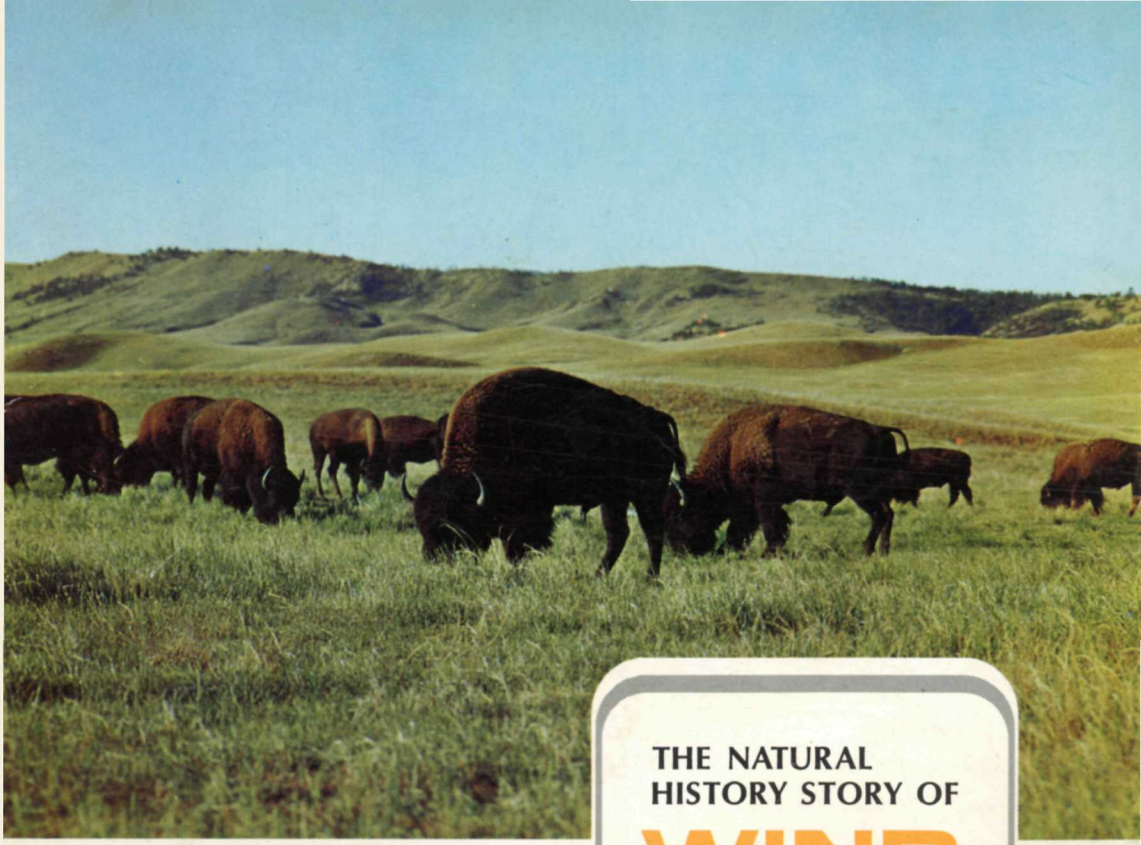
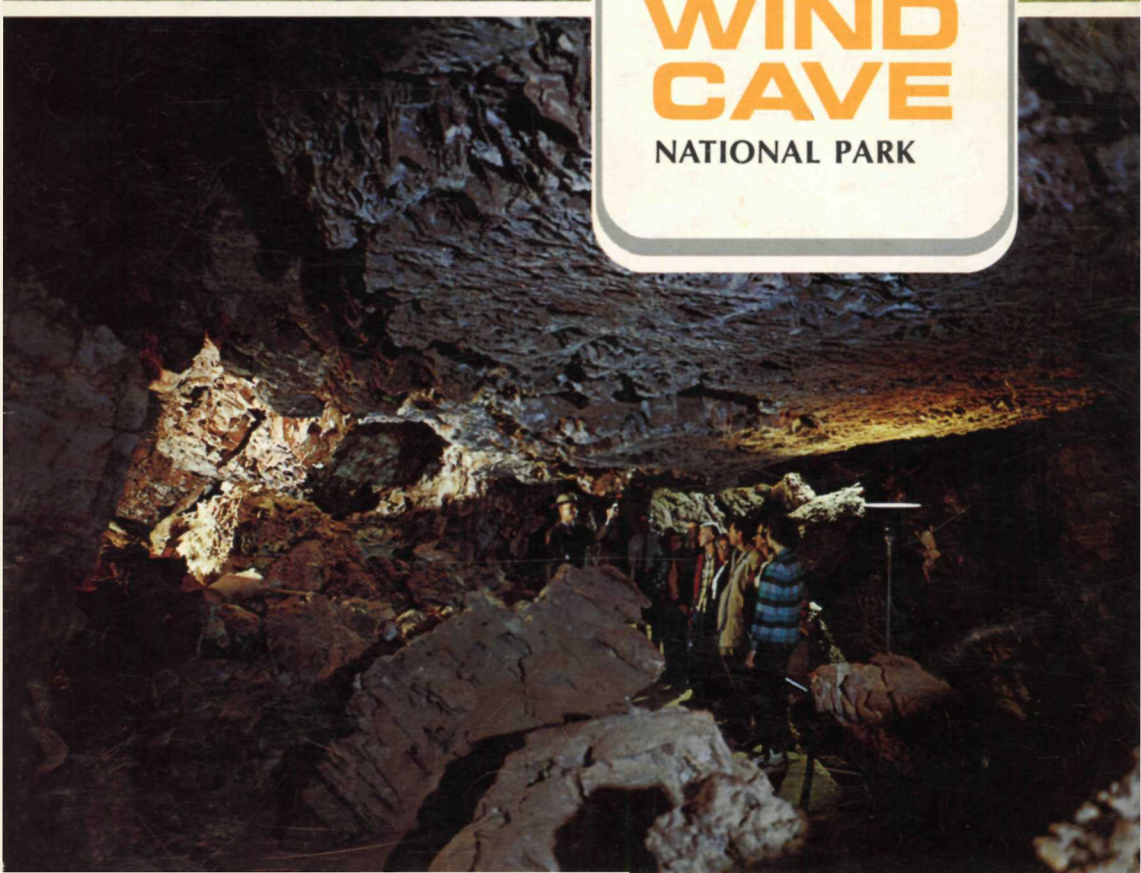


THE NATURAL HISTORY STORY OF WIND CAVE NATIONAL PARK



WIND CAVE NATURAL HISTORY ASSOCIATION

This booklet is published by the *Wind Cave Natural History Association,* a non-profit organization whose purpose is to stimulate interest in the educational aspects of Wind Cave's history and natural history. The Association cooperates with and is recognized by the National Park Service, U. S. Department of the Interior, as an essential operating organization.

East meets West in Wind Cave, where stands of ponderosa pine, typical of the mountain environment of the Black Hills, intermingle with wide open spaces of undulating grassland.

THE NATURAL HISTORY STORY OF

WIND CAVE NATIONAL PARK

by John A. Tyers

FOREWORD:

IMAGINE WIND BLOWING OUT OF A HOLE IN THE GROUND. . . . .

This freak of nature led to the discovery of Wind Cave in 1881. In that year, cowboy Tom Bingham found Wind Cave's 10-inch natural opening in the limestone rock of the southern Black Hills. In subsequent years, explorers managed to get into the cave by digging in places around the original "blow-hole." Once inside the cave, they marveled at the unusual crystal formation on the walls and ceilings. It resembled a honeycomb or "boxwork" structure. This unique mineral decoration made Wind Cave famous and worthy of being a national park.

But that is not the whole story. Here also is an unsurpassed surface feature made up of one of the finest remnants of the "vanishing" prairie in the western Great Plains today, complete with a wildlife display. The cave and its surface area give this park a dual significance and make it truly great.

John A. Tyers

CONTENTS

1. THE SETTING

THE BLACK HILLS LOOM UP AS A DARK MASS ON THE HORIZON. They are like reaching an island oasis after you leave a desert region.

To the early Plains Indians, the hills also looked black, so they called the area "Pahasapa," meaning "Hills Black." Actually, it is the dark bark and needles of the ponderosa pine which mantle these rolling hills and present this shaded image.

The natural vegetation found here is a blend of the mountains and plains. When you enter Wind Cave National Park, you are well within the confines of the Black Hills proper. You can view the scenic portions of the surface area from various vista points along roads which wind through the park. Over three-fourths of the park's 44 square miles are rolling mixed grass prairie and the remaining include wooded slopes and pine savannahs.

A trip through the park from any direction eventually brings you to the focal points of all park activities. This is the headquarters building with its adjacent cave entrance. If you wish to experience a trip into the limestone caverns of Wind Cave, this is the place to start. Guided tours are conducted by uniformed park personnel.

Over 10 miles of cave passages have been explored and mapped. On a trip through the cave, you have the opportunity to hike a part of the 1¼-mile surfaced electrically lighted trails. The contrast between the living verdant scene with active wildlife above ground, and the cool dark labyrinth of the cave underworld is striking. In a matter of minutes, you can go from the present into the past. Life on the surface is all around you and even though it stirs a feeling of awe within us as we try to comprehend the marvels of living growing things, going underground into the depth of the earth is like stepping backward into geologic history.

Probably uppermost in your mind as you approach and enter this cave is the feeling of mystery and suspense connected with this

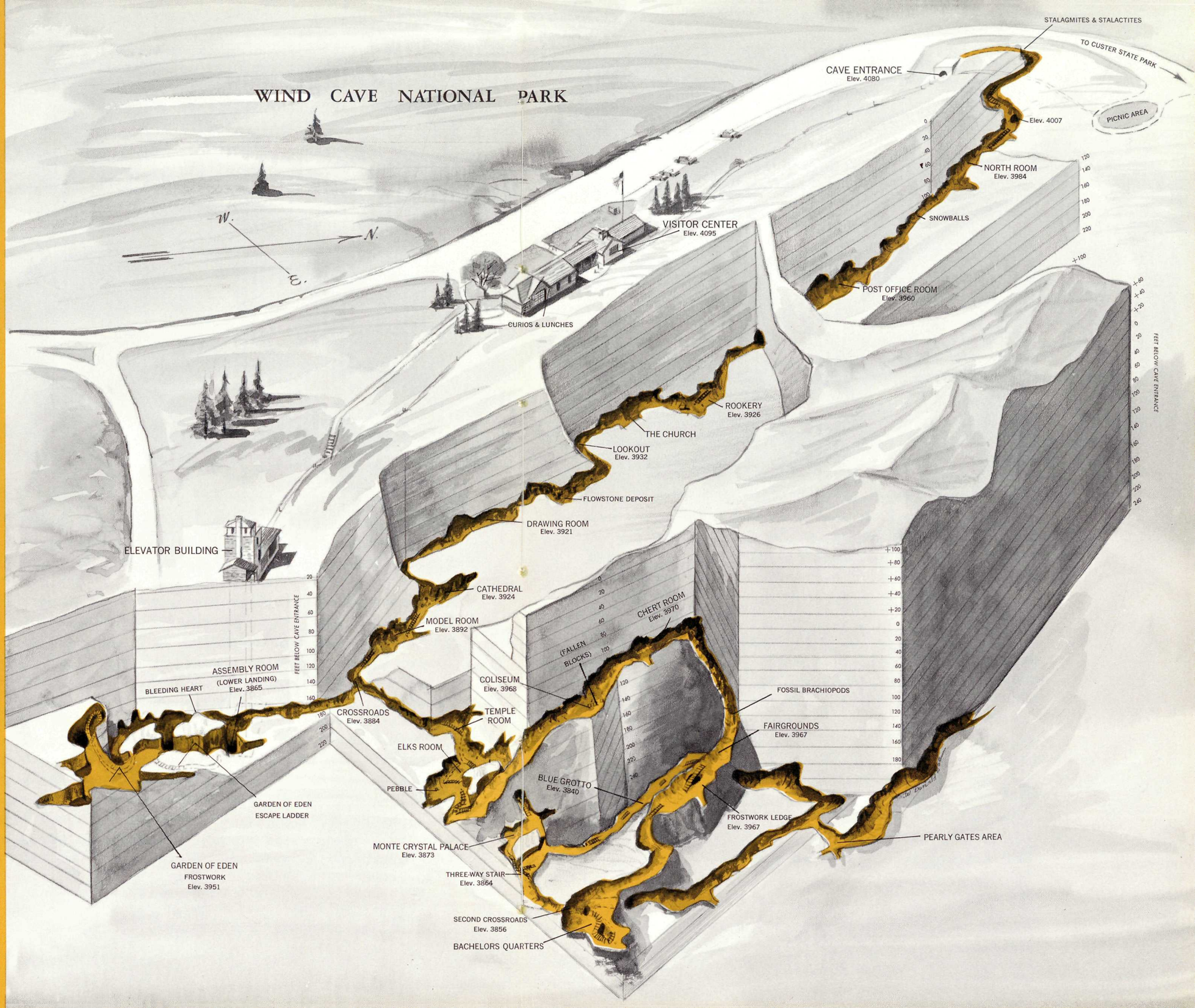
A uniformed National Park Service tour leader explains the origin of Wind Cave and compares it with other caverns.

unknown world. As you listen to your guide unfold the story of the cave, the mystery gradually begins to become clearer and you gain appreciation for the underworld.

If you think of yourself as an ant crawling through a gigantic sponge, you will have a better conception of the cave's vastness. Seeing the delicately beautiful calcite boxwork formation is a new experience and you appreciate its uniqueness. Wind Cave takes on new meaning. Not only boxwork, but seeing other mineral decorations such as flowstone, frostwork, popcorn, cave earth, manganese dendrites, gypsum crystals, and a chert layer with its fossil brachiopods adds to your experience on a cave tour.

Thus the dual significance of Wind Cave National Park becomes more apparent and you are stimulated to learn more about this fascinating park.

Formations and passages seen along the trail through Wind Cave are indicated in this artist's drawing.



2. THE UNDERWORLD

A Changing World

Why is Wind Cave here and what caused it to form?

The surface topography of Wind Cave some 250 million years ago was vastly different than it is today. You could not have visited the Black Hills then, for they did not exist. Instead, the region was flat and covered by a vast inland sea which extended for hundreds of miles. The climate was warm, and, in the sea, marine life was abundant. Seashells were strewn on the ocean bottom. As they were broken up by wave action, their fragments formed great beaches and also piled up in shallow offshore waters where they slowly cemented into limestone. This limestone layer eventually built up until it was from 300 to 600 feet thick.

Naming it after the Sioux Indian word for Black Hills, geologists called this the Pahasapa limestone. It took millions of years for this stratum of rock to form. Several periods of elevation and subsidence have occurred since deposition of this limestone. When it sank beneath the waters, the great limestone bed was covered by a deposit of fine sand. It later hardened into a sandstone bed, known locally as the Minnelusa. During the periods of submergence, the Pahasapa and Minnelusa were buried by other layers of sandstone, limestone, and sediments several hundred feet thick. Eventually, the entire mass appeared in cross section like the pages of a book.

The final uplift of the land from beneath the sea began at the end of the Cretaceous period, some 60 million years ago. Masses of igneous granites and mica schists domed up through the mantle of sediments. It was as though a huge blister had formed on the earth's crust. After this uplift activity, the dome was truncated by erosion. As the land emerged from the sea floor, streams, and other agencies of weathering began their work of eroding the surface into hills and valleys. This Black Hills uplift, with subsequent erosional activity, formed an irregular-shaped anticlinal dome, about 120 miles long and 50 miles wide, riding several thousand feet above the surrounding plains.

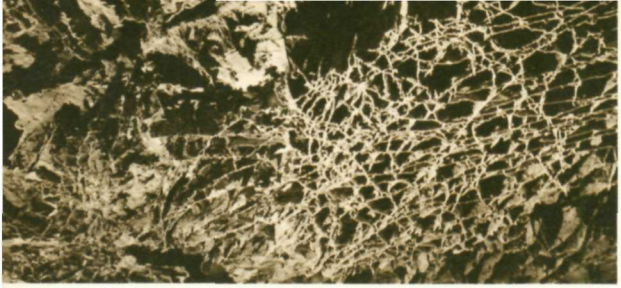
Here was the genesis of the Black Hills.

Boxwork in the Temple Room.

The Work of Water

During the uplift, the Pahasapa limestone was subjected to earth forces so great they are beyond comprehension. Where stresses were too great for warping, the great limestone was cracked and fissured. The largest fissures formed in a northwesterly direction, parallel to the mountain folds. Other smaller cracks developed in many directions and at different angles.

Thus the stage was set for water forces to begin their powerful erosive action and carve Wind Cave out of the Pahasapa limestone. Surface waters and runoff from the Black Hills permeated the many cracks that had developed in the limestone and began collecting in them. This ground water was the primary agent for the excavation of the cave. The major cracks in the Pahasapa became enlarged by the dissolving water action to create the passageways and rooms which make up the main part of the cave.



A boxwork ceiling in one of the cave passageways.

The generally accepted theory of cave origin, or "speleogenesis," is that limestone caverns are formed below the water table level. This theory is true for Wind Cave.

Before this enlarging activity, the minor, closely spaced joint systems were filled with crystalline calcite precipitated out of the waters. This material eventually formed the network of "boxwork" formations which makes this cave famous.

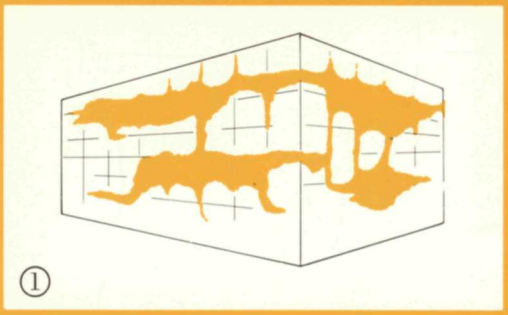
"Boxwork" is simply a pattern or interlacing of thin calcite blades projecting out from the walls and down from the ceilings in the rooms of Wind Cave. These blades join one another, enclosing irregularly shaped and sized spaces which give the feature its name.

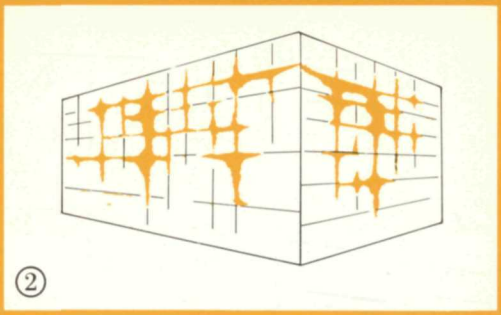
Composition of Boxwork

Rainwater seeping down from the surface through decaying vegetation, absorbing carbon dioxide, made the water acid and capable of dissolving limestone. The carbon-dioxide-bearing water took some of the limestone into solution; then, evaporation of the water caused the calcium carbonate to be deposited in the cracks and crevices below as calcite (the crystal form of calcium carbonate). Later, the more soluble limestone, between the calcite plates, dissolved, leaving the formation of calcite "fins" we call boxwork.

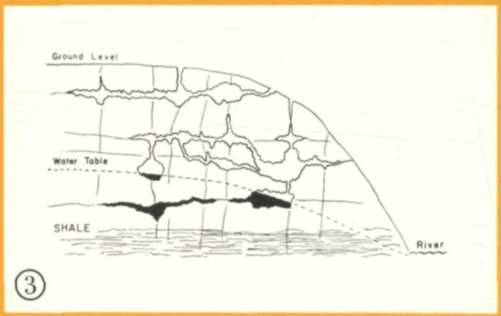
Besides the predominant boxwork formation, displays of secondary formations such as gypsum, aragonite, calcite, hydromagnesite, quartz, and hematite decorate the wall and ceilings.

Boxwork is composed of two major parts—cores and secondary deposits on the cores. The cores consist of red-brown to brown coarsely crystalline calcite. Examination of the junction of the boxwork cores with the cave walls in Wind Cave shows that the cores are thicker than the veins that continue into the limestone. These veins which protrude out from the limestone actually make up the inner core of the boxwork. Deposited on top of this core are a series of secondary deposits. These are in the form of sediments, hematite, and dogtooth spar crystals as well as others forms of calcite. Some areas in the cave have boxwork displaying different colors; for example, in the Blue Grotto section, the boxwork has a blue to gray color because of the secondary deposits of manganese.





1. The cavern system begins as limestone is dissolved along a lattice-work pattern of joints.
2. As long as the system is filled with ground water, dissolving continues; passageways and chambers form.
3. Eventually surface streams cut down through the system, draining it. The humid air-filled system is now ready for the tedious frosting of crystalline calcite.



Roughly, the process is like constructing a brick wall. The bricks could be compared to the soft layer of limestone rock, and the mortar between them to the boxwork fins. If the bricks were removed, all that would be left would be the framework of mortar, or, in the case of Wind Cave's unique feature, the boxwork.

Eventually, the cave was drained permanently because of regional uplift again or downcutting of the valley streams below the cave level in the surrounding area. As a result, air entered to fill the spaces vacated by water. Popcorn, frostwork, and other ornamental decorations developed at rates depending upon the humidity of the cave air and the supply of charged water seeping into the cave.

Popcorn and Frostwork

In abundance, popcorn and frostwork mineral decorations are second only to boxwork but are not nearly so extensive. In appearance, this formation resembles a rock wall covered with a heavy frost after a recent freeze. The popcorn is globular in appearance, with an internal structure of concentric layers.

Frostwork varies from minute hairs growing on popcorn to clusters of long, fine crystals, called "mineral cotton." Other radiating clusters of frostwork on the cave walls and ceilings resemble halves of snowballs.

Ledges of popcorn and frostwork.

Scientists call the popcorn formation calcite and the frostwork aragonite. They also believe that aragonite is unstable and slowly transforms to calcite. Droplets of water can be found on the terminations of the popcorn structure in many passages. This would indicate that solutions were either seeping through the walls or vapor was being condensed from the humid air in the cave. At the time the water table was lowered in the cave, the humid, carbonate-saturated vapor was condensing, and the popcorn formation began to develop as a subaerial deposit.

Chert

Nearly everyone is familiar with Indian tools made from flint and similar rocks. At Wind Cave is a layer of rock much like flint. It is called chert, and is a hard siliceous (meaning silica-rich) fine-grained rock whose broken surface appears uniform and lustrous.

In the Fairgrounds Room of the cave, chert is found as a ceiling about 4 inches thick, 50 feet wide, and extending laterally for a distance of about 1,500 feet. This chert layer lies between layers of limestone much like a slice of bologna between two pieces of bread.

Chert nodules or lumps resembling a knobby potato in shape and size are commonly found mixed with other materials. Some of the finest examples of shell-type fossils or their imprints called brachiopods can be seen in the chert layer at Wind Cave.

Frostwork of calcite and aragonite crystals.

Dendrites

Found also in this chert layer is a strange black crystal formation, lacy in appearance. At first glance, we are almost forced to believe that they are in reality fossil plants. Actually, they are a mineral deposit of manganese dioxide in dendritic form.

These crystal aggregates of manganese dioxide are formed in the same way as window frost. As water vapor carrying this material in solution slowly consolidates on the chert rock, it produces an interlacing pattern of rods, by one tiny crystal forming against another, resulting in the fernlike pattern.

Cave Earth

As you hike the trails in Wind Cave, you will occasionally see some red material resembling clay. It is called cave earth. This feature, common to caverns dissolved from limestone, is conspicuous in all passages of Wind Cave. In some sections, cave earth is but a slight covering on the floors, while in other passages, it has been deposited as a fine clay, several feet thick. Cave earth is nothing more than an insoluble residue remaining after solution of the limestone.

Calcite Crystals

Some of the other caves in the Black Hills have an extensive dogtooth spar lining of calcite on the walls and ceilings. Such a vast display is nonexistent in Wind Cave except found in miniature as calcite crystal-filled cavities known as vugs.

These openings range in shape from spherical to widely spaced fractures. They are rather small in size and exist as pockets which have formed in the limestone bedrock. Inside the pocket is a layer of coarse clear calcite individual crystals, ranging in size from 1 to 5 centimeters long. Some vugs are found containing quartz instead of calcite crystals. These vugs are not readily observed, and must be carefully looked for on the cave walls and ceilings.

Dripstone

At Wind Cave, there is little formation-building activity going on. But an exception is dripstone in the form of stalactites, stalagmites, or flowstone found in the Fairy Palace, Garden of Eden, or Rainbow Falls sections of the cave.

In the Fairy Palace, slender stalactites adorn the ceiling in profusion, along with delicate veined ribbons; flowstone covers the walls and ledges; a large stalagmitic mass stands in the center of the floor. Some of the stalagmites and stalactites coalesce to form columns, while some of the ribbon flowstone is multicolored and may be termed "bacon rind." In the Garden of Eden section, a large mass of flowstone is deposited on a wall, and in appearance resembles a "bleeding heart."

Rainbow Falls is a series of larger stalactites which form a feature resembling a frozen waterfall. All the dripstone formations are found in the upper level of the cave beneath surface depressions where percolating water from the surface seeps through fractures in the limestone. These mineral-laden waters eventually evaporate, leaving the mineral matter redeposited within the cave as masses of dripstone.

Dripstone formations in Wind Cave are not common, and the few which do exist are unfortunately well off the established trails. There is only one display of very small stalagmites and stalactites on a ledge above the trail just inside the walk-in entrance to the cave.

Gypsum

In various parts of the cave, white crusts of material show up on the ceilings, walls, and floors. These thin coatings are, in many cases, gypsum crystals. Sometimes they show up as tufts of thin hairlike crystals called "cave cotton." In one location near the Pearly Gates, a tuft of these crystals 8 to 10 inches long hangs from the ceiling, and this mass is called "Noah's Beard." This gypsum was leached from the rock units overlying the Pahasapa limestone containing this material and redeposited here.

Curved crystals of "gypsum flowers" have been found in one of the deepest parts of the cave near the Pearly Gates. Here the mineral occurred as curved crystals deposited in bedding planes between chert layers. These curved crystals are called helictites,

and by their very nature seem to defy the law of gravity. The curvature of these helictites is probably caused by difference in growth rates on the opposite side of the crystal.

Moonmilk

In a remote area of the cave called the Pearly Gates Annex, the rooms look as though a fresh snowfall had just taken place. All of the ledges, rocks, and floor are covered with this white material. This fine-grained white powder has been identified as hydromagnesite, one of the so-called "moonmilk minerals." It is believed the occurrence of hydromagnesite in Wind Cave can be explained by the seepage of magnesium-rich solutions into the dry cave, with the result that water has evaporated and moonmilk deposited.

The Cave Today

Thus far we have discussed the cave in terms of what has taken place in the past—the formation of the Pahasapa limestone, how it was uplifted and cracked, and the work of water in dissolving out the cave and secondary formations which eventually developed.

But what of Wind Cave today? Is anything spectacular happening in the cave?

In reality, Wind Cave is a dead cave today in contrast to those caves where mineral decorations are actively growing. It is a dead cave because it is virtually dry except for small amounts of seepage from surface water. Surprisingly enough, this small amount of water does its work well, for we can see evidence of a few formations which are actively growing.

There are differences in various sections of the cave which you can observe on a tour. This is particularly noticeable regarding the two distinct levels of the cave.

You will see boxwork and other associated mineral decorations in the "lower" level, while the "upper" level displays an absence of boxwork. Instead, the walls and ceilings are smooth and consist of innumerable small interconnecting cavities called "sponge work." These cavities are often extremely intricate in both outline and interconnections. The limestone bedrock in which spongework is found is literally honeycombed.

Large blocks fallen from ceiling in Coliseum Room.

Associated also with spongework are rounded indentations, several inches to a few feet in diameter, called wall or ceiling pockets. While often shallow, they sometimes reach a depth which gives them an appearance suggestive of the interior of a small kettle drum. In some cases, edges overlap over side areas.

Another cave feature is called a dome pit. These are holes or tubes in the limestone which have been hollowed out by the work of descending water. This name is best appreciated if you view such a vertically elongated solution cavity from mid-height. The dome is the part above; the pit is below. Examples of dome pits can be seen in the Garden of Eden and Coliseum areas of Wind Cave.

Fallen blocks of limestone are another noticeable feature. They clutter the floor of the cave in both the upper and lower levels. Those in the lower level are faced with boxwork, and are lying around at various odd angles. Evenly surfaced but irregularly shaped fallen blocks also litter the floors in the upper level. When water filled the cave, these fallen blocks which formed a part of the ceiling were loosened by solution along fractures until all support was gone, and they fell to the floor.

There has been no record of any fallen blocks in recent times. except for a cave-in in 1957. An excessive amount of spring rain weakened a part of the manmade arch over the walk-in entrance, causing a minor collapse. It was quickly repaired, and nothing similar has occurred since that time.

In some ways, the cave has been changed from its original state but little. Modern facilities and conveniences have been added to make a trip possible and more enjoyable. An electrical lighting system, surfaced trails, and concrete stairways with handrails make a trip through the cave easier. Two elevator cabs whisk you to the surface from a 200-foot depth in a matter of seconds.

The only alteration to the cave itself has been the surfaced trails. In some cases, it was necessary to dig into the cave floor several feet to make the trail gradient uniform. Ceilings and walls have not been changed in any way so that the natural formations of the cave are preserved in keeping with the National Park Service policy of protecting the natural features of the area.

Did you know the cave actually breathes? The cave-breathing phenomenon is controlled by atmospheric conditions. It is a fluctuating occurrence since a high barometric pressure condition causes the air to rush into the cave and conversely a low barometric condition causes it to rush out. In other words, the air in the cave is constantly trying to equalize itself with the air pressure outside. As a result, the cave seems to "breathe."

The cave is a sort of local barometer, for, to a certain extent, weather conditions can be predicted. It is this cave breathing which led to the cave's discovery, and this action still exists, even today.

Partly because of the breathing activity, the temperature of the cave remains at a constant 47 degrees the year around. Along with this cool condition, the humidity remains rather high, so you feel the cool dampness as you walk through the cave.

3. THE INFLUENCE OF MAN

During this country's westward expansion, the Black Hills meant different things to different people. To the Sioux nation of Indians, the "Paha Sapa" was a holy land. Here was the home of the Great Mystery, the Wakantanka. It was a place to cure illnesses in the warm springs and hunt wild animals.

By the treaty with the Sioux at the Peace Council of Laramie in 1868, the white man agreed he would not invade this sacred region. The discovery of gold in the Black Hills in 1874 changed his thinking on this commitment. From that time on, gold seekers filtered into the Black Hills until the Dacotah Sioux finally lost their "forbidden land." Some individuals homesteaded after the gold rush was over and the area became partly settled.

There were many caves in the Black Hills, and the Sioux people believed these crystal caves, hidden beneath the ground, held great mystery. They also believed that great streams of bison emanated from these caves at night to populate the plains with vast herds. Thus it was that the Indian was superstitious of these holes in the ground and, for that reason, Wind Cave remained undiscovered until found by the white man.

Several individuals lay claim to the discovery of the cave, but in all probability it was Jesse Bingham, accompanied by his brother, Tom, who first made the discovery in the spring of 1881.

Jesse was hunting deer up a ravine when he was startled by a loud whistling noise. At the same time, he noticed the grass waving violently on an otherwise calm, windless day. When Tom joined him, they investigated and found an 8- to 10-inch hole in the rocks through which wind blew with such force that it lifted the hat from Jesse's head as he tried to peer into it. After speculation as to what caused the wind, they marked the hole and rode off in pursuit of deer.

Sometime later, Jesse returned with his friends to show them the wind and hat trick, but much to his surprise the wind was blowing into the hole. The wind sucked the hat from his hand.

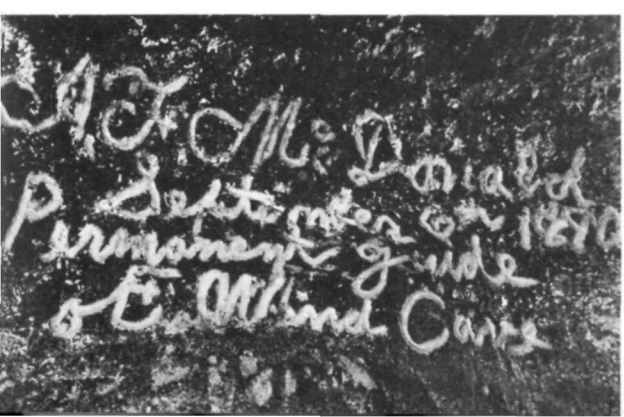
Jesse had a reputation for being a notorious renegade, and had been in trouble with the law. Since his brother, Tom, was a more respected citizen, he was eventually credited with the cave discovery. Today you can see this natural "blow-hole" about 200 yards north of the administration building and adjacent to the walk-in entrance of the cave. There is no conclusive evidence as to who actually first entered the cave, but, in succeeding years, many people made various attempts to explore it. Records indicate the first party visited the cave on July 17, 1886.

It was not until 1890 that a company called the South Dakota Mining Company filed location certificates on the cave. That same year, this company hired J. D. McDonald and Sons to manage the property. The McDonalds began serious explorations of Wind Cave and conducted guided tours. One of their boys, Alvin, was very enthusiastic about the cave, and went about exploration work rather systematically. He left an accurate diary of his activities.

Alvin named rooms, cave formations, established routes, and estimated distances. Much of this information is still in use. He died of pneumonia at the early age of 20 in 1893 after excessive exposure in the cave. He was buried near the cave entrance, and a bronze plaque still marks his grave.

An early photo of Alvin McDonald.

Inscription on cave wall
by Alvin McDonald.



By 1891, the McDonalds were not making a profit in their cave operation, and sold a half interest to John Stabler. A year later, McDonald, Stabler, and several other stockholders organized the "Wonderful Wind Cave Improvement Company." This company made improvements in the cave—more passageways were opened, stairways were built, and the Wind Cave Hotel was constructed.

Serious controversy developed in succeeding years between the McDonalds and the Stabler families over ownership of the land. After considerable litigation in the courts, the area was turned over to the Department of the Interior to administer.

On January 9, 1903, President Theodore Roosevelt signed a bill establishing Wind Cave National Park for the perpetual enjoyment and inspiration of the people.

A significant change in the park came about in 1912 when an area to be known as the Wind Cave National Game Preserve was established within the park boundaries. Here, herds of bison, elk, and antelope were gradually built up until the park now has one of the most impressive wildlife displays in the country.

4. PLANTLIFE

After the gigantic upheaval of the earth's crust by which the Black Hills came into being, the barren rock was exposed to the weathering action of the elements. The combined action of erosion, primitive plants, and decay eventually built up a thin mantle of soil. In this soil bed, various species of flora were able to gain a foothold and grow.

These plants are not the same ones we find at Wind Cave today. Flora, like the living organisms of which it is composed, is constantly changing, never in a state of rest. Some plant species, which were unable to adapt themselves to varying environmental conditions, have died out, succeeded by others which have come in and become established. Thus, variations in plant cover have existed in the Black Hills, depending upon the climate, altitude, and soil type.

Wind Cave National Park is in the lower periphery of the Black Hills. As a result, some of the flora found in the center and higher elevations of the Hills is absent from the park. Instead, a mixture of pine savannahs characteristic of the foothills region is intermixed with an upland prairie grass association.

The grasslands are the park's major botanical value, and are made up of several interesting types native to the Western Plains. As a mixed-grass prairie, it is composed of both medium-tall and short-grass types. The most abundant tree is the ponderosa or yellow pine which makes up almost all the forest cover. A few Rocky Mountain and dwarf junipers are interspersed with the pine in some places along with several deciduous trees.

Wildflowers add to the floral scene. Included are species associated with both the ponderosa pine forest and open grassland prairies.

Perhaps the most interesting aspect of the park's botanical story is the "East meets West" concept. A number of plants typical of the West grow here, almost at the easternmost extension of their range to compete with plant species characteristic of the East which have reached their westernmost range.

A prime example of this is the bur oak and American elm (typical of the East) growing in association with the ponderosa pine and Rocky Mountain juniper (typical of the West). The oak-ash-elm deciduous forest climax found in the lower canyons of the park may be a dwindling vestigial remnant of what was once a more extensive deciduous forest that may have flourished during a more favorable climatic interval. On the other hand, it is possible that some of these hardwood tree associations have reached the Black Hills only recently, and have hardly had time to become thoroughly established. At any rate, they are found here in what is an extremely western extension of their present range.

Trees

Pine forests dominate the park landscape, and the **ponderosa pine** occurs in the park either as stunted, widely scattered individual trees or in open stands. A forest of ponderosa pine is pleasing in appearance, with its tall, straight, evenly-spaced trees and clean forest floor. Being extremely hardy, this tree thrives on rocky soil containing little or no humus. It tolerates heat and light, and has roots growing so deeply it is not easily blown over.

The needles of the ponderosa pine are from 5 to 7 inches long, dark green in appearance, and grow in bundles of two or three. The bark of young trees is black and deeply furrowed, while the bark of older trees is composed of irregularly shaped scales of cinnamon red color.

The name "ponderosa" was suggested in 1826 by David Douglas because of its ponderous bulk. The brown cones are 3 to 6 inches long, and frequently grow in clusters. Each cone scale has a slender prickle on its tip.

The **Rocky Mountain juniper** is closely associated with the ponderosa pine in some of the drier, rockier regions of the park. It is an extremely hardy tree, and can survive under the severest weather conditions. Because of this ability, it has a wide range of distribution throughout the country.

At best, the Rocky Mountain juniper is a small tree, about 40 to 55 feet high and no more than 30 inches in diameter. Its dark green, awl-shaped leaves are small and flattened, some being sharp-pointed and others smooth and scalelike in appearance. It bears little, bluish berrylike cones which mature in two seasons and provide food for numerous birds and animals. The wood and

foliage has a pungent odor. Because of this characteristic, it has often been incorrectly called a "cedar."

A low-growing cousin of the Rocky Mountain juniper is the **common juniper,** which forms a dense mat of sprawling bush shrubs on the forest floor beneath the ponderosa pine.

Several deciduous tree species are found along streamcourses and valleys. The most common of these is the **American elm,** This dignified tree has a deliquescent or vase-shaped crown of great beauty and symmetry. Its lopsided, double-toothed leaves with parallel veins often grow from 2 to 5 inches long. The leaves terminate in a sharp point. In September, the leaves turn a golden yellow to provide a striking contrast to the perennial green of the evergreen forest. This tree reaches its westernmost natural extremity in this region of the Black Hills.

The **green ash** grows along streambeds and canyon bottoms. Its leaflets are narrow, with saw-toothed edges, and are bright green on both the upper and lower surfaces. It is exceedingly hardy to climatic extremes, and, although naturally a moist bottomland or streambank tree, it will persist on dry sterile soils.

The **boxelder** is scattered in company with its other bottomland hardwood cousins. Its short, crooked trunk usually divides into several irregularly spreading branches to form a wide bushy crown. This ash-leaved maple adds to the color when its leaves turn yellow in autumn.

Another close associate of the bottomland hardwood complex is the **bur oak.** It appears as a shrubby small tree in this region, and only isolated individuals are found in the park. Its peculiar ink-blot shaped leaf, fringed acorns, and corky twigs make it easy to recognize.

The **plains cottonwood** is another picturesque deciduous tree which grows in the canyon bottoms. This tree displays spreading branches which form a broad, open head. In size, it reaches from 60 to 90 feet high, with trunks 3 to 4 feet in diameter. The cottonwood has always been sought by both man and animals as a shade tree because its broad, triangularly shaped leaves help provide a canopy against the hot summer sun. The leaves have a leathery texture, and are bright green until they turn yellow in autumn. By May, the tiny fragile seeds, with fluffy white down, are scattered by the winds, and give this tree its name. Mature

FENDLER WOODS ROSE

BULL THISTLE

AMERICAN PLUM

HORSEMINT

ROCKY MTN. JUNIPER

BRACTED SPIDERWORT

PRICKLYPOPPY

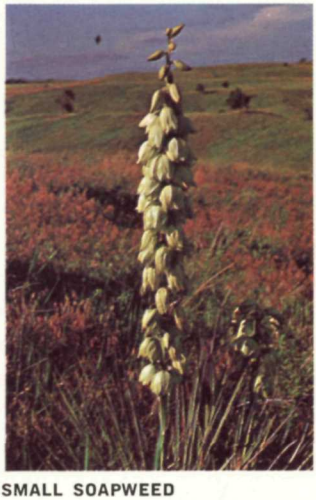
PLAINS ERYSIMUM

COMMON CHOKECHERRY

AMERICAN PASQUEFLOWER

BLUEBELL

PRAIRIE CONEFLOWER



SMALL SOAPWEED

BIGBRACT VERBENA

BROWN-EYED SUSAN

BUSH MORNING-GLORY

CURLYCUP GUMWEED

COMMON STARLILY

trees have thick, deeply furrowed bark several inches thick which offers insulation against fire.

Sometimes confused with the quaking aspen, isolated stands of **paper birch** are found along park streambeds. This delicate tree is characterized by a smooth white resinous bark, marked by long longitudinal lenticels. The bark separates freely into thin papery plates which are impervious to water. Indians and early pioneers used sheets of this bark material to make shoes, canoes, and boxes.

Shrubs

Equally important as a vegetative cover are the many kinds of shrubs which grow in canyon bottoms and ravines. These are low growing, and most of them produce edible fruits utilized by the park's wildlife.

The **common chokecherry** is a small tree of widespread distribution. It sprouts prolifically, and is very hardy even under the severest conditions. In spring, it blooms profusely with fragrant flowers. These become bright red berries which turn shiny black when ripe. The fruit is a favored food of birds and smaller animals, and is still used by man for making jams and jellies.

The **American plum** is another shrub with an edible fruit, found growing side by side with its close relative, the chokecherry. A particularly beautiful flowering shrub found at Wind Cave is the **Fendler woods rose.** Its pinkish white flowers add to the floral display, and its rose hip fruit is eaten by many birds, especially the sharp-tailed grouse.

The **true mountain-mahogany** is a hardy shrub which grows on dry canyon slopes, mostly in the southeastern corner of the park. It has a resinous evergreen leaf and a peculiar long feather-tailed seed. The elk and mule deer prefer it as a favorite browse food.

Another shrub which forms cover for rabbits, chipmunks, and other small animals as well as providing food with its berries is the **Rocky Mountain sumac** (sometimes called the **skunkbush**). These plants bushed together with the **golden currant** make up dense thickets in park ravines.

The **western snowberry** (or **coralberry**) produces clusters of white berries highly favored by birds as a source of food. They are low growing, and have dark green leathery leaves.

In winter, the park landscape, except for the evergreen trees, is brown, drab, and dead-looking. But a surge of life appears early in April. At that time, warmth from the spring sun motivates fresh green grass shoots to leap forth, and wildflower blossoms help decorate the scene.

One of the first to volunteer is the **American pasqueflower** with its pale blue bloom. The flower buds, quite furry at first, come directly from a buried root crown before the green leaves appear. As the State flower of South Dakota, it leads the parade of changing flower display.

Growing close to the ground is a delicate little five-petaled flower called the **lanceleaf spring-beauty.** Its rose-colored blooms hint that winter is really over and that spring is on its way.

Out in the open ravines, the **spreading thermopsis** displays its standard of yellow blossoms during early days of spring. Tucked away in dry, rocky areas, the dainty **starry cerastium** forms a dense mat of white flowers. Each flower petal has a notch at the apex, resembling two little mouse ears together.

The **pricklypear** is a spiny member of the park floral display. Usually growing on south-facing hillsides, it bears soft juicy fruits which are edible when the prickles on the skins are removed. Three-inch, shiny bright yellow flowers erupt from the edge of a flat oval joint when the plant blooms.

Another sign of spring is the appearance of the early-blooming **common starlily.** Its star-shaped, white flowers nestle between long, narrow grasslike leaves. This low-growing plant dots the prairie land in white-speckled profusion, heralding a season of new growth.

Tall sentinel stalks of the **small soapweed** (or **Spanish bayonet**), growing as high as 4 feet, bear podlike flowers in June which hang like drooping bells. Their leaves are narrow, stiff, and yellowish-green in color, and sharp at the tip.

The **Rocky Mountain iris** is a conspicuous early plant with long, drooping flower petals on stalks 8 to 15 inches high. It grows in moist areas, with flowers of soft blue shades to decorate the park landscape. The parent plant is the "wild flag," from which our highly developed irises have evolved.

LITTLE BLUESTEM (AUTUMN)

GUNNISON MARIPOSA LILY

SCARLET GLOBEMALLOW

ROCKY MOUNTAIN SUMAC

PRAIRIE & FLOWERS

SCENIC VIEW

BATS AT REST

PRAIRIE RATTLESNAKE

PORCUPINE

PRONGHORN ANTELOPE

MULE DEER DOE

COYOTE

BUFFALO CALF

PRAIRIE DOG

SHARP-TAILED GROUSE

Found in sandy places and along hillsides, the various species of **beardtongue** display a variety of colors — lilac, pink, and lavender blue. One of its five stamens is sterile, flattened, tongue-like, and often bearded at the tip, thus accounting for the common name.

Stemming from a bulbous root on a slender stem, the showy three white, tuliplike petals of the **Gunnison mariposa** speckle the dry, rocky hillsides of the park during June. When early explorers saw these delicate lilies floating like butterflies above the other flowers, they applied the Spanish name to this plant.

The **golden** and **Fendler groundsel** comprise a large group of plants which are difficult to distinguish. They all have yellow-ray and disc flower heads, with one to several in a bunch on one plant at the apex of a branch.

A tall-growing shrubby herb, the **American licorice** has compound locust-like leaves and yellowish-white flowers. It displays clusters of brown burs covered with hooked prickles, reminding one of a cocklebur. The roots are large and grow sweet-tasting tubers which the Indians used for food. This plant is found growing in meadows and on roadsides.

A delicate but inconspicuous plant, **common blue eyed grass,** is a diminutive cousin of the wild iris. Its star-shaped, dark blue flowers protrude from stiff stems having grasslike leaves. This flower blooms only in the forenoon when exposed to the sun.

What appears to be an individual flower in the **upright prairie coneflower** is actually a whole bouquet. In reality, a collection of tiny flowers are packed together as the head of an inflorescence. This conelike center of separate blossoms is ringed by yellow, petal-like rays called bracts. Found in moist, shady places, this close relative of the black-eyed susan grows several feet tall.

The yellow, five-petaled flower of the **montpelier cinquefoil** bears a striking resemblance to a single yellow rose or is sometimes mistaken for a buttercup. Interestingly enough, the scientific name of this plant means "powerful medicine;" it was used during the Middle Ages as a medicine. It has compound leaves, usually five in number, from which it derives its common name from the French word meaning "five fingers."

Growing low to the ground, forming a dense mat, the **Hoods phlox** has short, leafy stems, opposite leaves, and pale blue or

almost white stemless flowers. It grows at the edges of pine woods, among grasses, and often under bushes, first blooming in late May through June.

In damp, sandy places along stream bottoms, the beautiful **bracted spiderwort** begins to appear in June and blooms through August. Its long narrow, grasslike leaves form a striking contrast to the single, three-petaled, blue-purple flowers with the specklike yellow anthers.

The **plains erysimum,** frequently called the **wallflower,** is not as the name implies but rather a showy, handsome flower. This member of the mustard family has flowers which range in color from pale yellow to rich bronze shades. The terminal head of this plant consists of clusters of individual four-petaled flowers about one-half inch in diameter, arranged like a Maltese Cross. They are found growing in the open along park roadsides and out in the prairies.

Secreted in moist places throughout the forest, small clumps of the delicate **darkthroat shooting-star** appear in May with their nodding heads. The soft pink of their petals contrasts sharply with the conspicuous, almost black, "bill," separated by a circlet of white. These up-ended, rocket-appearing flowers stand suspended from a slender pedicel attached to a single stout main stem which may stand 8 to 10 inches above the ground.

Pink trumpet-shaped flowers, scattered freely along the outer third of stout yellowish stems which form a thick, dense bush, identifies the **bush morning-glory.** Each bush may stand as high as 2 feet, and its leaves are narrow and linear, usually about 2 inches long. One unusual thing about this plant is the large, spongy root it produces. These tubers are still prized by the Sioux Indians for the medicinal values they contain.

Also known as the "bellflower," the **little harebell** is the true **bluebell** of Scottish song and story. These graceful flowers will wave in the slightest breeze as they hang from wiry, hairlike stems. This plant's stem leaves are linear in shape, but its basal leaves are heart-shaped. Its dainty flowers appear in June to decorate the prairie with their sprinkling of blue color.

The blue **bigbract verbena** is a tall herb which grows along trails and roadways. Its small, purplish-blue flowers appear along the sides of a stiff stem which grows from 1 to 4 feet tall. These

flowers start blooming at the base of the flowering stem tip, appearing progressively further up on the tip as the plant matures. Its coarse leaves are deeply toothed and spear-shaped.

Truly a weed, the **pricklypoppy** displays a beautiful white flower, sometimes 3 inches or more in diameter with six brilliant white, crepe-paper-like petals, featuring a center of spun, gold-flowering parts. This coarse plant has large, prickly thistle-like leaves. Appearing late in summer, it can be found along roadsides and open areas.

The **meadow salisfy** (or **goatsbeard**) displays a large, yellow star-shaped flower which eventually forms a delicate, fluffy sphere as it goes to seed. At first, it appears to be a large dandelion that has gone to seed, but closer examination discloses the long, narrow, tapering leaves and larger size to be the whole plant.

Sometimes called the horsemint, the **wild bergamot beebalm** is a showy plant, with a fuzzy looking, lilac-colored flower head. Large patches of this plant appear in late summer in open meadow areas. Its leaves are broadly toothed blades, ovate or lanceolate in shape. Its genus name, *monarda*, refers to Monardez, a Spanish writer on medical plants.

One of the showiest flowers and a member of the composite family, the **common perennial gaillardia** is sometimes called the blanket-flower because it is found in profuse concentrations in some States. Its brilliantly colored flower heads are 2 to 3 inches across, and have dark red to brownish centers with golden yellow ray and disk flowers, each having a tri-notched apex. This characteristic helps to distinguish this flower from the **brown-eyed susan.**

Worthy of being considered the national flower because of its universal abundance, the **Missouri goldenrod** waves it banner-like flower-head in all parts of Wind Cave in July through September. The flower arrangement is pyramidal in shape, consisting of a dense spray of small yellow flower-heads, not over one-third of an inch in length. It is an herb with alternate leaves, and may be 2 to 3 feet in height. This plant has been falsely accused of causing hay fever; this is not true since its heavy, sticky pollen is not blown about by the wind but carried only by insects.

The **black-eyed susan** is a large, daisy-like flower that grows 2 to 3 feet in height. This native biennial plant displays a

hairy stem, and its large flowers are golden yellow with a brown-black, cone-shaped center. There may be 10 to 20 petals on a flower, and each petal has a notched tip.

The **common sunflower** is found in Wind Cave, but not in such great abundance as in the plains and prairie country. In the park, they grow 3 to 4 feet tall, with rough, hairy stems which branch several times near the top; each separate branch produces a brilliant, yellow ray flower with dark purplish disk flowers. This plant is found in waste places in the park, and blooms in late summer.

The **curlycup gumweed** is a many-branched plant, with numerous bright yellow flowers. Each flower has a roundish center bud covered with a sticky white substance which makes this plant easily recognizable. This gummy material sticks to the hair of animals that rub against it, and causes them to appear darker than normal when dust and dirt adheres to this sticky coating.

Grasses

When white man first began exploring the Great Plains and the fringes of the mountains, the vegetation was undisturbed by his influence. Even the vast herds of wild grazing animals had not seriously affected the conditions of this grassland range. After settlement, overgrazing had, in some cases, a profound effect. Today, a representative sample of upland prairie vegetative cover is preserved at Wind Cave.

The composition and very existence of certain grasses in this upland prairie depends upon several factors. Climatic conditions as they affect water content of the soil, soil types, and topography are primary factors which influence the nature of the vegetation. The open meadows resulting from establishment of certain grass types, interspersed in the ponderosa pine forest, make up the upland prairie grassland of Wind Cave.

There are certain dominant species of grasses, herbs, weeds, browse, and shrubs which make up this complex. The grass community found in Wind Cave is made up of mid- and shortgrass types. Predominant among these are the **blue grama, western wheatgrass, little bluestem,** and **threadleaf sedge.**

Blue grama is a short grass with crest-like seed heads which bend in a curve resembling a human eyebrow. It will grow on all

soil types, but most abundantly on the heavier rolling upland soils. Hidden most generally by the midgrasses, it nevertheless grows as the most abundant grass species at Wind Cave. The bison prefer it to most other grasses.

Western wheatgrass is a perennial, sod-forming grass which reproduces from underground stems and seeds. Being one of the midgrasses, it may reach 3 feet in height. Its stiff leaf blades feel rough when pulled through the fingers because of the harsh veins on the upper surface. As an extremely nutritious grass, it is preferred by grazing animals.

One of the most widely distributed perennial grasses in America, **little bluestem** is a vigorous, long-lived native bunchgrass. It can be identified by its flat, bluish-colored basal shoots and its leaf blades which tend to fold. After a frost, the fields of little bluestem have a reddish cast. This grass provides nutritious grazing, and has been cut for hay since early settlement days. Often growing in close proximity to its cousin, **big bluestem,** it is readily recognizable because of its smaller size.

This low-growing, dark green plant can be readily recognized by its triangularly shaped stems, solid between the joints and tubular leaf sheaths. It is preferred as a succulent food source by grazing animals.

Species of carex or sedges number well over 500 in the country. They are widely distributed in both lowland and upland habitats, but prefer the moist soils of meadows, marshes, and bogs.

Well over a dozen more grasses and sedges help complement the four predominant ones just described. And from an esthetic viewpoint, grasses individually do not appear as spectacular as a wildflower display. Collectively, however, a vast undulating sea of grass is a pleasing sight and forms a most important part of the ground cover.

It is not fully realized how much depends upon good grassland cover. Without this protective mat of vegetation, the topsoil would erode away, and ground nesting birds as well as other small animals would not find refuge. The larger grazing animals derive their entire subsistence from grass; without it, they would not survive. With proper management, this upland prairie can be preserved in its optimum condition, and a balanced biota can be upheld.

5. ANIMAL LIFE

Dwellers of the Land

Mankind has long delighted in the unrestricted observation of wild creatures. It never ceases to be a memorable experience for observers, whether hunting with a gun or camera or just plain sightseeing, to thrill at the sight of wild animals in their natural environment.

In the early days, hunting of wild game with bow and arrow or gun was necessary for survival. Today, hunting animals with a camera is a far more popular activity. And where else but in national parks and wildlife refuges can these creatures live out their lives in natural surroundings, with man on the sidelines as an observer?

At Wind Cave National Park, one of the finest displays of wildlife, once characteristic of the Great Plains, is preserved and protected. Herds of the mighty bison, American elk (or "wapiti" —not a true elk, the moose being the American representative of the Old World elks), the swift pronghorn (antelope), the stout-bodied mule deer, and the gregarious prairie dog live within the confines of Wind Cave.

To the vast majority of visitors, the **bison** is the most majestic, picturesque animal in the park. Vast herds of this great shaggy beast once roamed the plains. At one time, this species was on the brink of extinction, but today herds are being preserved in Wind Cave and other wildlife sanctuaries.

To many people, the bison is symbolic of our Nation. It is worthy of this honor, for it is the largest North American mammal. By tradition, this animal has been known as a "buffalo," and the name is still used, but that name actually belongs to a species of African and Asian buffalo.

As a member of the cattle family, bison have cloven hooves and chew their cud. Both cows and bulls grow a true horn, supported by a bony core. Their most distinguishing characteristic is the conspicuous hump they display. It is caused by elongated spines of the backbone.

A record bull bison may weigh well over a ton, but cows only half that much. Being gregarious by nature, a bison is basically a herd animal. Bulls stay with the herd during the "rutting" or "mating" season in late summer and early autumn, but the rest of the year they generally separate from the cows, their calves, and the remaining juveniles.

During the mating season, many fights develop between the bulls for possession of the cows. As a prelude of these contests, much bellowing, snorting, and pawing of hooves takes place as the combatants continually vie each other for supremacy. If you are fortunate to see two large bulls battling it out, you are in for the thrill of a lifetime. Nothing stands in the way as small trees and anything else may be knocked down as these seemingly ponderous beasts lightfootedly push each other around nature's arena.

The bison appears to be a slow-moving animal with all its great weight and bulkiness, but, when aroused, it can wheel and charge instantly. It is unpredictable by nature, and should never be taken for granted.

Bright tawny to buff-colored calves appear in the spring between mid-April and June. They resemble domestic calves at first, and do not display the hump. Several months later, their hair begins to darken, and they begin to show the hump feature. By then, they truly resemble their elders. Since the cow's milk is scanty, the youngsters are grazing with the herd within 4 to 5 months after birth.

In the spring also, the bison begins to shed its heavy winter coat of hair, and it hangs about the animal in tatters. The bison helps the shedding process along by rubbing against any available rock, tree, or signpost. In addition, it enjoys rolling in "wallows" —saucer-like depressions formed by this activity. This "wallowing" is a form of dust or mud bath to help get rid of plaguing insects.

A bison bull reaches its prime in about 6 years, but a cow may have calves when it is 3 years old. Normally, a bison lives about 15 to 20 years, but occasionally one might live for 30 or 40 years.

Regardless of when you visit the park, you should be able to see the bison. It is not confined to any particular part, but roams throughout the entire area as do other animal species. They quite often show up close to park roads.

The agile **pronghorn (antelope)** is truly a native. It is not a true antelope, but instead represents the only member of its family on this continent.

As with the bison, the antelope felt the pinch of the country's westward expansion. It was almost exterminated, but, through the efforts of conservationists, this true "westerner" was saved.

No other animal is more strikingly beautiful than the pronghorn when it "poses" on the open plains. Its rich brown coat lightens to an almost creamy white on its underparts, the sides of its face, and on its rump patch. The two broad white bands extending across its face contrast to the dark brown to black of the mane which spreads forward on each side of the neck.

The male buck displays a black mask of hair over most of the face. The most striking feature of the pronghorn is the rump patch of white hairs which can be lifted to form a rosette of raised hairs, much like a gigantic powder puff. These extended hairs actually shine, so when the rump patch is "flashed," it can be seen far across the plains by other animals of the herd. This warning system is used as an alert if danger is near.

Large, deep-set eyes are indicative of the pronghorn's keen eyesight. In fact, it has been credited with a certain amount of telescopic vision. Its hooves are deeply cleft and widely spread, enabling it to run swiftly over uneven surfaces.

Both sexes are relatively small in size. A large specimen is about 3 feet high at the shoulders. The buck, full grown, doesn't weigh more than 100 to 120 pounds, and the doe is even smaller.

This animal is named for its hollow, pronged horn. Other animal species with true horns retain them throughout their entire lives; the pronghorn loses its horns each year. They grow over a bony core, and are shed in early winter and grow back again by summer. Both bucks and does have horns.

The pronghorn is one of the fleetest animals afoot. It can maintain speeds of about 35 miles an hour, and it can run in spurts up to 70 miles an hour. Sometimes, it is seen running and racing for what seems to be the sheer fun of it. Often, it plays "follow the leader;" many times, it will seem to challenge passing cars to a race.

The pronghorn subsists in arid lands where grass is scarce because it actually prefers a browse diet of shrubby plants and many

weeds. It only chooses grass in early spring when the young shoots are just beginning to appear.

Like many other wild animals, mating takes place in autumn. In the spring the does drift to "kidding areas," where the young are born. Twins are common, and a single kid is the exception. Newborn kids have no scent, and rely on this characteristic to save them from predators while they are defenseless. They are pale in color, and lack the spots common to fawns of deer and elk. When only 3 days old, a pronghorn youngster can outrun a man, and when only 6 days old, outrun the average dog.

In beauty of form and grace of movement, few animals can equal the pronghorn. Its contrastingly marked body posed against a clear, blue western sky makes it a favorite subject for wildlife photographers.

"Towns" of the **black-tailed prairie dog** are scattered throughout the park; two of the largest ones are on the main park road. The prairie dog is, in reality, a ground squirrel. Its generic name, *cynomys,* means doglike mouse. Its only similiarity to a dog is its barklike call.

The prairie dog is a plump, short-eared burrowing rodent with coarse, buff-colored fur. It is highly sociable by nature; by living in densely populated colonies, they enjoy protection in numbers. Individual families occupy each burrow; collectively, these burrows are grouped together in towns. If danger is imminent, a "sentry"—one is constantly on duty—sounds the alarm with a shrill, piercing chirp or whistle. This so-called "bark" from which the prairie dog gets its name is accompanied by a flip of the tail, an upthrust of the sleek body, and an extension of the small forepaws skyward. Immediately following this action, the animal ducks into its burrow to wait out the situation. Other members of the community behave in a similar manner, and if a predator happens to be nearby, the whole town quickly dives into their burrows to safety.

Once below ground, each animal occupies its listening post niche just below the entrance to its burrow. When all-clear is determined, the animals pop out of their burrows, one after another. So, in keeping with this warning system, you will have more success watching prairie dogs from the road with the aid of binoculars than if you try to walk into the town among the burrows—by so doing you simply chase them underground.

The burrow is the prairie dog's home, and consists of a main vertical tunnel with several laterals. A mound rings the entrance to each burrow, and serves as a watchtower as well as a dike to keep out water from heavy rains. Dirt from excavating the burrow is used to build the mound, and the dogs pound this dirt into place with their noses. The vertical tunnel is 10 or more feet deep; going off horizontally from it are a living chamber, nesting chamber, and listening niche near the entrance. In older towns, many burrows are interconnected so that more than one entrance exists.

Prairie dogs mate in late winter, and some 30-odd days later, the young are born in litters of about five. Each pup doubles in size by about September when it is completely weaned. At this time, it automatically leaves the "nest" to find a new place of abode.

Since prairie dogs are omnivorous, you may see them eating many different kinds of food, but they eat far more vegetables than anything else. Because they live in semiarid climates, they seldom have an opportunity to drink water, so they obtain needed moisture from the juice of green plants and the roots of perennial grasses.

Though the prairie dog does go below ground for varying periods during the winter, it is not a true hibernator. It exists through the winter mainly on fat accumulated during the plant-growing season.

The prairie dog has many enemies. Badgers, eagles, coyotes, and black-footed ferrets appear to be the most successful predators. Rattlesnakes and burrowing owls are two other mortal enemies. The sentinel system and deep burrows are the best safeguards this little animal has against its common enemies.

It takes a keen observer to see the **American elk** (or **"wapiti"**). It is quite a timid animal even though it may weigh 700 to 800 pounds as an adult. The male or bull displays a spectacular spread of antlers, sometimes as wide as 60 inches. These antlers are shed each year, and a new growth occurs. The female, or cow elk, do not have antlers.

The elk is a member of the deer family, and is exceeded in size only by the moose. It is typically deerlike in body form and appearance except for the maned neck. You cannot help but notice the mane, for it consists of much longer hair than is found on the rest of the body. An elk's pelage varies from light brown to a definite reddish brown, depending on the time of year.

The large, pale-yellow rump patch distinguishes the elk from all other hoofed mammals.

Elk calves are born in late May or early June, and their reddish-brown color is speckled with spots for the first few weeks. They are soon able to run with the herd, and are extremely hardy.

To hear a bull elk "bugle" in autumn during the mating season is enough to send chills up and down your spine. This bugling starts with a low, hoarse bellow, rises to a clear, high-pitched tone, then explodes into a series of grunts. Elk bulls challenge each other in this way, and then engage in direct combat for possession of the cow harems.

Chances of seeing elk are good early in the morning or late in the evening in certain areas of the park. Herds can often be seen migrating through the southern end in the vicinity of the Bison Flat Prairie Dog Town. Other favorite haunts are U.S. 385 and 87 and the big flat off NPS 5 in the northern end of the park. Sometimes, they may be seen crossing Red Valley toward Boland Ridge on the eastern side.

A common sight around the headquarters area in winter is the **Rocky Mountain mule deer.** It moves out into the park in summer. Called "muley" or "burro deer" because of its big, black-fringed ears, it is also nicknamed the "jumping deer" from its habit of bounding into the air and landing on all fours.

The double-branched antlers, large broad ears, and rounded, whitish tail with a brushlike black tip, besides being heavier and stockier in form, distinguish the mule deer from its close cousin, the white-tailed deer.

The mule deer displays two distinct coats during different seasons of the year. In winter, it is dark gray, while in summer, the coat is tawny to yellowish brown. Fawns are dropped in June, and are spotted for several weeks after birth. The doe mothers nurse their fawns twice a day, and hide them in the woods. You might spot a fawn, seemingly without its mother, and report that it has been abandoned. Most likely, you have failed to see the mother screened in the background.

An interesting personality trait of the mule deer is that it runs with its tail down, often stopping after it has gone some distance to look back. A white-tailed deer keeps on going once it has started to move, waving its tail like a flag.

Are there any bats in Wind Cave? Strangely enough, there are very few. Occasionally, a **big brown, little brown,** and **western big-eared bat** might be observed hanging from some point on a cave room ceiling or silently flying through a part of the cave.

Contrary to common belief, the bats found in this part of the country will not harm you. They are little mouse-like creatures who fly about eating many more times their own weight in insects each night during summer. In the daytime, they hang by their hind legs in some dark, quiet place, with their wings folded beside them. *There is no evidence to suggest that bats carry bedbugs, and stories about them getting tangled in people's hair are likewise untrue. There is probably nothing a bat would hate worse!*

The bat is the only truly flying mammal. Its body is covered with brown or blackish-brown fur. Its wings consist of skin stretched between greatly elongated finger bones.

This little animal guides itself by sonar or echo-location as it flies about at night. It emits a series of high-frequency squeaks inaudible to the human ear. These cries are deflected by objects in the flight path, and the resulting echoes bounce back, to be intercepted by the animal's extremely sensitive ears. It is thus able to hear the echo which guides it in avoiding obstacles.

Most of the bats migrate to warmer climates each autumn, following a food supply. Few choose to spend the winter in Wind Cave. They are very active on summer nights, and can be observed flitting about under lights in the headquarters area as they harvest insects.

Because the wily **raccoon** is primarily nocturnal by habit, it is not often seen. Besides the black hair which resembles a mask over its eyes, it has a long bushy, alternately ringed black and gray tail. Being extremely clever in its continual quest for food, it will eat birds and eggs, but prefers a shallow pool or stream for what crustaceans it can find.

The formidable **badger** is ferocious by nature, and will not back off from any other animal. With long claws on its pigeon-toed feet and bowlegs, it slinks its underslung body about in search of prey. It is marked by distinctive black and white markings on the head while the rest of the body consists of multicolored hair. At Wind Cave, the prairie dog is one of its favorite foods. It spends a great deal of time trying to dig these little fellows out, and is skilled at this endeavor.

Often called the "clever" **coyote,** this animal is by far the most successful of all larger North American predators contending with the advance of civilization. Its diet is not limited to any one other animal, though it subsists mainly on rabbits and rodents. It is seen in the park, lurking in the prairie dog towns on the prowl for a meal. Actually, the coyote is a balancing factor in keeping down overpopulations of rodents and other small animals.

Easily recognized by its doglike appearance, the coyote displays a bushy, black-tipped tail along with tawny colored fur and sharply pointed ears and nose. Carrying the scientific name, *Canis latrans*, meaning "the barking dog," its rapid yip-yap call early in morning or late in evening is a thrill for those who enjoy the "call of the wild."

Though protected at Wind Cave, it is shot, trapped, and poisoned in areas outside the park. Because of its cunning ability to outwit man and a remarkable adaptability, it continues to survive.

The **cougar** or **mountain lion** occasionally roams the park while making its rounds. The adult cougar may be almost 9 feet long including a 3-foot tail, and can weigh close to 200 pounds. It is a crafty hunter with tireless energy and determination. Deer are its primary quarry, but it will select other animals as well. Chances to see a cougar at Wind Cave are very remote, but an occasional one is reported.

A smaller cousin to the mountain lion, the **bobcat** is a silent prowler, obtaining most of its food by stalking. Its name is derived from its absurdly short, black-tipped tail. In general appearance, it resembles an oversized tomcat. It hunts rodents and rabbits primarily, but also dines on grouse. Classed as a predator, there is a continuing price on the bobcat's head, but it is protected at Wind Cave. Even though it is an aggressive hunter, a small herd of deer have been known to tree and then chase a bobcat.

If you look sharply, you might see a **yellow-bellied marmot** in the rocks around Norbeck Lake. These rodents live in rockpile dens where they pack twigs and grass to make a comfortable nest. Its bushy tail and grizzled hair identify the marmot as does its sharp, single-noted whistle. It hibernates most of the year, except for the warm summer months when it enjoys sunning itself atop a rocky abode.

Sometimes confused with the prairie dog, the **thirteen-lined ground squirrel** may occasionally be seen along the road or in a prairie dog town. Usually a solitary traveler, it is often seen sitting upright, trying to be as tall as possible in an effort to look around. It resembles other rodents in its actions, but the alternate white and black with white-spotted stripes distinguish it from its cousins. Strangely enough, this creature is omnivorous, so it does not restrict its diet to plants.

Continually plagued by threats of sudden death from predators, the **least chipmunk** can often be seen scurrying for a place to hide as it runs with its tail high in the air. Usually, it is alarmed when it sees you, and utters shrill chipping cries as it darts about. Sometimes, it will stop and stare at you intently while it chatters and flicks its tail nervously. This little ground squirrel is only about 8 inches long, including its tail. Its grizzled chestnut hair is striped with five dark and four light-colored lines from shoulder to base of tail. It looks like a miniature squirrel with its fur-tufted tail.

A larger cousin to the chipmunk, the **red squirrel** is the smallest of the tree squirrels. This rust-colored fellow often scolds human visitors to its domain with a frenzy of chattering while it flicks its bushy tail. Usually it lives in the trunk of a hollow tree, and spends most of its time industriously gathering cones from the park's ponderosa forests.

Like a white powder puff, the tail of the cottontail bobs lightly about Wind Cave's forest border and glades.

In Wind Cave, the heavy-bodied, clumsy **porcupine** lives in the ponderosa pine forests because the bark is its main source of food. Its greatest means of protection are the many thousands of quills it carries as pelage. Contrary to popular belief, a "porky" cannot throw quills, but small barbs on the end of each quill become attached by direct contact and are released in this way. You may see one of these fellows waddling down the road on a summer evening as you drive through the park.

The **eastern cottontail** lives in Wind Cave as it does in many other parts of the country. It is a fairly small animal, with fur colored dark brown and mixed with gray. The cottontail's ears are shorter than those of its big cousin, the jackrabbit, from the plains and desert. It relies on protective cover rather than speed for defense against its many enemies, but its conspicuous cottony tail, much like a powder puff, often gives it away. Its diet consists of everything from roots and tops of grasses to herbs and bark of trees. It is most often observed in bush-covered ravines where it feels safe from its enemies.

Scaly Limbless Reptiles

Only one snake in Wind Cave National Park has venomous properties: the **prairie rattlesnake.** This snake is often 2 to 3 feet long, and rarely exceeds a length of 4 feet. Chipmunks, squirrels, cottontails, and mice have been found in the stomachs of these snakes.

You may hike throughout the park hundreds of times and fail to encounter a single rattlesnake, yet this species can hardly be regarded as scarce or rare. If you should encounter a rattlesnake

while walking through grass or in rocky terrain, chances are it will attempt to get out of your way. If it should hold its ground, usually coiled and "buzzing," you can readily cause it to become more reasonable by the use of a fairly long stick.

These heavy-bodied, slow-moving serpents are not aggressive. Danger from snakebite is usually greatest if you are in a region where there are rocky outcrops. In such a case, be on the alert where you place your feet or hands. If walking about after dark, use a flashlight or lantern.

When disturbed, the rattler does give a warning which consists of a sound produced by the vibration of "rattles" attached to the end of its tail. Colored greenish yellow or olive, with a row of large, round, well-separated blotches of brown upon its back, it is not very conspicuous except when it moves. It has the triangular head, characteristic of rattlesnakes.

A rattlesnake will seek refuge in prairie dog town holes when alarmed, but, contrary to popular belief, it does not live in harmony with prairie dogs and burrowing owls.

Larger and with similar markings, the **bull-snake** is often confused with the rattler. This snake kills its prey by squeezing it to death. It is sometimes called the yellow gopher snake because of its reddish yellow color marked with large square blotches of dark reddish brown on the back and sides. The tail is pointed, and its snout is also tapered. This snake is sometimes seen along the cavern entrance trail.

Living at Wind Cave but very seldom seen are three other harmless snakes. The **yellow-bellied racer** is a small snake olive green or yellowish brown, with a bluish tint on the sides and an immaculate yellow on the underbelly. The **Great Plains garter snake** is familiar to most, but a rather unique snake, the **western hognosed,** is worthy of description. It has often been improperly called a "puff adder," because of its characteristic blunt, upturned nose. It appears rather pugnacious, and will rear its head like a cobra, open its mouth wide, hiss, and strike repeatedly when encountered. In spite of these antics, it is a harmless creature whose maneuvers consist largely of bluff.

One ecologist has written, "The more than a million species of living things on this earth form an incomprehensibly complex and intricate pattern of life."

Certainly this is true at Wind Cave where the birds of the East mingle with the birds of the West. The variety is especially great here.

The larger birds of prey are bold and majestic in appearance. Their fierce and penetrating eyes help account for their success as predators. This talent for long-range vision, together with sharp, vise-grip talons, makes them masters at bringing in a meal.

Of the broad-tailed hawks, one of the most common is the **red-tailed hawk**—essentially a soaring bird. Being heavy and sluggish in its movements, it cannot capture many of the songbirds or healthy game birds, so its food consists largely of mice, rodents, and small reptiles. As one of the largest members of the hawk family, it displays broad wings. Its most distinguishing characteristic is a red coloration on top of a rounded tail. It is likewise known for the wide variation in the color of its plumage.

The confusing plumage of the **ferruginous hawk** makes this bird difficult to describe. A rust-colored mantle on the leading edges of its wings explains this bird's common name. Dark-colored thighs and legs form a chestnut "V" against the white underparts as it flies overhead. Being extremely large, it is oftentimes mistaken for an eagle. Primarily a bird of the open prairie regions, it has a fondness for ground squirrels and prairie dogs.

Ideally, the **golden eagle** prefers the haunts of remote mountain ranges. Nesting in tall trees or inaccessible mountaintop ledges, it is a hunter of wild game. This large bird of prey can be recognized in flight by its immense size and long blunt-ended wings with upturned edges. A closer examination reveals a golden crown and nape of feathers, with dark-brown body feathers and a white tail base.

Equal in size to its cousin the golden eagle, but with a more massive head, the **bald eagle** is a majestic, keen-eyed symbol of the Nation's freedom. Preferring forest-bordered lakes and seashores, this eagle feeds mainly on fish. Nests are usually built in the tops of tall trees. Its white head and tail make this bird easily recognizable from others of its size.

A white rump patch always visible in flight is the badge of the **marsh hawk.** Named a harrier because of its ability to hunt by flying low over open ground, this slender hawk has long angled wings and legs with a fan-shaped tail. It feeds chiefly on small mammals, reptiles, and insects.

Quick hard strokes of its slender, pointed wings and an overall sandy color with dark streaks below each eye characterize the **prairie falcon** in flight. Feeding on destructive insects and injurious rodents, one of its favorite haunts in Wind Cave is over the prairie dog towns.

One of the most brightly colored, and also the smallest, of the hawks is the sociable **sparrow hawk.** Actually, its name is misleading for this hawk doesn't feed on sparrows and other small birds, but on mice and insects. Easily recognized by its rufous-red tail and black and white face, it is the only common small hawk that habitually hovers in one spot while stalking prey. It is frequently seen perching on posts and telephone poles along roads.

Sometimes at night, the lights of your car will flash on a huge, gray-black bird. It will either take off from a tree in which it has been perching or swoop in front of you with a slow, rhythmic wing beat. This bird is the **great horned-owl.** Called the "tiger of the air," this bold, persistent, and powerful raider accounts for the death of many smaller animals and birds. Nearly 2 feet long, it displays ear tufts, or "horns," and large yellow eyes. Its call of "oot-too-hoo, hoo-hoo" is very distinctive when heard on a dark, clear night.

Often called "nature's garbage man," the **black-billed magpie** prefers a diet of carrion though it does eat insects and berries. It is a striking bird in appearance, and once observed is never forgotten. The magpie is the only black-and-white land bird with a long-sweeping tail. Marked with a white underbelly and white patches on the upper surfaces of its wings, the remaining parts of its body are black with a bronzy irridescent quality. These birds often gather in flocks, occasionally with crows, and mercilessly harass owls, hawks, and other predators, their raucous, excited chatter being heard for some distance.

Blending with the grasses of the prairies, it is sometimes difficult to see the **sharp-tailed grouse.** About the size of a domestic chicken, the grouse has a short-pointed tail, and its plumage is colored a speckled brown. Its food consists of various kinds of

berries, nuts, seeds, and shoots. This bird is gregarious, living in flocks which become very large in winter.

In spring, parties of the males congregate at dawn on knolls, perform various antics, and from time to time inflate and empty the air-sac (connected with the respiratory system) until the skin is distended to the size and form of half an orange. A loud booming noise is thus produced which is sometimes said to be audible for a mile, depending on the stillness of the air.

In a few days, the females gather, when the cocks engage in furious battles for possession of mates, before whom they strut and swell, with drooping wings and spreading tail, with air-sacs inflated almost to bursting, until the conquest is complete.

Smaller in size than the grouse, the **bobwhite** is considered a quail. Its clear whistle, "bob-white," or "poor bob-white," is considered one of the cheeriest bird calls ever heard. Rather nondescript in coloration, it is an overall rusty brown with a short, round tail. A master at the art of concealment, the bobwhite will flatten itself on the ground and seemingly disappear when alarmed. Be on the lookout for this bird in the park's grassland area.

The **wild turkey,** similar in appearance to those raised domestically, is a common resident in Wind Cave. It is considered to be the only native American representative of the pheasant family.

The **killdeer** is so named because of its oft-repeated cry of "kill-dee," "kill-dee." This long-legged member of the plovers is conspicuously marked with four black bands—two on the head and two on the white chest. The rest of its body is a dull olive brown with a golden red tail. Its habits of feinting a broken wing is a clever attempt to distract intruders from nearby chicks.

A small blue-gray pigeon, the **mourning dove,** is the common wild dove of the West. It is a medium-sized bird, with a plump, full breasted body, rather small and rounded head, short legs which are often red or pink, and downy, sleek plumage that is usually very softly colored. Its familiar cry of "caah-coo-coo-coo," can be heard plaintively echoing in secluded forest glens as this pointed-tail dove and its companions gather on tree perches.

About evening, the graceful **nighthawk** can be seen zigzagging in the shadows, with its white wing crescents showing at each flight turn. Though it may just fly for the fun of it, the nighthawk

is usually scooping insects out of the air. The strange whirring sound heard as this bird terminates a dive is not a vocal cry but is rather caused by the rush of air through the taut feathers of partly spread wings.

The **red-shafted flicker** is a brown-backed woodpecker, very striking in appearance and forceful by nature. As it flies low in an undulating line between trees, a brilliant red wing lining is displayed. The red shafts of wing and tail feathers give this bird its name. Its shrill cry of "wick-wick-wick-wick," with special notes of "flick-a, flick-a," help identify the flicker.

A veritable tyrant of the skies, the **eastern kingbird** displays remarkable courage and spirit when it defends itself against its natural enemies—the crows and hawks. It will simply not tolerate any badgering from these aggressors. A stately bird in action, it is one of the flycatchers. Its long, black fanshaped tail is tipped with a white band; otherwise it is black in color and with white underparts.

Two other members of the flycatcher family—the **Say's phoebe** and **western flycatcher** — both feed exclusively on insects. The phoebe is a fairly small bird, easily recognized by its pale-rusty underparts and full black tail. The western flycatcher displays an olive-brown back and yellow-tinged belly and throat.

The rusty-buff rump distinguishes the **cliff swallow;** perceived overhead it appears squaretailed, with a dark throat patch. It builds mud nests on cliffs or building walls.

A year-round resident, always in fine spirits, the little **black-capped chickadee** makes its presence known with a friendly call of "chick-a-dee-dee-dee." The only small bird with combination black cap, black bib, and white cheeks, it is extremely active as it quickly moves about trees in search of insects.

The **white-breasted nuthatch** may be called an "upside-down bird," for as a tree climber, it has the habit of going down tree trunks head first. Smaller than a sparrow, with a long bill and a stubby tail, it is easily recognized by its white breast, blue-gray back, and black cap.

Larger and slimmer than a robin, the **brown thrasher** has a very long tail and a curved bill, brown plumage, and a speckled breast. It is an accomplished singer and mimic, and has earned

the name "thrasher" because of its habit of vigorously twitching its long tail when disturbed.

To most of us, the **robin** is the first bird to arrive with its cheering spring song, often before the snow has disappeared. One of the most familiar of all birds, it is easily recognized by its gray back and brick-red breast.

Another welcomer of the spring season in the park is the **mountain bluebird.** Except for a whitish belly, the male of this species is a solid azure blue. This mountain dweller fills the air with a sweet warbling song when nesting pairs seek shelter in hollow posts or dead trees in the spring.

As the name implies, the **Townsend solitaire** is a "loner." This slim, gray bird, about the size of a robin, has a distinctive white eye ring. It sings with a clear, sweet voice, sounding very much like the song of the thrush.

Sometimes called the "butcher bird," the **loggerhead shrike** is a born killer, that is, it preys on other smaller birds as well as insects and rodents. It has a peculiar habit of hanging its dead victims in a tree for a future meal. Its coloration is gray above, white below, but with a distinctive black mask through the eyes. Like the mockingbird, it can mimic other birds.

The only bird that appears to be all yellow, the **yellow warbler,** actually has an olive-yellow back. Its cheery song complements its bright colors, and it is a pleasant creature to have around.

The **yellow-breasted chat** is a true merry-maker. Even though you may not be able to see it, you will know this bird by its amazing repertoire of cackles, whistles, barks, mews, and gurgles intermixed with some melodious notes. Notice its plain olive-brown color above "white spectacles" around the eyes, with bright yellow throat and breast. It also has a rather long tail, and prefers living in brushy draws such as are found behind the park administration building.

The **western meadowlark,** arriving early in March and lingering in autumn until a severe storm drives it southward, will generally sing a beautiful warbling song. This prairie dweller can easily be recognized by its streaked brown head and back, yellow throat and breast with its striking black "V."

Totally unlike any other American bird, the **western tanager** is one of the most colorful in the Rocky Mountain re-

gion. Its brilliant orange-red head and black and yellow body set it apart from other birds as a "flashy dresser."

A double-noted cry of alarm — "to-whee" — along with its ruddy colored side plumage is the reason why the **rufous-sided towhee** was given the name it bears. This handsome bird also displays a black head and throat, black back with white spots, and a long, white-tipped tail. It has a favorite habit of rummaging and scratching around in dry leaves for food, much as a domestic chicken does.

Though many species of sparrows are transient in Wind Cave, the **chipping sparrow** is a common summer resident. This bright little fellow is gray-breasted with a bright rufous cap, a black line through the eye and a white line over it.

COMMON AND SCIENTIFIC NAMES OF WIND CAVE'S ANIMALS

Mammals

Badger	*Taxidea taxus*
Bat, big brown	*Eptesicus fuscus*
Bat, little brown	*Myotis lucifugus*
Bat, western big-eared	*Plecotus townsendii*
Bison	*Bison bison*
Bobcat	*Lynx rufus*
Chipmunk, least	*Eutamias minimus*
Cottontail, eastern	*Sylvilagus floridanus*
Cougar, or mountain lion	*Felis concolor*
Coyote	*Canis latrans*
Elk (wapiti)	*Cervus canadensis*
Marmot, yellow-belly	*Marmota flaviventris*
Mule deer, Rocky Mountain	*Odocoileus hemionus*
Porcupine	*Erethizon dorsatum*
Prairie dog, black-tailed	*Cynomys ludovicianus*
Pronghorn (antelope)	*Antilocapra americana*
Raccoon	*Procyon lotor*
Squirrel, ground, thirteen-line	*Citellus tridceemlineatus*
Squirrel, red	*Tamiasciurus hudsonicus*

Snakes

Bull-snake	*Pituophis catenifer*
Garter snake, Great Plains	*Thamnophis radix*
Hog-nosed snake, western	*Heterodon nasicus*
Racer, yellow-bellied	*Coluber constrictor flaviventris*
Rattlesnake, prairie	*Crotalus confluentus*

Birds

Bluebird, mountain	*Sialia currucoides*
Bobwhite	*Colinus virginianus*
Chat, yellow-breasted	*Icteria virens*
Chickadee, black-capped	*Parus atricapillus*
Dove, mourning	*Zenaidura macroura*
Eagle, bald	*Haliaeetus leucocephalus*
Eagle, golden	*Aquila chrysaetos*
Falcon, prairie	*Falco mexicanus*
Flicker, red-shafted	*Colaptes cafer*
Flycatcher, western	*Empidonax difficilis*
Grouse, sharp-tailed	*Pedioecetes phasianellus*
Hawk, ferruginous	*Buteo regalis*
Hawk, marsh	*Circus cyaneus*
Hawk, red-tailed	*Buteo jamaicensis*
Hawk, sparrow	*Falco sparverius*
Killdeer	*Charadrius vociferus*
Kingbird, eastern	*Tyrannus tyrannus*
Lark, horned	*Eremophila alpestris*
Magpie, black-billed	*Pica pica*
Meadowlark, western	*Sturnella neglecta*
Nighthawk, common	*Chordeiles minor*
Nuthatch, white-breasted	*Sitta carolinensis*
Owl, great horned	*Bubo virginianus*
Phoebe, Say's	*Sayornis saya*
Robin	*Turdus migratorius*
Shrike, loggerhead	*Lanius ludovicianus*
Solitaire, Townsend	*Myadestes townsendi*
Sparrow, chipping	*Spizella passerina*
Swallow, cliff	*Petrochelidon pyrrhonota*
Tanager, western	*Piranga ludoviciana*
Thrasher, brown	*Toxostoma rufum*
Towhee, rufous-sided	*Pipilo erythrophthalmus*
Turkey, wild	*Meleagris gallopavo*
Warbler, yellow	*Dendroica petechia*

COMMON AND SCIENTIFIC NAMES OF WIND CAVE'S TREES AND SHRUBS

Trees

Ash, green—*Fraxinus pennsylvanica*
Birch, paper—*Betula papyrifera*
Boxelder—*Acer negundo*
Cottonwood, plains—*Populus sargentii*
Elm, American—*Ulmus americana*
Juniper, common—*Juniperus communis*
Juniper, Rocky Mountain—*Juniperus scopulorum*
Oak, bur—*Quercus macrocarpa*
Pine, ponderosa—*Pinus ponderosa*

Shrubs

Chokecherry, common—*Prunus virginiana*
Currant, golden—*Ribes aureum*
Mountain-mahogany, true—*Cercocarpus montanus*
Plum, American—*Prunus americana*
Rose, woods—*Rosa woodsii* (or *fendleri*)
Snowberry, western—*Symphoricarpos occidentalis*
Sumac, Rocky Mountain—*Rhus cismontana*

WILDFLOWERS, GRASSES, AND SEDGES OF WIND CAVE

Wildflowers

		When Flower May Be Seen
Beardtongue	*Penstemon* spp.	May-July
Bedstraw, northern	*Galium boreale*	May-August
Beeblam, wildbergamot	*Monarda fistulosa*	June-September
Blackeyed-susan	*Rudbeckia hirta*	July-August
Blue-eyed grass, common	*Sisyrinchium angustifolium*	May-August
Bluebell	*Campanula rotundifolia*	June-August
Cerastium, starry	*Cerastium arvense*	April-July
Cinquefoil, montpelier	*Potentilla monspeliensis*	May-September
Coneflower, upright prairie	*Ratibida columnaris*	May-September
Erysimum, plains	*Erysimum asperum*	June-August
Flax, perennial	*Linum perenne*	May-September
Fleabane, daisy	*Erigeron asper*	June-July
Gaillardia, common perennial	*Gaillardia aristata*	June-September
Globemallow, scarlet	*Sphaeralcea coccinea*	May-August
Goldenrod, Missouri	*Solidago missouriensis*	July-August
Groundsel, golden, and Fendler	*Senecio aureus; S. Fendleri*	May-July
Gumweed, curlycup	*Grindelia squarrosa*	August-September
Iris, Rocky Moutain	*Iris missouriensis*	May-July
Larkspur, little	*Delphinium bicolor*	April-July
Licorice, American	*Glycyrrhiza lepidota*	May-August
Lupine. silvery	*Lupinus argenteus*	June-August
Mariposa, Gunnison; segolily	*Calochortus gunnisonii*	May-July
Milkweed, common	*Asclepias syriaca*	June-September
Morning-glory, bush	*Ipomoea leptophylla*	June-August
Nightshade, buffalobur	*Solanum rostratum*	July-August
Pasqueflower, American	*Anemone ludoviciana*	March-April
Phlox, Hoods	*Phlox hoodi*	June
Poison-ivy, western	*Toxicodendron rydbergi*	June-July
Pricklypear	*Opuntia* spp.	May-June
Pricklypoppy	*Argemone intermedia*	June-August
Rose, Fendler woods	*Rosa woodsi fendleii*	May-July
Salsify, meadow	*Tragopogon pratensis*	June-August
Shooting-star, darkthroat	*Dodecatheon pauciflorum*	June-August
Soapweed, small	*Yucca glauca*	May-June
Spiderwort, bracted	*Tradescantia bracteata*	June-July
Spring-beauty, lanceleaf	*Claytonia lanceolata*	March-May
Starlily, common	*Leucocrinum montanum*	May-June
Stonecrop, wormleaf	*Sedum stenopetalum*	June-August
Sunflower, common prairie	*Helianthus (annuus petiolaris)*	July-September
Thermopsis, spreading	*Thermopsis divaricarpa*	April-June
Thistle, bull	*Cirsium lanceolatum*	July-September
Verbena, bigbract	*Verbena bracteosa*	June-August
Yarrow, common	*Achillea millefolium*	June-September

Grasses and Sedges

Bluestem, little	*Andropogon scoparius*
Grama, blue	*Bouteloua gracilis*
Sedge, threadleaf	*Carex filifolia*
Wheatgrass, western	*Agropyron smithii*

With minor exceptions, authority for the common names of all plants and their scientific (Latin) equivalents except trees is the second edition (1942) of *Standardized Plant Names*, edited by Harlan P. Kelsey and William A. Dayton. Authority for the common names of trees is *Check List of Native and Naturalized Trees of the United States (Including Alaska)*, by Elbert L. Little, Jr. (U.S. Department of Agriculture Handbook No. 41, published in 1953).

PICTURE CREDITS:
Lou Ell, Nebraska Game, Forestation and Parks Commission: Coyote, page 31; **Colorado Game, Fish and Parks Department:** Cottontail, page 46.