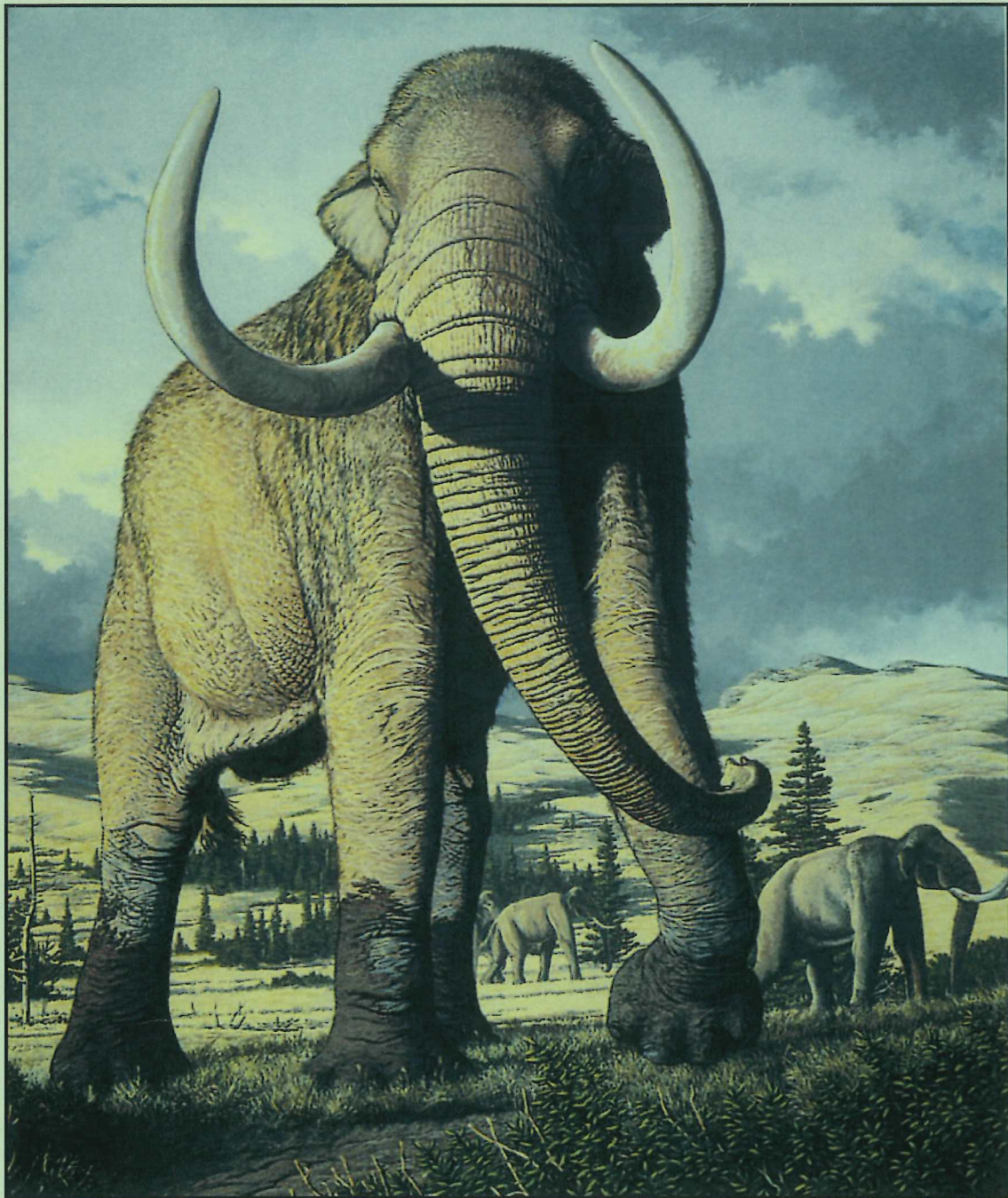


# SOUTH DAKOTA MAMMOTHS

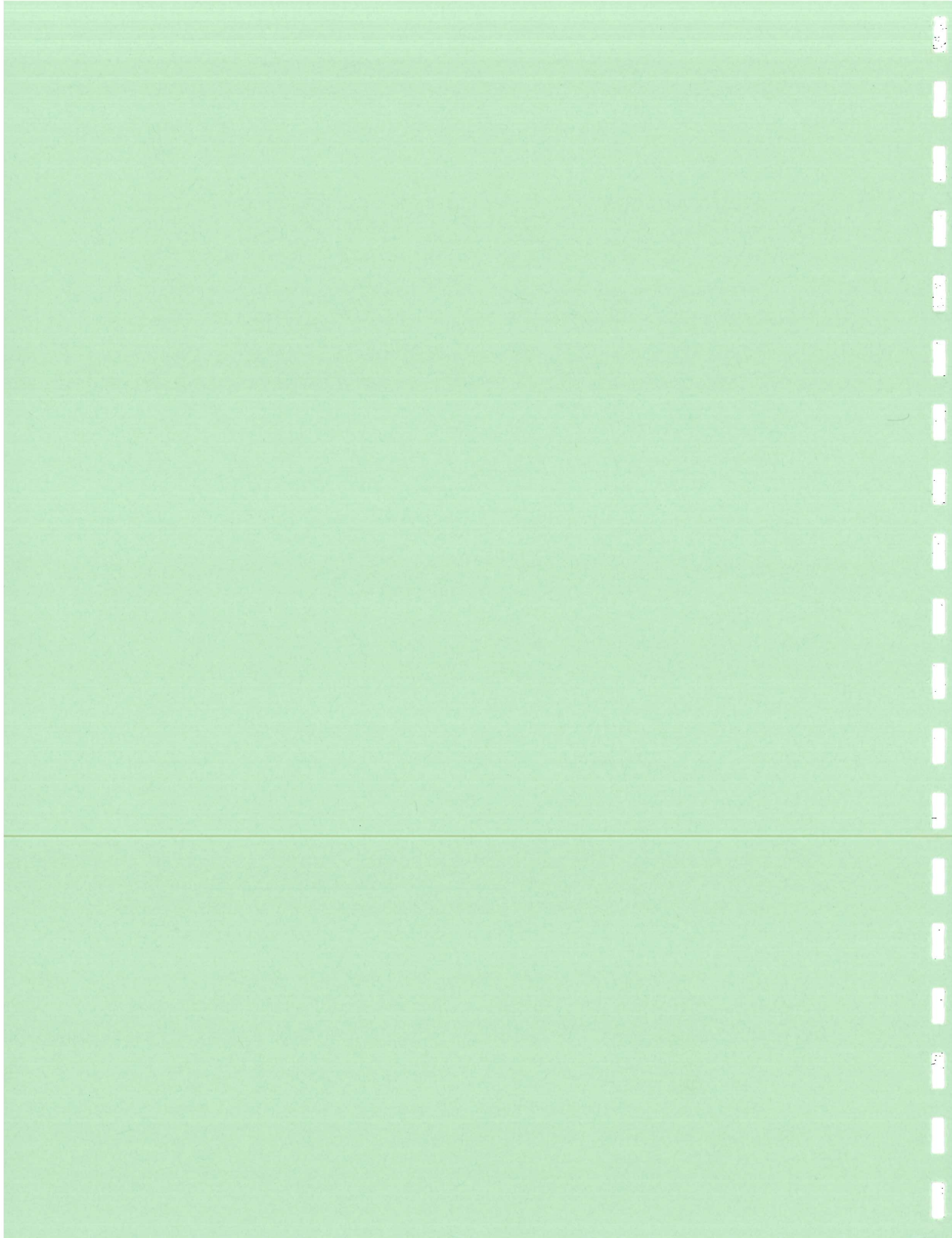


@Mammoth Site of Hot Springs, SD Inc

Illustrated by: Carl Dennis Buell

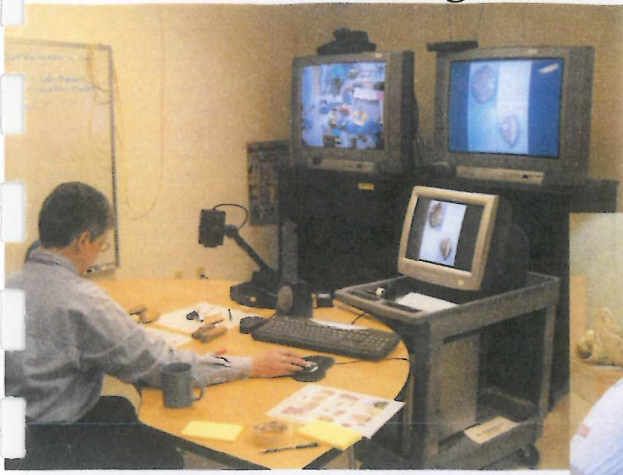
SECOND GRADE CURRICULAR ACTIVITIES OF  
THE HOT SPRINGS MAMMOTH SITE  
REVISED







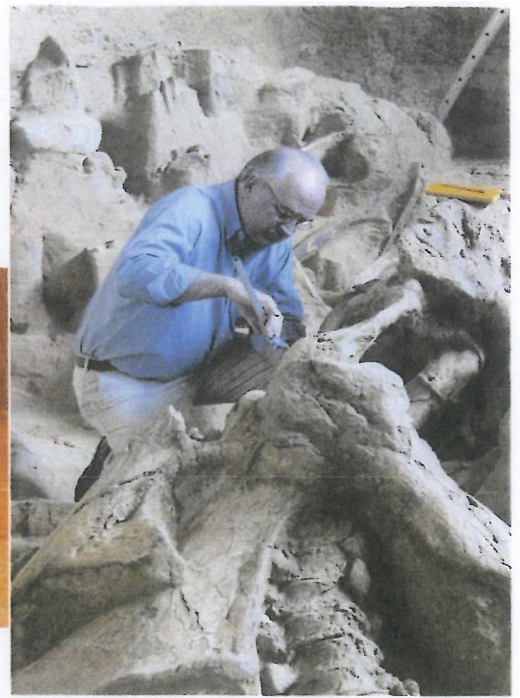
# Images from the Mammoth Site



Digital Dakota Network



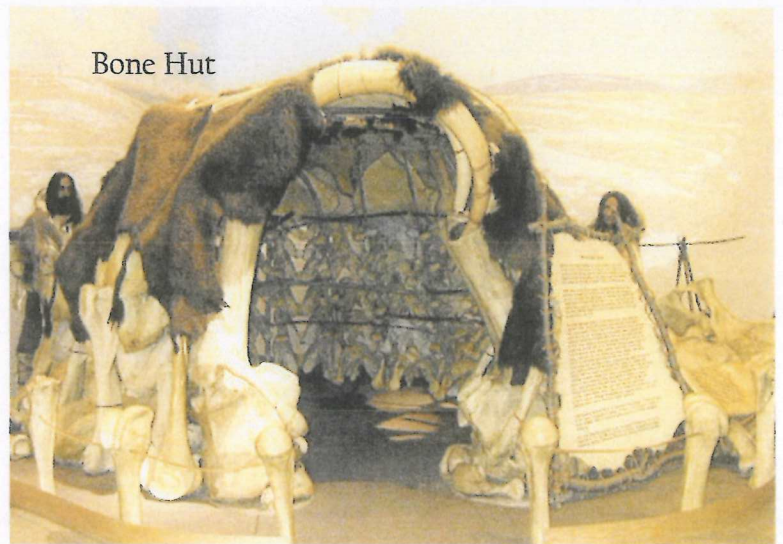
Sinkhole Panorama



Tooth Measurement



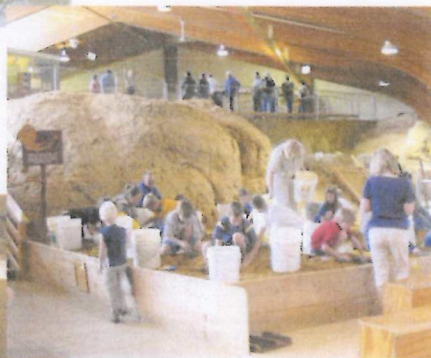
Bonebed Tour



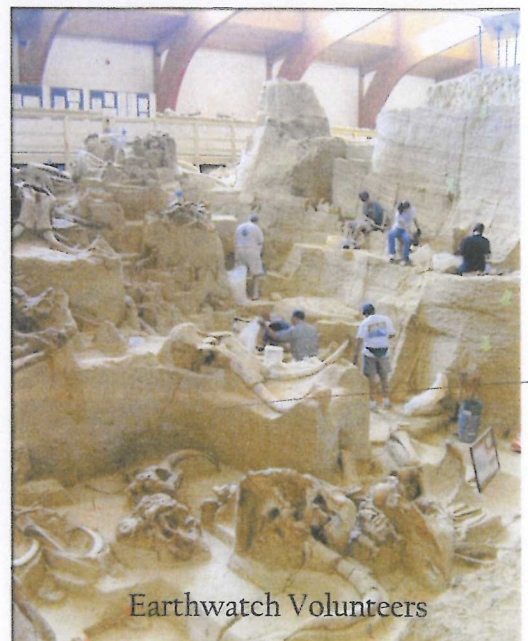
Bone Hut



Beauty



Jr. Paleo Excavation



Earthwatch Volunteers





Dear Teachers and Students,

Thank you for participating in our Curricular Activities. The Mammoth Site is the largest in situ exhibit of (50) Columbian Mammoths in the new world. The bones are displayed as found in the sinkhole where the animals became trapped. We also have tooth evidence of three Woolly mammoths and tooth and bone evidence of 36 other animals plus two to three unidentified insects (as of the 2002 revision) that were in the area at the same time. Scientists from around the world come to study our fossils. The paleontological information discovered through these scientific studies allows us to learn about our past plant ecology and animal extinction or survival.

We are very proud of the accomplishments of our Mammoth Site museum and are pleased to be able to share the activities we do on-site with students who are not able to visit our classroom and museum in person.

Twenty-six thousand years ago elephant-like animals called mammoths roamed across what is now western South Dakota. It might be helpful to say a long, long time ago with the 26,000 years to help young students understand the period of time. These animals were called Columbian mammoths. The word mammoth means huge or very large and these animals are now totally extinct.

Our museum is unique because pelvic bone measurements indicate the trapped animals were all males, and tooth measurements indicate they were mainly young animals. Our bones are very old, so they are called fossils and scientists who study past plant and animal life are called paleontologists. However, we also have original bone versus permineralized or petrified (hard like a rock) because minerals from the water did not replace the bone material.

Scientists think it took the sinkhole a long time (three hundred to seven hundred years) to fill in with bone and sediment to where it was again level with the plain. The bones were found in 1974 during excavation for a housing development. A 21,000 square foot visitor center now covers the sinkhole and is open year round to allow visitors to view this working paleontological site.

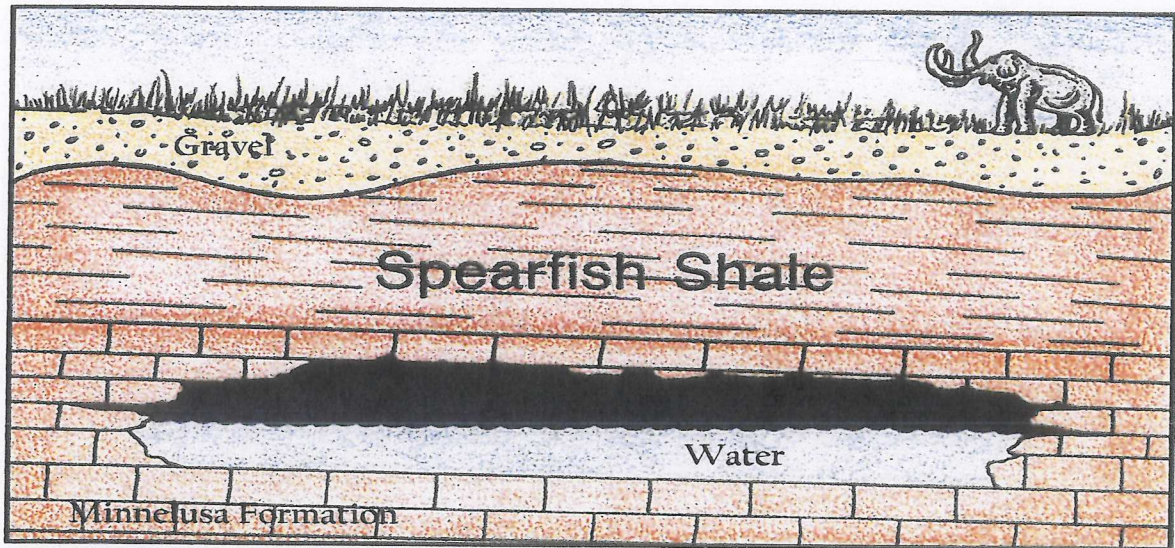
The Mammoth Site is located on the Highway 18 truck route, within the city limits of Hot Springs, South Dakota. Hot Springs is the southern gateway to the beautiful Black Hills.



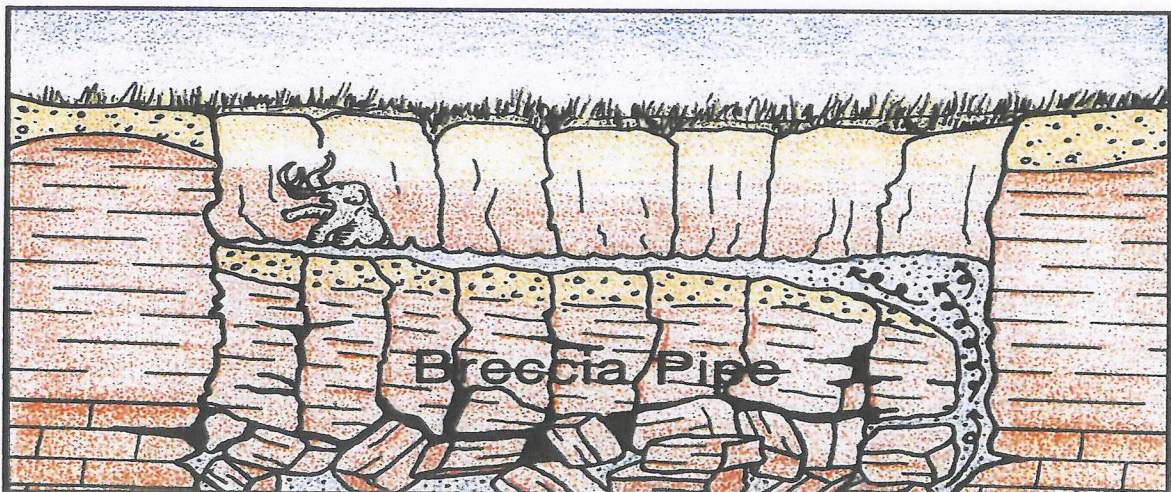


## SINKHOLE EXPLANATION

- ❖ #1 shows that 26,000 years ago mammoths roamed the land around what is now Hot Springs, SD eating grasses. Pollen grains found at the Mammoth Site show the pine trees commonly associated with the southern Black Hills were just beginning to appear.
- ❖ Underneath the grass an underground cave is forming under the Spearfish shale. This shale is found around the outside edge of the Black Hills and is red because it contains the mineral iron.
- ❖ The cave forms as the ground water from rain trickles down through the layers entering a soil formation called limestone. Limestone is porous or has small holes in it, much like a sponge. As water seeps into some of the holes, some of the limestone erodes away forming larger holes. As the holes continue to grow, they sometimes form caves or caverns and that is what happened at the Mammoth Site.



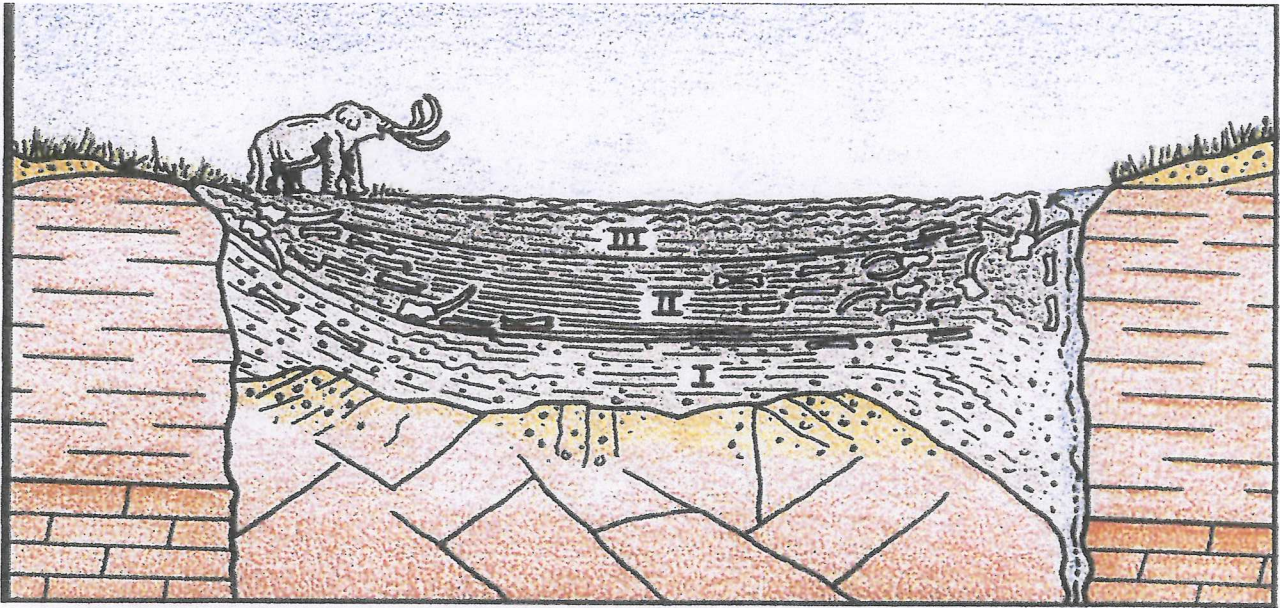
- ❖ #2 shows that as the cavern continued to grow, the roof became so thin it could no longer support the weight of the land above it and collapsed, forming a Breccia Pipe or sinkhole. Scientists think the roof collapsed with enough force that the rocks making up the floor of the cave were moved enough to allow a small warm water spring (90-95 degrees) to bubble up creating a pond environment. The mammoths were probably attracted to the sinkhole because of the warm water and the green vegetation. Because Spearfish shale is slippery when wet, once the mammoths entered the sinkhole, they would not be able to climb back out. Scientists believe the mammoths died of starvation or drowning.



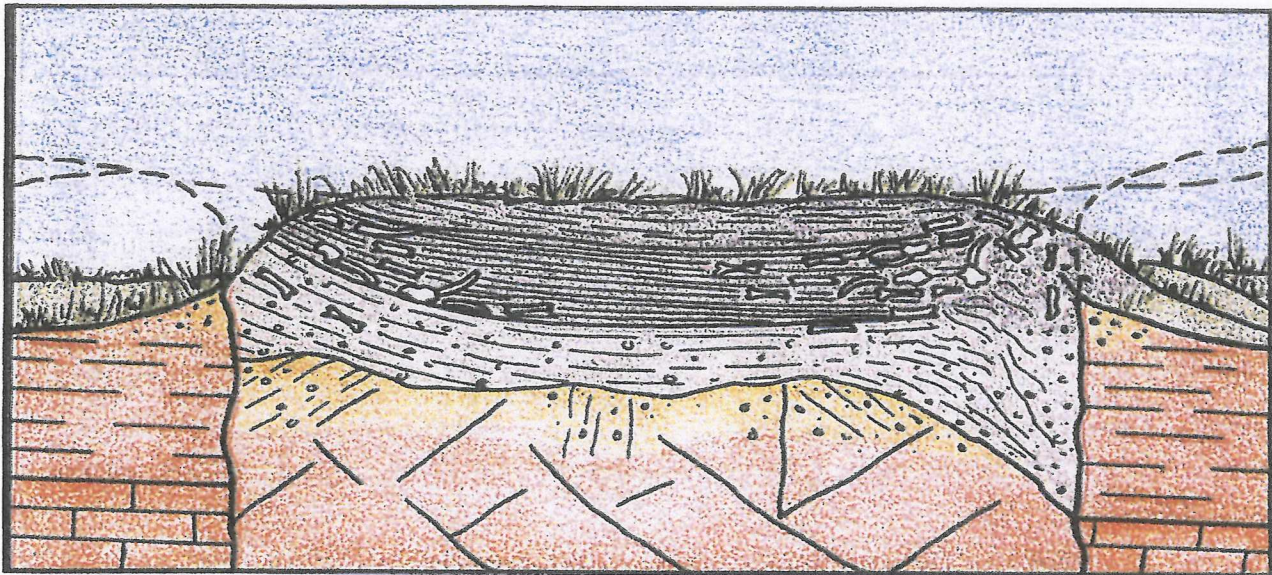








- ❖ #3 shows that over the next 300 hundred to 700 hundred years mammoths continued to slowly enter the sinkhole. Layers of mammoth bones mixed with the sediments eventually filled the sinkhole. The water table feeding the spring slowly dropped below the spring entrance, leaving behind a mineral called calcite. This mineral caused the soil around the bones to harden.



- ❖ #4 shows that as the soil in the sinkhole hardened and the sinkhole became very resistant to erosion. After 26,000 years of rain, snow and wind eroding away the softer Spearfish shale surrounding the sinkhole, we ended up with a hill. This is a process called **Reverse Topography**. First, we have a hole, which eventually filled back up to the level of the land around it and then became a hill by erosion. Our sinkhole was discovered in 1974 when the "hill" was being leveled during housing construction.







## OVERVIEW

The K-5 Mammoth Site Curricular activities, South Dakota Mammoths, are divided into six grade-level sections, each with its own theme. In addition, each grade-level section has activities designed both for the classroom and on-site use. In the most desirable cases, teachers conduct preliminary activities in the classroom, followed by field trips to the Mammoth Site.

Some of the on-site activities may be modified for classroom use. The Mammoth Site Education staff is able to customize site visits and activities to better suit individual teachers and classes. More of the activities may be done at the site, rather than in the classroom, if the teacher desires such assistance. Time spent at the site can vary from one to three hours, depending on the number of activities included in the visit.

Teachers, who are unable to conduct field trips to the Mammoth Site, may want to consider borrowing one of our "Mammoth in a Trunk" kits. Each kit contains posters, videos, books, a teacher's edition and most of the supplies necessary to do the hands-on activities. The kits are available for loan with a \$300.00 refundable deposit (can be a purchase order or personal credit card). Borrowers have two weeks to use the kit and must pay the return shipping cost. We also have available free video teleconferencing classes in some of the subject areas.

**Anyone interested is encouraged to email:**

**sharonm@mammothsite.org or call (605) 745-6017 and ask for the  
Education Department**

## THEMES

Each grade level has unique themes that are emphasized in both classroom and on-site activities. These themes were selected to fit within the normal scope and sequence of science concepts in major textbooks, thus allowing teachers to enrich their science curriculum regardless of geographic location. The themes are as follow:

KINDERGARTEN  
FIRST GRADE  
SECOND GRADE  
THIRD GRADE  
FOURTH GRADE  
FIFTH GRADE

MAMMOTHS, MAMMOTHS  
FOSSILS  
TRACKS  
EROSION  
ENTRAPMENT  
PALEO CULTURES

## ACTIVITIES TO EXPAND THE MAMMOTH SITE UNITS

For teachers who would like additional supplements to the Mammoth Site experiences, the following categories of general activities are suggested. These types of activities involve other subject areas like language arts, social studies, music and art. They allow for great latitude in application and student creativity.

### **General activities for all grade levels:**

- Nature poetry
- Animal dances and songs
- Pleistocene puppet shows
- Guided imagery reading followed by drawing
- Pleistocene plays and student-generated videos
- Round-robin writing of class stories
- Nature sculptures of soap, clay, art-stone or play-dough
- Animal bumper stickers
- Comic strips featuring Pleistocene animals
- Pleistocene stuffed animals
- Flip books with Pleistocene themes

## INSTRUCTIONAL FORMAT

The Mammoth Site is the largest *in situ* exhibit of Columbian Mammoths in the new world. The bones are displayed as found in the sinkhole where the animals became trapped. We also have evidence of woolly mammoths and other animals that were in the area at the same time. Scientists from around the world come to study our fossils. The paleontological information discovered through these scientific studies allows us to learn about our past plant ecology and animal extinction or survival.

We are very proud of the accomplishments of our Mammoth Site Museum and are pleased to be able to share the on-site activities we do with students who are not able to visit our classroom and museum in person. The activities in our South Dakota Mammoths have been set up with **objectives, directions for setting up the activities and a conclusion at the end of each activity.**



## **BE A TRACK DETECTIVE**

### **ANIMAL FOOTPRINTS ARE CALLED TRACKS**

#### **Teacher background information:**

Many wild animals live in the great outdoors. Can't see the animal? Look for signs that the animal has been in the area.

Common signs indicating an animal has passed through the area are: tracks, scat, nests, feathers, dried skins or fur that has fallen off the animals' body as they have moved through the grass.

Common areas to look for such items are around dams, ponds, or other muddy areas, in the dirt along a path or dirt road. Animal tracks can also be seen very easily in the snow.

Tracks can tell us many things about an animal. They can tell us which direction the animal was traveling, its size, how fast the animal was traveling, and if the animal was injured.

Tracks may also tell us what the animal eats, how it gets its food, where the animal lives and what kind of environment it uses for protection. The size, shape and how clearly we can see the tracks depends on ground or snow conditions. Some animals walk on their hands like the raccoon and bear while others like the cat and coyote walk on their toes. Bison and antelope walk on their toenails or hooves.

#### **Student references:**

- **Fields & Meadows** and **In Woods & Forest** by Paul, Tessa

- **Tracks, Scats, and Signs** by Dendy, Leslie

#### **Overview:**

The following activities are related to tracks, what they look like, how they may be preserved and the clues they provide about the animals that made them. The study of tracks re-enforces the practice of science process skills and problem-solving skills necessary for experimentation. Tracking requires good detective work! Animal track cards are available from many sources such as Project Wild ([www.projectwild.org](http://www.projectwild.org)). Scout manuals and books on tracks also describe how the spacing can provide clues about how fast the animal was traveling.

## WHO'S HERE?

“Track” activities will be more meaningful to the students if they are taken on a short field trip where tracks can be seen. If this is not possible, sometimes, cat, dog, rabbit, bird or squirrel tracks can be found and collected from low traffic areas on or around the playground.

### Materials:

- Cookie sheets or a variety of shallow pans
- Fine sand or soft soil
- Spray bottles for misting sand/soil with water
- Food bait, e.g. cheese, birdseed, corn, small pieces of meat, etc.

### Steps:

- Students fill shallow pans or cookie sheets with fine sand or dirt that is brushed smooth and level.
- The pans are sprayed lightly with water to make the sand or dirt firm enough to record tracks.
- Some pans have only sand while others have a piece of “bait” placed in the center. Types of bait used include possible food items for local animals like cheese, birdseed, oats or corn, ground meat.
- The pans are then placed outside in sheltered areas e.g. under bushes, where people will not disturb them. If possible, leave the pans for several days to collect numerous tracks.
- Plaster casts of the tracks are made using a collar of stiff paper around tracks to hold the plaster while it hardens.
- Students using easily obtained track cards for common animals or track identification books try to determine what animals made the tracks.
- The class discusses whether some bait is more useful than others and what the habits of the animals might be.
- Students create a display of local animals for their classroom, using the plaster casts of tracks and pictures of the animals.
- For extension, pans may be placed in other locations beyond the schoolyard, e.g. stream banks, woods.



## WHO'S THERE?

### Materials:

- Rubber replica animal feet available from a number of scientific catalogs.
- Damp sponges saturated with food coloring and placed on plastic lids.
- White copier paper.

### Steps:

- Students explore the various rubber feet by pressing them on the sponges and then on their papers. A pre-labeled sheet of paper with spaces for the track will help young students remember which track picture belongs with which track.
- Students compare the tracks with the physical appearance of the feet.
- Students discuss similarities and differences between these tracks and the ones they collected previously in the activity "Who's Here?"

## OBJECTIVES

-Teacher explains that 26,000 years ago large elephant-like animals called Columbian mammoths, woolly mammoths, plus 49 other animals including aquatic life were trapped and died in a spring fed sinkhole near what is now Hot Springs, South Dakota. Scientists think as many as 100 mammoths may have died there.

-Five extinct animals including the Columbian and woolly mammoth, the giant short-faced bear, *camelops*, and large-headed llama have been found so far.

-Animals that still exist today such as: clams, snails, a variety of minnows, toads, frogs, a feather imprint of an unidentified bird of prey, eastern mole, cottontail rabbit, white-tailed jackrabbit. Richardson's ground squirrel, thirteen-lined ground squirrel, white-tailed prairie dog, northern pocket gopher, deer mouse, heather vole, meadow vole, mink, gray wolf, coyote, bushy-tailed wood rat, badger, and pronghorn antelope have also been found.

-The bones were found in 1974 during excavation for a housing development. These bones are very old and are called fossils. They are not petrified because minerals from the water did not replace the bone material.

-Mammoth tracks or footprints have been found as swirls in the sinkhole indicating mammoths walked on the bottom of the pond.

-Scientists who study these ancient bones can tell us what our environment was like thousands of years ago. Studies tell us that animals tend to eat certain types of food, such as grasses, meats or a combination of both. Pollen of familiar plants and trees such as the pine tree have been found with our ancient animal remains, allowing scientist to assume temperature and rainfall were similar to



those of today. This indicates that some plants and animals became extinct for various reasons while others were able to adapt and survive.

## **BACKGROUND INFORMATION FOR STAMP ACTIVITY**

-Rubber scat can also be purchased from scientific supply house and will add to the study of animal tracks. The rubber scat sometimes is not very realistic, but it does give example of size and shape. The larger the animal, the larger the scat will be that gets left behind. Scientists can learn information about animals from the undigested material left behind in the scat.

- Track information cards can either be purchased or made by the students to match the rubber tracks purchased. Students can take turns playing a game of animal track "Concentration". We recommend students play the concentration game before making their track stamps.

-Show or pass around the rubber tracks. Students like to touch the tracks and this usually speeds up the stamping process if they have had a chance to touch before stamping. The tracks can be mounted on a thin block of wood, which makes it easier for small fingers to grasp the track. The name of the track can then be written on the wooden backing for track identification. Students will also enjoy passing the scat around.

-Animals can be easily identified by the tracks they leave behind. Animals with hooves are herbivores and eat grasses. Animals with paws are carnivores or they can be omnivore (eating berries, roots, and insects as well as meat).

-Pictures of the animals matching the tracks can be hung on a bulletin board. Ask students to take turns matching a track and scat to the correct animal in the picture. Discuss with students that the larger the animal the bigger and deeper the track. Tracks can also help tell what an animal was doing. If the tracks are all about the same depth and space apart, the animal was probably walking. If the tracks are deeper and farther apart, the animal may have been running. Three tracks of similar depth and space and the fourth track of a lesser depth may indicate an animal was limping.

-Ask for student volunteers or divide students into groups to demonstrate an animal walking, running, or limping.



### **STAMP ACTIVITY: #1- FLAT TRACKS**

-Place the pre-colored sponges on the plastic lids, and then dampen them with water. Since the sponges are treated with food coloring, you will need to explain to the students that they need to be careful not to get a lot on themselves. Because it is food coloring, it will wash out of clothes and eventually off skin.

-Have the students wash their hands with soap and water after completing the activity. This will remove any coloring that could be transferred to papers or clothing. A stain may remain until their hands have been washed several times.

-If you wish to dampen the sponges ahead of time, cover them with saran wrap or some type of plastic covering. The sponges can be allowed to dry with the coloring left in them for the next time you do the activity.

-This activity can be done at the student's desks especially if the desks are pushed together in groups of four. Or the activity can be done at a table where the sponges can be distributed down the length of the table.

-Pass out the stamp sheets that have the track spaces identified by animal.

-Have the students share the stamps. They will get the best stamp of the tracks if they push the stamp down into the sponge, then after they have found the correct space on the stamp sheet, place the stamp in the center of the space, push down, then lift up. Remind the students that not all tracks found in nature are perfect and not all of the tracks they make will turn out perfect.

### **STAMP ACTIVITY: #2 – MOLD AND CASTS**

Pressing the track into damp sand, then pouring plaster of Paris into the mold can also make track casts. Molds can also be made in bake able clay or play dough. The tracks show up the best if white clay or play dough is used and the tracks are pressed on treated sponges before being pressed into the clay or dough. The clay or play dough package should have directions for the temperature and the amount of time needed to bake the impressions.

### **CONCLUSION**

-Class discussion:

-What do tracks tell us about animals?

-What do animals with paws eat?

-What do animals with hoofs eat?

-How can you tell by the scat how large an animal is?

-How can you tell by the scat what an animal has eaten?

❖ The word search activity on the last page may be copied by the teacher.

**WE HOPE YOU HAD FUN LEARNING ABOUT TRACKS!**

For more information on the Mammoth Site, look us up on the Internet at:

**[www.mammothsite.org](http://www.mammothsite.org)**

If you have education questions you may e-mail:

**[sharonm@mammothsite.org](mailto:sharonm@mammothsite.org)**

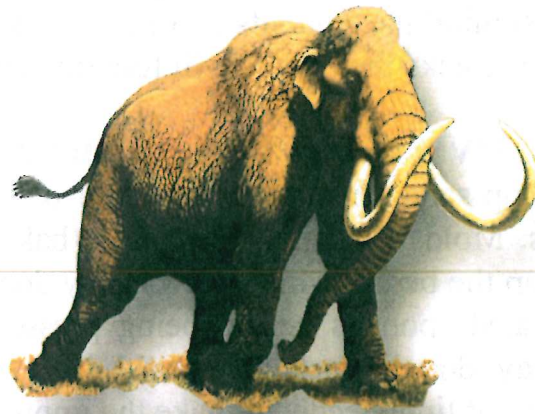
Or you may phone: (605) 745-6017

Or you may write: The Education Department

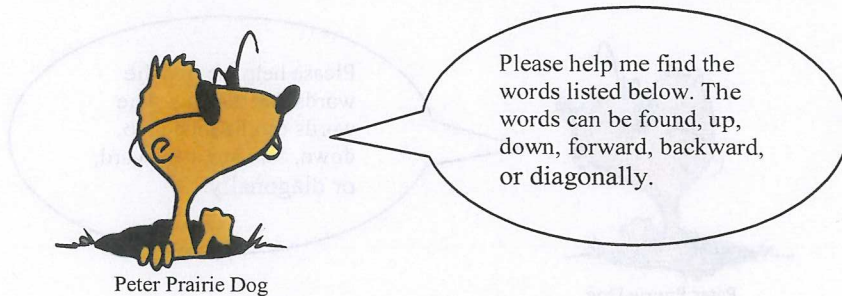
Mammoth Site

PO Box 692

Hot Springs, SD 57747







## ABOUT ANIMALS

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| Z | L | B | R | E | N | D | Z | C | T | C | E | O | K | G |
| V | O | O | D | A | G | T | I | I | D | A | T | M | L | C |
| M | W | O | Z | G | P | R | B | H | C | T | O | W | Y | C |
| L | Q | I | Q | L | I | B | A | H | N | W | Y | J | F | A |
| S | V | G | M | E | A | Q | A | S | A | H | O | W | O | Z |
| G | R | Y | Q | R | M | I | N | K | S | X | C | C | U | K |
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| W | M | M | H | Y | L | F | U | U | T | B | Z | L | G | L |
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| K | R | W | O | O | A | X | P | G | J | L | X | U | I | R |
| S | Y | A | H | L | X | E | S | D | E | E | S | M | U | W |
| K | K | O | E | P | E | B | F | L | O | J | P | F | S | A |
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BEAR  
COYOTE  
EAGLE  
FEATHERS  
FUR  
GRASS  
GROWL  
HIDE  
HOOF  
LIMP

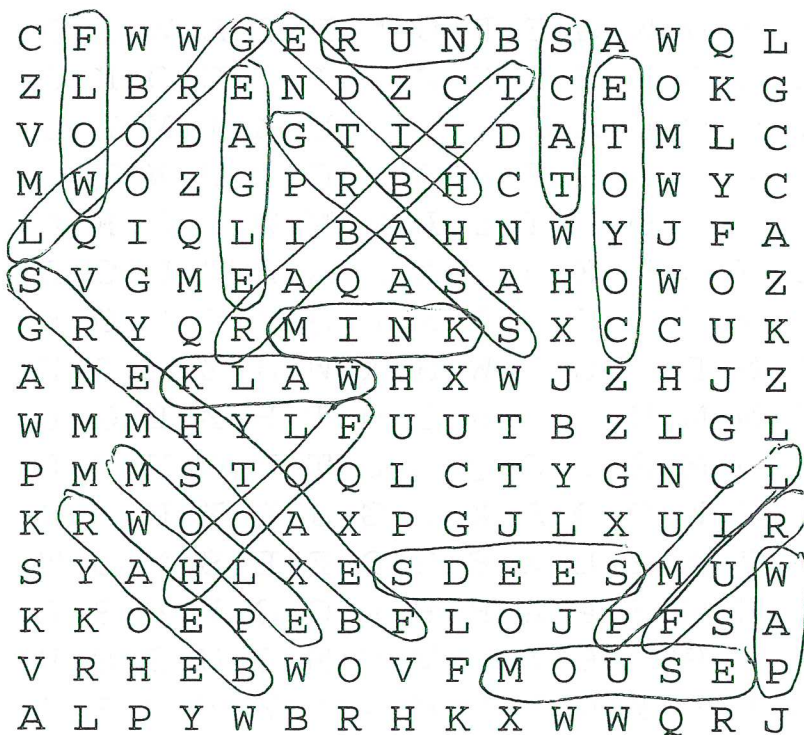
MINK  
MOLE  
MOUSE  
PAW  
RABBIT  
RUN  
SCAT  
SEEDS  
WALK  
WOLF



Peter Prairie Dog

Please help me find the words listed below. The words can be found, up, down, forward, backward, or diagonally.

### ABOUT ANIMALS



BEAR  
COYOTE  
EAGLE  
FEATHERS  
FUR  
GRASS  
GROWL  
HIDE  
HOOF  
LIMP

MINK  
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