WOLF DISCOVERY TRUNK

A Conservation Curriculum

RADIO COLLARS

Radio collars allow biologists to “observe” wild animals without actually having to get close enough to see them, thus eliminating or reducing the risk of the animal changing its behavior when approached by a biologist.

Key parts of a **Telemetry System** are: a **Transmitter**, a **Receiver**, and an **Antenna**.

TRANSMITTER

The transmitter is a device that emits a radio signal that cannot be heard. This can be compared to a radio station (the transmitter) that plays music that cannot be heard without a radio. The transmitter is made up of four components: a transmitter computer chip, a battery which provides power to the transmitter, an antenna that broadcasts the signal, and a crystal which defines the wavelength of the signal (a series of continual high-pitched beeps) emitted by the transmitter.

The wavelength is unique to each transmitter and allows the researcher to identify individual animals, much like you would tune your radio to 98.9 WOKO to listen to music.

Usually, the transmitter, battery and crystal are enclosed in a weatherproof casing and attached to a collar to be fastened around an animal’s neck. This device is called a RADIO COLLAR. It will transmit a signal for as long as the battery is viable. Collars with a large battery will last longer than collars with a small battery.

The strength of the transmitted signal can also be varied. A weaker signal will save battery life, but it will not be transmitted as far. Depending on the battery size and strength, a researcher can pick up a signal up to 1 to 2 miles way on the ground and more than 20 miles when in the air. Mountainous terrain and thick vegetation will cut down on the distance from which a signal can be heard.

RECEIVER

A scientist uses a receiver, or radio, and a direction-finding antenna to locate the collar once it has been place on an animal. When a directional antenna is pointed directly at a collar, the signal received is stronger. By finding the strongest signal, the biologist can then take a compass bearing in the direction from which the signal is coming and plot it on a map. If a biologist takes a number of bearings from several different spots, the bearings should cross each other when plotted on a map. The location where two or more bearings cross provides an ESTIMATE of an animal’s location, assuming the animal has not moved and that the biologist has not erred.

LOCATING COLLARED ANIMALS

Three Methods for Locating Collared Animals:

1. **TRIANGULATION** – Locating a radio-collared animal by plotting two or more compass bearings taken from the ground.

2. **HOMING** – Walking toward the strongest signal received from the collar in hopes of locating the animal before it moves away.

3. **AIRCRAFT** – Another technique used to locate wide-ranging animals, like wolves, is to attach a directional antenna to each wing of an airplane. By switching the antennas on and off, back and forth between the lift and right side of the aircraft, the researcher can tell which side of the plane the animal is located. By flying ever-shrinking circles around the collared animal, the researcher can eventually pinpoint the animal's location to within 200 meters. Sometimes the animal is even spotted from the air, allowing for very precise locations.

OTHER INFORMATION

Some radio collars also transmit other information about the collared animal including:

- Body temperature
- Heart rate
- Activity
- If the animal is alive or dead

MORTALITY SWITCHES are installed in radio collars when biologists are concerned about determining the time of death of collared animals. The pulse rate is set to change when the collar has not moved for a set period of time.

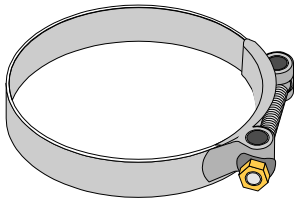
For wolves, a biologist might have the transmitter's pulse rate (number of beats per minute) double when there is no movement for ten hours. A bear biologist might have the pulse rate cut in half so that the battery is conserved when the bear goes into hibernation.

Frequent monitoring will allow the biologists to estimate the time at which a wolf died or a bear went into hibernation.

THE RADIO COLLAR

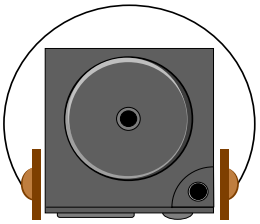
1. Wolf Wearing Radio Collar and Transmitter

2. Transmitter Emits Signal

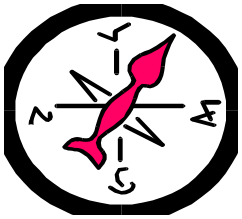


3. Direction-Finding Antenna Carried by Biologist or Direction-Finding Antenna on Aircraft Wing Tips

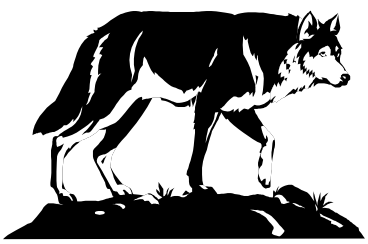
4. Receiver Picks Up Signal



5. Compass Bearing Strongest Signal or Triangulation and Map

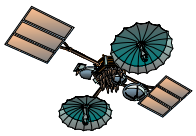


6. Wolf is Located!



GLOBAL POSITIONING SYSTEMS (GPS)

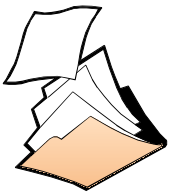
1. Satellite



2. GPS collar uses satellite signals to triangulate its own location.

3. Transmits information to researcher-either to a receiver or to a computer.

4. Data is provided on wolf's location and travel.

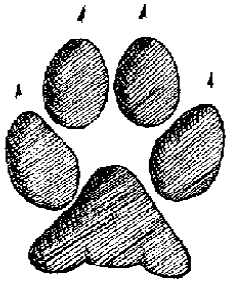


Global Positioning Systems (GPS) is an emerging technology that may revolutionize wildlife research. A GPS collar uses satellite signals to triangulate its own location and then transmit the coordinates to the researcher. These collars can provide information to computers even when there is not a biologist actually listening in on the signal. Almost continuous data on the animal's location is provided.

THE PAW CASTS-WOLF, COYOTE, FOX

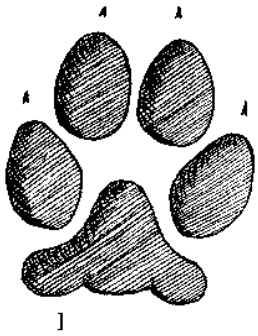
For help in answering these questions, please refer to *Take a Walk in Our Tracks Whose Footprints are These?* in the **Math** section.

1. How does the shape of the wolf's foot differ from the shape of a human's foot?

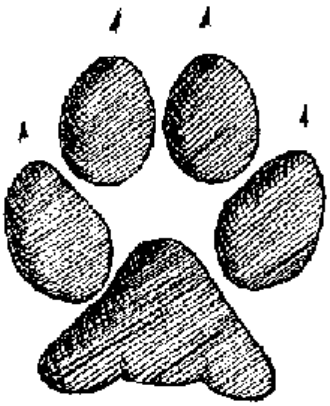


The human foot is long and narrow. The *canid* foot is round. Foxes, coyotes, and wolves walk on their toes. The heel is elevated. Humans walk on the soles of their feet. The heels and toes both have contact with the found. The *canid* foot, while tough and resistant to injury, will spread out so that the animal does not sink into deep snow. The toes are flexible allowing them to "get a grip" on slippery rocks and boulders.

2. Why are the wolf's front feet larger than the back feet?



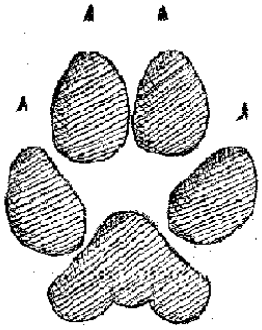
Hind Feet



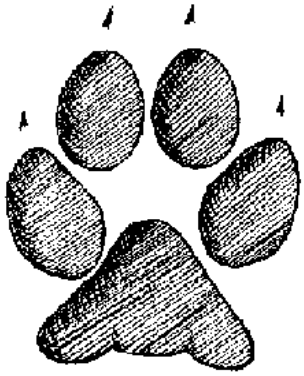
Front Feet

The front feet are the "load-bearing" feet. The wolf often travels 20 miles or more each day in search of food. When covering long distances, the wolf travels at a fluid, ground-eating trot. This is an energy-efficient gait with the diagonal legs moving forward and backward at the same time. The front paws bear the concussion (feet hitting the ground), and they carry most of the wolf's weight, which is on its shoulder, neck, and head. The large toes spread to keep the wolf from sinking in mud and snow, and the long toes grip boulders and slippery surfaces.

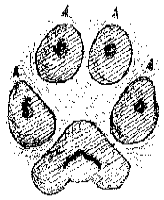
3. Look at the casts of the coyote, the wolf and the fox tracks. What advantage does having big feet provide for the wolf?



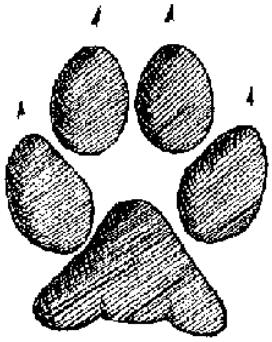
Coyote



Wolf



Red Fox



Wolf

Bear

Human

4. Look at the pictures of the wolf's foot and compare it to the human foot and the bear's foot. Where is the wolf's heel in relation to the rest of the foot? What advantages does this adaptation give the wolf?

5. Why don't the wolf's feet freeze in winter?

Think of it this way: What would happen if the wolf's feet were warmer than the freezing ground? What, therefore, must be the temperature of the wolf's feet?

6. **The wolf's paws are attached to long, slender legs. The "elbows" turn inward. The elbows of most dogs turn out. What advantage does this adaptation provide for the wolf?**

Long legs help the long-distance traveler in deep snow. So does a narrow chest. Think about a wedge and a rectangle. Which cuts through snow more efficiently? The wolf's narrow chest resembles a wedge. The in-turning elbows make the wolf's gait more efficient. It can trot with minimum stress on the shoulder muscles. The tracks of a wolf are in a straight line because the feet of the wolf are underneath its center of mass.

ADAPTATIONS FOR ANIMAL AMBULATION

VOCABULARY:

1. **DIGITS** – fingers and toes.

2. **PLANTIGRADE** – walking on the soles of the feet. Humans and bears, for example, walk on the soles of the feet.

3. **DIGITIGRADE** – walking on the toes. Members of the dog and cat families walk on their toes. Animals with hard hooves walk on what is, in essence, a hardened toe.

The feet of all animals are adapted for a variety of uses. How many uses of feet can you list? Can you name at least six?

PLANTIGRADE

What are the advantages of walking on the soles of the feet with heels and toes in contact with the ground?

BEAR	HUMAN
	

DIGITIGRADE - CATS AND DOGS

What are the advantages of walking on the toes with the heels elevated off the ground?

The human hand has an opposable thumb. This makes it possible for humans to pick up objects and to manipulate tools. Most animals do not have an opposable thumb. The canid paw has a fifth digit, but not a thumb.

"DRY BONES!" - TALENTED TEETH

The next time you pat a dog, run your hand over the top of the dog's head toward the neck. Chances are, if you have a dog for a friend, you do that regularly. Most dogs like to have their heads gently stroked by their human companions. Let's be scientific at the same time, though. Notice the high ridge on the top of the dog's head – almost between the ears. It's easier to feel in some breeds than in others. You will probably find it more apparent in big dogs with large heads. This ridge is called the sagittal crest.

Does that sound like a mouthful? Well, for the members of the dog family (wolves, coyotes, foxes, and domestic dogs), the sagittal crest IS a mouthful – or at least it helps them bite a mouthful! The jaw muscles of the canids are attached to the sagittal crest. These long jaw muscles mean more pressure when the animal bites – and if you are a wolf who needs to crush large bones to extract the marrow (as opposed to a chihuahua who is fed soft dog food!), you need lots of business in your bite – 1500 pounds per square inch (psi) to be exact! This allows the wolf to crush the dog bones of elk and moose and caribou.

Do wolves need those jaw muscles and teeth for chewing? Actually, they don't. Have you ever watched your dog eat? Most of us are amazed at how quickly "man's best friend" dispatches with a meal, mostly because there is little or no real chewing involved in the fine art of canid table manners. Dogs gulp their food. So do wolves. They rip or shear off large chunks of meat and swallow them whole. Those carnassial teeth in the jaws of wolves and dogs are for shearing off pieces of meat. They function just like scissors do.

Elk and deer (and humans!), on the other hand, use their jaw teeth for chewing. The ungulates grind up grass and plants. We humans finish the job that our knives and forks don't do with our teeth. Wolves have knives, too – in their mouths. They are called carnassial teeth!

What about those long curved front teeth, the ones you probably call fangs. They are BIG teeth! They are called canine teeth, and they make wolves look scary to some people. Look at the pictures of "The Big Bad Wolf" in some of the children's stories. The canine teeth are exaggerated, of course, but there is no getting around the fact that the wolf has serious teeth. Those canine teeth are for puncturing and grabbing and holding on to prey animals. They are all the wolf has for successful hunting besides speed and endurance. No teeth, no dinner. It's as simple as that.

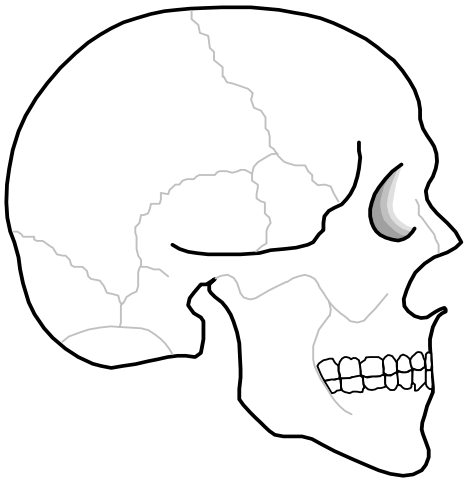
Do humans have canine teeth? Yes, we do. But ours do not function the way the wolf's canines do. Sometimes we use them to rip open a bag of potato chips, but that's about it.

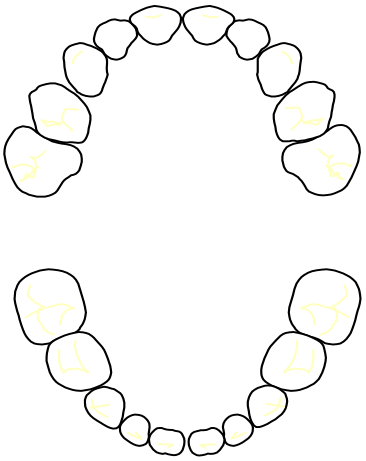
The little sharp teeth in the front are called incisors. Wolves use the incisors for picking meat off bones. What do you use your incisors for? The same thing!

Look carefully at the books included in the trunk. In Discovering Wolves there is a good description of a wolf's teeth on page 12 in the chapter "Designed for Predation." In Zoobooks – Wolves there is a great picture and description on page 3. The Return of the Wolf has pictures on page 36, page 40, and page 112 that will reinforce your knowledge of wolf dentistry!

TEETH!

We brush them, bleach them, straighten them, fill them, pull them, replace them, grind them, and hide them under the pillow for the tooth fairy! Wolves don't buy toothpaste and visit the dentist regularly, but surprisingly enough, their teeth have the same names, and some even have the same functions:



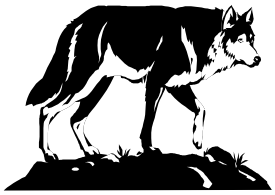


1. INCISORS
The eight front teeth, (4 on top and 4 on the bottom). These teeth are used for nipping and gnawing and picking "the meat off the bone." Wolves do that! So do humans! Ungulates use these teeth for nipping off grass and the leaves of plants.

2. CANINES
The four teeth (2 on top and 2 on the bottom) beside the incisors. These teeth are very different in form and function in humans and wolves. In the dog family, these teeth are often referred to as "fangs." They are long and curved, and wild canids use them for gripping and tearing and ripping. We humans have knives and forks for that! Our canine teeth are blunted and-well, they are just "other teeth!"

3. PRE-MOLARS and MOLARS
Humans use these flat round "back teeth" for grinding and chewing food. So do the grazing animals, the ungulates, whose jaws have no teeth between the incisors in the front and the molars. Wolves, however, have specialized molars called carnassials. These teeth are sharp with high ridges. They work just like scissors to cut meat off the bone and to crush bones.

CANDID CANINES AND DEER DENTURES

	WOLF 	
FRONT VIEW	**INCISORS - CANINES - MOLARS**	**SIDE VIEW**

ELK, DEER, MOOSE, BISON, MUSK OX, CARIBOU, SHEEP

INCISORS	**CHEEK TEETH**

CHALLENGE!
Look at the models and the pictures in your books. Try drawing the teeth!