

# Furs of Alaska Mammals

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## A Teacher's Guide

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Alaska Department of Fish and Game  
Division of Wildlife Conservation



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Curriculum Cards



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# Fur Kits

The Alaska Department of Fish and Game has furs that can be checked out by any educator who is teaching about Alaska mammals. These kits are housed in different locations depending upon where you are in the state.

## Interior

Kits are housed at the Fish and Game office on College Road in Fairbanks. They are also shipped out to Interior Alaska villages from this office. For availability call: 907-459-7206 or 907-459-7306.

## Southeast

Kits are housed at the Fish and Game office on 3rd Street in Douglas. They are also shipped to Southeast communities from this office. For availability call: 907-465-4292 or 907-465-4265.

## Southcentral

A fur kit that accompanies this teacher's guide can be checked out by contacting the ADF&G Wildlife Education Specialist, 333 Raspberry Road, Anchorage, 907-267-2168 or 267-2216. Other kits containing furs are made available at Alaska Resources Library and Information Services (ARLIS) located in the Library Building on Providence Drive in Anchorage. For assistance contact the ARLIS reference desk at: 907-272-7547.

## Northwest Arctic

A fur kit is housed in Kotzebue. It can be shipped out to all Northwest communities and villages in or around Barrow, Bethel, Kotzebue and Nome. For availability call 907-442-1714.

*If you are supplying your own furs, here is a list of suggested furs to obtain:*

Beaver	Coyote	Hare	Mink	River otter
Bear	Deer	Lynx	Moose	Sea otter
Caribou	Ermine	Marten	Red fox	Wolf

# 1. Introduction

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## Furs as teaching tools

Mammals in Alaska have evolved a variety of strategies for dealing with our state's notoriously cold, harsh climate. From sea otters in Southeast Alaska to polar bears on the Arctic coast, mammals survive because they have incredible adaptations that allow them to thrive in our climate. **Adaptations** are physical or behavioral changes that allow plants and animals to be more successful under given conditions.

Many of Alaska's animals constantly live in cold, exposed environments that seem harsh by our human standards, holed up in our warm homes and protected from the elements. Some animals migrate away from the cold and snow but many others must stay and live in it. Many mammals hibernate and, if they are fat and healthy, sleep away the winter underground or in the leaf litter on the forest floor. The rest are active and must maintain a body temperature that keeps them alive through the winter. How do they do it? We can learn a lot by looking at their fur.

*Consider for a moment the importance of fur for Alaska's mammals:*

- Imagine the enormous role it plays in insulating arctic mammals.
- Consider its ability to allow for heat dissipation even on a hot summer day.
- Ponder how some change color with the changing seasons, allowing for camouflage.
- Visualize the effectiveness of **pilo-erection** (bristling) in causing apparent increases in size to discourage aggression from others.
- Calculate the number of ways that this surface can protect mammals from mechanical injury.
- Investigate the functions of sweat or **sebaceous glands** as attractants, repellents, and general communicators.
- Consider how different surface types facilitate the gliding of aquatic mammals through water.

There are many more functions of this surface layer. *See how many your class can list.*

Discover many more wildlife teaching resources at:  
[www.wildlife.alaska.gov](http://www.wildlife.alaska.gov)





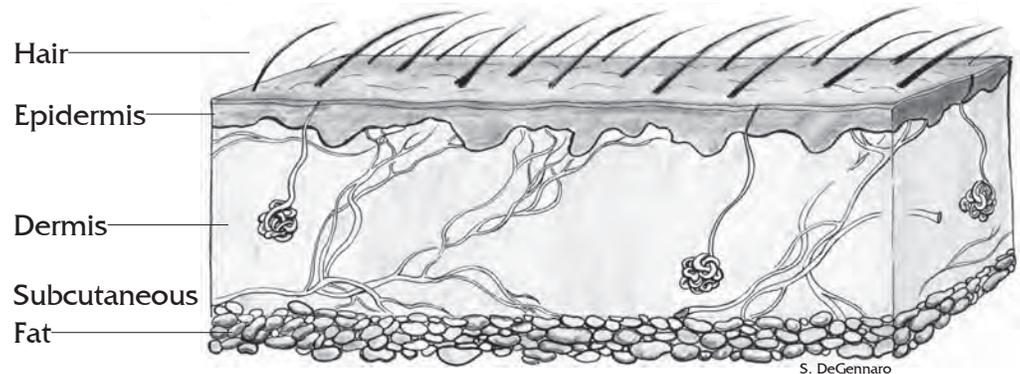
## 2. About Fur

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Fur is a synonym for hair, used more in reference to non-human mammals; particularly those with extensive body hair coverage. The term is sometimes used to refer to an animal's body hair as a complete coat, also known as the **pelage**. Fur is also used to refer to animal pelts which have been processed into leather with the hair still attached.

### Skin Structure

A closer look at this important outer layer of the mammal's body reveals four major layers: the subcutaneous fat, dermis, epidermis, and hair.



### Subcutaneous fat

Most mammals store a layer of fat beneath their skin in connective tissue called **adipose tissue**. It functions as a source of nutrition and as insulation. Adipose tissue is strongly developed in aquatic mammals such as cetaceans (whales, dolphins, and porpoises). But fat is not an effective insulator in the air. Terrestrial (land) mammals would need cumbersome amounts of fat to substitute for the relative efficiency of fur. Some terrestrial hibernators (like bears) develop large deposits of subcutaneous fat for use as a food reserve.

### Dermis

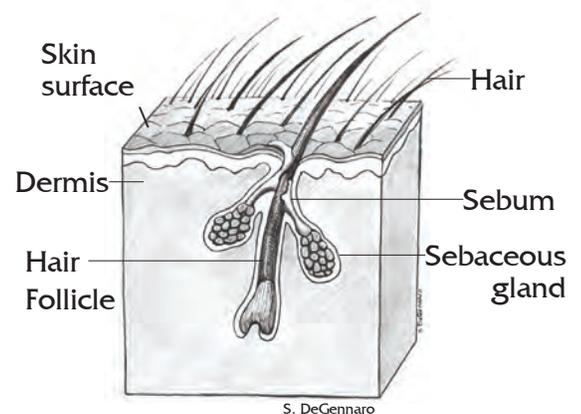
The dermis is the thickest skin layer in most terrestrial mammals. It is composed mostly of connective fibers called **collagen**. It also houses a network of nerves, muscle fibers, sweat and **sebaceous glands**, and blood vessels. The blood vessels provide a source of nutrition for the epidermis and play a large role in **thermoregulation** for most mammals. The dermis contains the **hair follicles**. The tanning process thickens and toughens this layer.

### Epidermis

This surface layer is formed by continuous growth from its basal layer. Its main functions are to prevent **diffusion** of water out of the body, and to protect the body from radiation and infectious organisms. It is also a useful frictional component of the skin (as evidenced by picking up a piece of paper). The epidermis is removed in the tanning process.

### Hair

Hairs grow from depressions in the dermis called **follicles**. The living, actively growing portion of the hair is only at the base. The upper shaft is dead and dried. The hair shaft is composed of three main sections: the **outer cuticle**, **cortex**, and **medulla**. These parts make up hair structure.



# Hair Structure

## Outer cuticle

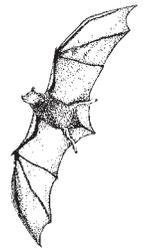
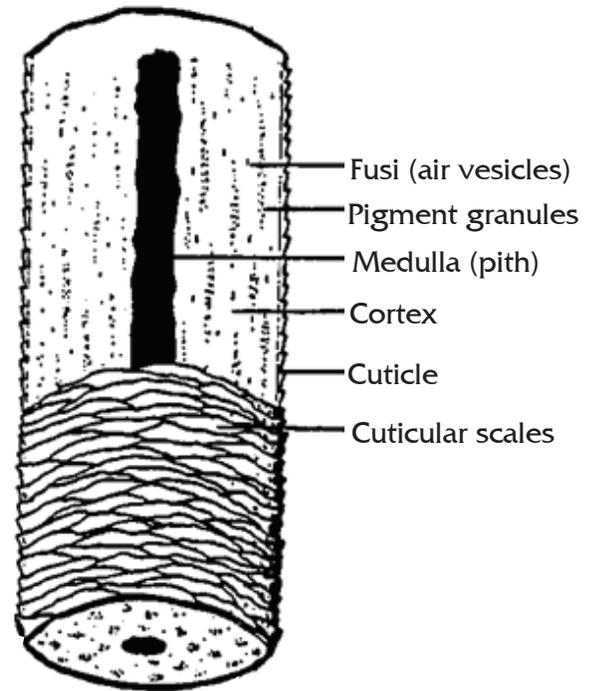
The outer cuticle is overlain by clear scales. These scales vary in shape and size depending on the species. These **cuticular scales** give the hair its barbed structure (demonstrated by running a strand of hair through your fingers in both directions.)

## Cortex

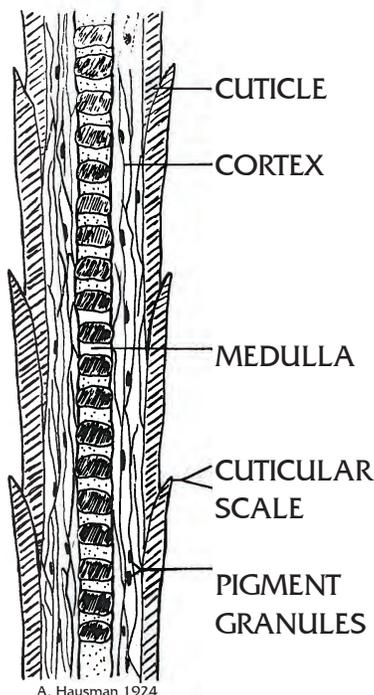
The cortex makes up the bulk of the hair shaft. The patterned arrangement of **pigment** particles in the cortex determines the color of the hair. White hair has no pigment, so light is reflected in all directions from the spaces between the cells.

## Medulla

The medulla is a **pith-like** (spongy core) structure running through the center of the shaft that is often responsible for the relative flexibility of a hair. Some medullas contain characteristic masses of pigment. The fine hairs of bats lack this pith.



# Identifying Animals from Hair



A. Hausman 1924

No two species have the exact same hair structure. The fur of each species has its own characteristic patterns. Microscopic examination of these patterns can be useful for identifying the source of hairs. Biologists identify prey species from the hair remnants in scats and owl pellets and around nests or feeding caches. Criminal investigators have perfected these techniques for suspect identification.



Ermine



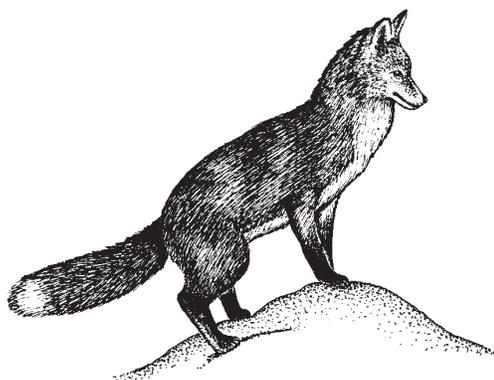
Hare



Squirrel



Muskrat



# Hair Types

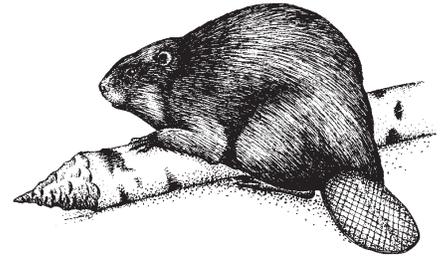
Hairs are of two major types:

## 1. Guard hairs

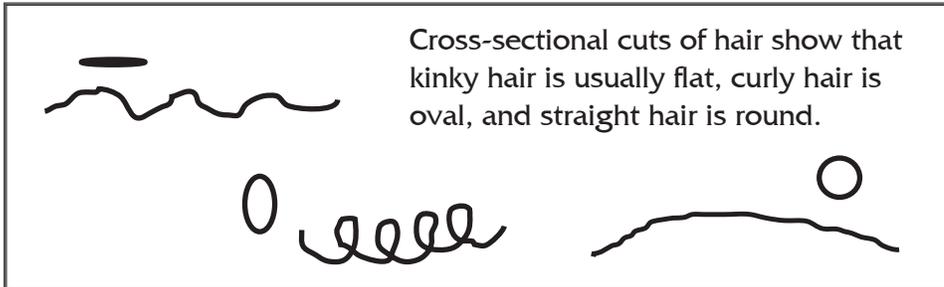
**Guard hairs** are longer, coarse hairs that give an animal its obvious color. They usually overlap the underfur and protect it by shedding water over the surface and shielding it from abrasion.

## 2. Underfur

The **underfur** is finer and denser and is responsible for most of the fur's insulation properties.

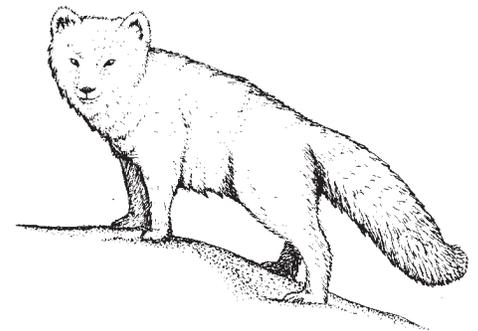


*Beavers provide great fur to observe the difference between guard hairs and underfur.*



# Insulation Capacity

Some arctic animals must maintain a difference in temperature of more than 180 degrees Fahrenheit between their body core and the surrounding environment. This is the equivalent of maintaining water at a boil in an environment at freezing temperatures. Body temperature can be maintained either by increasing the animal's heat production through **metabolism**, by decreasing the heat loss through **insulation**, or a combination of these methods.



**Animals can vary their insulative capacity in both the short term and the long term. Short term control of heat loss can be accomplished by:**

- **Pilo-erection:** This is the raising of the hairs on the surface of the skin to create more air space insulation.
- **Vasomotor control** of the skin temperature: This means changing the size of blood vessels to influence blood flow.
- Changes in **evaporation** rates: This retains moisture and heat within the body.
- Changes in **respiration:** This also retains moisture and heat within the body.
- Changes in **posture:** This helps conserve or dissipate heat.

**Long term control of heat loss can be altered by:**

- Effectiveness and thickness of subcutaneous fat density: This influences the ability of the fat to insulate the animal.
- Structure of the fur: The thickness, color, and structure of an animal's hair may change seasonally or in response to other environmental factors.

**Did You Know?**  
The behavior of an animal can affect heat absorption. For example, an animal with dark hair may sunbathe to absorb more heat.

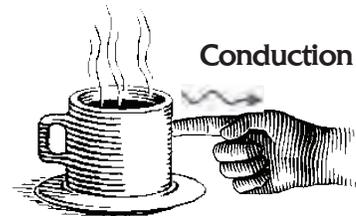
There are three main ways heat is transferred:

1. **Radiant** heat transfer (like heat from a fire warming you)
2. **Conductive** heat transfer (heat from objects touching)
3. **Convective** heat transfer (heat transferred by moving air or water around an object)

Radiation



Conduction

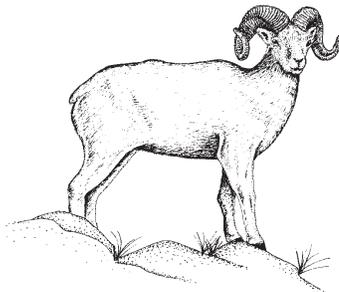


Convection



## Color and Insulation

In cold areas, white fur actually provides greater insulation than darker colored fur. White hair is actually the result of no **pigment** within the hair. Because there is no pigment, the hair is hollow. Hollow hair traps more air than solid hair. Because air is a poor heat conductor, air-filled hairs provide increased insulation.



*But don't darker colors absorb more heat from the sun?* Yes, dark colors do absorb more heat from the sun, but in the arctic and subarctic winter the sun is not high enough to create any heat value.

Some animals such as Dall sheep and mountain goats are white year-round while others molt. Molting from a summer coat of mottled brown to white not only conceals an animal during winter, but can also provide better insulation.

Members of the deer family also have hollow hair, but that type of hair is of a different design and is hollow even though they have pigment within the hair structure. A deer's winter coat has hollow hairs providing increased insulation. The summer coat has solid hairs, and surprisingly, there is more hair on the summer coat than the winter one. This protects against biting insects.

## Insulation and Infrared Technology

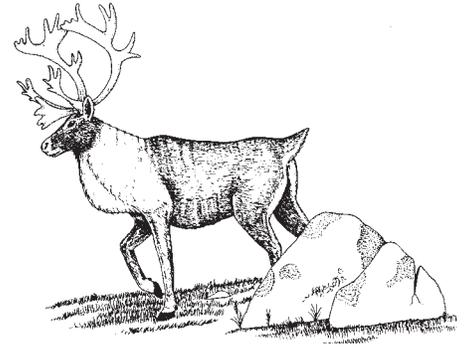
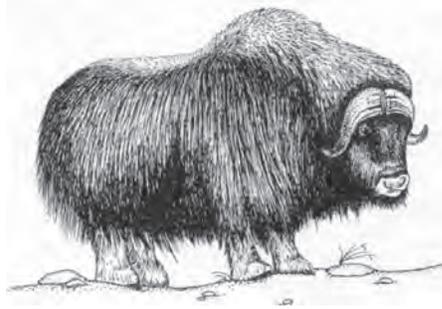
**Infrared** light viewing technology can be used to observe heat loss in animals. Many animals have varying levels of heat loss from their body. The warmer an object is, the more infrared radiation it emits. But areas with thicker fat or more insulative fur show reduced heat loss.

Polar bears show limited heat loss when viewed with infrared light. In an infrared image, only parts of a polar bear's face are visible. Thick layers of **blubber** insulate their bodies so they don't lose much heat.

Infrared technology can be used by scientists to find animals when their camouflage makes them harder to spot.

### Did You Know?

Caribou and muskoxen have hollow hairs that are wider at the tip than at the base. This shape helps trap a layer of air next to the body. Trapped air provides excellent insulation because air is a poor conductor of heat.

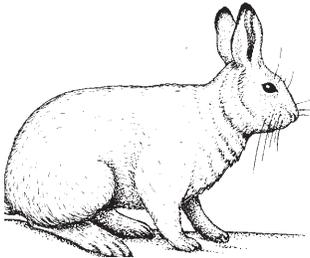


## Other Functions of Hair

We have considered how the structure of an animal's hair affects insulative function. Consider with your class the many other functions of hair.

### Camouflage

When it comes to survival, sometimes the ability to hide from predators or success at hunting is more important than heat absorption. Some arctic animals change colors seasonally and use the advantage of camouflage throughout the year. In general, most animals blend in with their surroundings. This is beneficial to them whether they are a predator or prey species, or both.



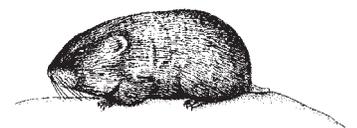
Some animals such as the snowshoe hare and short-tailed weasel (ermine) take this to the extreme and change colors as the seasons change by molting. They shed one color of fur and then grow the other. The change in color is stimulated by the length of day, not colder weather. If the snow is late in coming, white hares may be clearly seen against the brown colors of fall. This makes them more likely to be spotted and eaten by predators.

Some animals, particularly if they live in areas with snow and ice year-round, remain white. Polar bears remain white all year while arctic foxes change color with the season. White fur and feathers hide animals in the snow.

### Sensation

**Tactile hairs** are hairs modified to act as sensors for an animal. Tactile hairs such as eyebrows, chin hairs, and whiskers are usually located on the head. These specialized hairs have an abundant nerve and blood supply at the base of the follicles. The blood creates pressure in the sinuses to make the hair more sensitive to tactile pressure changes.

Cats use their long whiskers to detect objects, air movements, and other vibrations. This is essential for navigation, such as detecting paths and objects in the dark. River otters use several sets of strong whiskers in hunting and avoiding obstructions underwater. **Subnivean** mammals such as voles use their whiskers to navigate tunnels in the dark.



## Movement and Protection

Skin and hair surfaces can protect animals from mechanical injury. Some animals such as bears and dogs have areas on their body with extra, looser skin. This can help the animal move around easily or decrease the chance of injury when attacked.

Fur can assist an animal with movement on land and in water. The large hind feet of the snowshoe hare are well-furred, acting as snowshoes that keep these animals from sinking in deep snow. The large broad furry feet of the lynx also function as snowshoes to aid in winter hunting and traveling.

Different surface types, like as the slick fur of seals, can facilitate the gliding of aquatic animals through water. Some animals such as shrews and muskrats can propel themselves using fringes of hairs. Water shrews have long fringes of hair on their hind feet that allow them to capitalize on the water surface tension and run across the water surface without sinking.

Some animals, such as the polar bear, have fur that sheds water quickly after swimming. Other animals, such as the wolverine, have fur that is very good for shedding ice accumulation.

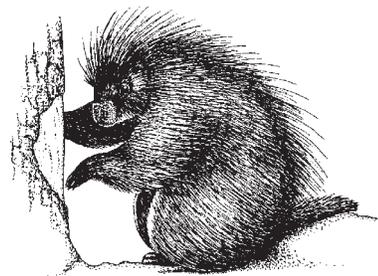
## Defense

**Pilo-erection** (puffing) can be effective in causing apparent increases in size. For example, more aggressive or dominant wolves will hold their hair erect while submissive wolves hold their hair flat and smooth.

Pilo-erection can be used to discourage aggression from others. For example, a porcupine will puff its quills when threatened. Porcupine quills are greatly enlarged hairs modified for purely defensive purposes. The hollow shafts are strengthened and barbed. The microscopic overlapping sheaths on the tips (which function like barbs) are filled with a spongy matrix. Quills from different parts of the body vary in length, flexibility, color, shaft diameter, and barb length.

### Did You Know?

The quilled pelage of the porcupine makes it unique among North American mammals.



## Furs and Trapping



Trapping has been economically and culturally important to Alaska's people since time immemorial. This seasonal harvest of wildlife provided meat and warm fur needed to sustain life in the north. Thick fur parkas, mitts, hats, and leggings protect against bitterly cold temperatures, enabling Alaskans to survive and work in an extreme environment.

Trapping continues to be an important part of Alaska's economy to this day. It is particularly important in rural communities because it still provides cash income during the winter when few jobs exist in more isolated villages. In the larger towns and villages, trapping income provides a supplement to salaries and a healthy outdoor pursuit during the colder months.

Residents of arctic climes wear fur not as a fashion statement, but rather for the warmth, durability, and protection they offer. Many **furbearers**, such as lynx, beaver, and muskrat, are also important as food for human consumption as well as for dog food.

More than a dozen species of furbearers are commonly trapped in Alaska, from the tiny ermine to the wolf. All these furbearers are not only common, but also abundant. None of Alaska's furbearers are endangered or threatened. All are managed professionally by the Alaska Department of Fish and Game, with harvest seasons and bag limits set by the Alaska Board of Game to ensure healthy furbearer populations for the future.

*--adapted from the Alaska Trapper's Association*

## Prime Time Fur

A total of 20 species of furbearers are trapped in Alaska: beaver; coyote; arctic fox; red fox; lynx; Alaska and hoary marmot; marten; mink; muskrat; river otter; red, flying, and ground squirrels; least and short-tailed weasel; wolf; wolverine; woodchuck; and most recently, fisher.

People are not allowed to trap animals any time they want. To ensure the maximum quality and value of the animal fur, regulations are set to allow trapping when the animal's fur is in its best condition. This is called primeness. Prime fur has reached its maximum length and density, and finest texture. Different animals become prime at different times of the year. In general, most animals are in prime condition during the winter months, and that is when harvest is allowed.

Alaska's mammals respond to the northern environment by utilizing different methods to minimize heat loss. No two species exhibit the same adaptations, but generalizations can be made if the animals are grouped into categories depending upon their environment (terrestrial or aquatic).

## Terrestrial Mammals

### Did You Know?

Of the terrestrial mammals, the wolf's fur shows the greatest insulative value per fur depth.

It has already been stated that fur is better than fat for providing insulation against cold air. Hibernating **terrestrial** (land) mammals that accumulate large subcutaneous stores of fat do so mainly for nutritional reserves. For the most part, terrestrial mammals maintain a suitable temperature difference between their body core and the environment through an effective fur layer and/or increased metabolic rates.

The fur on terrestrial mammals is generally thinnest on the abdomen. The thickness of the dermis and epidermis is also thinner in the abdominal areas. Hairs of terrestrial mammals generally grow singly rather than in tufts of several hairs.

### Color Change

Only terrestrial mammals change color with the seasons. Studies indicate that color change in weasels and snowshoe hares is a hormonal response to the **photoperiod**. *Speculate with your students why this phenomena is not exhibited in the aquatic or semi-aquatic mammals.*



### Smaller Mammals

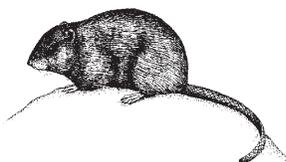


Smaller terrestrial mammals cannot afford the extra weight that a sufficient fur coat would add and therefore must depend upon high metabolic heat production to keep them warm. In other words, they must eat constantly and be efficient at turning that food into warmth. To protect them from extremes, they also make use of the **subnivean** environment (below the snow). Snow acts as a blanket that can keep trapped air warmer than on the surface.

## Semi-Aquatic Mammals

We consider the muskrat, river otter, mink, and beaver as **semi-aquatic** mammals. These mammals must depend on special adaptations to cope with both aquatic and terrestrial mediums. Unlike most terrestrial mammals, their hairs grow in tufts, and they also have thicker fur, dermis, and epidermal layers on their abdomens.

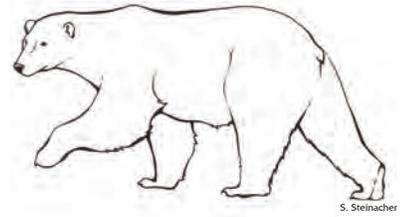
Since a large accumulation of subcutaneous fats would limit their movements on land, semi-aquatic mammals have developed furs that trap large quantities of air next to their skin, for a temporary insulative layer while they are submerged. Their dense furs are characterized by short, kinky, woolly layers with longer overgrowing hairs that bend to shelter the woolly underlayer. The woolly layer of muskrat fur can hold as much air as one-quarter the volume of the animal itself to protect its body temperature from the water's effect.



Semi-aquatic animals show little change in the **insulative value** of their fur between summer and winter, since the temperature of the water fluctuates less than that of the air. Heat is lost when necessary through their **vascularized**, scaly tails or by sweating.

## The Polar Bear:

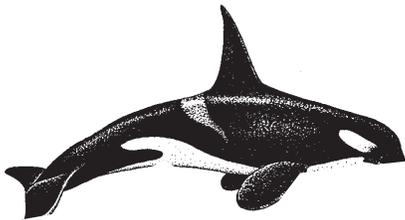
In some senses the polar bear could be considered a semi-aquatic mammal. However, the thermal properties of its fur are not similar to those of muskrat or beaver fur. Its fur does not capture large amounts of air to provide insulation while in arctic waters. Instead, the polar bear seems to be well-adapted for shedding water immediately upon its emergence onto land (or ice). The polar bear survives despite its fur's poor insulative ability thanks to its large volume-to-surface ratio. In the water it decreases heat loss through **vasoconstriction** and increases its heat production through increased **metabolism**.



## Aquatic Mammals

### Aquatic mammals are divided into two categories:

1. Those with reduced hair characteristics that occasionally emerge onto the land (such as seals, sea lions, walrus), and
2. Those that are wholly aquatic (cetaceans: whales, dolphins, porpoises).



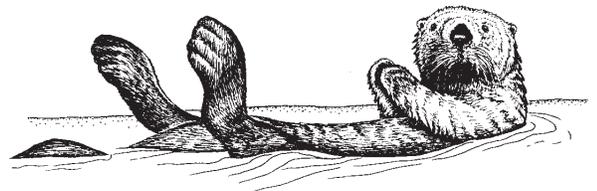
Neither of the two can depend upon an insulative layer of air in their fur, since it would require frequent returns to dry land to replenish. Subcutaneous fat plays a major role in insulating these mammals. These fat reserves exist year-round, and undergo only slight seasonal changes.

The fats of aquatic mammals differ in composition from those of terrestrial mammals. They are composed of nonsaturated **fatty acids**, which harden at much lower temperatures than the saturated fatty acids in the fats of other mammals. The fat layer under the skin of marine mammals such as whales, seals and walruses is called **blubber**. Blubber not only insulates marine mammals, but also stores energy and helps increase buoyancy (floating). Aquatic mammals dissipate heat to the environment through **vasodilation** (dilation of the blood vessels) especially in the tail/fluke and flipper region.

**Cetaceans** have lost almost all of the hair on their bodies, with remnants remaining for tactile purposes only. The other aquatic species have fur that is adapted to protect the body from mechanical injury and aid movement on the ice. (*Why are seal skins used on the bottoms of skis for touring?*).

## The Sea Otter:

Sea otters have the densest hair of any mammal, with 800,000 to one million hairs per square inch (humans only have 20,000 hairs on their entire head). When sea otters are not foraging, they are often grooming. They do this to dry their fur and remove salt crystals and excess oil, which fluffs the fur and traps air. Their body heat warms the trapped air and further insulates them. The trapped air provides four times as much insulation that the same thickness of fat would provide.



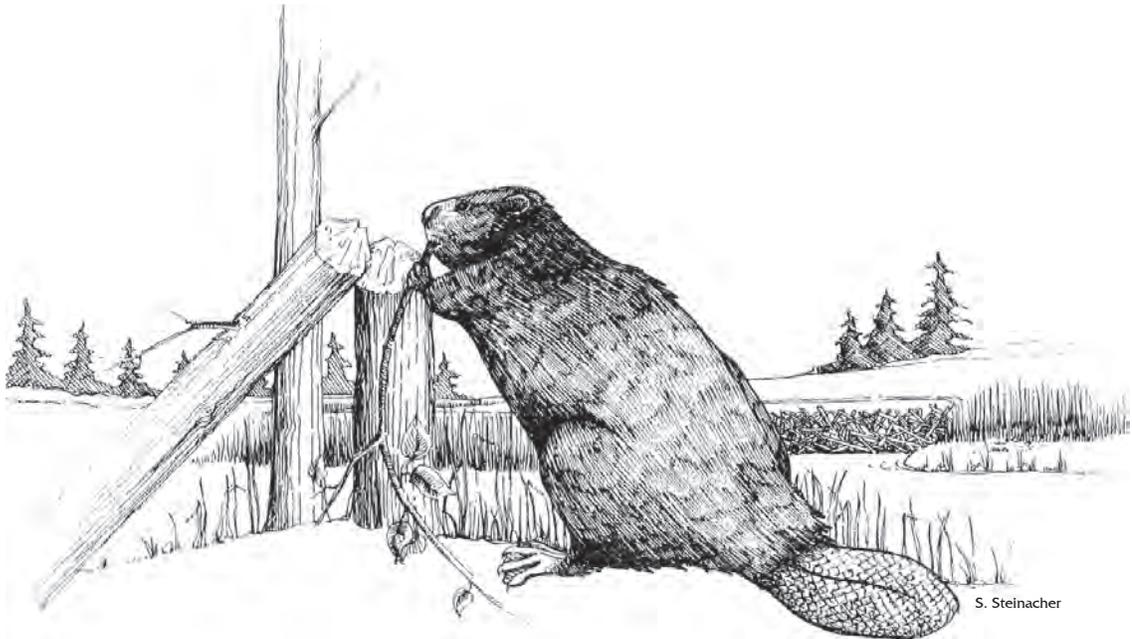
Sea otters rely on a high metabolism and a plush coat to keep warm. However, this high metabolism requires them to eat a lot of food. In order to maintain its body weight, a sea otter must eat 25 percent of its body weight per day.



# 3. Activities

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- A. Fur-ensics
- B. What's in the Bag?
- C. Blubber Mitts
- D. How Warm is My Coat?
- E. Snow Blanket
- F. Hair We Wear
- G. Fur Crossword Puzzle





# A. Fur-ensics

Procedures section adapted from *Alaska Fur ID Project*



## Objectives

Students will learn hair identification techniques and use them to solve a “case.” Students will use a microscope to investigate the hair types of sample furs, and draw conclusions that correlate to the structure and function of a variety of hair types.

## Methods

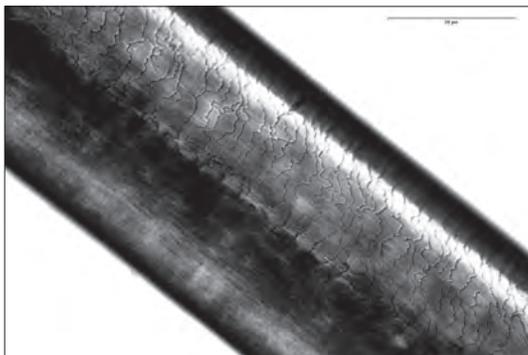
Students examine cuticular animal hair patterns to gather information on the length, diameter range, medulla, medullary index, color, scales, and other qualities of an animal’s hair.

## Background

Scales are present on the cuticle of all mammal hairs, and many “scale casting” techniques have been used to capture impressions of these scales for observation and analysis. Refer to the Alaska Fur ID Project “Sampling” page for information on various casting material choices.

## Materials

- Alaska Fur ID Project website: <http://alaskafurid.wordpress.com/>
- Sample furs
- Compound microscope (1 per group)
- Slides and cover slips
- Meltmount™ and Duco® Cement (casting materials)
- Small tweezers and scissors
- Small rulers/measuring tape (1 per group)
- A “case” to solve.



Mounted muskox hair. Cover slip over hair fiber at 400x transmitted light.

## Fur-ensics

**Grade Level:** 7 to 12

**Subjects:** Science

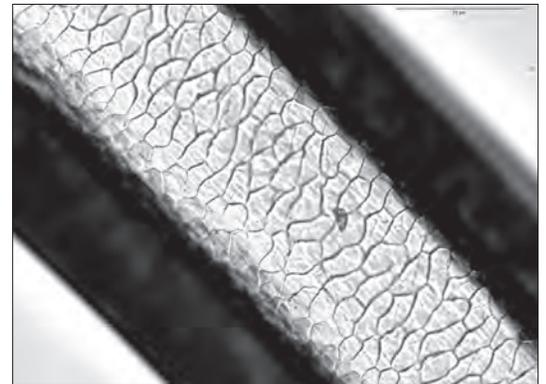
**Skills:** Analyzing, Comparing, Describing, Identifying, Inferring, Observing

**Duration:** 1 to 2 hours

**Group Size:** Individual or small teams

**Setting:** Indoors

**Vocabulary:** cuticular scale, medulla, medullary index



Moose guard hair scale cast (mid-section of a larger fiber) at 400x, transmitted ASM



Scale cast from the guard hair of a lynx (proximal end) at 400x transmitted light. Scale cast was done with Duco Cement.

# Procedures

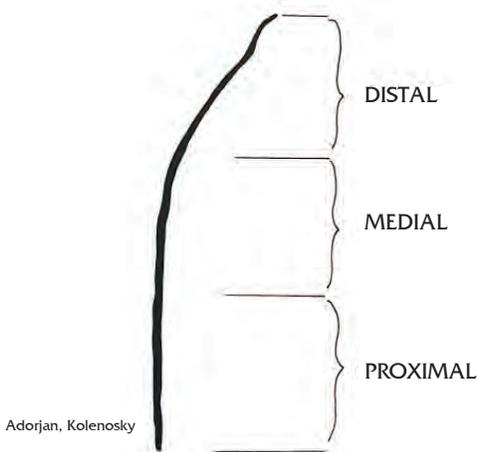
**BEFORE CLASS:** Refer to the Fur ID website and choose your mounting and casting materials.

Collect several hair specimens from furs of multiple species.

## Removing Hairs:

Get tips of very fine tweezers as close as possible to the skin and tug quickly and firmly. Hoofed animals tend to have brittle fur that breaks easily. Some hairs are hard to pull out. Be sure to get a sample of the underfur.

The maximum length of a hair is one of the clues you will look at, so try to get the full length of the hair. In some animals the scale pattern changes as it goes along the length.



Keep track of which hair is which. Label hairs as *Mystery Hair A*, *B*, etc. You should collect enough *Mystery Hair* samples for each student or small group to have at least one “case” to solve.

1. **IN CLASS:** Prepare *Mystery Hair* slides. (Note: you may wish to assist younger students with preparing the slides.)

## Making a Mounted Sample:

Use a clean glass slide and mounting material such as Meltmount. An individual hair might be too long to get completely under a cover slip, so using tweezers and small scissors, mount one end, snip, and mount the other. For thick hairs use a pencil eraser to squish down the cover slip and hold until the mounting material is dry. It is useful to leave a bit of hair sticking out from the medium to give more options in examining the scale pattern.

There is plenty of room to put two samples side by side on a single slide using two cover slips. Consider mounting guard hairs and underfur in two separate mounts. If mounted together (when the guard hair is much thicker than the underfur) the guard hair will mount nice and flat but the underfur might not, meaning you'll have a hard time getting the underfur in focus.

## Scale Casting:

Use a clean glass slide and a casting material such as Duco Cement. Squeeze a consistent and thin amount of Duco onto the slide. If the hair is wavy, try to match that wave rather than trying to stretch the hair fiber in an unnatural way. You can place the blank slide on top of the wavy hair and trace a wavy line on top of the slide in Duco. Place the hair fiber into the clear adhesive and allow it to dry in place. This should take about 5 minutes or less, depending on how thin your application was. Now pull the hair fiber out of the Duco by using tiny tweezers to pry up and remove the fiber. Your slide is ready for viewing now!

2. Each student/small group will need at least one *Mystery Hair* slide to observe. Students will examine their slide under the microscope.

## Observing the Pattern:

To see scale pattern better, try adjusting the light level through the aperture. More light is helpful for examining the **medulla**, while less light is helpful for looking at scale pattern. Try looking under crossed polars. Try looking with reflected light. A portion of the hair NOT in the medium can be seen better when looking with reflected light.

- Using the Alaska Fur ID Project website as a guide, students should observe information on length, diameter range, medulla, **medullary index**, color, scales, and macro qualities. Students will record these data on their individual student worksheet. (Each student will need one worksheet per slide.)
- Encourage students to browse through images in the Fur ID index, looking for hairs with similar qualities to their *Mystery Hair*. Using all the information they have gathered, students will identify each *Mystery Hair* and submit their "case."

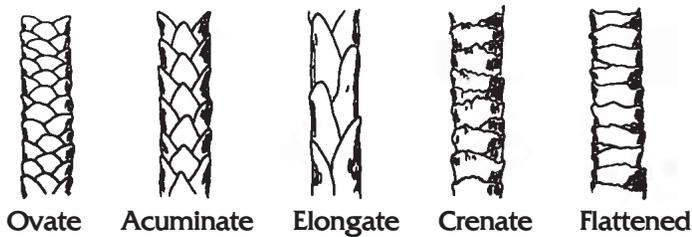
When all students are ready, reveal the true identity of each *Mystery Hair*. Let students examine the original furs where the hair samples were removed.

## Evaluation

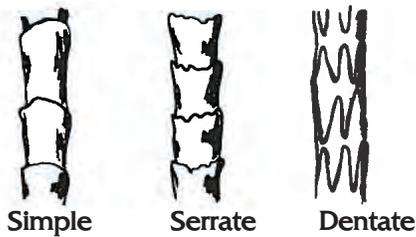
As a class, discuss the differences in scale pattern seen, and why these differences occur. Discuss which hairs were the easiest or most difficult to identify, and why.

Extension: Students may bring in hair samples from their pets to compare with those from wild animals. Is your dog's hair similar to wolf hair? Your cat's to lynx hair?

## DESCRIPTIONS OF MAMMAL HAIRS SCALE CLASSIFICATION



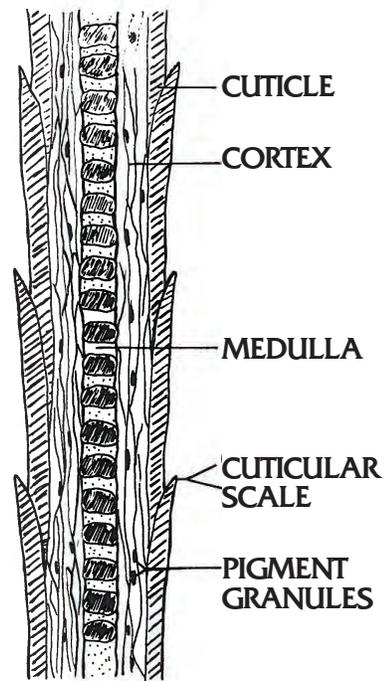
### Imbricate Scales



### Coronal Scales

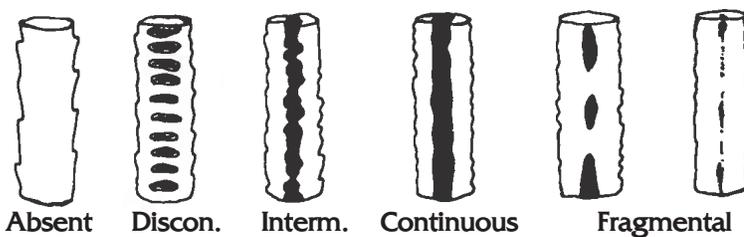
The eight types of cuticular scales of mammalian hair

A. Hausman 1930



A. Hausman 1924

Medullary Classification (based on examination of the central hair shaft)



# Fur-ensics Student Worksheet (1)



The Case of "*Mystery Hair* \_\_\_\_\_"

Draw a picture of the *Mystery Hair* from root to tip, as you see it under the microscope.  
Try to include as much detail as you can!

**Length:** Measure the hair from root to tip. How long is it? \_\_\_\_\_

**Medulla:** What is the medullary classification? (Absent, continuous, etc. See page 23.)

\_\_\_\_\_

**Medullary Index:** What is the ratio of the width of the medulla to the diameter of the hair at the point of greatest hair width? (Hint: Since the medulla is always smaller than the whole hair, it will be a number less than one.)

\_\_\_\_\_

**Color:** Describe the location on the hair of certain colors, as well as any color patterns. (Banding, stripes, etc.)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

With colored pencils or crayons, draw a picture of the hair color patterns.

# Fur-ensics Student Worksheet (2)

**Scales:** Describe the shape and spacing of scales. (Imbricate, coronal, etc. See page 23.) Note: Scales at the root may be different than those at the tip of the hair.

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Using pencil or pen, draw a detailed picture of the cuticular scales of the hair.

**Macro qualities:** What does the fur look like without a microscope?

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Once you have studied your *Mystery Hair* carefully, compare it with images of other mammal hairs on the Fur ID website.

Now it's time to crack the case! What animal do you think this hair came from? Why?

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- 1. Did you identify the *Mystery Hair* correctly? Why or why not?
  
  
  
  
  
  
  
  
  
  
- 2. Why do you think hairs from different species have so many different features?



## B. What's in the Bag?

Adapted from  
DISCOVER WILD®



### What's in the Bag?

**Grade Level:** K to 9

**Skills:** Comparing, Identifying, Inferring, Observing, Sorting

**Duration:** 30 minutes

**Group Size:** Individual or teams

**Setting:** Indoors

**Vocabulary:** underfur, guard hair, prime

### Objectives

Students will understand that different mammal species have different types of fur, and learn how gathering information is important to the decision-making process.

### Methods

Students use their senses and powers of observation to draw conclusions.

### Background

The more information we have about something, the easier it is for us to make a decision. This challenge is a fun way to learn how better research improves our decision-making.

Each group has five different fur samples they must try to identify using their sense of touch and sight plus other information.

### Materials

- Labeled fur samples (5 per group)
- Paper or dark plastic bags (1 per fur)
- Fur I.D. Cards (Section 4)

### Procedures

**BEFORE CLASS:** Before printing copies of the student worksheet: Fill out the mammal-lists portion with animal names, according to the fur samples your classroom will use for the activity.

Place five different fur samples for each group into separate bags numbered one through five.

1. **IN CLASS:** Divide the students into three groups and assign them a group number of one, two, or three. This activity can be used for groups or individuals.
2. Using only their sense of touch, have the students reach into the bag without looking and touch the fur. Have the students note features of the fur: Does it feel fluffy? Curly? Long haired? Short haired? Greasy? This is the first piece of information the student receives about the animal fur in the bag. Students will record answers based on this information.
3. Take the fur samples out of the bags and place them fur-side-up on the table in front of the numbered bag. Now students will use their senses of sight and touch to decide which animal fur belongs to the fur that was in the bag. Do not let the students see the back of the fur sample at this time.
4. Now give the Fur I.D. Cards to each group, allowing the students to use the information to match the fur samples with the correct animal.
5. Once students have recorded their answers, they may look at the back of the fur samples to record how many fur samples they correctly identified with the information that was available to them.

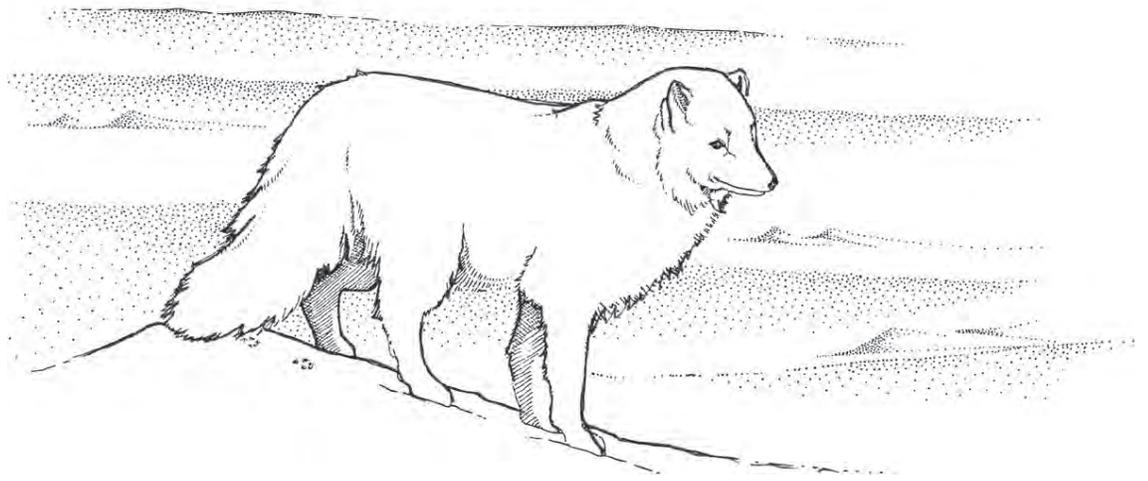
6. Students may also use the numerical data collected to calculate the percentages or fractions that were correct and those that were incorrect.

They may also create a bar graph or pie chart based on the fraction or percentage correct, illustrating how many answers were correct using only their sense of touch, how many were correct using their sense of touch and sight, and finally how many were correct when including information learned from the Fur I.D. Cards.

## *Evaluation*

Discuss which furs were easiest to identify, and why.

What other senses could we use to identify furs? What kind of attributes make a fur stand out as unique?



# What's in the Bag? Student Worksheet (1)

The fur samples for each group are listed below. They are not in any special order. Once you have answered each section, don't go back and change the answer. Good luck!




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## GROUP ONE MAMMALS:

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## GROUP TWO MAMMALS:

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## GROUP THREE MAMMALS:

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### SECTION ONE

Using only your sense of touch (do not look), feel the fur samples in the numbered bags and match the mammal with the fur.

Fur #1 \_\_\_\_\_ Fur #2 \_\_\_\_\_ Fur #3 \_\_\_\_\_

Fur #4 \_\_\_\_\_ Fur #5 \_\_\_\_\_

### SECTION TWO

Wait for the instructor to take the samples out of the bags. Using your senses of touch and sight, look at the fur and feel it to match the samples with the mammals. Leave the samples lying flat on the table in front of the numbered bag.

Fur #1 \_\_\_\_\_ Fur #2 \_\_\_\_\_ Fur #3 \_\_\_\_\_

Fur #4 \_\_\_\_\_ Fur #5 \_\_\_\_\_

### SECTION THREE

Wait for the instructor to bring the Fur I.D. Cards to your group. Use the information provided to match the fur samples with the mammal.

Fur #1 \_\_\_\_\_ Fur #2 \_\_\_\_\_ Fur #3 \_\_\_\_\_

Fur #4 \_\_\_\_\_ Fur #5 \_\_\_\_\_

# What's in the Bag? Student Worksheet (2)

Now look at the back of the fur samples to discover which animals the samples are from. Answer the following questions.

1. In SECTION ONE, how many of your answers were correct? \_\_\_\_\_

How many were incorrect? \_\_\_\_\_

2. In SECTION TWO, how many of your answers were correct? \_\_\_\_\_

How many were incorrect? \_\_\_\_\_

3. In SECTION THREE, how many of your answers were correct? \_\_\_\_\_

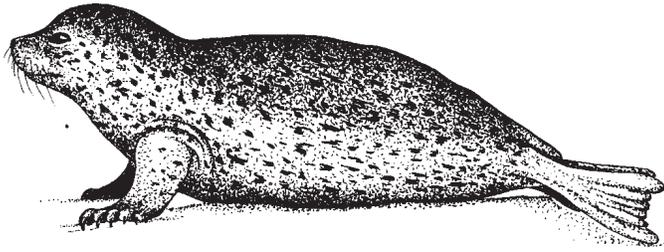
How many were incorrect? \_\_\_\_\_

4. Was it easier to decide which fur sample went with which animal when you had more information? Explain your answer.

5. What was your favorite fur and why?

# C. Blubber Mitts

Adapted from the Alaska Wildlife Curriculum, *Tundra and Wildlife*.



## Blubber Mitts

**Grade Level:** K to 6

**Subjects:** Science, Writing

**Skills:** Analyzing, Comparing, Describing, Inferring, Observing

**Duration:** 30 minutes

**Group Size:** Small teams

**Setting:** Indoors

**Vocabulary:** blubber, insulation

## Objectives

Students will experience and compare the insulating properties of fat and fur, which protect some animals from cold arctic temperatures.

## Methods

Students create blubber and fur mitts and perform a series of simple temperature experiments.

## Background

Refer to 'About Fur' section.

## Materials

- 2 to 6 ice cube trays (or bag of ice cubes)
- 1 to 6 buckets (enough to be shared among your class without crowding)
- 1 to 3 gallons of cold water
- 1 or 2 tubs of soft vegetable shortening
- Fur samples/scrap (small enough to fit in a one gallon plastic bag)
- Rubber gloves (enough for class)
- Masking tape
- One gallon plastic Ziploc® bags

*NOTE: If you are using the glove method, you will need one Ziploc bag per mitt. If using the reusable double Ziploc method, you will need two Ziploc bags per mitt and no gloves or tape.*

## Procedures

For each blubber mitt you wish to make, spoon a pound of vegetable shortening into a one gallon Ziploc bag. For each fur mitt you wish to make,

place a fur scrap into a one gallon Ziploc bag. There are two different ways to create your mitts, the glove method (done in class) or the reusable double Ziploc method (done in advance).

### *Double Ziploc method:*

*To create a blubber mitt: Simply turn a second Ziploc bag inside out. Place this bag inside the bag that is already filled with shortening. Zip the seal of the outer bag to the seal of the inner bag.*

*To create a fur mitt: Turn a second Ziploc bag inside out. Place this bag inside the bag containing the fur scrap. Arrange the fur (hair side out) evenly so that it wraps around the inner bag. Zip the seal of the outer bag to the seal of the inner bag. The fur should look like a liner between the two bag layers.*

**DAY IN ADVANCE:** Fill the ice cube trays with water and freeze overnight.

**BEFORE CLASS:** fill the buckets about half full with ice water.

1. **IN CLASS,** divide the class into as many teams as you have buckets. If you already have reusable mitts ready, proceed to step three.
2. **To create a blubber mitt:** After the student has put on a rubber glove, seal the gallon bag of shortening around the student's hand with masking tape. Make sure student covers hand and fingers with the shortening.

To create a fur mitt: After the student has put on a clean, dry rubber glove, seal the gallon bag containing fur around the student's hand with masking tape. Make sure the student's hand is mostly wrapped in the fur.

3. Let students test the insulating properties of each mitt by immersing one bare hand and one protected hand in the ice water and describing how it feels. Compare the blubber mitts with the fur mitts. Which feels warmer? What if an animal had both fur and blubber?

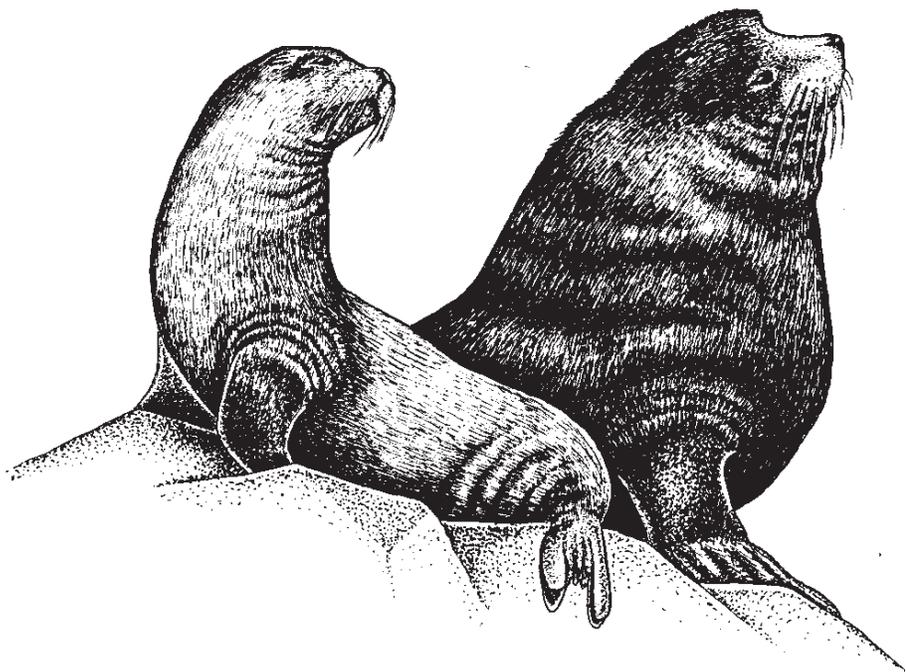
## *Evaluation*

Lead a discussion about how arctic animals are insulated. You may want to ask students to write or illustrate their reactions.

Ask students: What if they had an extra fat layer instead of wearing snow pants or a jacket? Would this fat layer be more effective for warmth on land or in water? Recall information learned about aquatic mammals and their use of blubber.

Students will select an arctic mammal and explain why it does not get cold. (Does it use blubber, fur, or both? Why?)

Students can also write about how the cold water felt when they tested the fur and blubber mitts. Challenge them to use synonyms for the word "cold" or have them write about the cold from the perspective of the arctic animal they selected.



## D. How Warm is My Coat?



### Objectives

Students will use the scientific method to make observations about which furs/materials provide the best insulation.

Students will graph and describe their findings.

### Methods

Students perform a series of simple experiments to test the insulation values of several different types of fur and other materials by wrapping them around warm potatoes and measuring temperature change over time.

### Background

Refer to 'About Fur' section.

### Materials

- Furs to test (at least 1 per group)
- Synthetic fabrics or other insulating materials (i.e. fleece, space blanket) to test to compare with fur
- Potatoes of the same size (2 per group)
- Bimetal thermometer (must be able to stab into potato (1 per group)

### Procedures

**Hypothesis:** Students should hypothesize which fur or material they think will keep the potato warmest and why. After testing their hypothesis, students will decide if it was correct.

1. Before beginning the experiment, explain to students the types of variables present in a scientific experiment. (Independent, dependent, and control.)
2. Divide students into small groups. Each group will need two materials to test, a thermometer, and two potatoes.

## How Warm is My Coat?

**Grade level:** 3 to 9

**Subjects:** Science

**Skills:** Comparing, Graphing, Hypothesizing, Inferring, Measuring, Observing

**Duration:** 30 minutes to 2 hours

**Group Size:** Small teams

**Setting:** Indoors and Outdoors

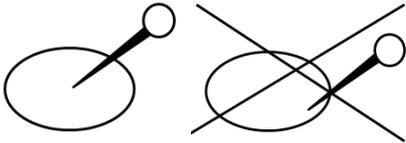
**Vocabulary:** independent variable, dependent variable, control variable, synthetic

*Independent variables* are the things you change on purpose to answer your hypothesis. They can be seen as "cause" variables. In this experiment, the fur is the independent variable because you are trying five different furs. The type of fur will cause the temperature of the potato to change.

The **dependent variable** is the factor you measure after making changes to the independent variable. You don't control it: It can be seen as the "effect" variable. In this experiment, the dependent variable is the temperature of the potato. The temperature will change depending on the fur type.

The **control variable** must be kept constant in order to accurately test the independent variables. In this experiment it is the potato. It is important that all the potatoes are the same size, and are heated to the same starting temperature. --Why would you not want to test two different furs on a big potato and a tiny potato, or start with a hot potato and a lukewarm one?

3. **Begin the Experiment:** Heat all potatoes to the same temperature (as close as possible.)
4. Students should record potato starting temperatures before wrapping, being sure to note any variation among the potatoes. Always take the potato temperature from the center, where temperature will remain the highest.
9. Each group presents the results of its investigations. Student reports should include hypotheses, methods, results and conclusions.
10. As a class, combine the data from all groups to create a master graph comparing all materials tested.
11. Discuss as a class which furs/material had the greatest insulation value and why. What can this information tell us about clothes we wear?



Students should also record the outside temperature. (If repeating this experiment later, outside temperature variations will change the results.)

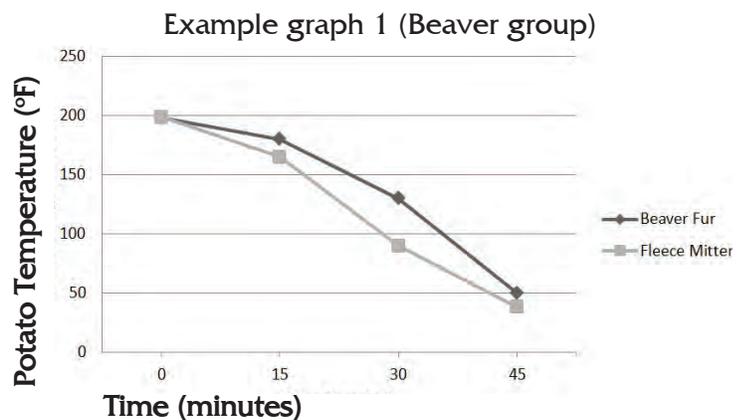
5. Students wrap each potato in a different test material. Make sure students only wrap the material around the potato once, so one layer of each material is tested. (Hint: wrap like a burrito fold.)
6. Place all potatoes outside to cool. Make sure they are placed in the same setting (do not place some in the shade, some in the sun, etc.)
7. Every 15 minutes, students should retrieve potatoes, unwrap indoors (always in the same manner) and record temperatures. If below zero outside, every 15 minutes is okay. If above zero, every half hour would be better. Adjust experiment times if needed. The goal is for students to gather enough temperature data points to graph.)
8. After recording 4 to 10 temperature readings, groups should graph their data using graphing paper or a computer. (See example graphs.)

**Further questions:** What if the potatoes were frozen and put in the hot sun? Which do you think would melt the fastest?

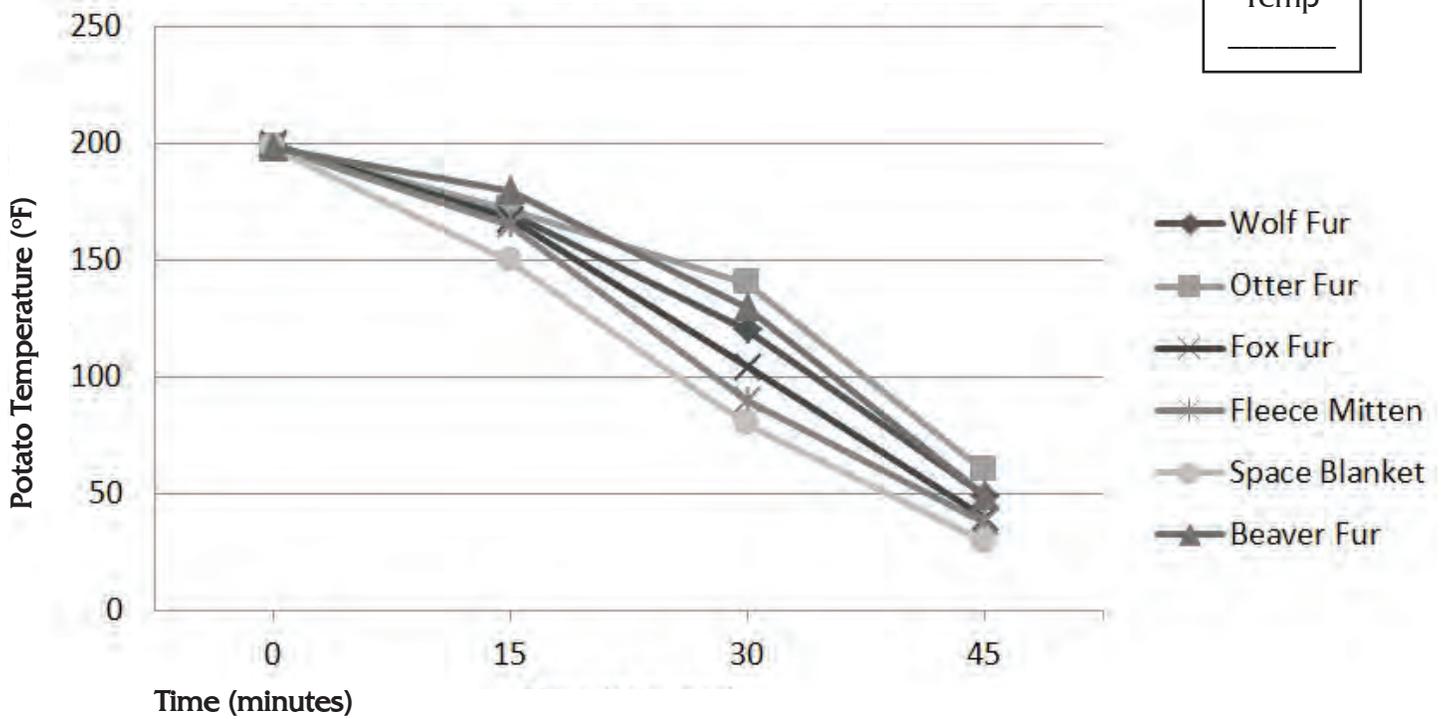
**Extension:** Test and compare the insulation properties of each fur when “inside out” by wrapping potatoes with the fur side in.

Try running the experiment repeatedly in different weather. Test furs in varying temperature or humidity levels and compare results.

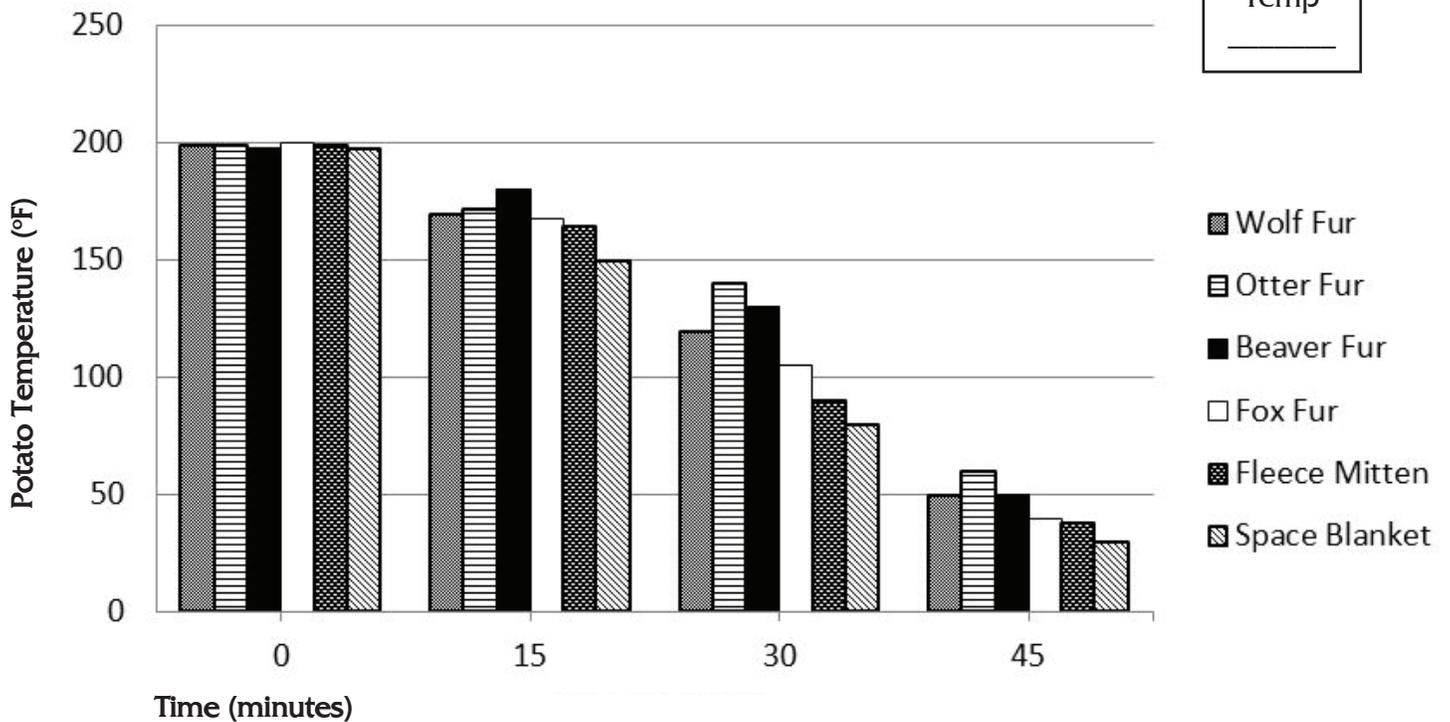
*Note: Example graphs do not include real data.*



Example graph 2 (total class data in a line graph)



Example graph 3 (total class data in a column graph)

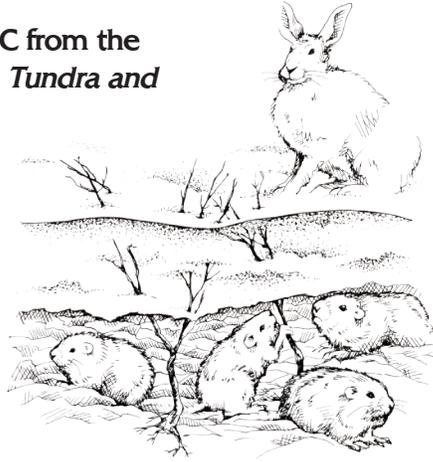


Example graphs do not include real data.



# E. Snow Blanket

Adapted from Experiment C from the Alaska Wildlife Curriculum, *Tundra and Wildlife*.



## Snow Blanket

**Grade Level:** K to 9

**Subjects:** Science

**Skills:** Analyzing, Comparing, Estimating, Hypothesizing, Inferring, Measuring, Observing

**Duration:** 30 minutes

**Group Size:** Small teams

**Setting:** Indoors & Outdoors

**Vocabulary:** air, conductor, heat energy, insulator, snow crystals

## Objectives

Students will describe the insulative function of snow in an ecosystem. Students will observe the differences and similarities between the insulating properties of fur and snow.

## Methods

Students perform a series of simple experiments to show that both snow and fur create insulation that can keep animals warm.

## Background

Snow is a good insulator because air is trapped in between snow crystals. The trapped air, a poor conductor of heat energy, insulates the ground from winter temperatures. For fur insulation information refer to 'About Fur' section.

## Materials

For each group:

- 4 film canisters or margarine tubs (at least 3 containers per group should have a lid)
- Powdered gelatin
- Fur samples/scraps
- 2 thermometers
- Snow shovel or trowel
- Large rubber bands or string

## Procedures

Choose a shaded area and perform this experiment early in the day to avoid the warmth of direct sun.

1. Explain to the students that they will be working with a powder called gelatin that dissolves in hot water and thickens when cooled.
2. Fill a measuring cup with hot water. Empty one package of gelatin into water and stir thoroughly. Fill all film canisters or margarine tubs half full with the gelatin solution. Give each group four film canisters containing gelatin, three lids, and two thermometers. Using rubber bands or string, students will wrap two of the lidded canisters with fur.
3. Divide students into groups of two or three. Each group needs a site to dig a snow pit one foot deep.
4. Students place the unlidded canister, one furred (lidded) canister, and one thermometer on the surface of the snow. Students bury the other two canisters (both lidded, one furred) and thermometer one foot deep in the snow.
5. After five minutes, check the unlidded surface canister for signs of gelling. When it begins to gel, students dig up the two buried containers and open and compare the progress of all four canisters. (The unlidded container above the snow should have gelled first.)
6. Check the thermometers. Students should find that the top layer of snow is cooler than the deeper, more thickly insulated layers.

7. Before discussion, have each student write a paragraph about their findings. Which canisters stayed the warmest? Which cooled the fastest?

## Evaluation

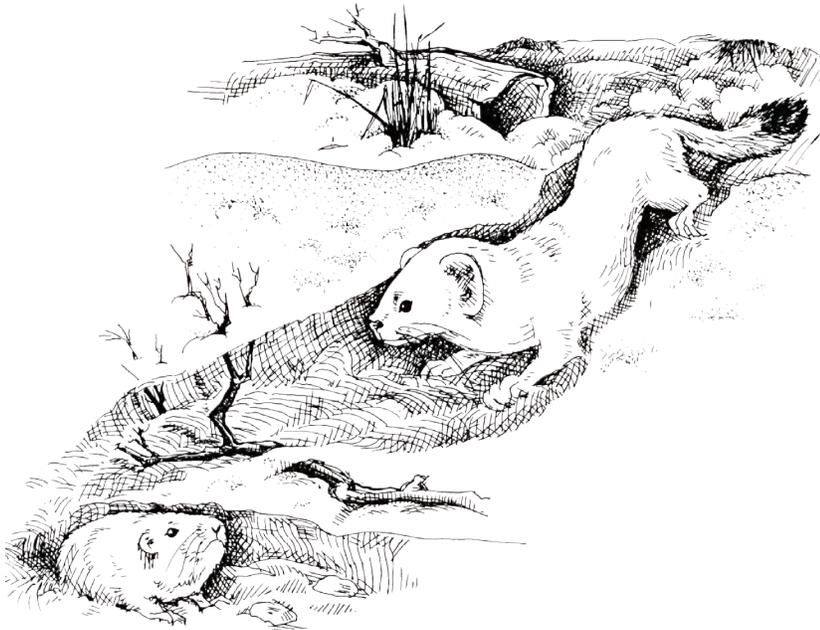
As a class, discuss the results of the experiments. Did every group have similar findings?

Discuss the basic similarity between snow and many common insulation materials such as down fill and Styrofoam. (They all trap air!)

Discuss with the students that snow acts as an insulator, just like a blanket or a jacket, or the fur of a mammal.

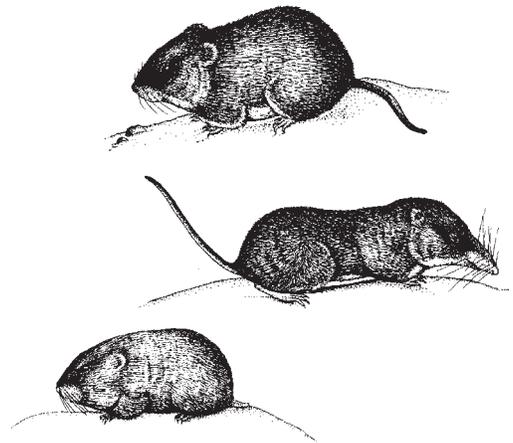
While some animals rely mainly on their fur to keep them warm, some animals depend on snow to keep them from getting too cold in the winter. For example, lemmings in the arctic spend their entire winter under the snow, not hibernating, but actively scurrying around eating, avoiding predators, and having babies.

What advantages could a mammal gain from both having very warm fur and living under the snow?



**Did You Know?**  
Subnivean mammals that live in Alaska include voles, shrews, lemmings, and mice.

**Snow is a good insulator because air is trapped between snow crystals. Air is a poor conductor of heat; therefore, objects surrounded by snow-trapped air stay warm.**



## F. Hair We Wear



### Hair We Wear

**Grade Level:** K to 6

**Subjects:** Social Studies, Writing

**Skills:** Analyzing, Comparing, Describing, Observing

**Duration:** 30 minutes to 1 hour

**Group Size:** Entire class

**Setting:** Indoors

**Vocabulary:** tanning, tawing, prime, synthetic

### Objectives

Students will consider the role of furs in relation to humans, gaining a better understanding of the place of people within ecosystems. Using information gained from studying furs, students should determine the usefulness of furs and skins as a resource.

### Methods

Students will bring fur items from home and analyze the qualities of the fur.

### Background

Residents of arctic climates wear animal skins and fur not as a fashion statement, but rather for the warmth, durability, and protection they offer.

Tanning refers to the treatment of skins to produce leather. There are many methods for tanning.

Traditionally, furs, hides, and fish skins in Alaska were prepared by working animal brains, fish eggs, and rendered animal oils into the skins as tanning agents. The skins were then smoked to preserve them and leave them soft enough for use. There were significant cultural differences between ethnic groups in preparations including the use of urine for tanning and freeze-drying techniques. Hides could be tanned with or without the fur or hair depending upon the specific needs for the skins.

Traditionally, tanning was a labor intensive process that was usually done by girls and women. Each woman had to learn early on how to make her own tanning tools and prepare the skins that she would use to clothe her family. Tanning and skin sewing skills were very highly valued in society and women took considerable pride in their abilities.

### Materials

- Clothing and other household items made from animal fur and skins
- Clothing and items made from synthetics to compare
- Fur samples to compare with clothing

### Procedures

**BEFORE CLASS:** Gather enough clothing and fur items for the entire class to observe items at the same time.

Students may also bring in items from home derived from animal skin or hair. (For example, some students might own fur hats, gloves, or other clothing. Some might own belts or knife sheaths made of leather.)

1. **IN CLASS:** Before sharing items, briefly discuss the importance of respecting other people's belongings. (Some students may choose to share items that are fragile, old, or valuable.)

2. Inform students they must handle all items and clothing with care and ask permission before touching special items.
3. Spread items out for the class to observe. Students should choose two to three of their favorite items to write about.

Using information learned about the useful properties of various mammal furs, students should write a paragraph about each chosen item.

Questions to consider when observing each item are:

- What kind of animal is it made from?
- Who made it?
- How long did it take to make?
- How old is the item?
- What is it used for?
- Does the item have special qualities such as providing warmth or waterproofing?
- Is there an equivalent item made from synthetic materials? Which is better? Why?

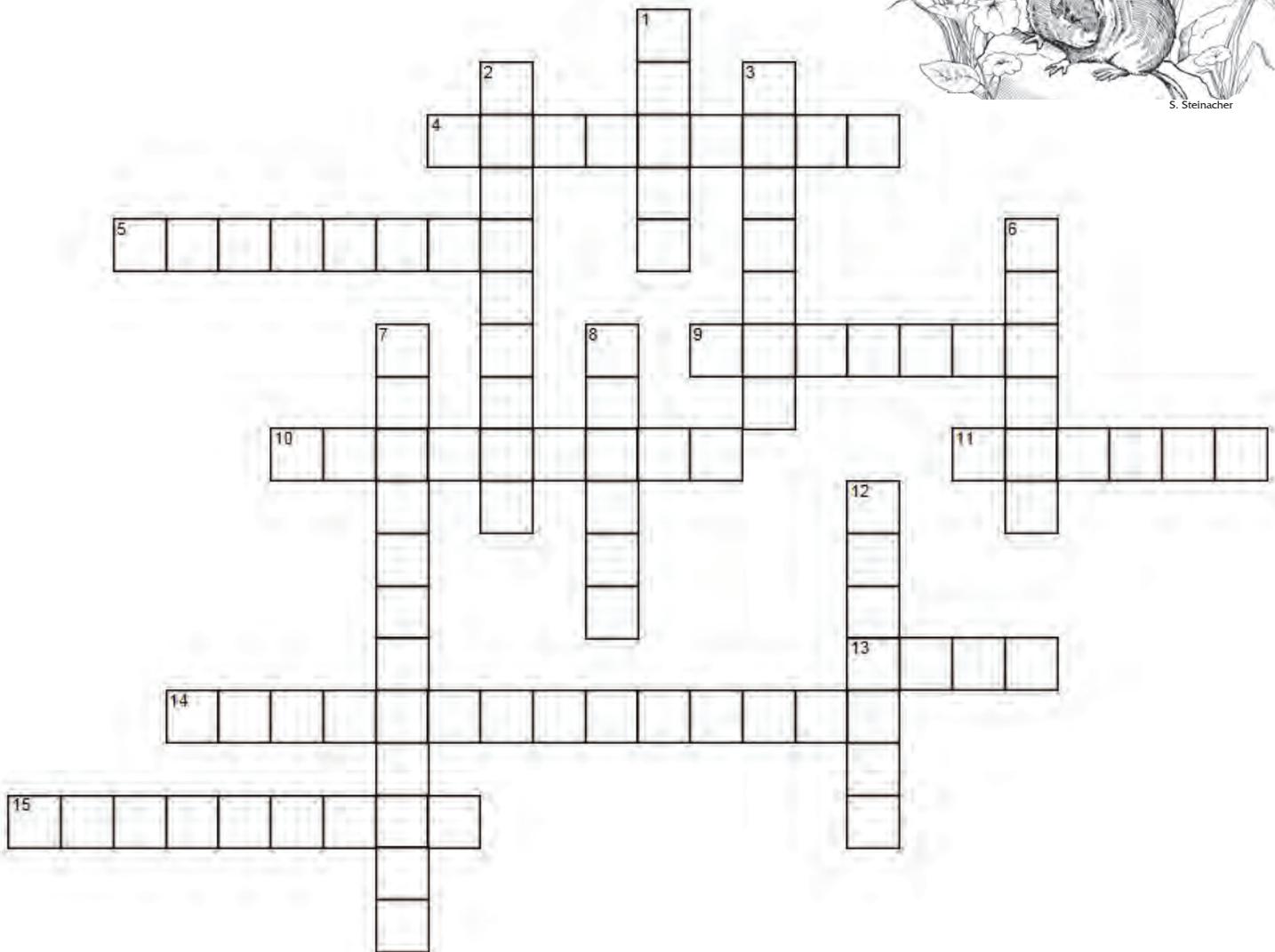
## Evaluation

People have used animal furs for as long as we can remember. As a class, list ways fur has been replaced with other technologies and materials. (For example, synthetic housing materials have replaced animal-derived housing materials in many communities.) Discuss the pros and cons of this change.

There are many items derived from animal fur and skin. Discuss ways in which we still use these items today. List some items derived from animal fur or skin that cannot be replaced with synthetic material.



# G. FUR CROSSWORD



## ACROSS

4. The insulated environment below the snow.
5. Finer, denser hair. Usually responsible for most insulation properties.
9. The fat of whales and other large marine mammals.
10. Depressions in the skin from which hair grows.
11. The thickest layer of skin, composed of collagen.
13. The shedding of old hair or feathers to be replaced with new ones.
14. These overlay the outer cuticle of a hair, giving it a barbed structure.
15. The layer of skin which prevents water diffusion and protects the body from radiation and infectious organisms.

## DOWN

1. Fur that has reached its maximum length, density, and finest texture.
2. Longer, courser outer hair that usually works to shed water and protect from abrasion.
3. The pith-like structure running through the center of a hair shaft.
6. Makes up the bulk of a hair shaft and contains pigment particles.
7. The “puffing” of hairs, creating more air space insulation or changing the size/appearance of the animal.
8. The complete coat of an animal.
12. This determines the color of hair.

(Answer key on page 42)

**ACROSS**

4. subnivean
5. underfur
9. blubber
10. follicles
11. dermis
13. molt
14. cuticular scale
15. epidermis

**DOWN**

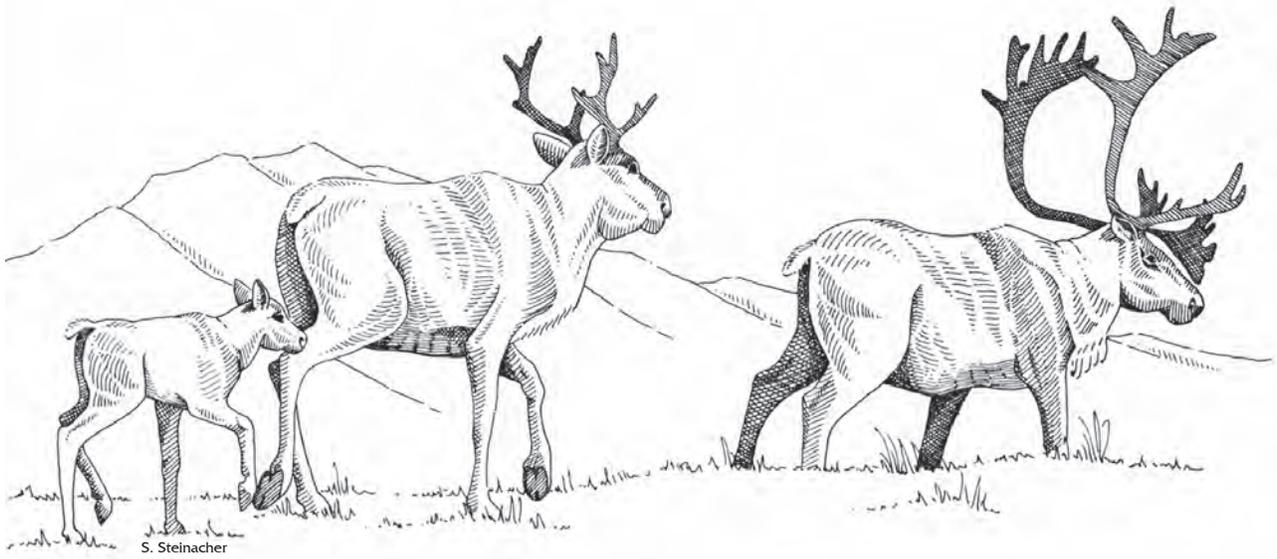
1. prime
2. guard hair
3. medulla
6. cortex
7. piloerection
8. pelage
12. pigment

# 4. Fur I.D. Cards

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## Species listed by Order:

- Order Carnivora (carnivores)
- Order Artiodactyla (even-toed ungulates)
- Order Rodentia (rodents)
- Order Lagomorpha (hares and rabbits)





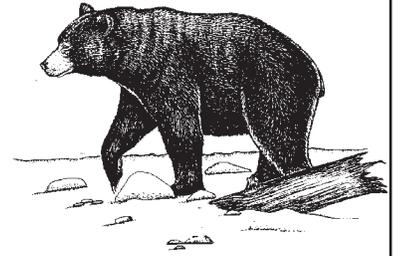
# Order Carnivora (carnivores)

## BLACK BEAR (*Ursus americanus*)

**Family:** Ursidae **Habitat:** Forest **Body Size:** Adult males average 51 to 75 inches total length. Females average 43 to 67 inches total length.

**Fur Description:** Color can vary from jet black to white. Black is encountered most frequently, but brown, cinnamon-colored, or bluish-colored bears are also found around the state. They often have brown muzzles. Some also have a patch of white hair on their chest. *NOTE: Color is not a reliable key in differentiating bears because black and brown bears have many color phases and polar bears may have stained fur.* Guard hairs are about 4 inches long and slightly wavy. Underfur is about 1.7 to 2 inches long, fine, very kinked, and usually dark brown.

**Pelt Durability:** High **Weight:** 7 ounces/square foot **Uses:** Black bears in Alaska are valued for their food and fur. Fur is used for rugs, clothing, ruffs, military hats, traditional weather stripping.



## BROWN BEAR (*Ursus arctos*)

**Family:** Ursidae **Habitat:** Forest, Tundra, Wetlands **Body Size:** Usually 54 to 108 inches total length. (Usually larger than black bears. Polar bears are similar in size to coastal brown bears. Size differences are not valid criteria in classification.)

**Fur Description:** Can be a wide range of colors varying from pale yellowish blonde to dark brown or almost black. *NOTE: Color is not a reliable key in differentiating bears because black and brown bears have many color phases and polar bears may have stained fur.* Underfur is typically chocolate brown. Guard hairs generally have a subterminal white band and white or silvery tips of various lengths, giving a “grizzly” appearance. In fully prime pelt, guard hairs are about 3 to 4 inches long and slightly longer than the underfur.

**Pelt Durability:** High **Weight:** 7 ounces/square foot **Uses:** Bear hunting is an important traditional and economic aspect of life in Alaska. Fur is used for rugs, clothing, ruffs, military hats, traditional weather stripping.

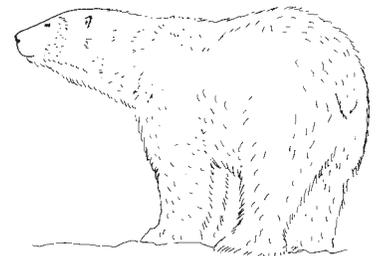


## POLAR BEAR (*Ursus maritimus*)

**Family:** Ursidae **Habitat:** Arctic Marine **Body Size:** Average 96 to 120 inches total length.

**Fur Description:** Stiff, durable, wear resistant, water repellent hair on top of a dense undercoat. Color may appear white, yellow, gray, or almost brown depending on cleanliness and season. *NOTE: Color is not a reliable key in differentiating bears because black and brown bears have many color phases and polar bears may have stained fur.* Guard hairs are about 3 to 4 inches long, glossy, and wavy; almost bristle-like. Underfur is extremely dense, fine, and woolly, appearing similar to sheep’s wool. The bottoms of their large feet are nearly covered in fur.

**Pelt Durability:** High **Uses:** Polar bears are valued by Alaska Natives for their food and fur. The fur is used for rugs, clothing, ruffs, fishing flies, and crafts.



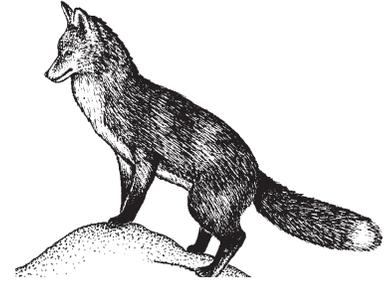
# Order Carnivora (carnivores)

## RED FOX (*Vulpes vulpes*)

**Family:** Canidae **Habitat:** Forest, Tundra, Wetlands **Body Size:** Average 39 to 43 inches total length. Tails average 14 to 16 inches in length.

**Fur Description:** Usually recognized by reddish coat, white-tipped tail, and black “stockings.” Red is the most common color, but there are many color variations. Red foxes displaying a distinct color pattern are referred by the name of that phase (i.e., red, cross, silver, black). The white tip on the tail will distinguish this fox from other species, regardless of color phase. The outside of the ears may be black-tipped, while the inside is usually white. Guard hairs are plentiful and strong, about 2 inches long, moderately soft, and appears fluffy. Underfur is about 1 to 1.5 inches long, very soft and fluffy. Pelt is at peak of primeness by December; by mid-January fur quality may begin to decline as a result of wear.

**Pelt Durability:** Medium **Weight:** 3 ounces/square foot **Uses:** Red foxes are trapped as a furbearer in Alaska and may also be hunted as a fur animal.

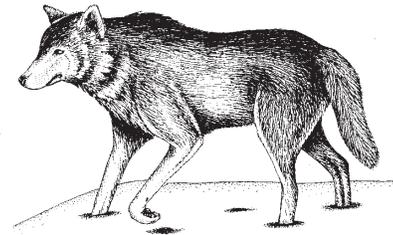


## WOLF (*Canis lupus*)

**Family:** Canidae **Habitat:** Forest, Tundra, Wetlands **Body Size:** Males average 55 to 63 inches total length. Females average 51 to 59 inches total length. In most cases, the tail is less than half the body length.

**Fur Description:** The pelt color of Alaska wolves ranges from black to nearly white, with every shade of gray and tan in between. Gray or black wolves are most common, and the relative abundance of each color phase varies over time and from place to place. Winter fur is dense and fluffy. Guard hairs are about 2.3 to 4 inches long, about 4.7 to 6 inches long on the mane. Underfur is fine, very wavy, and usually found in tufts.

**Pelt Durability:** Medium **Weight:** 6.5 ounces/square foot **Uses:** Wolves in Alaska are managed as both a big game animal and a furbearer; they are hunted and also trapped. Wolf fur is commonly used for parka ruffs.

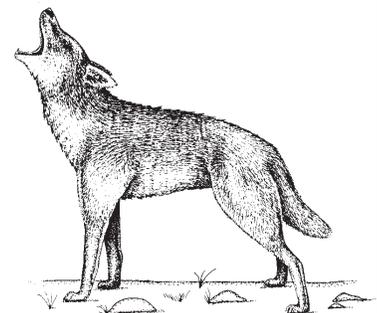


## COYOTE (*Canis latrans*)

**Family:** Canidae **Habitat:** Forest, Tundra, Wetlands **Body Size:** Average 48 to 60 inches total length. Tail average 16 inches in length.

**Fur Description:** The summer coat is predominantly gray, washing into tan along the belly, lower legs, muzzle, and ears. Some guard hairs are tipped with black, as is the tail. The upper lip and underside are whitish. The intensity and amount of coloring varies, and individuals are usually lighter in winter. Fur is long and dense. Guard hairs are about 2 to 2.8 inches long (about 3 to 4.4 inches on the mane) and slightly wavy. Underfur is fine and soft. Coats become prime during late autumn.

**Pelt Durability:** Medium **Uses:** Coyotes are managed as a furbearer in Alaska, and may also be hunted as a fur animal. A small number of coyotes are trapped each year, providing some income to Alaskan trappers.



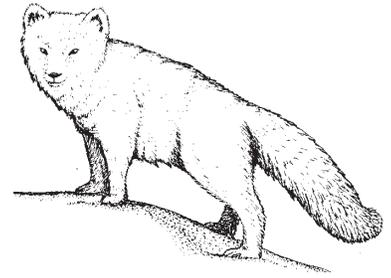
# Order Carnivora (carnivores)

## ARCTIC FOX (*Alopex lagopus*)

**Family:** Canidae **Habitat:** Tundra, Wetlands **Body Size:** Average 43 inches total length. Tails average 15 inches in length.

**Fur Description:** Both white and blue color phases occur. While foxes of the white phase alternate brown to white, foxes of the blue phase remain dark or charcoal colored year-round and only become somewhat lighter in winter. Molting occurs twice each year. The long, dense winter fur is shed in early April, and by late June, face, legs, and upper parts of the body are covered with short, brown summer fur. The fur of the lower sides and abdomen is yellowish-white. The change to winter pelage occurs in September and October, and by November the white winter coat is complete. White, winter guard hairs are about 1.5 to 2 inches long, appearing soft and fluffy. Underfur is very fine and cottony.

**Pelt Durability:** Medium **Uses:** Arctic foxes are trapped as a furbearer in Alaska and may also be hunted as a fur animal. The sale of their pelts is important to the economy of many coastal villages.

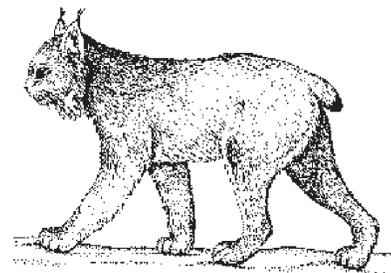


## LYNX (*Lynx canadensis*)

**Family:** Felidae **Habitat:** Forest **Body Size:** Adult males average 33.5 inches total length. Adult females average 32 inches total length.

**Fur Description:** The dense, soft fur is buffy gray with indistinct spotting. Color is reddish to gray-brown. The large feet are furry. Long tufts on the tip of each ear, and a black-tipped tail. Winter pelage is a grizzled, grayish brown mixed with buff or pale brown. Belly, legs, and feet are grayish white or buff white. Molting occurs during spring, changing to a darker, reddish brown pelage. Guard hair is fine, silky, and flowing, about 2.5 to 4 inches long. Underfur is fine, fluffy, and very wavy, about 1 to 1.5 inches long.

**Pelt Durability:** Low-Medium **Weight:** 2.75 ounces/square foot **Uses:** Lynx are trapped as a furbearer in Alaska and may also be hunted as a fur animal. They are valued for their beautiful valuable pelts. The leather is usually very supple. Many people also eat lynx meat.



## WOLVERINE (*Gulo gulo*)

**Family:** Mustelidae **Habitat:** Forest, Tundra **Body Size:** Average 25.6 to 41 inches length, not including tail. Tails average 6.7 to 10 inches in length.

**Fur Description:** Color is generally dark brown to black with a creamy white to gold stripe running from each shoulder along the flanks to the base of the tail. A white hair patch on the neck and chest is common. Dense, woolly, kinky underfur is about 0.7 to 1.2 inches long. Coarse, stiff, slightly wavy guard hairs are about 2.3 to 2.8 inches long, 4 to 5.5 inches long on the tail and around the flanks. Fur is short and thick on the head. Ears are fully furred.

**Pelt Durability:** Very High **Weight:** 7 ounces/square foot **Uses:** Wolverines in Alaska are managed as both a big game animal and a furbearer; they are hunted and also trapped. Wolverine fur arguably provides the best ruff. Its fur is commonly used for parka trim and hoods because of its beauty and durability and because the guard hairs help shed frost accumulation.



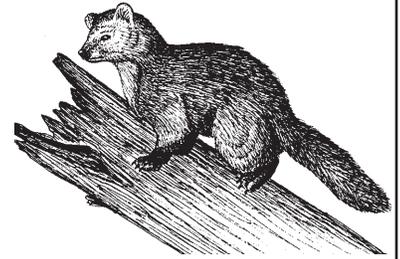
# Order Carnivora (carnivores)

## AMERICAN MARTEN (*Martes americana*)

**Family:** Mustelidae **Habitat:** Forest **Body Size:** Average 19 to 25 inches length not including tail. Tail accounts for nearly a third of total length.

**Fur Description:** Stiff, glossy guard hairs and dense, silky underfur. Color ranges from pale yellow to dark brown, often shading to black on feet and legs. Lighter-colored martens tend to have grayish brown tails, while darker animals have dark brown tail fur. The fur around the muzzle varies from gray to light brown with a short dark line extending up the forehead from the corner of each eye. Throat and upper chest are usually pale or buff or deep orange. Hairs on the mane about 2 to 2.4 inches, other guard hairs slightly shorter. Underfur is 0.7 to 1 inch long, fine, and slightly wavy. Large furry paws allow the marten to travel easily on snow. Quality is best after growth of winter coat is completed in mid-October.

**Pelt Durability:** Medium **Weight:** 2.5 ounces/square foot **Uses:** Marten are trapped as a furbearer in Alaska and are currently Alaska's most widely trapped animal. In Alaska the fur is commonly used for hats. Marten in Russia are known as sable.

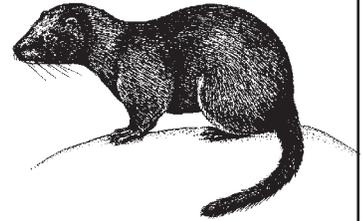


## AMERICAN MINK (*Neovison vison*)

**Family:** Mustelidae **Habitat:** Forest, Tundra, Wetlands **Body Size:** Average 19 to 28 inches total length. Tails are one-third to one-fourth of the body length and average 6 to 8 inches.

**Fur Description:** Dense pelage is soft and lustrous, with thick grayish brown underfur and long glossy guard hairs. Color usually varies from dark brown to almost black. Prime fur is chocolate brown with some irregular white patches on the chin, throat, and belly. Guard hairs are about 1 inch long. Underfur is usually thick, fine, and wavy, not longer than an inch, with some suggestion of light and dark bands. The tail is thickly furred, almost black at the tip, with slightly longer guard hairs than the body. As an adaptation to their aquatic lifestyle, oily guard hairs tend to waterproof the animal.

**Pelt Durability:** High **Weight:** 3.25 ounces/square foot **Uses:** Mink are trapped as a furbearer in Alaska. Fur is durable, light, and was/is traditionally usually used for women's clothing.

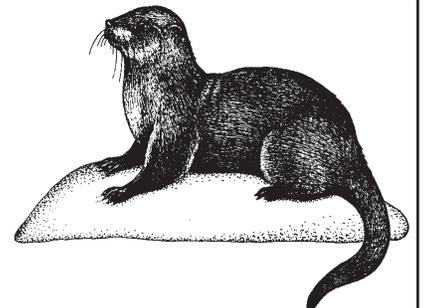


## NORTH AMERICAN RIVER OTTER (*Lontra canadensis*)

**Family:** Mustelidae **Habitat:** Tundra, Wetlands **Body Size:** Average 40 to 60 inches total length.

**Fur Description:** Pelt consists of short, dense, soft underfur protected by longer, stiff glossy guard hairs. Hairs are slightly curved. Guard hairs are about 0.9 to 1.1 inches long. Underfur is about 0.4 inches long, very soft, and fine. Air trapped within the fur acts as insulation when submerged. Color ranges from rich dark brown to pale chestnut dorsally, and light brown mixed with gray ventrally. When prime, river otter fur appears black-brown, with the belly slightly lighter in color than its back. The chin and throat are grayish.

**Pelt Durability:** Very High **Weight:** 4.5 ounces/square foot **Uses:** River otters are trapped as a furbearer in Alaska. Fur is heavy, durable, and was/is traditionally usually used for men's clothing. Can be plucked of guard hairs to make velvety material.



# Order Carnivora (carnivores)

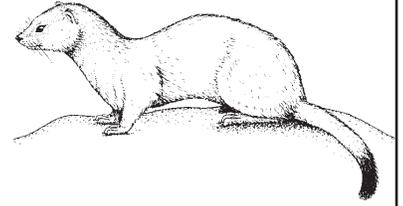
## ERMINE (Short-Tailed Weasel)

(*Mustela erminea*)

**Family:** Mustelidae **Habitat:** Forest, Tundra, Wetlands **Body Size:** Adult males average 8.7 to 13 inches total length. Females average 7.5 to 11.4 inches total length.

**Fur Description:** Pelage is reddish-brown above and creamy white below in summer, with white fur extending down the inner side of the hind leg. Completely white in winter, except for the tip of the tail which remains black in all seasons. Underfur is short and even, with guard hair slightly longer. Guard hairs are about 0.2 to 0.4 inches long, soft, and fluffy. Guard hair is slightly longer on the tail and mane, tail hairs are more rigid. Underfur is fine, very fluffy, and slightly wavy.

**Pelt Durability:** Low **Weight:** 1.25 ounces/square foot **Uses:** Ermine are trapped as a furbearer in Alaska. Fur traditionally used as trim for royal robes. Leather is light and durable.

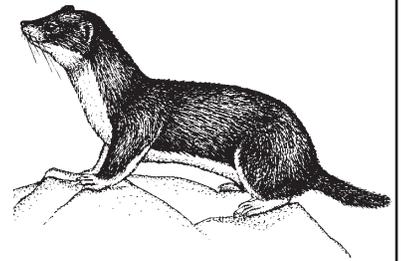


## LEAST WEASEL (*Mustela nivalis*)

**Family:** Mustelidae **Habitat:** Forest, Tundra **Body Size:** Adult males are 10 inches or less total length. Adult females are 9 inches or less total length.

**Fur Description:** Fur is brown above and light below during summer. Winter coat is white. Distinguished from ermines and other weasels by having a tail less than one-fourth the length of the head and body, and with no distinctive black tip. This weasel is the smallest carnivoran in the world. Guard hairs are about 0.2 to 0.4 inches long, underfur is about 0.1 to 0.2 inches long.

**Pelt Durability:** Low **Uses:** Least weasels are trapped as a furbearer in Alaska.

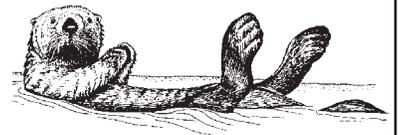


## NORTHERN SEA OTTER (*Enhydra lutris kenyoni*)

**Family:** Mustelidae **Habitat:** Marine **Body Size:** Adult males average 53 inches total length. Females average 49 inches total length.

**Fur Description:** The fur, which is possibly the finest in the world, consists of a very dense underfur of about 0.7 to 1.2 inch long fibers and sparse guard hairs. The underfur ranges from brown to almost black. Guard hairs may be black, pale brown, or silver, often giving a veiled effect of silvery hairs on a dark background. Older animals often develop a silvery head. Molting occurs year-round but appears to peak during late spring or summer. Because they have no blubber, they depend on air trapped in their fur for maintaining body temperature.

**Pelt Durability:** Very High **Weight:** 4.5 ounces/square foot **Uses:** Sea otters are hunted by Alaska Natives for subsistence use. Traditionally very valuable, they were one of the main causes of Russian exploration of Alaska.



# Order Artiodactyla (even-toed ungulates)

## SITKA BLACK-TAILED DEER

(*Odocoileus hemionus sitkensis*)

**Family:** Cervidae **Habitat:** Forest **Body Size:** Adult males average 120 pounds. Adult females average 80 pounds.

**Fur Description:** The winter coat is dark brownish gray and the hairs are hollow, providing increased insulation. The summer coat is reddish brown and the hairs are solid. Surprisingly, there is more hair on the summer coat than the winter one. This extra hair protects against biting insects. Guard hair is about 1 to 2 inches long, underfur about 0.5 to 1.4 inches long.

**Pelt Durability:** Low **Uses:** Deer are managed as a big game animal in Alaska. Fur is most often removed from the hide to make leather because the hair is brittle. The fur is also used for fishing flies.

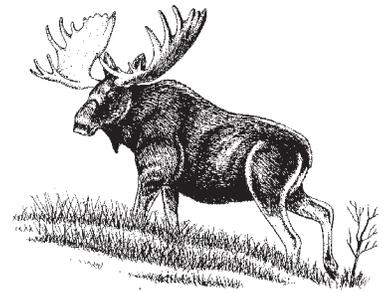


## MOOSE (*Alces alces*)

**Family:** Cervidae **Habitat:** Forest, Wetlands **Body Size:** Adult males average 1200 to 1600 pounds in weight. Adult females average 800 to 1300 pounds in weight. Can stand almost 72 inches tall at the shoulder.

**Fur Description:** Color ranges from golden brown to almost black, depending upon the season and the age of the animal. The hair of newborn calves is generally red-brown fading to a lighter rust color within a few weeks. By late summer, calves have shed their rust colored coat which is replaced with hair similar in texture and color to that of adults. Hair is about 2 to 3 inches long, with mane hairs about 6 inches long. Underfur is kinked in appearance.

**Pelt Durability:** Low **Uses:** Moose are managed as a big game animal in Alaska. Today, more people hunt moose than any other of Alaska's big game species. Hair is often removed and skin used for leather because the hair is brittle. The removed hairs are traditionally used in mukluks, to stuff pillows or line dog boxes, or for embroidery and tufting art. The moose leg skin was used by Russians as ski skins.

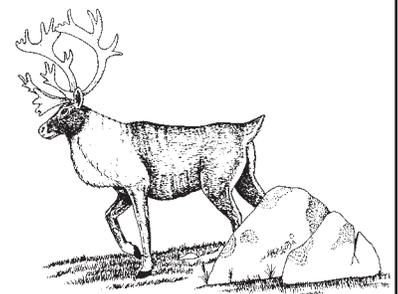


## CARIBOU (*Rangifer tarandus granti*)

**Family:** Cervidae **Habitat:** Forest, Tundra **Body Size:** Adult bulls average 350 to 400 pounds. Mature females average 175 to 225 pounds.

**Fur Description:** In late fall, caribou are clove-brown with a white neck, rump, and feet and often have a white flank stripe. The hair of newborn calves ranges from dark, chocolate brown to reddish brown. Hair is slightly wavy. Mane hairs are about 4.7 to 5.1 inches long, with other guard hairs slightly shorter. Underfur is about 0.7 to 1.2 inches long.

**Pelt Durability:** Low **Uses:** Caribou are managed as a big game animal in Alaska. Used for parkas, mittens, pants. Calves provide a softer skin, used for underclothes. Sometimes caribou is used for leather but less often than moose or deer because insects often damage the skin during its life. Used for snowshoe babiche. Hides also coarsely tanned with hair on for sleeping or sitting pads. The hair tends to shed badly from pelts. Caribou leg skins were/are traditionally used as boot uppers, preferred over moose.



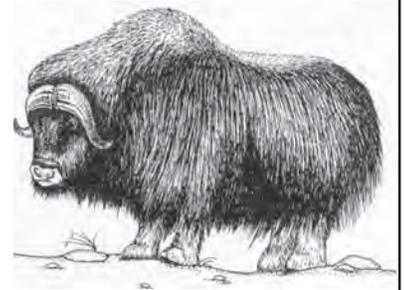
# Order Artiodactyla (even-toed ungulates)

## MUSKOX (*Ovibos moschatus*)

**Family:** Bovidae **Habitat:** Tundra **Body Size:** Adult males average 600 to 800 pounds, standing about 60 inches at the shoulder. Adult females average 400 to 500 pounds, standing about 48 inches at the shoulder.

**Fur Description:** The coat consists of a long, coarse, outer layer, and short, fine underfur. Coloration of the Greenland muskox, the kind found in Alaska, is generally dark brown with creamy-colored hair on the saddle, forehead, and legs. Guard hairs are about 7 to 14 inches long.

**Pelt Durability:** Medium **Uses:** Muskoxen are managed as a big game animal in Alaska. Qiviut (muskox underwool) is light and warm, and one of the softest wools. It is knitted into various clothing items, usually used for hats and scarves.

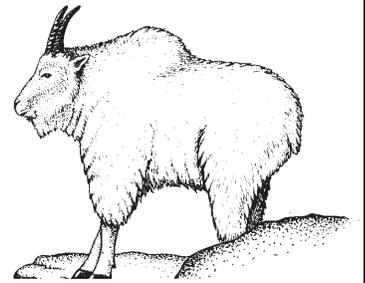


## MOUNTAIN GOAT (*Oreamnos americanus*)

**Family:** Bovidae **Habitat:** Alpine **Body Size:** Adult females average 180 pounds. Adult males average 260 pounds. Prime-aged males often weigh more than 300 pounds.

**Fur Description:** White coloration. Long, shaggy winter coat. A crest of long, erect hair up to 8 or more inches in length runs along the spine, on the rump, and over the shoulders and neck. Long hairs are present on the legs and chin. They begin shedding their winter coat in June. By July, their soft, sleek summer coat is grown in. When the first winter snows dust the high country in mid-October, mountain goats have fully grown their winter coats again. Coats are more yellowish in color than those of Dall sheep.

**Pelt Durability:** Medium **Weight:** 4.13 ounces/square foot **Uses:** Mountain goats are managed as a big game animal in Alaska. Underwool is traditionally used for weaving. Used in weaving of famous Chilkat blankets in Southeast Alaska.

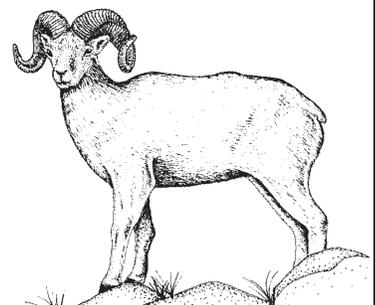


## DALL SHEEP (*Ovis dalli dalli*)

**Family:** Bovidae **Habitat:** Alpine **Body Size:** Adult males usually weigh less than 300 pounds. Adult females usually weigh less than 150 pounds.

**Fur Description:** White coloration. Coats are whiter in color than those of mountain goats, and hair is much shorter. Guard hairs are about 0.7 to 2.2 inches long, underfur is about 0.7 to 1.5 inches long.

**Pelt Durability:** Low **Uses:** Dall sheep are managed as a big game animal in Alaska. Fur traditionally used for accents and trim for parkas because of the fine white color. Hair is brittle.



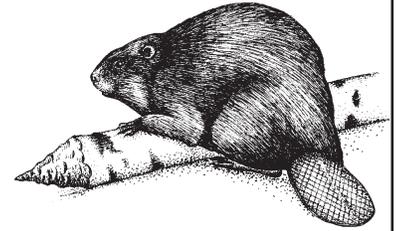
# Order Rodentia (rodents)

## BEAVER (*Castor canadensis*)

**Family:** Castoridae **Habitat:** Forest, Tundra, Wetlands **Body Size:** May reach 36 to 48 inches long, including tail. Tail is about 10 inches long and 6 inches wide.

**Fur Description:** Heavy, rich, chestnut brown coat over warm, soft underfur. Fur is waterproofed. Guard hairs are stiff, thick, and long, colored black to reddish. Guard hairs are about 1.5 to 4 inches long when fully grown. Underfur is fine, soft, wavy, and extremely dense, color ranges from black to gray and may be reddish tipped. Underfur is about 0.4 inches long. Large, webbed feet and broad, black tail are usually removed.

**Pelt Durability:** High **Weight:** 4 ounces/square foot **Uses:** Beaver are trapped as a furbearer in Alaska and may also be hunted as a fur animal. Peak primeness occurs between December and March. Fur is highly prized for cold weather coats, hats, and mittens. In the past, pelts were so valuable they were traded in place of money. The underfur was used for felt in fashionable hats. Many people also eat beaver meat.



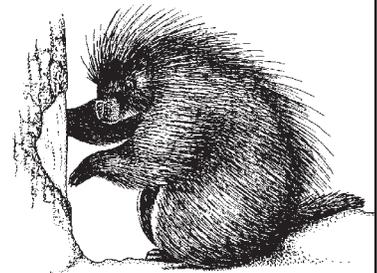
## NORTH AMERICAN PORCUPINE

(*Erethizon dorsatum*)

**Family:** Erethizontidae **Habitat:** Forest **Body Size:** Average 25 to 31 inches long.

**Fur Description:** Covered (except on the foot pads and nose) with wiry hair and quills of varying length. Quills (modified guard hairs) cover all but the legs and belly. Quills from different parts of the body vary in length, flexibility, color, shaft diameter, and barb length. Tips are lighter and give the coat hues of yellow or white. Underfur is rigid and wiry. Belly hair is sparse and varies from black to brown. The upper surface of the tail is heavily covered with quills, while the underside is covered in bristle-like hairs.

**Pelt Uses:** Quills are still used for decoration by Alaska Native groups. Guard hairs 6 to 8 inches long are used for headdresses, often dyed. Tails are very stiff; the tail skin was/is traditionally used for hair brushes.

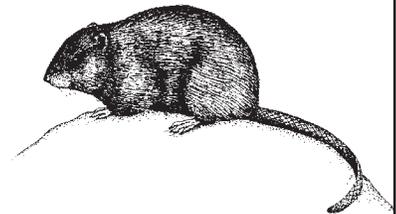


## MUSKRAT (*Ondatra zibethicus*)

**Family:** Cricetidae **Habitat:** Tundra, Wetlands **Body Size:** 10 to 14 inches in length, excluding 8 to 11 inch tails. 16 to 25.5 inches total length.

**Fur Description:** Coats consist of soft, dense, thick, waterproof underfur and long, coarse, glossy overlayer of guard hairs. The guard hairs produce the dominant color of the upper parts. Coloration ranges from a medium silvery brown to dark brown with a lighter belly. The feet and tail are dark brown or black. Guard hairs are about 1.2 inches long. Underfur is fine and wavy and appears fluffy, about 0.3 to 0.8 inches long.

**Pelt Durability:** Medium **Weight:** 3.25 ounces/square foot **Uses:** Muskrats are trapped as a furbearer in Alaska. The fur is used extensively for parkas. The fur can also be shaved down and used as a seal skin substitute.



# Order Rodentia (rodents)

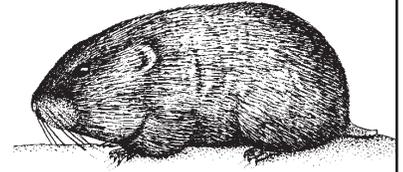
## NORTHERN COLLARED LEMMING

(*Dicrostonyx groenlandicus*)

**Family:** Cricetidae **Habitat:** Tundra, Wetlands **Body Size:** About 6.3 inches in length.

**Fur Description:** Thick pelage that varies seasonally: in summer the coat is light to dark gray with a buffy to reddish-brown tone, with dark lines down the back and on the sides of the head. In winter, coat is pure white, except in the lemmings on Unalaska and Umnak islands which do not molt to white pelage. *Dicrostonyx* is the only genus in Rodentia in which individuals have completely white coats in the winter season.

**Pelt Durability:** Low **Uses:** Alaska Natives use the soft white winter coats of the collared lemming to decorate clothing and for toys.

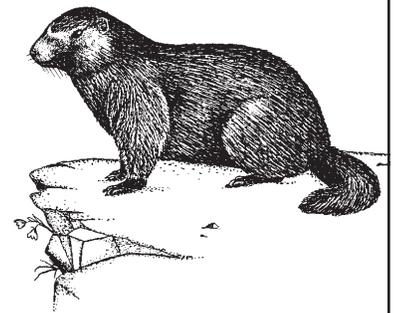


## MARMOT ALASKA MARMOT (*Marmota broweri*) HOARY MARMOT (*Marmota caligata*)

**Family:** Sciuridae **Habitat:** Alpine Tundra **Body Size:** Alaska Marmot males average 23.8 inches length, females 22.7 inches. Hoary marmots may exceed 30 inches in length.

**Fur Description:** Marmots are predominantly gray with a darker lower back and face and a dark, reddish tail. Tail is densely furred and bushy. The hoary marmot has a white patch above its nose and usually has dark brown feet. The Alaska marmot has a darker face and rump and much softer fur, it lacks the light patch on the snout, dorsal guard hairs have a tri-colored banding pattern, feet are lighter in color, and ventral color appears dark gray.

**Pelt Durability:** Medium **Uses:** Marmots are trapped as a furbearer in Alaska. Used for food and fur. Used for parkas. Harvested in early spring or fall.

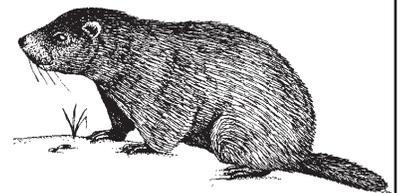


## WOODCHUCK (*Marmota monax*)

**Family:** Sciuridae **Habitat:** Forest **Body Size:** Up to 26 inches in length.

**Fur Description:** One of three marmot species found in Alaska, this marmot is a uniform reddish brown, with an unmarked brown face. Tail is densely furred and bushy. Guard hair length is about 1 to 1.5 inches. Underfur is fine and wavy. Tail hairs are 1.5 to 1.8 inches long, wavy, and wiry.

**Pelt Durability:** Medium **Uses:** Marmots are trapped as a furbearer in Alaska. Fur is not usually used. In the lower 48, the hide is used for babiche, shoelaces.



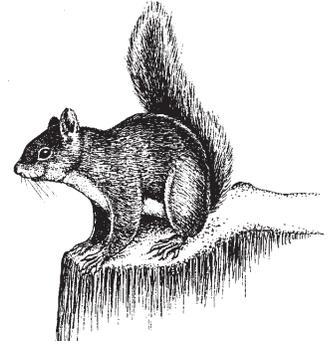
# Order Rodentia (rodents)

## RED SQUIRREL (*Tamiasciurus hudsonicus*)

**Family:** Sciuridae **Habitat:** Forest **Body Size:** Average 11 to 13 inches in length including tail. Tail length average 3.5 to 6 inches.

**Fur Description:** Rusty-olive color on the upper parts of its body with a whitish belly and underparts. Head is slightly grayer. In summer, a dark stripe on the side separates the upper rusty color from the white of the belly. Main guard hairs are about 0.3 inches. The bushy tail is often a lighter orange or red with light tipped hairs. Tail hairs are usually over 0.7 inches long. Underfur are very fine and slightly wavy.

**Pelt Durability:** Low **Weight:** 1.75 ounces/square foot **Uses:** Red squirrels are not widely trapped but are considered a furbearer in Alaska, and may also be hunted as a fur animal. Fur is decent, used for trim and small projects. Tail are still used by fishing lure companies for spinners. Although not a large animal some people eat red squirrel meat.



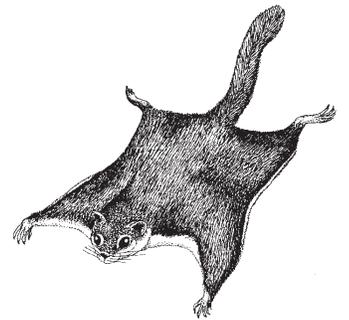
## NORTHERN FLYING SQUIRREL

(*Glaucomys sabrinus yukonensis*)

**Family:** Sciuridae **Habitat:** Forest **Body Size:** Adult 12 inches in total length.

**Fur Description:** The tail is broad, flattened, and feather-like. A unique feature of the body is the lateral skin folds (patagia) on each side that stretch between front and hind legs and function as gliding membranes. Flying squirrel pelage is silky and thick with the top of the body light brown to cinnamon, the sides grayish, and the belly whitish. Guard hairs are about 0.5 to 1.1 inches long. Underfur is about 0.2 to 0.3 inches long.

**Pelt Durability:** Very Low **Uses:** Flying squirrels are not widely used but may be trapped as a furbearer or hunted as a fur animal in Alaska. Fur is not usually used but is extremely soft.



## ARCTIC GROUND SQUIRREL

(*Spermophilus parryii*)

**Family:** Sciuridae **Habitat:** Tundra **Body Size:** Average 13 to 19.4 inches in length.

**Fur Description:** Tawny brown coloration with white flecks on the dorsal side of the pelage and a light tan or beige coloration on their undersides. Their undersides lighten during winter months. Tails are relatively short compared to other squirrel species. Guard hair is about 0.6 to 0.8 inches long, about 1.4 inches on the tail.

**Pelt Durability:** Medium **Uses:** Arctic ground squirrels are hunted as a fur animal and trapped as a furbearer in Alaska. Their fur was/is used to make parkas. Also known as "Parka squirrel." Used for coats, usually silvery males used.



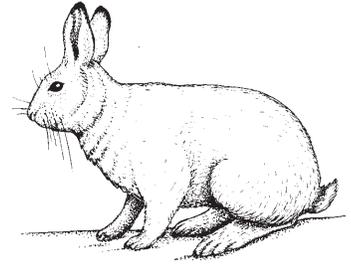
# Order Lagomorpha (hares and rabbits)

## SNOWSHOE HARE (*Lepus americanus*)

**Family:** Leporidae **Habitat:** Forest **Body Size:** Average 18 to 20 inches in total length.

**Fur Description:** During summer the coat is yellowish to grayish brown with white underparts, and the tail is brown on top. This coat is shed and replaced by white pelage in winter, but the hairs are dusky at the base and the underfur is gray. Guard hairs are slender and soft, about 1 to 1.6 inches in length. Underfur is very slender, wavy, and fluffy, about 0.5 to 0.8 long. The ears are dark at the tips. The large hind feet are well-furred, adapting these animals for deep snows.

**Pelt Durability:** Very Low **Weight:** 2.25 ounces/square foot **Uses:** Snowshoe hares are managed as small game species in Alaska. Fur is light, warm, not durable. Long strips of hair 1/2 inch wide (removed from the skin in a spiral) were traditionally woven together to make blankets, or woven into clothes like jackets, vests. Or the entire skin was dried inside out and used for socks.

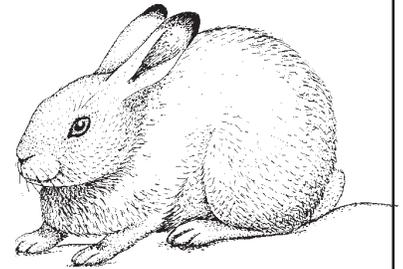


## ALASKA/TUNDRA HARE (*Lepus othus*)

**Family:** Leporidae **Habitat:** Tundra **Body Size:** Average 22 to 28 inches in length. Distinctly larger than the snowshoe hare.

**Fur Description:** During summer; dusky brown coat, grizzled with gray, darker on top of head; white under parts; dark cinnamon or buffy hair marking nose and mouth; white ring around dark eyes; dusky ears washed with gray and tipped with black. The tail is entirely white. During winter coat is long, dense, and the fur is white to the base. Ears are black-tipped. Guard hairs are about 0.9 to 1.2 inches long. Underfur is about 0.7 to 0.9 inches long.

**Pelt Durability:** Very Low **Weight:** 2.25 ounces/square foot **Uses:** Alaska hares are managed as small game species in Alaska. Not found in large numbers, used for trim due to fur being completely white.

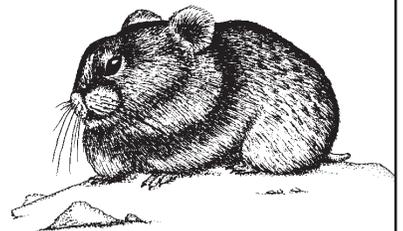


## COLLARED PIKA (*Ochotona collaris*)

**Family:** Ochotonidae **Habitat:** Alpine **Body Size:** Fully grown, they weigh about 5 ounces.

**Fur Description:** A distinct grayish patch on the shoulder and neck forms the "collar" from which the collared pika derives its name, appearing in definite contrast to the white fur on its chest and stomach. Pikas have fur-covered feet, but bare toe pads. Guard hair is about 1.1 to 2 inches long. Underfur is about 0.3 to 0.8 inches long.

**Pelt Durability:** Low **Uses:** While managed by the Alaska Department of Fish and Game as a game species, not many people utilize the collared pika fur.



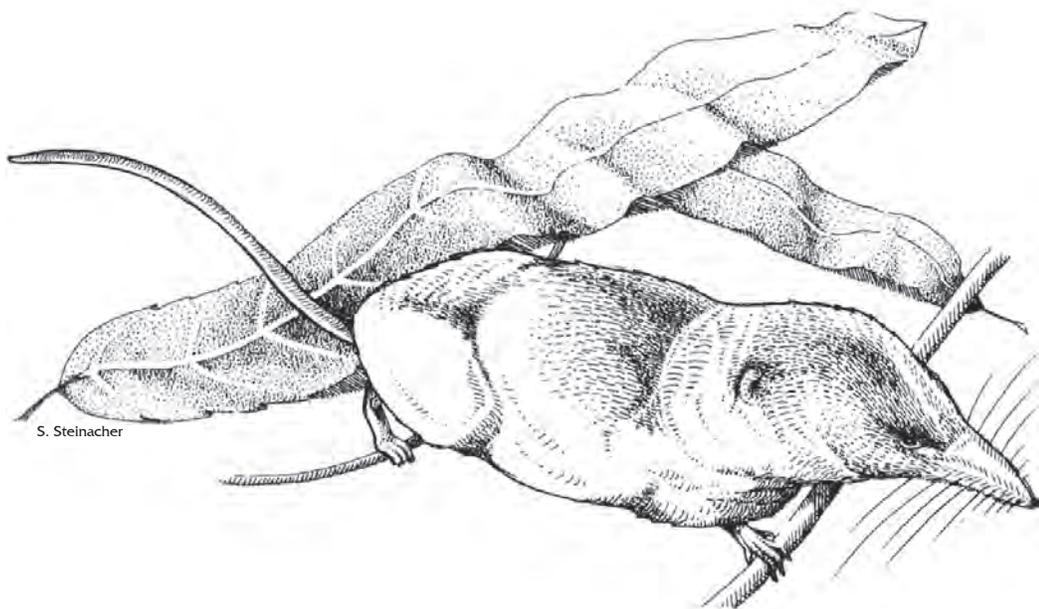


# 5. Alaska Mammal Family Trees

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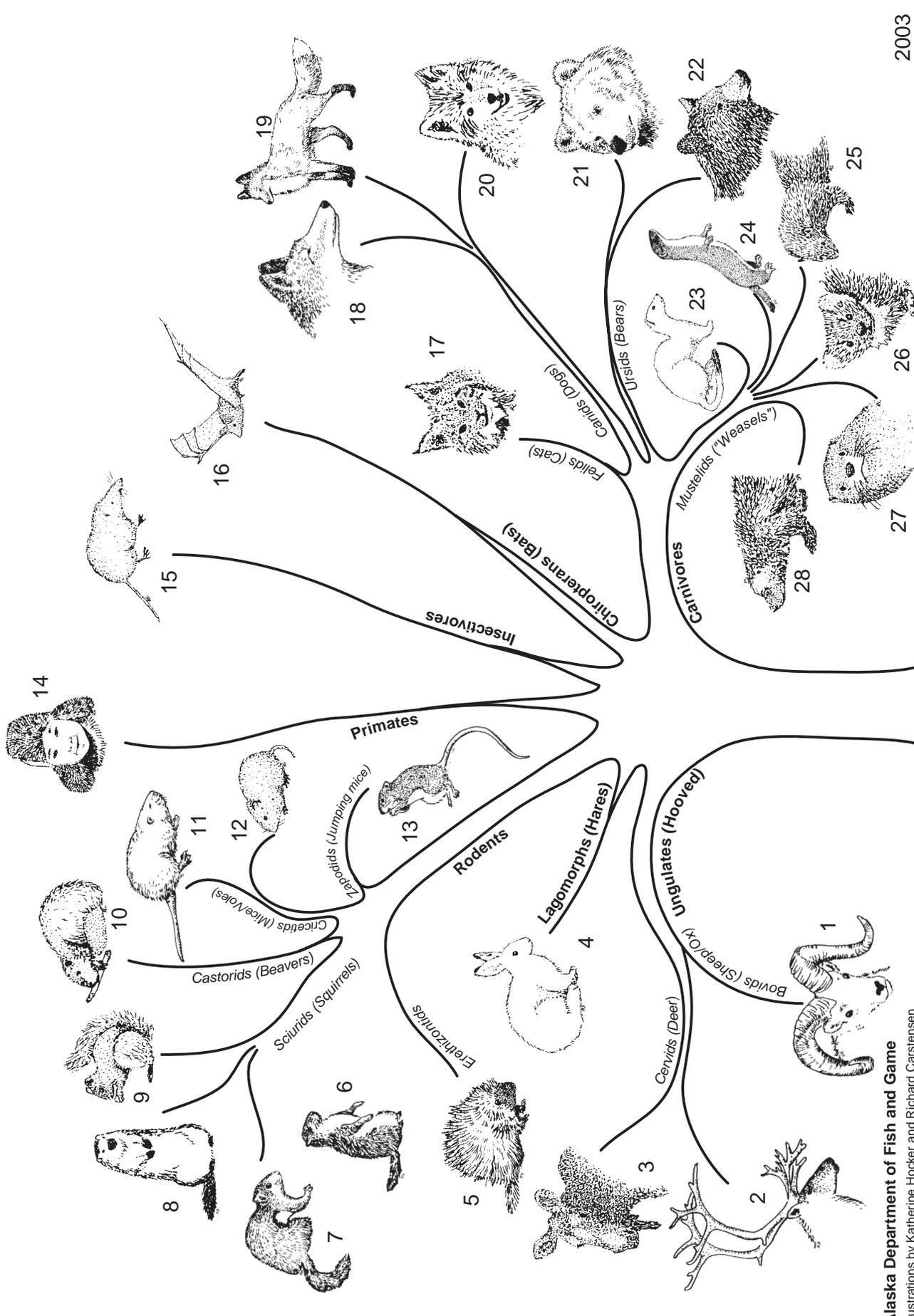
Please note: If you would like to see the following species grouped according to their families and orders, please refer to the UAF Museum website at:

[www.uaf.edu/museum/collections/mammal/](http://www.uaf.edu/museum/collections/mammal/)



# Native Mammals of Interior Alaska

Mammal orders are shown in **bold**;  
families- are shown in *italics*.



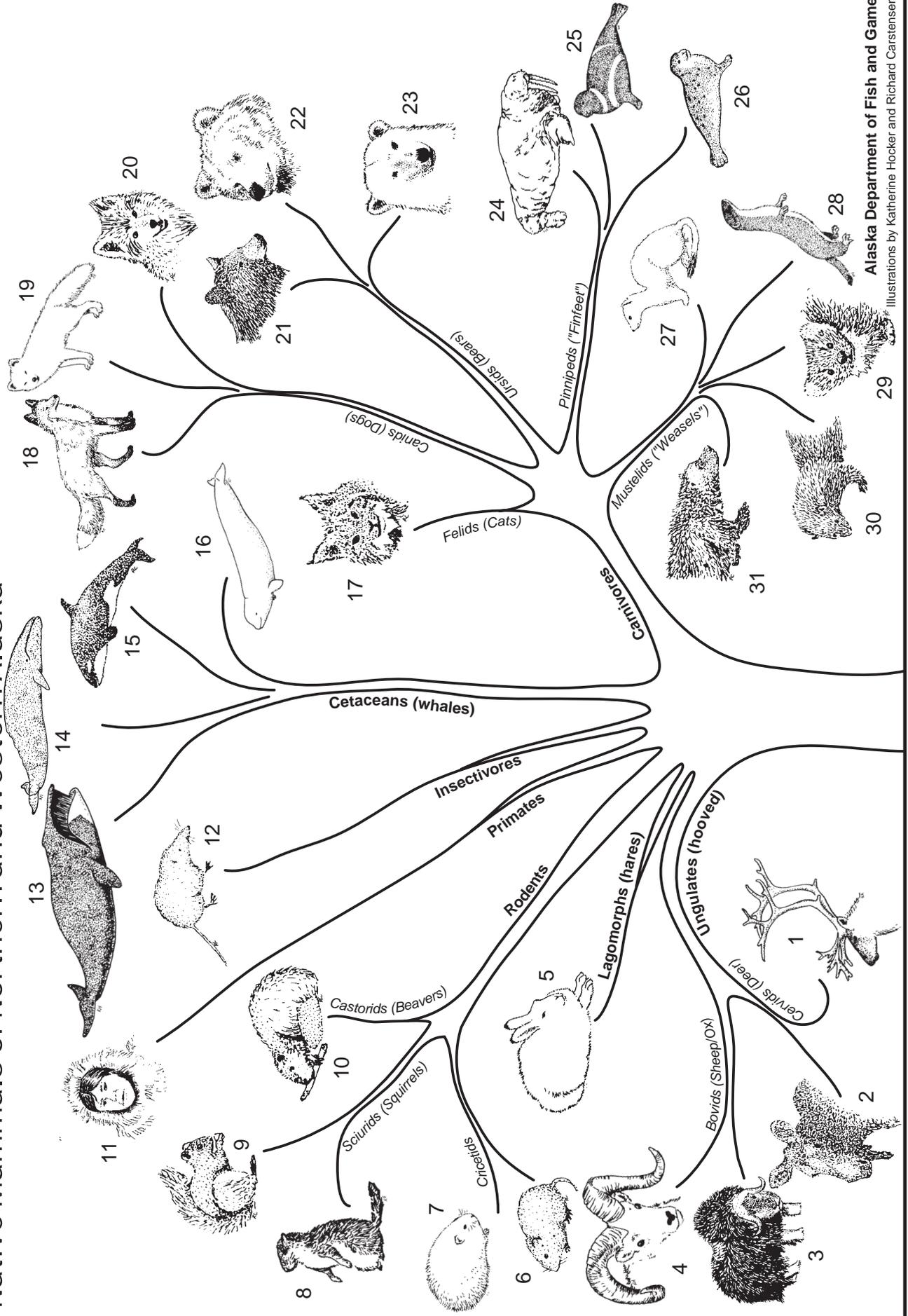
# Native Mammals of Interior Alaska

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1. Dall sheep
2. caribou
3. moose
4. snowshoe hare
5. porcupine
6. Arctic ground squirrel
7. flying squirrel
8. marmot
9. red squirrel
10. beaver
11. muskrat
12. voles
13. meadow jumping mouse
14. human
15. shrews
16. bat
17. lynx
18. coyote
19. red fox
20. wolf
21. brown (grizzly) bear
22. black bear
23. ermine
24. least weasel
25. mink
26. marten
27. river otter
28. wolverine

# Native Mammals of Northern and Western Alaska

Mammal orders are shown in **bold**;  
families are shown in *italics*.



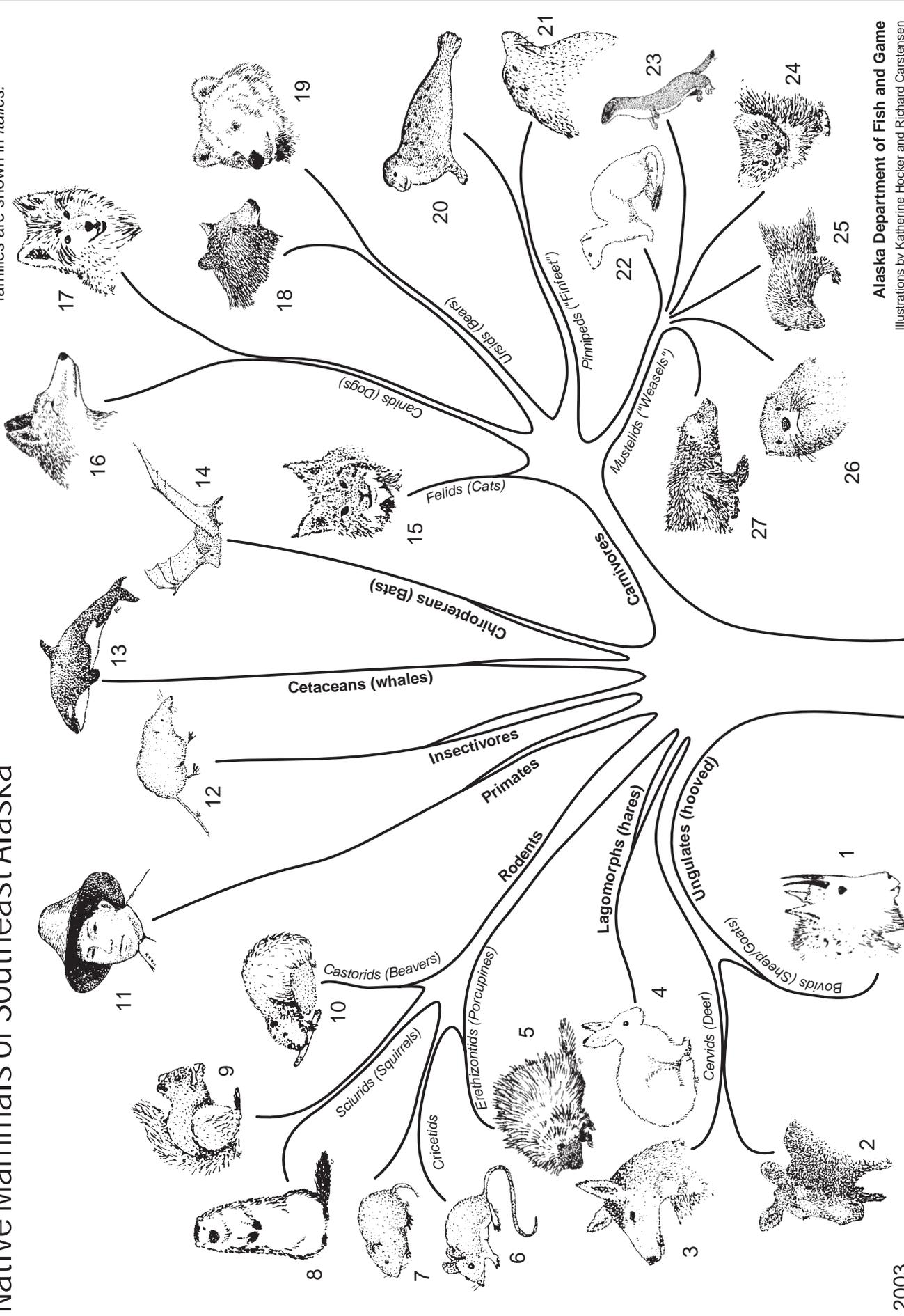
# Native Mammals of Northern & Western Alaska

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1. caribou
2. moose
3. muskox
4. Dall sheep
5. Arctic hare
6. voles
7. lemming
8. Arctic ground squirrel
9. red squirrel
10. beaver
11. human
12. shrews
13. bowhead whale
14. gray whale
15. orca (killer whale)
16. beluga
17. lynx
18. red fox
19. Arctic fox
20. wolf
21. black bear
22. brown (grizzly) bear
23. polar bear
24. walrus
25. ribbon seal
26. spotted seal
27. ermine
28. least weasel
29. marten
30. mink
31. wolverine

# Native Mammals of Southeast Alaska

Mammal orders are shown in **bold**;  
families are shown in *italics*.



Alaska Department of Fish and Game  
Illustrations by Katherine Hocker and Richard Carstensen

# Native Mammals of Southeast Alaska

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1. mountain goat
2. moose
3. Sitka black-tailed deer
4. snowshoe hare
5. porcupine
6. deer mouse
7. voles
8. marmot
9. red squirrel
10. beaver
11. human
12. shrews
13. orca (killer whale)
14. bat
15. lynx
16. coyote
17. wolf
18. black bear
19. brown bear
20. harbor seal
21. sea lion
22. ermine
23. least weasel
24. marten
25. mink
26. river otter
27. wolverine



# 6. Glossary of Terms

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**Adaptation:** the process of adjusting to the environment; a trait that helps an organism survive in a particular environment.

**Adipose tissue:** connective tissue below the skin in which fat is stored and which has the cells distended by droplets of fat.

**Alpine tundra:** cold, windy, treeless environments occurring at high elevations above tree line throughout the world.

**Aquatic animal:** lives in water.

**Arctic tundra:** the cold, windy, treeless environment found in the arctic and maritime subarctic; also called high-latitude tundra and lowland tundra; distinguishable from the alpine tundra.

**Artiodactyla:** An order of the hoofed mammals which have an even number of toes; this order includes bovids and cervids; deer, cows, sheep, goats, moose and caribou.

**Babiche:** thong, thread, or lacings made of rawhide, gut, or sinew, especially for making snowshoes.

**Bag limit:** the maximum number of animals of any one species that one hunter can kill in a given area in a single season.

**Banded hairs:** colored stripes are visible to the naked eye on the overall hair. The color changes radically in a short distance along the hair shaft.

**Basal:** the end of the hair that is close to the root. Also called proximal.

**Big game:** in Alaska, includes black bear, brown bear, bison, caribou, Sitka black-tailed deer, elk, mountain goat, moose, muskoxen, Dall sheep, wolf, and wolverine.

**Blubber:** the fat of whales and other large marine mammals.

**Boreal forest:** the forest of mixed conifers and hardwoods that grows in cold and dry northern areas around the world, including Interior Alaska.

**Bovidae:** a family of ruminant hollow-horned mammals within the order Artiodactyla. Bovids include sheep, goats, cattle, antelopes, and buffalo.

**Camouflage:** coloration and patterning (or, rarely, behavior) that provides a disguise from predators.

**Canidae:** The dog family; canids include fox, coyote, and wolf.

**Carnivora:** an order of Mammalia including the lion, tiger, wolf, bear, seal, etc. Carnivorans are adapted by their structure to feed upon flesh, though some of them, as the bears, also eat vegetable food. The teeth are large and sharp, suitable for cutting flesh, and the jaws powerful.

**Castor:** secretion from the castor sacs of beavers, a strong-smelling, oily substance they use to communicate through scent marking.

**Cervidae:** a family within the order Artiodactyla which includes the deer and elk. Male cervids typically grow antlers that are shed yearly.



**Cetacea:** an order of aquatic mostly marine mammals that includes the whales, dolphins, porpoises, and related forms and that have a torpedo-shaped nearly hairless body, paddle-shaped forelimbs but no hind limbs, one or two nares opening externally at the top of the head, and a horizontally flattened tail used for locomotion.

**Class:** A sub-grouping of animals; class Mammalia includes all mammals.

**Coastal rainforest:** the coniferous forest that grows along the western coast of North America from Kodiak Island to Northern California.

**Collagen:** fibrous protein of vertebrates that is the chief constituent of the fibrils of connective tissue (as in skin and tendons) and of the organic substance of bones. Yields gelatin and glue on prolonged heating with water.

**Conduction:** the transfer of heat by communication of energy from particle to particle with no net displacement of the particles. Energy is transferred by the medium without movement of the medium itself.

**Conductor:** a material capable of transmitting another form of energy (as heat or sound).

**Control variable:** value must be kept constant in order to accurately test the independent variables in an experiment.

**Convection:** the transfer of heat by the motion of fluid or air.

**Coronal Scales:** scales on a hair that look like stacked crowns or paper cups.

**Cortex:** the main body of the hair shaft, between the cuticle and the medulla, containing pigment granules, cortical fusi, and ovoid bodies. If the cortex is thin, the hair will be brittle (such as caribou).

**Cortical fusi:** irregular spindle-shaped (long and pointy on both ends) air pockets in the cortex, especially seen in cows. Much larger than pigment granules.

**Cuticle:** translucent outer protective layer of the hair shaft, made up of overlapping scales that cover the shaft much as bark covers a tree.

**Cuticular scale:** overlapping or abutting shapes that make up the cuticle layer on the outside of the hair shaft. Margin ends of the scales always point toward the distal tip of the hair.

**Dependant variable:** value is determined by that of one or more other variables in an experiment.

**Dermis:** the thickest layer in the skin of most terrestrial mammals. It is composed mostly of connective fibers called collagen. It also houses a network of nerves, muscle fibers, sweat and sebaceous glands, and blood vessels. The blood vessels provide a source of nutrition for the epidermis and play a large role in thermoregulation for most mammals. The dermis contains the hair follicles.

**Diffusion:** the process whereby particles of liquids, gases, or solids intermingle as the result of their spontaneous movement caused by thermal agitation and in dissolved substances move from a region of higher to one of lower concentration.

**Distal:** the tip end of the hair.

**Durability:** strength and ability of a pelt to withstand wear and tear. Mammals such as otters and wolverines provide a pelt with very high durability, while others such as hares provide a pelt with low durability.

**Epidermis:** this layer of the skin is formed by continuous growth from its basal layer. Its main functions are to prevent diffusion of water out of the body, and to protect the body from radiation and infectious organisms. It is also a useful frictional component of the skin (as evidenced by picking up a piece of paper).

**Evaporate:** to convert into vapor, or fumes, or to expel moisture from.

**Family:** A grouping of similar organisms ranking below an order and above a genus.

**Fatty acid:** any of a class of aliphatic carboxylic acids, such as palmitic acid, stearic acid, and oleic acid, that form part of a lipid molecule.

**Follicle:** the tubular epithelial sheath that surrounds the lower part of the hair shaft and encloses at the bottom a vascular papilla supplying the growing basal part of the hair with nourishment.

**Fur:** See **Hair**. Fur may also be used as a synonym for **Pelt**.

**Fur animal:** a classification of animals subject to taking with a hunting license. In Alaska, includes beaver, coyote, arctic fox, red fox, lynx, squirrel, that has not been domestically raised.

**Furbearer:** a classification of animals subject to taking with a trapping license. In Alaska, includes beaver, black bear, coyote, arctic fox, red fox, lynx, marten, mink, weasel, muskrat, river otter, squirrel, marmot, wolf, and wolverine.

**Fusi:** See **Cortical fusi**.

**Game:** any wildlife species sought after by humans for hunting and/or trapping. May be classified by regulation as big game, small game, furbearers or other categories. Wildlife species that are not hunted by humans are called nongame.

**Genus:** A grouping of similar organisms ranking below a family and above a species; it is the first part of the animal's scientific name. For example, *Lepus* is the genus of *Lepus americanus*, the snowshoe hare. Genus and species are underlined or italicized in scientific writing.

**Guard hair:** coarse hairs that provide protection and are generally longer than the underfur and contain more diagnostic information. Scale patterns and medulla of the guard hairs are usually different than those of the underfur.

**Habitat:** the place where an animal lives that provides food, water, shelter (or cover), and space in a suitable arrangement that an organism needs to survive.

**Hair:** a slender threadlike outgrowth of the epidermis of an animal; especially: one of the usually pigmented filaments that form the characteristic coat of a mammal.

**Hibernate:** to spend the winter in an inactive state during which life processes (breathing, heart rate, body temperature, etc.) are reduced but not shut down.

**Hide:** See **Pelt**.

**High-elevation tundra:** another term for alpine tundra; refers to cold, windy, treeless environments occurring at high elevations throughout the world.

**High-latitude tundra:** another term for lowland or arctic tundra; refers to the cold, windy, treeless environment found in the arctic and subarctic.

**Hypothesis:** tentative explanation that accounts for a set of facts and can be tested by further examination; something taken to be true for the purpose of argument or investigation; an assumption (If a hypothesis withstands experimental tests, it may be elevated to a theory.)

**Imbricate scales:** scales on a hair that are overlapping like roof tiles.

**Independent variable:** a variable whose values are specified first or before an experiment is performed and are used to find values of an expression, another variable, or a function that depends on the first variable.

**Infrared:** the part of the electromagnetic spectrum with a longer wavelength than light but a shorter wavelength than radio waves. The main source of infrared radiation is heat radiation.

**Insulation:** anything that reduces the movement of heat energy into or out of a particular object or area.

**Insulative ability:** the capability of a material to reduce the movement of heat energy.

**Keratin:** fibrous protein that forms the key structural component of hair, nails, hooves, and claws.

**Latitude:** a measure of the distance of a given point on earth from the equator.

**Lowland tundra:** the cold, windy, treeless environment found in the arctic and maritime subarctic; also called arctic or high-latitude tundra.

**Mammal:** belonging to the class Mammalia; distinguished by self-regulating body temperature, hair, and in females, milk production for feeding young; includes hare, beaver, moose, wolf, bear and humans.

**Medulla (Pith):** in hair, the central core of cells in the hair shaft. Cells are usually thin-walled and filled with air. Medulla can be present or absent, continuous, interrupted (evenly spaced bits,) or fragmented (discontinuous in a random way.) If it is filled with air, it is dark under transmitted light and white under reflected light. If it is filled with mounting medium or other clear substance, the medulla appears clear or translucent in transmitted light or almost invisible under reflected light. Can be loosely-packed or closely-packed, globular, or flattened.

**Medullary index:** ratio of the overall diameter of the hair shaft divided by the diameter of the medulla. Most mammals are between 0.5 and 0.9.

**Metabolism:** the chemical processes occurring in living organisms by which the complex substances in the cells are built up or broken down. These processes result in growth, energy production, elimination of waste material, and other processes that are essential to life.

**Migration:** seasonal or periodic movement between breeding and wintering grounds. Migration varies among species in terms of destinations, time and duration.

**Molt:** the shedding of old feathers or hair to be replaced with new; usually yearly.

**Mustelidae:** The weasel family; includes mink, marten and wolverine.

**Order:** A grouping of closely related organisms ranking below the class and above the family categories.

**Outer cuticle:** overlain by clear scales (which are colored by the dyeing process). These scales vary in shape and size depending on the species. These cuticular scales give the hair its barbed structure (demonstrated by running a strand of hair through your fingers in both directions).

**Pelage:** the body hair/fur of an animal as a complete coat.

**Pelt:** the untanned hide or skin of an animal with the fur, hair or wool still attached. Synonyms are hide, skin.

**Photoperiod:** a recurring cycle of light and dark periods of constant length.

**Pigment:** granules of material, often melanin, that give the hair color. Usually seen in the cortex, but occasionally in the scales or in the medulla as well. Distribution, clumping, streakiness etc. can be especially diagnostic in rodents.

**Pilo-erection:** erection or bristling of hairs usually triggered by cold, shock, or fright.

**Pith:** a usually continuous central strand of spongy tissue. See **Medulla**.

**Posture:** a position of the body or body parts.

**Predator:** an animal that kills and eats other animals.

**Prey:** animals that are killed and eaten by other animals.

**Primeness:** occurs when the fur has reached its maximum length, density, and finest texture; when the hairs have matured with seemingly no pigment being produced, and as a consequence, the flesh surface of the pelt appears devoid of hair root pigmentation.

**Proximal:** the end of the hair that is close to the root. Also called basal.

**Radiation:** a process of heat transfer; energy is radiated in the form of waves or particles.

**Respiration:** the physical processes (as breathing and diffusion) by which a living thing obtains the oxygen it needs to produce energy and eliminate waste gases (as carbon dioxide).

**Riparian:** bordering rivers and streams.

**Scale:** see **Cuticular scale**.

**Season:** a set period of time to legally hunt a certain species. Hunting seasons are determined through the Board of Game process.

**Sebaceous gland:** a gland in the skin that secretes sebum.

**Sebum:** fatty lubricant matter secreted by sebaceous glands of the skin, which can function as attractant, repellent, or general communicator.

**Semi-aquatic animal:** must depend on special adaptations to cope with both aquatic and terrestrial mediums.

**Skin:** on an animal body, skin is the external limiting tissue layer; the 2-layered covering of a vertebrate body consisting of an outer epidermis and an inner dermis.

**Small game:** all species of grouse, hares, rabbits, ptarmigan, waterfowl, cranes, and snipe.

**Snow:** precipitation in the form of small white ice crystals formed directly from the water vapor of the air at a temperature of less than 32°F.

**Solar energy:** heat and light from the sun.

**Species:** a category of taxonomic classification ranking below genus or subgenus and consisting of related organisms capable of interbreeding.

**Subcutaneous fat:** most mammals store a layer of fat beneath their skin. It functions as a source of nutrition and as insulation. This adipose tissue is strongly developed in aquatic mammals such as cetaceans (whales, dolphins, and porpoises).

**Subnivean:** refers to the insulated environment at the bottom of fallen snow layers, usually above the ground.

**Synthetic:** produced artificially.

**Tactile hair:** sensory hair that responds to pressure or touch.

**Tanning:** treatment of raw animal hides or skins to convert them into leather.

**Tawing:** tanning skins by a dry process (as with alum or salt). Also known as mineral tanning.

**Temperature:** the degree of hotness or coldness as shown by a thermometer.

**Temperature gradient:** in fallen snow, the variation of temperature at the bottom of the snowpack (warmer) to the snow at the top.

**Terrestrial animal:** land dwelling animal.

**Thermoregulation:** maintenance of a particular temperature of the body.

**Tundra:** the windy, treeless, and periodically cold environments that occur at high latitudes and at high elevations. Arctic tundra in the arctic is often overlaid by permafrost. Alpine tundra exists in high mountains at many latitudes.

**Underfur:** the soft fine hairs that make up the undercoat and provide warmth and insulation. Sometimes called "wool" or "fur." Scale pattern and medulla of the underfur are usually different from the guard hairs.

**Ungulate:** any of a large group of mammals all of which have hooves: divided into odd-toed ungulates and even-toed ungulates.

**Ursidae:** the bear family. Ursids include the black bear, brown bear, polar bear, sun bear, and sloth bear.

**Vascular:** related to blood vessels.

**Vasoconstriction:** constriction of a blood vessel.

**Vasodilation:** dilation of blood vessels (especially the arteries).

**Vasomotor:** relating to nerves or centers controlling the size of blood vessels.

**Wetlands:** areas of land that have waterlogged soils, support plants adapted to wet soil, and are covered by water for a least part of the year. Examples include swamps, bogs, freshwater and saltwater marshes, and river or stream banks.

**Wind-chill:** a still-air temperature that would have the same effect on exposed human skin as a given combination of temperature and wind speed.

# 7. Teacher Resources

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## Web sites

**ADF&G** [www.wildlife.alaska.gov](http://www.wildlife.alaska.gov)

The Alaska Department of Fish and Game offers a host of online materials about Alaska's wildlife, including:

- Species Profiles
- Living with Wildlife
- Teacher Resources Pages
- Endangered species in Alaska
- 'Sounds Wild' audio pieces
- Funtastic Facts



**UAF** [www.uaf.edu/museum/collections/mammal/](http://www.uaf.edu/museum/collections/mammal/)

A complete list of Alaska's mammals from the University of Alaska Fairbanks Museum.

**Alaska Geographic** [www.alaskageographic.org](http://www.alaskageographic.org)

Alaska Geographic offers information about wildlife on public lands, natural history seminars and teacher trainings, and an online bookstore stocked with wildlife and natural history related materials.

**Alaska Public Lands Information Centers** [www.alaskacenters.gov](http://www.alaskacenters.gov)

The Alaska Centers provides information, trip-planning assistance, and resource education.

## Books

Feldhamer, G. A., B. C. Thompson, and J. A. Chapman, editors. 2003. Wild mammals of North America: Biology, management, and conservation. The Johns Hopkins University Press, Maryland.

## Lessons Adapted From:

Carrlee, E. 2013. Alaska Fur ID Project. <http://alaskafurid.wordpress.com>. (Accessed 15 March 2013).

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