Flora and Fauna: Animal Population

chuttui / tuttu
caribou
What are the effects of oil exploration on Arctic wildlife populations?

Alert!

We have some breaking news from WPH. Team GoNorth! needs your help.

When Senator Frank Murkowski of Alaska compared the Arctic National Wildlife Refuge (ANWR) to a blank sheet of white paper in his address to the Senate, he did not keep in mind the 150,000 members of the Porcupine caribou herd and the other 250 animal species that call ANWR home.

While winter is a time when many of those animals are hibernating or have migrated south, many more remain year-round. “Sometimes it can seem like we’re traveling on an endless conveyor belt of white,” comments expedition leader Paul Pregont. “During blizzards and high winds, the Arctic can seem like a cold and lifeless place. In fact, I have traveled in conditions so hostile that I could barely see past my lead dog, Aksel. But those are also the times that help me realize how special the Arctic really is.

During the expedition, however, Team GoNorth! will most likely encounter many different animals like wolves, wolverines, ravens, arctic hare, arctic fox, caribou, ptarmigan, mink, snowy owls and even…polar bears. And that’s just a start. Many smaller mammals and insects spend their winter nestled safely under the snow in the small air space above the ground. There isn’t a day that goes by that team members don’t see some sign that an animal has passed nearby.

Before the departure of the expedition, GoNorth! team member Aaron Doering reported that one of the highlights of the expedition is bound to be the caribou. Of course, the trick is to keep the Polar Huskies from getting too distracted. With such a large population of caribou, expedition team member Mille Porsild comments, that can be a difficult task.

Ironically, the Porcupine caribou herd is the same group of caribou that some scientists label as a “threatened species.” This is of great concern to Native and non-Native residents of the Arctic alike, many of whom survive on wild plants and animals that may be contaminated with chemicals. Gwich’in Elders have observed that oil exploration seems to be affecting the migration pattern and lives of both caribou and whales, which in turn, impacts the traditional Alaskan way of life.

The extreme conditions of the Arctic environment make for animal populations easily impacted by alterations in habitat or food supplies, as may be the case with the Porcupine caribou population.

Furthermore, it has recently become obvious that the Arctic is not as isolated from more heavily populated areas as was once thought; in fact, our far-removed modern civilization is having an impact on this fragile region. For example, industrial activities are responsible for the presence of many persistent organic pollutants and toxic metals in the Arctic that are neither produced nor used there, but rather are transported through the atmosphere and deposited on Arctic land and water surfaces. The buildup of contaminants in the Arctic food chain is a particular hazard to the polar bear, which is now listed as an endangered animal throughout the Arctic.
Scientists report that unless drastic changes are made to limit pollution and, most importantly, the progression of global climate change—the greatest threat to polar bears and their habitat—they expect there to be no more polar bears on Earth in year 2104, only one hundred years from now.

Team GoNorth! is on the trail collecting firsthand facts, but they need your help doing three things. One is to study how Arctic animals, such as the caribou, survive living in the Arctic in the first place. Two is to investigate the role of caribou, both in the past and today, to the Gwich’in culture. And three—based on your analysis of the Porcupine caribou herd—to provide a recommendation on whether oil exploration can actually affect animal populations, especially caribou.

After determining the effects of oil exploration on Arctic animal populations, you will be asked to fly to Washington, DC. There, along with members of the National Resource Defense Council, you will report to the U.S. Senators on the state of the Porcupine caribou herd and what individuals can do on a local scale to save threatened species and habitat.

Good luck explorers—and we look forward to report your findings right here on WPH.
Summary: The Arctic region of northern Alaska is a complex and fragile ecosystem. Plants and animals employ many different survival strategies in order to live. In the past and today, the lives of the Gwich’in are directly tied to caribou for food, clothing, shelter, and tools. Learn about the role of caribou in the lives of the Gwich’in and how it is changing today, and then take an in-depth look at the Porcupine caribou herd. Chat topic: biodiversity.

Concepts:
1. Arctic animals are uniquely adapted to live and survive.
2. Caribou play an important role in the lives of Alaskan Natives.
3. The health of the Porcupine caribou herd is affected by many factors.
4. Humans have a great ability to change wildlife populations.

Table of Contents

Arctic Animal Adaptations
Background ........................................................................................................4
3-1 My Arctic Mural ....................................................................................6
3-2 Population Cycles Built by You! ..........................................................8
3-3 Arctic Survival .....................................................................................10

“People of the Caribou”
Background ........................................................................................................12
3-4 Caribou Legend ..................................................................................14
3-5 Caribou Hunt ......................................................................................16
3-6 Caribou Dilemma ................................................................................19

Case Study: The Porcupine Caribou Herd—The Importance of Happy Caribou Mothers!
Background ........................................................................................................21
Fact Finder : A Year In Caribou Life ........................................................22
  3-7.1 Gimme Some Space ..................................................................23
  3-7.2 Migration Migraine ..................................................................24
  3-7.3 Brief Your Representative! ...................................................27
Geographic Information System ..................................................................28
Think Global—Act Local ...........................................................................29
  Endangered Polar Bears ........................................................................30
  Nature Watch! ....................................................................................31
Your Voice!
  Online Chat 03: Biodiversity ..............................................................32
  Questions for the Team ........................................................................33

Teacher Notes / Student Pages ....................................................................34

References and Resources ...........................................................................68
Arctic Animal Adaptation and Survival

Guiding Question: What factors affect the survival of Arctic wildlife populations?

Key words: adaptation, population dynamics, habitat, limiting factors

Background: Northern Alaska contains some of the coldest and harshest inhabited areas on the earth. It is a truly Arctic place, with many spots that average winter temperatures of minus 30 degrees Fahrenheit. Summer temperatures warm to above 60 degrees throughout the Brooks Mountain Range. Because the average temperatures are so low throughout the year, permafrost exists in most Arctic areas. Permafrost is water permanently frozen in the underground layers of soil.

Usually, during the “warm” Arctic summer, the surface layer thaws; however, the layer of ice a few feet below the surface remains frozen year-round. Winters are usually cold and long. Average precipitation is low and occurs mostly as snow. As a result, the summer landscape of the Arctic is dotted with marshes, shallow lakes, bogs, and ponds. Life is challenging for most plants and animals that live in the Arctic. At these latitudes, high winds, low temperatures, and shallow soil conditions limit the ability of woody plants to grow. The resulting treeless plain is called tundra.

The Arctic is often referred to as “barren ground,” which implies a lifeless landscape. Actually, the Arctic is not barren at all, but a diverse place with many different types of plant and animal life. Hundreds of species of herbaceous plants, mosses, and lichens inhabit Arctic regions. Most have developed adaptations to promote photosynthesis at high latitudes, such as retaining leaves for long periods, even over the winter, in order to be extra ready to process sunlight as soon as possible in the spring.

The survival strategies of Arctic animals are complex. Some species simply migrate, whereas others hibernate to escape the big freeze. Those that stay active during the winter months are highly adapted to the harsh conditions. One example is the large surface-to-volume ratio of Arctic mammals to reduce heat loss. It is a natural reaction when cold to curl up into a tight ball to keep warm. This not only traps warm air, it also lowers the surface area, or amount of skin exposed, from which heat can

ACTIVITIES

3-1 My Arctic Mural ..................................................... 6
Research Question: What animals live in the Arctic and what are their characteristics?

3-2 Population Cycles Built by You! .............................. 8
Research Question: How do wildlife populations change over time?

3-3 Arctic Survival .....................................................10
Research Question: What are the strategies of Arctic animals to survive winter?
be lost. Small animals have a larger surface-to-volume ratio, which means there is more area from which heat is lost relative to their total size. The opposite is true for larger animals. Thus, the polar bear is much larger than its temperate and tropical relatives.

Bigger, however, is not always better in the Arctic, especially for appendages. Arctic animals have small appendages. The best example of this pattern is the Arctic fox, which has small projected body parts including muzzle, ears, legs, and tail, compared to its temperate zone relatives. Being small decreases the surface-to-volume ratio and thereby reduces the amount of exposed surface from which it loses heat. Long ears may be all the better to hear with, but they are also far more likely to get frostbitten!

The tundra’s permanent animal residents include small herbivores like lemmings, hares, voles, and ground squirrels and larger mammals like caribou, polar bears, musk ox, Arctic fox, and wolves. In the ocean, sea mammals like beluga and bowhead whales, narwhals, walrus, and seals roam the Arctic waters in search of food.

Sea birds like gulls, auklets, ducks (eider, northern pintail, etc.), murres, guillemots, loons, and puffins are also present in large numbers during the summer months. Ptarmigan, ravens, geese, snowy owls, terns, jaegers, and countless others species live on the coast or further inland. More than 150 bird species make northern Alaska their summer home. Only a few remain throughout the winter.

The extreme conditions of the Arctic environment make for animal populations easily impacted by alterations in habitat or food supplies. Furthermore it has become clear that the Arctic is very much a part of the world we all live in; it is impacted by our activities in the more industrial southerly latitudes of the planet. Unfortunately, nearly all of the organochlorine compounds (OCs) detected at southern latitudes have also been detected in the Arctic. OCs are anthropogenic (human caused) compounds that include pesticides such as lindane, chlorodane, endrin, dieldrin, toxaphene, hexachlorobenzene (HCB), and dichlorodiphenyl trichloroethane (DDT) and polychlorinated biphenyls (PCBs) to name a few. Since the Arctic has few local sources of pollution, most of the contaminants affecting it have traveled many miles from low- and mid-latitude sources. Once released into the environment they reach the Arctic through the atmosphere, rivers, and ocean water currents. The hazard lies in the continuous accumulation of contaminants transported to the Arctic in a process know as bioaccumulation. As the contaminants arrive in the Arctic via atmosphere, rivers, and ocean water currents, they tend to settle into the lower end of the food web. Unfortunately, due to the extreme conditions of low temperatures and long periods of darkness, they do not “burn off” as easily as in the lower latitudes. One organochlorine, for example, has a “shelf life” of eight months in the lower latitudes but in the Arctic region lasts for 40 years.

This phenomenon is of great concern to Native and non-Native residents of the Arctic alike, many of whom survive on wild plants and animals that may be contaminated with these materials. Over the past two decades, a series of unusual changes have occurred in the Arctic that may be related to release of greenhouse gases into the atmosphere by industrialized nations. Sea ice and permafrost are decreasing, precipitation patterns are changing, the air is warmer, and the intensity of harmful UV radiation is increasing. These climactic changes will forever alter life in the Arctic.

The web of life delicately connects plants and animals together to form a balanced ecosystem. It is important to realize that each web can only exist within a certain narrow range dictated by our climate. John Muir once wrote that “when we try to pick out anything by itself, we find it hitched to everything else.” A change in the earth’s atmosphere affects the earth’s climate, which in turn, affects life on earth.
My Arctic Mural

Research Question: What animals live in the Arctic and what are their characteristics?

Background: The Alaskan Arctic is home to a wide variety of plants and animals. For example, the wilderness area of Alaska National Wildlife Refuge in northeastern Alaska, is host to 36 fish species, 36 land mammals, 9 marine mammals, and more than 160 migratory and resident bird species. While some of these animals are year-round residents, others migrate to avoid the harsh conditions of winter. Regardless, all are adapted to the extreme conditions of the north.

An adaptation is something that helps an animal survive. These can be physical, like the shape of a bird's beak or the color of a polar bear's fur. Other adaptations are behavioral, for example, when a bird flies south for the winter or how wolves hunt in packs. Animals that live in the Arctic are uniquely adapted to live and survive.

Each animal that lives in northeastern Alaska must fit a specific role (niche) in order to survive. Because these animals have adapted to such an extreme environment, any changes to their habitat (food, water, shelter, or space) can have a dramatic effect on their populations.

There are three classifications of how wildlife species react to winter: chionophiles, chioneuphores and chionophobes. These words are all based on “chion,” the Greek word for snow. Chionophile means, literally, “snow lover,” while chioneuphore translates to “snow tolerator,” and chionophobe means “snow fearer.”

Snow lovers fare so well in winter they have actually developed special characteristics to help them in snow and cold. For instance, the snowshoe hare, the ptarmigan and the weasel all turn white for camouflage. The polar bear has an amazing winter coat, and the caribou and the lynx have feet especially designed for easy travel over snow.

Snow tolerators generally get through winter pretty well, even though they have no special adaptations. They take advantage of their snowy environment as best as they can. Mice and voles, for instance, tunnel under snow to keep warm and to hide from preda-

Additional Resources:

http://www.arctic.uoguelph.ca/cpl/organisms/animals.htm
Visit the University of Guelph’s Canada’s COOL Polar Life site for more information on plant and animal adaptations to life in the Arctic.

http://www.adfg.state.ak.us/pubs/notebook/notehome.php
Meet the animals of ANWR and get to know everything about them here!
tors. Deer and elk pack down trails that make traveling easier, and bears hibernate. In a very severe winter, however, many snow tolerators will die.

**Snow fearers** know better than to stick around in winter! Hummingbirds and other feathered species head south—otherwise they would simply freeze to death. (No wonder they are snow fearers.)

*Similar definitions can be used to describe insects and plants as well. For instance, spruce trees, could be considered snow lovers. They have developed branches that slant downwards so snow will slide off without breaking them.*

**Procedure:**

1. Using Teacher Notes 3-1a “My Arctic Animal,” familiarize yourself and your students with the following list of Arctic animals:

<table>
<thead>
<tr>
<th>Caribou</th>
<th>Wolf</th>
<th>Lemming</th>
<th>Tundra Shrew</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tundra Swan</td>
<td>Wolverine</td>
<td>Muskox</td>
<td>Rock Ptarmigan</td>
</tr>
<tr>
<td>Brown Bear</td>
<td>Arctic Fox</td>
<td>Ground Squirrel</td>
<td>Arctic Cod</td>
</tr>
<tr>
<td>Arctic Tern</td>
<td>Lynx</td>
<td>Bowhead Whale</td>
<td>Snowy Owl</td>
</tr>
<tr>
<td>Polar Bear</td>
<td>Snowshoe Hare</td>
<td>Ringed Seal</td>
<td>Narwhals</td>
</tr>
<tr>
<td>Moose</td>
<td>Dall Sheep</td>
<td>Walrus</td>
<td>Snow Geese</td>
</tr>
<tr>
<td>Raven</td>
<td>Snow Bunting</td>
<td>Ermine</td>
<td></td>
</tr>
</tbody>
</table>

2. Use a world map or globe to illustrate the location of your town as it compares to Alaska and the Arctic National Wildlife Refuge.

3. Ask students if they know what animals live in the Arctic, an environment that has long cold winters and short intense summers. Introduce the term adaptation. Discuss adaptations that help the animal inhabitants of northern Alaska survive and the three ways animals can react to winter—snow lover, snow tolerator, or snow fearer.

4. Pass out Student Page 3-1 “My Arctic Animal.” Assign each student an animal from the above list of Arctic animals. Students should record their assigned animals on their student pages. For younger students, you may discuss each animal and its characteristics as a group.

5. Ask students to guess if the species you name is a snow lover, snow tolerator, or snow fearer.

6. Give students twenty minutes to fill out Student Page 3-1b. Allow students access to pencils, crayons, and markers. Visit PolarHusky.com/lessonlinks/ to read the description and view images in the Online Classroom. You may have guidebooks or other reference material to help with accurately depicting their animal.

7. Once the students have completed Student Page 3-1b, ask each of them to introduce their animal to the rest of the class, and identify whether it is a snow lover, snow tolerator, or a snow fearer and some of the adaptations that it uses to survive in the Arctic.
Population Cycles Built by You!

Research Question: How do wildlife populations change over time?

Background: In order to live and survive, animals need food, water, shelter, and space. Each of these habitat requirements also needs to exist in a suitable arrangement. Quality habitat, in the appropriate proportion, sustains healthy populations. Everything in natural systems is interrelated and populations of organisms are continuously affected by elements in their environment. Wildlife populations do not stay at the same static number year after year but are continually changing in a process of maintaining a dynamic equilibrium. The term “carrying capacity” refers to the largest populations that a habitat can sustain while still remaining healthy.

A variety of factors affect the ability of wildlife to successfully reproduce and to maintain their populations over time.

In the wild, population is controlled by limiting factors. Limiting factors are considered to be anything that limits the presence, growth, abundance, or distribution of plants and/or animals in an ecosystem. Limiting factors such as predators, disease, weather, fire, accidents, and pollution can all affect wildlife population. Without these types of limiting factors, wildlife population would increase until all components of habitat were used. Some naturally caused limiting factors, as well as culturally induced ones, serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support. An excess of unnatural limiting factors can destroy a whole population.


Additional Resources:

http://www.ecoinfo.org/env_ind/region/caribou/caribou_e.cfm
Graphs data on the Porcupine caribou herd from Environment Canada. Graphs provide excellent visual representations.

http://www.cst.cmich.edu/users/swans1bj/graph/Graph.html
Graphing Tutorial. This tutorial is designed help you understand the basics of graphical interpretation. It’s easy to use and something your students can do on their own.
Procedure:

1. Find and reserve a large outdoor playing field or indoor area. Mark two parallel lines on the ground twenty yards apart.

2. Introduce concepts associated with population dynamics, habitat, and limiting factors. Also, prompt students to think about what animals need to live and survive. Students should identify food, water, shelter, and space—the main components of habitat.

3. Next, inform students that they will be modeling actual Arctic population dynamics and graphing the results. In this activity, there will be two groups of students. Some will be playing habitat, and some will be playing caribou trying to meet some of the habitat requirements. The caribou will have to race against one another to obtain food, shelter, water, and space.

4. Explain that during the activity, both caribou and habitat will need to make signs that depict them as food, shelter, water, or space. Appropriate symbols for each sign are:
   
   **Food**: hands on the stomach  
   **Water**: hands over the mouth  
   **Shelter**: hands over your head  
   **Space**: hands out to your sides.

   Practice the signs with the students.

5. Direct two students to be in one group, and all the others to another group. Each group of students should form a line. The two lines should be parallel to one another. The two students will represent caribou and the other group habitat (food, water, shelter, and space). Instruct students (both caribou and habitat) to face opposite directions and randomly make one of the four habitat signs.

6. On the count of three, the volunteers should face each other while still making their signs. The caribou then run to a habitat component that matches his or her sign. Only the caribou are allowed to run, while the “habitats” should stay where they are. If a caribou finds a component that matches his or her sign and it is not already taken by another caribou, then that caribou and the habitat component will both represent caribou in the next round. If a caribou does not find a match, then that caribou dies and will become a component of habitat in the following round.

7. As the rounds progress, tally how many caribou start each round and how many are left at the end of each round. Introduce limiting factors and discuss with the habitat how they will be affected. Examples of limiting factors that can be introduced include: drought, poison food source, disease, housing development, and predators.

8. Encourage students not to cheat and to keep their sign whether they are chosen or not. Once you have completed at least 15 cycles or years, use Student Page 3-2 “Population Graph” to graph the results.

9. Discuss how and why wildlife populations change over time.

* This activity is adapted from Project Wild’s “Oh Deer.”
Activity 3-3

Arctic Survival

Research Question: What are the strategies of Arctic animals to survive winter?

Background: Arctic summers provide plants and animals with a short but intense growing season. Relatively short summers filled with warm, long days help build strong plant and animal populations. In comparison, a winter environment undergoes many drastic changes: temperatures drop, water freezes, snow covers much of the land, food becomes unavailable, and day length decreases to nearly nothing. All organisms that live in the Arctic are thus faced with a major survival problem: winter. Every plant and animal that makes the Arctic its home has adapted to survive winter in one of several ways. They must snooze, stay, or go away.

Of special interest in this region are polar bears and caribou. The Porcupine herd of caribou migrates hundreds of mile south each year to their wintering grounds. While polar bears spend most of their lives on or near the sea ice, ANWR is the largest onshore denning area for polar bears in the United States.

Hibernation - Animals that hibernate must reduce their body temperatures, heart rates, and breathing rates. They also need to store enough energy (fat) to burn during their sleep. Hibernation is generally a midlatitude winter adaptation as an animal’s body temperature must remain above freezing.

Dormancy – Some animals become dormant, which is different from hibernating. Dormant animals become relatively inactive and their metabolism slows down; however, animals will awaken when weather becomes milder.

Migration – Animals that migrate must build up a huge amount of energy in the form of fat before making their journey. Some mammals and many birds migrate; however, birds use far less energy than mammals as they can travel more efficiently (fly). Many birds spend summers in the north to take advantage of the rich food sources and excellent breeding grounds.

Additional Resources:
- Life in a Deep Freeze—a National Geographic.com Article
- http://www.blm.gov/education/00_resources/articles/alaskas_cold_desert/posterback.html
- Surviving the Arctic Tundra: A Look at Cold-Weather Adaptations by Jeff Brune—a web site with great information and activities.

Assessment: Upon completion of this activity students should:
- Use terms such as hibernate, migrate, and resistance to describe animals that live in the Alaskan Arctic.
- Understand how winter affects the survival of different animals.
- Complete Student Page 3-3.
• **Resistance** – Both plants and animals have adapted a number of different solutions for tolerating cold. Adaptations include thick fur, camouflage, large fat reserves, special antifreeze chemicals (insects and plants), caching food, large feet (like snowshoes), and other shape-related changes.

**Procedure:**

1. Ask students to brainstorm a list of plants and animals that live in the Arctic and write the responses on the board for all to see. Once the list is compiled, ask students to quickly decide if each animal or plant will snooze, stay, or go away. Write these answers next to each plant or animal.

2. Pass out Student Page 3-3 to students. Assign students an animal from the list and have them complete the worksheet. Allow students access to [http://www.arctic.uoguelph.ca/cpl/organisms/animals.htm](http://www.arctic.uoguelph.ca/cpl/organisms/animals.htm) or other reference resources.

3. Once students have completed their worksheet, have them present their information to the class.

4. Divide class into groups of four students. Collect completed worksheets, shuffle them, and give each group four worksheets, face down. It is important that the animals and plants in each group that are given are not revealed.

5. Have the groups of four work in pairs (each group will consist of two pairs of students). One student in the pair will tape a worksheet to the other student’s back. Explain carefully to the students that it is important students should not know the identity of the plant or animal described on his/her back.

6. The student with the worksheet taped on the back must now guess the identity of the animal described on the page taped to their back by asking yes or no questions to the other student in the pair. Rotate within the group of four students until the four animals described on the worksheets have been identified.

7. Next, each group (or the entire class) should discuss the role winter plays in the life cycles of the plants and animals that were originally listed on the board. Examine and list out the costs and benefits of each winter survival strategy.

8. As an addition to this activity, create a “winter survival debate.” Divide the class into four groups and assign each group a winter survival strategy. Each group should gather information on why their particular strategy is the best way for a plant or animal to survive winter.

9. Arrange the debate as you see fit; however, encourage each group to make an opening statement, answer questions, offer rebuttals, and then make a closing statement.

10. Alternate each group for each part of the debate. Once finished, ask the class to vote and decide who has argued the best case.
People of the Caribou

**Guiding Question:** How has the role of caribou changed in the lives of the Gwich’in over time?

**Key words:** seasonal lifestyle
legend
subsistence hunting
wildlife management

**Background:** Alaska’s North Slope, encompassing the Arctic National Wildlife Refuge (ANWR), is one of the most extreme environments in which humans live and work. The average temperatures are too low to grow timber or food. To the Native people of the communities, the Gwich’in and the Inupiat, the means for survival have been, and to a large extent still are, hunting and gathering. The cultural knowledge and practice have been refined over many generations in an environment where one poor decision can lead to the death or starvation of an entire village.

Living on the coast, the Inupiat have traditionally relied on sea mammals, whereas the Gwich’in, living in the forested areas, relied primarily on the caribou. Records indicate that caribou have been hunted in the ANWR for about 300,000 years.

In their own language, Gwich’in means “people of the caribou.” While caribou provided life-sustaining food, the animals were also an important spiritual component of their lives. The traditional belief is that “every caribou has a bit of the human heart in him, and every human has a bit of caribou heart.” Most aboriginal cultures view themselves as part of the environment and not separate from it. This statement underlies a deep sentiment of respect and reverence for the land and its inhabitants. Wildlife is not a commodity and is never to be abused or destroyed needlessly.

Today, caribou is still a major food staple for the remote Arctic communities, where store-bought food is high-priced. The cooperative (the Co-op) in Arctic Village sells a chicken for $9.50 per pound and beef at $11.50 per pound (2004 prices). Relatively low incomes make purchasing these protein sources difficult and caribou meat highly valued. Furthermore caribou meat is very high-quality meat,

**ACTIVITIES**

3-4 “The Man Who Became a Caribou” ......................... 14
*Research Question: What is the importance of caribou to the Native people of Alaska as expressed through stories, music, and visual art?*

3-5 Caribou Hunt .......................................................... 16
*Research Question: Why is subsistence hunting important?*

3-6 Caribou Dilemma .................................................. 19
*Research Question: What is the best way to manage the Porcupine caribou herd?*
low in fat, and containing more protein per pound than beef, pork, or chicken. It is possible to keep a balanced diet simply by eating caribou, with the organs providing a range of vitamins and minerals.

With more than 75 to 80 percent of their resources coming from the land, Gwich’in community members continue to rely on the caribou to meet both their subsistence and spiritual needs. Hunting and living off the land fulfill a major component of their cultural lives. After a hunt, sharing the meat with other community members strengthens social ties and promotes respect and caring for Elders. While many people wear modern clothes, they continue to use caribou skins for winter boots, slippers, purses, bags, and other elements of Native dress.

Crafts and artwork created with materials from caribou are also an important aspect of the northern tourist industry. Based on traditional designs, clothing, foot-ware, bags, and wall hangings are elaborately decorated with caribou hair tufting, embroidery and beads. Before plastic beads were available, porcupine quills were colorfully dyed and woven into flower, animal, and geometric patterns. Bone and antler are carved into ornaments and jewelry. This art form is important not only for its economic value, but also for ensuring that the traditional skills are not lost.
“The Man Who Became a Caribou”

Research Question: What is the importance of caribou to the Native people of Alaska as expressed through stories, music, and visual art?

Background: Caribou are important to aboriginal cultures across Alaska. They form a basic part of the cultures of people living in the Arctic and sub-Arctic. Native people such Gwich’in have depended upon caribou for thousands of years for food, clothing, and a way of life that involves close ties with the northern land.

All human cultures create stories that express ideas about the world around them. They sing songs, tell tales, and create dances and artwork that express how they feel about important natural creatures and places. Stories are passed on from generation to generation, sharing important information about culture and environment. Animals are depicted in stories and legends in various ways according to beliefs about them and their importance. In the north, many stories contain powerful figures based on animals such as the bear, raven, and caribou.

The Gwich’in people structured their cultures around the caribou, forming mythologies, legends, and art. They traveled to known migration routes to intercept herds for hunting. They told stories about caribou. They taught their children to respect these animals. Traditional hunters believed that if they had the right thoughts about animals and treated the carcasses properly, they would always have enough to eat.

Procedure: See page 15.

Activity Level: experience

Subject Areas: social studies, language arts, art

Objectives: Students will:
- Read or listen to a legend about caribou.
- Understand the effects of natural changes in the environment on wildlife throughout the year.
- Interpret a legend by creating a picture.

Time Consideration: 45 minutes

Materials: - Student Page 3-4 “The Man Who Became a Caribou”

Vocabulary: legend, belief, mythology

Assessment: Upon completion of this activity students should:
- Understand the importance of caribou within the traditional Gwich’in culture.
- Study and understand one Gwich’in legend about caribou.
- Illustrate a legend about the relationship of caribou and the Gwich’in.

Additional Resources:
http://www.arctic-caribou.com/links.html “Other Caribou Links”
This web site contains absolutely everything you could possibly want to know about caribou and more.
http://www.oldcrow.ca/stories.htm Read other Gwich’in legends.
**Procedure**

1. Explain to your students that in the Gwich’íin language, “Gwich’íin” means “the people of the caribou,” and how the Gwich’íin for thousands of years have been depending on the caribou for food, clothing, and shelter—and still are today!

2. Read aloud or have students read Student Page 3-4, “The Man Who Became A Caribou.”

3. Have students draw pictures based on what they hear in the story. Have each student explain his or her drawing to the class.

4. Listen to the “Caribou Song” in the Online Classroom at PolarHusky.com/lessonlinks.

5. Discuss the importance of caribou to the Gwich’íin people as portrayed in the legend, the song, and the background information.

Visit PolarHusky.com/lessonlinks for more detail on the Gwich’íin culture.

*This activity is adapted from Project Caribou “First People Stories About Caribou.”*
Caribou Hunt

**Research Question:** Why is subsistence hunting important?

**Background:** Subsistence hunting can best be defined as a type of hunting specifically done for the sole purpose of providing a means of survival for each family or community. Historically, there was no need to differentiate subsistence hunting from other types of hunting like trophy or sport hunting because hunting was simply done to live and survive.

Today, most aboriginal cultures practice varying forms of subsistence hunting. While most supplement their diet with modern foods, ‘country food’ is still an important part of their diet. It also provides an important cultural component to their lives as well. Traditions and values that are learned and passed down from one generation to the next illustrate important social lessons.

The caribou is an excellent example of an animal that is harvested every year for subsistence. Nearly 80 percent of the resources that the Gwich’in use to live and survive still come from caribou. Traditionally, the meat was used for food, skin for clothes, and bones and antlers for food.

**Procedure:**

**Class Period One**

1. Discuss with your students what subsistence is. Have them look up the definition in the dictionary or online. Is this definition what your class expected? How does it relate to what your class thinks subsistence is?

   *For Alaskan Native Students:* Ask your students what subsistence means to them. For example, “What subsistence activities do you and your family participate in?” “What would you do if you didn’t do these activities?” “Are subsistence activities fun?” Or even, “What does subsistence mean to you?”


**Additional Resources:**

- [http://www.taiga.net/projectcaribou/activity_downloads.html](http://www.taiga.net/projectcaribou/activity_downloads.html) All about Caribou. Scroll down this page until you see ‘All about Caribou’ click and read all about caribou.
Module 3 • Flora and Fauna: “People of the Caribou”  ACTIVITY 3-5

3. Discuss why subsistence is important to Alaskan Natives, their families, to their whole community. What would happen if they were not able to subsist off the land?

4. Explain to your class that they are going to be caribou hunters and are going on a subsistence hunt. Discuss with them what parts of the caribou they can use. If you want, you can write the caribou part and its use on the board.

5. Compare the consumptive and nonconsumptive uses of a cow with that of a caribou. Are there any parts of the cow that are used that seem strange or even “gross” to the kids? How about parts of the caribou?

6. Discuss wasteful uses of caribou or any animal with your students. What is wasteful to them?

Class Period Two

Note: Before class, photocopy Student Page 3-5b, “Caribou Cards.” Cut out and tape caribou cards to the chalkboard or any clear area in the class. There should be two caribou cards to every one student. For older students we suggest you also copy Teacher Notes 3-5 “Gwich’in Traditional Management Practices,” as a hand-out to your students for discussion.

1. Explain to your class that they are going to be caribou hunters. They are going to go on a subsistence hunt for caribou.

2. Ask your students if there should be any rules or limits (ordinances) on how many caribou they can harvest. Discuss responses and students reasoning. Ask students to think about their ideas as they play the game.

3. If your class is large, have your students break up into caribou hunting parties with three to four students per group. If your class is small you can break them up in groups of two or even have individual hunters.

4. Write down the total number of caribou cards posted. Explain that this number represents the population of the herd of caribou they are going to hunt.

5. Ask each group to go up, one at a time, and harvest as many caribou as they want, even if they are being wasteful.

6. After the students take all or almost all of the cards from the board ask them to think about and discuss what happened. Did any groups get left out of the hunt because there were not enough caribou?

7. Have each group write the number of caribou they harvested on the board. Then write the number of caribou you started with and the number remaining.

8. Explain to the students that half of the caribou left are females and that each female will have one offspring. Calculate with your students how many offspring will be produced. Add that many caribou to the board. Were there any caribou left to reproduce? If there were caribou left, repeat this hunting style (steps five to eight) for five years (cycles) or until there are no more caribou.

9. Ask your students how the consequences of hunting as many as you want and being wasteful could be avoided. If harvests are limited, caribou can survive to reproduce and raise their young.

10. Have the students return all the caribou to the board.
11. Explain to your students that next, they are going to conduct a hunt with ordinances from the Gwich’in Caribou Commission for their “village,” that is, their class, as guidelines for how many caribou they can hunt. According to the Gwich’in Caribou Commission their village can hunt one caribou per person for a hunting party, (i.e. four people in a hunting party, four caribou can be hunted for that group). For an example of real management practice in the area of which Team GoNorth! is traveling, hand out Teacher Notes 3-5 “Gwich’in Traditional Management Practices.”

12. Have the students develop a hypothesis of how the caribou population will differ over time if there are limits placed on the number of caribou that can be hunted.

13. Have each hunting party go up and hunt for their number of caribou. (Note: in the end there should be half as many caribou left). Have the students count how many caribou were harvested and then subtract that number from the original number on the board. Write down on the board the number of caribou that each group harvested, the number remaining, and how many caribou there will be next year.

14. Repeat this process for four more years with the same ordinance. Discuss with your students how the ordinance affected the caribou population over time.

15. Ask the students to develop a hypothesis about the change in caribou population if animals are taken illegally.

16. Have students go on another hunt where two to three groups (hunting parties) are instructed to harvest three extra animals illegally for wasteful purposes, like head hunting, not needing that much meat, shooting the animal and making no attempt to retrieve it, etc. The rest of the groups will hunt legally as in the last harvest. Repeat this process for the same five-year period.

17. Discuss what happens to the herd population when there is illegal hunting. Count the caribou that are left. Calculate the number of females and offspring like previous harvests. Can the students explain why there are not as many animals as before? Is it important not to be wasteful? Do the students think that it is important for people to obey laws for hunting, fishing, and marine mammal harvest?

18. Ask your students if they understand the consequences of people not obeying laws for hunting, fishing, and marine mammal harvest (All animals over-hunted will eventually disappear).

**Discussion Questions:**

- What are wasteful uses of caribou or other animals hunted in your state?
- How do you think hunting laws should change when there are more hunters? What about when there are fewer hunters?
- How should hunting laws change when the population of the hunted species grows and shrinks?
- How do you subsist, if you don’t hunt, fish, or gather? Where does your food come from?

*This activity is adapted from the U.S. Park Service lesson plant “Activity 9: Walrus Hunt.”*
Caribou Dilemma

Research Question: What is the best way to manage the Porcupine caribou herd?

Background: The Porcupine caribou herd has a range that covers hundreds of miles. Some have even been documented traveling over 3,000 miles in one year. Each spring the Porcupine caribou herd travels from their winter ranges located south of the Brooks Range in Alaska, and from areas in Yukon Territory, to its traditional calving grounds on the Arctic refuge’s coastal plain and foothills. In the middle of this territory is an imaginary line that divides two different countries: the United States and Canada.

Because of this political boundary, special agreements were constructed to help protect the herd that was an important part of the ecosystem as well as a vital source of food and culture to many groups—Native and non-native alike.

Management of the herd must take the following into consideration:

Two federal governments, three state and territorial governments, eight native land claim agreements, five national parks or preserves, two native special management areas, two specific ordinances, Dempster Highway Area Development Act and a Federal Order-in-Council Withdrawal

Procedure: See page 20.

Additional Resources:
http://www.taiga.net/sustain/model/model.html Try “The Possible Futures Model,” an online sustainability model for a caribou population where you make the choices and see the result for up to 40 years!
http://www.yfwmb.yk.ca/comanagement/sgmtplans/pcmbplan/the caribou.html A brief concept map overview of the Porcupine caribou management plan.

Activity Level: expand

Subject Areas: social studies, science, language arts

Objectives:
- Examine their values and beliefs related to wildlife and other elements of the environment.
- Evaluate possible actions they might take that have an impact on wildlife and the environment.
- Discuss, write and make judgments about hypothetical dilemmas concerning wildlife and natural resources.

Time Consideration: 45 minutes

Materials:
- Student Page 3-6a “Caribou Dilemma Cards.”
- Student Page 3-6b “Agreement Between the Government of Canada and the Government of the United States on the Conservation of the Porcupine caribou herd.”

Vocabulary: dilemma, consensus

Assessment:
Upon completion of this activity students should:
- Participate in a discussion that examines the role of wildlife to humans and the environment.
- List and describe individual actions that affect the health of wildlife populations.
- Read a current international treaty and create comprehensive caribou management strategies.
Procedure:

1. Photocopy and cut up the dilemma cards of Student Page 3-6a. You will need at least one card per student.

2. Divide the class into groups of four and give each group four different dilemma cards. Place them face down in the center of the group.

3. Ask a student in each group to draw a card from the top of the stack. The student then studies the situation, decides what he or she should do about it, and formulates his or her reasons.

4. When the student is ready, he or she should read the card to the rest of the group. Then the student needs to explain the decision he or she has chosen and briefly describe the reasoning involved. Each student should read a card to their group. Encourage students to ask questions and discuss answers.

5. Pass out or read Student Page 3-6b, the treaty, “Agreement Between the Government of Canada and the Government of the United States on the Conservation of the Porcupine Caribou Herd,” or have students read it in the Online Classroom at PolarHusky.com/lessonlinks

6. Ask students to determine why it might have been necessary for the United States and Canada to form this treaty. List the costs and benefits associated with this agreement. Discuss if and how the treaty considers the need of the Native people relying on subsistence hunting.
The Porcupine Caribou Herd—
*The Importance of Happy Mothers*

**Guiding Question:** *How is the Porcupine caribou herd being affected by oil exploration?*

**The Case:** Hundreds of caribou cows, heavy with young, stream across a vast meadow carpeted in cotton grass. Abruptly, a cow stops and lowers her head as her sides heave with birthing contractions.

Another contraction seizes her, and she rolls flat on her side as a pale birth sac begins to emerge from her body. Minutes later, a glistening calf struggles to its legs and is soon tottering under its mother, bunting her udder for life-giving milk.

Every year, caribou of the Porcupine caribou Herd travel thousands of miles and endure incredible hardships to return to their calving grounds on the coastal plain of Arctic National Wildlife Refuge (ANWR), a region also known as the “1002 Area.” Biologists have tried for decades to answer these questions: What makes this area so special? And how are the Porcupine caribou herd affected by change?

The most challenging question facing caribou scientists today is what changes the proposed oil exploration on the coastal plain of the ANWR (1002 Area) will pose to the Porcupine caribou mothers, and thus to the entire herd?

In the following case study, we investigate the importance of the 1002 Area to the Porcupine herd and in particular to the calving females, in order to evaluate the potential impact of proposed oil exploration in this area.

**The Study**

**I. Fact Finder: A Year in Caribou Life**
- 3-7.1 Gimme Some Space
- 3-7.2 Migration Migraine
- 3-7.3 Brief Your Representative!

**II. GIS: Porcupine Collar Tracking**

**III. Think Global—Act Local**
- Think Global: Endangered Polar Bears
- Act Local—Nature Watch!

**IV. Your Voice**
- Online Chat 04: Biodiversity
- Questions for the Team

**Your Study Resources:**

“Potential Impacts of Proposed Oil and Gas Development on the Arctic Refuge’s Coastal Plain: Historical Overview and Issues of Concern” by U.S. Fish and Wildlife Service [http://arctic.fws.gov/issues1.htm](http://arctic.fws.gov/issues1.htm)

I. Fact Finder: A Year in Caribou Life

**Background:** The Porcupine caribou herd is one of the largest remaining congregations of wild animals in North America. Their range stretches across the Alaskan, Yukon and Northwest Territories. The annual migration of caribou from their wintering grounds to hundreds of miles away to their calving grounds is an incredible phenomenon of nature.

Biologists have tried for decades to understand this complex pattern. Why do caribou seemingly return to the same place every year to calve? What are the effects of man-made changes? Most likely, it is the remoteness of the habitat that has saved the herd from fates similar to the buffalo of the American plains. The herd’s range includes 250,000 square kilometers. In this area are just 7,500 people in fifteen communities and only one highway, the Dempster Highway in Canada’s Yukon and Northwest Territories. However, this protection is being challenged today.

This entire region was deemed so important that in 1980 a bill was passed designating the Arctic National Wildlife Refuge (ANWR), and designated most of the original range as wilderness. However, one part of the original area set aside was not designated as wilderness. This area is now called the “1002 Area.” Section 1002 outlined additional information that would be needed before Congress could designate the area as wilderness, or permit oil development.

In size, the 1002 Area is only one-tenth of the ANWR. However, it includes the largest diversity of plants, animals, and wildlife. These areas separate the mountains of the Brooks Range with the coastal plain and arctic foothills. A Legislative Environmental Impact Statement (LEIS) described that the potential impacts of oil and gas development in the 1002 Area would have major effects on the Porcupine caribou herd and musk oxen. The report states that oil development would result in “widespread, long-term change in habitat availability or quality which would likely modify natural abundance or distribution of species.”

The 1002 lands are very important to the ecological well being of the entire refuge. This area is the calving grounds of the Porcupine caribou herd, as well as an important denning area for polar bears. To successfully reproduce, female caribou must be able to move freely throughout the 1002 Area to find adequate food resources to build up their fat reserves and milk. This allows them to produce healthy calves, thus ensuring the basis of the caribou population.
Gimme Some Space

Procedure:

1. Draw a large map of your school on the chalkboard or butcher paper. This can be done beforehand or with the class. If you decide to make the map with the class, ask for student input about the location of different parts of the school (bathrooms, gymnasium, lunchroom, etc.).

2. Allow each student to come up to the picture one at a time, and mark different areas of the school where they spend time. Be sure to include all aspects of school life: bathrooms, getting dropped off, school buses, play ground, principal’s office, etc.

3. Explain to the students that the school is a “habitat.” It contains food, water, shelter, and space. Ask the students what they might do if they had to do all of those things that they marked on the map in one room. How about a closet? Now ask how the students would feel if one of the places where they spent time was destroyed or damaged?

4. Relate to students that animals also need a healthy habitat in order to survive.

5. Read Student Page 3-7 “A Caribou Year” to your students. Have students draw or present the yearly cycle (a timeline) and the events of a caribou mother. Post it in the Online Classroom at PolarHusky.com if possible and display it in your classroom.

6. Discuss why each of the places are important to the caribou. How do their habitats compare to the student’s school habitat? Why do the caribou need to travel so far in order to survive?

7. Review caribou migration with the students. Ask students if they can think of any things that could happen to a caribou’s habitat that might prevent it from living a healthy life.

8. Briefly explain that the United States is considering exploring for oil in the area that the caribou mothers of the Porcupine caribou herd calve. Based on their study, do they think exploration will impact the caribou mothers?

Activity Level: experience

Subject Areas: social studies, science, language art

Objectives:
Students will:
- Learn about the migration routes of the Porcupine caribou herd.
- Understand the importance of space in a habitat.
- Compare and contrast habitat needs of different animals.

Time Consideration: 1 to 2 45 minute periods

Materials:
- Student Page 3-7 “A Caribou Year.”

Vocabulary: migration, habitat

Assessment:
Upon completion of this activity students should:
- Understand that all animals need food, shelter, water, and space.
- Listen to an account of caribou migration.
- Evaluate the effects of human-made changes on a particular animal population.

Additional Resources:
http://www.hww.ca/hww2.asp?id=117 Discover Your Place in Your Habitat. More information about habitats and how they relate to you. This page contains several other great habitat activities.

http://arctic.fws.gov/cariboumaps.htm U.S. Fish and Wildlife Service’s maps of caribou locations during a typical year in ANWR.
Migration Migraine

Procedure

1. Select a large playing field about 20 to 30 meters in length. Place paper plates in two patches on the playing field as shown below:
   
   a. Choose the number of plates so that you have one plate for every three students at each end of the field.
   
   b. Designate one end of the field as the “wintering habitat” and the other as the “breeding habitat.” You will have two sets of plates: one set in the breeding habitat and one set in the wintering habitat.

2. In preparation for the activity, divide your class into four teams. Have each team study and read Student Page 3-7 “A Caribou Year.” Each team should develop a “timeline” of events for a caribou mother in a yearly cycle. Display it in your classroom and if possible post it in the Online Classroom at PolarHusky.com.

3. Explain to the students that they will be transformed into caribou who have to migrate to their summer and winter grounds.

4. Go to the playing field. Explain that students will migrate between the wintering and breeding habitats at your signal. Tell them that the paper plates represent “suitable habitat” for migrating animals. At the end of a migration, each student will have to have one foot on a paper plate in order to be allowed to continue. If students cannot get a foot on a plate, that means they have not found any suitable habitat. They “die” and have to move—at least temporarily—to the sidelines and watch.

5. Explain that many factors will limit the survival of populations of migrating animals. Some involve:
   
   a. Changes in wintering and breeding habitats.
   
   b. There will be times of abundant food, water, shelter, and space, all suitably arranged to meet the habitat requirements.

Additional Resources:

http://encarta.msn.com/encyclopedia_761557464_1_5/AnimalMigration.html#s5 A comprehensive encyclopedia article from Encarta detailing important principles of migration.

http://www.ucsusa.org/global_environment/archive/page.cfm?pageID=780 A long look at the costs of development in ANWR.
c. There will be other times when habitat is stressed, with many factors limiting the potential for survival. Sometimes, the area of available habitat will be reduced.

Tell the students that, for the purposes of this activity, only three individuals can occupy a “habitat haven” (paper plate) at any one time.

6. Begin the activity with all students at the wintering habitat. Announce the start of the first migration of caribou. Have students migrate in slow motion until they become familiar with the process. For fun, have them flap their arms, trot, and grunt as they migrate. Then, they can speed up. On the first try, all caribou will successfully migrate to their breeding grounds.

7. Explain that there has been no loss in the area of available habitat. Thus, a successful breeding season is at hand.

8. Before students begin their return migration, remove one plate from the wintering area. Explain that a large expanse of habitat has temporarily changed: Cold temperatures have slowed the thawing of snow in the calving grounds. Some caribou will have nowhere to feed or rest at the summer calving grounds. Repeat the instruction to migrate and send students to the wintering habitat. Have the three students that are temporarily eliminated stand on the sidelines. Tell students that these three “died” as a result of the loss of habitat.

NOTE: The series of migration cycles may be graphed if desired.

9. Before the next migration, remove four plates from the breeding area. This change represents a catastrophic habitat loss. Tell the students that this incident resulted from an oil spill. Then, instruct them to migrate. Many students will find themselves on the sidelines, waiting to reenter the activity.

10. Before many cycles are repeated, provide sidelined students with opportunities to reenter the breeding area. During some migrations, give students examples of favorable changes in habitat conditions that would make it possible for them to survive. (See the table below for both favorable and limiting factors). Two students can be made permanent monitors to restore or remove paper plates to or from the breeding and wintering grounds as instructed.

11. Repeat the process for at least eight cycles to illustrate changes in habitat conditions with resulting effects on migrating caribou.

12. In discussion, ask students to identify the apparent causes of the caribou’s population decline from year to year. Ask them to imagine what may be the major factors contributing to habitat loss and degradation. Ask them to make predictions about the effects of these factors. Distinguish between short and long-term effects. Distinguish between gradual and catastrophic changes.

13. Ask students to summarize what they have learned about factors affecting the success of animal migration. List, discuss, and compare and contrast human-caused factors and environmental factors. Highlight those factors that students identify as posing the most significant long-term threats to the survival of migrating animals.

14. Relate their findings to the Porcupine caribou herd. Discuss whether your student based on their study believes that oil exploration in the 1002 Area will have an effect on the caribou population.
Favorable changes
- Low snowfall in winter, meaning food/lichen easier to find
- Insect population low
- Warmer winter
- Low snowfall during migration time

Limiting Factors
- Deep snow delaying migration
- Lack of food/lichen at calving grounds
Brief Your Representative!

Procedure:

1. Pass out Student Page 3-7.3 “Brief Your Representative” to your students.

2. Identify students’ state representatives (i.e., senator, governor). Explain that they have been selected to write a briefing for their representative, titled “The Impact of Proposed Oil Exploration in ‘1002’ on the Porcupine Caribou Herd Population,” in order to prepare the representative for the final vote on whether to allow oil exploration to take place in the ANWR. Explain that this is an ongoing and very heated debate, which has been receiving a lot of attention since the election of the Bush Administration in 2000.

3. Explain what the briefing should contain (see Student Page 3-7.3a) and stress that it is their aim to be as objective in their writing as possible.

4. Students can work alone, in small groups, or as a class. Copy the resources needed for them to produce the briefing (or view the materials online):
   - Student Page 3-7 “A Caribou Year” (http://alaska.fws.gov/nwr/arctic/caribouyear.htm)
   - Student Page 3-7.3b “Caribou Maps” (http://alaska.fws.gov/nwr/arctic/cariboumaps.htm)
   - Student Page 3-7.3c “Porcupine Caribou"

5. Allow students time to write the briefing.

6. Once they are written, collect them from students and mail them to your state representatives.

7. Make sure to post the briefings in Collaboration Zone 03 if possible!
II. Geographic Information System:  
**Porcupine Caribou Collar Tracking**

**Background:** The Porcupine caribou herd is the same group of caribou that some scientists label as a “threatened species.” This is of great concern to Native and non-Native residents of the Alaskan Arctic alike. Gwich’in Elders have observed that oil exploration seems to be affecting the migration pattern and lives of both caribou and whales, which in turn, impacts their traditional culture and way of life. Therefore, in response to the caribou being classified as threatened species and because their migration patterns may be impacted by oil exploration, scientists have instigated a project that tracks the caribou throughout their migration process. Using satellite collars, scientists keep track of the herd’s migration patterns and are able to show where calving grounds are located.

*To learn more about tracking caribou with satellite collars, visit the Porcupine page in the ANWR section of PolarHusky.com.*

**During this GIS activity,** you are becoming a scientist who will help track the porcupine caribou. Therefore, you will use global positioning system (GPS) latitude and longitude data entering them into a geographic information systems (GIS) to perform numerous analyses. Once the data are acquired, you will explore the data through adding map layers and ultimately analyze the data to come to a decision on the impact oil exploration has had on the migrating pattern and lives of the caribou.

**Begin** by going to the GIS Activities page in the Teacher Lounge section of the Online Classroom at [http://www.PolarHusky.com](http://www.PolarHusky.com), to download the GIS lesson plan with correlating dataset for Activity 3: Porcupine Caribou Collar Tracking.

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**What Is GIS?**

A geographic information system (GIS) is a tool that allows students to collect, store, manipulate, analyze, and display data. A GIS can be used in any discipline, but it is most commonly used in the social studies and science courses. In 1994, the National Geography Standards were published which state, “Geography is composed of three interrelated and inseparable components: subject matter, skills, and perspectives” and all three of these are necessary for a learner to “become geographically informed” (National Geography Standards Project 1994). In order for students to meet these three components, geography educators have stressed that the integration of technology in an inquiry-based, active learning model is required (Nellis 1994). Geographic information systems (GIS) has been called the answer to providing this authentic learning environment based on real world issues within the K-12 classroom (Bednarz and Audet 1999). The National Geography Standards confirmed this, stating they were written, “…with geographic information systems in mind but not immediately in sight” (National Geography Standards Project 1994). However, even though GIS has been called the answer, less than two percent of American high schools have successfully implemented GIS in their curriculum today (Kerski 2001). Therefore, our goal is to give you one of the most authentic learning experiences possible meeting national standards while motivating students to learn.
III. Think Global—Act Local

Background: Animals can be affected directly by oil and gas activities or indirectly via alterations in habitat and food supplies. At sea, animals can be affected by noise, particularly sounds generated by seismic exploration, and by spills of oil and other contaminants. On land, animals can be affected by noise associated with seismic exploration, routine industrial activities, vehicle and aircraft traffic, and disturbance of dens. In addition, animals can be directly affected by changes in vegetation caused by industrial activities, contaminant spills, withdrawal of water from lake and streams, and by the availability food resources.

It is rare that only one limiting factor can bring a species or habitat to the point of being endangered or even threatened. Most often it is a matter of accumulating affects. Arctic animal populations are particularly sensitive to drastic changes, since survival in fierce Arctic conditions is a battle—and Arctic animals are highly adapted to their habitat and environment. Thus they are very sensitive to any changes.

Polar bears are an excellent example. The youngest of its species, it is considered one of the most sophisticated mammals on Earth, with the most sublime level of adaptation to its environment. Nevertheless, the polar bear population is an endangered species.

An endangered species is classified as any species that has so few individuals that it is in danger of extinction throughout all or a significant portion of its geographic range. A threatened species is any species likely to become endangered within the foreseeable future. The International Union for the Conservation of Nature collects information and issues lists about the world’s endangered or threatened species. Today the number of threatened or endangered world species is in the thousands.

Despite its negative connotation, extinction is a natural process. Throughout earth’s history, animals have become extinct for a variety reasons. However, in more recent times, rates of extinction have drastically increased. Rough estimates indicate that between 8000 BC and AD 1975 the average extinction rate of mammal and bird species increased about one thousand fold. Habitat destruction is often blamed for the most dramatic declines of plant and animal populations. Commercial hunting, predator and pest control, pollution, pets, medical research, and the introduction of foreign species also contribute to the disappearance of species.

Fortunately, it is possible for all of us to make changes and take action to limit loss of habitat and species on both a local and global scale. We invite your classroom to join us in understanding the current threats to polar bears globally—and to act locally in your community!
Think Global—Endangered Polar Bears

The coastal plain is not only an all-important calving area for the Porcupine caribou herd, it is also where you can find the highest concentration of on-land polar bear dens.

The threat to polar bears from oil exploration seem less tangible than that for the Porcupine caribou herd—and as such receives a lot less attention. Nevertheless it is very real and in many ways, sums up the situation for all larger Arctic mammals. As oil exploration is added to the list of human activities affecting the population, polar bears are threatened by the accumulation of limiting factors.

**Polar bears are not afraid of man. But man is afraid of polar bear!**

Polar bears are attracted to artificial structures that create leads in the ice, because leads increase the area bears use to hunt ringed seals. Buildings also offer places for bears to forage for human discard and stimulate their curiosity. Not only does this increase the likelihood that bears will encounter contaminants, but also the chances they will need to be driven away or killed to protect human safety. Besides the danger of increased contact with man, potential oil spills would be very harmful and is expected to have major impact on the Alaskan polar bear population.

For most of the year, polar bears are not very sensitive to noise or other human activities. However, pregnant females and those with newborn cubs in maternity dens on both land and on sea ice are very sensitive to noise or other human disturbances. **The 1002 Area of the Arctic National Wildlife Refuge is the largest polar bear denning area in the United States.**

Polar bear mothers being disturbed by oil exploration is a major concern. But it is only one of many concerns for the future of the entire polar bear population throughout the Arctic. Besides being threatened by toxic chemicals and habitat loss, polar bears are most importantly endangered because of climate change.

**Scientist predict that 100 years from today there will be no more polar bears.**

The most serious polar bear threats are global in nature, meaning that the polar bears are impacted not by factors originating in the Arctic, but by needs and actions in the Industrialized world—the world down south!

Join the public awareness campaign in the Polar Bear Collaboration Zone at PolarHusky.com

Visit the Collaboration Zone to learn more about polar bears and why they are endangered—then pick from the following projects and submit to the Zone, entering the contest to WIN!

**Present:** Write a riddle, draw, write an article or essay, create a cartoon, make a PowerPoint presentation, sing a song, take a picture, make a movie—anything you can think of to illustrate one of the following:

1. Polar bear facts—where they live and who they are.

2. Polar bear threats—what are the threats and how do they affect the bears?

3. Polar bear solutions—what can we do to make sure the polar bear is still around for our grandchildren?

Have a polar bear day!
Act Local—Nature Watch!

Take the Endangered Species Pledge. You can download it at http://action.nwf.org/campaign/pledgeesa20040920.

Inform your community. Get your community involved in helping to conserve rare, threatened, and endangered species and their habitats. The more people know about an endangered species or habitat, the more they tend to care whether it is around! Write a newspaper article, make a brochure, buttons, signs, speeches, or videos. Check out the “How To Inform Your Community” page in the Community section at PolarHusky.com for more details and ideas on how to do it.

Adopt a local species or habitat. Design a fundraiser or ask your student council to make a contribution to a local organization dedicated to recovering species and habitats.

A good place to begin is by going to your local DNR website or its office and learn about ongoing wildlife and habitat programs.

For a list of endangered species in your state visit:
http://ecos.fws.gov/tess_public/TESSUsmap?status=listed
or
http://www.endangeredspecie.com/map.htm

To encourage stewardship of the nation’s water resources, the Environmental Protection Agency (EPA) is leading an “Adopt Your Watershed” campaign. Join the effort here: http://www.epa.gov/adopt/

Make a garden habitat at your school. Visit National Wildlife Federation’s “Backyard Wildlife Habitat Program” at http://www.nwf.org/schoolyardhabitats/ for ideas and fundraising support—or to order a “School Habitats ® Starter Kit” ($18.95). By joining the program, your class will have the opportunity to become a “certified” habitat, joining thousands of other school communities!

Another excellent resource for help and ideas is with the U.S. Fish and Wildlife Service: http://www.fws.gov/R5CBFO/schoolyd.htm

If you are starting your OWN habitat at home, make sure to visit National Wildlife Federation’s Backyard Wildlife Habitat site at http://www.nwf.org/backyardwildlifehabitat/

Inspire the rest of us by posting your “results and outcomes” and entering the Zone contest at PolarHusky.com!
IV. Your Voice

Online Chat 03: Biodiversity

Background: Our planet is home to millions of plants and animals. Living on the tallest mountains and in the deepest oceans, the species that inhabit the earth come in a myriad of shapes and sizes. Scientists have already identified almost two million different species and estimate that there are between 3 million to 30 million more that simply have not yet been identified (three-quarters being insects). This amazing biological diversity, or biodiversity, is fundamental to the health and quality of all life.

Protecting and preserving the world’s biodiversity is important for many reasons:

- Economics: Several wild species of plants and animals are useful to people for products that we need to live and survive. Most of the plants that we eat as food were domesticated from wild varieties. Wild plants are also valuable genetic diversity banks. Wild animals can also be considered a renewable resource, if they are used responsibly.

- Medicine: Wild plants are already used in many drugs to help prevent illness. Cures for diseases like cancer and heart disease may lie within some wild tropical plants. Although it is not accepted by all, animals are also widely used in medical testing.

- Stability: Plants and animals live in a complex web of interactions. The more species there are in a system, the easier it will be able to withstand disturbance and accommodate the loss of some species.

- Genetic Viability: The more species that exist, the better the chances that plants and animals will be able to adapt to upcoming environmental changes.

- Tourism: Today ecotourism is a booming business. The money that people pay to see different plants and animals also helps fund preserves and wilderness management programs.

- Aesthetics: Plants and animals are beautiful and bring great pleasure. They need to be protected because of this inherent value.

- Culture: Aboriginal cultures like the Inuit rely heavily on the diversity of natural resources available in an area. As populations of wildlife decline, so do these unique cultures.

Procedure:

Access the expedition website www.PolarHusky.com. Participate in the moderated chat on “Biodiversity” during week 7 and 8 of GoNorth! Check in the chat section of the Online Classroom for exact schedule.

To prepare, open with a discussion on the following questions:

- What plants or animals are important to life on earth? Why?
- List possible threats to preserving the earth’s biodiversity.
- How should people balance progress with protecting biodiversity?
Questions for the Team

While Team GoNorth! does not depend on the plants and animals of the tundra for survival, the team is awed by the amazing biodiversity. Even in such a cold and harsh environment as ANWR, plants and animals live and thrive. Team members feel very lucky when they experience wildlife firsthand.

Use this simple worksheet to prepare questions to send to team members on the trail:

- Email your questions to questions@PolarHusky.com
- Check out the answers in the Question and Answer section of the Online Classroom at http://www.PolarHusky.com

Here are some questions other folks have asked:

1. What animals have you seen so far?
2. How do the Polar Huskies survive the harsh Arctic conditions?
3. Have you met any Native subsistence hunters on the land?
Arctic Adaptations

Biologists call the physical, physiological, and behavioral traits that help an organism survive in a particular environment “adaptations.” Organisms that live in the Arctic and sub-Arctic must have adaptations to help them survive and raise young despite the periodic extreme cold, persistent winds, short growing seasons, and other difficulties posed by their severe environment.

Tundra bumble bees provide a fascinating example of Arctic adaptation. Many insects cease functioning during winter. Since they are poikilothermic, or “cold-blooded,” insect body temperatures are closely related to the temperature of their surroundings. The chemical reactions necessary for insect movement do not occur at cold temperatures. Tundra bumble bees have developed a dense hair on their bodies which slows heat loss to the air. They also “shiver” their flight muscles to generate heat. This heat is temporarily trapped within their velvet coat. Some bumblebees can keep their body temperatures of 20 to 30 degrees Celcius (68 to 86 degrees Farenheit) above air temperatures and are easily active while other insects are too cold to move.

The furry and wax-like coatings of certain tundra plants are adaptations that enable them to resist cold and wind. The fine dense hair around the flowers of the woolly lousewort not only reduces wind chill, but also traps heat from sunlight like the glass of a greenhouse. The flowers are thus surrounded by relatively warm air, sometimes 20 degrees Celcius (34 degrees Farenheit) warmer than the environment. This is quite important because the process of cell division necessary for the formation of seeds cannot occur at cold temperatures. In addition, many tundra plants retain rather than shed their dead leaves each year. The dead leaves serve no apparent purpose except to insulate fragile new buds from the wind and cold.

Most living things are made up of 70 percent water. When water freezes, it expands and forms ice crystals. Repeated freezing and thawing can destroy living tissue. The Alaska blackfish overcomes this problem by producing chemicals within its body that lowers the freezing temperature of cell fluids. Much like the antifreeze we add to the water in our vehicles, the “antifreeze” of the Alaska blackfish prevents the formation of large ice crystals within its cells, even at low temperatures. The Alaska blackfish can survive temperatures of minus 20 degrees Celcius (4 degrees Farenheit) and the complete freezing of some body parts, including their heads, for up to several days.

One of the most obvious adaptations for life in a cold environment is insulating feathers or fur. Most tundra birds and mammals actually have two coats. Ptarmigan, whose feathery coats and thick down even cover their feet and provide a “snowshoe” effect, have the best insulation of any Alaska bird. They can keep their body temperatures at 40 degrees Celcius (104 degrees Farenheit) without increasing their respiration rate, even at air temperatures of minus 34 Celcius (minus 29 degrees Fahrenheit). The ptarmigan’s white winter feathers (brown during summer) not only help camouflage it in the snow from predators, but radiate less heat back to the frigid air than would dark feathers.

Other adaptations to cold climate include large size and short appendages. Since small animals have more surface area relative to their weight than large animals, they lose heat more quickly. Musk oxen are one of the largest mammals found in the Arctic. An average-sized adult bull may weigh 340 kilograms (750 pounds). Their relatively short legs and inconspicuous tails minimize heat loss. Only a small patch between the musk oxen’s’ nostrils and lips is hairless. The rest of the body, including the head and ears, are all densely haired. In addition to the animal’s long, course, guard hairs is an exceptionally effective insulating layer of the finest wool grown by any mammal. Below minus 40 degrees Celcius (minus 40 degrees Farenheit), musk oxen lie with their backs or sides to the wind and choose sheltered valleys or slopes during storms. Slow movements conserve energy in winter and reduce the likelihood of overheating during the brief but warm temperatures of summer.
Arctic Animals—Snow Lovers or Haters

**Caribou**

Caribou most often live on Arctic tundra, mountain tundra, and northern forests, and have been part of Alaska for thousands of years. There are about 500,000 wild caribou in Alaska in about 25 herds. They are large, stout members of the deer family. Caribou have developed large, concave hoofs that spread widely to support the animals in deep snow and soft tundra and function well as paddles when they swim.

**Tundra Swan**

Tundra or whistling swans are the largest and heaviest birds found in the Arctic, measuring over a meter (three feet) long and weighing six to seven kilograms (13 to 15 pounds). Tundra swans breed in lakes and rivers (freshwater habitats) across the Arctic from the treeline north to the southern Arctic islands. They winter along the Pacific coast and in the Gulf of Mexico. They eat mostly plants: seeds, stems, and roots and tubers from plants found in the water by dabbling (dipping for food on the water’s surface), or gleaning (picking seeds and grains off the ground). It is not uncommon to see a small group of apparently headless swans floating along, collecting food from a lake bottom!

**Brown Bear**

Brown bears live in much of Alaska. Brown and grizzly bears are now considered to be in the same family. In winter, when food is unavailable or scarce, most Alaska brown bears enter dens and sleep through winter. In northern Alaska, where the winters are long and harsh, brown bears may spend as much as six to seven months asleep in their dens.

**Arctic Tern**

The Arctic tern is one of the greatest travelers in the animal kingdom. Living in the Arctic during the summer, it migrates (flies) to its winter spots in Antarctica—a journey of at least 16,000 kilometers (10,000 miles)! This tern is about 35 to 43 centimeters (14 to 17 inches) in length, smaller than a crow. Because Arctic terns divide their time between the north and south pole, living to enjoy the summer midnight sun of each place, these birds see more hours of daylight than any other animal!

**Polar Bear**

Polar bears spend much of their life on the sea ice. Their white coats are made up of water-repellent guard hairs combined with a dense underfur that covers to the bottom of their feet. Polar bears have short, thickly furred snouts and ears that minimize heat loss to the environment. They have black skin, black tongue, and black paws. They also have extremely sensitive noses. Polar bears can smell a seal up to 20 miles away or under three feet of ice.

**Snow Geese**

The snow goose breeds in the northernmost Arctic regions. They built their nests on the ground, from grass and moss and sometimes lined with down. The snow goose eat mostly roots, shoots, and bulbs of grasses, sedges, berries, and vegetation found in the water, although it will also eat insects and some aquatic invertebrates. Snow geese have a special way of eating known as “grubbing,” they use their bill to dig out roots underwater. They also graze, clipping the stems and leaves of sedge and grasses. When many geese feed continuously in one place, the area can be stripped bare of vegetation.
Moose

Moose are the largest member of the deer family, and the Alaska race is the largest of all the moose. Moose are long legged and thick bodied, adaptations that enable them to move about through deep snow and wetlands and to carry sufficient fat stores. Their thick, hollow hair is fatter at the tip than at the base. The shape helps trap an efficient insulating layer of air next to their bodies.

Raven

The raven lives from the Arctic islands to northern Africa, and it is one of the few birds that can live and survive year-round in the Arctic. Ravens eat almost anything. When there is more food than they can eat at the time, ravens cache, or hide, their food and retrieve it later. Standing on snow and ice is chilly. Ravens have developed knobly feet to reduce their contact with the cold ground. When these birds land, the small bumps on the soles of each foot touch the ground first, keeping most of the foot off the cold snow. This protects the feet and reduces the amount of body heat lost to the cold surface.

Wolf

Arctic wolves generally appear white from a distance, but actually have grey, black, or reddish flecks in their coats. Their extremely dense underfur insulates them against harsh Arctic winters. Wolves hunt and live most of their lives in a pack with other wolves in their territory. In northern Alaska, the wolf is dependent on migratory caribou. Though wolf packs tend to remain within a home range of 200 to 600 square miles, they will abandon their range and travel longer distances if necessary to follow the migrating herds.

Wolverine

Wolverines, a relative of the mink and weasel, are common in Alaska. Wolverines have tremendous physical endurance—they are very strong. They may travel up to 40 miles each day in search of food, a necessity for an animal that does not hibernate. Even though they are not very large (an adult male averages about 14.5 kilograms or 32 pounds), wolverines are capable of bringing down some of Alaska's largest hoofed mammals. They can kill moose and caribou weighing up to 500 kilograms. During the summer, wolverines eat a wide variety of foods: lemmings, voles, ground squirrels, eggs, carrion, berries, and roots.

Snow Bunting

Snow buntings are truly Arctic birds. They are white, but the name fits it so well because it usually arrives to its wintering grounds in southern Canada and northern United States at the same time as the first major snowstorm! For this reason they are also sometimes called “snowbirds.” On the other side, the arrival of the first snow buntings is a sure sign of spring in the Arctic. Snow buntings live and nest in empty lemming burrows. The snow bunting’s song is very easy to recognize: a “ti-ti-chu-ree” repeated numerous times.

Arctic Fox

Arctic foxes are found in the treeless coastal areas of Alaska. They molt twice each year with the changing of the seasons. The white foxes begin to shed their long winter fur in early April, and by late June, the face, legs, and upper parts of the body are covered with short, brown summer fur. The change to winter’s camouflage begins in September, and by October or November, the luxurious white winter coat is complete. In the winter, they dig through the snow to capture lemmings. They have an excellent sense of hearing, which helps pinpoint the location of snow-covered prey. An Arctic fox will also scavenge on carrion left behind by polar bears.
**Lynx**

Lynx, shy and unobtrusive animals, are the only cats native to Alaska. Lynx inhabit much of Alaska’s forested terrain and use a variety of habitats, including spruce and hardwood forests and both sub-alpine and successional shrub communities. Lynx reproduction is highly influenced by small game populations. When prey are abundant, a high percentage of female lynx produce kittens. When prey is scarce, the number of adults that breed declines, and few offspring are produced.

**Snowshoe Hare**

Unlike rabbits, snowshoe hares are born fully furred with eyes open and can walk by the time their fur is dry. The hare’s summer coat of yellowish to grayish brown is replaced by white pelage (fur) in winter. The Arctic hare is active year-round, feeding on Arctic willow, crowberry, meat, and seaweed. The huge feet of these animals act as snowshoes to enable quick escapes on top of the snow.

**Dall Sheep**

Dall sheep live in the mountain ranges of Alaska. Male Dall sheep are called rams. They have massive curling horns. It takes a Dall ram about eight years to grow the majestic, circular horns that are the trademark of this species. The horns are made of keratin, the same substance as fingernails. These all-white sheep live their short lives on alpine ridges and meadows, and on steep, craggy slopes. When Dall sheep sense danger, they flock to rocks and crags to elude predators. Lambs are sure-footed just hours after being born. Dall sheep paw through snow on windblown slopes to browse on dry, frozen grasses and sedges. To balance their diet, these hardy animals travel long distances to eat dirt at “licks,” sites rich in minerals.

**Lemming**

These mice tend to have rounded bodies with long tails and have teeth for eating seeds, grains, and other plant material, as well as insects. Most of them do not hibernate but stay active all winter, tunneling through the space that forms between soil and snow in search of vegetation. Their short appendages (ears, legs, tail) help reduce heat loss, and their fur grows thicker in winter.

**Musk Ox**

The musk ox is called omingmak, meaning “the animal with skin like a beard,” by Inupiaq-speaking Eskimos because of their long guard hair that hangs nearly to the ground. Musk oxen have not changed much since the ice age and are perfectly adapted to live in their harsh Arctic environment. A stocky, long-haired animal with a slight shoulder hump and a very short tail, musk oxen have cloven hooves, all four of which are the same size. Musk oxen underwool—called qiviut—is considered the softest and warmest in the world.

**Arctic Ground Squirrel**

The Arctic ground squirrel lives throughout the Arctic. Known to the Inuit as siksiks—a descriptive term for their alarm call—ground squirrels are the only Arctic mammals that hibernate deeply, lowering their body temperature close to zero degrees Celsius, and their heart rate from 300 to 5 beats per minute. Arctic ground squirrels live in colonies, in a complex system of burrows with several side branches and exits to the surface. They eat a variety of plants, including leaves, seeds, flowers, and roots, and it is not uncommon for hungry adult males to cannibalize young squirrels.
**Bowhead Whale**

The bowhead whale live only in the north in Arctic and sub-Arctic waters, close to the edge of the pack ice. It is called a bowhead because of the curve of its upper jaw. It is also known “the whale with a moustache” because of the sheets of baleen that hang from its jaw. Baleen are horny plates with fringes that act like a massive filtration system for the bowhead’s food. Bowheads are the longest of any whale—up to 18 meters (54 feet) long and weigh 60 to 100 tons, with a 50 centimeter (1 to 2 foot) thick layer of blubber that weighs 30 tons. Instead of tear ducts with water, their tears are grease!

**Ringed Seal**

There are at least one million ringed seal in the Arctic! It is also smallest seal there is; adults measure about one and a half meters (four and a half feet) long and weigh only 50 kilograms (100 pounds) with a thick layer of blubber that keeps them warm. They are brown to bluish black in color with irregular creamy rings. Ringed seals often live alone on land-fast ice. Seals breathe through breathing holes in the ice that they scrape with the strong claws on their front flippers.

**Ermine**

The Ermine is a typical weasel, most often seen dashing across the tundra. Ermines live all over the Arctic region and remain active year-round. Their coat color shifts from brown in summer to white in winter, but the tip of their tail remains black all year. This is said to protect ermines from potential predators such as birds; a raptor is most likely to attack the eye-catching black tip, giving the ermine a chance to escape with minor injuries. Ermines feed on voles, birds, and lemmings, and are able to squeeze their slender bodies into lemming tunnels in pursuit of lunch.

**Walrus**

The walrus is related to seals but has two separate hind legs. Males reach 4 meters (12 feet) in length and weigh up to 1,200 kilograms (2,645 pounds). Walrus are best known for their tusks. They are actually two elongated canine teeth. Their Latin name, *Odobenus*, means “tooth walker,” referring to their behavior of dragging themselves along the ice using their tusks. In summer, walrus herds often bask on small islands or ice floes. Then they turn pink as their blood vessels widen out to not overheat. When feeding, walruses dive up to 100 meters (60 miles) in search of clams.

**Tundra Shrew**

The Arctic Tundra Shrew is the most brilliantly colored shrew in North America. In winter, its black back and brown sides contrast sharply with its grey belly, while in summer its entire coat is a dull brown. It is usually about seven centimeters (three inches) long with a two centimeter (one inch) tail. They eat insects. Because they are so small (their surface area-to-volume ratio is very high), and they live in such a cold place, they need to eat every three to four hours. In fact, a typical Arctic shrew will eat up to three times its body weight in just a day!

**Rock Ptarmigan**

The rock ptarmigan live in the Arctic year-round, often in places without much vegetation and with lots of rocks. They have grey plumage (feathers that covers a bird’s body) in the summer and go completely white in the winter for warmth and camouflage. The snow makes getting around a challenge for the ptarmigan, which spends most of its time walking around on the surface of the ground, searching for plants. In order to prevent itself from sinking, the ptarmigan grows extra long claws on its toes each winter. These claws help it to get a grip on icy surfaces and act as snowshoes in softer areas.
**Arctic Cod**

The Arctic cod lives all over the Arctic and the furthest north of any other marine fish. It likes temperatures below four degrees Celsius (39 degrees Fahrenheit) best, and it is one of the few fish that thrives in temperatures below zero degrees Celsius (32 degrees Fahrenheit). Antifreeze proteins in its blood are one adaptation responsible for this ability. This fish is very important to the Arctic food web and is the number one food source for narwhals, belugas, ringed seals, and seabirds. The age of an Arctic cod can be determined by counting annual rings of growth in its otoliths, the tiny bones in their inner ear, much like counting the rings of a tree.

**Snowy Owl**

Arctic owl, white owl, and snowy owl are all names used to describe this large white predator that thrives on the tundra. This bird is well-known for its unique white feathers, which provide excellent heat insulation as well as camouflage against an icy backdrop. Unlike most Arctic birds, the snowy owl remains white all year long. Feathers extend down the snowy owl’s legs and cover its toes, providing protection from the cold.

Snowy owls typically eat only lemmings in the Arctic. Most owls hunt at night, but these owls live in an environment where the sun may not set for up to four months!

**Narwhals**

The narwhal is a small whale that reaches a maximum length of five meters (15 feet). Adult males have a long, spirally twisted tusk up to three meters (nine feet) long, which come through their upper lip and is hollow for most of its length. Narwhals sometimes travel in herds of more than 1,000 animals, which are so noisy they can be heard several kilometers away. Inuit have long valued the narwhal and hunted it for its tusk and thick skin, which is traditionally eaten raw as a delicacy.

Source: [http://www.nps.gov/akso/ParkWise/Students/ReferenceLibrary/BELA/ArcticAdaptations.htm](http://www.nps.gov/akso/ParkWise/Students/ReferenceLibrary/BELA/ArcticAdaptations.htm)  
My Arctic Mural

Name ____________________________________________________________________________

Arctic animal name __________________________________________________________________

Draw a picture of your animal in this space.

Answer these questions to help you understand more about your animal:

• What types of food does this animal eat?

• How much space does this animal need to live?

• Does this species have any predators? If so, what?
• How does this animal protect itself?

• Where does this animal sleep?

• How does this animal survive the harsh arctic winter?

• What does this animal’s home look like?
Population Graph

Name __________________________________________

Record results from “Population Cycles Built By You!” activity. Use this information to graph the population of caribou over a twenty year cycle.

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Number of Habitats

Year 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Snooze, Stay, or Go Away

Name ____________________________________________________________

Choose a plant or animal that lives in the Arctic and answer the following questions. You may need to find several reference materials to help answer these questions.

1. My Arctic plant or animal is:

2. What type of food does this animal eat?

3. Does this animal’s diet change with the seasons?

4. How does this animal survive winter?

5. What specific physical adaptations does this animal have to help it survive winter?

6. What specific behavioral adaptations does this animal have to help it survive winter?
7. List the resources that you used to help find this information.

Find a picture or drawing of your animal to use in answering the following questions.

8. What is the animal doing?

9. What season is being shown? What clues lead you to believe this?

10. How would this picture change during a different season?

11. Write a short description of what this animal was doing right before this picture was taken or drawing made.
The Man Who Became a Caribou

(From www.gov.nt.ca/kids/legend/inuitleg.htm)

An Inuit man was unhappy because he was a poor hunter.

One day he decided to leave home. He left all his weapons and began to walk inland. All the time, as he was walking, he thought, “I wish I were an animal, not a man. No one can be as unhappy as I am. “He saw some ptarmigan eating the leaves and berries and making little noises. He followed the ptarmigan all day hoping they would feel sorry for him and, perhaps by their magic, change him into a ptarmigan. At last he came to a village where, he knew, the ptarmigan lived when they changed themselves into people. “I’m sorry,” said the chief of the village, “You cannot stay with us. You will not like being chased by the big birds of the air and men with their bows and arrows.” So the hunter left the village and, seeing some arctic hares playing among the rocks, he thought, “That’s the life I want. They seem very happy.” He followed the two hares all day and at last, saw them enter a little house at the bottom of a hill. When he got inside the house there were two old people already there, but no hares. “Why have you followed us?” asked the man. “I want to be a hare,” answered the hunter. “I’m sorry,” said the hare. “You cannot stay with us. You will not like being hunted by the big birds of the air and the men with their bows and arrows.” So the hunter left the little house and walked further inland until he saw a herd of caribou. All day he followed them until, in the evening, he came to a large village. Knowing that all the men were in the meeting house, the hunter went there, hoping that he could talk to the chief. “Why were you following us all day?” asked the chief. “I was not hunting you,” said the man. “See, I have no weapons.” Then the man told everyone of his wish to become a caribou and how he had talked to both the ptarmigan and the hares. They felt sorry for him so the chief allowed the hunter to join them. When the hunter ran with the caribou herd he found it difficult. He could not run quickly. He found the food unpleasant to eat and he did not grow big like the other caribou. Also, he was always afraid because the men came with their bows and arrows, and he never knew whether they were near. Sometimes, there were traps set for caribou, sometimes holes in the ground for them to fall into, but the old hunter who had become a caribou was never caught. Because he was old, however, he decided he would like to see his family again, so he went to see the chief. “It will be very hard,” said the chief. “You are a clever caribou now. It will be hard for you to learn to be a man again.” “I know,” said the hunter, “but I must see my family before I die.” For many days the hunter who had become a caribou walked. When he was getting near his village he was so excited he forgot about the traps, and his legs were caught so that he could not move.

In the evening two boys came and they were very happy to find a caribou in their trap. Before they could shoot him the hunter spoke. The two boys were afraid. “Don’t shoot me,” said the hunter, “Just take your knife and take off my skin.” The two boys did what they were told and were surprised to find a man inside the skin. They recognized him as their father who had left home many years before.

Gwich’in Traditional Management Practices

Richard Caulfield, in his 1983 report to the division of subsistence of the Alaska Department of Fish and Game, Fairbanks, described the traditional Gwich’in management practices as follows:

“[I]n March of 1981 a majority of Arctic Village residents in a general meeting approved limits on the harvest of caribou and procedures to be followed in processing and transporting caribou meat. These written rules, which were designed to apply to all persons hunting in the vicinity of Arctic Village, were said to mirror longstanding unwritten conventions. Copies of these written rules, which were reexamined and then affirmed once again in a general meeting held in January of 1982, were sent both to other communities in the region and to air taxi operators involved in transporting meat. The text of the rules [signed by 46 Arctic Village residents] is as follows:

A. CARIBOU MEAT MUST NOT BE SOLD

B. LIMITS

I. Non-residents: 2 caribou. Hunters will have a guide from the village. Hunters will register with Council. This does not include special events [e.g. potlatch, etc.] request.

II. Residents: 5 caribou. Caribou meat must be butchered properly before transporting to village, and [hunters must] clean butchery area. Meat will be contained in boxes or bags when shipped by plane. Hunters will use high powered rifles. All caribou must be brought into the village.

Residents of Arctic Village report that prescriptions about butchering in the field and the ‘cleaning’ of the kill site by covering it with fresh snow stem from beliefs about the proper treatment of caribou ‘spirits.’ Limits on non-residents apply to all persons who do not live in the community, and are designed to control the harvest activities of, and number of caribou taken by, persons visiting the community. Arctic Village households are limited to five caribou during one hunting trip, in the belief that this is a reasonable number to be properly butchered and transported at one time.”

Although not formally codified, additional tradition rules continue to be practiced:

Other rules relating to the harvest of caribou in Arctic Village pertain to prohibitions against feeding caribou meat to dogs, with the exceptions of bones, scraps, or unused meat. Furthermore, when caribou first appear near the community, customary law prescribes that the first group of caribou are to be allowed to pass by without interference. The belief is that once caribou migrate through without being killed, others will follow believing the route is safe. The failure of caribou to appear near the community during one fall in the late 1970s was attributed by local elders to a violation of this customary law by one individual.

Further evidence of this...element of customary law was documented in Venetie in November of 1981. Caribou had been observed north of the community by a community resident traveling on a scheduled flight between Venetie and Arctic Village. Venetie’s village council chief called a general meeting of all community residents, at which time a consensus was reached that hunting should not begin until greater numbers of caribou were observed in the area. About three weeks later, considerable more caribou were observed, and the village council approved the harvest. The next morning two hunters on snowmachines left in search of caribou.”

Shortly thereafter, a unified Venetie/Arctic village tribal government formally codified traditional principles of caribou management into tribal law. Commented on this step, the anthropologist Stephen Langdon wrote in a 1984 article summarizing Alaska Native Subsistence Practices “that the Venetie [and Arctic Village] community[ies have] taken the step of reifying these traditional spiritual concepts and behaviors into secular law is evidence of both the resiliency of the traditional cosmology and behavior and its ability to be flexibly incorporated into contemporary institutions and practice.”
A Gathering to Learn Traditional Ways


The Shriijaa Khalii River Traditional Knowledge Gathering near Arctic Village, just off the southern boundary of the Arctic Refuge, taught valuable lessons and left local youth with lingering memories and a hunger for more.

Arctic National Wildlife Refuge and Arctic Village residents have been working together on various projects for many years. Both of these long-time partners face the challenge to minimize impacts of human activities on the resources of one of America’s last frontiers.

Three years ago, when refuge staff and residents of Village gathered at Old John Lake (Van Choh Vee), about 20 miles east of the village, that special relationship blossomed. Old John Lake has been an important fishing site for Arctic Village people for thousands of years, and still serves that purpose to this day. The lake, which is within the Arctic refuge, is also a study site for the U.S. Fish and Wildlife Service’s ongoing fisheries research. At the end of that particularly intensive research season, a gathering was organized to thank the local people for helping support the research projects. That first celebration was so successful that it has evolved into an annual event. Every fall a traditional site is chosen in a different remote setting near Arctic Village and a traditional knowledge gathering and potlatch is held.

During the event, Elders teach the youth why the chosen location is important for subsistence use and instruct them in the ways of the Gwich’in Indian traditional culture. This education is supported by information concerning the things that western science says about the land and its resources. Elders and special guest speakers teach the youth a mixture of survival skills and science, including fish biology, wilderness travel preparation and gear choice, wild food preparation and cooking, animal trapping, edible and medicinal plant use, and hunting practices. In addition, Elders tell traditional stories, identify historical sites, and lead the youth in visits to lands owned by Native residents of the village.

In 2002, the gathering was held at K’aiizzihuuzhitgwitsik—or First Tower—within the refuge, about 20 miles north of Arctic Village. In 2003, it took place at Shriijaa Khalii River, in the refuge about five river miles north of the Village. As word about these events has spread to nearby villages, there has been increased interest and involvement from other areas. At this most recent gathering, many young people and Elders participated, representing a number of different villages across Alaska. It was a valuable opportunity to observe and compare the traditional knowledge and skills of different tribes.

On July 31 of this past year (2003), with the rainy fall season making an all-too characteristic beginning, the activities began in early afternoon with a mapping session in the Arctic Village community hall. Local youth learned how to design and label a map indicating areas of traditional and subsistence use.

The following day, with the sun beaming through the clouds and a warm, gentle wind blowing, a large group gathered in boats to travel to Shriijaa Khalii for the beginning of the traditional knowledge gathering. About 50 Elders, adults, and young people took part in the event. It was inspiring to observe the Elders, who have a wealth of knowledge and expertise, passing their valuable traditional wisdom and skills on to the younger generation. Almost everything that was taught at the camp involved hands-on demonstrations using locally gathered natural resources.
At the beginning of the gathering, a local priest and respected Elder blessed those assembled and discussed the history and use of fishing gear. He described the history of Shriijaa Khalii and how it got its name. It means “he pulls out grayling (on a hook).” Using a handmade willow fish trap, he demonstrated how fish are caught in the trap, as well as how to remove fish and store them.

Before items were transported into the Village, local residents ate a variety of local wildlife, and used furs for the cold-weather clothing that is needed in this area. Another knowledgeable Elder spoke about animal trapping and demonstrated setting traps and snares. The students then had an opportunity to make snares of their own. They also learned how to prepare a duck for cooking on a willow branch over an open fire, and they discovered that this is a delicious way to cook duck. From another Elder they learned a second method of how to prepare and cook a duck on a stick over an open fire. It was interesting to see two local ways to accomplish the same task.

A porcupine can be a challenging meal. Students were taught ways to remove the quills and then singe, cut, and cook the animal. Tips for handling porcupines without getting injured were especially appreciated. Everybody had a taste of the meat and enjoyed it. The quills were later used to create beautiful quill and bead earings.

Plants play an important role in traditional survival. Participants learned which native plants to eat and which to avoid, and they identified materials with medicinal use, including specific roots, pitch, bark, and leaves. Shelter is essential in this sub-Arctic land. Gathering participants learned how to build a temporary shelter out of a spruce tree and branches. The shelter looked very cozy and useful as protection from harsh weather.

During the evenings, a group of women who are talented bead-workers taught various methods of sewing beads onto a skin medicine pouch. During this time of quiet conversation, one instructor discussed survival skills, describing what to pack and carry when traveling on small airplanes (the only way to get into and out of the very remote village), spoke of her own experiences in dangerous situations, and described how she had been able to survive these ordeals with the help of a few simple survival items such as tea, matches, knives, fish hooks, and rabbit snares.

On the last day of the gathering, most of the participants hiked to Kiivitanlii Mountain within the refuge. The purpose of the trip was to show the youth that their ancestors used to migrate all over the Brooks Range country, traveling after the animals that were key to their survival.

Starting from the banks of the Chandalar River, the young men and women respectfully picked walking sticks from scattered dry wood and the journey began. The first ones to reach the top were excited to spot two Dall sheep rams. At the peak, there was a rapid change in weather from hail, to rain, to snow. In spite of this, the excursion, and the gathering, was an event that all will remember and treasure—an exciting (and very tiring) time.
Caribou Dilemma Cards

Adapted from “Project Caribou”
CARIBOU DILEMMA CARD #1
You are a member of an environmental group that supports animal rights. However, the caribou population in your area is so high that it is eating all of the food resources very quickly. The data that researchers have collected suggests that if nothing is done, the population will crash in less than ten years due to a food shortage. Wildlife managers have suggested that the number of caribou must be reduced in order to protect the entire population from starvation in the future. However, some members of your group have argued that killing is not a suitable way to limit the population. Your group must vote to decide how to deal with this problem. Do you:

- Vote to allow hunters to kill more caribou?
- Vote to leave the caribou population alone to regulate itself naturally?
- Take some other course of action?

CARIBOU DILEMMA CARD #2
You are a young woman living on a caribou range. Since graduating from high school, you have worked in part-time temporary jobs and are currently unemployed. Just when you think you may have to leave community to find work elsewhere, you hear that a large corporation is proposing a diamond mine in the area, promising many jobs for young northerners. This development may have a negative impact on the caribou upon which most of your family depends. You know that the caribou have not travelled through that area for many years, but you also know from your relatives that caribou migration patterns change over time. In the future the caribou may come in contact with the development. Do you:

- Support the proposal and apply for a high paying job?
- Campaign to prevent the mine from going ahead?
- Move to Anchorage and look for work?
- Support the mine as a source of employment for your friends but not work there yourself?
- Remain in the community, live a traditional lifestyle, and earn extra money working part-time at the band office?
- Take some other course of action?

CARIBOU DILEMMA CARD #3
You are a wildlife biologist who has been contracted by the government to conduct research on barren-ground caribou. One of the projects important to your research involves capturing animals and outfitting them with satellite collars. This will allow you to track their locations with a high degree of accuracy. When seeking project support, you discover two conflicting views. Many elders feel that this practice shows great disrespect to the animals and are morally opposed to it. On the other hand, a majority of hunters is in support because it will help them better understand the caribou and allow them to travel directly to the herd, saving a great deal of time and money. Do you:

- Abandon plans to satellite-collar caribou?
- Work with the community to find alternate ways of collecting the data you need?
- Ignore the views of the elders and side with the majority?
- Try to convince the elders to let you tag one animal as a demonstration in hopes of gaining their support?
- Take some other course of action?

CARIBOU DILEMMA CARD #4
You are a farmer who has just received an agricultural permit to grow potatoes on your land, which is located 50 kilometres from the nearest small community. After planting your crops, you receive a letter from a conservation organization telling you that your fences pose a threat to a local woodland caribou herd. The herd’s movement within its range is restricted by the fences, and several caribou have become entangled in the wire. Do you:

- Look for safer ways to construct your fences?
- Remove the fences and allow wild animals to tramp through your fields?
- Relocate your farm to another area?
- Leave your fences the way they are and hope the caribou will learn to use another route?
- Take some other course of action?

Adapted from “Project Caribou”
### CARIBOU DILEMMA CARD #5
You are a wildlife biologist. One of the most southerly woodland caribou populations in North America is located on an island several miles offshore in an inland lake. There are no predators on this island. This area has the highest known density of woodland caribou in the world, specifically because there are no wolves. During a recent severe winter, the lake froze from the mainland to the island, and two wolves traveled to the island.

The sex and age of these wolves is not known, but it is possible that they will breed, increase in number, and dramatically reduce the caribou population over time. Do you:

- Consider this a natural situation and monitor the establishment of the wolf population and the expected negative impacts on the caribou population, then publish your results?
- Try to kill the wolves before they can breed and increase in number, so that this unique caribou ecosystem will remain?
- Establish a committee to study the question?
- Do nothing?
- Take some other course of action?

### CARIBOU DILEMMA CARD #6
Two years ago you bought and began using a cottage located near a lake. Recently, researchers have determined that a local caribou herd has stopped using the area around your cabin because your presence is scaring them away. They have found that this is an important area during the time that the calves are being born because the lake has many islands which wolves cannot reach. Do you:

- Keep using your cabin and hope the caribou will get used to you?
- Try to keep quiet when at your cabin to minimize the disturbance?
- Sell your cabin and find one somewhere else to go?
- Move your cabin out of the area?
- Take some other course of action?

### CARIBOU DILEMMA CARD #7
You are a hunter out searching for a moose during hunting season. You spot one and shoot it, but when you get up close to it, you realize that it is actually a woodland caribou, which cannot be legally hunted in this area. Do you:

- Bury the caribou in the snow?
- Inform the conservation officer that you found a caribou carcass that someone shot?
- Tell the conservation officer that you shot a caribou by mistake?
- Take the caribou home to eat?
- Take some other course of action?

### CARIBOU DILEMMA CARD #8
You are a biologist responsible for wildlife viewing in your area. A large barren-ground caribou herd is not crossing the highway that crosses their winter range. Regulations are in place, that prohibit hunting along the highway. Local business owners are concerned that with the restrictions on hunting, there will be fewer hunters and thus fewer benefits to the local communities. Wildlife viewing opportunities exist, but there is some concern that the increased traffic caused by wildlife viewers could cause even greater disturbance by increasing road traffic. Local businesses are beginning to exert political pressure to remove the corridor restriction. Do you:

- Advertise the wildlife viewing opportunity in hopes that it will increase education and awareness of the herd?
- Monitor the situation to see how the herd is reacting to the highway with the new corridor in place?
- Allow some hunting from the highway?
- Close the highway altogether when the herd is passing by?
- Take some other course of action?

*Adapted from “Project Caribou”*
CARIBOU DILEMMA CARD #9
You are a young native man who lives in a remote northern community. Your community depends on a herd of barren-ground caribou for much of its food, crafts and clothing. Your culture has depended on the caribou for thousands of years. Your community has worked for many years to keep the range of the herd free from any development. However, there is little local employment. An oil company wants to start oil development in the winter range of the herd and has offered young people from your community jobs and training. A job would give you money and a sense of worth but would go against the wishes of your community. Do you:
• Take the job and live a good “southern” style of life?
• Take the job and try to make sure the company follows all environmental regulations?
• Take the training and then quit, as the training might help you get a job within your community?
• Stay in your community and try to get odds jobs when you can?
• Take some other course of action?

CARIBOU DILEMMA CARD #10
You are a scientist who has discovered that there is a chemical in the noses of caribou that can be used to make a cure for the common cold. You are all set to patent your idea when you realize that many caribou must be killed in order to obtain the chemicals. Do you:
• Keep working to come up with a cure that doesn’t need caribou noses?
• Patent your idea and make a huge fortune?
• Sell your idea to someone else and make a small fortune?
• Take some other course of action?

CARIBOU DILEMMA CARD #11
You are a wildlife manager. In your area, woodland caribou occupy a large portion of the landscape at some times during the year but are never found in high densities. Moose also occur in the area. People hunt moose but are not allowed to hunt caribou. Current logging practices improve the habitat for moose, but are clearly not beneficial to caribou populations. Scientists believe that changes in forestry practices will allow the caribou to continue to occupy their range, while also allowing forestry to continue. However, moose habitat will not improve to the same degree, and the forest industry will not be able to harvest as much wood every year. Do you:
• Continue with current logging practices to maintain wood harvest and improve moose hunting?
• Change logging practices to ensure the survival of caribou, and accept reduced wood harvest and moose populations?
• Change logging practices to ensure the survival of caribou, and restrict moose hunting to protect the diminished moose population?
• Take some other course of action?

CARIBOU DILEMMA CARD #12
You love to ride your snowmobile. You hear that a local snowmobiler’s association is planning to construct a series of trails in a beautiful wilderness area. This area is within the range of a local woodland caribou herd. A meeting is planned to discuss the trail construction. Do you:
• Get ready to experience some new snowmobile thrills?
• Attend the meeting and tell the association to scrap its plans because of possible effects on caribou?
• Ask a biologist to do a study on the area before the trail plan goes ahead?
• Attempt to educate snowmobilers on methods to avoid disturbing caribou during sensitive times of their breeding cycle?
• Take some other course of action?
CARIBOU DILEMMA CARD #13
You are a community health worker. A local study has determined that there are toxic levels of cadmium in the kidneys of caribou and has calculated that eating a certain amount of kidneys from older female caribou is a health risk. The results of this study have been sensationalized by the media and people have stopped eating caribou kidneys altogether. Do you:

• Assume that kidneys are not very important to northern diets and so there is no need to intervene?
• Consult with the communities about the importance of kidneys to local people and then decide if this needs further work?
• Consult with local people about the importance of kidneys to local diets and try to figure out how many kidneys of what age caribou could be consumed?
• Investigate the source of the health standard on cadmium to see if it is relevant to northern diets and lifestyles, make a judgment about the likelihood of anyone becoming seriously contaminated by cadmium in kidneys, and then make a statement about the risk as you see it?
• Take some other course of action?

CARIBOU DILEMMA CARD #14
You are a wildlife biologist. An all-weather road is being built to give northern communities road access to communities in the south. This road cuts through the main migration route of a large herd of barren-ground caribou. Local hunters now have easy access to the caribou. First Nation Elders are worried that the hunting pressure keeps the leaders of the herd from migrating to their traditional areas. They say that shooting the leaders is disrespectful to the caribou and that herd knowledge will be lost. Conservation officers have seen the herd turn back and take an alternate route when hunting pressure on the highway is great. Do you:

• Ignore the concerns of the Elders as most animals still cross the road at some point?
• Close the highway for a period of time when the main herd approaches to allow the leaders to go to traditional areas undisturbed by hunters?
• Try to institute an educational program and ask hunters not to hunt caribou when the main herd approaches?
• Take some other course of action?

CARIBOU DILEMMA CARD #15
You are the chief executive officer of a large oil company that wants to drill exploratory wells in the calving grounds of a caribou herd. Local First Nation people depend on the herd for food and clothing. The oil is needed to serve the growing demand for fuel by southern interests, but the cost of finding oil and transporting it may outweigh the environmental cost. Do you:

• Proceed to drill with environmental safeguards in place to protect the caribou?
• Drill for oil regardless of the environment and give royalty payments to the native people to compensate for damages?
• Decide to drill for oil in less environmentally sensitive areas and recommend protection of the calving grounds?
• Take some other course of action?

CARIBOU DILEMMA CARD #16
You have lived and worked in a small northern community for 20 years. A PhD student from a southern university has contacted you about doing a study of traditional knowledge about caribou in a northern native community. The student has never been to the north and wants to know how to get started with her project. Do you:

• Tell her to forget it because you sense that people are fed up with southern researchers?
• Send her some relevant literature about doing research in the north and/or advise her to contact a First Nation government directly?
• Advise her that traditional knowledge is a touchy subject for research and that she had better make a trip to the north and talk to a lot of people before she decides to pursue this as a thesis project?
• Take some other course of action?

Adapted from “Project Caribou”
Agreement between the government of Canada and the government of the United States of America on the conservation of the Porcupine Caribou Herd

The Government of Canada and the Government of the United States of America, hereinafter called the “Parties”:

RECOGNIZING that the Porcupine Caribou Herd regularly migrates across the international boundary between Canada and the United States of America and that caribou in their large free-roaming herds comprise a unique and irreplaceable natural resource of great value which each generation should maintain and make use of so as to conserve them for future generations;

ACKNOWLEDGING that there are various human uses of caribou and that for generations certain people of Yukon Territory and the Northwest Territories in Canada have customarily and traditionally harvested Porcupine Caribou to meet their nutritional, cultural and other essential needs and will continue to do so in the future, and that certain rural residents of the State of Alaska in the United States of America have harvested Porcupine Caribou for customary and traditional uses and will continue to do so in the future; and that these people should participate in the conservation of the Porcupine Caribou Herd and its habitat;

RECOGNIZING the importance of conserving the habitat of the Porcupine Caribou Herd, including such areas as calving, post-calving, migration, wintering and insect relief habitat;

UNDERSTANDING that the conservation of the Porcupine Caribou Herd and its habitat requires goodwill among landowners, wildlife managers, users of the caribou and other users of the area;

RECOGNIZING that the Porcupine Caribou Herd should be conserved according to ecological principles and that actions for the conservation of the Porcupine Caribou Herd that result in the long-term detriment of other indigenous species of wild fauna and flora should be avoided;

RECOGNIZING that the Parties wish to establish co-operative bilateral mechanisms to co-ordinate their activities for the long-term conservation of the Porcupine Caribou Herd and its habitat;

RECOGNIZING that co-operation and co-ordination under this Agreement should not alter domestic authorities regarding management of the Porcupine Caribou Herd and its habitat and should be implemented by existing rather than new management structures:

HAVE AGREED as follows:

1. Definitions

For the purpose of this Agreement only:

a. “Porcupine Caribou Herd” means those migratory barren ground caribou found north of 64o, 30’ north latitude and north of the Yukon River which usually share common and traditional calving and post-calving aggregation grounds between the Canning River in the State of Alaska and the Babbage River in Yukon Territory and which historically migrate within the State of Alaska, Yukon Territory, and the Northwest Territories.

b. “Conservation” means the management and use of the Porcupine Caribou Herd and its habitat utilizing methods and procedures which ensure the long-term productivity and usefulness of the Porcupine Caribou Herd. Such methods and procedures include, but are not limited to, activities associated with scientific resources management such as research, law enforcement, census taking, habitat maintenance, monitoring and public information and education.
c. “Habitat” means the whole or any part of the ecosystem, including summer, winter and migration range, used by the Porcupine Caribou Herd during the course of its long-term movement patterns, as generally outlined on the map attached as an Annex.

2. Objectives

The objectives of the Parties are:

a. To conserve the Porcupine Caribou Herd and its habitat through international co-operation and co-ordination so that the risk of irreversible damage or long-term adverse effects as a result of use of caribou or their habitat is minimized;

b. To ensure opportunities for customary and traditional uses of the Porcupine Caribou Herd by:

   (1) in Alaska, rural Alaska residents in accordance with 16 U.S.C. 3113 and 3114, AS 16.05.940(23), (28) and (32), and AS 16.05.258(c); and

   (2) in Yukon and the Northwest Territories, Native users as defined by sections A8 and A9 of the Porcupine Caribou Management Agreement (signed on October 26, 1985) and those other users identified pursuant to the process described in section E2(e) of the said Agreement;

c. To enable users of Porcupine Caribou to participate in the international coordination of the conservation of the Porcupine Caribou Herd and its habitat;

d. To encourage co-operation and communication among governments, users of Porcupine Caribou and others to achieve these objectives.

3. Conservation

a. The Parties will take appropriate action to conserve the Porcupine Caribou Herd and its habitat.

b. The Parties will ensure that the Porcupine Caribou Herd, its habitat and the interests of users of Porcupine Caribou are given effective consideration in evaluating proposed activities within the range of the Herd.

c. Activities requiring a Party’s approval having a potential impact on the conservation of the Porcupine Caribou Herd or its habitat will be subject to impact assessment and review consistent with domestic laws, regulations and processes.

d. Where an activity in one country is determined to be likely to cause significant long-term adverse impact on the Porcupine Caribou Herd or its habitat, the other Party will be notified and given an opportunity to consult prior to final decision.

e. Activities requiring a Party’s approval having a potential significant impact on the conservation or use of the Porcupine Caribou Herd or its habitat may require mitigation.

f. The Parties should avoid or minimize activities that would significantly disrupt migration or other important behavior patterns of the Porcupine Caribou Herd or that would otherwise lessen the ability of users of Porcupine Caribou to use the Herd.

g. When evaluating the environmental consequences of a proposed activity, the Parties will consider and analyse potential impacts, including cumulative impacts, to the Porcupine Caribou Herd, its habitat and affected users of Porcupine Caribou.

h. The Parties will prohibit the commercial sale of meat from the Porcupine Caribou Herd.
4. International Porcupine Caribou Board

a. The Parties will establish an advisory board to be known as the International Porcupine Caribou Board, hereinafter called the Board.

b. The Parties will each appoint four members of the Board within a reasonable period following the entry into force of the present Agreement.

c. The Board will:

   (1) adopt rules and procedures for its operation, including those related to the chairmanship of the Board; and

   (2) give advice or make recommendations to the Parties, subject to concurrence by a majority of each Party’s appointees.

d. The Board, seeking, where appropriate, information available from management agencies, local communities, users of Porcupine Caribou, scientific and other interests, will make recommendations and provide advice on those aspects of the conservation of the Porcupine Caribou Herd and its habitat that require international co-ordination, including but not limited to the following:

   (1) the sharing of information and consideration of actions to further the objectives of this Agreement at the international level;

   (2) the actions that are necessary or advisable to conserve the Porcupine Caribou Herd and its habitat;

   (3) co-operative conservation planning for the Porcupine Caribou Herd throughout its range;

   (4) when advisable to conserve the Porcupine Caribou Herd, recommendations on overall harvest and appropriate harvest limits for each of Canada and the United States of America taking into account the Board’s review of available data, patterns of customary and traditional uses and other factors the Board deems appropriate:

   (5) the identification of sensitive habitat deserving special consideration; and

   (6) recommendations, where necessary, through the Parties as required, to other boards and agencies in Canada and the United States of America on matters affecting the Porcupine Caribou Herd or its habitat.

e. It is understood that the advice and recommendations of the Board are not binding on the Parties; however, by virtue of this Agreement, it has been accepted that the Parties will support and participate in the operation of the Board. In particular they will:

   (1) provide the Board with information regarding the conservation and use of the Porcupine Caribou Herd and its habitat;

   (2) promptly notify the Board of proposed activities that could significantly affect the conservation of the Porcupine Caribou Herd or its habitat and provide an opportunity to the Board to make recommendations;

   (3) consider the advice and respond to the recommendations of the Board; and

   (4) provide written reasons for the rejection in whole or in part of conservation recommendations made by the Board.
5. International Responsibility

The Parties will consult promptly to consider appropriate action in the event of:

a. significant damage to the Porcupine Caribou Herd or its habitat for which there is responsibility, if any, under international law; or

b. significant disruption of migration or other important behavior patterns of the Porcupine Caribou Herd that would significantly lessen the ability of users of Porcupine Caribou to use the Herd.

6. Implementation

Co-operation and co-ordination under and other implementation of this Agreement shall be consistent with the laws, regulations and other national policies of the Parties and is subject to the availability of funding.

7. Interpretation and Application

All questions related to the interpretation or application of the Agreement will be settled by consultation between the Parties.

8. Entry into force; Amendments

a. This Agreement which is authentic in English and French shall enter into force on signature and shall remain in force until terminated by either Party upon twelve months’ written notice to the other.

b. At the request of either Party, consultations will be held with a view to convening a meeting of the representatives of the Parties to amend this Agreement.

IN WITNESS WHEREOF, the undersigned, being duly authorized by their respective Governments, have signed this Agreement.

DONE at Ottawa, in duplicate, this 17th day of July, 1987 in the English and French languages, both texts being equally authentic.

JOHN McMillan
For the Government of Canada

DONALD PAUL HODEL
For the Government of the United States of America
A Caribou Year

Source: U.S. Fish & Wildlife Service, Local Culture (http://alaska.fws.gov/nwr/arctic/caribouyear.htm)

Wintering Grounds—November to February

During winter, caribou switch to a diet primarily of lichens. Their favorite lichens grow on the ground in the boreal forest, sometimes in dense mats. Occasionally, lichens are also found on alpine tundra slopes. Caribou can smell lichens even through deep snow. Often, all the snow in a valley becomes cratered by caribou digging for lichens. Lichens are generally less abundant on the arctic tundra, which explains in part why Porcupine caribou herd migrates south for the winter. Lichens are very rich in carbohydrates, which the caribou need for energy. However, lichens are very poor in protein, which animals need for growth. Consequently, caribou tend to lose weight all winter.

Caribou hair is excellent insulation. Caribou also have other adaptations that help them cope with the bitter temperatures of arctic winters. They use their specially adapted, shovel-shaped hooves to paw away snow to get at lichens. Still, winter is a hard time. Deep or crusty snow can make it difficult for caribou to move and feed, while the same conditions make it easier for wolves to run across the surface of the snow to hunt and kill caribou. Old, sick, or weak caribou often don’t survive to spring.

Spring Migration—March and April

In late March, winter still grips the north, but caribou instinctively know that spring is near. Females and their calves of the previous summer begin moving north first. Soon, however, male calves start falling behind, followed later by female calves and then many of the nonpregnant cows. By the time spring migration is in full swing in late April, pregnant cows are far in the lead and bulls are only just beginning to leave the wintering areas.

Deep snows can delay spring migration, but the drive to return to the calving grounds draws caribou ever northward. The caribou often follow rivers, where snow is harder packed and easier to walk on, or they may travel on windswept ridges. Caribou also follow in each other’s trails. There is no “leader” to the migration. Older, more experienced cows are usually at the front, but leadership changes frequently because all of the caribou know instinctively where to go, and because no single animal can continue the tiring work of breaking trail for long. Because of the burdens of plowing through deep snow, spring migration trails are usually more concentrated than during fall. Not until they reach the shallower and harder packed snow of the coastal plain do the northward migrating caribou begin to fan out.

Snow is usually shallower and melts earlier on the coastal plain in the northern Yukon than in other nearby areas. Therefore, Porcupine herd cows that have wintered in Canada and south of the Brooks Range in Alaska migrate first to the northern Yukon before following the coastal plain west to favored calving grounds in the Arctic refuge.

Calving Grounds—May to Mid-June

Female caribou return to the same calving grounds year after year. Each population or herd of caribou has its own calving area. While small populations of caribou often calve in mountains or forested areas, calves of large, migratory caribou populations like the Porcupine herd are typically born in treeless tundra where there are few large predators. The calving grounds of the Porcupine herd stretch for over 100 miles, from the arctic coastal plain of the Yukon Territory in Canada across the border into northeastern Alaska. Many nutritious plants grow on the tundra calving grounds, and insect pests like mosquitoes and warble flies are scarce at calving time.
Because Porcupine herd caribou migrate toward their calving grounds from the east, many cows are forced to give birth in Canada if late snowmelt slows down migration. In normal years, however, the majority of calves are born farther west in Alaska in the Arctic National Wildlife Refuge, where there is generally more nutritious forage and fewer predators. Therefore, calves survive better when calving occurs in Alaska.

Caribou mothers give birth to a single calf. Females typically give birth for the first time when they are three years old, but very well-fed and healthy cows may give birth at age two, and cows in poor condition may not start having calves until they are four years old. Well-nourished adult cows give birth every year, but poorly fed cows may skip one or more years between having calves. Caribou calves are very precocious, so they can run and follow their mothers within a few hours of birth. Nevertheless, young calves are vulnerable to predators such as wolves, golden eagles, and grizzly bears. Caribou milk is rich in fat and full of nutrients, so calves grow quickly. When they are about three weeks old, calves begin to eat some of the same nutritious plants as their mothers. By then, the calves are also big and fast enough to have a better chance of escaping from predators.

**Postcalving Groups—Late-June to July**

The postcalving period occurs in the middle of the summer, after the new calves are born. This is the time when the plants that caribou eat are the most abundant and at their highest quality. By eating a lot of these plants, caribou grow during this time, and they also store the fat they’ll need to survive through the long winter ahead. Bulls put on fat and grow large antlers. Cows grow much smaller antlers and regain some of the weight they have lost during the winter and calving periods, but most of the nutrients they get from the plants they eat goes into milk for their calves. When the calves are three weeks to a month old, they begin to wander with their mothers in search of the best feeding areas.

The postcalving period is also the time of year when hordes of insects emerge and torment the caribou. To escape these pests, caribou travel to beaches and river deltas or run up onto mountains and ridgetops, where cool winds and lack of vegetation keep insect numbers lower than in calm valleys or out on moist tundra. Caribou drift about erratically between favored feeding areas on cool days or at night, and places where they can escape from insects on warm, still days. In addition, cows without calves, yearlings, and many adult bulls continue moving toward the calving area and eventually catch up with the mothers and calves. Caribou actually move about more now than at any other time of year, including during their migrations, but now their movements are haphazard and irregular.

As all these caribou move back and forth between feeding and insect-relief areas, they tend to encounter each other, gather together and mill about in larger and larger groups. These large groups offer extra protection from insects, at least for those caribou in the middle. After a few days of warm temperatures and little wind, nearly all the female and calf caribou in the Porcupine Herd, and often most of the bulls, can be found in a few very large groups, called aggregations, on insect-relief areas near the coast or on high hills near the mountains. The remainder of the adult bulls will also be in a few large groups on mountain tops, though they may be a hundred miles or more away from the bigger groups containing the cows and calves.

**Fall Migration—August to October**

During August, insect pests become less abundant than earlier in the summer, and eventually disappear. Caribou still travel widely in search of the best feeding areas, but they no longer need to congregate in insect relief areas. Thus, the large aggregations break up and caribou disperse widely. Mortality rates often increase as caribou come in contact with more predators. Sometime in late August or early September the caribou stop moving erratically and their travels become more direc-
tional. Often a storm or cold weather starts them moving south toward winter range. Fall migration has begun. Once again, larger groups form as caribou start moving in the same direction.

The rut, or mating season, in early October usually occurs when fall migration is still underway. Caribou are in the fattest and best condition of the year after the summer feeding and growing season. Bulls use their huge antlers to fight each other, and the largest, dominant males do most of the breeding. Fighting during rut puts a great strain on the dominant bulls and puts them in weakened condition before the harsh winter season. Smaller bulls usually come through rut in better shape, meaning they will stand a better chance of surviving winter and breeding in future years.

Fall migrations are often spread over a large area, with caribou moving in the same direction but along many parallel paths. By late October or early November, caribou from the Porcupine herd have usually moved deep into the taiga or boreal forest, though in some years many will remain north of the treeline all winter.
Brief Your State Representative!

The United States Congress has been debating whether to allow North Shore oil development to expand onto the coastal plain of the Arctic National Wildlife Refuge. The potential lease area, known as the 1002 Area, lies within the calving grounds of the Porcupine caribou herd. Breaking news is that the amendment to allow drilling in this area in search of valuable oil resources is now coming up for a final vote in the Congress!

As a trusted adviser of your state representative, you have been asked to develop a short but concise briefing on the impact of the proposed oil exploration in the 1002 Area on the Porcupine caribou population—specifically in regards to calving—for your representative to make a final decision on this important issue to our nation.

With many organizations working to stop the amendment from passing in the Congress, you are aware that emotions are running high. In your position, you must base your briefing on facts and objective resources whenever possible. You have obtained an article by Don Russell of Environment Canada, literature developed by the National Research Defense Council, as well as satellite images supplied by U.S Fish and Wildlife Service in Alaska.

Your briefing should include answers to the following elements:

- How large is the Porcupine caribou herd today?
- Is its population stable, in decline, or increasing?
- What are the limiting factors to the Porcupine caribou herd?
- How is the 1002 Area defined?
- What is the status of the 1002 Area?
- What is the importance of the 1002 Area to (1) oil exploration, and (2) the Porcupine caribou herd?
- Do the Porcupine caribou herd historically migrate to the 1002 Area? Why, or why not?
- How does oil exploration in the 1002 Area impact the Porcupine caribou herd?
- What is the value of the Porcupine caribou herd to people living in the area?
- What is your recommendation?

Once you have completed your briefing send it to your state representative!

Make sure it includes the title “The Impact of Proposed Oil Exploration in‘1002’ on the Porcupine Caribou Herd Population,” your resources, the date, and your name.
Caribou Maps

Source: U.S. Fish & Wildlife Service (http://arctic.fws.gov/cariboumaps.htm)

Traditional ranges of the Central Arctic and Porcupine caribou herds. Individual animals may move beyond these boundaries. (Porcupine caribou herd boundary as depicted in the International Agreement for the Conservation of the Porcupine caribou herd, 1987.)

Satellite locations of Porcupine caribou herd animals in June and July, 1985–2000. These are calving and postcalving months for the caribou. This map includes caribou who moved outside their traditional range boundaries. (The red lines indicate roads and pipelines.)
Historic calving areas of the Porcupine caribou herd. These data represent the years 1961, and 1972 to 2002.

The range and calving area of the Porcupine caribou herd, where it overlaps with lands used by the Central Arctic herd. (See the combined map below.) This map includes caribou who moved outside their traditional range boundaries.
The range and calving area of the Central Arctic caribou herd, where it overlaps with lands used by the Porcupine caribou herd. (See the combined map below.)

A combined view of the overlap of the ranges and calving areas of the Central Arctic and Porcupine caribou herds. This map includes Porcupine caribou herd animals who moved outside their traditional range boundaries.
Porcupine Caribou

By Don Russell, Environment Canada

What is Happening?
The Porcupine caribou herd, a large population of migrating Grant's Caribou which ranges across the border between Alaska, Yukon, and the Northwest Territories, has been an important part of ANWR's natural environment for thousands of years. It is the eighth largest herd in North America.

During the 1980s, the herd grew approximately 4.5 percent per year, numbering 178,000 by 1989 and almost doubling in size since the early 70s. Although the herd is considered physically healthy, by 1998 it had declined to 129,000. In 2001 the herd was estimated at 123,000 caribou.

Over the past 30 years, the reported harvest of the herd has ranged from 2,000 to 7,000 caribou with an annual average of about 2,900 per year. This estimate includes all non-Aboriginal and most, but not all, Aboriginal hunting.

Why is it Happening?
Despite having a comparable birth rate, the Porcupine caribou herd has not grown as quickly as other barren ground caribou herds. This suggests that the Porcupine herd experiences greater mortality than other barren-ground caribou herds.

On an annual basis, the main predators on caribou are wolves and humans. Since the local wolf population is relatively low, it does not have a large effect on caribou populations, taking between 3 and 5 percent of the herd each year. Human hunters take between 2 and 3 percent of the herd each year. In total, about 16 percent of the adult cows die from natural causes each year.

Biologists are uncertain about the causes of suspected increasing "natural" mortality, but they have noted a greater number of thaw days during spring migration periods since the herd has been in decline. These conditions change the structure of the snow and result in harsher traveling and feeding conditions for caribou. Scientists have also noted high variability in spring conditions, including both early melt and very late melt. When environmental conditions such as late snowmelt make it difficult for caribou to reach their coastal calving plains, as seen in 1987 and in the springs of 2000 and 2001, the caribou give birth in areas where predator numbers are higher. Predation rate and food availability are crucial during this period, as 50 percent of annual calf mortality occurs in the first month after birth.
Scientists predict that global warming may cause ANWR to have greater snowfall in winter, faster melt period in spring, and warmer summers. Warmer weather could lead to higher levels of insect harassment in summer; biologists created a model to predict the effects these changes will have on the caribou populations. Already, scientists are noting earlier snowmelts and a general increase in the biomass of green vegetation at calving areas. These conditions are associated with higher early calf survival. Elsewhere in the Arctic, global warming models predict that the habitat of the Peary Caribou on Bathrust Island will experience heavier snowfalls and more freezing rain, conditions that were linked to Peary caribou mortalities in 1974–75 and in three successive winters between 1994 and 1997. In 1998, only 43 Peary caribou remained from a population of 2,400 in 1993 (Miller and Gunn 2003). Another Arctic caribou species, the Arctic Island caribou, migrates across the ice from the islands to the mainland. Warmer weather means the ice melts earlier in the spring and freezes later in the fall making the crossings treacherous.

**Why is it Significant?**

Caribou are the main large ungulates ranging across northern Alaska and Yukon, and the Gwich’in, Inuvialuit, and Inupiat, as well as non-Aboriginal residents from 13 communities in the Yukon, Alaska, and Northwest Territories depend upon them for food and cultural well-being. Wolves, grizzly bears and golden eagles also rely on the herd as an important food source. Human caribou harvest depends on the accessibility of the herd to hunters during the hunting season. At no time has the harvest exceeded three percent of the population, despite a human population increase of 20–30 percent in nearby communities over the last three decades.

Porcupine caribou are most sensitive to disturbance while on their calving grounds and less so while on their winter range. There is potential for serious disturbance of important calving grounds on Alaska’s North Slope if proposals to allow oil exploration in the Alaska National Wildlife Refuge are approved.
Excerpt from “Cumulative Environmental Effects Of Oil And Gas Activities On Alaska’s North Slope” by National Research Council of the National Academies, 2003

**Arctic National Wildlife Refuge—1002 Area** (page 56)

Whether Congress will open the area to oil and gas exploration is unknown, but it is useful to assess what might happen if it did. Of the Arctic National Wildlife Refuge’s approximately 8 million hectares (19 million acres) (Bird and Magon 1987), the only part with potential for oil and gas exploration and development is the coastal plain 1002 Area of approximately 607,000 hectares (1.5 million acres) (Bird and Magon 1987).

The Kaktovik Inupiat Corporation, which controls the surface and mineral rights, own an extensive in-holding in the north central portion of the 1002 Area. This portion of the North Slope has long been considered to have great potential for gas and oil. It lies between the Prudhoe Bay area fields to the west and the numerous but as of yet, uncommercial discoveries in the Mackenzie delta area to the east in Canada. If the first federal lease sale were held in 2006, oil production could begin in 2013 and gas production by 2020. Estimates of the oil and gas potential of the 1002 Area vary.

**Effects on Animal Populations, Caribou, Introduction** (page 106)

The effects of North Slope industrial development on barren-ground caribou (*Rangifer tarandus granti*) herds have been contentious. Although much research has been conducted on caribou in the region, researchers have disagreed over the interpretation and relative importance of some data and the seriousness of data gaps. The disagreements are especially significant because caribou are nutritionally and culturally important to North Slope residents and because caribou are widely recognized as important symbols of the state and well-being of North Slope environments. For these reasons, the committee assembled information on caribou and evaluated conflicting interpretations of the information about how oil and gas development might have affected their population dynamics. The committee’s consensus on effects to date, and projections of probable future effects, is the product of this careful analysis and deliberation. Assessing the effects of oil and gas development on caribou is not straightforward because many factors other than oil and gas activities affect the sizes of North Slope caribou herds—weather, vegetation, disease, and predators, for example. Therefore, there is no steady baseline against which to identify and assess disturbance-induced changes. To evaluate the effects of petroleum development on caribou, the committee examined changes in distribution and habitat use, and evaluated the nutritional and reproductive implications of those changes and how they altered population dynamics.
Resources


