

## **Take a Walk in Our Tracks Whose Footprints Are These?**

### **Teacher Notes**

**Grade:** 6 to 10

**Subject:** Math

**Group Size:** Whole class or small groups

**Duration:** 50-minute period

**Skills:** Observation, measuring, calculating, drawing conclusions

**Vocabulary:** Gait, track, stride, trot, intergroup distance, plantar pad, symmetrical, asymmetrical, weight load on track

### **OBJECTIVES:**

Upon completion of this lesson, students should be able to:

- \$ Distinguish between the **tracks** of several species of animals
- \$ Discuss and/or write about their discoveries
- \$ Make accurate measurements
- \$ Calculate **weight load on track**

### **READING ASSIGNMENT:**

- \$ 3. The Wolf and the Web of Life

### **MATERIALS:**

- \$ **Wolves and Other Canids chart**
- \$ **Take a Walk in Our Tracks sheet**
- \$ **Determining Weight Load on Track of Wild and Domestic Canids sheet**
- \$ **Calculation Sheet**
- \$ **Discussion Sheet**
- \$ **Comparing Canid tracks sheet**
- \$ Butcher or other plain paper for tracing
- \$ Pawprint casts (in Wolf Trunk section) and corresponding information from the Hands-On Activities booklet (in Wolf Trunk section).

### **BACKGROUND:**

Wolves are travelers. So are people. Wolves seek new territories to occupy. So do people. Wolves, in the course of their “business” day (time spent hunting) cover a lot of ground. People also travel widely in the course of commuting to and from their jobs or going on business trips. There is, however, one big difference. The wolf’s mode of transportation is by foot. As a Russian proverb puts it, “the wolf lives by its feet.” People depend mainly on mechanized transportation.

This activity will teach students some basic measurement and calculating skills. But it will go beyond that by requiring students to think about how modern technology has reduced humans’

dependence on physical strength and endurance to get from one place to another. Students should be familiar with wolf biology and ecology (Background reading, “A Brief History of the Wolf in the States,” “Vital Statistics,” “ The Wolf and the Web of Life”) before doing this lesson.

**PROCEDURES:**

- \$ Hand out the activity sheets and work as a class or in groups to calculate, then compare, contrast and discuss the weight load on track for wild canids (wolves and coyotes), domestic canids and students.
- \$ Set out the pawprint casts included in the trunk for students to examine and compare.

**EXTENSION ACTIVITIES:**

- \$ Have students determine the weight load on track for their own dogs. Divide the class into teams with at least one dog owner per team. Instruct them to measure the dog's feet and weigh the dog if possible (if the dog is large, an estimate of weight will probably have to suffice). Once they have made their calculations, have the groups compare their results. They can make posters featuring their data, a photograph of the dog studied and basic information about it (name, age, breed).
- \$ For a writing exercise, have students research and write about the origin of their dog's breed.

## Take a Walk in our Tracks

Wolves are travelers. As an old Russian proverb says, “the wolf lives by its feet.” It is not unusual for wolves to travel 20 miles in a 24-hour period. Most adult wolves spend an average of eight to ten hours on the move every day. Dispersers seeking new territory will often travel hundreds of miles from their place of birth. This takes tremendous stamina. One observer watched two wolves cover 22 miles through five feet of snow in British Columbia. The wolves paused to rest, but they never lay down. Wolves on Isle Royale in Michigan travel an average of 30 miles a day. The naturalist Adolph Murie observed an Alaskan pack making daily rounds of 40 miles while the female was denning.

Wolves cover these enormous distances at a **gait** called a **trot**. At a **trot**, the animal’s front and rear legs on opposite sides move forward and back at the same time. In other words, the left front leg and the right rear leg will move forward together while the right front and the right rear move back.

The wolf’s **stride**, the distance from one footprint to the next footprint made by the same foot, at a trot is generally longer than that of a dog or a coyote. Some researchers have found it simpler to use a measurement called **intergroup distance** rather than **stride**. **Intergroup distance** is the distance from one footprint to the next. Several measurements are usually taken and an average determined. Some **intergroup distances** for various animals are: wolf- 26 inches; coyote- 16 inches; cougar- 20 inches; lynx- 14 inches; wolverine- 3 to 12 inches.

**What is your intergroup distance?** Try this outside! Get a long sheet of butcher- block paper. Have a student volunteer walk across the paper at a normal **stride** as someone else traces his or her footprints. If you are really ambitious, you could use a washable paint color to actually make the footprints! See if you can determine the **intergroup distance** for a person walking.

### **Determining Weight Load on Track of Wild and Domestic Canids**

Weight load on track refers to the amount of pressure an animal places on EACH foot as it steps on the ground. Larger feet spread the animal's weight out over a larger area much the way a snowshoe distributes a person's weight, allowing for ease in walking on top of the snow without sinking.

- 1.** Have a copy of the chart "Wolves and Other Canids" handy for reference. It will give you the WEIGHTS of the gray wolf, red wolf, coyote and fox. THE CHART GIVES YOU AVERAGE WEIGHT, SO PICK A NUMBER IN THE AVERAGE RANGE TO MAKE YOUR CALCULATIONS! Write the name of the animal and the weight on the Calculation Sheet.
- 2.** Using the plaster casts or the pictures provided, measure the LENGTH (from the back of the **plantar pad** to the front of the toes) and the WIDTH (the widest point from the outside edge of the right toe to the outside edge of the left toe) of a track. Write these measurements on the calculation sheet.
- 3.** To calculate its area, MULTIPLY THE LENGTH BY THE WIDTH. Since canids have four feet, you must then MULTIPLY THIS NUMBER BY FOUR to get the total area of foot surface that touches the ground when the animal is walking.
- 4.** In order to calculate the weight load for the track, you need to DIVIDE THE ANIMAL'S WEIGHT BY THE TOTAL SURFACE AREA OF FEET TOUCHING THE GROUND. Using the foot and body weight measurement provided, calculate the weight load on track for gray wolves, coyotes and foxes. Calculate an average weight load on track for each species.
- 5.** Draw your own footprint on a piece of construction paper. Compare your footprint in area to the track of a wolf. How many wolf tracks will fit into your footprint? Compare the length and the width and the size of the toes.
- 6.** Fill out the "Discussion Sheet" that follows the "Calculation Sheet."

## Calculation Sheet

ANIMAL \_\_\_\_\_

LENGTH OF FOOT \_\_\_\_\_

WIDTH OF FOOT \_\_\_\_\_

LENGTH x WIDTH = \_\_\_\_\_

(Area of one canid foot)

AREA OF ONE FOOT x 4 = \_\_\_\_\_

(Total foot surface area)

ANIMAL'S WEIGHT \_\_\_\_\_ DIVIDED BY \_\_\_\_\_ (Total foot surface area)

THE WEIGHT LOAD ON TRACK IS \_\_\_\_\_

\_\_\_\_\_

Now, try the same calculations for other animals, including yourself (remember, you don't have four feet!) You can look up the weights and foot sizes of other animals, like lynx, wolverine, deer and mouse. If you have a family dog or cat, ask your parents to help you weigh it and trace one of its paws. If you have a big dog, you could estimate its weight or call your veterinarian, who might have its weight on file.

Animal	Weight	Foot Length	Foot Width	Area of One Foot	Total Foot Surface Area	Weight Load on Track

How does weight load on track differ for each of the animals above?

## **COMPARING CANID TRACKS**

Wolf tracks are similar in shape to coyote and dog tracks, but they are much larger than coyote tracks and larger than most dog tracks. The wolf's front feet are larger than the hind feet. The toes spread out more on the front feet. This is so the wolf can cling to slippery boulders in rough terrain. When a wolf is trotting, the hind foot will often land in the print made by the front foot on the same side.

Wolves have narrow chests. This enables them to "plow" through deep snow. Dogs' chests, on the other hand, are much wider, especially the large breeds whose feet may be as large as a wolf's. Dogs do not, therefore, place their hind foot inside the front footprint but beside the front footprint.

Wolves and other wild canids tend to walk in a straight line, what we could call a "beeline." Dogs, on the other hand, meander; their trails zig-zag.

Mountain lion and wolf tracks are often confused with one another. Mountain lion tracks are generally rounder, and the shape of the plantar pad (the main foot pad) has a different shape and is wider. Mountain lions have retractable claws and usually travel with their claws retracted so their claws do not show tracks. Mountain lions sometimes use their claws for traction on slippery terrain, however, and sometimes claw marks will show when they are running. Mountain lion feet and toes are often less symmetrical than those of the wolf; their feet are more symmetrical.

## Wolves and Other Canids

The gray wolf (*Canis lupus*) is the largest member of the Canidae (dog) family in North America. The table below compares the size and appearance of the gray wolf to the other canid species in the United States.

	<b>GRAY WOLF</b> ( <i>Canis lupus</i> )	<b>RED WOLF</b> ( <i>Canis rufus</i> )	<b>COYOTE</b> ( <i>Canis latrans</i> )	<b>FOX</b> ( <i>Vulpes</i> or <i>Urocyon</i> )
<b>SIZE</b>	5 to 6 feet long from nose to tail	3 to 4 feet long from nose to tail	3 to 4 feet long from nose to tail	3 to 3.5 feet long from nose to tail
<b>WEIGHT</b>	80 to 120 pounds	40-80 pounds	30-40 pounds	12 pounds
<b>COLOR</b>	gray, tan, brown, black or white	reddish brown, black or gray	reddish brown, tan or gray	red-brown (red fox), grizzled- gray (gray fox)
<b>EYE COLOR</b>	yellow, green or brownish	yellow, green or brownish	yellow to green	yellow to brown

## Discussion Sheet

Answer the following questions:

1. How does the shape of the canid foot differ from the shape of the human foot? Answer in complete sentences.

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2. Why are the front feet of canids larger than the hind feet?

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3. Write a short paragraph explaining which species, canid or human, is best adapted to walk in the snow. Begin with a topic sentence, explain and conclude. Write a title for your paragraph.

Title:

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