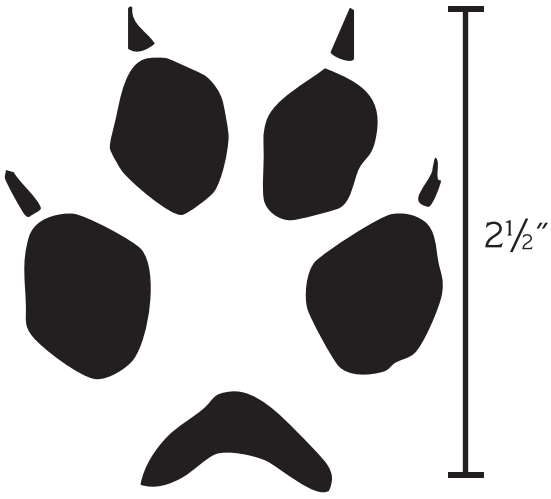
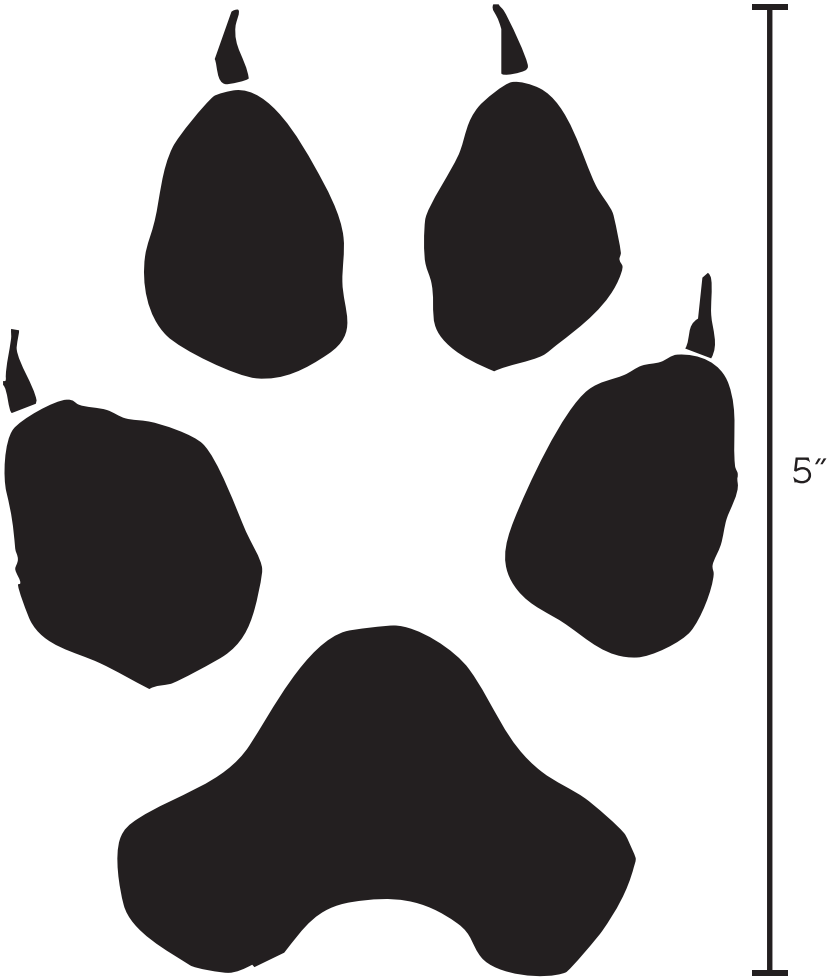
Tracks
of Alaska Animals

A Guide for Educators



Red Fox



Wolf

Coyote

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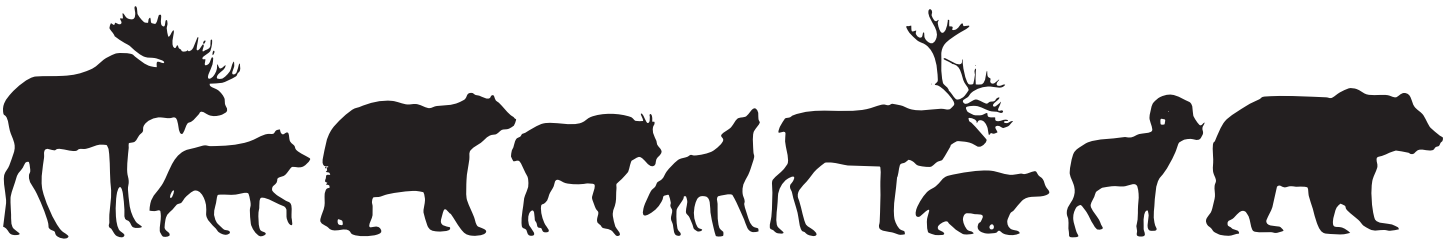

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1. Introduction

Tracks as teaching tools

Studying animal tracks is one way to engage students in learning about wildlife and natural ecosystems. Following the tracks of animals, or tracking, sparks students' curiosity in their surroundings, and fosters an appreciation for nature and the outdoors. Tracking requires students to know the wildlife within the habitat around them, look and listen for signs, and refine their observation skills. The art of tracking contributes to a sense of place, biological research, hunting, and outdoor safety.

This guide accompanies the Wildlife Tracks Kit which provides educators with information and activities to teach students the basics of tracking. The Tracks Kit is available at various Alaska Department of Fish and Game offices around the state. Together this guide and kit will help you introduce students to track reading and identification.

Place-based and STEAM learning

These lessons provide foundational knowledge for students to explore the natural world and prepare them to better understand and interpret outdoor observations. The "Tracks of Alaska Animals" emphasizes place-based learning, as well as STEAM (science, technology, engineering, art, and math) lessons. These activities are multidisciplinary by integrating science, math, art, reading, and writing.

While relative grade level targets are provided, all activities are adaptable to different ages and grade levels. Each activity lists target grade level, duration, science standards addressed, objectives, materials, and procedures.

Handle with care

The kit contains a collection of latex animal tracks that are durable but should be handled gently. Replacement of tracks is difficult and expensive.

Enjoy!

We hope you and your students enjoy learning about tracks of Alaskan animals. If you have questions, suggestions, or want to share student work, please contact the ADF&G Wildlife Education Program. Discover many more teaching resources about wildlife at:

education.adfg.alaska.gov

Scan here for educational resources.

2. About Tracks

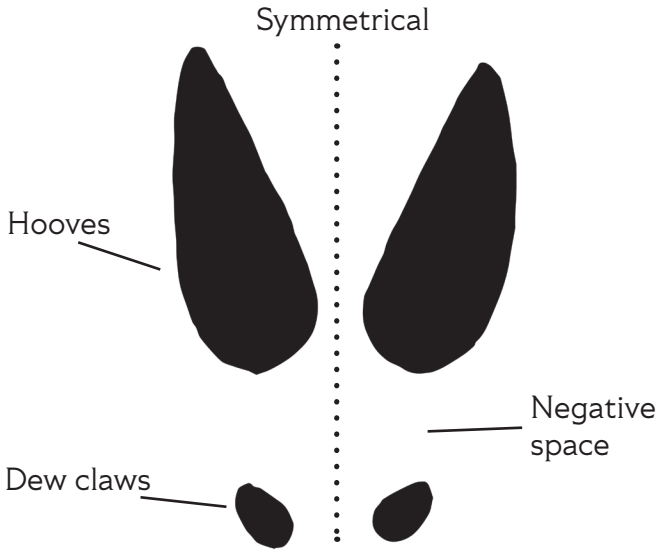
Tracks and trails tell stories of an animal's past. Learning to read and identify tracks is a skill learned over time with a lot of practice. Track identification is useful for hunting, research and monitoring, environmental education, and just to enjoy the outdoors. To learn to track, you must be curious!

Tracking has been likened developmentally to reading. Reading requires learning letters, then putting those letters together to form words, combining words to make sentences, which coalesce into paragraphs, and ultimately, a story.

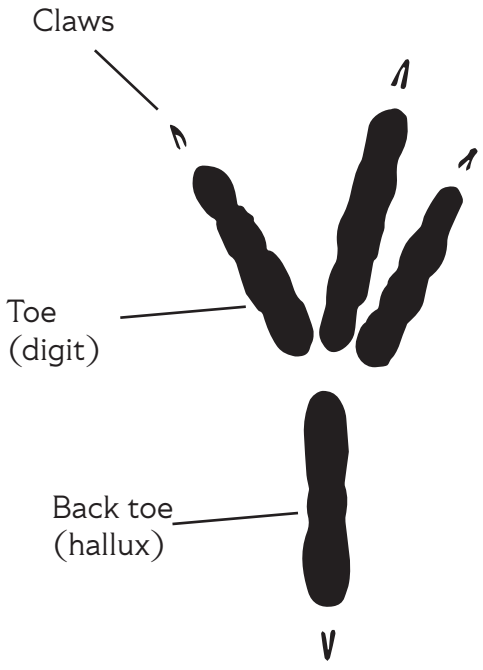
By observing the characteristics of a track, the identity of the animal it belongs to emerges. In situations where multiple tracks exist, examining the track pattern and trail provides clues to reveal the story of what happened in a particular area.

Track characteristics

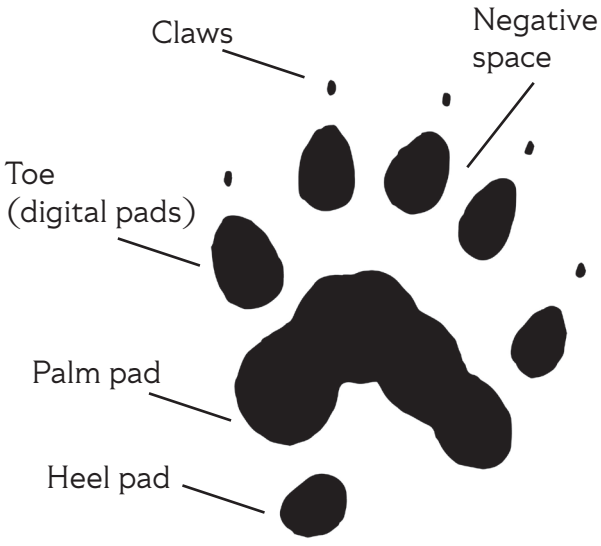
- size, shape, and symmetry
- toes, toe pads, nails or claws, and negative space
- palm pads and heel pads



Sitka black-tailed deer



Common raven



Marten

Parts of a track help to identify species and behaviors

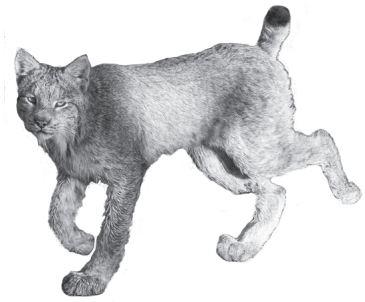
Footprint	A footprint is the outline and physical impression of an animal foot on the ground, consisting of the toes, pads, and claws. Size, shape, and symmetry help distinguish different species.
Toes	Toes are individual digits. The number of toes, spacing, and arrangement provides information about what species left the track. The negative space — or space between the toes, pads or palm pads — is also significant.
Pads	Pads are the fleshy portion at the base of a track below the toes.
Claws	Most animals show claws in their tracks, but some do not. For example, members of the cat family have retracted claws, which don't normally show, while members of the dog family typically do show claws in their tracks.
Stride	Stride is measured from the heel of one foot to the heel of the same foot on its next landing.
Gait	Gait is the way an animal moves and is determined by the pattern of footfalls and the sequence in which the feet touch the ground.
Track pattern	Track pattern is the arrangement of multiple tracks left by an animal in a sequence as it moves. Track patterns indicate what gait the animal was using.

Ways of walking

Plantigrade

Walking with the heel on the ground. Heavy back ended animals such as humans, bears, and beavers walk this way.

Bear



Digitigrade

Walking on the toes (digits). This increases the length of the leg and allows the animal to move faster. Dogs and cats walk like this.

Lynx

Unguligrade

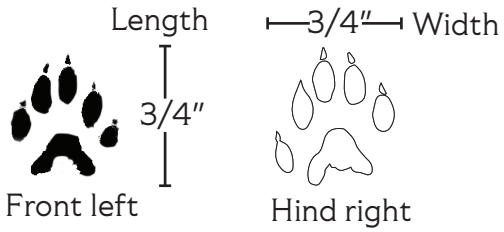
Walking on the toe nails. Hooved animals like moose and caribou walk this way.

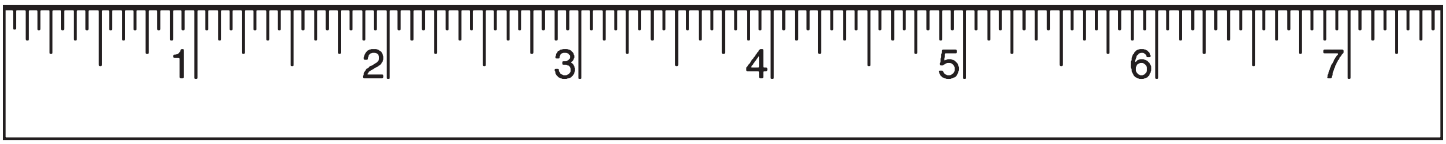
Moose

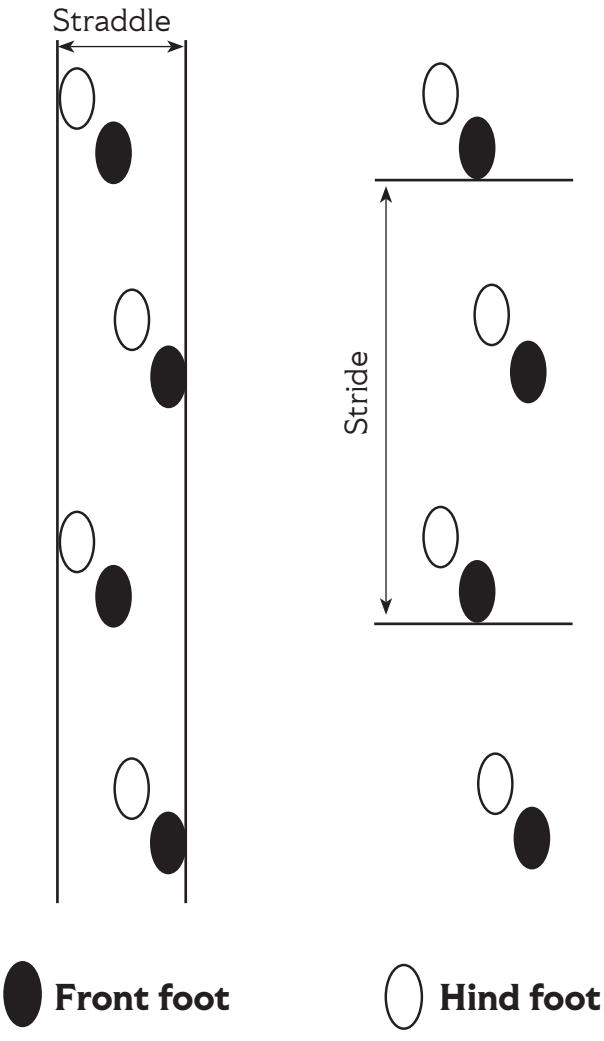
How should tracks be measured?

1. **Length:** measure the vertical length of an individual track.
2. **Width:** measure the widest part of the individual track perpendicular to the length.
3. **Stride:** measure the track pattern from the heel of the right foot to the heel of the right foot the next time it lands.
4. **Straddle:** measure the trail width across a group of tracks.

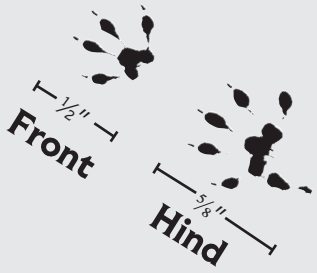
Ermine tracks







Front vs. hind



Vole hind feet are larger than front feet because voles have more weight over their hind vs. front feet.

Meadow vole

The front and hind feet of most four-legged animals are different sizes depending on how the animal's weight is distributed. Dogs and hooved mammals, who have more weight distribution at the front of their bodies tend to have larger front feet than hind feet. Animals with heavier rear ends like bears and rodents tend to have larger hind feet than front feet.

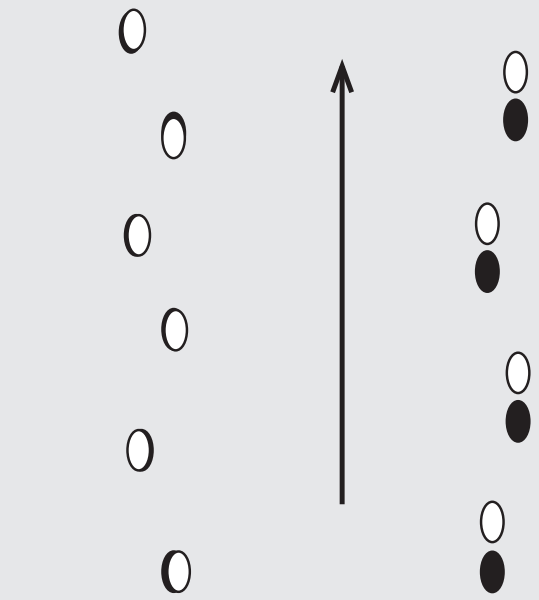
Gaits and track patterns

● Front foot ○ Hind foot

These are the most common, basic gaits and resulting track patterns used by animals. Any animal can use any gait, but animals typically have a couple of gaits that they use most often. For example, a fox normally uses a direct register trot or a side trot, but they also walk and gallop depending on the circumstances.

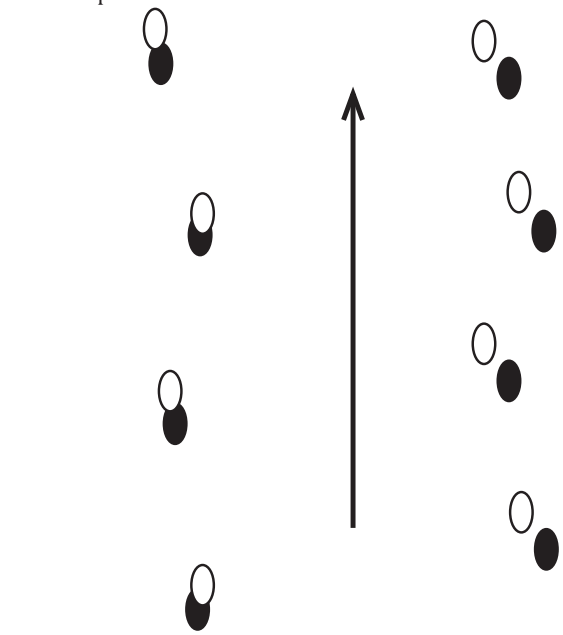
Walk- direct register
Hind foot lands directly where the front foot landed. Even space between each track.

Walk- overstep
Hind foot lands beyond where the front foot landed. Common gait for bears.



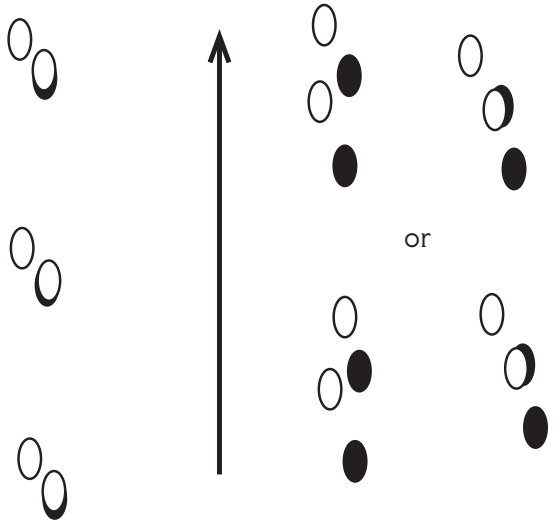
Trot
Faster than a walk with a longer stride length. Can be direct register or overstep.

Side Trot
The hind foot lands ahead of the front foot always on the same side.



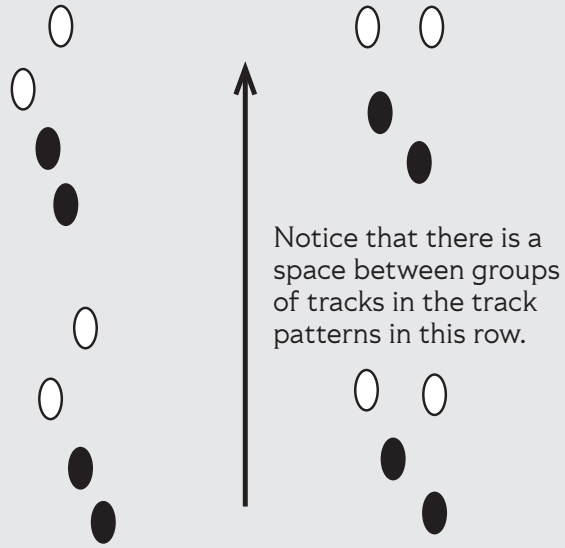
Lope- 2x2
The two hind feet land in the same tracks as the front feet. Especially used in the snow by weasels and voles.

Lope- 3x4
The two tracks in the middle of the pattern will either be a front and hind landing next to each other or the hind landing on top of a front.



Gallop
The two hind feet land ahead of where the two front feet landed but not at the same time. The fastest gait.

Bound
The two hind feet land at the same time, ahead of where the front feet landed.



Notice that there is a space between groups of tracks in the track patterns in this row.

*Gaits and track patterns adapted from Mark Elbroch- Mammal Tracks and Sign (2019)

3. Track Families

Mammals 8
- Bears 9
- Dogs 10
- Cats 11
- Mustelids 12
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- Hares and Pikas 15

Birds 16
- Birds 17
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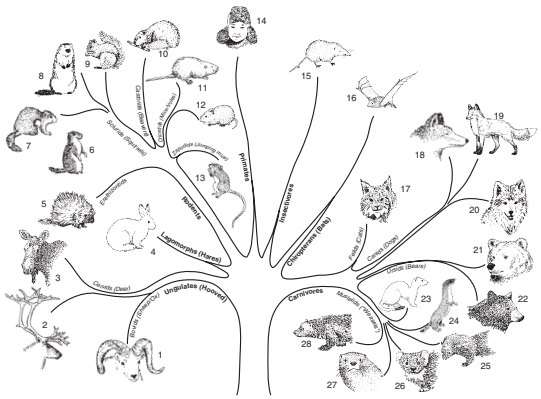
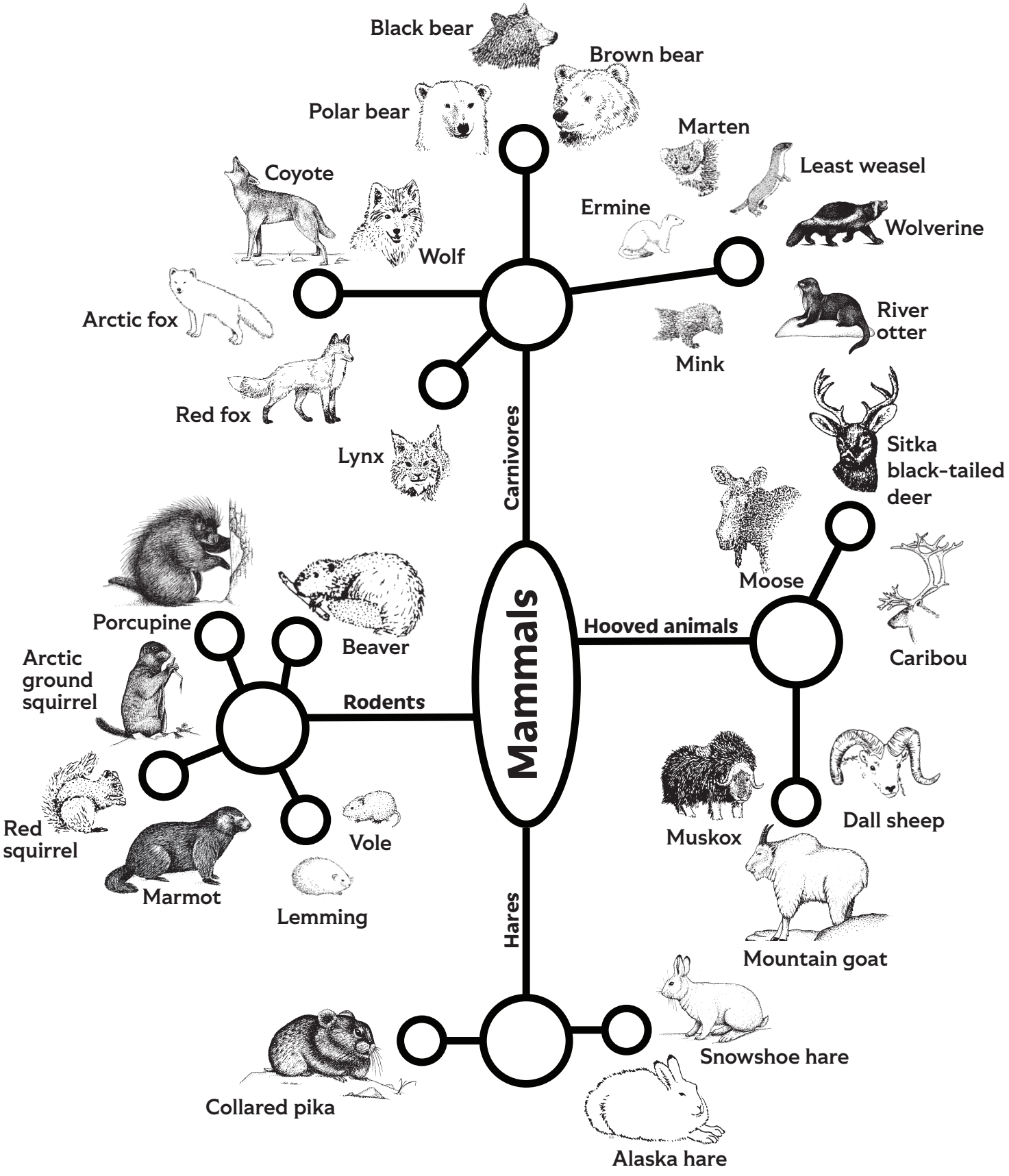
Track characteristics are shared by members of similar species. Understanding these similarities and differences helps to distinguish and identify tracks. The following pages represent similarities between common mammals and birds found in Alaska. These should not be confused with a true family tree. For more information about family trees:

see pg. 31 in Skulls of Alaskan Mammals: A Teacher's Guide.



Mammals

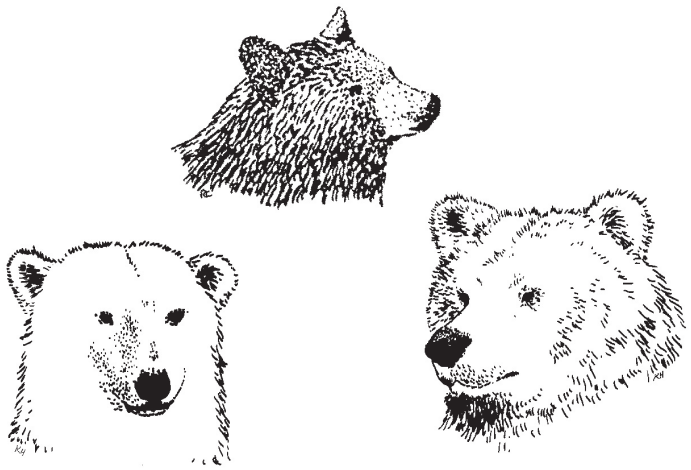

Mammals
Carnivores
Rodents
Hooved animals
Hares
Black bear
Brown bear
Polar bear
Marten
Least weasel
Coyote
Ermine
Wolverine
Wolf
Arctic fox
River otter
Mink
Red fox
Lynx
Sitka black-tailed deer
Moose
Porcupine
Beaver
Caribou
Arctic ground squirrel
Red squirrel
Vole
Marmot
Lemming
Muskox
Dall sheep
Mountain goat
Snowshoe hare
Collared pika
Alaska hare

Bears

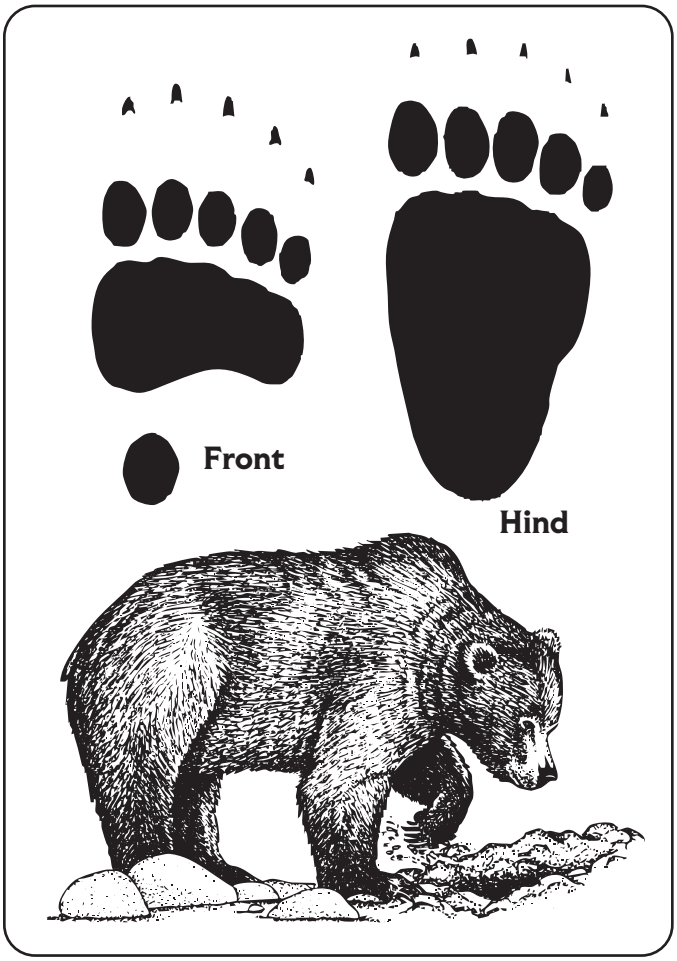
Bears have five toes on the front and hind feet. They have strong, non-retracted claws that usually show up in the tracks but sometimes do not (especially with black bear tracks). The front and hind feet of bears are very different from each other. The front feet have a wide rectangular shaped palm pad. Sometimes a small, disconnected, round “heel pad” will show up in the front track as well.

The rear track has a full heel pad connected to the palm pad and looks like a human foot. However, the smallest toes on bear feet are on the inside of the track. This is opposite of human feet where the smallest toe is on the outside of the foot.

Bears typically walk in an overstep walk for normal activity, although they will also lope and gallop depending on their motivations.

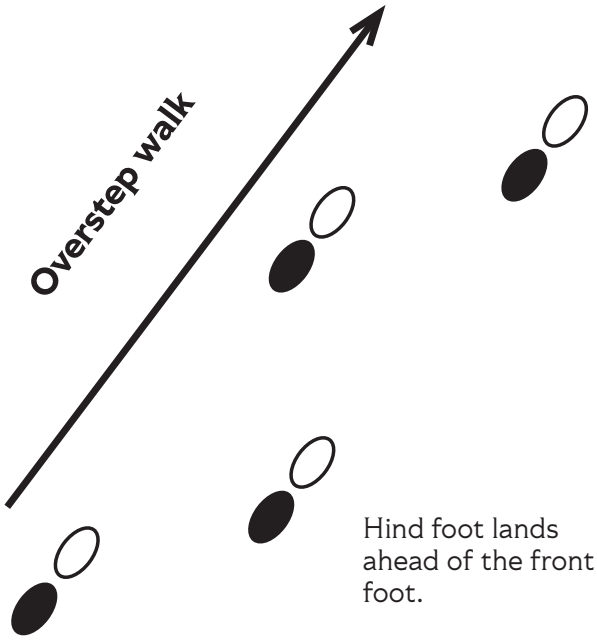


Brown bear tracks



Track characteristics

Number of toes on front foot	5
Number of toes on rear foot	5
Do claws show?	Yes
Is the track symmetrical?	No
Typical gait	Overstep walk

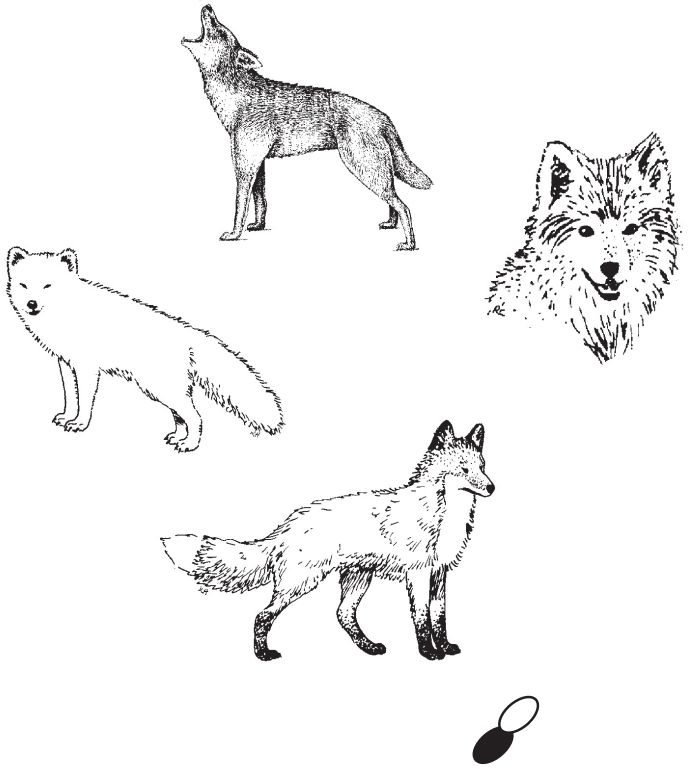


Hind foot lands ahead of the front foot.

Dogs

Canines have four toes on the front feet and four toes on the hind feet. They have non-retracted claws and claw marks usually show up in the tracks. The toes in canine tracks are generally oval-shaped (longer than wide) and they have a relatively small (compared to the entire track) triangular-shaped heel pad (except red fox, which have a bar-shaped heel pad on front feet). The overall shape of canine tracks is oval. The hind and front feet are similar in appearance but the front tracks are larger than the hinds. Most canine tracks will show an obvious X shape in the space between the toes and palm pad.

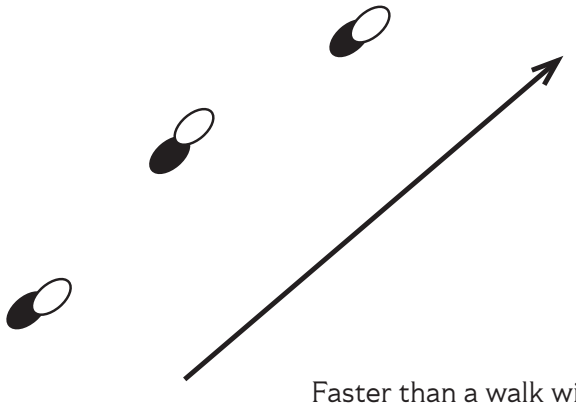
The normal gait for canines is a trot or a side trot, but they also use lopes and gallops depending on their activity and motivations.



Track characteristics

Number of toes on front foot	4
Number of toes on rear foot	4
Do claws show?	Yes, usually
Is the track symmetrical?	Yes
Typical gait	Trot or side trot

Trot

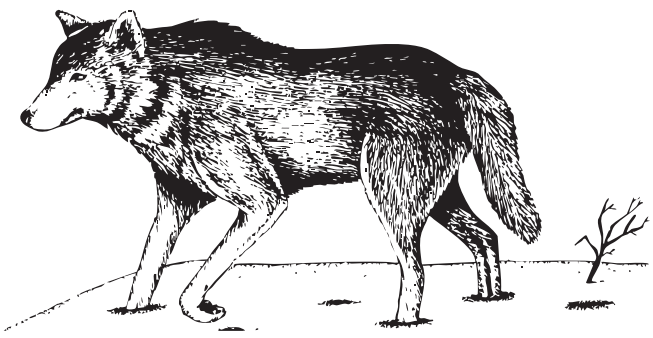


Faster than a walk with a longer stride length. Can be direct register or overstep.

Wolf tracks

Front

Hind

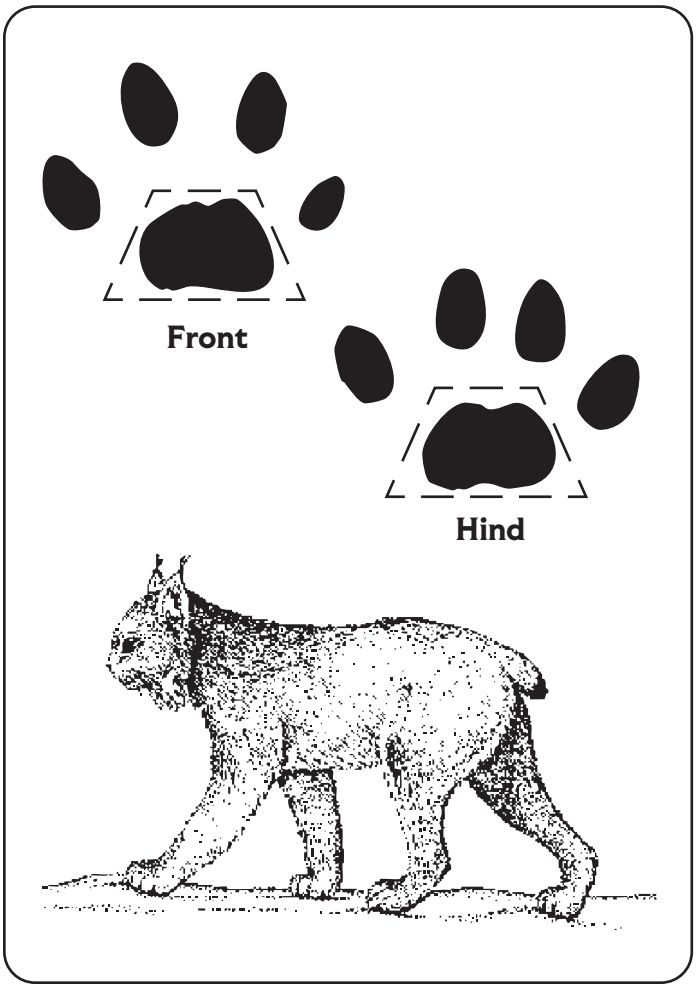


Cats

Cats have overall round-shaped tracks (as wide as long). They have four teardrop-shaped toes on the front and hind tracks and the natural state of their claws is retracted, so claw marks usually don't show up in the tracks (although they sometimes do). The palm pad of felines is large and accounts for a significant portion of the track (except for lynx which have small pads). The palm pad is trapezoidal with two lobes on the front of the pad and three lobes on the rear of the pad. The tracks are mostly symmetrical, however there is a "leading toe" in feline tracks — this means that one of the two center toes is more forward than the one next to it.

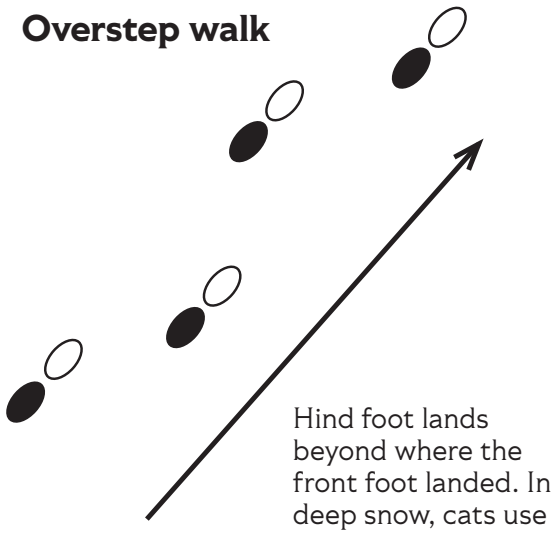
A cat's normal gait is generally a walk, but they will gallop when chasing prey or escaping danger.

Lynx tracks



Track characteristics

Number of toes on front foot	4
Number of toes on rear foot	4
Do claws show?	Not usually
Is the track symmetrical?	Almost
Typical gait	Overstep walk



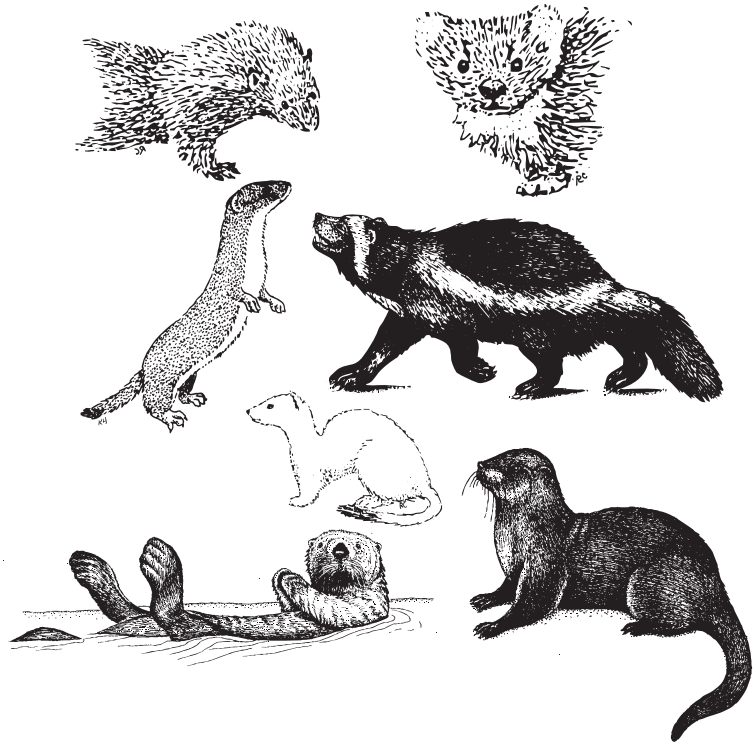
Hind foot lands beyond where the front foot landed. In deep snow, cats use direct register.

Mustelids

Members of the mustelid family have five toes on their front and hind feet in an asymmetrical pattern. Sometimes the small, inner toe may not show up in the track. The tracks usually show claw marks. The palm pad of mustelids has an irregular shape and appears “lumpy” because it is made up of smaller pads that are connected.

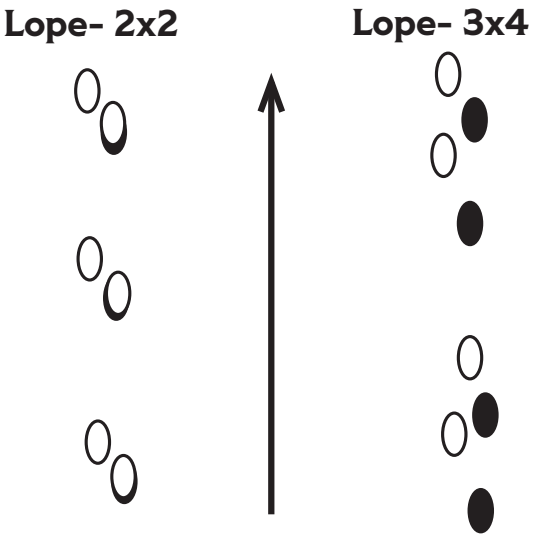
The normal gait for most mustelids is a 3x4 lope on hard ground (where either 3 or 4 tracks are visible) and a 2x2 lope in the snow. They also walk.

Sea otters have distinct and specialized feet that differ from other mustelids.



Track characteristics

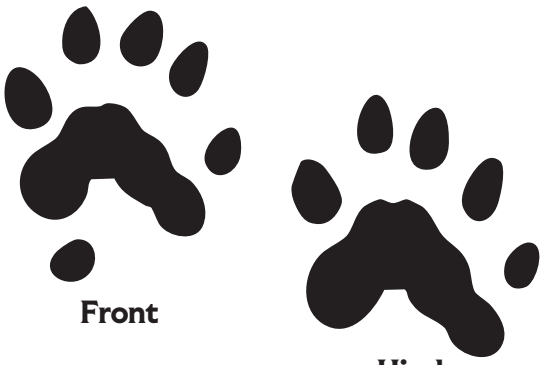
Number of toes on front foot	5
Number of toes on rear foot	5
Do claws show?	Yes
Is the track symmetrical?	No
Typical gait	Lope



The two hind feet land in the same tracks as the front feet. Especially used in the snow by weasels and voles.

The two tracks in the middle of the pattern will either be a front and hind landing next to each other or the hind landing on top of a front.

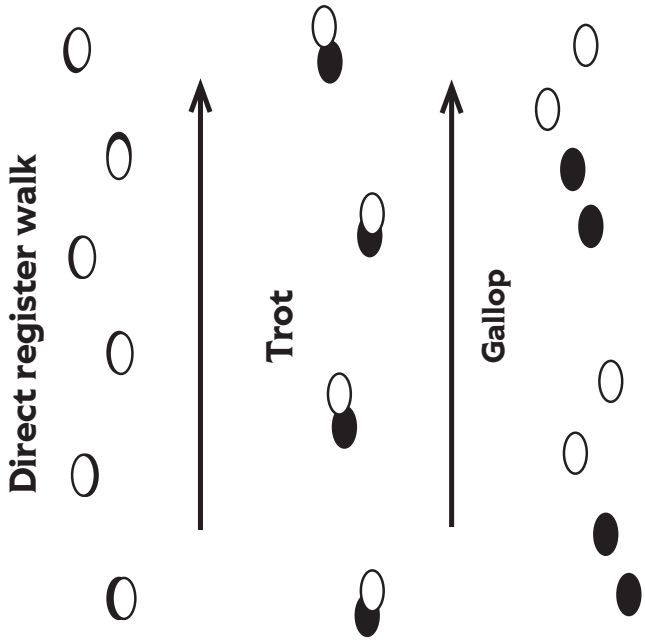
Marten tracks



Hooved Mammals

Hooved animals do not have toe pads like other mammals. They have hard hooves, which are equivalent to toenails. As a result, hooved animals are literally walking on their toenails. Each hoof represents a toe, and all of Alaska's wild hooved animals have two large toes (hooves) on each foot and two reduced toes called dew claws, which are higher on the back side of the leg. The front hooves and the hind hooves are similar, though the front hooves are larger than the hind in most animals.

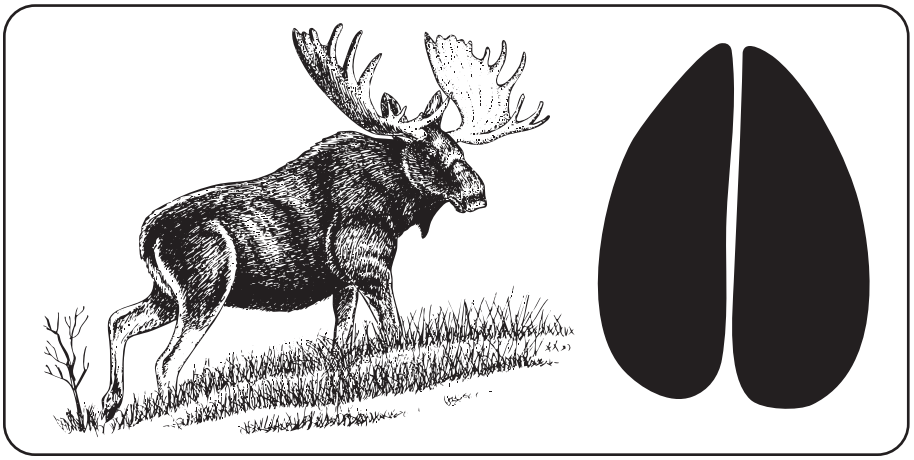
Walking is the normal gait for hooved animals, but they may also trot and gallop depending on the circumstances.



Track characteristics

Number of toes on front foot	2
Number of toes on rear foot	2
Do claws show?	No
Is the track symmetrical?	Yes
Typical gait	Walk, trot, or gallop

Moose tracks

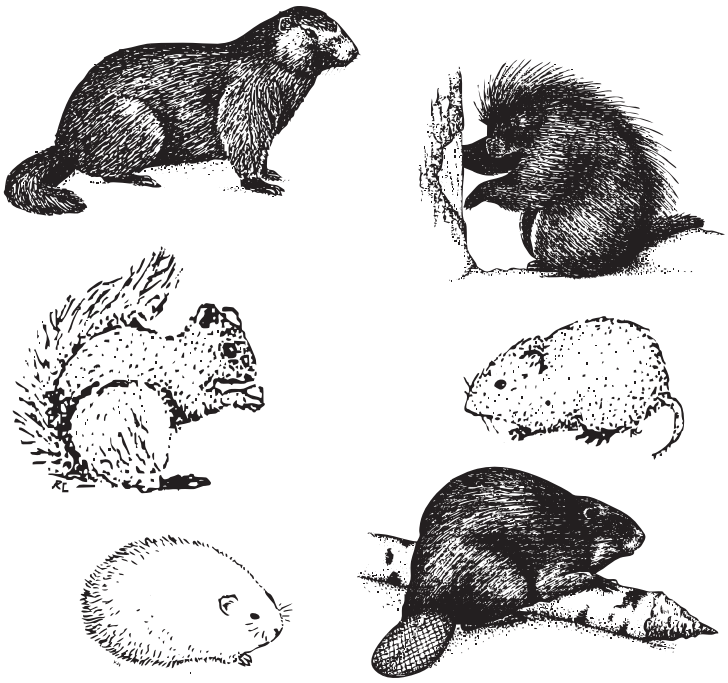


Dew Claws are short, reduced toes higher up on a hooved mammal leg that may show up in tracks made in mud, snow, or if the animal is moving fast.

Rodents

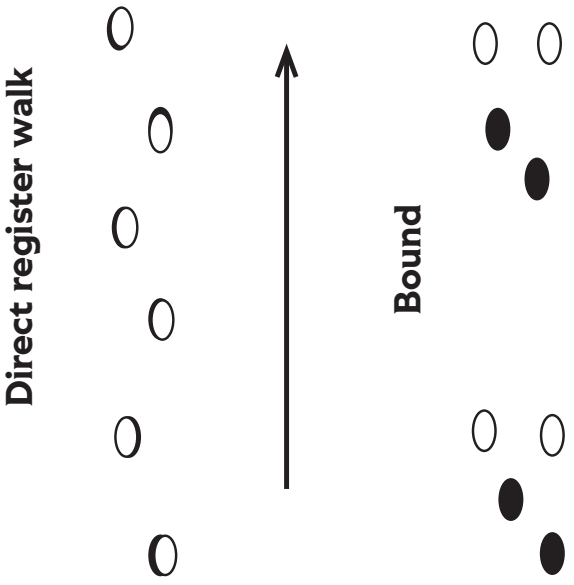
Rodents show tracks with five toes on the hind feet and four on the front feet. In general, the front feet and the hind feet are very different in appearance (except for porcupine) with the front feet looking hand-like without a heel, and the hind feet showing a full heel. The three center toes of the hind feet are also parallel to each other which is a very good clue to identifying rodent tracks that are not showing up clearly.

There is a wide variety of rodents, from tiny voles to larger beavers. Larger, wide-bodied rodents (porcupine, marmot) generally walk as their normal gait, but they may also trot and lope if threatened. Smaller rodents such as squirrels bound. Voles normally trot but when they are moving in snow, they bound.

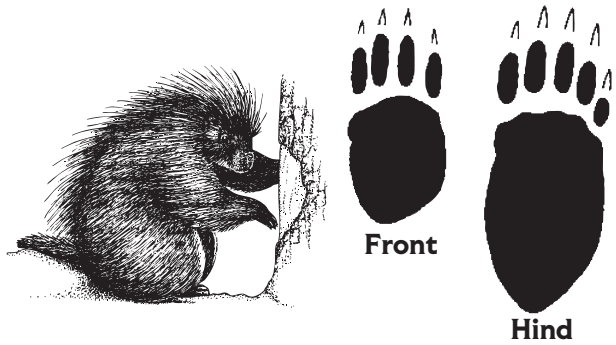


Track characteristics

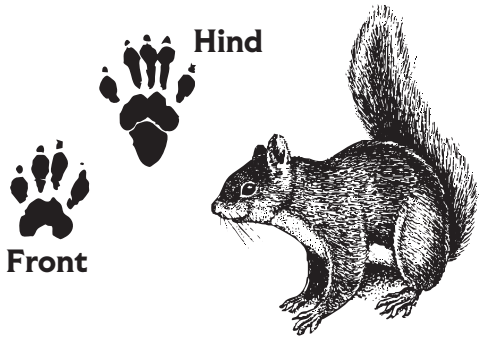
Number of toes on front foot	4
Number of toes on rear foot	5
Do claws show?	Yes
Is the track symmetrical?	No
Typical gait	walk or bound



Porcupine tracks



Squirrel tracks

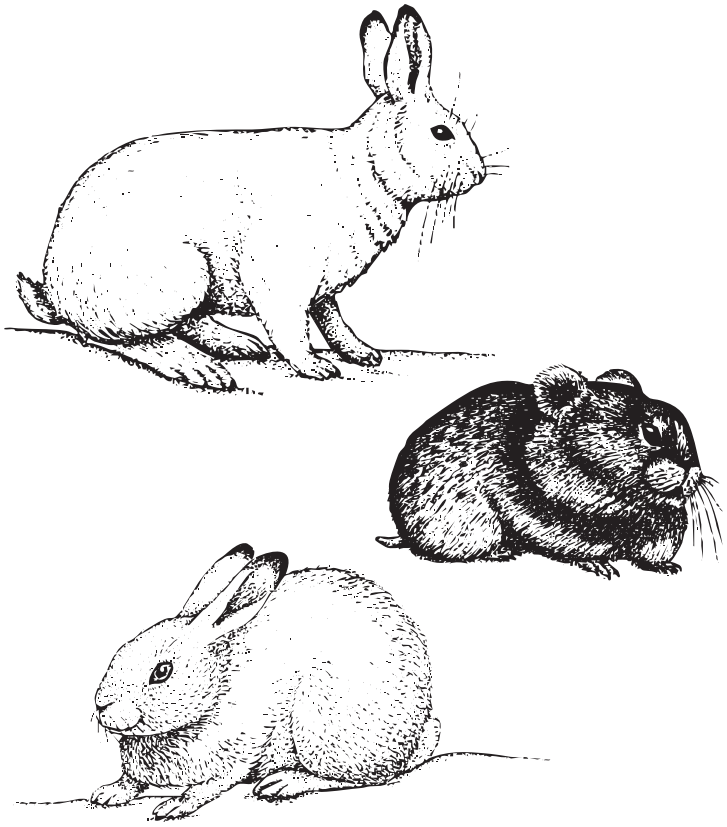


Hares and Pikas

Hares and pikas have five toes on the front feet (although the small inner toe is reduced and normally doesn't show up in the tracks), and four toes on the hind feet.

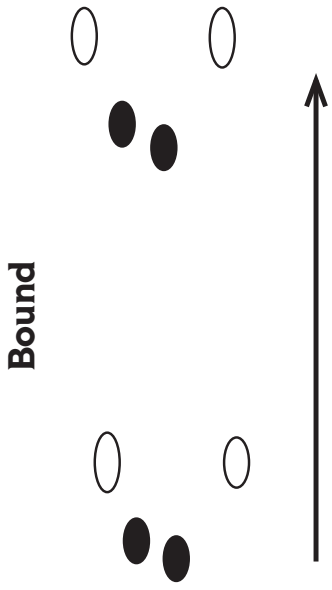
In hares, the hind feet are much larger than the front feet and normally show a heel.

The most common gait for hares and pikas is a bound in which the hind feet land in front of the tracks left by the front feet.



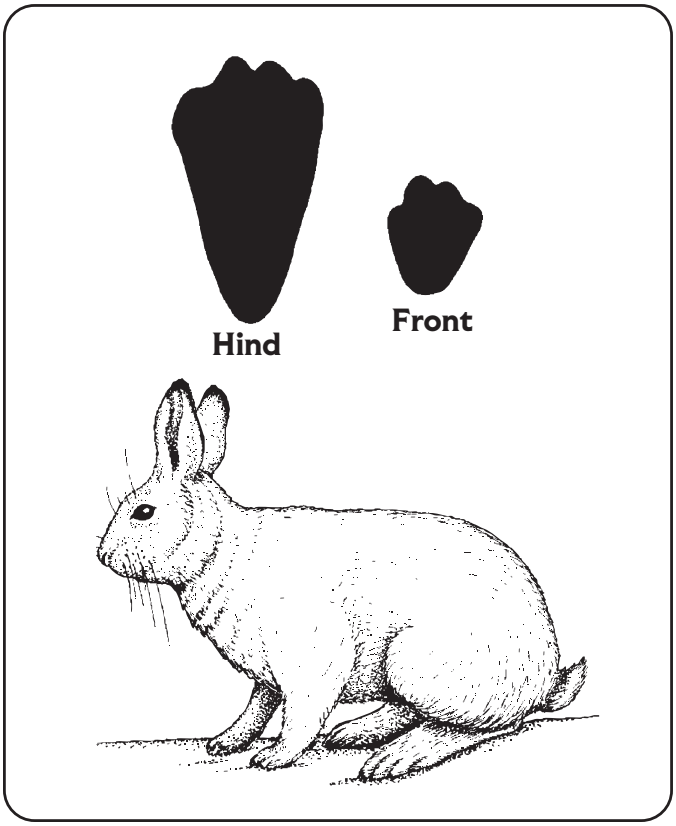
Track characteristics

Number of toes on front foot	4
Number of toes on rear foot	4
Do claws show?	sometimes
Is the track symmetrical?	No
Typical gait	bound

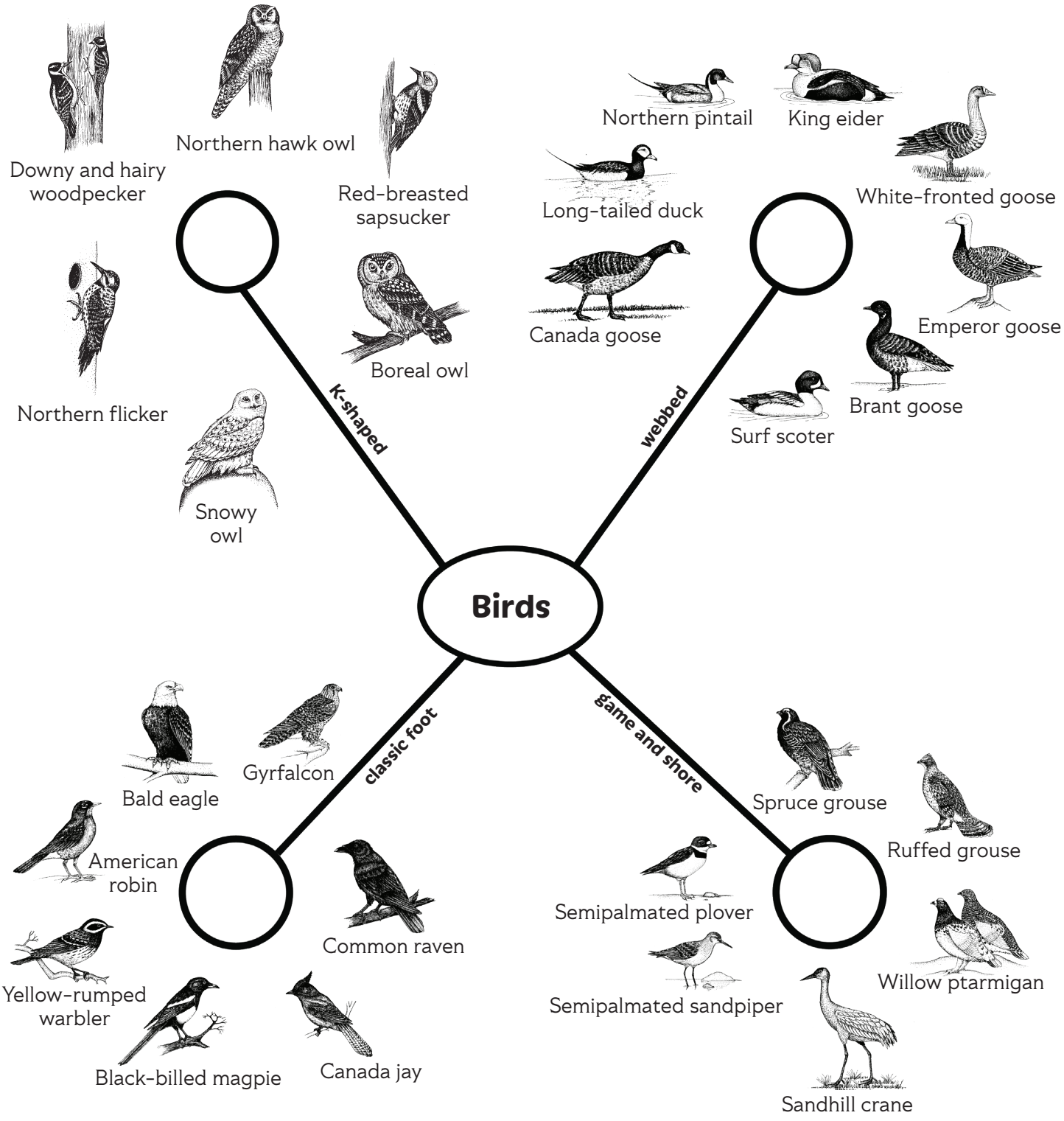


The two hind feet land at the same time, ahead of where the front feet landed.

Hare tracks



Birds


Birds
K-shaped
webbed
classic foot
game and shore
Downy and hairy woodpecker
Northern hawk owl
Red-breasted sapsucker
Northern flicker
Boreal owl
Snowy owl
Northern pintail
King eider
Long-tailed duck
White-fronted goose
Canada goose
Emperor goose
Brant goose
Surf scoter
Bald eagle
Gyrfalcon
American robin
Common raven
Yellow-rumped warbler
Black-billed magpie
Canada jay
Spruce grouse
Ruffed grouse
Semipalmated plover
Willow ptarmigan
Semipalmated sandpiper
Sandhill crane

Birds

In general, birds have four toes that come in a variety of configurations, radiating out from a small palm. Some have a rear toe, or hallux, that is long and some have a hallux that is short and may not show up in the tracks. Some toes are webbed, some are not. Birds walk, skip, or hop.

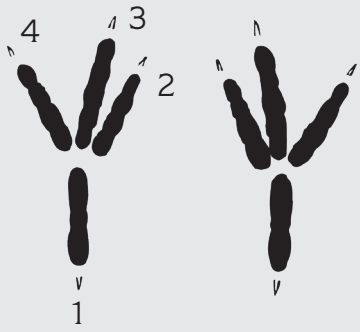
The toes on bird tracks are numbered 1 to 4, beginning on the hallux and moving in a counter clockwise fashion. Bird tracks can be grouped into four categories based on their overall shape: classic, game and shore, webbed and k-shaped.


Great horned owl

Classic foot

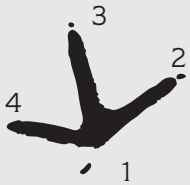
Classic perching birds leave classic tracks – the most common – with toes 2, 3, 4 pointing forward, and a long hallux pointing backward.


Common raven



Game and shore

Upland game and wading shorebirds leave tracks with three toes pointing forward (2-4) and one hallux that is reduced or absent. This group includes grouse, ptarmigan, cranes, sandpipers, oystercatchers, and others.

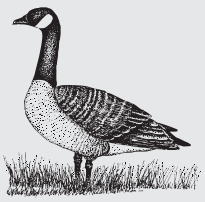


Sandhill crane


Ruffed grouse

Webbed foot

Webbed footed birds generally have a small or absent hallux and have the two outer toes (2 and 4) connected to the center toe (3) by webbing.


Canada Goose

Some webbed footed birds have a larger hallux that is connected with webbing. This structure is called the *totipalmate*. Example birds in this group are cormorants and pelicans.

K-shaped

Woodpeckers, owls and ospreys leave k-shaped tracks. These tracks feature toes 2 and 3 pointing forward, and toes 1 and 4 pointing backward.


Red-breasted sapsucker

4. Activities

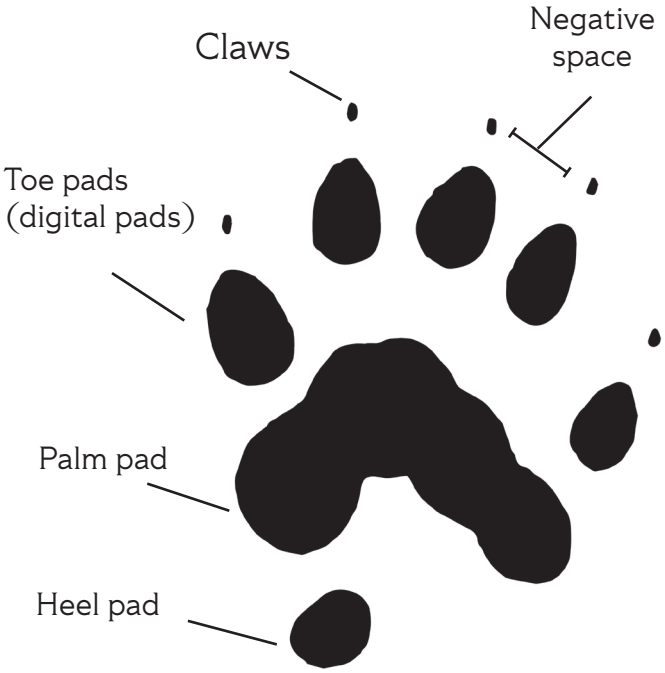
A. Parts of a track 21
B. Animal track match 23
C. Life-size track guide 25
D. Gaits and track patterns 27
E. Walk like a ... hop like a 29
F. Mammal signs 35
G. Bird signs 39
H. Track casting 43
I. Crime scene investigation 45
J. Why are my feet so big? 53
K. Crossword puzzle and word search 59

A. Parts of a track

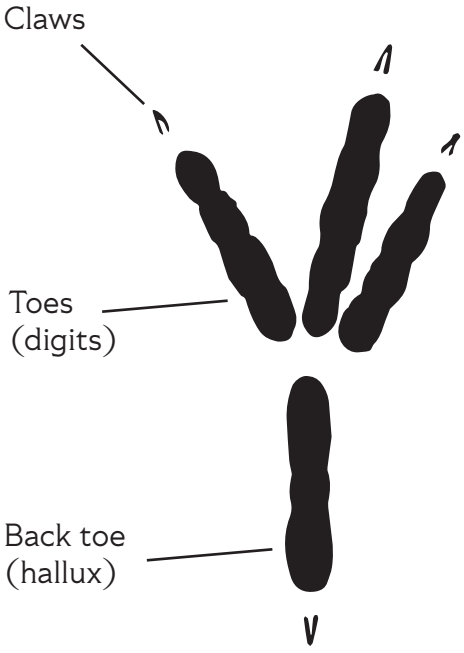
Knowing the parts of a track is important for learning the identifying features and describing tracks to other people.

Study the parts of a track. Then discuss and describe them to others.

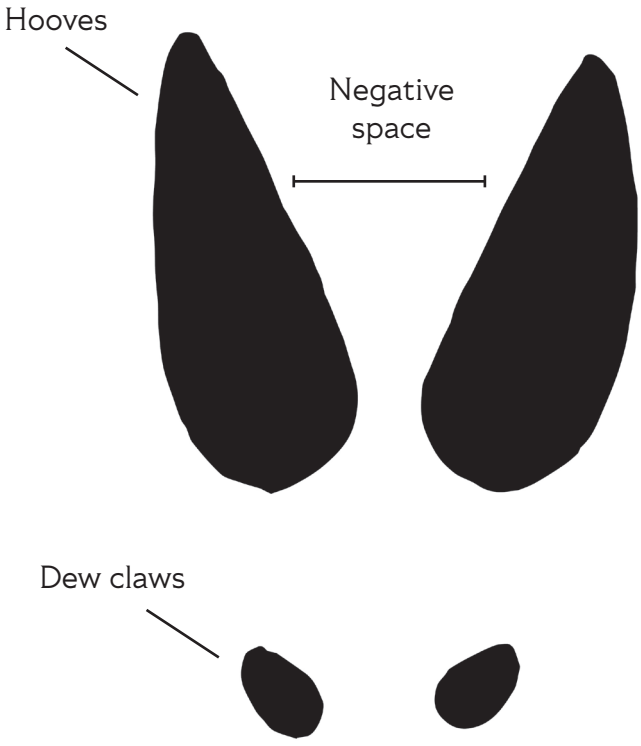
Each animal has different shaped toe pads, palm pads, claws, space between pads, shape of hooves, and so on. Pay careful attention to details to differentiate between animals with similar tracks.



Marten, front left



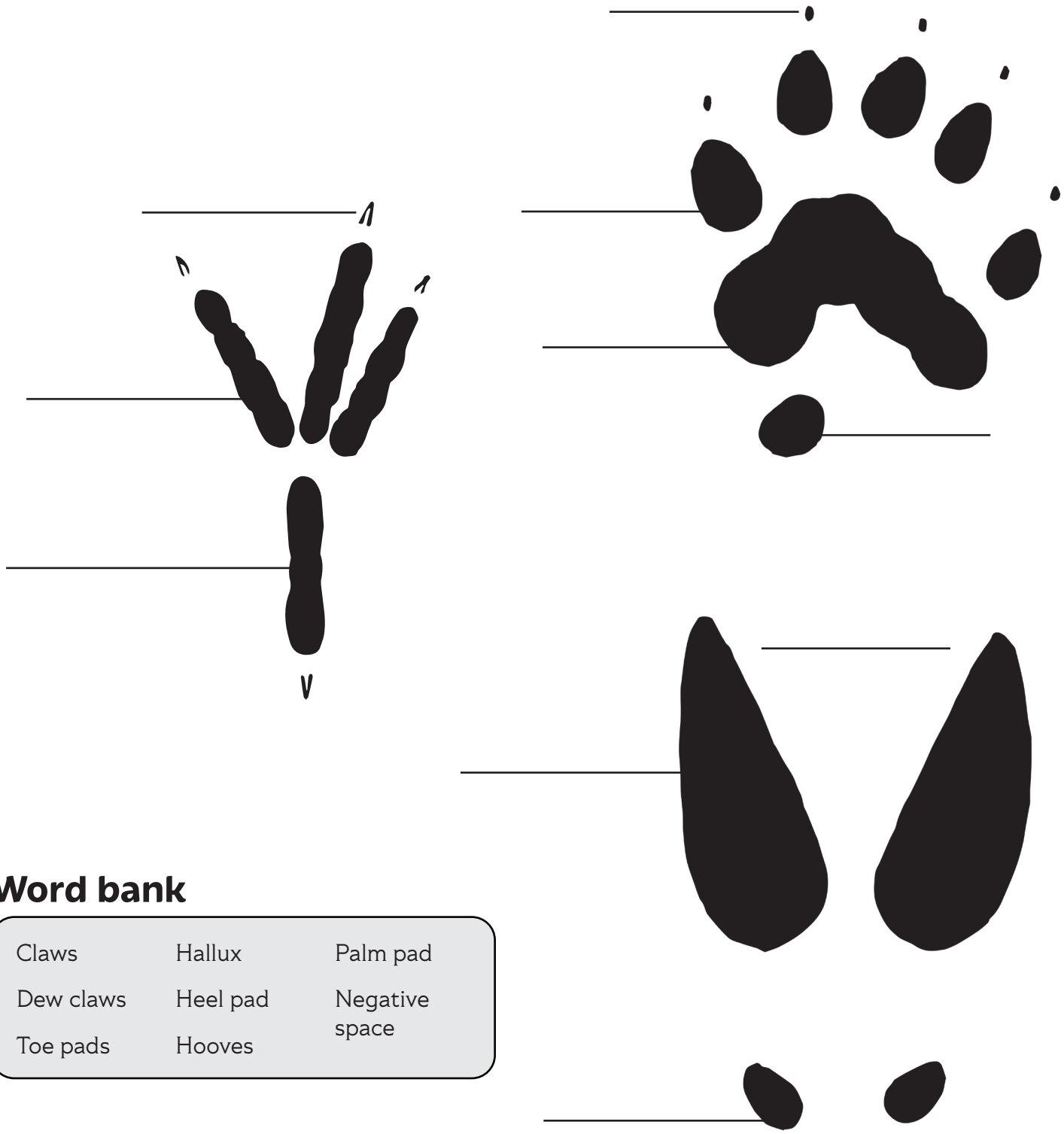
Common raven, front left



Sitka black-tailed deer hoof

Name _____

Parts of a track worksheet



Word bank

Claws	Hallux	Palm pad
Dew claws	Heel pad	Negative space
Toe pads	Hooves	

B. Animal track match

Animal track match

Grade Level: K–12
Subjects: Science, biology
Skills: Comparing, identifying, classifying, observing
Duration: 20 minutes
Group Size: up to 20
Setting: Indoors or outdoors
Vocabulary: Tracks, gait

Objectives

Students will be able to match animal pictures with their corresponding latex tracks.

Methods

Students use their observation skills and track knowledge to correctly identify animals and their tracks.

Background

This is a 'warm up' activity to assess students' current knowledge and their ability to use a guide to identify unknown objects. Identifying and matching the tracks will guide the students to start looking at track size, shape of the pads, number of toes, and other important characteristics.

Materials

- Alaska animal track cards or other quality track reference materials
- Latex tracks
- Pictures of Alaska animals
- Life size track canvases

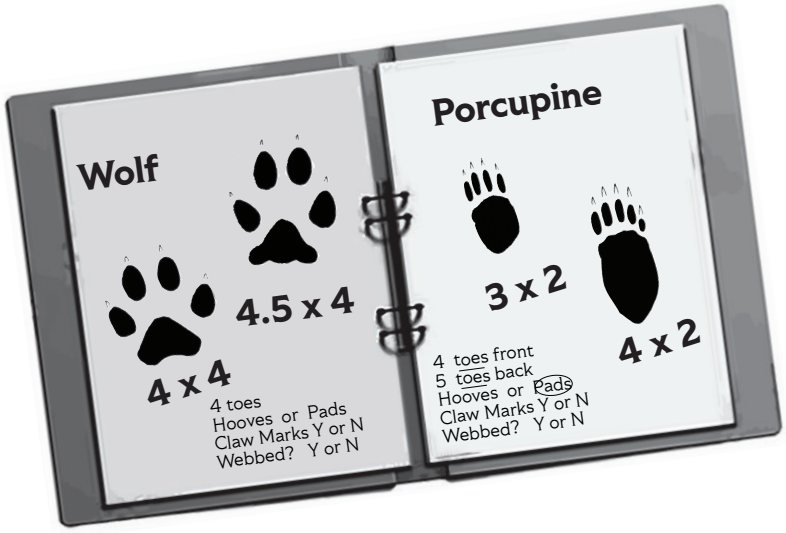
Procedures

1. With latex tracks – Place pictures of all the animals that you have latex tracks for on tables. Provide the students with an Alaska Animals Track card, and then randomly distribute latex tracks to the students. Have the students research their animal using the track card or other track reference materials and then place their picture next to the track belonging to their animal.
2. With track canvases – If you have track canvases with life size track silhouettes on them, lay these on the ground. Provide students with pictures of animals and an Alaska Animal Track card. Using the track card, have the students examine their animal and then place the picture of their animal on the corresponding life size tracks on the canvas

Evaluation

Observe how many tracks and animals students correctly matched.

C. Life-size track guide



Life-size track guide

Grade Level: K-12
Subjects: Science, biology, art
Skills: Observing, documenting, identifying, measuring
Duration: 60 minutes
Group Size: Individual
Setting: Indoors
Vocabulary: Animal names, tracks, toe pads, claws, hooves, shape, symmetry

Objectives

Students will create a life-size track guide of Alaska animal tracks.

Methods

Students are provided with individual, life-size track stencils of animal tracks (Tracks by Steve stencils in the kit). They use these stencils to trace (or create a crayon rubbing) of the animals front and hind foot on a track guide sheet (attached to this lesson) and then write down data about the track characteristics. They assemble all the sheets into a track field guide.

Background

Learning to identify tracks from books and measurements is good for building foundational knowledge. However, translating book knowledge and measurement to real life observation can be a challenge. Particularly, if students can't spend a lot of time outdoors observing the tracks of all animals. By creating a life-size track guide, students will associate various animal tracks with their real size and learn their characteristics. This will help them to identify tracks in the field.

In addition to the size of the tracks, the track worksheet will encourage students to make keen observations about other characteristics such as the number of toes, the claws, the shape of the pads, etc.

Materials

- Track stencils
- Ruler
- Track stencil worksheets (8.5 x 11" paper)
- Pens, markers, or crayons
- Some type of method to bind the sheets together into a book (staples, binder, notebook)

Procedures

Provide students with track stencils. If there are not enough track stencils for each student to have a set, you can leave the stencils in the front of the class and have students rotate through the stencils as they complete each one.

Have the students lay the stencil on top of their track stencil worksheet, trace the individual tracks of the animal, then fill them in with color – usually, this stenciling will include a front foot and a hind foot. Another method is to place the sheet on top of the track stencil and use a paperless crayon held flat against the paper to rub over the track to emboss the track onto the paper.

Evaluation

Examine the students' track stencil worksheets, which will make up their guide. Did they include all the animals that were available? Did they measure the tracks and fill out all the questions on the track stencil worksheet? Show some of the unlabeled track stencil drawings and ask the students to identify the animal.

Life-sized track guide

Name _____

Animal _____

Front or hind foot? (circle one)

1. How many toes? _____
2. Are toes like fingers, hooves, or pads?
3. Is the heel pad: one or multiple pads?
4. Claw marks? Yes or No
5. Webbing? Yes or No
6. How large is the track?

_____ inches long
_____ inches wide

D. Gaits and track patterns

Gaits and track patterns

Grade Level: 6-12
Subjects: Biology
Skills: Observing, interpreting
Duration: 60 minutes
Group Size: 2-3 students per group
Setting: Indoors
Vocabulary: Tracks, track pattern, animal gait, stride

Objectives

Students will be able to name three types of animal gaits and recognize the subsequent track pattern left by an animal using each gait.

Methods

Students use the animal gait track stencils (Tracks by Steve stencils in the kit) to create a trail (set of tracks) on a length of rolled out butcher paper (or similar material).

Background

Understanding animal gaits and track patterns is another level of learning after track identification. Understanding gaits and track patterns allows a student to interpret behavior and formulate a story of an animal's behavior.

Materials

- Animal gait information from the teacher guide
- Animal gait track stencils
- Roll of butcher or construction paper or similar material
- Markers, water soluble paint, sponges, and brushes

Procedure

Students pick an animal from the set of stencils available, research their animal, and determine how that animal usually moves (what gait it employs). Following the instructions on the stencil, students create a trail of track patterns left behind by the animal. They may use big markers, crayons, water-soluble paints, etc.

Evaluation

The instructor may evaluate this lesson by quizzing the students about their track pattern sheet. Each group can show their sheet for the rest of the class to determine what animal it is and what gait it is using. Some questions might include:

- What is the gait on this sheet?
- What group(s) of animals use this gait?
- What is the stride length of this animal?

EXTENSION (create your own track canvas)
Instead of butcher paper, draw or paint life-size track patterns onto large-scale, durable canvas fabric. Life-size tracks allow learners to understand the true size of tracks rather than relying on small field guides or cards with scaled down images and recorded measurements.

With a track canvas, students can see the track pattern that an animal is likely to leave on the ground or in the snow, using its most common gait.

While creating track canvases requires effort and time, they are effective learning tools with a long life-span.

Materials

- Large painter's canvas
- Tracks stencils (in track kit)
- Jumbo permanent markers or paint markers.

Procedure

1. Lay out the painter's canvas on the floor. If you are using paint markers or paint, make sure you lay a tarp down on the floor underneath the canvas in case there is a leak-through.

2. Take a track stencil and lay it on the bottom of the track canvas. Outline the feet of the track stencil onto the track canvas with a permanent marker. Follow the instructions on the track stencil to make the next track/ set of tracks to create a track pattern. Continue this until you get to the top and run out of canvas.

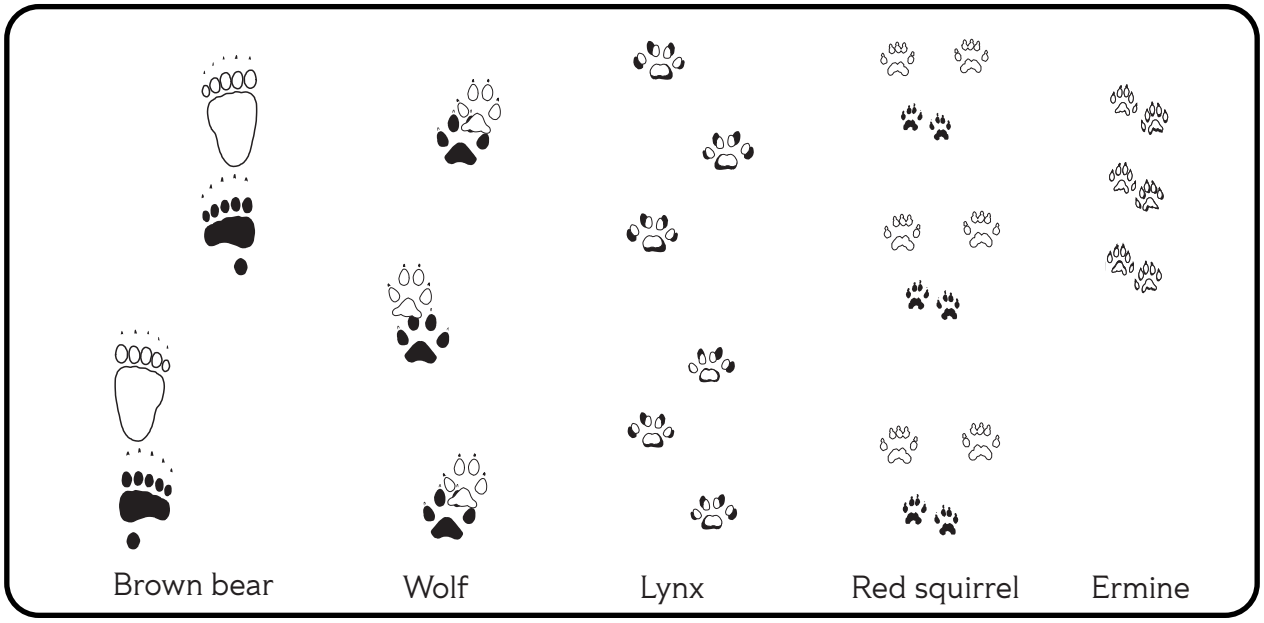
3. Fill in the track outlines with jumbo permanent markers or paint. Let dry completely before folding up the canvas.

4. You can label the animal, but do it discreetly on the underside of the hem where you start the tracks so that it is not visible. This will allow you to use the canvas for questions without having the answer show.

5. Continue adding track patterns for a variety of Alaskan mammals until you run out of room. For comparison purposes, you can group the animals into "track groups" or "gait groups" such as weasels, canines, felines, hooved animals, bears, etc.

6. You may make individual canvases for each animal to utilize for the next activity, "Walk like a...hop like a..." Differentiate between front and hind feet by using different colors so students know where to place their hands and feet when following the pattern.

7. Alternatively, create a scene around a pond or stream with animals that would likely be in the area, and use this as an assessment tool at the end of a track lesson. Ask questions such as "what animal left this track," "what was this animal doing," "how was it moving," "which animal came first," and so on.



E. Walk like a ... hop like a ...

Walk like a ..., hop like a ...

Grade Level: K-6
Subjects: Physical education, biology
Skills: Observing, hand-eye coordination
Duration: 30 minutes
Group Size: Up to 20
Setting: Indoors or outdoors
Vocabulary: Gait, lope, pace, bound, trot

Objectives

At the end of this activity, students will know the different gaits animals use to move and will understand the similarities and differences between how humans and animals move.

Methods

By following the footfalls of various mammals and mimicking their stride and gait, students will learn how different animals move and how "walking like a _____" may help them identify tracks left by these animals in their habitats.

Background

There are distinct gaits that various species use most of the time. Hence, it is useful to group the animals by their common gaits and resulting track patterns.

Four basic patterns exist that help to categorize tracks left behind by mammals. These are: 1) Walking 2) Trotting 3) Loping and 4) Bounding. The following pages show these patterns along with general examples of the animals that use each.

Materials

- Track canvases

OR

- "Front" and "Hind" circles

Procedures

Lay the track canvases out on a carpeted surface or secure the canvas to the ground with light duty tape if the flooring is slick. Alternatively, place the circle markers in the track pattern students should follow. Have students remove their shoes (keep socks on). Students will form two lines and take turns "hopping" like a hare or "walking" like a bear. The goal is for students to put their hands and feet in the corresponding "front" and "hind" paw prints of the hare and the bear.

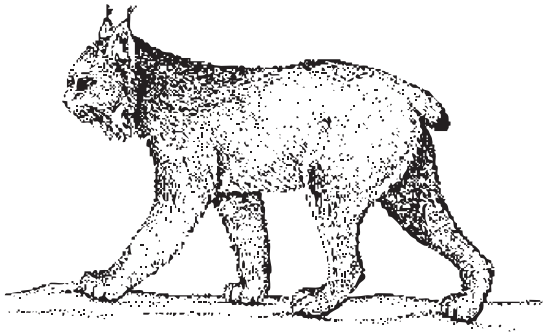
Ask students how would these patterns change as animals speed up or slow down their pace?

Allow students to practice as many times as possible. Feel free to challenge those who master the gait to complete the canvas at a slow, medium, and fast pace.

Evaluation

Break students into groups and assign each group a gait to practice and perfect. Have the students in each group demonstrate their gait in front of the rest of the class. Students can even pretend to be a certain animal performing that particular gait. The class should recognize the gait being demonstrated if the student performing the gait is doing so correctly.

Direct register walk

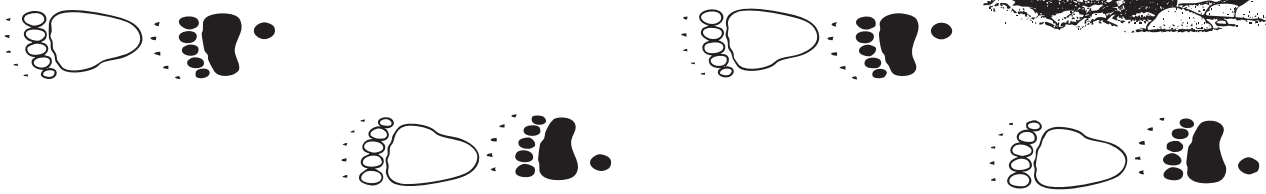


Example: lynx, deer, bear, porcupine, beaver, muskrat

Some mammals, such as a lynx, typically use the direct register walk in deep snow. In direct register walks, the back foot will land where the front paw previously was. When a lynx walks, it moves slowly and smoothly as if it's gliding.

Get on all fours and pretend you are a fierce lynx, slowly and quietly moving through the snow to detect a snowshoe hare. **Move one foot at a time,** beginning with your front left foot and then moving your back left foot to land where the front paw just stood. Do the same on the right side and repeat the pattern like a cycling motion down the path. While walking, keep your body low to the ground and your head level with your back. See an example of the direct register walk at minute 3:25 in the video by Steve Leckman provided on page 32 of this guide.

Overstep walk

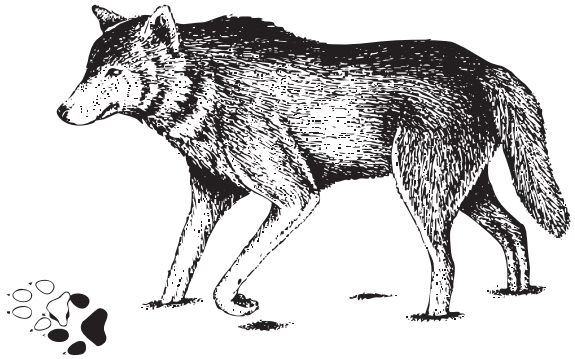


Example: lynx, deer, bear, porcupine, beaver, muskrat

The overstep walk, pictured above, is typical of bears and is characterized by the hind foot landing beyond where the front foot just landed.

Get on all fours and imagine you are a bear with four big, padded feet. Move your **left hand** and **left foot** forward. Your left foot will land slightly in front of where your left paw previously stood, and finishes the step slightly before your left front paw lands in its new place. Next, perform these motions on the right side of your body and steadily continue the full pattern down the path. Take your bear impression to the next level by stopping to sniff around for food, or standing up on your back legs to get a better look at something that sparks your curiosity! See an example of the overstep walk at minute 4:00 in the video by Steve Leckman provided on page 32.

Trot

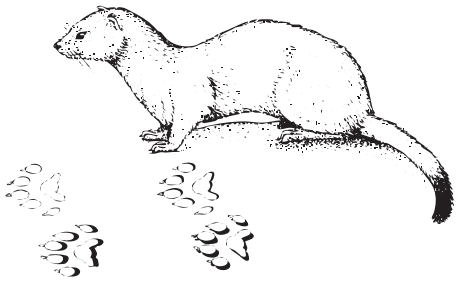


Example: wolf, mountain goat, moose, vole

Trotting is faster than a walk. Because of the faster speed, the track pattern is longer than a walk and the trail width can be more narrow. During trots, the diagonal legs move together, instead of limbs on the same side of the body moving together. While trotting, the animal is briefly airborne and seems to bounce. Like walking, trotting can be direct register or overstep. Think of a bicycle. When going slow there is more wobble — when going fast the tires get in line and go straight.

Imagine you are a wolf with four long legs that help you move quickly and gracefully. Hold yourself up on all four limbs. Lift your **Front left arm** and **back right leg** at the same time and begin moving forward. Then lift your front right arm and back left leg and move forward. Speed up as you get comfortable and notice how your body bounces while moving your legs in this criss-cross pattern. As for where your feet land, the rear-right foot lands close but diagonal of where the front-right foot was a moment earlier. Watch an example of a trot at timestamp 1:45 in the video by Steve Leckman on page 32.

2x2 lope

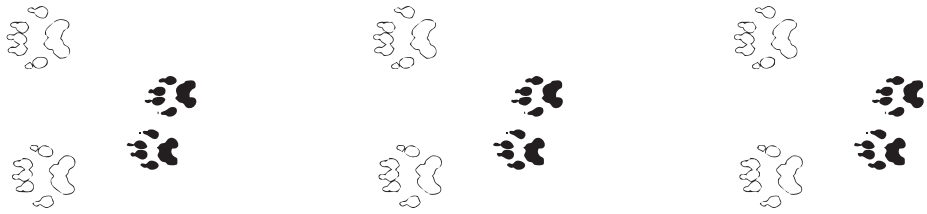


Example: ermine, fisher, mink, marten, short-tail weasel, voles in the snow

Loping is a faster gait than a trot. When moving, lopers tend to look like an airborne inch worm as their body hunches together and then elongates in quick successions. The front two feet land first, each foot independent of the other. Then, the rear two feet land, each paw independent of the other. The back feet land where the front feet just lifted off from, resulting in a direct register pattern.

Members of the mustelid family with long bodies and short legs use a lope as their main gait. Imagine you are a small, energetic ermine, hunting voles in the snow. Use the force of your back legs to launch your body off the ground and have your front arms as a pair catch you where you land. Speed up as you get comfortable and continue moving your legs as a unit to propel your body forward, followed by your arms moving forward and stabilizing the landing. Have your feet land where your hands just lifted off from. Watch an example of a 2x2 lope at timestamp 7:20 in the video by Steve Leckman on page 32.

Bound



Example: squirrel, hare

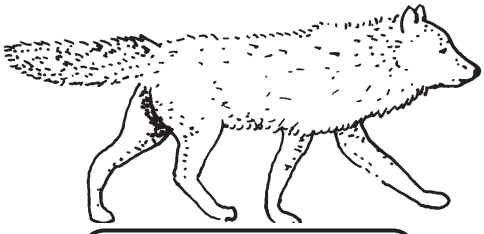
Bounders also use their rear feet to propel themselves forward and catch their fall with their front paws. Bounders will often have larger rear feet than front paws. When bounding, the animals feet land at the same time as a pair. A major difference from the lope practiced previously is that the rear feet land in a wider position and pass the front feet. When the back feet are about to land, the front feet lift off the ground.

Pretend you are a red squirrel energetically bounding towards a berry bush. Take a leap by pushing off your back legs and landing on your front paws. As your front paws land close together, have your back legs come around the outside and pass where your front paws landed. Practice having your back legs land simultaneously, while your front paws may land one right after the other. Notice how much faster bounding is than the other gaits! If it's hard to bound gracefully, remember that squirrels have long bushy tails to help them balance. Take your squirrel impression further by pretending to use your two front paws to carefully pluck a berry from the bush, sit on your hind legs and nibble away! Watch an example of bounding at timestamp 9:45 in the video by Steve Leckman provided on page 32.

Sources

The gait patterns in this activity were written by referencing A Crow's Path: An intro to gait patterns. Visit this website at:

www.crowspath.org/natural-history/wildlife/gaits



Extra Resources

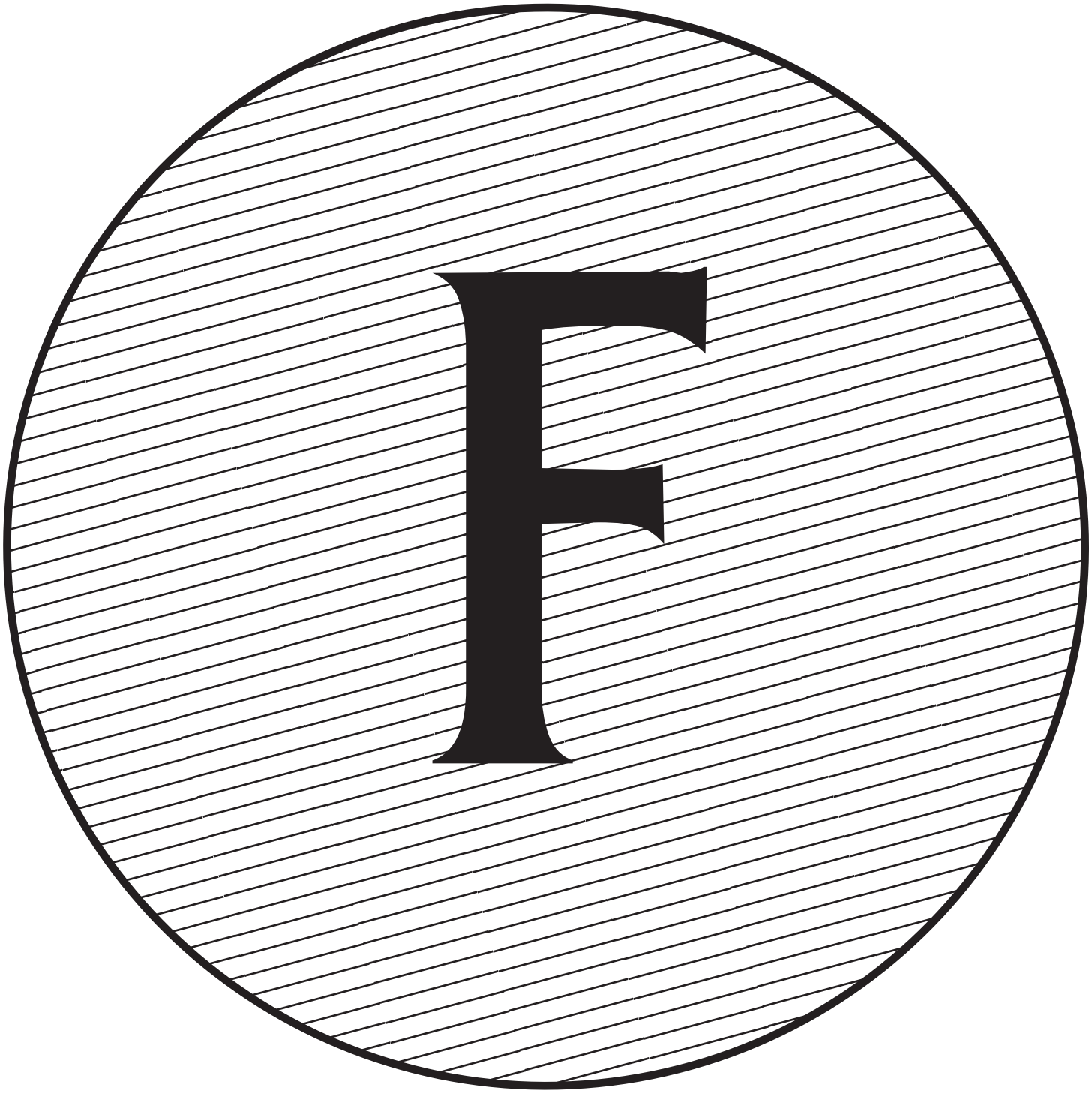
Watch Animal gaits a study by Steve Leckman at the QR code for a visual representation of humans and dogs performing gaits:

Time stamps

Direct register walk 3:25
Overstep walk 4:00
Trot 1:45
2x2 Lope 7:20
Bound 9:45

Front and hind foot marker

Copy this page and the next multiple times to place on the floor to show the footfalls of the track patterns you'd like to demonstrate. Make as many copies as you think you need! Have students cut out each circle and tape it to the floor in one of the gait patterns described. **Make it fun:** Copy each circle type onto a different color of paper (laminate to reuse). For example, F on red and H on blue. F is for front, H is for hind.




H

F. Mammal signs

Adapted from the Alaska Wildlife Curriculum, Forests and Wildlife.

Mammal signs

Grade Level: 5–12
Subjects: Science, language arts
Skills: Observing, identifying, inferring, comparing, descriptive writing
Duration: 50 minutes
Group Size: Individuals
Setting: Outdoors
Vocabulary: Animal names, carnivore, consumer, food chain, habitat, herbivore, predator, prey

Objectives

Students will use a variety of signs to identify the presence of specific mammals and determine their diet.

Background

Beyond tracks, animals leave evidence of their presence in the form of other signs such as scat, dens, or manipulation of plant life.

Materials

Copies of "Mammal Signs Chart" (following) and "Mammal Signs Science Card" for each student, clipboards and writing paper or field notebooks, pencils or pens.

Procedure

In advance, locate several sites where you find evidence of two or more mammals and mark them with flagging or survey tape (optional). Good choices may be near open water, sites with snow, and areas with a variety of shelter. Record the number of signs you find on the instruction card below as an incentive for students. Make a separate record of the mammal signs at these sites for later comparison with student notes.

If desired, you can have students make plaster track prints of what they find. See "Track Casting" on page 43.

1. In class, brainstorm what kind of mammals live in sites like you chose. Discuss what these animals obtain from the site (food, shelter, water, space and arrangement) and why the habitat is important for their survival. Review predator and prey relationships.
2. Tell the students they will go search for mammals. Students may not see specific animals, but they could find animal signs such as droppings, browse marks, or tracks.
3. Give each student the "Mammal Signs Science Card" and the "Mammal Signs Chart." Challenge your students to identify what mammals left behind the tracks and sign they found.

Evaluation

1. Students discuss and compare their findings. Based on what they found, where do their animals fit in the habitat's food chain and food web?
2. Ask if they think they might find more or less mammal signs at other seasons of the year. Why?
3. Where might they go to find signs of mammals on the chart that were not found during class? What does that habitat offer that the sites visited in class do not offer?

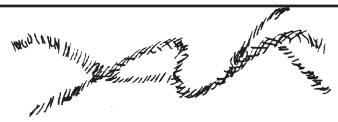
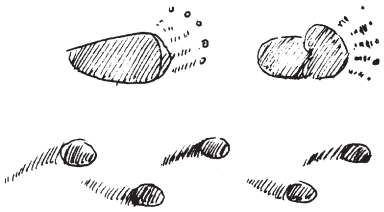
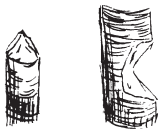
SCIENCE CARD

Mammal signs

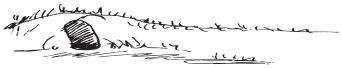
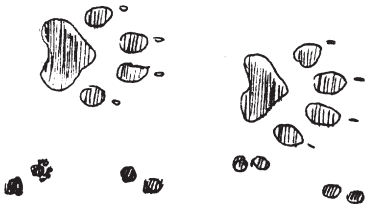
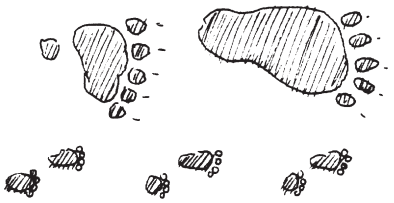
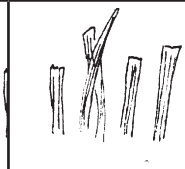
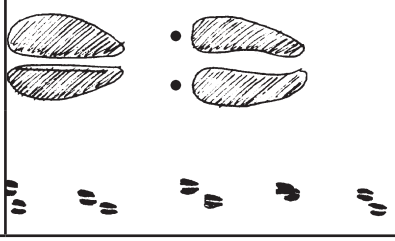
1. Write “Forest mammals” (substitute grassland, tundra, wetland, etc.) at the top of a page in your field notebook. Record the number of mammals whose evidence you find in this area.
2. List mammals whose evidence you find along the left side of your page.
3. Write what you think they eat based on the signs you find on the right side of the page. Decide whether they are herbivores or carnivores.
4. Write a short description of the signs next to each animal name. Try to compare each sign to something familiar. Make a rhyme or a humorous statement in order to help you remember which sign is evidence of which animal. (For example: Deer droppings look like big chocolate chips. Hare-browsed willows are sharp. Ow!)
5. If you find signs of other mammals while walking to or from this site, make notes of your findings on the page. The “Mammal Signs Chart” shows evidence of mammals that you might find in this area. There are signs of at least ____ kinds of mammals in this area. Can you find these signs and identify them?

Scan the QR code for the recommended background activity **“Who Lives Where”** on page 176, in the Alaska Wildlife Curriculum Forests & Wildlife. “Who Lives Where” shares what animals might leave tracks and signs in boreal and coastal rainforest habitats.

Mammal signs chart

ANIMAL	TRACKS	DROPPINGS	OTHER SIGNS
Shrew			
Vole, Mouse, or Lemming			 Tunnels under the snow or, after the snow melts, small piles of grasses lying in patterns like tunnels.
Squirrel			 Middens or large piles of cones, cone scales, and cone cobs. Also, mushrooms hanging in trees.
Snowshoe hare			 Willows, birch, rose, aspen, or other plants with stems neatly clipped.
Porcupine			 Large strips or patches of bark missing from a tree trunk.
Beaver			 Tree stumps or branches with gnawing marks; lodges or dams of sticks and branches.
River otter			 Strong odor; trampled grasses and plants, dens under tree roots, and sledding trails on small slopes.

Mammal signs chart

ANIMAL	TRACKS	DROPPINGS	OTHER SIGNS
Marten			
Fox or Coyote			 Dens
Wolf			 Dens
Lynx			 Scraping around droppings
Bear			 Grasses and sedges that have been grazed or clipped off. Skunk cabbage that is torn or dug up.
Deer			 Huckleberry or other shrubs with stems that appear to have been chewed off.
Moose			 Birch, aspen, willow, or other plants with stems roughly browsed (not neatly clipped).

G. Bird signs

Adapted from the Alaska Wildlife Curriculum, Forests and Wildlife.

Bird signs

Grade Level: 5-12
Subjects: Science
Skills: Observing, identifying, inferring, comparing
Duration: 50 minutes
Group Size: Small groups or individuals
Setting: Outdoors
Vocabulary: Bird names, food chain, food web, habitat

Objective

Students will recognize bird signs and identify the species and behavior of any birds in the area.

Materials

"Bird Signs Chart" and "Bird Signs Science Card" for each student, clipboards and writing paper or field notebooks, pencils or pens.

OPTIONAL: Field guides to animal tracks and birds, binoculars, and Alaska Ecology Cards.

Procedures

In advance, locate several sites where you can find evidence of several birds. Good choices may be near open water, sites with snow, and areas with a variety of shelter. If you cannot find examples of bird sign, you can create replica tracks by pressing a real or synthetic bird foot into the ground, and place feathers in the observation area ahead of time. Record the number and kinds of bird signs you find for later comparison with student observations and notes. Fill in the number of signs on the "Bird Signs Science Card."

1. In class, brainstorm what kind of birds live in the sites you chose. Discuss what these wildlife obtain from these areas (food, shelter, water, space, habitat) and why the habitat is important for their survival. Review the concept of food chains. Where are birds on food chain for each habitat?
2. Tell the students they will go search for birds at the sites you chose. Students may not see specific birds, but they could hear birds or find bird signs such as feathers, nests, whitewash (droppings), or tracks.
3. Give each student the "Bird Signs Science Card" and the "Bird Signs Chart."

Evaluation

1. Students discuss and compare their findings. Based on what they found, what do their birds need in these ecosystems? Where do they fit in the food web?
2. Ask students if they think they might find more or less bird sign at other seasons of the year. Why?
3. Where might they go to find the birds or their signs illustrated on the chart that were not found during class? What does that habitat offer that the sites visited in class do not offer?

Extension

A. Research local birds and create a display. Students use the Alaska Ecology Cards in the Alaska Wildlife Curriculum or other resources to find out more about their local birds. They use this information along with sketches of tracks or signs to make posters or a display of your local habitat's wildlife.

B. If a wooded area is near your classroom window, depending on grade level, students set up a winter bird feeding station after researching the best devices, food, and location through their local Alaska Fish and Game office, or Audubon Chapter.

Students keep a class chart of the kinds of birds that come to their feeding station, how often they are seen, and note their behaviors. Before the school year ends, students calculate the results and discuss the seasonal changes in bird visits.

Visit the webpage for the recommended background activity **"Who Lives Where"** on page 176 in the Alaska Wildlife Curriculum Forests & Wildlife. "Who Lives Where" shares what animals might leave tracks and signs in boreal and coastal rainforest habitats.

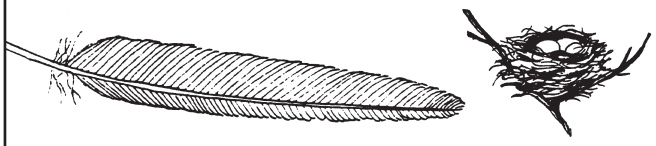
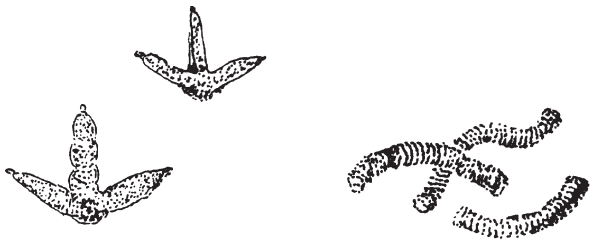
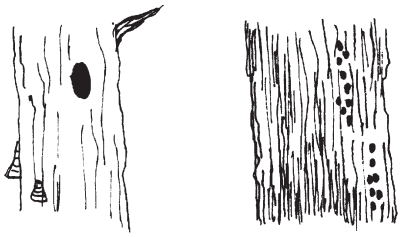
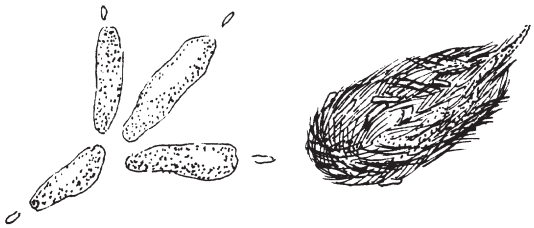
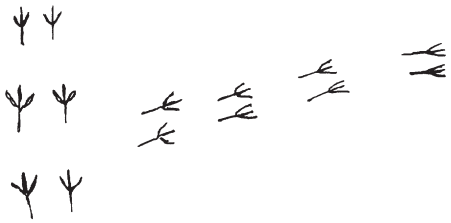
SCIENCE CARD

Bird signs

You have heard of mammal tracks. Did you know birds leave signs too? Open your eyes and look carefully, you will be able to find _____ bird signs that are in this area.

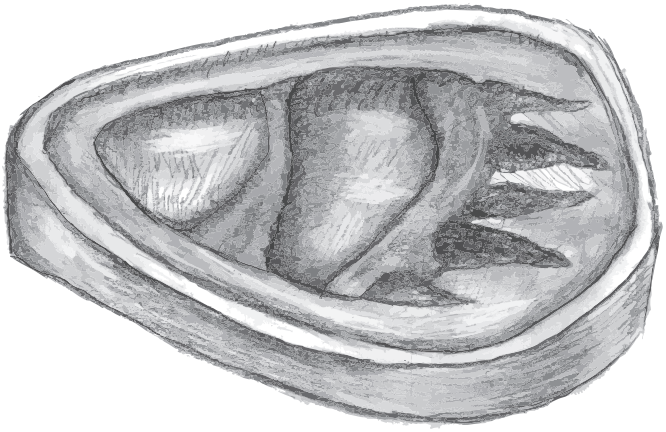
1. Write "Forest Birds" (substitute tundra, grasslands, wetlands, etc.) at the top of a page in your notebook.
2. Record the number of birds whose evidence you find at this site. Then list them by name along the left side of the page.
3. Listen and look carefully, these birds may still be nearby. Have one person in your group repeatedly make a "shhh, shhh, shhh" sound. Sometimes birds will move or call when they hear this sound.
4. If you see birds, watch them. Can you identify them using the guide book? Watch and record their behavior. What trees do they like most? Are they eating? Gathering sticks? Record what you see in sketches or words.
5. If you find signs of grouse or woodpeckers, look for these groups in a field guide to birds. Based on the season and the habitat you are in, can you figure out which kind of grouse or woodpeckers might be in this area? List the species you think are most likely to have made the signs.
6. If you find signs of other birds en route to the site, make notes of your findings in your notebook.

Bird signs chart

BIRD	SIGNS	
Signs Left by Many Birds		Feathers, sticks, or grass nests
Grouse		Grouse make 3-toed tracks on solid snow or wet soil, but in deep soft snow they make a trail that looks like a ditch in the snow. Their droppings seem dry and are shaped like fat worms. Listen for their hooting or low drumming calls.
Woodpeckers		Listen for tapping or drumming sounds. Look on live and dead trees for small or large holes that look like something drilled into the bark of the tree. Also look for flakes of bark around the base of trees.
Raven		Droppings and tracks around a dead animal. Hoarse croaking sounds.
Hawks and Owls		Hawks and owls regurgitate pellets of fur, feathers, and other indigestible bits of the prey. These pellets are cleaned of all meat, so that they smell and feel clean.
Songbirds		Listen for twittering, chirping, or other calls and songs.

H. Track casting

Adapted from the Alaska Wildlife Curriculum, Forests and Wildlife.



Track casting

Grade Level: 5-12
Subjects: Science, art
Skills: Observing, following instructions
Duration: Two 40-minute sections
Group Size: 2-4 students
Setting: Outdoors and indoors
Vocabulary: casting, parts of a track

Objectives

Students will make a cast of an animal track.

Materials

IN THE FOREST: Clipboards and writing paper or field notebooks, pencils or pens for each student. For each pair of students: 1/2 cup of plaster of Paris, waterbottle full of water, 1-inch wide lightweight cardboard strip, paper clip, toothbrush, forceps or tweezers, bucket for water, one empty container (tupperwear, large plastic cup, or similar).

IN THE CLASSROOM: Air dry clay, a piece of cardboard, track replicas, rolling pin, felt tip pens, and cards.

OPTIONAL: Sample casting as example.

Procedure

IN ADVANCE: Locate a forest site where tracks of mammals or birds are easy to find and where students will be able to return to the classroom after 20 or more minutes. If you are unable to locate reliable tracks, consider making tracks using latex replica tracks. Place the Science Card and the materials at the site. You may want to set up a sample casting as an example.

IN CLASS: Depending on the grade level, guide the students through the activity or send them outside and follow the instructions on the Science Card (next page).

IN CLASS: Students make a track display using air dry clay.

1. Have students roll out a 3/4-inch thick pancake of clay. Press each track replica into the clay to make replicas of the tracks found in the forest.
2. Students make labels for their replica tracks and a title sign for their display, such as "Forest Tracks." Display for other students in the school to see. Students may use toothpicks to mark initials in their tracks.

NOTE: Track replicas (typically latex) are available for loan throughout the state. Contact your regional ADF&G wildlife educator for checkout details.

Evaluation

Identify the parts of a track and what animal made the track. Did the student successfully make a track cast that shows the features needed for identification?

Teaching Kits for Teachers & Students

SCIENCE CARD

Track casting

Choose a partner to work together.

1. Be careful not to step on the animal tracks in the area so other students will be able to see and use them. Select one track of an animal from this area.
2. Carefully remove sticks and leaves from the animal track with forceps or tweezers. Press a strip of cardboard into the snow or mud so it wraps around the track. Secure it in place with the paperclip.
3. Using an empty container or large ziploc bag (recommended), mix enough plaster powder with water to make a thick batter.
4. If the track is in snow, mix snow with the water before you mix up the batter. This cold batter will be less likely to melt the snow and ruin your track. Pour the batter inside the cardboard strip over your track. Hint: If using a ziploc bag, cut a hole in one of the bottom corners and then squeeze out the plaster.

It will take about 20 minutes or longer for your track casting to dry. Wash out the mixing container so others can use it. Carefully pick up your track casting and gently clean off any dirt using the toothbrush. Then take the track casting back to class.

Wildlife Track Casting

Try it another way!

Scan the QR code for a video from Brenda Duty, former Teacher Resources and Curriculum Coordinator, demonstrating how to cast a track found in nature.

I. Crime scene investigation

Crime scene investigation

Grade Level: K-12
Subjects: Science, art, language arts
Skills: Investigating, observing, problem-solving, story-telling, drawing
Duration: 30 minutes for each part
Group Size: 2-4 students
Setting: Indoors or outdoors
Vocabulary: Gait, track, sign, predator, prey

Objective

Students will learn to interpret animal track stories by using their knowledge of predator-prey relationships, migration routes, and habitat use. At the end of this activity, students will have used problem solving and process of elimination to decipher animal "crime" scenes.

Methods

Students will learn to interpret track stories where animals interact with their environment and other species. Using observation and a process of elimination, students will decipher what animal fell prey to what predator, like the game "Clue". Lastly, students will have the opportunity to create their own track stories with art supplies and rubber stamps.

Background

Animals leave behind tracks and other signs when getting food, water, and shelter from their habitat. The evidence tells a story of what the animals were doing in that place.

Refer to the "About Tracks" and "Track Families" section for in-depth information relating to animal track characteristics. For Part 1, refer to the Crime Scene Suspect List on Page 47.

Materials

- Crime Scene Suspect List (p. 47)
- Crime Scene Canvases
- Crime Scene Kit props
- Notepad for taking notes
- Track Mystery worksheets (p. 48-50)
- Drawing paper or setting worksheets (p. 51-52)
- Pencils, crayons, or markers
- Animal tracks stamp set and ink pads

Procedure

The following three activities present scenes that allow the observer to predict animal interactions based on track and sign clues. Some ADF&G Tracks kits include a Crime Scene kit and canvas to display an interactive scene to students. The Mystery worksheets and templates for designing your own scene can be found on pages 51-52.

Part I — Crime scene demonstration:

1. **Introductory questions:** Display the crime scene canvas with props. Ask students, "What do you notice about the scene before you?" Have them take notes on observations, clues, and evidence inside the crime scene. Ask students, "What do you wonder about the scene?" after looking at the clues left behind. Present the crime scene suspect list and give students time to learn about the potential predators involved. Finally, ask students if they can draw any conclusions after reading the information on the suspect list.
2. **Who done it?:** After looking at the scene and reading the information about the subjects in question, write out a paragraph or a couple sentences about what you think happened at the scene of the crime. Who do

you think committed the crime, and why? Who was the prey, and why?

Note: For younger students, this can be done in small groups or as one large group by writing observations and guesses on a whiteboard.

Part 2 — Track mystery worksheets:

1. Make copies of Track Mysteries I, II, and III.
2. As a class or individually, explain what happened in each mystery OR have students try to explain what happened based on their understanding of animal tracks:

I. A deer was walking along when it encountered a wolf. The deer began to run with the wolf chasing it. There is no way to determine whether the wolf captured the deer. Alternatively, the deer may have begun to run for any number of reasons and later a wolf was loping along and followed the tracks.

II. Two deer enter the picture, walking in each other's footsteps. Many animals do this in snow because it takes less energy. Do humans? Two wolves run toward the deer and both deer begin to run. One deer escapes. The other deer is killed. The wolves feed and then walk away in each other's footsteps. The track in the upper right corner is a bird's—probably a raven or eagle. When a bird takes off, it leaves "brush" marks in the snow with its wings.

- Why might the raven or the eagle have been at the kill site?
- What other animals might benefit from having wolves around? (Other animals that scavenge on the carcasses, such as chickadees, foxes, magpies, wolverines, and bears).

III. This story has two plausible scenarios:

d. A moose was walking along when it saw 3 wolves approaching. It backed up against the trees and brush to protect its back, and when the wolves attacked, the moose managed to kill one, probably by striking it with its front feet. The other 2 wolves decided to leave and search for something easier. After they left, the moose walked away.

e. The moose walked through the area either before or after the wolf died and has nothing to do with the story. Two wolves from the same pack caught a trespassing wolf in their territory. They killed it and walked away.

- Why might wolves kill strange wolves that are in their territory?
- What other species sometimes kill strangers that are in their territories?

Part 3 — Create your own story:

1. Draw a setting or use the one provided by Discovery Southeast on page 52. An example would be a local park or a favorite trail or campsite they visit with their family, their yards, etc.
2. Plan a story you want to tell based on the setting, animal tracks available, and your understanding of how animals interact with their environment and leave clues via tracks.
3. Take turns visiting the track stamping station. Use the animal tracks stamp set to illustrate animal activity or interactions.
4. Write a story on the back of the artwork that describes the story you want to tell.
5. Team up with a partner and take turns interpreting the stories you illustrated. See if your partner can interpret the track story before reading the written story.

Evaluation

After each activity, have students reflect on what clues led them to believe a particular animal was the culprit. How did they know another suspect did not commit the crime? What did they notice about tracks in the snow, and what other possible stories could have unfolded at the interactive and illustrated scenes provided and imagined?

Crime scene suspect list

© Mark Emery

Haliaeetus leucocephalus
aka: Bald eagle, Chrome dome

What we know: The Bald eagle is named for its conspicuous white head and tail. The distinctive white adult plumage is not attained until five or more years of age. Immature birds lack this easily identifiable characteristic and can be confused with the golden eagle. Fish are the main diet of the Bald eagle. Eagles also prey upon waterfowl, small mammals, sea urchins, clams, crabs, and carrion. Bald eagles are sometimes seen swimming, laboriously "rowing" with their wings. Eagles have thick down and float well. There is a misconception that eagles cannot let go of prey. The talons grasp, but it's purely voluntary. An eagle will sometimes grab a fish that's too heavy to lift and will choose to swim, towing the meal to shore rather than lose it.

Vulpes vulpes
aka: Red fox, Foxy, Sly

What we know: The fox is known for its flashy good looks, ability to live close to people, and a reputation for cunning and intelligence. Several English expressions testify to the fox's wily mind: "sly as a fox," "foxy," outfoxed," and "crazy as a fox." The Red fox has well developed senses of sight, smell, and hearing, which are responsible for much of its reputation. The Red fox is omnivorous. Although it might eat muskrats, squirrels, birds, eggs, insects, vegetation, and carrion, voles seem to be its preferred food. Their general appearance is like dogs, wolves, and coyotes. The Red fox is common in most of northern North America.

Bubo virginianus
aka: Great Horned, Hoots

What we know: The Great horned owl is primarily a nighttime hunter. It is the only large owl in Alaska with ear tufts, which give it a horned appearance. It has a distinct white bib around its throat. The owl often perches near the edge of a meadow, slough, or open area where it hunts for small mammals. It has a deep call that can be heard from great distances. It sounds like it's saying "Who's awake? Me too." In Alaska, the diet of the owl has been determined by analysis of regurgitated pellets, which contain undigested bones and hair. Dissection of the pellets reveals the remains of skulls and lower jaws which can be identified. Small rodents compose 94 percent of the diet while other mammals (mainly shrews) and birds compose the remainder.

Canis latrans
aka: Coyote Ugly, Song Dog

What we know: The secretive nature of the coyote makes it an animal which is seldom seen by most Alaskans. It is for this reason that those rare sightings of a coyote take on a special significance. It appears that this newcomer to the Alaskan scene, the "song dog of the West," has found a niche in our state. The coyote, like the wolf, is a member of the dog family (Canidae) and resembles a medium-sized shepherd-collie type dog. Distinctive features of the coyote are its sharp pointed ears that never droop, a sharp pointed nose, and a long bushy tail. The coyote is best described as an opportunistic feeder. In Alaska, snowshoe hares, rodents, and carrion comprise the bulk of the coyote's diet while marmots, ground squirrels, muskrats, fish, and insects are taken in fewer numbers.

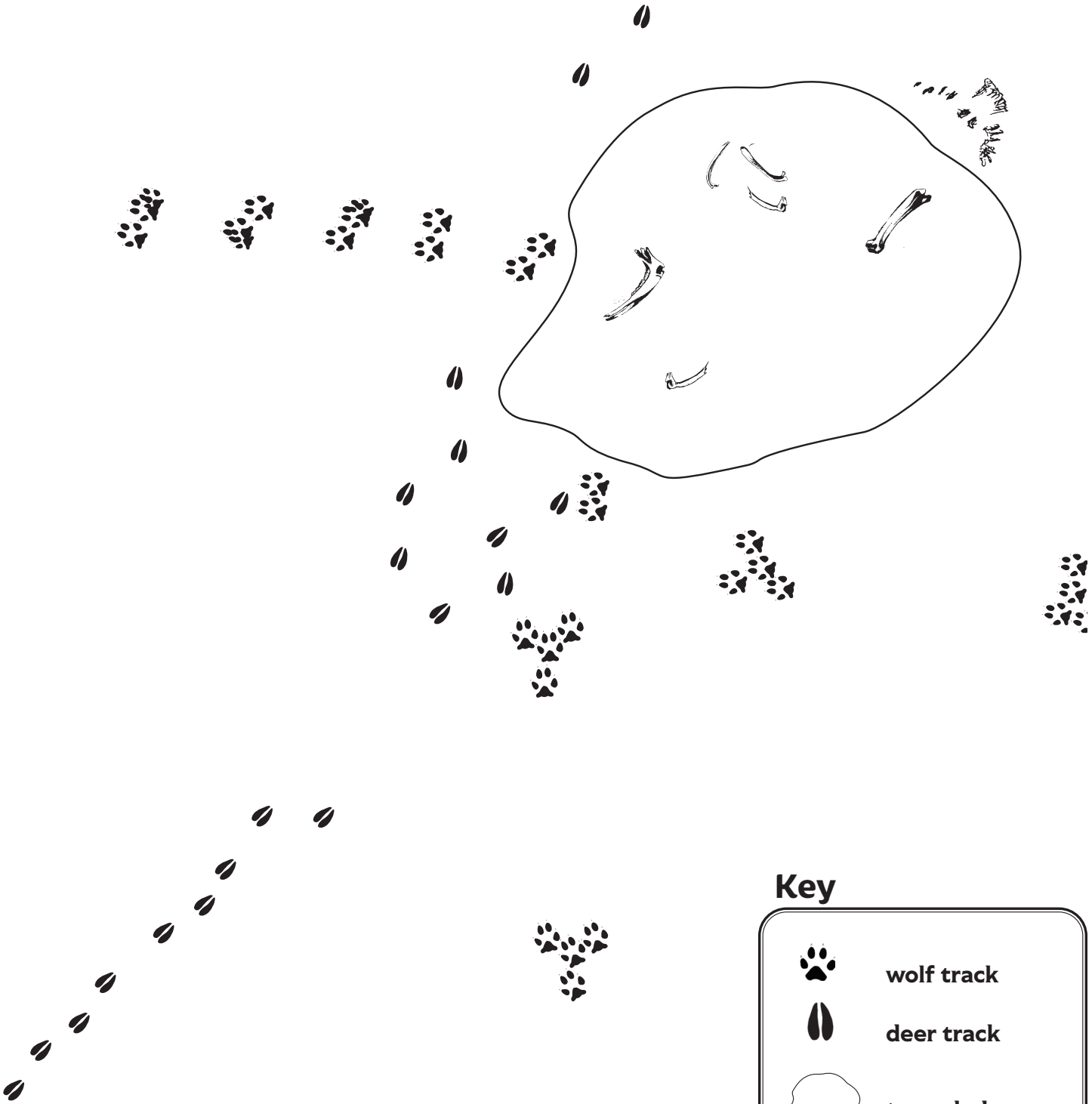
Track mystery I

Key

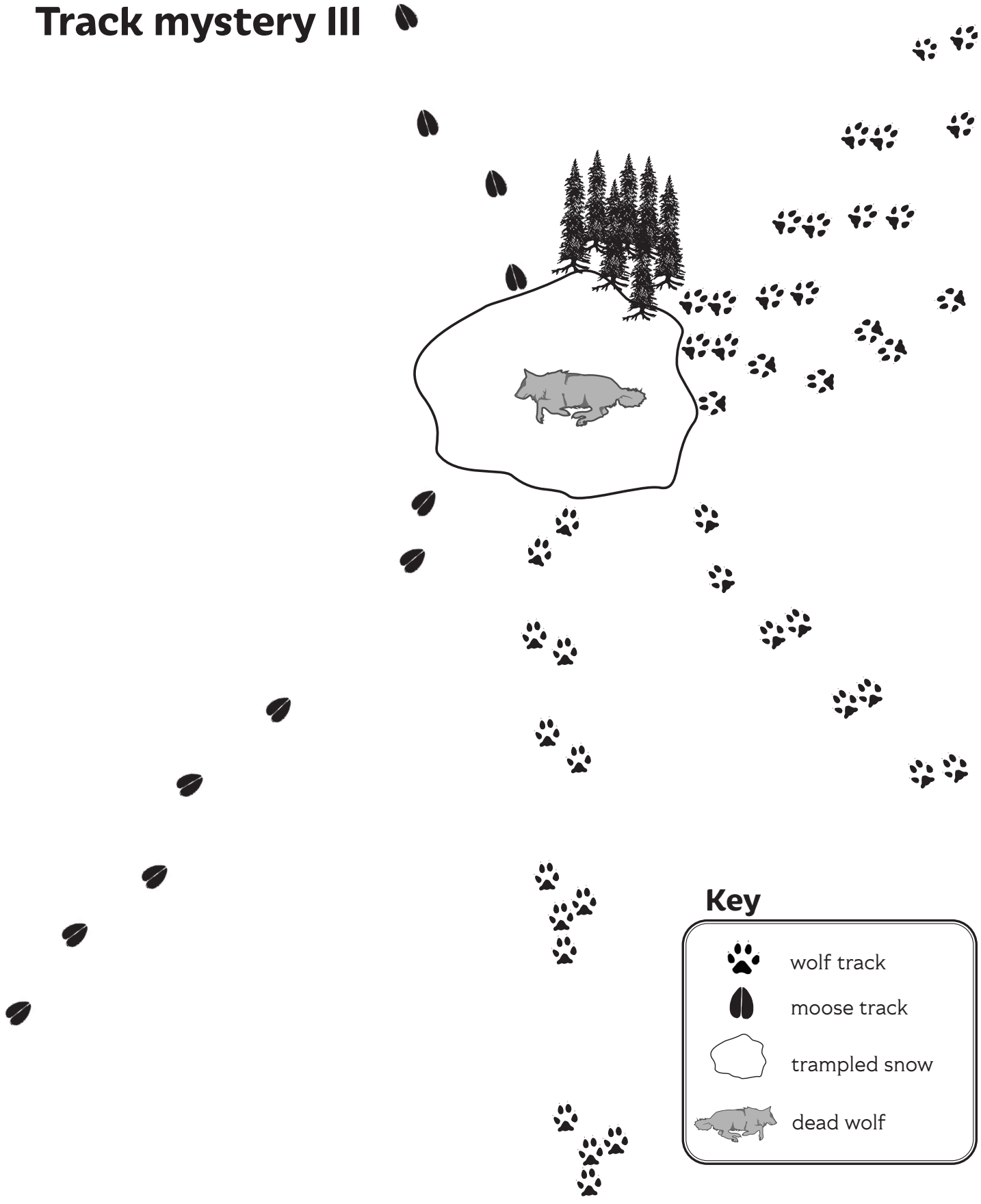
wolf track

deer track

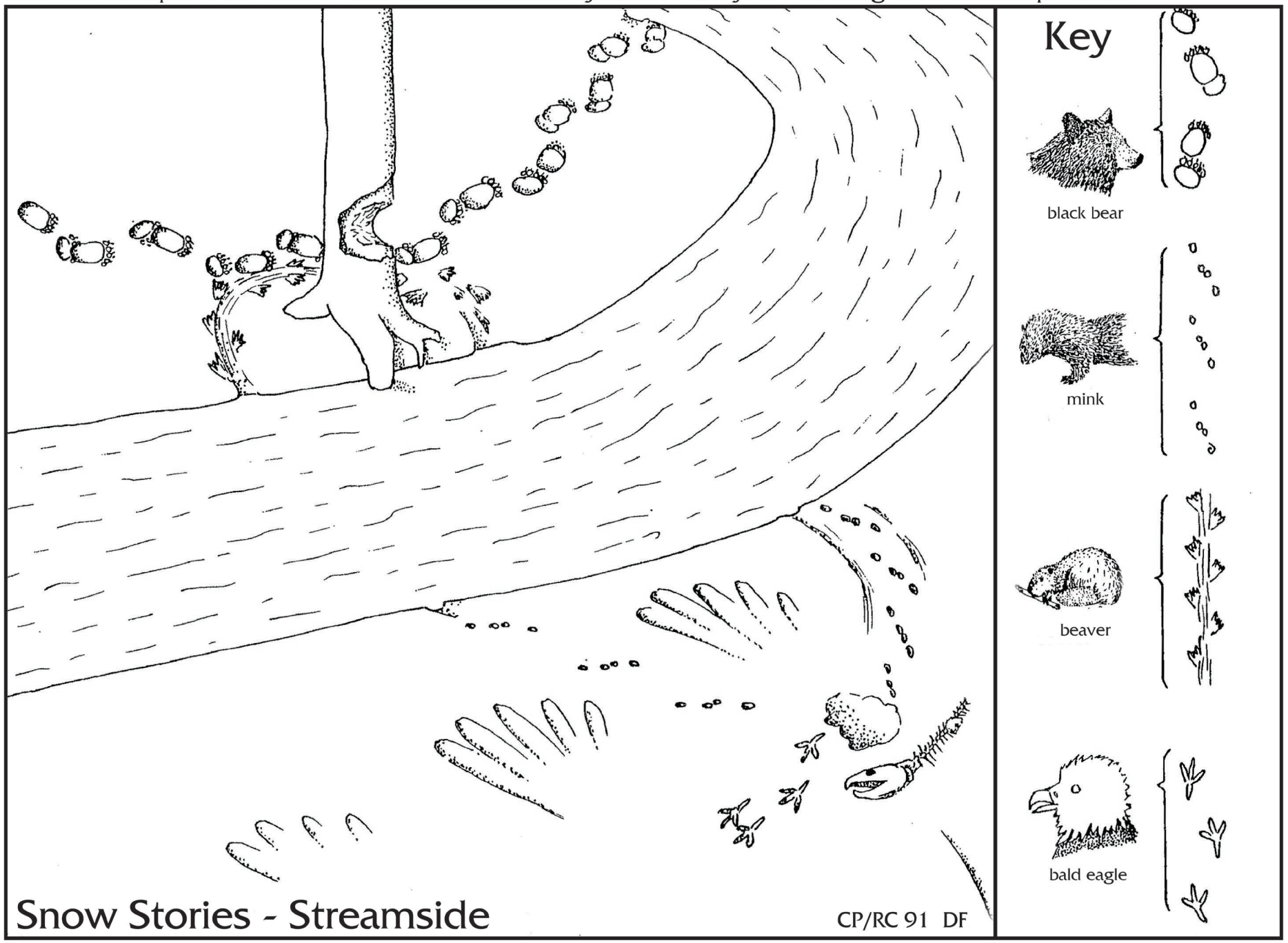
Track mystery II



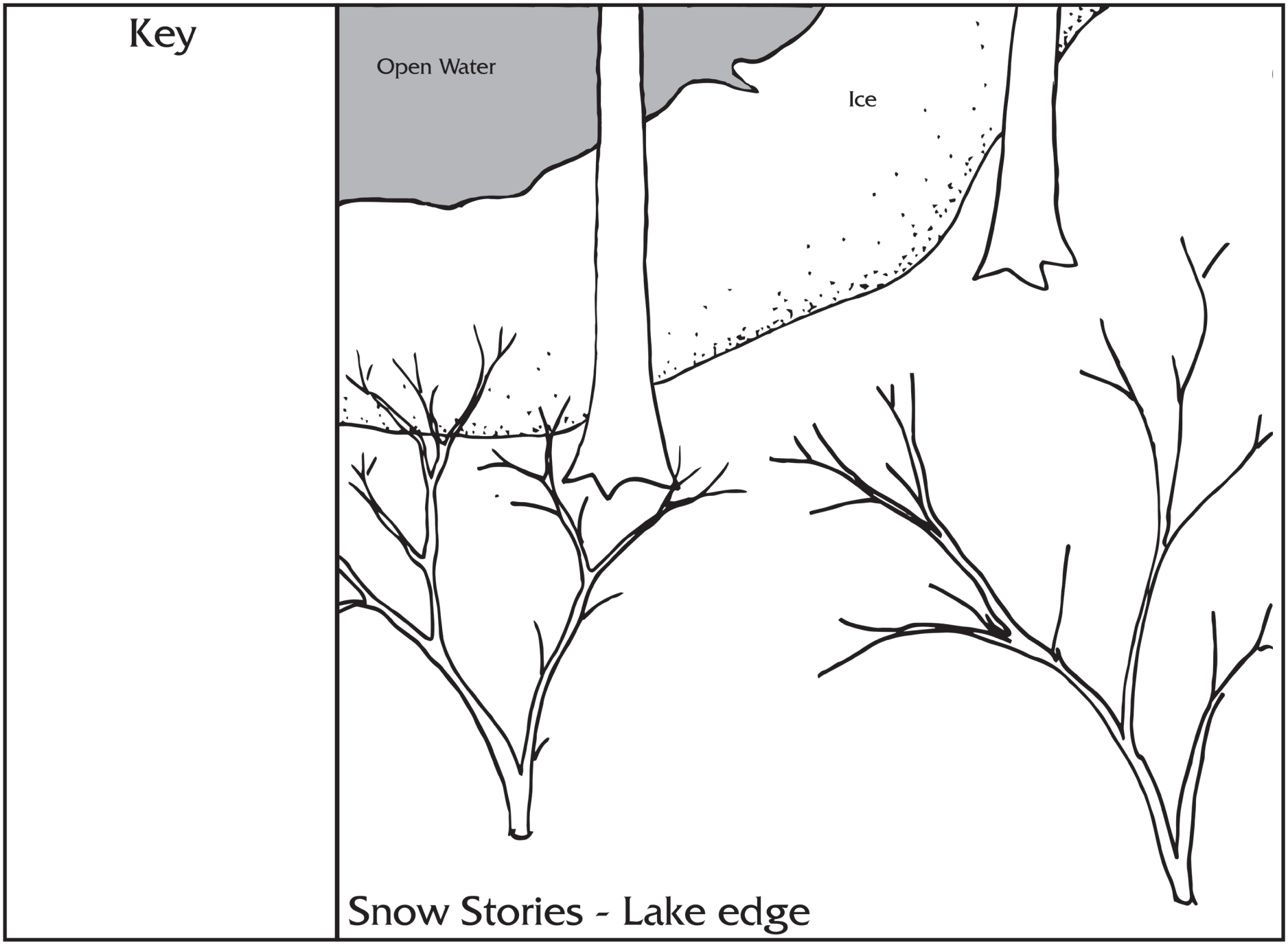
Track mystery III



Here's an example of the "stories" that can be left behind by tracks. Make your own using the worksheet provided.



Artwork courtesy of Discovery Southeast | discoverysoutheast.org



Artwork courtesy of Discovery Southeast | discoverysoutheast.org

J. Why are my feet so big?

Adapted from "Snow Floats" by the Canadian Wildlife Federation, Wild Education Below Zero Curriculum.

Why are my feet so big?

Grade Level: 4-10
Subjects: Science, mathematics
Skills: Prediction, measuring, team work, analysis, application, calculation, communication, discussion, inference, problem solving
Duration: 40 minutes
Group Size: Any size
Setting: Indoors
Vocabulary: Weight load, adaptation, area of support

Objectives

Students learn that some northern animals have specially adapted feet that allow them to "float" on top of the snow. Students can use the "weight load" of different species to predict which animals travel on snow best.

Methods

Students use the area of an animal's tracks along with its weight to calculate the "weight load".

Background

Several northern animals have feet designed for walking on snow. For example, lynx, snowshoe hare, and caribou have comparatively large feet for their body size. A caribou grows extra hair inside its hooves for winter travel. Each fall, the willow ptarmigan puts on a pair of "snowshoes." Its middle toes become longer and new feathers grow around all its toes. This feature reduces the pressure of its foot steps by more than 60%. These special adaptations help to spread the animals weight over a larger area so it won't sink into deep snow.The lynx "floats" across the snow while the much smaller house cat, with its tiny paws, sinks. The house cat's weight load is approximately 1.42 psi (pounds per square inch). In contrast, the lynx, which has its weight distributed over much larger paws, has a weight load of only 0.48 psi. Snowshoe hare and willow ptarmigan are even better snow floaters, with weight loads of 0.17 psi and 0.20 psi respectively.

Materials

Track stencils for several species, quarter-inch graph paper, and access to internet so students can research the weight of their animal. Check out the "ADF&G Species" page on wolverines!

Procedure

1. Discuss how many northern animals have comparatively large feet that allow them to "float" on the surface of the snow as they move across the landscape.
2. Provide each student with a track stencil for a northern animal.
3. Have students use the stencil to trace the front track outline on a piece of graph paper marked in quarter-inch squares.
4. In addition to having a footpad and claws, northern species also have lots of hair on their feet. Have students trace the area within their track that is likely to be covered by hair.
5. Have students count the number of squares that are inside the track/hair outline. Include the squares that are more than half inside the outline, but do not count squares that are less than half inside the outline.
6. Remember there are two front feet! Have students multiply the number of squares by two to get the total area supporting both

front feet.

7. Repeat steps 3-6 for the two hind tracks.
8. Have students research the approximate weight of their animal in pounds.
9. Now students can calculate the "weight load" by dividing the animal's weight (lb) by the area of support (in^2). Remember if your graph paper has quarter-inch squares, you must divide the area of support by 16. Weight load formula:

$$\frac{\text{Weight of animal (lb)}}{\text{Area of support (hind + front feet) } (in^2)} = \text{weight load (PSI)}$$

*See the full calculation for a wolverine on the following pages.

10. Create a table to compare the weight loads for each of the student's animals. Ask students to predict which animals travel across snow the best. You can also compare the class weight loads to the following animals:

Animal	Weight Load (PSI)
House cat	1.42
Wolverine	0.68
Wolf	1.42
Lynx	0.48
Ptarmigan	0.20
Snowshoe hare	0.17

11. Have students calculate how large their own feet would need to be to have the same weight load as their chosen animal. Using a wolverine for an example, if a student weighs 90 pounds, the calculation to find the area of support would be:

$$\frac{\text{Weight of student lbs}}{\text{Area of support } (in^2)} = \text{wolverine weight load PSI}$$

$$\frac{90 \text{ lbs}}{\text{Area of support}} = 0.68 \text{ PSI}$$

$$\frac{90 \text{ lbs (Area of Support)}}{\text{Area of Support}} = 0.68 \text{ PSI (Area of support)}$$

$$\frac{90 \text{ lbs } (\cancel{\text{Area of support}})}{\cancel{\text{Area of support}}} = 0.68 \text{ PSI (Area of support)}$$

$$\frac{90 \text{ lbs}}{0.68 \text{ PSI}} = \frac{\cancel{0.68 \text{ PSI}} \text{ (Area of support)}}{\cancel{0.68 \text{ PSI}}}$$

132.35 in^2 = Area of support

12. Have students calculate what their weight load would be while traveling on bare feet, snowshoes, or skis. For example, measure a snowshoe and estimate how many square inches it would cover.

Evaluation

Ask students to: Explain weight load and describe how it influences the ability of an animal to travel on snow.

EXTENSION (Build your own float)
Students will develop, construct, and evaluate various designs to "float" a weight on freshly fallen snow.

Materials:
A one-kilogram weight for each group of three students; a variety of materials for float construction, (cardboard, foam, aluminum pie plates, coat hangers, string, glue, wood, straws, margarine containers, pipe cleaners, and toilet paper rolls); weigh scale (optional, for variation only); one ruler per group, and a large bucket.

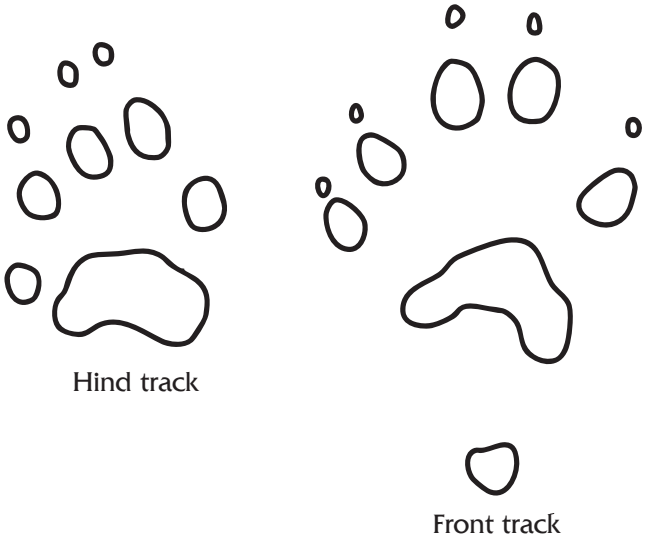
Procedure:

1. Begin by bringing a pail full of loose, fresh snow into the classroom. Then demonstrate what happens to a one-pound weight when you set it on the snow surface in the pail. Carefully remove the weight from the snow and measure and record how far it sank.
2. Now have students design a "float" that will keep the weight on the snow surface. Divide students into groups of three and show them the materials that can be used to build their floats. Assign a time limit for designing and constructing their floats.
3. Have each group present its design to the rest of the class. Students can also speculate which design will work best.
4. Test the floats outside after a fresh snowfall. Pick an untrampled area with an even snow cover. Have each group place its float on snow with the weight on the float. Let the float settle. Then, instruct each group to remove the weight and float and to measure and record the depth of the depression.
5. Back in the classroom, have students compare the results with both the class' prediction (optional) and the original test results. Ask students: which float designs worked best? Why? How could the designs be adjusted to be more efficient?

Example

In this example, we will calculate the weight load of a wolverine. We will demonstrate how to determine the area of support for the front track, but remember that the size of the front and hind tracks are different, so this procedure must be repeated for the hind track too.

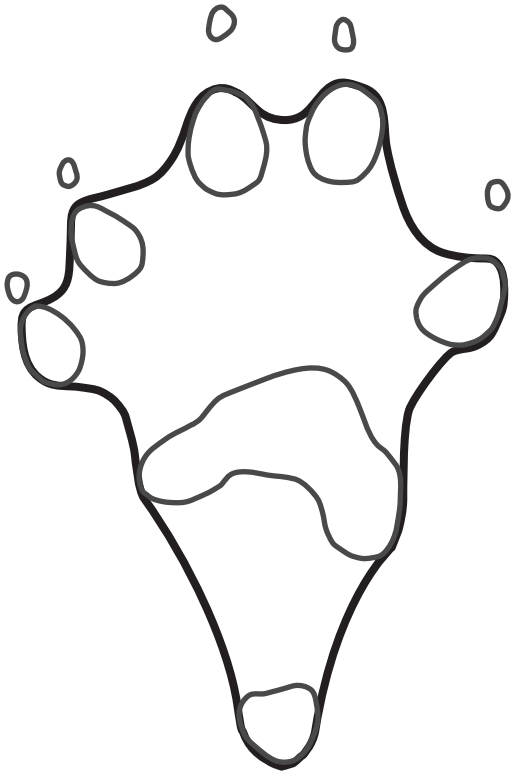
Step 1: Collect the stencil for the back and front track of your animal:



Hind track

Front track

Step 2: Because the foot pad is covered in hair that helps the animal "float" on the snow, have students outline the entire foot and toe pad region (excluding the claws).



Step 3: Provide students with quarter-inch graph paper. Have students count the number of squares that the track covers, including the outlined region covered in hair from Step 2.

In this example, the front foot of the wolverine covers 191 squares.

Step 4: Repeat step 3 for the hind track.

In this example, the hind foot of the wolverine covers 164 quarter inch squares.

Step 5: Research the weight range of a wolverine. For our example, we'll assume an average weight for a wolverine of 30 lbs.

Step 6: See the diagram on the next page for an actual size set of wolverine tracks. Use the following formula and calculations to figure out the weight load of a wolverine. Walk through each step on your own. Remember that the formula is in pounds per square inch (PSI), and our graph paper was in quarter inch squares. In order to get the answer in PSI, the **area of support must be divided by 16,** because there are 16 1/4 inch by 1/4 inch squares in a single square inch (see this visually in the key on the next page).

Area of support (in^2) = front (191x2) + hind (164x2)

Area of support (in^2) = (382) + (328) = 710/16 = 44.38 in

$$\text{Wolverine weight load (psi)} = \frac{\text{Weight lbs}}{\text{Area of support in}^2}$$

$$\text{Wolverine weight load (psi)} = \frac{30 \text{ lbs}}{44.38 \text{ in}^2} = \textbf{0.68 psi}$$

Step 7: On your own, calculate the snow weight loads of lynx and red fox on page 57. Which do you predict has the greater snow weight load? Why? Which animal actually has the greater weight load?

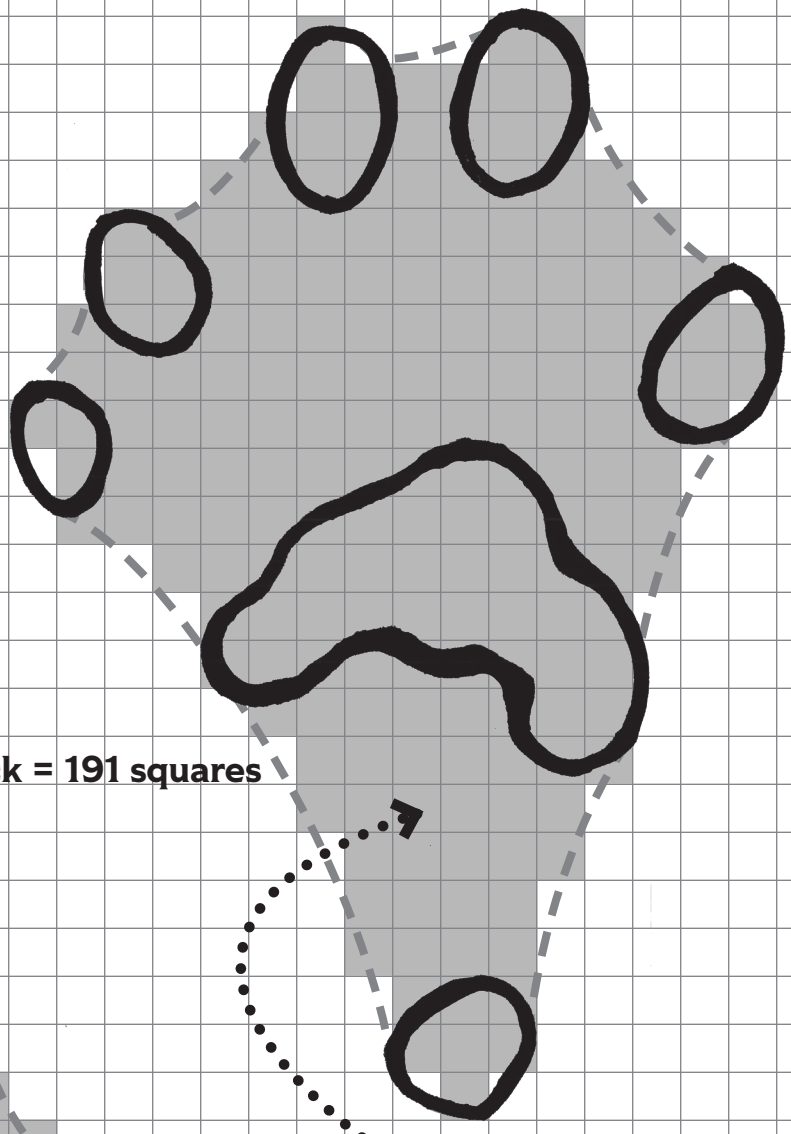
See the last page of this activity for blank graph paper to trace or stencil other animal tracks, student feet, or other objects you have known weights for.

16 squares
= 1 in. ^{2}

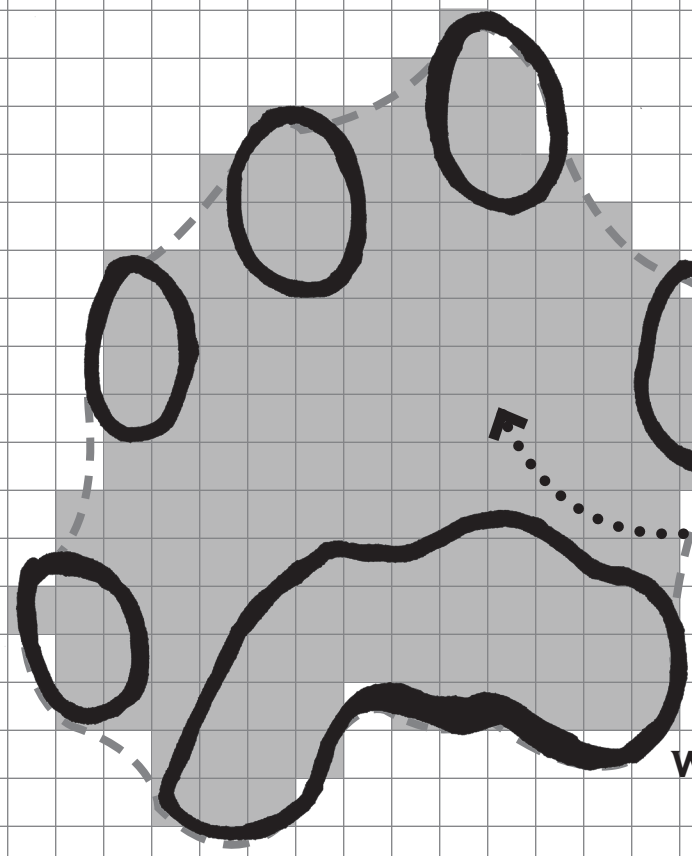
1/4 in.

1/2 in.

1 in.



Wolverine front track = 191 squares



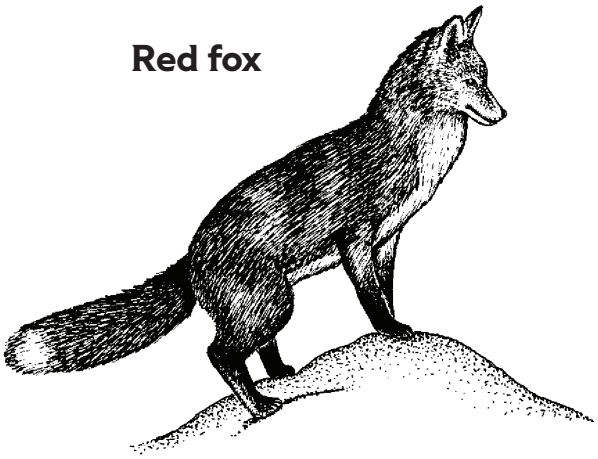
Count how many solid gray squares there are in the front and hind track.

Wolverine hind track = 164 squares

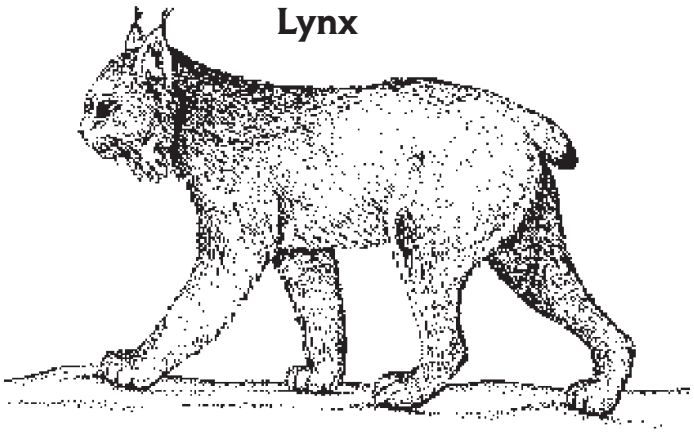
Suggested Comparison

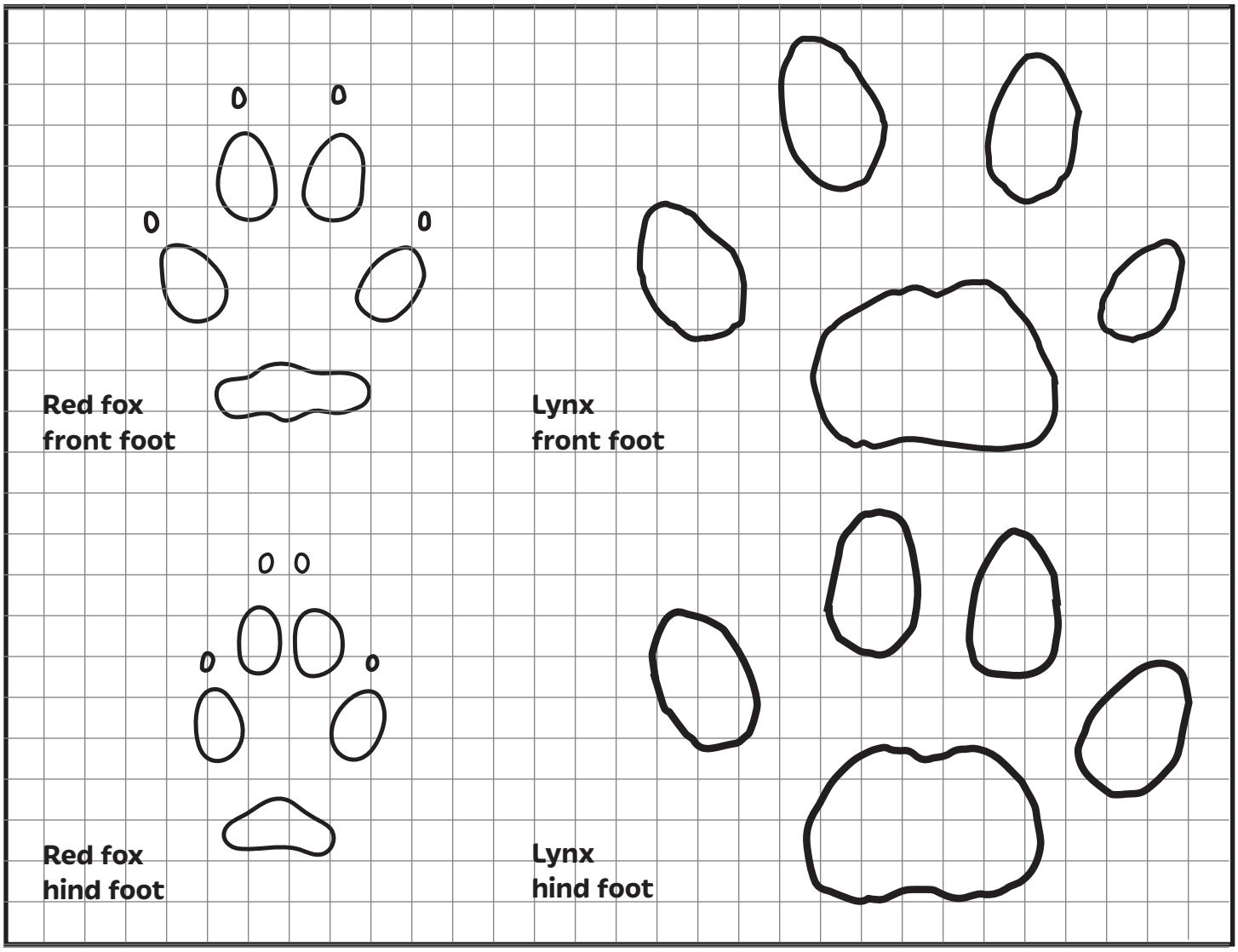
The Red fox and the lynx are two similar sized species that are found in interior Alaska. However, the lynx is especially adapted for life on snow and has substantially larger feet. The red fox weighs between 6 - 15 pounds while the lynx weighs between 18 - 30 pounds. Use these two species to see how their weight loads compare.

Red fox



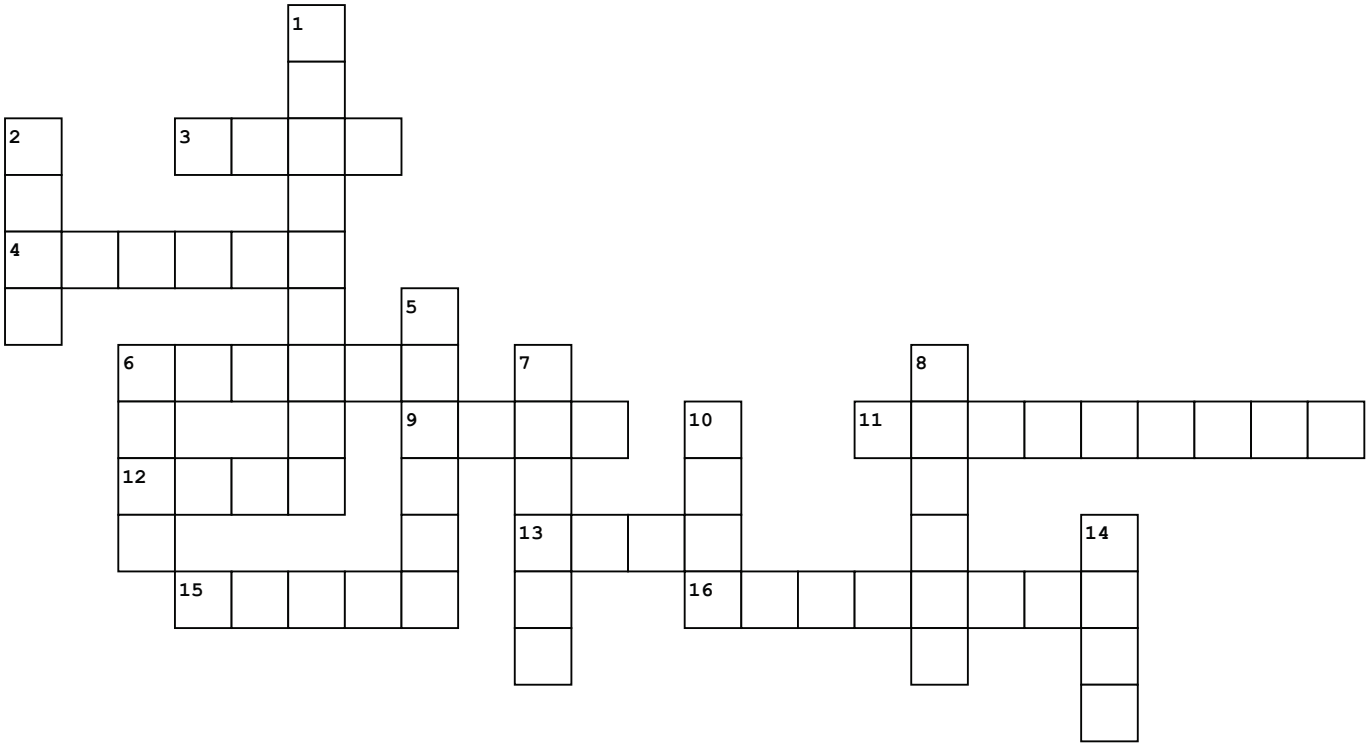
Lynx





K. Crossword puzzle and word search

Animals and their tracks



Across

3. A gait used by dogs and voles where the opposite side of the front and hind legs move together.

4. The fastest gait.

6. Measurement from the heel of a foot to the heel of same foot the next time it lands.

9. An omnivorous mammal that has the smallest toe on the inside of their track.

11. A large, wide-bodied rodent whose front and back tracks look very similar.

12. The way an animal moves.

13. A gait commonly used by members of the mustelid family.

15. A gait where both hind feet land exactly at the same time in front of where the front tracks landed.

16. When both halves of the track mirror each other.

Down

1. The outline of an animal's foot.

2. A group of mammals whose tracks show a distinct X-shape.

5. When toes are connected by skin to help with swimming.

6. Evidence of what was left behind by an animal such as tracks and scat.

7. The back toe of a bird.

8. Toenail-like structures that cover the toes of some animals.

10. Individual digits pressed into the ground.

14. A mammal whose tracks have teardrop-shaped toes and no sign of claws in the track.

Generated by
Crossword Labs

Name: _____

Animals and their tracks

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

Find the following words in the puzzle.
Words are hidden → ↓ and ↘ .

ANISODACTYL
BEARS
BOUND
CASTING
CATS
CLAWS
DEWCLAWS
FOOTPRINT
GAIT
GALLOP
HALLUX
HARE
HOOVES
LOPE
LYNX
PADS
PATTERN
PLANTIGRADE
PORCUPINE
SIGN
STRIDE
SYMMETRY
TOES
TROT

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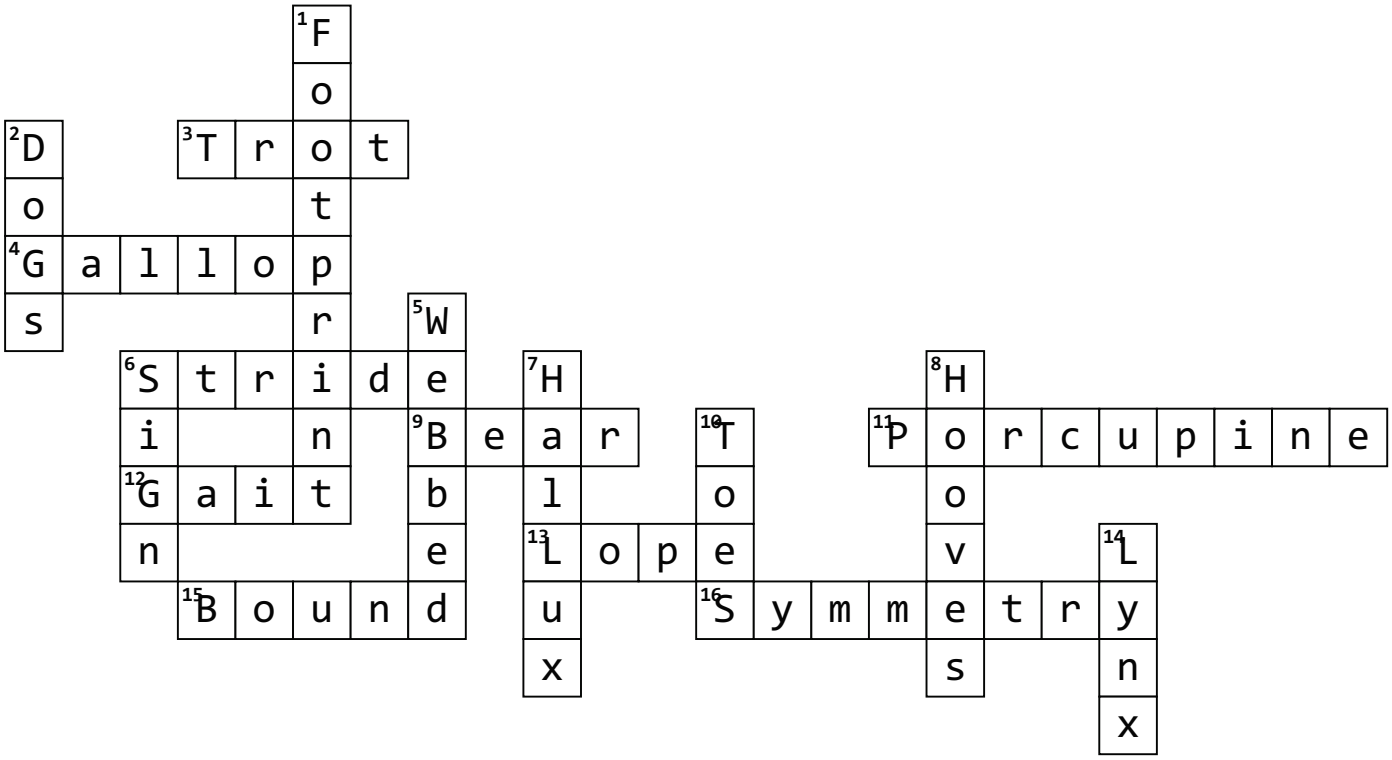
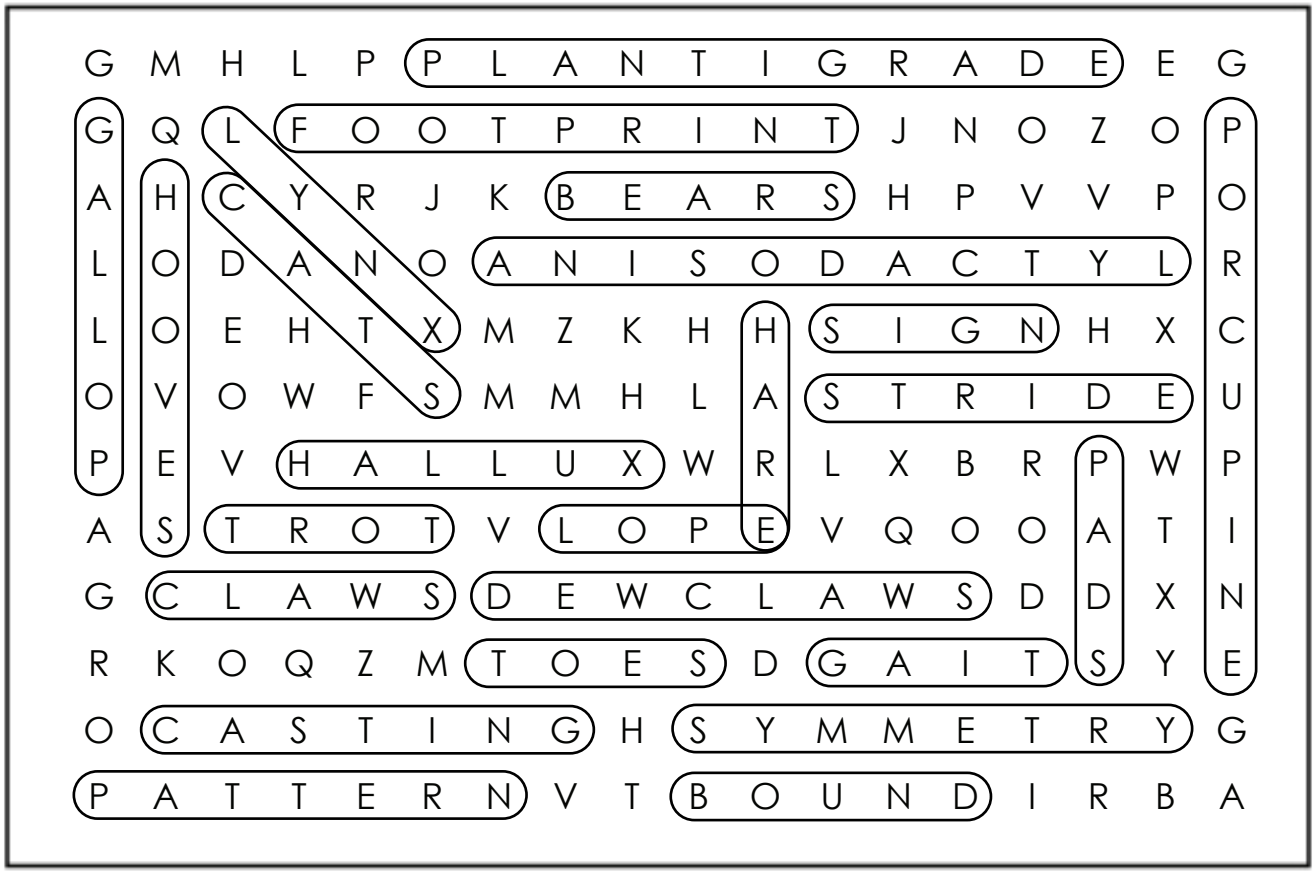
Answer keys


1 F
o
2 D
3 T r o t
o
t
4 G a l l o p
s
r
5 W
6 S t r i d e
7 H
8 H
i
n
9 B e a r
10 T
11 P o r c u p i n e
12 G a i t
b
l
o
o
n
e
13 L o p e
v
14 L
15 B o u n d
u
16 S y m m e t r y
x
s
n
x


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

5. Track ID Cards

Adapted from Kim Cabrera's Animal Tracks Concentration

Use the following track ID cards on pages 64-72 for identifying tracks in the field or classroom. The front and back of each card are situated so they may easily fold to become one, two-sided card. Cover up the species name on the tracks side of the card to quiz learners on their track identification skills.

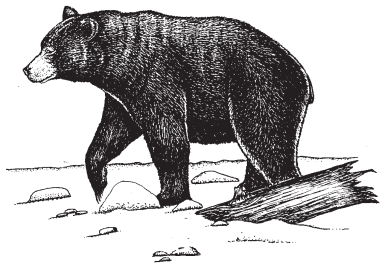
Track ID cards are listed by Track Family:

- Bears
- Dogs & Cats
- Mustelids
- Rodents
- Hares
- Birds

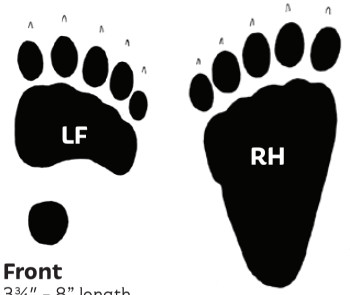
Fold

Fold

Black bear
Ursus americanus



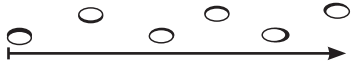
Black bear
Ursus americanus



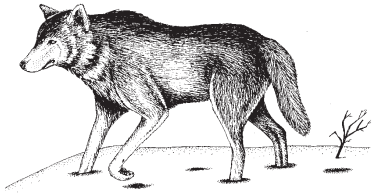
Front
3¾" - 8" length
3¼" - 6" width

Hind
5 3/8" - 8 7/8" length
3½" - 6" width

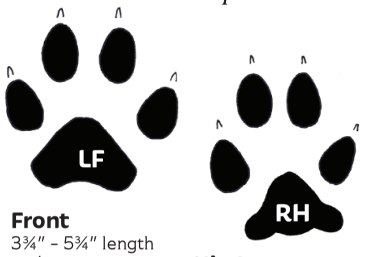
Typical gait : Walk



Wolf
Canis lupus



Wolf
Canis lupus



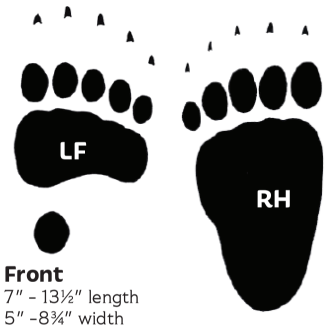
Front
3¾" - 5¾" length
27/8"- 5" width

Hind
3¾" - 5¼" length
2⅝" - 4½" width

Typical gait : Trot

Brown bear
Ursus arctos

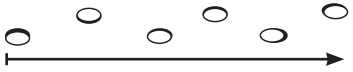
Brown bear
Ursus arctos



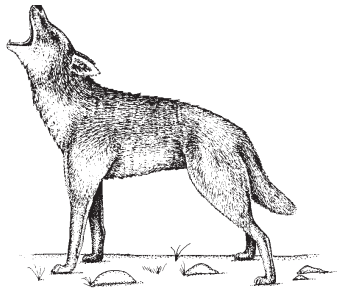
Front
7" - 13½" length
5" -8¾" width

Hind
8¼" - 14" length
4⅝" - 8½" width

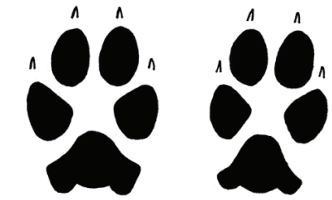
Typical gait : Walk



Coyote
Canis latrans



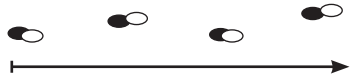
Coyote
Canis *latrans*



Front
2¼" - 3¼" length
1½" - 2½" width

Hind
2⅛" - 3" length
1⅛" - 2" width

Typical gait : Trot

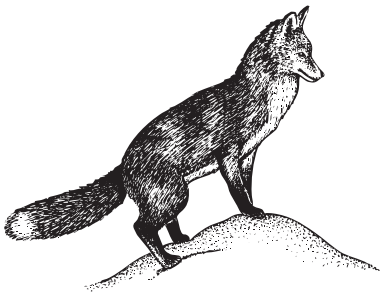


Fold

Fold

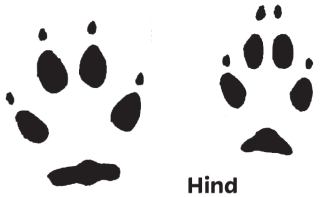
Red fox

Vulpes vulpes



Red fox

Vulpes vulpes



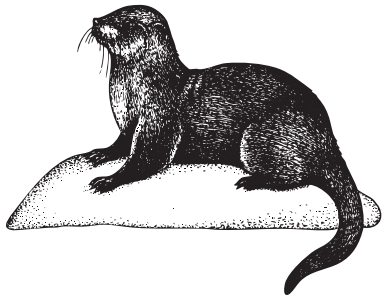
Front
1⅛″ - 2⅞″ length
1⅜″ - 2⅛″ width

Hind
1⅝″ - 2½″ length
1¼″ - 1⅞″ width

Typical gait : Walk

River otter

Lutra canadensis



River otter

Lutra canadensis

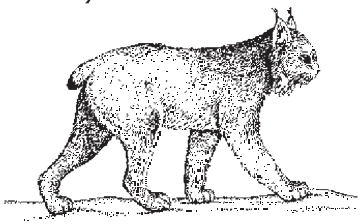
Front
2⅛″ - 3¼″ length
1⅞″ - 3″ width

Hind
2⅛″ - 4″ length
2⅛″ - 3¾″ width

Typical gait : Lope

Lynx

Lynx canadensis



Lynx

Lynx canadensis

Front
2⅜″ - 4¼″ length
2⅜″ - 5⅝″ width

Hind
2½″ - 4⅛″ length
2⅛″ - 5″ width

Typical gait : Walk

Wolverine

Gulo gulo

Wolverine

Gulo gulo

Front
3⅝″ - 6¼″ length
3½″ - 5¼″ width

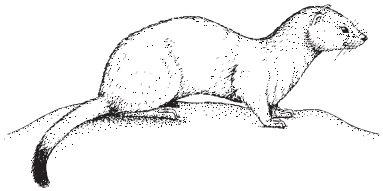
Hind
3⅝″ - 6″ length
3¼″ - 5¼″ width

Typical gait : Lope

Fold

Fold

Ermine
Mustela erminea



Ermine
Mustela erminea

Front
¾″ – 1⅛″ length
⅜″ – ⅞″ width

Hind
⅝″ – 1″ length
⅜″ – ⅞″ width

Typical gait : Lope

Mink
Neovison vison

Wolf
Canis lupus

Front
1⅛″ – 1⅞″ length
⅞″ – 1¾″ width

Hind
¾″ – 1¾″ length
⅞″ – 1⅝″ width

Typical gait : Lope

Marten
Martes americana

Marten
Martes americana

Front
1⅝” – 2¾” length
1⅜” – 2⅝” width

Hind
1½” – 2¾” length
1⅛” – 2¼” width

Typical gait : Lope

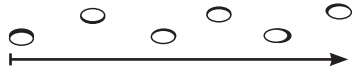
Hoary marmot
Marmota caligata

Hoary marmot
Marmota caligata

Front
1⅞″ – 2¾″ length
1″ – 2⅛″ width

Hind
1⅝″ – 3⅛″ length
1⅜″– 2″ width

Typical gait : Walk

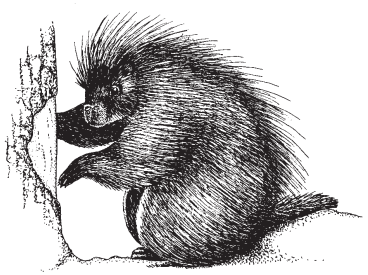


Fold

Fold

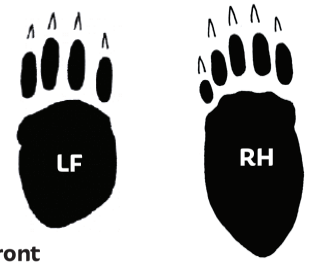
Porcupine

Erethizon dorsatum



Porcupine

Erethizon dorsatum



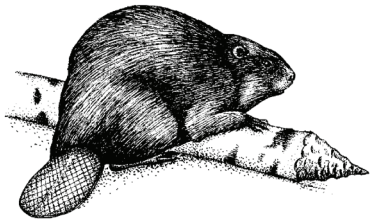
Front
2¼″ - 3⅜″ length
1¼″ - 1⅞″ width

Hind
2¾″ - 4″ length
1¼″ - 2″ width

Typical gait : Walk

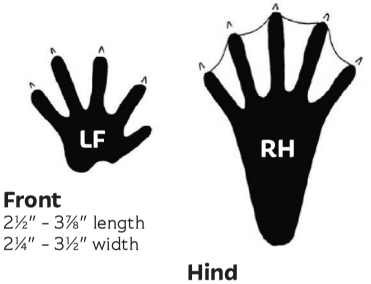
Beaver

Castor canadensis



Beaver

Castor canadensis



Front
2½″ - 3⅞″ length
2¼″ - 3½″ width

Hind
4¾” - 7″ length
3¼” - 5¼″ width

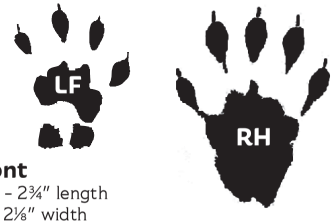
Typical gait : Walk

Woodchuck

Marmota monax

Woodchuck

Marmota monax



Front
1⅞″ - 2¾″ length
1″ - 2⅛″ width

Hind
1⅜″ - 3⅛″ length
1⅜″- 2″ width

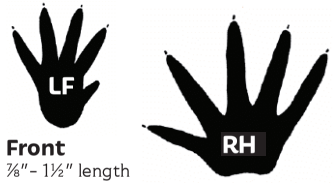
Typical gait : Walk

Muskrat

Ondatra zibethicus

Muskrat

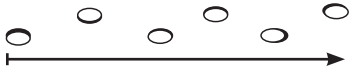
Ondatra zibethicus



Front
⅞″- 1½″ length
1″ - 1½″ width

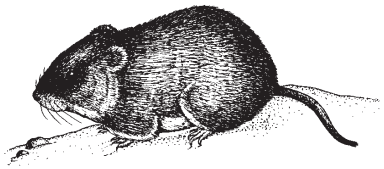
Hind
1½″ - 2¾″length
1½″- 2½″ width

Typical gait : Walk

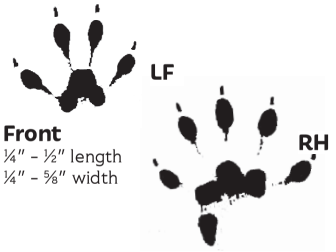


Fold

Meadow vole
Microtus pennsylvanicus



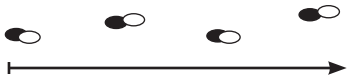
Meadow vole
Microtus pennsylvanicus



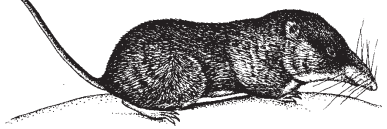
Front
¼″ – ½″ length
¼″ – ⅝″ width

Hind
⅜″ – ⅝″ length
⅜″ – ⅝″ width

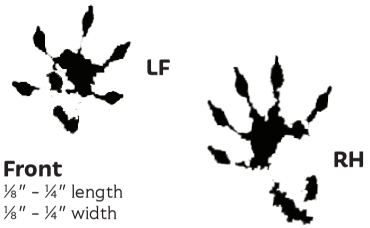
Typical gait : Trot



Masked shrew
Sorex cinereus



Masked shrew
Sorex cinereus



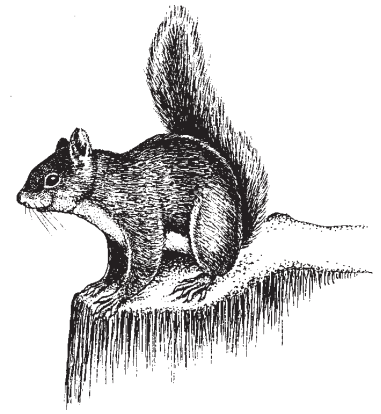
Front
⅛″ – ¼″ length
⅛″ – ¼″ width

Hind
⅛″ – ⅜″ length
⅛″ – ¼″ width

Typical gait : Walk

Fold

Red squirrel
Tamiasciurus hudsonicus



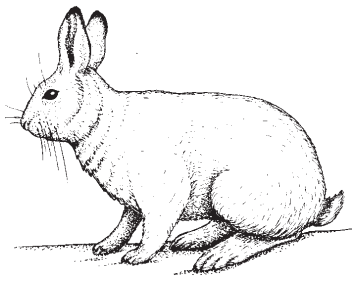
Red squirrel
Tamiasciurus hudsonicus

Front
1″ – 1¼″ length
½″ – 1″ width

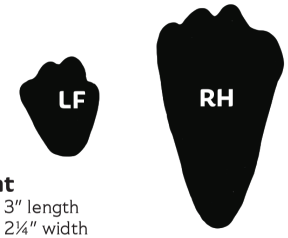
Hind
⅞″ – 2¼″ length
⅝″ – 1⅛″ width

Typical gait : Bound

Snowshoe hare
Lepus americanus



Snowshoe hare
Lepus americanus



Front
1⅞″ – 3″ length
1⅛″ – 2¼″ width

Hind
3¼″ – 6″ length
1⅝″ – 5″ width

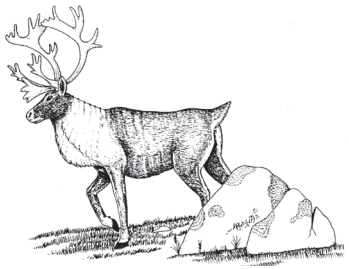
Typical gait : Bound

Fold

Fold

Caribou

Rangifer tarandus granti



Caribou

Rangifer tarandus granti

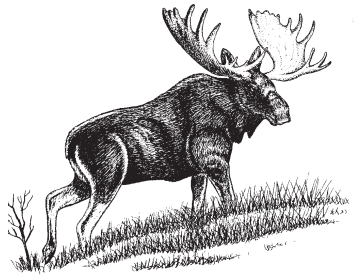
Front
3¼" - 5" length
4" - 6" width

Hind
3" - 4½" length
3⅝" - 4¾" width

Typical gait : Walk

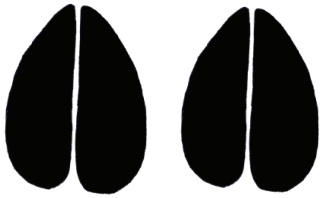
Moose

Alces alces



Moose

Alces alces



Front
4⅜" - 7" length
3¾" - 6" width

Hind
4⅛" - 6½" length
3½" - 4⅝" width

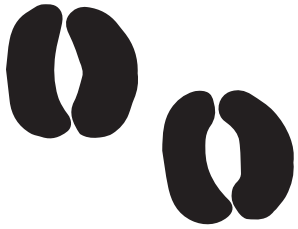
Typical gait : Walk

Muskox

Ovibus moschatus

Muskox

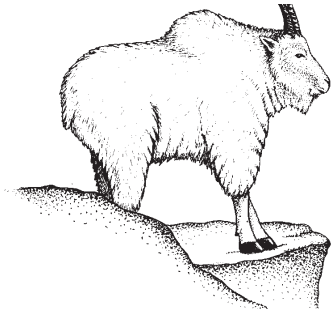
Ovibus moschatus



Typical gait : Walk

Mountain goat

Oreamnos americanus



Mountain goat

Oreamnos americanus

Front
2½" - 3½" length
2½" - 3½" width

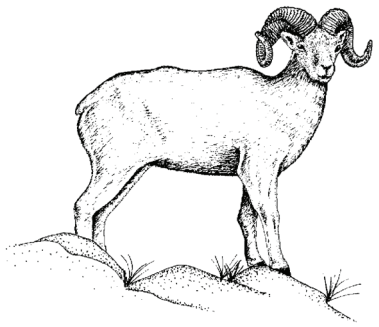
Hind
2½" - 3¼" length
2¼" - 3" width

Typical gait : Walk

Fold

Dall sheep

Ovis dalli



Dall sheep

Ovis dalli

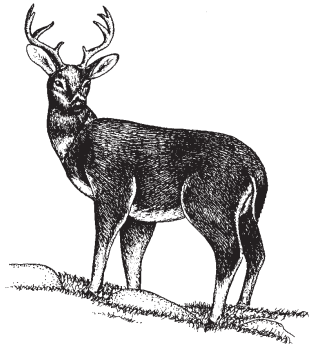
Front
2¼″ - 3½″ length
2″ - 2½″ width

Hind
2¼″ - 3¼″ length
2″ - 2½″ width

Typical gait : Walk

Sitka black-tailed deer

Odocoileus hemionus sitkensis



Sitka black-tailed deer

Odocoileus hemionus sitkensis

Front
2″ - 3⅛″ length
1½″ - 2⅜″ width

Hind
1¾″ - 2⅞″ length
1⅜″ - 2⅜″ width

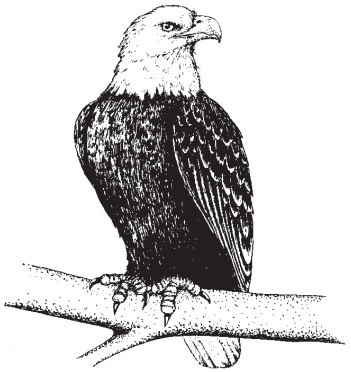
Typical gait : Walk

Fold

Fold

Bald eagle

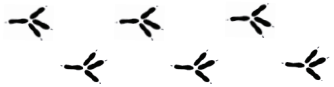
Haliaeetus leucocephalus



Bald eagle

Haliaeetus leucocephalus

6″ - 8¼″ length
3¼″ - 5¾″ width



Great horned owl

Bubo virginianus

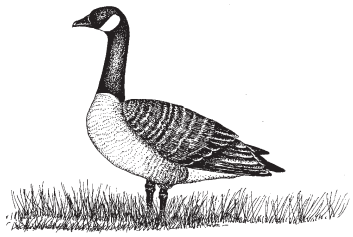
Great horned owl

Bubo virginianus

3¼″- 4⅝″ length
2⅜″ - 3″ width

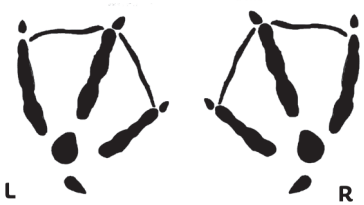
Canada goose

Branta canadensis



Canada goose

Branta canadensis



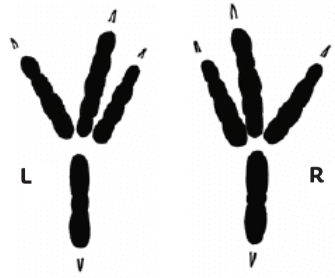
3⅜″ - 4¾″ length
3¾″ - 5″ width

Common raven

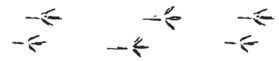
Corvus corax

Common raven

Corvus corax



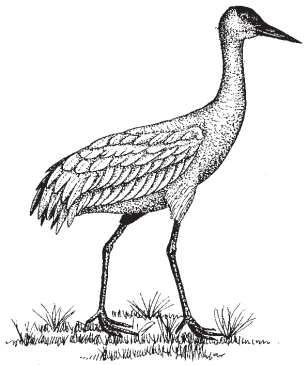
3¾″ - 5″ length
1⅝″ - 2½″ width



Fold

Fold

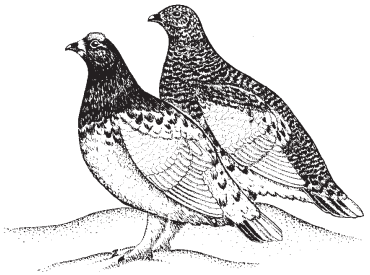
Sandhill crane
Grus canadensis



Sandhill crane
Grus canadensis

3¾″ - 4¾″ length
4¼″ - 5¾″ width

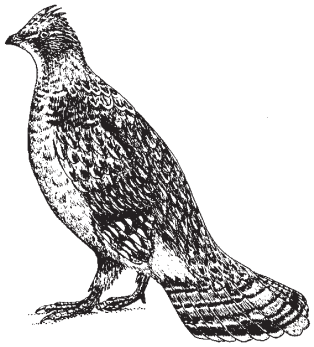
Willow ptarmigan
Lagopus lagopus



Willow ptarmigan
Lagopus lagopus

1⅜″ - 1¾″ length
1½″ - 1¾″width

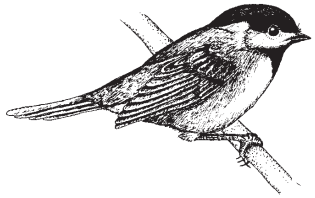
Ruffed grouse
Bonasa umbellus

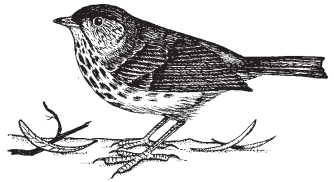


Ruffed grouse
Bonasa umbellus

1½″ - 2¼″ length
1¾″ - 2⅜″ width

Songbirds





Songbirds

ranging from ½″ - 5″

6. Useful Terms

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

Anisodactyl: the most common arrangement of toes for bird feet, with three toes facing forward and one toe facing backwards. The back facing toe varies greatly in length between species. Songbirds, eagles, and ravens have anisodactyl feet.

Birds: warm-blooded, feathered vertebrates that have a beaked jaw, lightweight skeleton and the ability to lay hard shelled eggs.

Bears: omnivorous mammals with five toes on their front and hind feet and strong non-retractable claws that usually show up in tracks. The smallest toes on their feet are on the inside of the track, opposite of humans. The three bear species found in Alaska are brown bears, black bears, and polar bears.

Bound: an animal bounds or hops if it pushes off with both hind feet at the same time. A bound is when the hind feet land exactly in the front tracks or past the front feet. Sometimes the term hopping or jumping is used as a substitute for bounding.

Bounder: an animal that uses a bound for its main gait such as hares and squirrels.

Carnivore: a meat eater. The teeth are large and sharp, suitable for cutting flesh, and the jaws are powerful.

Cast: a replica of an animal track made by using the track as a mold and pouring plaster or latex into the impression left by the animal.

Cats: round tracks with four teardrop-shaped toes on the front and hind feet. Cat claws retract, so often they do not show up as part of the visible track. Cats usually walk as their normal gait but gallop when chasing prey or escaping danger.

Deer: family within the order Artiodactyl, which includes deer and elk. Male members of the deer family typically grow antlers that are shed annually.

Dogs: carnivorous mammals with four oval-shaped toes on their front and hind feet, and non-retracted claws. Most dog tracks show an obvious "X" shape in the space between the toes and palm pad. Fox, coyotes, and wolves are part of this group.

Claws: hard, sharp, and curved structures at the end of many birds' and mammals' toes that assist in digging, defense, prey capture, gripping, and grooming. Most animals' claws show in tracks, but those with retractable claws, such as cats, do not.

Dew claw: vestigial toes on hooved mammals that only show up in tracks made in mud or snow.

Digitigrade: walking on the toes. This increases the length of legs, which helps increase speed. Dogs and cats use this method of walking.

Footprint: the outline and physical impression of the animal's foot onto the ground, consisting of toes, pads, and claws. Size, shape and symmetry of the footprint help distinguish different species. See Track.

Gait: the way an animal moves. Examples of gaits are walk, trot, hop, bound, lope, and gallop.

Gallop: the fastest gait where the two hind feet land ahead of where the two front feet landed but not at the same time.

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.

Hares: mammals with long ears, powerful hind legs, and the ability to run swiftly. Hares are herbivores and prey for predators like lynx, foxes, coyotes, and birds of prey. Hares bound when moving quickly, and their hind feet land in front of the tracks left by the front feet. Hares have five toes on their front feet and four on their hind feet. Their hind feet are much larger than the front!

Heel: the rear part of the footprint left by a plantigrade animal.

Herbivore: any living thing that eats producers (plants and algae).

Hooves: hard, thickened, and pointed structures that cover the toes of moose, caribou, muskox, Dall's sheep, mountain goats, deer, and bison. Hooves are protective, provide traction, and have evolved to aid in movement across various terrains. Hooves are made of keratin, the same protein found in human hair and nails.

Hop: a quick gait consisting of a push off of the hind limbs of an animal to suspend itself in the air before landing.

Lope: a fast gait where all feet are landing independently of each other. All animals can use this gait.

Mammal: belonging to the class Mammalia; distinguished by self-regulating body temperature, hair, and in females, milk production for feeding young.

Pads: the fleshy portion at the base of the track below the toes.

Palm: the center portion of the track, located between the toes and the heel of the footprint. Some animals have smooth palms, such as dogs and cats, while bears may have ridges within their palms.

Pattern: the arrangement of multiple tracks left by an animal in a sequence as the animal moves. Track patterns indicate a type of animal and what gait it was using.

Plantigrade: walking with the heel on the ground. Heavy back ended animals such as humans, bears, and beavers walk this way.

Rodents: a diverse group of mammals with sharp teeth (incisors) that grow continuously throughout their life. This group includes mice, rats, squirrels, beavers, and porcupines.

Sign: any indication or evidence of an animal's presence in an area such as tracks, trails, scat, nests, burrows, scratches or gnaw marks, remnants of food, sounds, or hair.

Stride: the distance between successive placements of the same foot. For example, the heel of the left foot to the heel of the left foot again.

Symmetry: the balance and arrangement of parts of a track, or how a track is placed in relation to other tracks in a pattern. Track symmetry aids in species identification, gait, and behavior.

Toes: the digits at the end of the foot of many vertebrate animals. The number of toes provides a clue as to which animal left the track.

Track: the mark or impression left on the ground by an animal's foot. Tracks can provide information about the presence, identity, behavior, and movement patterns of an animal.

Trot: a gait faster than a walk where opposite side front and hind legs move together. Canines and voles usually trot.

Ungulate: any of a large group of mammals all of which have hooves: divided into odd-toed ungulates and even-toed ungulates. In this book, all ungulates referenced are even-toed.

Unguligrade: a way of walking that is characterized by walking on toenails (aka hooves) and is associated with speed. Animals like moose and caribou are unguligrade.

Walk: a gait with an easy pace where each foot moves independently. Walking is something most animals can do.

Weasels: mammals with five toes on their front and hind feet in an asymmetrical pattern. Palm pads of weasels look lumpy because it is made up of small connected pads. Their normal gait is a 3x4 lope on hard ground and a 2x lope in the snow, and they also walk.

Weight load: the amount of pressure exerted by an animal's body on a surface, such as snow. The pressure is influenced by the animal's weight, distribution of its weight across its body, and the size and shape of its feet.

Zygodactyl: in birds, two toes face forward and two toes face backward, which provides a strong grip and helps with perching and climbing. Owls and woodpeckers have zygodactyl feet.

7. Teacher Resources

Websites:

ADF&G	wildlife.alaska.gov
Bear Tracker	bear-tracker.com
Crow's Path	crowspath.org
Discovery Southeast	discoverysoutheast.org
Crossword Labs	crosswordlabs.com
Super Teacher Worksheets	superteacherworksheets.com

Lessons Adapted From:

Bird Signs. (2018). Alaska's Forests & Wildlife: Alaska Wildlife Curriculum Teacher's Guide (pp.130-132). Alaska Department of Fish and Game, Division of Wildlife Conservation.

Mammal Signs. (2018). Alaska's Forests & Wildlife: Alaska Wildlife Curriculum Teacher's Guide (pp.126-129). Alaska Department of Fish and Game, Division of Wildlife Conservation.

Track Casting. (2018). Alaska's Forests & Wildlife: Alaska Wildlife Curriculum Teacher's Guide (pp.150-151). Alaska Department of Fish and Game, Division of Wildlife Conservation.

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Alaska Animals and Their Tracks. (2023). Wordsearch Generator. Super Teacher Worksheets. https://www.superteacherworksheets.com/generator-word-search.html.

Alaska Animals and Their Tracks. (2023). Crossword Labs. https://crosswordlabs.com/view/alaska-wildlife.

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Alaska Wildlife Curriculum, Alaska Department of Fish & Game

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References:

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Sheldon, I., and T. Hartson. (1999). Animal Tracks of Alaska. Lone Pine Publishing, Washington.

8. A few last requests...

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Community involvement

Lessons about tracks of Alaska animals lend themselves well to community involvement. Invite community members, such as elders, trappers, hunters and biologists, who are knowledgeable about wildlife and tracking to visit with your students.

Our thanks!

We hope you enjoy teaching from *Tracks of Alaska Animals*. We thank you for your respectful use of this educational resource.