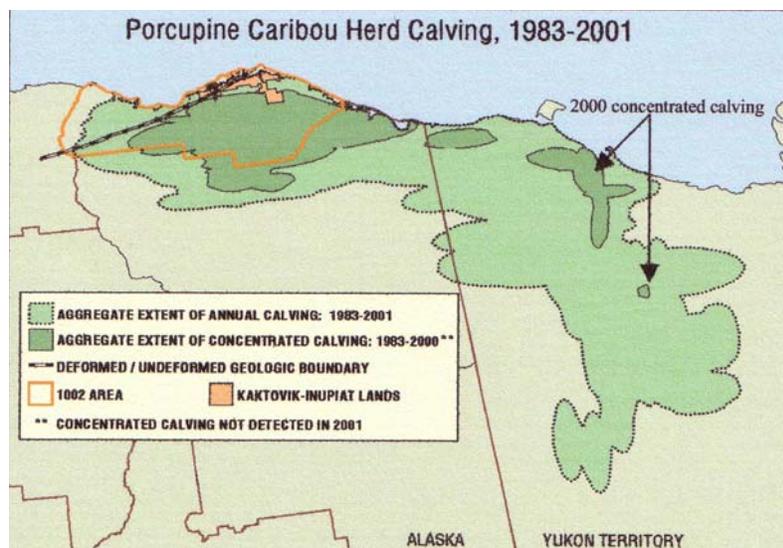
When the cow is **alarmed**, she may move to her calf and try to make it follow her away from danger. If she is being chased she will run at the same speed as the calf. If the calf cannot keep up she will **nudge** it and encourage it with **grunts**. When the danger is very close some cows will **abandon** their calves.

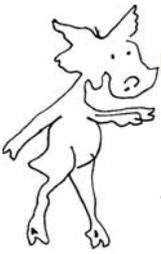
Cows will search for their calves if they become **separated** from them. They know their own calves by their smell. Most cows will not let a strange calf come near. They will move away from it or take a **threatening stance**. Calves learn proper responses to **group stimuli** from their mothers. Other members of the herd reinforce those responses



Cow displaying headbobbing behaviour.

Map of concentrated calving locations for 1983-2001. Note the unusual calving area for 2000. This was due to bad weather conditions during the spring migration that forced the caribou cows to calve before they reached their main calving area in Alaska.





## STUDENT ACTIVITY SHEET

### CALVING WORD-ADDITION

Choose the best answer from the list on the right that answers the clues on the left. Write the number of the answers in the magic box below. Once you have finished, add the numbers together in each horizontal, vertical and diagonal line. They should equal the same number. If you've made a mistake, go back and find it. This game is tricky because there are more answers than clues.

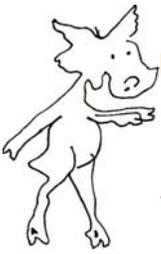
- A. a signal to follow
- B. material expelled from the cow
- C. calves born at the same time of year
- D. feeding changes from milk to grass
- E. change in numbers
- F. reaction to cow's actions
- G. feeding from the cow
- H. growing ability to stand, walk and run
- I. large groups of cows and calves
- J. attempt to stimulate milk production
- K. what frequent physical contact creates
- L. muscle contractions before birth
- M. calves' greatest enemy
- N. small groups of pregnant cows
- O. a learned group response
- P. separation causes this response in calves

- 1. grunting
- 2. mammal
- 3. headbobbing
- 4. motor development
- 5. labour
- 6. predators
- 7. following
- 8. bunting
- 9. behavioural responses
- 10. synchronous birthing
- 11. maternity bands
- 12. maternal bonds
- 13. suckling
- 14. afterbirth
- 15. weaning
- 16. population shifts
- 17. post-calving aggregations
- 18. searching behaviour
- 19. herbivore
- 20. vertebrate

A	B 14	C	D
E	9 F	G	H
I	J	12 K	L
M	N	O	18 P

What do the numbers add up to?





---

## STUDENT ACTIVITY SHEET

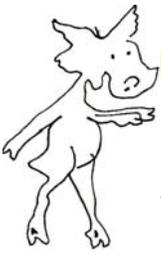
---

### CALVING GROUNDS WORD GAME

Can you find all 25 words in the box below? The words may run forwards, backwards or diagonally and some of the letters may be used twice. Some of them are tricky to find.

TYDSDNUORGROUPSA  
XHLDLVSHDFAUNAL  
DPEUFIOTSPRINGNO  
OAI BATLNTQUIELDR  
URHMRACCNBPGDASG  
TGSROTADERPRUC TA  
C OJOLENM IGRATION  
RPLCFG IERC PNI ANI  
OOSKLEC ITOTITLEC  
PTCALVEVUWRTLAK  
SMROTSWONSFEARCH

- |               |                |             |
|---------------|----------------|-------------|
| 1. grounds    | 11. sandstone  | 21. ice     |
| 2. vegetation | 12. rock       | 22. lake    |
| 3. predators  | 13. granite    | 23. organic |
| 4. calve      | 14. altitude   | 24. fauna   |
| 5. nutrients  | 15. flora      | 25. cows    |
| 6. migration  | 16. volcanic   |             |
| 7. spring     | 17. outcrops   |             |
| 8. snowstorms | 18. buds       |             |
| 9. glacial    | 19. topography |             |
| 10. shield    | 20. group      |             |



## STUDENT ACTIVITY SHEET

---

### CALVING

Here are some of the words or phrases you may have heard or read. Try and match them with the correct meaning. One is done for you.

- |               |                       |  |
|---------------|-----------------------|--|
| <u>  3  </u>  | a. abandon            | 1. Cow lowers antlers to threaten or frighten another animal.                                |
| <u>      </u> | b. suckle             | 2. Signs from other caribou that calves must learn to follow.                                |
| <u>      </u> | c. headbobbing        | 3. To leave behind, as sometimes happens to new calves.                                      |
| <u>      </u> | d. threatening stance | 4. Not being able to survive without help.   |
| <u>      </u> | e. wean               | 5. To feed by sucking the mother's milk.   |
| <u>      </u> | f. dependency         | 6. The calf pushing against the cow's udder.   |
| <u>      </u> | g. group stimuli      | 7. To change from drinking mother's milk to eating plants.                                   |
| <u>      </u> | h. bunting            | 8. Putting the head close to the ground and moving it up and down to get the calf to follow. |

## **SPRING MIGRATION**

### **CONCEPTS**

- The calving grounds of the Porcupine Caribou herd are the places where they give birth to their young.
- The calving grounds are international in scope as they occur in both the northern Yukon and Alaska.
- Spring migration is a goal-oriented movement by cows that leave the wintering areas to move north to the calving grounds to give birth.
- There are four main migration routes.

### **OBJECTIVES**

- To familiarize students with the calving grounds of the Porcupine Caribou herd.
- To familiarize students with some of the reasons why caribou are loyal to unique calving grounds.
- To familiarize students with why these areas are important and need to be protected.
- To familiarize students with the four main spring migration routes of the Porcupine Caribou herd documented over the last 20 years.
- To discuss the hazards of migration.

### **BACKGROUND INFORMATION**

The spring migration is initiated by pregnant cows that need to reach the calving grounds on the north slope to have their calves. The migration takes place in early May by the cows when the snows begin to rot. The cows move north of treeline from their wintering areas. The bulls and juveniles may start three weeks later than the cows and use different routes that take them to staging areas on the periphery of the calving grounds.

The spring migration trails can be grouped into three or four major routes:

1. The Old Crow Route has been used consistently by the caribou. This route gathers trails from the winter ranges in the Ogilvie-Hart River basin and funnels them through the Keele Range across the Porcupine River east and west of Old Crow, and onward through Old Crow Flats to eventually join the Richardson Route in the vicinity of Barn Mountains.

2. The Western Route is a small route used by caribou that winter along the border of Alaska and the Yukon in the Tatonduk River drainage area. It joins up with the Old Crow Route near the upper Salmon Fork River.
3. The Richardson Route pulls caribou from the wintering grounds in the Wind, Bonnet Plume, Snake and Arctic Red River areas. It follows the long axis of the Richardson Mountains to the Fish Creek-Rapid Creek-Blow River area where it turns northwest along the Barn and British Mountains to the Alaska border.
4. The Chandalar Route is used by caribou that winter in the Arctic Village region. The longer Chandalar route leads across the east fork of the Chandalar River towards the British Mountains in the vicinity of the Firth River. As well, caribou may travel northwards from the Chandalar region through a number of passes in the Brooks range more directly to the Arctic coast of Alaska.

The migration route taken by the caribou depends on where they are wintering that year. If they are wintering in the northern Richardson Mountains, then they do not have far to migrate. However if they are wintering in the Peel River Basin they still take the Richardson Route but have farther to travel.

Topographic features can dictate the movement from point A to point B as caribou will follow the spine of a mountain ridge. Also there is an advantage for caribou to avoid regions with deep snow accumulation or late snow melt. There are observations of migrating caribou using either side of a major mountain range depending on the relative snow depths. It appears that caribou can take the most advantageous route at any given time.

A hazard to migrating caribou are the water crossings of the major rivers such as the Porcupine, Babbage, Blow and Firth Rivers. Injuries and drowning may occur during breakup and, as well, hunting takes place at some of the traditional crossing sites on the rivers or along the Dempster Highway.

**SUGGESTED ACTIVITIES**

1. Ask students to describe a place where an animal could give birth to their young. Does it have to be a safe place, should there be food available, perhaps not many insects? etc.
2. Explain that “calving grounds” are places where cows have their calves. When the cows give birth and start producing milk they need good nutritious food. The vegetation right at that time is just greening up and is rich in nitrogen. There is an energetic advantage for the cows to be in this place after giving birth.
3. View the video or film on calving and have the students ask questions and discuss it.
4. Hand out the information sheet that shows the calving distribution of the Porcupine Caribou herd.
5. Introduce the topic of the proposed oil development in the 1002 section of the Arctic National Wildlife Refuge in Alaska, which is part of the Porcupine Caribou herd’s calving grounds. Research internet sites listed at back of manual.
6. Discuss Spring migration. Points to consider: long day length, melting and rotting snow, warmer temperatures, etc. After viewing the video on migration (Video #1) have the students write a story on the migration using the perspective of the caribou (i.e. hazards they face such as water crossings and hunters).
7. Hand out the information sheet and lead students through the routes by describing where caribou might winter and what route they would take. Talk about proposed development and how it might affect the migration routes of the caribou.
8. Have students go outside (has to be winter with lots of snow on the ground). Tell them they have to head in a certain direction for the calving grounds. Just let them head off and see if they eventually start following each other instead of everyone breaking trail. Talk about the energy required for caribou to migrate and why they follow each other.
9. Have students keep track of movements of the satellite collared caribou on the internet at <http://www.taiga.net/satellite/update.html>.
10. Have the students give the main reason for the spring migration (cows to head to the calving grounds) and be familiar with the four migration routes.



## **FALL MIGRATION**

### **CONCEPTS**

- The fall migration route is the movement from the summer ranges in the northern Yukon and Alaska in a southerly direction to the winter ranges. The Porcupine Caribou herd travels in four main routes.

### **OBJECTIVE**

- To familiarize students with the fall migration routes used by the Porcupine Caribou herd and the effects of the weather on the migration. Also to discuss the hunting that takes place along these routes.

### **BACKGROUND INFORMATION**

The fall migration is the movement from the summer range to the winter range. It can vary in timing, direction and duration, not only among years but among different herd segments in the same year. The initiation, rapidity and progress of the fall migration is strongly influenced by weather patterns in the northern Yukon. If the fall weather is relatively warm, the caribou move leisurely back towards the Yukon from Alaska and then southward in a widely dispersed pattern. When the fall temperatures start to rapidly decline and early snow storms occur in September, the caribou start to move more quickly in a southerly direction. However, if the weather improves again with warmer temperatures and little snowfall, the caribou slow down in movement, or even reverse the direction and head back north. For instance, the caribou can recross the Porcupine River or the Dempster Highway heading in a northerly direction, until inclement weather forces them back south.

Fall migration routes are more diverse than in the spring because the snow conditions are not a limiting factor. Still, the fall movements can be grouped in the same routes used in the spring migrations except in the reverse direction:

- a) The Old Crow Route brings caribou that were in the British and Barn Mountains south to cross the Porcupine River in many locations. This broad corridor leads south toward the Ogilvie Mountains where caribou branch out west or east from there.
- b) The Richardson Route brings caribou along the Richardson Mountains chain down the Peel River, crossing it between the Bonnet Plume and Wind Rivers. The caribou continue on to the wintering areas in the Snake, Hart, Blackstone, Bonnet Plume and Wind River drainage.
- c) The Western Route is a small route used by caribou that winter along the border of Alaska and the Yukon in the Tatonduk River drainage areas. It joins up with the Old Crow route

near the Upper Salmon Fork River.

- d) The Chandalar Route takes caribou in a westward direction from the Old Crow Flats across the Alaska/Yukon border to the Chandalar River drainage.

The rutting period (breeding season) coincides with the fall migration and takes place wherever the caribou happen to be in mid October.

### **SUGGESTED ACTIVITIES**

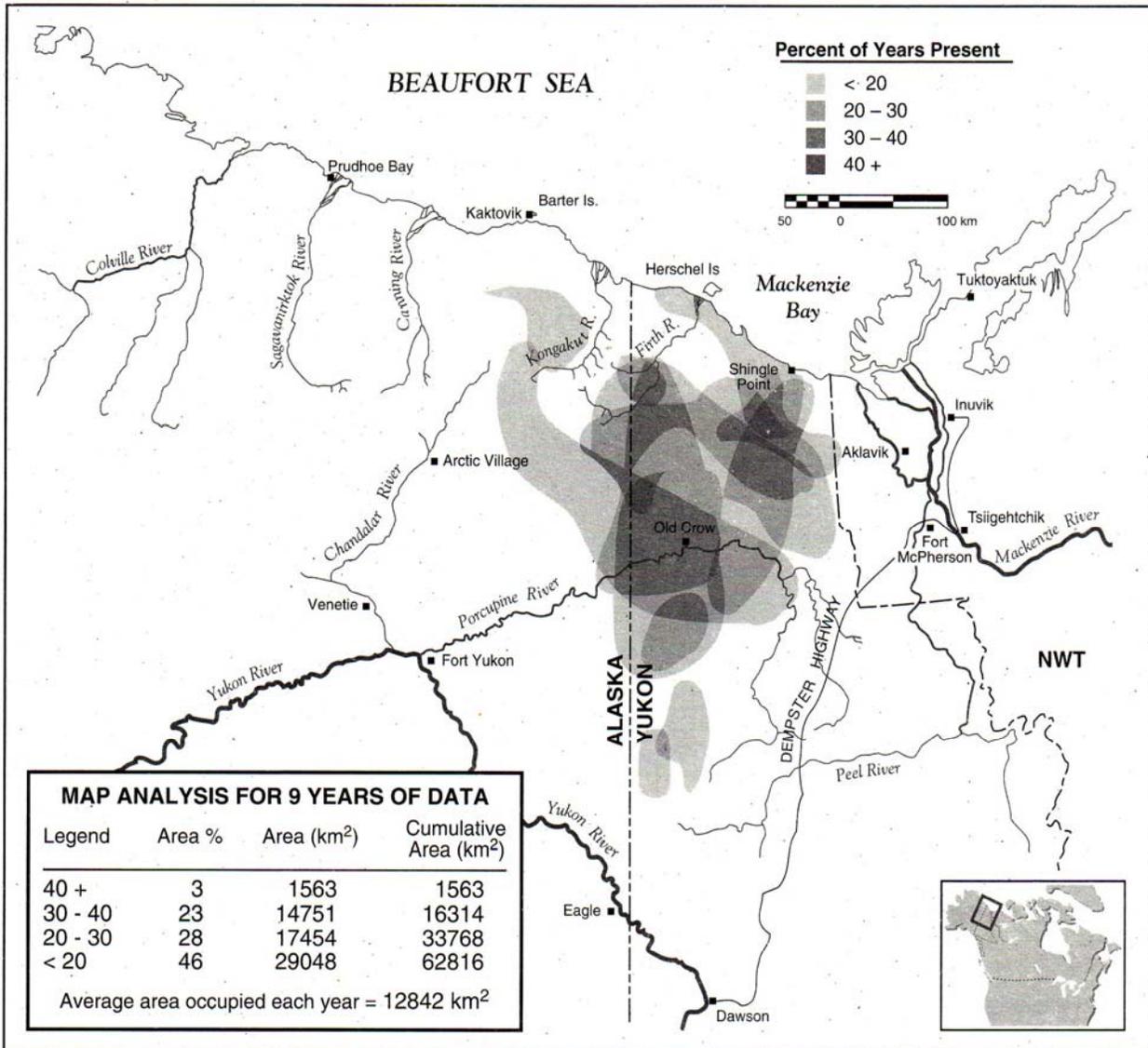
1. Discuss the weather for the northern Yukon in early September. What are some of the factors that cause caribou to move south (rapidly declining temperatures and snow storms). Have students research Edith Josie's, "Here Are the News", and the Porcupine Caribou Management Board's "Community Caribou Updates" for dates when caribou have crossed the Porcupine River and were hunted successfully.
2. Hand out the map on the information sheet and lead students through the four different routes that caribou might take.
3. Have the students keep track of the fall migration via the internet at [www.taiga.net/satellite/update.html](http://www.taiga.net/satellite/update.html).



# STUDENT INFORMATION SHEET

## Map of distribution of caribou during fall migration

From "Sensitive Habitats of the Porcupine Caribou Herd"



Distribution of the Porcupine Caribou Herd during fall migration.

## **CARIBOU RUT**

### **CONCEPTS**

- The rutting period is the first part of the caribou's reproductive cycle when the adult bulls mate with the cows. There are many physical changes in the bulls and behaviour aspects associated with this period.

### **OBJECTIVE**

- To familiarize students with the biological and behavioural aspects of rutting and some of the key terms.

### **BACKGROUND INFORMATION**

The rutting period is that part of the caribou's reproductive cycle when the adult bulls mate with the cows.

The adult bull's body undergoes some physical changes. They shed the velvet covering on their antlers. Their pelage has grown and is dark brown with a heavy white mane and white strips down their flanks. The adult bull's necks swell to twice their normal size and they almost completely stop eating. Their livers become yellow and mushy because their stores of glycogen are used up and ketones begin to build up. The bulls begin to stink and hunters avoid killing them because their meat is lean, stringy and can be inedible.

Note: There is some variation to the palatability or inedibility of the meat from these adult bulls. But generally it's best not to shoot an animal that displays obvious rut behaviour or has a swollen neck. Younger bulls stand a better chance of being edible and hunters are asked not to harvest cows through voluntary compliance to help stop the decline of the herd. By November, adult males usually lose their "rank" taste but the meat becomes increasingly lean. Caribou meat tastes better in late August and early September when the rump fat can exceed three inches.

The adult bulls do battle with each other to establish who will mate with the cows. This is part of the process of natural selection. After going through the courtship ritual, the strongest bulls mate with many cows who are in heat. Most of the bulls which take part in the rut are between five and ten years old. Some of these bulls head into the winter in poor physical condition with most of their fat reserves depleted.

Pre-rutting behaviour among Porcupine bulls begins around mid-September and continues to increase in intensity to mid-October. Rutting activity peaks about the middle to the third week in October and breeding occurs then. The rut wanes rapidly in early November and the larger bulls shed their antlers soon after.

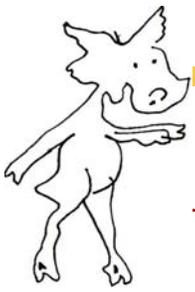
**SUGGESTED ACTIVITIES**

1. Present a video or film that shows caribou during the rutting period. Let the students discuss it and ask questions.
2. Have the students read as a group, each taking turns reading the information on caribou rutting.
3. Ask students if they have ever viewed caribou during the rut and have them talk about it.
4. Discuss the fact that the meat from some large adult bulls killed when they are at the peak of the rut can be very stinky, stringy, lean and inedible. Bull caribou are legally harvested during this time period. Many non-resident hunters select these large bulls for their antlers. The meat from some of these animals cannot be used as it is inedible. Have students debate this issue after developing pros and cons.

Pros: Once an animal is dead it makes no difference biologically if it is eaten by humans. In fact, it provides food for bears, wolves, wolverine and the many bird scavengers. Also the harvest takes place with an outfitter providing economic benefit to people involved in the industry. The number of caribou taken for their antlers is very small.

Cons: It is wasteful to kill an animal and not eat it.

5. For students in northern Yukon perhaps a field trip could be organized to the Dempster Highway if it is known that caribou are in the area during the rut. You can contact a Conservation Officer in the area. Perhaps highway personnel could also give you this information. One could view caribou displaying all the rutting behaviour.



---

## STUDENT INFORMATION SHEET

---

Caribou have adapted their breeding habits to the harsh northern environment to take advantage of the short growing season. Calves are born just before the season starts when they can take advantage of fresh green sedges and plants that are high in nutrition. The older animals manage to feed very little during the fly season which extends from July to late August, but toward the end of August they begin to feed heavily. The bulls use this time to build up their fat stores in their bodies and to gain weight which will be used for energy during the rut.

The rutting period is an important stage for the caribou because it is the start of the reproductive cycle and it ensures that the caribou herds will continue. It is at this time that adult bulls mate with the cows to produce the calves that will be born in the following spring.

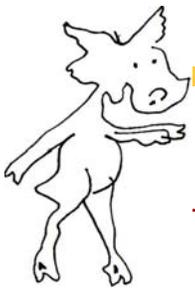
The peak of the rut may take place within a week but may start in October and finish in November. Because the herds are so large and not always together in one mass, some groups may be finished before others. Caribou may constantly move from one group to another. The timing and location of the rut may change from year to year depending on the weather and other factors but it usually occurs on or near the treeline. If the migration is early, the animals may be deep in the forest; if it starts late then the rut may occur near the treeline.

The caribou are always on the move during the rut. Those bulls, which are the largest and are the best fighters, are the ones that do most of the breeding. This is part of the process of natural selection. Only the strongest and the biggest bulls are able to compete in the battles to breed the cows. This means that the calves that are born in the spring should also be big, strong and capable of living through the severe winter conditions. There is a high mortality rate for bulls because after the exertion of the rut the weaker ones are not physically prepared to meet the harsh winter and many die.

The bulls eat large amounts of food to build up the body fat that will provide energy during the rut and winter migration. A mature bull will store up to 22.7 kilograms of fat in layers up to 7.6 cm thick across his lower rump and lower back. Globes of fat will also form on parts of the intestines, around the kidneys and inside the body cavity. Fat deposits can also be found in the bone marrow, behind the eyes and in other places in the caribou's body.

The caribou also shed their old hair and the new coat is dark brown in colour. By September the adult bulls have heavy white manes and white strips running down their flanks. Their antlers have now fully grown back and the blood circulation which helped them grow has stopped. The bulls begin to rub and polish their antlers against small trees and shrubs to remove the velvet that covered them. Broken-down "rubbing" trees can often be found along the migration trails used by the bulls. The shedding of the velvet is one of the first signs of the upcoming rutting season.

In late September and October other physical changes take place in the bulls. Their necks begin



to swell and they almost completely stop eating. Their livers become yellow and mushy because their stores of glycogen are used up and ketones begin to build up. The bulls begin to stink and hunters avoid killing them because their meat is lean, stringy and inedible.

During the rut the bulls will completely use up the fat they have stored for energy during the summer and early fall. The bulls eat little or no food at that time and they become very tired. By the end of the rut they are physically exhausted and drained of energy, and they are in poor condition to face the winter hardships.

### **Physical Changes**

The fall is a time for many changes in the caribou's body, especially in the mature adult bulls. At this point the caribou have made their way to the treeline and are starting to prepare for the winter dispersion and the rut. Up to now the adult bulls have traveled in small bands or alone, away from the cows and the younger adults. But as they make their way closer to the treeline they begin to intermingle with other caribou.

### **Behaviour**

Bulls begin to show signs of rutting behaviour in September, even though the actual rut does not take place until late October and early November. They become alert for intruders and other predators. The bulls become restless and aggressive. They fight with other bulls at the slightest chance as they attempt to prove their dominance over the other bulls. At first the fights are brief, but as the rutting season comes closer, the battles can become violent and the bulls can be severely wounded and sometimes even killed. Occasionally two bulls cannot free their antlers and both of them may be killed by predators or die from starvation.

The battles are a ritual. Two bulls who are near each other act in an aggressive manner. They take the threat position with their heads low to the ground.

**DEFINITIONS**

breed:	mate, cause to reproduce
dominance:	of superior strength, having commanding influence over another
flank:	fleshy part of side of body between ribs and hip
glycogen:	polysaccharide serving to store carbohydrates in animal tissues
heat:	sexual excitement of (female) animals during breeding season
ketones:	one of a class of organic compounds containing the group CO with double bond to carbon
mane:	long hair on neck of caribou
natural selection:	evolutionary sorting out of the animals better fitted to survive and multiply



**Bull caribou displaying full fall rutting colours. Note full white mane.**

## **ANNUAL DIET**

### **CONCEPTS**

- The main component of the winter diet is fruticose lichens, mainly the Cladonia type. During post-calving, caribou eat cottongrass and then later switch to willow and other shrubs as well as some forbs.

### **OBJECTIVE**

- To familiarize students with specialized terminology and basic information regarding the annual diet of the caribou.

### **BACKGROUND INFORMATION**

Barren-ground caribou are grazing animals and the average caribou eats over three kilograms of vegetation each day.

Caribou eat different types of food during the year.

In the winter, snow depths dictate food availability. Caribou have to dig holes in the snow (called feeding craters) to find the lichens and winter green plants such as low-cranberry sedges and horsetails. Caribou seek areas of reduced snow cover, south slopes and windswept mountain ridges to locate the food.

The winter diet of the Porcupine Caribou herd was determined by analyzing the fecal pellets. From late September to early May, fruticose lichens, mainly Cladonia type, are dominant (64%). The second most important component of the winter diet was evergreen shrubs (11%), mainly the lowbush cranberry (*Vaccinium vitis-idae*). The remaining plants eaten were moss (11%), horsetails (6%) (*Equisetum* that remains evergreen) and foliose lichens (5%) (*Peltigera apthosa*), grasses (graminoids - 3%), deciduous shrubs (2%) and forbs and mushrooms both less than 1%.

By late May, when the caribou reach the calving grounds, the Cladonia type lichens and the lowbush cranberry are the most important components of the diet as well as moss. Then in early to mid-June, cottongrass (*Eriophorum vaginatum*) becomes the most important food.

Once willow leaves emerge in late June, caribou quickly shift their diet. Willow or *Salix* becomes the most important food by the end of June. Some other green leaves of deciduous shrubs like dwarf birch and blueberry are also eaten.

The caribou can shift back to lichen as early as late August. Sometimes mushrooms are selected by caribou when they are available in August.

**SUGGESTED ACTIVITIES**

1. Hand out the information sheet and let students read through it individually or take turns reading parts of it. Answer questions the students might have on the different plants.
2. Look up the different plants that caribou eat in reference books to see what they look like and to find out if they occur in your area.
3. Go to an area near the school and try to find these plants. Collect them in bags or boxes.
4. Back in class put these plants (except the lichens) in a plant press or between pieces of paper and then between heavy books. These plants will then dry and can be pressed and ready for mounting and gluing to construction paper. Have two sheets of heavy paper, one for the winter foods and one for the summer foods. Put the common name for the plant and perhaps include the scientific name.
5. Introduce the graph to older students and let them read the graph to determine the amounts of each type of plant the caribou eats during the year.
6. Research the caribou food plants and whether any of these are also used by native people. (Lowbush cranberry berries and willows as well as the seed heads of cottongrass were used). Have the students work on this as a research project.
7. Have students list things that may deprive caribou of food (examples are crusted or very deep snow, fires, harassment by predators and insects or hunters). What effects might these have on the nutrition, health, lactation, longevity, etc. of the caribou?

## **LICHENS**

### **CONCEPTS**

- Lichens are a plant comprised of the algae and fungi living together. Lichens are a primary food source for caribou.

### **OBJECTIVES**

- To introduce the lichen as a symbioses between an algae and fungi.
- To make students aware of the importance of lichens as a food source for caribou.
- To let students recognize and collect lichens on a field walk. Have students attempt to key some of the lichens.

### **BACKGROUND INFORMATION**

Lichens are plants made up of an algae and fungi growing together. The fungus forms the real thallus as well as the threadlike hyphae that provides structural support to the algae cells. The algae cells in turn have the chlorophyll that uses the sunlight to produce carbohydrates from carbon dioxide and water. Most lichens derive their shape from the fungal component while the algae are usually only a single layer of cells.

Lichens can be described as an example of a symbiotic relationship where the fungus and algae live together and both generally benefit from the association. When a lichen is separated in the laboratory into its algal and fungal components they each can grow perfectly well. Then when you place these same components together they rarely reform into the original lichen. The formation of lichens, or the process of the algae and fungus joining together (lichenization), in nature remains a mystery of biology.

There are about 15,000-20,000 species of lichen in the world and they can be found almost anywhere from harsh desert environments to the cold arctic environment and even in lush mountain forests.

Moisture is essential to the growth of the lichens and they can act like a sponge and absorb the water over their surface area. Without water they dry out rapidly and become dormant.

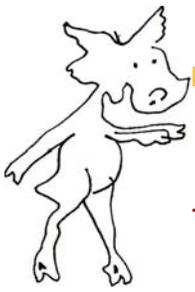
The lichens can be divided into three main groups: crustose, foliose and fruticose. The crustose or crust-like lichens occur mainly on rocks and have a very thin thallus attached directly to the substrate. The foliose lichens have a leaf-like lobed thallus and can be loosely attached to the substrate. The fruticose lichens have a thallus that is radially symmetric, tufted, or composed of erect stalks. All lichens are classified as belonging to the Kingdom Fungi.

fragrance in French perfume, and they also have been used in medicated lotions and toothpaste. Lichens are a principal food source for caribou in North America.

Lichens can play an important role in monitoring air pollution including radioactive fallout. The lichens absorb nutrients from the air and water which might also contain radioactive material. Radioactive fallout accumulates to a higher concentration in lichens than in many other plants.

**SUGGESTED ACTIVITIES:**

1. Check out a source of lichens in an area close to the school. Most forested areas will have a good selection of both foliose and fruticose lichens whereas the crustose lichens can be found mainly on rocks. Check in the library for reference guides to lichens. A recent good photographic field is the Mosses, Lichens and Ferns listed under the reference/resources section. It has excellent colour pictures of all the species found in the Yukon and a good description as well as some of the uses.
2. Hand out the paper bags or boxes to the students. During the field walk, have students collect as many different types of lichens they can find. When they find the lichens, have them decide what group it belongs to. Upon returning to the classroom let the lichens dry in the bags or in the boxes.
3. Hand out the slide holder sheets and let the students put a small sample of each different kind of lichen in each pocket. Try to organize them in groups of crustose, foliose and fruticose lichens.
4. Let students refer to a lichen identification book or look at the teacher's sample to learn either the scientific or common names for the lichen. Some identification books give uses for some of the lichens which might be interesting to the students.
5. Look at a piece of lichen under a microscope and draw it.
6. Describe the lichen-caribou-human food chain, and chart or make a model of it.
7. Ask elders for native names for some of the lichens and describe their importance or use as food or medicine. Have the students work together on this as a research project.
8. Have a biologist come to the class and give a talk on lichens and help identify the lichens.



---

## STUDENT INFORMATION SHEET

---



**LICHEN**

## HABITAT

### CONCEPTS

- There are some key habitats that are critical to the survival of the Porcupine Caribou herd. They include the calving areas, post-calving areas, coastal insect relief areas and some of the winter ranges and, to a lesser extent, the migration routes.

### OBJECTIVE

- For students to be made aware of the key habitats that are critical for the survival of the Porcupine Caribou herd. Discuss how these areas should be protected.

### BACKGROUND INFORMATION

Caribou, like all animals, need food, water, shelter and space. They also need these things in a way that is suitably arranged, hence the term “arrangement”. The area where these requirements are met is called the **habitat** or the place where the animal lives.

There are some specially important areas (key habitats) which caribou need to survive. These areas include safe places to have their calves, areas where they can find relief from insects in the summer, access to migration routes which are favourable for traveling so they can reach either a wintering ground or the coastal plain for calving, and access to winter ranges with low snow depths so they can obtain their food. These habitats should be considered critical to the well-being of the herd and they deserve special protection measures.

The areas in the northern Yukon have the most important habitats for the caribou.

The core calving areas provide a place where caribou choose to have their calves every year. These areas have early snow melt at this latitude and are adjacent to another important area where the nursery groups (cows and calves) move immediately after calving.

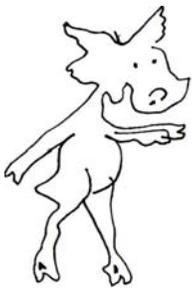
This post-calving area in the Jago uplands in Alaska provides the diversity of plants in their early phenological stages and hence are rich in nitrogen and very nutritious. These plants are also highly available in biomass. The cows are nursing their calves and require this high energy food as they are in relatively poor shape after migrating and giving birth. There is no alternative habitat offering these conditions during the time period when the cows could use. Therefore this is the most important long-term traditional habitat for the Porcupine Caribou herd.

Later in July, insects start to harass the herd. The cows and calves can find relief from the insects at the coast because of the cool temperatures and high winds from the Beaufort Sea. This is very important as it not only provides relief from insects, it also offers the same quality food.

Therefore this coastal insect-relief area is necessary for the well-being of the cows and should also be given a high level of protection.

**SUGGESTED ACTIVITIES**

1. Have the students view videos Part 1 and 2. Discuss the important habitats that the film documents.
2. Hand out the map on the information sheet that delineates the key habitats. Perhaps also hand out the table that gives the characteristics of the important habitat for the Porcupine Caribou herd.
3. Discuss ways that these important areas could be protected. Write the ideas down on chart paper.



## STUDENT INFORMATION SHEET

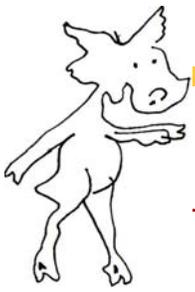
### Characteristics of important habitat for the Porcupine Caribou herd.

Chart from "Sensitive Habitats of the Porcupine Caribou Herd"

**TABLE 2**  
**ASSESSMENT OF CRITERIA OF SEASONAL HABITATS**

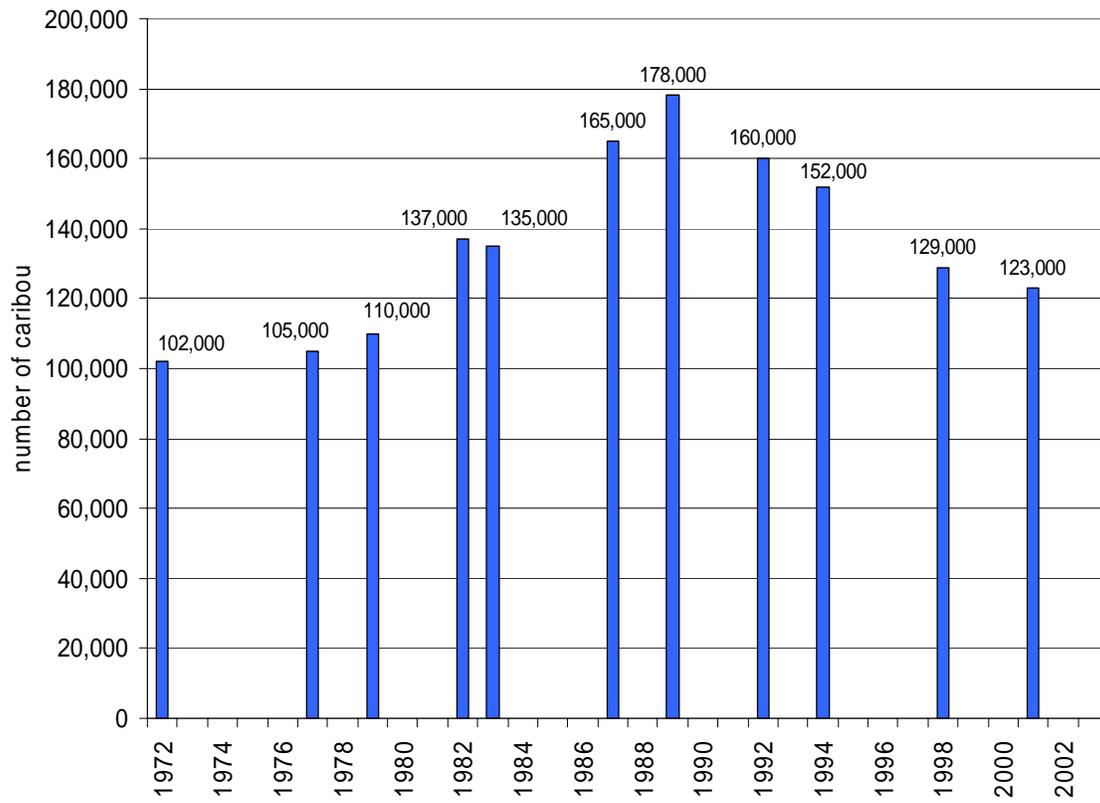
PERIOD	CRITERIA <sup>1</sup>						TOTAL <sup>2</sup> IMPORT <sup>3</sup>	
	energy balance	reproductive contribution	tolerance to disturbance	escape requirements	intensity of use	alternatives available		
<b>Early, Mid and Late Winter</b> 1 Dec. - 31 March	2	3	3	3	3	3	17	4
<b>Spring, Spring Migration and Pre-calving</b> 1 April - 31 May	1	2	3	3	3	2	14	3
<b>Calving (cows)</b> 1 - 10 June	1	1	1	1	1	1	6	1
<b>Calving to Movement (bulls)</b> 1 - 30 June	3	3	2	3	2	1	14	3
<b>Post-calving and Movement (cows)</b> 11 - 30 June	2	1	1	1	1	1	7	1
<b>Early Summer</b> 1 - 15 July	1	2	2	1	1	2	9	2
<b>Mid Summer</b> 16 July - 7 Aug	1	2	2	1	2	2	10	2
<b>Late Summer and Fall Migration</b> 8 Aug - 7 Oct	3	1	3	3	3	2	15	3
<b>Rut and Late Fall</b> 8 Oct - 30 Nov	3	3	3	3	3	3	18	4

<sup>1</sup> scores - based on a 1 - 2 - 3 rating (1 = highest concern)  
<sup>2</sup> total of criteria ratings  
<sup>3</sup> level of importance (1 = highest importance)



## STUDENT INFORMATION SHEET

Estimated Porcupine Caribou Herd Size, 1972 to present



## BIBLIOGRAPHY

Gauthier, David A., and Richard S. Farnell. Comparison of Physical Characteristics from Yukon and Neighboring Caribou Herds. Proceedings of the Fourth International Reindeer/Caribou Symposium. Rangifer Special Issue No. 1, 1986, pp. 131-135.

Y.T.G. Department of Environment. Yukon Hunting Regulations Synopsis. 2003/2004.

Biel, T. Zoobooks, The Deer Family. Vol. 5, No. 4. Quality Productions Inc., San Diego, CA. 1988.

Forsyth, A. Horns of a Dilemma. Equinox Magazine, No. 24. Nov./Dec. 1985.

Rozek, M. Antlers. National Wildlife Magazine. Vol. 23, No. 6. Oct/Nov. 1985.

Kelsall, J.P. Department of Renewable Resources pamphlet, 1990. Distribution of Caribou Herds in the Yukon Territory. Summary of Woodland and Barren-ground Caribou Populations.

Farnell, R., D. McEwen and K. Guenter. Seasonal Movements and Distribution of the Porcupine Caribou Herd. Final Report 1971-82. Y.T.G. Department of Renewable Resources.

International Porcupine Caribou Board, Sensitive Habitats of the Porcupine Caribou Herd, 1993.

Porcupine Caribou Management Board, Summer Ecology of the Porcupine Caribou Herd, December 2002.

Farnell, R., Zarnke, R., Kuzyk, G.. Serologic Survey of Yukon Caribou, 1988-1997 A Look at Disease Prevalence. YTG Department of Renewable Resources.

Porcupine Caribou Management Board Annual Reports, 1986-2003.

Gwich'in Renewable Resource Board, Gwich'in Words About the Land

### **Other Materials**

- Relief map of the range of the Porcupine Caribou range, made by the Porcupine Caribou Management Board, available from the Department of Education Resource Center, Yukon Government
- Display case depicting the uses of caribou, made by the Porcupine Caribou Management Board, available from the Department of Education Resource Center, Yukon Government

## INTERNET SITES

Satellite collared caribou tracking site <http://www.taiga.net/satellite/update.html>  
Project Caribou Educators' Guide <http://www.taiga.net>  
Environment Canada, [http://www.ecoinfo.org/env\\_ind/region/arcibou\\_e.cfm](http://www.ecoinfo.org/env_ind/region/arcibou_e.cfm)  
Journey North, <http://www.learner.org/jnorth>  
The Vuntut Gwitch'in of Old Crow, Yukon <http://www.oldcrow.yk.net>  
Gwich'in Steering Committee <http://www.alaska.net/~gwichin/index.html>  
Audubon Society <http://www.audubon.org>  
Public Interest Research Group <http://www.pirg.org>  
Alaska Wilderness League <http://www.alaskawild.org>  
Sierra Club <http://www.sierraclub.org/wilderness/wildlands>  
The Wilderness Society <http://www.wilderness.org>  
Northern Alaska Environmental Center <http://www.northern.org>  
World Wildlife Federation <http://www.panda.org>  
Canadian Nature Federation <http://www.cnf.ca>  
Northern Research Defence Council <http://www.nrdc.org>  
Native Web <http://www.nativeweb.org>  
Taiga Net <http://www.taiga.net/>  
Porcupine Caribou Management Board <http://www.pcmb.yk.ca/pcmb.html>  
Arctic National Wildlife Refuge - A Special Report: <http://arcticcircle.uconn.edu/ArcticCircle/ANWR/>  
Canadian Parks & Wilderness Society <http://www.cpaws.org/>  
Porcupine Caribou Harvest Model: <http://www.taiga.net/caribou/models/harvest/index.html>  
Canadian & International Green Links <http://www.raysweb.net/greenlinks/>  
Audubon Refuge Planning: <http://refuges100.fws.gov>  
Alaska Coalition: <Http://www.alaskacoalition.org>  
National Wildlife Federation: <http://www.nwf.org>  
International Agreement: <http://arcticcircle.uconn.edu/ANWR/anwrint-agreement.html>  
Canadian- American Govt site: <http://can-am.gc.ca>  
US Fish and Wildlife has several sites, enter key words  
Alaska Fish and Game <http://www.state.ak.us/local/akpages/FISH.GAME/notebook/biggame/caribou.htm>  
Department of Resources, Wildlife, and Economic Development, Northwest Territories Government  
<http://www.gov.nt.ca/RWED/index.html>  
Department of Resources, Wildlife, and Economic Development, Inuvik, NWT  
<http://www.inuvik.rwed.gov.nt.ca>  
Department of Environment, Yukon <http://www.environmentyukon.gov.yk.ca/main/index.html>