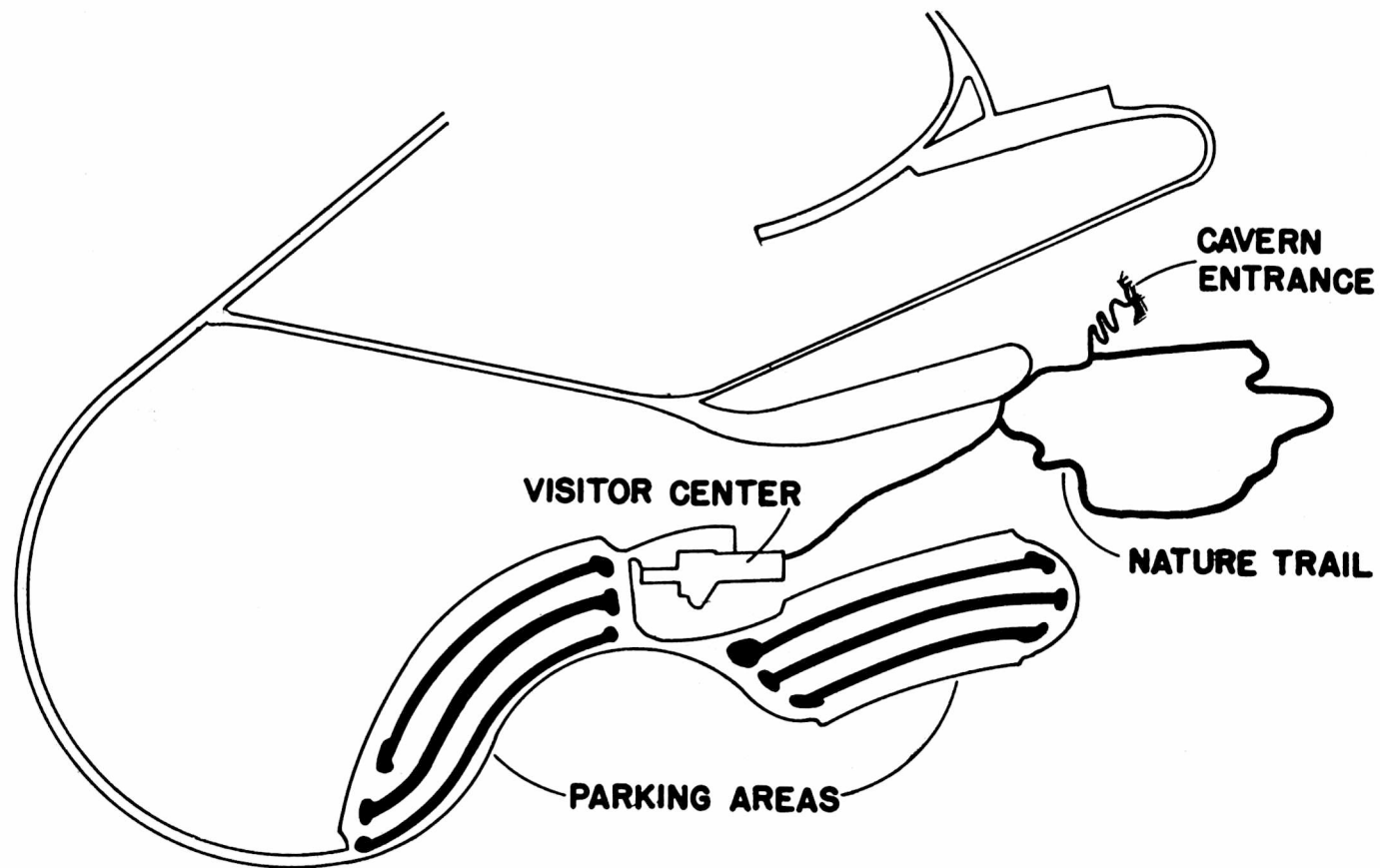


Desert Nature Trail



20c

CARLSBAD CAVERNS NATIONAL PARK
NEW MEXICO



DESERT NATURE TRAIL

A SELF-GUIDING TRAIL

The Desert Nature Trail has been constructed to help you enjoy and understand the natural and historic values of this National Park. Plan to take your time and study the interesting plants and geological features along the paved trail. It starts at the east end of the visitor center and continues on an easy round trip of approximately one mile. (The map on the opposite page shows the trail route in relationship to the visitor center and cave entrance.)

HOW TO USE THIS BOOKLET

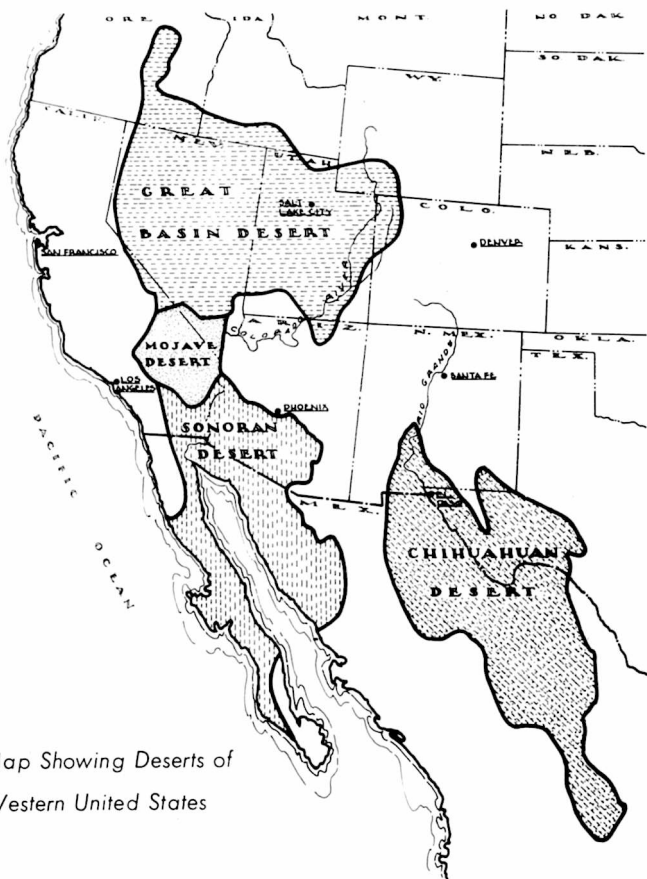
Each object of special interest is marked by a numbered rock. Refer to the corresponding number in this booklet and you will find the name of the feature and a description of it. The first numbered rock is at the trail junction about 75 feet from the east end of the visitor center.

Please remember that in a National Park all plants, animals, and rocks and minerals are protected and may not be collected, disturbed, injured, or destroyed.

WARNING

**DURING THE WARMER MONTHS AND
OCCASIONALLY ON WARMER DAYS
DURING THE WINTER, RATTLESNAKES
ARE SOMETIMES SEEN, PARTICULARLY
IN THE EVENING HOURS. PLEASE
WATCH OUT FOR THEM.**

1. THE DESERT THEME. The story of the Desert Nature Trail is of ecology, or the relations of plants and animals to an arid climate. Carlsbad Caverns National Park is on the northern fringes of the Chihuahuan Desert, one of four major deserts in the western United States. (See map.)



Map Showing Deserts of
Western United States

Look around you. Note the rocky terrain with scant soil and low shrub-like vegetation. Look closely at individual plants. Most have thorns or spines of one fashion or another. In the desert most things for their own protection either stick, sting, or stink.

Notice that plants may have no leaves, or very small ones. The leaves may be curled or long, tapered, and curved. Leaf surfaces may seem waxy and blue-green or gray-green. Also, stems and trunks of most desert plants are tough and hard or thick and fleshy. There are reasons for all these peculiarities and we shall discuss them farther along.

Continue down the trail as far as the bridge and look for wildlife. Do you see any? It may seem that wildlife is scarce. However, animals are really abundant. In daylight most are well camouflaged and resting in shade to escape the direct rays of the sun, or they may live in burrows and come out only at night. Thus desert animals can survive a harsh climate.

2. BRIDGE. This drainage is called Bat Cave Draw; you will walk through part of it farther on. The large tree just to the right of the bridge is a juniper. About 30 feet beyond are two soapberry trees and behind them is a large NETLEAF HACKBERRY, (*Celtis reticulata*). This species is rarely over 30 feet high and quite often is only a shrub. The large size of this hackberry and the other trees and the luxuriant grass, except in winter, reflects the relative abundance of water and a better soil in the bottoms of washes.

Hackberry wood is used to a limited extent for flooring, crating, and fuel. The tree is planted in the south as a shade tree, and its dry fruit is eaten by several species of birds.

TURN RIGHT UP THE HILL. THIS IS THE STEEPEST PART OF THE TRAIL



Texas
Sotol

3. SMOOTH-LEAF SOTOL. *Dasyliirion leiophyllum*. Several of these yucca-like plants are found to the left of the trail. The sotol, pronounced SO-tohl, is a member of the lily family. It exhibits prickly leaves characteristic of many desert plants. The prickles protect it from being grazed by wildlife. The basal parts of the plant when stripped of the leaves may be roasted and eaten or the juice may be distilled to produce an alcoholic beverage known as "sotol."

In periods of drouth, ranchers burn the leaves and split the heads open for cattle to eat. The leaves are used for thatch for roofing and to make mats and baskets.

In spring and summer, when in bloom, a large cluster of yellowish flowers grows on the end of a tall stalk high above the center of the plant.

4. PRICKLYPEAR CACTUS. *Opuntia engelmanni*. The common pricklypear of the Southwest, the Engelmann pricklypear is variable in size and may grow to six feet high. It has yellow blossoms in spring and dark purple fruit in late summer.



Pricklypear Cactus

The pricklypear is one of the desert's most useful plants. Its fruits, called "pears" or "tunas," are relished by livestock and wildlife and may be cooked to make delicious jams and jellies. The fruit juice is often boiled down with sugar to make syrup or candies, or it may be boiled with tallow in candle-making to make candles hard. Indians believed a tea made from the juice would cure ailments caused by gallstones.

The pricklypear has no leaves; the flattened pads are actually stems. When young and tender, the stems may be cooked and served with dressing and seasoning to make a palatable dish. When range conditions are poor, ranchers often burn off the spines to let hungry cattle feed on the fleshy pads. According to folklore, the coyote brushes the spines off the fruit with his tail before eating the fruit.

5. PRICKLYPEAR CACTUS. *Opuntia* species. This is the second species of pricklypear common to the area and differs from the former by having smaller pads and fruit. The pads may be tinged red or purple, and the fruits are red rather than dark purple as in the Engelmann pricklypear. Depending upon the botanist, this plant has been called *Opuntia macrocentra* and *O. Phaeacantha*, but the plant may be a hybrid.

In desert climates, pricklypears resist heat and dry weather by the absence of leaves which might otherwise cause excessive amounts of water loss through transpiration. Chlorophyll, the greenish substance in plants, carries on photosynthesis, or food making, in the stems and a waxy coating over the surface of the pads reduces the amounts of water evaporated. A shallow root system quickly gathers available moisture during rainstorms and stores the water in the fleshy tissues of the pads for long periods of time.

6. WALKING STICK CHOLLA. *Opuntia imbricata*. Pronounced CHOH'-yah, this plant is closely related to pricklypears. Both plants have jointed stems, although one has rounded stems and the other flat. Of the three species of cholla in the Park, the walkingstick cholla is the largest, sometimes growing to a height of nine feet and with a trunk ten inches in diameter. The purple

(Below);

Christmas cholla



(above)

Walkingstick
cholla



blossoms are large, and the ripe yellow fruits may remain on the plant for many months.

By removal of the fleshy tissues, a woody skeleton is left which may be made into wierd walking canes, hence its name, or it may be used for table lamps and other decorative pieces.

Chollas and pricklypears grow easy from stem cuttings. In Mexico they are planted in rows to make very effective fences and corrals.

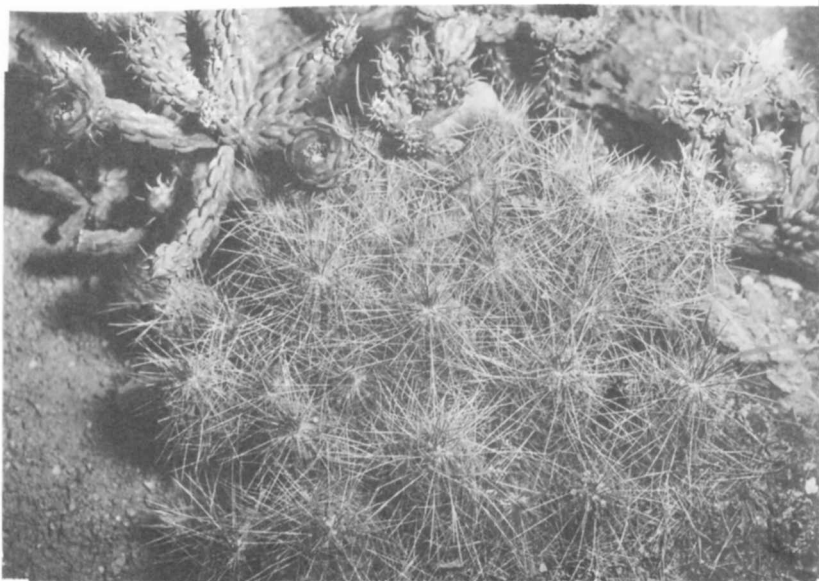
7. MESQUITE. *Prosopis juliflora*. The shrubby plant with the long thorns and light green foliage (except in winter) is a mesquite. In spring you may see its yellow flowers, called catkins, and in summer you will see its long beanpods. During the winter, the mesquite sheds its leaves.

The seeds are considered an important wildlife food, being eaten by scaled quail, rock squirrels, skunks, jack rabbits, and mule deer of the area.

The mesquite played an important part in the life of the Southwestern Indian. The beans were ground into flour for bread, or because of the beans' high sugar content the flour was fermented in preparation of an intoxicating beverage. The plant was a source of black dye and a cement for mending pottery.

The tree has deep roots to tap permanent moisture; an adaptation for arid conditions. The wood is used for charcoal, fuel, furniture, building blocks, crossties, and posts, and is often the only wood available in regions where it grows.

8. MARIOLA, *Parthenium incanum* Mariola is a rather nondescript plant with ashy-gray leaves and small inconspicuous flowers. Insects are not attracted to the flowers and the plant depends upon desert winds for pollination. It grows commonly on dry hills and gravelly mesas and because of its bad



Strawberry Hedgehog Cactus

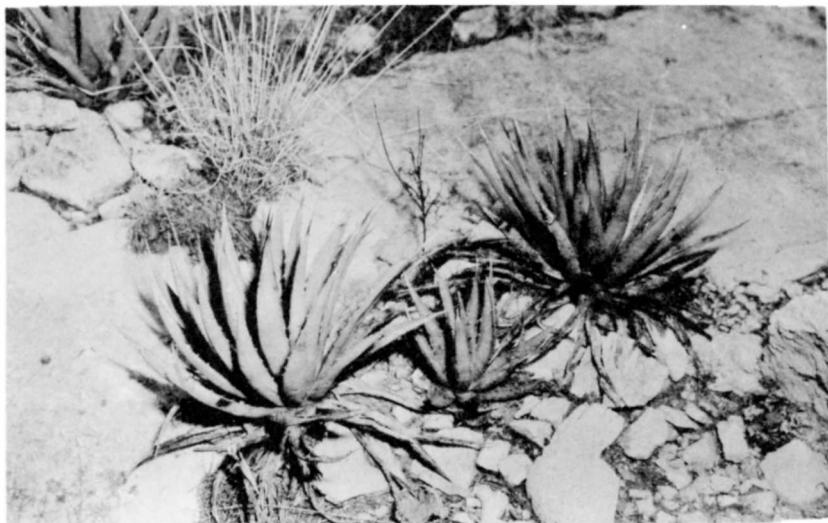
taste is only slightly browsed by wildlife.

A close relative, Guayule (Wye-YOU-lee), *Parthenium argentatum*, formerly was a basis for a flourishing rubber industry in Mexico. By various mechanical and chemical processes, rubber was removed from the stems of these plants. Mariola also contains rubber but in lesser amounts.

9. STRAWBERRY HEDGEHOG CACTUS. *Echinocereus stramineus*. The strawberry cactus, one of the first to bloom in spring, has large showy flowers, colored red or purple. The fruits are dark red, juicy, rich in sugar, and taste like strawberries. The fruits are important food items for birds and mammals.

10. LECHUGUILLA, *Agave lechuguilla*. Pronounced lay-choo-GHEE-ah, this plant is a member of the amaryllis family, and one of the so-called "century plants." It grows for several years, sends up a flowering stalk at an amazing speed of several inches daily, and then dies. Young plants may grow from the roots of older plants; thus lechuguillas often grow in dense clusters, making it difficult to hike or ride horseback over the countryside.

Lechuguilla



Few animals will feed on lechuguilla because of the long terminal spines and smaller spines along edges of the leaf. However, from below, pocket gophers eat the roots and escape the spines. Possibly you may notice small mounds of earth pushed up by these subterranean mammals as they burrow around the plants. Lechuguilla is considered poisonous to livestock.

Fibers in the fleshy leaves are used extensively in northern Mexico for making brushes, matting, twine, and rope. The short trunk can be cut into pieces, soaked in water, and used as a substitute for soap, called "amole." Indians roasted the stems and stalks of lechuguilla, sotol, and various yuccas in "mescal," or cooking pits, to make a food called mescal. The name of the Mescalero Apaches, who once roamed this area, came from this food habit. Lechuguilla is an important indicator plant for the Chihuahuan Desert.

11. BENCH. Rest for a few minutes, face the valley, and visualize the events that once occurred in this vicinity.

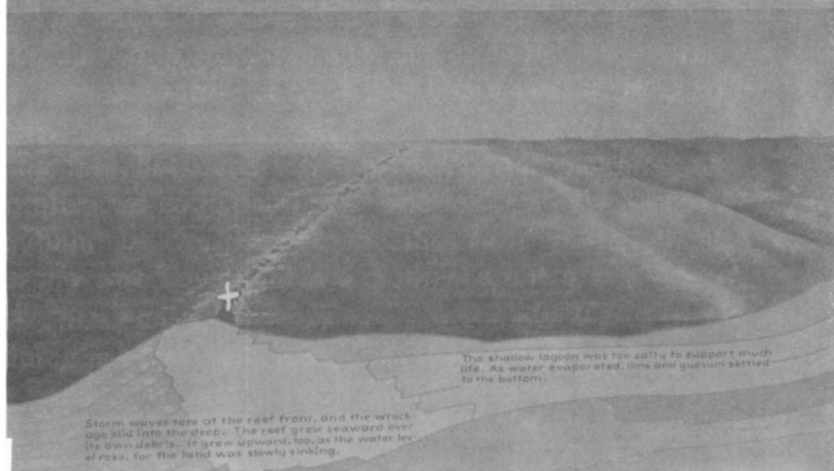
Imagine that before you is a broad expanse of deep blue sea water, as deep as the valley below. You are just above the level of the sea, and waves are lapping at your feet. It is low tide; to your left and right in a sweeping curve is the narrow exposed part of a reef crest. The reef front is the escarpment dipping steeply to the valley floor. Behind you for several miles is the quiet expanse of a shallow, peaceful lagoon. (In the photograph below, you would probably be at the point marked "X.") This is how the area would have appeared more than 200 million years ago in the Permian period, when a sea covered a large part of west Texas and southeastern New Mexico.

Precipitates of salt and gypsum were deposited in the sea. Today, these deposits have been eroded from the reef, but the valley below still has extensive beds of gypsum and salt; the salt gave rise to the potash industry, an important mining industry in the Carlsbad area. Black smoke from one of several potash mines can sometimes be seen to your left across the valley.

To your far right on the horizon are the Guadalupe Moun-

THE LIVING REEF

A deep arm of the sea covered this region 200 million years ago. Around its edge plants and animals built a limestone reef.



tains. The steep cliff-faced peak is El Capitan; the hump behind it is Guadalupe Peak, the highest point in Texas, 8,751 feet. If the day is extremely clear you may be able to see the Davis Mountains in Texas, 125 miles directly across the valley in front of you.

A pine, fir, and spruce forest once covered the valley and these arid foothills during the ice ages 10,000 or more years ago when the surface was enveloped in a relatively cool climate influenced by continental glaciation to the north. Rainfall was abundant; water seeped into the ground, and minerals were carried into the caverns to build the many formations. Today, because of sparse rainfall, the caverns are considered dormant.

In the times of the great forests, you could have seen mastodons, large elephant-like creatures, and other beasts characteristic of the ice ages. Now-extinct species of camel, horse, antelope, caribou, bison, and bear once roamed this area. The bones of a huge ground sloth and jaguar have been found inside

the caverns. Primitive man left his paintings on the walls inside.

Climates change, and now we have a desert with different kinds of plants and animals. In the past 400 to 600 years, Mes-calero Apaches roamed this area and camped over the very area of the nature trail. From this point they probably gazed across the plains below, watching for pioneer wagon trains that followed the Butterfield Trail.

Also, they might have watched the Spanish Conquistadores heading north across the valley looking for lost cities of gold. At the turn of this century, ranchers were already homesteading this area, and the Apaches were driven north. Cowboys, riding horseback over these hills likely discovered the cavern entrance by the 1880's. In 1901, one of these cowboys, Jim White, made the first known explorations of Carlsbad Caverns.

12. SLIMLEAF GOLDENEYE *Viguiera tenuifolia*. One of the most beautiful of the sunflower family, the goldeneye is a perennial or a plant that lives from year to year. During the summer months these plants color the hillsides.

The sunflower, or composite, family is a very large group. Other composites with which you may be familiar are the daisy, aster, zinnia, dahlia, marigold, chrysanthemum, and thistle. The chief characteristic of the family is the cluster of small flowers borne in one dense head. What we commonly call a sunflower and think of as being a single flower is really a whole "bouquet."

13. TORREY YUCCA, *Yucca torreyi*. The Torrey yucca is the largest of three yuccas found in the park, and like many yuccas is often mistaken for a palm tree. Yet it is a member of the lily family. It is adapted for desert life by having sharp spines and recurved leaves with a waxy coating. Recurved leaves may aid in breaking up direct rays of the sun and could concentrate the flow of rainwater down the trunk and around the roots of the plant.

In bloom, this yucca has a dense head of creamy-yellow, bell-shaped flowers growing from the top center of the plant. It blooms in the spring and by late summer has developed very large pods filled with seeds that are eaten by yucca moth



Torrey Yucca

larvae and by other animals. The buds, flowers and green peeling of the seed pods were eaten raw by Indians who used fibers from the leaves for sandals, rope, matting, and baskets.

This and other species of yucca are often called Spanish bayonet, or Spanish dagger.

14. ALGERITA.

Berberis (Mahonia) trifoliata.

The algerita, which blooms early, is a fine source of early nectar for honey bees. Berries of the algerita, excellent for jelly and wine, are relished by birds and various mammals besides man. The roasted seed is reported to be a substitute for coffee.

A yellow dye can be made from the roots and wood. The sap contains berberine, a drug used by Indians as a tonic and by frontiersmen for toothache. Berberine is used sometimes on certain tropical sores to kill protozoans and other forms of lower life.

Algerita is susceptible to black stem rust of wheat and is alternate host; therefore, it is a menace in cereal growing regions, and its use as an ornamental shrub is somewhat restricted.

15. GROVE OF SMALL OAK TREES AND BENCH.

The gray oak, *Quercus grisea*, is the most common oak in this area. On dry windy slopes this oak is usually shrub-like, but in well protected situations with adequate moisture it may grow to a tree 65 feet high.

The wood can be used as fuel and posts. The leaves are browsed by livestock, deer, and porcupines. Deer, ground squirrels, and some birds feed on the small acorns.

Sit and rest for a few minutes and read the next several paragraphs. While walking this nature trail you may feel that this is an arid desert region, especially if the weather is hot and dry. But to some people, deserts have different meanings. To many, a desert may be shifting sand dunes, as the Sahara, or it may be the floor of Death Valley with its salt-impregnated waters and furnace like winds. An adequate definition of a desert cannot be based on a single factor such as inadequate rainfall. Deficient and uncertain rainfall is certainly a basic factor, but accompanying temperatures, low humidities, high winds, and chemical composition of soils also may produce a desert. It can be defined only in general terms. However, a desert usually has less rain, more wind, more sun, and higher temperatures than other regions on earth.

Deserts are often regions of vast extremes; cool still nights and hot windy days and one common problem; lack of water. The biologist or ecologist, regards a desert as an area of deficient rainfall that has made strong impressions on the structure, function, and behavior of living things.

We have described some of the ways plants adapt to a scarcity of water: Shallow roots gather the scant rainfall; fleshy tissues store water; a waxy coating on leaves — and thin, narrow curved leaves — prevent excessive water loss. Or perhaps there are no leaves at all. Other adaptations include sap that has a high viscosity and is resistant to drying; roots that dig deep to tap permanent moisture, as in the mesquite; roots that may be toxic and prevent crowding of plants to lessen water competition, as in the creosotebush; the ability to shed leaves several times a year in times of dryness, as in the ocotillo; and numerous annuals whose seeds can lie dormant for several years and germinate only when the right moisture conditions exist, and then have the ability to grow quickly, bloom, and seed while moisture is still available.

Animals have their adaptations too. The burrowing habit is common, for within a depth of but several inches the soil temperature approaches the average annual temperature for the region. In burrows, or beneath rocks, or even inside caves, animals can escape the heat of summer and the cold of winter and emerge when conditions are favorable. Furthermore, the moist air of burrows helps lessen the degree of water lost through respiration.

Since animals are abundant in the desert, and some have home ranges that do not include a body of water, how do they obtain water? Many exist primarily on dew or water obtained from eating succulent plants. For those that eat dry seeds, the process is a little more complicated. The burning, or metabolism, of dry food eaten releases heat energy, carbon dioxide, and water. By reabsorbing water from their excrement before it leaves the body, many desert animals can reuse the water over and over again. Carnivores, or flesh eaters, often range long distances to permanent water holes. Also, they utilize water from the blood and tissue of their victims. Thus, most desert animals can exist for long periods without actually drinking.

Oneseed juniper (below)



16. ONESEED JUNIPER

Juniperus monosperma. There are three species of juniper in the park, but this one is the most common. Often mis-called cedars, junipers are closely related to pines. They are beneficial in furnishing food for many types of wildlife. Early Indians used the shredded bark for padding and torches, and made medicine from the berries or ground them into flour for bread. Since juniper wood does not decay rapidly it is

widely used for fence posts. It is also a good source of fuel.

17. OCOTILLO *Fouquieria splendens*. This thorny shrub, with numerous long, whip-like, unbranched stems, is a common plant throughout the deserts of the United States. It is often mistaken for a cactus, but it belongs in a family all to itself.

The ocotillo, pronounced oh-koh-TEE-oh, drops its leaves in dry weather to conserve water. It quickly refoliates after a heavy rain, except in winter when temperatures are too low. It thus becomes semidormant during hot dry periods. In sections of the desert where rains are relatively frequent, it may bear leaves several times a year.

Its uses are varied. The flowers and seed pods may be eaten, and a beverage and a cough medicine may be made from the flowers. The bark, containing gum, resin, and wax, was formerly used for waxing leather. The powdered root is used for dressing wounds and swellings. Apache Indians bathed in a decoction of the roots to relieve fatigue. The wood is hard and heavy, burns readily, and living stems are often used for fence rows.

18. CREOSOTE BUSH. *Larrea tridentata*. Vast acres of overgrazed plains are covered with inedible creosote bushes. The roots of this plant poison the soil, and other plants cannot always grow nearby to offer competition for precious moisture.

19. GREEN EPHEDRA AND CHRISTMAS CHOLLA. *Ephedra viridis* and *Opuntia leptocaulis*. The ephedra is a good example of a leafless plant. Chlorophyll for photosynthesis is contained in the slim rounded stems.

In winter, ephedra is an important browse plant for wildlife when better forage is lacking. A palatable beverage, known as Mormon tea, Brigham tea, or desert tea, is made from the dried stems and flowers. Indians and early settlers used ephedra for treatment of syphilis and other diseases.

The Christmas cholla, or tesajo, is the smallest of three cholla species found in the park. During winter it has bright red fruits and is one of the most attractive plants of this season.

20. LITTLELEAF SUMAC *Rhus microphylla*. The sumac

is related to poison oak and poison ivy but is not poisonous itself. The bushy nature of the plant affords protection for small birds but offers little in the way of food. The leaves are seldom browsed by livestock and wildlife, and the berries are eaten by only a few species.

21. CAVERN ENTRANCE. To your right is the main entrance to Carlsbad Caverns. Complete tours enter here and take park visitors through three miles of underground wonders. Shortly after sunset, on summer evenings, the large colony of Mexican freetail bats living in the Bat Cave section of the caverns swarm out of the entrance in a spectacular flight. Each evening during the warmer months a naturalist presents a talk on the bats. The time at which these talks are given is posted on the information board of the visitor center.



Cavern entrance

22. SOUTHWESTERN CONDALIA. *Condalia lycioides.*

Birds and other small animals find refuge in the impenetrable growth of this shrub. The dark blue fruits are relished by many birds, particularly scaled quail. A medicine was obtained from the roots by Indians to treat sore eyes, and the bark of the root was used as a soap substitute.

23. DESERT-WILLOW *Chilopsis linearis.* Not a true willow, the plant belongs to the Bignonia family. The leaves are willow-like in appearance.

The wood is used for fence posts and fuel, and baskets may be woven from the twigs. In Mexico, a decoction of the flowers is used for coughs. Bees make delicious honey from the nectar. The foliage is seldom used by wildlife. This tree grows readily and is often used for ornament because of its beautiful lavender blossoms.

We hope you have enjoyed this short hike and that you have found interest and inspiration in the desert personalities that you have met along the way. If we of the National Park Service may be of further assistance to you during your visit at Carlsbad Caverns, please feel free to call upon us. When in doubt, ask a park ranger.

This booklet is published by
CARLSBAD CAVERNS
NATURAL HISTORY ASSOCIATION

P. O. Box 1599, Carlsbad, New Mexico

which is a non-profit organization pledged to aid in the preservation and interpretation of the park area and features of interest in the Southwest.

The Association lists for sale interesting and accurate publications concerning the biological, archeological, and geological features of this park and the Southwest, and the National Parks in general. These publications are for adults and children and make fine gifts. They are of value as reference materials for children in their school work and hobbies.

THE INDIANS OF CARLSBAD CAVERNS NATIONAL PARK. Williams. An elementary booklet for those interested in the Indians of this area. Has 40 pages with numerous photographs and drawings and a bibliography. Paper edition \$0.50

ANIMALS OF THE SOUTHWEST DESERTS. Olin and Cannon. Handsome illustrations, full descriptions, and life habits of the 42 most interesting and common species which make up the strange animal population of the lower desert country of the Southwest below 4,500 feet. 112 pages, 74 illustrations, color paper. \$1.00

FLOWERS OF THE SOUTHWEST MOUNTAINS. Arnberger and Janish. Descriptions and illustrations of more than 150 plants and trees of the southern Rocky Mountains and other southwestern ranges above 7000 feet. 112 pages, color cover, paper \$1.00

FLOWERS OF THE SOUTHWEST DESERTS. Dodge. 100 of the most interesting and common desert plants, in color, with descriptive text. \$1.50

FLOWERS OF THE SOUTHWEST MESAS. Patraw and Janish. Companion volume to the deserts flower booklet, but covering the plants of the plateau country of the Southwest. More than 150 species are beautifully illustrated in the 100 plates of line drawings. Descriptive text, 112 pages, color cover, paper. \$1.00

GEOLOGY OF THE CARLSBAD CAVERNS EAST QUADRANGLE NEW MEXICO. Gale. A geologic quadrangle map of the United States with a chapter on the geologic development of Carlsbad Caverns. \$1.00

POISONOUS DWELLERS OF THE DESERT. Dodge. Invaluable handbook for persons living in the desert. Tells the facts about dangerous insects, snakes, etc., giving treatment for bites and stings, and dispels myths about harmless creatures mistakenly believed poisonous. 48 pages, color cover, paper \$0.60

EXPLORING OUR NATIONAL PARKS AND MONUMENTS. Butcher. An excellent guide and reference book to the National Parks and Monuments of the United States. It is beautifully illustrated with color and black and white photographs with vivid descriptions of the birds, trees, flowers, and scenic wonders of the National Parks and Monuments. 238 pages, color cover, paper \$3.85

THE NATIONAL PARKS: WHAT THEY MEAN TO YOU AND ME. Tilden. A readable and perceptive interpretation of the scenic and scientific areas of the National Park System. Not illustrated, 362 pages, paper. \$1.00

WHAT ABOUT BATS? Baker. An interesting description of bats written in a lively style, with numerous illustrations, and covering such topics as ancestry and classification, food habits, and ability to fly in the dark. Paper edition, 56 pages \$0.50

GUIDE BOOK TO CARLSBAD CAVERNS NATIONAL PARK. Spangle editor. A very informative publication on the geology, biology, archeology, and history of the Carlsbad Caverns. Numerous authors contributed to this guide book. Paper edition with 43 pages illustrated. \$0.50



Published in cooperation with the
NATIONAL PARK SERVICE

Cover: Texas Sotol